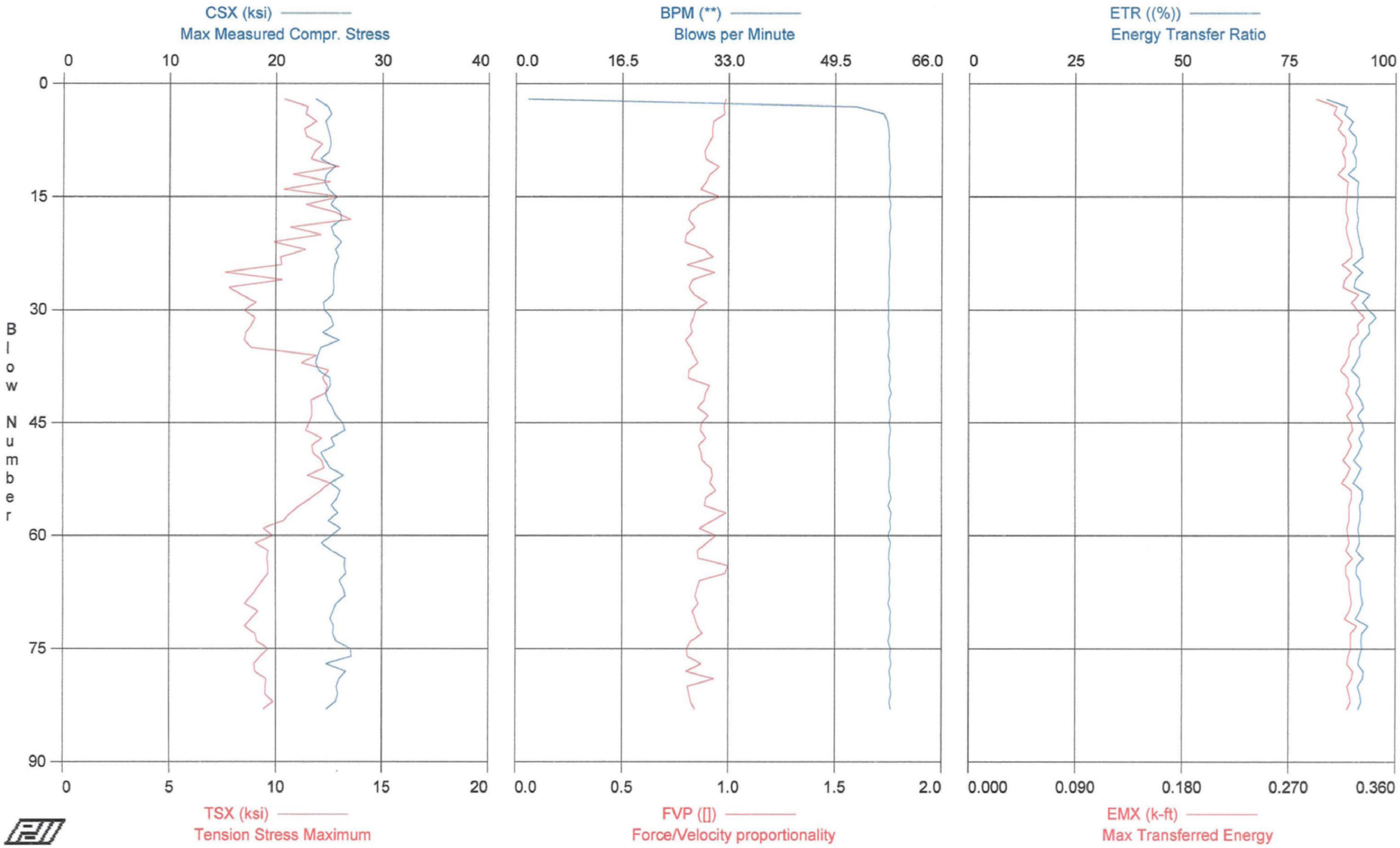
MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 23-Apr-2008

TURKEY POINT COL PROJECT - BORING B-636; 16.3 - 17.1 Sample



TURKEY POINT COL PROJECT - BORING B-636; 16.3 - 17.1 Sample
OP: HJC

HAMMER ID 72425 (P.PITTS)
Test date: 23-Apr-2008

AR: 1.49 in^2
LE: 26.00 ft
WS: 16,800.0 f/s

SP: 0.492 k/ft3
EM: 29,972 ksi
JC: 0.70

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

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	23.7	10.4	35	13.4	1.9	0.99	0.310	84	0.293
3	0.00	24.8	11.5	37	14.3	52.7	0.98	0.320	89	0.310
4	0.00	25.2	11.4	38	14.3	57.0	0.98	0.324	88	0.308
5	0.00	24.6	11.9	37	14.9	57.5	0.93	0.323	90	0.315
6	0.00	24.8	11.3	37	15.1	57.7	0.92	0.325	89	0.311
7	0.00	25.1	11.4	37	15.2	57.8	0.92	0.324	91	0.317
8	0.00	25.1	12.2	37	14.7	57.7	0.90	0.320	91	0.318
9	0.00	25.0	11.8	37	15.7	57.8	0.89	0.325	90	0.315
10	0.00	24.2	11.6	36	15.3	57.8	0.89	0.317	91	0.317
11	0.00	25.6	13.0	38	15.1	58.0	0.96	0.318	91	0.317
12	0.00	24.8	10.8	37	15.2	57.9	0.91	0.316	89	0.311
13	0.00	24.6	12.5	37	14.9	58.0	0.89	0.317	91	0.320
14	0.00	24.9	10.4	37	16.1	57.9	0.87	0.318	91	0.319
15	0.00	25.7	13.0	38	15.1	57.8	0.95	0.321	91	0.319
16	0.00	25.2	11.4	37	15.2	58.1	0.86	0.315	91	0.318
17	0.00	26.0	12.7	39	15.8	57.9	0.82	0.320	91	0.318
18	0.00	26.2	13.5	39	15.4	58.0	0.81	0.316	91	0.320
19	0.00	25.2	10.7	38	16.5	58.1	0.84	0.310	91	0.318
20	0.00	25.5	12.1	38	16.0	57.9	0.80	0.313	91	0.319
21	0.00	26.2	9.9	39	16.2	57.9	0.79	0.312	92	0.321
22	0.00	25.6	11.4	38	16.2	58.0	0.89	0.310	92	0.323
23	0.00	25.9	10.2	39	15.7	58.0	0.93	0.309	92	0.323
24	0.00	25.6	10.3	38	16.2	57.9	0.81	0.309	90	0.315
25	0.00	25.4	7.6	38	15.3	57.8	0.93	0.310	92	0.323
26	0.00	25.4	10.3	38	15.2	57.9	0.83	0.309	91	0.317
27	0.00	25.5	7.8	38	15.7	57.9	0.81	0.307	90	0.316
28	0.00	25.4	8.4	38	16.5	57.9	0.84	0.308	94	0.329
29	0.00	24.5	9.1	36	15.3	57.7	0.90	0.307	92	0.323
30	0.00	24.6	8.5	37	15.3	57.8	0.85	0.310	94	0.328
31	0.00	25.2	9.0	38	16.5	57.7	0.84	0.310	96	0.334
32	0.00	25.4	8.9	38	15.5	57.9	0.82	0.309	94	0.328
33	0.00	24.4	8.6	36	16.1	57.7	0.83	0.309	94	0.329
34	0.00	26.0	8.5	39	16.2	57.9	0.80	0.309	92	0.323
35	0.00	24.2	8.9	36	16.3	57.9	0.82	0.307	92	0.321
36	0.00	24.0	11.9	36	16.1	57.7	0.84	0.308	92	0.321
37	0.00	23.8	11.2	35	15.6	58.0	0.86	0.306	91	0.318
38	0.00	24.0	12.5	36	15.7	57.9	0.82	0.303	90	0.314
39	0.00	25.1	12.2	37	16.0	58.1	0.81	0.306	92	0.320
40	0.00	25.1	12.4	37	15.5	57.9	0.91	0.306	92	0.321
41	0.00	24.7	12.4	37	15.5	58.2	0.89	0.302	91	0.318
42	0.00	24.9	11.6	37	15.8	57.8	0.88	0.311	92	0.322
43	0.00	25.4	11.7	38	15.1	57.9	0.86	0.309	93	0.324
44	0.00	25.6	11.7	38	15.9	58.1	0.90	0.311	91	0.319
45	0.00	26.3	11.6	39	15.0	57.9	0.87	0.314	92	0.323
46	0.00	26.5	11.4	40	15.8	58.1	0.87	0.314	93	0.324
47	0.00	25.2	12.2	38	15.9	57.9	0.89	0.310	92	0.320
48	0.00	25.5	11.7	38	15.3	57.9	0.86	0.312	92	0.323
49	0.00	24.3	11.8	36	15.7	57.8	0.87	0.308	91	0.320
50	0.00	24.7	12.2	37	15.1	58.0	0.88	0.311	90	0.316
51	0.00	25.1	12.3	37	15.3	58.0	0.92	0.315	92	0.322
52	0.00	26.4	11.5	39	15.3	58.0	0.92	0.319	91	0.319
53	0.00	25.2	12.6	37	14.9	57.8	0.91	0.317	90	0.315
54	0.00	26.1	12.1	39	15.5	57.9	0.94	0.320	92	0.323
55	0.00	25.8	11.7	38	15.4	58.2	0.89	0.313	92	0.323
56	0.00	25.2	11.1	38	15.0	57.7	0.89	0.314	92	0.321
57	0.00	25.8	10.7	39	14.6	58.2	0.99	0.313	92	0.321
58	0.00	24.9	10.4	37	15.2	58.0	0.92	0.308	92	0.321
59	0.00	26.1	9.4	39	15.1	58.1	0.86	0.305	91	0.319
60	0.00	25.3	9.9	38	15.1	57.7	0.94	0.310	91	0.320
61	0.00	24.3	9.1	36	15.2	58.1	0.90	0.304	92	0.321
62	0.00	25.2	9.6	38	15.2	57.9	0.86	0.306	91	0.318
63	0.00	26.5	9.6	40	15.5	57.8	0.86	0.308	92	0.324
64	0.00	26.5	9.6	39	14.9	58.0	1.00	0.310	91	0.318
65	0.00	26.6	9.6	40	15.1	57.9	0.98	0.313	91	0.318
66	0.00	26.0	9.4	39	15.4	58.0	0.87	0.310	92	0.321

TURKEY POINT COL PROJECT - BORING B-636; 16.3 - 17.1 Sample

HAMMER ID 72425 (P.PITTS)

OP: HJC

Test date: 23-Apr-2008

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
67	0.00	26.4	9.1	39	15.3	57.9	0.85	0.306	92	0.321
68	0.00	26.5	8.9	40	16.2	58.0	0.84	0.305	92	0.322
69	0.00	25.7	8.5	38	16.3	57.7	0.86	0.303	92	0.323
70	0.00	25.4	9.2	38	16.0	58.1	0.83	0.300	92	0.321
71	0.00	25.1	8.8	37	15.7	58.0	0.84	0.301	91	0.317
72	0.00	25.4	8.5	38	16.2	58.1	0.86	0.305	93	0.327
73	0.00	25.4	9.0	38	16.3	58.0	0.88	0.297	92	0.322
74	0.00	25.7	9.1	38	15.6	57.7	0.82	0.302	92	0.322
75	0.00	27.0	9.6	40	16.4	58.1	0.80	0.301	92	0.322
76	0.00	27.1	9.3	40	16.2	58.0	0.81	0.300	92	0.320
77	0.00	24.8	9.0	37	15.9	58.2	0.87	0.298	91	0.319
78	0.00	26.6	9.0	40	16.4	57.9	0.80	0.299	92	0.324
79	0.00	26.0	9.5	39	15.7	58.1	0.93	0.296	92	0.323
80	0.00	25.7	9.5	38	15.5	58.0	0.81	0.297	91	0.319
81	0.00	25.8	9.5	38	15.8	58.2	0.82	0.299	92	0.321
82	0.00	25.6	9.9	38	15.9	57.9	0.82	0.298	92	0.322
83	0.00	24.8	9.4	37	15.9	58.1	0.84	0.301	91	0.319
	Average	25.4	10.5	38	15.5	57.2	0.88	0.310	91	0.320

Total number of blows analyzed: 82

Time Summary

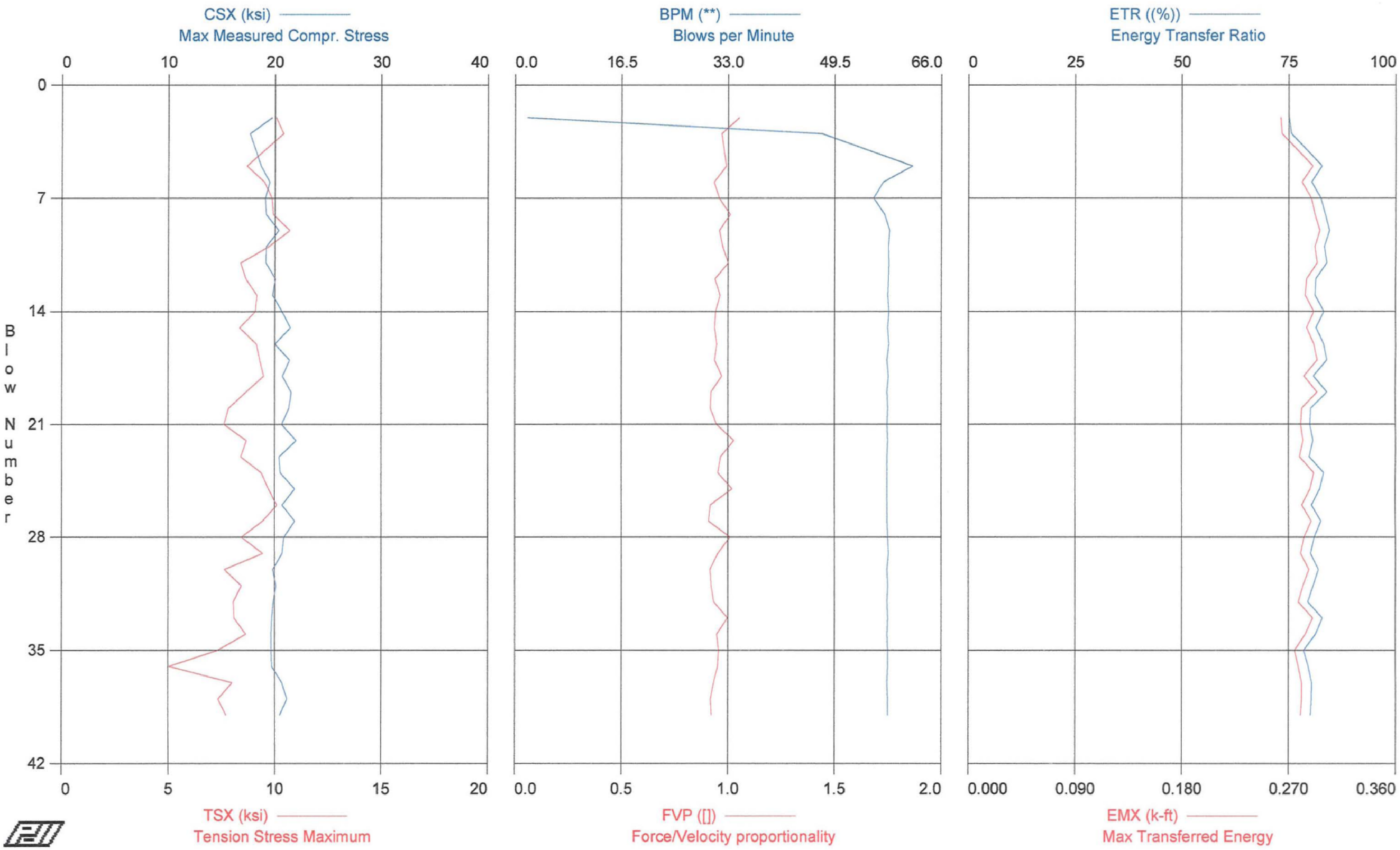
Drive 1 minute 24 seconds 2:39:07 PM - 2:40:31 PM (4/23/2008) BN 2 - 83

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 23-Apr-2008

TURKEY POINT COL PROJECT - BORING B-636; 18.9' - 20.4' Sample



TURKEY POINT COL PROJECT - BORING B-636; 18.9' - 20.4' Sample

HAMMER ID 72425 (P.PITTS)
Test date: 23-Apr-2008

OP: HJC
AR: 1.49 in^2
LE: 29.00 ft
WS: 16,800.0 f/s

SP: 0.492 k/ft3
EM: 29,972 ksi
JC: 0.70

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

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	19.7	10.1	29	12.7	1.9	1.05	0.274	75	0.263
3	0.00	17.7	10.4	26	12.7	47.5	0.97	0.276	76	0.264
5	0.00	18.7	8.7	28	12.1	61.5	0.99	0.292	83	0.290
6	0.00	19.5	9.5	29	11.8	57.0	0.93	0.288	80	0.281
7	0.00	19.1	9.9	28	12.7	55.5	0.96	0.296	82	0.289
8	0.00	19.2	9.9	29	12.4	57.2	1.01	0.294	84	0.292
9	0.00	20.4	10.7	30	12.0	58.0	0.96	0.288	84	0.296
10	0.00	19.2	9.7	29	11.2	57.8	0.98	0.287	83	0.292
11	0.00	19.2	8.4	29	11.3	57.9	1.00	0.291	84	0.294
12	0.00	20.1	8.6	30	11.4	57.8	0.94	0.293	81	0.285
13	0.00	19.8	9.2	30	11.6	57.7	0.96	0.288	81	0.284
14	0.00	20.7	9.1	31	11.9	57.9	0.94	0.291	83	0.291
15	0.00	21.5	8.4	32	11.6	57.7	0.94	0.293	81	0.285
16	0.00	20.0	9.1	30	11.9	57.9	0.95	0.291	83	0.291
17	0.00	21.4	9.3	32	12.5	57.6	0.94	0.291	84	0.294
18	0.00	20.7	9.5	31	12.0	57.8	0.97	0.292	81	0.283
19	0.00	21.5	8.6	32	12.3	57.6	0.92	0.297	84	0.294
20	0.00	21.3	7.8	32	11.9	57.7	0.92	0.290	80	0.281
21	0.00	20.7	7.6	31	12.2	57.6	0.95	0.294	80	0.280
22	0.00	22.0	8.7	33	12.0	57.7	1.03	0.293	81	0.282
23	0.00	20.4	8.4	30	11.8	57.6	0.97	0.293	80	0.279
24	0.00	20.5	9.4	31	12.1	57.6	0.95	0.295	83	0.291
25	0.00	21.9	9.7	33	12.1	57.6	1.02	0.294	82	0.288
26	0.00	20.7	10.1	31	12.4	57.6	0.92	0.297	80	0.281
27	0.00	21.9	9.4	33	12.1	57.6	0.91	0.294	82	0.289
28	0.00	20.9	8.4	31	11.6	57.7	1.01	0.291	81	0.283
29	0.00	20.7	9.4	31	12.1	57.8	0.95	0.293	80	0.280
30	0.00	19.8	7.6	30	11.9	57.6	0.92	0.294	82	0.287
31	0.00	20.1	8.4	30	12.3	57.7	0.92	0.291	81	0.282
32	0.00	19.9	8.1	30	11.6	57.6	0.93	0.292	79	0.278
33	0.00	19.7	8.1	29	11.1	57.7	1.00	0.294	83	0.290
34	0.00	19.7	8.6	29	11.7	57.6	0.95	0.292	81	0.284
35	0.00	19.6	7.3	29	11.5	57.7	0.96	0.292	78	0.275
36	0.00	19.7	5.0	29	11.7	57.7	0.95	0.290	80	0.278
37	0.00	20.6	8.0	31	12.1	57.6	0.93	0.291	80	0.281
38	0.00	21.1	7.3	31	12.3	57.7	0.92	0.292	80	0.281
39	0.00	20.5	7.7	30	12.0	57.7	0.92	0.290	80	0.280
	Average	20.3	8.8	30	12.0	55.9	0.96	0.291	81	0.284

Total number of blows analyzed: 37

Time Summary

Drive 38 seconds 3:15:53 PM - 3:16:31 PM (4/23/2008) BN 2 - 39

MACTEC

engineering and constructing a better tomorrow

June 30, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Tom McDaniel

Subject: **Report of SPT Energy – MACTEC Atlanta CME 550x Track Hammer Serial No. MEC-05 Automatic Hammer**
WORK INSTRUCTION TUR-055
Turkey Point COL Project
Dade County, Florida
MACTEC Project No. 6468-07-1950

Steve Kiser and Jay Cerceo, 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 March 11 and April 22, 2008, during drilling of Borings B-710 (DH) and B-630, respectively, at the referenced site. The testing was performed by Steve Kiser from approximately 8:40 to 10:45 AM under cloudy skies and a temperature of about 68 degrees Fahrenheit on March 11. The testing was also performed by Jay Cerceo from approximately 10:10 AM to 1:45 PM under clear skies and a temperatures in the 70s degrees Fahrenheit on April 22. The boring was drilled with personnel and equipment from MACTEC Atlanta. The drilling equipment consisted of a CME 550x model track-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of NW-J-sized drilling rods (March 11) and AW-J-sized drilling rods (April 22) 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. Ruben Landeros. 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. K1050 and P5992) and strain gages (Serial Nos. AW #75/1 and AW#75/2 on April 22; Serial Nos. NW#146/1 and NW146/2 on March 11). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert used on April 22 had a cross-sectional area of approximately 1.19 square inches and an outside diameter of approximately 1.75 inches at the gage location. The drill rods included in the drill rod string on April 22 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 instrumented rod insert used on March 11 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 March 11 were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 2.625 and 2.25

20 Pages Total

MACTEC Engineering and Consulting, Inc.
2801 Yorkmont Road, Suite 100 • Charlotte, NC 28208 • Phone: 704.357.8600 • Fax: 704.357.8638 www.mactec.com

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 TUR054.

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 range of average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method is shown in Table 1 below for each rod size tested. The corresponding energy transfer ratio of the SPT hammer system is also shown.

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

Rod Size	Range of Average Energy Transferred (foot-pounds)	Range of Average Energy Transfer Ratio (ETR)
AW-J	280 to 292	80% to 83%
NW-J	298 to 308	85% to 88%

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

Table 2: Overall Energy Testing Results for Each Rod Size

Rod Size	Range of Overall Average Energy Transferred (foot-pounds)	Range of Overall Average Energy Transfer Ratio (ETR)
AW-J	287.8	82.2%
NW-J	302.0	86.3%
All Rod Sizes (Combined)	292.5	83.6%

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN TUR-055 – 1 Page
Pages 6 – 7 Record of SPT Energy Measurement – 2 Pages
Pages 8 – 20 PDIPLOT Output – 13 Pages

Work Instruction No. 9
Turkey Point COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6468-07-1950

Issued To: Steve Kiser and Jay Cerceo **Rev. No.** 1

Issued By: Tom McDaniel **Date:** 3-24-08

Valid From: 3-24-08 **To:** 4-30-08

Task Description: Perform SPT Energy Measurements

Applicable Technical Procedures or Plans, or other reference: Geotechnical Work Plan (current revision; available at Site Office), Bechtel Specification 25409-102-3PS-CY00-00001, Rev. 000 or later revision, section 4.3, 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 Coordinator as to schedule for rigs that may be planned for use that are not yet present. 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. Be sure to check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Coordinator, and can be directed by Becthel in accordance with the specification. Site profile consists of very soft soils to about 5 feet followed by high-N-value soft rock to about 20 feet where coring begins. Sands are present below about 100 to 125 feet. Energy measurements should be made in the deeper sand zone as often as can be done, consistent with the drilling depths at the time of the measurements. See Site Coordinator 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 has been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, contact Site Coordinator, Project Principal (Tom McDaniel) or Sr. Project Principal (Al Tice) immediately.

Report Format: 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: _____ Date: _____

Project Principal Engineer: _____ Date: 3/24/08

Site Manager/Coordinator: _____ Date: _____

Pages: 1 plus attachment **DCN:** TUR-055

Attachments: ASTM D 4633-05

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
Turkey Point COL Project
Dade County, Florida
MACTEC Project No. 6468-07-1950

Hammer Serial No.	Rig Owner	Rig Operator	Boring No. Tested	Rod Size	Date Tested	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs)[a]	Energy Transfer Ratio (%)[b] (Average ETR)
MEC-05 (CME 550x ATV)	MACTEC Atlanta	Ruben Landeros	B-630	AW-J	4/22/2008	224.0 - 225.5	9 - 8 - 19	36	280	80.0%
						225.5 - 226.5	9 - 50 / 0.5'	60	292	83.4%
						227.0 - 227.8	48 - 50 / 0.3'	99	288	82.3%
							Average for AW-J Rods:		**287.8**	**82.2%**
			B-710G (DH)	NW-J	3/11/2008	138.3 - 139.8	8 - 9 - 11	28	302	86.3%
						143.3 - 144.8	9 - 14 - 18	41	298	85.1%
						144.8 - 146.3	7 - 10 - 11	28	308	88.0%
							Average for NW-J Rods:		**302.0**	**86.3%**
							Average for Rig:		**292.5**	**83.6%**

[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]	Date: 5-30-08	Checked By: WBO	Date: 6-4-08

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:	Turkey Point COL Project	MAKE:	CME
LOCATION:	Florida City, Florida	MODEL:	550X
PROJECT NO.:	6468-07-1950	SERIAL NO.:	337153
DATE:	4/22/2008	HAMMER TYPE:	Automatic
WEATHER:	Clear 70s-80s	ROPE CONDITION:	N/A
INSPECTOR: HC 4/22/08 ~~Steve Kiser~~ ~~Jay Cerreo~~		ROD SIZE:	AWJ
DRILLING COMPANY:	MACTEC-ATLANTA	NO. OF SHEAVES:	N/A

BORING DATA

BORING NUMBER:	B-630		
DEPTH DRILLED:	224, 225.5, 227.0		
TIME DRIVEN:	10:15am, 11:15am, 1:30		
RIG OPERATOR:	R. Landeros		
HAMMER OPERATOR:	N. Rodriguez		
PDA PAK SERIAL NO.:	3622L	3622L	3622L
INSTR. ROD AREA:	1.19 in²		
ACCEL. SERIAL NOS.:	P5992 or K1050		
STRAIN SERIAL NOS.:	75AW1 or 2 A1		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf) F1 F2	~~DEPTH~~ cont. (feet) LE HC 4/22/08	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)
224.5-225.5	9-8-19	228									
225.5-226.5	9-50/6"	229									
227-228	48-50/3"	231									

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:	Turkey Point COL Project	MAKE:	CME
LOCATION:	Florida City, Florida	MODEL:	550x TRACK
PROJECT NO.:	6468-07-1950	SERIAL NO.:	337153
DATE:	3-11-08	HAMMER TYPE:	Automatic
WEATHER:	CLOUDY 68°	ROPE CONDITION:	N/A
INSPECTOR:	Steve Kiser	ROD SIZE:	NW-I
DRILLING COMPANY:	MACTEC ATLANTA	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	B-710 DH		
DEPTH DRILLED:	200' PLANNED		
TIME DRIVEN:	VARIOUS - SEE DATA		
RIG OPERATOR:	RUBEN LANDAROS		
HAMMER OPERATOR:	N.R.		
PDA PAK SERIAL NO.:	3622L	3622L	3622L
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	K1050 / 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)
138.3'-139.8'	8-9-11										
143.3'-144.8'	9-14-18										
144.8'-146.3'	7-10-11										

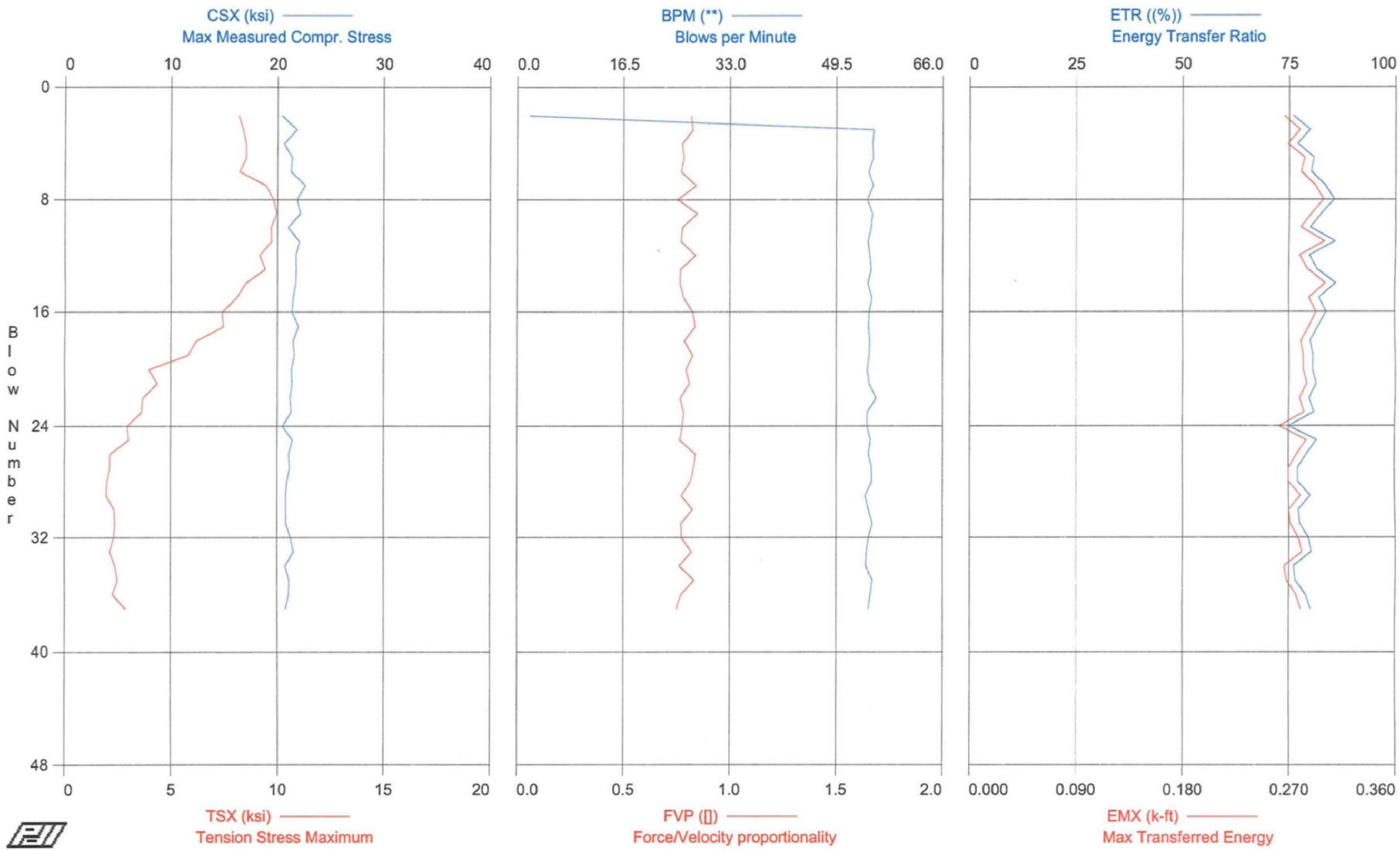
REMARKS:

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 22-Apr-2008

TURKEY POINT COL PROJECT - BORING B-630; 224' - 225.5' Sample



TURKEY POINT COL PROJECT - BORING B-630; 224' - 225.5' Sample

HAMMER ID 337153 LANDEROS
Test date: 22-Apr-2008

OP: HJC
AR: 1.19 in^2
LE: 228.00 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
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	20.4	8.2	24	14.0	1.9	0.82	0.231	76	0.266
3	0.00	21.8	8.4	26	14.8	55.3	0.83	0.246	80	0.279
4	0.00	20.6	8.5	25	14.4	55.1	0.78	0.238	77	0.269
5	0.00	21.4	8.5	25	15.3	55.2	0.78	0.252	81	0.283
6	0.00	21.3	8.2	25	14.8	54.5	0.77	0.249	80	0.280
7	0.00	22.6	9.5	27	15.0	55.2	0.84	0.262	83	0.292
8	0.00	21.8	9.8	26	15.7	54.3	0.76	0.266	86	0.299
9	0.00	22.2	10.0	26	14.7	55.1	0.85	0.254	83	0.289
10	0.00	21.0	9.7	25	15.0	54.9	0.78	0.244	80	0.280
11	0.00	22.1	9.7	26	16.1	54.4	0.77	0.267	86	0.300
12	0.00	21.7	9.2	26	14.6	54.7	0.84	0.247	80	0.279
13	0.00	21.8	9.4	26	14.9	54.9	0.77	0.255	82	0.286
14	0.00	21.7	8.5	26	15.9	54.4	0.77	0.255	86	0.301
15	0.00	21.5	8.1	26	15.4	55.0	0.78	0.250	82	0.287
16	0.00	21.4	7.4	25	14.5	54.6	0.83	0.245	84	0.293
17	0.00	22.0	7.5	26	14.7	54.5	0.84	0.249	82	0.287
18	0.00	21.5	6.2	26	15.3	54.7	0.79	0.238	80	0.280
19	0.00	21.6	5.8	26	14.6	54.6	0.83	0.244	81	0.282
20	0.00	21.3	4.0	25	15.0	54.3	0.80	0.237	80	0.282
21	0.00	21.4	4.3	25	14.9	54.6	0.81	0.236	81	0.285
22	0.00	21.2	3.7	25	14.7	55.7	0.77	0.239	80	0.279
23	0.00	21.3	3.6	25	15.3	54.3	0.78	0.231	81	0.283
24	0.00	20.5	2.9	24	14.8	54.3	0.78	0.218	75	0.262
25	0.00	21.4	3.0	25	15.0	54.8	0.77	0.241	82	0.285
26	0.00	21.1	2.1	25	14.1	54.5	0.84	0.233	79	0.277
27	0.00	21.2	2.1	25	14.3	55.0	0.83	0.226	77	0.270
28	0.00	20.9	2.0	25	14.4	55.0	0.82	0.224	77	0.270
29	0.00	20.8	2.0	25	14.2	54.0	0.77	0.232	80	0.280
30	0.00	20.8	2.3	25	14.1	54.5	0.83	0.225	77	0.270
31	0.00	20.8	2.4	25	14.3	55.1	0.77	0.230	77	0.271
32	0.00	21.3	2.3	25	15.3	54.5	0.77	0.239	80	0.278
33	0.00	21.5	2.1	26	14.8	54.2	0.82	0.239	80	0.281
34	0.00	20.7	2.4	25	15.3	54.1	0.76	0.227	76	0.266
35	0.00	21.1	2.5	25	14.1	55.1	0.83	0.233	76	0.268
36	0.00	21.1	2.3	25	15.3	54.8	0.77	0.232	79	0.276
37	0.00	20.8	2.9	25	15.3	54.5	0.75	0.240	80	0.280
	Average	21.3	5.6	25	14.9	53.2	0.80	0.241	80	0.280

Total number of blows analyzed: 36

Time Summary

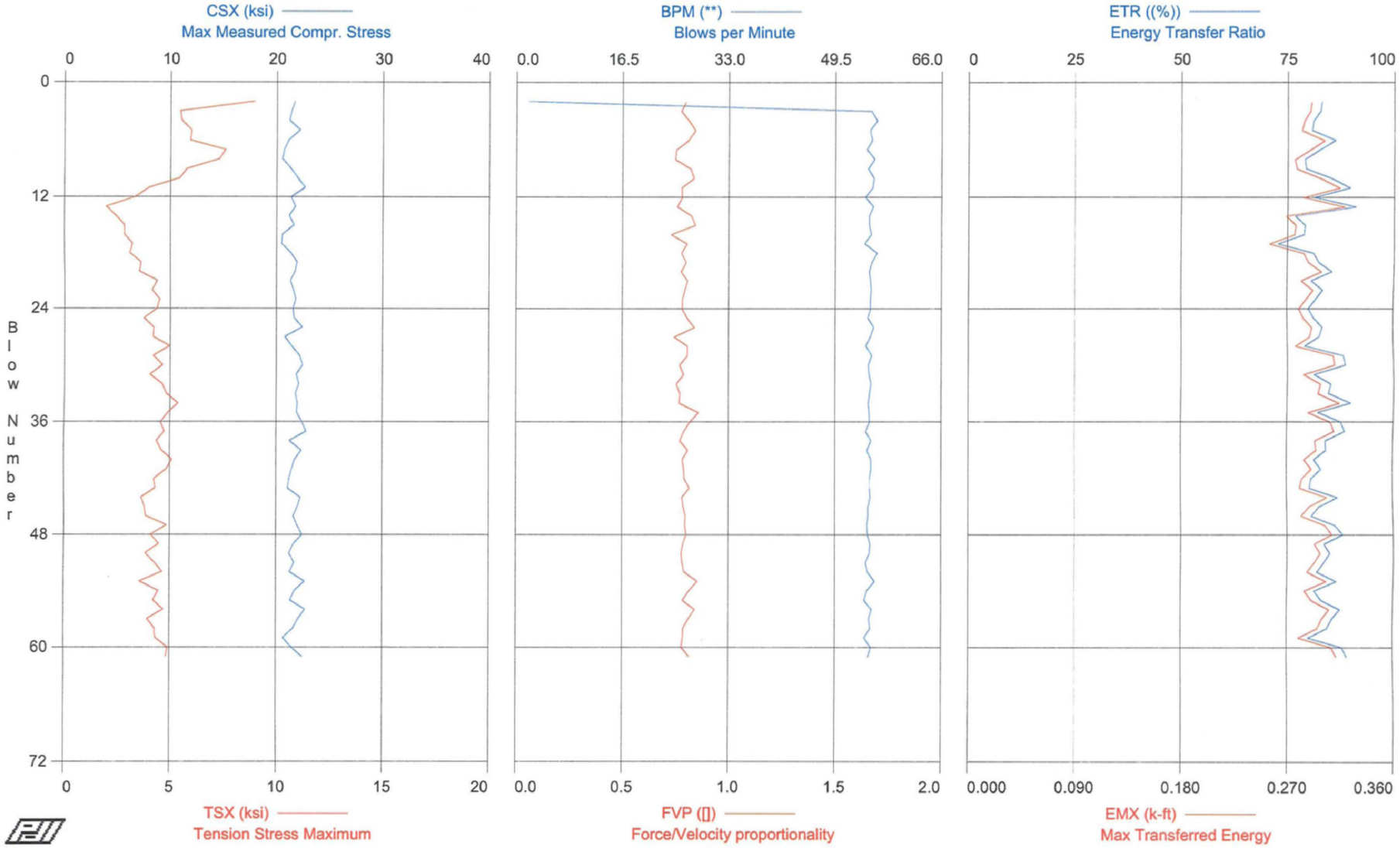
Drive 38 seconds 10:14:38 AM - 10:15:16 AM (4/22/2008) BN 2 - 37

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 22-Apr-2008

TURKEY POINT COL PROJECT - BORING B-630; 225.5 - 226.5 Sample



TURKEY POINT COL PROJECT - BORING B-630; 225.5 - 226.5 Sample
OP: HJC
AR: 1.19 in^2
LE: 229.00 ft
WS: 16,807.9 f/s

HAMMER ID 337153 LANDEROS
Test date: 22-Apr-2008
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

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

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	21.7	8.9	26	15.3	1.9	0.80	0.248	83	0.290
3	0.00	21.4	5.4	25	14.7	55.1	0.78	0.241	83	0.289
4	0.00	21.2	5.5	25	14.6	56.0	0.81	0.232	81	0.284
5	0.00	22.2	6.0	26	14.8	54.9	0.84	0.240	81	0.282
6	0.00	21.1	5.9	25	14.7	55.2	0.81	0.243	86	0.301
7	0.00	20.7	7.6	25	15.4	54.4	0.75	0.240	83	0.289
8	0.00	20.5	7.3	24	15.4	55.6	0.75	0.233	79	0.276
9	0.00	21.3	5.8	25	14.5	54.6	0.82	0.235	79	0.278
10	0.00	22.0	5.4	26	14.7	55.5	0.84	0.253	85	0.298
11	0.00	22.7	4.0	27	14.9	55.3	0.78	0.268	90	0.314
12	0.00	21.4	3.3	25	14.2	54.2	0.78	0.238	81	0.284
13	0.00	21.8	2.0	26	16.1	55.4	0.76	0.261	91	0.318
14	0.00	21.2	2.4	25	14.4	54.8	0.82	0.229	77	0.269
15	0.00	21.6	2.8	26	14.4	54.8	0.84	0.237	79	0.277
16	0.00	20.5	2.8	24	15.7	55.1	0.73	0.234	79	0.276
17	0.00	20.5	3.2	24	13.8	54.1	0.80	0.220	73	0.255
18	0.00	21.3	3.1	25	14.4	56.0	0.78	0.241	81	0.284
19	0.00	21.9	3.6	26	15.4	55.2	0.80	0.244	82	0.288
20	0.00	21.7	3.5	26	15.7	54.8	0.78	0.252	85	0.299
21	0.00	21.3	4.4	25	14.8	55.0	0.81	0.242	81	0.282
22	0.00	21.6	4.1	26	15.3	55.1	0.79	0.244	83	0.292
23	0.00	21.8	4.5	26	14.5	55.0	0.78	0.243	82	0.286
24	0.00	21.6	4.4	26	14.2	55.0	0.78	0.238	80	0.280
25	0.00	21.7	3.8	26	15.2	54.6	0.81	0.241	81	0.284
26	0.00	22.4	4.2	27	14.9	55.5	0.84	0.252	83	0.291
27	0.00	20.8	4.2	25	15.5	55.0	0.74	0.243	83	0.289
28	0.00	21.4	5.0	25	14.9	54.3	0.81	0.242	79	0.277
29	0.00	22.2	4.2	26	15.4	55.2	0.81	0.260	88	0.309
30	0.00	22.5	4.6	27	15.0	54.7	0.77	0.261	89	0.310
31	0.00	21.9	4.0	26	14.6	54.8	0.79	0.243	81	0.284
32	0.00	22.1	4.6	26	15.2	55.1	0.76	0.257	85	0.298
33	0.00	21.8	4.8	26	15.8	54.9	0.77	0.253	85	0.296
34	0.00	22.0	5.4	26	16.0	54.7	0.77	0.265	90	0.314
35	0.00	21.9	4.9	26	14.3	54.8	0.86	0.244	82	0.288
36	0.00	22.4	4.6	27	15.4	54.9	0.82	0.255	88	0.307
37	0.00	22.8	4.7	27	16.2	54.3	0.79	0.265	89	0.310
38	0.00	21.2	4.4	25	15.4	55.1	0.77	0.247	84	0.294
39	0.00	22.4	4.6	27	15.5	54.5	0.81	0.252	84	0.295
40	0.00	21.7	5.1	26	15.5	55.1	0.78	0.244	81	0.285
41	0.00	21.5	4.8	26	15.3	55.1	0.79	0.247	83	0.291
42	0.00	21.2	4.3	25	15.1	54.9	0.79	0.239	81	0.283
43	0.00	21.1	4.3	25	14.5	54.9	0.82	0.236	80	0.281
44	0.00	22.3	3.7	27	15.9	55.0	0.78	0.256	87	0.304
45	0.00	22.0	3.8	26	15.6	54.7	0.79	0.247	83	0.289
46	0.00	21.6	3.9	26	15.1	54.7	0.80	0.236	81	0.282
47	0.00	22.0	4.9	26	15.5	54.5	0.80	0.252	86	0.302
48	0.00	22.4	4.1	27	15.6	54.6	0.80	0.255	88	0.308
49	0.00	21.6	4.5	26	15.4	55.0	0.79	0.250	84	0.293
50	0.00	21.2	3.9	25	15.3	54.9	0.78	0.246	85	0.298
51	0.00	21.7	4.3	26	14.7	54.3	0.78	0.249	84	0.293
52	0.00	21.3	4.6	25	15.1	54.6	0.79	0.241	82	0.287
53	0.00	22.7	3.6	27	14.8	55.7	0.85	0.257	87	0.303
54	0.00	21.7	4.5	26	14.9	54.5	0.82	0.239	81	0.285
55	0.00	21.3	4.2	25	14.2	54.1	0.79	0.237	83	0.291
56	0.00	22.7	4.7	27	15.2	55.2	0.84	0.258	87	0.306
57	0.00	22.1	3.9	26	15.3	54.8	0.81	0.245	86	0.300
58	0.00	21.6	4.3	26	15.0	55.0	0.79	0.252	84	0.296
59	0.00	20.7	4.3	25	14.4	54.1	0.79	0.230	80	0.280
60	0.00	21.5	4.9	26	14.7	55.1	0.78	0.257	88	0.308
61	0.00	22.5	4.8	27	15.4	54.7	0.82	0.259	89	0.312
	Average	21.7	4.5	26	15.1	54.0	0.79	0.246	83	0.292

Total number of blows analyzed: 60

Time Summary

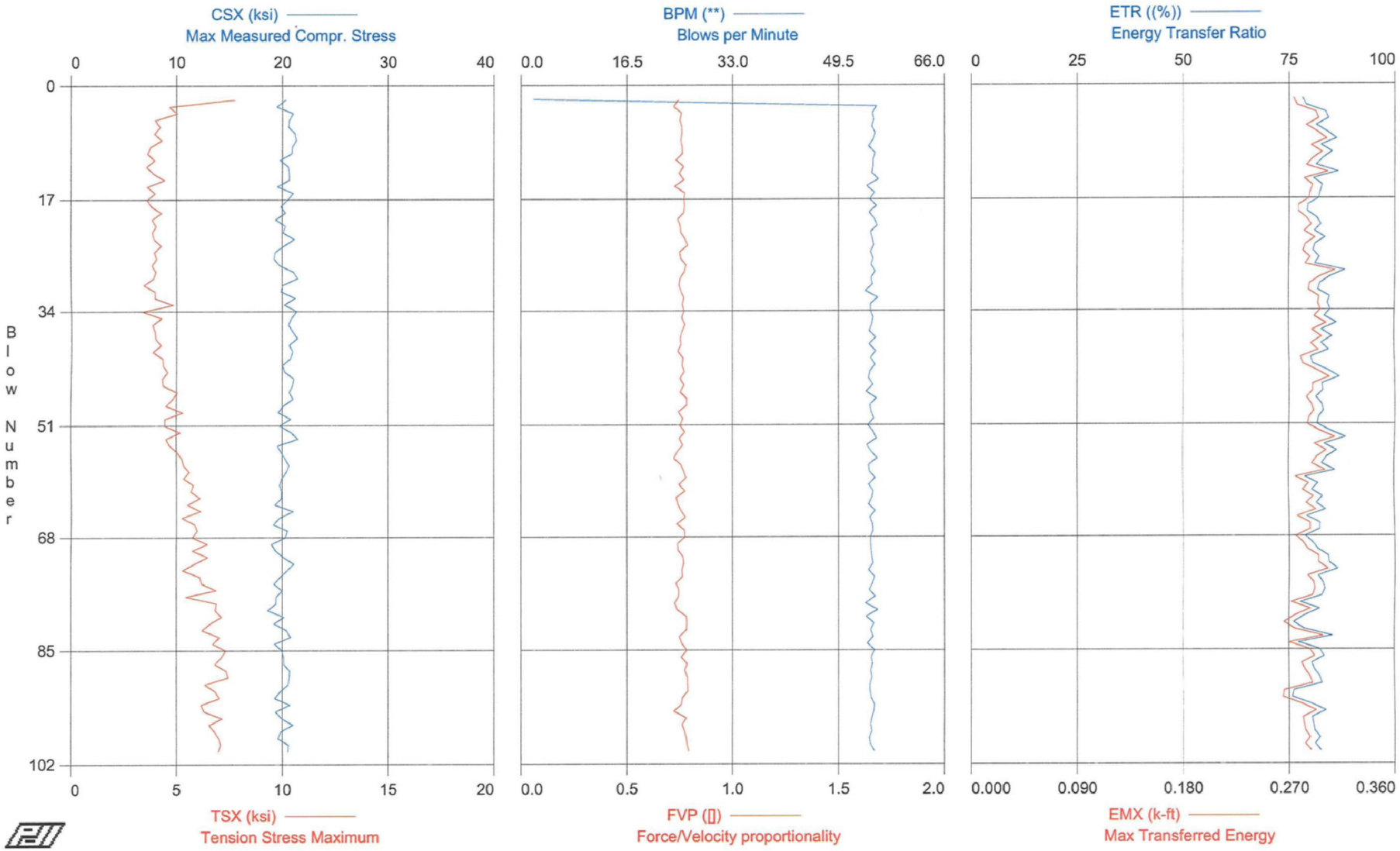
Drive 1 minute 5 seconds 11:12:17 AM - 11:13:22 AM (4/22/2008) BN 2 - 61

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 22-Apr-2008

TURKEY POINT COL PROJECT - BORING B-630; 227 - 227.8 Sample



TURKEY POINT COL PROJECT - BORING B-630; 227 - 227.8 Sample
OP: HJC
AR: 1.19 in^2
LE: 231.00 ft
WS: 16,807.9 f/s

HAMMER ID 337153 LANDEROS
Test date: 22-Apr-2008
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

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

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	20.3	7.8	24	15.2	1.9	0.75	0.232	78	0.274
3	0.00	19.5	4.7	23	14.8	55.4	0.72	0.231	79	0.277
4	0.00	21.0	5.0	25	15.5	54.8	0.76	0.243	84	0.293
5	0.00	20.7	4.0	25	15.4	55.0	0.75	0.243	84	0.295
6	0.00	20.6	4.2	25	15.2	54.7	0.76	0.238	81	0.285
7	0.00	21.2	4.0	25	15.6	55.2	0.76	0.249	84	0.294
8	0.00	21.3	4.3	25	15.8	54.9	0.76	0.252	86	0.302
9	0.00	20.9	3.8	25	15.4	54.2	0.76	0.240	83	0.289
10	0.00	20.9	3.6	25	15.4	55.2	0.76	0.243	85	0.298
11	0.00	19.8	4.0	24	15.1	54.9	0.73	0.237	83	0.290
12	0.00	20.6	3.6	24	15.0	54.9	0.77	0.232	81	0.285
13	0.00	20.6	3.9	25	15.6	54.7	0.75	0.246	87	0.303
14	0.00	20.7	4.4	25	15.0	55.7	0.77	0.232	81	0.283
15	0.00	19.5	3.6	23	14.9	53.9	0.73	0.234	83	0.290
16	0.00	21.0	4.0	25	15.2	55.1	0.77	0.242	82	0.288
17	0.00	20.5	3.6	24	14.9	54.4	0.77	0.237	82	0.287
18	0.00	19.9	3.8	24	14.3	55.4	0.77	0.230	79	0.278
19	0.00	20.3	4.3	24	14.7	54.3	0.77	0.234	79	0.278
20	0.00	19.4	3.8	23	14.7	55.1	0.74	0.237	82	0.285
21	0.00	20.3	4.0	24	15.2	55.5	0.75	0.237	82	0.289
22	0.00	20.1	3.9	24	14.9	54.5	0.76	0.236	81	0.283
23	0.00	21.1	4.0	25	15.3	54.8	0.78	0.240	83	0.292
24	0.00	20.2	4.3	24	14.5	55.0	0.79	0.229	81	0.284
25	0.00	19.3	4.0	23	14.3	54.5	0.75	0.233	81	0.282
26	0.00	19.2	4.1	23	14.3	54.9	0.76	0.236	82	0.288
27	0.00	19.7	3.8	23	14.2	54.6	0.78	0.234	81	0.284
28	0.00	21.0	4.0	25	15.2	55.2	0.77	0.257	88	0.309
29	0.00	21.5	3.9	26	15.9	54.6	0.75	0.244	85	0.296
30	0.00	20.1	3.5	24	15.1	54.8	0.75	0.236	82	0.288
31	0.00	19.9	4.0	24	14.8	53.7	0.76	0.233	82	0.287
32	0.00	21.2	4.0	25	15.4	55.6	0.77	0.249	85	0.296
33	0.00	20.2	4.8	24	14.9	54.5	0.76	0.236	84	0.295
34	0.00	21.4	3.4	25	15.5	54.5	0.77	0.246	85	0.297
35	0.00	20.9	4.3	25	15.4	54.9	0.76	0.238	83	0.292
36	0.00	20.6	3.9	24	15.0	54.7	0.78	0.244	86	0.302
37	0.00	21.0	4.0	25	15.4	54.3	0.76	0.237	83	0.290
38	0.00	21.5	4.0	26	15.9	55.3	0.75	0.248	85	0.298
39	0.00	20.7	4.3	25	15.2	54.3	0.76	0.239	83	0.289
40	0.00	21.0	3.9	25	15.8	55.3	0.74	0.242	84	0.295
41	0.00	20.8	4.3	25	15.1	54.5	0.77	0.232	80	0.280
42	0.00	20.0	4.4	24	14.7	55.2	0.76	0.234	81	0.282
43	0.00	20.2	4.6	24	14.8	54.4	0.77	0.238	84	0.294
44	0.00	21.1	4.3	25	15.7	54.2	0.75	0.247	87	0.304
45	0.00	21.0	4.4	25	15.3	54.9	0.77	0.237	83	0.290
46	0.00	20.7	5.0	25	15.4	53.8	0.75	0.236	83	0.290
47	0.00	21.0	4.8	25	14.9	55.4	0.78	0.240	81	0.285
48	0.00	20.1	4.5	24	14.5	54.4	0.78	0.235	83	0.289
49	0.00	19.6	5.3	23	14.7	54.6	0.74	0.237	83	0.291
50	0.00	20.8	4.5	25	15.2	55.0	0.77	0.237	82	0.287
51	0.00	19.7	4.5	23	14.7	54.1	0.75	0.234	82	0.286
52	0.00	20.8	5.2	25	15.1	54.9	0.77	0.242	85	0.296
53	0.00	21.5	4.5	26	16.1	55.4	0.75	0.247	88	0.309
54	0.00	19.6	4.7	23	14.3	53.9	0.76	0.236	83	0.292
55	0.00	19.9	5.0	24	15.1	54.6	0.74	0.244	86	0.302
56	0.00	20.3	5.3	24	14.9	55.5	0.72	0.238	84	0.294
57	0.00	20.6	5.3	25	15.4	54.2	0.76	0.233	83	0.290
58	0.00	20.4	5.6	24	14.8	54.3	0.77	0.247	86	0.301
59	0.00	19.9	5.3	24	14.2	55.2	0.78	0.232	79	0.276
60	0.00	19.7	5.8	23	14.8	54.2	0.75	0.235	82	0.287
61	0.00	19.9	5.7	24	14.4	54.9	0.78	0.232	80	0.282
62	0.00	19.9	6.1	24	14.6	54.7	0.73	0.239	83	0.291
63	0.00	19.3	5.5	23	14.5	54.2	0.74	0.239	82	0.285
64	0.00	21.0	6.1	25	15.6	55.2	0.76	0.238	84	0.293
65	0.00	19.8	5.3	24	14.3	54.4	0.78	0.224	79	0.277
66	0.00	19.2	5.9	23	14.6	54.8	0.74	0.235	82	0.288

TURKEY POINT COL PROJECT - BORING B-630; 227 - 227.8 Sample

HAMMER ID 337153 LANDEROS

OP: HJC

Test date: 22-Apr-2008

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
67	0.00	20.5	6.0	24	14.9	54.9	0.77	0.234	82	0.288
68	0.00	20.3	5.7	24	14.6	54.5	0.78	0.230	79	0.276
69	0.00	19.0	6.4	23	14.5	54.5	0.74	0.224	81	0.282
70	0.00	19.4	5.8	23	14.6	54.6	0.74	0.236	82	0.286
71	0.00	20.1	6.5	24	14.7	54.7	0.77	0.243	84	0.295
72	0.00	21.1	5.9	25	15.4	54.9	0.77	0.246	84	0.295
73	0.00	20.5	5.3	24	15.0	54.2	0.76	0.248	86	0.303
74	0.00	19.8	6.1	24	14.4	55.1	0.76	0.233	82	0.286
75	0.00	19.2	6.2	23	14.1	54.8	0.73	0.239	83	0.291
76	0.00	20.0	6.9	24	15.0	54.3	0.75	0.238	83	0.292
77	0.00	19.4	5.4	23	14.6	55.2	0.74	0.232	83	0.290
78	0.00	19.4	6.9	23	14.9	53.7	0.73	0.228	78	0.272
79	0.00	18.6	6.8	22	14.2	55.6	0.74	0.230	82	0.288
80	0.00	20.1	7.1	24	14.5	53.8	0.78	0.229	79	0.275
81	0.00	19.2	6.6	23	13.8	55.0	0.78	0.221	76	0.266
82	0.00	20.4	6.2	24	14.6	54.5	0.78	0.229	79	0.275
83	0.00	20.8	7.0	25	15.5	54.9	0.75	0.251	85	0.299
84	0.00	19.3	6.7	23	14.1	54.0	0.76	0.232	77	0.270
85	0.00	20.0	7.3	24	14.3	55.1	0.78	0.239	82	0.288
86	0.00	20.1	7.1	24	14.3	54.6	0.76	0.242	83	0.292
87	0.00	20.1	6.8	24	14.4	54.8	0.79	0.227	80	0.281
88	0.00	20.7	7.3	25	15.0	54.5	0.77	0.238	81	0.284
89	0.00	20.6	7.4	25	14.7	54.7	0.79	0.240	82	0.288
90	0.00	20.5	6.3	24	14.7	54.4	0.79	0.238	83	0.290
91	0.00	19.8	6.8	24	14.1	54.4	0.79	0.221	76	0.266
92	0.00	19.3	7.0	23	13.8	54.6	0.76	0.222	76	0.265
93	0.00	20.7	6.2	25	15.4	55.1	0.76	0.226	80	0.281
94	0.00	19.4	6.3	23	15.0	55.0	0.72	0.235	84	0.293
95	0.00	19.9	7.2	24	14.3	54.7	0.78	0.226	80	0.282
96	0.00	21.0	6.5	25	15.4	54.5	0.76	0.234	81	0.283
97	0.00	19.8	6.8	24	14.4	54.7	0.77	0.229	81	0.284
98	0.00	19.6	7.0	23	14.1	54.3	0.78	0.231	82	0.288
99	0.00	20.6	7.1	24	14.8	54.5	0.78	0.233	81	0.284
100	0.00	20.5	7.0	24	14.6	55.1	0.79	0.233	83	0.289
	Average	20.3	5.2	24	14.9	54.2	0.76	0.237	82	0.288

Total number of blows analyzed: 99

Time Summary

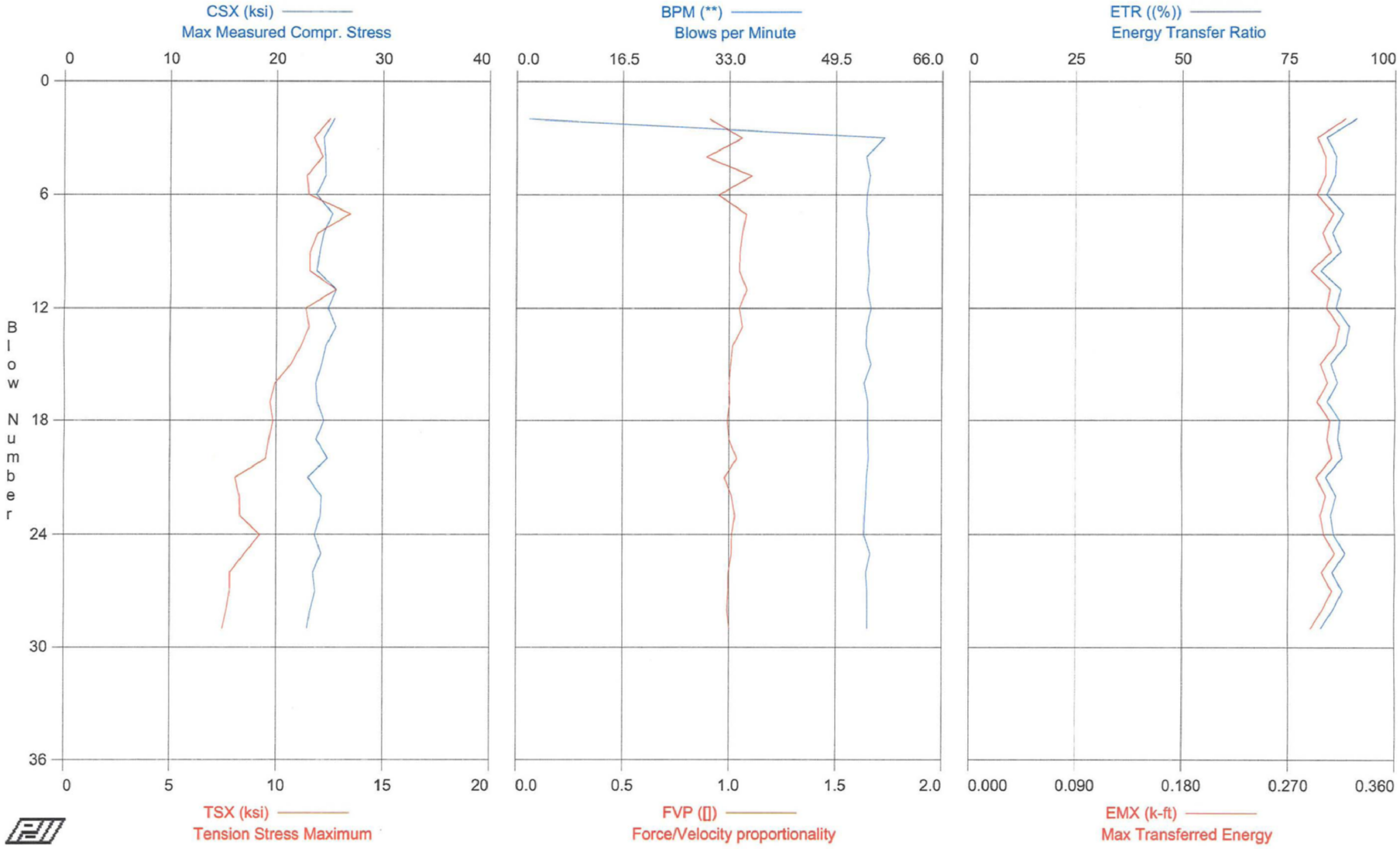
Drive 1 minute 47 seconds 1:41:24 PM - 1:43:11 PM (4/22/2008) BN 2 - 100

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 11-Mar-2008

TURKEY POINT COL PROJECT - BORING B-710G (DH); 138.3' - 139.8' Sample



TURKEY POINT COL PROJECT - BORING B-710G (DH); 138.3' - 139.8' Sample
HAMMER ID 337153 (LANDEROS
OP: SEK
Test date: 11-Mar-2008
AR: 1.49 in^2
SP: 0.492 k/ft3
LE: 143.00 ft
EM: 30,000 ksi
WS: 16,807.9 f/s
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute
FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	25.4	12.5	38	12.8	1.9	0.91	0.339	91	0.318
3	0.00	24.4	11.7	36	12.1	57.0	1.06	0.311	84	0.294
4	0.00	24.6	12.1	37	12.2	54.2	0.89	0.315	86	0.301
5	0.00	24.6	11.4	37	12.5	54.8	1.11	0.314	86	0.301
6	0.00	23.7	11.5	35	12.2	54.3	0.95	0.309	84	0.294
7	0.00	25.2	13.4	38	12.5	54.2	1.08	0.327	88	0.308
8	0.00	24.4	11.9	36	12.8	54.6	1.06	0.313	85	0.299
9	0.00	24.0	11.6	36	12.8	54.4	1.05	0.317	87	0.306
10	0.00	23.8	11.6	35	12.8	54.7	1.05	0.296	83	0.289
11	0.00	25.6	12.8	38	13.2	54.4	1.08	0.322	87	0.305
12	0.00	24.8	11.4	37	13.3	55.0	1.05	0.315	86	0.302
13	0.00	25.6	11.5	38	13.5	54.3	1.06	0.322	89	0.313
14	0.00	24.6	11.1	37	13.5	54.2	1.02	0.322	89	0.310
15	0.00	24.2	10.7	36	13.4	55.0	1.01	0.311	85	0.297
16	0.00	23.7	9.9	35	13.3	53.9	1.00	0.312	87	0.303
17	0.00	23.8	9.7	36	13.3	54.5	1.00	0.290	84	0.294
18	0.00	24.5	9.8	36	13.9	54.5	0.99	0.308	87	0.305
19	0.00	23.7	9.6	35	13.4	54.5	1.00	0.306	87	0.303
20	0.00	24.8	9.5	37	13.5	54.6	1.04	0.312	88	0.307
21	0.00	23.0	8.1	34	13.2	54.3	0.98	0.299	84	0.294
22	0.00	24.2	8.3	36	13.4	54.2	1.01	0.313	86	0.302
23	0.00	24.1	8.3	36	12.9	54.0	1.03	0.309	85	0.297
24	0.00	23.6	9.2	35	13.1	53.9	1.01	0.307	86	0.300
25	0.00	24.2	8.5	36	13.5	54.9	1.01	0.314	88	0.309
26	0.00	23.4	7.8	35	13.1	54.2	1.00	0.306	85	0.298
27	0.00	23.6	7.8	35	13.3	54.4	1.00	0.313	88	0.307
28	0.00	23.2	7.7	35	13.1	54.4	0.99	0.302	86	0.299
29	0.00	22.9	7.5	34	12.8	54.4	1.00	0.295	83	0.289
	Average	24.2	10.2	36	13.0	52.6	1.01	0.311	86	0.302

Total number of blows analyzed: 28

Time Summary

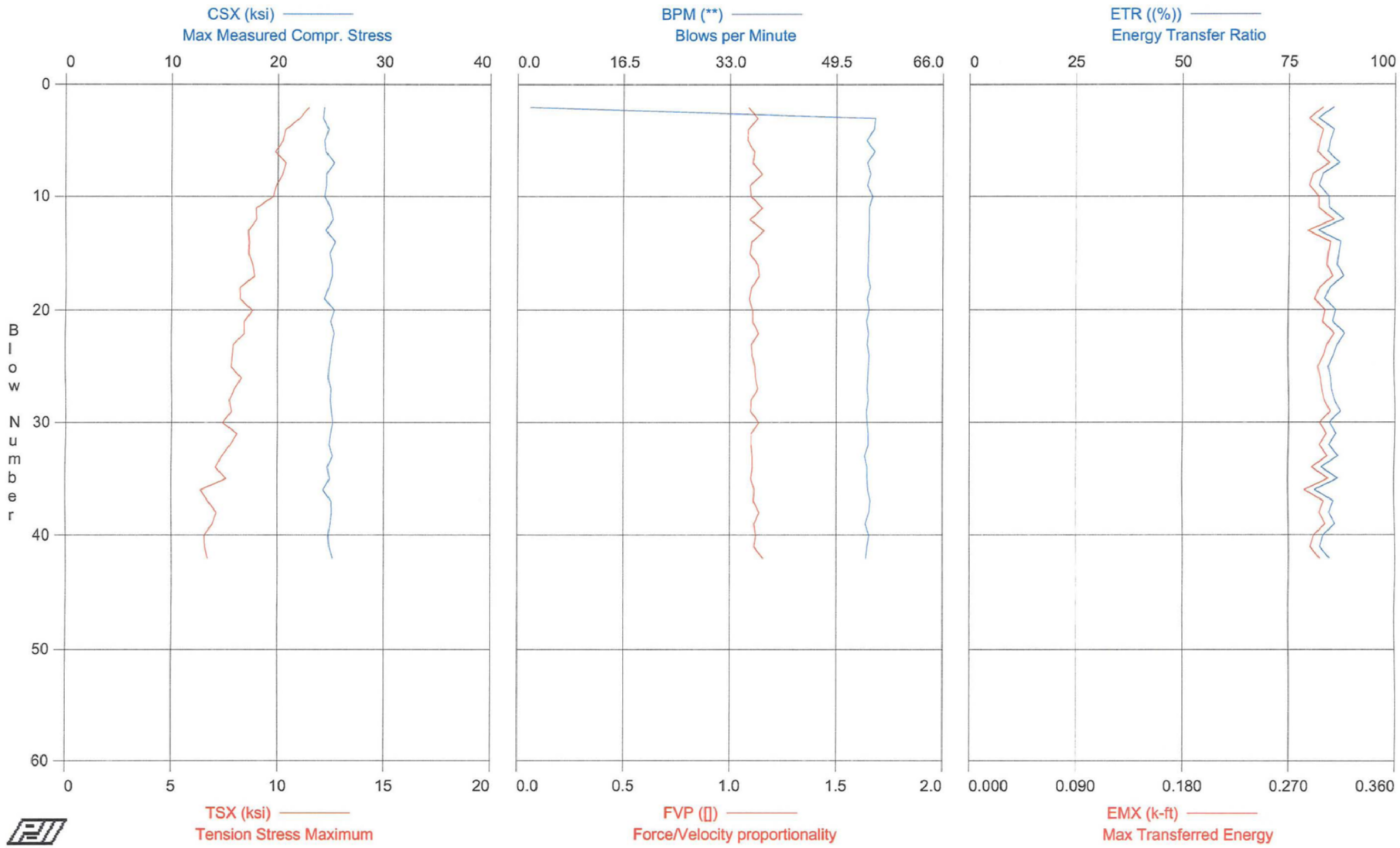
Drive 29 seconds 8:41:23 AM - 8:41:52 AM (3/11/2008) BN 2 - 29

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 11-Mar-2008

TURKEY POINT COL PROJECT - BORING B-710G (DH); 143.3' - 144.8' Sample



TURKEY POINT COL PROJECT - BORING B-710G (DH); 143.3' - 144.8' Sample
OP: SEK
AR: 1.49 in^2
LE: 148.00 ft
WS: 16,807.9 f/s

HAMMER ID 337153 (LANDEROS
Test date: 11-Mar-2008
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

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

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	24.4	11.5	36	12.6	1.9	1.09	0.321	86	0.299
3	0.00	24.2	11.0	36	12.0	55.5	1.13	0.309	82	0.287
4	0.00	24.8	10.4	37	12.6	55.3	1.08	0.327	86	0.299
5	0.00	24.4	10.2	36	12.6	54.2	1.08	0.320	85	0.296
6	0.00	24.5	9.9	36	12.4	55.4	1.11	0.317	84	0.294
7	0.00	25.3	10.4	38	12.7	54.3	1.11	0.332	87	0.304
8	0.00	24.6	10.2	37	12.0	54.8	1.15	0.312	83	0.290
9	0.00	24.6	9.9	37	12.2	54.3	1.09	0.313	82	0.287
10	0.00	24.4	9.8	36	12.4	55.1	1.10	0.319	84	0.295
11	0.00	24.9	9.0	37	12.1	54.6	1.15	0.322	84	0.295
12	0.00	25.2	9.0	38	12.6	54.6	1.09	0.326	88	0.308
13	0.00	24.5	8.6	37	11.9	54.6	1.16	0.309	82	0.286
14	0.00	25.4	8.6	38	12.5	54.5	1.10	0.334	87	0.305
15	0.00	24.9	8.6	37	12.6	54.5	1.09	0.325	87	0.303
16	0.00	25.1	8.8	37	12.4	54.4	1.13	0.326	86	0.302
17	0.00	25.1	8.9	37	12.4	54.4	1.14	0.326	88	0.307
18	0.00	24.8	8.2	37	12.5	54.8	1.10	0.326	85	0.296
19	0.00	24.4	8.2	36	12.4	54.3	1.09	0.316	83	0.292
20	0.00	25.3	8.8	38	12.3	54.6	1.11	0.332	86	0.301
21	0.00	25.0	8.4	37	12.3	54.2	1.11	0.322	85	0.299
22	0.00	25.3	8.4	38	12.5	54.5	1.13	0.334	88	0.309
23	0.00	25.1	7.9	37	12.8	54.3	1.10	0.331	87	0.303
24	0.00	25.0	7.9	37	12.6	54.6	1.11	0.326	86	0.300
25	0.00	24.8	7.8	37	12.5	54.5	1.12	0.323	84	0.295
26	0.00	24.7	8.3	37	12.4	54.4	1.12	0.321	85	0.297
27	0.00	25.0	8.0	37	12.4	54.3	1.13	0.325	85	0.298
28	0.00	24.9	7.7	37	12.7	54.5	1.10	0.322	86	0.300
29	0.00	25.1	7.8	37	12.8	54.2	1.10	0.331	87	0.305
30	0.00	25.2	7.4	38	12.3	54.3	1.14	0.326	85	0.296
31	0.00	25.0	8.1	37	12.6	54.5	1.10	0.328	86	0.302
32	0.00	24.8	7.8	37	12.6	54.5	1.10	0.322	84	0.296
33	0.00	25.2	7.4	38	12.5	53.9	1.11	0.332	87	0.303
34	0.00	24.7	7.1	37	12.0	54.3	1.11	0.316	83	0.290
35	0.00	24.9	7.6	37	12.5	54.3	1.10	0.322	87	0.304
36	0.00	24.3	6.4	36	12.2	54.4	1.12	0.310	81	0.284
37	0.00	25.0	6.7	37	12.6	54.8	1.11	0.325	86	0.300
38	0.00	25.1	7.1	37	12.3	54.6	1.14	0.326	85	0.296
39	0.00	24.9	6.9	37	12.4	54.0	1.11	0.324	86	0.301
40	0.00	24.7	6.5	37	12.3	54.6	1.12	0.321	83	0.291
41	0.00	24.8	6.6	37	11.9	54.3	1.11	0.318	82	0.288
42	0.00	25.2	6.7	38	12.2	54.1	1.16	0.323	84	0.296
	Average	24.9	8.4	37	12.4	53.2	1.11	0.323	85	0.298

Total number of blows analyzed: 41

Time Summary

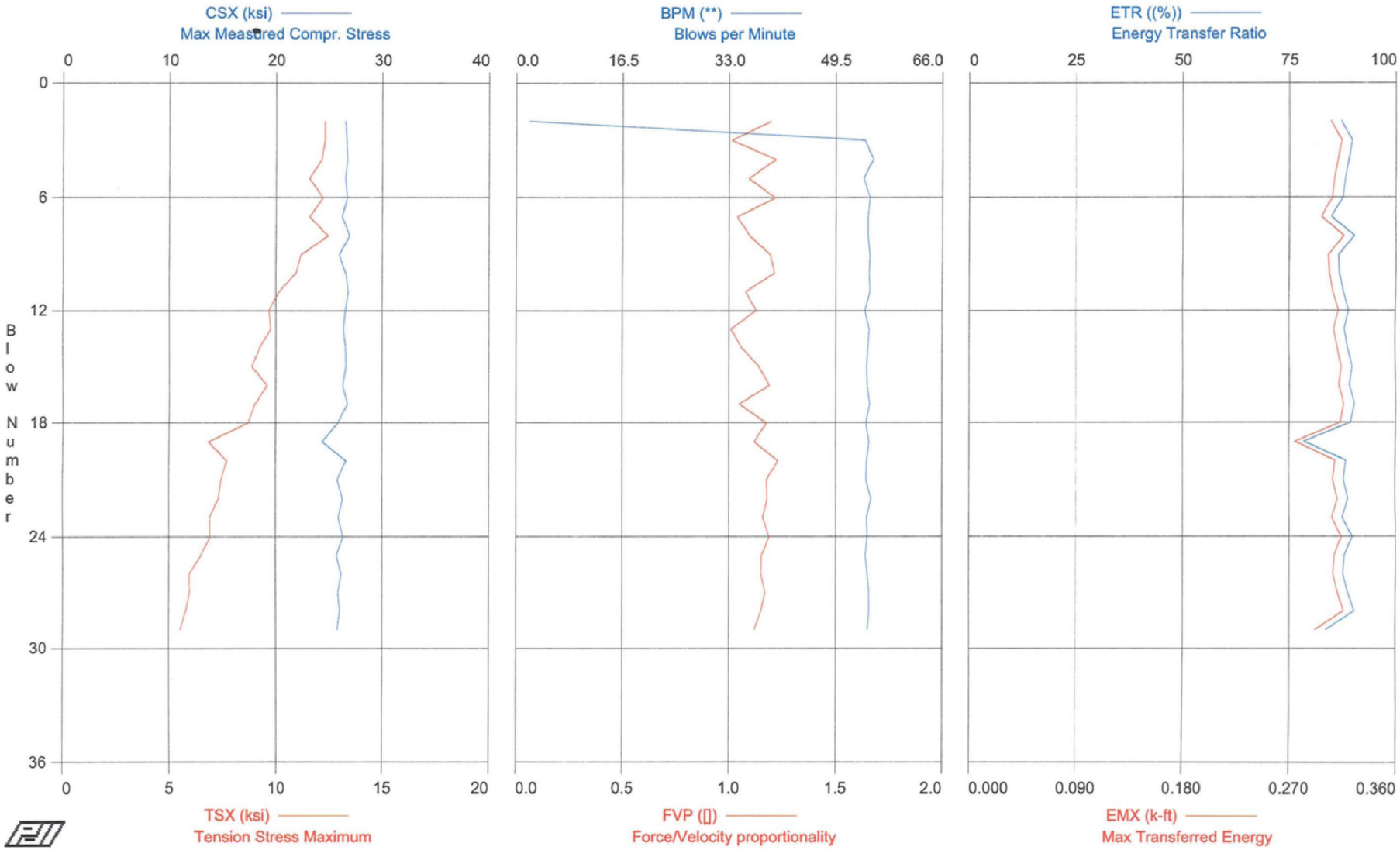
Drive 44 seconds 10:20:27 AM - 10:21:11 AM (3/11/2008) BN 2 - 42

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 11-Mar-2008

TURKEY POINT COL PROJECT - BORING B-710G (DH); 144.8' - 146.3' Sample



TURKEY POINT COL PROJECT - BORING B-710G (DH); 144.8' - 146.3' Sample
HAMMER ID 337153 (LANDEROS

OP: SEK
Test date: 11-Mar-2008

AR: 1.49 in^2
SP: 0.492 k/ft3
LE: 149.00 ft
EM: 30,000 ksi
WS: 16,807.9 f/s
JC: 0.70

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

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	26.5	12.3	39	12.5	1.9	1.20	0.324	87	0.305
3	0.00	26.6	12.3	40	12.2	54.0	1.01	0.338	90	0.314
4	0.00	26.7	12.2	40	12.3	55.3	1.22	0.326	89	0.311
5	0.00	26.5	11.6	39	12.0	53.8	1.09	0.330	88	0.308
6	0.00	26.7	12.2	40	12.3	54.8	1.22	0.322	88	0.306
7	0.00	26.2	11.6	39	12.0	54.5	1.04	0.323	85	0.297
8	0.00	26.9	12.4	40	12.4	54.5	1.10	0.327	90	0.316
9	0.00	25.9	11.2	39	12.2	54.8	1.19	0.319	87	0.303
10	0.00	26.5	10.9	40	12.2	54.7	1.21	0.320	87	0.304
11	0.00	26.8	10.1	40	12.3	54.8	1.08	0.325	88	0.307
12	0.00	26.5	9.7	39	12.3	54.0	1.13	0.322	89	0.312
13	0.00	26.4	9.7	39	12.1	54.7	1.01	0.325	88	0.308
14	0.00	26.5	9.2	40	12.1	54.5	1.06	0.333	89	0.311
15	0.00	26.6	8.9	40	12.3	54.3	1.14	0.324	90	0.314
16	0.00	26.3	9.6	39	12.4	54.4	1.19	0.327	89	0.312
17	0.00	26.7	9.0	40	12.4	54.8	1.05	0.324	90	0.316
18	0.00	25.8	8.7	38	12.2	54.2	1.18	0.321	89	0.313
19	0.00	24.4	6.8	36	11.7	54.7	1.12	0.279	78	0.275
20	0.00	26.6	7.7	40	12.1	54.3	1.23	0.316	88	0.309
21	0.00	25.8	7.4	38	12.3	54.2	1.18	0.312	88	0.307
22	0.00	26.3	7.3	39	12.5	55.0	1.18	0.330	89	0.311
23	0.00	25.9	6.9	39	12.2	54.3	1.16	0.325	87	0.306
24	0.00	26.3	6.9	39	12.4	54.4	1.19	0.323	90	0.314
25	0.00	25.7	6.5	38	12.5	54.1	1.15	0.314	88	0.308
26	0.00	26.1	6.0	39	12.7	54.4	1.15	0.315	88	0.307
27	0.00	25.8	6.0	38	12.4	54.7	1.17	0.321	89	0.311
28	0.00	26.0	5.8	39	12.7	54.7	1.15	0.317	90	0.316
29	0.00	25.7	5.5	38	12.8	54.4	1.12	0.307	84	0.292
	Average	26.2	9.1	39	12.3	52.6	1.14	0.321	88	0.308

Total number of blows analyzed: 28

Time Summary

Drive 30 seconds 10:44:51 AM - 10:45:21 AM (3/11/2008) BN 2 - 29

MACTEC

engineering and constructing a better tomorrow

June 30, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Tom McDaniel

Subject: **Report of SPT Energy – Miller Drilling CME 750 ATV Hammer Serial No. 07 Automatic Hammer**
WORK INSTRUCTION TUR-055
Turkey Point COL Project
Dade County, Florida
MACTEC Project No. 6468-07-1950

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 February 19 and March 11, 2008, during drilling of Borings B-628 and B-708 (DH), respectively, at the referenced site. The testing was performed from approximately 10:40 AM to 12:35 PM under cloudy skies and a temperature of about 70 degrees Fahrenheit on February 19. The testing was performed from approximately 9:45 AM to 2:20 PM under cloudy skies and a temperatures of about 68 degrees Fahrenheit on March 11. The boring was drilled with personnel and equipment from Miller Drilling. The drilling equipment consisted of a CME 750 model ATV-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of AW-J-sized drilling rods (February 19) and NW-J-sized drilling rods (March 11) 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. Glen Bilbrey. 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 February 19; K1050 and P5992 March 11) and strain gages (Serial Nos. AW #75/1 and AW#75/2 on February 19; Serial Nos. NW#146/1 and NW146/2 on March 11). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert used on February 19 had a cross-sectional area of approximately 1.19 square inches and an outside diameter of approximately 1.75 inches at the gage location. The drill rods included in the drill rod string on February 19 were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 1.75 and 1.375 inches, respectively. The instrumented rod insert used on March 11 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 March 11 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

25 Pages Total

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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 TUR054.

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 range of average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method is shown in Table 1 below for each rod size tested. The corresponding energy transfer ratio of the SPT hammer system is also shown.

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

Rod Size	Range of Average Energy Transferred (foot-pounds)	Range of Average Energy Transfer Ratio (ETR)
AW-J	279 to 312	80% to 89%
NW-J	306 to 313	87% to 89%

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

Table 2: Overall Energy Testing Results for Each Rod Size

Rod Size	Range of Overall Average Energy Transferred (foot-pounds)	Range of Overall Average Energy Transfer Ratio (ETR)
AW-J	286.2	81.8%
NW-J	311.1	88.9%
All Rod Sizes (Combined)	292.0	83.4%

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN TUR-055 – 1 Page
Pages 6 – 7 Record of SPT Energy Measurement – 2 Pages
Pages 8 – 25 PDIPLOT Output – 18 Pages

Work Instruction No. 9
Turkey Point COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6468-07-1950

Issued To: Steve Kiser and Jay Cerceo **Rev. No.** 1

Issued By: Tom McDaniel **Date:** 3-24-08

Valid From: 3-24-08 **To:** 4-30-08

Task Description: Perform SPT Energy Measurements

Applicable Technical Procedures or Plans, or other reference: Geotechnical Work Plan (current revision; available at Site Office), Bechtel Specification 25409-102-3PS-CY00-00001, Rev. 000 or later revision, section 4.3, 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 Coordinator as to schedule for rigs that may be planned for use that are not yet present. 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. Be sure to check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Coordinator, and can be directed by Becthel in accordance with the specification. Site profile consists of very soft soils to about 5 feet followed by high-N-value soft rock to about 20 feet where coring begins. Sands are present below about 100 to 125 feet. Energy measurements should be made in the deeper sand zone as often as can be done, consistent with the drilling depths at the time of the measurements. See Site Coordinator 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 has been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, contact Site Coordinator, Project Principal (Tom McDaniel) or Sr. Project Principal (Al Tice) immediately.

Report Format: 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: _____ Date: _____

Project Principal Engineer: _____ Date: 3/24/08

Site Manager/Coordinator: _____ Date: _____

Pages: 1 plus attachment **DCN:** TUR-055

Attachments: ASTM D 4633-05

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
Turkey Point COL Project
Dade County, Florida
MACTEC Project No. 6468-07-1950

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)
07 (CME 750 ATV)	Miller Drilling	Glen Bilbrey	B-628	AW-J	2/19/2008	10.2 - 11.7	6 - 5 - 23	34	281	80.3%
						12.7 - 14.2	19 - 24 - 10	53	279	79.7%
						15.1 - 16.6	15 - 19 - 17	51	287	82.0%
						18.3 - 19.8	2 - 2 - 3	9	312	89.1%
						23.3 - 24.8	4 - 12 - 20	37	294	84.0%
							Average for AW-J Rods:		**286.2**	**81.8%**
			B-708 (DH)	NW-J	3/11/2008	152.9 - 154.4	6 - 8 - 12	27	312	89.1%
						173.0 - 174.5	1 - 2 - 6	10	313	89.4%
						183.0 - 184.5	2 - 2 - 6	11	311	88.9%
						193.0 - 194.5	1 - 2 - 4	8	306	87.4%
							Average for NW-J Rods:		**311.1**	**88.9%**
							Average for Rig:		**292.0**	**83.4%**

[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:	Date: 5-30-08	Checked By:	Date: 6-4-08

MACTEC

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Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	Turkey Point COL Project	MAKE:	CME
LOCATION:	Florida City, Florida	MODEL:	750 ATV
PROJECT NO.:	6468-07-1950	SERIAL NO.:	299708
DATE:	2-19-08	HAMMER TYPE:	Automatic
WEATHER:	CLOUDY; WINDY 70°	ROPE CONDITION:	N/A
INSPECTOR:	Steve Kiser	ROD SIZE:	AW-J
DRILLING COMPANY:	MILLER DRILLING	NO. OF SHEAVES:	N/A

BORING DATA

BORING NUMBER:	B-628		
DEPTH DRILLED:	150' PLANNED		
TIME DRIVEN:	VARIOUS - SEE DATA PRINTOUT		
RIG OPERATOR:	GLEN BILBREY		
HAMMER OPERATOR:	N.R.		
PDA PAK SERIAL NO.:	3622L	3622L	3622L
INSTR. ROD AREA:	1.19 in²		
ACCEL. SERIAL NOS.:	P5953 P5992		
STRAIN SERIAL NOS.:	75 AW # 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)
10'-11.5'	6-5-23										
12.5'-14'	19-24-10										
15'-16.5'	15-19-17										
18.3'-19.8'	3-3-3										
23.3'-24.8'	4-12-20										

REMARKS:

MACTEC

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Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	Turkey Point COL Project	MAKE:	CME
LOCATION:	Florida City, Florida	MODEL:	750 ATV
PROJECT NO.:	6468-07-1950	SERIAL NO.:	299708
DATE:	3-11-08	HAMMER TYPE:	Automatic
WEATHER:	CLOUDY 68°	ROPE CONDITION:	N/A
INSPECTOR:	Steve Kiser	ROD SIZE:	NW-J
DRILLING COMPANY:	MILLER DRILLING	NO. OF SHEAVES:	N/A

BORING DATA

BORING NUMBER:	B-708 DM		
DEPTH DRILLED:	225' PLANNED		
TIME DRIVEN:	VARIOUS - SEE DATA		
RIG OPERATOR:	GLEN BILBREY		
HAMMER OPERATOR:	N.R.		
PDA PAK SERIAL NO.:	3622L	3622L	3622L
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	K1050 / 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)
152.9'-154.4'	6-8-12										
173'-174.5'	1-2-6										
183'-184.5'	2-2-6										
193'-194.5'	1-2-4										

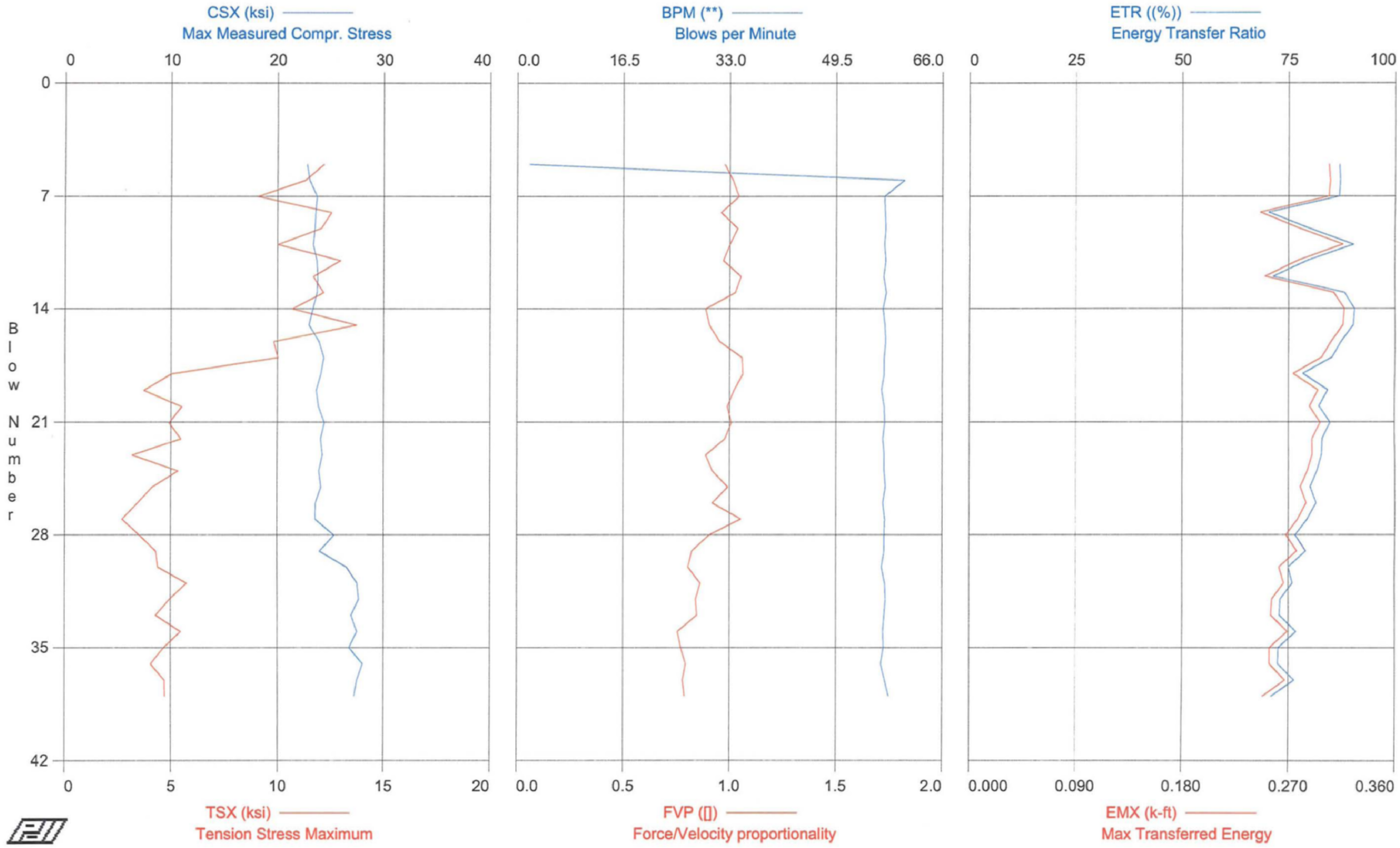
REMARKS:

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 19-Feb-2008

TURKEY POINT COL PROJECT - BORING B-628; 10.2' - 11.7' Sample



TURKEY POINT COL PROJECT - BORING B-628; 10.2' - 11.7' Sample
OP: SEK

HAMMER ID 299708 (MILLER)
Test date: 19-Feb-2008

AR: 1.19 in^2
LE: 15.00 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
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
5	0.00	22.8	12.2	27	14.1	1.9	0.98	0.241	87	0.304
6	0.00	23.0	11.3	27	13.7	60.1	1.02	0.231	87	0.305
7	0.00	23.7	9.1	28	12.6	57.0	1.04	0.238	87	0.304
8	0.00	23.6	12.5	28	14.1	57.1	0.96	0.244	70	0.246
9	0.00	23.5	12.0	28	13.7	57.2	1.04	0.242	80	0.279
10	0.00	23.3	10.0	28	13.1	57.0	1.00	0.244	90	0.316
11	0.00	23.7	13.0	28	13.7	57.2	0.97	0.242	79	0.278
12	0.00	23.8	11.7	28	13.6	56.9	1.05	0.242	71	0.250
13	0.00	23.7	12.2	28	13.4	57.3	1.03	0.239	88	0.308
14	0.00	23.3	10.7	28	13.6	56.8	0.89	0.231	90	0.317
15	0.00	23.0	13.7	27	14.2	57.1	0.91	0.234	90	0.316
16	0.00	23.9	9.8	28	12.6	57.2	0.95	0.238	87	0.306
17	0.00	24.4	10.0	29	13.0	57.0	1.06	0.238	85	0.298
18	0.00	24.1	5.0	29	12.7	57.0	1.06	0.240	78	0.274
19	0.00	23.7	3.7	28	12.7	56.6	1.02	0.236	84	0.295
20	0.00	23.9	5.5	28	13.5	57.0	0.99	0.240	82	0.288
21	0.00	24.4	4.9	29	13.6	57.1	1.01	0.237	85	0.297
22	0.00	24.1	5.5	29	13.8	56.8	0.98	0.237	83	0.290
23	0.00	24.2	3.2	29	12.5	57.0	0.89	0.234	83	0.290
24	0.00	23.9	5.3	28	14.5	57.0	0.92	0.236	82	0.286
25	0.00	24.1	4.1	29	13.6	57.2	0.99	0.235	80	0.280
26	0.00	23.6	3.4	28	13.2	56.8	0.92	0.232	81	0.285
27	0.00	23.6	2.7	28	12.6	57.1	1.05	0.229	79	0.278
28	0.00	25.3	3.5	30	13.8	57.0	0.90	0.227	77	0.268
29	0.00	24.0	4.3	29	14.8	57.0	0.82	0.225	79	0.277
30	0.00	26.5	4.4	32	14.9	56.6	0.81	0.221	75	0.262
31	0.00	27.5	5.7	33	14.2	57.1	0.86	0.224	76	0.266
32	0.00	27.7	4.9	33	14.2	57.2	0.84	0.220	73	0.256
33	0.00	26.9	4.3	32	13.9	57.0	0.85	0.217	73	0.255
34	0.00	27.5	5.5	33	15.5	56.8	0.76	0.215	77	0.269
35	0.00	26.7	4.7	32	14.1	56.9	0.77	0.211	73	0.254
36	0.00	28.0	4.1	33	15.0	56.5	0.79	0.217	72	0.254
37	0.00	27.5	4.7	33	15.1	57.1	0.78	0.216	76	0.267
38	0.00	27.2	4.7	32	14.3	57.7	0.79	0.211	71	0.248
	Average	24.7	7.1	29	13.8	55.5	0.93	0.231	80	0.281

Total number of blows analyzed: 34

Time Summary

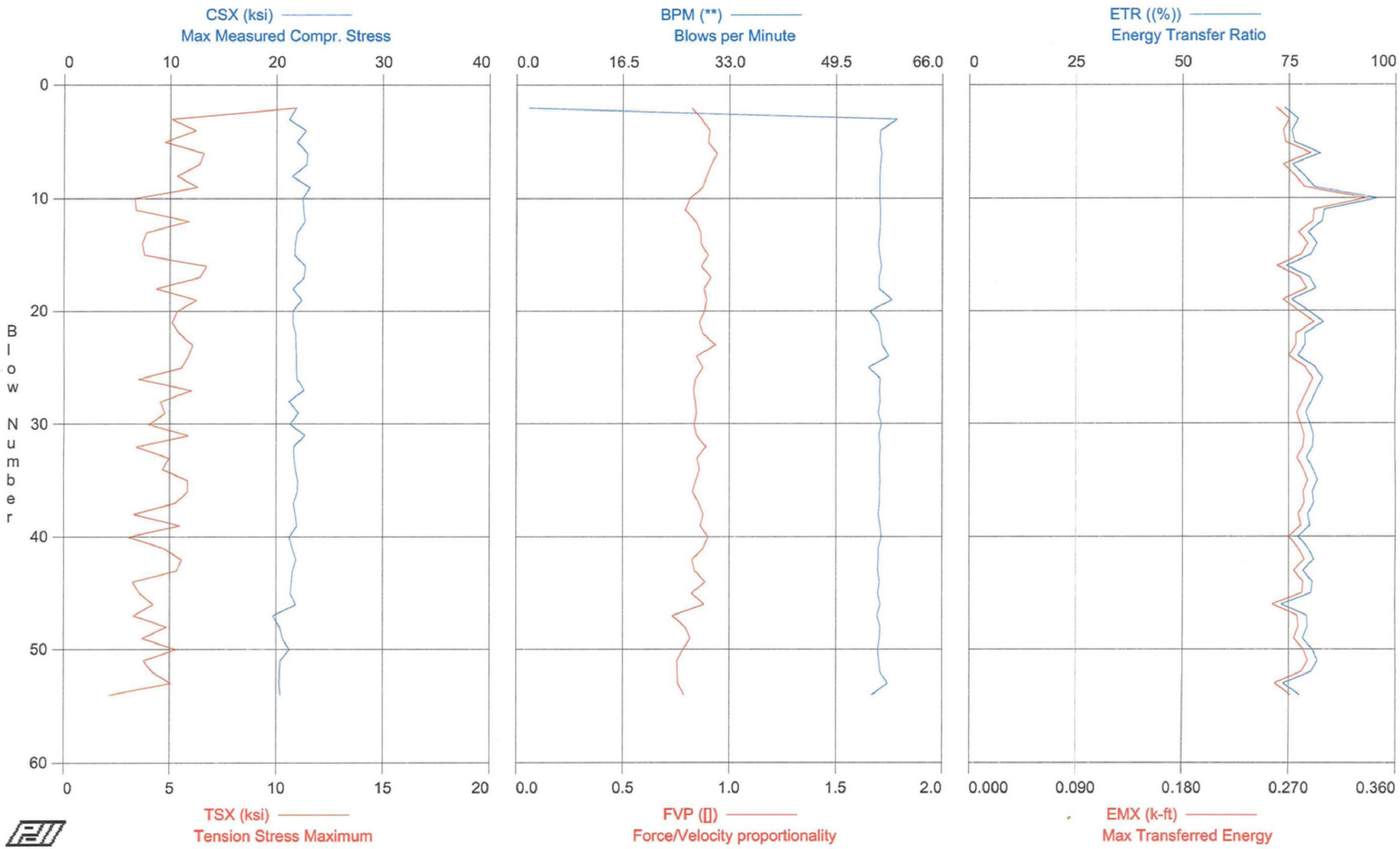
Drive 35 seconds 10:40:01 AM - 10:40:36 AM (2/19/2008) BN 5 - 38

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 19-Feb-2008

TURKEY POINT COL PROJECT - BORING B-628; 12.7' - 14.2' Sample



TURKEY POINT COL PROJECT - BORING B-628; 12.7' - 14.2' Sample
OP: SEK
AR: 1.19 in^2
LE: 18.00 ft
WS: 16,807.9 f/s

HAMMER ID 299708 (MILLER)
Test date: 19-Feb-2008
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

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

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	21.8	10.9	26	14.9	1.9	0.82	0.243	74	0.259
3	0.00	21.2	5.1	25	13.7	58.9	0.87	0.234	77	0.270
4	0.00	22.7	6.2	27	13.9	56.4	0.91	0.246	76	0.265
5	0.00	21.9	4.7	26	13.6	56.3	0.90	0.241	76	0.267
6	0.00	22.9	6.6	27	13.6	56.6	0.94	0.245	82	0.288
7	0.00	22.8	6.4	27	13.9	56.4	0.92	0.244	76	0.265
8	0.00	21.4	5.3	26	13.5	56.3	0.89	0.241	79	0.275
9	0.00	23.1	6.3	27	14.8	56.3	0.88	0.242	81	0.283
10	0.00	22.4	3.3	27	13.6	56.3	0.81	0.238	96	0.335
11	0.00	22.5	3.4	27	13.4	56.4	0.79	0.241	83	0.291
12	0.00	22.7	5.9	27	13.8	56.4	0.84	0.239	83	0.290
13	0.00	21.9	3.9	26	13.6	56.3	0.87	0.240	79	0.278
14	0.00	21.8	3.7	26	14.1	56.1	0.87	0.241	82	0.286
15	0.00	21.7	3.8	26	13.5	56.3	0.90	0.241	80	0.280
16	0.00	22.7	6.7	27	14.7	56.6	0.87	0.240	74	0.260
17	0.00	22.6	6.4	27	13.9	56.2	0.91	0.242	80	0.279
18	0.00	21.5	4.4	26	13.8	56.2	0.88	0.241	81	0.285
19	0.00	22.4	6.2	27	14.0	58.2	0.89	0.233	76	0.265
20	0.00	21.5	5.3	26	13.6	54.8	0.88	0.240	79	0.278
21	0.00	21.5	5.1	26	14.1	56.1	0.86	0.240	83	0.291
22	0.00	21.8	5.5	26	13.4	56.5	0.88	0.240	79	0.276
23	0.00	21.8	6.1	26	13.0	56.7	0.94	0.237	79	0.276
24	0.00	21.9	5.9	26	14.4	57.7	0.85	0.232	77	0.270
25	0.00	21.9	5.5	26	14.0	54.6	0.88	0.238	81	0.284
26	0.00	22.0	3.5	26	13.4	56.4	0.84	0.240	83	0.290
27	0.00	22.6	6.0	27	15.2	56.3	0.83	0.240	82	0.286
28	0.00	21.2	4.6	25	14.1	56.4	0.84	0.235	80	0.281
29	0.00	22.1	4.8	26	14.6	56.1	0.85	0.241	79	0.277
30	0.00	21.3	4.0	25	13.8	56.6	0.84	0.231	80	0.280
31	0.00	22.7	5.9	27	15.0	56.2	0.85	0.241	81	0.283
32	0.00	21.6	3.4	26	13.6	56.4	0.89	0.239	81	0.282
33	0.00	21.7	5.0	26	14.4	56.3	0.85	0.235	79	0.277
34	0.00	21.8	4.7	26	14.2	56.3	0.86	0.239	81	0.282
35	0.00	22.0	5.9	26	14.7	56.4	0.84	0.241	82	0.286
36	0.00	22.0	5.8	26	14.9	56.3	0.83	0.237	80	0.282
37	0.00	21.6	5.3	26	14.1	56.3	0.86	0.238	81	0.283
38	0.00	21.8	3.3	26	13.9	56.1	0.88	0.238	79	0.278
39	0.00	21.9	5.5	26	14.2	56.4	0.87	0.235	80	0.280
40	0.00	21.2	3.1	25	13.2	56.6	0.90	0.232	77	0.270
41	0.00	21.5	4.7	26	13.7	56.1	0.88	0.233	80	0.278
42	0.00	21.9	5.5	26	14.9	56.1	0.83	0.236	81	0.283
43	0.00	21.5	5.3	26	14.4	56.0	0.84	0.236	78	0.274
44	0.00	21.4	3.3	25	13.5	56.3	0.89	0.233	81	0.282
45	0.00	21.3	3.6	25	14.6	56.0	0.82	0.232	80	0.281
46	0.00	21.8	4.2	26	13.9	56.4	0.88	0.233	73	0.256
47	0.00	19.7	3.3	23	15.1	55.9	0.73	0.231	79	0.277
48	0.00	20.3	4.8	24	14.4	56.4	0.79	0.231	79	0.278
49	0.00	20.6	3.7	24	14.1	56.3	0.82	0.224	78	0.274
50	0.00	21.2	5.3	25	15.1	56.0	0.78	0.233	80	0.282
51	0.00	20.4	3.8	24	15.1	56.2	0.75	0.227	82	0.286
52	0.00	20.3	4.2	24	14.3	56.4	0.76	0.224	80	0.280
53	0.00	20.3	5.0	24	15.0	57.5	0.76	0.220	74	0.258
54	0.00	20.4	2.2	24	14.5	55.1	0.79	0.226	77	0.271
	Average	21.7	4.9	26	14.1	55.3	0.85	0.237	80	0.279

Total number of blows analyzed: 53

Time Summary

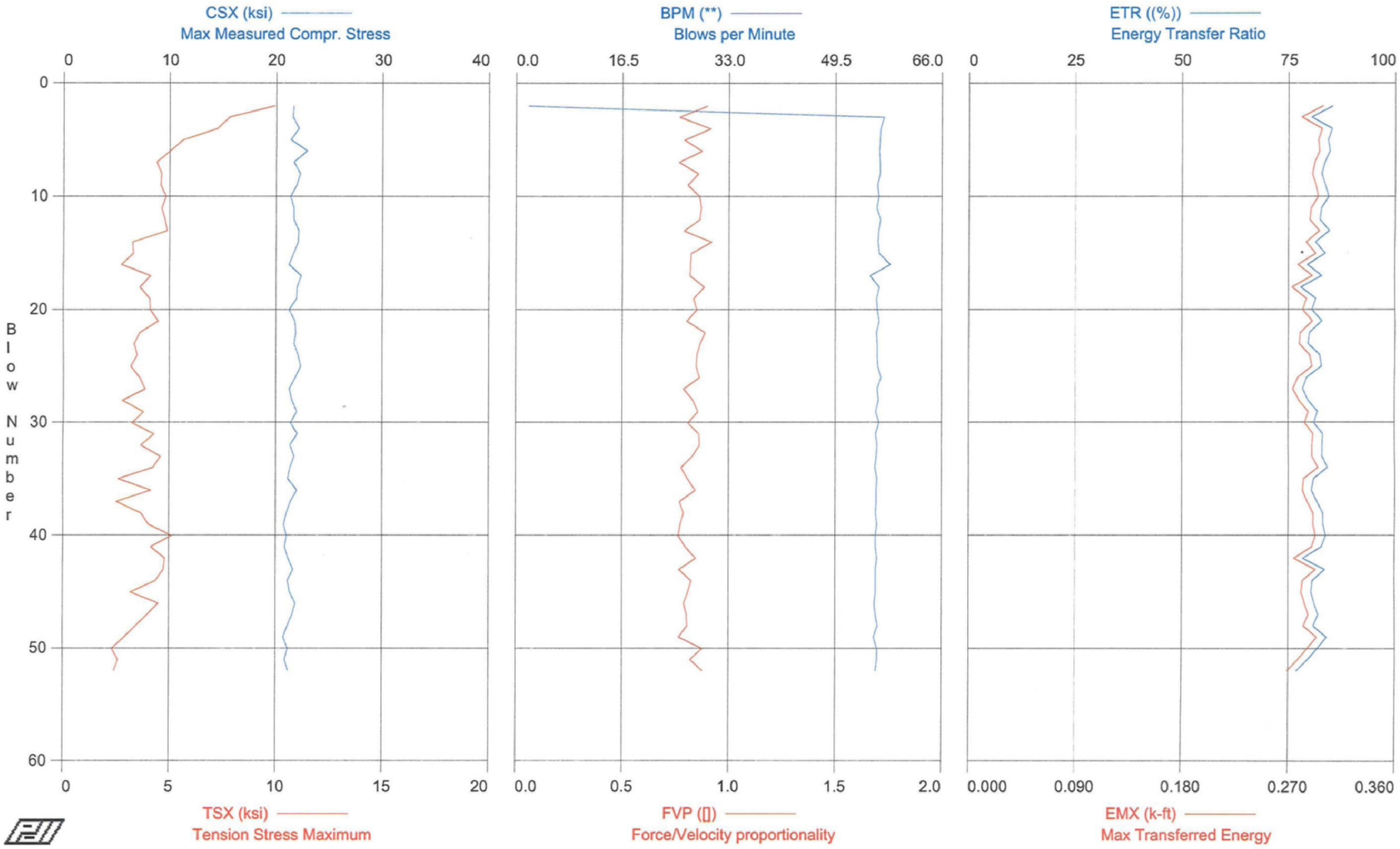
Drive 55 seconds 11:05:51 AM - 11:06:46 AM (2/19/2008) BN 2 - 54

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 19-Feb-2008

TURKEY POINT COL PROJECT - BORING B-628; 15.1' - 16.6' Sample



TURKEY POINT COL PROJECT - BORING B-628; 15.1' - 16.6' Sample
OP: SEK

HAMMER ID 299708 (MILLER)
Test date: 19-Feb-2008

AR: 1.19 in^2
LE: 20.00 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
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	21.6	9.9	26	13.6	1.9	0.90	0.243	85	0.299
3	0.00	21.6	7.8	26	15.8	57.0	0.77	0.250	80	0.281
4	0.00	22.1	7.2	26	13.6	56.5	0.91	0.247	85	0.298
5	0.00	21.4	5.6	25	15.1	56.4	0.79	0.244	84	0.295
6	0.00	22.9	5.0	27	14.7	56.3	0.87	0.253	85	0.296
7	0.00	21.6	4.4	26	14.7	56.4	0.77	0.247	83	0.292
8	0.00	22.3	4.6	26	14.6	56.4	0.86	0.247	83	0.290
9	0.00	21.9	4.6	26	15.2	56.0	0.81	0.251	84	0.293
10	0.00	21.4	4.8	25	14.0	56.2	0.86	0.244	84	0.295
11	0.00	21.7	4.6	26	13.9	55.9	0.87	0.244	83	0.289
12	0.00	21.7	4.8	26	14.0	56.5	0.86	0.248	82	0.288
13	0.00	22.1	4.9	26	15.8	56.2	0.79	0.246	85	0.296
14	0.00	22.1	3.2	26	13.4	56.1	0.92	0.240	81	0.285
15	0.00	21.6	3.3	26	13.7	56.3	0.82	0.238	84	0.293
16	0.00	21.2	2.7	25	13.5	58.0	0.82	0.232	79	0.278
17	0.00	22.4	4.1	27	15.3	54.9	0.82	0.241	83	0.290
18	0.00	22.0	3.6	26	13.9	56.3	0.89	0.240	78	0.273
19	0.00	21.9	4.1	26	14.7	55.9	0.84	0.241	81	0.285
20	0.00	21.2	4.1	25	14.0	56.0	0.85	0.238	80	0.282
21	0.00	21.8	4.5	26	15.1	56.3	0.80	0.242	83	0.290
22	0.00	21.9	3.6	26	13.8	55.9	0.89	0.238	80	0.280
23	0.00	21.7	3.3	26	14.1	56.0	0.87	0.237	80	0.279
24	0.00	22.1	3.5	26	14.6	56.0	0.85	0.241	82	0.288
25	0.00	22.3	3.2	27	14.8	56.1	0.85	0.239	83	0.290
26	0.00	21.8	3.6	26	14.2	56.6	0.86	0.237	79	0.278
27	0.00	21.3	3.9	25	13.9	56.0	0.79	0.238	78	0.274
28	0.00	21.5	2.8	26	14.4	56.2	0.83	0.239	80	0.279
29	0.00	22.0	3.8	26	14.4	55.8	0.86	0.239	82	0.287
30	0.00	21.4	3.3	25	14.7	56.3	0.81	0.240	81	0.284
31	0.00	22.0	4.3	26	14.4	55.8	0.86	0.240	83	0.291
32	0.00	21.3	3.7	25	13.8	56.0	0.86	0.234	83	0.290
33	0.00	21.7	4.6	26	14.6	55.9	0.83	0.243	83	0.290
34	0.00	21.4	4.2	25	15.4	55.7	0.78	0.239	84	0.295
35	0.00	21.1	2.6	25	14.1	56.0	0.81	0.238	81	0.283
36	0.00	22.0	4.1	26	14.5	55.9	0.84	0.241	80	0.282
37	0.00	21.4	2.5	25	14.4	55.9	0.77	0.240	82	0.286
38	0.00	21.0	3.7	25	14.8	55.8	0.79	0.238	83	0.291
39	0.00	20.8	4.0	25	14.8	56.0	0.77	0.237	83	0.291
40	0.00	21.0	5.1	25	15.4	55.8	0.77	0.240	84	0.293
41	0.00	20.9	4.2	25	14.7	55.8	0.80	0.238	83	0.290
42	0.00	21.2	4.8	25	14.0	56.0	0.85	0.240	78	0.275
43	0.00	21.6	4.7	26	15.7	55.8	0.77	0.242	84	0.293
44	0.00	21.1	4.4	25	14.4	55.8	0.83	0.236	81	0.282
45	0.00	21.3	3.2	25	14.3	55.8	0.81	0.241	80	0.281
46	0.00	21.9	4.5	26	15.5	55.6	0.79	0.240	81	0.284
47	0.00	21.6	4.0	26	15.0	55.8	0.80	0.238	82	0.287
48	0.00	21.1	3.4	25	14.7	56.1	0.81	0.238	81	0.283
49	0.00	20.7	2.9	25	15.1	55.5	0.77	0.237	84	0.294
50	0.00	21.1	2.3	25	13.6	56.0	0.88	0.234	82	0.286
51	0.00	20.9	2.6	25	14.3	56.0	0.82	0.235	80	0.278
52	0.00	21.2	2.4	25	13.4	55.8	0.88	0.237	77	0.269
	Average	21.6	4.1	26	14.5	55.0	0.83	0.241	82	0.287

Total number of blows analyzed: 51

Time Summary

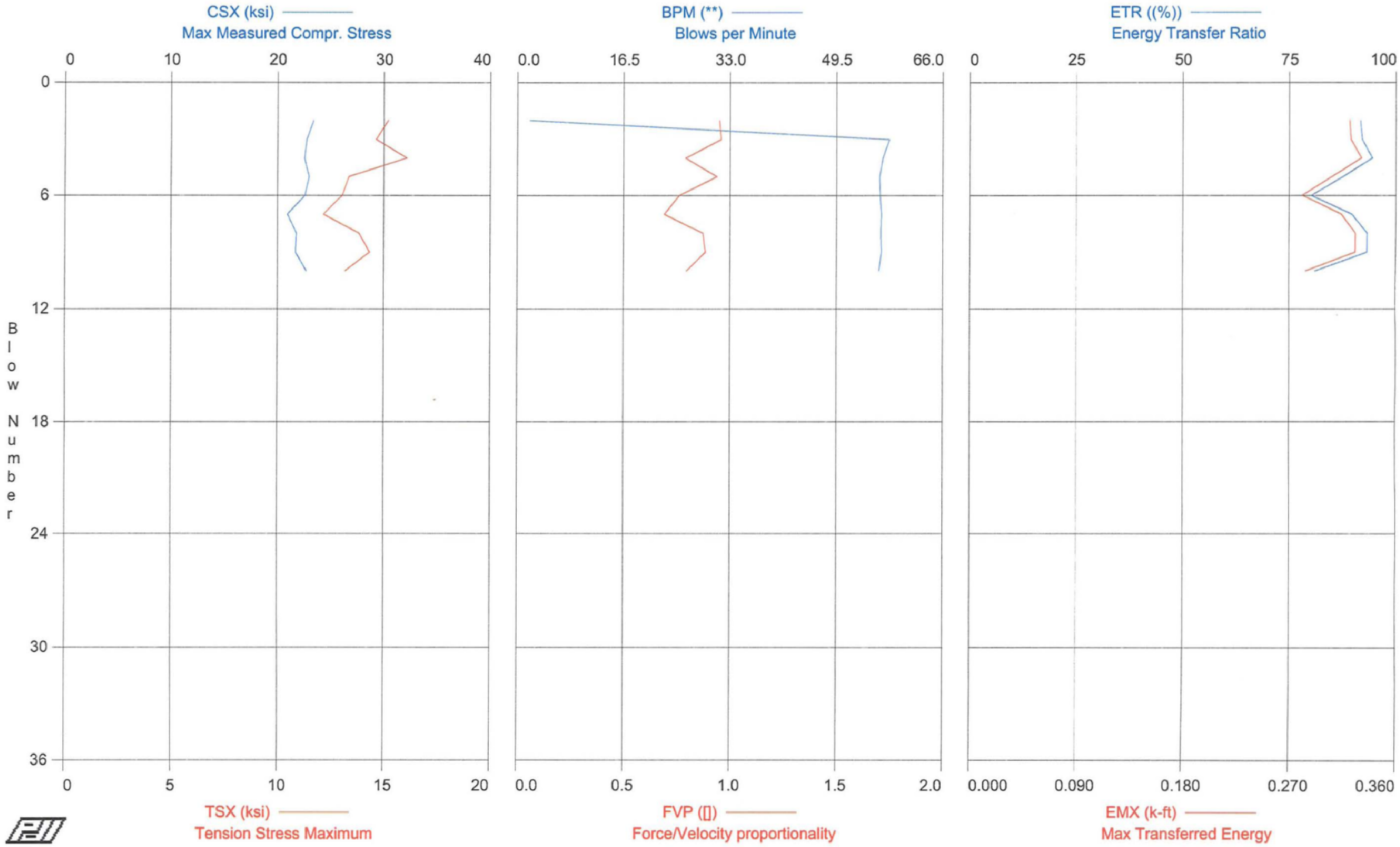
Drive 54 seconds 11:25:49 AM - 11:26:43 AM (2/19/2008) BN 2 - 52

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 19-Feb-2008

TURKEY POINT COL PROJECT - BORING B-628; 18.3' - 19.8' Sample



TURKEY POINT COL PROJECT - BORING B-628; 18.3' - 19.8' Sample

HAMMER ID 299708 (MILLER)
Test date: 19-Feb-2008

OP: SEK
AR: 1.19 in^2
LE: 23.00 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
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	23.4	15.2	28	13.8	1.9	0.95	0.286	92	0.321
3	0.00	22.7	14.6	27	13.8	57.7	0.96	0.280	92	0.322
4	0.00	22.5	16.1	27	14.5	56.7	0.79	0.273	94	0.331
5	0.00	23.0	13.4	27	13.8	56.2	0.94	0.274	88	0.306
6	0.00	22.6	13.0	27	15.3	56.3	0.76	0.275	80	0.281
7	0.00	20.9	12.2	25	17.0	56.5	0.69	0.267	90	0.314
8	0.00	21.8	13.8	26	14.0	56.4	0.87	0.269	93	0.326
9	0.00	21.7	14.3	26	13.7	56.5	0.88	0.268	93	0.326
10	0.00	22.7	13.2	27	14.4	56.1	0.80	0.271	81	0.284
	Average	22.4	14.0	27	14.5	50.5	0.85	0.274	89	0.312

Total number of blows analyzed: 9

Time Summary

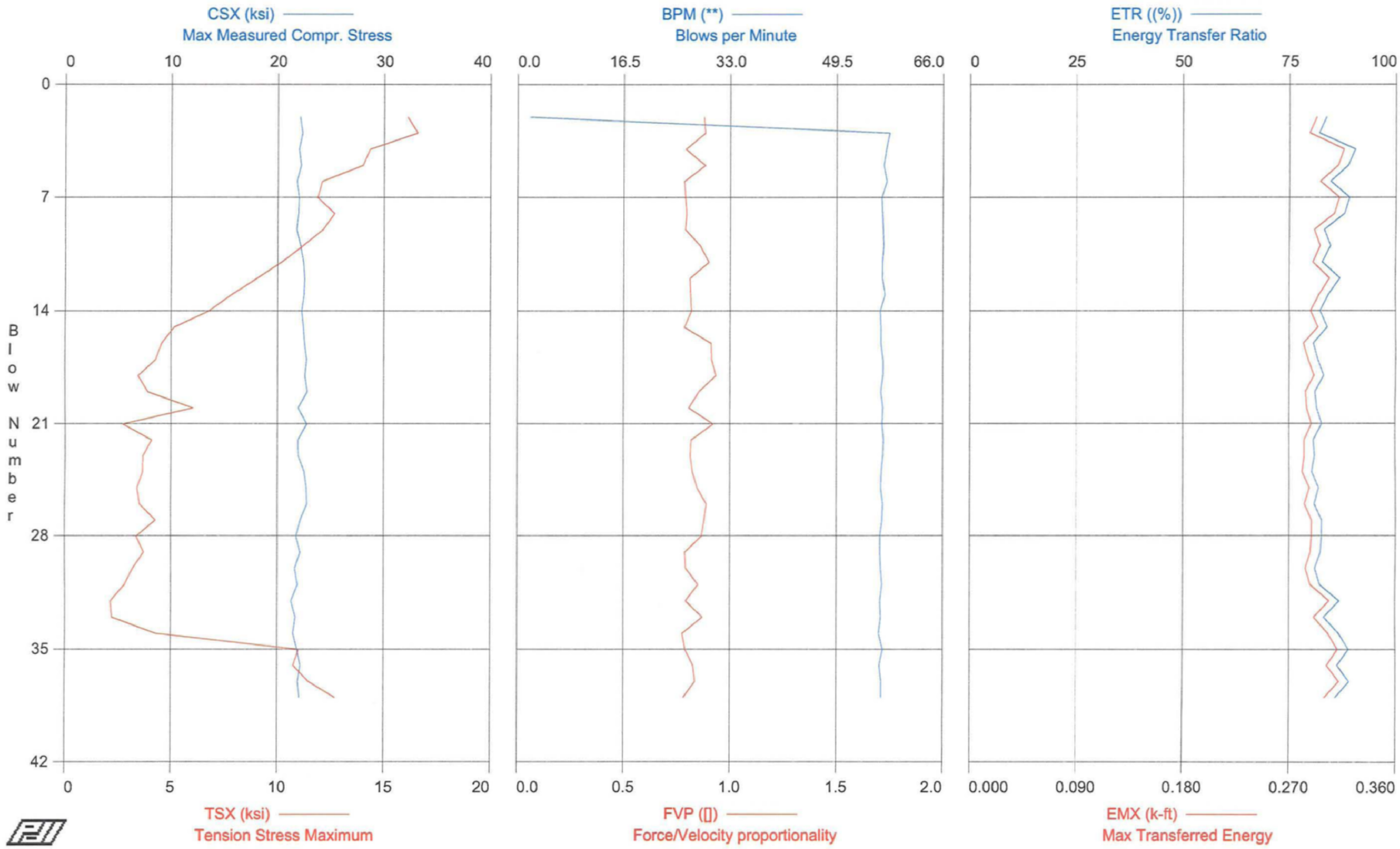
Drive 8 seconds 12:01:14 PM - 12:01:22 PM (2/19/2008) BN 2 - 10

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 19-Feb-2008

TURKEY POINT COL PROJECT - BORING B-628; 23.3' - 24.8' Sample



TURKEY POINT COL PROJECT - BORING B-628; 23.3' - 24.8' Sample
OP: SEK

HAMMER ID 299708 (MILLER)
Test date: 19-Feb-2008

AR: 1.19 in^2
LE: 27.00 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
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	22.1	16.1	26	14.1	1.9	0.88	0.278	84	0.293
3	0.00	22.3	16.6	27	14.2	57.7	0.88	0.274	82	0.287
4	0.00	22.0	14.3	26	14.3	57.2	0.79	0.271	90	0.316
5	0.00	22.2	14.0	26	14.0	56.8	0.88	0.274	89	0.311
6	0.00	21.8	12.1	26	15.5	57.3	0.78	0.274	85	0.296
7	0.00	22.0	11.9	26	15.6	56.5	0.79	0.275	89	0.312
8	0.00	21.9	12.7	26	15.0	56.6	0.80	0.273	88	0.308
9	0.00	21.8	12.1	26	15.5	56.7	0.79	0.275	83	0.291
10	0.00	22.2	11.2	26	14.5	56.8	0.86	0.271	85	0.296
11	0.00	22.4	10.2	27	14.0	56.6	0.90	0.275	83	0.290
12	0.00	22.5	9.0	27	15.6	56.6	0.81	0.277	87	0.304
13	0.00	22.5	7.8	27	15.5	57.0	0.81	0.275	84	0.295
14	0.00	22.3	6.8	26	15.2	56.3	0.82	0.275	82	0.288
15	0.00	22.4	5.1	27	13.9	56.4	0.79	0.276	84	0.294
16	0.00	22.5	4.5	27	13.8	56.4	0.91	0.276	81	0.282
17	0.00	22.7	4.3	27	13.8	56.7	0.91	0.278	82	0.286
18	0.00	22.6	3.4	27	13.6	56.7	0.93	0.274	83	0.291
19	0.00	22.8	3.9	27	15.0	56.4	0.85	0.274	81	0.284
20	0.00	21.9	6.0	26	13.6	56.7	0.81	0.273	82	0.285
21	0.00	22.8	2.7	27	13.9	56.6	0.92	0.275	83	0.289
22	0.00	21.9	4.1	26	14.4	56.8	0.82	0.272	81	0.283
23	0.00	22.0	3.7	26	14.4	56.7	0.81	0.272	81	0.283
24	0.00	22.5	3.7	27	15.3	56.5	0.82	0.274	80	0.281
25	0.00	22.7	3.4	27	15.0	56.4	0.85	0.274	82	0.287
26	0.00	22.8	3.5	27	14.3	56.7	0.89	0.273	81	0.283
27	0.00	22.2	4.3	26	14.2	56.6	0.88	0.269	83	0.289
28	0.00	21.8	3.4	26	14.1	56.3	0.87	0.268	83	0.289
29	0.00	22.1	3.7	26	13.7	56.3	0.79	0.274	82	0.288
30	0.00	21.6	3.2	26	15.3	56.4	0.79	0.273	81	0.284
31	0.00	21.9	2.8	26	14.4	56.6	0.85	0.270	82	0.288
32	0.00	21.3	2.2	25	15.1	56.3	0.79	0.270	87	0.304
33	0.00	21.7	2.2	26	13.9	56.4	0.87	0.268	83	0.291
34	0.00	21.5	4.3	26	15.3	56.1	0.78	0.269	87	0.303
35	0.00	21.9	11.0	26	15.5	56.7	0.79	0.269	89	0.311
36	0.00	22.2	10.8	26	15.0	56.2	0.83	0.274	86	0.302
37	0.00	21.9	11.5	26	14.7	56.5	0.84	0.273	89	0.312
38	0.00	22.1	12.7	26	14.6	56.5	0.78	0.272	86	0.300
	Average	22.2	7.4	26	14.6	55.1	0.84	0.273	84	0.294

Total number of blows analyzed: 37

Time Summary

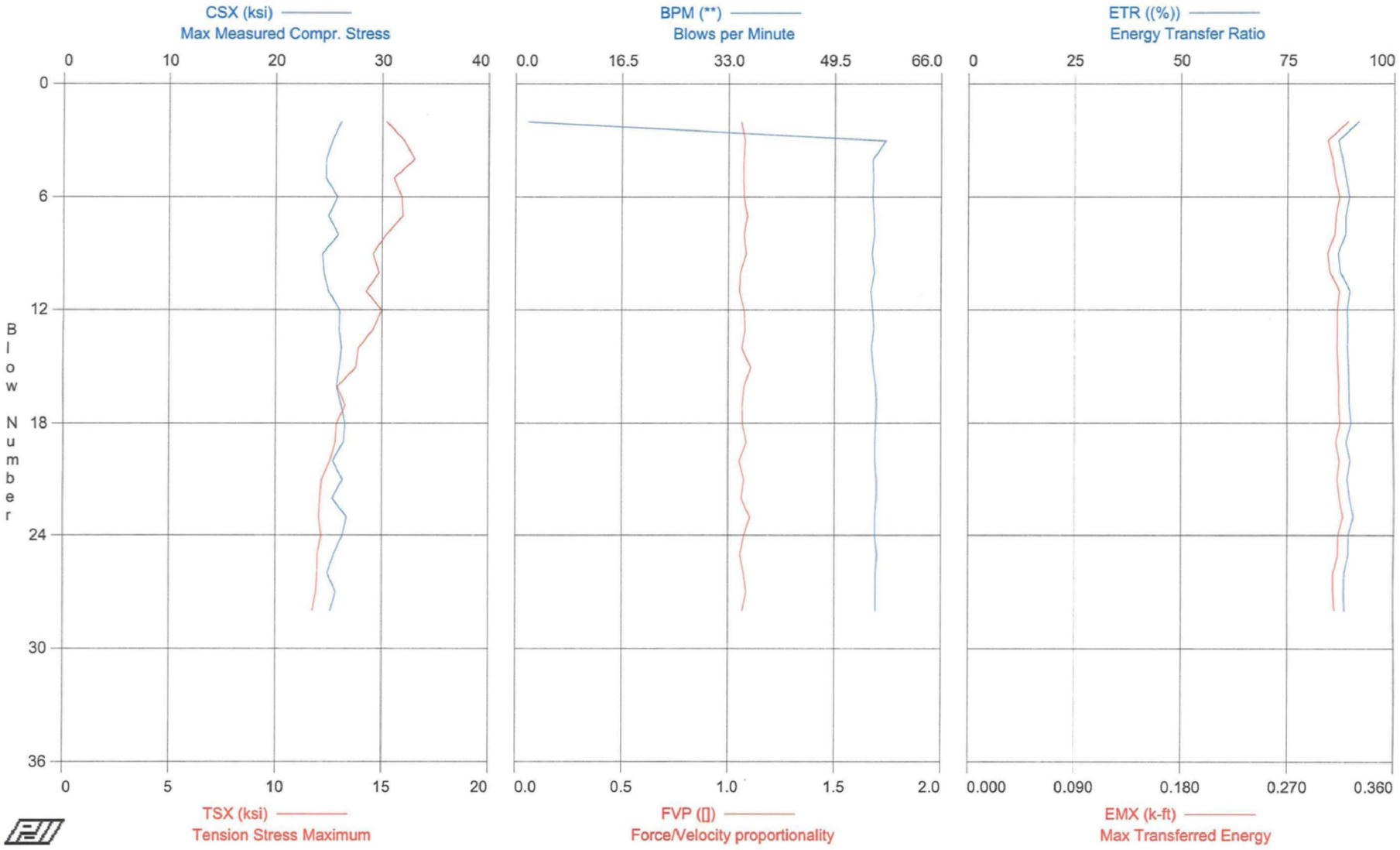
Drive 38 seconds 12:31:20 PM - 12:31:58 PM (2/19/2008) BN 2 - 38

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 11-Mar-2008

TURKEY POINT COL PROJECT - BORING B-708 (DH); 152.9' - 154.4' Sample



TURKEY POINT COL PROJECT - BORING B-708 (DH); 152.9' - 154.4' Sample
OP: SEK
AR: 1.49 in^2
LE: 157.00 ft
WS: 16,807.9 f/s

HAMMER ID 299708 (BILBREY)
Test date: 11-Mar-2008
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

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

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	26.1	15.2	39	13.0	1.9	1.06	0.344	92	0.321
3	0.00	25.3	16.0	38	13.1	57.4	1.08	0.336	87	0.304
4	0.00	24.7	16.5	37	13.0	55.4	1.07	0.336	88	0.308
5	0.00	24.7	15.5	37	12.9	55.5	1.07	0.339	89	0.310
6	0.00	25.8	15.9	38	13.5	55.4	1.07	0.339	90	0.314
7	0.00	25.0	16.0	37	12.9	55.6	1.09	0.338	89	0.311
8	0.00	25.9	15.2	39	13.5	55.7	1.07	0.338	89	0.310
9	0.00	24.4	14.6	36	12.6	55.3	1.09	0.334	87	0.304
10	0.00	24.5	14.9	37	13.0	55.7	1.06	0.327	87	0.306
11	0.00	25.0	14.2	37	13.3	55.1	1.05	0.336	90	0.314
12	0.00	26.0	15.0	39	13.6	55.4	1.08	0.339	89	0.312
13	0.00	26.0	14.6	39	13.5	55.6	1.08	0.333	89	0.312
14	0.00	26.2	13.9	39	13.8	55.2	1.07	0.341	89	0.312
15	0.00	26.0	13.8	39	13.2	55.5	1.11	0.343	89	0.313
16	0.00	25.7	12.9	38	13.4	55.9	1.08	0.341	90	0.314
17	0.00	26.2	13.3	39	13.7	56.0	1.07	0.339	90	0.314
18	0.00	26.5	12.9	40	13.9	55.9	1.07	0.341	90	0.315
19	0.00	26.4	12.8	39	13.5	55.8	1.09	0.344	89	0.311
20	0.00	25.4	12.6	38	13.5	55.8	1.05	0.345	90	0.314
21	0.00	26.3	12.2	39	13.7	56.0	1.08	0.341	89	0.312
22	0.00	25.3	12.1	38	13.3	56.0	1.06	0.344	90	0.314
23	0.00	26.7	12.1	40	13.6	55.8	1.10	0.344	91	0.317
24	0.00	26.3	12.2	39	13.7	55.8	1.08	0.339	89	0.313
25	0.00	25.5	12.0	38	13.3	56.1	1.06	0.344	89	0.313
26	0.00	24.9	12.0	37	13.0	55.9	1.07	0.335	88	0.309
27	0.00	25.7	11.9	38	13.2	55.9	1.09	0.335	88	0.309
28	0.00	25.2	11.7	37	13.2	55.9	1.07	0.342	88	0.310
	Average	25.6	13.8	38	13.3	53.8	1.07	0.339	89	0.312

Total number of blows analyzed: 27

Time Summary

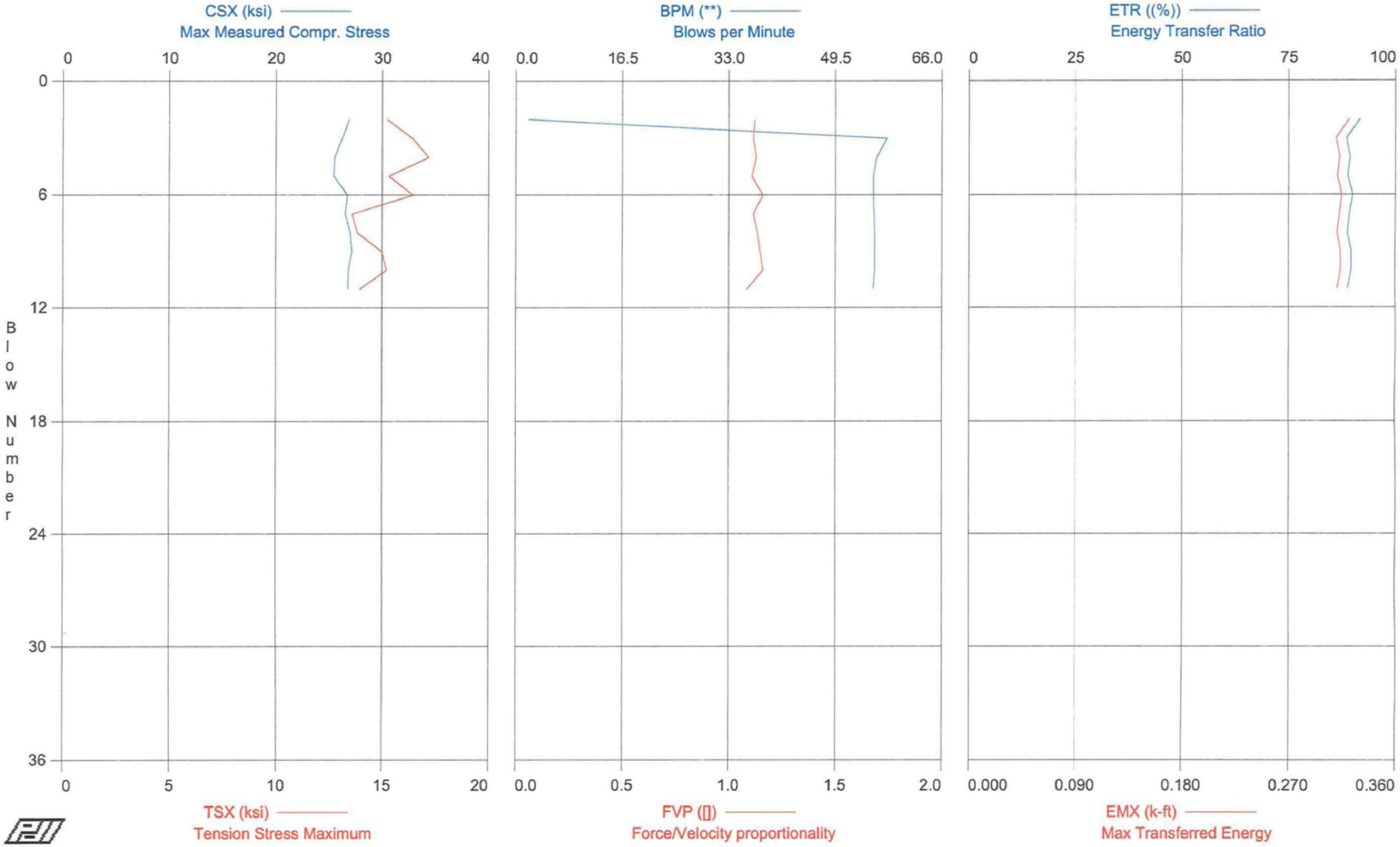
Drive 28 seconds 9:45:09 AM - 9:45.37 AM (3/11/2008) BN 2 - 28

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 11-Mar-2008

TURKEY POINT COL PROJECT - BORING B-708 (DH); 173' - 174.5' Sample



TURKEY POINT COL PROJECT - BORING B-708 (DH); 173' - 174.5' Sample

HAMMER ID 299708 (BILBREY)
Test date: 11-Mar-2008

OP: SEK

AR: 1.49 in^2
LE: 178.00 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
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	26.9	15.2	40	13.5	1.9	1.12	0.351	92	0.321
3	0.00	26.2	16.4	39	13.1	57.5	1.12	0.349	89	0.310
4	0.00	25.5	17.2	38	12.7	55.9	1.13	0.346	89	0.313
5	0.00	25.4	15.3	38	12.8	55.4	1.11	0.345	89	0.311
6	0.00	26.7	16.4	40	12.9	55.4	1.16	0.351	90	0.315
7	0.00	26.5	13.6	39	13.4	55.5	1.12	0.349	89	0.313
8	0.00	27.0	13.8	40	13.3	55.6	1.14	0.353	89	0.311
9	0.00	27.1	15.0	40	13.3	55.6	1.15	0.354	90	0.314
10	0.00	26.8	15.2	40	13.0	55.6	1.16	0.352	90	0.314
11	0.00	26.8	14.0	40	12.8	55.4	1.09	0.353	89	0.311
	Average	26.5	15.2	39	13.1	50.4	1.13	0.350	90	0.313

Total number of blows analyzed: 10

Time Summary

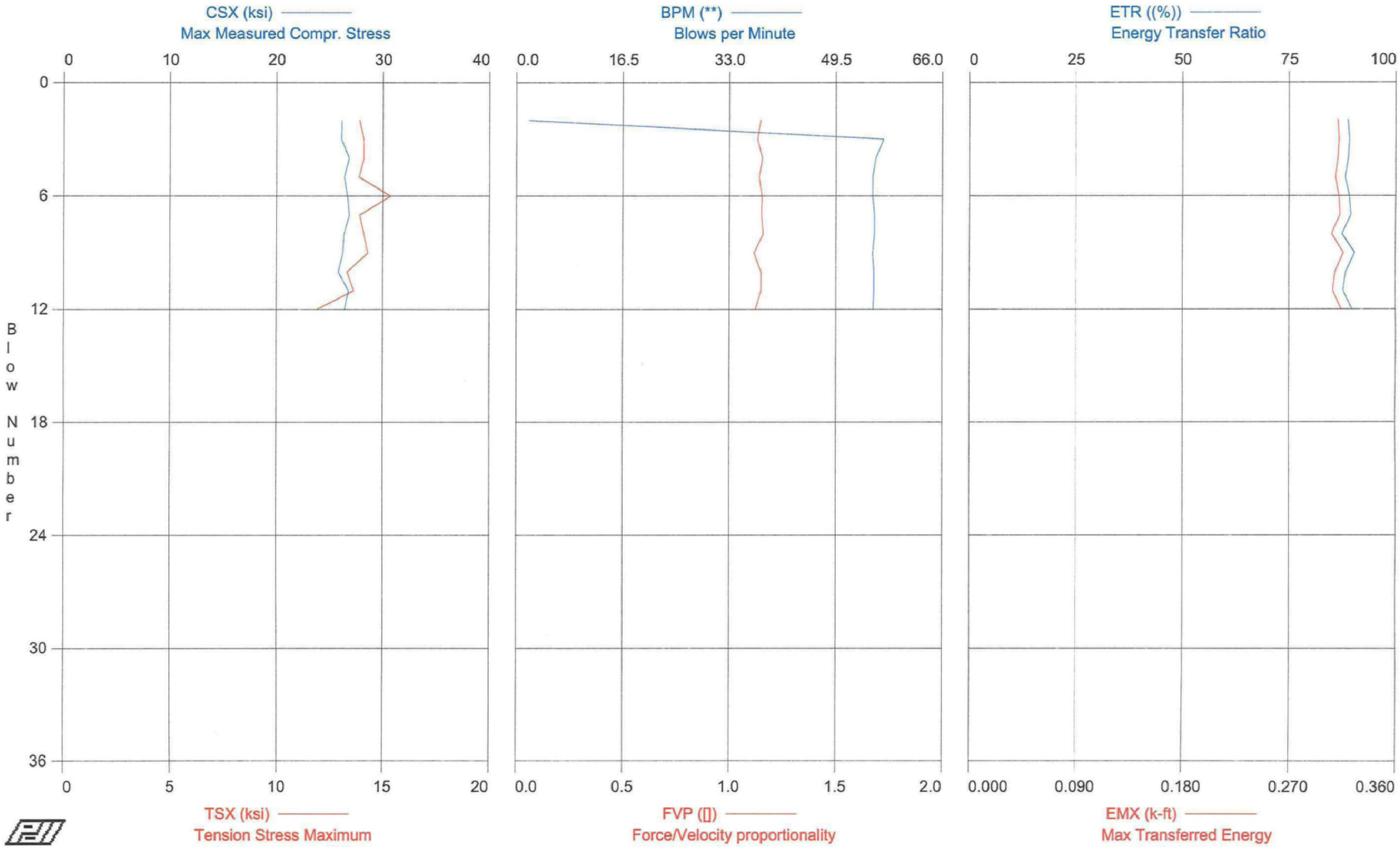
Drive 10 seconds 11:59:29 AM - 11:59:39 AM (3/11/2008) BN 2 - 11

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 11-Mar-2008

TURKEY POINT COL PROJECT - BORING B-708 (DH); 183' - 184.5' Sample



TURKEY POINT COL PROJECT - BORING B-708 (DH); 183' - 184.5' Sample
OP: SEK
AR: 1.49 in^2
LE: 188.00 ft
WS: 16,807.9 f/s

HAMMER ID 299708 (BILBREY)
Test date: 11-Mar-2008
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

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

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	26.1	13.9	39	12.7	1.9	1.15	0.340	89	0.311
3	0.00	26.1	14.1	39	12.9	56.9	1.13	0.339	89	0.312
4	0.00	26.8	14.1	40	13.0	55.7	1.16	0.340	89	0.311
5	0.00	26.4	13.9	39	12.9	55.2	1.14	0.332	88	0.309
6	0.00	26.7	15.4	40	13.0	55.2	1.15	0.343	89	0.312
7	0.00	26.8	13.9	40	13.1	55.5	1.15	0.339	90	0.313
8	0.00	26.3	14.1	39	12.7	55.5	1.16	0.341	87	0.306
9	0.00	26.2	14.3	39	13.2	55.2	1.12	0.350	90	0.316
10	0.00	25.8	13.3	38	12.6	55.4	1.15	0.340	88	0.309
11	0.00	26.8	13.6	40	13.0	55.4	1.15	0.345	88	0.307
12	0.00	26.4	11.9	39	13.2	55.3	1.12	0.344	90	0.314
	Average	26.4	13.9	39	13.0	50.7	1.14	0.341	89	0.311

Total number of blows analyzed: 11

Time Summary

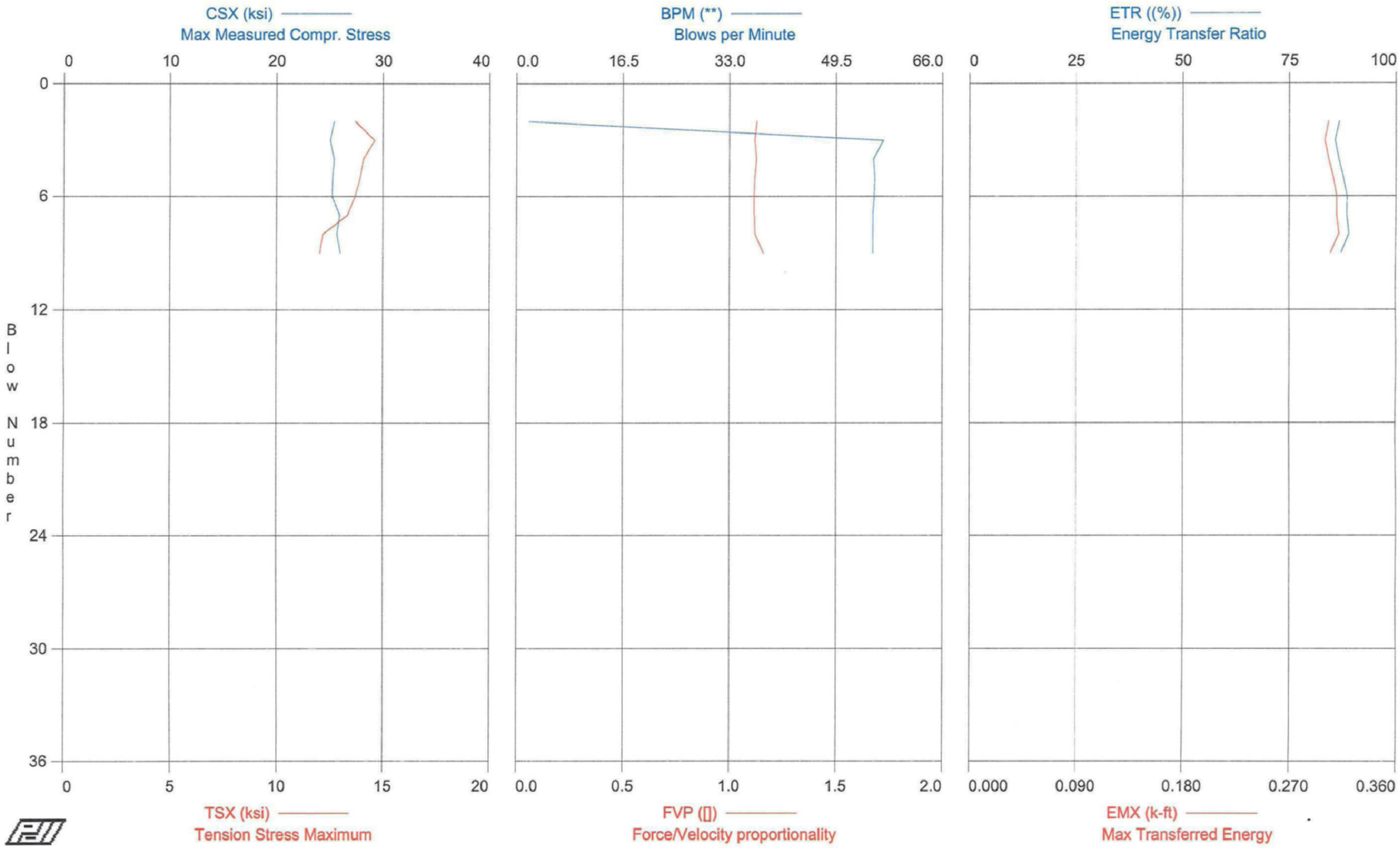
Drive 10 seconds 1:05:53 PM - 1:06:03 PM (3/11/2008) BN 2 - 12

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 11-Mar-2008

TURKEY POINT COL PROJECT - BORING B-708 (DH); 193' - 194.5' Sample



TURKEY POINT COL PROJECT - BORING B-708 (DH); 193' - 194.5' Sample
OP: SEK

HAMMER ID 299708 (BILBREY)
Test date: 11-Mar-2008

AR: 1.49 in^2
LE: 198.00 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
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	25.4	13.7	38	12.5	1.9	1.13	0.339	87	0.303
3	0.00	25.0	14.6	37	12.5	56.8	1.12	0.333	86	0.300
4	0.00	25.4	14.1	38	12.7	55.3	1.13	0.333	87	0.303
5	0.00	25.3	13.9	38	12.7	55.5	1.12	0.334	88	0.307
6	0.00	25.2	13.7	38	12.7	55.4	1.12	0.341	89	0.310
7	0.00	25.9	13.3	39	13.0	55.2	1.12	0.343	89	0.310
8	0.00	25.7	12.2	38	12.9	55.2	1.12	0.340	89	0.312
9	0.00	26.0	12.0	39	12.6	55.2	1.16	0.341	87	0.305
	Average	25.5	13.4	38	12.7	48.8	1.13	0.338	87	0.306

Total number of blows analyzed: 8

Time Summary

Drive 8 seconds 2:18:54 PM - 2:19:02 PM (3/11/2008) BN 2 - 9

MACTEC

engineering and constructing a better tomorrow

June 30, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Tom McDaniel

Subject: **Report of SPT Energy – Miller Drilling CME 550 ATV Hammer Serial No. M06 Automatic Hammer WORK INSTRUCTION TUR-055**
Turkey Point COL Project
Dade County, Florida
MACTEC Project No. 6468-07-1950

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 February 19 and 20, 2008, during drilling of Borings B-707 at the referenced site. The testing was performed by Steve Kiser from approximately 4:25 PM on February 19 to 3:45 PM on February 20 under cloudy and rainy skies and a temperature of about 65 degrees Fahrenheit (February 19) and sunny skies and a temperature of about 70 degrees Fahrenheit (February 20). The boring was drilled with personnel and equipment from Miller Drilling. The drilling equipment consisted of a CME 550 model ATV-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of AW-J-sized drilling rods and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the borings below the depth at which groundwater was encountered at the time of energy testing. The drill rig operator during sampling was Mr. 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. 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 TUR054.

15 Pages Total

MACTEC Engineering and Consulting, Inc.
2801 Yorkmont Road, Suite 100 • Charlotte, NC 28208 • Phone: 704.357.8600 • Fax: 704.357.8638 www.mactec.com

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 297 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 81% to 85% 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 292.7 foot-pounds, with an average ETR of 83.6%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN TUR-055 – 1 Page
Pages 6 – 7 Record of SPT Energy Measurement – 2 Pages
Pages 8 – 15 PDIPLOT Output – 8 Pages

Work Instruction No. 9
Turkey Point COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6468-07-1950

Issued To: Steve Kiser and Jay Cerceo **Rev. No.** 1

Issued By: Tom McDaniel **Date:** 3-24-08

Valid From: 3-24-08 **To:** 4-30-08

Task Description: Perform SPT Energy Measurements

Applicable Technical Procedures or Plans, or other reference: Geotechnical Work Plan (current revision; available at Site Office), Bechtel Specification 25409-102-3PS-CY00-00001, Rev. 000 or later revision, section 4.3, 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 Coordinator as to schedule for rigs that may be planned for use that are not yet present. 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. Be sure to check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Coordinator, and can be directed by Becthel in accordance with the specification. Site profile consists of very soft soils to about 5 feet followed by high-N-value soft rock to about 20 feet where coring begins. Sands are present below about 100 to 125 feet. Energy measurements should be made in the deeper sand zone as often as can be done, consistent with the drilling depths at the time of the measurements. See Site Coordinator 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 has been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, contact Site Coordinator, Project Principal (Tom McDaniel) or Sr. Project Principal (Al Tice) immediately.

Report Format: 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: _____ Date: _____

Project Principal Engineer: _____ Date: 3/24/08

Site Manager/Coordinator: _____ Date: _____

Pages: 1 plus attachment **DCN:** TUR-055

Attachments: ASTM D 4633-05

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
Turkey Point COL Project
Dade County, Florida
MACTEC Project No. 6468-07-1950

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)
M06 (CME 550 ATV)	Miller Drilling	Rick White	B-707	AW-J	2/19/2008	108.8 - 110.3	7 - 7 - 7	20	297	84.9%
					2/20/2008	110.3 - 111.0	4 - 50 / 0.2'	56	296	84.6%
						115.3 - 116.8	10 - 11 - 12	33	284	81.1%
						120.3 - 121.8	3 - 6 - 8	17	294	84.0%
								Average for Rig:	**292.7**	**83.6%**

[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]	Date: 5-30-08	Checked By: WBC	Date: 6-4-08

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:	Turkey Point COL Project	MAKE:	CME
LOCATION:	Florida City, Florida	MODEL:	550 ATV
PROJECT NO.:	6468-07-1950	SERIAL NO.:	271353
DATE:	2-19-08	HAMMER TYPE:	Automatic
WEATHER:	CLOUDY - RAINY 65°	ROPE CONDITION:	N/A
INSPECTOR:	Steve Kiser	ROD SIZE:	AW-J
DRILLING COMPANY:	MILLER DRILLING	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	S-707		
DEPTH DRILLED:	150' PLANNED		
TIME DRIVEN:	VARIOUS - SEE TEST DATA		
RIG OPERATOR:	RICK WHITE		
HAMMER OPERATOR:	N.R		
PDA PAK SERIAL NO.:	3622L	3622L	3622L
INSTR. ROD AREA:	1.19 in²		
ACCEL. SERIAL NOS.:	P5953 P5992		
STRAIN SERIAL NOS.:	75 AW #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)
108'-109.5'	7-7-7										

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:	Turkey Point COL Project	MAKE:	CME 550
LOCATION:	Florida City, Florida	MODEL:	550 ATV
PROJECT NO.:	6468-07-1950	SERIAL NO.:	271353
DATE:	2-20-08	HAMMER TYPE:	Automatic
WEATHER:	SUNNY BREEZY 70°	ROPE CONDITION:	N/A
INSPECTOR:	Steve Kiser	ROD SIZE:	AW-J
DRILLING COMPANY:	MILLER DRILLING	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	B-707		
DEPTH DRILLED:	150' PLANNED		
TIME DRIVEN:	VARIOUS - SEE DATA SHEETS		
RIG OPERATOR:	RICK WHITE		
HAMMER OPERATOR:	N.R.		
PDA PAK SERIAL NO.:	3622L	3622L	3622L
INSTR. ROD AREA:	1.19 in²		
ACCEL. SERIAL NOS.:	P5953 P5992		
STRAIN SERIAL NOS.:	75 AW # 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)
110.3'-111.8'	4-50/2"										
115.3'-116.8'	10-11-12										
120.3'-121.8'	3-6-8										

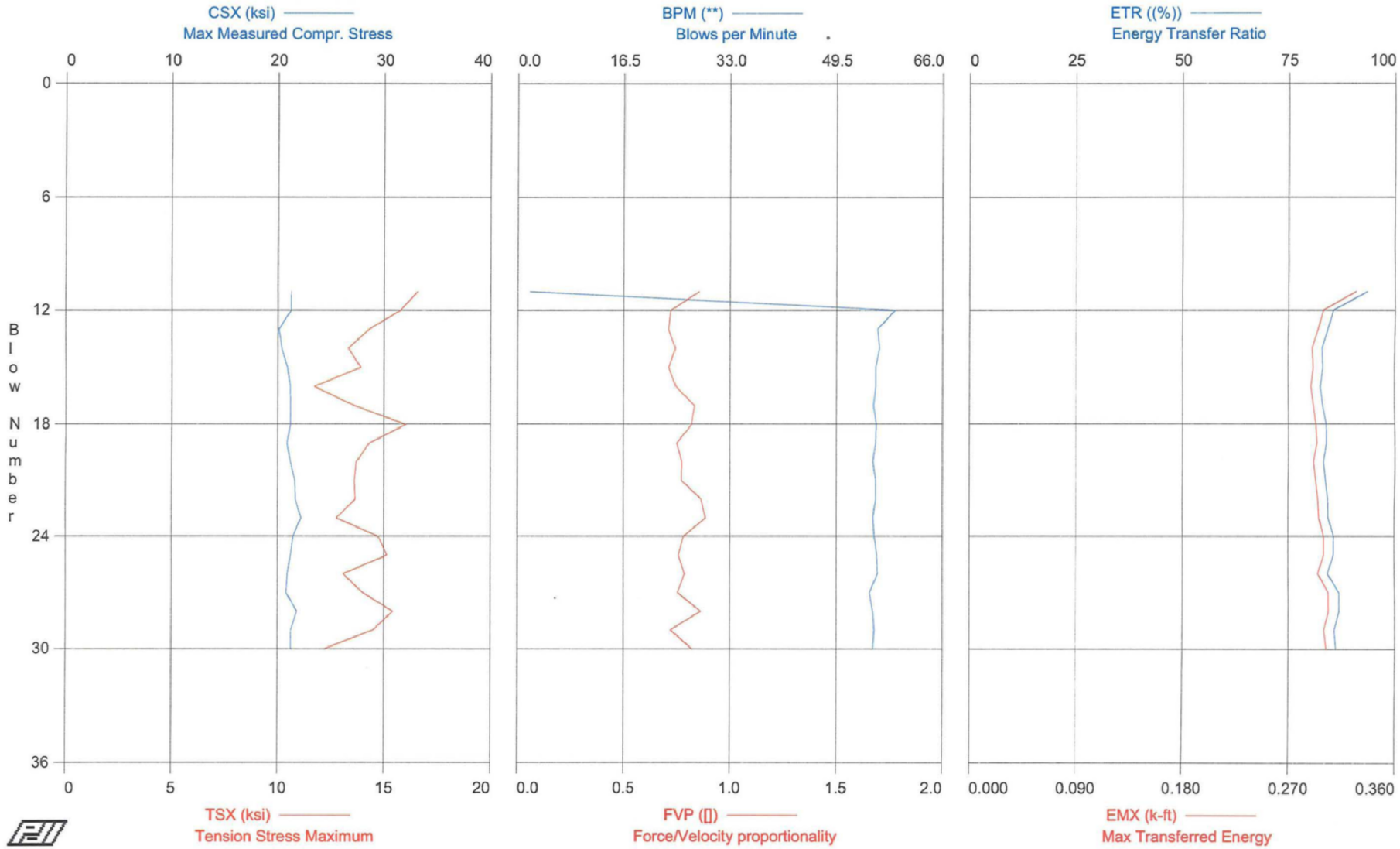
REMARKS:

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 19-Feb-2008

TURKEY POINT COL PROJECT - BORING B-707; 108.8' - 110.3' Sample



TURKEY POINT COL PROJECT - BORING B-707; 108.8' - 110.3' Sample

HAMMER ID 271353 (MILLER)
Test date: 19-Feb-2008

OP: SEK
AR: 1.19 in^2
LE: 112.00 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
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
11	0.00	21.2	16.6	25	13.9	1.9	0.86	0.282	94	0.327
12	0.00	21.2	15.7	25	14.7	58.6	0.72	0.278	85	0.299
13	0.00	20.1	14.3	24	15.7	55.9	0.71	0.270	84	0.295
14	0.00	20.3	13.3	24	15.3	56.2	0.74	0.269	83	0.290
15	0.00	20.9	13.9	25	15.0	55.6	0.71	0.271	83	0.291
16	0.00	21.1	11.7	25	14.5	55.6	0.75	0.271	82	0.289
17	0.00	21.2	13.6	25	14.2	55.3	0.83	0.274	83	0.291
18	0.00	21.2	16.0	25	14.5	55.7	0.82	0.275	84	0.293
19	0.00	20.9	14.3	25	15.5	55.6	0.75	0.276	84	0.294
20	0.00	21.2	13.7	25	15.1	55.2	0.77	0.276	83	0.291
21	0.00	21.6	13.6	26	14.0	55.6	0.77	0.272	84	0.293
22	0.00	21.7	13.6	26	14.1	55.6	0.86	0.271	84	0.295
23	0.00	22.2	12.8	26	14.0	55.2	0.89	0.275	84	0.296
24	0.00	21.4	14.7	25	14.7	55.4	0.78	0.277	86	0.300
25	0.00	21.2	15.1	25	15.8	55.8	0.76	0.274	86	0.300
26	0.00	20.9	13.1	25	14.9	55.9	0.79	0.269	84	0.295
27	0.00	20.8	14.0	25	15.5	54.7	0.75	0.274	87	0.304
28	0.00	21.8	15.4	26	14.2	55.2	0.86	0.274	87	0.304
29	0.00	21.2	14.5	25	15.3	55.4	0.72	0.275	86	0.300
30	0.00	21.2	12.2	25	14.5	55.2	0.82	0.272	86	0.302
	Average	21.2	14.1	25	14.8	53.0	0.78	0.274	85	0.297

Total number of blows analyzed: 20

Time Summary

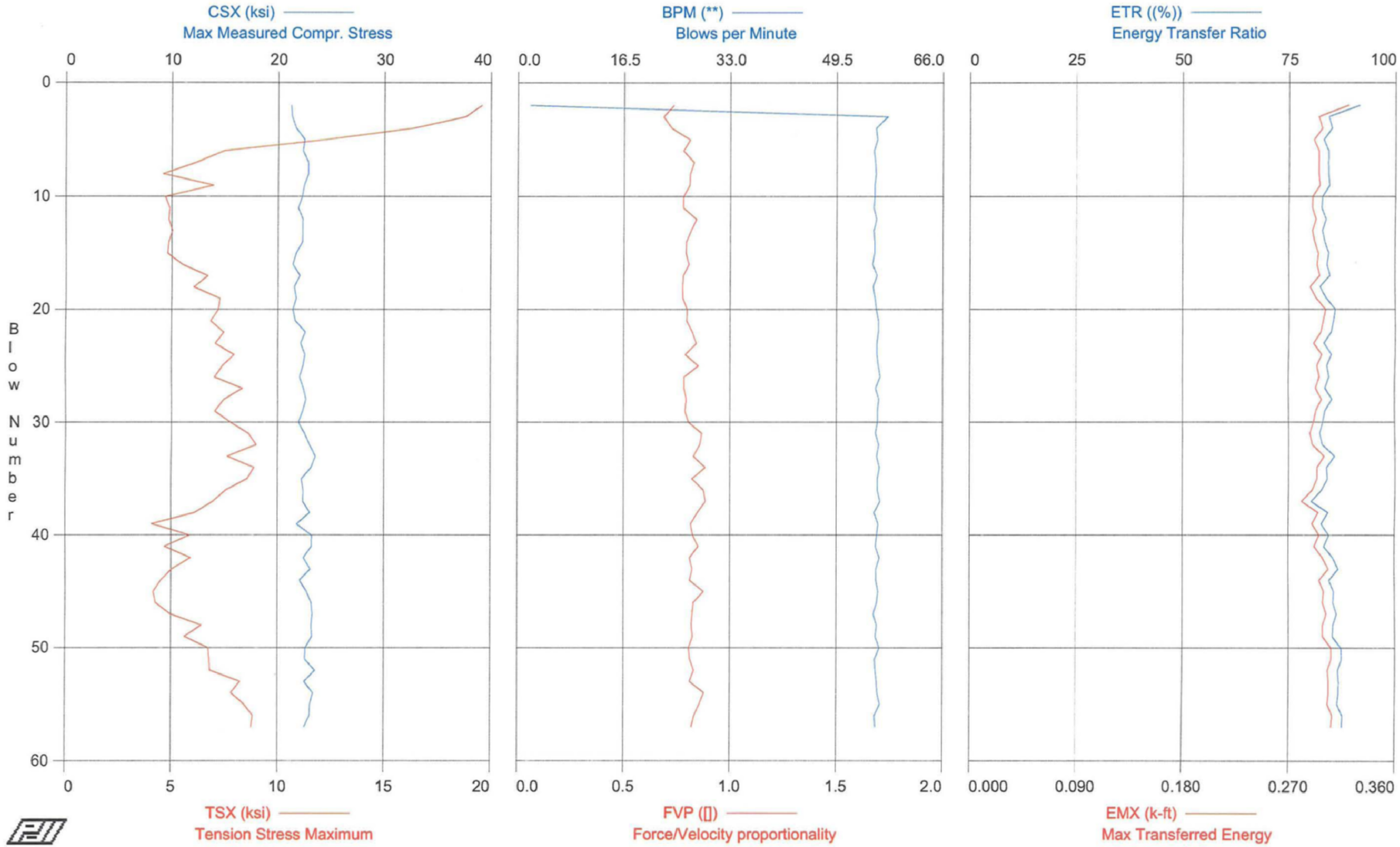
Drive 20 seconds 4:25:53 PM - 4:26:13 PM (2/19/2008) BN 11 - 30

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 20-Feb-2008

TURKEY POINT COL PROJECT - BORING B-707; 110.3' - 111.0' Sample



TURKEY POINT COL PROJECT - BORING B-707; 110.3' - 111.0' Sample

HAMMER ID 271353 (MILLER)
Test date: 20-Feb-2008

OP: SEK
AR: 1.19 in^2
LE: 115.00 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
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	21.2	19.6	25	16.1	1.9	0.73	0.277	92	0.320
3	0.00	21.3	18.8	25	17.4	57.4	0.69	0.268	84	0.295
4	0.00	21.7	16.3	26	15.4	55.6	0.72	0.268	85	0.298
5	0.00	22.5	12.2	27	15.5	55.8	0.81	0.272	83	0.291
6	0.00	22.3	7.5	27	16.1	55.3	0.78	0.271	84	0.295
7	0.00	22.8	6.2	27	15.5	55.5	0.83	0.271	84	0.295
8	0.00	22.8	4.6	27	15.8	55.6	0.81	0.271	84	0.295
9	0.00	22.4	7.0	27	14.6	55.4	0.81	0.271	84	0.296
10	0.00	22.3	4.7	26	16.0	55.4	0.78	0.265	83	0.290
11	0.00	21.9	4.9	26	14.9	55.3	0.78	0.265	83	0.290
12	0.00	22.3	4.9	27	15.0	55.7	0.84	0.264	84	0.293
13	0.00	22.3	5.0	27	15.3	55.3	0.82	0.264	83	0.290
14	0.00	22.3	4.8	27	15.8	55.4	0.79	0.264	83	0.292
15	0.00	21.7	4.8	26	15.4	55.4	0.79	0.265	84	0.295
16	0.00	21.4	5.5	25	14.6	55.1	0.81	0.267	84	0.294
17	0.00	22.1	6.7	26	15.9	55.8	0.78	0.269	85	0.296
18	0.00	21.5	6.0	26	15.5	55.2	0.78	0.265	82	0.288
19	0.00	21.7	7.3	26	15.1	55.5	0.78	0.266	84	0.293
20	0.00	21.4	7.2	25	14.8	55.7	0.80	0.270	86	0.301
21	0.00	21.6	6.8	26	15.3	56.0	0.80	0.271	85	0.299
22	0.00	22.6	7.5	27	15.4	56.0	0.82	0.269	85	0.297
23	0.00	22.2	7.1	26	14.7	55.8	0.84	0.269	83	0.291
24	0.00	22.5	7.9	27	16.0	55.8	0.79	0.271	85	0.298
25	0.00	22.4	7.4	27	14.7	56.0	0.85	0.272	84	0.294
26	0.00	22.1	7.0	26	15.8	56.3	0.78	0.272	85	0.296
27	0.00	22.4	8.3	27	16.0	55.6	0.79	0.271	84	0.293
28	0.00	22.7	7.5	27	16.0	56.1	0.80	0.273	85	0.298
29	0.00	22.4	7.0	27	14.8	55.9	0.79	0.271	84	0.293
30	0.00	22.0	7.8	26	15.0	55.9	0.81	0.272	83	0.291
31	0.00	22.5	8.6	27	14.5	55.6	0.87	0.274	82	0.288
32	0.00	23.0	9.0	27	15.0	56.1	0.86	0.274	83	0.290
33	0.00	23.6	7.6	28	16.0	55.8	0.83	0.278	86	0.300
34	0.00	23.1	8.9	28	14.7	56.2	0.88	0.273	84	0.294
35	0.00	22.2	8.6	26	14.8	55.9	0.82	0.272	84	0.294
36	0.00	22.4	7.6	27	14.3	55.9	0.88	0.271	83	0.290
37	0.00	22.4	7.0	27	14.1	56.3	0.89	0.269	80	0.281
38	0.00	23.0	6.1	27	15.2	55.4	0.85	0.273	84	0.295
39	0.00	21.8	4.1	26	15.0	56.0	0.82	0.273	83	0.290
40	0.00	23.2	5.9	28	15.8	55.8	0.83	0.274	85	0.296
41	0.00	23.2	4.7	28	15.2	55.6	0.85	0.277	83	0.292
42	0.00	22.4	5.9	27	14.8	56.2	0.81	0.276	86	0.299
43	0.00	23.1	5.0	27	15.8	55.7	0.82	0.276	87	0.304
44	0.00	22.1	4.5	26	15.3	55.7	0.81	0.274	85	0.296
45	0.00	22.8	4.2	27	14.5	56.0	0.88	0.276	86	0.300
46	0.00	23.2	4.3	28	15.7	55.8	0.83	0.276	86	0.299
47	0.00	23.3	5.0	28	15.9	55.3	0.82	0.274	86	0.302
48	0.00	23.2	6.4	28	15.8	55.8	0.82	0.276	85	0.299
49	0.00	23.2	5.6	28	15.7	55.6	0.83	0.278	85	0.299
50	0.00	22.6	6.8	27	15.7	56.2	0.81	0.277	87	0.306
51	0.00	22.6	6.8	27	14.5	55.5	0.81	0.275	87	0.306
52	0.00	23.5	6.8	28	15.8	55.6	0.83	0.279	87	0.303
53	0.00	22.5	8.2	27	15.1	55.8	0.81	0.281	87	0.304
54	0.00	23.3	7.8	28	14.9	55.9	0.88	0.278	87	0.304
55	0.00	23.1	8.4	27	15.1	56.3	0.86	0.275	86	0.303
56	0.00	23.0	8.9	27	15.5	55.5	0.83	0.279	88	0.307
57	0.00	22.5	8.8	27	15.0	55.6	0.82	0.278	88	0.306
	Average	22.5	7.3	27	15.3	54.8	0.81	0.272	85	0.296

Total number of blows analyzed: 56

Time Summary

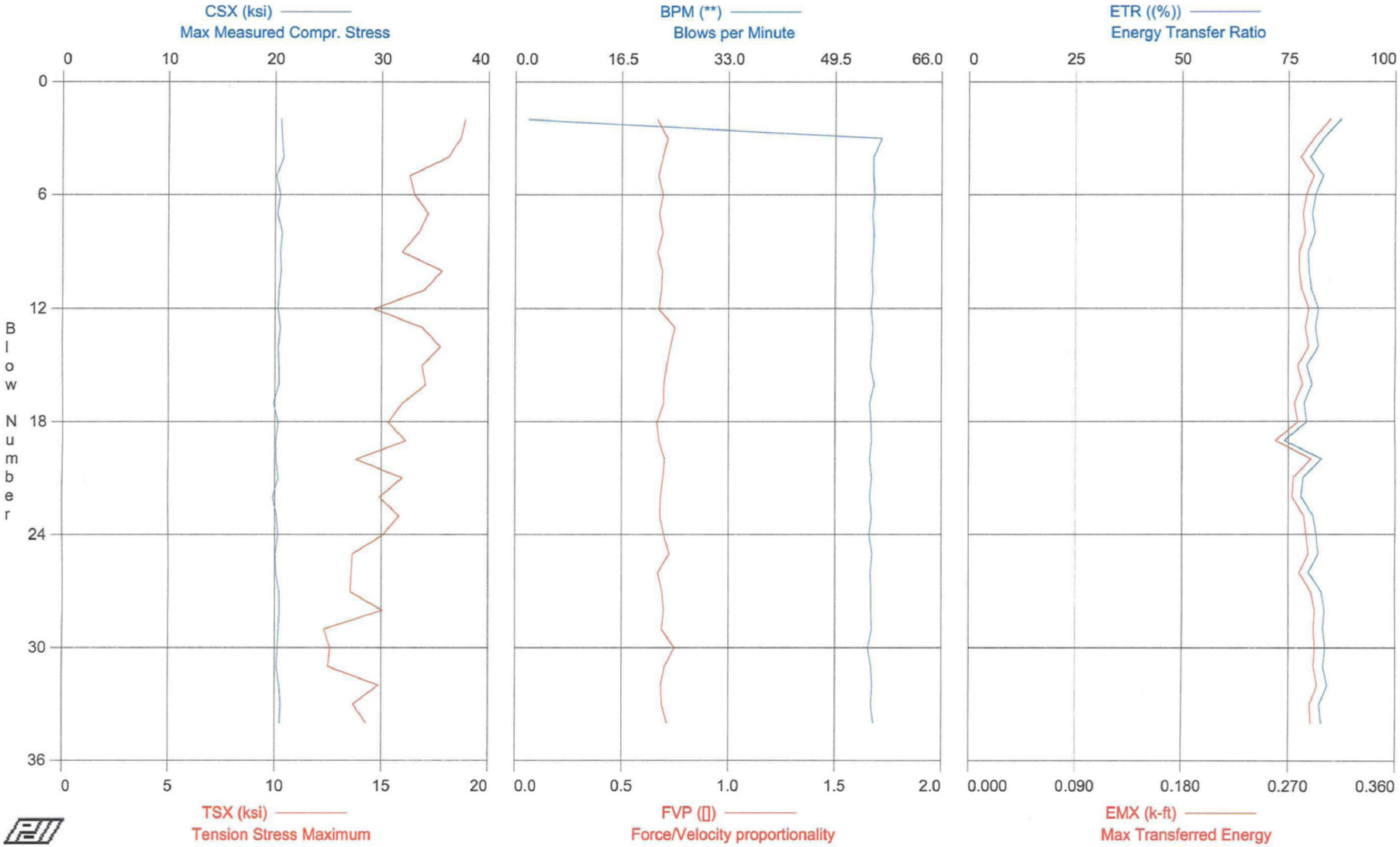
Drive 59 seconds 9:44:56 AM - 9:45:55 AM (2/20/2008) BN 2 - 57

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 20-Feb-2008

TURKEY POINT COL PROJECT - BORING B-707; 115.3' - 116.8' Sample



TURKEY POINT COL PROJECT - BORING B-707; 115.3' - 116.8' Sample
OP: SEK
AR: 1.19 in^2
LE: 119.00 ft
WS: 16,807.9 f/s

HAMMER ID 271353 (MILLER)
Test date: 20-Feb-2008
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

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

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	20.5	18.9	24	17.3	1.9	0.67	0.273	87	0.305
3	0.00	20.6	18.7	25	16.0	56.7	0.71	0.273	83	0.291
4	0.00	20.8	18.1	25	16.9	55.4	0.69	0.273	80	0.280
5	0.00	20.1	16.3	24	16.8	55.4	0.67	0.269	83	0.291
6	0.00	20.5	16.5	24	15.7	55.6	0.69	0.271	81	0.285
7	0.00	20.2	17.2	24	16.4	55.3	0.67	0.269	80	0.282
8	0.00	20.6	16.7	25	16.8	55.5	0.69	0.270	81	0.284
9	0.00	20.5	16.0	24	17.2	55.4	0.67	0.273	80	0.279
10	0.00	20.5	17.8	24	16.7	55.2	0.69	0.273	80	0.279
11	0.00	20.4	17.0	24	16.0	55.4	0.69	0.268	80	0.281
12	0.00	20.3	14.6	24	16.9	55.1	0.67	0.272	82	0.287
13	0.00	20.5	16.9	24	15.3	55.4	0.75	0.272	81	0.284
14	0.00	20.3	17.8	24	15.6	55.2	0.73	0.271	82	0.287
15	0.00	20.4	16.9	24	16.1	55.0	0.71	0.271	79	0.278
16	0.00	20.4	17.1	24	15.6	55.6	0.70	0.268	81	0.282
17	0.00	19.9	16.0	24	15.8	54.9	0.70	0.270	79	0.275
18	0.00	20.3	15.3	24	17.1	55.1	0.67	0.270	79	0.278
19	0.00	20.1	16.1	24	16.7	55.2	0.67	0.271	74	0.259
20	0.00	20.1	13.8	24	15.3	54.9	0.70	0.269	83	0.289
21	0.00	20.3	16.0	24	15.7	55.2	0.69	0.269	78	0.274
22	0.00	19.8	14.9	24	16.3	54.9	0.68	0.272	78	0.273
23	0.00	20.2	15.8	24	16.6	55.2	0.68	0.274	81	0.283
24	0.00	20.3	15.1	24	16.2	54.8	0.70	0.274	82	0.285
25	0.00	20.0	13.6	24	15.5	55.3	0.72	0.274	82	0.287
26	0.00	20.1	13.6	24	16.8	55.0	0.67	0.275	80	0.279
27	0.00	20.4	13.5	24	16.6	55.1	0.69	0.275	83	0.289
28	0.00	20.4	15.0	24	16.4	55.1	0.70	0.274	83	0.292
29	0.00	20.4	12.3	24	16.6	55.2	0.69	0.273	83	0.291
30	0.00	20.3	12.6	24	15.2	54.6	0.75	0.276	84	0.292
31	0.00	20.2	12.5	24	16.1	55.1	0.70	0.274	83	0.291
32	0.00	20.4	14.9	24	16.7	55.3	0.68	0.276	84	0.294
33	0.00	20.5	13.7	24	16.7	55.1	0.69	0.274	82	0.288
34	0.00	20.5	14.3	24	16.1	55.5	0.71	0.271	83	0.289
	Average	20.3	15.6	24	16.3	53.6	0.69	0.272	81	0.284

Total number of blows analyzed: 33

Time Summary

Drive 35 seconds 2:57:58 PM - 2:58:33 PM (2/20/2008) BN 2 - 34

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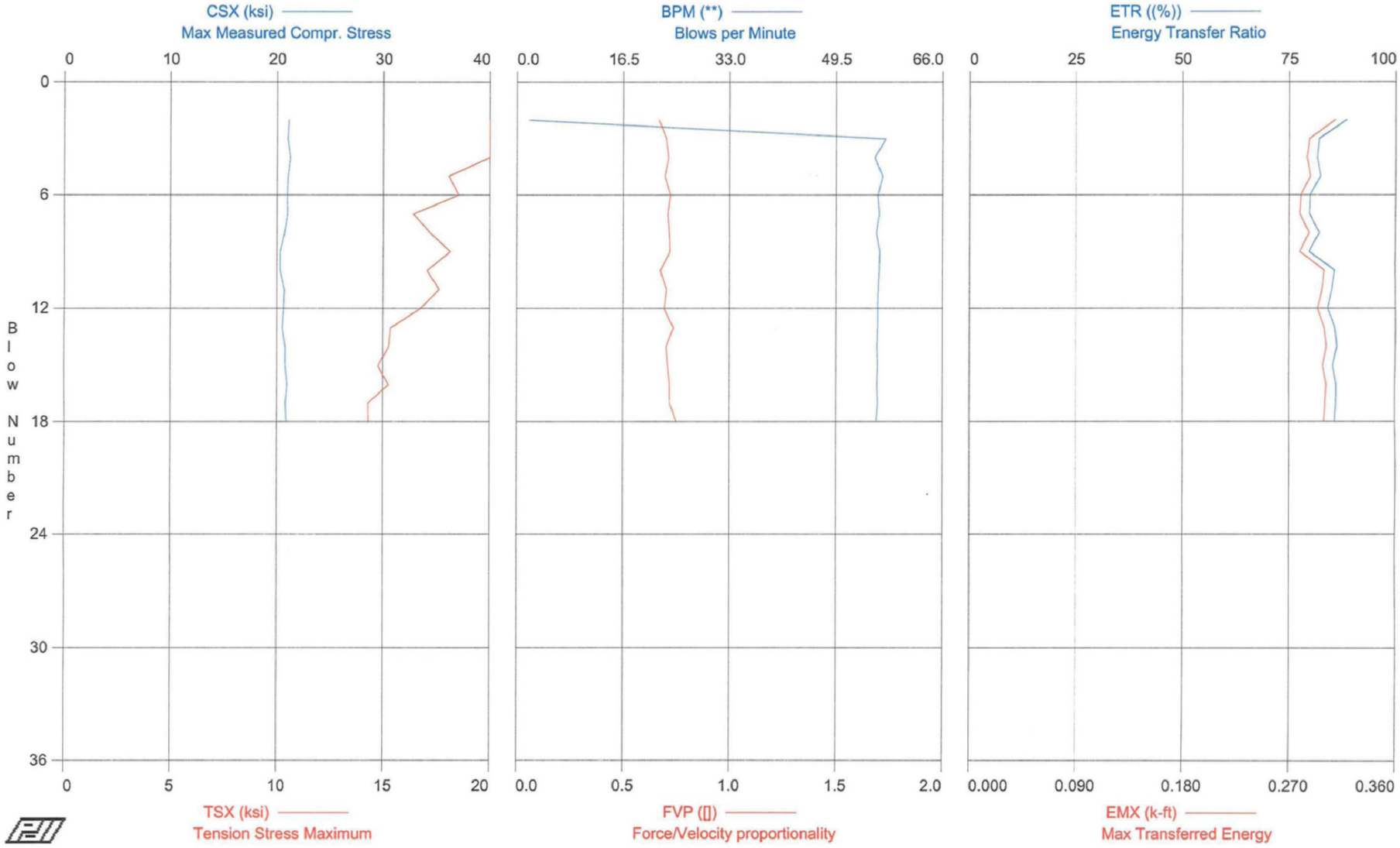
Test date: 20-Feb-2008

TURKEY POINT COL PROJECT - BORING B-707; 120.3' - 121.8' Sample



TURKEY POINT COL PROJECT - BORING B-707; 120.3' - 121.8' Sample
OP: SEK
AR: 1.19 in^2
LE: 125.00 ft
WS: 16,807.9 f/s

HAMMER ID 271353 (MILLER)
Test date: 20-Feb-2008
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
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FVP: Force/Velocity proportionality
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BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	21.1	22.1	25	17.7	1.9	0.67	0.281	88	0.309
3	0.00	21.0	21.3	25	16.8	57.2	0.70	0.271	82	0.287
4	0.00	21.3	21.2	25	16.7	55.5	0.71	0.274	82	0.285
5	0.00	21.0	18.1	25	17.0	56.7	0.70	0.274	82	0.288
6	0.00	21.0	18.5	25	15.9	56.0	0.72	0.274	80	0.280
7	0.00	21.0	16.4	25	16.6	56.2	0.71	0.275	80	0.279
8	0.00	20.7	17.2	25	16.2	55.8	0.72	0.271	82	0.287
9	0.00	20.3	18.1	24	15.8	56.3	0.72	0.269	80	0.279
10	0.00	20.3	17.1	24	16.9	56.2	0.68	0.273	86	0.300
11	0.00	20.7	17.6	25	15.3	56.1	0.70	0.270	85	0.298
12	0.00	20.7	16.7	25	15.9	56.0	0.69	0.269	84	0.294
13	0.00	20.5	15.4	24	15.6	56.0	0.74	0.274	86	0.300
14	0.00	20.8	15.3	25	16.5	55.9	0.70	0.274	86	0.302
15	0.00	20.8	14.8	25	16.0	56.0	0.71	0.271	85	0.299
16	0.00	21.0	15.2	25	16.3	55.9	0.72	0.274	86	0.302
17	0.00	20.8	14.3	25	15.8	56.0	0.72	0.273	86	0.301
18	0.00	20.9	14.3	25	15.6	55.8	0.75	0.275	86	0.300
	Average	20.8	17.3	25	16.3	52.9	0.71	0.273	84	0.294

Total number of blows analyzed: 17

Time Summary

Drive 17 seconds 3:42:21 PM - 3:42:38 PM (2/20/2008) BN 2 - 18