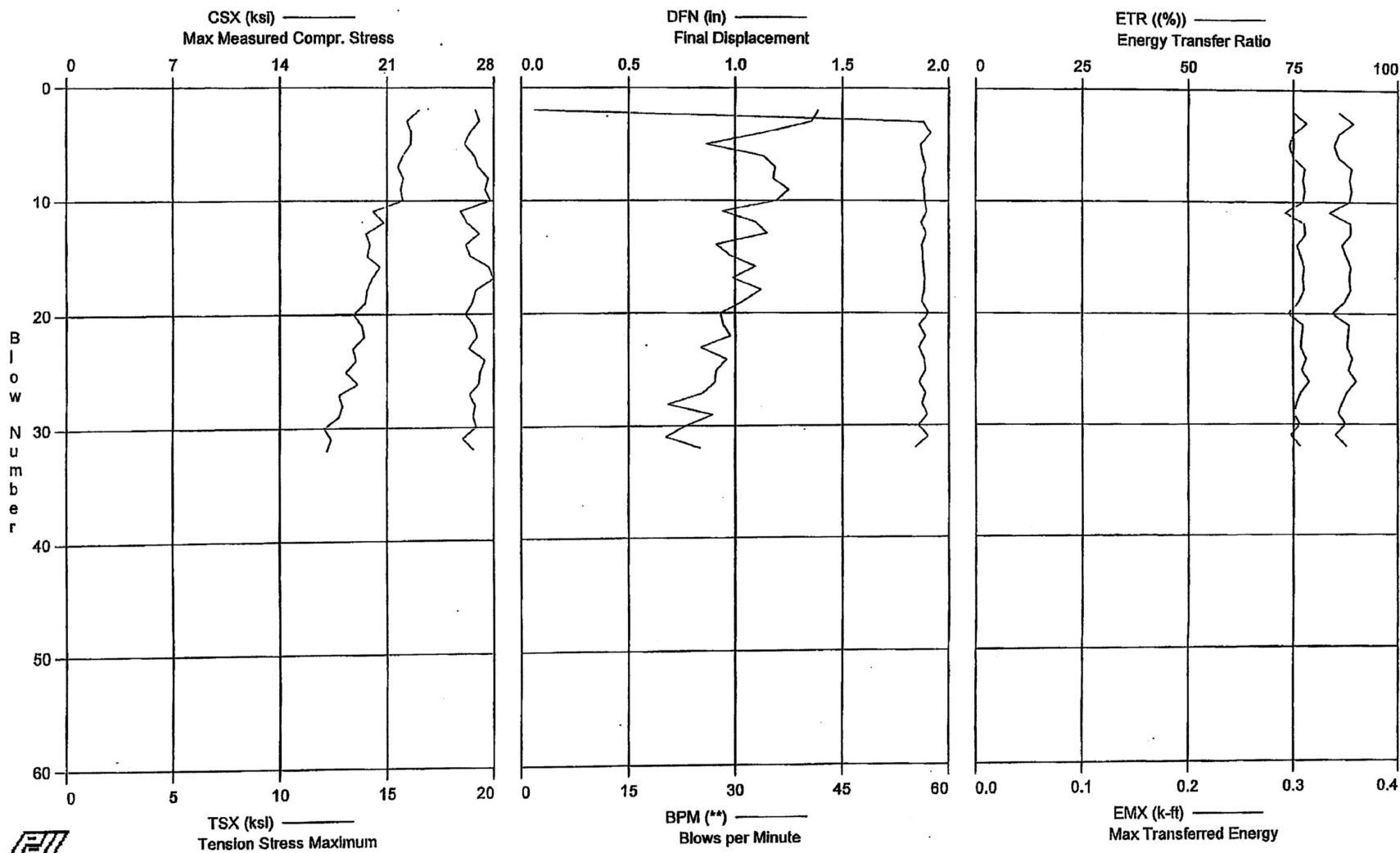


PDIPLOT Ver. 2008.1 - Printed: 7-Jan-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 20-Dec-2007

EXELON VICTORIA COL SITE - Boring B-2171 OFFSET; 63.5' - 65' Sample



EXELON VICTORIA COL SITE - Boring B-2171 OFFSET; 63.5' - 65' Sample
OP: SEK

HAMMER ID: MEC-11; CME 75 TRUCK (NALLS)
Test date: 20-Dec-2007

AR: 1.49 in² SP: 0.492 k/ft³
LE: 69.00 ft EM: 30,000.0 ksi
WS: 16,807.9 f/s JC: 0.70

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

BL#	depth ft	FMX kips	VMX f/s	CSX ksi	TSX ksi	BPM **	DFN In	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	40	12.4	26.8	16.5	1.9	1.39	0.339	86	0.300
3	0.00	40	13.5	27.1	15.9	56.4	1.36	0.333	89	0.312
4	0.00	39	13.1	26.4	16.1	57.5	1.14	0.323	86	0.300
5	0.00	39	13.1	26.1	16.1	56.0	0.86	0.343	85	0.296
6	0.00	40	13.3	26.7	15.7	56.3	1.13	0.328	86	0.300
7	0.00	40	12.7	27.0	15.5	56.8	1.19	0.344	89	0.311
8	0.00	41	13.3	27.6	15.8	56.3	1.18	0.334	88	0.309
9	0.00	41	13.3	27.4	15.7	56.5	1.25	0.340	89	0.311
10	0.00	41	13.2	27.8	15.7	56.6	1.19	0.342	88	0.309
11	0.00	38	13.6	25.8	14.4	56.9	0.94	0.334	84	0.292
12	0.00	39	13.2	26.3	14.9	56.1	1.10	0.348	89	0.310
13	0.00	40	13.0	27.1	14.0	56.8	1.15	0.331	89	0.311
14	0.00	39	13.4	26.2	14.2	56.2	0.91	0.334	86	0.303
15	0.00	39	13.5	26.5	14.1	56.3	0.98	0.337	88	0.307
16	0.00	41	12.8	27.7	14.7	56.4	1.09	0.342	89	0.310
17	0.00	42	13.2	28.1	14.3	56.6	0.99	0.344	88	0.309
18	0.00	40	12.9	26.8	14.1	56.5	1.12	0.332	89	0.310
19	0.00	40	12.5	26.6	14.0	56.2	1.04	0.331	87	0.305
20	0.00	39	13.2	26.1	13.4	57.2	0.93	0.321	84	0.295
21	0.00	40	13.5	26.7	13.8	55.8	0.94	0.336	88	0.309
22	0.00	40	12.7	26.9	13.9	56.7	0.98	0.328	88	0.308
23	0.00	39	13.1	26.4	13.4	55.8	0.84	0.351	88	0.307
24	0.00	41	13.4	27.4	13.6	56.5	0.96	0.335	89	0.312
25	0.00	40	13.3	27.1	13.1	56.7	0.91	0.334	88	0.308
26	0.00	40	12.9	27.0	13.6	55.8	0.91	0.336	90	0.315
27	0.00	39	12.6	26.4	12.7	56.7	0.85	0.345	88	0.307
28	0.00	40	13.4	26.8	12.9	56.2	0.68	0.334	87	0.303
29	0.00	40	13.4	26.6	12.7	57.0	0.89	0.321	86	0.300
30	0.00	40	13.5	26.8	12.1	55.7	0.77	0.335	87	0.306
31	0.00	39	12.3	25.9	12.4	57.1	0.67	0.334	85	0.297
32	0.00	40	13.3	26.7	12.2	55.2	0.83	0.334	88	0.306
Average		40	13.1	26.8	14.2	54.7	1.00	0.336	87	0.306

Total number of blows analyzed: 31

Time Summary

Drive 1 minute

9:25:31 AM - 9:26:31 AM (12/20/2007) BN 1 - 32

March 14, 2008

Memorandum to File

From: Steve Kiser *SK*

Reviewed By: Kathryn White *KAW* 3/14/08

Subject: **Report of SPT Energy – MACTEC Charlotte CME 45 Track
Hammer Serial No. MEC-12 Automatic Hammer
WORK INSTRUCTION 19
Exelon COL Project
Victoria County, Texas
MACTEC Project No. 6468-07-1777**

Kyle Miller, 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 3 and 4, 2007, during drilling of Boring B-2152 at the referenced site. The testing was performed from approximately 4:00 to 5:00 PM under partly cloudy skies and a temperature of about 60 degrees Fahrenheit on December 3, and from approximately 7:30 to 8:00 AM under sunny skies and a temperature of about 40 degrees Fahrenheit on December 4. The borings were drilled with personnel and equipment from the Charlotte office of MACTEC. The drilling equipment consisted of a CME 45 model track-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of AW-J-sized drilling rods 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. Jimmy Warren. 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, P5992, K990, and K983) and strain gages (Serial Nos. AW #75/1 and AW#75/2). 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 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 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 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.

14 Pages Total

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 average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 253 foot-pounds to

282 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 72% to 81% of the theoretical energy (350 foot-pounds) of the SPT hammer.

- 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) was 258.7 foot-pounds, with an average ETR of 73.9%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN EXE 19 – 1 Page
Page 6 – 7 Record of SPT Energy Measurement – 2 Pages
Pages 8 – 14 PDILOT Output – 7 Pages

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)

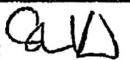
Exelon COL Project
 Victoria County, Texas
 MACTEC Project No. 6468-07-1777

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)
MBC-12 (CME 45 Track)	MACTEC Charlotte	Jimmy Warren	B-2152	AW-J	12/3/2007	52.8 - 54.3	19 - 23 - 32	49	259	74.0%
						57.8 - 59.3	28 - 28 - 28	84	253	72.3%
					12/4/2007	63.3 - 64.8	7 - 8 - 11	20	282	80.6%
					Average for Rig:					258.7

^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: KAW	Date: 3/14/08
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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: <u>8</u>	DCN: <u>EXE</u>

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:	GME-45
LOCATION:	Victoria, Texas	MODEL:	45
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MFC-12
DATE:	12-3-2007	HAMMER TYPE:	Auto
WEATHER:	~60°F P. Cloudy	ROPE CONDITION:	N/A
INSPECTOR:	Kyle Miller	ROD SIZE:	AW-J
DRILLING COMPANY:	MACTEC	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	B-2152		
DEPTH DRILLED:	53.5' to 60'		
TIME DRIVEN:	4:00 PM to 5:00 PM		
RIG OPERATOR:	Jimmy Warren		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.19 in ²		
ACCEL. SERIAL NOS.:	K990 ; K983		
STRAIN SERIAL NOS.:	75 AW-1 ; 75 AW-2		

[illegible]

No data collected for
first approx. 24 hours
KBM 12/3/07

Testing resumed
on 12/4/07
KBM 12/9/07

REMARKS:	Testing continued on 12/4/2007
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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:	45
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-12
DATE:	12/4/2007	HAMMER TYPE:	Auto
WEATHER:	Sunny ~ 40°F	ROPE CONDITION:	N/A
INSPECTOR:	Kyle Miller	ROD SIZE:	AW-5
DRILLING COMPANY:	MACTEC	NO. OF SHEAVES:	N/A

BORING DATA.

BORING NUMBER:	B-2152		
DEPTH DRILLED:	63.5' to 65.0'		
TIME DRIVEN:	7:30 AM to 8:00 AM		
RIG OPERATOR:	Jimmy Warren		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.19 in ²		
ACCEL. SERIAL NOS.:	5953; 5992		
STRAIN SERIAL NOS.:	75AW-1; 75AW-2		

[illegible]

REMARKS:

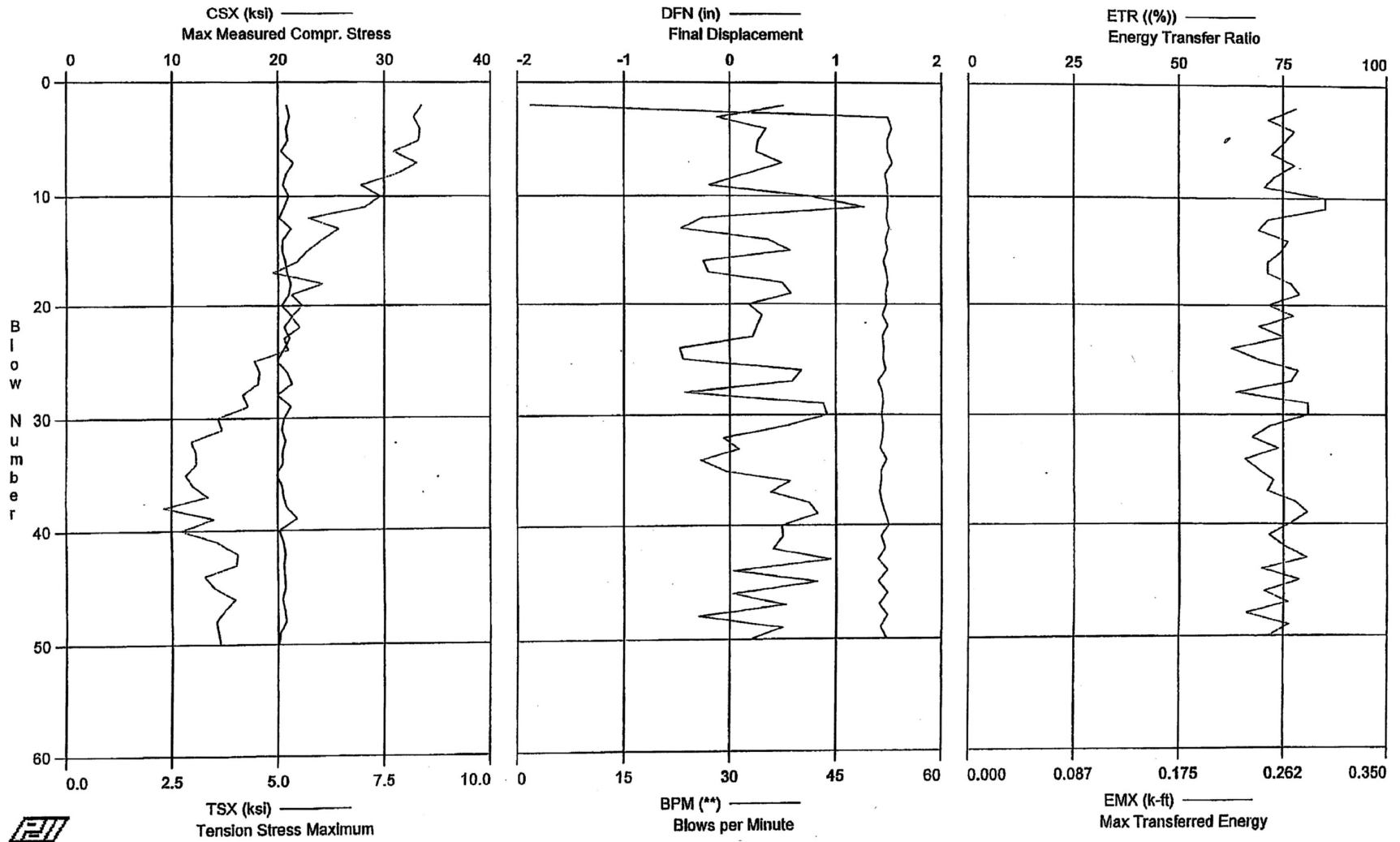
NOTE

PDILOT Ver. 2008.1 - Printed: 14-Mar-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 3-Dec-2007

Exelon Victoria COL Site - Boring B-2152; 53.5' - 55' Sample



Exelon Victoria COL Site - Boring B-2152; 53.5' - 55' Sample
OP: KBM

Hammer ID: MEC-12; MACTEC Charlotte (J. Warren CME 45 Track)
Test date: 3-Dec-2007

AR: 1.19 in²
LE: 60.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft³
EM: 30,000.0 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BPM: Blows per Minute
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	DFN in	BPM *	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	20.8	8.4	25	16.7	0.51	1.9	0.238	78	0.273
3	0.00	21.1	8.2	25	15.4	-0.12	52.4	0.238	72	0.250
4	0.00	20.8	8.3	25	16.5	0.34	52.9	0.237	78	0.272
5	0.00	20.9	8.3	25	16.4	0.27	52.3	0.239	75	0.263
6	0.00	20.3	7.7	24	14.9	0.25	52.4	0.227	72	0.253
7	0.00	21.4	8.3	26	16.4	0.49	53.0	0.243	78	0.272
8	0.00	20.8	7.8	25	16.2	0.14	52.0	0.240	73	0.256
9	0.00	20.5	7.0	24	15.5	-0.20	52.3	0.239	70	0.247
10	0.00	21.0	7.4	25	17.3	0.75	52.4	0.240	85	0.298
11	0.00	20.6	7.0	24	17.7	1.27	52.4	0.239	85	0.298
12	0.00	20.1	5.7	24	15.8	-0.26	52.2	0.237	71	0.250
13	0.00	21.2	6.4	25	15.8	-0.46	52.6	0.240	69	0.242
14	0.00	20.4	6.0	24	15.9	0.36	52.1	0.233	76	0.267
15	0.00	20.4	5.7	24	16.0	0.57	52.4	0.235	75	0.261
16	0.00	20.7	5.5	25	16.3	-0.25	51.8	0.238	71	0.250
17	0.00	20.9	4.9	25	16.6	-0.20	52.2	0.240	71	0.250
18	0.00	21.2	6.1	25	15.6	0.49	52.4	0.235	77	0.269
19	0.00	21.0	5.3	25	17.1	0.58	52.1	0.236	79	0.276
20	0.00	20.3	5.6	24	16.5	0.18	52.2	0.225	71	0.250
21	0.00	21.3	5.3	25	16.8	0.30	51.6	0.244	77	0.271
22	0.00	20.6	5.5	24	16.3	0.26	52.4	0.229	69	0.242
23	0.00	21.1	5.1	25	16.6	0.22	51.6	0.239	75	0.263
24	0.00	20.5	5.2	24	15.1	-0.47	51.8	0.252	63	0.219
25	0.00	19.9	4.4	24	16.8	-0.44	51.7	0.242	69	0.242
26	0.00	20.9	4.6	25	16.6	0.68	52.1	0.236	79	0.275
27	0.00	21.3	4.5	25	16.7	0.59	51.0	0.236	77	0.269
28	0.00	20.0	4.2	24	16.0	-0.43	51.6	0.222	64	0.223
29	0.00	21.2	4.3	25	16.5	0.88	51.7	0.238	81	0.283
30	0.00	20.6	3.6	24	17.6	0.92	51.5	0.234	81	0.283
31	0.00	20.3	3.7	24	15.9	0.51	51.7	0.223	72	0.251
32	0.00	20.7	3.0	25	16.2	-0.06	51.6	0.256	67	0.236
33	0.00	20.4	3.1	24	17.5	0.09	51.3	0.235	74	0.258
34	0.00	20.4	3.1	24	15.3	-0.27	52.2	0.230	66	0.230
35	0.00	19.9	2.8	24	16.8	-0.04	51.4	0.234	69	0.242
36	0.00	20.4	3.0	24	15.7	0.57	51.4	0.226	73	0.254
37	0.00	20.5	3.4	24	15.3	0.39	51.2	0.225	71	0.249
38	0.00	20.9	2.3	25	16.3	0.75	51.5	0.235	78	0.272
39	0.00	21.8	3.5	26	17.0	0.83	52.0	0.236	81	0.282
40	0.00	20.1	2.7	24	17.1	0.49	52.5	0.231	76	0.267
41	0.00	20.5	3.6	24	14.9	0.50	51.4	0.228	72	0.250
42	0.00	20.7	4.1	25	16.6	0.41	52.0	0.227	76	0.264
43	0.00	20.6	4.0	24	16.0	0.95	51.0	0.234	81	0.282
44	0.00	20.6	3.3	25	16.1	0.04	52.3	0.224	70	0.244
45	0.00	20.7	3.5	25	17.1	0.82	51.0	0.227	79	0.275
46	0.00	20.4	4.0	24	16.1	0.03	52.3	0.226	70	0.246
47	0.00	20.6	3.7	25	15.5	0.53	51.1	0.228	76	0.266
48	0.00	20.7	3.6	25	15.8	-0.29	52.3	0.226	66	0.231
49	0.00	20.2	3.6	24	17.4	0.50	51.3	0.230	76	0.267
50	0.00	20.1	3.6	24	16.9	0.19	52.2	0.227	71	0.250
Average		20.7	5.0	25	16.3	0.29	50.9	0.234	74	0.259

Total number of blows analyzed: 49

Time Summary

Drive 55 seconds

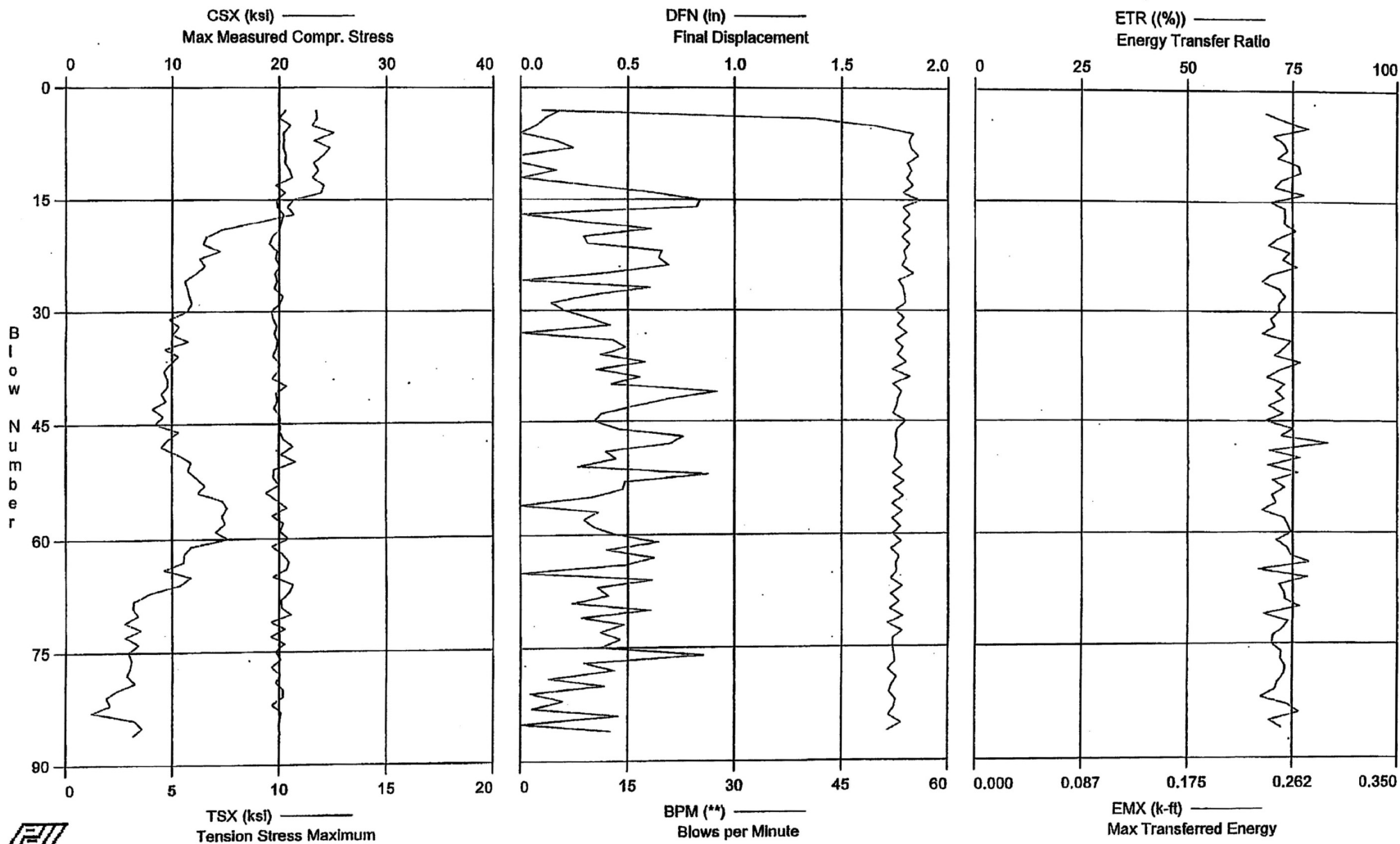
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PDILOT Ver. 2008.1 - Printed: 11-Mar-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 3-Dec-2007

EXELON VICTORIA COL SITE - BORING B-2152; 58.5' - 60' SAMPLE



EXELON VICTORIA COL SITE - BORING B-2152; 58.5' - 60' SAMPLE
OP: KBM

Hammer ID: MEC-12; CME 45 TRACK (J. Warren)
Test date: 3-Dec-2007

AR: 1.19 in²

SP: 0.492 k/ft³

LE: 65.00 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
3	0.00	20.59	11.72	0.18	3.0	0.71	25	0.223	69	0.240
4	0.00	20.05	11.77	0.12	41.1	0.66	24	0.232	73	0.256
5	0.00	21.04	11.54	0.07	49.9	0.69	25	0.255	79	0.275
6	0.00	20.40	12.56	-0.39	55.1	0.69	24	0.235	70	0.246
7	0.00	20.44	11.61	0.16	54.5	0.74	24	0.237	73	0.255
8	0.00	20.37	12.38	0.25	54.8	0.71	24	0.236	74	0.258
9	0.00	20.63	12.06	-0.06	55.8	0.72	25	0.219	72	0.250
10	0.00	20.51	11.60	-0.18	54.3	0.66	24	0.252	76	0.267
11	0.00	20.94	11.83	0.17	54.9	0.74	25	0.244	77	0.269
12	0.00	21.20	11.54	-0.41	54.2	0.72	25	0.243	72	0.253
13	0.00	19.71	12.09	0.30	55.1	0.65	23	0.227	71	0.248
14	0.00	20.53	11.98	0.62	53.7	0.68	24	0.241	78	0.272
15	0.00	19.77	10.64	0.84	56.1	0.68	24	0.221	70	0.244
16	0.00	19.79	10.39	0.82	53.7	0.65	24	0.230	73	0.256
17	0.00	20.40	10.67	-0.03	54.6	0.70	24	0.230	73	0.256
18	0.00	20.21	9.09	0.27	53.7	0.68	24	0.232	73	0.256
19	0.00	20.05	7.34	0.61	54.7	0.65	24	0.255	76	0.265
20	0.00	19.33	6.61	0.29	53.5	0.62	23	0.225	72	0.250
21	0.00	19.08	6.45	0.31	54.6	0.69	23	0.205	69	0.242
22	0.00	19.85	7.24	0.66	53.8	0.66	24	0.223	74	0.260
23	0.00	19.70	6.31	0.65	54.1	0.65	23	0.217	73	0.254
24	0.00	20.04	6.54	0.69	53.5	0.67	24	0.225	76	0.266
25	0.00	19.64	6.10	0.40	55.1	0.67	23	0.210	70	0.244
26	0.00	19.81	5.60	0.01	53.0	0.67	24	0.219	68	0.237
27	0.00	19.57	5.72	0.61	53.7	0.66	23	0.210	72	0.251
28	0.00	20.34	5.80	0.33	53.9	0.67	24	0.229	73	0.256
29	0.00	20.08	5.90	0.14	54.0	0.64	24	0.230	72	0.251
30	0.00	19.25	5.68	0.20	52.5	0.65	23	0.220	72	0.251
31	0.00	19.45	4.86	0.32	53.8	0.64	23	0.213	70	0.244
32	0.00	19.79	5.32	0.42	52.8	0.68	24	0.211	71	0.247
33	0.00	19.57	5.00	-0.06	54.2	0.65	23	0.212	68	0.237
34	0.00	19.89	5.75	0.43	52.5	0.66	24	0.228	75	0.261
35	0.00	19.75	4.66	0.49	53.6	0.61	24	0.216	73	0.255
36	0.00	19.45	5.31	0.37	52.8	0.64	23	0.205	71	0.247
37	0.00	20.09	4.91	0.58	54.1	0.67	24	0.230	77	0.268
38	0.00	19.97	4.63	0.35	52.1	0.65	24	0.223	72	0.251
39	0.00	19.37	4.78	0.56	54.6	0.65	23	0.202	69	0.241
40	0.00	20.70	4.80	0.42	52.2	0.71	25	0.227	73	0.255
41	0.00	19.72	4.49	0.92	53.4	0.65	23	0.211	71	0.248
42	0.00	19.89	4.71	0.70	52.9	0.66	24	0.210	73	0.255
43	0.00	19.55	4.11	0.54	52.7	0.66	23	0.216	69	0.242
44	0.00	20.08	4.59	0.38	52.2	0.66	24	0.223	73	0.254
45	0.00	20.14	4.20	0.34	54.0	0.72	24	0.212	68	0.240
46	0.00	20.06	5.32	0.46	52.8	0.63	24	0.220	75	0.262
47	0.00	20.40	4.80	0.76	52.5	0.69	24	0.218	72	0.252
48	0.00	21.29	4.48	0.70	52.7	0.69	25	0.261	83	0.291
49	0.00	20.16	5.30	0.40	52.6	0.66	24	0.221	69	0.243
50	0.00	21.49	5.88	0.45	52.4	0.73	26	0.237	76	0.268
51	0.00	19.52	5.74	0.27	53.5	0.66	23	0.213	69	0.241
52	0.00	19.47	6.14	0.88	52.1	0.70	23	0.222	76	0.266
53	0.00	20.03	6.55	0.49	53.8	0.67	24	0.222	70	0.245
54	0.00	18.78	6.21	0.48	52.3	0.73	22	0.220	73	0.255
55	0.00	19.82	7.36	0.34	53.7	0.69	24	0.214	70	0.245
56	0.00	20.75	7.60	-0.01	52.1	0.73	25	0.230	71	0.248
57	0.00	19.35	7.33	0.36	53.5	0.70	23	0.217	68	0.237
58	0.00	20.41	7.49	0.29	52.1	0.68	24	0.229	73	0.255
59	0.00	20.08	7.03	0.35	53.3	0.71	24	0.234	74	0.258
60	0.00	20.86	7.63	0.45	52.1	0.70	25	0.238	75	0.261
61	0.00	19.34	5.88	0.65	53.4	0.73	23	0.221	71	0.249
62	0.00	20.32	5.57	0.40	51.9	0.72	24	0.232	74	0.257
63	0.00	20.91	5.53	0.63	53.1	0.72	25	0.230	75	0.261
64	0.00	20.69	4.63	0.50	52.6	0.68	25	0.250	79	0.276
65	0.00	19.45	5.87	-0.04	52.7	0.68	23	0.217	67	0.234
66	0.00	21.27	5.35	0.61	51.9	0.71	25	0.248	78	0.274
67	0.00	20.96	3.96	0.36	53.5	0.73	25	0.222	72	0.251

EXELON VICTORIA COL SITE - BORING B-2152; 58.5' - 60' SAMPLE

Hammer ID: MEC-12; CME 45 TRACK (J. Warren)

OP: KBM

Test date: 3-Dec-2007

BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM **	FVP []	FMX kips	EF2 k-ft	ETR (%)	EMX k-ft
68	0.00	20.18	3.20	0.41	51.9	0.68	24	0.230	73	0.255
69	0.00	20.21	3.17	0.24	53.1	0.75	24	0.222	73	0.256
70	0.00	21.07	3.39	0.61	51.7	0.72	25	0.228	77	0.268
71	0.00	19.25	2.77	0.28	53.6	0.64	23	0.204	68	0.238
72	0.00	20.53	3.53	0.48	51.4	0.67	24	0.226	74	0.258
73	0.00	19.18	2.78	0.37	53.5	0.63	23	0.214	73	0.254
74	0.00	20.48	3.42	0.46	52.2	0.73	24	0.226	70	0.246
75	0.00	19.64	2.94	0.37	52.2	0.69	23	0.214	70	0.245
76	0.00	20.14	3.11	0.85	52.4	0.68	24	0.216	72	0.253
77	0.00	19.27	3.02	0.29	52.5	0.67	23	0.208	72	0.252
78	0.00	20.09	2.88	0.44	51.5	0.66	24	0.221	73	0.256
79	0.00	19.67	3.27	0.13	52.7	0.65	23	0.216	73	0.255
80	0.00	20.33	2.43	0.39	52.1	0.70	24	0.219	71	0.250
81	0.00	20.35	1.92	0.05	51.7	0.65	24	0.220	71	0.248
82	0.00	19.33	2.09	0.20	52.6	0.71	23	0.212	67	0.236
83	0.00	20.15	1.22	0.05	52.4	0.67	24	0.250	74	0.258
84	0.00	20.06	3.20	0.46	51.6	0.72	24	0.227	77	0.268
85	0.00	19.91	3.59	-0.07	53.4	0.67	24	0.212	69	0.243
86	0.00	20.12	3.18	0.42	51.5	0.68	24	0.220	72	0.253
Average		20.07	6.16	0.36	52.4	0.68	24	0.225	72	0.253

Total number of blows analyzed: 84

Time Summary

Drive 1 minute 34 seconds

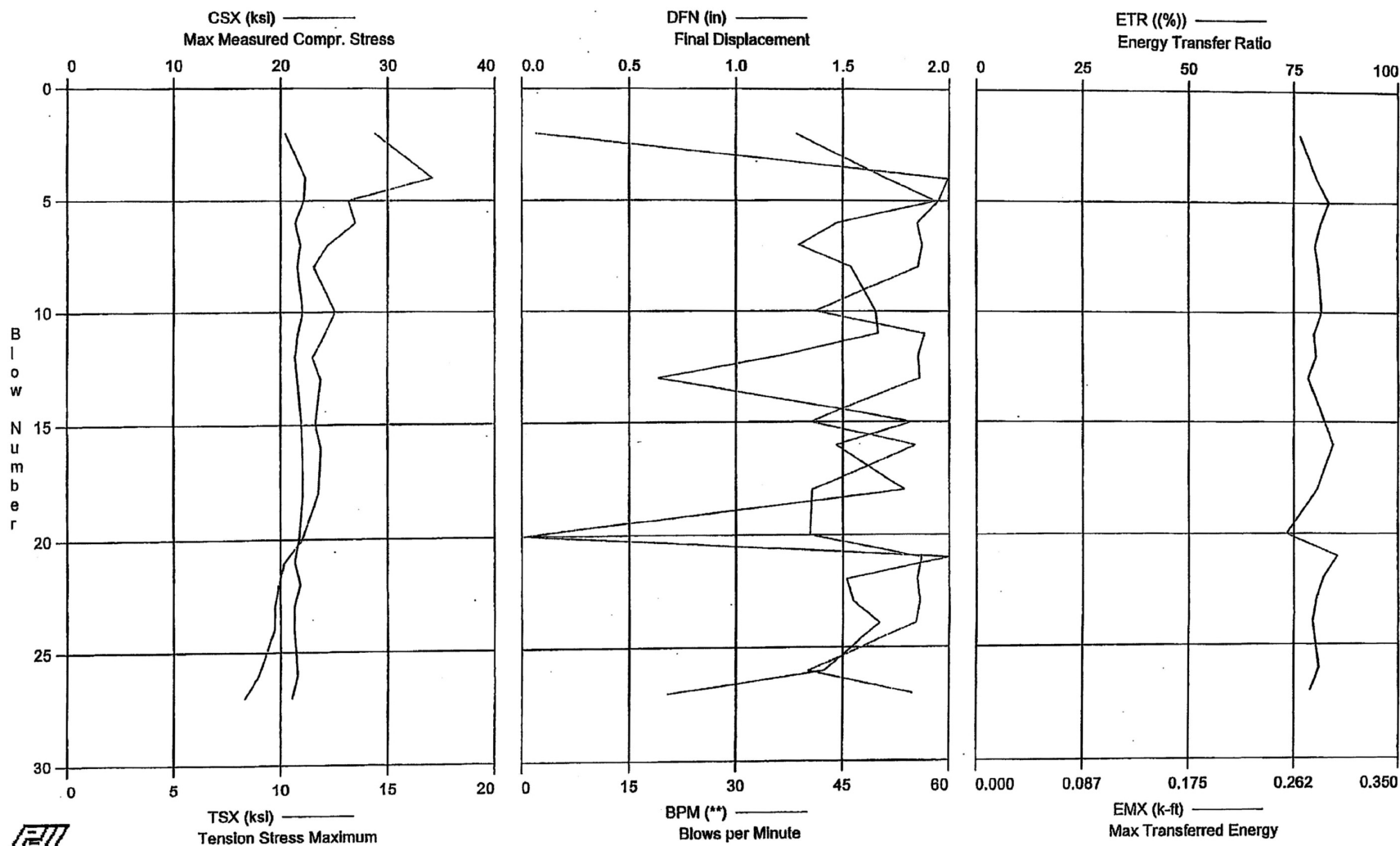
4:29:57 PM - 4:31:31 PM (12/3/2007) BN 3 - 86

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

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 4-Dec-2007

EXCELON VICTORIA COL SITE - BORING B-2152; 63.5' - 65' SAMPLE



EXCELON VICTORIA COL SITE - BORING B-2152; 63.5' - 65' SAMPLE
OP: KBM

HAMMER ID: MEC-12; CME 45 TRACK (J. WARREN)
Test date: 4-Dec-2007

AR: 1.19 in²
LE: 69.00 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	20.43	14.40	1.28	1.9	0.84	24	0.235	77	0.268
4	0.00	22.33	17.10	1.71	59.9	0.85	27	0.258	81	0.282
5	0.00	22.17	13.16	1.94	58.5	0.80	26	0.253	83	0.292
6	0.00	21.35	13.48	1.47	55.5	0.96	25	0.249	81	0.285
7	0.00	21.83	12.19	1.30	56.2	0.81	26	0.248	80	0.280
8	0.00	21.55	11.53	1.54	55.6	0.89	26	0.252	81	0.283
10	0.00	22.03	12.55	1.65	41.1	0.80	26	0.253	82	0.286
11	0.00	21.61	12.07	1.67	56.5	0.99	26	0.247	80	0.279
12	0.00	21.35	11.49	1.20	55.6	1.04	25	0.252	80	0.281
13	0.00	21.53	11.87	0.63	55.8	1.03	26	0.249	78	0.274
15	0.00	21.94	11.62	1.82	40.5	1.03	26	0.249	82	0.288
16	0.00	22.02	11.88	1.47	55.2	0.84	26	0.250	84	0.295
18	0.00	22.10	11.77	1.79	40.7	0.78	26	0.249	81	0.282
20	0.00	21.73	11.01	-1.07	40.4	1.07	26	0.245	73	0.256
21	0.00	21.30	10.19	2.19	56.1	0.77	25	0.244	85	0.299
22	0.00	21.85	9.94	1.52	55.5	0.71	26	0.247	82	0.287
23	0.00	21.28	9.74	1.55	55.9	1.00	25	0.251	80	0.281
24	0.00	21.27	9.72	1.67	55.3	0.98	25	0.244	79	0.278
26	0.00	21.55	8.97	1.41	40.1	0.90	26	0.247	81	0.283
27	0.00	21.05	8.32	0.68	54.8	0.91	25	0.242	79	0.276
Average		21.61	11.65	1.37	49.6	0.90	26	0.248	80	0.282

Total number of blows analyzed: 20

Time Summary

Drive 27 seconds

8:09:35 AM - 8:10:02 AM (12/4/2007) BN 2 - 27

March 14, 2008

Memorandum to File

From: Steve Kiser *SK*

Reviewed By: Kathryn White KAW 3/14/08

**Subject: Report of SPT Energy – Environmental Exploration CME 750 ATV
Hammer Serial No. 263048 Automatic Hammer
WORK INSTRUCTION 19
Exelon COL Project
Victoria County, Texas
MACTEC Project No. 6468-07-1777**

Kyle Miller, 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 4, 2007, during drilling of Boring B-2156 at the referenced site. The testing was performed from approximately 8:40 to 10:00 AM under sunny skies and a temperature of about 40 degrees Fahrenheit. The borings were drilled with personnel and equipment from Environmental Exploration, Inc. The drilling equipment consisted of a CME 750 model ATV-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of AW-J-sized drilling rods 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. Gary Bray. 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. AW #75/1 and AW#75/2). 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 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 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 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.

16 Pages Total

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 average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 236 foot-pounds to

269 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 67% to 77% of the theoretical energy (350 foot-pounds) of the SPT hammer.

- 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) was 253.6 foot-pounds, with an average ETR of 72.5%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN EXE 19 – 1 Page
Page 6 Record of SPT Energy Measurement – 1 Page
Pages 7 - 16 PDILOT Output – 10 Pages

TABLE 1
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)
263048 (CME 750 ATV)	Environmental Exploration	Gary Bray	B-2156	AW-J	12/4/2007	35.0 - 36.5	8 - 11 - 14	34	236	67.4%
						40.0 - 41.5	5 - 5 - 7	19	249	71.1%
						45.0 - 46.5	5 - 7 - 10	24	248	70.9%
						50.0 - 51.5	8 - 12 - 12	32	269	76.9%
						55.0 - 56.5	9 - 12 - 15	39	262	74.9%
Average for Rig:								253.6	72.5%	

^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: KAW	Date: 3/14/08
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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.

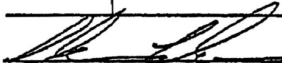
Specific Quality Assurance Procedures Applicable: MACTEC QA Manual, QAPD, HASP and QAP-25-1; current revisions apply.

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:	750
PROJECT NO.:	6468-07-1777	SERIAL NO.:	1456 263048 KBM 12/4/07
DATE:	12/4/2007	HAMMER TYPE:	Auto
WEATHER:	Sunny ~40°F	ROPE CONDITION:	N/A
INSPECTOR:	Kyle Miller	ROD SIZE:	AW-3
DRILLING COMPANY:	EEI (Environmental Exploration Inc.)	NO. OF SHEAVES:	N/A

BORING DATA

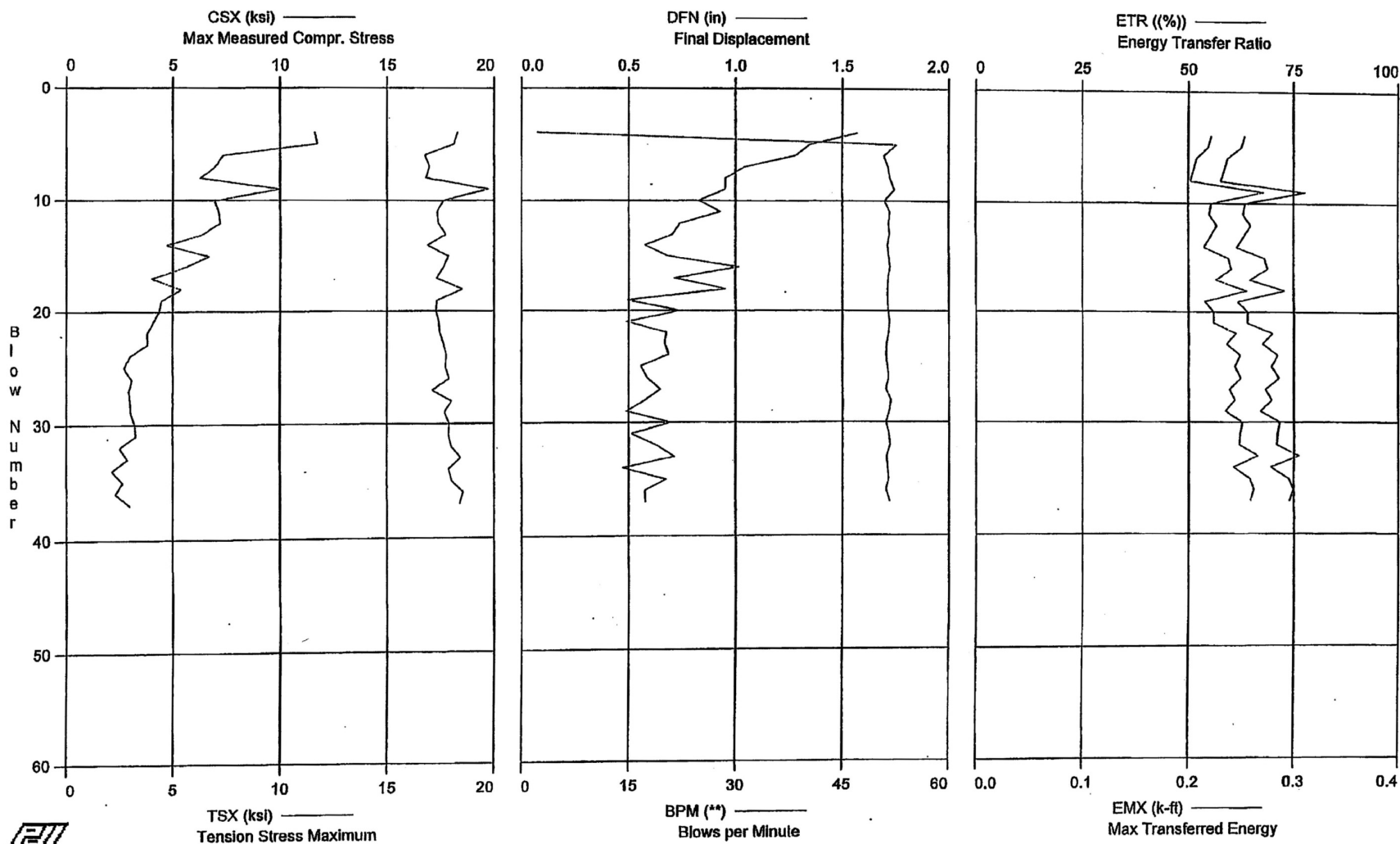
BORING NUMBER:	B-2150											
DEPTH DRILLED:	35' to 50'											
TIME DRIVEN:	8:00AM to 10:00AM											
RIG OPERATOR:	Gary Bray											
HAMMER OPERATOR:	N/A											
PDA PAK SERIAL NO.:	3622L											
INSTR. ROD AREA:	1.19 in ²											
ACCEL. SERIAL NOS.:	5993; 5992											
STRAIN SERIAL NOS.:	75 AW-1; 75 AW-2											
	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)
133M ¹² /4/57	35	5-5-7										
	35	8-11-14										
	40	5-5-7										
	45	5-7-10										
	50	8-12-12										
REMARKS:	Visually verified hammer weight drop height through viewing slot. Driller always "revved" engine up to normal operating speed when hammering (did not use idle speed)											

PDIPLOT Ver. 2008.1 - Printed: 7-Jan-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 4-Dec-2007

EXELON VICTORIA COL SITE - Boring B-2156; 35' - 36.5' Sample



EXELON VICTORIA COL SITE - Boring B-2156; 35' - 36.5' Sample

Hammer ID: 263048; CME 750 ATV (BRAY)

OP: KBM

Test date: 4-Dec-2007

AR: 1.19 in²

SP: 0.492 k/ft³

LE: 40.50 ft

EM: 30,000.0 ksi

WS: 16,807.9 f/s

JC: 0.70

FMX: Maximum Force

DFN: Final Displacement

VMX: Maximum Velocity

EF2: Energy of F²

CSX: Max Measured Compr. Stress

ETR: Energy Transfer Ratio

TSX: Tension Stress Maximum

EMX: Max Transferred Energy

BPM: Blows per Minute

BL#	depth ft	FMX kips	VMX f/s	CSX ksi	TSX ksi	BPM **	DFN in	EF2 k-ft	ETR (%)	EMX k-ft
4	0.00	22	11.8	18.3	11.6	2.2	1.57	0.188	63	0.222
5	0.00	22	11.5	18.1	11.7	52.6	1.35	0.188	63	0.219
6	0.00	20	10.6	16.8	7.3	50.8	1.28	0.170	59	0.208
7	0.00	20	11.0	17.0	7.0	51.4	1.04	0.170	59	0.205
8	0.00	20	11.3	16.8	6.3	51.7	0.95	0.170	58	0.202
9	0.00	23	13.1	19.7	10.0	52.4	0.95	0.235	78	0.272
10	0.00	21	11.2	17.7	6.9	50.9	0.83	0.190	64	0.222
11	0.00	21	12.0	17.3	7.1	51.7	0.93	0.178	63	0.220
12	0.00	21	12.0	17.4	7.2	51.5	0.74	0.192	65	0.227
13	0.00	21	11.9	17.7	6.4	51.6	0.70	0.185	63	0.221
14	0.00	20	11.7	16.9	4.7	51.3	0.57	0.180	61	0.215
15	0.00	21	11.9	17.9	6.7	51.5	0.68	0.200	68	0.238
16	0.00	21	11.2	17.6	5.6	51.7	1.01	0.196	69	0.241
17	0.00	21	12.0	17.3	4.0	51.4	0.71	0.187	65	0.226
18	0.00	22	12.5	18.5	5.4	51.3	0.96	0.207	73	0.255
19	0.00	21	11.6	17.3	4.5	51.3	0.49	0.181	62	0.216
20	0.00	21	11.9	17.3	4.3	51.4	0.74	0.183	64	0.224
21	0.00	21	11.7	17.4	4.1	51.6	0.49	0.189	64	0.224
22	0.00	21	11.9	17.5	3.8	51.5	0.68	0.203	70	0.245
23	0.00	21	11.8	17.6	3.8	51.2	0.67	0.191	68	0.236
24	0.00	21	12.3	17.8	3.0	51.1	0.69	0.199	71	0.249
25	0.00	21	12.0	17.7	2.7	51.3	0.56	0.199	70	0.244
26	0.00	21	12.0	17.9	3.1	51.5	0.59	0.204	72	0.250
27	0.00	20	12.1	17.1	2.9	51.1	0.65	0.194	68	0.239
28	0.00	21	12.1	18.0	3.0	51.8	0.58	0.202	70	0.244
29	0.00	21	11.9	17.7	3.0	51.6	0.49	0.194	67	0.235
30	0.00	21	12.3	17.9	3.2	51.1	0.70	0.204	72	0.251
31	0.00	21	12.2	17.9	3.2	51.5	0.51	0.205	71	0.249
32	0.00	21	11.8	18.0	2.5	51.7	0.63	0.204	71	0.248
33	0.00	22	12.5	18.4	2.9	51.2	0.71	0.212	76	0.266
34	0.00	21	11.9	17.9	2.1	51.3	0.47	0.198	69	0.243
35	0.00	21	12.0	18.0	2.6	51.5	0.67	0.207	74	0.258
36	0.00	22	12.7	18.5	2.3	51.1	0.58	0.212	75	0.262
37	0.00	22	12.4	18.4	3.0	51.6	0.58	0.213	74	0.259
Average		21	11.9	17.8	4.9	50.0	0.76	0.195	68	0.236

Total number of blows analyzed: 34

Time Summary

Drive 38 seconds

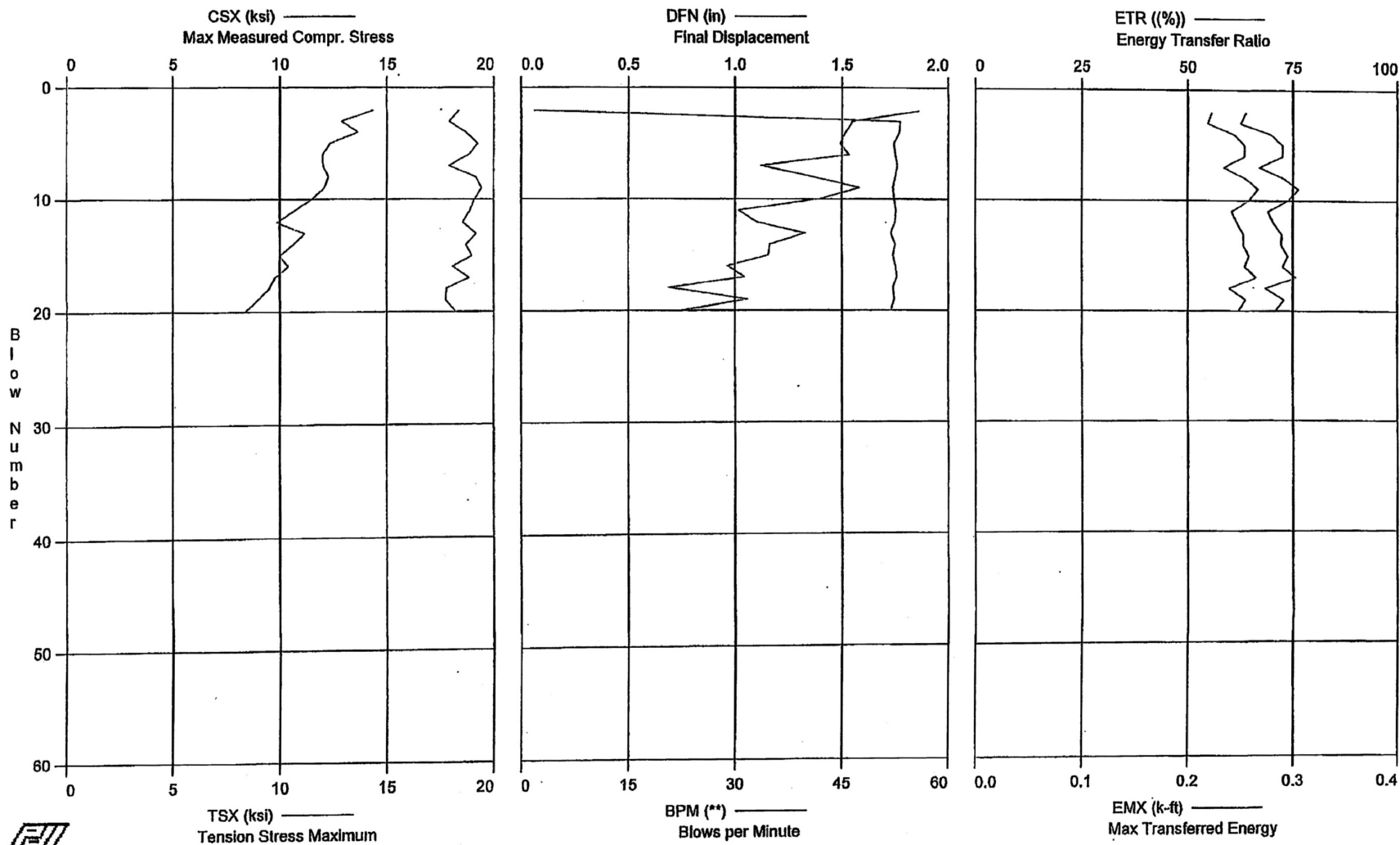
8:41:06 AM - 8:41:44 AM (12/4/2007) BN 4 - 37

PDIPLOT Ver. 2008.1 - Printed: 7-Jan-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 4-Dec-2007

EXCELON VICTORIA COL SITE - Boring B-2158; 40' - 41.5' Sample



EXCELON VICTORIA COL SITE - Boring B-2156; 40' - 41.5' Sample
OP: KBM

Hammer ID: 263048; CME 750 ATV (BRAY)
Test date: 4-Dec-2007

AR: 1.19 in²
LE: 48.50 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft³
EM: 30,000.0 ksi
JC: 0.70

FMX: Maximum Force
VMX: Maximum Velocity
CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
BPM: Blows per Minute

DFN: Final Displacement
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	FMX kips	VMX f/s	CSX ksi	TSX ksi	BPM **	DFN in	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	22	11.9	18.4	14.3	1.9	1.86	0.189	64	0.223
3	0.00	21	11.8	17.9	12.9	53.2	1.55	0.184	63	0.219
4	0.00	22	12.0	18.7	13.6	53.1	1.52	0.202	70	0.244
5	0.00	23	12.1	19.2	12.3	52.3	1.49	0.214	72	0.254
6	0.00	22	12.4	18.8	12.0	52.5	1.53	0.211	72	0.254
7	0.00	21	11.9	17.9	12.0	52.8	1.12	0.197	67	0.234
8	0.00	23	12.5	19.1	12.3	52.5	1.36	0.210	73	0.255
9	0.00	23	13.1	19.4	12.1	52.2	1.58	0.211	76	0.267
10	0.00	23	13.5	19.1	11.5	52.4	1.40	0.211	74	0.258
11	0.00	22	12.3	18.9	10.7	52.6	1.02	0.210	69	0.242
12	0.00	22	13.0	18.6	9.9	52.5	1.10	0.201	70	0.247
13	0.00	23	12.3	19.2	11.2	51.9	1.33	0.205	72	0.253
14	0.00	22	12.5	18.7	10.6	52.5	1.16	0.207	72	0.253
15	0.00	23	12.3	19.0	10.0	52.2	1.16	0.211	74	0.258
16	0.00	22	12.7	18.1	10.4	52.5	0.96	0.206	73	0.254
17	0.00	22	12.7	18.8	9.8	52.7	1.04	0.218	76	0.265
18	0.00	21	12.2	17.8	9.5	52.2	0.69	0.195	68	0.239
19	0.00	21	12.8	17.7	8.9	52.4	1.06	0.203	73	0.255
20	0.00	22	12.5	18.2	8.4	51.9	0.75	0.205	71	0.248
Average		22	12.4	18.6	11.2	49.8	1.25	0.205	71	0.249

Total number of blows analyzed: 19

Time Summary

Drive 21 seconds

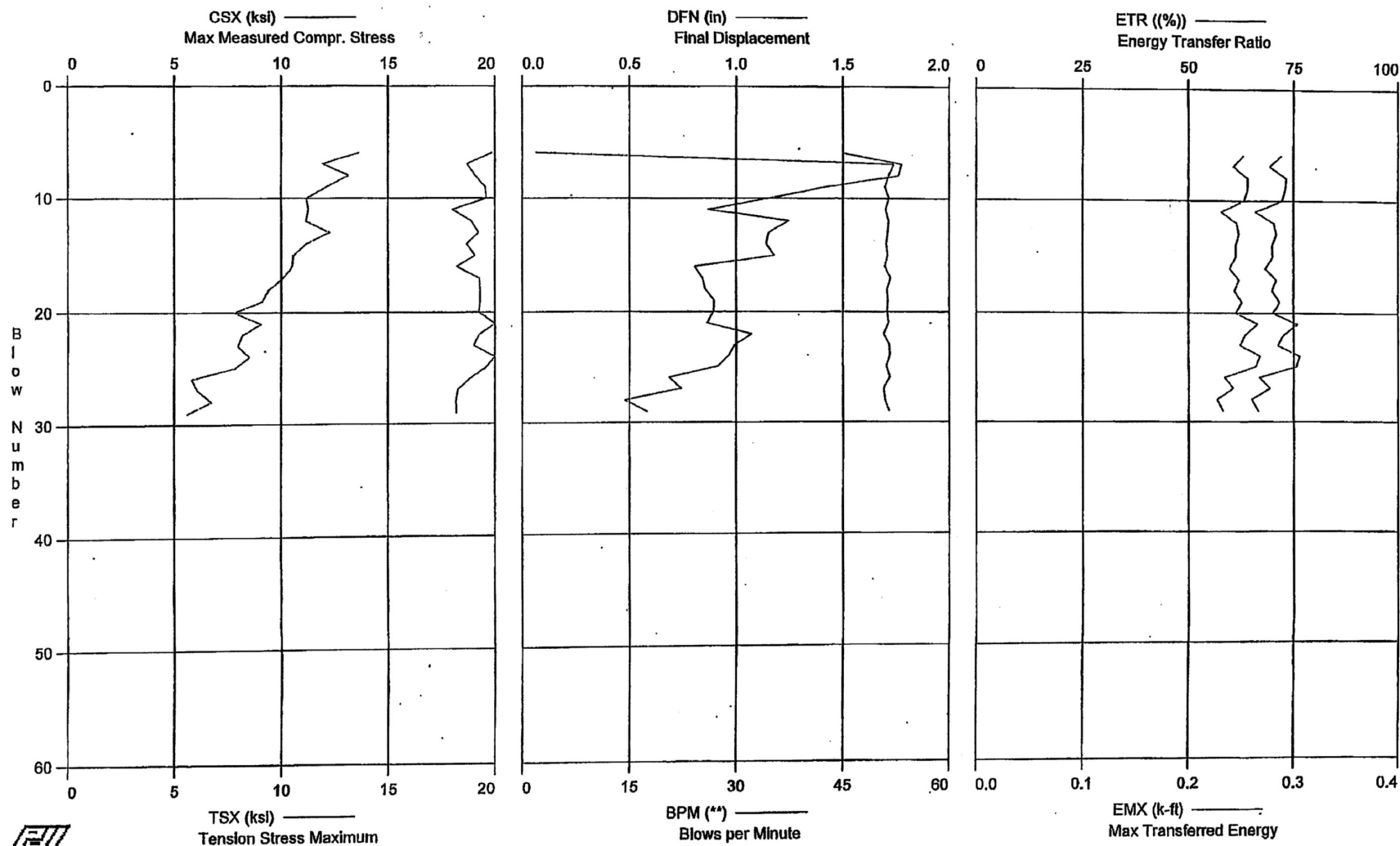
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PDILOT Ver. 2008.1 - Printed: 7-Jan-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 4-Dec-2007

EXCELON VICTORIA COL SITE - Boring B-2156; 45' - 46.5' Sample



EXCELON VICTORIA COL SITE - Boring B-2156; 45' - 46.5' Sample
OP: KBM

Hammer ID: 263048; CME 750 ATV (BRAY)
Test date: 4-Dec-2007

AR: 1.19 in²
LE: 51.50 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft³
EM: 30,000.0 ksi
JC: 0.70

FMX: Maximum Force
VMX: Maximum Velocity
CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
BPM: Blows per Minute

DFN: Final Displacement
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	FMX kips	VMX f/s	CSX ksi	TSX ksi	BPM **	DFN in	EF2 k-ft	ETR (%)	EMX k-ft
6	0.00	24	12.4	19.8	13.6	1.9	1.50	0.205	72	0.252
7	0.00	22	12.3	18.7	11.9	52.2	1.78	0.192	69	0.243
8	0.00	23	13.3	19.1	13.2	51.4	1.76	0.200	73	0.256
9	0.00	23	12.8	19.5	12.1	50.9	1.42	0.198	73	0.256
10	0.00	23	13.2	19.6	11.2	51.5	1.15	0.200	72	0.253
11	0.00	21	12.2	18.0	11.3	51.0	0.87	0.191	66	0.231
12	0.00	22	12.2	18.9	11.2	51.4	1.25	0.195	70	0.246
13	0.00	23	11.9	19.2	12.3	51.3	1.15	0.194	71	0.248
14	0.00	22	12.2	18.7	11.1	51.1	1.14	0.193	70	0.245
15	0.00	23	11.9	19.1	10.6	51.3	1.18	0.189	70	0.245
16	0.00	22	12.1	18.2	10.5	50.9	0.80	0.190	68	0.239
17	0.00	23	12.0	19.3	10.1	51.7	0.84	0.195	71	0.248
18	0.00	23	12.1	19.3	9.4	51.2	0.86	0.190	70	0.244
19	0.00	23	12.2	19.3	9.1	51.3	0.90	0.196	72	0.251
20	0.00	23	11.8	19.2	7.8	51.2	0.89	0.195	70	0.245
21	0.00	24	12.5	20.2	9.1	51.4	0.86	0.211	76	0.266
22	0.00	23	12.0	19.3	8.2	50.7	1.07	0.195	73	0.254
23	0.00	23	12.0	19.0	8.0	51.5	0.99	0.194	71	0.249
24	0.00	24	12.9	20.1	8.5	51.6	0.97	0.210	76	0.268
25	0.00	23	12.6	19.6	7.9	51.1	0.91	0.208	76	0.264
26	0.00	22	11.6	18.8	5.8	51.6	0.69	0.187	67	0.234
27	0.00	22	12.3	18.3	6.1	50.7	0.75	0.194	69	0.243
28	0.00	22	11.8	18.2	6.7	50.9	0.48	0.182	65	0.227
29	0.00	22	11.8	18.2	5.6	51.5	0.58	0.186	67	0.233
Average		23	12.2	19.1	9.6	49.2	1.03	0.195	71	0.248

Total number of blows analyzed: 24

Time Summary

Drive 27 seconds

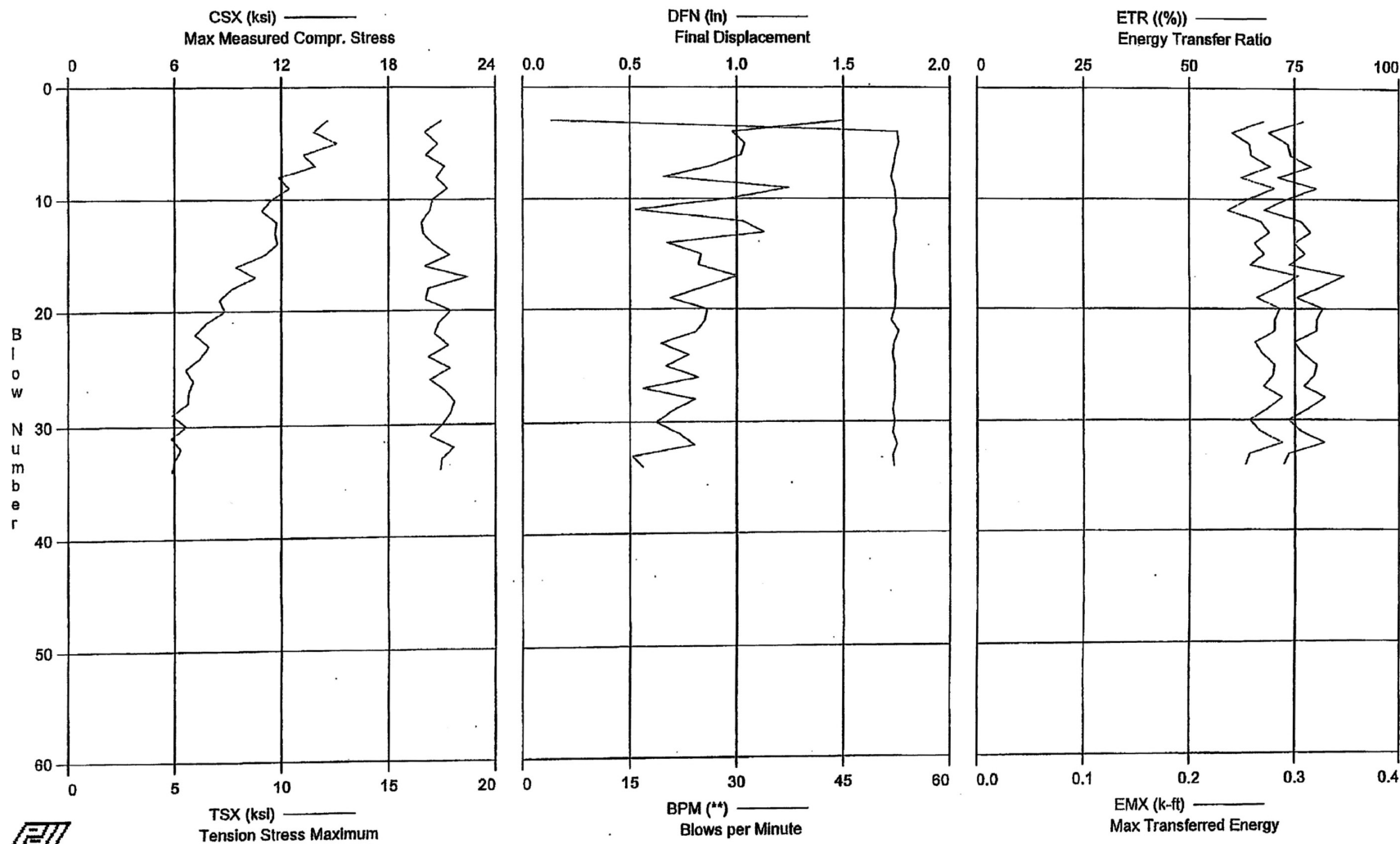
9:16:11 AM - 9:16:38 AM (12/4/2007) BN 6 - 29

PDILOT Ver. 2008.1 - Printed: 7-Jan-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 4-Dec-2007

EXCELON VICTORIA COL SITE - Boring B-2156; 50' - 51.5' Sample



EXCELON VICTORIA COL SITE - Boring B-2156; 50' - 51.5' Sample
OP: KBM

Hammer ID: 263048; CME 750 ATV (BRAY)
Test date: 4-Dec-2007

AR: 1.19 in²
LE: 56.50 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft³
EM: 30,000.0 ksi
JC: 0.70

FMX: Maximum Force
VMX: Maximum Velocity
CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
BPM: Blows per Minute

DFN: Final Displacement
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	FMX kips	VMX f/s	CSX ksi	TSX ksi	BPM **	DFN in	EF2 k-ft	ETR (%)	EMX k-ft
3	0.00	25	12.5	21.0	12.1	4.0	1.50	0.213	77	0.270
4	0.00	24	12.4	20.0	11.5	52.6	0.98	0.195	69	0.241
5	0.00	25	12.9	20.8	12.6	52.7	1.04	0.207	73	0.257
6	0.00	24	12.2	20.1	11.0	52.3	1.02	0.206	74	0.259
7	0.00	25	12.6	21.1	11.6	52.1	0.88	0.223	79	0.277
8	0.00	25	12.2	20.7	9.9	51.7	0.66	0.202	71	0.249
9	0.00	25	13.0	21.3	10.3	52.2	1.25	0.211	80	0.281
10	0.00	24	12.6	20.5	9.5	52.4	0.96	0.198	73	0.256
11	0.00	24	11.7	20.3	9.1	52.5	0.53	0.194	68	0.237
12	0.00	24	13.4	19.8	9.8	52.1	1.03	0.205	77	0.268
13	0.00	24	13.4	19.9	9.7	52.4	1.13	0.209	79	0.276
14	0.00	24	13.0	20.5	9.8	52.4	0.67	0.211	75	0.262
15	0.00	25	12.4	21.4	9.2	52.1	0.83	0.209	78	0.271
16	0.00	24	12.6	20.0	7.9	52.1	0.82	0.200	74	0.258
17	0.00	27	13.2	22.4	8.8	52.1	1.01	0.230	87	0.304
18	0.00	24	12.8	20.3	7.7	52.3	0.85	0.217	81	0.285
19	0.00	24	12.4	20.1	7.1	52.3	0.69	0.204	75	0.264
20	0.00	26	12.8	21.5	7.4	52.2	0.86	0.216	82	0.286
21	0.00	25	12.7	20.9	6.5	51.7	0.85	0.211	80	0.281
22	0.00	24	12.4	20.6	6.0	52.7	0.81	0.211	80	0.281
23	0.00	25	12.5	21.4	6.6	52.1	0.84	0.204	75	0.262
24	0.00	24	12.8	20.2	6.2	51.9	0.78	0.203	77	0.269
25	0.00	26	12.8	21.5	5.5	52.2	0.67	0.211	80	0.281
26	0.00	24	12.5	20.3	5.9	52.2	0.82	0.212	80	0.279
27	0.00	25	12.8	21.2	5.7	52.2	0.56	0.208	77	0.270
28	0.00	26	12.6	21.7	5.6	52.2	0.81	0.216	82	0.288
29	0.00	26	12.7	21.5	4.9	51.9	0.70	0.210	78	0.274
30	0.00	25	12.2	21.0	5.6	52.2	0.62	0.198	74	0.257
31	0.00	24	12.1	20.3	4.9	51.9	0.73	0.202	76	0.267
32	0.00	26	12.8	21.7	5.3	52.5	0.80	0.215	82	0.288
33	0.00	25	12.1	21.0	5.0	51.9	0.51	0.198	74	0.257
34	0.00	25	12.0	20.9	4.9	52.1	0.56	0.196	72	0.253
Average		25	12.6	20.8	7.9	50.7	0.83	0.208	77	0.269

Total number of blows analyzed: 32

Time Summary

Drive 36 seconds

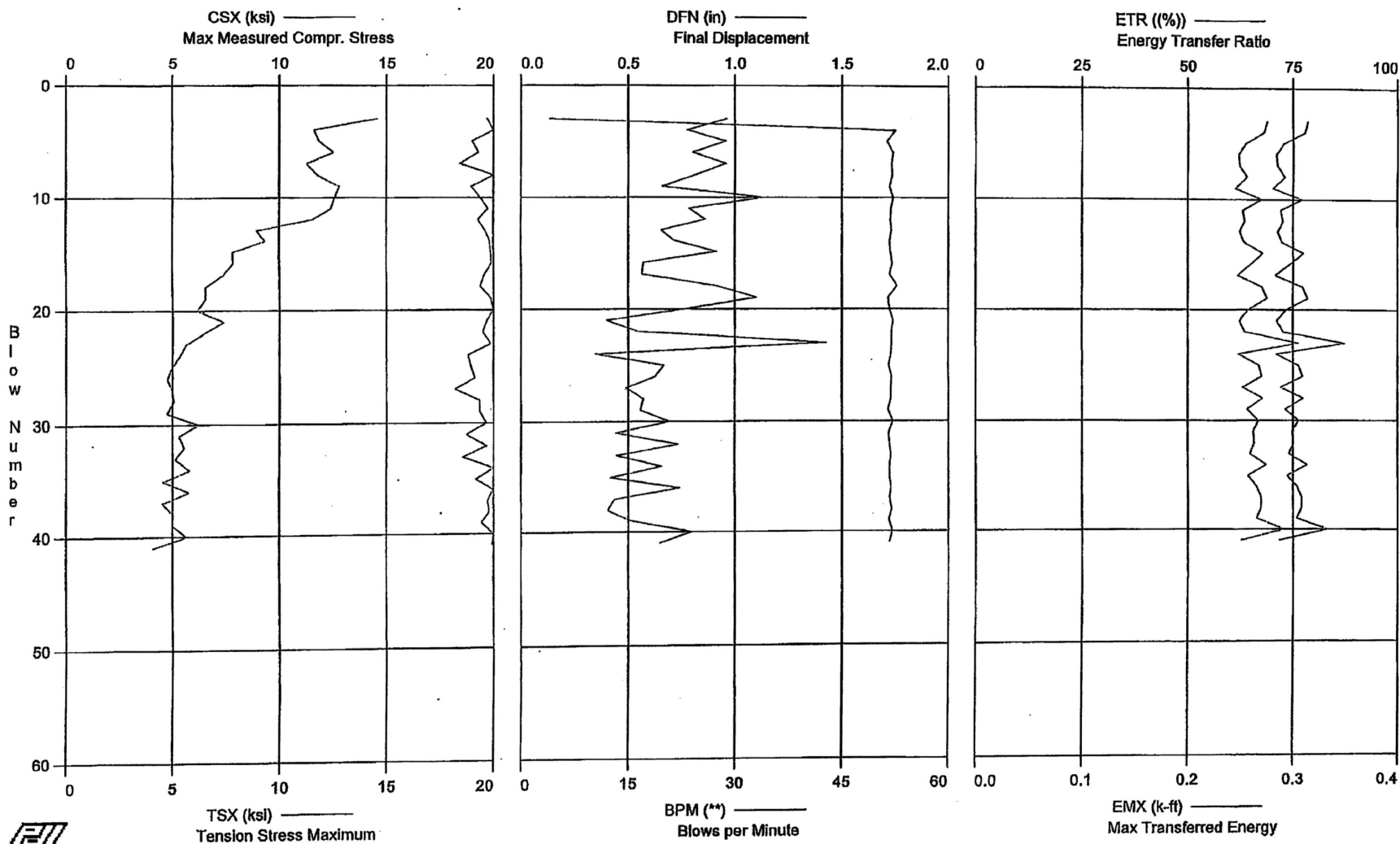
9:34:29 AM - 9:35:05 AM (12/4/2007) BN 3 - 34

PDILOT Ver. 2008.1 - Printed: 7-Jan-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 4-Dec-2007

EXCELON VICTORIA COL SITE - Boring B-2156; 55' - 66.5' Sample



EXCELON VICTORIA COL SITE - Boring B-2156; 55' - 56.5' Sample
OP: KBM

Hammer ID: 263048; CME 750 ATV (BRAY)
Test date: 4-Dec-2007

AR: 1.19 in²
LE: 61.50 ft
WS: 16,807.9 f/s

SP: 0.492 k/f³
EM: 30,000.0 ksi
JC: 0.70

FMX: Maximum Force
VMX: Maximum Velocity
CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
BPM: Blows per Minute

DFN: Final Displacement
EF2: Energy of F²
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	FMX kips	VMX f/s	CSX ksi	TSX ksi	BPM **	DFN in	EF2 k-ft	ETR (%)	EMX k-ft
3	0.00	23	13.2	19.7	14.5	4.0	0.96	0.217	78	0.275
4	0.00	24	13.0	20.1	11.6	52.5	0.78	0.216	78	0.272
5	0.00	23	13.2	19.0	11.8	51.3	0.96	0.202	73	0.255
6	0.00	23	12.2	19.3	12.5	52.2	0.80	0.200	71	0.248
7	0.00	22	12.4	18.4	11.3	52.0	0.96	0.198	71	0.249
8	0.00	24	13.2	20.2	11.8	52.1	0.82	0.209	73	0.256
9	0.00	23	12.8	18.9	12.8	51.7	0.66	0.205	70	0.245
10	0.00	23	13.2	19.4	12.6	52.2	1.14	0.212	77	0.270
11	0.00	23	12.8	19.7	12.4	51.9	0.79	0.207	72	0.252
12	0.00	23	12.4	19.3	11.5	51.8	0.86	0.205	73	0.254
13	0.00	23	12.5	19.6	8.9	52.0	0.65	0.204	71	0.249
14	0.00	24	13.1	19.8	9.3	51.7	0.72	0.206	72	0.253
15	0.00	24	13.0	19.9	7.8	51.8	0.92	0.210	77	0.271
16	0.00	24	12.9	19.9	7.8	52.1	0.57	0.207	74	0.260
17	0.00	23	12.4	19.6	7.4	51.7	0.56	0.199	71	0.247
18	0.00	23	12.7	19.4	6.5	52.7	0.91	0.210	77	0.270
19	0.00	24	13.4	19.9	6.5	51.5	1.10	0.208	78	0.276
20	0.00	24	12.6	20.1	6.2	51.7	0.76	0.208	73	0.257
21	0.00	23	12.6	19.7	7.4	52.2	0.40	0.204	71	0.249
22	0.00	23	12.4	19.5	6.5	52.0	0.54	0.205	73	0.254
23	0.00	24	13.5	19.9	5.6	52.0	1.43	0.220	87	0.305
24	0.00	22	12.4	18.8	5.3	51.9	0.35	0.206	71	0.248
25	0.00	23	12.9	19.0	5.0	51.6	0.67	0.208	76	0.267
26	0.00	23	12.6	19.1	4.7	52.0	0.63	0.207	77	0.270
27	0.00	22	12.6	18.2	5.0	51.9	0.49	0.195	72	0.252
28	0.00	23	13.0	19.3	5.1	51.9	0.57	0.212	77	0.271
29	0.00	23	12.5	19.3	4.7	51.5	0.56	0.200	73	0.256
30	0.00	23	13.5	19.7	6.2	52.2	0.70	0.207	76	0.267
31	0.00	22	12.5	18.7	5.3	51.6	0.44	0.203	75	0.262
32	0.00	23	12.0	19.7	5.5	51.7	0.73	0.199	75	0.263
33	0.00	22	12.8	18.6	5.1	51.9	0.45	0.201	74	0.259
34	0.00	24	12.7	20.3	5.8	51.7	0.66	0.209	78	0.274
35	0.00	23	11.9	19.2	4.5	51.7	0.42	0.197	74	0.257
36	0.00	24	12.6	20.1	5.8	51.9	0.74	0.202	76	0.265
37	0.00	23	12.8	19.7	4.5	51.7	0.44	0.207	77	0.269
38	0.00	24	13.2	19.8	5.0	52.0	0.40	0.209	77	0.269
39	0.00	23	13.3	19.4	5.0	51.6	0.51	0.204	76	0.265
40	0.00	24	13.3	20.3	5.7	52.1	0.80	0.220	83	0.291
41	0.00	24	11.8	19.9	4.1	51.7	0.65	0.196	72	0.251
Average		23	12.8	19.5	7.6	50.7	0.70	0.206	75	0.262

Total number of blows analyzed: 39

Time Summary

Drive 44 seconds

9:57:15 AM - 9:57:59 AM (12/4/2007) BN 3 - 41

March 14, 2008

Memorandum to File

From: Steve Kiser *SK*

Reviewed By: Kathryn White **KAW 3/14/08**

Subject: **Report of SPT Energy – MACTEC Raleigh CME 45 Track
Hammer Serial No. MEC-13 Automatic Hammer
WORK INSTRUCTION 19
Exelon COL Project
Victoria County, Texas
MACTEC Project No. 6468-07-1777**

Kyle Miller, 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 3, 2007, during drilling of Boring B-2165 at the referenced site. The testing was performed from approximately 2:35 to 3:30 PM under partly cloudy skies and a temperature of about 60 degrees Fahrenheit. The borings were drilled with personnel and equipment from the Raleigh office of MACTEC. The drilling equipment consisted of a CME 45 model track-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of AW-J-sized drilling rods 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. Donnie Rhodes. 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. K990 and K983) and strain gages (Serial Nos. AW #75/1 and AW#75/2). 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 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 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 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.

12 Pages Total

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 average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 296 foot-pounds to

302 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 85% to 86% of the theoretical energy (350 foot-pounds) of the SPT hammer.

- 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) was 298.2 foot-pounds, with an average ETR of 85.2%.

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

TABLE 1
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)
MBC-13 (CME 45 Track)	MACTEC Raleigh	Donnie Rhodes	B-2165	AW-J	12/3/2007	23.5 - 25.0	4 - 5 - 8	17	302	86.3%
						28.6 - 30.1	5 - 5 - 7	17	296	84.6%
						33.5 - 35.0	6 - 8 - 10	21	297	84.9%
							Average for Rig:		298.2	85.2%

^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: KAW	Date: 3/14/08
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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: Stephen E. Kiser, Kyle B. Miller	Rev. No. 0
Issued By: Kathryn A. White	Date: 8-19-07
Valid From: 8-19-07	To: 8-19-08

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.

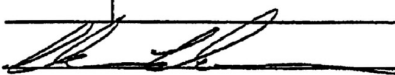
Specific Quality Assurance Procedures Applicable: MACTEC QA Manual, QAPD, HASP and QAP-

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: 8-20-07
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:	45
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-13
DATE:	12/3/2007	HAMMER TYPE:	Auto
WEATHER:	P. Cloudy ~60°F	ROPE CONDITION:	N/A
INSPECTOR:	Kyle Miller	ROD SIZE:	AW-5
DRILLING COMPANY:	MACTEC	NO. OF SHEAVES:	N/A

BORING DATA

BORING NUMBER:	D-2165		
DEPTH DRILLED:	23.5' to 35'		
TIME DRIVEN:	2:00pm to 3:30pm		
RIG OPERATOR:	Donny Rhodes		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.19 in ²		
ACCEL. SERIAL NOS.:	K990; K983		
STRAIN SERIAL NOS.:	75AW-1; 75AW-2		

[illegible]

REMARKS:

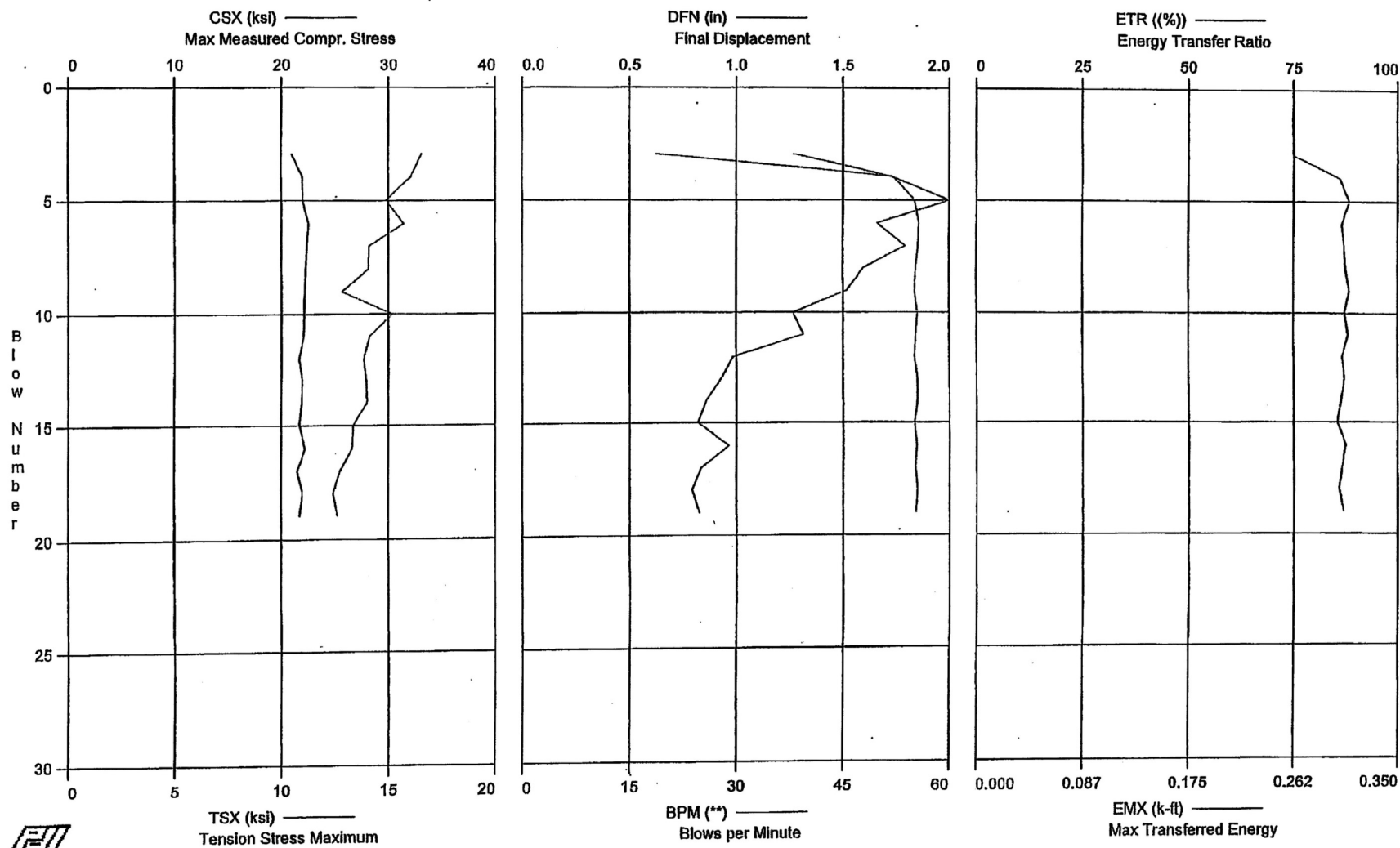
NOTE

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

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 3-Dec-2007

EXCELON VICTORIA COL SITE - BORING B-2165; 23.5' - 25' SAMPLE



EXCELON VICTORIA COL SITE - BORING B-2165; 23.5' - 25' SAMPLE
OP: KBM

HAMMER ID: MEC-13; CME 45 TRUCK (RHODES)
Test date: 3-Dec-2007

AR: 1.19 in²
LE: 32.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/f³
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

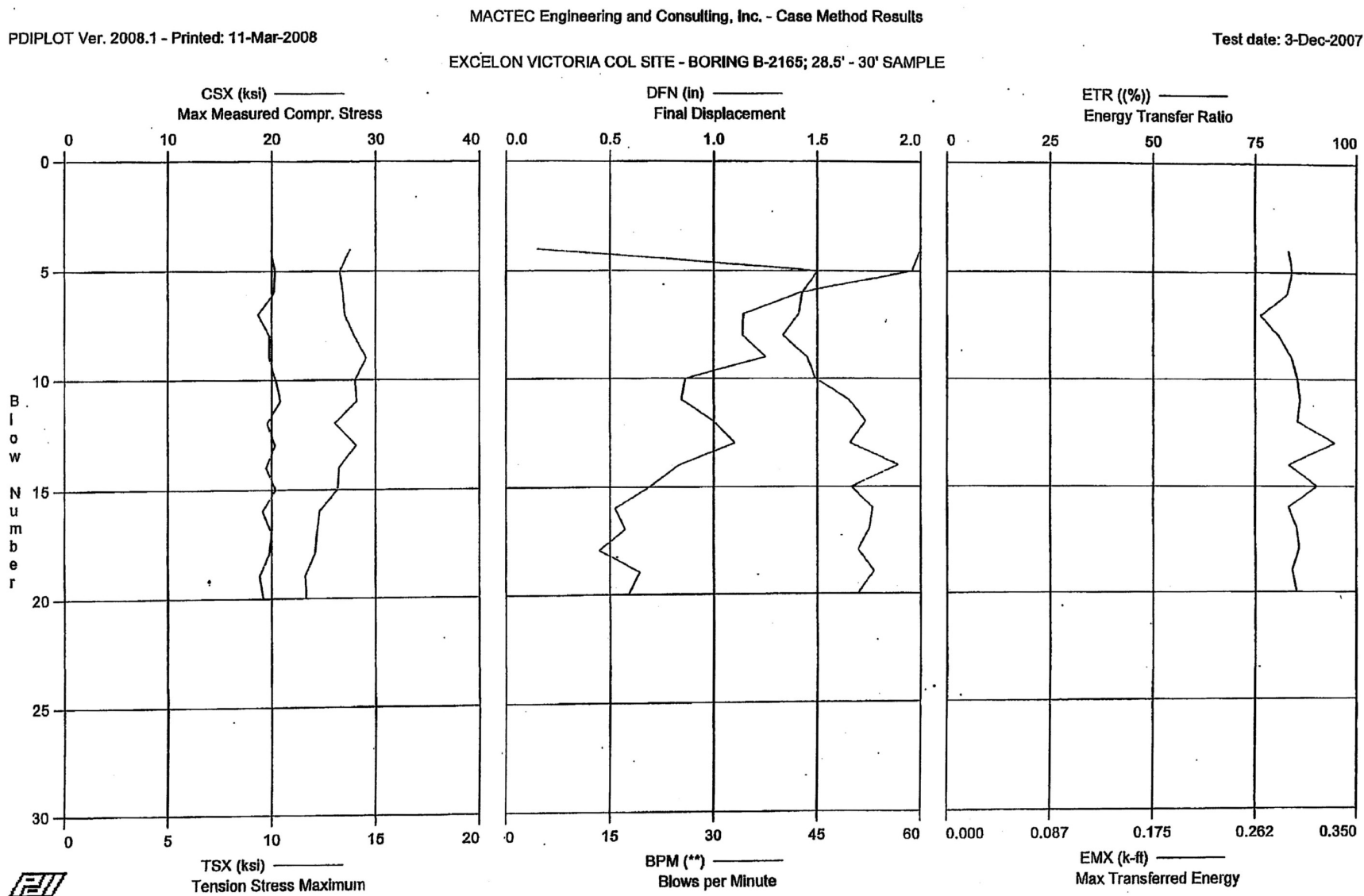
BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM **	FVP □	FMX kips	EF2 k-ft	ETR (%)	EMX k-ft
3	0.00	20.95	16.55	1.27	18.7	0.75	25	0.252	75	0.263
4	0.00	21.96	16.06	1.73	52.0	0.70	26	0.283	86	0.301
5	0.00	21.98	14.88	2.02	55.1	0.73	26	0.286	88	0.309
6	0.00	22.55	15.71	1.66	55.7	0.74	27	0.289	86	0.303
7	0.00	22.38	14.07	1.79	55.6	0.72	27	0.286	87	0.305
8	0.00	22.27	14.05	1.60	55.3	0.73	27	0.285	88	0.306
9	0.00	22.18	12.82	1.52	55.1	0.71	26	0.288	88	0.309
10	0.00	22.14	15.20	1.27	55.5	0.71	26	0.288	87	0.305
11	0.00	22.09	14.12	1.32	55.3	0.71	26	0.285	88	0.308
12	0.00	21.64	13.85	0.98	55.1	0.72	26	0.290	87	0.303
13	0.00	21.96	13.97	0.93	55.5	0.72	26	0.290	87	0.305
14	0.00	21.91	14.00	0.86	55.5	0.72	26	0.286	86	0.302
15	0.00	21.68	13.37	0.82	55.1	0.72	26	0.287	85	0.299
16	0.00	22.21	13.31	0.97	55.4	0.72	26	0.287	88	0.306
17	0.00	21.48	12.75	0.84	55.2	0.72	26	0.284	87	0.303
18	0.00	21.98	12.42	0.79	55.5	0.72	26	0.285	86	0.300
19	0.00	21.69	12.63	0.83	55.3	0.74	26	0.286	87	0.304
Average		21.94	14.10	1.25	53.0	0.72	26	0.285	86	0.302

Total number of blows analyzed: 17

Time Summary

Drive 17 seconds

2:38:50 PM - 2:39:07 PM (12/3/2007) BN 3 - 19



EXCELON VICTORIA COL SITE - BORING B-2165; 28.5' - 30' SAMPLE

HAMMER ID: MEC-13; CME 45 TRUCK (RHODES)

OP: KBM

Test date: 3-Dec-2007

AR: 1.19 in²

SP: 0.492 k/f³

LE: 36.00 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
4	0.00	19.88	13.78	2.07	4.5	0.60	24	0.250	83	0.291
5	0.00	20.35	13.27	1.96	45.1	0.63	24	0.256	84	0.294
6	0.00	20.19	13.41	1.42	42.8	0.58	24	0.256	83	0.290
7	0.00	18.68	13.50	1.14	42.3	0.57	22	0.236	76	0.267
8	0.00	19.79	13.97	1.14	40.0	0.57	24	0.252	81	0.283
9	0.00	19.75	14.55	1.25	43.5	0.57	24	0.259	84	0.294
10	0.00	20.38	14.01	0.86	44.7	0.58	24	0.269	85	0.299
11	0.00	20.84	14.08	0.84	49.5	0.59	25	0.273	86	0.301
12	0.00	19.57	13.03	1.00	52.0	0.57	23	0.259	85	0.299
13	0.00	20.34	14.07	1.10	49.7	0.56	24	0.280	95	0.331
14	0.00	19.45	13.24	0.83	56.7	0.57	23	0.257	83	0.291
15	0.00	20.39	13.16	0.69	49.9	0.58	24	0.282	90	0.316
16	0.00	19.13	12.32	0.52	53.0	0.56	23	0.262	83	0.291
17	0.00	19.93	12.17	0.57	52.5	0.56	24	0.265	85	0.298
18	0.00	19.78	12.08	0.45	50.9	0.54	24	0.266	86	0.300
19	0.00	18.84	11.62	0.64	53.2	0.55	22	0.257	84	0.294
20	0.00	19.19	11.68	0.59	50.9	0.55	23	0.261	85	0.298
Average		19.79	13.17	1.00	46.0	0.57	24	0.261	85	0.296

Total number of blows analyzed: 17

Time Summary

Drive 20 seconds

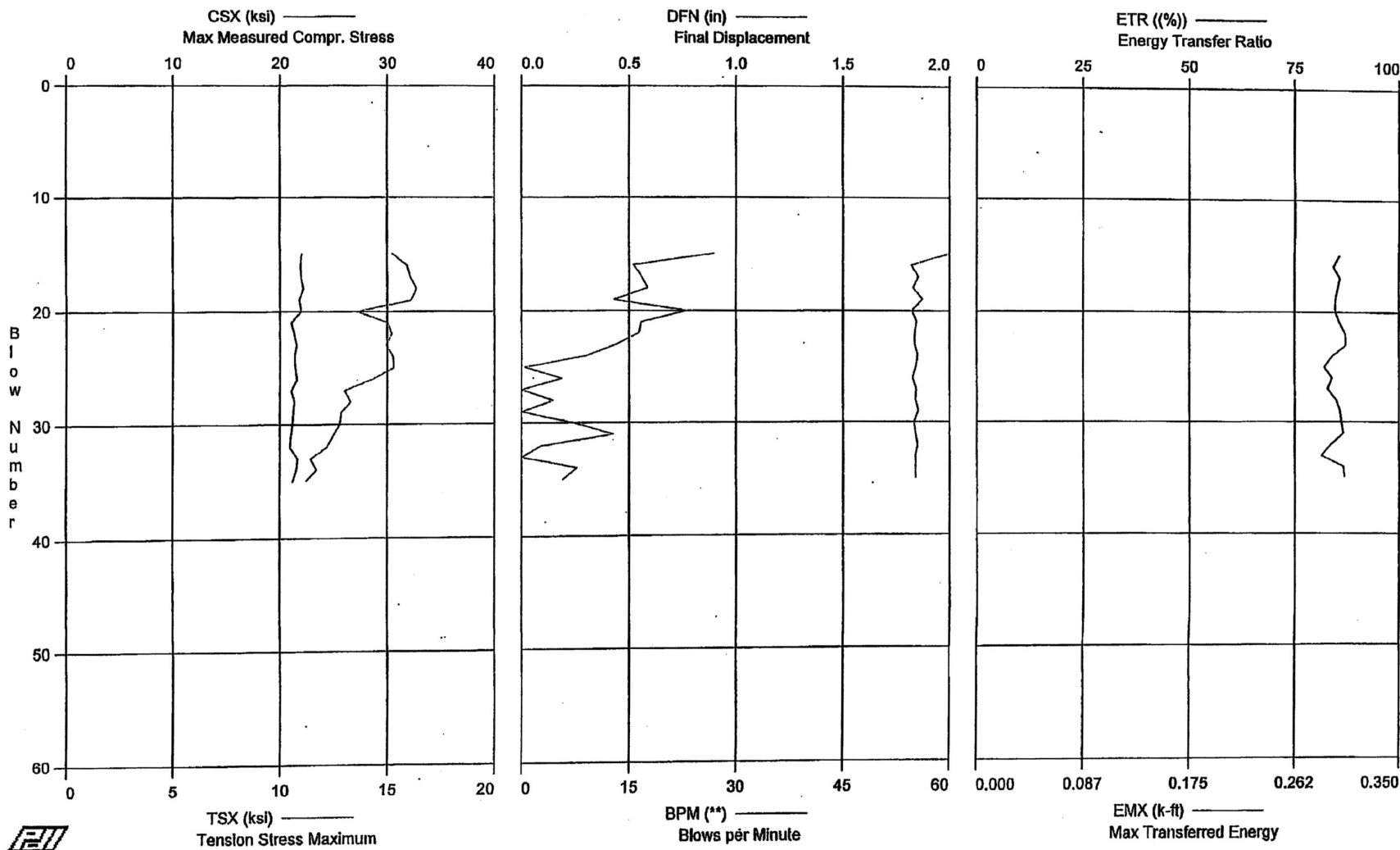
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PDILOT Ver. 2008.1 - Printed: 11-Mar-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 3-Dec-2007

EXCELON VICTORIA COL SITE - BORING B-2165; 33.5' - 35' SAMPLE



EXCELON VICTORIA COL SITE - BORING B-2165; 33.5' - 35' SAMPLE
OP: KBM

HAMMER ID: MEC-13; CME 45 TRUCK (RHODES)
Test date: 3-Dec-2007

AR: 1.19 in²
LE: 42.00 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
15	0.00	22.04	15.24	0.90	89.0	0.71	26	0.280	86	0.300
16	0.00	21.88	15.92	0.52	54.6	0.69	26	0.282	84	0.295
17	0.00	21.95	16.08	0.56	55.6	0.70	26	0.280	86	0.300
18	0.00	22.20	16.36	0.59	54.9	0.70	26	0.283	85	0.298
19	0.00	21.76	16.13	0.43	56.2	0.69	26	0.274	85	0.296
20	0.00	21.95	13.59	0.77	54.7	0.70	26	0.280	85	0.296
21	0.00	21.03	15.02	0.56	55.4	0.70	25	0.283	86	0.300
22	0.00	21.31	15.21	0.55	55.1	0.72	25	0.281	87	0.305
23	0.00	21.54	14.95	0.44	55.1	0.67	26	0.287	87	0.305
24	0.00	21.34	15.27	0.30	55.5	0.66	25	0.276	84	0.294
25	0.00	21.45	15.29	0.01	55.3	0.67	26	0.277	82	0.287
26	0.00	21.57	14.28	0.19	54.8	0.67	26	0.279	84	0.294
27	0.00	21.04	13.00	-0.12	55.3	0.66	25	0.279	83	0.290
28	0.00	21.34	13.29	0.15	55.2	0.66	25	0.276	85	0.297
29	0.00	21.23	12.84	-0.03	55.6	0.66	25	0.272	86	0.300
30	0.00	21.17	12.79	0.24	55.0	0.66	25	0.282	86	0.301
31	0.00	21.00	12.48	0.43	55.2	0.68	25	0.274	87	0.303
32	0.00	20.92	12.17	0.09	55.5	0.67	25	0.275	84	0.292
33	0.00	21.64	11.41	-0.22	55.2	0.68	26	0.278	81	0.285
34	0.00	21.52	11.69	0.26	55.2	0.69	26	0.279	87	0.303
35	0.00	21.16	11.20	0.19	55.2	0.66	25	0.281	87	0.304
Average		21.48	14.01	0.32	56.8	0.68	26	0.279	85	0.297

Total number of blows analyzed: 21

Time Summary

Drive 22 seconds

3:25:45 PM - 3:26:07 PM (12/3/2007) BN 15 - 35