GEOTECHNICAL SUBSURFACE INVESTIGATION DATA REPORT ADDENDUM NO. 3 (RCTS TEST RESULTS) – REV. 02

CGG Combined Operating License Application (COLA) Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

December 13, 2007

Prepared By:

SCHNABEL ENGINEERING NORTH, LLC
Gaithersburg, Maryland
(Schnabel Project No. 06120048)

Submitted To:

BECHTEL POWER CORPORATION
Frederick, Maryland
(Bechtel Subcontract No. 25237-103-HC4-CY00-00001)

Binder No. 1 of 1

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December 13, 2007

Mr. Scott Close, P.E.
Bechtel Power Corporation
5275 Westview Drive
Frederick, MD 21703-8306

Subject: **Geotechnical Subsurface Investigation Data Report Addendum No. 3 (RCTS Test Results) – Rev. 02 CGG Combined Operating License Application (COLA) Project, Calvert Cliffs Nuclear Power Plant (CCNPP), Calvert County, Maryland**
Subcontract No. 25237-103-HC4-CY00-00001
(Schnabel Project No. 06120048)

Dear Mr. Close:

Schnabel Engineering North, LLC (Schnabel) is pleased to submit this Addendum No. 3 (Rev. 02) to the Geotechnical Subsurface Investigation Data Report dated April 13, 2007 for the above referenced project. This data report addendum was prepared in accordance with the Technical Services Subcontract agreement between Bechtel Power Corporation (Bechtel) and Schnabel, dated March 23, 2006. Revisions to this Addendum are based on Bechtel review comments.

Our scope of work addressed in this report addendum includes resonant column and torsional shear (RCTS), moisture content, soil classification, unit weight and specific gravity geotechnical laboratory testing as prescribed in the Bechtel Geotechnical Laboratory Test Assignment Schedule dated August 11, 2006 (revised January 26, 2007) with associated cover letter dated January 29, 2007 (document number 25237-103-T7S-CY00-00003). RCTS, moisture content and unit weight testing were conducted by Fugro Consultants, Inc. in their Houston, Texas laboratory. The soil classification and specific gravity testing were performed by Schnabel's Baltimore, Maryland laboratory. A total of 13 of the 20 assigned soil samples were tested, the results of which are provided herein. A fourteenth sample (B765-UD25) did not yield a testable specimen due to a high shell content and fractured character and was subsequently rejected. The remaining six samples

(B310-UD19, B340-UD17, B401-UD45, B409-UD8, B429-UD13, B437-UD23) are being held at the Fugro laboratory for possible future testing. These samples will be held at the Houston laboratory until written direction is received from you for their disposition.

This addendum provides the RCTS and associated soil index test results, including the following attachments:

1. Summary of RCTS Test Procedures
2. “Final RCTS Report for the Calvert Cliffs (CC) Project,” dated December 12, 2007, prepared by Fugro Consultants, Inc.
3. Updated “Summary of Soil Laboratory Test Results” spreadsheet, dated November 2, 2007.
4. Replacement test boring log pages for Appendix C of the final report.

Sampling and testing activities for this project were performed under Bechtel’s quality assurance program meeting NQA-1 requirements, and according to the project technical specification (25237-103-HC4-CY00-00001, Rev. 3, Oct 06), and the approved project procedures and work plans.

We appreciate the opportunity to be of service to you for this project. Please contact Mr. Brian Banks at (301) 417-2400 if you have any questions regarding this addendum.

Very truly yours,

SCHNABEL ENGINEERING NORTH, LLC

Brian K. Banks, P.G.
Senior Associate

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G:\2006\06120048 Calvert Cliffs\WP\FINAL\Addendum 3\06120048 Calvert Cliffs Data Report - Addendum No 3 (07_12-13) - RCTS Results - REV 02.doc

Attachments:

1. Summary of RCTS Test Procedures
2. Final RCTS Report for the Calvert Cliffs (CC) Project, dated December 12, 2007 (343 Sheets)
3. Summary of Soil Laboratory Test Results (24 Sheets)
4. Replacement Boring Log Sheets (26 Sheets)

SUMMARY OF RCTS TEST PROCEDURES

Summary of RCTS Test Procedures
Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Fugro laboratory personnel used resonant column and torsional shear (RCTS) equipment to measure the material properties (shear modulus and material damping in shear) of soil specimens. The RCTS equipment used is of the fixed-free type, with the bottom of the specimen fixed and shear stress applied to the top.

Both the resonant column (RC) and torsional shear (TS) tests were performed in a sequential series on the same specimen over a shearing strain range from about 10^{-4}% to about 1%, depending upon specimen stiffness.

The basic operational principle is to vibrate the cylindrical specimen in first-mode torsional motion. Harmonic torsional excitation is applied to the top of the specimen over a range in frequencies, and the variation of the acceleration amplitude of the specimen with frequency is obtained. Once first-mode resonance is established, measurements of the resonant frequency and amplitude of vibration are made. These measurements are then combined with equipment characteristics and specimen size to calculate shear wave velocity and shear modulus based on elastic wave propagation.

The RC test is based on the one-dimensional wave equation derived from the theory of elasticity. The shear modulus is obtained by measuring the first-mode resonant frequency while material damping is evaluated from either the free-vibration decay curve or from the width of the frequency response curve at the so-called half power points. In the TS test, the actual stress-strain hysteresis loop is determined by means of measuring the torque-twist curve. Shear modulus is calculated from the slope of the hysteresis loop, and the hysteric damping ratio is calculated using the area of the hysteresis loop compared to the triangle made by the slope of the hysteresis loop and a line passing horizontally through the origin. The primary difference between the two types of tests is the excitation frequency. In the RC test, frequencies above 20 Hz are generally required and inertia of the specimen and drive system is considered when analyzing the measurements. The TS test is associated with slow cyclic loading frequencies generally below 10 Hz and inertia is not considered in the data analysis.

Equipment wise, the RCTS apparatus consists of four basic subsystems which are: 1) a confinement system, 2) a drive system, 3) a height-change measurement system, and 4) a motion monitoring system. The test apparatus is automated so that a microcomputer controls the test and collects the data. Compressed air is used to confine isotropically the specimen in the stainless steel confining chamber. The drive system consists of a drive plate, magnets, drive coils, a power amplifier and a signal generating source. The magnets are fixed to the drive plate and the drive coils encircle the ends of the magnets such that the drive plate excites the soil specimen in torsional motion when a current is passed through the coils. The height change of the specimen is measured by a linear variable differential transformer to determine the changes in the length and mass of the specimen during consolidation or swell, and to calculate change in the mass moment of inertia, mass density, and void ratio during testing.

RCTS testing was performed on each soil specimen at confining pressures of 0.25, 0.5, 1, 2, and 4 times the estimated effective stress. Testing at each successive stage (i.e., confining pressure condition) occurred after the specimens were allowed to consolidate at each pressure step. The soil specimen is sealed in a membrane and pore pressure in the specimen is vented to atmospheric pressure. The samples were not backpressure saturated. In general, the rate of consolidation decreased with increasing confining pressure for each specimen, and cohesive soil specimens take longer to consolidate than granular soils. Consolidation times range from about 1 day up to about 21 days or longer. Fugro laboratory personnel analyzed the resulting stress/strain curve to determine when the sample was sufficiently consolidated for testing.

At each level of shear strain amplitude, the shear modulus (G) and material damping ratio (λ) were determined. For each consolidation stage, the maximum shear modulus (G_{max}) and minimum material damping ratio (λ_{min}) were determined, along with some values of G and λ versus strain amplitude. Typically, in the 0.25-, 0.5-, and 2-times consolidation stages, shear strain amplitude less than 0.001% is applied throughout each testing sequence. In the 1- and 4-times consolidation stages, additional levels of shear strain amplitude are applied, up to that obtainable by the equipment. In each consolidation stage, after testing at the maximum strain amplitude, additional values of G were determined to monitor specimen recovery.

Because different frequencies are applied in the RC and TS tests, different motion monitoring systems are used. The motion monitoring system in the RC test consists of an accelerometer, a charge amplifier, and a data acquisition system (DAQ). The motion monitoring system in the RS test consists of two proximitor probes, an operational amplifier, a DC power supply, a U-shaped target and a digital data acquisition system to monitor torque-twist hysteresis loops of the specimen.

Each critical component of the RCTS apparatus was calibrated prior to testing for the project. Metal specimens were used to evaluate the RCTS equipment for system compliance, and the system was also checked using a standard graded Ottawa Sand specimen.

FINAL RCTS REPORT
FOR THE CALVERT CLIFFS (CC) PROJECT
December 12, 2007
Fugro Consultants, Inc.

FUGRO CONSULTANTS, INC.

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

December 12, 2007

Mr. Brian K. Banks, P.G.
Schnabel Engineering
656 Quince Orchard Road, Suite 700
Gaithersburg, MD 20878

RE: Final RCTS Report for the Calvert Cliffs (CC) Project

Dear Mr. Banks:

Fugro has performed RCTS testing for the referenced project. Dr. Stokoe has reviewed the data and the associated results and found them to be reasonable. Fugro has incorporated all applicable comments from Dr. Kenneth Stokoe.

This report includes the following items (in hardcopy and CD-ROM):

- Index test summary table (supplied by Schnabel Engineering, Inc.),
- Applicability of Report, and
- Appendices A through M with test results for each test.

Each appendix includes the following items:

- Summary sheet,
- Figures,
- Tables, and
- Gradation curve (supplied by Schnabel Engineering, Inc.).

Please let us know if you have questions.

Very truly yours,

Fugro Consultants, Inc.

Jiewu Meng, PhD, P.E.
Project Engineer

Bill DeGroff, P.E.
Laboratory Department Manager

Enclosures

Index Testing Summary for RCTS Samples
Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Appendix No.	Sample	Sample No.	Sample Top Depth (ft)	Sample Bottom Depth (ft)	Sample Type	Index Testing					
						Lab Class	UW (lb/ft^3)	MC (%)	SG	LL	PI
A	B-437	6	13.5	15.5	UD	SP-SM	124.1	7.2	2.66	NP	NP
B	B-301	10	33.5	35.5	UD	CH	117.5	31.1	2.74	59	42
C	B-305	17	39.5	41.5	UD	SC	117.2	34.7	2.71	72	50
D	B-404	14	52	53.6	UD	SP-SM	117.6	27.7	2.68	NP	NP
E	B-401	31	138.5	140.5	UD	CH	104.1	44.1	2.63	80	49
F	B-401	67	348.5	350.5	UD	SM	116.4	35.6	2.78	52	13
G	B-401	48	228.5	229.6	UD	MH	98.2	58.6	2.48	139	51
H	B-301	76	368.5	370	jar	SM	116.4	34.4	2.86	40	4
	B-301	77	378.5	379.5	jar						
	B-301	78	383.5	384.4	jar						
	B-301	79	388.5	390	jar						
	B-301	81	398.5	400	jar						
	B-401	68	358.5	359.4	jar						
	B-401	70	378.5	380	jar						
I	B-306	17	68	70	UD	CH	115.8	30.7	2.73	62	38
J	B-409	15	35	36.1	UD	SP-SM	124.8	23.3	2.66	NP	NP
K	B-404	22	83.5	85.1	UD	SM	115.4	32.2	2.63	53	25
L	B-401	42	198.5	200.3	UD	SM	101.2	48.8	2.52	82	27
M	B-409	39	95	96.6	UD	SM	109.3	33.1	2.64	61	19

Note: Fugro performed UW and MC testing in Houston, TX; Schnabel performed Lab Class, SG, LL, PI testing in Baltimore, MD.

Applicability of Report

The laboratory testing results, as well as the conclusions and recommendations, if any, contained in this report, were completed based on our scope of services and on our established technical practice. We have prepared this report exclusively for Schnabel Engineering, Inc. to assist in their Calvert Cliffs (CC) project. We conducted our services using the standard level of care and diligence normally practiced by recognized engineering laboratories now performing similar services under similar circumstances. We intend for this report, including all illustrations, to be used in its entirety. Data as presented in this report should be used along with other available information and questions should be asked when inconsistency, if any, is observed.

APPENDIX A

CC B437-UD6
POORLY GRADED SAND (SP-SM), with silt, brown*
(Non-Plastic; Gs=2.66)*

Borehole B-437
Sample UD6
Sample Depth = 13.5 to 15.5 ft
RCTS Test Depth = 14.9 ft
Total Unit Weight = 124.1 lb/ft^3
Water Content = 7.2 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 8.6 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

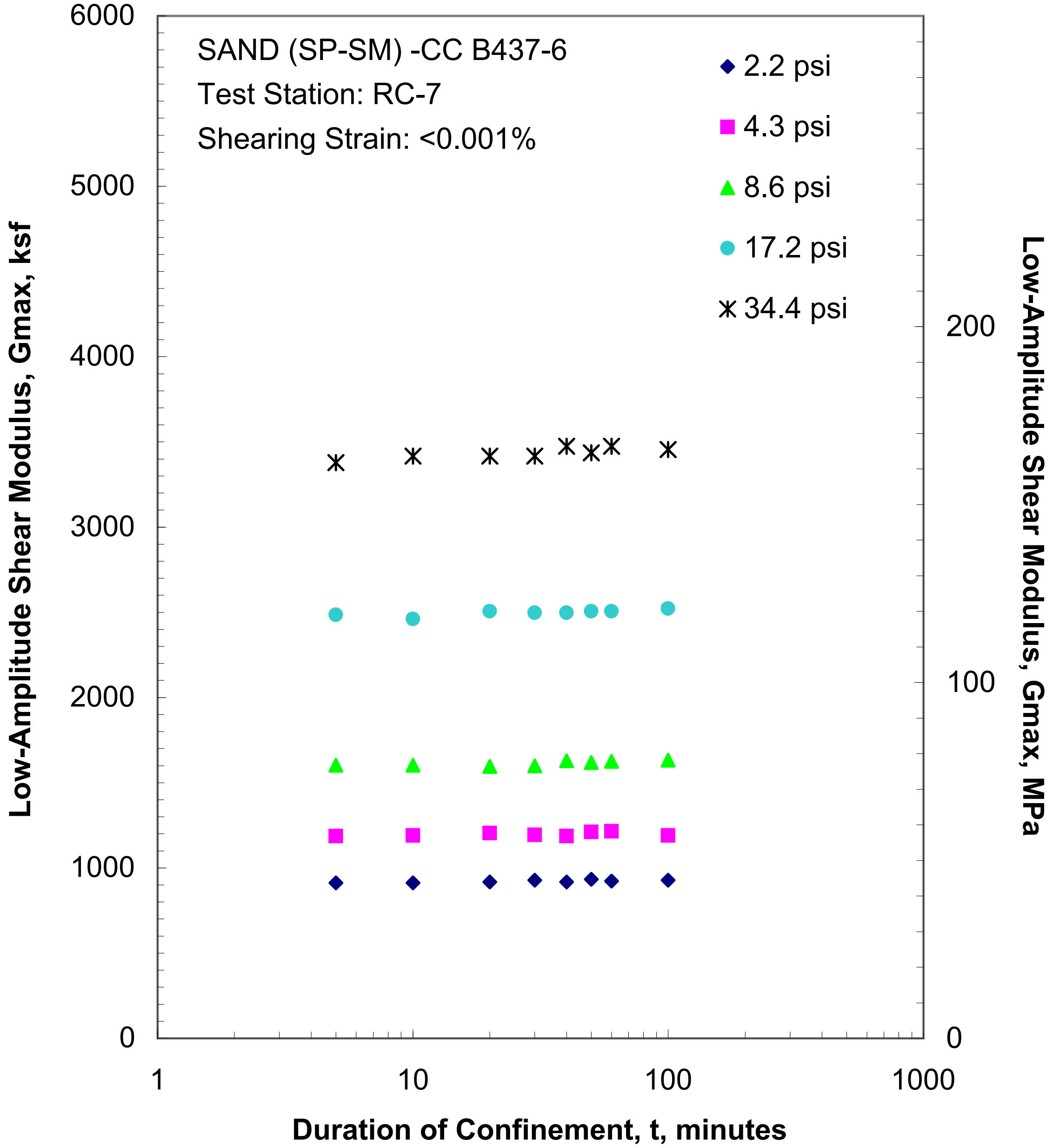


Figure A.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

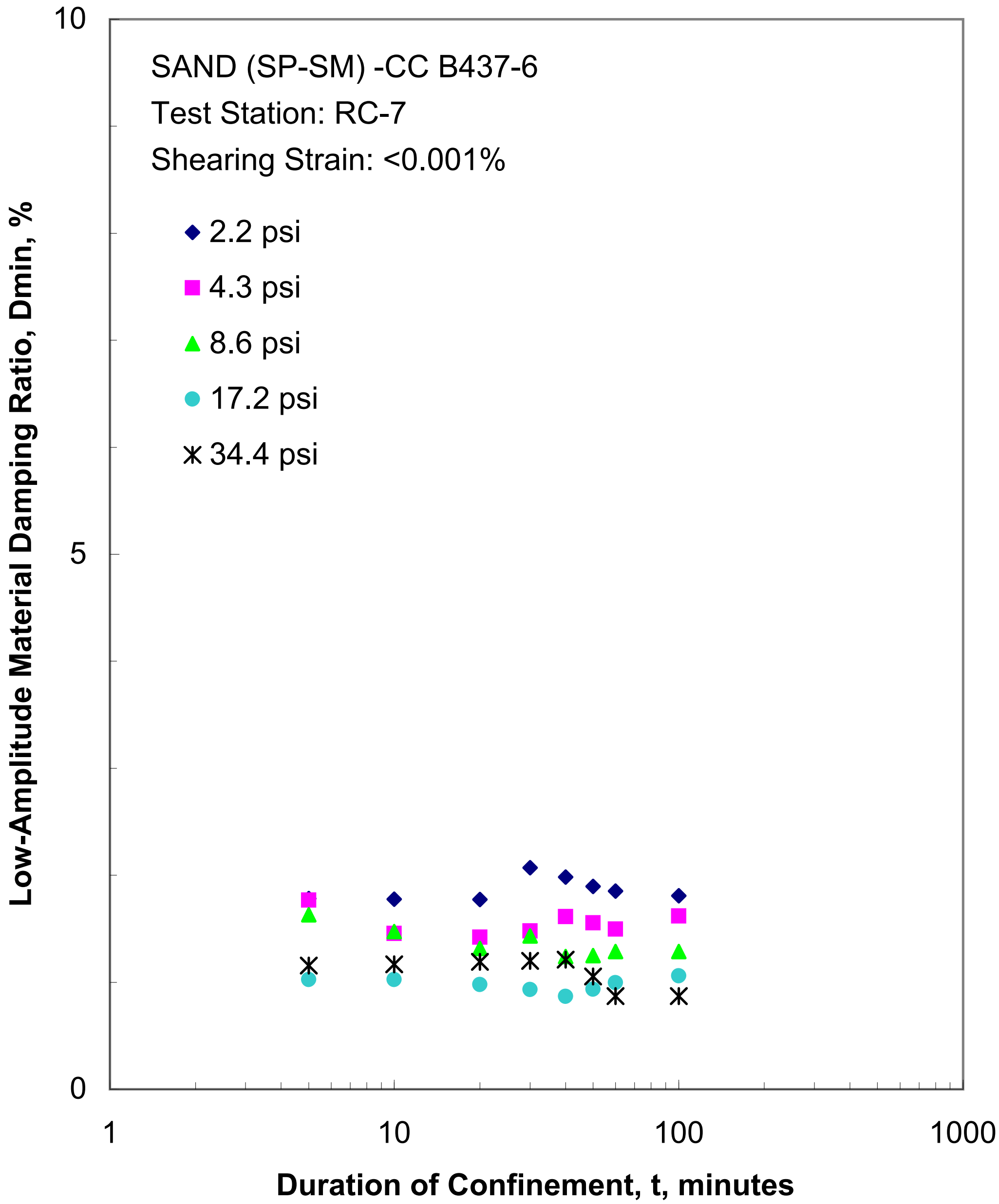


Figure A.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

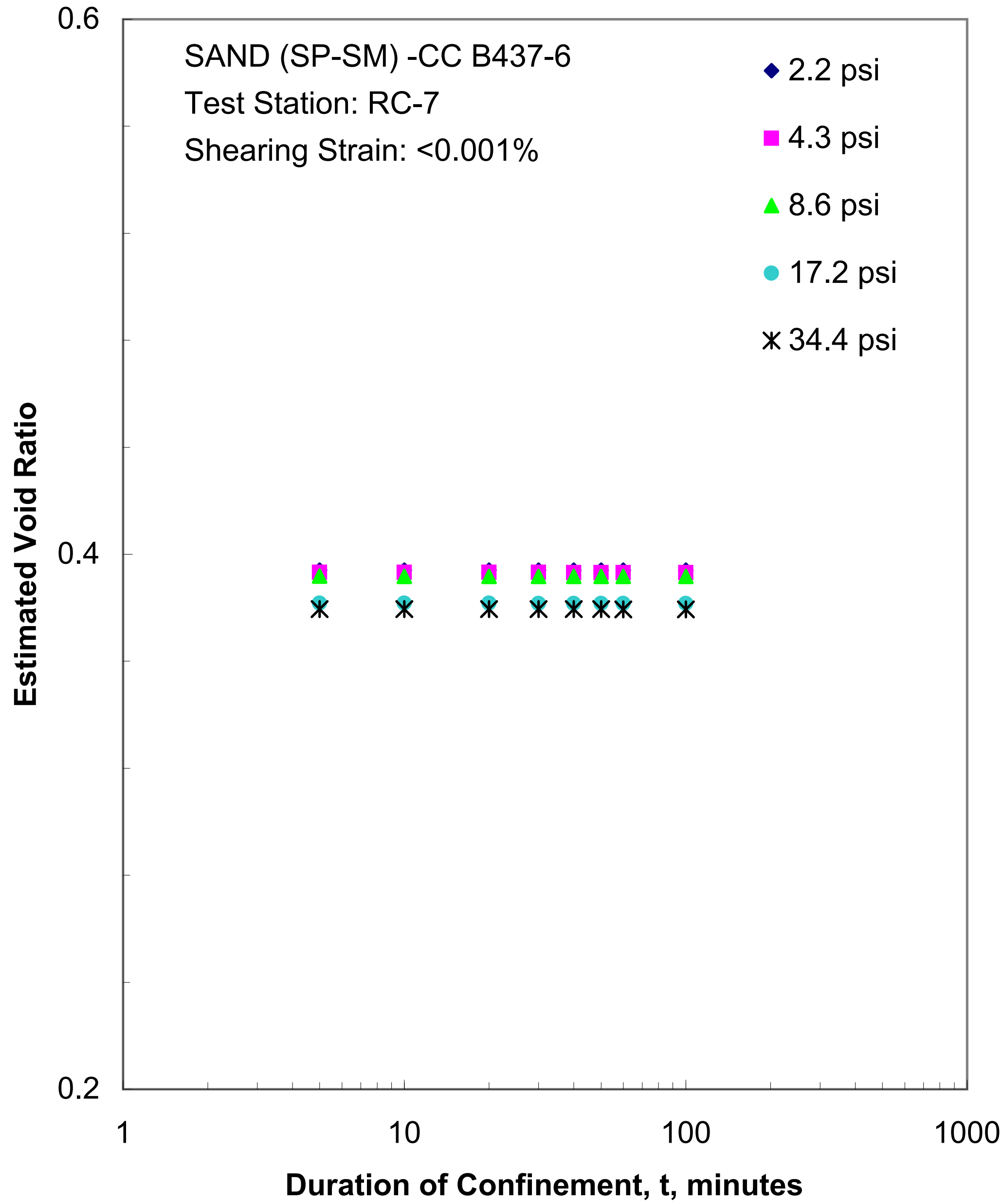


Figure A.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

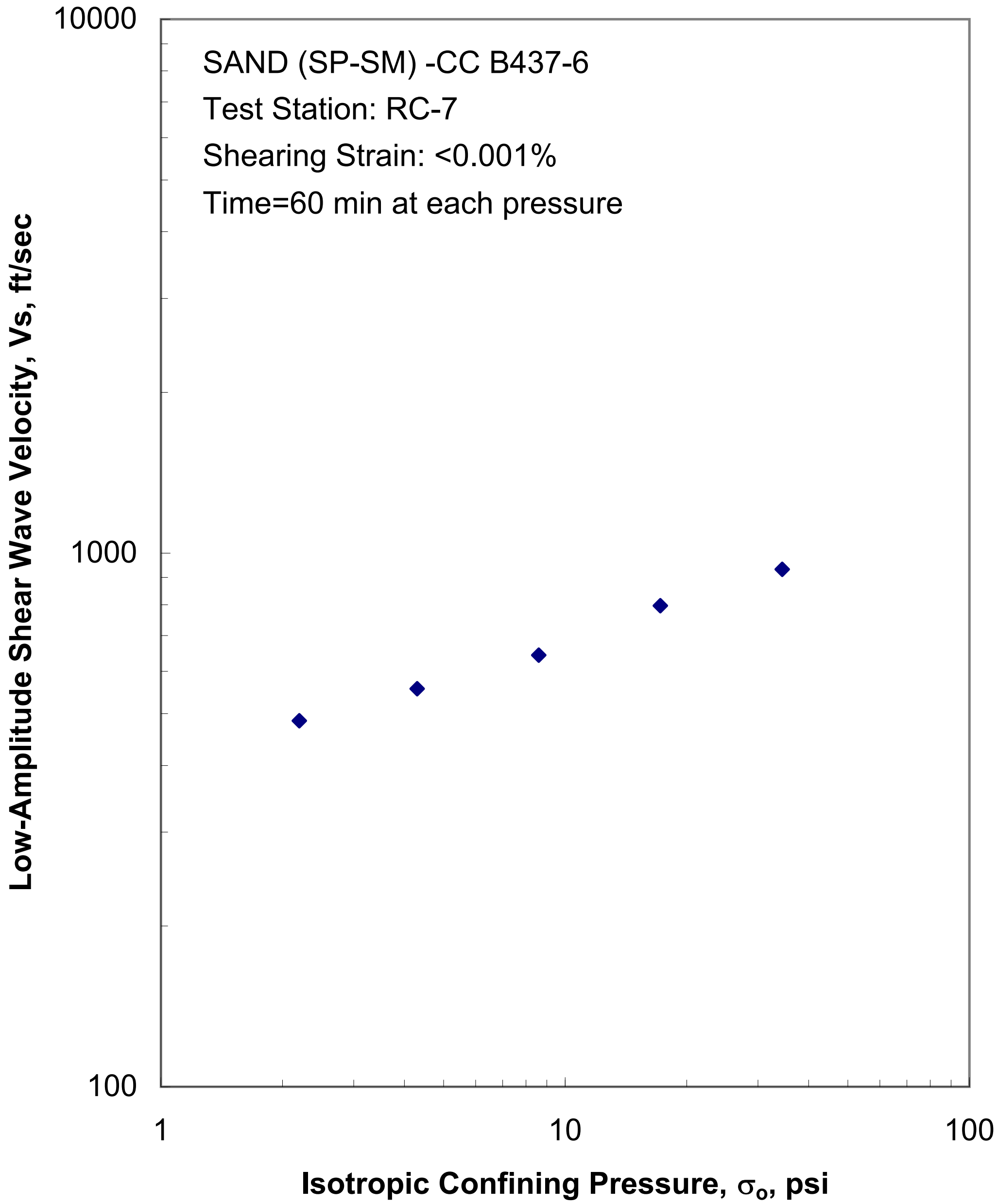


Figure A.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

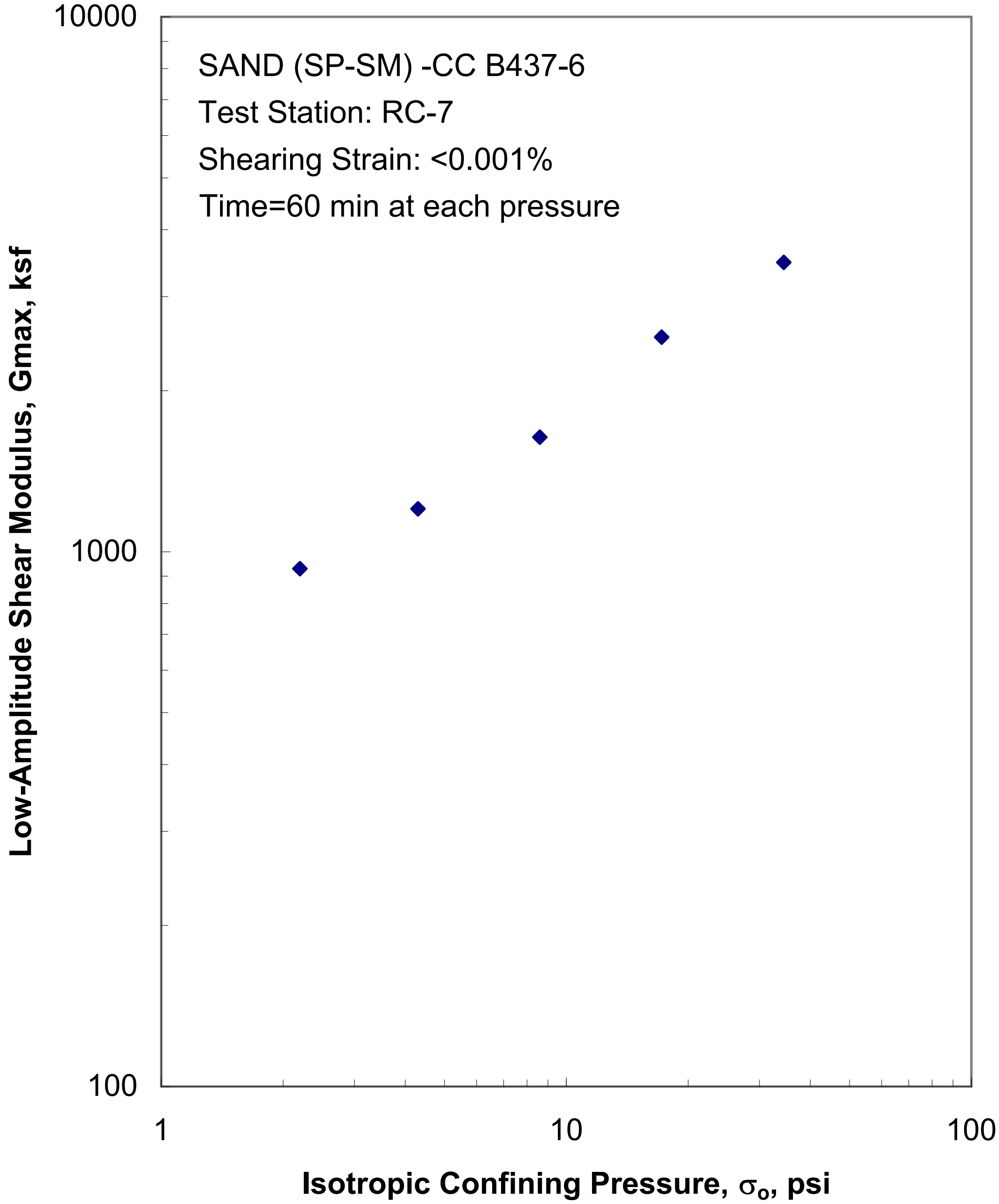


Figure A.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

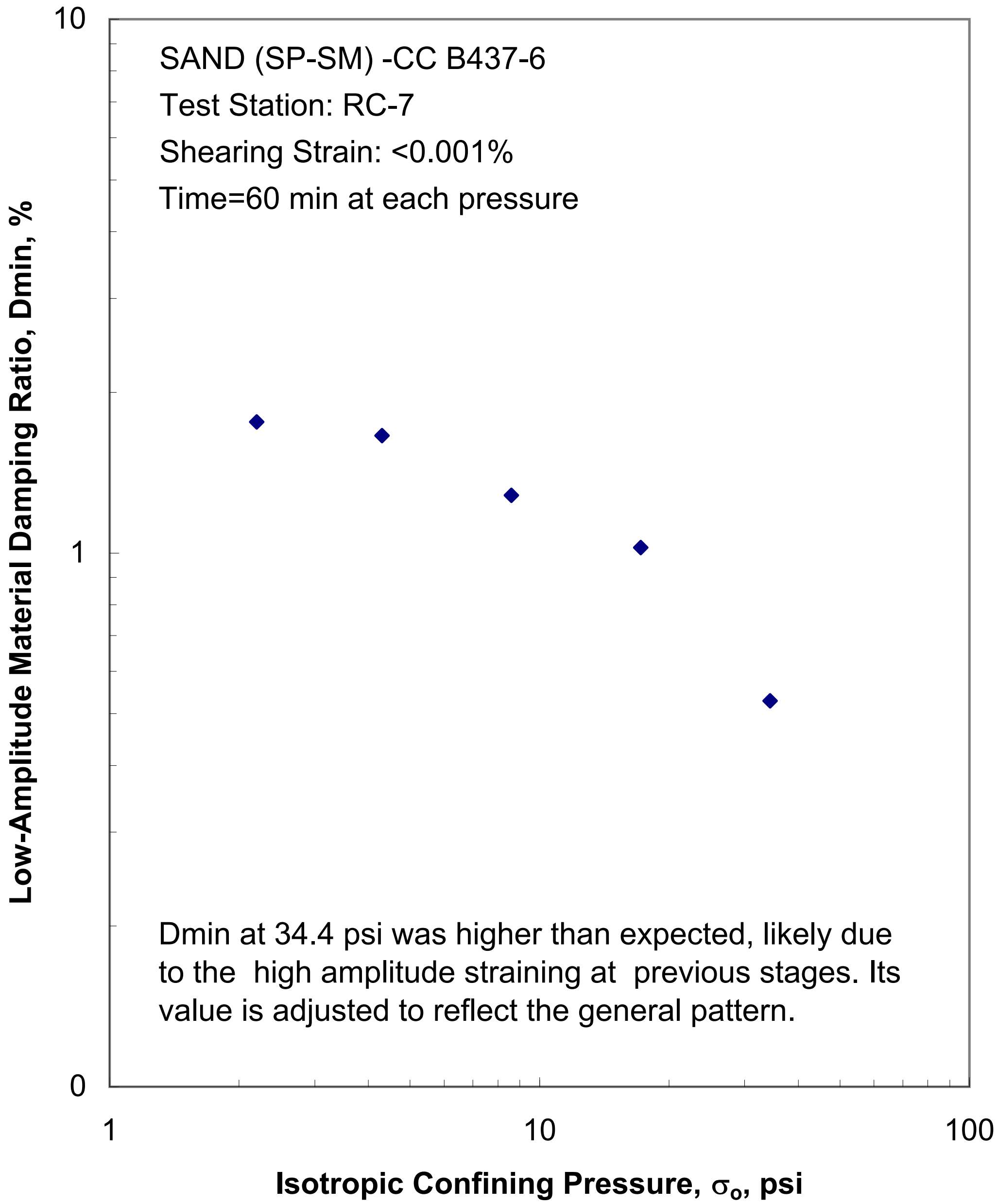


Figure A.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

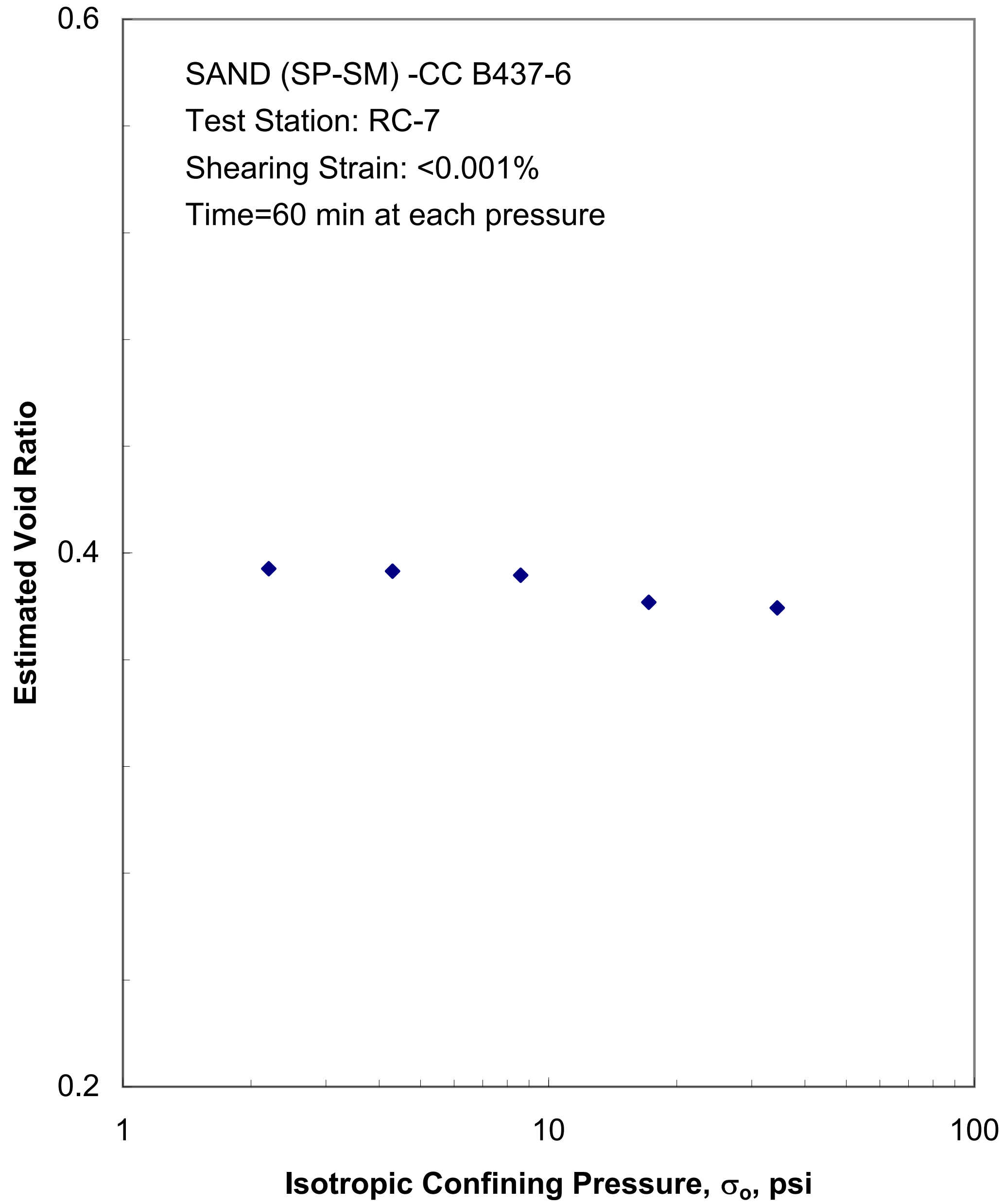


Figure A.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

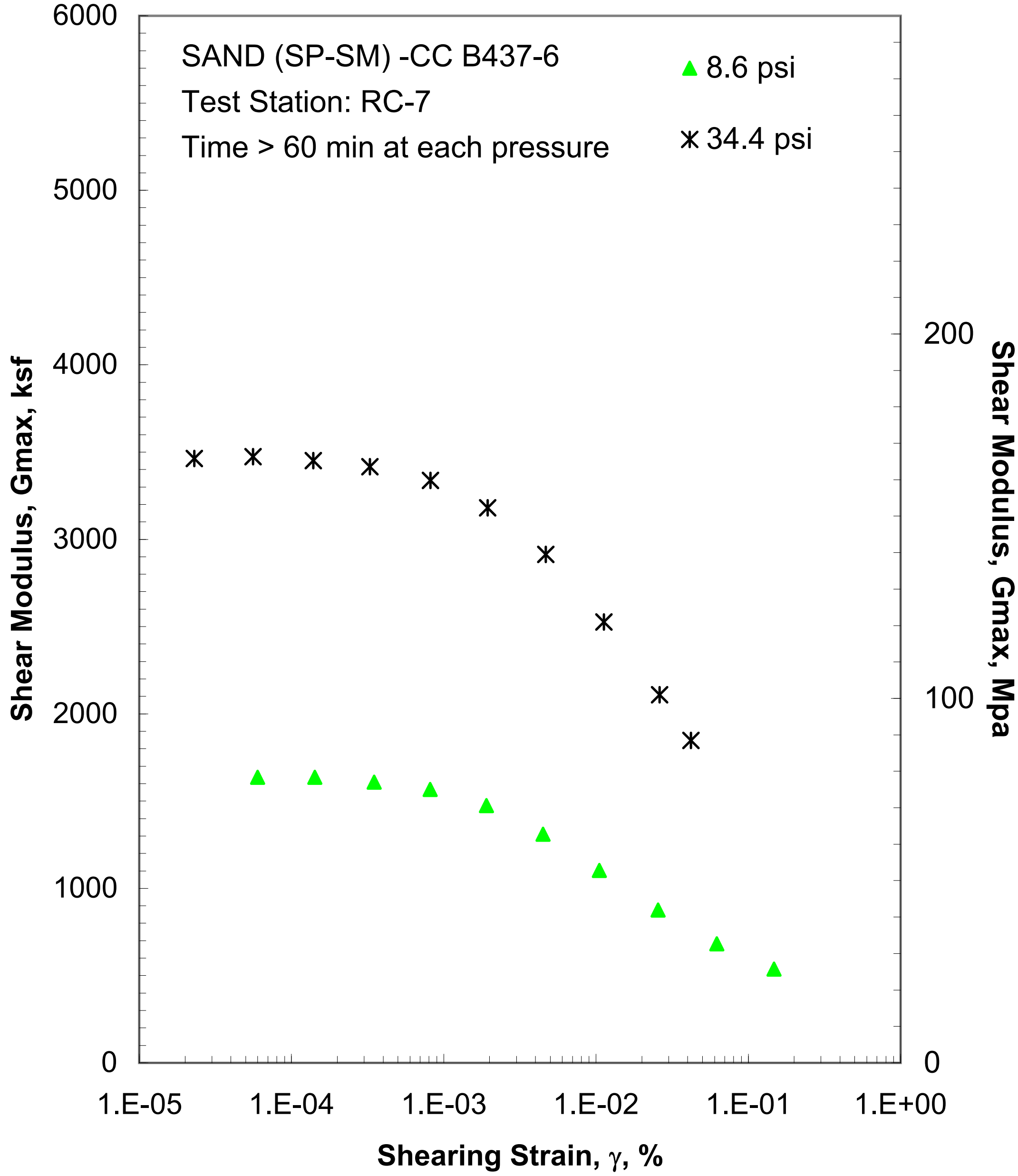


Figure A.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

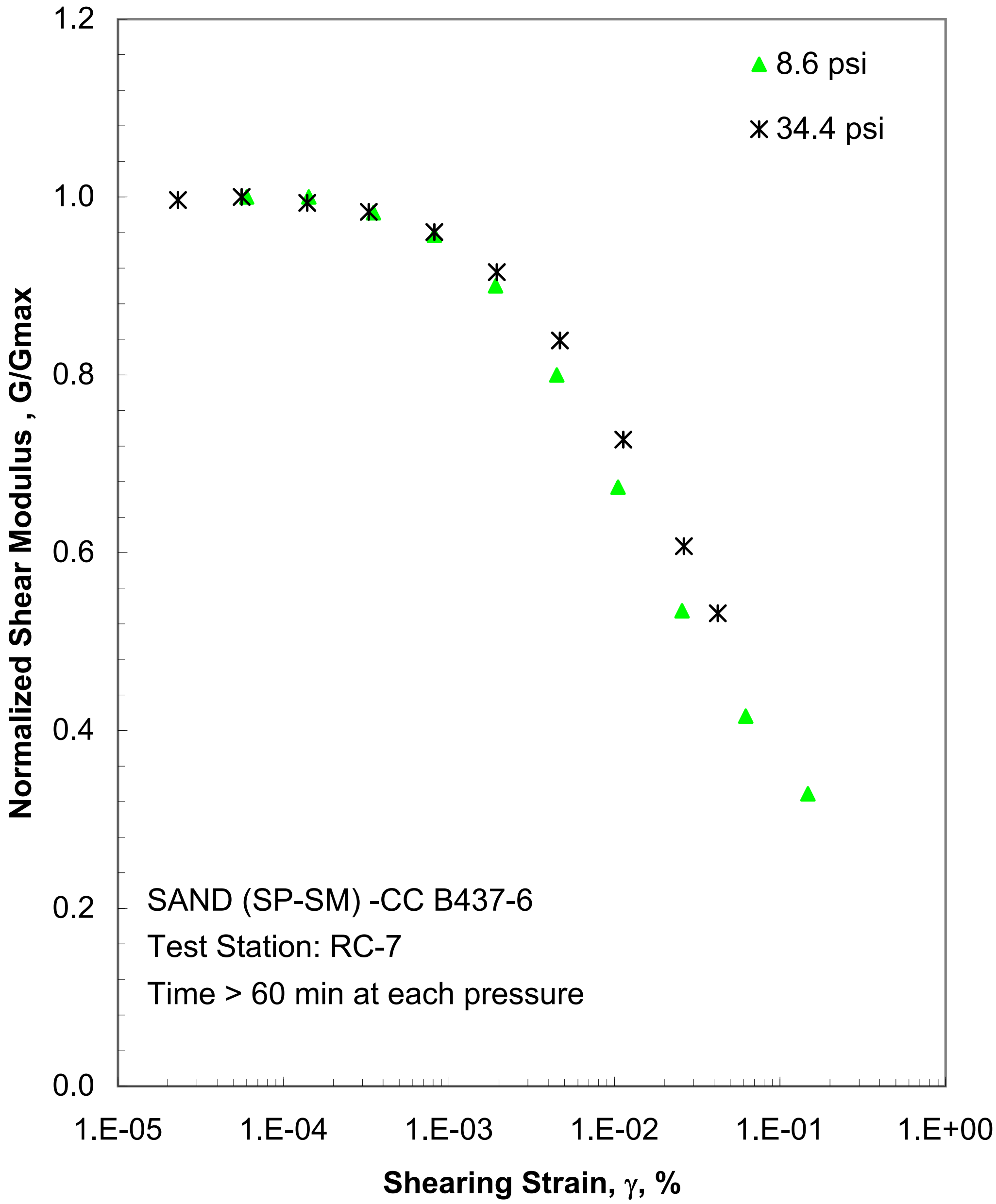


Figure A.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

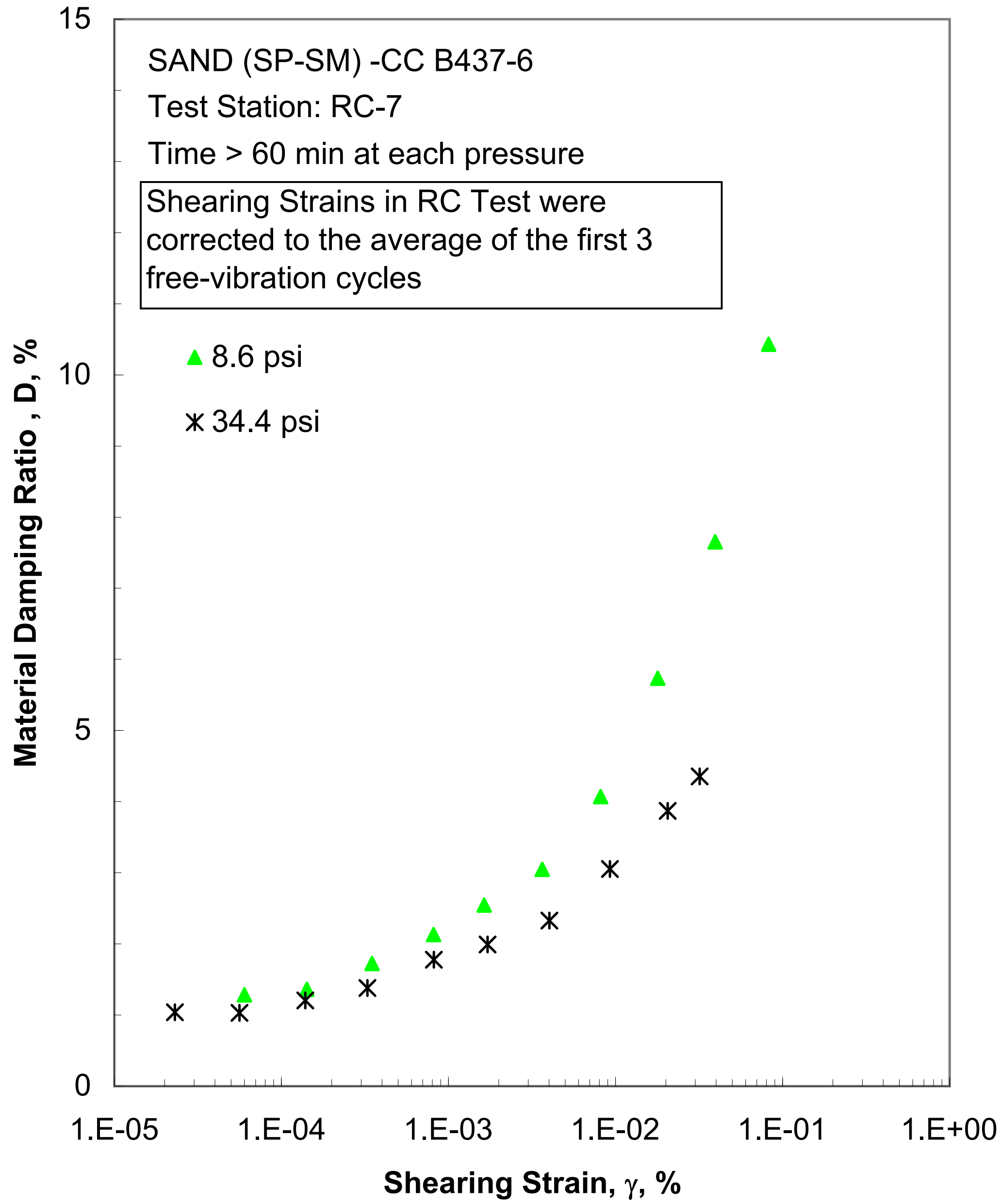


Figure A.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

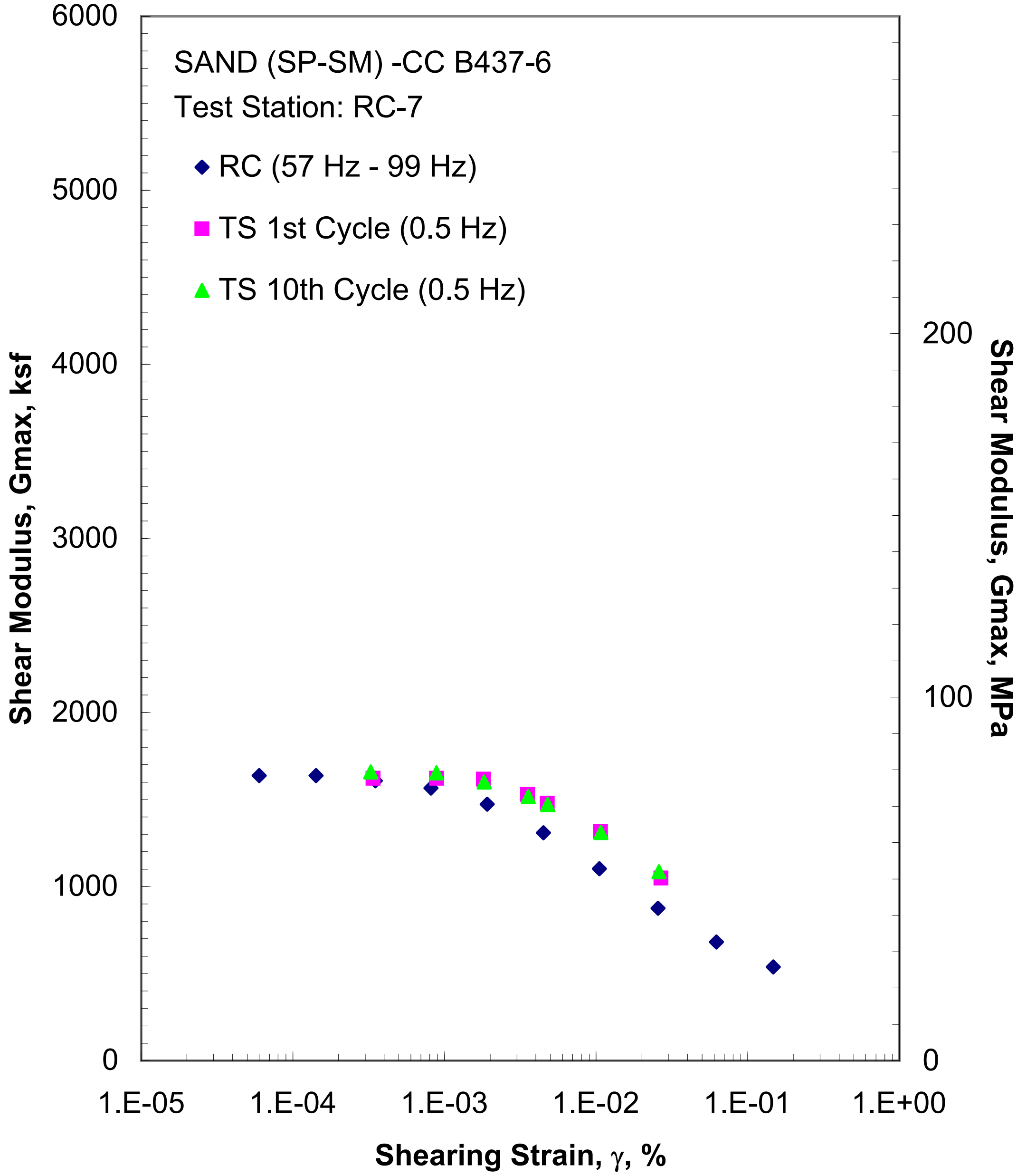


Figure A.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 8.6 psi from the Combined RCTS Tests

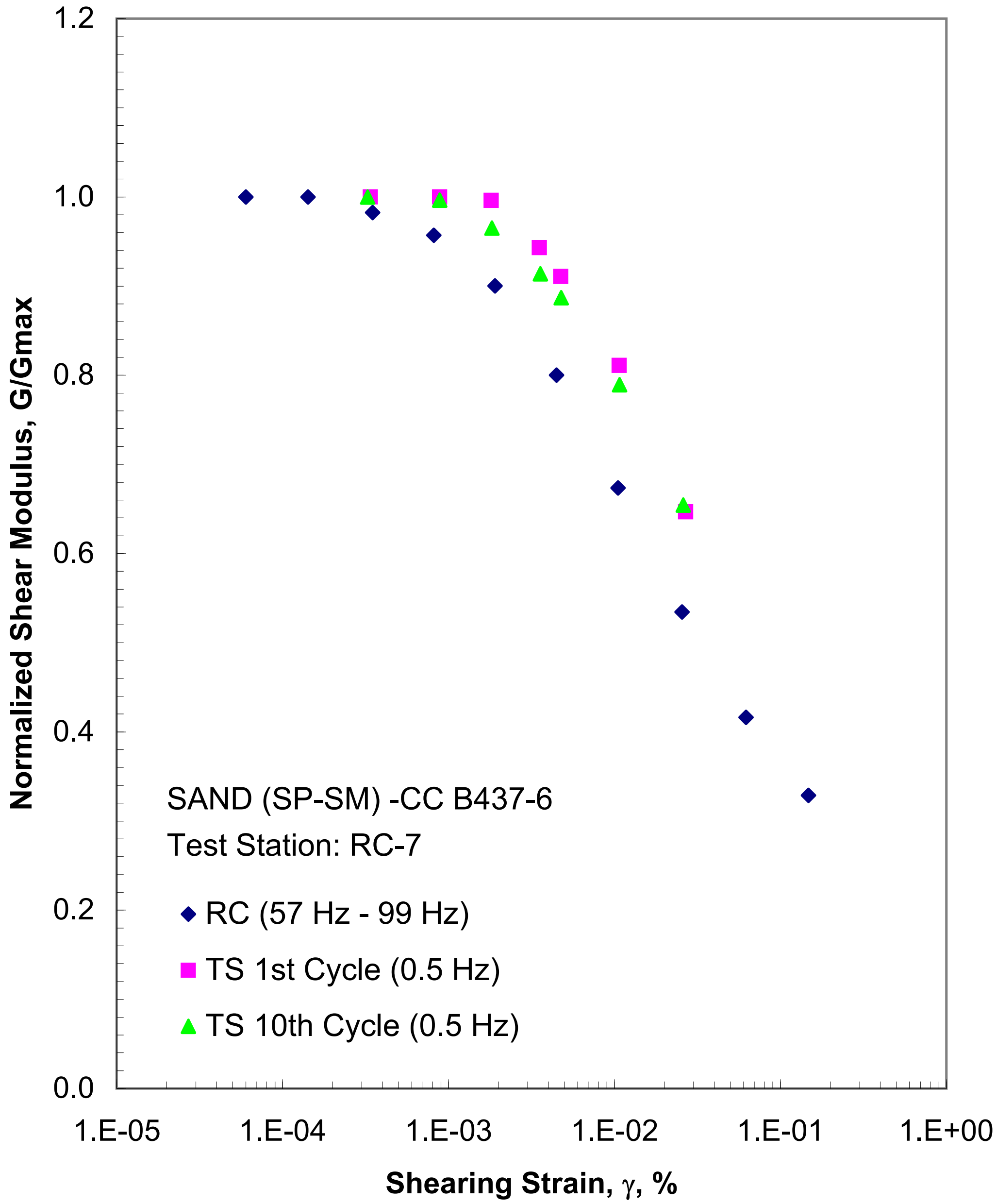


Figure A.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 8.6 psi from the Combined RCTS Tests

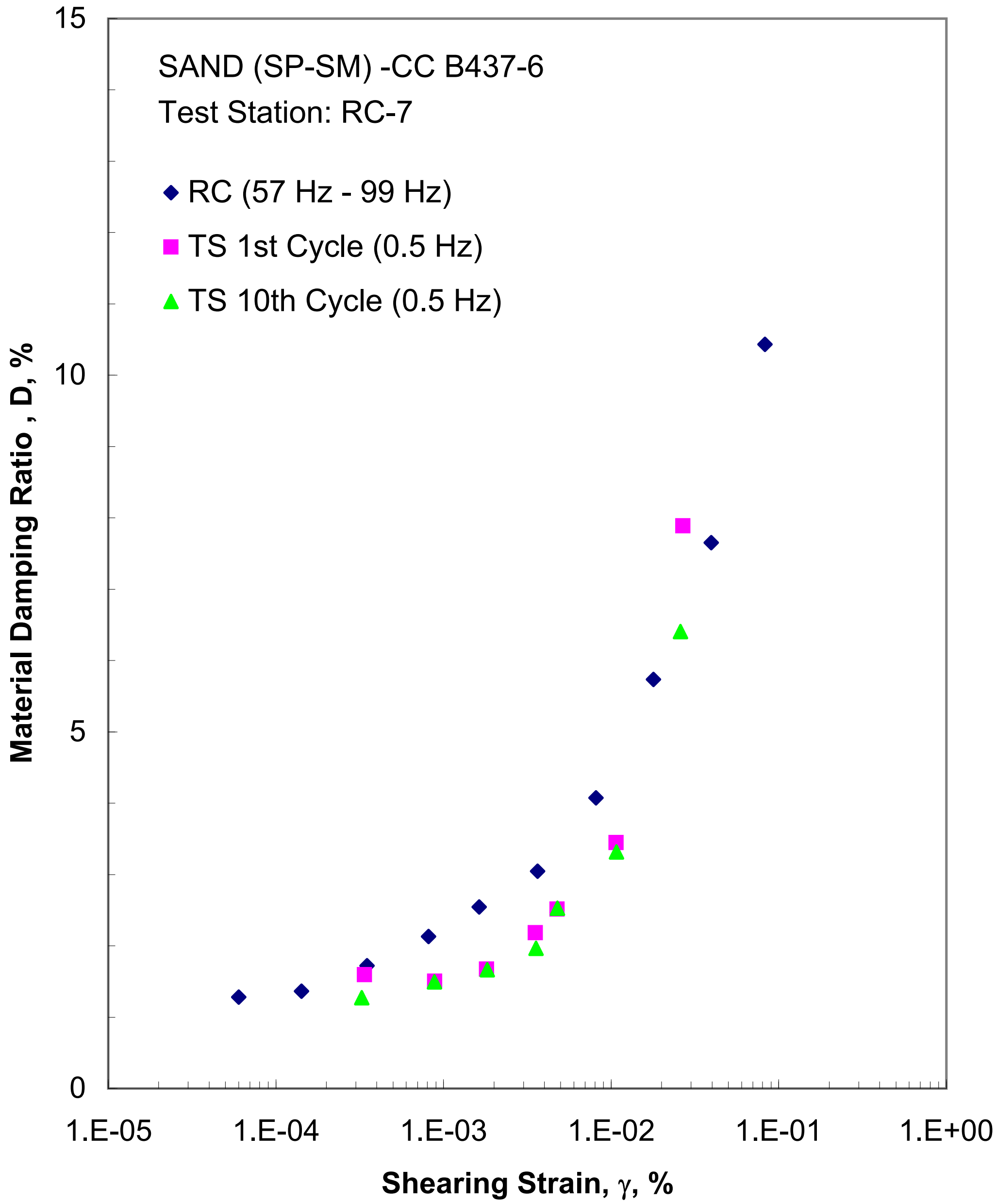


Figure A.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 8.6 psi from the Combined RCTS Tests

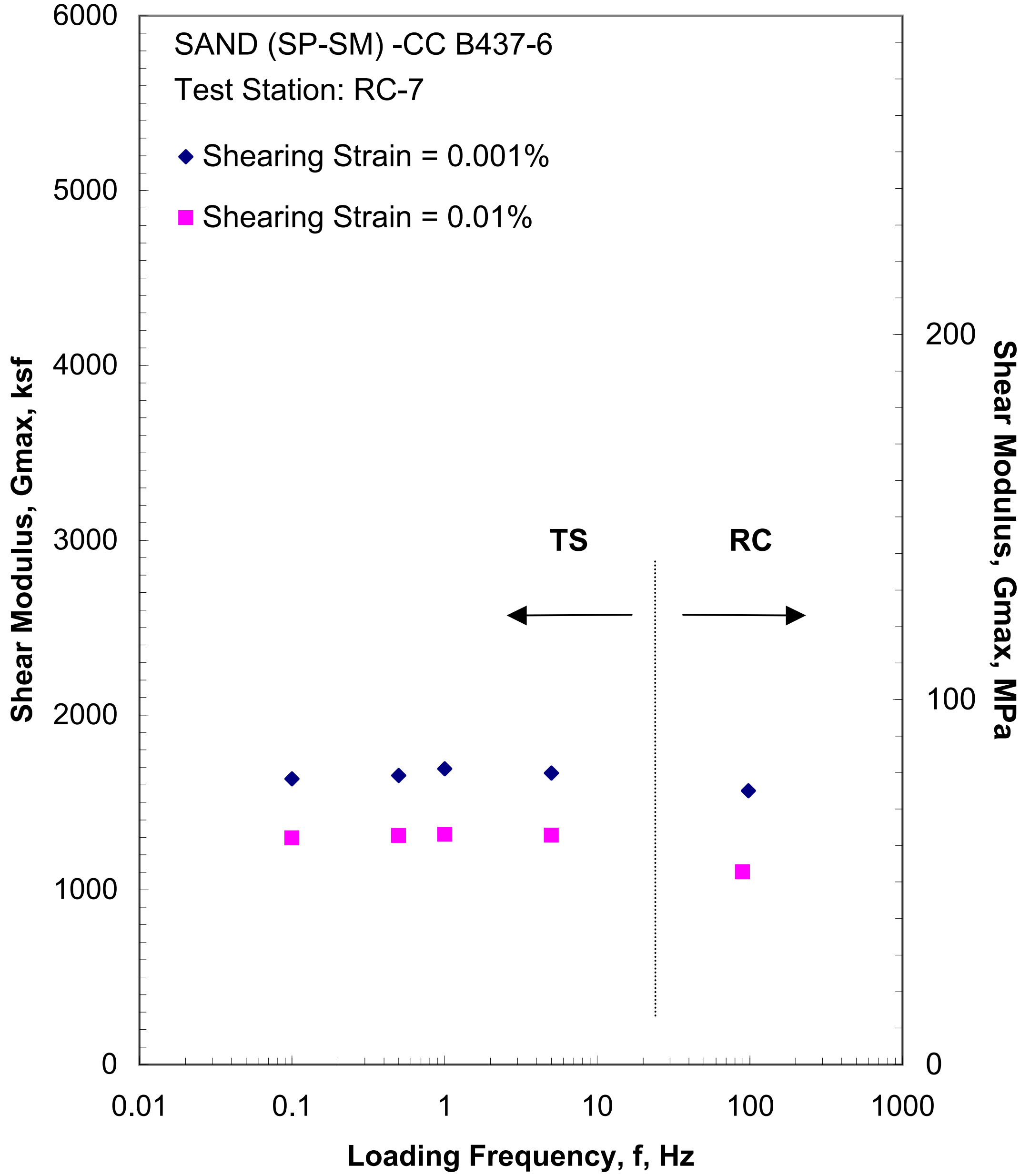


Figure A.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 8.6 psi from the Combined RCTS Tests

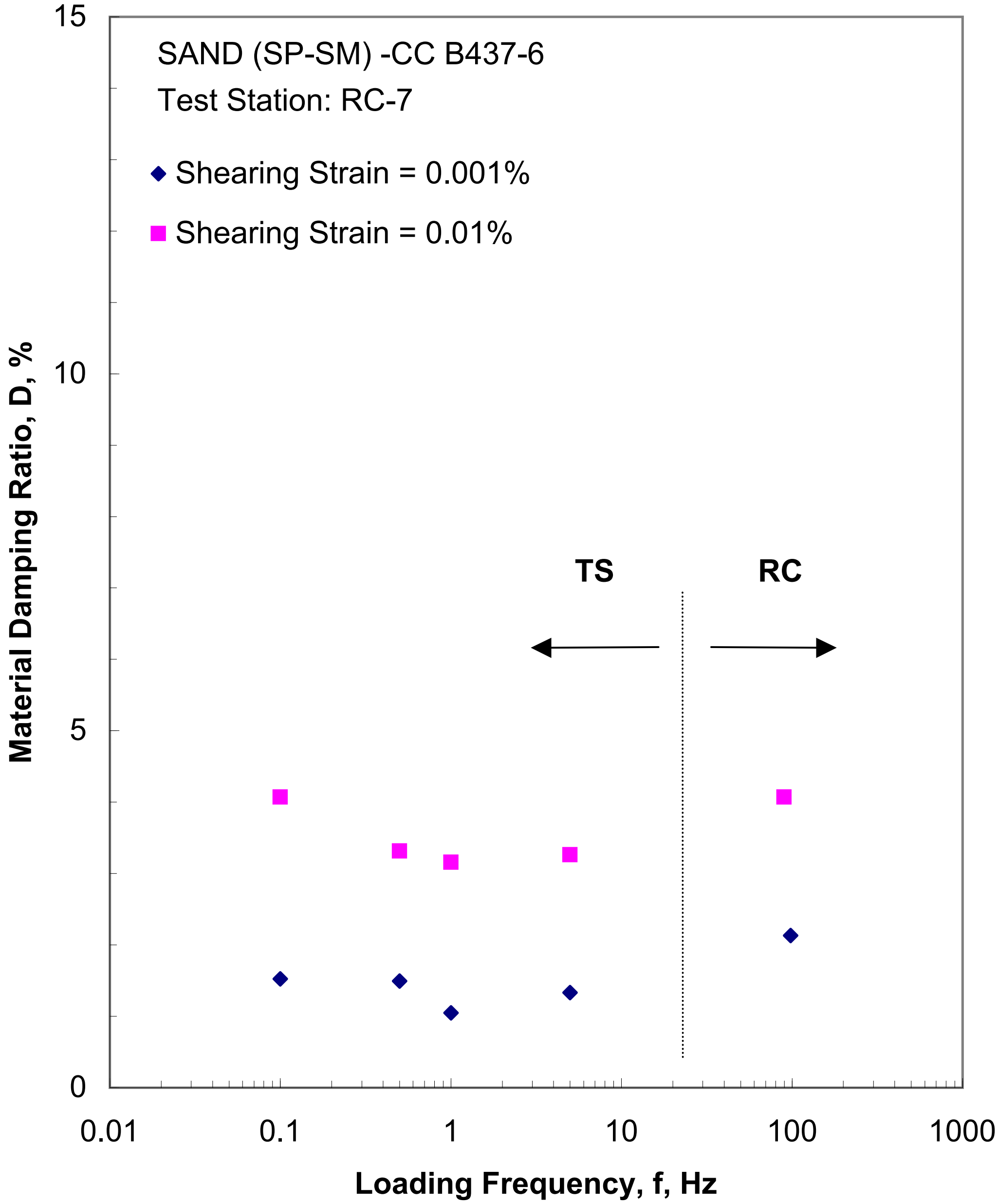


Figure A.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 8.6 psi from the Combined RCTS Tests

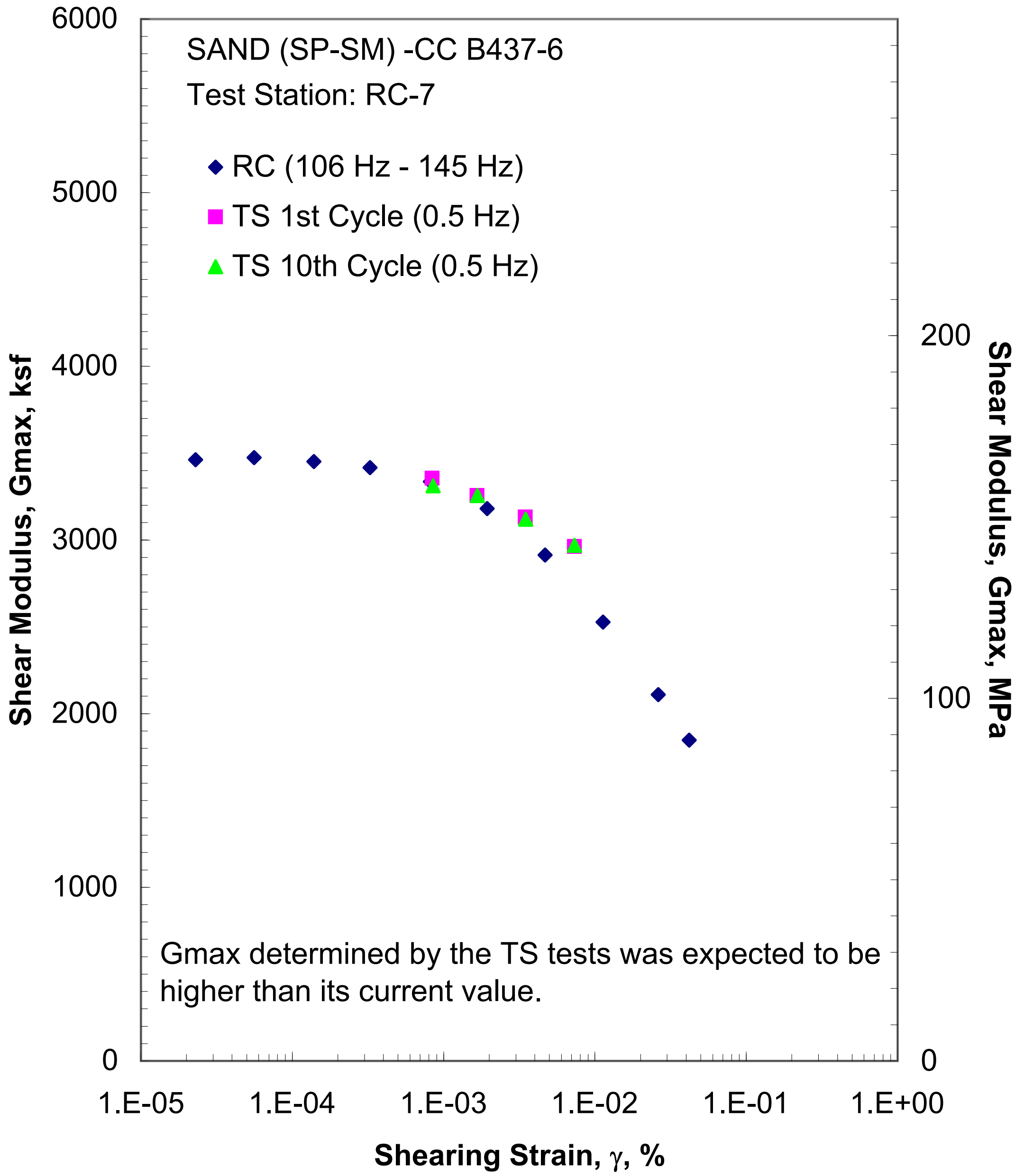


Figure A.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 34.4 psi from the Combined RCTS Tests

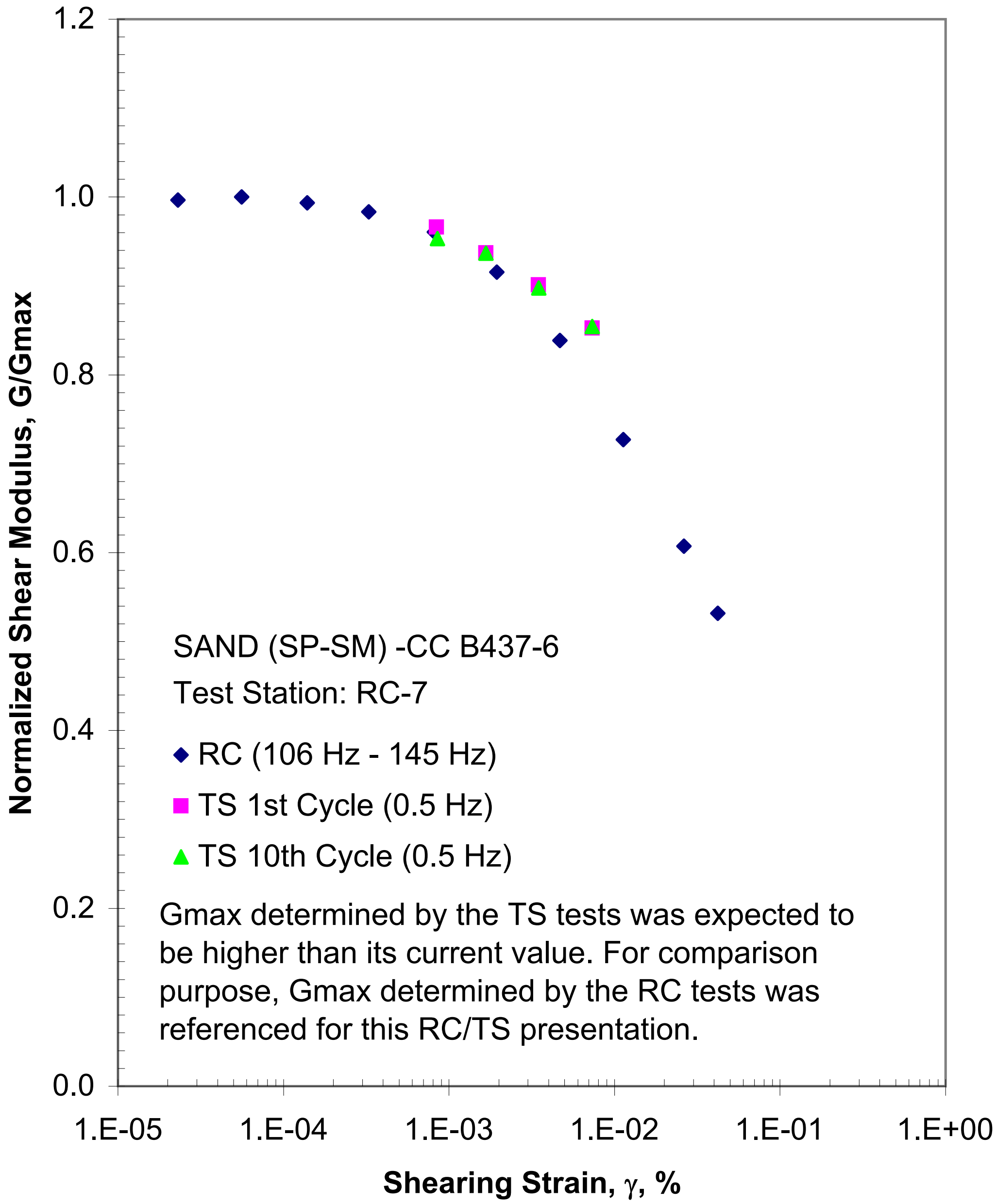


Figure A.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 34.4 psi from the Combined RCTS Tests

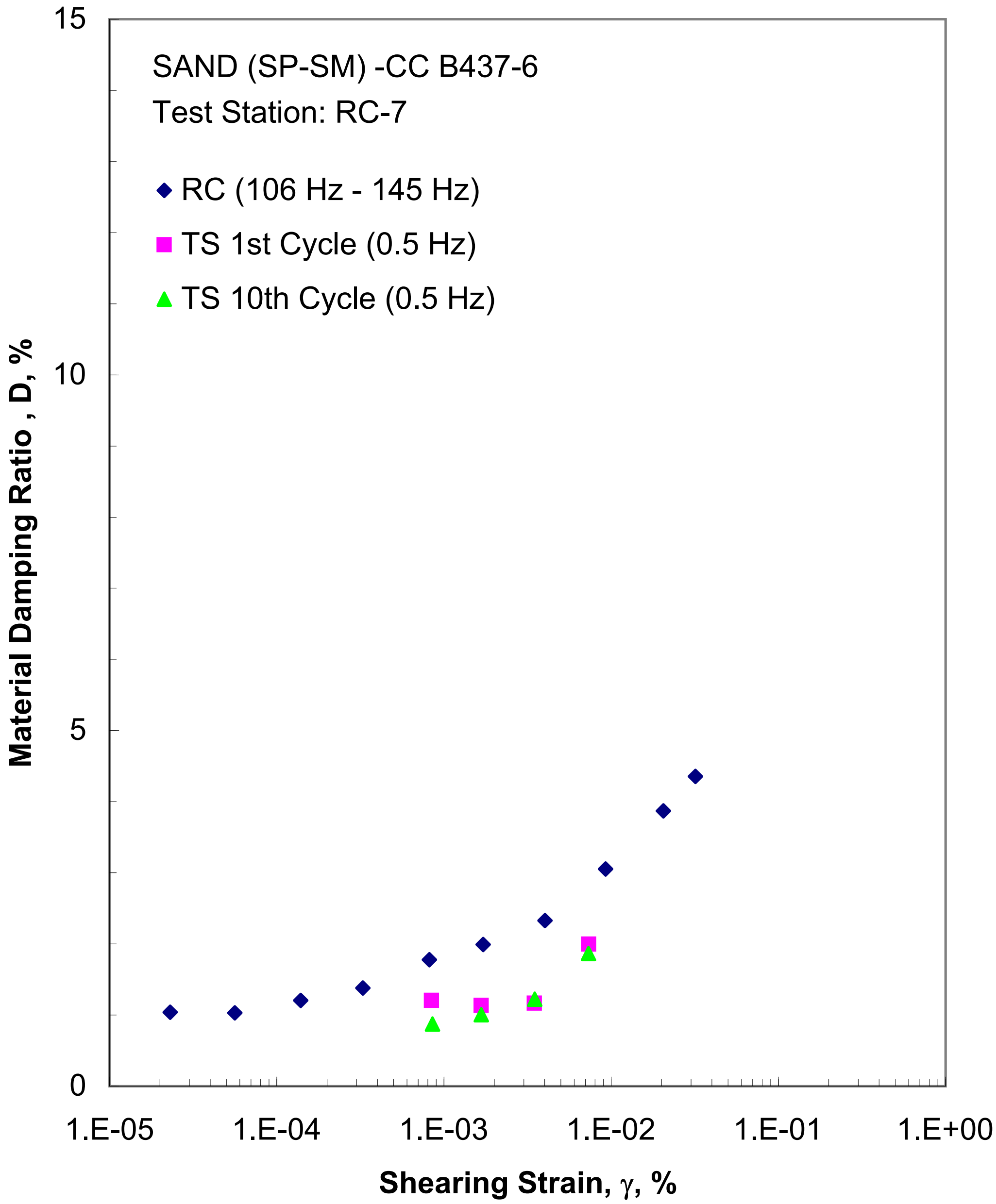


Figure A.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 34.4 psi from the Combined RCTS Tests

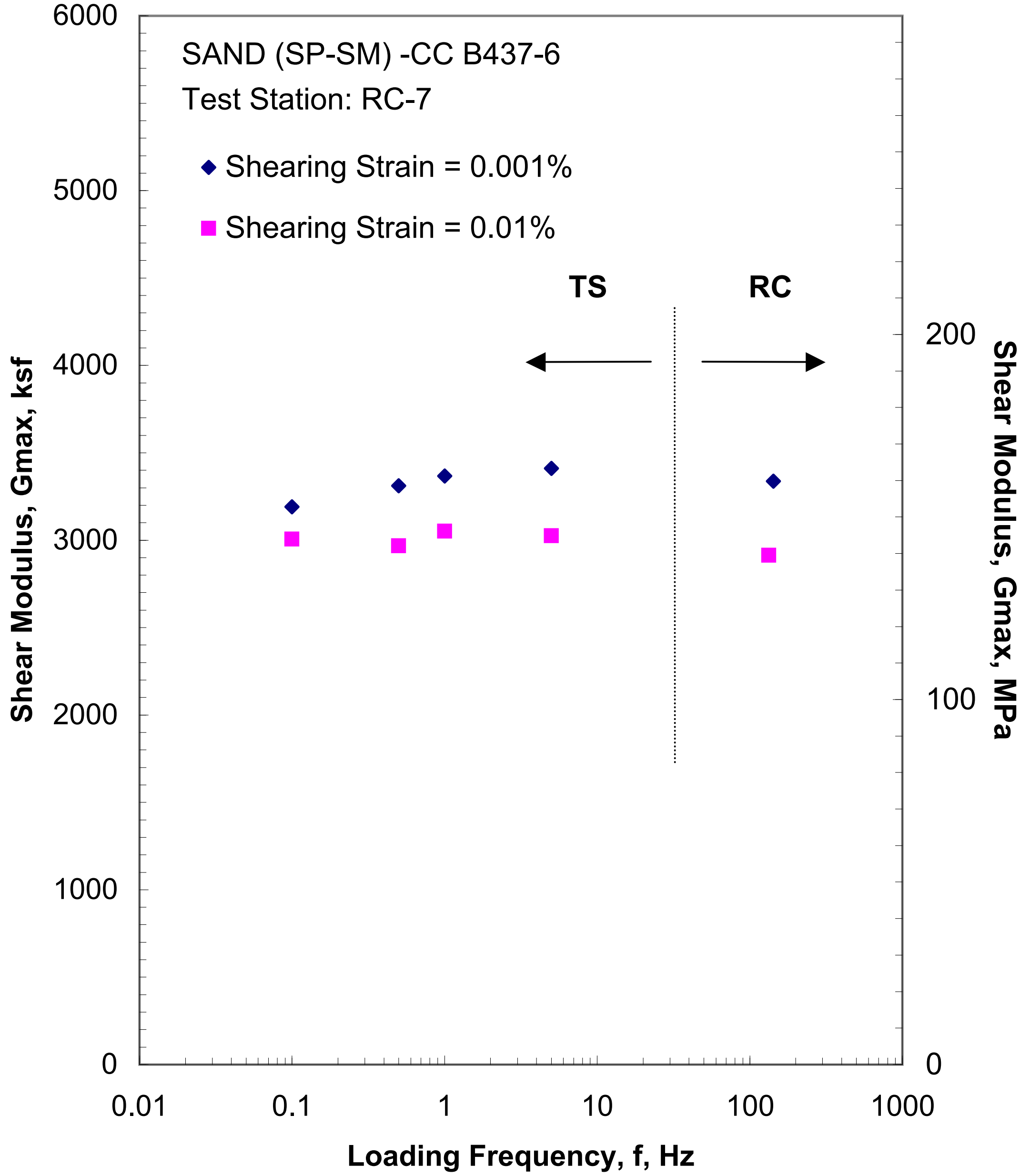


Figure A.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 34.4 psi from the Combined RCTS Tests

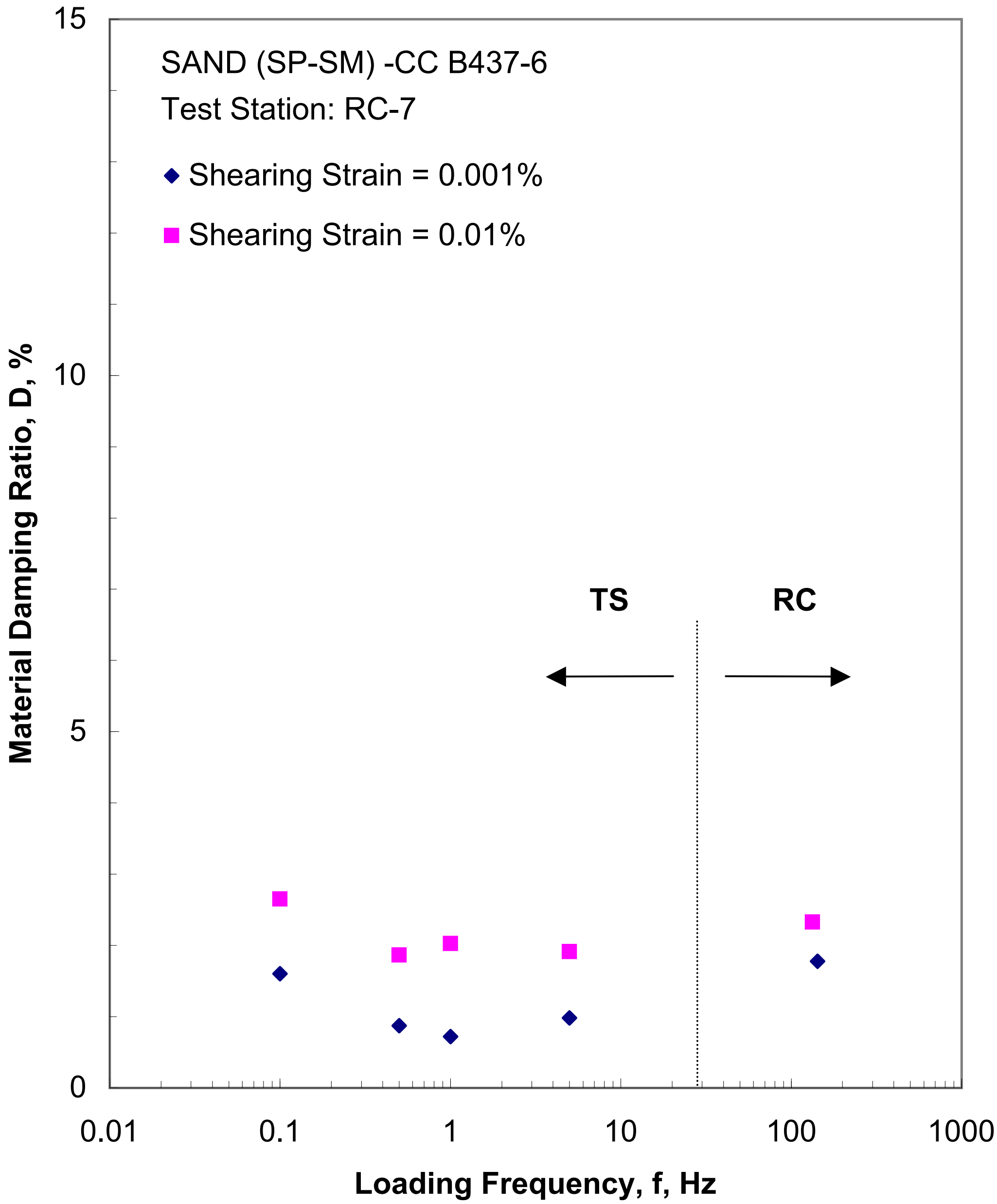


Figure A.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 34.4 psi from the Combined RCTS Tests

Table A.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 CC B437-UD6

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)	(%)	
2.2	317	15	930	45	485	1.76	0.394
4.3	619	30	1202	58	557	1.66	0.393
8.6	1238	59	1637	79	644	1.28	0.392
17.2	2477	119	2517	121	797	1.02	0.382
34.4	4954	237	3474	167	933	0.53	0.379

Table A.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B437-UD6; Isoptropic Confining Pressure, σ_o=8.6 psi (1.2 ksf = 59 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
6.00E-05	1637	1.00	6.00E-05	1.28
1.42E-04	1637	1.00	1.42E-04	1.36
3.49E-04	1608	0.98	3.49E-04	1.72
8.14E-04	1567	0.96	8.14E-04	2.13
1.91E-03	1474	0.90	1.63E-03	2.55
4.48E-03	1310	0.80	3.64E-03	3.05
1.05E-02	1103	0.67	8.13E-03	4.07
2.56E-02	875	0.53	1.79E-02	5.74
6.21E-02	681	0.42	3.96E-02	7.65
1.47E-01	538	0.33	8.26E-02	10.43

[+] 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 A.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B437-UD6; Isotropic Confining Pressure, σ_o= 8.6 psi (1.2 ksf = 59 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, %
3.38E-04	1623	1.00	1.59	3.26E-04	1659	1.00	1.27
8.87E-04	1623	1.00	1.50	8.83E-04	1653	1.00	1.49
1.81E-03	1616	1.00	1.67	1.82E-03	1601	0.97	1.66
3.54E-03	1530	0.94	2.18	3.57E-03	1516	0.91	1.96
4.76E-03	1478	0.91	2.51	4.78E-03	1472	0.89	2.53
1.07E-02	1316	0.81	3.45	1.07E-02	1310	0.79	3.32
2.69E-02	1049	0.65	7.89	2.60E-02	1086	0.65	6.41

Table A.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B437-UD6; Isoptropic Confining Pressure, σ_o= 34.4 psi (5.0 ksf = 237 kPa)

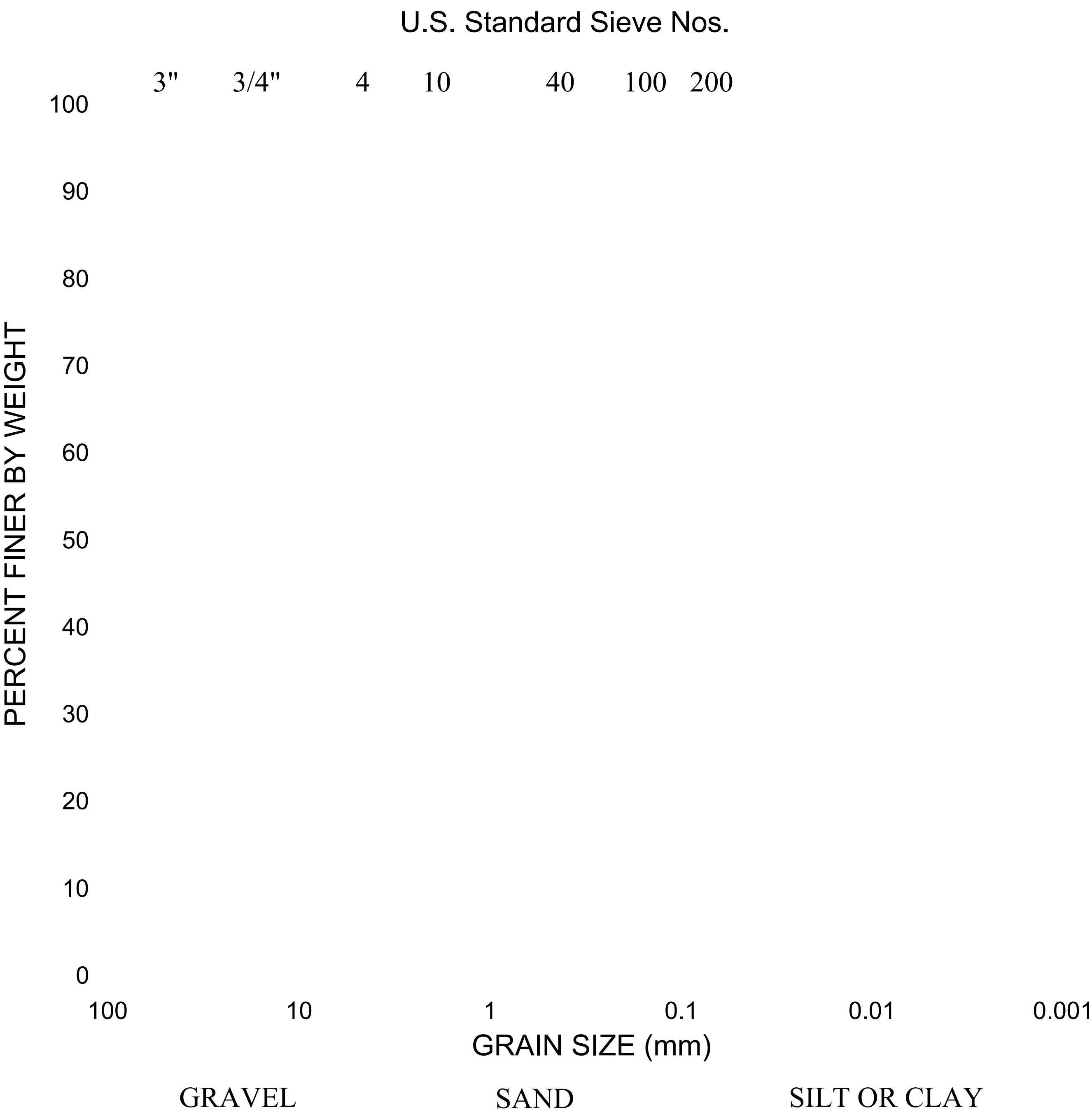
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratiox, D, %
2.30E-05	3463	1.00	2.30E-05	1.04
5.60E-05	3474	1.00	5.60E-05	1.03
1.39E-04	3451	0.99	1.39E-04	1.21
3.27E-04	3417	0.98	3.27E-04	1.38
8.17E-04	3337	0.96	8.17E-04	1.78
1.94E-03	3181	0.92	1.72E-03	1.99
4.68E-03	2913	0.84	4.02E-03	2.33
1.13E-02	2526	0.73	9.28E-03	3.05
2.62E-02	2110	0.61	2.06E-02	3.87
4.20E-02	1848	0.53	3.20E-02	4.35

+ 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 A.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B437-UD6; Isotropic Confining Pressure, σ_o=34.4 psi (5.0 ksf = 237 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D,	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D, %
8.41E-04	3356	0.97	1.20	8.53E-04	3312	0.95	0.87
1.67E-03	3257	0.94	1.13	1.67E-03	3256	0.94	1.00
3.47E-03	3132	0.90	1.16	3.48E-03	3119	0.90	1.22
7.34E-03	2962	0.85	2.00	7.33E-03	2969	0.85	1.86



GRADATION CURVE

ASTM D422

Project: Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland

Contract No.: 06120048.00

Date: 9/21/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-437	13.5-15.0	POORLY GRADED SAND, with silt, brown	SP-SM	NP	NP

Schnabel Engineering

APPENDIX B

CC B301-UD10
FAT CLAY (CH), with sand, gray*
(LL=59, PL=17, PI=42; Gs=2.74)*

Borehole B-301
Sample UD10
Sample Depth = 33.5 to 35.5 ft
RCTS Test Depth = 35.4 ft
Total Unit Weight = 117.5 lb/ft^3
Water Content = 31.1 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 12.0 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

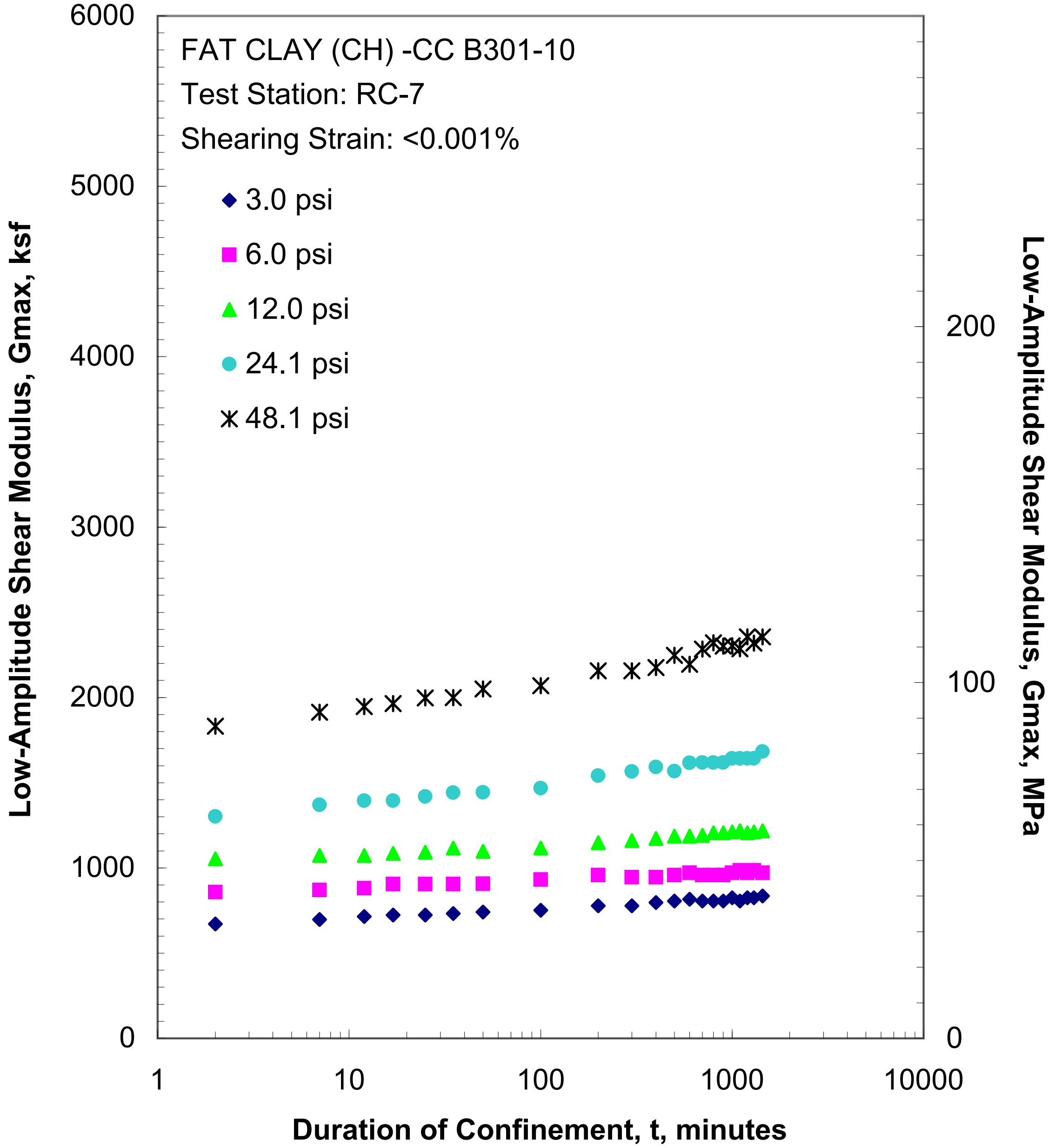


Figure B.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

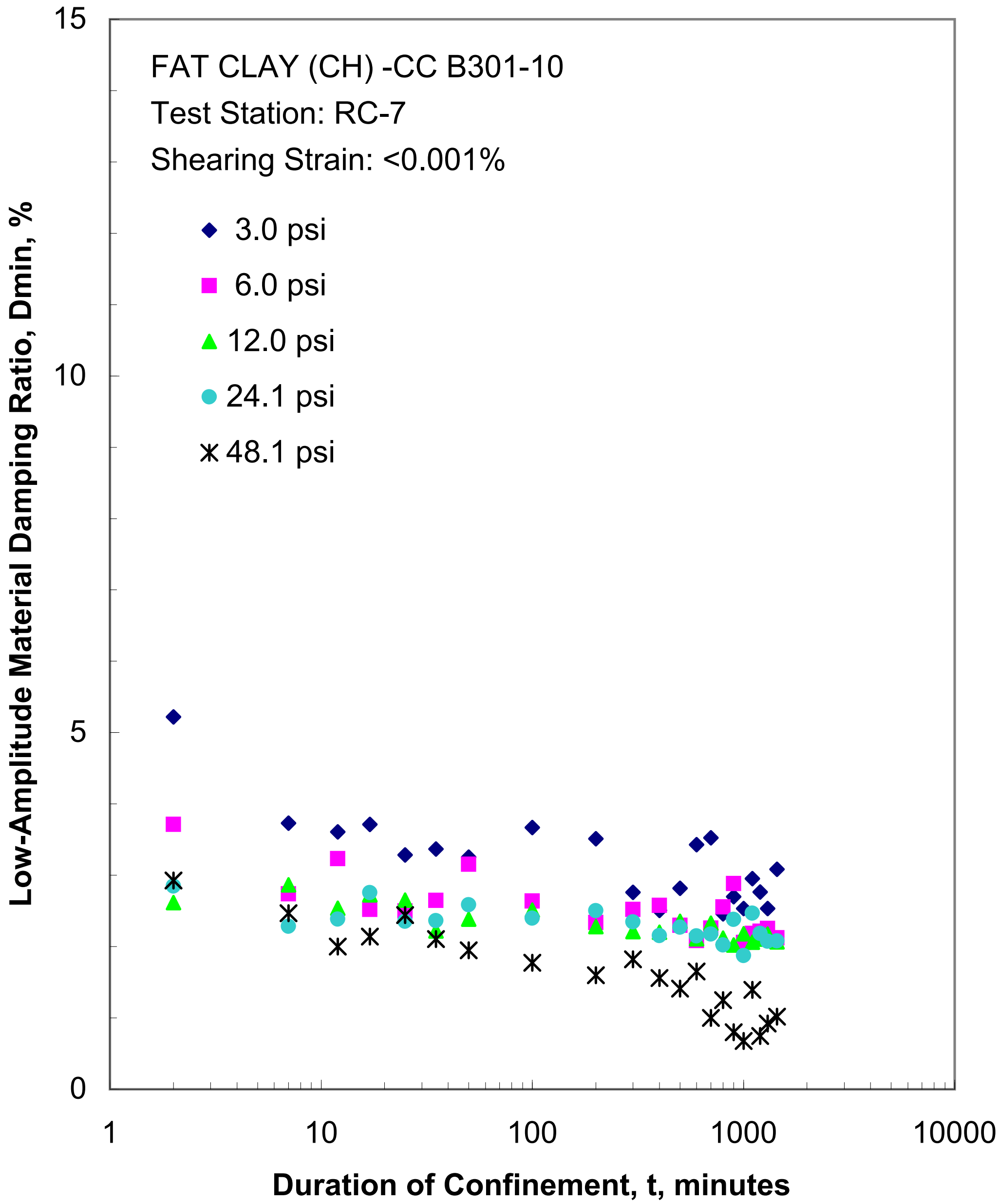


Figure B.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

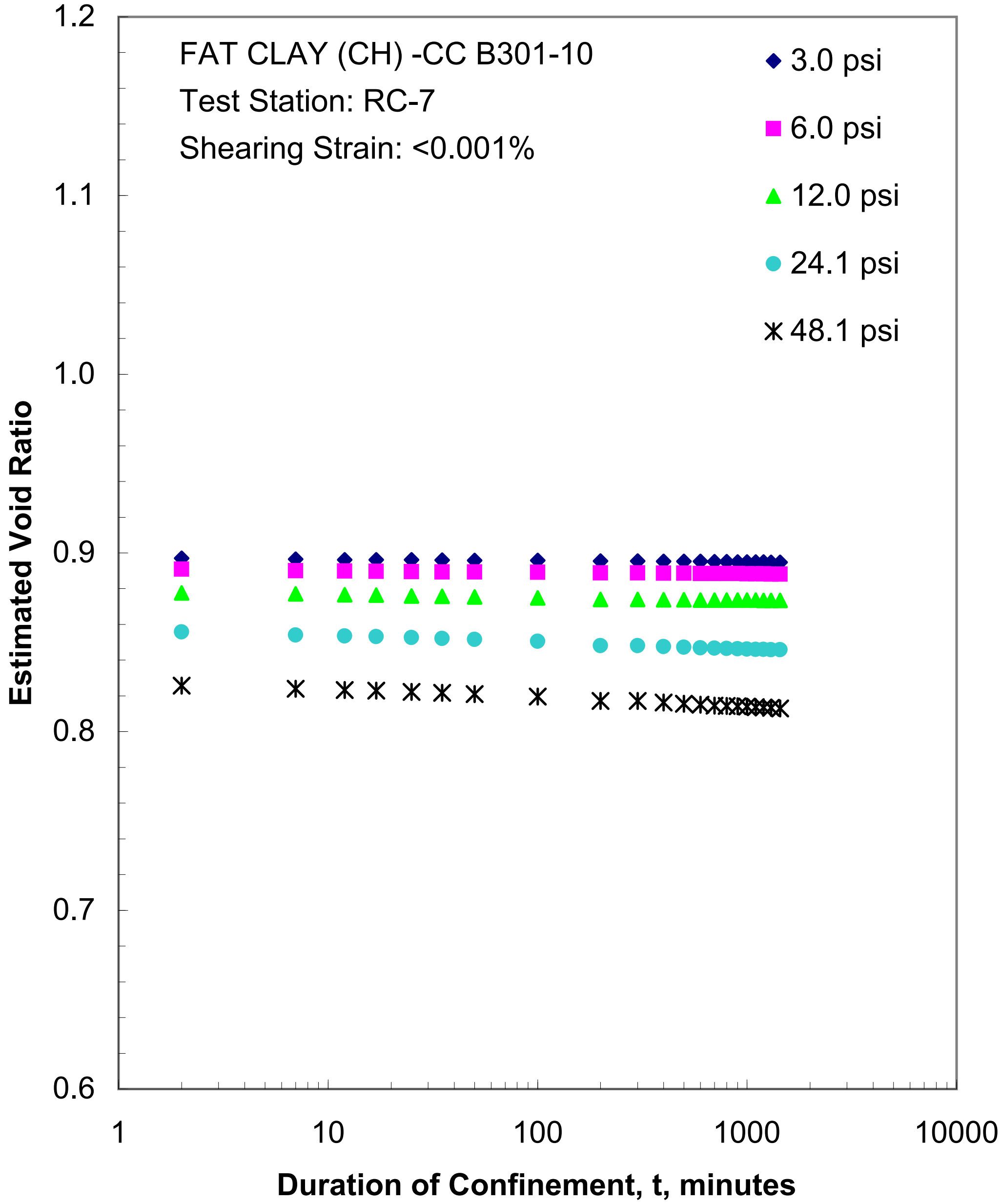


Figure B.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

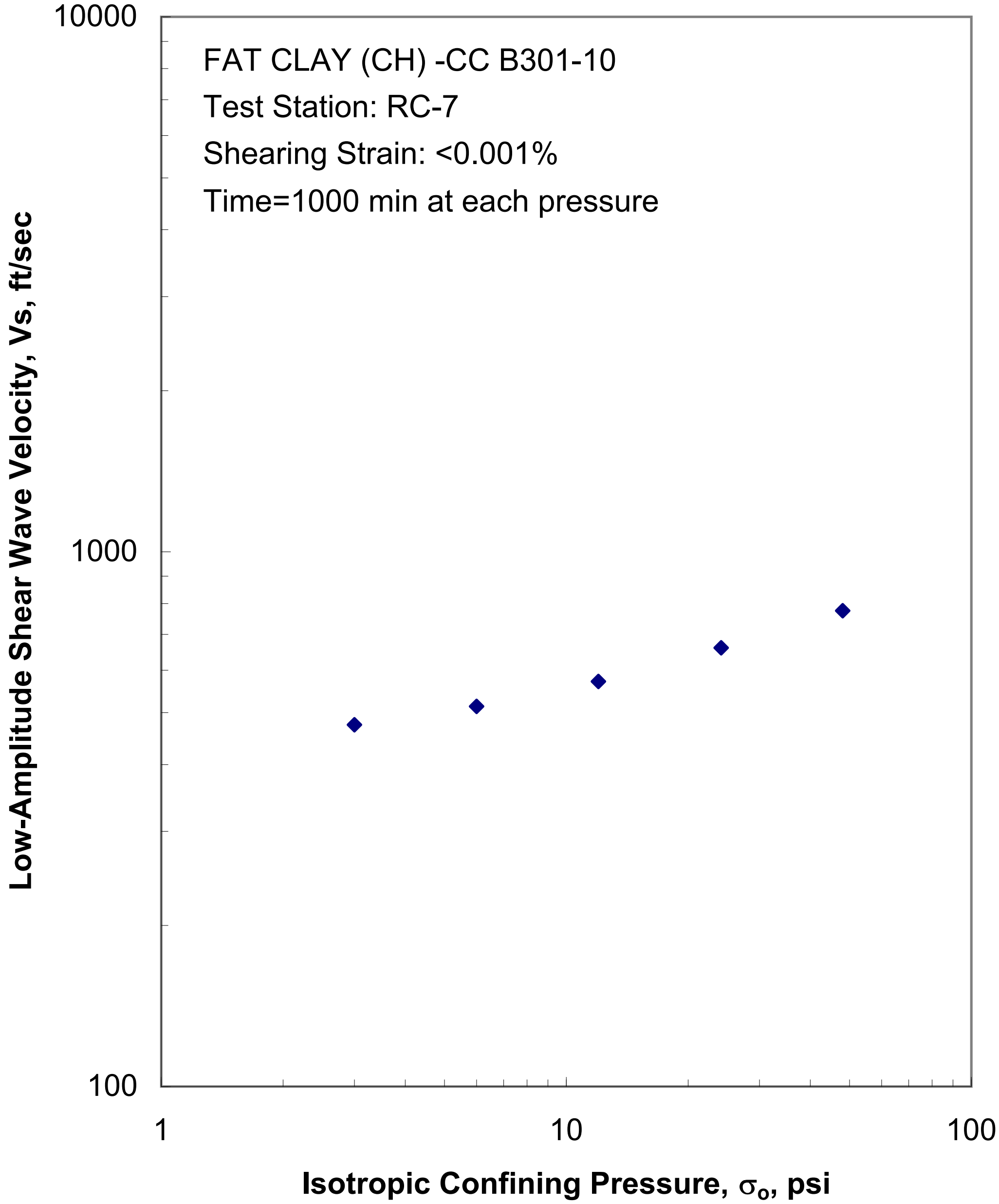


Figure B.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

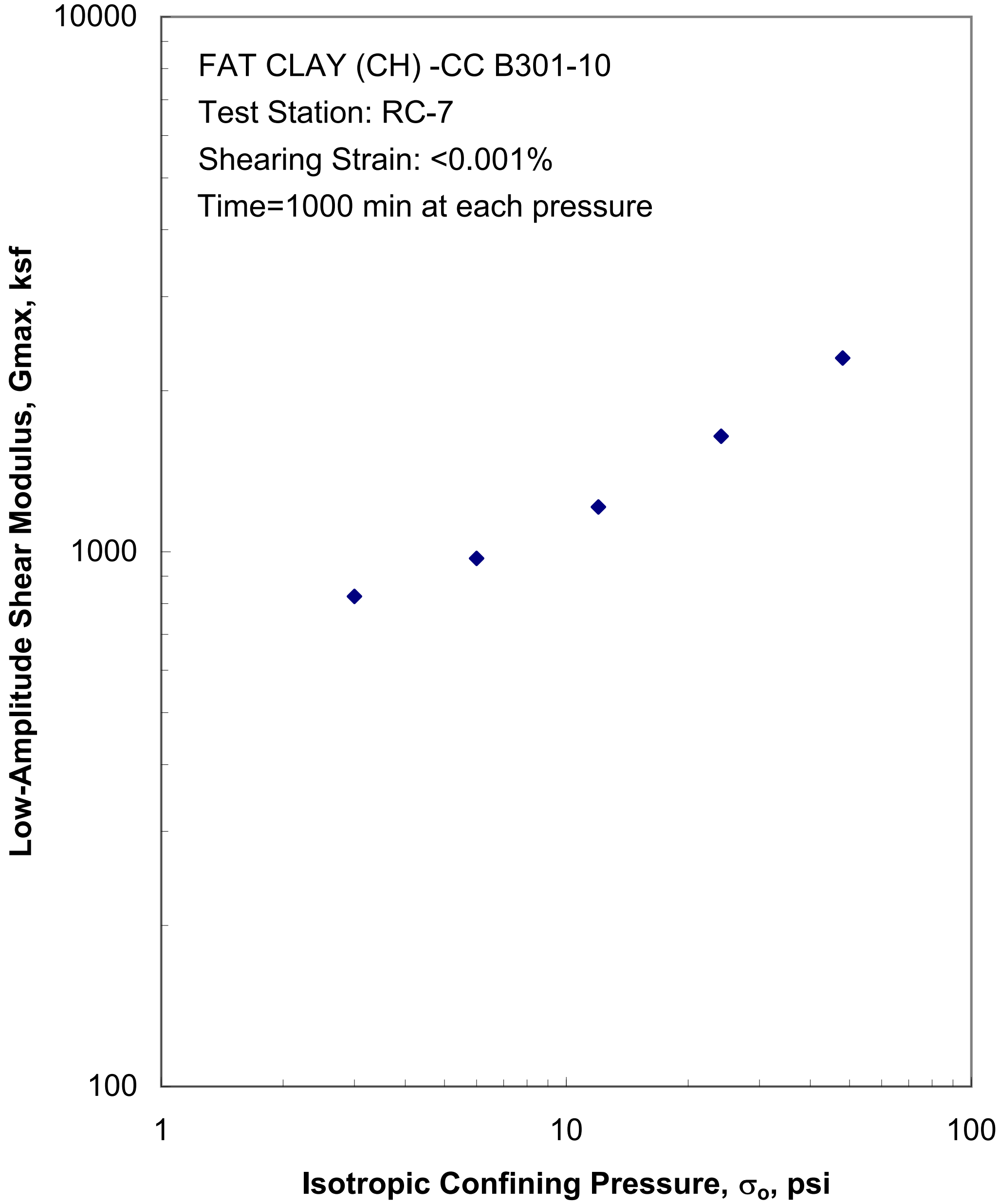


Figure B.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

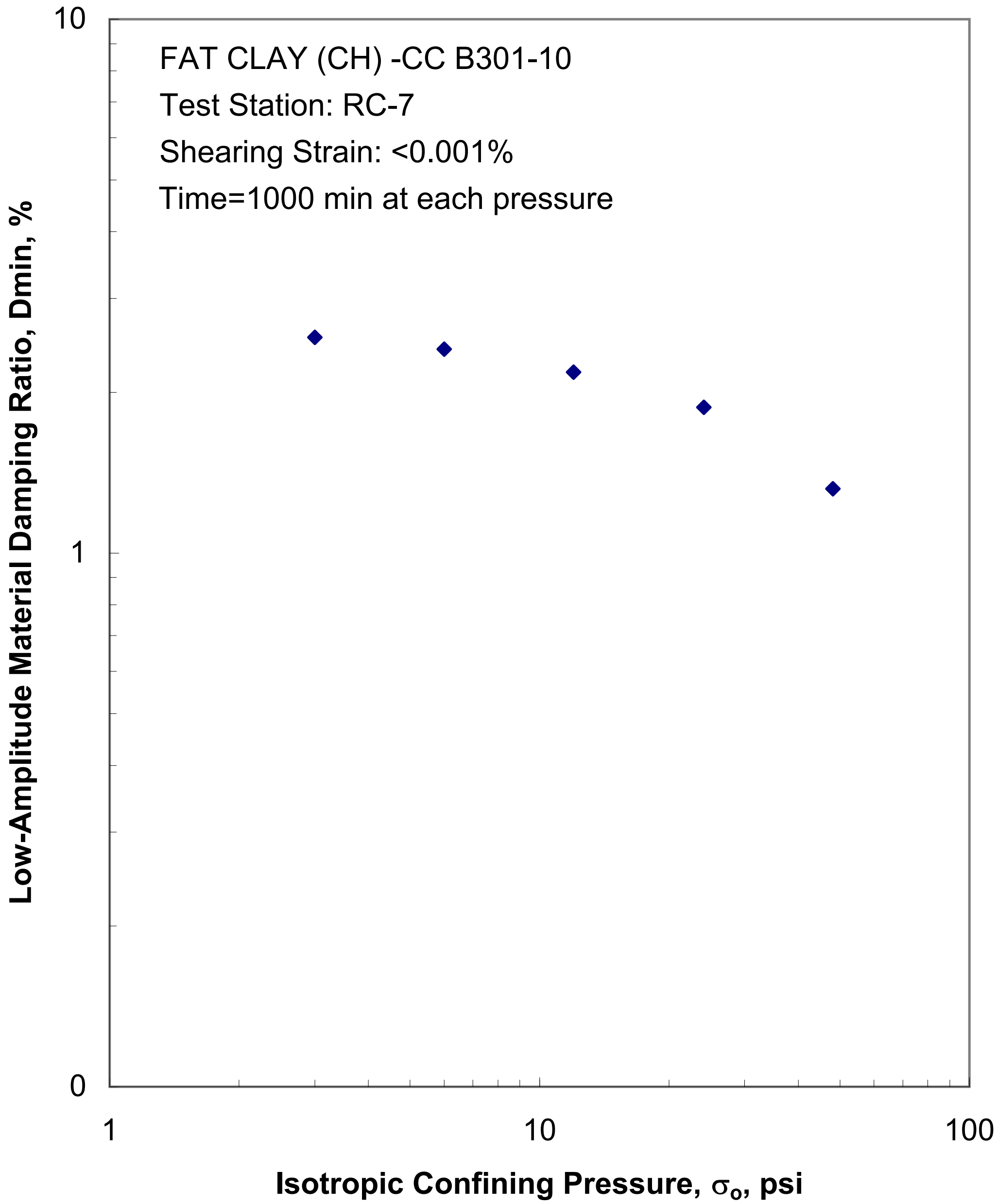


Figure B.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

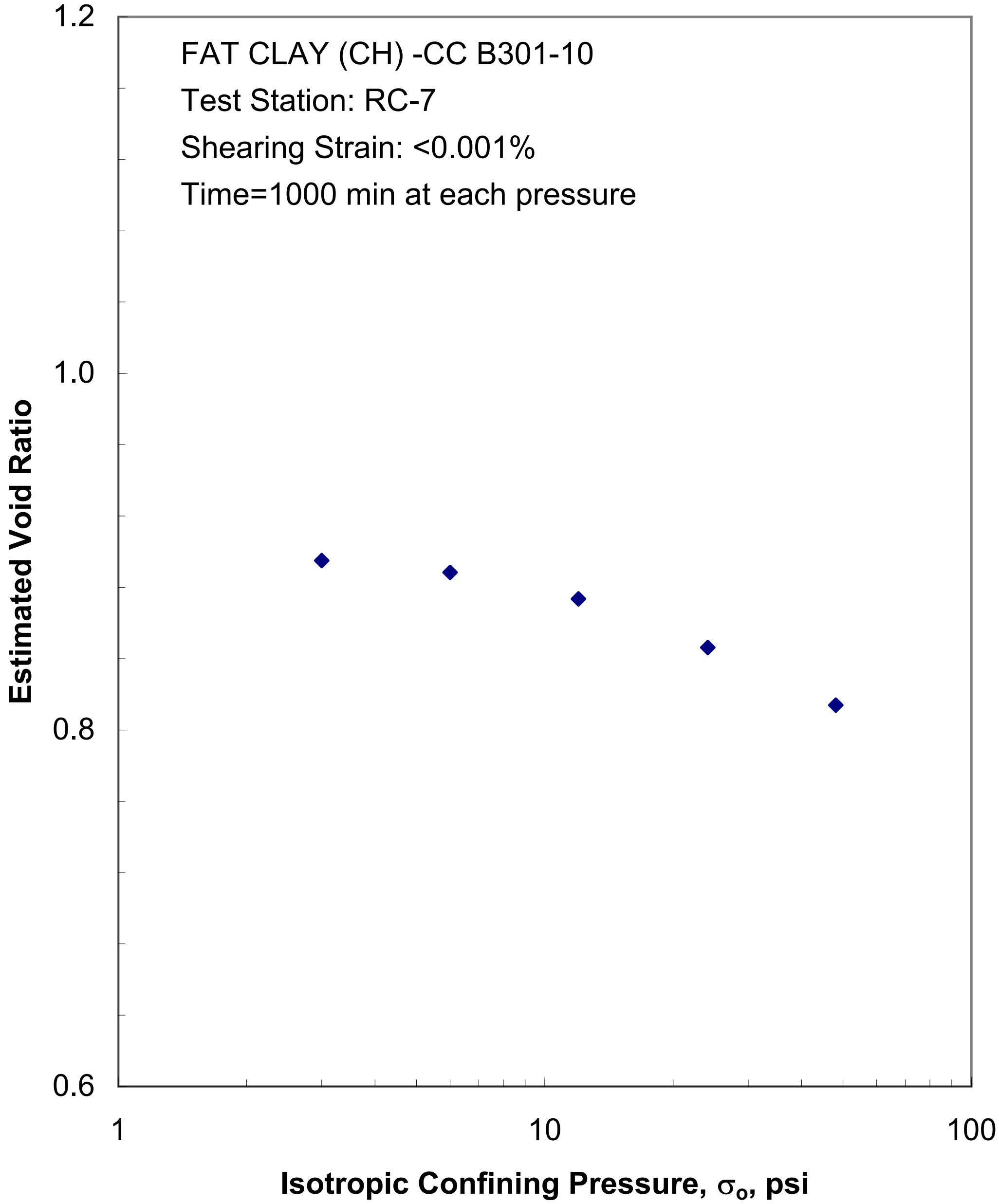


Figure B.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

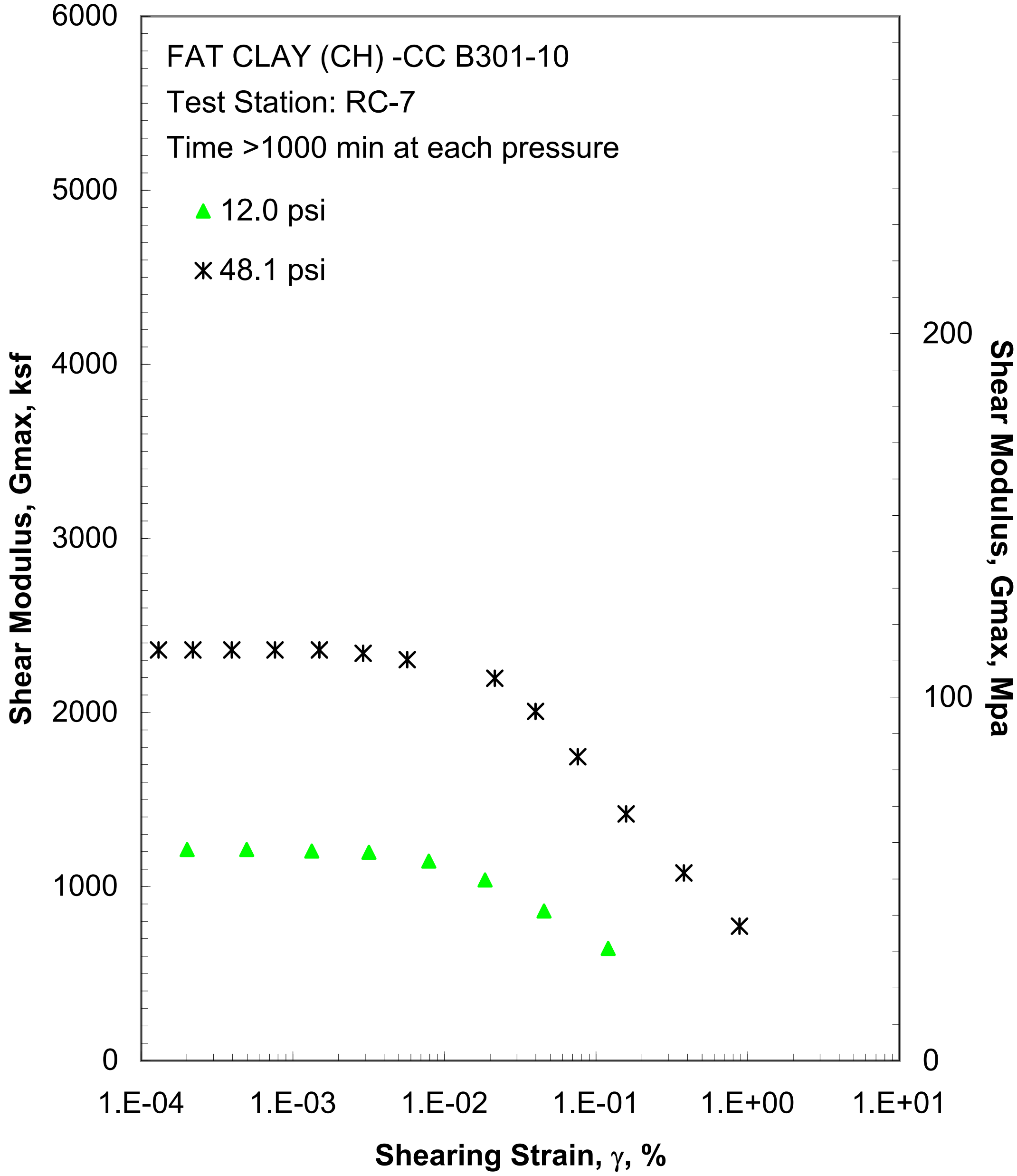


Figure B.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

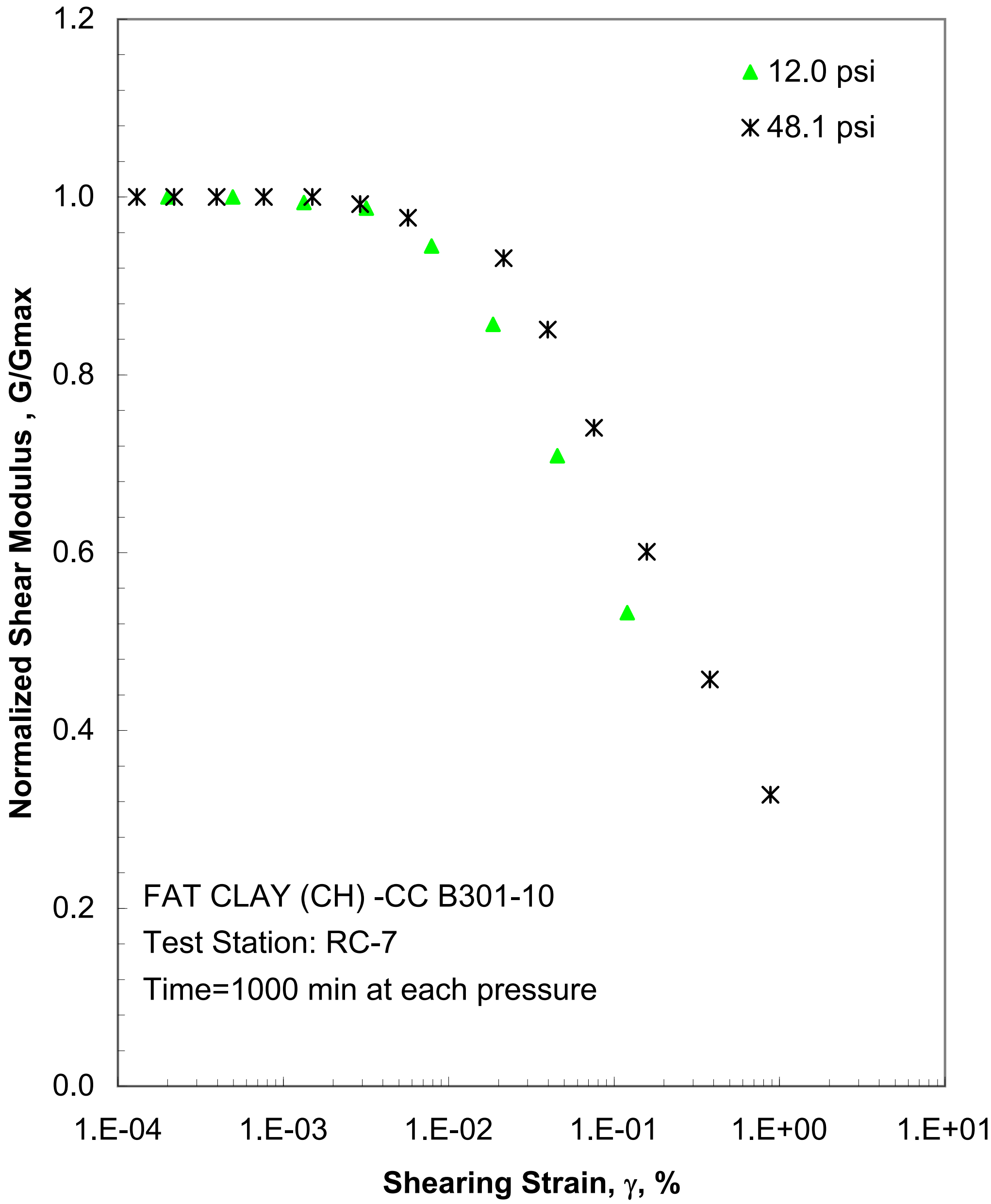


Figure B.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

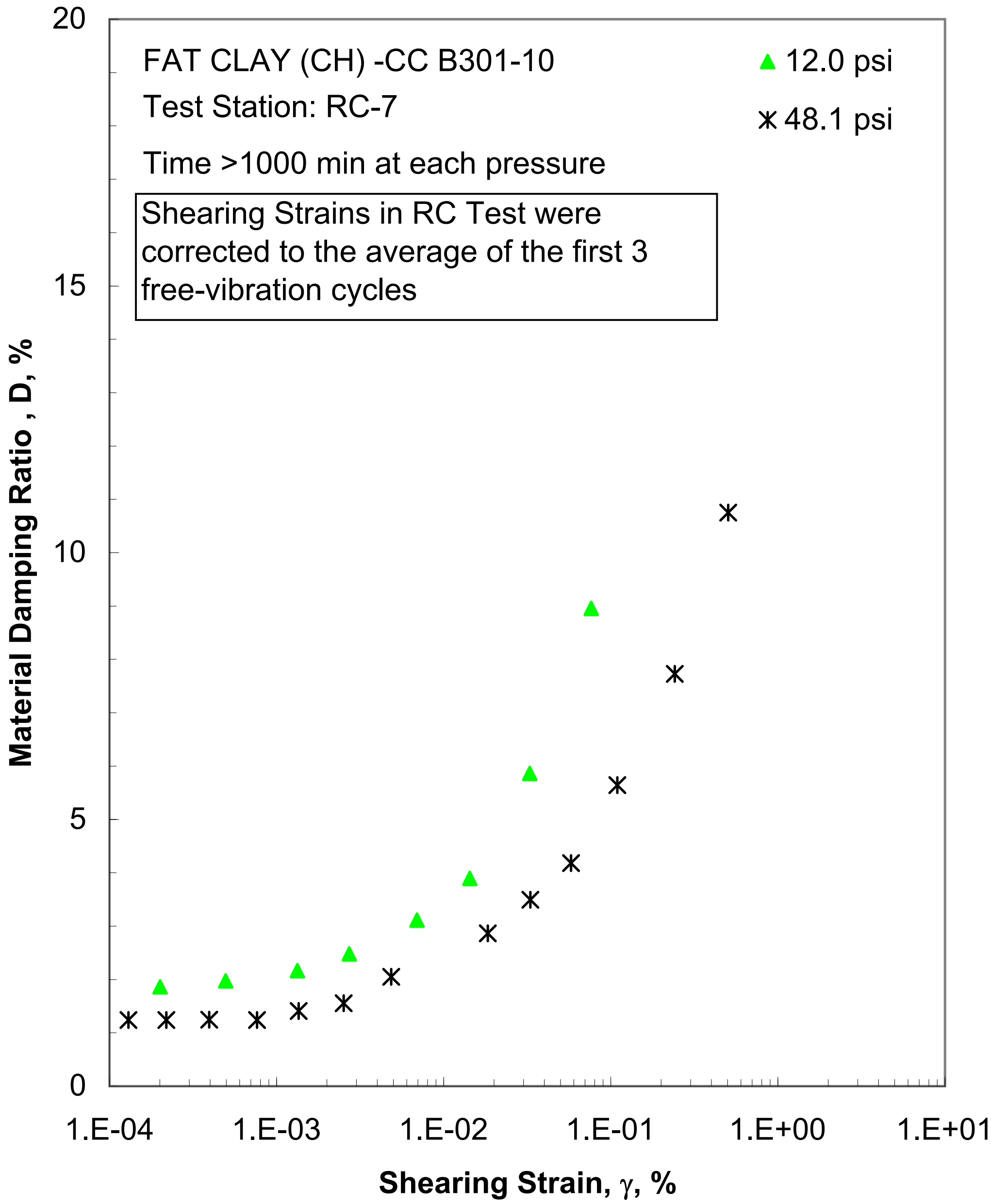


Figure B.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

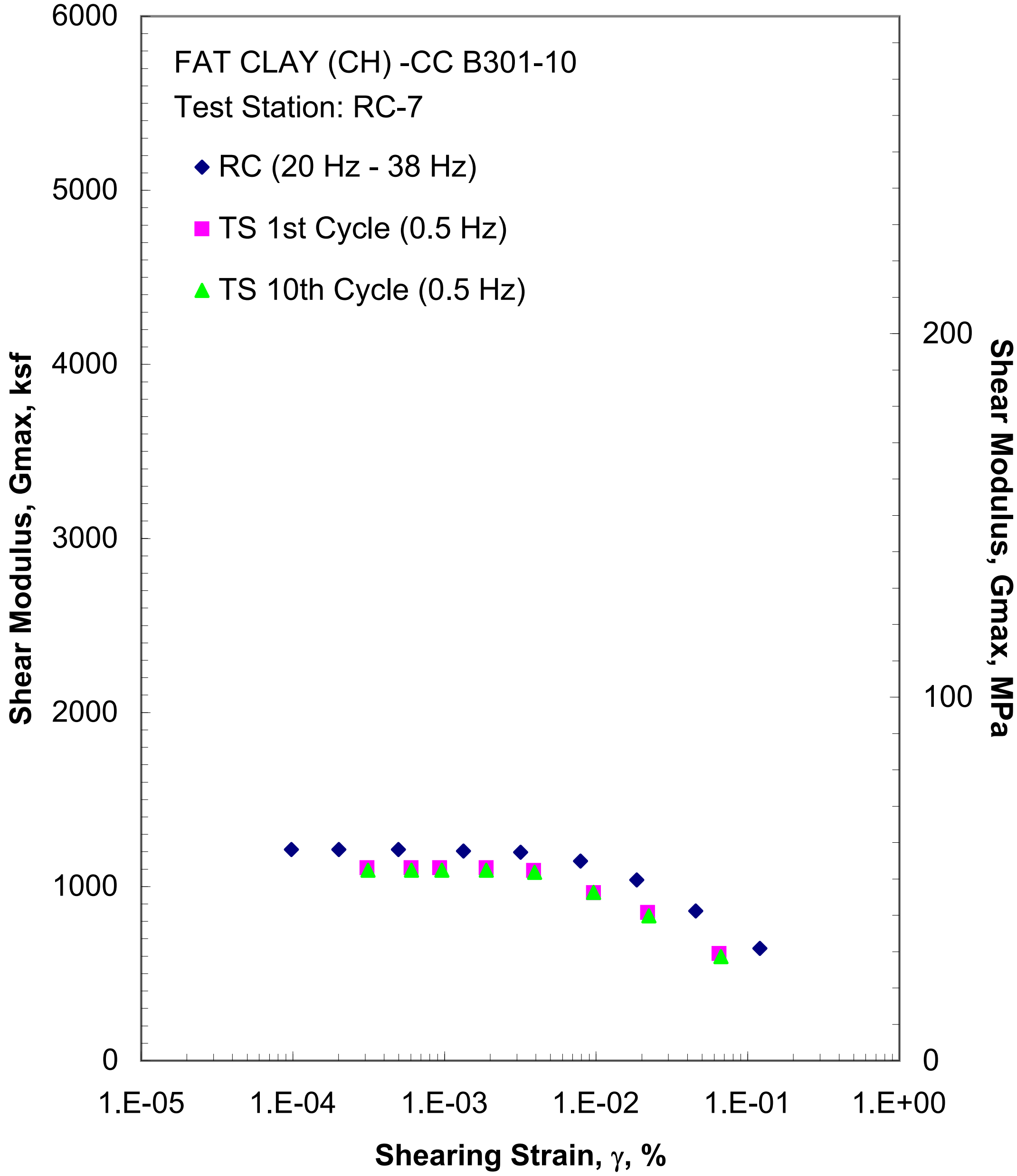


Figure B.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 12.0 psi from the Combined RCTS Tests

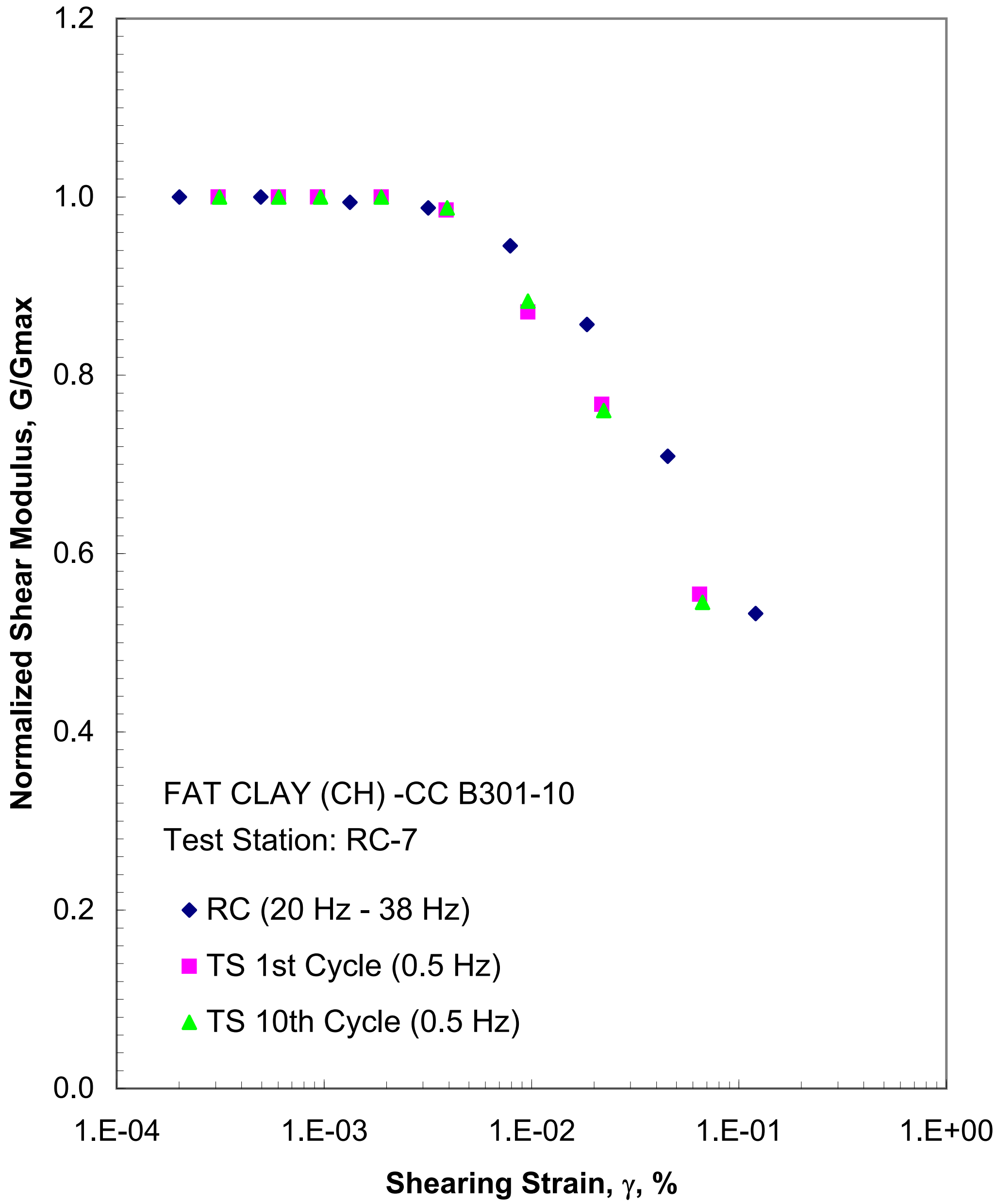


Figure B.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 12.0 psi from the Combined RCTS Tests

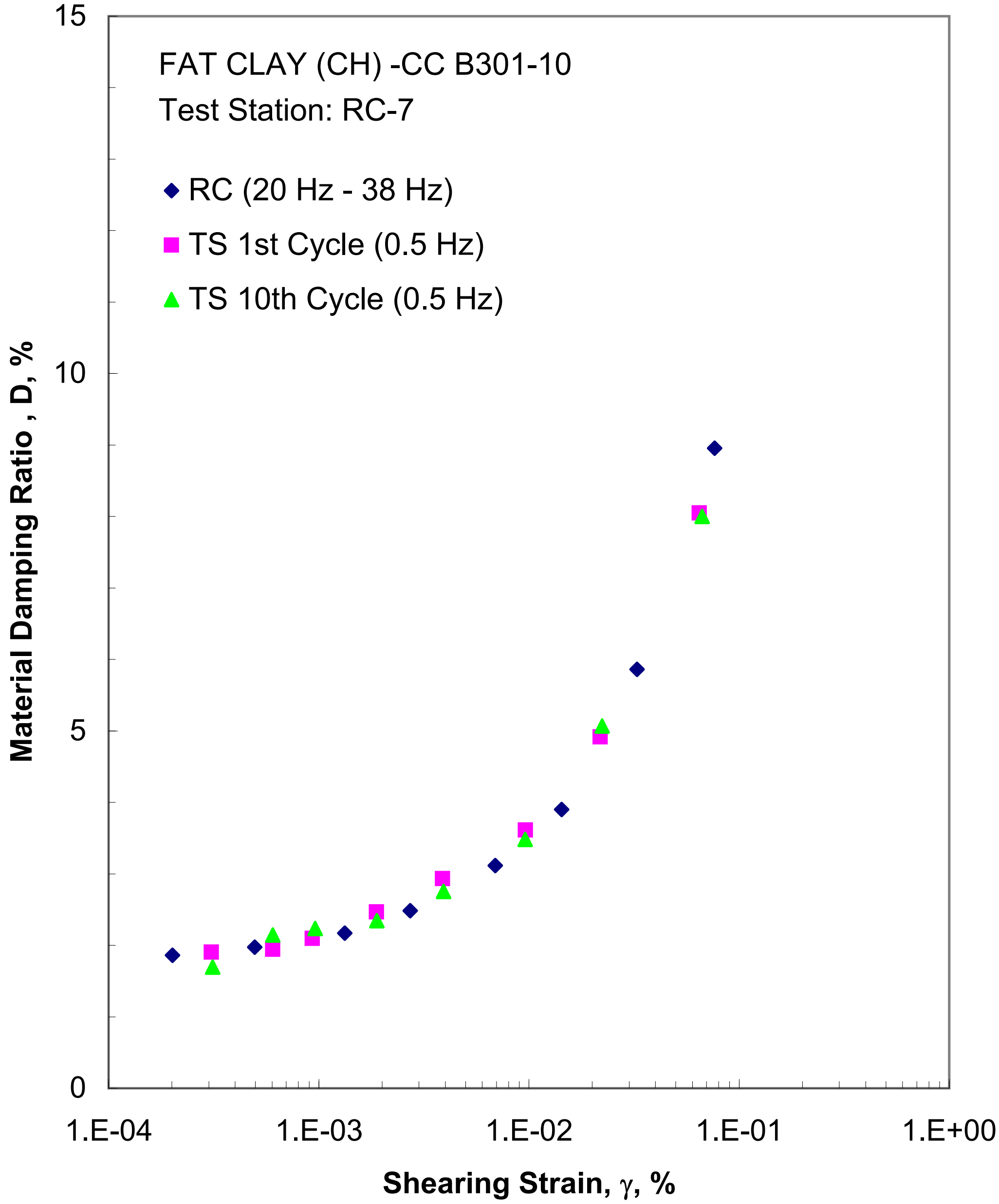


Figure B.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 12.0 psi from the Combined RCTS Tests

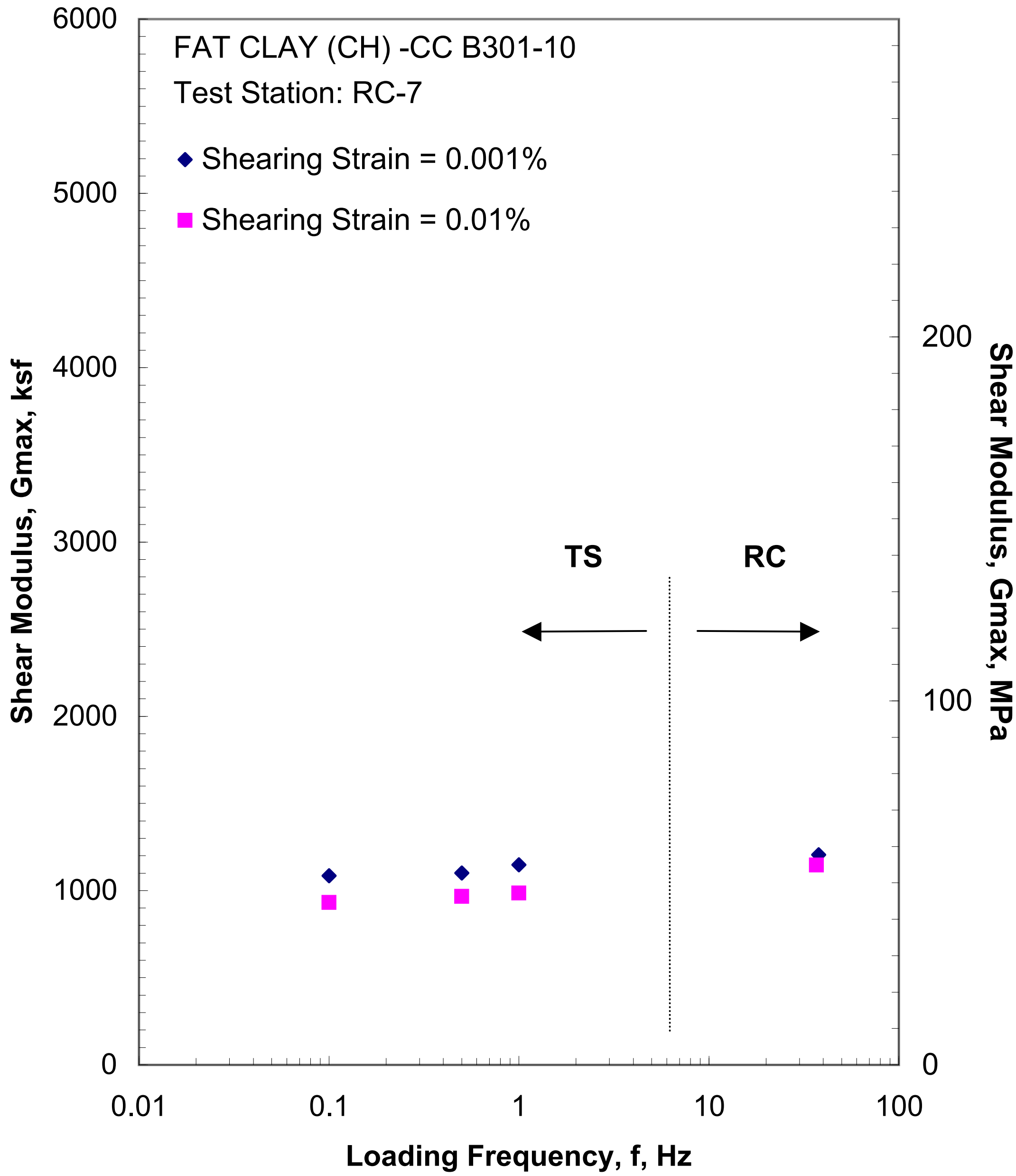


Figure B.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 12.0 psi from the Combined RCTS Tests

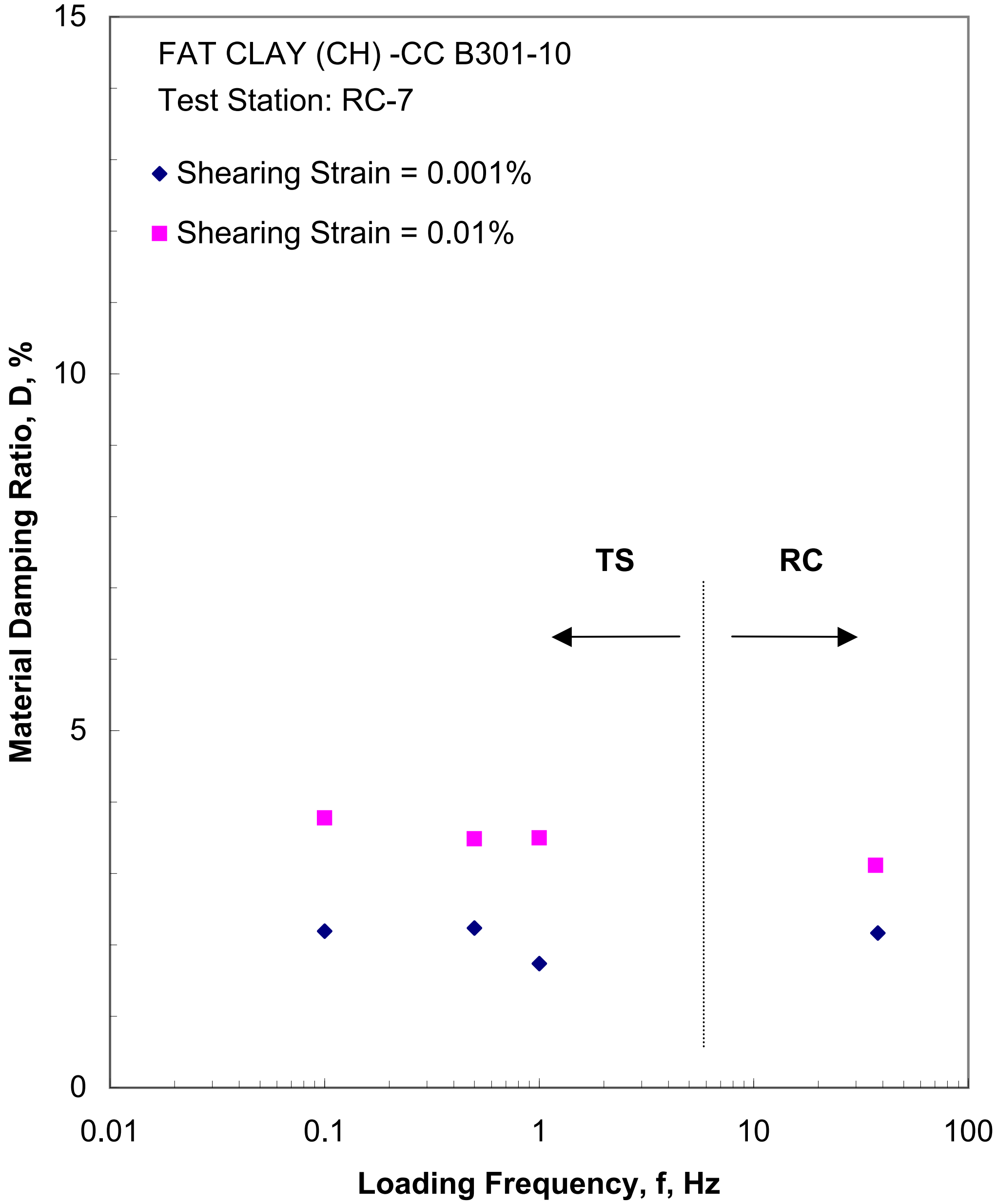


Figure B.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 12.0 psi from the Combined RCTS Tests

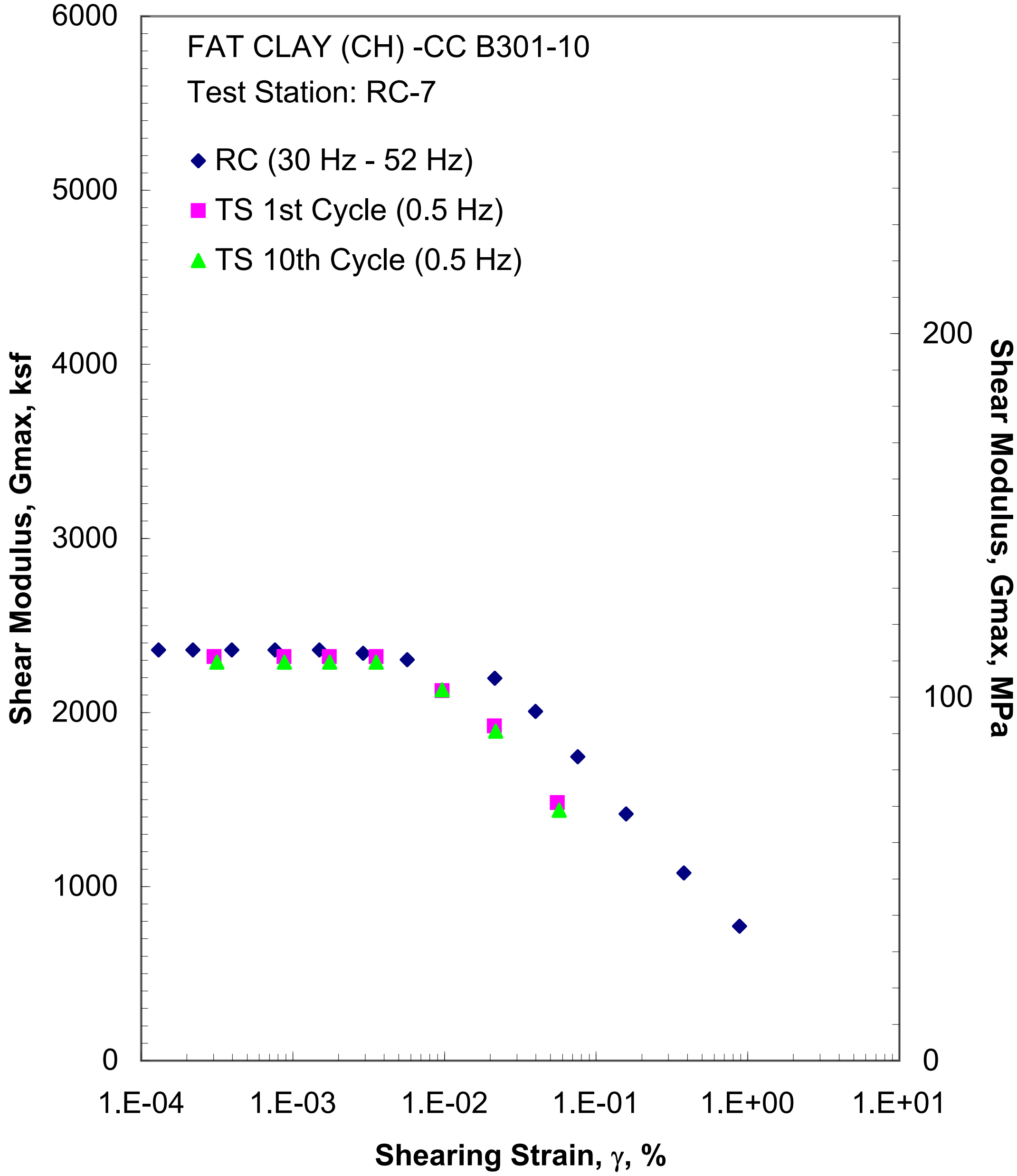


Figure B.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 48.1 psi from the Combined RCTS Tests

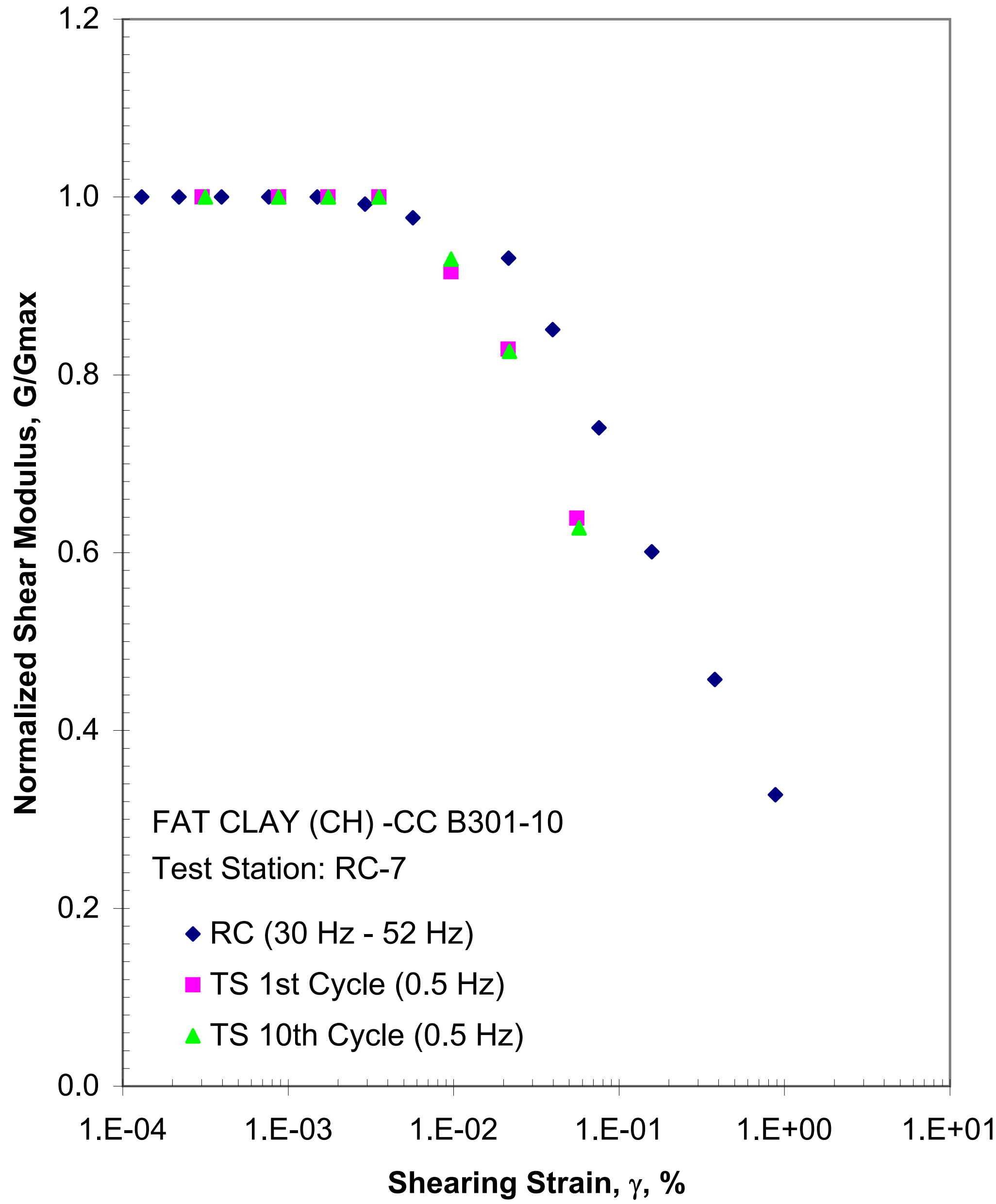


Figure B.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 48.1 psi from the Combined RCTS Tests

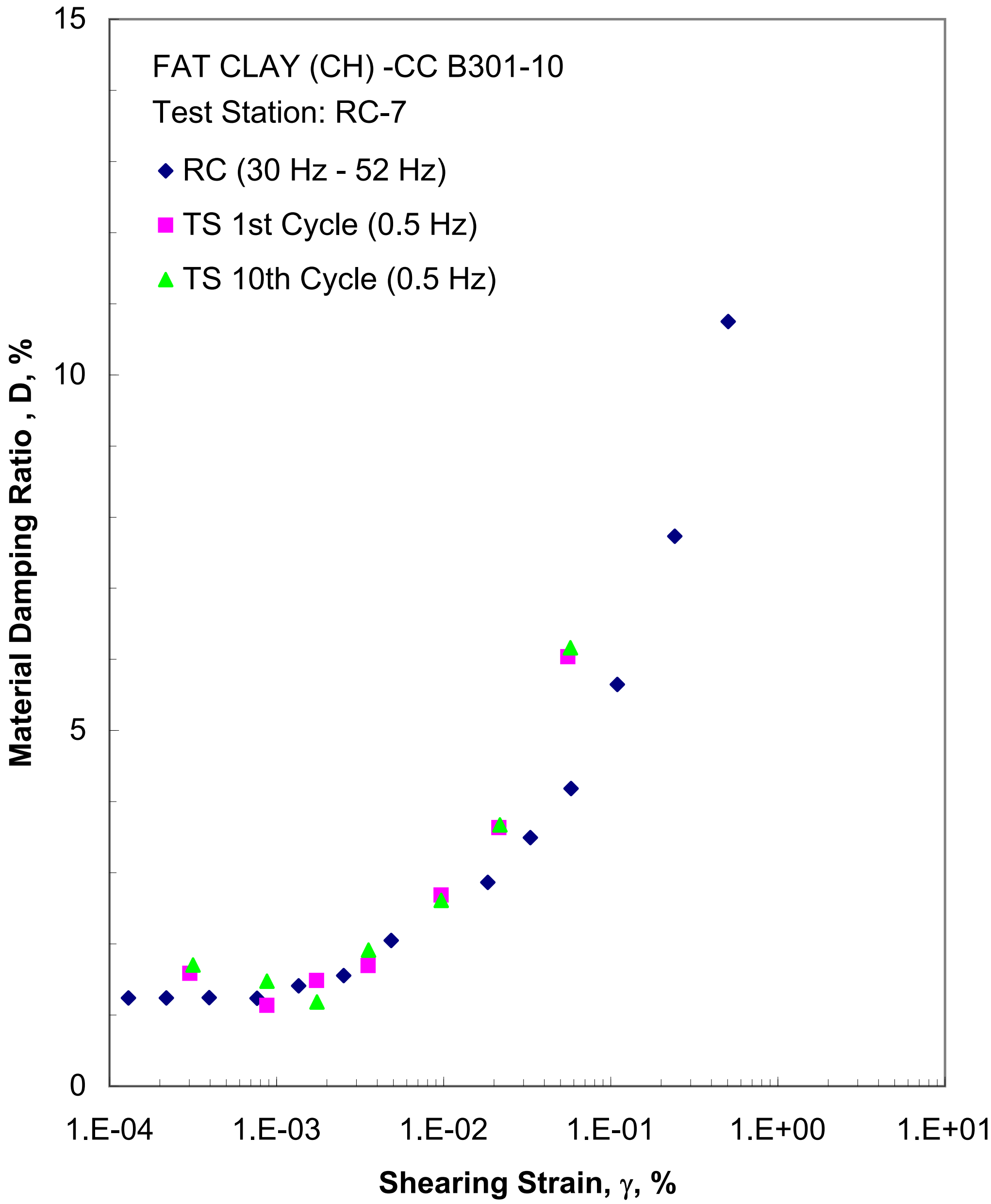


Figure B.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 48.1 psi from the Combined RCTS Tests

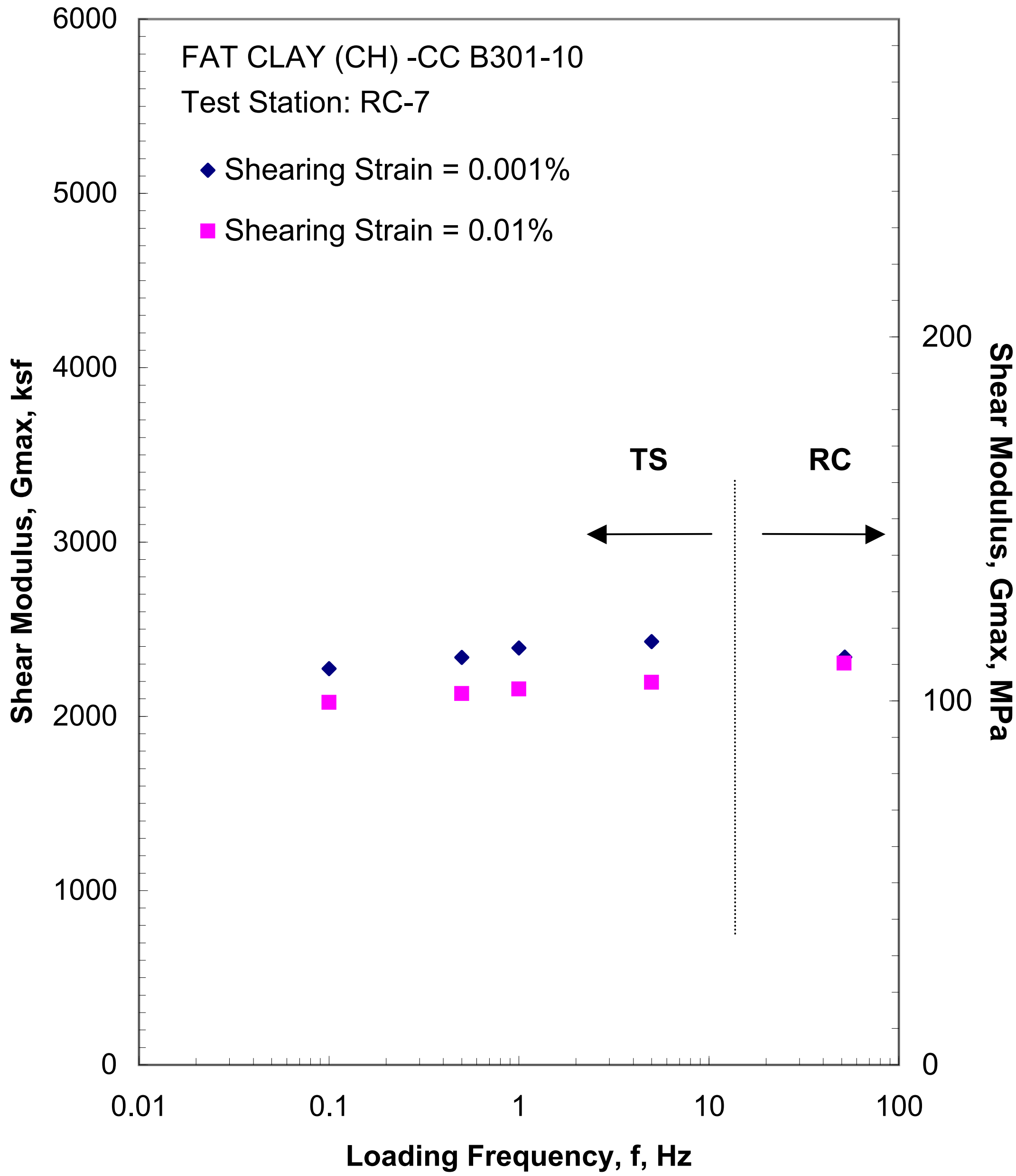


Figure B.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 48.1 psi from the Combined RCTS Tests

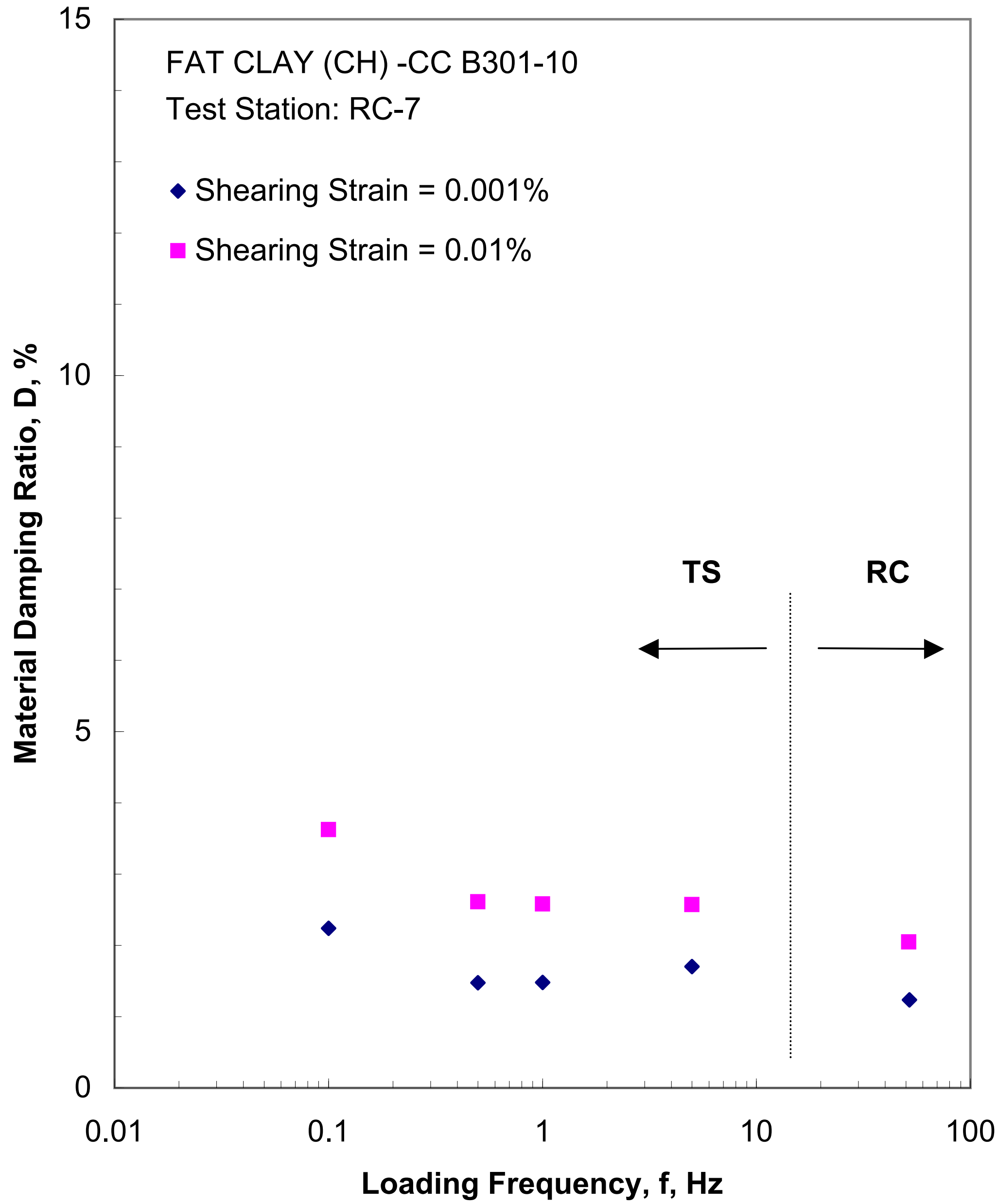


Figure B.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 48.1 psi from the Combined RCTS Tests

Table B.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 CC B301-UD10

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)	(%)	
3.0	432	21	825	40	475	2.53	0.895
6.0	864	41	972	47	514	2.41	0.888
12.0	1728	83	1212	58	572	2.18	0.874
24.1	3470	166	1643	79	661	1.88	0.846
48.1	6926	331	2303	111	775	1.32	0.814

Table B.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B301-UD10; Isoptropic Confining Pressure, σ_o=12 psi (1.7 ksf = 83 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio^x, D, %
9.80E-05	1213	1.00	9.80E-05	1.87
2.01E-04	1213	1.00	2.01E-04	1.86
4.96E-04	1213	1.00	4.96E-04	1.98
1.33E-03	1205	0.99	1.33E-03	2.17
3.18E-03	1198	0.99	2.73E-03	2.48
7.88E-03	1146	0.95	6.92E-03	3.11
1.85E-02	1039	0.86	1.43E-02	3.90
4.53E-02	860	0.71	3.27E-02	5.86
1.20E-01	646	0.53	7.64E-02	8.96

+ 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 B.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B301-UD10; Isotropic Confining Pressure, σ_o= 12 psi (1.7 ksf = 83 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, %
3.09E-04	1109	1.00	1.90	3.13E-04	1095	1.00	1.69
6.03E-04	1109	1.00	1.94	6.05E-04	1095	1.00	2.14
9.31E-04	1109	1.00	2.09	9.60E-04	1095	1.00	2.23
1.89E-03	1109	1.00	2.46	1.89E-03	1095	1.00	2.34
3.88E-03	1092	0.99	2.93	3.92E-03	1082	0.99	2.75
9.62E-03	965	0.87	3.61	9.60E-03	967	0.88	3.48
2.18E-02	851	0.77	4.92	2.23E-02	833	0.76	5.07
6.48E-02	614	0.55	8.05	6.67E-02	597	0.55	8.00

Table B.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B301-UD10; Isoptropic Confining Pressure, σ_o= 48.1 psi (6.9 ksf = 331 kPa)

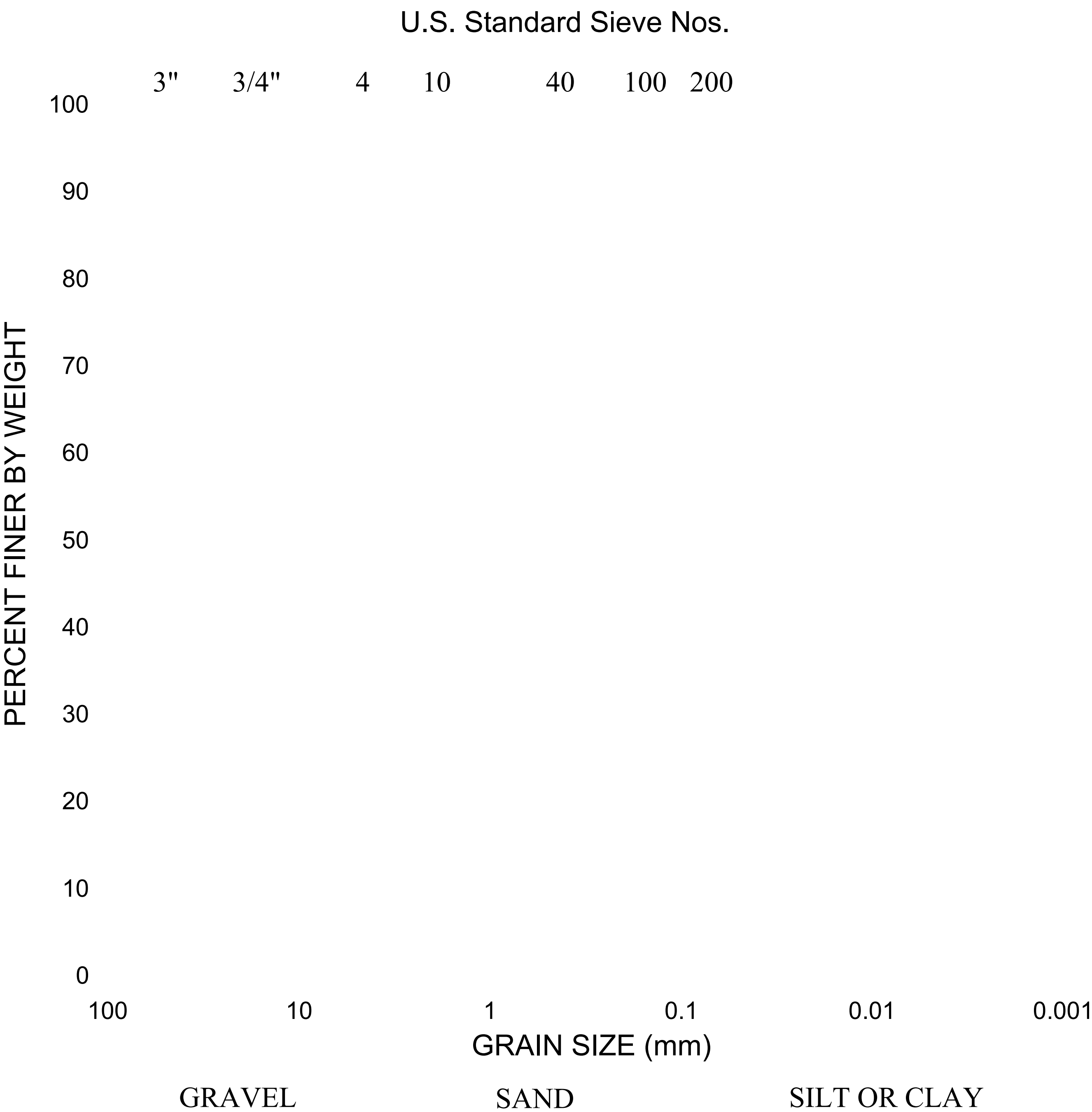
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
1.30E-04	2359	1.00	1.30E-04	1.24
2.19E-04	2359	1.00	2.19E-04	1.24
3.95E-04	2359	1.00	3.95E-04	1.24
7.64E-04	2359	1.00	7.64E-04	1.24
1.50E-03	2359	1.00	1.36E-03	1.41
2.91E-03	2340	0.99	2.52E-03	1.56
5.67E-03	2304	0.98	4.86E-03	2.05
2.14E-02	2197	0.93	1.84E-02	2.87
3.97E-02	2007	0.85	3.29E-02	3.49
7.56E-02	1746	0.74	5.79E-02	4.18
1.58E-01	1418	0.60	1.09E-01	5.65
3.79E-01	1079	0.46	2.41E-01	7.73
8.81E-01	773	0.33	5.04E-01	10.75

[+] 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 B.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B301-UD10; Isotropic Confining Pressure, σ_o=48.1 psi (6.9 ksf = 331 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D,	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D, %
3.03E-04	2320	1.00	1.58	3.16E-04	2290	1.00	1.70
8.75E-04	2320	1.00	1.13	8.78E-04	2290	1.00	1.47
1.74E-03	2320	1.00	1.48	1.75E-03	2290	1.00	1.18
3.54E-03	2320	1.00	1.69	3.54E-03	2290	1.00	1.91
9.67E-03	2125	0.92	2.69	9.65E-03	2130	0.93	2.61
2.14E-02	1923	0.83	3.63	2.17E-02	1893	0.83	3.67
5.55E-02	1482	0.64	6.04	5.72E-02	1438	0.63	6.16



GRADATION CURVE

ASTM D422

Project: Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland

Contract No.: 06120048.00

Date: 9/14/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-301	33.5-35.0	FAT CLAY, with sand, gray	CH	59	42

Schnabel Engineering

APPENDIX C

CC B305-UD17
Clayey SAND (SC), contains shells, gray*
(LL=72, PL=29, PI=50; Gs=2.71)*

Borehole B-305
Sample UD17
Sample Depth = 39.5 to 41.5 ft
RCTS Test Depth = 41.0 ft
Total Unit Weight = 117.2 lb/ft^3
Water Content = 34.7 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 20.7 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

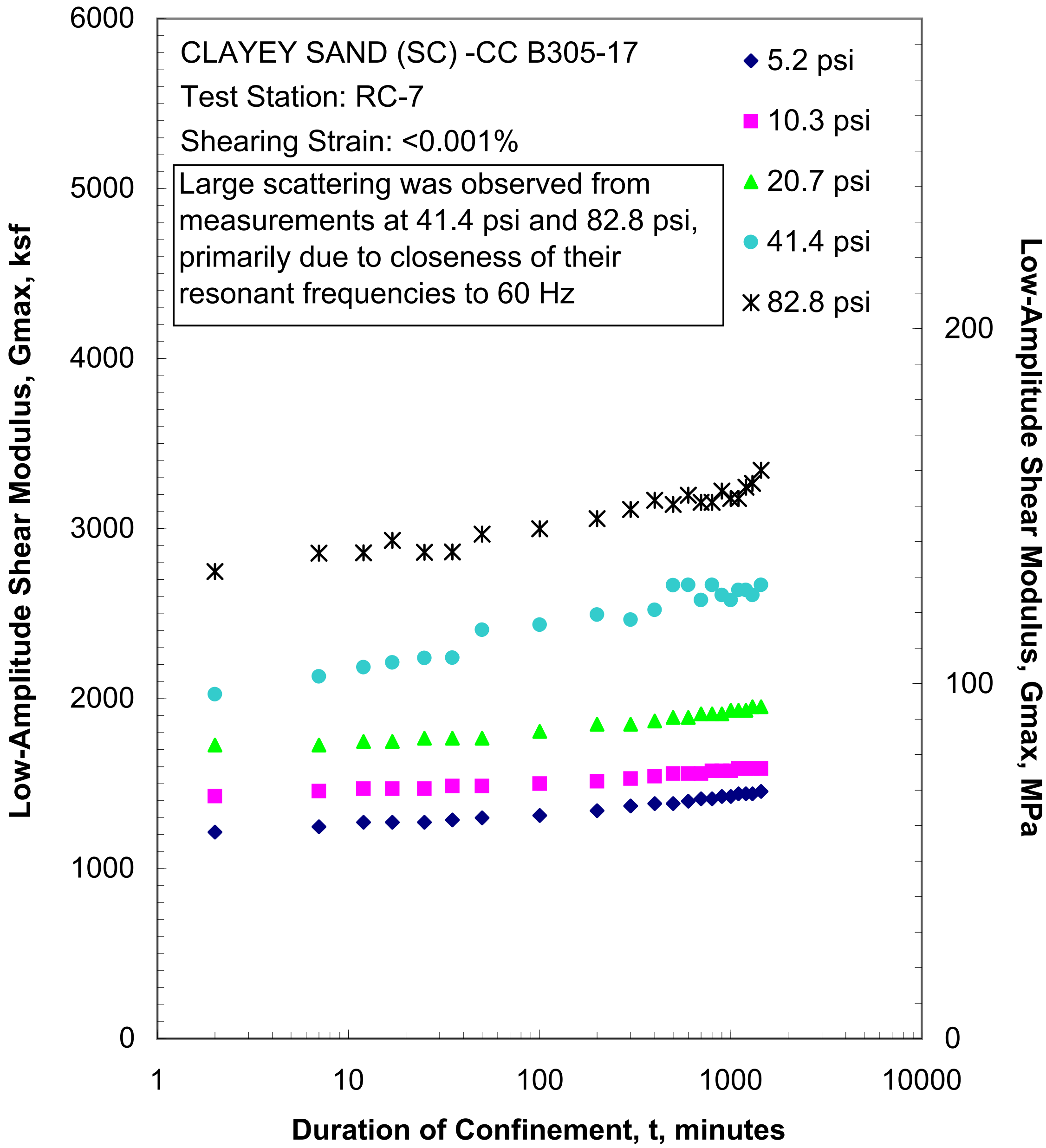


Figure C.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

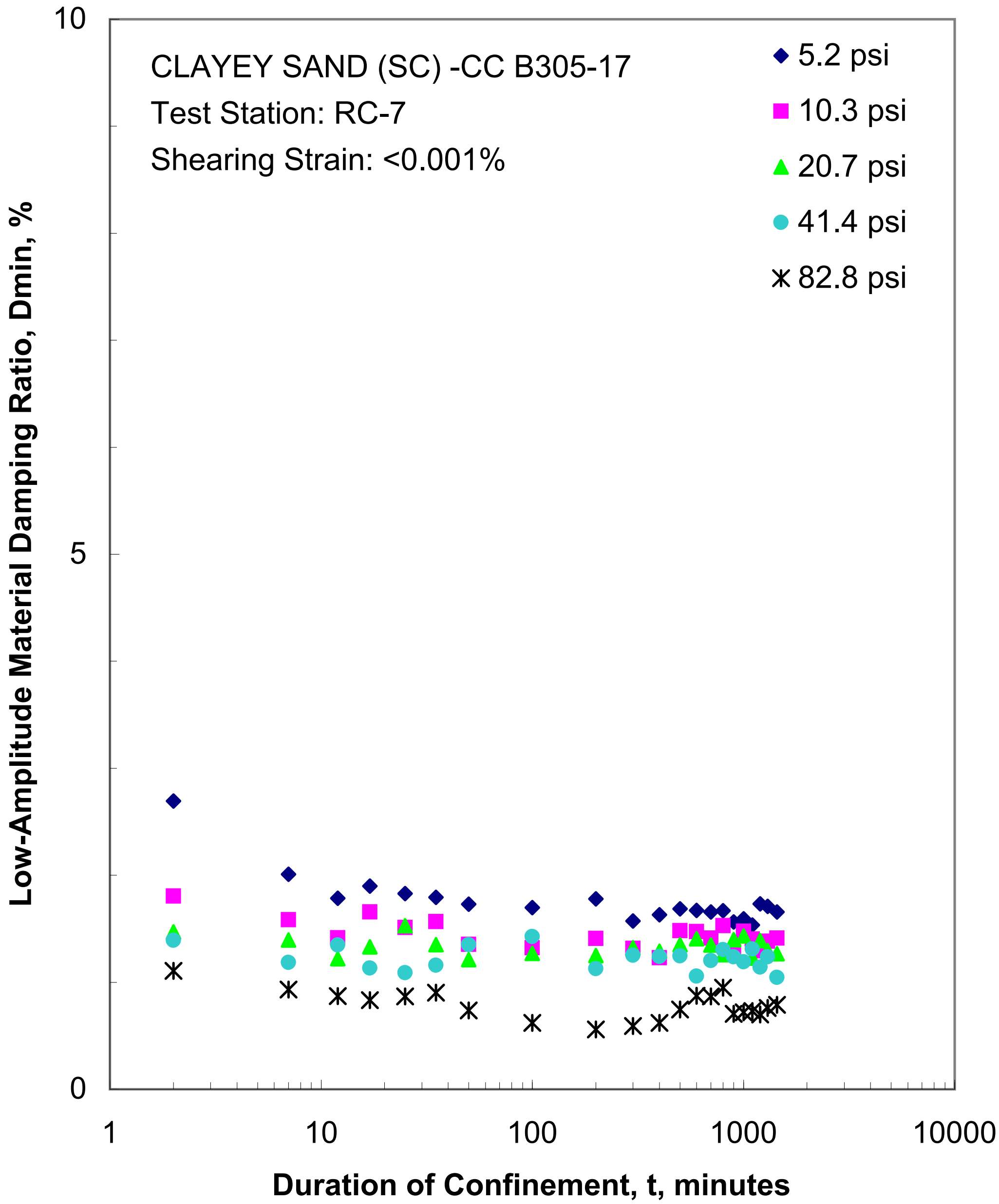


Figure C.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

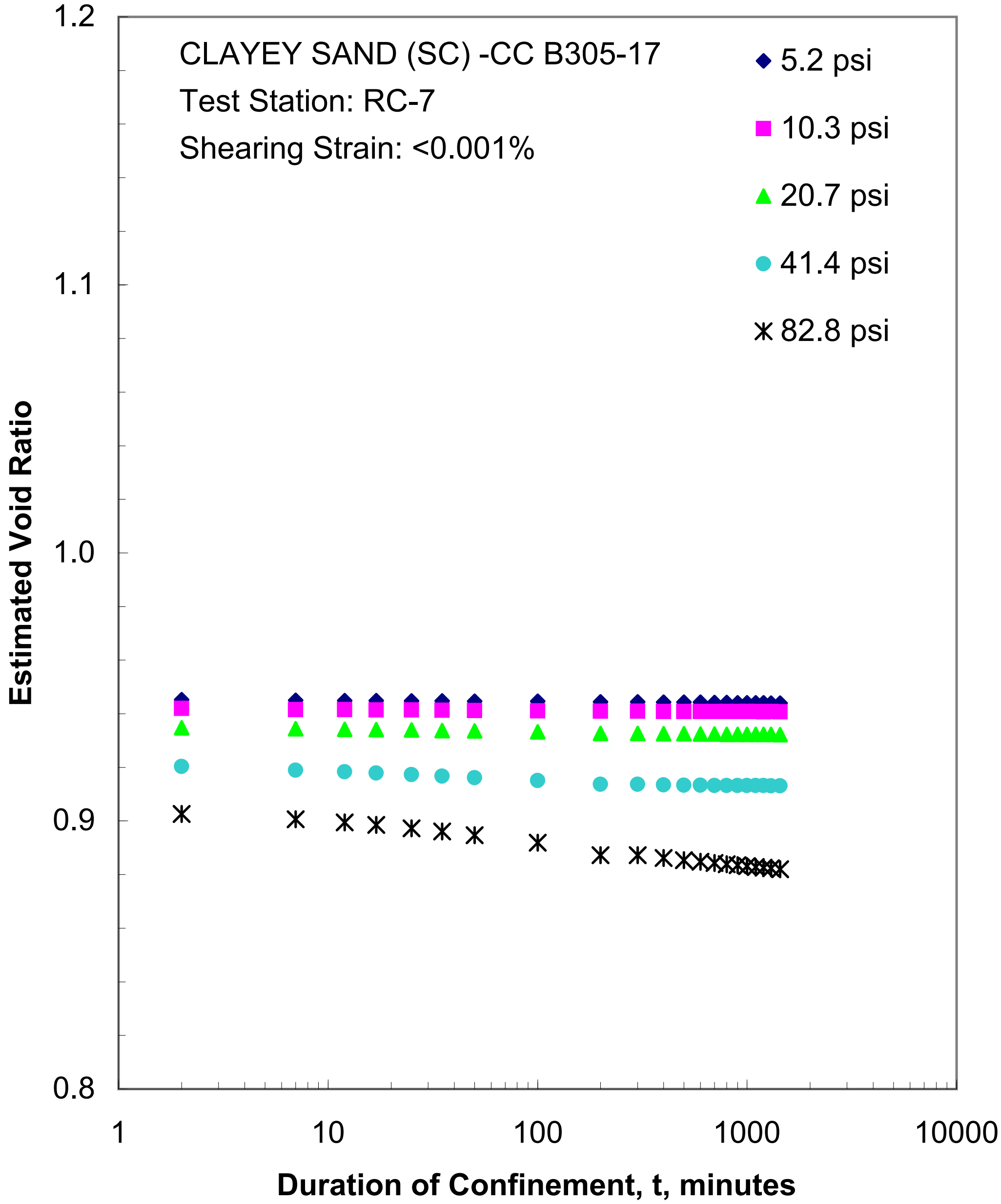


Figure C.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

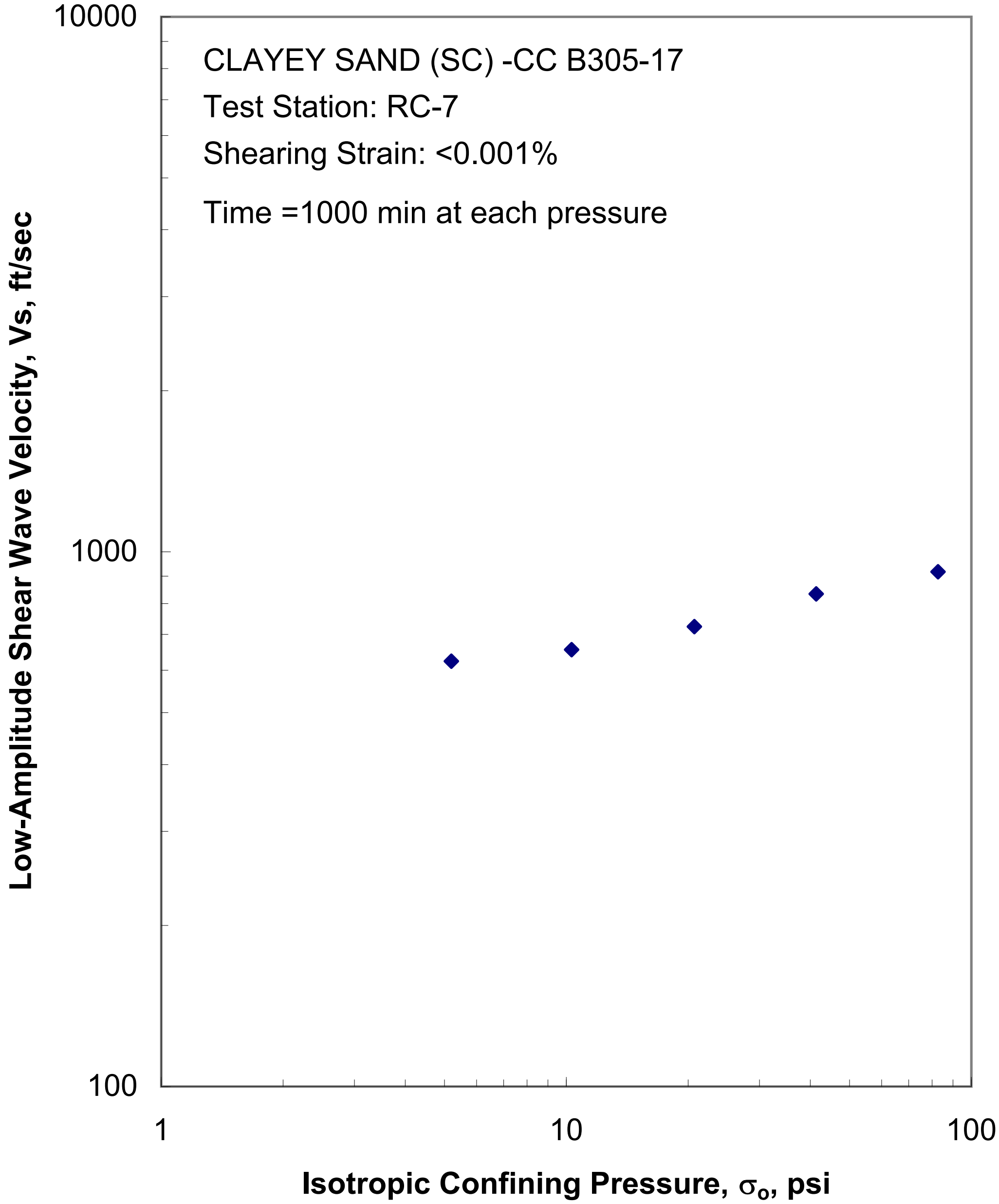


Figure C.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

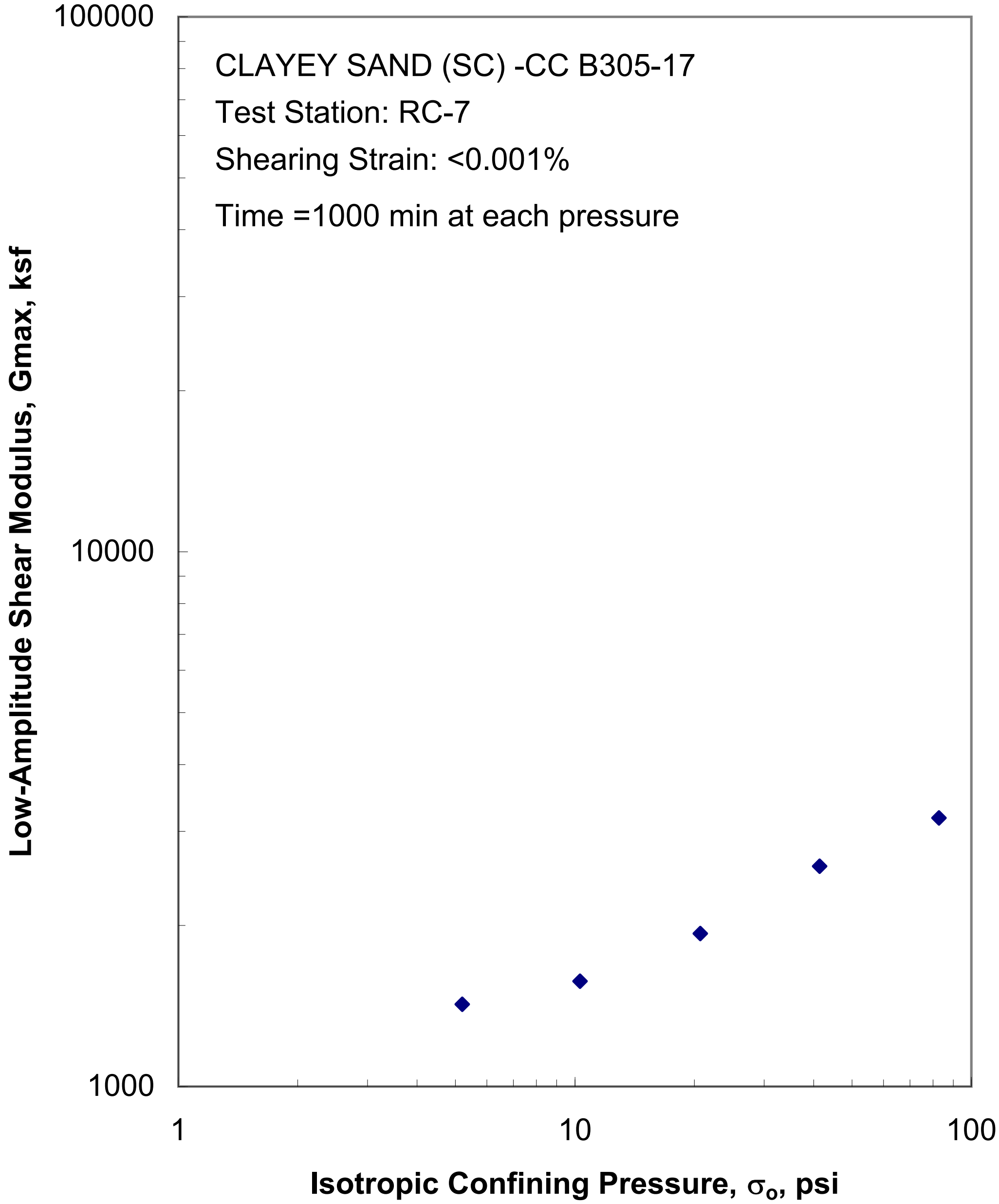


Figure C.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

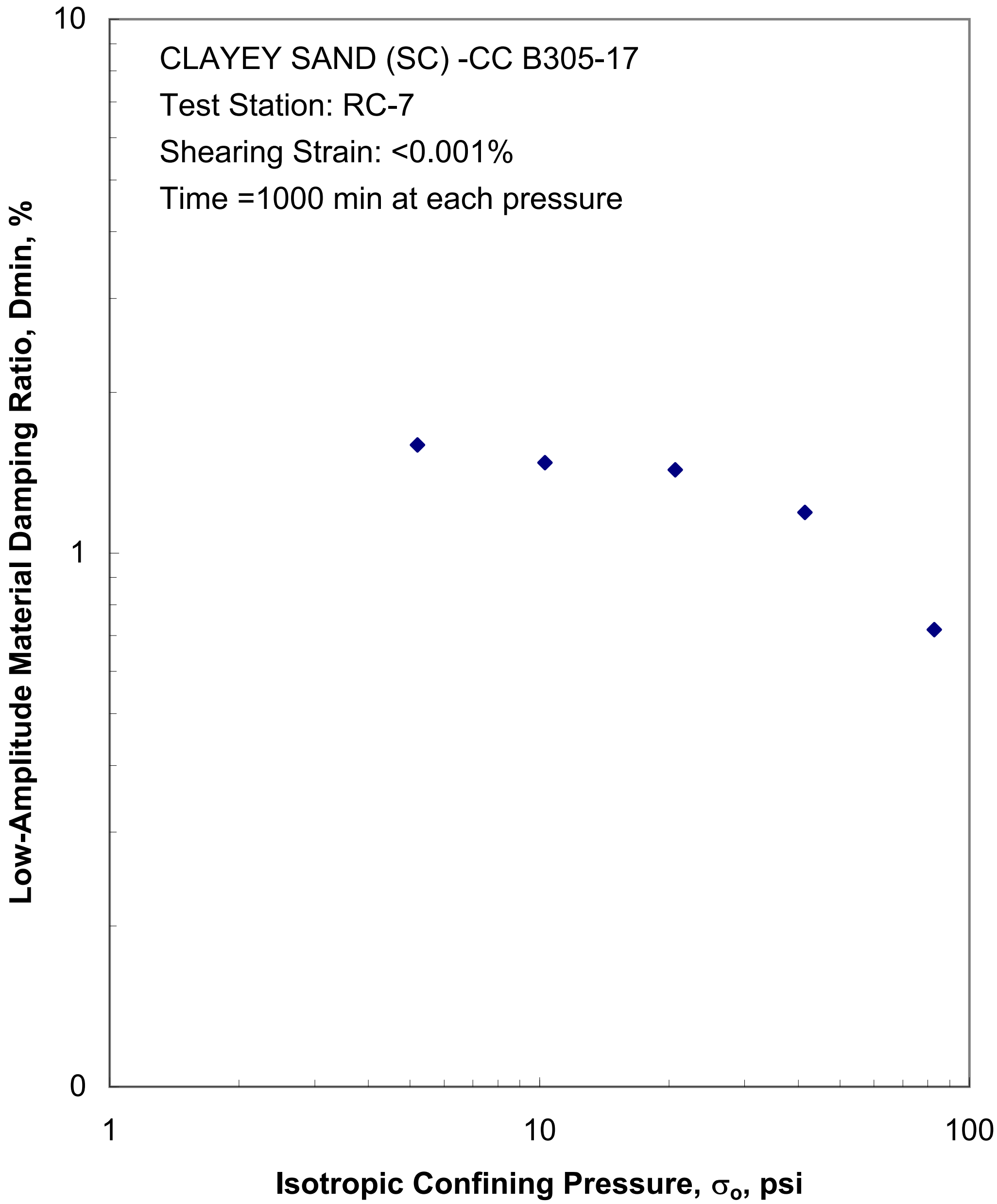


Figure C.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

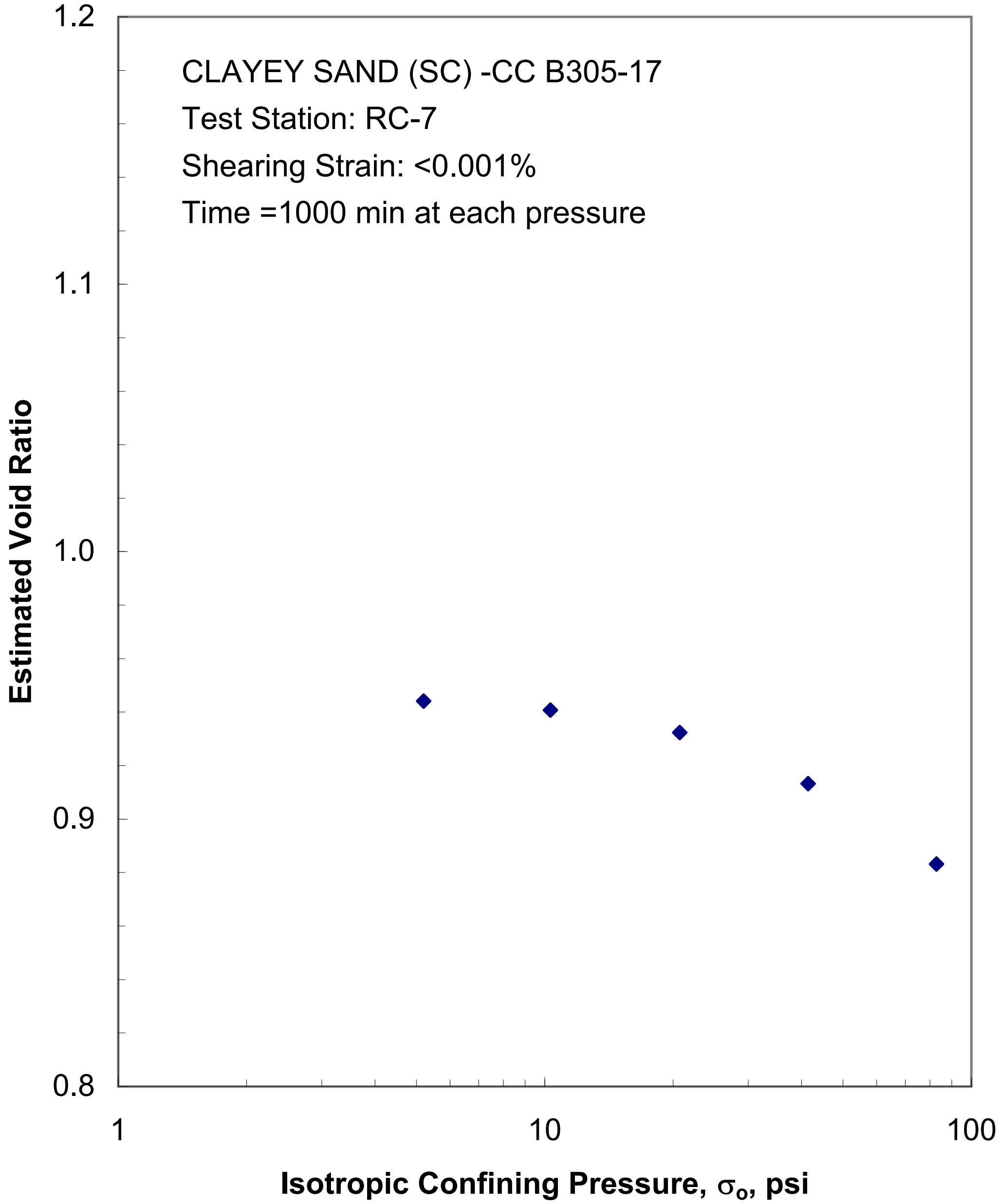


Figure C.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

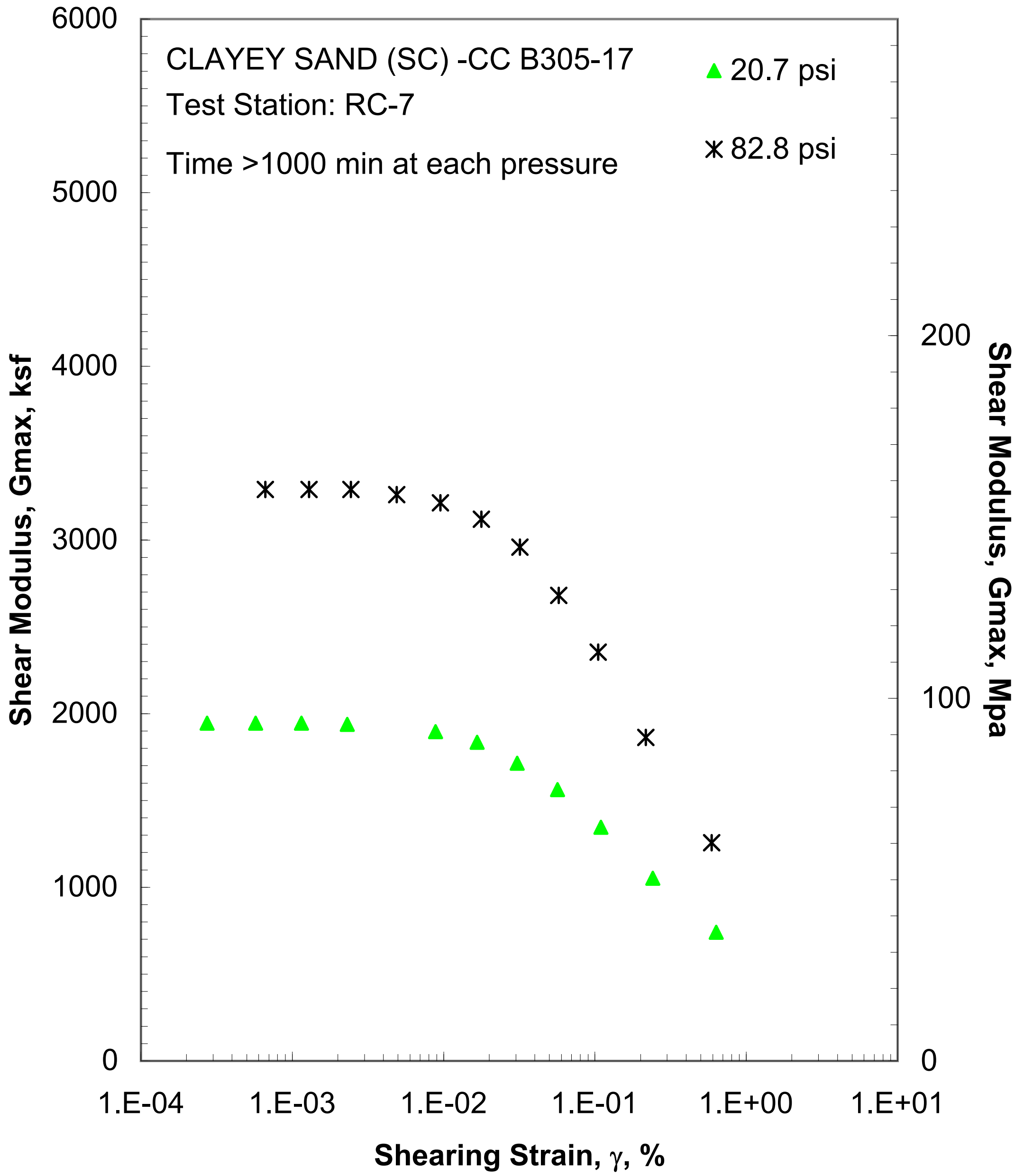


Figure C.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

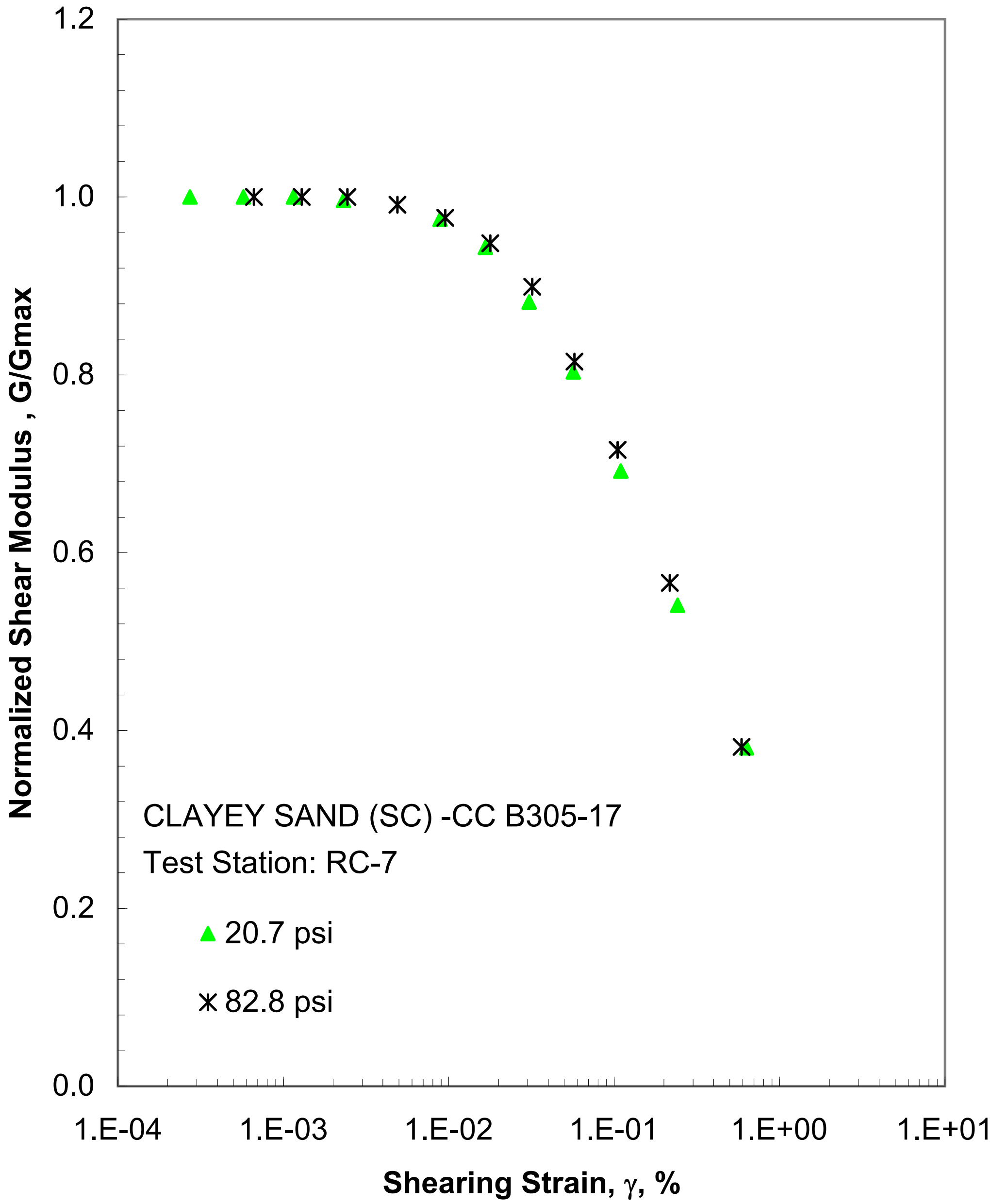


Figure C.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

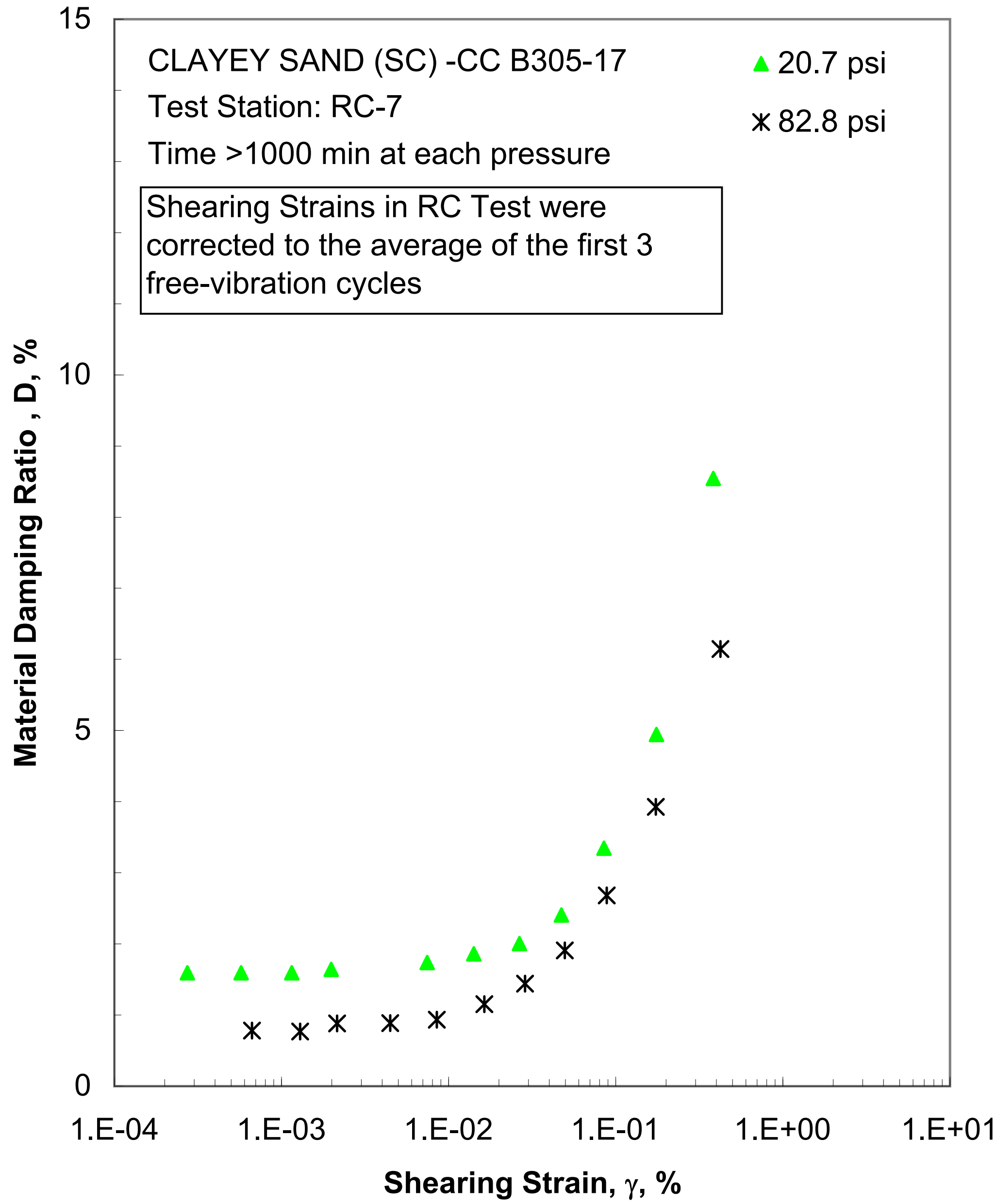


Figure C.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

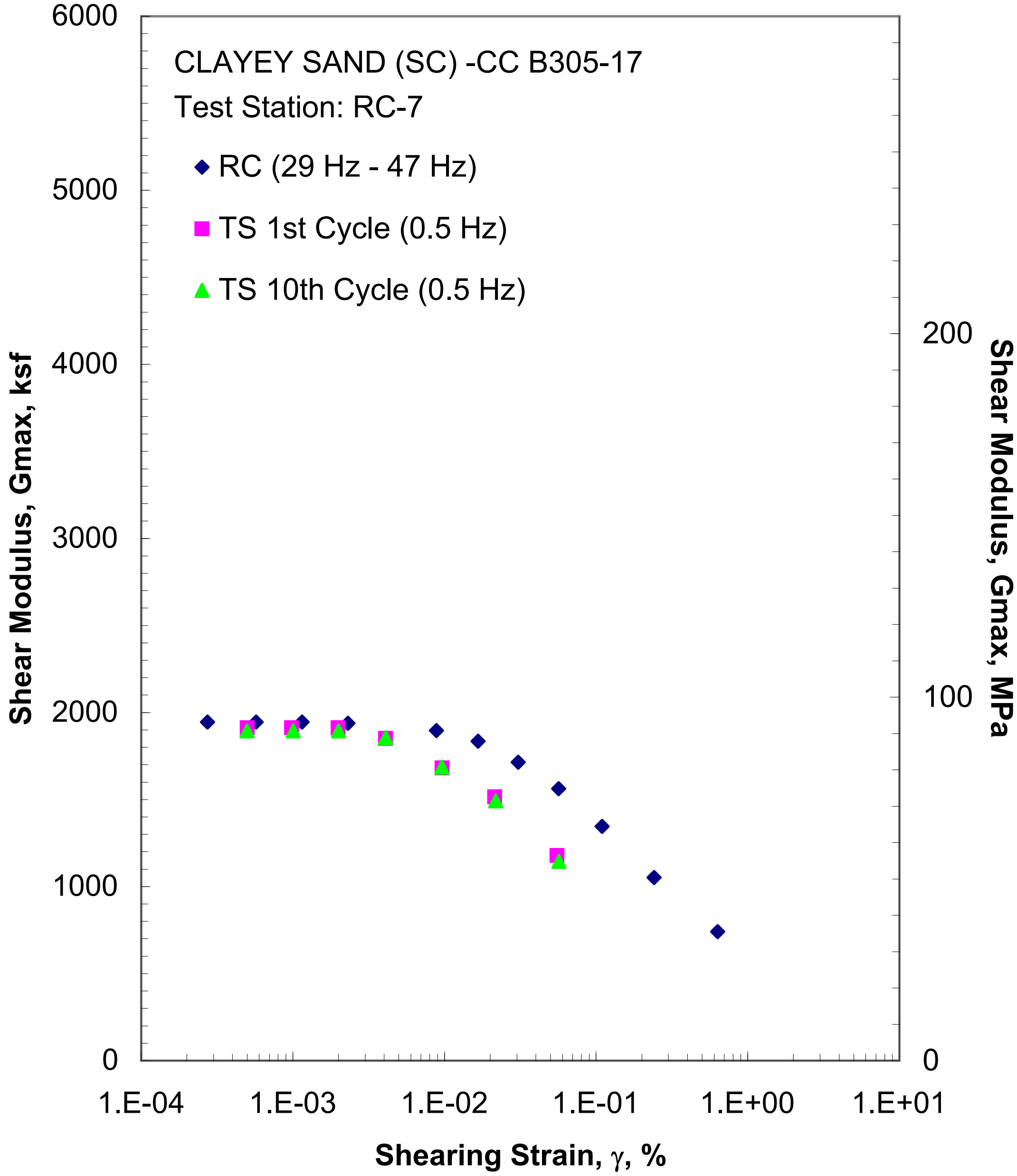


Figure C.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 20.7 psi from the Combined RCTS Tests

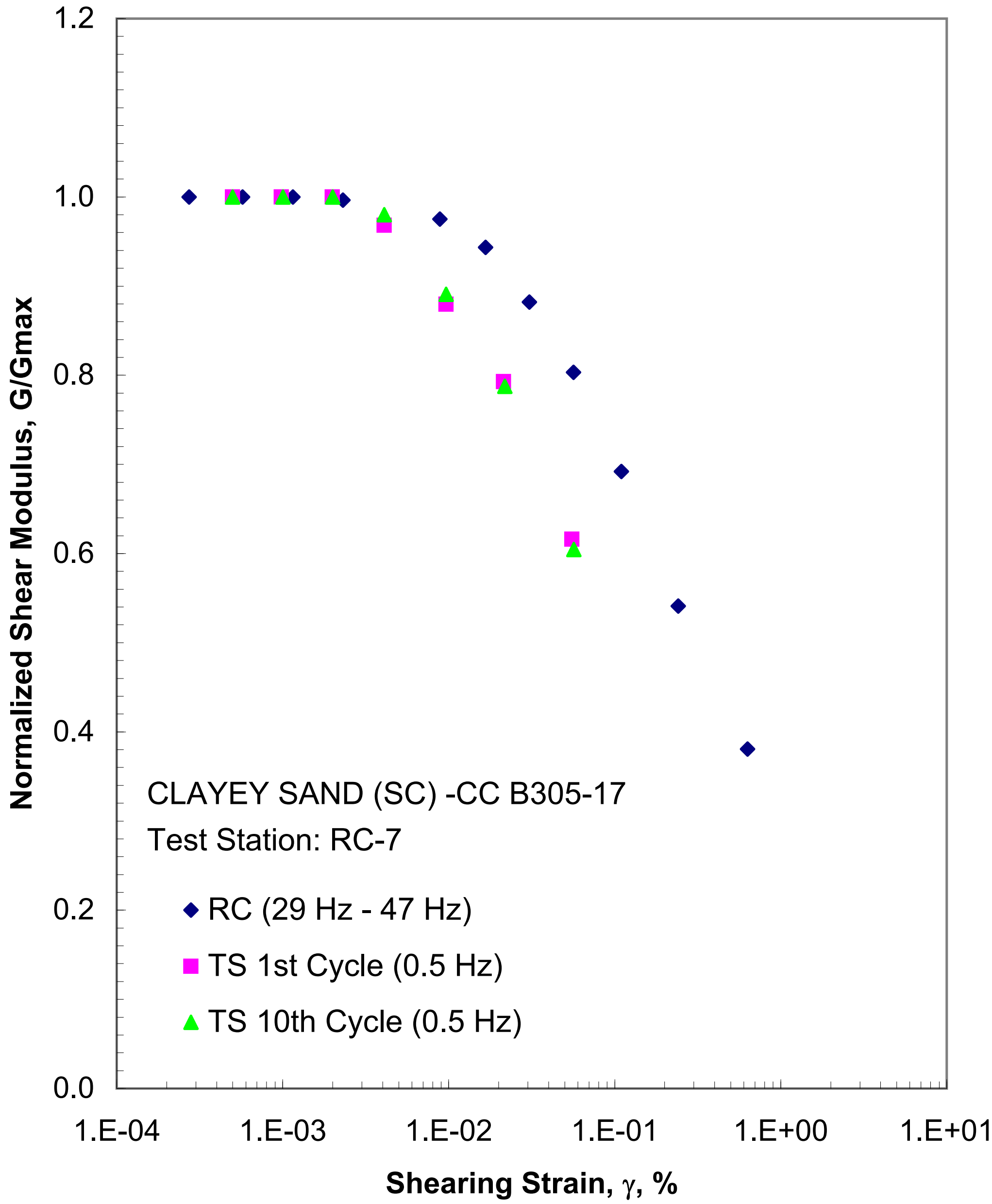


Figure C.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 20.7 psi from the Combined RCTS Tests

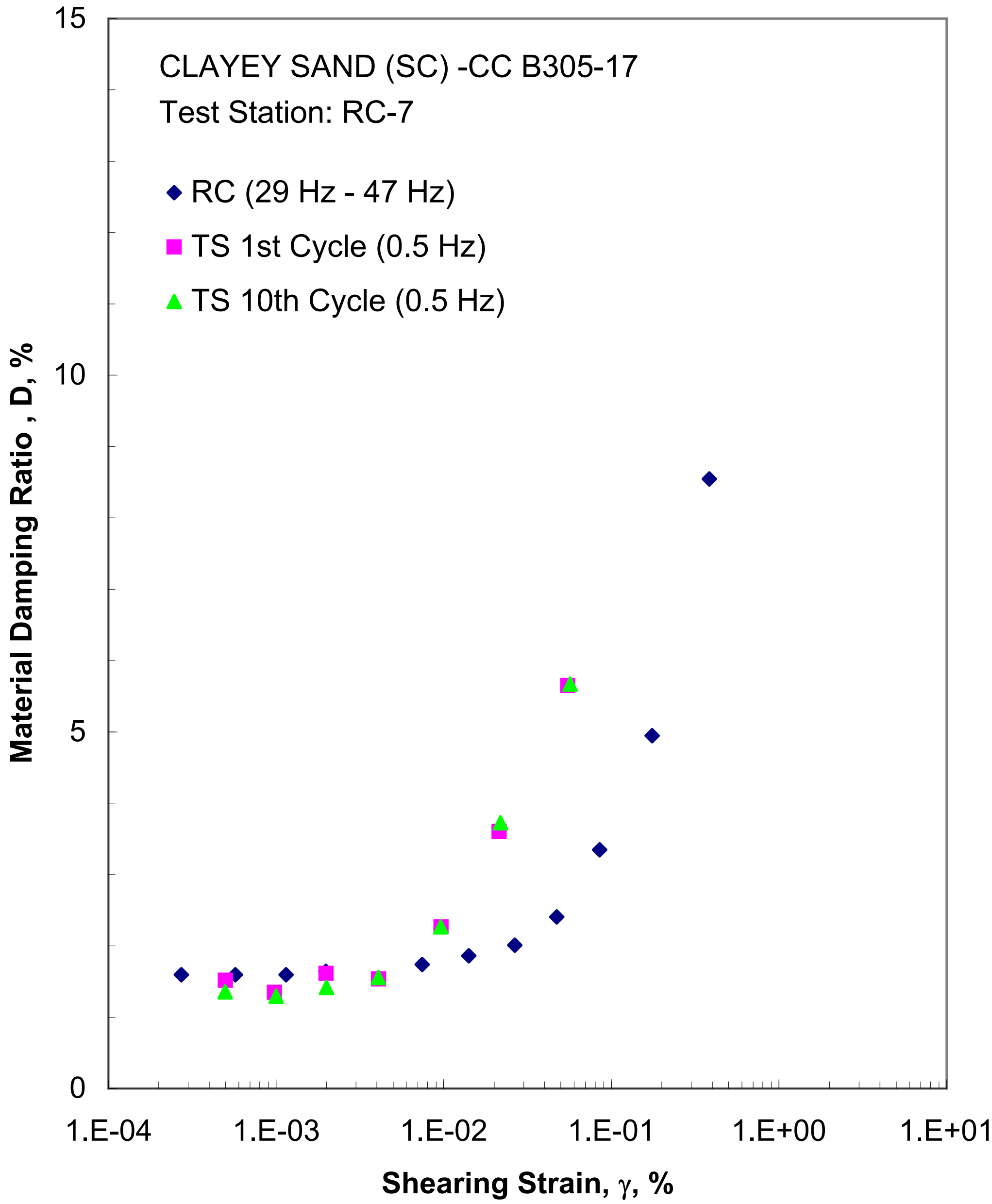


Figure C.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 20.7 psi from the Combined RCTS Tests

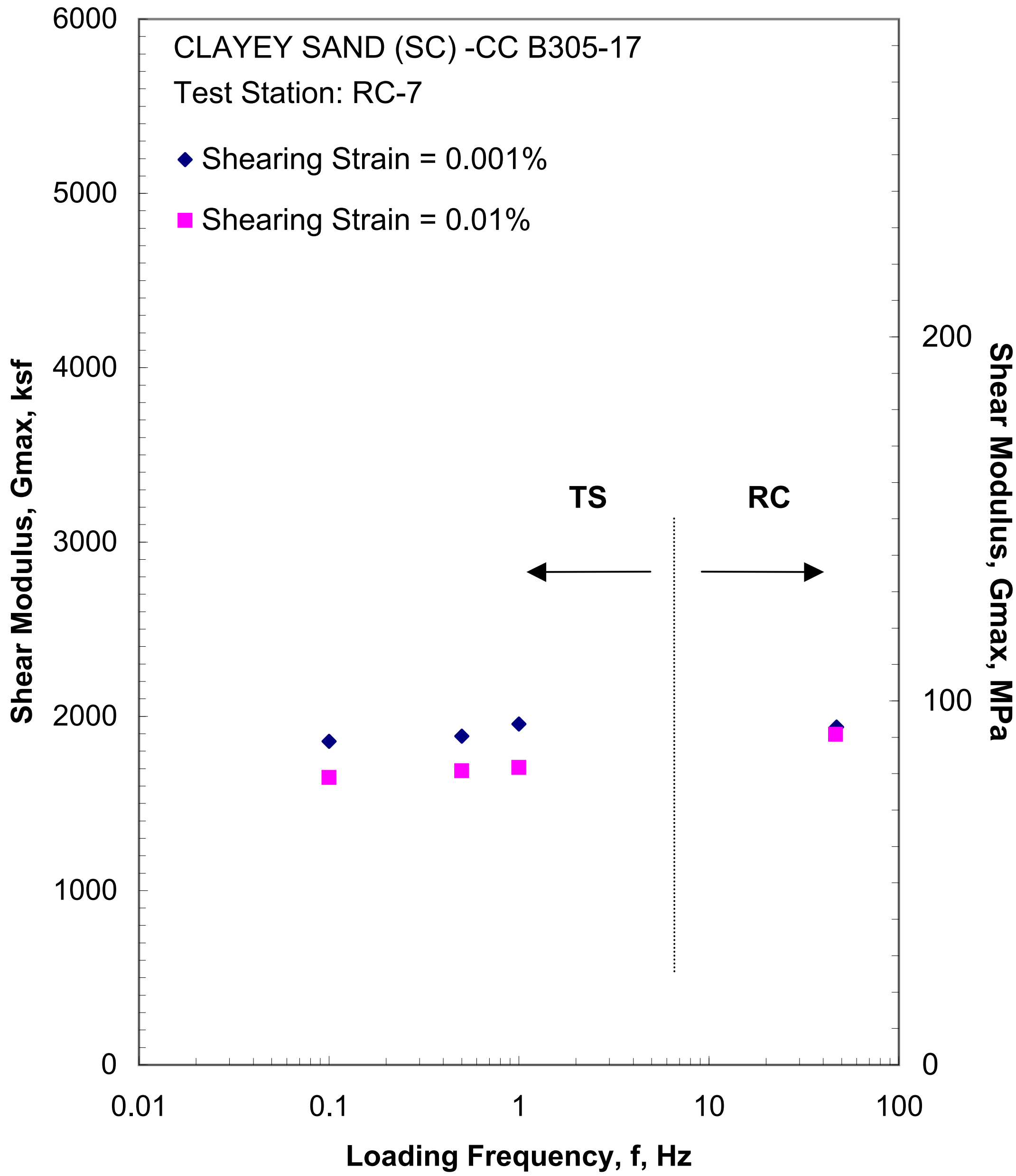


Figure C.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 20.7 psi from the Combined RCTS Tests

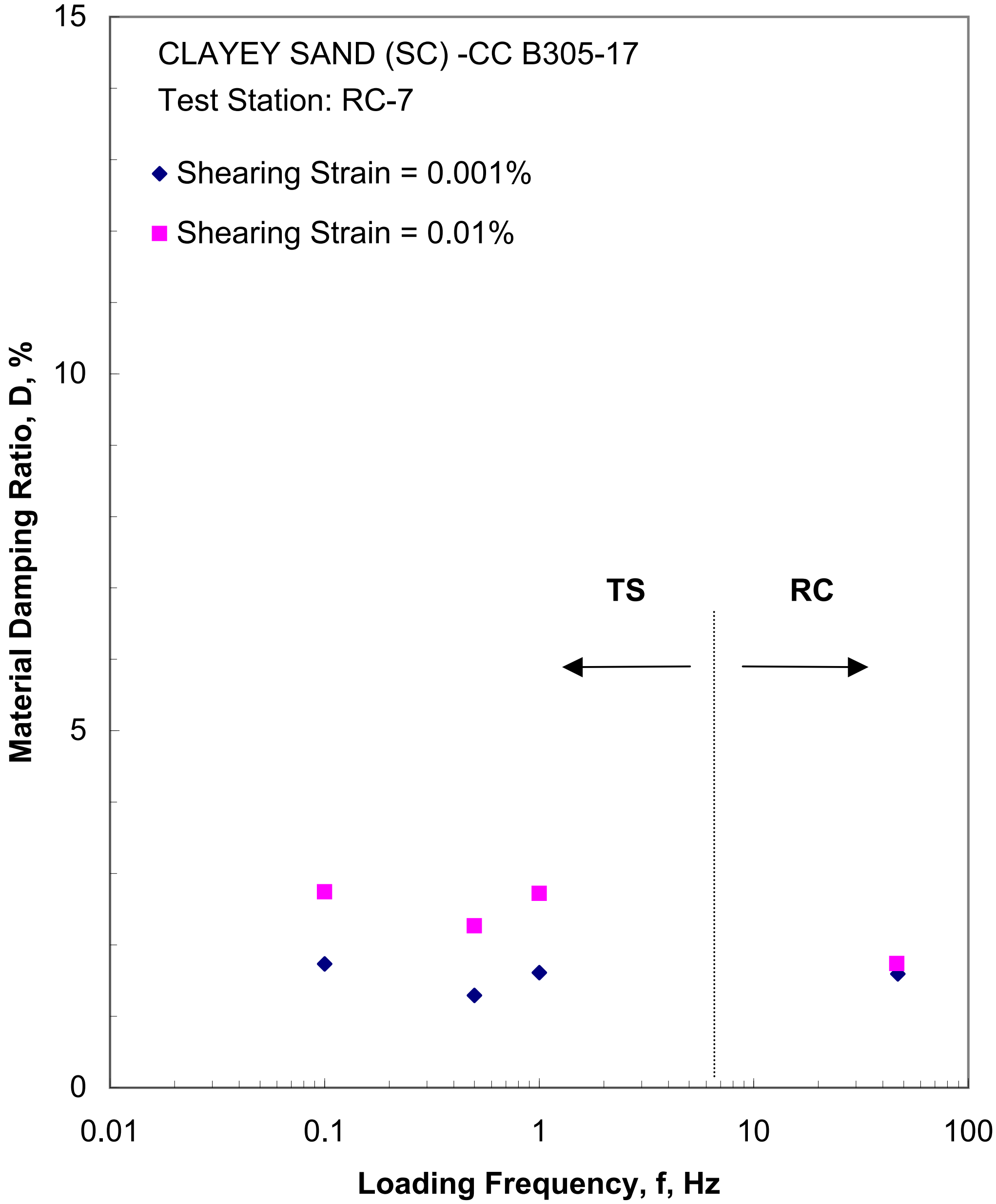


Figure C.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 12.0 psi from the Combined RCTS Tests

NOTE: Figures C.16 through C.20 are NOT available[1].

[1] The noise experienced in performing the torsional shear test diminished the usefulness of the presentation of the combined resonant column and torsional shear data. Therefore, those figures (i.e., the data) are not presented.

Table C.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 CC B305-UD17

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)	(%)	
5.2	749	36	1425	68	624	1.59	0.944
10.3	1483	71	1574	76	656	1.48	0.941
20.7	2981	143	1931	93	725	1.43	0.932
41.4	5962	285	2580	124	833	1.19	0.913
82.8	11923	570	3178	153	918	0.72	0.883

Table C.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B305-UD17; Isoptropic Confining Pressure, σ_o=20.7 psi (3.0 ksf = 143 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average$^+$ Shearing Strain, %	Material Damping Ratio^x, D, %
2.73E-04	1945	1.00	2.73E-04	1.59
5.73E-04	1945	1.00	5.73E-04	1.59
1.15E-03	1945	1.00	1.15E-03	1.59
2.31E-03	1938	1.00	1.98E-03	1.64
8.85E-03	1896	0.98	7.44E-03	1.74
1.67E-02	1835	0.94	1.41E-02	1.86
3.07E-02	1715	0.88	2.65E-02	2.01
5.65E-02	1562	0.80	4.73E-02	2.41
1.10E-01	1346	0.69	8.51E-02	3.35
2.41E-01	1052	0.54	1.75E-01	4.95
6.32E-01	740	0.38	3.83E-01	8.54

$^+$ 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 C.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B305-UD17; Isotropic Confining Pressure, σ_o= 20.7 psi (3.0 ksf = 143 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, %
5.00E-04	1912	1.00	1.51	4.98E-04	1894	1.00	1.35
9.81E-04	1912	1.00	1.34	1.00E-03	1894	1.00	1.29
1.99E-03	1912	1.00	1.61	2.00E-03	1894	1.00	1.41
4.09E-03	1851	0.97	1.53	4.08E-03	1857	0.98	1.55
9.66E-03	1681	0.88	2.26	9.63E-03	1687	0.89	2.26
2.14E-02	1515	0.79	3.60	2.18E-02	1492	0.79	3.72
5.52E-02	1178	0.62	5.65	5.68E-02	1145	0.60	5.67

Table C.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B305-UD17; Isoptropic Confining Pressure, σ_o= 82.8 psi (11.9 ksf = 570 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio^x, D, %
6.65E-04	3290	1.00	6.65E-04	0.78
1.29E-03	3290	1.00	1.29E-03	0.77
2.44E-03	3290	1.00	2.15E-03	0.88
4.90E-03	3262	0.99	4.47E-03	0.89
9.52E-03	3214	0.98	8.50E-03	0.93
1.78E-02	3120	0.95	1.64E-02	1.15
3.19E-02	2958	0.90	2.86E-02	1.44
5.75E-02	2682	0.82	4.96E-02	1.91
1.05E-01	2355	0.72	8.84E-02	2.68
2.17E-01	1863	0.57	1.74E-01	3.93
5.90E-01	1256	0.38	4.24E-01	6.15

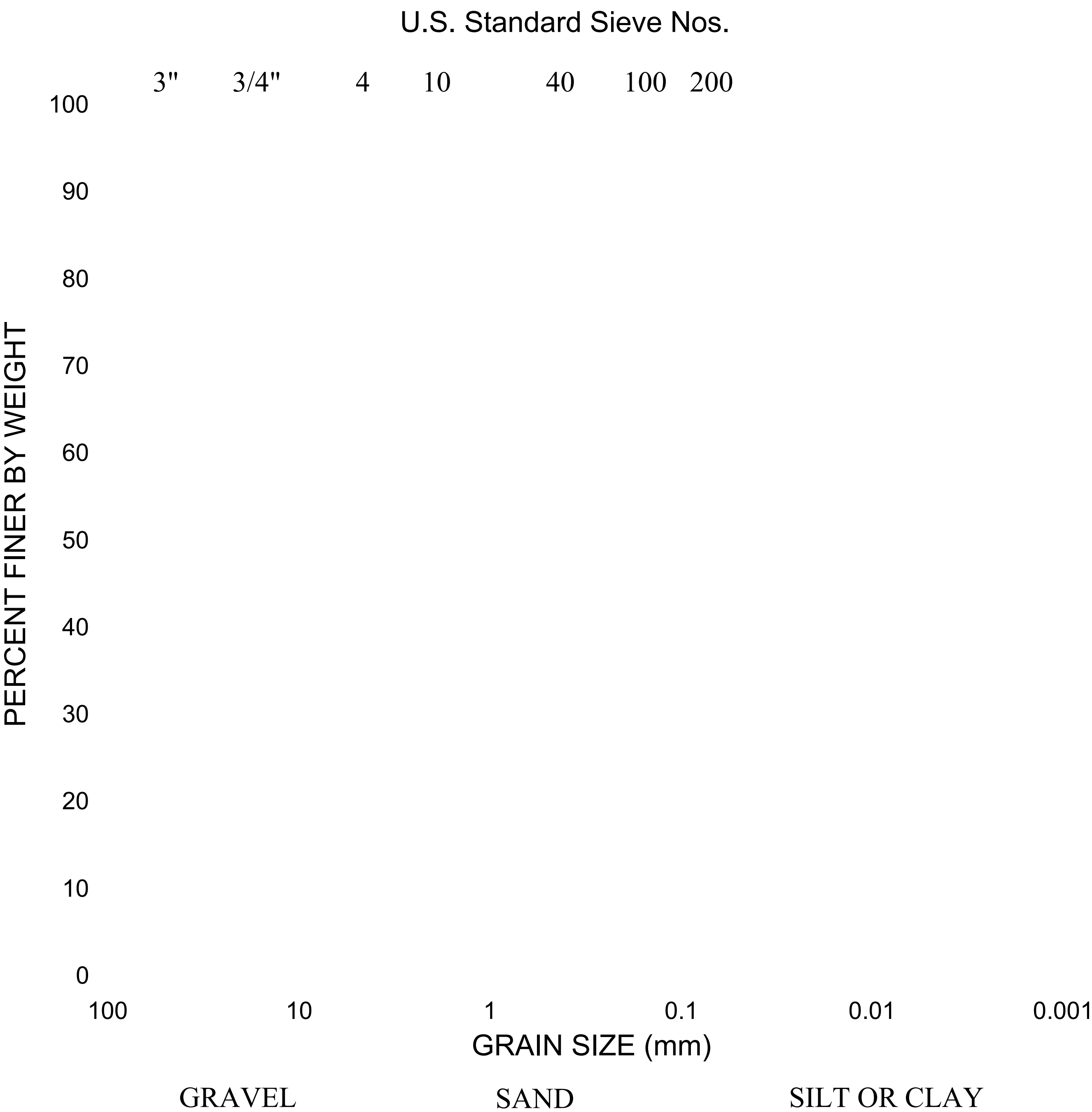
+ Average Shearing Strain from the First Three Cycles of the Free Vibration Decay Curve

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

Table C.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B305-UD17; Isotropic Confining Pressure, σ_o=82.8 psi (11.9 ksf = 570 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D,	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D, %
---*	---*	---*	---*	---*	---*	---*	---*

---* Results are not available to establish well defined patterns.



GRADATION CURVE

ASTM D422

Project: Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland

Contract No.: 06120048.00

Date: 9/14/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-305	39.5-41.5	CLAYEY SAND, contains shells, gray	SC	72	50

Schnabel Engineering

APPENDIX D

CC B404-UD14
POORLY GRADED SAND (SP-SM), with silt*
with shells, gray*
(Non-Plastic; Gs=2.68)*

Borehole B-404
Sample UD14
Sample Depth = 52.0 to 53.6 ft
RCTS Test Depth = 53.2 ft
Total Unit Weight = 117.6 lb/ft^3
Water Content = 27.7 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 21.9 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

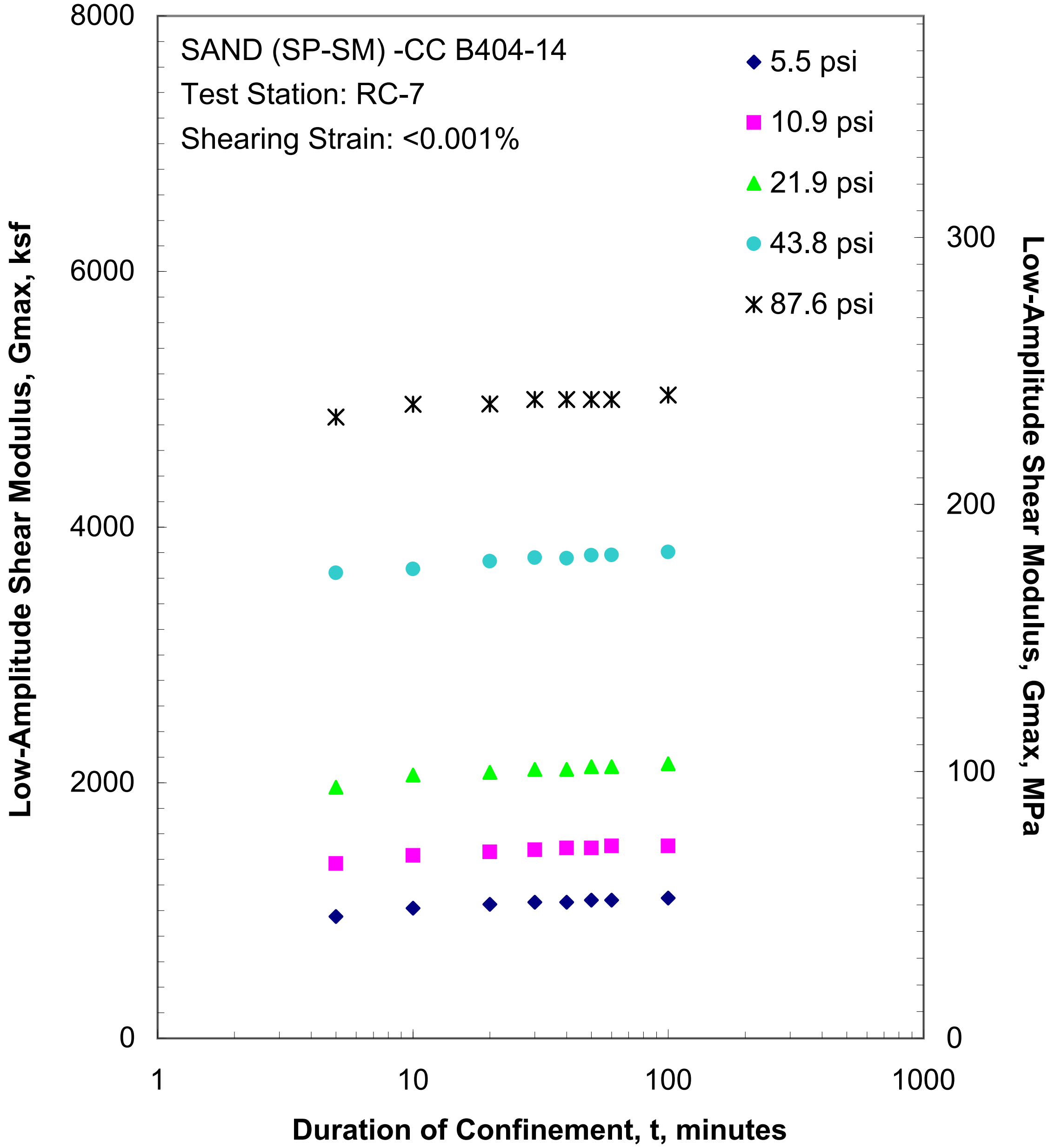


Figure D.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

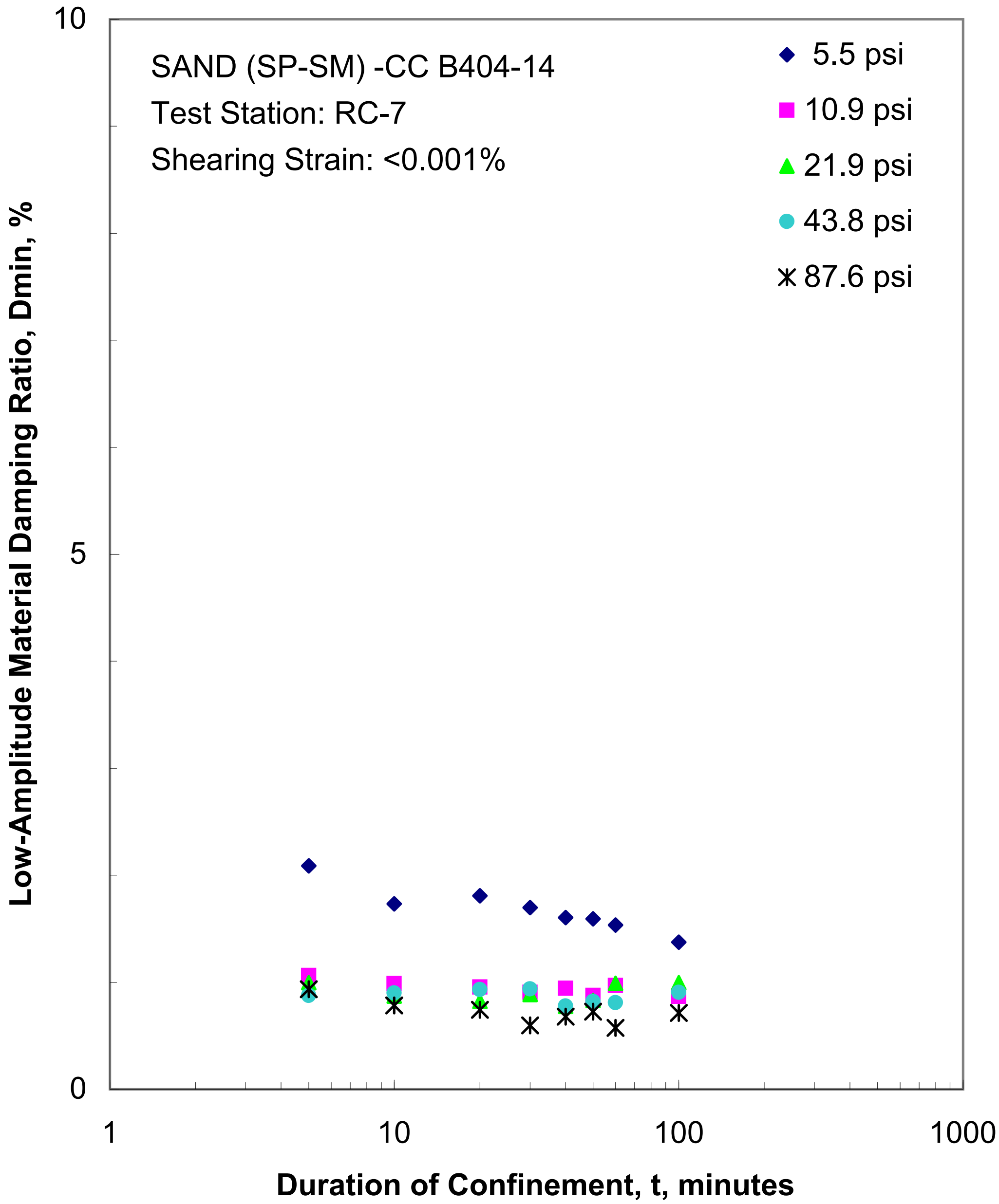


Figure D.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

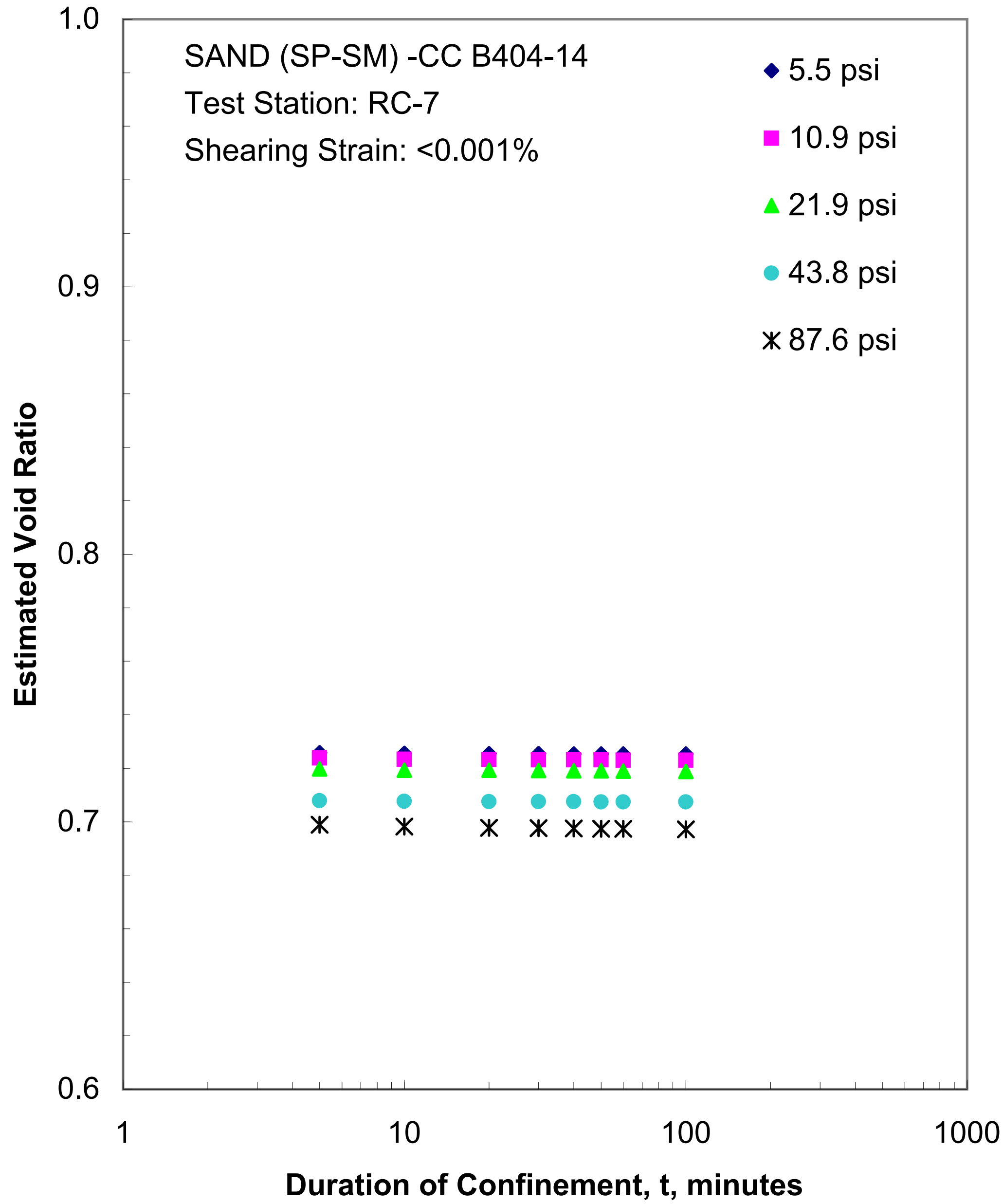


Figure D.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

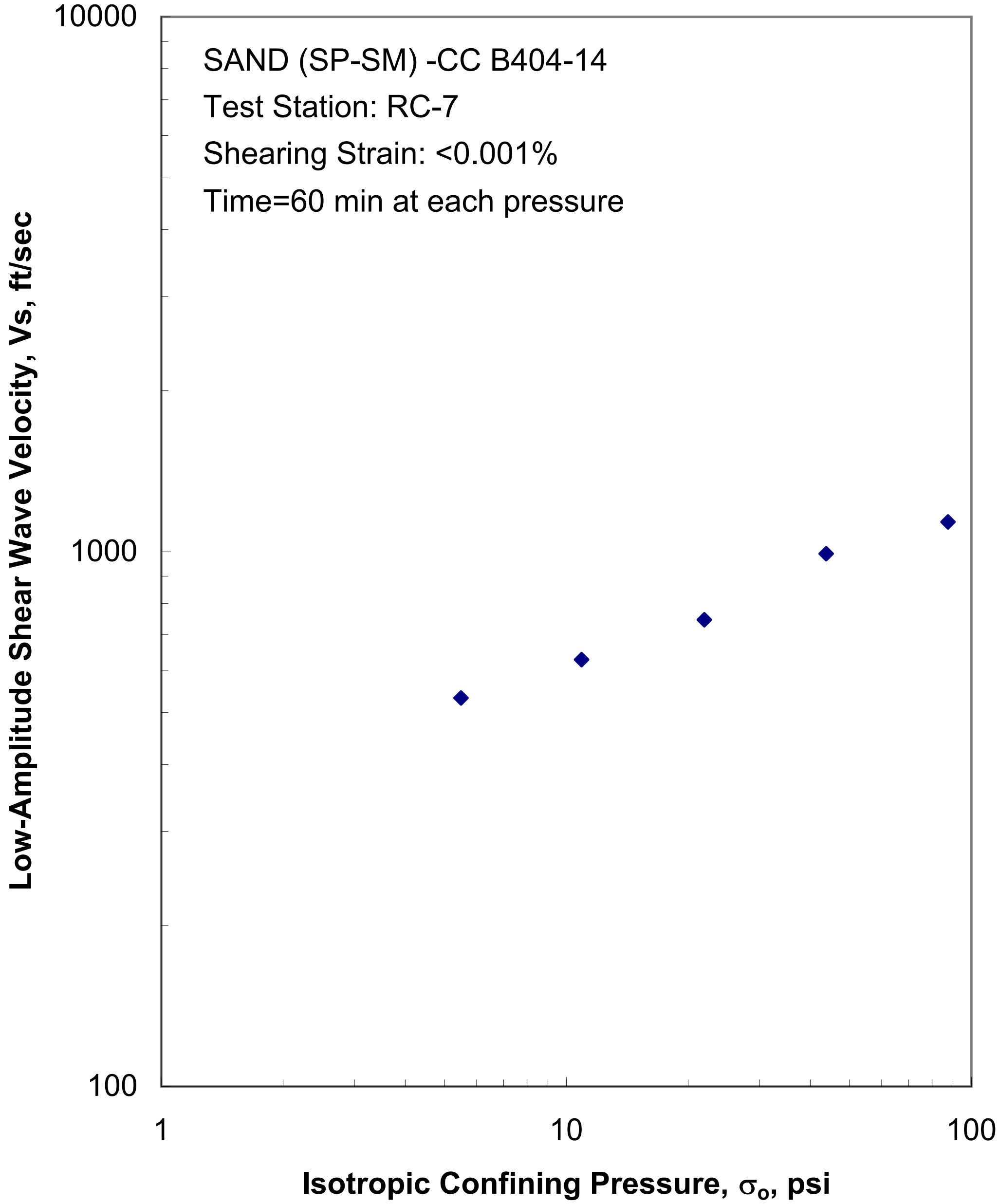


Figure D.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

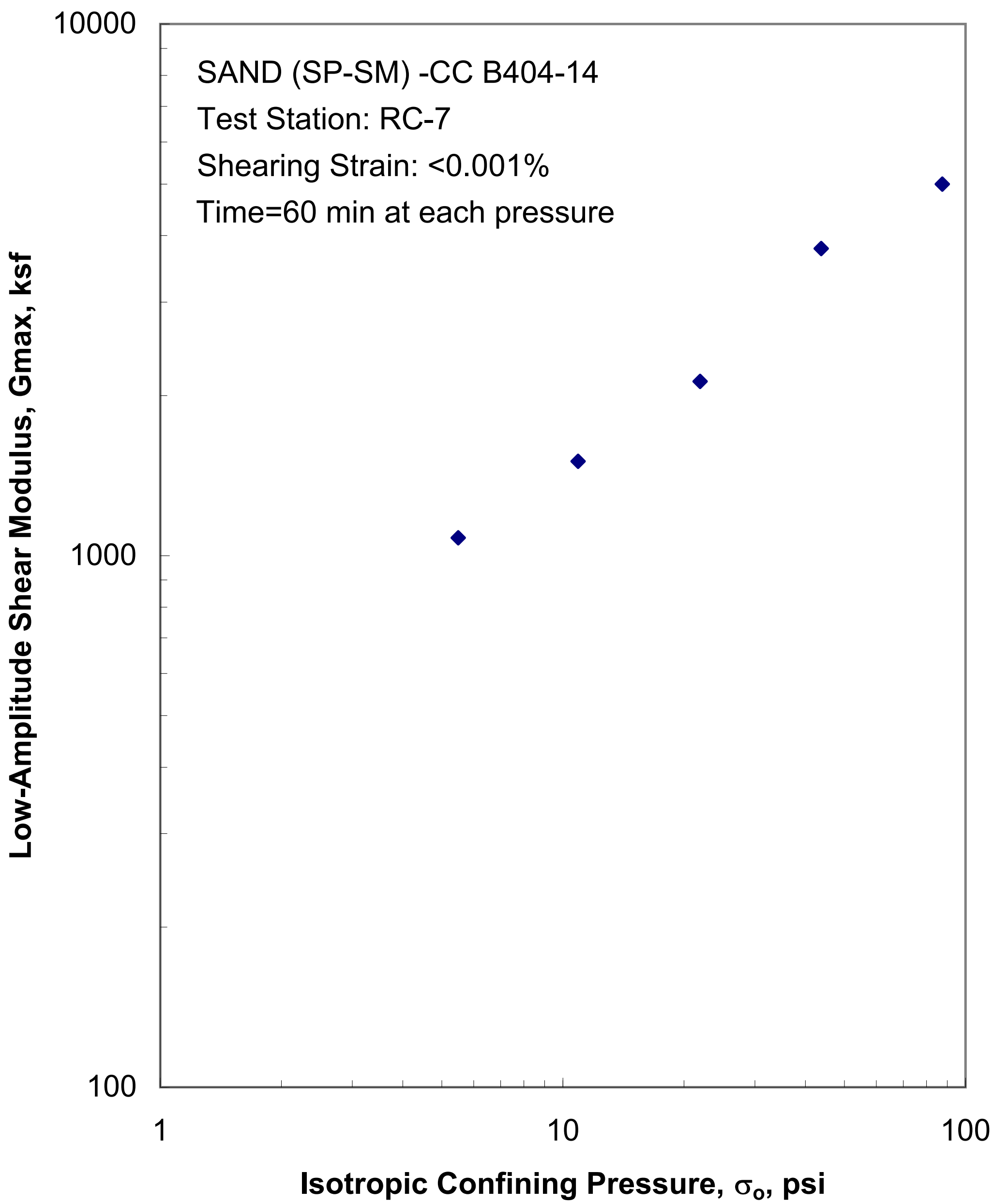


Figure D.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

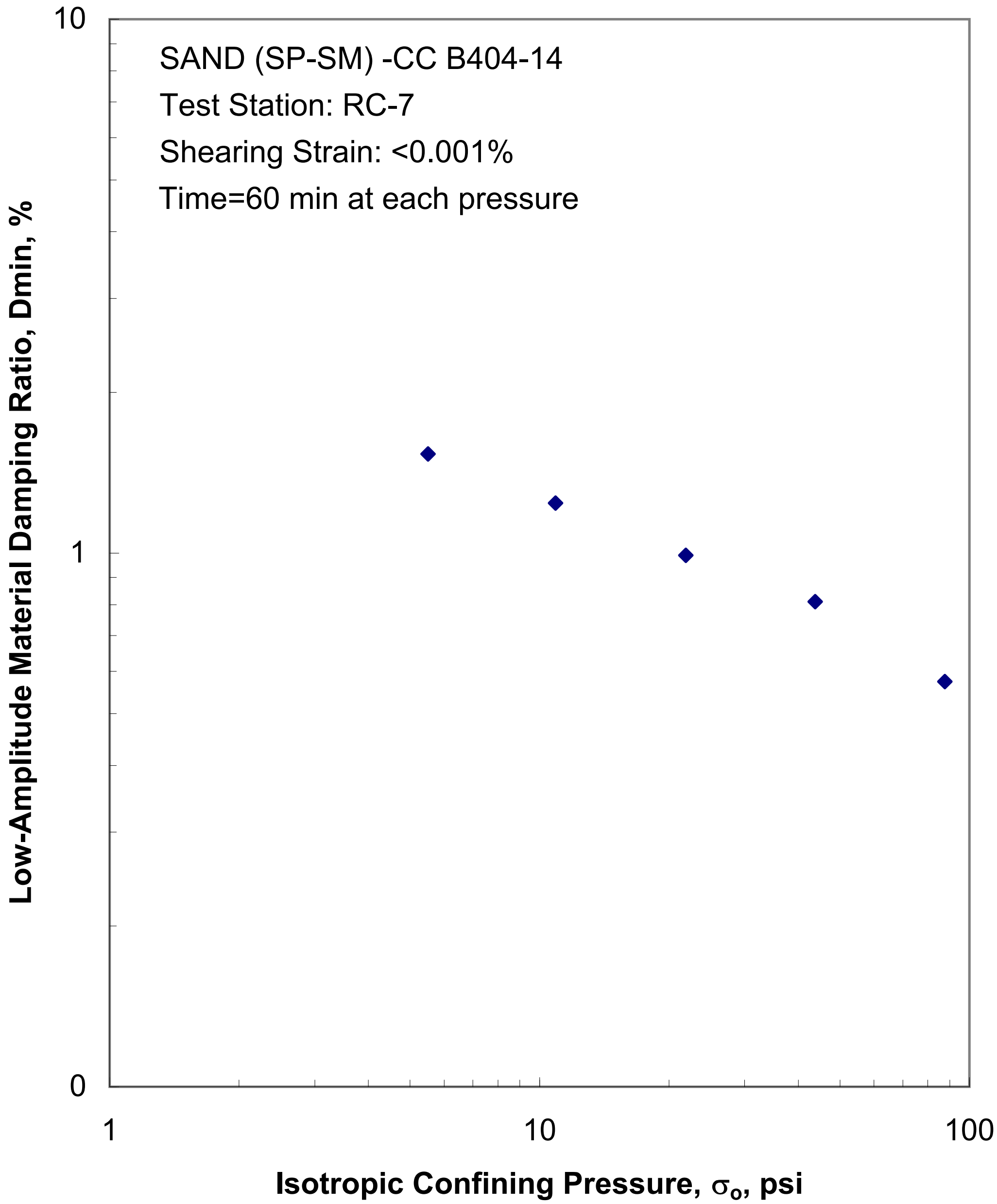


Figure D.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

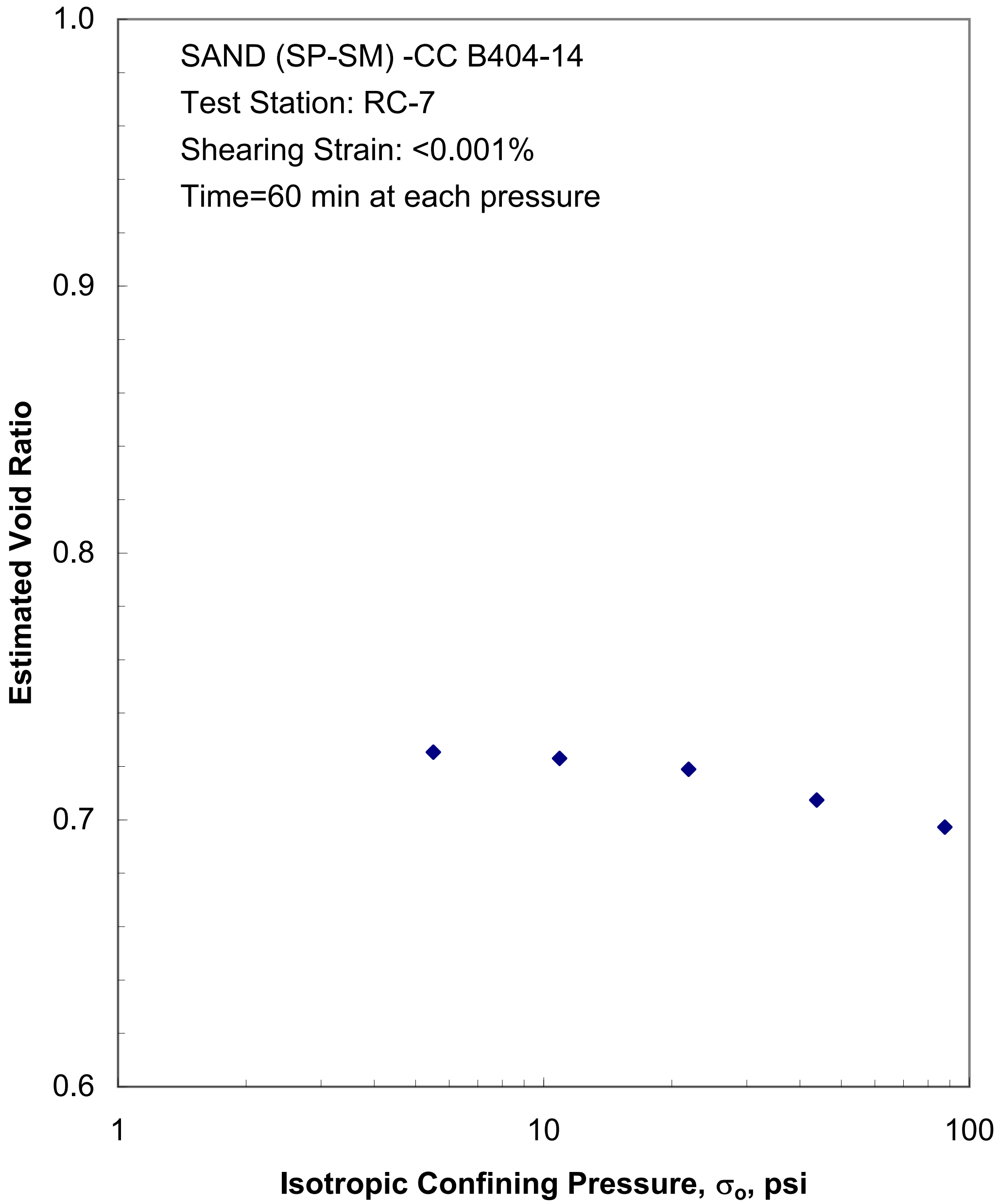


Figure D.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

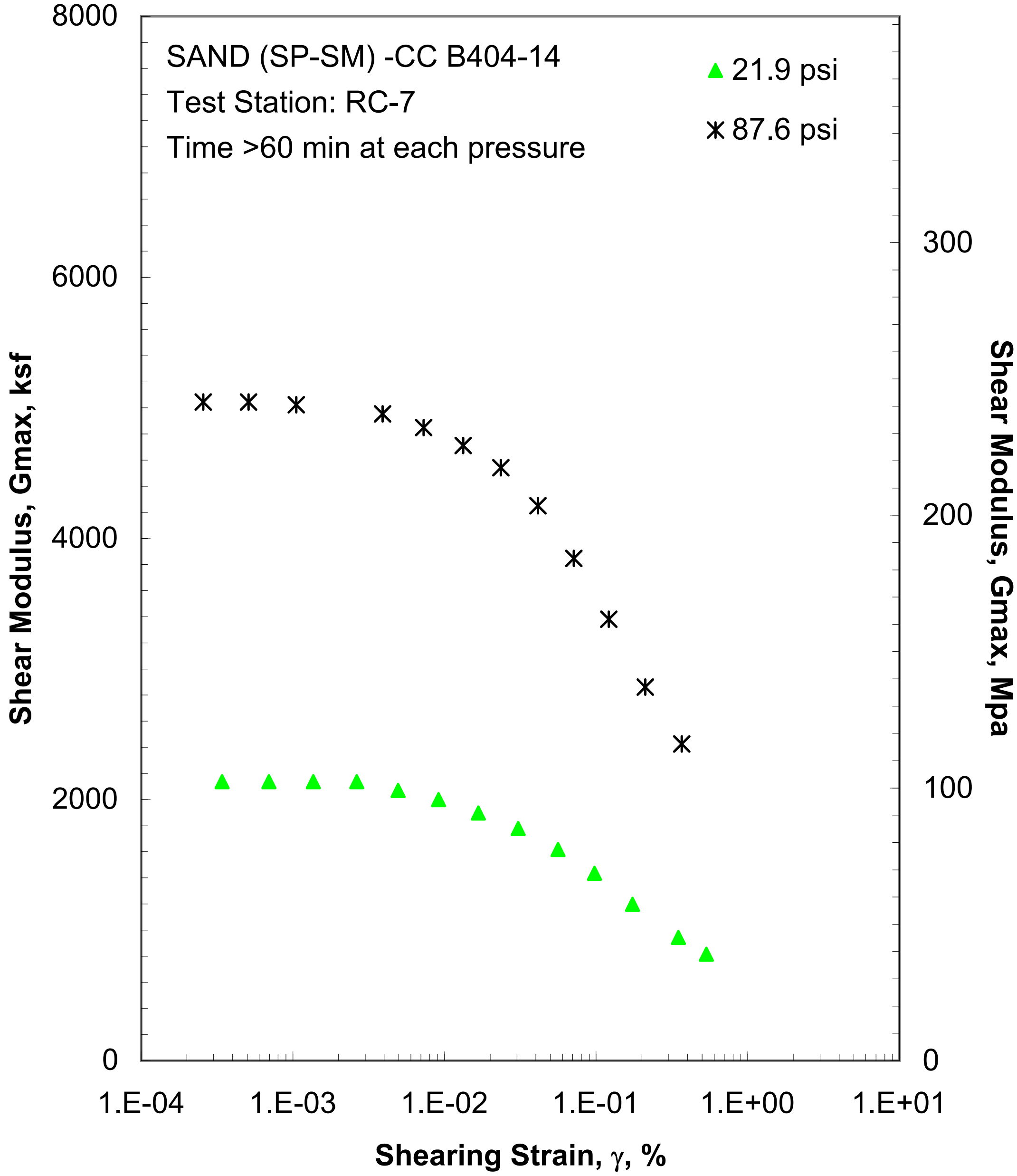


Figure D.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

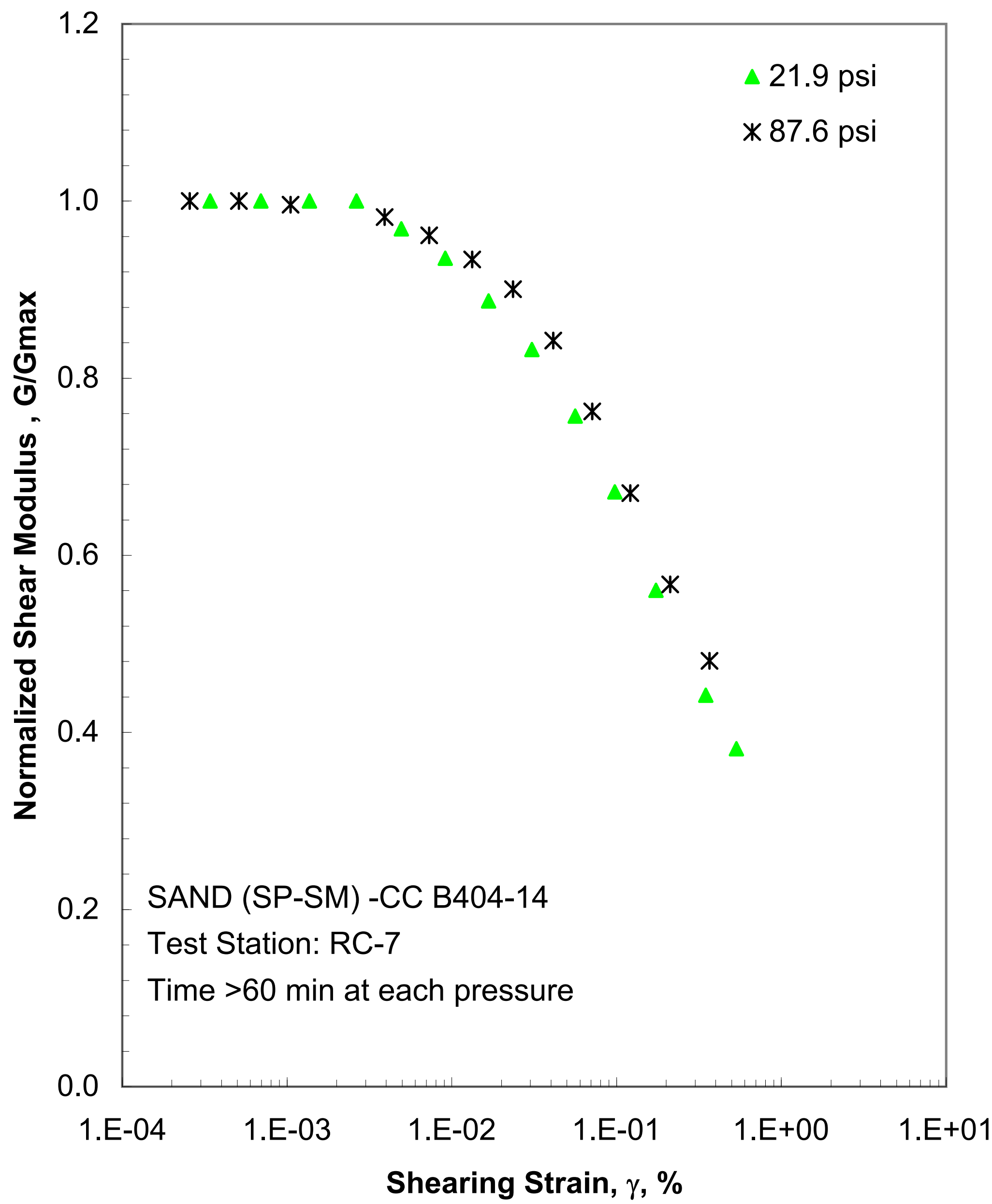


Figure D.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

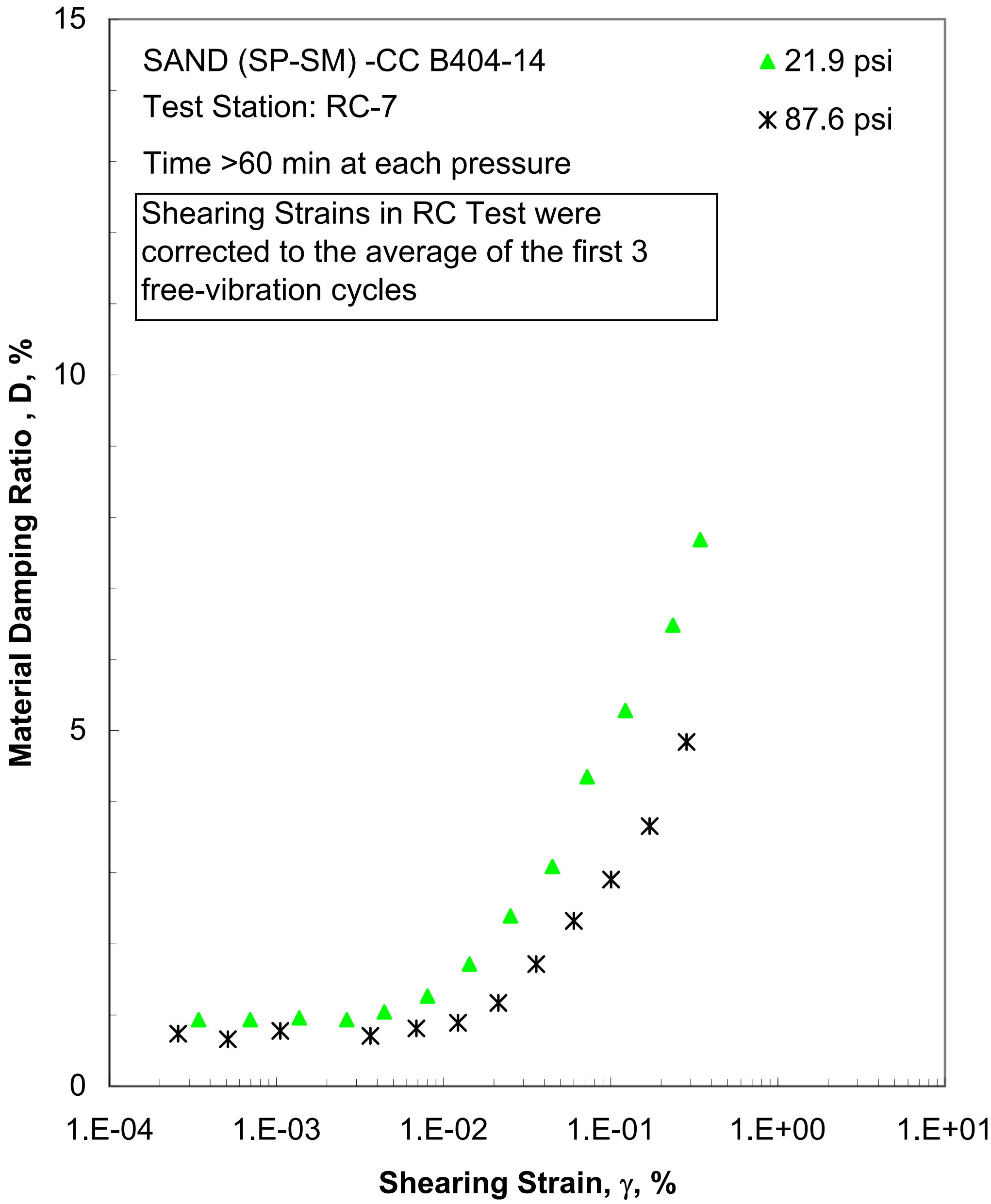


Figure D.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

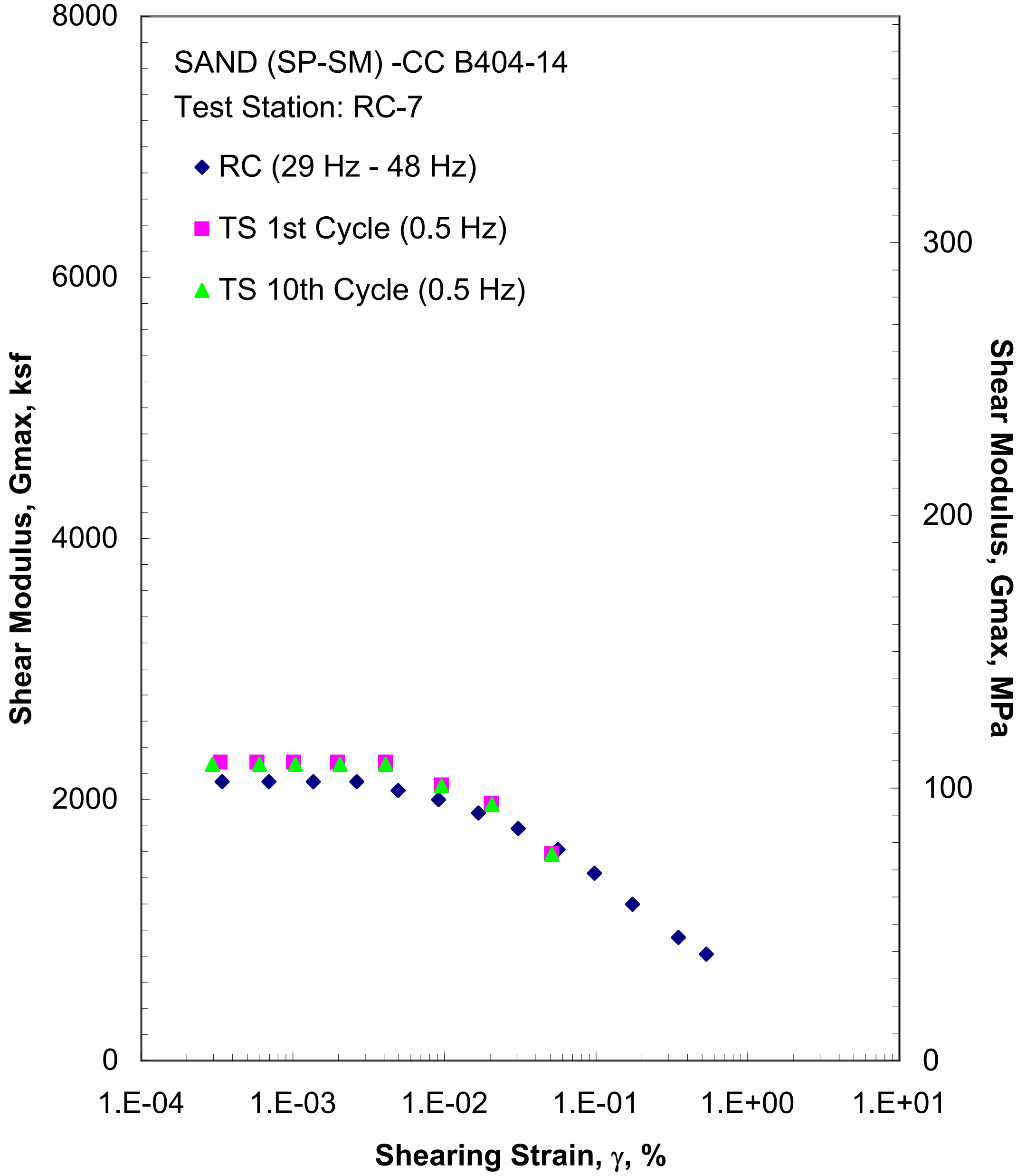


Figure D.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 21.9 psi from the Combined RCTS Tests

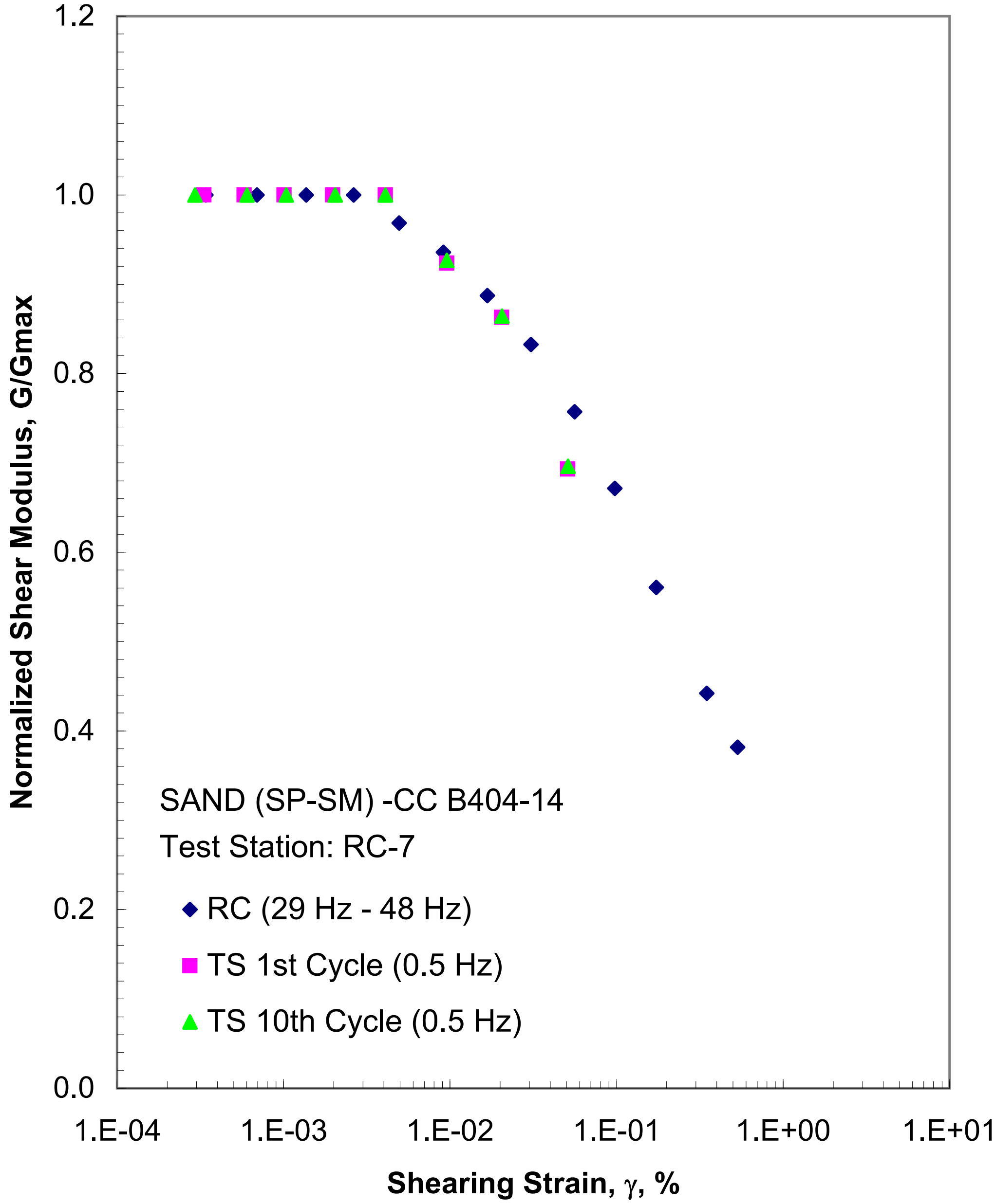


Figure D.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 21.9 psi from the Combined RCTS Tests

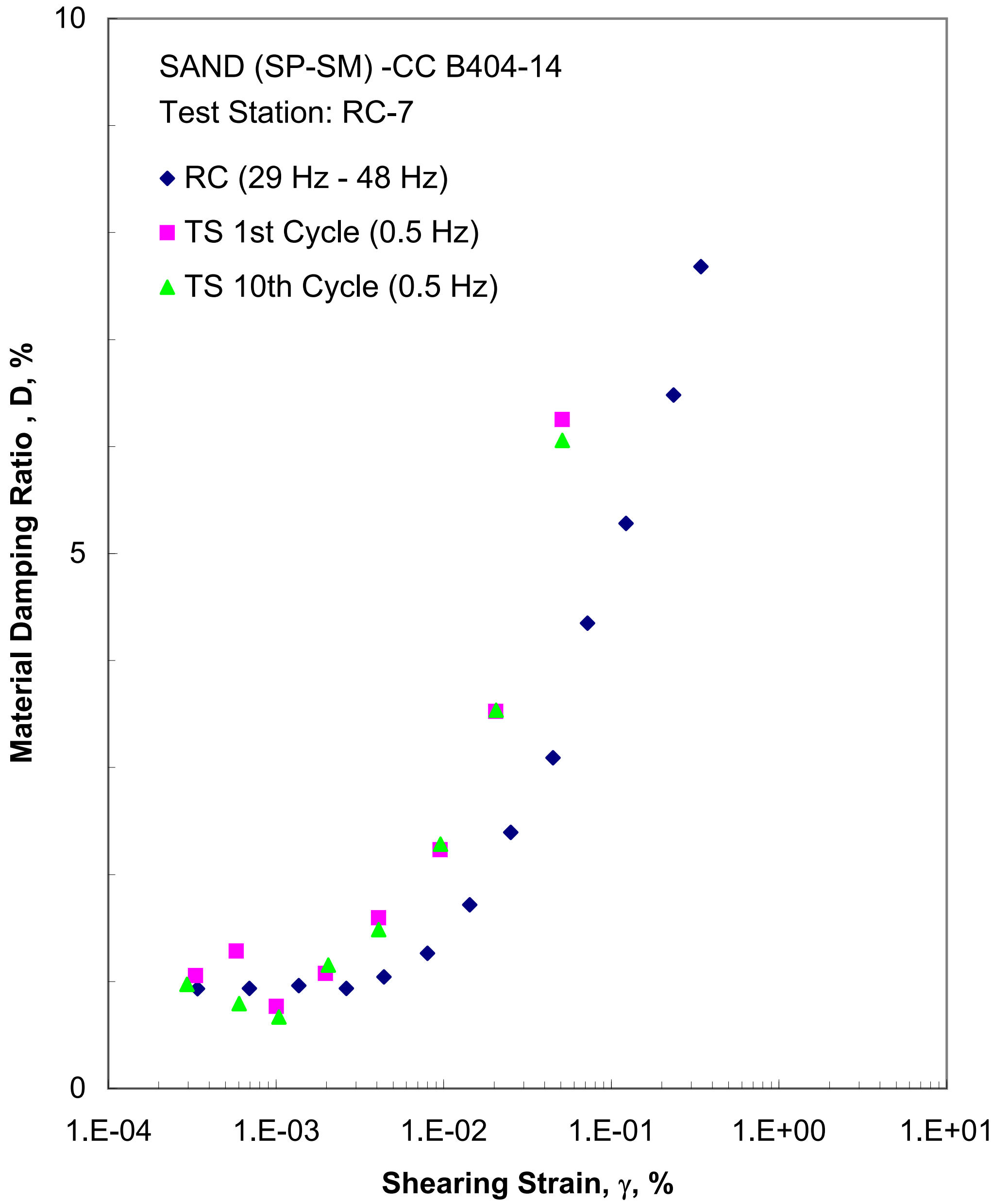


Figure D.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 21.9 psi from the Combined RCTS Tests

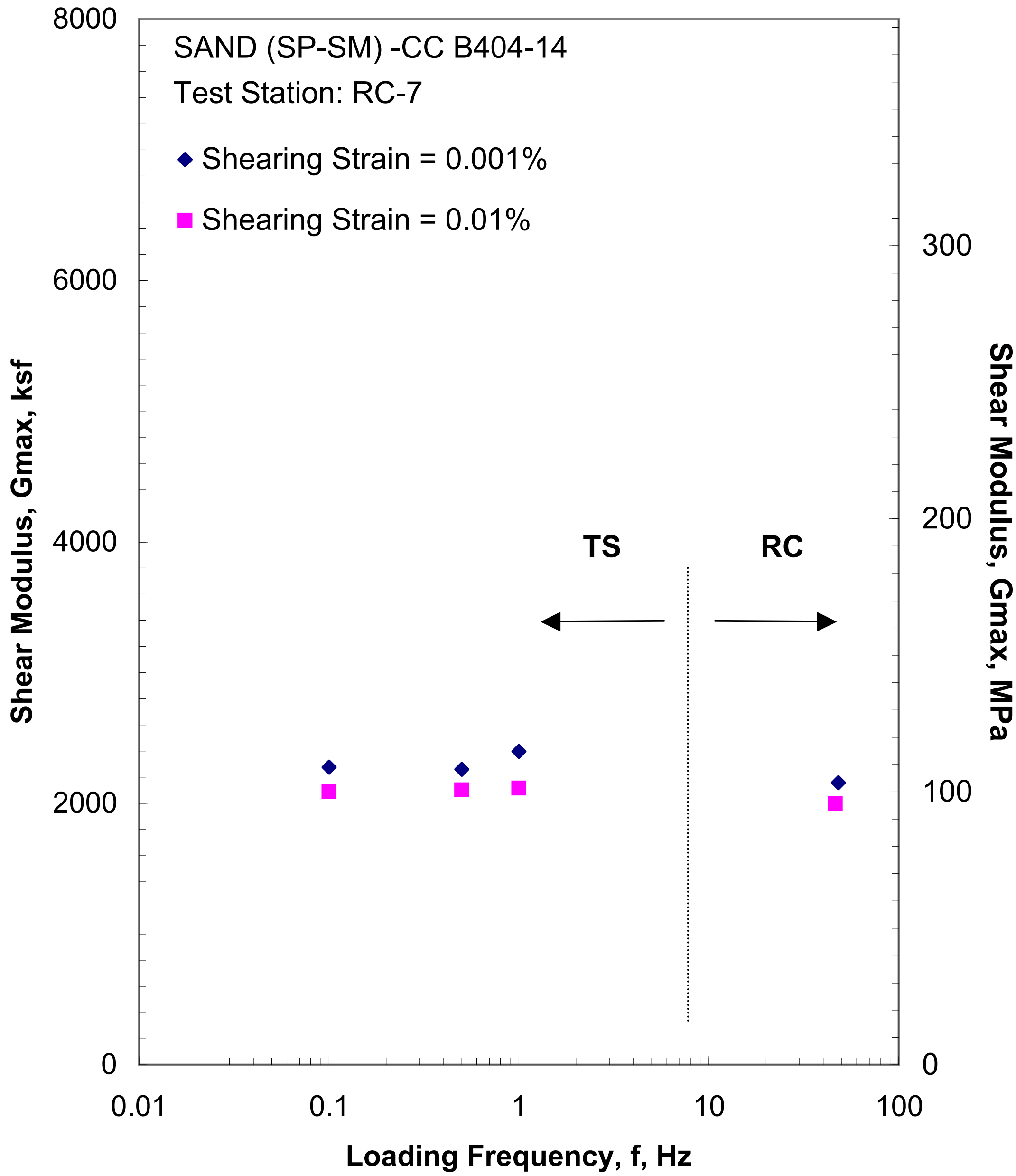


Figure D.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 21.9 psi from the Combined RCTS Tests

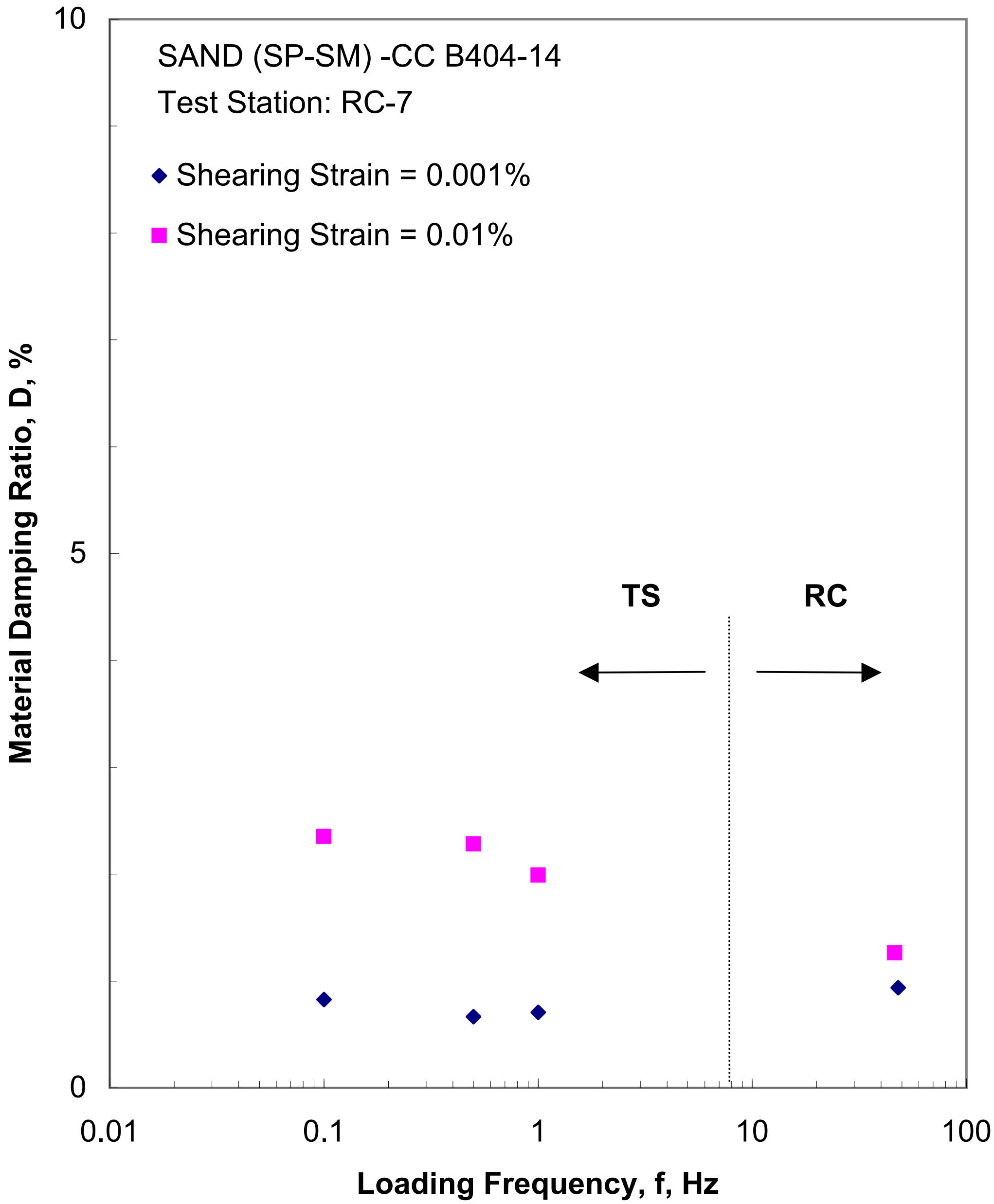


Figure D.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 21.9 psi from the Combined RCTS Tests

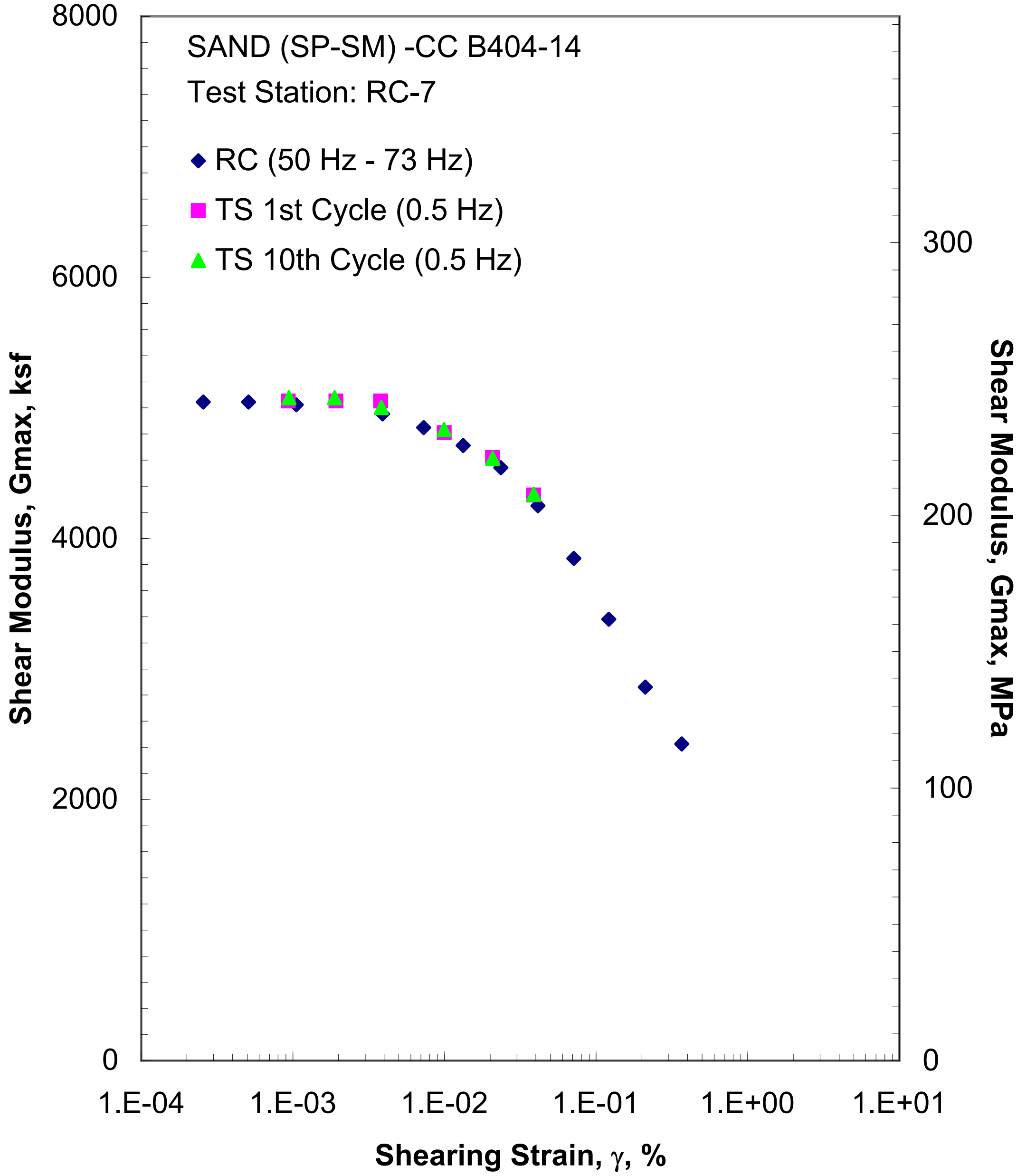


Figure D.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 87.6 psi from the Combined RCTS Tests

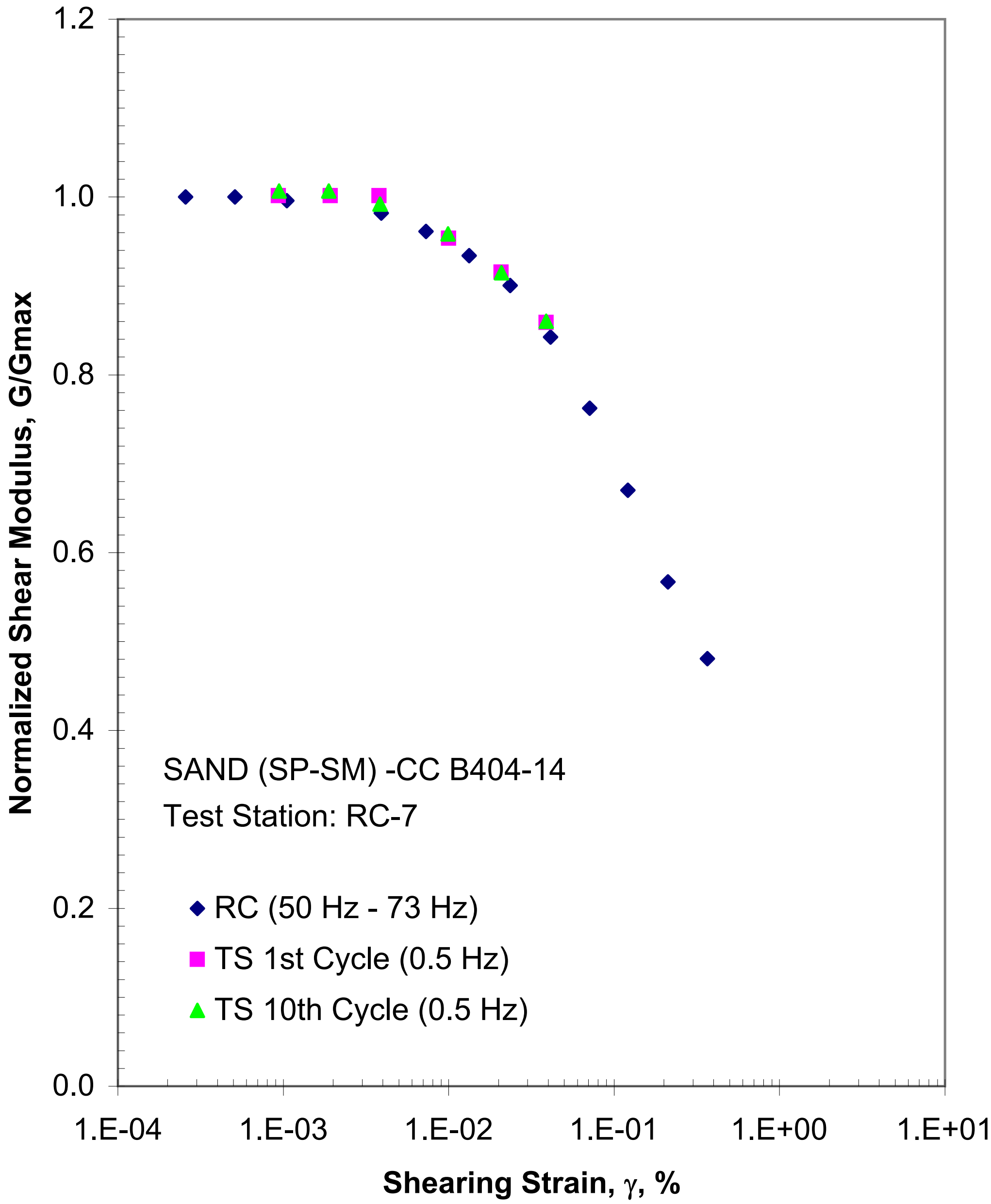


Figure D.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 87.6 psi from the Combined RCTS Tests

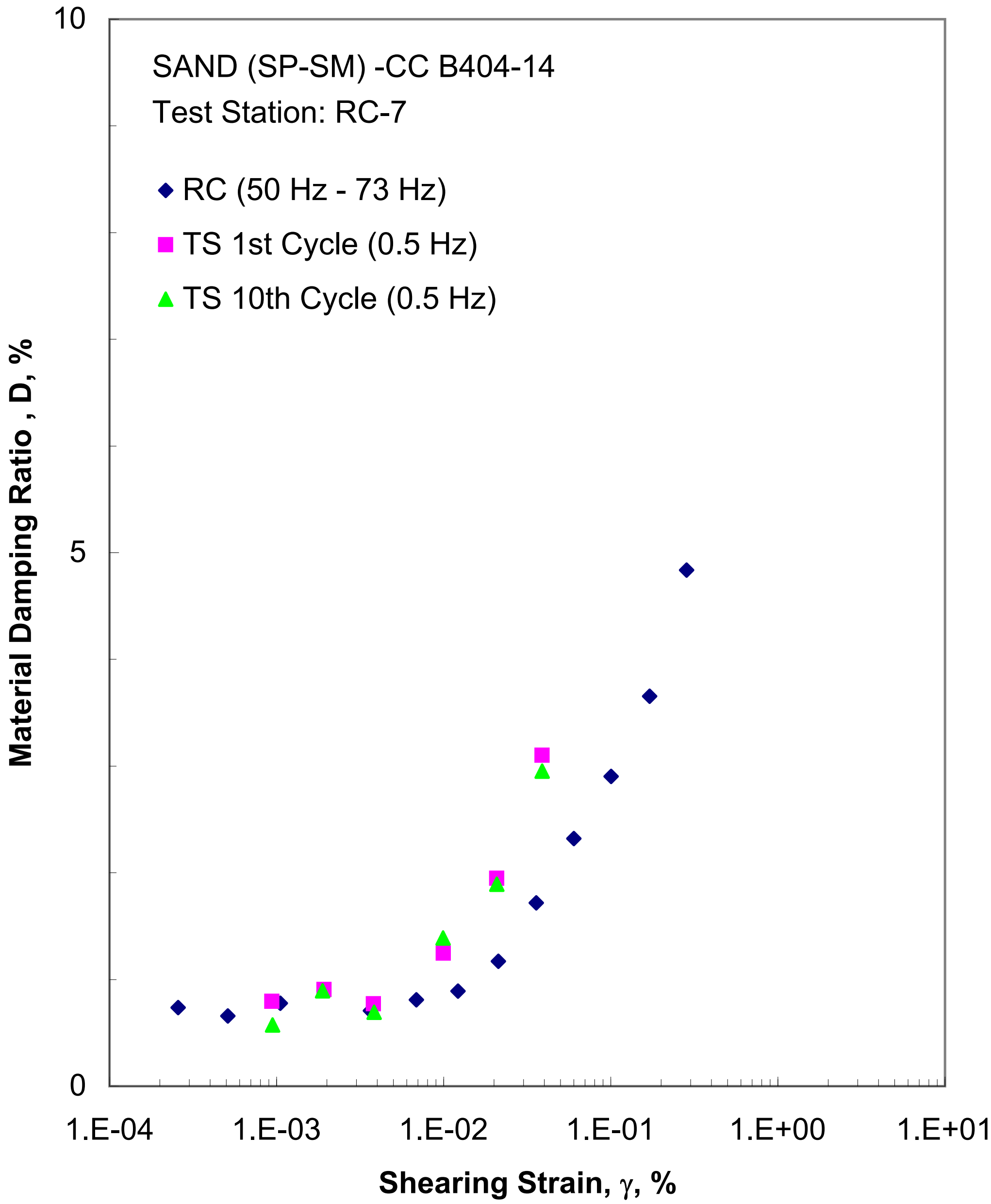


Figure D.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 87.6 psi from the Combined RCTS Tests

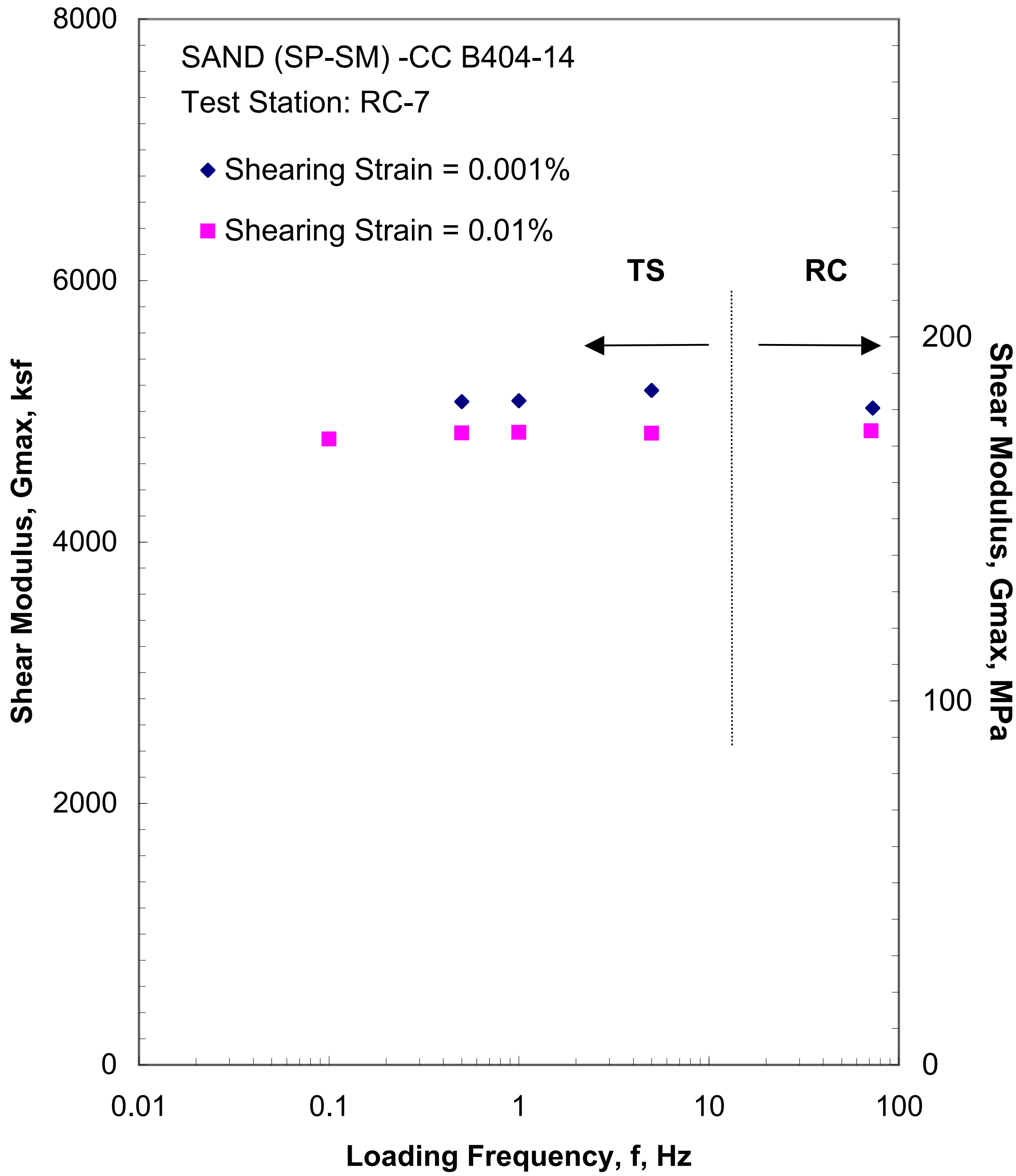


Figure D.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 87.6 psi from the Combined RCTS Tests

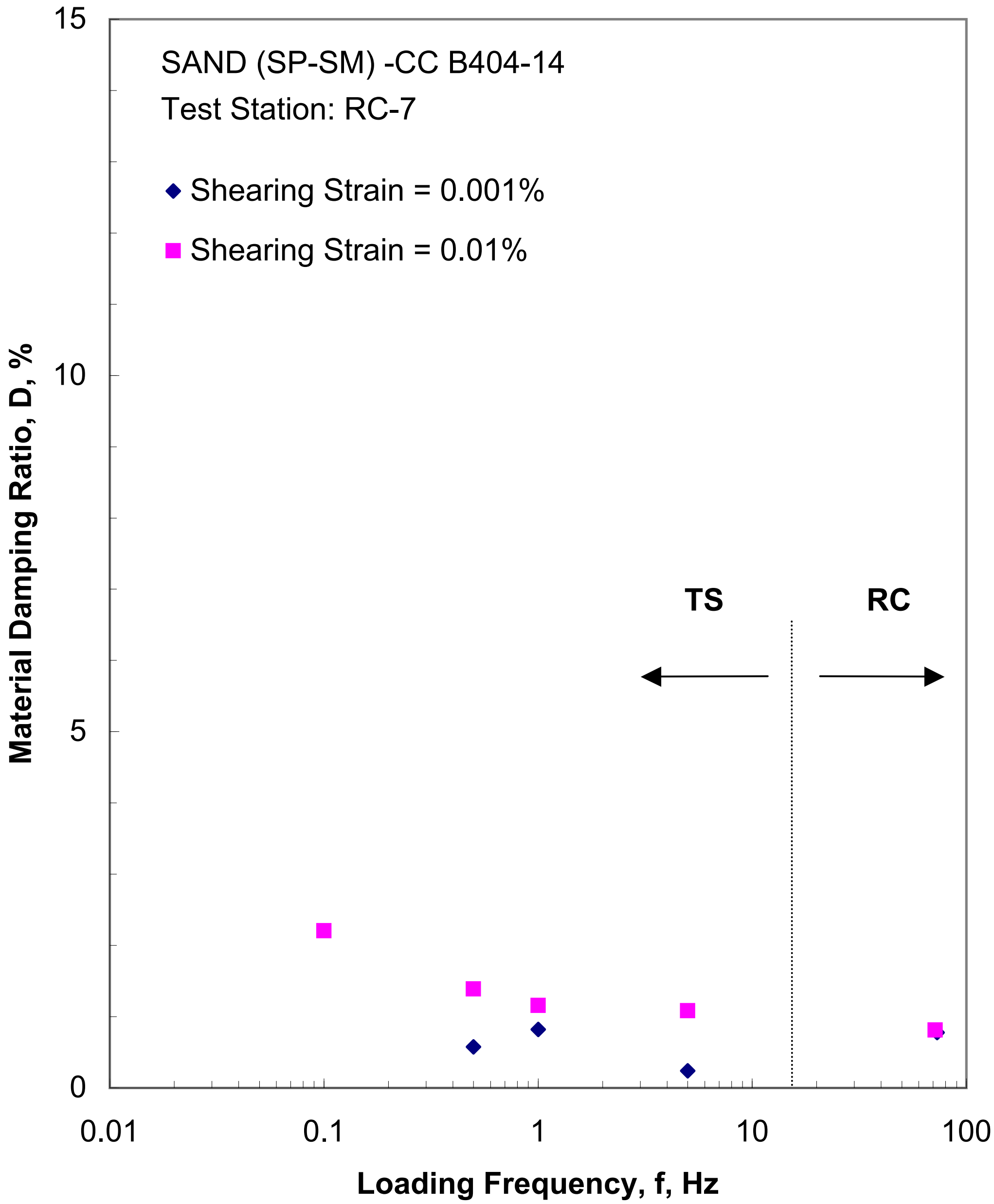


Figure D.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 87.6 psi from the Combined RCTS Tests

Table D.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 CC B404-UD14

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)	(%)	
5.5	792	38	1081	52	533	1.53	0.725
10.9	1570	75	1505	72	628	1.24	0.723
21.9	3154	151	2126	102	746	0.99	0.719
43.8	6307	302	3781	181	991	0.81	0.707
87.6	12614	604	4999	240	1137	0.57	0.697

Table D.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B404-UD14; Isoptropic Confining Pressure, σ_o=21.9 psi (3.2 ksf = 151 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio^x, D, %
3.41E-04	2137	1.00	3.41E-04	0.93
6.94E-04	2137	1.00	6.94E-04	0.94
1.37E-03	2137	1.00	1.37E-03	0.96
2.63E-03	2137	1.00	2.63E-03	0.93
4.94E-03	2070	0.97	4.41E-03	1.04
9.13E-03	1999	0.94	8.01E-03	1.26
1.67E-02	1896	0.89	1.43E-02	1.72
3.06E-02	1779	0.83	2.51E-02	2.39
5.61E-02	1618	0.76	4.48E-02	3.09
9.74E-02	1435	0.67	7.22E-02	4.35
1.73E-01	1198	0.56	1.22E-01	5.28
3.48E-01	945	0.44	2.35E-01	6.48
5.34E-01	815	0.38	3.43E-01	7.68

+ 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 D.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B404-UD14; Isotropic Confining Pressure, σ_o= 21.9 psi (3.2 ksf = 151 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, %
3.32E-04	2286	1.00	1.05	2.94E-04	2270	1.00	0.97
5.81E-04	2286	1.00	1.28	6.02E-04	2270	1.00	0.79
1.01E-03	2286	1.00	0.77	1.04E-03	2270	1.00	0.67
1.98E-03	2286	1.00	1.07	2.05E-03	2270	1.00	1.15
4.10E-03	2286	1.00	1.59	4.10E-03	2270	1.00	1.48
9.55E-03	2111	0.92	2.23	9.58E-03	2104	0.93	2.28
2.04E-02	1973	0.86	3.52	2.05E-02	1962	0.86	3.53
5.09E-02	1584	0.69	6.25	5.10E-02	1580	0.70	6.06

Table D.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B404-UD14; Isoptropic Confining Pressure, σ_o= 87.6 psi (12.6 ksf = 604 kPa)

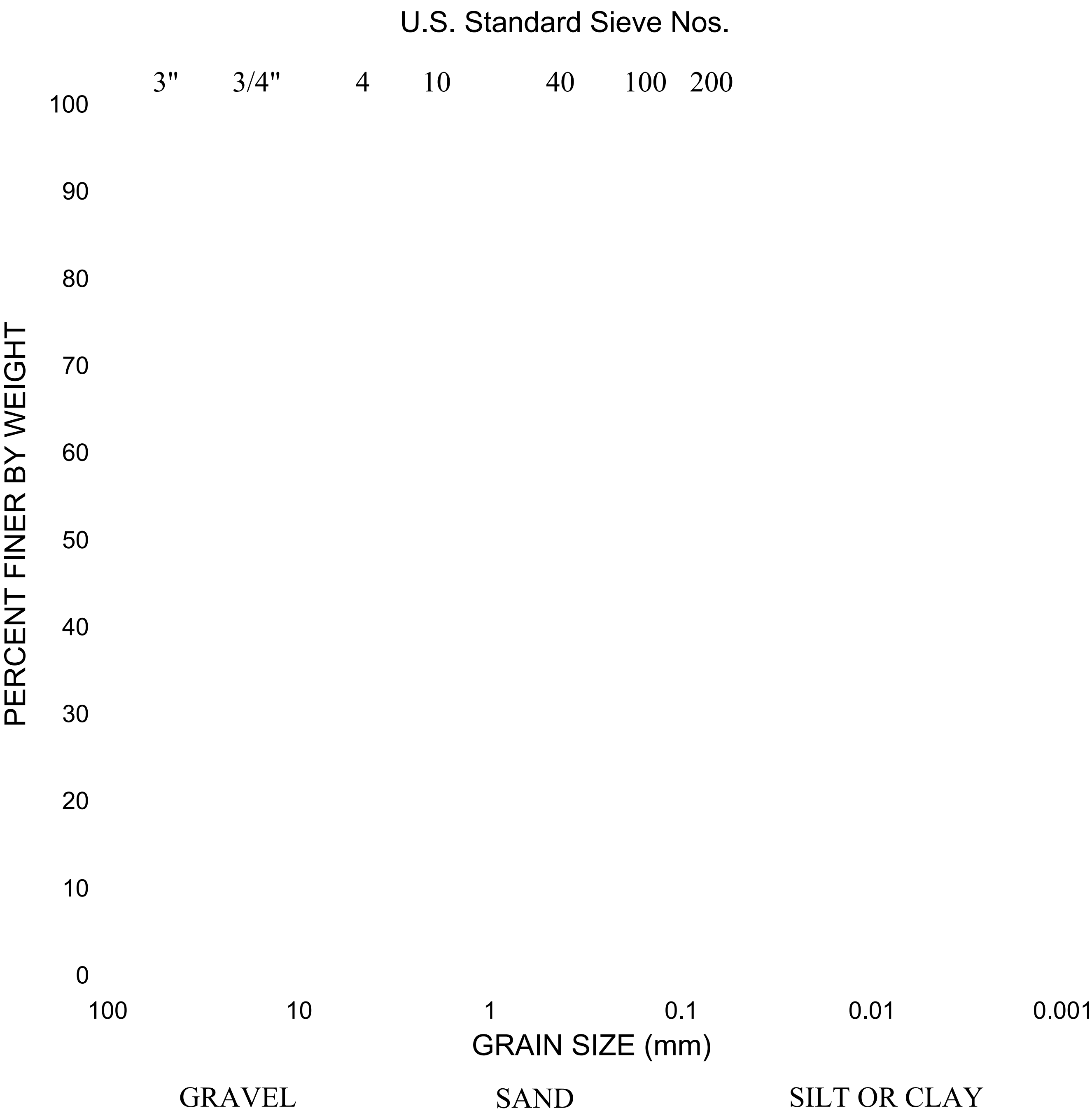
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
2.57E-04	5044	1.00	2.57E-04	0.74
5.10E-04	5044	1.00	5.10E-04	0.66
1.05E-03	5024	1.00	1.05E-03	0.78
3.91E-03	4954	0.98	3.64E-03	0.71
7.29E-03	4849	0.96	6.85E-03	0.81
1.33E-02	4712	0.93	1.22E-02	0.89
2.35E-02	4543	0.90	2.12E-02	1.17
4.13E-02	4251	0.84	3.59E-02	1.72
7.11E-02	3846	0.76	6.00E-02	2.32
1.21E-01	3381	0.67	1.00E-01	2.90
2.11E-01	2861	0.57	1.70E-01	3.65
3.67E-01	2425	0.48	2.84E-01	4.84

[+] 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 D.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B404-UD14; Isotropic Confining Pressure, σ_o=87.6 psi (12.6 ksf = 604 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D,	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D, %
9.36E-04	5051	1.00	0.79	9.44E-04	5078	1.01	0.57
1.93E-03	5051	1.00	0.90	1.89E-03	5078	1.01	0.89
3.80E-03	5051	1.00	0.77	3.84E-03	5004	0.99	0.69
9.97E-03	4811	0.95	1.25	9.92E-03	4835	0.96	1.39
2.08E-02	4619	0.92	1.95	2.08E-02	4614	0.91	1.89
3.88E-02	4332	0.86	3.10	3.88E-02	4339	0.86	2.95



GRADATION CURVE

ASTM D422

Project:	Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland	Contract No.: 06120048.00	Date: 9/14/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-404	52.0-53.6	POORLY GRADED SAND, with silt, with shells, gray	SP-SM	NP	NP

Schnabel Engineering

APPENDIX E

CC B401-UD31
SANDY FAT CLAY (CH), gray*
(LL=80, PL=31, PI=49; Gs=2.63)*

Borehole B-401
Sample UD31
Sample Depth = 138.5 to 140.5 ft
RCTS Test Depth = 140.0 ft
Total Unit Weight = 104.1 lb/ft^3
Water Content = 44.1 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 46.6 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

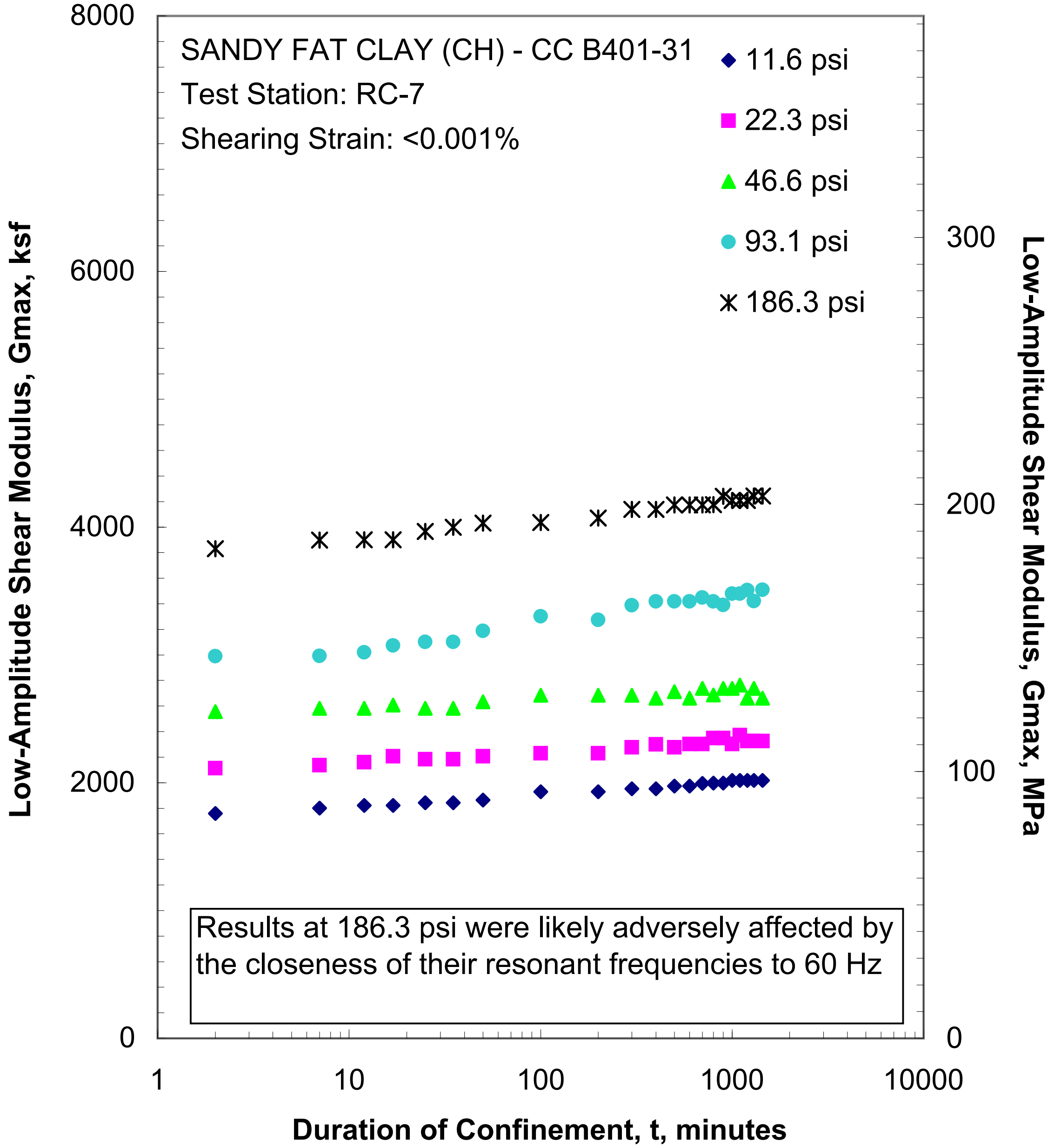


Figure E.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

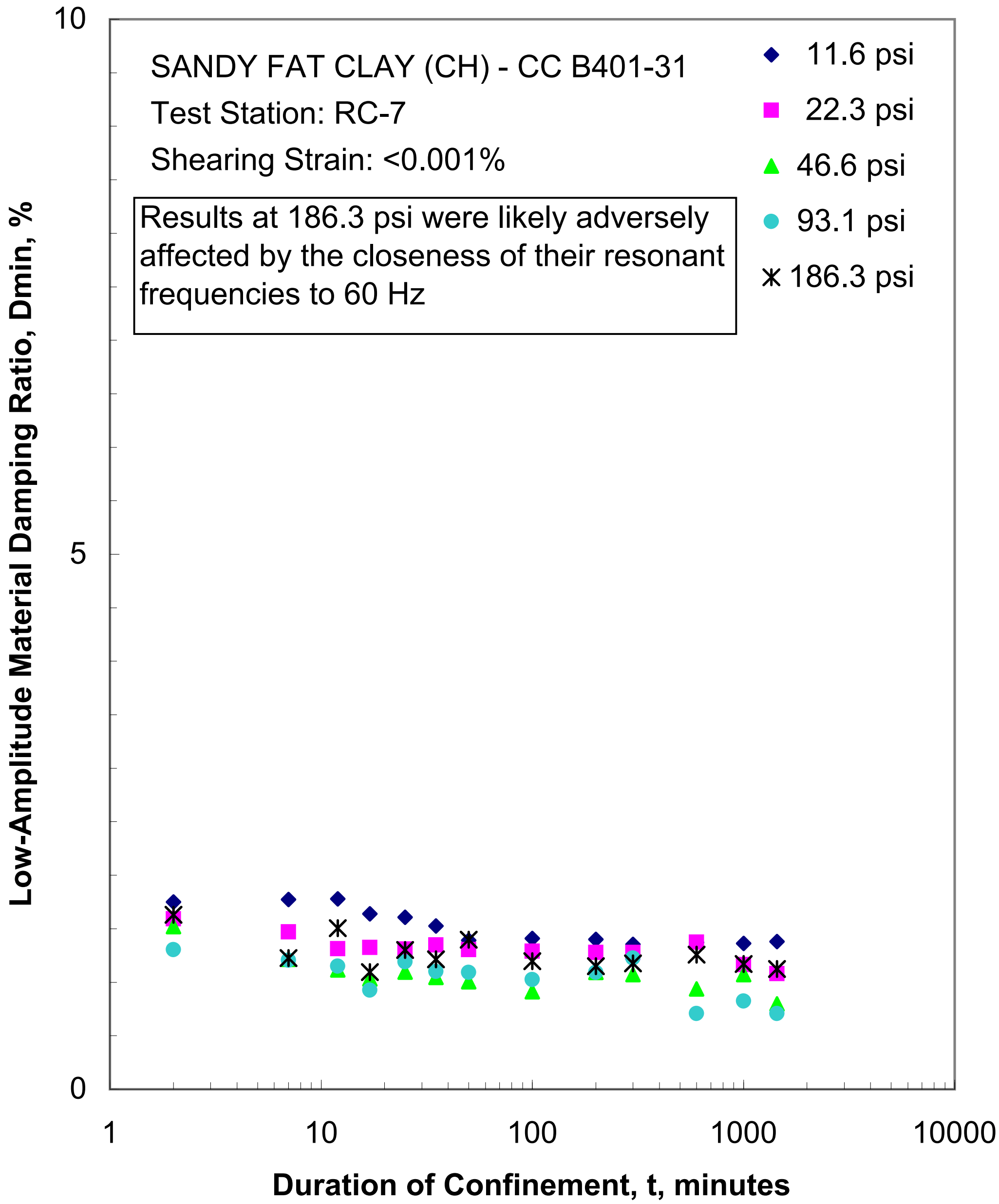


Figure E.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

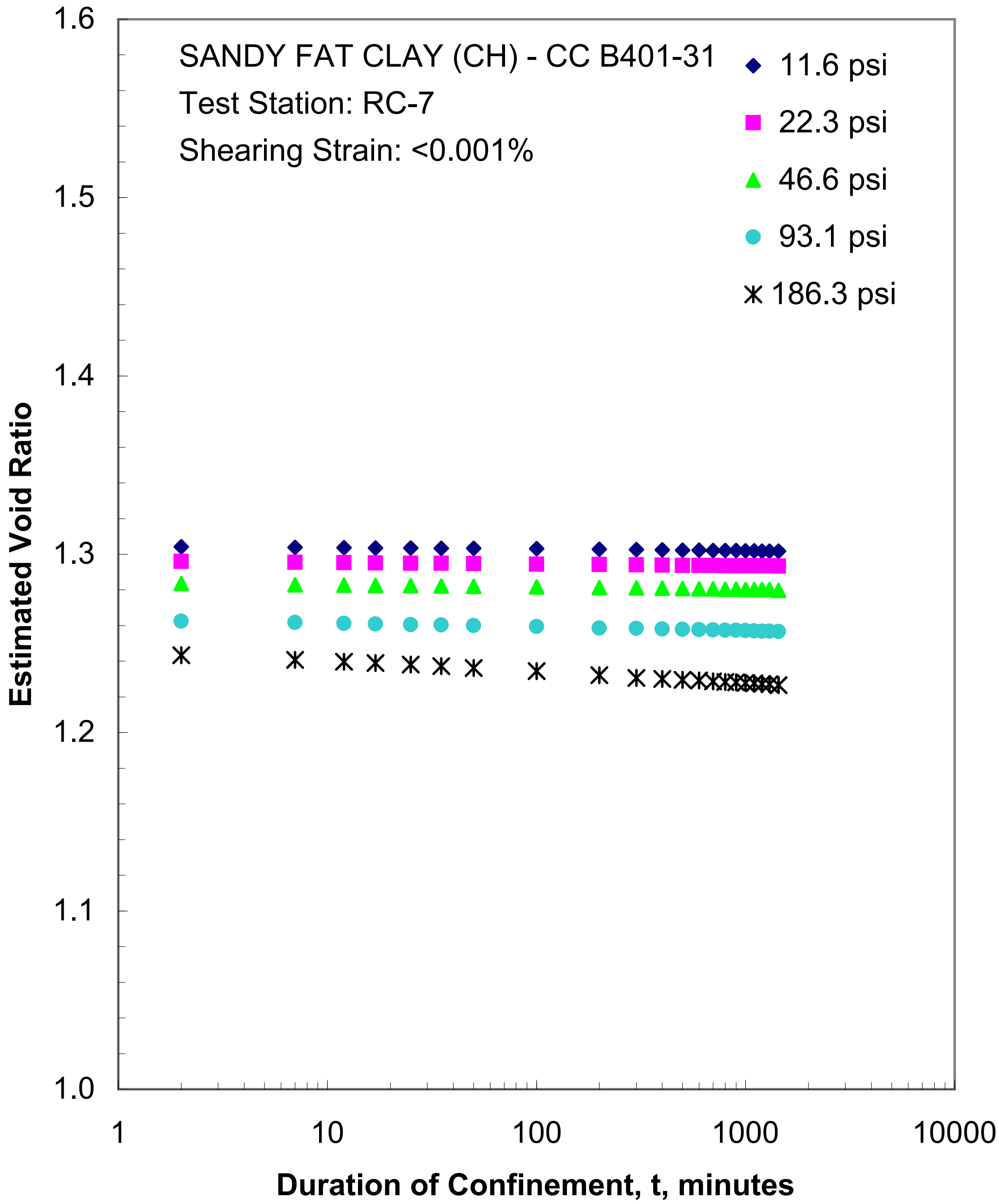


Figure E.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

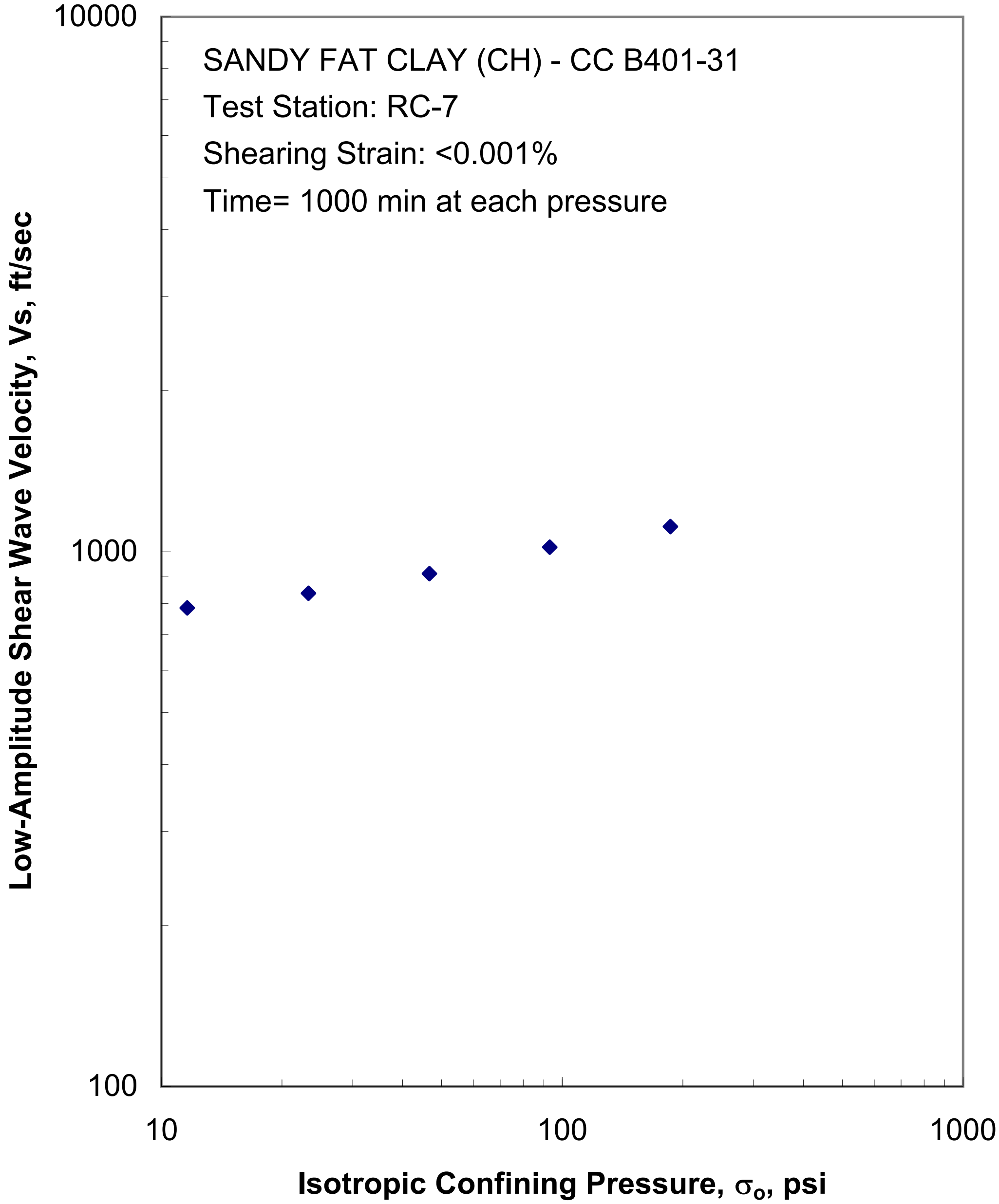


Figure E.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

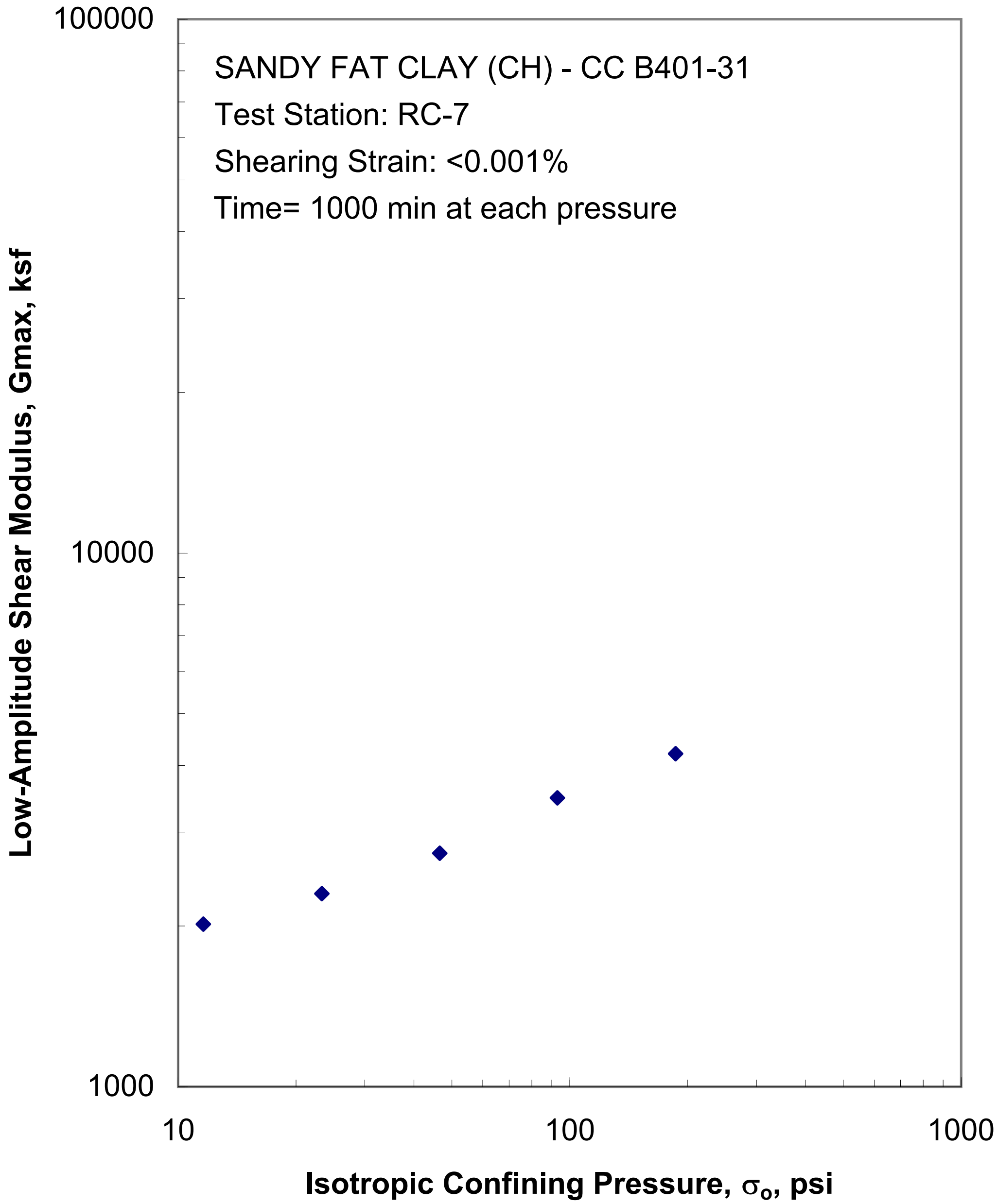


Figure E.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

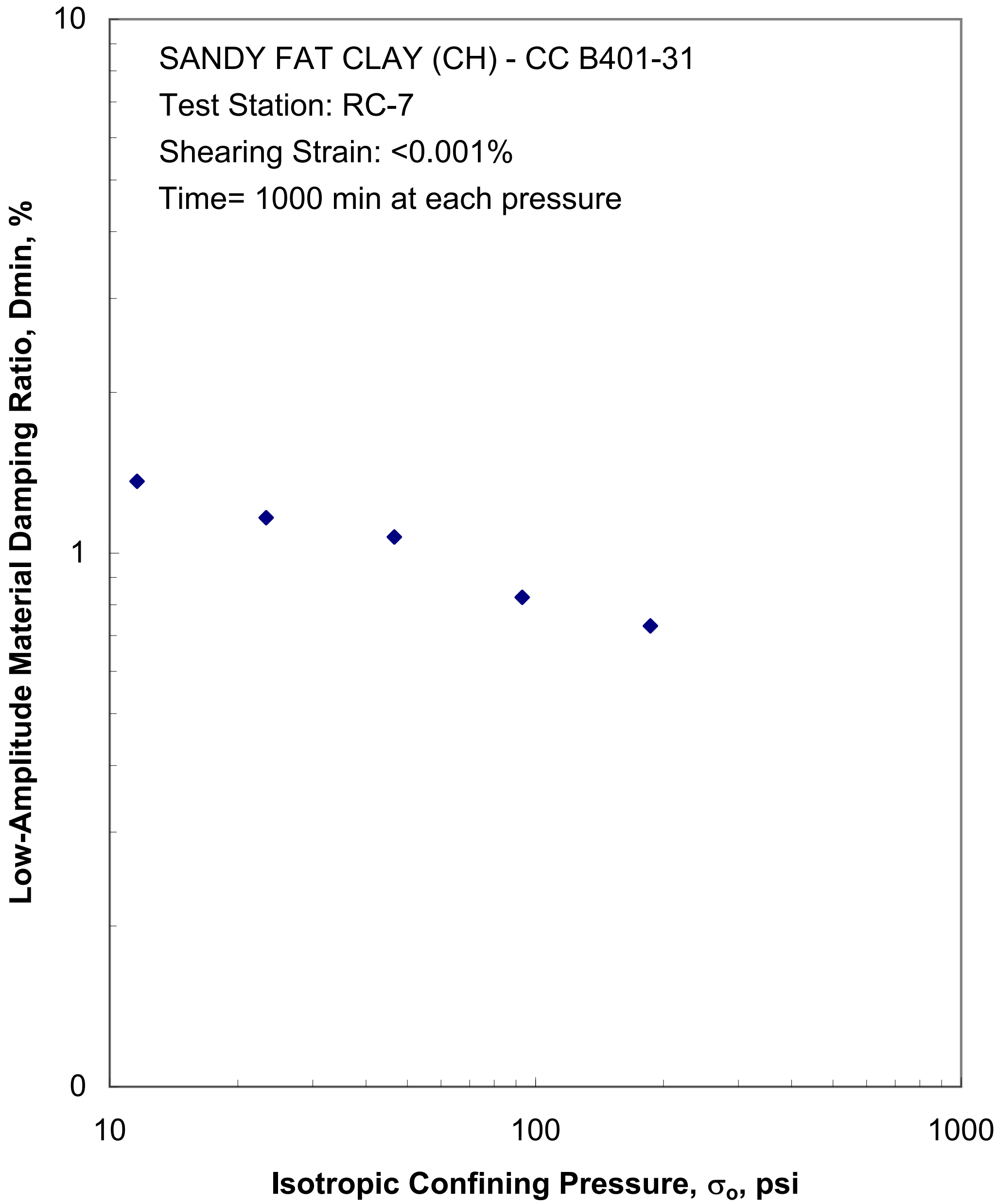


Figure E.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

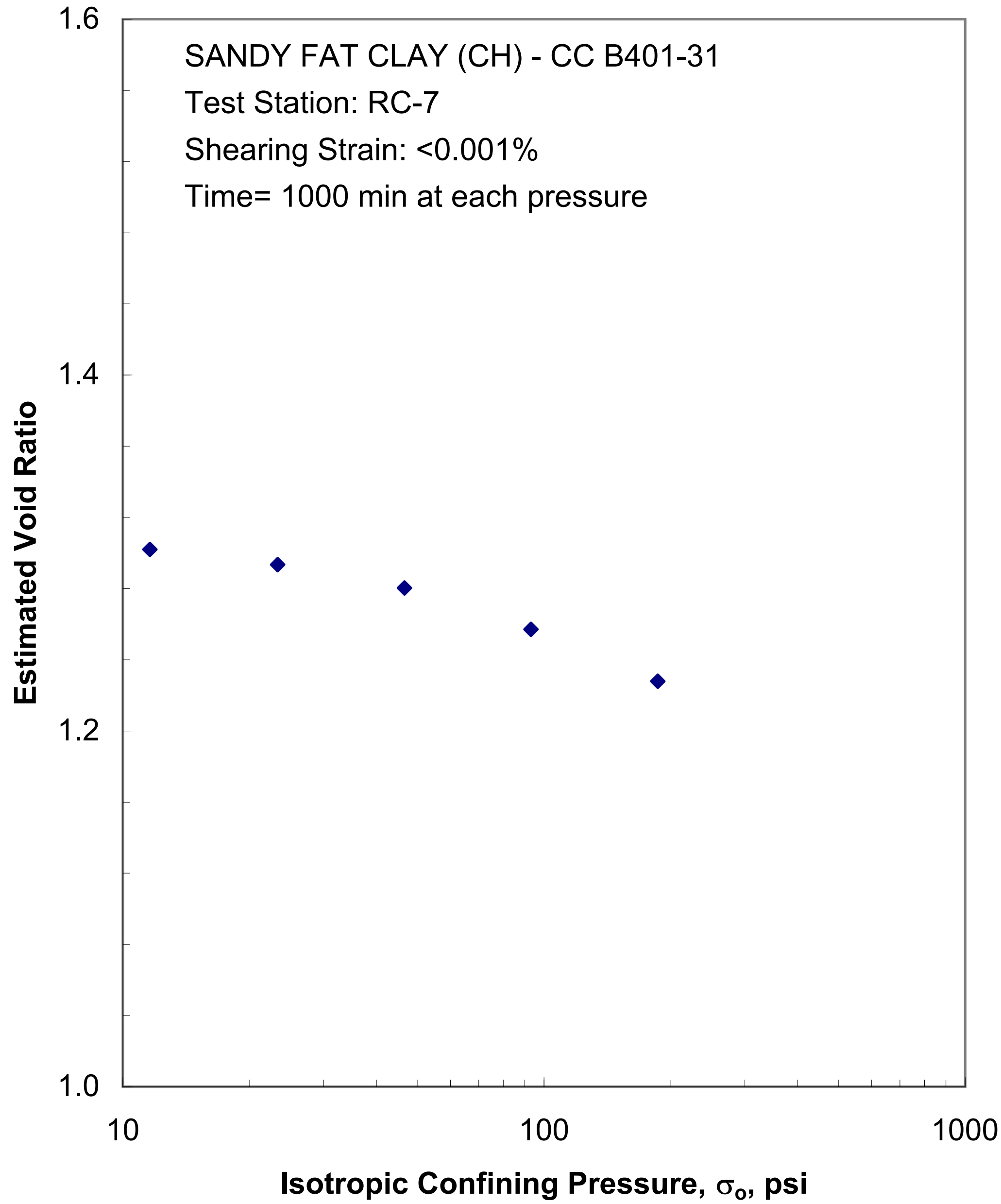


Figure E.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

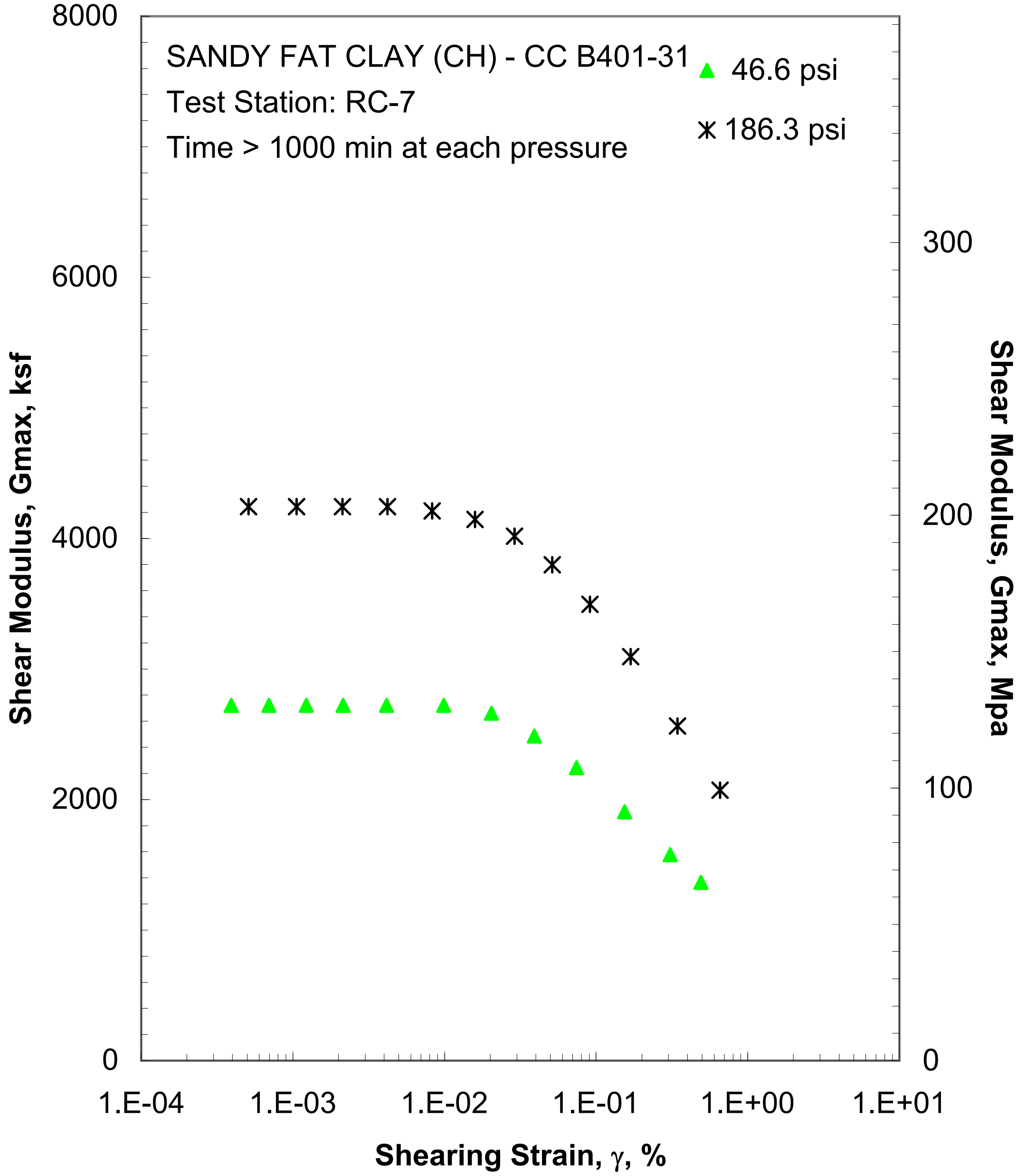


Figure E.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

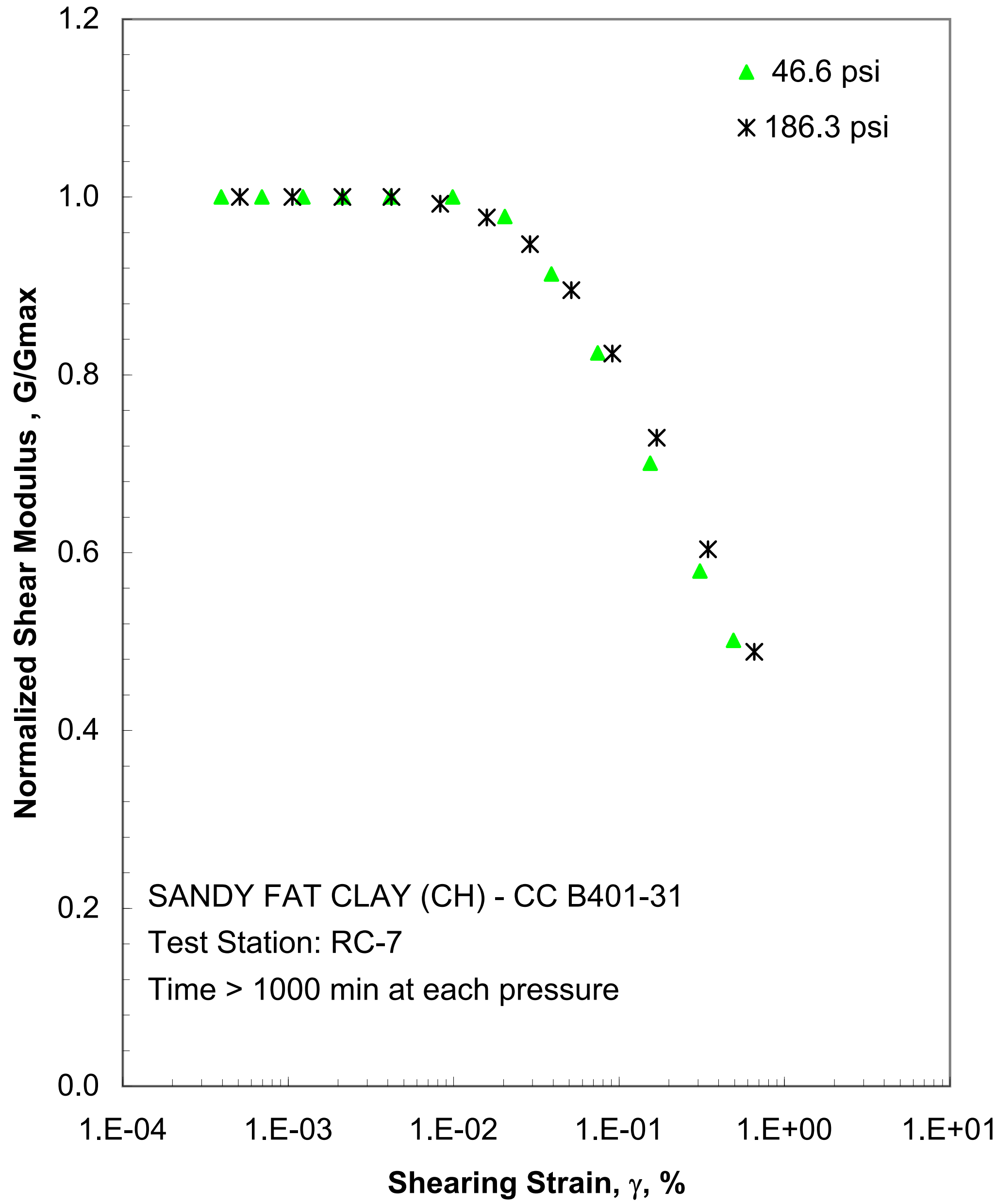


Figure E.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

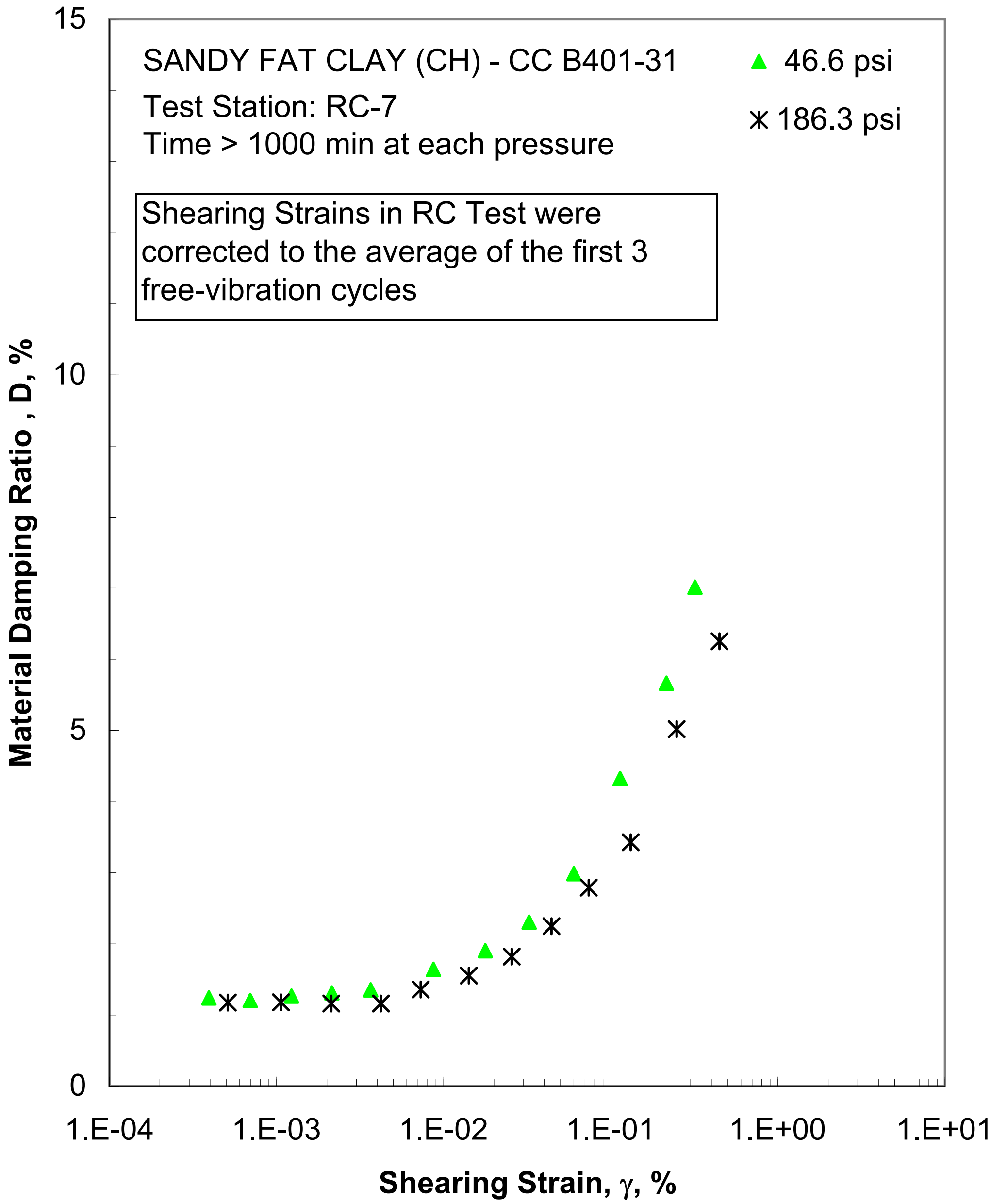


Figure E.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

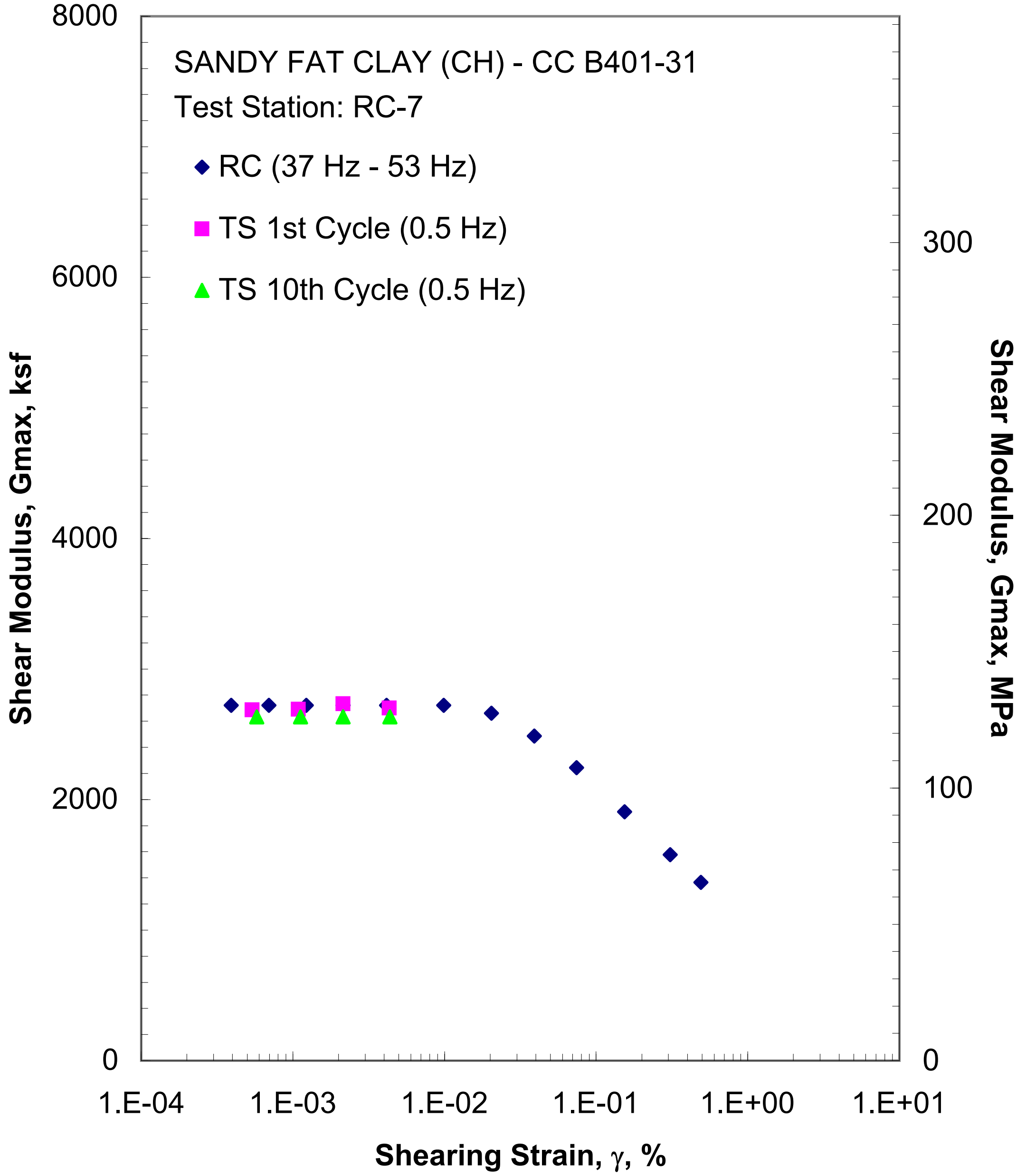


Figure E.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 46.6 psi from the Combined RCTS Tests

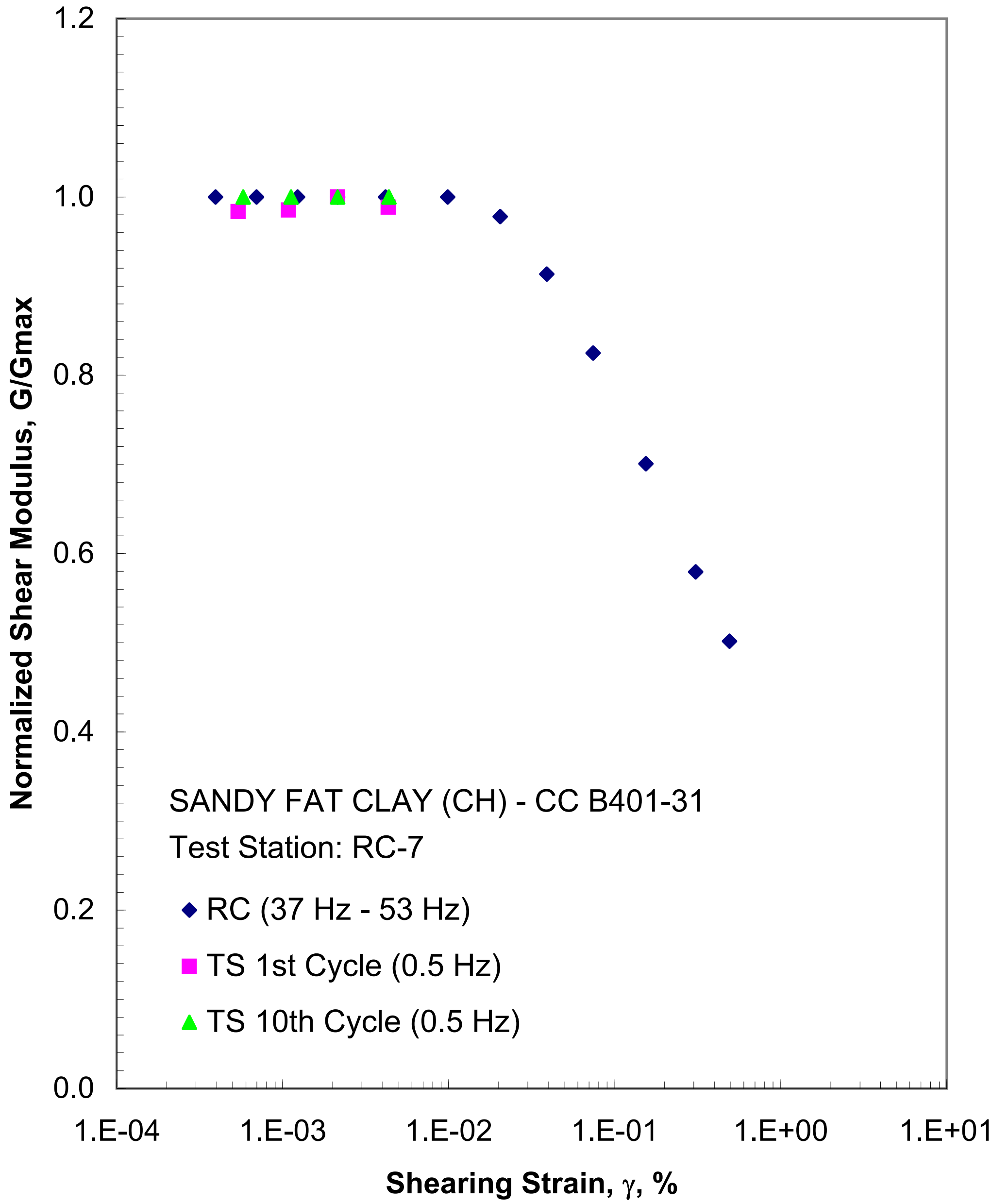


Figure E.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 46.6 psi from the Combined RCTS Tests

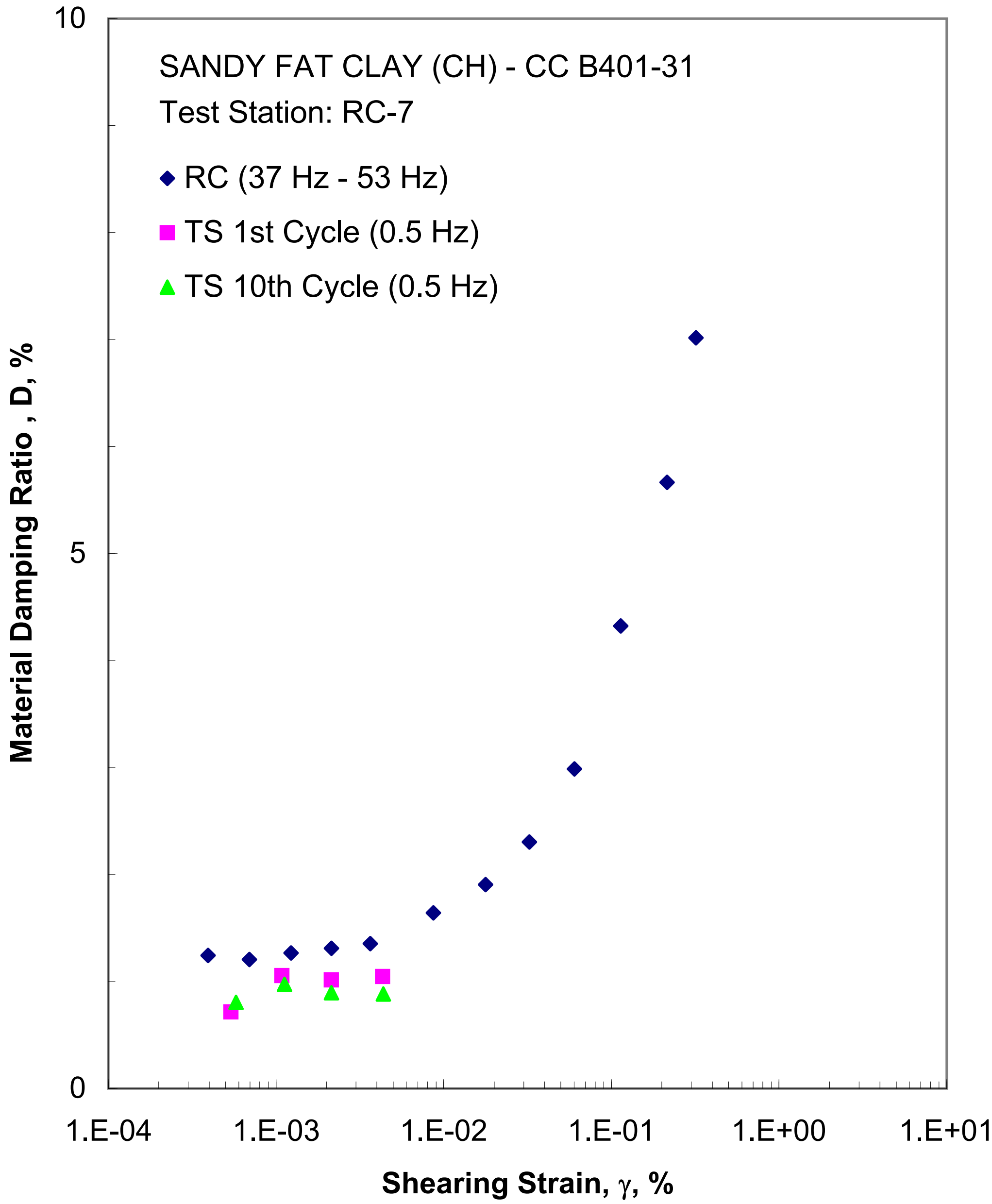


Figure E.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 46.6 psi from the Combined RCTS Tests

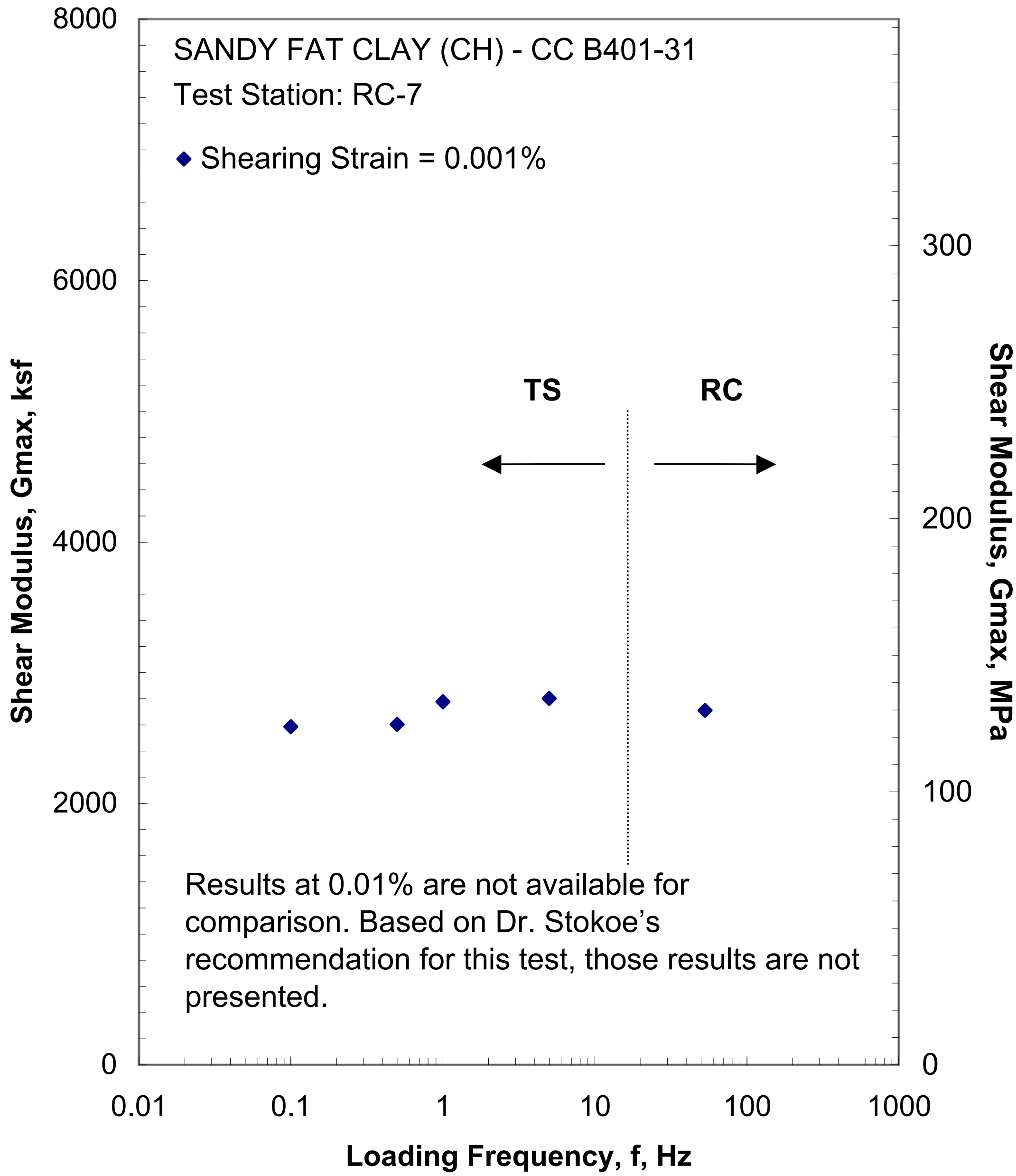


Figure E.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 46.6 psi from the Combined RCTS Tests

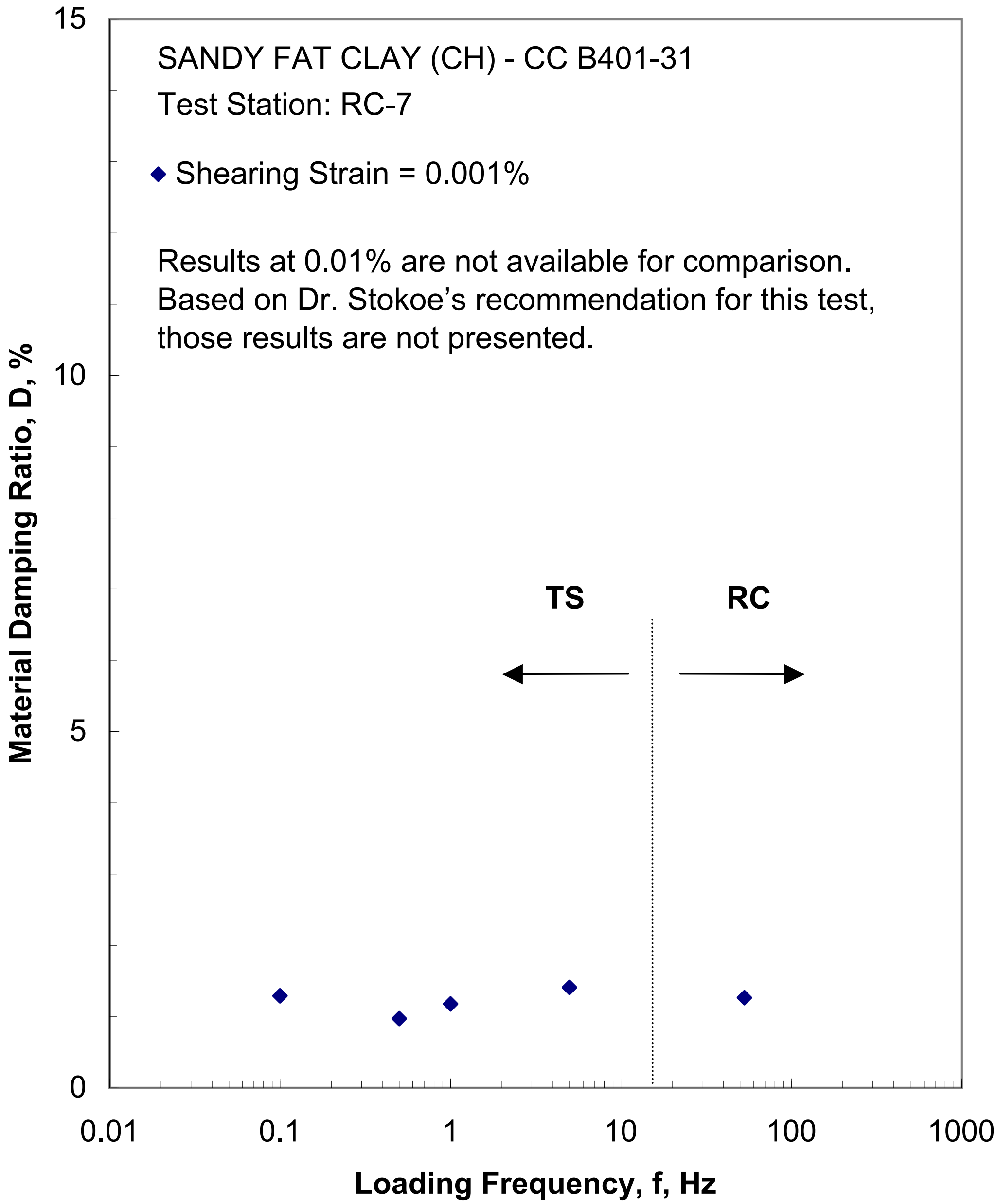


Figure E.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 46.6 psi from the Combined RCTS Tests

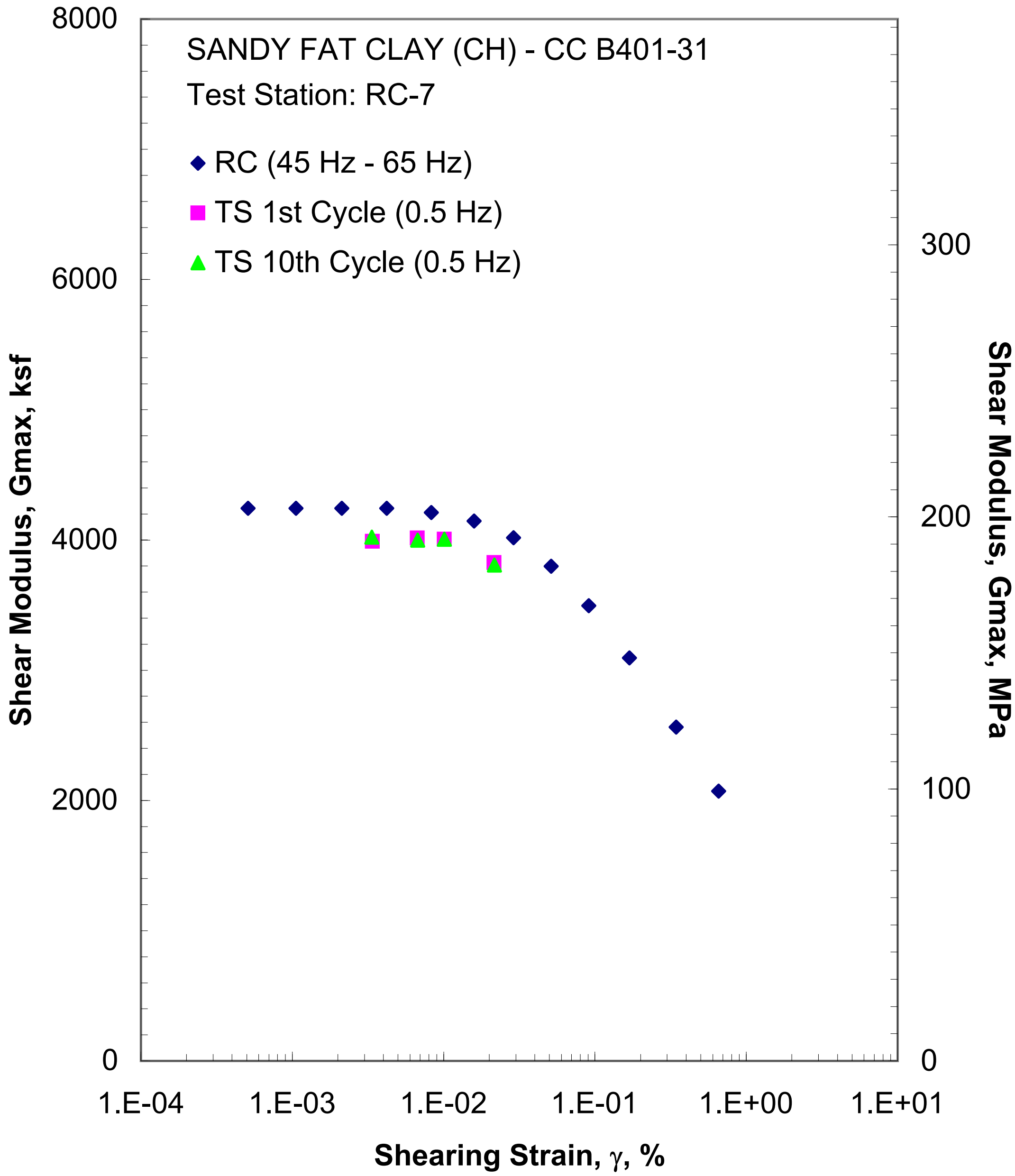


Figure E.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 186.3 psi from the Combined RCTS Tests

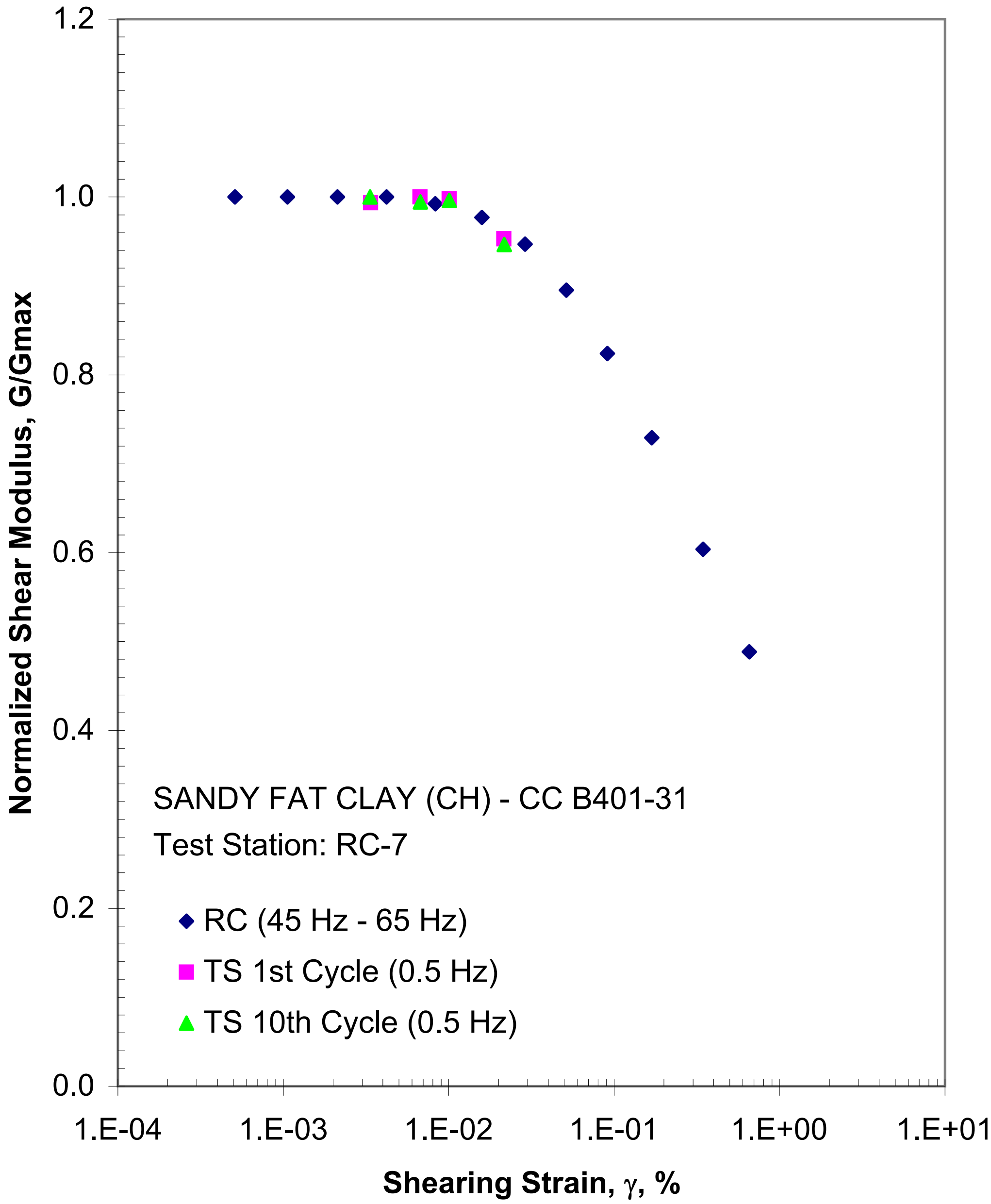


Figure E.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 186.3 psi from the Combined RCTS Tests

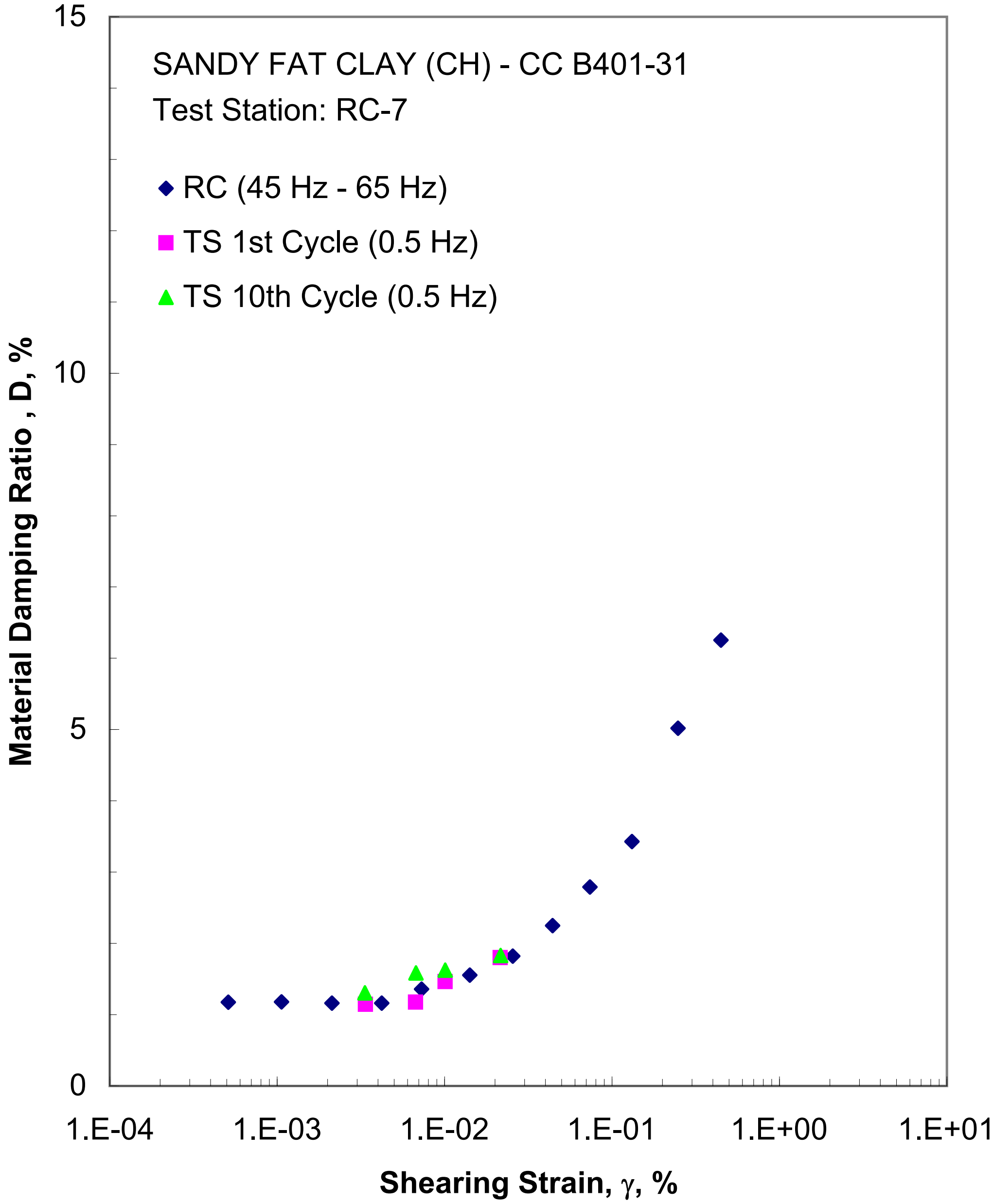


Figure E.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 186.3 psi from the Combined RCTS Tests

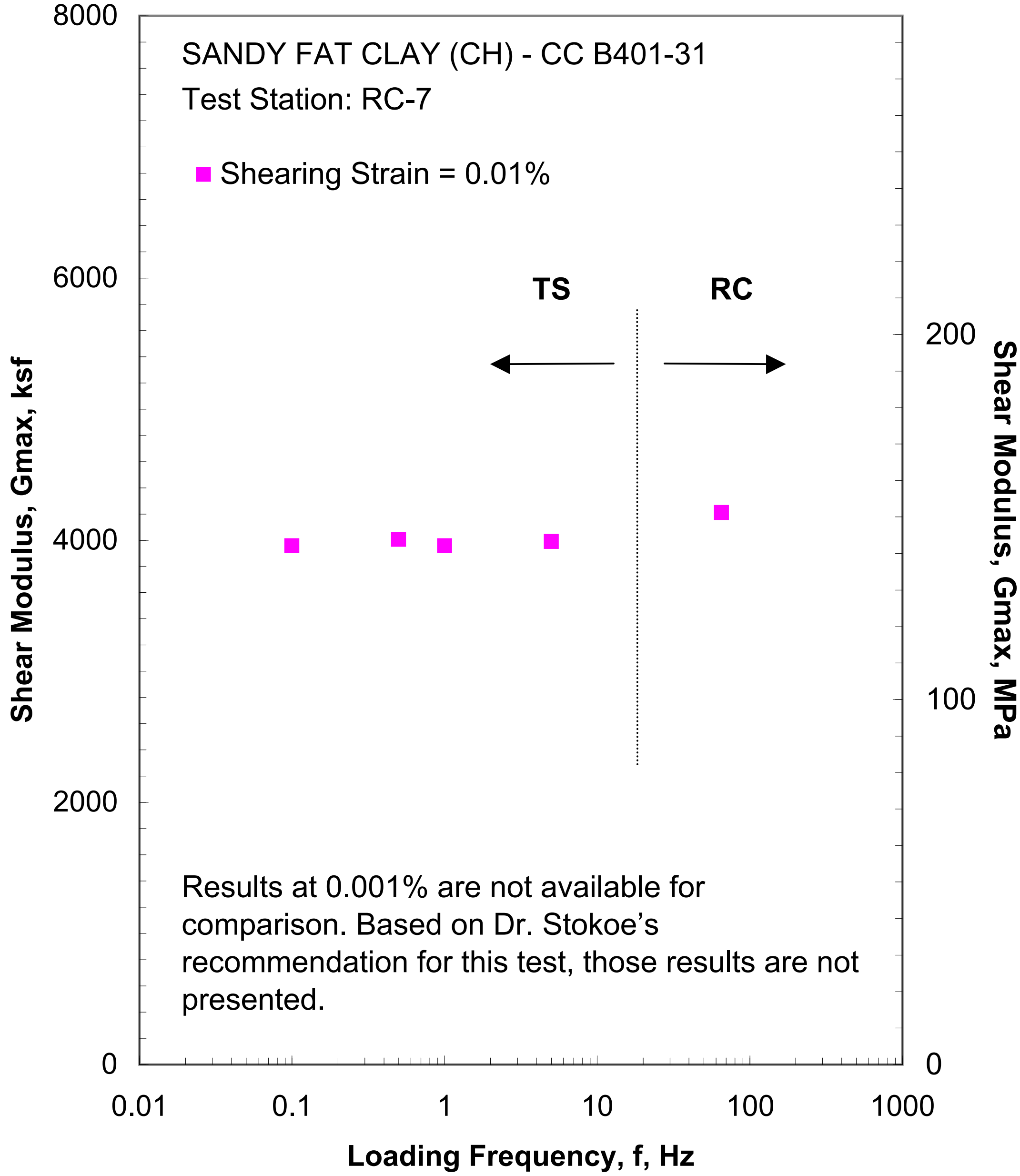


Figure E.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 186.3 psi from the Combined RCTS Tests

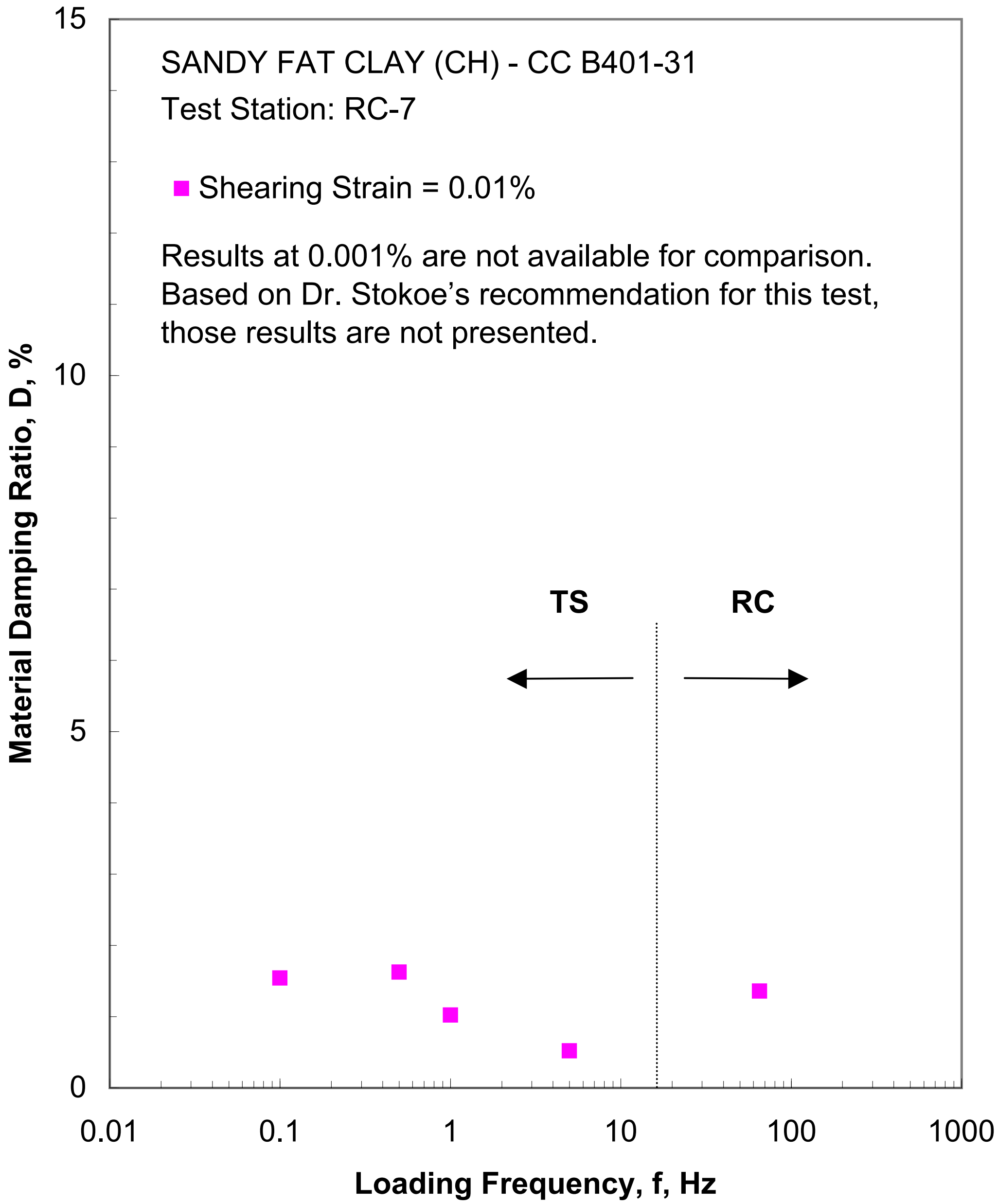


Figure E.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 186.3 psi from the Combined RCTS Tests

Table E.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 CC B401-UD31

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)	(%)	
11.6	1670	80	2018	97	785	1.36	1.302
23.3	3355	161	2302	110	836	1.16	1.294
46.6	6710	321	2738	131	910	1.07	1.280
93.1	13406	641	3478	167	1020	0.83	1.257
186.3	26827	1284	4208	202	1115	0.73	1.228

Table E.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B401-UD31; Isoptropic Confining Pressure, σ_o=46.6 psi (6.7 ksf = 321 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
3.93E-04	2722	1.00	3.93E-04	1.24
6.95E-04	2722	1.00	6.95E-04	1.21
1.23E-03	2722	1.00	1.23E-03	1.27
2.15E-03	2722	1.00	2.15E-03	1.31
4.16E-03	2722	1.00	3.66E-03	1.35
9.87E-03	2722	1.00	8.68E-03	1.64
2.04E-02	2662	0.98	1.78E-02	1.91
3.91E-02	2486	0.91	3.24E-02	2.31
7.42E-02	2245	0.82	6.01E-02	2.99
1.54E-01	1907	0.70	1.14E-01	4.32
3.07E-01	1578	0.58	2.15E-01	5.67
4.91E-01	1365	0.50	3.19E-01	7.02

[+] 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 E.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B401-UD31; Isotropic Confining Pressure, σ_o= 46.6 psi (6.7 ksf =321 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, %
5.40E-04	2687	0.98	0.71	5.77E-04	2633	1.00	0.80
1.09E-03	2692	0.99	1.05	1.12E-03	2633	1.00	0.97
2.14E-03	2733	1.00	1.01	2.14E-03	2633	1.00	0.89
4.33E-03	2701	0.99	1.04	4.37E-03	2633	1.00	0.88

Table E.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B401-UD31; Isoptropic Confining Pressure, σ_o= 186.3 psi (26.8 ksf = 1284 kPa)

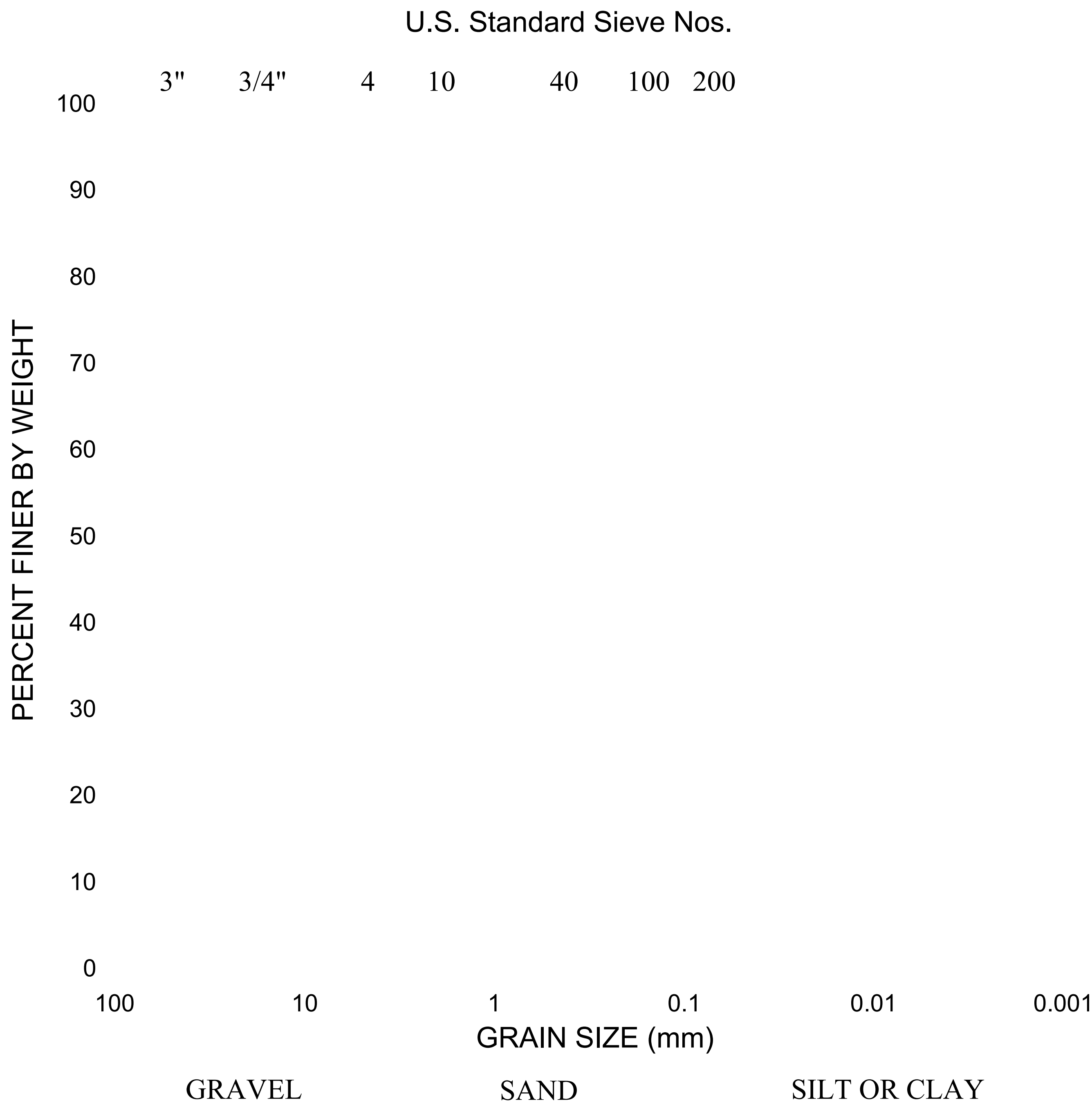
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio x, D, %
5.11E-04	4244	1.00	5.11E-04	1.17
1.06E-03	4244	1.00	1.06E-03	1.18
2.12E-03	4244	1.00	2.12E-03	1.16
4.21E-03	4244	1.00	4.21E-03	1.16
8.30E-03	4211	0.99	7.30E-03	1.36
1.59E-02	4146	0.97	1.41E-02	1.55
2.90E-02	4018	0.94	2.55E-02	1.82
5.14E-02	3799	0.89	4.42E-02	2.25
9.11E-02	3497	0.82	7.38E-02	2.79
1.69E-01	3094	0.73	1.32E-01	3.43
3.45E-01	2563	0.60	2.48E-01	5.02
6.57E-01	2073	0.49	4.47E-01	6.25

+ 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 E.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B401-UD31; Isotropic Confining Pressure, σ_o=186.3 psi (26.8 ksf = 1284 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D,	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D, %
3.38E-03	3989	0.99	1.23	3.35E-03	4021	1.00	1.30
6.72E-03	4014	1.00	1.26	6.74E-03	3999	0.99	1.58
1.01E-02	4007	1.00	1.55	1.01E-02	4007	1.00	1.62
2.16E-02	3825	0.95	1.89	2.17E-02	3807	0.95	1.83



GRADATION CURVE

ASTM D422

Project: Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland

Contract No.: 06120048.00

Date: 9/21/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-401	138.5-140.5	SANDY FAT CLAY, gray	CH	80	49

Schnabel Engineering

APPENDIX F

CC B401-UD67
Silty SAND (SM), brown*
(LL=52, PL=39, PI=13; Gs=2.78)*

Borehole B-401
Sample UD67
Sample Depth = 348.5 to 350.5 ft
RCTS Test Depth = 349.0 ft
Total Unit Weight = 116.4 lb/ft^3
Water Content = 35.6 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 113.9 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

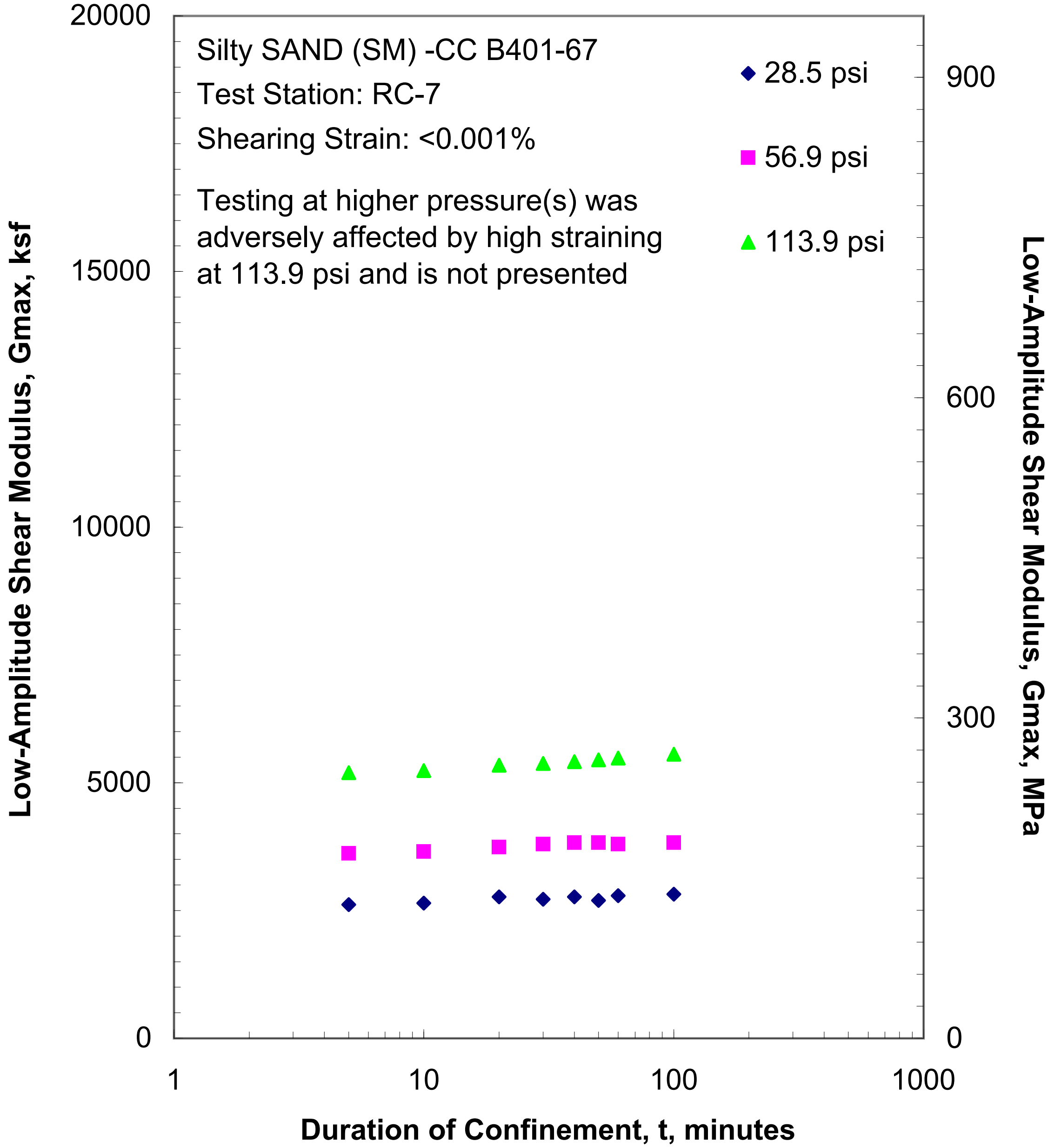


Figure F.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

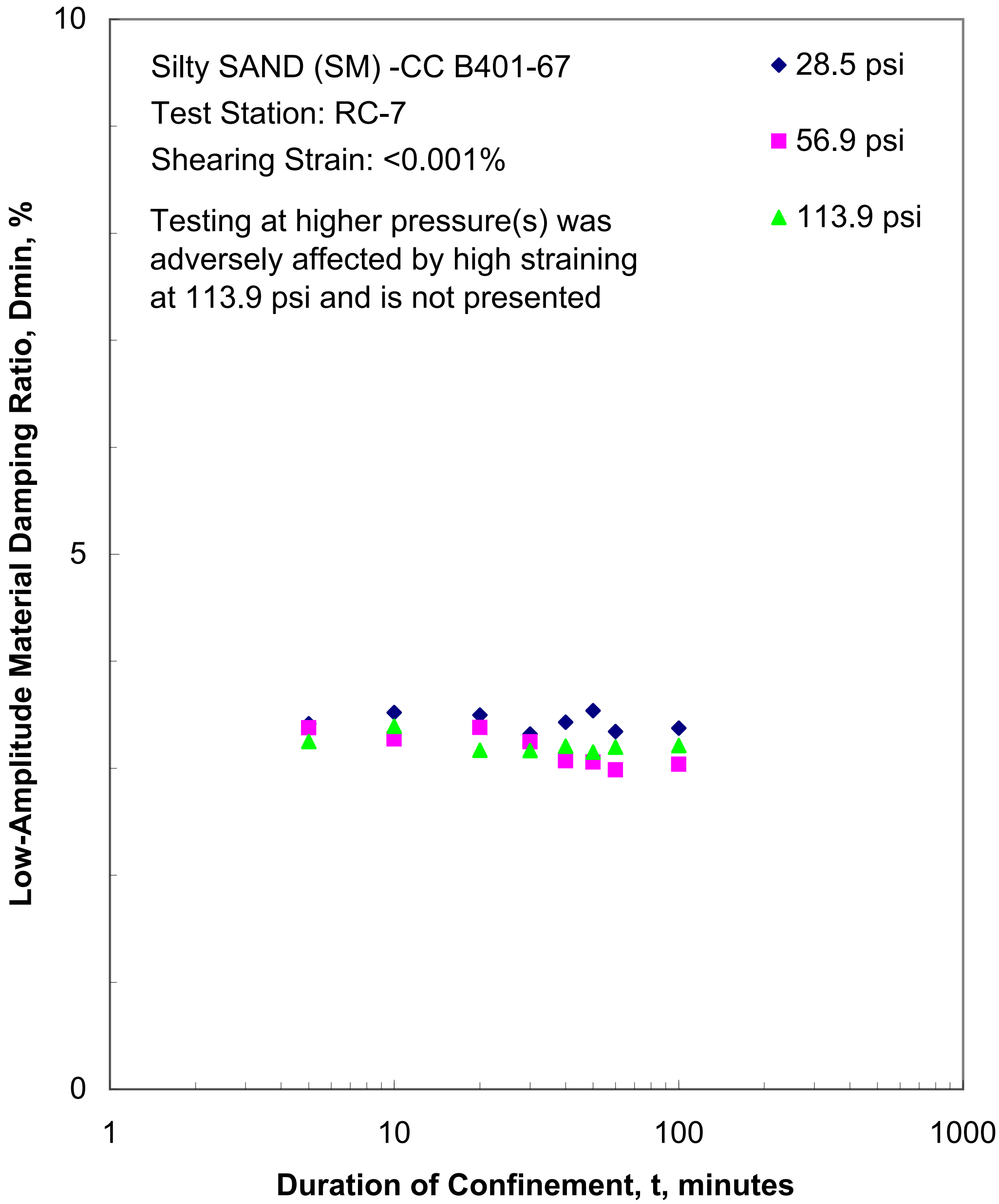


Figure F.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

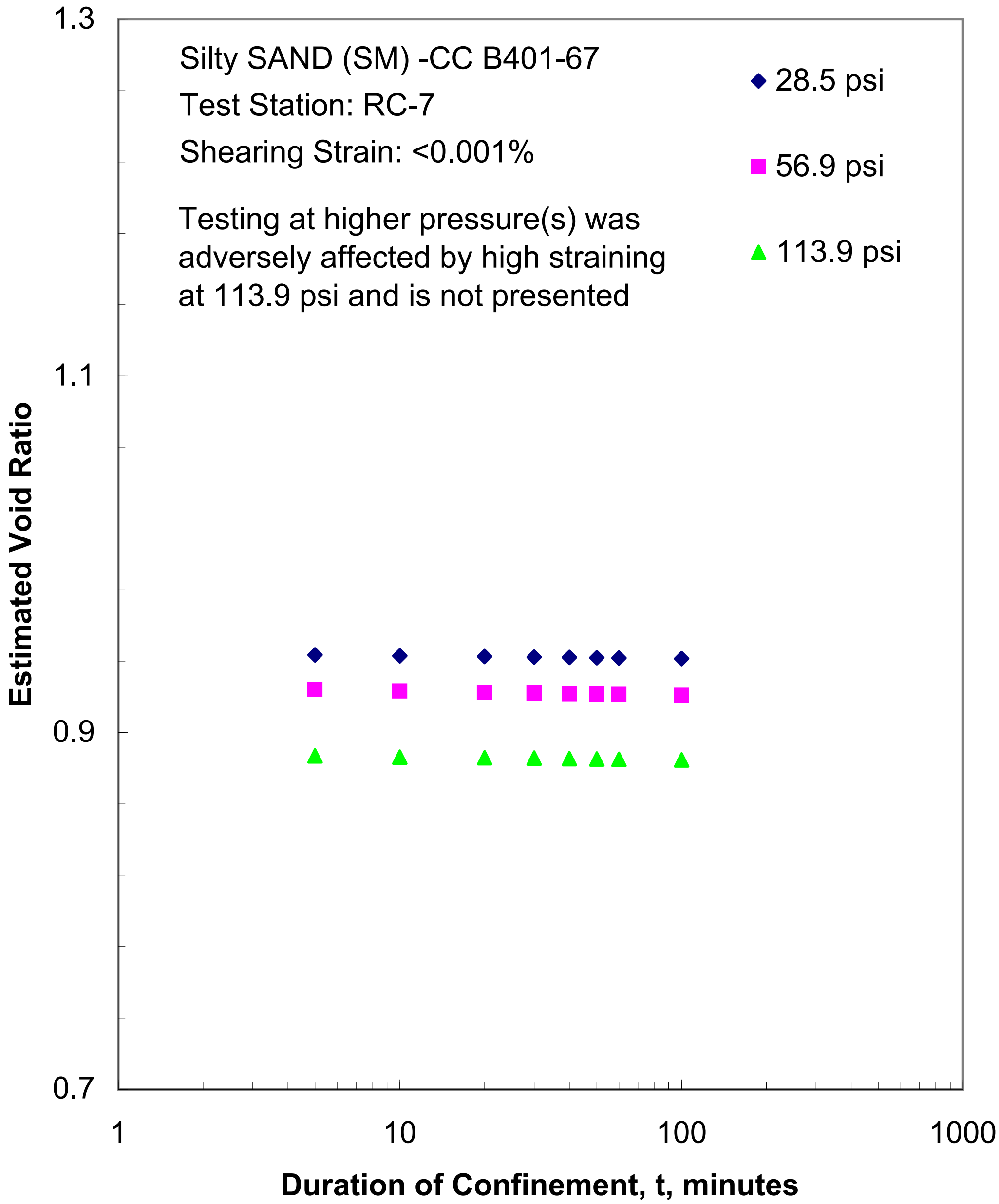


Figure F.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

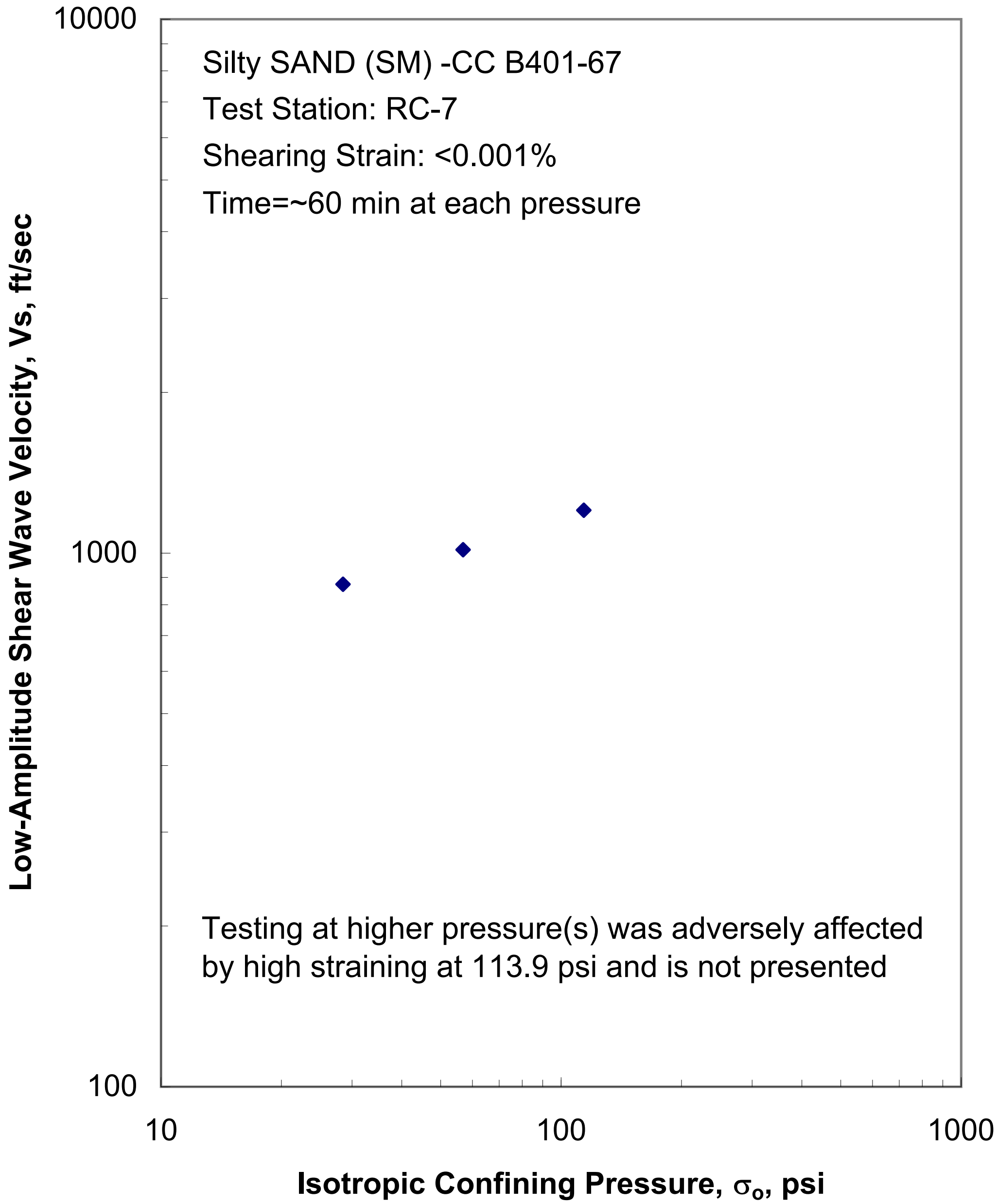


Figure F.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

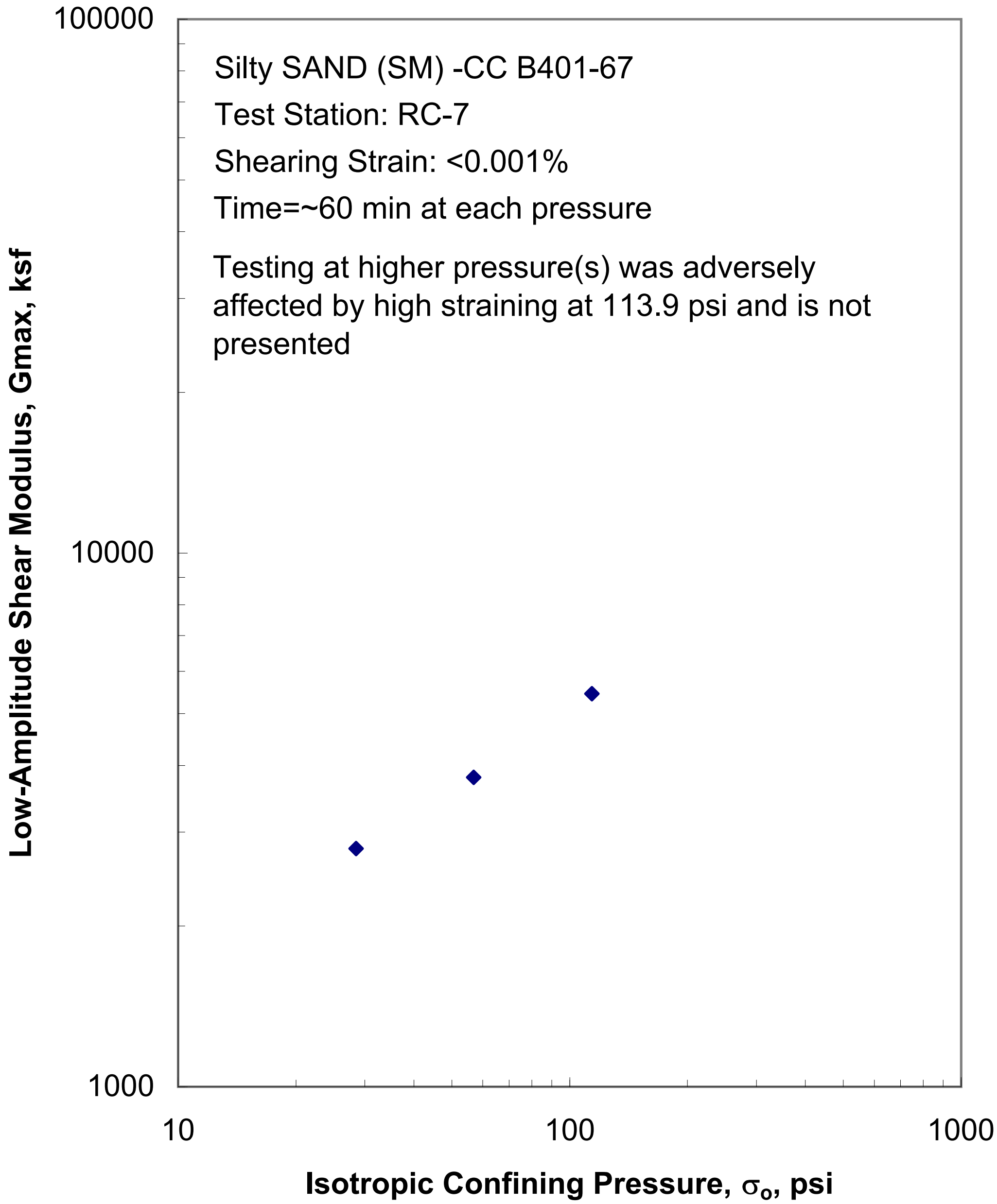


Figure F.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

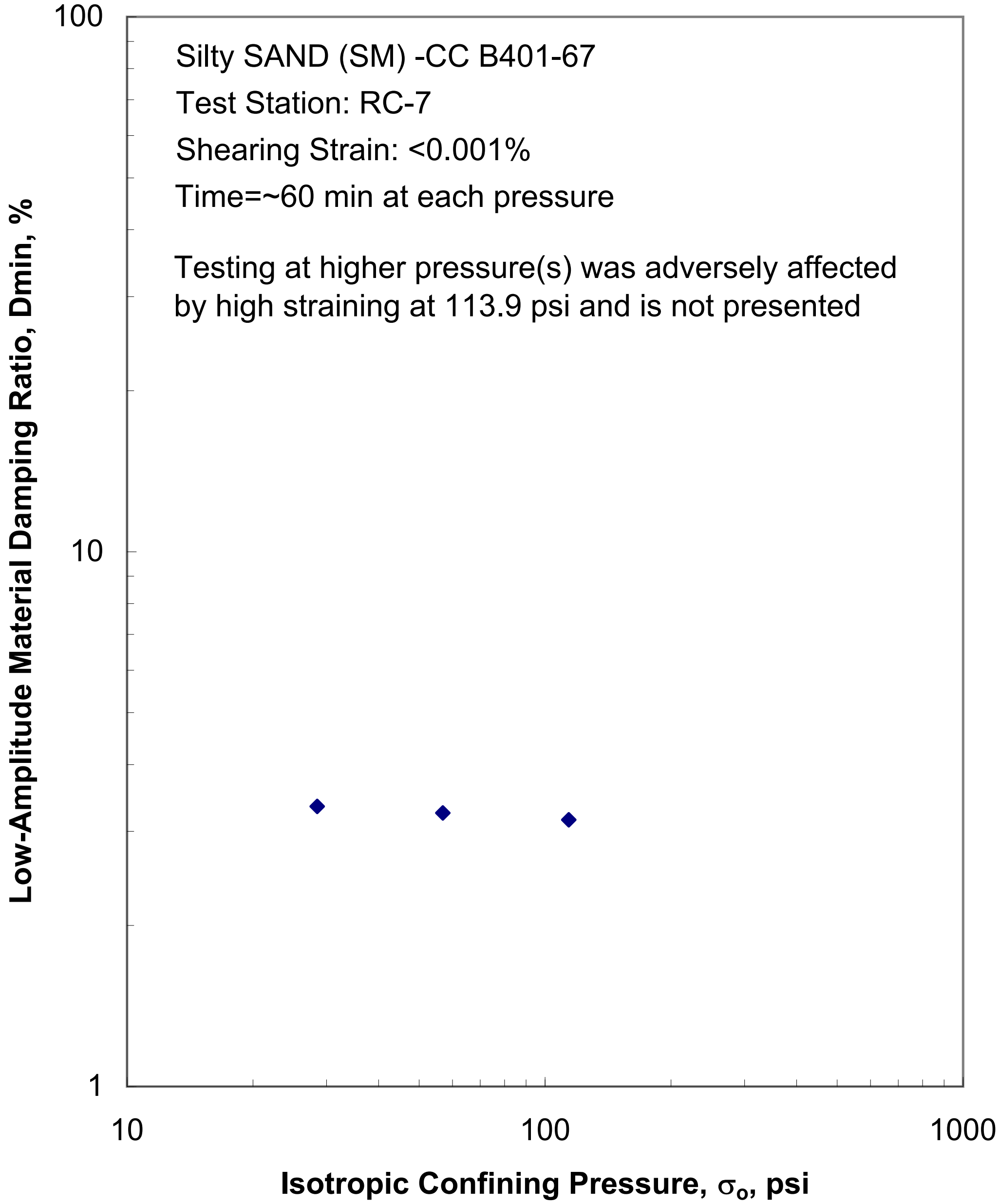


Figure F.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

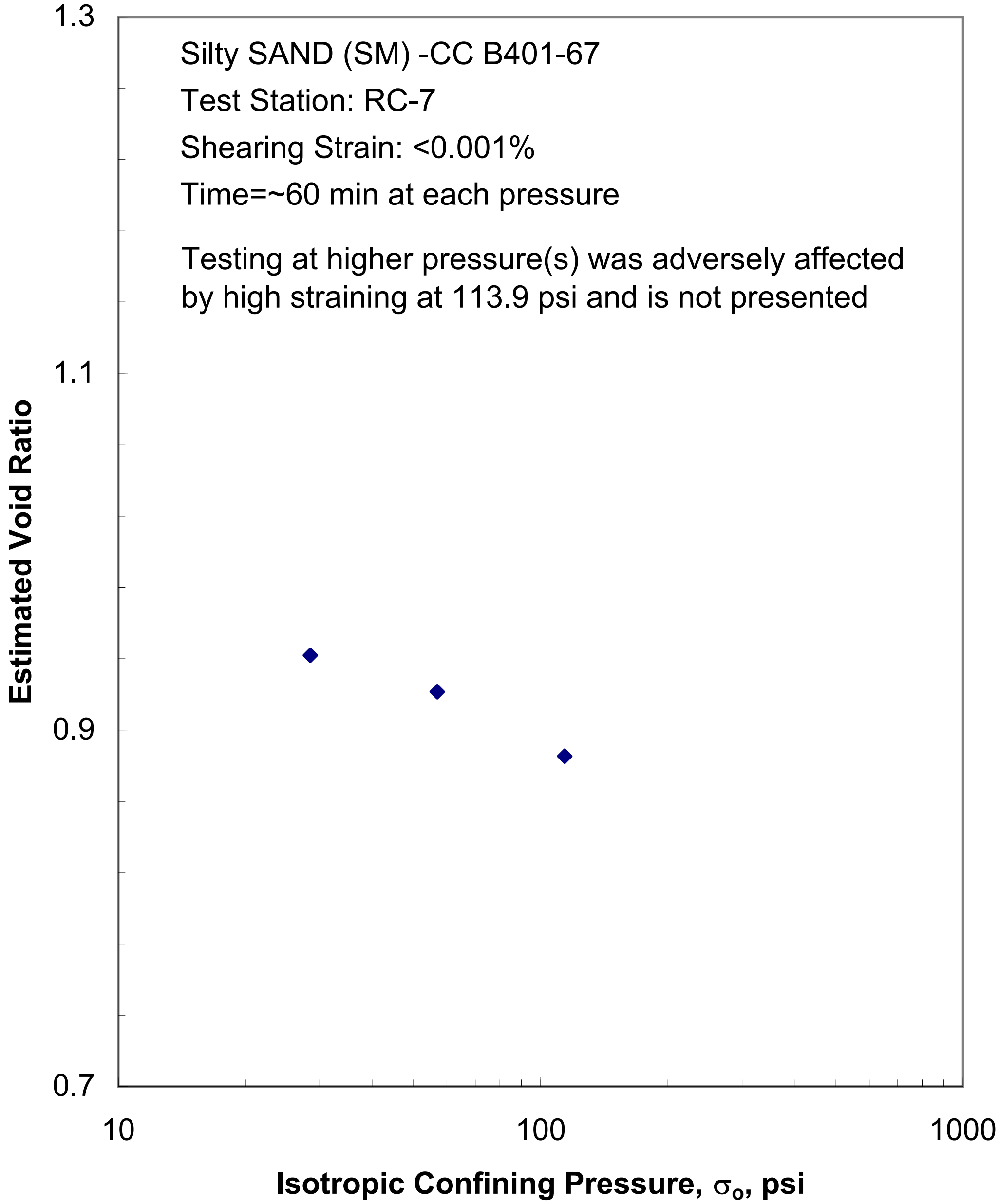


Figure F.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

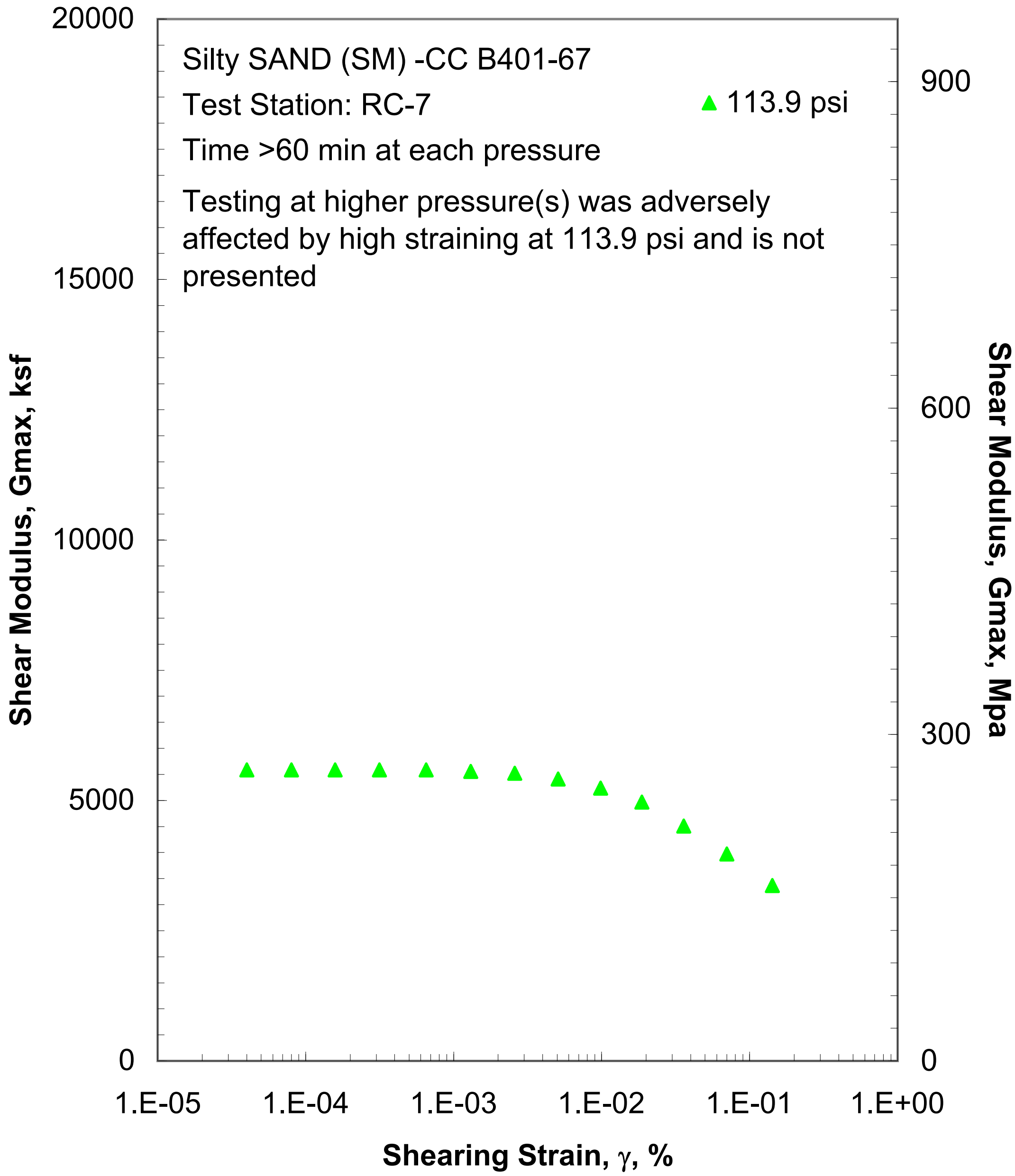


Figure F.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

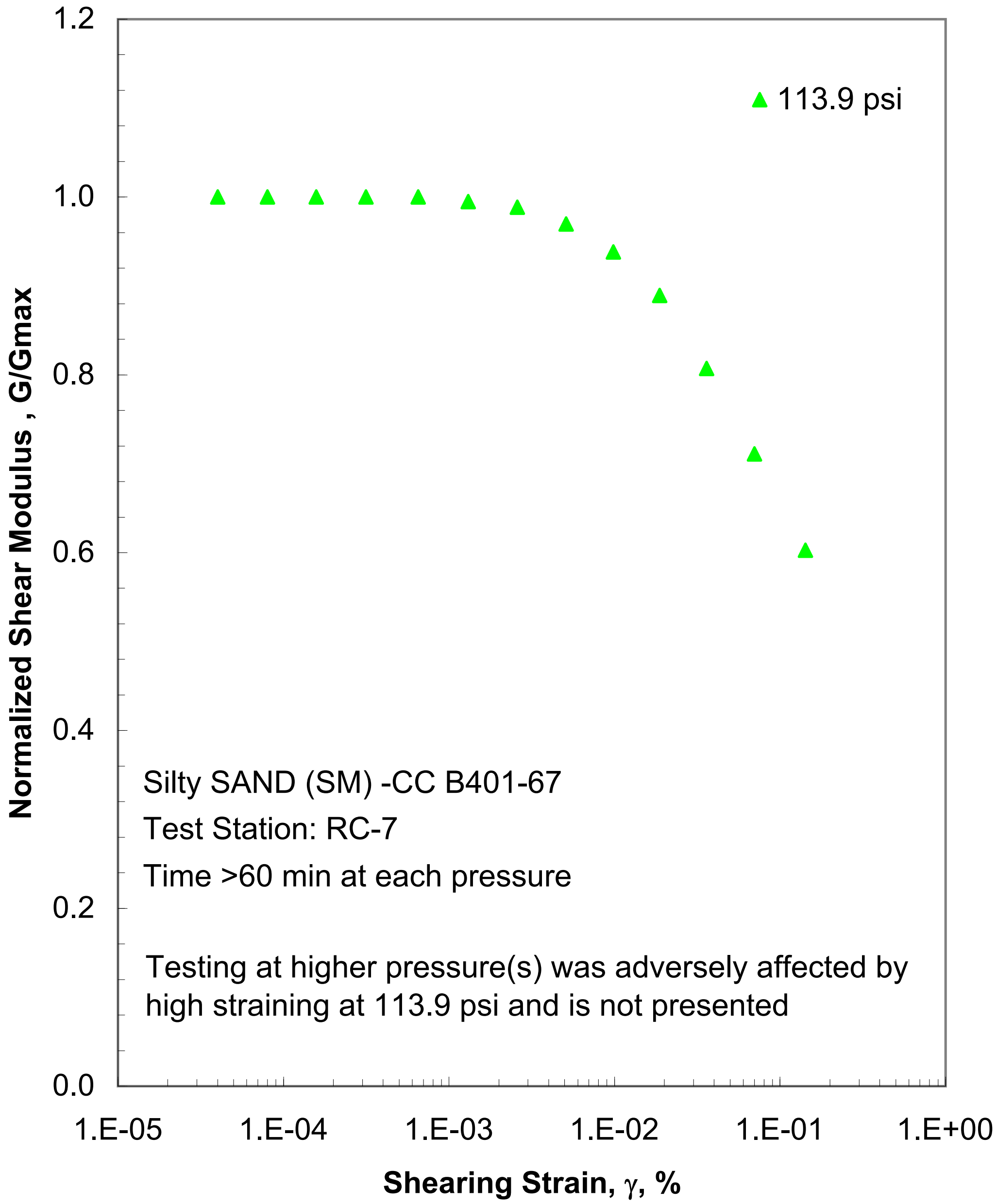


Figure F.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

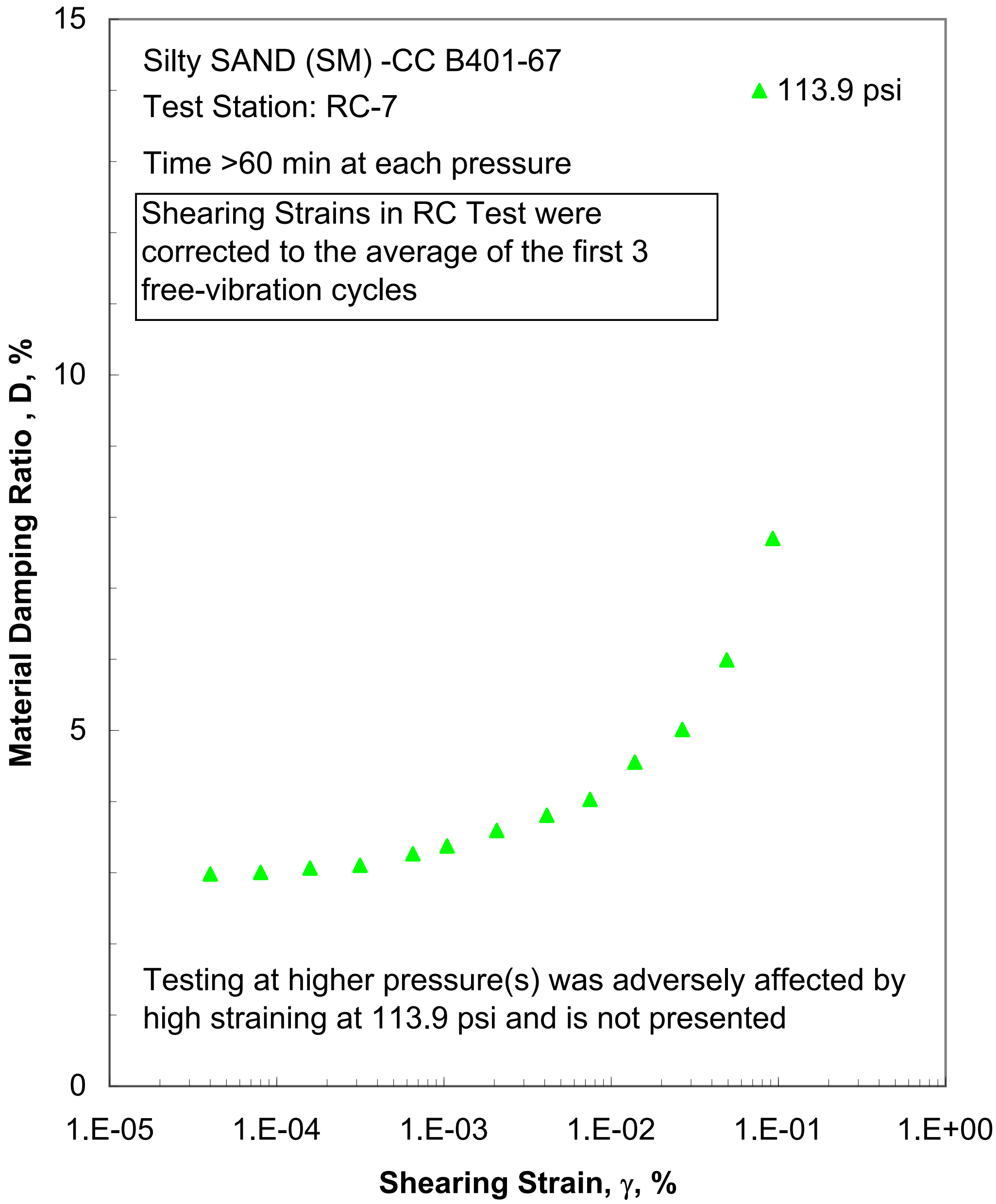


Figure F.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

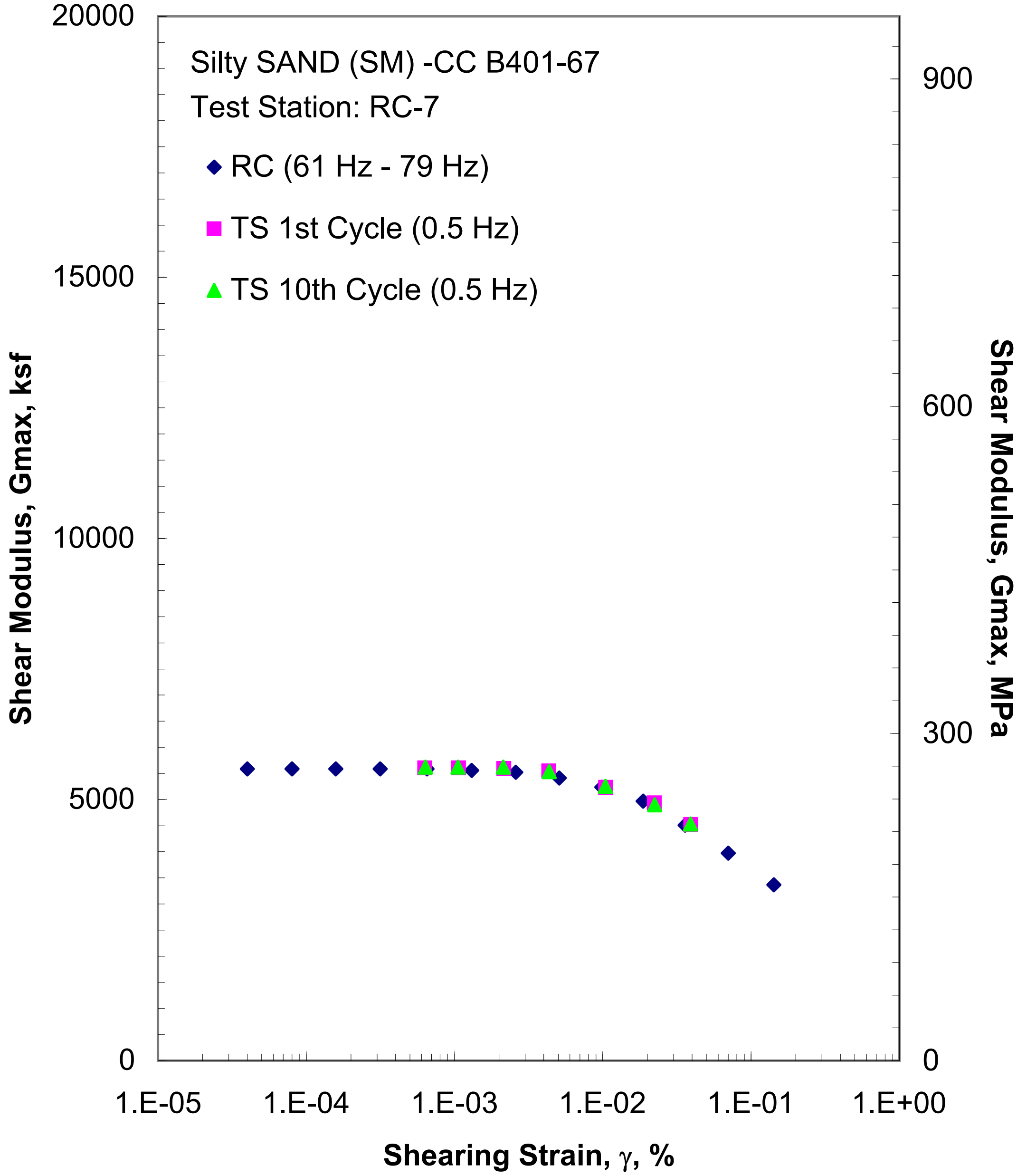


Figure F.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 113.9 psi from the Combined RCTS Tests

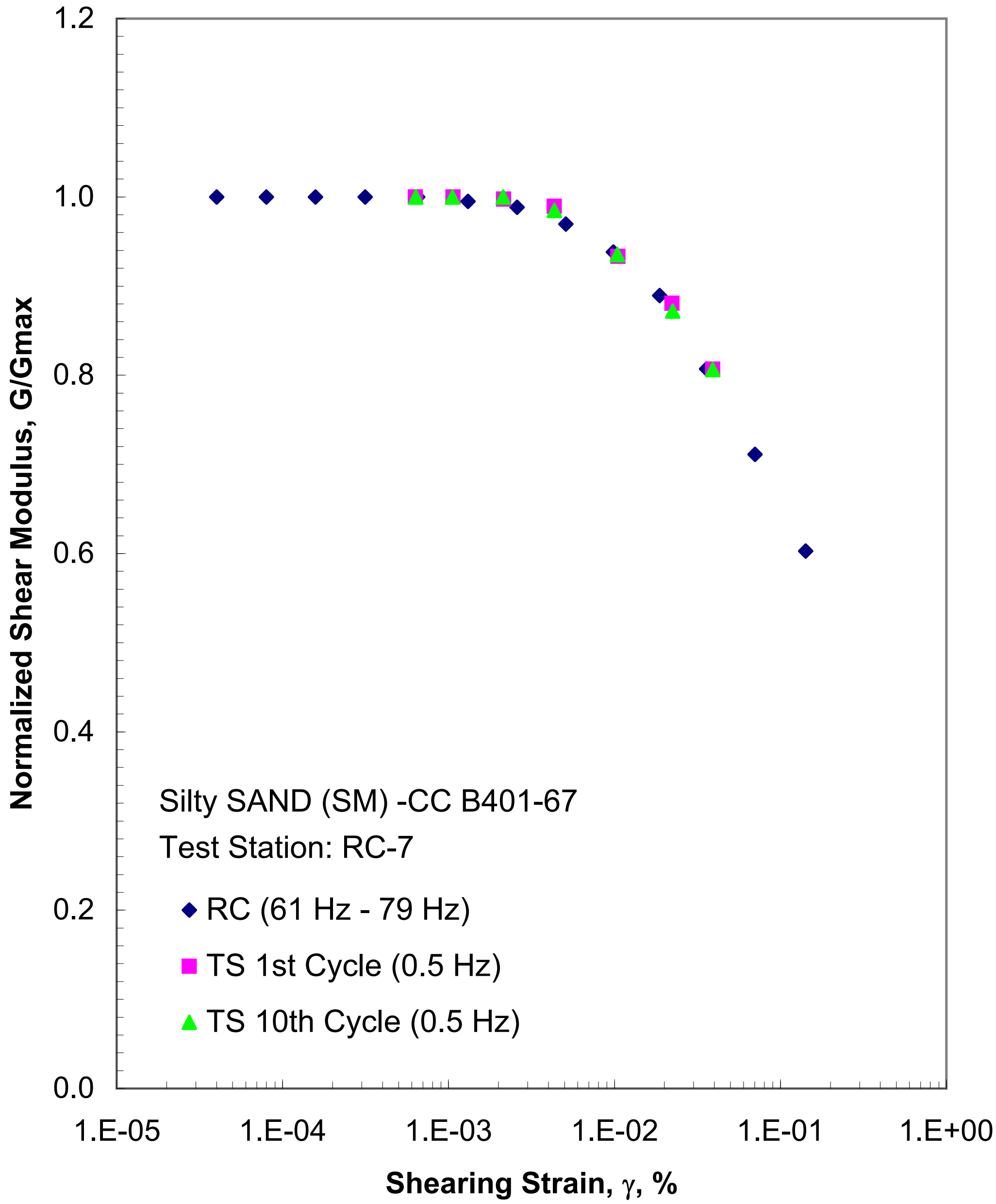


Figure F.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 113.9 psi from the Combined RCTS Tests

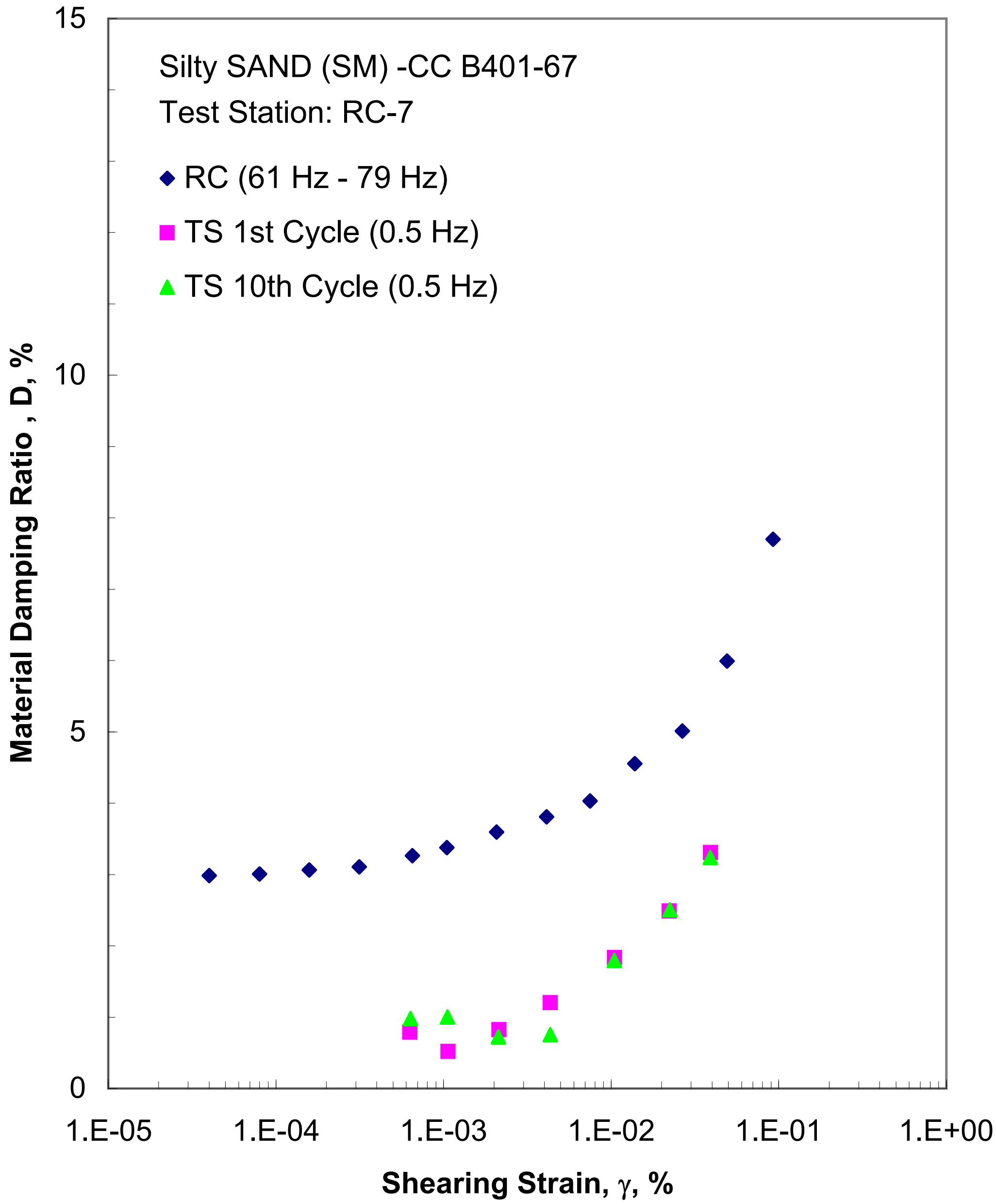


Figure F.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 113.9 psi from the Combined RCTS Tests

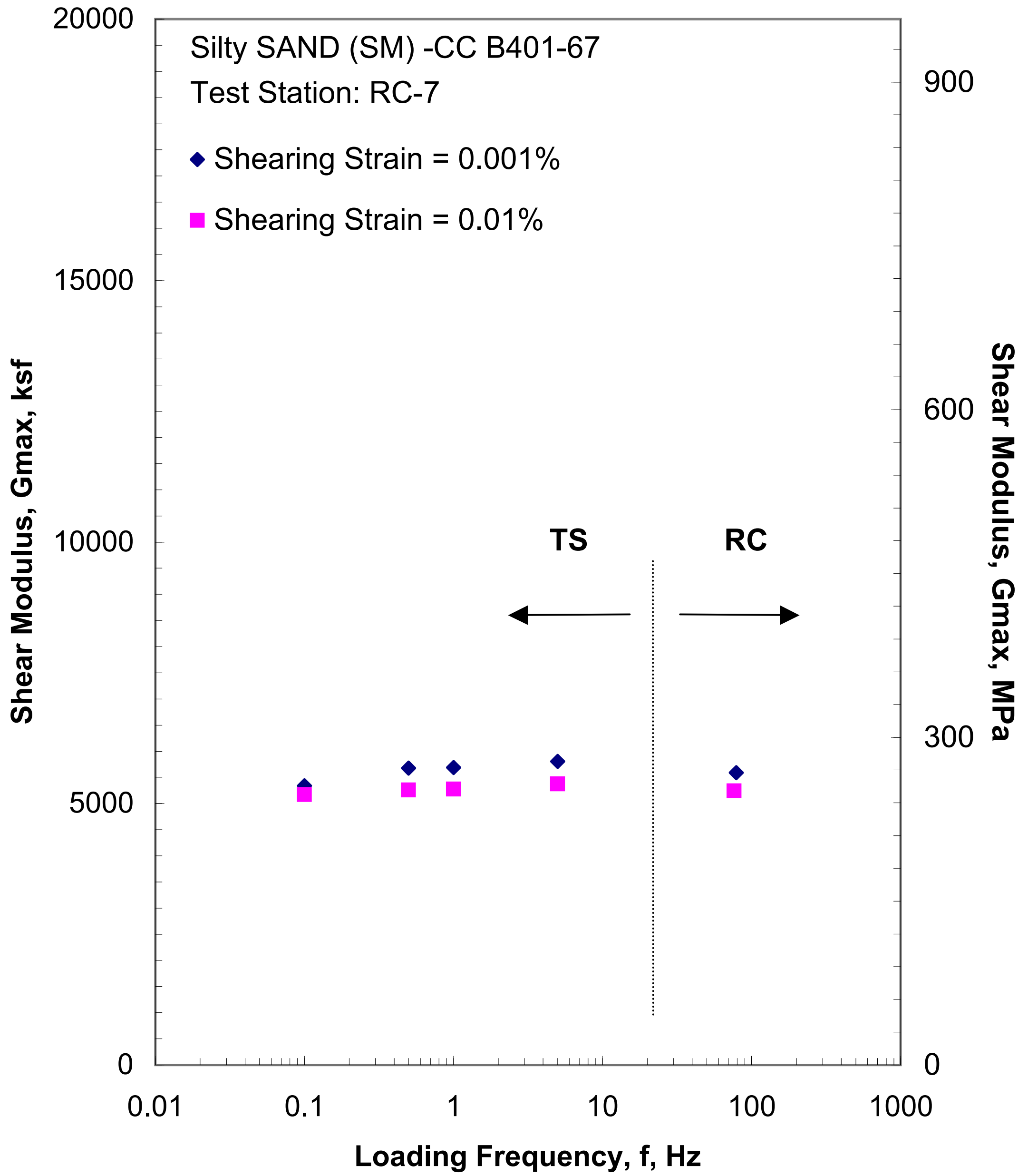


Figure F.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 113.9 psi from the Combined RCTS Tests

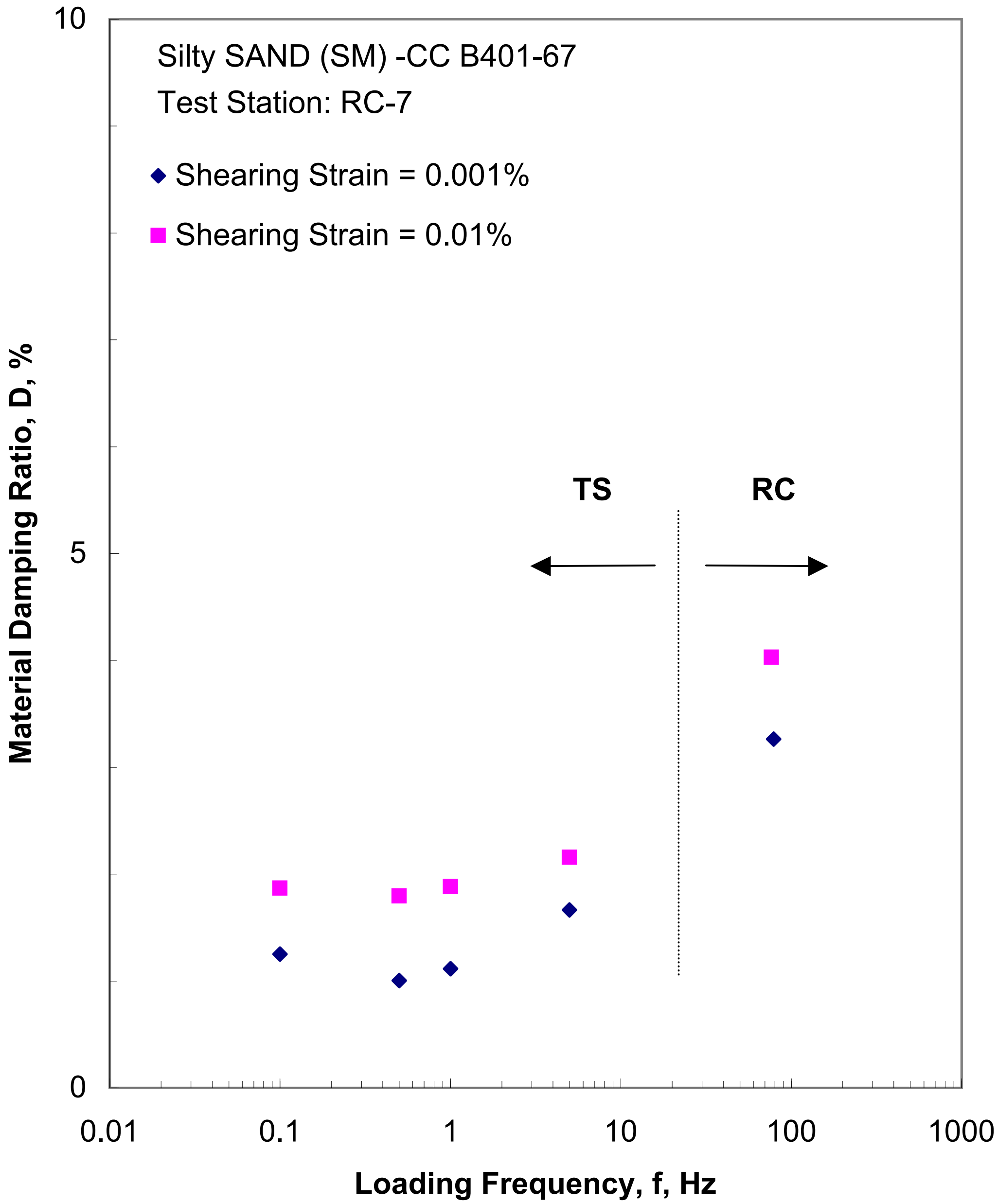


Figure F.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 113.9 psi from the Combined RCTS Tests

NOTE: Figures F.16 through F.20 are NOT available[1].

[1] Figures F.16 through F.20 are not provided because testing at higher pressure(s) was adversely affected by high straining at 113.9 psi.

Table F.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 CC B401-UD67

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)	(%)	
28.5	4104	196	2793	134	874	3.34	0.942
56.9	8194	392	3798	182	1014	3.25	0.921
113.9	16402	785	5447	261	1202	3.15	0.885

Table F.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B401-UD67; Isoptropic Confining Pressure, σ_o=113.9 psi (16.4 ksf = 785 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio^x, D, %
4.00E-05	5584	1.00	4.00E-05	2.98
8.00E-05	5584	1.00	8.00E-05	3.01
1.58E-04	5584	1.00	1.58E-04	3.07
3.15E-04	5584	1.00	3.15E-04	3.11
6.52E-04	5584	1.00	6.52E-04	3.27
1.31E-03	5556	0.99	1.05E-03	3.38
2.59E-03	5520	0.99	2.07E-03	3.60
5.09E-03	5414	0.97	4.12E-03	3.81
9.84E-03	5240	0.94	7.48E-03	4.03
1.87E-02	4967	0.89	1.39E-02	4.55
3.59E-02	4508	0.81	2.66E-02	5.01
7.02E-02	3972	0.71	4.91E-02	5.99
1.42E-01	3365	0.60	9.24E-02	7.70

+ 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 F.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B401-UD67; Isotropic Confining Pressure, σ_o= 113.9 psi (16.4 ksf = 785 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, %
6.31E-04	5606	1.00	0.79	6.36E-04	5621	1.00	0.98
1.07E-03	5606	1.00	0.52	1.06E-03	5621	1.00	1.00
2.15E-03	5592	1.00	0.82	2.13E-03	5621	1.00	0.72
4.34E-03	5545	0.99	1.20	4.34E-03	5535	0.98	0.75
1.05E-02	5232	0.93	1.83	1.04E-02	5257	0.94	1.80
2.22E-02	4936	0.88	2.49	2.24E-02	4901	0.87	2.50
3.92E-02	4523	0.81	3.31	3.91E-02	4532	0.81	3.24

Table F.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B401-UD67; Isoptropic Confining Pressure, σ_o= 455.6 psi (65.6 ksf = 3139 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
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[+] 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 F.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B401-UD67; Isotropic Confining Pressure, σ_o=455.6 psi (65.6 ksf = 3139 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D,	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D, %
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U.S. Standard Sieve Nos.

3" 3/4" 4 10 40 100 200

PERCENT FINER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

100 10 1 0.1 0.01 0.001

GRAIN SIZE (mm)

GRAVEL SAND SILT OR CLAY

GRADATION CURVE

ASTM D422

Project:	Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland	Contract No.: 06120048.00	Date: 10/5/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-401	348.5-350.5	SILTY SAND, brown	SM	52	13

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APPENDIX G

CC B401-UD48
ELASTIC SILT (MH), with sand, green*
(LL=139, PL=88, PI=51; Gs=2.48)*

Borehole B-401
Sample UD48
Sample Depth = 228.5 to 229.6 ft
RCTS Test Depth = 229.0 ft
Total Unit Weight = 98.2 lb/ft^3
Water Content = 58.6 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 70.3 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

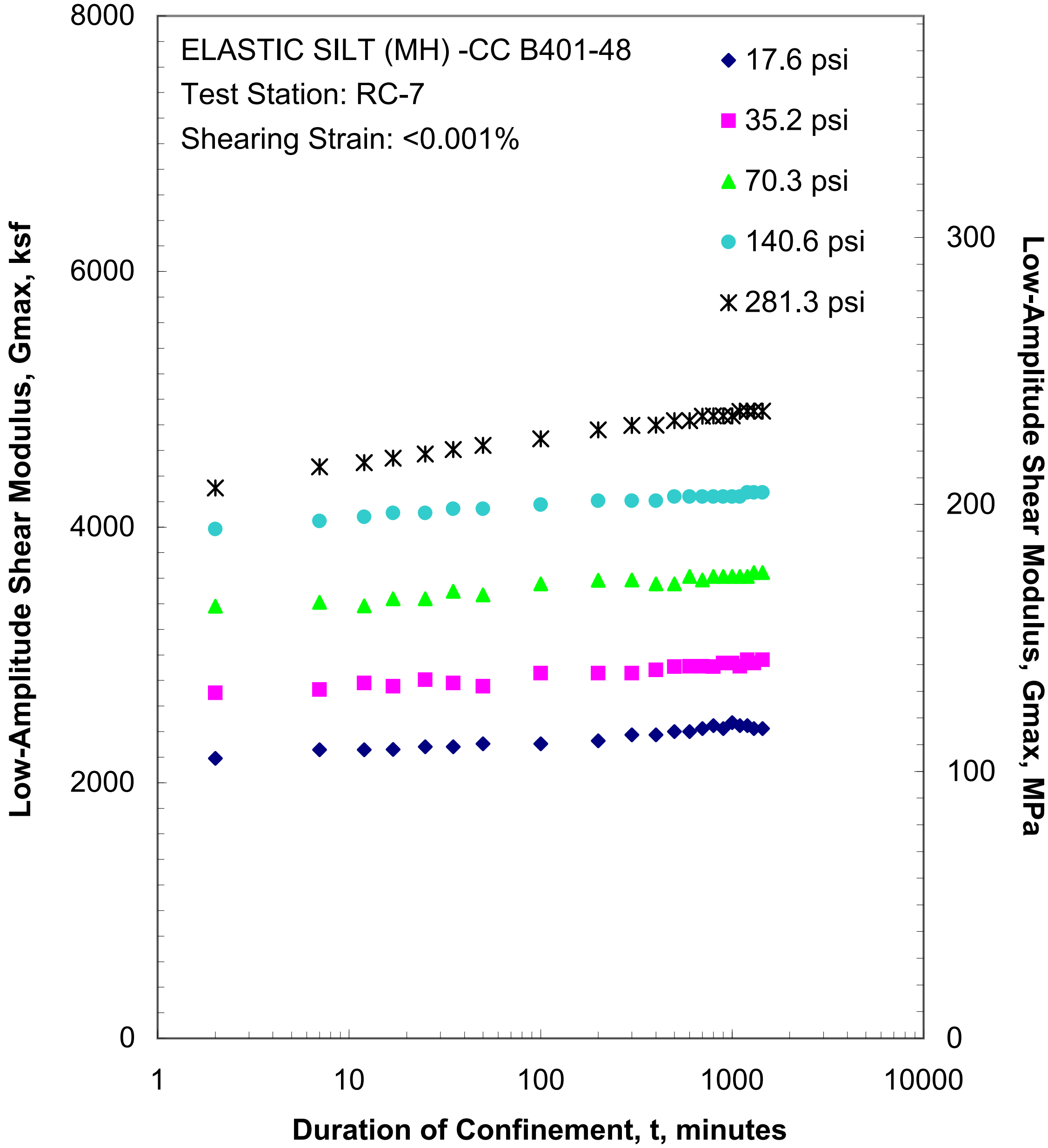

Figure G.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

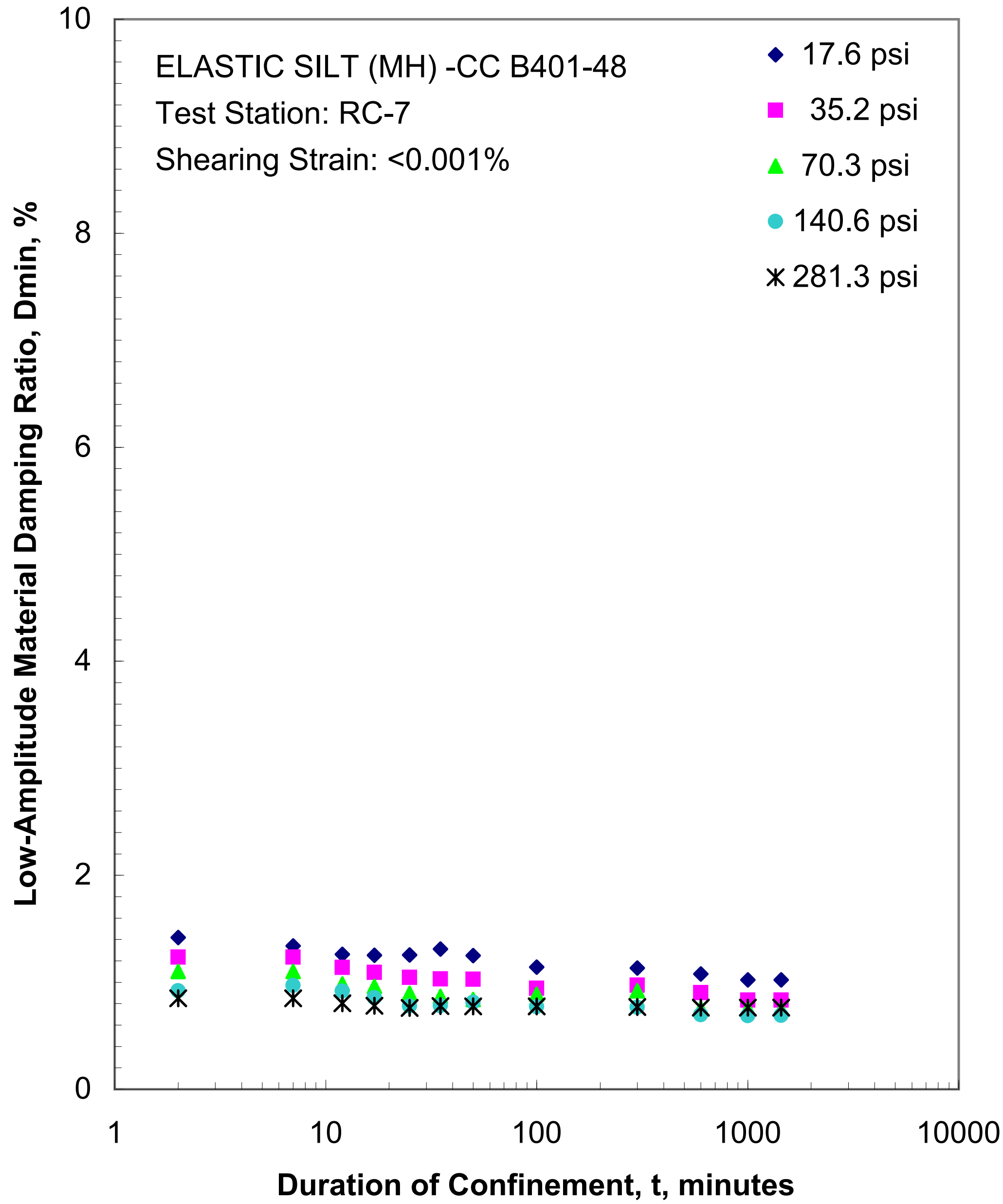

Figure G.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

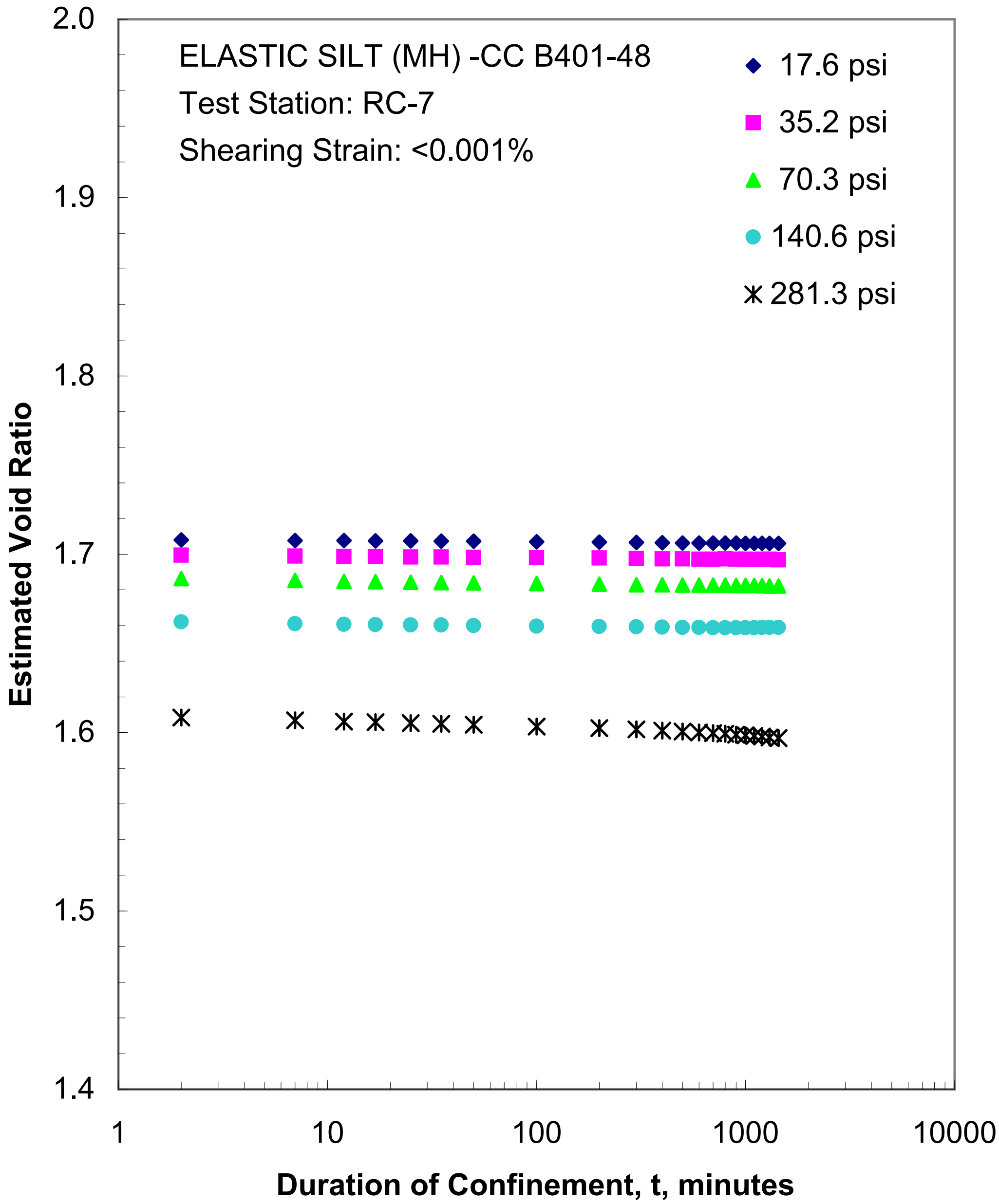

Figure G.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

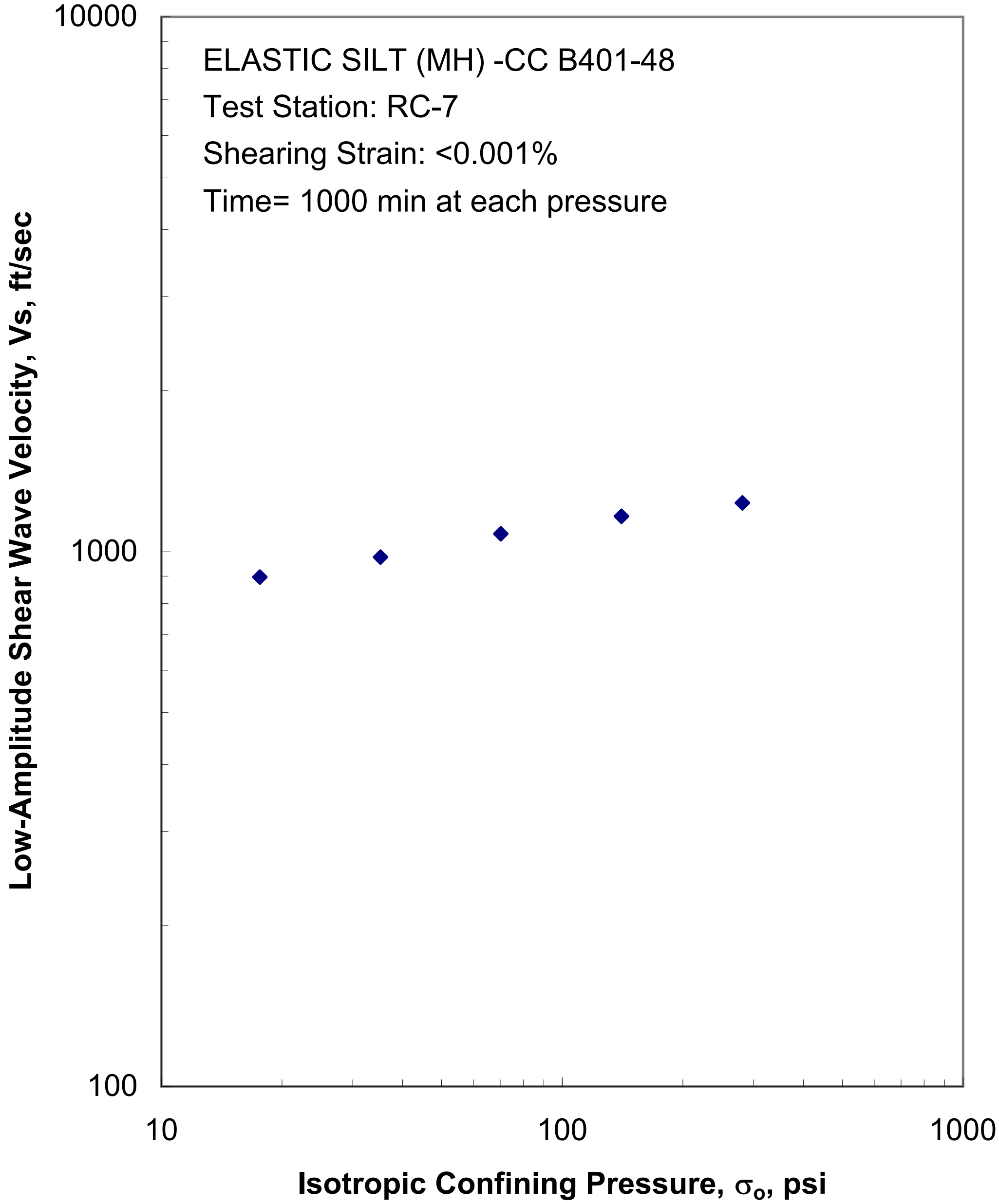

Figure G.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

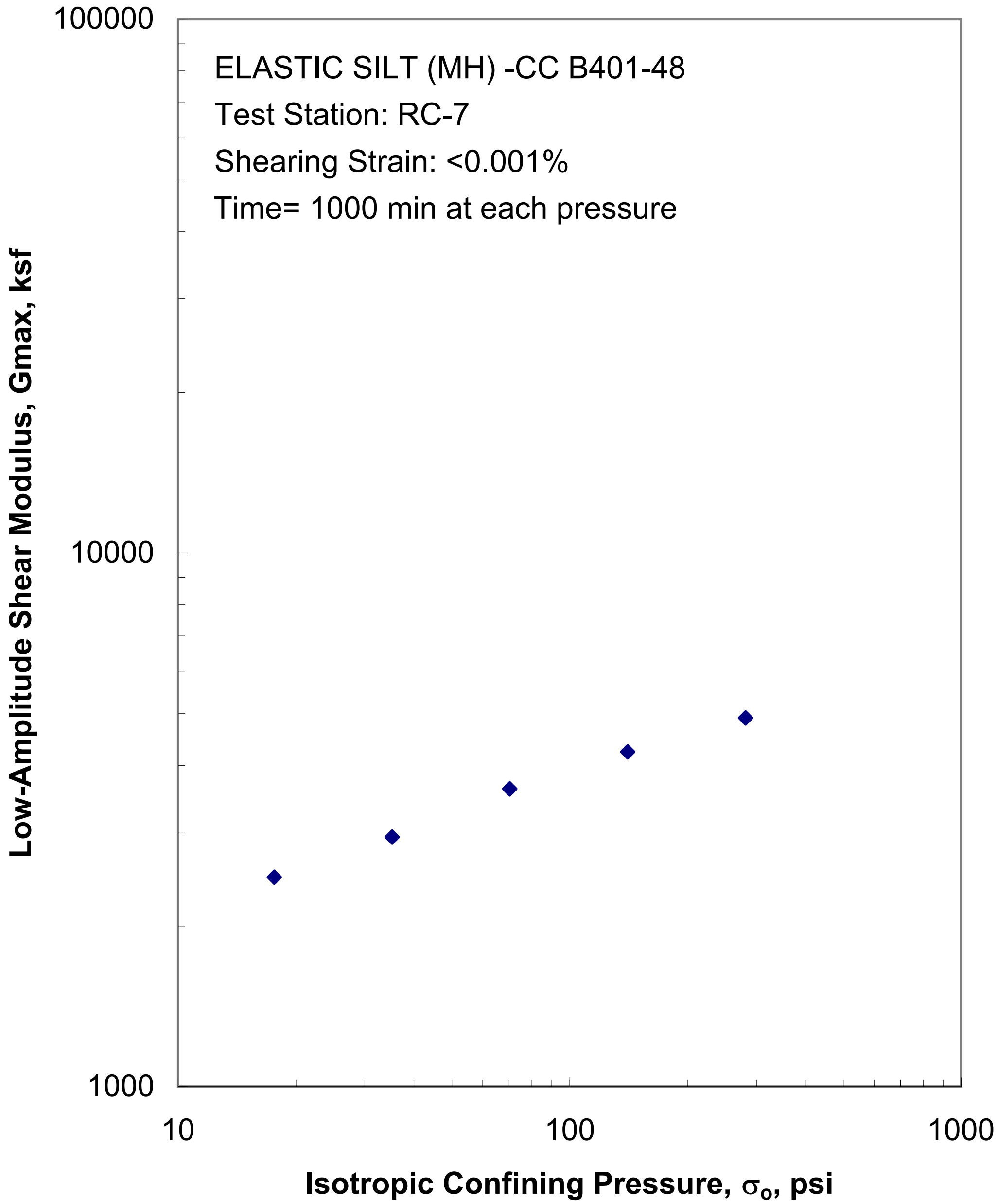

Figure G.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

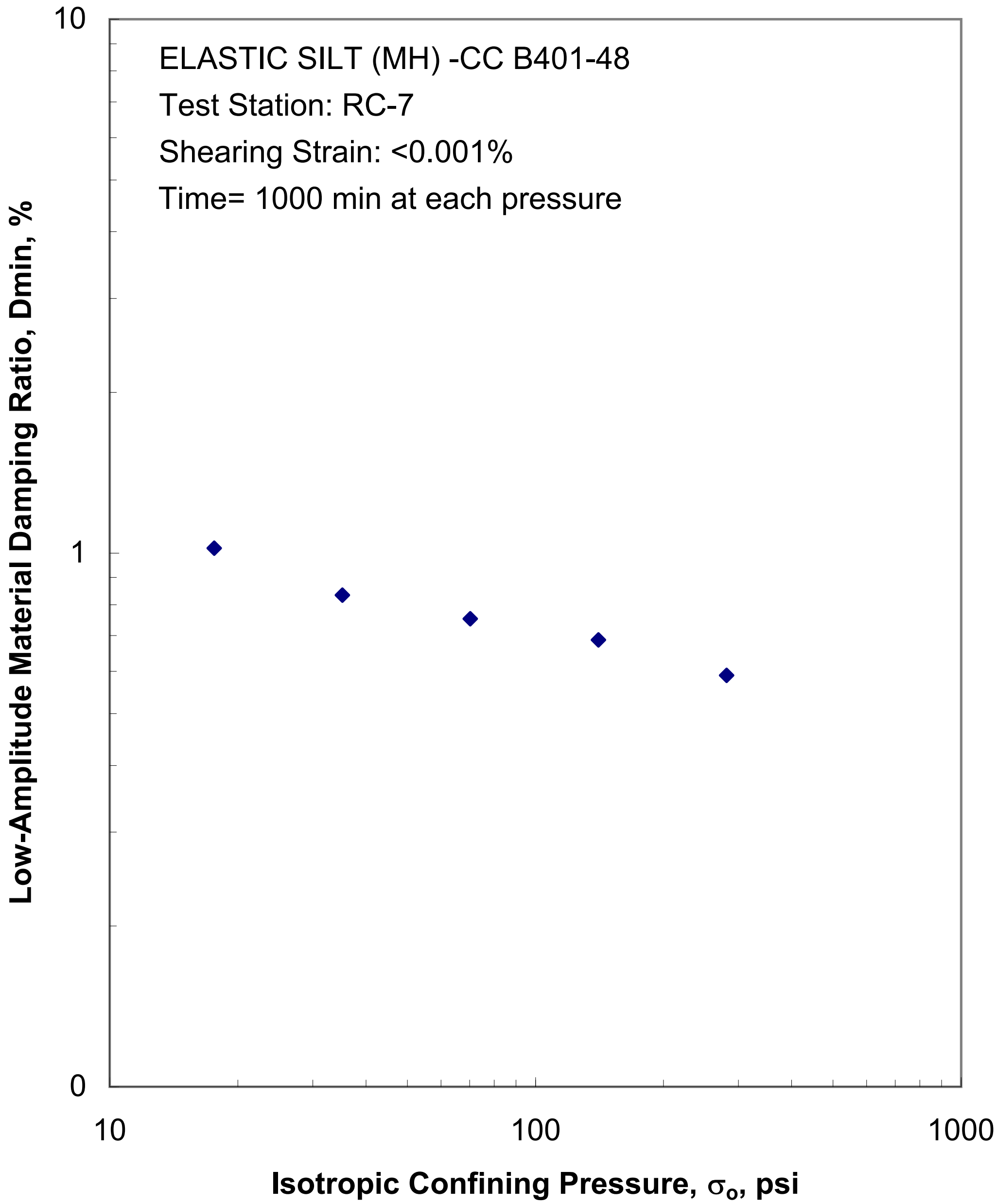

Figure G.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

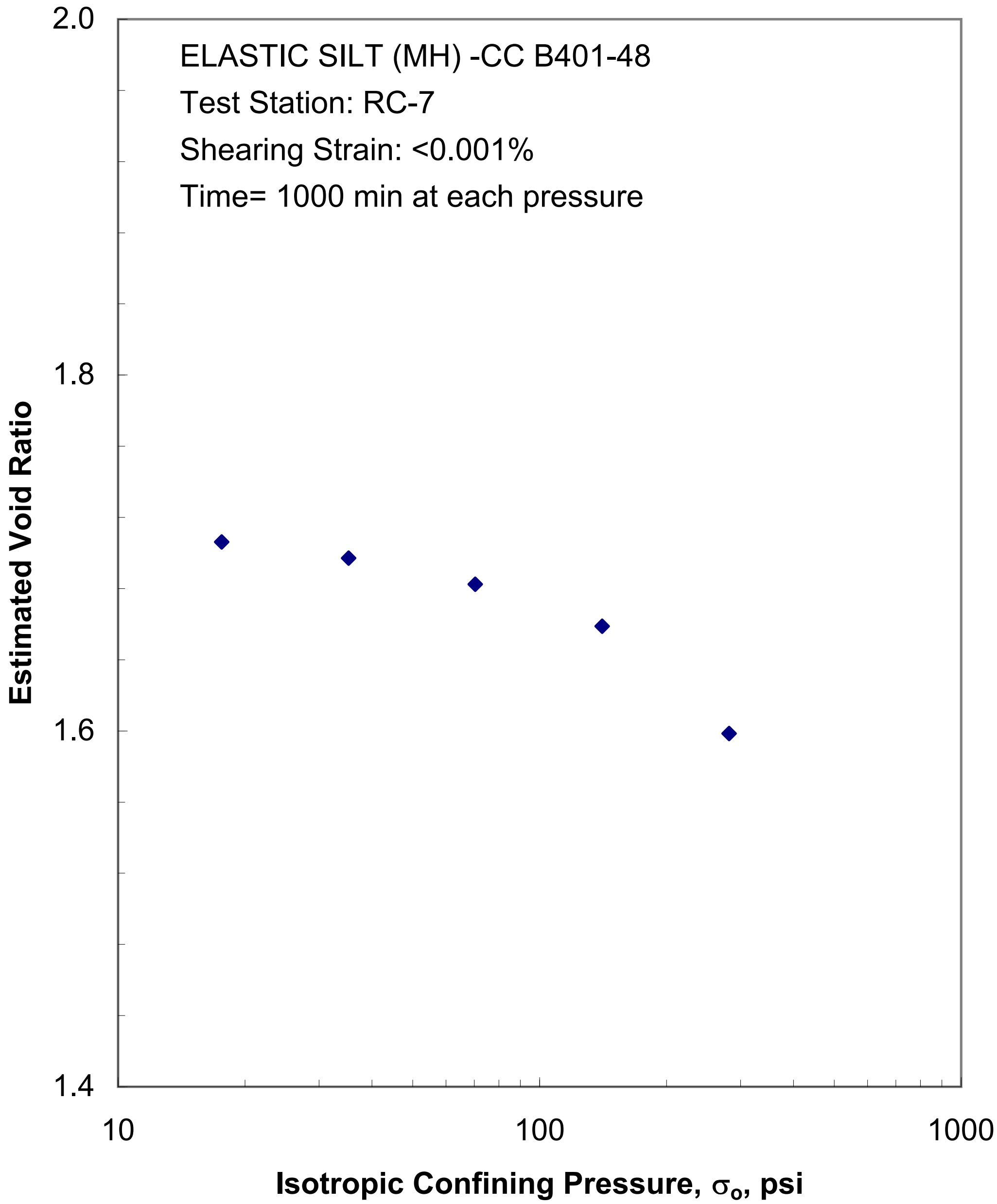

Figure G.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

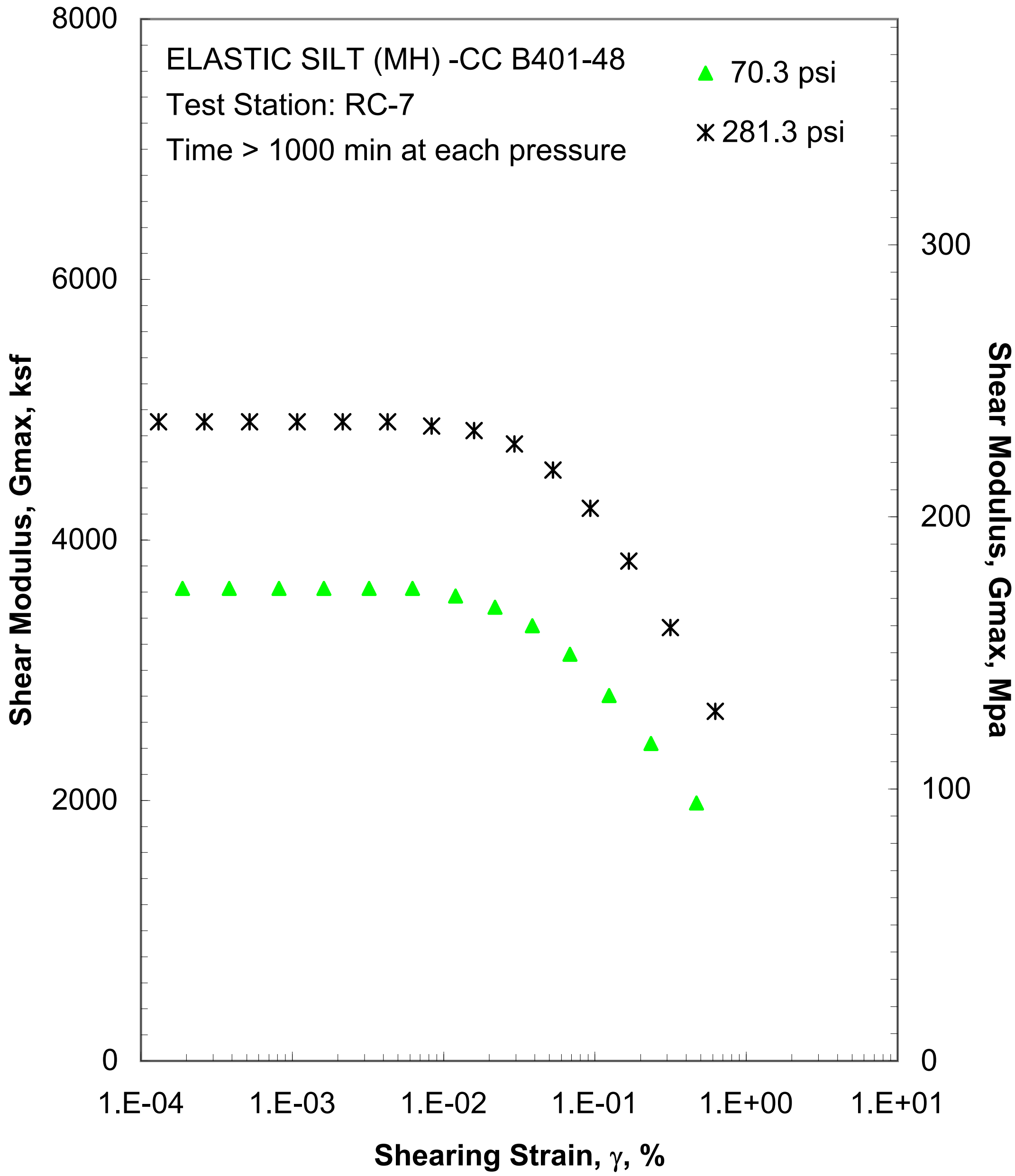

Figure G.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

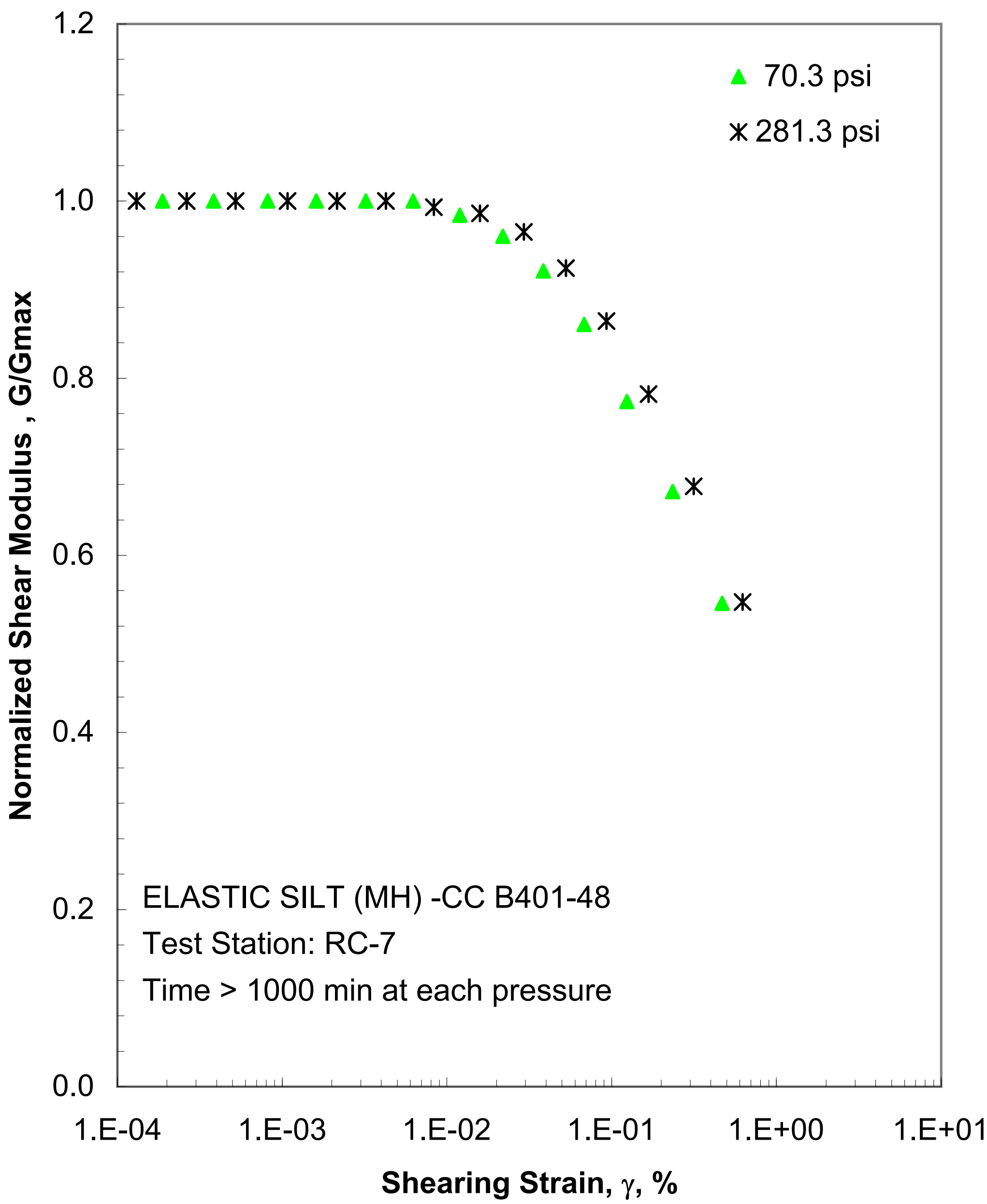

Figure G.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

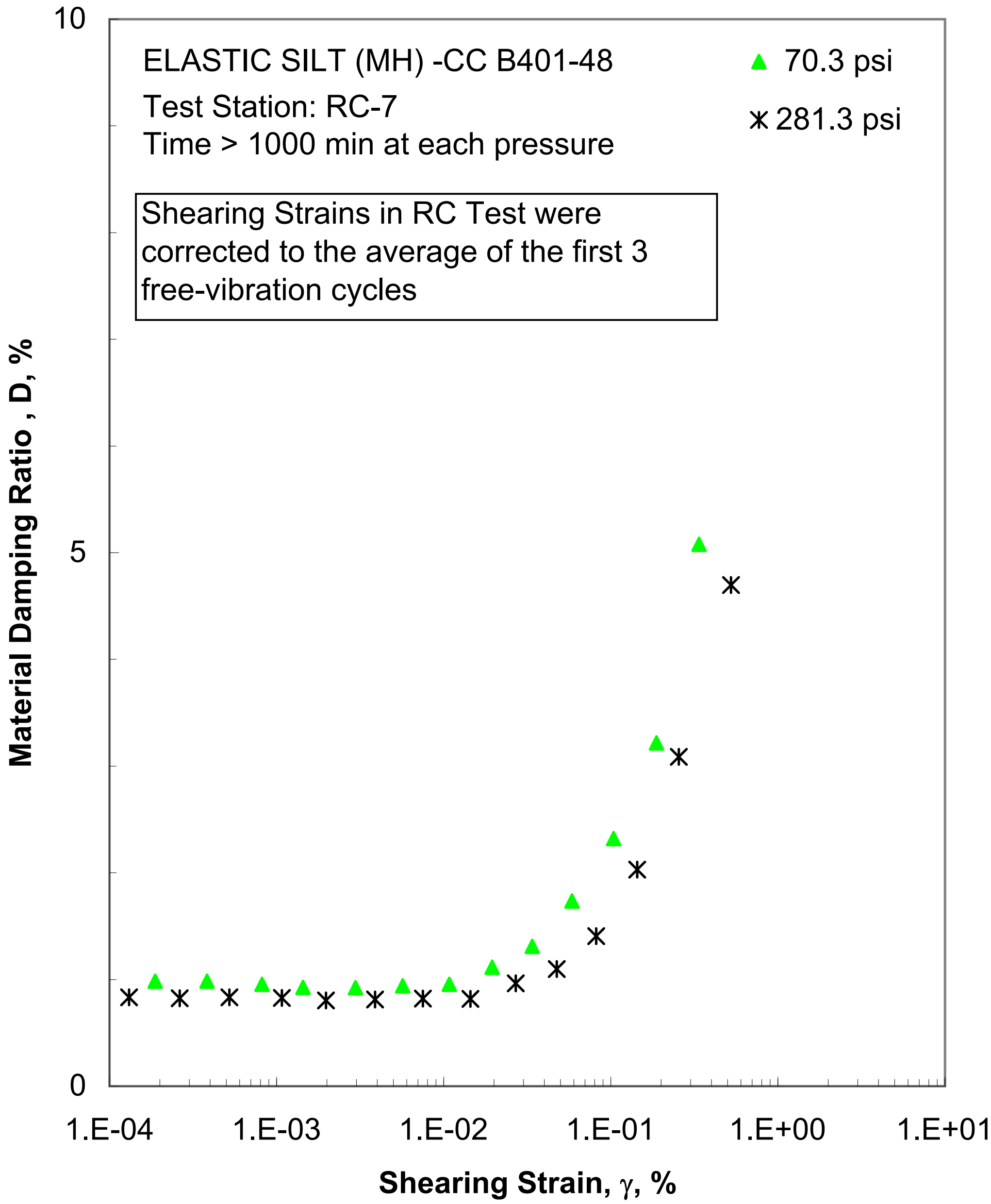

Figure G.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

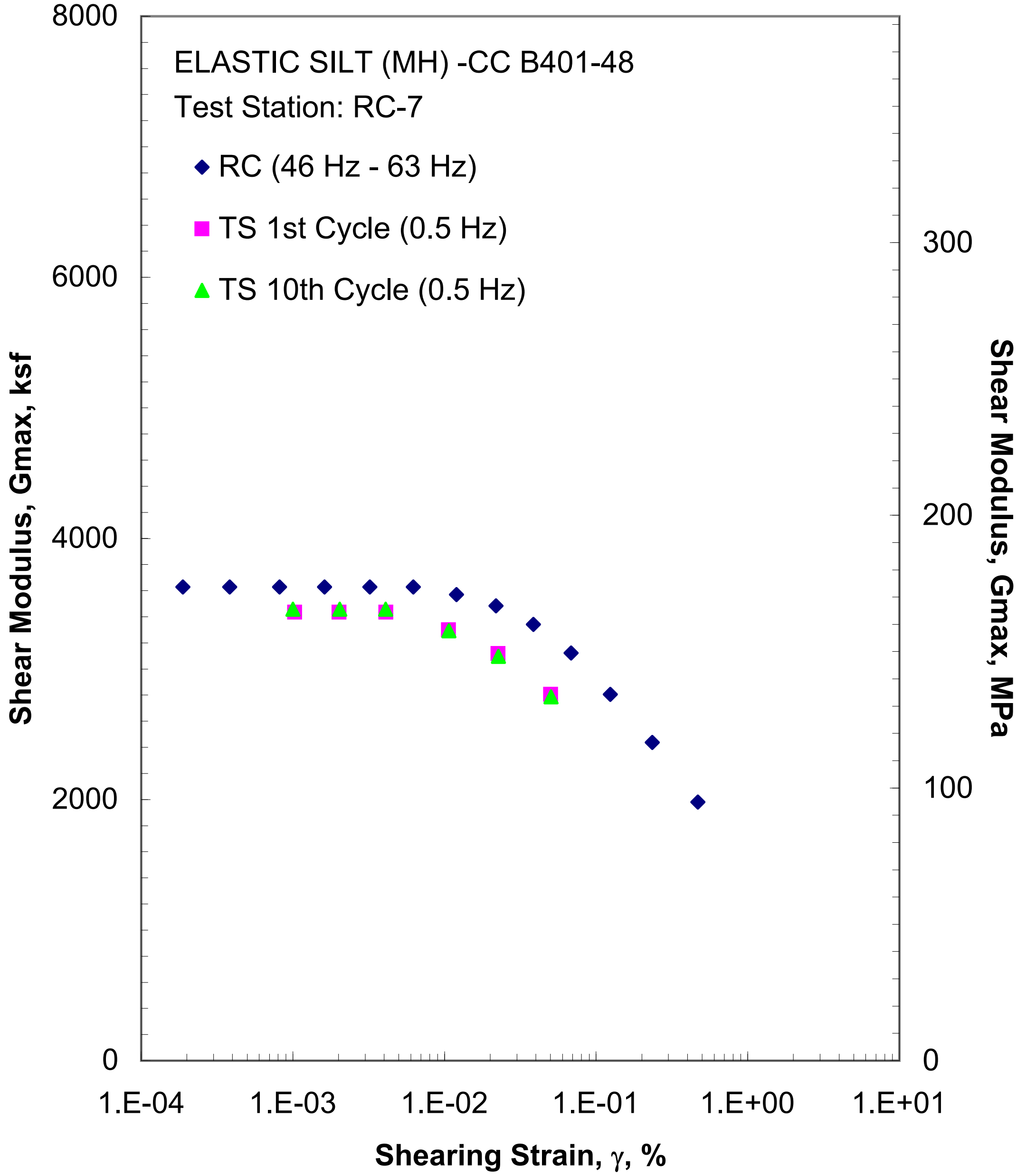

Figure G.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 70.3 psi from the Combined RCTS Tests

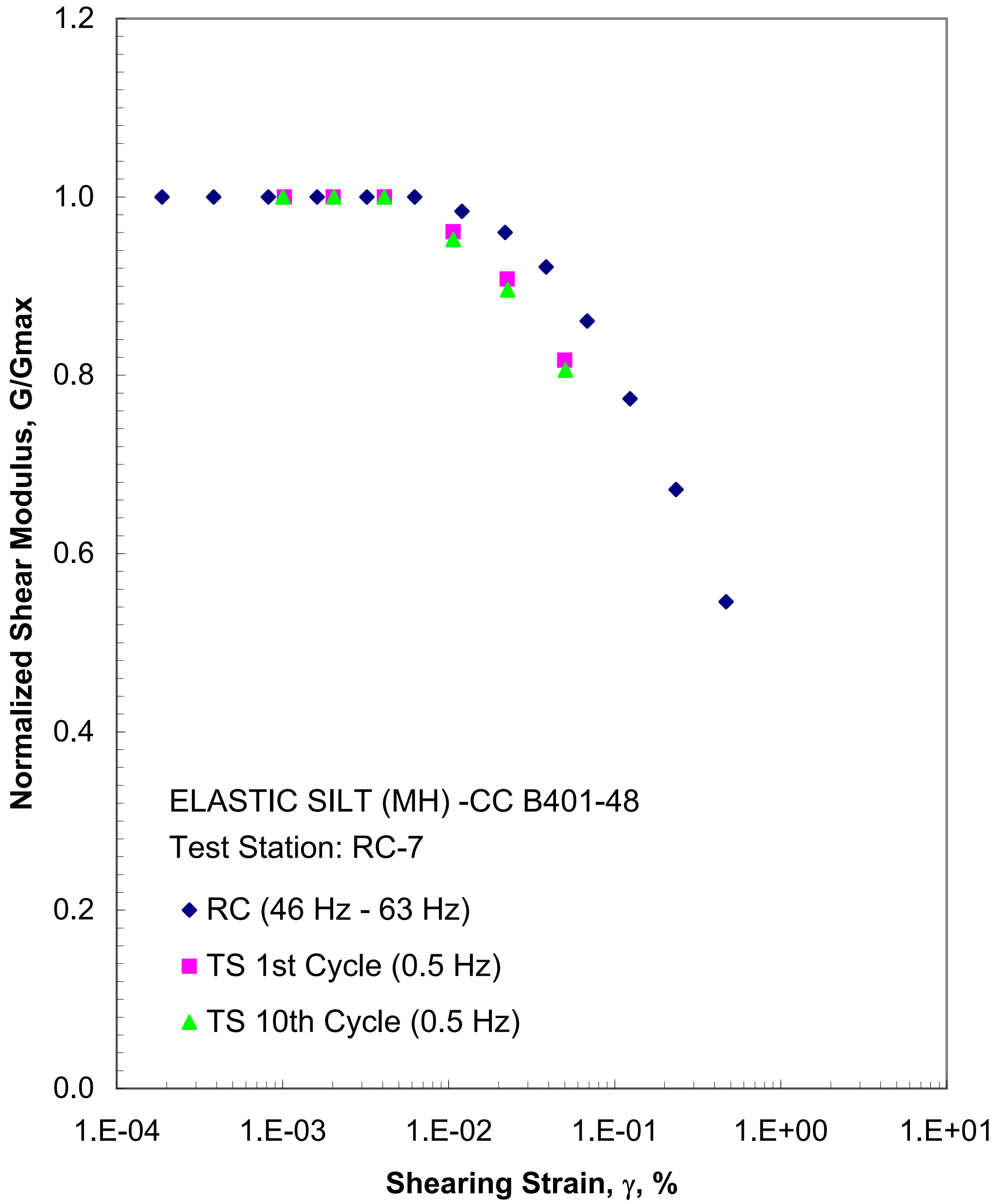

Figure G.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 70.3 psi from the Combined RCTS Tests

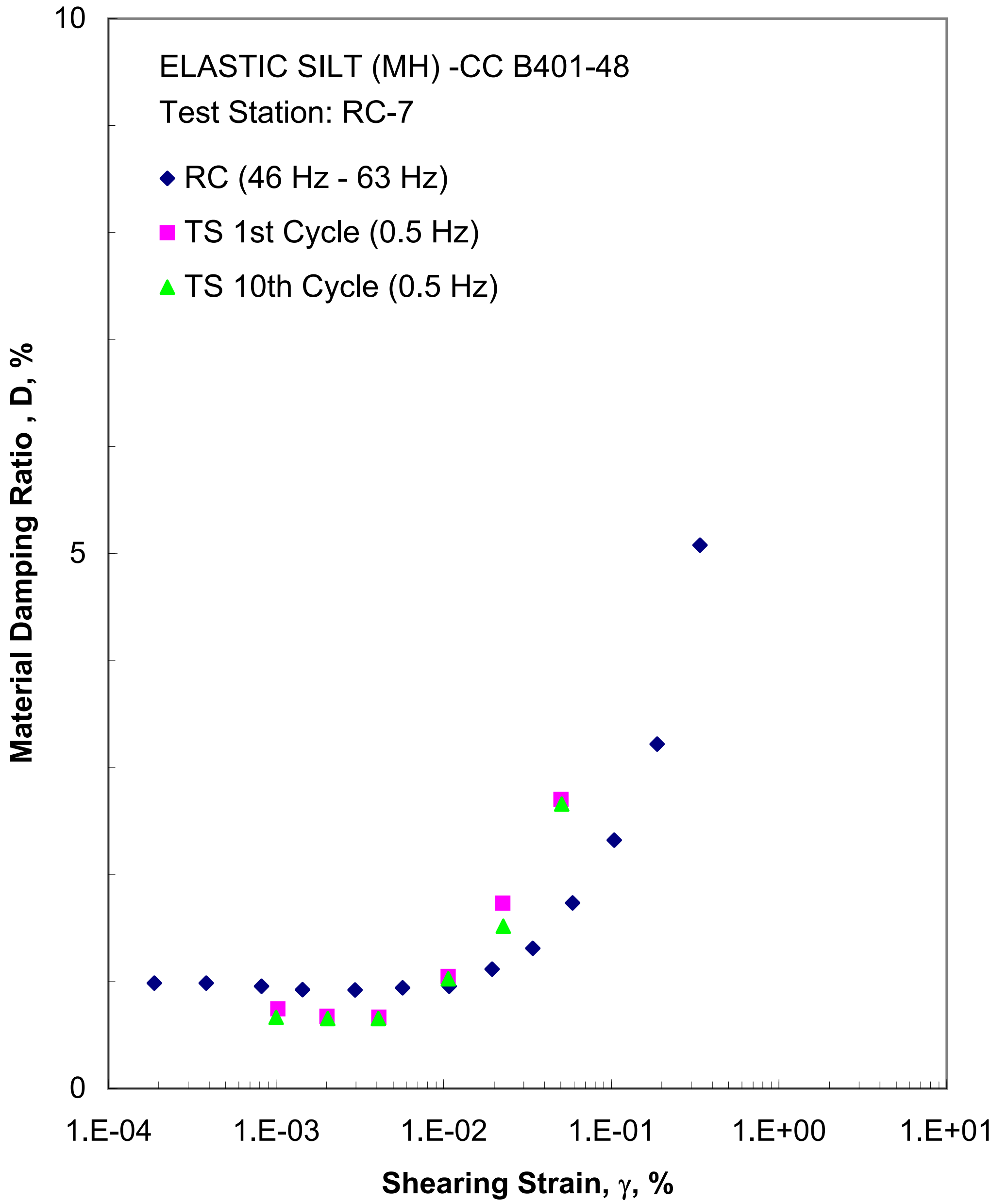

Figure G.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 70.3 psi from the Combined RCTS Tests

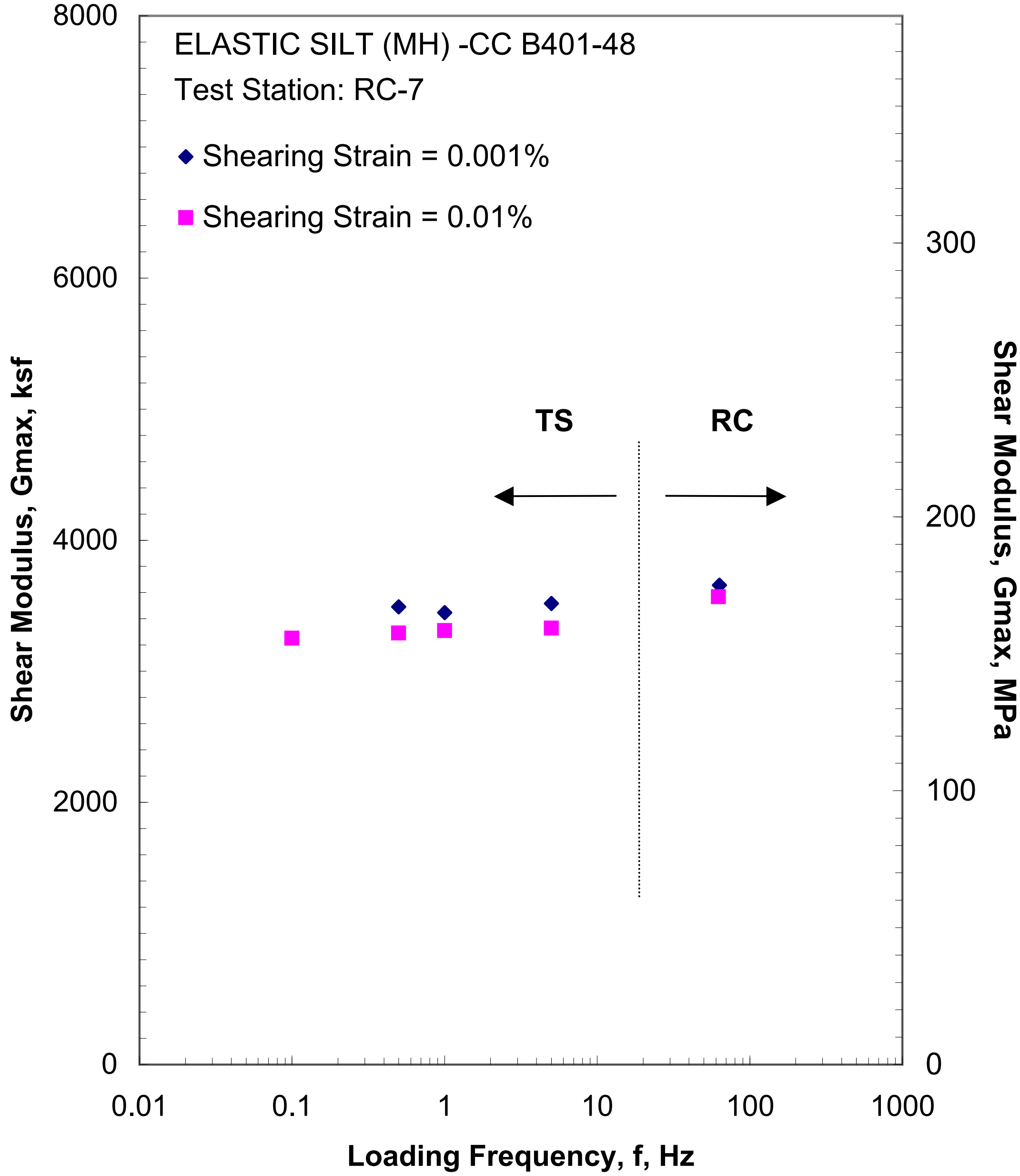

Figure G.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 70.3 psi from the Combined RCTS Tests

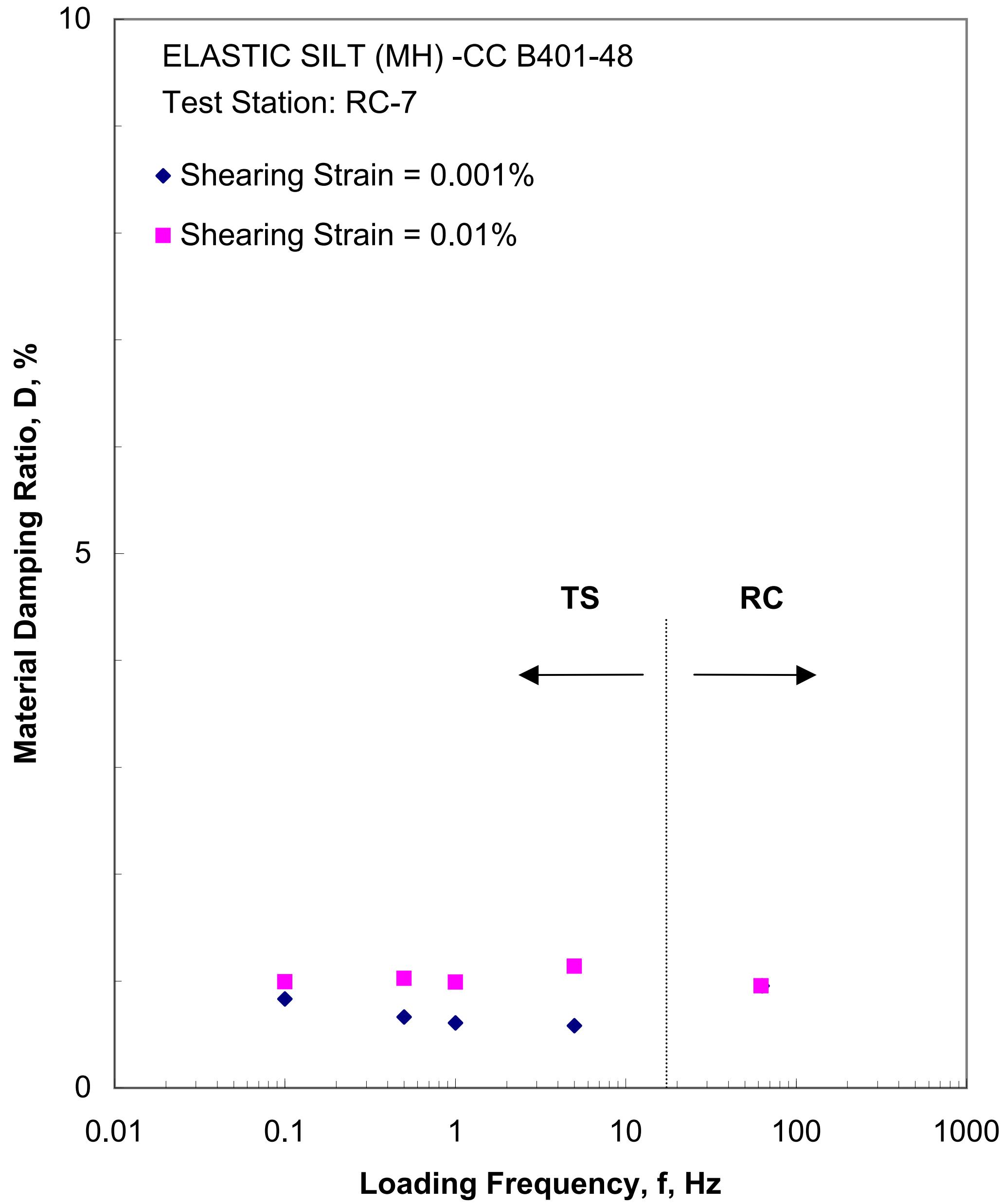

Figure G.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 70.3 psi from the Combined RCTS Tests

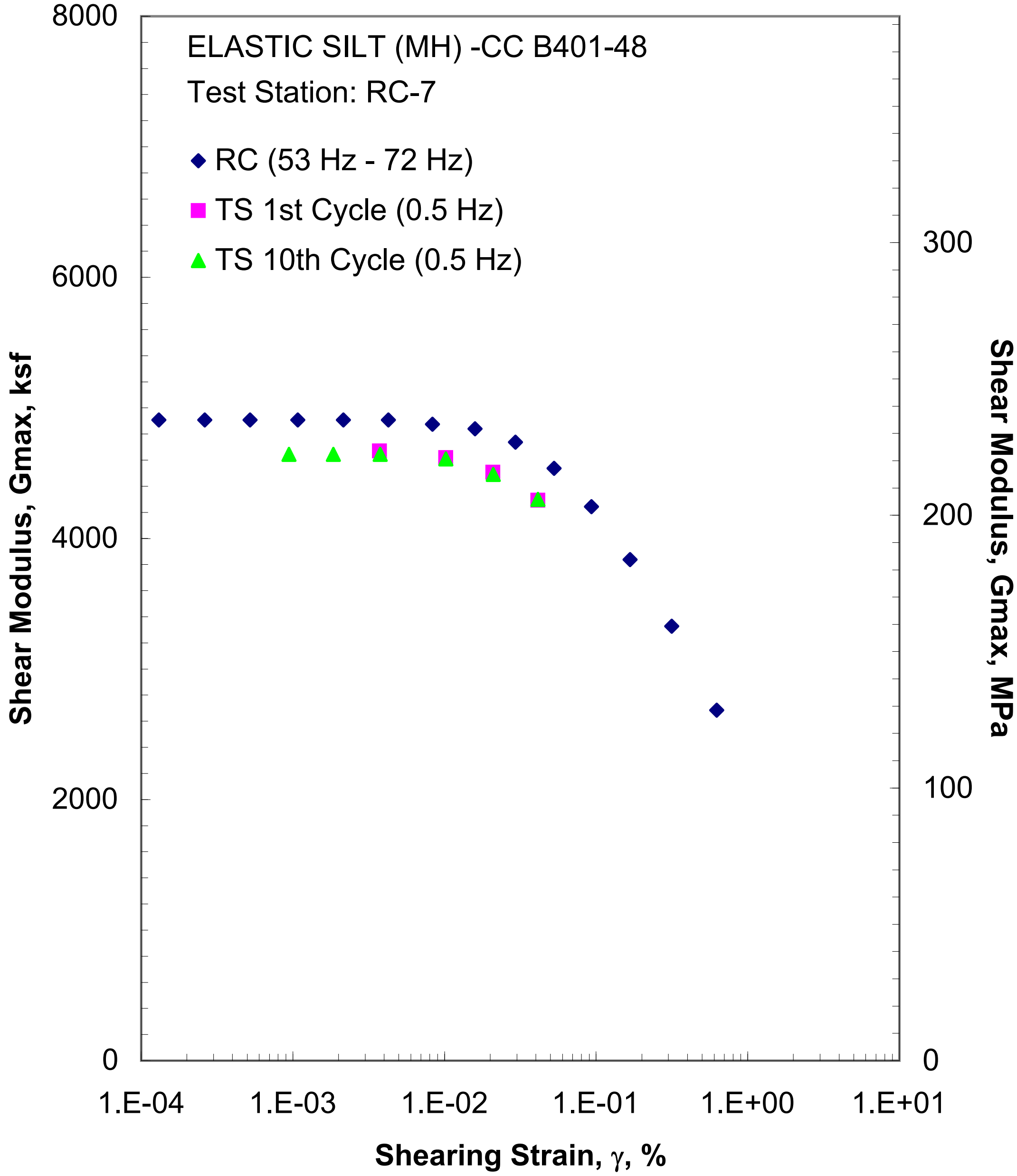

Figure G.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 281.3 psi from the Combined RCTS Tests

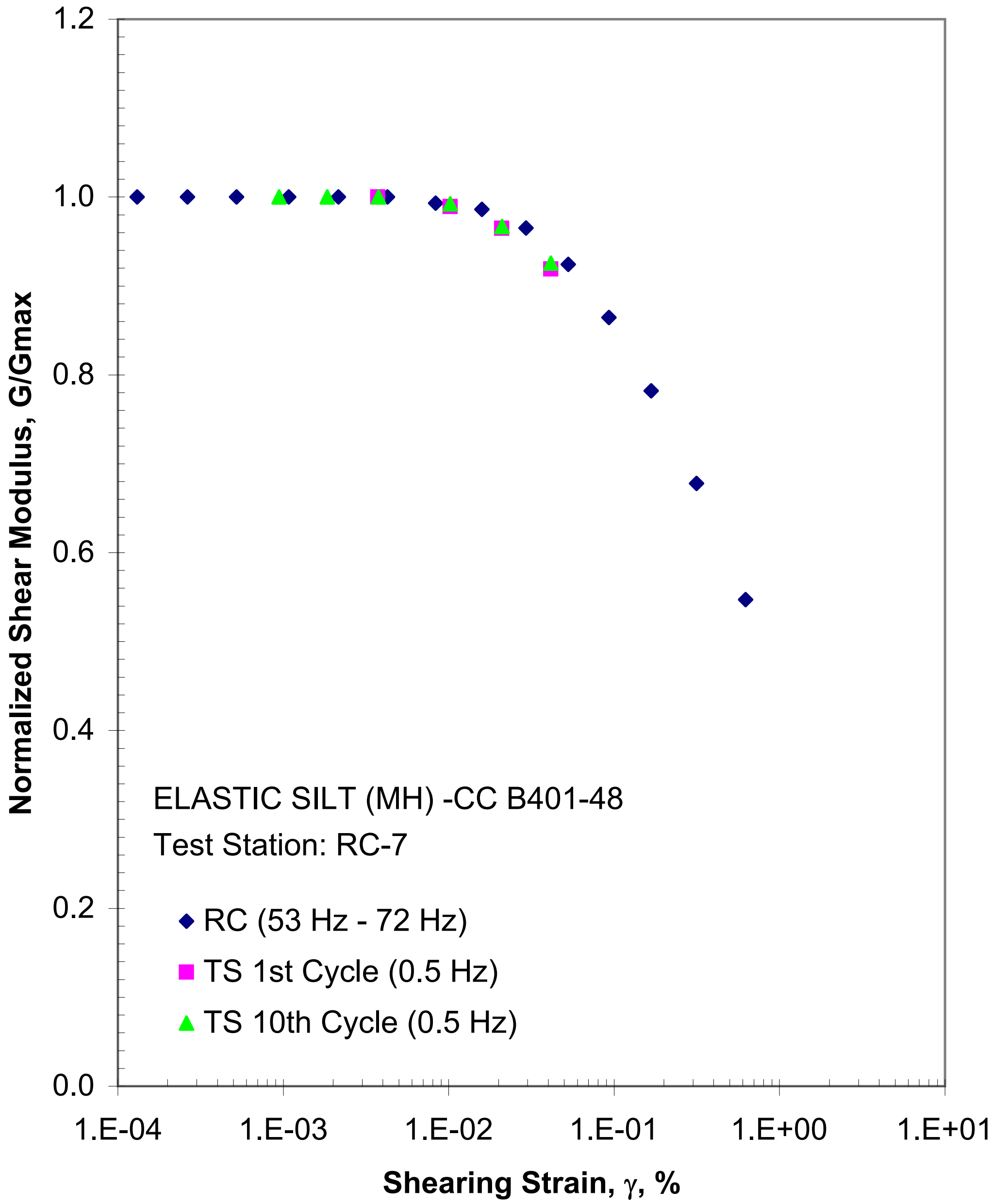

Figure G.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 281.3 psi from the Combined RCTS Tests

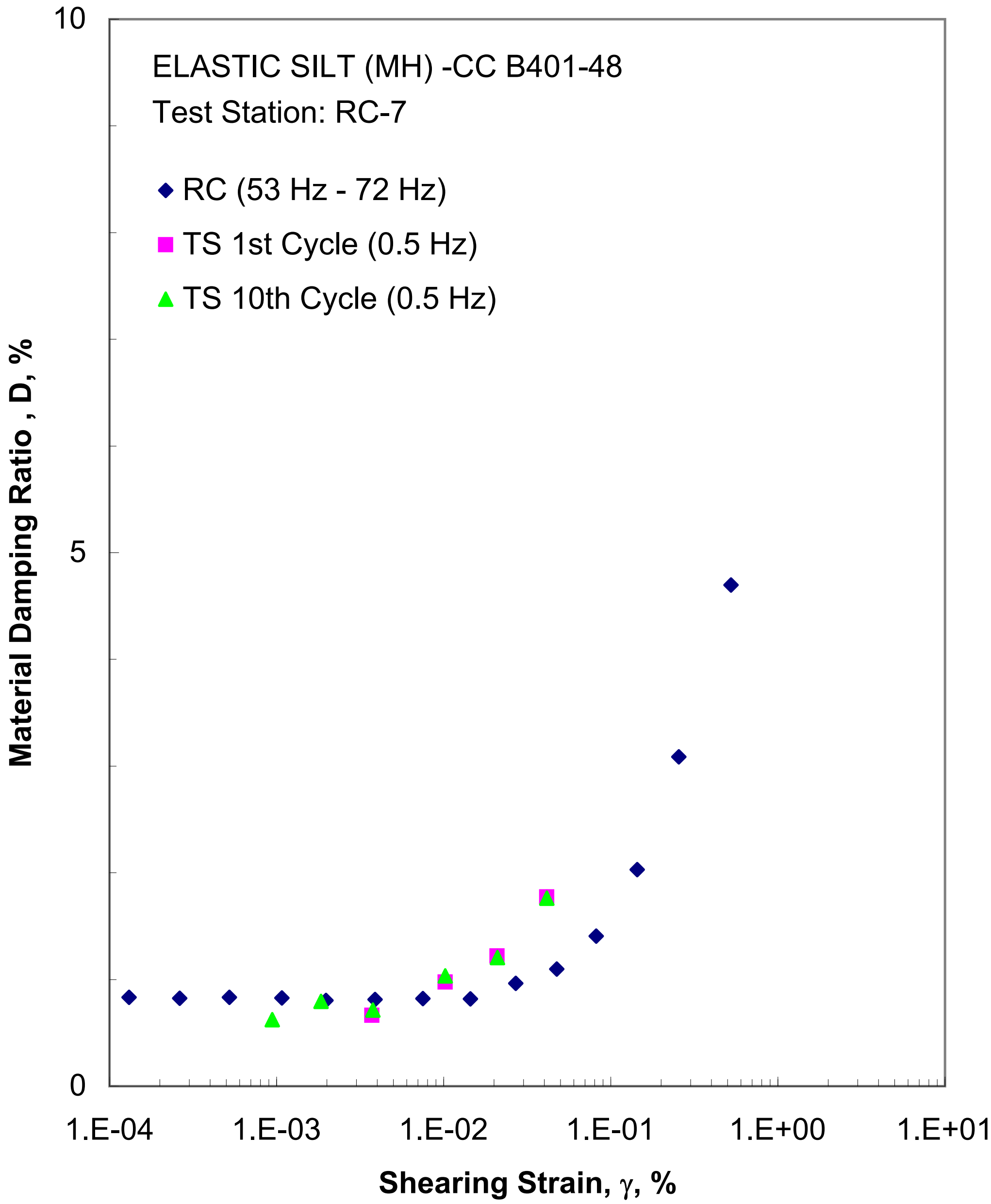

Figure G.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 281.3 psi from the Combined RCTS Tests

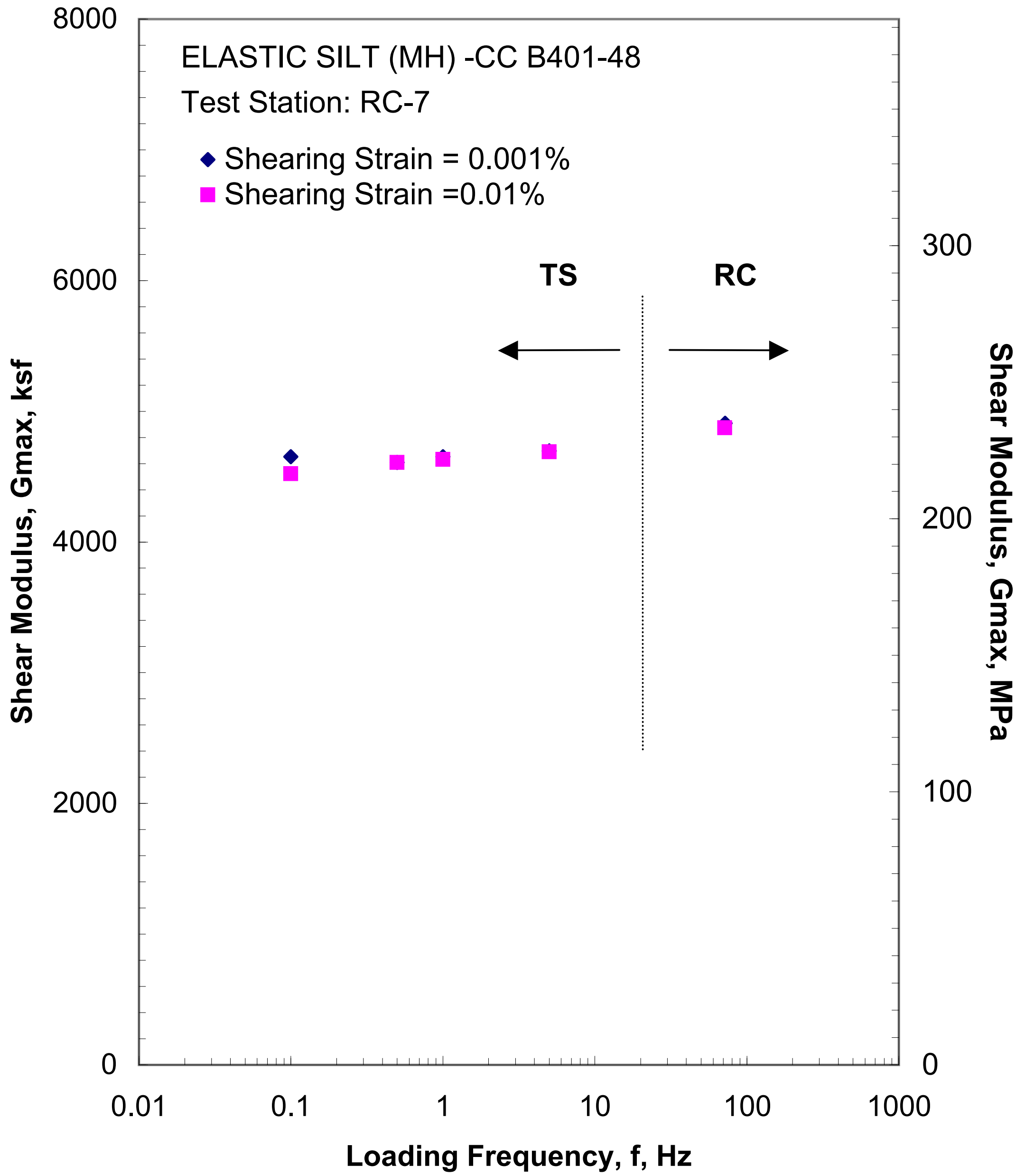

Figure G.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 281.3 psi from the Combined RCTS Tests

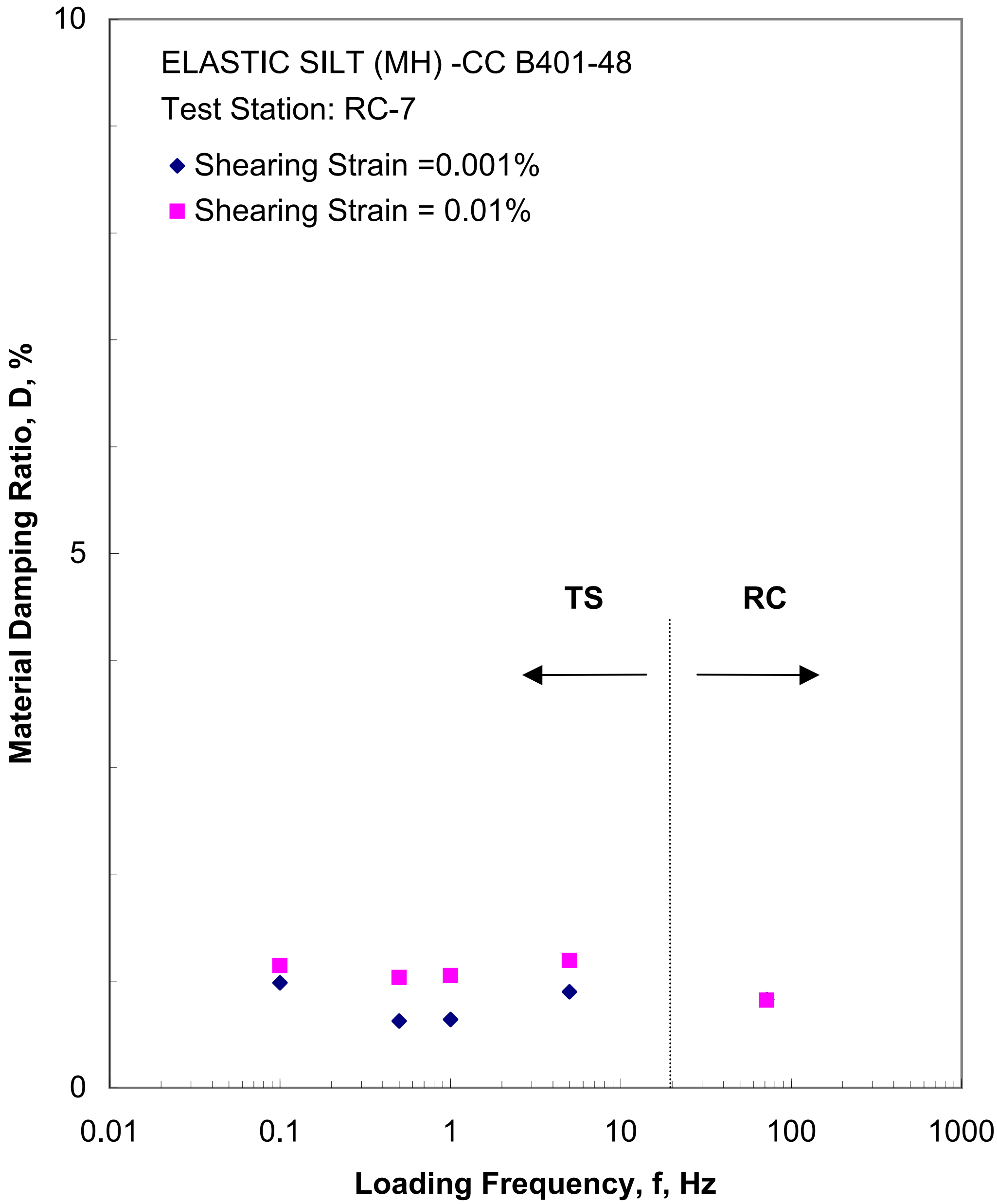

Figure G.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 281.3 psi from the Combined RCTS Tests

Table G.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 CC B401-UD48

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)	(%)	
17.6	2534	121	2471	119	897	1.02	1.706
35.2	5069	243	2936	141	976	0.83	1.697
70.3	10123	484	3615	174	1080	0.75	1.682
140.6	20246	969	4239	203	1165	0.69	1.659
281.3	40507	1938	4906	235	1234	0.59	1.599

Table G.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B401-UD48; Isoptropic Confining Pressure, σ_o=70.3 psi (10.1 ksf = 484 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
1.88E-04	3628	1.00	1.88E-04	0.98
3.83E-04	3628	1.00	3.83E-04	0.98
8.18E-04	3628	1.00	8.18E-04	0.95
1.62E-03	3628	1.00	1.44E-03	0.92
3.22E-03	3628	1.00	2.96E-03	0.92
6.24E-03	3628	1.00	5.68E-03	0.94
1.20E-02	3570	0.98	1.08E-02	0.96
2.19E-02	3483	0.96	1.95E-02	1.12
3.86E-02	3342	0.92	3.39E-02	1.31
6.82E-02	3122	0.86	5.87E-02	1.73
1.24E-01	2807	0.77	1.04E-01	2.32
2.34E-01	2437	0.67	1.87E-01	3.22
4.69E-01	1981	0.55	3.38E-01	5.08

[+] 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 G.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B401-UD48; Isotropic Confining Pressure, σ_o=70.3 psi (10.1 ksf = 484 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, %
1.03E-03	3434	1.00	0.74	1.00E-03	3458	1.00	0.66
2.02E-03	3434	1.00	0.67	2.04E-03	3458	1.00	0.65
4.11E-03	3434	1.00	0.66	4.09E-03	3458	1.00	0.65
1.06E-02	3300	0.96	1.04	1.07E-02	3292	0.95	1.02
2.25E-02	3117	0.91	1.73	2.27E-02	3097	0.90	1.52
5.01E-02	2805	0.82	2.70	5.05E-02	2787	0.81	2.66

Table G.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B401-UD48; Isoptropic Confining Pressure, σ_o= 281.3 psi (40.5 ksf = 1938 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
1.31E-04	4908	1.00	1.31E-04	0.83
2.63E-04	4908	1.00	2.63E-04	0.83
5.21E-04	4908	1.00	5.21E-04	0.83
1.08E-03	4908	1.00	1.08E-03	0.83
2.15E-03	4908	1.00	1.98E-03	0.80
4.26E-03	4908	1.00	3.88E-03	0.81
8.33E-03	4874	0.99	7.50E-03	0.82
1.59E-02	4840	0.99	1.44E-02	0.82
2.94E-02	4738	0.97	2.70E-02	0.96
5.27E-02	4537	0.92	4.75E-02	1.10
9.31E-02	4244	0.86	8.19E-02	1.41
1.67E-01	3838	0.78	1.44E-01	2.03
3.15E-01	3328	0.68	2.55E-01	3.09
6.23E-01	2685	0.55	5.23E-01	4.70

[+] 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 G.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B401-UD48; Isotropic Confining Pressure, σ_o=281.3 psi (40.5 ksf = 1938 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D,	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D, %
---	---	---	---	9.41E-04	4644	1.00	0.62
---	---	---	---	1.85E-03	4644	1.00	0.79
3.72E-03	4670	1.00	0.66	3.76E-03	4644	1.00	0.71
1.02E-02	4619	0.99	0.97	1.02E-02	4609	0.99	1.03
2.09E-02	4506	0.96	1.22	2.10E-02	4490	0.97	1.20
4.14E-02	4292	0.92	1.77	4.14E-02	4299	0.93	1.76

U.S. Standard Sieve Nos.

3" 3/4" 4 10 40 100 200

PERCENT FINER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

100 10 1 0.1 0.01 0.001

GRAIN SIZE (mm)

GRAVEL SAND SILT OR CLAY

GRADATION CURVE

ASTM D422

Project: Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland

Contract No.: 06120048.00

Date: 9/14/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-401	228.5-229.6	ELASTIC SILT, with sand, green	MH	139	51

Schnabel Engineering

APPENDIX H

CC B301& 401Mixture
Silty SAND (SM), dark gray*
(LL=40, PL=36, PI=4; Gs=2.86)*

Borehole B-301&-401
Reconstituted Specimen
Sample Depth = 359 to 385 ft
RCTS Test Depth = 359 to 385 ft
Total Unit Weight = 116.4 lb/ft^3
Water Content = 34.4 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 120.4 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

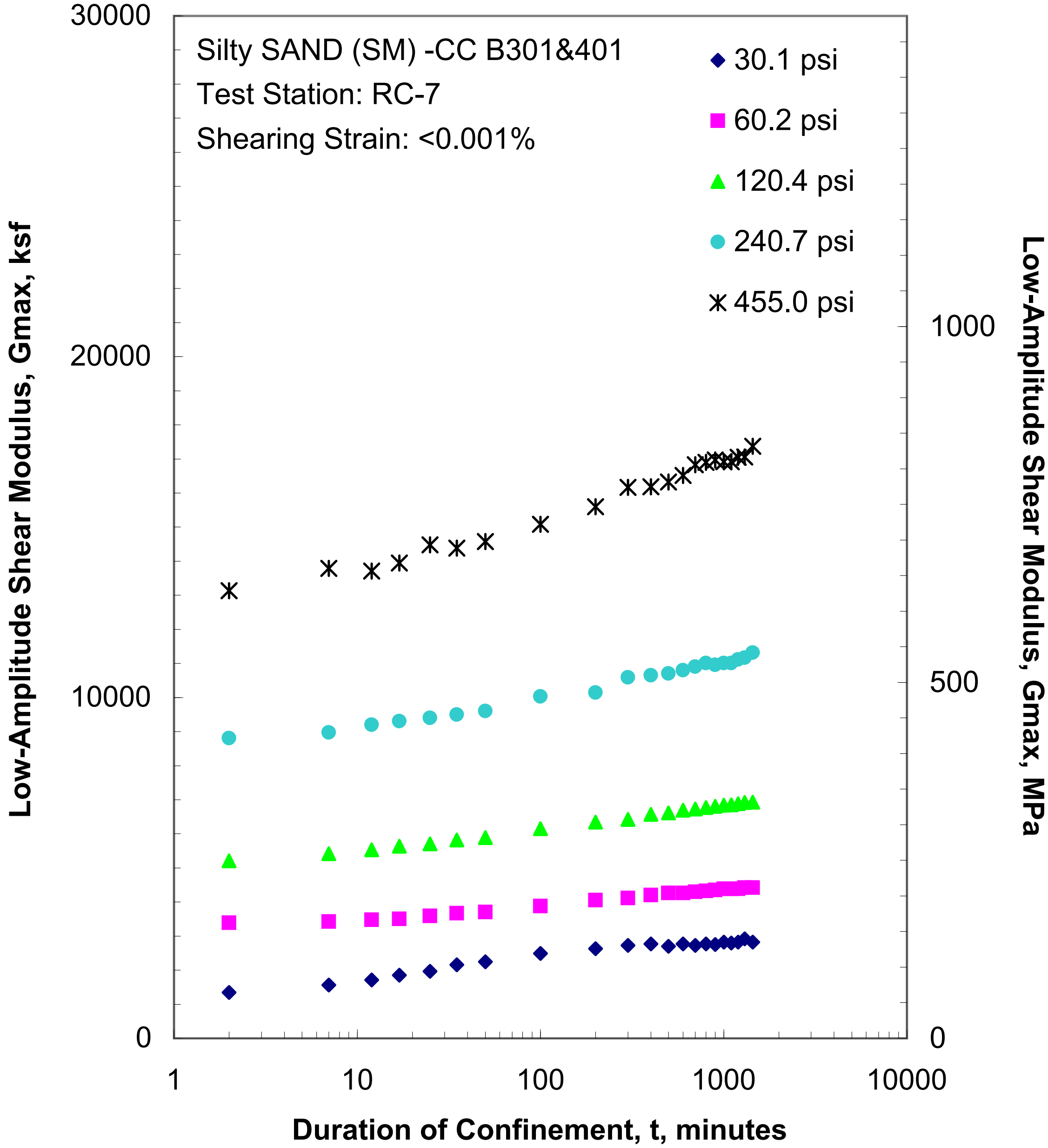

Figure H.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

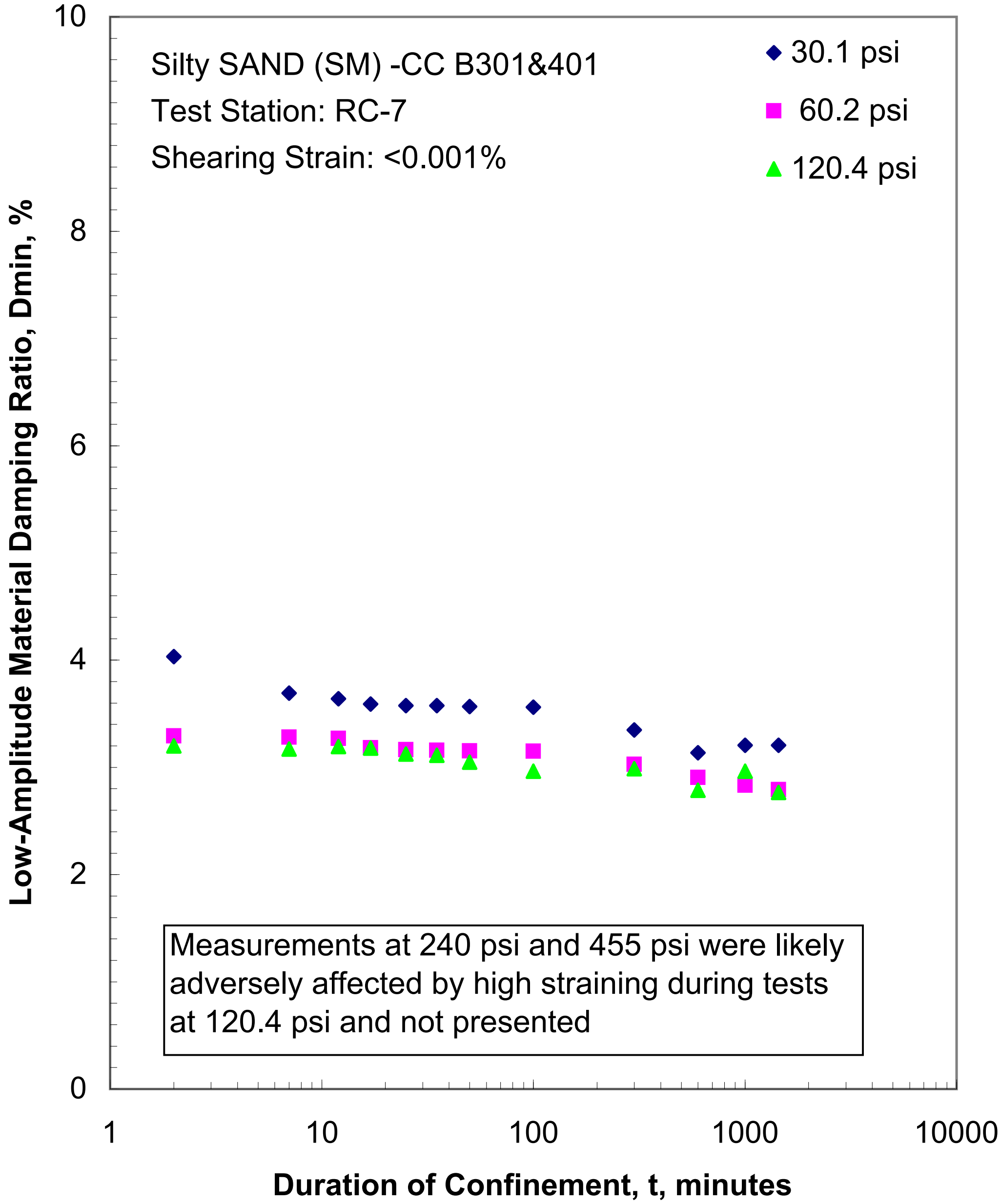

Figure H.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

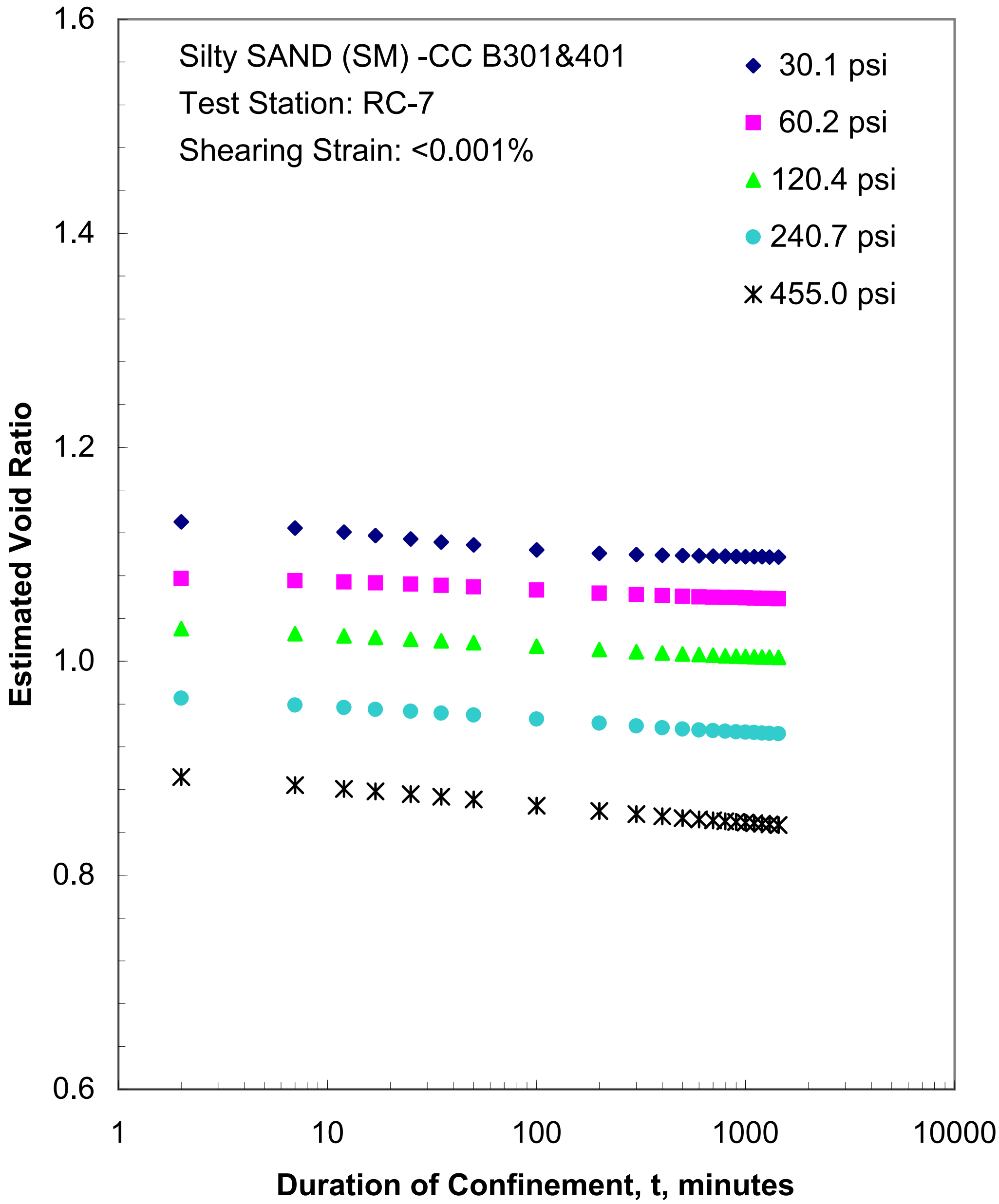

Figure H.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

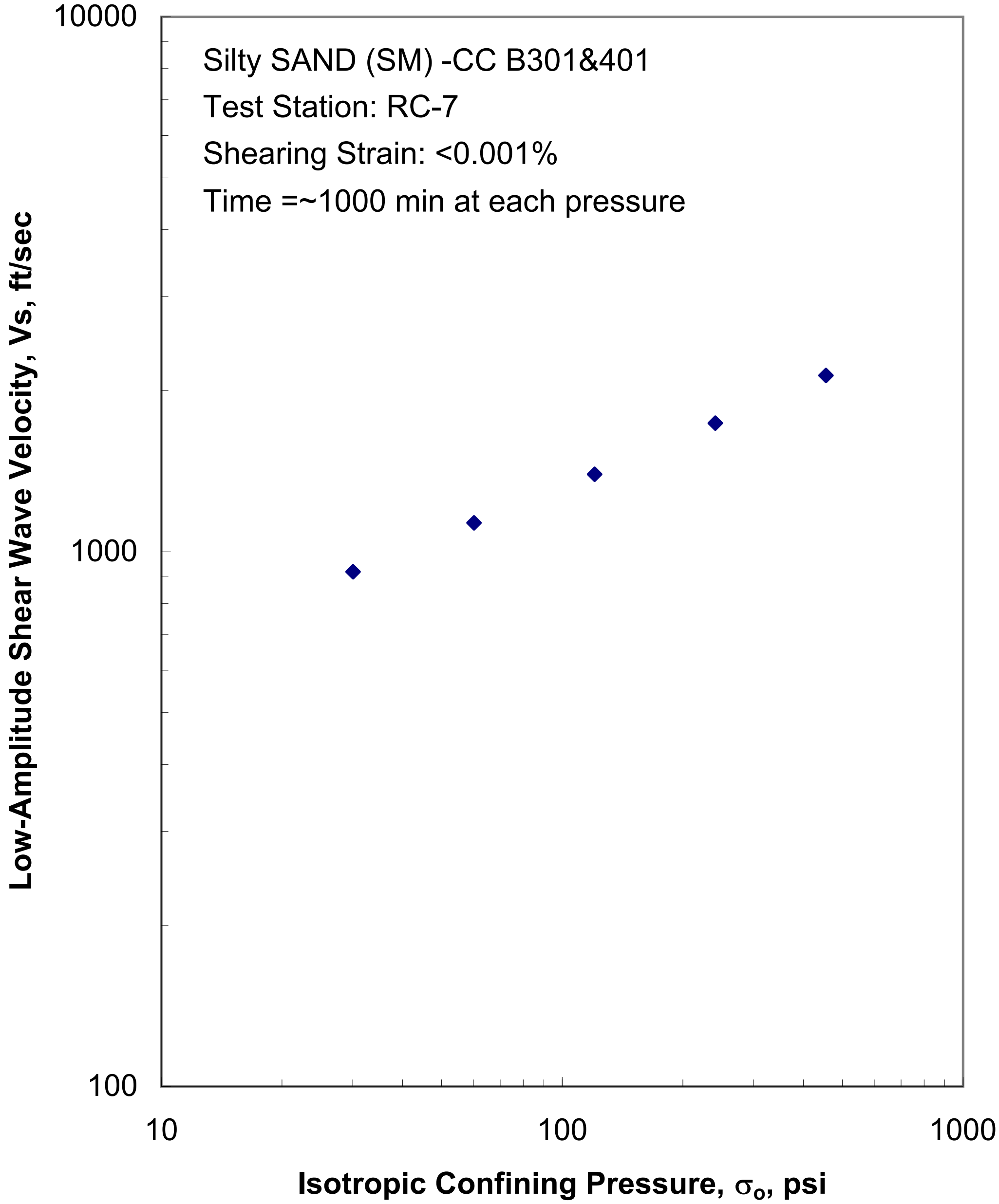

Figure H.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

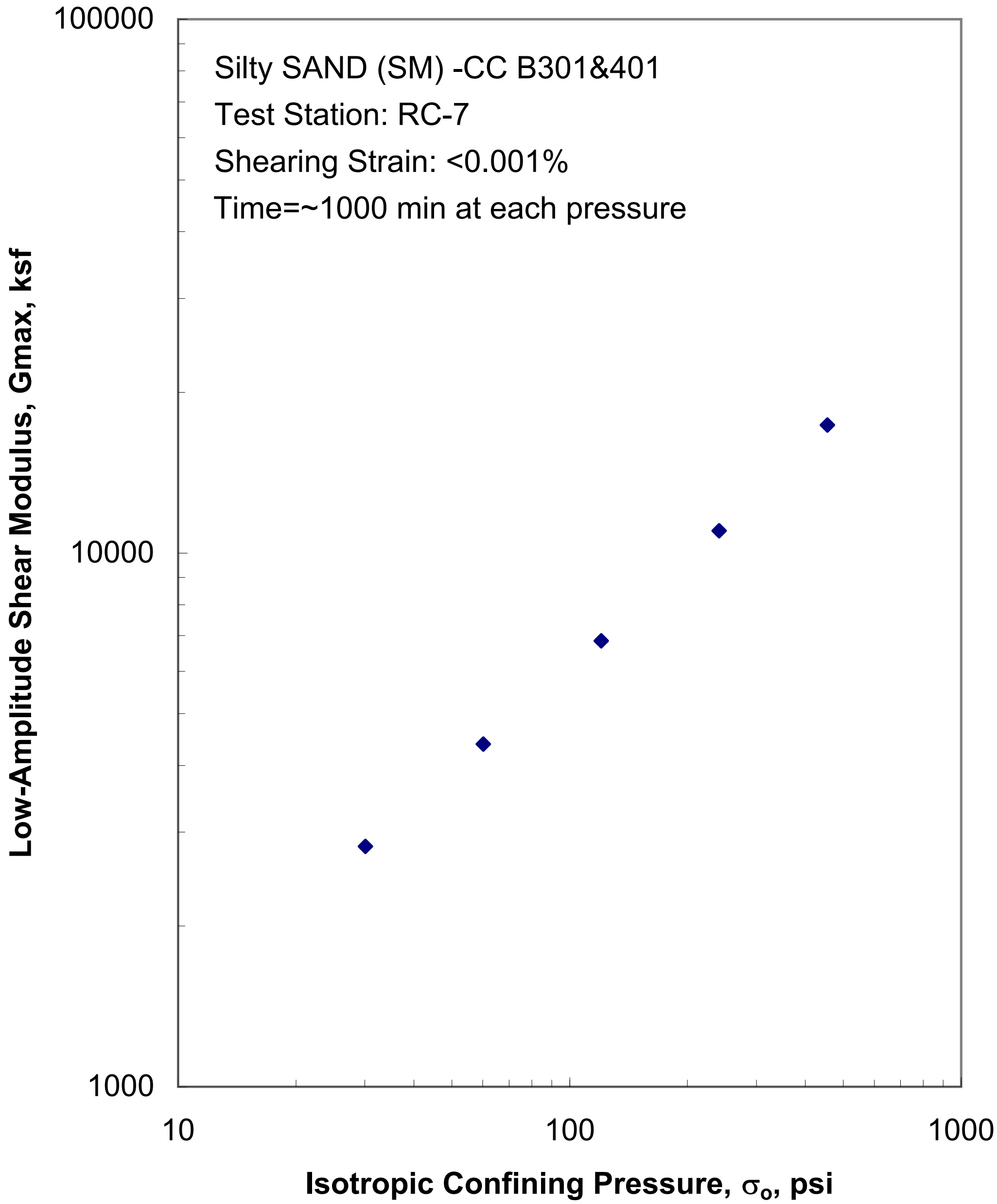

Figure H.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

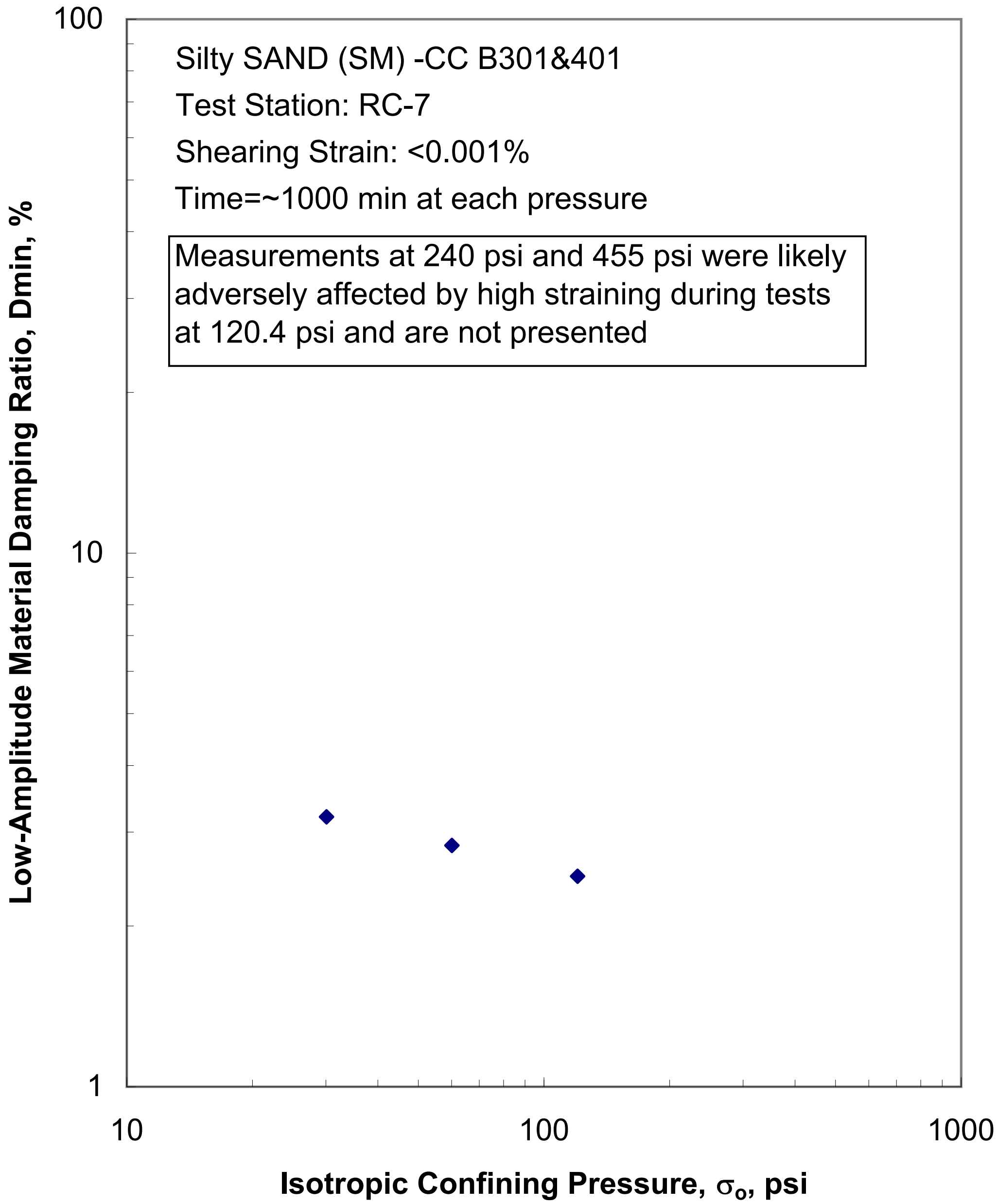

Figure H.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

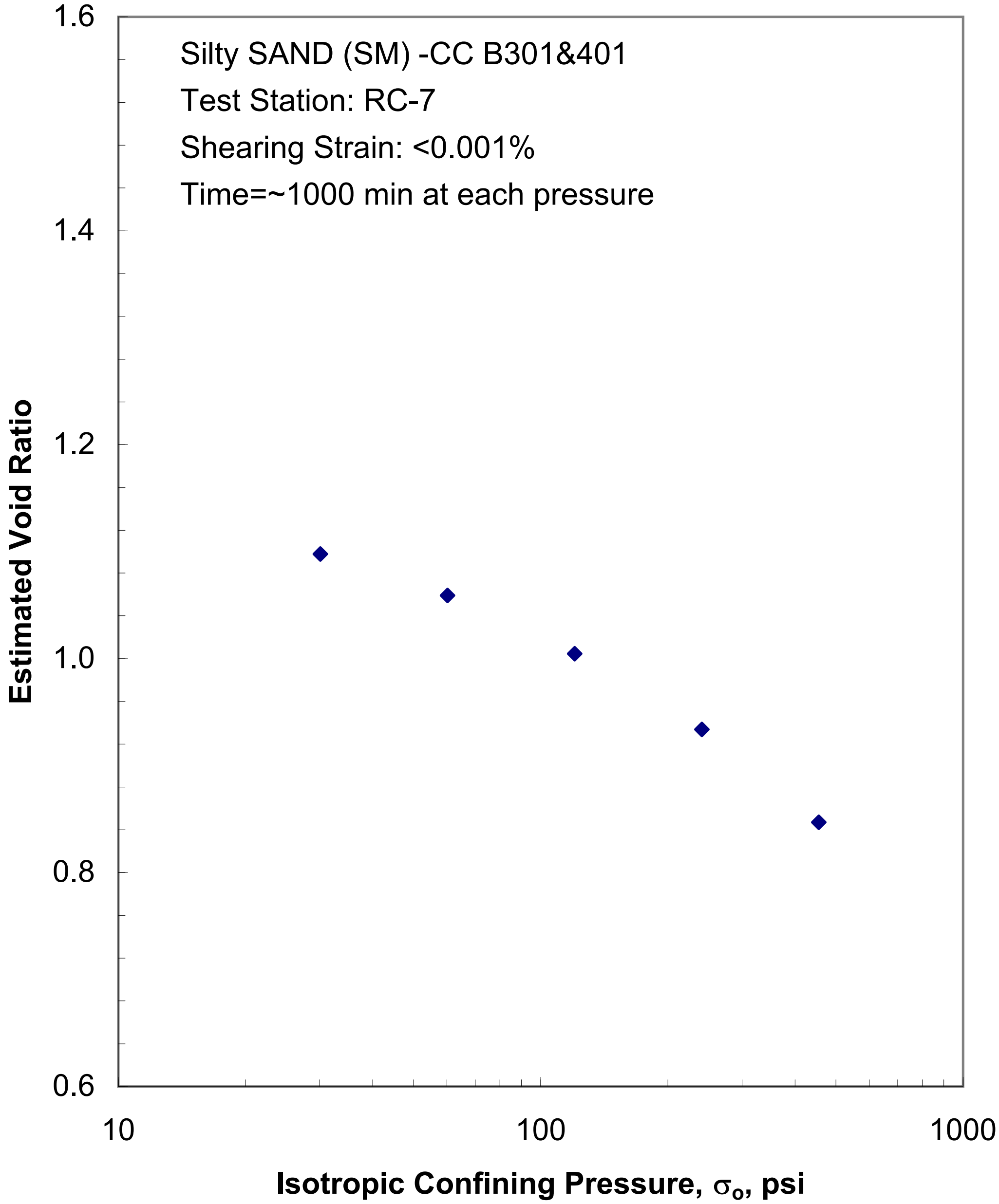

Figure H.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

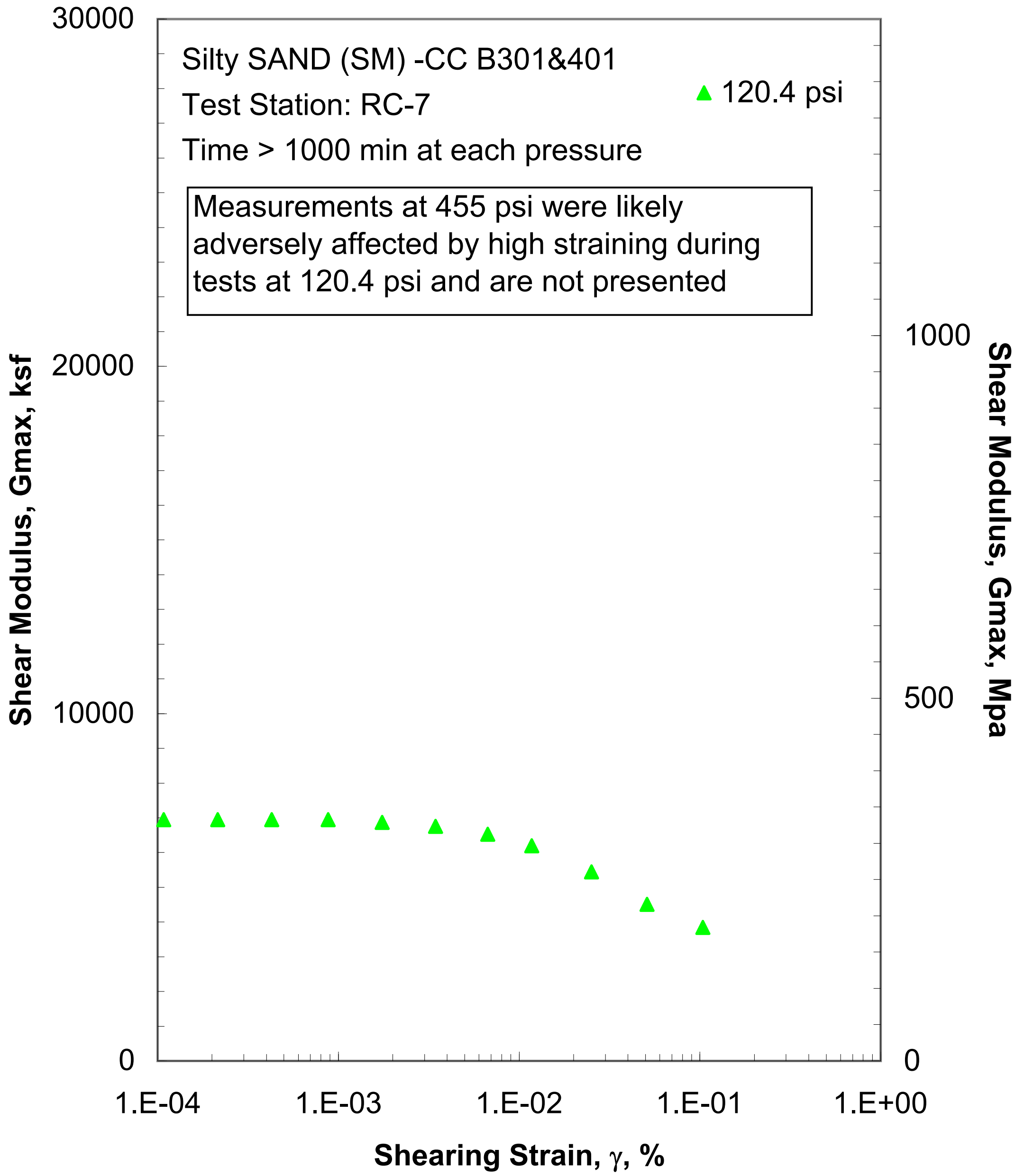

Figure H.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

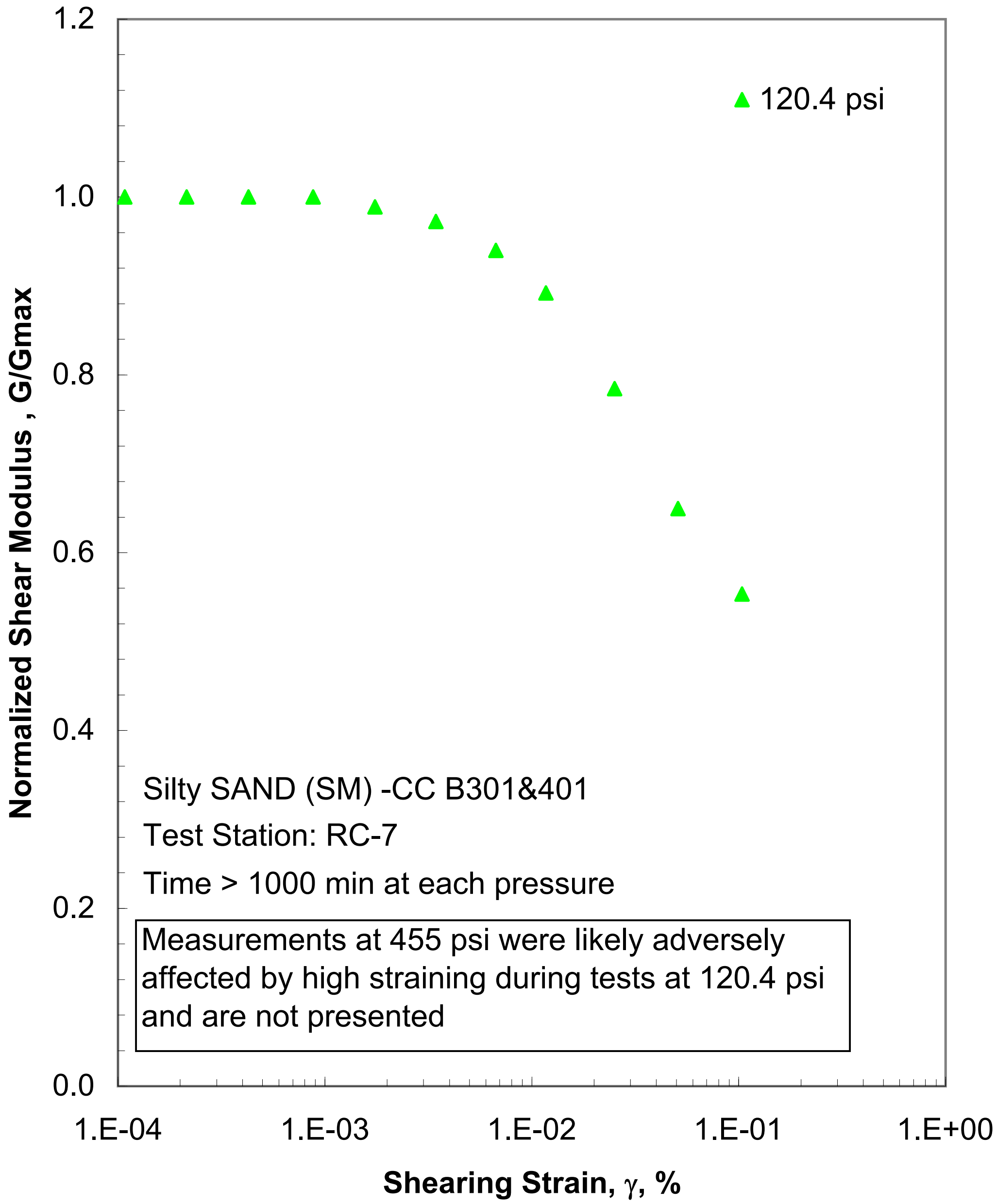

Figure H.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

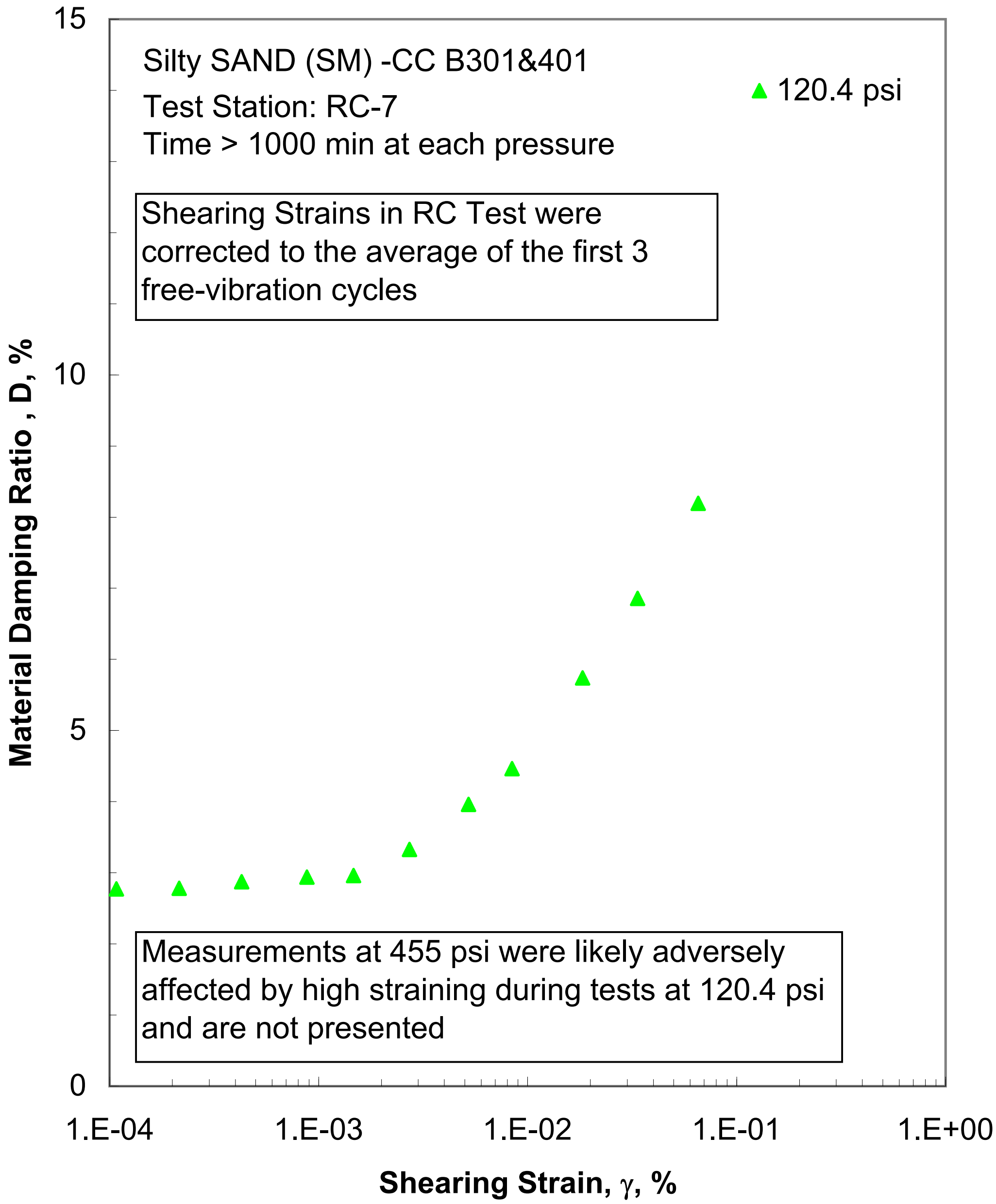

Figure H.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

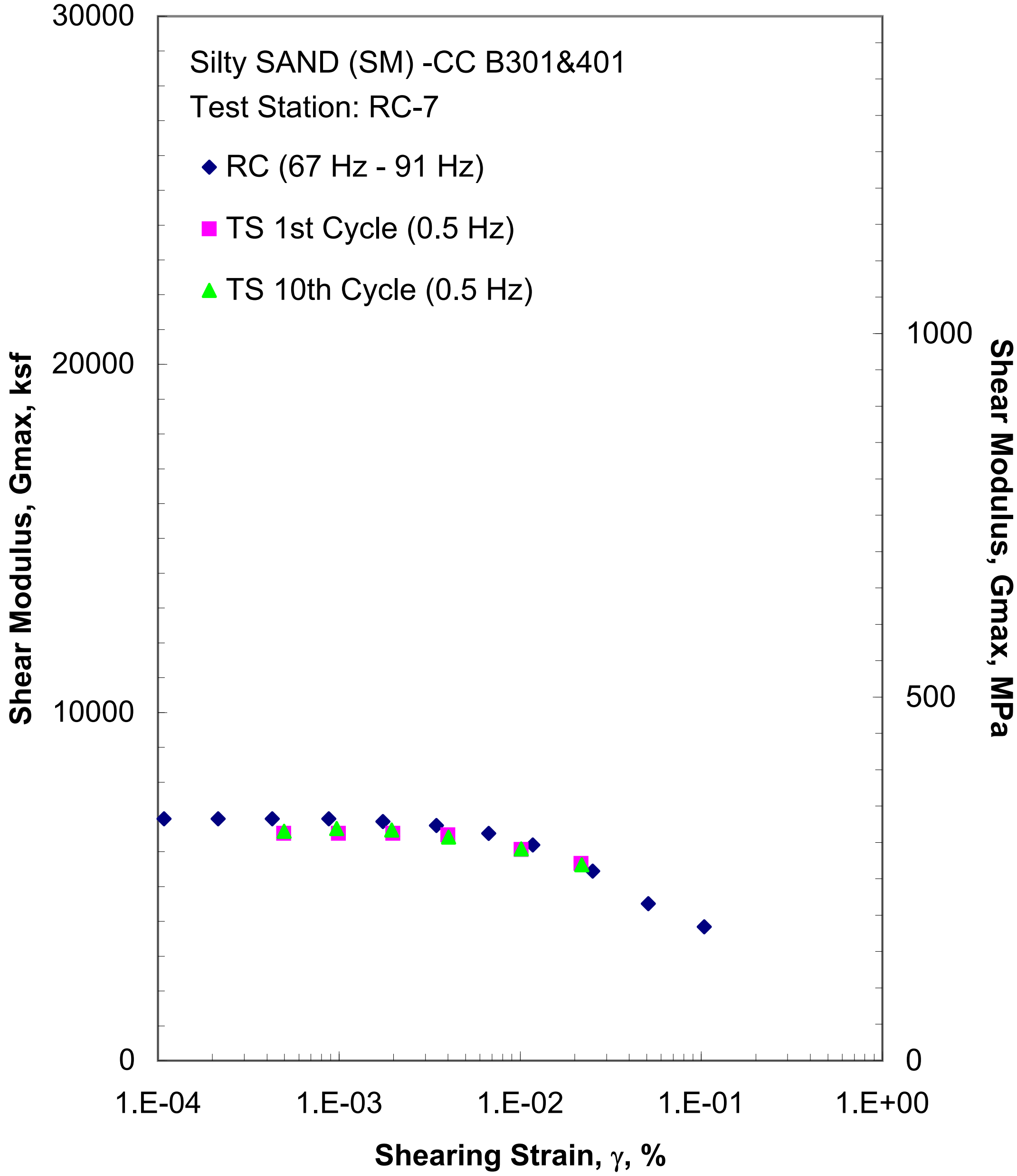

Figure H.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 120.4 psi from the Combined RCTS Tests

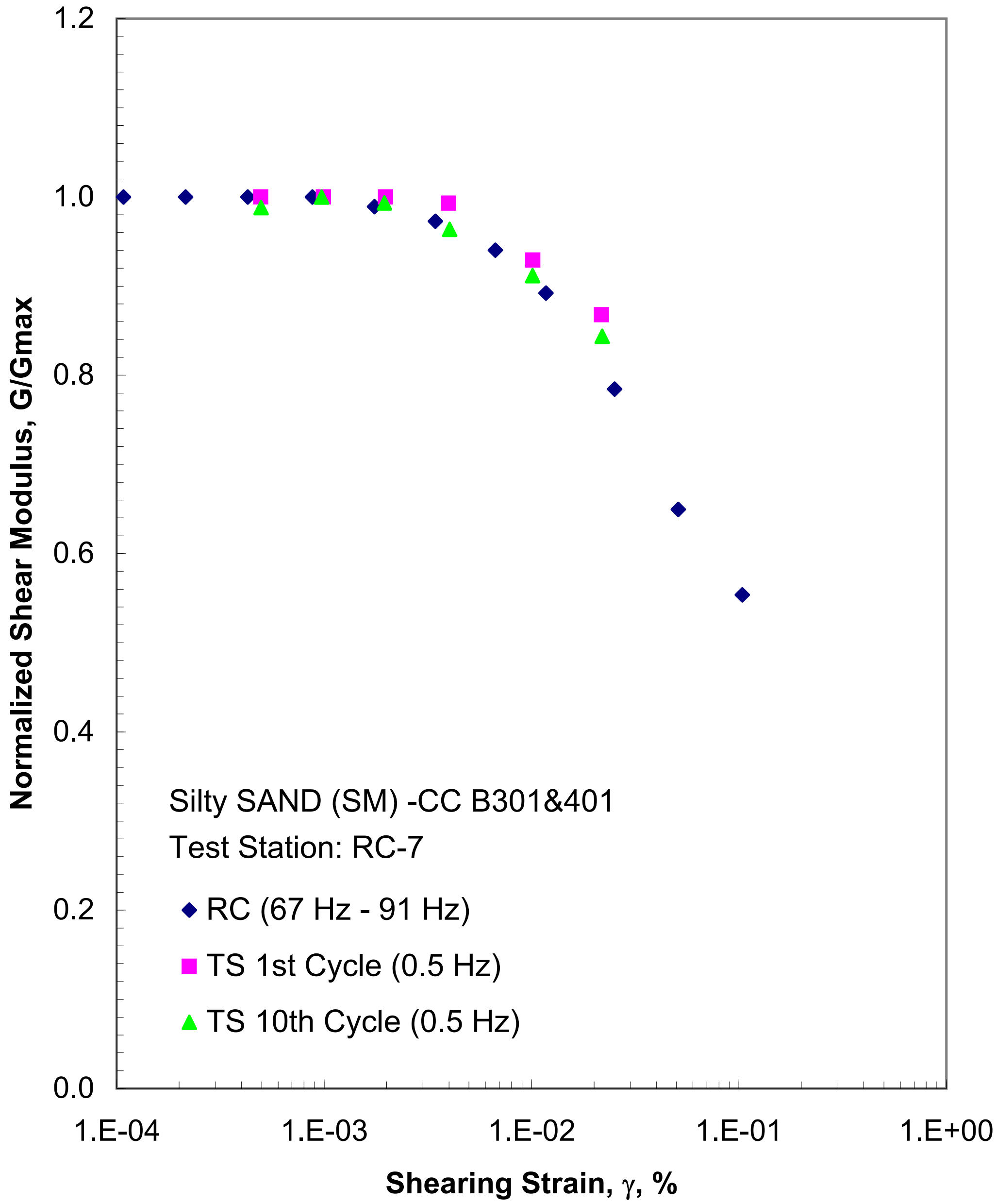

Figure H.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 120.4 psi from the Combined RCTS Tests

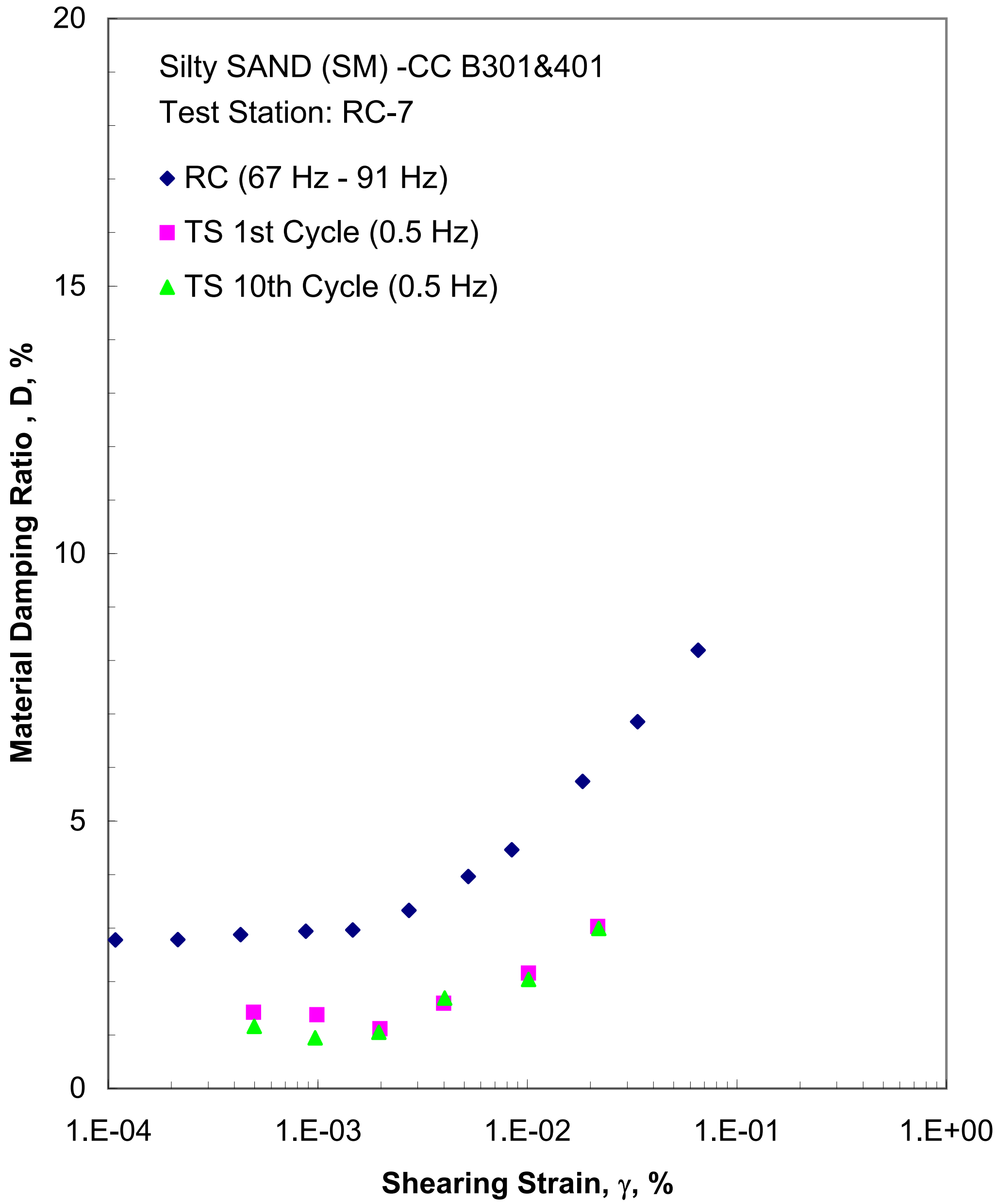

Figure H.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 120.4 psi from the Combined RCTS Tests

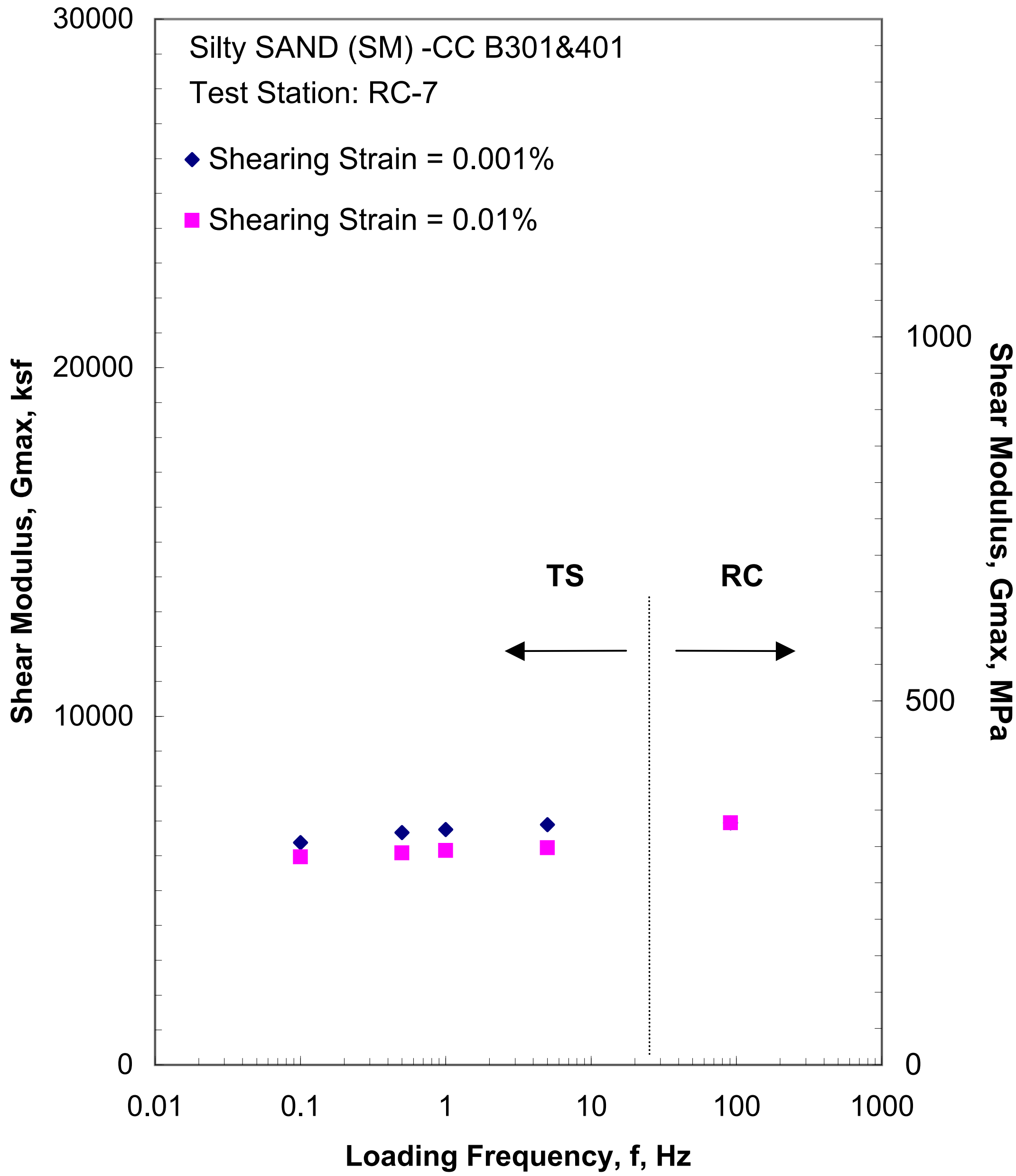

Figure H.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 120.4 psi from the Combined RCTS Tests

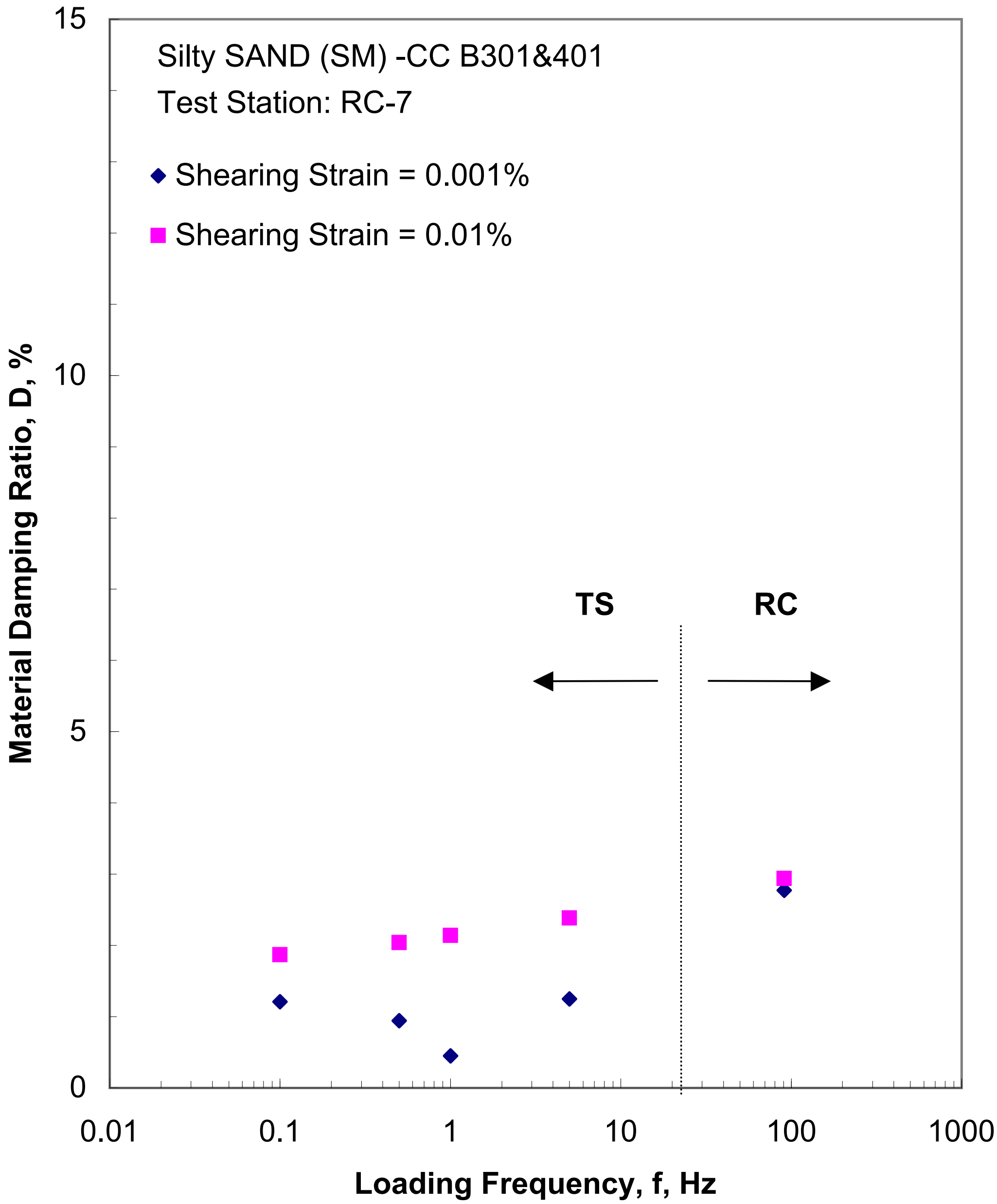

Figure H.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 120.4 psi from the Combined RCTS Tests

NOTE: Figures H.16 through H.20 are NOT available.

Table H.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 CC B301& 401Mixture

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)	(%)	
30.1	4334	207	2820	135	917	3.21	1.098
60.2	8669	415	4386	211	1133	2.83	1.059
120.4	17338	830	6846	329	1396	2.48	1.005
240.7	34661	1658	11012	529	1739	---	0.934
455.0	65520	3135	17374	834	2135	---	0.847

Table H.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B301& 401Mixture; Isoptropic Confining Pressure, σ_o=120.4 psi (17.3 ksf = 830 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio^x^, D, %
1.08E-04	6943	1.00	1.08E-04	2.78
2.15E-04	6943	1.00	2.15E-04	2.78
4.28E-04	6943	1.00	4.28E-04	2.88
8.78E-04	6943	1.00	8.78E-04	2.94
1.75E-03	6867	0.99	1.47E-03	2.96
3.45E-03	6753	0.97	2.72E-03	3.33
6.70E-03	6528	0.94	5.23E-03	3.96
1.17E-02	6194	0.89	8.44E-03	4.47
2.51E-02	5447	0.78	1.84E-02	5.74
5.10E-02	4510	0.65	3.36E-02	6.86
1.04E-01	3844	0.55	6.55E-02	8.19

+ 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 H.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B301& 401Mixture; Isotropic Confining Pressure, σ_o=120.4 psi (17.3 ksf = 830 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, %
4.95E-04	6530	1.00	1.42	4.97E-04	6587	0.99	1.16
9.93E-04	6530	1.00	1.37	9.72E-04	6667	1.00	0.94
1.98E-03	6529	1.00	1.11	1.95E-03	6623	0.99	1.05
3.99E-03	6483	0.99	1.59	4.03E-03	6424	0.96	1.69
1.01E-02	6066	0.93	2.16	1.01E-02	6079	0.91	2.04
2.17E-02	5665	0.87	3.03	2.19E-02	5625	0.84	2.99

Table H.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B301& 401Mixture; Isoptropic Confining Pressure, σ_o= 455 psi (65.5 ksf = 3135 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
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[+] 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 H.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B301& 401Mixture; Isotropic Confining Pressure, σ_o=455 psi (65.5 ksf = 3135 kPa)

First Cycle				Tenth Cycle			
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D,	Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus,	Material Damping Ratio, D, %
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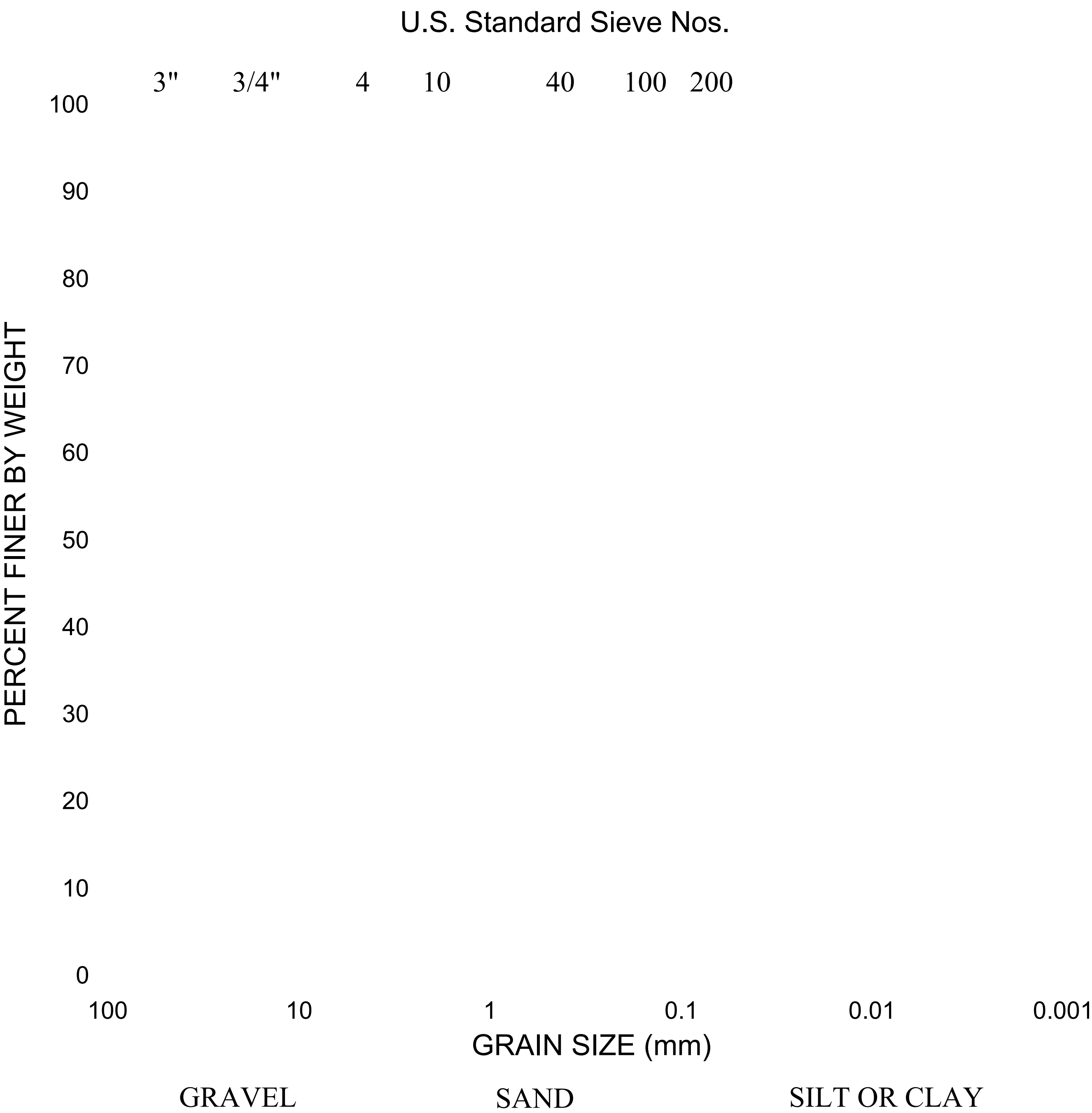


GRADATION CURVE

ASTM D422

Project: Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland

Contract No.: 06120048.00

Date: 9/21/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-301 & B-401	348.5-400.0	SILTY SAND, dark gray	SM	40	4

Schnabel Engineering

APPENDIX I

CC B306-UD17
FAT CLAY (CH), trace sand, gray*
(LL=62, PL=24, PI=38; Gs=2.73)*

Borehole B-306
Sample UD17
Sample Depth = 68.0 to 70.0 ft
RCTS Test Depth = 69.3 ft
Total Unit Weight = 115.8 lb/ft^3
Water Content = 30.7 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 23.6 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

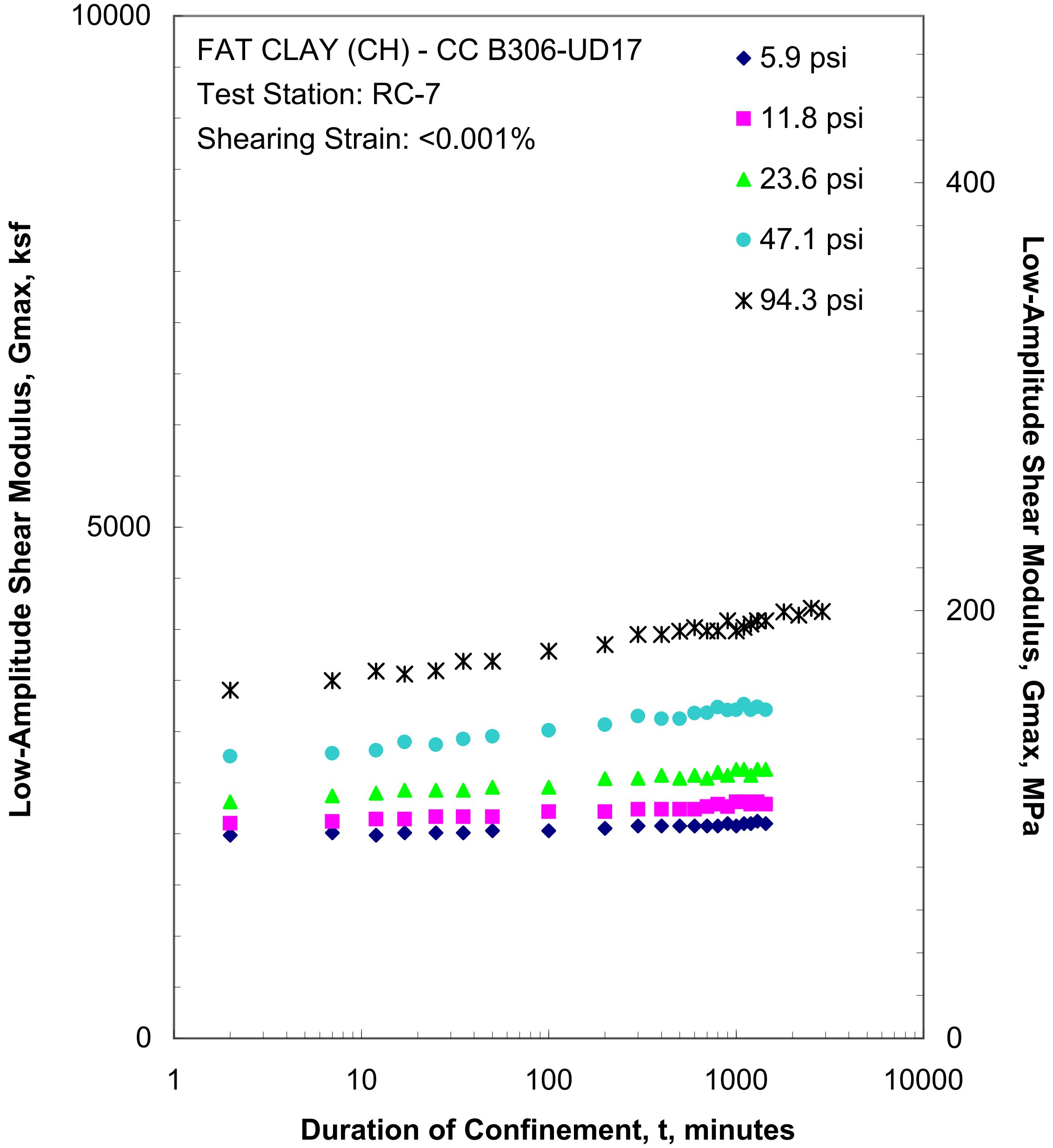


Figure I.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

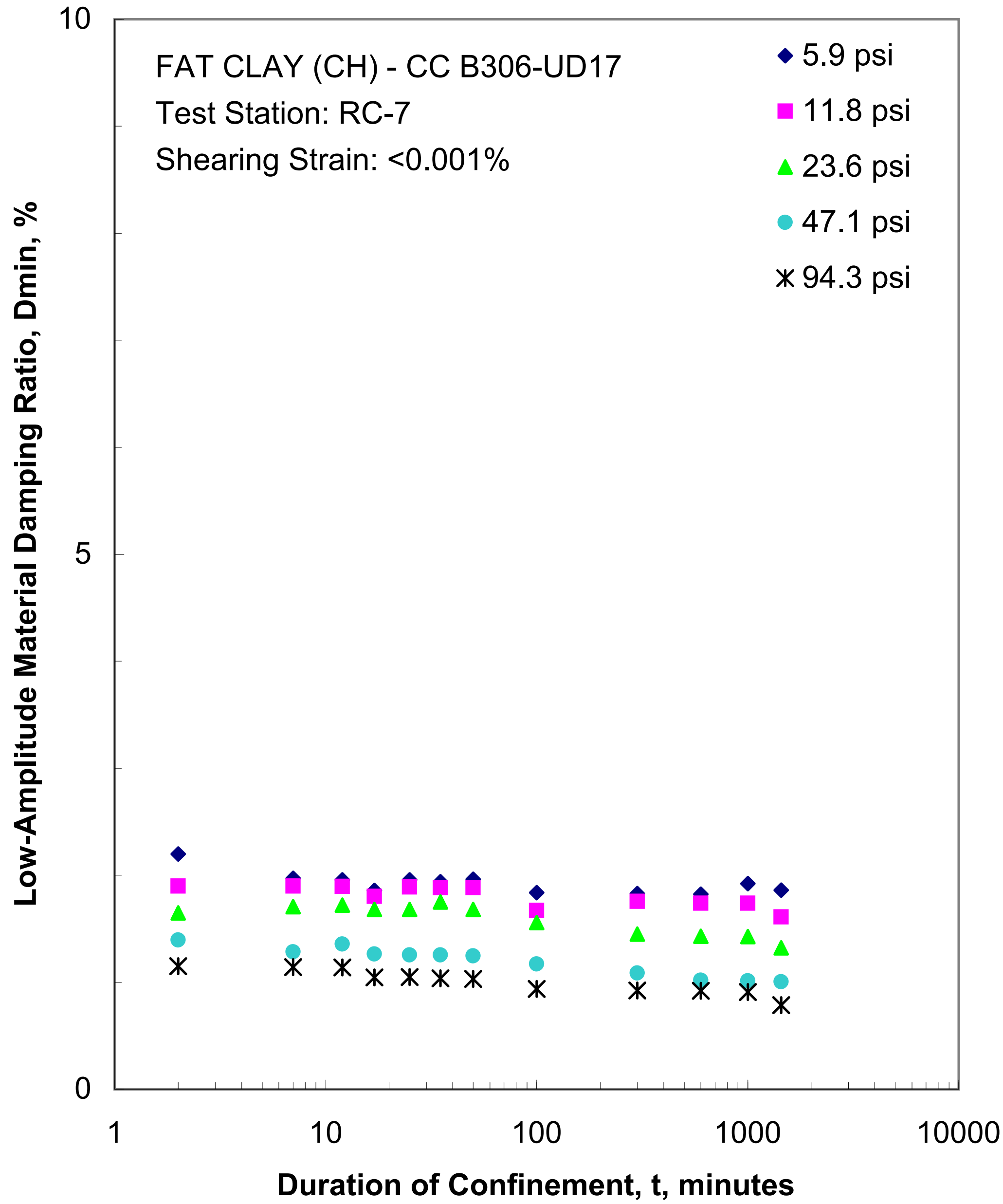


Figure I.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

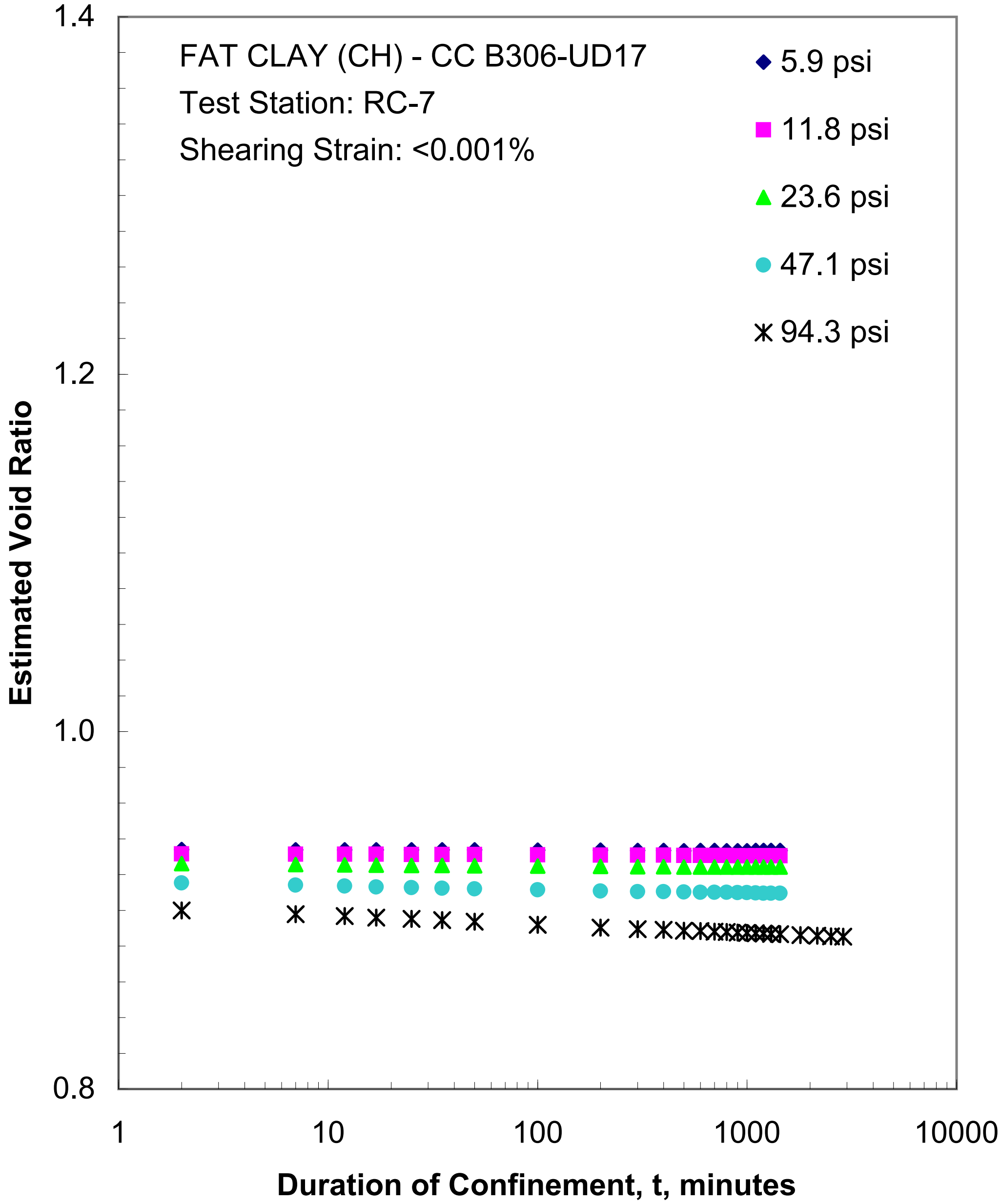


Figure I.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

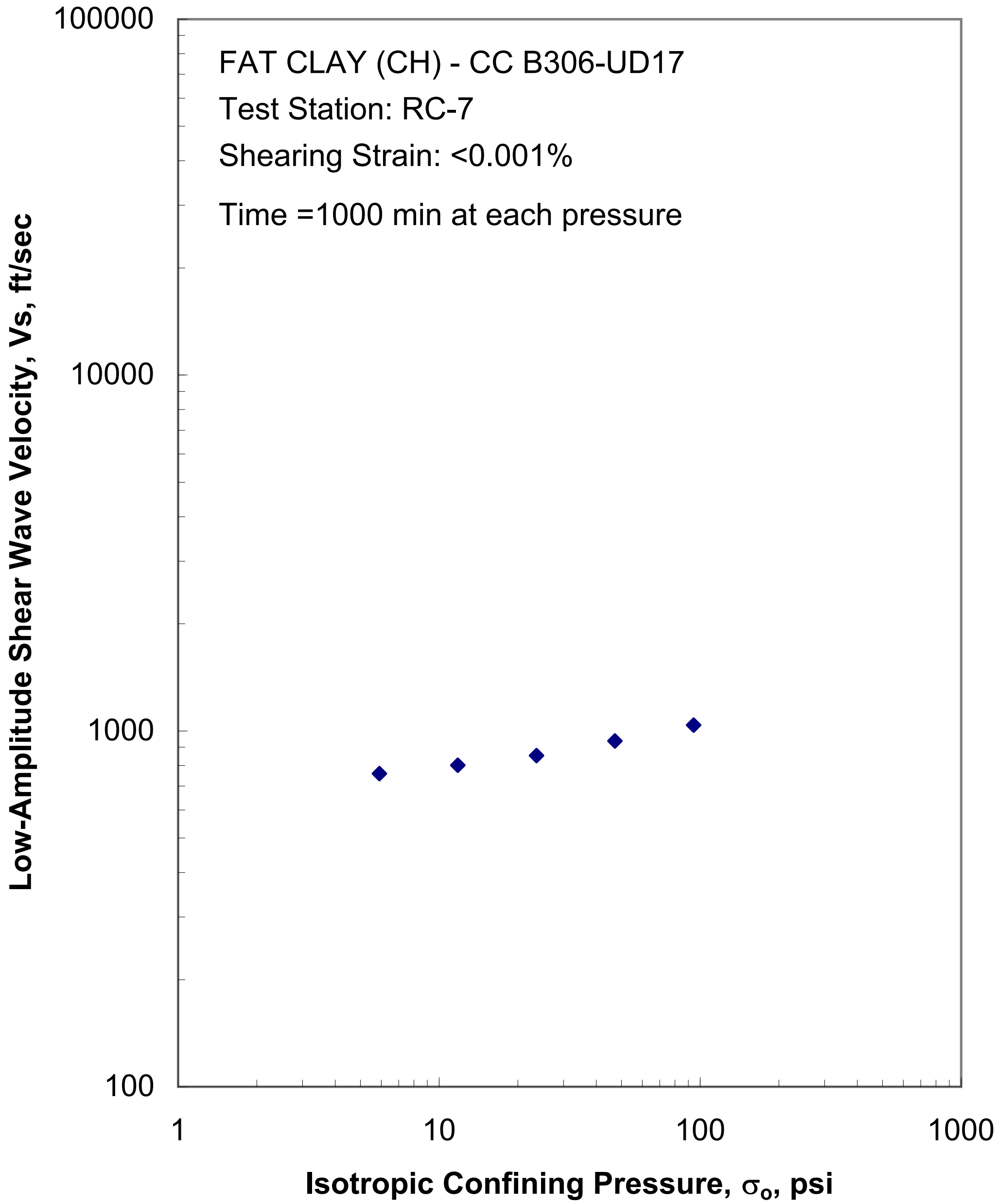


Figure I.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

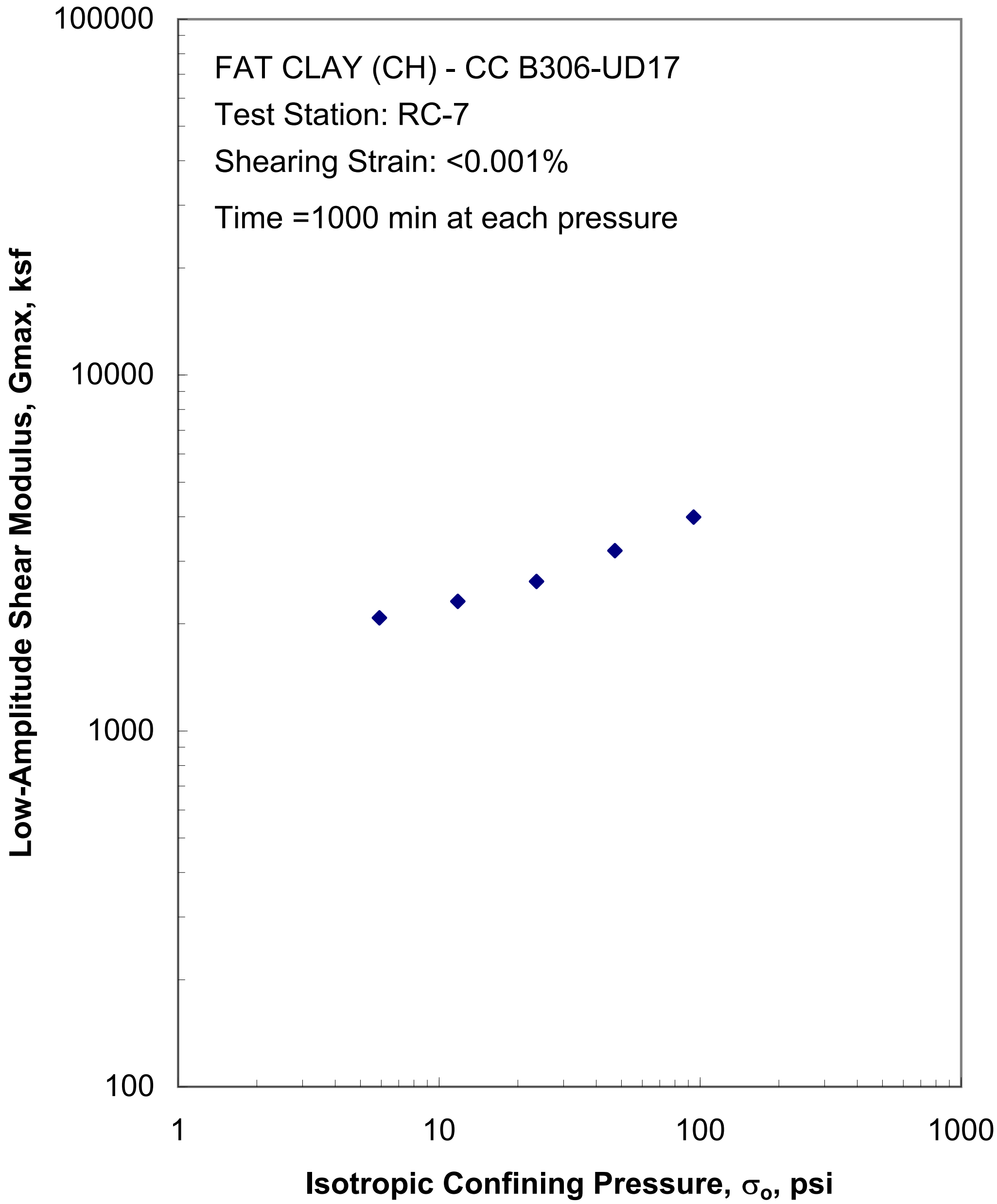


Figure I.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

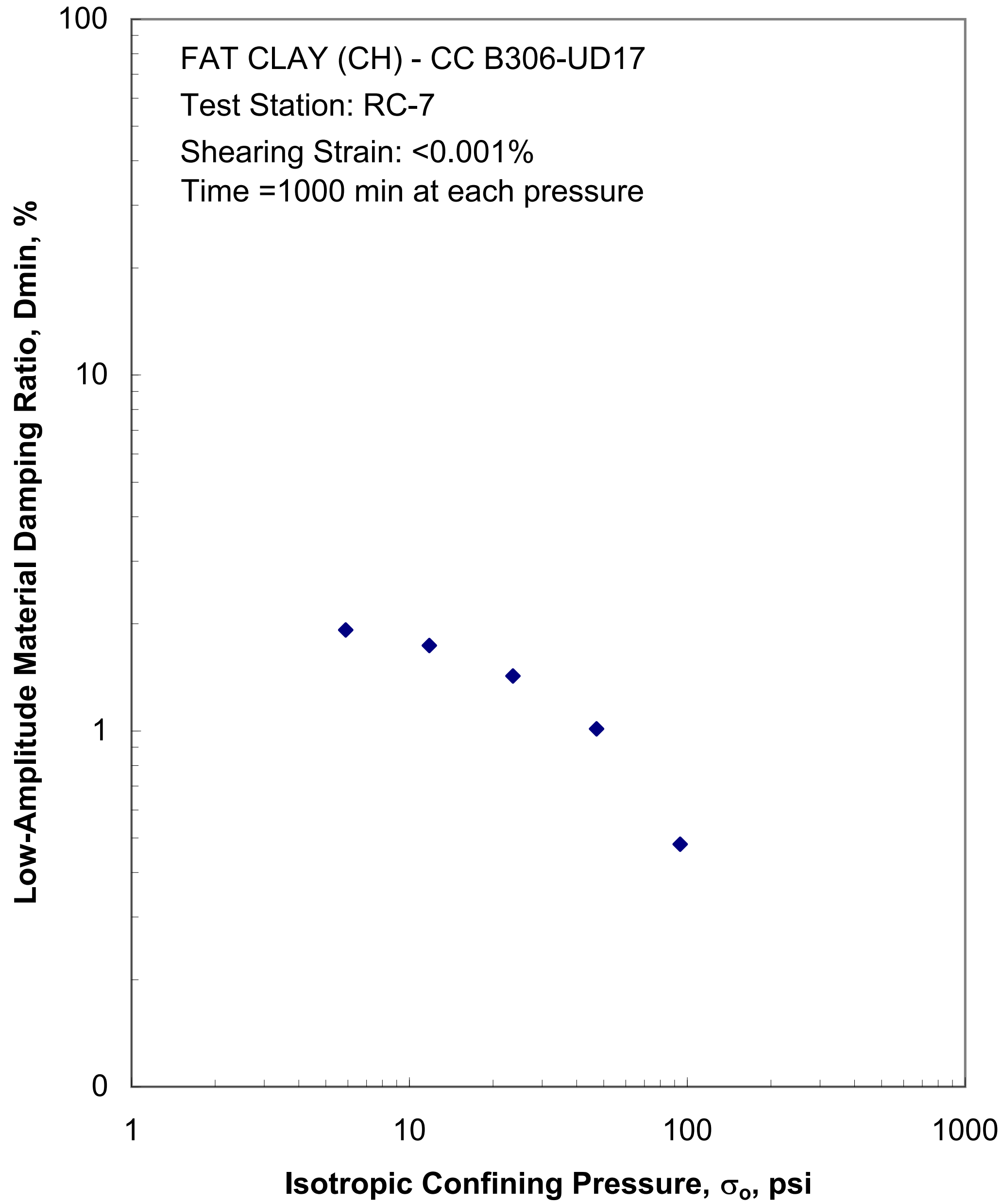


Figure I.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

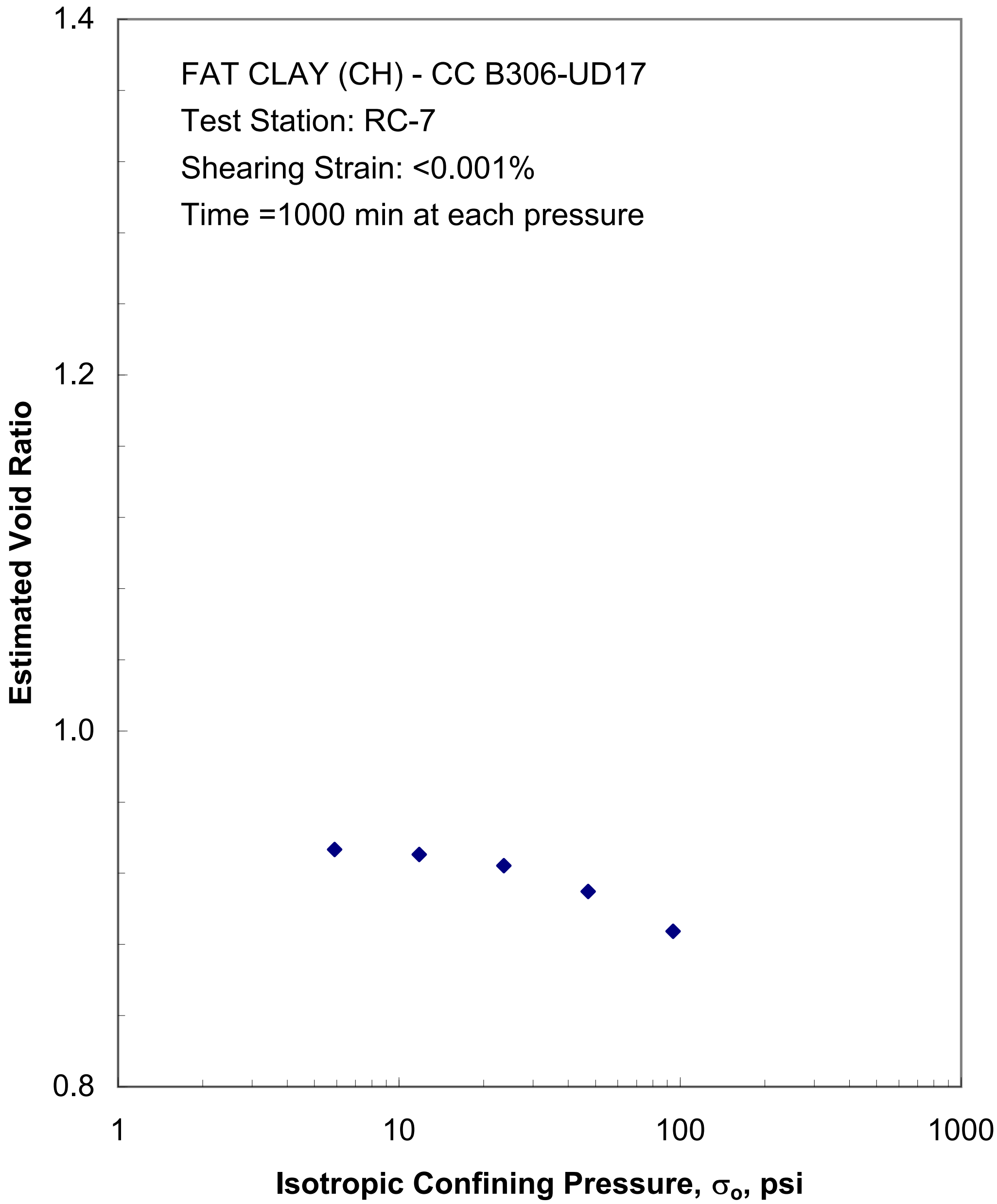


Figure I.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

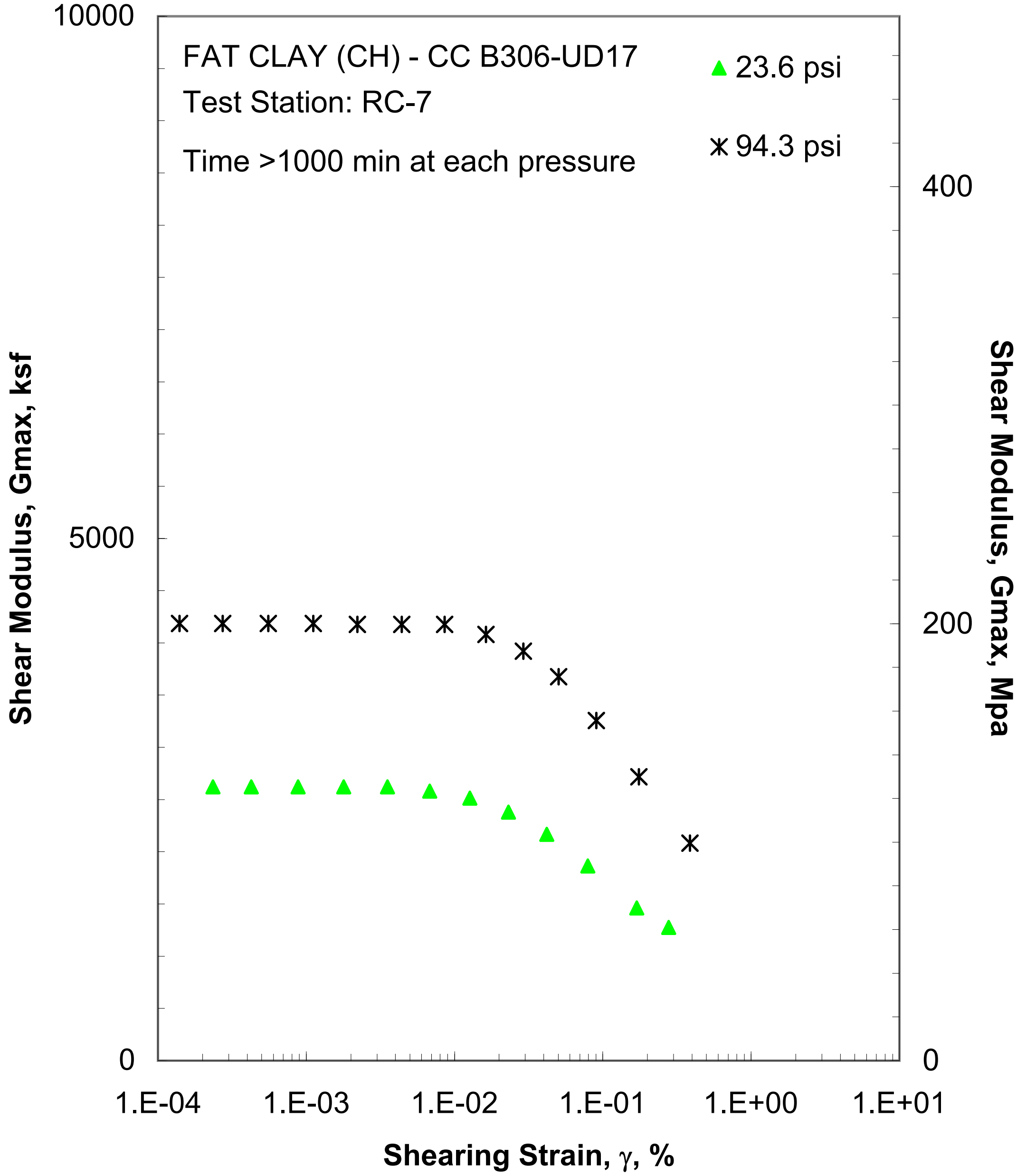


Figure I.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

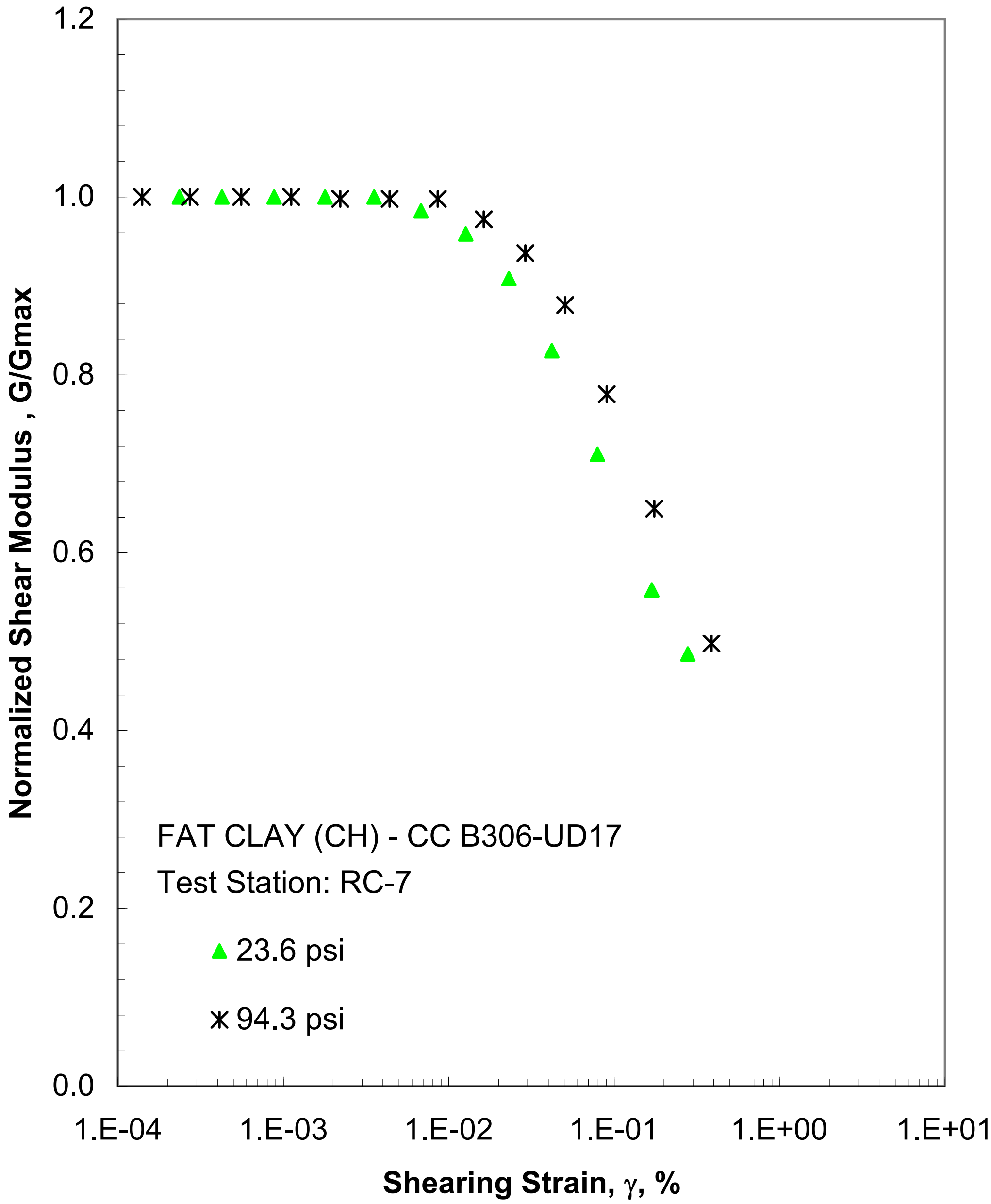


Figure I.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

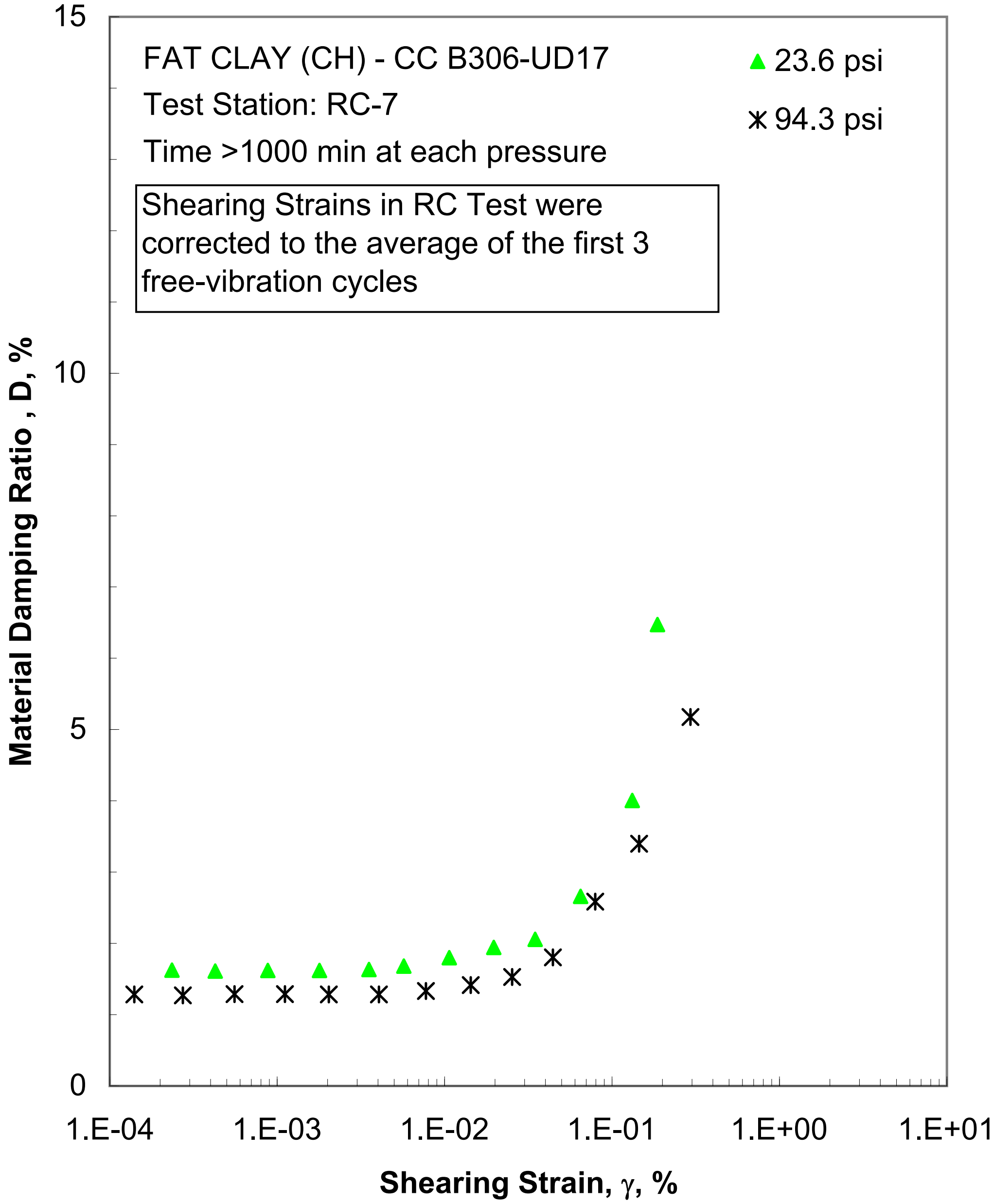


Figure I.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

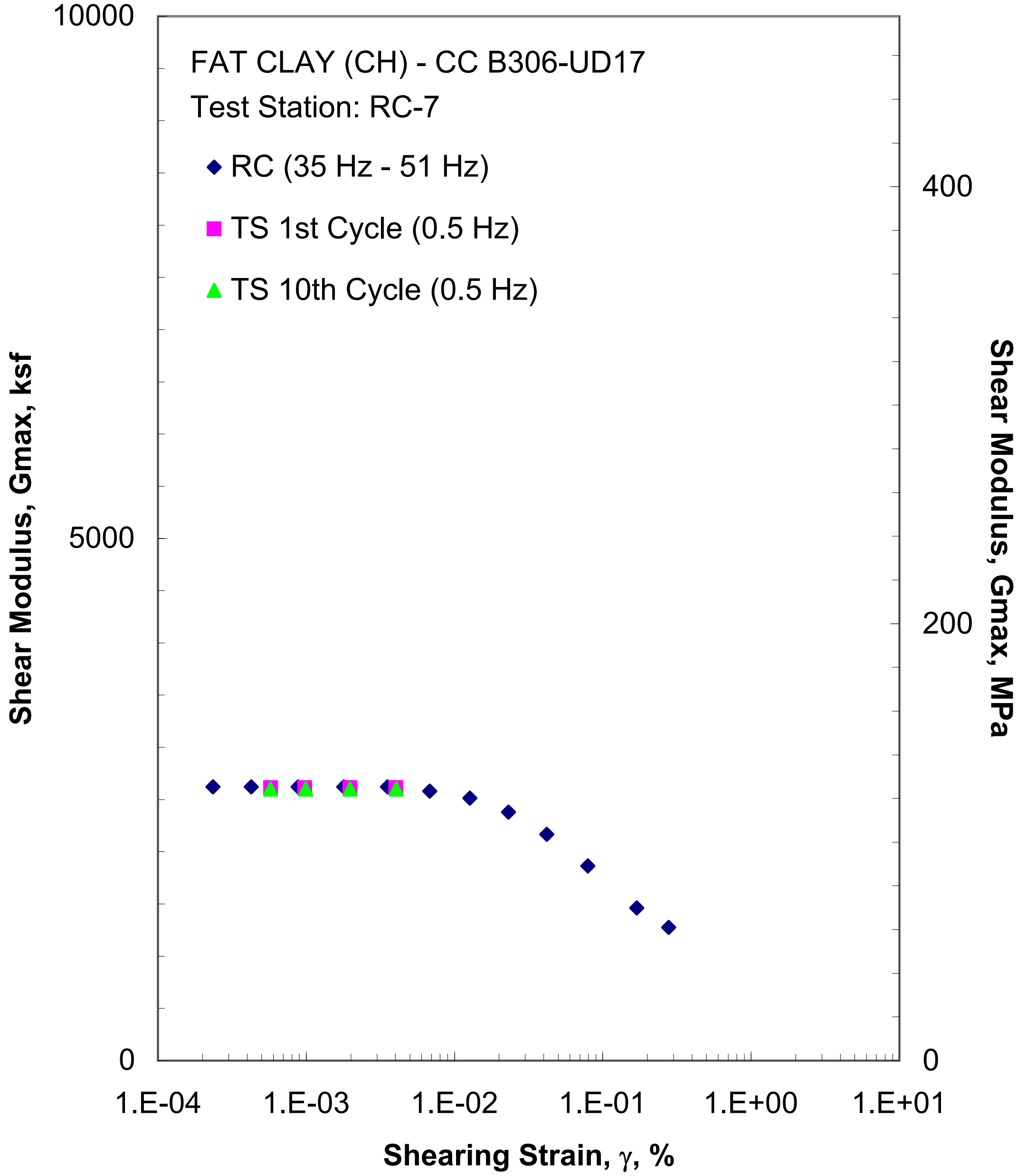


Figure I.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 23.6 psi from the Combined RCTS Tests

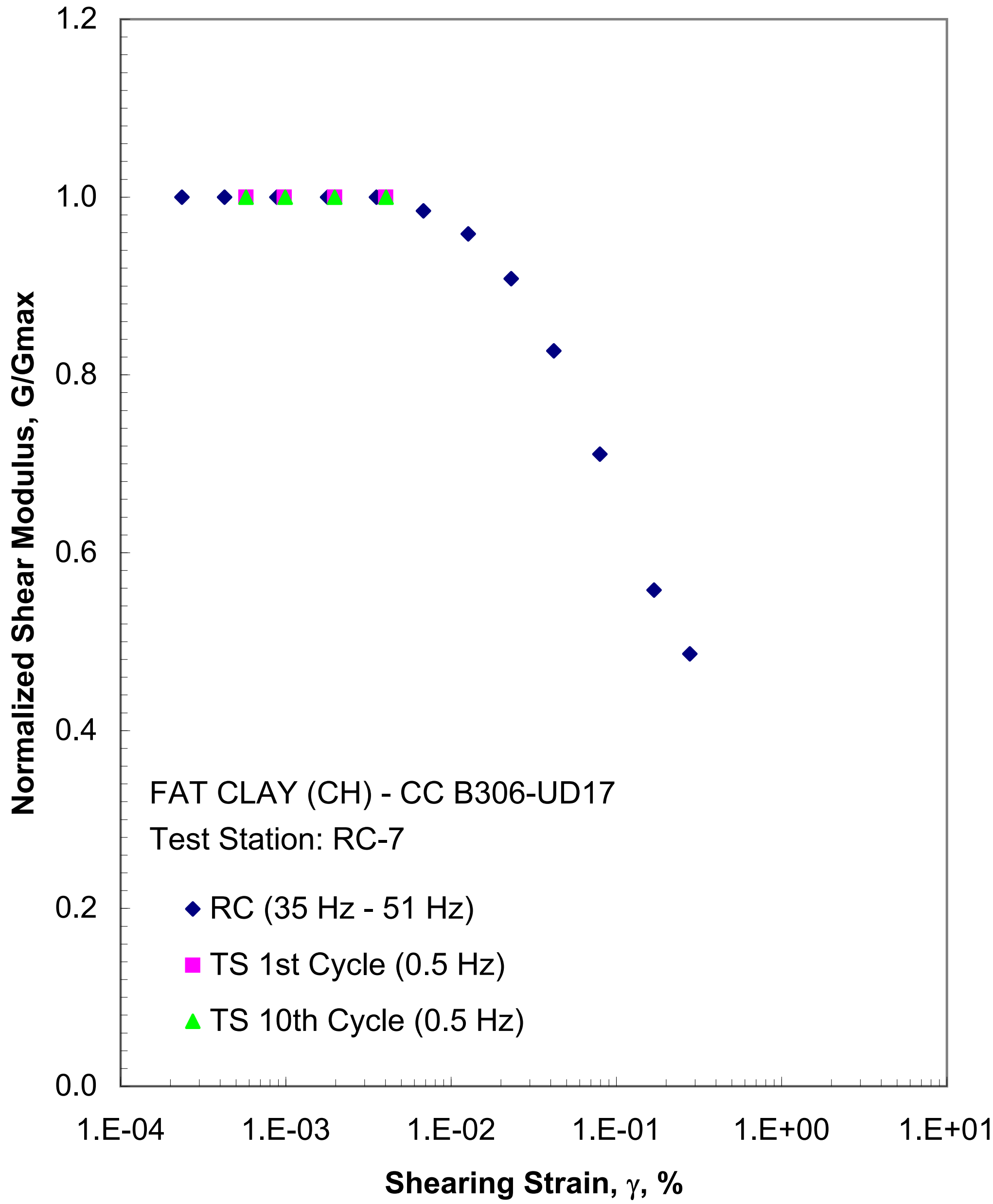


Figure I.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 23.6 psi from the Combined RCTS Tests

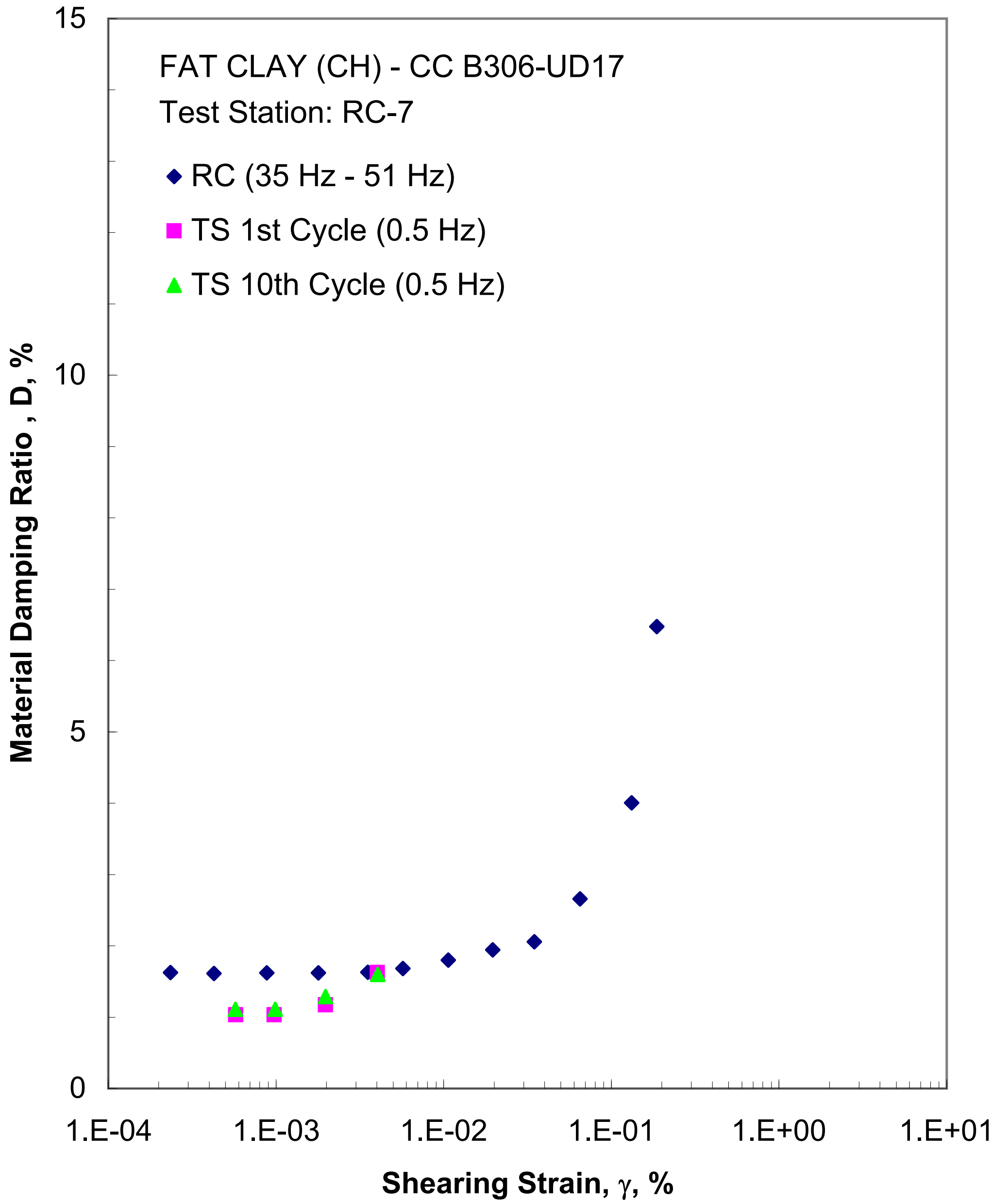


Figure I.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 23.6 psi from the Combined RCTS Tests

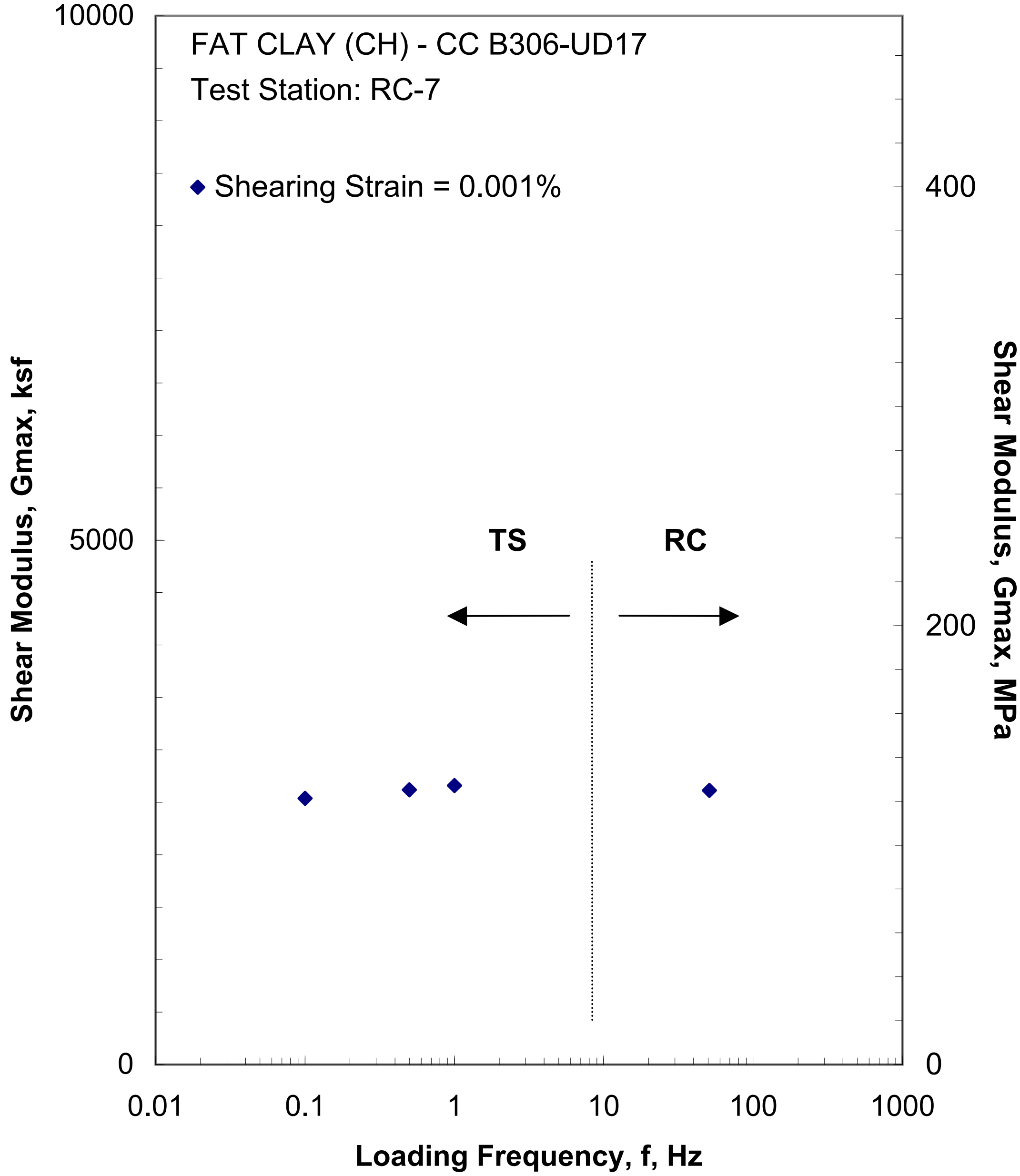


Figure I.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 23.6 psi from the Combined RCTS Tests

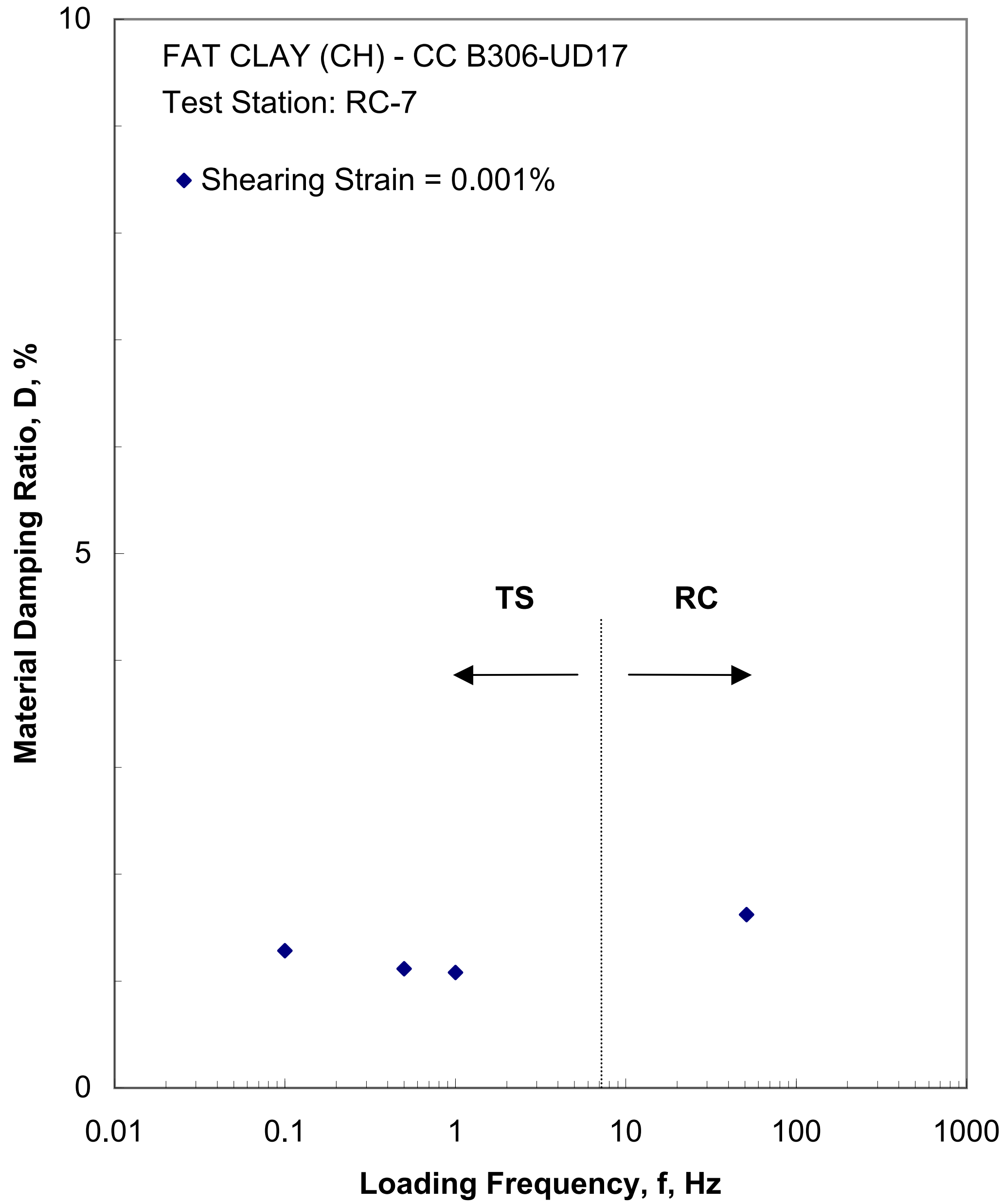


Figure I.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 23.6 psi from the Combined RCTS Tests

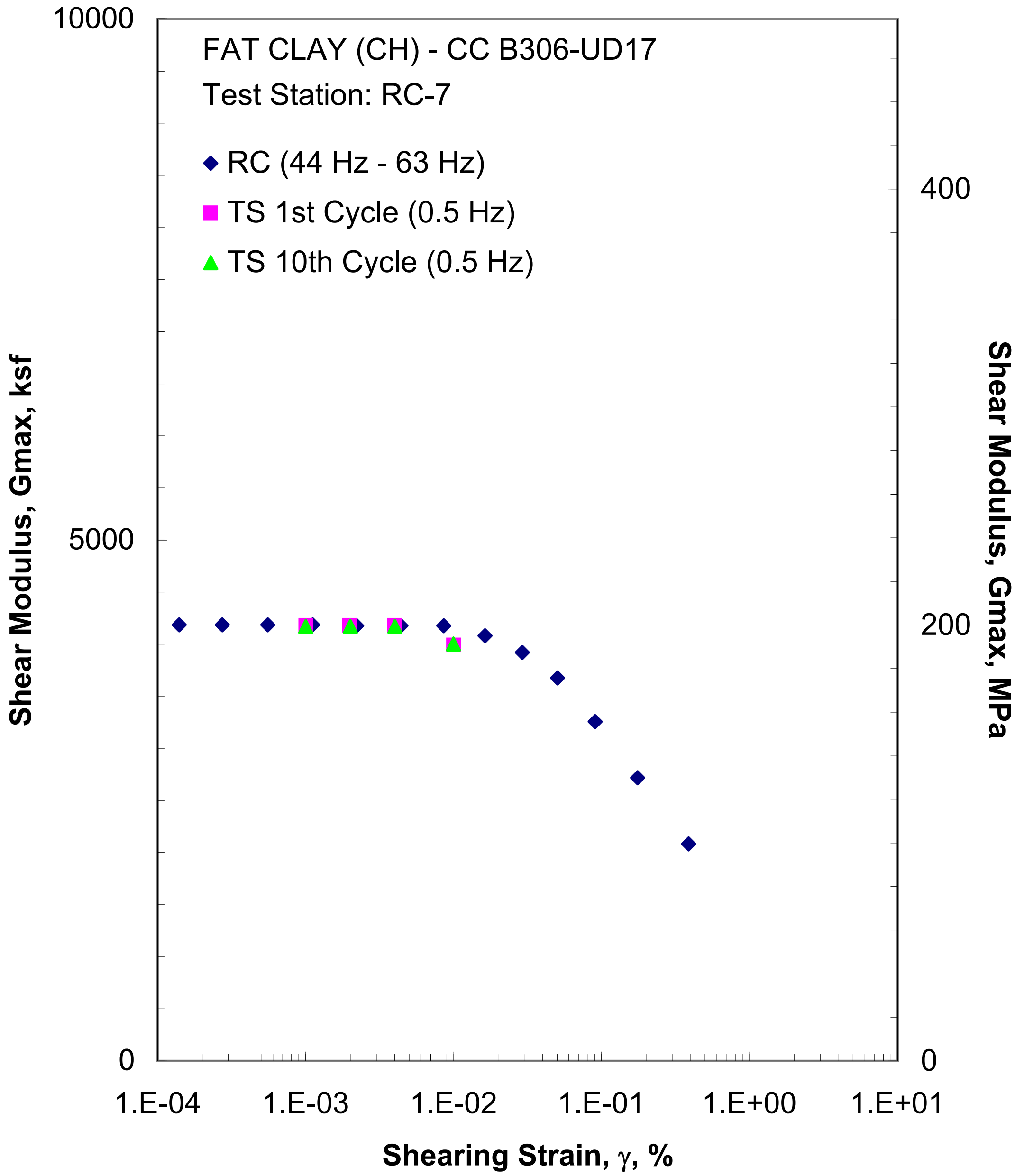


Figure I.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 94.3 psi from the Combined RCTS Tests

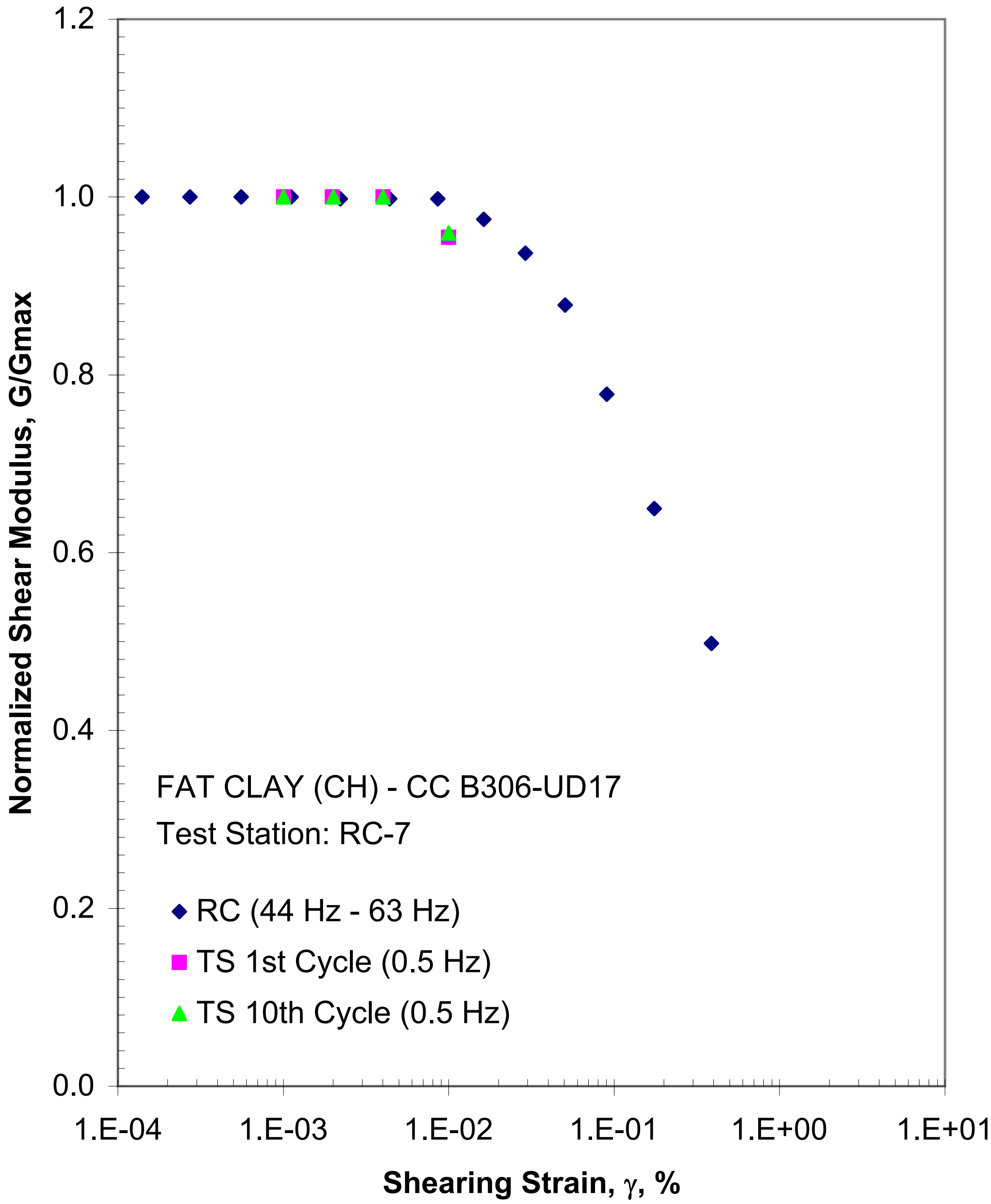


Figure I.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 94.3 psi from the Combined RCTS Tests

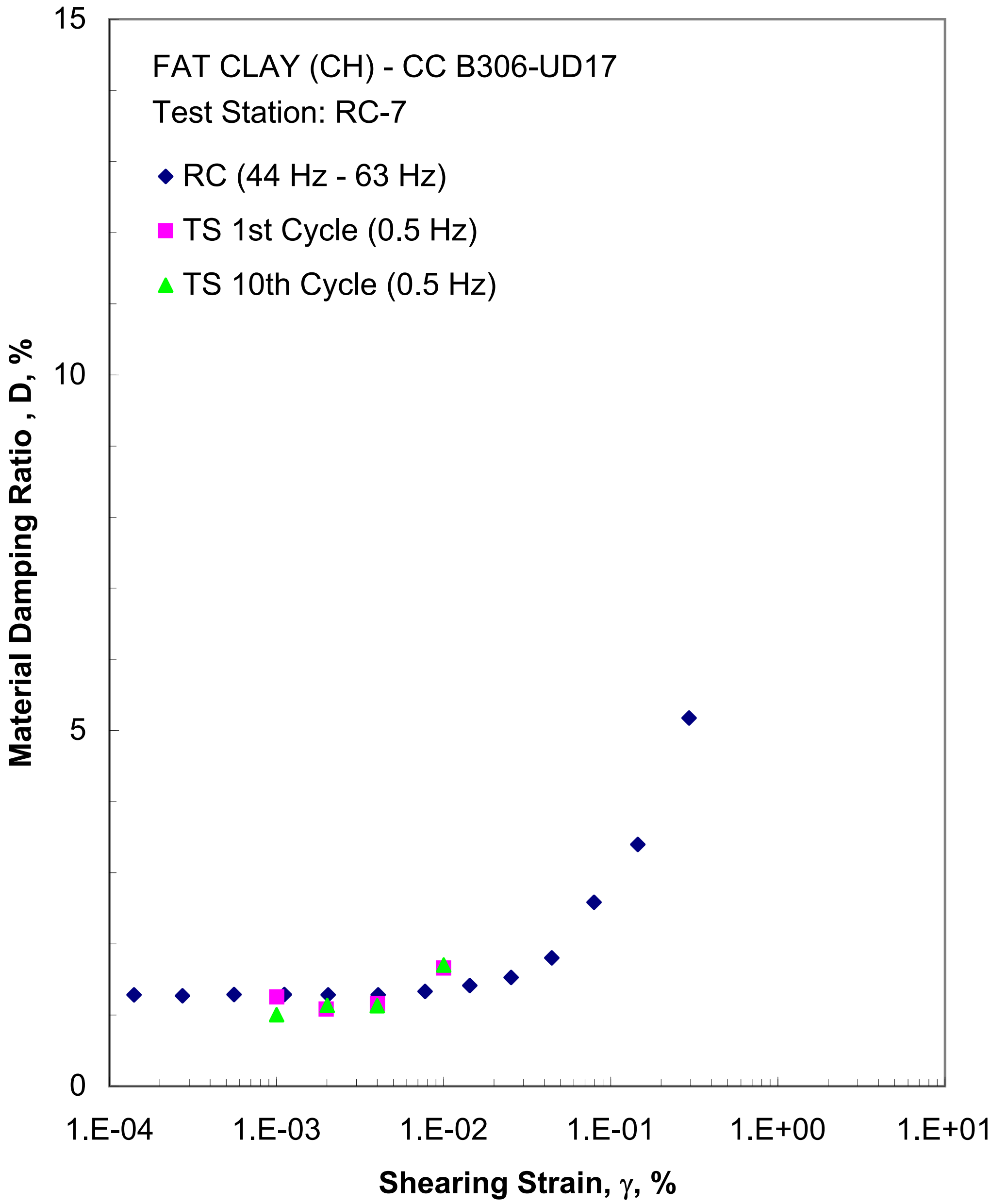


Figure I.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 94.3 psi from the Combined RCTS Tests

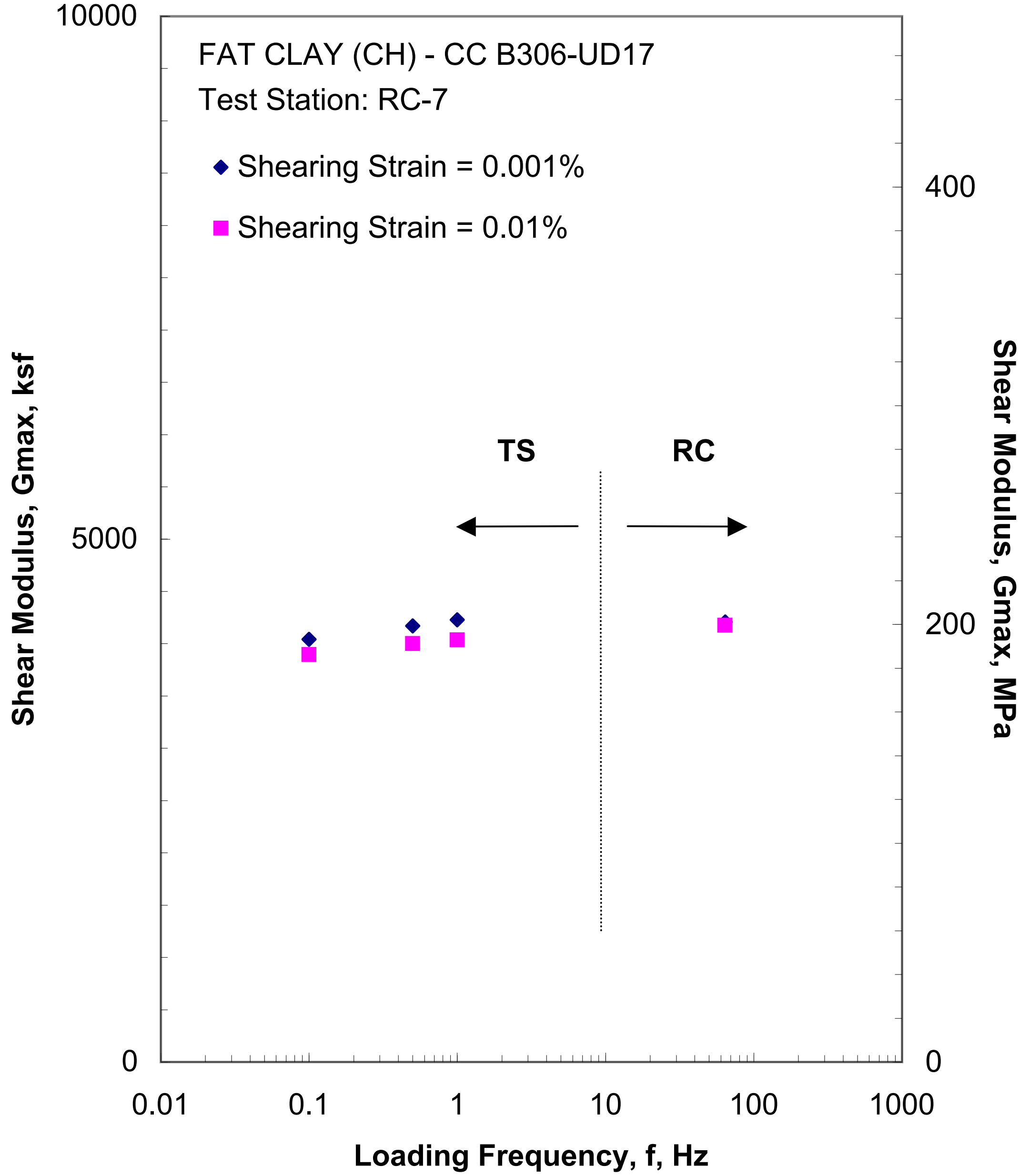


Figure I.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 94.3 psi from the Combined RCTS Tests

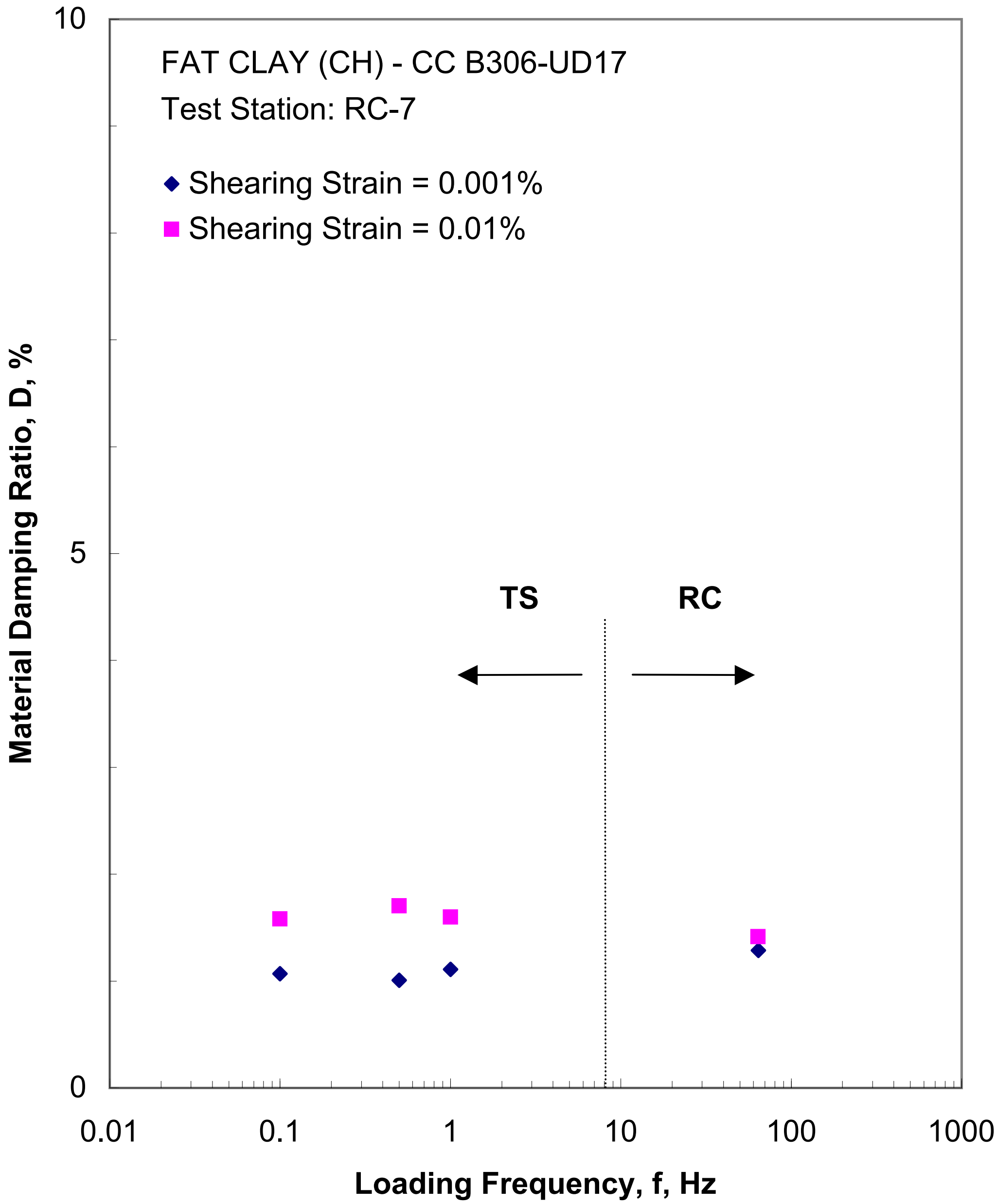


Figure I.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 94.3 psi from the Combined RCTS Tests

Table I.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 CC B306-UD17

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)	(%)	
5.9	850	41	2078	100	759	1.92	0.933
11.8	1699	81	2314	111	800	1.74	0.931
23.6	3398	163	2629	126	852	1.43	0.924
47.1	6782	325	3212	154	938	1.01	0.910
94.3	13579	650	3986	191	1038	0.48	0.887

Table I.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B306-UD17; Isoptropic Confining Pressure, σ_o=23.6 psi (3.4 ksf = 163 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio^x, D, %
2.35E-04	2622	1.00	2.35E-04	1.63
4.26E-04	2622	1.00	4.26E-04	1.61
8.80E-04	2622	1.00	8.80E-04	1.62
1.79E-03	2622	1.00	1.79E-03	1.62
3.53E-03	2622	1.00	3.53E-03	1.63
6.81E-03	2581	0.98	5.72E-03	1.68
1.27E-02	2513	0.96	1.07E-02	1.80
2.31E-02	2381	0.91	1.96E-02	1.95
4.19E-02	2168	0.83	3.48E-02	2.06
7.93E-02	1863	0.71	6.50E-02	2.66
1.69E-01	1463	0.56	1.32E-01	4.01
2.78E-01	1275	0.49	1.87E-01	6.48

+ 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 I.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B306-UD17; Isotropic Confining Pressure, σ_o= 23.6 psi (3.4 ksf =163 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, %
5.75E-04	2612	1.00	1.03	5.73E-04	2601	1.00	1.11
9.77E-04	2612	1.00	1.03	9.91E-04	2601	1.00	1.11
1.98E-03	2612	1.00	1.17	1.97E-03	2601	1.00	1.29
4.02E-03	2612	1.00	1.63	4.05E-03	2601	1.00	1.60

Table I.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B306-UD17; Isoptropic Confining Pressure, σ_o= 94.3 psi (13.6 ksf = 650 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
1.40E-04	4184	1.00	1.40E-04	1.28
2.73E-04	4184	1.00	2.73E-04	1.27
5.56E-04	4184	1.00	5.56E-04	1.29
1.11E-03	4184	1.00	1.11E-03	1.29
2.21E-03	4176	1.00	2.04E-03	1.29
4.40E-03	4176	1.00	4.05E-03	1.29
8.58E-03	4176	1.00	7.72E-03	1.33
1.63E-02	4080	0.98	1.43E-02	1.41
2.91E-02	3920	0.94	2.53E-02	1.53
5.04E-02	3676	0.88	4.44E-02	1.80
9.03E-02	3257	0.78	7.94E-02	2.59
1.75E-01	2719	0.65	1.45E-01	3.40
3.87E-01	2083	0.50	2.94E-01	5.18

[+] 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 I.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B306-UD17; Isotropic Confining Pressure, σ_o=94.3 psi (13.6 ksf = 650 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, %
1.00E-03	4179	1.00	1.25	1.00E-03	4170	1.00	1.00
1.98E-03	4179	1.00	1.08	2.01E-03	4170	1.00	1.14
4.02E-03	4179	1.00	1.16	4.01E-03	4170	1.00	1.13
1.00E-02	3989	0.95	1.66	9.98E-03	4001	0.96	1.70

U.S. Standard Sieve Nos.

3" 3/4" 4 10 40 100 200

PERCENT FINER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

100 10 1 0.1 0.01 0.001

GRAIN SIZE (mm)

GRAVEL SAND SILT OR CLAY

GRADATION CURVE

ASTM D422

Project: Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland

Contract No.: 06120048.00

Date: 9/21/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-306	68.0-70.0	FAT CLAY, trace sand, gray	CH	62	38

Schnabel Engineering

APPENDIX J

CC B409-UD15
POORLY GRADED SAND (SP-SM), with silt, gray*
(Non-Plastic; Gs=2.66)*

Borehole B-409
Sample UD15
Sample Depth = 35 to 36.1 ft
RCTS Test Depth = 36.1 ft
Total Unit Weight = 124.8 lb/ft^3
Water Content = 23.3 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 11.8 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

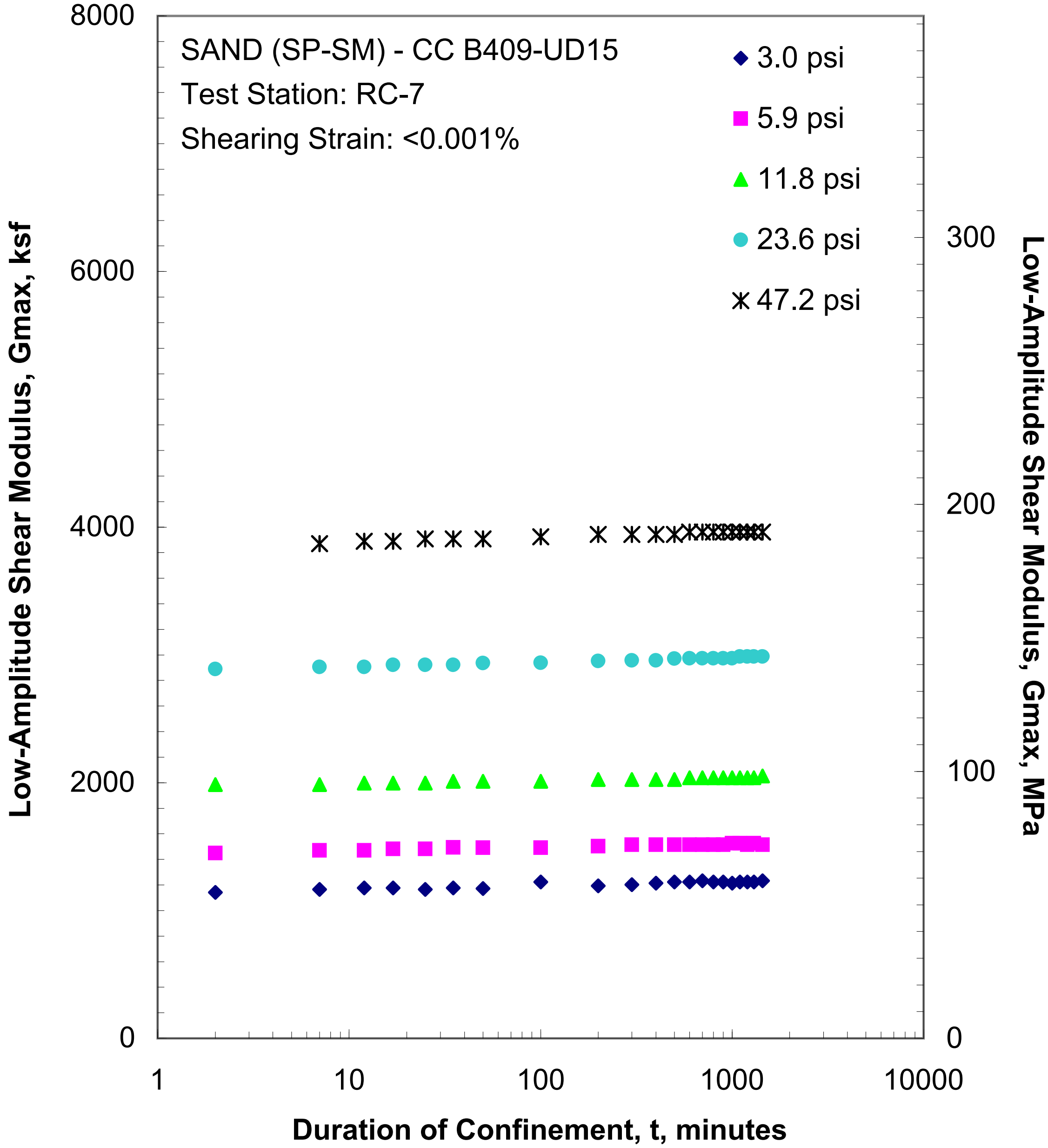


Figure J.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

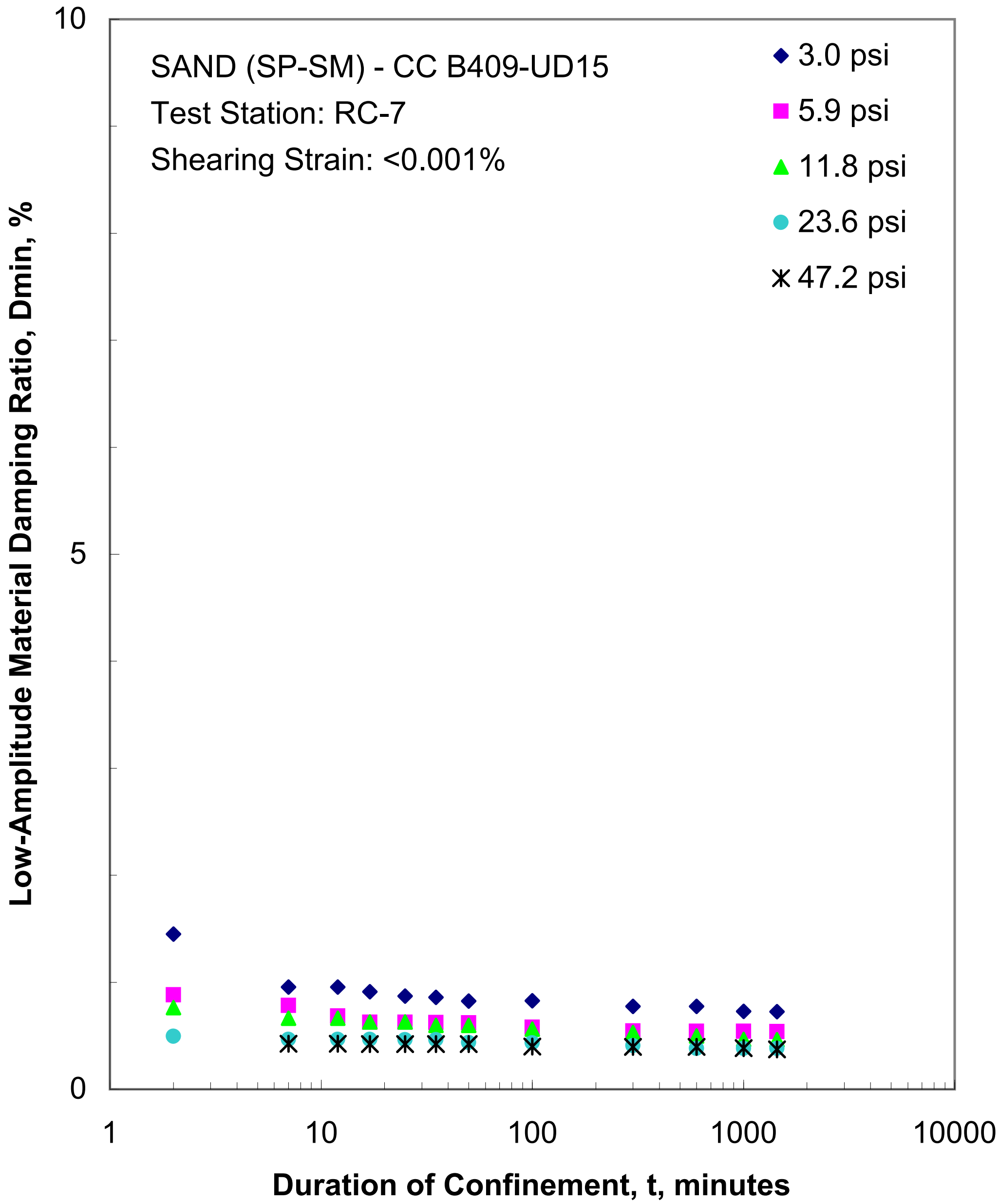


Figure J.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

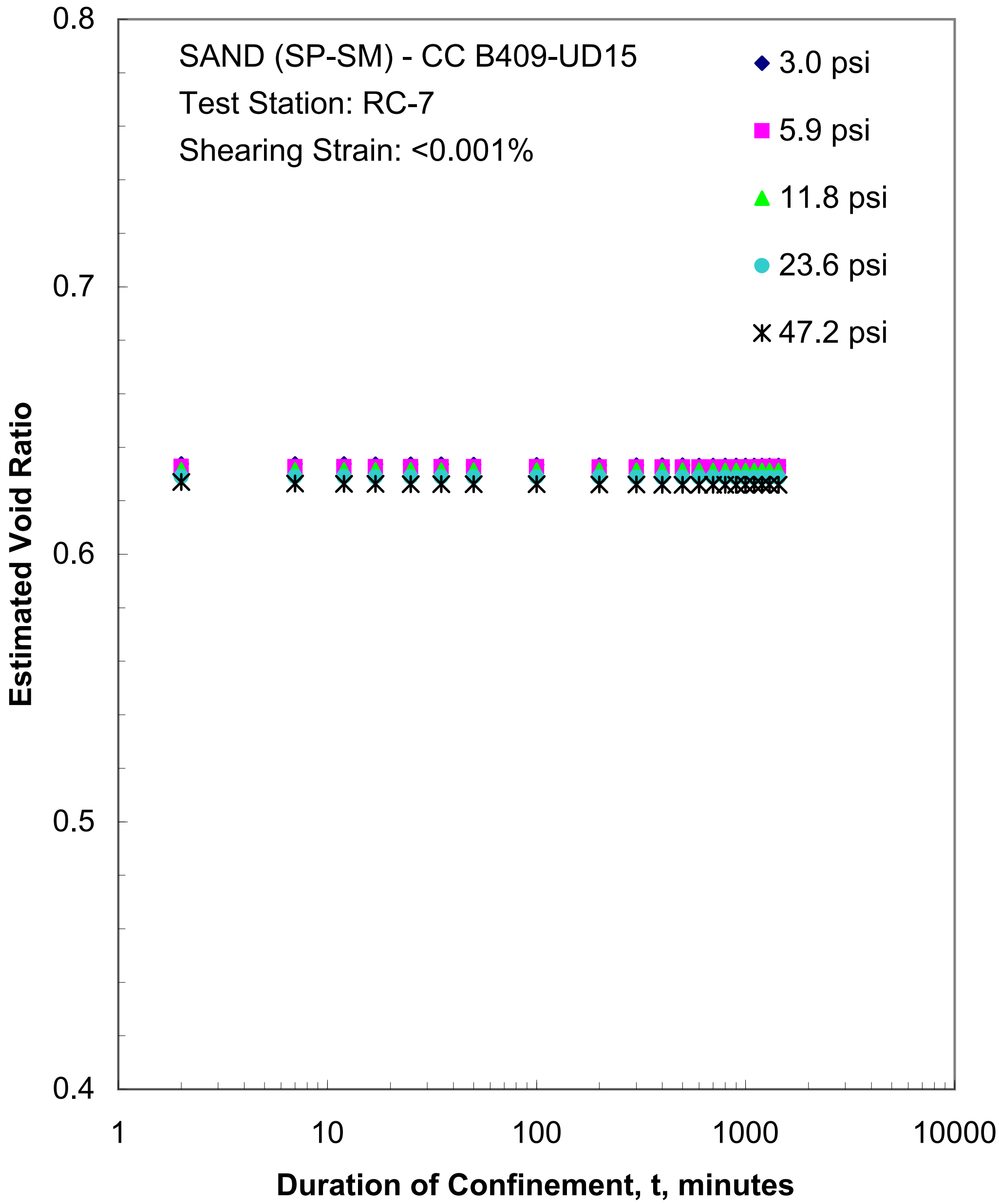


Figure J.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

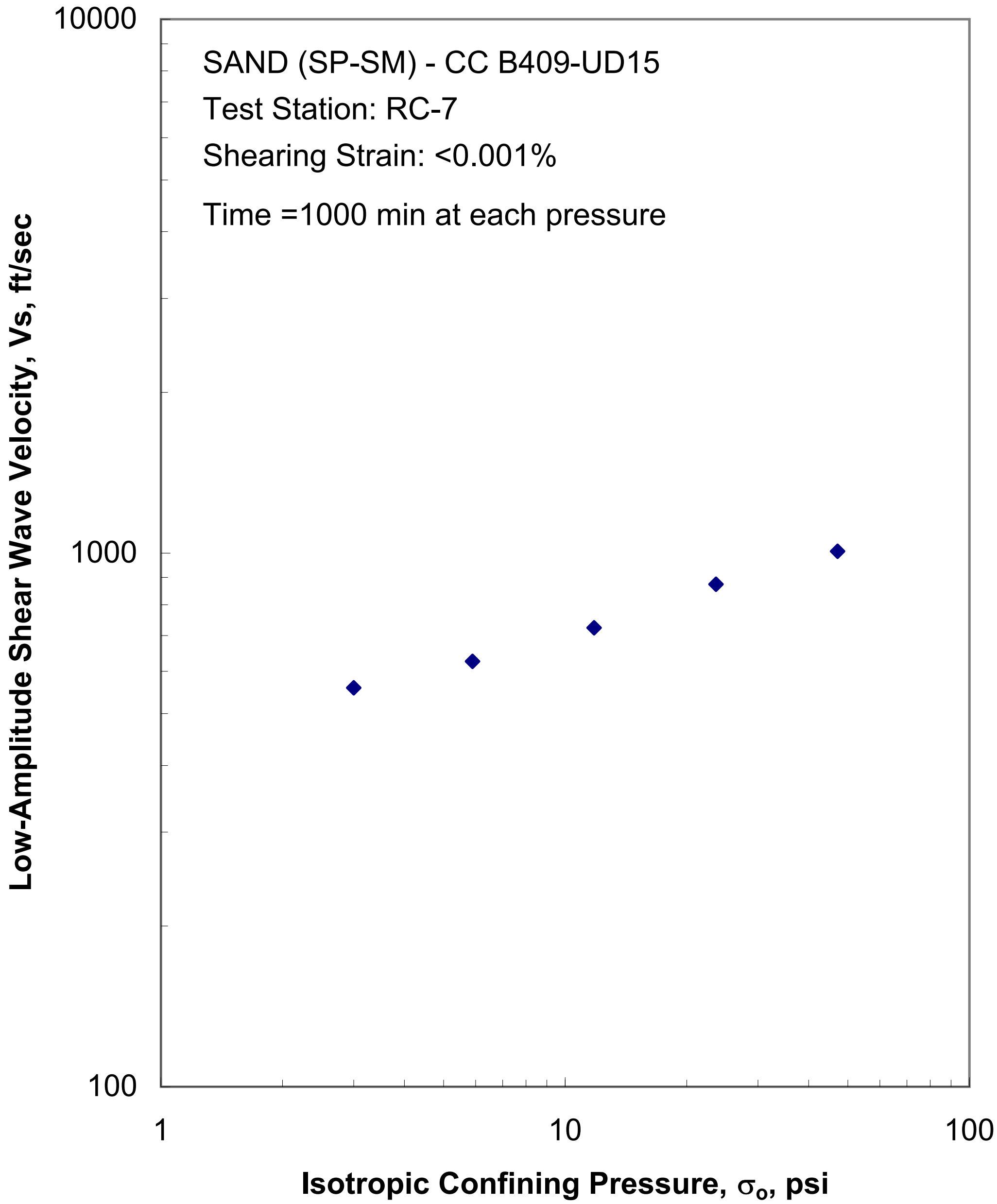


Figure J.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

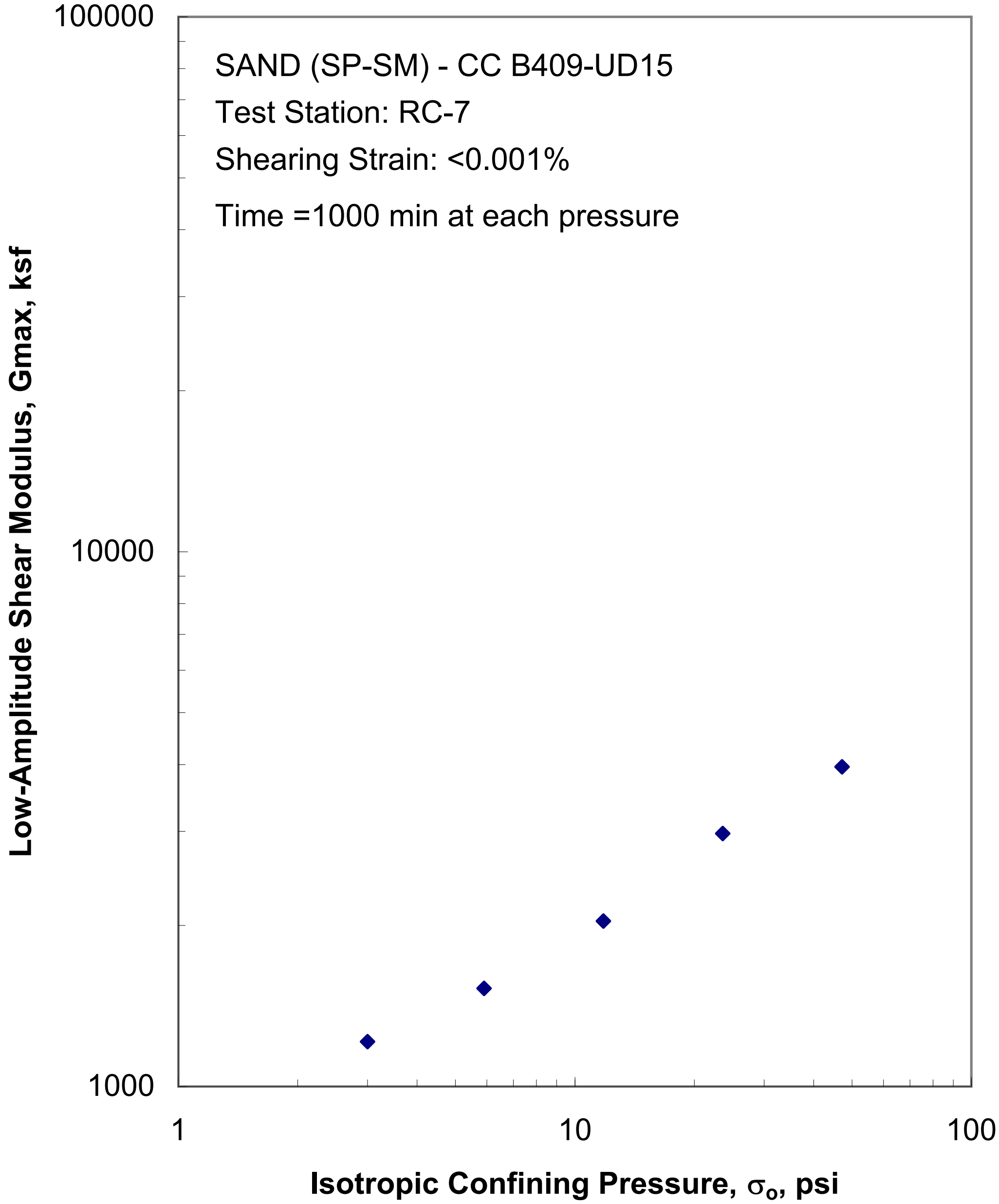


Figure J.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

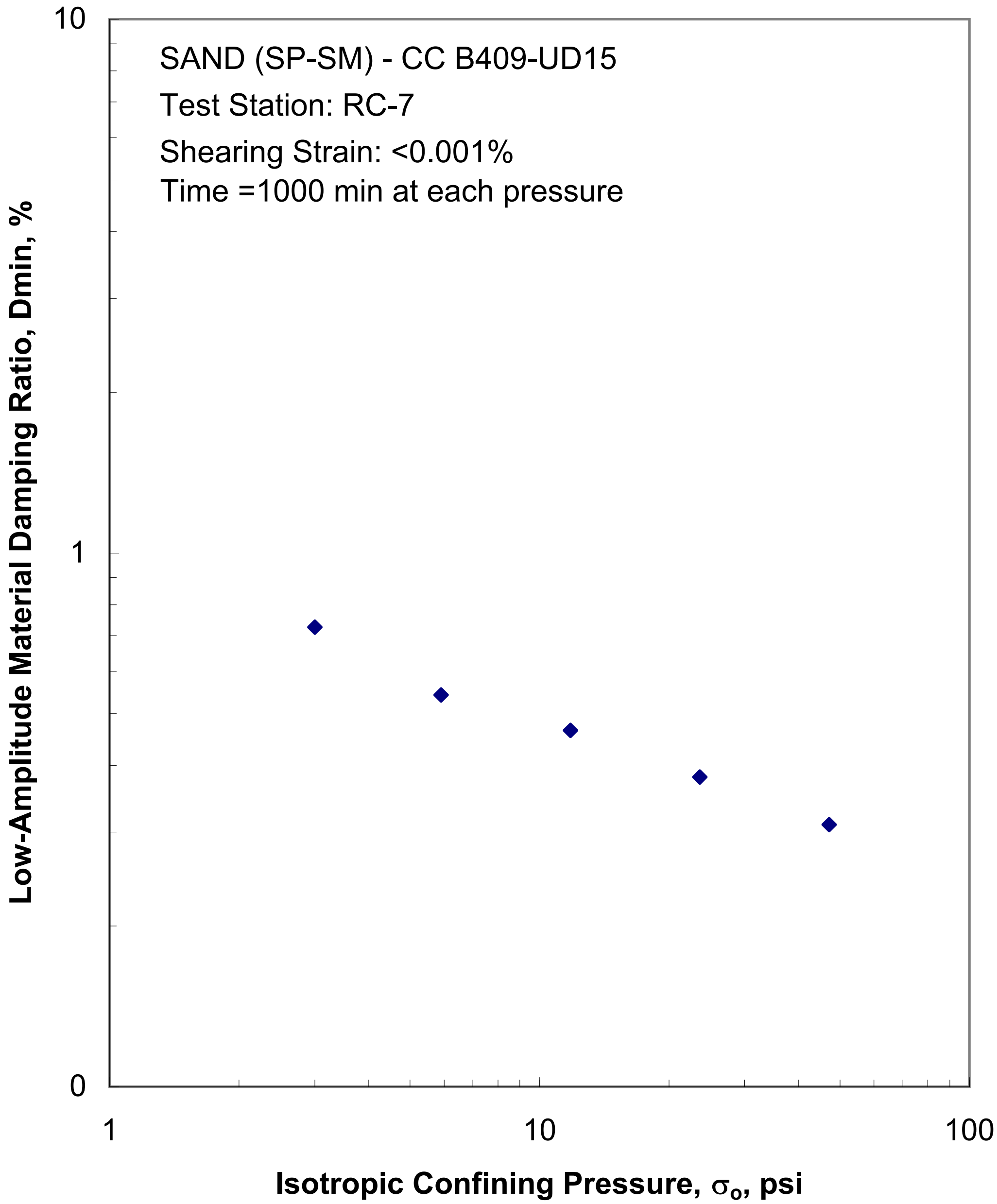


Figure J.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

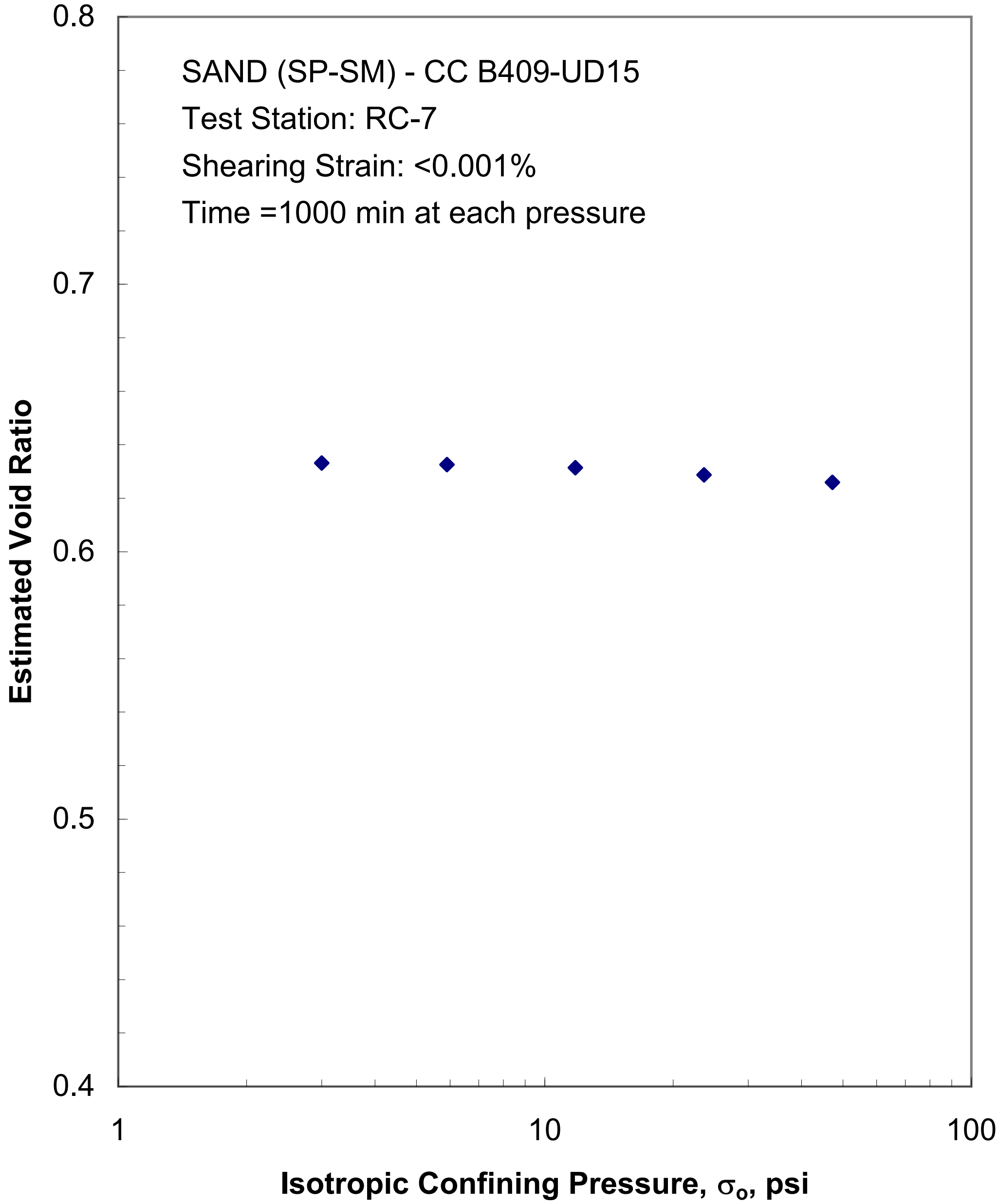


Figure J.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

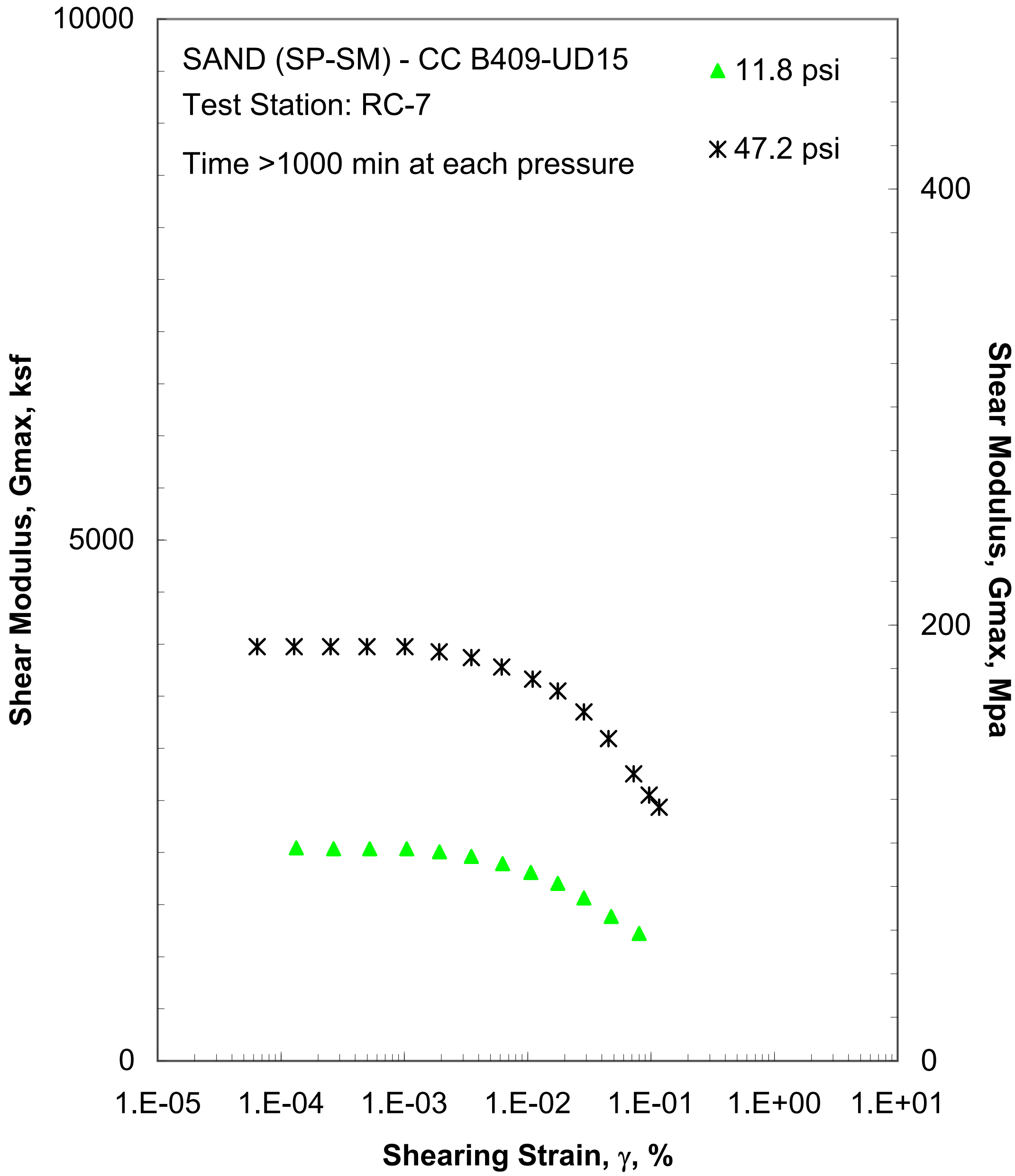


Figure J.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

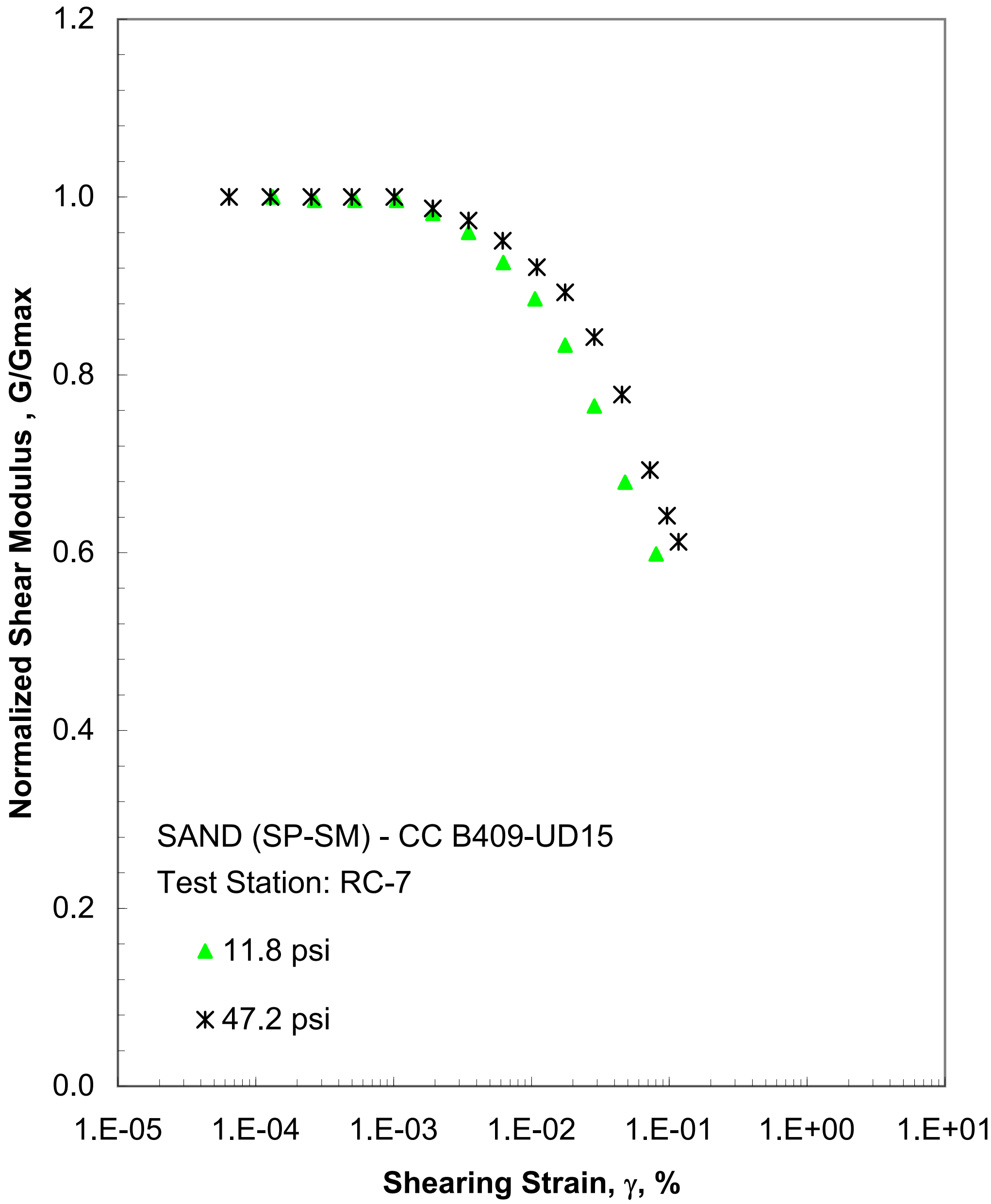


Figure I.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

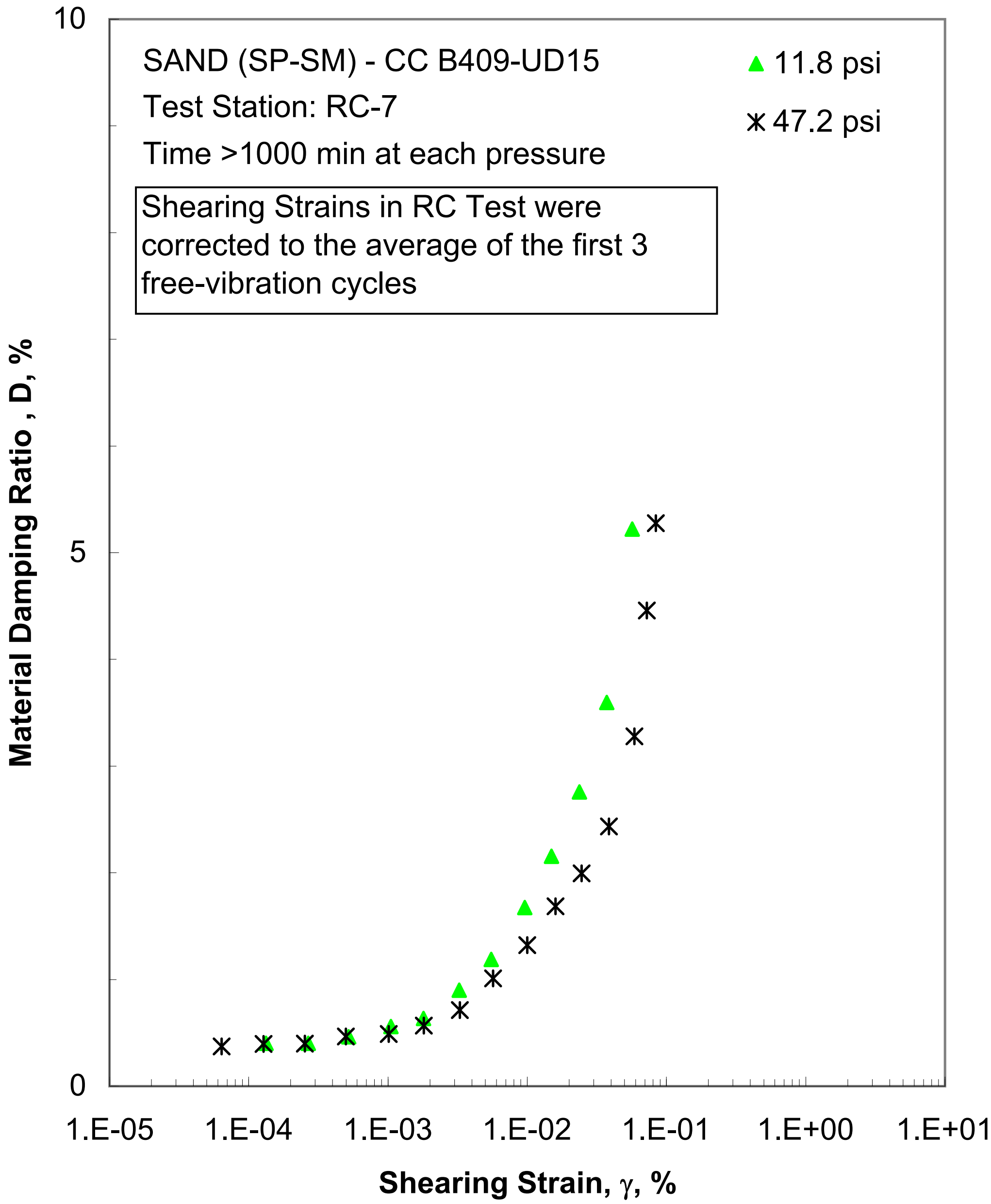


Figure J.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

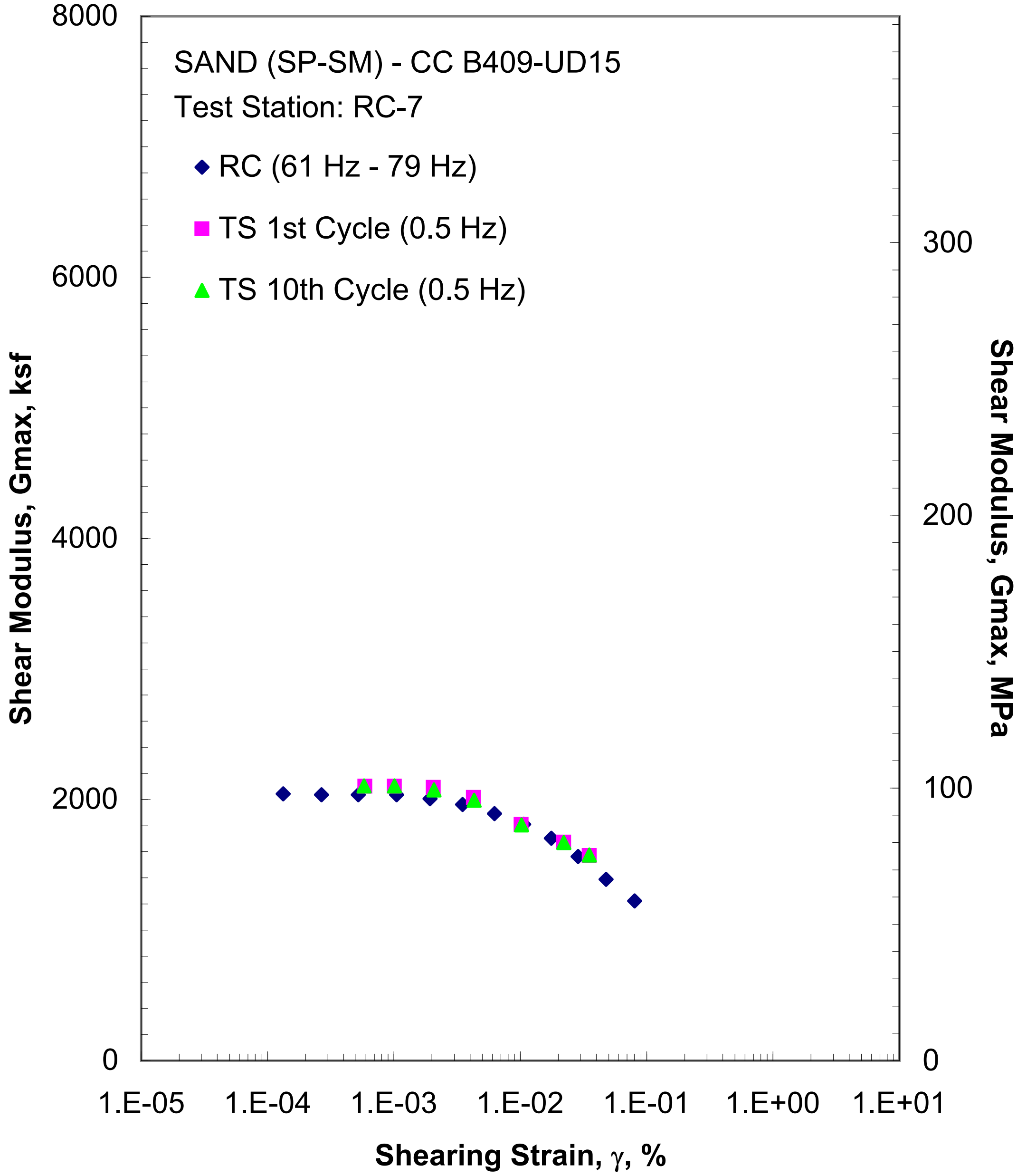


Figure J.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 11.8 psi from the Combined RCTS Tests

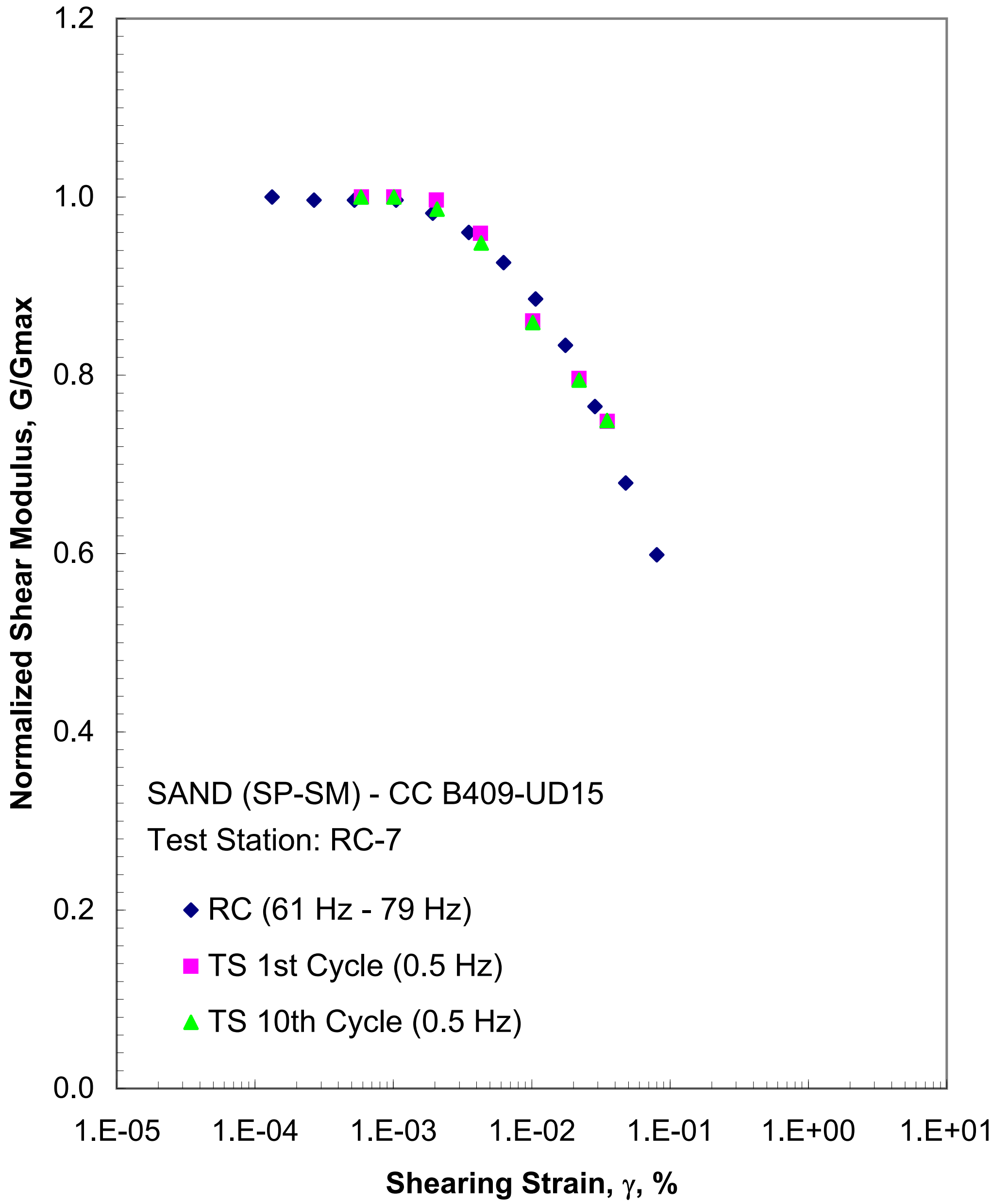


Figure J.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 11.8 psi from the Combined RCTS Tests

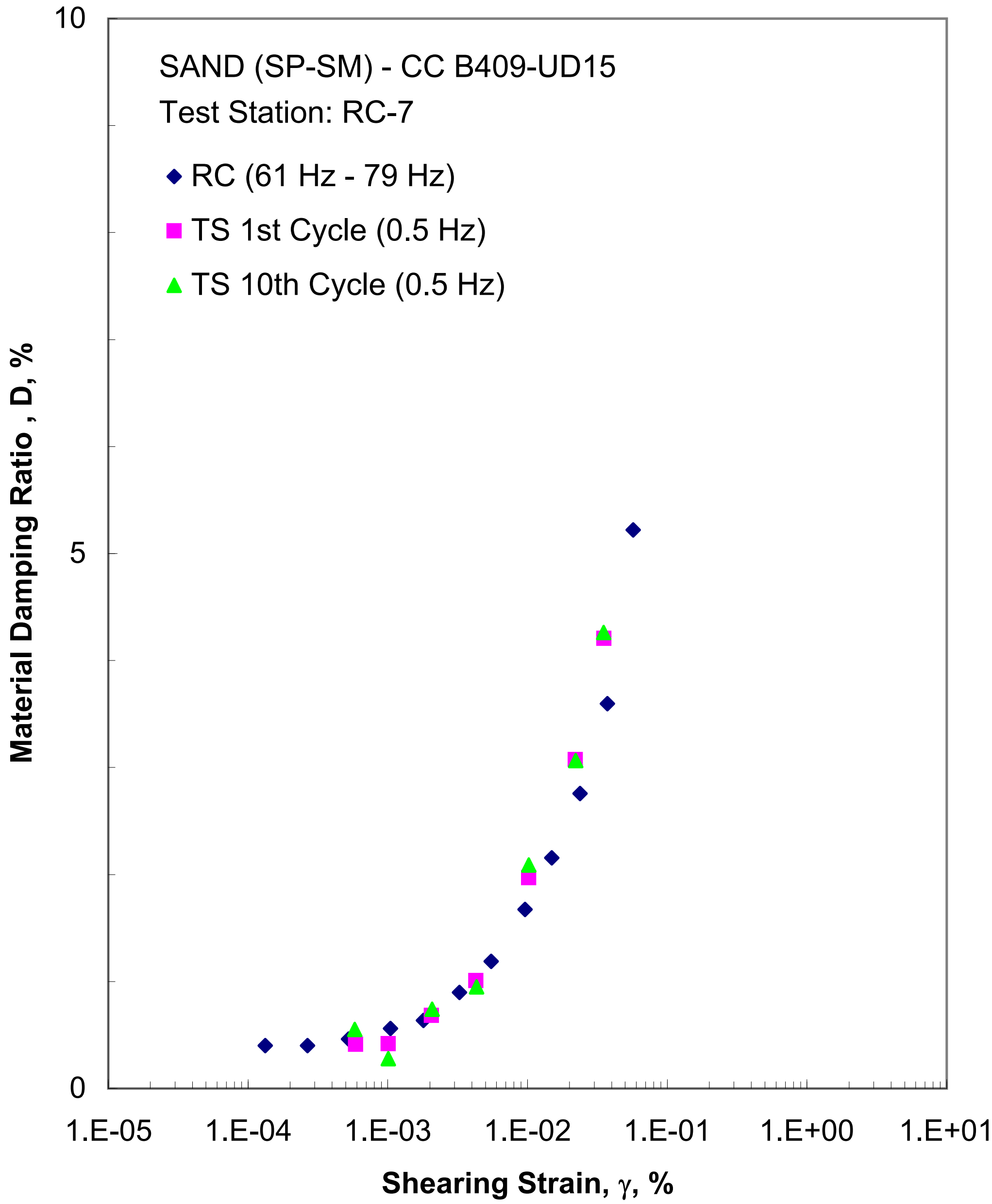


Figure J.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 11.8 psi from the Combined RCTS Tests

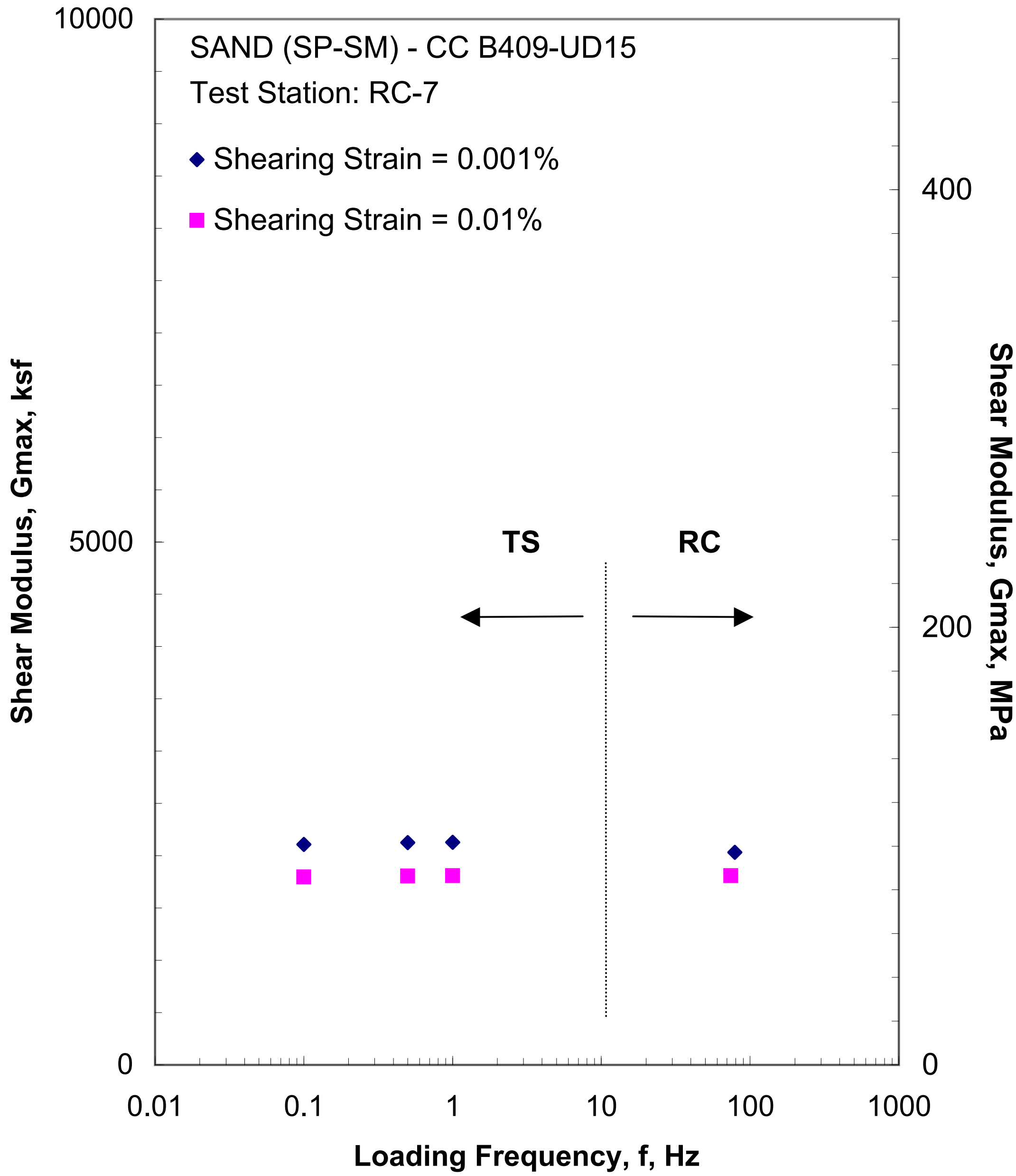


Figure J.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 11.8 psi from the Combined RCTS Tests

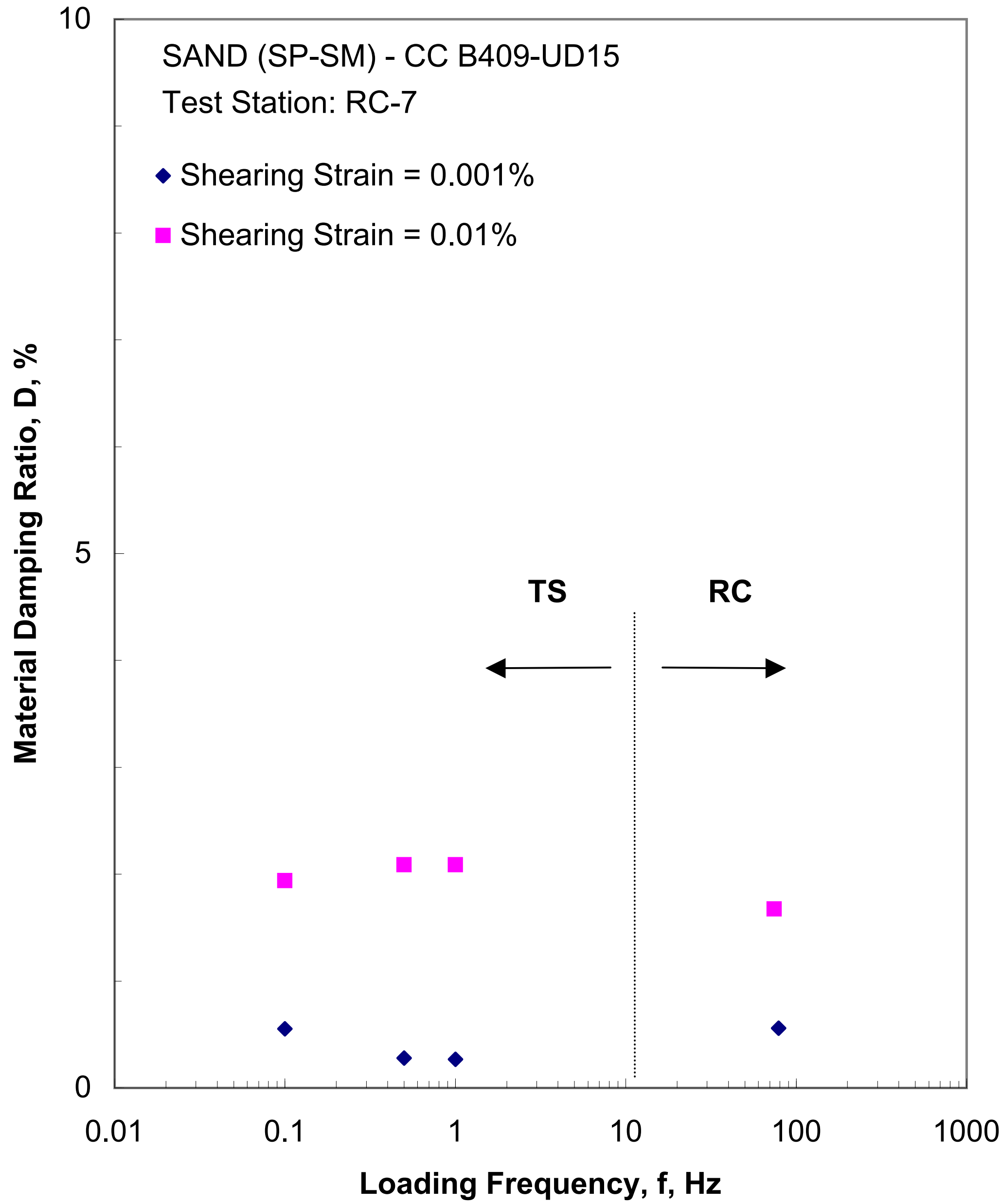


Figure J.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 11.8 psi from the Combined RCTS Tests

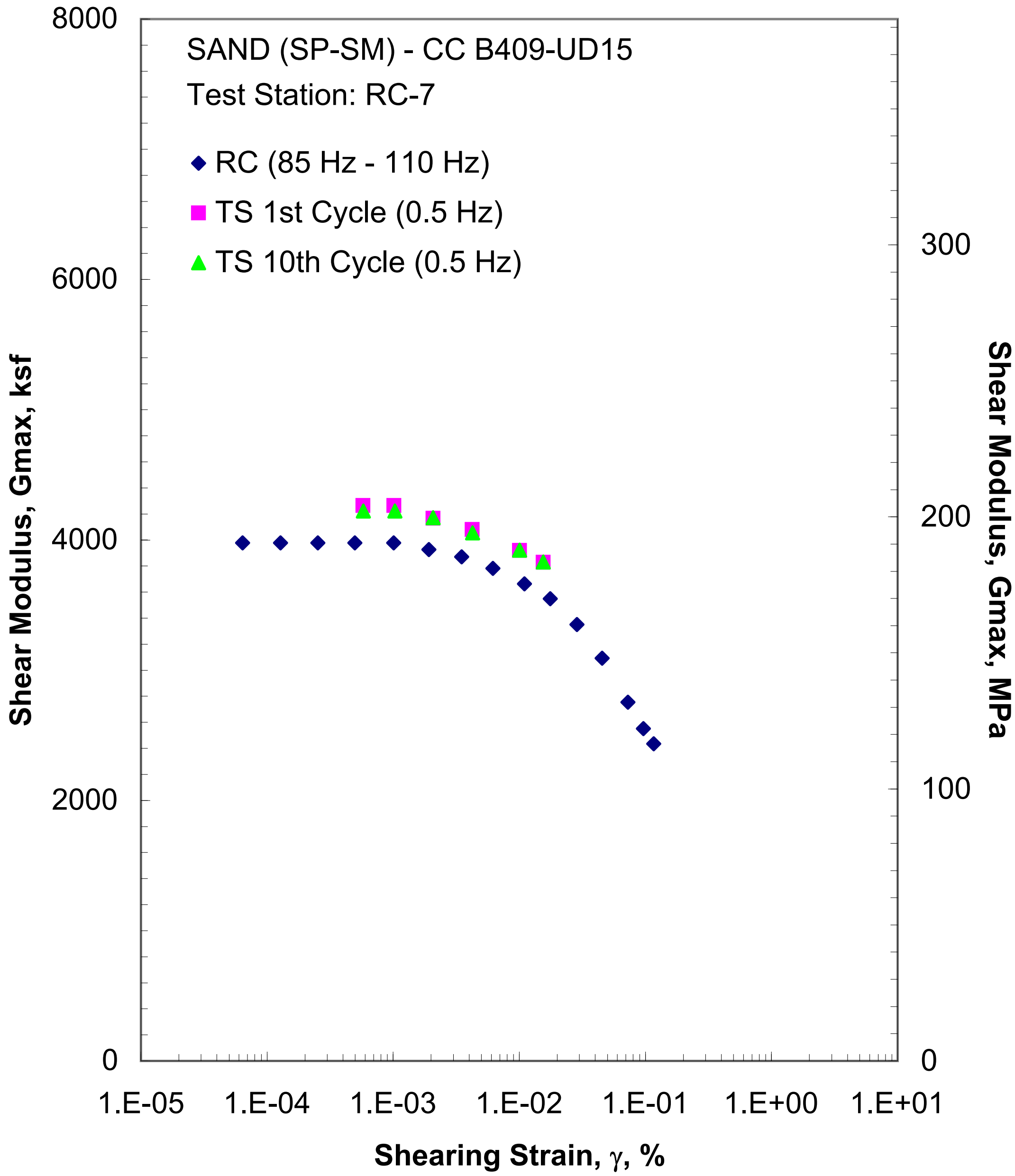


Figure J.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 47.2 psi from the Combined RCTS Tests

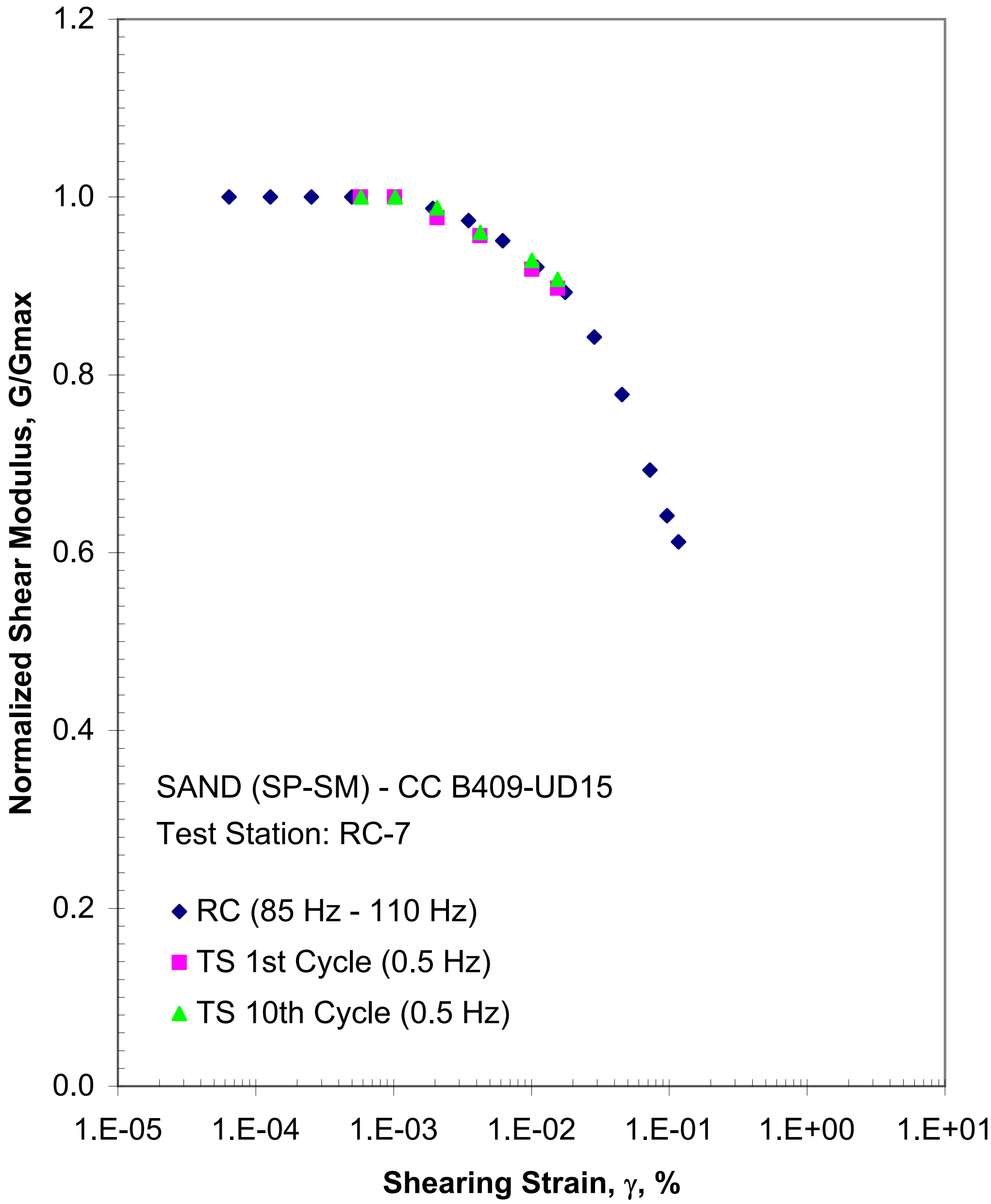


Figure J.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 47.2 psi from the Combined RCTS Tests

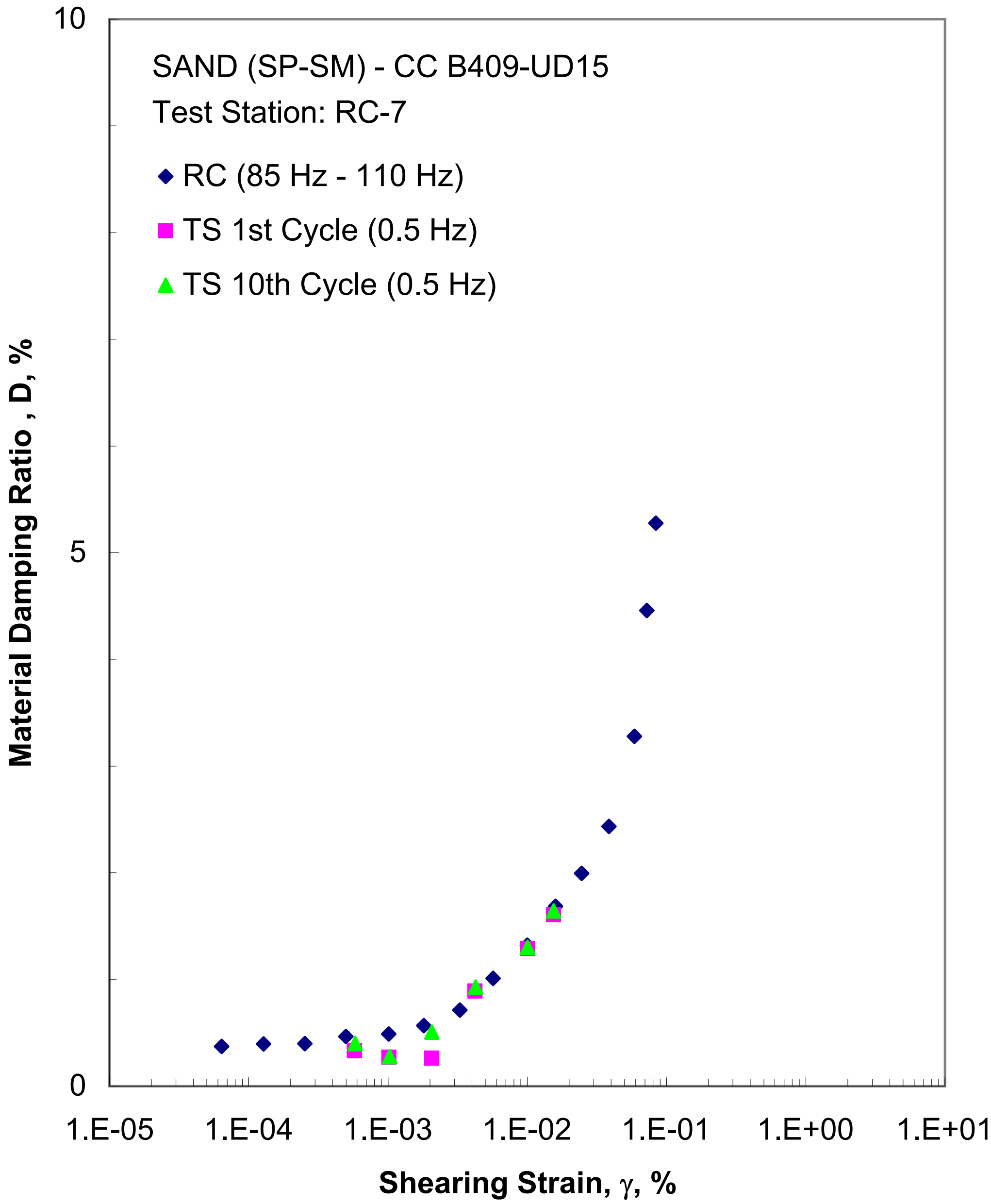


Figure J.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 47.2 psi from the Combined RCTS Tests

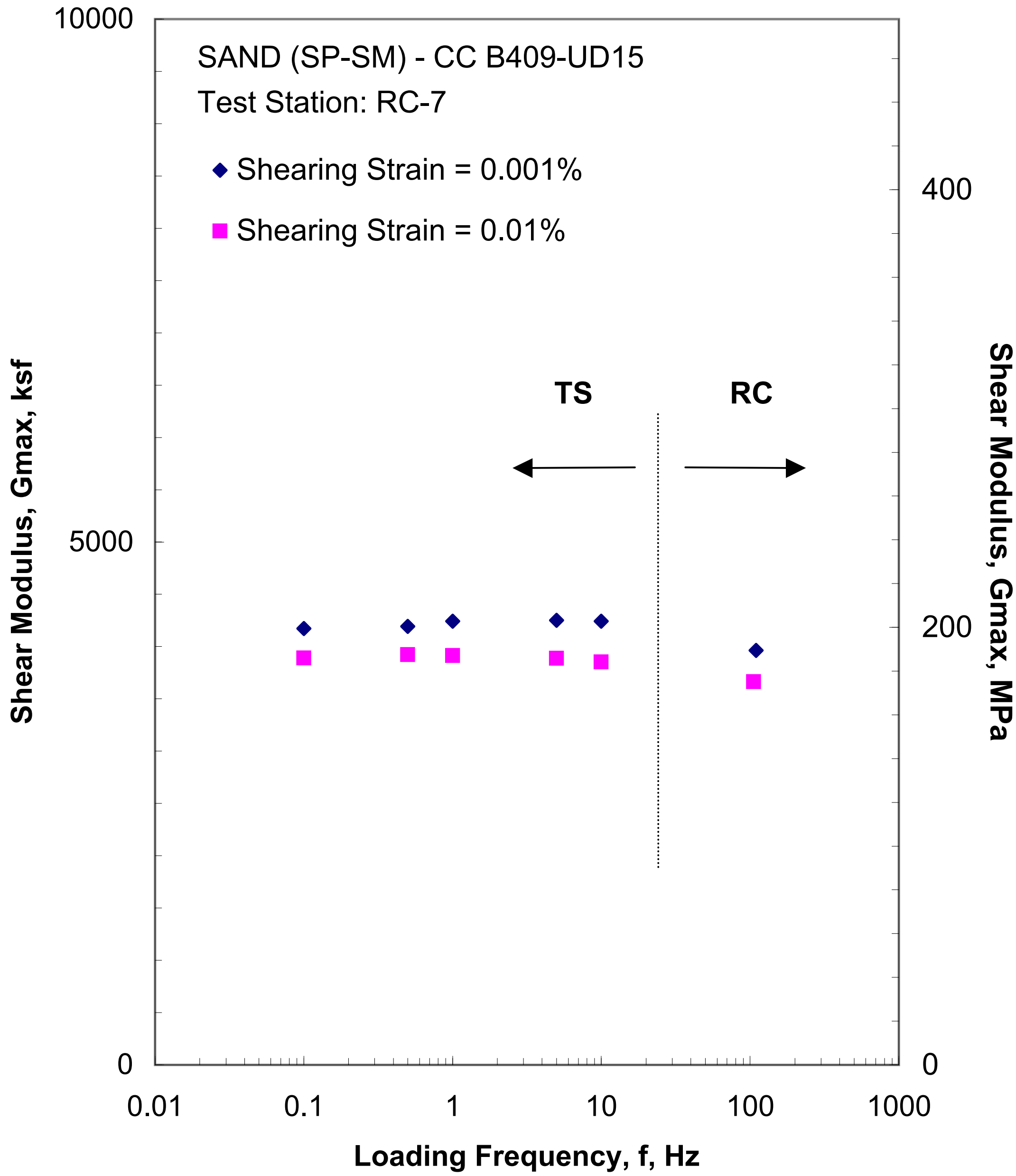


Figure J.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 47.2 psi from the Combined RCTS Tests

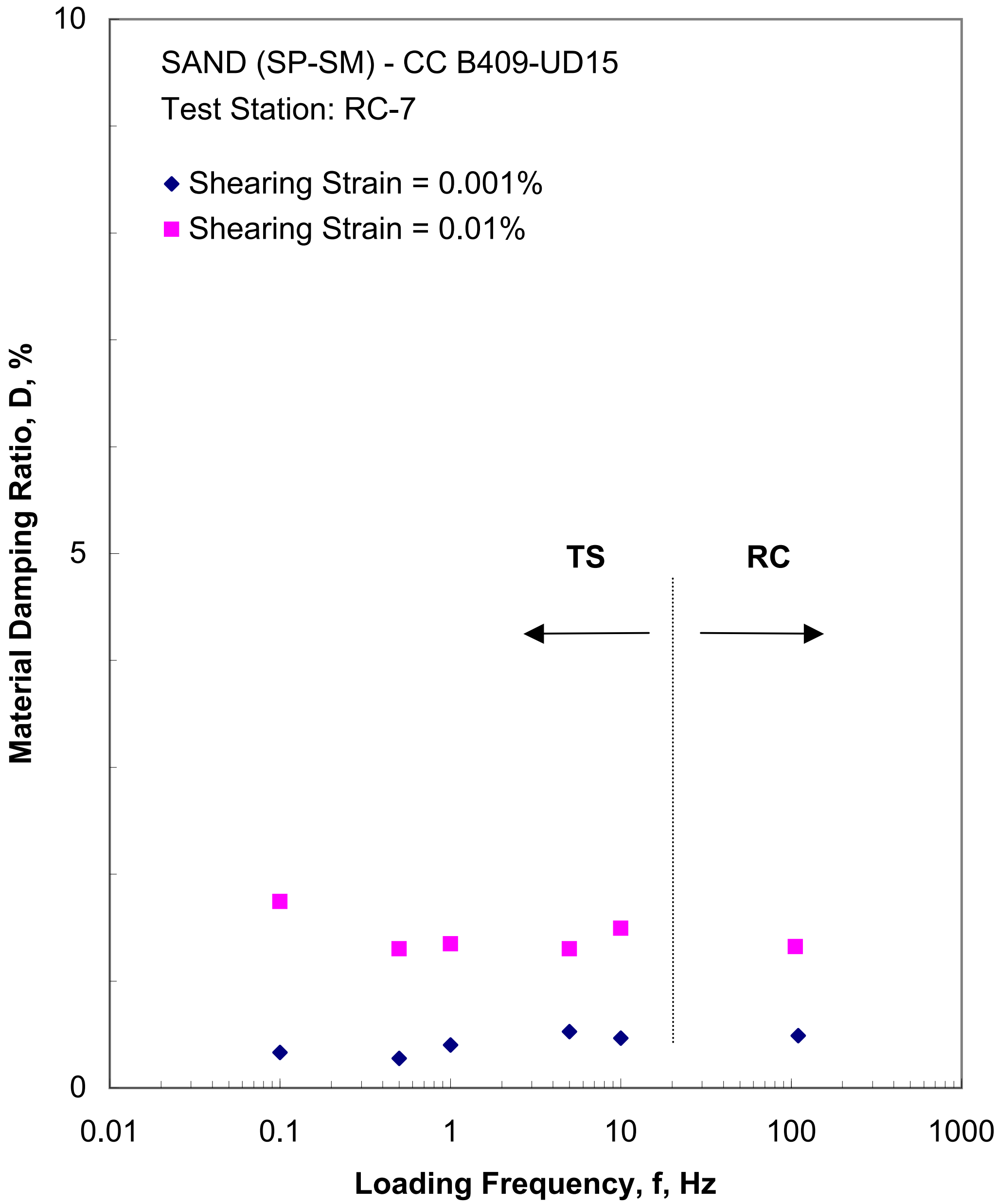


Figure J.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 47.2 psi from the Combined RCTS Tests

Table J.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 CC B409-UD15

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)	(%)	
3.0	432	21	1213	58	559	0.73	0.633
5.9	850	41	1527	73	627	0.54	0.633
11.8	1699	81	2039	98	724	0.47	0.631
23.6	3398	163	2972	143	874	0.38	0.629
47.2	6797	325	3962	190	1008	0.31	0.626

Table J.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B409-UD15; Isoptropic Confining Pressure, σ_o=11.8 psi (1.7 ksf = 81 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio^x, D, %
1.33E-04	2044	1.00	1.33E-04	0.40
2.67E-04	2036	1.00	2.67E-04	0.40
5.23E-04	2036	1.00	5.23E-04	0.46
1.05E-03	2036	1.00	1.05E-03	0.56
1.93E-03	2006	0.98	1.79E-03	0.63
3.50E-03	1962	0.96	3.26E-03	0.90
6.25E-03	1893	0.93	5.50E-03	1.19
1.06E-02	1810	0.89	9.58E-03	1.67
1.75E-02	1703	0.83	1.49E-02	2.16
2.86E-02	1563	0.76	2.38E-02	2.76
4.77E-02	1388	0.68	3.72E-02	3.60
8.01E-02	1223	0.60	5.69E-02	5.22

+ 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 J.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B409-UD15; Isotropic Confining Pressure, σ_o= 11.8 psi (1.7 ksf =81 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, %
5.89E-04	2101	1.00	0.41	5.81E-04	2104	1.00	0.55
1.01E-03	2101	1.00	0.42	1.01E-03	2104	1.00	0.28
2.05E-03	2094	1.00	0.68	2.07E-03	2075	0.99	0.74
4.27E-03	2015	0.96	1.01	4.31E-03	1995	0.95	0.95
1.02E-02	1809	0.86	1.97	1.02E-02	1807	0.86	2.09
2.20E-02	1673	0.80	3.08	2.21E-02	1671	0.79	3.07
3.52E-02	1572	0.75	4.21	3.51E-02	1576	0.75	4.26

Table J.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B409-UD15; Isoptropic Confining Pressure, σ_o= 47.2 psi (6.8 ksf = 325 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	3977	1.00	6.40E-05	0.37
1.28E-04	3977	1.00	1.28E-04	0.40
2.53E-04	3977	1.00	2.53E-04	0.40
4.97E-04	3977	1.00	4.97E-04	0.47
1.01E-03	3977	1.00	1.01E-03	0.49
1.92E-03	3926	0.99	1.81E-03	0.57
3.50E-03	3872	0.97	3.29E-03	0.71
6.17E-03	3782	0.95	5.68E-03	1.01
1.10E-02	3663	0.92	9.98E-03	1.32
1.76E-02	3550	0.89	1.60E-02	1.69
2.86E-02	3351	0.84	2.46E-02	1.99
4.54E-02	3093	0.78	3.85E-02	2.44
7.25E-02	2755	0.69	5.87E-02	3.28
9.65E-02	2551	0.64	7.24E-02	4.46
1.17E-01	2435	0.61	8.40E-02	5.28

+ 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 J.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B409-UD15; Isotropic Confining Pressure, σ_o=47.2 psi (6.8 ksf = 325 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, %
5.76E-04	4266	1.00	0.33	5.80E-04	4222	1.00	0.40
1.01E-03	4266	1.00	0.27	1.03E-03	4222	1.00	0.28
2.07E-03	4166	0.98	0.26	2.07E-03	4171	0.99	0.51
4.23E-03	4080	0.96	0.89	4.26E-03	4054	0.96	0.93
1.01E-02	3919	0.92	1.29	1.01E-02	3922	0.93	1.30
1.55E-02	3828	0.90	1.61	1.55E-02	3832	0.91	1.64

U.S. Standard Sieve Nos.

3" 3/4" 4 10 40 100 200

PERCENT FINER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

100 10 1 0.1 0.01 0.001

GRAIN SIZE (mm)

GRAVEL SAND SILT OR CLAY

GRADATION CURVE

ASTM D422

Project: Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland

Contract No.: 06120048.00

Date: 9/21/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-409	35.0-36.1	POORLY GRADED SAND, with silt, gray	SP-SM	NP	NP

Schnabel Engineering

APPENDIX K

CC B404-UD22
SILTY SAND (SM), greenish gray*
(LL=53, PL=28, PI=25; Gs=2.63)*

Borehole B-404
Sample UD22
Sample Depth = 83.5 to 85.1 ft
RCTS Test Depth = 84.0 ft
Total Unit Weight = 115.4 lb/ft^3
Water Content = 32.2 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 30.3 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

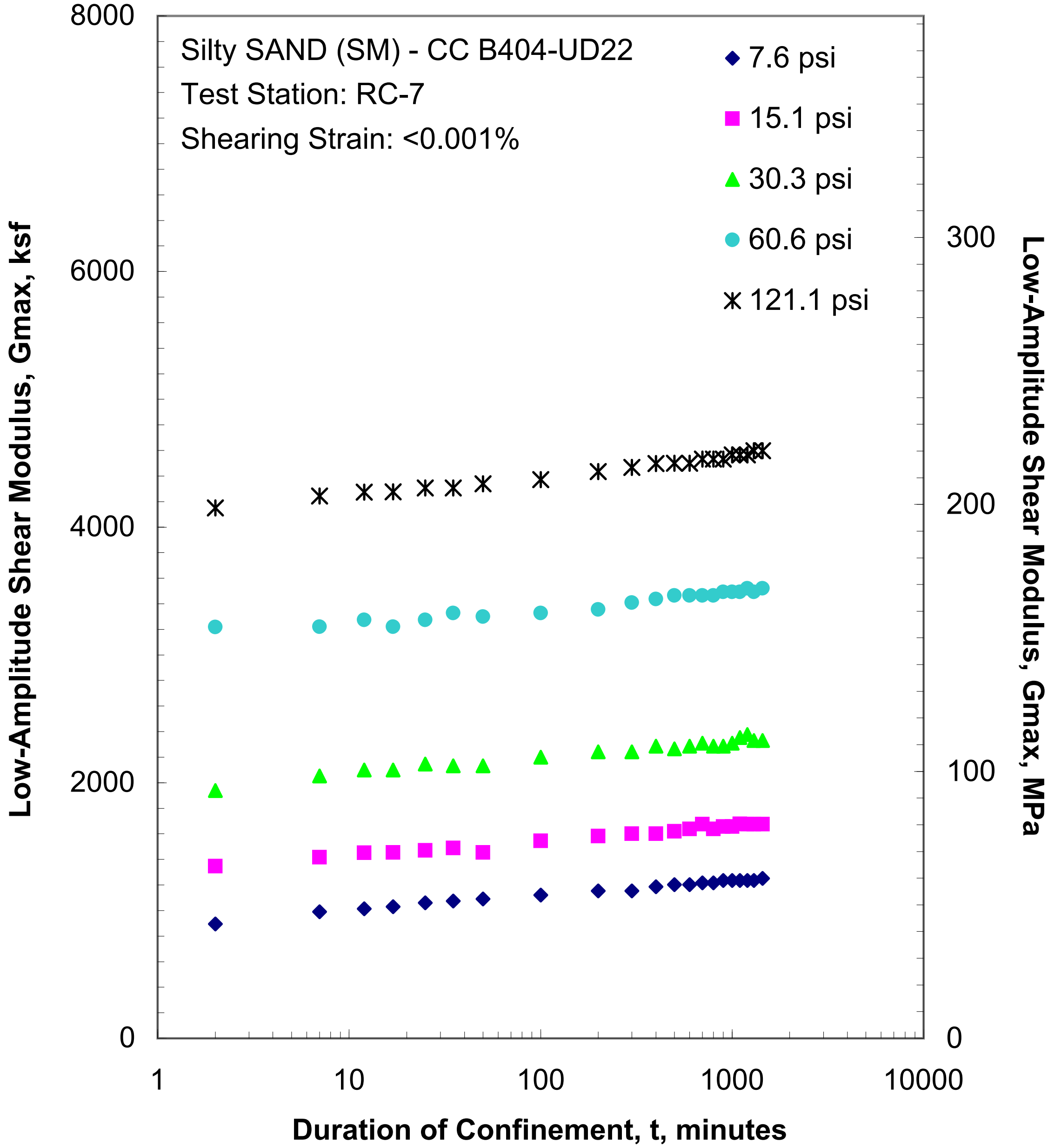


Figure K.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

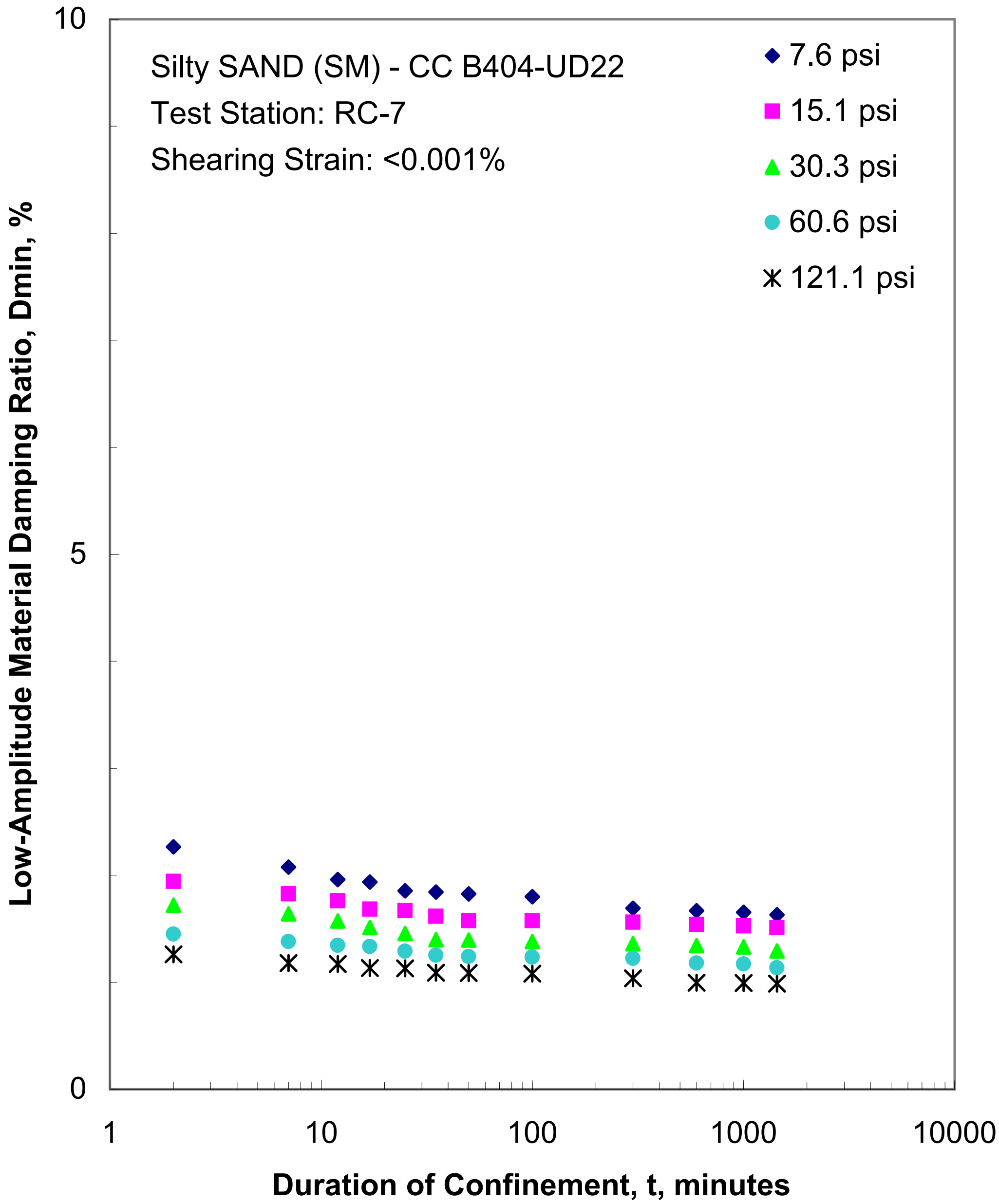


Figure K.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

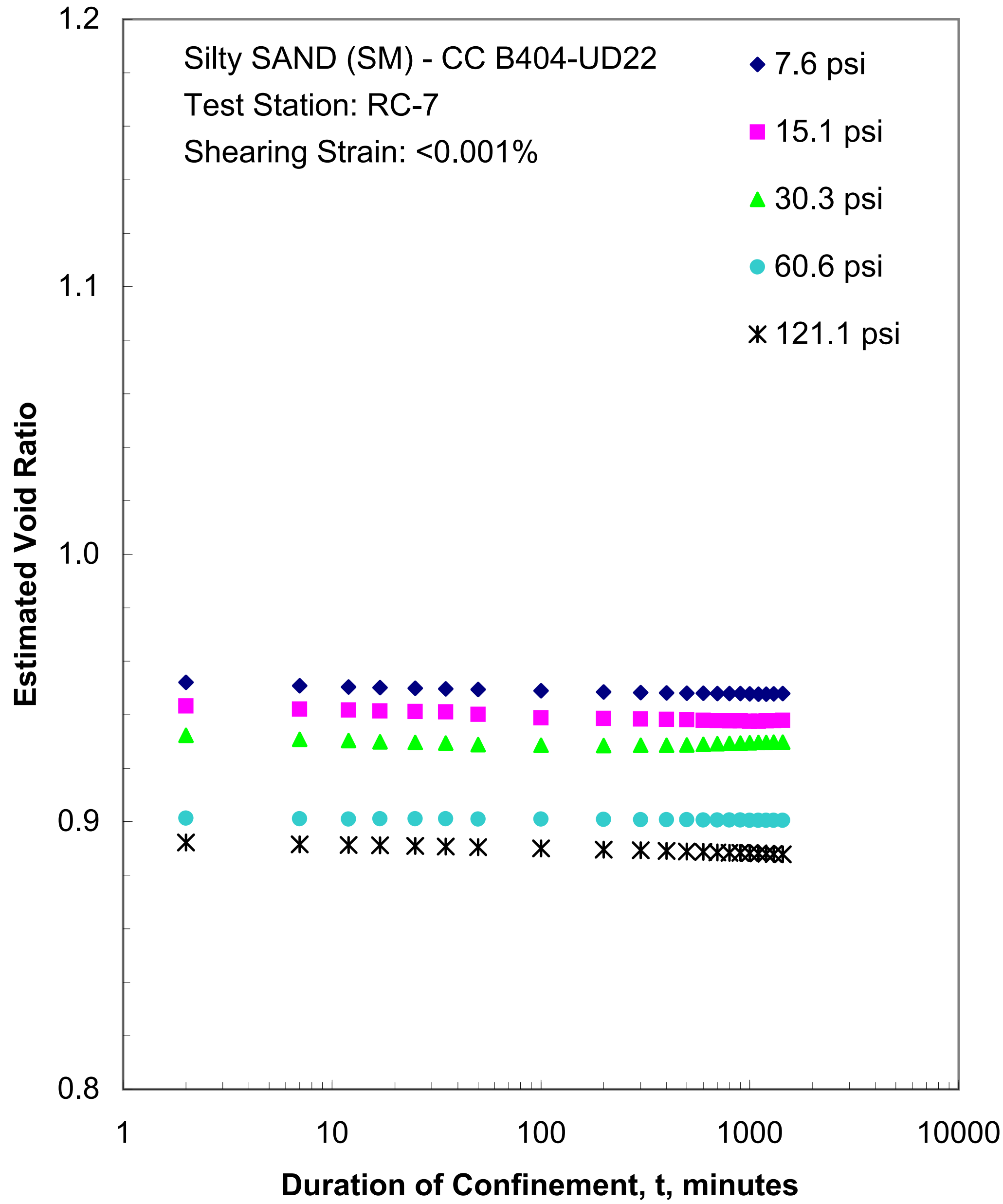


Figure K.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

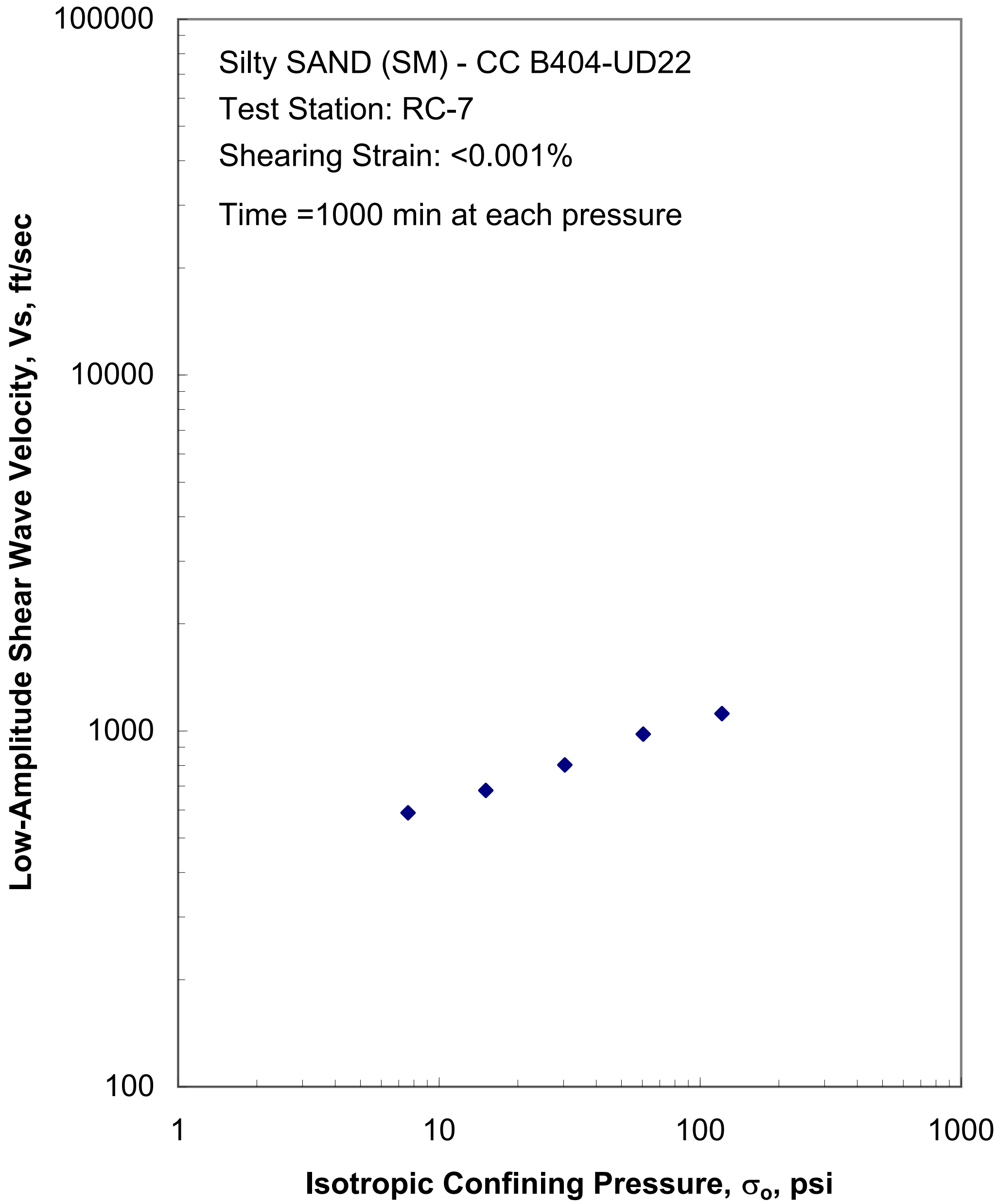


Figure K.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

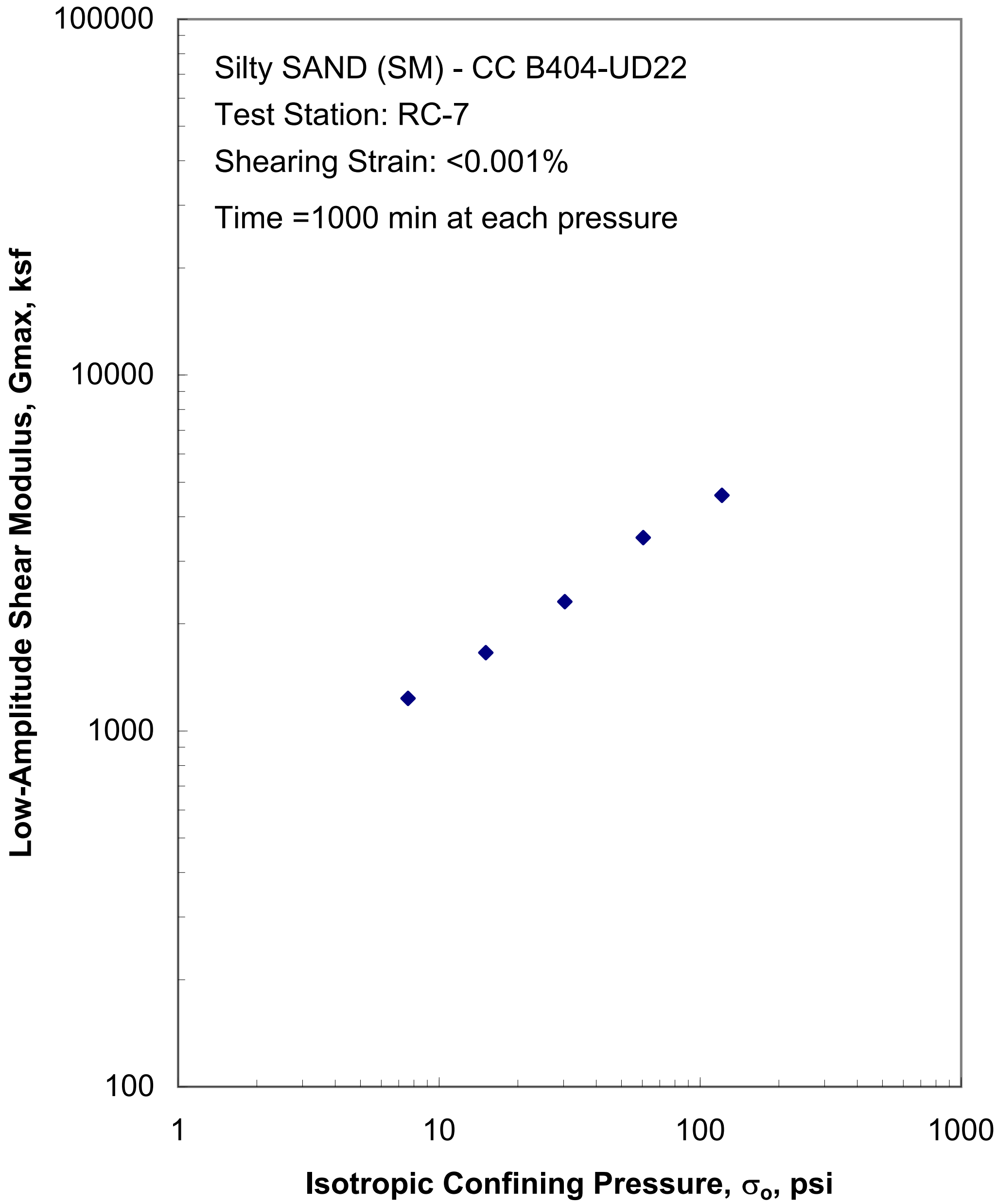


Figure K.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

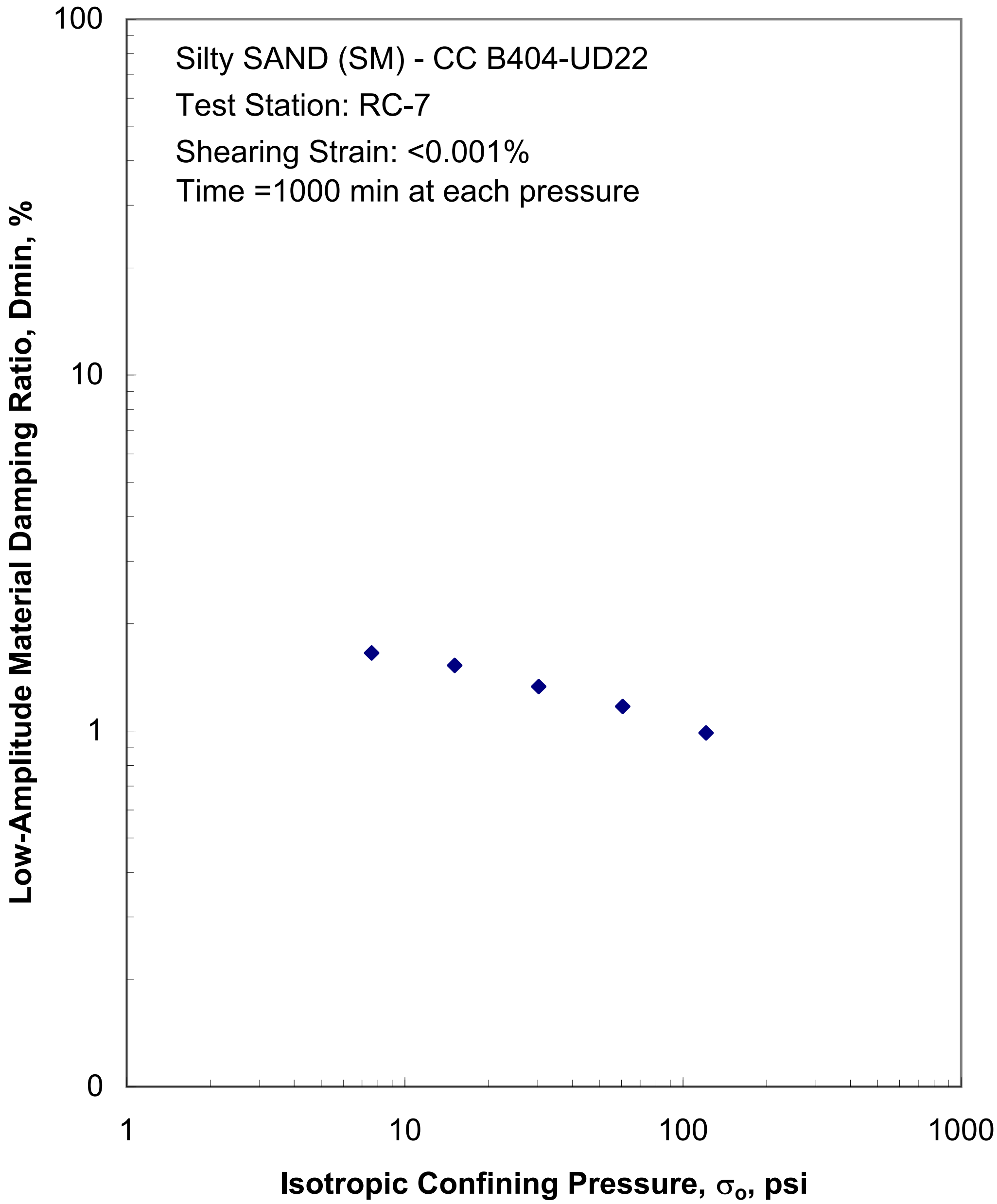


Figure K.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

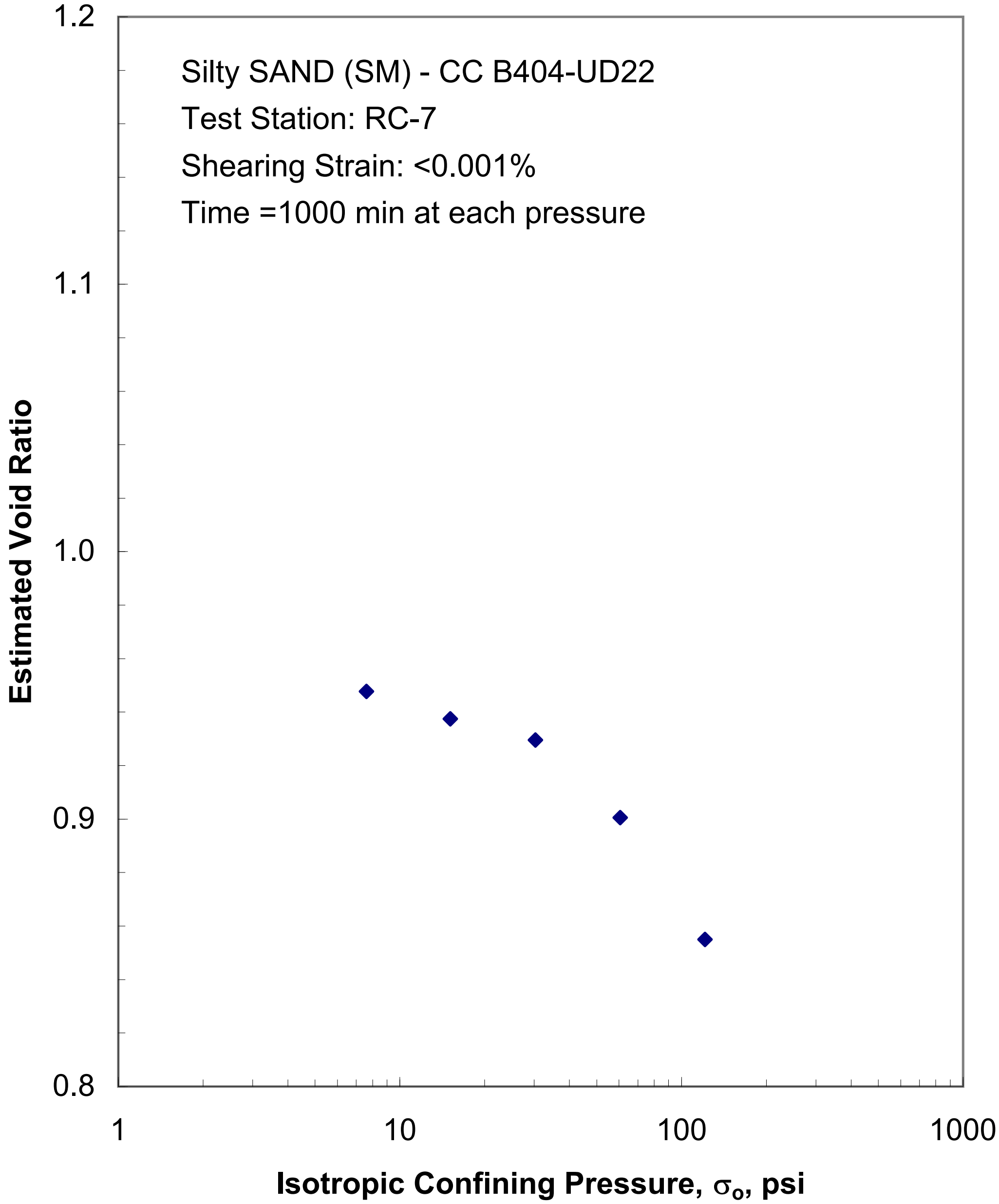


Figure K.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

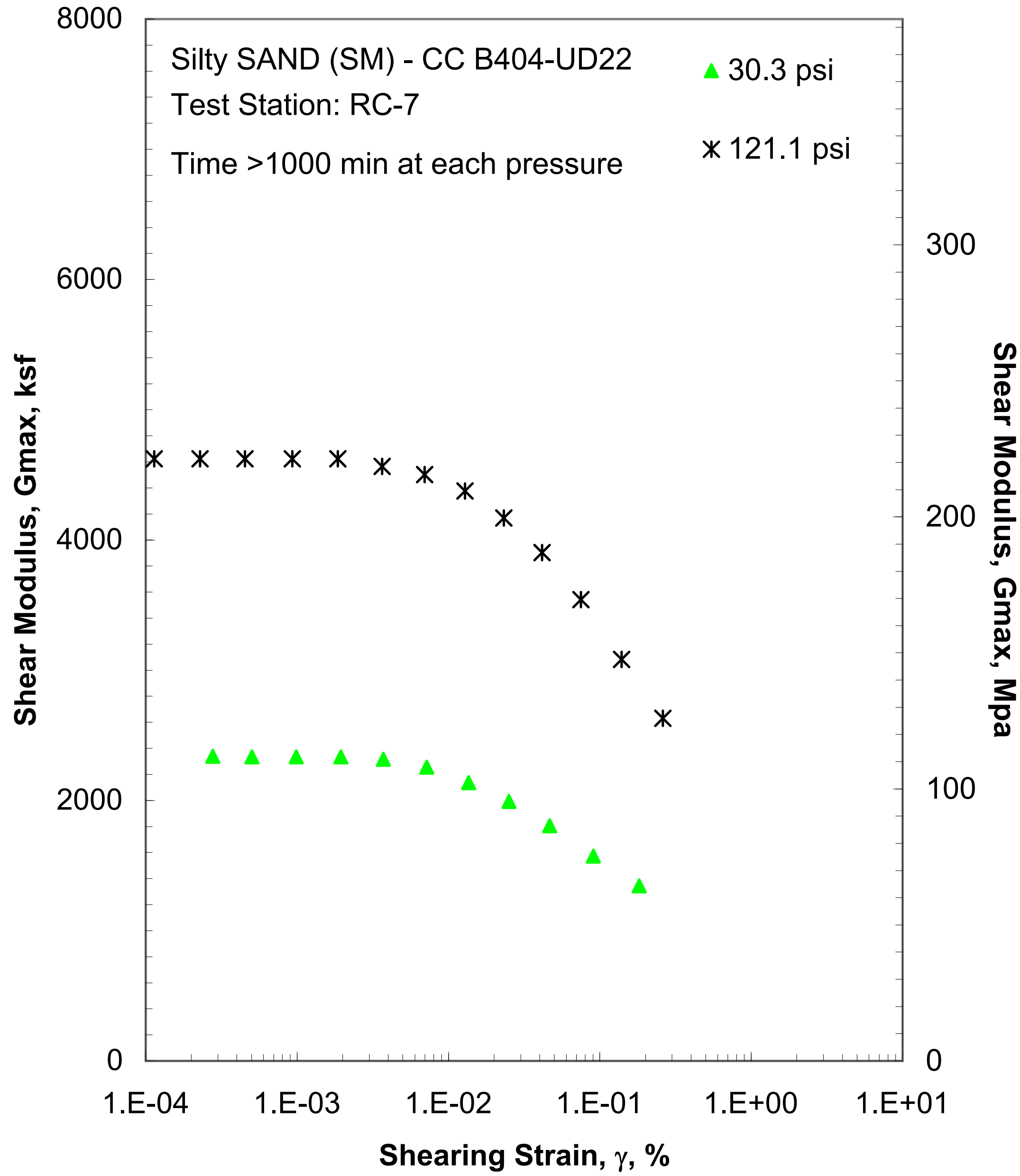


Figure K.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

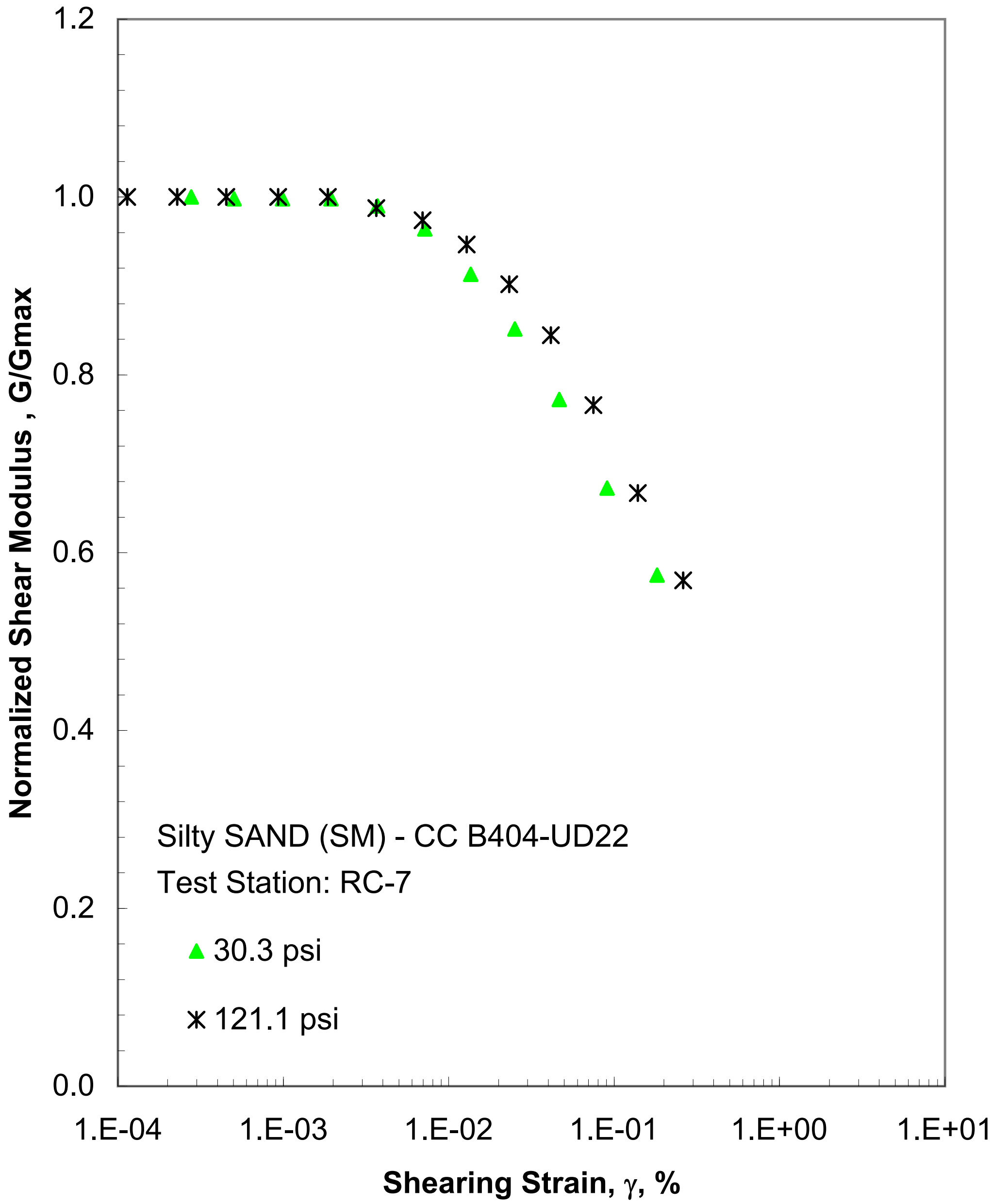


Figure K.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

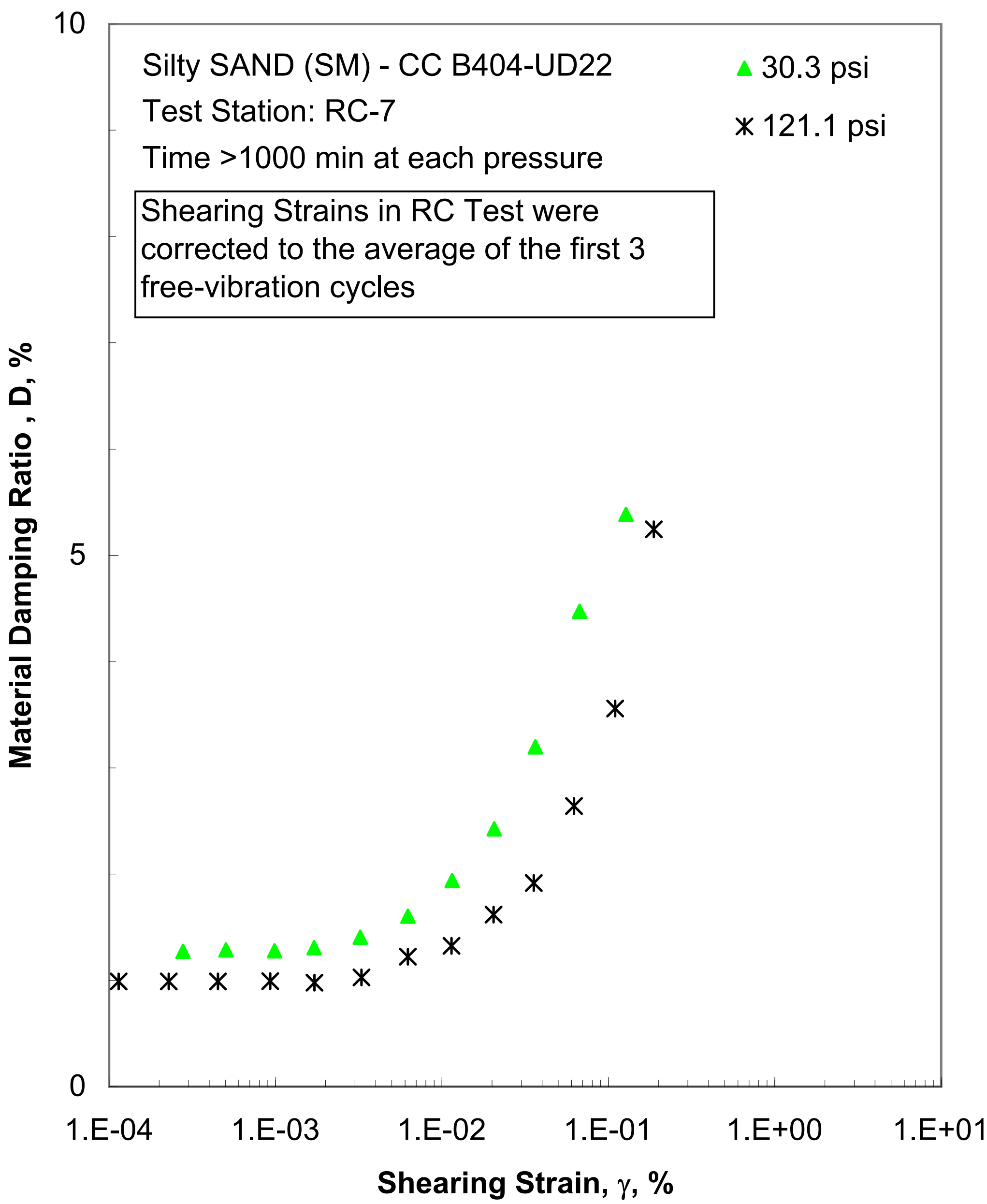


Figure K.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

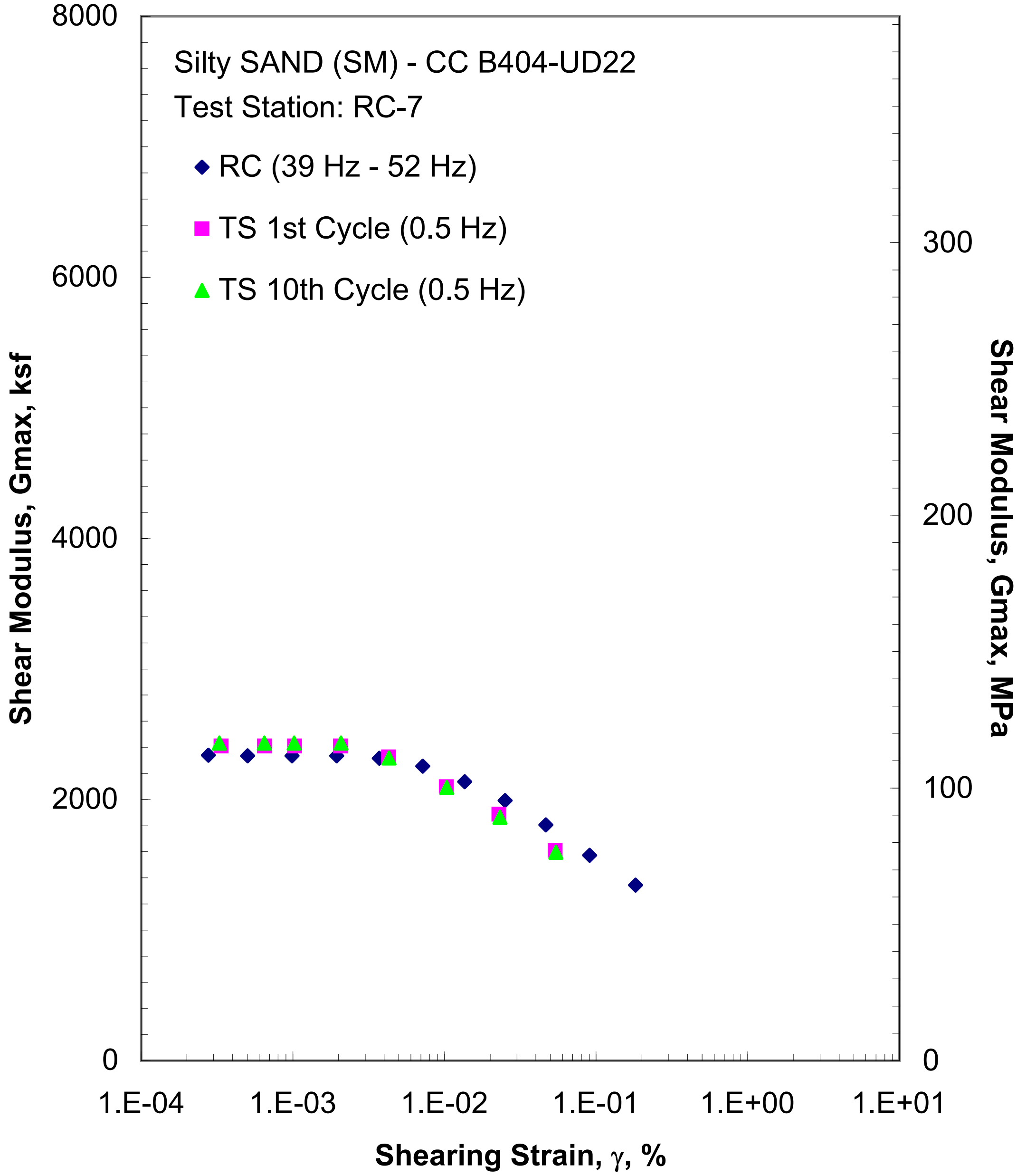


Figure K.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 30.3 psi from the Combined RCTS Tests

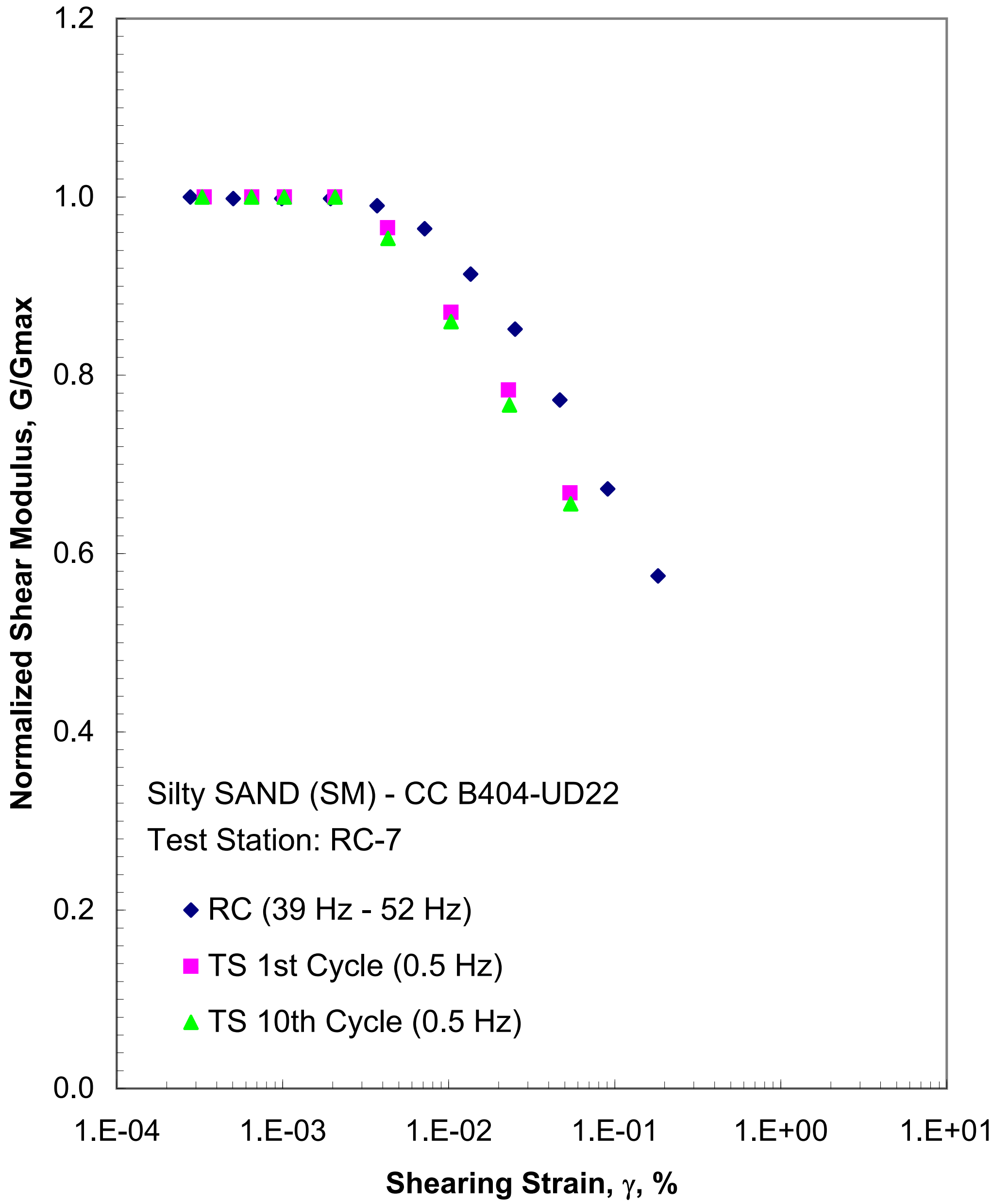


Figure K.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 30.3 psi from the Combined RCTS Tests

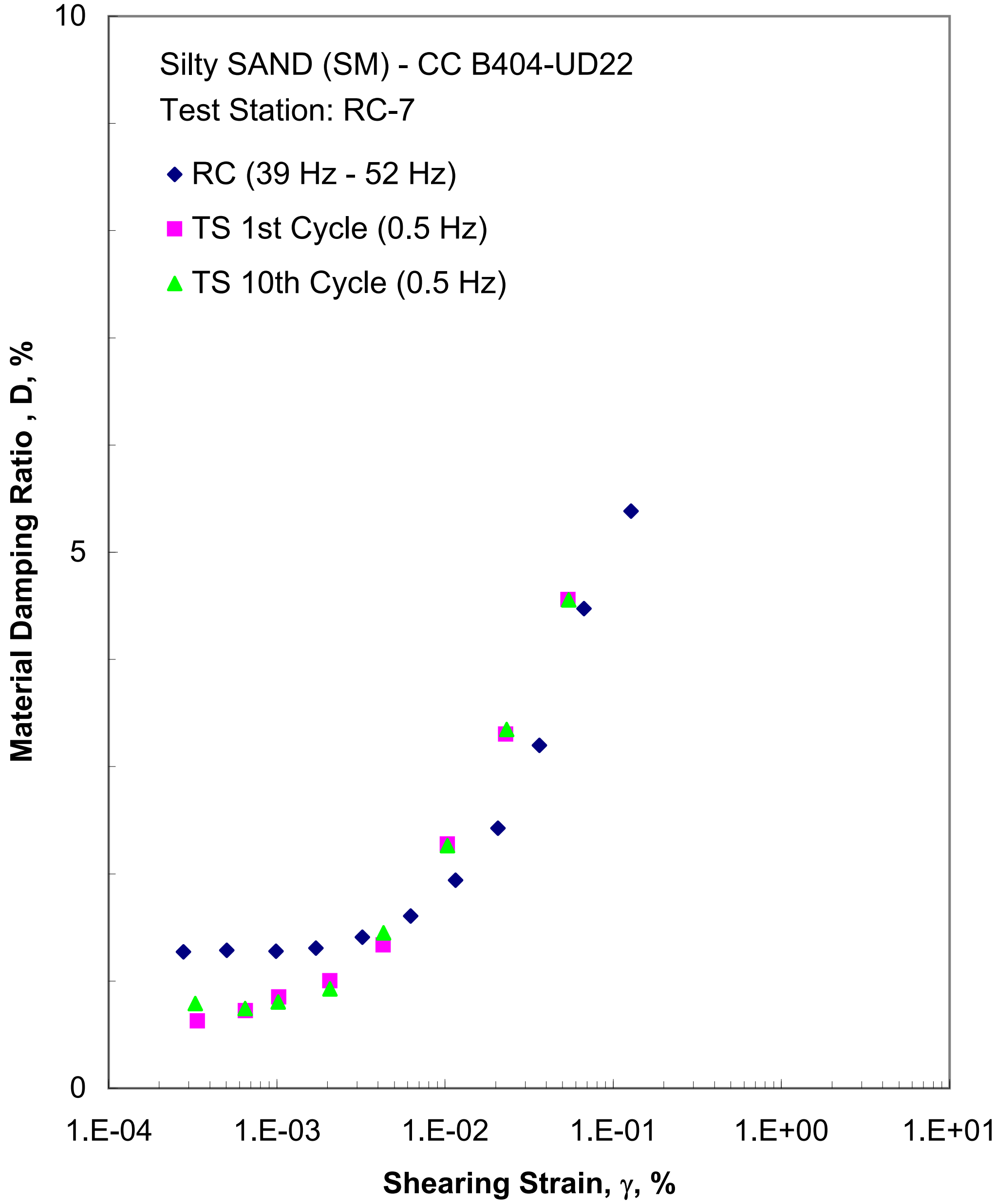


Figure K.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 30.3 psi from the Combined RCTS Tests

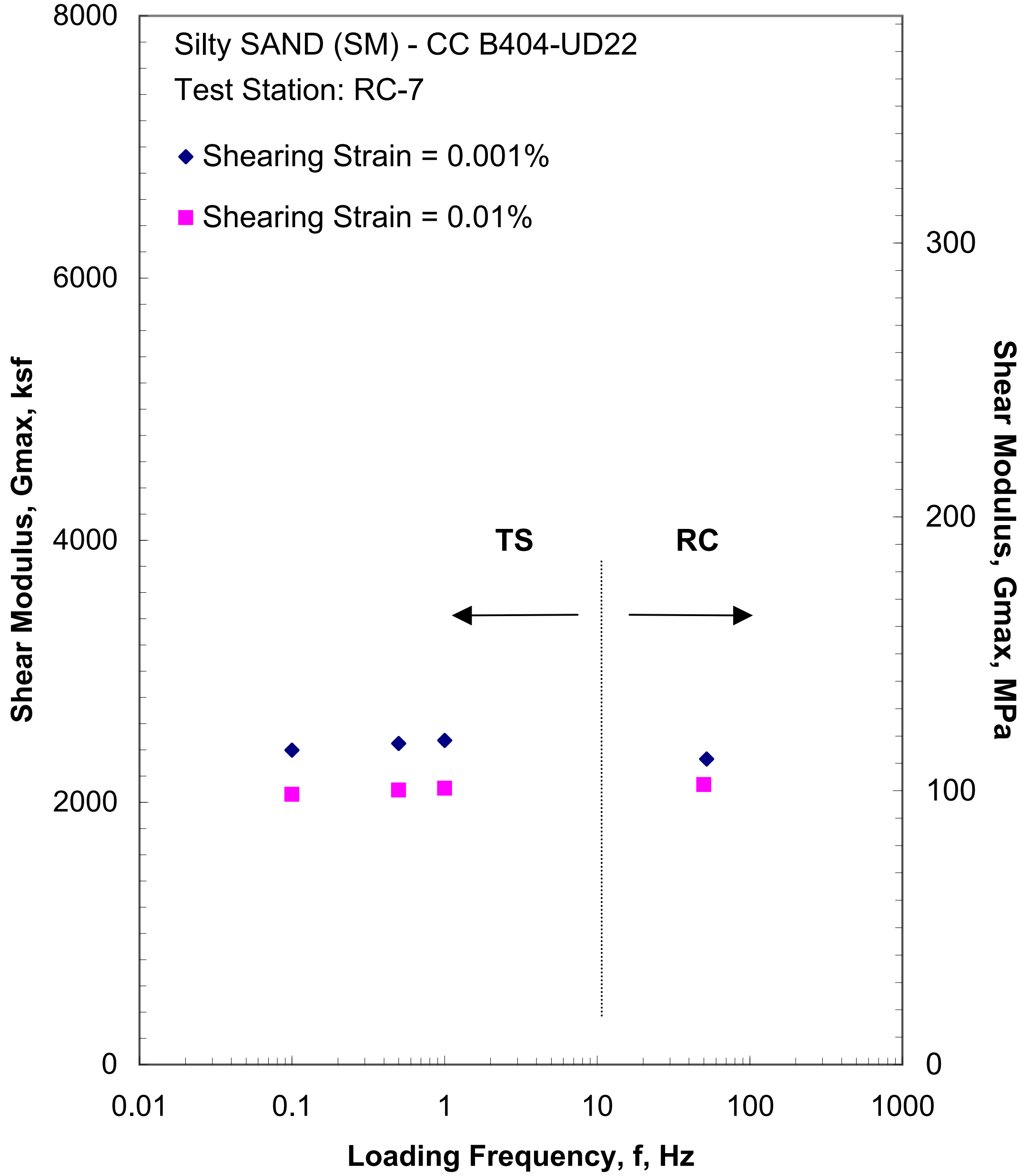


Figure K.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 30.3 psi from the Combined RCTS Tests

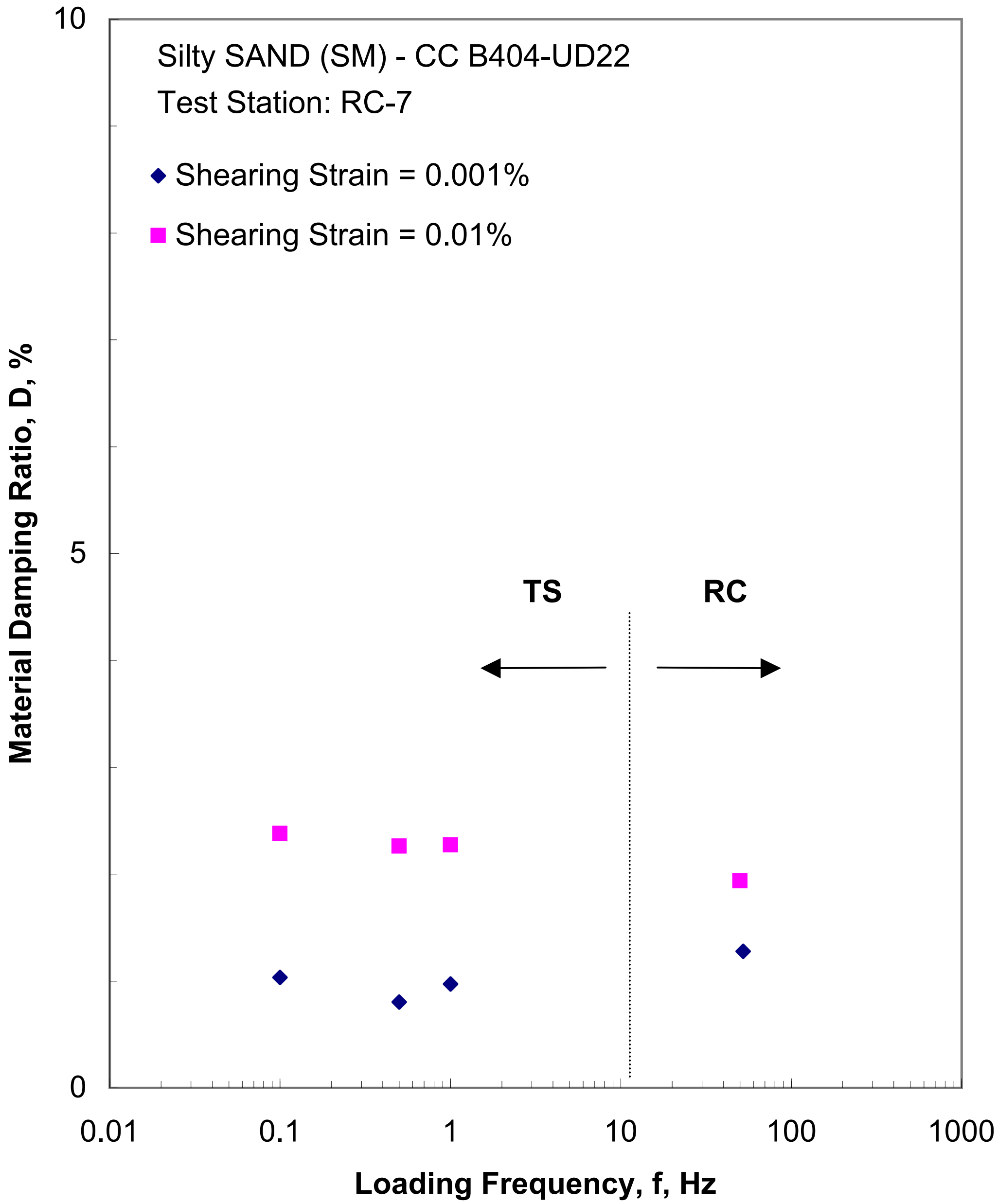


Figure K.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 30.3 psi from the Combined RCTS Tests

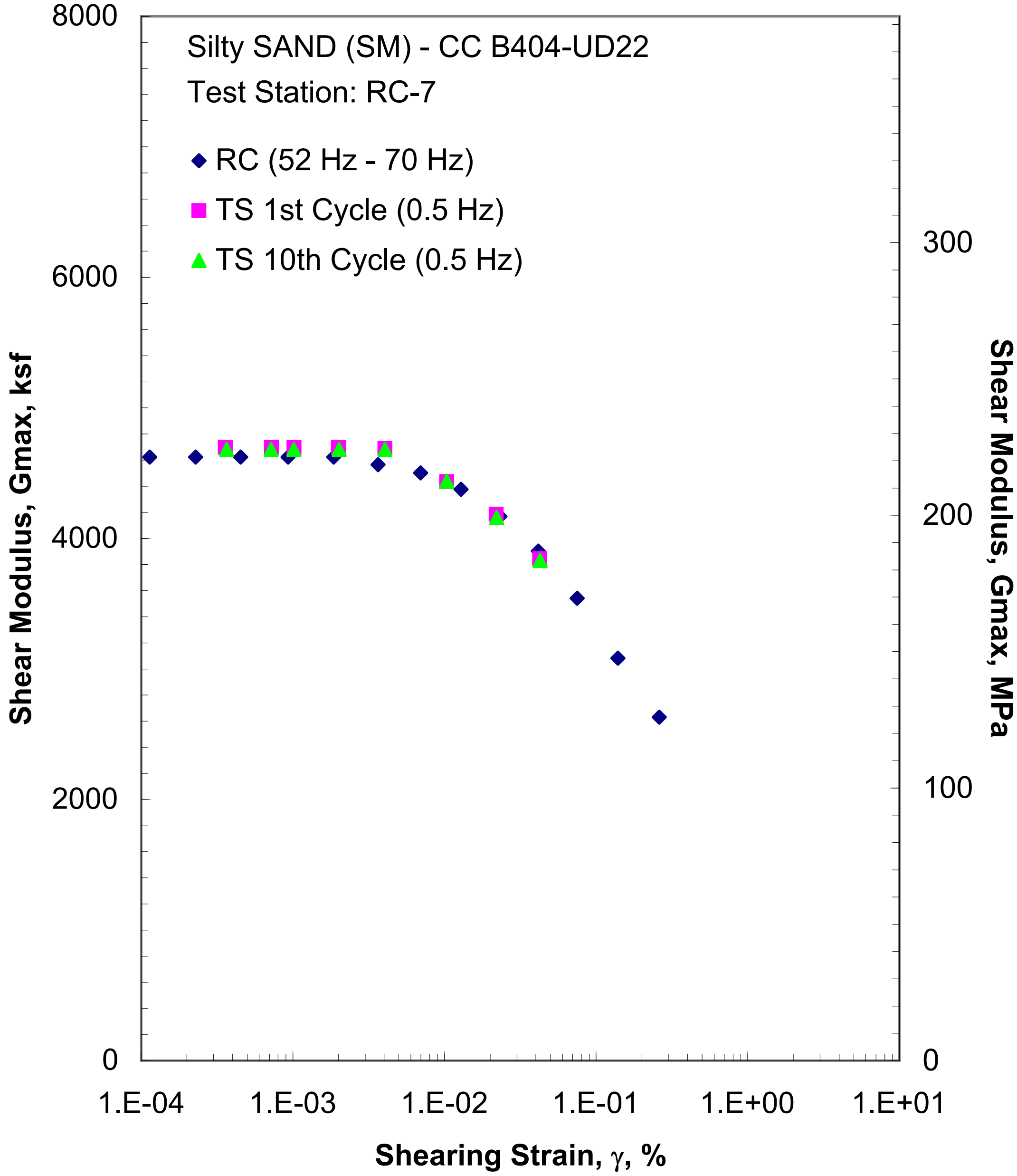


Figure K.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 121.1 psi from the Combined RCTS Tests

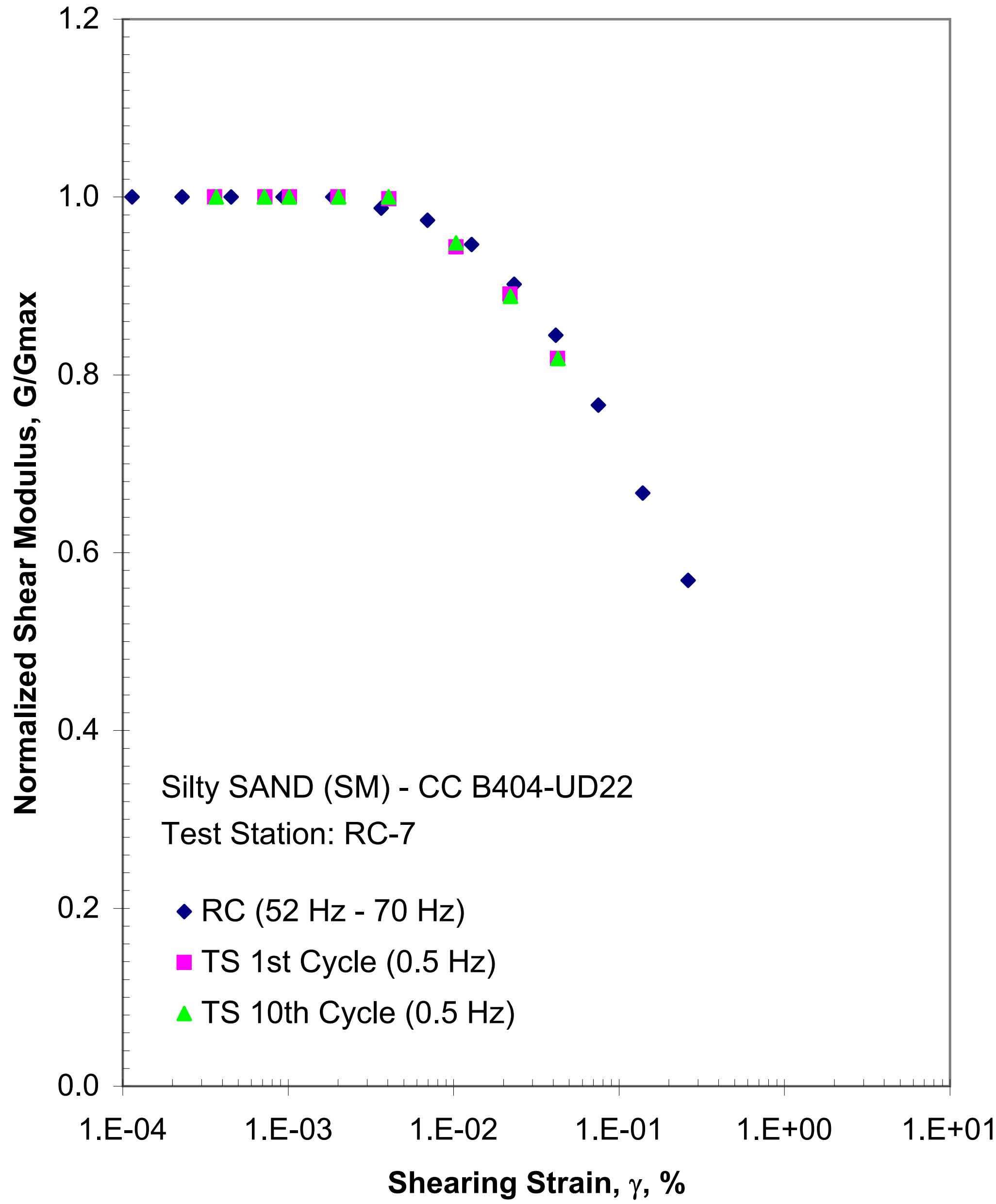


Figure K.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 121.1 psi from the Combined RCTS Tests

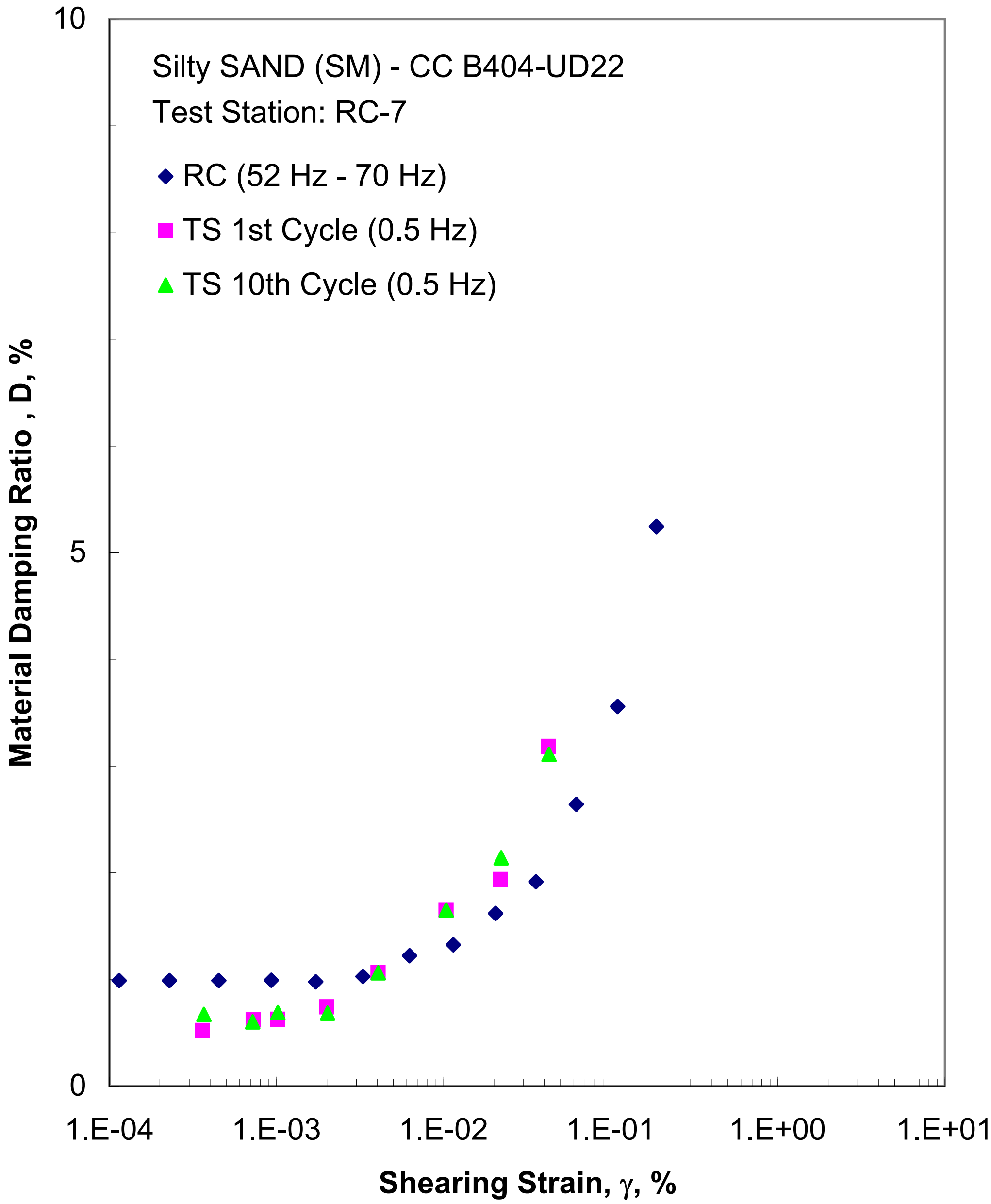


Figure K.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 121.1 psi from the Combined RCTS Tests

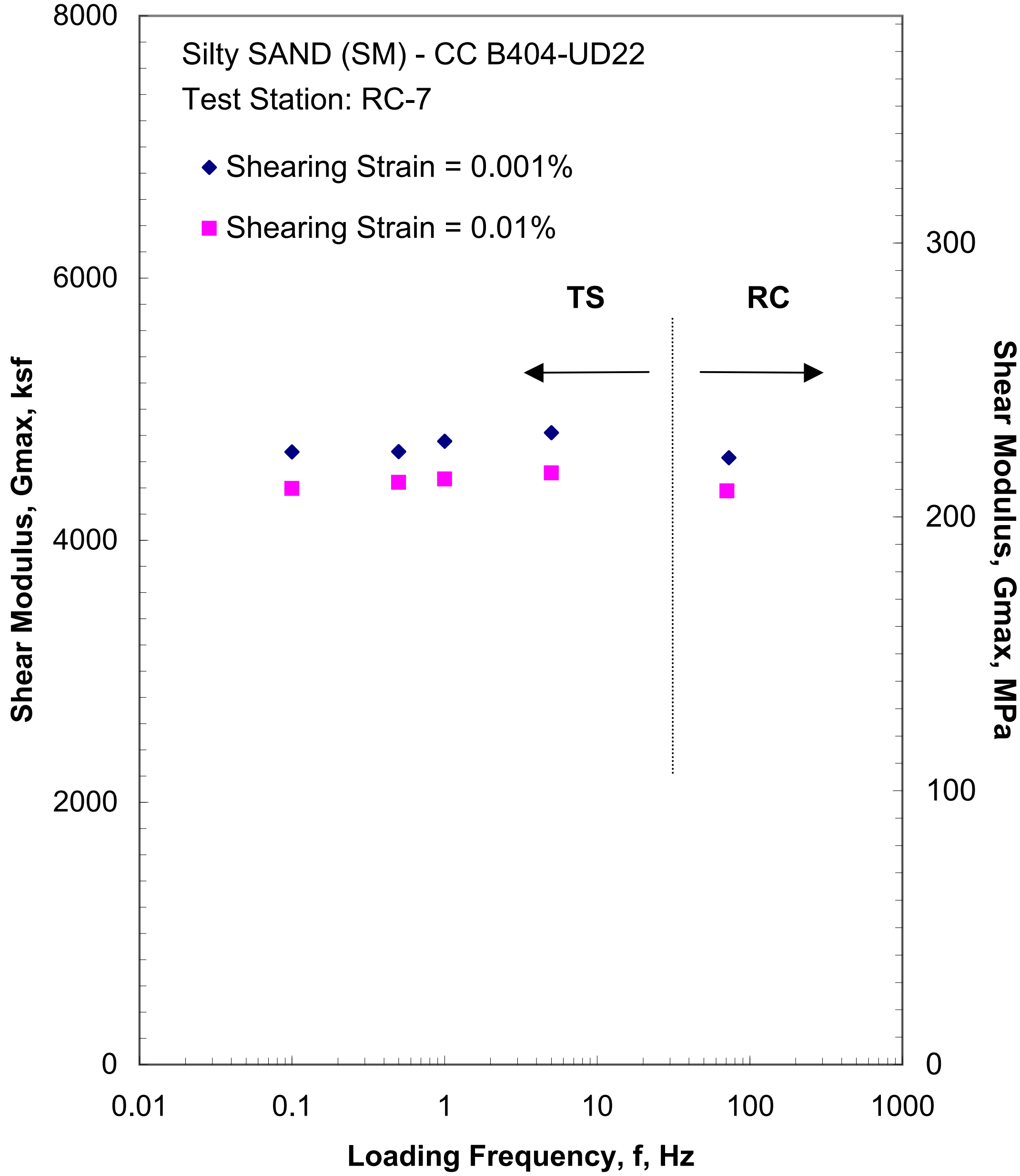


Figure K.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 121.1 psi from the Combined RCTS Tests

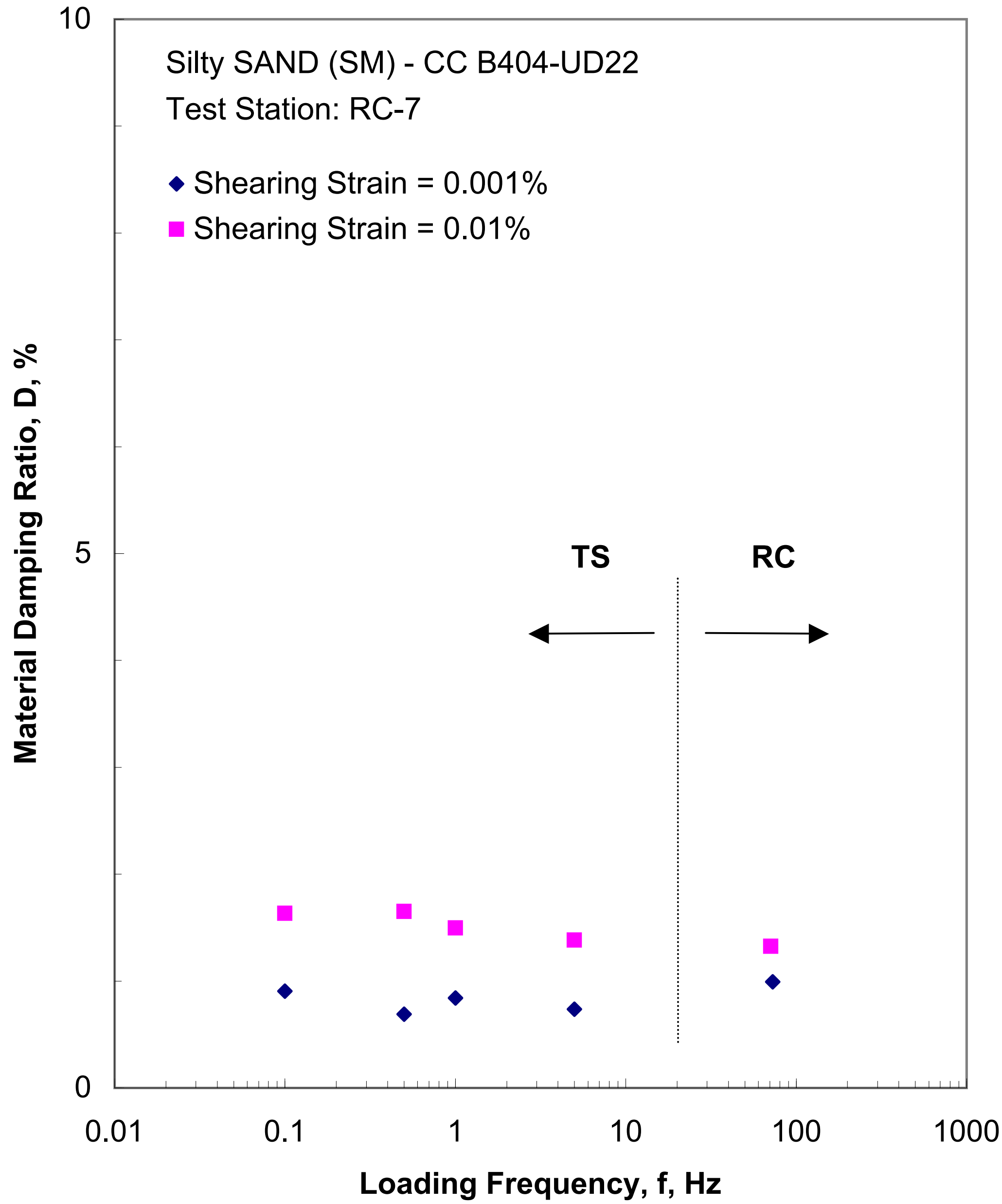


Figure K.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 121.1 psi from the Combined RCTS Tests

Table K.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 CC B404-UD22

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)	(%)	
7.6	1094	52	1234	59	589	1.65	0.948
15.1	2174	104	1658	80	681	1.53	0.938
30.3	4363	209	2308	111	802	1.33	0.930
60.6	8726	418	3493	168	979	1.17	0.901
121.1	17438	834	4597	221	1119	0.99	0.855

Table K.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B404-UD22; Isoptropic Confining Pressure, σ_o=30.3 psi (4.4 ksf = 209 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average+ Shearing Strain, %	Material Damping Ratio^x, D, %
2.78E-04	2339	1.00	2.78E-04	1.27
5.04E-04	2335	1.00	5.04E-04	1.29
9.88E-04	2335	1.00	9.88E-04	1.28
1.94E-03	2335	1.00	1.71E-03	1.31
3.71E-03	2316	0.99	3.23E-03	1.41
7.17E-03	2256	0.96	6.24E-03	1.61
1.36E-02	2137	0.91	1.15E-02	1.94
2.51E-02	1992	0.85	2.06E-02	2.43
4.66E-02	1807	0.77	3.64E-02	3.20
9.07E-02	1574	0.67	6.71E-02	4.47
1.82E-01	1345	0.57	1.27E-01	5.38

+ 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 K.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B404-UD22; Isotropic Confining Pressure, σ_o= 30.3 psi (4.4 ksf =209 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, %
3.37E-04	2410	1.00	0.63	3.27E-04	2433	1.00	0.79
6.51E-04	2410	1.00	0.72	6.49E-04	2433	1.00	0.74
1.03E-03	2410	1.00	0.85	1.02E-03	2433	1.00	0.80
2.07E-03	2410	1.00	1.00	2.07E-03	2433	1.00	0.93
4.29E-03	2327	0.97	1.34	4.31E-03	2320	0.95	1.45
1.03E-02	2098	0.87	2.28	1.03E-02	2093	0.86	2.26
2.29E-02	1888	0.78	3.30	2.32E-02	1865	0.77	3.35
5.38E-02	1610	0.67	4.56	5.43E-02	1596	0.66	4.55

Table K.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B404-UD22; Isoptropic Confining Pressure, σ_o= 121.1 psi (17.4 ksf = 834 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average$^+$ Shearing Strain, %	Material Damping Ratio^x, D, %
1.14E-04	4623	1.00	1.14E-04	0.99
2.28E-04	4623	1.00	2.28E-04	0.99
4.52E-04	4623	1.00	4.52E-04	0.99
9.31E-04	4623	1.00	9.31E-04	0.99
1.86E-03	4623	1.00	1.71E-03	0.98
3.64E-03	4565	0.99	3.28E-03	1.03
6.95E-03	4502	0.97	6.26E-03	1.22
1.28E-02	4376	0.95	1.14E-02	1.32
2.32E-02	4169	0.90	2.04E-02	1.62
4.14E-02	3904	0.84	3.56E-02	1.92
7.51E-02	3542	0.77	6.23E-02	2.64
1.39E-01	3083	0.67	1.10E-01	3.56
2.61E-01	2630	0.57	1.88E-01	5.24

$^+$ 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 K.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B404-UD22; Isotropic Confining Pressure, σ_o=121.1 psi (17.4 ksf = 834 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, %
3.60E-04	4698	1.00	0.52	3.67E-04	4681	1.00	0.67
7.24E-04	4698	1.00	0.62	7.19E-04	4681	1.00	0.60
1.02E-03	4698	1.00	0.63	1.02E-03	4681	1.00	0.69
2.00E-03	4698	1.00	0.74	2.02E-03	4681	1.00	0.68
4.06E-03	4688	1.00	1.06	4.05E-03	4681	1.00	1.06
1.03E-02	4434	0.94	1.65	1.03E-02	4440	0.95	1.65
2.19E-02	4184	0.89	1.94	2.21E-02	4159	0.89	2.14
4.25E-02	3844	0.82	3.18	4.26E-02	3831	0.82	3.11

U.S. Standard Sieve Nos.

3" 3/4" 4 10 40 100 200

PERCENT FINER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

100 10 1 0.1 0.01 0.001

GRAIN SIZE (mm)

GRAVEL SAND SILT OR CLAY

GRADATION CURVE

ASTM D422

Project: Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland

Contract No.: 06120048.00

Date: 10/18/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-404	83.5-85.1	SILTY SAND, greenish gray	SM	53	25

Schnabel Engineering

APPENDIX L

CC B401-UD42
SILTY SAND (SM), greenish gray*
(LL=82, PL=55, PI=27; Gs=2.52)*

Borehole B-401
Sample UD42
Sample Depth = 198.5 to 200.3 ft
RCTS Test Depth = 200.3 ft
Total Unit Weight = 101.2 lb/ft^3
Water Content = 48.8 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 62.5 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

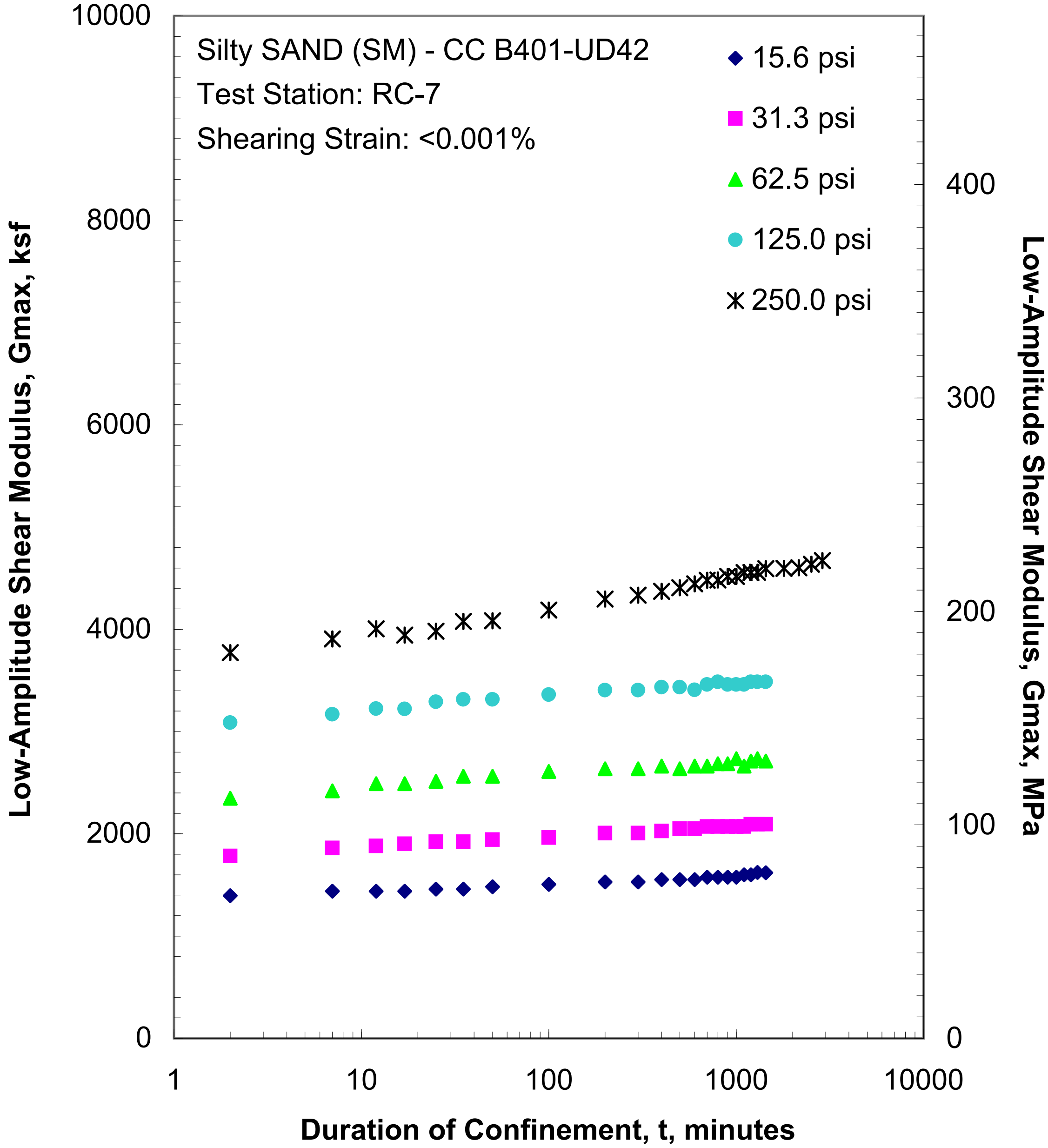


Figure L.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

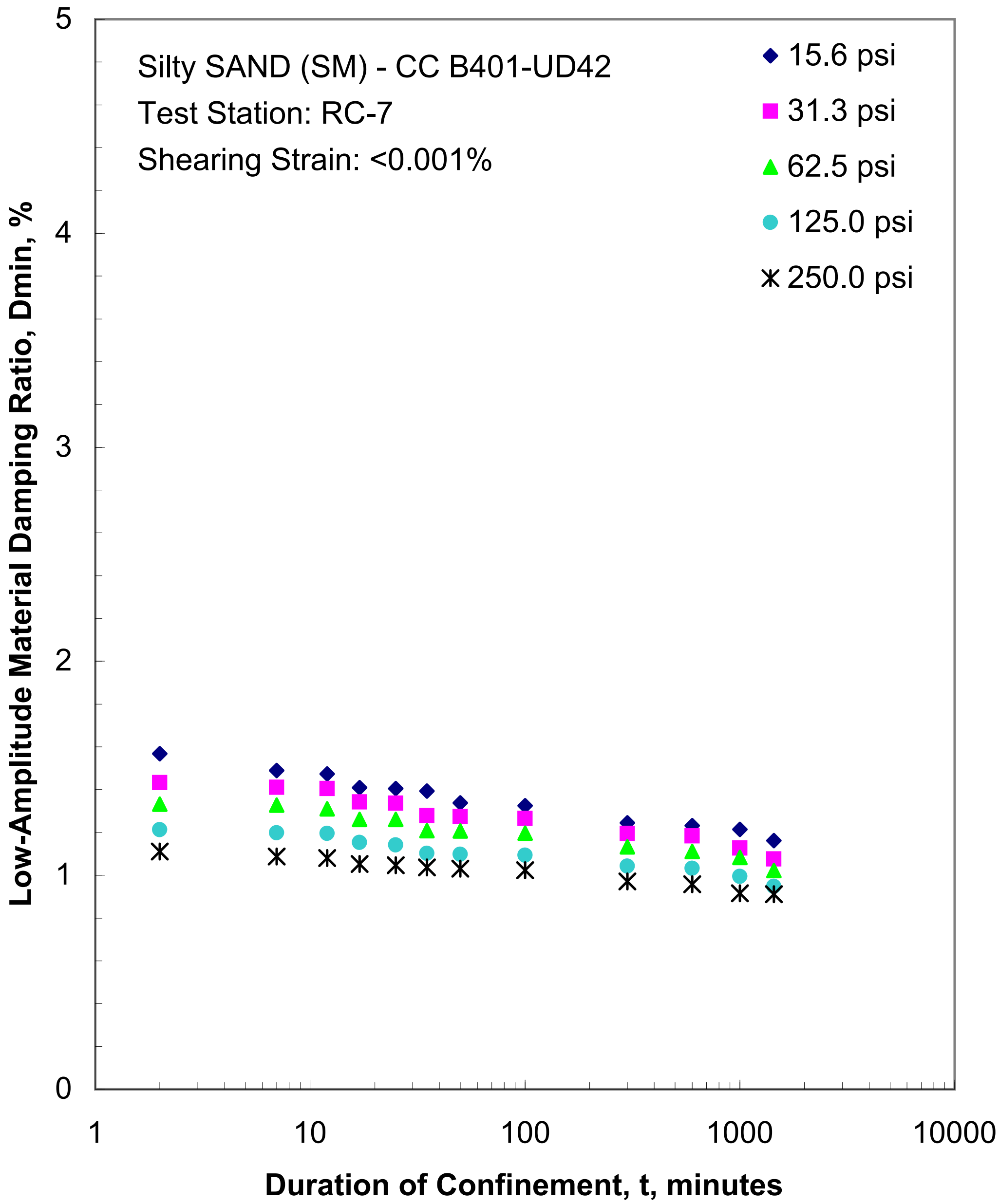


Figure L.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

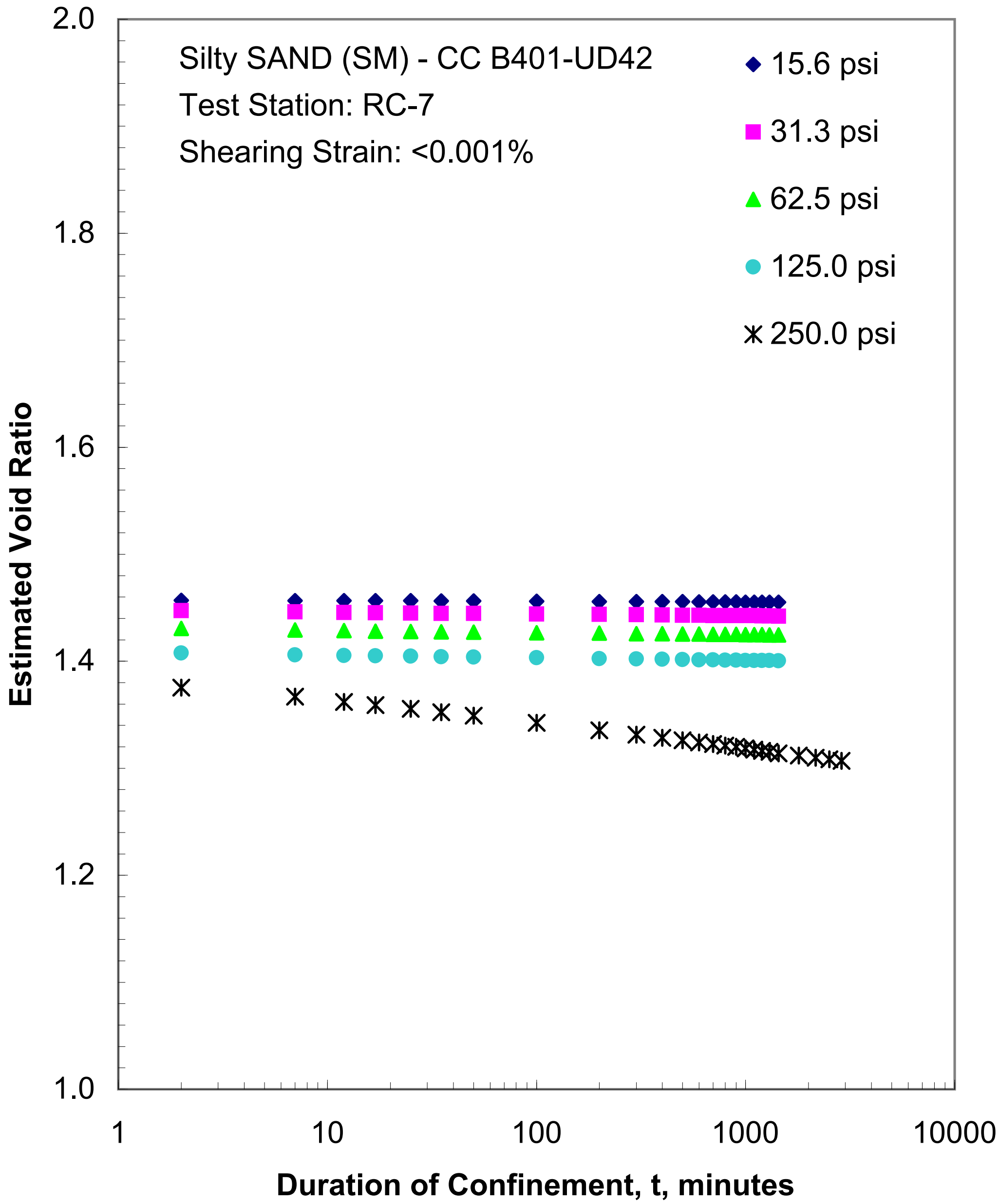


Figure L.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

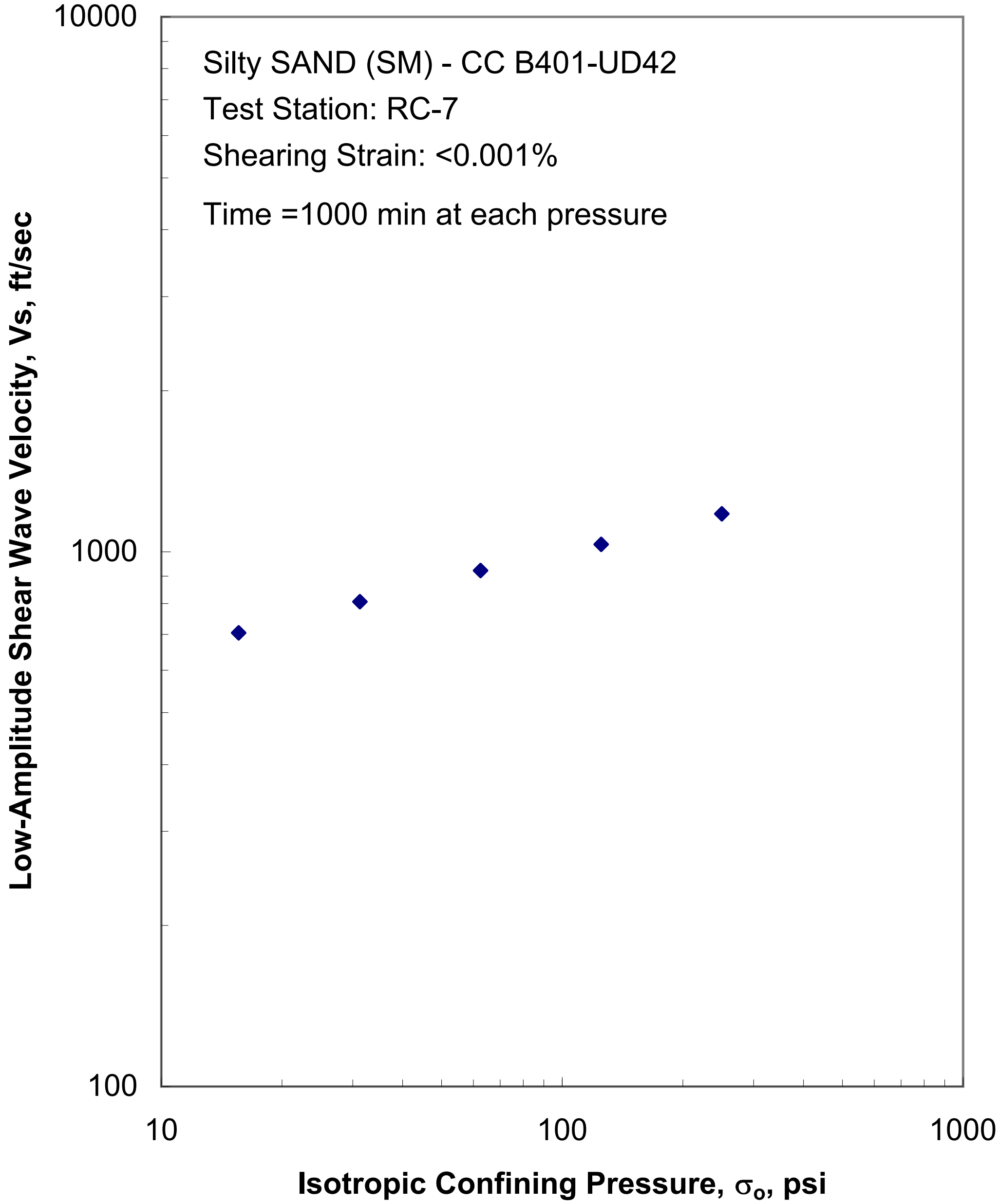


Figure L.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

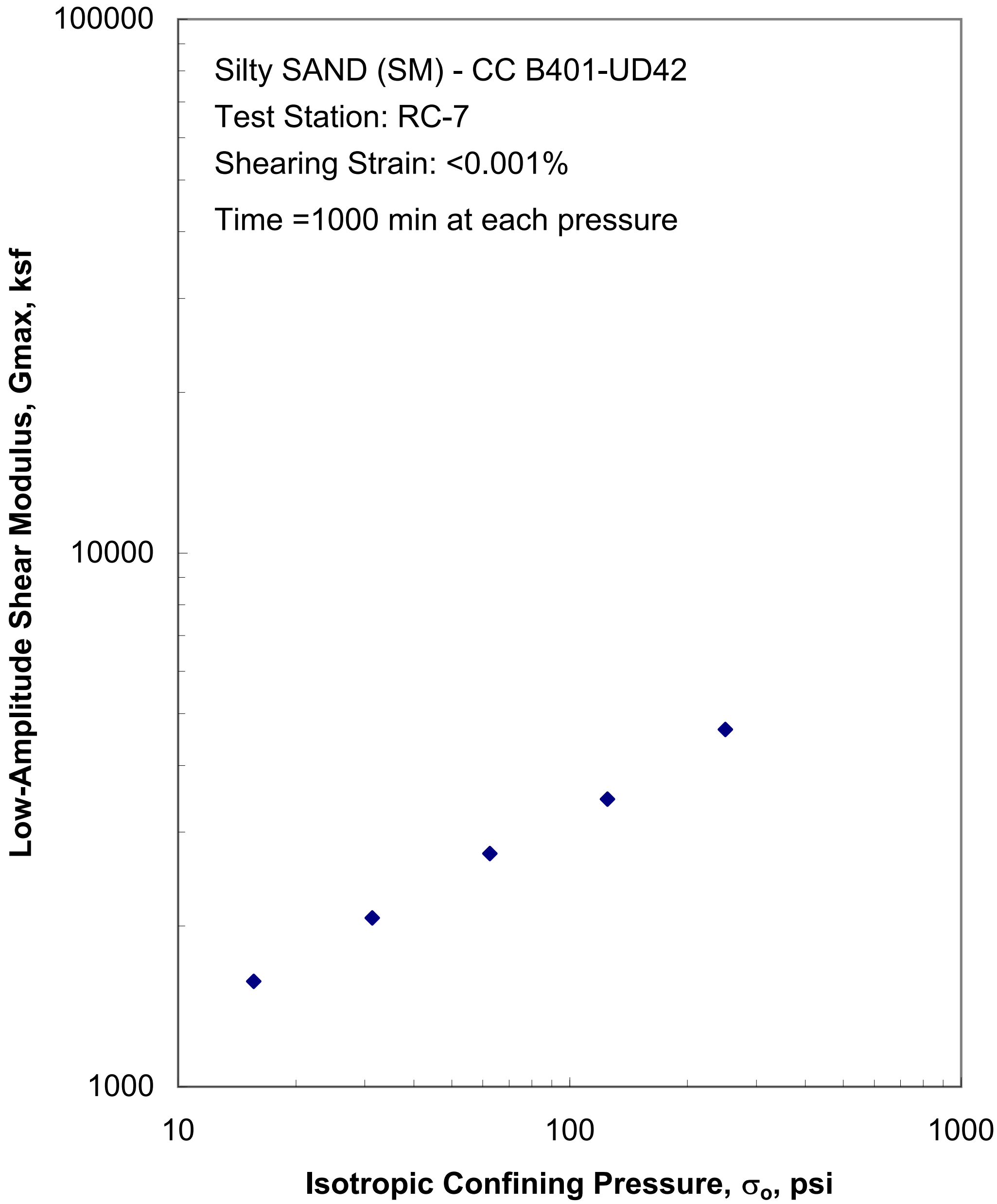


Figure L.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

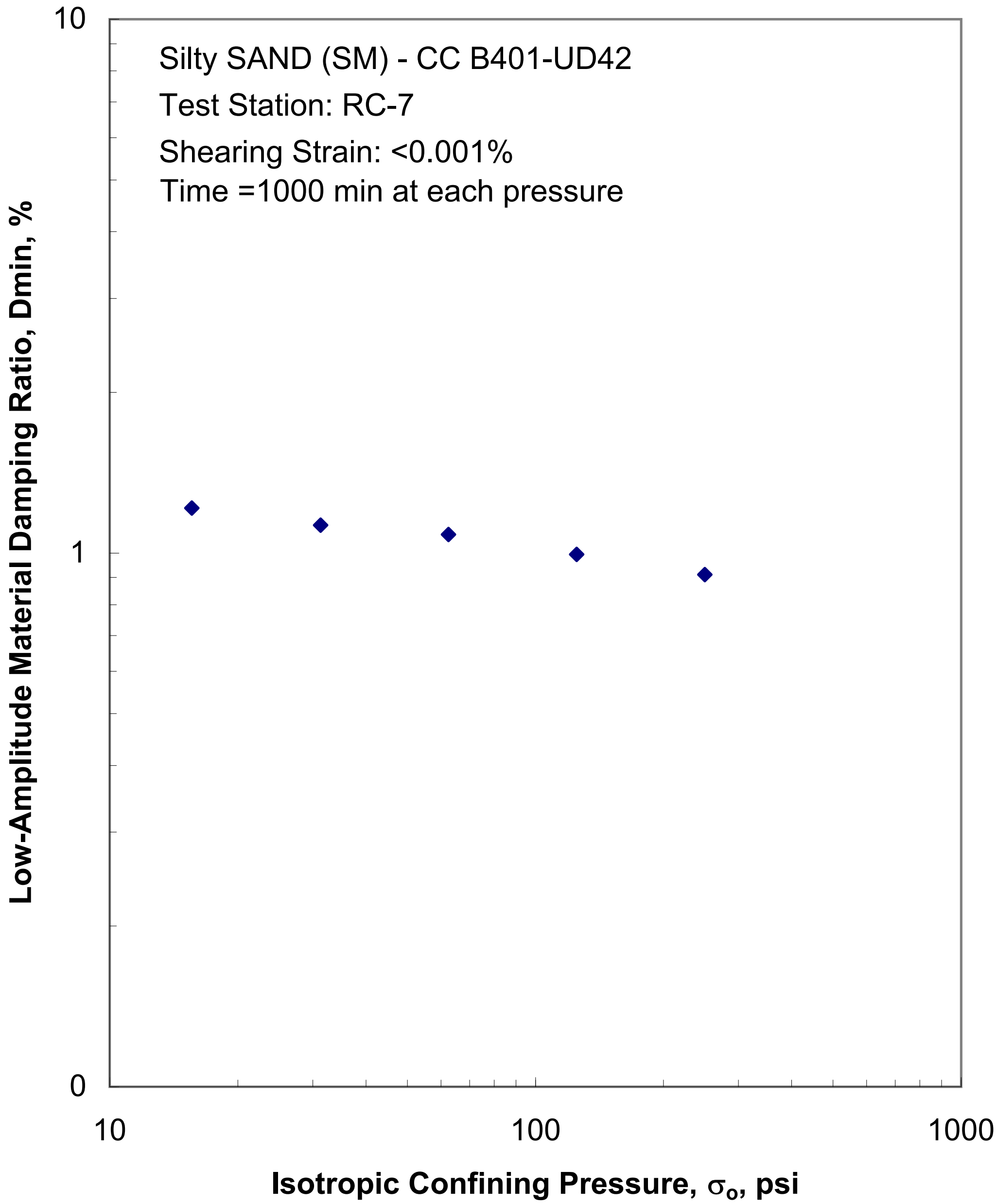


Figure L.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

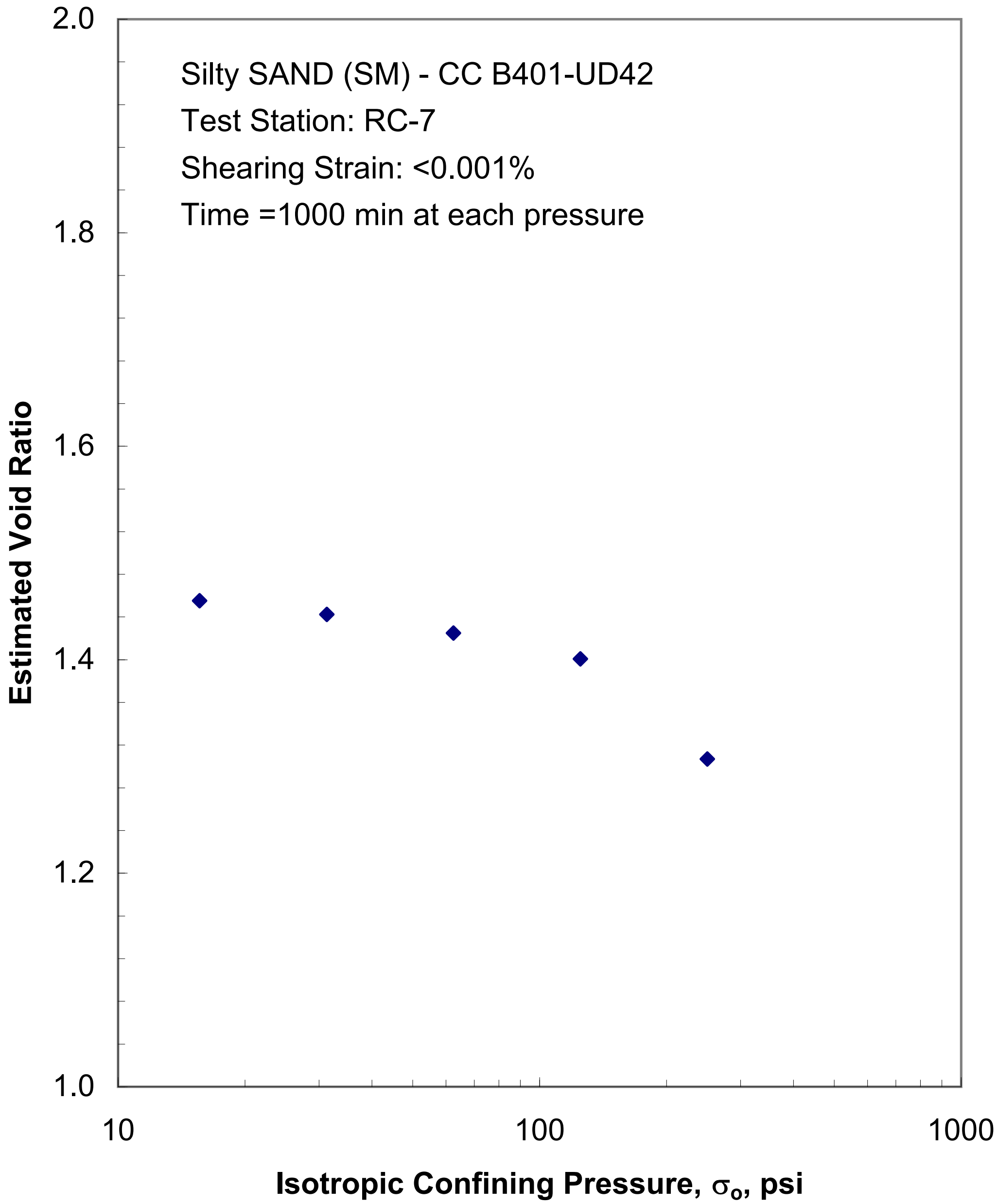


Figure L.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

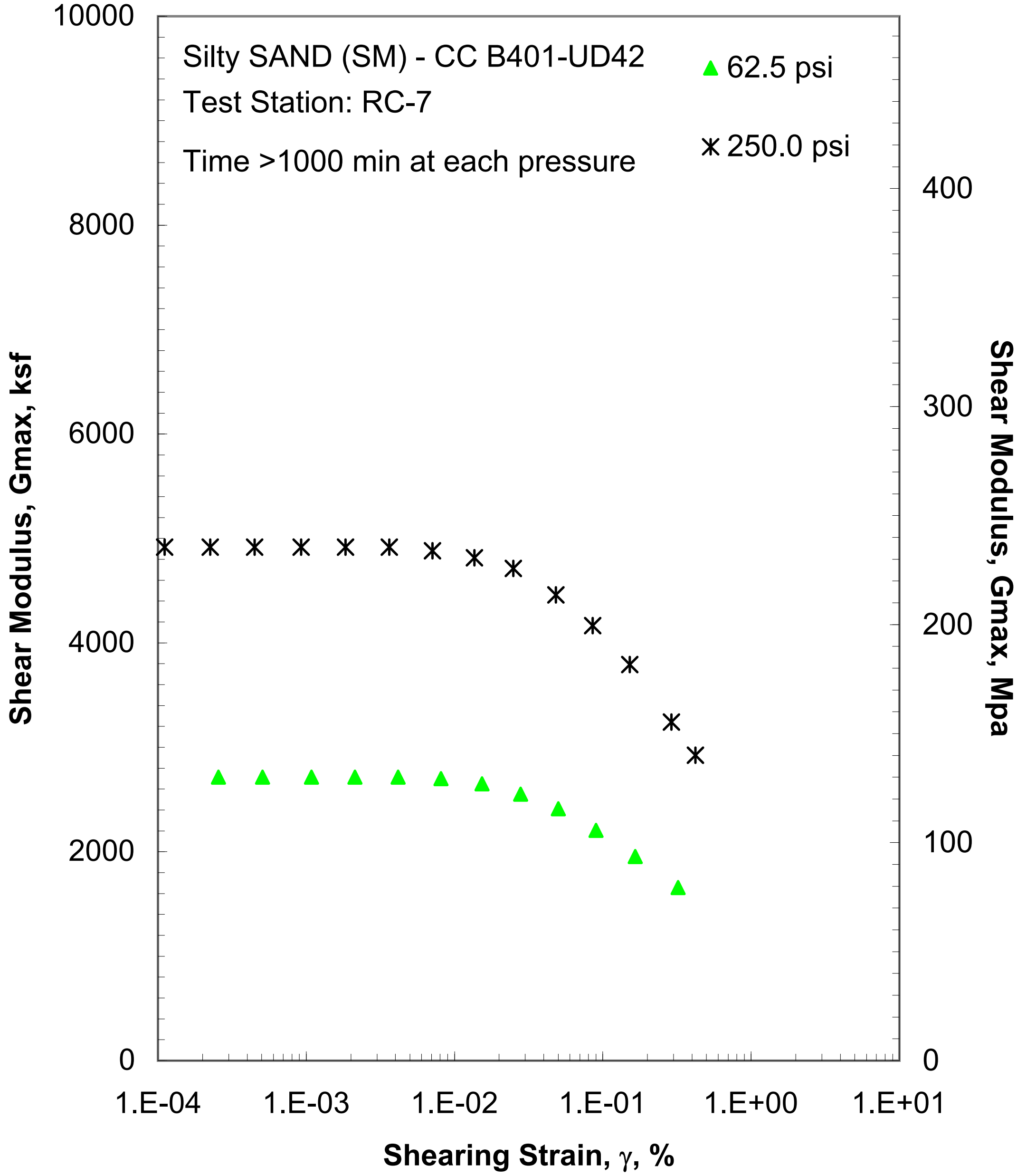


Figure L.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

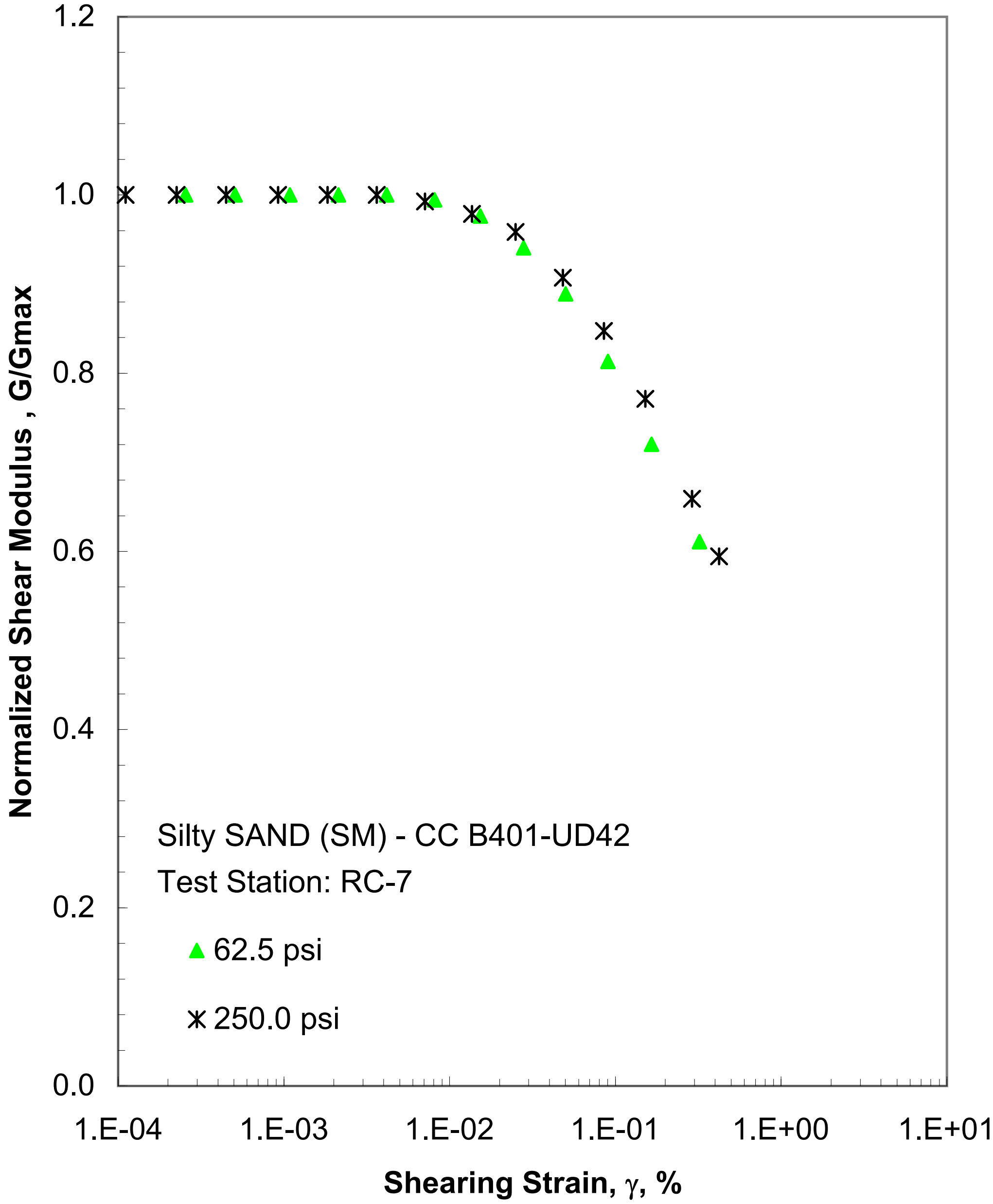


Figure L.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

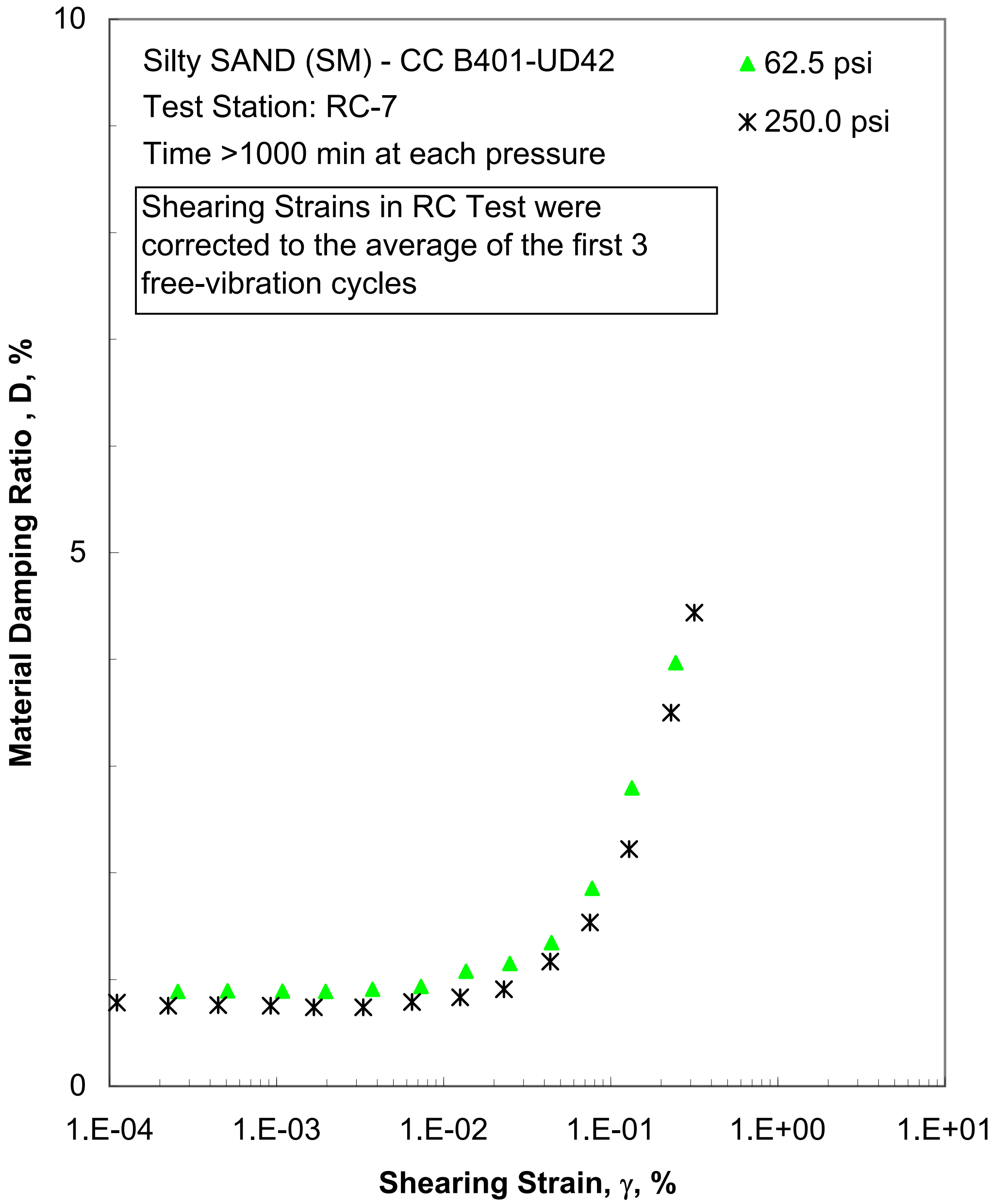


Figure L.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

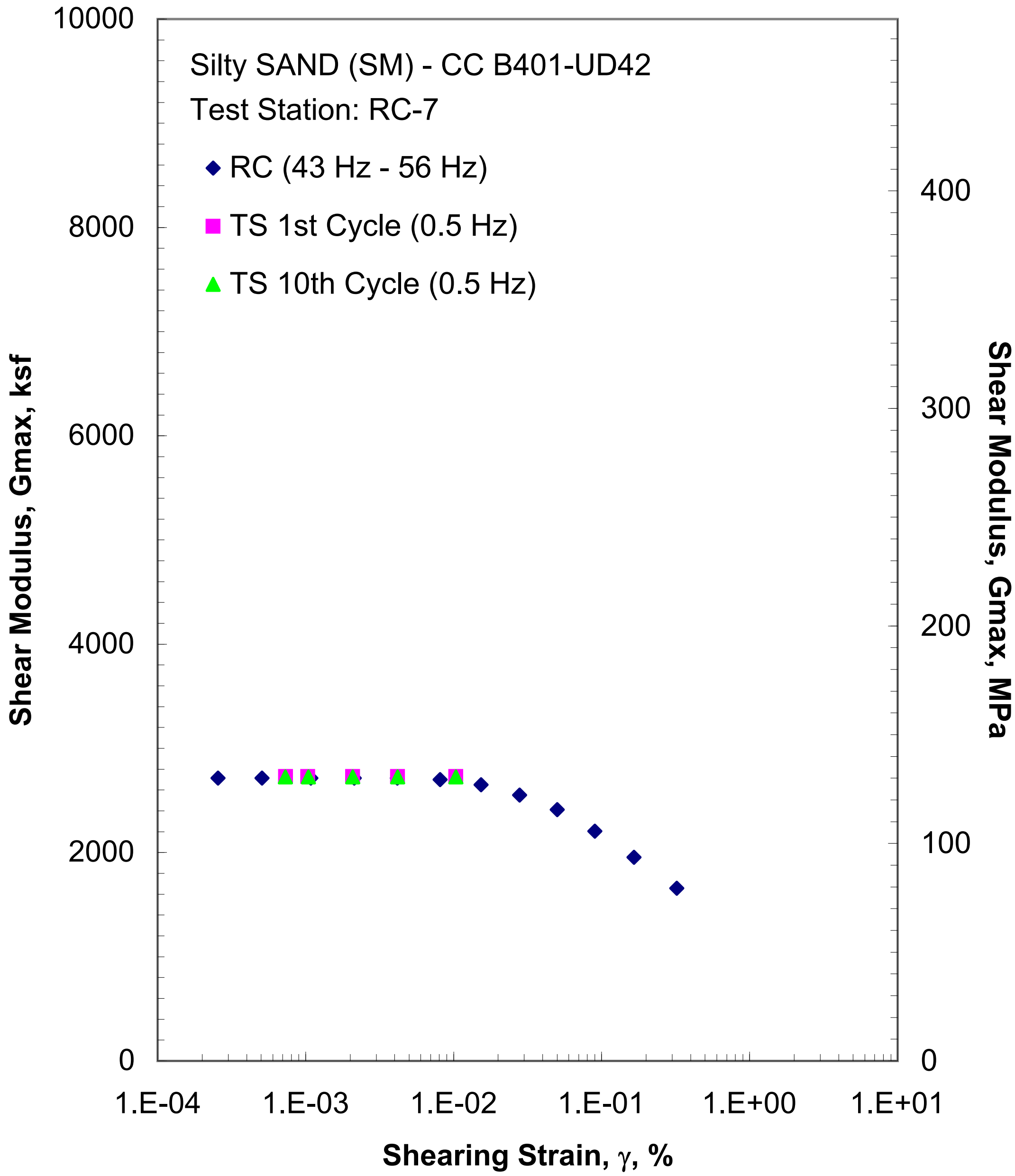


Figure L.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 62.5 psi from the Combined RCTS Tests

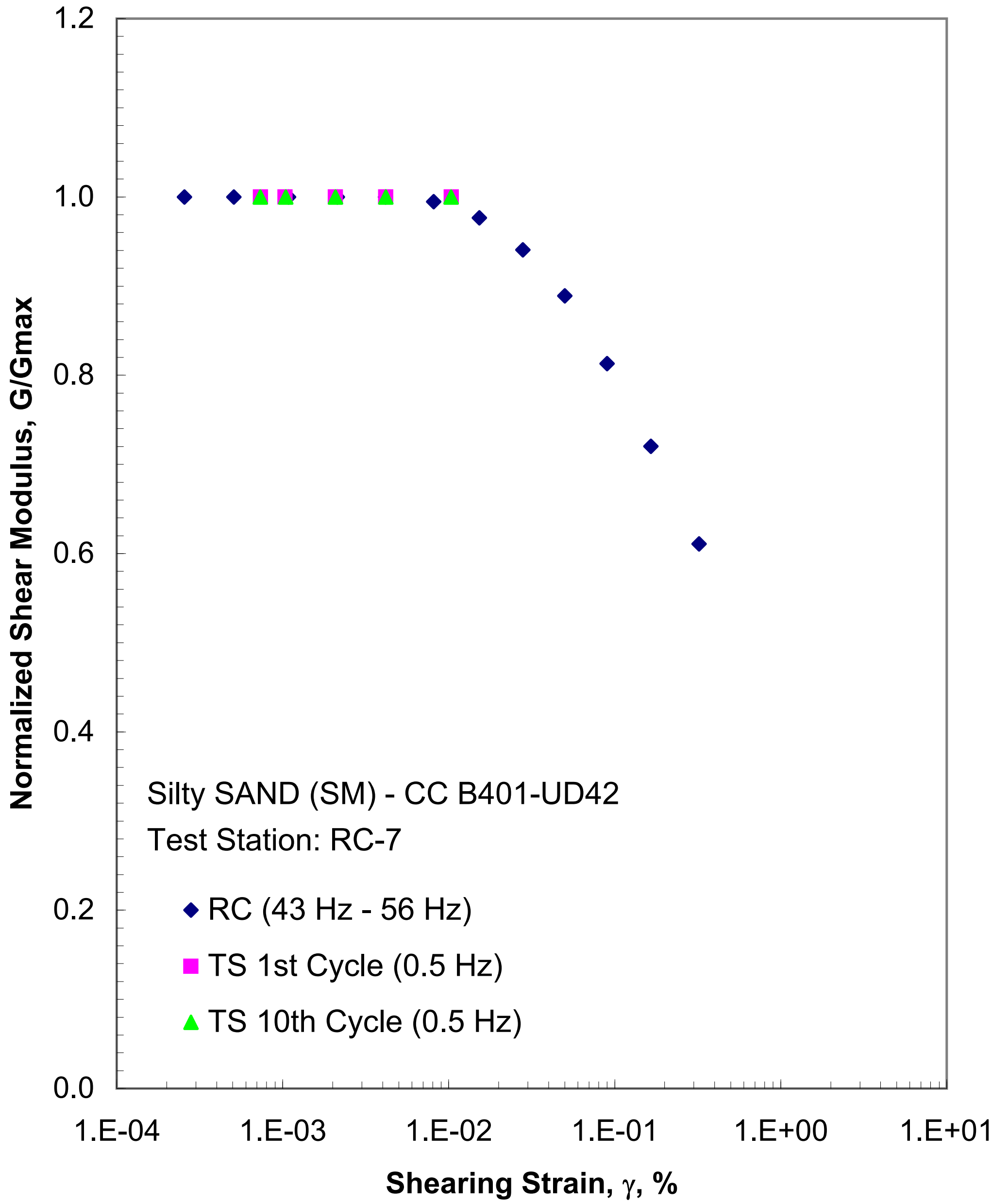


Figure L.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 62.5 psi from the Combined RCTS Tests

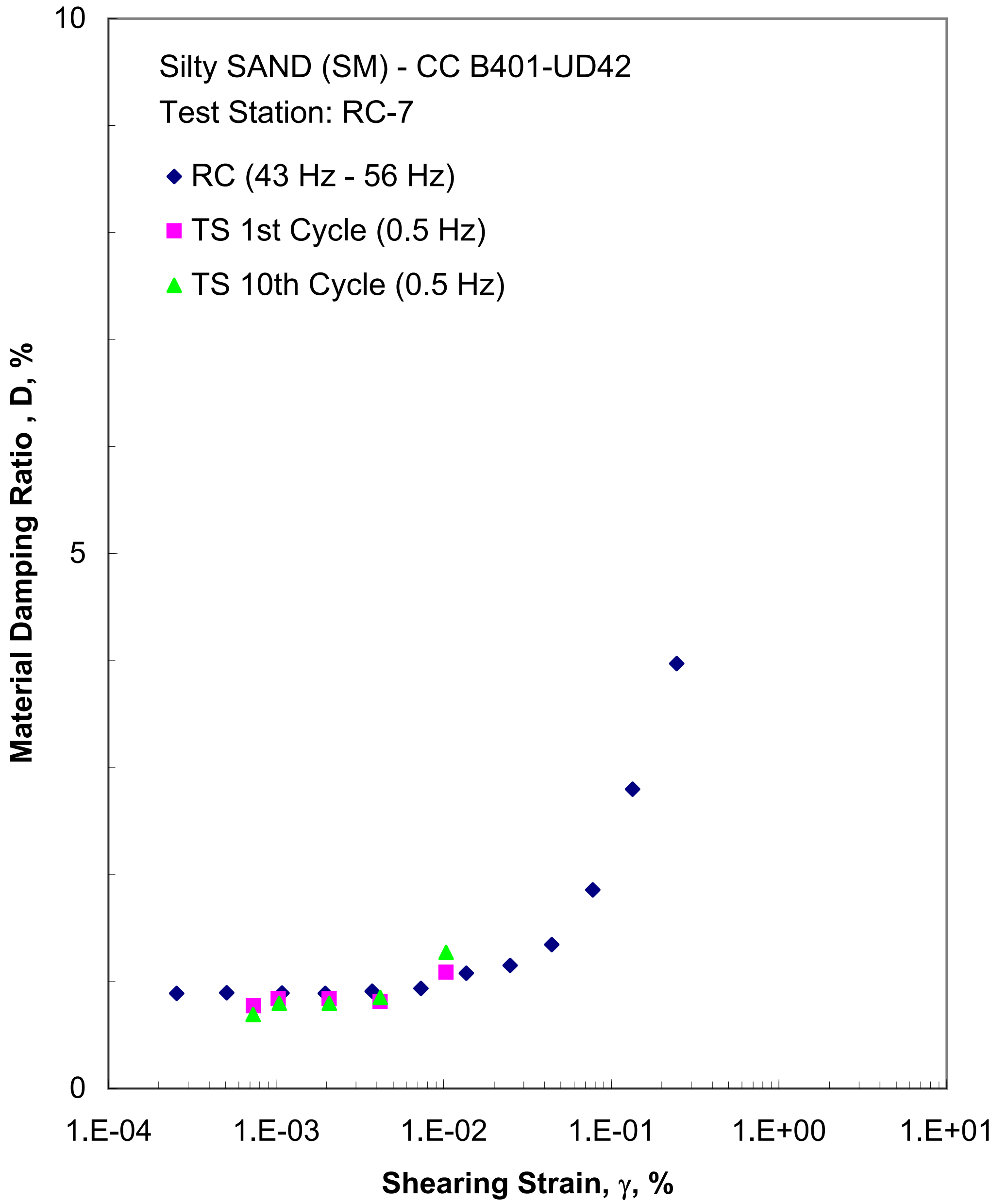


Figure L.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 62.5 psi from the Combined RCTS Tests

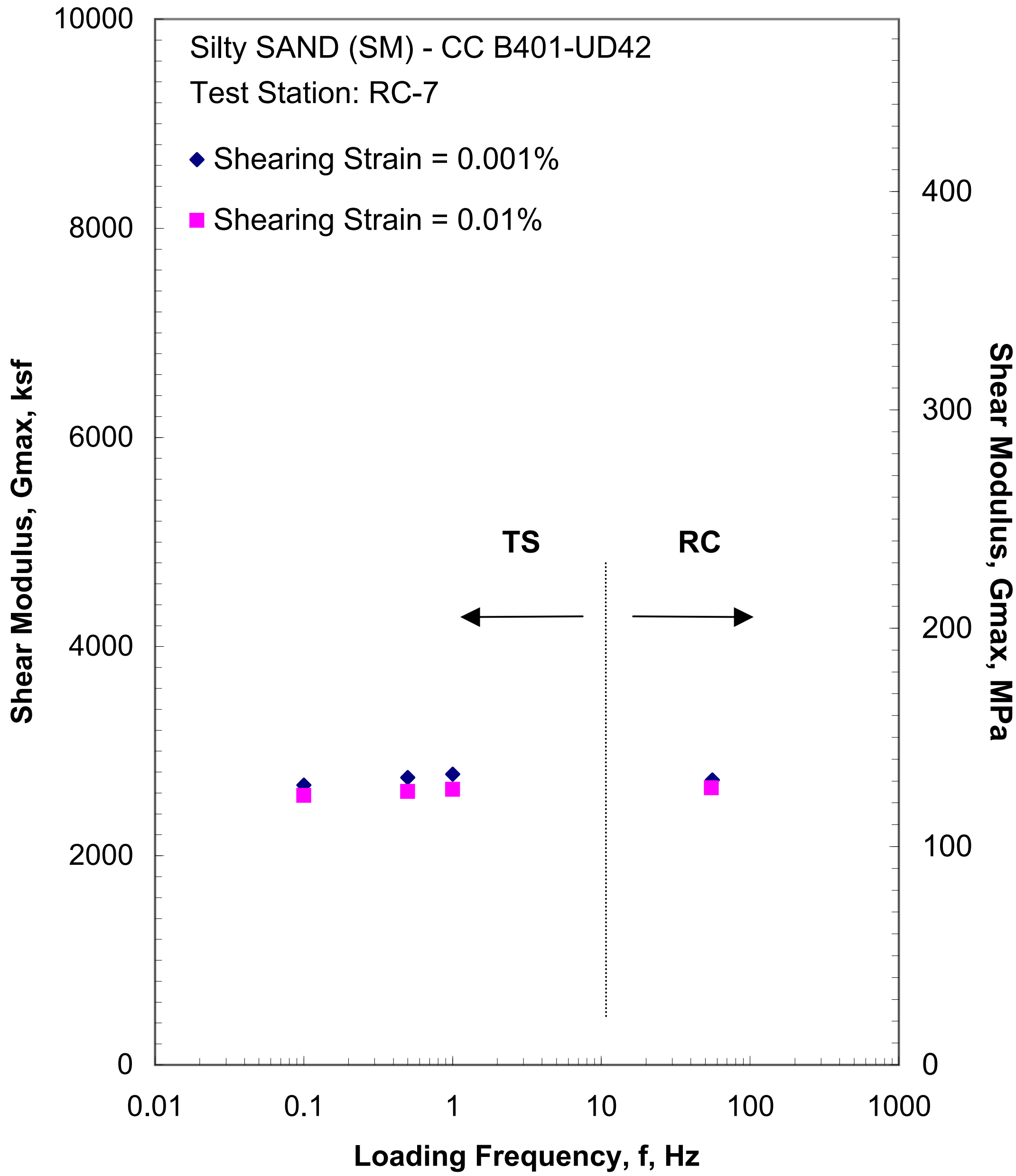


Figure L.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 62.5 psi from the Combined RCTS Tests

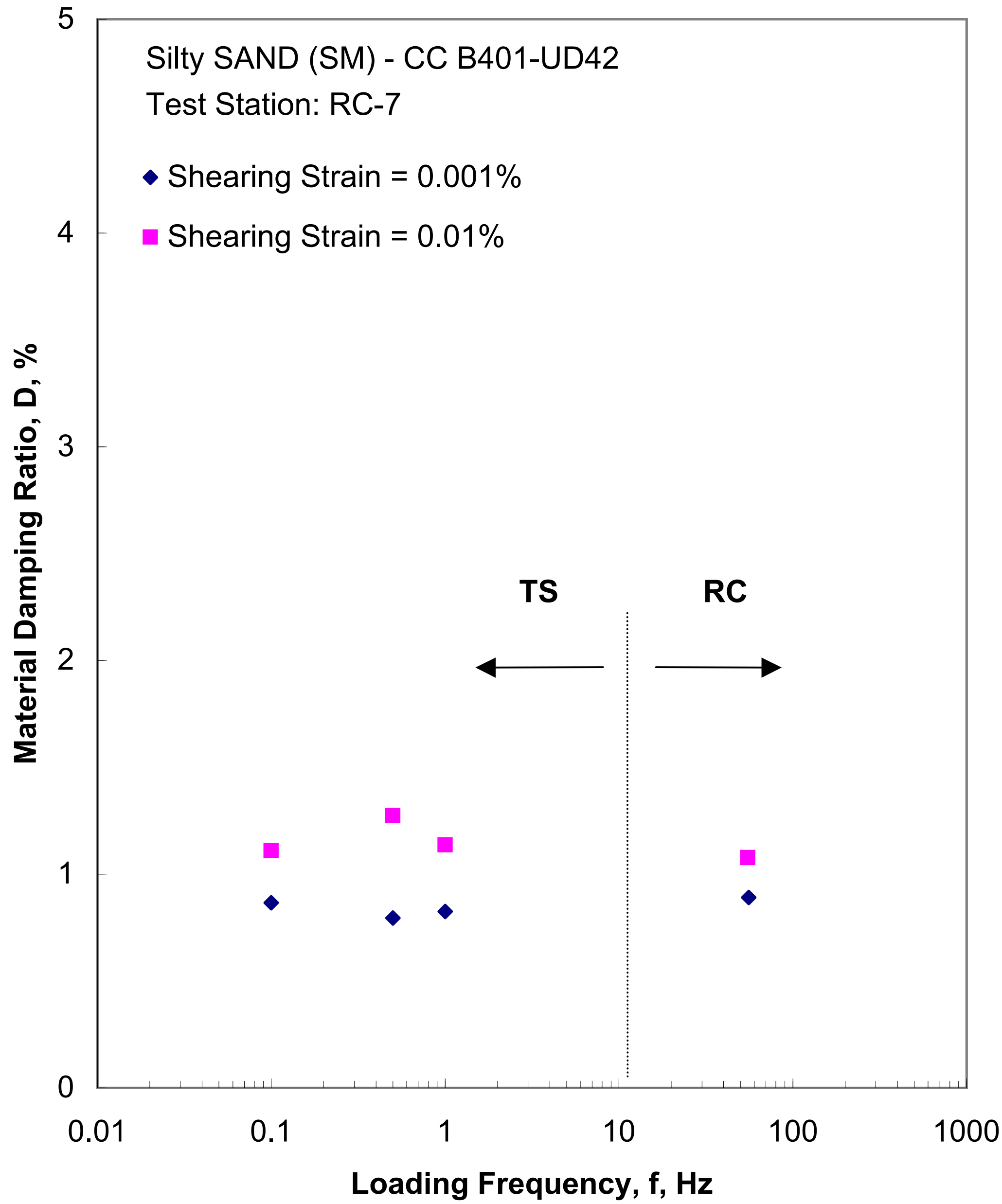


Figure L.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 62.5 psi from the Combined RCTS Tests

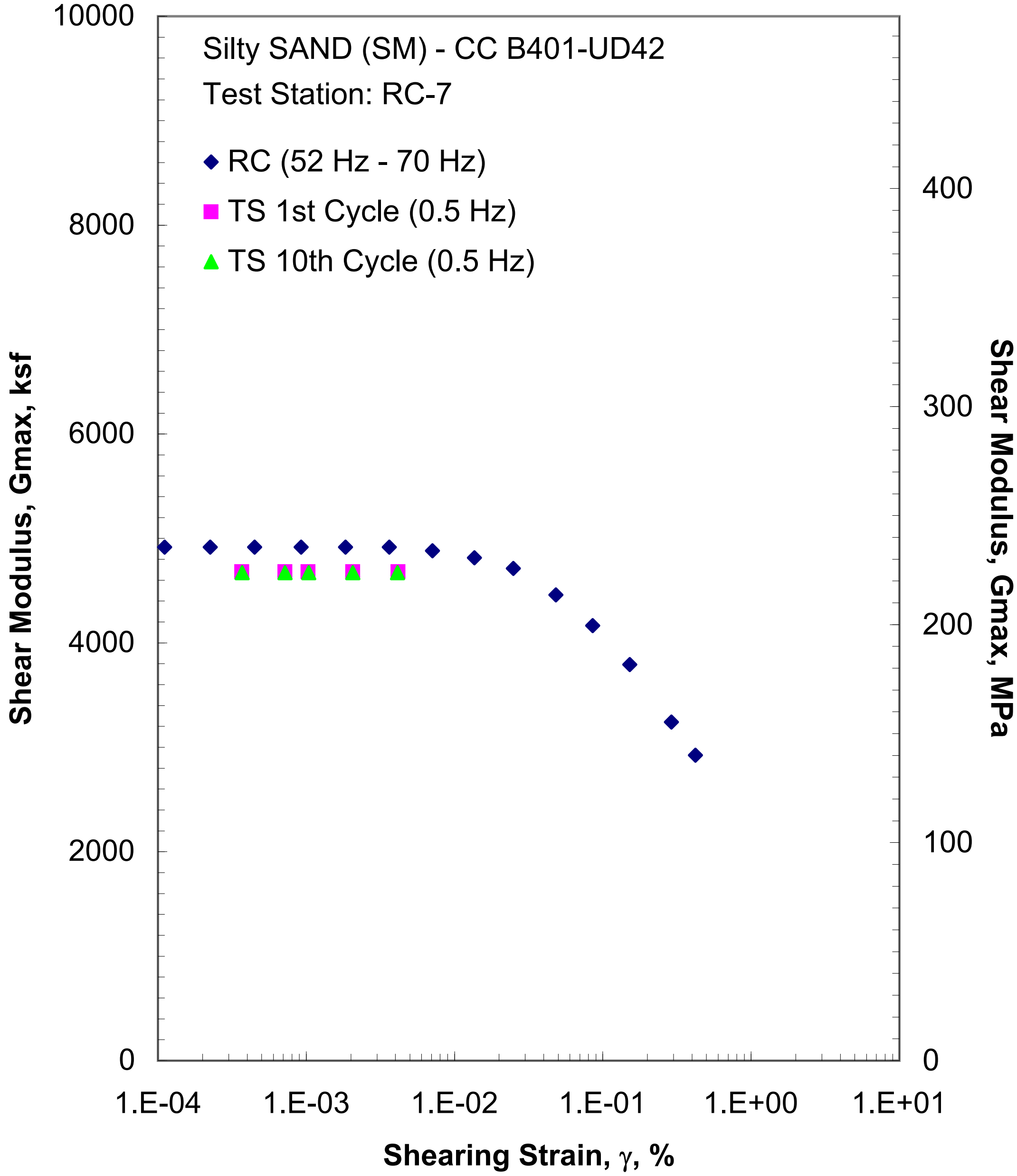


Figure L.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 250.0 psi from the Combined RCTS Tests

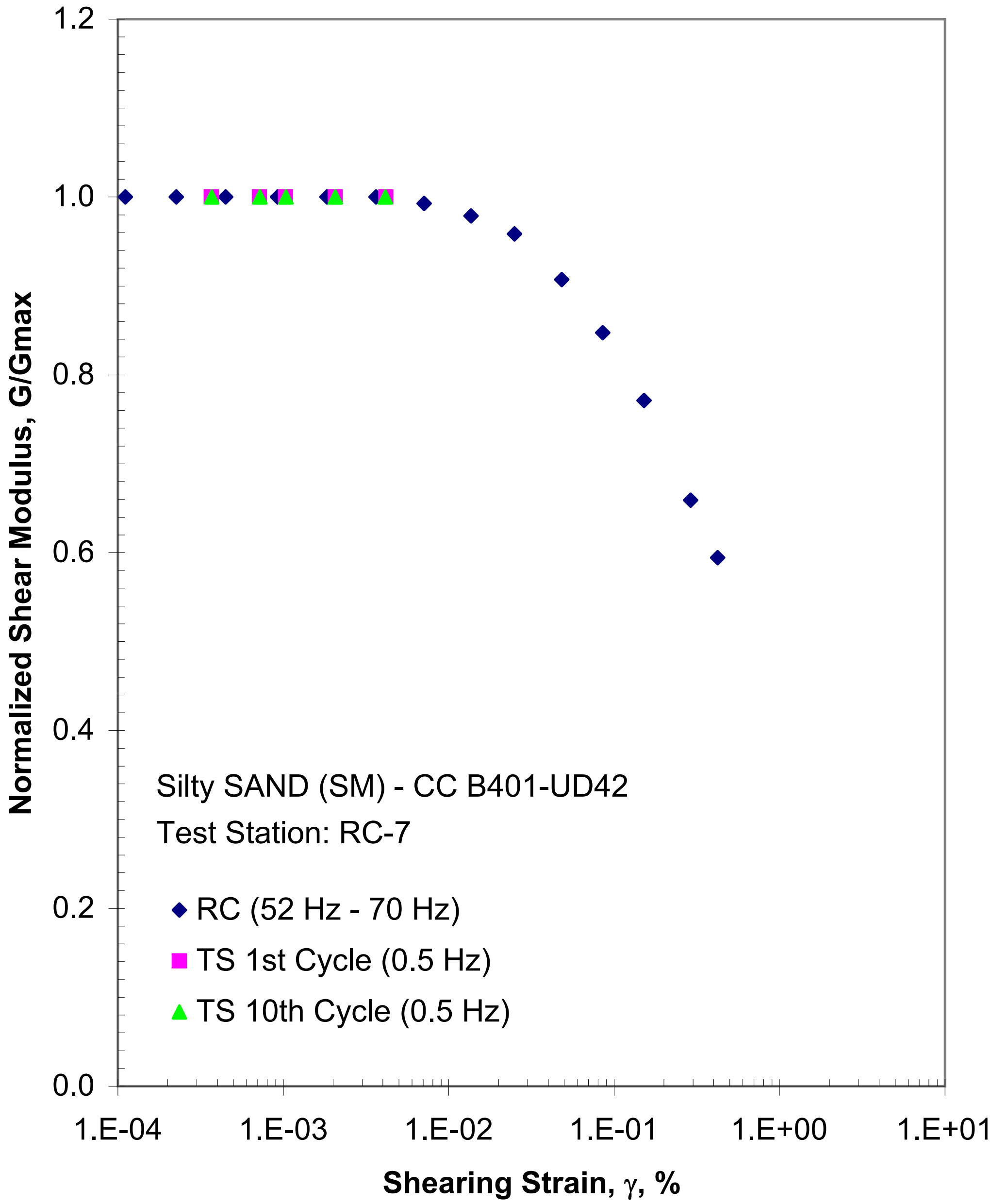


Figure L.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 250.0 psi from the Combined RCTS Tests

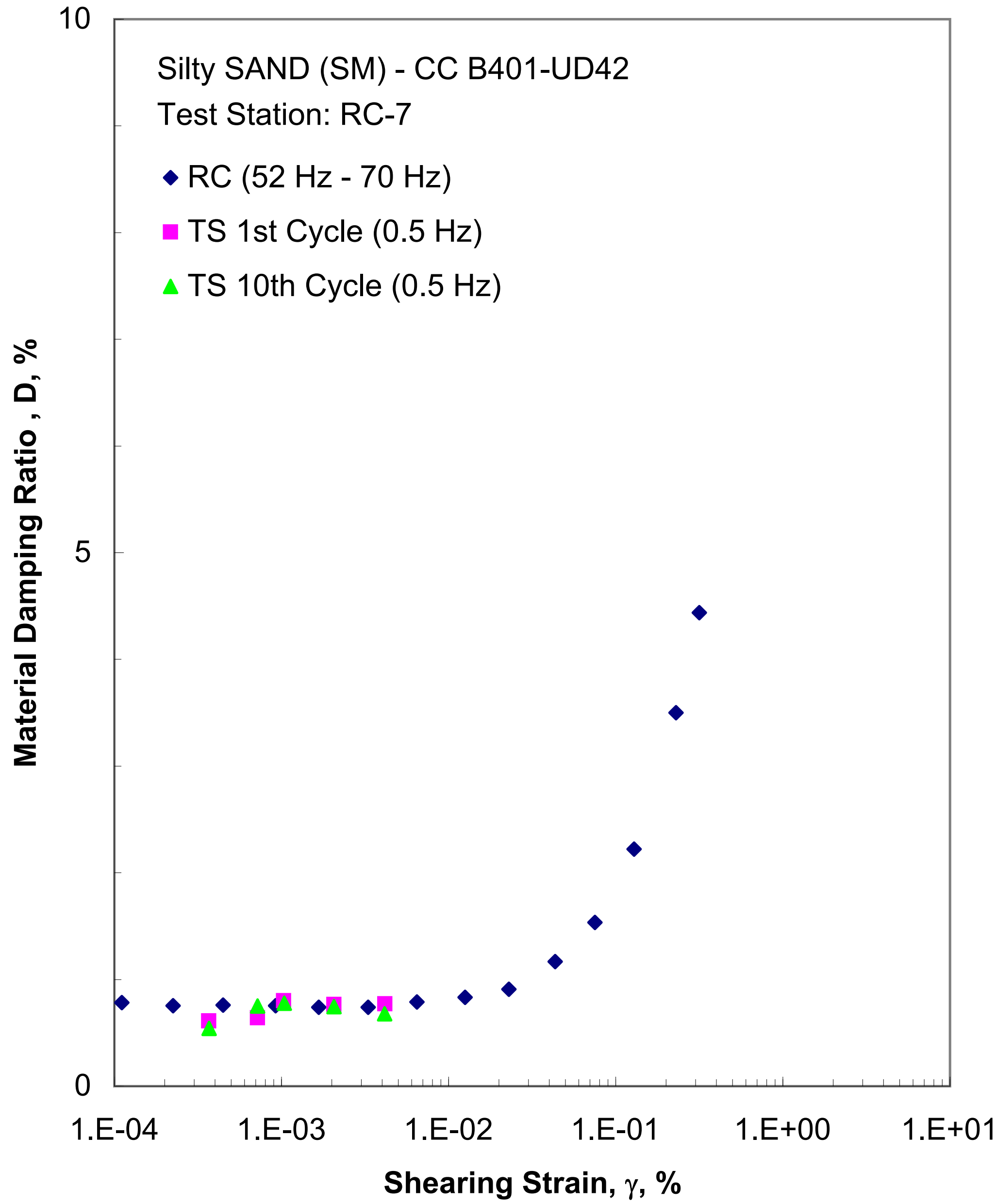


Figure L.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 250.0 psi from the Combined RCTS Tests

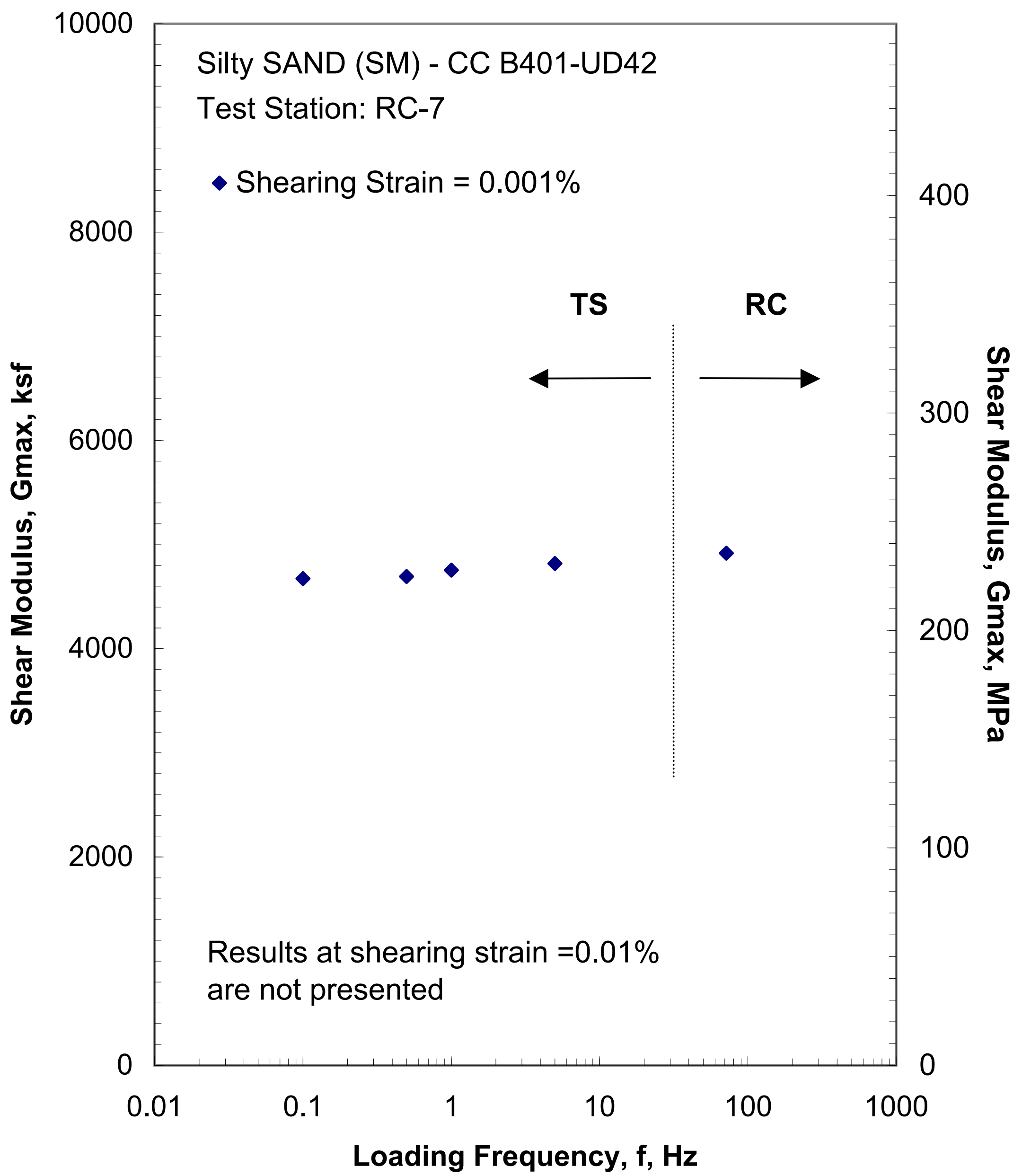


Figure L.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 250.0 psi from the Combined RCTS Tests

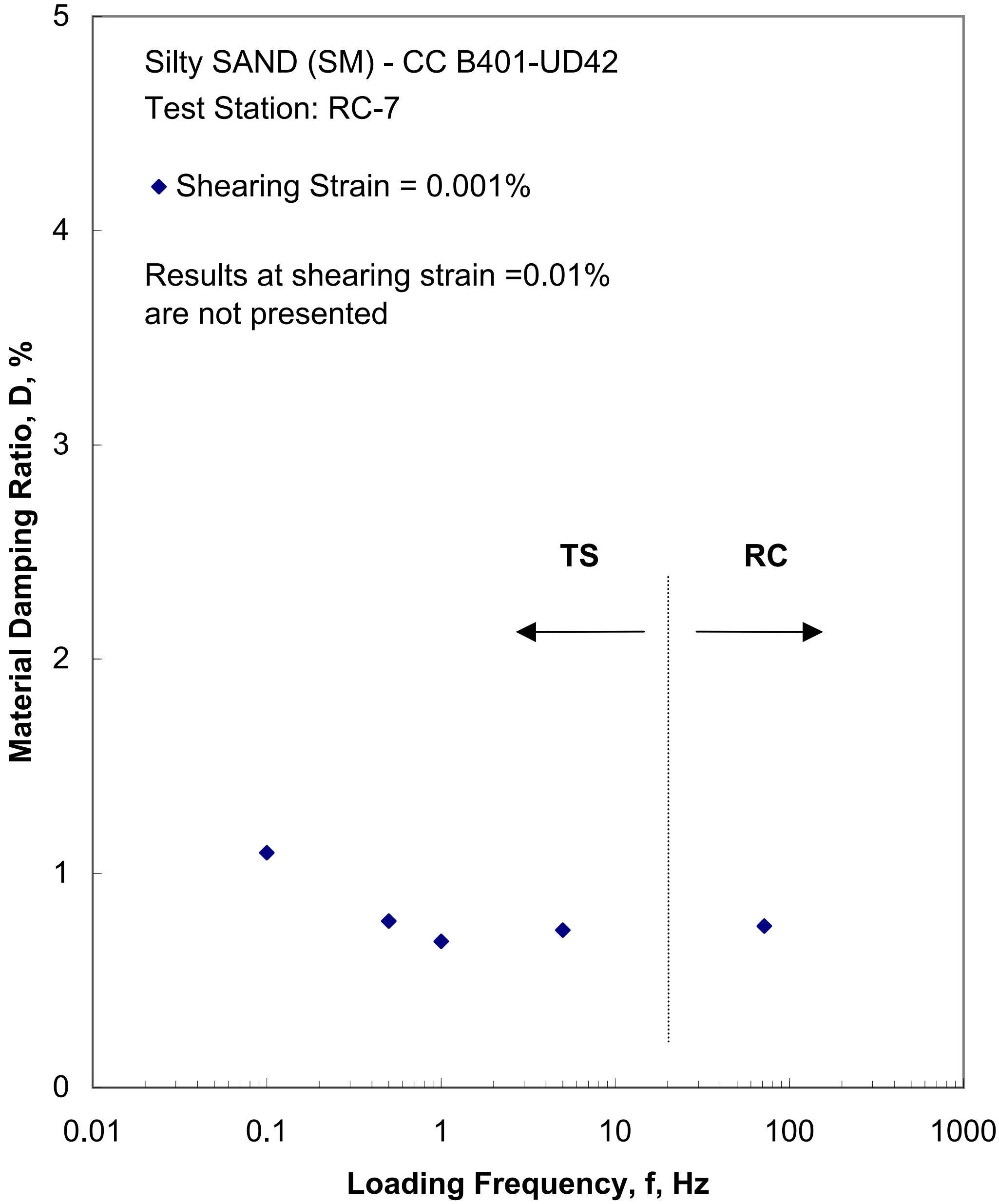


Figure L.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 250.0 psi from the Combined RCTS Tests

Table L.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 CC B401-UD42

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)	(%)	
15.6	2246	107	1576	76	705	1.21	1.455
31.3	4507	216	2072	99	806	1.13	1.443
62.5	9000	431	2736	131	923	1.08	1.425
125.0	18000	861	3461	166	1033	0.99	1.401
250.0	36000	1723	4674	224	1176	0.91	1.307

Table L.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B401-UD42; Isoptropic Confining Pressure, σ_o=62.5 psi (9.0 ksf = 431 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
2.56E-04	2714	1.00	2.56E-04	0.89
5.08E-04	2714	1.00	5.08E-04	0.89
1.09E-03	2714	1.00	1.09E-03	0.89
2.13E-03	2714	1.00	1.96E-03	0.89
4.16E-03	2714	1.00	3.75E-03	0.91
8.12E-03	2699	0.99	7.30E-03	0.93
1.53E-02	2650	0.98	1.36E-02	1.08
2.79E-02	2553	0.94	2.49E-02	1.15
5.01E-02	2413	0.89	4.41E-02	1.35
9.01E-02	2206	0.81	7.75E-02	1.86
1.66E-01	1955	0.72	1.34E-01	2.80
3.22E-01	1658	0.61	2.45E-01	3.97

[+] 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 L.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B401-UD42; Isotropic Confining Pressure, σ_o= 62.5 psi (9.0 ksf =431 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, %
7.34E-04	2730	1.00	0.77	7.31E-04	2727	1.00	0.69
1.03E-03	2730	1.00	0.84	1.04E-03	2727	1.00	0.80
2.08E-03	2730	1.00	0.84	2.08E-03	2727	1.00	0.80
4.19E-03	2730	1.00	0.81	4.19E-03	2727	1.00	0.85
1.04E-02	2730	1.00	1.09	1.03E-02	2727	1.00	1.27

Table L.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B401-UD42; Isoptropic Confining Pressure, σ_o= 250.0 psi (36.0 ksf = 1723 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
1.11E-04	4917	1.00	1.11E-04	0.78
2.25E-04	4917	1.00	2.25E-04	0.75
4.48E-04	4917	1.00	4.48E-04	0.76
9.23E-04	4917	1.00	9.23E-04	0.75
1.84E-03	4917	1.00	1.67E-03	0.74
3.63E-03	4917	1.00	3.30E-03	0.74
7.11E-03	4883	0.99	6.47E-03	0.79
1.36E-02	4814	0.98	1.25E-02	0.83
2.50E-02	4714	0.96	2.30E-02	0.91
4.82E-02	4461	0.91	4.34E-02	1.17
8.54E-02	4167	0.85	7.52E-02	1.54
1.52E-01	3792	0.77	1.29E-01	2.22
2.90E-01	3241	0.66	2.29E-01	3.50
4.21E-01	2923	0.59	3.16E-01	4.44

[+] 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 L.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B401-UD42; Isotropic Confining Pressure, σ_o=250.0 psi (36.0 ksf = 1723 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, %
3.67E-04	4680	1.00	0.61	3.70E-04	4671	1.00	0.54
7.19E-04	4680	1.00	0.64	7.20E-04	4671	1.00	0.75
1.03E-03	4680	1.00	0.80	1.04E-03	4671	1.00	0.78
2.06E-03	4680	1.00	0.77	2.06E-03	4671	1.00	0.75
4.16E-03	4680	1.00	0.77	4.13E-03	4671	1.00	0.68

U.S. Standard Sieve Nos.

3" 3/4" 4 10 40 100 200

PERCENT FINER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

100 10 1 0.1 0.01 0.001

GRAIN SIZE (mm)

GRAVEL SAND SILT OR CLAY

GRADATION CURVE

ASTM D422

Project:	Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland	Contract No.: 06120048.00	Date: 10/18/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-401	198.5-200.3	SILTY SAND, greenish gray	SM	82	27

Schnabel Engineering

APPENDIX M

CC B409-UD39
Silty SAND (SM), contains shells, greenish gray*
(LL=61, PL=42, PI=19; Gs=2.64)*

Borehole B-409
Sample UD39
Sample Depth =95.0 to 96.6 ft
RCTS Test Depth = 96.1 ft
Total Unit Weight = 109.3 lb/ft^3
Water Content = 33.1 %
Estimated In-Situ Ko = 0.5*
Estimated In-Situ Mean Effective Stress = 28.0 psi*

*Data supplied by Schnabel Engineering, Inc.

FUGRO JOB #: 0401-1661
Testing Station: RC7

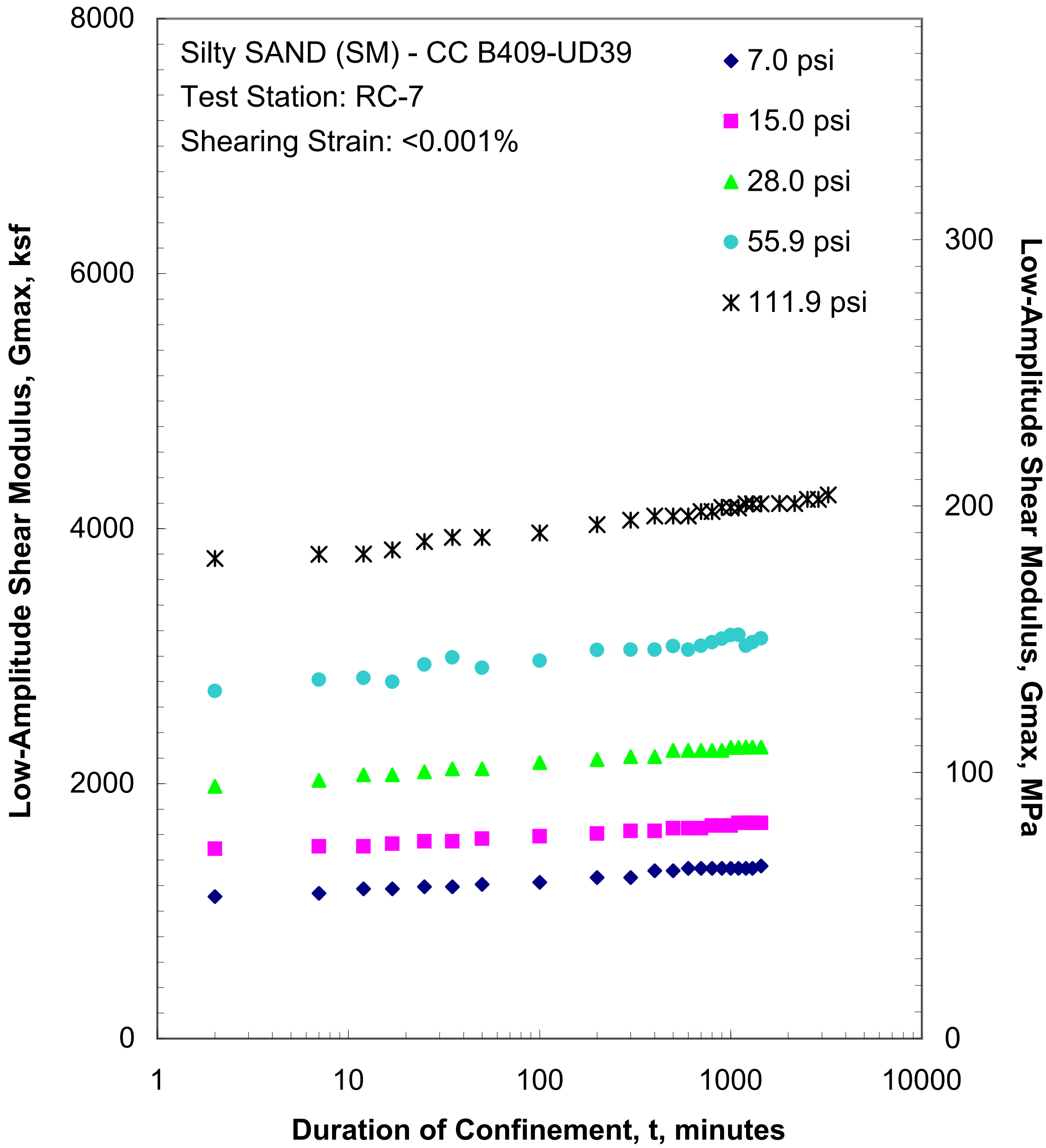


Figure M.1 Variation in Low-Amplitude Shear Modulus with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

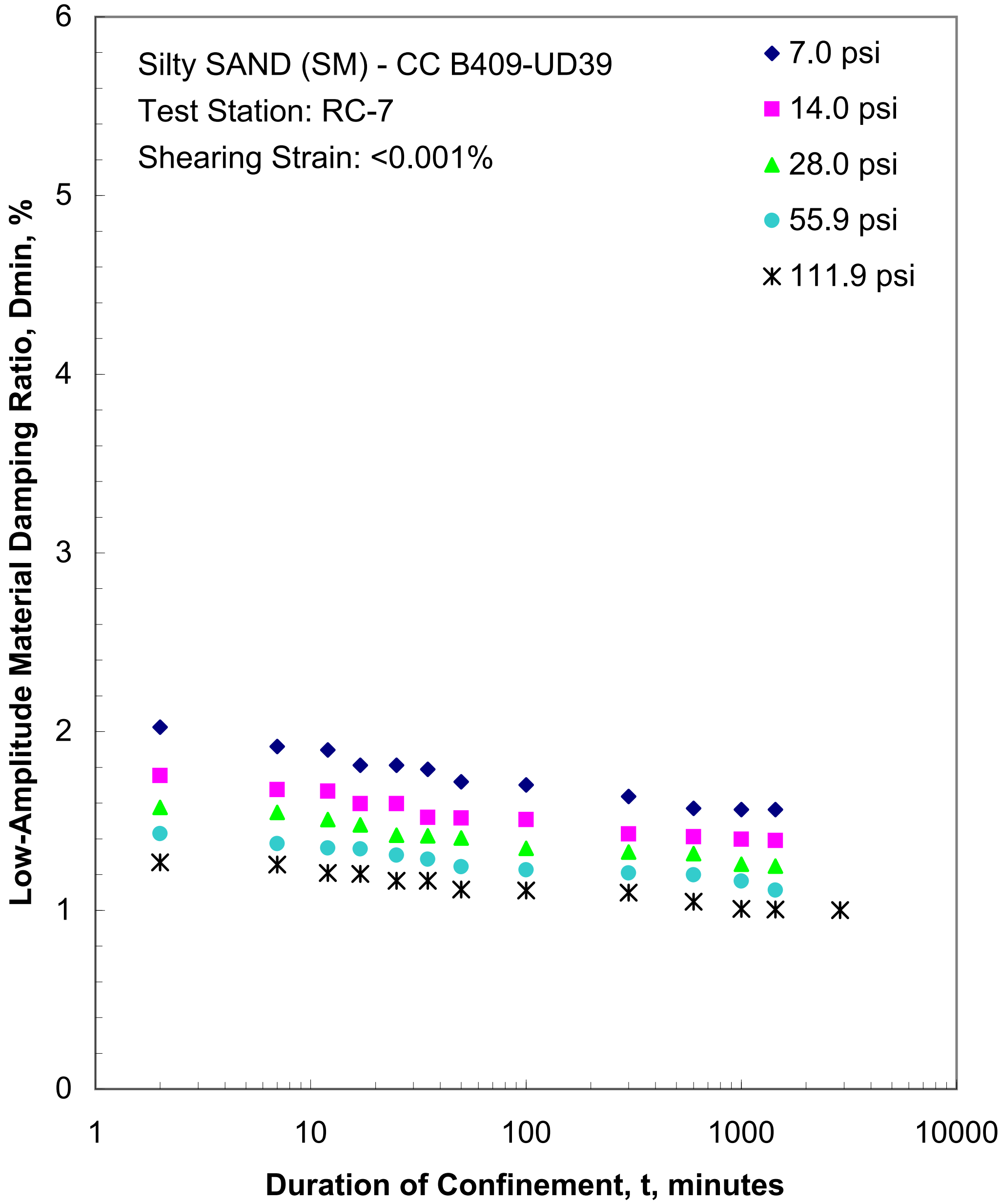


Figure M.2 Variation in Low-Amplitude Material Damping Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

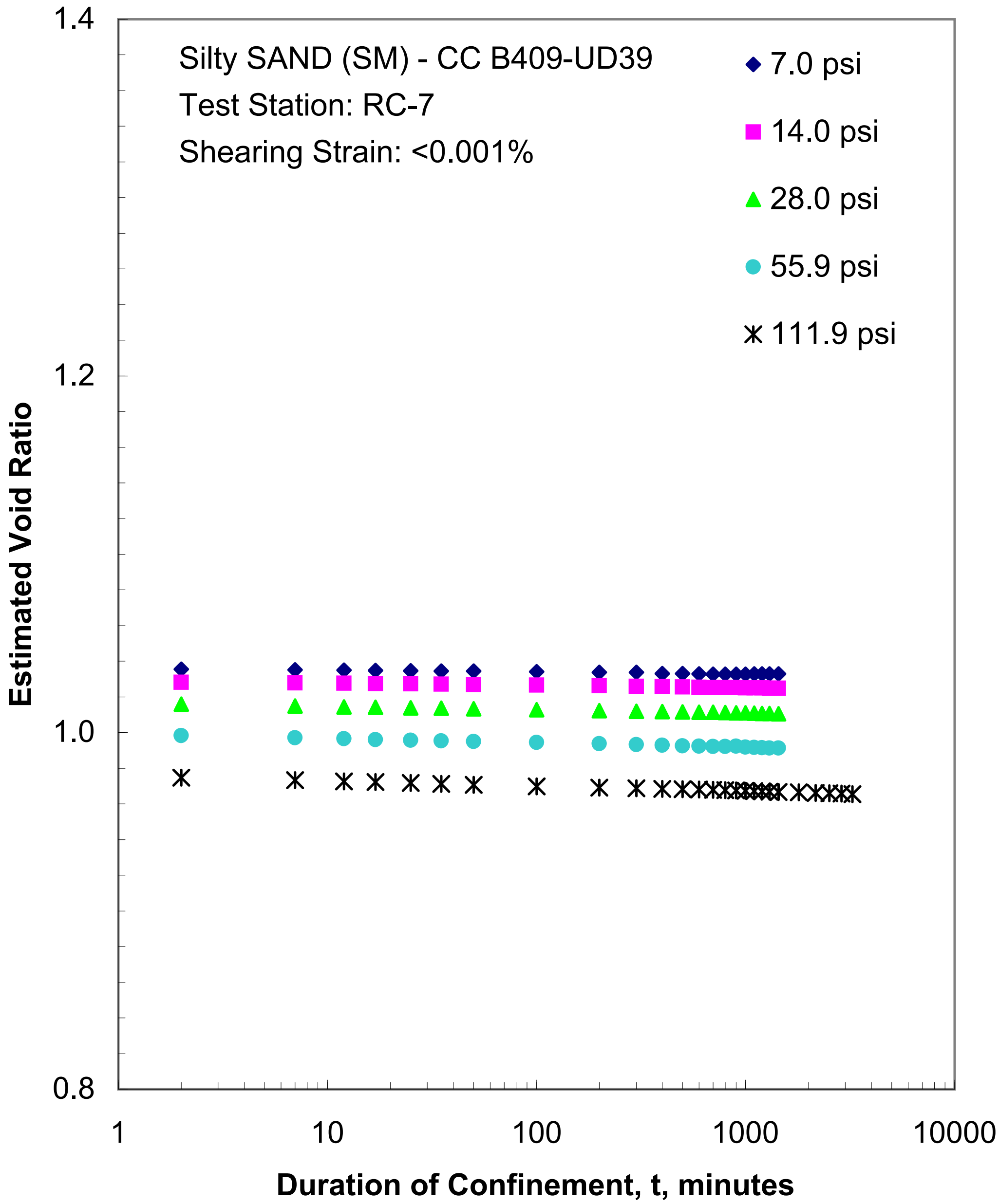


Figure M.3 Variation in Estimated Void Ratio with Magnitude and Duration of Isotropic Confining Pressure from Resonant Column Tests

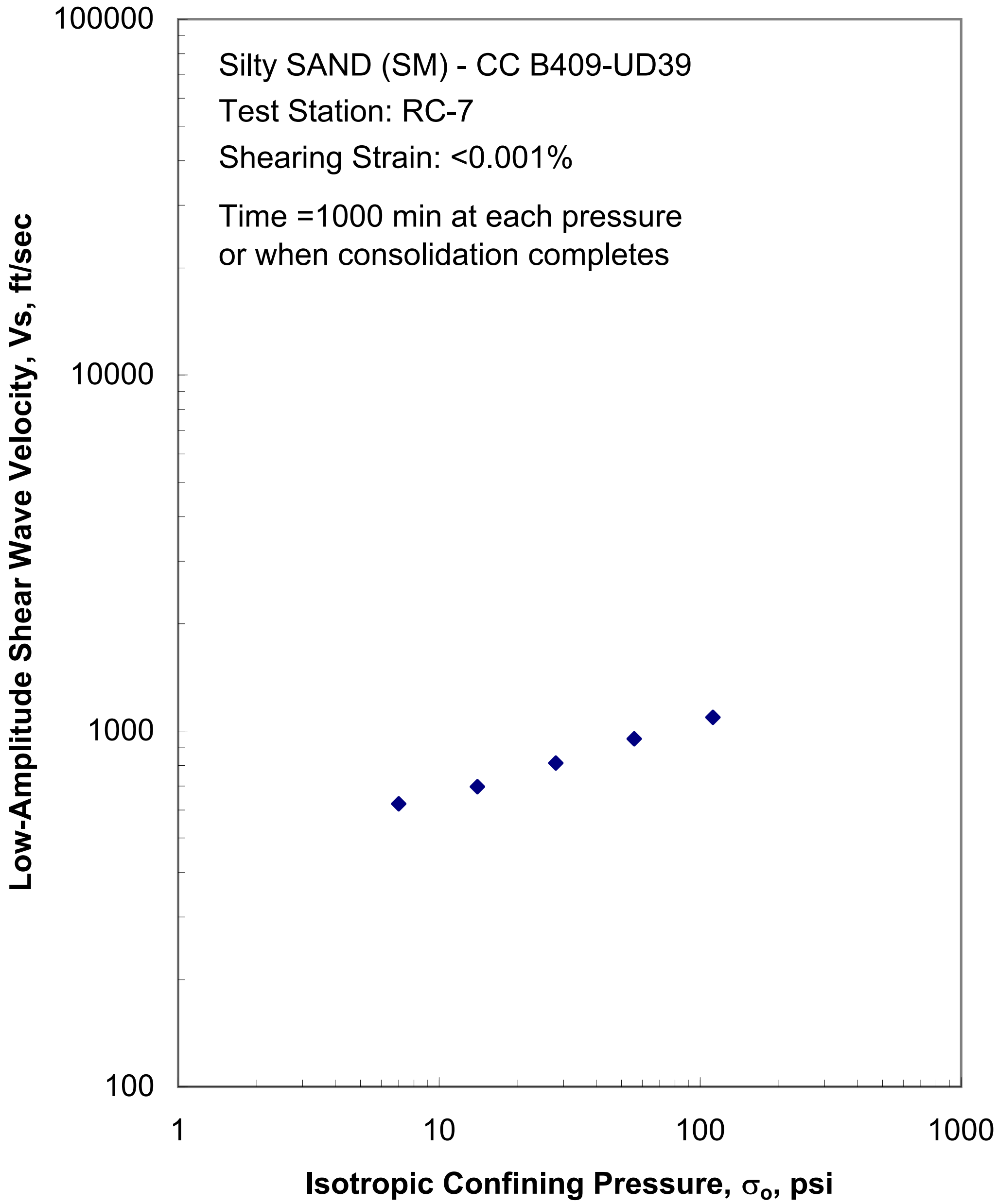


Figure M.4 Variation in Low-Amplitude Shear Wave Velocity with Isotropic Confining Pressure from Resonant Column Tests

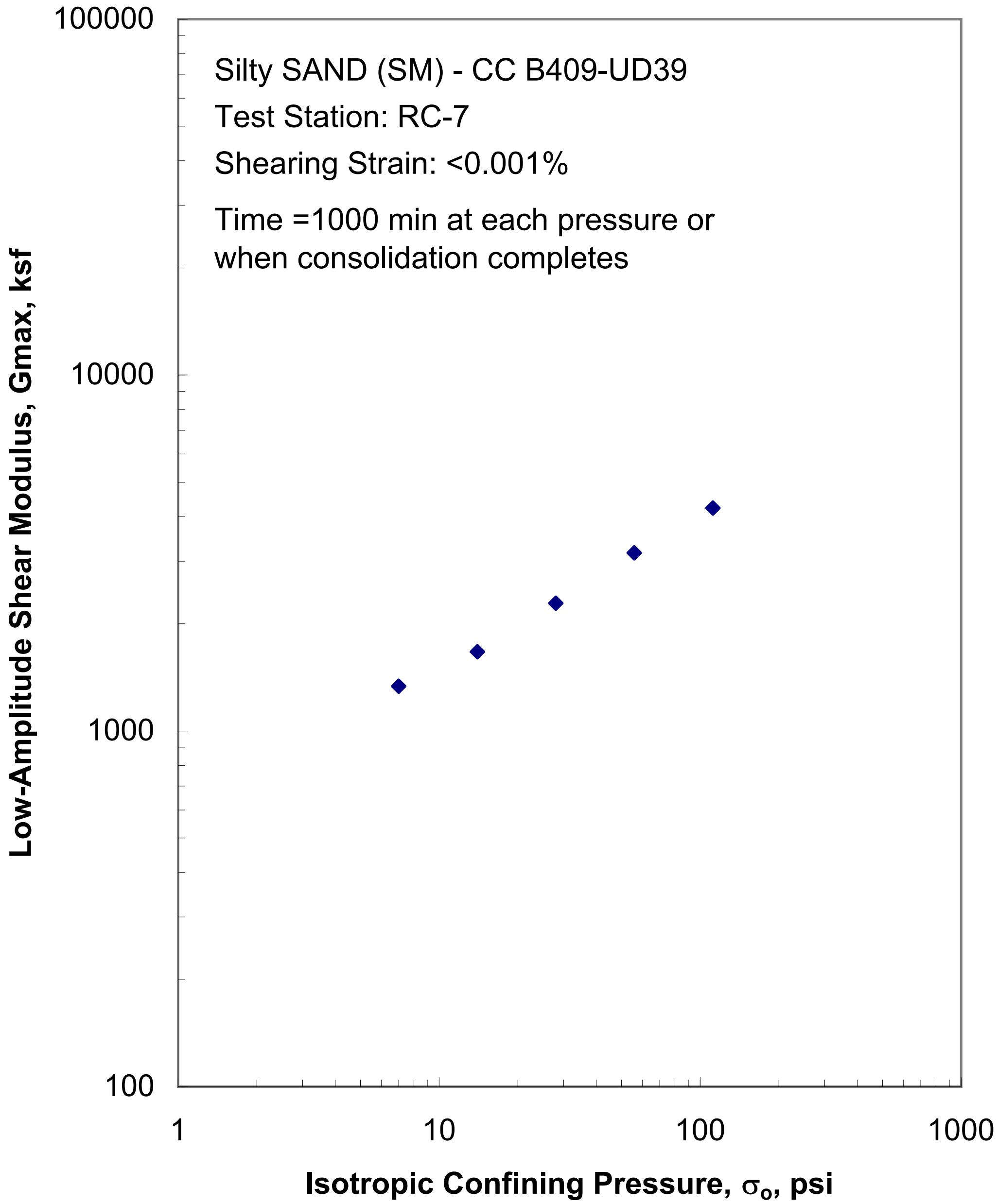


Figure M.5 Variation in Low-Amplitude Shear Modulus with Isotropic Confining Pressure from Resonant Column Tests

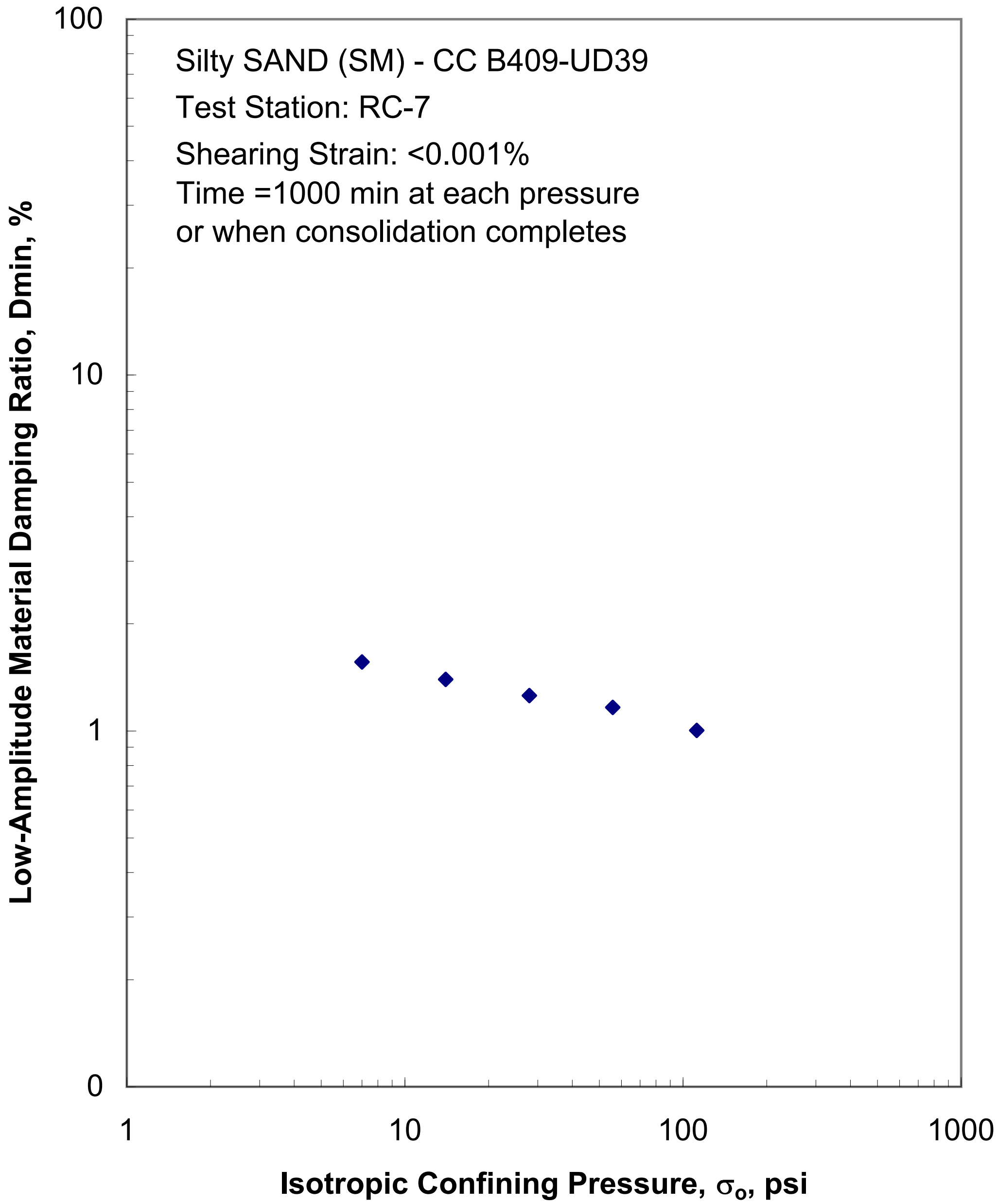


Figure M.6 Variation in Low-Amplitude Material Damping Ratio with Isotropic Confining Pressure from Resonant Column Tests

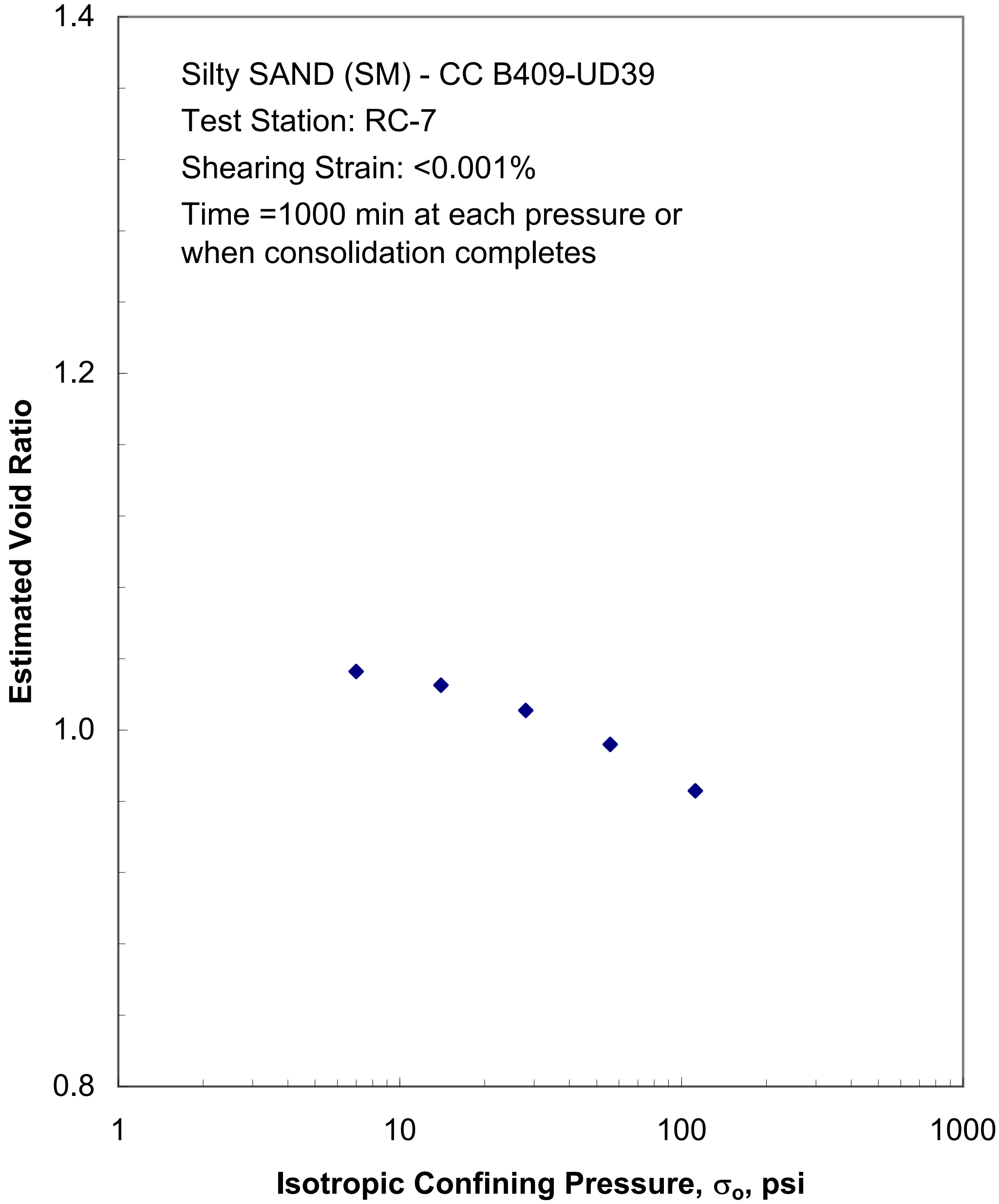


Figure M.7 Variation in Estimated Void Ratio with Isotropic Confining Pressure from Resonant Column Tests

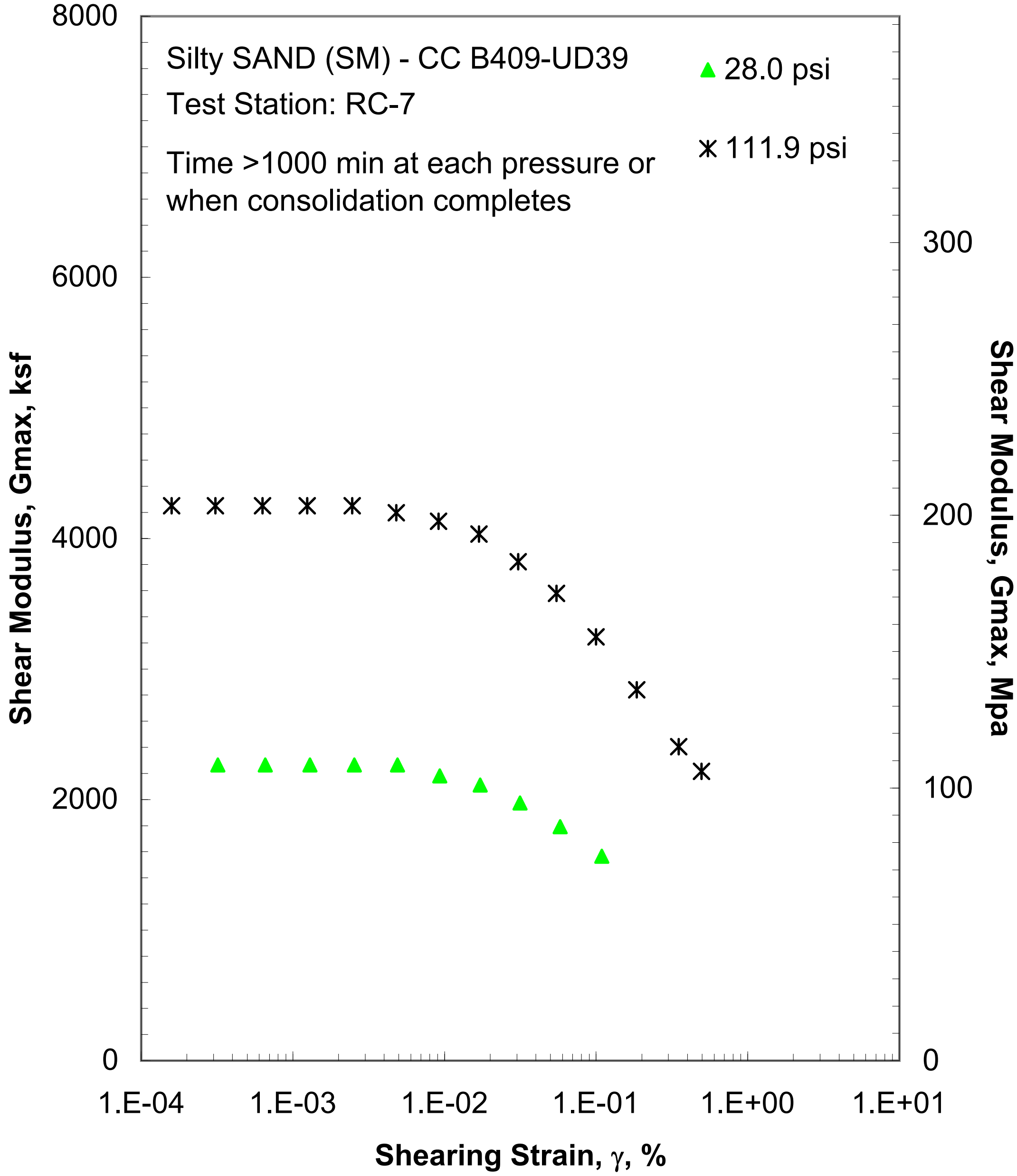


Figure M.8 Comparison of the Variation in Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

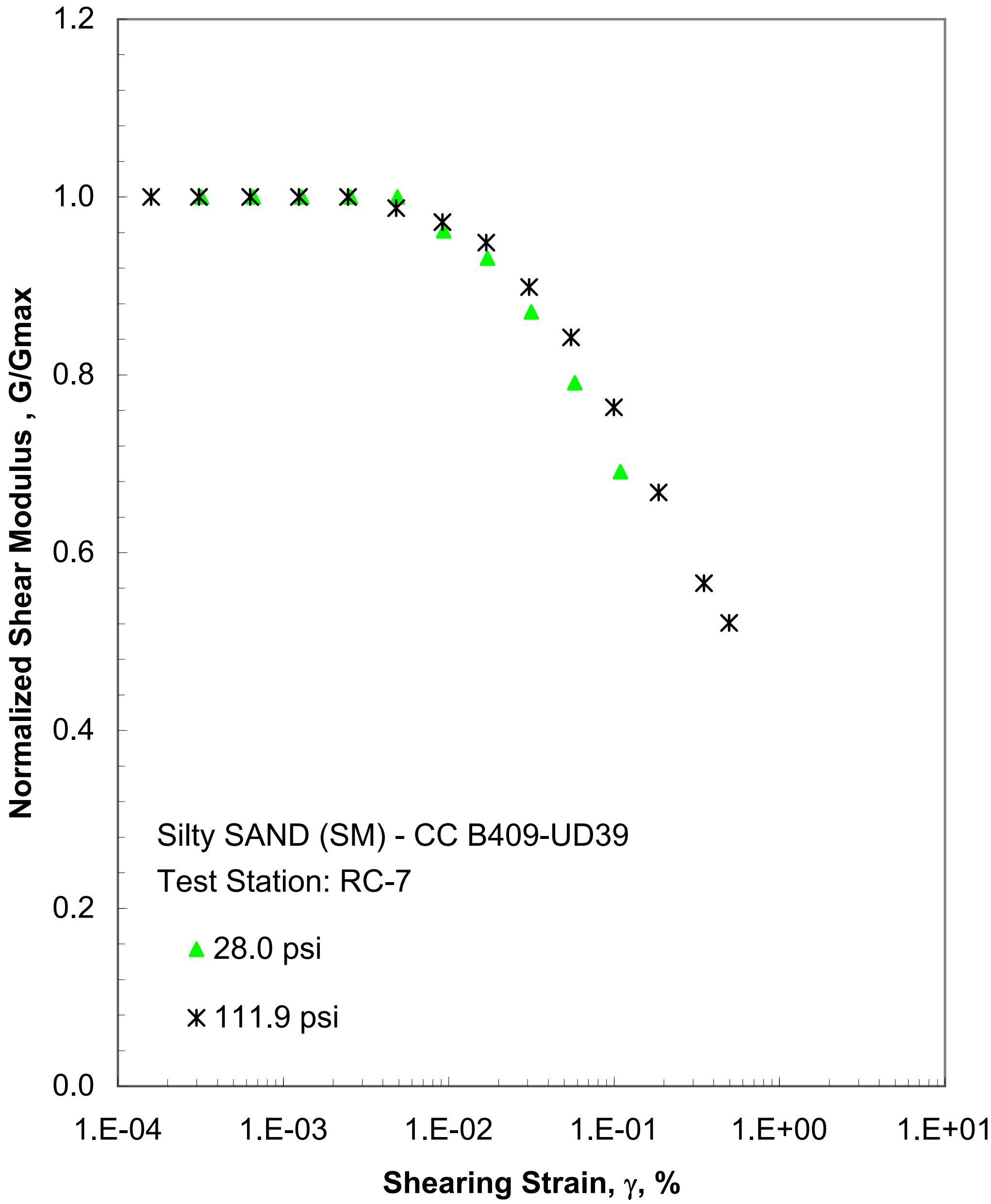


Figure M.9 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

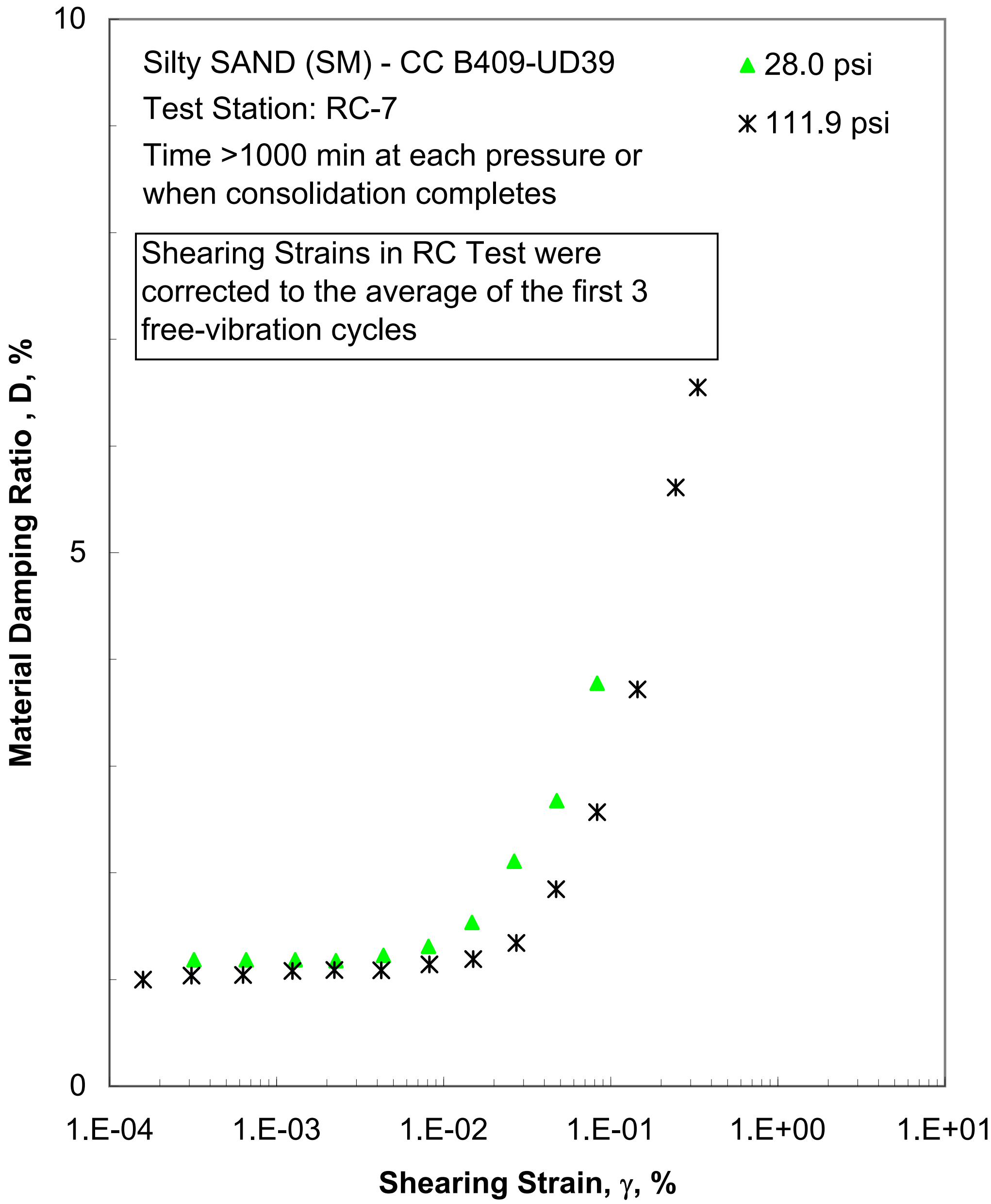


Figure M.10 Comparison of the Variation in Material Damping Ratio with Shearing Strain and Isotropic Confining Pressure from the Resonant Column Tests

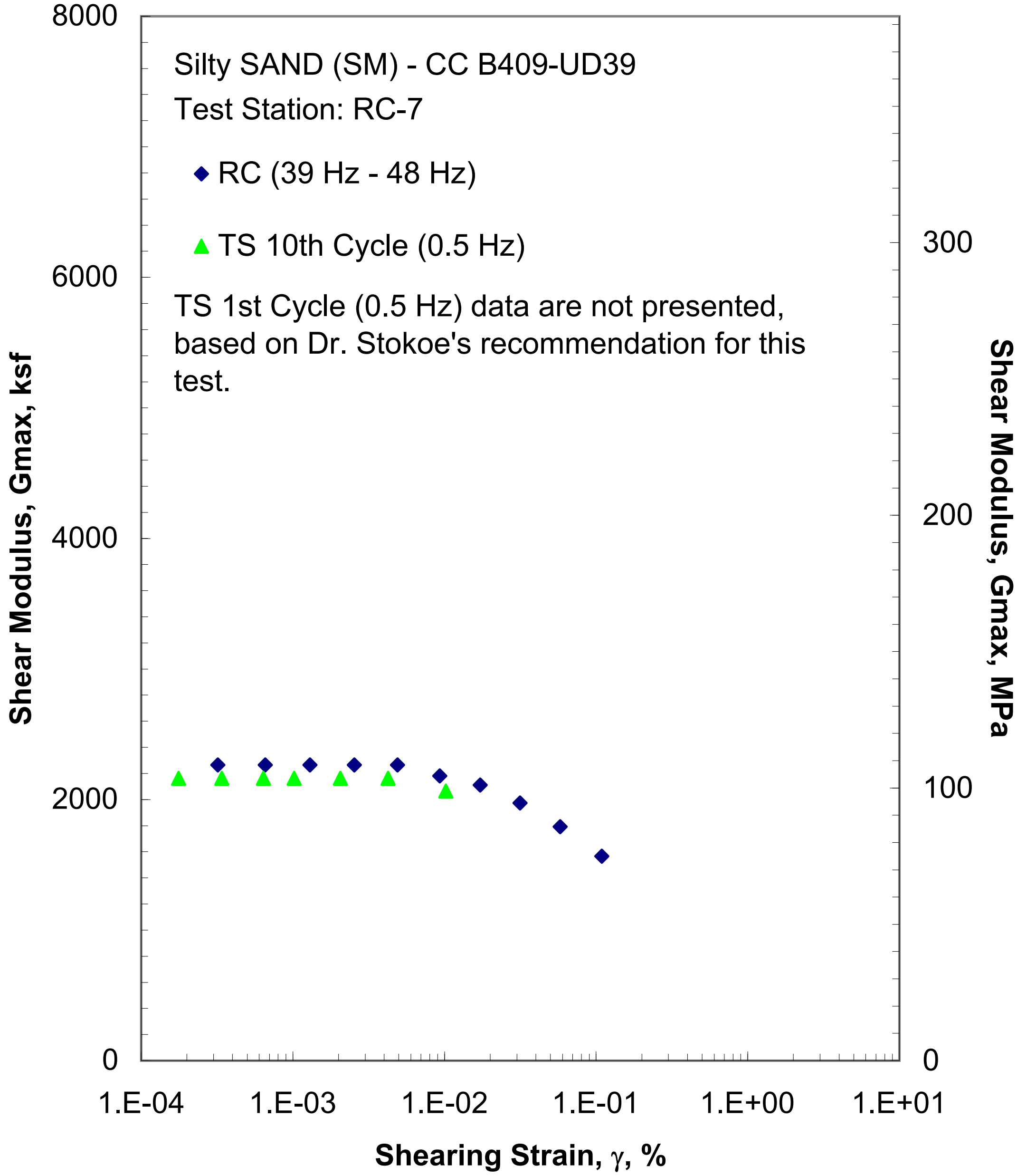


Figure M.11 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 28.0 psi from the Combined RCTS Tests

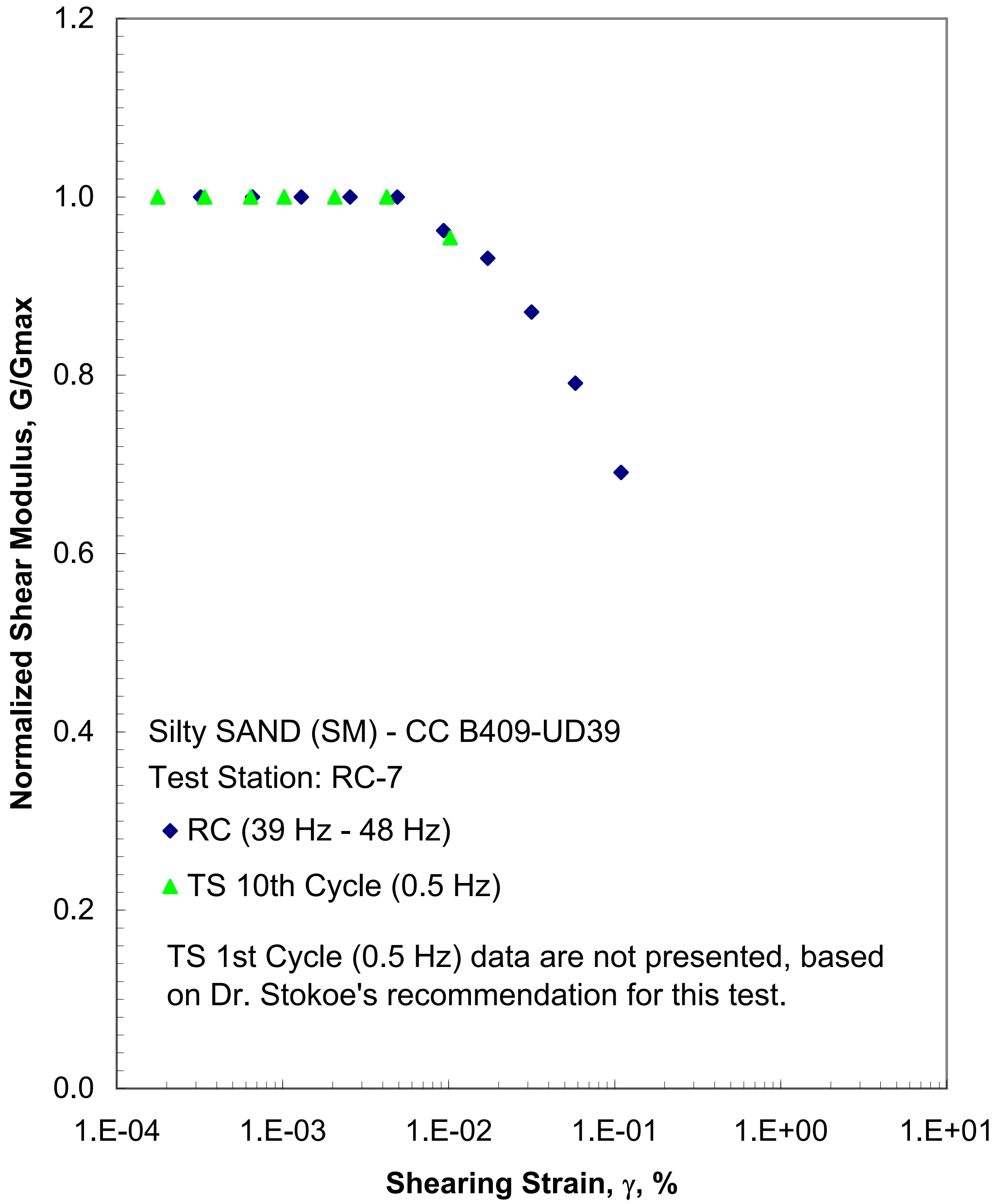


Figure M.12 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 28.0 psi from the Combined RCTS Tests

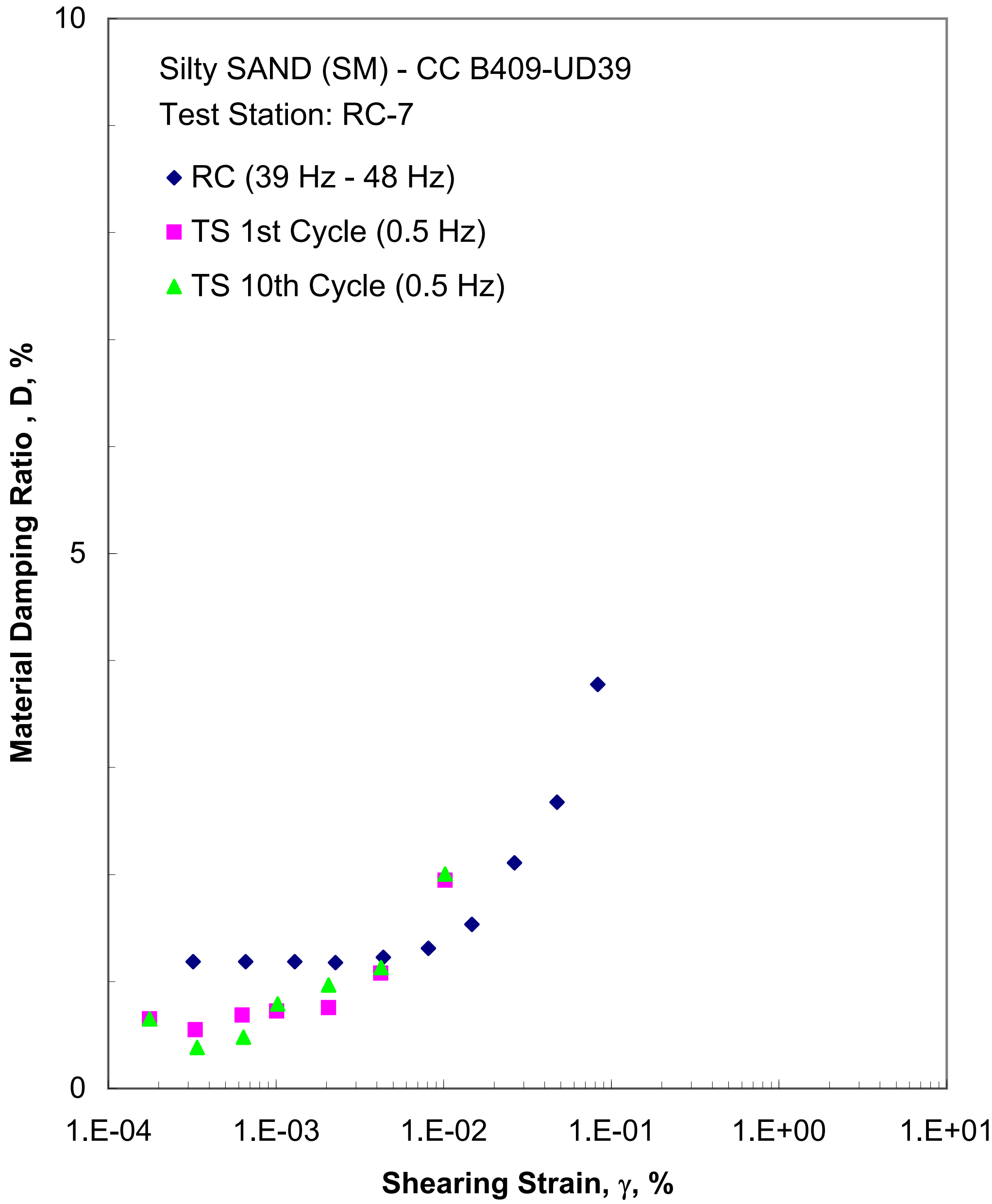


Figure M.13 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 28.0 psi from the Combined RCTS Tests

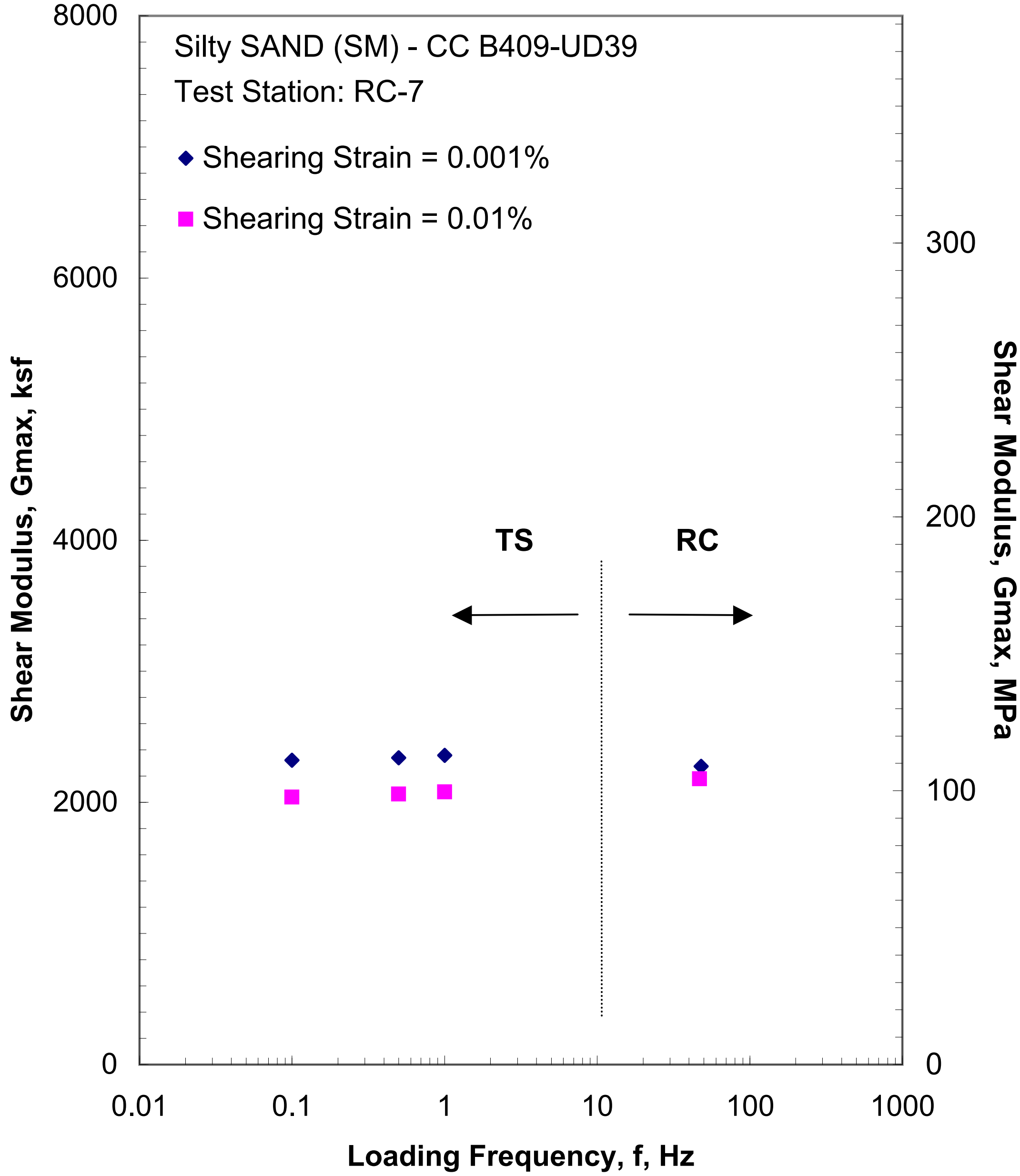


Figure M.14 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 28.0 psi from the Combined RCTS Tests

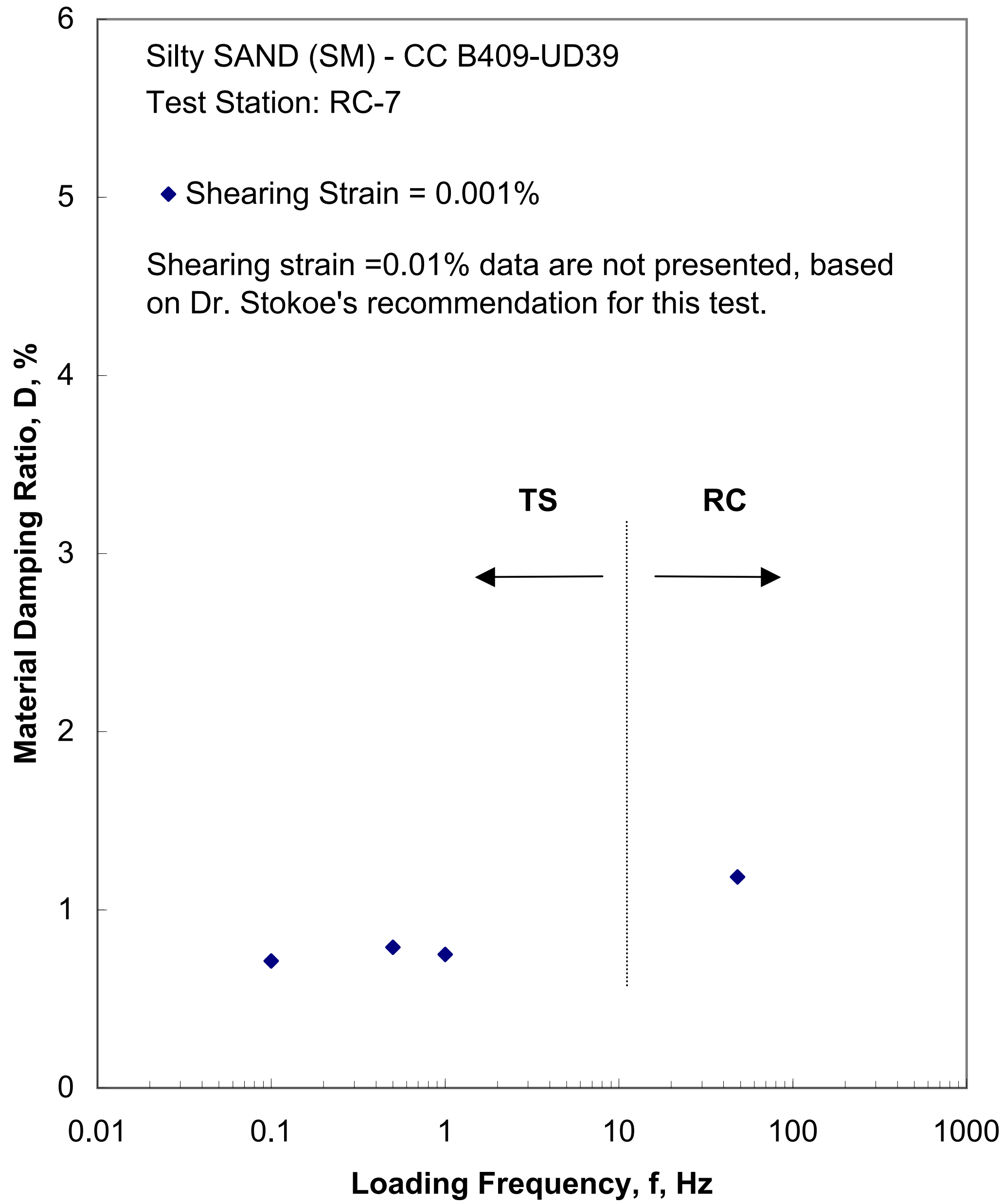


Figure M.15 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 28.0 psi from the Combined RCTS Tests

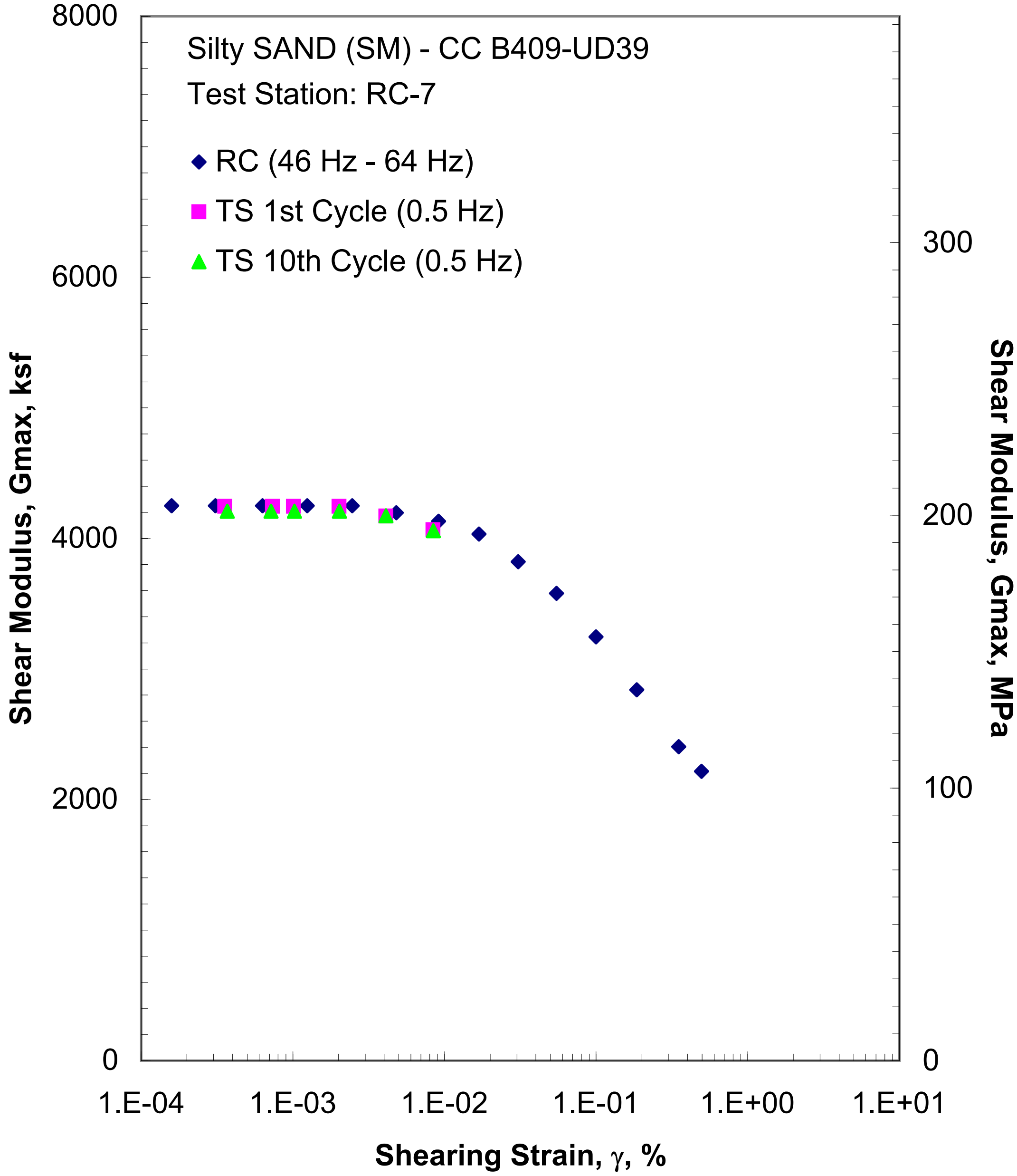


Figure M.16 Comparison of the Variation in Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 111.9 psi from the Combined RCTS Tests

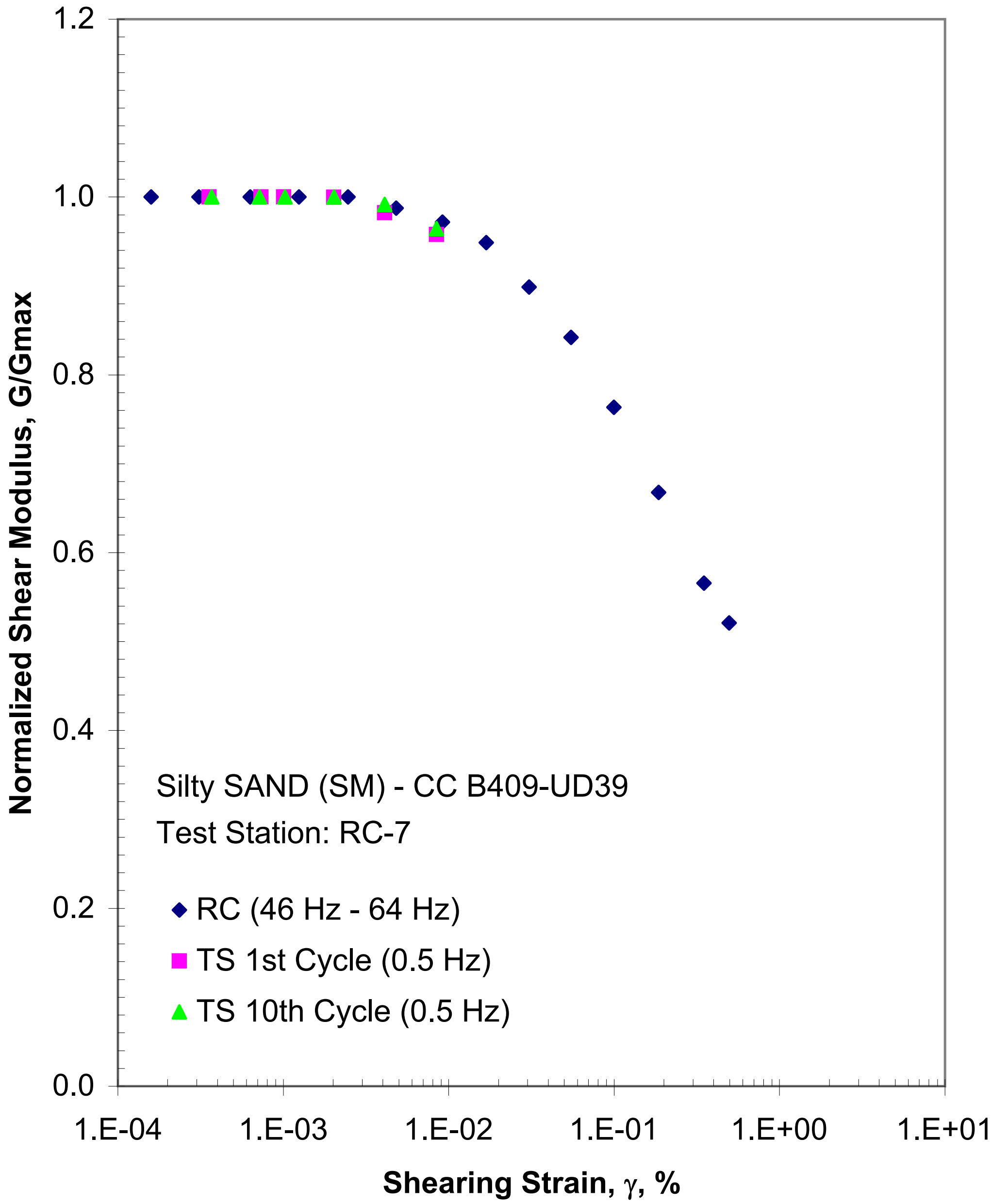


Figure M.17 Comparison of the Variation in Normalized Shear Modulus with Shearing Strain at an Isotropic Confining Pressure of 111.9 psi from the Combined RCTS Tests

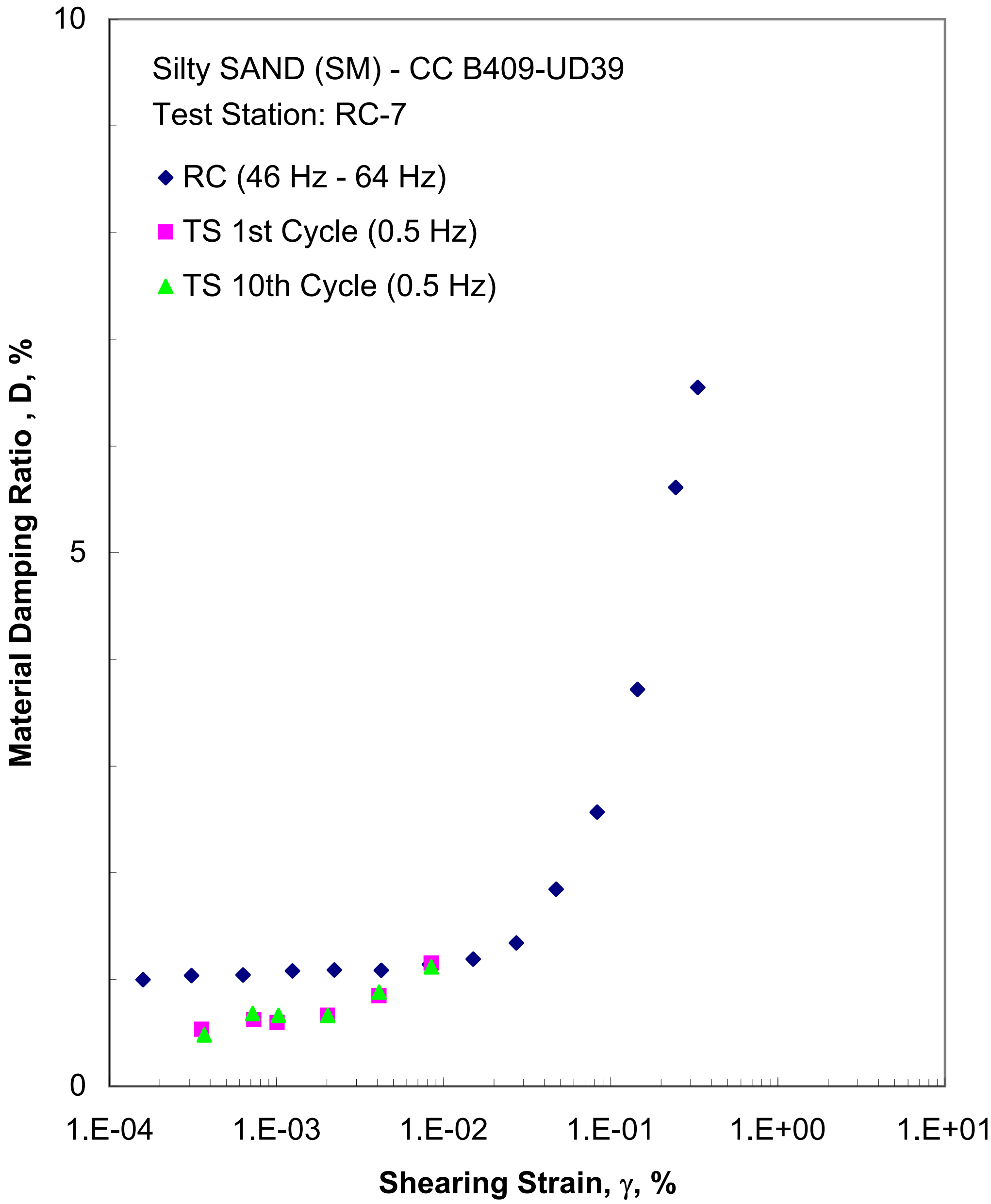


Figure M.18 Comparison of the Variation in Material Damping Ratio with Shearing Strain at an Isotropic Confining Pressure of 111.9 psi from the Combined RCTS Tests

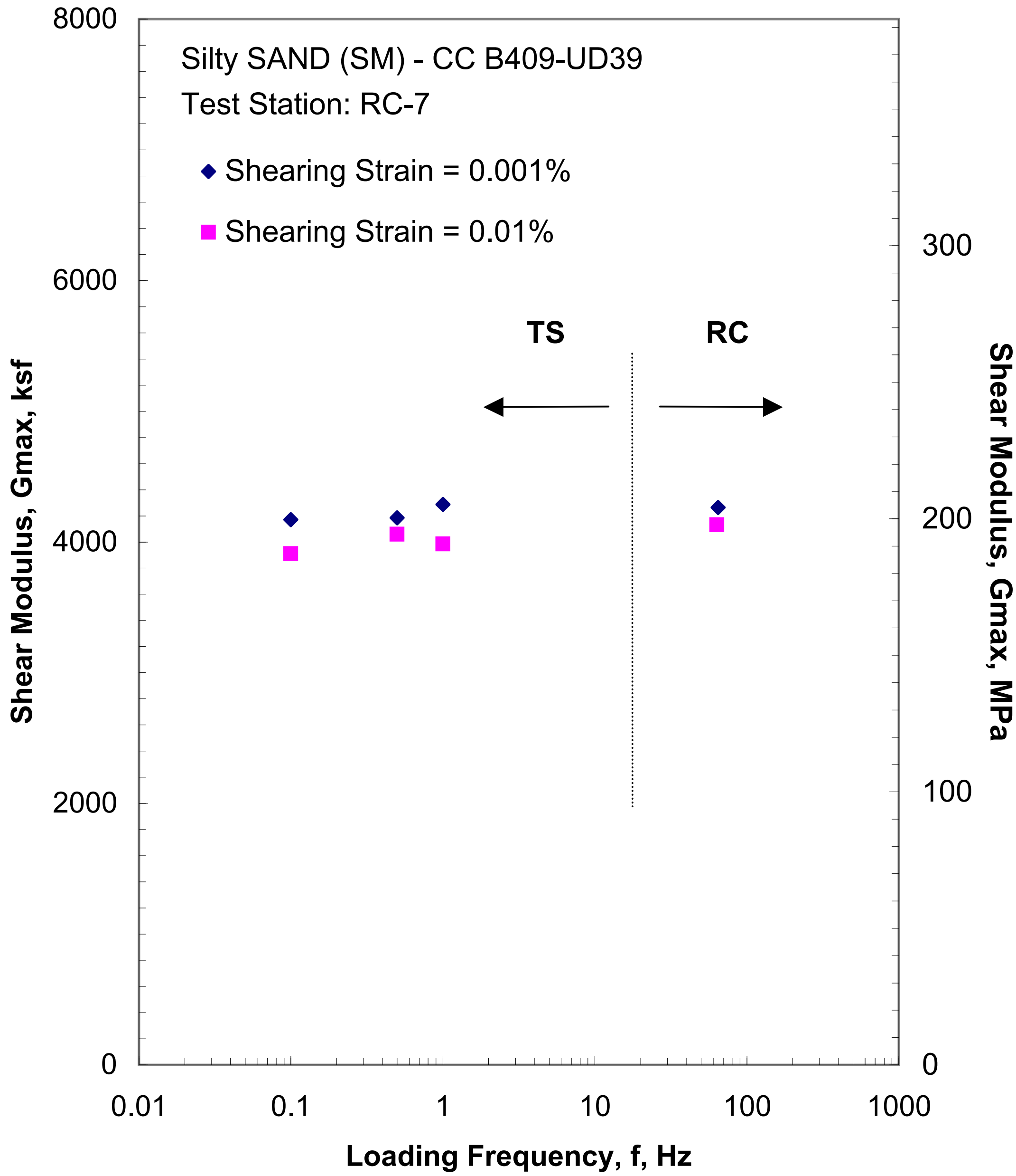


Figure M.19 Comparison of the Variation in Shear Modulus with Loading Frequency at an Isotropic Confining Pressure of 111.9 psi from the Combined RCTS Tests

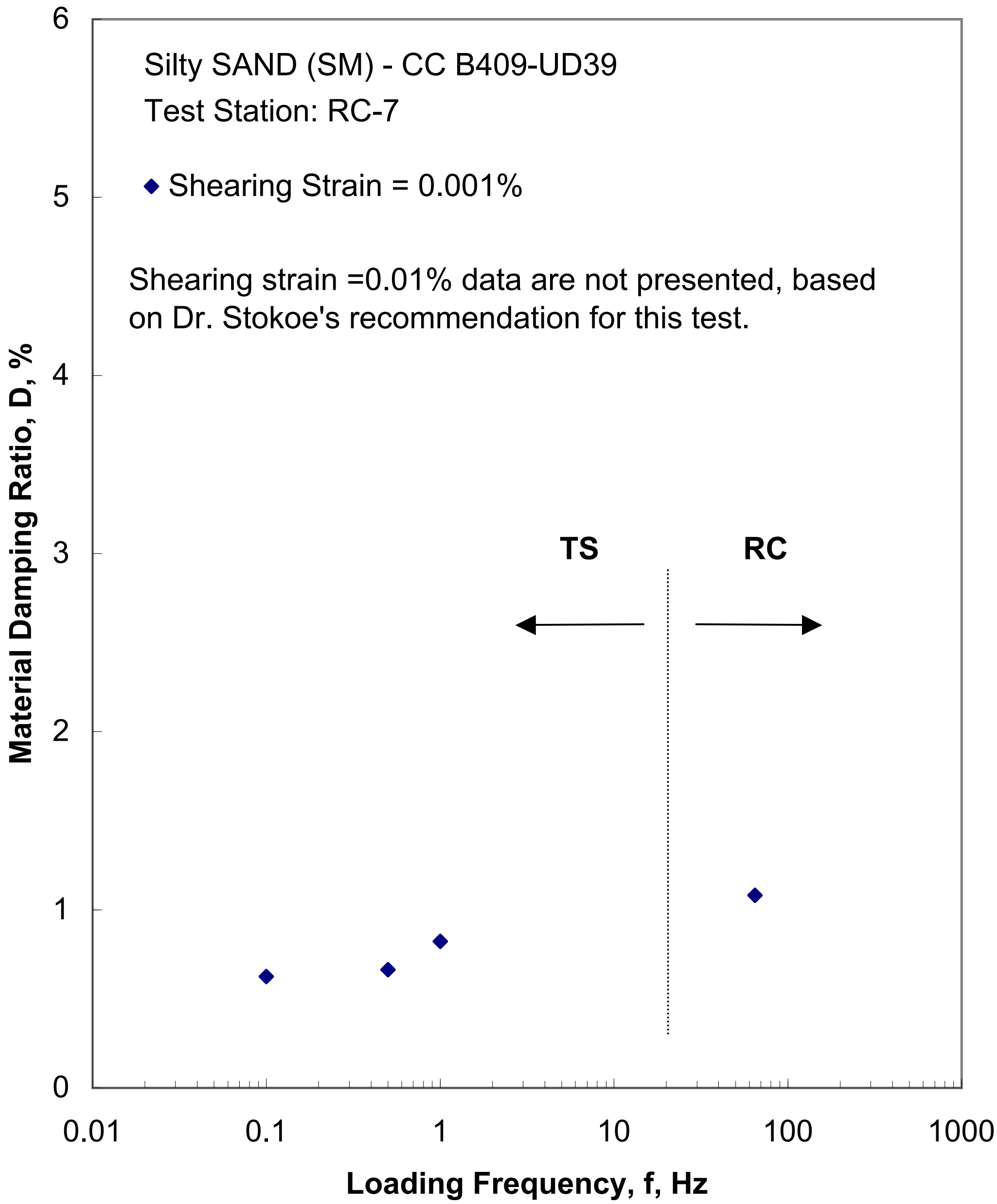


Figure M.20 Comparison of the Variation in Material Damping Ratio with Loading Frequency at an Isotropic Confining Pressure of 111.9 psi from the Combined RCTS Tests

Table M.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 CC B409-UD39

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)	(%)	
7.0	1008	48	1335	64	624	1.56	1.033
14.0	2016	96	1670	80	696	1.40	1.025
28.0	4032	193	2285	110	812	1.26	1.011
55.9	8050	385	3165	152	951	1.16	0.992
111.9	16114	771	4231	203	1092	1.00	0.966

Table M.2 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B409-UD39; Isoptropic Confining Pressure, σ_o=28.0 psi (4.0 ksf = 193 kPa)

Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average[+] Shearing Strain, %	Material Damping Ratio[x], D, %
3.20E-04	2266	1.00	3.20E-04	1.19
6.58E-04	2266	1.00	6.58E-04	1.19
1.30E-03	2266	1.00	1.30E-03	1.19
2.55E-03	2266	1.00	2.27E-03	1.18
4.90E-03	2266	1.00	4.36E-03	1.23
9.32E-03	2180	0.96	8.11E-03	1.31
1.72E-02	2110	0.93	1.48E-02	1.53
3.15E-02	1973	0.87	2.65E-02	2.11
5.79E-02	1793	0.79	4.75E-02	2.68
1.09E-01	1566	0.69	8.30E-02	3.78

[+] 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 M.3 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B409-UD39; Isotropic Confining Pressure, σ_o=28.0 psi (4.0 ksf =193 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, %
---	---	---	---	1.77E-04	2163	1.00	0.65
---	---	---	---	3.39E-04	2163	1.00	0.38
---	---	---	---	6.40E-04	2163	1.00	0.48
---	---	---	---	1.02E-03	2163	1.00	0.79
---	---	---	---	2.06E-03	2163	1.00	0.97
---	---	---	---	4.24E-03	2163	1.00	1.13
---	---	---	---	1.02E-02	2064	0.95	2.01

Table M.4 Variation in Shear Modulus and Material Damping Ratio with Shearing Strain from RC Tests of Specimen CC B409-UD39; Isoptropic Confining Pressure, σ_o= 111.9 psi (16.1 ksf = 771 kPa)

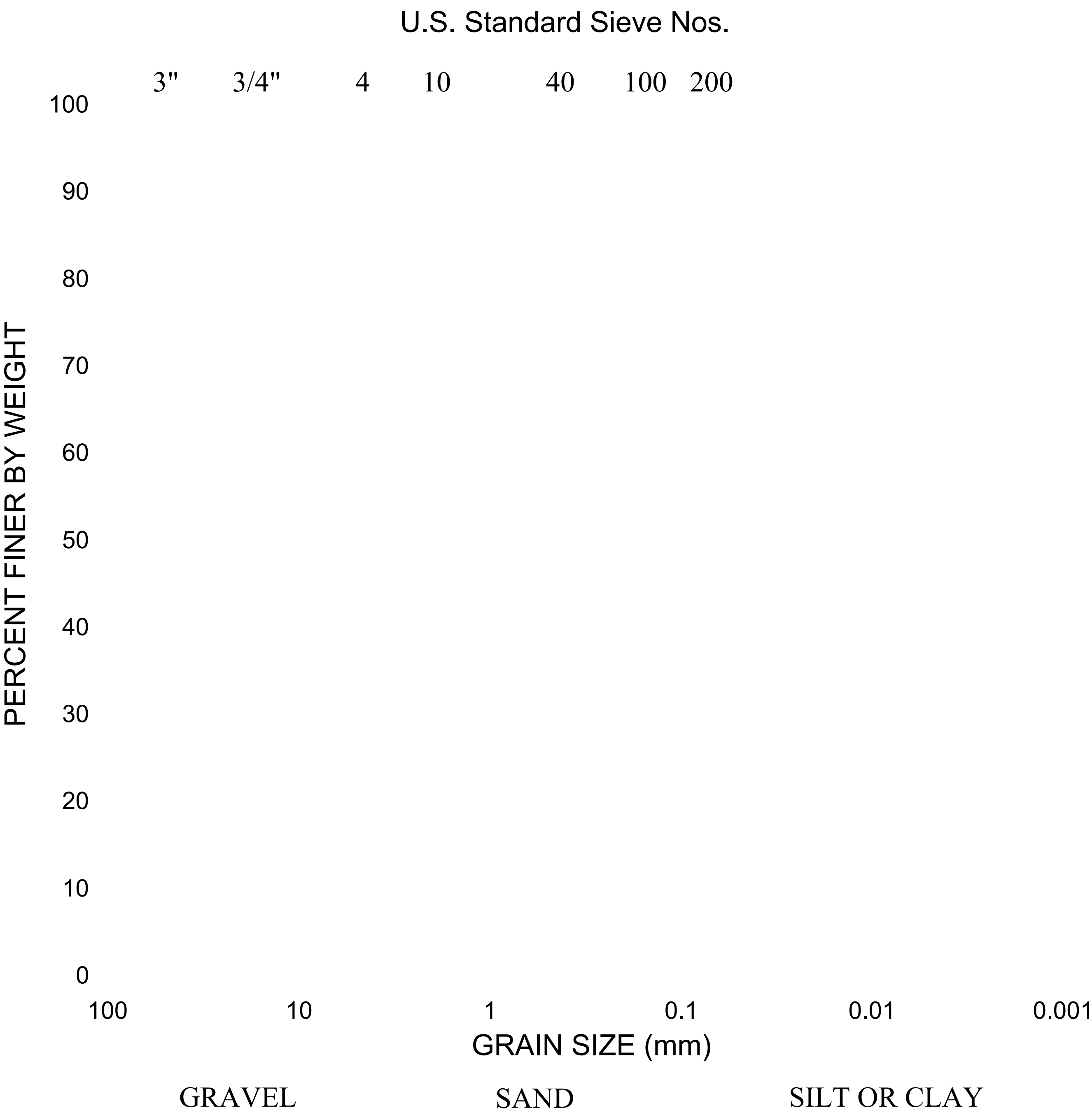
Peak Shearing Strain, %	Shear Modulus, G, ksf	Normalized Shear Modulus, G/G_{max}	Average$^+$ Shearing Strain, %	Material Damping Ratio^x, D, %
1.59E-04	4251	1.00	1.59E-04	1.00
3.09E-04	4251	1.00	3.09E-04	1.04
6.30E-04	4251	1.00	6.30E-04	1.04
1.25E-03	4251	1.00	1.25E-03	1.08
2.47E-03	4251	1.00	2.22E-03	1.09
4.81E-03	4198	0.99	4.23E-03	1.09
9.15E-03	4132	0.97	8.23E-03	1.14
1.69E-02	4033	0.95	1.50E-02	1.19
3.06E-02	3821	0.90	2.72E-02	1.34
5.48E-02	3580	0.84	4.71E-02	1.85
9.97E-02	3246	0.76	8.28E-02	2.57
1.85E-01	2840	0.67	1.45E-01	3.72
3.50E-01	2406	0.57	2.45E-01	5.61
4.95E-01	2215	0.52	3.32E-01	6.55

$^+$ 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 M.5 Variation in Shear Modulus, Normalized Shear Modulus and Material Damping Ratio with Shearing Strain from TS Tests of Specimen CC B409-UD39; Isotropic Confining Pressure, σ_o=111.9 psi (16.1 ksf = 771 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, %
3.56E-04	4247	1.00	0.53	3.69E-04	4209	1.00	0.48
7.33E-04	4247	1.00	0.62	7.19E-04	4209	1.00	0.68
1.01E-03	4247	1.00	0.60	1.02E-03	4209	1.00	0.66
2.02E-03	4246	1.00	0.66	2.03E-03	4209	1.00	0.66
4.11E-03	4171	0.98	0.85	4.10E-03	4174	0.99	0.88
8.42E-03	4067	0.96	1.15	8.44E-03	4060	0.96	1.12



GRADATION CURVE

ASTM D422

Project: Constellation Energy Group COLA Project, Calvert Cliffs NuclearPower Plant (CCNPP), Calvert County, Maryland

Contract No.: 06120048.00

Date: 10/18/2007

Boring No.	Depth (ft)	Sample Description	Class.	LL	PI
B-409	95.0-96.5	SILTY SAND, contains shells, greenish gray	SM	61	19

Schnabel Engineering

SUMMARY OF SOIL LABORATORY TEST RESULTS

Schnabel Engineering

Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	Atterberg Limits PL	Atterberg Limits PI	Atterberg Limits Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Moisture-Density Relationship Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Bearing Ratio Soaked	Specimen Intact	Specimen Compacted	Shear Strength Test Type[5]	Shear Strength Total f deg.	Shear Strength Total C psi	Shear Strength Effective f' deg.	Shear Strength Effective C' psi	Shear Strength Failure Crieterion[6]	Consolidation (D 2435) Cεr	Consolidation Cεc	Consolidation eo	Consolidation Pp' tsf
B-301	2.5	SPT	SP-SM	8.1	0.7						6.6																		
B-301	10.5	SPT	SP-SM	6.2	0.1						14.3																		
B-301	18.5	SPT	SP-SM	10.9	0.8						19.0																		
B-301	28.5	SPT	CL	58.5	0.0	48	17	31			28.9																		
B-301	33.5	UD	CH	80.5	0.0	59	17	42			31.1	117.5	2.74																
B-301	48.5	SPT	CL								29.6																		
B-301	63.5	SPT	SP	2.1	0.0						20.4																		
B-301	83.5	SPT	SM	21.0	2.4						26.5																		
B-301	93.5	SPT	SM								25.8																		
B-301	103.5	SPT	CL								17.8																		
B-301	108.5	SPT	SM	34.7	1.5						23.2																		
B-301	118.5	SPT	SM	19.6	0.3						33.1																		
B-301	128.5	SPT	SC	32.3	0.0						42.3																		
B-301	143.5	SPT	CL	55.5	0.0						45.0																		
B-301	148.5	SPT	MH			114	55	59			62.2																		
B-301	153.5	SPT	SM	45.4	0.0						34.0																		
B-301	158.5	UD	CH	99.5	0.0	76	30	46			38.7	112.2	2.68					X	-	UU	NA	61.2	NA	NA	Dev	0.005	0.243	1.01	20
B-301	168.5	UD	CH	66.2	0.0	112	39	73			65.4	97.3	2.62													0.012	0.453	1.82	16
B-301	178.5	SPT	MH	60.0	0.0	111	47	64			60.4																		
B-301	193.5	SPT	MH			98	45	53			53.2																		
B-301	198.5	SPT	MH	79.0	0.0	157	71	86			82.6																		
B-301	203.5	SPT	SC								27.5																		
B-301	208.5	SPT	SM								32.4																		
B-301	218.5	SPT	CL	50.7	0.0						47.9																		
B-301	228.5	SPT	SC	46.9	0.0						54.0																		
B-301	238.5	SPT	CL	72.9	0.0						56.8																		
B-301	253.5	SPT	MH	64.6	0.0	137	87	50			72.7																		
B-301	263.5	SPT	CL	85.2	0.0						100.9																		
B-301	273.5	SPT	MH			199	119	80			102.0																		
B-301	283.5	SPT	CL	73.5	0.0						91.3																		
B-301	293.5	SPT	MH	73.1	0.0	117	73	44			64.4																		
B-301	303.5	SPT	SC	44.6	0.0						24.8																		
B-301	313.5	SPT	SC	26.6	1.7						20.0																		
B-301	323.5	SPT	SC	22.1	11.4						27.8																		
B-301	333.5	SPT	SC								31.8																		
B-301	343.5	SPT	SC	17.9	14.0	47	24	23			22.9																		
B-301	353.5	SPT	SC	18.0	0.2	58	22	36			36.1																		

Schnabel Engineering

Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-301	363.5	SPT	SM	28.6	1.4	54	36	18			37.2																		
B-301	373.5	SPT	SC	16.0	0.0	61	26	35			30.3																		
B-301	388.5	SPT	SC	15.7	0.0						32.7																		
B-301	398.5	SPT	SC								33.7																		
B-304	0.0	SPT	SM								17.1																		
B-304	2.5	SPT	SM								25.9																		
B-304	5.0	SPT	ML								29.4																		
B-304	7.5	SPT	CH	71.8	0.0	57	23	34			34.1																		
B-304	10.5	SPT	CH	57.4	0.0	59	19	40			31.4																		
B-304	13.5	SPT	CH			63	23	40			31.7																		
B-304	18.5	SPT	CH	96.9	0.0	62	21	41			32.1																		
B-304	23.5	SPT	CL			38	20	18			25.6																		
B-304	28.5	SPT	SM								32.3																		
B-304	33.5	SPT	SP								20.1																		
B-304	38.5	SPT	SP-SM	8.5	1.3						19.3																		
B-304	43.5	SPT	SP-SM								21.9																		
B-304	48.5	SPT	GM-GC			25	18	7			14.5																		
B-304	53.5	SPT	SM								13.5																		
B-304	58.5	SPT	SM	12.4	5.4	NP	NP	NP			29.1																		
B-304	63.5	SPT	SM	14.6	3.8	30	23	7			29.4																		
B-304	68.5	SPT	SM								29.5																		
B-304	78.5	SPT	SC			32	19	13			16.3																		
B-304	83.5	SPT	SM								21.8																		
B-304	88.5	SPT	SM	35.9	0.0	49	28	21			38.7																		
B-304	93.5	SPT	SM								33.0																		
B-304	98.5	UD	SC	47.3	0.0	79	28	51			42.1	113.2	2.65					X	-	Qu	NA	26.0	NA	NA	Dev	0.003	0.251	1.03	20
B-304	103.5	SPT	SC	35.4	0.0						44.0																		
B-304	108.5	SPT	SM	28.2	2.4						33.8																		
B-304	113.5	SPT	SC	36.3	0.4						43.9																		
B-304	118.5	SPT	SC								47.9																		
B-304	123.5	SPT	ML								60.2																		
B-304	128.5	SPT	SC	42.7	0.3						34.9																		
B-304	133.5	SPT	ML								45.0																		
B-304	138.5	UD	SC	45.7	0.0	43	26	17			36.5	113.4	2.65					X	-	Qu	NA	36.4	NA	NA	Dev	0.003	0.143	0.95	16
B-304	143.5	SPT	CH	91.3	0.0	134	49	85			70.0																		
B-304	148.5	SPT	MH								72.1																		
B-304	153.5	SPT	MH								70.9																		

Schnabel Engineering

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Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422)		Atterberg Limits[4] (D 4318)				Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557)		Bearing Ratio (D 1883)		Specimen		Shear Strength						Consolidation (D 2435)			
																					Total		Effective						
				Percent Passing No. 200	Percent Retained No. 4	LL	PL	PI	Oven Dried LL					Dry Unit Wt. (PCF)	Optium Moisture (%)	Dry	Soaked	Intact	Compacted	Test Type[5]	f deg.	C psi	f' deg.	C' psi	Failure Crieterion[6]	Cεr	Cεc	eo	Pp' tsf
B-304	158.5	SPT	MH	59.1	0.0	92	53	39			55.1																		
B-304	163.5	SPT	MH								47.2																		
B-304	168.5	SPT	MH								62.9																		
B-304	173.5	SPT	MH	94.0	0.0	158	84	74			84.0																		
B-304	178.5	SPT	SC								27.5																		
B-304	183.5	SPT	SC	43.6	0.0						39.2																		
B-304	188.5	SPT	SC								42.8																		
B-304	193.5	SPT	CL								51.1																		
B-304	198.5	SPT	CL	55.9	0.0						55.8																		
B-305	39.5	UD	SC	49.5	0.0	72	22	50			34.7	117.2	2.71																
B-306	68.0	UD	CH	98.6	0.0	62	24	38			30.7	115.8	2.73																
B-307	5.0	SPT	SC	38.4	0.6						11.6																		
B-307	13.5	SPT	SM			NP	NP	NP			7.9																		
B-307	23.5	SPT	SP-SM	11.2	3.3						13.0																		
B-307	33.5	SPT	SM			NP	NP	NP			14.5																		
B-307	43.5	SPT	SM								24.8																		
B-307	48.5	SPT	CL								25.1																		
B-307	53.5	SPT	CH								28.1																		
B-307	58.5	SPT	CH	60.5	0.3	62	20	42			33.1																		
B-307	63.5	SPT	CH			52	18	34			35.5																		
B-307	68.5	SPT	CH	98.5	0.0	66	23	43			34.0																		
B-307	73.5	SPT	SC								24.9																		
B-307	83.5	SPT	SM	13.0	0.6						20.6																		
B-307	88.5	SPT	ML			NP	NP	NP			21.5																		
B-307	93.5	SPT	SM	17.9	4.6						27.7																		
B-307	108.5	SPT	SP-SM	9.8	2.7	NP	NP	NP			29.2																		
B-307	118.5	SPT	SM	17.9	0.0	32	25	7			28.9																		
B-307	123.5	UD	SC	30.0	6.4	35	19	16			29.8	123	2.70					X	-	CIU-bar	Test Not Performed								
B-307	133.5	SPT	SM	21.8	0.3						26.0																		
B-307	143.5	SPT	MH			59	33	26			36.8																		
B-307	148.5	SPT	MH								50.6																		
B-307	153.5	SPT	SM	24.4	0.0	58	37	21			38.8																		
B-307	178.5	UD	SC	37.7	0.0	41	25	16			33.5	117	2.67					X	-	DS	NA	NA	35	0	NA				
B-307	188.5	SPT	SM	45.6	0.0	61	39	21			43.0																		
B-307	200.0	SPT	MH	66.2	0.0	137	61	76			68.7																		
B-310	78.5	UD	Reserve Sample - Tests Not Performed																										
B-313	0.0	SPT	SM								9.9																		

Project Name: Constellation Generation Group COLA Project
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Schnabel Engineering

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Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Test Type[5]	Shear Strength Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-313	2.5	SPT	CL-ML			19	14	5			11.8																		
B-313	5.0	SPT	CH			67	21	46			27.6																		
B-313	7.5	SPT	CL			30	17	13			15.1																		
B-313	10.5	SPT	ML								27.0																		
B-313	13.5	SPT	ML								31.5																		
B-313	18.5	SPT	SP-SM								23.1																		
B-313	23.5	SPT	SM			NP	NP	NP			21.1																		
B-313	28.5	SPT	SM			NP	NP	NP			18.2																		
B-313	33.5	SPT	CL			38	21	17			28.1																		
B-313	38.5	SPT	SM								17.1																		
B-313	43.5	SPT	ML			34	27	7			29.3																		
B-313	48.5	SPT	SM								27.9																		
B-313	53.5	SPT	SM			NP	NP	NP			31.5																		
B-313	63.5	SPT	CL			33	17	16			26.2																		
B-313	73.5	SPT	ML								28.4																		
B-313	83.5	SPT	MH								37.3																		
B-313	88.5	SPT	MH			98	47	51			55.0																		
B-313	93.5	UD	CL			49	25	24			35.6	116	2.69					X	-	UU	NA	38.8	NA	NA	Dev	0.005	0.166	1.07	16
																		X	-	DS	NA	NA	29	11	NA				
B-313	98.5	SPT	ML			42	28	14			32.4																		
B-313	103.5	SPT	MH			70	45	25			43.4																		
B-313	108.5	SPT	MH			106	55	51			57.7																		
B-313	113.5	SPT	MH			72	46	26			44.3																		
B-313	118.5	SPT	MH			81	42	39			43.5																		
B-313	123.5	UD	SC			44	26	18			33.1	116	2.67					X	-	UU	NA	41.3	NA	NA	Dev	0.002	0.205	0.98	23
																		X	-	DS	Test Not Performed								
B-313	128.5	SPT	MH			132	60	72			66.0																		
B-313	133.5	SPT	MH								69.1																		
B-313	138.5	SPT	MH			106	51	55			62.9																		
B-313	143.5	SPT	CH								49.1																		
B-313	148.5	SPT	CH			103	30	73			49.4																		
B-314	0.4	SPT	SM								9.7																		
B-314	2.5	SPT	SM			NP	NP	NP			14.1																		
B-314	5.0	SPT	CH			73	25	48			35.0																		
B-314	7.5	SPT	CH			59	21	38			41.2																		
B-314	10.5	SPT	CH			73	25	48			26.2																		
B-314	13.5	UD	SC	35.0	0.0	54	11	43			25.9	119	2.74					X	-	UU	Test Not Performed					0.010	0.110	0.86	10.5

Schnabel Engineering

Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-314	18.5	SPT	SM								24.2																		
B-314	23.5	SPT	SM			NP	NP	NP			22.6																		
B-314	28.5	SPT	SM								20.3																		
B-314	33.5	SPT	CL			42	22	20			25.4																		
B-314	38.5	SPT	SM			NP	NP	NP			26.8																		
B-314	43.5	SPT	SM								31.9																		
B-314	48.5	SPT	SM								25.4																		
B-314	53.5	SPT	SM			NP	NP	NP			32.8																		
B-314	58.5	SPT	SP			NP	NP	NP			33.0																		
B-314	63.5	SPT	CH			59	24	35			40.3																		
B-314	68.5	SPT	ML			NP	NP	NP			19.5																		
B-314	73.5	SPT	ML			NP	NP	NP			27.9																		
B-314	78.5	SPT	ML			NP	NP	NP			36.5																		
B-314	83.5	SPT	MH			57	36	21			41.2																		
B-314	88.5	SPT	CH			68	20	48			34.3																		
B-314	93.5	SPT	SM								36.4																		
B-314	98.5	SPT	SM								31.0																		
B-315	7.5	SPT	SP-SM	8.3	3.2						5.6																		
B-315	13.5	SPT	SM	14.0	0.0						28.3																		
B-315	18.5	SPT	SC								28.3																		
B-315	23.5	UD	SC	35.0	0.0	41	11	30			23.3	126	2.73					X	-	UU	NA	17	NA	NA	Dev	0.020	0.170	0.92	10.2
B-315	28.5	SPT	SM								27.6																		
B-315	38.5	SPT	SM	13.2	6.9	NP	NP	NP			22.2																		
B-315	53.5	SPT	ML			NP	NP	NP			25.6																		
B-315	63.5	SPT	SP-SM	11.9	0.3	NP	NP	NP			29.4																		
B-315	73.5	SPT	CH			58	18	40			36.3																		
B-315	83.5	SPT	SM	28.6	0.1	NP	NP	NP			29.6																		
B-315	93.5	SPT	SM								35.6																		
B-316	2.5	SPT	CL			35	16	19			19.1																		
B-316	7.5	SPT	CL	55.5	0.0						14.5																		
B-316	23.5	SPT	SP-SM	8.8	0.0	NP	NP	NP			20.0																		
B-316	33.5	SPT	SP-SM	11.3	1.6	43	17	26			20.1																		
B-316	38.5	SPT	CL								28.5																		
B-316	43.5	UD	CL	71.0	0.0	44	16	28			28.6	121	2.79					X X	- -	Qu UU	NA NA	7.9 9.9	NA NA	NA NA	Dev Dev	0.017	0.266	0.94	9.3
B-316	48.5	SPT	MH	69.5	0.0						38.0																		

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422)		Atterberg Limits[4] (D 4318)				Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557)		Bearing Ratio (D 1883)		Specimen		Shear Strength						Consolidation (D 2435)			
				Percent Passing No. 200	Percent Retained No. 4	LL	PL	PI	Oven Dried LL					Dry Unit Wt. (PCF)	Optium Moisture (%)	Dry	Soaked	Intact	Compacted	Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Cεr	Cεc	eo	Pp' tsf
B-316	53.5	UD	CL	50.0	1.0	33	11	22			26.2	103	2.77					X	-	DS	NA	NA	30.1	4.5	NA				
																		X	-	CIU-bar	12.5	14.3	32.1	6.84	PSR				
B-316	58.5	SPT	SC								24.4																		
B-316	63.5	SPT	SC								31.3																		
B-316	68.5	SPT	SM	16.5	0.1						19.8																		
B-316	73.5	SPT	SP								21.2																		
B-316	93.5	SPT	SC	17.7	0.5						32.0																		
B-316	98.5	SPT	SC								27.7																		
B-317	23.5	SPT	ML								28.4																		
B-317	28.5	UD	CL	97.8	2.2	27	19	8			31.7	122.3	2.75					X	-	CIU-bar	17	5	31	3.1	PSR				
B-317	33.5	SPT	CH								30.2																		
B-317	48.5	UD	CL	69.8	0.0	35	17	18			22.8	125.5	2.7					X	-	CIU-bar	19.5	8.2	33.5	4.2	PSR				
B-317	58.5	SPT	SP-SM								26.0																		
B-317	73.5	SPT	SC								22.3																		
B-319	2.5	SPT	SP-SM	8.1	0.2						5.7																		
B-319	7.5	SPT	SP			NP	NP	NP			4.7																		
B-319	13.5	SPT	SP-SM	8.6	1.3						7.6																		
B-319	23.5	SPT	SC	20.0	1.4						19.8																		
B-319	28.5	SPT	SC								24.5																		
B-319	33.5	UD	CL	72.0	0.0	49	12	37			29.2	120	2.67					X	-	UU	NA	10.1	NA	NA	Dev	0.010	0.190	0.85	5.4
																		X	-	DS	NA	NA	24.9	6.2	NA				
B-319	38.5	SPT	CH								27.9																		
B-319	43.5	UD	CH	87.0	0.0	58	13	45			32.1	121	2.73					X	-	UU	NA	12	NA	NA	Dev	0.040	0.280	0.82	12
																		X	-	DS	NA	NA	20.8	9.1	NA				
B-319	48.5	SPT	CH			79	27	52			38.6																		
B-319	58.5	SPT	ML			40	32	8			26.7																		
B-319	73.5	SPT	SM	13.6	4.6						17.5																		
B-319	83.5	SPT	SM	25.7	14.0						18.2																		
B-319	88.5	SPT	SM	18.9	1.4						29.8																		
B-319	98.5	SPT	SM	12.9	0.6	NP	NP	NP			30.0																		
B-320	2.5	SPT	SP-SM								10.4																		
B-320	7.5	SPT	SP								6.3																		
B-320	18.5	SPT	SP								9.1																		
B-320	33.5	SPT	SC	42.5	0.0	33	18	15			26.1																		
B-320	38.5	UD	SC	49.0	0.0	36	16	20			29.4	124	2.63					X	-	CIU-bar	13.3	8.03	27.9	3.79	PSR				
																		X	-	DS	NA	NA	26.0	2.9	NA				
B-320	43.5	SPT	CH	60.7	0.0	56	19	37			30.0																		

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422)		Atterberg Limits[4] (D 4318)				Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557)		Bearing Ratio (D 1883)		Specimen		Shear Strength						Consolidation (D 2435)			
				Percent Passing No. 200	Percent Retained No. 4	LL	PL	PI	Oven Dried LL					Dry Unit Wt. (PCF)	Optium Moisture (%)	Dry	Soaked	Intact	Compacted	Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Cεr	Cεc	eo	Pp' tsf
B-320	48.5	UD	CH	81.5	0.0	59	19	40			34.4	114	2.74					X	-	UU	NA	12.7	NA	NA	Dev				
																		X	-	DS	NA	NA	21.9	9.6	NA				
B-320	53.5	SPT	CH			69	24	45			34.9																		
B-320	73.5	SPT	SM	15.3	5.0						18.8																		
B-320	93.5	SPT	SM	15.1	1.8						25.4																		
B-320	103.5	SPT	SM	16.8	0.0						29.2																		
B-320	113.5	SPT	CL			44	16	28			28.5																		
B-320	128.5	SPT	MH			50	30	20			34.1																		
B-320	148.5	SPT	SM	47.7	1.4						37.0																		
B-321	2.5	SPT	SC	31.0	0.9						9.7																		
B-321	5.0	SPT	SP-SM								7.4																		
B-321	7.5	SPT	CL								25.2																		
B-321	10.5	SPT	CH	65.9	0.0	55	20	35			36.2																		
B-321	13.5	SPT	SC								30.0																		
B-321	18.5	SPT	SC	35.3	0.0						29.7																		
B-321	23.5	UD	CL	99.7	0.0	45	18	27			26.2	117.8	2.79					X	-	UU	NA	32	NA	NA	Dev	0.009	0.306	1.03	19
B-321	28.5	SPT	SM	43.6	0.0	47	29	18			27.0																		
B-321	33.5	SPT	SP-SM								30.9																		
B-321	38.5	SPT	SP-SM	9.0	1.5						27.1																		
B-321	43.5	SPT	SP-SM								26.0																		
B-321	48.5	SPT	MH	73.0	0.0						35.1																		
B-321	53.5	SPT	SM	14.3	8.6	NP	NP	NP			25.0																		
B-321	58.5	SPT	SM	18.6	5.1						27.4																		
B-321	63.5	SPT	SM								27.6																		
B-321	68.5	SPT	SM	16.0	0.2						28.4																		
B-321	73.5	UD	SM	15.3	0.0	NP	NP	NP			28.5	120.5	2.67					X	-	CIU-bar	20	13.5	30	7	PSR	0.003	0.064	0.72	14.2
B-321	78.5	SPT	SM								34.9																		
B-321	83.5	SPT	SM								20.6																		
B-321	88.5	SPT	SM	30.0	0.2						31.0																		
B-321	93.5	SPT	SC	32.2	1.0	59	26	33			36.9																		
B-321	98.5	SPT	SM	29.8	0.0						36.1																		
B-321	103.5	SPT	SM								58.2																		
B-321	108.5	SPT	SM								42.6																		
B-321	113.5	SPT	SM	36.3	0.9						34.6																		
B-321	118.5	SPT	SM								39.8																		
B-321	123.5	SPT	SM								43.1																		
B-321	128.5	SPT	MH	60.8	0.0						49.5																		

Schnabel Engineering

Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422)		Atterberg Limits[4] (D 4318)				Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557)		Bearing Ratio (D 1883)		Specimen		Shear Strength						Consolidation (D 2435)			
																					Total		Effective						
				Percent Passing No. 200	Percent Retained No. 4	LL	PL	PI	Oven Dried LL					Dry Unit Wt. (PCF)	Optium Moisture (%)	Dry	Soaked	Intact	Compacted	Test Type[5]	f deg.	C psi	f' deg.	C' psi	Failure Crieterion[6]	Cεr	Cεc	eo	Pp' tsf
B-321	133.5	SPT	MH								42.3																		
B-321	138.5	SPT	MH								39.7																		
B-321	143.5	SPT	MH	84.6	0.0						60.2																		
B-321	148.5	SPT	MH								66.0																		
B-323	2.5	SPT	SP								5.0																		
B-323	7.5	SPT	SP-SM	8.2	1.1						13.0																		
B-323	13.5	SPT	SP-SM	8.4	0.0						16.2																		
B-323	18.5	SPT	SM			NP	NP	NP			11.9																		
B-323	28.5	SPT	SP								17.6																		
B-323	38.5	SPT	SP-SM	11.4	0.9						20.7																		
B-323	48.5	SPT	CH	51.0	0.0	50	17	33			28.1																		
B-323	58.5	SPT	CH	89.1	0.0	65	22	43			35.1																		
B-323	68.5	SPT	SC	32.8	0.0	46	24	22			29.0																		
B-323	83.5	UD	CL	72.7	0.0	42	20	22			36.2	117	2.76					X	-	UU	NA	40	NA	NA	Dev				
B-323	93.5	SPT	SM	27.9	6.8	NP	NP	NP			26.3																		
B-323	103.5	SPT	SP-SM	10.6	0.8	NP	NP	NP			28.6																		
B-323	113.5	SPT	SM	18.1	0.0						30.2																		
B-323	123.5	SPT	SM								19.4																		
B-323	133.5	SPT	SM	30.2	0.1						33.1																		
B-323	143.5	SPT	MH	52.1	0.0	73	38	35			48.3																		
B-323	153.5	SPT	ML			39	30	9			31.3																		
B-323	163.5	SPT	MH	63.3	0.0						54.2																		
B-323	173.5	SPT	CH	56.9	0.0	97	31	66			44.0																		
B-323	183.5	SPT	CH	94.0	0.0	124	33	91			68.3																		
B-323	193.5	SPT	CH	70.3	0.0	116	36	80			58.1																		
B-323	198.5	SPT	MH			97	62	35			52.9																		
B-326	5.0	SPT	SP-SM								8.2																		
B-326	13.5	SPT	SP-SM	10.5	0.0						12.2																		
B-326	23.5	SPT	SM	23.7	1.0						22.7																		
B-326	33.5	UD	CL	62.0	0.0	41	16	25			27.6	120	2.76					X	-	Qu	NA	11.9	NA	NA	Dev				
																		X	-	UU	NA	8.4	NA	NA	Dev				
B-326	43.5	UD	OH	89.3	0.0	63	22	41	45	0.4	33.9	111	2.70					X	-	Qu	NA	19.7	NA	NA	Dev				
																		X	-	DS	NA	NA	19.0	4.9	NA				
B-327	113.5	UD	CH	51.9	0.0	60	24	36			44.3	107	2.70													0.003	0.374	1.34	20.6
B-328	2.5	SPT	SP-SM	8.7	0.0	NP	NP	44			4.5																		
B-328	7.5	SPT	CH								30.0																		
B-328	10.5	SPT	CH			59	17	42			28.8																		

Schnabel Engineering

Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422)		Atterberg Limits[4] (D 4318)				Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557)		Bearing Ratio (D 1883)		Specimen		Shear Strength						Consolidation (D 2435)			
				Percent Passing No. 200	Percent Retained No. 4	LL	PL	PI	Oven Dried LL					Dry Unit Wt. (PCF)	Optium Moisture (%)	Dry	Soaked	Intact	Compacted	Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Cεr	Cεc	eo	Pp' tsf
B-328	18.5	SPT	MH			64	36	28			35.1																		
B-328	23.5	SPT	CH			77	28	49			33.0																		
B-328	28.5	SPT	SC	42.6	0.1	40	21	19			30.5																		
B-328	33.5	SPT	SP-SM								18.2																		
B-328	38.5	SPT	SP-SM	7.8	0.0						22.6																		
B-328	43.5	SPT	SP-SM	10.8	4.2	NP	NP	NP			24.2																		
B-328	48.5	SPT	ML								25.8																		
B-328	53.5	SPT	SM	21.9	9.6						24.0																		
B-328	63.5	UD	OH	87.0	0.0	72	41	31	50		44.2	121	2.66					X	-	UU	Test Not Performed					<0.01	0.060	0.90	2.3
																		X	-	CIU-bar	13.4	23.3	34.6	0.236	PSR				
B-328	68.5	SPT	SM			NP	NP	NP			29.4																		
B-328	73.5	SPT	SM			NP	NP	NP			32.2																		
B-328	83.5	SPT	SM	18.6	15.7	NP	NP	NP			21.2																		
B-328	88.5	SPT	MH			47	31	16			34.0																		
B-328	98.5	SPT	MH			53	34	19			38.2																		
B-328	103.5	SPT	SM	36.6	0.0						62.7																		
B-328	113.5	SPT	MH								30.5																		
B-328	118.5	SPT	MH								44.7																		
B-328	123.5	UD	MH	82.6	0.0	72	45	27			45.6	102	2.76					X	-	CIU-bar	Test Not Performed					0.020	0.380	1.74	10.0
B-328	133.5	SPT	MH	52.8	0.0	70	51	19			48.2																		
B-328	143.5	SPT	MH								59.3																		
B-328	148.5	SPT	MH			134	100	34			74.8																		
B-331	5.0	SPT	CL	66.9	0.0	43	15	28			20.2																		
B-331	18.5	UD	CH	97.1	0.0	57	23	34			30.8	111	2.71					X	-	Qu	NA	28.2	NA	NA	Dev				
																		X	-	UU	NA	22.7	NA	NA	Dev				
B-331	33.5	SPT	SP-SM	8.3	0.8						21.9																		
B-331	43.5	SPT	SM	50.6	0.0						31.6																		
B-331	58.5	SPT	SM								26.6																		
B-331	73.5	SPT	SM								35.8																		
B-331	88.5	SPT	SM								32.7																		
B-333	2.5	SPT	SP-SM	6.9	0.4						6.2																		
B-333	7.5	SPT	SP-SM	5.3	0.1						4.8																		
B-333	23.5	SPT	CH	74.2	0.0	57	33	24			32.0																		
B-333	28.5	UD	CH	85.3	0.0	52	19	33			38.9	114	2.82					X	-	Qu	NA	10.4	NA	NA	Dev	0.021	0.316	1.15	9.3
B-333	38.5	UD	CH	98.8	0.0	61	23	38			39.7	115	2.85					X	-	Qu	NA	20.7	NA	NA	Dev	0.009	0.240	1.10	15.2
B-333	43.5	SPT	SM	38.8	0.0						26.1																		

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Test Type[5]	Shear Strength Total f deg.	C psi	Effective f' deg.	C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-333	48.5	UD	SC	20.0	2.0	34	13	21			25.2	Test Not Performed	2.73					X	-	Qu	Test Not Performed								
B-333	53.5	SPT	SM	13.4	1.6						20.9																		
B-333	58.5	SPT	SM								34.5																		
B-333	68.5	SPT	SM	23.2	20.4						19.3																		
B-333	78.5	SPT	SP-SM	10.8	5.7	NP	NP	NP			28.7																		
B-333	93.5	SPT	SM	23.7	23.3						16.1																		
B-334	0.0	SPT	SP-SM	11.2	0.0						9.6																		
B-334	5.0	SPT	SM	21.3	0.0						15.9																		
B-334	10.5	SPT	SM			NP	NP	NP			15.6																		
B-334	18.5	SPT	CL								31.3																		
B-334	23.0	UD	CH	79.0	0.0	51	16	35			35.3	119	2.7					X	-	UU	NA	10.1	NA	NA	Dev	0.020	0.220	1.12	5.3
B-334	28.5	SPT	CH								42.5																		
B-334	33.0	UD	CL	95.0	0.0	47	13	34			32.6	115	2.71					X	-	UU	Test Not Performed					0.020	0.210	1.06	5.4
B-334	43.5	SPT	SM								27.0																		
B-334	48.5	SPT	SM	26.2	0.0						27.2																		
B-334	53.5	SPT	SP-SM								21.4																		
B-334	63.5	SPT	GM	29.8	36.1	NP	NP	NP			19.0																		
B-334	73.5	SPT	SM	12.6	9.9						27.3																		
B-334	83.5	SPT	SM	13.8	0.1						28.0																		
B-334	98.5	SPT	SM	16.6	1.0						28.9																		
B-336	13.5	SPT	SC								11.4																		
B-336	28.5	SPT	CH								26.9																		
B-336	48.5	SPT	CL								25.9																		
B-336	68.5	SPT	SM								19.6																		
B-336	83.5	SPT	SM								27.3																		
B-336	98.5	SPT	SC								32.1																		
B-337	33.5	SPT	ML								29.0																		
B-337	48.5	SPT	SC								39.9																		
B-337	53.5	UD	SC	39.0	2.0	38	19	19			25.7	126	2.75					X	-	UU	NA	6.2	NA	NA	Dev				
B-337	73.5	SPT	SM								30.9																		
B-337	88.5	SPT	SM								21.0																		
B-339	5.0	SPT	SP	4.6	0.1						6.9																		
B-339	13.5	SPT	SM	12.1	10.8						19.9																		
B-339	28.5	SPT	CH			55	19	36			31.5																		
B-339	33.5	SPT	CH	62.7	0.0	62	21	41			27.0																		
B-339	38.5	SPT	CH			71	17	54			28.6																		

Project Name: Constellation Generation Group COLA Project, Calvert Cliffs Nuclear Power Plant (CCNPP), Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Test Type[5]	Shear Strength Total f deg.	C psi	Effective f' deg.	C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-339	43.5	SPT	CH	86.9	0.0	60	22	38			31.0																		
B-339	48.5	SPT	CL			40	20	20			27.8																		
B-339	53.5	SPT	SM	33.7	0.0	48	30	18			30.8																		
B-339	58.5	SPT	SP-SM			NP	NP	NP			28.1																		
B-339	63.5	SPT	SC	15.5	9.9	49	21	28			25.0																		
B-339	68.5	SPT	MH			53	38	15			38.8																		
B-339	78.5	SPT	SM	23.6	18.6						16.6																		
B-339	83.5	SPT	SM								31.5																		
B-339	88.5	SPT	SP-SM	11.0	0.4						29.0																		
B-339	93.5	SPT	SP-SM								31.7																		
B-339	98.5	SPT	SP-SM								32.7																		
B-340	66.0	UD	Reserve Sample - Tests Not Performed																										
B-401	2.5	SPT	SM								3.6																		
B-401	10.5	SPT	CH	85.3	0.0	66	20	46			26.6																		
B-401	13.5	SPT	CH			62	20	42			34.2																		
B-401	18.5	SPT	MH			70	37	33			36.9																		
B-401	23.5	SPT	CL	52.1	0.0	47	28	19			27.9																		
B-401	33.5	SPT	SP								20.8																		
B-401	43.5	SPT	SM	21.2	13.1						21.4																		
B-401	53.5	SPT	SM								31.6																		
B-401	58.5	SPT	SM	13.1	4.3						25.0																		
B-401	78.5	SPT	SM								17.5																		
B-401	88.5	SPT	SM	38.3	0.5						35.3																		
B-401	98.5	UD	MH	64.8	0.0	78	48	30			50.5	117	2.70					X	-	UU	NA	19.6	NA	NA	Dev	Test Not Performed			
																		X	-	DS	Test Not Performed								
B-401	108.5	SPT	SM	34.2	1.9						35.6																		
B-401	113.5	SPT	CL								46.1																		
B-401	123.5	UD	MH	82.4	0.0	85	54	31			57.4	103	2.65					X	-	Qu	Test Not Performed					0.030	0.430	1.74	13
																		X	-	UU	NA	72.3	NA	NA	Dev				
B-401	128.5	SPT	ML	56.6	0.0						43.8																		
B-401	138.5	UD	CH	67.5	0.0	80	31	49			44.1	104.1	2.63																
B-401	143.5	SPT	MH			142	104	38			77.1																		
B-401	148.5	SPT	MH	86.6	0.0	150	89	61			72.7																		
B-401	153.5	SPT	MH			142	93	49			68.8																		
B-401	158.5	UD	MH	59.2	0.0	81	54	27			49.9	105	2.65					X	-	Qu	Test Not Performed					0.030	0.350	1.56	14
																		X	-	UU	Test Not Performed								
B-401	168.5	SPT	MH	71.8	0.0	103	52	51			53.9																		

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Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422)		Atterberg Limits[4] (D 4318)				Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557)		Bearing Ratio (D 1883)		Specimen		Shear Strength						Consolidation (D 2435)			
																					Total		Effective						
				Percent Passing No. 200	Percent Retained No. 4	LL	PL	PI	Oven Dried LL					Dry Unit Wt. (PCF)	Optium Moisture (%)	Dry	Soaked	Intact	Compacted	Test Type[5]	f deg.	C psi	f' deg.	C' psi	Failure Criterion[6]	Cεr	Cεc	eo	Pp' tsf
B-401	173.5	UD	CH	98.2	0.0	57	17	40			33.7	95	2.76					X	-	UU	Test Not Performed					0.040	0.540	2.80	11
																		X	-	DS	NA	NA	18.9	32.5	NA				
B-401	183.5	SPT	SM	32.2	0.0						31.2																		
B-401	193.5	SPT	ML								49.2																		
B-401	198.5	UD	SM	45.3	0.0	82	55	27			48.8	101.2	2.52																
B-401	203.5	SPT	MH			94	69	25			58.4																		
B-401	208.5	SPT	MH	64.5	0.0	113	74	39			62.7																		
B-401	213.5	UD	Reserve Sample - Tests Not Performed																										
B-401	218.5	SPT	MH	64.6	0.0						77.4																		
B-401	228.5	UD	MH	80.4	0.0	139	88	51		1.7	58.6	98.2	2.48																
B-401	238.5	SPT	MH								122.5																		
B-401	243.5	UD	MH	98.7	0.0	140	65	75			96.2	86.0	2.36													0.006	0.519	2.41	18.3
B-401	248.5	SPT	MH			218	100	118			122.8																		
B-401	258.5	SPT	MH								130.2																		
B-401	268.5	SPT	SM	43.0	0.0						63.5																		
B-401	284.5	SPT	MH			76	42	34			30.2																		
B-401	293.5	SPT	SC								20.7																		
B-401	307.5	SPT	SM	16.3	0	57	42	15			27.4																		
B-401	318.5	SPT	CH			58	28	30			28.9																		
B-401	338.5	SPT	ML								25.3																		
B-401	348.5	UD	SM	23.0	0.0	52	39	13			35.6	116.4	2.78																
B-401	368.5	SPT	SP-SM	11.7	0.0						36.9																		
B-401	400.0	SPT	SM	18.2	0.0						33.1																		
B-404	52.0	UD	SP-SM	10.8	2.0	NP	NP	NP			27.7	117.6	2.66																
B-404	83.5	UD	SM	33.9	0.0	53	28	25			32.2	115.4	2.63																
B-406	63.5	UD	OH	90.1	0.0	63	19	44	41	1.6	36.1	122.0	2.74					X	-	Qu	NA	20	NA	NA	Dev	0.04	0.3	1.17	10.5
																		X	-	UU	NA	8.2	NA	NA	Dev				
B-407	2.5	SPT	ML			NP	NP	NP			4.8																		
B-407	10.5	SPT	SP-SM								12.3																		
B-407	18.5	SPT	SM	30.4	0.0						24.9																		
B-407	28.5	SPT	MH								35.1																		
B-407	33.5	SPT	MH	96.0	0.0	77	43	34			39.4																		
B-407	43.5	SPT	SM	17.4	1.6						23.3																		
B-407	63.5	SPT	SM								28.1																		
B-407	68.5	SPT	SM	11.4	6.0						30.0																		
B-407	73.5	SPT	SM								27.3																		
B-407	83.5	SPT	SM	14.8	12.5						38.3																		

Schnabel Engineering

Project Name: Constellation Generation Group COLA Project, Calvert Cliffs Nuclear Power Plant (CCNPP), Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-407	88.5	SPT	SM								12.4																		
B-407	98.5	SPT	SP-SM								30.8																		
B-407	108.5	SPT	ML	56.2	0.0						47.8																		
B-407	118.5	SPT	SM								34.2																		
B-407	123.0	SPT	MH								42.2																		
B-407	138.5	SPT	SM	43.3	0.0						49.2																		
B-407	143.5	SPT	MH			92	63	29			56.4																		
B-407	148.5	SPT	CH			81	45	45			43.1																		
B-407	158.5	SPT	MH								78.4																		
B-407	163.5	SPT	MH			120	50	70			62.7																		
B-407	168.5	SPT	MH			104	69	35			55.2																		
B-407	173.5	SPT	CH			102	37	65			53.7																		
B-407	178.5	SPT	CH			102	40	62			50.9																		
B-407	183.5	SPT	MH	59.1	0.0	154	97	57			82.2																		
B-407	188.5	SPT	SM								32.6																		
B-407	193.5	SPT	SM								31.6																		
B-407	198.5	SPT	SM	22.4	0.0						32.7																		
B-409	17.5	UD	Reserve Sample - Tests Not Performed																										
B-409	35.0	UD	SP-SM	6.0	0.0	NP	NP	NP			23.3	124.8	2.66																
B-409	95.0	UD	SM	37.6	0.0	61	42	19			33.1	109.3	2.64																
B-411	2.5	SPT	SP-SM								6.8																		
B-411	7.5	SPT	CL								27.4																		
B-411	13.5	SPT	CH								31.0																		
B-411	23.5	UD	OH	95.0	0.0	61	19	42	44	1.0	37.9	118	2.67					X	-	Qu	Test Not Performed					0.050	0.260	1.51	4.9
B-411	33.5	SPT	ML			34	29	5			24.4																		
B-411	43.5	SPT	SM	15.0	0.0						24.0																		
B-411	53.5	SPT	CL			44	17	27			25.2																		
B-411	63.5	SPT	SP-SM	11.4	6.5						34.4																		
B-411	73.5	SPT	SP-SM								32.0																		
B-411	83.5	SPT	SP-SM								36.4																		
B-411	93.5	SPT	CL								31.6																		
B-411	103.5	SPT	ML			43	30	13			38.2																		
B-411	113.5	SPT	ML								40.4																		
B-411	123.5	SPT	MH			63	43	20			42.7																		
B-413	7.5	SPT	SP-SM	10.2	0.0						9.7																		
B-413	18.5	SPT	SP-SM	10.1	1.2						12.9																		
B-413	33.5	SPT	SP-SM	8.2	0.0						8.6																		

Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Specimen Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Criterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-413	48.5	SPT	SM	31.5	0.0	NP	NP	NP			26.9																		
B-413	53.5	SPT	MH			56	27	26			25.7																		
B-413	58.5	SPT	MH	70.5	0.0	58	29	29			27.5																		
B-413	73.0	UD	CH	97.5	0.0	51	15	36			35.5	103	2.73					X	-	UU	NA	10.6	NA	NA	Dev	0.030	0.240	1.13	10.5
																		X	-	DS	NA	NA	31.4	6.4	NA				
																		X	-	CIU-bar	Test Not Performed								
B-413	78.5	SPT	SM	34.6	0.0						26.1																		
B-413	83.5	SPT	SP-SM								21.0																		
B-413	98.5	SPT	SM	15.9	17.2						34.9																		
B-413	108.5	SPT	SP-SM	9.6	7.4						24.8																		
B-413	113.5	SPT	SM								26.3																		
B-413	118.5	SPT	SM	16.2	4.8						32.5																		
B-413	123.5	SPT	SM								35.1																		
B-413	128.5	SPT	SM								18.7																		
B-413	133.5	SPT	SM	28.8	3.8						24.8																		
B-413	138.5	SPT	SM								27.5																		
B-413	143.5	SPT	SM								32.1																		
B-413	148.5	SPT	SM	28.7	0.0						39.8																		
B-414	7.5	SPT	SP-SM								4.2																		
B-414	18.5	SPT	SP-SM								9.2																		
B-414	33.5	SPT	SP-SM								9.7																		
B-414	43.5	SPT	SM	22.1	2.4	NP	NP	NP			20.6																		
B-414	48.5	SPT	SM	33.5	0.0	NP	NP	NP			27.7																		
B-414	53.5	SPT	CL	60.4	0.0	42	23	19			28.0																		
B-414	58.0	UD	CH	84.9	0.0	58	19	39			33.2	117.1	2.71																
B-414	63.5	SPT	CH								38.3																		
B-414	68.0	UD	CH	96.8	0.1	51	15	36			36.7	103	2.78					X	-	Qu	NA	4.7	NA	NA	Dev	0.040	0.280	1.43	4
																		X	-	CIU-bar	10.4	13.2	20	10.2	PSR				
B-414	73.5	SPT	CL	52.8	0.0	39	20	19			22.9																		
B-414	78.5	SPT	ML								29.8																		
B-414	83.5	SPT	SM	16.6	0.0						19.0																		
B-414	93.5	SPT	SM	39.7	10.0						20.1																		
B-414	98.5	SPT	GM	19.6	40.9						13.5																		
B-415	5.0	SPT	SP-SM	5.8	0.3						3.6																		
B-415	13.5	SPT	SP	3.4	0.0						2.5																		
B-415	28.5	SPT	SP-SM	10.4	0.3						13.5																		
B-415	43.5	SPT	SM	31.1	0.2	26	22	4			28.2																		

Schnabel Engineering

Project Name: Constellation Generation Group COLA Project
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Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-415	58.5	SPT	CH	93.3	0.0	61	21	40			36.6																		
B-415	73.5	SPT	SM	47.8	0.0	40	30	10			26.3																		
B-415	83.5	SPT	SM	17.8	2.4						17.0																		
B-416	5.0	SPT	SP-SM								3.8																		
B-416	13.5	SPT	SM								13.0																		
B-416	28.5	SPT	CH	87.7	0.0	58	17	41			33.7																		
B-416	43.5	SPT	SC								25.6																		
B-416	58.5	SPT	SM	15.5	0.0						26.2																		
B-416	73.5	SPT	SP-SC								29.5																		
B-416	88.5	SPT	SC								33.5																		
B-418	2.5	SPT	SC								27.9																		
B-418	7.5	SPT	SM			NP	NP	NP			30.9																		
B-418	13.5	SPT	CL			49	22	27			32.7																		
B-418	23.5	SPT	SP-SM								25.2																		
B-418	33.5	SPT	SP-SM								28.4																		
B-418	43.5	SPT	SC								27.4																		
B-418	53.5	SPT	SP-SC								23.3																		
B-418	63.5	SPT	SM								32.1																		
B-418	73.5	SPT	SC								41.7																		
B-418	88.5	SPT	MH			76	49	27			49.8																		
B-418	98.5	SPT	CL			46	25	21			36.7																		
B-418	108.5	SPT	MH			55	38	17			39.8																		
B-418	123.5	SPT	CH			106	41	65			56.4																		
B-418	138.5	SPT	MH			103	63	40			64.4																		
B-418	148.5	SPT	CH			69	27	42			52.6																		
B-418	168.5	SPT	MH			76	49	27			57.3																		
B-418	183.5	SPT	MH			100	60	40			56.7																		
B-418	198.5	SPT	MH			109	71	38			66.5																		
B-420	0.0	SPT	CH			52	21	31			17.2																		
B-420	2.5	SPT	CH			68	23	45			28.6																		
B-420	5.0	SPT	CH	89.7	0.0	64	22	42			29.7																		
B-420	7.5	SPT	CH			71	19	52			38.3																		
B-420	13.5	SPT	CH	94.2	0.0	74	31	43			42.1																		
B-420	18.5	SPT	CH								28.6																		
B-420	23.5	SPT	ML			NP	NP	NP			24.4																		
B-420	33.5	SPT	SM								24.2																		
B-420	38.5	SPT	CL			30	19	11			20																		

Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422)		Atterberg Limits[4] (D 4318)				Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557)		Bearing Ratio (D 1883)		Specimen		Shear Strength						Consolidation (D 2435)			
				Percent Passing No. 200	Percent Retained No. 4	LL	PL	PI	Oven Dried LL					Dry Unit Wt. (PCF)	Optium Moisture (%)	Dry	Soaked	Intact	Compacted	Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Cεr	Cεc	eo	Pp' tsf
B-420	43.5	SPT	SM	17.1	7.8						26.5																		
B-420	48.5	SPT	SM								28.4																		
B-420	53.5	SPT	SM								28.0																		
B-420	58.5	SPT	SM								34.9																		
B-420	63.5	UD	SC	19.1	6.7	49	11	38			28.3	117	2.75					X	-	Qu	NA	16.0	NA	NA	Dev	0.010	0.130	1.26	1.1
																		X	-	DS	NA	NA	34.0	3.4	NA				
B-420	68.5	SPT	SM	20.7	28.9						16.8																		
B-420	73.5	SPT	SM								24.4																		
B-420	78.5	SPT	SM	39.5	2.2	48	32	15			26.2																		
B-420	83.5	SPT	MH			60	39	21			47.3																		
B-420	88.5	SPT	CH			90	35	55			55.3																		
B-420	93.5	SPT	CH								39.4																		
B-420	98.5	SPT	ML			49	30	19			34.8																		
B-420	103.5	SPT	SM	38.1	0.0	57	42	15			38.5																		
B-420	108.5	SPT	MH			80	51	29			46.4																		
B-420	113.5	SPT	CH			118	38	80			64.9																		
B-420	118.5	SPT	MH			65	40	25			41.6																		
B-420	123.5	SPT	CH			83	29	54			47.5																		
B-420	128.5	UD	OH	50.1	0.3	59	34	25	40		39.0	109	2.62					X	-	UU	Test Not Performed					Test Not Performed			
																		X	-	CIU-bar	15.4	21.3	29.1	13.2	PSR				
B-420	133.5	SPT	MH	76.6	0.0	147	75	72			73.4																		
B-420	138.5	SPT	MH			145	76	69			78.8																		
B-420	143.5	SPT	MH	75.4	0.0	107	56	51			58.9																		
B-420	148.5	SPT	MH	61.3	0.0	127	100	27			74.2																		
B-421	0.0	SPT	SP-SM								11.6																		
B-421	2.5	SPT	SP-SM								14.8																		
B-421	5.0	SPT	SC								11.9																		
B-421	7.5	SPT	SM	14.0	0.0						7.6																		
B-421	10.5	SPT	SP			NP	NP	NP			11.8																		
B-421	13.5	SPT	SP								9.2																		
B-421	18.5	SPT	SW-SM	10.1	0.0						9.4																		
B-421	23.5	SPT	SM			NP	NP	NP			11.0																		
B-421	28.5	SPT	SP-SM	11.4	1.8						15.6																		
B-421	38.5	SPT	SP-SM								17.3																		
B-421	43.5	SPT	MH								31.5																		
B-421	48.5	UD	CH	69.5	0.0	50	18	32			28.8	122.68	2.69																
B-421	53.5	SPT	CH								29.6																		

Schnabel Engineering

Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
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SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422)		Atterberg Limits[4] (D 4318)				Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557)		Bearing Ratio (D 1883)		Specimen		Shear Strength						Consolidation (D 2435)			
				Percent Passing No. 200	Percent Retained No. 4	LL	PL	PI	Oven Dried LL					Dry Unit Wt. (PCF)	Optium Moisture (%)	Dry	Soaked	Intact	Compacted	Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Cεr	Cεc	eo	Pp' tsf
B-421	58.5	UD	CH	86.9	0.0	78	32	46			34.2	119.44	2.72																
B-421	63.5	SPT	CH								28.6																		
B-421	68.5	SPT	SM	33.1	0.3						22.2																		
B-421	73.5	SPT	SM								24.9																		
B-421	78.5	SPT	SM								19.7																		
B-421	83.5	SPT	SM								20.5																		
B-421	88.5	SPT	SM	14.5	11.4						26.0																		
B-421	93.5	SPT	SP-SC			NP	NP	NP			20.7																		
B-421	98.5	SPT	SP-SM								28.4																		
B-421	103.5	SPT	SM								26.0																		
B-421	108.5	SPT	SM	14.0	0.1	NP	NP	NP			26.1																		
B-421	113.5	SPT	SM	18.4	0.0						31.7																		
B-421	118.5	SPT	ML			NP	NP	NP			27.8																		
B-421	128.5	SPT	ML								22.0																		
B-421	133.5	SPT	SM	41.7	0.0						29.0																		
B-421	138.5	SPT	CH			53	25	28			38.5																		
B-421	143.5	SPT	SM								46.8																		
B-421	148.5	SPT	SM								47.4																		
B-423	2.5	SPT	SM	12.5	0.1						4.9																		
B-423	13.5	SPT	SM			NP	NP	NP			12.3																		
B-423	18.5	SPT	SM								10.4																		
B-423	23.5	SPT	SP-SM	11.8	0.0						16.6																		
B-423	28.5	SPT	SM								17.4																		
B-423	33.5	SPT	SM			NP	NP	NP			13.6																		
B-423	38.5	SPT	SC	36.9	0.0	43	15	28			43.9																		
B-423	43.5	SPT	CH	73.0	0.0	55	20	35			30.9																		
B-423	48.5	SPT	CH			61	16	45			36.6																		
B-423	53.5	SPT	CH	81.2	0.0	80	34	46			38.1																		
B-423	58.5	SPT	MH			78	45	33			33.8																		
B-423	63.5	SPT	ML			37	27	10			21.9																		
B-423	68.5	SPT	SM			NP	NP	NP			25.4																		
B-423	73.5	SPT	SM								22.8																		
B-423	78.5	SPT	ML	11.3	9.3						21.9																		
B-423	83.5	SPT	SM								25.6																		
B-423	88.5	SPT	SM								23.1																		
B-423	93.5	SPT	SM	13.0	1.1						29.8																		
B-423	98.5	SPT	SM								27.4																		

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422)		Atterberg Limits[4] (D 4318)				Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557)		Bearing Ratio (D 1883)		Specimen		Shear Strength						Consolidation (D 2435)			
				Percent Passing No. 200	Percent Retained No. 4	LL	PL	PI	Oven Dried LL					Dry Unit Wt. (PCF)	Optium Moisture (%)	Dry	Soaked	Intact	Compacted	Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Cεr	Cεc	eo	Pp' tsf
B-423	103.5	UD	SP-SC	9.7	14.4	24	18	6			23.1	120	2.74					X	-	CIU-bar	14.1	32.5	27	11.4	PSR				
																		X	-	DS	Test Not Performed								
B-423	108.5	SPT	SP-SC								30.8																		
B-423	118.5	SPT	SM	19.6	13.9	NP	NP	NP			26.2																		
B-423	123.5	SPT	SM								33.9																		
B-423	128.5	SPT	SM	21.4	0.0						31.9																		
B-423	133.5	SPT	ML								37.1																		
B-423	138.5	SPT	SM	43.2	0.0						45.1																		
B-423	143.5	SPT	SM								38.9																		
B-423	148.5	SPT	SM	32.9	4.6						32.8																		
B-423	153.5	SPT	CL								44.9																		
B-423	158.5	UD	OH	87.6	0.0	74	18	56	49	1.3	44.9	108	2.70					X	-	UU	NA	16.6	NA	NA	Dev	0.010	0.310	1.46	11.5
B-423	163.5	SPT	MH								59.7																		
B-423	168.5	SPT	ML								41.0																		
B-423	173.5	SPT	SM								49.7																		
B-423	178.5	UD	SM	46.4	0.0	64	34	30			41.5	112	2.36					X	-	UU	NA	2.63	NA	NA	Dev	0.030	0.310	1.71	7
B-423	183.5	SPT	SM								73.3																		
B-423	188.5	UD	MH	90.6	0.0	111	70	41			72.4	96	2.50					X	-	DS	NA	NA	18.5	23.0	NA				
B-423	193.5	SPT	MH								71.0																		
B-423	200.0	SPT	CL								45.3																		
B-425	0.0	SPT	SP-SM								13.7																		
B-425	3.5	SPT	SP-SM	7.9	0.0						7.3																		
B-425	5.0	SPT	SP-SM								2.5																		
B-425	8.5	SPT	SP-SM								10.8																		
B-425	10.0	SPT	SP-SM								14.2																		
B-425	13.5	SPT	SP-SM	6.5	0.4						16.4																		
B-425	20.0	SPT	SP-SM								11.1																		
B-425	25.0	SPT	SP-SM								11.6																		
B-425	30.0	SPT	SP-SM	11.3	0.2						15.2																		
B-425	35.0	SPT	SP-SM								12.0																		
B-425	40.0	SPT	SP-SM	7.4	0.9						14.9																		
B-425	45.0	SPT	SW-SM								13.7																		
B-425	50.0	SPT	SW-SM	10.1	10.9	28	17	11			12.1																		
B-425	55.0	SPT	CL			46	19	27			28.2																		
B-425	57.0	UD	CH	81.8	0.0	55	25	30			31.2	119.69	2.71																
B-425	60.0	SPT	CH			63	21	42			35.1																		
B-425	65.0	UD	CH	89.6	0.0	69	28	41			39.5	114.52	2.72																

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-425	70.0	SPT	MH			77	42	35			38.4																		
B-425	75.0	UD	SC	45.1	0.1	41	20	21			21.8	125.36	2.69																
B-425	80.0	SPT	SC								31.7																		
B-425	85.0	SPT	SP								19.0																		
B-425	90.0	SPT	SP								20.5																		
B-425	95.0	SPT	SP								17.9																		
B-427	2.5	SPT	SM	30.6	0.0						9.4																		
B-427	7.5	SPT	SP-SM								7.9																		
B-427	18.5	SPT	SM	12.5	1.1						8.2																		
B-427	28.5	SPT	SP-SM	8.4	0.2						12.2																		
B-427	38.5	SPT	SP								13.6																		
B-427	48.5	SPT	SP-SM	6.3	0.1						18.6																		
B-427	63.5	UD	OH	61.3	38.7	56	18	38	36		32.8	116	2.74					X	-	Qu	NA	25	NA	NA	Dev	0.030	0.260	1.02	8.7
																		X	-	UU	NA	10.6	NA	NA	Dev				
																		X	-	DS	NA	NA	29.2	6.1	NA				
B-427	78.5	SPT	SM								23.1																		
B-427	93.5	SPT	SM	34.8	24.7						12.0																		
B-427	103.5	SPT	SP-SM	11.2	4.1						24.8																		
B-427	118.5	SPT	SM	24.2	0.0						29.2																		
B-427	128.5	SPT	SM								31.4																		
B-427	138.5	SPT	SM	29.8	0.0						38.5																		
B-427	148.5	SPT	SM	33.1	0.0						44.3																		
B-428	60.0	UD	CH	92.6	0.0	61	17	44	46		37	120	2.78					X	-	Qu	NA	33.9	NA	NA	Dev				
																		X	-	UU	NA	10.3	NA	NA	Dev				
B-428	63.0	UD	CH							0.1																			
B-429	45.0	UD	Reserve Sample - Tests Not Performed																										
B-433	5.0	SPT	ML								27.0																		
B-433	10.5	SPT	SW-SM	10.2	0.1						5.8																		
B-433	23.5	SPT	SW-SM								14.4																		
B-433	33.5	SPT	MH								23.3																		
B-433	38.5	UD	CH	91.0	0.0	61	14	47			33.5	113	2.77					X	-	Qu	NA	26.4	NA	NA	Dev	0.040	0.280	1.00	8.3
																		X	-	UU	NA	22.5	NA	NA	Dev				
																		X	-	DS	NA	NA	20.2	9.4	NA				
B-433	43.5	SPT	CH			59	22	37			33.50																		
B-433	48.5	UD	CH	94.5	0.0	64	23	41			33.6	121	2.66					X	-	Qu	NA	6.6	NA	NA	Dev	0.030	0.310	1.16	10
																		X	-	CIU-bar	8.3	6.14	19.3	4.22	PSR				
B-433	53.5	SPT	CL			45	18	27			21.0																		

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-433	58.5	SPT	SM	48.2	0.0	44	35	9			29.3																		
B-433	73.5	SPT	SW-SM	11.6	7.8						23.7																		
B-433	93.5	SPT	ML	12.1	1.1						31.5																		
B-434	7.5	SPT	SP-SM								11.8																		
B-434	13.5	SPT	SM	13.9	0.8						7.0																		
B-434	18.5	SPT	SP-SM								10.6																		
B-434	28.5	SPT	SM	27.2	0.1						21.9																		
B-434	33.5	SPT	SM								26.6																		
B-434	38.5	SPT	SM			NP	NP	NP			27.4																		
B-434	48.5	SPT	CH			73	24	49			38.2																		
B-434	53.5	UD	CH	94.9	0.0	56	23	32			87.8	118	2.84					X	-	Qu	NA	28.5	NA	NA	Dev	0.010	0.368	1.09	14
																		X	-	UU	NA	25.4	NA	NA	Dev				
B-434	58.5	SPT	CH	94.7	0.0	86	22	64			36.6																		
B-434	63.5	UD	SM	36.9	0.0	---	---	NP			23.7	100.5	2.72					X	-	DS	Test Not Performed					0.004	0.111	0.72	11.8
																		X	-	CIU-bar	Test Not Performed								
B-434	68.5	SPT	SM								25.0																		
B-434	73.5	SPT	SM								22.6																		
B-434	78.5	SPT	SM								15.6																		
B-434	83.5	SPT	CL			30	22	8			19.8																		
B-434	88.5	SPT	SM								15.6																		
B-434	93.5	SPT	SP			NP	NP	NP			31.2																		
B-434	98.5	SPT	SM								25.6																		
B-436	7.5	SPT	SP-SM	4.9	0.5						3.3																		
B-436	23.5	SPT	SP-SM	8.1	3.1						11.1																		
B-436	33.5	SPT	SM	26.3	0.0						25.2																		
B-437	13.5	UD	SP-SM	5.6	0.0	NP	NP	NP			7.2	124.1	2.66																
B-437	98.5	UD	Reserve Sample - Tests Not Performed																										
B-440	2.5	SPT	SM	33.2	0.1						8.6																		
B-440	7.5	SPT	Test Not Performed																										
B-440	13.5	SPT	SM	19.7	11.8						16.1																		
B-440	23.5	SPT	SP-SM	8.4	0.0						22.1																		
B-440	33.5	SPT	SM	28.4	10.8						20.1																		
B-440	43.5	SPT	SM	17.6	5.3						27.1																		
B-440	51.0	UD	SC	18.0	0.0	30	21	9			30.0	116	2.75					X	-	Qu	NA	5.1	NA	NA	Dev				
																		X	-	DS	NA	NA	30.3	5.5	NA				
B-440	63.5	SPT	SM	19.5	16.8						19.4																		
B-440	78.5	SPT	SM	28.7	0.0						41.0																		

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Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Specimen Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-701	7.5	SPT	SM	27.9	0.9						15.9																		
B-701	10.5	SPT	SW-SM	6.3	45.7						12.4																		
B-701	18.5	SPT	SM	21.1	2.8						28.2																		
B-701	28.5	SPT	SM	34.3	1.7						37.3																		
B-701	43.5	UD	MH	64.1	0.0	54	33	21			37.3	116	2.64					X	-	UU	NA	24.6	NA	NA	Dev				
B-701	48.5	SPT	SM	17.5	3.9						33.1																		
B-701	53.5	SPT	ML								42.5																		
B-701	58.5	SPT	MH								55.7																		
B-701	63.5	SPT	ML								40.4																		
B-701	68.5	SPT	MH								48.0																		
B-703	18.5	SPT	OH	83.4	0.0	69	25	44	39	0.9	45.1	106	2.70					X	-	Qu	Test Not Performed					0.003	0.300	1.31	9
B-707	2.5	SPT	CH								27.3																		
B-707	7.5	SPT	CH	74.6	0.0	59	21	38			32.8																		
B-707	13.5	SPT	CH								32.7																		
B-707	23.5	SPT	SC								29.5																		
B-707	33.5	SPT	MH	70.8	21.0	59	45	14			45.5																		
B-707	48.5	SPT	SP-SM								27.0																		
B-709	7.5	SPT	SC								27.3																		
B-709	13.5	SPT	SM								29.1																		
B-709	23.5	SPT	SC								30.4																		
B-709	33.5	SPT	ML								33.8																		
B-709	48.5	SPT	CL								23.0																		
B-722	5.0	SPT	SP								3.5																		
B-722	13.5	SPT	SP								12.4																		
B-722	23.5	SPT	ML								21.1																		
B-722	33.5	UD	SM	20.1	0.0	NP	NP	NP			26.8	120	2.76					X	-	Qu	NA	4.1	NA	NA	Dev	0.010	0.040	0.78	6
																		X	-	UU	NA	8.5	NA	NA	Dev				
B-722	43.5	SPT	CH								37.1																		
B-722	53.5	SPT	CH								41.9																		
B-722	63.5	SPT	CH								47.5																		
B-722	73.5	SPT	SM								18.8																		
B-723	28.5	UD	CH	89.7	0.0	56	15	41			31.9	120	2.71					X	-	Qu	NA	5.8	NA	NA	Dev	0.010	0.500	0.83	10.5
																		X	-	UU	NA	16.7	NA	NA	Dev				
B-723	38.5	UD	CH	95.2	0.0	64	19	45			33.9	112	2.73					X	-	UU	NA	11.7	NA	NA	Dev	0.030	0.240	1.15	6.4
B-724	73.5	UD	OL	60.1	0.1	45	24	21	32	3.2	31.9	103	2.7					X	-	DS	NA	NA	27.5	8.2	NA				
B-726	23.5	UD	CH	96.0	0.0	69	22	47			35.7	117	2.7					X	-	UU	NA	11.8	NA	NA	Dev	0.040	0.290	1.16	10.3
B-729	2.5	SPT	SC								16.0																		

Schnabel Engineering

Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-729	7.5	SPT	SP-SM								13.5																		
B-729	18.5	SPT	SP-SM								14.2																		
B-729	28.5	SPT	SP-SM								12.5																		
B-729	38.5	SPT	SM								18.4																		
B-729	48.5	SPT	ML								28.2																		
B-729	58.5	SPT	SM								28.8																		
B-729	68.5	UD	OH	92.7	0.0	56	18	38	40	1.4	32.8	118	2.79					X	-	UU	NA	19.2	NA	NA	Dev	0.040	0.290	1.05	12
B-732	15.0	UD	SC	32.0	2.7	26	19	7			23.1	124	2.75					X	-	Qu	NA	6.9	NA	NA	Dev	0.010	0.080	0.82	4
																		X	-	UU	NA	3.3	NA	NA	Dev				
B-733	23.5	UD	CH	78.0	22.0	51	15	36			33.2	119	2.73					X	-	Qu	NA	6	NA	NA	Dev	0.020	0.180	1.00	5.7
																		X	-	UU	NA	8.1	NA	NA	Dev				
B-735	2.5	SPT	SP-SM	6.2	3.8						7.6																		
B-735	10.5	SPT	SM	27.8	0.0						13.5																		
B-735	18.5	SPT	SM	28.1	0.0	NP	NP	NP			28.7																		
B-735	28.0	UD	CH	87.1	12.9	51	16	35			32.3	119						X	-	UU	NA	17.5	NA	NA	Dev	0.030	0.250	1.01	7.5
																		X	-	DS	NA	NA	27.2	4.9	NA				
B-735	43.5	SPT	CH	98.5	0.0	85	30	55			39.6																		
B-735	58.5	SPT	SP-SM	5.8	0.0						20.9																		
B-735	73.5	SPT	SM	14.3	14.7						24.5																		
B-737	10.5	UD	CH	92.9	0.0	75	23	52			37.6	113	2.63					X	-	UU	NA	8.6	NA	NA	Dev	0.030	0.200	1.13	6.1
																		X	-	DS	NA	NA	22.7	5.2	NA				
B-738	5.0	SPT	SM								9.0																		
B-738	10.5	SPT	SP								12.3																		
B-738	18.5	SPT	CH								24.2																		
B-738	28.5	SPT	MH								28.4																		
B-738	35.0	UD	SC-SM	25.1	0.0	26	22	4			26.4	118	2.67					X	-	Qu	NA	5.7	NA	NA	Dev	0.010	0.040	0.78	8
																		X	-	UU	NA	15.9	NA	NA	Dev				
B-738	48.5	SPT	CH								32.1																		
B-738	58.5	SPT	SC								28.7																		
B-738	68.5	SPT	CL								30.9																		
B-743	23.5	UD	CL	57.2	0.0	38	13	25			21.1	115	2.69					X	-	DS	NA	NA	29.2	3.7	NA				
B-746	2.5	SPT	ML								14.4																		
B-746	7.5	SPT	SM	27.3	0.0						25.1																		
B-746	13.5	UD	SC-SM	28.8	0.0	25	21	4			27.2	121	2.76					X	-	UU	NA	7.1	NA	NA	Dev	0.010	0.060	0.83	10.8
B-746	23.5	SPT	CH	86.5	0.0	52	17	35			30.8																		
B-746	33.5	SPT	CH	93.6	0.0	64	24	40			34.8																		
B-746	43.5	SPT	ML			40	34	6			29.2																		

Schnabel Engineering

Project Name: Constellation Generation Group COLA Project
Calvert Cliffs Nuclear Power Plant (CCNPP)
Calvert County, Maryland

Project Number: 06120048.00

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
B-746	58.5	SPT	SM								17.9																		
B-746	68.5	SPT	SM								24.8																		
B-747	2.5	SPT	SM	36.2	0.0						7.5																		
B-747	5.0	SPT	ML	71.2	0.0						12.7																		
B-747	10.5	SPT	SP-SM	4.8	0.0						20.3																		
B-747	13.5	SPT	SM	20.4	0.0						26.6																		
B-747	18.5	SPT	SM	15.0	0.1						23.9																		
B-747	23.5	SPT	ML	66.3	0.0						28.2																		
B-747	28.5	SPT	ML								32.6																		
B-747	33.5	SPT	CH	77.5	0.0						34.2																		
B-747	38.5	SPT	CH	81.5	0.1						32.6																		
B-747	43.5	SPT	CH								27.5																		
B-747	48.5	SPT	CH								39.4																		
B-747	53.5	SPT	MH	76.1	0.0	78	47	31			48.6																		
B-747	58.0	UD	CH			53	16	37			35.0	108	2.73					X	-	UU	NA	23.6	NA	NA	Dev	0.020	0.260	1.09	11.3
B-747	63.5	SPT	SC	38.0	18.3	43	20	23			27.6																		
B-747	68.5	SPT	SM			NP	NP	NP			30.3																		
B-747	73.5	SPT	SP-SM			NP	NP	NP			28.1																		
B-752	2.5	SPT	SP-SM	10.0	0.5						5.9																		
B-752	10.5	SPT	SW-SM	10.2	0.4						6.7																		
B-752	18.5	SPT	SW-SM	13.2	6.7						12.7																		
B-752	28.5	SPT	SM	36.9	0.0						29.0																		
B-752	33.5	SPT	CH	67.0	0.0	52	23	29			29.1																		
B-752	38.5	SPT	MH	80.4	0.0	63	31	32			33.1																		
B-752	43.5	SPT	MH			71	26	19			37.1																		
B-752	48.5	SPT	CH			68	24	44			40.3																		
B-752	53.5	SPT	SM	44.9	0.0	40	29	11			27.7																		
B-752	58.0	UD	OH	97.9	0.0	65	17	48	46	0.6	45.3	110	2.79					X	-	UU	NA	21.8	NA	NA	Dev	0.050	0.400	1.73	10.3
B-752	63.5	SPT	MH			64	43	21			37.0																		
B-752	68.5	SPT	ML	60.5	0.0						34.6																		
B-752	83.5	SPT	SP-SM	10.9	8.3						28.0																		
B-752	98.5	SPT	SC	27.2	6.2						31.6																		
B-765	100.0	UD	Tests Not Performed																										
TP-B307	4.5	Bulk	SP-SM	5.8	0.0						2.3			109.3	10.5	14.8	4.4												
TP-B314	4.0	Bulk	CH	93.1	0.0	71	24	47			37.0			114.6	15.5														
TP-B315	6.0	Bulk	SP-SM	9.7	0.2						5.4			114.9	11.4	11.6	18.9												
TP-B334	3.0	Bulk	SM	13.9	0.0						7.4			116.3	9.3														

SUMMARY OF SOIL LABORATORY TEST RESULTS[1]

Boring / Test Pit No.	Sample Top Depth (ft.)	Sample Type[2]	USCS Sample Class. (D 2487)[3]	Sieve Results (D 422) Percent Passing No. 200	Sieve Results (D 422) Percent Retained No. 4	Atterberg Limits[4] (D 4318) LL	PL	PI	Oven Dried LL	Organic Content (%)	Natural Moisture (%) (D 2216)	Moist Unit Weight (PCF)	Specific Gravity (D 854)	Moisture-Density Relationship (D 1557) Dry Unit Wt. (PCF)	Optium Moisture (%)	Bearing Ratio (D 1883) Dry	Soaked	Specimen Intact	Compacted	Shear Strength Test Type[5]	Total f deg.	Total C psi	Effective f' deg.	Effective C' psi	Failure Crieterion[6]	Consolidation (D 2435) Cεr	Cεc	eo	Pp' tsf
TP-B334	6.0	Bulk	SM	13.2	0.0						14.5			129.8	8.0														
TP-B335	3.0	Bulk	CL	65.3	0.0	30	20	10			19.0			128.8	9.9														
TP-B335	5.0	Bulk	SM	24.6	0.0						8.9			130.5	7.6	36.2	18.0												
TP-B407	4.5	Bulk	SW-SM	9.0	2.2						7.1			118.9	8.8	14.8	17.0												
TP-B414	6.0	Bulk	SP-SM	6.4	0.0						6.0			105.4	11.9														
TP-B415	3.0	Bulk	SP	3.5	0.2						10.2			116.7	9.8	11.1	4.7												
TP-B423	5.0	Bulk	CL	51.1	0.0	24	16	8			16.0			123.4	10.8														
TP-B434	2.0	Bulk	CL	59.8	0.2	25	18	7			21.0			127.1	10.1	9.3	3.2												
TP-B435	5.0	Bulk	SM	13.2	0.0						6.0			119.1	8.9														
TP-B435	7.0	Bulk	SP-SM	8.3	0.8						4.6			123.9	8.9	26.8	33.7												
TP-B435	9.0	Bulk	SC	14.1	0.0	34	17	17			6.7			130.2	7.3	34.4	41.8												
TP-B715	5.5	Bulk	SP-SM	11.0	0.9						4.8			110.7	11.8														
TP-B716	6.0	Bulk	SP-SM	6.0	1.0						3.8			116.3	9.4														
TP-B717	7.0	Bulk	SP-SM	6.4	2.6						3.4			123.8	10.2	17.2	23.1												
TP-B719	0.5	Bulk	CL	84.5	0.0	35	22	13			23.9			118.4	13.5														
TP-B719	7.0	Bulk	SM	44.3	0.0						26.7			119.6	10.0	41.3	29.0												
TP-B727	6.0	Bulk	SM	30.1	0.0						10.3			130.5	6.8														
TP-B744	1.5	Bulk	CL	64.2	0.0	25	17	8			18.0			131.2	8.0														
TP-B758	2.0	Bulk	SP-SM	8.4	0.8						6.0			121.0	8.8														
TP-B758	7.5	Bulk	SM	31.1	2.6						11.8			127.3	8.9	11.3	4.4												
TP-C309	2.0	Bulk	SP	3.7	1.2						4.3			111.2	13.9														
TP-C309	7.0	Bulk	SP-SM	7.8	0.0						8.7			112.3	9.8														
TP-C723	2.5	Bulk	SC	39.5	0.0	30	15	15			12.0			132.8	7.3	26.8	17.2												
TP-C723	6.0	Bulk	SP-SM	7.5	1.2						4.6			113.8	6.8														
B-301	368.5	SPT (Composite)	SM	15.0	0.0	40	36	4			34.4	116.4	2.86																
B-301	378.5																												
B-301	383.5																												
B-301	388.5																												
B-301	398.5																												
B-401	358.5																												
B-401	378.5																												

NOTES:

1. Tests are in accordance with applicable ASTM standards.
2. Sample type: SPT = sample obtained from split spoon, UD = undisturbed sample in thin walled sampler
3. Visual-manual procedures (ASTM D 2488) used as appropriate.
4. Key: LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; NP = Nonplastic
5. Test Type: Qu - unconfined compression; UU - Triaxial Unconsolidated, Undrained; CIU-bar - Triaxial Consolidated Undrained; CD - Triaxial Consolidated Drained; DS - Drained Direct Shear
6. Failure Criterion: Dev. - maximum deviator stress; PSR - maximum principal stress ratio; Strain - defined level of axial strain

REPLACEMENT BORING LOG SHEETS

- B-301, Sheets 1 and 2 of 13
- B-305, Sheets 1 and 2 of 5
- B-306, Sheets 2 and 3 of 5
- B-401, Sheets 4 through 13 of 13
- B-404, Sheets 1 through 4 of 7
- B-409, Sheets 2 through 5 of 5
- B-437, Sheets 1 and 2 of 4

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant Calvert County, Maryland	Boring Number: **B-301** Contract Number: 06120048 Sheet: 1 of 13

Boring Contractor: UNI-TECH DRILLING
MALAGA, NEW JERSEY

Boring Foreman: J. Evans

Drilling Method: Mud Rotary

Drilling Equipment: Failing-1500 (Truck)

Schnabel Representative: K. Megginson

Dates Started: 5/25/06 **Finished:** 6/6/06

Location: Northing: 217024.06 ft
Easting: 960815.05 ft

Ground Surface Elevation: 94.5 (feet)

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	5/25	---	10.5'	---	---
Start of day	5/26	---	25.0'	---	---
Start of day	5/30	---	41.0'	---	---
Start of day	6/1	---	10.0'	---	---

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	CLAYEY SAND, fine to medium grained, contains root fragments, moist, brown. Majority of root system extends about 0.7 ft below ground surface.	SC				3+3+4 N = 7 REC = 9"		
2.0	POORLY GRADED SAND WITH SILT, trace gravel, fine to medium grained, moist, stratified orangeish brown and brown, contains fine to coarse silty sand lense at 3.5 ft.	SP-SM	92.5			3+4+5 N = 9 REC = 13"	w=6.6% *	
	fine to coarse grained, brown.				5	4+7+7 N = 14 REC = 10"		
	fine to medium grained,stratified light brown and yellowish brown					4+7+8 N = 15 REC = 12"		
	wet, brown and light brown			∇	10	6+9+9 N = 18 REC = 9"	w=14.3% *	
	light orangeish brown.					8+6+8 N = 14 REC = 10"		
14.5	CLAYEY SAND, fine to medium grained, moist, brown	SC	80.0		15			
17.0	POORLY GRADED SAND WITH SILT, trace gravel, fine to coarse grained, wet, dark orangeish brown and orangeish brown, contains fine to medium clayey sand pockets.	SP-SM	77.5		20	6+11+10 N = 21 REC = 14"	w=19% *	Drilling foreman used 5.4" O.D. Drag Bit from 0 to 18.5 ft. Switched to 4-3/4" O.D. Drag bit below 18.5 ft.
22.0	SANDY LEAN CLAY, fine to medium, trace mica, moist, gray.	CL	72.5		25	3+3+5 N = 8 REC = 18"		

continued on next page

Comments:
1. Boring backfilled with cement/bentonite grout via tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/6/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-301 installed at nearby location.

Schnabel Engineering	TEST BORING LOG	**Project:** Calvert Cliffs Nuclear Power Plant Calvert County, Maryland	**Boring Number:** **B-301** **Contract Number:** 06120048 **Sheet:** 2 of 13

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		CL						
27.0	SANDY LEAN CLAY, with fine to medium sand, trace mica, contains fine to medium sandy fat clay and fine to medium clayey sand pockets, moist, gray.	CL	67.5		30	2+4+3 N = 7 REC = 18"	w=28.9% LL=48 PL=17 *	
32.0	FAT CLAY, with fine to medium sand and mica, moist, gray.	CH	62.5		35	REC = 22"	w=31.1% LL=59 PL=17 *	Osterberg sampler tube push from 33.5 to 35.5 ft
	gray and dark gray, trace organic matter (±1%), contains fine to medium silty sand pockets.				40	4+5+5 N = 10 REC = 18"		
	gray and light greenish gray.				45	REC = 22"	PP=2.00 tsf	Osterberg sampler tube push from 43.5 to 45.2 ft
47.0	SANDY LEAN CLAY, fine to medium, trace mica, contains indurated lean clay pockets, moist, gray.	CL	47.5		50	5+6+8 N = 14 REC = 18"	w=29.6% *	
52.0	CLAYEY SAND, fine to medium grained, trace fine to medium shell fragments (±5%), strong HCl reaction, moderate cementation, moist, dark gray, contains indurated silt layer from 54.5 to 54.7 ft (layer exhibits fissility).	SC	42.5		55	11+48+50/3" N = 98/9" REC = 16"		Switched to 4-3/4" Tri-cone roller bit below 53.5 ft. Moderate difficulty in rotary advancement from 54.5 to 56.5 ft (slight rig chatter).
57.0	POORLY GRADED SAND, trace silt, fine to medium grained, wet, gray, weak	SP	37.5					

continued on next page

Comments:
1. Boring backfilled with cement/bentonite grout via tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/6/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-301 installed at nearby location.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: B-305
			Contract Number: 06120048
			Sheet: 1 of 5

Boring Contractor: CONNELLY AND ASSOCIATES, INC.
FREDERICK, MARYLAND

Boring Foreman: T. Connelly

Drilling Method: Mud Rotary

Drilling Equipment: CME-550

Schnabel Representative: K. Bell

Dates Started: 7/17/06 **Finished:** 7/20/06

Location: Northing: 217166.25 ft
Easting: 960686.74 ft

Ground Surface Elevation: 72.0 (feet)

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/18	---	37.5'	---	---
Start of Day	7/19	---	35.0'	---	---
Start of Day	7/20	---	24.0'	---	---

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.5	POORLY GRADED SAND WITH SILT, fine to medium grained, moist, yellowish brown, trace root fragments, trace wood fragments.	SP-SM	71.5			woh+1+2 N = 3 REC = 11"		
2.0	POORLY GRADED SAND WITH SILT, fine to medium grained, moist, yellowish brown, trace root fragments, trace wood fragments.	SP-SM	70.0			1+1+3 N = 4 REC = 7"		
4.5	CLAYEY SAND, fine to medium grained, moist, yellowish brown and orangeish brown, trace root fragments, trace wood fragments.	SC	67.5		5	2+2+3 N = 5 REC = 12"		
	SILTY SAND, fine grained, moist, gray and orangeish brown, trace root fragments.	SM				woh+woh+1 N = 1 REC = 4"		
10.0	FAT CLAY, moist, gray and orangeish brown, trace sand.	CH	62.0		10	2+2+2 N = 4 REC = 15"		
						REC = 22"	PP=2.50 tsf	
					15	2+3+4 N = 7 REC = 18"		color change in mud tub from orangeish brown to gray
						3+4+6 N = 10 REC = 18"		
19.0	SILTY SAND, fine to medium grained, moist, gray.	SM	53.0		20	REC = 16"		
22.5	ELASTIC SILT, moist, gray, trace sand.	MH	49.5			4+4+6 N = 10 REC = 18"		
					25			

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Comments:
1. Boring backfilled with cement/bentonite grout through
2. * = See Appendix I for additional lab testing data.

Schnabel Engineering — **TEST BORING LOG**

Project: Calvert Cliffs Nuclear Power Plant
Calvert County, Maryland

Boring Number: **B-305**
Contract Number: 06120048
Sheet: 2 of 5

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		MH				5+7+9 N = 16 REC = 18"		
27.0	SANDY SILT, moist, gray.	ML	45.0			5+5+7 N = 12 REC = 18"		
	weak cementation				30	4+5+8 N = 13 REC = 18"		
						8+13+25 N = 38 REC = 18"		Harder drilling
35.0	CLAYEY SAND, fine to medium grained, wet, gray and white, contains fine to medium shell fragments, 30-40%, HCl reaction strong.	SC	37.0		35	REC = 5"		resumed drilling on 7/18/06 @7:30am Harder drilling
				▽				
						32+45+48 N = 93 REC = 12"		
					40	REC = 23"	w=34.7% LL=72 PL=22 *	
						30+50/5" N = 50/5" REC = 10"		
					45	50/5" N = 50/5" REC = 4"		
47.0	CLAYEY SAND, fine to medium grained, wet, white and gray, with fine to coarse shell fragments, 60-70%, HCl reaction strong.	SC	25.0			40+50/5" N = 50/5" REC = 8"		
					50	12+8+8 N = 16 REC = 16"		
50.8	LEAN CLAY, wet, gray, trace sand, contains fine to medium shell fragments, 20-30%, HCl reaction moderate.	CL	21.2			REC = 8"	PP=>4.5 tsf	harder
55.0	SILTY SAND, fine to medium grained, wet, greenish gray, strong cementation.	SM	17.0		55	50/5" N = 50/5" REC = 5"		
	with fine to coarse shell fragments,					36+50/1"		

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Comments:
1. Boring backfilled with cement/bentonite grout through
2. * = See Appendix I for additional lab testing data.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: B-306
			Contract Number: 06120048
			Sheet: 2 of 5

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		SM						
	trace fine gravel.				30	8+13+17 N = 30 REC = 16"		
	medium to coarse grained,dark orangeish brown.							
	orangeish brown and black.				35	5+8+10 N = 18 REC = 13"		
	light orangeish brown, with 3" layer of fine gravel.				40	4+9+10 N = 19 REC = 14"		
41.0	CLAYEY SAND, fine to medium grained, moist, orange and gray.	SC	77.6					
					45	3+2+2 N = 4 REC = 18"		
	gray, contains mica.				50	3+3+5 N = 8 REC = 18"		
51.0	LEAN CLAY, with sand, fine to medium grained, moist, gray.	CL	67.6					
					55	3+3+5 N = 8 REC = 18"		

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. * = See Appendix I for additional lab testing data.

TEST BORING LOG

Schnabel Engineering

Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland

Boring Number: B-306
Contract Number: 06120048
Sheet: 3 of 5

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	greenish gray.	CL				REC = 24"	PP=2.00 tsf	
	with fine to medium sand lenses.				65	6+6+7 N = 13 REC = 18"	PP=1.50 tsf	
67.0	FAT CLAY, trace fine sand, moist, light gray.	CH	51.6		70	REC = 24"	w=30.7% LL=62 PL=24 PP=3.15 tsf *	
71.0	SILTY SAND, fine grained, moist, greenish gray, contains mica.	SM	47.6		75	6+8+10 N = 18 REC = 18"		
	dark gray, with fine shell fragments, weak HCl reaction.				80	38+50/4" N = 50/4" REC = 10"		
81.0	POORLY GRADED SAND, fine to medium grained, moist, gray, with fine to medium shell fragments, weak HCl reaction.	SP	37.6		85	50/3" N = 50/3" REC = 4"		
87.0	SILTY SAND, fine to medium grained, moist, light gray, with fine to medium shell fragments, strong HCl reaction.	SM	31.6		90	35+29+41 N = 70 REC = 18"		

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. * = See Appendix I for additional lab testing data.

TEST BORING LOG	**Project:** Calvert Cliffs Nuclear Power Plant Calvert County, Maryland	**Boring Number:** **B-401** **Contract Number:** 06120048 **Sheet:** 4 of 13		

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		SM						
92.0	ELASTIC SILT, moist, gray and light greenish gray, trace fine to coarse shell fragments (±<5%),weak HCl reaction.	MH	-19.9		95	6+11+16 N = 27 REC = 18"		
					100	REC = 15"	w=50.5% LL=78 PL=48 PP=>4.5 tsf *	*Osterberg sampler tube push from 98.5 to 99.8 ft
103.5	SILTY SAND, fine to medium sandy, light greenish gray, trace fine to coarse shell fragments (±5%) and organic matter (±<1%), contains clayey sand layers.	SM	-31.4		105	5+9+22 N = 31 REC = 18"		
					110	5+10+17 N = 27 REC = 13"	w=35.6% *	
112.0	LEAN CLAY, moist, gray and light greenish gray, with fine to medium sand, trace and fine to coarse shell fragments (±5%), strong HCl reaction.	CL	-39.9		115	4+8+10 N = 18 REC = 18"	w=46.1% *	
117.0	SILT, moist, gray and light greenish gray, with fine to medium sand, trace mica and fine to medium shell fragments (±5%), weak HCl reaction.	ML	-44.9		120	5+9+12 N = 21 REC = 18"		
122.0	ELASTIC SILT, moist, gray, trace fine to medium sand, mica, and fine to medium shell fragments (±1%), weak HCl reaction.	MH	-49.9			REC = 16"	w=57.4%	*Osterberg

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/29/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-401 installed at a nearby location.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: B-401 Contract Number: 06120048 Sheet: 5 of 13

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		MH			125		LL=85 PL=54 PP=>4.5 tsf *	sampler tube push from 123.5 to 124.8 ft
128.5	SANDY SILT, gray and greenish gray, with fine to medium sand, trace fine to medium shell fragments (±<5%), strong HCl reaction.	ML	-56.4		130	5+6+11 N = 17 REC = 18"	w=43.8% *	
	fine to medium sandy, greenish gray, very weak HCl reaction.				135	7+9+11 N = 20 REC = 18"		
137.0	SANDY FAT CLAY, moist, greenish gray, fine to medium sand, strong HCl reaction.	CH	-64.9		140	REC = 23"	w=44.1% LL=80 PL=31 PP=>4.5 tsf *	*Osterberg sampler tube push from 138.5 to 140.5 ft
142.0	ELASTIC SILT, moist, greenish gray, trace fine to medium sand, weak HCl reaction	MH	-69.9		145	7+9+11 N = 20 REC = 18"	w=77.1% LL=142 PL=104 *	
	trace mica.				150	8+10+12 N = 22 REC = 18"	w=72.7% LL=150 PL=89 *	**Resumed drilling at 6:55 AM on 6/21/06.
					155	6+8+11 N = 19 REC = 18"	w=68.8% LL=142 PL=93 *	

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/29/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-401 installed at a nearby location.

Schnabel Engineering

TEST BORING LOG

Project: Calvert Cliffs Nuclear Power Plant
Calvert County, Maryland

Boring Number: **B-401**
Contract Number: 06120048
Sheet: 6 of 13

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		MH						
	dark greenish gray.				160	REC = 10"	w=49.9% LL=81 PL=54 PP=>4.5 tsf *	*Osterberg sampler tube push from 158.5 to 159.3 ft
	with fine to medium sand.				165			
					170	8+10+15 N = 25 REC = 18"	w=53.9% LL=103 PL=52 *	
172.0	FAT CLAY, trace fine sand, greenish gray.	CH	-99.9					
					175	REC = 11"	w=33.7% LL=57 PL=17 PP=>4.5 tsf *	*Osterberg sampler tube push from 173.5 to 174.4 ft
					180	4+10+21 N = 31 REC = 0"		
182.0	SILTY SAND, fine to medium grained, contains clayey sand pockets, wet, dark greenish gray, trace fine to medium shell fragments (±1%), moderate HCl reaction.	SM	-109.9					
					185	7+15+22 N = 37 REC = 18"	w=31.2% *	
187.0	CLAYEY SAND, fine to medium grained, contains sandy lean clay pockets, wet, dark greenish gray and brownish gray, trace fine to medium shell fragments (±1%)	SC	-114.9					
					190	5+9+19 N = 28 REC = 11"		

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/29/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-401 installed at a nearby location.

Schnabel Engineering

TEST BORING LOG

Project: Calvert Cliffs Nuclear Power Plant
Calvert County, Maryland

Boring Number: **B-401**
Contract Number: 06120048

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		SC						
192.0	SANDY SILT, fine to medium, contains clayey sand pockets, moist, dark greenish gray, very weak HCl reaction	ML	-119.9		195	6+9+17 N = 26 REC = 18"	w=49.2% *	
197.0	SILTY SAND, fine grained, moist, greenish gray, very weak HCL reaction, trace mica.	SM	-124.9		200	REC = 22"	w=48.8% LL=82 PL=55 PP=>4.5 tsf *	*Osterberg sampler tube push from 198.5 to 200.3 ft
202.0	ELASTIC SILT, with fine to medium sand, trace mica and organic matter (±1%), moist, greenish gray, very weak HCl reaction.	MH	-129.9		205	5+8+13 N = 21 REC = 18"	w=58.4% LL=94 PL=69 *	
	trace fine to medium shell fragments (±1%).				210	7+11+16 N = 27 REC = 18"	w=62.7% LL=113 PL=74 *	**Resumed drilling at 7:00 AM on 6/22/06.
212.0	ELASTIC SILT, trace fine to medium sand, contains indurated silt pockets, moist, greenish gray, very weak HCl reaction.	MH	-139.9		215	REC = 13"	PP=>4.5 tsf	*Osterberg sampler tube push from 213.5 to 214.6 ft
	trace mica.				220	7+11+15 N = 26 REC = 18"	w=77.4% *	

continued on next page

Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/29/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-401 installed at a nearby location.

TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: B-401
Schnabel Engineering		Contract Number: 06120048
		Sheet: 8 of 13

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	trace organic matter (±<1%).	MH			225	9+13+18 N = 31 REC = 18"		
	contains indurated silt pockets.				230	REC = 13"	w=58.6% LL=139 PL=88 PP=>4.5 tsf *	*Osterberg sampler tube push from 228.5 to 229.6 ft
					235	10+15+21 N = 36 REC = 18"		
	weak HCl reaction.				240	8+11+21 N = 32 REC = 18"	w=122.5% *	
	mostly indurated silt layers.				245	REC = 8"	w=96.2% LL=140 PL=65 PP=>4.5 tsf *	*Osterberg sampler tube push from 243.5 to 244.4 ft
					250	7+8+17 N = 25 REC = 18"	w=122.8% LL=218 PL=100 *	
					255	7+10+15 N = 25 REC = 18"		

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/29/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-401 installed at a nearby location.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: **B-401**
			Contract Number: 06120048
			Sheet: 9 of 13

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		MH						
	trace fine to medium sand, very weak HCl reaction.				260	8+11+19 N = 30 REC = 18"	w=130.2% *	
					265	9+16+21 N = 37 REC = 0"		**Resumed drilling at 7:15 AM on 6/23/06.
267.0	SILTY SAND, dark green, with fine to medium sand, trace organic matter (±<1%), very weak HCl reaction.	SM	-194.9					
					270	7+12+18 N = 30 REC = 18"	w=63.5% *	
	greenish gray, weak HCl reaction.				275	8+12+15 N = 27 REC = 18"		
	trace fine to medium sand, moderate HCl reaction.				280	50/3" N = 50/3" REC = 4"		*Switched to 5" O.D. Tri-cone roller bit below 278.5 ft.
								*Very to extremely difficult rotary advancement from 278 to 280 ft (moderate rig chatter).
283.0	SANDY ELASTIC SILT, moist, dark greenish gray, trace fine to coarse sand, some fine to coarse shell fragments (±30%), strong HCl reaction.	MH	-210.9		285	11+13+17 N = 30 REC = 18"	w=30.2% LL=76 PL=42 *	*Switched to 5" O.D. Drag bit below 284.5 ft.
								**Resumed drilling at 11:00 AM on 6/26/06.
287.0	CLAYEY SAND, fine to medium grained, wet, dark brownish gray and blackish gray, few fine to coarse shell fragments (±10%), trace mica, strong	SC	-214.9			9+17+23		

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/29/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-401 installed at a nearby location.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: B-401 — Contract Number: 06120048 — Sheet: 10 of 13

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	HCl reaction, glauconitic	SC			290	N = 40 REC = 18"		
	dark brownish gray and dark greenish gray, trace fine to coarse shell fragments (±5%). fine to coarse grained, moist, dark brownish gray and blackish gray, trace fine gravel and fine to medium shell fragments (±<5%) below 294.5 ft.				295	8+12+50/2" N = 62/8" REC = 14"	w=20.7% *	*Switched to 5" O.D. Tri-cone roller bit below 293.5 ft. *Extremely difficult rotary advancement from 294.5 to 295.5 ft (very strong rig chatter). *Extremely difficult rotary advancememt from 297.3 to 298.3 ft (mod to strong rig chatter). **Resumed drilling at 7:20 AM on 6/27/06. *Switched to 4-3/4" O.D. Drag bit below 298.5 ft.
	brownish gray and light blackish gray, trace fine to coarse shell fragments (±5%), weak HCl reaction, contains lean clay layers and pockets.				300	9+14+18 N = 32 REC = 18"		
					305			
306.0	SILTY SAND, fine to coarse, contains clayey sand pockets, moist, dark greenish gray and dark blackish brown, very weak HCl reaction	SM	-233.9			10+12+20 N = 32 REC = 18"	w=27.4% LL=57 PL=42 *	
					310			
					315			
317.0	SANDY FAT CLAY, fine to medium grained, moist, dark greenish gray and dark blackish gray, very weak HCl reaction, glauconitic.	CH	-244.9		320	18+26+35 N = 61 REC = 18"	w=28.9% LL=58 PL=28 *	

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/29/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-401 installed at a nearby location.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: B-401 Contract Number: 06120048 Sheet: 11 of 13

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		CH						
					325			
					330	11+11+17 N = 28 REC = 0"		
					335			
337.0	SILT with fine to coarse sand, trace fine gravel and mica, contains sandy lean clay pockets, moist, dark brownish gray and blackish gray, moderate HCl reaction, silt exhibits fissility.	ML	-264.9					
					340	8+12+29 N = 41 REC = 8"	w=25.3% *	
345.0	SILTY SAND, fine to coarse grained, moist, dark brownish gray and blackish gay, moderate HCl reaction	SM	-272.9		345			
					350	REC = 7"	w=35.6% LL=52 PL=39 *	*Osterberg sampler tube push from 348.5 to 350.5 ft
					355			

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/29/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-401 installed at a nearby location.

Schnabel Engineering — TEST BORING LOG

Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland

Boring Number: B-401
Contract Number: 06120048
Sheet: 12 of 13

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	contains clayey sand pockets, trace mica, very weak HCl reaction	SM			360	30+50/5" N = 50/5" REC = 9"		
367.0	POORLY GRADED SAND WITH SILT, fine to medium grained, contains silty sand and lean clay pockets, trace mica, moist, dark brownish gray and blackish gray, very weak HCl reaction.	SP-SM	-294.9		370	16+25+44 N = 69 REC = 18"	w=36.9% *	**Resumed drilling at 7:00 AM on 6/28/06.
377.0	SILTY SAND, fine to medium grained, moist, dark brownish gray and blackish gray, trace mica, very weak HCl reaction.	SM	-304.9		380	16+21+36 N = 57 REC = 18"		
	fine to coarse grained, contains lean clay pockets, moist, dark brownish gray				385			

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/29/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-401 installed at a nearby location.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: **B-401** Contract Number: 06120048 Sheet: 13 of 13

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	and blackish gray, trace mica, very weak HCl reaction.	SM				12+20+32 N = 52 REC = 18"		
					390			
					395			**Resumed grouting at 7:00 AM on 6/29/06.
	fine to medium grained.				400	11+15+29 N = 44 REC = 18"	w=33.1% *	
401.5	BOTTOM OF BORING @ 401.5 FT.		-329.4					

Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/29/06.
3. * = See Appendix I for additional lab testing data.
4. Ground water observation well OW-401 installed at a nearby location.

Schnabel Engineering	TEST BORING LOG	**Project:** Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	**Boring Number:** B-404
			Contract Number: 06120048
			Sheet: 1 of 7

Boring Contractor: UNI-TECH DRILLING
MALAGA, NEW JERSEY

Boring Foreman: J. Blemings

Drilling Method: Mud Rotary

Drilling Equipment: CME-750 (ATV)

Schnabel Representative: B. Bradfield

Dates Started: 6/22/06 **Finished:** 6/27/06

Location: Northing: 216441.34 ft
Easting: 961596.49 ft

Ground Surface Elevation: 67.9 (feet)

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	6/22	---	30.0'	---	---
Start of day	6/23	---	27.5'	---	---

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	SILTY SAND, fine to coarse grained, moist, orangeish brown, trace fine rounded gravel, contains root fragments.	SM				1+2+2 N = 4 REC = 13"		1.5'- Mud rotary with 3 7/8" drag bit
2.0	SANDY SILT, fine to coarse, moist, orangeish brown and gray, contains decomposed root fragments.	ML	65.9			5+5+5 N = 10 REC = 8"		
4.5	LEAN CLAY with sand, moist, orangeish brown and gray, colors layered <1/2" thick.	CL	63.4		5	4+4+5 N = 9 REC = 12"		
7.0	FAT CLAY with sand, moist, gray and orangeish brown, colors layered 1/4" to 3/4" thick.	CH	60.9			2+2+2 N = 4 REC = 18"		
10.0	LEAN CLAY with sand, moist, gray, contains mica.	CL	57.9		10	3+3+5 N = 8 REC = 18"		
	With darker gray pockets up to 1" thick.				15	4+5+6 N = 11 REC = 18"		
					20	3+6+7 N = 13 REC = 18"		
22.0	CLAYEY SAND, fine to medium grained, moist, dark gray, contains mica.	SC	45.9		25	3+4+7 N = 11 REC = 18"		

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Comments:
1. Boring backfilled with cement/bentonite grout via tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/27/06.
3. * = See Appendix I for additional lab testing data.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant Calvert County, Maryland	Boring Number: **B-404** Contract Number: 06120048 Sheet: 2 of 7

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		SC						
27.5	POORLY GRADED SAND, fine to medium grained, wet, orange and yellowish brown, trace silt.	SP	40.4					29-30'- Harder drilling
				∇	30	40+50/3" N = 50/3" REC = 8"		
	None silt, with gray clay lenses <1/4" thick.					21+50/5" N = 50/5" REC = 10"		
					35			
						WOH/18" N = WOH/18" REC = 2"		
39.9	CLAYEY SAND, fine to medium grained, moist, gray.	SC	28.0		40			
43.0	SILTY SAND, fine to coarse grained, wet, light gray and brownish white, 20-30% cemented sand, 30-40% fine to coarse shell fragments.	SM	24.9					
					45	48+32+29 N = 61 REC = 18"		
47.5	POORLY GRADED SAND WITH SILT, fine to medium grained, wet, gray and brownish white, 20-30% fine to medium shell fragments, moderate HCl reaction, HCl reaction localized to shell fragments.	SP-SM	20.4			4+4+5 N = 9 REC = 18"		
					50			
	20-30% fine to medium shell fragments, strong HCl reaction.					REC = 18"	w=27.7% LL=NP PL=NP *	52'- Shelby tube pushed
	10-20% fine to medium shell fragments, HCl reaction localized to shell fragments.					5+10+10 N = 20 REC = 18"		
					55			
57.5	SILTY SAND, fine to medium grained,	SM	10.4					

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Comments:
1. Boring backfilled with cement/bentonite grout via tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/27/06.
3. * = See Appendix I for additional lab testing data.

TEST BORING LOG — Schnabel Engineering

Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland

Boring Number: B-404
Contract Number: 06120048
Sheet: 3 of 7

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	wet, dark gray, 0-10% fine to medium shell fragments, weak HCl reaction.	SM			60	4+5+7 N = 12 REC = 18"		
62.5	CLAYEY SAND, fine to medium grained, wet, dark gray, 0-10% fine to medium shell fragments, weak HCl reaction, HCl reaction localized to shell fragments.	SC	5.4		65	2+3+4 N = 7 REC = 18"		
	Gray and brownish white, 20-30% fine to medium shell fragments, strong HCl reaction.					REC = 18"		66'- Shelby tube pushed
	Wet, dark gray and brownish white, 30-40% fine to medium shell fragments, strong HCl reaction.				70	10+14+13 N = 27 REC = 18"		68.5'- Start of day 6/23/06
	20-30% fine to medium shell fragments, 10-20% cemented sand, strong HCl reaction, cemented sand fragments <3/4" in diameter.				75	4+19+21 N = 40 REC = 13"		
77.5	SILTY SAND, fine to medium grained, wet, dark gray, 0-10% fine to medium shell fragments, weak HCl reaction.	SM	-9.6		80	6+7+10 N = 17 REC = 15"		
	greenish gray and brownish white, 20-30% fine to medium shell fragments, strong HCl reaction.				85	REC = 17"	w=32.2% LL=53 PL=28 *	83.5'- Shelby tube pushed
87.5	SILTY SAND, fine to medium grained, wet, greenish gray and dark gray, 0-10% fine to medium shell fragments, weak HCl reaction.	SM	-19.6		90	5+8+11 N = 19		

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Comments:
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2. Downhole geophysical logging performed on 6/27/06.
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Schnabel Engineering

TEST BORING LOG

Project: Calvert Cliffs Nuclear Power Plant
Calvert County, Maryland

Boring Number: **B-404**
Contract Number: 06120048
Sheet: 4 of 7

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		SM				REC = 18"		
92.5	SANDY ELASTIC SILT, fine to medium, moist, greenish gray, 0-10% fine to medium shell fragments, contains mica, weak HCl reaction.	MH	-24.6		95	6+9+10 N = 19 REC = 18"		
97.5	SILTY SAND, fine to medium grained, wet, greenish gray, 0-10% fine to medium shell fragments, contains mica, weak HCl reaction.	SM	-29.6		100	4+9+12 N = 21 REC = 18"		
103.0	CLAYEY SAND, fine to medium grained, moist, greenish gray and brownish white, 30-40% fine to medium shell fragments, contains mica, strong HCl reaction, shell fragments decomposed and fractured.	SC	-35.1		105	7+12+15 N = 27 REC = 18"		
107.5	FINE TO MEDIUM SANDY ELASTIC SILT, moist, greenish gray, 10-20% fine to medium shell fragments, contains mica, moderate HCl reaction, shell fragments decomposed.	MH	-39.6		110	4+6+10 N = 16 REC = 18"		
	0-10% fine to medium shell fragments, weak HCl reaction, shell fragments decomposed.				115	5+7+10 N = 17 REC = 18"		
117.5	SANDY SILT, fine to medium, moist, greenish gray, 0-10% fine to medium shell fragments, contains mica, weak HCl reaction, HCl reaction localized to shell fragments.	ML	-49.6		120	5+8+10 N = 18 REC = 18"		
						5+5+7		

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Comments:
1. Boring backfilled with cement/bentonite grout via tremie pipe upon completion.
2. Downhole geophysical logging performed on 6/27/06.
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Schnabel Engineering

TEST BORING LOG

Project: Calvert Cliffs Nuclear Power Plant
Calvert County, Maryland

Boring Number: **B-409**
Contract Number: 06120048
Sheet: 2 of 5

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	fine to medium grained, moist, orange, small 1/16" clay layers.	SP-SC				15+26+28 N = 54 REC = 18"		
27.0	POORLY GRADED SAND, fine to medium grained, moist, orange.	SP	34.6			38+50/5" N = 50/5" REC = 11"		
29.0	POORLY GRADED SAND with silt, fine to medium grained, moist, gray	SP-SM	32.6		30	18+50/5" N = 50/5" REC = 11"		
						30+40+40 N = 80 REC = 18"		
					35		w=23.3% LL=NP PL=NP *	pitcher sample pushed
37.0	CLAYEY SAND, fine to medium grained, moist, gray, contains cemented sand, with fine to coarse shell fragments, 10% shell frag, gray colored.	SC	24.6			3+26+6 N = 32 REC = 12"		
	wet, grayish green.				40	WOH+WOR +WOR N = WOR REC = 18"		
	contains cemented sand.					3+38+28 N = 66 REC = 18"		43' cemented layer, grinding
44.5	SILTY SAND, fine to medium grained, moist, green, with fine to coarse shell fragments, contains cemented sand, strong HCl reaction, 20-30% shell frag.	SM	17.1		45	5+6+6 N = 12 REC = 18"		
						4+5+5 N = 10 REC = 18"		
					50	REC = 24"		tube pushed
						4+5+5 N = 10 REC = 18"		
54.5	POORLY GRADED SAND WITH SILT, fine to medium grained, moist, green, strong HCl reaction, 10-20% shell frag.	SP-SM	7.1		55	4+5+6 N = 11 REC = 18"		
	weak HCl reaction.					4+3+5		

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. * = See Appendix I for additional lab testing data.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: **B-409**
			Contract Number: 06120048
			Sheet: 3 of 5

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		SP-SM				N = 8 REC = 18"		
59.5	SILTY SAND, fine to medium grained, moist, green, with fine to coarse shell fragments, strong HCl reaction, 10-20% shell frag.	SM	2.1		60	2+3+2 N = 5 REC = 18"		
	contains fine to coarse shell fragments, moderate HCl reaction.					REC = 24"		tube pushed
	with fine to coarse shell fragments, strong HCl reaction, 30-40% shell frag.				65	3+6+9 N = 15 REC = 18"		
67.0	CLAYEY SAND, fine to medium grained, moist, green and white, contains cemented sand, with fine to coarse shell fragments, strong HCl reaction, 70-80% shell frag.	SC	-5.5			8+14+16 N = 30 REC = 18"		
69.5	WELL GRADED SAND WITH CLAY, fine to medium grained, wet, green and white, with fine to coarse shell fragments, strong HCl reaction, 70-90% shell frag.	SW-SC	-8.0		70	11+6+12 N = 18 REC = 18"		
	moist, green, with silt, with fine to coarse shell fragments, strong HCl reaction, 60-80% shell frag.					7+29+45 N = 74 REC = 18"		
74.5	SILTY SAND, fine to medium grained, moist, green, trace fine to coarse shell fragments, moderate HCl reaction, 0-10% shell frag.	SM	-13.0		75	5+7+13 N = 20 REC = 18"		
	with fine to coarse shell fragments, strong HCl reaction, 20-30% shell frag.					5+7+9 N = 16 REC = 18"		79' start of day 6/23/06
					80	5+7+10 N = 17 REC = 18"		
						7+8+11 N = 19 REC = 18"		
	trace fine to medium shell fragments, moderate HCl reaction, 0-10% shell frag.				85	4+5+7 N = 12 REC = 18"		
	with fine to coarse shell fragments, strong HCl reaction, 10-20% shell frag.					4+5+8 N = 13 REC = 18"		
89.5	SANDY SILT, fine to medium, moist, green, trace fine to medium shell fragments, moderate HCl reaction,	ML	-28.0		90	5+7+9 N = 16		

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. * = See Appendix I for additional lab testing data.

Schnabel Engineering — **TEST BORING LOG**

Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland

Boring Number: B-409
Contract Number: 06120048
Sheet: 4 of 5

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	0-10% shell frag.	ML				REC = 18"		
92.0	SILTY SAND, fine to medium grained, moist, green, trace fine to medium shell fragments, moderate HCl reaction, 0-10% shell frag.	SM	-30.5			5+6+6 N = 12 REC = 18"		
	contains fine to medium shell fragments, greenish gray				95	REC = 19"	w=33.1% LL=61 PL=42 *	95' tube pushed
97.0	SILTY SAND, fine to medium grained, moist, green, with fine to coarse shell fragments, strong HCl reaction, 10-20% shell frag.	SM	-35.5			4+6+5 N = 11 REC = 18"		
	30-50% shell frag.				100	2+5+6 N = 11 REC = 18"		
102.0	CLAYEY SAND, fine to medium grained, moist, green, with fine to coarse shell fragments, strong HCl reaction, 50-60% shell frag.	SC	-40.5			8+10+8 N = 18 REC = 18"		
104.5	SANDY SILT, fine to medium, moist, green, with fine to coarse shell fragments, strong HCl reaction, 10-20% shell frag.	ML	-43.0		105	4+5+8 N = 13 REC = 18"		105' start of day 6/26/06
	oliveish green, trace fine to coarse shell fragments, weak HCl reaction, 0-5% shell frag.					4+6+6 N = 12 REC = 18"		
	moderate HCl reaction, 0-10% shell frag.				110	5+6+7 N = 13 REC = 18"		
	with sand.					5+6+8 N = 14 REC = 18"		
114.5	ELASTIC SILT, moist, oliveish green, trace fine to medium shell fragments, weak HCl reaction, 0-10% shell frag.	MH	-53.0		115	6+6+9 N = 15 REC = 18"		
117.0	SANDY SILT, fine to medium, moist, oliveish green, trace fine to coarse shell fragments, moderate HCl reaction, 0-10% shell frag.	ML	-55.5			4+6+8 N = 14 REC = 18"		
	with fine to coarse shell fragments, strong HCl reaction, 10-25% shell frag.				120	4+5+5 N = 10 REC = 18"		
122.0	ELASTIC SILT, moist, oliveish green, trace fine to medium shell fragments, with sand, weak HCl reaction, 0-5% shell frag.	MH	-60.5			4+5+7 N = 12 REC = 18"		

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
2. * = See Appendix I for additional lab testing data.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant Calvert County, Maryland	Boring Number: **B-409** Contract Number: 06120048 Sheet: 5 of 5

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		MH						
	no shells.				125	5+5+7 N = 12 REC = 18"		
	with clay.					4+5+6 N = 11 REC = 18"		
					130	5+5+7 N = 12 REC = 18"		130' start of day 6/27/06
						6+7+9 N = 16 REC = 18"		
					135	5+6+9 N = 15 REC = 18"		
						REC = 18"	PP=4.00 tsf	137.5' tube pushed
					140	5+6+8 N = 14 REC = 18"		
						5+6+8 N = 14 REC = 18"		
					145	4+6+7 N = 13 REC = 18"		
147.5	LEAN CLAY, moist, oliveish green, with silt.	CL	-86.0					
						7+8+10 N = 18 REC = 18"		
150.0	BOTTOM OF BORING @ 150.0 FT.		-88.5		150			

Comments:
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2. * = See Appendix I for additional lab testing data.

Schnabel Engineering	TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: B-437 Contract Number: 06120048 Sheet: 1 of 4

Boring Contractor: UNI-TECH DRILLING, MALAGA, NEW JERSEY

Boring Foreman: J. Evans

Drilling Method: Mud Rotary

Drilling Equipment: Failing-1500 (Truck)

Schnabel Representative: K. Megginson

Dates Started: 7/10/06 **Finished:** 7/11/06

Location: Northing: 216521.76 ft, Easting: 960968.8 ft

Ground Surface Elevation: 110.6 (feet)

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/10	---	18.5'	---	---
Start of day	7/11	---	20.0'	---	---

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.2	Rootmat and topsoil		110.4			3+3+6, N = 9, REC = 10"		
2.0	Silty Sand PROBABLE FILL fine to coarse grained, moist, brown, trace coarse gravel, contains root fragments and fine to coarse sandy fat clay layer from 0.2 to 0.4 ft.	FILL	108.6			2+2+1, N = 3, REC = 18"		
4.5	CLAYEY SAND, fine to coarse grained, moist, brown.	SC	106.1		5	WOH+1+1, N = 2, REC = 14"		
9.5	LEAN CLAY, moist, brown, trace fine to medium sand. trace organic matter (±1%).	CL	101.1			3+5+7, N = 12, REC = 18"		
12.0	CLAYEY SAND, fine to medium grained, moist, brown and light brown, trace organic matter (±1%), contains sandy lean clay pockets. brown and grayish brown below 11 ft.	SC	98.6		10	4+7+8, N = 15, REC = 18"		
	POORLY GRADED SAND, with silt, fine to coarse grained, moist, brown, trace fine gravel, contains clayey sand pockets.	SP-SM			15	REC = 23"	w=7.2% LL=NP PL=NP PP=NP tsf *	*Osterberg sampler tube push from 13.5 to 15.5 ft
	fine to medium grained, wet, brown. fine to coarse grained, moist, yellowish brown and dark reddish brown, contains strongly cemented sand pockets and lenses below 19 ft .			▽	20	7+17+12, N = 29, REC = 12"		*5.4" O.D. Drag bit from 0 to 18.5 ft. *Swtiched to 4-3/4" O.D. Drag bit below 18.5 ft.
	wet, contains clayey sand lenses.				25	5+5+8, N = 13, REC = 13"		

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
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TEST BORING LOG	Project: Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland	Boring Number: B-437
Schnabel Engineering		Contract Number: 06120048
		Sheet: 2 of 4

DEPTH (FT)	STRATA DESCRIPTION	CLASS.	ELEV. (FT)	WL	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		SP-SM						
	fine to medium grained, mottled light gray and yellowish brown.				30	2+1+1 N = 2 REC = 18"		
	brown, yellowish brown, and light gray.				35	7+12+12 N = 24 REC = 10"		
37.0	LEAN CLAY, wet, yellowish brown and light gray, trace fine to medium sand.	CL	73.6					
					40	1+3+6 N = 9 REC = 18"		
39.5	SILTY SAND, fine to medium grained, wet, stratified brown and orangeish brown.	SM	71.1					
42.0	LEAN CLAY, wet, light grayish brown and yellowish brown, trace fine to medium sand, contains cemented sand fragments, contains silty sand layer from 43.8 to 44 ft.	CL	68.6					
44.0	FAT CLAY, moist, gray, trace fine to medium sand and mica.	CH	66.6		45	4+4+5 N = 9 REC = 18"		
	gray and dark gray, contains silty sand pockets.				50	2+3+4 N = 7 REC = 18"		
	gray, contains silty sand layers from 54.1 to 54.2 ft and from 54.8 to 55 ft.				55	2+3+4 N = 7 REC = 18"		
57.0	ELASTIC SILT, moist, gray, trace fine sand and mica.	MH	53.6					

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Comments:
1. Boring backfilled with cement/bentonite grout through tremie pipe upon completion.
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