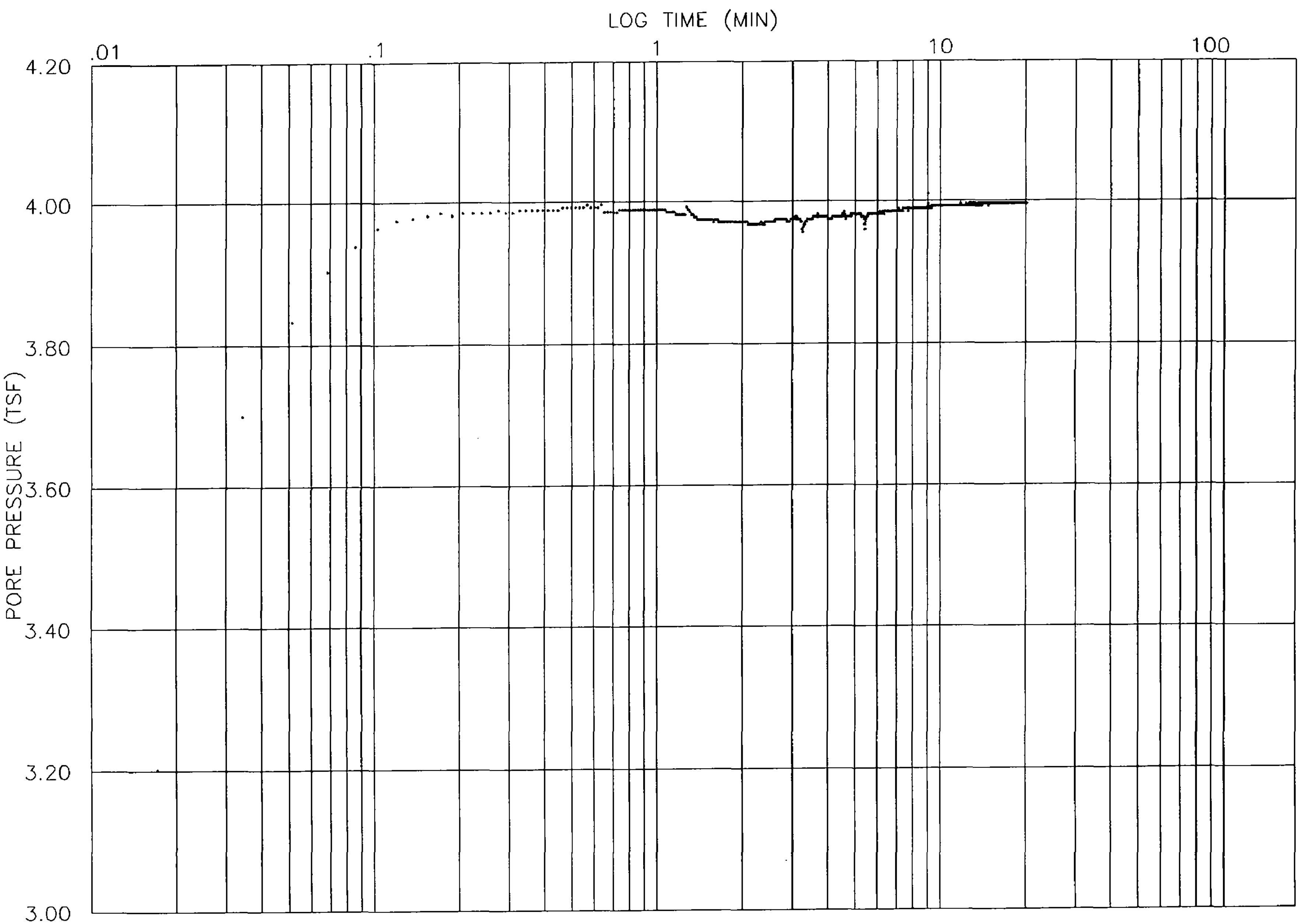
DISSIPATION PLOTS

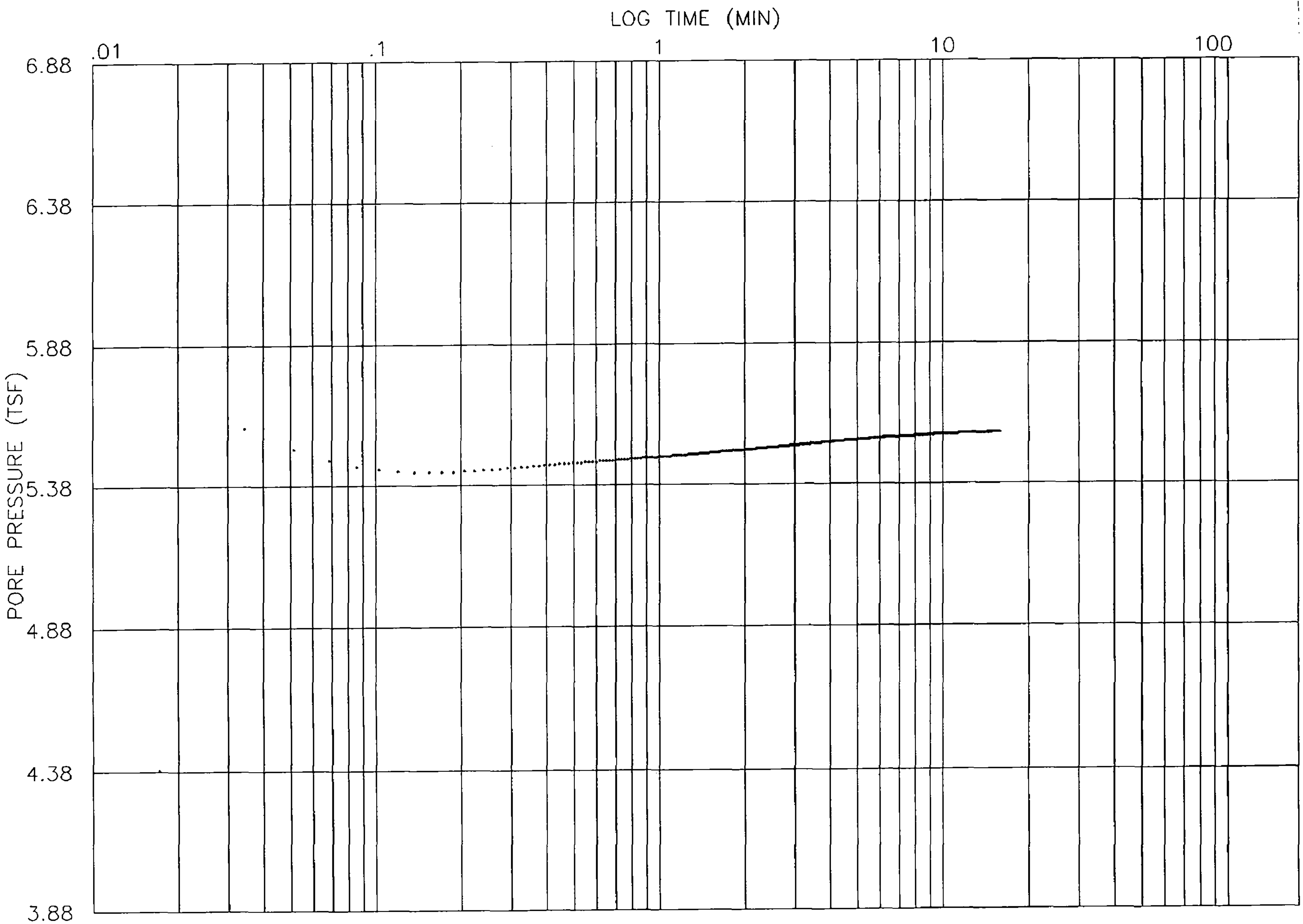


CPT NUMBER: C-601
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 125.9 FEET
DATE: 15-May-2008

FUGRO CONSULTANTS, INC.

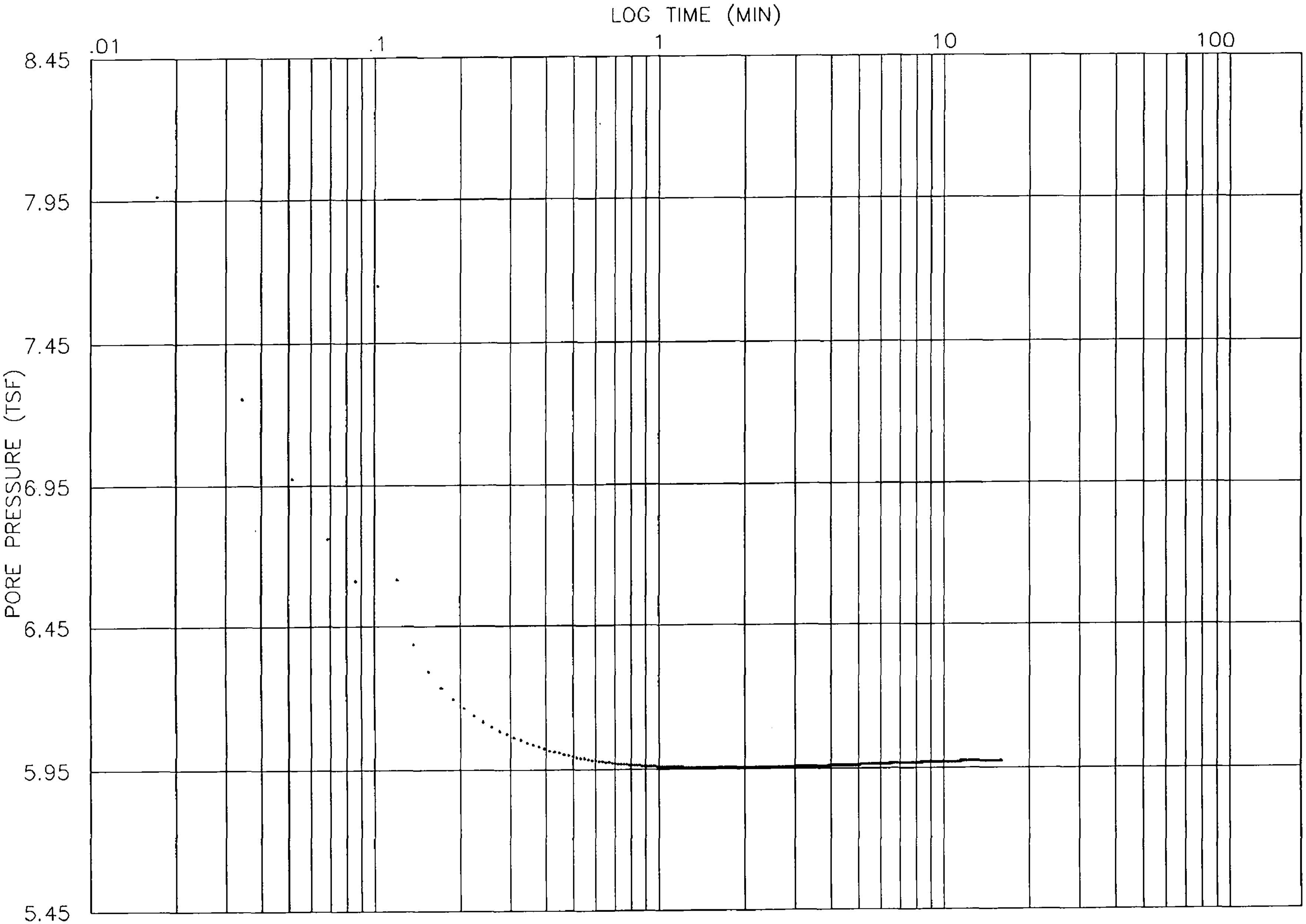


CPT NUMBER: C-601
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 175.1 FEET
DATE: 15-May-2008

FUGRO CONSULTANTS, INC.

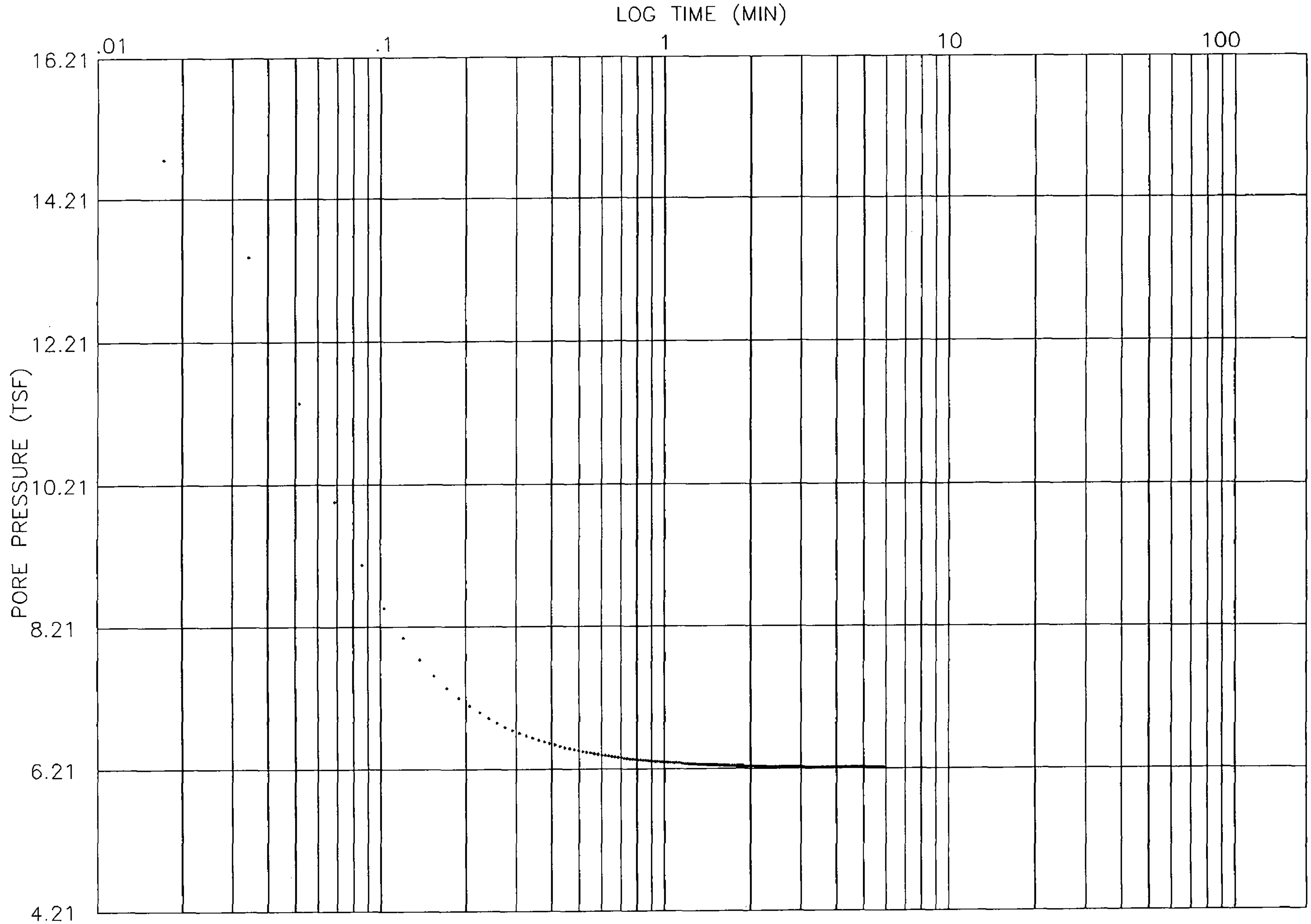


CPT NUMBER: C-601
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 187.7 FEET
DATE: 15-May-2008

FUGRO CONSULTANTS, INC.

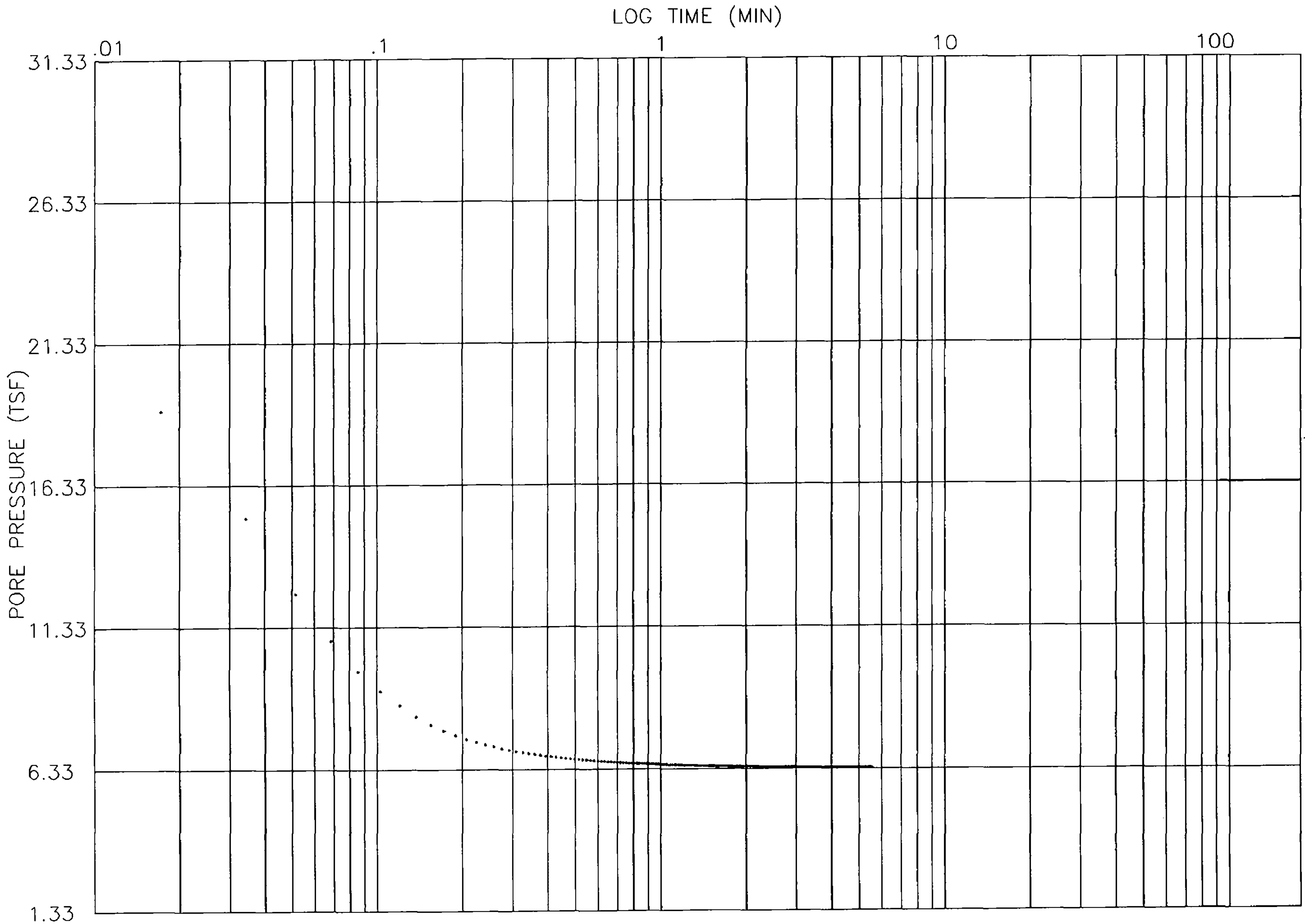


CPT NUMBER: C-601
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 195.2 FEET
DATE: 15-May-2008

FUGRO CONSULTANTS, INC.

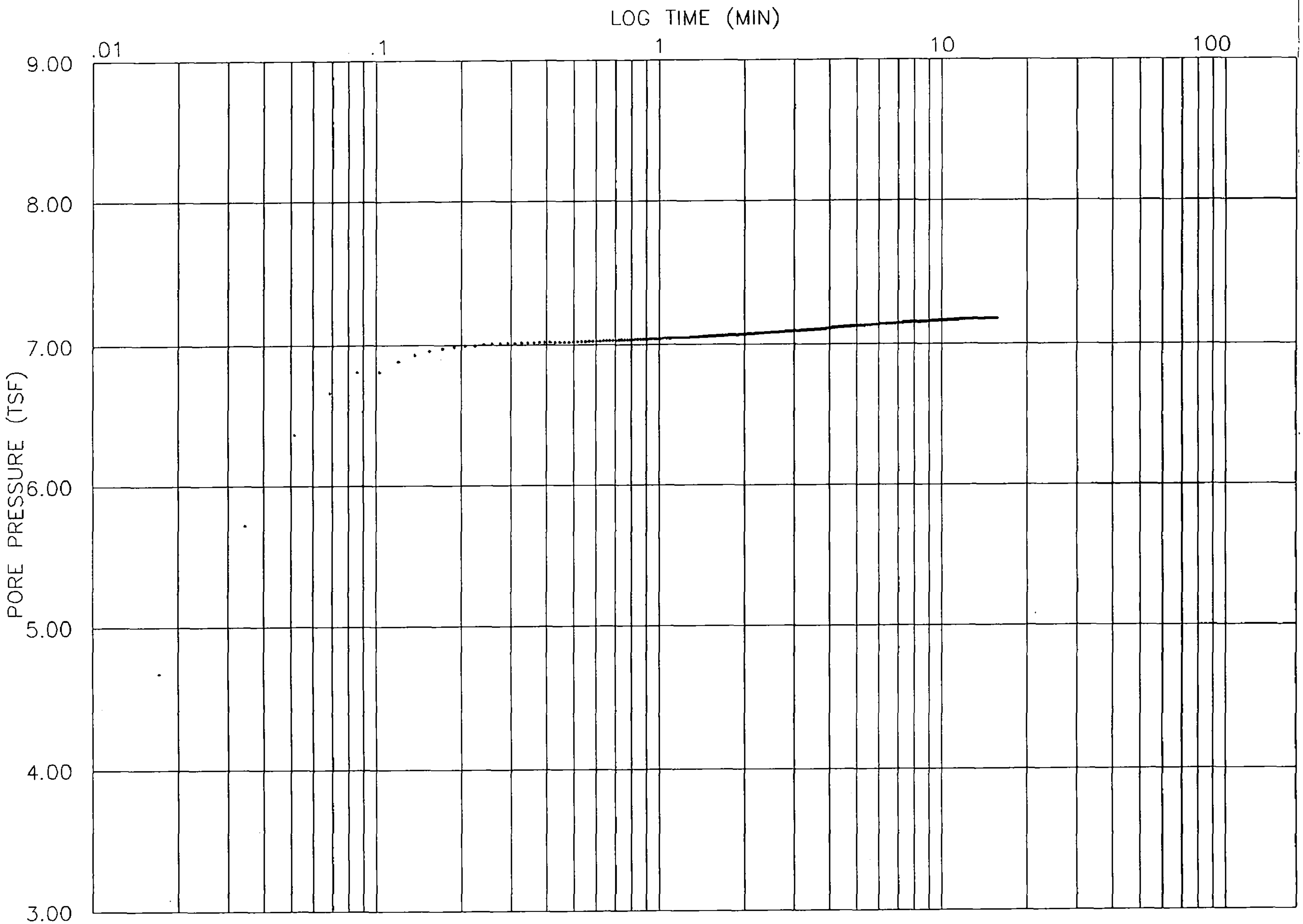


CPT NUMBER: C-601
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 198.7 FEET
DATE: 15-May-2008

FUGRO CONSULTANTS, INC.

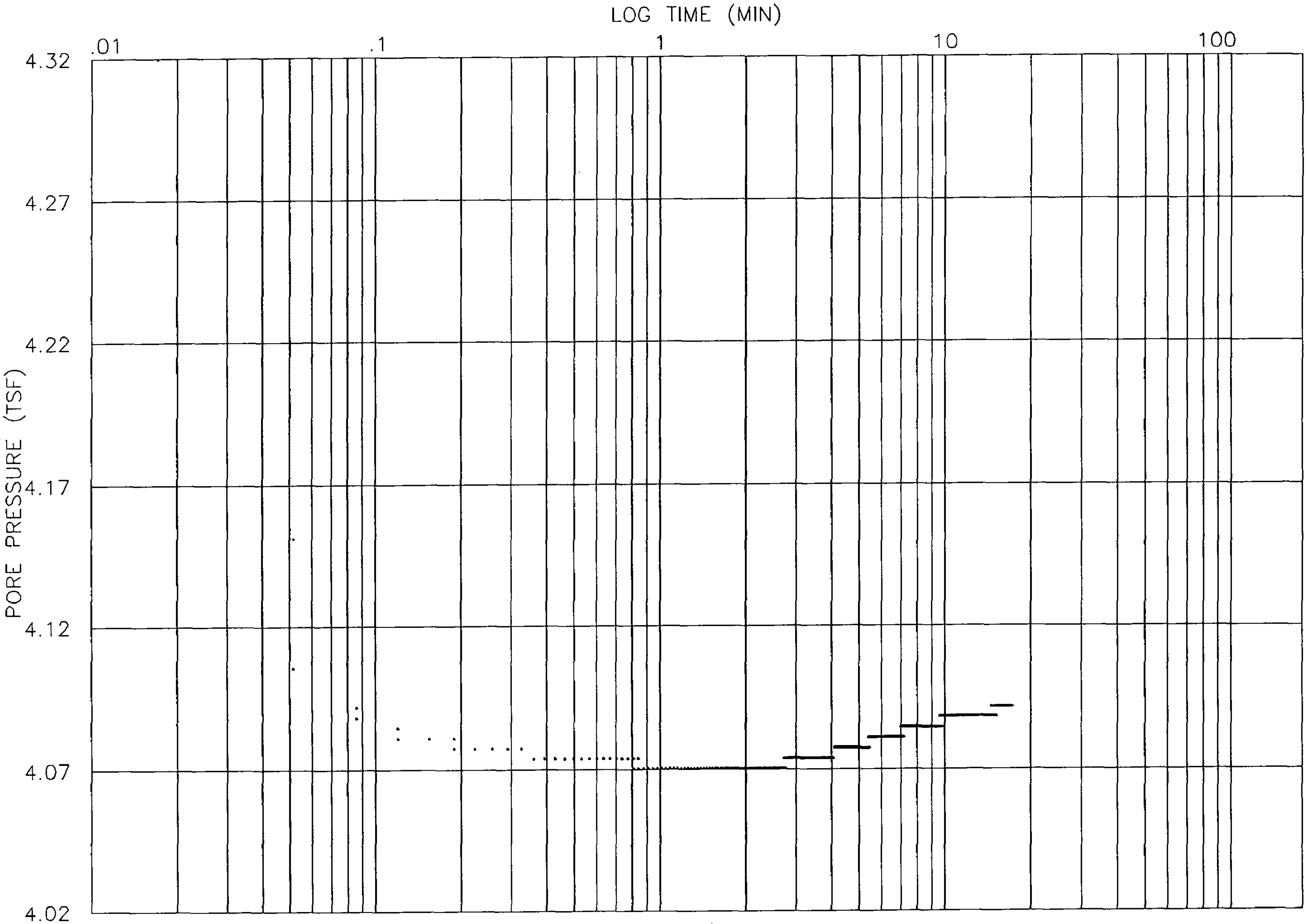


CPT NUMBER: C-601
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 226.3 FEET
DATE: 15-May-2008

FUGRO CONSULTANTS, INC.

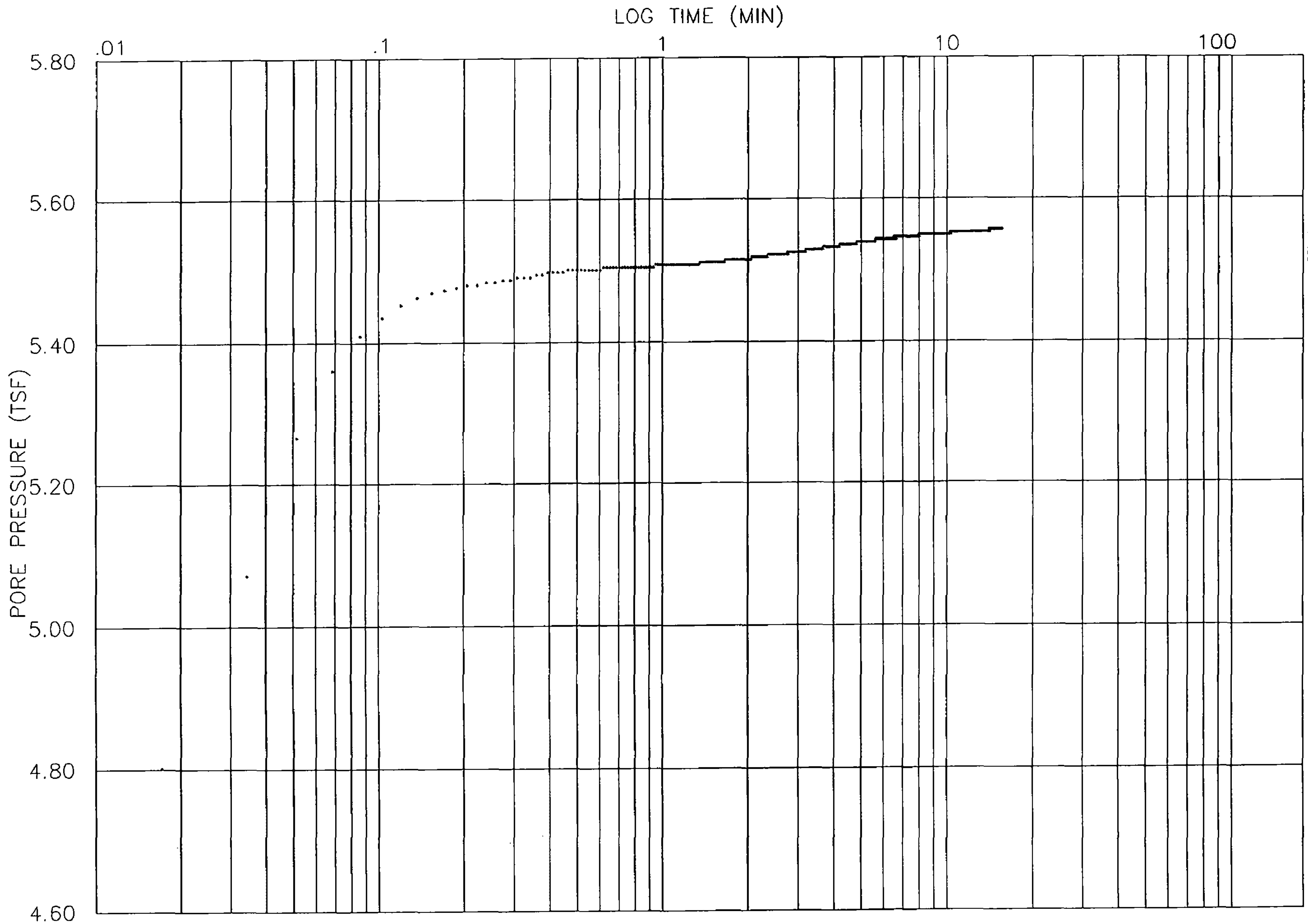


CPT NUMBER: C-602A
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 128.6 FEET
DATE: 17-May-2008

FUGRO CONSULTANTS, INC.

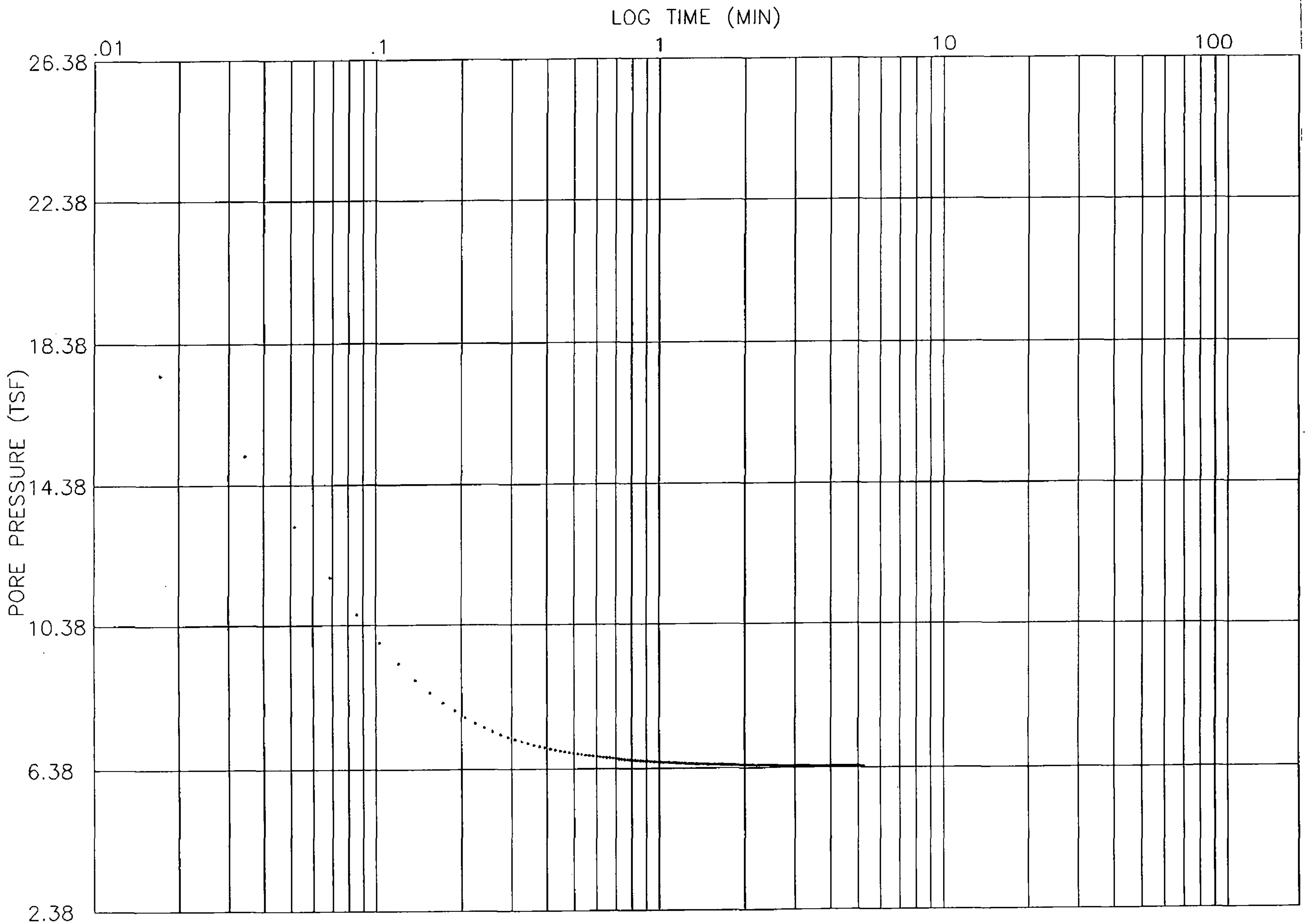


CPT NUMBER: C-602A
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 175.1 FEET
DATE: 17-May-2008

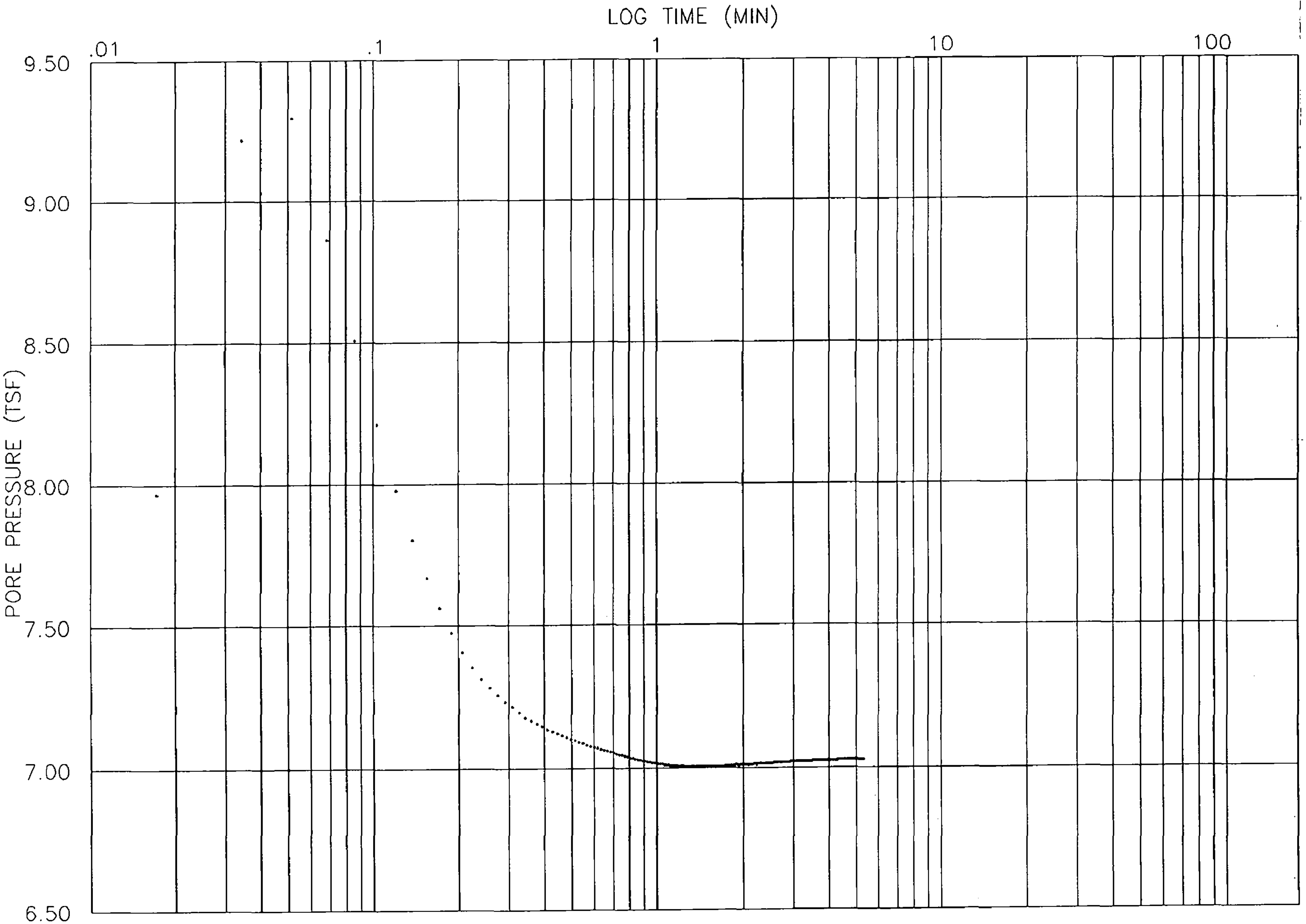
FUGRO CONSULTANTS, INC.



CPT NUMBER: C-602A
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 200.5 FEET
DATE: 17-May-2008

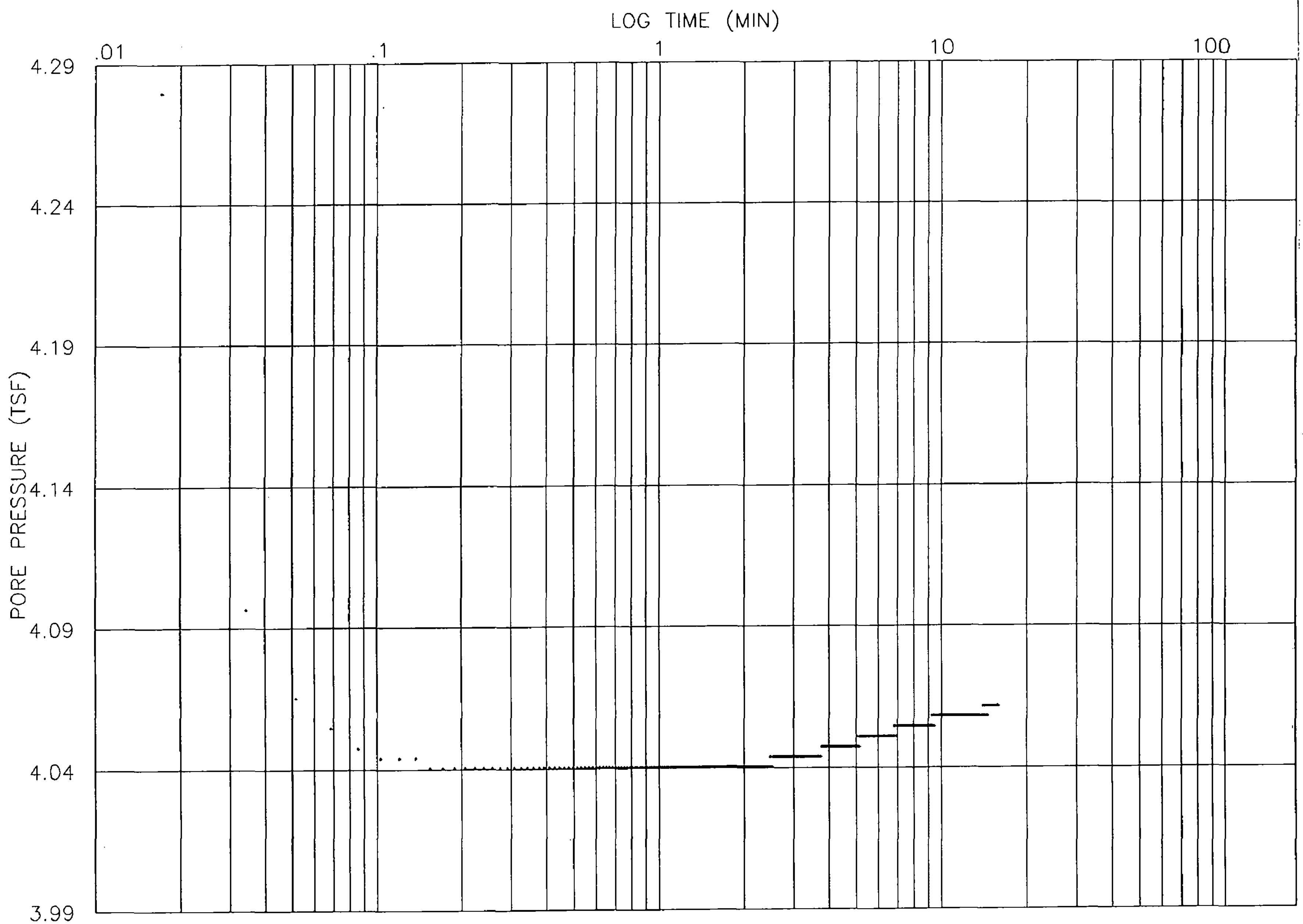


CPT NUMBER: C-602A
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 221.7 FEET
DATE: 17-May-2008

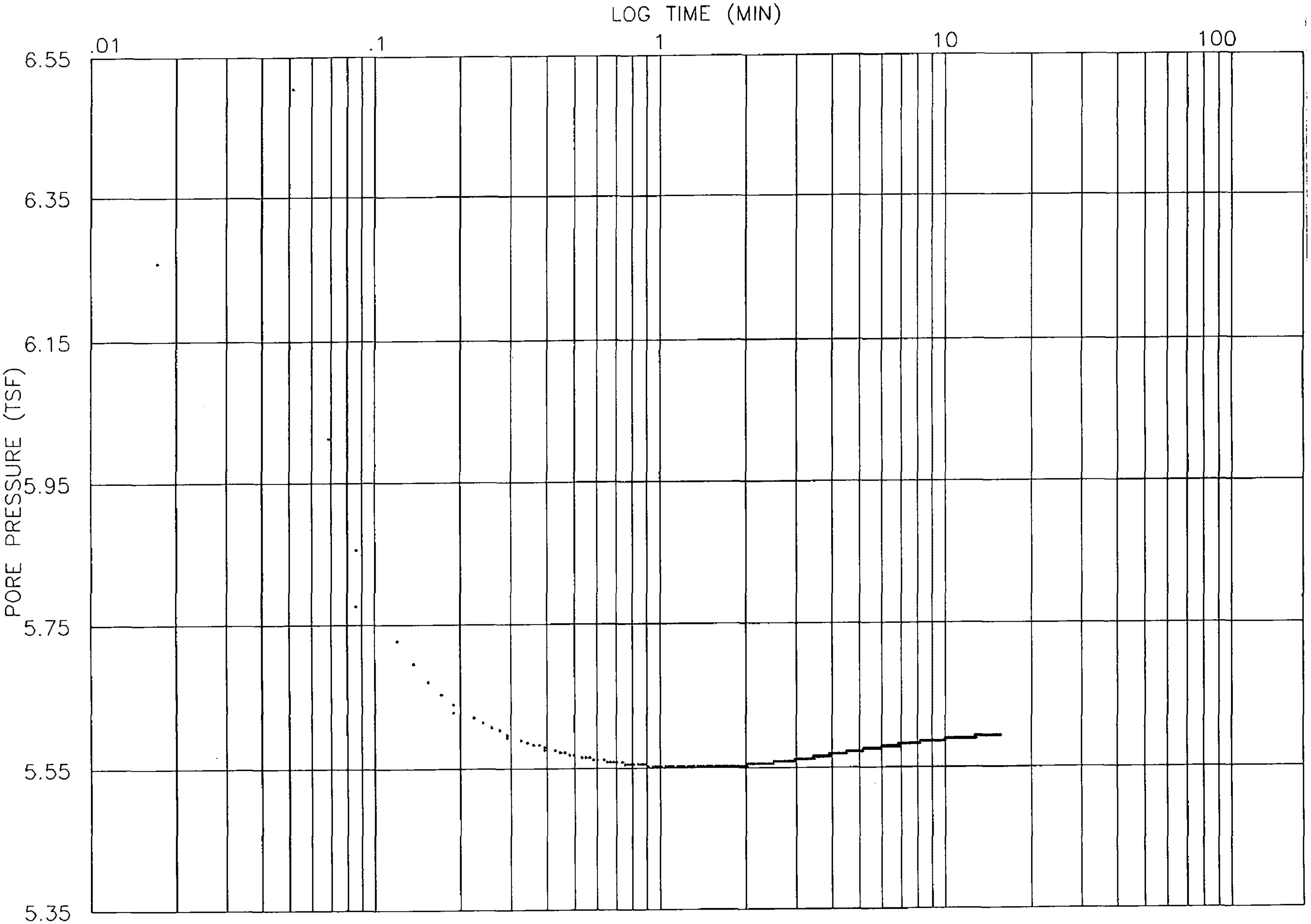
FUGRO CONSULTANTS, INC.



CPT NUMBER: C-701
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 127.1 FEET
DATE: 18-May-2008

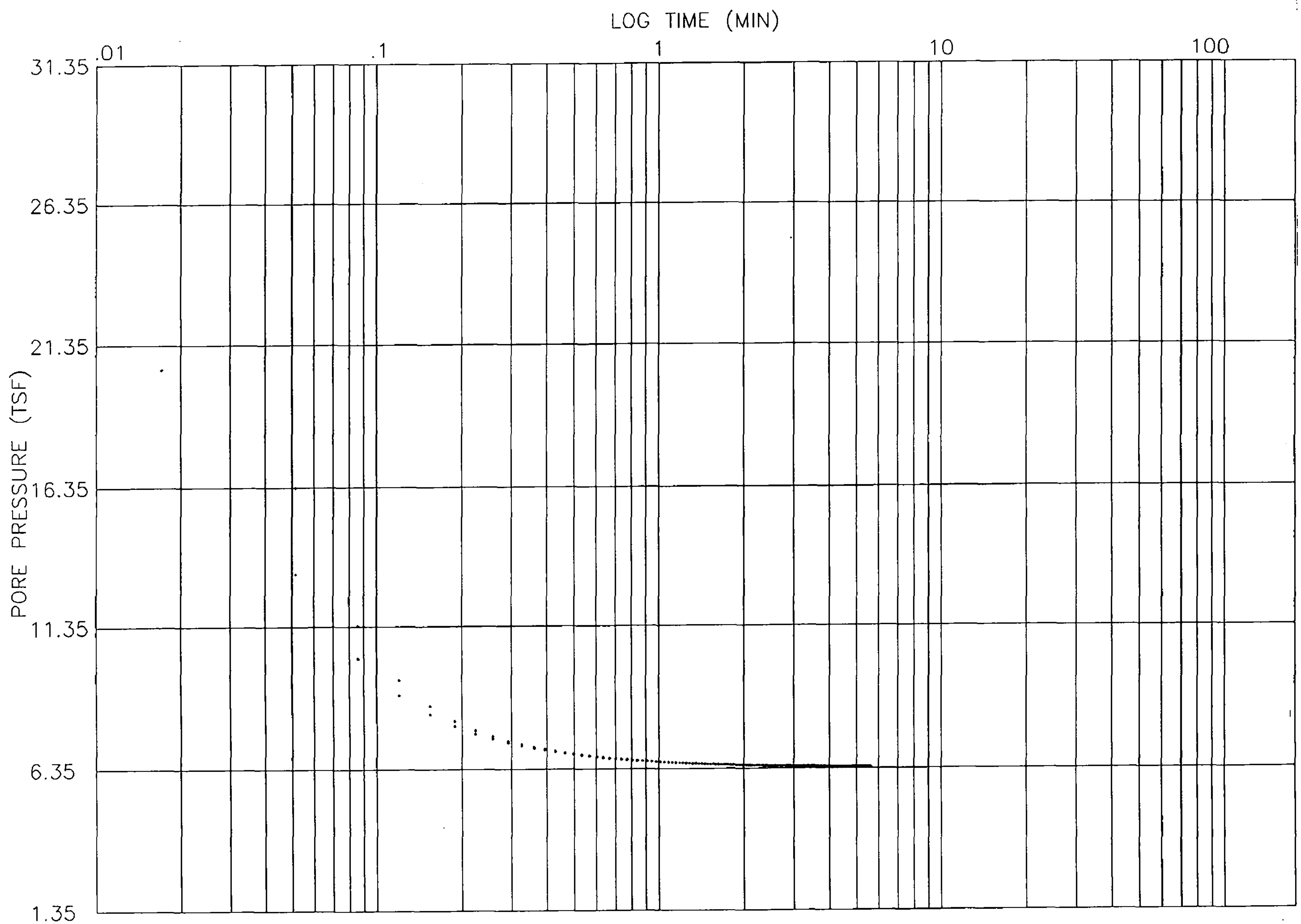


CPT NUMBER: C-701
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 175.1 FEET
DATE: 18-May-2008

FUGRO CONSULTANTS, INC.

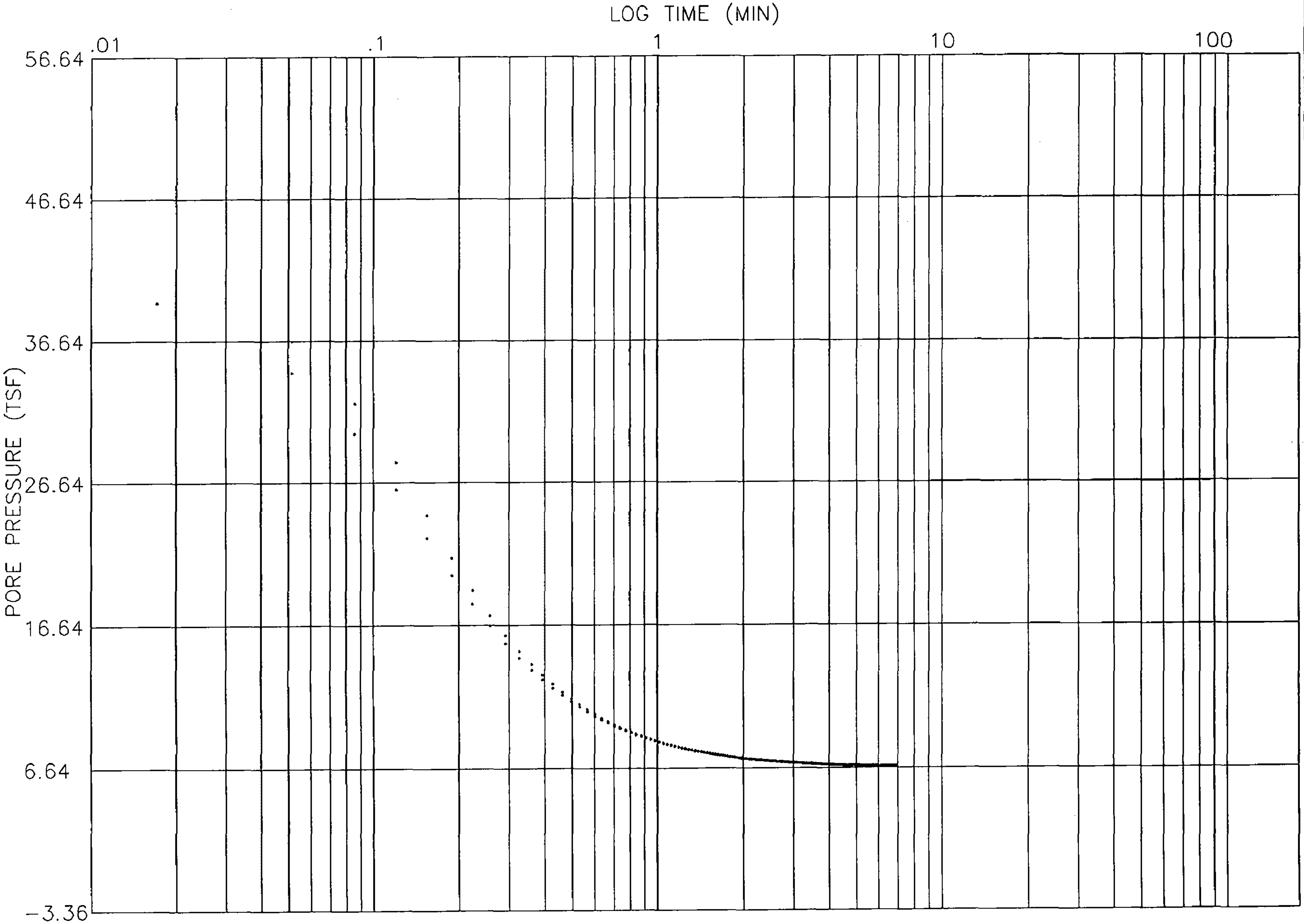


CPT NUMBER: C-701
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 198.3 FEET
DATE: 18-May-2008

FUGRO CONSULTANTS, INC.

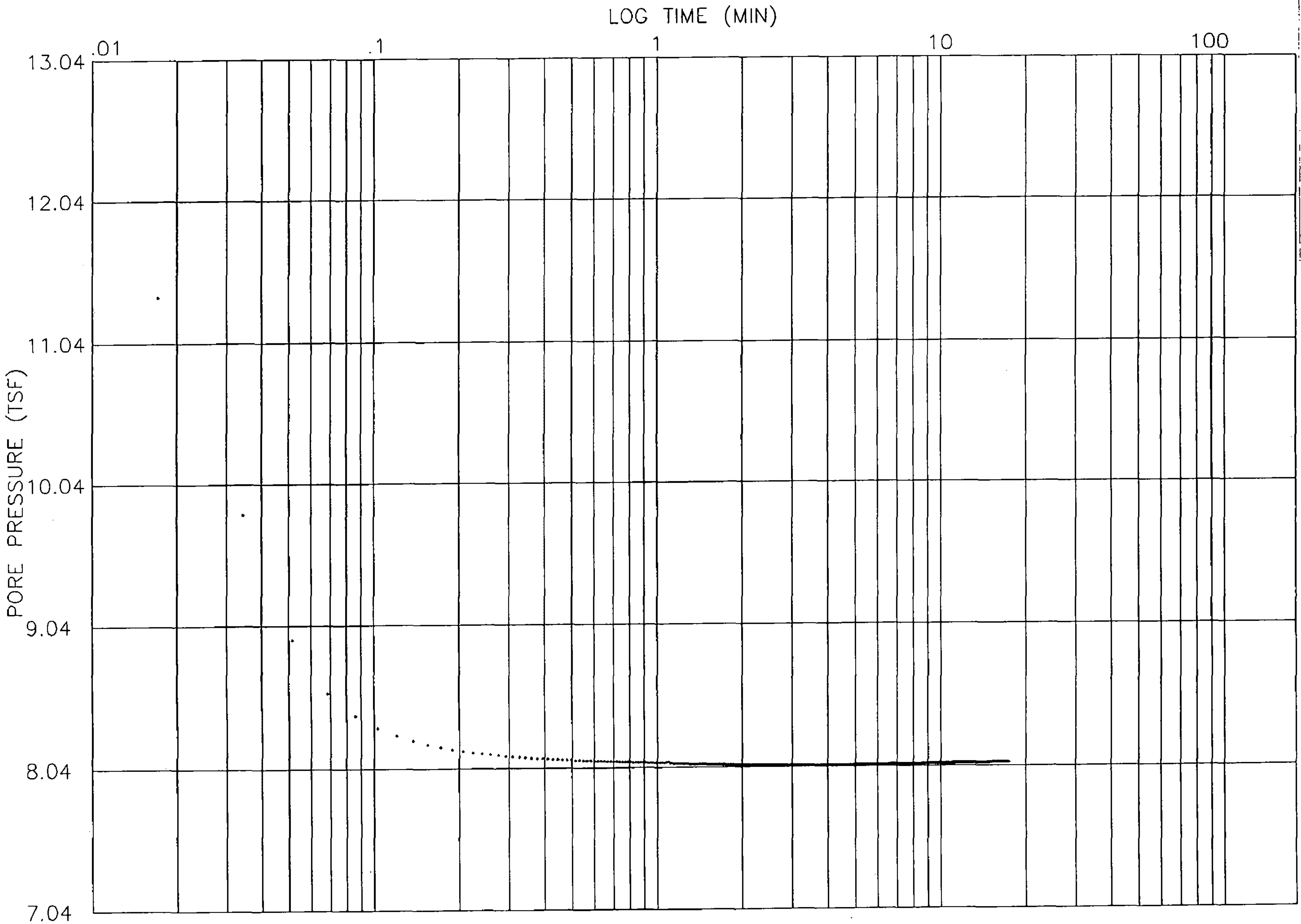


CPT NUMBER: C-701
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 204.1 FEET
DATE: 18-May-2008

FUGRO CONSULTANTS, INC.

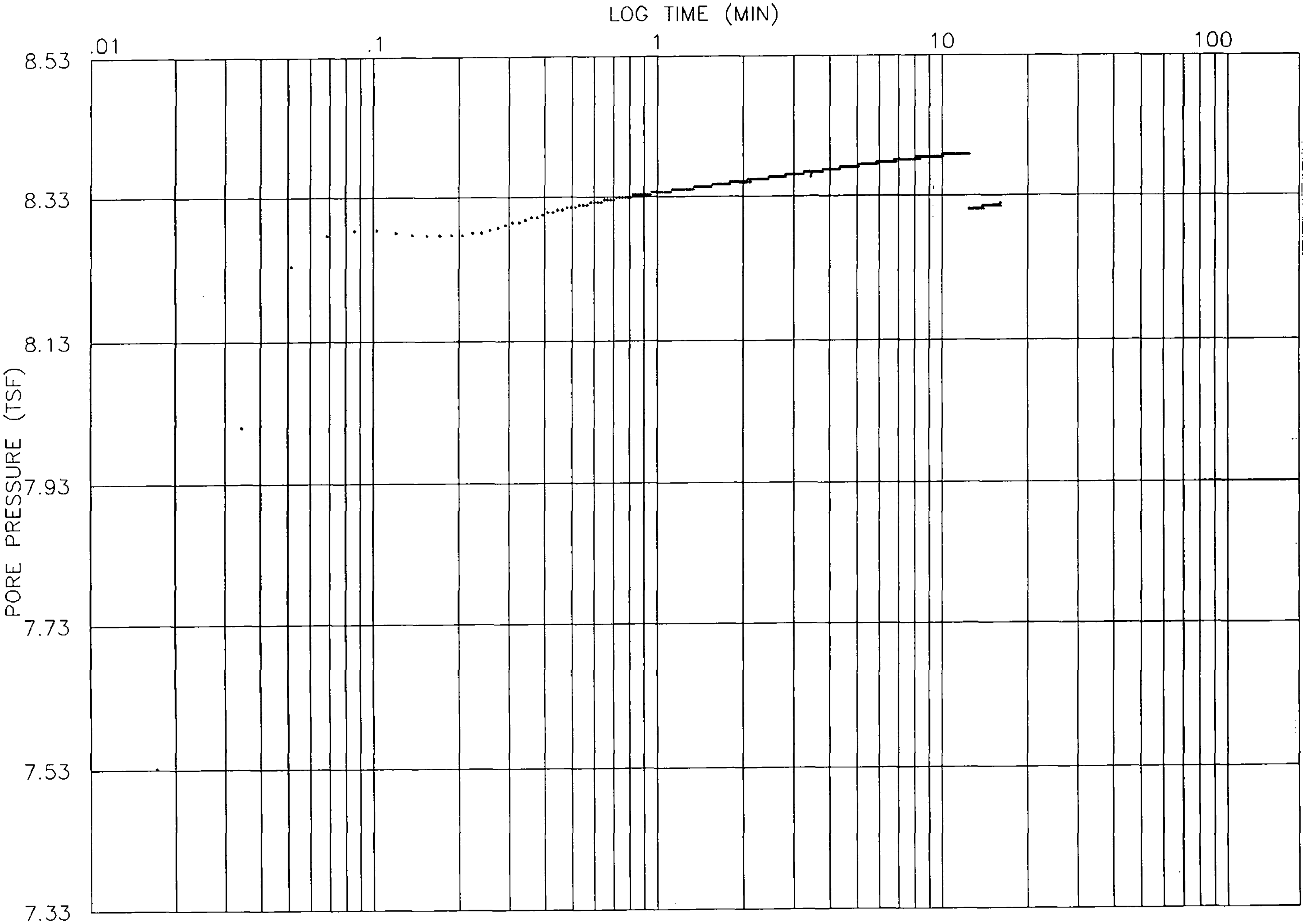


CPT NUMBER: C-701-3
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 252.4 FEET
DATE: 20-May-2008

FUGRO CONSULTANTS, INC.

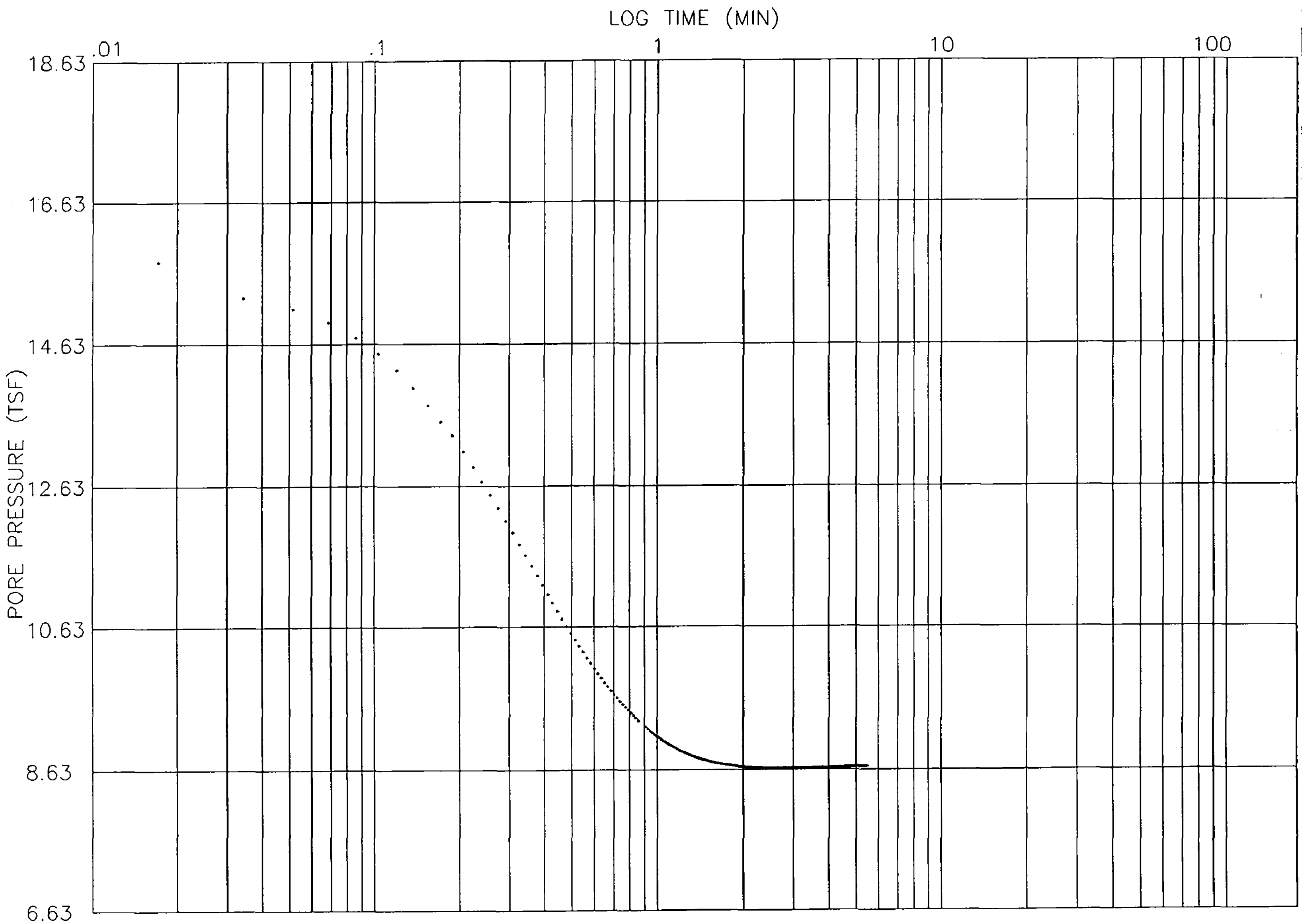


CPT NUMBER: C-701-3
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 261.7 FEET
DATE: 20-May-2008

FUGRO CONSULTANTS, INC.

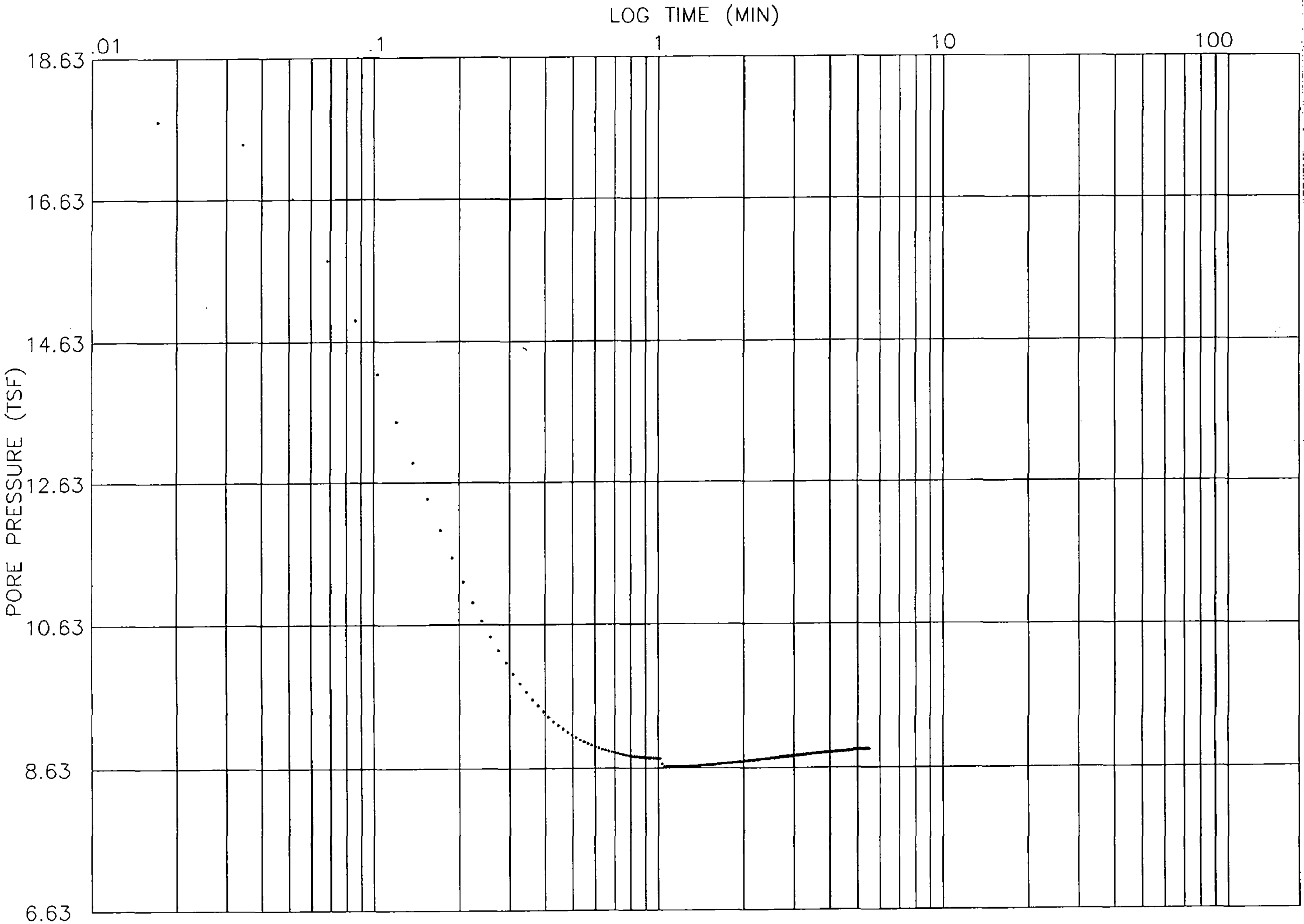


CPT NUMBER: C-701-3
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 273.1 FEET
DATE: 20-May-2008

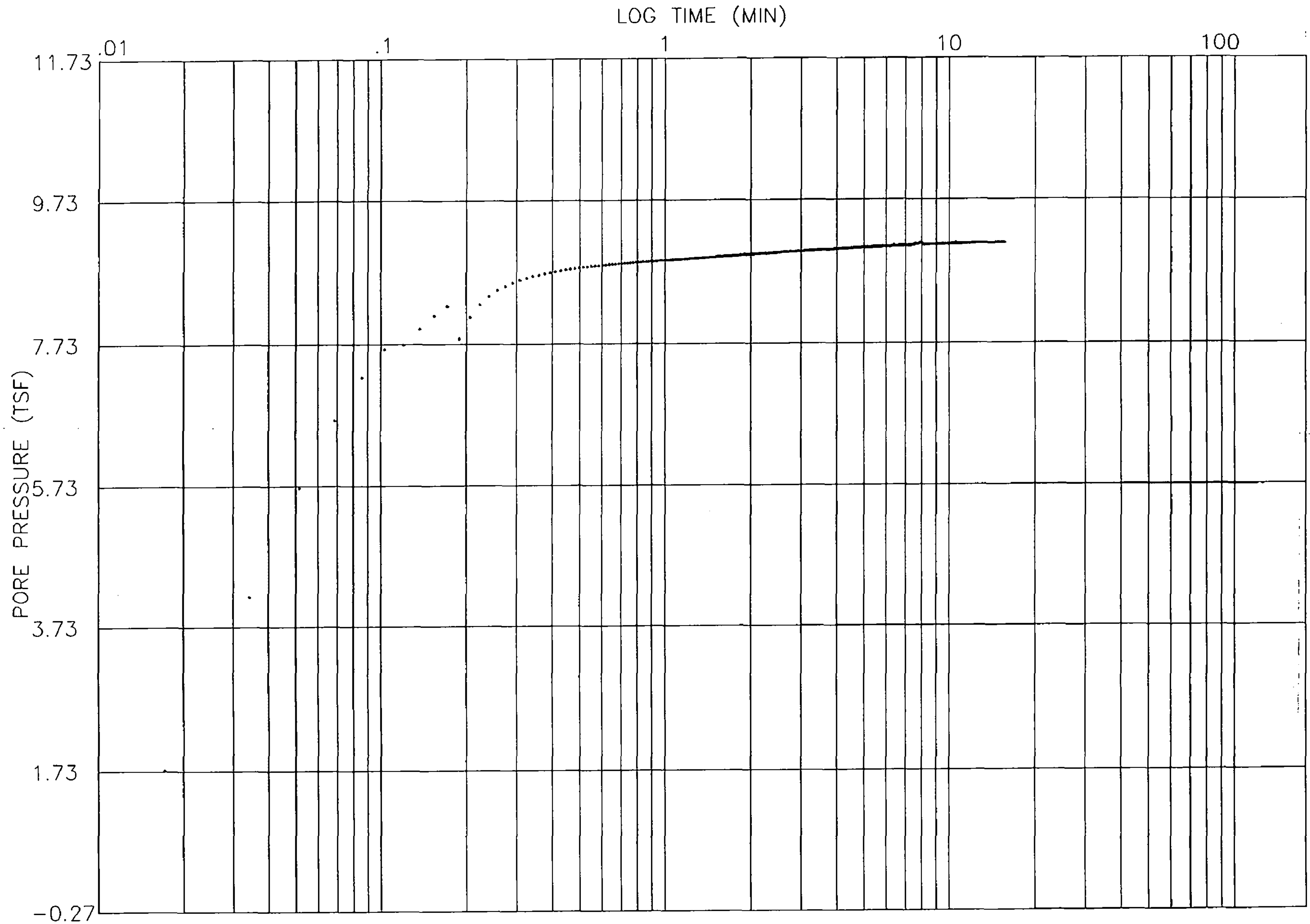
FUGRO CONSULTANTS, INC.



CPT NUMBER: C-701-3
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 283.5 FEET
DATE: 20-May-2008

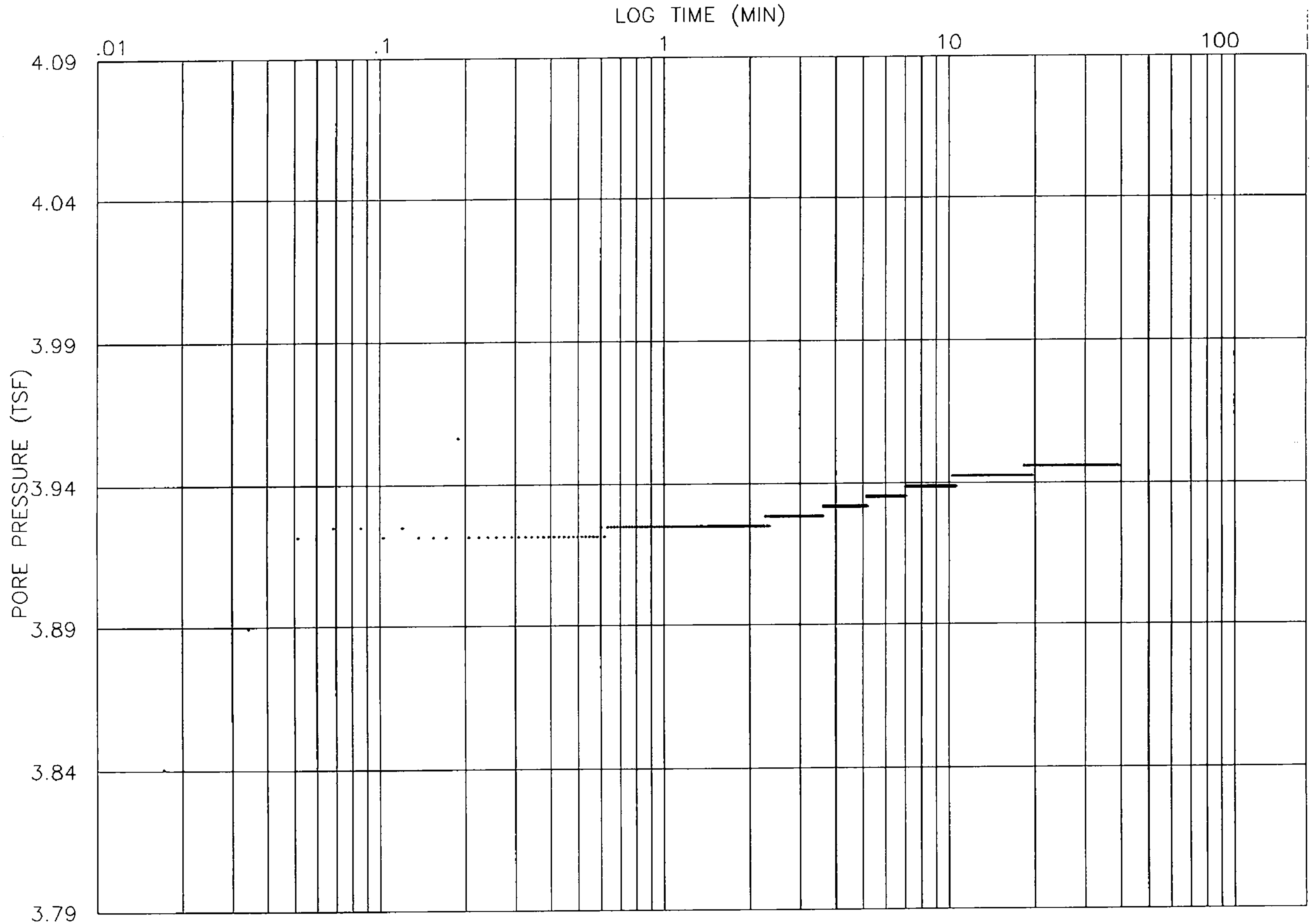


CPT NUMBER: C−701−3
JOB NUMBER: 04.1908−0029

DISSIPATION TEST

DEPTH: 289.1 FEET
DATE: 20−May−2008

FUGRO CONSULTANTS, INC.

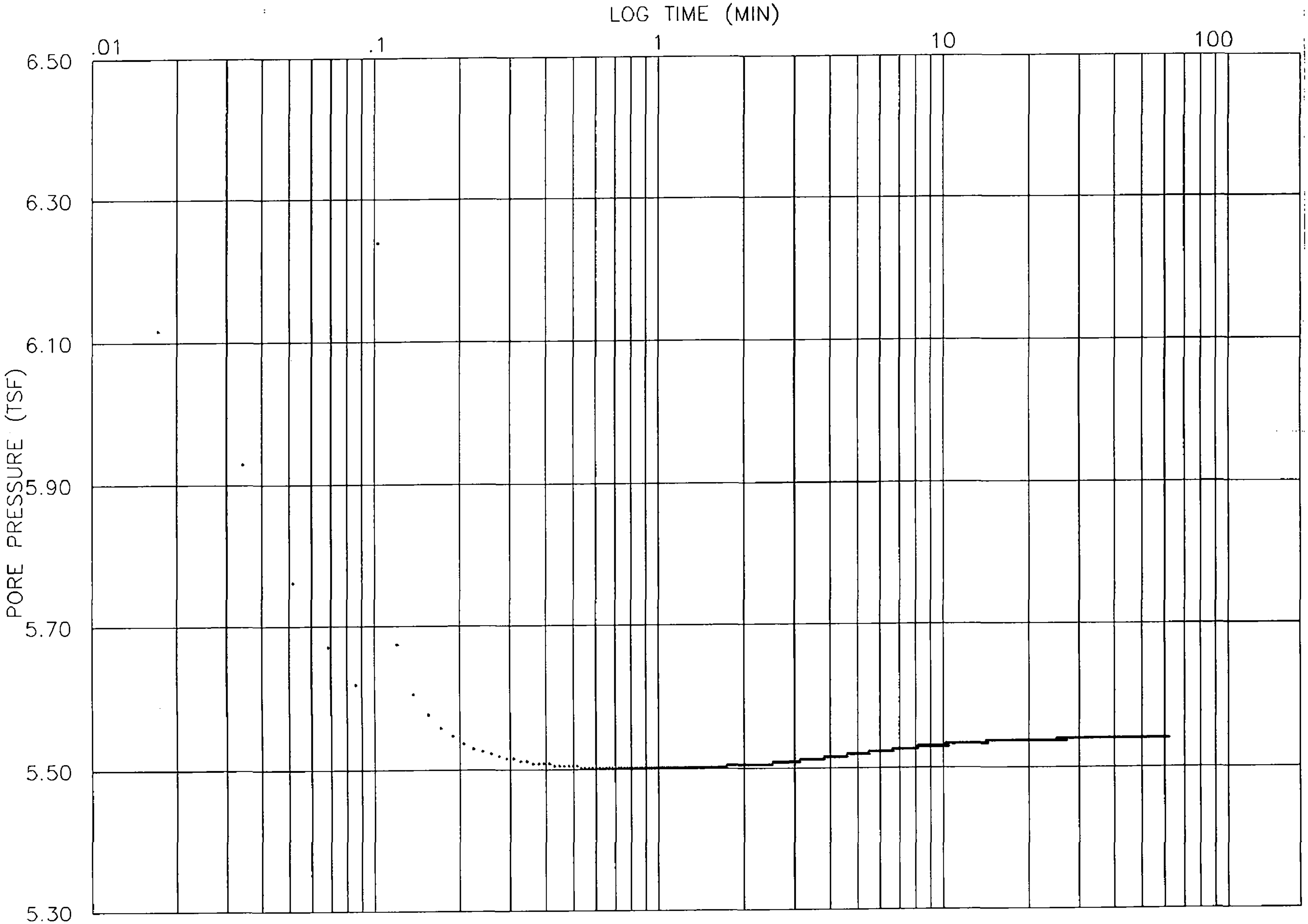


CPT NUMBER: C-702
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 125.2 FEET
DATE: 14-May-2008

FUGRO CONSULTANTS, INC.

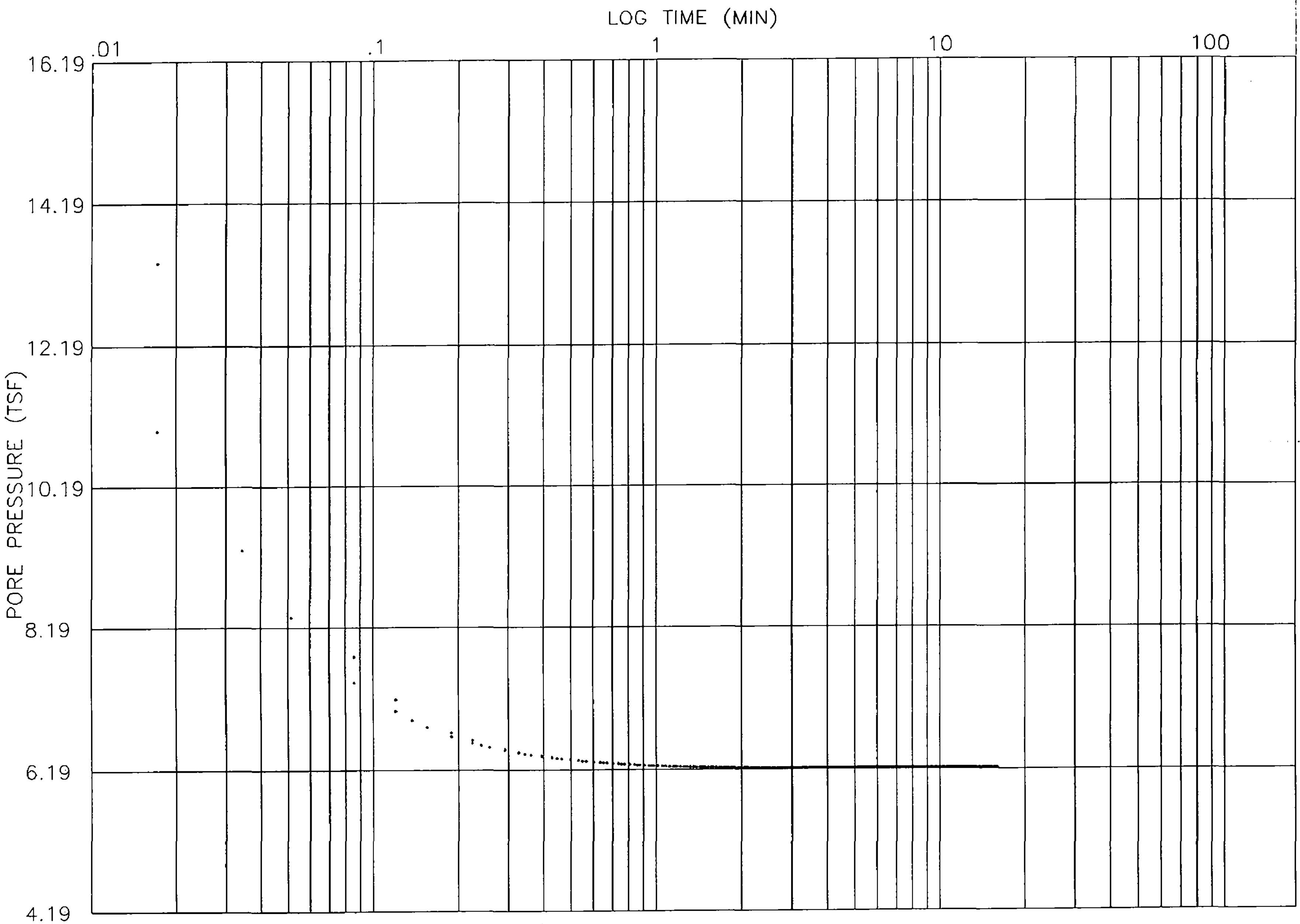


CPT NUMBER: C-702
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 175.1 FEET
DATE: 14-May-2008

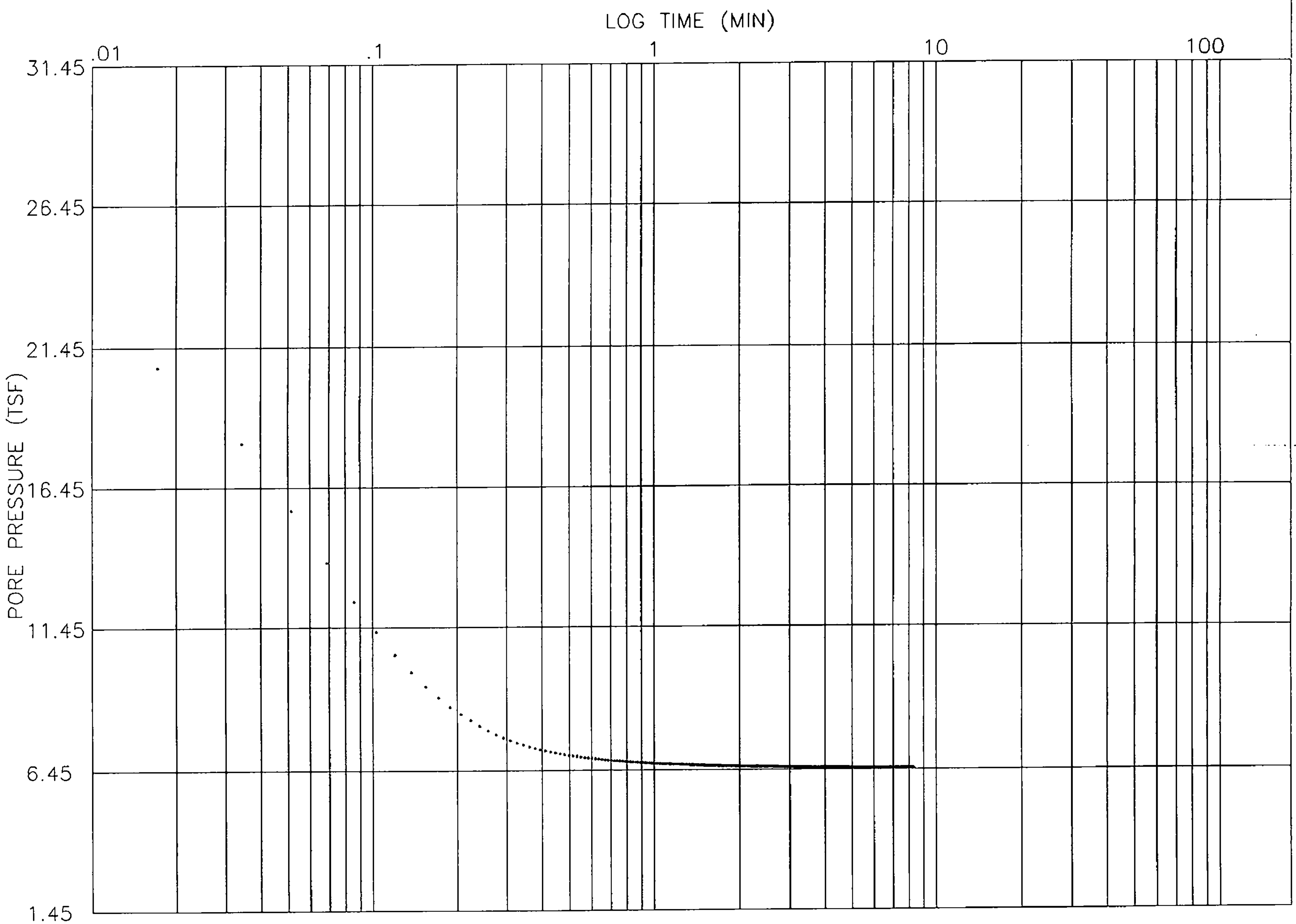
FUGRO CONSULTANTS, INC.



CPT NUMBER: C-702
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 196.2 FEET
DATE: 14-May-2008



CPT NUMBER: C-702
JOB NUMBER: 04.1908-0029

DISSIPATION TEST

DEPTH: 204.0 FEET
DATE: 14-May-2008

APPENDIX A

FUGRO'S CONE PENETROMETERS

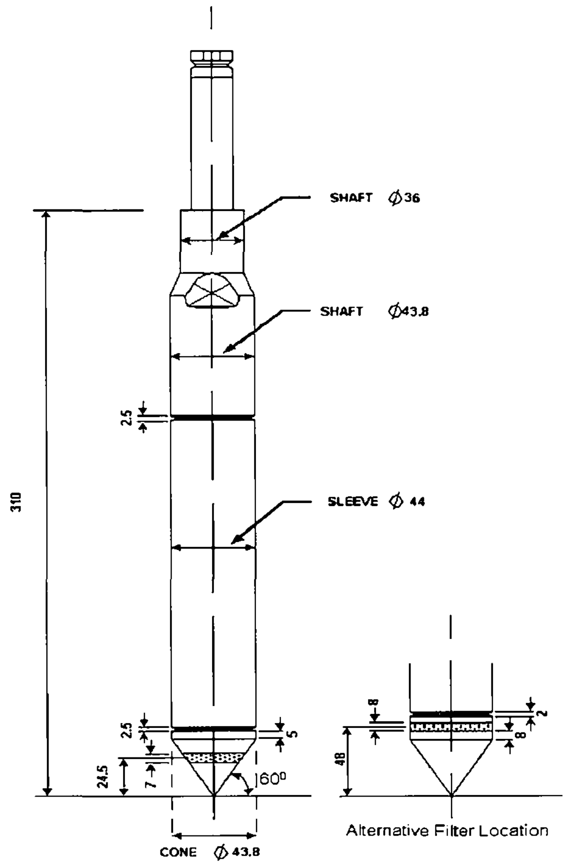
APPENDIX A

FUGRO PENETROMETER TIPS DATA - TYPES FCKE

SPECIFICATIONS LOADCELLS		F5CKE	F10CKE	F7.5CKE & F15CKE
CONE LOADCELL				
Base Area	cm^2	10	10	15
Apex Angle	DEG	60	60	60
Full Range	kN	50	100	150
Load Limit	kN	100	100	200
Effect of 10 bar water pressure	N	450	450	880
Output at zero load	mV	< ± 0.5	< ± 0.5	< ± 0.5
Full range output (FRO)	mV	10	10	10
Input resistance	ohm ca.	270	270	270
Output resistance	ohm ca.	240	240	240
Non linearity and hysteresis	%FRO	< 0.1	< 0.1	< 0.1
Calibration accuracy	%FRO	< 0.5	< 0.5	< 0.5
Rated bridge supply voltage	Volt	10	10	10
Maximum bridge supply voltage	Volt	15	15	15
Thermal zero shift	%FRO/10^{0}C	< 0.2	< 0.2	< 0.2
Thermal Sensitivity shift	%FRO/10^{0}C	< 0.1	< 0.1	< 0.1
Repeatability	%FRO	< 0.1	< 0.1	< 0.1
SLEEVE + CONE LOADCELL				
Sleeve Area	cm^2	150	150	200
Full Range	kN	50	100	150
Load Limit	kN	100	100	200
Effect of 10 bar water pressure	N	300	300	280
Output at zero load	mV	< ± 0.5	< ± 0.5	< ± 0.5
Full range output	mV	10	10	10
Input resistance	ohm ca.	270	270	270
Output resistance	ohm ca.	240	240	240
Non linearity and hysteresis	%FRO	< 0.1	< 0.1	< 0.1
Calibration accuracy	%FRO	< 0.5	< 0.5	< 0.5
Rated bridge supply voltage	Volt	10	10	10
Maximum bridge supply voltage	Volt	15	15	15
Thermal zero shift	%FRO/10^{0}C	< 0.2	< 0.2	< 0.2
Thermal Sensitivity shift	%FRO/10^{0}C	< 0.1	< 0.1	< 0.1
Repeatability	%FRO	< 0.1	< 0.1	< 0.1
GENERAL				
Friction output at full range load of cone	%FRO	< 2		
Compensated temperature range	^{0}C	- 10 to + 40		
Maximum temperature	^{0}C	80		
Insulation resistance	10^8 ohm	> 5		
Slope sensor built-in		on request		

NOTES: The friction sleeve is located immediately above the cone.
Standard delivery includes: cone, calibration sheet, and connector tube.
The accuracy during field use will depend on: field calibrations, treatment during testing, readout equipment, abrasion and maintenance.

TYPE F7.5CKEW/V



DIMENSIONS

CONE BASE AREA	(mm^2)	:	1,500
SLEEVE AREA	(mm^2)	:	20,000
ά FACTOR		:	0.59

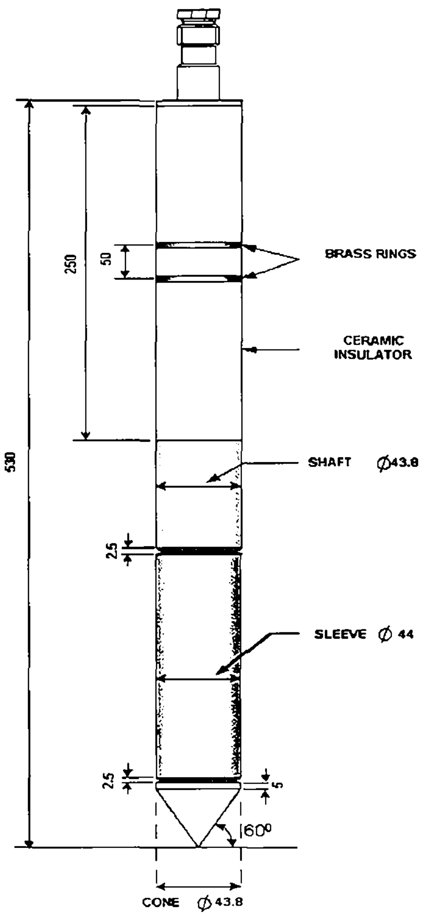
SPECIFICATIONS

CONE LOAD CELL			
- FULL SCALE RANGE	(kN)	:	75
- OVERLOAD CAPACITY	(kN)	:	200
CONE PLUS SLEEVE LOAD CELL			
- FULL SCALE RANGE	(kN)	:	75
- OVERLOAD CAPACITY	(kN)	:	200
PORE PRESSURE TRANSDUCER			
- FULL SCALE RANGE	(Mpa)	:	5.0
- BURST PRESSURE	(Mpa)	:	12.5

NOTES:

1. LOAD CELLS/TRANSDUCERS MAY BE CALIBRATED FOR LOWER RANGES
2. UNEQUAL SLEEVE END AREAS
3. SUBTRACTION TYPE
4. ALL DIMENSIONS IN mm
5. BUILT-IN AMPLIFIERS
6. SLOPE SENSOR INCORPORATED
7. THREADED END : INTERNAL, CONICAL

TYPE F7.5CKEG/V



DIMENSIONS

CONE BASE AREA	(mm^2)	: 1,500
SLEEVE AREA	(mm^2)	: 20,000
ά FACTOR		: 0.59

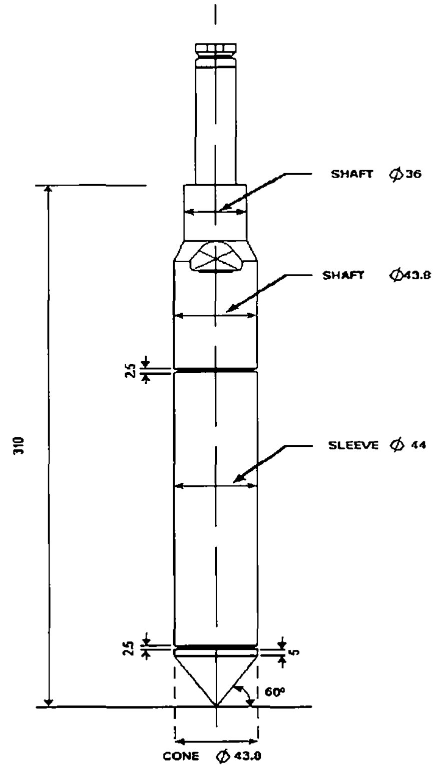
SPECIFICATIONS

CONE LOAD CELL		
- FULL SCALE RANGE	(kN)	: 75
- OVERLOAD CAPACITY	(kN)	: 200
CONE PLUS SLEEVE LOAD CELL		
- FULL SCALE RANGE	(kN)	: 75
- OVERLOAD CAPACITY	(kN)	: 200
PORE PRESSURE TRANSDUCER		
- FULL SCALE RANGE	(Mpa)	: 5.0
- BURST PRESSURE	(Mpa)	: 12.5
ELECTRICAL CONDUCTIVITY		
- FULL SCALE RANGE	(S/m)	: 1.0
- MAXIMUM RANGE	(S/m)	: 5.0

NOTES:

1. LOAD CELLS/TRNSDUCERS MAY BE CALIBRATED FOR LOWER RANGES
2. UNEQUAL SLEEVE END AREAS
3. SUBTRACTION TYPE
4. ALL DIMENSIONS IN mm
5. BUILT-IN AMPLIFIERS
6. SLOPE SENSOR INCORPORATED
7. THREADED END : EXTERNAL. M28 x 2

TYPE F7.5CKE/V



DIMENSIONS

CONE BASE AREA	(mm^2)	:	1,500
SLEEVE AREA	(mm^2)	:	20,000
α FACTOR		:	0.59

SPECIFICATIONS

CONE LOAD CELL

- FULL SCALE RANGE	(kN)	:	75
- OVERLOAD CAPACITY	(kN)	:	200

CONE PLUS SLEEVE LOAD CELL

- FULL SCALE RANGE	(kN)	:	75
- OVERLOAD CAPACITY	(kN)	:	200

NOTES:

1. LOAD CELLS/TRANSDUCERS MAY BE CALIBRATED FOR LOWER RANGES
2. UNEQUAL SLEEVE END AREAS
3. SUBTRACTION TYPE
4. ALL DIMENSIONS IN mm
5. BUILT-IN AMPLIFIERS
6. SLOPE SENSOR INCORPORATED
7. THREADED END : INTERNAL, CONICAL

APPENDIX B

FUGRO'S DEPLOYMENT SYSTEMS


UGRO
GEOTECHNICAL
ENVIRONMENTAL
CONE PENETROMETER SYSTEM
HOUSTON, TEXAS
LOS ANGELES, CALIFORNIA
BATON ROUGE, LOUISIANA


FUGRO


FUGRO

APPENDIX C

ZERO READINGS

CPT Zero Readings

CPT	Date	Cone Type	Cone S/N	Tip Start	Tip Stop	Sleeve Start	Sleeve Stop	Piezo Start	Piezo End	Slope Start	Slope End
C-601	15-May-2008	F7.5CKE3SW2/B	1701-0750	0.024390	0.024455	0.025562	0.025269	-0.007617	-0.007617	0.005668	0.009609
C-602A	17-May-2008	F7.5CKE3SW2/B	1701-0750	0.027478	0.026489	0.027686	0.026530	-0.007617	-0.007910	0.005520	0.005742
C-701	18-May-2008	F7.5CKE3SW2/B	1701-0750	0.027246	0.028768	0.025525	0.027995	-0.007324	-0.008203	0.005668	0.006263
C-701	19-May-2008	F7.5CKE3SW2/B	1701-0750	0.025513	0.026855	0.026746	0.028524	-0.007617	-0.007617	0.005695	0.005547
C-701	20-May-2008	F7.5CKE3SW2/B	1701-0750	0.027600	0.027832	0.028564	0.028931	-0.007617	-0.007910	0.005855	0.005703
C-702	14-May-2008	F7.5CKE3SW2/B	1701-0750	0.021692	0.022339	0.022510	0.023071	-0.007422	-0.008008	0.005773	0.006380

FUGRO CONSULTANTS, INC.

6105 Rookin Road
Houston, Texas 77074
Tel: 713-346-4000
Fax: 713-346-4002

June 30, 2008
Report Number 04.19080029

Mactec Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

Attention: Mr. Scot Auger, P.E., PMP

CALIBRATION VERIFICATION REPORT
FOR PIEZOCONE PENETRATION TESTING
TURKEY POINT COL PROJECT
FLORIDA
MACTEC PROJECT # 6468071950

Dear Mr. Auger:

Please find enclosed herewith the calibration verification results for the instruments used in the above referenced project. The data has been reviewed and has undergone the appropriate QA/QC process. Calibrations checks were performed on cones F7.5CKESW2/B 1701-1788, and F7.5CKEW2/B 1701-0750 before the project began. Post project calibration checks were performed on cone F7.5CKEW2/B 1701-0750 which was the only cone used on the project. There is no post project verification of the seismograph because no seismic data was obtained on this project.

Fugro's cone penetrometer manufacturing and calibration procedures include ISO 9001, ASTM D5778-2007 and European cone penetrometer standards. Cone penetrometers are tested and calibrated for the following:

Mechanical Calibration

- Cross Talk Check
- Dimension Check
- Seal/O-Ring Check

Electronic Calibration

- Temperature effect
- Pre and Post test voltage readings (zeros)
- Full scale output load readings
- Pore Pressure transducer calibration
- Slope indicator calibration

Calibration Verification Methodology

Manufactured and calibrated according to ISO 9001, the calibration values of the electric cone penetrometers used for this project were verified before and after fieldwork utilizing the following A2LA and/or ANSI/NCSL approved verification systems.

Tip and Friction

Load cell:	Geotac
Calibrated by:	Interface (A2LA approved)
Calibration date:	March 14, 2008
Load cell model:	560K
Load cell serial no:	129739
Capacity:	50,000K

Pore Pressure Transducer

Digital Pressure Indicator

Calibrated by:	GD Sensing (ANSI/NCSL approved)
Manufactured by:	Eaton
Model number:	UPS 3000CC
Serial number:	A0813
Calibration date:	September 15, 2006

Cone Penetrometer Temperature

Digital Thermometer

Calibrated by:	Houston Precision (ANSI/NCSL approved)
Manufactured by:	Cole Parmer
Model Number:	Degi-sence Type K
Serial Number:	TD-001
Calibration date:	November 16, 2007

Utilizing the above systems each was load and pressure tested as follows:

Tip:	0-20,000 lb.
Friction:	0-7,500 lb.
Pore Pressure:	0:350 PSI
Temperature effect	30 Degrees Fahrenheit – 115 Degrees Fahrenheit

Under each load/pressure increment, the cone penetrometer readings are recorded in millivolts (mV). Load/pressure (pounds/psi) load increments and corresponding cone readings in mV are input into **HGL Instrument Verificaton** software to obtain linear regression and correlation coefficient (R^2) values (See attached **HGL Instrument Verification** Forms).

Additionally, load/pressure increments and cone readings were also input into a calibration **Verification Certificate Program** to calculate each cone penetrometer's calibration value in MPa units (See attached **Calibration Verification Certificates** for each cone penetrometer). The last column in these forms represents the calibration values of tip, friction and pore pressure.

Calculation Example

Load Increment, P1	= 590 lb.
	= 0.295 tons
Tip Reading	= 35.2 mV
Tip Area, A= 15cm^2	= 0.0161 sq. ft.
Tip Pressure	= P1/A = 0.295/0.0161

	= 18.32298 tsf
Tip Pressure Per mV	= 18.32298/35.2 mV
	= 0.520539 tsf/mv
Tip Pressure Per Volt	= 0.520539 x 1,000
	= 520.539 tsf/volt
	= 49.847 MPa/Volt
Tip Calibration Valve	~ 50 Mpa/Volt

Temperature Calibration:

Cone Penetrometers are placed in a temperature-controlled enclosure and zero readings recorded in mV at intervals between 30 degrees (F) and 115 degees (F). Temperatures and zero readings (mV) are entered into the **Calibration Verification Certificate** software which calculates the deviation between the maximum and minimum zero readings (mV) for the tip friction and pore pressure channels.

Data Recording

During the cone penetration test, the calibration numbers are automatically recorded in CPT test data files along with the following information (See attached CPT test data file, 6710.DEP):

Date of CPT test
Starting time of test
Project Number
CPT test number
Operator name
Elevation, starting depth, water depth
Cone serial number
Number of cone channels (3)
- Tip calibration (50 MPa)
- Friction calibration (0.5 MPa)
- Pore Pressure Calibration (2.5 MPa)
- Slope calibration (525)

Initial baseline (zero) readings for depth, tip, friction, pore pressure and slope.

Seismograph

Seismic data was collected using an ES-3000 seismograph manufactured by Geometrics, Inc. The accuracy of the time readings of this instrument was verified before and after field work utilizing following A2LA and/or ANSI/NCSL approved verification systems.

Function Generator:	Oscilliscope with built function generator.
Manufactured by:	EZ Digital, Inc.
Model number:	OS-5020G
Serial number:	3080209
Calibrated by:	Transcat Calibration Services (ANSI/NCSL approved)
Calibration date:	February 28, 2007

Frequency Counter, 120 MHz, 1	Channel
Manufactured by:	Insetek God Will Instruments
Model number:	GFC – 8010H
Serial number:	CF 871549
Calibrated by:	Transcat Calibration Services (A2LA/NCSL approved)
Calibration date:	February 28, 2007

Seismograph Verification Methodology

The function generator was connected to the input of the seismograph and frequency counter. Sine wave signals were generated at 10 Hz intervals from 10-100 Hz. The seismograph was manually triggered for each frequency and the data stored in standard seg2 seismic data format files, one frequency per file. Each file was opened with SeisImager software and converted to the frequency domain. The input and seismograph frequencies were entered into **Calibration Verification Certificate** software (See attached **Calibration Verification Certificate**).

Fugro appreciates the opportunity to submit our calibration verification report for your review. If you have any questions, or if we can be of further assistance, please do not hesitate to contact us.

Very truly yours,
FUGRO CONSULTANTS, INC.

For Recep Yilmaz
Senior Vice President

RY/jm

CALIBRATION CERTIFICATES

TRANSCAT® CALIBRATION SERVICES

NVLAP LAB CODE
200730-0

CERTIFICATE OF CALIBRATION

Customer:	FUGRO CONSULTANTS INC 6100 HILLCROFT HOUSTON, TX 77081	Customer Nbr:	1-525293-000
		PO Nbr:	FO200708
Cert/RA Nbr:	5-V8842-1-1	Date Received:	Nov 16, 2007
Manufacturer:	Cole-Parmer	Date Calibrated:	Nov 16, 2007
Model Nbr:	8528-40	Next Calibration:	Nov 16, 2008
Description:	Thermometer, Type K	Calibration Proc:	1-AC22434-0
		Item Received:	In Tolerance
Serial Nbr:	C95005824	Item Returned:	In Tolerance
ID Nbr:	TD 001		

For calibration data, see Supplemental Report for RA Nbr 5-V8842-1-1

Temperature: 70°F / 21.1°C **Temp/RH Asset: temp02** **Relative Humidity: 33%**

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number on this Certificate of Calibration. Any measurements on an accredited calibration not covered by that Lab's Scope are noted below.

Transcat calibrations, as applicable, are performed in compliance with the requirements of ISO 9001:2000, ISO TS16949, ANSI/NCSL Z540-1994, QS-9000 and ISO 10012-1992. When specified contractually, the requirements of 10CFR21, 10CFR50 App. B and NQA-1 are also covered.

Transcat will maintain and document the traceability of all its standards to the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or to other recognized national or international standard bodies (NMIs), or to measurable conditions created in our laboratory, or accepted fundamental and/or natural physical constants, ratio type of calibration, or by comparison to consensus standards. The specific path of traceability for the reported measurement results is maintained at the Transcat facility and is available there for review.

Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are shown below.

The results in this report relate only to the item calibrated or tested, and the determination of in or out of tolerance is specific to the model/serial no. referenced above based on the manufacturer's published specifications.

All calibrations have been performed using processes having a test uncertainty ratio of four or more times greater than the unit calibrated, unless otherwise noted. Uncertainties have been estimated at a 95 percent confidence level (k=2). Calibration at a 4:1 TUR provides reasonable confidence that the instrument is within the manufacturer's published specifications. Limitations on the uses of this instrument are detailed in the manufacturer's operating instructions. Any number of factors can cause a unit to drift out of tolerance at any time following its calibration.

Notes: Unit meets all manufacturers specifications. When using the K type probe with the unit, the readings were: @0.0°C/0.1°C @50.0°C/49.8°C @100.0°C/100.2°C

Assets	Manufacturer	Model	Description	Cal Date	Due Date	Traceability Numbers
5072	Fluke Corporation	5500A	Multi-Product Calibrator	5/7/2007	5/31/2008	5-&5072-3-8
5342	Hart Scientific	1502A	Thermometer, SPRT, -200° to 96	8/21/2007	8/31/2008	15-V54VR-1-1
5343	Hart Scientific	5626	Probe, Secondary Reference, PR	8/21/2007	8/31/2008	15-V54VR-1-1
K1TCW-11	Omega Engineering, Inc.	Type-K	Thermocouple Probe, Type-K	6/11/2007	12/31/2099	6-&K1TCW-507-11

Calibrated at:
1181 Brittmore
Houston, TX 77043
By: Thomas M. Laguna

Facility Responsible:
1181 Brittmore
Houston, TX 77043
713-465-4399

Robert Westfall / MAS 11/18/07
Michael A. Sublett Date
Lab Manager

F0013R20 5/02/2007

TRANSCAT® CALIBRATION SERVICES

SUPPLEMENTAL REPORT FOR 5-V8842-1-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

RA Nbr:	5-V8842-1-1	Mfg:	Cole-Parmer
Description:	Thermometer, Type K	Model:	8528-40
Customer:	FUGRO CONSULTANTS INC	Serial:	C95005824
Calibrated:	Nov 16, 2007	PO Nbr:	FO200708
Date Due:	Nov 16, 2008	ID Nbr:	TD 001
Service Type:	R6	Calibration Proc:	1-AC22434-0

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	OOT	Uncertainty (k=2; ±)	TUR
Temperature Measure								
Type K (ITS90)	-145.0 °C	±(0.25% Rdg + 2 °C)	-147.4	-142.6	-145.2 °C			
	0.0 °C	±(0.25% Rdg + 1 °C)	-1.0	1.0	-0.1 °C			
	450.0 °C	±(0.25% Rdg + 1 °C)	447.9	452.1	450.1 °C			
	900.0 °C	±(0.25% Rdg + 1 °C)	896.7	903.3	900.0 °C			
	1350 °C	±(0.25% Rdg + 1 °C)	1346	1354	1350 °C			
Units Conversion	2462 °F	±(0.25% Rdg + 1.8 °F)	2454	2470	2461 °F			

Remarks:

Unit meets all manufacturers specifications. When using the K type probe with the unit, the readings were: @0.0°C/ 0.1°C @50.0°C/49.8°C @100.0°C/100.2°C

When uncertainties are provided, the uncertainty only includes the measurement process and does not include uncertainty contributions of the instrument under test.

Field not applicable.

TRANSCAT® CALIBRATION SERVICES

NVLAP LAB CODE
200730-0

CERTIFICATE OF CALIBRATION

Customer:	FUGRO CONSULTANTS LP 6100 HILLCROFT HOUSTON, TX 77081	Customer Nbr:	1-525293-000
Cert/RA Nbr:	5-V2023-1-1	Date Received:	Feb 28, 2007
Manufacturer:	EZ Digital, Inc	Date Calibrated:	Feb 28, 2007
Description:	OSCILLOSCOPE	Next Calibration:	Feb 28, 2008
Model Nbr:	OS-5020G	Calibration Proc:	1-AC10468-0
Serial Nbr:	3080209	Item Received:	Out Of Tolerance
ID Nbr:		Item Returned:	Limited Calibration
PO Nbr:	D111		

For calibration data, see Supplemental Report for RA Nbr 5-V2023-1-1

Temperature: 72°F / 22.2°C **Relative Humidity: 47%**

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number on this Certificate of Calibration. Any measurements on an accredited calibration not covered by that Lab's Scope are noted below.

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Transcat will maintain and document the traceability of all its standards to the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or to other recognized national or international standards bodies (NMIs), or to measurable conditions created in our laboratory, or accepted fundamental and/or natural physical constants, ratio type of calibration, or by comparison to consensus standards. The specific path of traceability for the reported measurement results is maintained at the Transcat facility and is available there for review.

Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are shown below.

The results in this report relate only to the item calibrated or tested, and the determination of in or out of tolerance is specific to the model/serial no. referenced above based on the manufacturer's published specifications.

All calibrations have been performed using processes having a test uncertainty ratio of four or more times greater than the unit calibrated, unless otherwise noted. Uncertainties have been estimated at a 95 percent confidence level (k=2). Calibration at a 4:1 TUR provides reasonable confidence that the instrument is within the manufacturer's published specifications. Limitations on the uses of this instrument are detailed in the manufacturer's operating instructions. Any number of factors can cause a unit to drift out of tolerance at any time following its calibration.

Notes: Limited Calibration: "Limitations on this calibration are: Sweep time is +/- 6%, and Frequency is +/- 10%, approved by (Brent Lawrence, 02/28/2007)." Risetime measurements are calibrated traceable, not accredited.

Assets	Manufacturer	Model	Description	Cal Date	Due Date	Traceability Numbers
5346	Fluke Corporation	5520A-SC1100	Multifunction Cal. w/ Scope Op	03/13/2006	03/31/2007	F3094007
TEMP02	Oakton Instruments	35710-10	RH/Temperature Datalogger	01/25/2007	01/31/2008	6-V10A4-1-1

Calibrated at:
1181 Brittmore
Houston, TX 77043
By: Jimmy Shipley

Facility Responsible:
1181 Brittmore
Houston, TX 77043
713-465-4399

Michael Sublett 2/28/07
Michael A. Sublett Date
Lab Manager

FOUIR19 [illegible]

Certificate - Page 1 of 1

TRANSCAT® CALIBRATION SERVICES

SUPPLEMENTAL REPORT FOR 5-V2024-2-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

RA Nbr:	5-V2024-2-1	Mfg:	Instek Good Will Instruments
Description:	Frequency Counter, 120 MHz, 1 Channel	Model:	GFC-8010H
Customer:	FUGRO CONSULTANTS LP	Serial:	CF871549
Calibrated:	Feb 28, 2007	PO Nbr:	D111
Date Due:	Feb 28, 2008	ID Nbr:	NONE
Service Type:	S6	Calibration Proc:	1-AC17352-0

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	OOT	Uncertainty (k=2; ±)	TUR
Frequency Accuracy								
Frequency Accuracy	10.000000 MHz	±(12 PPM Rdg)	9.999880	10.000120	10.000007 MHz		[illegible]	[illegible]
Input Sensitivity								
10 Hz to 10 MHz < (15 mVrms)		[illegible]	P	P	P		[illegible]	[illegible]
10 MHz to 40 MHz < (20 mVrms)		[illegible]	P	P	P		[illegible]	[illegible]
40 MHz to 80 MHz < (35 mVrms)		[illegible]	P	P	P		[illegible]	[illegible]
80 MHz to 120 MHz < (50 mVrms)		[illegible]	P	P	P		[illegible]	[illegible]

When uncertainties are provided, the uncertainty only includes the measurement process and does not include uncertainty contributions of the instrument under test.

Field not applicable.

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CALIBRATION SERVICES • TEST & MEASUREMENT INSTRUMENTS

PICK LIST 16:05:11 02/28/07

PAGE 1

PL Run 852503

01V202300

1181 BRITTMOORE
SUITE 600
HOUSTON TX 77043

Ship To: FUGRO CONSULTANTS LP
6100 HILLCROFT
HOUSTON TX 77081

Order 02/27/07
3/09/07
DSNYDER MSUBLETT

Co/Cust	P.O. No	Order No	Ship Via	WH
01/0000525293	D111	V2023/00	UPS GROUND	05

Item Number/Description	Ordered	Shipped	B/O	U/M	Loc Seq
Contact BRENT LAWRENCE 7133695400					
Carrier: UPS GROUND					
001 ED1801-6 Cal&Data EZ Digital, Inc Mdl OS -5020G OSCILLOSCOPE	1.000	1.000	.000	EA	BELOW

LOC: ZZ.99.99

S/N 3080209 UNIT ID:

1 YEAR CALIBRATION INTERVAL

TURNAROUND TIME - 7 BUSINESS DAYS AFTER RECEIPT OF ORDER

Thank you!! Denise Snyder 800-828-1470 x 9505

Fax: 800-395-0543 E-Mail: dsnyder@transcat.com

* COMPLETE *

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TRANSCAT® CALIBRATION SERVICES

NVLAP LAB CODE
200730-0

CERTIFICATE OF CALIBRATION

Customer: FUGRO CONSULTANTS LP
6100 HILLCROFT
HOUSTON, TX 77081

Customer Nbr: 1-525293-000

Cert/RA Nbr:	5-V2024-2-1	Date Received:	Feb 27, 2007
Manufacturer:	Instek Good Will Instruments	Date Calibrated:	Feb 28, 2007
Description:	Frequency Counter, 120 MHz, 1 Channel	Next Calibration:	Feb 28, 2008
Model Nbr:	GFC-8010H	Calibration Proc:	1-AC17352-0
Serial Nbr:	CF871549	Item Received:	In Tolerance
ID Nbr:	NONE	Item Returned:	In Tolerance
PO Nbr:	D111		

For calibration data, see Supplemental Report for RA Nbr 5-V2024-2-1

Temperature: 72°F / 22.2°C **Relative Humidity: 47%**

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number on this Certificate of Calibration. Any measurements on an accredited calibration not covered by that Lab's Scope are noted below.

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Notes:

Assets	Manufacturer	Model	Description	Cal Date	Due Date	Traceability Numbers
5219	Agilent/HP/Agilent Tech	8902A	Measuring Receiver	11/20/2006	11/30/2007	1-496265449-1
5346	Fluke Corporation	5520A-SC1100	Multifunction Cal. w/ Scope Op	03/13/2006	03/31/2007	F3094007
J568	Agilent/HP/Agilent Tech	11722A	Sensor Module, 100k-2.6GHz	03/30/2006	03/31/2007	1-270725701-1
TEMP02	Oakton Instruments	35710-10	RH/Temperature Datalogger	01/25/2007	01/31/2008	6-Y10A4-1-1

Calibrated at:
1181 Brittmore
Houston, TX 77043
By: Jimmy Shipley

Facility Responsible:
1181 Brittmore
Houston, TX 77043
713-465-4399

2/28/07
Date
Michael A. Sublett
Lab Manager

Certificate - Page 1 of 1

To access your calibration records, log on to www.caltrakonline.com
For all of your product, repair, and calibration needs, call Transcat at 1.800.828.1470.

TRANSCAT®
CALIBRATION SERVICES • TEST & MEASUREMENT INSTRUMENTS

01V202400

PICK LIST 16:05:03 02/28/07

PAGE 1
PL Run 852502

35 VANTAGE POINT DR
ROCHESTER NY 14624

Ship To: FUGRO CONSULTANTS LP
6100 HILLCROFT
HOUSTON TX 77081

Order 02/27/07
3/02/07
DSNYDER MSUBLETT

Co/Cust	P.O. No	Order No	Ship Via	WH
01/0000525293	D111	V2024/00	DO NOT SHIP	01

Item Number/Description	Ordered	Shipped	B/O	U/M	Loc Seq
Contact BRENT LAWRENCE			7133695400		
Carrier: DO NOT SHIP					
001 GFC8010H FREQUENCY COUNTER 120MHZ LOC: I 14 05	1.000	1.000	.000	EA	BELOW
002 EHP016 Cal&Data-Instek Good Will Instruments Mdl:GFC-8010H,FREQUENCY LOC: OS 01 01	1.000	1.000	.000	EA	BELOW

********* PLEASE SHIP TO HOUSTON LAB UPS RED EARLY AM

MIKE SUBLETT WILL CALIBRATE TOMORROW 2/28/07

1 YEAR CALIBRATION INTERVAL

* COMPLETE *

Equal Opportunity/Affirmative Action Employer, H/V

PICK

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200730-0

Transcat - Houston
Houston, TX

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

CALIBRATION LABORATORIES

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated 18 June 2005).

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

2008-01-01 through 2008-12-31
Effective dates

Sally S. Bruce
For the National Institute of Standards and Technology

NVLAP-01C (REV. 2006-09-13)
DCN# TUR512

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Transcat - Houston
1181 Brittmore, Suite 600
Houston, TX 77043
Mr. Michael Sublett
Phone: 713-465-4399 Fax: 713-465-0525
E-mail: msublett@transcat.com
URL: www.transcat.com

CALIBRATION LABORATORIES **NVLAP LAB CODE 200730-0**

NVLAP Code: 20/A01 ANSI/NCSL Z540-1-1994; Part 1 Compliant

DIMENSIONAL

NVLAP Code: D05
Length and Diameter; Step Gages [note 2]

Micrometers – Outside, Inside, Depth

Range	***Best Uncertainty (±)*** [note 1]	***Remarks***
(0.02 to 4) in	(12 + 14L) µin	Comparison to Gage Blocks
(4 to 8) in	(23 + 14L) µin	Comparison to Gage Blocks
(8 to 16) in	(34 + 14L) µin	Comparison to Gage Blocks
(16 to 20) in	(46 + 14L) µin	Comparison to Gage Blocks

Calipers – Outside, Inside, Depth

to 36 in	(46 + 14L) µin	Comparison to Gage Blocks

Dial Indicators

(0.0625 to 6) in	(23 + 14L) µin	Comparison to Gage Blocks

2008-01-01 through 2008-12-31
Effective dates

Sally S. Bruce
For the National Institute of Standards and Technology

CALIBRATION LABORATORIES **NVLAP LAB CODE 200730-0**

ELECTROMAGNETICS – DC/LOW FREQUENCY

NVLAP Code: 20/E02
AC Current

Best Uncertainty (±) in % note 1
Frequency in Hz

Range	*10 to 20*	*20 to 40 k*	*40 to10 k*	*10 k to 30 k*
100 μA	0.02	0.01	0.009	0.014
200 μA	0.02	0.009	0.009	0.014
300 μA	0.02	0.01	0.007	0.013
1 mA	0.022	0.009	0.006	0.008
2 mA	0.02	0.009	0.005	0.007
10 mA	0.024	0.009	0.005	0.006
20 mA	0.025	0.009	0.005	0.007
50 mA	0.024	0.009	0.006	0.012
100 mA	0.024	0.009	0.005	0.008
200 mA	0.024	0.009	0.006	0.008
300 mA	0.024	0.009	0.006	0.012
1 A	0.024	0.009	0.007	0.012
2 A	0.024	0.009	0.006	0.012
3 A	0.027	0.01	0.008	0.016
5 A	0.027	0.01	0.008	0.02
10 A	0.049	0.042	0.042	0.044
20 A	0.11	0.11	0.11	0.11

AC Current note 2
Measuring Equipment and Measure

Best Uncertainty (±) in % + A note 1
Frequency in Hz

Range	*10 to 20*	*20 to 45*	*45 to 100*	*100 to 5 k*
(0 to 100) μA	0.46 + 30 n	0.18 + 30 n	0.08 + 30 n	0.08 + 30 n
(0.1 to 1) mA	0.46 + 200 n	0.18 + 200 n	0.07 + 200 n	0.07 + 200 n
(1 to 10) mA	0.46 + 2 μ	0.17 + 2 μ	0.07 + 2 μ	0.04 + 2 μ
(10 to 100) mA	0.46 + 20 μ	0.18 + 20 μ	0.69 + 20 μ	0.35 + 20 μ
(100 to 1000) mA	0.46 + 200 μ	0.19 + 200 μ	0.1 + 200 μ	0.12 + 200 μ

2008-01-01 through 2008-12-31
Effective dates

Sally S. Bruce
For the National Institute of Standards and Technology

CALIBRATION LABORATORIES **NVLAP LAB CODE 200730-0**

NVLAP Code: 20/E05
DC Resistance
Measuring Equipment and Measure

Range	*Best Uncertainty* (±)[note 1]	*Remarks*
0 Ω to 0.1 mΩ	1.4 nΩ	Standard Resistors w/Low Thermal Switch
0.1 mΩ to 1 mΩ	7.1 nΩ	Standard Resistors w/Low Thermal Switch
1 mΩ to 10 mΩ	5.4 ppm	Standard Resistors w/Low Thermal Switch
10 mΩ to 100 mΩ	8.2 ppm	Standard Resistors w/Low Thermal Switch
0.1 Ω to 1 Ω	0.36 ppm	Standard Resistors w/Low Thermal Switch
1 Ω to 10 Ω	0.5 ppm	Standard Resistors w/Guildline 9975 Bridge
10 Ω to 100 Ω	0.84 ppm	Standard Resistors w/Guildline 9975 Bridge
100 Ω to 1 kΩ	0.42 ppm	Standard Resistors w/Guildline 9975 Bridge
1 kΩ to 10 kΩ	0.31 ppm	Standard Resistors w/Guildline 9975 Bridge
19 kΩ	0.78 ppm	Standard Resistors w/Fluke 8508A in transfer mode
100 kΩ	2.9 ppm	Standard Resistors w/Fluke 8508A in transfer mode
190 kΩ	2.8 ppm	Standard Resistors w/Fluke 8508A in transfer mode
1 MΩ	3.8 ppm	Standard Resistors w/Fluke 8508A in transfer mode
1.9 MΩ	5.1 ppm	Standard Resistors w/Fluke 8508A in transfer mode
10 MΩ Source	4.4 ppm	Standard Resistors w/Fluke 8508A in transfer mode
10 MΩ Measure	5.0 ppm	Standard Resistors w/Fluke 8508A in transfer mode
19 MΩ Measure	8.3 ppm	Standard Resistors w/Fluke 8508A in transfer mode
100 MΩ	13 ppm	Standard Resistors w/Fluke 8508A in transfer mode
1 GΩ Source	63 ppm	Standard Resistors w/Fluke 8508A in transfer mode
1 GΩ Measure	200 ppm	Standard Resistors w/Fluke 8508A in transfer Mode

Resistance Ratio

2008-01-01 through 2008-12-31
Effective dates

Sally S. Bruce
For the National Institute of Standards and Technology

CALIBRATION LABORATORIES NVLAP LAB CODE 200730-0

1 Ω to 1 kΩ	0.33 ppm	Guildline 9975 Bridge
Measuring Equipment and Measure note 2		
10 mΩ to 10 Ω	19 ppm + 0.05 mΩ	HP3458A w/Decade Resistor
10 Ω to 1 kΩ	15 ppm + 0.5 mΩ	HP3458A w/Decade Resistor
1 kΩ to 10 kΩ	12 ppm + 5 mΩ	HP3458A w/Decade Resistor
10 kΩ to 100 kΩ	14 ppm + 50 mΩ	HP3458A w/Decade Resistor
100 kΩ to 1 MΩ	23 ppm + 2 Ω	HP3458A w/Decade Resistor
1 MΩ to 10 MΩ	73 ppm + 50 Ω	HP3458A w/Decade Resistor
10 MΩ to 100 MΩ	630 ppm + 1 kΩ	HP3458A w/Decade Resistor
100 MΩ to 1 GΩ	0.6 % + 10 kΩ	HP3458A w/Decade Resistor
Measuring Equipment note 2		
10 GΩ to 100 GΩ	1.16 %	Biddle Mega Dek

DC Current
Measuring Equipment and Measure

Range	*Best Uncertainty (±)* note 1	*Remarks*
0 A to 100 μA	4 ppm + 230 pA	Standard Shunts w/current source
100 μA to 1 mA	3.1 ppm + 1.2 nA	Standard Shunts w/current source
1 mA to 10 mA	3.2 ppm + 12 nA	Standard Shunts w/current source
10 mA to 100 mA	3.2 ppm + 115 nA	Standard Shunts w/current source
100 mA to 1 A	8.8 ppm + 1.4 μA	Standard Shunts w/current source
1 A to 10 A	8.8 ppm + 12 μA	Standard Shunts w/current source
10 A to 100 A	160 ppm + 7 mA	Standard Shunts w/current source
DC Current note 2		
Measuring Equipment and Measure		
0 μA to 100 μA	26 ppm + 0.8 nA	HP3458A w/current source
100 μA to 1 mA	26 ppm + 5 nA	HP3458A w/current source
1 mA to 10 mA	26 ppm + 50 nA	HP3458A w/current source
10 mA to 100 mA	42 ppm + 0.5 μA	HP3458A w/current source
100 mA to 1 A	0.013 % + 10 μA	HP3458A w/current source
1 A to 20 A	0.12 %	Fluke 5520A w/current shunt

2008-01-01 through 2008-12-31
Effective dates

Sally S. Bruce
For the National Institute of Standards and Technology

Measure Only

1 A to 100 A	0.06 %	Valhalla 2575A

Clamp-on Ammeter Toroidal Type

20 A to 150 A	0.3 % + 20 mA	5520A/coil w/Fluke 5220A Amplifier
150 A to 1000 A	0.3 % + 90 mA	5520A/coil w/Fluke 5220A Amplifier

Non-Toroidal Type

20 A to 150 A	0.6 % + 140 mA	5520A/coil w/Fluke 5220A Amplifier
150 A to 1000 A	0.6 % + 540 mA	5520A/coil w/Fluke 5220A Amplifier

NVLAP Code: 20/E06
DC Voltage – Fixed Points
Measuring Equipment and Measure

Range	***Best Uncertainty* (±)** *note 1*	***Remarks***
0 V	90 nV	Ratio Metric w/Zener Reference
1 mV	90 nV	Ratio Metric w/Zener Reference
10 mV	9.7 ppm	Ratio Metric w/Zener Reference
100 mV	1.5 ppm	Ratio Metric w/Zener Reference
1 V	0.39 ppm	Ratio Metric w/Zener Reference
10 V	0.2 ppm	Ratio Metric w/Zener Reference
100 V	0.4 ppm	Ratio Metric w/Zener Reference
1000 V	0.64 ppm	Ratio Metric w/Zener Reference
10 mV to 100 mV	4.5 ppm + 90 nV	Ratio Metric w/Zener Reference
100 mV to 1000 V	2.4 ppm + 90 nV	Ratio Metric w/Zener Reference
1 kV to 120 kV	91 ppm	High Voltage Divider Comparison

DC Voltage *note 2*
Measuring Equipment and Measure

0 V to 100 mV	7.8 ppm + 0.5 µV	3458A (002) w/5700A
100 mV to 10 V	5 ppm + 0.5 µV	3458A (002) w/5700A
10 V to 100 V	7.6 ppm + 30 µV	3458A (002) w/5700A
100 V to 500 V	11 ppm + 100 µV	3458A (002) w/5700A
500 V to 800 V	14 ppm + 100 µV	3458A (002) w/5700A

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800 V to 1000 V	21 ppm + 100 µV	3458A (002) w/5700A

NVLAP Code: 20/E09
AC Voltage

Frequency in Hz	*Best Uncertainty (±) in %* note 1			*Remarks*
		22 mV range		
	6 mV	*10 mV*	*20 mV*	
10	0.19	0.03	0.03	Fluke 792A
20	0.14	0.03	0.02	Fluke 792A
(40, 100)	0.14	0.03	0.014	Fluke 792A
(1, 10, 20) k	0.14	0.03	0.014	Fluke 792A
50 k	0.14	0.05	0.03	Fluke 792A
100 k	0.17	0.07	0.02	Fluke 792A
300 k	0.22	0.12	0.014	Fluke 792A
500 k	0.40	0.15	0.014	Fluke 792A
1 M	0.45	0.15	0.13	Fluke 792A
		220 mV Range		
	20 mV	*60 mV*	*200 mV*	
10	0.04	0.035	0.02	Fluke 792A
20	0.03	0.021	0.008	Fluke 792A
(40, 100)	0.02	0.017	0.004	Fluke 792A
(1, 10, 20) k	0.02	0.017	0.004	Fluke 792A
50 k	0.03	0.021	0.01	Fluke 792A
100 k	0.05	0.041	0.015	Fluke 792A
300 k	0.07	0.068	0.045	Fluke 792A
500 k	0.11	0.11	0.06	Fluke 792A
1 M	0.2	0.17	0.06	Fluke 792A
		700 mV Range		
	200 mV		*600 mV*	
10	0.022		0.007	Fluke 792A
20	0.008		0.007	Fluke 792A
(40, 100)	0.005		0.003	Fluke 792A
(1, 10, 20) k	0.005		0.003	Fluke 792A

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50 k		0.01	0.005	Fluke 792A
100 k		0.02	0.006	Fluke 792A
300 k		0.05	0.014	Fluke 792A
500 k		0.06	0.043	Fluke 792A
1 M		0.06	0.06	Fluke 792A

	2.2 V Range			
	600 mV	***1 V***	***2 V***	
10	0.02	0.02	0.02	Fluke 792A
20	0.007	0.006	0.006	Fluke 792A
40	0.003	0.003	0.003	Fluke 792A
(0.1, 1, 10, 20) k	0.003	0.004	0.0011	Fluke 792A
50 k	0.005	0.005	0.004	Fluke 792A
100 k	0.006	0.012	0.005	Fluke 792A
300 k	0.012	0.043	0.012	Fluke 792A
500 k	0.043	0.045	0.043	Fluke 792A
1 M	0.06	0.045	0.045	Fluke 792A

	7 V Range		
	2 V	***6 V***	
10	0.02	0.02	Fluke 792A
20	0.007	0.006	Fluke 792A
40	0.003	0.003	Fluke 792A
(0.01, 1, 10, 20) k	0.003	0.0011	Fluke 792A
50 k	0.005	0.004	Fluke 792A
100 k	0.006	0.005	Fluke 792A
300 k	0.012	0.012	Fluke 792A
500 k	0.044	0.043	Fluke 792A
1 M	0.05	0.046	Fluke 792A

	22 V Range			
	6 V	***10 V***	***20 V***	
10	0.02	0.02	0.02	Fluke 792A
20	0.007	0.006	0.006	Fluke 792A

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40	0.003	0.003	0.003	Fluke 792A
(0.1, 1, 10, 20) k	0.003	0.002	0.002	Fluke 792A
50 k	0.005	0.004	0.004	Fluke 792A
100 k	0.006	0.005	0.005	Fluke 792A
300 k	0.012	0.012	0.012	Fluke 792A
500 k	0.044	0.043	0.043	Fluke 792A
1 M	0.05	0.05	0.05	Fluke 792A

70 V Range

	20 V	*60 V*	
10	0.02	0.02	Fluke 792A
20	0.007	0.006	Fluke 792A
40	0.003	0.003	Fluke 792A
(0.1, 1, 10, 20) k	0.003	0.002	Fluke 792A
50 k	0.006	0.005	Fluke 792A
100 k	0.007	0.007	Fluke 792A
300 k	0.013	0.013	Fluke 792A

220 V Range

	60 V	*100 V*	*200 V*	
10	0.02	0.02	0.02	Fluke 792A
20	0.007	0.007	0.006	Fluke 792A
(0.04, 0.1, 1, 10, 20) k	0.004	0.003	0.003	Fluke 792A
50 k	0.007	0.007	0.006	Fluke 792A
100 k	0.007	0.007	0.007	Fluke 792A
200 k	0.01	0.01	0.01	Fluke 792A

1000 V Range

	200 V	*600 V*	*1000 V*	
10	0.02			Fluke 792A
20	0.009			Fluke 792A
(0.04, 0.1, 1, 10, 20) k	0.004	0.004	0.003	Fluke 792A
50 k	0.007	0.007	0.006	Fluke 792A
100 k	0.007	0.008	0.007	Fluke 792A

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(5 to 80) kV @ 60 Hz	0.054	HV Divider Comparison

AC Voltage – Measure [note 2]

Range	*Frequency in Hz*	*Best Uncertainty* (±) [note 1]	*Remarks*
(0 to 10) mV	1 to 40	0.06 % + 3 µV	3458A
	40 to 1 k	0.05 % + 1 µV	3458A
	1 k to 20 k	0.05 % + 1 µV	3458A
	20 k to 50 k	0.12 % + 1 µV	3458A
	50 k to 100 k	0.6 % + 1 µV	3458A
	100 k to 300 k	4.6 % + 2 µV	3458A
(10 to 100) mV	1 to 40	0.01 % + 4 µV	3458A
	40 to 1 k	0.01 % + 2 µV	3458A
	1 k to 20 k	0.018 % + 2 µV	3458A
	20 k to 50 k	0.036 % + 2 µV	3458A
	50 k to 100 k	0.1 % + 2 µV	3458A
	100 k to 300 k	0.35 % + 10 µV	3458A
	300 k to 1 M	1.2 % + 10 µV	3458A
(100 m to 1) V	1 to 40	0.009 % + 40 µV	3458A
	40 to 1 k	0.009 % + 20 µV	3458A
	1 k to 20 k	0.017 % + 20 µV	3458A
	20 k to 50 k	0.035 % + 20 µV	3458A
	50 k to 100 k	0.09 % + 20 µV	3458A
	100 k to 300 k	0.35 % + 100 µV	3458A
	300 k to 1 M	1.2 % + 100 µV	3458A
(1 to 10) V	1 to 40	0.009 % + 0.4 mV	3458A
	40 to 1 k	0.009 % + 0.2 mV	3458A
	1 k to 20 k	0.017 % + 0.2 mV	3458A
	20 k to 50 k	0.035 % + 0.2 mV	3458A
	50 k to 100 k	0.09 % + 0.2 mV	3458A
	100 k to 300 k	0.35 % + 1 mV	3458A
	300 k to 1 M	1.2 % + 1 mV	3458A
(10 to 100) V	1 to 40	0.025 % + 4 mV	3458A
	40 to 1 k	0.025 % + 2 mV	3458A

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	1 k to 20 k	0.025 % + 2 mV	3458A
	20 k to 50 k	0.04 % + 2 mV	3458A
	50 k to 100 k	0.14 % + 2 mV	3458A
	100 k to 300 k	0.5 % + 10 mV	3458A
	300 k to 1 M	1.8 % + 10 mV	3458A
(100 to 700) V	1 to 40	0.05 % + 40 mV	3458A
	40 to 1 k	0.05 % + 20 mV	3458A
	1 k to 20 k	0.07 % + 20 mV	3458A
	20 k to 50 k	0.14 % + 20 mV	3458A
	50 k to 100 k	0.35 % + 20 mV	3458A

AC Voltage [note 2]
Measuring Equipment

Range	***Frequency in Hz***	***Best Uncertainty (±)*** [note 1]	***Remarks***
(0 to 2.2) mV	10 to 40	0.6 % + 5 µV	5700A / 5725A
	40 to 50 k	0.15 % + 5 µV	5700A / 5725A
	50 k to 100 k	0.1 % + 7 µV	5700A / 5725A
	100 k to 300 k	0.13 % + 13 µV	5700A / 5725A
	300 k to 500 k	0.2 % + 30 µV	5700A / 5725A
	500 k to 1 M	0.4 % + 30 µV	5700A / 5725A
(2.2 to 22) mV	10 to 20	0.08 % + 5 µV	5700A / 5725A
	20 to 20 k	0.05 % + 5 µV	5700A / 5725A
	20 k to 50 k	0.06 % + 5 µV	5700A / 5725A
	50 k to 100 k	0.13 % + 7 µV	5700A / 5725A
	100 k to 300 k	0.15 % + 12 µV	5700A / 5725A
	300 k to 500 k	0.13 % + 25 µV	5700A / 5725A
	500 k to 1 M	0.4 % + 25 µV	5700A / 5725A
(22 to 220) mV	10 to 20	0.07 % + 13 µV	5700A / 5725A
	20 to 40	0.03 % + 10 µV	5700A / 5725A
	40 to 20 k	0.015 % + 10 µV	5700A / 5725A
	20 k to 50 k	0.04 % + 8 µV	5700A / 5725A
	50 k to 100 k	0.1 % + 25 µV	5700A / 5725A
	100 k to 300 k	0.14 % + 25 µV	5700A / 5725A
	300 k to 500 k	0.2 % + 35 µV	5700A / 5725A

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	500 k to 1 M	0.34 % + 80 µV	5700A / 5725A
(220 m to 2.2) V	10 to 20	0.06 % + 100 µV	5700A / 5725A
	20 to 40	0.02 % + 25 µV	5700A / 5725A
	40 to 20 k	0.01 % + 6 µV	5700A / 5725A
	20 k to 50 k	0.014 % + 16 µV	5700A / 5725A
	50 k to 100 k	0.03 % + 70 µV	5700A / 5725A
	100 k to 300 k	0.06 % + 130 µV	5700A / 5725A
	300 k to 500 k	0.13 % + 350 µV	5700A / 5725A
	500 k to 1 M	0.26 % + 85 µV	5700A / 5725A
(2.2 to 22) V	10 to 20	0.06 % + 0.8 mV	5700A / 5725A
	20 to 40	0.02 % + 0.3 mV	5700A / 5725A
	40 to 20 k	0.009 % + 60 µV	5700A / 5725A
	20 k to 50 k	0.014 % + 0.2 mV	5700A / 5725A
	50 k to 100 k	0.03 % + 0.4 mV	5700A / 5725A
	100 k to 300 k	0.06 % + 1.5 mV	5700A / 5725A
	300 k to 500 k	0.15 % + 5 mV	5700A / 5725A
	500 k to 1 M	0.32 % + 9 mV	5700A / 5725A
(22 to 220) V	10 to 20	0.06 % + 8 mV	5700A / 5725A
	20 to 40	0.02 % + 3 mV	5700A / 5725A
	40 to 20 k	0.01 % + 1 mV	5700A / 5725A
	20 k to 50 k	0.03 % + 4 mV	5700A / 5725A
	50 k to 100 k	0.06 % + 8 mV	5700A / 5725A
	100 k to 300 k	0.18 % + 8 mV	5700A / 5725A
(220 to 1100) V	40 to 1 k	0.01 % + 4 mV	5700A / 5725A
	1 k to 20 k	0.02 % + 6 mV	5700A / 5725A
	20 k to 30 k	0.07 % + 11 mV	5700A / 5725A
(220 to 750) V	30 k to 50 k	0.07 % + 11 mV	5700A / 5725A
	50 k to 100 k	0.3 % + 45 mV	5700A / 5725A

NVLAP Code: 20/E10
Capacitance – Source: (100 to 10 k) Hz

Range	*Best Uncertainty (±)* [note 1]	*Remarks*

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0.01 pF	0.02 %	Fixed Capacitors w/GR1615-A Bridge
0.1 pF	0.02 %	Fixed Capacitors w/GR1615-A Bridge
1 pF	0.02 %	Fixed Capacitors w/GR1615-A Bridge
10 pf	0.02 %	Fixed Capacitors w/GR1615-A Bridge
100 pF	0.02 %	Fixed Capacitors w/GR1615-A Bridge
500 pF	0.02 %	Fixed Capacitors w/GR1615-A Bridge
1 nF	0.002%	Fixed Capacitors w/GR1615-A Bridge
10 nF	0.02 %	Fixed Capacitors w/GR1615-A Bridge
200 nF	0.02 %	Fixed Capacitors w/GR1615-A Bridge

Capacitance – Measure: (50 to 1M) Hz

(1 a to 1.1 µ) F	0.012 % + 30 aF	GR1615-A Bridge
(1.1 µ to 10 m) F	0.06 % + 30 aF	Quadtech 7600LCR Bridge

Capacitance – Measure Equipment [note 2]

Range	*Frequency in Hz*	*Best Uncertainty (±)* [note 1]	*Remarks*
(0.19 to 1.0999) nF	10 to 10 k	0.60 % + 0.01 nF	5520A
(1.1 to 3.2999) nF	10 to 3 k	0.60 % + 0.01 nF	5520A
(3.3 to 10.9999) nF	10 to 1 k	0.30 % + 0.01 nF	5520A
(11 to 109.999) nF	10 to 1 k	0.30 % + 0.01 nF	5520A
(110 to 329.999) nF	10 to 1 k	0.30 % + 0.3 nF	5520A
(0.33 to 1.09999) µF	10 to 600	0.30 % + 1 nF	5520A
(1.1 to 3.2999) µF	10 to 300	0.30 % + 3 nF	5520A
(3.3 to 10.9999) µF	10 to 150	0.30 % + 10 nF	5520A
(11 to 32.9999) µF	10 to 120	0.48 % + 30 nF	5520A
(33 to 109.9999) µF	10 to 80	0.54 % + 100 nF	5520A
(110 to 329.999) µF	DC to 50	0.54 % + 300 nF	5520A
(0.33 to 1.09999) mF	DC to 20	0.54 % + 1 µF	5520A
(1.1 to 3.29999) mF	DC to 6	0.54 % + 3 µF	5520A
(3.3 to 10.9999) mF	DC to 2	0.54 % + 10 µF	5520A
(11 to 32.9999) mF	DC to 0.6	0.90 % + 30 µF	5520A
(33 to 110) mF	DC to 0.2	1.31 % + 100 µF	5520A

NVLAP Code: 20/E11
LF Inductance [note 2]

Source Only

Range	*Best Uncertainty (±) in %* [note 1]	*Remarks*
1 mH	0.07	Fixed Inductors w/Quadtech 7600

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10 mH		0.07	Fixed Inductors w/Quadtech 7600
100 mH		0.07	Fixed Inductors w/Quadtech 7600
1 H		0.07	Fixed Inductors w/Quadtech 7600
Measure @ 1 kHz (10 μ to 100) H		0.07	Quadtech 7600

NVLAP Code: 20/E15
AC Phase note 2
Measure

Range	*Frequency in Hz*	*Best Uncertainty* (±) note 1	*Remarks*
0° to 360°	1 to 50 k	3 m°	Clark-Hess 5002 Bridge Set
	50 k to 200 k	11 m°	Clark-Hess 5002 Bridge Set

AC Phase – Generate note 2
50mV to 100V

Range	*Frequency in Hz*	*Best Uncertainty* (±) note 1	*Remarks*
0° to 360°	1 to 1 k	13 m°	Clark-Hess 5500-2 Phase Standard
	1 k to 6.25 k	17 m°	Clark-Hess 5500-2 Phase Standard
	6.25 k to 50 k	21 m°	Clark-Hess 5500-2 Phase Standard
	50 k to 200 k	50 m°	Clark-Hess 5500-2 Phase Standard

100V to 120V

Range	*Frequency in Hz*	*Best Uncertainty* (±) note 1	*Remarks*
0° to 360°	1 to 1 k	1.7 m°	Clark-Hess 5500-2 Phase Standard
	1 k to 6.25 k	26 m°	Clark-Hess 5500-2 Phase Standard
	6.25 k to 50 k	37 m°	Clark-Hess 5500-2 Phase Standard

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50 k to 200 k	95 m°	Clark-Hess 5500-2 Phase Standard

TIME AND FREQUENCY

NVLAP Code: 20/F01
Frequency – Source and Measure

Range in Hz note 3	*Best Uncertainty (±)* note 1	*Remarks*
10 M	5.8×10^{-11}	Rubidium Frequency Standard

MECHANICAL

NVLAP Code: 20/M06
Torque note 2

Measure

Range	*Best Uncertainty (±) in %* note 1	*Remarks*
10 lbf-in to 600 lbf-ft	2.0 %	CDI

NVLAP Code: 20/M08
Mass note 2

Range	*Best Uncertainty (±)* note 1	*Remarks*
8 kg	12 mg	Echelon III
7 kg	12 mg	Echelon III
6 kg	12 mg	Echelon III
5 kg	9.3 mg	Echelon III
4 kg	8.8 mg	Echelon III
2 kg	6.9 mg	Echelon III
1 kg	3.6 mg	Echelon III
500 g	2 mg	Echelon III
200 g	0.68 mg	Echelon III
100 g	0.34 mg	Echelon III
50 g	0.17 mg	Echelon III
20 g	0.10 mg	Echelon III
10 g	68 µg	Echelon III
5 g	54 µg	Echelon III
2 g	54 µg	Echelon III

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1 g	54 µg	Echelon III
500 mg	43 µg	Echelon III
200 mg	43 µg	Echelon III
100 mg	43 µg	Echelon III
50 mg	43 µg	Echelon III
20 mg	43 µg	Echelon III
10 mg	43 µg	Echelon III
5 mg	43 µg	Echelon III
2 mg	43 µg	Echelon III
1 mg	43 µg	Echelon III

ELECTROMAGNETICS – RF/MICROWAVE

NVLAP Code: 20/R11
RF-DC Voltage/Current Converters *note 2*

Sinewave Flatness

Range in Hz	*Best Uncertainty (±) in % note 1*	*Remarks*
30 k to 1 M	0.014	Thermal Converters
1 M to 10 M	0.08	Thermal Converters
10 M to 30 M	0.17	Thermal Converters
30 M to 80 M	0.71	Thermal Converters
80 M to 100 M	0.84	Thermal Converters

NVLAP Code: 20/R17
RF Power *note 2*
Absolute

Range	*Frequency in Hz*	*Best Uncertainty (±) note 1*	*Remarks*
(+30 to -20) dBm	0.1 M to 1.3 G	0.10 dBm + M	8902A

Harmonic Distortion (50 and 600 Ω)

Range	*Best Uncertainty (±) note 1*	*Remarks*

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0 dB @ (10 to 26 G) Hz	0.3 dB	8903B 71209A 8902A

THERMODYNAMIC

NVLAP Code: 20/T05
Pressure
Absolute Pressure Source – Pneumatic

Range	***Best Uncertainty (±)*** *note 1*	***Remarks***
(0.2 to 100) psia	11 ppm + 0.07 m psia	Ruska 2465
(100 to 1000) psia	12 ppm	Ruska 2465

Gage Pressure Source – Gage

Range	***Best Uncertainty (±)*** *note 1*	***Remarks***
(0 to 1.2) psi	0.013 m psi	Ruska 2465
(1.2 to 100) psi	11 ppm	Ruska 2465
(100 to 1000) psi	12 ppm	Ruska 2465
(-20 to 20) in H_2O	11 ppm + 240 µin H_2O	Differential

Gage Pressure Source – Hydraulic

Range	***Best Uncertainty (±)*** *note 1*	***Remarks***
(75 to 3000) psi	16 ppm	DHI PG7000
(725 to 30 000) psi	36 ppm	DHI PG7000

Determination of Piston Area

Range	***Best Uncertainty (±)*** *note 1*	***Remarks***
(0.2 to 100) psi	16 ppm	Ruska 2465
(100 to 1000) psi	17 ppm	Ruska 2465
(40 to 10 000) psi	35 ppm	DHI 5300

Gage Pressure Source *note 2*

Range	***Best Uncertainty (±)*** *note 1*	***Remarks***
(0.5 to 500) psi	73 ppm	Pressurements T2300

Hydraulic *note 2*

Range	***Best Uncertainty (±)*** *note 1*	***Remarks***

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(500 to 15 000) psi	0.03 %	Ametek T-150

NVLAP Code: 20/T07
Thermodynamic

Range in °C	*Best Uncertainty (±) in C° note 1*	*Remarks*
-10 to 110	0.044	Liquid Bath w/PRT
100 to 300	0.12	Dry Block Calibrator
300 to 600	0.23	Dry Block Calibrator
Measure only note 2		
-195 to 660	0.044	PRT & Super Thermometer

NVLAP Code: 20/T08
Thermocouple

Isothermal Block Verification note 2

Range	*Best Uncertainty (±) note 1*	*Remarks*
Ambient (~23 °C)	0.04 °C	Thermocouple Half Junction

1. Represents an expanded uncertainty using a coverage factor, k = 2, at an approximate level of confidence of 95%.
2. Onsite calibrations available.
3. Uncertainty values of derivatives of 10 MHz will differ due to resolution, noise, and gating errors.

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CERTIFICATE OF CALIBRATION

Certificate Number M503691-1

Manufacturer: **Geotac**
Model No: **560K**
Customer PO No.: **L-2416**

Description: **Load Cell**
Serial No: **129739**
Customer Asset No.: **129739**

Customer:
Fugro Consultants LP
6100 Hillcroft
Houston, TX 77081

Location of Calibration:
Applied Technical Services, Inc.
1049 Triad Court
Marietta, GA 30062

Calibration Procedure: **ATS-521 Rev. 5: Calibration of Force Gages**

Date of Calibration: **November 28, 2006**
Temperature: **70° F**
Condition Received: **As Found Data Only**

*Next Calibration Due: **November 28, 2007**
Humidity: **29 %**
Condition Returned: **As Found Data Only**

This instrument has been calibrated using primary or secondary standards whose calibration is traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST). Some measurements are traceable to natural physical constants, consensus standards or ratio type measurements.

The reported expanded measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a confidence level of approximately 95%. ATS maintains, wherever possible, at least a 4:1 Test Uncertainty Ratio. Statements of compliance, where applicable, are based on test results falling within specified limits with no reduction by the uncertainty of the measurement, unless otherwise allowed by procedure.

All calibrations are performed in accordance with the ATS Quality Manual QM1, Rev. 7 dated July 7, 2006. Applied Technical Services, Inc.'s Quality System complies with the applicable requirements of ANSI/NCSL Z540-1, ISO 9001-2000, 10CFR 50 Appendix B, 10CFR Part 21 and ISO/IEC 17025. ATS is an ISO/IEC 17025 Accredited Calibration Laboratory through A2LA.

The reported data is valid only at the time of the test and related only to the item calibrated. *Calibration due dates appearing on this Certificate of Calibration and calibration label are determined by the client and do not imply continued conformance to specifications.

Notes: *Gage Factor = -2.1826mV/V*

Calibration Equipment Used::

Model: **Tinius Olsen Super L** Desc.: **Universal Testing Machine** ID No.: **ATS-01226** Cal Due Date: **2/11/2007**

Calibrated by: CAG

Christopher A. Gerlach
Senior Calibration Technician

APPLIED TECHNICAL SERVICES, INCORPORATED

CALIBRATION DATA SHEET

Customer: Fugro Consultants　　Purchase Order No.: L-2416

Item Name: Load Cell w/o Display　　Asset No.: 129739　　ATS Reference No.: M503691-1

Manufacturer: GeoTac　　Model No.: 50Klbs　　Proc. No.: 521　　Rev.: 5

Serial No.: 129739　　Calibration Date: 11/28/06　　Calibration Due Date: 11/28/07

Reason For Service: ☒ Initial Calibration　☐ Due For Calibration　☐ Repair and Calibration

Equipment Used: ATS-01226　Due: 02/11/07　Universal Testing Machine

Due:

Due:

Due:

Due:

Due:

Calibrated By: [signature]

Customer Instrument Under Test

UNCERTAINTY (SEE NOTE) g	RANGE Lbs	ATS STANDARD Lbs	TOLERANCE Lbs	AS FOUND READING mV	AS CALIBRATED READING Lbs
0.03%	50000	(Comp.) 5000.000	As Found Data Only	-2.176	Same as - As Found
0.03%		10000.000	As Found Data Only	-4.358	Same as - As Found
0.03%		20000.000	As Found Data Only	-8.722	Same as - As Found
0.03%		30000.000	As Found Data Only	-13.092	Same as - As Found
0.03%		40000.000	As Found Data Only	-17.479	Same as - As Found
0.03%		50000.000	As Found Data Only	-21.826	Same as - As Found
Excitation (Before)	10.0000VDC				
Excitation (After)	10.0000VDC				
Zero (Before)	0.000				
Zero (After)	0.000				
Gage Factor	-2.1826mV/V				

* Indicates out of tolerance readings.

Remarks: Measurement Uncertainty reported at coverage factor K = 2 or 95% confidence level.

A= + Excitation　B= -Excitation　C= + Output D= -Output

ATS 538, 05/03

ACCREDITED CALIBRATION CERTIFICATE 1991.01

LOAD CELL CALIBRATION CERTIFICATION

CUSTOMER : FUGRO CONSULTANTS INC.
ADDRESS : Houston,TX 77081
CONDITION: AS FOUND & FINAL S.O. #: 78664 P.O. #: L-2563
MODEL: FT451-50K SERIAL: 129739 BRIDGE: A CAPACITY: 50 Klbf
PROCEDURE: C-1257

INPUT RESISTANCE: 376.3 OHM OUTPUT RESISTANCE: 354.7 OHM
ZERO BALANCE : 0.166 %RO

TEST CONDITIONS

TEMPERATURE: 74 °F HUMIDITY: 30 % EXCITATION: 10 VDC

TRACEABILITY

FORCE STANDARD	: STD-14	NIST #: 822/273338-06	DUE: 15-MAR-10
STANDARD INDICATOR	: BRD295	NIST #: 512727	
TEST INDICATOR	: BRD297	NIST #: 512727	

SHUNT CALIBRATION

	Shunt (± 0.01%)	Output	Straight Line Conversion	Connections*
Tension	Kohm	.00000 mV/V	.0000 Klbf	
Compression	60 Kohm	-1.46285 mV/V	33.650 Klbf	-Out to +Exc

*For models wired with +Sense, -Sense, or -SCal leads, resistor connections are actually to these leads in place of +Exc, -Exc, or -Out respectively.

PERFORMANCE

	RATED OUTPUT	SEB OUTPUT	NONLINEARITY	HYSTERESIS	SEB
TENSION	.00000 mV/V	.00000 mV/V	.000 %FS	.000 %FS	± .000 %FS
COMPRESSION	-2.17387 mV/V	-2.17364 mV/V	-.027 %FS	.045 %FS	± .022 %FS

STATIC ERROR BAND (SEB) - The band of maximum deviations of the ascending and descending calibration points from a best fit straight line through zero OUTPUT. It includes the effects of NONLINEARITY, HYSTERESIS, and nonreturn to MINIMUM LOAD.

TEST LOAD APPLIED (Klbf)	RECORDED READINGS (mV/V) Tension	Compression
0		.00000
10		-.43434
20		-.86897
30		-1.30378
40		-1.73876
50		-2.17387
20		-.86994
0		-.00018

Interface, Inc. certifies that force measurements are traceable to primary standards at NIST. Calibration performed per Interface QA program and the requirements of ISO/IEC 17025, MIL-STD-45662A & ANSI/NCSL Z540-1-1994. Estimated measurement uncertainty is 0.040%, expressed as the expanded uncertainty at 95% confidence level using a coverage factor of k=2. Results relate to load cell serial 129739 only.
DO NOT REPRODUCE THIS REPORT except in full or with Interface Inc. written approval.

TECHNICIAN : Josh Smith DATE :14-MAR-08

INTERFACE INC.
7401 EAST BUTHERUS DRIVE · SCOTTSDALE, ARIZONA 85260, U.S.A.
TELEPHONE (480)948-5555 · FAX (480)948-1924

F16-4D-1206

ACCREDITED CALIBRATION CERTIFICATE 1991.01

interface
ADVANCED FORCE MEASUREMENT

LOAD CELL CALIBRATION CERTIFICATION

CUSTOMER : FUGRO CONSULTANTS INC.
ADDRESS : Houston,TX 77081
CONDITION: FINAL S.O. #: 78664 P.O. #: L-2563
MODEL: FT451-50K SERIAL: 129739 BRIDGE: A CAPACITY: 12.5 Klbf
PROCEDURE: C-1257

INPUT RESISTANCE: 374.7 OHM OUTPUT RESISTANCE: 353.0 OHM
ZERO BALANCE : -0.386 %RO

TEST CONDITIONS

TEMPERATURE: 75 °F HUMIDITY: 30 % EXCITATION: 10 VDC

TRACEABILITY

FORCE STANDARD : STD-22 NIST #: 822/275431-07 DUE: 15-SEP-11
STANDARD INDICATOR: BRD106 NIST #: 512727
TEST INDICATOR : BRD300 NIST #: 512727

SHUNT CALIBRATION

	Shunt (± 0.01%)	Output	Straight Line Conversion	Connections*
Tension	60 Kohm	1.46154 mV/V	33.590 Klbf	-Out to -Exc
Compression	Kohm	.00000 mV/V	.0000 Klbf	

*For models wired with +Sense, -Sense, or -SCal leads, resistor connections are actually to these leads in place of +Exc, -Exc, or -Out respectively.

PERFORMANCE

	RATED OUTPUT	SEB OUTPUT	NONLINEARITY	HYSTERESIS	SEB
TENSION	.54411 mV/V	.54388 mV/V	-.073 %FS	.066 %FS	± .044 %FS
COMPRESSION	.00000 mV/V	.00000 mV/V	.000 %FS	.000 %FS	± .000 %FS

STATIC ERROR BAND (SEB) - The band of maximum deviations of the ascending and descending calibration points from a best fit straight line through zero OUTPUT. It includes the effects of NONLINEARITY, HYSTERESIS, and nonreturn to MINIMUM LOAD.

TEST LOAD APPLIED (Klbf)	RECORDED READINGS (mV/V) Tension	Compression
0.0	.00000	
2.5	.10868	
5.0	.21743	
7.5	.32609	
10.0	.43489	
12.5	.54411	
5.0	.21779	
0.0	.00026	

Interface, Inc. certifies that force measurements are traceable to primary standards at NIST. Calibration performed per Interface QA program and the requirements of ISO/IEC 17025, MIL-STD-45662A & ANSI/NCSL Z540-1-1994. Estimated measurement uncertainty is 0.040%, expressed as the expanded uncertainty at 95% confidence level using a coverage factor of k=2. Results relate to load cell serial 129739 only.
DO NOT REPRODUCE THIS REPORT except in full or with Interface Inc. written approval.

TECHNICIAN : Josh Smith DATE :14-MAR-08

INTERFACE INC.
7401 EAST BUTHERUS DRIVE · SCOTTSDALE, ARIZONA 85260, U.S.A.
TELEPHONE (480)948-5555 · FAX (480)948-1924

F16-40-1206

THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

INTERFACE, INC.

Scottsdale, AZ

for technical competence in the field of **Calibration**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005*).

Presented this 18th day of October 2006.

President
For the Accreditation Council
Certificate Number 1991.01
Valid to November 30, 2008

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO 17025:2005
& ANSI/NCSL Z540-1-1994

INTERFACE, INC.
7401 E. Butherus Drive
Scottsdale, AZ 85260
LaVar Clegg Phone: 480 948 5555 ext 106

CALIBRATION

Valid To: November 30, 2008 Certificate Number: 1991.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1]:

I. Mechanical

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
Force – Load Cells, Force Transducers	(200 to 240 000) lbf (100 to 1100) lbf (240 000 to 1 000 000) lbf	0.035 % reading 0.050 % reading 0.041 % reading	Load cells
	(1 to 500) lbf	0.040 % reading	Free weights
	(25 to 1100) lbf	0.030 % reading	Actuated weights
	(10 to 550) lbf	0.021 % reading	Actuated weights (stainless steel)
	(25 to 2000) gf	0.030 % reading	Free weights
Mass – Measure Dead Weight	 (1 to 25) lb (25 to 100) lb	 0.0032 % 0.0085 %	Transfer method using load cells

(A2LA Cert. No. 1991.01) 10/18/2006 Page 1 of 2

II. Electrical – DC & Low Frequency

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
DC Voltage – Measure	(0 to 0.14) V (0.14 to 1.4) V (1.4 to 14) V (14 to 140) V	0.0026 % + 0.2 µV 0.0024 % + 2 µV 0.0022 % + 20 µV 0.0022 % + 200 µV	Solartron 7071
DC Voltage Ratio	(0 to 0.1) V	0.0007 % rdg + 0.1 µV/V_{ref}	Kelvin-Varley divider
Resistance – Measure	(0 to 1.4) kΩ (0.14 to 1.4) kΩ (1.4 to 14) kΩ (14 to 140) kΩ (140 to 1400) kΩ	0.0026 % + 0.2 mΩ 0.0026 % + 2 mΩ 0.0026 % + 20 mΩ 0.0028 % + 0.2 Ω 0.0036 % + 2 Ω	Solartron 7071

[1] This laboratory offers commercial calibration service.

[2] "Best Uncertainty" is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards of nearly ideal measuring equipment. Best uncertainties represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The best uncertainty of a specific calibration performed by the laboratory may be greater than the best uncertainty due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

Roxanne M. Robinson

GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Manufacturer: Eaton

Sales Order: 216724

Model Number: UPS3000CC

Serial Number: A0813

ID Number: XPE-001

Preceding the calibration, the elastic element of this gauge was exercised and zero was adjusted. The horizontal plane of reference for pressure measurement is at the centerline of the test port.

The calibration and traceability of the transfer standards used in this calibration are maintained according to Quality Manual (QMS-001) Revision R (12/14/2005). The measurement results are traceable through an unbroken chain of comparisons to reference standards developed and maintained by the National Institute of Standards and Technology. The uncertainty reported with the data is the expanded uncertainty, and is based on the standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

This calibration was performed at the GE Infrastructure Sensing Houston facility. At the time of the calibration, the environmental conditions were 21 °C, 60%RH, and 101 kPa. The best estimate of gravitational acceleration at the site of calibration was 9.792778 m/s².

The calibration procedure CS-125 Revision D satisfies the requirements of ANSI/NCSL Z540-1-1994, ISO 9001, ISO/IEC 17025:1999 (E), NIST Handbook 150, and MIL-STD-45662A.

Sharon R. Ellis

Approved by: Sharon R. Ellis
Calibration Technician

Calibrated by: Joseph P. Balliew
Calibration Technician

General Electric Company
10311 Westpark Drive
Houston, TX 77042
USA

T 713 975 0547
F 713 975 6338

GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Full Scale: 250 psi gauge

As Found Calibration Data

Calibration Date: September 15, 2006

Calibration Standard: PC-89, WS-12, and WS-27

Medium: nitrogen

Applied psi	Uncertainty psi	Displayed psi
0.00	0.0E+00	0.00
124.6680	1.4E-03	124.70
249.579	2.7E-03	249.65
124.6680	1.4E-03	124.65
0.00	0.0E+00	0.05

Note: The instrument was not adjusted prior to the above data being recorded. An asterisk denotes a point that is out of tolerance.

General Electric Company
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GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Full Scale: 100 psi gauge

As Found Calibration Data

Calibration Date: September 15, 2006

Calibration Standard: PC-67, WS-12, and WS-27

Medium: nitrogen

Applied psi	Uncertainty psi	Displayed psi
0.00	0.0E+00	0.00
49.8390	5.0E-04	49.80
99.9320	1.0E-03	99.88
49.8400	5.0E-04	49.76
0.00	0.0E+00	0.00

Note: The instrument was not adjusted prior to the above data being recorded. An asterisk denotes a point that is out of tolerance.

General Electric Company
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Houston, TX 77042
USA

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F 713 975 6338

GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Full Scale: 500 psi gauge

As Found / As Left Calibration Data

Calibration Date: September 15, 2006

Calibration Standard: PC-89, and ,WS-12

Medium: nitrogen

Applied psi	Uncertainty psi	Displayed psi
0.0	0.0E+00	0.0
124.6700	1.4E-03	124.7
249.580	2.7E-03	249.6
374.330	4.1E-03	374.4
499.070	5.5E-03	499.2
249.580	2.7E-03	249.6
0.0	0.0E+00	0.1

Notes: The instrument was not adjusted.

General Electric Company
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Houston, TX 77042
USA

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GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Full Scale: 250 psi gauge

As Left Calibration Data

Calibration Date: September 15, 2006

Calibration Standard: PC-89, WS-12, and WS-27

Medium: nitrogen

Applied psi	Uncertainty psi	Displayed psi
0.00	0.0E+00	0.00
61.7960	6.8E-04	61.80
124.6680	1.4E-03	124.65
186.5430	2.1E-03	186.55
249.579	2.7E-03	249.60
124.6680	1.4E-03	124.65
0.00	0.0E+00	0.00

Notes: The instrument was adjusted prior to recording the above data.

General Electric Company
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Houston, TX 77042
USA

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F 713 975 6338

GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Full Scale: 100 psi gauge

As Left Calibration Data

Calibration Date: September 15, 2006

Calibration Standard: PC-67, WS-12, and WS-27

Medium: nitrogen

Applied psi	Uncertainty psi	Displayed psi
0.00	0.0E+00	0.00
24.86100	2.5E-04	24.84
49.8390	5.0E-04	49.84
74.9860	7.5E-04	74.98
99.9310	1.0E-03	99.96
49.8390	5.0E-04	49.82
0.00	0.0E+00	0.00

Notes: The instrument was adjusted prior to recording the above data.

General Electric Company
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USA

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NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999

GE Infrastructure Sensing
10311 Westpark Drive
Houston, TX 77042-5312
Mr. Kenneth A. Kolb
Phone: 713-975-0547 Fax: 713-975-6338
E-mail: kenneth.kolb@ge.com
URL: http://www.gesening.com

CALIBRATION LABORATORIES **NVLAP LAB CODE 200491-0**

NVLAP Code: 20/A01 ANSI/NCSL Z540-1-1994; Part 1 Compliant

MECHANICAL

NVLAP Code: 20/M08
Mass

Calibration of Primary Piston Gauge Masses

Range	*Best Uncertainty (±) Relative to Indicated Value* note 1	*Remarks*
1 mg to 17 kg	5.0×10^{-6} but not less than 0.5 mg	Substitution – Mechanical
1 mg to 1.2 kg	5.0×10^{-6} but not less than 0.5 mg	Substitution – Electronic

Calibration of Secondary Piston Gauge Masses

1 mg to 8.0 kg	2.0×10^{-5} but not less than 0.5 mg	Substitution – Electronic
1 mg to 1.2 kg	2.0×10^{-5} but not less than 0.5 mg	Direct Reading - Electronic
1.2 kg to 8 kg	2.0×10^{-5} but not less than 43 mg	Direct Reading – Electronic

2006-01-01 through 2006-12-31

Effective dates

For the National Institute of Standards and Technology

National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200491-0**

THERMODYNAMICS

NVLAP Code: 20/T05
Pressure

Pneumatic Pressure using Primary Piston Gauge note 2

Range	*Best Uncertainty (±) of Reading* note 1	*Remarks*
-100 kPa to -1.38 kPa	1.0×10^{-5} but not less than 0.07 Pa	Negative Gauge Mode
-16 kPa to 16 kPa	1.1×10^{-5} but not less than 0.034 Pa	Differential Mode
1.38 kPa to 1.4 MPa	1.0×10^{-5} but not less than 0.07 Pa	Gauge Mode note 4
1.4 MPa to 7 MPa	1.1×10^{-5} but not less than 2.8 Pa	Gauge Mode note 4
7 MPa to 21 MPa	$1.1 \times 10^{-5} + 1.9 \times 10^{-7}$ per MPa	Gauge Mode
21 MPa to 104 MPa	3.5×10^{-5}	Gauge Mode

Pneumatic Effective Area Determination using Primary Piston Gauge note 2

Range	*Best Uncertainty (±) of Reading* notes 1, 7	*Remarks*
1.38 kPa to 345 kPa	8.8×10^{-6}	
11.72 kPa to 1.4 MPa	8.3×10^{-6}	
14 kPa to 7 MPa	$1.0 \times 10^{-5} + 2.4 \times 10^{-7}$ per MPa note 3	
700 kPa to 21 MPa	$1.0 \times 10^{-5} + 4.8 \times 10^{-7}$ per MPa note 3	
1.17 MPa to 104 MPa	3.37×10^{-5}	

Pneumatic Pressure using Precision Transducer note 2

Range	*Best Uncertainty (±) of Reading* note 1	*Remarks*
0 Pa to 133 Pa	0.133 Pa	Absolute Mode
-16 kPa to 16 kPa	5.0×10^{-5} but not less than 0.035 Pa	Differential Mode
-100 kPa to 17 MPa	6.5×10^{-5} but not less than 0.22 Pa	Gauge Mode note 5

2006-01-01 through 2006-12-31

Effective dates

For the National Institute of Standards and Technology

CALIBRATION LABORATORIES **NVLAP LAB CODE 200491-0**

Pneumatic Effective Area Determination using Precision Transducer note 2

20 Pa to 17 MPa	7.2×10^{-5} but not less than 0.05 Pa	

Pneumatic Deadweight Tester Output Pressure Conformance using Precision Transducer note 2

Range	*Best Uncertainty (±) of Reading* notes 1, 8	*Remarks*
20 Pa to 17 MPa	7.5×10^{-5} but not less than 0.053 Pa	

Hydraulic Pressure using Primary Piston Gauge note 2

Range	*Best Uncertainty (±) of Reading* notes 1, 6	*Remarks*
50 kPa to 7 MPa	2.5×10^{-5} but not less than 10 Pa	Gauge Mode
7 MPa to 140 MPa	3.5×10^{-5}	Gauge Mode
14 MPa to 280 MPa	7.5×10^{-5}	Gauge Mode
280 MPa to 500 MPa	1.0×10^{-4}	Gauge Mode

Hydraulic Effective Area Determination using Primary Piston Gauge note 2

Range	*Best Uncertainty (±) of Reading* note 1	*Remarks*
50 kPa to 7 MPa	2.31×10^{-5}	
7 MPa to 140 MPa	3.34×10^{-5}	
140 MPa to 280 MPa	7.29×10^{-5}	
280 MPa to 500 MPa	9.80×10^{-5}	

Hydraulic Effective Area Determination using Secondary Piston Gauge note 2

70 kPa to 140 MPa	7.2×10^{-5}	

2006-01-01 through 2006-12-31
Effective dates

For the National Institute of Standards and Technology

NVLAP-01S (REV. 2004-10-31)

CALIBRATION LABORATORIES **NVLAP LAB CODE 200491-0**

Hydraulic Deadweight Tester Output Pressure Conformance using Secondary Piston Gauge note 2

70 kPa to 140 MPa	7.5×10^{-5} but not less than 50 Pa

1. Represents an expanded uncertainty using a coverage factor, k = 2, at an approximate level of confidence of 95 %.
2. This capability includes on-site calibration service, as limited by influences of operating environment.
3. Component uncertainties are combined in quadrature.
4. For absolute mode, uncertainties increase by 1.33E + 00 Pa, combined in quadrature with stated level.
5. For absolute mode, uncertainties increase by 1.88E + 00 Pa, combined in quadrature with stated level.
6. For absolute mode, uncertainties increase by 1.31E + 01 Pa, combined in quadrature with stated level.
7. Calibration process may include the use of transducers to measure small differential pressures.
8. Conformance evaluation of Deadweight Tester output pressure compared to indicated pressure.

2006-01-01 through 2006-12-31

Effective dates

For the National Institute of Standards and Technology

QUALITY SYSTEM MANUAL

FOR

HOUSTON GEOTECHNICAL LABORATORY

CONTROL #: GEO-1

Fugro Consultants, Inc.
6100 Hillcroft
Houston, Texas 77081
Phone: (713) 369-5400
Fax: (713) 369-5545

Document Revised: July 07, 2007

CALIBRATION EQUIPMENT OR REFERENCE STANDARDS			
Equipment Name	Calibration Interval	Check Interval	Procedure Used
Digital Micrometer & Mechanical Micrometers	2 years		Outside Source
Force Transducers	1 year		Outside Source
Metal Specimens	Verify Before Use or After Repair		HGL-2655
Pressure Gages	2 years		Outside Source
Set of Gage Blocks	5 years		Outside Source
Thermometers	1 year		Outside Source
Torque Transducers	2 years		Outside Source
Voltmeters/Multimeters (6.5 digit)	3 years		Outside Source

*The term "calibration" is used to maintain consistency with ASTM D 3740. It is taken to mean "verification."

PRE JOB CALIBRATION VERIFICATION

CALIBRATION CERTIFICATE

APPLICANT	FGI HOUSTON	Certificate number	FC070040 Page 1 of 1
SUBMITTED	**A Piezo Cone Penetrometer**	Manufacturer	Fugro Engineers B.V.
Device type	CONE, A15F2.5CKE3SW2/ B, 50 bar	Serial number	1701-1788

The device contains an electronic data sheet which contains, amongst others, the characteristics of all the sensors inside the device. The data acquisition system calculates the measured value from these known characteristics. All calibration results are conform the values specified below.

Force calibration

Calibration reference : 548 FRE.001
Procedure : FEBV.CAL.PRO.003 KALIBRATIE KRACHT
Title of channel(s) : Cone and Cone+Fric.
Max. load 150 kN

Range	Calibration range From	to	Sensitivity Deviation	Zero load output
1	0	25 kN	< 0.5 %	< 0.75 kN
Calibration uncertainty			0.3 %	0.008 kN

Pressure test :

Deviation from specified Alpha factor at 2.5 MPa	< 5 %

Cone quality control values :

Max. deviation from reference	< 1 %
Max. Tip to Sleeve friction Crosstalk	< 1 %

Pressure calibration

Calibration reference : 3257-0001
Procedure : FEBV.CAL.PRO.004 KALIBRATIE DRUK
Title of channel : Pore 2
Max. load 30 Mpa

Range	Calibration range From		Sensitivity Deviation	Zero load output
1	0	2.5 MPa	< 1.0 %	< 0.002 MPa
Calibration uncertainty			0.6 %	0.003 MPa
Pore 2 transducer : Kistler 4043A50 SN : 1233109				

Calibration of the slope sensor

Calibration reference :
Procedure:FEBV.CAL.PRO.006 KALIBRATIE HELLING
Title of channel : Slope x

Range	Calibration range From		Sensitivity Deviation	Zero load output
1	0	15 deg	< 10 %	< 1.5 deg
Calibration uncertainty			1 %	0.5 deg

Typical values for this type of device

Cone diameter (mm)	43.7	Pore 2 position	2	Alpha factor	0.58
Cone area (square cm)	15	Sleeve length (mm)	144.7	Cone - Sleeve distance (mm)	14.4
Sleeve diameter (mm)	43.9	Sleeve area (square cm)	200	Cone - Pore 2 distance (mm)	6.0

TRACEABILITY. The measurements have been executed using standards for which the traceability to primary and/or (inter)national standards has been demonstrated .

Calibrated by: Hoogendoorn, Raymond　　Approved by : Sinjorgo, Gerry

Calibration date: 16-1-2007　　Approval date: 16-1-2007

Calibrate before: 16-1-2008

FUGRO ENGINEERS B.V.

Calibration Verification Certificate

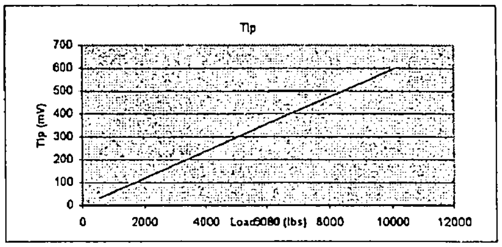
Device Type: Piezo Cone Penetrometer

Device Number: **F7.5CKESW2/V 1701-1788**

TIP CALIBRATION

Tip area = 15 cm2 = 0.0161 ft2
Tip readings in mV

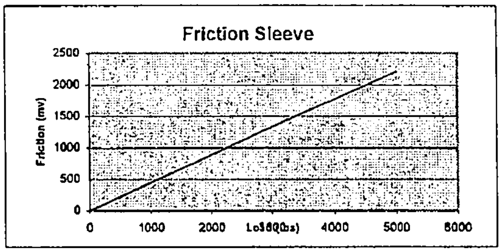
Load lb	Load Tons	load/area tsf	Tip mV	TIP Cal Factor Mpa
0	0	0	0	0
540	0.27	16.77019	32.1	50.0287963
5110	2.555	158.6957	303.4	50.0883413
7580	3.79	235.4037	449.8	50.1165401
10020	5.01	311.1801	596.3	49.9728639
15020	7.51	466.4596	892.5	50.0487269
20005	10.0025	621.2733	1183.2	50.2819048



FRICTION CALIBRATION

Sleeve area = 200 cm2 = 0.2153 ft2
Friction readings in mV

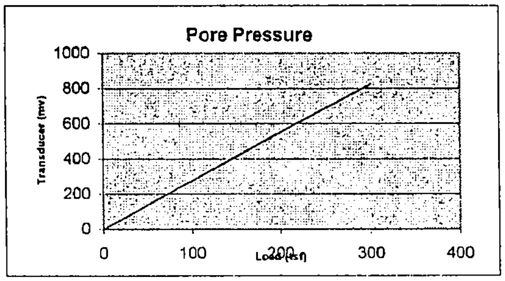
Load lb	Load Tons	load/area tsf	Friction mV	Friction Cal Factor Mpa
0	0	0	0	0
620	0.31	1.439851	279.8	0.49278463
1990	0.995	4.621458	884.6	0.50028711
3520	1.76	8.17464	1562.3	0.50106193
5010	2.505	11.63493	2212.2	0.5036473
7510	3.755	17.44078	3308.9	0.50474203



PORE PRESSURE TRANSDUCER CALIBRATION

Serial : 1233109
Pore Pressure readings in mV

Pressure psi	Pressure tsf	Transducer readings mV	P.Pres. Cal Factor Mpa
0	0	0	0
75	5.4	206.7	2.50173026
150	10.8	413.6	2.50052053
300	21.6	824.2	2.50962215



Temperature Calibration (30 - 115 degrees F)

Temp (deg	TIP (mV)	FRIC (mV)	PIEZO (mV)
30	-0.017	-0.198	-0.109
50	-0.008	-0.336	-0.067
75	0.011	-0.456	-0.054
100	0.132	2.307	-2.192
115	0.257	2.987	-2.647

Deviation	mV	Mpa	% Full Scale
Tip	0.274	0.0137	0.0274
Friction	3.185	0.001593	0.3185
Piezo	2.593	0.006483	0.2593

TIP CALIBRATED BY GEOTAC (A2LA APPROVED) LOAD CELL:
Model 560K, Serial No. 129739
FRICTION CALIBRATED BY INTERFACE (A2LA APPROVED) LOAD CELL :
Model: 1211EX-10K-B, Serial : 113655
PORE PRESSURE TRANSDUCER CALIBRATED BY GE SENSING (AANSI/NCSL APPROVED)
Pressure Indicator Model: UPS3000CC, Serial : A0813
TEMPERATURE CALIBRATED BY HOUSTON PRECISION TYPE K THERMOCOUPLE (A2LA APPROVED)
Model # 8528-40, Serial # C95005824, ID # TD-001

Calibration Verified by: Dennis Stauffer Date: 11/5/2007

Checked By : Recep Yilmaz Date: 11/5/2007

HGL Instrument Verification

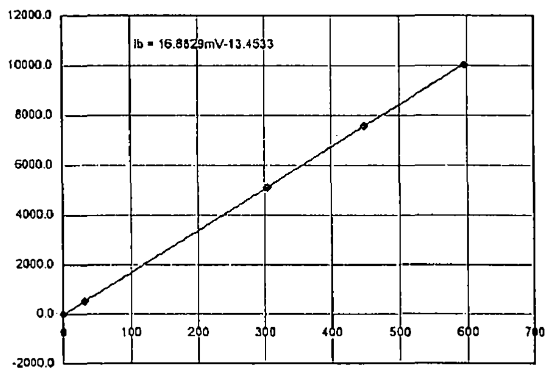
DATE: 11/5/2007 Instrument No.: ft Location: Houston LVDT?: [ ] Yes; [X] No

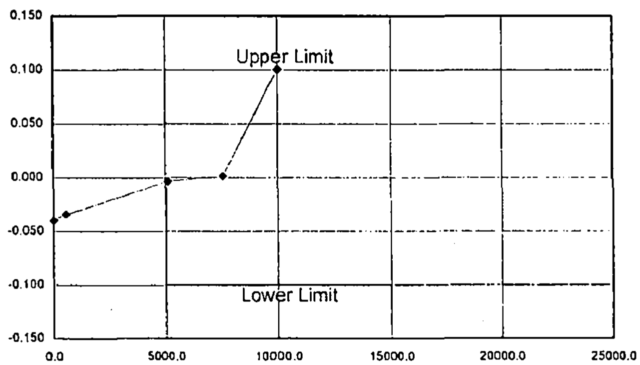
Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data	
Type	Cone Penetrometer_TIP
Manufacturer	Fugro
Model Number	F7.5CKESW2/B1
Serial Number	1701-1788 (Tip)
HGL Instrument Number	ft
Excitation (V)	
Gain/Span Setting	NA
Full Range Output (V)	
Full Range/Capacity (lb)	33716
Date Verified	11/5/2007
Date Due	11/4/2008
Service Status	In Service
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.
Verification/Standard Equipment	
Type	Load Cell (A2AL APPROVED)
Manufacturer	Geotac
Model Number	560K
Serial Number	129739
HGL Instrument Number	
Date Verified	
Temperature	°C = °F
Linear Regression, Uncertainty, & Error Summary	
Correlation Coeff. (R^2)	0.999986252
Intercept (lb)	-13.45326099
Slope (lb/mV)	16.88287763
Verification (Calib.) Factor	16.88287763
Verification Factor Units	lb/mV
Absolute Zero (V)	
Floating Zero (V)	
Combined Uncertainty (lb)	6.479058372
Coverage Factor	2
Expanded Uncertainty (lb)	12.95811674
Max. Abs. or FS Error (%)	-0.13 [X] FS; [ ] Abs.

Instrument mV	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
0.000000	0.0	-13.5	13.5	-0.04
32.100000	540.0	528.5	11.5	-0.03
303.400000	5110.0	5108.8	1.2	0.00
449.800000	7580.0	7580.5	0.5	0.00
596.300000	10020.0	10053.8	33.8	0.10
892.500000	15020.0	15054.5	34.5	0.10
1183.200000	20005.0	19962.4	42.6	-0.13

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	6.4791	N	1.0000	A	6.4791	41.9782	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	6.4791		Coverage Factor		2	for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		12.958		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: ______ Reviewed By: ______ Checked By: [signature]

File:

Remarks:

HGL Instrument Verification

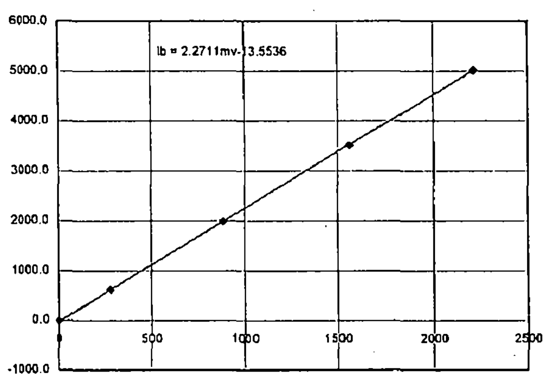
DATE: 11/5/2007 Instrument No.: ft100 Location: ______ LVDT?: [ ] Yes; [X] No

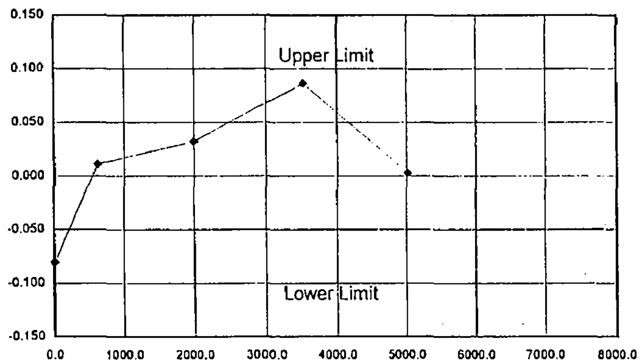
Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data	
Type	Cone Penetrometer
Manufacturer	Fugro
Model Number	F7.5CKESW2/B1
Serial Number	1701-1788 (Friction)
HGL Instrument Number	ft100
Excitation (V)	
Gain/Span Setting	NA
Full Range Output (V)	
Full Range/Capacity (lb)	16858
Date Verified	11/5/2007
Date Due	11/4/2008
Service Status	In Service
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.
Verification/Standard Equipment	
Type	Load Cell (A2AL APPROVED)
Manufacturer	INTERFACE
Model Number	1211EX-10K-B
Serial Number	113655
HGL Instrument Number	
Date Verified	
Temperature	°C = °F
Linear Regression, Uncertainty, & Error Summary	
Correlation Coeff. (R^2)	0.999987431
Intercept (lb)	-13.55356528
Slope (lb/mv)	2.271068817
Verification (Calib.) Factor	2.27106882
Verification Factor Units	lb/mv
Absolute Zero (V)	
Floating Zero (V)	
Combined Uncertainty (lb)	2.398188297
Coverage Factor	2
Expanded Uncertainty (lb)	4.796376595
Max. Abs. or FS Error (%)	0.09 [X] FS; [ ] Abs.

Instrument mv	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
0.000000	0.0	-13.6	13.6	-0.08
279.800000	620.0	621.9	1.9	0.01
884.600000	1990.0	1995.4	5.4	0.03
1562.300000	3520.0	3534.5	14.5	0.09
2212.200000	5010.0	5010.5	0.5	0.00
3308.900000	7510.0	7501.2	8.8	-0.05

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	2.3982	N	1.0000	A	2.3982	5.7513	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	2.3982	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]	4.796	lb					

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: ______ Reviewed By: ______ Checked By: [signature]

File:

Remarks:

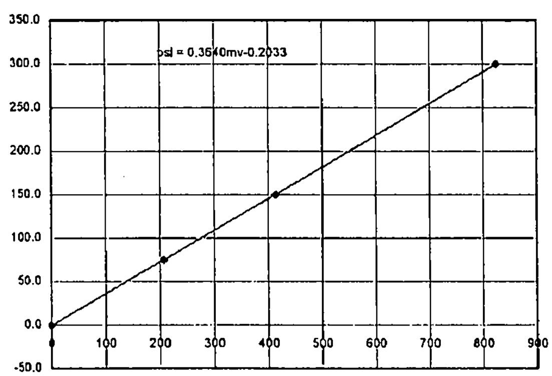
HGL Instrument Verification

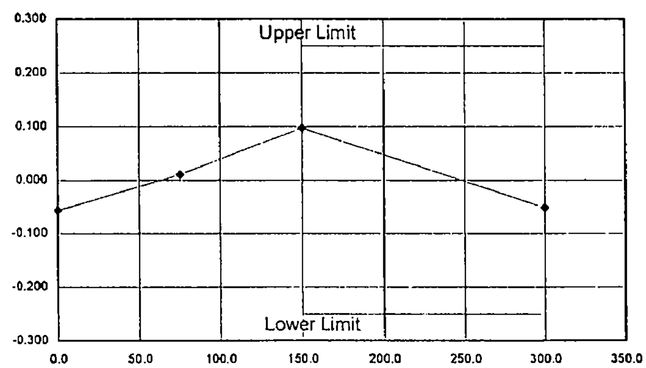
DATE: 11/5/2007 Instrument No.: pt Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard psi	Prediction psi	Abs. Error psi	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	-0.2	0.2	-0.06
Model Number	F7.5CKESW2/B1	206.700000	75.0	75.0	0.0	0.01
Serial Number	1701-1788-1233109 (Piezo)	413.600000	150.0	150.4	0.4	0.10
HGL Instrument Number	pt	824.200000	300.0	299.8	0.2	-0.05
Excitation (V)						
Gain/Span Setting	NA					
Full Range Output (V)						
Full Range/Capacity (psi)	360					
Date Verified	11/5/2007					
Date Due	11/4/2008					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.25 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	PT(ANSI/NCSL APPROVED)					
Manufacturer	Eaton					
Model Number	UPS3000CC					
Serial Number	A0813					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.99999592					
Intercept (psi)	-0.20331044					
Slope (psi/mv)	0.364010552					
Verification (Calib.) Factor	0.36401055					
Verification Factor Units	psi/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (psi)	0.064150208					
Coverage Factor	2					
Expanded Uncertainty (psi)	0.128300415					
Max. Abs. or FS Error (%)	0.10 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For pt							
Source of Uncertainty	Value in psi	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.0642	N	1.0000	A	0.0642	0.0041	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.0642	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		0.128		psi			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: ______ Reviewed By: ______ Checked By: [signature]

File:

Remarks:

Calibration Verification Certificate

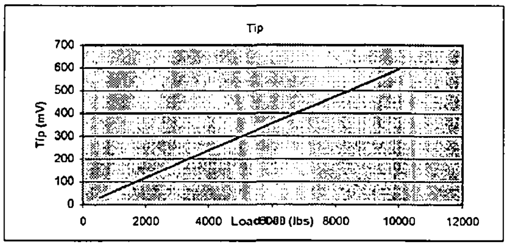
Device Type: Piezo Cone Penetrometer

Device Number: **F7.5CKE3SW2/B 1701-0750**

TIP CALIBRATION

Tip area = 15 cm2 = 0.0161 ft2
Tip readings in mV

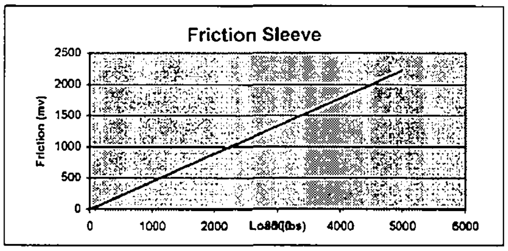
Load lb	Load Tons	load/area tsf	Tip mV	TIP Cal Factor Mpa
0	0	0	0	0
530	0.265	16.45963	31.5	50.0376197
5010	2.505	155.5901	298.1	49.9812458
7490	3.745	232.6087	445.2	50.0331664
10020	5.01	311.1801	595.9	50.0064083
15050	7.525	467.3913	895.2	49.9974383
19910	9.955	618.323	1184.3	49.9966444

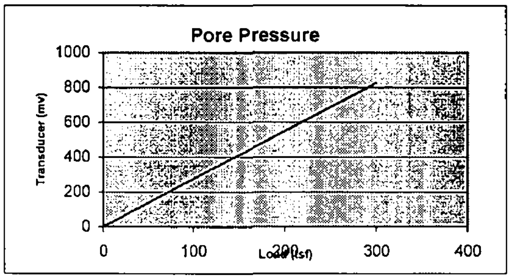


FRICTION CALIBRATION

Sleeve area = 200 cm2 = 0.2153 ft2
Friction readings in mV

Load lb	Load Tons	load/area tsf	Friction mV	Friction Cal Factor Mpa
0	0	0	0	0
520	0.26	1.207617	231.3	0.49996647
2490	1.245	5.782629	1107.3	0.50008891
3750	1.875	8.708778	1665.6	0.50069555
5010	2.505	11.63493	2228.3	0.50000833
7510	3.755	17.44078	3340.2	0.50001224





PORE PRESSURE TRANSDUCER CALIBRATION

Serial : 8091223
Pore Pressure readings in mV

Pressure psi	Pressure tsf	Transducer readings mV	P.Pres. Cal Factor Mpa
0	0	0	0
75	5.4	206.8	2.50052053
150	10.8	413.5	2.50112525
300	21.6	825.7	2.50506307

Temperature Calibration (30 - 115 degrees F)

Temp (deg	TIP (mV)	FRIC (mV)	PIEZO (mV)
30	0.946	0.783	-0.132
50	0.983	0.974	-0.077
75	1.012	1.114	0.264
100	1.297	1.267	0.357
115	1.324	1.771	0.992

Deviation	mV	Mpa	% Full Scale
Tip	0.378	0.0189	0.0378
Friction	0.988	0.000494	0.0988
Piezo	1.124	0.00281	0.1124

TIP CALIBRATED BY GEOTAC (A2LA APPROVED) LOAD CELL:
Model 560K, Serial No. 129739
FRICTION CALIBRATED BY INTERFACE (A2LA APPROVED) LOAD CELL :
Model: 1211EX-10K-B, Serial : 113655
PORE PRESSURE TRANSDUCER CALIBRATED BY GE SENSING (AANSI/NCSL APPROVED)
Pressure Indicator Model: UPS3000CC, Serial : A0813
TEMPERATURE CALIBRATED BY HOUSTON PRECISION TYPE K THERMOCOUPLE (A2LA APPROVED)
Model # 8528-40, Serial # C95005824, ID # TD-001

Calibration Verified by: Dennis Stauffer   Date: 4/23/2008

Checked By : Recep Yilmaz   Date: 4/23/2008

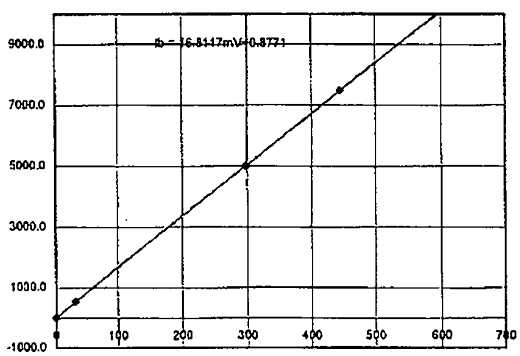
HGL Instrument Verification

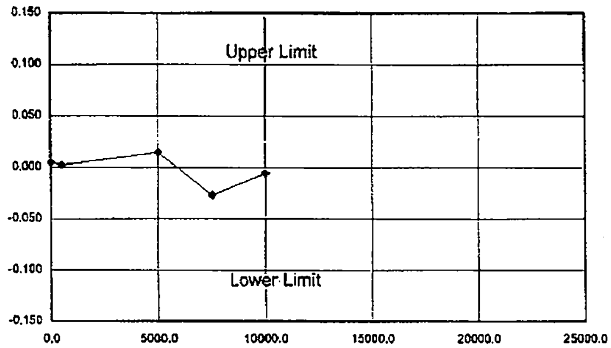
DATE: 4/23/2008 Instrument No.: ft100 Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mV	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer-TIP					
Manufacturer	Fugro	0.000000	0.0	0.9	0.9	0.01
Model Number	F7.5CKEW2/B	31.500000	530.0	530.4	0.4	0.00
Serial Number	1701-0750	298.100000	5010.0	5012.5	2.5	0.01
HGL Instrument Number	ft100	445.200000	7490.0	7485.5	4.5	-0.03
Excitation (V)		595.900000	10020.0	10019.0	1.0	-0.01
Gain/Span Setting	NA	895.200000	15050.0	15050.7	0.7	0.00
Full Range Output (V)		1184.300000	19910.0	19911.0	1.0	0.01
Full Range/Capacity (lb)	16858					
Date Verified	4/23/2008					
Date Due	4/23/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load cell (A2LA APPROVED)					
Manufacturer	GEOTAC					
Model Number	560K					
Serial Number	129739					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999999907					
Intercept (lb)	0.877122495					
Slope (lb/mV)	16.81173849					
Verification (Calib.) Factor	16.81173849					
Verification Factor Units	lb/mV					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	0.54832333					
Coverage Factor	2					
Expanded Uncertainty (lb)	1.09664666					
Max. Abs. or FS Error (%)	-0.03 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.5483	N	1.0000	A	0.5483	0.3007	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.5483	Coverage Factor			2	for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		1.097		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: ________ Reviewed By: ________ Checked By: [signature]

File:

Remarks:

HGL Instrument Verification

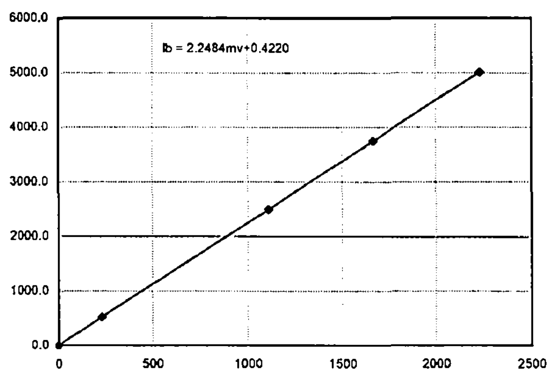
DATE: 4/23/2008 Instrument No.: ft100 Location: LVDT?: [ ] Yes; [X] No

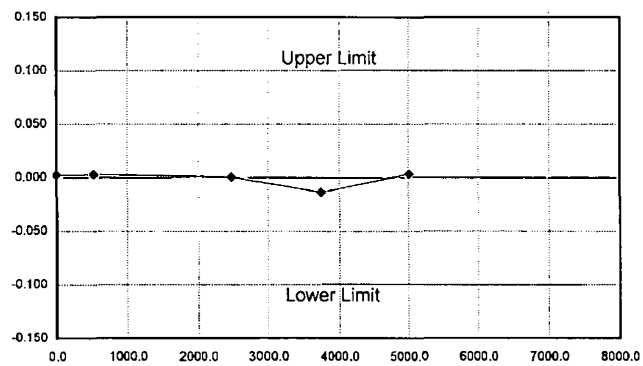
Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data	
Type	Cone Penetrometer
Manufacturer	Fugro
Model Number	F7.5CKE3SW2/B
Serial Number	1701-0750
HGL Instrument Number	ft100
Excitation (V)	
Gain/Span Setting	NA
Full Range Output (V)	
Full Range/Capacity (lb)	16858
Date Verified	4/23/2008
Date Due	4/23/2009
Service Status	In Service
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.
Verification/Standard Equipment	
Type	Load Cell (A2AL APPROVED)
Manufacturer	INTERFACE
Model Number	1211EX-10K-B
Serial Number	113655
HGL Instrument Number	
Date Verified	
Temperature	°C = °F
Linear Regression, Uncertainty, & Error Summary	
Correlation Coeff. (R^2)	0.999999834
Intercept (lb)	0.421964823
Slope (lb/mv)	2.248442121
Verification (Calib.) Factor	2.24844212
Verification Factor Units	lb/mv
Absolute Zero (V)	
Floating Zero (V)	
Combined Uncertainty (lb)	0.319825144
Coverage Factor	2
Expanded Uncertainty (lb)	0.639650288
Max. Abs. or FS Error (%)	-0.01 [X] FS; [ ] Abs.

Instrument mv	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
0.000000	0.0	0.4	0.4	0.00
231.300000	520.0	520.5	0.5	0.00
1107.300000	2490.0	2490.1	0.1	0.00
1666.600000	3750.0	3747.7	2.3	-0.01
2228.300000	5010.0	5010.6	0.6	0.00
3340.200000	7510.0	7510.7	0.7	0.00

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.3198	N	1.0000	A	0.3198	0.1023	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.3198		Coverage Factor		2	for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		0.640		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: ______ Reviewed By: ______ Checked By: [signature]

File:

Remarks:

HGL Instrument Verification

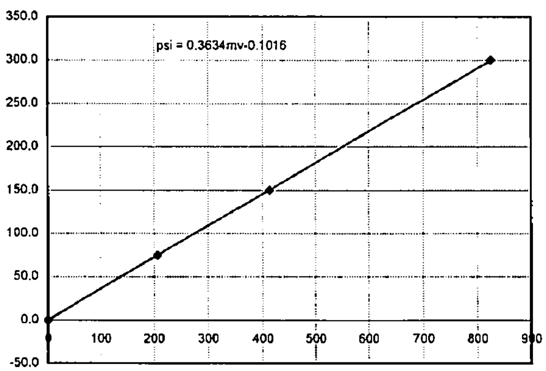
DATE: 4/23/2008 Instrument No.: pt Location: Houston LVDT?: [ ] Yes; [X] No

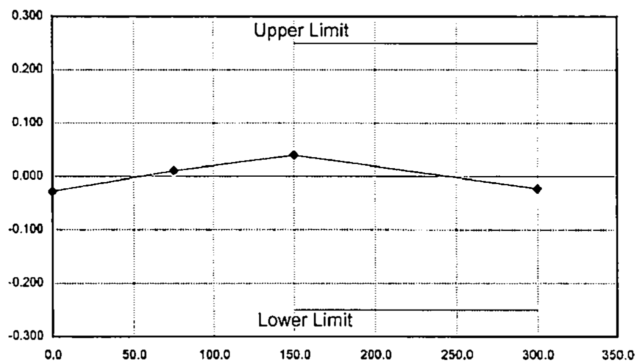
Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data	
Type	Cone Penetrometer
Manufacturer	Fugro
Model Number	F7.5CKEW2/B
Serial Number	1701-0750-8091223
HGL Instrument Number	pt
Excitation (V)	
Gain/Span Setting	NA
Full Range Output (V)	
Full Range/Capacity (psi)	360
Date Verified	4/23/2008
Date Due	4/23/2009
Service Status	In Service
Accept. Abs. or FS Error (%)	0.25 [X] FS; [ ] Abs.
Verification/Standard Equipment	
Type	PT(ANSI/NCSL APPROVED)
Manufacturer	Eaton
Model Number	UPS3000CC
Serial Number	A0813
HGL Instrument Number	
Date Verified	
Temperature	°C = °F
Linear Regression, Uncertainty, & Error Summary	
Correlation Coeff. (R^2)	0.999999198
Intercept (psi)	-0.101633254
Slope (psi/mv)	0.363351683
Verification (Calib.) Factor	0.36335168
Verification Factor Units	psi/mv
Absolute Zero (V)	
Floating Zero (V)	
Combined Uncertainty (psi)	0.021757343
Coverage Factor	2
Expanded Uncertainty (psi)	0.043514685
Max. Abs. or FS Error (%)	0.04 [X] FS; [ ] Abs.

Instrument mv	Standard psi	Prediction psi	Abs. Error psi	Full Scale Error (%)
0.000000	0.0	-0.1	0.1	-0.03
206.800000	75.0	75.0	0.0	0.01
413.500000	150.0	150.1	0.1	0.04
825.700000	300.0	299.9	0.1	-0.02

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For pt							
Source of Uncertainty	Value in psi	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.0218	N	1.0000	A	0.0218	0.0005	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.0218		Coverage Factor		2	for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]	0.044		psi				

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: ________ Reviewed By: ________ Checked By: Ry

File:

Remarks:

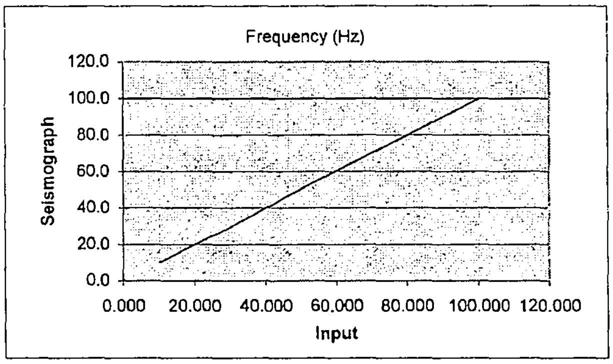
Calibration Verification Certificate

Device Type: **Seismograph**

Device Manufacturer **Geometrics, Inc.**
Model Number: **ES-3000**
Serial Number: **5138**

Frequency (Hz)

Input	Seismograph
10.055	9.9
20.037	19.9
30.071	29.3
40.040	40.1
50.061	50.6
60.048	60.3
70.005	70.2
80.011	79.9
90.090	90.1
100.014	99.8

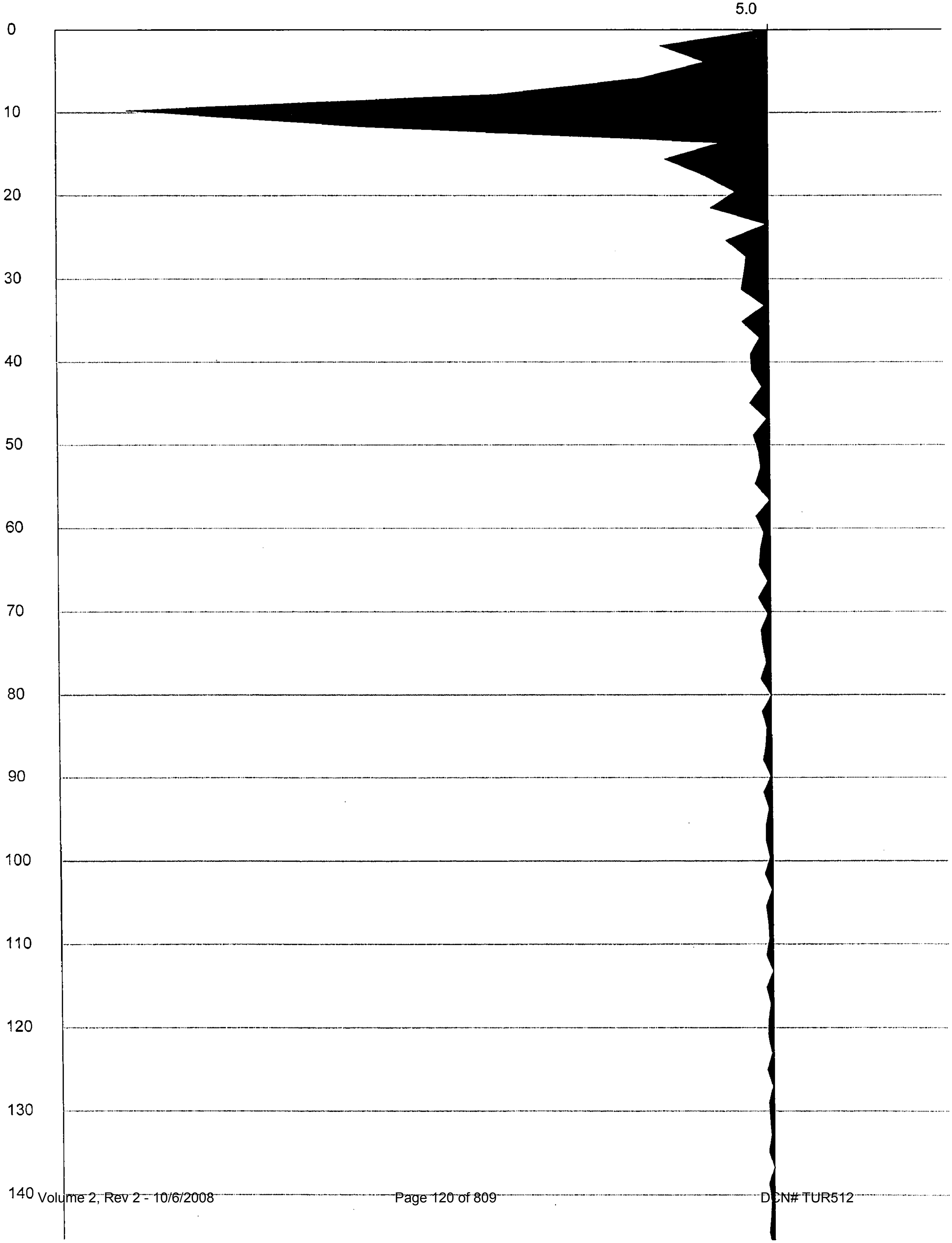


FREQUENCY CALIBRATED BY INSTEK GOOD WILL INSTRUMENTS (A2LA APPROVED) FREQUENCY COUNTER :
Model: GFC-80101H, Serial No. CF871549
FREQUENCY GENERATED BY EZ DIGITAL, INC (A2LA APPROVED) OSCILLISCOPE WITH BUILT IN FUNCTION GENERATOR
Model: OS-5020G, Serial No.: 3080209

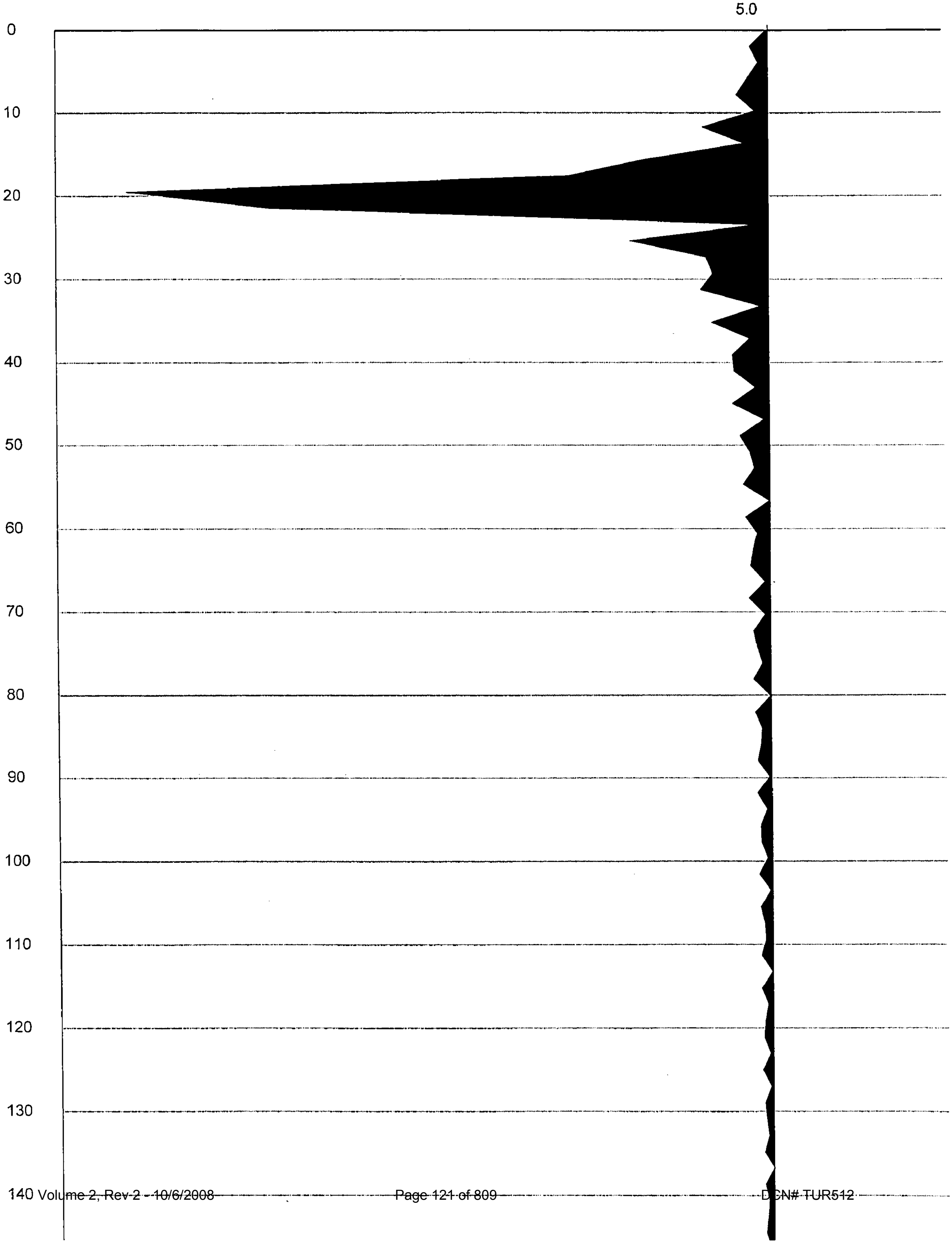
Calibration Verified by: Dennis Stauffer Date: 1/22/2008

Checked By : Recep Yilmaz Date: 1/22/2008

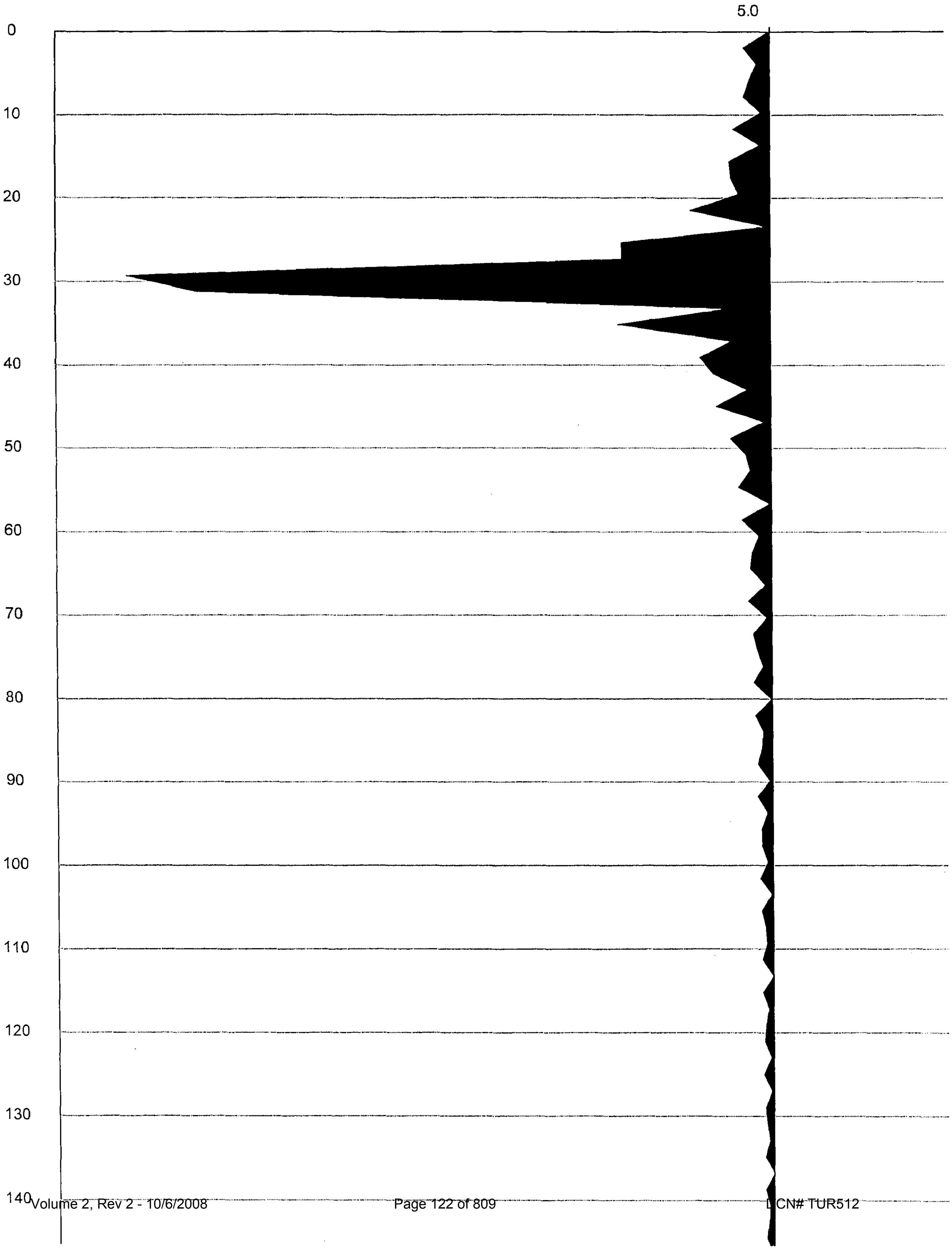
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 10.055 Seismograph: 9.9
Date: 1/22/2008



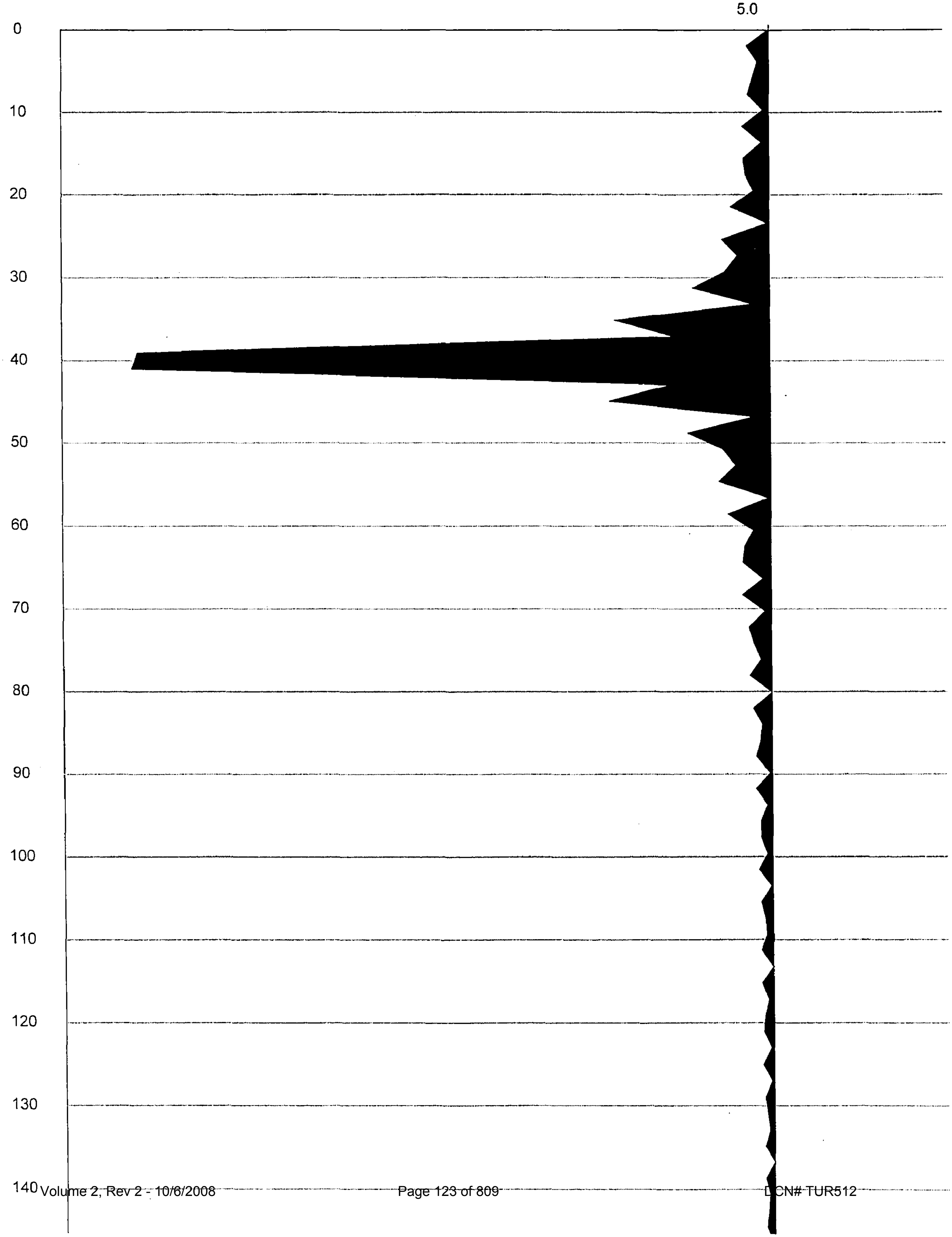
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 20.037 Seismograph: 19.9
Date: 1/22/2008



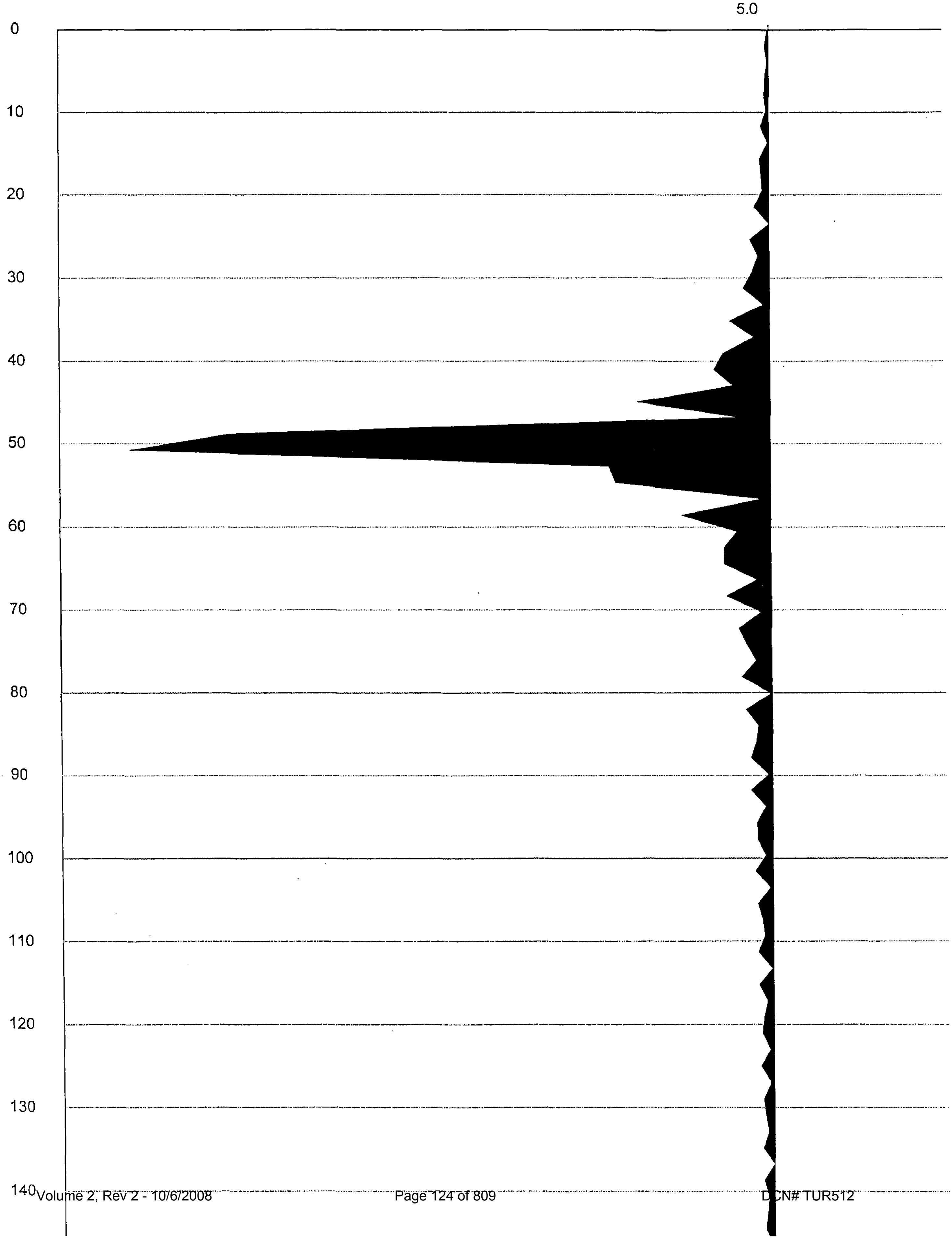
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 30.071 Seismograph: 29.3
Date: 1/22/2008



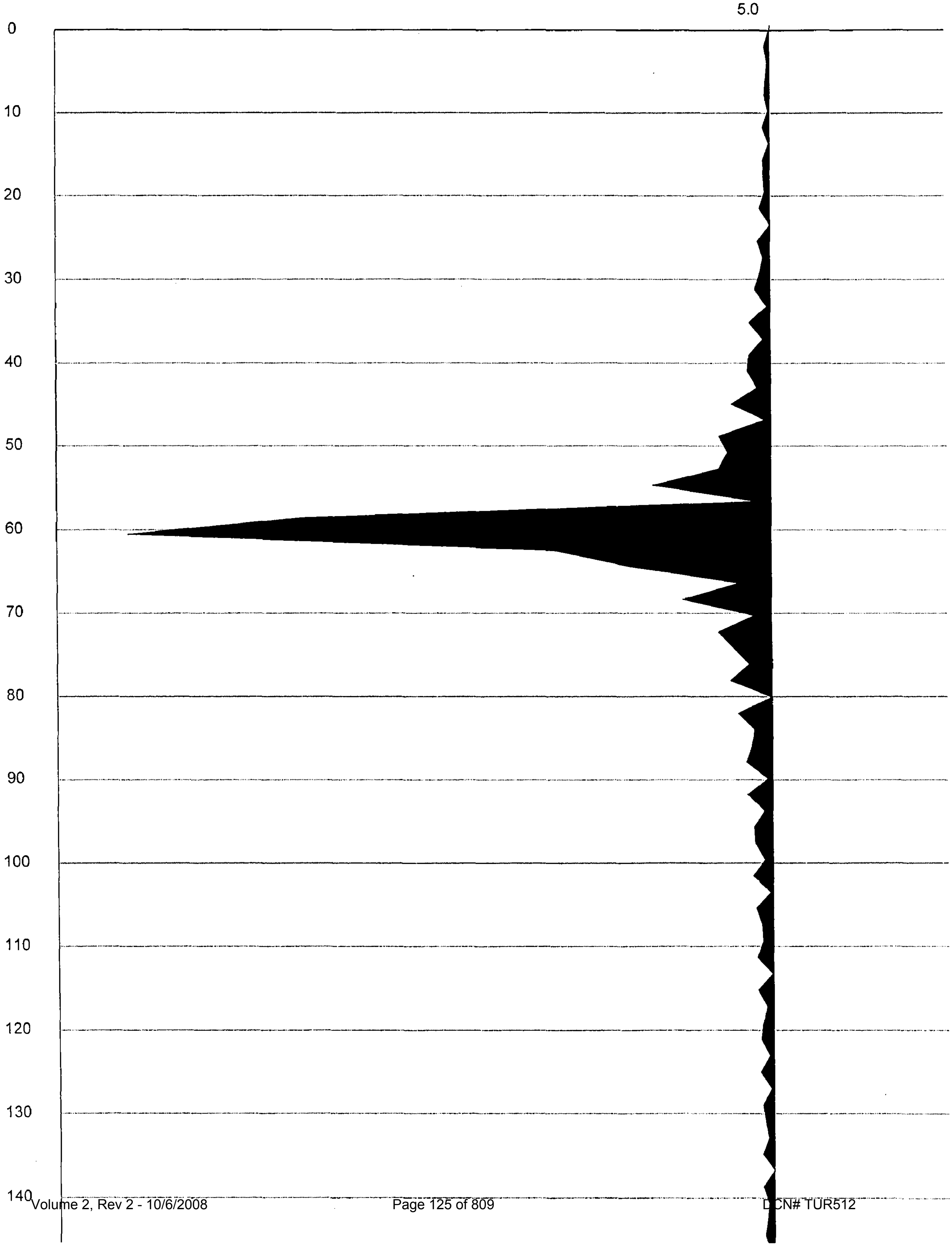
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 40.040 Seismograph: 40.1
Date: 1/22/2008



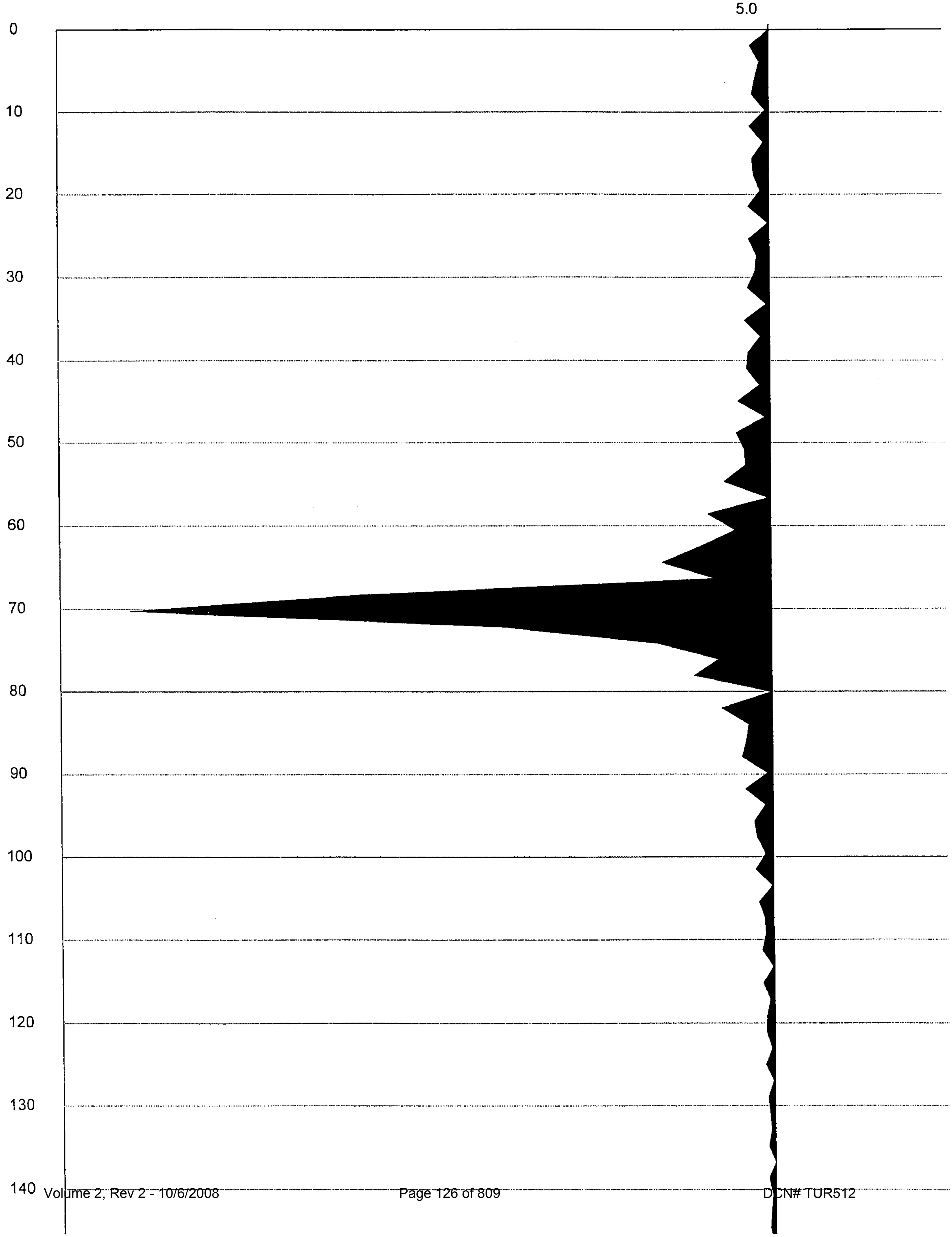
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 50.061 Seismograph: 50.6
Date: 1/22/2008



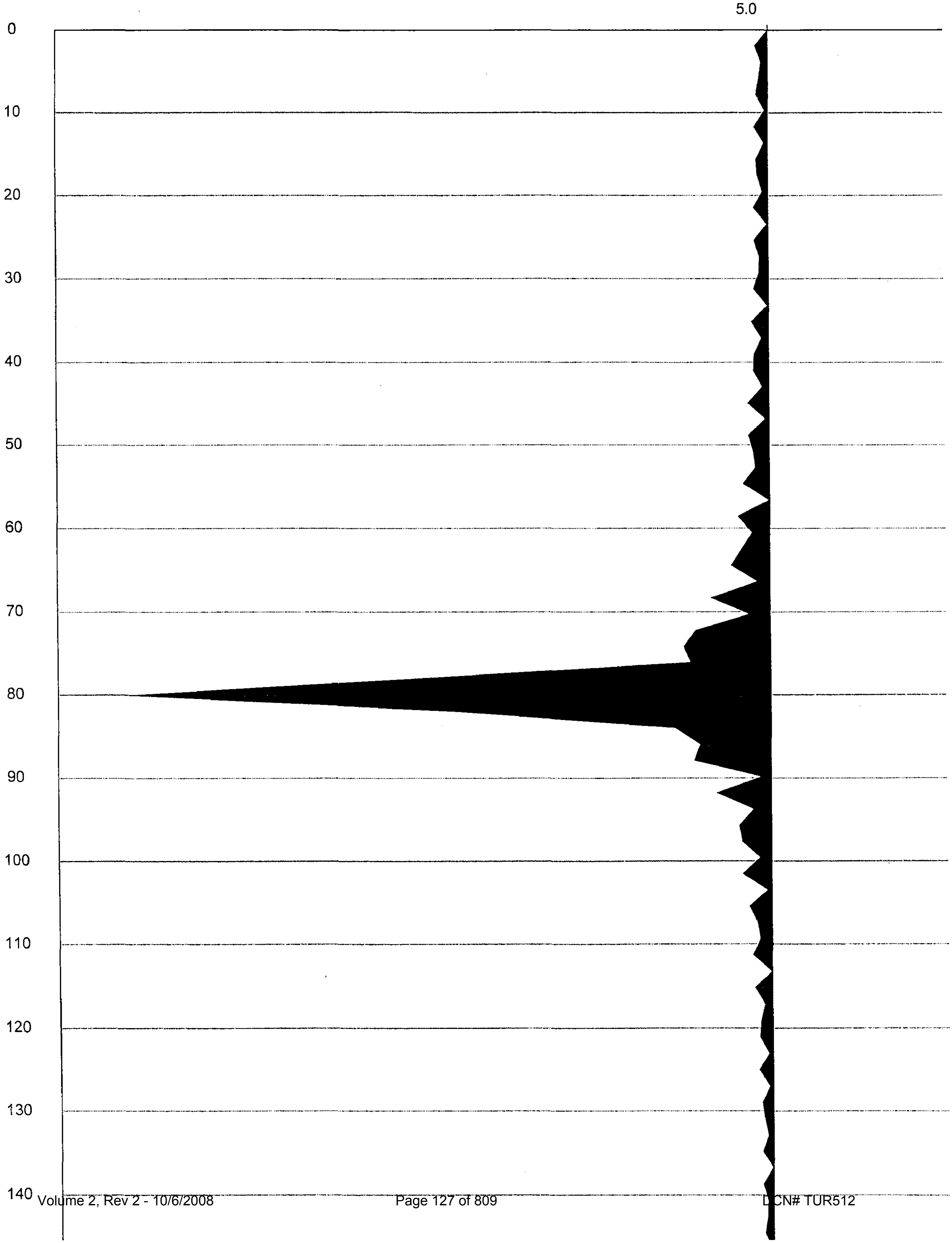
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 60.048 Seismograph: 60.3
Date: 1/22/2008



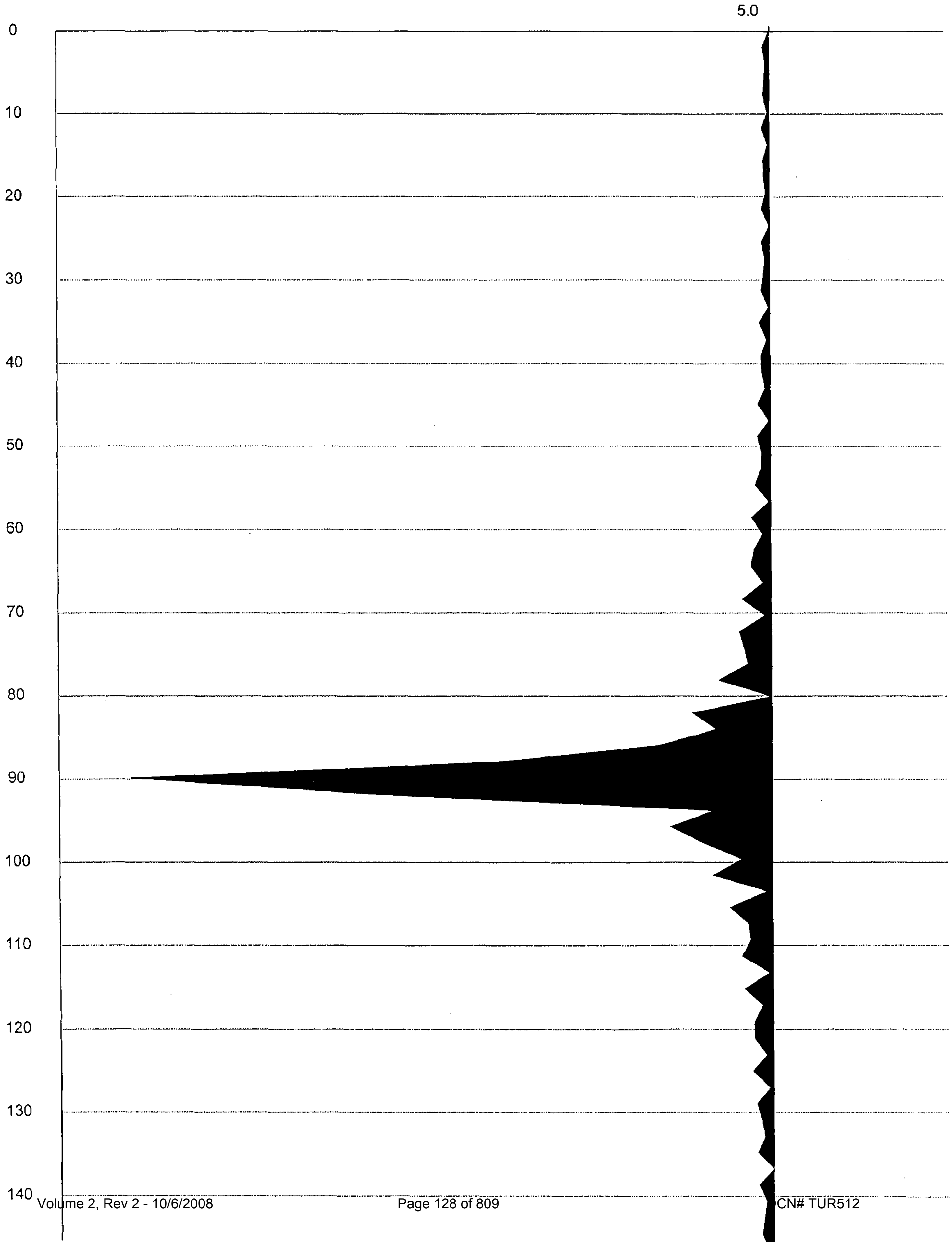
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 70.005 Seismograph: 70.2
Date: 1/22/2008



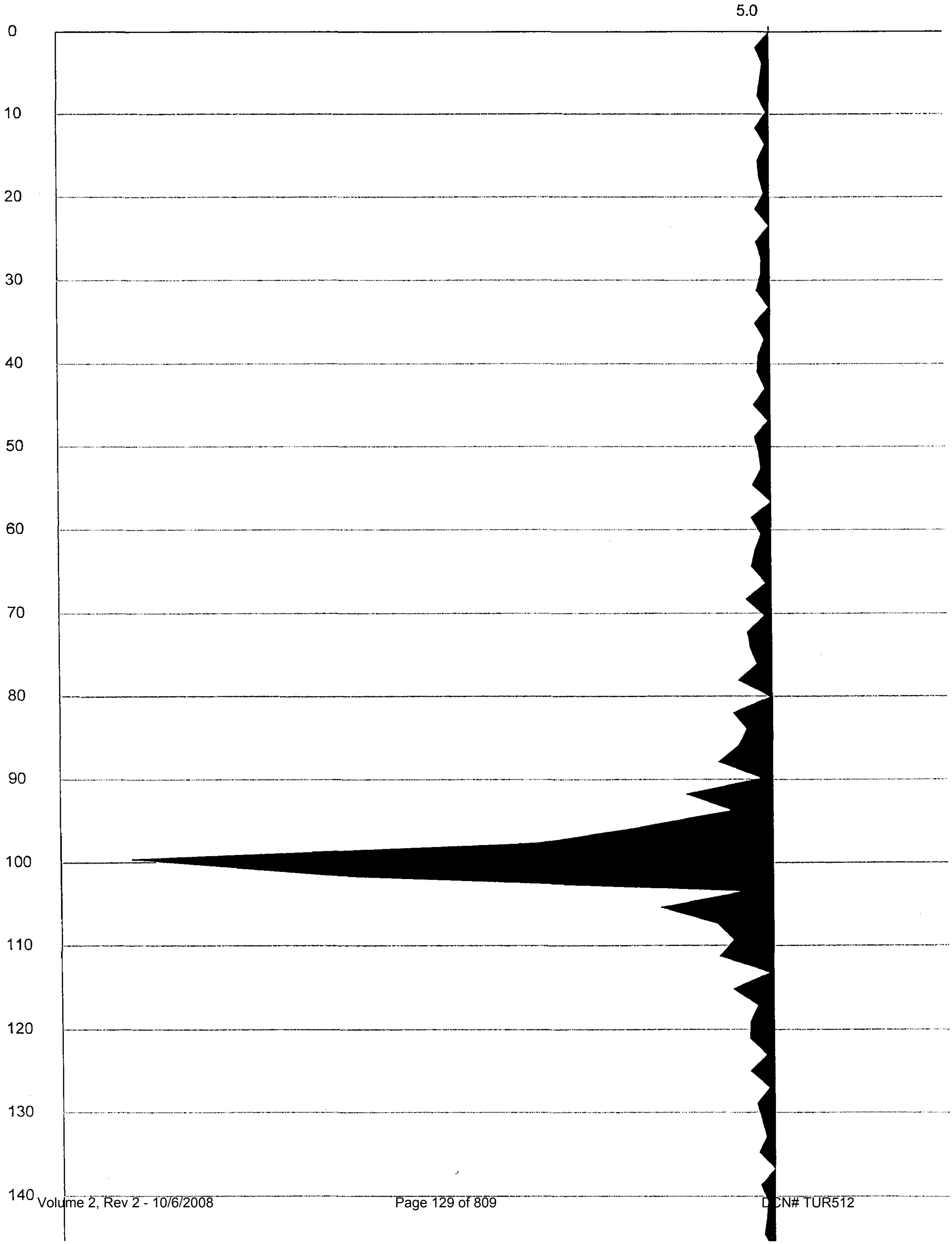
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 80.011 Seismograph: 79.9
Date: 1/22/2008



Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 90.090 Seismograph: 90.1
Date: 1/22/2008



Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 100.014 Seismograph: 99.8
Date: 1/22/2008



POST JOB CALIBRATION VERIFICATION

Calibration Verification Certificate

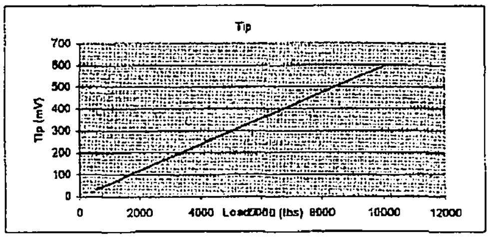
Device Type: Piezo Cone Penetrometer

Device Number: **F7.5CKE3SW2/B 1701-0750**

TIP CALIBRATION

Tip area = 15 cm2 = 0.0161 ft2
Tip readings in mV

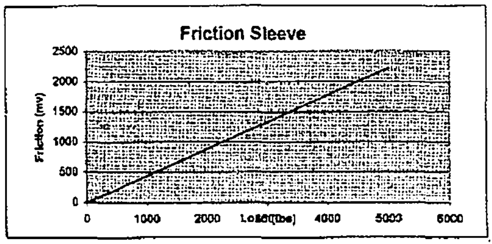
Load lb	Load Tons	load/area tsf	Tip mV	**TIP** Cal Factor Mpa
0	0	0	0	0
540	0.27	16.77019	32.1	50.0287963
5015	2.5075	155.7453	298.3	49.9975831
7510	3.755	233.2298	446.2	50.0543352
10005	5.0025	310.7143	594.3	50.0659763
15010	7.505	466.1491	892.6	50.0098021
19980	9.99	620.4969	1186.6	50.0751739



FRICTION CALIBRATION

Sleeve area = 200 cm2 = 0.2153 ft2
Friction readings in mV

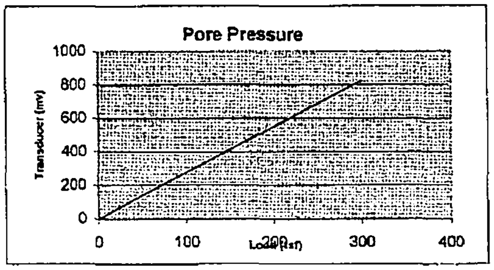
Load lb	Load Tons	load/area tsf	Friction mV	**Friction** Cal Factor Mpa
0	0	0	0	0
500	0.25	1.16117	220.3	0.50474111
2520	1.26	5.852299	1110.6	0.50461022
3755	1.8775	8.72039	1666.2	0.5011826
4990	2.495	11.58848	2215.9	0.50079912
7505	3.7525	17.42917	3335.8	0.50033843



PORE PRESSURE TRANSDUCER CALIBRATION

Serial : 8091223
Pore Pressure readings in mV

Pressure psi	Pressure tsf	Transducer readings mV	**P.Pres.** Cal Factor Mpa
0	0	0	0
75	5.4	206.6	2.50294116
150	10.8	413.3	2.50233557
300	21.6	823.4	2.51206045



Temperature Calibration (30 - 115 degrees F)

Temp (deg	TIP (mV)	FRIC (mV)	PIEZO (mV)
30	0.957	0.788	-0.124
50	0.994	0.957	-0.065
75	1.054	1.037	0.258
100	1.284	1.236	0.369
115	1.352	1.752	1.013

Deviation	mV	Mpa	% Full Scale
Tip	0.395	0.01975	0.0395
Friction	0.964	0.000482	0.0964
Piezo	1.137	0.002843	0.1137

TIP CALIBRATED BY GEOTAC (A2LA APPROVED) LOAD CELL:
Model 560K, Serial No. 129739
FRICTION CALIBRATED BY INTERFACE (A2LA APPROVED) LOAD CELL :
Model 560K, Serial No. 129739
PORE PRESSURE TRANSDUCER CALIBRATED BY GE SENSING (AANSI/NCSL APPROVED)
Pressure Indicator Model: UPS3000CC, Serial : A0813
TEMPERATURE CALIBRATED BY HOUSTON PRECISION TYPE K THERMOCOUPLE (A2LA APPROVED)
Model # 8528-40, Serial # C95005824, ID # TD-001

Calibration Verified by: Dennis Stauffer   Date: 6/2/2008

Checked By : Recep Yilmaz   Date: 6/2/2008

HGL Instrument Verification

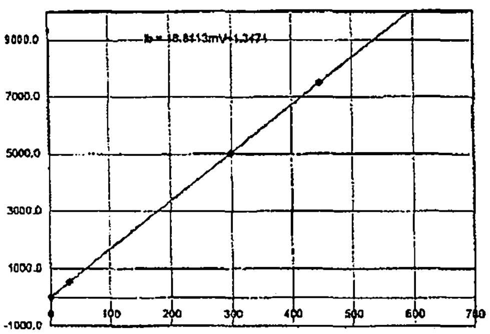
DATE: 6/2/2008 Instrument No.: ft100 Location: Houston LVDT?: [ ] Yes; [X] No

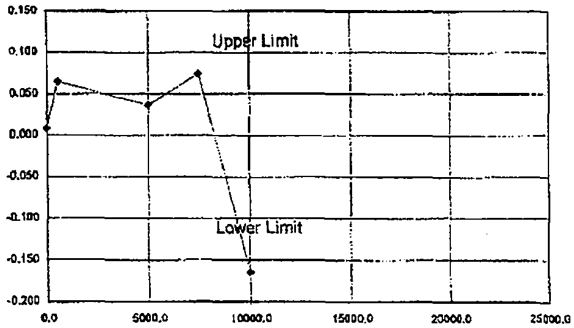
Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data	
Type	Cone Penetrometer-TIP
Manufacturer	Fugro
Model Number	F7.5CKEW2/B
Serial Number	1701-0750
HGL Instrument Number	ft100
Excitation (V)	
Gain/Span Setting	NA
Full Range Output (V)	
Full Range/Capacity (lb)	16858
Date Verified	6/2/2008
Date Due	6/2/2009
Service Status	In Service
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.
Verification/Standard Equipment	
Type	Load cell (A2LA APPROVED)
Manufacturer	Geotac
Model Number	560K
Serial Number	129739
HGL Instrument Number	
Date Verified	
Temperature	°C = °F
Linear Regression, Uncertainty, & Error Summary	
Correlation Coeff. (R^2)	0.999986128
Intercept (lb)	1.347403615
Slope (lb/mV)	16.81127161
Verification (Calib.) Factor	16.81127161
Verification Factor Units	lb/mV
Absolute Zero (V)	
Floating Zero (V)	
Combined Uncertainty (lb)	6.258542548
Coverage Factor	2
Expanded Uncertainty (lb)	12.5170851
Max. Abs. or FS Error (%)	-0.25 [X] FS; [ ] Abs.

Instrument mV	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
0.000000	0.0	1.3	1.3	0.01
32.100000	530.0	541.0	11.0	0.07
298.300000	5010.0	5016.1	6.1	0.04
446.200000	7490.0	7502.5	12.5	0.07
594.300000	10020.0	9992.3	27.7	-0.16
892.600000	15050.0	15007.1	42.9	-0.25
1186.600000	19910.0	19949.6	39.6	0.23

MTS [ ] Yes; [X] No





Uncertainty Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	6.2585	N	1.0000	A	6.2585	39.1694	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	6.2585		Coverage Factor		2	for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		12.517		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: ______ Reviewed By: ______ Checked By: [signature]

File:

Remarks:

2000.2 (06/14/07) Tip0750.xls, 6-2-2008 6/26/2008 FUGRO CONSULTANTS INC

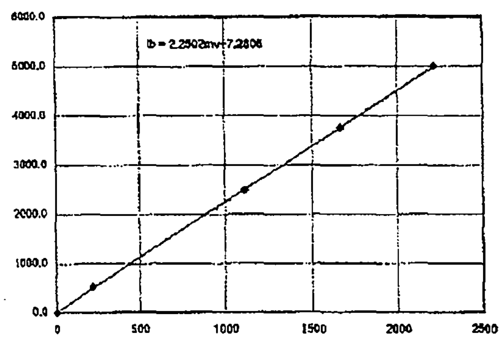
HGL Instrument Verification

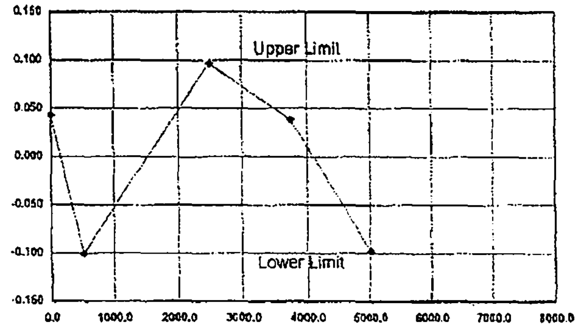
DATE: 6/2/2008 Instrument No.: ft100 Location: ____ LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	7.3	7.3	0.04
Model Number	F7.5CKE3SW2/B	220.300000	520.0	503.0	17.0	-0.10
Serial Number	1701-0750	1110.600000	2490.0	2506.3	16.3	0.10
HGL Instrument Number	ft100	1666.200000	3750.0	3756.5	6.5	0.04
Excitation (V)		2215.900000	5010.0	4993.4	16.6	-0.10
Gain/Span Setting	NA	3335.800000	7510.0	7513.4	3.4	0.02
Full Range Output (V)						
Full Range/Capacity (lb)	16858					
Date Verified	6/2/2008					
Date Due	6/2/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	Geotac					
Model Number	560K					
Serial Number	129739					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999976621					
Intercept (lb)	7.280791244					
Slope (lb/mv)	2.250177247					
Verification (Calib.) Factor	2.25017725					
Verification Factor Units	lb/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	2.492195376					
Coverage Factor	2					
Expanded Uncertainty (lb)	4.984390751					
Max. Abs. or FS Error (%)	-0.10 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainty Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	2.4922	N	1.0000	A	2.4922	6.2110	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	2.4922	Coverage Factor			2	for 95% confidence level	
Expanded Uncertainty (Best Measurement Capability)[3]		4.984		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: ________ Reviewed By: ________ Checked By: [signature]

File: ____

Remarks: ____

2000.2 (06/14/07) Fric0750.xls, 6-2-2008 6/26/2008 FUGRO CONSULTANTS INC

HGL Instrument Verification

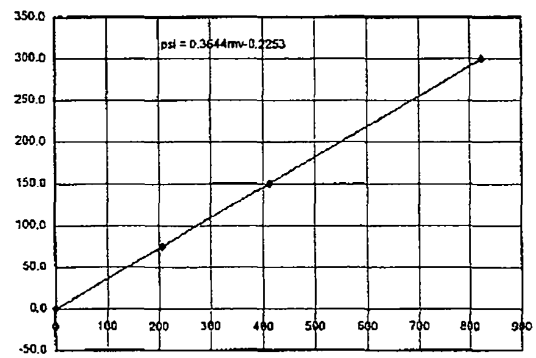
DATE: 6/2/2008 Instrument No.: pt Location: Houston LVDT?: [ ] Yes; [X] No

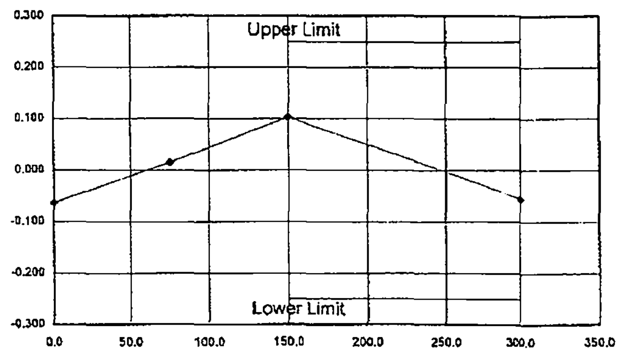
Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data	
Type	Cone Penetrometer - Piezo
Manufacturer	Fugro
Model Number	F7.5CKEW2/B
Serial Number	1701-0750-8091223
HGL Instrument Number	pt
Excitation (V)	
Gain/Span Setting	NA
Full Range Output (V)	
Full Range/Capacity (psi)	360
Date Verified	6/2/2008
Date Due	6/2/2009
Service Status	In Service
Accept. Abs. or FS Error (%)	0.25 [X] FS; [ ] Abs.
Verification/Standard Equipment	
Type	PT(ANSI/NCSL APPROVED)
Manufacturer	Eaton
Model Number	UPS3000CC
Serial Number	A0813
HGL Instrument Number	
Date Verified	
Temperature	°C = °F
Linear Regression, Uncertainty, & Error Summary	
Correlation Coeff. (R^2)	0.999995309
Intercept (psi)	-0.225296318
Slope (psi/mv)	0.364374132
Verification (Calib.) Factor	0.36437413
Verification Factor Units	psi/mv
Absolute Zero (V)	
Floating Zero (V)	
Combined Uncertainty (psi)	0.064742646
Coverage Factor	2
Expanded Uncertainty (psi)	0.129485291
Max. Abs. or FS Error (%)	0.10 [X] FS; [ ] Abs.

Instrument mv	Standard psi	Prediction psi	Abs. Error psi	Full Scale Error (%)
0.000000	0.0	-0.2	0.2	-0.06
206.600000	75.0	75.1	0.1	0.02
413.300000	150.0	150.4	0.4	0.10
823.400000	300.0	299.8	0.2	-0.06

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For pt							
Source of Uncertainty	Value in psi	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.0647	N	1.0000	A	0.0647	0.0042	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.0647	Coverage Factor			2	for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		0.129		psi			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: TS Input By: ______ Reviewed By: ______ Checked By: RJ

File:

Remarks:

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