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Standard Guide for Planning and Conducting Borehole Geophysical Logging[1]

This standard is issued under the fixed designation D 5753; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers the documentation and general procedures necessary to plan and conduct a geophysical log program as commonly applied to geologic, engineering, ground-water, and environmental (hereafter referred to as geotechnical) investigations. It is not intended to describe the specific or standard procedures for running each type of geophysical log and is limited to measurements in a single borehole. It is anticipated that standard guides will be developed for specific methods subsequent to this guide.

1.2 Surface or shallow-depth nuclear gages for measuring water content or soil density (that is, those typically thought of as construction quality assurance devices), measurements while drilling (MWD), cone penetrometer tests, and logging for petroleum or minerals are excluded.

1.3 Borehole geophysical techniques yield direct and indirect measurements with depth of the (*1*) physical and chemical properties of the rock matrix and fluid around the borehole, (*2*) fluid contained in the borehole, and (*3*) construction of the borehole.

1.4 To obtain detailed information on operating methods, publications (for example, **2**, **5**, **7**, **18**, **24**, **29**, **34**, **35**, and **36**)[2] should be consulted. A limited amount of tutorial information is provided, but other publications listed herein, including a glossary of terms and general texts on the subject, should be consulted for more complete background information.

1.5 This guide provides an overview of the following: (*1*) the uses of single borehole geophysical methods, (*2*) general logging procedures, (*3*) documentation, (*4*) calibration, and (*5*) factors that can affect the quality of borehole geophysical logs and their subsequent interpretation. Log interpretation is very important, but specific methods are too diverse to be described in this guide.

1.6 Logging procedures must be adapted to meet the needs of a wide range of applications and stated in general terms so that flexibility or innovation are not suppressed.

1.7 *This standard does not purport to address all of the safety and liability concerns, if any, (for example, lost or lodged probes and radioactive sources*[3]*) associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.8 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

2. Referenced Documents

2.1 *ASTM Standards:* [4]

D 653 Terminology Relating to Soil, Rock, and Contained Fluids

D 5088 Practice for the Decontamination of Field Equipment Used at Non-Radioactive Waste Sites

D 5608 Practice for the Decontamination of Field Equipment Used at Low Level Radioactive Waste Sites

3. Terminology

3.1 Definitions—Definitions shall be in accordance with Terminology D 653.

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[1] This guide is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.01 on Surface and Subsurface Characteristics.

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[2] The boldface numbers in parentheses refer to the list of references at the end of this standard.

[3] The use of radioactive materials required for some log measurements is regulated by federal, state, and local agencies. Specific requirements and restrictions must be addressed prior to their use.

[4] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.2 *Definitions of Terms Specific to This Standard:* Descriptions of Terms Specific to This Standard—Terms shall be in accordance with Ref (**1**).

4. Summary of Guide

4.1 This guide applies to borehole geophysical techniques that are commonly used in geotechnical investigations. This guide briefly describes the significance and use, apparatus, calibration and standardization, procedures and reports for planning and conducting borehole geophysical logging. These techniques are described briefly in Table 1 and their applications in Table 2.[5]

4.2 Many other logging techniques and applications are described in the textbooks in the reference list. There are a number of logging techniques with potential geotechnical applications that are either still in the developmental stage or have limited commercial availability. Some of these techniques and a reference on each are as follows: buried electrode direct current resistivity (**37**), deeply penetrating electromagnetic techniques (**38**), gravimeter (**39**), magnetic susceptibility (**40**), magnetometer, nuclear activation (**41**), dielectric constant (**42**), radar (**50**), deeply penetrating seismic (**39**), electrical polarizability (**45**), sequential fluid conductivity (**46**), and diameter (**48**). Many of the guidelines described in this guide also apply to the use of these newer techniques that are still in the research phase. Accepted practices should be followed at the present time for these techniques.

5. Significance and Use

5.1 An appropriately developed, documented, and executed guide is essential for the proper collection and application of borehole geophysical logs.

5.1.1 The benefits of its use include improving the following:

5.1.1.1 Selection of logging methods and equipment,

5.1.1.2 Log quality and reliability, and

5.1.1.3 Usefulness of the log data for subsequent display and interpretation.

5.1.2 This guide applies to commonly used logging methods (see Table 1 and Table 2) for geotechnical investigations.

5.1.3 It is essential that personnel (see 7.3.3) consult up-to-date textbooks and reports on each of the logging techniques, applications, and interpretation methods. A partial list of selected publications is given at the end of this guide.

5.1.4 This guide is not meant to describe the specific or standard procedures for running each type of geophysical log and is limited to measurements in a single borehole.

6. Apparatus

6.1 *Geophysical Logging System*, including probes, cable, draw works, depth measurement system, interfaces and surface controls, and digital and analog recording equipment.

6.1.1 Logging probes, also called sondes or tools, enclose the sensors, sources, electronics for transmitting and receiving signals, and power supplies.

6.1.2 Logging cable routinely carries signals to and from the logging probe and supports the weight of the probe.

6.1.3 The draw works move the logging cable and probe up and down the borehole and provide the connection with the interfaces and surface controls.

6.1.4 The depth measurement system provides probe depth information for the interfaces and surface controls and recording systems.

6.1.5 The surface interfaces and controls provide some or all of the following: electrical connection, signal conditioning, power, and data transmission between the recording system and probe.

6.1.6 The recording system includes the digital recorder and an analog display or hard copy device.

7. Calibration and Standardization of Geophysical Logs

7.1 *General*:

7.1.1 National Institute of Standards and Technology (NIST) calibration and operating procedures do not exist for the borehole geophysical logging industry. However, calibration or standardization physical models are available (see Appendix X1).

7.1.2 Geophysical logs can be used in a qualitative (for example, comparative) or quantitative manner, depending on the project objectives. (For example, a gamma-gamma log can be used to indicate that one rock is more or less dense than another, or it can be expressed in density units.)

7.1.3 The calibration and standardization scope and frequency shall be sufficient for project objectives.

7.1.3.1 Calibration or standardization should be performed each time a logging probe is modified or repaired or at periodic intervals.

7.2 *Calibration*:

7.2.1 Calibration is the process of establishing values for log response. It can be accomplished with a representative physical model or laboratory analysis of representative samples. Calibration data values related to the physical properties (for example, porosity) may be recorded in units (for example, pulses/s or μm/ft) that can be converted to apparent porosity units.

7.2.1.1 At least three, and preferably more, values are needed to establish a calibration curve, and the interface or contact between different values in the model should be recorded. Because of the variability in subsurface conditions, many more values are needed if sample analyses are used for calibration.

7.2.1.2 The statistical scatter in regression of core analysis against geophysical log values may be caused by the difference between the sample size and geophysical volume of investigation and may not represent measurement error.

7.2.2 *Physical Models*—A representative model simulates the chemical and physical composition of the rock and fluids to be measured.

7.2.2.1 Physical models include calibration pits, coils, resistors, rings, temperature baths, etc.

7.2.2.2 The calibration of nuclear probes should be performed in a physical model that is nearly infinite with respect to probe response.

[5] The references indicated in these tables should be consulted for detailed information on each of these techniques and applications.

TABLE 1 Common Geophysical Logs

Type of Log (References)	Varieties and Related Techniques	Properties Measured	Required Hole Conditions	Other Limitations	Typical Measuring Units and Calibration or Standardization	Brief Probe Description
Spontaneous potential **(7, 8, 12)**	differential	electric potential caused by salinity differences in borehole and interstitial fluids, streaming potentials	uncased hole filled with conductive fluid	salinity difference needed between borehole fluid and interstitial fluids; needs correction for other than NaCl fluids	mV; calibrated power supply	records natural voltages between electrode in well and another at surface
Single-point resistance **(7)**	conventional, differential	resistance of rock, saturating fluid, and borehole fluid	uncased hole filled with conductive fluid	not quantitative; hole diameter effects are significant	Ω; V-Ω meter	constant current applied across lead electrode in well and another at surface of well
Multi-electrode resistivity **(7, 8, 13)**	various normal focused, guard, lateral arrays	resistivity and saturating fluids	uncased hole filled with conductive fluid	reverses or provides incorrect values and thickness in thin beds	Ω-m; resistors across electrodes	current and potential electrodes in probe and remote current and potential electrodes
Induction **(10, 11)**	various coil spacings	conductivity or resistivity of rock and saturating fluids	uncased hole or nonconductive casing; air or fluid filled	not suitable for high resistivities	mS or Ω-m; standard dry air zero check or conductive ring	transmitting coil(s) induce eddy currents in formation; receiving coil(s) measures induced voltage from secondary magnetic field
Gamma **(5, 7, 22)**	gamma spectral **(44)**	gamma radiation from natural or artificial radioisotopes	any hole conditions	may be problem with very large hole, or several strings of casing and cement	pulses per second or API units; gamma source	scintillation crystal and photomultiplier tube measure gamma radiation
Gamma-gamma **(23, 24)**	compensated (dual detector)	electron density	optimum results in uncased hole; can be calibrated for casing	severe hole-diameter effects; difficulty measuring formation density through casing or drill stem	gs/cm^3; Al, Mg, or Lucite blocks	scintillation crystal(s) shielded from radioactive source measure Compton scattered gamma
Neutron **(7, 14, 25)**	epithermal, thermal, compensated sidewall, activation, pulsed	hydrogen content	optimum results in uncased hole; can be calibrated for casing	hole diameter and chemical effects	pulses/s or API units; calibration pit or plastic sleeve	crystal(s) or gas-filled tube(s) shielded from radioactive neutron source
Acoustic velocity **(5, 26, 27)**	compensated, waveform, cement bond	compressional wave velocity or transit time, or compressional wave amplitude	fluid filled, uncased, except cement bond	does not detect secondary porosity; cement bond and wave form require expert analysis	velocity units, for example, ft/s or m/s or µs/ft; steel pipe	1 or more transmitters and 2 or more receivers
Acoustic televiewer **(28, 7)**	acoustic caliper	acoustic reflectivity of borehole wall	fluid filled, 3 to 16-in. diameter; problems in deviated holes	heavy mud or mud cake attenuate signal; very slow logging speed	orientated image-magnetometer must be checked	rotating transducer sends and receives high-frequency pulses
Borehole video	axial or side view (radial)	visual image on tape	air or clean water; clean borehole wall	may need special cable	NA[A]	video camera and light source
Caliper **(29, 7)**	oriented, 4-arm high-resolution, *x-y* or max-min bow spring	borehole or casing diameter	any conditions	deviated holes limit some types; significant resolution difference between tools	distance units, for example, in.; jig with holes or rings	1 to 4 retractable arms contact borehole wall
Temperature **(30, 31, 32)**	differential	temperature of fluid near sensor	fluid filled	large variation in accuracy and resolution of tools	°C or °F; ice bath or constant temperature bath	thermistor or solid-state sensor
Fluid conductivity **(7)**	fluid resistivity	most measure resistivity of fluid in hole	fluid filled	accuracy varies, requires temperature correction	µS/cm or Ω-m; conductivity cell	ring electrodes in a tube
Flow **(12, 33, 7)**	impellers, heat pulse	vertical velocity of fluid column	fluid filled	impellers require higher velocities. Needs to be centralized.	velocity units, for example, ft/min; lab flow column or log in casing	rotating impellers; thermistors detect heated water; other sensors measure tagged fluid.
Deviation **(4, 7, 47)**	magnetic, gyroscopic, or mechanical	horizontal and vertical displacement of borehole	any conditions (see limitations)	magnetic methods orientation not valid in steel casing	degrees and depth units; orientation and inclination must be checked	various techniques to measure inclination and bearing of borehole

[A] NA = not applicable.

TABLE 2 Log Selection Chart for Geotechnical Applications Using Common Geophysical Logs[A]

Information Desired	Acoustic Televiewer	Acoustic Velocity	Induced Polarization	Multi-electrode Resistivity	Single-Point Resistance	Spontaneous Potential	Induction	Flow Meter	Fluid Resistivity	Fluid Sampler	Temperature	Gamma-Gamma Density	Gamma	Neutron	Spectral Gamma	Borehole Video	Caliper	Casing Collar Locator	Deviation
	Acoustic		Electrical and Induction					Fluid Logs				Radioactive or Nuclear				Other Methods			
Lithology and Correlation																			
Bed/layer (thickness, correlation, structure)	■	■		■	■	■	★					▲	√	▲	√	●	√		
Lithology—depositional environment	¶	■		■	■	■	★					▲	√	▲	√	●	√		
Shale or clay content			■	■		■	★					▲	√	▲	√				
Bulk density												▲							
Formation resistivity				■			★												
Injection/production profiles				¶			¶	¤	¤		¤	▲		▲					
Permeability estimation		■						¤	¤		¤		√						
Porosity (amount and type)	■	■		■			★					▲		▲					
Mineral identification			■									▲			√				
Petroleum-constituent fraction content (NLT)															√				
Rock Structure																			
Strike and dip of bedding	■															●			√
Fracture detection (number of fractures), RQD	■	■		■	■											●	√		
Fracture orientation and character	■															●			√
Thin bed resolution	■			¶	■											●	√		
Fluid Parameters																			
Borehole fluid characterization								¶	¤	¤	¤								
Fluid flow						■		¤	¤		¤					●			
Formation water quality				■		■	★			¤									
Moisture content—water saturation				¶			¶					▲		▲					
Temperature		¶									¤								
Water level and water table	■	■		■	■	■	¶		¤		¤	▲		▲		●			
Borehole Parameters																			
Casing evaluation: integrity, holes, damage, screen location	✖	✖					¶	✖			✖					●	√	†	
Deviation of borehole																			√
Diameter of borehole	■																√		
Cement/collar behind casing		■					★					▲		▲					
Location of debris in wells	■															●	√	√	
Well completion evaluation, for example, cement bond, seal location, grout location	¶	■					★					▲	√	▲					

[A] [illegible]

7.2.2.3 Some probes have internal devices such as resistors, but this does not substitute for checking the probe response in an environment that simulates borehole conditions, and the use of such devices is considered standardization.

7.2.2.4 *Calibration Facilities*—Commonly used calibration pits or models for use by anyone at the present time are listed in Appendix X1 (**14-18**). The user should inquire concerning the present validity of any facility.

7.2.3 *Sample Analyses*:

7.2.3.1 Representative samples from boreholes in the project area that have been collected carefully and analyzed quantitatively also may be used to calibrate log response.

7.2.3.2 To reduce depth errors, the sample recovery of rock cores in calibration holes needs to approach 100 % for the intervals used for calibration. Log response should be used to select sample depths to span the range of desired log calibration values and to be within thick units to minimize the effects of potential depth errors. Samples need to be analyzed immediately or steps taken to preserve them for later analysis.

7.2.3.3 Samples to be used for log calibration should be analyzed only from depth intervals at which the log response is relatively uniform for a depth interval considerably greater than the vertical dimension of the volume of investigation of the logging probe. Samples near lithologic contacts or fluid interfaces should not be used because of possible boundary effects or depth errors.

7.3 *Standardization*:

7.3.1 Standardization is the process of checking the log response to reveal evidence of repeatability and consistency.

7.3.2 Standardization is needed to establish comparability between logs made with different equipment or at different times and to ensure the accuracy of measurements.

7.3.2.1 Standardization checks should include at least two different measurement values approximating the range of interest (For example, aluminum and magnesium or plastic blocks are used commonly to check the response of gamma-gamma density logging systems in the field.)

7.3.3 Standardization uses some type of a standard that may be used in the field or laboratory and repeat logs.

7.3.3.1 Log response needs to be checked using field standards often enough to satisfy the project objectives. Standardization of the log response provides the basis for correcting for changes (for example, changes in output with time due to system drift or changes of equipment).

7.3.3.2 Selected log intervals should be repeated (that is, re-logged). Repeat logs provide information on the stability of logging equipment.

7.3.3.3 A representative borehole may be used to check log response periodically. This borehole environment and the rocks and fluids penetrated may change with time.

8. Procedure

8.1 *Planning the Logging Program*:

8.1.1 A work plan should be developed prior to implementing the logging program.

8.1.2 The key steps in developing a logging work plan should include the following:

8.1.2.1 *Log Selection*—See Table 1 and Table 2.

8.1.2.2 *Personnel Selection*—See 8.3.2.

8.1.2.3 *Quality Control and Documentation*—See 8.4.

8.1.2.4 *Calibration and Standardization Procedures*—See Section 7.

8.1.2.5 *Equipment Liability*—See 1.7.

8.1.2.6 *Equipment Decontamination*—In environmental investigations, equipment decontamination may be required before, after, and between individual wells. Equipment decontamination may involve a number of standardized procedures, depending on the nature of the project (see Practices D 5088 and D 5608). A decontamination program should be agreed upon by all parties before logging commences, and procedures specified by the work plan should be followed.[6]

8.1.2.7 *Log Interpretation*—See 8.5.

8.2 *Field Assessment of Borehole Conditions*:

8.2.1 Borehole conditions can have a profound influence on the quality of log data and subsequent interpretation. Important parameters to consider include the following:

8.2.1.1 Drilling method, casing, drill hole history, and well completion materials.

8.2.1.2 *Borehole Fluid Properties*—Resistivity, temperature, density, viscosity, and chemistry at the time of logging.

8.2.1.3 Borehole diameter, rugosity, and stability.

8.2.1.4 Deviation of borehole.

8.2.1.5 Wellhead pressure.

8.2.2 *Logging Operations*:

8.2.2.1 Determine the sequence and direction of logging. The sequence in which a suite of logs is run is important from both a data quality and operational viewpoint. Because logging operations mix the borehole fluid, logs of fluid properties (for example, temperature, fluid resistivity, and fluid sampling should be run prior to other logs). Consideration should also be given to when borehole video surveys are performed because some logging tools may degrade borehole clarity. Tools that have arms or bowsprings that contact the borehole wall should be run late in the logging sequence because of the greater possibility of material from the borehole wall falling into the borehole. Because of the consequences of losing a tool with a radioactive source, these tools should be run last, and after a caliper log. Unstable boreholes should not be logged with radioactive source probes. All logs except fluid properties and video should be run with the probe moving up the borehole to reduce depth errors.

8.2.2.2 Select the depth reference. The selected depth reference needs to be stable and accessible.

8.2.2.3 Select horizontal and vertical scales.

8.2.2.4 Select the digitizing interval. See 8.3.1.2.

8.3 *Other Considerations*:

8.3.1 *Data Formats*—There are two methods of recording log data, digital and analog. Digital recording of logs should be used because of the numerous benefits of data manipulation. Digital recording is not yet practical for some logs such as video or acoustic televiewer.

8.3.1.1 An analog display should be available to be viewed in the field to verify the correct tool operation. Depth scales and units of measurement for the horizontal scale must be indicated clearly on each log.

8.3.1.2 The digital data are recorded at an operator-selected depth interval that should be as small as possible, at most, half the thickness of the smallest rock unit that can be resolved. The time interval for digital samples can also be selected by the operator. ASCII is the recommended format except for such logs as spectral gamma, full waveform sonic, borehole video, and acoustic televiewer. The digital file header should include all of the necessary information to reconstruct the logging

[6] Equipment decontamination procedures may have specific safety and equipment limitations that must be addressed prior to their use.

procedures accurately and should duplicate the information included in the written header of the log.

8.3.1.3 Unprocessed data should be available. Nonproprietary processing algorithms shall be furnished if processed data is provided.

8.3.2 *Personnel*:

8.3.2.1 Personnel not having specialized training or experience should be cautious about using borehole geophysics and should solicit assistance from qualified practitioners or attend courses on borehole geophysics.

8.3.2.2 Personnel operating logging equipment should have an understanding of the theory, field procedures, and methods of log interpretation.

8.3.2.3 A geoscientist, with experience in borehole geophysics, who understands the project objectives and local geohydrology may need to be available to examine logging results during logging operations when consistent with objectives of the program. This geoscientist is responsible for determining whether the instructions selected in the prelogging conference are being followed and whether changes should be made.

8.3.2.4 Log interpretation should be performed by a geoscientist with experience in borehole geophysics and knowledge of the site geology and hydrology.

8.4 *Field Documentation*—A documentation plan for both the analog plot and digital data file should be established and become part of the work plan. Documentation of the following procedures is needed: calibration of logging probes, field operation of geophysical logging equipment, applicable decontamination, and format for presenting geophysical well log data. Repair, standardization, and calibration information should also be documented. Probes should be numbered to simplify the identification of associated documentation. Document all field problems including equipment malfunctions. This should include the steps taken to solve the problem and how the logs might have been affected. Repeat runs and field standardization should be more frequent when equipment problems occur. The use of one borehole on the project to check the probe response may aid in the identification of equipment or other problems. Probes should be recalibrated in a physical model after major repairs have been made.

8.4.1 *Log Headings (Headers)*—The log heading should contain all of the information that is necessary to analyze the log trace. Because auxiliary documents are frequently unavailable to other users of the log, all of the critical information concerning the log should be included on the final log heading. The header information should also be included in the same computer file as the log data. The following items listed are necessary and should be included on the log headings and computer files when appropriate. If information is not available or applicable, it should be noted on the heading. The following information should be included:

8.4.1.1 *Background Well Information*:

Owner of well and address, location of well (UTM coordinates, ¼ section, etc.); date; logging contractor and address; logging operator; drilling contractor and address; client and address; observer and address; elevation of top casing and distance above ground; and drilling history, methods etc.

8.4.1.2 *Borehole Conditions*:

Casing description; description of log depth datum; elevation of log depth datum; type of drilling fluid; resistivity and temperature of borehole fluid; depth of origin of borehole fluid samples; fluid level; time since last mud circulation; bottom hole temperature; and problems and unusual conditions.

8.4.1.3 *Equipment Data and Logging Parameters*:

Description of probe reference point; model and manufacturer of logging tools; logging company tool number; date and type of last calibration; date, type, and response of field standardization; top and bottom of logged interval; logging speed and direction; vertical depth error after logging; time constant or the time interval of digital samples; identification of disk containing digitized logs; and equipment problems.

8.4.1.4 *Specific Information for Nuclear Logging Probes*:

Source description, initial source strength, and date determined; source to detector or receiver spacing; detector description; and data filtering or enhancement parameters.

8.4.1.5 *Specific Information for Acoustic and Electric Logging Probes*:

source or transmitter description and signal output; source or transmitter to detector or receiver spacing; detector or receiver description; and data filtering or enhancement parameters.

8.4.2 *Quality Control During Logging Operations*:

request changes in logging speed and time constant; repeat logs or log intervals based on field log analysis; check depth readout against log; note errors or changes on the log; and verify documentation listed above.

8.5 *Log Interpretation*—The full potential of a logging program cannot be realized until the logging measurements are interpreted. Log interpretation should start at the time of data acquisition and should continue as an iterative process throughout the project.

8.5.1 Logs should be analyzed and described as a suite and combined with information on lithology and fluid quality because of the synergistic nature of log data. The nonunique response of logs dictates the use of data from other sources to check the log interpretation, and this background data must be included in the report. A computer will be used in most cases to aid analysis of the logs, and information on the software and algorithms used should be included in the report.

8.5.2 Important interpretation steps include the following:

8.5.2.1 Establishing database (for example, format conversion, depth corrections, editing, and filtering).

8.5.2.2 Applying borehole corrections (for example, correct electric logs for borehole diameter and fluid resistivity).

8.5.2.3 Performing initial data inversion-conversion log units to values appropriate for investigation (for example, density units to porosity).

8.5.2.4 Performing large-scale data inversion (for example, cross sections, regional correlation, and model parameters).

9. Report

9.1 Depending on the project objective, report only data or data and interpretations.

9.1.1 Both types of reports should include the following:

9.1.1.1 Objectives and scope.

9.1.1.2 Field Documentation (for example, site conditions, borehole conditions, data collection procedures, calibration and standardization of logging probes, field operation of geophysical logging equipment, and format for recording geophysical log data, including any filtering or processing of the data, problems, and unusual conditions; see 8.4).

9.1.1.3 Both the digital log data and log plots.

9.1.1.4 Abstract, executive summary, or conclusions.

9.1.2 Interpretation reports should include the following:

9.1.2.1 Log composites (for example, summary plots showing logs, lithology, well construction, and water quality zones). These composites are commonly annotated to indicate the features of interest and correlated with lithologic descriptions.

9.1.2.2 Brief description of the geologic and hydrologic setting.

9.1.2.3 Specific information on log analysis, that is, depth corrections and recalibration of logs, physical models or sample analyses that were used for calibration, methods of log interpretation, software used, and copies of cross-plots or other plots of data resulting from log analysis.

9.1.2.4 Well-to-well correlation sections and comparison to surface geophysical and other testing data, when available.

10. Keywords

10.1 acoustic logging; acoustic televiewer; borehole geophysics; borehole video; caliper logging; chemical properties and physical properties; deviation; electric logging; environmental; fluid conductivity/resistivity logging; fluid logging; gamma logging; gamma-gamma logging; geology; geophysics; geotechnical; ground water; hydrology; induction logging; log calibration and standardization; log headings; neutron logging; nuclear logging; resistivity logging; singlepoint resistance logging; spontaneous potential logging; temperature logging; well logging

APPENDIX

(Nonmandatory Information)

X1. CALIBRATION FACILITIES AVAILABLE FOR PUBLIC USE (1989)

X1.1 *Name and Location*—American Petroleum Institute Calibration Facility, University of Houston, Houston, TX: four pits (**14**, **19**, **20**).

X1.2 *Who to Contact:* University of Houston, Cullen College of Engineering, (713) 749-3423.

X1.3 *Probes That Can Be Calibrated*—Pit 1: neutron and gamma-gamma; Pit 2: gamma (simulated shale); Pits 3 and 4: spectral gamma.

X1.3.1 *Name and Location*—U.S. Department of Energy, Grand Junction, CO: 20 models or pits (**18**).

X1.3.2 *Who to Contact*—U.S. Department of Energy, Grand Junction Operations Office, or the prime contractor at the U.S. Department of Energy office, (303) 248-7768 or 6702.

X1.4 *Probes That Can Be Calibrated*—Gamma, gamma spectral, neutron, gamma-gamma, and magnetic susceptibility. Also, wet and dry borehole size factors and a 300-ft borehole with radium foil at known depths for check of depth measurements.

X1.4.1 *Name and Location*—U.S. Bureau of Mines density pits Pit 1: six holes and magnetic susceptibility (Pits 2). Denver Federal Center, Lakewood, CO: Pit six holes; Pit 2: three holes (**17**).

X1.4.2 *Who to Contact*—U.S. Geological Survey, Water Resources Division, Borehole Geophysics Project, Building 25, Denver Federal Center, (303) 236-5913.

X1.5 *Probes That Can Be Calibrated*—Pit 1: gamma-gamma, acoustic, resistivity; and Pit 2: magnetic susceptibility.

X1.5.1 *Name and Location*—U.S. Department of Energy, Fractured igneous rock calibration models, Denver Federal Center, Lakewood, CO: Three models or pits (**16**).

X1.5.2 *Who to Contact*—U.S. Geological Survey, Water Resources Division, Borehole Geophysics Project, Building 25, Denver Federal Center, (303) 236-5913.

X1.6 *Probes That Can Be Calibrated*—Fracture detection probes, neutron, gamma-gamma, short-spaced resistivity, and acoustic velocity.

X1.7 *Other Facilities*—The Geological Survey of Canada is developing a system of deep test holes and calibration facilities that are presently available at several locations in Canada. Gamma, gamma spectral, and coal property models are completed, and other physical property models are under construction (**15**). Calibration facilities at universities, private logging companies, and government agencies may also be available at other locations for use by outside logging groups.

REFERENCES

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Designation: D 6167 – 97 (Reapproved 2004)

Standard Guide for Conducting Borehole Geophysical Logging: Mechanical Caliper[1]

This standard is issued under the fixed designation D 6167; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers the general procedures necessary to conduct caliper logging of boreholes, wells, access tubes, caissons, or shafts (hereafter referred as boreholes) as commonly applied to geologic, engineering, ground-water, and environmental (hereafter referred as geotechnical) investigations. Caliper logging for mineral or petroleum exploration and development are excluded.

1.2 This guide defines a caliper log as a record of borehole diameter with depth.

1.2.1 Caliper logs are essential in the interpretation of geophysical logs since they can be significantly affected by borehole diameter.

1.2.2 Caliper logs are commonly used to measure borehole diameter, shape, roughness, and stability; calculate borehole volume; provide information on borehole construction; and delineate lithologic contacts, fractures, and solution cavities and other openings.

1.3 This guide is restricted to mechanically based devices with spring-loaded arms, which are the most common calipers used in caliper logging with geotechnical applications.

1.4 This guide provides an overview of caliper logging, including general procedures, specific documentation, calibration and standardization, and log quality and interpretation.

1.5 To obtain additional information on caliper logs see Section 9 of this guide.

1.6 This guide is to be used in conjunction with Guide D 5753.

1.7 This guide should not be used as a sole criterion for caliper logging and does not replace professional judgement. Caliper logging procedures should be adapted to meet the needs of a range of applications and stated in general terms so that flexibility or innovation is not suppressed.

1.8 The geotechnical industry uses English or SI units. The caliper log is typically recorded in units of inches, millimetres, or centimetres.

1.9 *This guide does not purport to address all of the safety and liability problems (for example, lost or lodged probes and equipment decontamination) associated with its use.*

1.10 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 653 Terminology Relating to Soil, Rock and Contained Fluids

D 5088 Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites

D 5608 Practice for Decontamination of Field Equipment Used at Low Level Radioactive Waste Sites

D 5753 Guide for Planning and Conducting Borehole Geophysical Logging

3. Terminology

3.1 *Definitions:* Definitions shall be in accordance with Terminology D 653, Section 12, Ref **(1)**,[3] or as defined below:

3.1.1 *accuracy*, *n*—how close a measured log values approaches true value. It is determined in a controlled environment. A controlled environment represents a homogeneous sample volume with known properties.

3.1.2 *depth of investigation*, *n*—the radial distance from the measurement point to a point where the predominant measured response may be considered centered, that is not to be confused with borehole depth (for example, distance) measured from the surface.

3.1.3 *measurement resolution*, *n*—the minimum change in measured value that can be detected.

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[1] This guide is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.01 on Surface and Subsurface Characterization.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The boldface numbers given in parentheses refer to a list of references at the end of the text.

3.1.4 *repeatability*, *n*—the difference in magnitude of two measurements with the same equipment and in the same environment.

3.1.5 *vertical resolution*, *n*—the minimum thickness that can be separated into distinct units.

3.1.6 *volume of investigation*, *n*—the volume that contributes 90 % of the measured response. It is determined by a combination of theoretical and empirical modeling. The volume of investigation is non-spherical and has gradational boundaries.

4. Summary of Guide

4.1 This guide applies to borehole caliper logging and is to be used in conjunction with Guide D 5753.

4.2 This guide briefly describes the significance and use, apparatus, calibration and standardization, procedures, and reports for conducting borehole caliper logging.

5. Significance and Use

5.1 An appropriately developed, documented, and executed guide is essential for the proper collection and application of caliper logs. This guide is to be used in conjunction with Guide D 5753.

5.2 The benefits of its use include the following: improving selection of caliper logging methods and equipment, caliper log quality and reliability, and usefulness of the caliper log data for subsequent display and interpretation.

5.3 This guide applies to commonly used caliper logging methods for geotechnical applications.

5.4 It is essential that personnel (see the Personnel section of Guide D 5753) consult up-to-date textbooks and reports on the caliper technique, application, and interpretation methods.

6. Interferences

6.1 Most extraneous effects on caliper logs are caused by instrument problems and borehole conditions.

6.2 Instrument problems include the following: electrical leakage of cable and grounding problems, temperature drift, wear of mechanical components including the hinge pins and in the linear potentiometer (mechanical hysteresis), damaged or bent arms, and lack of lubrication of the mechanical components.

6.3 Borehole conditions include heavy drilling mud, borehole deviation, and drilling-related borehole irregularities.

7. Apparatus

7.1 A geophysical logging system has been described in the general guide (see the Apparatus section of Guide D 5753).

7.2 Caliper logs may be obtained with probes having a single arm, three arms (averaging or summation), multiple independent arms (x-y caliper), multiple-feeler arms, bow springs, or gap wheels. Single-arm and three-arm averaging probes are most commonly used for geotechnical investigations.

7.2.1 A single-arm caliper commonly provides a record of borehole diameter while being used to decentralize another type of log, such as a side-collimated gamma-gamma probe (see Fig. 1). The caliper arm generally follows the high side of a deviated hole. The single-arm decentralizing caliper may not have the resolution needed for some applications.

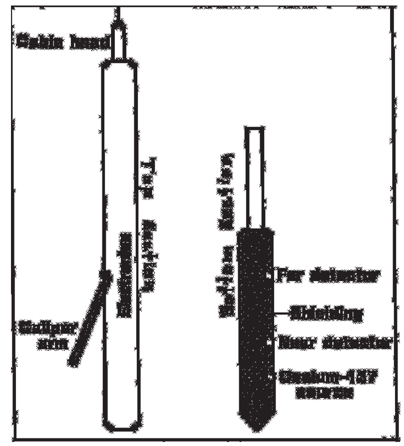


FIG. 1 Probe for Making Side-Collimated Gamma-Gamma Logs with Single-Arm Caliper (2)

7.2.2 The three-arm averaging or summation caliper has arms of equal length oriented 120° apart (see Fig. 2). All arms move together, which provides an average diameter measurement. This caliper provides higher resolution than the single-arm caliper measurement (see Fig. 3).

7.2.3 Multiple independent arm calipers generally have three or four independent arms of equal length; these arms are sometimes oriented. Horizontal resolution, that provides accurate borehole-diameter measurement regardless of borehole shape, is related to the number of independent arms. In general, calipers with four or more independent arms will have higher resolution than three-arm averaging (see Fig. 3). The four independent-arm caliper log may show borehole elongation (elliptical borehole shape) and better indicates the actual irregularity of the borehole.

7.3 Caliper probes using arms are typically spring loaded. The arms are retracted and opened with an electric motor and

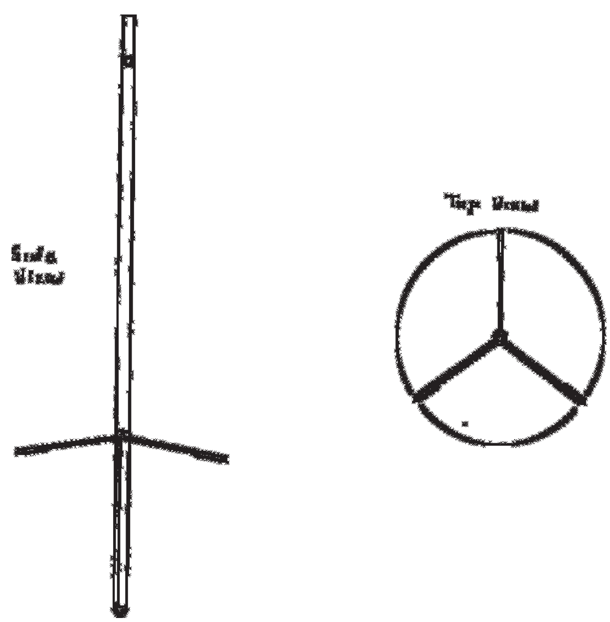


FIG. 2 Three-Arm Averaging Caliper

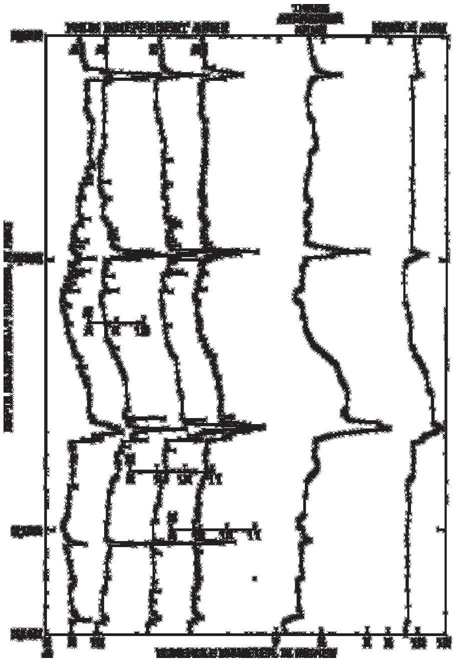


FIG. 3 Caliper Logs From Probes Having Four Independent Arms, Three Averaging Arms, and a Single Arm, Madison Limestone Test Well 1, Wyoming (2)

retention spring. The arms and gears are lubricated. Caliper probes closed by hand are held closed with an electric solenoid or weighted retention ring that is released with a sudden drop. Typically, the caliper arms are mechanically connected to a linear or rotary potentiometer such that changes in the angle of the arms causes changes in resistance. These changes in resistance are proportional to average borehole diameter. In some probes, the voltage changes are converted to a varying pulse rate or digitized downhole to eliminate or minimize cable transmission noise. Different arm length can be used to optimize sensitivity for the borehole-diameter range expected.

7.4 The concepts of volume of investigation and depth of investigation are not applicable to caliper logs since it is a surface-contact measurement.

7.5 Vertical resolution of caliper measurements is a function of the size of the contact surface (arm tip or pad), the response of the mechanical and electronic components, and digitizing interval used. The theoretical limit of vertical resolution is equal to the width of the caliper pad or tip. Selection of arm lengths and angle, and tip diameter will affect sensitivity. Shorter arms generally will provide more detail of the rugosity (borehole roughness as defined by Ref. **(2)**) of the borehole wall than longer arms. However, size of caliper probe and borehole diameter may also determine arm lengths used.

7.6 Measurement resolution of typical caliper probes is 0.05 in. (0.13 cm) of borehole diameter.

7.7 A variety of caliper logging equipment is available for geotechnical investigations. It is not practical to list all of the sources of potentially acceptable equipment.

8. Calibration and Standardization of Caliper Logs

8.1 *General:*

8.1.1 National Institute of Standards and Technology (NIST) calibration and standardization procedures do not exist for caliper logging.

8.1.2 Caliper logs can be used in a qualitative (for example, comparative) or quantitative (for example, borehole diameter corrections) manner depending upon the project objectives.

8.1.3 Caliper calibration methods and frequency shall be sufficient to meet project objectives.

8.1.3.1 Calibration and standardization should be performed each time a caliper probe is suspected to be damaged, modified, repaired, and at periodic intervals.

8.2 Calibration is the process of establishing values for caliper response and is accomplished with a physical model of a known diameter. Calibration data values related to the physical properties (for example, borehole diameter, roughness) may be recorded in units (for example, counts per second), that can be converted to units of length (for example, inches, millimetres, or centimetres.)

8.2.1 At least two, and preferably more, values, which approximate the anticipated operating range, are needed to establish a calibration curve (for example, 4- and 10-in. (10.2- and 25.4-cm) rings) if the borehole diameter to be logged is 5 in. (12.7 cm)).

8.2.2 Physical models of measured diameter that may be used to calibrate the caliper response may include rings or bars made of rigid materials that are not easily deformed and resist wear.

8.2.2.1 Calibration of caliper probes is done most accurately in rings of different diameters.

8.2.2.2 A calibration bar is a plate that is drilled and marked at regular intervals and machined to fit over the body of the probe (see Fig. 4). One arm is placed in the appropriate hole for the range to be logged.

8.2.2.3 Calibration can be checked by using casing of measured diameter logged in the borehole.

8.3 Standardization is the process of checking logging response to show evidence of repeatability and consistency.

8.3.1 Calibration serves as a check of standardization.

8.3.2 A representative borehole may be used to periodically check caliper response providing the borehole environment does not change with time. Caliper response may not repeat exactly because the probe may rotate, causing the arms to follow slightly different paths within the borehole.

9. Procedure

9.1 See the Procedure section of Guide D 5753 for planning a logging program, data formats, personnel qualifications, field documentation, and header documentation.

9.2 Caliper specific information (for example, arm length) should be documented.

9.3 Identify caliper logging objectives.

9.4 Select appropriate equipment to meet objectives.

9.4.1 Caliper equipment decontamination is addressed according to project specifications (see Practice D 5088 for non-radioactive waste sites and Practice D 5608 for low level radioactive waste sites). Some materials commonly used for caliper-arm lubrication may be environmentally sensitive.

9.5 Select the order in the logging sequence in which the caliper probe is to be run (see 8.2.2.1 of Guide D 5753).

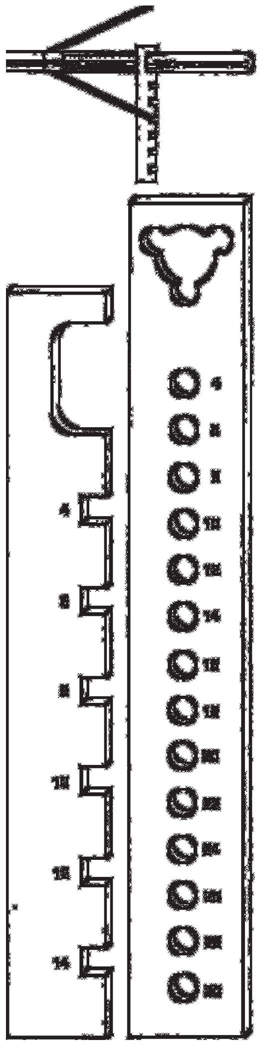


FIG. 4 Calibration Bars for Caliper Probes (3)

9.5.1 Caliper probes are run before any probe utilizing nuclear sources and more expensive centralized probes.

9.5.2 Caliper probes are run after any television camera and fluid property probes are run.

9.6 Caliper operation and calibration are checked at the start of each borehole or at an interval consistent with project objectives. (see the Procedure section of Guide D 5753). After calibration, the caliper arms are closed before lowering.

9.7 Select and document the depth reference.

9.7.1 The selected depth reference needs to be stable and accessible (for example, top of borehole casing).

9.8 Determine and document probe zero reference point (for example, top of probe or cablehead) and depth offset to caliper measurement point.

9.8.1 The measurement point of a caliper is the end of caliper arms and it changes as the arms open and close with the sine of arm angle multiplied by length of arm. Typically, the measurement point varies less than a few tenths of a foot (a few centimetres).

9.8.2 The measurement point will change if the arm length is changed.

9.9 Select horizontal and vertical scales for log display.

9.10 Select digitizing interval (or sample rate if applicable) to meet project objectives (see 8.3.1.2 of Guide D 5753).

9.10.1 Maximum vertical resolution requires the selection of a digitizing interval at least as small as the arm tip contact height.

9.10.2 Typically, this interval is no larger than 0.1 ft (0.03 m) for high-resolution applications.

9.11 The caliper probe is lowered to the bottom of the borehole.

9.11.1 Any time the caliper probe is lowered in the borehole, the arms should be closed to avoid damaging equipment or borehole.

9.11.2 Selection of probe speed while lowering is based on knowledge of borehole depth, stability, and other conditions.

9.12 Open caliper arm(s).

9.13 Select logging speed.

9.13.1 A logging speed of approximately 15 ft (5 m) per min is recommended for high-resolution applications. Faster logging speeds may induce noise due to the caliper probe bumping the borehole wall. Slower logging speeds will not enhance measurement resolution for most systems.

9.14 Collect caliper data while the probe is moving up the borehole.

9.15 When the probe reaches the top of the borehole:

9.15.1 If surface casing is present, compare and document caliper measurement.

9.15.2 Check depth reference and document after survey depth error (ASDE).

9.15.3 Determine if ASDE meets project objectives.

9.15.4 Typical tolerance for ASDE is ±0.4 ft per 100-ft (0.4 m per 100-m) interval logged.

9.16 Selected borehole intervals should be repeated (that is, relogged) under similar logging parameters as the initial log. Repeat logs provide information on the stability of the caliper equipment. The interval repeated should have enough variability, if possible, to check repeatability and resolution.

9.16.1 Repeat logs should be compared with the original log to ensure correct operation of the probe prior to ending a logging event.

9.16.2 Repeat sections may not repeat exactly due to a different orientation of the logging probe on the repeat run or changes in the borehole between logging runs (see Section 6).

9.16.3 Close caliper arms prior to lowering the probe down the borehole for a repeat section.

9.17 Evaluate the field log quality and compare log with drilling and completion information.

9.17.1 A reduction in borehole diameter over large depth sections may be indicative of borehole deviation on three-arm averaging caliper logs.

9.17.1.1 The magnitude of borehole deviation that causes this effect depends upon the length of the caliper arms being used and the strength of the tensioning spring within the caliper. Typically, a borehole deviation of greater than 15° is likely to produce this effect.

9.17.1.2 Converting the three-arm averaging caliper by removing two of the caliper arms may allow a good log to be obtained in these types of boreholes.

9.17.2 Mud can prevent caliper arms from opening fully, and thick mud cake may prevent accurate measurement of drilled diameter. Lack of caliper arm movement, especially in the bottom of a mud drilled borehole, may be indicative of arm sticking due to heavy mud.

9.17.2.1 If mud interferences are suspected, the borehole may be reconditioned, the caliper probe cleaned and lubricated, and the caliper log repeated.

9.18 Post-acquisition calibration checks may be required (surface casing or calibration standard) to meet the objectives of the logging program. Typical tolerances between pre- and post-calibration are ±0.2 in. (0.5 cm).

10. Interpretation of Results

10.1 See the Log Interpretation section of Guide D 5753 for procedures on log interpretation.

10.2 A valid caliper log is essential in the interpretation of the logs that are affected by changes in borehole diameter, including those logs that are labeled 'borehole compensated.' It is not always possible to compensate logs for substantial differences in borehole diameter.

10.2.1 Caliper logs can be analyzed individually (that is, borehole volume).

10.2.2 Caliper logs can be analyzed as part of a suite to take advantage of the synergistic nature of log data.

10.3 The caliper log should be depth correlated with the other geophysical logs as the first step to interpretation. This is especially important for logs that use the caliper data for borehole correction and depth adjustment.

10.4 Other pertinent information, including borehole construction (casing size), drilling history (hole size, drill method, penetration rate, core loss, fluid loss, etc.), and geologic information, should be integrated with the caliper-log data.

10.5 Interpretations based on changes in borehole diameter may be related to changes in drilling, mud cake, mud rings, borehole construction, lithology and structure, fractures and solution openings, and stress-induced breakouts.

10.6 The measured borehole diameter may be significantly different than the drilled diameter because of plastic formations extruded into the borehole and friable formations enlarging the borehole. A series of caliper logs may also show increases or decreases in borehole diameter with time.

10.6.1 Caliper logs are useful for determining what other logs can be made and what range of borehole diameters will be accepted by centralizers or decentralizers.

10.7 Fractures and solution openings may be obvious on a caliper log; however, their character may not be uniquely defined.

10.7.1 The single-arm caliper log may completely miss a feature or indicate only a small anomaly.

10.7.2 The three-arm averaging caliper log of a fracture dipping at an angle such that the three arms enter the opening at different depths will indicate three separate anomalies rather than one.

10.8 Borehole-diameter information is essential for calculation of volumetric rate from flowmeter logs.

10.9 Caliper logs provide useful information for borehole completion and testing.

10.9.1 Caliper logs are used to locate the optimum placement of inflatable packers for borehole testing. Inflatable packers can only form an effective seal within a specified range of borehole diameters, and can be damaged if they are set in rough or irregular parts of the borehole.

10.9.2 Caliper logs are used to estimate the volume of borehole completion material (cement, gravel, etc.) needed to fill the annular space between borehole and casing(s) or well screen.

10.10 Caliper logs may be applied to correlate lithology between boreholes based upon enlargements related to lithology.

11. Report

11.1 Consult the Report section, Guide D 5753 for requirements of the report.

11.2 Reports presenting caliper logs shall describe the components of the caliper logging system, the principles of the methods used, and their limits, methods and results of calibration and standardization, and performance verification (for example, diameter of surface casing, correlation with other logs, repeat sections, ASDE, etc.).

11.3 Information on the software and algorithms used should be included in the report.

11.4 Any deviations from this guide should be justified with documentation.

11.5 Presentation of caliper logs should be designed to meet project objectives. At a minimum, depth (y-axis) and units of measurement (x-axis) scales should be clearly marked (see Fig. 3). There may be a difference between presentations of data collected in the field versus in final report. Any scale "wraps" should be clearly marked.

11.5.1 Caliper logs are typically displayed with linear scales in inches, millimetres, or centimetres.

12. Keywords

12.1 borehole correction; borehole diameter; borehole geophysics; borehole volume; caliper log; ground water; single-arm caliper; three-arm caliper; well construction; well logging

REFERENCES

(**1**) *Glossary of Terms and Expressions Used in Well Logging*, 2nd Ed., Society of Professional Well Log Analysts, Houston, TX, 1984.
(**2**) Keys, W. S., *Borehole Geophysics Applied To Ground-Water Investigations, Techniques of Water-Resources Investigations of the United States Geological Survey, Book 2*, Chapter E2, 1990.
(**3**) Hodges, R. E., Calibration and Standardization of Geophysical Well-Logging Equipment for Hydrologic Applications, *U.S. Geological Survey Water Resources Investigations Report 88-4058*, 1988.

Designation: D 6274 – 98 (Reapproved 2004)

Standard Guide for Conducting Borehole Geophysical Logging - Gamma[1]

This standard is issued under the fixed designation D 6274; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers the general procedures necessary to conduct gamma, natural gamma, total count gamma, or gamma ray (hereafter referred to as gamma) logging of boreholes, wells, access tubes, caissons, or shafts (hereafter referred to as boreholes) as commonly applied to geologic, engineering, ground-water, and environmental (hereafter referred to as geotechnical) investigations. Spectral gamma and logging where gamma measurements are made in conjunction with a nuclear source are excluded (for example, neutron activation and gamma-gamma density logs). Gamma logging for minerals or petroleum applications are excluded.

1.2 This guide defines a gamma log as a record of gamma activity of the formation adjacent to a borehole with depth (See Fig. 1).

1.2.1 Gamma logs are commonly used to delineate lithology, correlate measurements made on different logging runs, and define stratigraphic correlation between boreholes (See Fig. 2).

1.3 This guide is restricted to gamma logging with nuclear counters consisting of scintillation detectors (crystals coupled with photomultiplier tubes), which are the most common gamma measurement devices used in geotechnical applications.

1.4 This guide provides an overview of gamma logging including general procedures, specific documentation, calibration and standardization, and log quality and interpretation.

1.5 To obtain additional information on gamma logs, see Section 13.

1.6 This guide is to be used in conjunction with Guide D 5753.

1.7 Gamma logs should be collected by an operator that is trained in geophysical logging procedures. Gamma logs should be interpreted by a professional experienced in log analysis.

1.8 The geotechnical industry uses English or SI units. The gamma log is typically recorded in units of counts per second (cps) or American Petroleum Institute (API) units.

1.9 *This guide does not purport to address all of the safety and liability problems (for example, lost or lodged probes and equipment decontamination) associated with its use.*

1.10 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.11 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 653 Terminology Relating to Soil, Rock and Contained Fluids

D 5088 Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites

D 5608 Practice for Decontamination of Field Equipment Used at Low Level Radioactive Waste Sites

D 5753 Guide for Planning and Conducting Borehole Geophysical Logging

D 6167 Guide for Conducting Borehole Geophysical Logging: Mechanical Caliper

3. Terminology

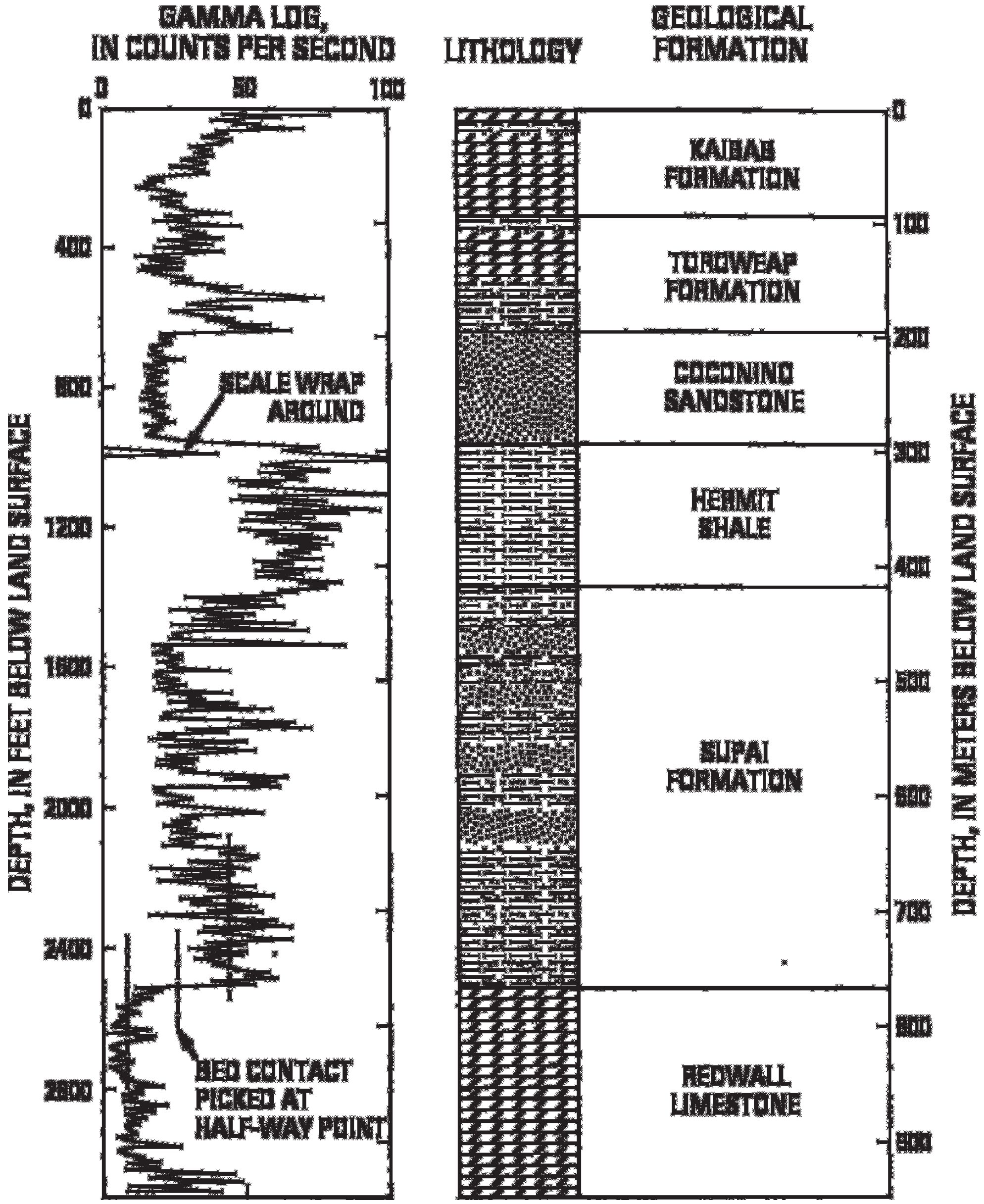
3.1 *Definitions*:

3.1.1 Definitions shall be in accordance with Terminology D 653, Section 13, Ref **(1)**, or as defined below.

[1] This guide is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.01 on Surface and Subsurface Characterization.

Current edition approved July 1, 2004. Published August 2004. Originally approved in 1998. Last previous edition approved in 1998 as D 6274 - 98.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.



NOTE 1—This figure demonstrates how the log can be used to identify specific formations, illustrating scale wrap-around for a local gamma peak, and showing how the contact between two formations is picked to coincide with the half-way point of the transition between the gamma activities of the two formations.

FIG. 1 Example of a Gamma Log From Near the South Rim of the Grand Canyon

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *accuracy*, *n*—how close measured log values approach true value. It is determined in a controlled environment. A controlled environment represents a homogeneous sample volume with known properties.

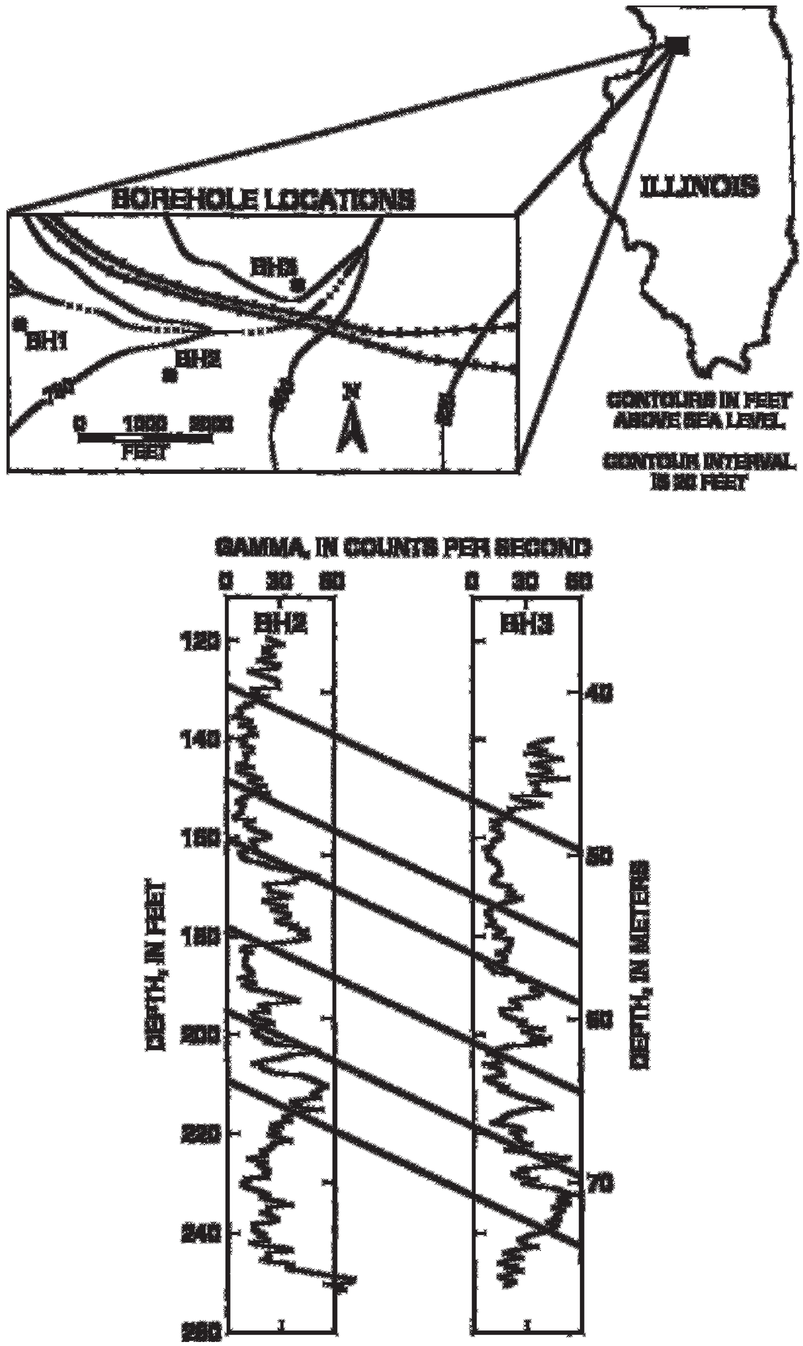
3.2.2 *dead time*, *n*—the time after each pulse when a second pulse cannot be detected.

3.2.3 *dead time effect*, *n*—the inability to distinguish closely-spaced nuclear counts leads to a significant underestimation of gamma activity in high radiation environments and is known as the "dead time effect".

3.2.4 *depth of investigation*, *n*—the radial distance from the measurement point to a point where the predominant measured response may be considered centered, which is not to be confused with borehole depth (for example, distance) measured from the surface.

3.2.5 *measurement resolution*, *n*—the minimum change in measured value that can be detected.

3.2.6 *repeatability*, *n*—the difference in magnitude of two measurements with the same equipment and in the same environment.



NOTE 1—From a study site showing how the gamma logs can be used to identify where beds intersect each of the individual boreholes, demonstrating lateral continuity of the subsurface geology.

FIG. 2 Example of Gamma Logs From Two Boreholes

3.2.7 *vertical resolution*, *n*—the minimum thickness that can be separated into distinct units.

3.2.8 *volume of investigation*, *n*—the volume that contributes 90 % of the measured response. It is determined by a combination of theoretical and empirical modeling. The volume of investigation is non-spherical and has gradational boundaries.

4. Summary of Guide

4.1 This guide applies to borehole gamma logging and is to be used in conjunction with Guide D 5753.

4.2 This guide briefly describes the significance and use, apparatus, calibration and standardization, procedures, and reports for conducting borehole gamma logging.

5. Significance and Use

5.1 An appropriately developed, documented, and executed guide is essential for the proper collection and application of gamma logs. This guide is to be used in conjunction with Guide D 5753.

5.2 The benefits of its use include improving selection of gamma logging methods and equipment, gamma log quality and reliability, and usefulness of the gamma log data for subsequent display and interpretation.

5.3 This guide applies to commonly used gamma logging methods for geotechnical applications.

5.4 It is essential that personnel (see the Personnel section of Guide D 5753) consult up-to-date textbooks and reports on the gamma technique, application, and interpretation methods.

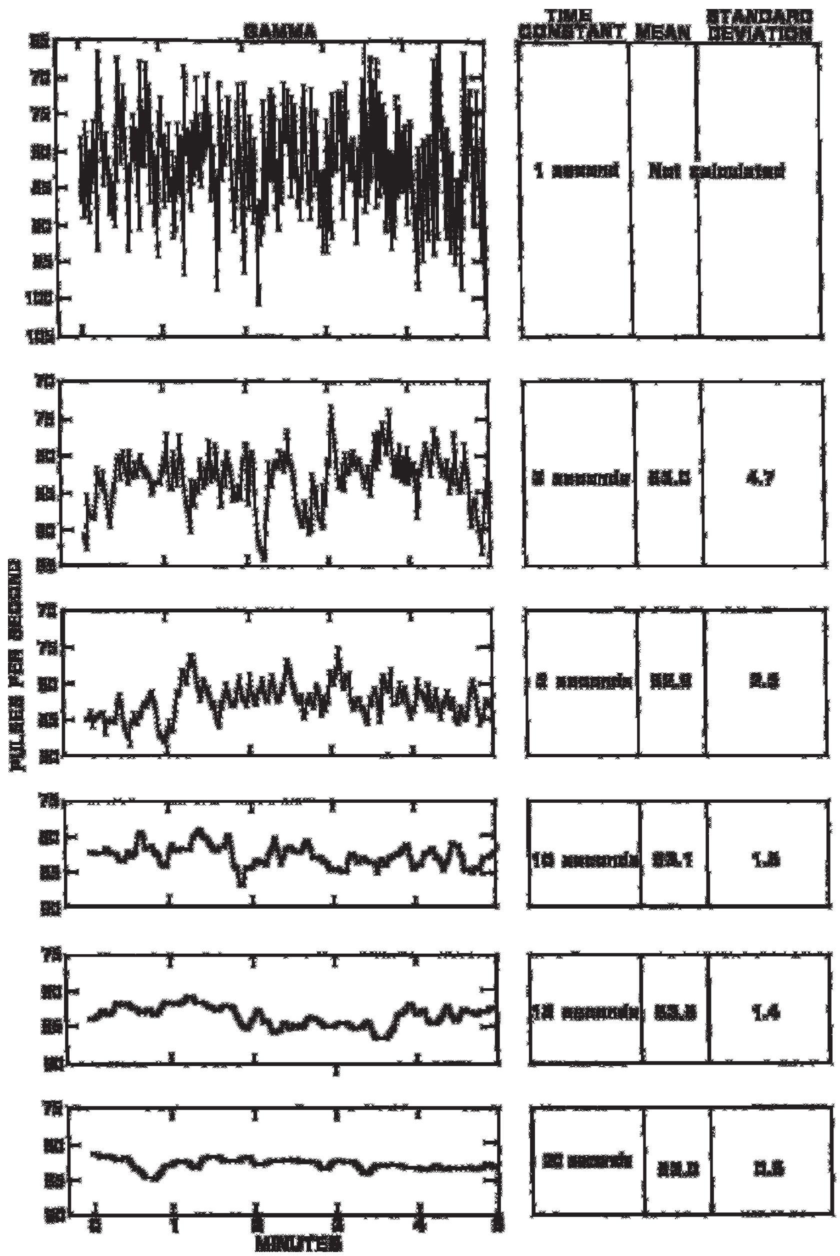
6. Interferences

6.1 Most extraneous effects on gamma logs are caused by logging too fast, instrument problems, borehole conditions, and geologic conditions.

6.2 Logging too fast can significantly degrade the quality of gamma logs. Gamma counts originating at a given depth need to be averaged over a time interval such that the natural statistical variation in the rate of gamma photon emission is negligible (see Fig. 3).

6.3 Instrument problems include electrical leakage of cable and grounding problems, degradation of detector efficiency attributed to loss of crystal transparency (fogging) or fractures or breaks in the crystal, and mechanical damage causing separation of crystal and photomultiplier tube.

6.4 Borehole conditions include changes in borehole diameter (especially in the fluid-filled portion); casing type and number; radioactive elements in drilling fluid in the borehole, or in cement or slurry behind casing; and steel casing or cement in the annulus around casing, and thickness of the annulus.



NOTE 1—The fluctuations in gamma activity in counts per second is shown to vary by progressively smaller amounts as the averaging period (time constant) is increased from 1 to 20 s.

FIG. 3 Example of Natural Statistical Fluctuation of Gamma Counts From a Test Source of Given Strength

6.5 Geologic conditions include high levels of radiation which can degrade the efficiency of gamma counting through the dead time effect, energy level of emitted gammas, formation density, and lithologic bed geometry.

7. Apparatus

7.1 A geophysical logging system has been described in the general guide (the Apparatus section of Guide D 5753).

7.2 Gamma logs are collected with probes using scintillation detectors.

7.2.1 The most common gamma detectors are sodium iodide (NaI).

7.2.2 Other gamma detectors include cesium iodide (CsI) and bismuth germanate (BGO).

7.3 Gamma probes generate nuclear counts as pulses of voltage that are amplified and clipped to a uniform amplitude.

7.3.1 Gamma probes used for geotechnical applications typically can be logged inside of a 2-in. (5-cm) diameter monitoring well.

7.4 The volume of investigation and depth of investigation are determined by the density of the material near the probe, which controls the average distance a gamma photon can travel before being absorbed.

7.4.1 The volume of investigation for gamma logs is generally considered spherical with a radius of 0.5 to 1.0 ft (15 to 30 cm) from the center of the detector in typical geological formations. The volume becomes elongated when detector length exceeds approximately 0.5 ft (15 cm).

7.4.2 The depth of investigation for gamma logs is generally considered to be 0.5 to 1.0 ft (15 to 30 cm).

7.5 Vertical resolution of gamma logs is determined by the size of the volume from which gammas can reach a nuclear detector suspended in the borehole. In typical geological formations surrounding a fluid-filled borehole, this is a roughly spherical volume about 1 to 2 ft (30 to 60 cm) in diameter. Excessive logging speed can decrease vertical resolution.

7.6 Measurement resolution of gamma probes is determined by the counting efficiency of the nuclear detector being used in the probe. Typical measurement resolution is 1 cps.

7.7 A variety of gamma logging equipment is available for geotechnical investigations. It is not practical to list all of the sources of potentially acceptable equipment.

8. Calibration and Standardization of Gamma Logs

8.1 *General*:

8.1.1 National Institute of Standards and Technology (NIST) calibration and standardization procedures do not exist for gamma logging.

8.1.2 Gamma logs can be used in a qualitative (for example, comparative) or quantitative (for example, estimating radioisotope concentration) manner depending upon the project objectives.

8.1.3 Gamma calibration and standardization methods and frequency shall be sufficient to meet project objectives.

8.1.3.1 Calibration and standardization should be performed each time a gamma probe is suspected to be damaged, modified, repaired, and at periodic intervals.

8.2 Calibration is the process of establishing values for gamma response associated with specific levels of radioisotope concentration in the sampled volume and is accomplished with a representative physical model. Calibration data values related to the physical properties (for example, radioisotope concentration) may be recorded in units (for example, cps), that can be converted to units of radioactive element concentration (for example, ppm Radium-226 or percent Uranium-238 equivalents).

8.2.1 Calibration is performed by recording gamma log response in cps in boreholes centered within volumes containing known homogenous concentrations of radioactivity elements.

8.2.2 Calibration volumes should be designed to contain material as close as possible to that in the environment where the logs are to be obtained to allow for effects such as gamma energy level, formation density, and activity of daughter isotopes on the calibration process.

8.3 Standardization is the process of checking logging response to show evidence of repeatability and consistency, and to ensure that logging probes with different detector efficiencies measure the same amount of gamma activity in the same formation. The response in cps of every gamma detector is different for the same radioactive environment.

8.3.1 Calibration ensures standardization.

8.3.2 The American Petroleum Institute maintains a borehole in Houston, Texas, where two formations have been fabricated to provide homogeneous levels of gamma activity so that probes can be standardized on the basis of the response in these boreholes. 1 API gamma unit is 1/200th of the full scale response in the representative shale model in this borehole (see Guide D 5753).

8.3.3 For geotechnical applications, gamma logs should be presented in API units for standardization.

8.3.4 A representative borehole may be used to periodically check gamma probe response providing the borehole and surrounding environment does not change with time or their effects on gamma response can be documented.

8.3.5 A small radioactive source(s) (thorium-treated lantern mantles, small bottles of potassium chloride, laboratory radioactive test sources, or sleeves containing natural radioisotopes (phosphate sands, etc.)) placed over the gamma detector can be used to check calibration if the sources have been related to a calibration facility.

8.4 Gamma log output needs to be corrected for dead time when logging in formations with unusually large count rates, such as uranium-rich pegmatites or phosphatic sands, and areas contaminated with radioactive waste.

8.4.1 Dead time corrections are usually negligible under typical logging conditions when measured gamma counts are less than a few hundred counts per second.

8.4.2 Dead time corrections are estimated by comparing the gamma log response under the influence of two similar radioactive sources. The measured count rate would approximately double over that with one source when both sources are placed in the sample volume of the logging tool. The dead time causes the count rates to be slightly less than double. Dead time is given by the formula:

$$\text{Dead Time} = t_0 = 2(N_1 + N_2 - N_{12})/(N_{12}(N_1 + N_2)) \quad (1)$$

$$\text{Corrected count rate} = N^* = N/(1 - N\,t_0)$$

where:

N_1, N_2 = the count rates measured using each of the two similar sources,
N_{12} = the count rate obtained using both of the similar sources in counts per second,
t_0 = the dead time correction in seconds,
N = the measured count rate in a formation in counts per second, and
N^* = the count rate after correction for the dead time effect.

t_0 is usually found to be a few microseconds for most gamma logging equipment.

9. Procedure

9.1 See the Procedure section of Guide D 5753 for planning a logging program, data formats, personnel qualifications, field documentation, and header documentation.

9.1.1 Document gamma specific information (for example, crystal size, type, and location).

9.2 Identify gamma logging objectives. Select appropriate equipment to meet objectives.

9.3 Gamma logs are commonly run with other logging measurements in combination probes for correlation purposes. This is most often done by equipping other classes of logging probes (electric, indication, neutron porosity, etc.) with gamma detectors (see Fig. 4).

9.3.1 Detector location on the probe needs to be appropriate to meet the project objectives. Long combination probe strings with the gamma detector located at a significant distance from the bottom of the probe may be inappropriate. Gamma detection position on the logging probe is especially important in shallow boreholes where over drilling the borehole is not possible.

9.3.2 Gamma probes are usually run free-hanging where the probe lies against one side of the borehole that is, as a mandrel. However, gamma detectors are sometimes included with combination probes that are run centralized or decentralized in the borehole. Gamma response may be somewhat different depending upon the method used (for example, free-hanging or centralized) in a given geologic environment.

9.3.3 Gamma equipment decontamination is addressed according to project specifications (see Practice D 5088 for non-radioactive waste sites and Practice D 5608 for low level radioactive waste sites).

9.4 Select when the gamma probe is to be run in the logging sequence (see 8.2.2.1 of Guide D 5753).

9.4.1 Gamma probes are run after or in combination with any television camera and fluid property probes to insure that there is minimum disturbance to the borehole fluid that can degrade those logs.

9.4.2 Gamma probes are run before any probe utilizing nuclear sources and more expensive centralized probes to ensure borehole stability possible.

9.4.3 Whenever possible, gamma probes should be run open hole or through the least amount of completion material to minimize well construction effects and to provide a base line for comparing subsequent logs.

9.5 Gamma probe operation is typically checked before the start of each run to insure that equipment is operating and that nuclear counters are producing output.

9.5.1 Gamma operation may be checked by placing a small radioactive source over the gamma detector. Common materials, such as thorium-treated lantern mantles, small bottles of potassium chloride, laboratory radioactive test sources, or sleeves containing natural radioisotopes (phosphatic sands, etc.), are frequently used.

9.6 Select and document the depth reference point.

9.6.1 The selected depth reference needs to be stable and accessible (for example, top of borehole casing).

9.7 Determine and document probe zero reference point (for example, top of probe or cablehead) and depth offset to gamma measurement point.

9.7.1 The measurement point of the gamma logging probe is the distance along the probe corresponding with the center of the crystal within the logging tool; this position is not visible unless the position is marked on the outside of the tool or the operator has information specifying that position with respect to a prominent reference point on the probe housing.

9.7.2 Position the probe zero reference point to the depth reference point (ground level, top of casing, etc.) and initialize depth recording/display systems.

9.8 Select horizontal and vertical scales for log display to meet project objectives.

9.8.1 Preferred horizontal scale divisions are multiples of two or five inches, such that the log value is easily determined on the plot (for example, 0 to 100, 0 to 200, 50 to 150, etc.).

9.8.2 Preferred vertical scales are multiples of two or five, such that depth can be easily determined on a log plot (for example, 1/5, 1/10...1/100, etc.).

9.9 Select digitizing interval (or sample rate if applicable) to meet project objectives (see 8.3.1.2 of Guide D 5753).

9.9.1 Digitizing interval needs to be at least as small as the vertical resolution of the gamma probe, that is typically about 1 ft (30 cm).

9.9.2 Typically, this interval is no larger than 0.5 ft (15 cm) to ensure that the optimum vertical resolution is achieved.

9.9.3 Even though field plots may be generated with smoothing, the rawest (non-filtered) form of the data should be recorded.

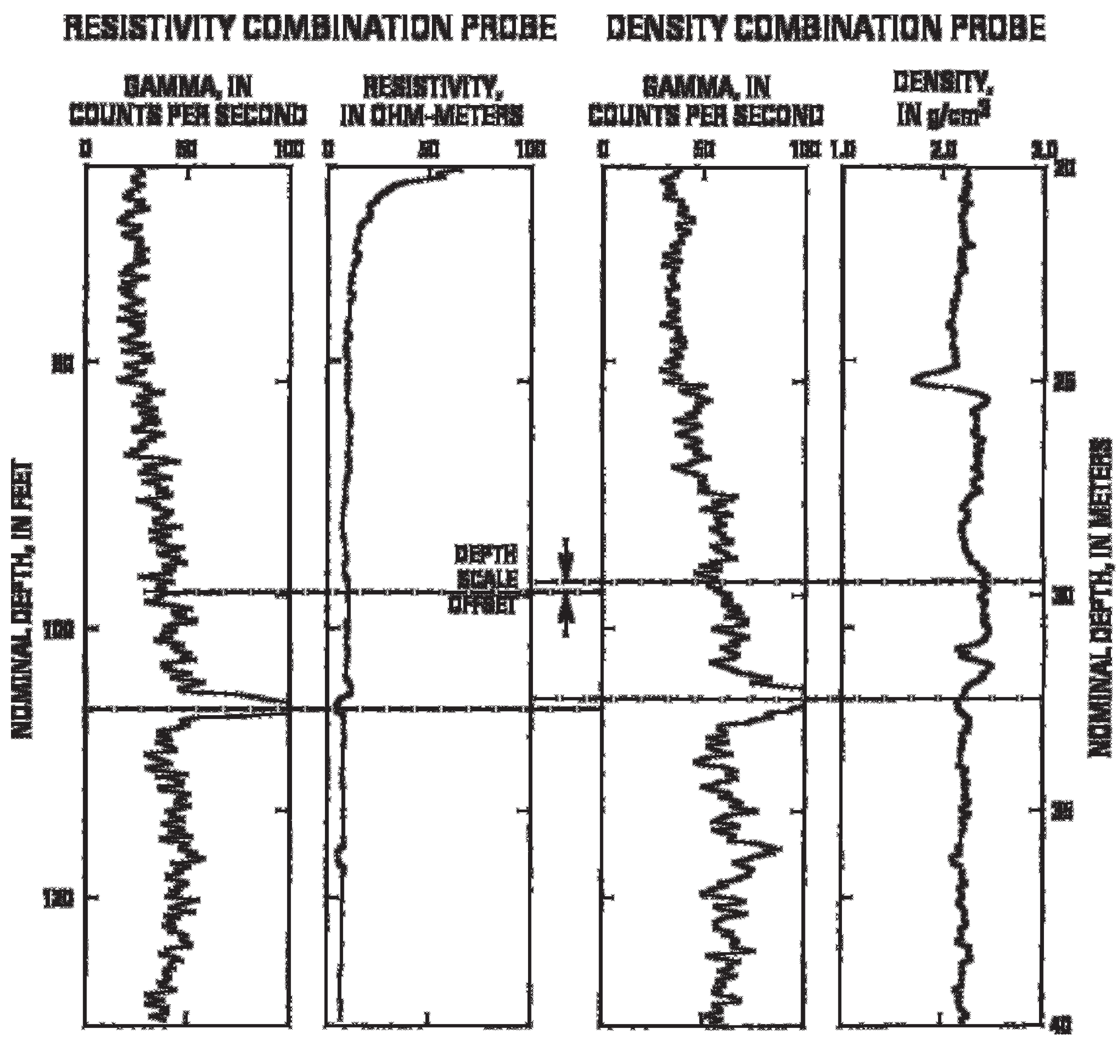
9.10 The gamma probe is lowered to the bottom of the borehole.

9.10.1 Gamma counts should be monitored as the probe is lowered because knowledge of the average count rates produced by the formation is important in determining proper logging speed. Gamma value range is also needed to determine proper horizontal scale and with some instrumentation, to determine sensitivity/gain settings.

9.10.2 Selection of probe speed while lowering is based on knowledge of borehole depth, stability, and other conditions; tension on the measuring wheel and smoothness of probe descent should be monitored to ensure that depth errors are not being introduced.

9.11 Select logging speed.

9.11.1 Logging speed should be determined by the application of the data acquired to meet project objectives.



NOTE 1—This figure shows a small depth offset that should be removed by adjusting the depth scale on one of the logs; note that the average count rates for the two different gamma detectors differ as a result of different detector efficiencies.

FIG. 4 Example of Gamma Logs From Gamma Detectors in Two Different Logging Tools (Electrical Resistivity on Density)

9.11.2 Typical gamma logging speed is approximately 20 ft/min (6 m/min), but slower speeds may be needed if formation gamma activity is low.

9.11.3 Proper logging speed is indicated by gamma logs that show distinct beds, which correlate with other information such as core descriptions or driller's logs, and where there is relatively little random fluctuation within beds (see Fig. 1).

9.11.4 If the operator is concerned about whether logging speed is affecting the quality of the gamma log, the operator should repeat a representative section of the log (representative of the geologic variation in the borehole) using the same speed; if the log reproduces interpreted bed boundaries that agree with other log and geologic data and the initial run, then the logging speed is adequate. If there are significant changes in the interpreted bed boundaries or if bed boundaries (lithologic contacts) are not indicated, the operator should try logging at a reduced speed.

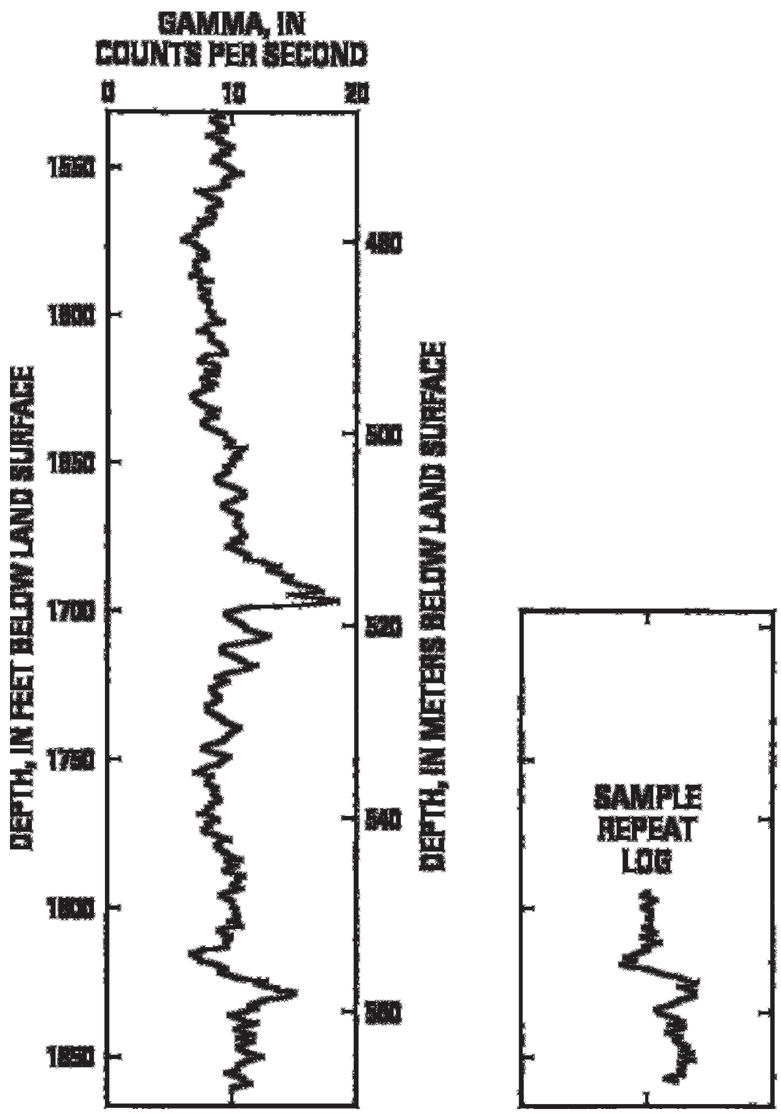
9.11.5 In situations where gamma activity is extremely low, such as in many basalts and some carbonate and quartzite formations, the operator can estimate the maximum logging speed from the formula:

$$S_f < 0.50G \quad \text{or} \quad S_m < 0.15G \tag{2}$$

where:

S_f = the logging speed in feet per minute,
S_m = the logging speed in metres per minute, and
G = the average measured gamma activity of the interval or intervals of interest in counts per second.

This formula gives the logging speed required to ensure that the standard nuclear statistical error is less than about 5 %. In some situations, the available time and budget and the length of borehole to be logged may indicate that a trade-off be made between statistical errors and log resolution; an effective trade-off for a given situation can be made by experimenting



NOTE 1—In this figure, experimentation with logging speed demonstrates that a 10 ft (m) per minute logging speed generates useful and repeatable gamma logs with statistical errors somewhat greater than 5 %, but where beds can be effectively detected.

FIG. 5 Example of a Gamma Log From a Basalt Formation of Very Low Gamma Activity

with repeat logging runs over representative intervals containing bed contacts (see Fig. 5).

9.12 Collect gamma log data while the probe is moving up the borehole; data collection while logging upward ensures that the probe is retrieved smoothly and continuously.

9.12.1 In unstable boreholes, it is sometimes advantageous to collect data both while probe is being lowered and being pulled up the borehole.

9.13 When the probe reaches the top of the borehole:

9.13.1 Check depth reference and document after survey depth error (ASDE).

9.13.2 Determine if ASDE meets project objectives.

9.13.3 Typical tolerance for ASDE is ±0.4 per 100-ft interval logged (±0.4 m per 100-m).

9.13.4 Typical depth tolerance for repeat logs is within 0.4 %.

9.14 Selected borehole intervals should be repeated (that is, relogged) under similar logging parameters as the initial log. Repeat logs verify that the gamma electronics are functioning correctly, and that the logging speed (effect of nuclear statistical fluctuations) is adequate for project objectives. The interval repeated should have enough variability, if possible, to check repeatability and resolution; also note that nuclear statistical noise is most likely to affect intervals with relatively low gamma count rates.

9.14.1 Repeat logs should be compared with the original log to ensure correct operation of the probe prior to ending a logging event.

9.14.2 Repeat sections may not repeat exactly because of the statistical nature of nuclear activity that introduces some random fluctuation into the measured count rate. Individual log values should typically repeat within one standard deviation, and the character and shape of the logs should be similar. Note that the importance of high count rates to reduce the statistical variations between log runs.

9.14.3 Repeat sections may not repeat exactly due to a different orientation of the logging probe on the repeat run or changes in the borehole between logging runs (see Section 6, Interferences).

9.15 Evaluate the quality of field logs and compare logs with drilling and completion information.

9.16 Gamma logs are usually smoothed by filtering (in hardware or software) with an N-point averaging window (for example, running average, weighted average, etc.) to minimize the effects of statistical variation caused by radioactive decay. The window width:

$$(N-1)\Delta z \tag{3}$$

where:

N = the number of points, and
Δz = the digitizing interval, which should correspond with the vertical resolution, which is typically about 1 ft (30 cm) in most geological formations.

9.16.1 Larger filters are frequently applied to gamma logs for presentation purposes (compression of the vertical scale); however, this filtering generally results in loss of some log information.

9.16.2 The rawest form of the gamma data and the filtered data should be saved.

9.17 Post-acquisitions calibration checks may be required to meet the objectives of the logging program to verify gamma log standardization and dead time correction.

10. Interpretation of Results

10.1 See the Log Interpretation section of Guide D 5753 for procedures on log interpretation.

10.2 A valid gamma log is important to establish the distribution of lithology and bedding within a borehole for correlation purposes, for different logs run in the same borehole (see Fig. 4), and for the extrapolation of results between boreholes (see Fig. 2).

10.2.1 Except at sites contaminated by radioactive waste, the measured gamma photons originate from the radioactive decay of naturally-occurring isotopes of Potassium-40 and daughter products of Uranium-238 and Thorium-232 (see Fig. 6).

10.2.2 Gamma logs can be analyzed individually (that is, borehole lithology).

10.2.3 Gamma logs can be analyzed as part of a suite to take advantage of the synergistic nature of log data.

10.3 The gamma log should be depth correlated with the other geophysical logs as the first step to interpretation. This is especially important for logs that use the gamma data for depth adjustment.

10.3.1 The gamma log data may be filtered, edited, combined, and merged with other log values.

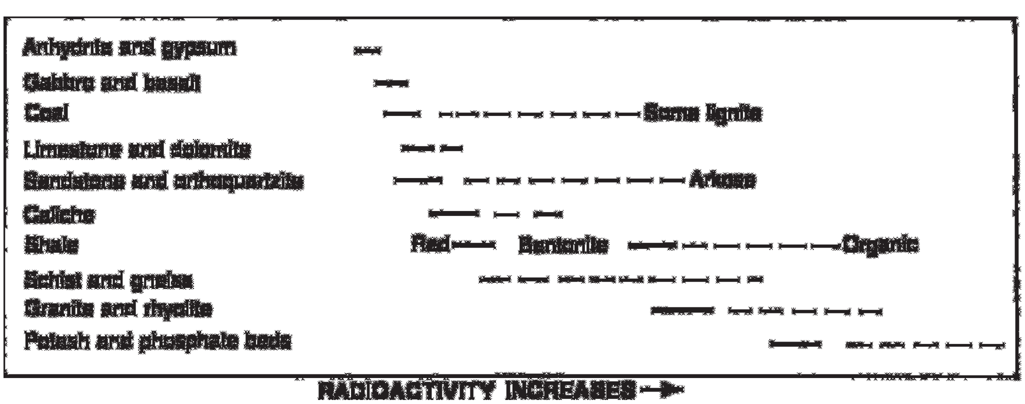


FIG. 6 Range of Relative Gamma Activity of Common Rocks

10.3.2 Final log headers are filled out and attached to the data.

10.3.3 The gamma log may be plotted at different scales for the purpose of interpreting, summarizing, and presenting the final data.

10.4 Other pertinent information, including borehole construction (casing size), drilling history (hole size, drill method, penetration rate, core loss, fluid loss, etc.), and geologic information should be integrated with the gamma log data.

10.4.1 Many of the borehole effects on the gamma log, such as correction for attenuation of steel casing and borehole fluid, can be normalized with empirical data to facilitate interpretation. This is especially important in comparing gamma logs from boreholes logged with different completion designs.

10.4.2 It is also possible to normalize the gamma log for well construction if it is possible to log a similar borehole prior to completion and again after a similar scheme.

10.5 Gamma logs commonly are the primary indicator of geologic structure and stratigraphy to be used as a guide in installing well screens, positioning cement plugs, bentonite seals or packers, etc.

10.5.1 When gamma logs are used as indicators of bed boundaries, the bed contact is usually identified as the point where the log measures half of the total change in amplitude across the bed contact (see Fig. 5).

10.6 Gamma logs obtained for depth correlation on logging runs using different probes may not produce the same count rates at each depth because of differences in detector efficiencies and probe designs.

10.7 Gamma logs may be applied to correlate lithology between boreholes based upon the characteristic gamma activity of specific beds or formations (See Fig. 6). Gamma logs can be used to determine the continuity of lithology, strike, and dip of beds between boreholes, and to infer the existence of faults and other discontinuities.

10.8 The primary application of gamma logs for geotechnical applications assumes a correlation between gamma activity and the proportion of fine-grained material in the formation. The gamma log may be used to calculate a clay volume or percentage. This assumption is frequently not valid (for example, phosphatic sands, arkosic sands, non-sedimentary environments, areas of natural radioactive mineralization, etc.) and should be tested in the project area. This testing may consist of cross plots, principal component analysis, and other multivariate statistical techniques. The application of gamma log analysis in the estimation of clay fraction may also be complicated by the presence of more than one clay type, each of which has a distinctly different level of gamma activity.

10.9 Gamma logs can be used to detect the presence of radioisotopes in borehole tracer studies, calibrated in units of radioisotope concentration to assess the degree of radioisotope contamination at radioactive waste sites, and used to locate source rocks in natural radium and radon hazard assessment studies.

11. Report

11.1 The Report section of Guide D 5753 should be consulted for requirements of the report.

11.2 Providers of gamma logs shall describe the components of the gamma logging system, the principles of the methods used, methods and results of calibration and standardization, performance verification (repeat sections, ASDE, correlation with other logs and key features such as bottom of steel casing, etc.), and uniqueness of interpretation.

11.3 Information on the software and algorithms used should be documented.

11.4 Any deviations from this guide should be documented.

11.5 Presentation of gamma logs should be designed to meet project objectives. At a minimum, depth (y-axis) and units of measurement (x-axis) scales should be clearly marked. There may be a difference between presentations of data collected in the field versus in the final report. Any scale "wraps" should be clearly marked (see Fig. 1).

11.5.1 Gamma logs are typically displayed with linear scales in counts per second or API units (see Fig. 1).

11.5.2 The digital data should be provided in ASCII format and include depth referenced gamma values and all pertinent header and calibration information; for example, Log ASCII Standard format (LAS).

11.5.3 Field plots typically are generated at the time of logging or immediately upon completion of data acquisition. These plots may be delivered in the field or may be discarded at some point later in the project. They are not typically included in the report.

11.5.4 Final log plots are typically generated post acquisition. They consist of the filtered and edited gamma data combined and merged with logical combinations of other log data. Final log plots are typically plotted in an industry standard format such as API format and may be included in the report.

11.5.5 Summary log plots may be generated (typically at reduced scales) to incorporate other logs, relevant data, and interpretations. These plots are generally included in the report.

12. Keywords

12.1 borehole geophysics; dead time correction; gamma log; natural gamma log; nuclear statistics; radioisotope; well construction; well logging

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GRL engineers, inc.
Dynamic Measurements and Analyses

July 20, 2006

Schnabel Engineering, Inc.
1 West Cary Street
Richmond, VA 23220

Attention: Mr. Jim Sell

Re: Summary Report for SPT Energy Measurements
Calvert Cliffs Project
Calvert County, MD

GRL Job No. 064054

Dear Mr. Sell:

This report summarizes the results from the Standard Penetration Test (SPT) energy measurements performed for five drilling rigs, at the above referenced project. Graphical and tabular summaries of the dynamic test results are included with this report. The field testing was performed during our site visits between June 19 and 27, 2006.

The purposes of the SPT energy measurements were to provide energy transfer efficiency for the SPT N values obtained from five drill rigs and drillers. To meet this objective, a PAK Model Pile Driving Analyzer® (PDA) was used to acquire and process the dynamic test data. Additional information regarding the testing equipment and analytical procedures is included in Appendix A.

Soil Information

The reported soil profile consisted of varying layers of silty sands, silts and clays typical of alluvial deposits for this region. A detailed discussion of the subsurface conditions is beyond the scope of this report. The reader is referred to the proper geotechnical investigation report for further details.

Pennsylvania Office: [illegible], PA [illegible]
Corporate Office: [illegible], Cleveland, OH [illegible] USA, phone [illegible], fax [illegible]

California 661.259.2977 | Colorado 303-666-6127 | Florida 407.826.9539 | Illinois 847.670.7720 | North Carolina [illegible] | Ohio [illegible]

Test Sequence

As directed by Schnabel Engineering, GRL was requested to obtain SPT energy measurements for five drill rigs at various depths from a single boring for each rig. Energy measurements for each rig were to be obtained at intervals of 15 feet to a boring depth of 300 feet and then at intervals of 20 feet between 300 and 400 feet. If necessary due to indications of poor quality dynamic test data or changes in the drilling procedure energy measurements were to be obtained at the next available sample depth. Therefore, GRL performed energy measurements at intervals of 15 feet sampling depths with the total number of samples collected varying between 6 and 26 depending upon the boring depth. The largest number of samples were collected for Boring B401 which was a 400 foot boring and the smallest number of samples collected was for Boring B744 which was a 100 foot boring. All SPT samples were driven for a total of 3 six-inch increments, or 1.5 feet.

DYNAMIC TESTING ANALYSES AND RESULTS

Energy Transfer Measurements

A PAK model Pile Driving Analyzer was used to take measurements of strain and acceleration. The strain and acceleration measurements were taken on the 2 ft long N3, NWJ or AWJ rod located directly below the automatic hammer. The strain and acceleration signal were conditioned and converted to force and velocities by the PDA. The PDA interprets the measured dynamic data according to the Case Method equation. The dynamic test data was evaluated for maximum force and velocity at the gage location. These quantities are presented in the summaries of the dynamic test results in Appendix B.

Force and velocity records from the PDA were also viewed graphically on an LCD screen to evaluate data quality. All force and velocity records were also digitally stored for subsequent laboratory analysis.

The maximum energy transferred to the gage location was calculated using the Case Method equations as required by ASTM D4633. Therefore the transferred energy, EFV, is calculated by integrating both the force and velocity records over time as follows:

$$EFV = \int F(t)V(t)dt$$

Where: $F(t)$ = the force at time t
$V(t)$ = the velocity at time t

The integration begins at the time the hammer impacts the rod and continues to the end of the record.

Discussion of Test Results

Tables 1 through 5 contain a summary of the average energy transfer calculated using the EFV equation and the energy transfer ratio (ETR = EFV/PE, where PE is potential energy of the SPT hammer) for each drilling rig and SPT sample with dynamic measurements. A summary of the dynamic measurements of the energy transfer to the drill rods using the EFV equation for each drill rig is provided in the table below.

Borehole and Drill Rig	Avg EFV (ft-lbs)	Avg ETR (%)	Range of EFV (ft-lbs)	Range of ETR (%)
B401 / Failing 1500 Truck	274	78	235 - 309	67 - 88
B403 / CME 550X ATV	293	84	255 - 321	73 - 92
B404 / CME 750 ATV	304	87	274 - 316	78 - 90
B409 / CME 75 Truck	293	84	243 - 315	69 - 90
B744 / Diedrich D50 ATV	282	81	257 - 294	73 - 84

Conclusions

Based upon the dynamic test data obtained, the following conclusions are presented:

1 - Loose connections in the drill string were sometimes observed in the force and velocity records. However, energy transfer values calculated using the EFV equation are not adversely affected by the connectors and therefore are considered a better indication of transferred energy.

2 - Dynamic measurements of the transferred energy to the drill rods using the EFV equation ranged from 235 to 321 ft-lbs for all five drill rigs. This corresponds to a transfer efficiency ranging from 67 to 92% of the SPT hammer energy of 350 ft-lbs.

3 - The average transferred energy (EFV) and energy transfer ratio (ETR) for each drill rig tested was as follows:

B401 - Failing 1500, Average EFV = 274 ft-lbs, Average ETR = 78%
B403 - CME 550X ATV, Average EFV = 293 ft-lbs, Average ETR = 84%
B404 - CME 750 ATV, Average EFV = 304 ft-lbs, Average ETR = 87%
B409 - CME 75 Truck, Average EFV = 293 ft-lbs, Average ETR = 84%
B744 - Diedrich D50 ATV, Average EFV = 282 ft-lbs, Average ETR = 81%

We appreciate the opportunity to be of assistance on this project. Please do not hesitate to contact us if you have any questions regarding this report, or if we may be of further service.

Respectfully,
GRL Engineers, Inc.

Scott D. Webster, P.E.

Wondem Teferra, P.E.

SDW:WT:dms

APPENDIX H
SPT HAMMER ENERGY STUDY

- SPT Hammer Energy Study Report

SPT HAMMER ENERGY STUDY REPORT

GRL Engineers, Inc.

Summary Report for SPT Energy Measurements

July 20, 2006

TABLE 1: Summary of SPT Energy Measurements
Borehole B401 - Failing 1500 Truck
Calvert Cliffs, MD

Sample No.	Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency1 (%)	Blow per Minute (bpm)
B401-15	6/19/2006	13.5 - 15	19	2-4-4	8	242	69.1	42
B401-20	6/19/2006	18.5 -20	24	2-3-6	9	235	67.1	42
B401-30	6/19/2006	28.5 - 30	34	4-7-16	23	261	74.6	42
B401-45	6/19/2006	43.5 - 45	49	16-50/5"	50/5"	277	79.1	43
B401-60	6/20/2006	58.5 - 60	64	7-14-50	64	262	74.9	43
B401-75	6/20/2006	73.5 - 75	79	16-50/5"	50/5"	276	78.9	43
B401-90	6/20/2006	88.5 - 90	94	9-12-17	29	262	74.9	43
B401-105	6/20/2006	103.5 - 105	109	5-9-22	31	272	77.7	42
B401-120	6/20/2006	118.5 - 120	124	5-9-12	21	260	74.3	43
B401-135	6/20/2006	133.5 - 135	139	7-9-11	20	286	81.7	43
B401-150	6/20/2006	148.5 - 150	154	8-10-12	22	273	78.0	43
B401-170	6/21/2006	168.5 - 170	174	8-10-15	25	281	80.3	43
B401-180	6/21/2006	178.5 - 180	184	4-10-11	21	270	77.1	43
B401-195	6/21/2006	193.5 - 195	199	6-9-17	26	281	80.3	43
B401-210	6/21/2006	208.5 - 210	214	6-10-16	26	276	78.9	43
B401-225	6/22/2006	223.5 - 225	229	9-13-18	31	284	81.1	43
B401-240	6/22/2006	238.5 - 240	244	8-11-21	32	278	79.4	42
B401-255	6/22/2006	253.5 - 255	259	8-11-19	30	275	78.6	42
B401-270	6/23/2006	268.5 - 270	274	7-12-18	30	289	82.6	43
B401-286	6/23/2006	284.5 - 286	290	11-13-17	30	309	88.3	43
B401-300	6/26/2006	298.5 - 300	304	9-14-18	32	282	80.6	43
B401-320	6/27/2006	318.5 - 320	324	18-26-35	61	280	80.0	43
B401-340	6/27/2006	338.5 - 340	344	8-12-29	41	281	80.3	43
B401-360	6/27/2006	358.5 - 360	364	30-50/5"	50/5"	274	78.3	43
B401-380	6/28/2006	378.5 - 380	384	16-21-36	57	280	80.0	42
B401-400	6/28/2006	400 - 401.5	405	11-15-29	44	283	80.9	43

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.

TABLE 2: Summary of SPT Energy Measurements
Borehole B403 - CME 550X ATV
Calvert Cliffs, MD

Sample No.	Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency1 (%)	Blow per Minute (bpm)
B403-15	6/20/2006	13.5 - 15	19	3-5-6	11	277	79.1	55
B403-30	6/20/2006	28.5 - 30	34	2-50/5"	50/5"	304	86.9	54
B403-45	6/21/2006	43.5 - 45	49	4-4-7	11	320	91.4	55
B403-60	6/21/2006	58.5 - 60	64	2-3-4	7	321	91.7	54
B403-75	6/21/2006	73.5 - 75	79	6-7-12	19	299	85.4	54
B403-90	6/21/2006	88.5 - 90	94	6-6-10	16	291	83.1	54
B403-105	6/21/2006	103.5 - 105	109	4-6-9	15	277	79.1	54
B403-120	6/21/2006	118.5 - 120	124	6-9-17	26	289	82.6	54
B403-135	6/21/2006	133.5 - 135	139	6-8-11	19	277	79.1	53
B403-150	6/21/2006	148.5 - 150	154	7-9-12	21	304	86.9	55
B403-165	6/22/2006	163.5 - 165	169	5-8-12	20	255	72.9	55
B403-180	6/22/2006	178.5 - 180	184	6-10-20	30	275	78.6	54
B403-200	6/22/2006	198.5 - 200	204	7-9-14	23	317	90.6	55

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.

TABLE 3: Summary of SPT Energy Measurements
Borehole B404 - CME 750 ATV
Calvert Cliffs, MD

Sample No.	Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency1 (%)	Blow per Minute (bpm)
B404-15	6/22/2006	15 - 16.5	21	4-5-6	11	274	78.3	48
B404-30	6/22/2006	30 - 31.5	36	40-50/3"	50/3"	314	89.7	56
B404-45	6/22/2006	45 - 46.5	51	48-32-28	60	316	90.3	52
B404-60	6/22/2006	60 - 61.5	66	4-5-7	12	308	88.0	54
B404-75	6/23/2006	75 - 76.5	81	4-9-21	30	303	86.6	53
B404-90	6/23/2006	90 - 91.5	96	5-8-11	19	304	86.9	55
B404-105	6/23/2006	105 - 106.5	111	7-12-15	27	308	88.0	56
B404-120	6/23/2006	120 - 121.5	126	5-8-10	18	306	87.4	55
B404-135	6/26/2006	135 - 136.5	141	6-9-10	19	303	86.6	52
B404-150	6/26/2006	150 - 151.5	156	6-8-12	20	308	88.0	55
B404-165	6/26/2006	165 - 166.5	170	7-9-9	18	295	84.3	48
B404-180	6/26/2006	180 - 181.5	186	6-14-20	34	307	87.7	54
B404-195	6/27/2006	195 - 196.5	201	4-8-13	21	312	89.1	56

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.

TABLE 4: Summary of SPT Energy Measurements
Borehole B409 - CME 75 Truck
Calvert Cliffs, MD

Sample No.	Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency1 (%)	Blow per Minute (bpm)
B409-15	6/22/2006	15 - 16.5	19	1-4-3	7	288	82.3	56
B409-30	6/22/2006	30 - 31.5	34	18-50/5"	50/5"	289	82.6	55
B409-47	6/22/2006	47.5 - 49	53	4-5-5	10	243	69.4	56
B409-60	6/22/2006	60 - 61.5	65	2-3-2	5	296	84.6	---
B409-75	6/22/2006	75 - 76.5	81	5-7-13	20	298	85.1	56
B409-90	6/23/2006	90 - 91.5	96	5-7-9	16	288	82.3	54
B409-105	6/23/2006	105 - 106.5	111	4-5-8	13	315	90.0	55
B409-120	6/26/2006	120 - 121.5	126	4-5-5	10	302	86.3	54
B409-135	6/27/2006	135 - 136.5	141	4-6-9	15	307	87.7	55
B409-150	6/27/2006	148.5 - 150	154	7-8-10	18	301	86.0	56

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.

TABLE 5: Summary of SPT Energy Measurements
Borehole B744 - Diedrich D50 ATV
Calvert Cliffs, MD

Sample No.	Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency1 (%)	Blow per Minute (bpm)
B744-15	6/20/2006	15 - 16.5	19	3-3-3	6	257	73.4	51
B744-30	6/20/2006	30 - 31.5	34	2-2-2	4	277	79.1	51
B744-45	6/20/2006	43.5 - 45	49	5-7-9	16	291	83.1	51
B744-60	6/20/2006	60 - 61.5	64	4-6-7	13	293	83.7	51
B744-75	6/21/2006	75 - 76.5	79	8-11-35	46	294	84.0	52
B744-90	6/21/2006	90 - 91.5	94	5-8-11	19	280	80.0	52

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.

Appendix A

An Introduction Into SPT Dynamic Pile Testing

APPENDIX A
AN INTRODUCTION INTO SPT DYNAMIC PILE TESTING

The following has been written by GRL Engineers, Inc. and may only be copied with its written permission.

1. BACKGROUND

The Standard Penetration Test is frequently conducted as an in-situ assessment of soil strength. This test requires that a 140 lb weight is dropped 30 inches onto a drive rod at whose bottom a sampler is usually installed. This sampler is driven for 18 inches; the number of blows required for the last 12 inches of driving is the so-called N-value. The N-value may be used as a strength indicator for foundation design or as a means of assessing the liquefaction potential of soils.

Obviously, the SPT hammer efficiency is an important consideration when using the N-values for design purposes. Measurements have indicated that the energy in the drive rod is sometimes only 30% and and may reach 90% of the potential or rated energy of the SPT hammer (E-rated = 0.35 kip-ft or 0.475 kJ). The type of hammer used to drive the rod is the main reason for these variations. On the average, the energy in the drive rod is 60% of the standard rated energy.

Because of the variability of energy, methods based on N-values are considered unreliable. However, measurements during SPT testing using the Case Method can be done on a routine basis and these measurements yield the transferred energy values. With measured energy, EMX, known, an adjustment of the measured N-value, N_m, can be made as follows.

$$N_{60} = N_m \left[E_m / (0.6 E_r) \right] \qquad (1)$$

Thus, if the measured energy value is equal to the normally expected transferred energy of 60% of E-rated then the adjusted and measured N-values are identical. On the other hand, if the measured energy is only 30% then the adjusted blow count will be reduced by 50%.

2. DYNAMIC TESTING AND ANALYSIS METHODS APPLIED TO SPT

The Case Method of dynamic pile testing, named after the Case Institute of Technology where it was developed between 1964 and 1975, requires that a substantial ram mass (e.g. a pile driving hammer) impacts the pile top such that the pile undergoes at least a small permanent set. Thus, the method is also referred to as a "High Strain Method". The Case Method requires dynamic measurements on the pile or shaft under the ram impact and then a calculation of various quantities. Conveniently, for SPT applications, the measurements and analyses are done by a single piece of equipment, the SPT Analyzer. The Pile Driving Analyzer® (PDA) is also suitable to perform these measurements and data processing.

A related analysis method is the "Wave Equation Analysis" which calculates a relationship between bearing capacity, pile stresses, transferred energy and field blow count. The GRLWEAP™ program performs this analysis and provides a complete set of helpful information and input data. This program can be used very effectively to simulate the SPT driving process.

3. MEASUREMENTS

GRL uses equipment manufactured by Pile Dynamics, Inc. The system includes either an SPT-Analyzer™ (SPTA) or a Pile Driving Analyzer® (PDA), an instrumented rod section and two accelerometers. SPT energy testing is very closely related to and borrows procedures from dynamic pile testing. Those interested in the basis of the SPT energy testing method may obtain extensive literature on dynamic pile testing from GRL Engineers, Inc.

3.1 SPT Analyzer or Pile Driving Analyzer

The basis for the results calculated by the SPTA or PDA are strain and acceleration measured in an instrumented rod section. These signals are converted to rod top force, F(t), and rod top velocity, v(t). The SPTA or PDA conditions, calibrates and displays these signals and immediately computes average pile force and velocity thereby eliminating bending effects. The product of these two measurements is then integrated over time which yields the energy transferred to the instrumented section as a function of time (see Section 4.1).

For convenience and accuracy, strain measurements are usually taken on an instrumented section of SPT drive rod. Ideally, the section properties of the instrumented rod and those of the drive rod are the same, however, using subs, other sections can also be utilized.

For the instrumented section, PDI provides a force calibration in such a way that the output of the instrumented rod is directly calculated without the need for an accurate elastic modulus or cross sectional area of the rod section.

The acceleration measurements are often demanding in the SPT environment, because of high frequency and high acceleration motion components. An experienced measurement engineer, therefore, has to evaluate the quality of this data before final conclusions are drawn from the numerical results calculated by SPTA or PDA.

SPTA or PDA records are taken while the standard N-value is acquired in the conventional manner. This then allows a direct correlation between N-value and average transferred energy.

3.2 HPA

The SPT hammer's ram velocity may be directly obtained using radar technology in the Hammer Performance Analyzer™. The impact velocity results can be automatically processed with a PC or recorded on a strip chart. HPA measurements yield a hammer kinetic energy, but not the energy transferred to the drive rod.

4 RECORD EVALUATION BY SPTA OR PDA

4.1 HAMMER PERFORMANCE

The PDA calculates the energy transferred to the pile top from:

$$E(t) = \int_0^t F(\tau)V(\tau)\,d\tau \qquad (2)$$

The maximum of the E(t) curve is often called ENTHRU or EMX. It is the most important quantity for an overall evaluation of the performance of a hammer and driving system. EMX allows for a classification of the hammer's performance when presented as, e_T, the rated transfer efficiency, also called energy transfer ratio (ETR) or global efficiency.

$$e_T = EMX/E_R \qquad (3)$$

where E_R is the hammer manufacturer's rated energy value of 0.35 kip-ft (0.475 kJ) in the case of the SPT hammer.

Often in the SPT literature one finds also reference to the EF2 energy. This evaluation is based on assumed proportionality between force and velocity (see also Section 5).

$$v(t) = F(t) / Z \qquad (4)$$

where Z = EA/c is the pile impedance, E is the elastic modulus, A is the cross sectional area and c is the speed of the stress wave in the pile material.

Combining equations 2 and 4 leads to

$$EF(t) = \int_0^t F(\tau)^2 / Z\,d\tau \qquad (5)$$

The EF2 transferred energy value is the EF value at the time t = 2L/c, where L is the drive rod length and c is the stress wave speed in steel (16,800 ft/s or 5,124 m/s). Since the force is easier to measure than both force and velocity, Equation 5 is preferred by some test engineers. However, the EF method is fraught with errors and certain correction factors have to be applied to make it approximately correct. Among the error sources are the following:

- Proportionality is often violated prior to time 2L/c. The proportionality between force and velocity in a downward traveling wave only holds if the wave does not encounter a disturbance prior to reflecting off the pile toe. Such disturbances include a change in cross sectional area, an open or loose splice or joint, or resistance along the shaft.

- Using only one force measurement precludes a data quality check based on the proportionality between force and velocity. Thus, a force measurement that is for some reason in error may not be detectable, which will lead to errors in the EF2 value. Data quality checks will be discussed further in Section 5.

The use if EF2 is therefore not recommended but it is often included in result presentations for the sake of completeness.

4.2 STRESSES

During SPT monitoring, it is also of interest to monitor compressive stresses at both the top of the drive rod and at its bottom.

At the pile top (location of sensors) the maximum compression stress averaged over the rod's cross section, CSX, is directly obtained from the measurements. Note that this stress value refers to the instrumented section. If the rod has a different cross sectional area then the stress in the rod will be different from CSX.

The SPTA or PDA can also calculate, in an approximate manner, the force at the rod bottom, CFB. To obtain the corresponding stress, this force value should be divided by the appropriate cross sectional area, e.g. by the rod area just above the sampler or by the sampler area itself. Of course, non-uniform stress components as they might occur at the sampler tip due to a sloping rock are not considered in this calculation.

5. DATA QUALITY CHECKS

Quality data is the first and foremost requirement for accurate dynamic testing results. It is therefore important that the measurement engineer performing SPTA or PDA tests has the experience necessary to recognize measurement problems and take appropriate corrective action should problems develop. Fortunately, dynamic pile testing allows for certain data quality checks because two independent measurements are taken that have to conform to the so-called proportionality relationship.

As long as there is only a wave traveling in one direction, as is the case during impact when only a downward traveling wave exists in the rod, force and velocity measured at its top are proportional

$$F = v\,Z \qquad (5)$$

where Z is again the pile impedance, Z = EA/c. This relationship can also be expressed in terms of stress

$$\sigma = F/A = v\,(E/c) \qquad (6)$$

or strain

$$\varepsilon = \sigma/E = v\,/\,c \qquad (7)$$

This means that the early portion of strain times wave speed must be equal to the velocity unless the proportionality is affected by high friction near the pile top or by a pile cross sectional change not far below the sensors. Checking the proportionality is an excellent means of assuring meaningful measurements but is only truly meaningful for perfectly uniform rods. Open or loose splices, for example, will lead to a non-proportionality. For SPT rods it is fortunate that usually no soil resistance acts along the shaft and for that reason, proportionality can exist until the stress wave returns from sampler top or rod bottom unless connectors are not sufficiently tightened or have a significant mass.

Velocity data quality can also be checked by looking at the final displacement, DFN, which is calculated from the acceleration by double integration. If the calculated final displacement is much higher or lower then indicated by the N-value, the accelerometer attachment may be loose or the sensor may be faulty. If major drift in the velocity is observed, the EMX value may be in error, even though proportionality from impact to time 2L/c exists. In this case, it may be useful to evaluate the energy transferred to the drill rod at time 2L/c, which is calculated by the PDA or SPTA as the E2E quantity.

Appendix B:

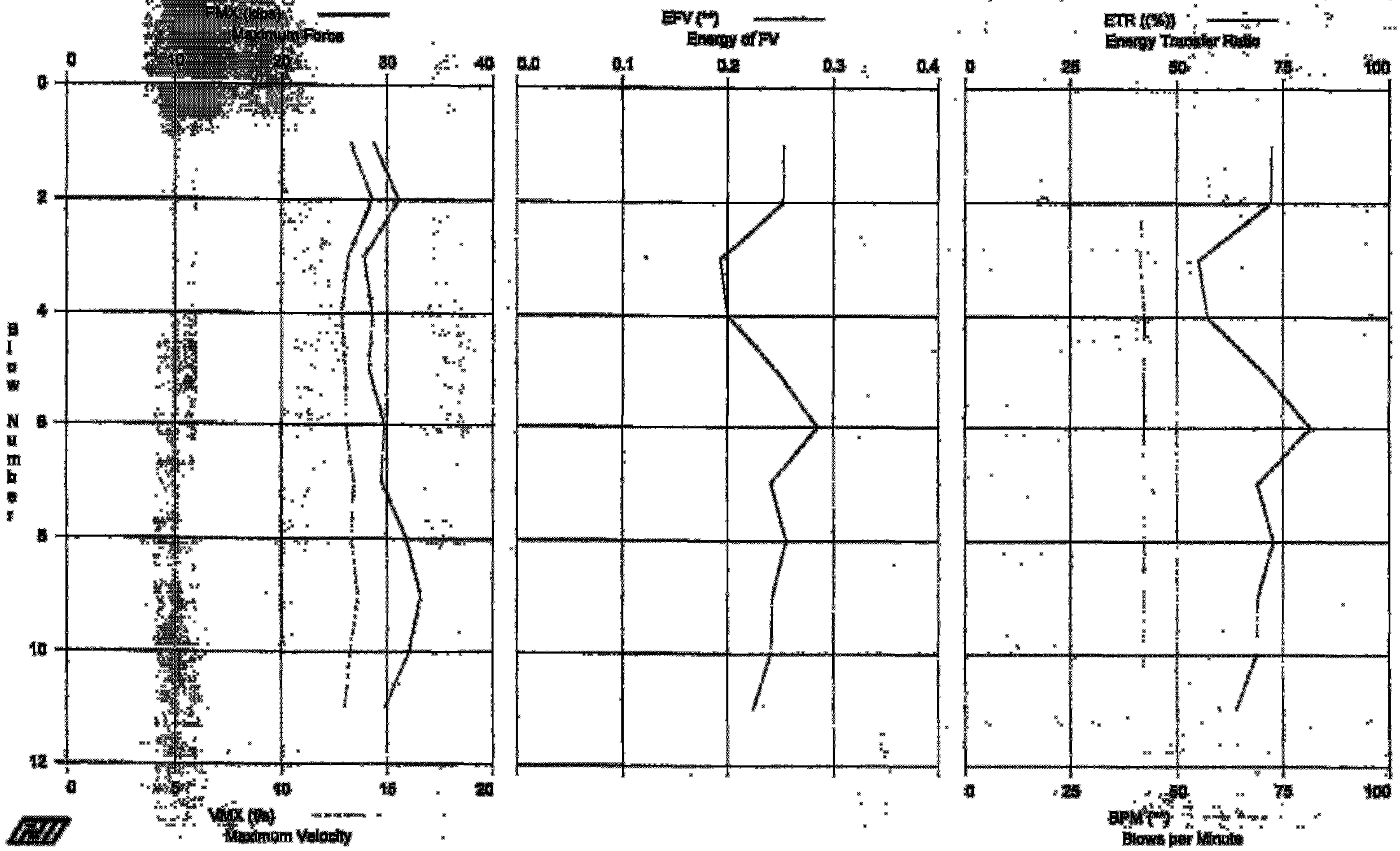
SPT Energy Measurement

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-15

Test date: 19-Jun-2006



SPT, Calvert Cliffs - B401-15   N3 rod

OP: KB   Test date: 19-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 19.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	()
1	0.00	AV1	29	13.3	0.253	72.3	**	0.253	0.142	2.90	0.64
2	0.00	AV1	31	14.3	0.253	72.2	41.9	0.253	0.148	2.58	0.62
3	0.00	AV1	28	13.2	0.193	55.0	41.5	0.193	0.123	1.87	0.68
4	0.00	AV1	29	12.8	0.200	57.2	42.4	0.200	0.128	1.77	0.65
5	0.00	AV1	28	13.0	0.247	70.6	42.3	0.247	0.143	2.04	0.63
6	0.00	AV1	30	13.1	0.285	81.5	42.2	0.285	0.144	1.92	0.60
7	0.00	AV1	29	13.4	0.241	69.0	42.1	0.241	0.143	1.93	0.59
8	0.00	AV1	32	13.3	0.255	72.7	42.3	0.255	0.155	1.88	0.60
9	0.00	AV1	33	13.6	0.242	69.0	42.1	0.242	0.156	1.85	0.56
10	0.00	AV1	32	13.3	0.241	68.8	42.2	0.241	0.152	1.81	0.63
11	0.00	AV1	30	13.0	0.224	64.1	42.1	0.224	0.143	1.78	0.59

Time Summary

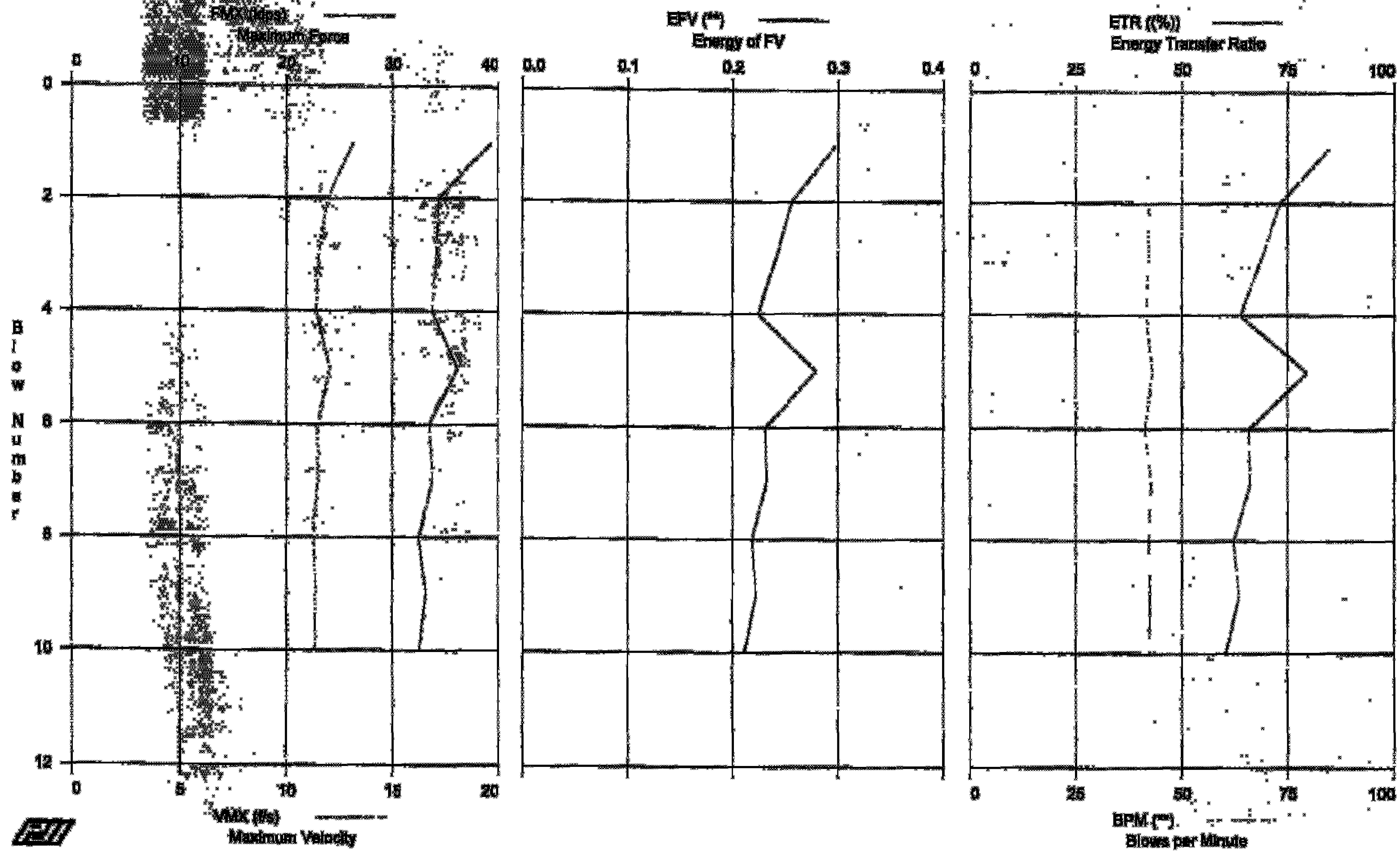
Drive 15 seconds 3:33:14 PM - 3:33:29 PM (6/19/2006) BN 1 - 11

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-20

Test date: 19-Jun-2006



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-20 N3 rod
OP: KB Test date: 19-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 24.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	39	13.2	0.297	84.9	**	0.297	0.193	2.70	0.78
2	0.00	AV1	34	11.9	0.256	73.2	42.1	0.256	0.165	2.03	0.73
3	0.00	AV1	34	11.5	0.241	68.7	42.3	0.241	0.152	1.68	0.74
4	0.00	AV1	34	11.4	0.224	63.9	41.7	0.224	0.142	1.34	0.73
5	0.00	AV1	36	12.0	0.279	79.6	43.0	0.279	0.178	1.73	0.74
6	0.00	AV1	33	11.5	0.231	65.9	41.4	0.231	0.146	1.30	0.72
7	0.00	AV1	34	11.5	0.232	66.2	42.8	0.232	0.149	1.22	0.73
8	0.00	AV1	32	11.3	0.218	62.2	42.3	0.218	0.138	1.17	0.71
9	0.00	AV1	33	11.4	0.222	63.5	42.5	0.222	0.144	1.13	0.72
10	0.00	AV1	33	11.3	0.211	60.4	42.4	0.211	0.134	1.14	0.71
		Average	34	11.7	0.241	68.8	42.3	0.241	0.154	1.54	0.73

Total number of blows analyzed: 10

Time Summary

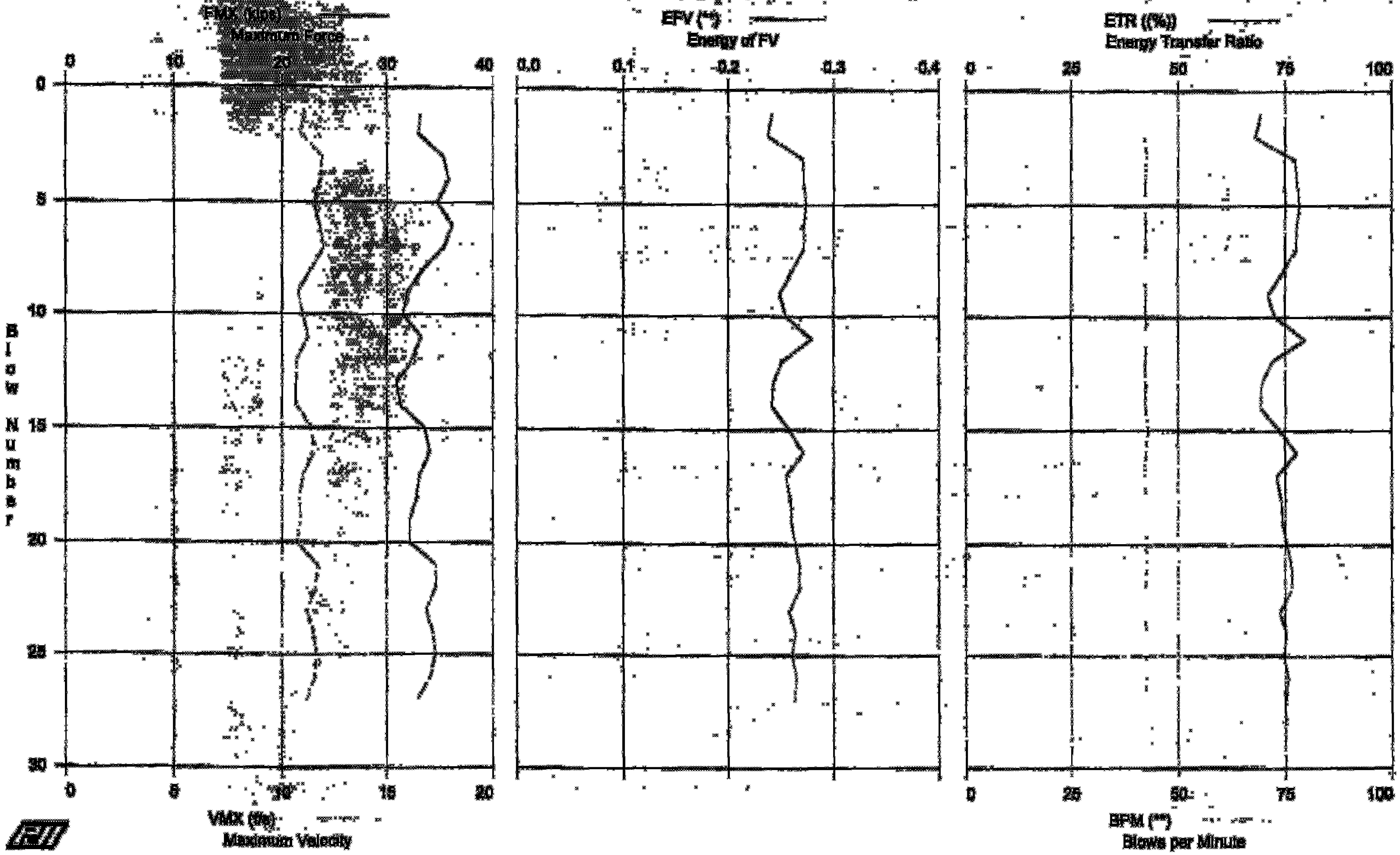
Drive 13 seconds 3:46:12 PM - 3:46:25 PM (6/19/2006) BN 1 - 10

PDIPLOT Ver. 2005.2 - Printed: 17-[illegible]-2008

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-30

Test date: 19-Jun-2008



GRL Engineers, Inc.
Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-30 N3 rod
OP: KB Test date: 19-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 34.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	33.17	11.07	0.242	69.3	**	0.242	0.156	1.35	0.64
2	0.00	AV1	32.96	10.86	0.238	67.9	42.2	0.238	0.152	1.49	0.58
3	0.00	AV1	35.35	11.90	0.271	77.4	42.8	0.271	0.181	1.70	0.59
4	0.00	AV1	35.83	11.82	0.272	77.9	42.5	0.272	0.179	1.98	0.61
5	0.00	AV1	34.73	11.51	0.274	78.4	42.4	0.274	0.175	1.14	0.56
6	0.00	AV1	36.15	11.76	0.272	77.7	42.5	0.272	0.181	0.82	0.63
7	0.00	AV1	35.35	11.97	0.272	77.6	42.4	0.272	0.178	0.92	0.62
8	0.00	AV1	33.37	11.36	0.260	74.3	42.3	0.260	0.164	1.05	0.63
9	0.00	AV1	31.87	10.76	0.249	71.0	42.4	0.249	0.158	1.04	0.58
10	0.00	AV1	31.50	10.98	0.255	72.7	42.4	0.255	0.161	0.82	0.64
11	0.00	AV1	33.20	11.23	0.279	79.7	42.6	0.279	0.171	0.94	0.65
12	0.00	AV1	32.35	10.70	0.251	71.8	42.4	0.251	0.158	0.55	0.57
13	0.00	AV1	30.87	10.65	0.243	69.4	42.5	0.243	0.152	0.66	0.63
14	0.00	AV1	31.30	10.66	0.242	69.1	42.4	0.242	0.152	0.58	0.59
15	0.00	AV1	33.56	11.43	0.258	73.9	43.0	0.258	0.164	0.60	0.64
16	0.00	AV1	34.08	11.49	0.272	77.7	42.4	0.272	0.175	0.72	0.63
17	0.00	AV1	33.06	11.01	0.255	73.0	42.2	0.255	0.162	0.81	0.57
18	0.00	AV1	32.83	10.81	0.259	74.1	42.6	0.259	0.163	0.60	0.57
19	0.00	AV1	32.14	10.88	0.260	74.3	42.6	0.260	0.163	0.61	0.63
20	0.00	AV1	32.19	10.69	0.264	75.4	42.3	0.264	0.160	0.67	0.60
21	0.00	AV1	34.70	11.70	0.268	76.6	42.8	0.268	0.176	0.69	0.65
22	0.00	AV1	34.64	11.60	0.268	76.7	42.4	0.268	0.174	0.70	0.61
23	0.00	AV1	33.73	11.21	0.258	73.8	42.4	0.258	0.164	0.69	0.58
24	0.00	AV1	34.36	11.47	0.264	75.3	42.6	0.264	0.171	0.70	0.58
25	0.00	AV1	34.63	11.64	0.261	74.7	42.7	0.261	0.170	0.74	0.59
26	0.00	AV1	34.13	11.55	0.265	75.6	42.5	0.265	0.167	0.65	0.56
27	0.00	AV1	32.86	11.19	0.263	75.3	42.4	0.263	0.164	0.66	0.62
		Average	33.51	11.26	0.261	74.5	42.5	0.261	0.166	0.89	0.61

Total number of blows analyzed: 27

Time Summary

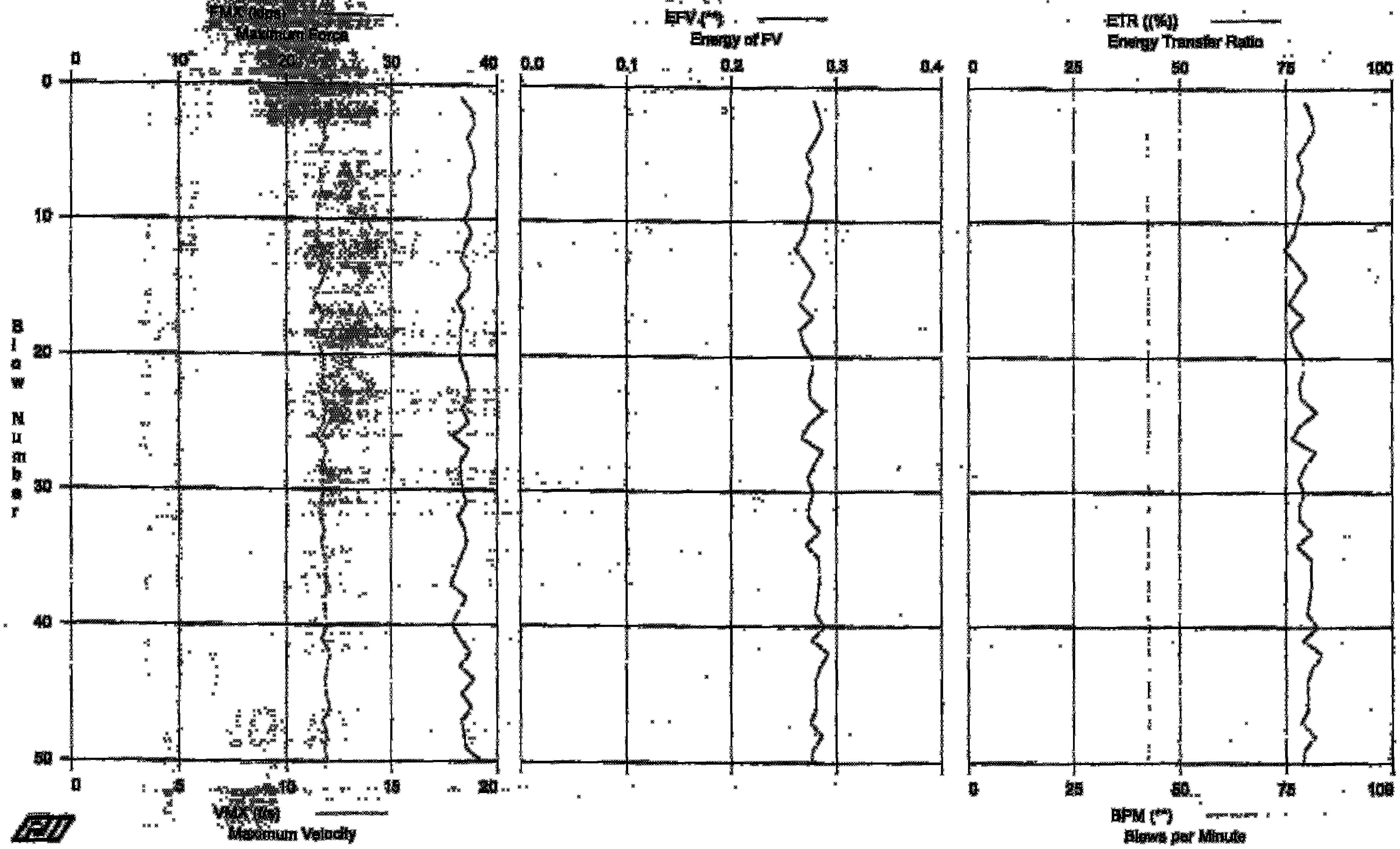
Drive 37 seconds 4:10:06 PM - 4:10:43 PM (6/19/2006) BN 1 - 27

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 19-Jun-2006

SPT, Calvert Cliffs - B401-45



GRL Engineers, Inc.
Case Method Results

SPT, Calvert Cliffs - B401-45 NB rod
OP: KB Test date: 19-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 49.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	36.67	11.43	0.278	79.5	**	0.278	0.187	0.91	0.61
2	0.00	AV1	37.68	11.77	0.283	80.9	42.3	0.283	0.182	0.55	0.63
3	0.00	AV1	37.98	11.79	0.286	81.6	42.4	0.286	0.187	0.56	0.69
4	0.00	AV1	37.23	11.83	0.280	80.0	42.5	0.280	0.179	0.44	0.60
5	0.00	AV1	37.81	11.58	0.272	77.8	42.5	0.272	0.174	0.54	0.64
6	0.00	AV1	38.01	11.57	0.277	79.0	42.6	0.277	0.180	0.39	0.64
7	0.00	AV1	37.30	11.62	0.272	77.8	42.7	0.272	0.175	0.29	0.67
8	0.00	AV1	37.60	11.66	0.277	79.2	42.6	0.277	0.178	0.49	0.68
9	0.00	AV1	37.50	11.49	0.276	78.8	42.5	0.276	0.176	0.34	0.63
10	0.00	AV1	36.97	11.47	0.272	77.8	42.8	0.272	0.173	0.37	0.64
11	0.00	AV1	37.66	11.49	0.269	76.9	42.6	0.269	0.174	0.37	0.66
12	0.00	AV1	37.00	11.25	0.261	74.6	42.8	0.261	0.168	0.29	0.63
13	0.00	AV1	36.59	11.61	0.271	77.5	42.7	0.271	0.172	0.42	0.60
14	0.00	AV1	37.50	11.82	0.279	79.9	42.4	0.279	0.182	0.40	0.63
15	0.00	AV1	37.33	11.56	0.272	77.7	42.7	0.272	0.178	0.38	0.67
16	0.00	AV1	36.24	11.28	0.265	75.7	42.6	0.265	0.170	0.35	0.61
17	0.00	AV1	36.95	11.77	0.278	79.4	42.8	0.278	0.177	0.43	0.63
18	0.00	AV1	36.59	11.45	0.266	76.1	42.5	0.266	0.171	0.38	0.62
19	0.00	AV1	36.57	11.48	0.269	76.9	42.8	0.269	0.173	0.39	0.61
20	0.00	AV1	36.39	11.75	0.277	79.2	42.7	0.277	0.177	0.55	0.70
21	0.00	AV1	36.77	11.76	0.277	79.2	42.8	0.277	0.176	0.57	0.62
22	0.00	AV1	37.28	11.67	0.274	78.1	42.6	0.274	0.176	0.44	0.64
23	0.00	AV1	37.40	11.64	0.275	78.6	42.7	0.275	0.176	0.41	0.63
24	0.00	AV1	36.62	11.84	0.287	82.1	42.7	0.287	0.180	0.57	0.69
25	0.00	AV1	37.30	11.77	0.274	78.4	42.8	0.274	0.176	0.36	0.64
26	0.00	AV1	35.86	11.45	0.267	76.4	42.7	0.267	0.168	0.41	0.60
27	0.00	AV1	37.30	11.92	0.287	82.1	42.6	0.287	0.183	0.48	0.65
28	0.00	AV1	36.52	11.68	0.279	79.6	42.6	0.279	0.178	0.36	0.60
29	0.00	AV1	36.59	11.72	0.273	78.1	42.5	0.273	0.175	0.39	0.64
30	0.00	AV1	36.75	11.79	0.278	79.3	42.9	0.278	0.176	0.43	0.62
31	0.00	AV1	37.02	11.63	0.274	78.2	42.7	0.274	0.175	0.40	0.65
32	0.00	AV1	36.34	11.60	0.274	78.2	42.6	0.274	0.174	0.43	0.61
33	0.00	AV1	36.92	11.82	0.284	81.2	42.8	0.284	0.180	0.48	0.68
34	0.00	AV1	37.13	11.66	0.272	77.6	42.6	0.272	0.173	0.30	0.64
35	0.00	AV1	36.59	11.87	0.283	81.0	42.8	0.283	0.176	0.37	0.65
36	0.00	AV1	36.09	11.85	0.284	81.0	42.6	0.284	0.175	0.42	0.69
37	0.00	AV1	35.63	11.93	0.283	81.0	42.8	0.283	0.171	0.51	0.60
38	0.00	AV1	37.05	11.82	0.282	80.5	42.7	0.282	0.179	0.37	0.64
39	0.00	AV1	36.34	11.86	0.280	80.1	42.6	0.280	0.174	0.49	0.65
40	0.00	AV1	35.79	11.87	0.288	82.3	42.9	0.288	0.179	0.48	0.70
41	0.00	AV1	36.49	11.71	0.277	79.1	42.7	0.277	0.175	0.51	0.60
42	0.00	AV1	37.40	12.07	0.292	83.5	42.7	0.292	0.182	0.62	0.66
43	0.00	AV1	36.52	11.96	0.284	81.2	42.8	0.284	0.178	0.67	0.63
44	0.00	AV1	37.76	11.83	0.280	80.1	42.7	0.280	0.179	0.55	0.65
45	0.00	AV1	36.62	11.88	0.281	80.3	42.7	0.281	0.175	0.69	0.62
46	0.00	AV1	37.58	12.06	0.281	80.3	42.8	0.281	0.178	0.51	0.64
47	0.00	AV1	36.59	11.73	0.275	78.7	42.9	0.275	0.172	0.32	0.61
48	0.00	AV1	36.90	11.93	0.286	81.8	42.7	0.286	0.178	0.48	0.62
49	0.00	AV1	37.02	11.80	0.278	79.5	42.8	0.278	0.174	0.36	0.61
50	0.00	AV1	38.51	11.95	0.276	79.0	42.6	0.276	0.178	0.23	0.67
		Average	36.97	11.71	0.277	79.3	42.7	0.277	0.176	0.45	0.64

Total number of blows analyzed: 50

Time Summary

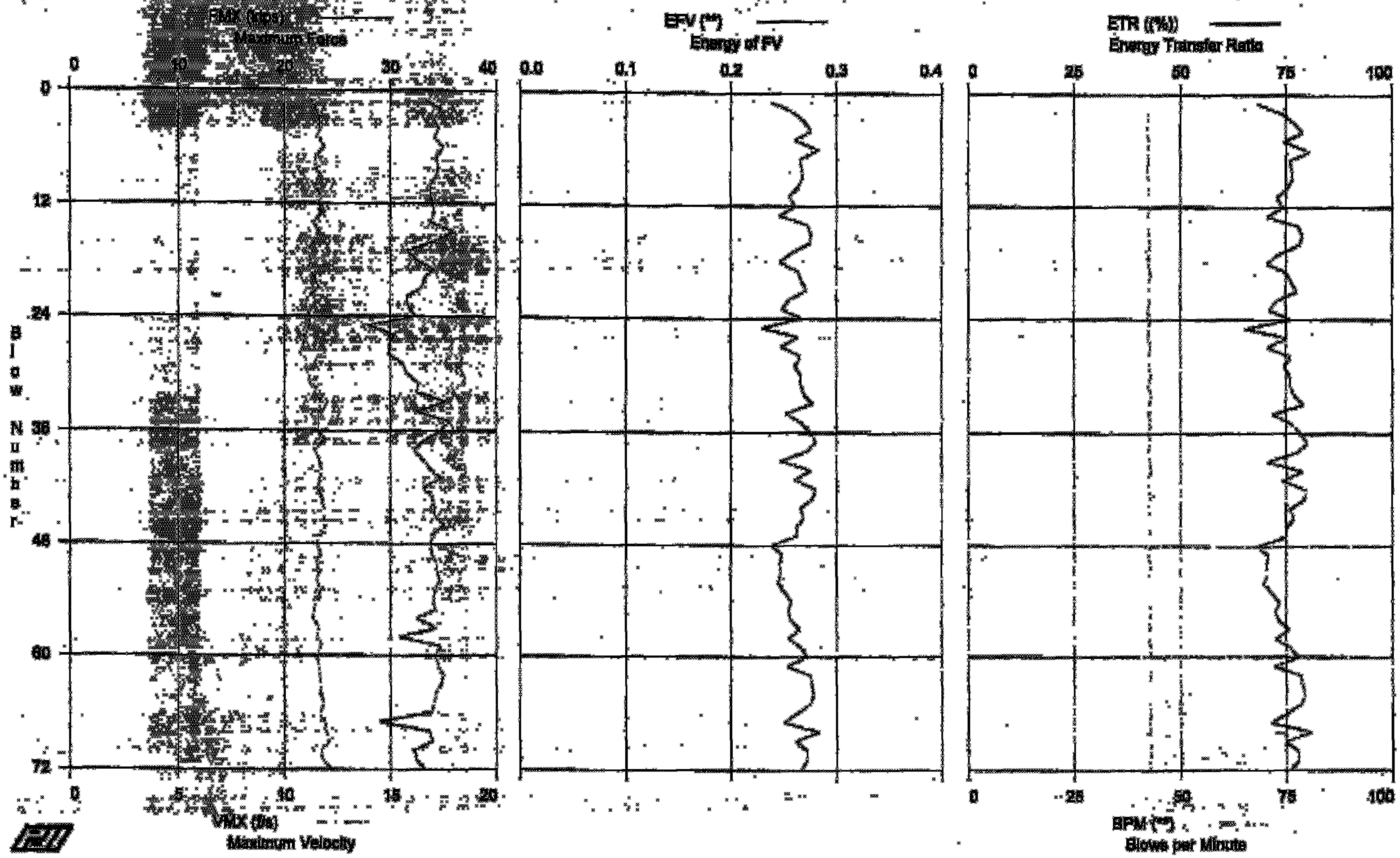
Drive 1 minute 8 seconds 4:44:37 PM - 4:45:45 PM (6/19/2006) BN 1 - 50

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-60

Test date: 20-Jun-2006



SPT, Calvert Cliffs - B401-60
OP: KB

NW rod
Test date: 20-Jun-2006

AR: 2.30 in^2
LE: 64.0 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	33.31	11.23	0.239	68.4	**	0.239	0.153	1.24	0.64
2	0.00	AV1	34.78	11.48	0.259	74.1	42.4	0.259	0.166	1.03	0.60
3	0.00	AV1	34.14	11.65	0.270	77.2	42.6	0.270	0.169	1.20	0.63
4	0.00	AV1	34.55	11.66	0.276	79.0	42.0	0.276	0.174	1.14	0.58
5	0.00	AV1	34.17	11.62	0.261	74.6	42.6	0.261	0.164	0.97	0.60
6	0.00	AV1	34.98	11.86	0.282	80.6	42.4	0.282	0.178	0.76	0.53
7	0.00	AV1	34.37	11.45	0.265	75.8	42.5	0.265	0.166	0.66	0.57
8	0.00	AV1	34.52	11.46	0.267	76.4	42.1	0.267	0.169	0.71	0.60
9	0.00	AV1	34.37	11.67	0.268	76.6	42.6	0.268	0.167	0.82	0.61
10	0.00	AV1	33.79	11.44	0.263	75.1	42.6	0.263	0.165	0.65	0.44
11	0.00	AV1	33.76	11.65	0.255	72.8	42.6	0.255	0.095	0.77	0.61
12	0.00	AV1	33.97	11.60	0.260	74.3	42.7	0.260	0.157	0.91	0.52
13	0.00	AV1	34.09	11.72	0.246	70.4	42.4	0.246	0.145	0.75	0.49
14	0.00	AV1	33.76	11.37	0.272	77.8	42.3	0.272	0.172	0.77	0.73
15	0.00	AV1	35.96	11.61	0.276	78.9	42.6	0.276	0.173	0.91	0.63
16	0.00	AV1	34.17	11.42	0.274	78.1	42.8	0.274	0.172	0.81	0.60
17	0.00	AV1	31.64	11.06	0.256	73.2	42.5	0.256	0.156	0.78	0.71
18	0.00	AV1	32.35	11.22	0.246	70.3	42.3	0.246	0.152	0.47	0.61
19	0.00	AV1	34.02	11.15	0.263	75.0	42.9	0.263	0.164	[illegible]	0.59
20	0.00	AV1	33.21	11.42	0.267	76.3	42.6	0.267	0.163	0.81	0.58
21	0.00	AV1	32.93	11.61	0.272	77.7	42.7	0.272	0.161	0.80	0.60
22	0.00	AV1	31.54	11.10	0.255	72.8	42.7	0.255	0.154	0.65	0.63
23	0.00	AV1	31.69	10.97	0.248	70.9	42.4	0.248	0.143	0.81	0.49
24	0.00	AV1	32.35	11.16	0.267	76.3	42.7	0.267	0.163	0.75	0.61
25	0.00	AV1	27.93	11.21	0.229	65.3	42.6	0.229	0.079	0.67	0.55
26	0.00	AV1	30.33	10.96	0.263	75.1	42.3	0.263	0.158	0.83	0.60
27	0.00	AV1	29.87	10.88	0.247	70.6	42.9	0.247	0.140	0.87	0.53
28	0.00	AV1	29.82	10.73	0.266	76.1	42.6	0.266	0.159	0.59	0.66
29	0.00	AV1	31.14	11.16	0.260	74.4	42.6	0.260	0.149	0.47	0.59
30	0.00	AV1	31.49	11.15	0.266	75.9	43.0	0.266	0.157	0.54	0.55
31	0.00	AV1	32.58	11.22	0.266	76.0	42.4	0.266	0.163	0.55	0.58
32	0.00	AV1	32.55	11.66	0.269	76.9	43.0	0.269	0.167	0.38	0.44
33	0.00	AV1	35.18	11.70	0.277	79.2	42.6	0.277	0.166	0.33	0.57
34	0.00	AV1	32.40	11.61	0.251	71.6	42.5	0.251	0.146	0.37	0.53
35	0.00	AV1	35.48	11.60	0.267	76.2	42.9	0.267	0.161	0.36	0.58
36	0.00	AV1	34.78	11.61	0.275	78.5	42.5	0.275	0.166	0.48	0.57
37	0.00	AV1	33.26	11.89	0.280	80.1	42.9	0.280	0.170	0.44	0.54
38	0.00	AV1	32.20	11.42	0.271	77.5	42.3	0.271	0.164	0.46	0.54
39	0.00	AV1	33.01	11.65	0.247	70.5	42.9	0.247	0.149	0.40	0.59
40	0.00	AV1	33.69	11.73	0.275	78.7	43.0	0.275	0.167	0.42	0.61
41	0.00	AV1	34.78	11.70	0.260	74.1	42.3	0.260	0.159	0.37	0.58
42	0.00	AV1	33.06	11.56	0.280	80.1	42.6	0.280	0.175	0.33	0.55
43	0.00	AV1	33.99	11.75	0.277	79.3	42.9	0.277	0.173	0.40	0.58
44	0.00	AV1	34.12	11.85	0.266	76.0	42.6	0.266	0.164	0.27	0.60
45	0.00	AV1	34.19	11.86	0.269	76.9	42.9	0.269	0.167	0.31	0.62
46	0.00	AV1	35.10	11.93	0.262	75.0	42.9	0.262	0.165	0.24	0.59
47	0.00	AV1	33.97	11.67	0.262	74.9	42.6	0.262	0.167	0.29	0.63
48	0.00	AV1	33.81	11.53	0.238	68.1	42.8	0.238	0.144	[illegible]	0.59
49	0.00	AV1	33.87	11.71	0.248	70.8	42.4	0.248	0.155	[illegible]	0.66
50	0.00	AV1	34.32	11.53	0.246	70.4	43.0	0.246	0.154	0.24	0.60
51	0.00	AV1	34.42	11.63	0.247	70.5	42.7	0.247	0.156	0.23	0.63
52	0.00	AV1	34.65	11.54	0.244	69.7	42.7	0.244	0.152	0.17	0.63
53	0.00	AV1	34.17	11.69	0.250	71.4	42.9	0.250	0.155	0.26	0.62
54	0.00	AV1	34.09	11.56	0.257	73.4	42.8	0.257	0.159	0.33	0.59
55	0.00	AV1	34.17	11.42	0.254	72.5	43.0	0.254	0.155	0.33	0.58
56	0.00	AV1	32.47	11.36	0.256	73.2	42.8	0.256	0.160	0.31	0.60
57	0.00	AV1	34.32	11.62	0.265	75.7	42.7	0.265	0.165	0.29	0.57
58	0.00	AV1	30.83	11.54	0.254	72.5	42.5	0.254	0.147	0.32	0.56
59	0.00	AV1	34.72	11.74	0.266	76.0	43.0	0.266	0.161	0.30	0.63
60	0.00	AV1	34.17	11.56	0.272	77.8	42.8	0.272	0.169	0.34	0.56
61	0.00	AV1	34.57	11.62	0.253	72.2	42.8	0.253	0.154	0.24	0.48

SPT, Calvert Cliffs - B401-60 N3 rod
OP: KB Test date: 20-Jun-2006

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
62	0.00	AV1	35.00	11.66	0.275	78.5	43.0	0.275	0.173	0.17	0.60
63	0.00	AV1	34.85	11.72	0.276	78.9	42.7	0.276	0.172	0.31	0.58
64	0.00	AV1	34.27	11.70	0.278	79.3	42.8	0.278	0.171	0.34	0.56
65	0.00	AV1	34.14	11.86	0.275	78.6	42.7	0.275	0.169	0.39	0.62
66	0.00	AV1	33.81	11.72	0.263	75.1	43.0	0.263	0.159	0.24	0.59
67	0.00	AV1	28.99	11.93	0.250	71.5	42.7	0.250	0.142	0.41	0.47
68	0.00	AV1	33.59	11.97	0.283	80.9	42.9	0.283	0.173	0.38	0.60
69	0.00	AV1	33.99	12.11	0.261	74.7	42.8	0.261	0.151	0.39	0.58
70	0.00	AV1	32.25	11.73	0.272	77.7	43.1	0.272	0.162	0.45	0.51
71	0.00	AV1	32.45	11.80	0.272	77.8	42.7	0.272	0.161	0.43	0.63
72	0.00	AV1	33.18	12.19	0.266	76.0	43.0	0.266	0.154	0.50	0.53
		Average	33.39	11.55	0.263	75.1	42.7	0.263	0.159	0.52	0.58

Total number of blows analyzed: 72

Time Summary

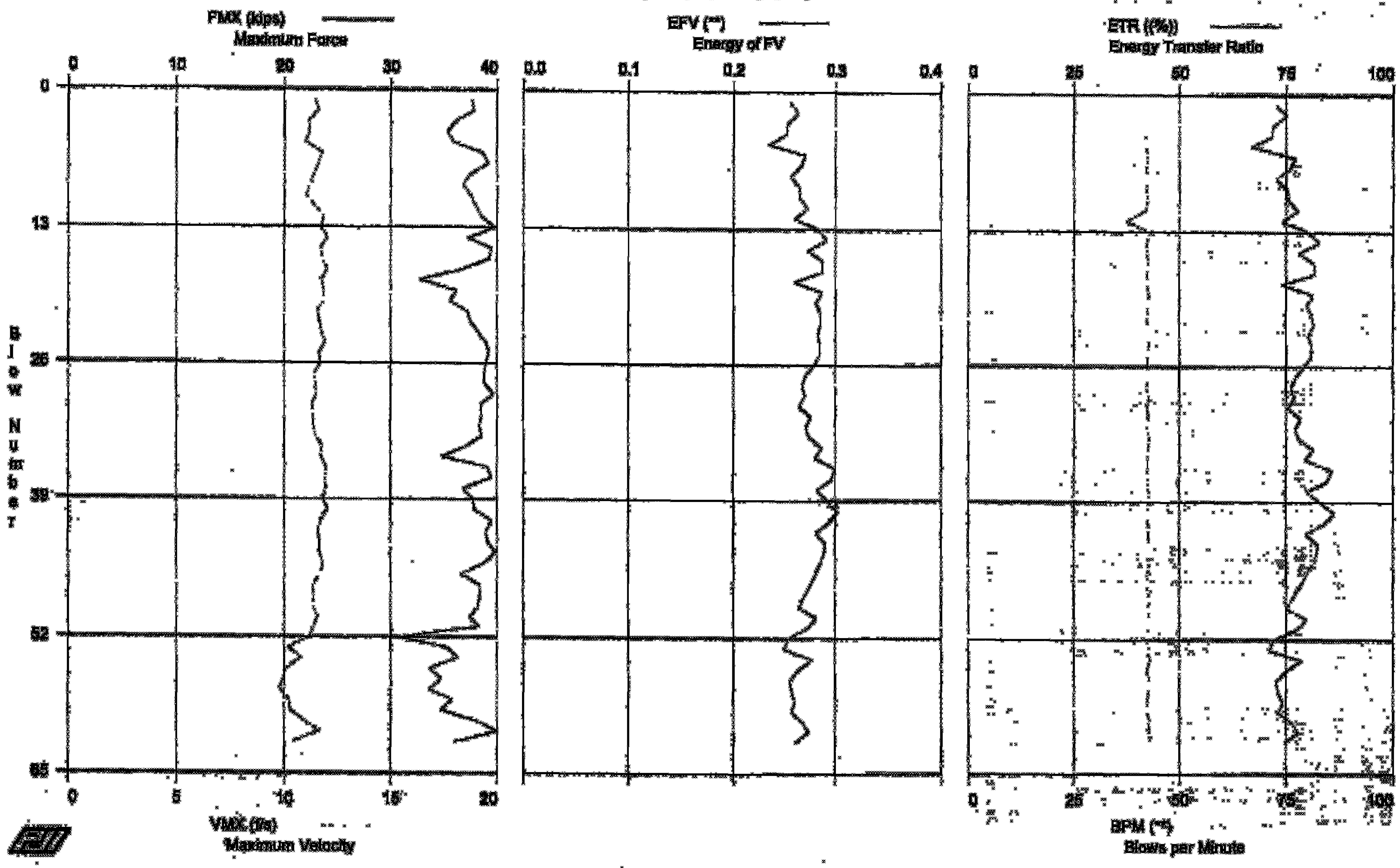
Drive 1 minute 40 seconds 8:39:47 AM - 8:41:27 AM (6/20/2006) BN 1 - 72

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-75

Test date: 20-Jun-2006



SPT; Calvert Cliffs - B401-75 N3 rod
OP: RB Test date: 20-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 79.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	37.60	11.47	0.255	72.8	**	0.255	0.164	1.05	0.66
2	0.00	AV1	37.78	11.59	0.263	75.3	42.2	0.263	0.167	1.08	0.70
3	0.00	AV1	36.11	11.16	0.252	71.9	**	0.252	0.153	0.74	0.61
4	0.00	AV1	35.36	11.19	0.251	71.7	42.0	0.251	0.153	0.93	0.42
5	0.00	AV1	35.91	10.99	0.234	66.9	42.1	0.234	0.145	0.66	0.41
6	0.00	AV1	38.62	11.79	0.270	77.1	42.7	0.270	0.166	1.02	0.63
7	0.00	AV1	39.15	11.60	0.266	75.9	42.3	0.266	0.168	0.67	0.65
8	0.00	AV1	37.40	11.39	0.255	72.8	42.4	0.255	0.159	0.49	0.64
9	0.00	AV1	36.80	11.20	0.264	75.3	42.2	0.264	0.164	0.40	0.63
10	0.00	AV1	37.50	11.01	0.265	75.6	42.5	0.265	0.161	0.35	0.61
11	0.00	AV1	38.01	11.42	0.272	77.7	42.3	0.272	0.169	0.47	0.66
12	0.00	AV1	38.51	11.85	0.260	74.2	37.4	0.260	0.153	0.38	0.61
13	0.00	AV1	39.68	11.71	0.282	80.5	42.8	0.282	0.170	0.47	0.61
14	0.00	AV1	37.25	12.02	0.290	82.8	42.3	0.290	0.164	0.48	0.61
15	0.00	AV1	39.45	11.70	0.272	77.8	42.3	0.272	0.160	0.44	0.49
16	0.00	AV1	39.22	11.78	0.286	81.7	42.7	0.286	0.163	0.55	0.60
17	0.00	AV1	36.44	12.02	0.286	81.8	42.5	0.286	0.158	0.46	0.64
18	0.00	AV1	32.73	11.74	0.259	74.0	42.3	0.259	0.132	0.51	0.37
19	0.00	AV1	36.19	11.85	0.285	81.3	42.7	0.285	0.163	0.47	0.66
20	0.00	AV1	35.53	11.82	0.279	79.8	42.6	0.279	0.159	0.44	0.68
21	0.00	AV1	37.20	11.56	0.284	81.1	42.3	0.284	0.158	0.54	0.80
22	0.00	AV1	37.48	11.67	0.284	81.3	42.6	0.284	0.157	0.47	0.56
23	0.00	AV1	38.19	11.74	0.281	80.3	42.6	0.281	0.164	0.51	0.61
24	0.00	AV1	38.92	11.91	0.283	80.9	42.7	0.283	0.164	0.60	0.66
25	0.00	AV1	39.20	11.62	0.283	80.9	42.4	0.283	0.164	0.58	0.62
26	0.00	AV1	38.92	11.68	0.277	79.1	42.5	0.277	0.166	0.59	0.68
27	0.00	AV1	38.82	11.43	0.270	77.2	42.7	0.270	0.161	0.44	0.62
28	0.00	AV1	38.82	11.45	0.267	76.2	42.3	0.267	0.163	0.46	0.66
29	0.00	AV1	39.63	11.50	0.269	76.9	42.7	0.269	0.163	0.53	0.60
30	0.00	AV1	38.44	11.30	0.264	75.4	42.3	0.264	0.162	0.41	0.62
31	0.00	AV1	38.51	11.36	0.274	78.4	42.7	0.274	0.162	0.49	0.59
32	0.00	AV1	38.34	11.37	0.270	77.1	42.5	0.270	0.163	0.40	0.68
33	0.00	AV1	38.56	11.45	0.273	78.0	42.9	0.273	0.167	0.46	0.70
34	0.00	AV1	37.05	11.77	0.285	81.4	42.6	0.285	0.160	0.43	0.69
35	0.00	AV1	34.83	11.71	0.278	79.3	42.5	0.278	0.154	0.41	0.61
36	0.00	AV1	39.05	11.95	0.299	85.6	42.5	0.299	0.164	0.65	0.64
37	0.00	AV1	39.47	11.91	0.296	84.7	42.7	0.296	0.167	0.61	0.67
38	0.00	AV1	36.80	11.94	0.280	80.0	42.6	0.280	0.159	0.52	0.69
39	0.00	AV1	37.71	11.82	0.291	83.0	42.6	0.291	0.160	0.53	0.65
40	0.00	AV1	37.86	12.02	0.302	86.3	42.6	0.302	0.161	0.56	0.64
41	0.00	AV1	39.45	11.69	0.293	83.8	42.4	0.293	0.163	0.53	0.63
42	0.00	AV1	38.92	11.58	0.279	79.7	42.8	0.279	0.167	0.46	0.65
43	0.00	AV1	39.15	11.66	0.289	82.6	42.6	0.289	0.170	0.46	0.71
44	0.00	AV1	39.83	11.65	0.287	82.1	42.6	0.287	0.166	0.41	0.49
45	0.00	AV1	38.74	11.82	0.283	80.8	42.9	0.283	0.166	0.44	0.71
46	0.00	AV1	36.59	11.70	0.278	79.5	42.3	0.278	0.163	0.44	0.64
47	0.00	AV1	38.36	11.33	0.273	77.9	42.5	0.273	0.165	0.40	0.62
48	0.00	AV1	38.39	11.39	0.268	76.6	42.8	0.268	0.162	0.41	0.64
49	0.00	AV1	38.16	11.33	0.263	75.1	42.6	0.263	0.162	0.52	0.66
50	0.00	AV1	37.40	11.56	0.279	79.8	42.8	0.279	0.167	0.66	0.67
51	0.00	AV1	38.31	11.38	0.271	77.4	42.6	0.271	0.162	0.61	0.69
52	0.00	AV1	30.66	11.15	0.253	72.4	42.6	0.253	0.144	0.65	0.63
53	0.00	AV1	35.36	10.20	0.249	71.0	42.5	0.249	0.159	0.40	0.62
54	0.00	AV1	36.29	10.77	0.275	78.4	43.0	0.275	0.156	0.68	0.62
55	0.00	AV1	33.66	10.08	0.263	75.1	42.4	0.263	0.150	0.69	0.83
56	0.00	AV1	34.70	9.92	0.254	72.6	42.9	0.254	0.150	0.38	0.64
57	0.00	AV1	33.59	9.78	0.256	73.2	42.7	0.256	0.151	0.44	0.60
58	0.00	AV1	35.79	10.21	0.260	74.3	42.5	0.260	0.154	0.55	0.65
59	0.00	AV1	34.75	10.30	0.256	73.2	42.4	0.256	0.150	0.49	0.70
60	0.00	AV1	37.98	10.90	0.267	76.3	42.7	0.267	0.161	0.65	0.66
61	0.00	AV1	40.01	11.64	0.272	77.7	42.8	0.272	0.168	0.72	0.69

SPT, Calvert Cliffs - B401-75   NW rod
OP: KB   Test date: 20-Jun-2006

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
62	0.00	AV1	36.01	10.40	0.260	74.4	43.2	0.260	0.150	0.56	0.65
		Average	37.44	11.40	0.272	77.8	42.5	0.272	0.160	0.55	0.63

Total number of blows analyzed: 62

Time Summary

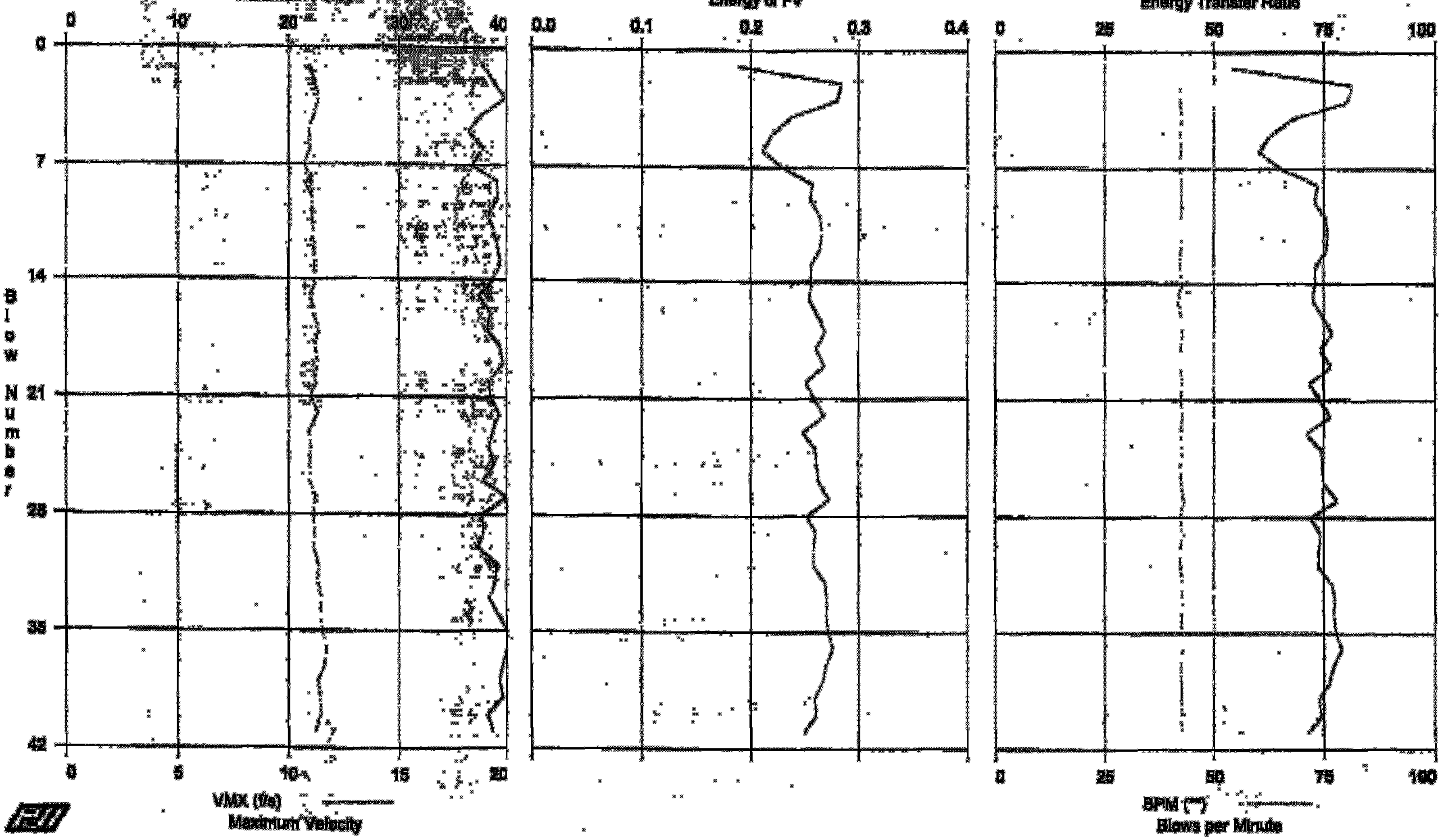
Drive   1 minute 41 seconds   9:39:22 AM - 9:41:03 AM (6/20/2006) BN 1 - 62

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-50

Test date: 20-Jun-2006



GRL Engineers, Inc.
Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-90 N3 rod
OP: KB Test date: 20-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 94.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	37.68	10.92	0.189	53.9	**	0.189	0.075	1.15	0.48
2	0.00	AV1	38.69	11.19	0.284	81.2	42.3	0.284	0.169	1.62	0.60
3	0.00	AV1	39.83	11.37	0.280	80.1	42.2	0.280	0.164	1.34	0.59
4	0.00	AV1	37.68	11.15	0.238	68.1	42.6	0.238	0.149	0.60	0.65
5	0.00	AV1	36.44	10.93	0.220	62.8	42.2	0.220	0.137	0.63	0.67
6	0.00	AV1	37.81	10.98	0.211	60.4	42.6	0.211	0.135	0.62	0.64
7	0.00	AV1	36.80	10.73	0.229	65.4	42.1	0.229	0.145	0.64	0.65
8	0.00	AV1	39.02	10.98	0.257	73.6	42.6	0.257	0.164	0.88	0.59
9	0.00	AV1	39.12	11.07	0.255	72.9	42.6	0.255	0.164	0.63	0.60
10	0.00	AV1	38.19	11.07	0.264	75.4	42.5	0.264	0.165	0.55	0.64
11	0.00	AV1	38.74	11.10	0.266	75.9	42.6	0.266	0.169	0.69	0.87
12	0.00	AV1	39.12	11.12	0.264	75.5	42.5	0.264	0.168	0.76	0.61
13	0.00	AV1	39.40	11.18	0.256	73.1	42.2	0.256	0.158	0.80	0.57
14	0.00	AV1	38.64	11.20	0.256	73.0	42.7	0.256	0.163	0.64	0.64
15	0.00	AV1	37.40	11.00	0.254	72.5	41.7	0.254	0.160	0.66	0.84
16	0.00	AV1	38.41	11.12	0.262	74.7	42.6	0.262	0.167	0.60	0.63
17	0.00	AV1	38.11	11.34	0.269	76.9	42.7	0.269	0.170	0.73	0.67
18	0.00	AV1	39.32	11.20	0.260	74.1	42.4	0.260	0.160	0.73	0.60
19	0.00	AV1	39.80	11.31	0.268	76.7	42.3	0.268	0.173	0.66	0.62
20	0.00	AV1	38.36	11.21	0.251	71.8	42.7	0.251	0.156	0.62	0.59
21	0.00	AV1	38.41	11.02	0.259	74.1	42.3	0.259	0.165	0.58	0.61
22	0.00	AV1	39.20	11.30	0.268	76.5	42.7	0.268	0.170	0.69	0.67
23	0.00	AV1	38.62	10.93	0.248	70.9	42.4	0.248	0.159	0.54	0.69
24	0.00	AV1	38.29	11.01	0.260	74.4	42.8	0.260	0.167	0.56	0.67
25	0.00	AV1	38.74	10.97	0.261	74.7	42.3	0.261	0.167	0.50	0.56
26	0.00	AV1	37.81	10.96	0.263	75.0	42.5	0.263	0.169	0.57	0.85
27	0.00	AV1	39.96	11.24	0.273	78.0	43.0	0.273	0.175	0.57	0.57
28	0.00	AV1	37.66	11.10	0.252	72.0	42.3	0.252	0.159	0.53	0.84
29	0.00	AV1	37.86	11.18	0.260	74.3	42.5	0.260	0.166	0.58	0.65
30	0.00	AV1	37.35	11.13	0.258	73.8	42.3	0.258	0.164	0.52	0.51
31	0.00	AV1	39.02	11.35	0.258	73.8	42.3	0.258	0.165	0.55	0.61
32	0.00	AV1	38.94	11.33	0.269	76.9	42.8	0.269	0.170	0.61	0.65
33	0.00	AV1	38.36	11.49	0.271	77.5	42.7	0.271	0.174	0.58	0.71
34	0.00	AV1	39.15	11.44	0.270	77.2	42.5	0.270	0.175	0.51	0.60
35	0.00	AV1	40.26	11.51	0.272	77.7	42.6	0.272	0.177	0.50	0.60
36	0.00	AV1	40.16	11.70	0.276	79.0	42.7	0.276	0.181	0.53	0.63
37	0.00	AV1	39.65	11.65	0.270	77.2	42.4	0.270	0.170	0.79	0.69
38	0.00	AV1	39.27	11.34	0.267	76.3	42.5	0.267	0.171	0.58	0.55
39	0.00	AV1	39.63	11.44	0.259	73.9	42.5	0.259	0.160	0.77	0.65
40	0.00	AV1	38.26	11.46	0.261	74.5	42.6	0.261	0.165	0.67	0.67
41	0.00	AV1	38.64	11.22	0.250	71.4	42.6	0.250	0.158	0.50	0.66
		Average	38.62	11.19	0.258	73.6	42.5	0.258	0.162	0.66	0.64

Total number of blows analyzed: 41

Time Summary

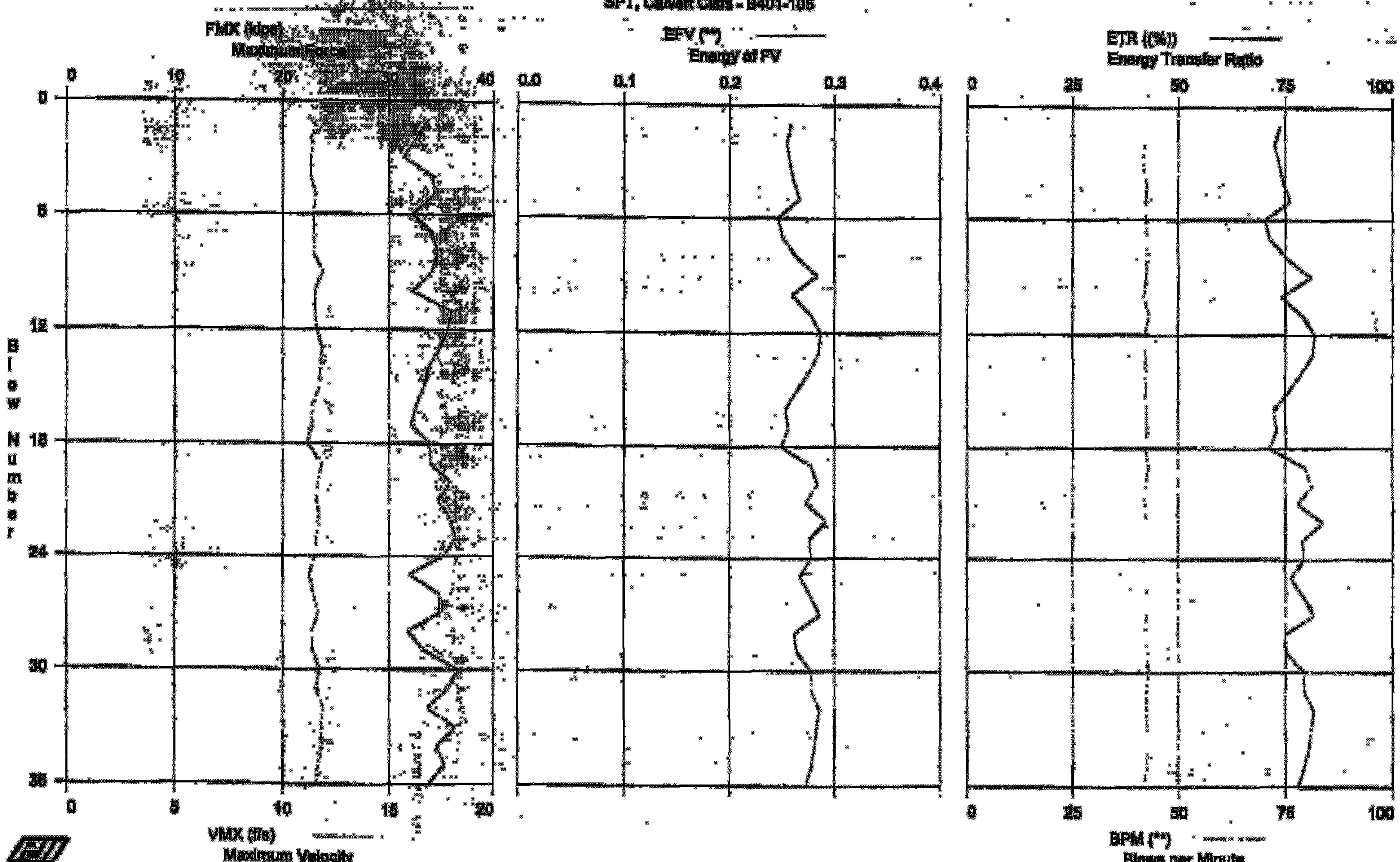
Drive 56 seconds 10:19:22 AM - 10:20:18 AM (6/20/2006) BN 1 - 41

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2008

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-105

Test date: 20-Jun-2008



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-105
N3 rod
OP: KB
Test date: 20-Jun-2006

AR: 2.30 in^2
SP: 0.492 k/ft3
LE: 109.0 ft
EM: 30,000 ksi
WS: 16,807.9 f/s
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	33.74	11.55	0.258	73.8	**	0.258	0.150	0.96	0.56
2	0.00	AV1	32.55	11.44	0.254	72.5	42.0	0.254	0.152	1.14	0.70
3	0.00	AV1	31.35	11.31	0.257	73.4	41.7	0.257	0.153	1.02	0.68
4	0.00	AV1	34.22	11.34	0.261	74.5	42.6	0.261	0.160	1.03	0.56
5	0.00	AV1	34.28	11.55	0.267	76.2	42.4	0.267	0.162	1.21	0.54
6	0.00	AV1	32.22	11.47	0.246	70.2	42.2	0.246	0.141	1.01	0.66
7	0.00	AV1	34.17	11.47	0.250	71.3	42.6	0.250	0.152	1.06	0.71
8	0.00	AV1	34.65	11.42	0.263	75.3	42.6	0.263	0.164	0.91	0.74
9	0.00	AV1	34.07	11.89	0.284	81.0	42.6	0.284	0.168	1.07	0.66
10	0.00	AV1	32.20	11.50	0.259	74.1	41.9	0.259	0.152	0.95	0.70
11	0.00	AV1	35.99	11.52	0.277	79.1	43.1	0.277	0.179	0.95	0.74
12	0.00	AV1	35.60	11.61	0.287	81.9	42.1	0.287	0.181	0.90	0.74
13	0.00	AV1	34.79	11.87	0.285	81.4	42.2	0.285	0.166	0.92	0.58
14	0.00	AV1	33.71	11.75	0.276	78.8	42.3	0.276	0.160	1.05	0.65
15	0.00	AV1	33.26	11.72	0.264	75.6	42.2	0.264	0.152	0.87	0.66
16	0.00	AV1	32.60	11.39	0.253	72.2	42.4	0.253	0.148	0.68	0.53
17	0.00	AV1	32.11	11.38	0.256	73.0	42.5	0.256	0.151	0.79	0.70
18	0.00	AV1	33.93	11.16	0.249	71.2	42.3	0.249	0.150	0.78	0.58
19	0.00	AV1	33.94	11.82	0.278	79.6	43.0	0.278	0.171	0.73	0.70
20	0.00	AV1	35.79	11.68	0.284	81.1	42.3	0.284	0.179	0.85	0.56
21	0.00	AV1	34.72	11.60	0.273	77.9	42.0	0.273	0.169	0.63	0.71
22	0.00	AV1	35.89	11.70	0.292	83.6	42.4	0.292	0.179	0.64	0.70
23	0.00	AV1	36.34	11.56	0.276	79.0	42.4	0.276	0.176	0.60	0.56
24	0.00	AV1	35.15	11.52	0.278	79.3	42.4	0.278	0.173	0.60	0.75
25	0.00	AV1	31.93	11.26	0.267	76.2	42.3	0.267	0.158	0.58	0.70
26	0.00	AV1	34.76	11.44	0.277	79.2	42.6	0.277	0.166	0.45	0.55
27	0.00	AV1	34.83	11.68	0.286	81.7	42.5	0.286	0.174	0.66	0.74
28	0.00	AV1	31.79	11.39	0.262	74.9	42.2	0.262	0.155	0.68	0.70
29	0.00	AV1	33.40	11.42	0.264	75.4	42.6	0.264	0.156	0.19	0.65
30	0.00	AV1	36.59	11.72	0.278	79.4	42.8	0.278	0.179	0.12	0.73
31	0.00	AV1	35.61	11.57	0.278	79.4	42.5	0.278	0.174	0.50	0.55
32	0.00	AV1	33.70	11.89	0.286	81.6	42.5	0.286	0.171	0.38	0.70
33	0.00	AV1	36.24	11.78	0.283	80.9	42.5	0.283	0.175	0.68	0.58
34	0.00	AV1	34.57	11.81	0.281	80.4	42.6	0.281	0.168	0.72	0.54
35	0.00	AV1	35.28	11.67	0.278	79.4	42.5	0.278	0.172	0.46	0.34
36	0.00	AV1	33.76	11.57	0.273	78.0	42.1	0.273	0.165	0.55	0.68
		Average	34.16	11.57	0.271	77.3	42.4	0.271	0.164	0.76	0.65

Total number of blows analyzed: 36

Time Summary

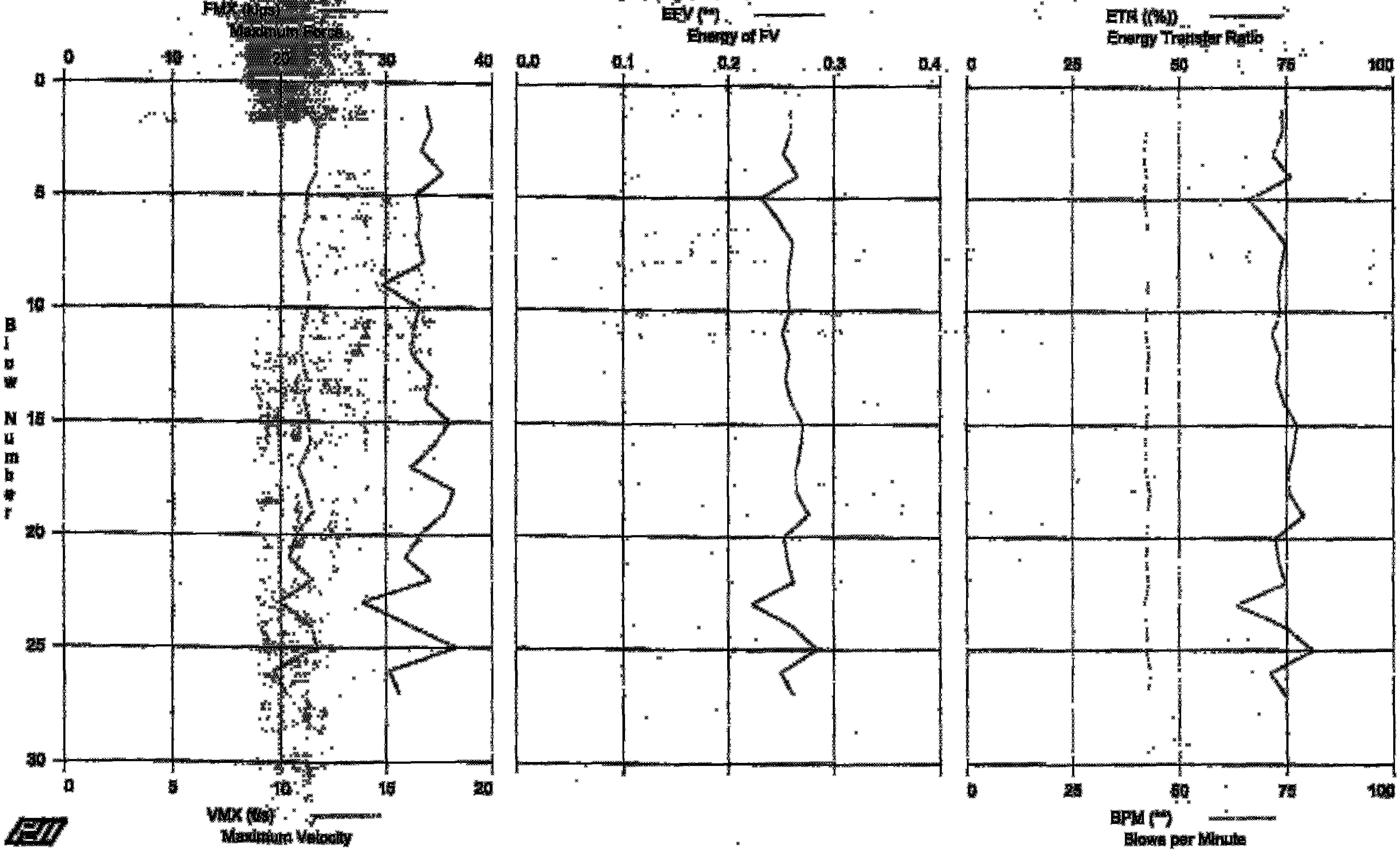
Drive 50 seconds 11:56:02 AM - 11:56:52 AM (6/20/2006) BN 1 - 36

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-120

Test date: 20-Jun-2006



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-120 N3 rod
OP: KB Test date: 20-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 124.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	33.81	11.48	0.259	73.9	**	0.259	0.168	1.13	0.73
2	0.00	AV1	34.29	11.73	0.259	74.0	42.5	0.259	0.157	0.96	0.73
3	0.00	AV1	33.35	11.64	0.252	71.9	41.8	0.252	0.138	1.17	0.71
4	0.00	AV1	35.38	11.65	0.266	76.0	42.4	0.266	0.171	1.09	0.60
5	0.00	AV1	32.80	11.17	0.231	66.0	41.9	0.231	0.143	0.81	0.68
6	0.00	AV1	33.16	11.23	0.248	71.0	42.8	0.248	0.154	0.80	0.72
7	0.00	AV1	33.06	10.81	0.261	74.7	42.6	0.261	0.165	0.95	0.76
8	0.00	AV1	33.50	11.02	0.258	73.8	42.6	0.258	0.166	0.90	0.56
9	0.00	AV1	29.62	11.35	0.256	73.1	42.7	0.256	0.153	0.96	0.55
10	0.00	AV1	33.18	11.27	0.258	73.6	42.4	0.258	0.157	0.85	0.59
11	0.00	AV1	32.55	10.98	0.251	71.8	42.3	0.251	0.159	1.06	0.74
12	0.00	AV1	32.40	10.97	0.258	73.6	43.0	0.258	0.159	0.82	0.55
13	0.00	AV1	34.22	11.18	0.254	72.7	42.5	0.254	0.162	0.90	0.59
14	0.00	AV1	33.76	11.11	0.260	74.4	42.6	0.260	0.167	0.93	0.56
15	0.00	AV1	35.96	11.35	0.271	77.5	42.5	0.271	0.175	0.80	0.60
16	0.00	AV1	34.57	11.38	0.269	76.8	42.2	0.269	0.174	0.84	0.59
17	0.00	AV1	32.35	10.83	0.264	75.4	42.3	0.264	0.165	0.99	0.59
18	0.00	AV1	36.39	11.20	0.265	75.7	43.2	0.265	0.169	1.00	0.62
19	0.00	AV1	35.61	11.50	0.276	79.0	42.5	0.276	0.183	1.01	0.58
20	0.00	AV1	33.21	10.72	0.253	72.4	42.6	0.253	0.160	0.89	0.60
21	0.00	AV1	31.84	10.38	0.256	73.1	42.4	0.256	0.162	0.89	0.63
22	0.00	AV1	34.26	11.50	0.262	74.8	42.9	0.262	0.165	1.15	0.56
23	0.00	AV1	27.75	9.90	0.222	63.4	42.0	0.222	0.123	0.76	0.69
24	0.00	AV1	32.18	11.39	0.262	74.9	42.5	0.262	0.156	0.94	0.52
25	0.00	AV1	36.62	11.70	0.284	81.2	42.3	0.284	0.187	0.86	0.65
26	0.00	AV1	30.28	9.70	0.249	71.1	43.9	0.249	0.155	0.81	0.59
27	0.00	AV1	31.24	10.24	0.262	74.8	42.7	0.262	0.167	0.79	0.57
		Average	33.23	11.09	0.258	73.7	42.5	0.258	0.161	0.93	0.62

Total number of blows analyzed: 27

Time Summary

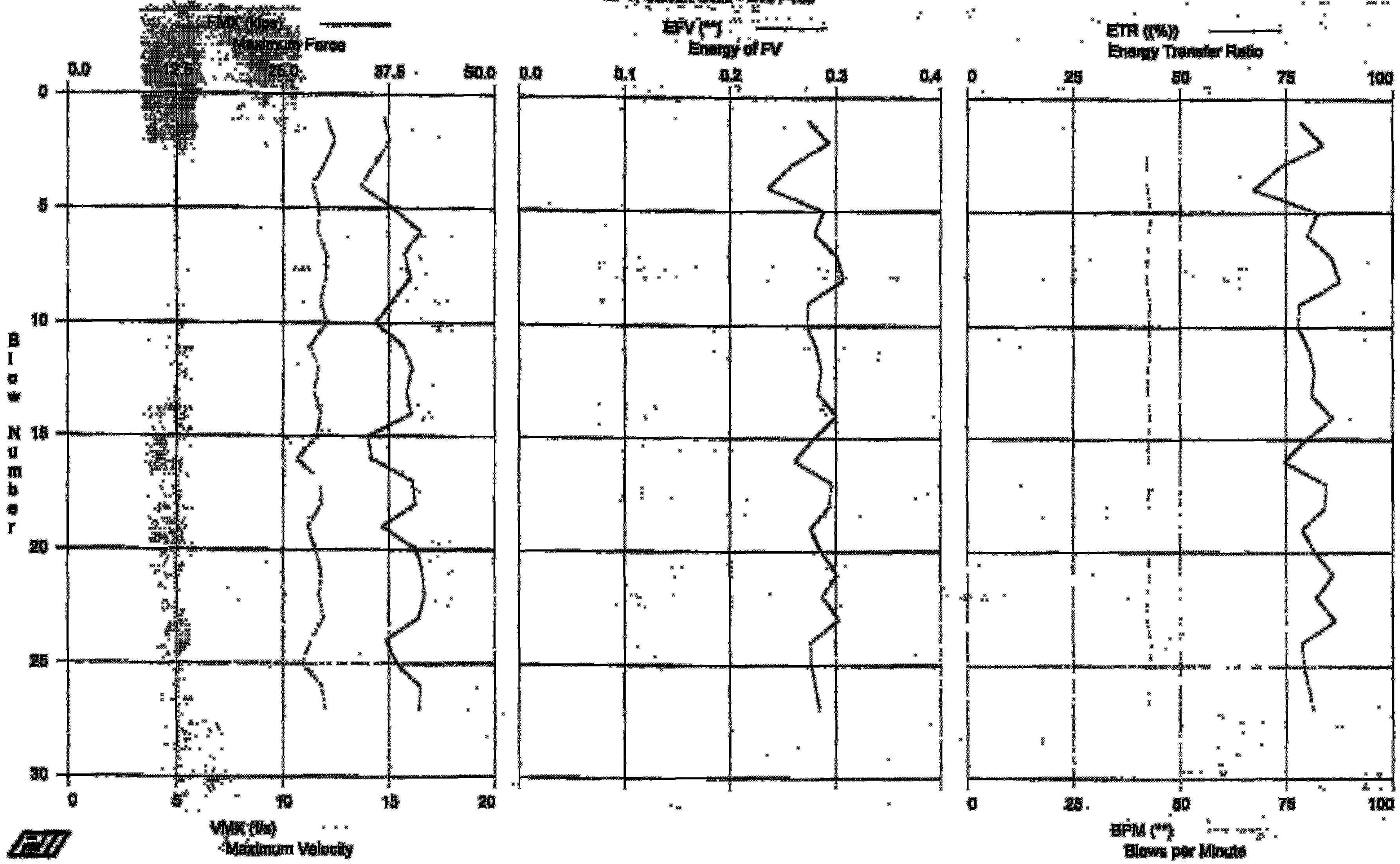
Drive 37 seconds 1:20:37 PM - 1:21:14 PM (6/20/2006) BN 1 - 27

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 20-Jun-2006

SPT, Calvert Cliffs - B401-135



GRL Engineers, Inc.
Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-135 N3 rod
OP: KB Test date: 20-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 139.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	36.95	12.07	0.274	78.4	**	0.274	0.171	1.47	0.67
2	0.00	AV1	37.60	12.47	0.293	83.8	42.4	0.293	0.181	1.44	0.62
3	0.00	AV1	35.91	12.01	0.257	73.5	42.2	0.257	0.160	1.11	0.58
4	0.00	AV1	34.19	11.40	0.236	67.4	42.5	0.236	0.144	1.00	0.63
5	0.00	AV1	37.98	11.70	0.288	82.3	43.2	0.288	0.178	1.10	0.73
6	0.00	AV1	41.17	11.63	0.280	80.0	42.6	0.280	0.184	1.06	0.66
7	0.00	AV1	39.35	12.02	0.301	85.9	42.5	0.301	0.186	1.25	0.59
8	0.00	AV1	40.03	12.04	0.307	87.7	42.2	0.307	0.192	1.15	0.74
9	0.00	AV1	38.01	11.76	0.274	78.2	42.9	0.274	0.176	1.04	0.59
10	0.00	AV1	35.86	12.04	0.273	77.9	42.7	0.273	0.168	1.18	0.62
11	0.00	AV1	39.22	11.31	0.282	80.5	43.0	0.282	0.183	1.09	0.61
12	0.00	AV1	40.18	11.66	0.286	81.6	42.3	0.286	0.185	0.91	0.71
13	0.00	AV1	39.63	11.47	0.283	80.9	42.6	0.283	0.186	0.97	0.62
14	0.00	AV1	40.13	11.79	0.301	86.0	42.9	0.301	0.189	1.08	0.71
15	0.00	AV1	35.08	11.61	0.279	79.7	42.6	0.279	0.173	0.92	0.69
16	0.00	AV1	35.48	10.67	0.261	74.6	42.5	0.261	0.168	0.90	0.75
17	0.00	AV1	40.33	11.77	0.296	84.5	42.8	0.296	0.191	1.09	0.74
18	0.00	AV1	40.59	11.80	0.294	84.1	42.5	0.294	0.188	0.97	0.69
19	0.00	AV1	36.59	11.15	0.276	78.9	42.6	0.276	0.177	0.96	0.58
20	0.00	AV1	40.79	11.53	0.286	81.9	42.7	0.286	0.189	0.95	0.64
21	0.00	AV1	41.37	11.80	0.301	86.0	42.8	0.301	0.191	0.98	0.66
22	0.00	AV1	41.65	11.68	0.287	81.9	42.3	0.287	0.189	0.86	0.67
23	0.00	AV1	40.94	11.90	0.303	86.6	42.2	0.303	0.194	0.91	0.61
24	0.00	AV1	37.07	11.32	0.276	78.8	43.2	0.276	0.177	0.70	0.59
25	0.00	AV1	38.41	10.92	0.277	79.2	42.8	0.277	0.181	0.79	0.69
26	0.00	AV1	41.17	11.83	0.281	80.4	42.6	0.281	0.186	0.84	0.70
27	0.00	AV1	41.02	11.99	0.285	81.5	42.9	0.285	0.187	0.77	0.66
		Average	38.77	11.68	0.283	80.8	42.6	0.283	0.181	1.02	0.65

Total number of blows analyzed: 27

Time Summary

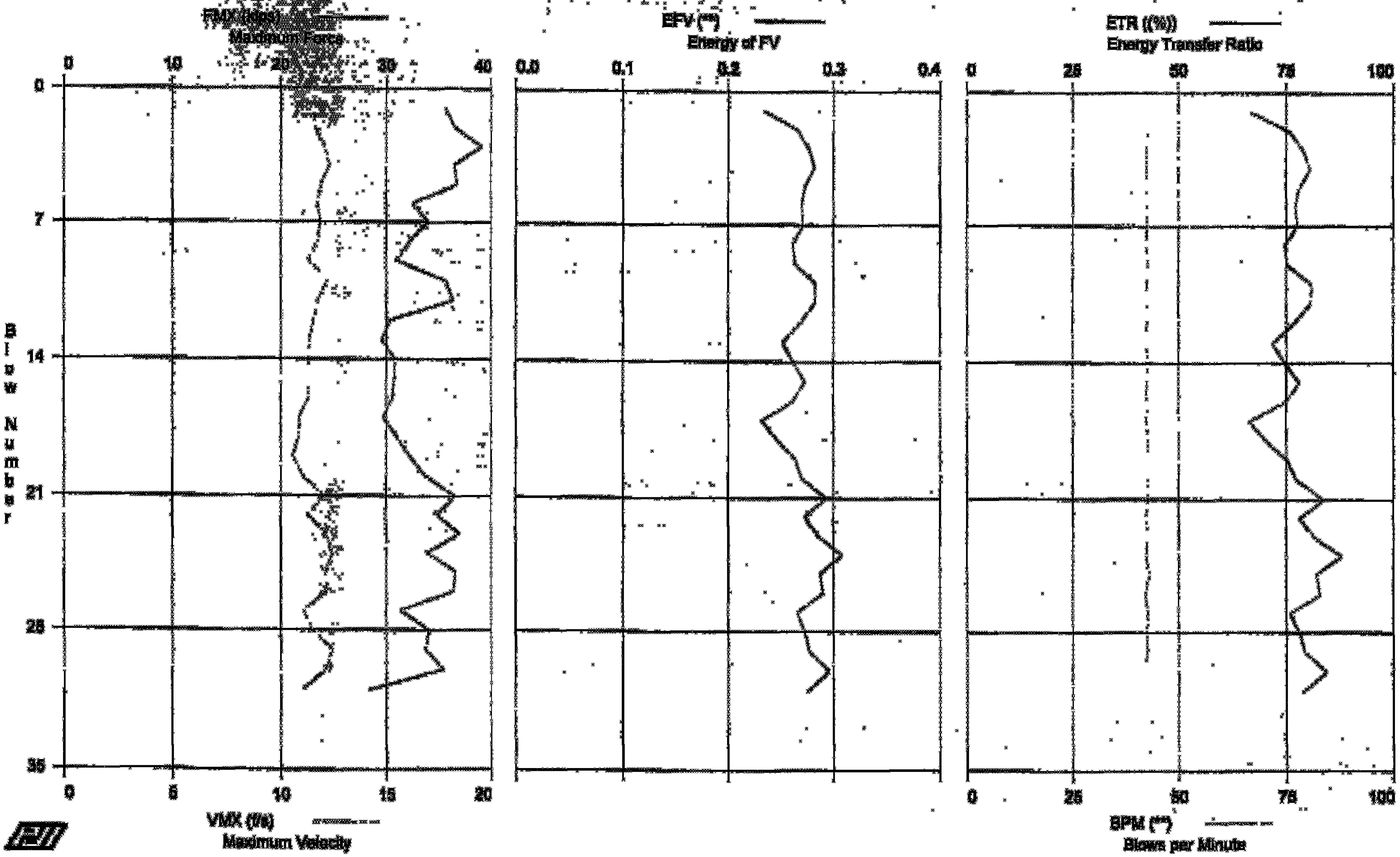
Drive 37 seconds 3:05:57 PM - 3:06:34 PM (6/20/2006) BN 1 - 27

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-150

Test date: 20-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-150
NW Rod
OP: KB
Test date: 20-Jun-2006

AR: 2.30 in^2
LE: 154.0 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	35.58	11.55	0.234	66.9	**	0.234	0.150	0.94	0.61
2	0.00	AV1	36.54	11.50	0.266	75.9	42.7	0.266	0.165	1.08	0.60
3	0.00	AV1	39.05	12.01	0.277	79.0	42.4	0.277	0.178	1.11	0.64
4	0.00	AV1	36.49	12.25	0.282	80.5	42.5	0.282	0.173	0.94	0.55
5	0.00	AV1	36.77	11.88	0.273	77.9	42.3	0.273	0.165	0.87	0.60
6	0.00	AV1	32.54	11.68	0.270	77.0	42.3	0.270	0.157	1.04	0.55
7	0.00	AV1	33.93	11.82	0.271	77.5	42.6	0.271	0.165	0.93	0.63
8	0.00	AV1	32.16	11.69	0.261	74.6	42.4	0.261	0.154	0.82	0.56
9	0.00	AV1	30.95	11.27	0.263	75.2	42.7	0.263	0.152	0.90	0.59
10	0.00	AV1	35.66	12.15	0.283	80.9	42.5	0.283	0.173	1.00	0.63
11	0.00	AV1	36.34	11.73	0.282	80.4	42.7	0.282	0.180	0.91	0.58
12	0.00	AV1	30.38	11.49	0.268	76.5	42.4	0.268	0.156	0.79	0.54
13	0.00	AV1	29.56	11.35	0.251	71.8	42.3	0.251	0.149	0.74	0.50
14	0.00	AV1	30.81	11.27	0.261	74.6	42.5	0.261	0.156	0.66	0.53
15	0.00	AV1	30.76	11.31	0.273	78.0	42.4	0.273	0.156	0.75	0.58
16	0.00	AV1	30.58	11.28	0.261	74.6	42.4	0.261	0.154	0.68	0.52
17	0.00	AV1	29.66	10.84	0.232	66.3	42.3	0.232	0.135	0.71	0.59
18	0.00	AV1	31.00	10.82	0.246	70.3	42.7	0.246	0.147	0.66	0.56
19	0.00	AV1	32.20	10.55	0.263	75.2	42.6	0.263	0.157	0.88	0.64
20	0.00	AV1	33.72	11.01	0.270	77.3	42.6	0.270	0.163	0.91	0.58
21	0.00	AV1	36.51	11.99	0.293	83.7	42.7	0.293	0.177	0.92	0.58
22	0.00	AV1	34.85	11.25	0.273	78.0	42.3	0.273	0.170	0.94	0.60
23	0.00	AV1	36.94	12.10	0.285	81.5	42.6	0.285	0.180	0.99	0.57
24	0.00	AV1	33.83	12.41	0.308	87.9	42.3	0.308	0.169	1.15	0.58
25	0.00	AV1	36.60	12.08	0.287	81.9	43.0	0.287	0.178	0.97	0.62
26	0.00	AV1	36.39	12.15	0.290	82.8	42.2	0.290	0.181	0.85	0.60
27	0.00	AV1	31.34	11.09	0.266	75.9	42.7	0.266	0.159	0.88	0.61
28	0.00	AV1	34.06	11.43	0.273	77.9	42.5	0.273	0.167	0.74	0.57
29	0.00	AV1	33.74	12.42	0.277	79.2	42.5	0.277	0.163	0.95	0.55
30	0.00	AV1	35.42	12.07	0.296	84.4	42.4	0.296	0.179	0.84	0.58
31	0.00	AV1	28.32	11.04	0.275	78.6	42.3	0.275	0.152	0.81	0.52
		Average	33.63	11.60	0.271	77.5	42.5	0.271	0.163	0.88	0.58

Total number of blows analyzed: 31

Time Summary

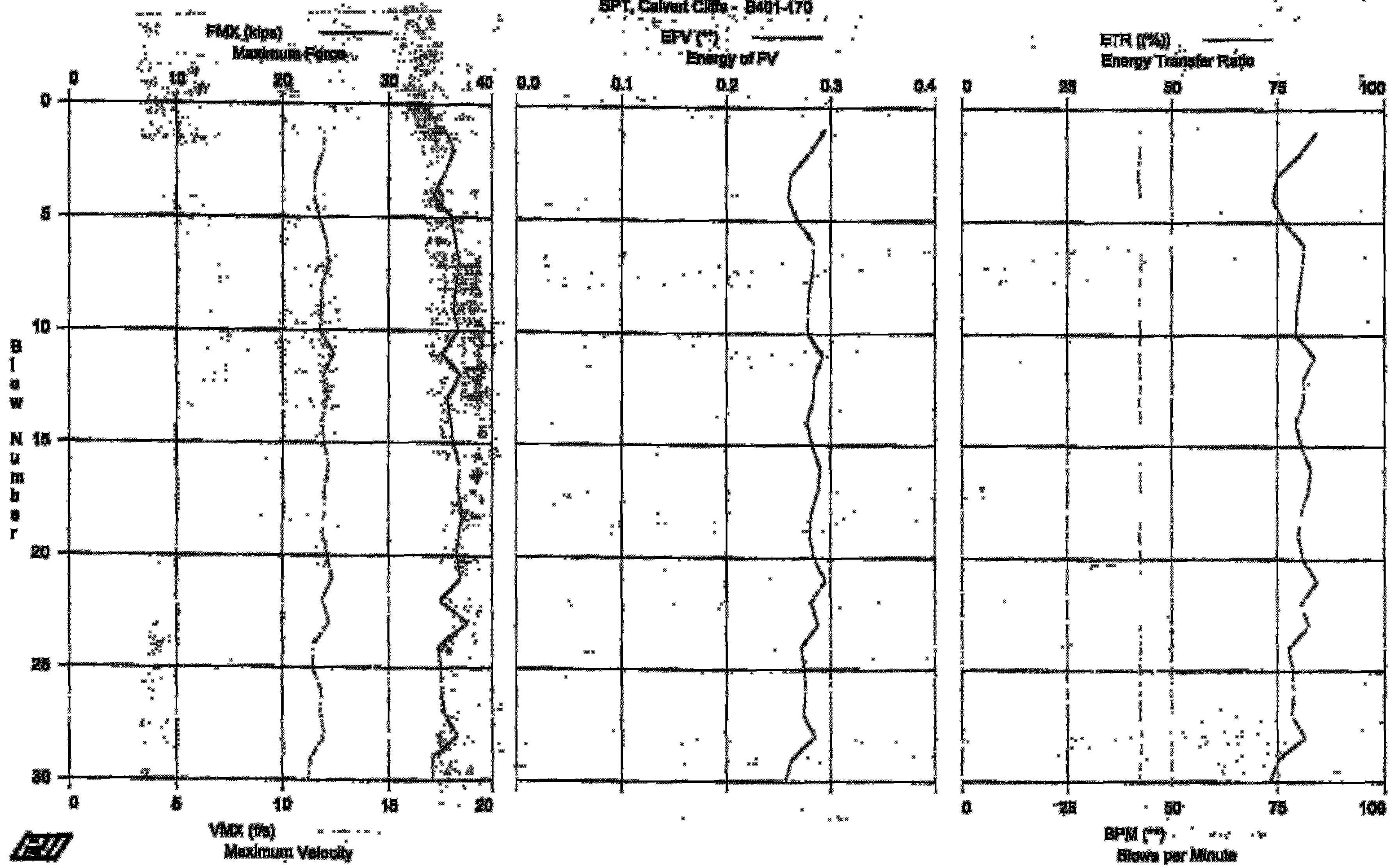
Drive 42 seconds 4:37:18 PM - 4:38:00 PM (6/20/2006) BN 1 - 31

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 21-Jun-2006

SPT, Calvert Cliffs - B401-170



Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-170 NW rod

OP: KB Test date: 21-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3

LE: 174.0 ft EM: 30,000 ksi

WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	35.14	11.96	0.294	84.0	42.3	0.294	0.169	0.91	0.56
2	0.00	AV1	36.24	11.95	0.280	80.1	42.4	0.280	0.172	0.93	0.59
3	0.00	AV1	35.41	11.56	0.262	74.9	41.8	0.262	0.159	0.80	0.60
4	0.00	AV1	34.26	11.48	0.259	74.0	42.6	0.259	0.156	0.83	0.74
5	0.00	AV1	35.97	11.70	0.268	76.6	42.6	0.268	0.166	1.01	0.56
6	0.00	AV1	36.34	12.04	0.284	81.2	42.6	0.284	0.175	1.08	0.59
7	0.00	AV1	36.70	12.18	0.283	80.7	42.7	0.283	0.178	0.89	0.65
8	0.00	AV1	36.47	11.84	0.280	80.1	42.3	0.280	0.172	0.90	0.60
9	0.00	AV1	36.13	11.80	0.278	79.4	42.3	0.278	0.170	0.78	0.62
10	0.00	AV1	36.62	11.74	0.278	79.4	42.5	0.278	0.171	0.86	0.56
11	0.00	AV1	35.02	12.39	0.293	83.7	42.3	0.293	0.176	0.95	0.63
12	0.00	AV1	36.88	11.94	0.284	81.1	42.6	0.284	0.174	0.96	0.61
13	0.00	AV1	35.55	12.07	0.283	81.0	42.2	0.283	0.168	0.99	0.61
14	0.00	AV1	35.90	11.84	0.277	79.2	42.6	0.277	0.167	0.90	0.62
15	0.00	AV1	36.10	11.95	0.282	80.5	42.6	0.282	0.170	0.94	0.64
16	0.00	AV1	36.80	12.18	0.290	82.8	42.5	0.290	0.176	0.94	0.61
17	0.00	AV1	36.55	11.98	0.288	82.2	42.5	0.288	0.173	0.90	0.59
18	0.00	AV1	37.09	11.96	0.281	80.3	42.6	0.281	0.175	0.81	0.61
19	0.00	AV1	36.72	11.88	0.280	79.9	42.2	0.280	0.172	0.87	0.62
20	0.00	AV1	36.46	12.10	0.284	81.0	42.5	0.284	0.178	0.88	0.67
21	0.00	AV1	36.90	12.33	0.295	84.3	42.6	0.295	0.177	0.73	0.58
22	0.00	AV1	34.83	11.85	0.281	80.4	42.7	0.281	0.166	0.83	0.56
23	0.00	AV1	37.60	12.17	0.288	82.3	42.4	0.288	0.182	0.87	0.66
24	0.00	AV1	34.73	11.44	0.272	77.6	42.6	0.272	0.163	0.82	0.58
25	0.00	AV1	34.94	11.41	0.275	78.6	42.4	0.275	0.165	0.62	0.58
26	0.00	AV1	34.94	11.80	0.276	78.7	42.6	0.276	0.168	0.68	0.63
27	0.00	AV1	35.33	11.76	0.274	78.4	42.4	0.274	0.168	0.57	0.58
28	0.00	AV1	36.55	11.96	0.285	81.3	42.8	0.285	0.174	0.63	0.61
29	0.00	AV1	34.12	11.33	0.263	75.2	42.6	0.263	0.158	0.62	0.58
30	0.00	AV1	34.16	11.18	0.256	73.1	42.1	0.256	0.156	0.59	0.62
		Average	35.88	11.86	0.279	79.7	42.5	0.279	0.170	0.84	0.61

Total number of blows analyzed: 30

Time Summary

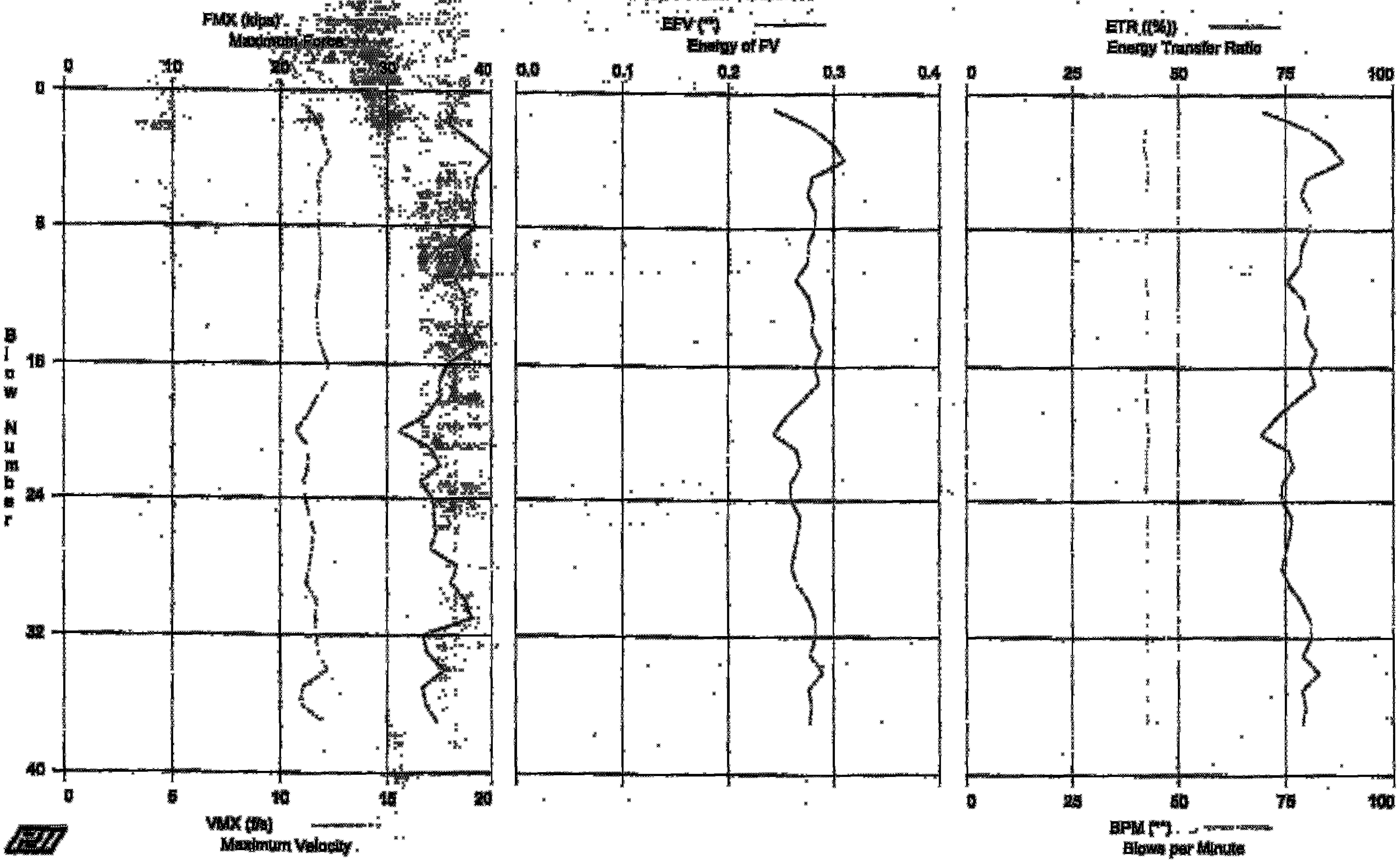
Drive 41 seconds 9:43:13 AM - 9:43:54 AM (6/21/2006) BN 1 - 30

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-180

Test date: 21-Jun-2006



GRL-Engineers, Inc.
Case Method Results

SPT, Calvert Cliffs - B401-180 N3 rod
OP: KB Test date: 21-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 184.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	36.23	11.28	0.244	69.9	**	0.244	0.158	0.26	0.70
2	0.00	AV1	35.93	11.79	0.279	79.7	42.3	0.279	0.173	0.75	0.66
3	0.00	AV1	38.00	12.04	0.299	85.4	41.8	0.299	0.184	0.98	0.60
4	0.00	AV1	40.20	12.33	0.310	88.4	42.6	0.310	0.203	1.09	0.68
5	0.00	AV1	38.58	11.78	0.280	80.1	42.9	0.280	0.184	0.81	0.66
6	0.00	AV1	38.18	11.77	0.275	78.7	42.6	0.275	0.181	1.15	0.70
7	0.00	AV1	38.11	11.83	0.283	80.8	42.8	0.283	0.184	0.78	0.73
8	0.00	AV1	38.37	11.79	0.282	80.6	42.8	0.282	0.184	0.73	0.62
9	0.00	AV1	36.80	11.85	0.276	78.8	42.6	0.276	0.172	0.65	0.59
10	0.00	AV1	37.60	11.83	0.275	78.5	42.7	0.275	0.177	0.73	0.65
11	0.00	AV1	36.49	11.85	0.264	75.5	42.5	0.264	0.165	0.56	0.63
12	0.00	AV1	37.51	11.72	0.276	79.0	42.9	0.276	0.179	0.78	0.71
13	0.00	AV1	37.35	11.69	0.281	80.3	42.7	0.281	0.182	0.72	0.62
14	0.00	AV1	37.52	11.75	0.279	79.6	42.6	0.279	0.179	0.53	0.69
15	0.00	AV1	38.24	11.91	0.288	82.3	42.6	0.288	0.185	0.44	0.65
16	0.00	AV1	35.74	12.23	0.282	80.7	42.6	0.282	0.171	0.31	0.59
17	0.00	AV1	35.02	12.24	0.286	81.8	42.4	0.286	0.175	0.40	0.66
18	0.00	AV1	34.98	11.69	0.270	77.1	42.8	0.270	0.165	0.47	0.58
19	0.00	AV1	33.72	11.29	0.254	72.6	42.6	0.254	0.185	0.35	0.56
20	0.00	AV1	31.05	10.76	0.243	69.4	43.1	0.243	0.140	0.37	0.62
21	0.00	AV1	34.15	11.34	0.265	75.8	42.5	0.265	0.159	0.49	0.65
22	0.00	AV1	35.08	11.30	0.268	76.7	42.5	0.268	0.166	0.41	0.65
23	0.00	AV1	33.16	11.13	0.259	74.1	42.6	0.259	0.156	0.46	0.65
24	0.00	AV1	34.35	11.18	0.260	74.2	42.3	0.260	0.162	0.47	0.63
25	0.00	AV1	34.47	11.33	0.268	76.4	42.8	0.268	0.165	0.49	0.62
26	0.00	AV1	34.64	11.56	0.266	76.0	42.6	0.266	0.166	0.44	0.64
27	0.00	AV1	34.11	11.47	0.263	75.0	42.8	0.263	0.162	0.45	0.66
28	0.00	AV1	36.67	11.36	0.260	74.1	42.6	0.260	0.167	0.58	0.63
29	0.00	AV1	36.09	11.22	0.266	75.9	42.7	0.266	0.171	0.53	0.70
30	0.00	AV1	37.57	11.67	0.276	78.8	42.5	0.276	0.179	0.43	0.64
31	0.00	AV1	38.08	11.65	0.283	80.7	42.8	0.283	0.182	0.54	0.69
32	0.00	AV1	33.36	11.69	0.283	81.0	42.4	0.283	0.170	0.64	0.58
33	0.00	AV1	33.85	11.75	0.277	79.0	42.9	0.277	0.164	0.52	0.63
34	0.00	AV1	35.48	12.19	0.290	82.8	42.8	0.290	0.176	0.43	0.62
35	0.00	AV1	33.36	11.04	0.276	78.8	42.6	0.276	0.167	0.52	0.66
36	0.00	AV1	33.70	10.97	0.279	79.6	42.9	0.279	0.169	0.52	0.65
37	0.00	AV1	34.81	12.04	0.277	79.1	42.6	0.277	0.169	0.81	0.58
		Average	35.91	11.63	0.274	78.3	42.6	0.274	0.171	0.57	0.64

Total number of blows analyzed: 37

Time Summary

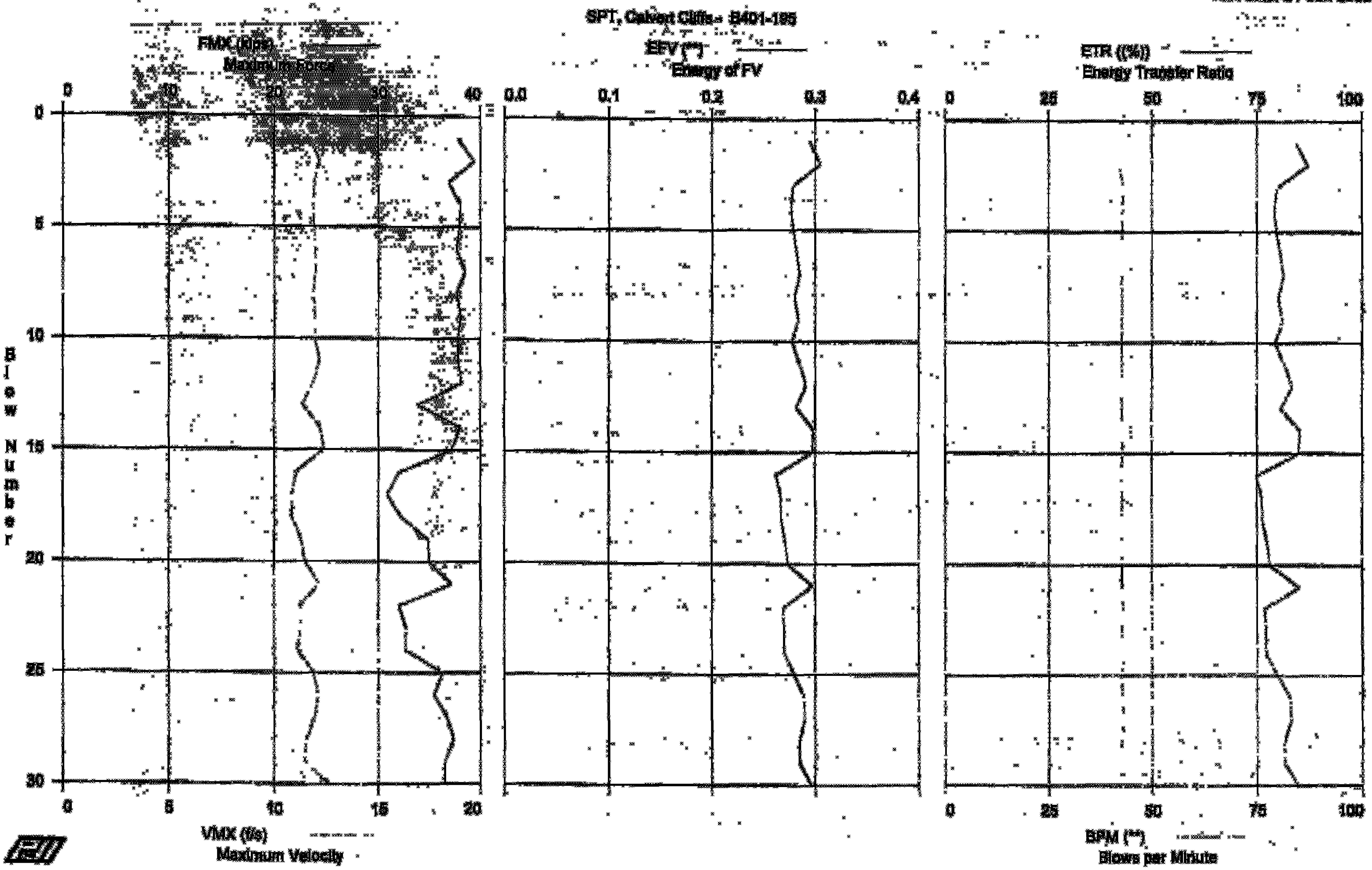
Drive 51 seconds 11:39:11 AM - 11:40:02 AM (6/21/2006) BN 1 - 37

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-195

Test date: 21-Jun-2006



SPT, Calvert Cliffs - B401-195   AW rod
OP: KB   Test date: 21-Jun-2006

AR: 2.30 in^2   SP: 0.492 k/ft3
LE: 199.0 ft   EM: 30,000 ksi
WS: 16,807.9 f/s   JC: 0.00

FMX: Maximum Force   EMX: Max Transferred Energy
VMX: Maximum Velocity   EF2: Energy of F^2
EFV: Energy of FV   DFN: Final Displacement
ETR: Energy Transfer Ratio   FVP: Force/Velocity proportionality
BPM: Blows per Minute

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	37.82	11.80	0.295	84.3	**	0.295	0.193	0.73	0.72
2	0.00	AV1	39.31	12.14	0.305	87.1	42.0	0.305	0.202	0.27	0.69
3	0.00	AV1	36.95	11.92	0.279	79.8	43.1	0.279	0.178	0.66	0.63
4	0.00	AV1	38.04	11.84	0.277	79.2	42.8	0.277	0.184	0.60	0.67
5	0.00	AV1	37.90	11.90	0.279	79.6	42.7	0.279	0.180	0.85	0.68
6	0.00	AV1	37.66	11.94	0.282	80.5	42.5	0.282	0.185	0.84	0.71
7	0.00	AV1	38.47	11.98	0.285	81.3	42.7	0.285	0.186	1.00	0.67
8	0.00	AV1	37.67	11.85	0.280	80.0	42.8	0.280	0.180	1.01	0.65
9	0.00	AV1	38.04	11.94	0.284	81.1	42.7	0.284	0.183	0.99	0.64
10	0.00	AV1	37.78	11.95	0.278	79.4	42.8	0.278	0.181	0.94	0.64
11	0.00	AV1	37.81	12.17	0.285	81.6	42.7	0.285	0.183	0.82	0.63
12	0.00	AV1	38.10	11.85	0.291	83.2	42.6	0.291	0.186	0.95	0.67
13	0.00	AV1	33.87	11.36	0.282	80.7	42.7	0.282	0.171	0.95	0.69
14	0.00	AV1	38.05	12.20	0.298	85.2	42.8	0.298	0.187	0.94	0.65
15	0.00	AV1	37.17	12.36	0.297	84.7	42.8	0.297	0.183	0.77	0.61
16	0.00	AV1	32.01	11.02	0.262	74.8	42.5	0.262	0.158	0.75	0.62
17	0.00	AV1	30.82	10.86	0.267	76.3	42.7	0.267	0.160	0.85	0.68
18	0.00	AV1	32.24	10.85	0.267	76.3	42.6	0.267	0.162	0.70	0.65
19	0.00	AV1	34.81	11.27	0.271	77.4	42.6	0.271	0.169	0.72	0.64
20	0.00	AV1	34.95	11.47	0.274	78.2	42.7	0.274	0.170	0.53	0.64
21	0.00	AV1	37.10	12.14	0.297	84.8	42.7	0.297	0.186	0.61	0.69
22	0.00	AV1	32.00	11.23	0.269	76.8	42.9	0.269	0.161	0.42	0.65
23	0.00	AV1	32.70	11.25	0.270	77.3	42.7	0.270	0.164	0.55	0.63
24	0.00	AV1	32.65	11.14	0.270	77.2	42.8	0.270	0.164	0.58	0.61
25	0.00	AV1	36.24	11.87	0.280	79.9	42.7	0.280	0.175	0.55	0.62
26	0.00	AV1	35.43	12.11	0.289	82.7	42.8	0.289	0.184	0.64	0.72
27	0.00	AV1	36.75	11.95	0.290	83.0	43.1	0.290	0.186	0.71	0.74
28	0.00	AV1	37.38	11.54	0.285	81.5	42.7	0.285	0.178	0.79	0.68
29	0.00	AV1	36.51	11.46	0.285	81.5	42.6	0.285	0.179	0.46	0.71
30	0.00	AV1	36.53	12.59	0.296	84.6	42.6	0.296	0.182	0.54	0.65
		Average	36.09	11.73	0.282	80.7	42.7	0.282	0.178	0.72	0.66

Total number of blows analyzed: 30

Time Summary

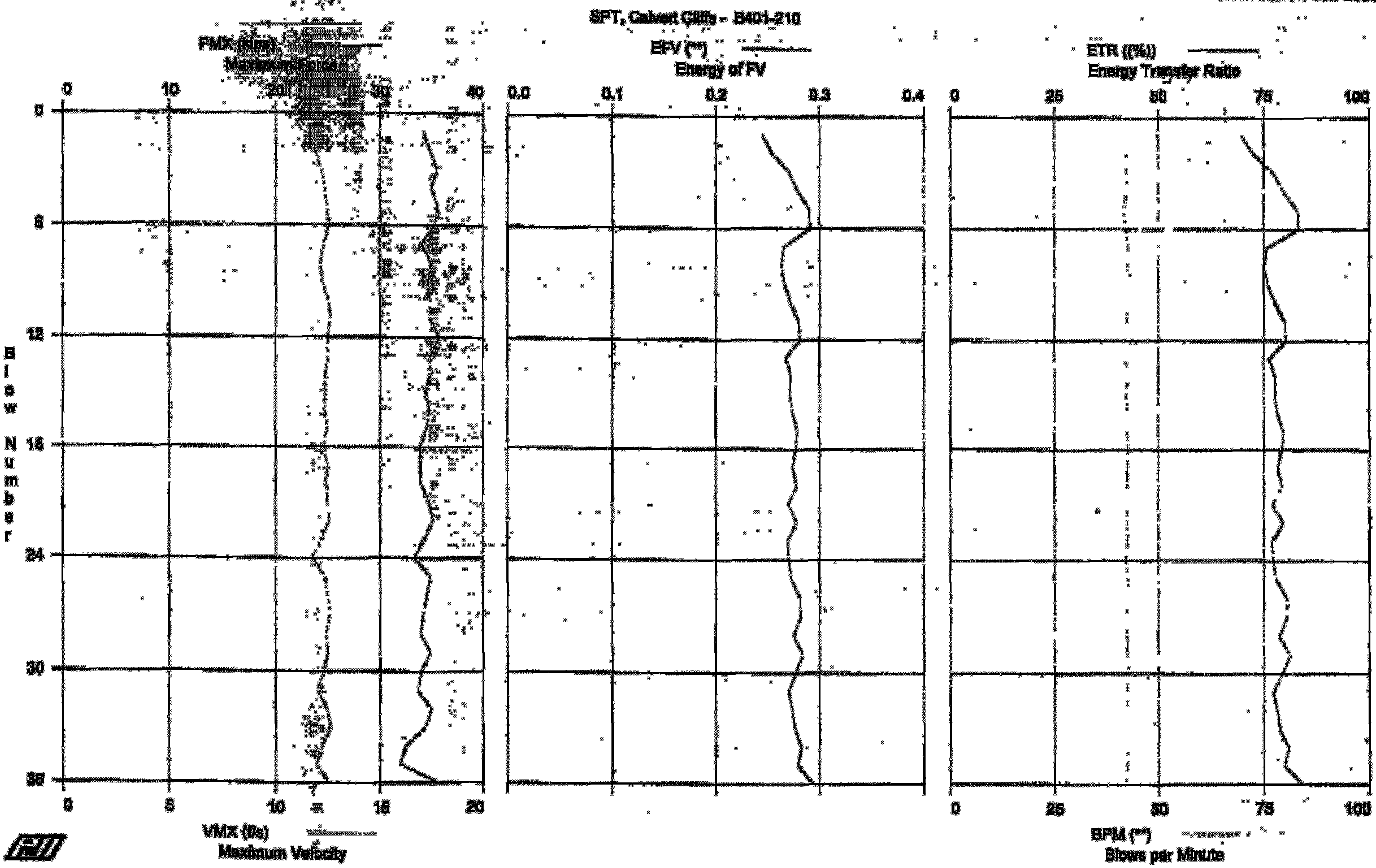
Drive 40 seconds 1:19:30 PM - 1:20:10 PM (6/21/2006) BN 1 - 30

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 21-Jun-2006

SPT, Calvert Cliffs - B401-210



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-210

N3 rod

OP: KB

Test date: 21-Jun-2006

AR: 2.30 in^2
LE: 214.0 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	34.17	11.83	0.245	69.9	**	0.245	0.157	0.99	0.58
2	0.00	AV1	34.76	11.85	0.254	72.6	42.3	0.254	0.162	0.92	0.63
3	0.00	AV1	35.50	12.14	0.270	77.3	42.3	0.270	0.168	0.91	0.56
4	0.00	AV1	34.91	12.30	0.279	79.6	42.4	0.279	0.170	0.96	0.59
5	0.00	AV1	35.58	12.42	0.290	82.9	41.7	0.290	0.177	0.98	0.60
6	0.00	AV1	35.24	12.54	0.291	83.2	42.2	0.291	0.176	0.96	0.55
7	0.00	AV1	33.97	12.25	0.265	75.7	42.7	0.265	0.162	0.98	0.60
8	0.00	AV1	34.87	12.10	0.263	75.2	42.7	0.263	0.164	0.87	0.58
9	0.00	AV1	34.63	12.22	0.266	75.9	42.5	0.266	0.162	0.94	0.55
10	0.00	AV1	34.80	12.47	0.272	77.8	42.6	0.272	0.168	0.84	0.56
11	0.00	AV1	34.79	12.60	0.280	80.0	42.4	0.280	0.172	0.83	0.57
12	0.00	AV1	35.70	12.45	0.281	80.2	42.4	0.281	0.174	0.81	0.58
13	0.00	AV1	34.80	12.49	0.267	76.3	42.3	0.267	0.166	0.84	0.54
14	0.00	AV1	34.76	12.36	0.272	77.6	42.6	0.272	0.167	0.85	0.54
15	0.00	AV1	34.42	12.31	0.271	77.6	42.2	0.271	0.167	0.83	0.55
16	0.00	AV1	34.80	12.34	0.274	78.2	42.6	0.274	0.170	0.67	0.57
17	0.00	AV1	34.51	12.45	0.279	79.7	42.6	0.279	0.167	0.82	0.57
18	0.00	AV1	33.81	12.28	0.277	79.2	42.4	0.277	0.165	0.75	0.50
19	0.00	AV1	33.96	12.46	0.274	78.2	42.6	0.274	0.163	0.71	0.54
20	0.00	AV1	33.96	12.40	0.278	79.4	42.4	0.278	0.165	0.91	0.51
21	0.00	AV1	34.71	12.47	0.270	77.1	42.3	0.270	0.166	0.88	0.54
22	0.00	AV1	35.09	12.62	0.278	79.5	42.5	0.278	0.173	0.81	0.61
23	0.00	AV1	34.31	12.17	0.269	76.9	42.5	0.269	0.163	0.88	0.54
24	0.00	AV1	33.30	11.69	0.270	77.2	42.2	0.270	0.160	0.88	0.52
25	0.00	AV1	34.84	12.32	0.273	77.9	42.7	0.273	0.167	0.75	0.59
26	0.00	AV1	34.51	12.46	0.281	80.4	42.6	0.281	0.168	0.76	0.54
27	0.00	AV1	34.17	12.56	0.282	80.4	42.3	0.282	0.169	0.86	0.51
28	0.00	AV1	33.96	12.40	0.275	78.6	42.4	0.275	0.166	0.83	0.52
29	0.00	AV1	34.81	12.47	0.284	81.2	42.5	0.284	0.170	0.88	0.58
30	0.00	AV1	34.06	12.28	0.277	79.2	42.7	0.277	0.168	0.73	0.57
31	0.00	AV1	33.65	11.99	0.270	77.2	42.4	0.270	0.162	0.65	0.57
32	0.00	AV1	34.90	12.43	0.274	78.1	42.6	0.274	0.169	0.69	0.54
33	0.00	AV1	34.41	12.62	0.276	78.9	42.5	0.276	0.168	0.68	0.57
34	0.00	AV1	32.48	12.19	0.283	80.8	42.6	0.283	0.165	0.80	0.55
35	0.00	AV1	31.95	11.90	0.279	79.8	42.5	0.279	0.163	0.77	0.51
36	0.00	AV1	35.65	12.53	0.294	84.0	42.2	0.294	0.177	0.68	0.55
		Average	34.47	12.31	0.275	78.4	42.4	0.275	0.167	0.83	0.56

Total number of blows analyzed: 36

Time Summary

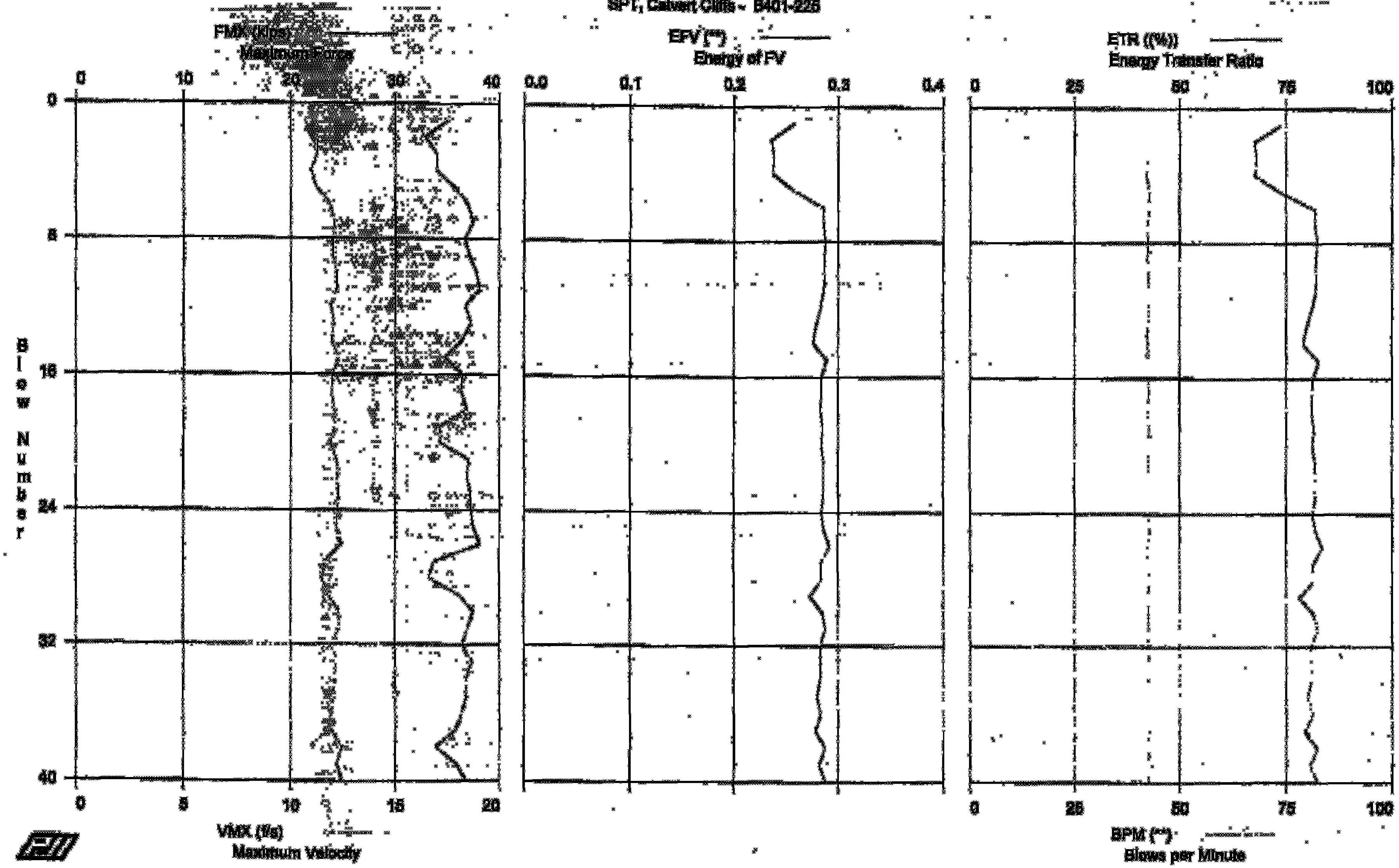
Drive 50 seconds 4:58:56 PM - 4:59:46 PM (6/21/2006) BN 1 - 36

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-225

Test date: 22-Jun-2006



GRL Engineers, Inc. Page 1 of 1
Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-225 NW rod
OP: KH Test date: 22-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 229.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	35.07	11.17	0.258	73.6	**	0.258	0.164	1.21	0.67
2	0.00	AV1	32.89	11.21	0.236	67.5	**	0.236	0.143	0.77	0.63
3	0.00	AV1	33.97	11.22	0.238	68.0	42.5	0.238	0.148	0.75	0.65
4	0.00	AV1	33.97	10.94	0.237	67.7	42.2	0.237	0.150	0.69	0.61
5	0.00	AV1	35.76	11.19	0.258	73.9	42.9	0.258	0.162	0.74	0.59
6	0.00	AV1	37.06	11.85	0.286	81.8	42.8	0.286	0.181	0.72	0.63
7	0.00	AV1	37.49	12.03	0.286	81.8	42.4	0.286	0.183	0.78	0.61
8	0.00	AV1	36.70	11.99	0.288	82.3	42.6	0.288	0.183	0.74	0.68
9	0.00	AV1	37.15	11.98	0.287	81.9	42.5	0.287	0.183	0.67	0.58
10	0.00	AV1	37.82	12.18	0.287	82.0	42.8	0.287	0.182	0.59	0.61
11	0.00	AV1	38.08	12.18	0.286	81.8	42.6	0.286	0.187	0.76	0.62
12	0.00	AV1	36.77	11.87	0.283	80.9	42.7	0.283	0.180	0.68	0.59
13	0.00	AV1	37.32	12.03	0.279	79.8	42.5	0.279	0.180	0.70	0.64
14	0.00	AV1	36.33	11.93	0.276	78.9	42.5	0.276	0.175	0.69	0.66
15	0.00	AV1	34.71	12.25	0.289	82.6	42.6	0.289	0.175	0.83	0.64
16	0.00	AV1	36.42	11.95	0.284	81.2	42.6	0.284	0.176	0.60	0.58
17	0.00	AV1	36.29	11.93	0.284	81.0	42.8	0.284	0.175	0.75	0.63
18	0.00	AV1	36.90	12.05	0.283	81.0	42.6	0.283	0.177	0.68	0.61
19	0.00	AV1	34.32	12.06	0.285	81.4	42.7	0.285	0.169	0.62	0.60
20	0.00	AV1	34.30	11.86	0.284	81.1	42.6	0.284	0.167	0.57	0.60
21	0.00	AV1	37.10	12.16	0.286	81.7	42.7	0.286	0.182	0.55	0.65
22	0.00	AV1	36.89	12.23	0.286	81.8	42.6	0.286	0.182	0.50	0.64
23	0.00	AV1	37.28	12.27	0.286	81.8	42.6	0.286	0.180	0.63	0.62
24	0.00	AV1	37.29	12.21	0.284	81.0	42.6	0.284	0.180	0.64	0.60
25	0.00	AV1	37.53	12.15	0.286	81.8	42.9	0.286	0.183	0.43	0.62
26	0.00	AV1	38.11	12.38	0.292	83.5	42.6	0.292	0.185	0.44	0.62
27	0.00	AV1	33.78	11.60	0.284	81.2	42.6	0.284	0.167	0.75	0.55
28	0.00	AV1	33.17	11.45	0.284	81.3	42.8	0.284	0.166	0.55	0.56
29	0.00	AV1	36.04	11.72	0.273	78.0	42.6	0.273	0.169	0.35	0.60
30	0.00	AV1	37.51	12.24	0.285	81.5	42.8	0.285	0.181	0.38	0.64
31	0.00	AV1	36.98	12.31	0.288	82.4	42.7	0.288	0.184	0.33	0.65
32	0.00	AV1	36.37	11.88	0.283	80.7	42.6	0.283	0.174	0.54	0.59
33	0.00	AV1	37.38	12.14	0.283	80.8	42.8	0.283	0.178	0.69	0.60
34	0.00	AV1	36.81	12.09	0.283	80.9	42.7	0.283	0.181	0.66	0.59
35	0.00	AV1	36.86	12.00	0.280	80.0	42.6	0.280	0.177	0.39	0.62
36	0.00	AV1	36.42	11.91	0.284	81.2	42.6	0.284	0.176	0.34	0.58
37	0.00	AV1	35.80	11.91	0.278	79.3	42.7	0.278	0.172	0.30	0.61
38	0.00	AV1	33.88	12.42	0.288	82.2	42.8	0.288	0.169	0.40	0.60
39	0.00	AV1	35.89	12.20	0.282	80.5	42.6	0.282	0.172	0.35	0.61
40	0.00	AV1	36.76	12.44	0.288	82.3	42.7	0.288	0.179	0.38	0.58
		Average	36.18	11.94	0.279	79.8	42.6	0.279	0.174	0.60	0.61

Total number of blows analyzed: 40

Time Summary

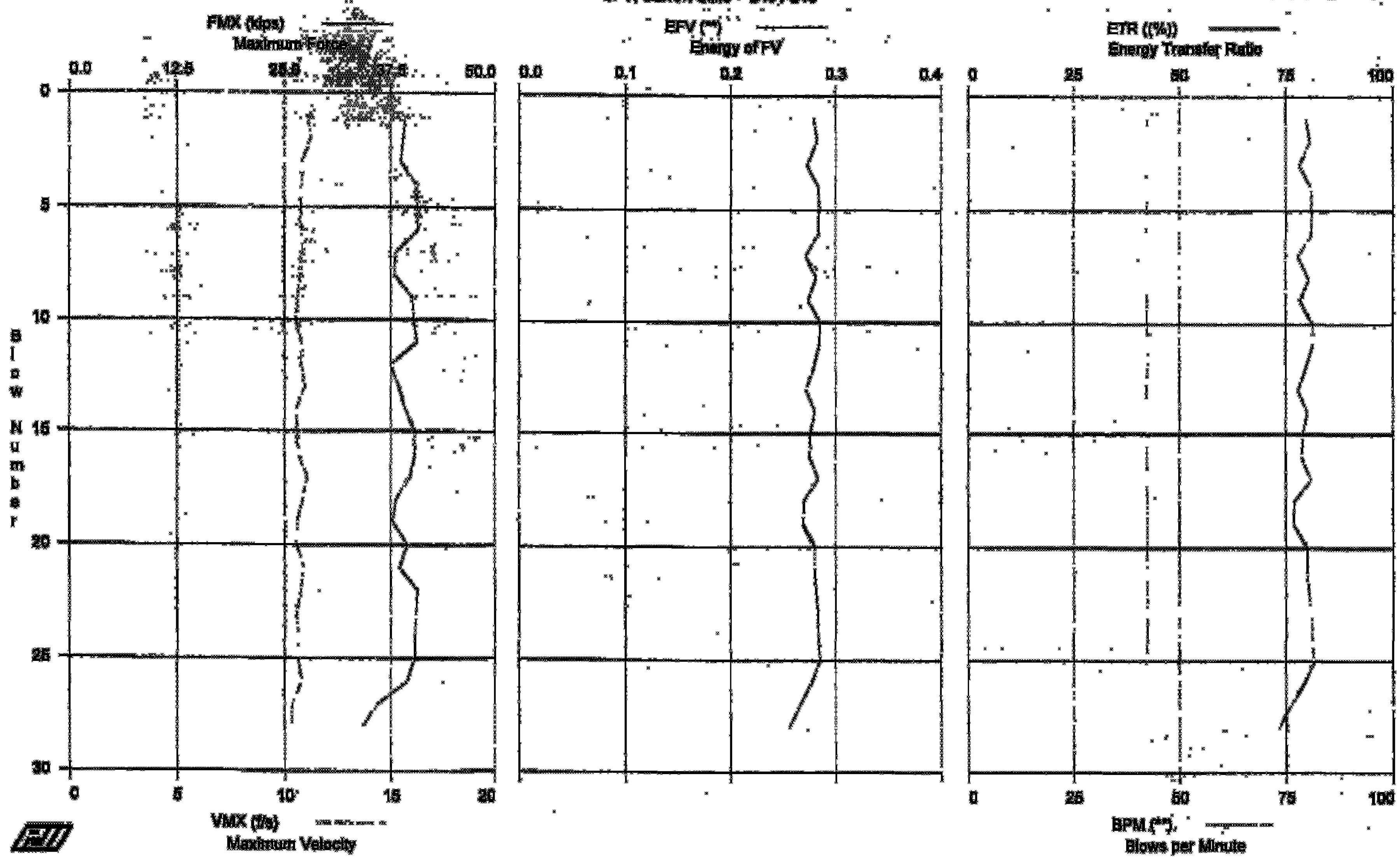
Drive 1 minute 12 seconds 11:09:17 AM - 11:10:29 AM (6/22/2006) BN 1 - 40

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 22-Jun-2006

SPT, Calvert Cliffs - B401-240



SPT, Calvert Cliffs - B401-240   N3 rod
OP: KB   Test date: 22-Jun-2006

AR: 2.30 in^2   SP: 0.492 k/ft3
LE: 244.0 ft   EM: 30,000 ksi
WS: 16,807.9 f/s   JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	39.26	11.08	0.279	79.7	42.5	0.279	0.246	0.56	0.88
2	0.00	AV1	38.92	11.22	0.282	80.6	42.3	0.282	0.246	0.61	0.87
3	0.00	AV1	38.68	10.82	0.273	78.1	42.1	0.273	0.242	0.65	0.89
4	0.00	AV1	40.49	10.79	0.283	81.0	42.4	0.283	0.252	0.69	0.94
5	0.00	AV1	40.65	10.73	0.284	81.0	42.4	0.284	0.259	0.57	0.94
6	0.00	AV1	40.74	10.80	0.284	81.1	42.2	0.284	0.258	0.47	0.93
7	0.00	AV1	38.02	10.85	0.272	77.8	42.4	0.272	0.237	0.59	0.87
8	0.00	AV1	37.91	10.72	0.281	80.3	42.3	0.281	0.244	0.55	0.88
9	0.00	AV1	40.10	10.61	0.274	78.3	42.5	0.274	0.247	0.43	0.93
10	0.00	AV1	40.20	10.51	0.285	81.3	42.4	0.285	0.258	0.36	0.95
11	0.00	AV1	40.59	10.77	0.284	81.2	42.6	0.284	0.255	0.34	0.94
12	0.00	AV1	37.39	10.75	0.279	79.7	42.6	0.279	0.243	0.41	0.86
13	0.00	AV1	38.42	10.96	0.272	77.7	42.3	0.272	0.237	0.33	0.87
14	0.00	AV1	39.19	10.53	0.280	80.0	42.4	0.280	0.250	0.42	0.92
15	0.00	AV1	40.38	10.59	0.276	79.0	42.4	0.276	0.252	0.31	0.94
16	0.00	AV1	40.39	10.63	0.275	78.7	42.4	0.275	0.253	0.26	0.94
17	0.00	AV1	39.79	11.07	0.283	80.8	42.4	0.283	0.249	0.25	0.89
18	0.00	AV1	38.11	10.86	0.270	77.0	42.5	0.270	0.235	0.52	0.87
19	0.00	AV1	37.71	10.59	0.269	76.8	42.5	0.269	0.235	0.74	0.88
20	0.00	AV1	39.43	10.59	0.280	80.0	42.5	0.280	0.253	0.59	0.92
21	0.00	AV1	38.48	10.89	0.280	79.9	42.4	0.280	0.244	0.30	0.88
22	0.00	AV1	40.69	10.77	0.281	80.3	42.4	0.281	0.257	0.20	0.94
23	0.00	AV1	40.45	10.56	0.283	80.9	42.5	0.283	0.259	0.17	0.95
24	0.00	AV1	40.35	10.64	0.283	81.0	42.5	0.283	0.256	0.30	0.94
25	0.00	AV1	40.29	10.64	0.285	81.5	42.3	0.285	0.257	0.44	0.94
26	0.00	AV1	39.50	10.79	0.277	79.2	42.3	0.277	0.250	0.33	0.90
27	0.00	AV1	35.85	10.37	0.266	76.1	42.3	0.266	0.232	0.29	0.85
28	0.00	AV1	34.11	10.32	0.256	73.1	42.4	0.256	0.222	0.20	0.82
		Average	39.15	10.73	0.278	79.4	42.4	0.278	0.247	0.42	0.90

Total number of blows analyzed: 28

Time Summary

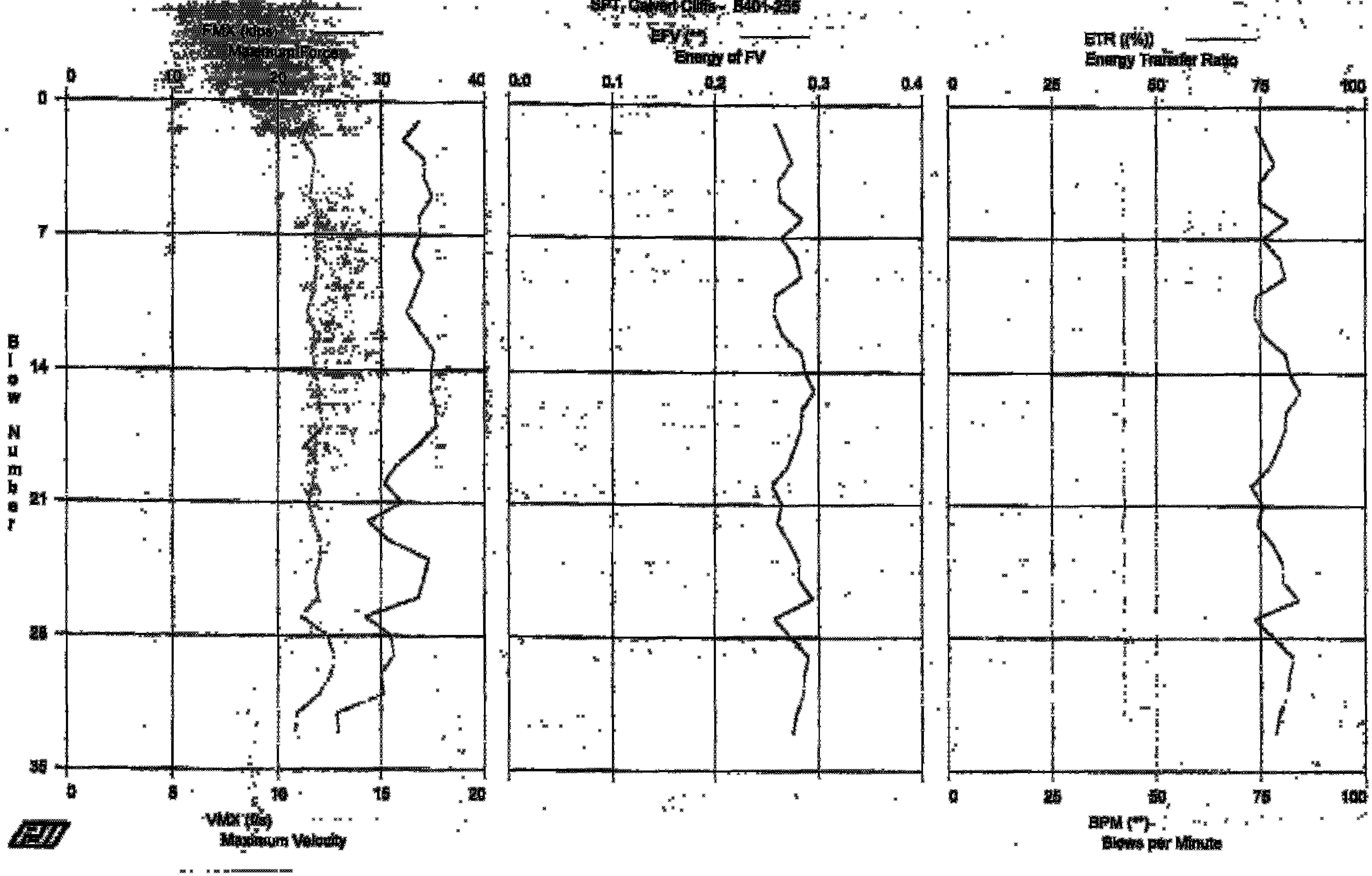
Drive 38 seconds 1:46:35 PM - 1:47:13 PM (6/22/2006) BN 1 - 28

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-255

Test date: 22-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-255 N3

OP: KB Test date: 22-Jun-2006

AR: 2.30 in^2
LE: 259.0 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	33.74	11.53	0.258	73.8	**	0.258	0.189	0.38	0.63
2	0.00	AV1	32.18	11.19	0.266	76.0	42.0	0.266	0.191	1.05	0.56
3	0.00	AV1	34.12	11.78	0.274	78.2	41.8	0.274	0.197	0.97	0.56
4	0.00	AV1	34.17	11.64	0.261	74.6	42.3	0.261	0.191	1.20	0.59
5	0.00	AV1	34.88	11.57	0.262	74.7	42.1	0.262	0.194	1.12	0.59
6	0.00	AV1	33.67	11.95	0.284	81.2	42.3	0.284	0.200	1.20	0.58
7	0.00	AV1	33.77	11.78	0.264	75.5	42.0	0.264	0.192	0.95	0.61
8	0.00	AV1	33.03	11.89	0.278	79.5	42.4	0.278	0.200	1.10	0.64
9	0.00	AV1	33.97	11.83	0.283	80.7	42.3	0.283	0.202	1.03	0.65
10	0.00	AV1	33.26	11.67	0.258	73.8	42.2	0.258	0.185	0.73	0.56
11	0.00	AV1	32.45	11.42	0.257	73.4	42.3	0.257	0.184	0.80	0.54
12	0.00	AV1	33.84	11.80	0.265	75.8	42.2	0.265	0.194	0.09	0.62
13	0.00	AV1	35.06	11.64	0.283	80.9	42.5	0.283	0.202	0.84	0.63
14	0.00	AV1	34.78	11.80	0.287	81.9	42.3	0.287	0.208	0.88	0.67
15	0.00	AV1	34.78	11.98	0.296	84.5	42.1	0.296	0.207	0.79	0.64
16	0.00	AV1	35.28	12.03	0.284	81.2	42.3	0.284	0.207	0.69	0.66
17	0.00	AV1	35.18	12.19	0.283	80.7	42.1	0.283	0.199	0.65	0.62
18	0.00	AV1	33.62	11.37	0.277	79.1	42.2	0.277	0.199	0.74	0.58
19	0.00	AV1	31.54	11.87	0.270	77.1	42.2	0.270	0.189	0.55	0.51
20	0.00	AV1	30.31	11.66	0.255	72.7	42.2	0.255	0.180	0.51	0.52
21	0.00	AV1	32.00	11.49	0.264	75.5	42.5	0.264	0.186	0.49	0.58
22	0.00	AV1	28.71	11.70	0.260	74.2	41.9	0.260	0.169	0.62	0.50
23	0.00	AV1	30.74	12.11	0.272	77.8	42.4	0.272	0.185	0.64	0.53
24	0.00	AV1	34.58	12.03	0.281	80.2	42.4	0.281	0.204	0.61	0.63
25	0.00	AV1	34.12	11.79	0.281	80.4	42.1	0.281	0.203	0.44	0.62
26	0.00	AV1	33.64	11.97	0.294	84.0	42.5	0.294	0.205	0.42	0.62
27	0.00	AV1	28.51	11.13	0.257	73.5	42.1	0.257	0.175	0.41	0.51
28	0.00	AV1	30.94	12.40	0.274	78.2	42.4	0.274	0.185	0.49	0.57
29	0.00	AV1	31.22	12.71	0.290	82.8	42.5	0.290	0.193	0.47	0.57
30	0.00	AV1	30.00	12.58	0.286	81.8	42.2	0.286	0.188	0.45	0.50
31	0.00	AV1	30.25	12.02	0.285	81.3	42.6	0.285	0.189	0.39	0.54
32	0.00	AV1	25.73	10.90	0.278	79.4	42.3	0.278	0.177	0.39	0.56
33	0.00	AV1	25.83	10.82	0.275	78.7	42.1	0.275	0.177	0.45	0.56
		Average	32.42	11.77	0.274	78.3	42.2	0.274	0.192	0.68	0.58

Total number of blows analyzed: 33

Time Summary

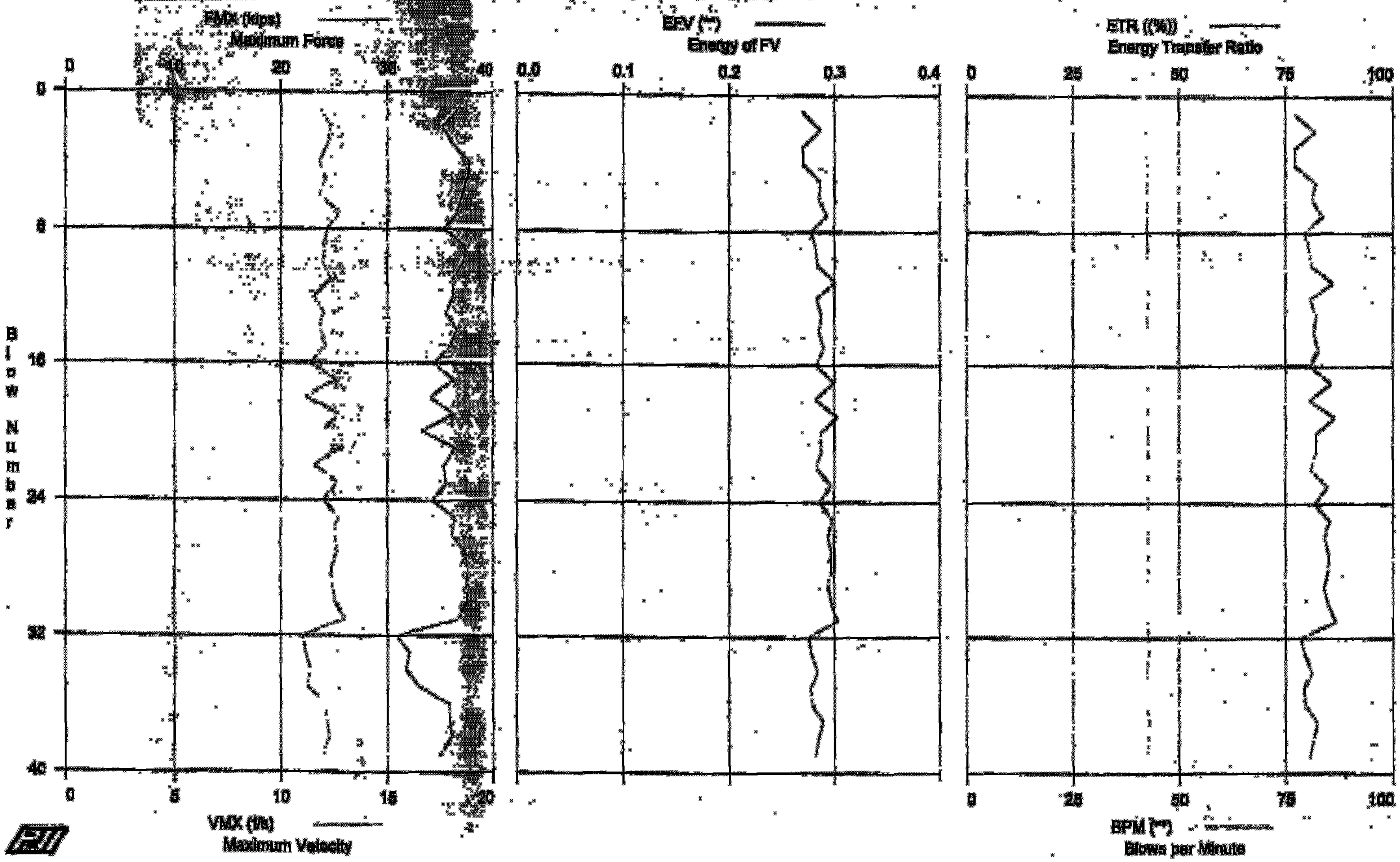
Drive 45 seconds 4:41:37 PM - 4:42:22 PM (6/22/2006) BN 1 - 33

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-270

Test date: 23-Jun-2006



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-270 N3
OP: KB Test date: 23-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 274.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

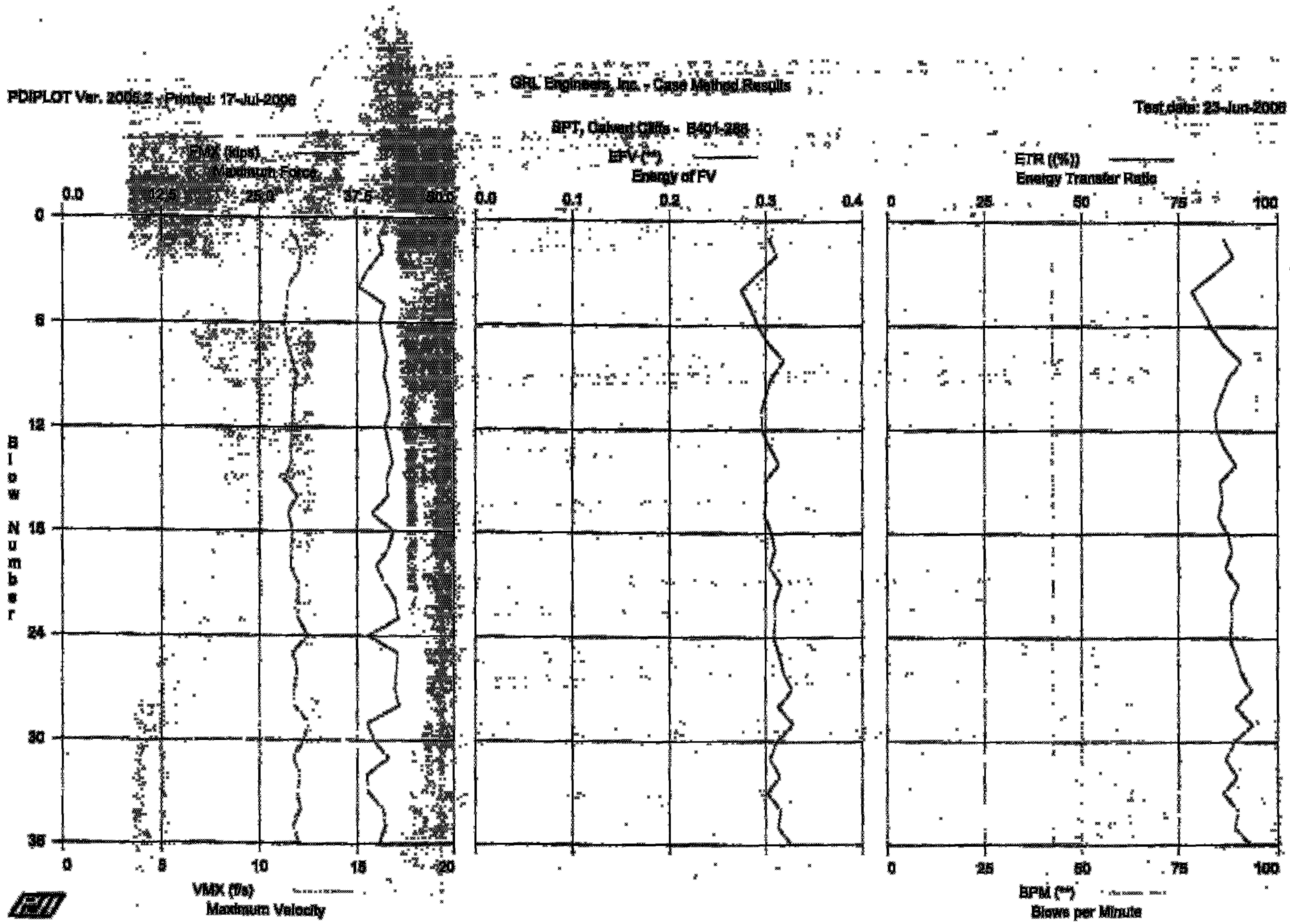
FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	36.61	11.85	0.270	77.1	**	0.270	0.213	0.53	0.64
2	0.00	AV1	35.06	12.34	0.287	82.0	42.2	0.287	0.220	0.68	0.53
3	0.00	AV1	36.10	12.22	0.270	77.2	42.1	0.270	0.208	0.48	0.59
4	0.00	AV1	37.63	11.78	0.270	77.2	42.4	0.270	0.212	0.70	0.63
5	0.00	AV1	37.46	12.10	0.287	82.1	42.5	0.287	0.224	0.70	0.60
6	0.00	AV1	36.99	11.80	0.285	81.3	42.6	0.285	0.220	0.68	0.58
7	0.00	AV1	36.48	12.71	0.293	83.7	42.5	0.293	0.220	0.57	0.61
8	0.00	AV1	35.23	12.19	0.278	79.4	42.6	0.278	0.209	0.68	0.54
9	0.00	AV1	37.29	12.02	0.282	80.6	42.6	0.282	0.217	0.73	0.60
10	0.00	AV1	37.15	11.95	0.284	81.2	42.6	0.284	0.219	1.02	0.59
11	0.00	AV1	36.01	12.31	0.301	86.0	42.6	0.301	0.220	0.96	0.57
12	0.00	AV1	36.08	11.54	0.283	80.7	42.8	0.283	0.217	0.87	0.60
13	0.00	AV1	35.38	11.98	0.288	82.3	42.6	0.288	0.214	0.83	0.59
14	0.00	AV1	36.46	11.80	0.285	81.6	42.6	0.285	0.216	0.95	0.57
15	0.00	AV1	35.70	12.10	0.290	82.7	42.6	0.290	0.217	0.91	0.56
16	0.00	AV1	34.44	11.39	0.283	81.0	42.6	0.283	0.215	0.91	0.57
17	0.00	AV1	36.00	12.57	0.299	85.4	42.7	0.299	0.218	0.85	0.58
18	0.00	AV1	33.97	11.15	0.282	80.7	42.6	0.282	0.213	0.85	0.61
19	0.00	AV1	36.12	12.70	0.302	86.3	42.8	0.302	0.217	0.85	0.59
20	0.00	AV1	33.17	12.01	0.287	82.1	42.7	0.287	0.208	0.79	0.60
21	0.00	AV1	36.24	12.79	0.288	82.2	42.7	0.288	0.216	0.81	0.60
22	0.00	AV1	35.18	11.56	0.283	80.8	42.6	0.283	0.213	0.81	0.59
23	0.00	AV1	35.40	12.64	0.297	84.8	42.9	0.297	0.217	0.83	0.54
24	0.00	AV1	34.17	12.00	0.286	81.8	42.7	0.286	0.211	0.72	0.57
25	0.00	AV1	36.19	12.67	0.298	85.2	42.6	0.298	0.221	0.73	0.57
26	0.00	AV1	35.95	12.52	0.294	84.0	42.7	0.294	0.222	0.58	0.56
27	0.00	AV1	37.28	12.61	0.297	85.0	42.7	0.297	0.227	0.71	0.65
28	0.00	AV1	37.54	12.35	0.297	84.9	42.7	0.297	0.228	0.66	0.63
29	0.00	AV1	37.40	12.40	0.294	84.0	42.6	0.294	0.221	0.70	0.68
30	0.00	AV1	37.47	12.51	0.297	84.8	42.6	0.297	0.223	0.72	0.60
31	0.00	AV1	36.52	12.98	0.303	86.7	42.7	0.303	0.222	0.51	0.56
32	0.00	AV1	30.81	11.02	0.275	78.5	42.8	0.275	0.199	0.58	0.60
33	0.00	AV1	32.02	11.15	0.278	79.5	42.9	0.278	0.204	0.46	0.56
34	0.00	AV1	31.69	11.38	0.284	81.2	42.4	0.284	0.204	0.71	0.65
35	0.00	AV1	32.91	11.23	0.277	79.2	42.7	0.277	0.201	0.71	0.57
36	0.00	AV1	35.72	12.10	0.279	79.7	42.6	0.279	0.209	0.77	0.56
37	0.00	AV1	35.75	12.14	0.289	82.5	42.9	0.289	0.217	0.47	0.62
38	0.00	AV1	35.89	12.24	0.285	81.6	42.7	0.285	0.214	0.64	0.61
39	0.00	AV1	34.78	11.96	0.282	80.7	42.7	0.282	0.211	0.40	0.56
		Average	35.60	12.07	0.287	82.0	42.6	0.287	0.215	0.72	0.59

Total number of blows analyzed: 39

Time Summary

Drive 53 seconds 9:22:04 AM - 9:22:57 AM (6/23/2006) BN 1 - 39


PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006
GRL Engineers, Inc. - Case Method Results
Test date: 23-Jun-2006
SPT, Calvert Cliffs -
FMX (kips)
Maximum Force
EFV (**)
Energy of FV
ETR ((%))
Energy Transfer Ratio
Blow Number
VMX (f/s)
Maximum Velocity
BPM (**)
Blows per Minute

GRL Engineers, Inc.
Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-286 N3
OP: KB Test date: 23-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 290.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force EMX: Max Transferred Energy
VMX: Maximum Velocity EF2: Energy of F^2
EFV: Energy of FV DFN: Final Displacement
ETR: Energy Transfer Ratio FVP: Force/Velocity proportionality
BPM: Blows per Minute

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	40.16	11.81	0.303	86.6	**	0.303	0.217	0.67	0.69
2	0.00	AV1	40.64	12.10	0.311	88.8	42.3	0.311	0.223	0.80	0.75
3	0.00	AV1	38.82	12.00	0.293	83.8	42.6	0.293	0.203	0.67	0.65
4	0.00	AV1	37.71	11.44	0.274	78.4	42.5	0.274	0.192	0.63	0.67
5	0.00	AV1	40.97	11.39	0.284	81.1	42.3	0.284	0.212	0.82	0.73
6	0.00	AV1	40.33	11.27	0.291	83.3	42.6	0.291	0.212	0.78	0.75
7	0.00	AV1	40.76	11.38	0.302	86.2	42.6	0.302	0.219	0.81	0.80
8	0.00	AV1	41.24	11.64	0.318	90.8	42.5	0.318	0.223	0.94	0.80
9	0.00	AV1	40.87	11.88	0.306	87.5	42.7	0.306	0.223	0.79	0.70
10	0.00	AV1	41.45	11.71	0.300	85.9	42.5	0.300	0.213	0.86	0.73
11	0.00	AV1	41.65	11.71	0.295	84.3	42.6	0.295	0.226	0.71	0.78
12	0.00	AV1	40.94	11.65	0.296	84.7	42.6	0.296	0.225	0.71	0.74
13	0.00	AV1	41.55	11.62	0.304	86.8	42.5	0.304	0.221	0.81	0.73
14	0.00	AV1	41.95	11.62	0.313	89.5	42.6	0.313	0.232	0.73	0.78
15	0.00	AV1	41.22	11.31	0.299	85.4	42.7	0.299	0.221	0.71	0.77
16	0.00	AV1	41.35	11.90	0.301	86.1	42.7	0.301	0.218	0.87	0.68
17	0.00	AV1	39.32	11.47	0.298	85.1	42.7	0.298	0.220	0.93	0.85
18	0.00	AV1	42.08	11.68	0.306	87.5	42.6	0.306	0.228	0.99	0.75
19	0.00	AV1	41.45	11.63	0.309	88.4	42.7	0.309	0.228	0.89	0.77
20	0.00	AV1	39.93	11.59	0.304	86.9	42.5	0.304	0.226	0.88	0.85
21	0.00	AV1	40.94	11.94	0.315	90.1	42.7	0.315	0.222	1.06	0.74
22	0.00	AV1	42.36	11.97	0.309	88.3	42.6	0.309	0.233	1.12	0.79
23	0.00	AV1	42.74	11.95	0.309	88.4	42.7	0.309	0.233	0.91	0.77
24	0.00	AV1	38.79	12.43	0.308	88.0	42.6	0.308	0.209	0.98	0.68
25	0.00	AV1	42.66	11.70	0.313	89.5	42.6	0.313	0.233	0.96	0.76
26	0.00	AV1	42.56	11.90	0.318	91.0	42.7	0.318	0.230	1.07	0.75
27	0.00	AV1	42.28	11.77	0.327	93.4	42.7	0.327	0.231	1.00	0.75
28	0.00	AV1	42.86	11.77	0.313	89.5	42.7	0.313	0.234	0.90	0.78
29	0.00	AV1	38.69	12.47	0.328	93.8	42.5	0.328	0.217	1.08	0.67
30	0.00	AV1	39.50	12.24	0.311	88.9	42.8	0.311	0.207	1.02	0.67
31	0.00	AV1	41.45	11.74	0.304	86.8	42.6	0.304	0.221	0.95	0.77
32	0.00	AV1	38.72	12.05	0.314	89.7	42.6	0.314	0.209	1.05	0.66
33	0.00	AV1	38.77	11.89	0.302	86.3	42.7	0.302	0.205	0.83	0.81
34	0.00	AV1	40.79	12.08	0.315	90.1	42.7	0.315	0.212	1.06	0.69
35	0.00	AV1	40.94	11.69	0.312	89.2	42.6	0.312	0.230	0.85	0.87
36	0.00	AV1	40.33	12.02	0.326	93.2	42.7	0.326	0.215	0.85	0.66
		Average	40.80	11.79	0.306	87.6	42.6	0.306	0.220	0.88	0.75

Total number of blows analyzed: 36

Time Summary

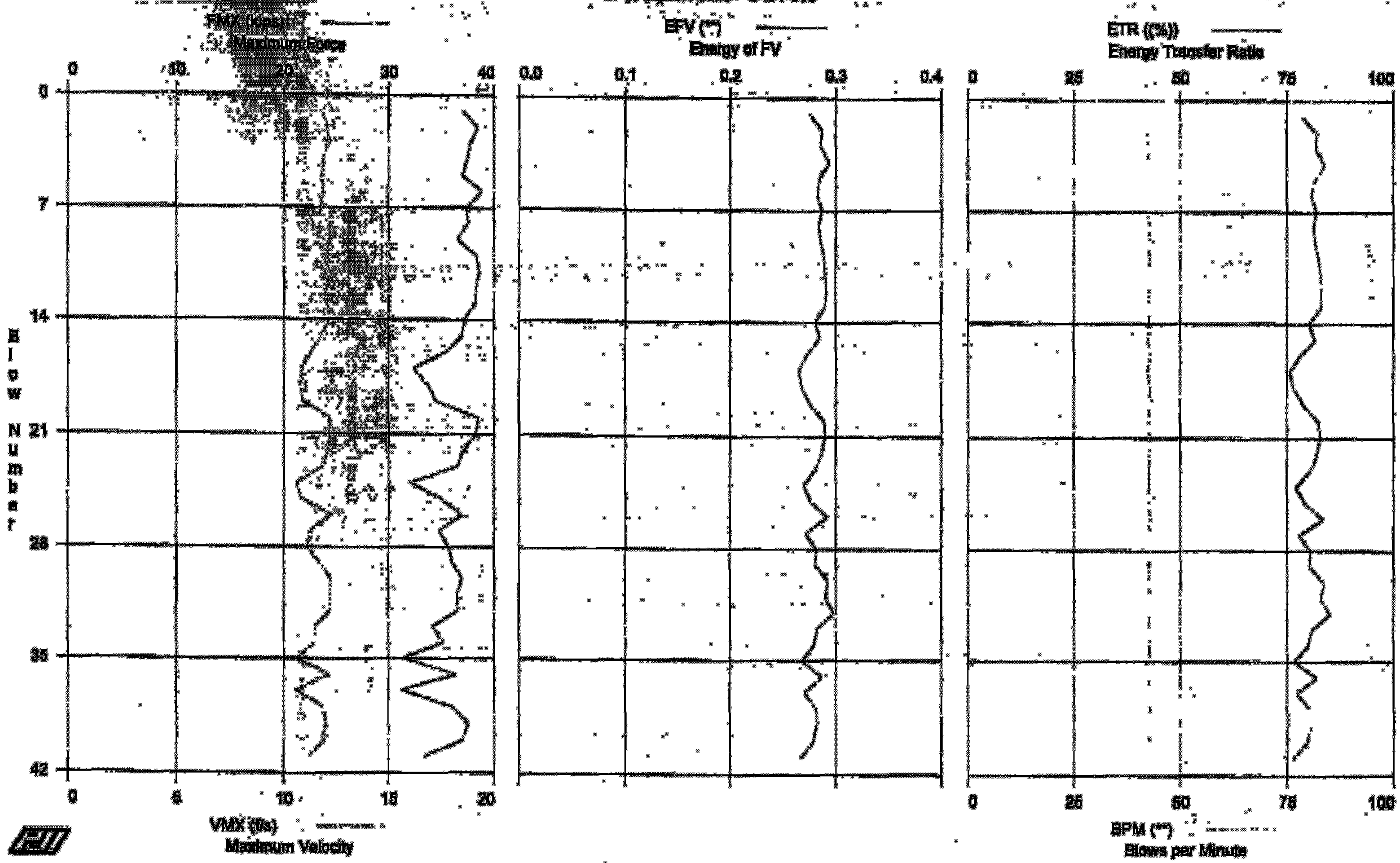
Drive 54 seconds 12:21:59 PM - 12:22:53 PM (6/23/2006) BN 1 - 36

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-500

Test date: 26-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-300
N3
OP: KB
Test date: 26-Jun-2006

AR: 2.30 in^2
LE: 304.0 ft
WS: 16,807.9 f/s
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	37.11	11.81	0.275	78.6	**	0.275	0.192	1.03	0.62
2	0.00	AV1	38.37	12.09	0.287	81.9	42.0	0.287	0.205	0.85	0.63
3	0.00	AV1	37.66	12.09	0.286	81.8	42.6	0.286	0.201	0.85	0.60
4	0.00	AV1	37.43	11.84	0.294	83.9	42.3	0.294	0.199	0.98	0.58
5	0.00	AV1	37.04	11.78	0.285	81.6	42.5	0.285	0.194	0.76	0.66
6	0.00	AV1	38.81	11.91	0.283	80.8	42.6	0.283	0.196	0.92	0.63
7	0.00	AV1	37.33	11.71	0.287	81.9	42.5	0.287	0.201	0.90	0.59
8	0.00	AV1	37.82	11.65	0.284	81.1	42.8	0.284	0.193	0.93	0.66
9	0.00	AV1	36.52	11.61	0.286	81.6	42.6	0.286	0.194	0.88	0.67
10	0.00	AV1	38.23	11.84	0.289	82.5	42.8	0.289	0.201	0.93	0.62
11	0.00	AV1	38.56	12.23	0.290	82.9	42.5	0.290	0.200	0.86	0.68
12	0.00	AV1	38.21	11.98	0.291	83.1	42.7	0.291	0.200	0.84	0.63
13	0.00	AV1	38.13	12.10	0.290	83.0	42.7	0.290	0.200	0.88	0.70
14	0.00	AV1	37.18	12.23	0.281	80.2	42.7	0.281	0.190	0.84	0.63
15	0.00	AV1	36.99	11.74	0.285	81.5	42.4	0.285	0.194	0.80	0.61
16	0.00	AV1	35.32	11.28	0.273	78.0	42.8	0.273	0.184	0.71	0.61
17	0.00	AV1	32.30	10.84	0.265	75.7	42.3	0.265	0.171	0.79	0.63
18	0.00	AV1	33.70	10.76	0.268	76.6	42.9	0.268	0.181	0.65	0.65
19	0.00	AV1	34.45	10.86	0.276	78.9	42.8	0.276	0.181	0.87	0.63
20	0.00	AV1	38.47	12.17	0.289	82.5	42.6	0.289	0.200	0.85	0.63
21	0.00	AV1	38.16	12.20	0.290	82.8	42.8	0.290	0.199	0.88	0.60
22	0.00	AV1	37.10	12.07	0.287	81.9	42.7	0.287	0.197	0.88	0.58
23	0.00	AV1	36.43	11.85	0.281	80.4	42.7	0.281	0.188	0.78	0.63
24	0.00	AV1	32.02	10.61	0.270	77.1	42.8	0.270	0.173	0.89	0.66
25	0.00	AV1	35.02	10.79	0.277	79.2	42.5	0.277	0.184	0.89	0.69
26	0.00	AV1	36.85	12.25	0.292	83.4	42.9	0.292	0.188	0.96	0.61
27	0.00	AV1	34.76	11.26	0.272	77.8	42.5	0.272	0.177	0.87	0.64
28	0.00	AV1	35.67	11.07	0.282	80.5	42.9	0.282	0.190	0.79	0.69
29	0.00	AV1	35.99	11.68	0.281	80.2	42.7	0.281	0.182	0.66	0.64
30	0.00	AV1	36.95	12.22	0.293	83.8	42.6	0.293	0.188	0.86	0.62
31	0.00	AV1	36.44	12.19	0.290	82.9	42.8	0.290	0.188	0.85	0.62
32	0.00	AV1	36.49	12.20	0.298	85.1	42.8	0.298	0.190	0.92	0.58
33	0.00	AV1	34.16	11.48	0.283	80.8	42.6	0.283	0.181	0.76	0.65
34	0.00	AV1	35.14	11.50	0.280	79.9	42.7	0.280	0.184	0.55	0.63
35	0.00	AV1	31.29	10.52	0.268	76.6	42.8	0.268	0.169	0.78	0.59
36	0.00	AV1	36.36	12.13	0.287	81.9	42.8	0.287	0.190	0.79	0.66
37	0.00	AV1	31.23	10.56	0.271	77.3	42.6	0.271	0.173	0.57	0.63
38	0.00	AV1	35.99	11.85	0.282	80.6	42.9	0.282	0.185	0.71	0.62
39	0.00	AV1	37.56	12.01	0.282	80.7	42.6	0.282	0.193	0.51	0.61
40	0.00	AV1	37.01	11.89	0.279	79.6	42.8	0.279	0.187	0.48	0.67
41	0.00	AV1	33.36	11.18	0.267	76.3	42.9	0.267	0.175	0.43	0.64
		Average	36.18	11.66	0.282	80.7	42.7	0.282	0.189	0.81	0.63

Total number of blows analyzed: 41

Time Summary

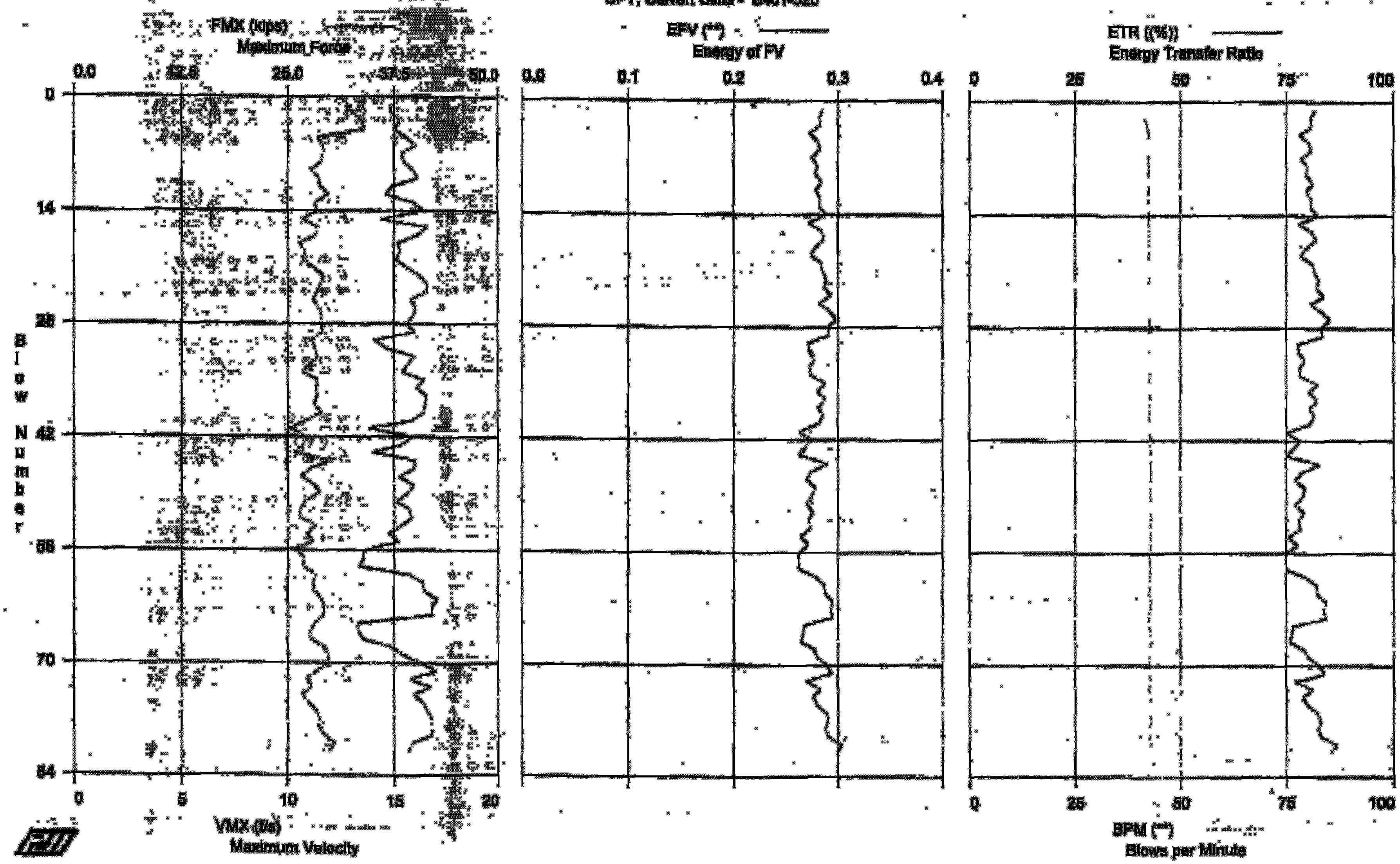
Drive 56 seconds 3:33:30 PM - 3:34:26 PM (6/26/2006) BN 1 - 41

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B401-320

Test date: 27-Jun-2006



SPT, Calvert Cliffs - B401-320
N3
OP: KR
Test date: 27-Jun-2006

AR: 2.30 in^2
LE: 324.0 ft
WS: 16,807.9 f/s
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	36.95	12.90	0.286	81.7	**	0.286	0.227	0.84	0.71
2	0.00	AV1	37.20	13.07	0.282	80.7	41.5	0.282	0.230	0.69	0.70
3	0.00	AV1	38.18	13.52	0.283	80.9	42.1	0.283	0.232	0.61	0.70
4	0.00	AV1	37.38	13.61	0.273	78.0	42.5	0.273	0.227	0.54	0.68
5	0.00	AV1	38.83	11.42	0.280	80.1	42.3	0.280	0.238	0.61	0.83
6	0.00	AV1	40.03	11.66	0.283	80.8	42.3	0.283	0.243	1.00	0.85
7	0.00	AV1	38.33	11.63	0.275	78.4	42.5	0.275	0.236	0.55	0.81
8	0.00	AV1	38.59	11.57	0.280	80.0	42.4	0.280	0.250	0.67	0.82
9	0.00	AV1	39.63	11.11	0.278	79.5	42.5	0.278	0.242	0.65	0.86
10	0.00	AV1	40.19	11.44	0.284	81.1	42.6	0.284	0.246	0.37	0.87
11	0.00	AV1	37.34	11.52	0.279	79.7	42.4	0.279	0.232	0.67	0.81
12	0.00	AV1	36.49	11.89	0.283	80.7	42.3	0.283	0.230	0.72	0.75
13	0.00	AV1	39.64	11.29	0.282	80.6	42.6	0.282	0.250	0.72	0.87
14	0.00	AV1	40.89	11.38	0.288	82.4	42.5	0.288	0.264	0.49	0.88
15	0.00	AV1	35.95	10.66	0.272	77.8	42.5	0.272	0.239	0.76	0.83
16	0.00	AV1	41.31	11.46	0.284	81.0	42.6	0.284	0.253	0.07	0.90
17	0.00	AV1	40.16	11.33	0.287	82.1	42.5	0.287	0.253	0.59	0.88
18	0.00	AV1	37.88	10.57	0.279	79.7	42.6	0.279	0.250	0.64	0.85
19	0.00	AV1	38.20	10.78	0.274	78.2	42.4	0.274	0.249	0.67	0.85
20	0.00	AV1	37.66	10.67	0.284	81.2	42.7	0.284	0.245	0.61	0.85
21	0.00	AV1	38.99	11.23	0.285	81.5	42.5	0.285	0.247	0.85	0.83
22	0.00	AV1	40.48	11.65	0.289	82.7	42.8	0.289	0.255	0.80	0.86
23	0.00	AV1	41.35	11.55	0.287	82.1	42.6	0.287	0.258	0.87	0.86
24	0.00	AV1	41.33	11.34	0.293	83.7	42.6	0.293	0.260	0.54	0.86
25	0.00	AV1	39.35	11.17	0.282	80.6	42.6	0.282	0.249	0.54	0.88
26	0.00	AV1	40.01	11.49	0.292	83.4	42.5	0.292	0.266	0.52	0.86
27	0.00	AV1	39.73	11.56	0.298	85.1	42.7	0.298	0.260	0.28	0.83
28	0.00	AV1	38.97	11.57	0.291	83.2	42.8	0.291	0.254	0.46	0.82
29	0.00	AV1	39.92	11.61	0.292	83.5	42.5	0.292	0.252	0.44	0.85
30	0.00	AV1	35.18	11.11	0.271	77.5	42.7	0.271	0.226	0.36	0.79
31	0.00	AV1	36.47	11.27	0.273	77.9	42.6	0.273	0.228	0.66	0.80
32	0.00	AV1	39.77	11.35	0.277	79.2	42.7	0.277	0.246	0.64	0.86
33	0.00	AV1	39.02	11.05	0.273	78.0	42.5	0.273	0.239	0.53	0.83
34	0.00	AV1	38.42	10.66	0.274	78.3	42.8	0.274	0.238	0.64	0.84
35	0.00	AV1	40.85	11.39	0.288	82.2	42.6	0.288	0.253	0.69	0.88
36	0.00	AV1	40.12	11.32	0.280	80.1	42.6	0.280	0.249	0.60	0.88
37	0.00	AV1	41.28	11.37	0.288	82.2	42.8	0.288	0.254	0.84	0.88
38	0.00	AV1	41.16	11.24	0.281	80.3	42.8	0.281	0.251	0.65	0.88
39	0.00	AV1	40.97	11.58	0.286	81.6	42.7	0.286	0.253	0.55	0.88
40	0.00	AV1	39.59	10.90	0.281	80.2	42.6	0.281	0.256	0.49	0.85
41	0.00	AV1	34.46	10.14	0.263	75.1	42.6	0.263	0.238	-0.23	0.84
42	0.00	AV1	39.50	10.77	0.273	78.1	42.8	0.273	0.242	0.28	0.86
43	0.00	AV1	38.35	10.78	0.269	76.8	42.8	0.269	0.238	0.50	0.86
44	0.00	AV1	35.00	10.29	0.263	75.2	43.1	0.263	0.228	0.68	0.82
45	0.00	AV1	40.07	11.89	0.289	82.7	42.9	0.289	0.251	0.79	0.83
46	0.00	AV1	39.72	11.05	0.274	78.4	42.9	0.274	0.246	0.41	0.87
47	0.00	AV1	38.01	10.61	0.270	77.0	42.9	0.270	0.238	0.21	0.83
48	0.00	AV1	39.74	11.22	0.278	79.3	42.9	0.278	0.249	0.43	0.81
49	0.00	AV1	39.03	11.48	0.275	78.7	42.9	0.275	0.246	0.27	0.81
50	0.00	AV1	37.76	10.82	0.270	77.1	42.8	0.270	0.241	0.35	0.83
51	0.00	AV1	39.24	10.60	0.276	78.8	42.8	0.276	0.256	0.38	0.89
52	0.00	AV1	39.53	10.53	0.272	77.8	43.0	0.272	0.237	-0.22	0.85
53	0.00	AV1	38.30	11.30	0.274	78.3	42.8	0.274	0.237	0.54	0.82
54	0.00	AV1	36.92	10.87	0.264	75.5	43.0	0.264	0.235	0.46	0.79
55	0.00	AV1	37.99	11.16	0.272	77.6	42.9	0.272	0.248	0.02	0.83
56	0.00	AV1	33.93	10.35	0.263	75.0	42.8	0.263	0.223	0.41	0.76
57	0.00	AV1	33.97	10.79	0.262	74.9	42.6	0.262	0.223	0.46	0.76
58	0.00	AV1	33.42	10.67	0.263	75.1	42.9	0.263	0.225	0.07	0.76
59	0.00	AV1	39.28	11.31	0.279	79.6	42.7	0.279	0.252	0.33	0.85
60	0.00	AV1	40.84	11.20	0.287	82.0	42.8	0.287	0.257	0.39	0.84
61	0.00	AV1	40.98	11.26	0.288	82.2	42.5	0.288	0.256	0.24	0.89

SPT, Calvert Cliffs - B401-320 N3
OP: EB Test date: 27-Jun-2006

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
62	0.00	AV1	42.51	11.57	0.295	84.3	43.0	0.295	0.262	0.32	0.86
63	0.00	AV1	41.90	11.70	0.293	83.6	42.9	0.293	0.263	0.20	0.85
64	0.00	AV1	41.97	11.68	0.295	84.4	42.4	0.295	0.282	0.26	0.86
65	0.00	AV1	33.31	11.31	0.268	76.7	42.6	0.268	0.218	0.29	0.73
66	0.00	AV1	33.32	11.03	0.267	76.4	43.0	0.267	0.217	0.27	0.73
67	0.00	AV1	33.89	11.08	0.265	75.8	42.7	0.265	0.223	0.32	0.76
68	0.00	AV1	37.17	11.73	0.277	79.2	42.9	0.277	0.241	0.24	0.78
69	0.00	AV1	38.59	11.91	0.280	80.1	42.8	0.280	0.237	0.21	0.76
70	0.00	AV1	40.55	11.85	0.290	82.8	42.7	0.290	0.252	0.31	0.80
71	0.00	AV1	42.51	11.38	0.294	84.0	42.6	0.294	0.259	0.13	0.86
72	0.00	AV1	39.28	10.91	0.270	77.1	42.9	0.270	0.240	0.09	0.84
73	0.00	AV1	41.65	11.14	0.283	81.0	42.6	0.283	0.248	0.34	0.87
74	0.00	AV1	39.81	10.69	0.276	78.7	43.1	0.276	0.237	0.32	0.86
75	0.00	AV1	40.94	10.97	0.280	80.0	42.6	0.280	0.259	0.15	0.89
76	0.00	AV1	41.40	11.35	0.289	82.4	42.7	0.289	0.279	0.18	0.90
77	0.00	AV1	41.94	11.50	0.291	83.1	43.2	0.291	0.266	0.20	0.88
78	0.00	AV1	41.96	11.45	0.288	82.3	42.6	0.288	0.254	0.20	0.86
79	0.00	AV1	41.89	11.71	0.291	83.1	42.7	0.291	0.255	0.25	0.85
80	0.00	AV1	39.63	12.23	0.303	86.7	42.9	0.303	0.246	0.26	0.77
81	0.00	AV1	39.12	11.92	0.299	85.3	42.7	0.299	0.246	0.27	0.77
		Average	38.93	11.33	0.280	80.1	42.7	0.280	0.245	0.44	0.83

Total number of blows analyzed: 81

Time Summary

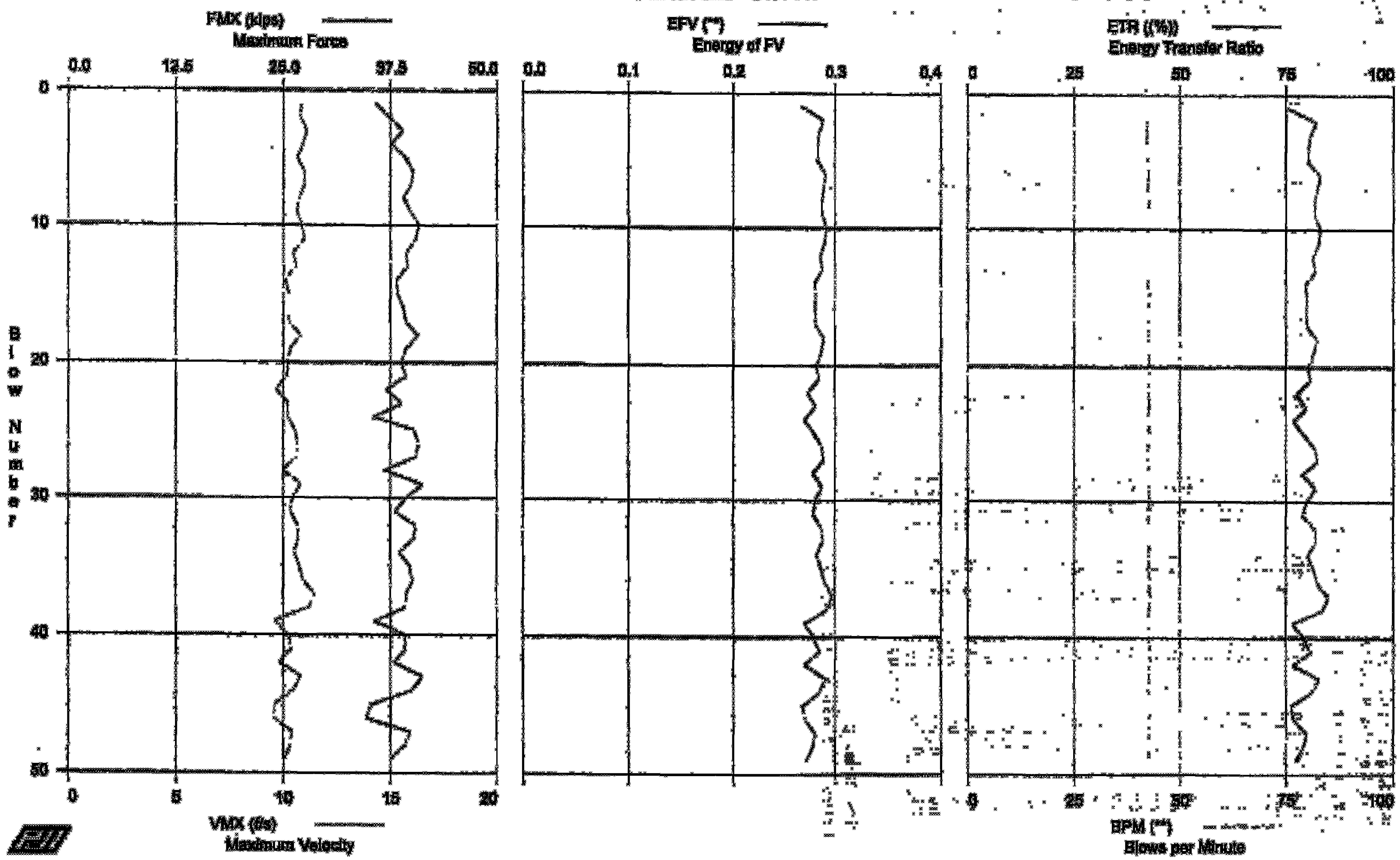
Drive 1 minute 52 seconds 9:15:39 AM - 9:17:31 AM (6/27/2006) BN 1 - 81

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2008

GRL Engineers, Inc. - Case Method Results

Test date: 27-Jun-2008

SPT, Calvert Cliffs - B401-340



GRL Engineers, Inc.
Case Method Results

SPT, Calvert Cliffs - B401-340
N3
OP: KF
Test date: 27-Jun-2006

AR: 2.30 in^2
LE: 344.0 ft
WS: 16,807.9 f/s
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	35.74	10.82	0.265	75.6	**	0.265	0.246	0.54	0.80
2	0.00	AV1	37.35	10.76	0.287	82.0	42.3	0.287	0.265	0.63	0.86
3	0.00	AV1	38.93	11.05	0.282	80.7	42.3	0.282	0.266	0.82	0.87
4	0.00	AV1	37.61	10.88	0.281	80.1	42.2	0.281	0.256	0.86	0.86
5	0.00	AV1	39.29	10.63	0.281	80.2	42.6	0.281	0.268	0.69	0.90
6	0.00	AV1	40.19	10.94	0.290	83.0	42.8	0.290	0.276	0.74	0.90
7	0.00	AV1	39.92	10.95	0.288	82.4	42.5	0.288	0.276	0.76	0.90
8	0.00	AV1	39.07	10.72	0.286	81.6	42.8	0.286	0.275	0.72	0.89
9	0.00	AV1	39.90	10.61	0.286	81.7	42.5	0.286	0.273	0.56	0.93
10	0.00	AV1	40.85	10.83	0.291	83.1	42.6	0.291	0.281	0.70	0.94
11	0.00	AV1	40.48	10.96	0.289	82.6	42.5	0.289	0.276	0.60	0.92
12	0.00	AV1	39.34	10.43	0.284	81.1	42.6	0.284	0.269	0.78	0.90
13	0.00	AV1	39.49	10.56	0.286	81.8	42.7	0.286	0.275	0.48	0.91
14	0.00	AV1	38.21	10.08	0.278	79.5	42.4	0.278	0.264	0.52	0.94
15	0.00	AV1	38.37	10.24	0.279	79.8	42.9	0.279	0.266	0.58	0.91
16	0.00	AV1	39.06	10.27	0.279	79.8	42.5	0.279	0.268	0.67	0.91
17	0.00	AV1	39.38	10.24	0.279	79.8	42.7	0.279	0.265	0.74	0.92
18	0.00	AV1	40.72	10.77	0.288	82.3	42.6	0.288	0.278	0.58	0.94
19	0.00	AV1	39.33	10.31	0.285	81.3	42.8	0.285	0.271	0.66	0.90
20	0.00	AV1	38.79	10.17	0.280	80.1	42.7	0.280	0.267	0.68	0.95
21	0.00	AV1	39.38	10.20	0.283	80.8	42.6	0.283	0.268	0.63	0.93
22	0.00	AV1	37.03	9.66	0.271	77.5	42.7	0.271	0.258	0.68	0.94
23	0.00	AV1	38.87	10.19	0.279	79.7	42.7	0.279	0.268	0.69	0.91
24	0.00	AV1	35.41	10.18	0.268	76.7	42.6	0.268	0.248	0.69	0.86
25	0.00	AV1	40.26	10.51	0.277	79.1	42.9	0.277	0.267	0.82	0.95
26	0.00	AV1	40.78	10.61	0.286	81.8	42.7	0.286	0.273	0.54	0.96
27	0.00	AV1	40.46	10.65	0.288	82.4	42.6	0.288	0.275	0.61	0.94
28	0.00	AV1	36.80	9.96	0.276	78.8	42.8	0.276	0.256	0.82	0.91
29	0.00	AV1	41.25	10.76	0.286	81.8	42.6	0.286	0.273	0.64	0.95
30	0.00	AV1	39.34	10.42	0.279	79.8	42.8	0.279	0.267	0.42	0.93
31	0.00	AV1	38.01	10.29	0.276	78.8	42.6	0.276	0.258	0.45	0.91
32	0.00	AV1	40.45	10.63	0.286	81.8	42.8	0.286	0.272	0.48	0.93
33	0.00	AV1	40.19	10.66	0.287	82.0	42.8	0.287	0.274	0.41	0.92
34	0.00	AV1	38.56	10.48	0.280	80.1	42.6	0.280	0.263	0.61	0.90
35	0.00	AV1	39.73	10.70	0.285	81.4	42.9	0.285	0.271	0.38	0.92
36	0.00	AV1	40.10	10.88	0.289	82.4	42.6	0.289	0.272	0.44	0.91
37	0.00	AV1	39.33	11.43	0.297	84.8	43.1	0.297	0.269	0.50	0.86
38	0.00	AV1	39.28	11.18	0.292	83.4	42.7	0.292	0.270	0.43	0.85
39	0.00	AV1	35.64	9.62	0.268	76.5	42.7	0.268	0.248	0.71	0.92
40	0.00	AV1	39.24	10.49	0.277	79.1	42.6	0.277	0.263	0.71	0.95
41	0.00	AV1	39.21	10.35	0.283	80.8	43.1	0.283	0.267	0.55	0.91
42	0.00	AV1	37.96	9.82	0.268	76.5	42.8	0.268	0.254	0.63	0.96
43	0.00	AV1	41.28	10.77	0.290	82.7	42.8	0.290	0.270	0.54	0.95
44	0.00	AV1	39.84	10.43	0.283	80.8	42.6	0.283	0.266	0.56	0.95
45	0.00	AV1	35.19	9.57	0.266	76.1	42.6	0.266	0.245	0.53	0.91
46	0.00	AV1	34.64	9.54	0.269	76.9	42.1	0.269	0.251	0.40	0.90
47	0.00	AV1	39.78	10.40	0.279	79.8	42.7	0.279	0.261	0.55	0.95
48	0.00	AV1	39.15	10.30	0.276	79.0	42.9	0.276	0.262	0.34	0.94
49	0.00	AV1	37.46	10.03	0.270	77.3	42.5	0.270	0.254	0.34	0.93
		Average	38.91	10.46	0.281	80.3	42.7	0.281	0.266	0.60	0.91

Total number of blows analyzed: 49

Time Summary

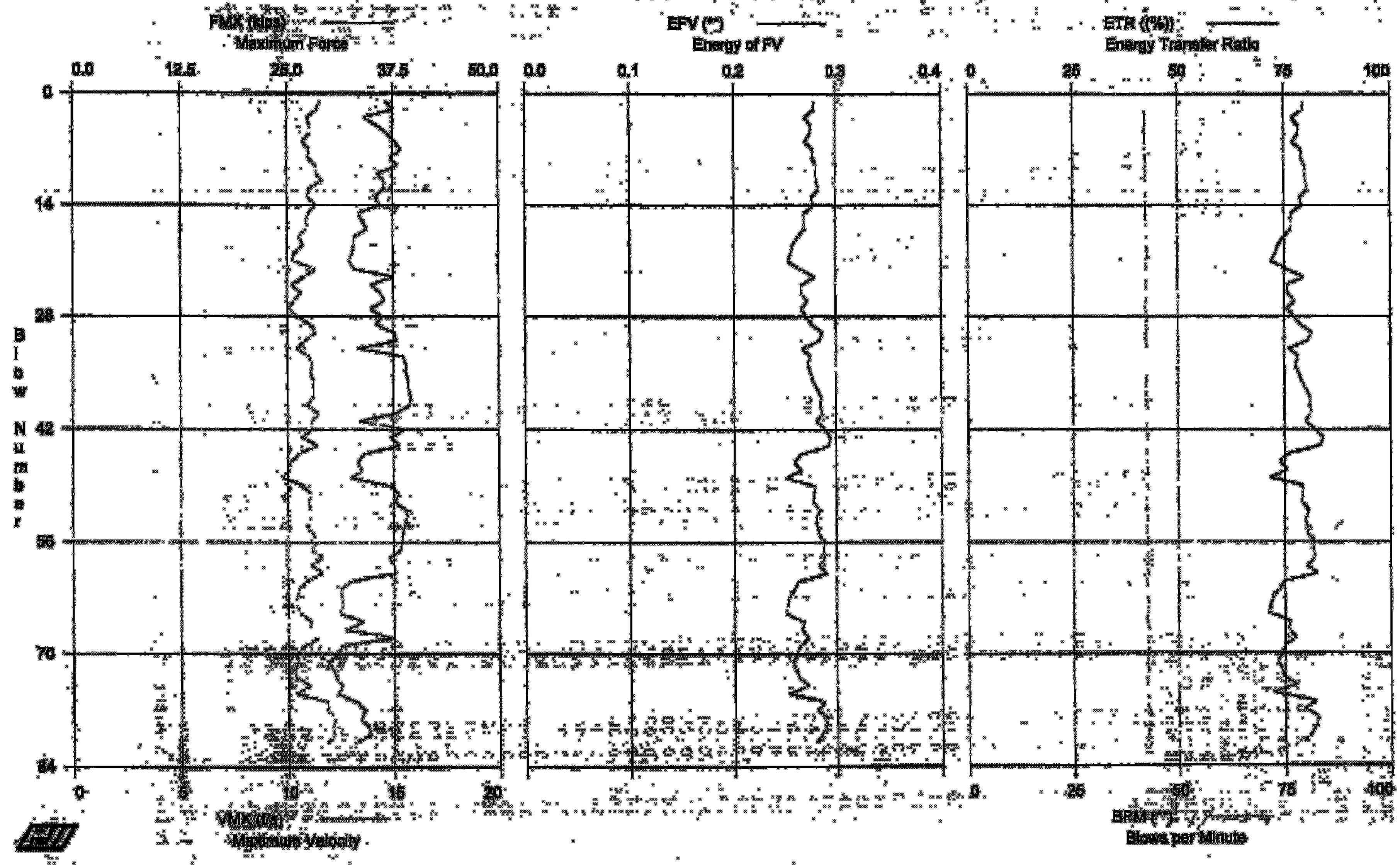
Drive 1 minute 7 seconds 11:19:19 AM - 11:20:26 AM (6/27/2006) BN 1 - 49

FDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 27-Jun-2006

SPT, Calvert Cliffs - B401-360



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-360 N3
OP: KB Test date: 27-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 364.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force EMX: Max Transferred Energy
VMX: Maximum Velocity EF2: Energy of F^2
EFV: Energy of FV DFN: Final Displacement
ETR: Energy Transfer Ratio FVP: Force/Velocity proportionality
BPM: Blows per Minute

BL#	Depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	36.61	11.56	0.278	79.5	**	0.278	0.261	0.46	0.78
2	0.00	AV1	37.51	11.40	0.278	79.3	42.2	0.278	0.238	0.56	0.81
3	0.00	AV1	34.08	10.96	0.269	76.8	42.3	0.269	0.257	0.47	0.77
4	0.00	AV1	35.64	11.05	0.275	78.5	42.2	0.275	0.262	0.50	0.80
5	0.00	AV1	36.80	11.07	0.274	78.3	42.3	0.274	0.228	0.64	0.82
6	0.00	AV1	37.70	10.72	0.269	77.0	42.3	0.269	0.270	0.70	0.87
7	0.00	AV1	38.37	11.03	0.277	79.1	42.3	0.277	0.274	0.54	0.86
8	0.00	AV1	37.17	10.97	0.276	78.9	42.4	0.276	0.270	0.50	0.84
9	0.00	AV1	37.96	11.32	0.280	80.0	42.3	0.280	0.270	0.50	0.83
10	0.00	AV1	35.72	11.37	0.279	79.8	42.6	0.279	0.261	0.51	0.78
11	0.00	AV1	36.42	11.63	0.280	80.1	42.6	0.280	0.260	0.48	0.76
12	0.00	AV1	36.40	11.02	0.282	80.4	42.6	0.282	0.268	0.57	0.81
13	0.00	AV1	35.33	10.94	0.275	78.6	42.3	0.275	0.261	0.41	0.80
14	0.00	AV1	35.94	11.31	0.277	79.1	42.4	0.277	0.260	0.48	0.79
15	0.00	AV1	33.41	11.00	0.268	76.7	42.4	0.268	0.242	0.49	0.75
16	0.00	AV1	33.93	10.88	0.268	76.5	42.6	0.268	0.248	0.51	0.77
17	0.00	AV1	34.47	10.89	0.268	76.6	42.6	0.268	0.251	0.68	0.78
18	0.00	AV1	32.91	10.52	0.262	74.9	42.5	0.262	0.240	0.58	0.78
19	0.00	AV1	32.88	10.73	0.257	73.5	42.6	0.257	0.236	0.49	0.76
20	0.00	AV1	32.67	10.34	0.255	72.9	42.8	0.255	0.234	0.46	0.78
21	0.00	AV1	32.28	10.23	0.252	72.0	42.3	0.252	0.229	0.51	0.78
22	0.00	AV1	32.91	11.32	0.265	75.6	42.5	0.265	0.239	0.46	0.72
23	0.00	AV1	37.49	10.77	0.278	79.6	42.7	0.278	0.273	0.53	0.86
24	0.00	AV1	34.88	10.19	0.265	75.6	42.4	0.265	0.257	0.40	0.85
25	0.00	AV1	35.98	10.63	0.265	75.8	42.7	0.265	0.256	0.51	0.84
26	0.00	AV1	36.44	10.31	0.271	77.3	42.4	0.271	0.265	0.48	0.88
27	0.00	AV1	34.83	10.08	0.265	75.6	42.2	0.265	0.256	0.16	0.86
28	0.00	AV1	36.17	10.43	0.270	77.2	42.8	0.270	0.262	0.36	0.86
29	0.00	AV1	35.43	11.06	0.275	78.7	42.5	0.275	0.256	0.49	0.79
30	0.00	AV1	37.60	11.32	0.285	81.4	42.6	0.285	0.268	0.23	0.82
31	0.00	AV1	37.86	10.85	0.282	80.6	42.4	0.282	0.270	0.43	0.87
32	0.00	AV1	33.26	10.43	0.266	76.0	42.6	0.266	0.249	0.63	0.79
33	0.00	AV1	38.62	10.99	0.274	78.2	42.6	0.274	0.269	0.60	0.87
34	0.00	AV1	38.97	11.16	0.271	77.5	42.5	0.271	0.267	0.41	0.86
35	0.00	AV1	38.99	11.06	0.274	78.3	42.6	0.274	0.270	0.33	0.87
36	0.00	AV1	39.22	11.22	0.276	79.0	42.5	0.276	0.269	0.38	0.87
37	0.00	AV1	39.26	11.23	0.280	79.9	42.5	0.280	0.272	0.39	0.87
38	0.00	AV1	39.54	11.21	0.284	81.0	42.5	0.284	0.278	0.39	0.87
39	0.00	AV1	39.36	10.91	0.283	81.0	42.7	0.283	0.279	0.23	0.87
40	0.00	AV1	37.78	11.43	0.285	81.3	42.6	0.285	0.267	0.41	0.82
41	0.00	AV1	33.46	11.14	0.279	79.8	42.5	0.279	0.252	0.50	0.75
42	0.00	AV1	38.72	11.13	0.288	82.2	42.5	0.288	0.277	0.52	0.86
43	0.00	AV1	37.19	10.67	0.294	84.0	42.8	0.294	0.275	0.62	0.84
44	0.00	AV1	38.18	11.39	0.292	83.3	42.6	0.292	0.280	0.30	0.82
45	0.00	AV1	34.02	10.51	0.265	75.7	42.5	0.265	0.246	0.51	0.80
46	0.00	AV1	33.26	10.15	0.258	72.8	42.5	0.258	0.242	0.47	0.81
47	0.00	AV1	33.79	10.06	0.265	75.7	42.8	0.265	0.243	0.48	0.85
48	0.00	AV1	32.45	9.75	0.250	71.5	42.6	0.250	0.235	0.34	0.83
49	0.00	AV1	37.18	10.78	0.278	79.3	42.7	0.278	0.269	0.44	0.85
50	0.00	AV1	38.13	11.07	0.277	79.2	42.6	0.277	0.267	0.37	0.85
51	0.00	AV1	37.61	10.98	0.276	79.0	42.4	0.276	0.229	0.45	0.84
52	0.00	AV1	39.01	11.06	0.282	80.6	42.5	0.282	0.271	0.45	0.87
53	0.00	AV1	39.00	11.07	0.279	79.9	42.8	0.279	0.271	0.35	0.86
54	0.00	AV1	38.77	10.93	0.280	80.1	42.5	0.280	0.269	0.25	0.86
55	0.00	AV1	38.54	11.21	0.281	80.4	42.6	0.281	0.270	0.32	0.85
56	0.00	AV1	38.43	11.34	0.287	81.9	42.8	0.287	0.273	0.33	0.84
57	0.00	AV1	38.31	11.11	0.286	81.7	42.4	0.286	0.232	0.36	0.82
58	0.00	AV1	37.00	11.61	0.287	82.0	42.7	0.287	0.267	0.58	0.79
59	0.00	AV1	37.48	11.08	0.281	80.2	42.4	0.281	0.263	0.60	0.82
60	0.00	AV1	37.65	11.62	0.289	82.6	42.9	0.289	0.270	0.59	0.80
61	0.00	AV1	32.44	10.89	0.262	75.0	42.4	0.262	0.234	0.33	0.74

Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-360 N3
OP: KB Test date: 27-Jun-2006

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
62	0.00	AV1	31.17	10.55	0.258	73.7	42.5	0.258	0.223	0.48	0.74
63	0.00	AV1	31.29	10.42	0.252	72.1	42.6	0.252	0.223	0.34	0.75
64	0.00	AV1	31.44	10.40	0.251	71.6	42.8	0.251	0.221	0.39	0.75
65	0.00	AV1	31.01	10.58	0.249	71.2	42.6	0.249	0.222	0.34	0.73
66	0.00	AV1	33.90	11.08	0.267	76.2	42.4	0.267	0.241	0.41	0.76
67	0.00	AV1	31.82	10.99	0.265	75.8	43.0	0.265	0.237	0.39	0.71
68	0.00	AV1	37.57	11.38	0.271	77.5	42.6	0.271	0.219	0.36	0.82
69	0.00	AV1	31.23	10.75	0.263	75.0	42.9	0.263	0.232	0.37	0.72
70	0.00	AV1	30.80	10.39	0.260	74.3	42.6	0.260	0.229	0.32	0.74
71	0.00	AV1	29.72	10.47	0.256	73.2	42.5	0.256	0.222	0.38	0.70
72	0.00	AV1	30.29	10.27	0.260	74.3	42.8	0.260	0.227	0.47	0.74
73	0.00	AV1	30.59	10.37	0.262	74.7	42.6	0.262	0.233	0.51	0.73
74	0.00	AV1	31.33	11.00	0.271	77.6	42.6	0.271	0.237	0.64	0.70
75	0.00	AV1	30.83	10.39	0.252	72.0	42.6	0.252	0.227	0.44	0.73
76	0.00	AV1	33.04	11.84	0.287	82.0	42.8	0.287	0.248	0.44	0.69
77	0.00	AV1	34.07	11.84	0.279	79.6	42.6	0.279	0.247	0.47	0.71
78	0.00	AV1	33.60	12.21	0.289	82.6	42.9	0.289	0.252	0.59	0.68
79	0.00	AV1	34.41	12.10	0.288	82.4	42.6	0.288	0.255	0.47	0.70
80	0.00	AV1	34.69	12.14	0.284	81.3	42.7	0.284	0.256	0.48	0.71
81	0.00	AV1	32.84	11.82	0.278	79.4	42.4	0.278	0.241	0.36	0.69
		Average	35.37	10.96	0.273	77.9	42.6	0.273	0.253	0.46	0.80

Total number of blows analyzed: 81

Time Summary

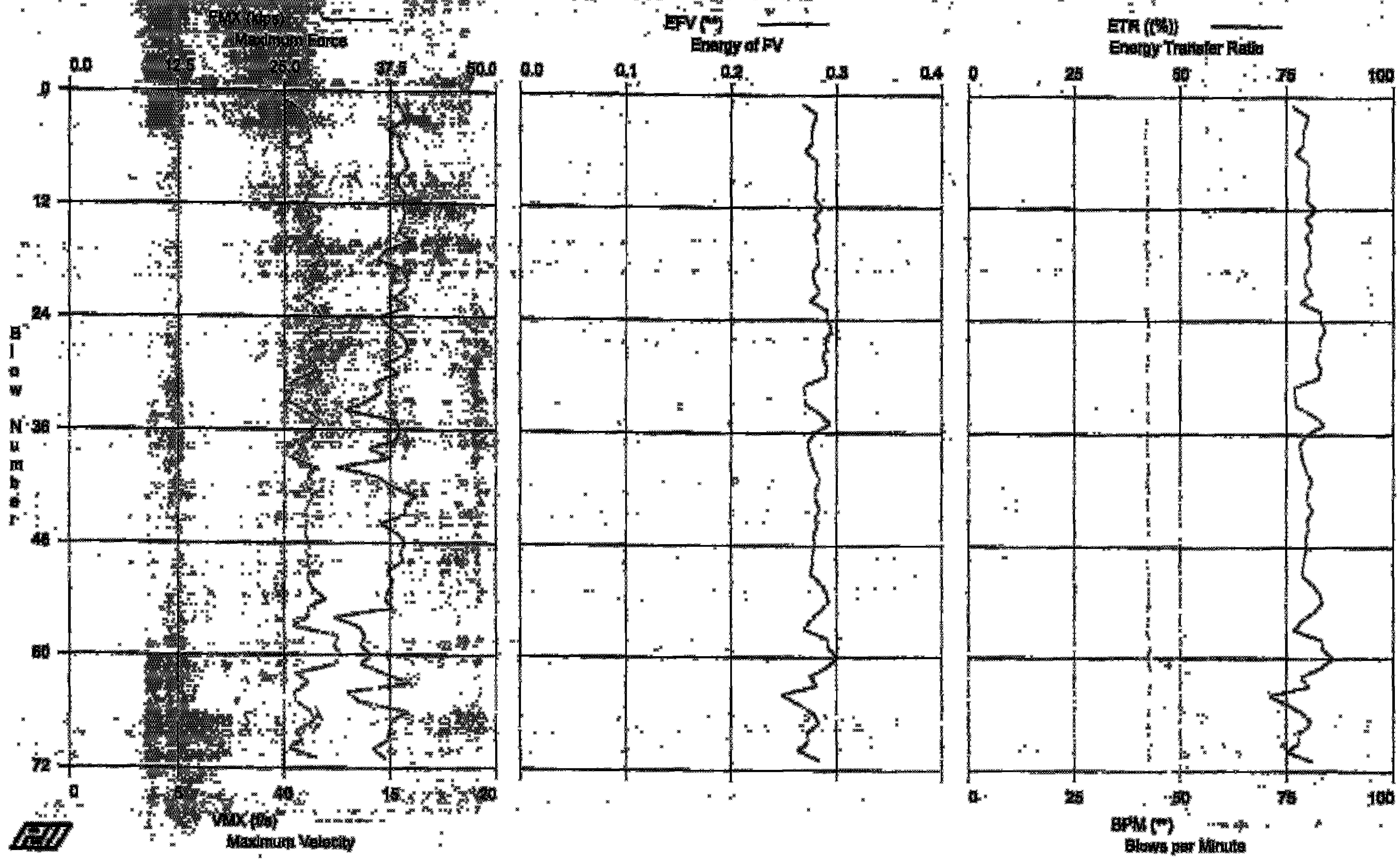
Drive 1 minute 53 seconds 3:18:27 PM - 3:20:20 PM (6/27/2006) BN 1 - 81

PDIPLOT Ver. 2005.2 - Printed: [illegible]

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - 5401-380

Test date: 28-Jun-2006



SPT, Calvert Cliffs - B401-380
OP: KB

N3
Test date: 28-Jun-2006

AR: 2.30 in^2
LE: 384.0 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	[%]	**	k-ft	k-ft	in	[]
1	0.00	AV1	38.04	10.08	0.268	76.5	**	0.268	0.249	0.53	0.93
2	0.00	AV1	38.77	10.71	0.281	80.3	41.8	0.281	0.252	0.54	0.85
3	0.00	AV1	39.00	11.07	0.278	79.5	42.1	0.278	0.251	0.52	0.83
4	0.00	AV1	37.19	11.12	0.276	78.9	41.8	0.276	0.240	0.54	0.80
5	0.00	AV1	38.67	11.22	0.277	79.1	41.8	0.277	0.254	0.57	0.81
6	0.00	AV1	38.47	10.70	0.270	77.2	41.8	0.270	0.253	0.57	0.86
7	0.00	AV1	39.12	10.97	0.281	80.2	42.0	0.281	0.258	0.65	0.88
8	0.00	AV1	39.55	11.03	0.281	80.3	42.3	0.281	0.262	0.58	0.88
9	0.00	AV1	38.44	11.46	0.280	79.9	42.0	0.280	0.255	0.41	0.83
10	0.00	AV1	38.42	11.09	0.281	80.4	42.3	0.281	0.258	0.65	0.86
11	0.00	AV1	39.26	11.11	0.279	79.8	42.2	0.279	0.257	0.41	0.88
12	0.00	AV1	38.85	10.86	0.286	81.8	42.2	0.286	0.262	0.68	0.89
13	0.00	AV1	39.19	11.12	0.278	79.5	42.1	0.278	0.254	0.65	0.88
14	0.00	AV1	38.92	11.27	0.284	81.1	42.3	0.284	0.259	0.64	0.85
15	0.00	AV1	38.37	11.03	0.279	79.7	42.1	0.279	0.254	0.64	0.86
16	0.00	AV1	39.84	11.47	0.282	80.7	42.0	0.282	0.258	0.60	0.86
17	0.00	AV1	36.79	11.68	0.281	80.3	42.0	0.281	0.244	0.58	0.78
18	0.00	AV1	35.98	11.78	0.283	80.7	42.5	0.283	0.243	0.64	0.75
19	0.00	AV1	38.74	11.02	0.277	79.3	42.0	0.277	0.257	0.58	0.87
20	0.00	AV1	39.43	10.94	0.279	79.7	42.3	0.279	0.257	0.49	0.89
21	0.00	AV1	39.34	11.42	0.284	81.1	42.1	0.284	0.256	0.55	0.86
22	0.00	AV1	37.94	10.78	0.275	78.4	42.1	0.275	0.248	0.59	0.88
23	0.00	AV1	39.45	11.44	0.291	83.0	41.9	0.291	0.269	0.45	0.86
24	0.00	AV1	36.27	11.69	0.291	83.1	42.4	0.291	0.254	0.56	0.73
25	0.00	AV1	37.20	11.63	0.295	84.2	42.6	0.295	0.258	0.59	0.77
26	0.00	AV1	38.82	11.14	0.290	82.9	42.3	0.290	0.267	0.46	0.86
27	0.00	AV1	39.52	11.43	0.290	83.0	42.3	0.290	0.262	0.56	0.85
28	0.00	AV1	39.26	11.14	0.287	82.0	42.4	0.287	0.265	0.57	0.87
29	0.00	AV1	36.79	11.38	0.291	83.1	42.1	0.291	0.258	0.48	0.80
30	0.00	AV1	38.38	11.29	0.289	82.5	42.0	0.289	0.264	0.40	0.84
31	0.00	AV1	35.52	10.31	0.269	76.9	42.4	0.269	0.241	0.42	0.84
32	0.00	AV1	36.34	10.38	0.270	77.0	42.3	0.270	0.244	0.37	0.84
33	0.00	AV1	34.68	10.16	0.271	77.4	42.4	0.271	0.244	0.52	0.82
34	0.00	AV1	32.30	11.02	0.285	81.4	42.3	0.285	0.242	0.53	0.70
35	0.00	AV1	38.19	11.65	0.294	83.9	42.3	0.294	0.258	0.45	0.80
36	0.00	AV1	38.52	11.31	0.279	79.8	42.2	0.279	0.257	0.48	0.84
37	0.00	AV1	38.10	10.78	0.273	78.1	42.3	0.273	0.252	0.38	0.84
38	0.00	AV1	35.03	10.73	0.274	78.3	42.2	0.274	0.242	0.44	0.81
39	0.00	AV1	37.61	10.41	0.276	79.0	42.4	0.276	0.252	0.54	0.89
40	0.00	AV1	31.19	11.48	0.280	79.9	42.3	0.280	0.232	0.50	0.67
41	0.00	AV1	36.03	11.15	0.284	81.1	42.3	0.284	0.251	0.33	0.76
42	0.00	AV1	37.68	11.07	0.280	80.0	42.5	0.280	0.252	0.43	0.82
43	0.00	AV1	40.24	11.34	0.280	80.0	42.2	0.280	0.257	0.45	0.88
44	0.00	AV1	39.30	11.10	0.284	81.2	42.3	0.284	0.258	0.42	0.86
45	0.00	AV1	39.15	10.97	0.280	80.1	42.4	0.280	0.254	0.51	0.89
46	0.00	AV1	36.29	11.06	0.281	80.2	42.6	0.281	0.243	0.49	0.81
47	0.00	AV1	38.37	10.99	0.278	79.6	42.4	0.278	0.251	0.55	0.85
48	0.00	AV1	39.21	11.14	0.279	79.9	42.3	0.279	0.253	0.32	0.86
49	0.00	AV1	38.72	11.26	0.277	79.3	42.4	0.277	0.251	0.36	0.85
50	0.00	AV1	38.92	11.10	0.277	79.0	42.1	0.277	0.249	0.47	0.87
51	0.00	AV1	37.15	11.21	0.275	78.7	42.7	0.275	0.238	0.41	0.82
52	0.00	AV1	37.75	11.10	0.284	81.2	42.3	0.284	0.253	0.35	0.85
53	0.00	AV1	37.34	11.35	0.290	82.8	42.5	0.290	0.247	0.58	0.82
54	0.00	AV1	36.89	11.95	0.292	83.3	42.5	0.292	0.249	0.50	0.77
55	0.00	AV1	37.73	11.14	0.285	81.5	42.3	0.285	0.250	0.32	0.81
56	0.00	AV1	30.89	11.08	0.275	78.4	42.5	0.275	0.223	0.37	0.69
57	0.00	AV1	33.82	10.45	0.269	76.8	42.0	0.269	0.232	0.30	0.80
58	0.00	AV1	34.49	12.59	0.291	83.3	42.6	0.291	0.234	0.25	0.63
59	0.00	AV1	33.97	12.34	0.292	83.5	42.6	0.292	0.233	0.33	0.62
60	0.00	AV1	35.13	12.68	0.301	85.9	42.1	0.301	0.241	0.38	0.62
61	0.00	AV1	34.02	12.38	0.291	83.1	42.9	0.291	0.236	0.35	0.63

SPT, Calvert Cliffs - B401-380   N3
OP: KB   Test date: 28-Jun-2006

BL# end	depth ft	TYPE :	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
62	0.00	AV1	36.86	10.56	0.275	78.5	42.5	0.275	0.246	0.38	0.87
63	0.00	AV1	39.81	11.14	0.281	80.3	42.7	0.281	0.255	0.25	0.88
64	0.00	AV1	32.50	10.45	0.248	71.0	42.3	0.248	0.203	0.29	0.77
65	0.00	AV1	33.88	10.54	0.264	75.6	42.3	0.264	0.224	0.23	0.78
66	0.00	AV1	39.50	11.24	0.278	79.3	42.6	0.278	0.251	0.21	0.87
67	0.00	AV1	37.46	11.44	0.283	80.8	42.4	0.283	0.245	0.23	0.81
68	0.00	AV1	37.35	10.68	0.272	77.7	42.4	0.272	0.243	0.18	0.87
69	0.00	AV1	37.22	10.81	0.273	77.9	42.9	0.273	0.243	0.28	0.86
70	0.00	AV1	35.43	10.25	0.263	75.0	42.1	0.263	0.232	0.26	0.86
71	0.00	AV1	36.81	11.52	0.284	81.2	42.6	0.284	0.242	0.35	0.79
		Average	37.35	11.15	0.280	80.1	42.3	0.280	0.249	0.45	0.82

Total number of blows analyzed: 71

Time Summary

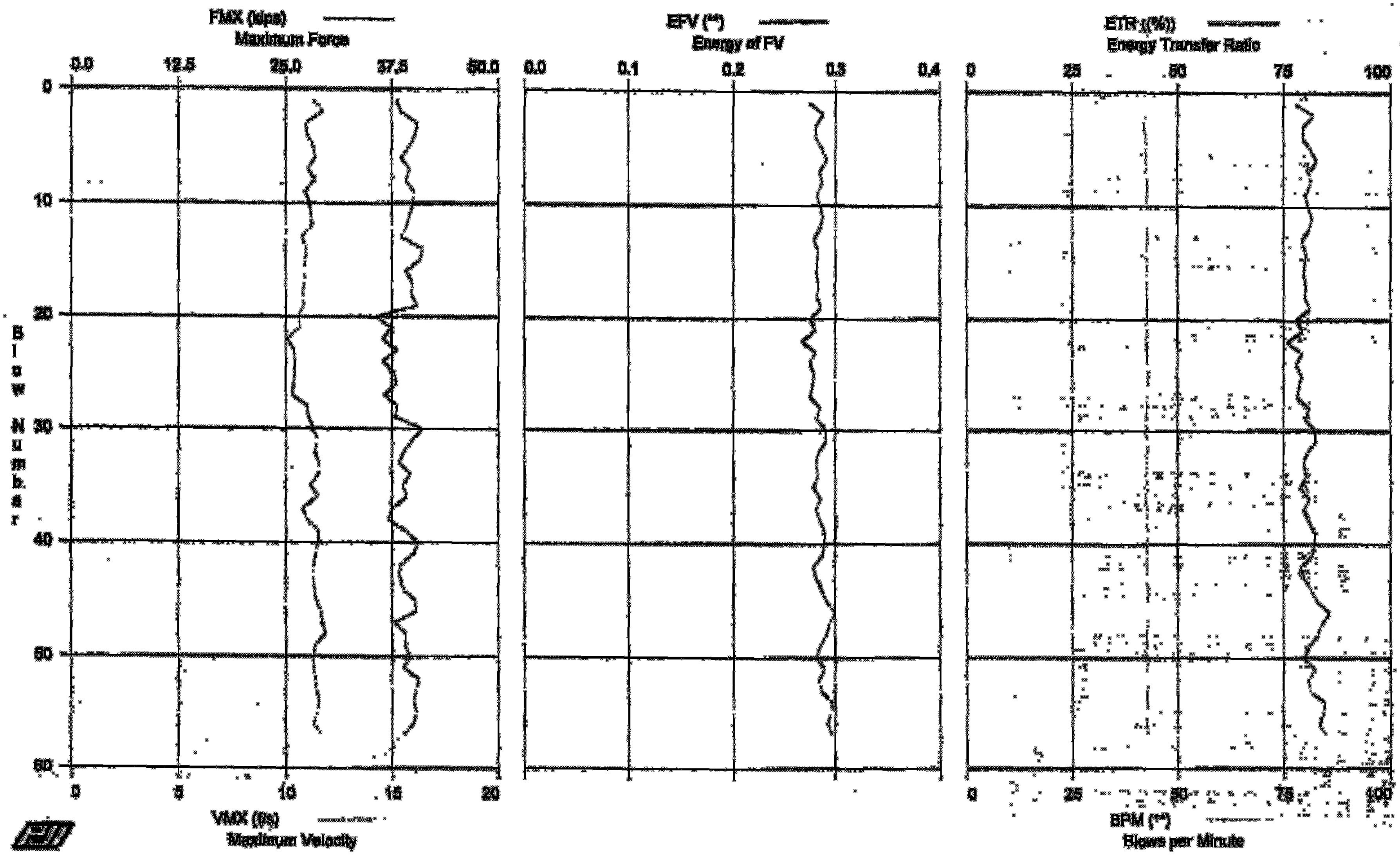
Drive   1 minute 42 seconds   8:32:41 AM - 8:34:23 AM (6/28/2006) BN 1 - 71

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 28-Jun-2006

SPT, Calvert Cliffs - B401-400



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B401-400 N3
OP: KB Test date: 28-Jun-2006

AR: 2.30 in^2 SP: 0.492 k/ft3
LE: 405.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	38.11	11.28	0.273	78.0	**	0.273	0.240	0.50	0.81
2	0.00	AV1	38.52	11.74	0.287	82.1	42.2	0.287	0.243	0.61	0.81
3	0.00	AV1	40.55	10.95	0.279	79.6	41.9	0.279	0.246	0.57	0.87
4	0.00	AV1	40.20	11.02	0.278	79.4	42.6	0.278	0.248	0.55	0.87
5	0.00	AV1	39.55	11.29	0.285	81.3	42.5	0.285	0.257	0.54	0.87
6	0.00	AV1	38.58	11.38	0.290	82.8	42.5	0.290	0.249	0.52	0.83
7	0.00	AV1	39.54	11.05	0.283	81.0	42.6	0.283	0.249	0.57	0.89
8	0.00	AV1	39.11	11.38	0.285	81.3	42.8	0.285	0.253	0.43	0.85
9	0.00	AV1	40.12	10.93	0.280	80.0	42.7	0.280	0.257	0.48	0.85
10	0.00	AV1	40.00	11.15	0.283	80.8	42.7	0.283	0.258	0.50	0.87
11	0.00	AV1	39.58	11.18	0.286	81.7	42.6	0.286	0.258	0.53	0.88
12	0.00	AV1	39.20	11.23	0.283	80.9	42.7	0.283	0.256	0.60	0.87
13	0.00	AV1	38.57	10.77	0.277	79.2	42.8	0.277	0.250	0.53	0.85
14	0.00	AV1	41.15	10.97	0.281	80.2	42.5	0.281	0.261	0.53	0.93
15	0.00	AV1	40.79	10.91	0.280	79.9	42.8	0.280	0.259	0.53	0.93
16	0.00	AV1	39.03	10.86	0.279	79.7	42.5	0.279	0.254	0.51	0.86
17	0.00	AV1	39.87	10.88	0.281	80.2	42.7	0.281	0.258	0.47	0.91
18	0.00	AV1	39.86	10.81	0.280	80.0	42.8	0.280	0.259	0.54	0.86
19	0.00	AV1	40.45	10.84	0.284	81.1	42.8	0.284	0.253	0.45	0.86
20	0.00	AV1	35.52	10.61	0.273	77.9	42.7	0.273	0.235	0.48	0.83
21	0.00	AV1	37.42	10.67	0.278	79.5	42.8	0.278	0.243	0.43	0.87
22	0.00	AV1	36.39	10.07	0.266	75.9	42.8	0.266	0.232	0.41	0.86
23	0.00	AV1	37.99	10.37	0.278	79.3	42.7	0.278	0.250	0.49	0.85
24	0.00	AV1	36.35	10.42	0.273	77.9	42.8	0.273	0.236	0.45	0.87
25	0.00	AV1	37.80	10.43	0.277	79.2	42.9	0.277	0.248	0.58	0.86
26	0.00	AV1	37.96	10.38	0.275	78.6	42.9	0.275	0.247	0.43	0.86
27	0.00	AV1	36.61	10.28	0.273	78.1	42.8	0.273	0.235	0.51	0.88
28	0.00	AV1	38.03	11.01	0.283	80.9	42.8	0.283	0.242	0.42	0.86
29	0.00	AV1	37.91	11.08	0.280	80.1	42.6	0.280	0.231	0.42	0.85
30	0.00	AV1	41.04	11.28	0.289	82.5	42.6	0.289	0.256	0.41	0.90
31	0.00	AV1	39.90	11.47	0.289	82.5	42.9	0.289	0.234	0.40	0.76
32	0.00	AV1	38.90	11.37	0.281	80.3	42.7	0.281	0.230	0.56	0.78
33	0.00	AV1	38.21	11.56	0.279	79.6	42.6	0.279	0.223	0.37	0.78
34	0.00	AV1	39.63	11.52	0.281	80.4	42.6	0.281	0.228	0.28	0.85
35	0.00	AV1	38.74	11.16	0.276	78.9	42.8	0.276	0.223	0.47	0.74
36	0.00	AV1	39.20	11.47	0.283	81.0	42.4	0.283	0.227	0.46	0.85
37	0.00	AV1	37.52	10.81	0.279	79.7	42.8	0.279	0.227	0.40	0.86
38	0.00	AV1	37.00	10.99	0.283	81.0	42.6	0.283	0.226	0.47	0.80
39	0.00	AV1	39.07	11.51	0.288	82.3	42.9	0.288	0.229	0.41	0.77
40	0.00	AV1	40.59	11.52	0.288	82.3	42.6	0.288	0.233	0.41	0.77
41	0.00	AV1	40.11	11.40	0.286	81.6	42.7	0.286	0.239	0.44	0.87
42	0.00	AV1	38.37	11.31	0.276	79.0	42.7	0.276	0.225	0.38	0.84
43	0.00	AV1	38.38	11.28	0.279	79.8	42.6	0.279	0.221	0.52	0.84
44	0.00	AV1	38.74	11.34	0.285	81.5	43.0	0.285	0.227	0.51	0.79
45	0.00	AV1	40.19	11.41	0.290	82.9	42.9	0.290	0.231	0.45	0.87
46	0.00	AV1	40.40	11.64	0.300	85.8	42.8	0.300	0.235	0.43	0.73
47	0.00	AV1	37.77	11.69	0.294	84.0	42.8	0.294	0.225	0.46	0.74
48	0.00	AV1	39.07	11.85	0.290	83.0	42.7	0.290	0.226	0.45	0.76
49	0.00	AV1	39.01	11.36	0.283	81.0	42.8	0.283	0.235	0.60	0.82
50	0.00	AV1	39.64	11.26	0.279	79.7	42.8	0.279	0.239	0.38	0.88
51	0.00	AV1	38.78	11.30	0.288	82.3	42.8	0.288	0.248	0.45	0.85
52	0.00	AV1	40.64	11.38	0.282	80.7	42.9	0.282	0.248	0.40	0.88
53	0.00	AV1	40.34	11.44	0.285	81.4	42.8	0.285	0.233	0.43	0.87
54	0.00	AV1	40.06	11.54	0.296	84.5	42.7	0.296	0.229	0.57	0.74
55	0.00	AV1	40.39	11.47	0.295	84.3	42.8	0.295	0.233	0.52	0.87
56	0.00	AV1	40.03	11.32	0.292	83.5	42.7	0.292	0.251	0.36	0.81
57	0.00	AV1	38.83	11.63	0.297	84.8	42.9	0.297	0.238	0.44	0.80
		Average	39.04	11.14	0.283	80.8	42.7	0.283	0.241	0.47	0.84

Total number of blows analyzed: 57

Time Summary

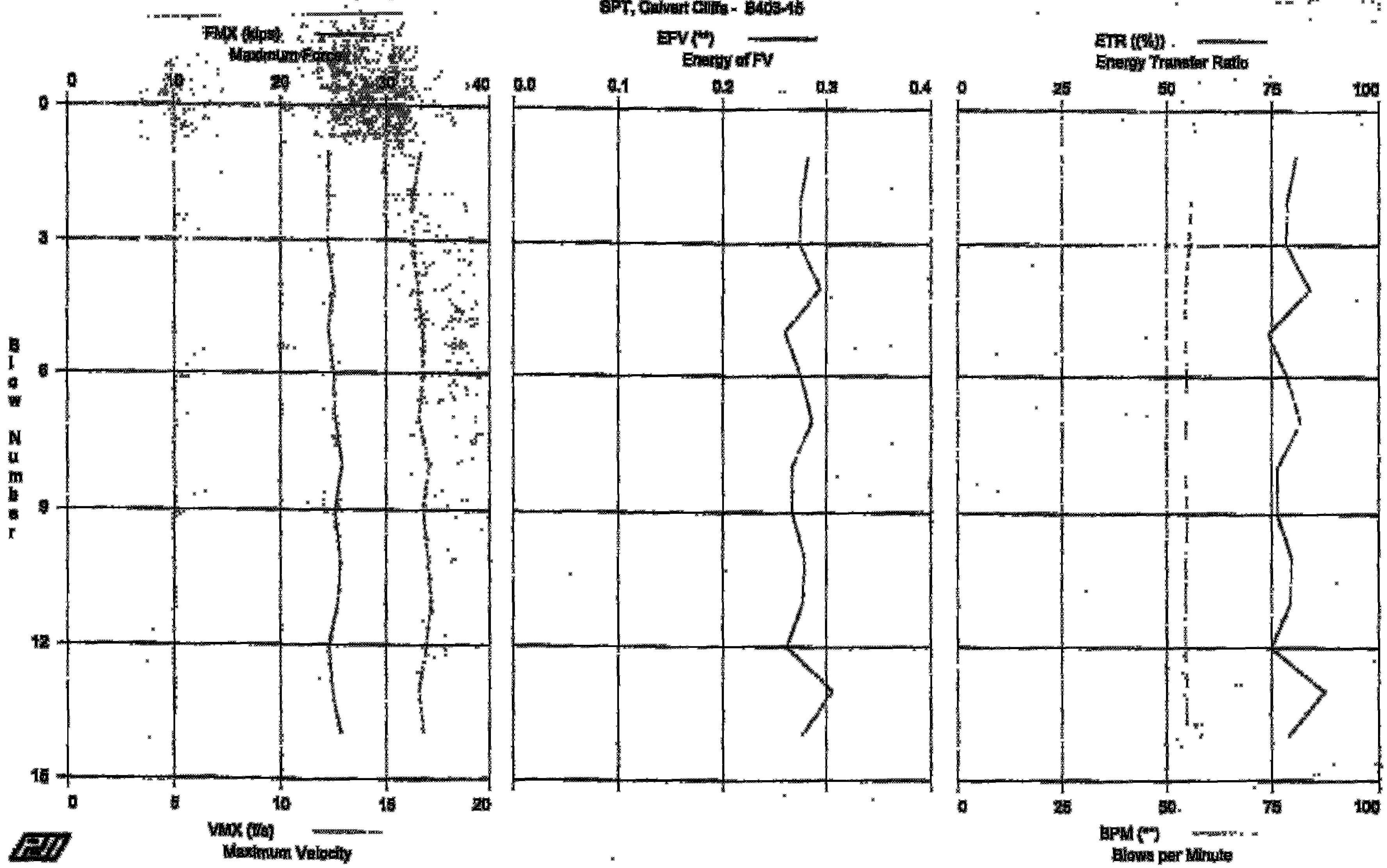
Drive 1 minute 19 seconds 11:12:01 AM - 11:13:20 AM (6/28/2006) BN 1 - 57

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B403-15

Test date: 20-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-15
AW Rod
OP: KB
Test date: 20-Jun-2006

AR: 1.19 in^2
SP: 0.492 k/ft3
LE: 19.0 ft
EM: 30,000 ksi
WS: 16,807.9 f/s
JC: 0.00

FMX: Maximum Force
EMX: Max Transferred Energy
VMX: Maximum Velocity
EF2: Energy of F^2
EFV: Energy of FV
DFN: Final Displacement
ETR: Energy Transfer Ratio
FVP: Force/Velocity proportionality
BPM: Blows per Minute

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	24.56	16.68	0.283	80.8	**	0.283	0.223	2.20	0.65
2	0.00	AV1	24.55	16.26	0.275	78.6	55.9	0.275	0.224	1.23	0.59
3	0.00	AV1	24.42	16.28	0.274	78.3	55.4	0.274	0.225	1.11	0.58
4	0.00	AV1	24.99	16.47	0.294	83.9	54.6	0.294	0.228	1.31	0.60
5	0.00	AV1	24.50	16.74	0.260	74.3	54.4	0.260	0.227	-0.70	0.60
6	0.00	AV1	25.04	16.79	0.275	78.5	54.8	0.275	0.228	0.79	0.61
7	0.00	AV1	25.19	16.57	0.286	81.7	54.6	0.286	0.231	0.98	0.60
8	0.00	AV1	25.83	17.05	0.267	76.3	54.4	0.267	0.234	0.08	0.62
9	0.00	AV1	25.14	16.77	0.267	76.4	54.8	0.267	0.232	0.00	0.59
10	0.00	AV1	25.63	17.01	0.279	79.6	54.6	0.279	0.233	0.39	0.63
11	0.00	AV1	25.90	17.18	0.277	79.3	54.5	0.277	0.235	0.34	0.63
12	0.00	AV1	24.54	16.95	0.262	74.9	54.4	0.262	0.227	-1.47	0.58
13	0.00	AV1	24.88	16.56	0.306	87.4	54.8	0.306	0.231	1.02	0.58
14	0.00	AV1	25.69	16.78	0.276	78.9	54.6	0.276	0.238	0.45	0.62
		Average	25.03	16.72	0.277	79.2	54.8	0.277	0.230	0.55	0.60

Total number of blows analyzed: 14

Time Summary

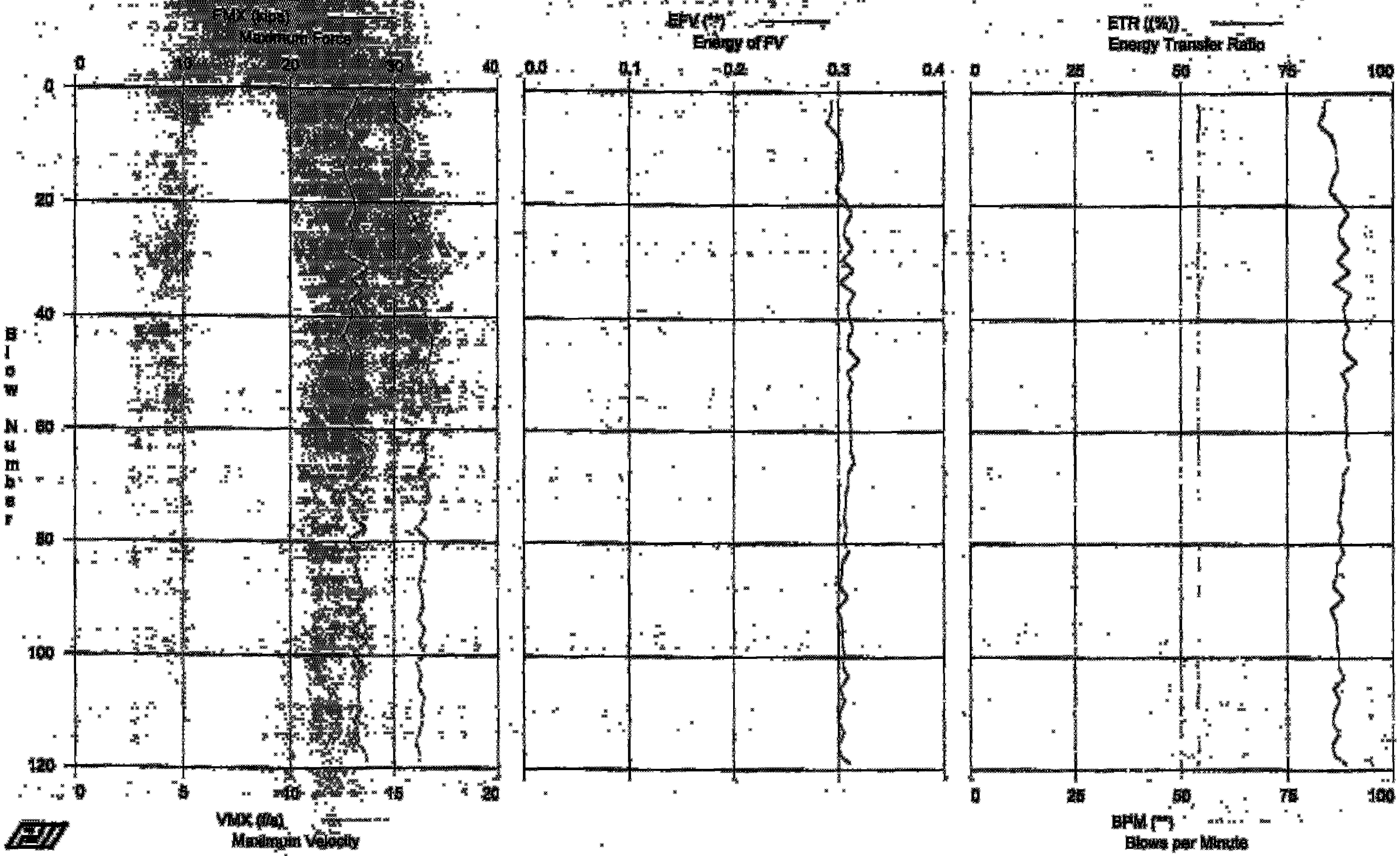
Drive 14 seconds 4:41:50 PM - 4:42:04 PM (6/20/2006) BN 1 - 14

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 20-Jun-2006

SPT_Calvert Cliffs - B403-30



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-30
AW Rod
OP: KB
Test date: 20-Jun-2006

AR: 1.19 in^2
LE: 34.0 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	25.56	15.25	0.288	82.3	**	0.288	0.282	0.11	0.80
2	0.00	AV1	27.44	14.31	0.299	85.5	54.0	0.299	0.290	-0.51	0.80
3	0.00	AV1	26.52	15.02	0.280	80.0	54.3	0.280	0.288	-1.77	0.80
4	0.00	AV1	25.81	15.02	0.307	87.7	54.5	0.307	0.282	-0.59	0.75
5	0.00	AV1	25.01	15.27	0.291	83.0	54.1	0.291	0.280	-2.22	0.74
6	0.00	AV1	25.59	14.81	0.287	82.0	54.7	0.287	0.275	-2.88	0.82
7	0.00	AV1	25.47	15.35	0.295	84.4	54.1	0.295	0.275	-0.97	0.79
8	0.00	AV1	25.04	15.88	0.302	86.3	54.2	0.302	0.278	-1.08	0.74
9	0.00	AV1	25.12	15.59	0.295	84.4	54.3	0.295	0.279	-1.01	0.76
10	0.00	AV1	26.78	15.44	0.311	88.8	54.3	0.311	0.284	-0.29	0.80
11	0.00	AV1	25.61	15.13	0.300	85.6	54.5	0.300	0.274	-0.08	0.81
12	0.00	AV1	25.42	15.51	0.306	87.5	53.8	0.306	0.278	-0.58	0.72
13	0.00	AV1	25.09	15.82	0.307	87.7	54.4	0.307	0.275	-0.29	0.70
14	0.00	AV1	25.09	15.74	0.303	86.4	54.2	0.303	0.280	-0.40	0.76
15	0.00	AV1	25.04	15.76	0.305	87.1	54.4	0.305	0.277	-0.37	0.73
16	0.00	AV1	25.55	15.23	0.296	84.5	53.9	0.296	0.281	-1.13	0.74
17	0.00	AV1	25.82	15.40	0.302	86.2	54.3	0.302	0.282	-0.37	0.79
18	0.00	AV1	25.70	15.55	0.294	84.1	54.3	0.294	0.280	-0.86	0.72
19	0.00	AV1	26.97	15.50	0.316	90.1	54.0	0.316	0.286	-0.62	0.83
20	0.00	AV1	25.27	15.12	0.298	85.0	54.4	0.298	0.280	-0.55	0.80
21	0.00	AV1	26.58	15.65	0.315	90.1	54.1	0.315	0.282	-0.37	0.81
22	0.00	AV1	26.00	15.90	0.311	89.0	54.4	0.311	0.278	-0.46	0.73
23	0.00	AV1	25.35	16.43	0.306	87.4	54.2	0.306	0.280	-0.55	0.70
24	0.00	AV1	26.11	15.81	0.307	87.6	54.3	0.307	0.278	-0.78	0.68
25	0.00	AV1	26.17	15.62	0.308	87.9	54.2	0.308	0.280	-0.55	0.73
26	0.00	AV1	26.02	15.80	0.303	86.7	54.3	0.303	0.285	-0.67	0.75
27	0.00	AV1	26.86	16.02	0.315	90.1	54.2	0.315	0.283	-0.34	0.74
28	0.00	AV1	24.70	16.40	0.312	89.0	54.2	0.312	0.275	-0.02	0.67
29	0.00	AV1	26.55	15.73	0.303	86.6	53.9	0.303	0.285	-0.50	0.74
30	0.00	AV1	24.70	16.81	0.305	87.3	54.3	0.305	0.281	-0.58	0.67
31	0.00	AV1	27.54	15.59	0.315	89.9	54.2	0.315	0.289	0.01	0.73
32	0.00	AV1	27.48	15.61	0.314	89.7	54.1	0.314	0.287	0.12	0.72
33	0.00	AV1	26.35	16.47	0.295	84.2	54.3	0.295	0.282	2.42	0.74
34	0.00	AV1	25.69	16.57	0.308	88.0	54.4	0.308	0.275	-0.26	0.68
35	0.00	AV1	27.88	16.05	0.322	92.0	53.8	0.322	0.290	0.07	0.77
36	0.00	AV1	25.85	15.85	0.309	88.2	54.2	0.309	0.279	0.22	0.69
37	0.00	AV1	25.61	16.47	0.300	85.7	54.0	0.300	0.281	0.10	0.65
38	0.00	AV1	25.79	16.60	0.318	91.0	54.4	0.318	0.283	-0.86	0.70
39	0.00	AV1	26.27	16.34	0.308	88.0	54.0	0.308	0.286	-0.20	0.68
40	0.00	AV1	25.85	16.64	0.313	89.5	54.2	0.313	0.282	-0.03	0.68
41	0.00	AV1	24.89	16.78	0.312	89.1	54.2	0.312	0.280	0.13	0.65
42	0.00	AV1	26.35	16.31	0.315	90.0	54.0	0.315	0.285	0.11	0.67
43	0.00	AV1	25.27	17.10	0.312	89.2	54.4	0.312	0.279	-0.08	0.65
44	0.00	AV1	24.89	16.49	0.306	87.5	53.9	0.306	0.276	-0.07	0.61
45	0.00	AV1	26.00	16.69	0.313	89.5	54.2	0.313	0.280	-0.01	0.66
46	0.00	AV1	25.40	16.89	0.307	87.6	54.0	0.307	0.277	0.05	0.62
47	0.00	AV1	25.80	16.79	0.320	91.4	54.4	0.320	0.278	0.36	0.67
48	0.00	AV1	26.08	16.53	0.320	91.4	53.7	0.320	0.281	0.00	0.65
49	0.00	AV1	25.72	16.51	0.312	89.0	54.5	0.312	0.279	-0.24	0.70
50	0.00	AV1	25.64	16.60	0.305	87.0	53.9	0.305	0.276	0.01	0.66
51	0.00	AV1	25.95	16.91	0.313	89.4	54.0	0.313	0.278	-0.04	0.65
52	0.00	AV1	25.16	16.90	0.313	89.5	54.3	0.313	0.277	0.13	0.64
53	0.00	AV1	26.57	16.43	0.308	87.9	53.8	0.308	0.283	-0.21	0.69
54	0.00	AV1	25.74	16.94	0.312	89.2	54.2	0.312	0.279	-0.18	0.64
55	0.00	AV1	26.09	16.67	0.313	89.5	54.0	0.313	0.281	0.13	0.66
56	0.00	AV1	26.43	16.66	0.311	88.9	54.0	0.311	0.281	-0.14	0.67
57	0.00	AV1	25.66	17.03	0.312	89.2	54.3	0.312	0.280	-0.18	0.66
58	0.00	AV1	25.51	16.79	0.309	88.2	54.1	0.309	0.277	-0.13	0.67
59	0.00	AV1	25.74	16.85	0.306	87.4	54.2	0.306	0.276	-0.14	0.66
60	0.00	AV1	26.53	16.95	0.318	91.0	54.0	0.318	0.279	-0.16	0.68
61	0.00	AV1	25.00	16.87	0.310	88.5	54.3	0.310	0.276	-0.06	0.68

SPT, Calvert Cliffs - B403-30 AW Rod
OP: KB Test date: 20-Jun-2006

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
62	0.00	AV1	27.33	15.94	0.313	89.4	54.2	0.313	0.284	-0.23	0.69
63	0.00	AV1	27.75	16.50	0.307	87.8	54.3	0.307	0.286	-0.10	0.72
64	0.00	AV1	27.84	16.49	0.316	90.4	54.1	0.316	0.285	-0.10	0.72
65	0.00	AV1	27.88	16.53	0.320	91.5	54.1	0.320	0.287	-0.05	0.73
66	0.00	AV1	27.64	16.49	0.309	88.3	54.0	0.309	0.284	-0.38	0.72
67	0.00	AV1	27.35	16.14	0.306	87.3	54.4	0.306	0.282	-0.07	0.70
68	0.00	AV1	27.03	16.16	0.312	89.0	54.1	0.312	0.280	0.29	0.76
69	0.00	AV1	27.11	16.24	0.311	88.9	54.0	0.311	0.281	0.03	0.68
70	0.00	AV1	25.65	16.92	0.308	87.9	54.6	0.308	0.274	-0.03	0.67
71	0.00	AV1	25.40	16.75	0.304	87.0	53.7	0.304	0.278	-0.08	0.70
72	0.00	AV1	26.10	16.51	0.310	88.5	54.3	0.310	0.281	-0.11	0.71
73	0.00	AV1	27.65	16.21	0.307	87.7	54.0	0.307	0.284	0.09	0.70
74	0.00	AV1	26.33	16.88	0.307	87.8	54.2	0.307	0.281	-0.07	0.67
75	0.00	AV1	25.31	16.72	0.306	87.3	54.0	0.306	0.275	-0.13	0.64
76	0.00	AV1	26.69	16.26	0.304	86.8	54.2	0.304	0.280	-0.17	0.76
77	0.00	AV1	27.37	15.65	0.302	86.4	54.1	0.302	0.281	-0.37	0.71
78	0.00	AV1	26.99	16.38	0.314	89.7	54.0	0.314	0.283	0.09	0.71
79	0.00	AV1	26.74	16.24	0.310	88.7	54.2	0.310	0.281	0.00	0.75
80	0.00	AV1	24.79	17.02	0.300	85.6	53.9	0.300	0.272	-0.39	0.68
81	0.00	AV1	25.14	16.77	0.312	89.1	54.3	0.312	0.276	-0.08	0.63
82	0.00	AV1	27.36	16.04	0.307	87.8	54.2	0.307	0.283	-0.22	0.73
83	0.00	AV1	26.88	16.31	0.309	88.2	54.3	0.309	0.280	-0.20	0.71
84	0.00	AV1	25.69	16.61	0.298	85.1	54.1	0.298	0.276	-0.14	0.68
85	0.00	AV1	25.68	16.50	0.300	85.8	54.3	0.300	0.272	-0.25	0.66
86	0.00	AV1	27.11	16.03	0.307	87.7	54.2	0.307	0.279	0.00	0.76
87	0.00	AV1	27.07	16.03	0.302	86.2	53.9	0.302	0.278	-0.35	0.70
88	0.00	AV1	26.70	16.31	0.299	85.4	54.5	0.299	0.278	-0.71	0.71
89	0.00	AV1	26.72	16.32	0.312	89.3	53.9	0.312	0.281	-0.30	0.73
90	0.00	AV1	26.91	16.29	0.306	87.3	54.3	0.306	0.450	-0.29	0.76
91	0.00	AV1	27.18	16.36	0.298	85.0	54.0	0.298	0.278	-0.56	0.73
92	0.00	AV1	25.72	16.43	0.299	85.5	54.2	0.299	0.275	-0.34	0.68
93	0.00	AV1	27.15	16.02	0.302	86.3	54.3	0.302	0.274	-0.22	0.71
94	0.00	AV1	26.80	16.22	0.304	86.8	54.0	0.304	0.280	-0.18	0.74
95	0.00	AV1	26.82	16.51	0.311	88.9	54.0	0.311	0.283	-0.28	0.73
96	0.00	AV1	24.97	16.45	0.297	84.9	54.3	0.297	0.273	-0.69	0.72
97	0.00	AV1	27.44	16.01	0.308	87.9	54.0	0.308	0.280	-0.06	0.72
98	0.00	AV1	27.31	16.35	0.299	85.5	54.2	0.299	0.281	-0.46	0.73
99	0.00	AV1	26.62	16.37	0.306	87.3	53.9	0.306	0.278	-0.49	0.73
100	0.00	AV1	25.55	16.57	0.305	87.3	54.1	0.305	0.271	-0.17	0.66
101	0.00	AV1	27.25	16.09	0.303	86.7	54.0	0.303	0.281	-0.09	0.74
102	0.00	AV1	26.66	16.07	0.306	87.5	54.0	0.306	0.279	-0.15	0.67
103	0.00	AV1	26.65	16.04	0.303	86.5	54.1	0.303	0.277	-0.35	0.74
104	0.00	AV1	26.36	16.54	0.316	90.4	54.0	0.316	0.277	-0.20	0.68
105	0.00	AV1	27.34	16.00	0.301	86.0	54.1	0.301	0.281	-0.30	0.72
106	0.00	AV1	25.87	16.26	0.301	85.9	54.3	0.301	0.271	-0.04	0.66
107	0.00	AV1	25.61	16.78	0.310	88.7	53.6	0.310	0.278	-0.16	0.69
108	0.00	AV1	27.53	16.04	0.302	86.4	54.1	0.302	0.281	0.19	0.74
109	0.00	AV1	27.14	16.23	0.303	86.5	54.2	0.303	0.279	-0.32	0.72
110	0.00	AV1	26.46	16.39	0.300	85.8	54.1	0.300	0.277	-0.31	0.67
111	0.00	AV1	26.95	16.11	0.300	85.8	54.0	0.300	0.277	-0.18	0.70
112	0.00	AV1	25.36	16.56	0.300	85.7	54.4	0.300	0.274	-0.64	0.67
113	0.00	AV1	27.01	16.02	0.302	86.3	54.2	0.302	0.278	-0.16	0.73
114	0.00	AV1	25.96	16.37	0.308	88.0	53.9	0.308	0.274	-0.03	0.65
115	0.00	AV1	25.68	16.03	0.295	84.3	54.3	0.295	0.273	-0.53	0.65
116	0.00	AV1	27.52	16.04	0.304	87.0	54.2	0.304	0.283	-0.16	0.75
117	0.00	AV1	27.35	16.30	0.304	86.8	54.1	0.304	0.279	-0.18	0.72
118	0.00	AV1	27.18	16.15	0.300	85.8	54.1	0.300	0.281	-0.33	0.77
119	0.00	AV1	27.35	16.15	0.311	88.9	53.9	0.311	0.281	0.49	0.75
		Average	26.26	16.20	0.306	87.5	54.1	0.306	0.281	-0.26	0.71

Total number of blows analyzed: 119

Time Summary

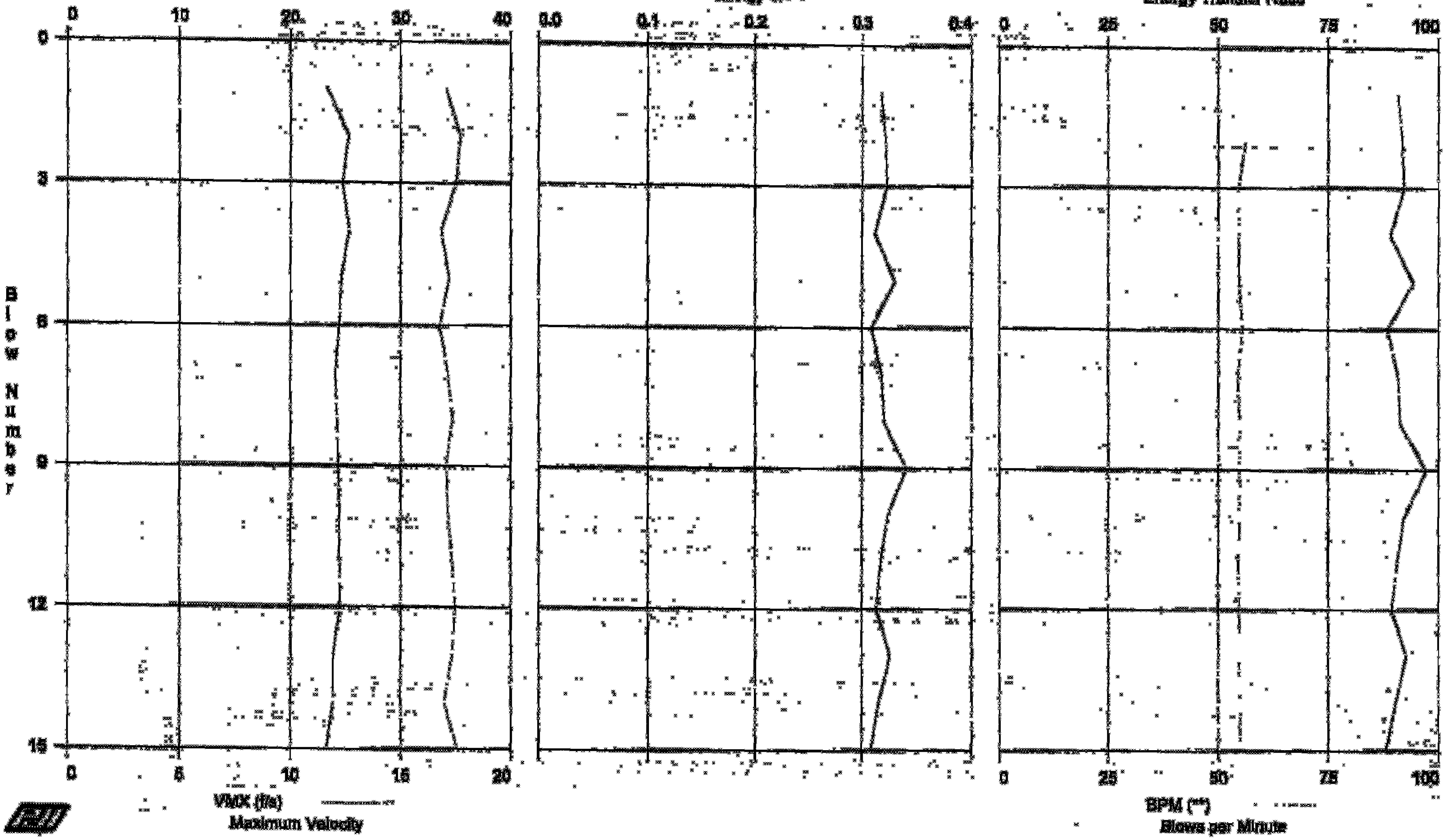
Drive 2 minutes 11 seconds 5:05:58 PM - 5:08:09 PM (6/20/2006) BN 1 - 119

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 21-Jun-2006

SPT, Calvert Cliffs - B403-45



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-45 AW Rod
OP: KB Test date: 21-Jun-2006

AR: 1.19 in^2 SP: 0.492 k/ft3
LE: 49.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	23.36	17.07	0.318	90.8	**	0.318	0.263	1.78	0.53
2	0.00	AV1	25.29	17.73	0.322	91.9	56.3	0.322	0.275	1.55	0.60
3	0.00	AV1	24.72	17.51	0.323	92.2	54.6	0.323	0.272	0.52	0.54
4	0.00	AV1	25.32	16.82	0.312	89.0	54.7	0.312	0.273	1.50	0.62
5	0.00	AV1	24.62	17.21	0.330	94.4	54.8	0.330	0.271	1.41	0.56
6	0.00	AV1	24.42	16.76	0.309	88.4	55.5	0.309	0.265	0.31	0.63
7	0.00	AV1	24.10	17.12	0.318	90.8	54.5	0.318	0.261	0.76	0.58
8	0.00	AV1	24.25	17.37	0.320	91.3	54.9	0.320	0.267	1.36	0.57
9	0.00	AV1	24.35	17.05	0.340	97.3	54.8	0.340	0.267	0.62	0.60
10	0.00	AV1	24.44	17.15	0.323	92.3	54.9	0.323	0.267	1.30	0.61
11	0.00	AV1	24.46	17.33	0.317	90.5	54.5	0.317	0.272	0.10	0.54
12	0.00	AV1	24.51	17.47	0.313	89.3	54.7	0.313	0.269	-0.46	0.56
13	0.00	AV1	23.89	17.34	0.325	92.8	54.6	0.325	0.266	0.00	0.53
14	0.00	AV1	23.85	16.96	0.315	90.1	55.1	0.315	0.263	0.77	0.60
15	0.00	AV1	23.23	17.56	0.308	88.1	54.8	0.308	0.257	0.23	0.52
		Average	24.32	17.23	0.320	91.3	54.9	0.320	0.267	0.78	0.57

Total number of blows analyzed: 15

Time Summary

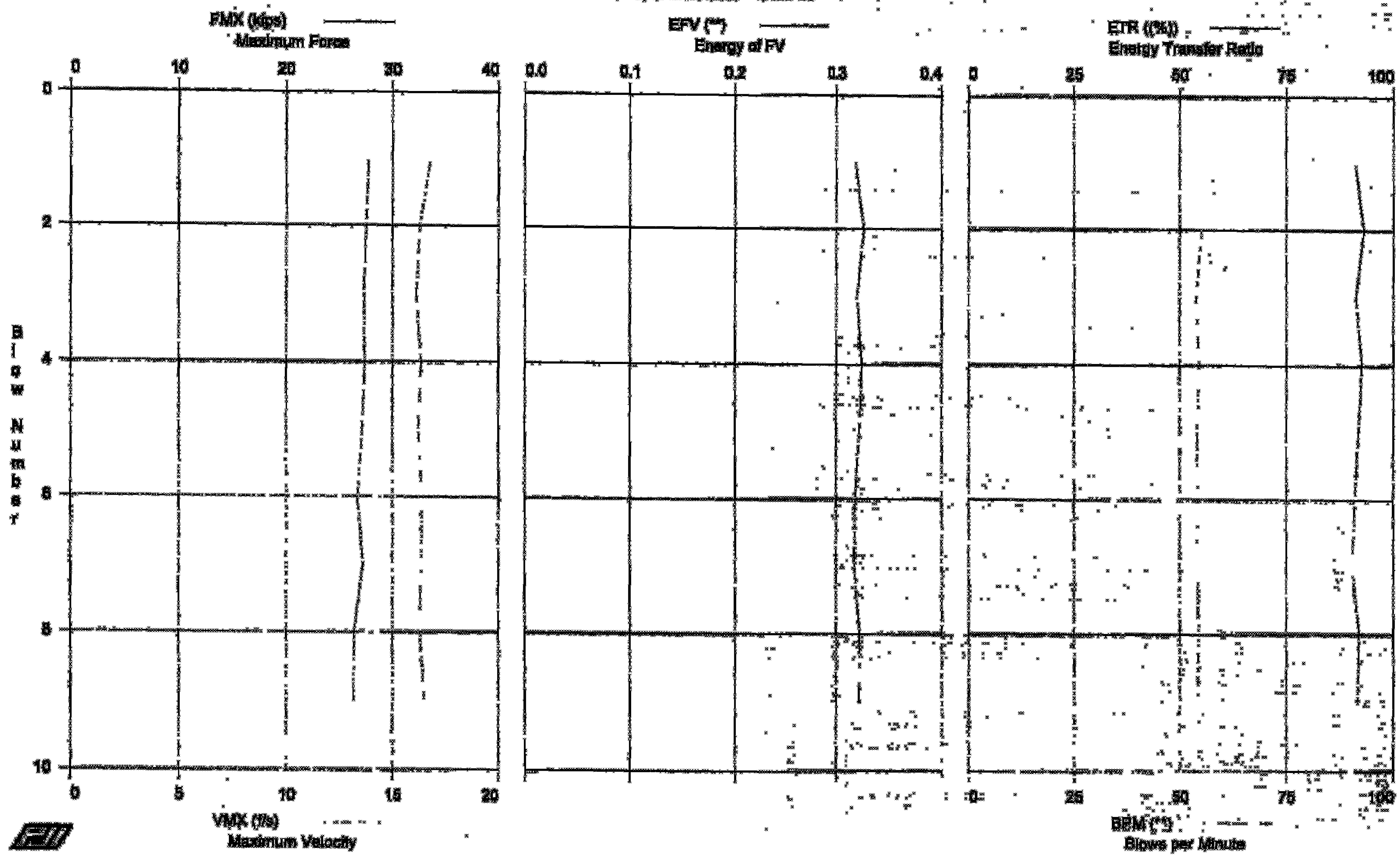
Drive 15 seconds 7:39:53 AM - 7:40:08 AM (6/21/2006) BN 1 - 15

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B403-60

Test date: 21-Jun-2006



GRL Engineers, Inc. Page 1 of 1
Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-60 AW Rod
OP: KB Test date: 21-Jun-2006

AR: 1.19 in^2 SP: 0.492 k/ft3
LE: 64.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force EMX: Max Transferred Energy
VMX: Maximum Velocity EF2: Energy of F^2
EFV: Energy of FV DFN: Final Displacement
ETR: Energy Transfer Ratio FVP: Force/Velocity proportionality
BPM: Blows per Minute

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	27.75	16.79	0.319	91.1	**	0.319	0.308	1.70	0.73
2	0.00	AV1	27.54	16.29	0.326	93.0	55.1	0.326	0.301	1.66	0.73
3	0.00	AV1	27.32	16.12	0.320	91.3	53.8	0.320	0.299	0.97	0.73
4	0.00	AV1	27.39	16.34	0.324	92.6	54.5	0.324	0.303	1.12	0.76
5	0.00	AV1	27.18	16.23	0.322	91.9	54.1	0.322	0.304	1.27	0.75
6	0.00	AV1	26.73	16.38	0.318	90.9	54.2	0.318	0.303	1.02	0.77
7	0.00	AV1	27.24	16.36	0.317	90.4	54.2	0.317	0.301	0.22	0.73
8	0.00	AV1	26.40	16.29	0.322	92.0	54.4	0.322	0.300	0.83	0.76
9	0.00	AV1	26.33	16.48	0.321	91.6	54.2	0.321	0.297	0.55	0.70
		Average	27.10	16.36	0.321	91.7	54.3	0.321	0.302	1.04	0.74

Total number of blows analyzed: 9

Time Summary

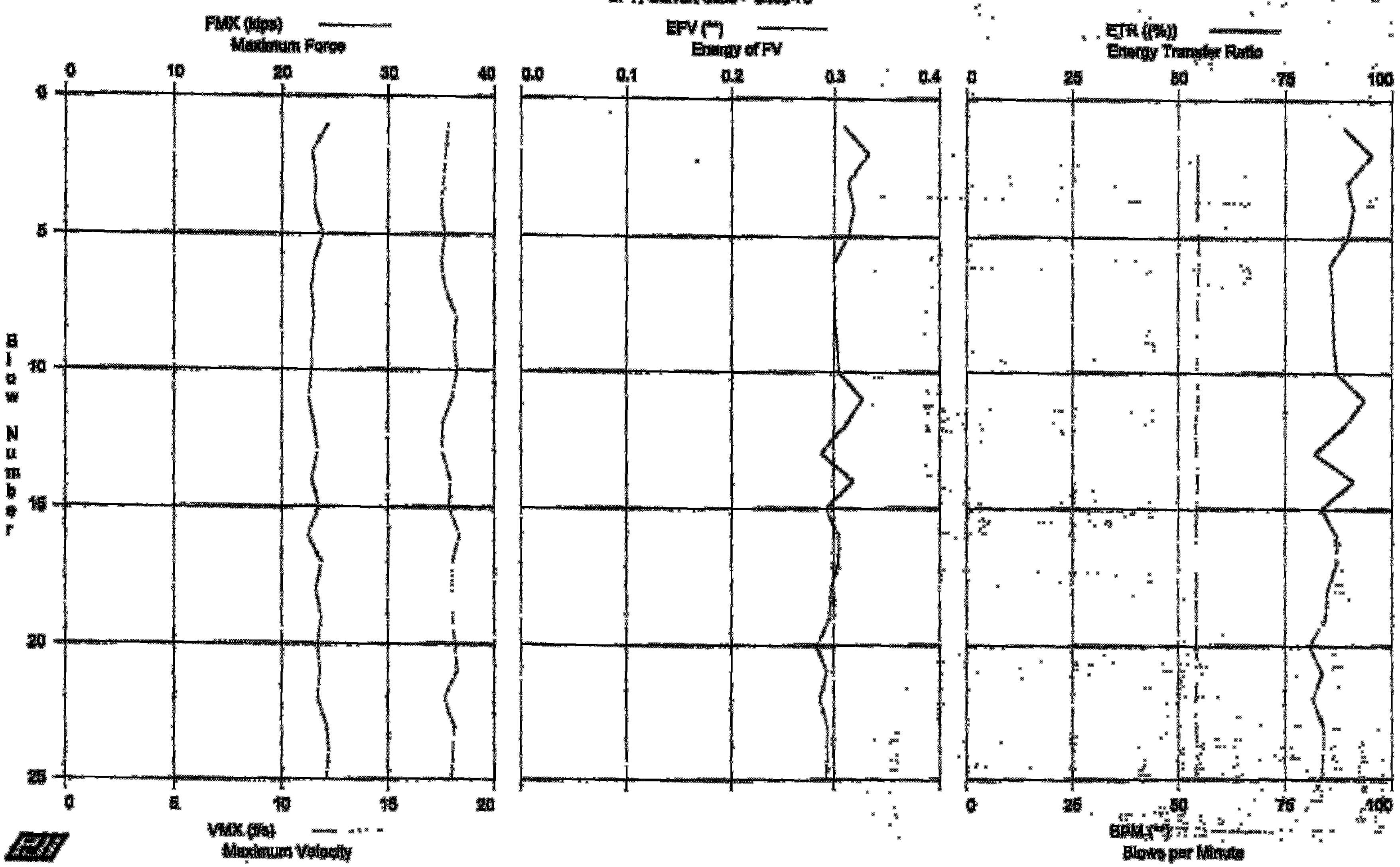
Drive 9 seconds 8:33:13 AM - 8:33:22 AM (6/21/2006) BN 1 - 9

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B403-75

Test date: 21-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-75

AW rod

OP: KB

Test date: 21-Jun-2006

AR: 1.19 in^2
LE: 79.0 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	24.33	17.84	0.310	88.6	**	0.310	0.271	-0.19	0.56
2	0.00	AV1	22.86	17.71	0.333	95.2	54.5	0.333	0.271	1.57	0.50
3	0.00	AV1	23.18	17.61	0.314	89.6	54.6	0.314	0.271	-0.32	0.47
4	0.00	AV1	23.06	17.49	0.319	91.1	54.5	0.319	0.271	-0.72	0.47
5	0.00	AV1	23.87	17.67	0.314	89.7	54.7	0.314	0.269	0.16	0.54
6	0.00	AV1	23.03	17.50	0.299	85.4	54.8	0.299	0.272	-0.52	0.51
7	0.00	AV1	22.76	17.70	0.301	86.0	54.6	0.301	0.270	-0.10	0.50
8	0.00	AV1	23.02	18.20	0.301	86.1	54.4	0.301	0.273	-0.79	0.51
9	0.00	AV1	22.79	18.11	0.303	86.4	54.4	0.303	0.277	-0.19	0.50
10	0.00	AV1	22.79	18.23	0.305	87.0	54.3	0.305	0.273	-0.25	0.49
11	0.00	AV1	22.49	18.00	0.327	93.5	54.8	0.327	0.275	1.94	0.47
12	0.00	AV1	23.02	17.56	0.311	88.7	54.1	0.311	0.271	0.32	0.50
13	0.00	AV1	23.37	17.53	0.286	81.7	54.3	0.286	0.274	-1.09	0.51
14	0.00	AV1	22.83	17.92	0.319	91.1	54.6	0.319	0.272	1.43	0.48
15	0.00	AV1	23.47	17.87	0.292	83.4	54.3	0.292	0.274	-0.76	0.52
16	0.00	AV1	22.48	18.32	0.305	87.1	54.3	0.305	0.277	-0.17	0.48
17	0.00	AV1	23.72	18.02	0.304	86.9	54.2	0.304	0.277	-0.14	0.52
18	0.00	AV1	23.19	18.01	0.297	84.8	54.3	0.297	0.272	-0.47	0.48
19	0.00	AV1	23.67	18.02	0.296	84.4	54.3	0.296	0.273	-0.42	0.48
20	0.00	AV1	23.36	18.13	0.282	80.6	54.3	0.282	0.272	-1.19	0.52
21	0.00	AV1	23.58	18.21	0.293	83.6	54.4	0.293	0.276	-0.90	0.49
22	0.00	AV1	23.36	17.66	0.285	81.5	54.3	0.285	0.274	-1.18	0.50
23	0.00	AV1	24.23	18.09	0.294	84.0	54.3	0.294	0.273	-0.40	0.54
24	0.00	AV1	24.42	18.03	0.294	83.9	54.5	0.294	0.274	-0.62	0.55
25	0.00	AV1	24.20	17.98	0.292	83.4	54.2	0.292	0.273	-0.28	0.52
		Average	23.32	17.90	0.303	86.5	54.4	0.303	0.273	-0.21	0.51

Total number of blows analyzed: 25

Time Summary

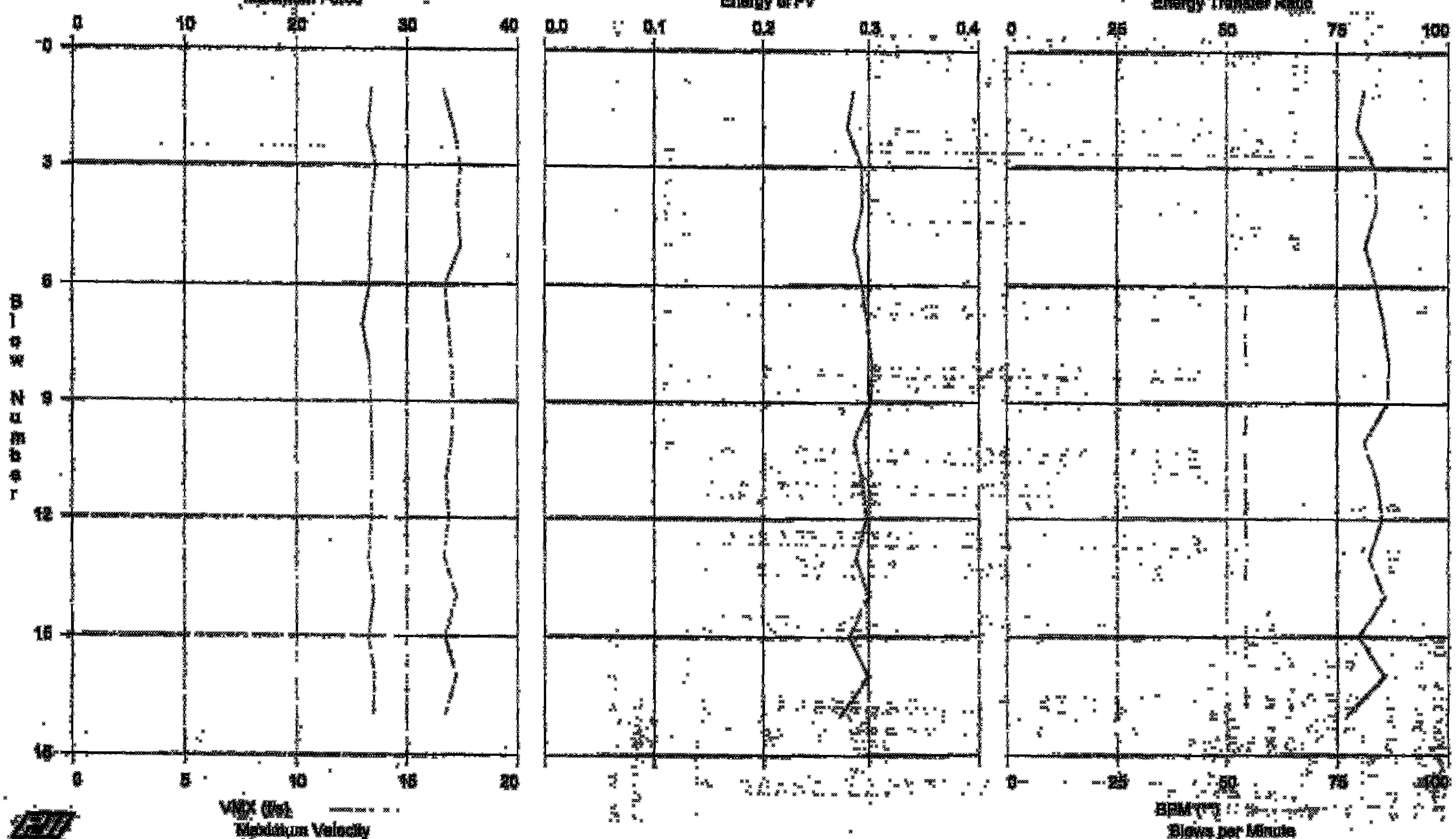
Drive 26 seconds 9:35:54 AM - 9:36:20 AM (6/21/2006) BN 1 - 25

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B403-60

Test date: 21-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-90
AW rod
OP: KB
Test date: 21-Jun-2006

AR: 1.19 in^2
LE: 94.0 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	26.78	16.62	0.284	81.1	**	0.284	0.303	-0.35	0.77
2	0.00	AV1	26.50	17.10	0.278	79.5	54.4	0.278	0.300	-0.77	0.74
3	0.00	AV1	27.16	17.41	0.292	83.5	54.3	0.292	0.304	-0.49	0.74
4	0.00	AV1	26.76	17.28	0.293	83.9	**	0.293	0.306	-0.31	0.74
5	0.00	AV1	26.57	17.43	0.284	81.3	**	0.284	0.303	-0.28	0.73
6	0.00	AV1	26.59	16.73	0.293	83.8	54.5	0.293	0.302	-0.10	0.72
7	0.00	AV1	25.95	16.88	0.299	85.5	54.2	0.299	0.304	0.56	0.70
8	0.00	AV1	26.59	17.03	0.303	86.7	54.4	0.303	0.307	0.71	0.74
9	0.00	AV1	26.73	17.11	0.302	86.2	54.4	0.302	0.306	0.81	0.74
10	0.00	AV1	26.88	17.03	0.284	81.0	54.2	0.284	0.303	-0.01	0.75
11	0.00	AV1	26.84	16.79	0.294	84.0	54.3	0.294	0.309	0.37	0.76
12	0.00	AV1	26.76	16.90	0.298	85.0	54.3	0.298	0.306	0.73	0.72
13	0.00	AV1	26.52	16.69	0.287	82.1	54.4	0.287	0.302	-0.06	0.76
14	0.00	AV1	27.05	17.25	0.300	85.7	54.1	0.300	0.300	-0.19	0.75
15	0.00	AV1	26.52	16.73	0.279	79.8	54.3	0.279	0.308	-0.25	0.70
16	0.00	AV1	27.09	17.23	0.300	85.6	54.2	0.300	0.304	-0.18	0.75
17	0.00	AV1	26.94	16.72	0.270	77.1	54.4	0.270	0.300	-0.59	0.77
		Average	26.72	17.00	0.291	83.0	54.3	0.291	0.304	-0.02	0.74

Total number of blows analyzed: 17

Time Summary

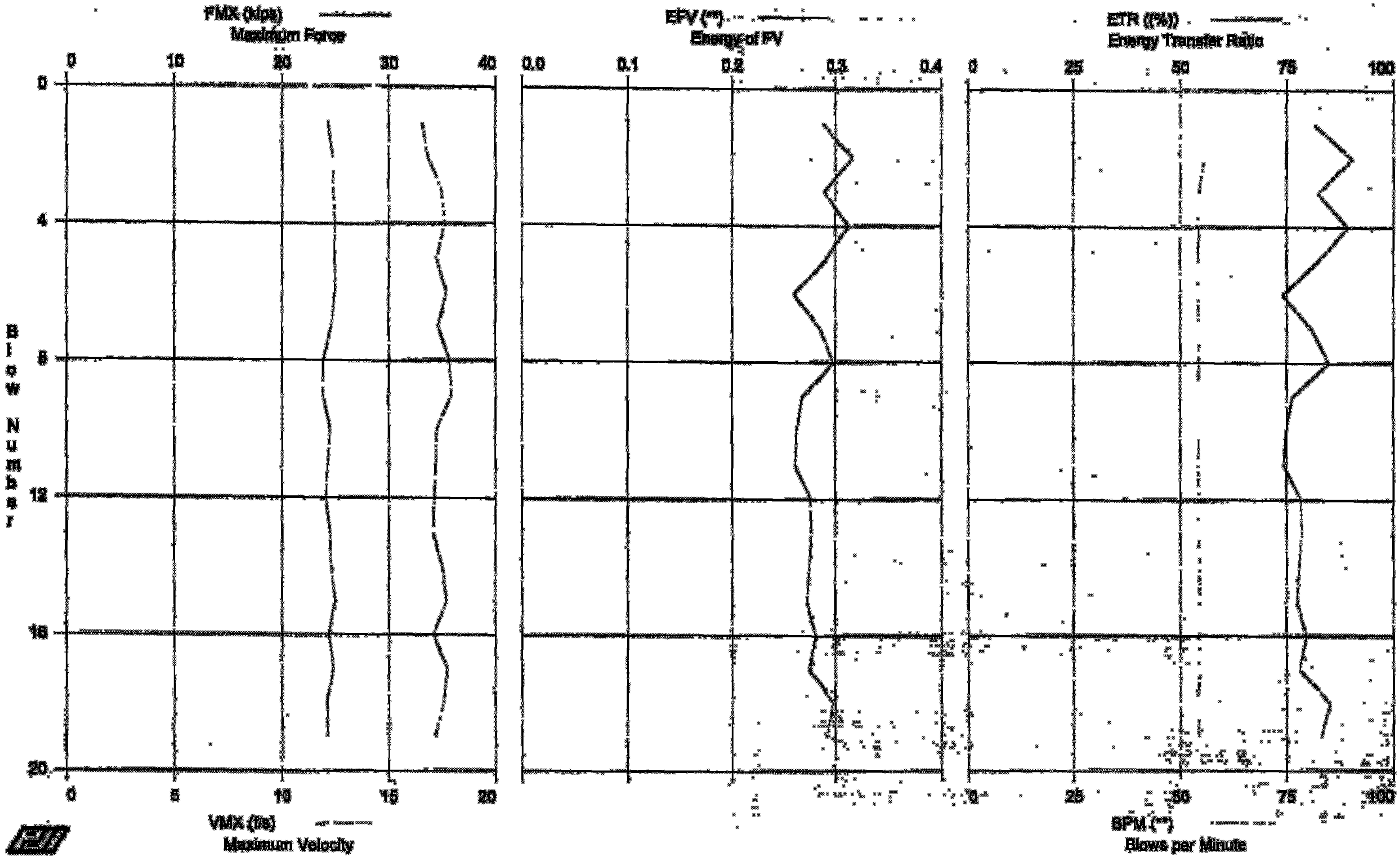
Drive 22 seconds 10:23:59 AM - 10:24:21 AM (6/21/2006) BN 1 - 17

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 21-Jun-2006

SPT, Calvert Cliffs - B403-105



GRL Engineers, Inc.
Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-105 AW rod
OP: KP Test date: 21-Jun-2006

AR: 1.19 in^2 SP: 0.492 k/ft3
LE: 109.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force EMX: Max Transferred Energy
VMX: Maximum Velocity EF2: Energy of F^2
EFV: Energy of FV DFN: Final Displacement
ETR: Energy Transfer Ratio FVP: Force/Velocity proportionality
BPM: Blows per Minute

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	24.25	16.55	0.286	81.6	**	0.286	0.258	0.63	0.64
2	0.00	AV1	24.74	16.82	0.317	90.5	55.6	0.317	0.261	1.18	0.70
3	0.00	AV1	24.78	17.44	0.288	82.3	54.4	0.288	0.251	0.61	0.68
4	0.00	AV1	24.97	17.61	0.313	89.4	54.3	0.313	0.255	1.36	0.57
5	0.00	AV1	24.97	17.22	0.289	82.4	54.3	0.289	0.255	0.23	0.69
6	0.00	AV1	24.95	17.68	0.259	74.1	54.2	0.259	0.248	-0.51	0.56
7	0.00	AV1	24.61	17.30	0.283	80.7	54.4	0.283	0.254	-0.60	0.54
8	0.00	AV1	23.85	17.82	0.297	84.9	54.3	0.297	0.250	-1.37	0.59
9	0.00	AV1	23.80	17.93	0.267	76.4	54.5	0.267	0.250	-0.18	0.58
10	0.00	AV1	24.48	17.22	0.262	74.8	54.4	0.262	0.248	-0.96	0.54
11	0.00	AV1	24.27	17.20	0.260	74.3	54.2	0.260	0.253	-0.14	0.54
12	0.00	AV1	24.08	17.12	0.274	78.3	54.4	0.274	0.250	-0.03	0.67
13	0.00	AV1	24.48	17.07	0.275	78.6	54.3	0.275	0.247	-0.20	0.68
14	0.00	AV1	24.59	17.51	0.273	77.9	54.5	0.273	0.255	-0.12	0.56
15	0.00	AV1	24.99	17.68	0.271	77.5	54.4	0.271	0.248	-0.15	0.56
16	0.00	AV1	24.37	17.08	0.279	79.6	54.4	0.279	0.251	0.07	0.68
17	0.00	AV1	24.82	17.73	0.273	78.0	54.4	0.273	0.251	-0.36	0.55
18	0.00	AV1	24.19	17.57	0.298	85.2	54.2	0.298	0.258	0.08	0.65
19	0.00	AV1	24.25	17.18	0.291	83.1	54.3	0.291	0.247	-0.87	0.52
		Average	24.50	17.35	0.282	80.5	54.4	0.282	0.252	-0.07	0.61

Total number of blows analyzed: 19

Time Summary

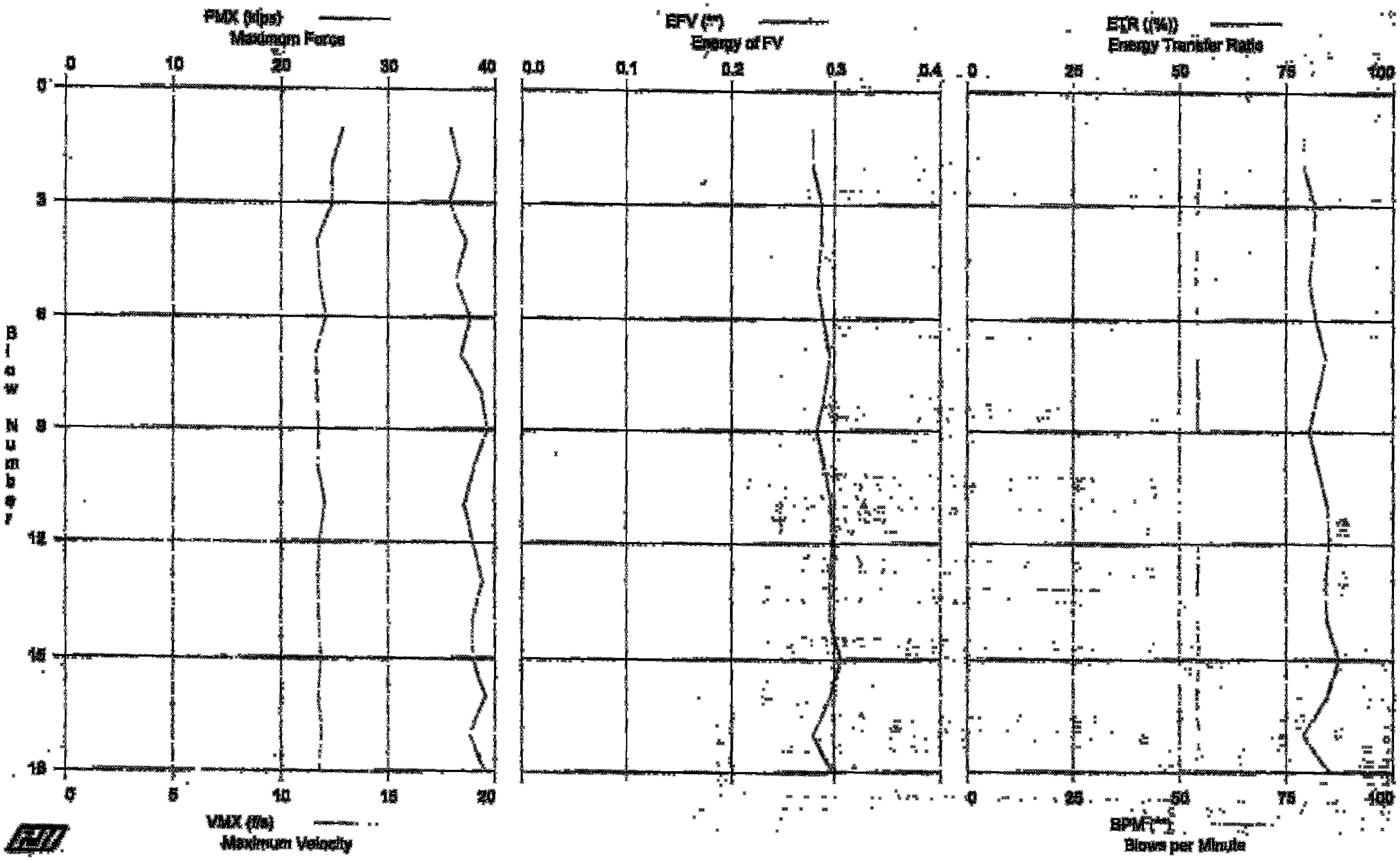
Drive 20 seconds 11:30:38 AM - 11:30:58 AM (6/21/2006) BN 1 - 19

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B403-120

Test date: 21-Jun-2006



Case Method Results
PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-120 AW rod
OP: KB Test date: 21-Jun-2006

AR: 1.19 in^2 SP: 0.492 k/ft3
LE: 124.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	25.80	17.90	0.277	79.2	**	0.277	0.279	-0.04	0.59
2	0.00	AV1	24.72	18.35	0.277	79.2	54.7	0.277	0.273	-0.30	0.54
3	0.00	AV1	24.77	17.88	0.286	81.8	54.2	0.286	0.274	-0.47	0.53
4	0.00	AV1	23.36	18.67	0.285	81.5	54.2	0.285	0.268	0.30	0.59
5	0.00	AV1	23.58	18.19	0.282	80.5	53.9	0.282	0.268	0.40	0.62
6	0.00	AV1	24.19	18.83	0.287	82.0	54.2	0.287	0.272	-0.71	0.52
7	0.00	AV1	23.23	18.42	0.295	84.4	54.3	0.295	0.266	0.61	0.60
8	0.00	AV1	23.38	19.36	0.289	82.5	54.3	0.289	0.271	-0.86	0.57
9	0.00	AV1	23.45	19.62	0.281	80.4	54.3	0.281	0.269	-0.43	0.52
10	0.00	AV1	23.41	19.02	0.289	82.6	54.2	0.289	0.266	0.50	0.59
11	0.00	AV1	24.11	18.56	0.297	84.8	54.1	0.297	0.268	0.53	0.62
12	0.00	AV1	23.52	18.97	0.298	85.1	54.3	0.298	0.271	0.19	0.59
13	0.00	AV1	23.43	19.42	0.295	84.3	54.3	0.295	0.267	0.23	0.49
14	0.00	AV1	23.51	18.94	0.296	84.5	54.1	0.296	0.270	0.52	0.59
15	0.00	AV1	23.73	18.95	0.306	87.4	54.4	0.306	0.266	1.76	0.49
16	0.00	AV1	23.45	19.55	0.296	84.5	54.0	0.296	0.270	0.26	0.47
17	0.00	AV1	23.77	18.80	0.277	79.0	54.4	0.277	0.271	-0.34	0.60
18	0.00	AV1	23.55	19.54	0.298	85.0	53.8	0.298	0.265	0.48	0.50
		Average	23.83	18.83	0.289	82.7	54.2	0.289	0.270	0.15	0.56

Total number of blows analyzed: 18

Time Summary

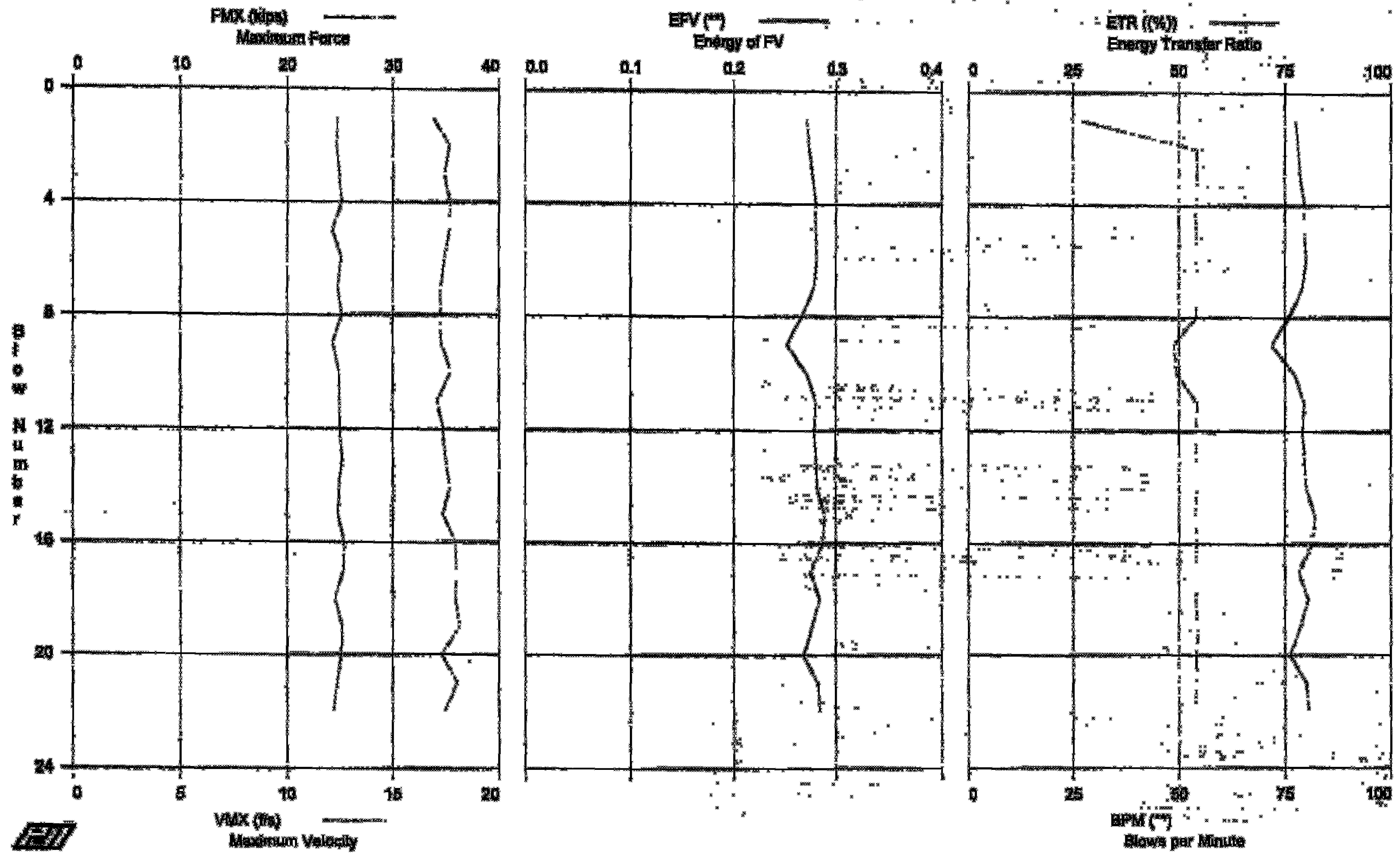
Drive 19 seconds 1:01:30 PM - 1:01:49 PM (6/21/2006) BN 1 - 18

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B403-135

Test date: 21-Jun-2006



SPT, Calvert Cliffs - B403-135

AW rod

OP: KB

Test date: 21-Jun-2006

AR: 1.19 in^2
LE: 139.0 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	24.74	16.90	0.271	77.5	27.3	0.271	0.262	-0.47	0.57
2	0.00	AV1	24.63	17.68	0.273	78.1	54.3	0.273	0.275	-0.86	0.66
3	0.00	AV1	24.90	17.43	0.276	78.7	54.3	0.276	0.263	-0.62	0.56
4	0.00	AV1	25.14	17.70	0.279	79.7	54.1	0.279	0.265	-0.53	0.60
5	0.00	AV1	24.25	17.68	0.279	79.6	54.1	0.279	0.277	-0.96	0.65
6	0.00	AV1	25.10	17.44	0.280	80.0	54.2	0.280	0.265	-0.76	0.57
7	0.00	AV1	24.76	17.25	0.277	79.1	54.3	0.277	0.266	-0.96	0.69
8	0.00	AV1	25.15	17.24	0.266	75.9	54.1	0.266	0.264	-0.54	0.57
9	0.00	AV1	24.27	17.27	0.251	71.9	48.9	0.251	0.247	-1.11	0.59
10	0.00	AV1	24.89	17.76	0.270	77.2	49.5	0.270	0.266	-1.01	0.57
11	0.00	AV1	24.93	17.09	0.279	79.6	54.3	0.279	0.263	0.23	0.56
12	0.00	AV1	24.97	17.38	0.277	79.2	53.9	0.277	0.259	-0.40	0.55
13	0.00	AV1	25.16	17.48	0.279	79.7	54.2	0.279	0.277	-0.47	0.57
14	0.00	AV1	24.95	17.69	0.280	80.0	54.3	0.280	0.275	-0.41	0.67
15	0.00	AV1	24.78	17.36	0.287	82.1	53.9	0.287	0.272	-0.47	0.68
16	0.00	AV1	25.37	17.96	0.285	81.5	54.3	0.285	0.274	-0.55	0.56
17	0.00	AV1	25.33	18.02	0.274	78.4	53.9	0.274	0.268	-0.82	0.56
18	0.00	AV1	24.51	17.97	0.282	80.6	54.1	0.282	0.268	-0.77	0.65
19	0.00	AV1	25.21	18.16	0.275	78.7	54.4	0.275	0.264	-0.73	0.56
20	0.00	AV1	25.12	17.30	0.267	76.2	54.1	0.267	0.273	-1.12	0.69
21	0.00	AV1	24.73	18.04	0.281	80.1	54.2	0.281	0.261	-1.06	0.65
22	0.00	AV1	24.37	17.45	0.282	80.6	54.0	0.282	0.262	-0.38	0.54
		Average	24.87	17.56	0.276	78.8	52.5	0.276	0.267	-0.67	0.60

Total number of blows analyzed: 22

Time Summary

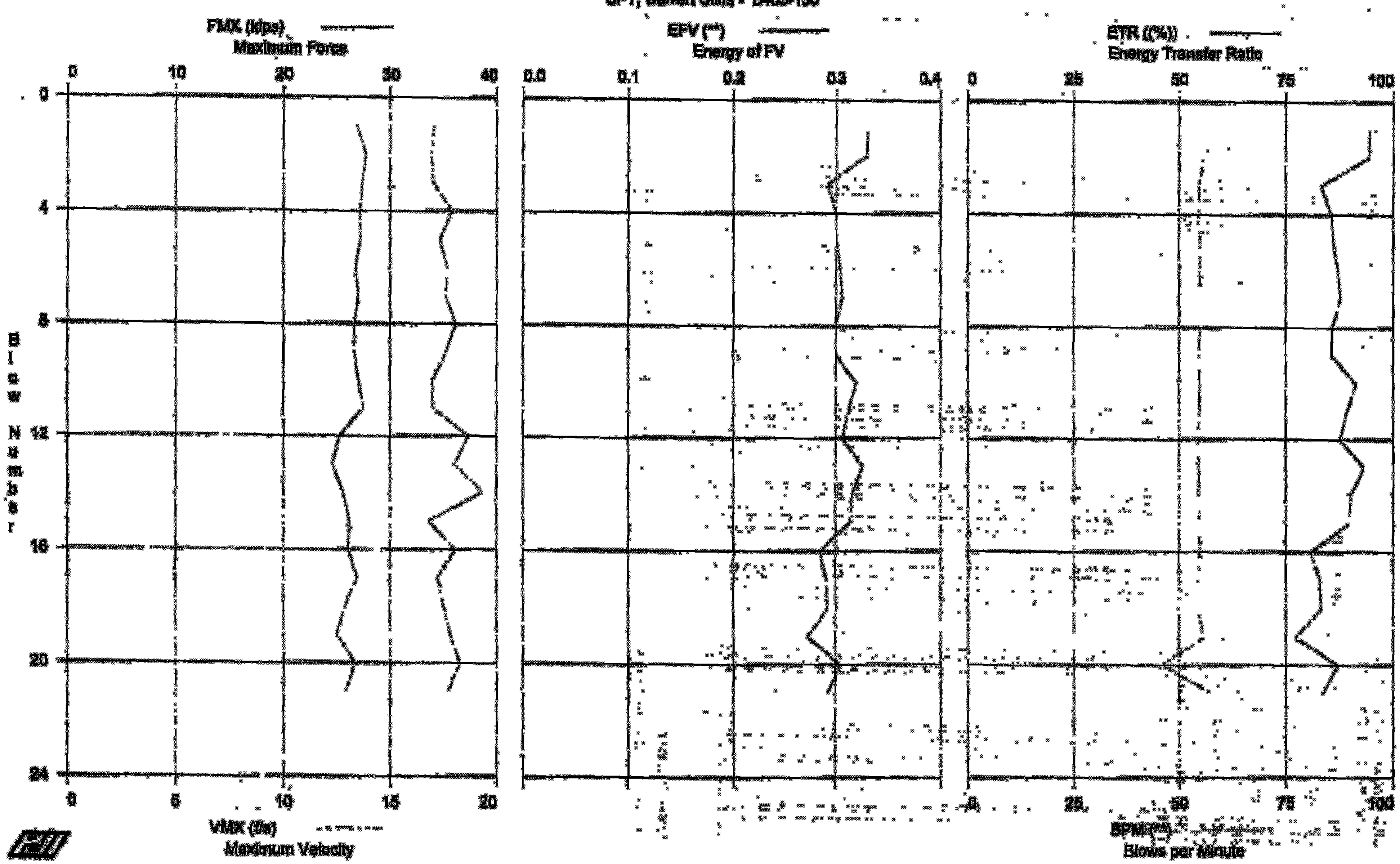
Drive 25 seconds 2:35:09 PM - 2:35:34 PM (6/21/2006) BN 1 - 22

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B403-150

Test date: 21-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-150

AW rod

OP: KB

Test date: 21-Jun-2006

AR: 1.19 in^2
LE: 154.0 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	26.85	17.10	0.331	94.4	**	0.331	0.310	2.80	0.75
2	0.00	AV1	27.73	16.93	0.330	94.2	55.6	0.330	0.306	2.41	0.73
3	0.00	AV1	27.39	17.02	0.291	83.2	54.6	0.291	0.299	0.91	0.77
4	0.00	AV1	27.16	17.92	0.300	85.6	54.4	0.300	0.299	0.40	0.72
5	0.00	AV1	27.19	17.33	0.301	86.0	54.8	0.301	0.303	1.02	0.72
6	0.00	AV1	26.73	17.69	0.305	87.1	54.8	0.305	0.301	0.50	0.68
7	0.00	AV1	27.00	17.63	0.307	87.8	54.8	0.307	0.303	0.40	0.73
8	0.00	AV1	26.63	18.08	0.300	85.8	54.8	0.300	0.295	0.57	0.70
9	0.00	AV1	26.63	17.65	0.300	85.7	54.6	0.300	0.297	1.02	0.69
10	0.00	AV1	27.02	17.01	0.320	91.4	54.8	0.320	0.301	1.87	0.69
11	0.00	AV1	27.49	17.00	0.313	89.3	54.7	0.313	0.300	1.95	0.73
12	0.00	AV1	25.23	18.66	0.307	87.6	54.3	0.307	0.295	0.32	0.65
13	0.00	AV1	24.56	18.00	0.326	93.2	54.6	0.326	0.286	3.04	0.65
14	0.00	AV1	25.56	19.30	0.316	90.1	54.6	0.316	0.286	1.29	0.63
15	0.00	AV1	26.14	16.83	0.314	89.7	54.8	0.314	0.293	2.27	0.71
16	0.00	AV1	26.09	18.04	0.283	80.8	54.8	0.283	0.289	-1.53	0.69
17	0.00	AV1	26.90	17.24	0.290	83.0	54.4	0.290	0.297	1.04	0.74
18	0.00	AV1	25.74	17.52	0.291	83.2	54.4	0.291	0.290	0.04	0.68
19	0.00	AV1	24.97	17.83	0.271	77.3	55.7	0.271	0.276	-0.09	0.67
20	0.00	AV1	26.74	18.27	0.305	87.2	45.9	0.305	0.308	0.50	0.70
21	0.00	AV1	25.81	17.72	0.292	83.5	57.6	0.292	0.265	1.12	0.69
		Average	26.46	17.66	0.304	86.9	54.5	0.304	0.295	1.04	0.70

Total number of blows analyzed: 21

Time Summary

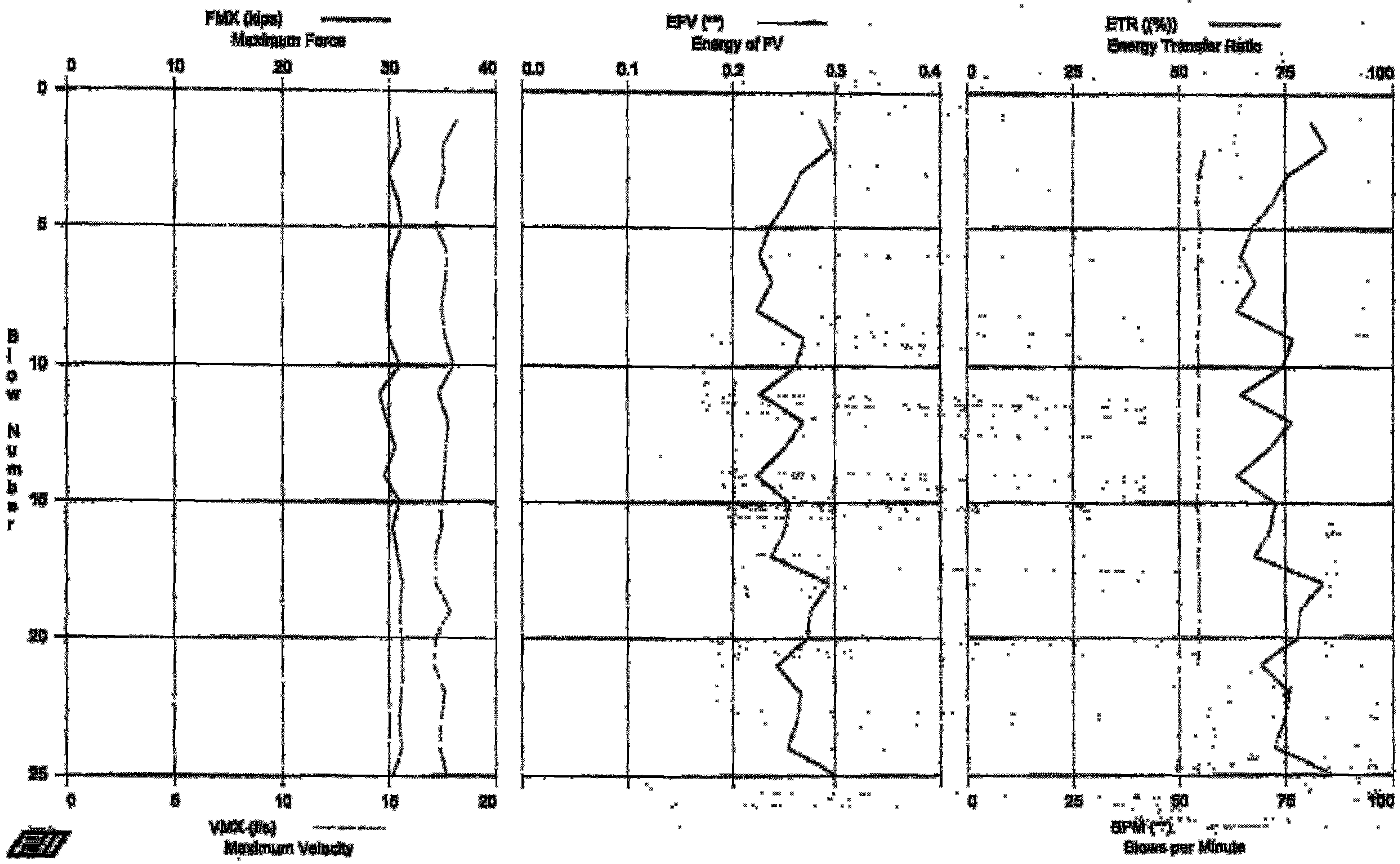
Drive 31 seconds 4:13:07 PM - 4:13:38 PM (6/21/2006) BN 1 - 21

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B403-165

Test date: 22-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-165 AW rod
OP: KB Test date: 22-Jun-2006

AR: 1.18 in^2 SP: 0.492 k/ft3
LE: 169.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	30.76	18.24	0.283	80.8	**	0.283	0.414	0.65	0.81
2	0.00	AV1	30.97	17.53	0.296	84.5	56.2	0.296	0.418	1.50	0.84
3	0.00	AV1	29.92	17.58	0.265	75.7	54.8	0.265	0.410	0.96	0.74
4	0.00	AV1	30.79	17.28	0.252	72.1	54.3	0.252	0.409	-1.42	0.74
5	0.00	AV1	31.17	17.24	0.235	67.1	55.0	0.235	0.405	-1.35	0.69
6	0.00	AV1	30.23	17.73	0.226	64.6	54.6	0.226	0.421	-4.55	0.81
7	0.00	AV1	29.81	17.64	0.238	68.0	54.6	0.238	0.406	-1.47	0.81
8	0.00	AV1	29.75	17.48	0.223	63.6	54.9	0.223	0.407	-3.04	0.74
9	0.00	AV1	29.97	17.64	0.269	76.7	54.4	0.269	0.417	1.59	0.71
10	0.00	AV1	30.96	18.02	0.260	74.4	54.6	0.260	0.419	-0.17	0.82
11	0.00	AV1	29.09	17.31	0.226	64.6	54.8	0.226	0.412	-4.31	0.80
12	0.00	AV1	29.79	17.77	0.268	76.4	54.4	0.268	0.418	-0.34	0.80
13	0.00	AV1	30.59	17.66	0.249	71.2	54.6	0.249	0.418	-3.11	0.82
14	0.00	AV1	29.54	17.59	0.223	63.7	54.8	0.223	0.412	-2.22	0.74
15	0.00	AV1	30.92	17.49	0.254	72.6	54.2	0.254	0.423	-4.97	0.84
16	0.00	AV1	30.30	17.46	0.250	71.5	54.8	0.250	0.420	-5.49	0.82
17	0.00	AV1	30.79	17.19	0.237	67.8	54.5	0.237	0.422	-3.73	0.85
18	0.00	AV1	31.23	17.22	0.293	83.8	54.7	0.293	0.421	2.42	0.74
19	0.00	AV1	30.99	17.85	0.274	78.4	54.7	0.274	0.420	-1.02	0.83
20	0.00	AV1	31.13	17.19	0.272	77.8	54.7	0.272	0.415	0.12	0.87
21	0.00	AV1	31.26	17.11	0.242	69.2	54.5	0.242	0.417	-5.00	0.73
22	0.00	AV1	31.15	17.60	0.265	75.8	54.4	0.265	0.420	-2.05	0.84
23	0.00	AV1	30.90	17.45	0.262	74.8	54.4	0.262	0.416	-3.52	0.84
24	0.00	AV1	31.16	17.39	0.253	72.4	54.5	0.253	0.418	-5.31	0.74
25	0.00	AV1	30.35	17.68	0.301	86.0	54.3	0.301	0.409	-0.87	0.82
		Average	30.54	17.53	0.257	73.3	54.7	0.257	0.415	-1.87	0.79

Total number of blows analyzed: 25

Time Summary

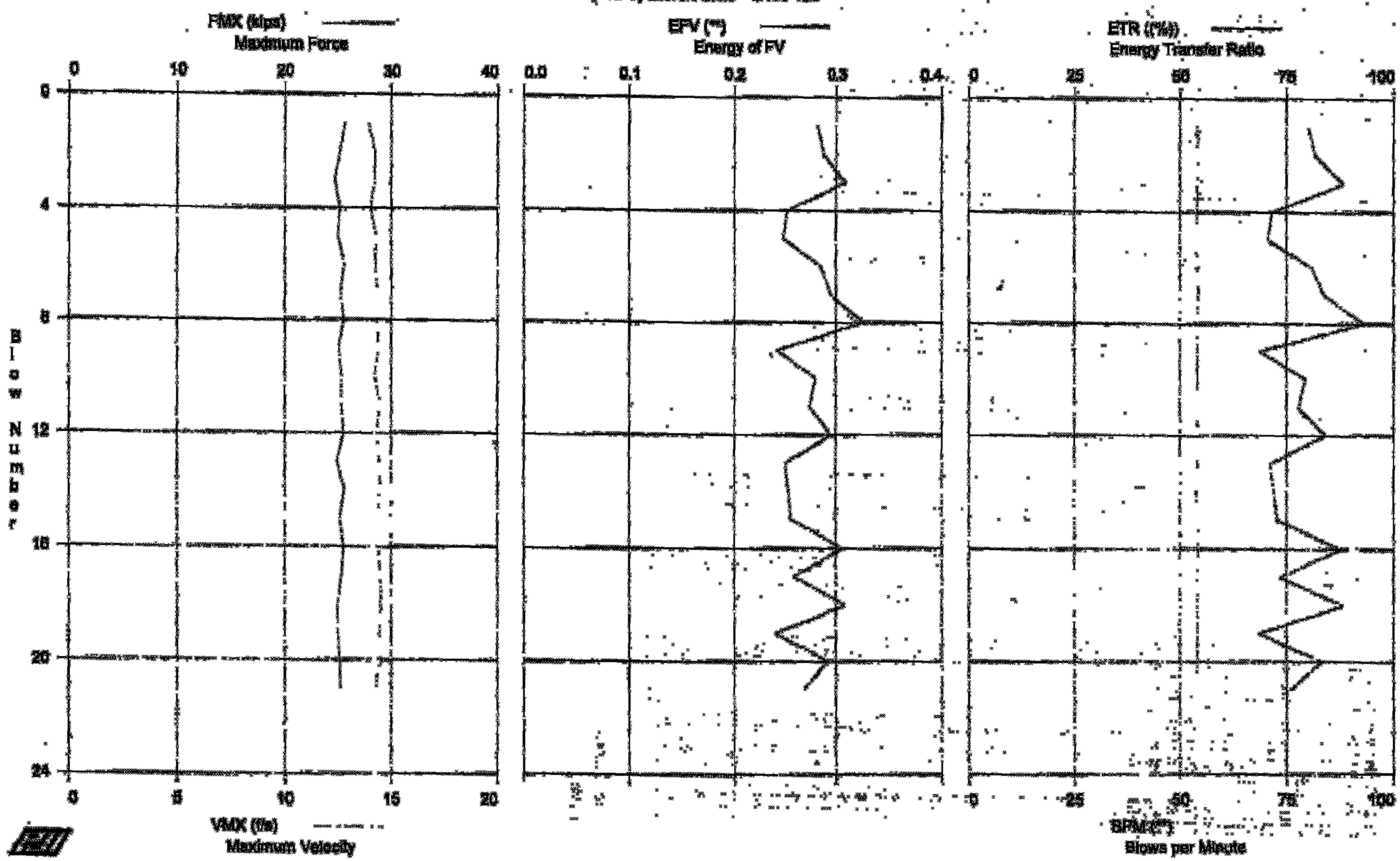
Drive 27 seconds 9:01:55 AM - 9:02:22 AM (6/22/2006) BN 1 - 25

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B403-180

Test date: 22-Jun-2006



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-180 AW rod
OP: KB Test date: 22-Jun-2006

AR: 1.19 in^2 SP: 0.492 k/ft3
LE: 184.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force EMX: Max Transferred Energy
VMX: Maximum Velocity EF2: Energy of F^2
EFV: Energy of FV DFN: Final Displacement
ETR: Energy Transfer Ratio FVP: Force/Velocity proportionality
BPM: Blows per Minute

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	25.66	13.95	0.280	80.1	54.1	0.280	0.292	-0.61	0.68
2	0.00	AV1	25.16	14.21	0.286	81.7	54.3	0.286	0.291	-0.91	0.72
3	0.00	AV1	24.66	14.22	0.309	88.3	54.1	0.309	0.286	-1.48	0.71
4	0.00	AV1	25.17	14.04	0.251	71.7	54.1	0.251	0.288	-1.67	0.68
5	0.00	AV1	24.95	14.27	0.247	70.6	53.9	0.247	0.290	-1.32	0.68
6	0.00	AV1	25.59	14.24	0.283	80.9	54.1	0.283	0.292	-0.76	0.68
7	0.00	AV1	25.21	14.31	0.294	84.0	54.3	0.294	0.288	-0.48	0.69
8	0.00	AV1	25.53	14.31	0.326	93.1	53.9	0.326	0.289	-0.31	0.67
9	0.00	AV1	25.05	14.38	0.241	68.8	54.1	0.241	0.289	-1.10	0.71
10	0.00	AV1	25.34	14.22	0.278	79.3	54.1	0.278	0.285	-0.62	0.68
11	0.00	AV1	25.33	14.44	0.272	77.7	53.9	0.272	0.289	-0.75	0.69
12	0.00	AV1	25.53	14.31	0.294	84.1	54.3	0.294	0.287	-0.75	0.67
13	0.00	AV1	24.89	14.40	0.249	71.2	54.1	0.249	0.288	-1.07	0.70
14	0.00	AV1	25.60	14.47	0.252	72.0	53.8	0.252	0.291	-0.81	0.73
15	0.00	AV1	25.15	14.35	0.255	72.9	54.0	0.255	0.289	-0.67	0.71
16	0.00	AV1	25.50	14.36	0.306	87.5	54.3	0.306	0.285	-0.33	0.67
17	0.00	AV1	25.33	14.47	0.257	73.4	54.1	0.257	0.287	-0.64	0.71
18	0.00	AV1	24.95	14.50	0.309	88.2	54.1	0.309	0.285	-0.25	0.70
19	0.00	AV1	24.99	14.44	0.239	68.4	54.1	0.239	0.285	-1.28	0.71
20	0.00	AV1	25.15	14.48	0.291	83.2	54.1	0.291	0.283	-0.48	0.70
21	0.00	AV1	25.22	14.24	0.266	75.9	54.0	0.266	0.283	-1.13	0.68
		Average	25.23	14.31	0.275	78.7	54.1	0.275	0.288	-0.83	0.69

Total number of blows analyzed: 21

Time Summary

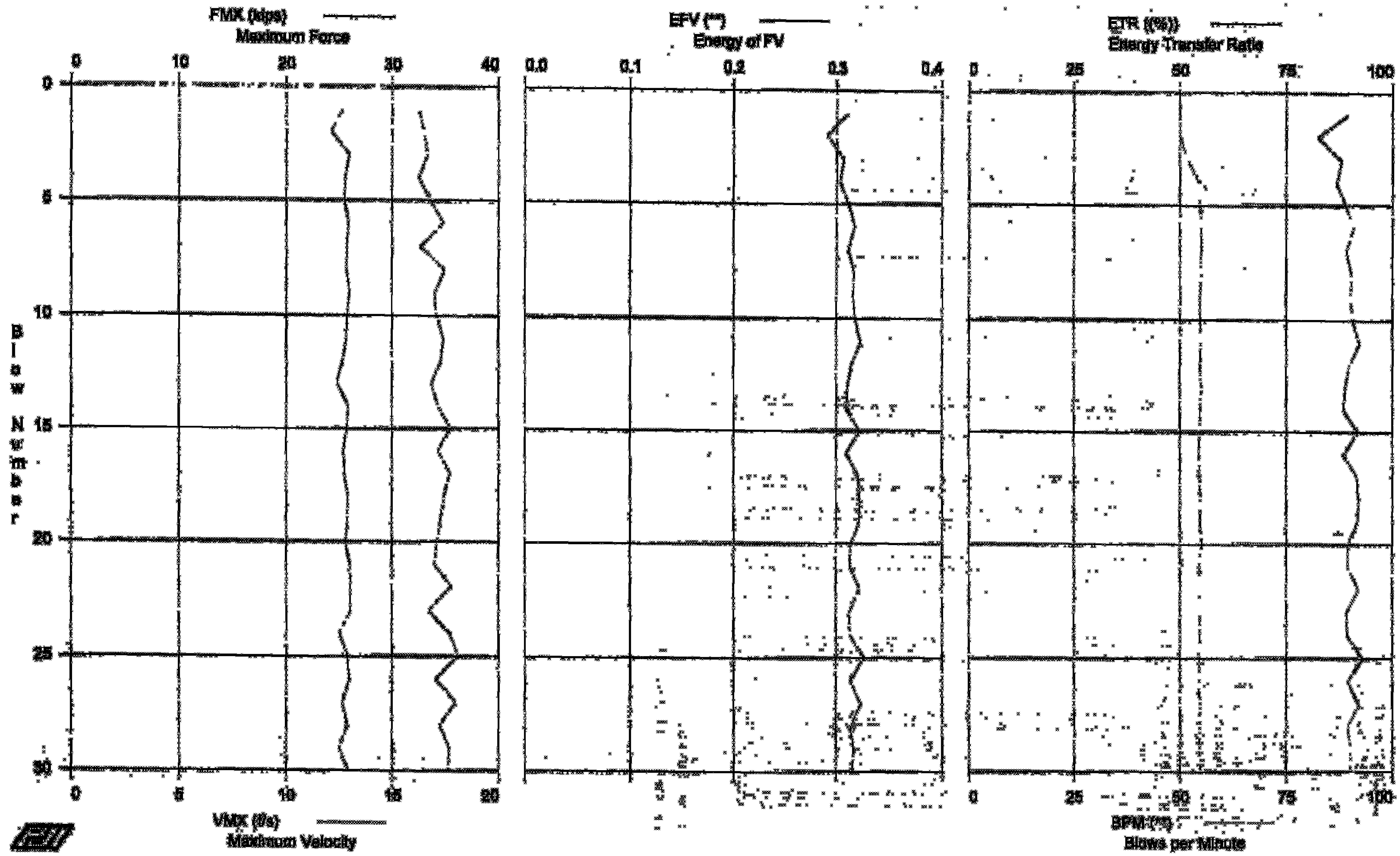
Drive 33 seconds 10:42:15 AM - 10:42:48 AM (6/22/2006) BN 1 - 21

PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 22-Jun-2006

SPT, Calvert Cliffs - B403-200



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 17-Jul-2006

SPT, Calvert Cliffs - B403-200 AWJ
OP: KB Test date: 22-Jun-2006

AR: 1.19 in^2 SP: 0.492 k/ft3
LE: 204.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	25.35	16.30	0.313	89.5	**	0.313	0.292	1.08	0.43
2	0.00	AV1	24.25	16.47	0.289	82.5	50.0	0.289	0.259	1.16	0.41
3	0.00	AV1	25.96	16.66	0.308	88.0	52.0	0.308	0.283	1.09	0.36
4	0.00	AV1	25.55	16.23	0.304	86.9	54.6	0.304	0.285	0.99	0.44
5	0.00	AV1	25.47	16.82	0.312	89.1	54.7	0.312	0.293	0.96	0.42
6	0.00	AV1	25.87	17.42	0.318	91.0	55.0	0.318	0.297	0.93	0.43
7	0.00	AV1	25.68	16.32	0.312	89.2	55.0	0.312	0.289	0.97	0.47
8	0.00	AV1	25.68	17.47	0.317	90.4	54.8	0.317	0.288	0.74	0.46
9	0.00	AV1	25.95	17.00	0.316	90.3	54.7	0.316	0.295	0.70	0.37
10	0.00	AV1	25.73	17.08	0.318	90.7	54.8	0.318	0.294	0.58	0.43
11	0.00	AV1	25.66	17.41	0.323	92.3	54.9	0.323	0.294	0.53	0.49
12	0.00	AV1	25.30	17.29	0.315	89.9	54.7	0.315	0.282	0.70	0.40
13	0.00	AV1	24.76	16.84	0.311	88.9	55.0	0.311	0.287	0.69	0.40
14	0.00	AV1	25.85	17.16	0.310	88.5	54.8	0.310	0.285	0.64	0.43
15	0.00	AV1	25.70	17.75	0.322	91.9	54.6	0.322	0.293	0.73	0.42
16	0.00	AV1	25.40	17.15	0.310	88.6	54.5	0.310	0.278	0.69	0.40
17	0.00	AV1	25.48	17.71	0.321	91.7	54.6	0.321	0.293	0.62	0.40
18	0.00	AV1	25.81	17.45	0.322	92.0	54.9	0.322	0.290	0.67	0.46
19	0.00	AV1	25.81	17.28	0.322	91.9	54.7	0.322	0.291	0.50	0.46
20	0.00	AV1	25.57	17.12	0.314	89.6	55.0	0.314	0.276	0.54	0.42
21	0.00	AV1	26.01	16.99	0.313	89.5	54.5	0.313	0.290	0.53	0.44
22	0.00	AV1	26.06	17.79	0.322	92.1	54.7	0.322	0.293	0.69	0.42
23	0.00	AV1	26.06	16.70	0.312	89.1	54.7	0.312	0.276	0.51	0.45
24	0.00	AV1	25.02	17.71	0.313	89.4	54.7	0.313	0.276	0.47	0.37
25	0.00	AV1	25.78	18.09	0.326	93.1	54.6	0.326	0.292	0.66	0.41
26	0.00	AV1	25.96	17.04	0.313	89.5	54.4	0.313	0.288	0.52	0.45
27	0.00	AV1	25.28	18.00	0.323	92.2	54.6	0.323	0.290	0.55	0.38
28	0.00	AV1	25.76	17.23	0.313	89.6	54.7	0.313	0.289	0.67	0.41
29	0.00	AV1	24.99	17.67	0.316	90.2	54.4	0.316	0.280	0.70	0.37
30	0.00	AV1	25.83	17.60	0.315	90.1	54.8	0.315	0.274	0.90	0.41
		Average	25.59	17.19	0.315	89.9	54.5	0.315	0.287	0.72	0.42

Total number of blows analyzed: 30

Time Summary

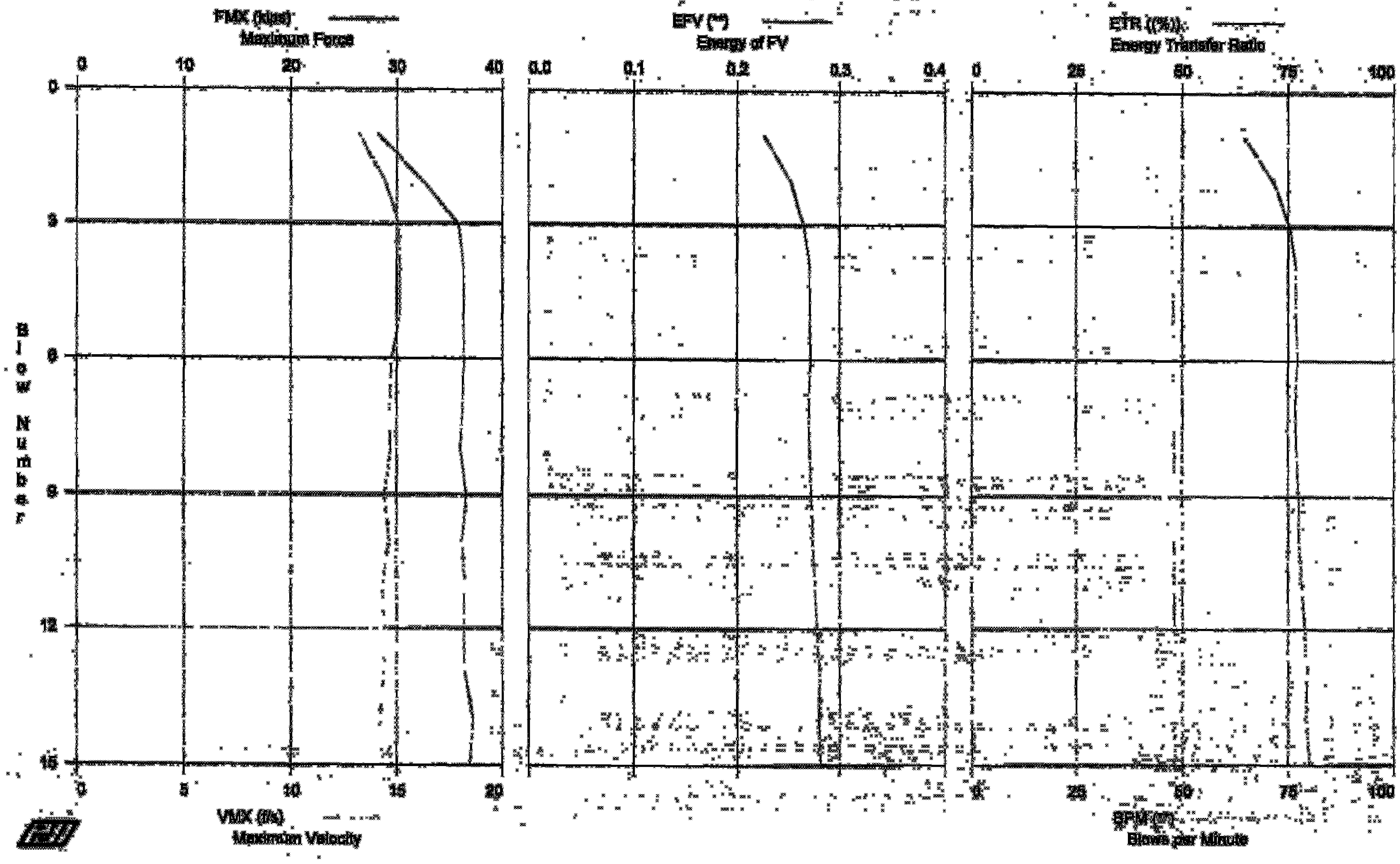
Drive 32 seconds 1:02:23 PM - 1:02:55 PM (6/22/2006) BN 1 - 30

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B404-15

Test date: 22-Jun-2006



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B404-15 MWJ
OP: KB Test date: 22-Jun-2006

AR: 1.45 in^2 SP: 0.492 k/ft3
LE: 20.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	28.20	13.21	0.226	64.6	**	0.226	0.245	1.84	1.24
2	0.00	AV1	32.31	14.41	0.251	71.8	47.2	0.251	0.278	1.91	1.25
3	0.00	AV1	35.83	15.08	0.264	75.4	47.7	0.264	0.299	1.79	1.17
4	0.00	AV1	36.34	15.16	0.269	76.9	47.8	0.269	0.305	1.93	1.20
5	0.00	AV1	36.34	15.16	0.269	76.8	48.0	0.269	0.307	1.73	1.23
6	0.00	AV1	36.34	14.75	0.270	77.2	48.1	0.270	0.305	1.73	1.21
7	0.00	AV1	36.19	14.65	0.268	76.6	48.0	0.268	0.305	1.65	1.18
8	0.00	AV1	36.00	14.68	0.269	77.0	48.1	0.269	0.304	1.76	1.28
9	0.00	AV1	36.56	14.42	0.271	77.6	48.0	0.271	0.308	1.67	1.16
10	0.00	AV1	36.16	14.63	0.272	77.6	48.1	0.272	0.304	1.59	1.22
11	0.00	AV1	36.38	14.32	0.274	78.3	48.1	0.274	0.309	1.51	1.29
12	0.00	AV1	36.31	14.42	0.276	79.0	48.1	0.276	0.311	1.47	1.28
13	0.00	AV1	36.40	14.38	0.279	79.6	48.0	0.279	0.312	1.48	1.25
14	0.00	AV1	37.21	14.22	0.278	79.3	48.1	0.278	0.311	1.50	1.16
15	0.00	AV1	36.86	14.16	0.280	80.1	48.3	0.280	0.310	1.46	1.19
		Average	35.56	14.51	0.268	76.5	48.0	0.268	0.301	1.67	1.22

Total number of blows analyzed: 15

Time Summary

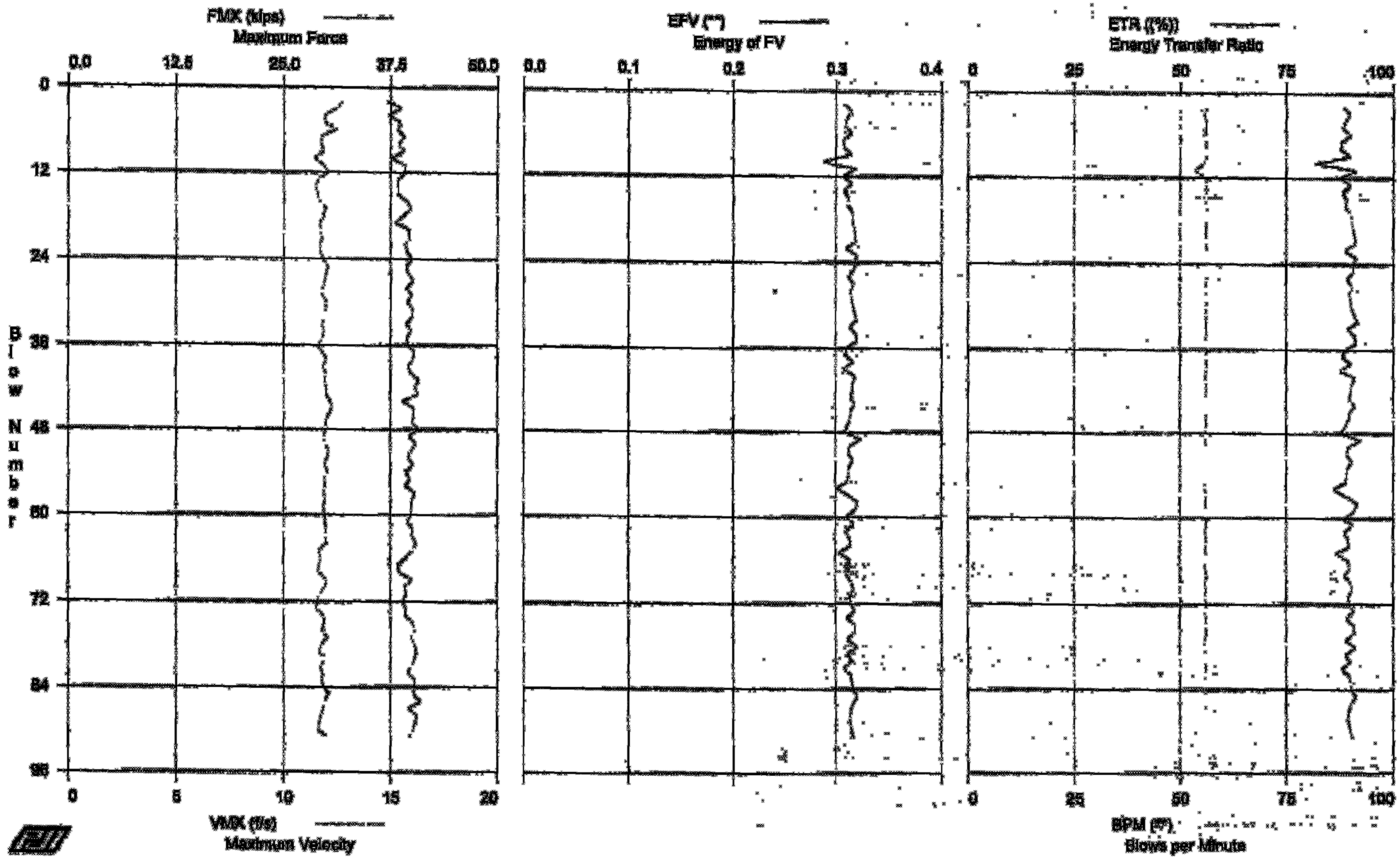
Drive 17 seconds 1:54:08 PM - 1:54:25 PM (6/22/2006) BN 1 - 15

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 22-Jun-2006

SPT, Calvert Cliffs - B404-30



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B404-30 NMJ
OP: KB Test date: 22-Jun-2006

AR: 1.45 in^2 SP: 0.492 k/ft3
LE: 35.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
2	0.00	AV1	37.13	12.73	0.310	88.5	56.4	0.310	0.335	1.05	1.26
3	0.00	AV1	38.76	12.49	0.315	89.9	55.7	0.315	0.336	0.90	1.17
4	0.00	AV1	37.21	11.93	0.310	88.7	56.2	0.310	0.330	1.03	1.26
5	0.00	AV1	38.76	11.91	0.309	88.2	56.2	0.309	0.334	0.80	1.21
6	0.00	AV1	38.33	12.46	0.315	90.1	56.1	0.315	0.335	1.14	1.24
7	0.00	AV1	39.09	11.76	0.307	87.8	56.1	0.307	0.334	0.85	1.19
8	0.00	AV1	38.46	11.71	0.308	87.9	56.3	0.308	0.335	0.86	1.26
9	0.00	AV1	39.13	11.90	0.315	90.1	56.4	0.315	0.335	1.03	1.19
10	0.00	AV1	37.66	11.44	0.286	81.6	55.5	0.286	0.313	0.66	1.23
11	0.00	AV1	39.25	11.89	0.319	91.3	53.5	0.319	0.339	0.85	1.22
12	0.00	AV1	39.14	12.06	0.307	87.7	56.2	0.307	0.340	1.01	1.15
13	0.00	AV1	38.41	11.61	0.315	90.1	56.2	0.315	0.340	1.05	1.30
14	0.00	AV1	38.42	11.49	0.308	88.1	56.2	0.308	0.339	0.90	1.30
15	0.00	AV1	38.42	11.58	0.312	89.2	56.1	0.312	0.343	0.84	1.30
16	0.00	AV1	39.51	11.70	0.311	88.8	56.3	0.311	0.339	0.92	1.26
17	0.00	AV1	39.94	11.98	0.316	90.3	56.2	0.316	0.341	1.17	1.21
18	0.00	AV1	39.03	11.87	0.316	90.2	56.3	0.316	0.340	0.92	1.27
19	0.00	AV1	38.04	11.68	0.317	90.6	56.1	0.317	0.338	1.13	1.27
20	0.00	AV1	39.73	11.72	0.319	91.0	56.2	0.319	0.341	0.96	1.22
21	0.00	AV1	39.76	11.78	0.319	91.3	56.1	0.319	0.338	1.00	1.23
22	0.00	AV1	39.24	11.71	0.310	88.6	56.3	0.310	0.341	0.71	1.27
23	0.00	AV1	39.40	11.69	0.320	91.4	56.3	0.320	0.341	1.05	1.26
24	0.00	AV1	40.03	11.86	0.318	90.8	56.2	0.318	0.341	0.77	1.19
25	0.00	AV1	39.38	12.05	0.317	90.7	56.3	0.317	0.333	1.06	1.17
26	0.00	AV1	39.59	11.99	0.312	89.2	56.3	0.312	0.337	0.88	1.17
27	0.00	AV1	40.27	11.92	0.317	90.6	56.1	0.317	0.343	0.88	1.21
28	0.00	AV1	39.44	11.84	0.314	89.7	56.1	0.314	0.340	0.93	1.26
29	0.00	AV1	40.02	11.80	0.315	90.0	56.3	0.315	0.340	0.97	1.26
30	0.00	AV1	39.48	12.02	0.316	90.2	56.1	0.316	0.341	0.81	1.22
31	0.00	AV1	40.15	11.94	0.318	91.0	56.2	0.318	0.343	0.77	1.24
32	0.00	AV1	40.08	11.98	0.320	91.5	56.1	0.320	0.344	0.90	1.21
33	0.00	AV1	39.41	11.77	0.313	89.3	56.2	0.313	0.343	0.61	1.29
34	0.00	AV1	39.89	11.88	0.319	91.0	56.1	0.319	0.339	0.97	1.22
35	0.00	AV1	39.44	11.81	0.320	91.4	56.3	0.320	0.342	1.06	1.25
36	0.00	AV1	39.60	11.64	0.310	88.6	56.4	0.310	0.335	0.74	1.27
37	0.00	AV1	40.32	11.80	0.309	88.2	56.0	0.309	0.339	0.56	1.22
38	0.00	AV1	40.10	12.01	0.316	90.2	56.2	0.316	0.340	0.81	1.19
39	0.00	AV1	39.62	11.82	0.307	87.6	56.2	0.307	0.342	0.68	1.27
40	0.00	AV1	39.89	11.97	0.318	91.0	55.9	0.318	0.347	0.96	1.26
41	0.00	AV1	40.85	11.93	0.316	90.2	56.2	0.316	0.346	0.66	1.26
42	0.00	AV1	40.34	11.98	0.316	90.2	56.2	0.316	0.343	0.91	1.23
43	0.00	AV1	40.72	11.97	0.314	89.6	56.1	0.314	0.346	0.66	1.21
44	0.00	AV1	38.93	12.10	0.318	90.9	56.1	0.318	0.341	0.82	1.20
45	0.00	AV1	40.24	12.25	0.314	89.8	56.1	0.314	0.345	0.51	1.25
46	0.00	AV1	40.27	12.05	0.314	89.6	56.2	0.314	0.342	0.67	1.27
47	0.00	AV1	40.03	11.98	0.311	88.8	56.2	0.311	0.341	0.61	1.26
48	0.00	AV1	40.80	11.95	0.308	88.0	55.9	0.308	0.344	0.58	1.25
49	0.00	AV1	39.70	11.88	0.323	92.2	55.9	0.323	0.346	0.81	1.25
50	0.00	AV1	40.46	11.92	0.313	89.5	56.1	0.313	0.344	0.58	1.19
51	0.00	AV1	39.95	12.10	0.312	89.1	56.0	0.312	0.337	0.79	1.16
52	0.00	AV1	39.60	12.03	0.316	90.4	56.1	0.316	0.337	0.95	1.22
53	0.00	AV1	40.16	11.90	0.312	89.2	56.0	0.312	0.341	0.78	1.24
54	0.00	AV1	39.28	12.05	0.312	89.2	56.1	0.312	0.339	0.69	1.24
55	0.00	AV1	39.83	11.91	0.311	88.8	56.0	0.311	0.341	0.57	1.18
56	0.00	AV1	39.25	11.95	0.301	86.0	55.9	0.301	0.332	0.40	1.16
57	0.00	AV1	40.40	11.87	0.312	89.1	56.2	0.312	0.343	0.67	1.25
58	0.00	AV1	40.02	11.96	0.321	91.7	56.2	0.321	0.342	0.95	1.23
59	0.00	AV1	39.95	11.86	0.318	91.0	56.1	0.318	0.339	1.17	1.17
60	0.00	AV1	39.91	11.96	0.310	88.5	56.1	0.310	0.342	0.42	1.24
61	0.00	AV1	39.44	11.92	0.317	90.6	56.2	0.317	0.341	0.81	1.26
62	0.00	AV1	40.10	11.98	0.310	88.6	55.9	0.310	0.341	0.73	1.18

SPT, Calvert Cliffs - B404-30   MMJ
OP: KB   Test date: 22-Jun-2006

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
63	0.00	AV1	40.02	11.95	0.313	89.4	56.2	0.313	0.344	0.78	1.19
64	0.00	AV1	40.54	11.98	0.314	89.8	56.0	0.314	0.342	0.62	1.33
65	0.00	AV1	40.02	11.62	0.303	86.7	56.0	0.303	0.339	0.37	1.18
66	0.00	AV1	39.30	11.74	0.313	89.4	56.1	0.313	0.337	0.69	1.21
67	0.00	AV1	38.33	11.64	0.314	89.8	55.9	0.314	0.333	0.85	1.21
68	0.00	AV1	38.54	11.62	0.310	88.7	56.3	0.310	0.331	0.58	1.21
69	0.00	AV1	39.95	11.98	0.315	90.1	55.9	0.315	0.339	0.75	1.18
70	0.00	AV1	39.16	11.97	0.317	90.5	56.2	0.317	0.334	0.76	1.16
71	0.00	AV1	39.36	11.64	0.313	89.4	55.8	0.313	0.336	0.62	1.21
72	0.00	AV1	38.97	11.57	0.314	89.7	56.3	0.314	0.333	0.70	1.19
73	0.00	AV1	39.28	11.50	0.318	90.8	56.0	0.318	0.333	0.81	1.18
74	0.00	AV1	39.30	11.87	0.311	89.0	56.2	0.311	0.339	0.44	1.30
75	0.00	AV1	40.15	11.90	0.318	90.9	56.1	0.318	0.343	0.72	1.32
76	0.00	AV1	40.42	11.79	0.318	90.9	56.2	0.318	0.340	0.85	1.35
77	0.00	AV1	39.95	12.03	0.311	89.0	55.8	0.311	0.342	0.44	1.31
78	0.00	AV1	40.30	11.77	0.320	91.3	56.1	0.320	0.340	0.93	1.34
79	0.00	AV1	40.58	11.65	0.311	88.9	55.9	0.311	0.340	0.67	1.37
80	0.00	AV1	40.29	11.94	0.315	89.9	56.1	0.315	0.341	0.52	1.33
81	0.00	AV1	40.02	11.72	0.308	88.0	56.2	0.308	0.340	0.40	1.21
82	0.00	AV1	39.52	11.81	0.314	89.7	55.9	0.314	0.341	0.62	1.32
83	0.00	AV1	40.34	11.76	0.315	90.0	56.1	0.315	0.339	0.69	1.35
84	0.00	AV1	40.26	11.86	0.316	90.2	56.0	0.316	0.343	0.73	1.33
85	0.00	AV1	40.27	12.09	0.320	91.3	56.1	0.320	0.341	0.84	1.31
86	0.00	AV1	41.05	11.89	0.316	90.2	56.1	0.316	0.346	0.75	1.35
87	0.00	AV1	39.57	11.83	0.314	89.6	56.0	0.314	0.342	0.65	1.31
88	0.00	AV1	40.59	11.75	0.313	89.3	56.1	0.313	0.340	0.69	1.24
90	0.00	AV1	40.18	11.62	0.315	90.0	56.1	0.315	0.338	0.65	1.37
91	0.00	AV1	39.76	11.98	0.317	90.5	56.1	0.317	0.339	0.71	1.30
		Average	39.62	11.88	0.314	89.6	56.1	0.314	0.339	0.78	1.24

Total number of blows analyzed: 89

Time Summary

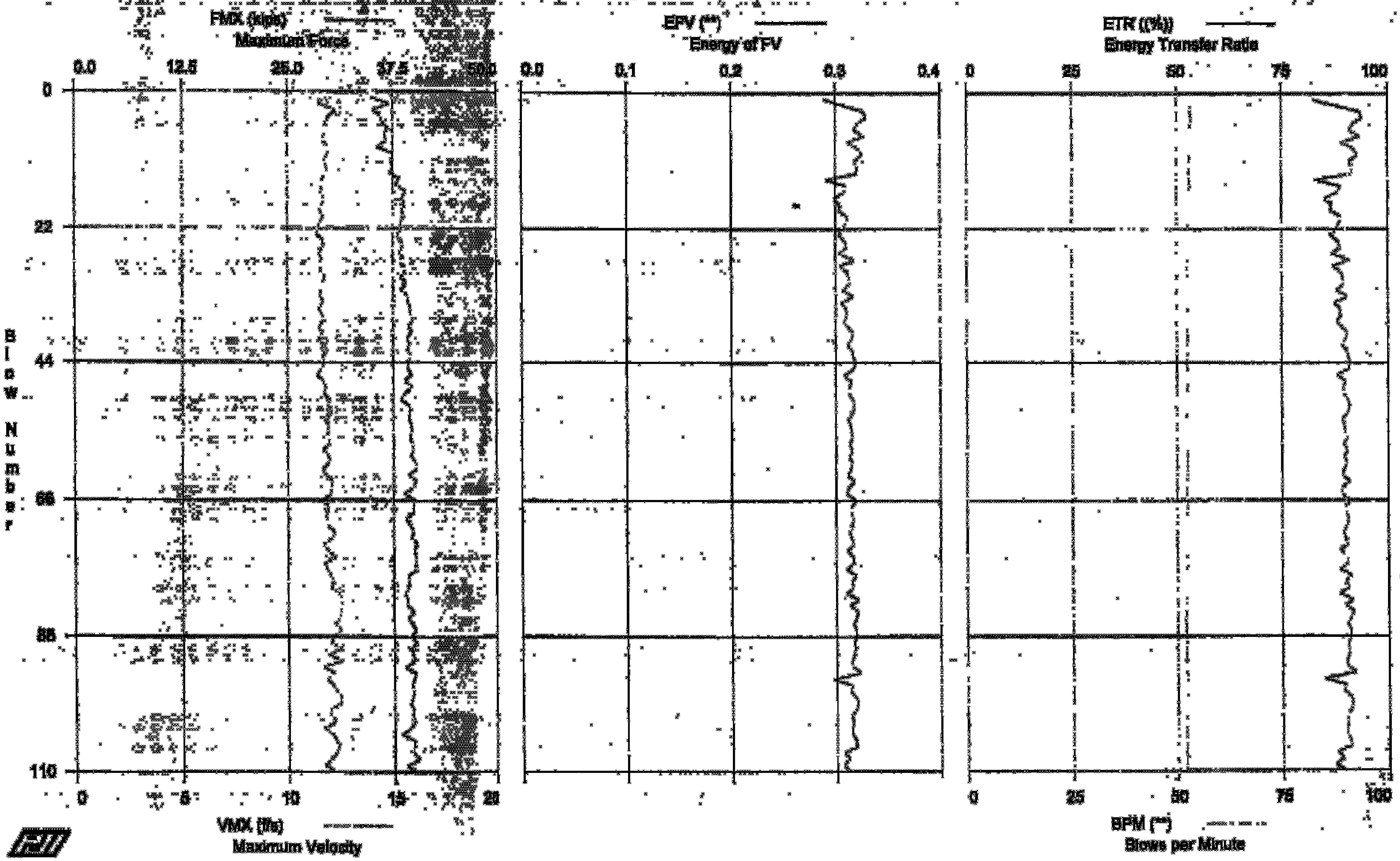
Drive   1 minute 37 seconds   2:27:51 PM - 2:29:28 PM (6/22/2006) BN 1 - 91

PDIPLOT Ver. 2005.2 - Printed: 20-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 22-Jun-2006

SPT, Calvert Cliffs - B404-45



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 20-Jul-2006

SPT, Calvert Cliffs - B404-45 MMJ
OP: KB Test date: 22-Jun-2006

AR: 1.45 in^2 SP: 0.492 k/ft3
LE: 50.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	34.87	11.52	0.288	82.2	**	0.288	0.310	0.79	1.10
2	0.00	AV1	37.07	11.49	0.307	87.6	53.1	0.307	0.329	0.95	1.16
3	0.00	AV1	35.19	12.26	0.327	93.5	53.2	0.327	0.328	1.09	1.13
4	0.00	AV1	36.08	11.96	0.329	93.9	53.5	0.329	0.331	0.60	1.18
5	0.00	AV1	36.26	11.77	0.321	91.6	53.3	0.321	0.325	0.30	1.14
6	0.00	AV1	36.96	11.81	0.318	91.0	53.1	0.318	0.331	0.48	1.15
7	0.00	AV1	36.51	11.70	0.327	93.3	53.1	0.327	0.331	0.52	1.17
8	0.00	AV1	36.72	11.65	0.312	89.1	53.1	0.312	0.333	0.15	1.20
9	0.00	AV1	35.62	11.91	0.322	92.0	53.1	0.322	0.328	0.99	1.15
10	0.00	AV1	37.53	11.90	0.325	92.8	53.0	0.325	0.339	0.89	1.15
11	0.00	AV1	37.23	11.71	0.318	90.9	53.0	0.318	0.335	0.78	1.20
12	0.00	AV1	37.50	11.83	0.321	91.7	53.1	0.321	0.336	1.00	1.20
13	0.00	AV1	37.09	11.85	0.320	91.5	52.8	0.320	0.335	1.32	1.16
14	0.00	AV1	38.17	11.62	0.290	82.9	53.0	0.290	0.334	0.28	1.17
15	0.00	AV1	37.85	11.62	0.311	88.8	53.0	0.311	0.334	0.88	1.25
16	0.00	AV1	38.95	11.55	0.308	88.1	52.9	0.308	0.333	1.01	1.20
17	0.00	AV1	38.49	11.67	0.298	85.2	52.8	0.298	0.331	0.78	1.18
18	0.00	AV1	38.79	11.63	0.304	86.8	52.9	0.304	0.336	0.92	1.20
19	0.00	AV1	38.57	11.52	0.303	86.5	52.8	0.303	0.336	0.72	1.24
20	0.00	AV1	38.73	11.65	0.312	89.2	52.8	0.312	0.336	1.06	1.17
21	0.00	AV1	38.42	11.52	0.310	88.5	52.7	0.310	0.337	0.76	1.24
22	0.00	AV1	38.41	11.47	0.307	87.8	52.6	0.307	0.335	0.88	1.26
23	0.00	AV1	37.93	11.36	0.303	86.5	52.7	0.303	0.332	0.76	1.26
24	0.00	AV1	38.39	11.65	0.309	88.2	52.6	0.309	0.332	0.86	1.16
25	0.00	AV1	38.58	11.64	0.311	88.8	52.6	0.311	0.337	0.71	1.22
26	0.00	AV1	38.17	11.43	0.303	86.7	52.7	0.303	0.332	0.76	1.31
27	0.00	AV1	38.63	11.55	0.318	91.0	52.5	0.318	0.336	1.11	1.26
28	0.00	AV1	38.62	11.51	0.304	86.9	52.5	0.304	0.334	0.70	1.24
29	0.00	AV1	38.90	11.57	0.311	88.9	52.3	0.311	0.335	0.70	1.23
30	0.00	AV1	38.42	11.76	0.313	89.3	52.6	0.313	0.337	0.76	1.28
31	0.00	AV1	38.93	11.64	0.313	89.4	52.5	0.313	0.336	0.89	1.12
32	0.00	AV1	38.42	11.56	0.307	87.8	52.7	0.307	0.335	0.84	1.31
33	0.00	AV1	39.13	11.54	0.317	90.5	52.5	0.317	0.341	1.29	1.30
34	0.00	AV1	39.19	11.64	0.306	87.4	52.6	0.306	0.334	0.92	1.25
35	0.00	AV1	39.41	11.48	0.310	88.7	52.5	0.310	0.339	0.71	1.26
36	0.00	AV1	39.44	11.58	0.311	88.8	52.5	0.311	0.336	0.77	1.26
37	0.00	AV1	39.72	11.63	0.308	88.0	52.6	0.308	0.335	1.01	1.23
38	0.00	AV1	39.22	11.47	0.312	89.2	52.6	0.312	0.339	0.94	1.26
39	0.00	AV1	39.51	11.61	0.317	90.5	52.4	0.317	0.342	0.89	1.24
40	0.00	AV1	39.11	11.48	0.315	89.9	52.5	0.315	0.339	0.95	1.26
41	0.00	AV1	39.32	11.63	0.312	89.1	52.4	0.312	0.340	0.86	1.33
42	0.00	AV1	39.13	11.76	0.316	90.3	52.6	0.316	0.339	1.04	1.10
43	0.00	AV1	39.60	11.62	0.317	90.6	52.4	0.317	0.338	0.88	1.08
44	0.00	AV1	39.19	11.71	0.319	91.1	52.4	0.319	0.337	1.26	1.31
45	0.00	AV1	39.19	11.59	0.317	90.6	52.4	0.317	0.339	0.88	1.02
46	0.00	AV1	39.52	11.40	0.308	87.9	52.3	0.308	0.333	0.56	1.37
47	0.00	AV1	38.81	11.64	0.315	90.0	52.4	0.315	0.337	0.86	1.02
48	0.00	AV1	39.63	11.79	0.313	89.4	52.5	0.313	0.336	0.82	1.11
49	0.00	AV1	38.81	11.72	0.313	89.6	52.3	0.313	0.333	0.88	1.30
50	0.00	AV1	38.38	11.98	0.317	90.5	52.4	0.317	0.333	0.93	1.26
51	0.00	AV1	39.32	11.89	0.318	90.9	52.3	0.318	0.337	0.93	1.29
52	0.00	AV1	39.33	12.09	0.316	90.4	52.3	0.316	0.339	0.79	1.28
53	0.00	AV1	39.27	11.69	0.312	89.2	52.3	0.312	0.335	0.80	1.32
54	0.00	AV1	39.49	11.91	0.314	89.6	52.4	0.314	0.336	0.83	1.04
55	0.00	AV1	39.59	11.85	0.315	89.9	52.4	0.315	0.340	0.77	1.31
56	0.00	AV1	39.38	11.91	0.316	90.4	52.4	0.316	0.336	0.97	1.01
57	0.00	AV1	39.63	11.93	0.313	89.6	52.4	0.313	0.339	0.83	1.30
58	0.00	AV1	39.79	11.64	0.316	90.4	52.5	0.316	0.338	0.87	1.02
59	0.00	AV1	39.44	11.93	0.313	89.5	52.4	0.313	0.333	1.03	1.30
60	0.00	AV1	40.13	11.92	0.316	90.4	52.5	0.316	0.340	1.04	1.05
61	0.00	AV1	40.10	11.63	0.314	89.6	52.4	0.314	0.337	1.13	1.35

SPT, Calvert Cliffs - B404-45   NWJ
OP: KB   Test date: 22-Jun-2006

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
62	0.00	AV1	39.25	11.80	0.312	89.2	52.4	0.312	0.335	0.93	1.31
63	0.00	AV1	40.08	12.09	0.318	90.9	52.4	0.318	0.340	1.15	1.09
64	0.00	AV1	39.70	12.04	0.312	89.0	52.3	0.312	0.336	0.78	1.12
65	0.00	AV1	38.73	12.01	0.311	88.9	52.3	0.311	0.333	1.01	1.07
66	0.00	AV1	39.75	11.67	0.319	91.1	52.4	0.319	0.338	1.23	1.34
67	0.00	AV1	39.81	11.89	0.315	89.9	52.4	0.315	0.337	1.08	1.03
68	0.00	AV1	39.70	11.87	0.315	90.1	52.3	0.315	0.338	0.80	1.31
69	0.00	AV1	38.87	11.80	0.317	90.6	52.4	0.317	0.330	1.12	1.29
70	0.00	AV1	39.44	11.82	0.316	90.2	52.4	0.316	0.338	0.86	1.31
71	0.00	AV1	39.73	12.15	0.313	89.4	52.3	0.313	0.336	1.03	1.09
72	0.00	AV1	39.54	12.08	0.315	89.9	52.4	0.315	0.336	0.99	1.05
73	0.00	AV1	40.15	11.64	0.317	90.5	52.4	0.317	0.338	1.16	1.35
74	0.00	AV1	39.83	11.86	0.311	88.8	52.4	0.311	0.336	0.94	1.02
75	0.00	AV1	40.03	12.22	0.317	90.4	52.3	0.317	0.340	1.02	1.10
76	0.00	AV1	40.00	11.72	0.317	90.4	52.4	0.317	0.338	0.89	1.34
77	0.00	AV1	40.15	11.81	0.310	88.6	52.2	0.310	0.336	0.77	1.02
78	0.00	AV1	39.17	11.98	0.319	91.2	52.1	0.319	0.339	0.89	1.28
79	0.00	AV1	39.27	12.13	0.315	89.9	52.2	0.315	0.332	1.01	1.00
80	0.00	AV1	39.06	12.01	0.317	90.7	52.2	0.317	0.338	0.81	1.28
81	0.00	AV1	38.81	12.39	0.310	88.6	52.1	0.310	0.326	0.88	0.99
82	0.00	AV1	39.08	12.52	0.321	91.6	52.1	0.321	0.335	0.95	1.01
83	0.00	AV1	39.00	12.54	0.314	89.8	52.2	0.314	0.335	0.76	1.01
84	0.00	AV1	39.83	12.48	0.321	91.8	52.0	0.321	0.337	0.94	1.00
85	0.00	AV1	39.09	12.46	0.319	91.1	51.9	0.319	0.334	0.91	1.02
86	0.00	AV1	39.57	12.18	0.317	90.4	52.1	0.317	0.339	0.75	0.98
87	0.00	AV1	40.00	12.51	0.319	91.0	52.0	0.319	0.343	0.83	1.06
88	0.00	AV1	39.44	12.12	0.319	91.1	52.0	0.319	0.338	0.81	1.00
89	0.00	AV1	40.02	11.98	0.317	90.6	52.1	0.317	0.337	0.95	0.98
90	0.00	AV1	39.51	12.48	0.318	90.7	52.1	0.318	0.339	0.84	1.05
91	0.00	AV1	39.70	11.87	0.317	90.6	52.0	0.317	0.337	0.82	1.32
92	0.00	AV1	39.83	12.53	0.315	90.0	52.0	0.315	0.340	0.79	1.07
93	0.00	AV1	38.81	11.61	0.316	90.2	52.1	0.316	0.334	0.91	0.98
94	0.00	AV1	39.95	12.14	0.323	92.3	52.2	0.323	0.342	1.08	0.98
95	0.00	AV1	39.70	11.83	0.297	84.8	52.3	0.297	0.340	0.62	1.27
96	0.00	AV1	39.51	12.10	0.315	89.9	52.1	0.315	0.334	0.78	1.00
97	0.00	AV1	39.68	12.28	0.313	89.4	52.3	0.313	0.333	0.75	1.02
98	0.00	AV1	39.57	12.48	0.319	91.2	52.2	0.319	0.335	1.08	1.05
99	0.00	AV1	39.30	12.44	0.320	91.4	52.2	0.320	0.335	1.05	1.04
100	0.00	AV1	39.70	11.95	0.319	91.1	52.3	0.319	0.337	1.03	1.31
101	0.00	AV1	39.63	12.00	0.314	89.8	52.1	0.314	0.336	0.96	1.30
102	0.00	AV1	39.79	12.21	0.316	90.3	52.0	0.316	0.338	0.99	1.01
103	0.00	AV1	39.32	11.66	0.315	90.1	52.1	0.315	0.332	1.08	1.32
104	0.00	AV1	38.36	12.04	0.315	90.0	52.0	0.315	0.328	1.10	1.25
105	0.00	AV1	39.72	12.22	0.318	90.8	52.0	0.318	0.339	1.01	1.07
106	0.00	AV1	39.68	12.35	0.319	91.2	52.0	0.319	0.335	1.29	1.07
107	0.00	AV1	39.63	12.21	0.307	87.8	51.9	0.307	0.331	0.80	1.08
108	0.00	AV1	40.27	11.96	0.312	89.1	52.0	0.312	0.336	0.80	1.32
109	0.00	AV1	38.85	11.69	0.306	87.3	52.0	0.306	0.332	0.83	1.30
110	0.00	AV1	39.89	12.20	0.313	89.4	51.9	0.313	0.334	0.81	1.07
		Average	38.96	11.86	0.314	89.7	52.4	0.314	0.335	0.88	1.17

Total number of blows analyzed: 110

Time Summary

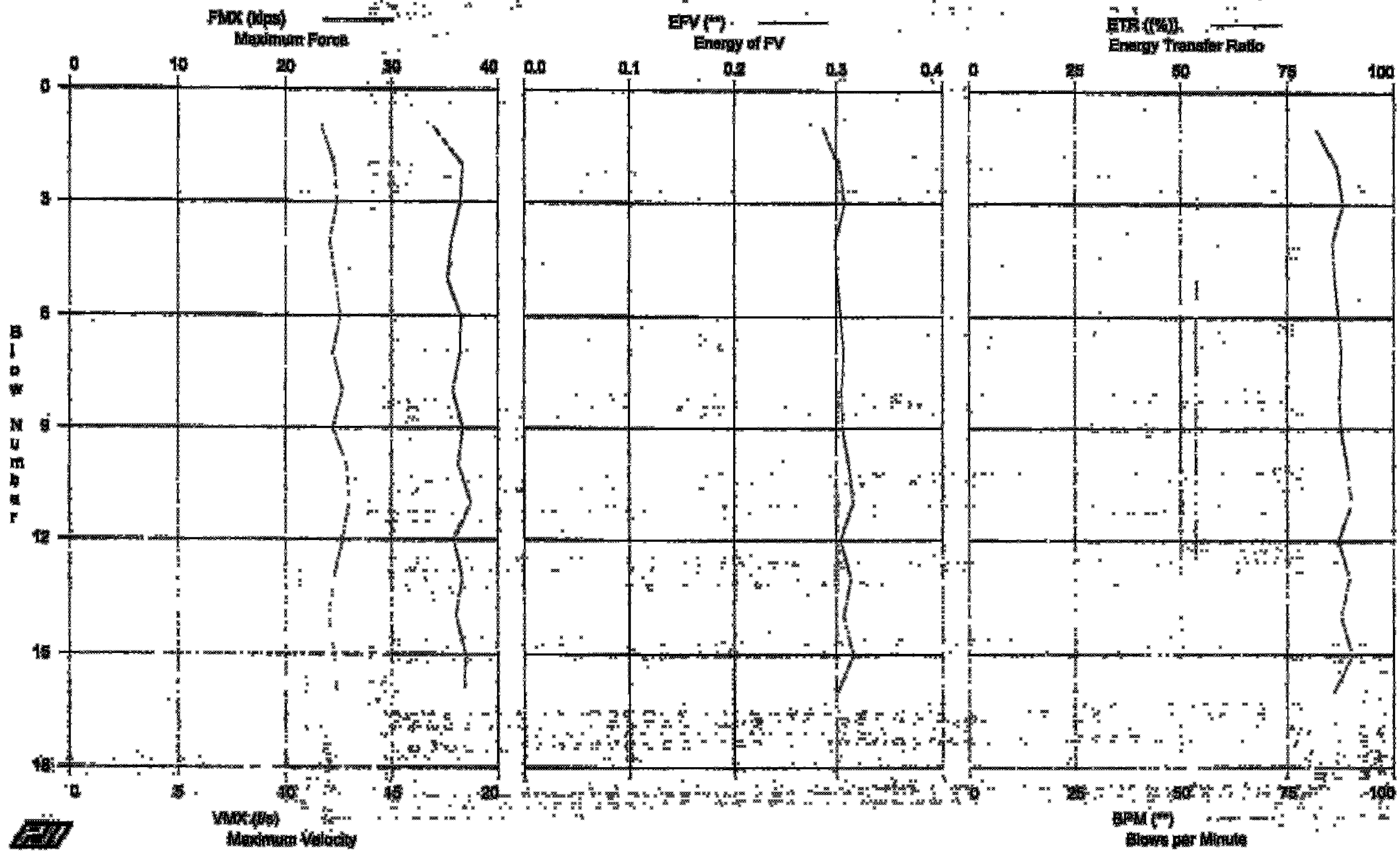
Drive   2 minutes 4 seconds   3:07:31 PM - 3:09:35 PM (6/22/2006) BN 1 - 110

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2008

GRL Engineers, Inc. - Case Method Results

Test date: 22-Jun-2008

SPT, Calvert Cliffs - B404-60



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B404-6D

NWJ

OP: KB

Test date: 22-Jun-2006

AR: 1.45 in^2
LE: 65.5 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	33.93	11.68	0.286	81.8	**	0.286	0.303	1:08	1.03
2	0.00	AV1	36.61	12.27	0.303	86.6	54.0	0.303	0.315	1.68	1.09
3	0.00	AV1	36.42	12.42	0.308	88.0	53.9	0.308	0.323	1.64	1.15
4	0.00	AV1	35.64	12.08	0.299	85.5	53.9	0.299	0.317	1.32	1.16
5	0.00	AV1	35.24	12.30	0.301	86.1	53.9	0.301	0.322	1.02	1.17
6	0.00	AV1	36.45	12.57	0.304	86.9	53.6	0.304	0.318	1.91	1.22
7	0.00	AV1	36.38	12.22	0.307	87.6	53.6	0.307	0.320	1.25	1.20
8	0.00	AV1	35.75	12.67	0.305	87.1	53.7	0.305	0.320	1.21	1.22
9	0.00	AV1	36.64	12.20	0.306	87.5	53.6	0.306	0.319	1.72	1.18
10	0.00	AV1	36.19	12.87	0.312	89.1	53.7	0.312	0.322	1.62	1.23
11	0.00	AV1	37.42	13.00	0.316	90.2	53.5	0.316	0.322	1.84	1.24
12	0.00	AV1	35.81	12.68	0.304	86.9	53.6	0.304	0.312	1.54	1.19
13	0.00	AV1	36.58	12.25	0.314	89.7	53.5	0.314	0.319	1.56	1.18
14	0.00	AV1	36.02	12.01	0.307	87.7	53.5	0.307	0.315	1.25	1.17
15	0.00	AV1	36.91	12.26	0.316	90.3	53.5	0.316	0.326	1.46	1.18
16	0.00	AV1	36.75	12.38	0.301	85.9	53.5	0.301	0.322	0.79	1.16
		Average	36.17	12.37	0.306	87.3	53.7	0.306	0.318	1.43	1.17

Total number of blows analyzed: 16

Time Summary

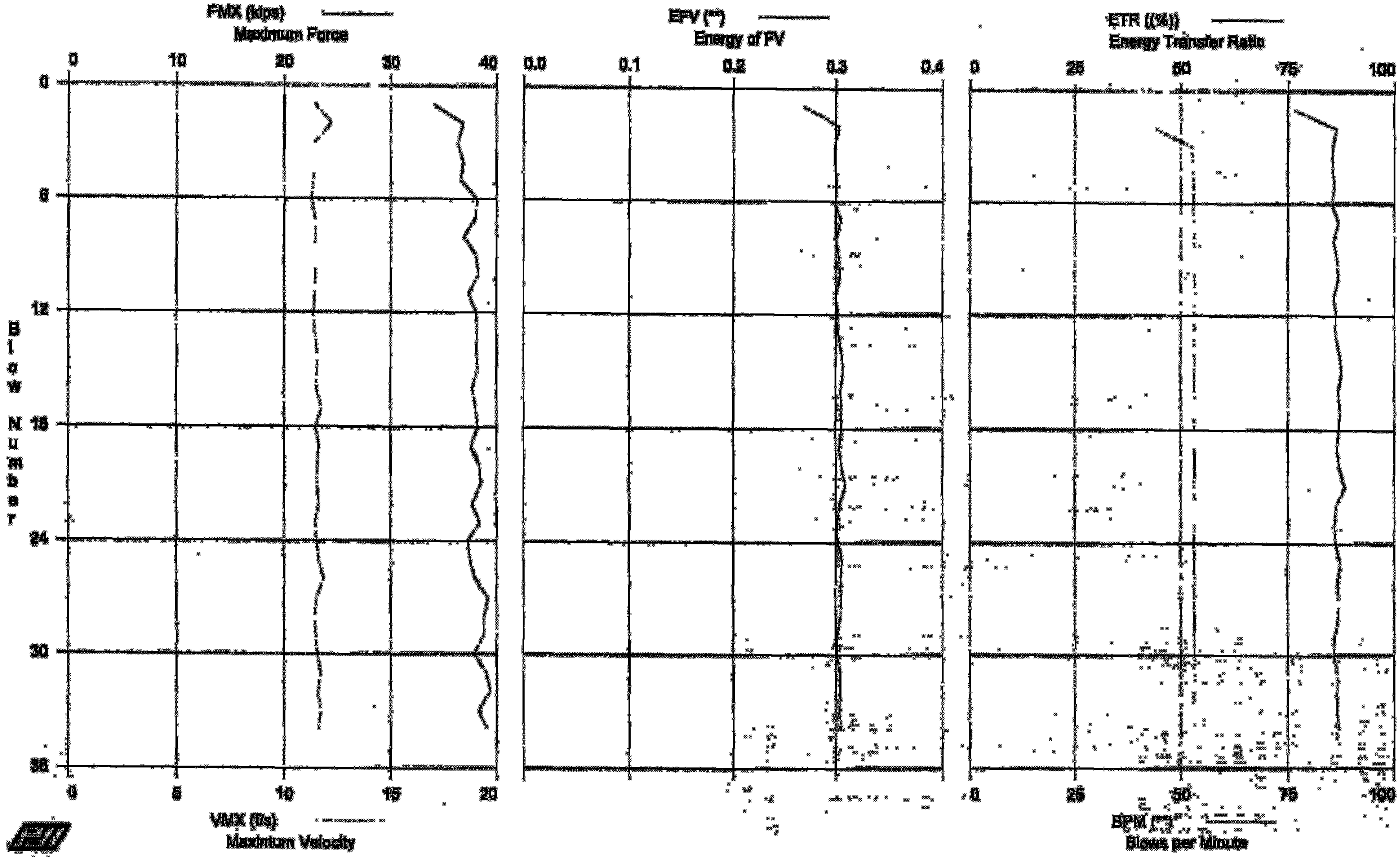
Drive 17 seconds 4:10:38 PM - 4:10:55 PM (6/22/2006) BN 1 - 16

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B404-75

Test date: 23-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B404-75 HWJ
OP: KB Test date: 23-Jun-2006

AR: 1.45 in^2 SP: 0.492 k/ft3
LE: 80.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	34.09	11.45	0.268	76.5	**	0.268	0.296	1.89	1.24
2	0.00	AV1	36.83	12.22	0.303	86.5	44.2	0.303	0.329	1.39	1.22
3	0.00	AV1	36.34	11.43	0.299	85.5	52.6	0.299	0.327	1.20	1.25
4	0.00	AV1	36.81	11.44	0.299	85.5	52.8	0.299	0.329	1.18	1.26
5	0.00	AV1	36.58	11.36	0.301	86.0	52.9	0.301	0.328	1.37	1.26
6	0.00	AV1	38.09	11.27	0.299	85.4	52.8	0.299	0.332	1.20	1.33
7	0.00	AV1	37.99	11.43	0.305	87.0	53.0	0.305	0.337	1.33	1.30
8	0.00	AV1	36.90	11.47	0.300	85.7	53.1	0.300	0.326	1.30	1.20
9	0.00	AV1	38.04	11.42	0.303	86.6	52.9	0.303	0.330	1.42	1.20
10	0.00	AV1	38.28	11.47	0.304	87.0	53.1	0.304	0.334	1.27	1.22
11	0.00	AV1	37.31	11.43	0.300	85.8	53.1	0.300	0.329	1.26	1.28
12	0.00	AV1	38.04	11.37	0.302	86.3	53.1	0.302	0.331	1.38	1.20
13	0.00	AV1	38.12	11.44	0.302	86.3	53.1	0.302	0.333	1.00	1.23
14	0.00	AV1	38.06	11.53	0.305	87.1	53.1	0.305	0.332	0.84	1.20
15	0.00	AV1	38.17	11.56	0.307	87.7	53.1	0.307	0.333	0.79	1.30
16	0.00	AV1	37.66	11.50	0.304	86.8	53.1	0.304	0.332	0.73	1.28
17	0.00	AV1	37.98	11.73	0.305	87.3	53.2	0.305	0.332	0.83	1.27
18	0.00	AV1	38.19	11.49	0.305	87.1	53.1	0.305	0.329	0.70	1.31
19	0.00	AV1	37.53	11.61	0.303	86.6	53.1	0.303	0.330	0.57	1.27
20	0.00	AV1	38.36	11.55	0.305	87.1	53.1	0.305	0.329	0.64	1.30
21	0.00	AV1	38.44	11.55	0.309	88.4	53.0	0.309	0.331	0.98	1.22
22	0.00	AV1	37.66	11.61	0.303	86.5	53.2	0.303	0.333	0.71	1.27
23	0.00	AV1	38.36	11.46	0.301	86.0	53.1	0.301	0.326	0.65	1.32
24	0.00	AV1	37.28	11.53	0.302	86.4	53.1	0.302	0.328	0.62	1.26
25	0.00	AV1	37.47	11.61	0.306	87.4	53.1	0.306	0.329	0.71	1.27
26	0.00	AV1	37.92	11.85	0.304	86.8	53.1	0.304	0.334	0.64	1.25
27	0.00	AV1	39.19	11.53	0.305	87.0	53.1	0.305	0.337	0.47	1.33
28	0.00	AV1	38.79	11.43	0.304	86.9	53.1	0.304	0.331	0.91	1.19
29	0.00	AV1	38.76	11.46	0.301	86.1	53.1	0.301	0.329	0.78	1.20
30	0.00	AV1	37.87	11.54	0.301	86.0	53.1	0.301	0.332	0.68	1.29
31	0.00	AV1	39.00	11.71	0.304	86.8	53.1	0.304	0.336	0.43	1.23
32	0.00	AV1	39.38	11.89	0.304	86.7	53.1	0.304	0.336	0.66	1.22
33	0.00	AV1	38.30	11.72	0.303	86.7	53.1	0.303	0.332	0.82	1.25
34	0.00	AV1	39.08	11.60	0.305	87.0	53.2	0.305	0.334	0.61	1.22
		Average	37.85	11.54	0.302	86.3	52.8	0.302	0.330	0.94	1.25

Total number of blows analyzed: 34

Time Summary

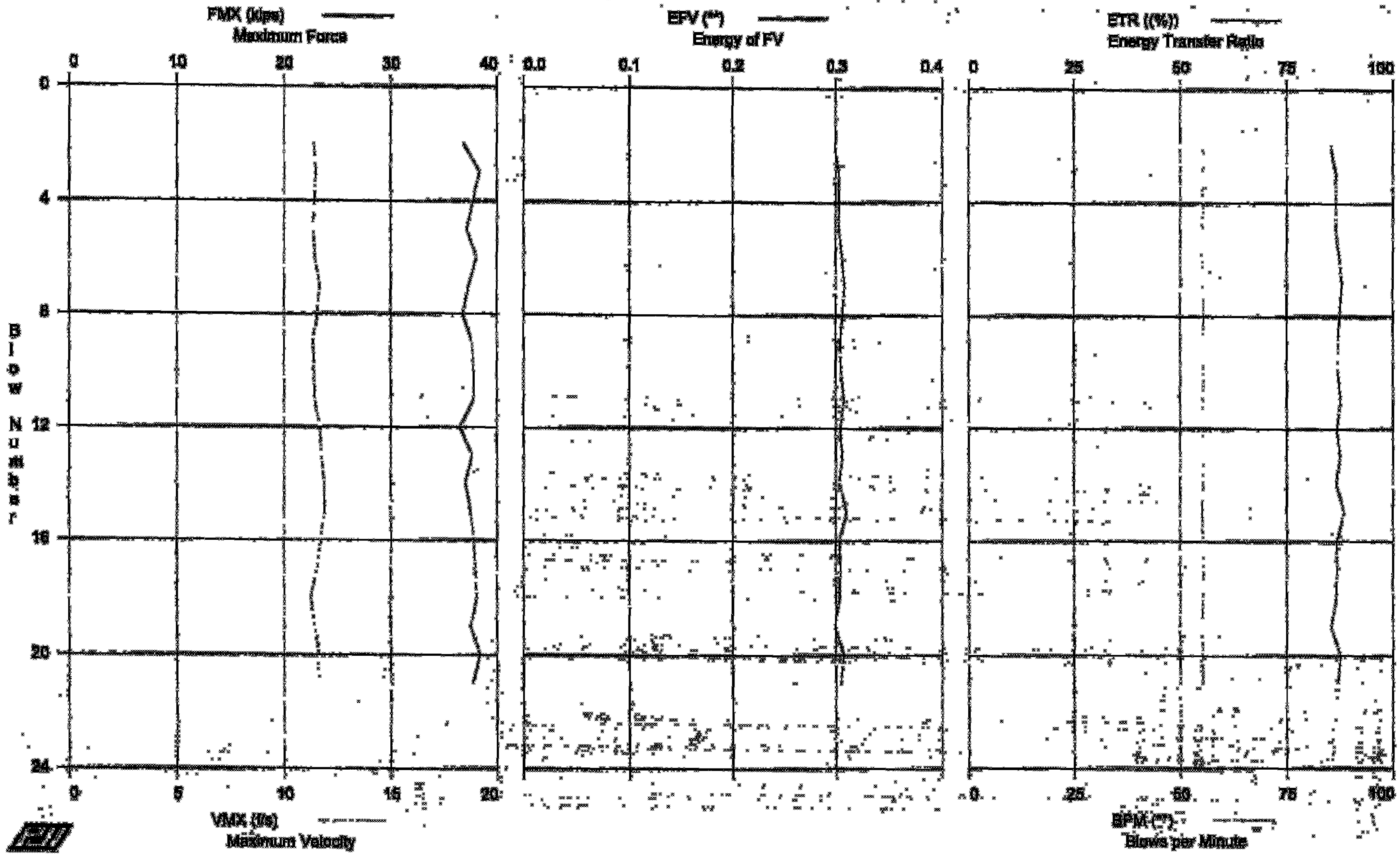
Drive 38 seconds 8:07:13 AM - 8:07:51 AM (6/23/2006) BN 1 - 34

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 23-Jun-2006

SPT, Calvert Cliffs - B404-90



SPT, Calvert Cliffs - B404-90

NWJ

OP: KB

Test date: 23-Jun-2006

AR: 1.45 in^2
LE: 95.5 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
2	0.00	AV1	36.83	11.39	0.299	85.4	55.5	0.299	0.328	1.11	1.26
3	0.00	AV1	38.33	11.47	0.303	86.6	55.3	0.303	0.332	1.30	1.19
5	0.00	AV1	37.12	11.35	0.303	86.5	55.4	0.303	0.326	1.13	1.20
6	0.00	AV1	38.04	11.42	0.306	87.5	55.4	0.306	0.329	1.03	1.15
7	0.00	AV1	37.24	11.66	0.308	87.9	55.4	0.308	0.327	1.04	1.17
8	0.00	AV1	36.77	11.53	0.306	87.4	55.5	0.306	0.329	1.07	1.22
9	0.00	AV1	37.60	11.36	0.304	87.0	55.4	0.304	0.325	0.96	1.28
10	0.00	AV1	37.76	11.39	0.305	87.1	55.5	0.305	0.327	0.86	1.29
11	0.00	AV1	37.79	11.42	0.307	87.6	55.4	0.307	0.329	0.79	1.17
12	0.00	AV1	36.47	11.67	0.304	86.8	55.4	0.304	0.324	0.64	1.21
13	0.00	AV1	37.60	11.73	0.306	87.5	55.4	0.306	0.334	0.55	1.21
14	0.00	AV1	36.97	11.89	0.303	86.6	55.5	0.303	0.324	0.55	1.21
15	0.00	AV1	37.47	11.89	0.310	88.5	55.2	0.310	0.331	0.56	1.20
16	0.00	AV1	37.79	11.71	0.303	86.7	55.4	0.303	0.324	0.49	1.25
17	0.00	AV1	37.95	11.55	0.304	86.8	55.5	0.304	0.327	0.50	1.28
18	0.00	AV1	38.06	11.43	0.303	86.6	55.3	0.303	0.326	0.52	1.19
19	0.00	AV1	37.45	11.44	0.299	85.5	55.1	0.299	0.320	0.41	1.27
20	0.00	AV1	38.35	11.63	0.307	87.6	55.2	0.307	0.329	0.41	1.28
21	0.00	AV1	37.66	11.63	0.304	87.0	55.2	0.304	0.322	0.44	1.26
		Average	37.54	11.55	0.304	87.0	55.4	0.304	0.327	0.76	1.23

Total number of blows analyzed: 19

Time Summary

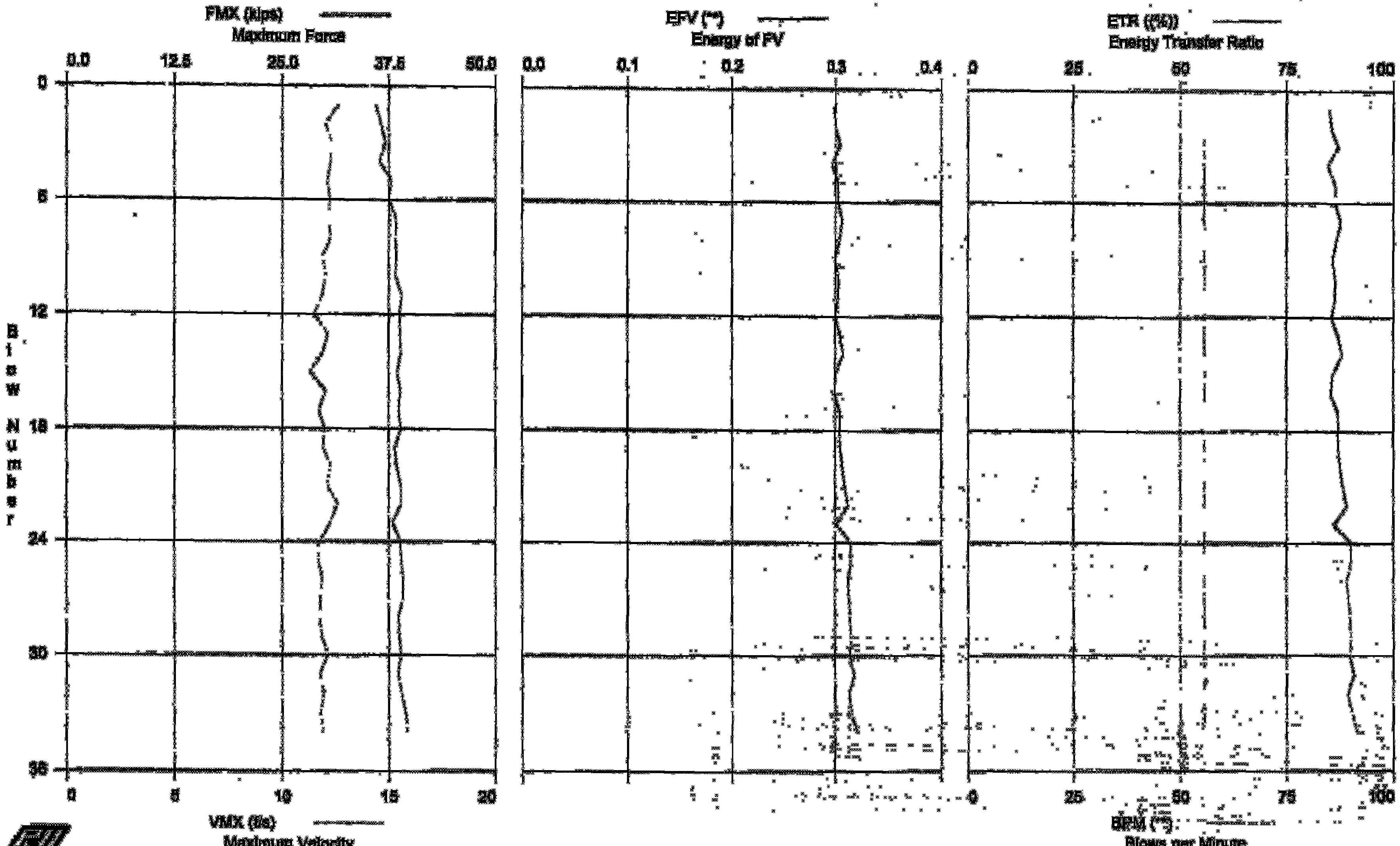
Drive 23 seconds 9:44:43 AM - 9:45:06 AM (6/23/2006) BN 1 - 21

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 23-Jun-2006

SPT, Calvert Cliffs - B404-105



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B404-105 NMJ
OP: KB Test date: 23-Jun-2006

AR: 1.45 in^2 SP: 0.492 k/ft3
LE: 110.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force EMX: Max Transferred Energy
VMX: Maximum Velocity EF2: Energy of F^2
EFV: Energy of FV DFN: Final Displacement
ETR: Energy Transfer Ratio FVP: Force/Velocity proportionality
BPM: Blows per Minute

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	35.96	12.66	0.298	85.2	**	0.298	0.318	0.31	1.07
2	0.00	AV1	36.56	12.02	0.300	85.6	55.6	0.300	0.322	1.15	1.20
3	0.00	AV1	37.09	12.31	0.305	87.2	55.7	0.305	0.328	0.87	1.17
4	0.00	AV1	36.40	12.24	0.296	84.7	55.7	0.296	0.321	0.86	1.17
5	0.00	AV1	37.79	12.11	0.303	86.5	55.7	0.303	0.327	0.60	1.22
6	0.00	AV1	37.45	12.22	0.303	86.6	55.7	0.303	0.327	0.87	1.20
7	0.00	AV1	38.31	12.18	0.307	87.7	55.7	0.307	0.329	0.88	1.23
8	0.00	AV1	38.26	12.24	0.304	86.7	55.9	0.304	0.328	0.89	1.23
9	0.00	AV1	38.36	11.89	0.300	85.8	55.6	0.300	0.329	0.91	1.26
10	0.00	AV1	38.23	12.02	0.303	86.4	55.8	0.303	0.326	0.84	1.25
11	0.00	AV1	39.06	11.89	0.303	86.5	55.9	0.303	0.336	0.60	1.29
12	0.00	AV1	38.69	11.49	0.300	85.7	55.8	0.300	0.330	0.70	1.32
13	0.00	AV1	38.78	12.15	0.305	87.1	55.7	0.305	0.334	0.79	1.25
14	0.00	AV1	38.87	11.89	0.308	88.0	55.8	0.308	0.335	0.87	1.28
15	0.00	AV1	38.44	11.32	0.300	85.8	55.9	0.300	0.327	0.82	1.33
16	0.00	AV1	38.82	12.04	0.299	85.4	55.7	0.299	0.333	0.43	1.26
17	0.00	AV1	38.62	11.72	0.305	87.1	55.9	0.305	0.332	0.77	1.29
18	0.00	AV1	38.89	11.99	0.305	87.1	55.8	0.305	0.334	0.68	1.27
19	0.00	AV1	38.14	11.91	0.305	87.2	55.7	0.305	0.330	0.83	1.26
20	0.00	AV1	38.38	12.26	0.307	87.6	55.8	0.307	0.333	0.66	1.23
21	0.00	AV1	38.87	12.10	0.309	88.2	55.7	0.309	0.337	0.52	1.26
22	0.00	AV1	38.90	12.60	0.312	89.1	55.8	0.312	0.340	0.53	1.21
23	0.00	AV1	37.92	12.26	0.301	86.1	55.8	0.301	0.328	0.47	1.22
24	0.00	AV1	38.81	11.74	0.315	90.1	55.6	0.315	0.334	0.81	1.30
25	0.00	AV1	38.93	11.70	0.315	90.1	55.9	0.315	0.332	1.01	1.20
26	0.00	AV1	39.19	11.88	0.312	89.1	55.7	0.312	0.338	0.59	1.30
27	0.00	AV1	39.19	11.78	0.313	89.5	55.7	0.313	0.331	0.83	1.22
28	0.00	AV1	38.55	11.76	0.314	89.9	55.7	0.314	0.332	0.78	1.23
29	0.00	AV1	38.69	11.85	0.315	90.1	55.8	0.315	0.327	0.87	1.19
30	0.00	AV1	38.90	12.11	0.314	89.8	55.6	0.314	0.337	0.39	1.22
31	0.00	AV1	38.54	11.77	0.318	90.8	55.9	0.318	0.335	0.89	1.28
32	0.00	AV1	39.00	11.95	0.313	89.5	55.6	0.313	0.336	0.53	1.28
33	0.00	AV1	39.46	11.79	0.316	90.4	55.8	0.316	0.335	0.61	1.31
34	0.00	AV1	39.68	11.91	0.321	91.8	55.6	0.321	0.340	0.73	1.31
		Average	38.40	11.99	0.307	87.8	55.7	0.307	0.331	0.76	1.24

Total number of blows analyzed: 34

Time Summary

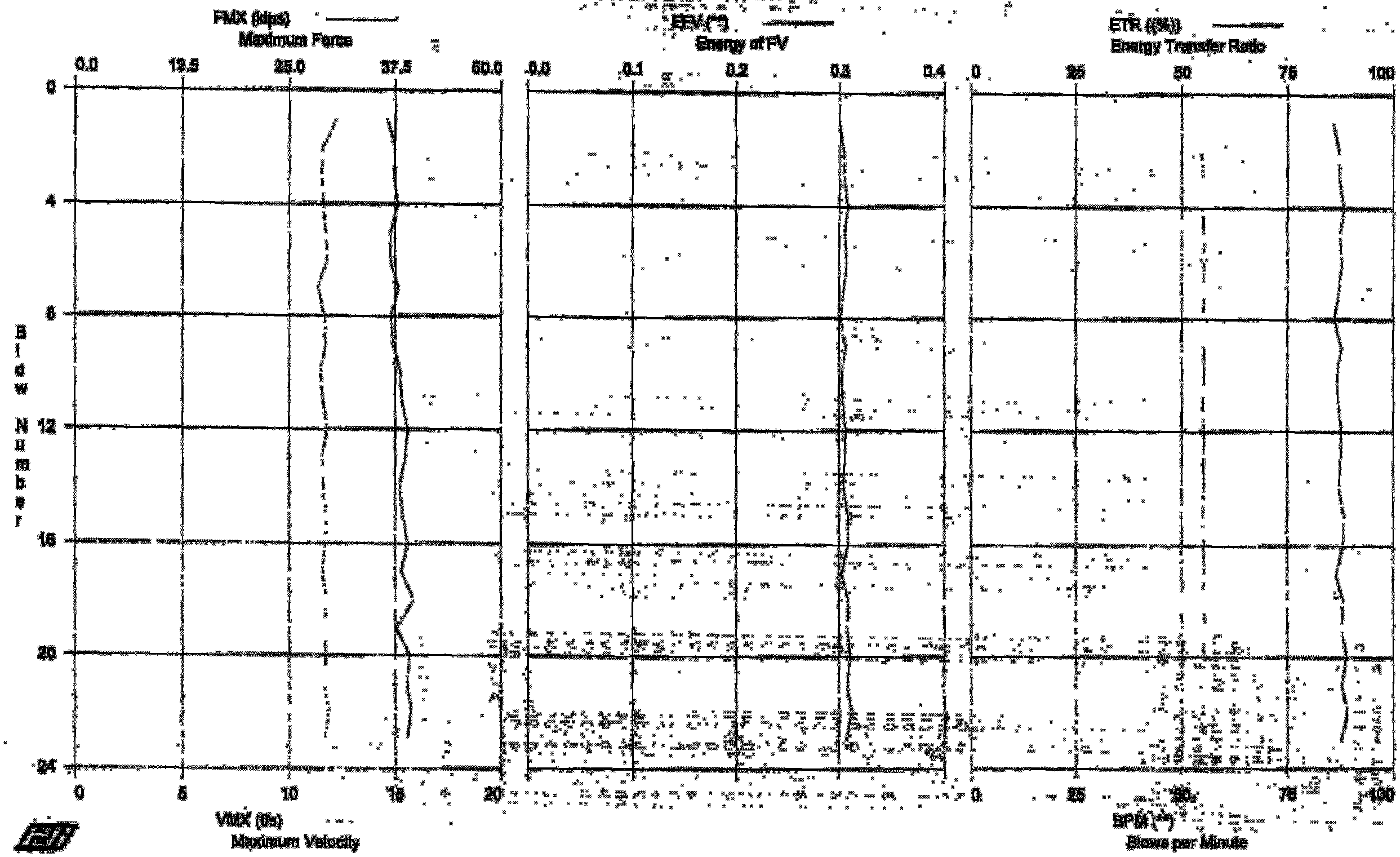
Drive 35 seconds 10:47:59 AM - 10:48:34 AM (6/23/2006) BN 1 - 34

PDIPLOT Ver. 2005.2 - Printed: 15-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 23-Jun-2006

SPT, Calvert Cliffs - B404-120



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B404-120 NWJ
OP: KB Test date: 23-Jun-2006

AR: 1.45 in^2 SP: 0.492 k/ft3
LE: 125.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	36.58	12.25	0.300	85.7	**	0.300	0.315	1.44	1.08
2	0.00	AV1	37.48	11.61	0.305	87.2	54.7	0.305	0.325	1.36	1.27
3	0.00	AV1	37.28	11.55	0.306	87.3	55.1	0.306	0.324	1.30	1.27
4	0.00	AV1	37.79	11.61	0.309	88.4	55.1	0.309	0.328	1.31	1.27
5	0.00	AV1	36.91	11.70	0.306	87.4	55.2	0.306	0.318	1.39	1.24
6	0.00	AV1	36.90	11.79	0.308	87.9	55.2	0.308	0.316	1.24	1.23
7	0.00	AV1	37.83	11.37	0.305	87.1	55.4	0.305	0.324	1.35	1.22
8	0.00	AV1	36.99	11.65	0.301	86.1	55.1	0.301	0.315	0.94	1.16
9	0.00	AV1	37.21	11.71	0.307	87.7	55.2	0.307	0.324	1.05	1.25
10	0.00	AV1	38.07	11.48	0.303	86.6	55.3	0.303	0.322	1.16	1.21
11	0.00	AV1	38.23	11.59	0.304	87.0	55.0	0.304	0.326	1.03	1.30
12	0.00	AV1	39.00	11.77	0.307	87.8	55.2	0.307	0.329	0.96	1.30
13	0.00	AV1	38.63	11.56	0.306	87.5	55.2	0.306	0.327	1.05	1.31
14	0.00	AV1	37.98	11.60	0.305	87.2	55.3	0.305	0.317	1.39	1.20
15	0.00	AV1	38.36	11.75	0.309	88.4	54.9	0.309	0.332	0.94	1.28
16	0.00	AV1	38.93	11.71	0.309	88.2	55.3	0.309	0.328	0.95	1.31
17	0.00	AV1	38.17	11.56	0.303	86.5	55.2	0.303	0.323	1.14	1.24
18	0.00	AV1	39.70	11.75	0.309	88.2	55.1	0.309	0.332	1.17	1.19
19	0.00	AV1	37.61	11.66	0.308	87.9	55.4	0.308	0.324	1.18	1.24
20	0.00	AV1	39.19	11.71	0.311	89.0	55.1	0.311	0.331	1.13	1.23
21	0.00	AV1	38.92	11.67	0.308	87.9	55.1	0.308	0.333	0.94	1.22
22	0.00	AV1	39.36	11.85	0.312	89.2	55.0	0.312	0.331	1.33	1.17
23	0.00	AV1	38.82	11.65	0.307	87.8	55.4	0.307	0.331	0.93	1.18
		Average	38.08	11.68	0.306	87.6	55.2	0.306	0.325	1.16	1.23

Total number of blows analyzed: 23

Time Summary

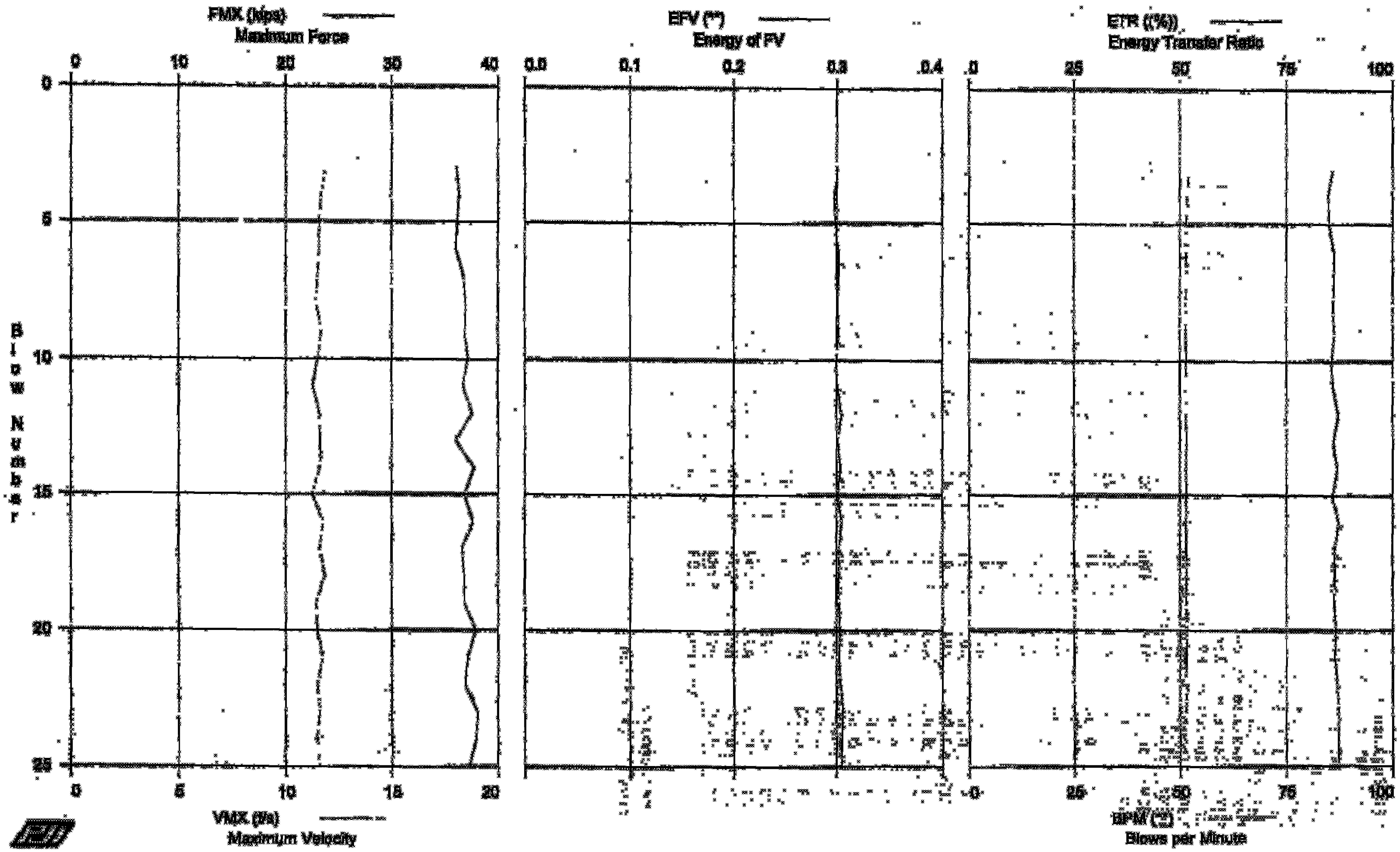
Drive 24 seconds 12:09:13 PM - 12:09:37 PM (6/23/2006) BN 1 - 23

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B404-135

Test date: 26-Jun-2006



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B404-135 NMJ
OP: KB Test date: 26-Jun-2006

AR: 1.45 in^2 SP: 0.492 k/ft3
LE: 140.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
3	0.00	AV1	36.10	11.84	0.301	85.9	52.0	0.301	0.315	0.90	1.17
4	0.00	AV1	36.32	11.65	0.297	84.9	51.8	0.297	0.313	0.96	1.23
5	0.00	AV1	36.13	11.53	0.298	85.1	51.4	0.298	0.316	0.97	1.23
6	0.00	AV1	36.05	11.57	0.302	86.2	51.4	0.302	0.318	1.00	1.23
7	0.00	AV1	36.77	11.49	0.302	86.3	51.6	0.302	0.316	1.19	1.26
8	0.00	AV1	36.96	11.42	0.301	86.0	51.3	0.301	0.318	1.22	1.27
9	0.00	AV1	36.86	11.66	0.302	86.3	51.5	0.302	0.319	1.29	1.24
10	0.00	AV1	37.15	11.49	0.299	85.5	51.5	0.299	0.317	0.92	1.27
11	0.00	AV1	36.70	11.26	0.301	86.0	51.3	0.301	0.316	0.99	1.20
12	0.00	AV1	37.55	11.57	0.305	87.2	51.4	0.305	0.321	1.00	1.27
13	0.00	AV1	36.00	11.61	0.301	86.0	51.5	0.301	0.311	0.92	1.22
14	0.00	AV1	37.72	11.59	0.304	87.0	51.4	0.304	0.320	0.96	1.28
15	0.00	AV1	36.83	11.26	0.301	85.9	51.5	0.301	0.315	0.88	1.28
16	0.00	AV1	37.63	11.74	0.305	87.2	51.5	0.305	0.322	0.93	1.26
17	0.00	AV1	36.58	11.60	0.302	86.4	51.5	0.302	0.315	1.00	1.24
18	0.00	AV1	36.83	11.82	0.302	86.4	51.5	0.302	0.318	1.08	1.22
19	0.00	AV1	36.77	11.43	0.302	86.2	51.4	0.302	0.317	0.86	1.27
20	0.00	AV1	37.85	11.47	0.303	86.6	51.5	0.303	0.323	1.00	1.30
21	0.00	AV1	37.07	11.72	0.302	86.3	51.4	0.302	0.314	1.19	1.24
22	0.00	AV1	36.88	11.48	0.304	86.9	51.5	0.304	0.317	1.02	1.26
23	0.00	AV1	38.06	11.61	0.306	87.3	51.4	0.306	0.324	0.89	1.29
24	0.00	AV1	37.87	11.46	0.305	87.1	51.4	0.305	0.320	0.95	1.30
25	0.00	AV1	37.26	11.61	0.305	87.2	51.4	0.305	0.316	0.95	1.26
		Average	36.95	11.56	0.302	86.3	51.5	0.302	0.317	1.00	1.25

Total number of blows analyzed: 23

Time Summary

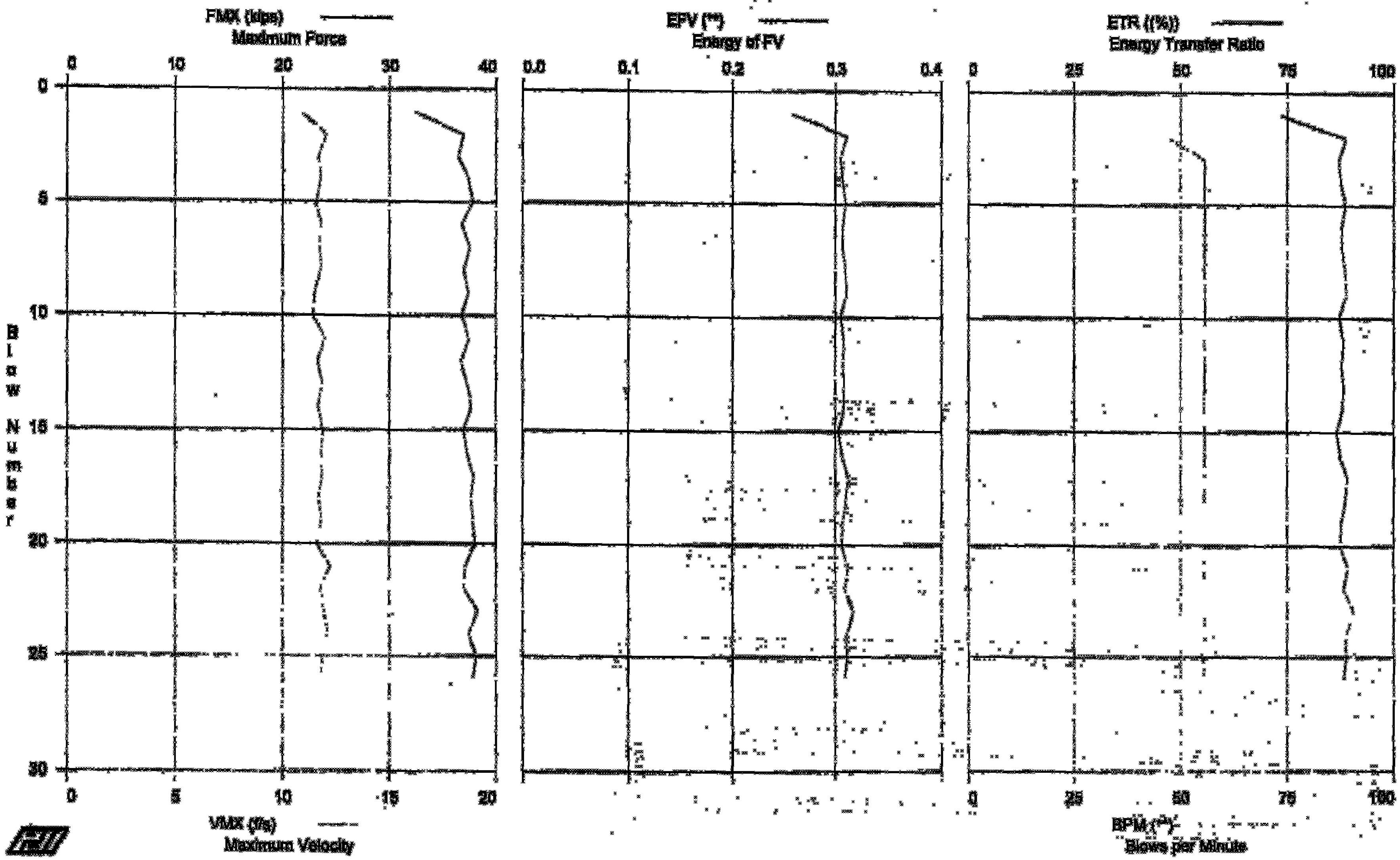
Drive 29 seconds 10:42:55 AM - 10:43:24 AM (6/26/2006) BN 1 - 25

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B404-150

Test date: 28-Jun-2006



SPT, Calvert Cliffs - B404-150 NMJ
OP: KB Test date: 26-Jun-2006

AR: 1.45 in^2 SP: 0.492 k/ft3
LE: 155.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	32.39	10.82	0.257	73.5	**	0.257	0.273	0.55	1.14
2	0.00	AV1	36.90	12.03	0.311	88.7	47.1	0.311	0.327	0.83	1.21
3	0.00	AV1	36.45	11.69	0.305	87.1	55.8	0.305	0.321	0.74	1.20
4	0.00	AV1	37.40	11.79	0.307	87.6	55.7	0.307	0.325	0.77	1.24
5	0.00	AV1	37.79	11.56	0.310	88.6	55.7	0.310	0.330	1.08	1.28
6	0.00	AV1	36.77	11.79	0.307	87.7	55.8	0.307	0.324	0.77	1.22
7	0.00	AV1	37.53	11.73	0.307	87.8	55.7	0.307	0.324	0.90	1.26
8	0.00	AV1	36.94	11.78	0.310	88.6	55.7	0.310	0.329	0.99	1.23
9	0.00	AV1	37.36	11.49	0.311	88.8	55.8	0.311	0.329	1.03	1.27
10	0.00	AV1	36.75	11.41	0.305	87.1	55.7	0.305	0.319	1.05	1.26
11	0.00	AV1	37.42	11.98	0.308	88.1	55.6	0.308	0.328	0.93	1.22
12	0.00	AV1	36.64	11.64	0.307	87.7	55.7	0.307	0.323	0.93	1.24
13	0.00	AV1	37.28	11.85	0.308	88.1	55.7	0.308	0.324	0.96	1.24
14	0.00	AV1	37.66	11.65	0.308	87.9	55.5	0.308	0.321	0.98	1.27
15	0.00	AV1	36.88	11.90	0.303	86.6	55.7	0.303	0.323	0.85	1.20
16	0.00	AV1	37.21	11.79	0.306	87.3	55.7	0.306	0.326	0.74	1.23
17	0.00	AV1	37.88	11.84	0.312	89.0	55.8	0.312	0.327	0.89	1.25
18	0.00	AV1	37.64	11.68	0.310	88.6	55.6	0.310	0.328	0.98	1.26
19	0.00	AV1	37.80	11.81	0.307	87.7	55.5	0.307	0.323	0.98	1.26
20	0.00	AV1	38.04	11.59	0.306	87.4	55.6	0.306	0.323	0.92	1.29
21	0.00	AV1	37.05	12.22	0.312	89.2	55.4	0.312	0.324	1.26	1.19
22	0.00	AV1	36.91	11.77	0.309	88.2	55.7	0.309	0.319	0.97	1.23
23	0.00	AV1	38.30	11.94	0.317	90.6	55.7	0.317	0.334	1.04	1.26
24	0.00	AV1	37.40	12.11	0.311	88.8	55.7	0.311	0.325	0.88	1.21
25	0.00	AV1	38.12	11.88	0.311	88.8	55.6	0.311	0.324	0.98	1.26
26	0.00	AV1	37.79	11.74	0.309	88.2	55.5	0.309	0.323	0.97	1.26
		Average	37.17	11.78	0.307	87.6	55.3	0.307	0.323	0.92	1.24

Total number of blows analyzed: 26

Time Summary

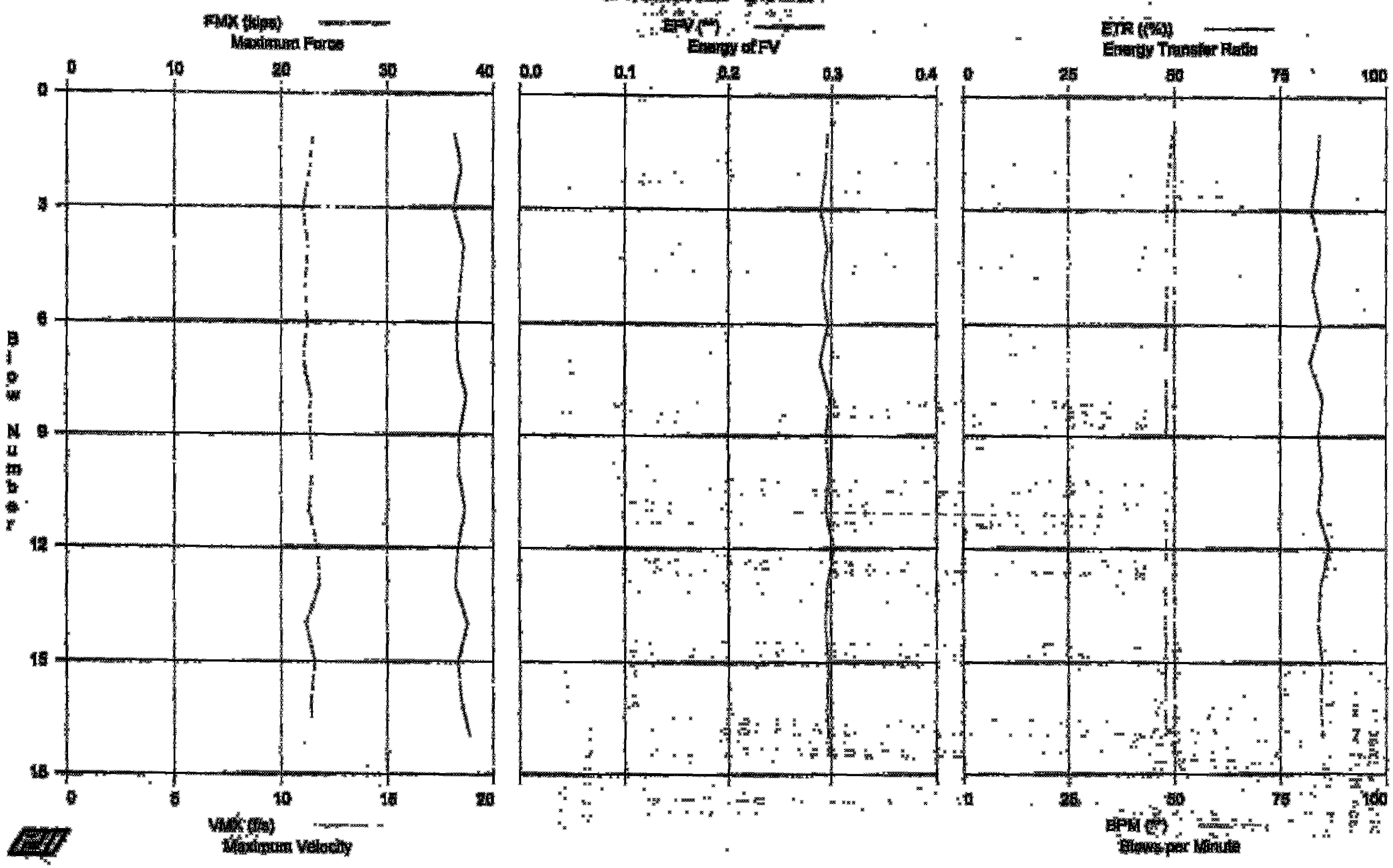
Drive 27 seconds 11:56:28 AM - 11:56:55 AM (6/26/2006) BN 1 - 26

PDIPLOT Ver. 2005.2 - Printed: 15-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 26-Jun-2006

SPT, Calvert Cliffs - B404-155



SPT, Calvert Cliffs - B404-165
OP: KB

WMJ
Test date: 26-Jun-2006

AR: 1.45 in^2
LE: 169.5 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute

EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	36.32	11.50	0.295	84.2	49.6	0.295	0.316	0.93	1.24
2	0.00	AV1	36.96	11.36	0.293	83.8	48.7	0.293	0.311	1.11	1.28
3	0.00	AV1	36.27	11.04	0.288	82.4	48.4	0.288	0.308	0.85	1.29
4	0.00	AV1	37.17	11.27	0.295	84.4	48.3	0.295	0.307	1.09	1.30
5	0.00	AV1	36.88	11.14	0.290	82.7	48.2	0.290	0.310	0.86	1.23
6	0.00	AV1	36.53	11.24	0.296	84.5	48.2	0.296	0.312	0.88	1.21
7	0.00	AV1	36.64	11.06	0.287	82.1	48.0	0.287	0.307	0.96	1.31
8	0.00	AV1	37.40	11.39	0.298	85.0	48.2	0.298	0.316	0.93	1.29
9	0.00	AV1	36.77	11.38	0.294	84.0	48.1	0.294	0.311	0.94	1.27
10	0.00	AV1	36.74	11.45	0.297	84.8	48.1	0.297	0.315	1.00	1.26
11	0.00	AV1	37.26	11.31	0.294	84.0	47.9	0.294	0.311	0.86	1.29
12	0.00	AV1	36.69	11.72	0.303	86.6	48.1	0.303	0.314	1.02	1.24
13	0.00	AV1	36.40	11.80	0.296	84.5	48.0	0.296	0.310	0.97	1.21
14	0.00	AV1	37.52	11.17	0.294	84.0	47.9	0.294	0.310	0.96	1.21
15	0.00	AV1	36.64	11.58	0.297	84.9	48.0	0.297	0.308	1.06	1.24
16	0.00	AV1	36.91	11.41	0.296	84.6	47.9	0.296	0.314	0.93	1.27
17	0.00	AV1	37.74	11.39	0.297	84.9	47.9	0.297	0.313	0.93	1.20
		Average	36.87	11.36	0.295	84.2	48.2	0.295	0.311	0.96	1.26

Total number of blows analyzed: 17

Time Summary

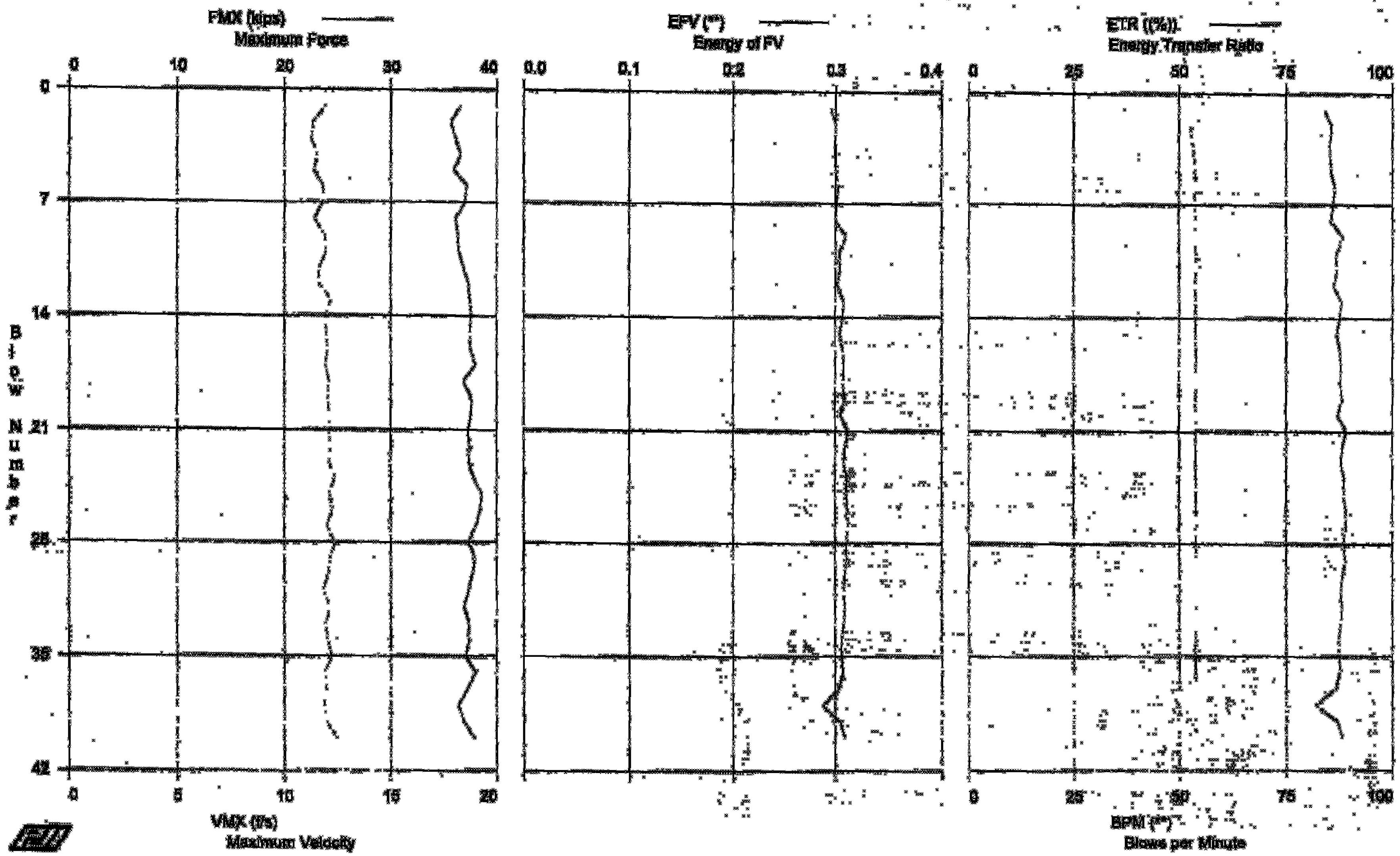
Drive 20 seconds 1:34:17 PM - 1:34:37 PM (6/26/2006) BN 1 - 17

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B404-180

Test date: 26-Jun-2006



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B404-180 NWJ
OP: KB Test date: 26-Jun-2006

AR: 1.45 in^2 SP: 0.492 k/ft3
LE: 185.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	36.58	11.94	0.294	83.9	**	0.294	0.315	0.88	1.15
2	0.00	AV1	35.68	11.34	0.300	85.7	52.6	0.300	0.315	0.98	1.24
3	0.00	AV1	36.07	11.26	0.299	85.5	53.0	0.299	0.320	0.87	1.25
4	0.00	AV1	36.59	11.51	0.299	85.3	53.5	0.299	0.313	0.99	1.25
5	0.00	AV1	35.94	11.38	0.300	85.7	53.8	0.300	0.315	1.06	1.24
6	0.00	AV1	37.20	11.79	0.303	86.5	53.7	0.303	0.318	0.99	1.23
7	0.00	AV1	36.97	11.76	0.301	86.0	53.4	0.301	0.316	1.08	1.23
8	0.00	AV1	36.11	11.39	0.300	85.6	53.9	0.300	0.316	0.88	1.24
9	0.00	AV1	36.29	11.87	0.310	88.5	53.7	0.310	0.319	1.02	1.20
10	0.00	AV1	36.38	11.95	0.304	86.8	53.8	0.304	0.321	0.92	1.19
11	0.00	AV1	36.85	11.63	0.305	87.0	53.9	0.305	0.320	0.79	1.24
12	0.00	AV1	37.28	11.57	0.302	86.3	53.7	0.302	0.316	0.85	1.26
13	0.00	AV1	37.40	12.19	0.308	88.1	53.9	0.308	0.321	0.85	1.21
14	0.00	AV1	37.53	11.93	0.307	87.6	53.8	0.307	0.318	0.87	1.24
15	0.00	AV1	37.40	11.94	0.304	87.0	53.8	0.304	0.316	0.80	1.23
16	0.00	AV1	37.44	12.01	0.307	87.7	53.9	0.307	0.321	0.89	1.22
17	0.00	AV1	37.96	11.92	0.308	88.1	53.8	0.308	0.322	0.72	1.25
18	0.00	AV1	36.83	12.06	0.307	87.8	54.0	0.307	0.320	0.83	1.20
19	0.00	AV1	37.53	12.04	0.309	88.2	53.8	0.309	0.324	0.73	1.22
20	0.00	AV1	37.55	12.11	0.305	87.2	53.9	0.305	0.319	0.66	1.22
21	0.00	AV1	37.28	12.10	0.312	89.2	53.9	0.312	0.326	0.76	1.19
22	0.00	AV1	37.34	12.12	0.309	88.3	53.9	0.309	0.320	0.66	1.18
23	0.00	AV1	37.34	12.08	0.308	88.0	53.8	0.308	0.322	0.69	1.19
24	0.00	AV1	37.74	12.34	0.311	88.8	53.8	0.311	0.322	0.69	1.20
25	0.00	AV1	38.60	12.10	0.310	88.6	53.9	0.310	0.328	0.57	1.25
26	0.00	AV1	38.38	12.25	0.312	89.1	53.9	0.312	0.320	0.68	1.23
27	0.00	AV1	37.98	11.99	0.312	89.0	54.0	0.312	0.319	0.74	1.25
28	0.00	AV1	37.28	12.35	0.310	88.6	53.8	0.310	0.321	0.53	1.18
29	0.00	AV1	37.93	12.14	0.311	89.0	54.0	0.311	0.318	0.64	1.23
30	0.00	AV1	37.66	12.06	0.309	88.2	54.0	0.309	0.318	0.61	1.23
31	0.00	AV1	37.29	11.80	0.308	87.9	54.0	0.308	0.320	0.60	1.20
32	0.00	AV1	36.90	12.15	0.309	88.2	53.9	0.309	0.319	0.69	1.18
33	0.00	AV1	37.34	11.94	0.308	87.9	53.9	0.308	0.315	0.60	1.23
34	0.00	AV1	37.34	12.04	0.306	87.4	53.8	0.306	0.320	0.47	1.21
35	0.00	AV1	37.02	12.20	0.306	87.5	53.8	0.306	0.319	0.55	1.18
36	0.00	AV1	37.95	11.90	0.307	87.7	53.8	0.307	0.319	0.44	1.06
37	0.00	AV1	37.21	11.98	0.303	[illegible]	53.9	0.303	0.313	0.49	1.06
38	0.00	AV1	36.32	11.87	0.287	81.9	53.9	0.287	0.311	0.31	1.16
39	0.00	AV1	36.86	12.00	0.305	87.1	53.9	0.305	0.313	0.49	1.21
40	0.00	AV1	37.85	12.46	0.309	88.3	53.8	0.309	0.317	0.60	1.16
		Average	37.18	11.94	0.306	87.3	53.8	0.306	0.319	0.74	1.21

Total number of blows analyzed: 40

Time Summary

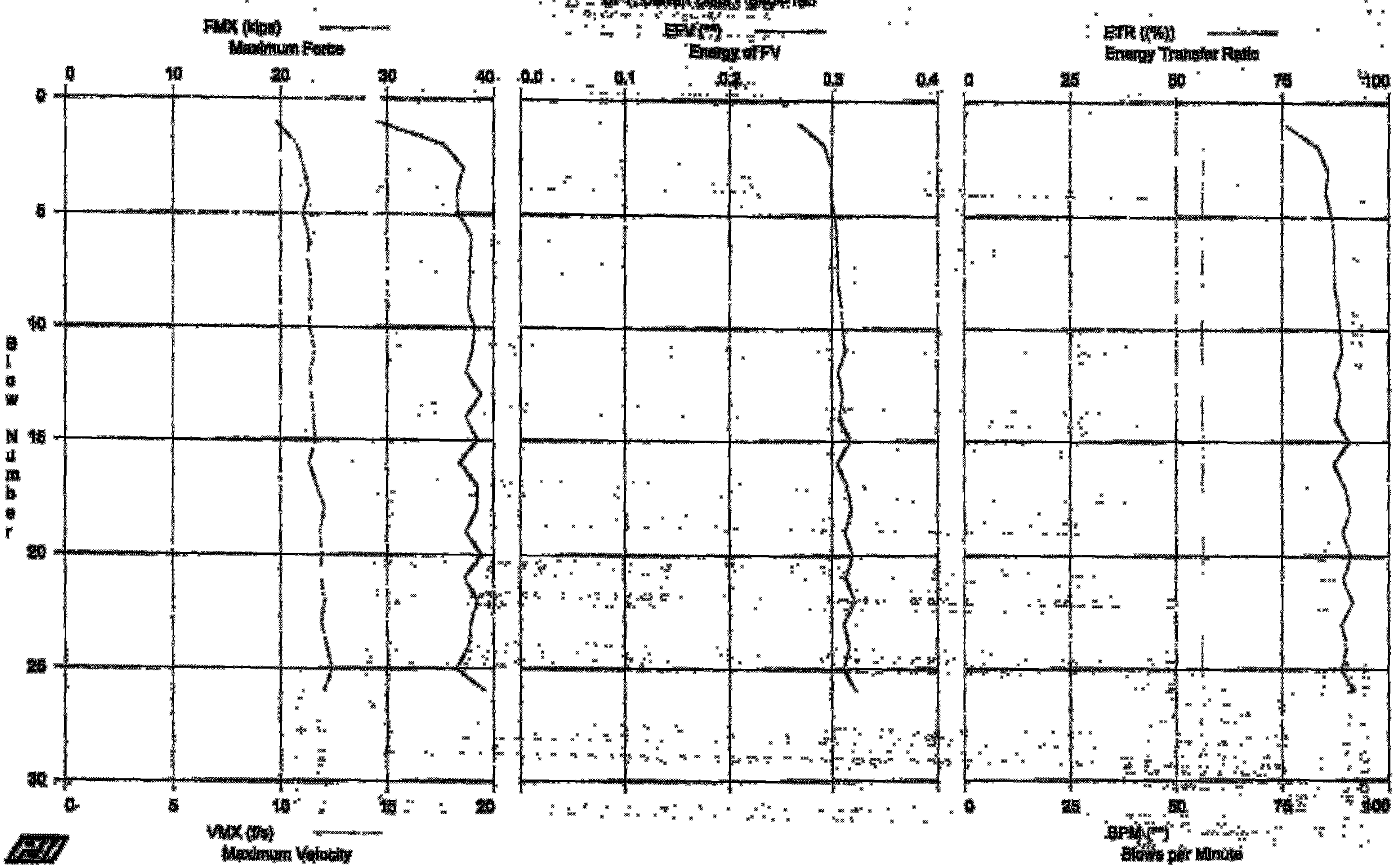
Drive 44 seconds 3:09:27 PM - 3:10:11 PM (6/26/2006) BN 1 - 40

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs, B404-195

Test date: 27-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B404-195 NWJ
OP: KB Test date: 27-Jun-2006

AR: 1.45 in^2 SP: 0.492 k/ft3
LE: 210.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	29.01	9.78	0.266	75.9	**	0.266	0.275	0.11	1.17
2	0.00	AV1	35.43	10.77	0.292	83.6	56.3	0.292	0.314	0.30	1.29
3	0.00	AV1	37.20	11.10	0.300	85.7	56.4	0.300	0.324	0.34	1.32
4	0.00	AV1	36.58	11.32	0.298	85.2	56.2	0.298	0.319	0.42	1.16
5	0.00	AV1	36.70	11.06	0.303	86.6	56.2	0.303	0.333	0.56	1.30
6	0.00	AV1	37.98	11.32	0.305	87.3	56.3	0.305	0.332	0.56	1.25
7	0.00	AV1	37.79	11.30	0.306	87.3	56.2	0.306	0.334	0.74	1.27
8	0.00	AV1	37.79	11.41	0.306	87.3	56.3	0.306	0.331	0.64	1.30
9	0.00	AV1	37.60	11.41	0.309	88.2	56.3	0.309	0.332	0.69	1.27
10	0.00	AV1	38.22	11.35	0.310	88.6	56.2	0.310	0.333	0.86	1.24
11	0.00	AV1	38.04	11.59	0.312	89.1	56.1	0.312	0.335	0.88	1.29
12	0.00	AV1	37.40	11.40	0.306	87.4	56.3	0.306	0.324	0.82	1.25
13	0.00	AV1	38.81	11.46	0.310	88.7	56.2	0.310	0.336	0.71	1.33
14	0.00	AV1	37.40	11.54	0.307	87.7	56.2	0.307	0.328	0.78	1.27
15	0.00	AV1	38.47	11.64	0.317	90.6	56.4	0.317	0.337	0.87	1.30
16	0.00	AV1	36.80	11.34	0.305	87.1	56.2	0.305	0.320	0.85	1.27
17	0.00	AV1	38.49	11.69	0.314	89.8	56.2	0.314	0.331	1.05	1.29
18	0.00	AV1	38.46	12.07	0.318	91.0	56.3	0.318	0.339	0.80	1.25
19	0.00	AV1	37.37	11.84	0.312	89.2	56.3	0.312	0.324	0.84	1.24
20	0.00	AV1	38.82	11.94	0.319	91.2	56.4	0.319	0.339	0.80	1.28
21	0.00	AV1	37.26	11.91	0.313	89.3	56.3	0.313	0.329	0.64	1.22
22	0.00	AV1	38.50	12.08	0.321	91.7	56.3	0.321	0.335	0.73	1.25
23	0.00	AV1	37.85	11.81	0.311	89.0	56.3	0.311	0.330	0.65	1.24
24	0.00	AV1	37.66	12.17	0.316	90.2	56.2	0.316	0.335	0.64	1.22
25	0.00	AV1	36.45	12.38	0.311	88.9	56.2	0.311	0.322	0.60	1.16
26	0.00	AV1	39.16	12.07	0.322	92.0	56.4	0.322	0.337	0.83	1.27
		Average	37.36	11.53	0.308	88.0	56.3	0.308	0.328	0.68	1.26

Total number of blows analyzed: 26

Time Summary

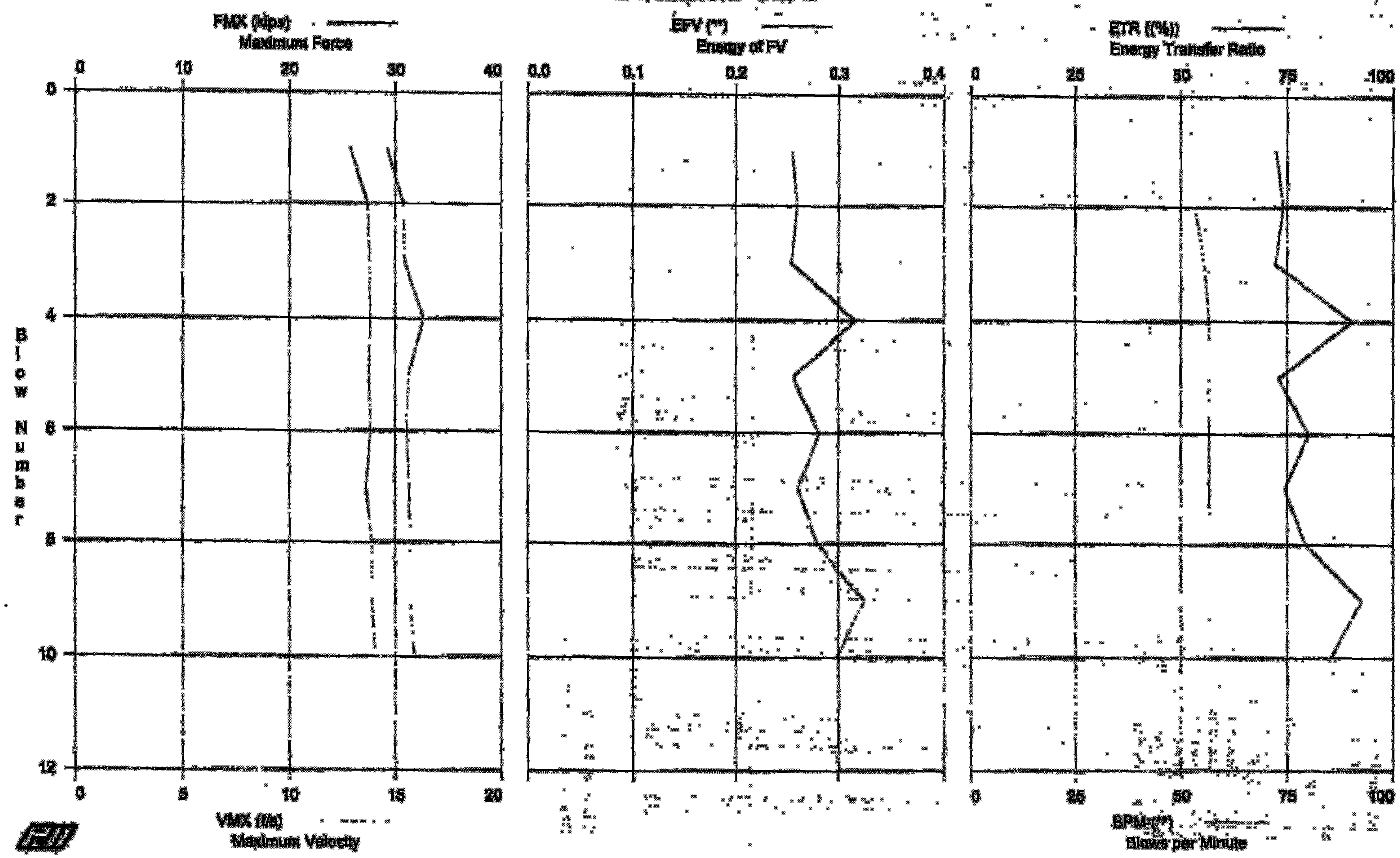
Drive 26 seconds 9:32:06 AM - 9:32:32 AM (6/27/2006) BN 1 - 26

PDIPLOT Ver. 2005.2 - Printed: 16-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B409-15

Test date: 22-Jun-2006



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B409-15 AW rod
OP: KB Test date: 22-Jun-2006

AR: 1.19 in^2 SP: 0.492 k/ft3
LE: 19.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	25.74	14.60	0.254	72.5	**	0.254	0.256	1.43	0.80
2	0.00	AV1	27.35	15.34	0.259	74.0	53.3	0.259	0.263	-0.08	0.81
3	0.00	AV1	27.56	15.43	0.253	72.2	55.4	0.253	0.264	0.95	0.85
4	0.00	AV1	27.65	16.32	0.316	90.3	56.6	0.316	0.273	1.13	0.80
5	0.00	AV1	27.52	15.62	0.255	72.9	56.4	0.255	0.268	-0.92	0.80
6	0.00	AV1	27.67	15.53	0.280	80.0	56.7	0.280	0.267	0.61	0.80
7	0.00	AV1	27.22	15.65	0.260	74.3	56.7	0.260	0.267	0.14	0.80
8	0.00	AV1	27.78	15.71	0.278	79.4	56.8	0.278	0.267	-0.10	0.80
9	0.00	AV1	27.80	15.69	0.324	92.6	56.7	0.324	0.269	1.79	0.86
10	0.00	AV1	28.09	15.90	0.298	85.2	56.8	0.298	0.272	-0.25	0.79
		Average	27.44	15.58	0.278	79.4	56.2	0.278	0.267	0.47	0.81

Total number of blows analyzed: 10

Time Summary

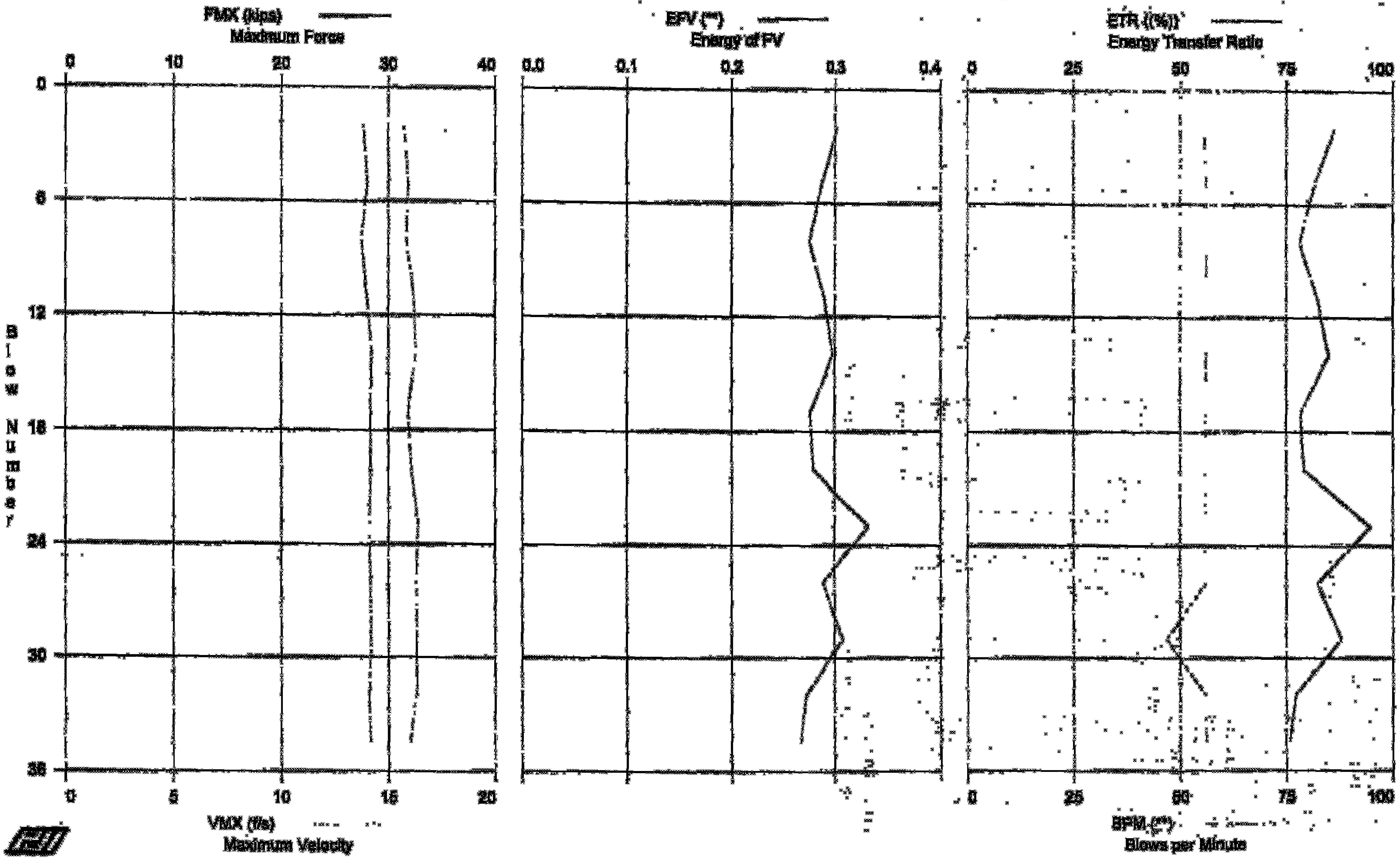
Drive 9 seconds 7:24:47 AM - 7:24:56 AM (6/22/2006) BN 1 - 10

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B409-30

Test date: 29-Jun-2006



Case Method Results PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B409-30 AW rod
OP: KB Test date: 22-Jun-2006

AR: 1.19 in^2 SP: 0.492 k/ft3
LE: 34.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL# end	depth ft	TYPE	FMX kips	VMX f/s	EFV **	ETR (%)	BPM **	EMX k-ft	EF2 k-ft	DFN in	FVP []
1	0.00	AV1	27.05	15.38	0.275	78.7	**	0.275	0.298	-1.71	0.84
2	0.00	AV1	27.92	15.93	0.313	89.3	55.1	0.313	0.302	-1.25	0.75
3	0.00	AV1	28.05	15.82	0.318	90.9	56.0	0.318	0.301	-1.05	0.76
4	0.00	AV1	28.26	15.74	0.304	86.7	55.6	0.304	0.310	-2.39	0.76
5	0.00	AV1	27.90	15.84	0.264	75.4	56.8	0.264	0.301	-2.70	0.84
6	0.00	AV1	27.97	16.17	0.288	82.3	56.3	0.288	0.303	-1.77	0.76
7	0.00	AV1	27.84	15.94	0.250	71.4	55.9	0.250	0.299	-2.51	0.76
8	0.00	AV1	27.18	15.77	0.271	77.3	56.5	0.271	0.298	-2.78	0.82
9	0.00	AV1	27.52	15.79	0.300	85.7	56.5	0.300	0.296	-1.75	0.75
10	0.00	AV1	28.19	16.20	0.293	83.7	55.9	0.293	0.306	-2.17	0.76
11	0.00	AV1	28.08	15.85	0.293	83.7	55.9	0.293	0.306	-2.57	0.75
12	0.00	AV1	27.65	16.37	0.278	79.3	56.2	0.278	0.298	-3.40	0.75
13	0.00	AV1	28.42	16.48	0.303	86.4	56.2	0.303	0.309	-3.38	0.78
14	0.00	AV1	28.27	16.00	0.242	69.1	56.1	0.242	0.304	-3.19	0.75
15	0.00	AV1	28.60	16.30	0.347	99.2	56.2	0.347	0.305	-2.25	0.75
16	0.00	AV1	28.07	15.67	0.238	68.1	56.1	0.238	0.304	-3.14	0.85
17	0.00	AV1	28.48	16.07	0.339	96.9	56.0	0.339	0.308	-1.29	0.75
18	0.00	AV1	28.35	15.97	0.246	70.3	56.1	0.246	0.304	-2.85	0.76
19	0.00	AV1	28.35	16.16	0.282	80.5	56.0	0.282	0.301	-2.87	0.76
20	0.00	AV1	28.20	15.77	0.262	74.9	56.1	0.262	0.305	-2.73	0.74
21	0.00	AV1	28.41	16.23	0.288	82.2	56.1	0.288	0.305	-2.14	0.76
22	0.00	AV1	28.27	16.37	0.311	88.8	56.1	0.311	0.306	-2.10	0.77
23	0.00	AV1	27.95	16.36	0.340	97.1	56.2	0.340	0.303	-1.88	0.79
24	0.00	AV1	28.51	16.42	0.344	98.3	56.0	0.344	0.308	-1.56	0.77
25	0.00	AV1	28.24	16.16	0.298	85.3	56.1	0.298	0.303	-2.71	0.76
26	0.00	AV1	28.33	16.36	0.304	87.0	56.1	0.304	0.306	-2.17	0.76
27	0.00	AV1	28.36	16.40	0.261	74.6	56.0	0.261	0.305	-2.46	0.77
28	0.00	AV1	28.37	16.42	0.335	95.6	56.2	0.335	0.307	-2.48	0.78
29	0.00	AV1	28.35	16.21	0.293	83.8	56.1	0.293	0.305	-2.30	0.75
30	0.00	AV1	28.41	16.37	0.296	84.5	28.0	0.296	0.304	-2.28	0.75
31	0.00	AV1	28.20	16.41	0.256	73.1	56.0	0.256	0.302	-3.42	0.75
32	0.00	AV1	28.25	16.02	0.243	69.3	56.2	0.243	0.302	-3.50	0.75
33	0.00	AV1	28.12	16.52	0.312	89.0	56.1	0.312	0.303	-2.86	0.77
34	0.00	AV1	28.12	15.88	0.252	72.0	56.1	0.252	0.301	-3.74	0.75
35	0.00	AV1	28.48	16.11	0.278	79.5	56.3	0.278	0.306	-3.28	0.75
		Average	28.13	16.10	0.289	82.6	55.7	0.289	0.304	-2.47	0.77

Total number of blows analyzed: 35

Time Summary

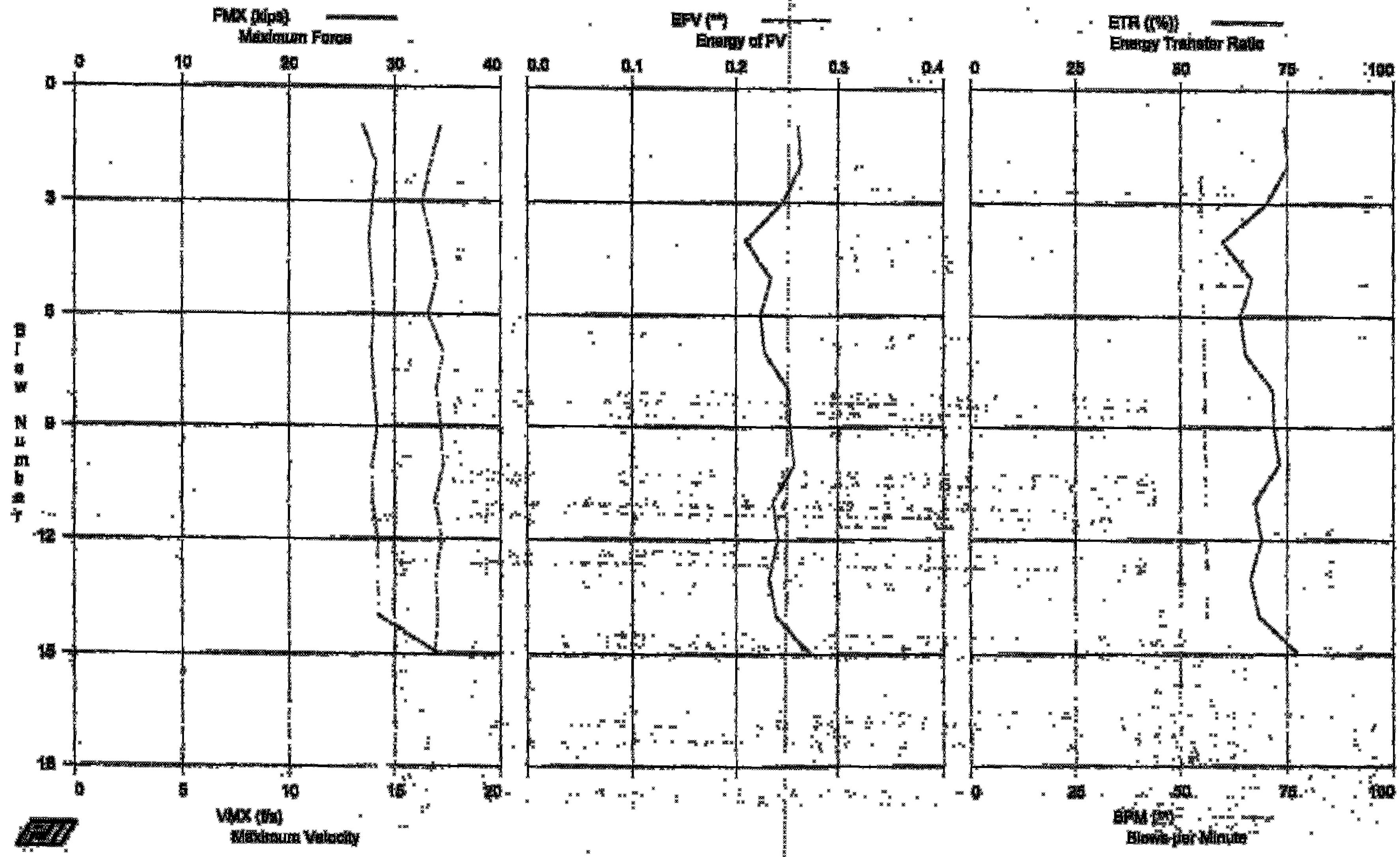
Drive 1 minute 9 seconds 8:38:28 AM - 8:39:37 AM (6/22/2006) BN 1 - 35

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 22-Jun-2006

SPT, Calvert Cliffs - B409-49



GRL Engineers, Inc.
Case Method Results PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B409-49 AW rod
OP: KB Test date: 22-Jun-2006

AR: 1.19 in^2 SP: 0.492 k/ft3
LE: 53.0 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	26.94	17.16	0.260	74.2	**	0.260	0.312	-3.23	0.75
2	0.00	AV1	28.22	16.70	0.263	75.2	54.6	0.263	0.311	-0.31	0.74
3	0.00	AV1	27.90	16.28	0.245	70.1	54.8	0.245	0.312	-5.43	0.72
4	0.00	AV1	27.53	16.70	0.209	59.8	54.9	0.209	0.306	-9.22	0.74
5	0.00	AV1	27.79	16.99	0.234	66.7	54.9	0.234	0.310	-3.12	0.73
6	0.00	AV1	28.01	16.57	0.224	64.0	55.4	0.224	0.309	-2.33	0.73
7	0.00	AV1	27.78	17.29	0.228	65.2	55.5	0.228	0.312	-3.26	0.73
8	0.00	AV1	28.04	16.97	0.251	71.7	55.8	0.251	0.307	-5.95	0.75
9	0.00	AV1	28.33	17.15	0.252	71.9	55.5	0.252	0.305	-3.62	0.71
10	0.00	AV1	27.90	17.28	0.256	73.2	55.8	0.256	0.310	-3.00	0.75
11	0.00	AV1	27.90	16.89	0.236	67.4	55.8	0.236	0.307	-4.17	0.76
12	0.00	AV1	28.39	17.22	0.241	69.0	55.9	0.241	0.306	-4.26	0.72
13	0.00	AV1	28.33	16.92	0.232	66.4	56.3	0.232	0.311	-3.43	0.74
14	0.00	AV1	28.50	17.02	0.239	68.4	56.1	0.239	0.316	-2.59	0.74
15	0.00	AV1	34.09	16.86	0.272	77.9	56.1	0.272	0.452	-4.12	0.91
		Average	28.38	16.93	0.243	69.4	55.5	0.243	0.319	-3.87	0.75

Total number of blows analyzed: 15

Time Summary

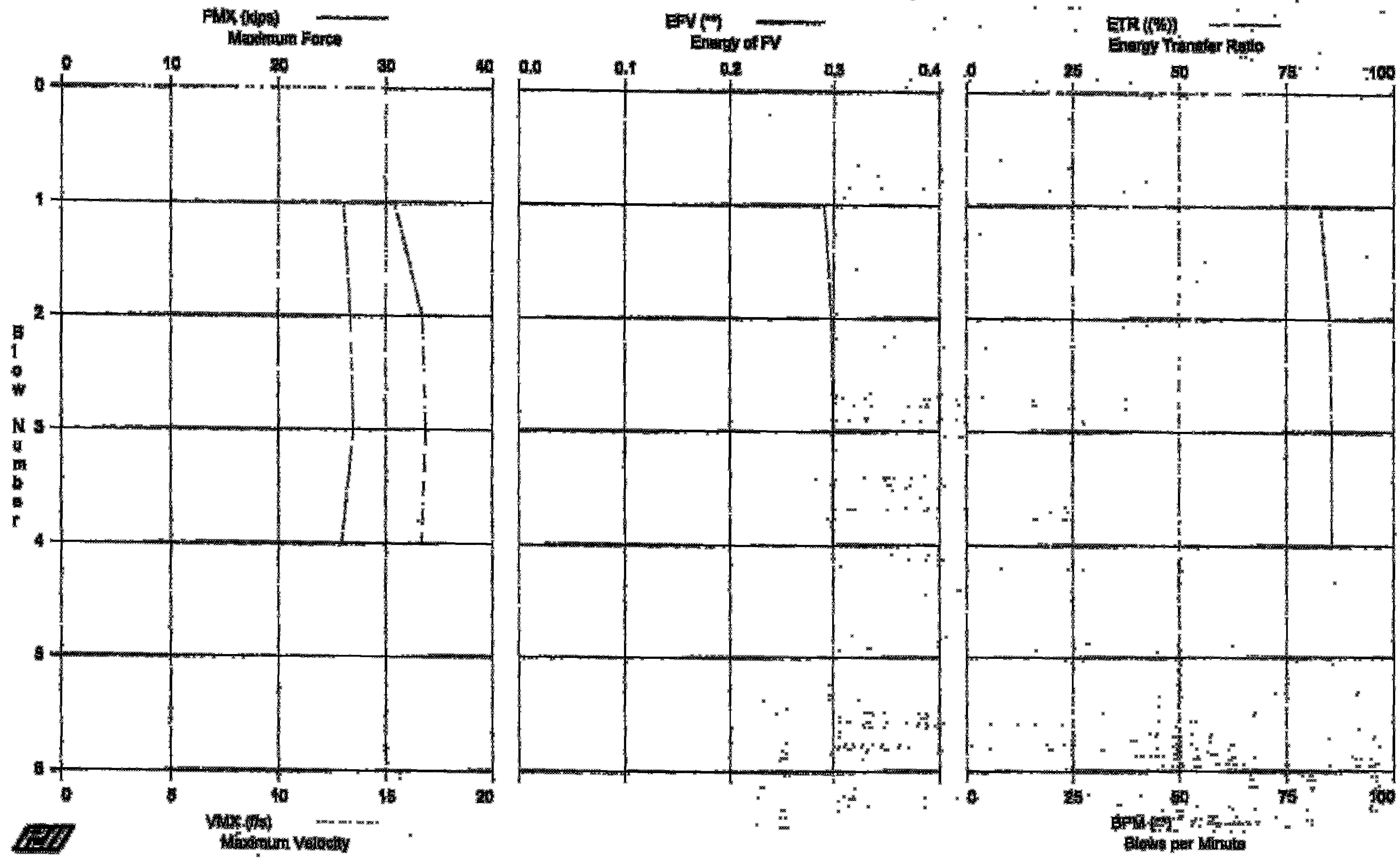
Drive 16 seconds 10:55:15 AM - 10:55:31 AM (6/22/2006) BN 1 - 15

PDIPLOT Ver. 2005.2 - Printed: 16-Jul-2006

GRL Engineers, Inc. - Case Method Results

SPT, Calvert Cliffs - B409-60

Test date: 22-Jun-2006



GRL Engineers, Inc.
Case Method Results

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

SPT, Calvert Cliffs - B409-60 ANJ

OP: KB Test date: 22-Jun-2006

AR: 1.19 in^2 SP: 0.492 k/ft3
LE: 65.5 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.00

FMX: Maximum Force
VMX: Maximum Velocity
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
EMX: Max Transferred Energy
EF2: Energy of F^2
DFN: Final Displacement
FVP: Force/Velocity proportionality

BL#	depth	TYPE	FMX	VMX	EFV	ETR	BPM	EMX	EF2	DFN	FVP
end	ft		kips	f/s	**	(%)	**	k-ft	k-ft	in	[]
1	0.00	AV1	26.05	15.41	0.290	82.9	**	0.290	0.288	2.71	0.47
2	0.00	AV1	26.68	16.71	0.297	84.9	27.3	0.297	0.288	2.83	0.38
3	0.00	AV1	26.97	16.88	0.299	85.5	**	0.299	0.291	2.08	0.38
4	0.00	AV1	25.87	16.68	0.299	85.5	28.1	0.299	0.286	1.77	0.41
		Average	26.39	16.42	0.296	84.7	27.7	0.296	0.288	2.35	0.41

Total number of blows analyzed: 4

Time Summary

Drive 8 seconds 12:42:32 PM - 12:42:40 PM (6/22/2006) BN 1 - 4

PDIPLOT Ver. 2005.2 - Printed: 18-Jul-2006

GRL Engineers, Inc. - Case Method Results

Test date: 22-Jun-2006

SPT, Calvert Cliffs - B409-75