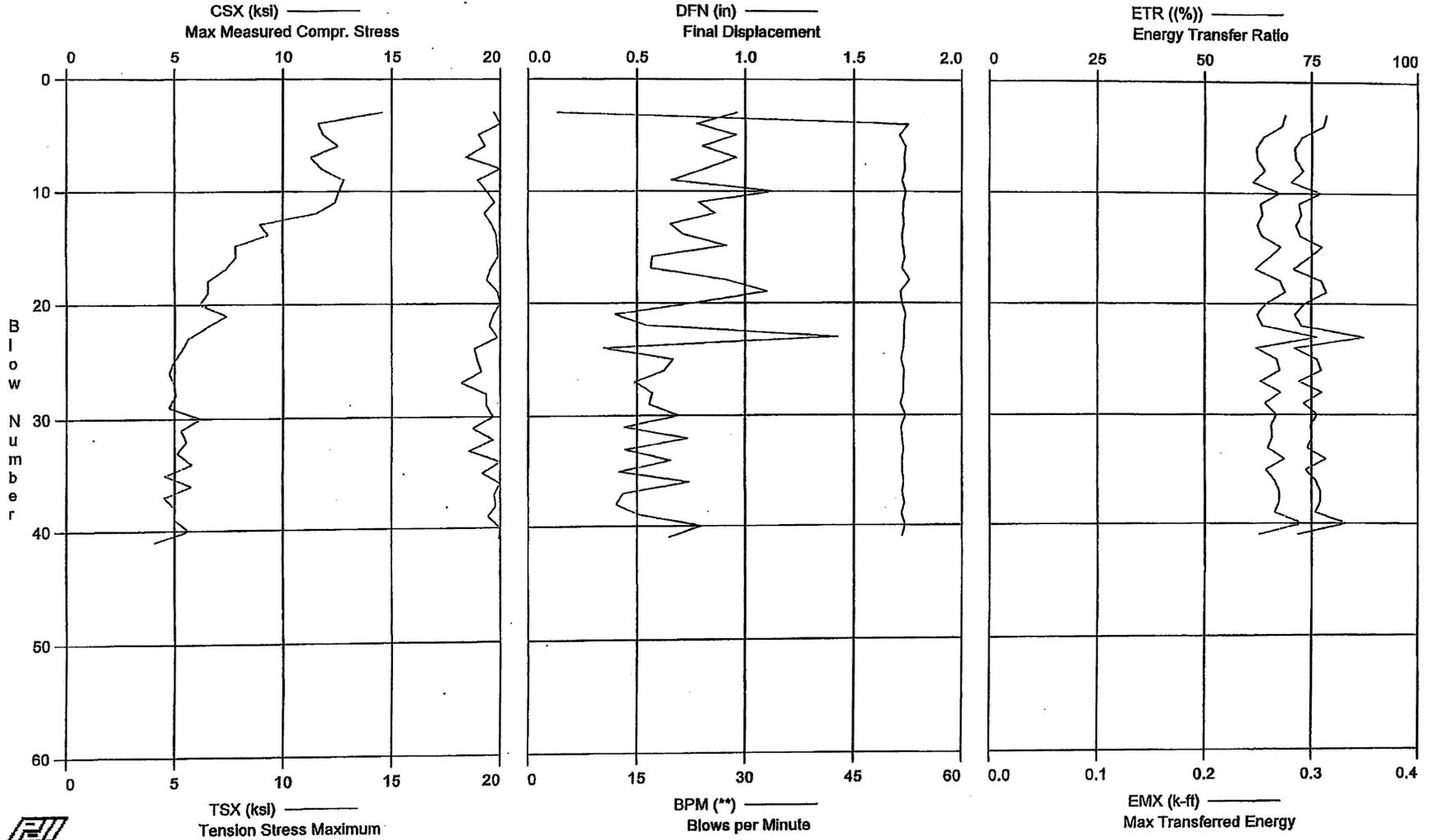


PDILOT Ver. 2008.1 - Printed: 7-Jan-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 4-Dec-2007

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



EXCELON VICTORIA COL SITE - Boring B-2156; 55' - 56.5' 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: 61.50 ft

EM: 30,000.0 ksi

WS: 16,807.9 f/s

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	0.275
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)
MEC-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.

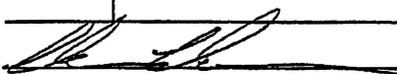
Report Format: Standard MACTEC forms provided by Project Manager and Project Principal Engineer.

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.

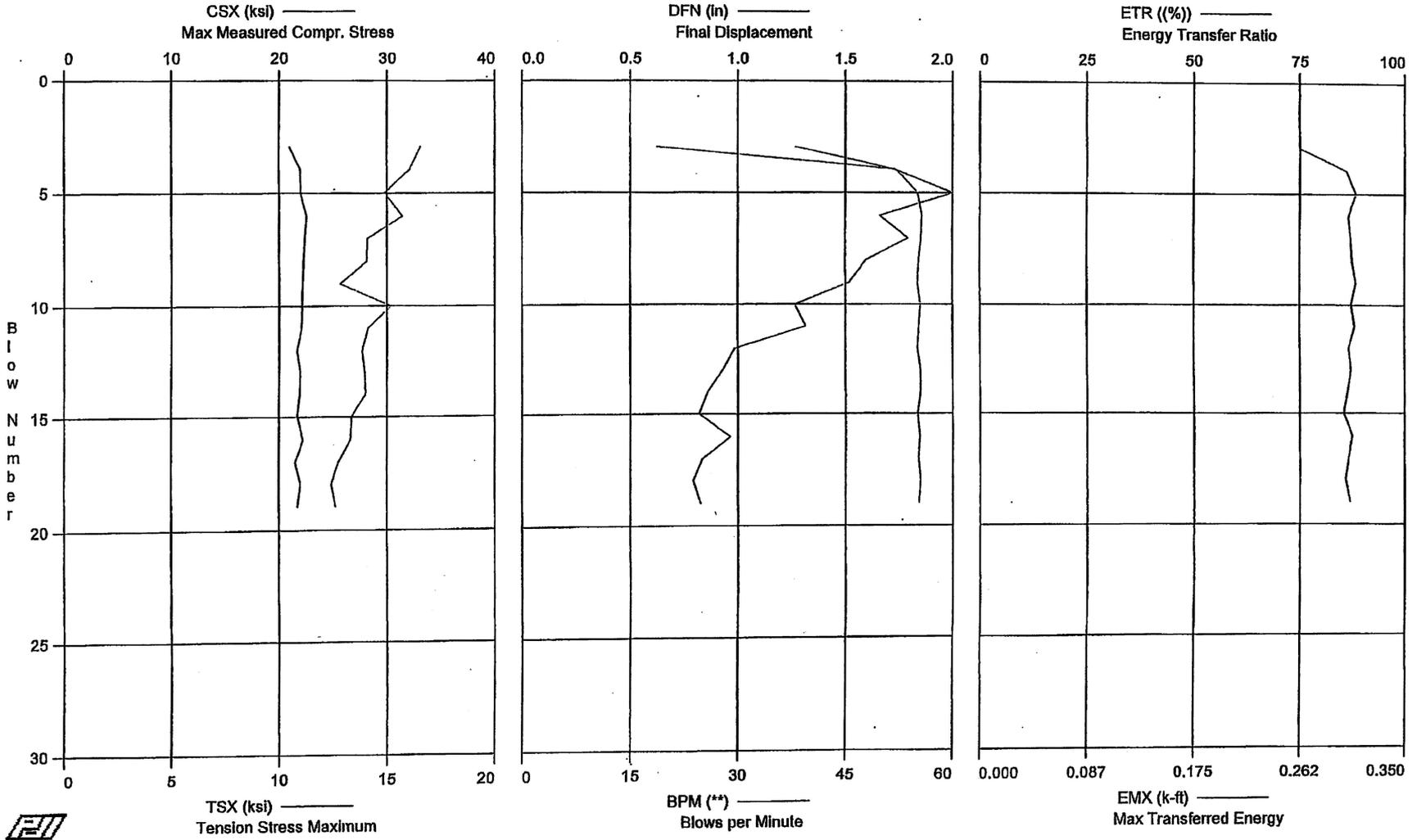
Reviewed and Approved by: (Note: Only one signature is required for issuance)	
Project Manager: _____	Date: _____
Project Principal Engineer: _____	Date: _____
Site Manager/Coordinator: 	Date: 8-20-07
Pages: 8	DCN: EXE

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 SP: 0.492 k/f³
LE: 32.00 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	20.95	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

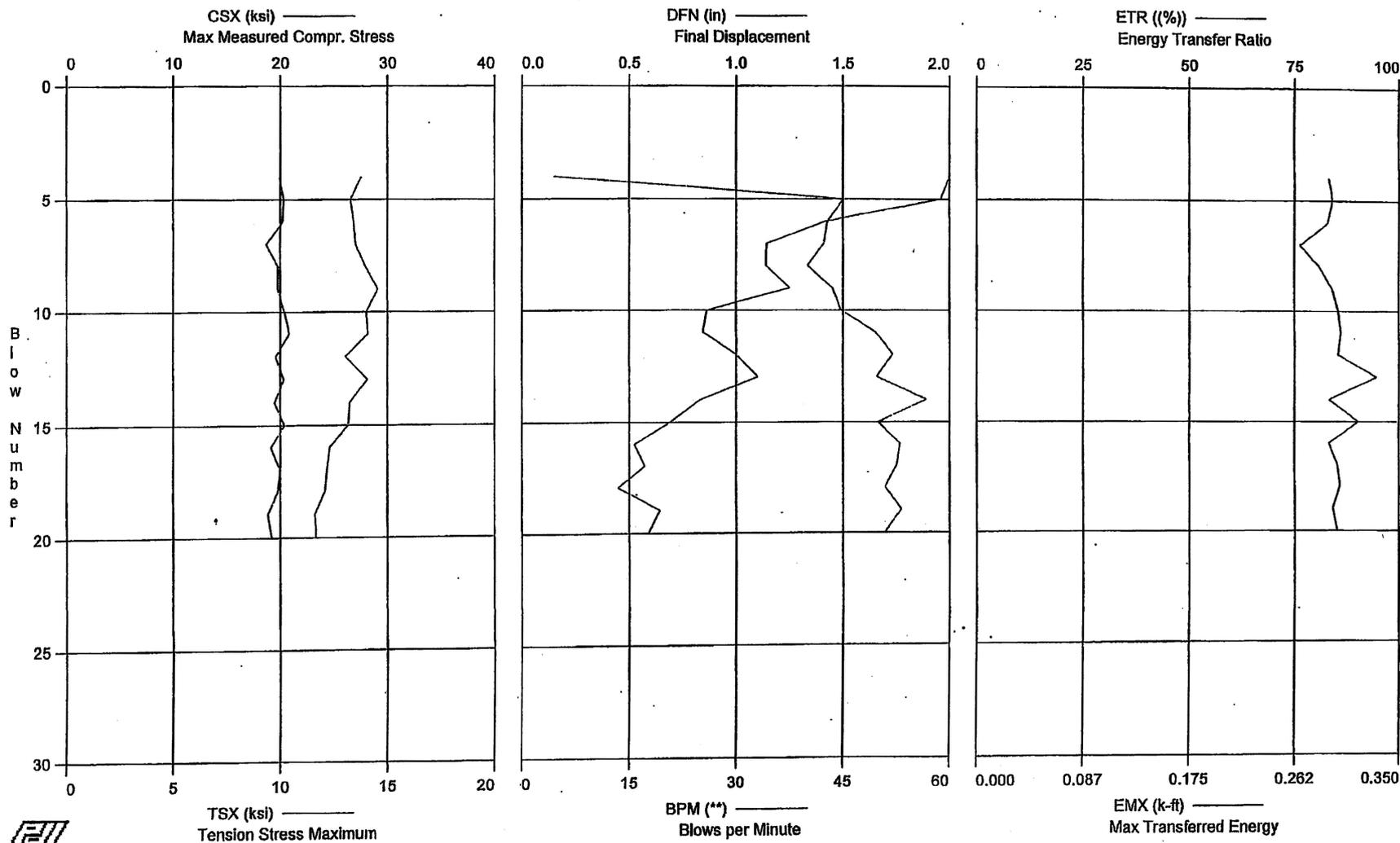
2:38:50 PM - 2:39:07 PM (12/3/2007) BN 3 - 19

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; 28.5' - 30' SAMPLE



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

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

AR: 1.19 in²
LE: 36.00 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
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

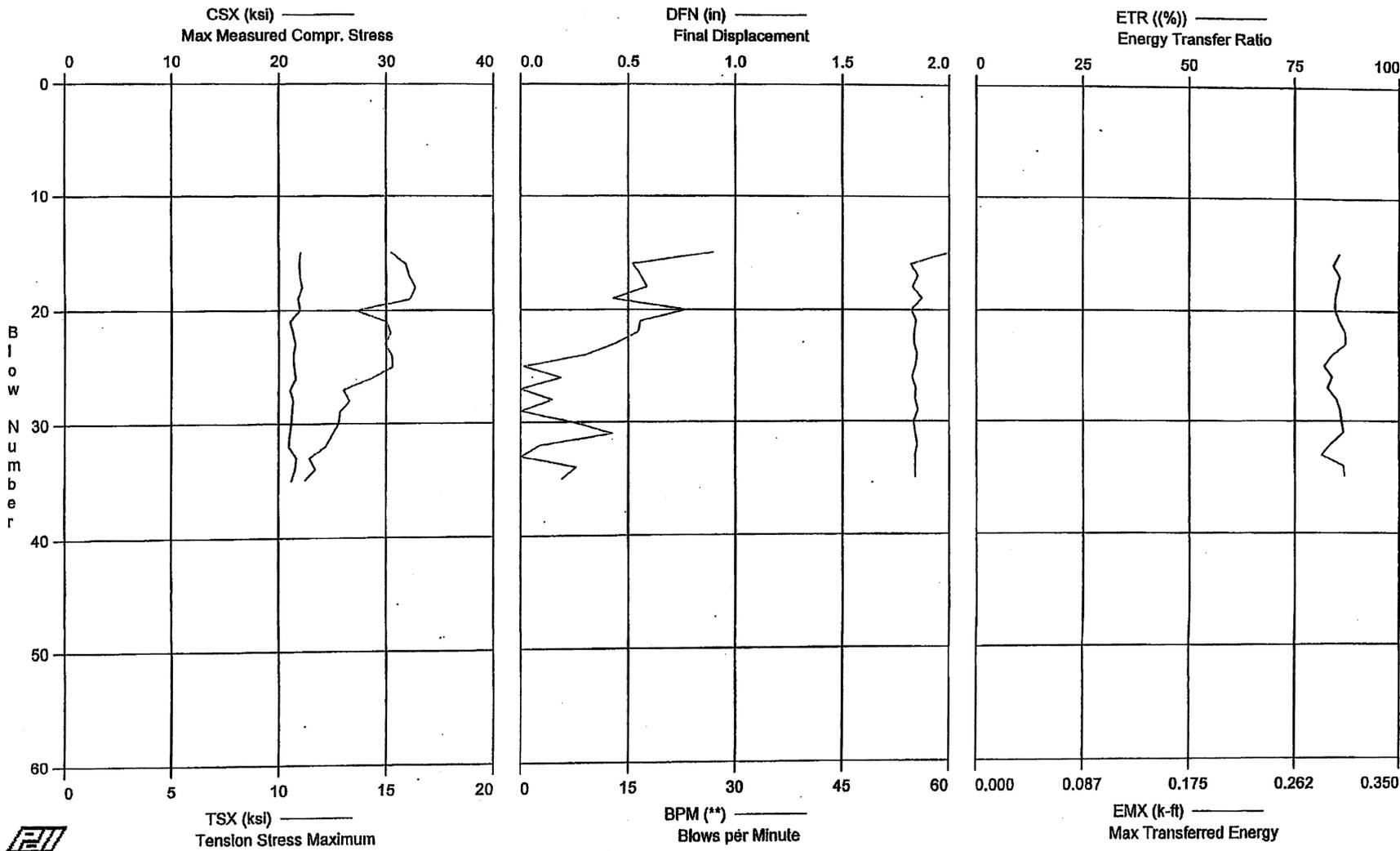
3:11:35 PM - 3:11:55 PM (12/3/2007) BN 4 - 20

MACTEC Engineering and Consulting, Inc. - Case Method Results

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

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