

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	Exelon 2 (Victoria) COL Site	MAKE:	CME
LOCATION:	Victoria, Texas	MODEL:	550
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-05
DATE:	12/5/2007	HAMMER TYPE:	Auto
WEATHER:	SUNNY ~ 60°F	ROPE CONDITION:	N/A
INSPECTOR:	Kyle Miller	ROD SIZE:	AW-J
DRILLING COMPANY:	MACTEC	NO. OF SHEAVES:	N/A

BORING DATA	
BORING NUMBER:	B-2283
DEPTH DRILLED:	18.5' to 36.2
TIME DRIVEN:	Various
RIG OPERATOR:	Larry Carter
HAMMER OPERATOR:	N/A
PDA PAK SERIAL NO.:	3622L
INSTR. ROD AREA:	1.19 in ²
ACCEL. SERIAL NOS.:	5953, 5992
STRAIN SERIAL NOS.:	75 AW.1; 75 AW.2

[illegible]

REMARKS:

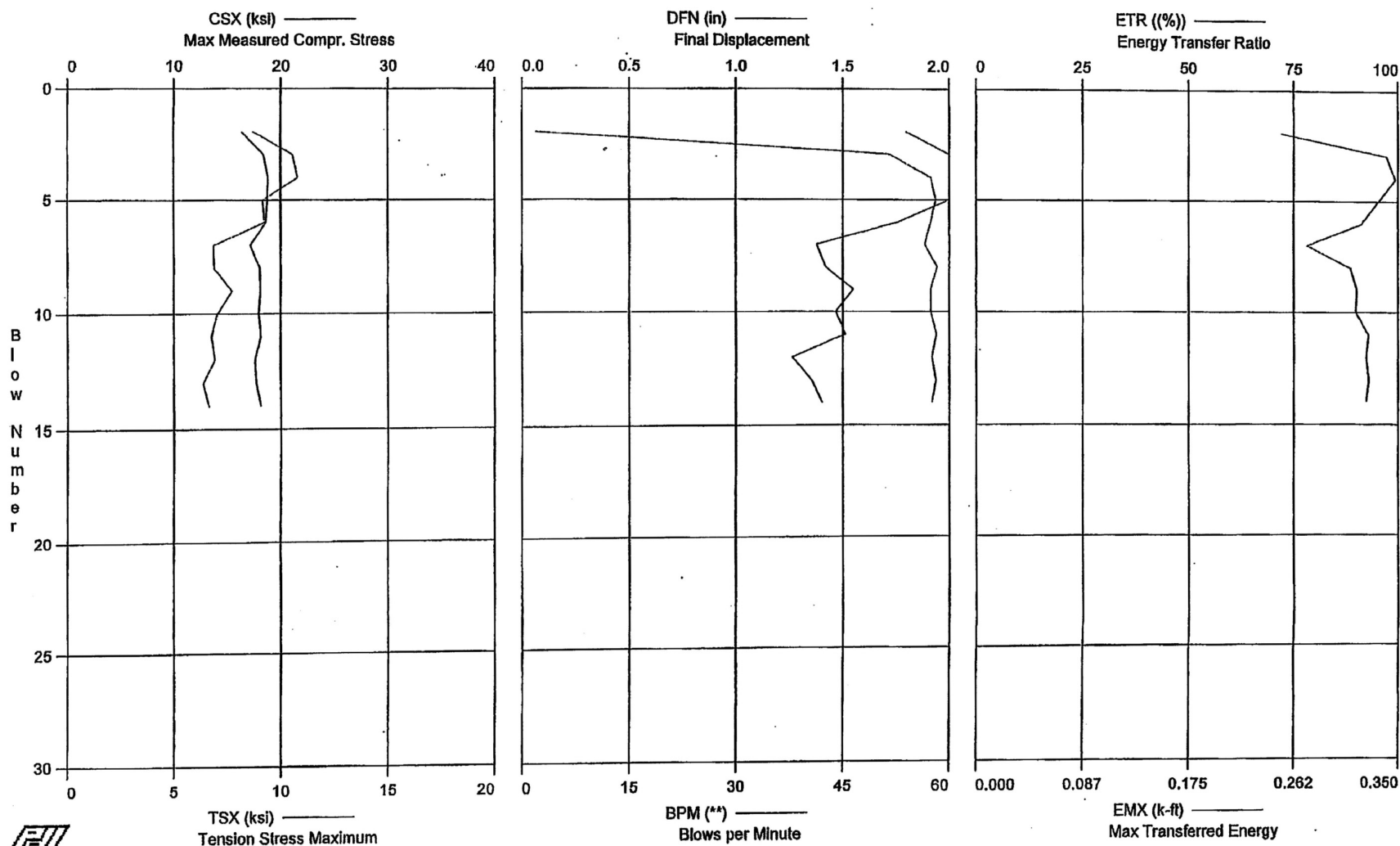
NONE

PDILOT Ver. 2008.1 - Printed: 11-Mar-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 5-Dec-2007

EXCELON VICTORIA COL SITE - BORING B-2283; 19.7' - 21.2' SAMPLE



EXCELON VICTORIA COL SITE - BORING B-2283; 19.7' - 21.2' SAMPLE
OP: KBM

HAMMER ID: MEC-05; CME 550 ATV (CARTER)
Test date: 5-Dec-2007

AR: 1.49 in²
LE: 26.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft³
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
DFN: Final Displacement
BPM: Blows per Minute
FVP: Force/Velocity proportionality

FMX: Maximum Force
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

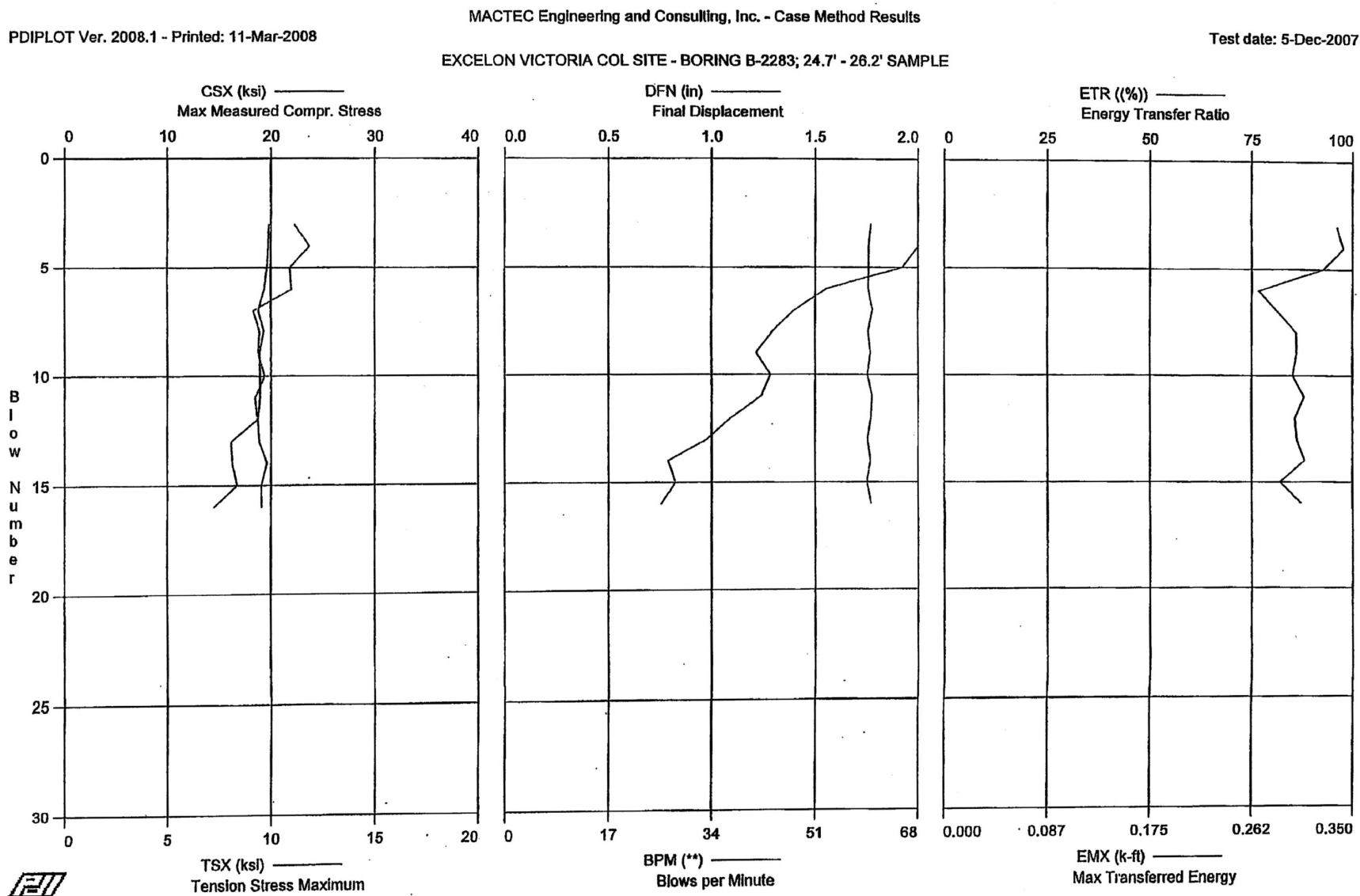
BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM **	FVP □	FMX kips	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	16.39	8.74	1.80	1.9	0.73	24	0.204	72	0.252
3	0.00	18.37	10.53	2.82	51.5	0.89	27	0.250	97	0.340
4	0.00	18.81	10.79	2.43	57.4	0.89	28	0.260	99	0.348
5	0.00	18.73	9.16	2.09	58.1	0.86	28	0.254	95	0.333
6	0.00	18.59	9.23	1.76	57.4	0.80	28	0.268	91	0.319
7	0.00	17.16	6.86	1.38	56.5	0.74	26	0.224	78	0.273
8	0.00	18.03	6.87	1.42	58.3	0.75	27	0.245	89	0.310
9	0.00	18.11	7.73	1.55	57.4	0.75	27	0.246	90	0.315
10	0.00	17.95	7.04	1.47	57.4	0.75	27	0.238	90	0.314
11	0.00	18.14	6.76	1.51	58.2	0.74	27	0.246	93	0.325
12	0.00	17.60	6.92	1.26	57.6	0.72	26	0.246	92	0.323
13	0.00	17.73	6.37	1.35	58.1	0.73	26	0.242	93	0.325
14	0.00	18.17	6.66	1.40	57.6	0.74	27	0.247	92	0.323
Average		17.98	7.97	1.71	52.9	0.78	27	0.244	90	0.315

Total number of blows analyzed: 13

Time Summary

Drive 13 seconds

9:36:15 AM - 9:36:28 AM (12/5/2007) BN 2 - 14



EXCELON VICTORIA COL SITE - BORING B-2283; 24.7' - 26.2' SAMPLE
OP: KBM

HAMMER ID: MEC-05; CME 550 ATV (CARTER)
Test date: 5-Dec-2007

AR: 1.49 in²
LE: 31.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft³
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
DFN: Final Displacement
BPM: Blows per Minute
FVP: Force/Velocity proportionality

FMX: Maximum Force
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM **	FVP []	FMX kips	EF2 k-ft	ETR (%)	EMX k-ft
3	0.00	19.79	11.12	2.70	60.2	0.87	29	0.282	96	0.336
4	0.00	19.72	11.87	2.40	59.8	0.93	29	0.280	98	0.342
5	0.00	19.64	10.91	1.92	59.8	0.86	29	0.271	93	0.324
6	0.00	19.36	10.99	1.55	59.7	0.90	29	0.246	77	0.268
7	0.00	18.76	9.13	1.40	60.5	0.88	28	0.265	81	0.285
8	0.00	19.30	9.44	1.30	59.7	0.88	29	0.274	86	0.301
9	0.00	18.88	9.38	1.22	60.1	0.85	28	0.279	86	0.301
10	0.00	18.93	9.70	1.28	59.6	0.85	28	0.272	85	0.298
11	0.00	18.94	9.23	1.24	60.4	0.86	28	0.279	88	0.308
12	0.00	18.73	9.33	1.09	60.2	0.85	28	0.278	86	0.300
13	0.00	18.85	8.07	0.97	59.6	0.88	28	0.272	86	0.301
14	0.00	19.64	8.14	0.79	60.1	0.91	29	0.283	88	0.308
15	0.00	19.05	8.35	0.83	59.5	0.83	28	0.253	82	0.287
16	0.00	19.06	7.23	0.76	60.2	0.84	28	0.286	87	0.305
Average		19.19	9.49	1.39	60.0	0.87	29	0.273	87	0.305

Total number of blows analyzed: 14

Time Summary

Drive 13 seconds

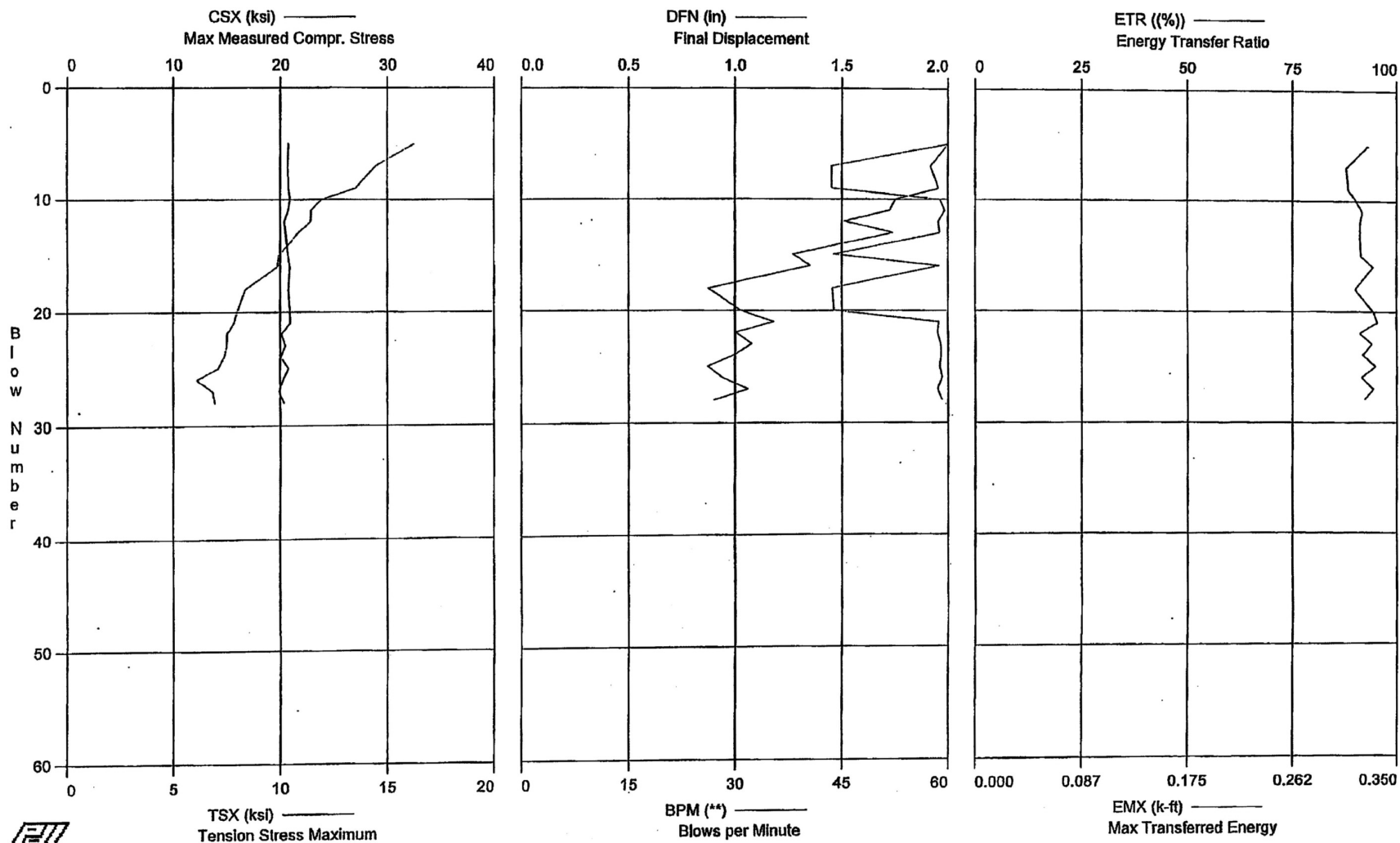
9:48:03 AM - 9:48:16 AM (12/5/2007) BN 3 - 16

PDILOT Ver. 2008.1 - Printed: 11-Mar-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 5-Dec-2007

EXCELON VICTORIA COL SITE - BORING B-2283; 29.7' - 31.2' SAMPLE



EXCELON VICTORIA COL SITE - BORING B-2283; 29.7' - 31.2' SAMPLE
OP: KBM

HAMMER ID: MEC-05; CME 550 ATV (CARTER)
Test date: 5-Dec-2007

AR: 1.49 in² SP: 0.492 k/ft³
LE: 36.20 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
DFN: Final Displacement
BPM: Blows per Minute
FVP: Force/Velocity proportionality

FMX: Maximum Force
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM **	FVP []	FMX kips	EF2 k-ft	ETR (%)	EMX k-ft
5	0.00	20.74	16.29	2.06	60.2	0.97	31	0.322	93	0.326
7	0.00	20.69	14.46	1.92	43.6	0.79	31	0.305	88	0.307
9	0.00	20.77	13.52	1.95	43.6	0.81	31	0.308	88	0.309
10	0.00	20.92	11.96	1.75	58.8	0.81	31	0.311	90	0.316
11	0.00	20.75	11.44	1.72	59.5	0.85	31	0.321	92	0.321
12	0.00	20.37	11.43	1.51	58.6	0.88	30	0.321	91	0.319
13	0.00	20.49	10.85	1.74	58.8	0.86	31	0.315	91	0.319
15	0.00	20.69	9.94	1.27	43.9	0.85	31	0.326	91	0.320
16	0.00	20.87	9.87	1.35	58.7	1.00	31	0.320	94	0.330
18	0.00	20.76	8.37	0.88	43.7	1.00	31	0.318	90	0.315
20	0.00	20.89	7.98	1.03	43.9	0.84	31	0.319	94	0.330
21	0.00	20.92	7.83	1.18	58.7	1.00	31	0.313	95	0.334
22	0.00	20.11	7.52	1.00	58.5	0.91	30	0.309	91	0.319
23	0.00	20.50	7.52	1.08	58.9	0.86	31	0.310	94	0.329
24	0.00	20.04	7.39	1.00	59.0	0.96	30	0.309	92	0.321
25	0.00	20.76	7.09	0.87	58.8	0.99	31	0.322	95	0.332
26	0.00	20.27	6.09	0.94	59.1	1.00	30	0.306	92	0.320
27	0.00	19.87	6.84	1.06	58.5	0.92	30	0.311	94	0.330
28	0.00	20.33	6.94	0.90	59.1	0.98	30	0.317	92	0.323
Average		20.57	9.65	1.33	54.9	0.91	31	0.315	92	0.322

Total number of blows analyzed: 19

Time Summary

Drive 24 seconds

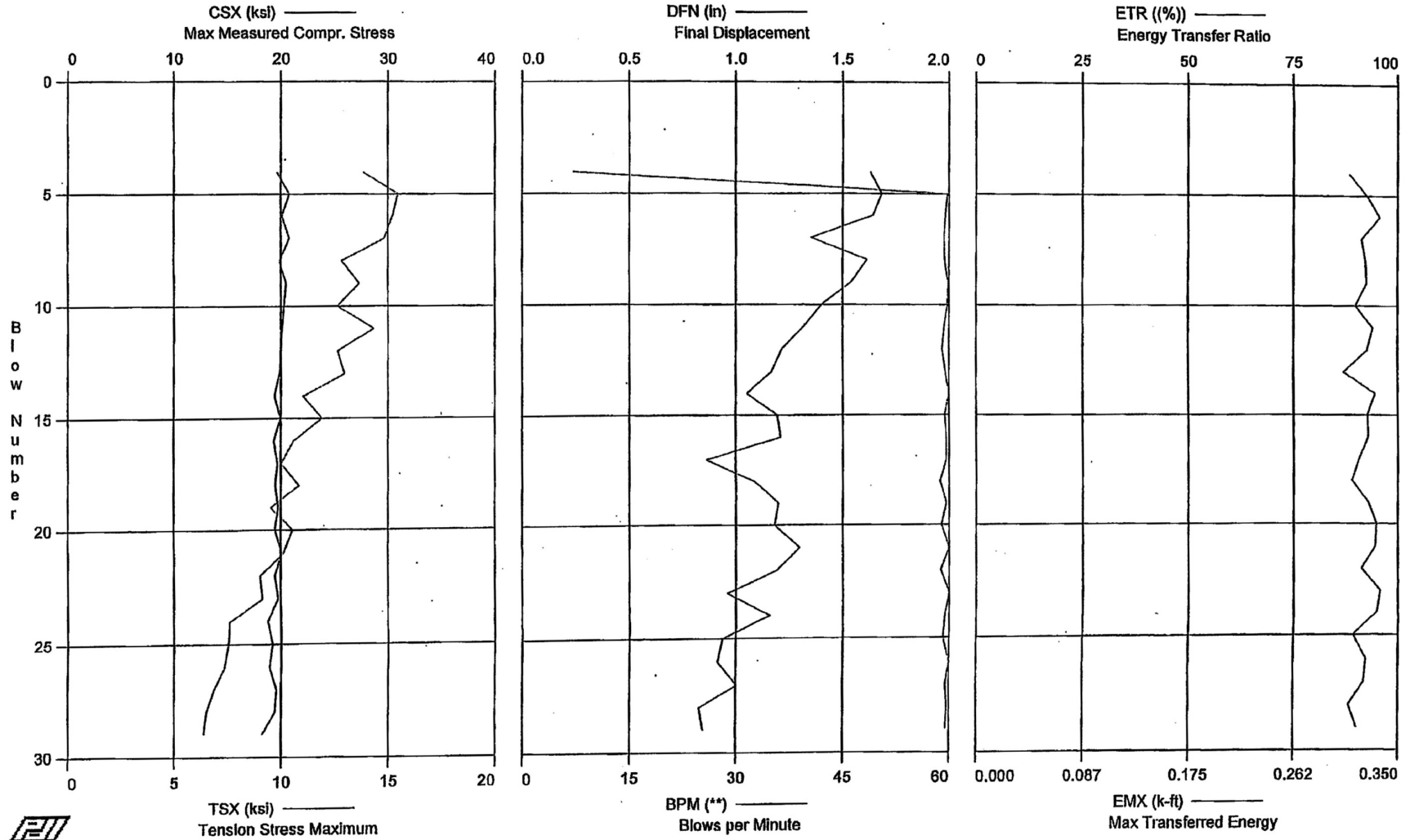
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PDILOT Ver. 2008.1 - Printed: 11-Mar-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 5-Dec-2007

EXCELON VICTORIA COL SITE - BORING B-2283; 34.7' - 36.2' SAMPLE



EXCELON VICTORIA COL SITE - BORING B-2283; 34.7' - 36.2' SAMPLE
OP: KBM

HAMMER ID: MEC-05; CME 550 ATV (CARTER)
Test date: 5-Dec-2007

AR: 1.49 in²
LE: 40.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft³
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
DFN: Final Displacement
BPM: Blows per Minute
FVP: Force/Velocity proportionality

FMX: Maximum Force
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM **	FVP []	FMX klps	EF2 k-ft	ETR (%)	EMX k-ft
4	0.00	19.64	13.85	1.63	7.1	0.90	29	0.299	88	0.309
5	0.00	20.77	15.46	1.68	59.8	0.93	31	0.316	93	0.324
6	0.00	20.09	15.22	1.64	59.5	0.82	30	0.318	96	0.335
7	0.00	20.76	14.83	1.35	59.3	0.98	31	0.310	91	0.319
8	0.00	19.84	12.84	1.62	59.4	0.89	30	0.311	92	0.323
9	0.00	20.46	13.65	1.54	59.9	0.85	30	0.307	92	0.324
10	0.00	20.25	12.63	1.40	59.8	0.92	30	0.301	90	0.314
11	0.00	20.11	14.35	1.32	59.3	0.84	30	0.314	94	0.329
12	0.00	19.95	12.63	1.22	59.0	0.91	30	0.311	93	0.324
13	0.00	19.86	12.98	1.17	59.5	0.95	30	0.300	87	0.304
14	0.00	19.40	11.02	1.05	60.2	0.81	29	0.321	94	0.331
15	0.00	19.95	11.94	1.19	59.4	0.97	30	0.308	93	0.324
16	0.00	19.35	10.59	1.21	59.6	0.86	29	0.309	93	0.325
17	0.00	19.68	10.01	0.86	59.6	0.87	29	0.307	91	0.317
18	0.00	19.48	10.85	1.09	58.7	0.81	29	0.299	89	0.311
19	0.00	19.72	9.52	1.20	59.6	0.93	29	0.303	93	0.325
20	0.00	19.46	10.55	1.18	58.9	0.81	29	0.311	95	0.332
21	0.00	20.03	10.13	1.30	60.0	0.97	30	0.310	94	0.331
22	0.00	19.44	9.02	1.19	58.8	0.77	29	0.300	91	0.319
23	0.00	19.73	9.13	0.96	60.5	0.91	29	0.315	96	0.335
24	0.00	18.78	7.61	1.16	59.4	0.84	28	0.305	95	0.332
25	0.00	19.19	7.55	0.94	59.1	0.94	29	0.294	89	0.312
26	0.00	18.90	7.36	0.91	60.1	0.86	28	0.300	92	0.323
27	0.00	19.56	6.86	1.00	59.5	0.95	29	0.303	92	0.321
28	0.00	19.42	6.50	0.83	59.7	0.97	29	0.298	88	0.308
29	0.00	18.23	6.38	0.84	59.5	0.79	27	0.301	90	0.315
Average		19.69	10.90	1.21	57.5	0.89	29	0.307	92	0.322

Total number of blows analyzed: 26

Time Summary

Drive 26 seconds

10:11:19 AM - 10:11:45 AM (12/5/2007) BN 4 - 29

March 14, 2008

Memorandum to File

From: Steve Kiser 

Reviewed By: Kathryn White KAW 3/14/08

Subject: Report of SPT Energy – MACTEC Atlanta CME 550x ATV
Hammer Serial No. MEC-05 Automatic Hammer
WORK INSTRUCTION 19
Exelon COL Project
Victoria County, Texas
MACTEC Project No. 6468-07-1777

Steve Kiser, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the drill rig at the subject site per the referenced Work Instructions. This memorandum summarizes the field testing activities and presents the results of the energy measurements.

SPT Energy Field Measurements

SPT energy measurements were made on December 18 and 19, 2007, during drilling of Borings B-2169 and B-2169 Offset, respectively, at the referenced site. The testing was performed from approximately 10:40 AM to 5:50 PM under partly cloudy skies and a temperature of about 76 degrees Fahrenheit on December 18, and from approximately 5:45 PM to 6:05 PM under cloudy skies and a temperature of about 76 degrees Fahrenheit on December 19. The borings were drilled with personnel and equipment from the Atlanta office of MACTEC. The drilling equipment consisted of a CME 550x model ATV-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of N3-sized drilling rods (December 18) and AW-J-sized drilling rods (December 19) and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the borings below the depth at which groundwater was encountered at the time of energy testing. The drill rig operator during sampling was Mr. Robert Banks. Energy measurements were recorded during sampling at the depth intervals shown in Table 1.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAX (Serial No. 3622L), and calibrated accelerometers (Serial Nos. P5953 and P5992) and strain gages (Serial Nos. NW#146/1 and NW146/2 on December 18; Serial Nos. AW #75/1 and AW#75/2 on December 19). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert used on December 18 had a cross-sectional area of approximately 1.49 square inches and an outside diameter of approximately 2.625 inches at the gage location. The drill rods included in the drill rod string on December 18 were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 2.625 and 2.25 inches, respectively. The instrumented rod insert used on December 19 had a cross-sectional area of approximately 1.19 square inches and an outside diameter of approximately 1.75 inches at the gage location. The drill rods included in the drill rod string on December 19 were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 1.75 and 1.375 inches, respectively. The recommended operation rate of the hammer is not known. Due to the

19 Pages Total

closed hammer system, the hammer lubrication condition and anvil dimensions could not be observed.

Calibration Records

The calibration records for all the above are filed in DCN EXE 315.

Calculations for EFV

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV

F(t) = Calculated force at time t

V(t) = Calculated velocity at time t

The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed are tabulated in the attached PDILOT tables and are also shown graphically in the PDILOT charts.

Calculations for ETR

The ratio of the measured transferred energy (EFV) to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR. The ETR values (as percent of the theoretical value) are shown in Table 1.

Comparison of ETR to Typical Energy Transfer Ratio Range

Based on a research report published by the Florida Department of Transportation (FDOT) (Report WPI No. 0510859, 1999), the average ETR measured for automatic hammers is 79.6%. The standard deviation was 7.9%; therefore, the range of ETRs within one standard deviation of the average was reported to be 71.7% to 87.5%. This range of ETRs was also consistent with other research that was cited in the FDOT research paper; however, maximum and minimum ETR values of up to 98% and 56%, respectively, were reported in the literature. The ETR values shown in Table 1 are generally within the range of typical values for automatic hammers as reported in the literature.

Discussion

Based on the field testing results, observations from the SPT energy measurements are summarized below:

- The data obtained by the PDA are consistent between individual hammer blows and between the sample depths tested. In general, the first and last one (and sometimes two) hammer blow records recorded by the PDA produced poor quality data (which is relatively common) and, as such, the record(s) was(were) not used in the data reduction.
- The range of average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method is shown in Table 1 below for each rod size tested. The corresponding energy transfer ratio of the SPT hammer system is also shown.

Table 1: Average Energy Transfer Range for the Depth Intervals Tested

Rod Size	Range of Average Energy Transferred, Per Individual Sample (foot-pounds)	Range of Average Energy Transfer Ratio (ETR)
AW-J	286 to 311	82% to 89%
NW-J	295 to 311	84% to 89%

- The average at each depth interval was calculated as the transferred energy for each analyzed blow of the depth intervals divided by the total number of hammer blows analyzed. The overall average energy transfer of the SPT system (for all the depth intervals tested) is shown in Table 2 below for each rod size tested.

Table 2: Overall Energy Testing Results for Each Rod Size

Rod Size	Overall Average Energy Transferred (foot-pounds)	Range of Overall Average Energy Transfer Ratio (ETR)
AW-J	299.5	85.6%
NW-J	302.6	86.4%

Attachments: Page 4 Table 3 - Summary of SPT Energy Measurements – 1 Page
 Page 5 Work Instruction – DCN EXE 19 – 1 Page
 Pages 6 – 7 Record of SPT Energy Measurement – 2 Pages
 Pages 8 – 19 PDILOT Output – 12 Pages

TABLE 3
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)

Exelon COL Project
 Victoria County, Texas
 MACTEC Project No. 6468-07-1777

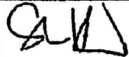
Hammer Serial No.	Rig Owner	Rig Operator	Boring No. Tested	Rod Size	Date Tested	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs) ^a	Energy Transfer Ratio (%) ^b (Average ETR)
MEC-05 (CME 550x ATV)	MACTEC Atlanta	Ruben Landeros / Robert Banks	B-2169 OFFSET	AW-J	12/19/2007	13.5 - 15.0	4 - 7 - 8	20	302	86.3%
						15.5 - 17.0	4 - 7 - 8	19	311	88.9%
						18.5 - 20.0	4 - 8 - 7	20	286	81.7%
						Average for AW-J Rods:			299.5	85.6%
			B-2169	N3	12/18/2007	348.5 - 350.0	10 - 17 - 22	40	295	84.3%
						368.5 - 370.0	7 - 11 - 21	39	311	88.9%
						378.5 - 380.0	10 - 18 - 21	50	302	86.3%
						Average for N3 Rods:			302.6	86.4%
						Average for Rig:			301.6	86.2%

^aMeasured Energy is energy based on the EFV method, as outlined in ASTM D4633-05, for each blow recorded by the PDA. In some cases, the initial and final one to two blows produced poor quality data, and were not used to calculate the Average Measured Energy.

EFV = EMX * 1000 lbs/kip, where EMX equals the maximum transferred energy measured by the PDA (see attached PDA data).

^bEnergy Transfer Ratio is the Measured Energy divided by the theoretical SPT energy of 350 foot-pounds (140 pound hammer falling 2.5 feet).

The average ETR values may differ slightly and insignificantly from those in the PDILOT tables due to roundoff.

Prepared By: 	Date: 3-14-08	Checked By:	Date:
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STEVE KISER

Work Instruction No. 19
Exelon COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6468-07-1777

Issued To: <u>Stephen E. Kiser, Kyle B. Miller</u>	Rev. No. <u>0</u>
Issued By: <u>Kathryn A. White</u>	Date: <u>8-19-07</u>
Valid From: <u>8-19-07</u>	To: <u>8-19-08</u>

Task Description: Perform SPT Hammer Energy Measurements

Applicable Technical Procedures or Plans, or other reference: Geotechnical Work Plan (current revision), Bechtel Engineering Specification 25352-102-3PS-CY00-00001, Rev 000, and ASTM D 4633-05. Copies of the Work Plan and Bechtel Engineering Specification are provided in the Site Office. A copy of ASTM procedure are attached.

Specific Instructions (note attachments where necessary): Energy measurement will be performed in accordance with ASTM D 4633-05 at borings and depths selected by Bechtel. For drill rigs using both AW and NW drill rods, energy measurements must be made for both rod types as indicated in assignment sheet provided by Site Coordinator prior to start of work. Prepare and submit an energy measurement report containing information described in Section 8 of ASTM D 4633-05.

Special Instructions (note attachments where necessary): If changed conditions are encountered contact Project Manager and Project Principal Engineer immediately.

Report Format: Standard MACTEC forms provided by Project Manager and Project Principal Engineer.

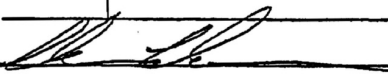
Specific Quality Assurance Procedures Applicable: MACTEC QA Manual, QAPD, HASP and QAP-25-1; current revisions apply.

Hold Points or Witness Points:

- Calibration information is submitted to Bechtel
- Deviations from QAPD/HASP/Work Plan

Records: All records generated shall be considered QA Records.

Reviewed and Approved by: (Note: Only one signature is required for issuance)

Project Manager: _____	Date: _____
Project Principal Engineer: _____	Date: _____
Site Manager/Coordinator: 	Date: <u>8-20-07</u>

Pages: 8

DCN: EXE

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	Exelon 2 (Victoria) COL Site	MAKE:	CME
LOCATION:	Victoria, Texas	MODEL:	550 x ATV
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-05
DATE:	12-18-07	HAMMER TYPE:	AUTOMATIC
WEATHER:	Partly Cloudy 76°	ROPE CONDITION:	N/A
INSPECTOR:	24 Kyle Miller STEVE KISER	ROD SIZE:	N3
DRILLING COMPANY:	MACTEC ATLANTA	NO. OF SHEAVES:	N/A

BORING DATA	
BORING NUMBER:	B-2169
DEPTH DRILLED:	400' PLANNED
TIME DRIVEN:	VARIOUS
RIG OPERATOR:	ROBERT BANKS
HAMMER OPERATOR:	N/A
PDA PAK SERIAL NO.:	3622L
INSTR. ROD AREA:	1.49 in ²
ACCEL. SERIAL NOS.:	P5953 P5992
STRAIN SERIAL NOS.:	146 NW #1/2

[illegible]

REMARKS:

AT 348.5 - 350 SAMPLE, ENERGY
TESTING DONE ON LAST 12"
OF DRIVING ONLY. ROD LENGTH

WAS TOO HIGH TO FIT BELOW HAMMER, SO FIRST 6" NOT TESTED.

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	Exelon 2 (Victoria) COL Site	MAKE:	CME
LOCATION:	Victoria, Texas	MODEL:	550X ATV
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-US
DATE:	12-19-07	HAMMER TYPE:	AUTOMATIC
WEATHER:	Cloudy, 76°	ROPE CONDITION:	N/A
INSPECTOR:	Steve Miller STEVE KISER	ROD SIZE:	AW-J
DRILLING COMPANY:		NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	B-2169 OFFSET		
DEPTH DRILLED:	30' PLANNED		
TIME DRIVEN:	VARIOUS		
RIG OPERATOR:	ROBERT BANKS		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:			
ACCEL. SERIAL NOS.:	P5953 P5992		
STRAIN SERIAL NOS.:	1111 75 AW #1 1/2		

[illegible]

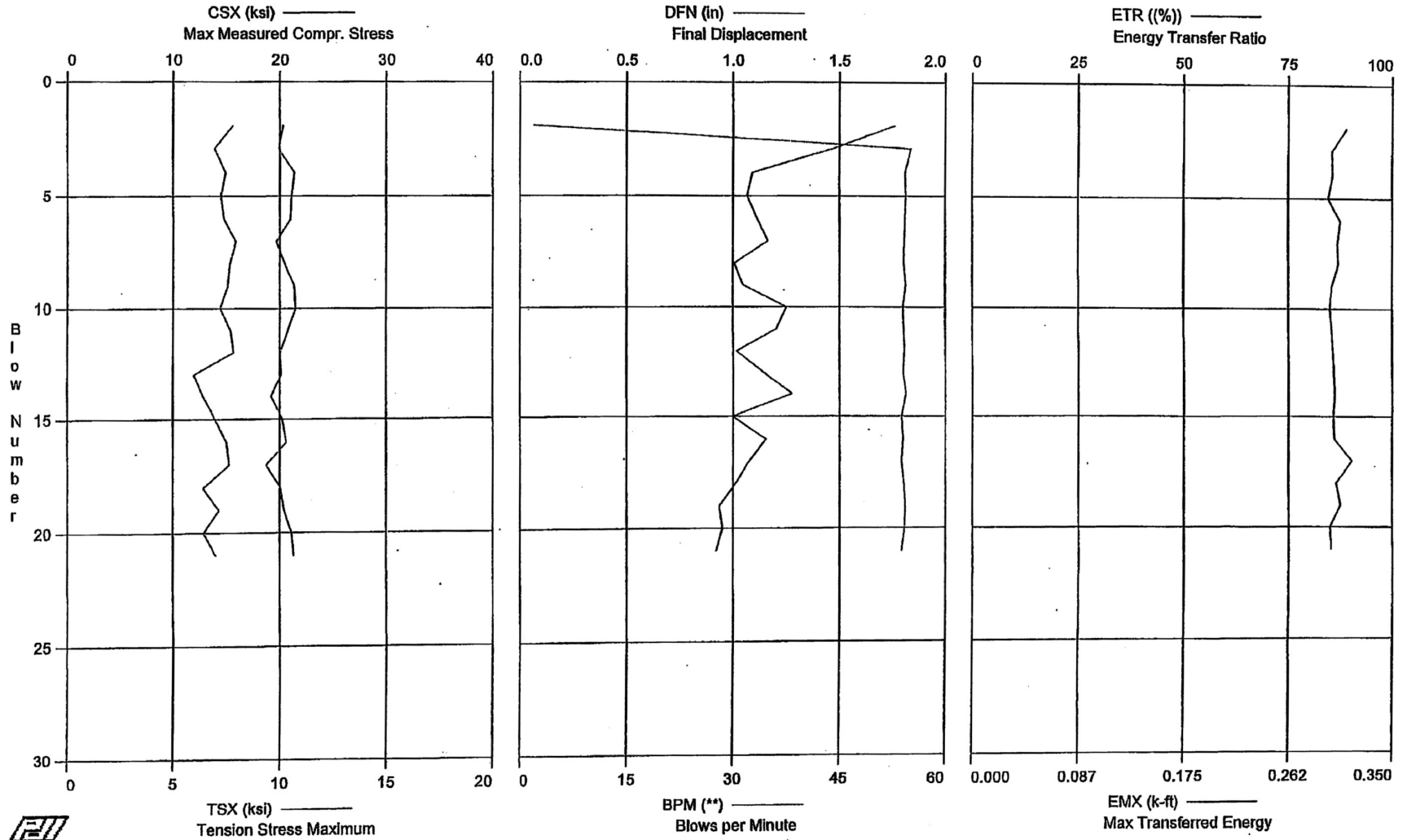
REMARKS:	OFFSET HOLE FOR ENERGY TESTING
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PDIPLOT Ver. 2008.1 - Printed: 11-Mar-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 19-Dec-2007

EXELON VICTORIA COL SITE - BORING B-2169 OFFSET; 13.5' - 15' SAMPLE



EXELON VICTORIA COL SITE - BORING B-2169 OFFSET; 13.5' - 15' SAMPLE
OP: SEK

HAMMER ID: MEC-05; CME 550 ATV (BANKS)
Test date: 19-Dec-2007

AR: 1.19 in²

SP: 0.492 k/ft³

LE: 19.00 ft

EM: 30,000 ksi

WS: 16,807.9 f/s

JC: 0.70

CSX: Max Measured Compr. Stress

FMX: Maximum Force

TSX: Tension Stress Maximum

EF2: Energy of F²

DFN: Final Displacement

ETR: Energy Transfer Ratio

BPM: Blows per Minute

EMX: Max Transferred Energy

FVP: Force/Velocity proportionality

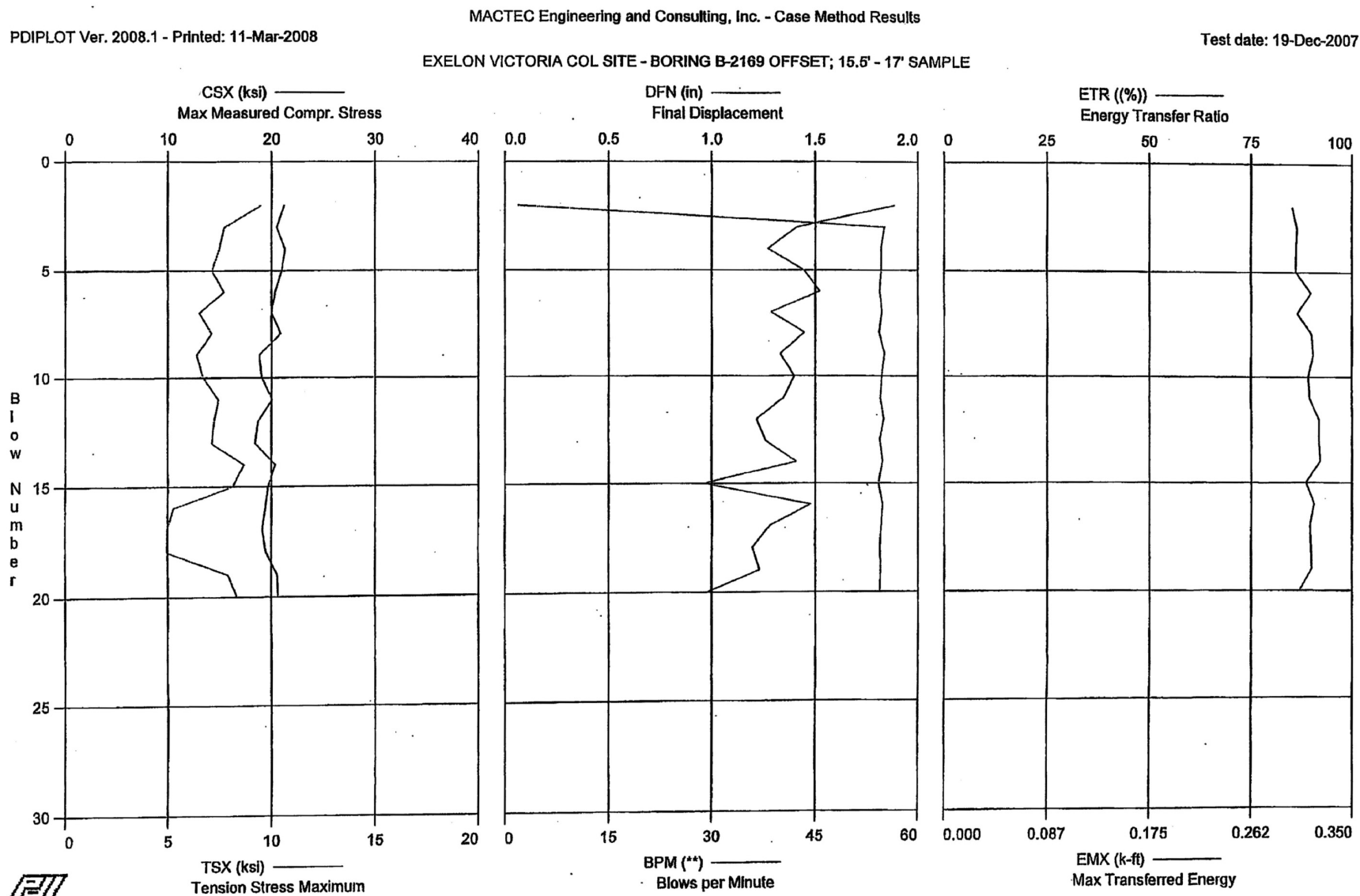
BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM **	FVP []	FMX kips	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	20.35	7.83	1.76	1.9	0.95	24	0.207	89	0.311
3	0.00	19.88	6.96	1.47	55.1	0.81	24	0.213	85	0.299
4	0.00	21.38	7.46	1.09	54.3	0.95	25	0.207	86	0.300
5	0.00	21.10	7.26	1.07	54.4	0.92	25	0.207	84	0.296
6	0.00	21.01	7.39	1.11	54.3	0.89	25	0.211	87	0.306
7	0.00	19.67	7.94	1.16	54.2	0.63	23	0.210	87	0.304
8	0.00	20.46	7.67	1.01	54.1	0.84	24	0.213	87	0.304
9	0.00	21.36	7.58	1.05	54.4	0.94	25	0.211	85	0.299
10	0.00	21.48	7.22	1.25	54.0	1.04	26	0.209	85	0.297
11	0.00	20.76	7.70	1.20	54.1	1.02	25	0.204	85	0.299
12	0.00	20.06	7.84	1.02	54.2	0.82	24	0.212	86	0.300
13	0.00	20.16	5.98	1.14	54.0	0.57	24	0.205	86	0.300
14	0.00	19.21	6.41	1.28	54.4	0.60	23	0.205	86	0.301
15	0.00	20.26	6.98	1.00	53.8	0.58	24	0.208	86	0.300
16	0.00	20.64	7.51	1.16	54.0	1.01	25	0.207	86	0.301
17	0.00	18.73	7.64	1.08	53.8	0.68	22	0.218	90	0.316
18	0.00	20.10	6.40	1.01	54.1	0.58	24	0.210	86	0.302
19	0.00	20.39	7.17	0.94	54.3	0.83	24	0.215	87	0.306
20	0.00	21.12	6.42	0.95	54.2	0.99	25	0.207	85	0.297
21	0.00	21.31	7.02	0.92	53.8	1.03	25	0.210	85	0.298
Average		20.47	7.22	1.13	51.6	0.83	24	0.209	86	0.302

Total number of blows analyzed: 20

Time Summary

Drive 53 seconds

5:47:24 PM - 5:48:17 PM (12/19/2007) BN 1 - 21



EXELON VICTORIA COL SITE - BORING B-2169 OFFSET; 15.5' - 17' SAMPLE
OP: SEK

HAMMER ID: MEC-05; CME 550 ATV (BANKS)
Test date: 19-Dec-2007

AR: 1.19 in²
LE: 21.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft³
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
DFN: Final Displacement
BPM: Blows per Minute
FVP: Force/Velocity proportionality

FMX: Maximum Force
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM **	FVP []	FMX kips	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	21.24	9.50	1.88	1.9	0.94	25	0.205	85	0.298
3	0.00	20.50	7.72	1.41	55.1	0.80	24	0.207	86	0.302
4	0.00	21.32	7.48	1.27	54.6	0.93	25	0.208	86	0.301
5	0.00	20.99	7.12	1.45	54.6	0.89	25	0.205	86	0.301
6	0.00	20.34	7.70	1.52	54.4	0.77	24	0.211	90	0.314
7	0.00	20.00	6.50	1.29	54.7	0.57	24	0.206	86	0.302
8	0.00	20.88	7.10	1.45	54.3	0.85	25	0.210	90	0.314
9	0.00	18.81	6.37	1.33	55.1	0.68	22	0.212	90	0.316
10	0.00	19.07	6.70	1.40	54.7	0.61	23	0.206	89	0.312
11	0.00	20.10	7.45	1.35	54.5	0.79	24	0.206	89	0.313
12	0.00	18.70	7.24	1.22	55.0	0.68	22	0.208	92	0.321
13	0.00	18.41	7.11	1.26	54.4	0.67	22	0.209	92	0.321
14	0.00	20.37	8.68	1.41	54.8	0.82	24	0.205	92	0.322
15	0.00	19.68	8.12	0.96	54.2	0.76	23	0.211	88	0.310
16	0.00	19.42	5.26	1.48	54.8	0.56	23	0.204	91	0.317
17	0.00	19.12	4.96	1.28	54.6	0.58	23	0.205	89	0.313
18	0.00	19.47	4.93	1.20	54.4	0.58	23	0.206	90	0.314
19	0.00	20.53	7.89	1.23	54.5	0.94	24	0.205	90	0.315
20	0.00	20.64	8.34	0.98	54.4	0.93	25	0.205	87	0.304
Average		19.98	7.17	1.33	51.8	0.76	24	0.207	89	0.311

Total number of blows analyzed: 19

Time Summary

Drive 46 seconds

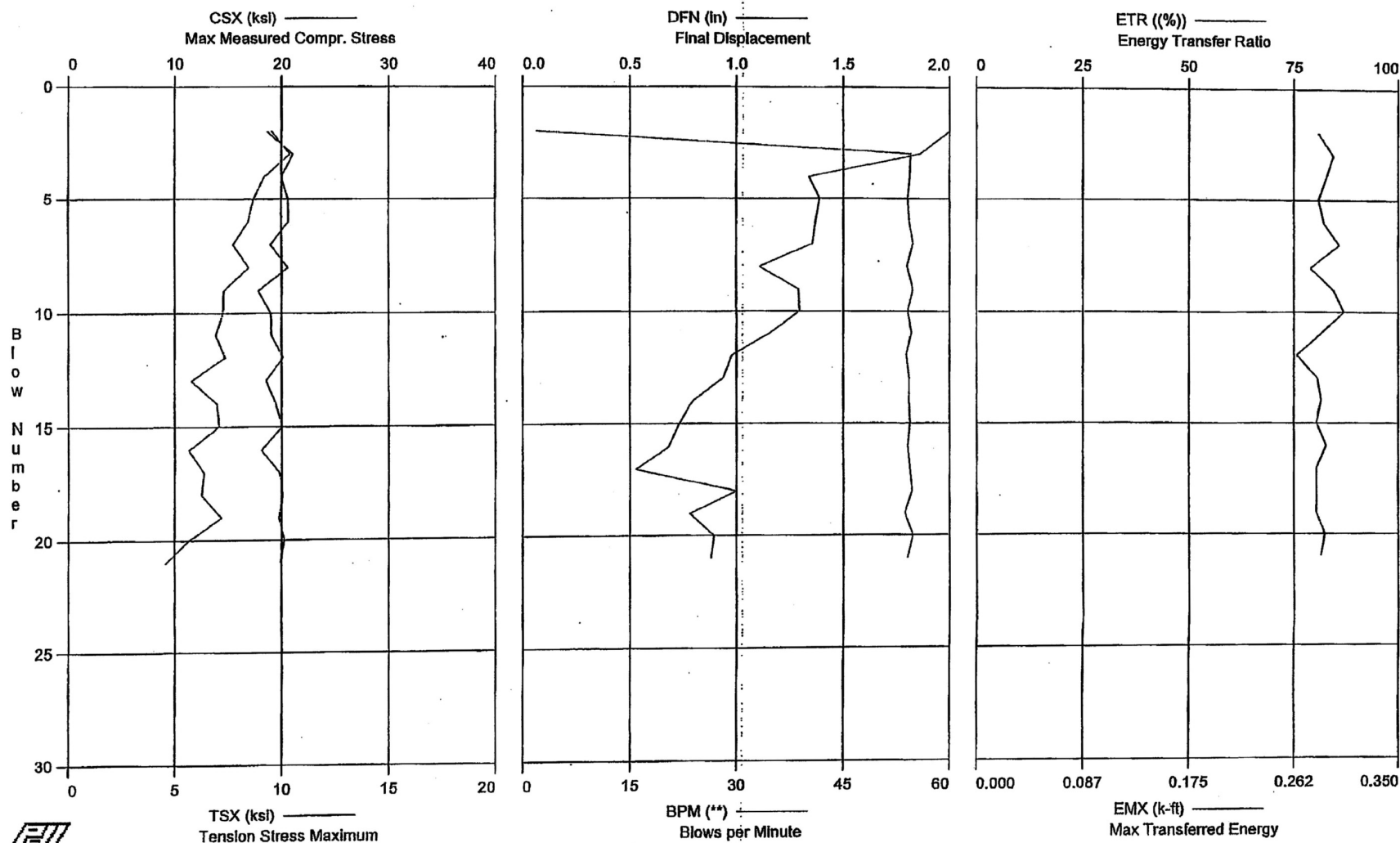
5:53:52 PM - 5:54:38 PM (12/19/2007) BN 1 - 20

PDILOT Ver. 2008.1 - Printed: 11-Mar-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 19-Dec-2007

EXELON VICTORIA COL SITE - BORING B-2169 OFFSET; 18.5' - 20' SAMPLE



EXELON VICTORIA COL SITE - BORING B-2169 OFFSET; 18.5' - 20' SAMPLE
OP: SEK

HAMMER ID: MEC-05; CME 550 ATV (BANKS)
Test date: 19-Dec-2007

AR: 1.19 in²
LE: 24.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft³
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
DFN: Final Displacement
BPM: Blows per Minute
FVP: Force/Velocity proportionality

FMX: Maximum Force
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

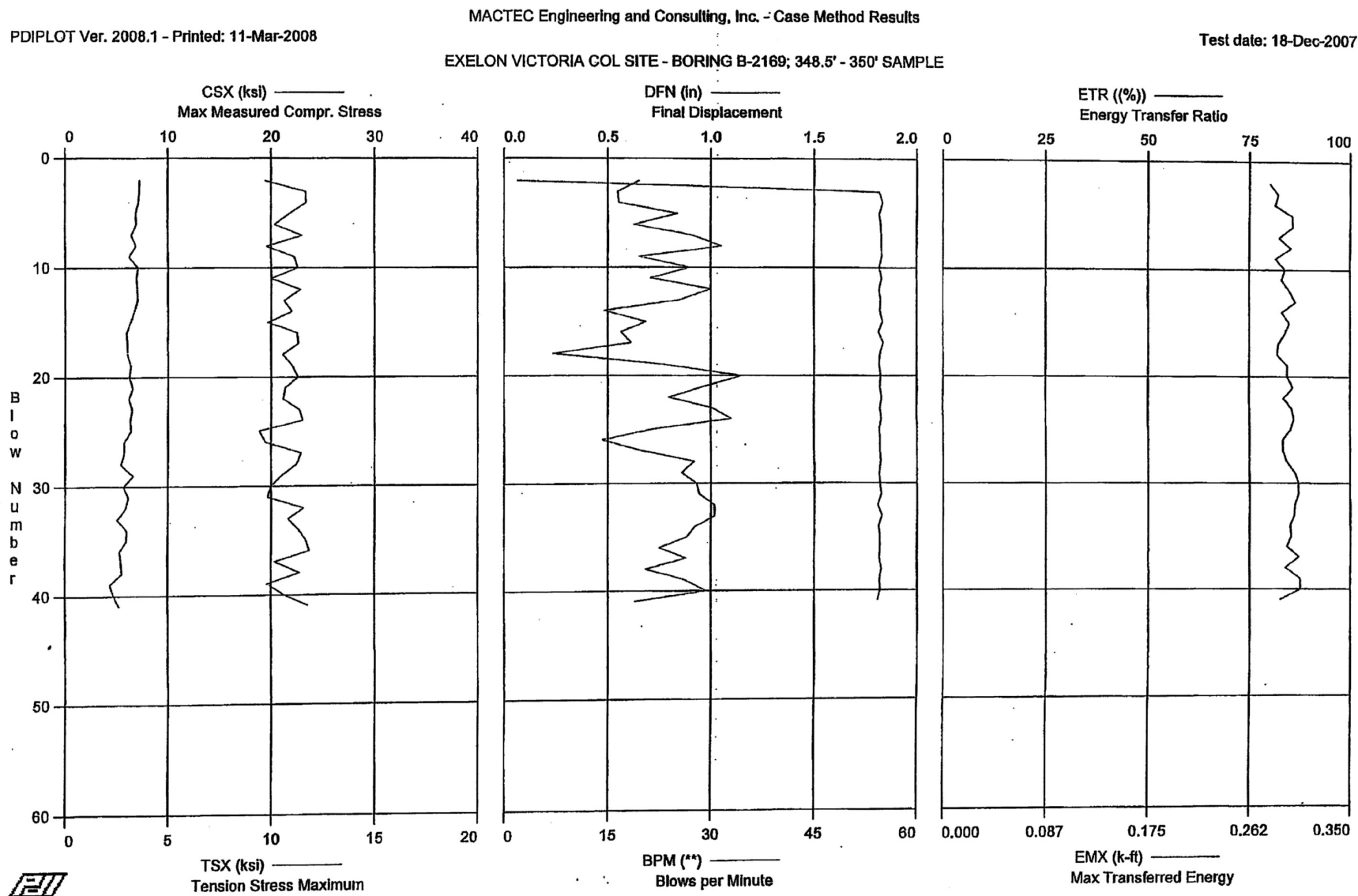
BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM **	FVP []	FMX klps	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	18.61	9.54	2.12	1.9	0.67	22	0.233	81	0.283
3	0.00	21.05	10.39	1.86	54.5	0.92	25	0.230	84	0.295
4	0.00	19.99	9.19	1.34	54.4	0.75	24	0.228	83	0.289
5	0.00	20.62	8.70	1.39	54.1	0.89	25	0.224	81	0.283
6	0.00	20.62	8.45	1.37	54.3	0.88	25	0.225	82	0.287
7	0.00	18.94	7.75	1.36	54.8	0.71	23	0.227	86	0.300
8	0.00	20.58	8.46	1.11	54.0	1.00	24	0.221	79	0.276
9	0.00	17.81	7.29	1.29	54.8	0.60	21	0.224	84	0.295
10	0.00	18.97	7.26	1.29	54.1	0.61	23	0.228	87	0.304
11	0.00	19.01	6.93	1.16	54.6	0.57	23	0.223	81	0.285
12	0.00	20.15	7.36	0.88	53.9	1.04	24	0.217	76	0.265
13	0.00	18.51	5.76	0.94	54.3	0.61	22	0.223	80	0.282
14	0.00	19.44	6.97	0.80	54.3	0.73	23	0.228	82	0.285
15	0.00	20.05	7.06	0.73	54.4	0.55	24	0.225	80	0.281
16	0.00	18.10	5.66	0.68	54.1	0.59	22	0.230	83	0.289
17	0.00	19.79	6.37	0.53	54.4	0.75	24	0.229	80	0.281
18	0.00	20.12	6.26	1.00	54.7	0.94	24	0.224	80	0.281
19	0.00	19.76	7.20	0.78	53.7	1.05	24	0.226	80	0.281
20	0.00	20.28	5.67	0.90	54.8	0.85	24	0.229	82	0.288
21	0.00	19.88	4.56	0.88	54.1	0.56	24	0.230	81	0.285
Average		19.61	7.34	1.12	51.7	0.76	23	0.226	82	0.286

Total number of blows analyzed: 20

Time Summary

Drive 53 seconds

6:01:23 PM - 6:02:16 PM (12/19/2007) BN 1 - 21



EXELON VICTORIA COL SITE - BORING B-2169; 348.5' - 350' SAMPLE
OP: SEK

HAMMER ID: MEC-05; CME 550 ATV (BANKS)
Test date: 18-Dec-2007

AR: 1.49 in² SP: 0.492 k/ft³
LE: 354.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.70

CSX: Max Measured Compr. Stress FMX: Maximum Force
TSX: Tension Stress Maximum EF2: Energy of F²
DFN: Final Displacement ETR: Energy Transfer Ratio
BPM: Blows per Minute EMX: Max Transferred Energy
FVP: Force/Velocity proportionality

BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM *	FVP []	FMX kips	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	19.43	3.63	0.65	1.9	0.55	29	0.289	80	0.280
3	0.00	23.31	3.62	0.55	54.5	0.60	35	0.305	82	0.287
4	0.00	23.39	3.57	0.55	55.0	0.58	35	0.303	81	0.284
5	0.00	21.74	3.44	0.84	54.5	1.12	32	0.306	85	0.299
6	0.00	20.31	3.48	0.63	54.7	1.03	30	0.305	86	0.300
7	0.00	22.98	3.22	0.91	54.8	0.68	34	0.297	82	0.288
8	0.00	19.56	3.45	1.05	54.8	1.02	29	0.297	85	0.298
9	0.00	22.24	3.12	0.65	54.9	0.57	33	0.300	81	0.285
10	0.00	22.56	3.56	0.90	54.5	0.60	34	0.296	84	0.293
11	0.00	19.99	3.48	0.71	54.9	0.89	30	0.297	83	0.290
12	0.00	22.83	3.50	1.00	54.5	0.71	34	0.306	85	0.297
13	0.00	21.23	3.53	0.84	54.7	0.82	32	0.305	86	0.302
14	0.00	22.01	3.36	0.48	54.6	0.55	33	0.305	83	0.290
15	0.00	19.66	3.19	0.69	55.0	1.01	29	0.298	85	0.297
16	0.00	22.54	2.98	0.56	54.4	0.59	34	0.298	84	0.293
17	0.00	22.61	3.03	0.61	55.1	0.59	34	0.295	82	0.287
18	0.00	21.10	3.03	0.23	54.6	0.55	31	0.295	82	0.286
19	0.00	22.05	3.21	0.77	54.5	0.58	33	0.290	84	0.295
20	0.00	22.59	3.13	1.15	54.7	0.62	34	0.292	84	0.295
21	0.00	21.34	3.29	0.97	54.6	0.77	32	0.298	86	0.300
22	0.00	21.15	3.10	0.80	54.9	1.12	32	0.291	83	0.292
23	0.00	22.74	3.27	1.01	54.6	0.65	34	0.297	85	0.299
24	0.00	23.05	3.18	1.10	54.8	0.69	34	0.299	86	0.301
25	0.00	18.83	3.20	0.73	54.5	0.93	28	0.296	85	0.298
26	0.00	19.42	2.88	0.47	54.6	0.99	29	0.291	83	0.291
27	0.00	22.91	2.88	0.67	54.6	0.67	34	0.299	83	0.291
28	0.00	22.47	2.71	0.92	54.7	0.72	33	0.298	84	0.294
29	0.00	21.00	3.31	0.86	54.5	1.09	31	0.295	86	0.301
30	0.00	20.00	2.83	0.93	54.6	0.89	30	0.299	87	0.305
31	0.00	19.66	3.08	0.95	54.8	0.97	29	0.299	87	0.305
32	0.00	23.11	2.94	1.02	54.3	0.66	34	0.298	86	0.302
33	0.00	21.63	2.52	1.02	54.9	1.12	32	0.296	86	0.301
34	0.00	22.67	3.00	0.92	54.4	0.72	34	0.300	85	0.297
35	0.00	23.34	2.99	0.88	54.6	0.62	35	0.300	85	0.298
36	0.00	23.70	2.65	0.75	54.6	0.59	35	0.301	84	0.294
37	0.00	20.34	2.73	0.88	54.5	0.85	30	0.297	87	0.305
38	0.00	22.79	2.77	0.68	54.8	0.72	34	0.302	84	0.293
39	0.00	19.63	2.18	0.87	54.5	0.91	29	0.299	87	0.306
40	0.00	21.29	2.37	0.98	54.6	0.84	32	0.298	88	0.306
41	0.00	23.53	2.62	0.63	54.2	0.64	35	0.300	82	0.289
Average		21.67	3.10	0.79	53.3	0.77	32	0.298	84	0.295

Total number of blows analyzed: 40

Time Summary

Drive 1 minute 13 seconds

10:44:05 AM - 10:45:18 AM (12/18/2007) BN 1 - 41

PDIPLOT Ver. 2008.1 - Printed: 11-Mar-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 18-Dec-2007

EXELON VICTORIA COL SITE - BORING B-2169; 368.5' - 370' SAMPLE

