Resilient Modulus Testing - US Customary Units

Date: March 22, 2010

Project: BL-10-00425

Client:
Mr. Harkanwal Brar
SRA
1201 New Road Suite 242
Linwood, NJ 08221

Project Description:
Resilient Modulus Test
AASHTO T307
Client ID: NAPTF Subgrade Soils
Station:

Sample Information

Braun Sample ID./ File Name:	440S	Sample Diameter, in.:	2.82	Sample M.C., % before, after:	29.9, 29.9
Sample Type:	Type 2	Sample Height, in.:	5.58	Sample Dry Den., pcf:	92.5
Test Date:	04-Mar-2010	Desired M.C., %:	29.9	Failed in Shear?:	YES
Comments:		Desired Dry Den., pcf:	92.5	Triaxial Shear Strength, psi:	31.8

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 Maximum Axial Load	Actual Applied Cyclic Load	Actual Applied Contact Load	Actual Applied Maximum 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 LVDT 2	Resilient Strain	Resilient Modulus
DESIGNATION	S3	Scyclic	c1	Pmax	Pcyclic	Pcontact	Smax	Scyclic	Scontact	H1	H2	H average		Mr
UNIT	psi	psi	---	lbs.	lbs.	lbs.	psi	psi	psi	inches	inches	inches	in/in	psi
PRECISION	- - -.-	- - -.-	-	- - - -.-	- - - -.-	- - -.-	- - -.-	- - -.-	- - -.-	-.- - - - -	-.- - - - -	-.- - - - -	-.- - - - -	- - -
SEQUENCE 1	6.0	2.0	1	12.5	11.3	1.2	2.0	1.8	0.2	0.00079	0.00074	0.00076	0.00014	13,255
			2	12.5	11.3	1.2	2.0	1.8	0.2	0.00078	0.00074	0.00076	0.00014	13,234
			3	12.5	11.3	1.2	2.0	1.8	0.2	0.00079	0.00074	0.00076	0.00014	13,202
			4	12.6	11.4	1.2	2.0	1.8	0.2	0.00079	0.00074	0.00076	0.00014	13,282
			5	12.5	11.3	1.2	2.0	1.8	0.2	0.00079	0.00074	0.00076	0.00014	13,340
	COLUMN AVERAGE			12.5	11.3	1.2	2.0	1.8	0.2	0.00079	0.00074	0.00076	0.00014	13,263
	STANDARD DEV.			0.04	0.04	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	52

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 2	6.0	4.0	1	25.0	22.5	2.4	4.0	3.6	0.4	0.00151	0.00147	0.00149	0.00027	13,510
			2	24.9	22.5	2.4	4.0	3.6	0.4	0.00151	0.00147	0.00149	0.00027	13,480
			3	24.9	22.5	2.4	4.0	3.6	0.4	0.00151	0.00147	0.00149	0.00027	13,504
			4	25.0	22.6	2.4	4.0	3.6	0.4	0.00151	0.00148	0.00149	0.00027	13,518
			5	25.0	22.6	2.4	4.0	3.6	0.4	0.00151	0.00147	0.00149	0.00027	13,562
	COLUMN AVERAGE			24.9	22.5	2.4	4.0	3.6	0.4	0.00151	0.00147	0.00149	0.00027	13,515
	STANDARD DEV.			0.05	0.05	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	30
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 3	6.0	6.0	1	37.5	33.8	3.7	6.0	5.4	0.6	0.00228	0.00226	0.00227	0.00041	13,301
			2	37.5	33.9	3.7	6.0	5.4	0.6	0.00228	0.00226	0.00227	0.00041	13,328
			3	37.6	34.0	3.7	6.0	5.4	0.6	0.00228	0.00227	0.00227	0.00041	13,332
			4	37.5	33.8	3.7	6.0	5.4	0.6	0.00228	0.00226	0.00227	0.00041	13,330
			5	37.4	33.8	3.6	6.0	5.4	0.6	0.00228	0.00226	0.00227	0.00041	13,308
	COLUMN AVERAGE			37.5	33.8	3.7	6.0	5.4	0.6	0.00228	0.00226	0.00227	0.00041	13,320
	STANDARD DEV.			0.07	0.07	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	14
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 4	6.0	8.0	1	49.9	45.1	4.9	8.0	7.2	0.8	0.00309	0.00307	0.00308	0.00055	13,073
			2	49.9	45.0	4.9	8.0	7.2	0.8	0.00308	0.00307	0.00308	0.00055	13,057
			3	49.9	45.1	4.9	8.0	7.2	0.8	0.00308	0.00308	0.00307	0.00055	13,085
			4	50.0	45.1	4.9	8.0	7.2	0.8	0.00308	0.00308	0.00308	0.00055	13,092
			5	49.9	45.1	4.8	8.0	7.2	0.8	0.00309	0.00308	0.00308	0.00055	13,062
	COLUMN AVERAGE			49.9	45.1	4.9	8.0	7.2	0.8	0.00308	0.00307	0.00308	0.00055	13,074
	STANDARD DEV.			0.04	0.04	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	15

Sample ID: 440S

Project: BL-10-00425

Sheet No. 2 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 5	6.0	10.0	1	62.3	56.2	6.1	10.0	9.0	1.0	0.00392	0.00392	0.00392	0.00070	12,788
			2	62.3	56.2	6.1	10.0	9.0	1.0	0.00392	0.00392	0.00392	0.00070	12,806
			3	62.4	56.3	6.1	10.0	9.0	1.0	0.00392	0.00391	0.00391	0.00070	12,834
			4	62.4	56.3	6.1	10.0	9.0	1.0	0.00392	0.00391	0.00391	0.00070	12,842
			5	62.3	56.2	6.1	10.0	9.0	1.0	0.00392	0.00391	0.00391	0.00070	12,813
	COLUMN AVERAGE			62.3	56.2	6.1	10.0	9.0	1.0	0.00392	0.00391	0.00391	0.00070	12,816
	STANDARD DEV.			0.06	0.06	0.01	0.01	0.01	0.00	0.00000	0.00001	0.00000	0.00000	22
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 6	4.0	2.1	1	12.9	11.3	1.6	2.1	1.8	0.3	0.00080	0.00077	0.00078	0.00014	12,879
			2	12.9	11.3	1.6	2.1	1.8	0.3	0.00081	0.00077	0.00079	0.00014	12,802
			3	12.8	11.2	1.6	2.0	1.8	0.3	0.00080	0.00077	0.00078	0.00014	12,785
			4	12.9	11.3	1.6	2.1	1.8	0.3	0.00081	0.00077	0.00079	0.00014	12,812
			5	12.9	11.3	1.6	2.1	1.8	0.3	0.00081	0.00077	0.00078	0.00014	12,883
	COLUMN AVERAGE			12.9	11.3	1.6	2.1	1.8	0.3	0.00081	0.00077	0.00078	0.00014	12,832
	STANDARD DEV.			0.03	0.03	0.01	0.01	0.00	0.00	0.00000	0.00000	0.00000	0.00000	45
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 7	4.0	4.0	1	25.1	22.6	2.5	4.0	3.6	0.4	0.00157	0.00154	0.00155	0.00028	13,020
			2	25.0	22.5	2.5	4.0	3.6	0.4	0.00156	0.00154	0.00155	0.00028	12,944
			3	25.1	22.6	2.5	4.0	3.6	0.4	0.00156	0.00154	0.00155	0.00028	13,014
			4	25.2	22.6	2.5	4.0	3.6	0.4	0.00157	0.00154	0.00155	0.00028	13,036
			5	25.1	22.6	2.5	4.0	3.6	0.4	0.00157	0.00154	0.00155	0.00028	13,015
	COLUMN AVERAGE			25.1	22.6	2.5	4.0	3.6	0.4	0.00156	0.00154	0.00155	0.00028	13,006
	STANDARD DEV.			0.05	0.05	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	35

Sample ID: 440S

Project: BL-10-00425

Sheet No. 3 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 8	4.0	6.0	1	37.5	33.8	3.7	6.0	5.4	0.6	0.00234	0.00235	0.00235	0.00042	12,860
			2	37.4	33.8	3.6	6.0	5.4	0.6	0.00235	0.00234	0.00235	0.00042	12,846
			3	37.4	33.8	3.7	6.0	5.4	0.6	0.00234	0.00235	0.00235	0.00042	12,848
			4	37.5	33.8	3.6	6.0	5.4	0.6	0.00234	0.00235	0.00234	0.00042	12,891
			5	37.5	33.9	3.6	6.0	5.4	0.6	0.00235	0.00235	0.00235	0.00042	12,880
	COLUMN AVERAGE			37.5	33.8	3.6	6.0	5.4	0.6	0.00235	0.00235	0.00235	0.00042	12,865
	STANDARD DEV.			0.05	0.05	0.01	0.01	0.01	0.00	0.00001	0.00000	0.00000	0.00000	20
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 9	4.0	8.0	1	50.1	45.1	5.0	8.0	7.2	0.8	0.00319	0.00320	0.00319	0.00057	12,617
			2	50.0	45.0	5.0	8.0	7.2	0.8	0.00319	0.00319	0.00319	0.00057	12,614
			3	49.9	45.0	5.0	8.0	7.2	0.8	0.00319	0.00320	0.00319	0.00057	12,567
			4	49.9	45.0	5.0	8.0	7.2	0.8	0.00318	0.00320	0.00319	0.00057	12,596
			5	50.0	45.1	4.9	8.0	7.2	0.8	0.00318	0.00320	0.00319	0.00057	12,615
	COLUMN AVERAGE			50.0	45.0	5.0	8.0	7.2	0.8	0.00319	0.00319	0.00319	0.00057	12,602
	STANDARD DEV.			0.05	0.06	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	21
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 10	4.0	10.0	1	62.4	56.3	6.1	10.0	9.0	1.0	0.00409	0.00410	0.00409	0.00073	12,278
			2	62.4	56.3	6.1	10.0	9.0	1.0	0.00409	0.00410	0.00409	0.00073	12,272
			3	62.5	56.4	6.1	10.0	9.0	1.0	0.00409	0.00411	0.00410	0.00073	12,282
			4	62.5	56.4	6.1	10.0	9.0	1.0	0.00409	0.00411	0.00409	0.00073	12,299
			5	62.5	56.3	6.1	10.0	9.0	1.0	0.00409	0.00410	0.00410	0.00073	12,269
	COLUMN AVERAGE			62.5	56.3	6.1	10.0	9.0	1.0	0.00409	0.00411	0.00410	0.00073	12,280
	STANDARD DEV.			0.06	0.05	0.02	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	12

Sample ID: 440S

Project: BL-10-00425

Sheet No. 4 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 11	2.0	2.1	1	13.2	11.3	2.0	2.1	1.8	0.3	0.00091	0.00087	0.00089	0.00016	11,367
			2	13.3	11.3	2.0	2.1	1.8	0.3	0.00091	0.00087	0.00089	0.00016	11,367
			3	13.3	11.3	2.0	2.1	1.8	0.3	0.00091	0.00088	0.00089	0.00016	11,306
			4	13.3	11.3	2.0	2.1	1.8	0.3	0.00091	0.00087	0.00089	0.00016	11,319
			5	13.3	11.3	2.0	2.1	1.8	0.3	0.00091	0.00087	0.00089	0.00016	11,364
	COLUMN AVERAGE			13.3	11.3	2.0	2.1	1.8	0.3	0.00091	0.00087	0.00089	0.00016	11,345
	STANDARD DEV.			0.03	0.03	0.01	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000	30
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 12	2.0	4.0	1	25.0	22.5	2.5	4.0	3.6	0.4	0.00177	0.00175	0.00176	0.00031	11,437
			2	25.1	22.6	2.5	4.0	3.6	0.4	0.00178	0.00176	0.00177	0.00032	11,433
			3	25.1	22.6	2.5	4.0	3.6	0.4	0.00178	0.00175	0.00176	0.00032	11,449
			4	25.0	22.5	2.5	4.0	3.6	0.4	0.00178	0.00176	0.00177	0.00032	11,397
			5	25.1	22.6	2.5	4.0	3.6	0.4	0.00178	0.00175	0.00176	0.00032	11,440
	COLUMN AVERAGE			25.0	22.6	2.5	4.0	3.6	0.4	0.00177	0.00175	0.00176	0.00032	11,431
	STANDARD DEV.			0.05	0.04	0.00	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	20
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 13	2.0	6.0	1	37.4	33.7	3.7	6.0	5.4	0.6	0.00263	0.00263	0.00263	0.00047	11,439
			2	37.4	33.7	3.7	6.0	5.4	0.6	0.00263	0.00263	0.00263	0.00047	11,458
			3	37.5	33.8	3.7	6.0	5.4	0.6	0.00263	0.00263	0.00263	0.00047	11,473
			4	37.5	33.8	3.7	6.0	5.4	0.6	0.00263	0.00263	0.00263	0.00047	11,492
			5	37.4	33.7	3.7	6.0	5.4	0.6	0.00263	0.00262	0.00262	0.00047	11,468
	COLUMN AVERAGE			37.4	33.7	3.7	6.0	5.4	0.6	0.00263	0.00263	0.00263	0.00047	11,466
	STANDARD DEV.			0.06	0.06	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	19

Sample ID: 440S

Project: BL-10-00425

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 14	2.0	8.0	1	50.0	45.1	4.9	8.0	7.2	0.8	0.00352	0.00354	0.00353	0.00063	11,396
			2	49.9	45.0	4.9	8.0	7.2	0.8	0.00353	0.00354	0.00353	0.00063	11,373
			3	49.9	45.0	4.9	8.0	7.2	0.8	0.00352	0.00355	0.00353	0.00063	11,359
			4	50.0	45.1	4.9	8.0	7.2	0.8	0.00352	0.00354	0.00353	0.00063	11,418
			5	50.0	45.1	4.9	8.0	7.2	0.8	0.00353	0.00354	0.00353	0.00063	11,392
	COLUMN AVERAGE			50.0	45.0	4.9	8.0	7.2	0.8	0.00353	0.00354	0.00353	0.00063	11,388
	STANDARD DEV.			0.06	0.06	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	23
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 15	2.0	10.0	1	62.5	56.3	6.1	10.0	9.0	1.0	0.00449	0.00450	0.00449	0.00080	11,188
			2	62.6	56.4	6.1	10.0	9.0	1.0	0.00449	0.00451	0.00450	0.00081	11,202
			3	62.6	56.5	6.1	10.0	9.0	1.0	0.00449	0.00450	0.00449	0.00080	11,217
			4	62.5	56.4	6.1	10.0	9.0	1.0	0.00449	0.00450	0.00449	0.00080	11,206
			5	62.5	56.3	6.1	10.0	9.0	1.0	0.00449	0.00451	0.00450	0.00081	11,184
	COLUMN AVERAGE			62.5	56.4	6.1	10.0	9.0	1.0	0.00449	0.00450	0.00449	0.00080	11,199
	STANDARD DEV.			0.06	0.07	0.01	0.01	0.01	0.00	0.00000	0.00000	0.00000	0.00000	14

Sample ID: 440S

Project: BL-10-00425

Sheet No. 6 of

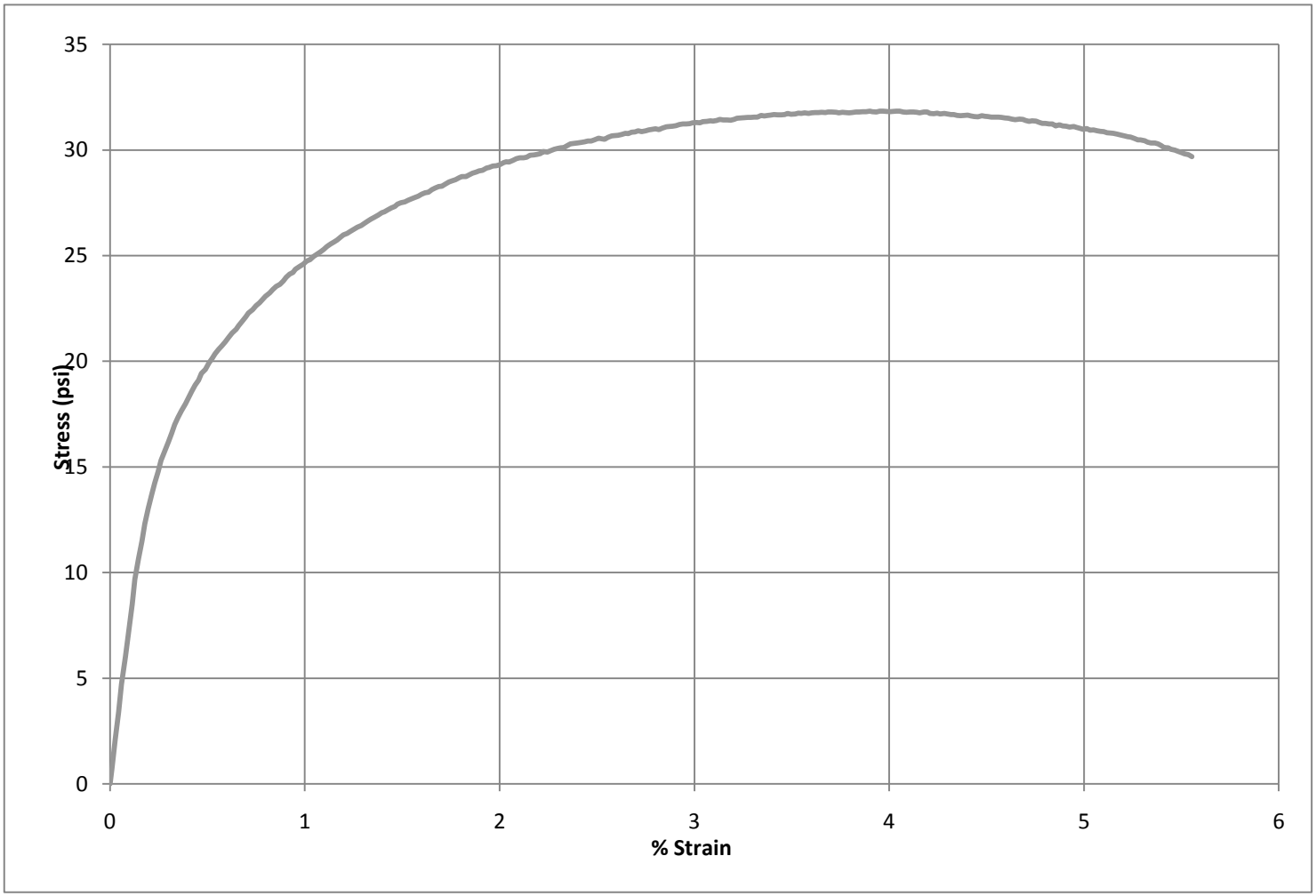
EJK

Laboratory Technician

Quick Shear

Confining Pressure 4 PSI

Peak Shear Stress (psi) = 31.84



Sample ID: 440S

Project: BL-10-00425

Sheet No. of

Resilient Modulus Testing - S. I. Units

Date: March 22, 2010

Project: BL-10-00425

Client:
Mr. Harkanwal Brar
SRA
1201 New Road Suite 242
Linwood, NJ 08221

Project Description:
Resilient Modulus Test
AASHTO T307
Client ID: NAPTF Subgrade Soils
Station:

Sample Information

Braun Sample ID./ File Name:	440S	Sample Diameter, mm:	71.7	Sample M.C., % before, after:	29.9, 29.9
Sample Type:	Type 2	Sample Height, mm:	141.8	Sample Dry Den., Kg/cu.m:	1480.9
Test Date:	04-Mar-2010	Desired M.C., %:	29.9	Failed in Shear?:	YES
Comments:		Desired Dry Den., Kg/cu.ı	1481.7	Triaxial Shear Strength, kPa:	219.5

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 Maximum Axial Load	Actual Applied Cyclic Load	Actual Applied Contact Load	Actual Applied Maximum 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 LVDT 2	Resilient Strain	Resilient Modulus
DESIGNATION	S3	Scyclic	c1	Pmax	Pcyclic	Pcontact	Smax	Scyclic	Scontact	H1	H2	H average		Mr
UNIT	kPa	kPa	---	N	N	N	kPa	kPa	kPa	mm	mm	mm	mm/mm	MPa
PRECISION	- - -.-	- - -.-	-	- - - -.-	- - - -.-	- - -.-	- - -.-	- - -.-	- - -.-	-.- - - - -	-.- - - - -	-.- - - - -	-.- - - - -	- - -
SEQUENCE 1	41.4	13.8	1	55.7	50.3	5.4	13.8	12.5	1.3	0.02000	0.01876	0.01934	0.00014	91
			2	55.5	50.2	5.3	13.8	12.4	1.3	0.01992	0.01891	0.01934	0.00014	91
			3	55.5	50.1	5.4	13.8	12.4	1.3	0.02008	0.01876	0.01934	0.00014	91
			4	55.9	50.5	5.4	13.8	12.5	1.3	0.02000	0.01891	0.01938	0.00014	92
			5	55.8	50.4	5.4	13.8	12.5	1.3	0.02000	0.01884	0.01926	0.00014	92
	COLUMN AVERAGE			55.7	50.3	5.4	13.8	12.5	1.3	0.02000	0.01884	0.01933	0.00014	91
	STANDARD DEV.			0.17	0.16	0.05	0.04	0.04	0.01	0.00005	0.00008	0.00004	0.00000	0

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 2	41.4	27.5	1	111.0	100.3	10.7	27.5	24.8	2.7	0.03829	0.03744	0.03783	0.00027	93
			2	110.6	99.9	10.7	27.4	24.8	2.7	0.03829	0.03736	0.03779	0.00027	93
			3	110.8	100.2	10.6	27.5	24.8	2.6	0.03829	0.03744	0.03783	0.00027	93
			4	111.1	100.4	10.7	27.5	24.9	2.7	0.03829	0.03752	0.03787	0.00027	93
			5	111.3	100.5	10.7	27.6	24.9	2.7	0.03829	0.03744	0.03779	0.00027	94
	COLUMN AVERAGE			111.0	100.3	10.7	27.5	24.9	2.7	0.03829	0.03744	0.03782	0.00027	93
	STANDARD DEV.			0.24	0.23	0.04	0.06	0.06	0.01	0.00000	0.00005	0.00003	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 3	41.3	41.3	1	166.7	150.4	16.3	41.3	37.3	4.0	0.05790	0.05744	0.05763	0.00041	92
			2	166.8	150.6	16.2	41.3	37.3	4.0	0.05783	0.05744	0.05759	0.00041	92
			3	167.3	151.0	16.2	41.5	37.4	4.0	0.05798	0.05759	0.05775	0.00041	92
			4	166.8	150.5	16.3	41.3	37.3	4.0	0.05790	0.05736	0.05755	0.00041	92
			5	166.5	150.3	16.2	41.3	37.2	4.0	0.05790	0.05736	0.05756	0.00041	92
	COLUMN AVERAGE			166.8	150.6	16.3	41.3	37.3	4.0	0.05790	0.05744	0.05762	0.00041	92
	STANDARD DEV.			0.30	0.30	0.03	0.07	0.07	0.01	0.00005	0.00010	0.00008	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 4	41.3	55.0	1	222.0	200.4	21.6	55.0	49.7	5.4	0.07837	0.07790	0.07814	0.00055	90
			2	221.8	200.2	21.6	55.0	49.6	5.4	0.07829	0.07806	0.07813	0.00055	90
			3	222.1	200.5	21.6	55.0	49.7	5.3	0.07821	0.07814	0.07810	0.00055	90
			4	222.3	200.7	21.6	55.1	49.7	5.4	0.07814	0.07821	0.07814	0.00055	90
			5	222.1	200.5	21.5	55.0	49.7	5.3	0.07837	0.07813	0.07825	0.00055	90
	COLUMN AVERAGE			222.1	200.5	21.6	55.0	49.7	5.4	0.07828	0.07809	0.07815	0.00055	90
	STANDARD DEV.			0.19	0.19	0.04	0.05	0.05	0.01	0.00010	0.00012	0.00006	0.00000	0

Sample ID: 440S

Project: BL-10-00425

Sheet No. 2 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 5	41.4	68.7	1	277.1	249.8	27.3	68.7	61.9	6.8	0.09961	0.09961	0.09957	0.00070	88
			2	277.2	250.0	27.2	68.7	61.9	6.8	0.09945	0.09961	0.09949	0.00070	88
			3	277.5	250.2	27.3	68.8	62.0	6.8	0.09945	0.09930	0.09937	0.00070	88
			4	277.7	250.4	27.3	68.8	62.0	6.8	0.09953	0.09930	0.09937	0.00070	89
			5	277.1	249.8	27.3	68.7	61.9	6.8	0.09945	0.09937	0.09937	0.00070	88
	COLUMN AVERAGE			277.3	250.0	27.3	68.7	62.0	6.8	0.09950	0.09944	0.09944	0.00070	88
	STANDARD DEV.			0.26	0.25	0.04	0.06	0.06	0.01	0.00007	0.00016	0.00009	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 6	27.6	14.2	1	57.4	50.3	7.0	14.2	12.5	1.7	0.02039	0.01953	0.01992	0.00014	89
			2	57.2	50.1	7.1	14.2	12.4	1.8	0.02046	0.01961	0.01996	0.00014	88
			3	57.0	50.0	7.0	14.1	12.4	1.7	0.02039	0.01953	0.01992	0.00014	88
			4	57.3	50.2	7.2	14.2	12.4	1.8	0.02054	0.01953	0.01996	0.00014	88
			5	57.3	50.3	7.0	14.2	12.5	1.7	0.02046	0.01954	0.01988	0.00014	89
	COLUMN AVERAGE			57.2	50.2	7.1	14.2	12.4	1.8	0.02045	0.01955	0.01993	0.00014	88
	STANDARD DEV.			0.14	0.14	0.06	0.04	0.03	0.01	0.00006	0.00003	0.00003	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 7	27.6	27.7	1	111.7	100.6	11.1	27.7	24.9	2.8	0.03984	0.03914	0.03938	0.00028	90
			2	111.3	100.1	11.2	27.6	24.8	2.8	0.03969	0.03914	0.03942	0.00028	89
			3	111.5	100.3	11.1	27.6	24.9	2.8	0.03969	0.03907	0.03930	0.00028	90
			4	111.9	100.7	11.2	27.7	25.0	2.8	0.03977	0.03907	0.03938	0.00028	90
			5	111.7	100.5	11.2	27.7	24.9	2.8	0.03977	0.03899	0.03938	0.00028	90
	COLUMN AVERAGE			111.6	100.5	11.2	27.7	24.9	2.8	0.03975	0.03908	0.03937	0.00028	90
	STANDARD DEV.			0.24	0.24	0.02	0.06	0.06	0.01	0.00006	0.00006	0.00004	0.00000	0

Sample ID: 440S

Project: BL-10-00425

Sheet No. 3 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 8	27.6	41.3	1	166.6	150.4	16.2	41.3	37.3	4.0	0.05953	0.05968	0.05961	0.00042	89
			2	166.4	150.2	16.2	41.2	37.2	4.0	0.05976	0.05953	0.05961	0.00042	89
			3	166.4	150.2	16.2	41.2	37.2	4.0	0.05953	0.05961	0.05957	0.00042	89
			4	166.7	150.6	16.2	41.3	37.3	4.0	0.05945	0.05969	0.05953	0.00042	89
			5	166.9	150.7	16.2	41.4	37.4	4.0	0.05976	0.05961	0.05965	0.00042	89
	COLUMN AVERAGE			166.6	150.4	16.2	41.3	37.3	4.0	0.05961	0.05962	0.05959	0.00042	89
	STANDARD DEV.			0.22	0.23	0.03	0.05	0.06	0.01	0.00015	0.00006	0.00004	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 9	27.6	55.1	1	222.7	200.6	22.1	55.2	49.7	5.5	0.08100	0.08116	0.08104	0.00057	87
			2	222.4	200.4	22.0	55.1	49.7	5.5	0.08100	0.08100	0.08096	0.00057	87
			3	222.1	200.0	22.1	55.0	49.6	5.5	0.08108	0.08123	0.08112	0.00057	87
			4	222.2	200.1	22.1	55.1	49.6	5.5	0.08085	0.08116	0.08097	0.00057	87
			5	222.5	200.5	22.0	55.1	49.7	5.4	0.08085	0.08116	0.08100	0.00057	87
	COLUMN AVERAGE			222.4	200.3	22.0	55.1	49.6	5.5	0.08096	0.08114	0.08102	0.00057	87
	STANDARD DEV.			0.24	0.26	0.05	0.06	0.06	0.01	0.00010	0.00008	0.00006	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 10	27.6	68.9	1	277.7	250.5	27.2	68.8	62.1	6.7	0.10395	0.10418	0.10399	0.00073	85
			2	277.6	250.4	27.2	68.8	62.0	6.7	0.10379	0.10426	0.10399	0.00073	85
			3	278.2	250.9	27.3	68.9	62.2	6.8	0.10395	0.10433	0.10414	0.00073	85
			4	278.0	250.8	27.2	68.9	62.2	6.7	0.10379	0.10434	0.10395	0.00073	85
			5	277.9	250.5	27.4	68.9	62.1	6.8	0.10387	0.10426	0.10406	0.00073	85
	COLUMN AVERAGE			277.9	250.6	27.2	68.9	62.1	6.8	0.10387	0.10427	0.10402	0.00073	85
	STANDARD DEV.			0.25	0.24	0.07	0.06	0.06	0.02	0.00008	0.00006	0.00008	0.00000	0

Sample ID: 440S

Project: BL-10-00425

Sheet No. 4 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 11	13.8	14.6	1	58.9	50.1	8.8	14.6	12.4	2.2	0.02302	0.02201	0.02248	0.00016	78
			2	59.0	50.1	8.9	14.6	12.4	2.2	0.02302	0.02209	0.02248	0.00016	78
			3	59.2	50.3	8.9	14.7	12.5	2.2	0.02317	0.02225	0.02267	0.00016	78
			4	59.0	50.1	8.9	14.6	12.4	2.2	0.02302	0.02217	0.02256	0.00016	78
			5	59.2	50.4	8.8	14.7	12.5	2.2	0.02310	0.02217	0.02259	0.00016	78
	COLUMN AVERAGE			59.1	50.2	8.9	14.6	12.4	2.2	0.02307	0.02214	0.02256	0.00016	78
	STANDARD DEV.			0.13	0.12	0.06	0.03	0.03	0.01	0.00007	0.00009	0.00008	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 12	13.8	27.6	1	111.2	100.2	11.0	27.5	24.8	2.7	0.04496	0.04449	0.04465	0.00031	79
			2	111.6	100.7	11.0	27.7	24.9	2.7	0.04511	0.04473	0.04488	0.00032	79
			3	111.4	100.5	11.0	27.6	24.9	2.7	0.04511	0.04441	0.04473	0.00032	79
			4	111.2	100.3	10.9	27.6	24.8	2.7	0.04511	0.04465	0.04484	0.00032	79
			5	111.4	100.5	11.0	27.6	24.9	2.7	0.04511	0.04457	0.04476	0.00032	79
	COLUMN AVERAGE			111.4	100.4	11.0	27.6	24.9	2.7	0.04508	0.04457	0.04477	0.00032	79
	STANDARD DEV.			0.20	0.19	0.02	0.05	0.05	0.00	0.00007	0.00012	0.00009	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 13	13.8	41.3	1	166.2	149.8	16.4	41.2	37.1	4.1	0.06690	0.06674	0.06674	0.00047	79
			2	166.4	150.0	16.4	41.2	37.2	4.1	0.06682	0.06682	0.06674	0.00047	79
			3	166.7	150.3	16.4	41.3	37.3	4.1	0.06674	0.06682	0.06678	0.00047	79
			4	166.8	150.5	16.4	41.3	37.3	4.1	0.06682	0.06682	0.06674	0.00047	79
			5	166.3	150.0	16.3	41.2	37.2	4.0	0.06674	0.06666	0.06666	0.00047	79
	COLUMN AVERAGE			166.5	150.1	16.4	41.3	37.2	4.1	0.06680	0.06677	0.06673	0.00047	79
	STANDARD DEV.			0.27	0.28	0.04	0.07	0.07	0.01	0.00007	0.00007	0.00004	0.00000	0

Sample ID: 440S

Project: BL-10-00425

Sheet No. 5 of

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 14	13.8	55.1	1	222.5	200.5	22.0	55.1	49.7	5.4	0.08953	0.08992	0.08968	0.00063	79
			2	222.0	200.0	22.0	55.0	49.6	5.4	0.08961	0.08984	0.08965	0.00063	78
			3	222.1	200.0	22.0	55.0	49.6	5.5	0.08953	0.09007	0.08976	0.00063	78
			4	222.6	200.7	21.9	55.2	49.7	5.4	0.08945	0.08984	0.08957	0.00063	79
			5	222.4	200.4	22.0	55.1	49.7	5.4	0.08961	0.08992	0.08968	0.00063	79
	COLUMN AVERAGE			222.3	200.3	22.0	55.1	49.6	5.4	0.08955	0.08992	0.08967	0.00063	79
	STANDARD DEV.			0.26	0.28	0.03	0.07	0.07	0.01	0.00007	0.00009	0.00007	0.00000	0
COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SEQUENCE 15	13.8	68.9	1	277.9	250.5	27.4	68.9	62.1	6.8	0.11402	0.11433	0.11414	0.00080	77
			2	278.3	251.0	27.3	69.0	62.2	6.8	0.11395	0.11449	0.11422	0.00081	77
			3	278.5	251.2	27.3	69.0	62.2	6.8	0.11402	0.11441	0.11414	0.00080	77
			4	278.1	250.8	27.4	68.9	62.1	6.8	0.11395	0.11426	0.11406	0.00080	77
			5	277.9	250.5	27.3	68.9	62.1	6.8	0.11394	0.11449	0.11418	0.00081	77
	COLUMN AVERAGE			278.1	250.8	27.3	68.9	62.2	6.8	0.11398	0.11440	0.11415	0.00080	77
	STANDARD DEV.			0.27	0.29	0.03	0.07	0.07	0.01	0.00004	0.00010	0.00006	0.00000	0

Sample ID: 440S

Project: BL-10-00425

Sheet No. 6 of

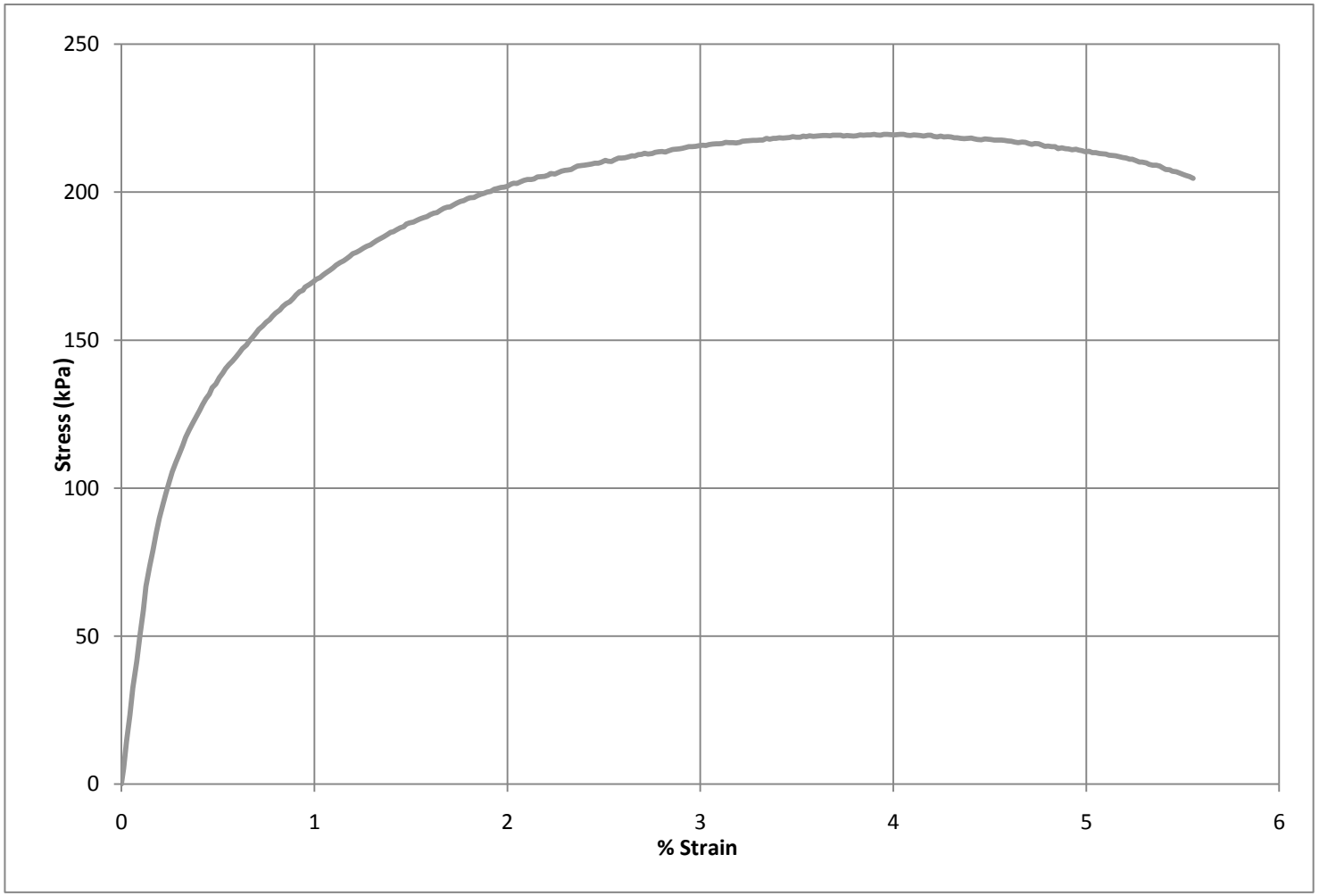
EJK

Laboratory Technician

Quick Shear

Confining Pressure 27.6 kPa

Peak Shear Stress (kPa) = 219.54



Sample ID: 440S

Project: BL-10-00425

Sheet No. of

Universal Model Calculations - US Customary Units

Braun Sample ID: 440S

Project: BL-10-00425

Station:

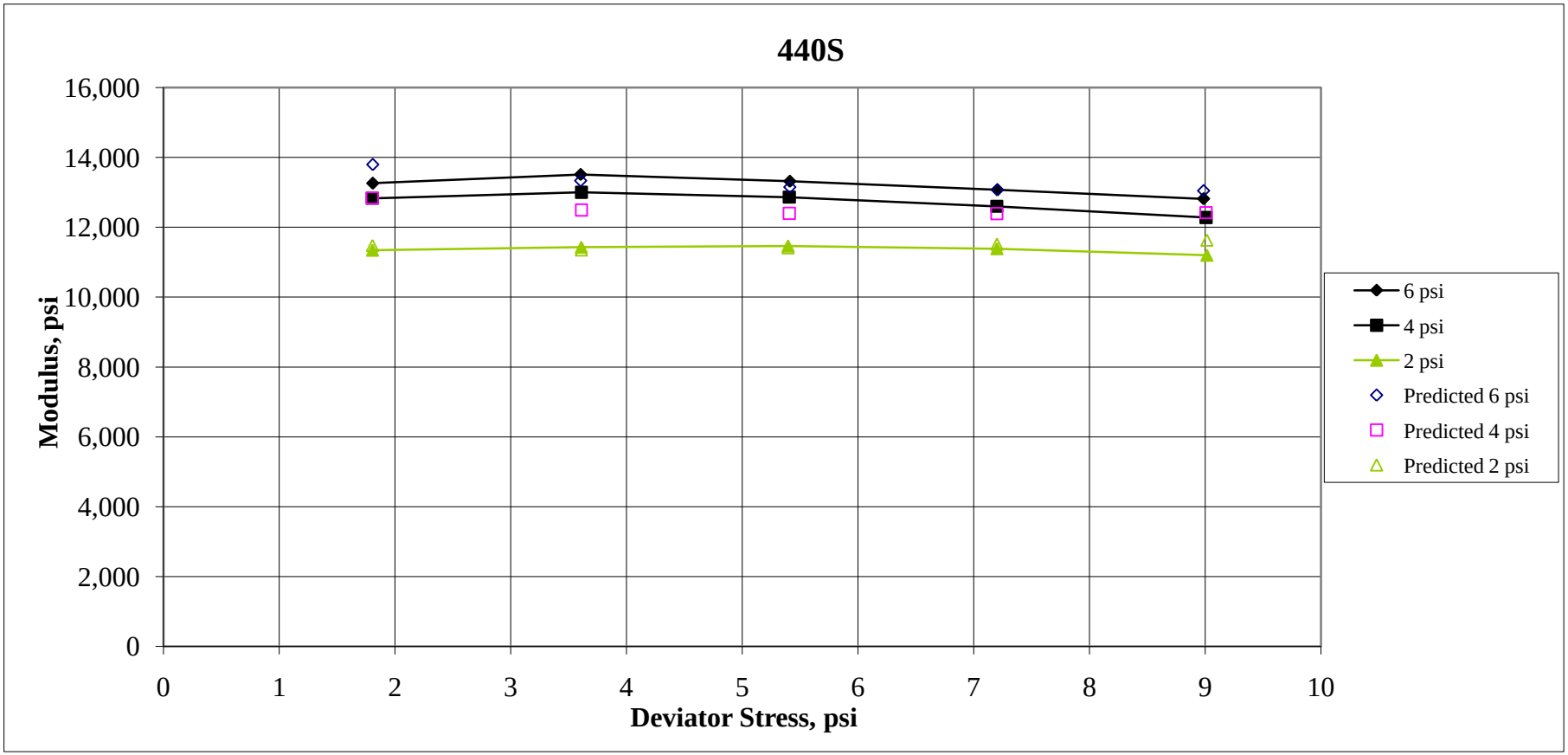
Seq.	Conf. psi	Axial Stress psi	Bulk psi	Deviator psi	M_r psi	Pred. Mr psi	Ln(Mr)	Ln(Bulk)	Ln(Dev)
1	6.0	2.0	20.0	1.8	13,263	13,801	9.493	2.996	0.592
2	6.0	4.0	22.0	3.6	13,515	13,336	9.512	3.091	1.282
3	6.0	6.0	24.0	5.4	13,320	13,152	9.497	3.177	1.689
4	6.0	8.0	26.0	7.2	13,074	13,074	9.478	3.257	1.975
5	6.0	10.0	28.0	9.0	12,816	13,048	9.458	3.331	2.196
6	4.0	2.1	14.1	1.8	12,832	12,840	9.460	2.643	0.590
7	4.0	4.0	16.0	3.6	13,006	12,494	9.473	2.773	1.284
8	4.0	6.0	18.0	5.4	12,865	12,401	9.462	2.889	1.688
9	4.0	8.0	20.0	7.2	12,602	12,393	9.442	2.995	1.974
10	4.0	10.0	22.0	9.0	12,280	12,419	9.416	3.091	2.198
11	2.0	2.1	8.1	1.8	11,345	11,480	9.336	2.096	0.590
12	2.0	4.0	10.0	3.6	11,431	11,351	9.344	2.304	1.283
13	2.0	6.0	12.0	5.4	11,466	11,413	9.347	2.483	1.686
14	2.0	8.0	14.0	7.2	11,388	11,520	9.340	2.638	1.974
15	2.0	10.0	16.0	9.0	11,199	11,635	9.324	2.772	2.199

Universal Model Graph - US Customary Units

Braun Sample ID: 440S

Station:

Project: BL-10-00425



Universal Model Calculations - US Customary Units

Braun Sample ID: 440S

Project: BL-10-00425

Station:

SUMMARY OUTPUT

	k1	k2	k3
Value	7,828	0.205	-0.078
t-Stat	164.81	9.50	-5.97
R-sqr Adj.	0.86579		
Std Err	0.02484	or 2.52%	

Regression Statistics	
Multiple R	0.940726078
R Square	0.884965554
Adjusted R Square	0.865793147
Standard Error	0.024843965
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.056979881	0.0284899	46.15829	2.31722E-06
Residual	12	0.007406671	0.0006172		
Total	14	0.064386553			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	8.965522724	0.054398849	164.81089	1.673E-21	8.846997815	9.084047633	8.846997815	9.084047633
X Variable 1	0.204572544	0.021540308	9.4971968	6.235E-07	0.157640244	0.251504843	0.157640244	0.251504843
X Variable 2	-0.07768294	0.013014408	-5.968995	6.52E-05	-0.106038898	-0.049326979	-0.106038898	-0.049326979

Universal Model Calculations - S.I. Units

Braun Sample ID: 440S

Project: BL-10-00425

Station:

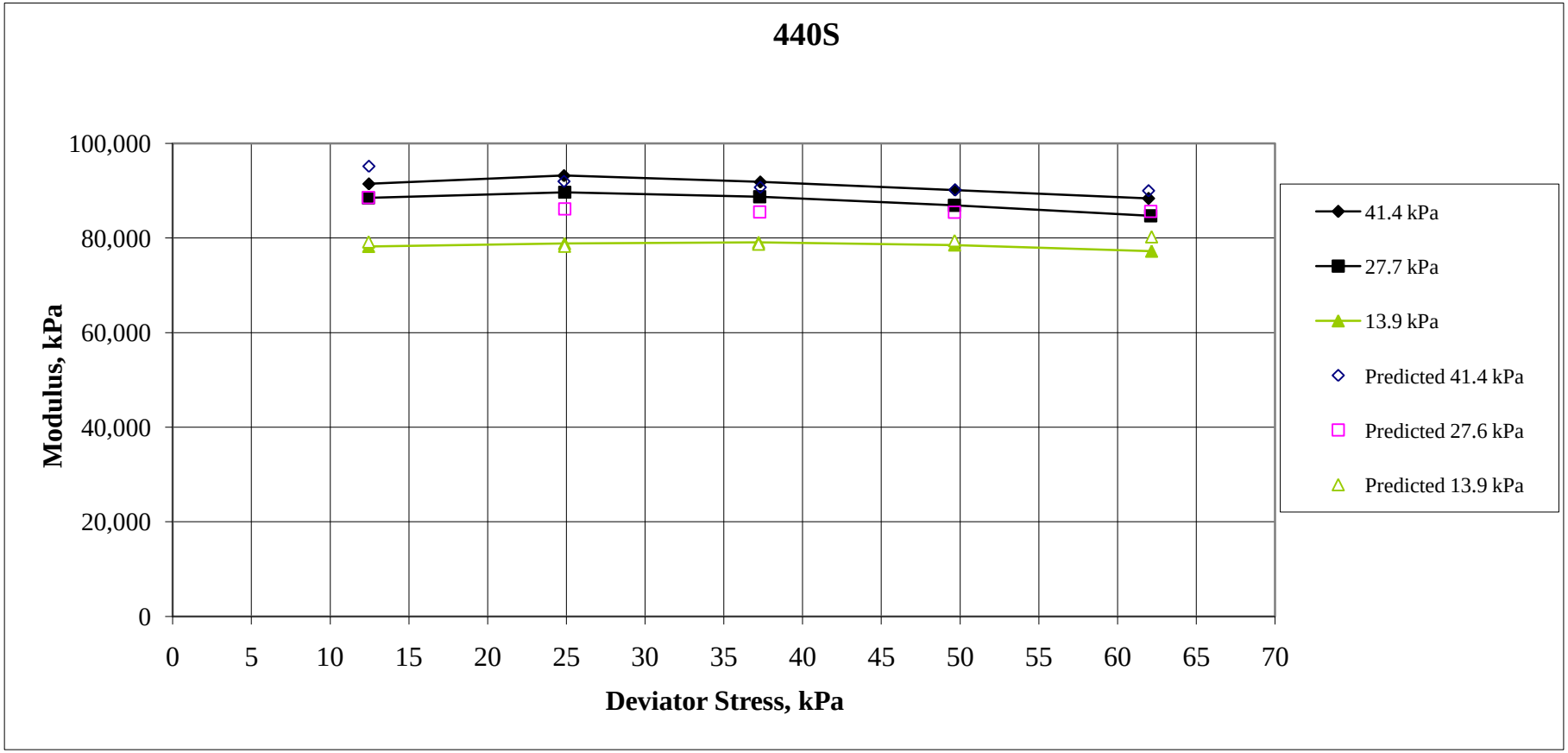
Seq.	Conf. kPa	Axial Stress kPa	Bulk kPa	Deviator kPa	M_r kPa	Pred. Mr kPa	Ln(Mr)	Ln(Bulk)	Ln(Dev)
1	41.4	13.8	138.0	12.5	91,442	95,152	11.423	4.927	2.523
2	41.4	27.5	151.6	24.9	93,181	91,945	11.442	5.021	3.213
3	41.3	41.3	165.4	37.3	91,836	90,682	11.428	5.108	3.619
4	41.3	55.0	179.0	49.7	90,140	90,140	11.409	5.187	3.906
5	41.4	68.7	192.8	62.0	88,366	89,962	11.389	5.262	4.127
6	27.6	14.2	96.9	12.4	88,474	88,531	11.390	4.574	2.520
7	27.6	27.7	110.3	24.9	89,672	86,146	11.404	4.704	3.215
8	27.6	41.3	124.0	37.3	88,699	85,500	11.393	4.820	3.618
9	27.6	55.1	137.8	49.6	86,885	85,447	11.372	4.926	3.905
10	27.6	68.9	151.6	62.1	84,669	85,628	11.347	5.021	4.129
11	13.8	14.6	56.1	12.4	78,218	79,154	11.267	4.026	2.521
12	13.8	27.6	69.0	24.9	78,814	78,263	11.275	4.234	3.214
13	13.8	41.3	82.6	37.2	79,055	78,692	11.278	4.414	3.616
14	13.8	55.1	96.4	49.6	78,515	79,425	11.271	4.569	3.905
15	13.8	68.9	110.3	62.2	77,218	80,223	11.254	4.703	4.130

Universal Model Graph - S.I. Units

Braun Sample ID: 440S

Station:

Project: BL-10-00425



Universal Model Calculations - S.I. Units

Braun Sample ID: 440S

Project: BL-10-00425

Station:

SUMMARY OUTPUT

	k1	k2	k3
Value	42,247	0.205	-0.078
t-Stat	118.88	9.50	-5.97
R-sqr Adj.	0.86579		
Std Err	0.02484	or 2.52%	

Regression Statistics	
Multiple R	0.940726078
R Square	0.884965554
Adjusted R Square	0.865793147
Standard Error	0.024843965
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.056979881	0.0284899	46.15829	2.31722E-06
Residual	12	0.007406671	0.0006172		
Total	14	0.064386553			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	10.65129046	0.089596021	118.88129	8.414E-20	10.4560775	10.84650342	10.4560775	10.84650342
X Variable 1	0.204572544	0.021540308	9.4971968	6.235E-07	0.157640244	0.251504843	0.157640244	0.251504843
X Variable 2	-0.07768294	0.013014408	-5.968995	6.52E-05	-0.106038898	-0.049326979	-0.106038898	-0.049326979