MACTEC Engineering and Consulting, Inc.
Case Method Results

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

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

HAMMER ID: MEC-05; CME 550 ATV (BANKS)

OP: SEK

Test date: 18-Dec-2007

AR: 1.49 in^2
LE: 374.00 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 F^2
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	22.86	2.80	1.20	1.9	0.95	34	0.291	91	0.318
3	0.00	23.95	3.76	2.04	56.0	0.89	36	0.337	92	0.321
4	0.00	25.85	3.71	1.60	55.4	0.94	39	0.306	89	0.311
5	0.00	25.43	3.51	2.12	55.5	1.47	38	0.336	88	0.308
6	0.00	24.24	3.44	1.94	54.9	1.19	36	0.345	92	0.323
7	0.00	22.01	3.49	2.09	55.4	1.06	33	0.296	94	0.327
8	0.00	22.78	3.44	1.15	54.9	1.02	34	0.299	90	0.316
9	0.00	23.30	3.04	1.23	55.4	0.94	35	0.338	86	0.300
10	0.00	26.35	3.16	1.73	54.8	1.46	39	0.311	89	0.313
11	0.00	25.20	3.04	1.74	55.6	1.32	38	0.298	90	0.316
12	0.00	26.59	2.96	1.98	55.0	0.95	40	0.350	89	0.312
13	0.00	25.78	3.01	1.92	55.1	1.01	38	0.358	92	0.323
14	0.00	23.83	2.94	1.30	55.3	0.92	36	0.340	87	0.303
15	0.00	22.42	2.87	1.63	54.6	1.03	33	0.348	91	0.320
16	0.00	25.14	3.19	1.98	55.5	1.27	37	0.298	93	0.324
17	0.00	24.78	3.05	1.51	54.8	0.88	37	0.310	91	0.318
18	0.00	24.04	2.71	1.97	55.5	1.17	36	0.300	94	0.328
19	0.00	26.64	2.64	1.53	54.7	0.97	40	0.300	90	0.316
20	0.00	25.26	2.71	1.21	55.4	0.99	38	0.352	88	0.307
21	0.00	24.50	2.78	1.45	55.0	1.19	37	0.300	92	0.321
22	0.00	23.37	2.56	1.62	55.1	0.93	35	0.344	89	0.313
23	0.00	24.37	2.20	1.88	55.0	1.29	36	0.335	91	0.319
24	0.00	24.24	2.34	1.42	54.8	0.87	36	0.344	90	0.316
25	0.00	23.27	2.24	1.84	55.4	1.17	35	0.301	92	0.323
26	0.00	23.54	2.36	1.12	55.0	1.26	35	0.339	87	0.303
27	0.00	23.19	2.46	1.03	54.8	1.21	35	0.341	87	0.305
28	0.00	23.28	2.18	1.15	55.0	1.22	35	0.338	86	0.303
29	0.00	24.30	2.22	1.44	55.2	1.40	36	0.332	86	0.302
30	0.00	22.36	2.16	1.05	54.8	1.16	33	0.332	86	0.299
31	0.00	22.79	2.33	1.15	54.6	0.91	34	0.333	87	0.305
32	0.00	23.80	2.16	1.18	54.9	1.38	35	0.337	86	0.303
33	0.00	23.08	2.29	0.97	54.6	0.91	34	0.340	88	0.308
34	0.00	24.09	1.86	1.05	55.0	0.91	36	0.302	80	0.281
35	0.00	22.17	2.05	0.76	54.9	1.11	33	0.338	86	0.300
36	0.00	20.72	1.83	1.42	55.1	1.08	31	0.326	87	0.303
37	0.00	23.22	1.97	1.27	54.8	1.05	35	0.336	90	0.315
38	0.00	23.36	2.08	0.54	54.9	1.38	35	0.327	82	0.287
39	0.00	22.49	2.20	0.91	54.4	0.92	34	0.335	87	0.303
40	0.00	23.35	2.26	0.97	55.4	1.35	35	0.328	85	0.299
	Average	23.89	2.67	1.44	53.7	1.11	36	0.326	89	0.311

Total number of blows analyzed: 39

Time Summary

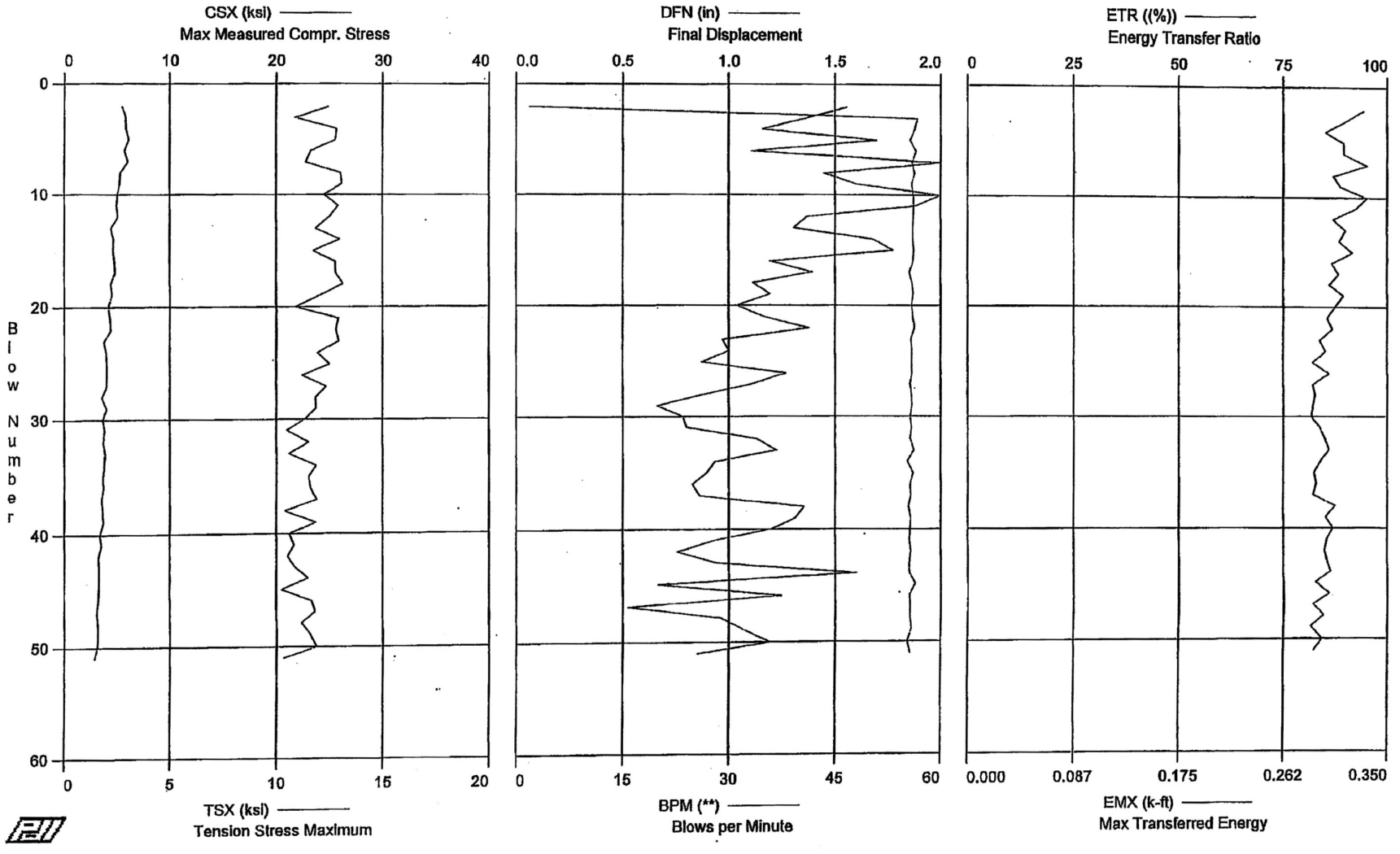
Drive 1 minute 6 seconds 3:57:05 PM - 3:58:11 PM (12/18/2007) BN 1 - 40

MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 18-Dec-2007

EXELON VICTORIA COL SITE - BORING B-2169; 378.5' - 380' SAMPLE



MACTEC Engineering and Consulting, Inc.
Case Method Results

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

EXELON VICTORIA COL SITE - BORING B-2169; 378.5' - 380' SAMPLE

HAMMER ID: MEC-05; CME 550 ATV (BANKS)

OP: SEK

Test date: 18-Dec-2007

AR: 1.49 in^2
LE: 384.00 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 F^2
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	24.88	2.75	1.56	1.9	0.75	37	0.277	94	0.330
3	0.00	21.77	2.91	1.36	56.7	1.02	32	0.297	90	0.315
4	0.00	25.68	2.93	1.16	56.3	0.75	38	0.295	85	0.298
5	0.00	25.55	3.06	1.70	55.6	0.84	38	0.300	89	0.313
6	0.00	23.24	2.85	1.11	56.5	1.11	35	0.307	89	0.313
7	0.00	22.75	3.02	2.14	55.9	1.09	34	0.307	95	0.333
8	0.00	26.08	2.67	1.45	56.3	0.74	39	0.303	87	0.304
9	0.00	26.20	2.64	1.60	55.8	0.77	39	0.309	89	0.310
10	0.00	24.45	2.53	2.21	56.1	0.98	36	0.312	95	0.333
11	0.00	25.84	2.46	1.88	56.2	0.88	38	0.314	92	0.324
12	0.00	24.96	2.54	1.37	56.1	0.73	37	0.302	87	0.304
13	0.00	23.69	2.21	1.31	56.0	1.15	35	0.309	90	0.315
14	0.00	25.98	2.34	1.68	56.0	0.81	39	0.307	88	0.309
15	0.00	23.47	2.32	1.78	56.2	0.94	35	0.308	92	0.321
16	0.00	25.53	2.37	1.19	56.1	0.86	38	0.311	87	0.303
17	0.00	25.57	2.41	1.39	55.5	0.73	38	0.311	88	0.309
18	0.00	26.27	2.21	1.11	55.9	0.78	39	0.310	86	0.301
19	0.00	24.12	2.25	1.19	56.1	0.97	36	0.313	89	0.313
20	0.00	21.79	2.07	1.04	55.8	1.04	32	0.299	87	0.306
21	0.00	25.85	2.17	1.17	56.0	0.73	39	0.307	85	0.299
22	0.00	25.62	2.22	1.38	56.3	0.83	38	0.310	87	0.304
23	0.00	25.88	1.89	0.97	55.7	0.74	39	0.304	84	0.293
24	0.00	23.89	1.99	1.00	55.9	0.72	36	0.305	85	0.298
25	0.00	25.00	2.02	0.87	55.9	0.78	37	0.296	82	0.287
26	0.00	22.43	2.02	1.27	55.9	0.97	33	0.301	86	0.301
27	0.00	24.69	2.01	1.10	55.6	0.77	37	0.289	82	0.287
28	0.00	23.71	1.78	0.87	55.8	0.90	35	0.301	83	0.289
29	0.00	23.72	2.02	0.66	55.9	0.76	35	0.294	82	0.287
30	0.00	22.67	1.83	0.78	55.6	0.71	34	0.296	82	0.286
31	0.00	20.99	1.92	0.80	55.8	1.05	31	0.299	84	0.293
32	0.00	23.04	1.85	1.13	55.6	0.73	34	0.297	85	0.297
33	0.00	21.17	1.95	1.22	56.2	1.16	32	0.295	86	0.301
34	0.00	23.74	1.88	0.94	55.2	0.89	35	0.295	84	0.294
35	0.00	23.02	1.85	0.89	56.1	0.90	34	0.298	82	0.288
36	0.00	23.20	1.86	0.83	55.6	0.90	35	0.299	83	0.290
37	0.00	23.79	1.77	0.86	55.7	0.83	35	0.299	82	0.287
38	0.00	20.80	1.82	1.36	55.4	1.07	31	0.300	87	0.306
39	0.00	23.72	1.85	1.31	55.7	0.82	35	0.299	85	0.298
40	0.00	21.21	1.68	1.20	55.6	1.02	32	0.300	87	0.304
41	0.00	21.67	1.76	0.93	55.5	1.19	32	0.296	85	0.299
42	0.00	21.05	1.63	0.76	55.7	1.18	31	0.294	85	0.297
43	0.00	21.79	1.65	0.94	55.5	0.98	32	0.296	85	0.299
44	0.00	22.99	1.64	1.60	55.5	0.73	34	0.278	86	0.302
45	0.00	20.48	1.65	0.67	56.4	1.06	31	0.291	83	0.289
46	0.00	23.32	1.62	1.25	55.5	0.75	35	0.297	86	0.301
47	0.00	23.65	1.55	0.52	55.6	0.76	35	0.292	82	0.287
48	0.00	22.35	1.60	0.96	55.6	0.73	33	0.292	85	0.296
49	0.00	23.18	1.59	1.07	55.8	0.77	35	0.290	81	0.285
50	0.00	23.78	1.58	1.20	55.2	0.78	35	0.295	84	0.295
51	0.00	20.65	1.43	0.85	55.6	1.08	31	0.298	82	0.288
	Average	23.62	2.09	1.19	54.8	0.88	35	0.300	86	0.302

Total number of blows analyzed: 50

Time Summary

Drive 1 minute 18 seconds 5:48:46 PM - 5:50:04 PM (12/18/2007) BN 1 - 51

March 14, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Kathryn White KAW 3/14/08

Subject: **Report of SPT Energy – MACTEC Charlotte CME 75 Truck Hammer Serial No. MEC-09 Automatic Hammer**
WORK INSTRUCTION 19
Exelon COL Project
Victoria County, Texas
MACTEC Project No. 6468-07-1777

Kyle Miller and 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 4, 19, and 20, 2007, during drilling of Borings B-2182A and B-2174A at the referenced site. The testing was performed at various times (please refer to the data sheets) on December 4 and 20 under sunny skies and a temperature of about 60 to 70 degrees Fahrenheit, and at various times under cloudy skies and a temperature of about 70 degrees Fahrenheit on December 19. The borings were drilled with personnel and equipment from the Charlotte office of MACTEC. The drilling equipment consisted of a CME 75 model truck-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of NW-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. Tony 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 and P5992) and strain gages (Serial Nos. NW#146/1 and NW146/2). 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 1.49 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 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.

15 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 PDIPLOT tables and are also shown graphically in the PDIPLOT 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 284 foot-pounds to

295 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 81% to 84% 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 287.1 foot-pounds, with an average ETR of 82.0%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN EXE 19 – 1 Page
Pages 6 – 8 Record of SPT Energy Measurement – 3 Pages
Pages 9 – 15 PDIPLOT 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)
MEC-09 CME 75 Truck	MACTEC Charlotte	Tony Warren	B-2182A	NW-J	12/4/2007	358.4 - 359.9	50/0.5'	50	295	84.3%
			B-2174A		12/19/2007	478.8 - 480.3	11 - 15 - 18	44	287	82.0%
					12/20/2007	498.6 - 500.1	38 - 36 - 50	124	284	81.1%
								Average for Rig:	287.1	82.0%

[a]Measured 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).

[b]Energy 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 PDIPLOT tables due to roundoff.

Prepared By: [signature] Date: 3-14-08	Checked By: KAW Date: 3/14/08
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

1/8

MACTEC

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:	75
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-09
DATE:	12/4/2007	HAMMER TYPE:	Auto
WEATHER:	Sunny ~60°F	ROPE CONDITION:	N/A
INSPECTOR:	Kyle Miller	ROD SIZE:	NW-J
DRILLING COMPANY:	MACTEC	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	B-2182A		
DEPTH DRILLED:	358.5 to		
TIME DRIVEN:	1:15 PM to		
RIG OPERATOR:	Tony Warren		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	5953; 5992		
STRAIN SERIAL NOS.:	146 NW-1; 146 NW-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)
358.5	50/6"										

REMARKS: NONE

MACTEC

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:	75 TRUCK
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-09
DATE:	12-19-07	HAMMER TYPE:	AUTOMATIC
WEATHER:	CLOUDY 70°	ROPE CONDITION:	N/A
INSPECTOR:	~~Kyle Miller~~ STEVE KISER	ROD SIZE:	NW-J
DRILLING COMPANY:	MACTEC CHARLOTTE	NO. OF SHEAVES:	N/A

BORING DATA

BORING NUMBER:	B-2174A		
DEPTH DRILLED:	600' PLANNED		
TIME DRIVEN:	VARIOUS		
RIG OPERATOR:	TONY WARREN		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	P5953 P5992		
STRAIN SERIAL NOS.:	146 NW #1/2		

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)
478.0 / 480.3'	11-15-18										

REMARKS:

MACTEC

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 7
LOCATION:	Victoria, Texas	MODEL:	75 TRUCK
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-09
DATE:	12-20-07	HAMMER TYPE:	AUTOMATIC
WEATHER:	SUNNY 70°	ROPE CONDITION:	N/A
INSPECTOR:	~~Kyle Miller~~ STEVE KISER	ROD SIZE:	NW-J
DRILLING COMPANY:	MACTEC CHARLOTTE	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	B-2124 A		
DEPTH DRILLED:	600' PLANNED		
TIME DRIVEN:	VARIOUS		
RIG OPERATOR:	TONY WARREN		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	P5953 P5992		
STRAIN SERIAL NOS.:	146 NW #1/2		

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)
498.6'	38-36-										
500.1'	50										

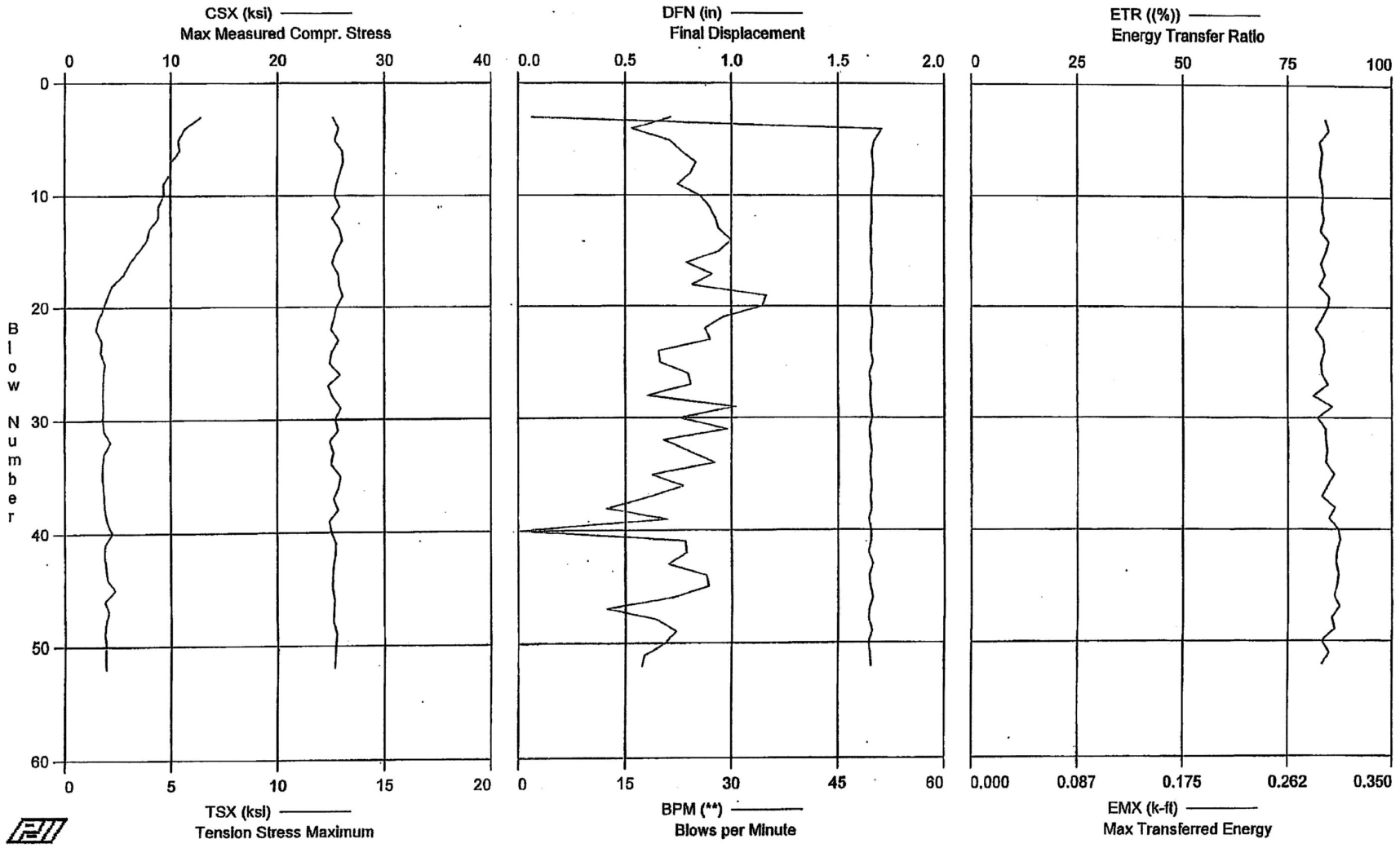
REMARKS:

MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 4-Dec-2007

EXCELON VICTORIA COL SITE - BORING B-2182A; 358.5' - 360' SAMPLE



EXCELON VICTORIA COL SITE - BORING B-2182A; 358.5' - 360' SAMPLE HAMMER ID: MEC-09; CME 75 TRUCK (T. WARREN)
OP: KBM Test date: 4-Dec-2007

AR: 1.49 in^2
LE: 366.00 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 F^2
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	25.16	6.42	0.72	1.9	0.95	37	0.306	84	0.294
4	0.00	25.72	5.67	0.53	51.2	1.00	38	0.309	85	0.297
5	0.00	25.33	5.37	0.71	50.1	1.13	38	0.301	83	0.289
6	0.00	26.08	5.42	0.76	49.7	1.26	39	0.309	83	0.291
7	0.00	26.13	5.00	0.83	49.9	1.19	39	0.314	83	0.290
8	0.00	25.85	4.99	0.81	50.0	1.22	39	0.300	83	0.289
9	0.00	25.53	4.66	0.75	49.8	1.07	38	0.298	83	0.291
10	0.00	25.36	4.69	0.85	49.7	1.13	38	0.310	83	0.292
11	0.00	25.83	4.42	0.90	49.7	1.24	38	0.299	83	0.291
12	0.00	25.15	4.42	0.93	49.8	1.10	37	0.309	84	0.293
13	0.00	25.81	3.99	0.94	49.6	1.27	38	0.295	83	0.290
14	0.00	26.06	3.85	1.00	49.6	1.21	39	0.299	85	0.297
15	0.00	25.45	3.44	0.94	49.7	1.10	38	0.304	84	0.294
16	0.00	25.12	3.06	0.79	49.6	0.95	37	0.294	83	0.290
17	0.00	25.70	2.76	0.91	49.8	1.17	38	0.297	84	0.294
18	0.00	25.77	2.23	0.81	49.7	1.24	38	0.298	82	0.289
19	0.00	26.09	2.01	1.16	49.8	1.21	39	0.298	85	0.297
20	0.00	25.53	1.86	1.14	49.5	1.10	38	0.299	85	0.296
21	0.00	25.31	1.59	0.96	49.8	1.07	38	0.294	83	0.291
22	0.00	25.01	1.48	0.87	49.8	0.93	37	0.291	82	0.286
23	0.00	25.72	1.74	0.90	49.6	1.19	38	0.296	83	0.292
24	0.00	25.11	1.69	0.66	49.6	0.91	37	0.297	84	0.293
25	0.00	24.90	1.91	0.66	49.9	1.12	37	0.291	83	0.290
26	0.00	25.85	1.83	0.80	49.4	1.23	39	0.290	83	0.291
27	0.00	24.74	1.82	0.81	49.6	1.10	37	0.293	85	0.296
28	0.00	25.16	1.81	0.60	49.5	1.14	37	0.290	81	0.284
29	0.00	25.94	1.84	1.02	49.6	1.22	39	0.297	86	0.300
30	0.00	25.41	1.81	0.75	49.8	1.07	38	0.289	82	0.287
31	0.00	25.70	1.86	0.98	49.4	1.25	38	0.292	84	0.294
32	0.00	24.90	2.18	0.68	49.5	1.13	37	0.293	84	0.294
33	0.00	25.26	1.87	0.80	49.7	1.12	38	0.293	84	0.295
34	0.00	25.03	1.80	0.92	49.5	1.11	37	0.292	84	0.294
35	0.00	25.89	1.78	0.63	49.5	1.20	39	0.297	86	0.301
36	0.00	25.71	1.83	0.77	49.7	1.03	38	0.293	84	0.296
37	0.00	25.27	1.88	0.61	49.5	1.18	38	0.291	83	0.291
38	0.00	25.69	1.91	0.41	49.7	1.19	38	0.294	86	0.302
39	0.00	24.84	2.01	0.70	49.3	0.90	37	0.305	85	0.297
40	0.00	25.08	2.26	-0.05	49.6	1.08	37	0.309	87	0.305
41	0.00	25.45	1.91	0.78	49.6	1.09	38	0.308	88	0.306
42	0.00	25.40	1.87	0.79	49.3	1.07	38	0.307	87	0.304
43	0.00	25.22	1.94	0.70	49.9	0.93	38	0.295	87	0.303
44	0.00	25.16	2.00	0.88	49.4	1.05	37	0.304	87	0.305
45	0.00	25.14	2.39	0.89	49.5	1.05	37	0.305	87	0.304
46	0.00	25.34	1.88	0.73	49.9	0.96	38	0.292	86	0.301
47	0.00	25.27	2.09	0.41	49.4	1.07	38	0.306	87	0.306
48	0.00	25.22	1.95	0.64	49.3	1.05	38	0.291	85	0.299
49	0.00	25.54	1.89	0.74	49.8	1.02	38	0.293	86	0.301
50	0.00	25.40	1.94	0.69	49.3	1.24	38	0.289	83	0.291
51	0.00	25.38	1.92	0.59	49.5	1.17	38	0.306	85	0.297
52	0.00	25.33	1.95	0.58	49.6	1.10	38	0.289	83	0.291
	Average	25.44	2.70	0.77	48.7	1.11	38	0.298	84	0.295

Total number of blows analyzed: 50

Time Summary

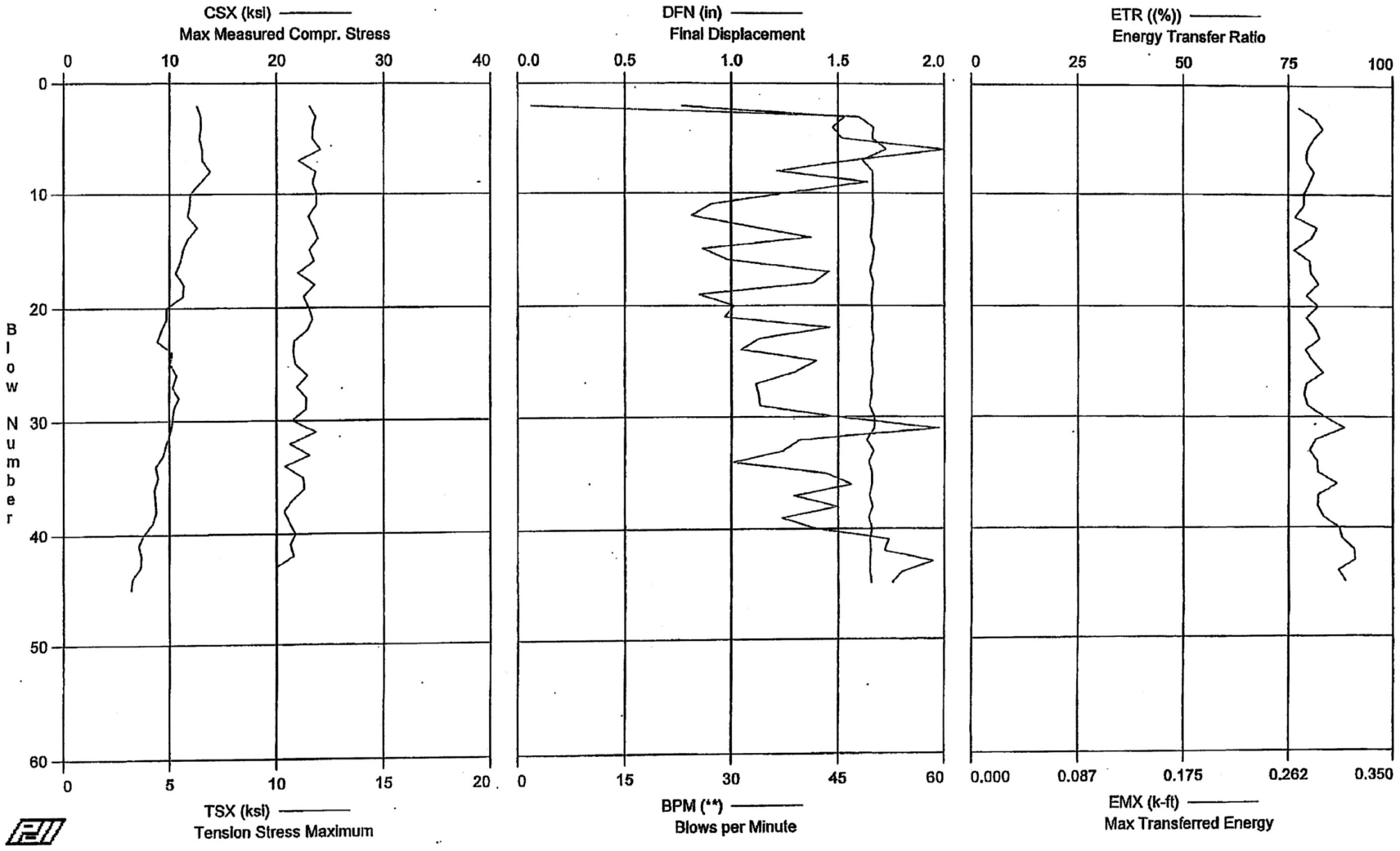
Drive 59 seconds 5:28:43 PM - 5:29:42 PM (12/4/2007) BN 3 - 52

MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 19-Dec-2007

EXELON VICTORIA COL SITE - BORING B-2174A; 478.8' - 480.3' SAMPLE



EXELON VICTORIA COL SITE - BORING B-2174A; 478.8' - 480.3' SAMPLE HAMMER ID: MEC-09; CME 75 TRUCK (T. WARREN)
OP: SEK Test date: 19-Dec-2007

AR: 1.49 in^2
LE: 484.00 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 F^2
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	23.06	6.29	0.77	1.9	1.15	34	0.278	77	0.271
3	0.00	23.67	6.45	1.53	47.9	1.18	35	0.281	81	0.285
4	0.00	23.39	6.46	1.48	50.0	1.16	35	0.287	83	0.291
5	0.00	23.35	6.39	1.52	49.9	1.20	35	0.292	81	0.283
6	0.00	24.14	6.52	2.02	51.8	1.30	36	0.286	80	0.278
7	0.00	22.06	6.53	1.57	48.4	1.02	33	0.288	79	0.278
8	0.00	23.66	6.90	1.21	49.9	1.11	35	0.286	81	0.284
9	0.00	23.35	6.44	1.64	49.9	1.23	35	0.282	80	0.280
10	0.00	23.75	5.97	1.26	49.9	1.24	35	0.290	79	0.275
11	0.00	23.71	5.94	0.91	50.0	1.17	35	0.280	79	0.275
12	0.00	22.94	5.83	0.81	49.9	1.19	34	0.281	76	0.268
13	0.00	23.48	6.31	1.09	49.8	1.10	35	0.284	82	0.286
14	0.00	23.88	5.86	1.37	49.6	1.19	36	0.281	80	0.281
15	0.00	23.07	5.63	0.87	50.1	1.25	34	0.283	76	0.267
16	0.00	23.51	5.51	0.98	49.9	1.13	35	0.280	80	0.280
17	0.00	21.98	5.29	1.46	49.5	1.03	33	0.287	80	0.281
18	0.00	23.58	5.66	1.38	50.0	1.13	35	0.281	82	0.287
19	0.00	22.55	5.62	0.85	49.7	1.00	34	0.292	79	0.277
20	0.00	23.02	4.86	1.01	49.7	1.05	34	0.286	82	0.287
21	0.00	23.37	4.85	0.97	49.9	1.18	35	0.280	79	0.277
22	0.00	22.89	4.61	1.46	49.7	1.20	34	0.283	81	0.284
23	0.00	21.68	4.43	1.13	50.0	1.02	32	0.284	82	0.288
24	0.00	21.56	5.11	1.04	49.7	1.02	32	0.282	79	0.276
25	0.00	21.74	5.03	1.40	49.7	1.03	32	0.283	81	0.282
26	0.00	22.91	5.34	1.29	49.9	1.11	34	0.277	83	0.291
27	0.00	21.89	5.14	1.12	49.6	1.05	33	0.268	79	0.277
28	0.00	22.80	5.43	1.13	49.7	1.13	34	0.273	79	0.275
29	0.00	22.75	5.19	1.14	49.4	1.17	34	0.278	79	0.278
30	0.00	21.46	5.13	1.49	50.1	1.01	32	0.280	83	0.292
31	0.00	23.69	5.05	1.97	50.1	1.20	35	0.292	88	0.309
32	0.00	21.25	4.83	1.32	49.0	1.01	32	0.281	81	0.285
33	0.00	23.12	4.69	1.24	50.0	1.23	34	0.281	80	0.280
34	0.00	20.77	4.35	1.01	49.3	1.00	31	0.281	82	0.286
35	0.00	22.48	4.45	1.44	49.8	1.20	34	0.284	82	0.287
36	0.00	22.60	4.29	1.56	49.8	1.02	34	0.280	87	0.303
37	0.00	21.46	4.32	1.29	49.4	1.00	32	0.283	82	0.287
38	0.00	20.69	4.37	1.50	49.9	0.99	31	0.281	82	0.287
39	0.00	21.21	4.20	1.24	49.3	0.99	32	0.283	83	0.291
40	0.00	21.78	3.78	1.40	49.8	1.00	32	0.285	87	0.305
41	0.00	21.31	3.54	1.74	49.5	1.01	32	0.279	88	0.307
42	0.00	21.62	3.68	1.72	49.6	0.81	32	0.281	91	0.317
43	0.00	20.04	3.63	1.95	49.5	0.89	30	0.281	91	0.318
44	0.00	20.07	3.25	1.80	49.5	0.97	30	0.279	87	0.304
45	0.00	19.93	3.19	1.75	49.7	0.88	30	0.281	89	0.310
	Average	22.44	5.14	1.34	48.6	1.09	33	0.282	82	0.287

Total number of blows analyzed: 44

Time Summary

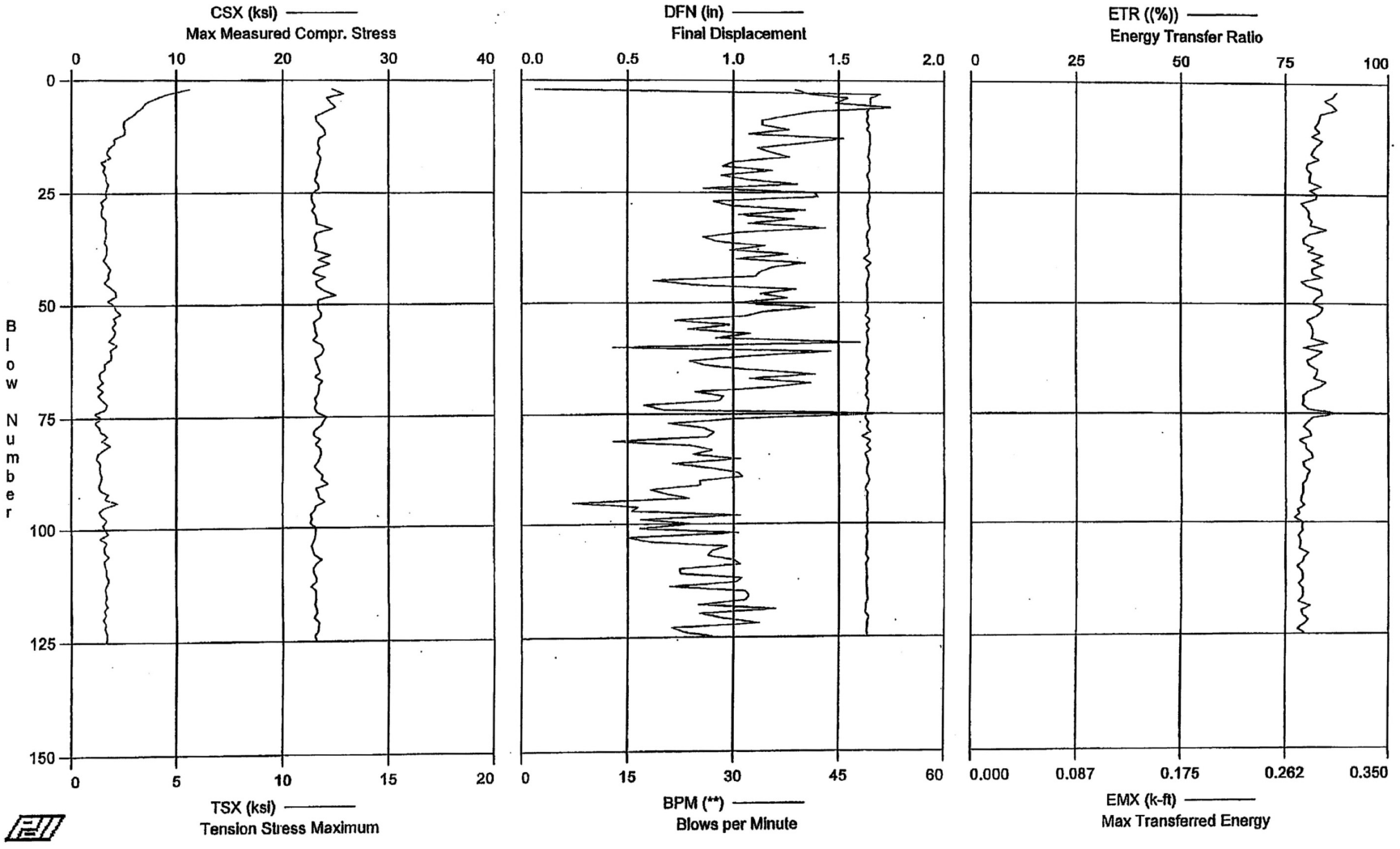
Drive 52 seconds 6:50:15 PM - 6:51:07 PM (12/19/2007) BN 2 - 45

MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 20-Dec-2007

EXELON VICTORIA COL SITE - BORING B-2174A; 498.6' - 500.1' SAMPLE



EXELON VICTORIA COL SITE - BORING B-2174A; 498.6' - 500.1' SAMPLE HAMMER ID: MEC-09; CME 75 TRUCK (T. WARREN)
OP: SEK Test date: 20-Dec-2007

AR: 1.49 in^2 SP: 0.492 k/ft3
LE: 504.00 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 F^2
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	24.71	5.65	1.29	1.9	0.67	37	0.304	87	0.306
3	0.00	25.76	4.69	1.36	50.9	0.68	38	0.306	87	0.303
4	0.00	24.15	4.08	1.54	49.5	0.84	36	0.296	85	0.296
5	0.00	24.59	3.55	1.49	49.5	0.92	37	0.298	86	0.303
6	0.00	25.00	3.39	1.74	49.5	0.76	37	0.298	87	0.306
7	0.00	24.08	3.12	1.38	49.0	0.76	36	0.290	84	0.292
8	0.00	23.14	2.90	1.24	49.2	0.93	34	0.288	83	0.291
9	0.00	23.17	2.54	1.14	48.9	0.82	35	0.292	83	0.290
10	0.00	23.53	2.49	1.14	49.3	0.92	35	0.290	82	0.287
11	0.00	23.94	2.56	1.26	49.0	0.92	36	0.284	83	0.291
12	0.00	24.08	2.54	1.08	49.4	0.67	36	0.280	81	0.285
13	0.00	23.46	2.05	1.52	49.4	0.84	35	0.289	84	0.294
14	0.00	23.35	2.07	1.33	49.5	0.94	35	0.282	83	0.289
15	0.00	23.50	1.81	1.12	49.3	0.96	35	0.287	82	0.286
16	0.00	23.28	1.69	1.18	49.3	0.76	35	0.284	81	0.284
17	0.00	23.59	1.87	1.27	49.1	0.94	35	0.291	83	0.291
18	0.00	23.56	1.40	1.00	49.4	0.75	35	0.283	80	0.281
19	0.00	23.43	1.60	0.95	49.3	0.79	35	0.286	80	0.280
20	0.00	23.27	1.51	1.19	49.4	0.78	35	0.287	81	0.284
21	0.00	23.29	1.66	0.94	49.0	0.74	35	0.289	81	0.283
22	0.00	23.04	1.64	1.07	49.2	0.80	34	0.288	81	0.283
23	0.00	23.39	1.78	1.31	49.4	0.94	35	0.291	84	0.293
24	0.00	23.43	1.69	0.86	49.3	0.80	35	0.293	81	0.284
25	0.00	22.89	1.62	1.38	49.2	0.88	34	0.287	83	0.289
26	0.00	22.72	1.68	1.40	49.4	0.84	34	0.287	82	0.288
27	0.00	22.82	1.41	0.91	49.3	0.79	34	0.285	79	0.276
28	0.00	23.09	1.51	0.99	49.1	0.77	34	0.285	80	0.280
29	0.00	22.78	1.44	1.34	49.2	0.82	34	0.283	81	0.283
30	0.00	23.12	1.43	1.03	49.1	0.96	34	0.286	81	0.282
31	0.00	23.21	1.64	1.29	49.2	0.76	35	0.284	81	0.285
32	0.00	23.24	1.64	1.07	49.2	0.98	35	0.287	81	0.284
33	0.00	24.66	1.59	1.44	49.5	0.84	37	0.295	85	0.298
34	0.00	23.22	1.66	1.04	49.1	0.92	35	0.287	81	0.283
35	0.00	23.01	1.63	0.86	49.0	0.83	34	0.285	79	0.278
36	0.00	23.10	1.56	0.92	49.2	0.83	34	0.288	79	0.278
37	0.00	23.22	1.71	1.15	49.1	0.82	35	0.289	82	0.286
38	0.00	23.07	1.70	0.99	49.4	0.82	34	0.287	80	0.282
39	0.00	24.53	1.64	1.26	49.3	0.82	37	0.294	84	0.294
40	0.00	23.36	1.51	1.02	48.6	0.96	35	0.286	81	0.285
41	0.00	24.42	1.70	1.34	49.6	0.71	36	0.293	84	0.295
42	0.00	23.15	1.86	1.18	48.9	0.84	34	0.288	82	0.285
43	0.00	22.87	1.77	1.13	49.2	0.85	34	0.287	82	0.285
44	0.00	24.04	1.78	1.11	49.3	0.86	36	0.294	84	0.294
45	0.00	23.14	1.56	0.62	49.1	0.83	34	0.286	79	0.276
46	0.00	23.29	1.84	0.81	49.0	0.75	35	0.285	80	0.281
47	0.00	23.93	2.08	1.30	49.1	0.78	36	0.291	84	0.293
48	0.00	25.00	2.13	1.13	49.1	0.78	37	0.295	84	0.294
49	0.00	23.36	1.75	1.26	49.1	0.97	35	0.284	82	0.288
50	0.00	23.30	2.02	1.01	49.0	0.78	35	0.288	82	0.286
51	0.00	23.35	2.11	1.38	49.2	0.79	35	0.288	84	0.295
52	0.00	23.64	2.34	1.14	49.1	0.91	35	0.288	84	0.293
53	0.00	23.57	2.01	1.05	48.8	0.82	35	0.287	82	0.288
54	0.00	22.93	2.12	0.73	49.5	0.89	34	0.285	80	0.281
55	0.00	23.05	1.94	0.99	48.9	0.82	34	0.287	81	0.284
56	0.00	23.10	2.11	0.79	49.3	0.86	34	0.290	82	0.286
57	0.00	23.29	2.00	1.08	48.9	0.99	35	0.285	82	0.286
58	0.00	22.89	1.79	0.92	49.1	0.87	34	0.286	81	0.285
59	0.00	23.65	2.18	1.60	49.2	0.97	35	0.289	85	0.299
60	0.00	23.91	1.86	0.43	49.0	0.78	36	0.290	80	0.278
61	0.00	23.71	1.90	1.46	49.0	0.79	35	0.288	84	0.294
62	0.00	23.05	1.89	1.07	48.9	0.86	34	0.286	82	0.288
63	0.00	23.21	1.55	0.80	49.3	0.95	35	0.285	80	0.281
64	0.00	23.37	1.61	0.87	49.1	0.92	35	0.289	81	0.283
65	0.00	23.56	1.31	1.08	48.9	0.95	35	0.290	83	0.290
66	0.00	23.05	1.35	1.39	49.3	0.78	34	0.283	83	0.289

EXELON VICTORIA COL SITE - BORING B-2174A; 498.6' - 500.1' SAMPLE HAMMER ID: MEC-09; CME 75 TRUCK (T. WARREN)
OP: SEK Test date: 20-Dec-2007

BL#	depth ft	CSX ksi	TSX ksi	DFN in	BPM **	FVP []	FMX kips	EF2 k-ft	ETR (%)	EMX k-ft
67	0.00	23.74	1.49	1.08	48.8	0.76	35	0.288	82	0.287
68	0.00	23.40	1.23	1.37	49.1	0.86	35	0.292	85	0.297
69	0.00	23.42	1.51	1.18	48.9	0.87	35	0.291	83	0.292
70	0.00	23.32	1.25	0.82	49.1	0.94	35	0.287	81	0.282
71	0.00	23.03	1.46	0.96	48.8	0.82	34	0.284	79	0.277
72	0.00	23.20	1.70	0.93	49.2	0.79	35	0.286	79	0.278
73	0.00	23.01	1.61	0.58	49.2	0.77	34	0.287	79	0.277
74	0.00	23.26	1.11	0.67	49.1	0.91	35	0.289	80	0.282
75	0.00	24.17	1.42	1.76	49.0	0.92	36	0.295	88	0.307
76	0.00	23.84	1.13	1.03	48.7	0.78	36	0.291	82	0.285
77	0.00	23.61	1.30	0.69	49.2	0.97	35	0.290	80	0.281
78	0.00	22.98	1.38	0.86	48.9	0.82	34	0.288	79	0.278
79	0.00	22.93	1.72	0.91	49.5	0.91	34	0.286	81	0.283
80	0.00	23.56	1.44	0.88	48.3	0.97	35	0.293	81	0.284
81	0.00	23.12	1.87	0.43	49.5	0.95	34	0.288	78	0.274
82	0.00	23.54	1.51	0.81	48.9	0.76	35	0.291	80	0.280
83	0.00	23.64	1.25	0.90	49.5	0.81	35	0.292	80	0.280
84	0.00	23.52	1.18	0.81	48.7	0.87	35	0.295	81	0.284
85	0.00	23.35	1.38	1.03	49.0	0.91	35	0.293	82	0.286
86	0.00	23.01	1.35	0.71	49.2	0.84	34	0.291	79	0.277
87	0.00	23.41	1.38	0.89	49.0	0.78	35	0.289	79	0.278
88	0.00	23.78	1.46	1.02	48.9	0.77	35	0.292	81	0.283
89	0.00	23.69	1.42	1.04	49.1	0.77	35	0.291	80	0.281
90	0.00	24.32	1.30	0.84	49.3	0.77	36	0.294	80	0.280
91	0.00	23.16	1.35	0.84	49.0	0.89	35	0.289	79	0.277
92	0.00	23.39	1.79	0.61	48.7	0.77	35	0.290	79	0.277
93	0.00	23.45	1.59	0.68	49.1	0.76	35	0.290	79	0.277
94	0.00	24.00	2.21	0.79	48.9	0.77	36	0.293	79	0.276
95	0.00	23.17	1.59	0.24	49.0	0.78	35	0.288	79	0.275
96	0.00	23.05	1.32	0.55	49.0	0.88	34	0.290	80	0.278
97	0.00	22.67	1.46	0.52	49.1	0.84	34	0.287	78	0.272
98	0.00	22.81	1.72	1.03	48.9	0.83	34	0.286	78	0.274
99	0.00	22.65	1.50	0.56	49.0	0.85	34	0.287	77	0.270
100	0.00	23.17	1.58	0.82	49.1	0.89	35	0.291	79	0.277
101	0.00	23.15	1.80	0.56	48.9	0.85	34	0.292	79	0.276
102	0.00	23.10	1.36	1.02	49.1	0.83	34	0.290	79	0.277
103	0.00	22.94	1.71	0.50	48.8	0.84	34	0.291	78	0.273
104	0.00	22.77	1.54	0.60	49.0	0.85	34	0.289	79	0.275
105	0.00	22.86	1.58	0.97	49.0	0.87	34	0.288	79	0.275
106	0.00	23.01	1.80	0.90	49.0	0.81	34	0.288	78	0.274
107	0.00	23.68	1.54	0.88	48.8	0.94	35	0.294	81	0.282
108	0.00	23.23	1.60	1.00	49.2	0.97	35	0.287	79	0.278
109	0.00	22.90	1.69	1.03	48.8	0.84	34	0.291	79	0.277
110	0.00	22.94	1.65	0.75	48.9	0.82	34	0.288	78	0.272
111	0.00	23.22	1.79	0.75	48.9	0.97	35	0.290	79	0.276
112	0.00	23.24	1.75	1.04	49.0	0.78	35	0.291	79	0.277
113	0.00	22.70	1.63	1.01	48.9	0.86	34	0.287	79	0.277
114	0.00	23.16	1.65	0.70	48.9	0.78	35	0.289	78	0.273
115	0.00	23.16	1.71	1.06	49.0	0.79	35	0.291	79	0.277
116	0.00	23.20	1.60	1.07	49.0	0.79	35	0.289	79	0.277
117	0.00	23.05	1.74	1.06	49.1	0.82	34	0.290	79	0.277
118	0.00	23.22	1.57	0.84	48.8	0.99	35	0.291	78	0.273
119	0.00	23.29	1.65	1.20	48.8	0.81	35	0.292	81	0.283
120	0.00	22.98	1.49	0.84	48.7	0.88	34	0.291	79	0.276
121	0.00	23.43	1.65	0.95	49.2	0.95	35	0.293	79	0.277
122	0.00	23.38	1.58	1.12	49.0	0.77	35	0.290	80	0.282
123	0.00	23.33	1.71	0.71	49.0	0.77	35	0.290	79	0.278
124	0.00	23.01	1.72	0.77	48.9	0.87	34	0.294	78	0.273
125	0.00	23.27	1.67	0.93	49.1	0.77	35	0.291	80	0.279
Average		23.40	1.80	1.01	48.7	0.84	35	0.289	81	0.284

Total number of blows analyzed: 124

Time Summary

Drive 2 minutes 30 seconds 10:45:32 AM - 10:48:02 AM (12/20/2007) BN 2 - 125

March 14, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Kathryn White KAW 3/14/08

Subject: **Report of SPT Energy – Miller Drilling CME 85 Truck Hammer Serial No. MEC-10 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, 2007, during drilling of Boring B-2274A at the referenced site. The testing was performed from approximately 10:15 AM to 3:20 PM under partly cloudy and a temperature of about 70 degrees Fahrenheit. The borings were drilled with personnel and equipment from Miller Drilling. The drilling equipment consisted of a CME 85 model truck-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of NW-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. Rick White. 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 NW#146/2). 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 1.49 square inches and an outside diameter of approximately 2.625 inches at the gage location. The drill rods included in the drill rod string 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 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 PDIPLOT tables and are also shown graphically in the PDIPLOT 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 was 310 foot-pounds and 317 foot-

pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 89% and 91% 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 312.5 foot-pounds, with an average ETR of 89.3%.

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 PDIPLOT 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-10 (CME 85 Truck)	Miller Drilling	Rick White	B-2274A	NW-J	12/18/2007	408.4 - 409.9	10 - 14 - 19	46	310	88.6%
						428.3 - 429.8	10 - 16 - 25	55	317	90.6%
						448.3 - 449.8	10 - 16 - 25	53	310	88.6%
								Average for Rig:	312.5	89.3%

[a]Measured 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).

[b]Energy 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 PDIPLOT tables due to roundoff.

Prepared By: [illegible] STEVE KISER	Date: 3-14-08	Checked By: KAW	Date: 3/14/08

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

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MACTEC

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:	85 TRUCK
PROJECT NO.:	6468-07-1777	SERIAL NO.:	MEC-10
DATE:	12-18-07	HAMMER TYPE:	AUTOMATIC
WEATHER:	PARTLY CLOUDY - 70°	ROPE CONDITION:	N/A
INSPECTOR:	SL ~~Kyle Miller~~ STEVE KISER	ROD SIZE:	NW-5
DRILLING COMPANY:	MILLER	NO. OF SHEAVES:	N/A

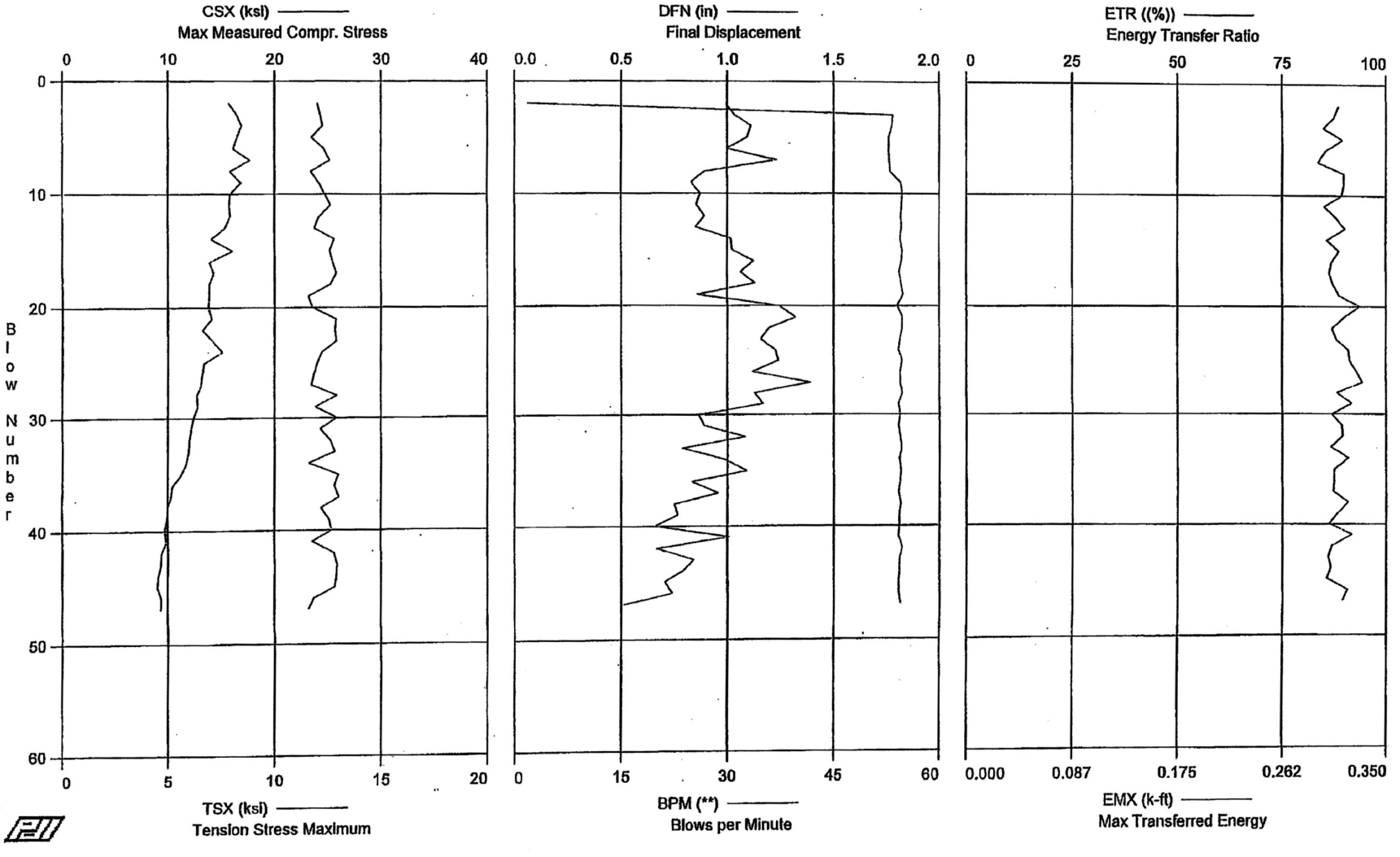
BORING DATA			
BORING NUMBER:	B-2274 A		
DEPTH DRILLED:	SL 100 ~~400'~~ PLANNED		
TIME DRIVEN:	VARIOUS		
RIG OPERATOR:	RICK WHITE		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	P5953 P5992		
STRAIN SERIAL NOS.:	146 NW #1/2		

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)
408.5/410	10-14-19										
SL ~~426.3/2~~											
428.3/428.8	10-16-25										
448.3/448.8	10-16-25										

REMARKS:

MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 18-Dec-2007

EXELON VICTORIA COL SITE - BORING B-2274A; 408.5' - 410' SAMPLE