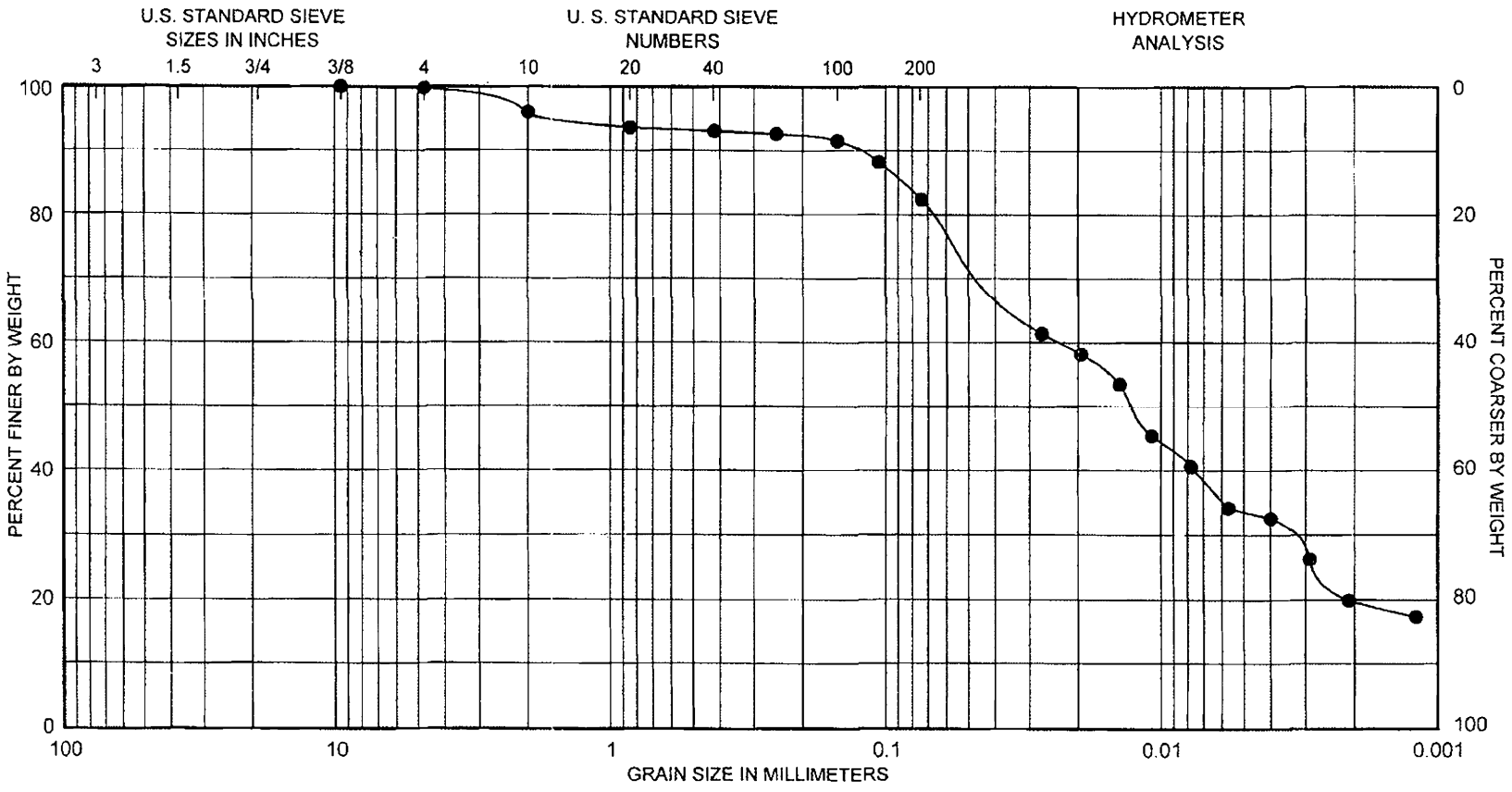
Table N.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen VGL B3001-UD11; Isotropic Confining Pressure, σ_o=320 psi (46.0 ksf = 2201 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
1.01E-03	9450	1.00	0.66	1.02E-03	9422	1.00	0.97
2.03E-03	9365	0.99	1.02	2.02E-03	9422	1.00	0.86
4.07E-03	9315	0.99	0.93	4.04E-03	9403	1.00	0.74
1.06E-02	8672	0.92	1.85	1.05E-02	8744	0.93	1.85



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

SYMBOL	BORING	DEPTH, FT	C_c	C_u	D_{30}	D_{90}	CLASSIFICATION
●	B-3001-UD11	249.85			0.0126	0.13	Silty Clay, light gray, with calcareous nodules

GRAIN SIZE CURVE

Report No. 0401-1667

PLATE 1

APPENDIX O

Specimen VGL B3001-UD7
(Non-Plastic; Gs=2.66)

Borehole B3001
Sample UD7
Depth = 170 ft (52 m)
Total Unit Weight = 124.8 lb/ft^3
Water Content = 20.9 %
Estimated In-Situ Ko = 0.44
Estimated In-Situ Mean Effective
Stress = 58 psi

FUGRO JOB #: 0401-1667
Testing Station: RC5

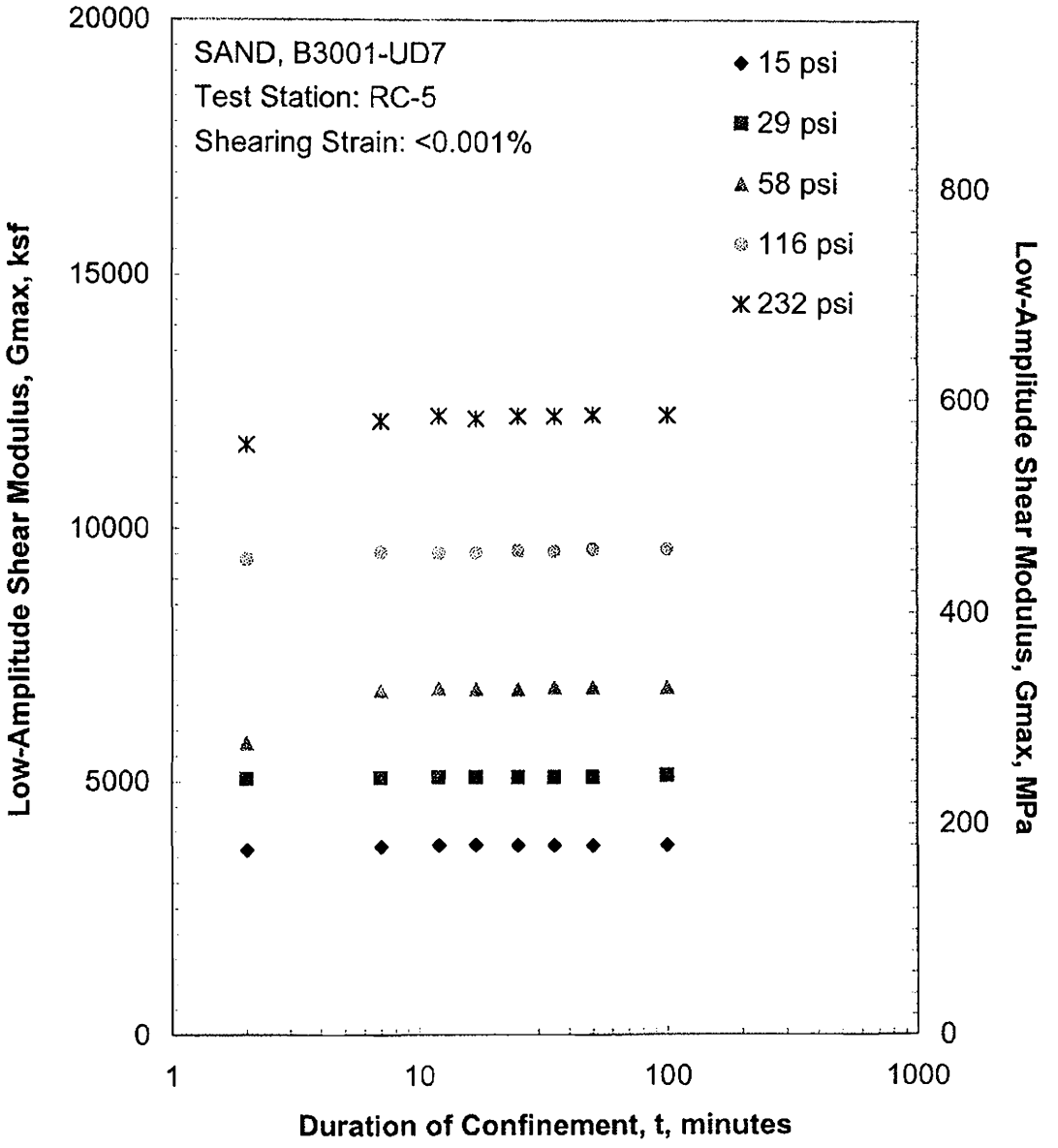


Figure O.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

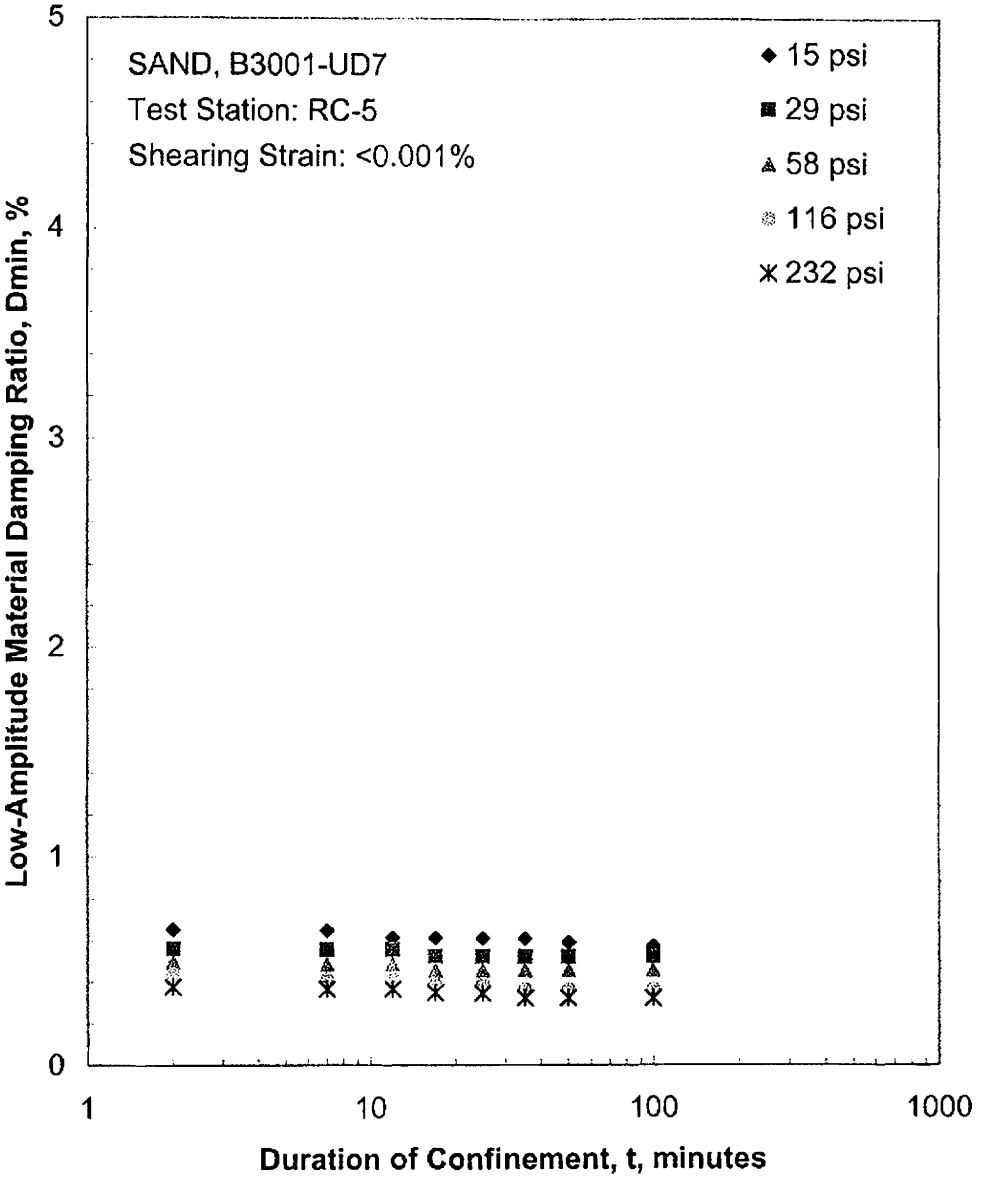


Figure O.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

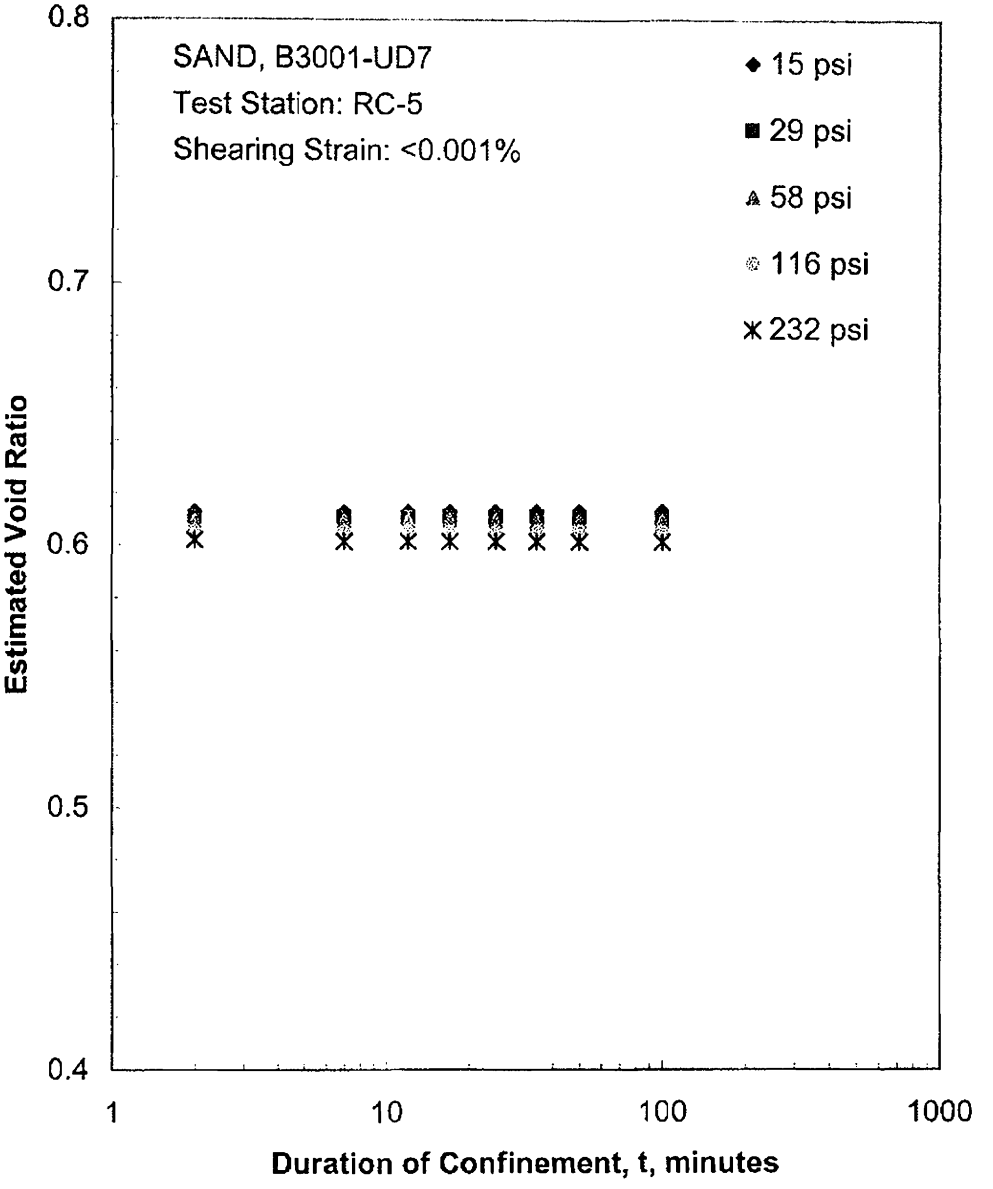


Figure O.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

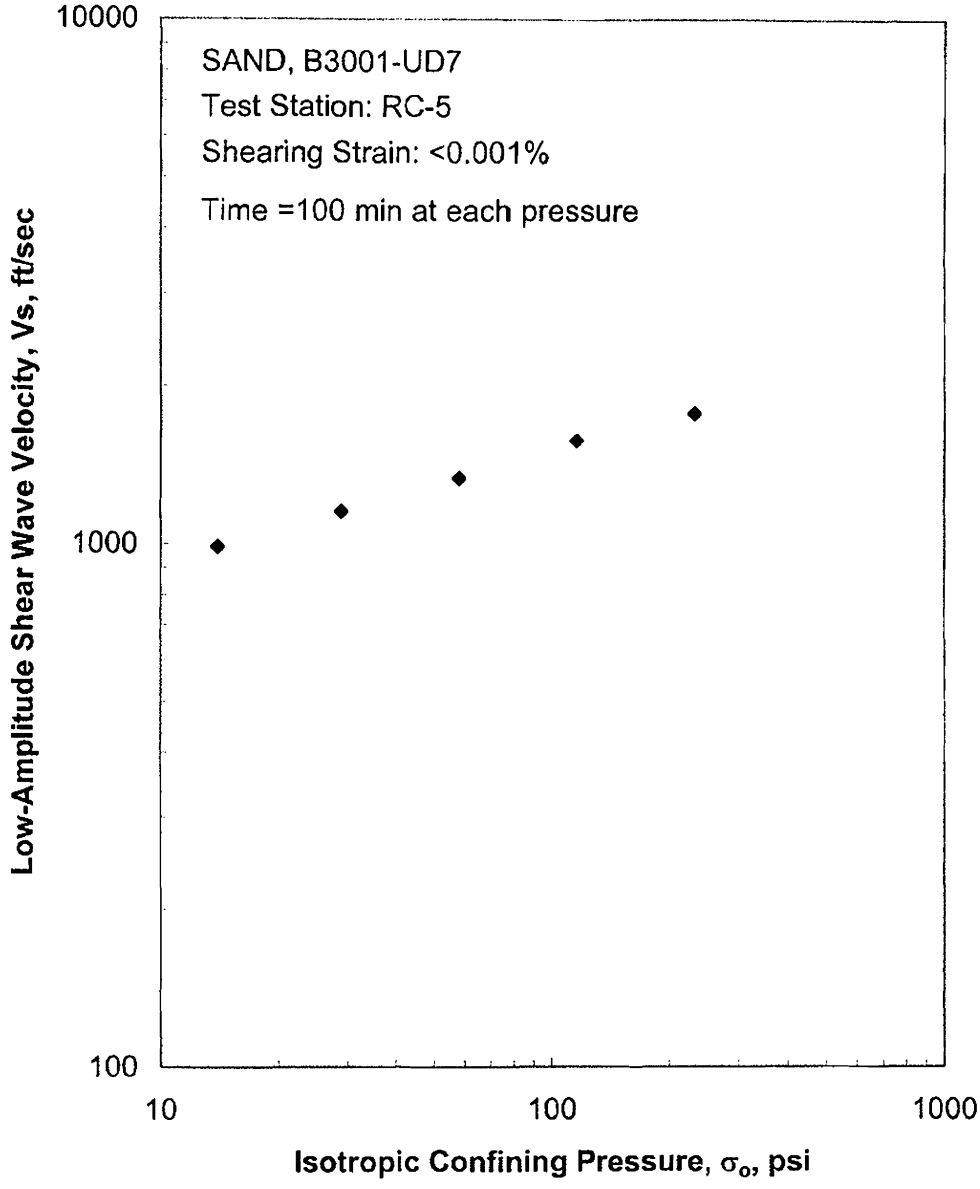


Figure O.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

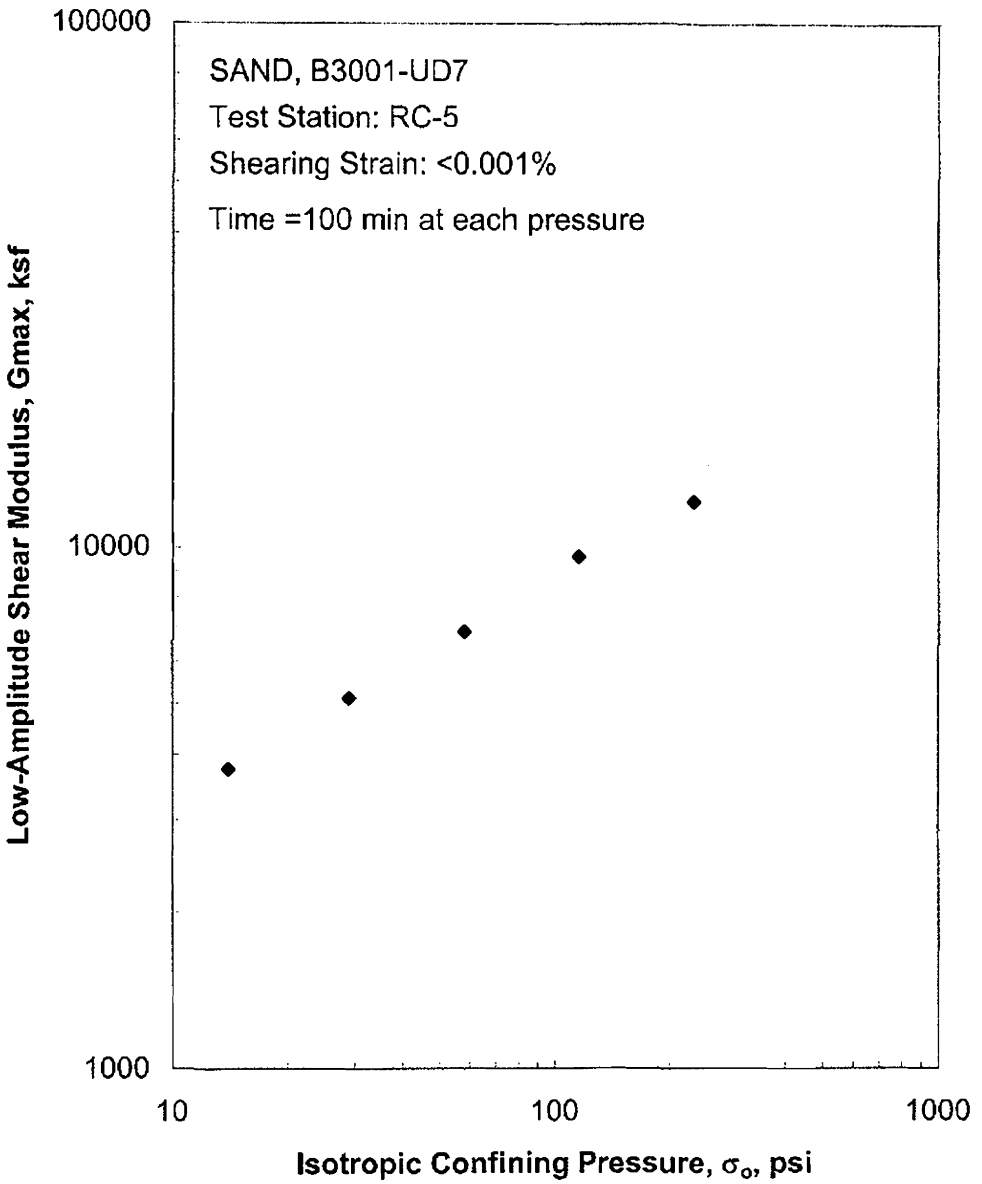


Figure O.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

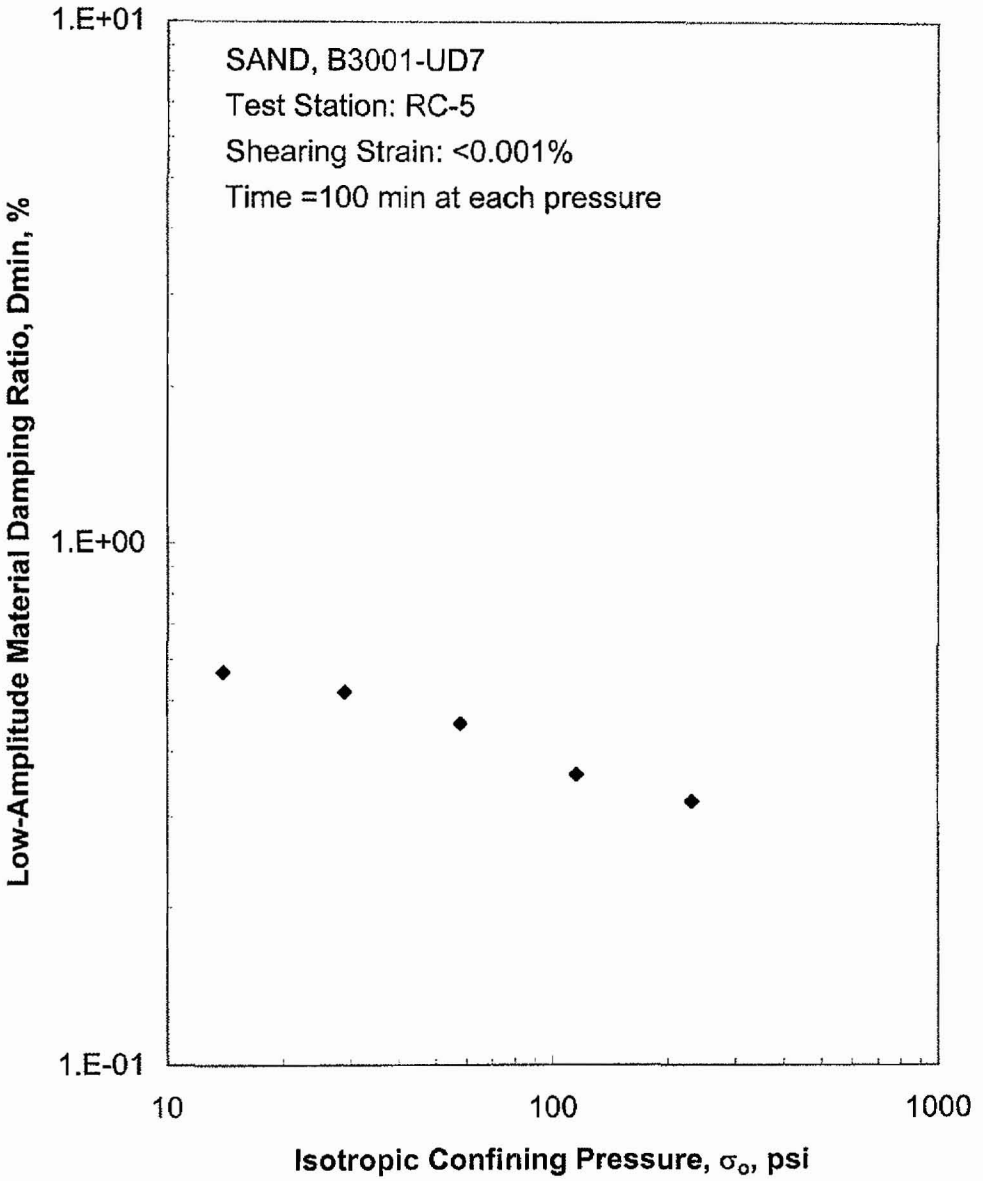


Figure O.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

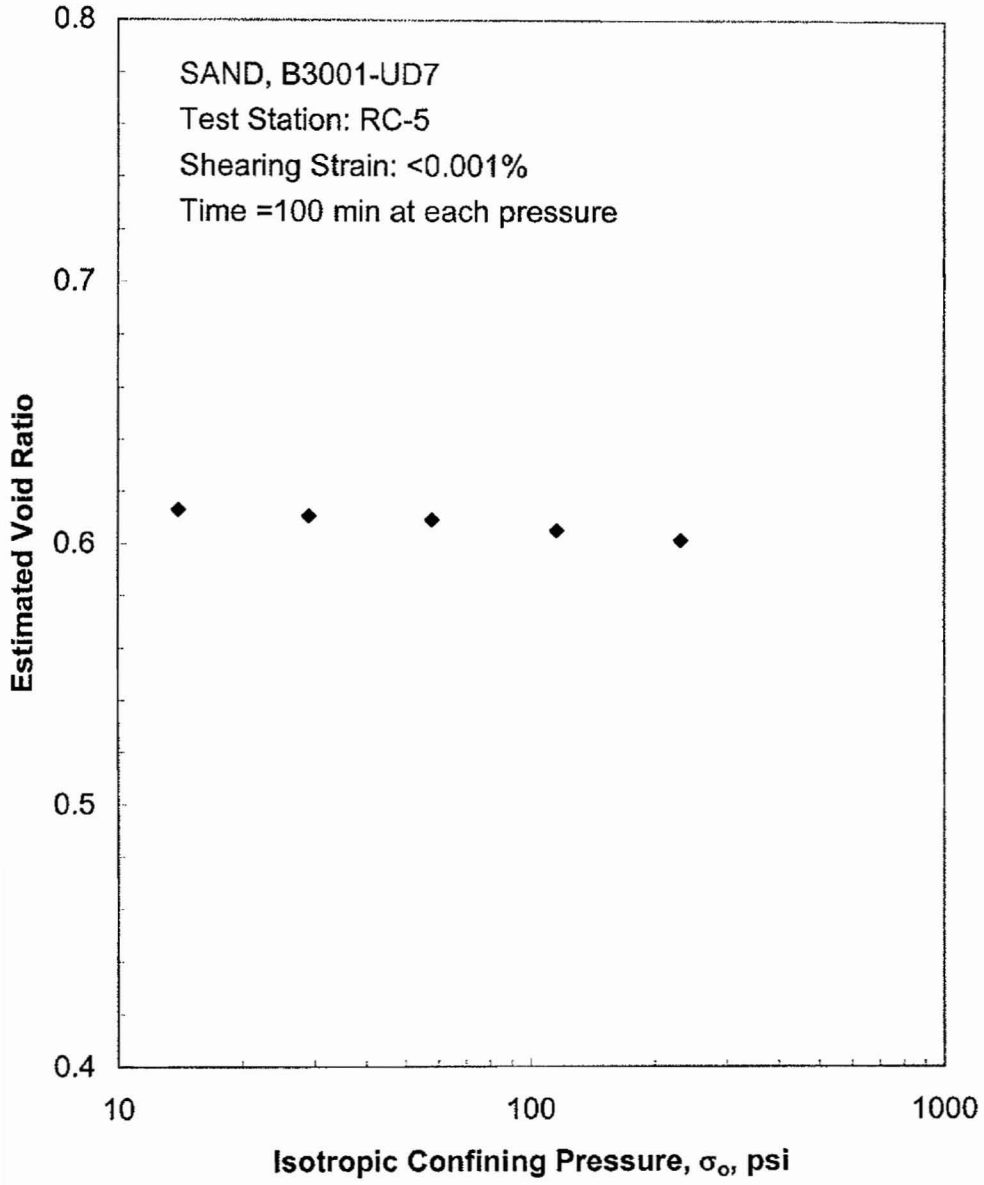


Figure O.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

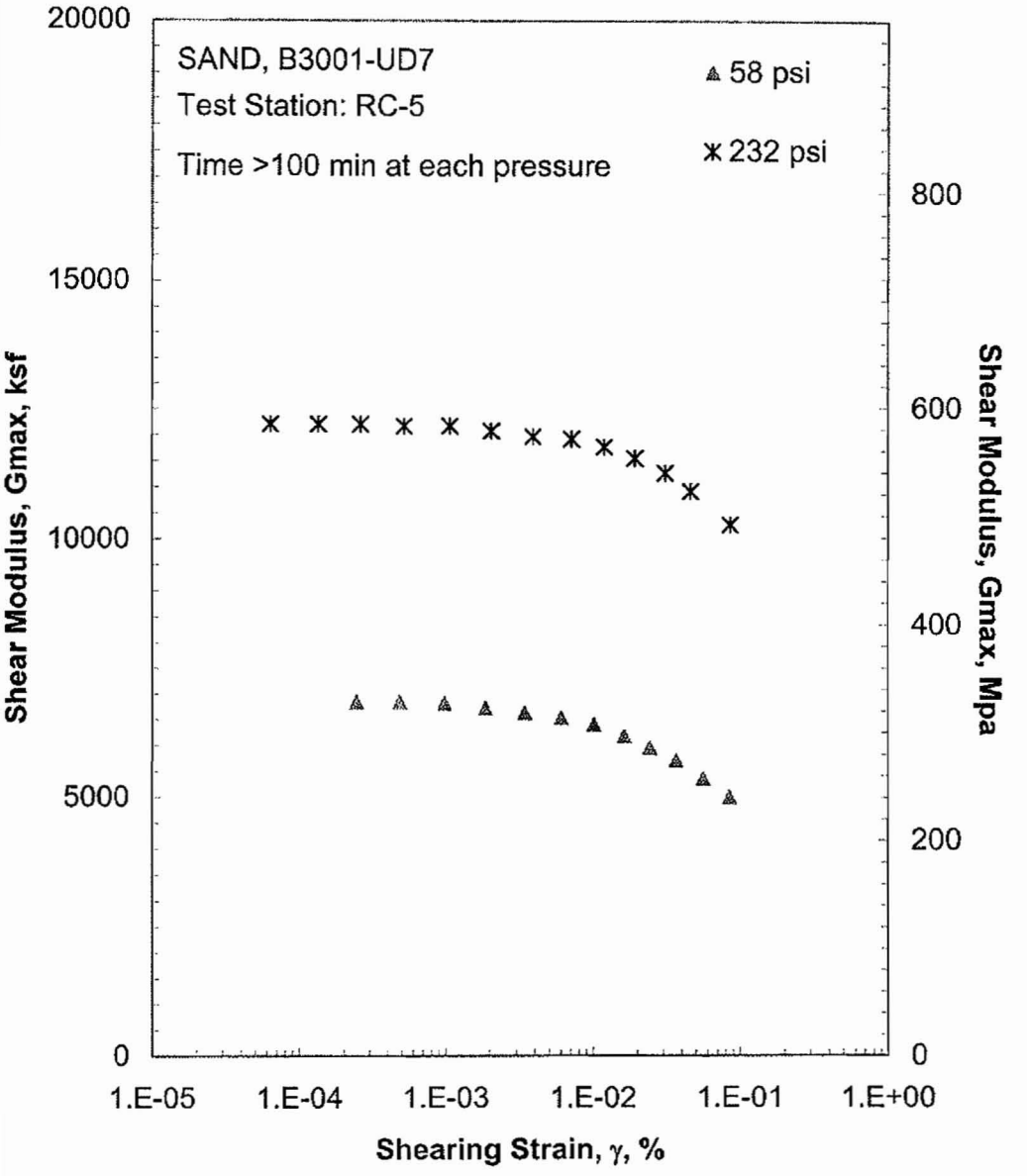


Figure O.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

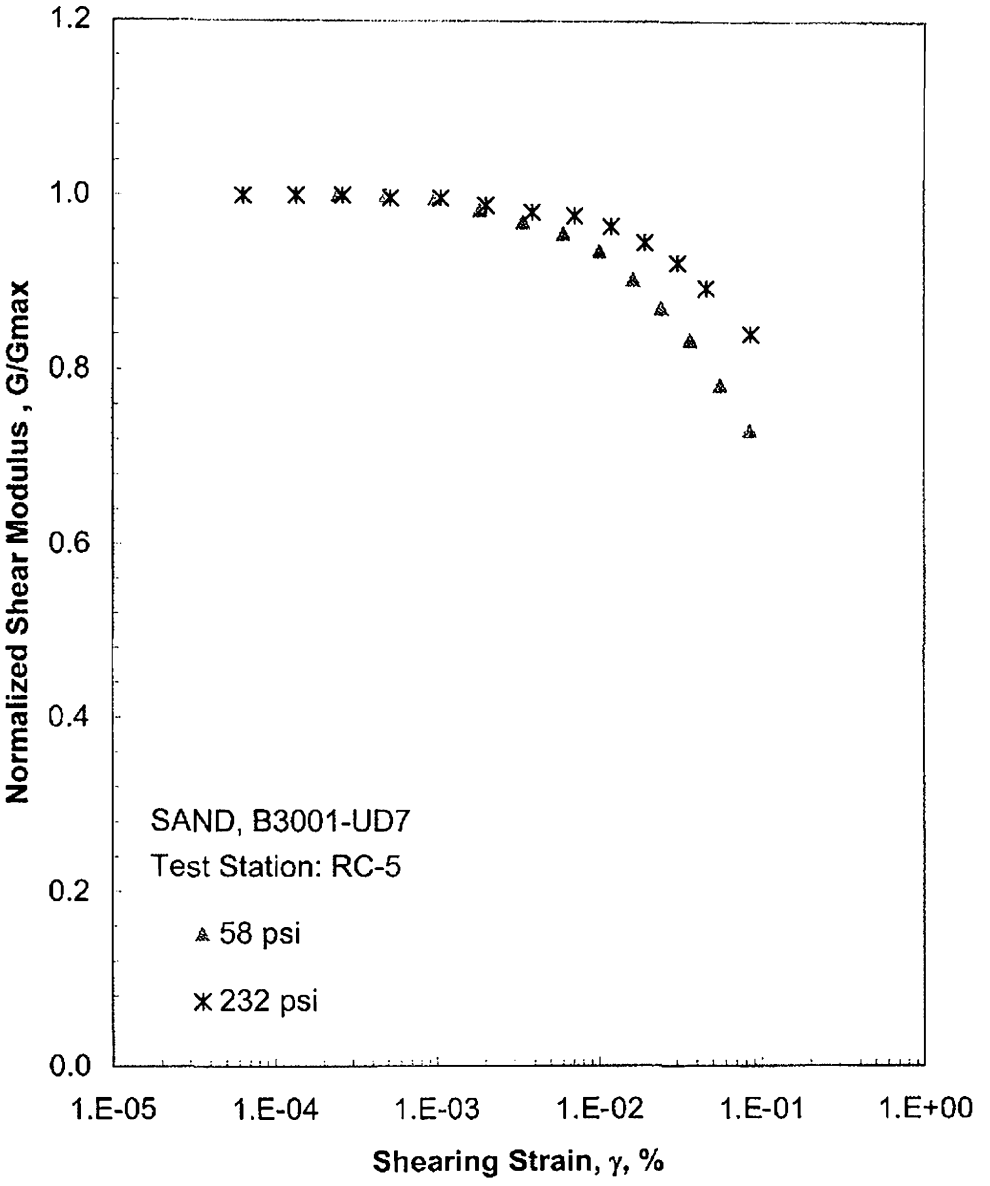


Figure O.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

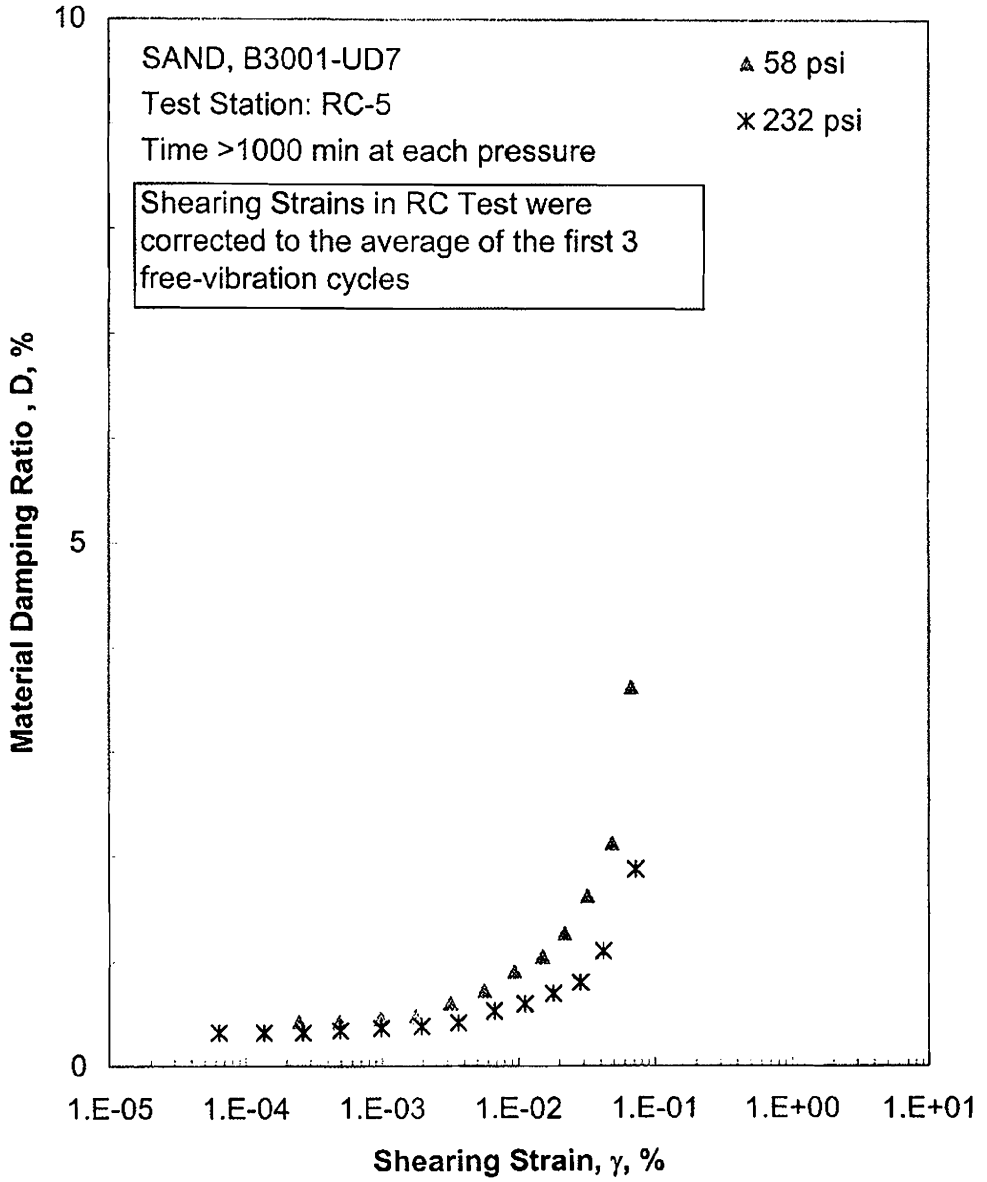


Figure O.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

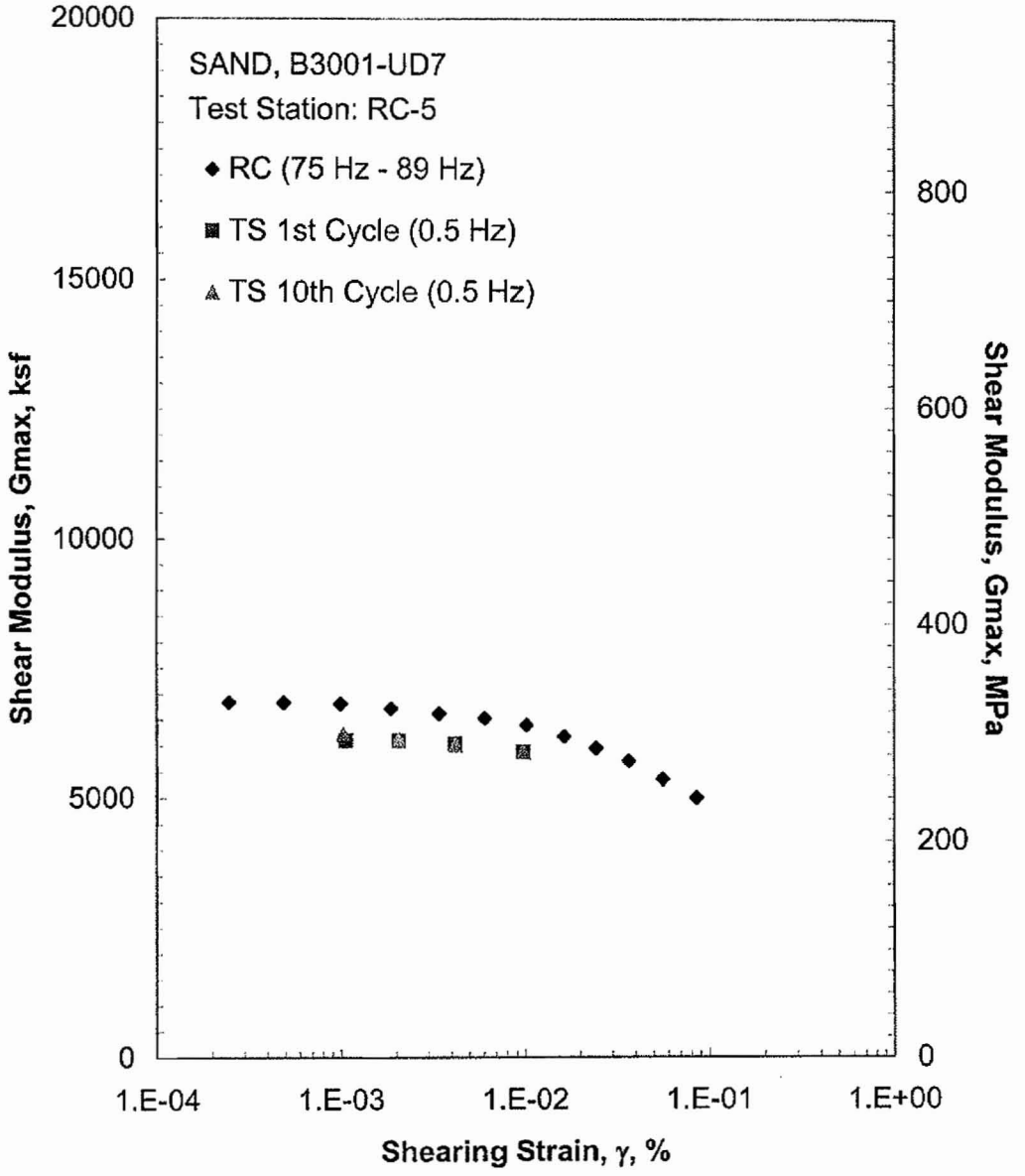


Figure O.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 58 psi from the Combined RCTS Tests

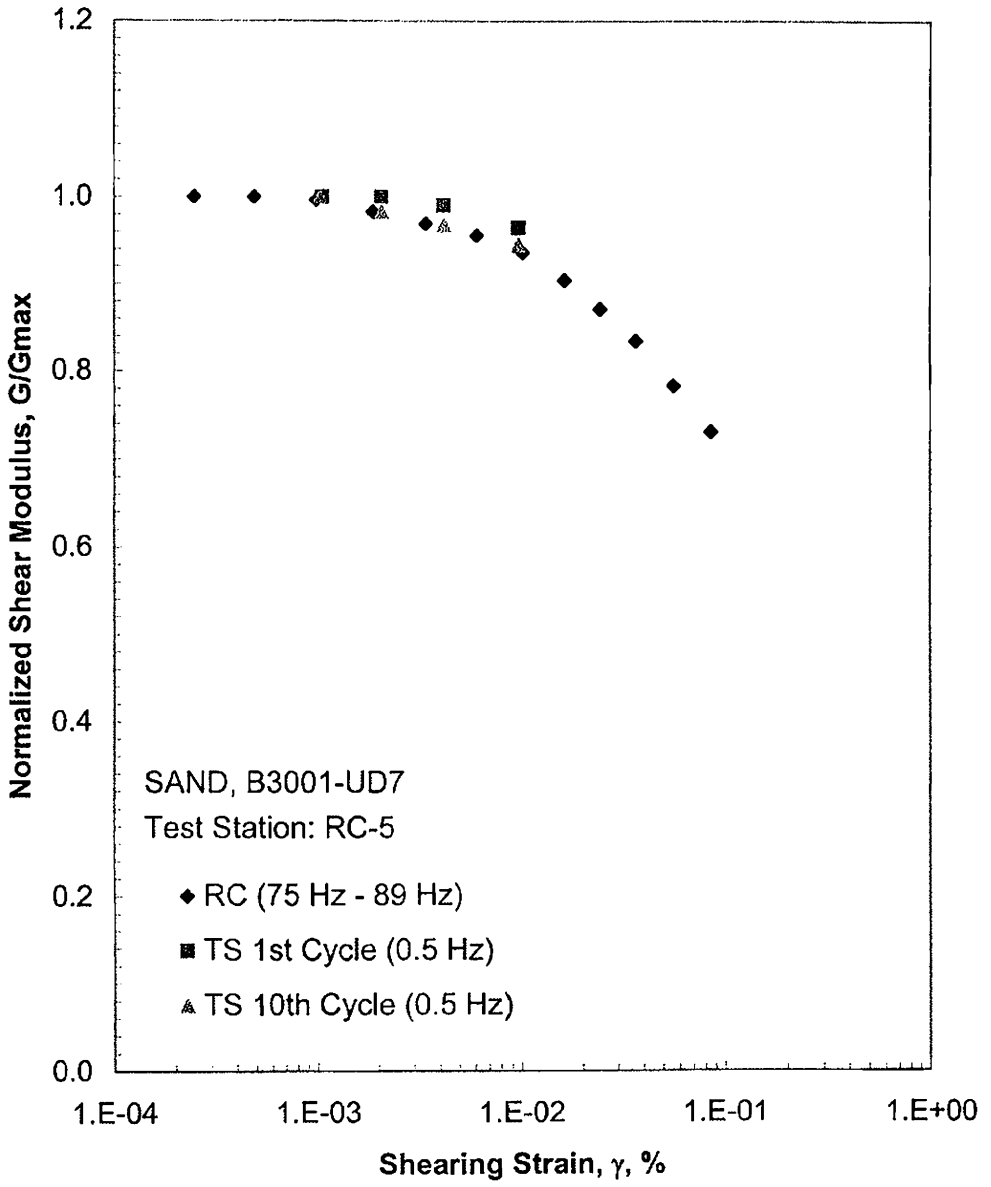


Figure O.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 58 psi from the Combined RCTS Tests

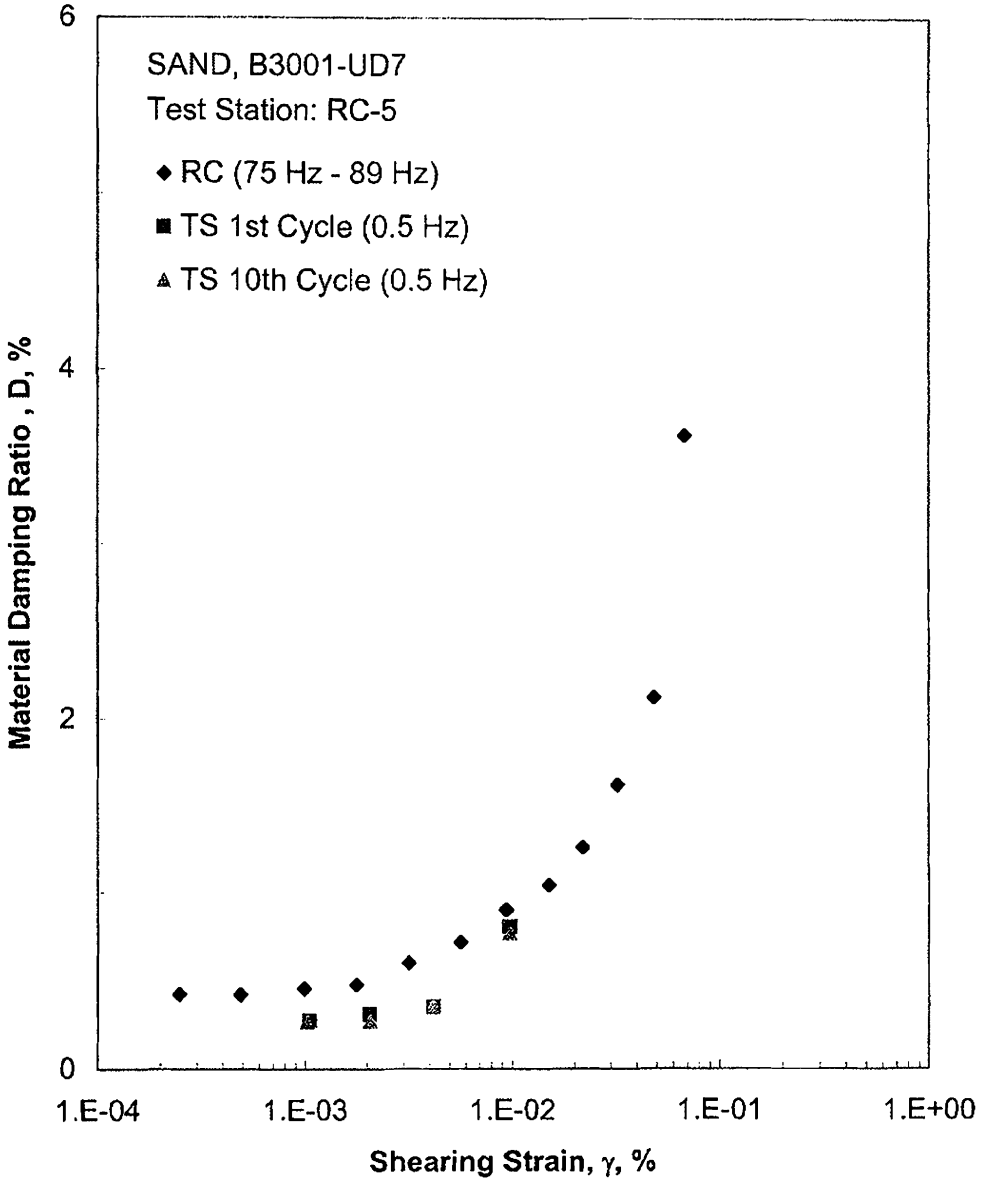


Figure O.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 58 psi from the Combined RCTS Tests

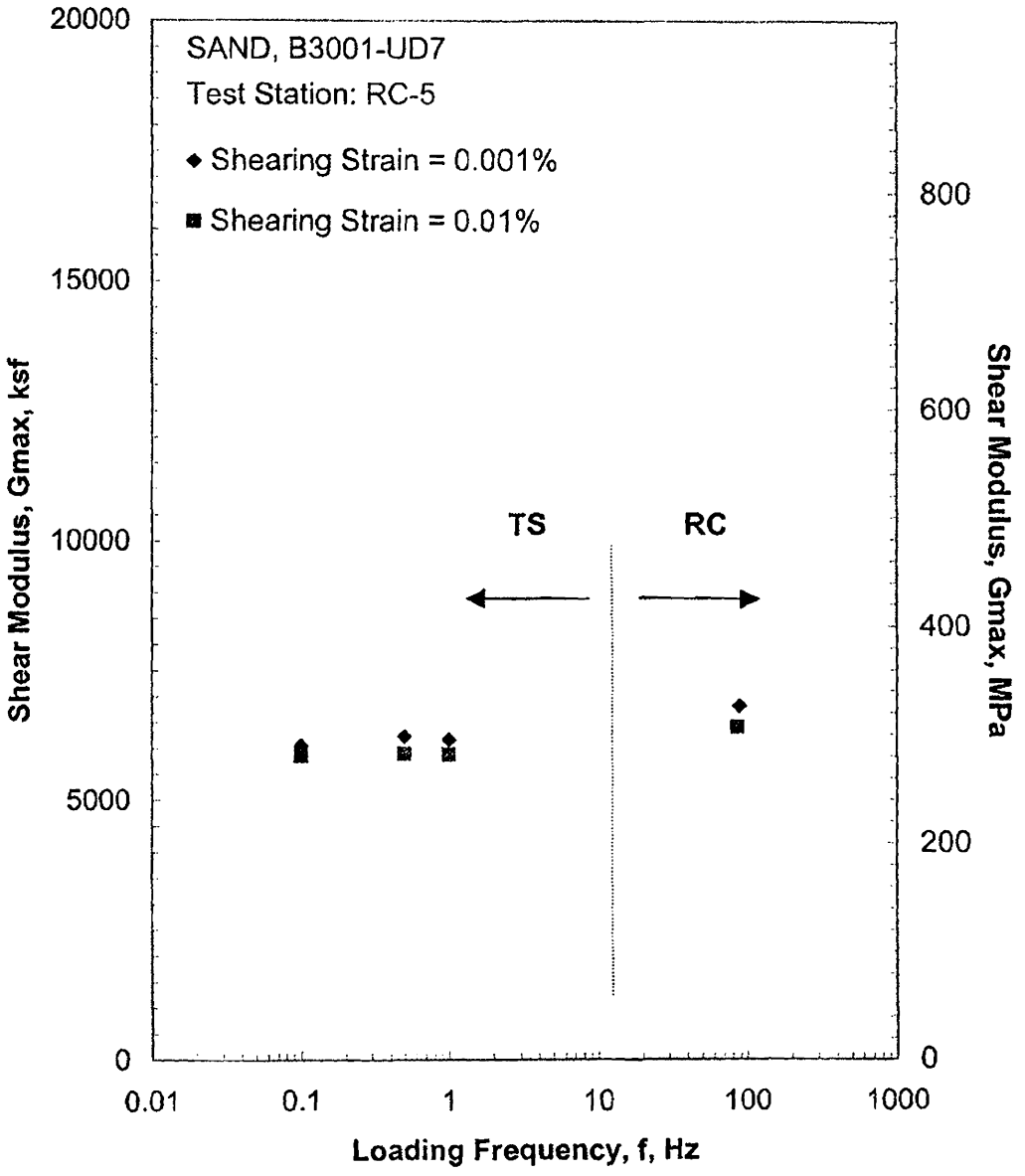


Figure O.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 58 psi from the Combined RCTS Tests

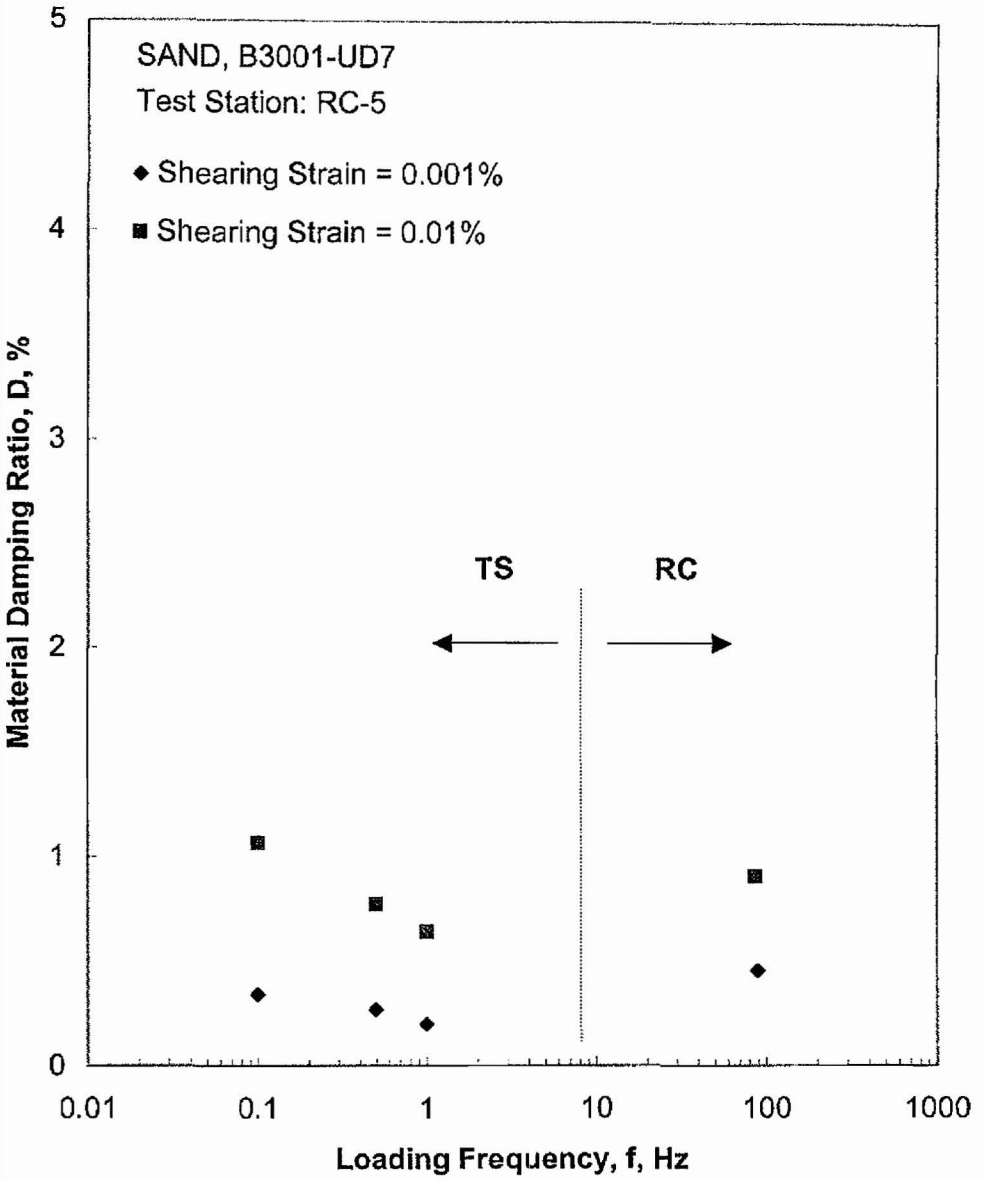


Figure O.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 58 psi from the Combined RCTS Tests

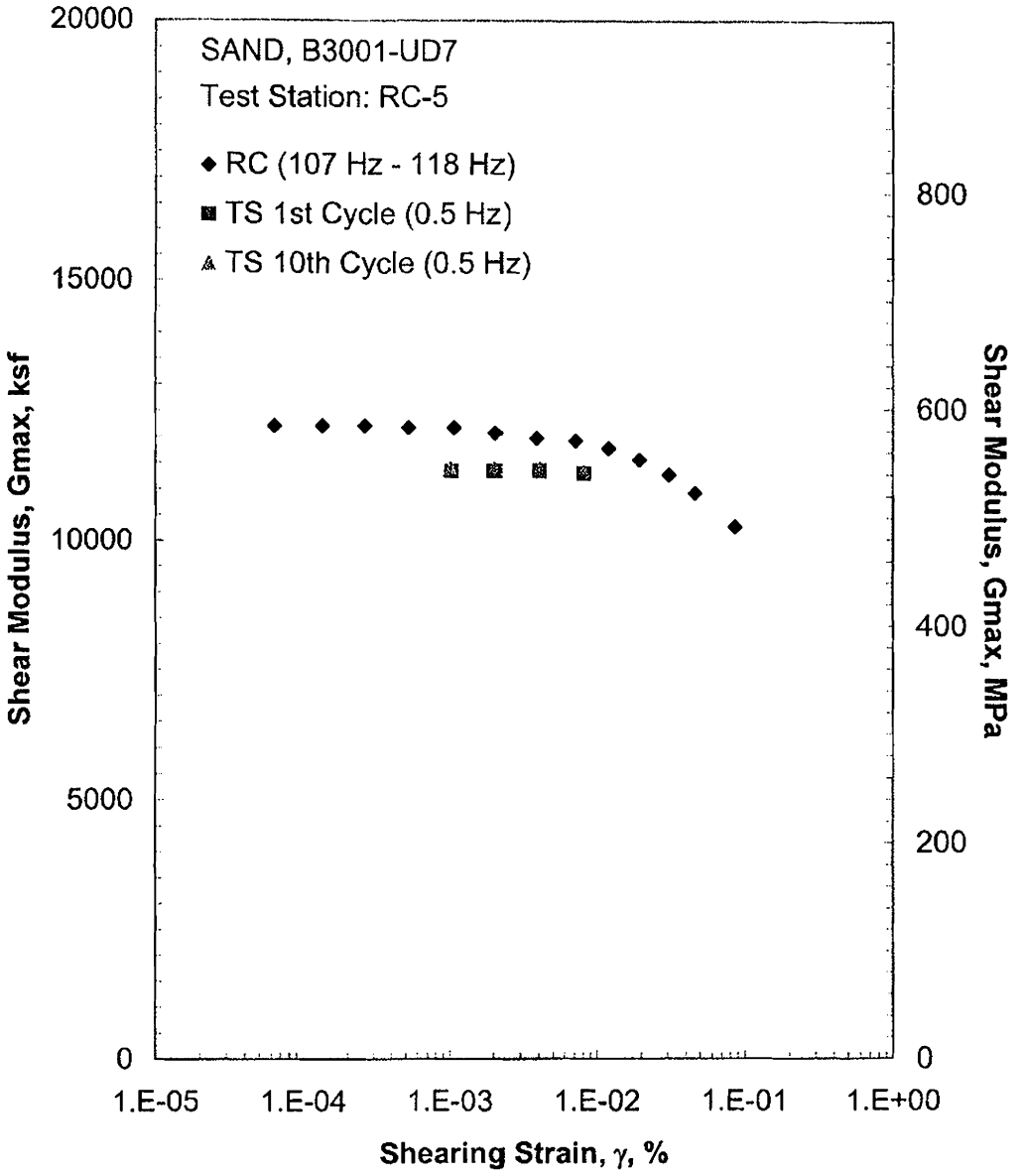


Figure O.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 232 psi from the Combined RCTS Tests

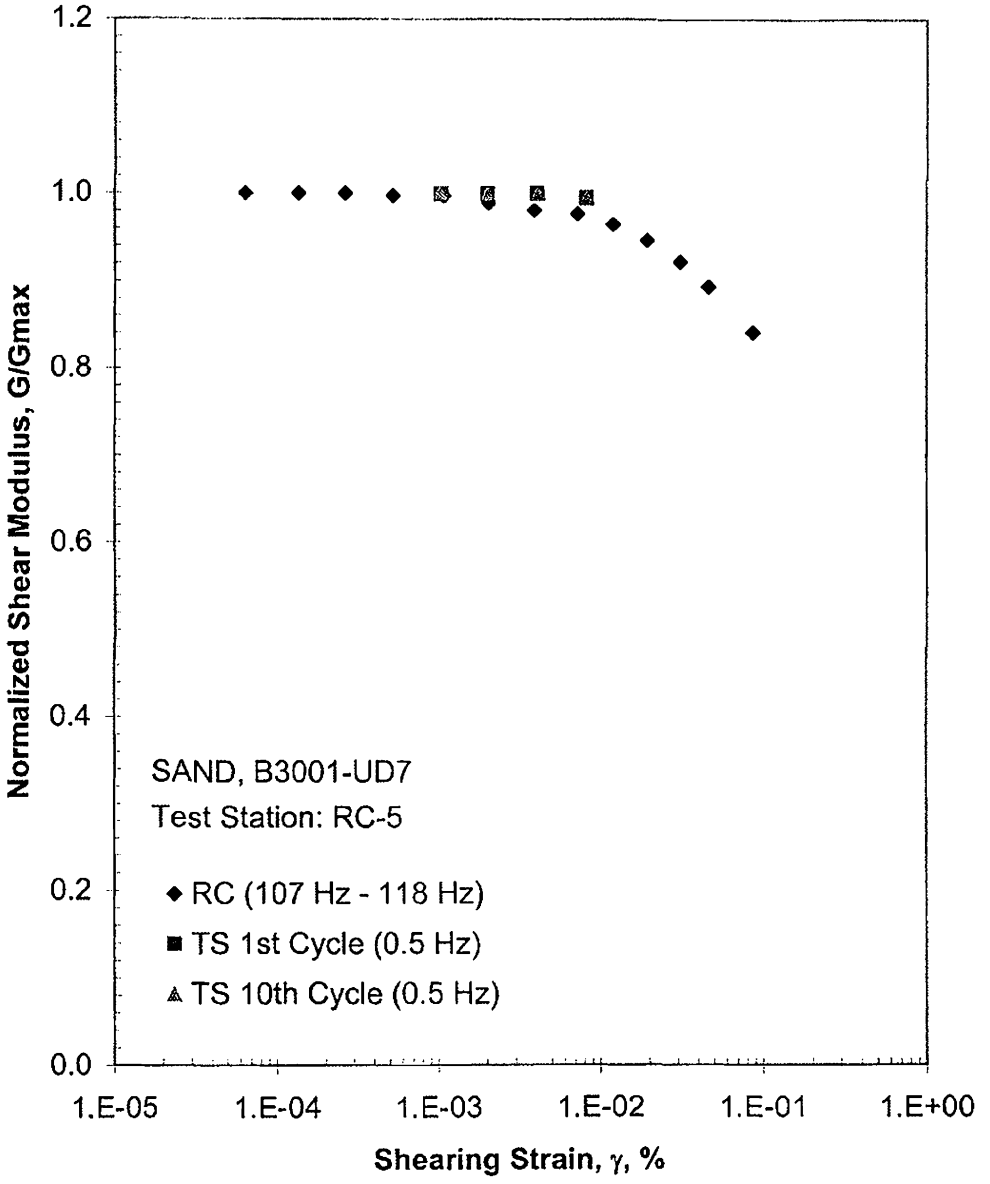


Figure O.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 232 psi from the Combined RCTS Tests

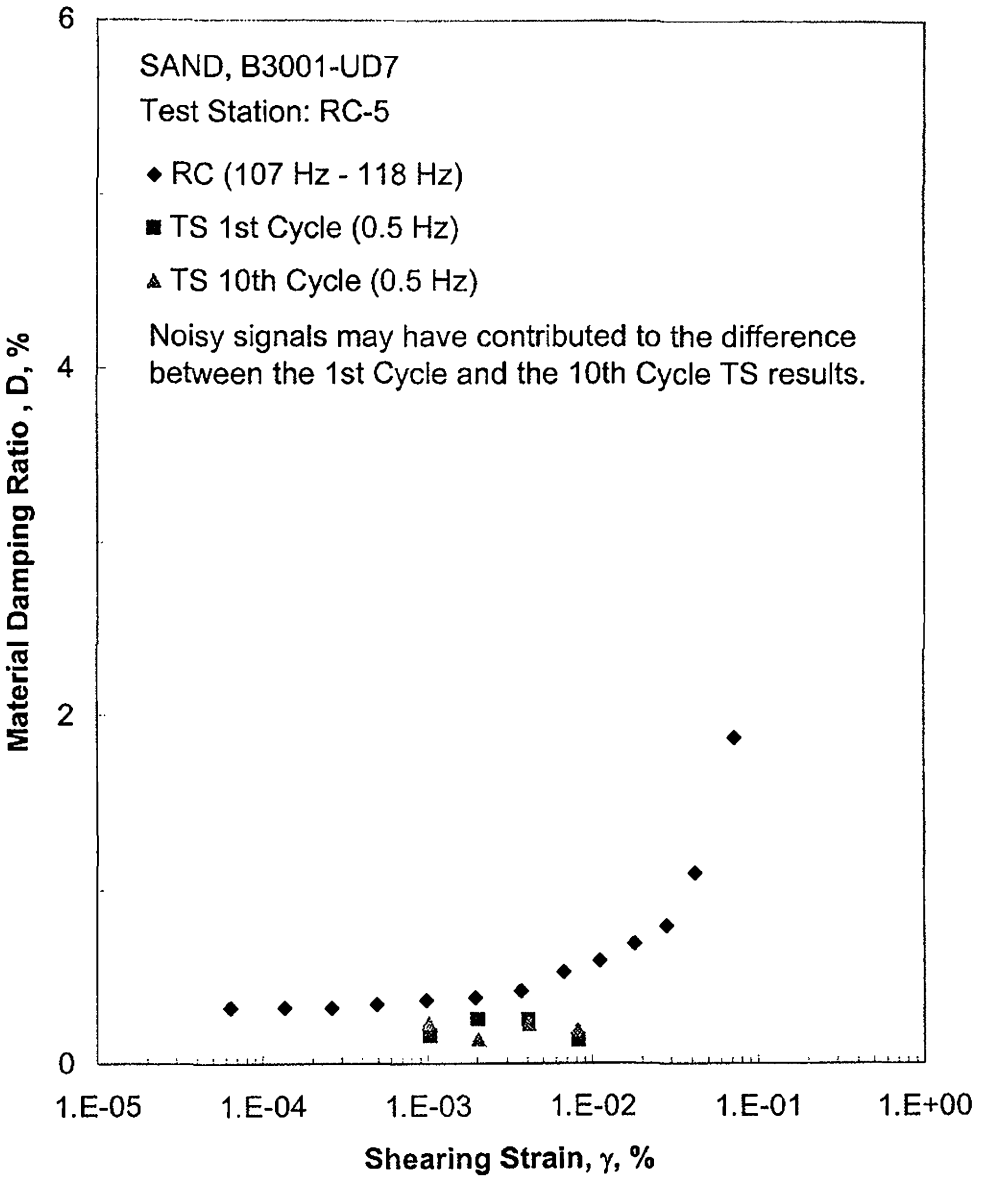


Figure O.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 232 psi from the Combined RCTS Tests

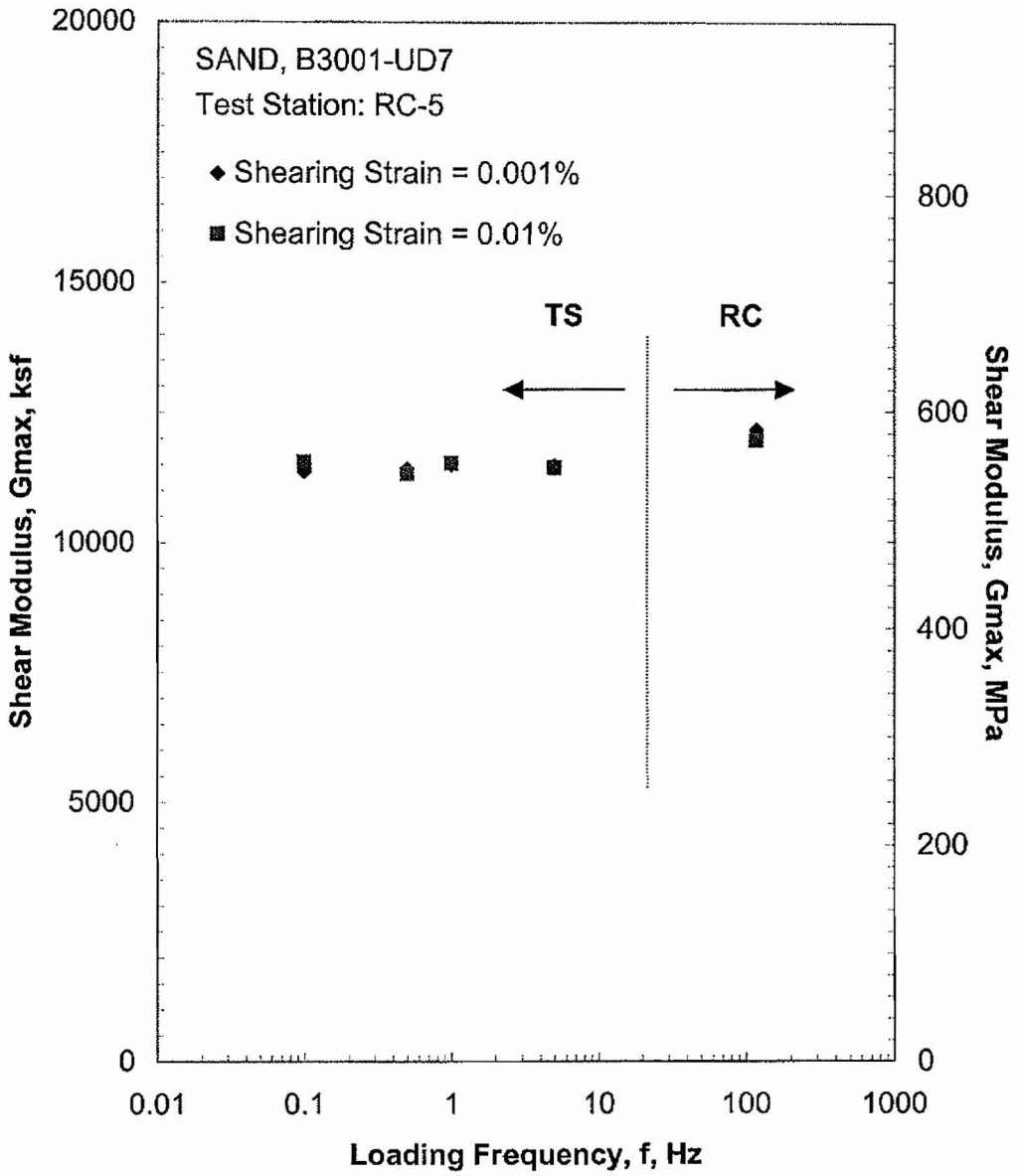


Figure O.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 232 psi from the Combined RCTS Tests

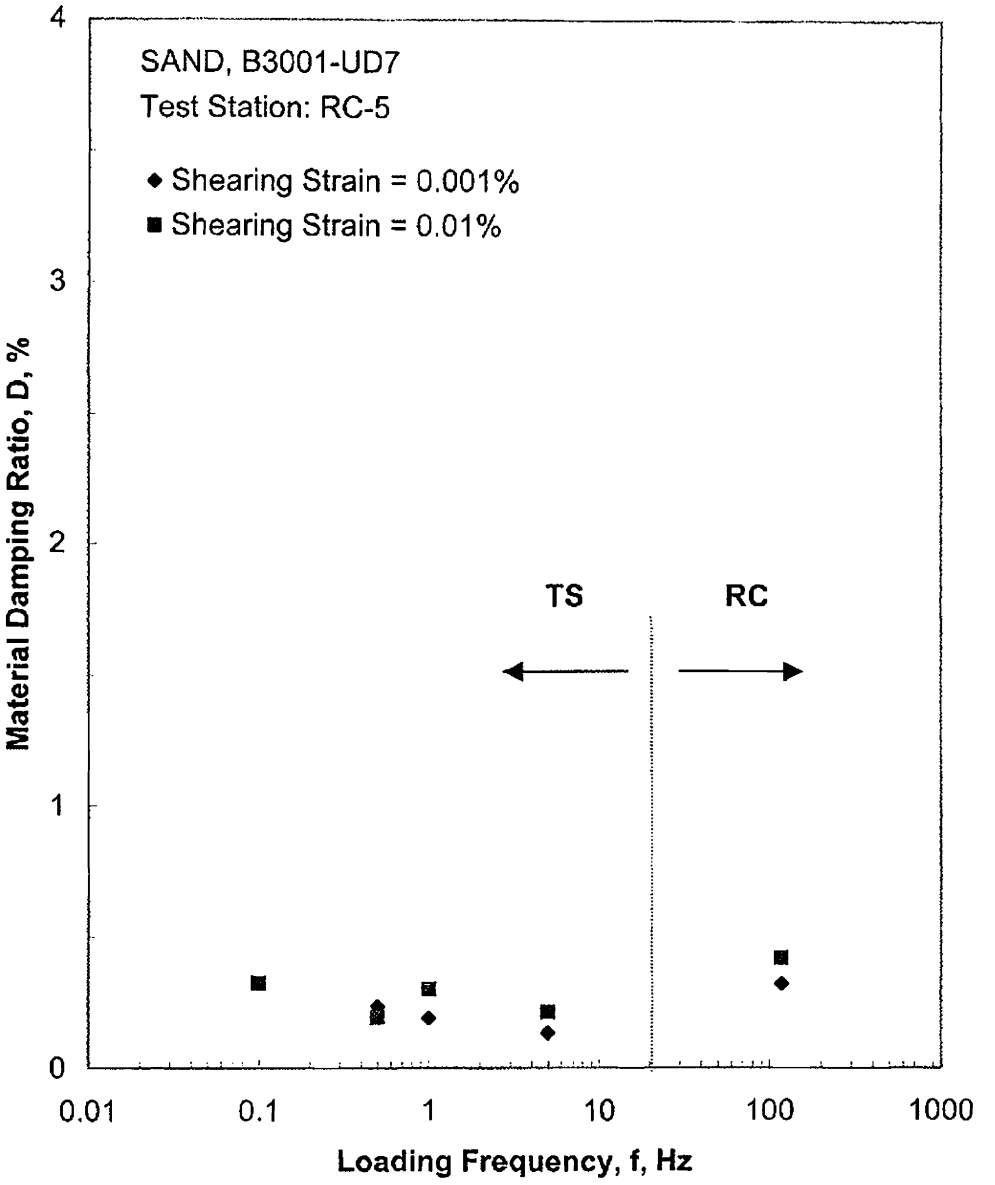


Figure O.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 232 psi from the Combined RCTS Tests

Table O.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio and Estimated Void Ratio with Isotropic Confining Pressure from RC Tests of Specimen VGL B3001-UD7

Isotropic Confining Pressure, σ_o			Low-Amplitude Shear Modulus, G_{max}		Low-Amplitude Shear Wave Velocity, Vs	Low-Amplitude Material Damping Ratio, Dmin	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	
14	2016	96	3749	180	986	0.57	0.61
29	4176	200	5119	246	1152	0.52	0.61
58	8352	400	6862	329	1333	0.45	0.61
116	16704	799	9592	460	1574	0.36	0.61
232	33408	1598	12227	587	1774	0.32	0.60

Table O.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen VGL B3001-UD7; Isoptropic Confining Pressure, σ_o=58 psi (8.4 ksf = 400 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
2.47E-04	6847	1.00	2.47E-04	0.43
4.89E-04	6847	1.00	4.89E-04	0.43
9.88E-04	6823	1.00	9.88E-04	0.46
1.87E-03	6730	0.98	1.78E-03	0.48
3.43E-03	6637	0.97	3.19E-03	0.61
6.09E-03	6544	0.96	5.66E-03	0.72
1.02E-02	6407	0.94	9.36E-03	0.91
1.64E-02	6187	0.90	1.50E-02	1.05
2.44E-02	5962	0.87	2.20E-02	1.27
3.67E-02	5715	0.83	3.23E-02	1.62
5.61E-02	5363	0.78	4.88E-02	2.13
8.51E-02	5008	0.73	6.81E-02	3.62

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table O.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen VGL B3001-UD7; Isotropic Confining Pressure, σ_o = 58 psi (8.4 ksf =400 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
1.06E-03	6108	1.00	0.28	1.03E-03	6236	1.00	0.27
2.06E-03	6108	1.00	0.31	2.07E-03	6128	0.98	0.27
4.19E-03	6047	0.99	0.35	4.20E-03	6032	0.97	0.36
9.75E-03	5889	0.96	0.81	9.75E-03	5889	0.94	0.77

Table O.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen VGL B3001-UD7; Isoptropic Confining Pressure, σ_o= 232 psi (33.4 ksf = 1598 kPa)

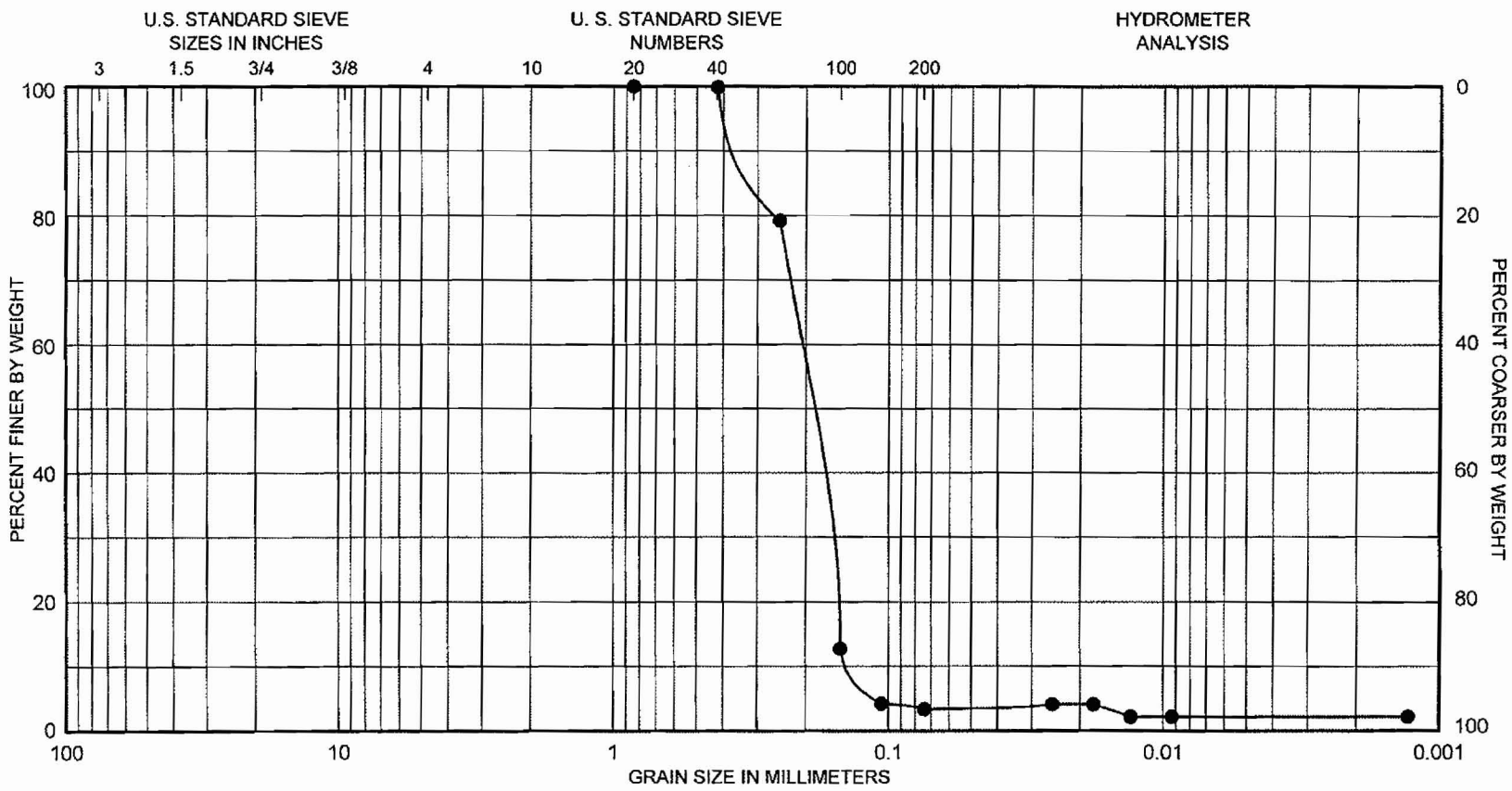
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
6.40E-05	12209	1.00	6.40E-05	0.32
1.36E-04	12209	1.00	1.36E-04	0.32
2.64E-04	12209	1.00	2.64E-04	0.32
5.25E-04	12175	1.00	4.94E-04	0.34
1.08E-03	12175	1.00	9.90E-04	0.37
2.05E-03	12075	0.99	1.97E-03	0.38
3.89E-03	11974	0.98	3.66E-03	0.42
7.16E-03	11925	0.98	6.73E-03	0.53
1.20E-02	11775	0.96	1.12E-02	0.60
1.94E-02	11554	0.95	1.81E-02	0.69
3.09E-02	11268	0.92	2.85E-02	0.80
4.62E-02	10916	0.89	4.20E-02	1.10
8.65E-02	10273	0.84	7.27E-02	1.88

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table O.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen VGL B3001-UD7; Isotropic Confining Pressure, σ_o=232 psi (33.4 ksf = 1598 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
1.04E-03	11343	1.00	0.16	1.02E-03	11386	1.00	0.24
2.02E-03	11343	1.00	0.26	2.03E-03	11386	1.00	0.14
4.07E-03	11351	1.00	0.25	4.09E-03	11386	1.00	0.23
8.18E-03	11295	1.00	0.14	8.16E-03	11326	0.99	0.19



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

SYMBOL	BORING	DEPTH, FT	C_c	C_u	D_{50}	D_{90}	CLASSIFICATION
●	B-3001-UD7	170.2	1.01	1.61	0.1997	0.33	Sand, gray

GRAIN SIZE CURVE

Report No. 0401-1667

PLATE 1

FUGRO CONSULTANTS, INC.

6100 Hillcroft (77081)
P.O. Box 740010
Houston, Texas 77274
Tel: 713-369-5400
Fax: 713-369-5518

January 14, 2008

Mr. Wm. Allen Lancaster
MACTEC Engineering and Consulting, Inc.
396 Plasters Avenue
Atlanta, Georgia 30324

RE: Four (4) Reports For The Vogtle (a.k.a. VGL) Project

Dear Mr. Lancaster:

Fugro has completed four (4) RCTS tests, which are TP-B-1197 at 95%, TP-B-1197 at 100%, TP-B-1194 at 95%, and TP-B-1194 at 100% for the VGL project. Fugro has incorporated, as applicable, Dr. Kenneth Stokoe's comments into the final reports. The final reports and the associated RCTS Test Approval by Dr. Kenneth Stokoe have been attached.

Please let us know if you have questions. Thanks.

Very truly yours,

Fugro Consultants, Inc.

Jiewu Meng, PhD, P.E.
Project Engineer

Bill DeGroff, P.E.
Laboratory Department Manager

Enclosures

DCN: VGCOL-400

A member of the Fugro group of companies with offices throughout the world.

RCTS TEST APROVAL

PROJECT SITE/NAME	VGL

Test ID	Sample ID	Depth B.S. (Ft)	Approved By (Initials)	Date
RCTS#P	TP-B-1197, 95%	45	KHS ⊕	21 Dec 07
RCTS#Q	TP-B-1197, 100%	45	KHS ⊕	21 Dec 07

Two RCTS tests for the site referenced above were tested, and two reports were prepared, by Fugro Consultants, Inc.

I have reviewed the data and associated results listed above and found them to be reasonable.

Approved By:

K. H. Stokoe II

Dr. Kenneth Stokoe

⊕ see notes on figures. Only minor comments except Dmin scale on Figs P.6 & Q.6.

RCTS TEST APROVAL

PROJECT SITE/NAME	VGL

Test ID	Sample ID	Depth B.S. (Ft)	Approved By (Initials)	Date
RCTS#R	TP-B-1194, 95%	15	KHS (+)	10 Jan '08
RCTS#S	TP-B-1194, 100%	15	KHS (+)	10 Jan '08

Two RCTS tests for the site referenced above were tested, and two reports were prepared, by Fugro Consultants, Inc.

I have reviewed the data and associated results listed above and found them to be reasonable.

Approved By:

K. H. Stokoe

Dr. Kenneth Stokoe

(+) minor comments on some figures for information only. RCTS results are very good!

APPENDIX P

Specimen TP-B-1197, 95%
Reconstituted Engineering Fill at 95% Compaction
(Non-Plastic)

Borehole ---
B-1197
Depth = 45 ft (13.7 m)
Total Unit Weight = 119.1 lb/ft^3
Water Content = 10.4 %
Estimated In-Situ Ko = 0.44
Estimated In-Situ Mean Effective
Stress = 24 psi

FUGRO JOB #: 0401-1667
Testing Station: RC6

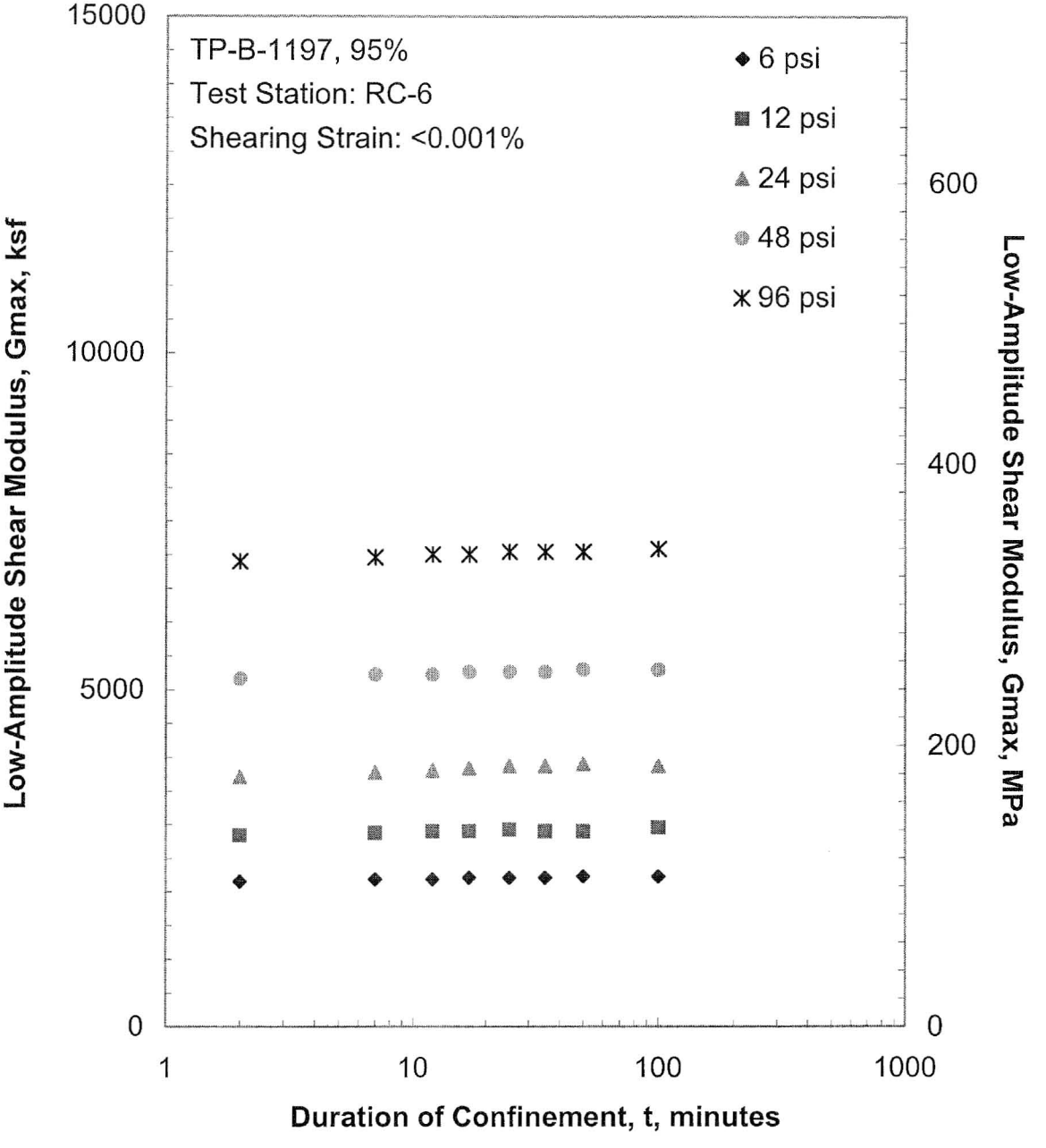


Figure P.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

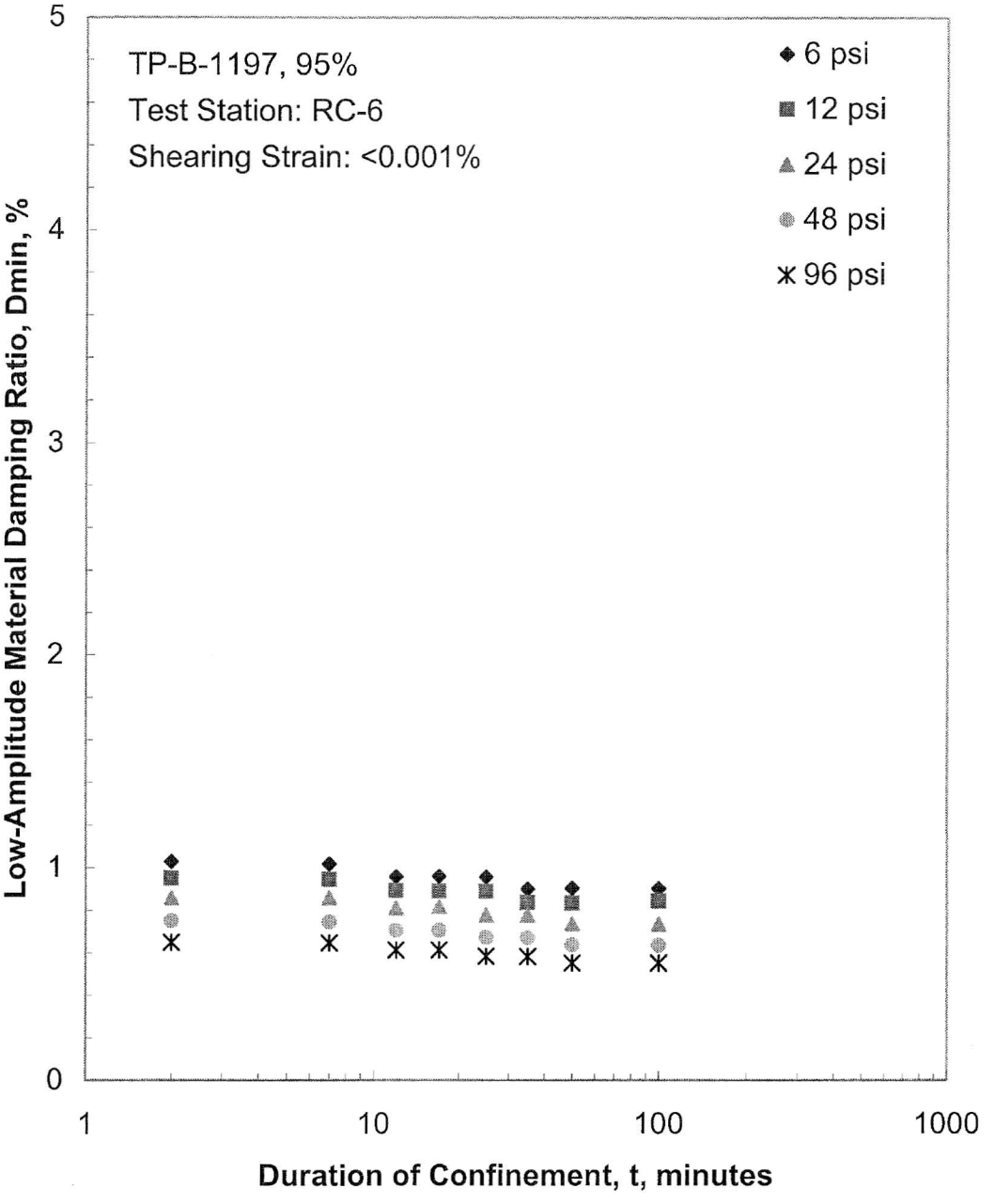


Figure P.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

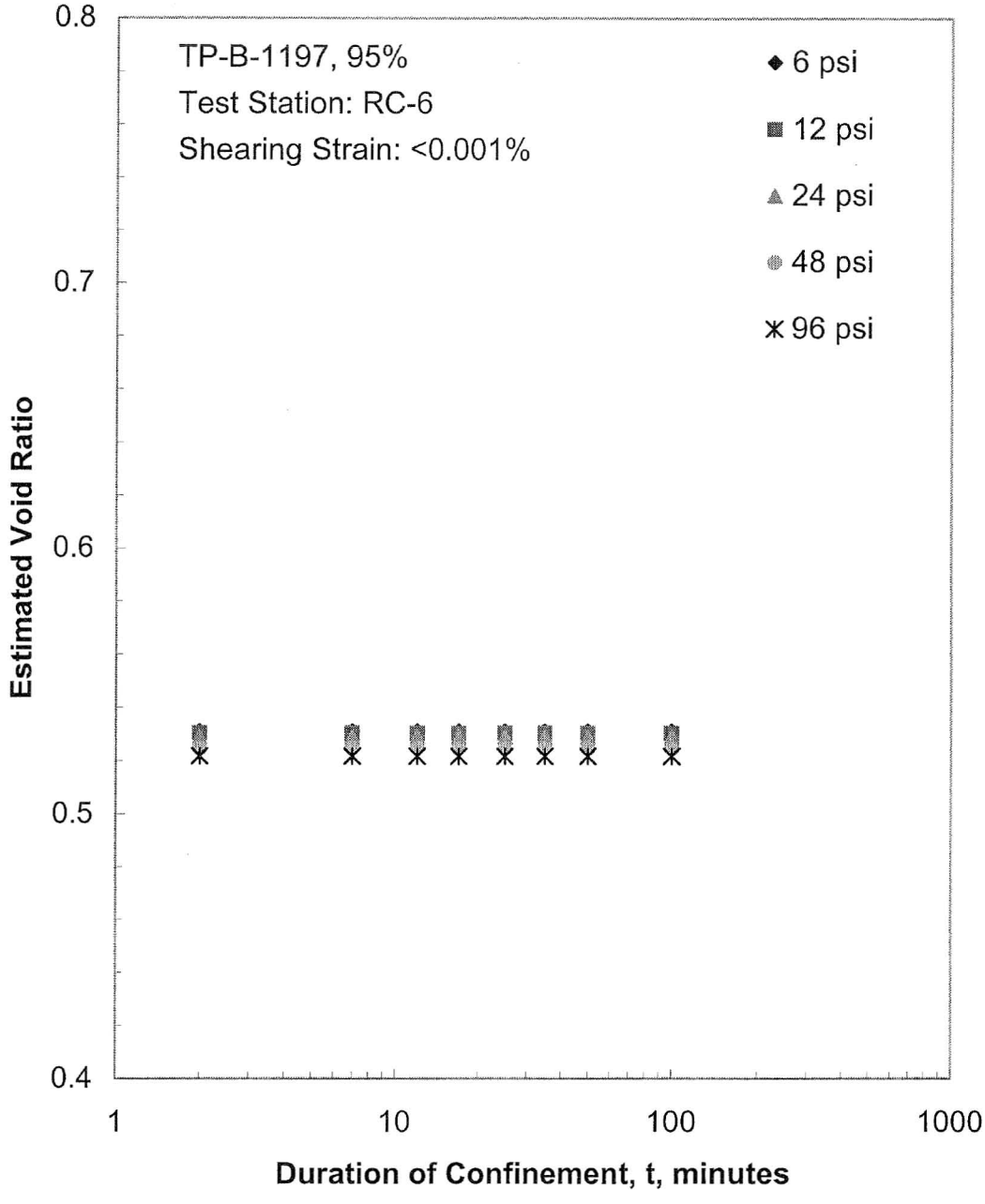


Figure P.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

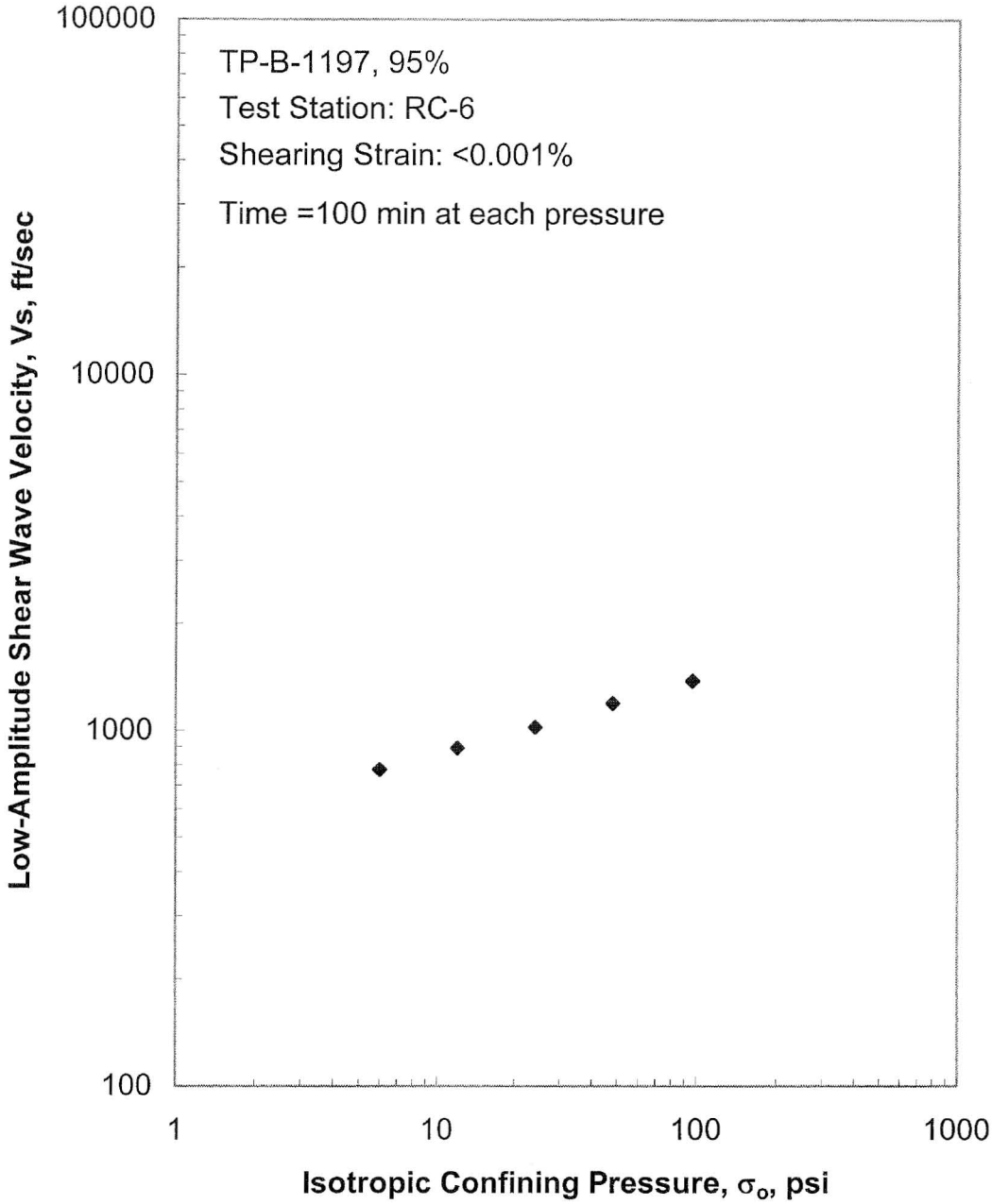


Figure P.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

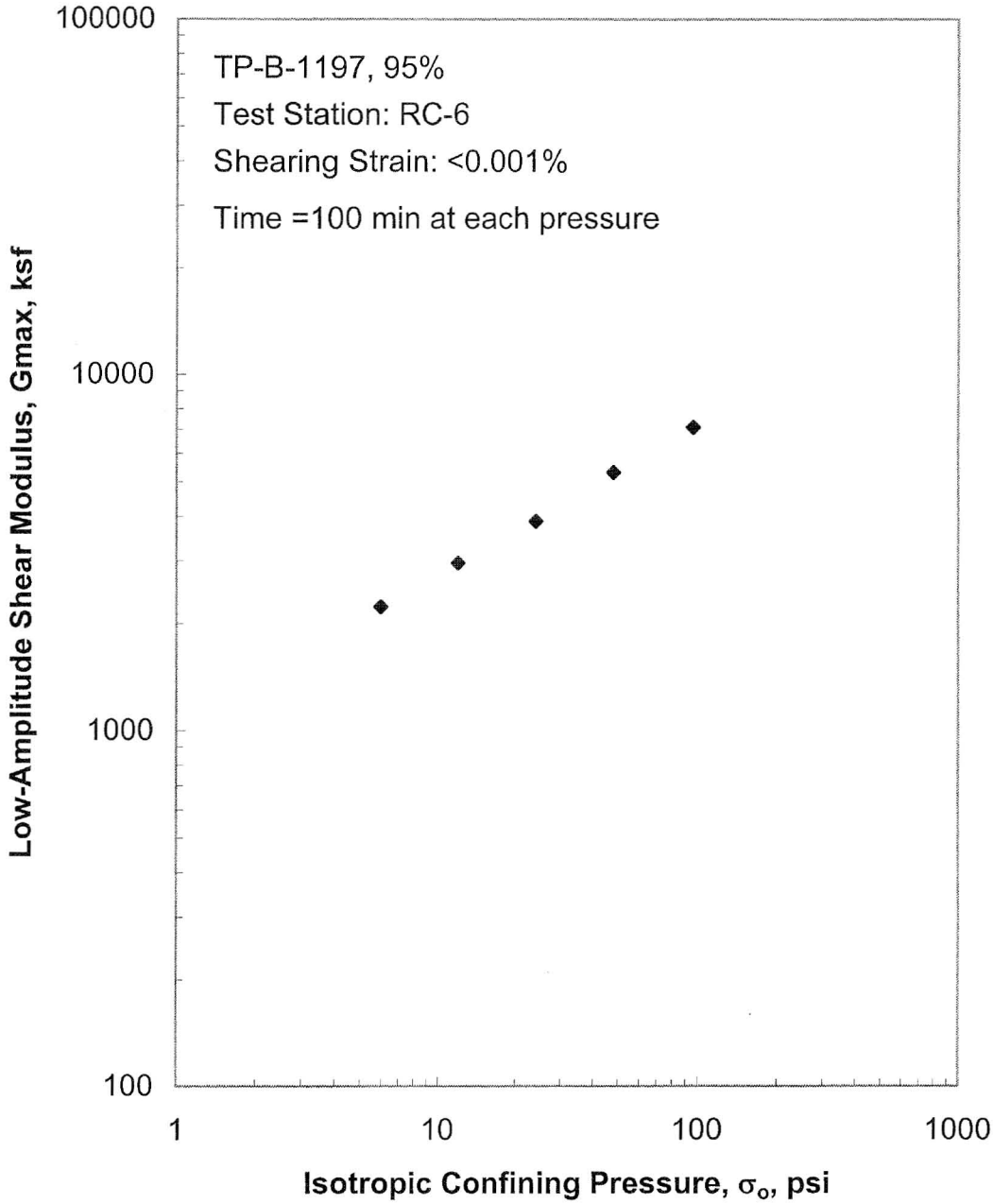


Figure P.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

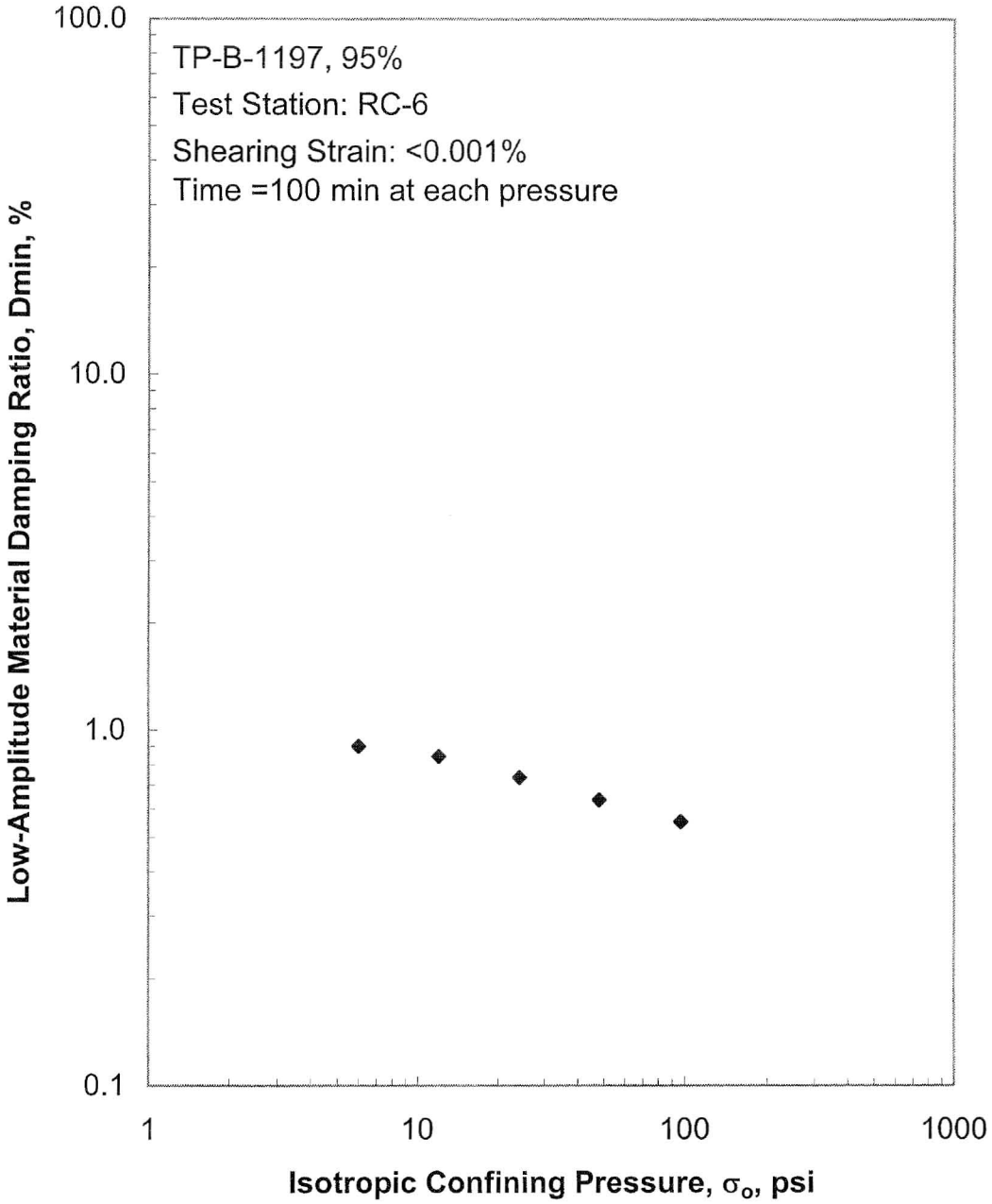


Figure P.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

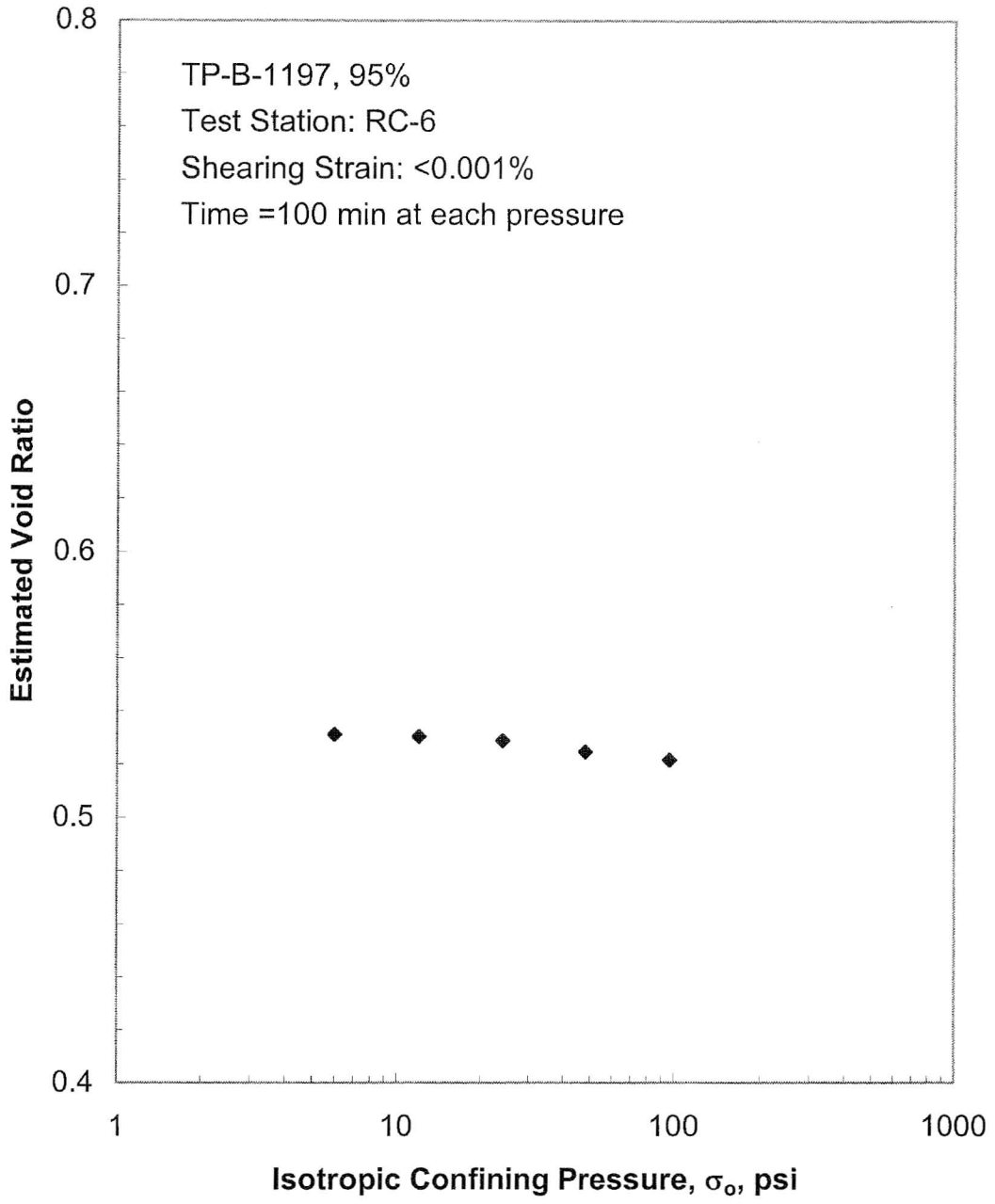


Figure P.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

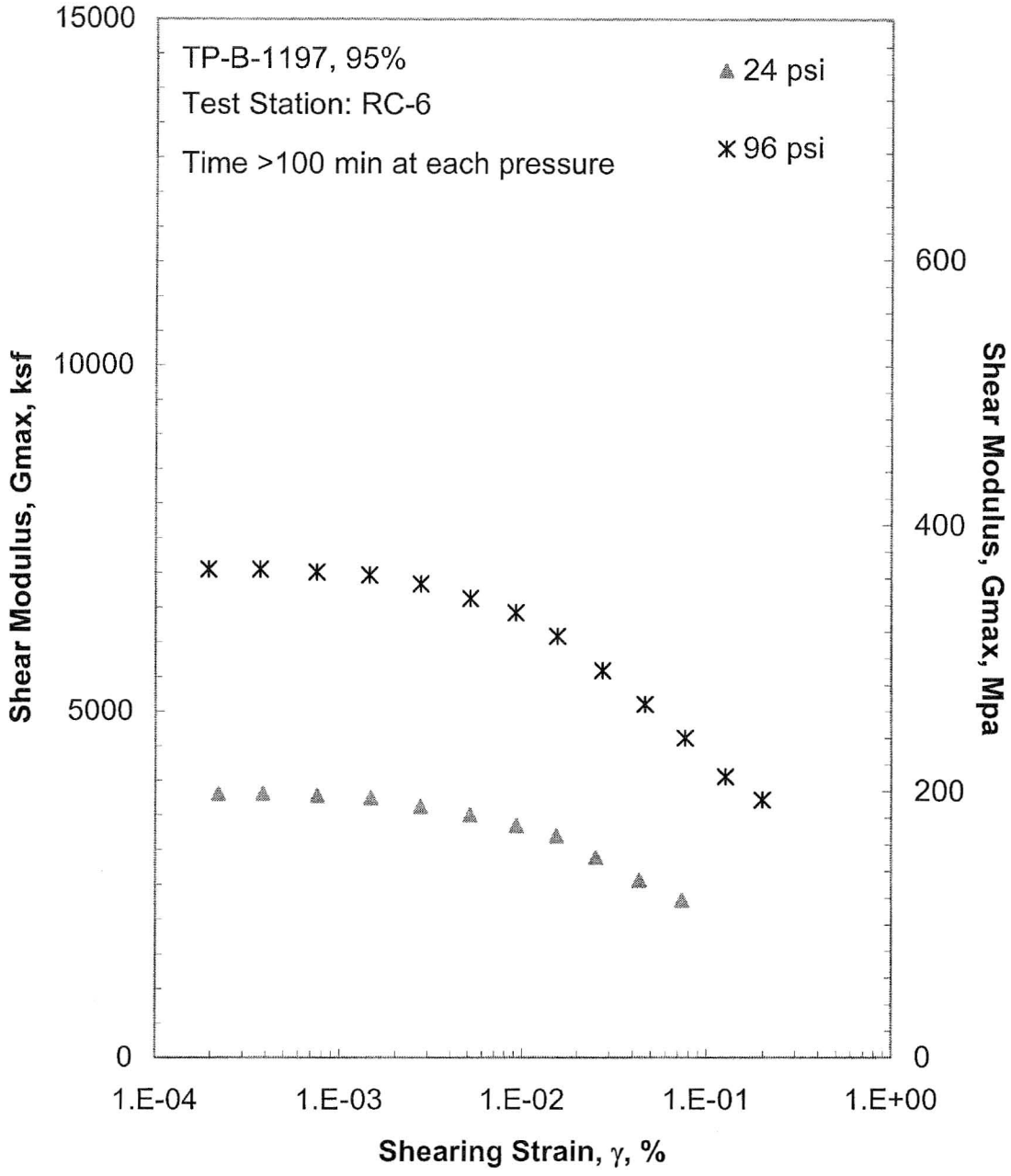


Figure P.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

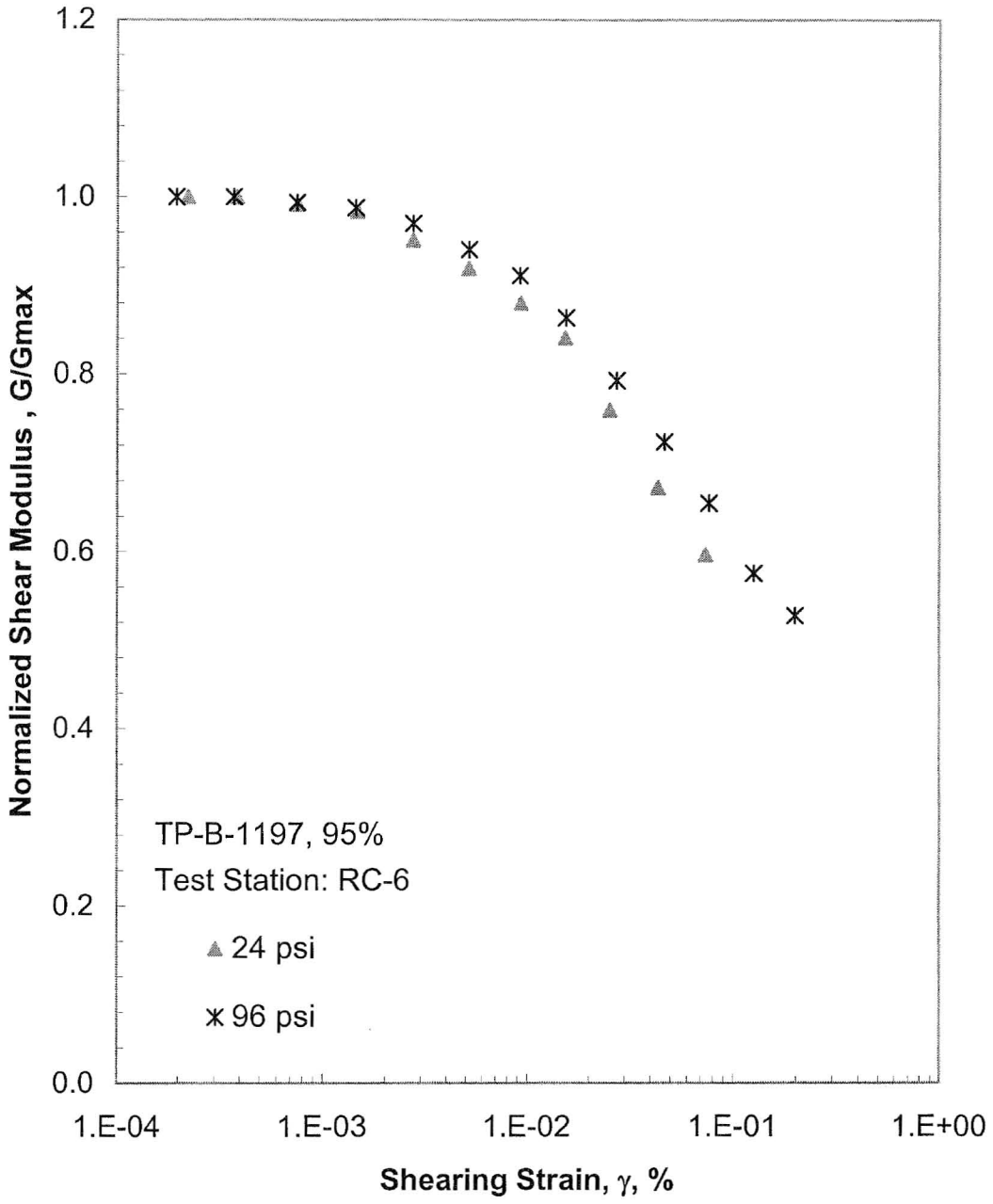


Figure P.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

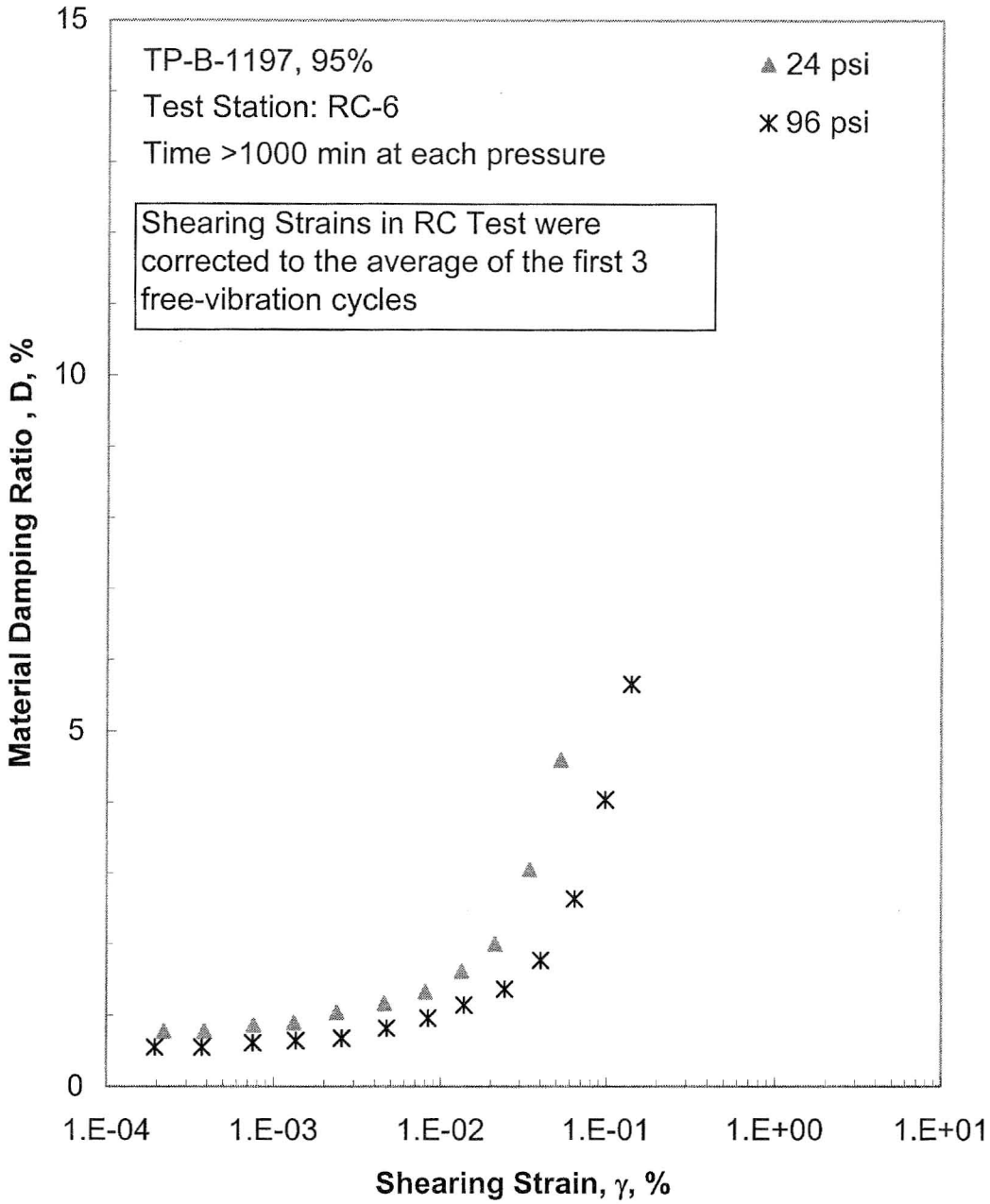


Figure P.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

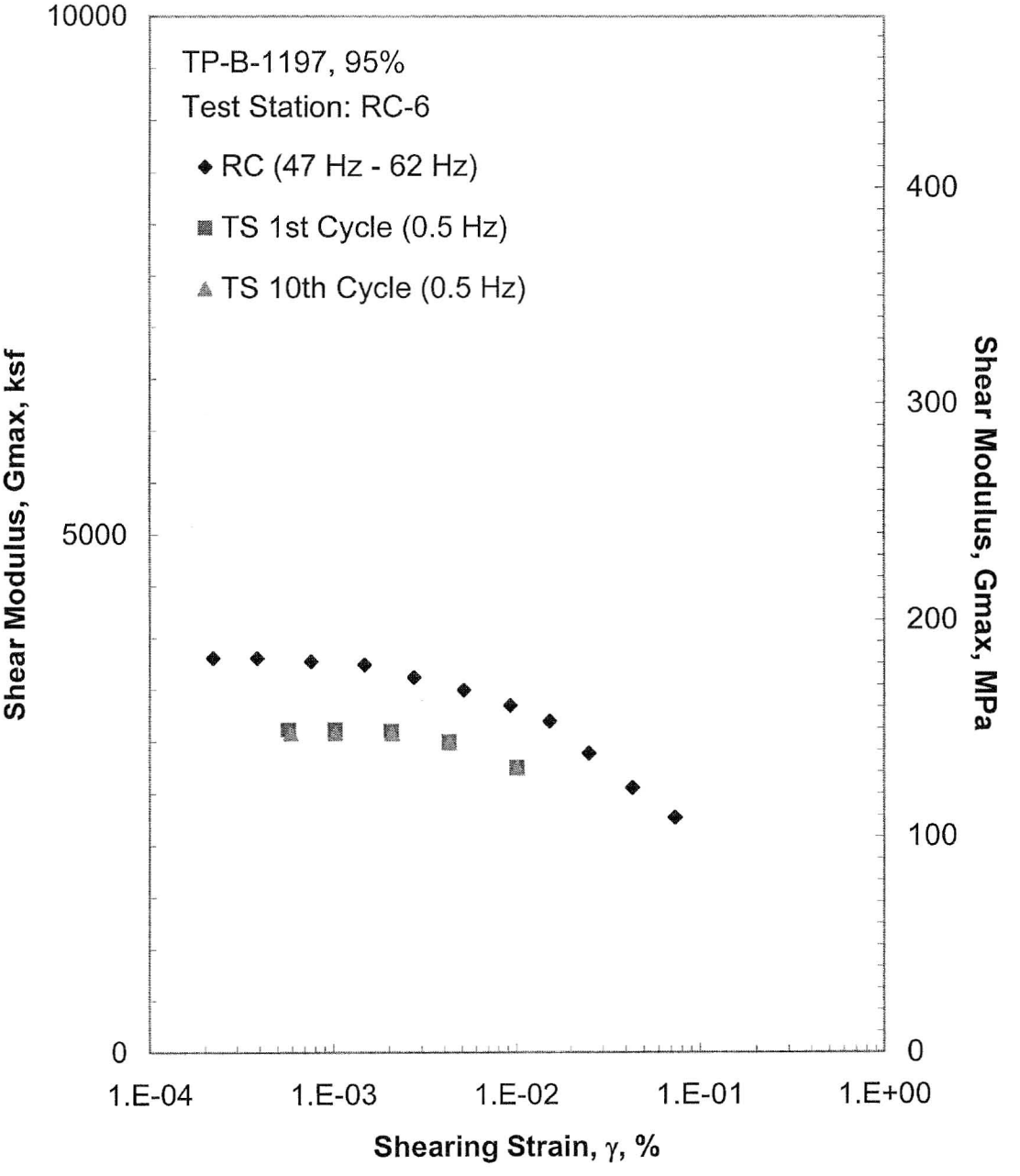


Figure P.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 24 psi from the Combined RCTS Tests

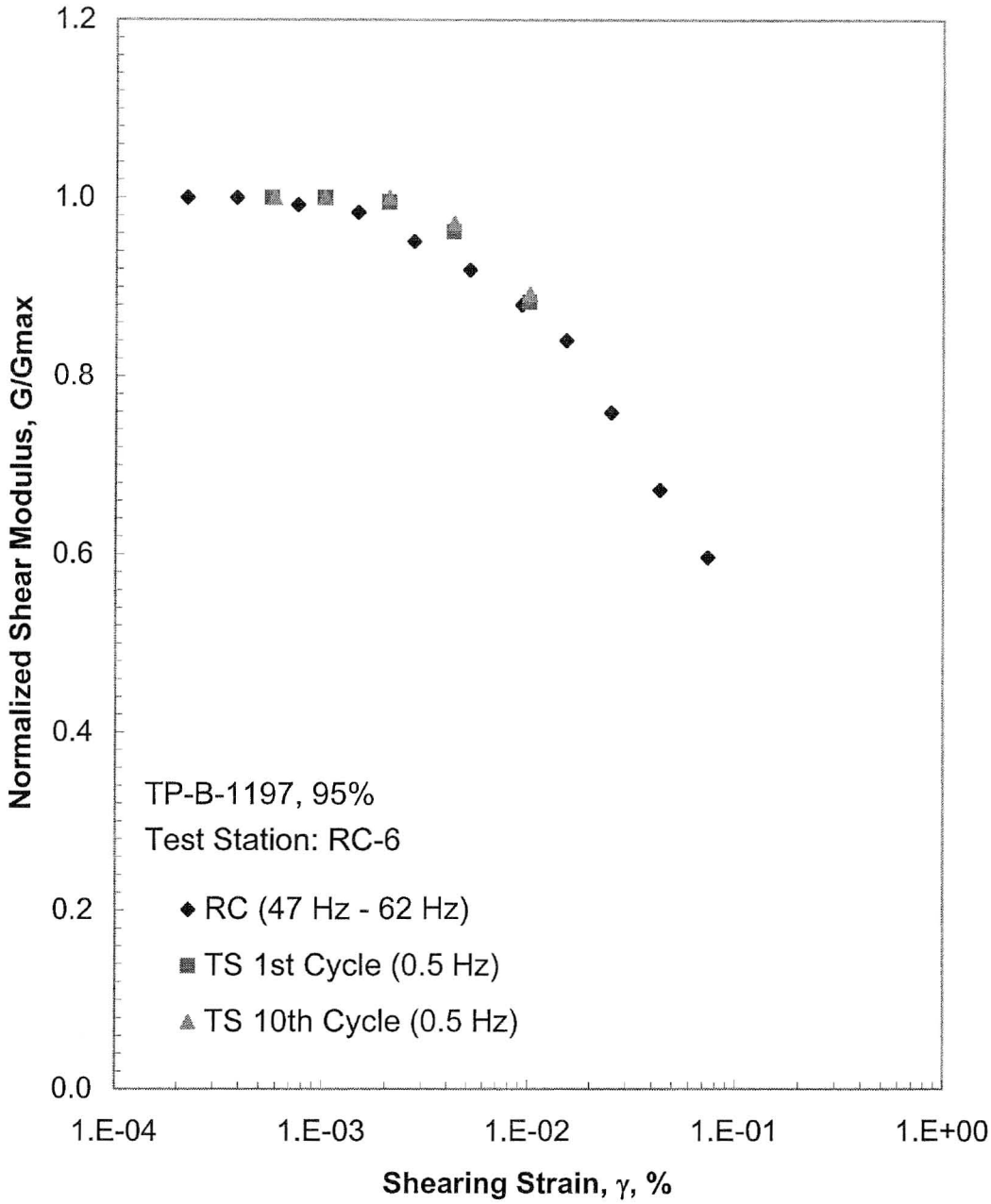


Figure P.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 24 psi from the Combined RCTS Tests

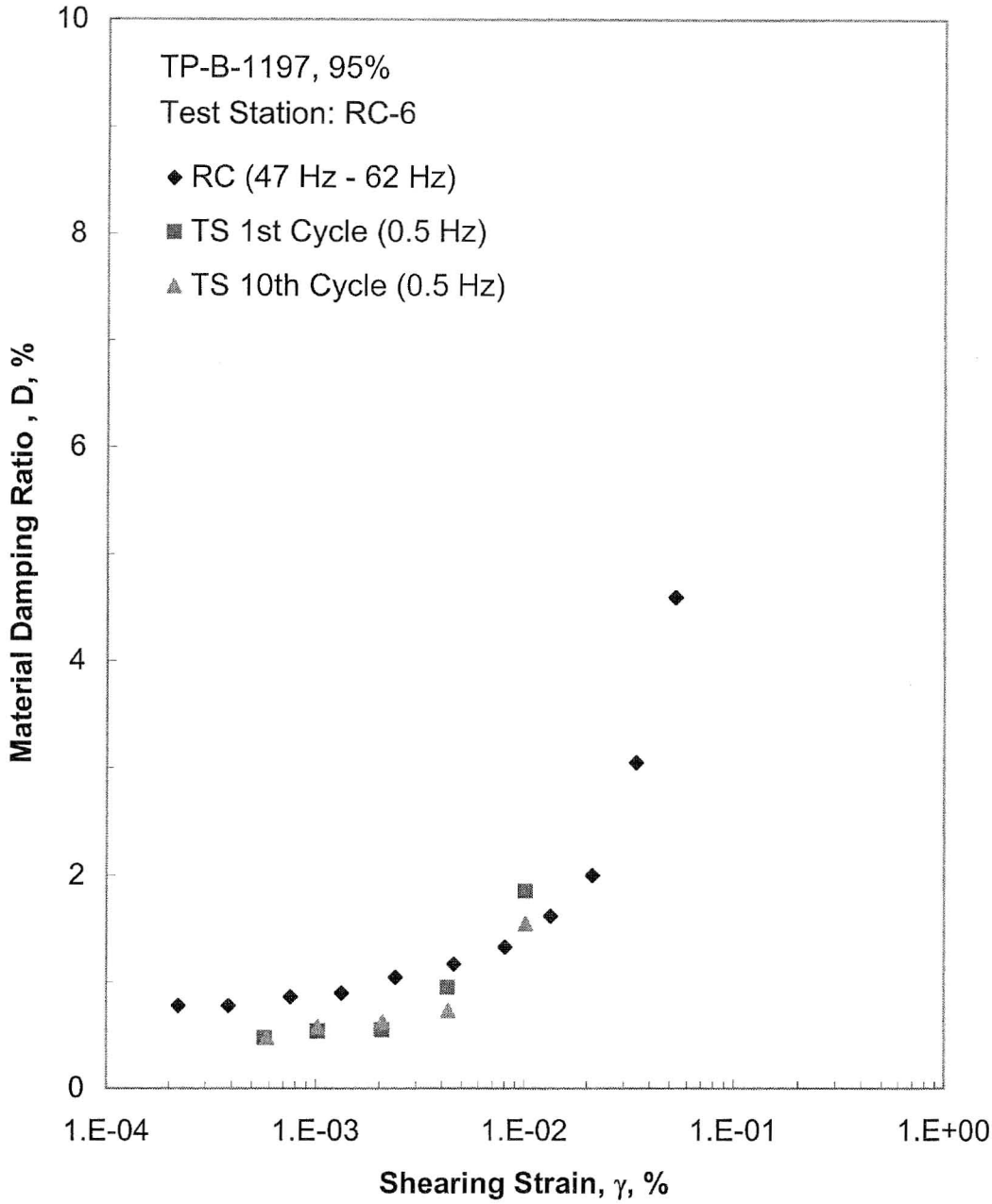


Figure P.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 24 psi from the Combined RCTS Tests

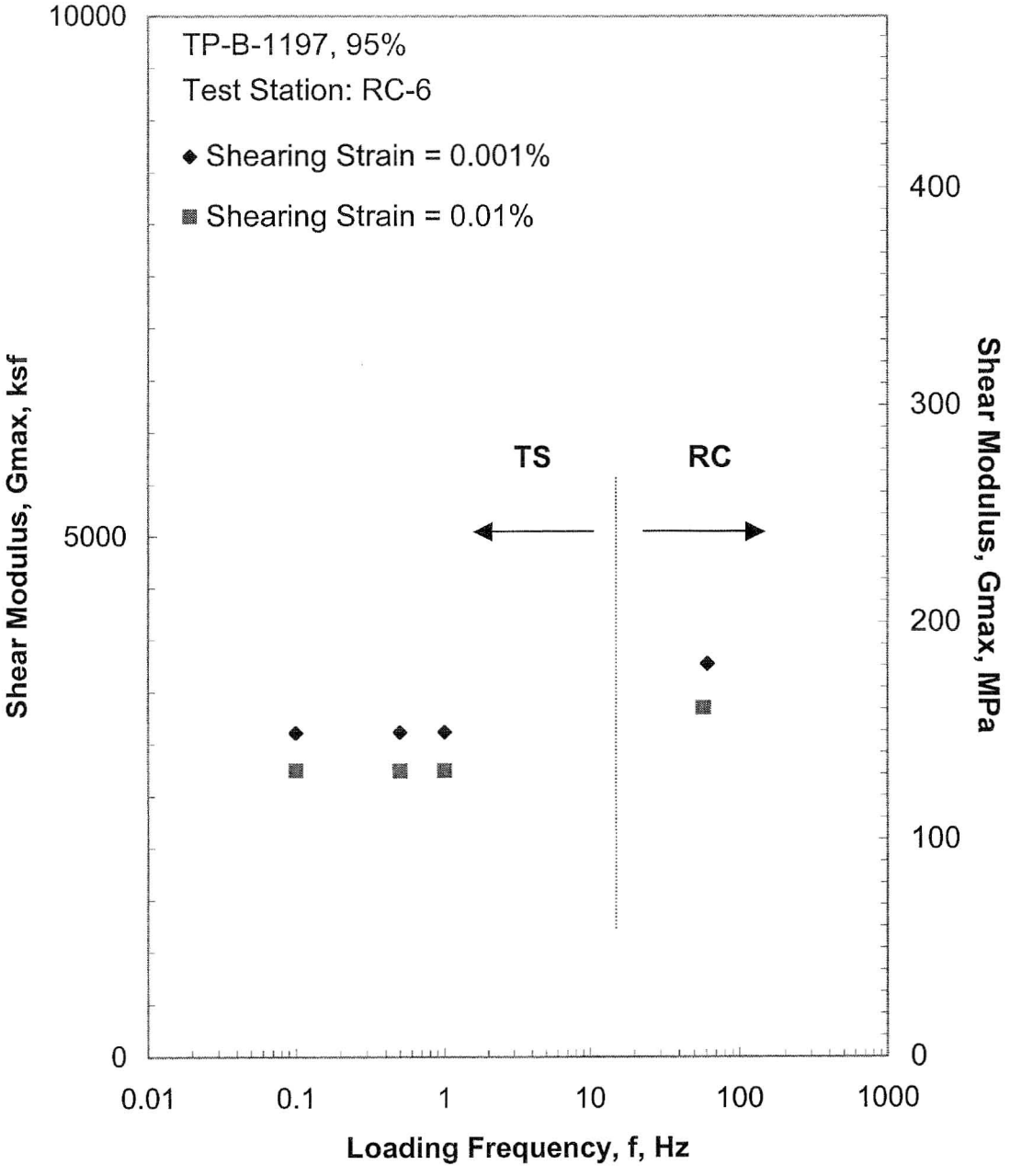


Figure P.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 24 psi from the Combined RCTS Tests

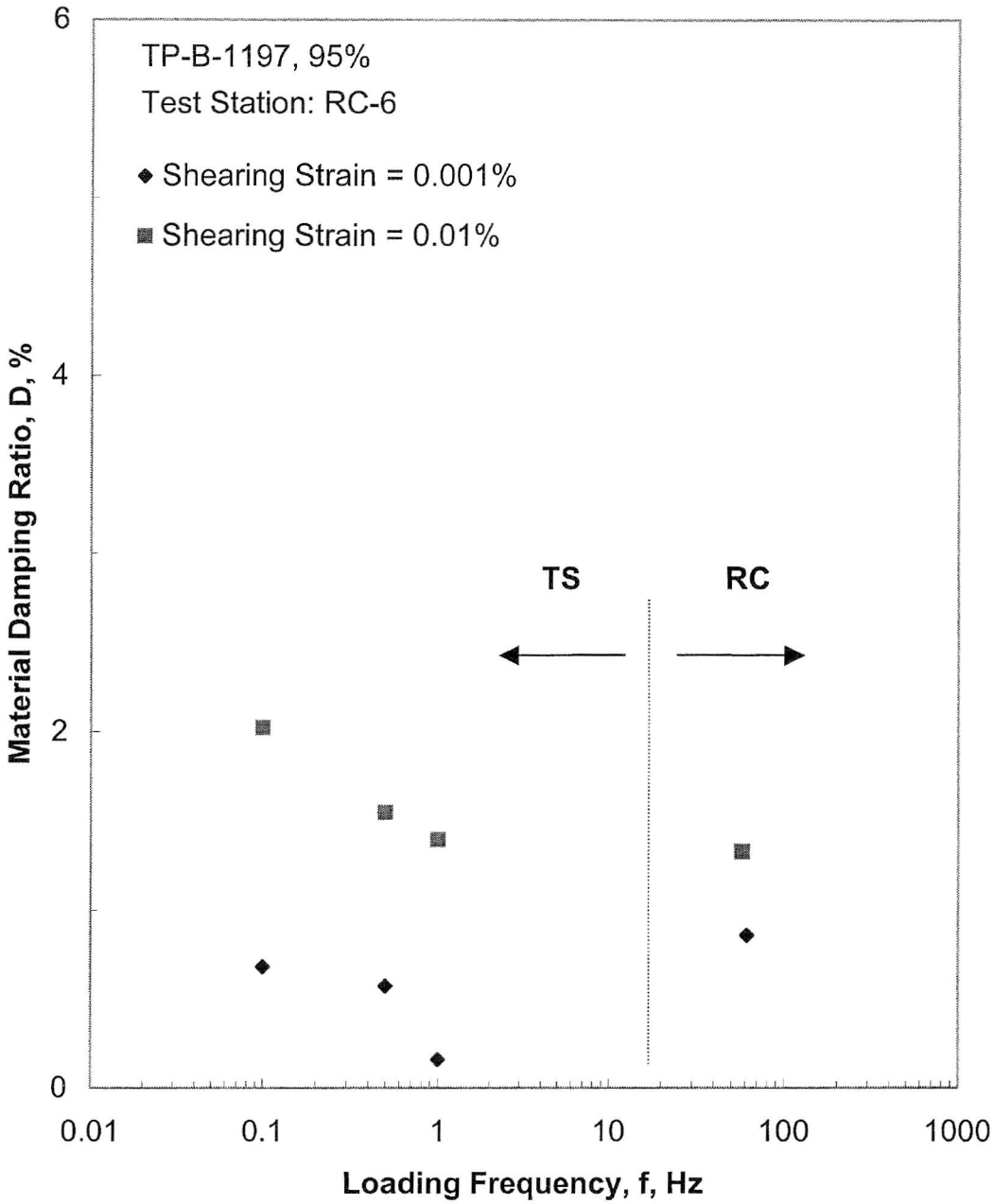


Figure P.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 24 psi from the Combined RCTS Tests

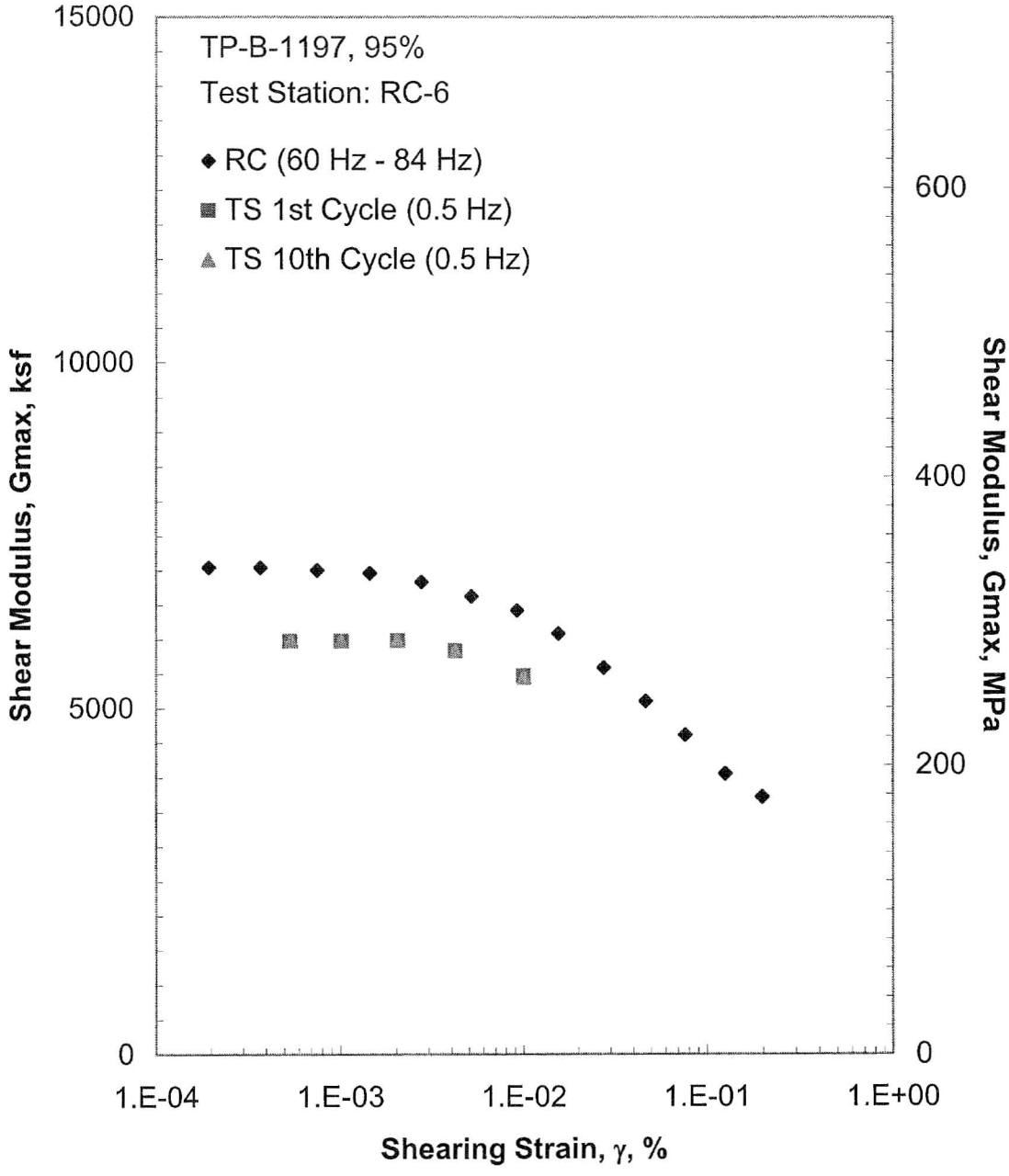


Figure P.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 96 psi from the Combined RCTS Tests

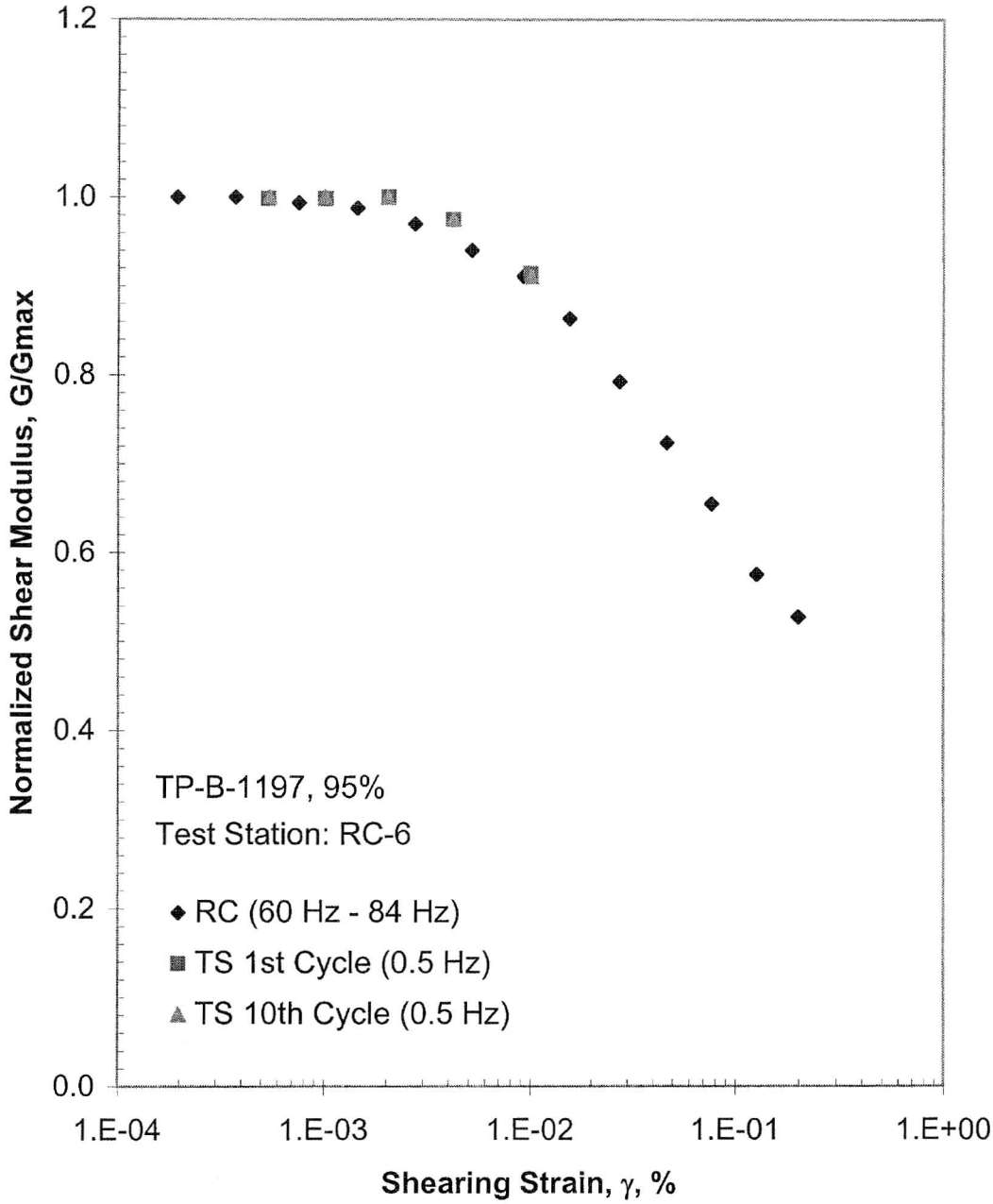


Figure P.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 96 psi from the Combined RCTS Tests

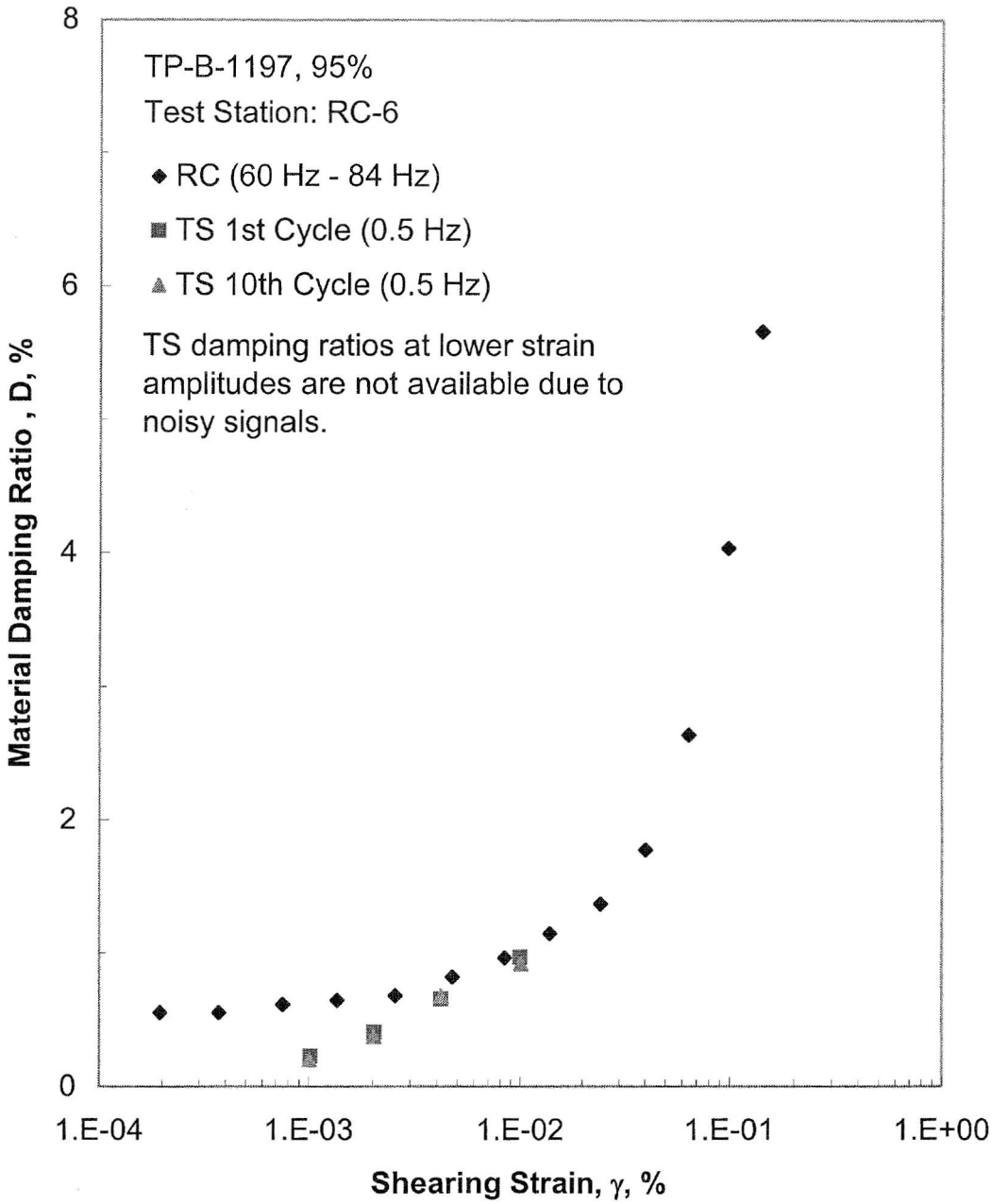


Figure P.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 96 psi from the Combined RCTS Tests

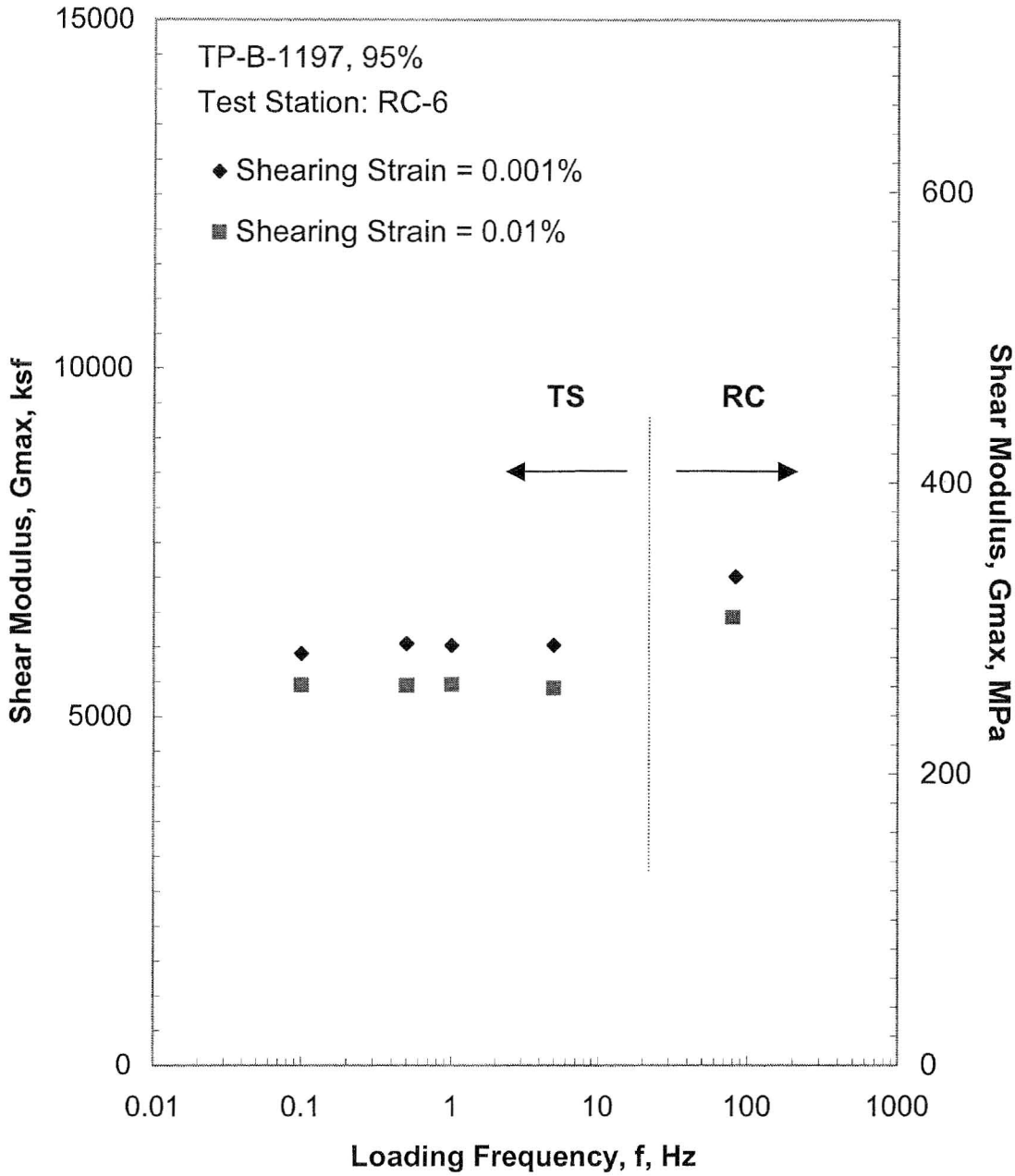


Figure P.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 96 psi from the Combined RCTS Tests

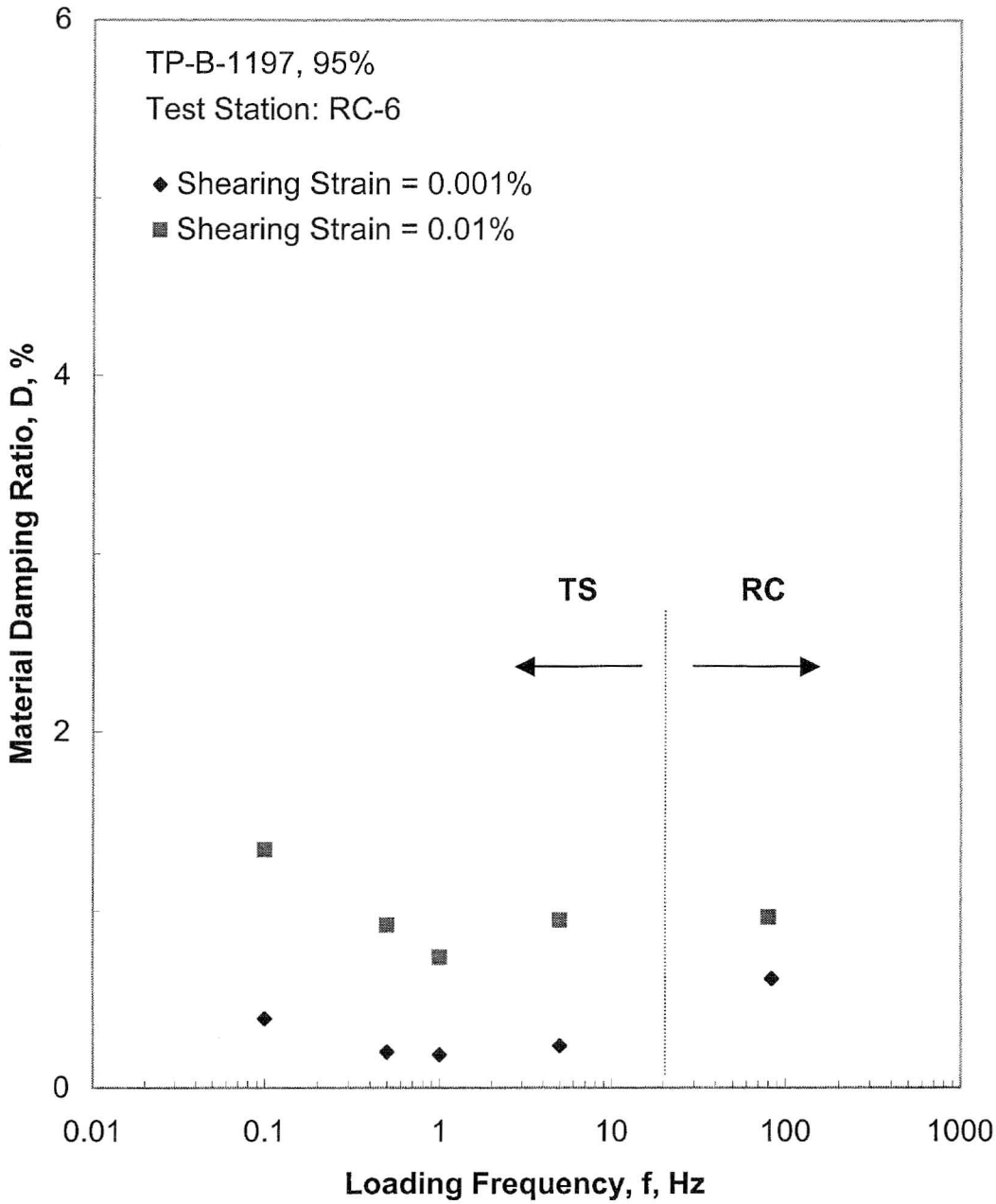


Figure P.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 96 psi from the Combined RCTS Tests

Table P.1 Variation in Low-Amplitude Shear Wave Velocity, Low-Amplitude Shear Modulus, Low-Amplitude Material Damping Ratio and Estimated Void Ratio with Isotropic Confining Pressure from RC Tests of Specimen TP-B-1197, 95%

Isotropic Confining Pressure, σ_o			Low-Amplitude Shear Modulus, G_{max}		Low-Amplitude Shear Wave Velocity, Vs	Low-Amplitude Material Damping Ratio, Dmin	Estimated Void Ratio, e
(psi)	(psf)	(kPa)	(ksf)	(MPa)	(fps)	(%)	
6	864	41	2231	107	776	0.90	0.53
12	1728	83	2957	142	893	0.84	0.53
24	3470	166	3870	186	1021	0.73	0.53
48	6912	331	5301	254	1193	0.64	0.52
96	13882	664	7092	340	1379	0.55	0.52

Table P.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen TP-B-1197, 95%; Isoptropic Confining Pressure, σ_o=24 psi (3.5 ksf = 166 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
2.22E-04	3806	1.00	2.22E-04	0.78
3.87E-04	3806	1.00	3.87E-04	0.78
7.60E-04	3775	0.99	7.60E-04	0.86
1.47E-03	3743	0.98	1.32E-03	0.90
2.74E-03	3620	0.95	2.38E-03	1.04
5.14E-03	3498	0.92	4.57E-03	1.17
9.28E-03	3349	0.88	8.07E-03	1.33
1.54E-02	3198	0.84	1.34E-02	1.62
2.53E-02	2890	0.76	2.12E-02	2.00
4.35E-02	2558	0.67	3.44E-02	3.05
7.37E-02	2271	0.60	5.31E-02	4.60

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table P.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen TP-B-1197, 95%; Isotropic Confining Pressure, σ_o = 24 psi (3.5 ksf =166 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
5.71E-04	3116	1.00	0.48	5.87E-04	3078	1.00	0.48
1.02E-03	3117	1.00	0.54	1.02E-03	3078	1.00	0.58
2.06E-03	3101	0.99	0.55	2.07E-03	3078	1.00	0.62
4.27E-03	2997	0.96	0.95	4.28E-03	2989	0.97	0.73
1.01E-02	2752	0.88	1.85	1.01E-02	2746	0.89	1.55

Table P.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen TP-B-1197, 95%; Isoptropic Confining Pressure, σ_o= 96 psi (13.9 ksf = 664 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
1.95E-04	7050	1.00	1.95E-04	0.55
3.73E-04	7050	1.00	3.73E-04	0.55
7.53E-04	7007	0.99	7.53E-04	0.62
1.45E-03	6965	0.99	1.36E-03	0.65
2.74E-03	6838	0.97	2.55E-03	0.68
5.15E-03	6629	0.94	4.74E-03	0.82
9.23E-03	6424	0.91	8.40E-03	0.96
1.56E-02	6087	0.86	1.38E-02	1.14
2.74E-02	5588	0.79	2.44E-02	1.37
4.66E-02	5102	0.72	4.01E-02	1.77
7.65E-02	4616	0.65	6.43E-02	2.64
1.26E-01	4057	0.58	9.82E-02	4.04
1.98E-01	3720	0.53	1.41E-01	5.66

[+] Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

[x] Average Damping Ratio from the First Three Cycles of the Free Vibration Decay Curve

Table P.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen TP-B-1197, 95%; Isotropic Confining Pressure, σ_o=96 psi (13.9 ksf = 664 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Material Damping Ratio, D, %
5.37E-04	5976	1.00	---*	5.44E-04	5983	1.00	---*
1.02E-03	5976	1.00	0.23	1.01E-03	5983	1.00	0.20
2.04E-03	5986	1.00	0.41	2.02E-03	5983	1.00	0.38
4.19E-03	5836	0.97	0.66	4.19E-03	5835	0.98	0.68
9.99E-03	5473	0.91	0.97	1.00E-02	5449	0.91	0.92

* Data not available due to noisy signals

APPENDIX Q

Specimen TP-B-1197, 100%
Reconstituted Engineering Fill at 100% Compaction
(Non-Plastic)

Borehole ---
B-1197
Depth = 45 ft (13.7 m)
Total Unit Weight = 125.4 lb/ft^3
Water Content = 10.1 %
Estimated In-Situ Ko = 0.44
Estimated In-Situ Mean Effective
Stress = 24 psi

FUGRO JOB #: 0401-1667
Testing Station: RC6

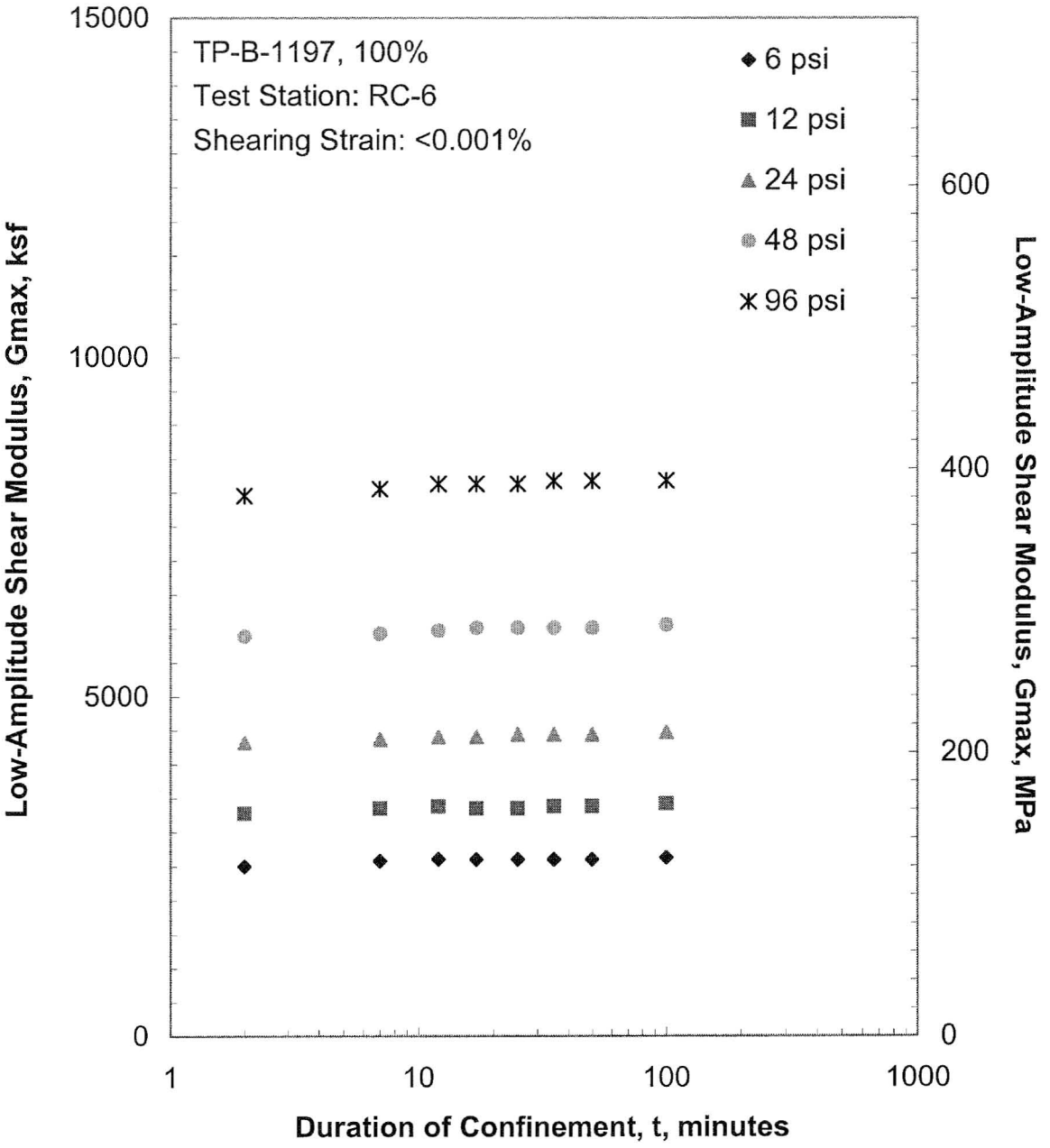


Figure Q.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

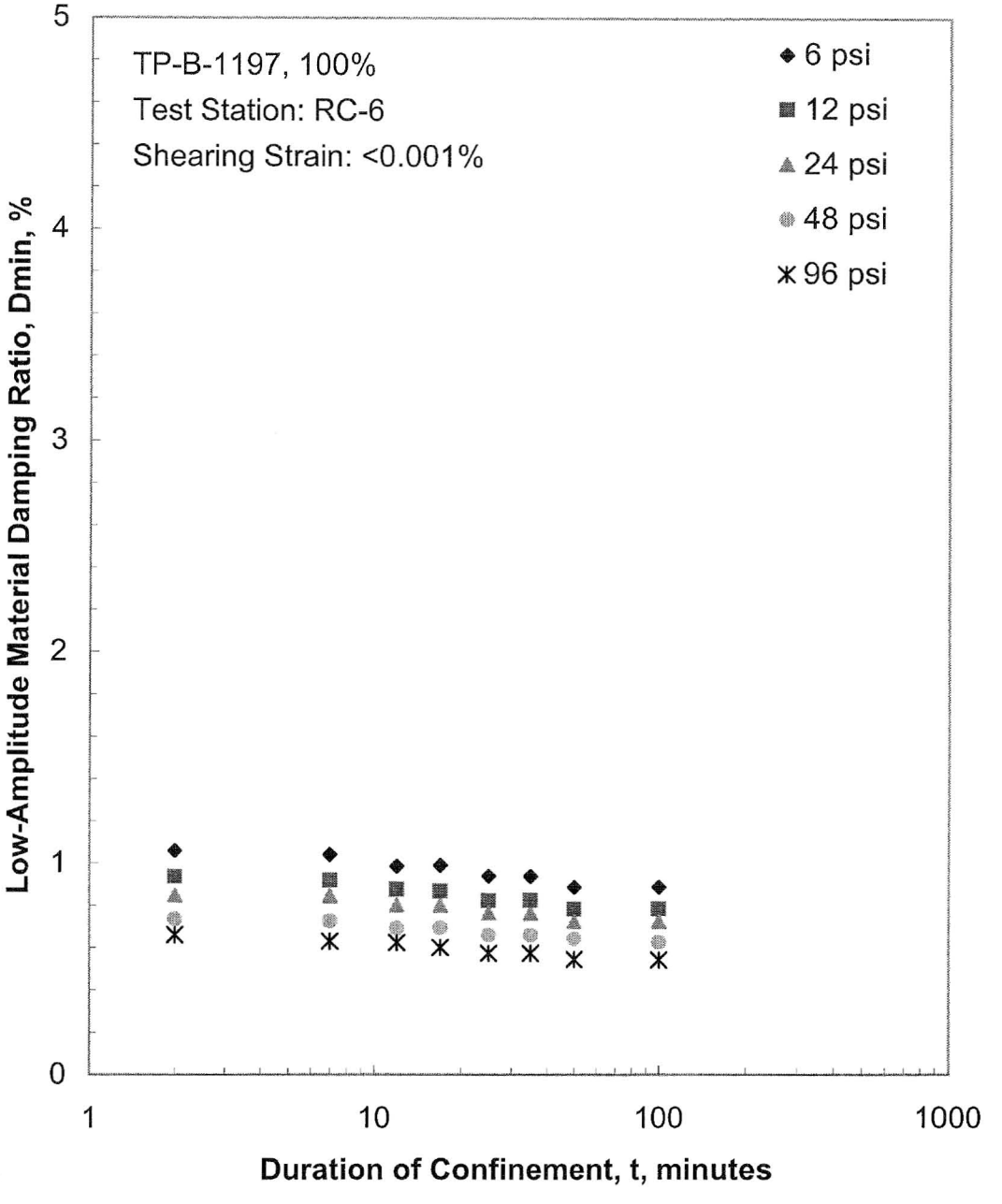


Figure Q.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

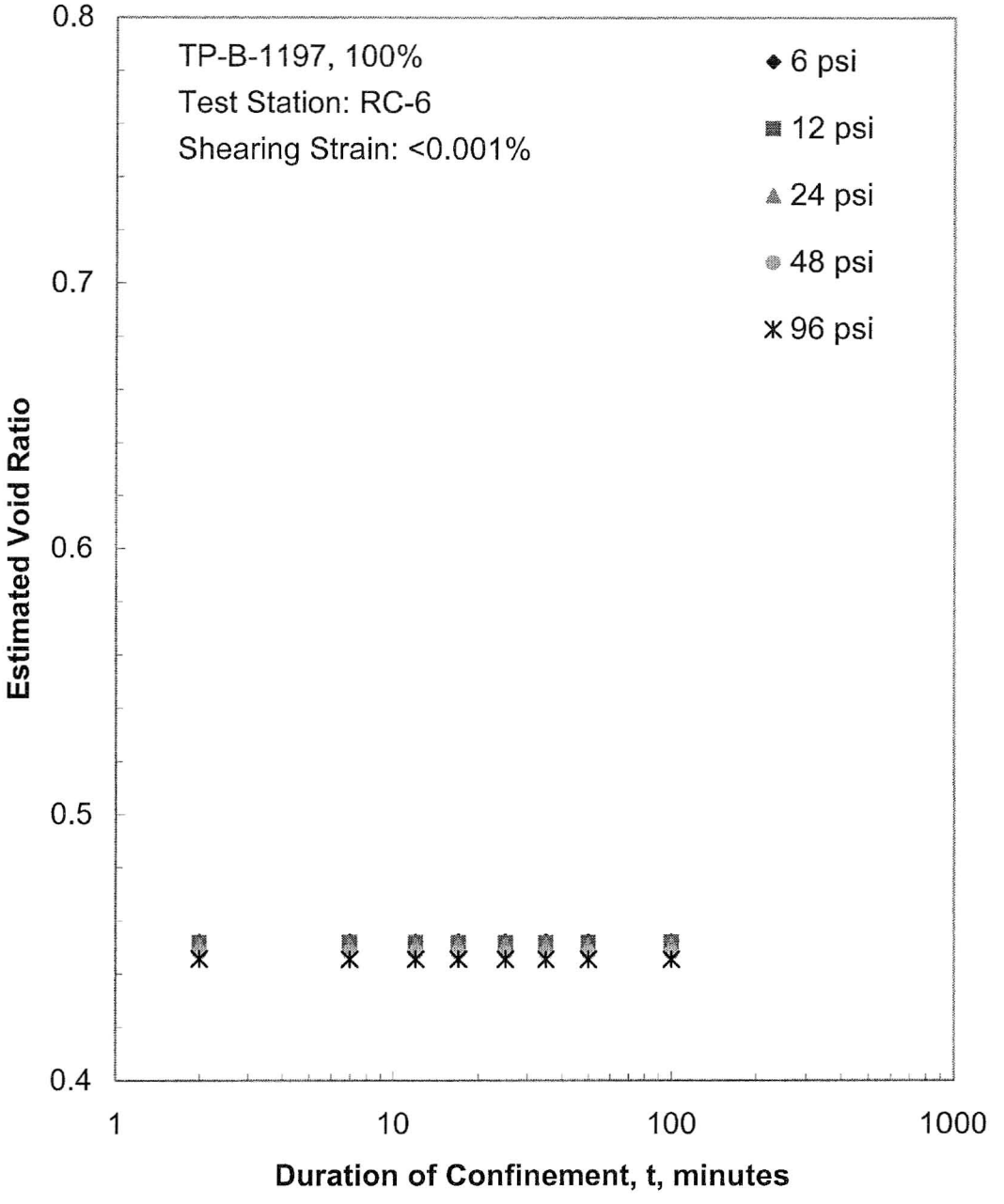


Figure Q.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

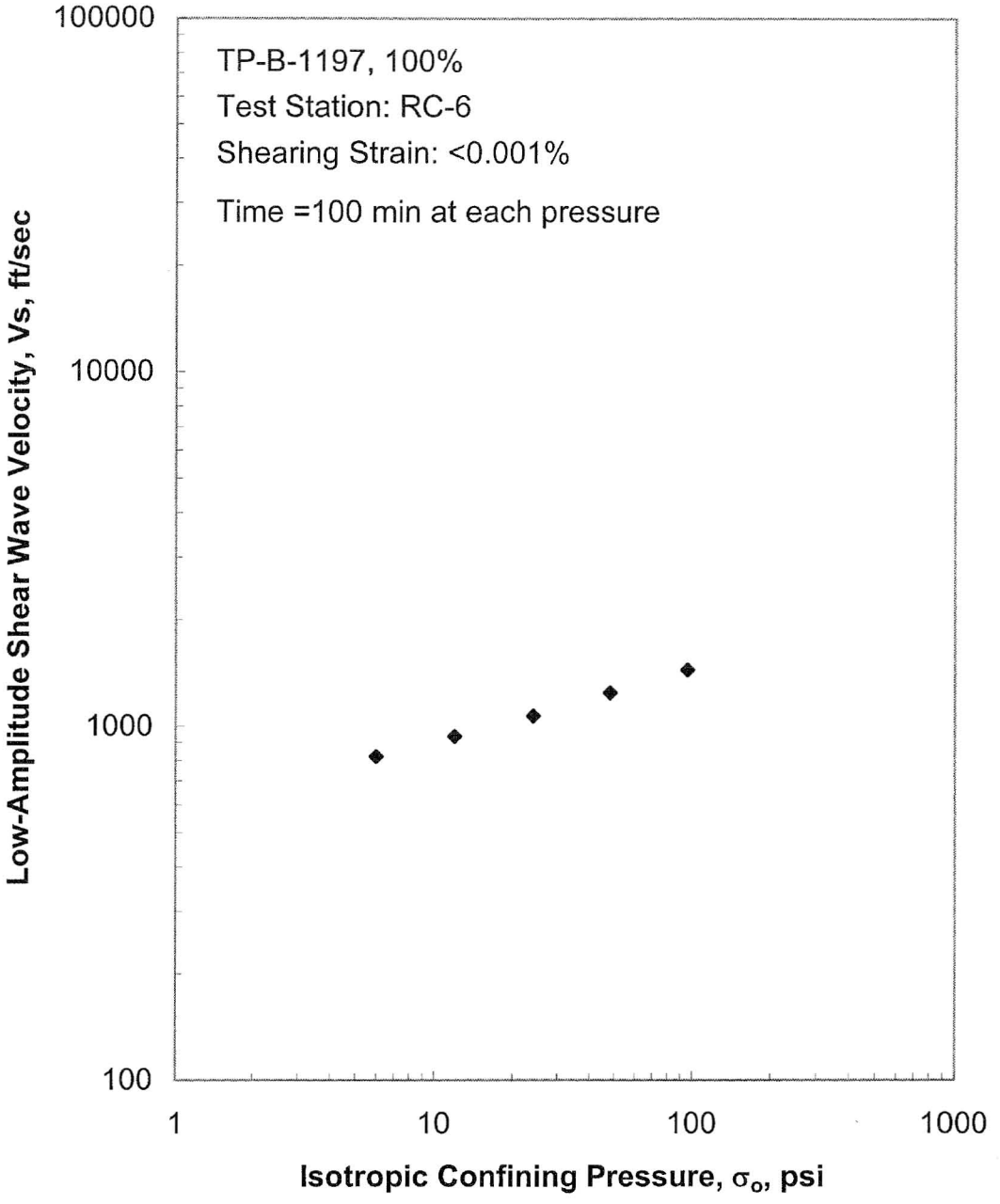


Figure Q.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

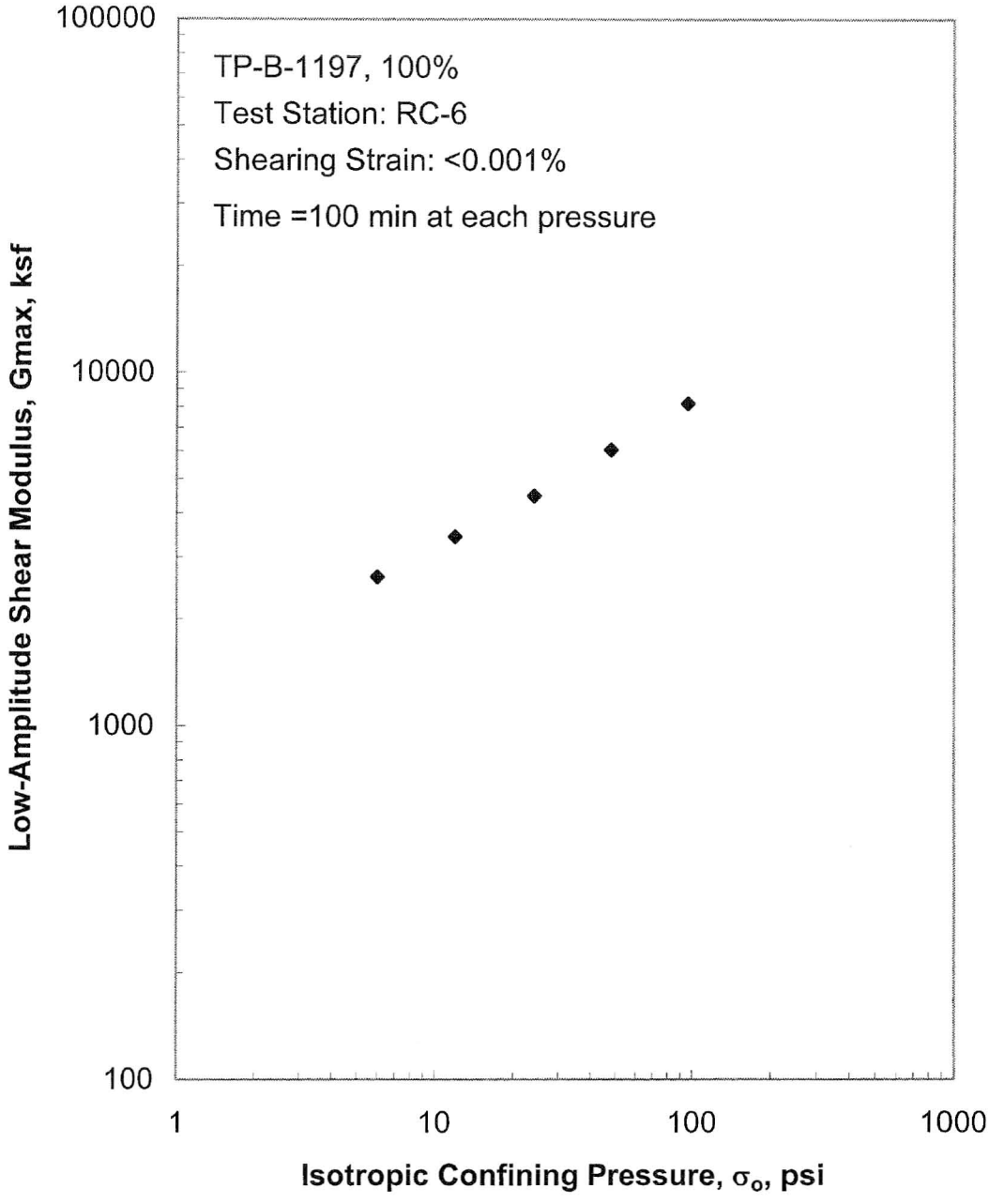


Figure Q.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

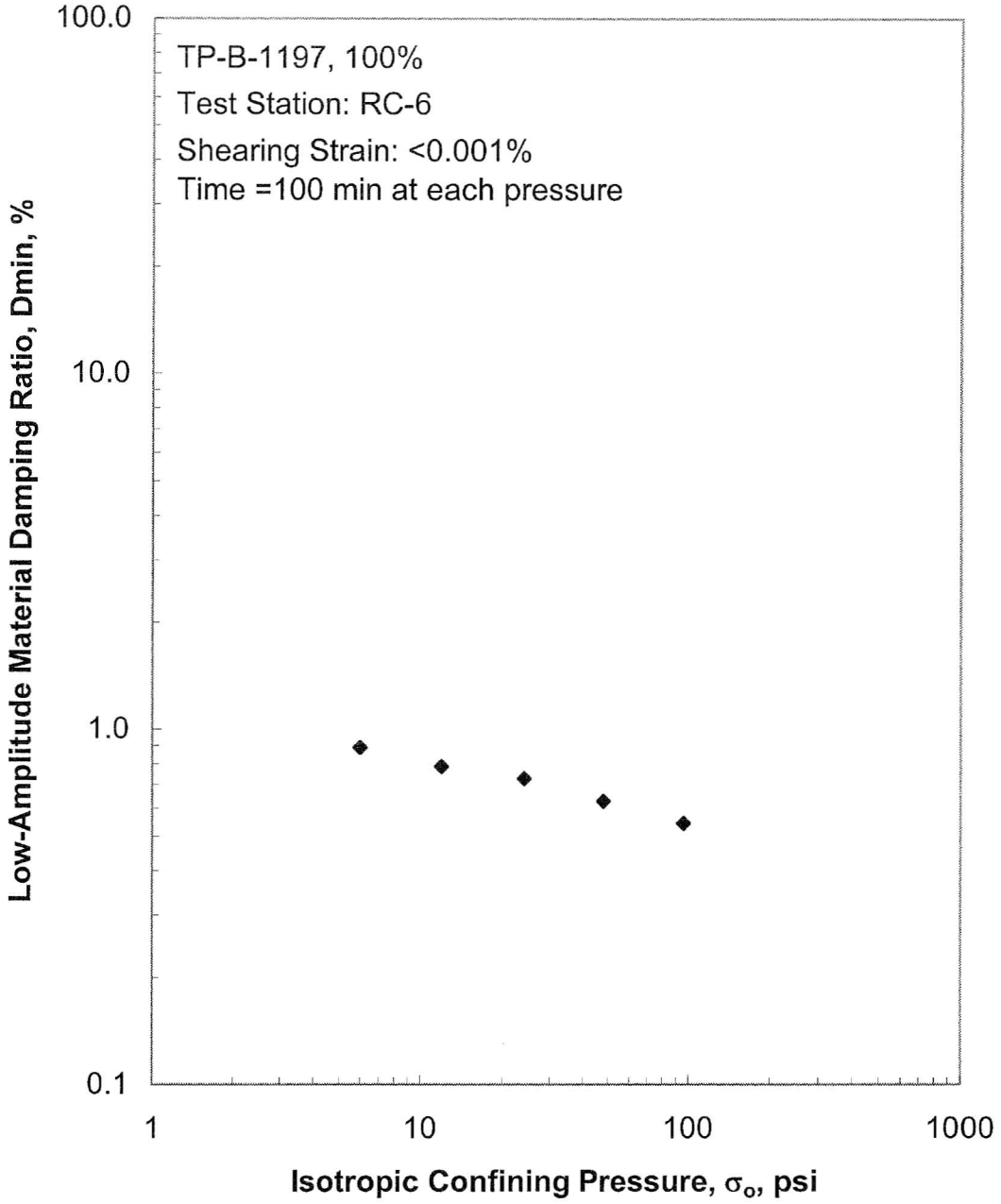


Figure Q.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

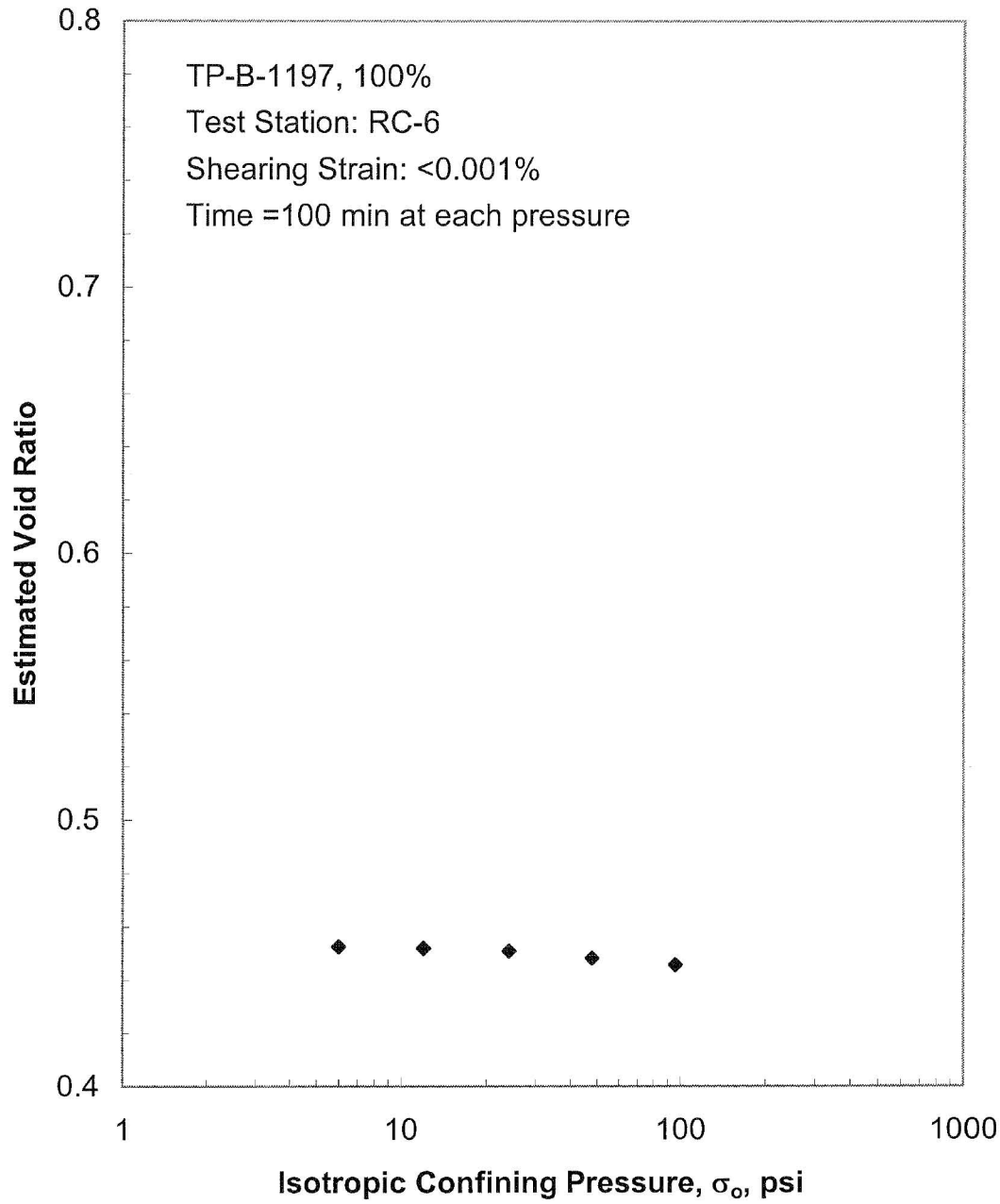


Figure Q.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests