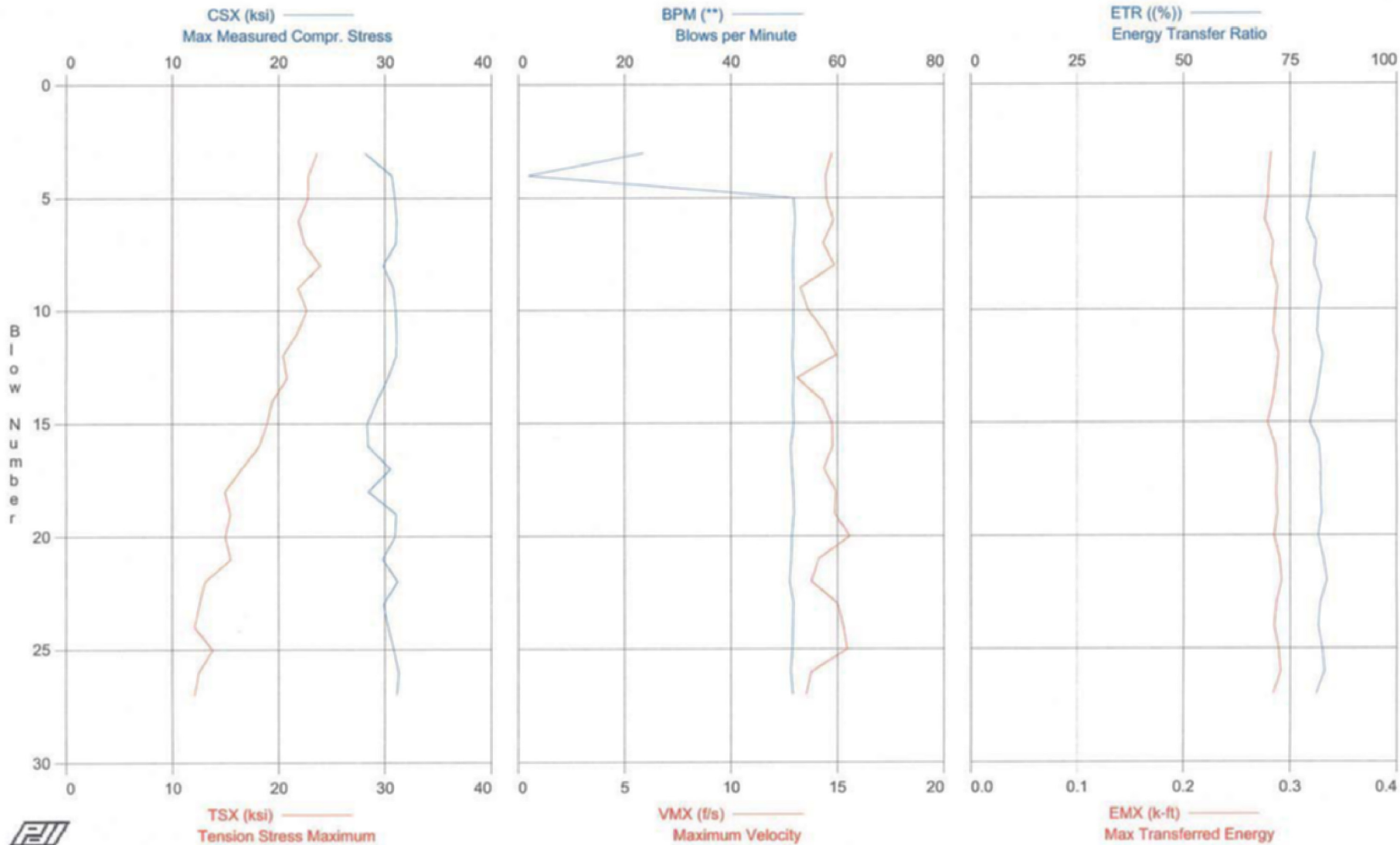


PDIPLOT Ver. 2008.2 - Printed: 5-Mar-2009

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 24-Jan-2009

EXELON VICTORIA - Boring B3204 (39.1-40.6 sample)



EXELON VICTORIA - Boring B3204 (39.1-40.6 sample)
OP: JNH

Hammer ID: MEC02; Driller: D.WHITE CME 55LC (MACTEC)
Test date: 24-Jan-2009

AR: 1.43 in² SP: 0.492 k/ft³
LE: 44.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.70

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

BL#	CSX ksi	TSX ksi	VMX f/s	FMX kips	FVP []	BPM **	EF2 k-ft	ETR (%)	EMX k-ft
3	28.1	23.6	14.7	40	1.0	23.5	0.353	80.6	0.282
4	30.6	22.8	14.4	44	0.9	1.9	0.350	80.0	0.280
5	30.9	22.8	14.5	44	0.9	51.7	0.351	79.7	0.279
6	31.1	21.9	14.8	44	0.9	52.0	0.345	78.8	0.276
7	31.0	22.4	14.3	44	0.9	51.7	0.353	81.1	0.284
8	29.8	23.9	14.9	43	1.0	51.6	0.356	80.6	0.282
9	30.8	21.8	13.3	44	0.9	51.7	0.357	82.3	0.288
10	31.0	22.7	13.6	44	0.9	51.7	0.359	81.6	0.286
11	31.1	21.8	14.4	44	0.9	51.7	0.357	81.3	0.284
12	31.1	20.4	14.9	44	0.9	51.5	0.360	82.7	0.289
13	30.3	20.8	13.1	43	0.8	51.8	0.355	81.9	0.287
14	29.2	19.4	14.3	42	1.1	51.6	0.359	81.1	0.284
15	28.3	18.9	14.8	41	1.1	51.8	0.353	79.6	0.279
16	28.4	18.2	14.8	41	1.1	51.2	0.355	81.8	0.286
17	30.5	16.5	14.4	44	1.2	51.4	0.355	82.2	0.288
18	28.4	14.9	14.9	41	1.0	51.7	0.351	82.1	0.287
19	31.1	15.5	14.9	44	0.9	51.8	0.351	82.4	0.288
20	30.9	15.0	15.6	44	0.9	51.4	0.359	81.5	0.285
21	29.8	15.5	14.1	43	1.2	51.3	0.351	82.8	0.290
22	31.2	13.1	13.8	45	1.3	51.0	0.358	83.5	0.292
23	29.8	12.6	15.0	43	0.9	51.7	0.347	82.0	0.287
24	30.3	12.1	15.3	43	0.9	51.6	0.350	81.6	0.285
25	30.8	13.8	15.5	44	0.9	51.5	0.365	82.5	0.289
26	31.3	12.5	13.8	45	0.9	51.2	0.351	83.1	0.291
27	31.1	12.1	13.5	45	0.9	51.6	0.356	81.1	0.284
Average	30.3	18.2	14.5	43	1.0	48.5	0.354	81.5	0.285

Total number of blows analyzed: 25

Time Summary

Drive 2 minutes 20 seconds

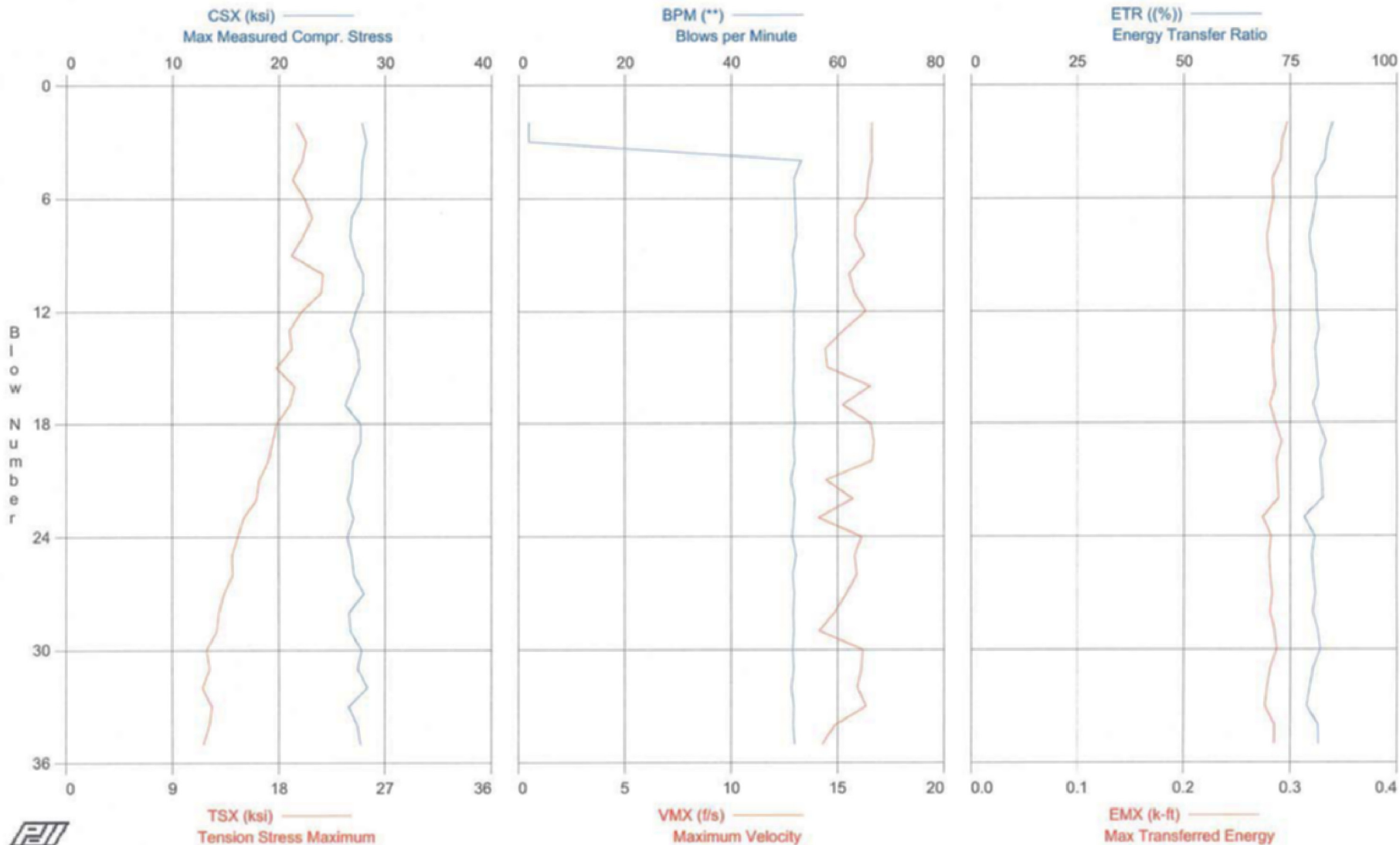
12:24:14 PM - 12:26:34 PM (1/24/2009) BN 1 - 27

PDILOT Ver. 2008.2 - Printed: 5-Mar-2009

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 24-Jan-2009

EXELON VICTORIA - Boring B3204 (44.1'-45.6' sample)



EXELON VICTORIA - Boring B3204 (44.1'-45.6' sample)
OP: JNH

Hammer ID: MEC02; Driller: D.WHITE CME 55LC (MACTEC)
Test date: 24-Jan-2009

AR: 1.43 in² SP: 0.492 k/ft³
LE: 49.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.70

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

BL#	CSX ksi	TSX ksi	VMX f/s	FMX kips	FVP []	BPM **	EF2 k-ft	ETR (%)	EMX k-ft
2	27.8	19.5	16.6	40	0.9	1.9	0.357	84.9	0.297
3	28.2	20.3	16.6	40	0.8	1.9	0.350	83.5	0.292
4	27.8	20.0	16.6	40	0.9	53.1	0.345	83.1	0.291
5	27.7	19.1	16.4	40	0.8	51.7	0.347	80.8	0.283
6	27.7	20.2	16.4	40	0.8	51.9	0.342	81.1	0.284
7	26.8	20.8	15.8	38	0.9	52.1	0.342	80.3	0.281
8	26.7	20.0	15.8	38	0.9	52.2	0.336	79.5	0.278
9	27.2	19.1	16.2	39	0.9	51.5	0.340	79.8	0.279
10	27.9	21.7	15.5	40	0.8	51.8	0.341	80.9	0.283
11	27.9	21.6	15.8	40	0.8	52.1	0.339	81.1	0.284
12	27.2	19.9	16.3	39	0.9	51.7	0.343	81.2	0.284
13	26.7	18.9	15.3	38	1.0	51.8	0.341	81.7	0.286
14	27.4	19.1	14.4	39	1.1	51.7	0.339	80.7	0.283
15	27.6	17.8	14.5	39	0.8	51.8	0.343	81.2	0.284
16	26.9	19.4	16.5	38	0.9	51.6	0.338	81.6	0.286
17	26.3	18.9	15.2	38	1.0	51.7	0.342	80.3	0.281
18	27.7	17.8	16.6	40	0.8	51.9	0.343	81.7	0.286
19	27.7	17.5	16.7	40	0.8	51.6	0.348	83.4	0.292
20	27.0	17.1	16.6	39	0.9	51.9	0.342	82.0	0.287
21	26.9	16.3	14.5	38	1.0	51.2	0.346	82.4	0.288
22	26.5	16.1	15.7	38	0.9	51.9	0.347	82.6	0.289
23	27.0	15.0	14.1	39	1.1	51.7	0.348	78.2	0.274
24	26.4	14.5	16.1	38	0.9	51.4	0.337	80.7	0.282
25	26.8	14.0	15.8	38	0.9	52.2	0.348	80.0	0.280
26	27.0	14.1	15.9	39	0.9	51.5	0.351	80.3	0.281
27	28.0	13.4	15.4	40	0.8	51.8	0.350	80.8	0.283
28	26.6	12.9	14.9	38	0.8	51.6	0.334	80.2	0.281
29	26.7	12.8	14.1	38	0.8	51.7	0.339	81.4	0.285
30	27.8	11.9	16.2	40	0.9	51.5	0.352	82.0	0.287
31	27.4	12.2	16.1	39	0.9	51.7	0.339	80.3	0.281
32	28.3	11.5	15.9	41	0.8	51.3	0.349	79.5	0.278
33	26.6	12.3	16.3	38	0.8	51.7	0.337	78.7	0.276
34	27.4	12.1	14.9	39	1.0	51.6	0.347	81.4	0.285
35	27.7	11.6	14.3	40	0.8	51.9	0.345	81.5	0.285
Average	27.3	16.8	15.7	39	0.9	48.8	0.344	81.1	0.284

Total number of blows analyzed: 34

Time Summary

Drive 7 minutes 40 seconds

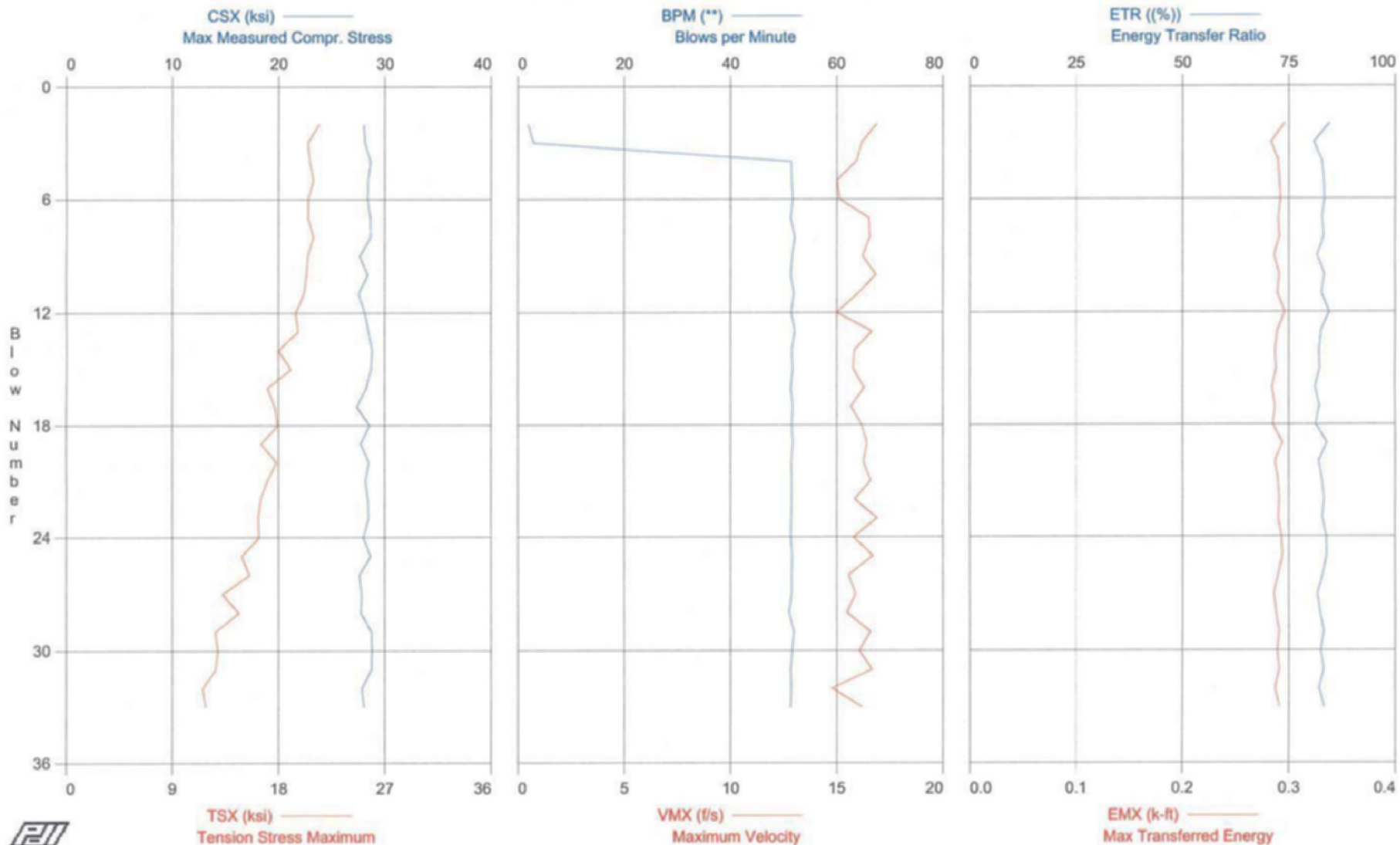
1:58:51 PM - 2:06:31 PM (1/24/2009) BN 1 - 35

PDIPLOT Ver. 2008.2 - Printed: 5-Mar-2009

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 24-Jan-2009

EXELON VICTORIA - Boring B3204 (49.1'-50.6' sample)



EXELON VICTORIA - Boring B3204 (49.1'-50.6' sample)
OP: JNH

Hammer ID: MEC02; Driller: D.WHITE CME 55LC (MACTEC)
Test date: 24-Jan-2009

AR: 1.43 in² SP: 0.492 k/ft³
LE: 54.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.70

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

BL#	CSX ksi	TSX ksi	VMX f/s	FMX kips	FVP []	BPM **	EF2 k-ft	ETR (%)	EMX k-ft
2	28.0	21.5	16.9	40	0.9	1.9	0.347	84.5	0.296
3	28.1	20.5	16.2	40	0.8	2.9	0.335	80.8	0.283
4	28.7	20.6	15.9	41	0.8	51.4	0.343	82.7	0.290
5	28.4	21.0	15.0	41	1.1	51.5	0.348	83.2	0.291
6	28.4	20.5	15.1	41	1.1	51.7	0.350	83.3	0.292
7	28.6	20.5	16.5	41	0.8	51.3	0.343	82.8	0.290
8	28.7	21.0	16.6	41	0.8	52.1	0.348	83.1	0.291
9	27.6	20.5	16.2	40	0.9	51.6	0.345	81.6	0.286
10	28.4	20.4	16.8	41	0.9	51.3	0.348	83.3	0.291
11	27.5	20.2	16.0	39	1.0	51.9	0.352	82.6	0.289
12	28.1	19.5	15.0	40	1.1	51.4	0.344	84.4	0.296
13	28.5	19.7	16.7	41	0.8	52.1	0.342	82.5	0.289
14	28.8	18.0	15.8	41	0.8	51.5	0.353	82.0	0.287
15	28.7	19.1	15.8	41	0.8	51.7	0.345	82.2	0.288
16	28.2	17.1	16.3	40	0.8	51.3	0.337	81.2	0.284
17	27.4	17.7	15.7	39	1.0	51.7	0.350	82.1	0.287
18	28.6	17.9	16.2	41	0.8	51.5	0.345	81.3	0.285
19	27.7	16.5	16.4	40	0.9	51.7	0.348	83.9	0.294
20	28.5	17.8	16.3	41	0.9	51.4	0.345	81.9	0.287
21	28.1	17.1	16.6	40	0.9	51.5	0.341	82.8	0.290
22	28.4	16.5	15.8	41	0.9	51.5	0.354	83.2	0.291
23	28.5	16.3	16.9	41	0.9	51.4	0.350	82.9	0.290
24	28.0	16.4	15.8	40	1.0	51.3	0.348	83.8	0.293
25	28.7	14.9	16.7	41	0.8	51.6	0.343	83.9	0.294
26	27.6	15.5	15.6	39	1.0	51.5	0.345	82.9	0.290
27	27.8	13.2	15.9	40	0.9	51.5	0.342	81.7	0.286
28	27.8	14.6	15.5	40	1.0	51.0	0.350	82.3	0.288
29	28.7	12.6	16.6	41	0.8	51.9	0.348	83.2	0.291
30	28.8	12.9	16.1	41	0.8	51.6	0.355	82.4	0.289
31	28.7	12.7	16.7	41	0.8	51.3	0.346	83.1	0.291
32	27.8	11.6	14.8	40	1.1	51.4	0.347	82.0	0.287
33	28.0	11.8	16.2	40	0.9	51.3	0.344	83.2	0.291
Average	28.2	17.4	16.1	40	0.9	48.5	0.346	82.7	0.290

Total number of blows analyzed: 32

Time Summary

Drive 6 minutes 36 seconds

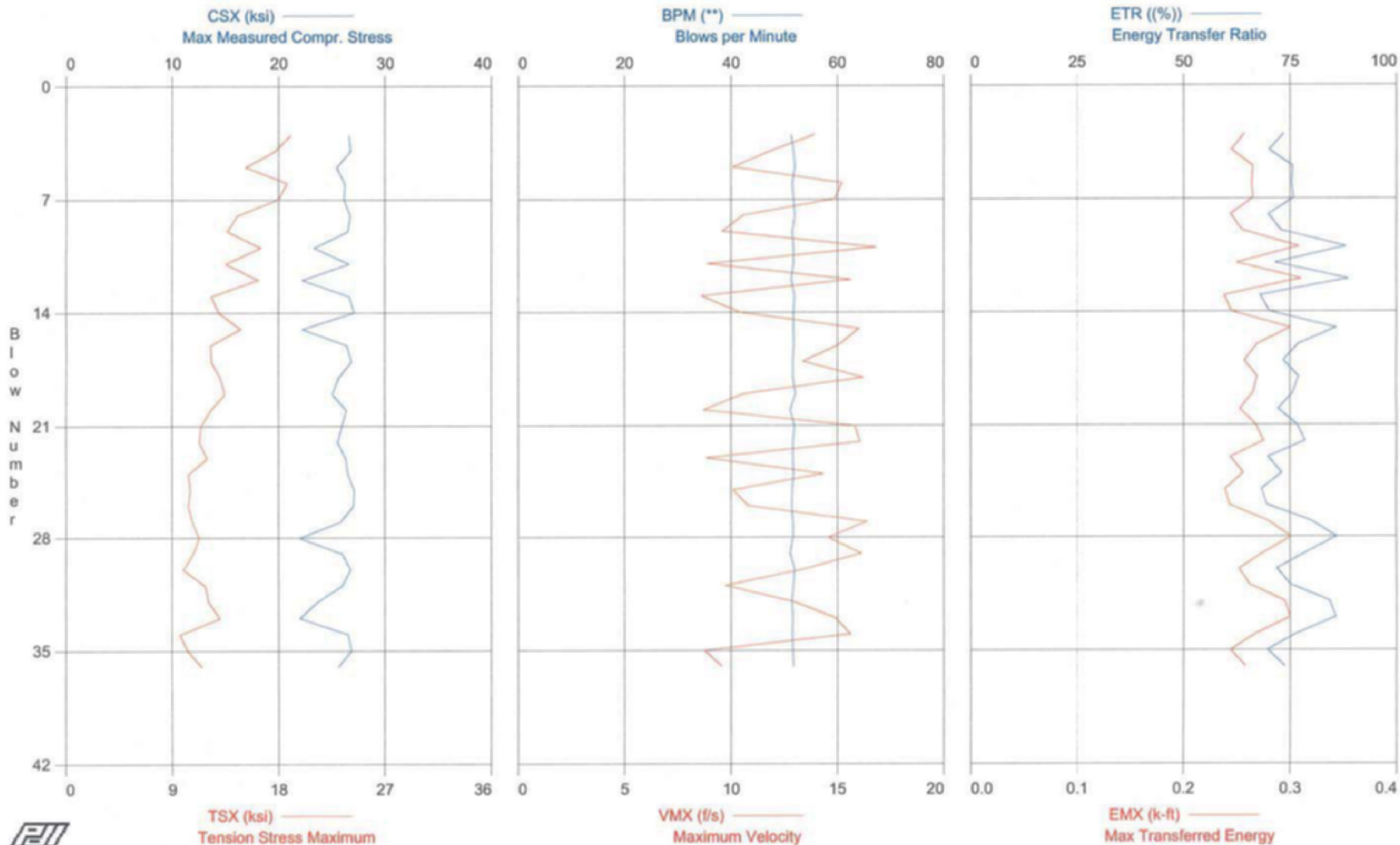
2:27:56 PM - 2:34:32 PM (1/24/2009) BN 1 - 33

PDIPLOT Ver. 2008.2 - Printed: 5-Mar-2009

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 24-Jan-2009

EXELON VICTORIA - Boring B3204 (54.1'-55.6'sample)



EXELON VICTORIA - Boring B3204 (54.1'-55.6'sample)
OP: JNH

Hammer ID: MEC02; Driller: D.WHITE CME 55LC (MACTEC)
Test date: 24-Jan-2009

AR: 1.43 in² SP: 0.492 k/ft³
LE: 59.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.70

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

BL#	CSX ksi	TSX ksi	VMX f/s	FMX kips	FVP []	BPM **	EF2 k-ft	ETR (%)	EMX k-ft
3	26.6	19.0	13.9	38	0.4	51.3	0.333	73.5	0.257
4	26.7	17.7	11.9	38	1.0	51.7	0.336	70.0	0.245
5	25.4	15.2	10.1	36	1.5	52.0	0.337	75.6	0.265
6	26.2	18.7	15.2	37	0.4	51.5	0.331	75.3	0.264
7	26.1	18.0	14.9	37	0.4	51.7	0.328	75.8	0.265
8	26.7	14.5	10.6	38	0.4	52.0	0.330	69.9	0.244
9	26.5	13.7	9.6	38	1.0	51.5	0.344	72.8	0.255
10	23.3	16.5	16.8	33	0.6	51.7	0.330	88.1	0.308
11	26.6	13.5	8.9	38	1.0	51.7	0.341	71.4	0.250
12	22.2	16.3	15.6	32	0.8	51.3	0.333	88.6	0.310
13	26.6	12.3	8.6	38	1.0	51.9	0.332	68.0	0.238
14	27.1	12.9	10.4	39	0.4	51.7	0.339	70.1	0.245
15	22.2	14.8	16.0	32	0.7	51.7	0.332	85.8	0.300
16	26.4	12.3	15.1	38	0.4	51.8	0.330	76.9	0.269
17	26.8	12.3	13.4	38	0.4	51.6	0.334	73.3	0.257
18	25.6	13.1	16.2	37	0.4	51.6	0.325	77.0	0.269
19	25.0	13.5	10.6	36	1.3	52.1	0.336	75.6	0.265
20	26.4	12.2	8.7	38	1.7	51.1	0.338	72.2	0.253
21	25.9	11.5	15.8	37	0.4	51.9	0.327	76.7	0.268
22	25.5	11.3	16.1	37	0.5	51.6	0.323	78.5	0.275
23	26.3	12.0	8.8	38	1.0	51.6	0.329	69.8	0.244
24	26.5	10.4	14.3	38	0.4	51.7	0.327	73.0	0.256
25	27.1	10.5	10.1	39	0.4	51.5	0.333	68.3	0.239
26	27.0	10.4	10.8	39	0.4	51.4	0.335	69.5	0.243
27	25.8	10.7	16.4	37	0.5	51.6	0.331	79.8	0.279
28	22.0	11.3	14.6	31	0.8	51.6	0.334	85.9	0.301
29	26.0	10.8	16.1	37	0.5	51.1	0.332	78.7	0.275
30	26.7	10.0	13.4	38	0.4	51.9	0.330	71.9	0.252
31	26.0	11.8	9.7	37	1.5	51.7	0.342	75.0	0.262
32	23.6	12.1	12.9	34	1.0	51.4	0.340	84.3	0.295
33	22.0	13.0	14.9	31	0.8	51.6	0.335	85.7	0.300
34	26.5	9.7	15.6	38	0.4	51.5	0.332	76.6	0.268
35	26.8	10.3	8.8	38	0.4	51.6	0.332	69.6	0.244
36	25.6	11.5	9.6	37	1.5	51.7	0.333	73.6	0.258
Average	25.6	13.0	12.8	37	0.7	51.6	0.333	75.8	0.265

Total number of blows analyzed: 34

Time Summary

Drive 2 minutes 33 seconds

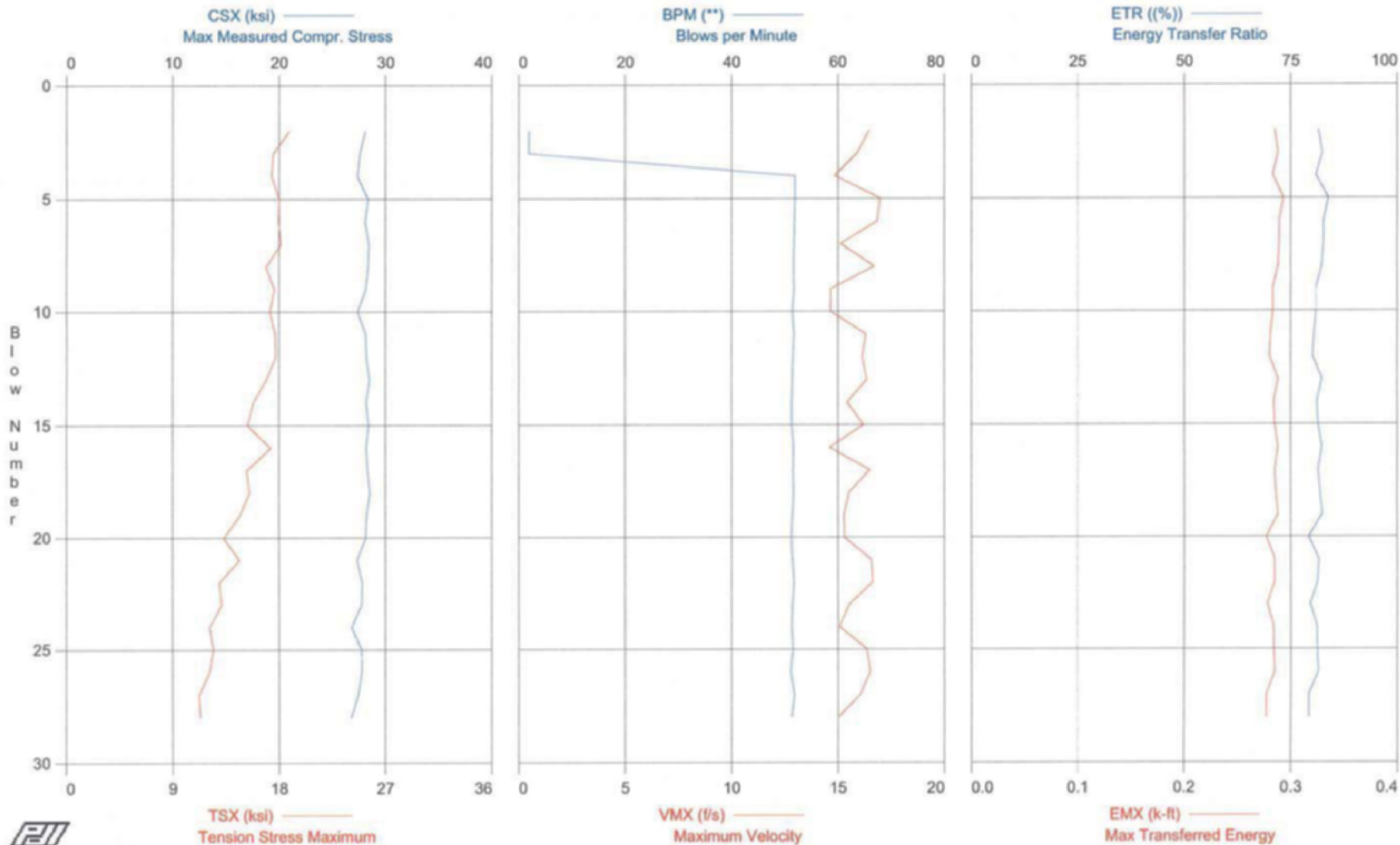
3:03:39 PM - 3:06:12 PM (1/24/2009) BN 1 - 36

PDILOT Ver. 2008.2 - Printed: 5-Mar-2009

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 24-Jan-2009

EXELON VICTORIA - Boring B3204 (64.1'-65.6' sample)



EXELON VICTORIA - Boring B3204 (64.1'-65.6' sample)
OP: JNH

Hammer ID: MEC02; Driller: D.WHITE CME 55LC (MACTEC)
Test date: 24-Jan-2009

AR: 1.43 in²
LE: 69.00 ft
WS: 16,807.9 l/s

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

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
VMX: Maximum Velocity
FMX: Maximum Force
FVP: Force/Velocity proportionality

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

BL#	CSX ksi	TSX ksi	VMX f/s	FMX kips	FVP []	BPM **	EF2 k-ft	ETR (%)	EMX k-ft
2	28.1	18.9	16.5	40	0.8	1.9	0.330	81.5	0.285
3	27.6	17.5	15.9	39	0.9	1.9	0.339	82.4	0.288
4	27.4	17.4	14.8	39	1.0	51.9	0.333	80.9	0.283
5	28.4	18.0	17.0	41	0.8	51.9	0.335	83.8	0.293
6	28.1	18.0	16.8	40	0.8	51.8	0.328	82.7	0.289
7	28.4	18.2	15.1	41	0.8	51.7	0.333	82.7	0.289
8	28.4	16.9	16.7	41	0.8	51.6	0.335	82.2	0.288
9	28.1	17.6	14.7	40	0.8	51.7	0.330	80.9	0.283
10	27.4	17.2	14.6	39	1.1	51.4	0.335	80.9	0.283
11	28.1	17.7	16.3	40	0.8	51.7	0.328	80.4	0.281
12	28.2	17.7	16.1	40	0.8	51.5	0.330	80.1	0.280
13	28.5	16.9	16.4	41	0.8	51.4	0.331	82.3	0.288
14	28.2	15.8	15.4	40	0.8	51.3	0.341	81.1	0.284
15	28.4	15.4	16.2	41	0.8	51.3	0.340	81.4	0.285
16	28.2	17.3	14.6	40	0.8	51.6	0.336	82.2	0.288
17	28.3	15.3	16.5	40	0.8	51.5	0.341	81.4	0.285
18	28.5	15.5	15.5	41	0.8	51.6	0.337	81.8	0.286
19	28.2	14.7	15.3	40	0.8	51.4	0.337	82.3	0.288
20	28.1	13.3	15.3	40	0.8	51.2	0.332	79.2	0.277
21	27.3	14.7	16.6	39	0.9	51.4	0.337	81.5	0.285
22	27.8	13.0	16.6	40	0.8	51.7	0.336	81.3	0.285
23	27.8	13.1	15.5	40	0.8	51.4	0.329	79.5	0.278
24	26.8	12.1	15.1	38	1.0	51.3	0.326	81.1	0.284
25	27.8	12.4	16.4	40	0.8	51.5	0.331	81.2	0.284
26	27.8	12.1	16.5	40	0.8	51.1	0.328	81.5	0.285
27	27.4	11.2	16.0	39	0.8	51.8	0.323	79.2	0.277
28	26.8	11.3	15.0	38	1.0	51.3	0.330	79.2	0.277
Average	27.9	15.5	15.8	40	0.9	47.8	0.333	81.3	0.284

Total number of blows analyzed: 27

Time Summary

Drive 8 minutes 9 seconds

4:00:30 PM - 4:08:39 PM (1/24/2009) BN 1 - 28



Engineering and constructing a better tomorrow

May 4, 2009

Memorandum to File

From: Jon Honeycutt, Staff Professional JVH

Reviewed By: Steve Kiser, Principal Professional SK

Subject: **Report of SPT Energy – MACTEC Charlotte CME 550 ATV
Hammer Serial No. ME-05 Automatic Hammer
WORK INSTRUCTION No. 311 (DCN EXE917)
Exelon Texas COL Project – Supplemental Investigation, Including UHS
Victoria County, Texas
MACTEC Project No. 6468-07-1777**

Jonathan Honeycutt, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the above referenced 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 January 23, 24 and 25, 2009, during drilling of Boring B3104 at the referenced site. The testing was performed by Jonathan Honeycutt from approximately 12:01 PM to 12:14 PM (ET) on January 23 under sunny and clear skies with a temperature of about 70 degrees Fahrenheit, from approximately 9:44 AM to 12:01 PM (ET) on January 24 under cloudy skies with a temperature of about 60 degrees Fahrenheit, and from approximately 9:50 to 9:55 AM (ET) on January 25 under cloudy skies with a temperature of about 65 degrees Fahrenheit. The boring was drilled with personnel and equipment from the MACTEC Charlotte office. The drilling equipment consisted of a CME 550 model ATV-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 boring. The drill rig operator during sampling was Mr. Mickey Casteel. 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 K1050) and strain gages (Serial Nos. NW#95/1 and NW#95/2 on January 23; NW#146/1 and NW#146/2 on January 24 and 25). 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 inserts had cross-sectional areas of approximately 2.31 square inches

18 Pages Total

MACTEC Engineering and Consulting, Inc.

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(NW#95) and 1.43 square inches (NW#146) 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 918.

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 3.

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. This may result in more or less blows evaluated for ETR than what is shown on the boring logs.
- The average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 242 foot-pounds to 254 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 69% to 73% 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 247.1 foot-pounds, with an average ETR of 70.6%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction No. 311 – DCN EXE917 – 1 Page
Pages 6 – 8 Record of SPT Energy Measurement – 3 Pages
Pages 9 – 18 PDILOT Output – 10 Pages

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
 Exelon Texas COL Project - Supplemental Investigation, Including UHS
 Victoria, Texas
 MACTEC Project No. 6468-07-1777

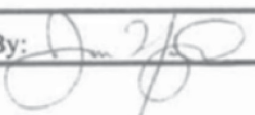
Automatic Hammer Serial Number and Rig Model	Rig Owner	Rig Operator	Boring No. Tested	Date Tested	Drill Rod Size	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs) ^a	Energy Transfer Ratio (%) ^b (Average ETR)
ME-05 (CME 550 ATV)	MACTEC Charlotte	Mickey Casteel	B3104	1/23/2009	NW-J	13.7 - 15.2	5 - 7 - 9	21	254	72.6%
				1/24/2009		53.5 - 55	8 - 12 - 17	37	242	69.1%
						68.6 - 70.1	6 - 9 - 13	28	247	70.6%
						73.6 - 75.1	8 - 10 - 14	32	244	69.7%
				1/25/2009		108.6 - 110.1	8 - 9 - 13	31	252	72.0%
Average for Rig:							247.1	70.6%		

^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. This may result in more or less blows evaluated for ETR than what is shown on the boring logs.

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

Prepared By: 	Date: 5/4/09	Checked By: 	Date: 5-4-09
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Work Instruction No. 311
Exelon COL Victoria Site
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6468-07-1777

DCN 11/2/09

Issued To: Steve Kiser and Jonathan Honeycutt

Issued By: Daniel E. Atkinson

Rev. No. 0

Valid From: 1/12/09

Date: 1/12/09

To: 12/31/09

Task Description: Perform SPT Energy Measurements

Applicable Technical Procedures or Plans, or other reference:

1. Geotechnical Work Plan (current revision; available at Site Office), and
2. ASTM D 4633-05 (copy attached.).

Specific Instructions (note attachments where necessary): Perform energy measurements for each drill rig on site in accordance with ASTM D-4633-05. Consult with Site Manager as to schedule for performing the measurements. Hammer weights have been checked by site personnel, and records will be available on site. All rigs are using automatic hammer systems. Confirm that automatic hammer system is being operated within manufacturer's recommendations or in a typical operating fashion as observed from watching one or two SPT measurements prior to measuring energy. Check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Manager. See Site Manager for current boring logs of holes drilled and use these to plan most effective field measurement program. Submit copies of calibration records for equipment to Project Principal for review prior to beginning work on site.

Special Instructions (note attachments where necessary): Confirm with Site Manager that approval of equipment calibration records have been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, contact Site Manager or Project Principal immediately.

Report Format: Prepare standard report in accordance with ASTM D 4633 requirements.

Specific Quality Assurance Procedures Applicable: QAP 20-1; QAP 25-1; QAP for Reporting Nuclear-Related Defects, or Noncompliances, per Federal Regulation 10CFR21 and Section 306 of the Energy Reorganization Act of 1974. Current revisions apply.

Hold Points or Witness Points: None

Records: All records generated shall be considered QA Records.

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

Project Manager: _____

Project Principal Engineer: _____

Site Manager/Coordinator: _____

Pages: 1 plus attachment

Attachments: ASTM D 4633-05

Date: _____

Date: _____

Date: 11/2/09

DCN: EXE917

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	MAKE:	CME
LOCATION:	Victoria, Texas	MODEL:	550
PROJECT NO.:	6468-07-1777	SERIAL NO.:	ME 05
DATE:	1/23/2007	HAMMER TYPE:	Auto
WEATHER:	SUNNY 70°F C/FAIR SKIES	ROPE CONDITION:	N/A
INSPECTOR:	JNH	ROD SIZE:	NW 5
DRILLING COMPANY:	MACTEC	NO. OF SHEAVES:	N/A

BORING DATA	
BORING NUMBER:	B3104
DEPTH DRILLED:	Various
TIME DRIVEN:	11:00 am - 4:00 pm
RIG OPERATOR:	M. CASTELL
HAMMER OPERATOR:	N/A
PDA PAK SERIAL NO.:	3622L
INSTR. ROD AREA:	2-31 in 2
ACCEL. SERIAL NOS.:	43-41050 44 4990
STRAIN SERIAL NOS.:	75 NW 1/2

[illegible]

REMARKS:

1 * (23.8 - 25.3) - BAD	Don't do
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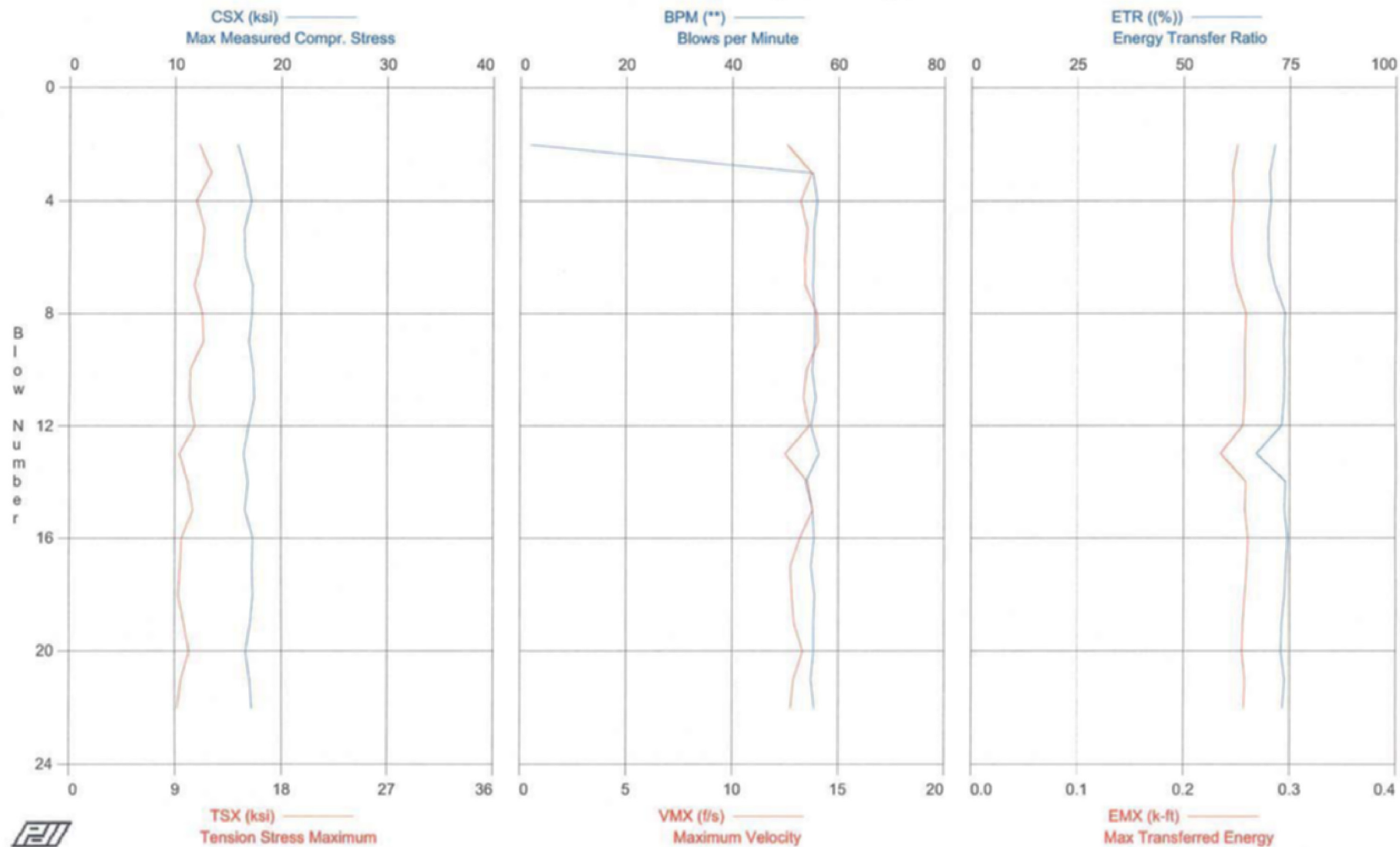
2* (38.7 - 40.2) - BAD DATA

PDIPLOT Ver. 2008.1 - Printed: 24-Mar-2009

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 23-Jan-2009

EXELON VICTORIA - Boring B3104 (13.7'-15.2' sample)



EXELON VICTORIA - Boring B3104 (13.7'-15.2' sample)
OP: JNH

Hammer ID: ME05; Driller: M.CASTEEL CME 550 (MACTEC)
Test date: 23-Jan-2009

AR: 2.31 in² SP: 0.492 k/ft³
LE: 19.00 ft EM: 30,000 ksi
WS: 16,807.9 l/s JC: 0.70

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

BL#	CSX ksi	TSX ksi	VMX l/s	FMX kips	FVP []	BPM **	EF2 k-ft	ETR (%)	EMX k-ft
2	15.9	11.0	12.6	37	0.8	1.9	0.175	71.6	0.251
3	16.6	12.0	13.7	38	0.8	55.2	0.172	70.3	0.246
4	17.2	10.8	13.2	40	0.8	56.0	0.172	70.6	0.247
5	16.5	11.5	13.5	38	0.8	55.4	0.172	69.9	0.245
6	16.6	11.2	13.4	38	0.8	55.4	0.169	70.0	0.245
7	17.3	10.6	13.4	40	0.8	55.2	0.175	71.6	0.250
8	17.3	11.3	14.0	40	0.8	55.6	0.180	73.9	0.259
9	17.0	11.4	14.1	39	0.7	55.6	0.179	73.7	0.258
10	17.4	10.3	13.5	40	0.8	55.1	0.179	73.9	0.258
11	17.5	10.2	13.4	40	0.8	55.8	0.179	73.8	0.258
12	16.9	10.7	13.6	39	0.8	54.9	0.176	73.2	0.256
13	16.5	9.4	12.5	38	0.8	56.4	0.163	67.2	0.235
14	16.9	10.1	13.6	39	0.7	53.9	0.175	74.1	0.259
15	16.6	10.5	13.8	38	0.7	55.2	0.174	73.8	0.258
16	17.4	9.6	13.2	40	0.8	55.5	0.177	74.6	0.261
17	17.3	9.4	12.7	40	0.8	54.9	0.176	74.2	0.260
18	17.3	9.3	12.8	40	0.8	55.6	0.176	73.9	0.258
19	17.1	9.7	12.9	39	0.8	55.4	0.175	73.2	0.256
20	16.6	10.2	13.3	38	0.7	55.4	0.172	72.9	0.255
21	17.0	9.5	12.9	39	0.8	54.9	0.173	73.8	0.258
22	17.2	9.2	12.8	40	0.8	55.5	0.173	73.3	0.257
Average	17.0	10.4	13.3	39	0.8	52.8	0.174	72.5	0.254

Total number of blows analyzed: 21

Time Summary

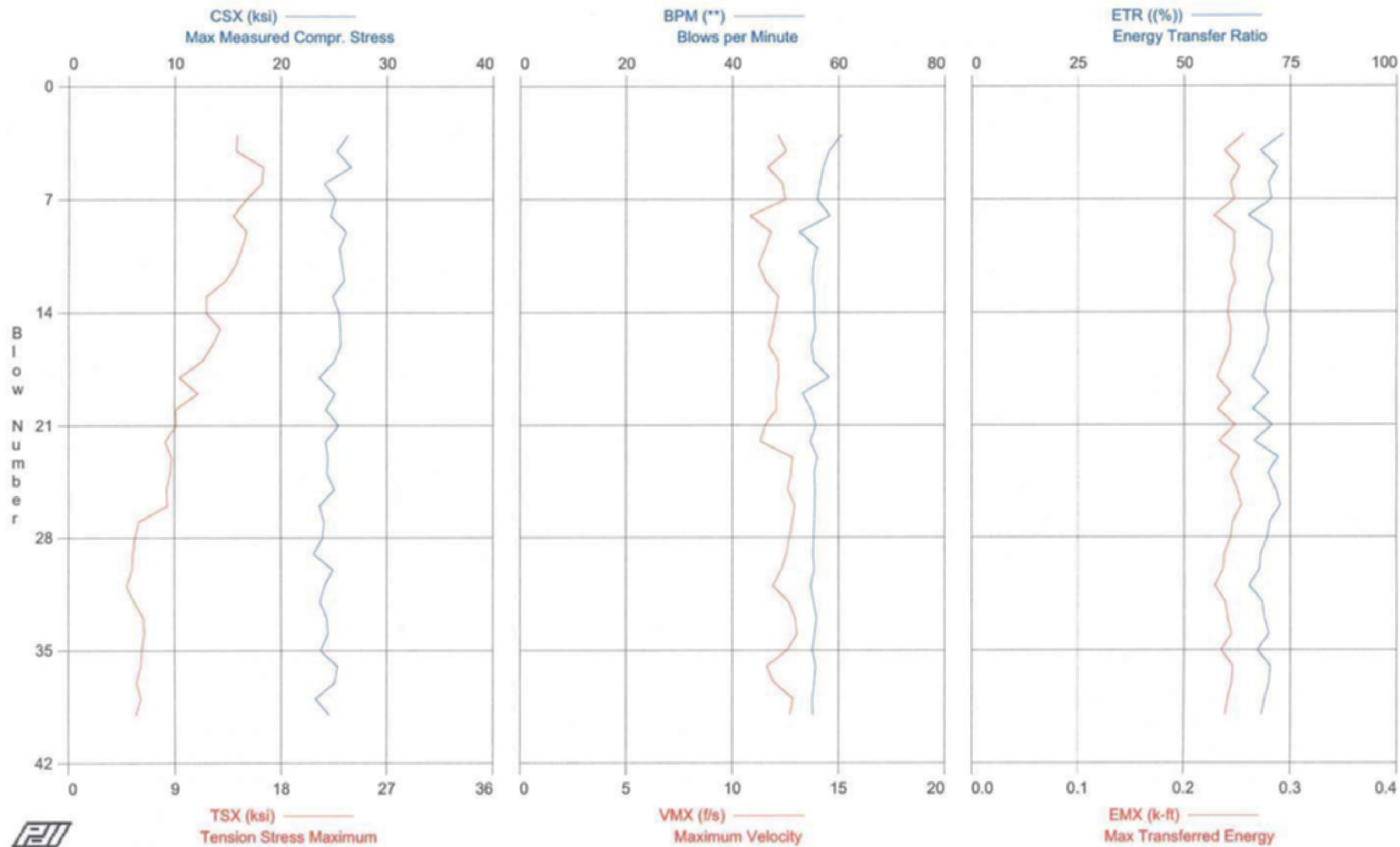
Drive 12:01:19 PM - 12:01:19 PM (1/23/2009) BN 1 - 1
Stop 12 minutes 42 seconds 12:01:19 PM - 12:14:01 PM
Drive 22 seconds 12:14:01 PM - 12:14:23 PM BN 2 - 22
Total time [0:13:04] = (Driving [0:00:22] + Stop [0:12:42])

PDILOT Ver. 2008.2 - Printed: 10-Mar-2009

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 24-Jan-2009

EXELON VICTORIA - Boring B3104 (53.5'-55' sample)



EXELON VICTORIA - Boring B3104 (53.5'-55' sample)
OP: JNH

Hammer ID: ME05; Driller: M.CASTEEL CME 550 (MACTEC)
Test date: 24-Jan-2009

AR: 1.43 in² SP: 0.492 k/ft³
LE: 59.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.70

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

BL#	CSX ksi	TSX ksi	VMX f/s	FMX kips	FVP []	BPM **	EF2 k-ft	ETR (%)	EMX k-ft
3	26.3	14.3	12.1	38	1.2	60.5	0.307	73.1	0.256
4	25.3	14.2	12.5	36	1.0	58.2	0.280	68.0	0.238
5	26.6	16.5	11.7	38	1.3	57.1	0.299	71.9	0.252
6	24.1	16.4	12.4	34	1.1	56.5	0.291	69.8	0.244
7	25.1	15.0	12.5	36	1.0	56.0	0.296	70.6	0.247
8	24.7	14.0	10.8	35	1.3	58.4	0.271	65.1	0.228
9	26.2	15.1	11.8	37	0.9	52.6	0.294	70.7	0.247
10	25.5	14.7	11.5	36	1.2	56.0	0.288	70.6	0.247
11	25.8	14.2	11.2	37	1.3	55.2	0.290	69.7	0.244
12	26.0	13.3	11.5	37	0.9	55.1	0.291	70.9	0.248
13	24.9	11.7	12.2	36	1.1	55.4	0.290	69.4	0.243
14	25.5	11.7	12.0	36	0.9	55.4	0.284	69.0	0.241
15	25.6	12.9	11.9	37	0.9	55.6	0.284	69.8	0.244
16	25.7	12.2	11.7	37	0.9	54.9	0.287	69.3	0.243
17	25.1	11.3	12.2	36	0.9	55.3	0.279	67.7	0.237
18	23.6	9.4	12.2	34	1.1	58.2	0.265	66.0	0.231
19	25.1	11.0	12.1	36	1.2	53.2	0.287	69.8	0.244
20	24.3	9.1	12.1	35	0.9	54.9	0.268	66.2	0.232
21	25.5	9.1	11.5	36	0.9	55.7	0.284	70.8	0.248
22	24.2	8.2	11.3	35	0.9	54.7	0.267	66.5	0.233
23	24.4	8.8	12.8	35	1.0	56.0	0.285	72.1	0.252
24	24.4	8.6	12.8	35	0.9	55.4	0.279	69.8	0.244
25	25.0	8.3	12.6	36	0.9	55.6	0.282	71.5	0.250
26	23.7	8.4	12.9	34	1.0	55.5	0.288	72.7	0.254
27	24.1	6.0	12.8	34	1.0	55.4	0.284	70.3	0.246
28	23.9	5.7	12.7	34	1.1	55.3	0.279	69.6	0.244
29	23.1	5.5	12.6	33	1.0	55.2	0.277	68.0	0.238
30	24.9	5.4	12.3	36	0.9	55.4	0.273	67.8	0.237
31	24.1	4.9	11.9	34	0.9	54.8	0.260	65.4	0.229
32	23.7	5.6	12.7	34	1.1	55.3	0.272	68.4	0.239
33	24.3	6.4	13.0	35	0.9	55.9	0.274	68.9	0.241
34	24.4	6.5	13.1	35	0.9	55.5	0.276	70.0	0.245
35	23.7	6.2	12.6	34	1.1	55.1	0.272	67.3	0.235
36	25.3	6.1	11.6	36	0.8	55.7	0.282	70.3	0.246
37	25.1	5.8	12.0	36	1.2	55.4	0.278	70.0	0.245
38	23.2	6.2	12.9	33	1.0	55.1	0.276	68.9	0.241
39	24.6	5.7	12.7	35	0.9	55.2	0.272	68.2	0.239
Average	24.8	9.8	12.2	35	1.0	55.7	0.281	69.3	0.242

Total number of blows analyzed: 37

Time Summary

Drive 3 minutes 39 seconds

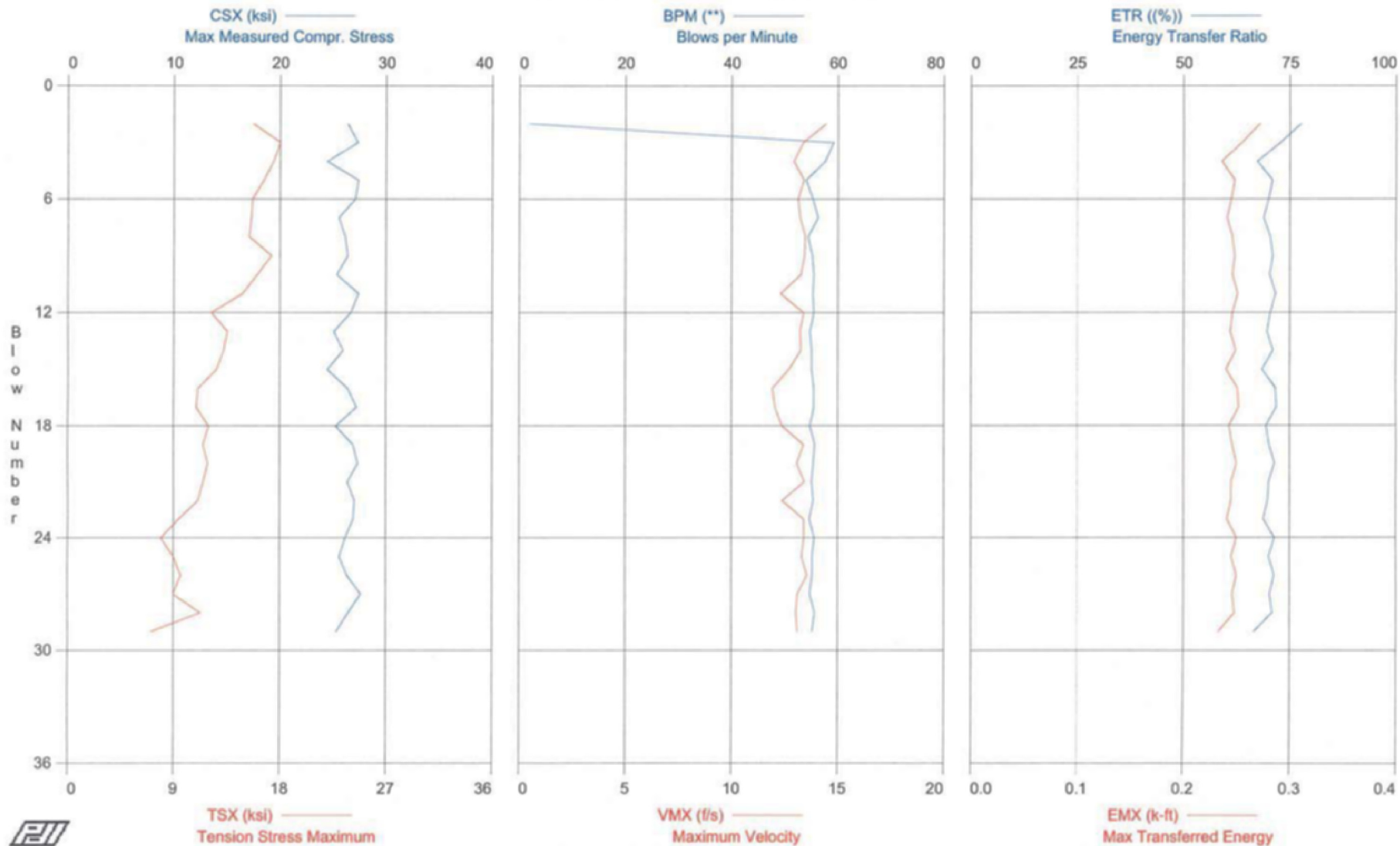
9:44:16 AM - 9:47:55 AM (1/24/2009) BN 1 - 39

PDILOT Ver. 2008.2 - Printed: 10-Mar-2009

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 24-Jan-2009

EXELON VICTORIA - Boring B3104 (68.6-70.1 sample)



EXELON VICTORIA - Boring B3104 (68.6-70.1 sample)
OP: JNH

Hammer ID: ME05; Driller: M.CASTEEL CME 550 (MACTEC)
Test date: 24-Jan-2009

AR: 1.43 in^2
LE: 74.00 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
VMX: Maximum Velocity
FMX: Maximum Force
FVP: Force/Velocity proportionality

BPM: Blows per Minute
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	CSX ksi	TSX ksi	VMX f/s	FMX kips	FVP []	BPM **	EF2 k-ft	ETR (%)	EMX k-ft
2	26.4	15.7	14.4	38	1.0	1.9	0.313	77.7	0.272
3	27.3	18.0	13.4	39	0.9	59.2	0.289	72.8	0.255
4	24.4	17.4	12.9	35	1.1	57.6	0.279	67.3	0.236
5	27.4	16.6	13.4	39	0.9	54.0	0.294	70.9	0.248
6	27.1	15.7	13.1	39	0.9	55.3	0.291	70.0	0.245
7	25.6	15.6	13.2	37	1.0	56.3	0.289	68.8	0.241
8	26.1	15.4	13.5	37	1.0	54.4	0.296	70.4	0.246
9	26.4	17.3	13.4	38	1.0	55.2	0.290	71.0	0.248
10	25.4	16.1	13.3	36	1.0	55.5	0.289	70.2	0.246
11	27.4	14.8	12.3	39	0.9	55.3	0.302	71.7	0.251
12	26.7	12.2	13.4	38	0.9	55.5	0.292	70.4	0.246
13	25.1	13.5	13.2	36	1.0	54.8	0.285	69.6	0.244
14	26.0	13.2	13.3	37	1.0	55.1	0.286	71.1	0.249
15	24.5	12.6	12.7	35	1.1	55.1	0.279	68.5	0.240
16	26.4	11.1	11.9	38	1.2	55.5	0.294	71.7	0.251
17	27.2	10.9	12.1	39	0.9	55.5	0.297	71.9	0.252
18	25.3	12.0	12.4	36	1.1	54.8	0.280	69.4	0.243
19	26.9	11.5	13.4	38	0.9	55.7	0.285	70.2	0.246
20	27.3	11.9	13.1	39	0.9	55.4	0.288	71.4	0.250
21	26.4	11.5	13.4	38	1.0	55.1	0.289	70.1	0.245
22	27.0	11.1	12.4	39	0.9	55.4	0.283	69.9	0.245
23	26.9	9.4	13.4	38	0.9	54.7	0.286	68.8	0.241
24	26.2	7.9	13.4	37	1.0	55.6	0.292	71.4	0.250
25	25.6	9.0	13.3	37	1.0	55.2	0.291	70.1	0.245
26	26.3	9.6	13.6	38	1.0	55.2	0.293	71.4	0.250
27	27.6	9.0	13.1	40	0.9	54.8	0.289	70.3	0.246
28	26.5	11.3	13.0	38	1.1	55.7	0.290	70.9	0.248
29	25.3	7.1	13.1	36	1.1	55.2	0.287	66.6	0.233
Average	26.3	12.8	13.1	38	1.0	53.5	0.290	70.5	0.247

Total number of blows analyzed: 28

Time Summary

Drive 1 minute 5 seconds

11:24:51 AM - 11:25:56 AM (1/24/2009) BN 1 - 29