MACTEC

Vogtle Units 3 & 4 COL Project

Attachment D

GEOPHYSICAL TEST DATA (DOWNHOLE)

FIELD ELECTRICAL RESISTIVITY

Consists of:

GEOVision Report dated May 18, 2007
(Boring Geophysical Logging)

GEOVision Report dated May 7, 2007
(Four Electrode Wenner Resistivity Tests)

Volume 1 of 1

Job No. 6141-06-0286

MACTEC ENGINEERING
AND CONSULTING, INC.

May 31, 2007

MACTEC

May 31, 2007

Mr. Tom McCallum
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Subject: **Geotechnical Data Report Attachment D – Geophysical Test Data (Downhole and Field Electrical Resistivity)**
Vogtle Units 3 & 4 COL Project
Vogtle Electric Generating Plant
Burke County, Georgia
MACTEC Project Number 6141-06-0286

Dear Mr. McCallum:

MACTEC Engineering & Consulting, Inc. is pleased to submit Attachment D of the Final Data Report for the geotechnical exploration and laboratory testing for the Vogtle Units 3 & 4 COL Project located adjacent to the existing Vogtle Electric Generating Plant near Waynesboro, Burke County, Georgia.

It has been a pleasure to perform the work described in the attached report. If you have any questions, or if we may be of further service, we hope that you will contact us at your convenience.

Sincerely,

MACTEC ENGINEERING & CONSULTING, INC.

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DCN VGCOL 324
Revision 0, 5/31/07

ATTACHMENT D

This Attachment is one of a number of attachments that are part of the following report which was prepared by MACTEC Engineering & Consulting Inc.:

Geotechnical Data Report
Vogtle Units 3 & 4 COL Project
Vogtle Electric Generating Plant
Burke County, Georgia
Subsurface Investigation and Laboratory Testing
SNC Subcontract No. 7074425
MACTEC Job No. 6141-06-0286

For background and a description of scope of work contained in the report, please refer to the above referenced report. The report was addressed as follows:

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The following list shows other Attachments to the above report and their included information:

Survey Data and Test Locations…… See Attachment A

Geotechnical Boring Logs……..…….See Attachment B

Cone Penetrometer Test Results……..…See Attachment C

ReMi Seismic Shear Wave Velocity Measurements .....…….See Attachment E

Laboratory Testing Data (Geotechnical)...…….See Attachment F

Resonant Column Torsional Shear (RCTS) Test Results.…….See Attachment G

ATTACHMENT D

GEOPHYSICAL TEST DATA (DOWNHOLE)

FIELD ELECTRICAL RESISTIVITY

CONSISTS OF:

GEOVision Report dated May 18, 2007
(Boring Geophysical Logging)

GEOVision Report dated May 7, 2007
(Four Electrode Wenner Resistivity Tests)

Volume 1 of 1

GEOVision Report dated May 18, 2007

Boring Geophysical Logging

GEOVision
geophysical services

FINAL REPORT

BORING GEOPHYSICAL LOGGING
BORINGS B-3001, B-3002, B-3003, B-4001, B-4002 AND B-4003

VOGTLE UNITS 3 & 4 COL PROJECT
VOGTLE ELECTRIC GENERATING PLANT

Report 6517-01 vol 1 of 2 rev B

May 18, 2007

FINAL REPORT

BORING GEOPHYSICAL LOGGING BORINGS B-3001, B-3002, B-3003, B-4001, B-4002 AND B-4003

VOGTLE UNITS 3 & 4 COL PROJECT VOGTLE ELECTRIC GENERATING PLANT

Report 6517-01 vol 1 of 2 rev B

May 18, 2007

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INTRODUCTION

Boring geophysical measurements were collected in six partially cased borings located at the Vogtle Electric Generating Plant, located in Burke County, Georgia. Geophysical data acquisition was performed between January 9 and February 16, 2007 by Rob Steller of **GEO***Vision*. Data analysis and report preparation was performed by Rob Steller and reviewed by John Diehl of **GEO***Vision*. The work was performed under subcontract with MACTEC Engineering and Consulting, Inc., (MACTEC) with Matt Cooke serving as the point of contact for MACTEC.

This report describes the field measurements, data analysis, and results of this work.

SCOPE OF WORK

This report presents the results of boring geophysical measurements collected between January 9 and February 16, 2007, in six partially cased borings, as detailed below. The purpose of these studies was to supplement stratigraphic information obtained during MACTEC's soil sampling program and to acquire shear wave velocities and compressional wave velocities as a function of depth, as a component of the Vogtle Combined Operating License (COL) Application Project.

BORING DESIGNATION	DATES LOGGED	ELEVATION – FEET [1] NGVD 1929	COORDINATES – FEET [1] GEORGIA EAST STATE PLANE NAD 1927	
			NORTHING	EASTING
B-3001	2/12/2007, 2/13/2007	218.40	1142599.50	621799.64
B-3002	2/15/2007	218.89	1142599.97	621872.49
B-3003	2/16/2007	218.29	1142599.85	621727.30
B-4001	1/9/2007, 1/10/2007, 2/13/2007	218.88	1142599.53	621000.20
B-4002	2/15/2007	219.06	1142600.19	621072.22
B-4003	2/14/2007	218.99	1142599.93	620927.13

[1] Survey data provided by MACTEC

Table 1 Boring locations and logging dates

An OYO/Robertson Suspension Logging System was used to obtain in-situ horizontal shear and compressional wave velocity measurements at 1.6 foot intervals. The acquired data were analyzed and a profile of velocity versus depth was produced for both compressional and horizontally polarized shear waves.

A detailed reference for the velocity measurement techniques used in this study is:

> Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

A Robertson ELXG Combination Electrical probe was used to obtain resistivity, spontaneous potential and natural gamma data at 0.05 foot intervals.

A Robertson 3ACS Caliper probe was used to obtain caliper and natural gamma data at 0.05 foot intervals.

A Robertson High Resolution Acoustic Televiewer probe was used to obtain boring deviation data at 0.04 foot intervals.

INSTRUMENTATION

Suspension Instrumentation

Suspension soil velocity measurements were performed in all borings using the PS suspension logging system, manufactured by OYO Corporation, and their subsidiary, Robertson Geologging. This system directly determines the average velocity of a 3.3 foot high segment of the soil column surrounding the boring of interest by measuring the elapsed time between arrivals of a wave propagating upward through the soil column. The receivers that detect the wave, and the source that generates the wave, are moved as a unit in the boring producing relatively constant amplitude signals at all depths.

Winch GEOVision 4-conductor
Sheave - Measuring wheel GEOVision S/N 102
OYO PS telemetry unit M/N 3403 S/N 160024
Robertson Micrologger II S/N 5310
OYO PS Logger Borehole Probe, includes:
Isolation tube, 1m Model 3387B S/N 28068
Weight Model 3302W S/N 12007
OYO PS 170 Source Model 3304 S/N 19043
Receiver/Sensor S/N 30086, 12008
Driver Model 3386A S/N 27073

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave source (S_H) and compressional-wave source (P), joined to two biaxial receivers by a flexible isolation cylinder, as shown in Figure 1. The separation of the two receivers is 3.3 feet, allowing average wave velocity in the region between the receivers to be determined by inversion of the wave travel time between the two receivers. The total length of the probe as used in these surveys is 19 feet, with the center point of the receiver pair 12.1 feet above the bottom end of the probe.

The probe receives control signals from, and sends the digitized receiver signals to, instrumentation on the surface via an armored 4 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data, using a 3.28 foot circumference sheave fitted with a digital rotary encoder.

The entire probe is suspended in the boring by the cable, therefore, source motion is not coupled directly to the boring walls; rather, the source motion creates a horizontally propagating impulsive pressure wave in the fluid filling the boring and surrounding the source. This pressure wave is converted to P and S_H-waves in the surrounding soil and rock as it passes through the casing and grout annulus and impinges upon the wall of the boring. These waves propagate through the soil and rock surrounding the boring, in turn causing a pressure wave to be generated in the fluid surrounding the receivers as the soil waves pass their location. Separation of the P and S_H-waves at the receivers is performed using the following steps:

1. Orientation of the horizontal receivers is maintained parallel to the axis of the source, maximizing the amplitude of the recorded S_H -wave signals.
2. At each depth, S_H-wave signals are recorded with the source actuated in opposite directions, producing S_H-wave signals of opposite polarity, providing a characteristic S_H-wave signature distinct from the P-wave signal.
3. The 6.3 foot separation of source and receiver 1 permits the P-wave signal to pass and damp significantly before the slower S_H-wave signal arrives at the receiver. In faster soils or rock, the isolation cylinder is extended to allow greater separation of the P- and S_H-wave signals.
4. In saturated soils, the received P-wave signal is typically of much higher frequency than the received S_H-wave signal, permitting additional separation of the two signals by low pass filtering.
5. Direct arrival of the original pressure pulse in the fluid is not detected at the receivers because the wavelength of the pressure pulse in fluid is significantly greater than the dimension of the fluid annulus surrounding the probe (meter versus centimeter scale), preventing significant energy transmission through the fluid medium.

In operation, a distinct, repeatable pattern of impulses is generated at each depth as follows:

1. The source is fired in one direction producing dominantly horizontal shear with some vertical compression, and the signals from the horizontal receivers situated parallel to the axis of motion of the source are recorded.
2. The source is fired again in the opposite direction and the horizontal receiver signals are recorded.
3. The source is fired again and the vertical receiver signals are recorded. The repeated source pattern facilitates the picking of the P and S_H-wave arrivals; reversal of the source changes the polarity of the S_H-wave pattern but not the P-wave pattern.

The data from each receiver during each source activation is recorded as a different channel on the recording system. The Suspension PS system has six channels (two simultaneous recording channels), each with a 1024 sample record. The recorded data are displayed as six channels with a common time scale. Data are stored on disk for further processing. Up to 8 sampling sequences can be summed to improve the signal to noise ratio of the signals.

Review of the displayed data on the recorder or computer screen allows the operator to set the gains, filters, delay time, pulse length (energy), sample rate, and summing number to optimize the quality of the data before recording. Verification of the calibration of the Suspension PS digital recorder is performed every twelve months using a NIST traceable frequency source and counter, as outlined in Appendix C.

Caliper / Natural Gamma Instrumentation

Caliper and natural gamma data were collected using a Model 3ACS 3-leg caliper probe, serial number 5368, manufactured by Robertson Geologging, Ltd. With the short arm configuration used in these surveys, the probes permitted measurement of boring diameters between 1.6 and 16 inches. With this tool, caliper measurements were collected concurrent with measurement of natural gamma emission from the boring walls. The probe was 6.82 feet long, and 1.5 inches in diameter.

This probe is useful in the following studies:

- Measurement of boring diameter and volume
- Location of hard and soft formations
- Location of fissures, caving, pinching and casing damage
- Bed boundary identification
- Strata correlation between borings

The probe receives control signals from, and sends the digitized measurement values to, a Robertson Micrologger II, S/N 5310, on the surface via an armored 4 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data, using a 3.28 foot circumference sheave fitted with a digital rotary encoder. The probe and depth data are transmitted by USB link from the Micrologger unit to a laptop computer where it is displayed and stored on hard disk.

The caliper consists of three arms, each with a toothed quadrant at their base, pivoted in the lower probe body. A toothed rack engages with each quadrant, thus constraining the arms to move together. Linear movement of the rack is converted to opening and closing of the arms. Springs hold the arms open in the operating position. A motor drive is provided to retract the arms, allowing the probe to be lowered into the boring. The rack is coupled to a potentiometer which converts movement into a voltage sensed by the probe's microprocessor.

Natural gamma measurements rely upon small quantities of radioactive material contained in all rocks to emit gamma radiation as they decay. Trace amounts of Uranium and Thorium are present in a few minerals, where potassium-bearing minerals such as feldspar, mica and clays will include traces of a radioactive isotope of Potassium. These emit gamma radiation as they decay with an extremely long half-life. This radiation is detected by scintillation - the production of a tiny flash of light when gamma rays strike a crystal of sodium iodide. The light is converted into an electrical pulse by a photomultiplier tube. Pulses above a threshold value of 60 KeV are counted by the probe's microprocessor. The measurement is useful because the radioactive elements are concentrated in certain rock types e.g. clay or shales, and depleted in others e.g. sandstone or coal.

Resistivity / Spontaneous Potential / Natural Gamma Instrumentation

Resistivity, spontaneous potential and natural gamma data were collected using a Model ELXG electric log probe, S/N 5490, manufactured by Robertson Geologging, Ltd. This probe measures Single Point Resistance (SPR), short normal (16") resistivity, long normal (64") resistivity, Spontaneous Potential (SP) and natural gamma. The probe is 8.20 feet long, and 1.73 inches in diameter.

This probe is useful in the following studies:

- Bed boundary identification
- Strata correlation between borings
- Strata geometry and type (shale indication)

The probe receives control signals from, and sends the digitized measurement values to, a Robertson Micrologger II, S/N 5310, on the surface via an armored 4 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data, using a 3.28 foot circumference sheave fitted with a digital rotary encoder. The probe and depth data are transmitted by USB link from the Micrologger unit to a laptop computer where it is displayed and stored on hard disk.

The resistivity section of the probe operates by driving an alternating current into the formation from the central SPR/DRIVE electrode. The current returns via the logging cable armor. To ensure adequate penetration of the formation the logging cable is insulated for approximately 30 feet from the cablehead. Voltages are measured between the 16" and 64" electrodes and the remote earth connection at surface, as noted below:

- Single Point Resistance (SPR): The current flowing to the cable armor is measured along with the voltage at the SPR electrode. The voltage divided by current gives resistance.

- Spontaneous Potential (SP): This is the DC bias of the 16" electrode with respect to the voltage return at the surface (ground stake).

Data quality depends upon good grounding at the surface. This is achieved with a metal stake driven into the mud-pit.

Boring Deviation Instrumentation

Boring deviation data were collected using a High Resolution Acoustic Televiewer probe (HiRAT), serial numbers 4727 and 5174, manufactured by Robertson Geologging, Ltd. The probe is 7.58 feet long, and 1.9 inches in diameter.

In this application, this probe is useful in the following studies:

- Measurement of boring inclination and deviation from vertical
- Determination of need to correct soil and geophysical log depths to true vertical depths

The probe receives control signals from, and sends the digitized measurement values to, a Robertson Micrologger II, S/N 5310, on the surface via an armored 4 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data, using a 3.28 foot circumference sheave fitted with a digital rotary encoder. The probe and depth data are transmitted by USB link from the Micrologger unit to a laptop computer where it is displayed and stored on hard disk.

The probe contains a fluxgate magnetometer to monitor magnetic north, and all raw televiewer data are referenced to magnetic north. A three-axis accelerometer is enclosed in the probe, providing boring dip data that, when processed with the orientation data, allows boring deviation data to be obtained.

The data are presented on a computer screen for operator review during the logging run, and stored on hard disk for later processing.

MEASUREMENT PROCEDURES

Suspension Measurement Procedures

All six borings were logged as partially cased borings, filled with bentonite or polymer based drilling mud. Measurements followed the **GEO***Vision* Procedure for P-S Suspension Seismic Velocity Logging, revision 1.3. These procedures were supplied and approved in advance of the work, and included in the MACTEC work plan, as presented in Appendix E. In each boring, the probe was positioned with the top of the probe at the top of the casing, and the electronic depth counter was set to 6.6 feet, the distance between the mid-point of the receiver and the top of the probe, minus the height of the casing stick-up, as verified with a tape measure, and recorded on the field logs. The probe was lowered to the bottom of the boring, and then returned to the surface, stopping at 1.6 foot intervals to collect data, as summarized in Table 2.

At each measurement depth the measurement sequence of two opposite horizontal records and one vertical record was performed, and the gains were adjusted as required. The data from each depth were viewed on the computer display, checked, and recorded on disk before moving to the next depth.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring.

Caliper / Natural Gamma Measurement Procedures

All six borings were logged as partially cased borings, filled with bentonite or polymer based drilling mud. Measurements followed the ASTM D6167 Conducting Borehole Geophysical Logging – Mechanical Caliper.

Prior to and following each logging run, the caliper tool was verified, using the manufacturer's supplied three point calibration jig, and a PVC coupling provided by MACTEC with an inside diameter traceable to NIST. The three point jig is a circular plate with a series of holes in the top surface into which the tips of the caliper arms fit. This has circles of diameters from 2" to 12", with NIST traceable calibration as documented in Appendix C. The calibration jig is placed over a bucket with the probe standing upright with its nose section passing through the jig's central hole. The caliper probe arms are opened under program control, and a log is recorded as the tips of the arms are placed in the holes on the calibration jig and inside the PVC coupling. The measured dimensions, as displayed on the recording computer screen was recorded on the field log sheet, as well as in the digital files, and compared with the calibration jig dimensions. These files are presented in LAS 2.0 format in the boring specific sub-directories of the data directory on volume 2 of 2 (CD-R) of this report. If the verification records did not fall within +/- 0.05 inches of the calibration jig values, the caliper tool was re-calibrated, using the three point calibration jig, and the log repeated. As with the verification, the tips of the caliper arms are placed in the holes marked with the required diameter. During calibration, the value of the current calibration point, as stamped on the jig, is entered via the control computer. The system counts for 15 seconds to make an average of the response. The procedure is repeated for the second and third required openings.

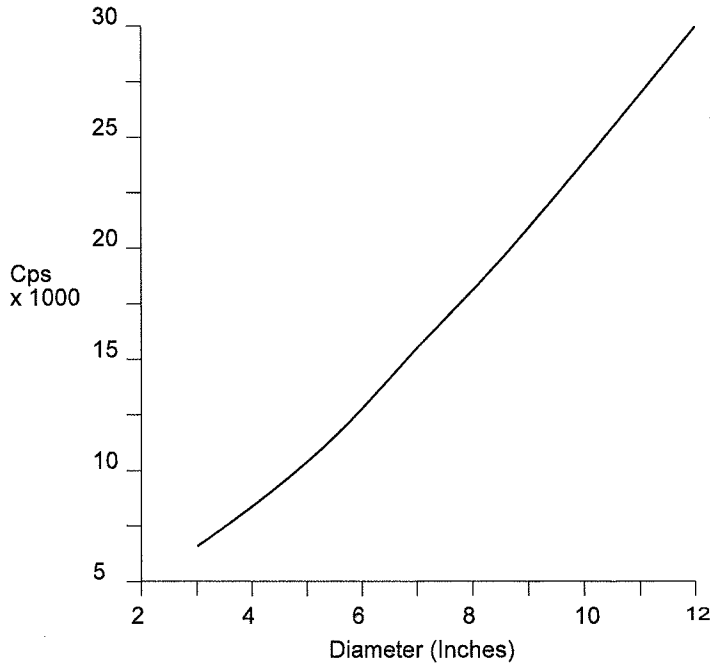


Figure 1. Example Calibration Curve for Caliper Probe

The computation and generation of the calibration coefficient file is entirely automatic. The calibration file is simply the set of coefficients of a quadratic curve which fits the three data points. Figure 1 shows the response of a caliper probe using data gathered during calibration.

Natural gamma was not calibrated in the field, as it is a qualitative measurement, not a quantitative value, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D6274, Conducting Borehole Geophysical Logging - Gamma,.

In each boring, the probe was positioned with the top of the probe at the top of the mud box, and the electronic depth counter was set to 6.82 feet, the specified length of the probe, minus the height of the mud box, as verified with a tape measure, and recorded on the field logs. The probe was lowered to the bottom of the boring, where the caliper legs were opened, and data collection begun. The probe was then returned to the surface at 10 feet/minute, collecting data continuously at 0.05 foot spacing, as summarized in Table 2.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring, as summarized in Table 3.

Resistivity / Spontaneous Potential Measurement Procedures

All six borings were logged as partially cased borings, filled with bentonite or polymer based drilling mud. The probe was connected to the logging cable using a 32.8 foot long insulating cable section or "yoke". The probe head was insulated by wrapping all exposed metal of the cablehead and probe with self-amalgamating insulation tape. The 32.8 foot insulating yoke was checked for any damage, and repaired with self-amalgamating insulation tape as needed.

The reference ground stake was driven firmly into the mud pit, and connected to the ground socket on the winch switch box.

This sonde was not calibrated in the field, as it is used to provide qualitative measurements, not quantitative values, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D5753, Planning and Conducting Borehole Geophysical Surveys. A functional test is performed prior to each logging run by applying fixed resistance values across the probe electrodes, as well as a 100 millivolt signal across the SP electrodes, and recording the resultant output of the system. These functional checks are presented in LAS 2.0 format in the boring specific sub-directories of the data directory on volume 2 of 2 (CD-R) of this report.

In each boring, the probe was positioned with the top of the probe at the top of the casing or mud box, and the electronic depth counter was set to 8.2 feet, the specified length of the probe, minus the height of the casing stick-up or mud box, as verified with a tape measure. When logging on smaller drill rigs, the depth was zeroed to the top of the yoke, and 32.8 feet was added to the zero depth, as recorded in the field logs. The probe was lowered to the bottom of the boring, where data collection was begun. The probe was then returned to the surface at 10 feet/minute, collecting data continuously at 0.05 foot spacing, as summarized in Table 2. The natural gamma data collected in

these logs is redundant with the data collected in the caliper / natural gamma logs, and the caliper / natural data may be used to verify the natural gamma data collected in these logs.

Normally, when the un-insulated section of the logging cable leaves the boring fluid, the log is terminated, as the electrical measurements do not function under these conditions. However, in these surveys, the log was continued, in order to collect as much natural gamma data as possible before the yoke connector reached the measuring wheel.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring, as summarized in Table 3.

Boring Deviation Measurement Procedures

All six borings were logged as partially cased borings, filled with bentonite or polymer based drilling mud. Although the High Resolution Acoustic Televiewer (HiRAT) cannot image in the soft soils at this site, this instrument was used in order to provide a deviation log for each boring. Measurements followed ASTM D5753, Planning and Conducting Borehole Geophysical Surveys.

Prior to use, the HiRAT probe tiltmeter and compass functions were checked by comparison with a Brunton surveyors' compass.

In each boring, the HiRAT probe was positioned with the top of the probe at the top of the casing, and the electronic depth counter was set to 4.71 feet, the specified length of the probe, minus the height of the casing stick-up, as verified with a tape measure, and recorded on the field logs. The probe was lowered to the bottom of the boring, and data collection begun. The probe was then returned to the surface at 10.0 feet/minute, collecting data continuously at 0.04 foot intervals, as summarized in Table 2.

Upon completion of the measurements, the probe zero depth indication at grade was verified prior to removal from the boring. The log was reviewed in the field, and the data processed with Robertson Geologging RGLDIP software, version 6.2, to produce a boring deviation plot and data in ASCII format. These files are presented in the boring specific sub-directories of the data directory on volume 2 of 2 (CD-R) of this report, and summarized in Table 4.

BORING NUMBER	TOOL AND RUN NUMBER	DEPTH RANGE (FEET)	OPEN HOLE (FEET)	DEPTH TO BOTTOM OF CASING (FEET)	SAMPLE INTERVAL (FEET)	DATE LOGGED
B-3001	ELOG/GAMMA 1	262.0 – 20.0	262.0	95.0	0.05	2/12/2007
B-3001	SUSPENSION 1	98.4 – 237.9	-	95.0	1.6	2/12/2007
B-3001	CALIPER/GAMMA 1	245.0 - 0	-	95.0	0.05	2/12/2007
B-3001	DEVIATION 1	247.0 - 0	-	95.0	0.04	2/12/2007
B-3001	ELOG/GAMMA 2	405.0 – 240.0	405.0	275.0	0.05	2/13/2007
B-3001	ELOG/GAMMA 3	404.0 – 240.0	-	275.0	0.05	2/13/2007
B-3001	SUSPENSION 2	277.2 – 394.0	406.1	275.0	1.6	2/13/2007
B-3001	CALIPER/GAMMA 2	400.0 - 240.0	-	275.0	0.05	2/13/2007
B-3001	DEVIATION 2	402.0 – 240.0	-	275.0	0.04	2/13/2007
B-3002	ELOG/GAMMA 1	248.0 – 25.0	248.0	95.5	0.05	2/15/2007
B-3002	ELOG/GAMMA 2	248.0 – 25.0	248.0	95.5	0.05	2/15/2007
B-3002	SUSPENSION 1	96.8 – 236.2	248.3	95.5	1.6	2/15/2007
B-3002	CALIPER/GAMMA 1	245.0 - 0	-	95.5	0.05	2/15/2007
B-3002	DEVIATION 1	246.0 - 0	-	95.5	0.04	2/15/2007
B-3003	ELOG/GAMMA 1	249.0 – 20.0	249.0	97.0	0.05	2/16/2007
B-3003	SUSPENSION 1	98.4 – 236.2	248.3	97.0	1.6	2/16/2007
B-3003	CALIPER/GAMMA 1	245.0 - 0	-	97.0	0.05	2/16/2007
B-3003	DEVIATION 1	248.0 - 0	248.0	97.0	0.04	2/16/2007
B-4001	ELOG/GAMMA 1	399.2 – 340.0	399.2	97.5	0.05	1/9/2007
B-4001	ELOG/GAMMA 2	340.0 - 319.6	-	97.5	0.05	1/9/2007
B-4001	ELOG/GAMMA 3	330.0 – 288.6	-	97.5	0.05	1/9/2007
B-4001	ELOG/GAMMA 4	300.0 - 0	-	97.5	0.05	1/9/2007
B-4001	CALIPER/GAMMA 1	395.0 – 343.3	-	97.5	0.05	1/9/2007
B-4001	ELOG/GAMMA 5	399.5 – 111.5	399.5	97.5	0.05	1/10/2007
B-4001	ELOG/GAMMA 6	0 – 61.9	-	97.5	0.05	1/10/2007
B-4001	DEVIATION 1	399.0 - 0	-	97.5	0.04	1/10/2007
B-4001	SUSPENSION 1	8.2 – 385.5	-	97.5	1.6	1/10/2007
B-4001	ELOG/GAMMA 7	399.5 – 20.0	399.5	97.5	0.05	2/13/2007
B-4001	CALIPER/GAMMA 1	397.0 - 0	-	97.5	0.05	2/13/2007
B-4002	ELOG/GAMMA 1	250.7 – 20.0	250.7	96.0	0.05	2/15/2007
B-4002	ELOG/GAMMA 2	250.0 – 20.0	250.07	96.0	0.05	2/15/2007
B-4002	SUSPENSION 1	98.4 – 236.2	-	96.0	1.6	2/15/2007
B-4002	CALIPER/GAMMA 1	247.0 - 0	-	96.0	0.05	2/15/2007
B-4002	DEVIATION 1	248.0 - 0	-	96.0	0.04	2/15/2007
B-4003	ELOG/GAMMA 1	250.8 – 20.0	250.8	96.0	0.05	2/14/2007
B-4003	SUSPENSION 1	3.3 – 211.6	-	96.0	1.6	2/14/2007
B-4003	SUSPENSION 2	NO DATA	-	96.0		2/14/2007
B-4003	SUSPENSION 3	167.3 – 237.9	-	96.0	1.6	2/14/2007
B-4003	CALIPER/GAMMA 1	247.0 - 0	-	96.0	0.05	2/14/2007
B-4003	DEVIATION 1	250.0 - 0	250.0	96.0	0.04	2/14/2007
B-4003	DEVIATION 2	250.0 – 0	250.0	96.0	0.04	2/14/2007

- PROBE DID NOT TOUCH BOTTOM OF BORING

Table 2. Logging dates and depth ranges

BORING NUMBER	TOOL AND RUN NUMBER	TOOL HIT BOTTOM DEPTH (FEET)	DRILLER DEPTH (FEET)	STARTING DEPTH REF. (FEET)	ENDING DEPTH REF. (FEET)	ASDE (FEET)
B-3001	ELOG/GAMMA 1	262.0	420.0	38.7	38.4	0.3
B-3001	SUSPENSION 1	-		5.9	5.9	0
B-3001	CALIPER/GAMMA 1	-		4.5	4.5	0
B-3001	DEVIATION 1	-		2.4	2.5	0.1
B-3001	ELOG/GAMMA 2	405.0		38.7	38.5	-0.2
B-3001	ELOG/GAMMA 3	-		38.7	38.5	-0.2
B-3001	SUSPENSION 2	406.1		5.9	5.8	-0.1
B-3001	CALIPER/GAMMA 2	-		4.5	4.5	0
B-3001	DEVIATION 2	-		2.4	2.2	-0.2
B-3002	ELOG/GAMMA 1	248.0	250.0	39.5	39.5	0
B-3002	ELOG/GAMMA 2	248.0		39.5	39.5	0
B-3002	SUSPENSION 1	248.3		6.6	6.6	0
B-3002	CALIPER/GAMMA 1	-		5.3	5.3	0
B-3002	DEVIATION 1	-		3.2	3.2	0
B-3003	ELOG/GAMMA 1	249.0	250.0	39.5	39.4	-0.1
B-3003	SUSPENSION 1	248.3		6.6	6.6	0
B-3003	CALIPER/GAMMA 1	-		5.3	5.3	0
B-3003	DEVIATION 1	248.0		3.2	3.2	0
B-4001	ELOG/GAMMA 1	399.2	400.0	6.2	6.5	0.3
B-4001	ELOG/GAMMA 2	-		6.2	6.5	0.3
B-4001	ELOG/GAMMA 3	-		6.2	6.5	0.3
B-4001	ELOG/GAMMA 4	-		6.2	6.5	0.3
B-4001	CALIPER/GAMMA 1	-		4.8	4.8	0
B-4001	ELOG/GAMMA 5	399.5		6.2	6.0	-0.2
B-4001	ELOG/GAMMA 6	-		6.2	6.0	-0.2
B-4001	DEVIATION 1	-		2.7	2.5	-0.2
B-4001	SUSPENSION 1	-		5.9	5.9	-0.1
B-4001	ELOG/GAMMA 7	399.5		38.8	38.7	-0.1
B-4001	CALIPER/GAMMA 1	-		4.6	4.6	0
B-4002	ELOG/GAMMA 1	250.7	250.0	38.6	38.4	-0.2
B-4002	ELOG/GAMMA 2	250.0	250.0	38.6	38.4	-0.2
B-4002	SUSPENSION 1	-		5.8	5.7	-0.1
B-4002	CALIPER/GAMMA 1	-		4.4	4.4	0
B-4002	DEVIATION 1	-		2.3	2.3	0
B-4003	ELOG/GAMMA 1	250.8	250.0	38.5	38.5	0
B-4003	SUSPENSION 1	-		5.7	5.6	-0.1
B-4003	SUSPENSION 2	-		5.7	5.7	0
B-4003	SUSPENSION 3	-		5.7	5.7	0
B-4003	CALIPER/GAMMA 1	-		4.3	4.3	0
B-4003	DEVIATION 1	250.0		2.2	2.2	0
B-4003	DEVIATION 2	250.0		2.2	2.1	-0.1

- PROBE DID NOT TOUCH BOTTOM OF BORING

Table 3. Boring Bottom Depths and After Survey Depth Error (ASDE)

DATA ANALYSIS

Suspension Analysis

Using the proprietary OYO program PSLOG.EXE version 1.0, included in volume 2 of 2 (CD-R) of this report, the recorded digital waveforms were analyzed to locate the most prominent first minima, first maxima, or first break on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between receiver 1 and receiver 2 (R1-R2) arrivals was used to calculate the P-wave velocity for that 3.3 foot segment of the soil column. When observable, P-wave arrivals on the horizontal axis records were used to verify the velocities determined from the vertical axis data. The time picks were then transferred into an EXCEL template (EXCEL version 2003 SP2) to complete the velocity calculations based upon the arrival time picks made in PSLOG. The PSLOG pick files and the EXCEL analysis files are included in the boring specific directories on volume 2 of 2 (CD-R) of this report.

The P-wave velocity over the 6.3 foot interval from source to receiver 1 (S-R1) was also picked using PSLOG, and calculated and plotted in EXCEL, for quality assurance of the velocity derived from the travel time between receivers. In this analysis, the depth values as recorded were increased by 4.8 feet to correspond to the mid-point of the 6.3 foot S-R1 interval. Travel times were obtained by picking the first break of the P-wave signal at receiver 1 and subtracting 0.3 milliseconds, the calculated and experimentally verified delay from source trigger pulse (beginning of record) to source impact. This delay corresponds to the duration of acceleration of the solenoid before impact.

As with the P-wave records, using PSLOG, the recorded digital waveforms were analyzed to locate the presence of clear S_H-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the S_H-wave signals from the 'normal' and 'reverse' source pulses are very nearly inverted images of each other. Digital FFT - IFFT lowpass filtering was used to remove the higher frequency P-wave signal from the S_H-wave signal. Different filter cutoffs

were used to separate P- and S_H-waves at different depths, ranging from 600 Hz in the slowest zones to 2000 Hz in the regions of highest velocity. At each depth, the filter frequency was selected to be at least twice the fundamental frequency of the S_H-wave signal being filtered.

Generally, the first maxima were picked for the 'normal' signals and the first minima for the 'reverse' signals, although other points on the waveform were used if the first pulse was distorted. The absolute arrival time of the 'normal' and 'reverse' signals may vary by +/- 0.2 milliseconds, due to differences in the actuation time of the solenoid source caused by constant mechanical bias in the source or by boring inclination. This variation does not affect the R1-R2 velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

As with the P-wave data, S_H-wave velocity calculated from the travel time over the 6.3 foot interval from source to receiver 1 was calculated and plotted for verification of the velocity derived from the travel time between receivers. In this analysis, the depth values were increased by 4.8 foot to correspond to the mid-point of the 6.3 foot S-R1 interval. Travel times were obtained by picking the first break of the S_H-wave signal at the near receiver and subtracting 0.3 milliseconds, the calculated and experimentally verified delay from the beginning of the record at the source trigger pulse to source impact.

These data and analysis were reviewed by John Diehl and Tony Martin as a component of **GEO***Vision*'s in-house QA-QC program.

Figure 2 shows an example of R1 - R2 measurements on a sample filtered suspension record. In Figure 2, the time difference over the 3.3 foot interval of 1.88 milliseconds for the horizontal signals is equivalent to an S_H-wave velocity of 1745 feet/second. Whenever possible, time differences were determined from several phase points on the S_H-waveform records to verify the data obtained from the first arrival of the S_H-wave pulse. Figure 3 displays the same record before filtering of the S_H-waveform record with a 1400 Hz FFT - IFFT digital lowpass filter, illustrating

the presence of higher frequency P-wave energy at the beginning of the record, and distortion of the lower frequency S_H-wave by residual P-wave signal.

Caliper / Natural Gamma Analysis

No analysis is required with the caliper or natural gamma data, however depths to identifiable boring features were compared to verify compatible depth readings on all logs. Using Robertson Geologging Winlogger software version 1.5, build 401J, these data were combined with the resistivity, ELOG based natural gamma and spontaneous potential (SP) logs, and converted to LAS 2.0 and PDF formats for transmittal to the client.

Resistivity / Natural Gamma / Spontaneous Potential Analysis

No analysis is required with the resistivity, natural gamma or spontaneous potential data, however depths to identifiable boring features were compared to verify compatible depth readings on all logs. Using Robertson Geologging Winlogger software version 1.5, build 401J, these data were combined with the caliper and caliper-based natural gamma logs, and converted to LAS 2.0 and PDF formats for transmittal to the client.

Boring Deviation Analysis

The collected deviation data were processed with Robertson Geologging's RGLDIP program, version 6.2, to extract the deviation values and produce an ASCII file and plots of deviation data as presented in the boring specific sub-directories in the data directory on volume 2 of 2 (CD-R) of this report, and summarized in Table 4.

RESULTS

Suspension Results

Suspension R1-R2 P- and S_H-wave velocities are plotted in Figures 5, 9, 12, 15, 18 and 21 The suspension velocity data presented in these figures are presented in Tables 5 – 10. The PSLOG and EXCEL analysis files for each boring are included in the boring specific directories on volume 2 of 2 (CD-R) of this report, along with the raw and filtered waveforms.

P- and S_H-wave velocity data from R1-R2 analysis and quality assurance analysis of S-R1 data are plotted together in Figures A-1 through A-6 to aid in visual comparison. It should be noted that R1-R2 data are an average velocity over a 3.3 foot segment of the soil column; S-R1 data are an average over 6.3 feet, creating a significant smoothing relative to the R1-R2 plots. S-R1 data are presented in Tables A-1 through A-6, and included in the EXCEL analysis files for each boring on volume 2 of 2 (CD-R) of this report.

Calibration procedures and records for the suspension PS measurement system are presented in Appendix C, and **GEO***Vision* standard field log sheets for all borings are reproduced in Appendix D.

The **GEO***Vision* standard field procedures are reproduced in Appendix E.

Caliper/ Natural Gamma Results

Caliper and natural gamma data are presented in combined log plots with resistivity and spontaneous potential as single page logs in Figures 6, 7, 10, 13, 16, 19 and 22, as well as multi-page logs in Appendix B. On these plots, the following acronyms are used:

- NGAM: Natural gamma data collected with the caliper probe.
- SP: Spontaneous (self) potential.
- EGAM: Natural gamma data collected with the ELOG probe.
- CALP: Caliper (borehole diameter)
- SHN: Short normal resistivity (16 inch resistivity)
- LON: Long normal resistivity (64 inch resistivity)
- SPR: Single point resistance

LAS 2.0 data and Acrobat files of the plots for each boring are included in the boring specific sub-directories in the data directory on volume 2 of 2 (CD-R) of this report.

Resistivity / Spontaneous Potential Results

Resistivity and spontaneous potential data are presented in combined log plots with caliper and natural gamma data as single page logs in Figures 6, 7, 10, 13, 16, 19 and 22, as well as multi-page logs in Appendix B. LAS 2.0 data and Acrobat files for each boring are included in the boring specific sub-directories in the data directory on volume 2 of 2 (CD-R) of this report.

Boring Deviation Results

Boring deviation data are presented graphically in Figures 8, 11, 14, 17, 20 and 23, and summarized in Table 4. Deviation data plots in Acrobat format and deviation data at 1.0 foot stations are presented in ASCII format in the boring specific sub-directories of the data directory on volume 2 of 2 (CD-R) of this report.

SUMMARY

Discussion of Suspension Results

Suspension PS velocity data are ideally collected in an uncased fluid filled boring, drilled with rotary mud (rotary wash) methods. Below approximately 96 feet, the borings at this site were generally good for collection of suspension PS velocity data. The upper 96 feet of these borings were cased with 6 inch casing to prevent collapse and fluid loss. In B-3001, drill rod was placed to 275 feet as a temporary casing through a persistently collapsing zone between 262 and 270 feet. Data collection was performed in the top 96 feet of B-4001, to evaluate if valid velocity data could be obtained through the 6 inch casing. Review of the data indicated poor casing coupling, and the data was not interpretable. No further velocity data was collected in the cased sections of the borings.

Suspension PS velocity data quality is judged based upon 5 criteria:

1. Consistent data between receiver to receiver (R1 – R2) and source to receiver (S – R1) data.
2. Consistent relationship between P-wave and S_H -wave (excluding transition to saturated soils)
3. Consistency between data from adjacent depth intervals.
4. Clarity of P-wave and S_H-wave onset, as well as damping of later oscillations.
5. Consistency of profile between adjacent borings, if available.

These data show excellent correlation between R1 – R2 and S – R1 data, as well as excellent correlation between P-wave and S_H-wave velocities. P-wave and S_H-wave onsets are generally clear, and later oscillations are well damped.

Discussion of Caliper / Natural Gamma Results

Caliper and natural gamma data were collected for the entire depth of each boring, as natural gamma data can be collected through PVC casing without attenuation, and through steel casing with some attenuation. The caliper logs for these borings show boring erosion extending beyond 12 inches in diameter in a number of areas. Natural gamma data were collected with this tool in all the borings, as well as with the ELOG probe, and the comparison between the two data sets provides an almost exact match, verifying the performance of the natural gamma measuring systems.

Discussion of Resistivity / Spontaneous Potential Results

These electrical methods provide clear demarcation of different lithologic units at this site. All three resistivity logs show the same structure, and match very closely with the structure indicated by the natural gamma logs. The electrical data are not valid above about 97 feet, as the electrodes move into casing at this depth. This is also the case for B-3001 lower section above 275 feet, where drill rod was placed as a temporary casing. The natural gamma data remains valid, though attenuated, inside the casing, and agrees well with gamma data from the caliper probe. The comparison between the two data sets provides an almost exact match, verifying the performance of the natural gamma measuring systems.

Discussion of Boring Deviation Results

All six borings were inclined at 4.9 degrees, or less, from vertical, and the maximum error in depth value was 1.9 feet in 397 feet, or 0.5 percent, as presented in Table 4. This error is only slightly more than the 0.4 percent after survey depth error (ASDE) required by ASTM D5753, Planning and Conducting Borehole Geophysical Surveys, and probably less than cumulative depth errors from other causes, so no adjustment of log depth is indicated.

BORING NUMBER	MEAN DEVIATION AND AZIMUTH (DEGREES)	SURVEY DEPTH (FEET)	VERTICAL DEPTH (FEET)	DEPTH ERROR (FEET)	HORIZONTAL OFFSET (FEET)
B-3001	0.8 – N106.8	401.9	401.7	0.2	5.4
B-3002	1.0 – N252.4	245.9	245.7	0.2	4.5
B-3003	1.3 – N105.3	247.9	247.8	0.1	5.8
B-4001	4.9 – N278.5	398.9	397.0	1.9	34.0
B-4002	1.8 – N37.4	248.8	248.5	0.3	7.8
B-4003	2.6 – N120.1	249.8	249.3	0.5	11.5

Table 4. Boring Deviation Data Summary

Quality Assurance

These boring geophysical measurements were performed using industry-standard or better methods for measurements and analyses. All work was performed under **GEO***Vision* quality assurance procedures, which include:

- Use of NIST-traceable calibrations, where applicable, for field and laboratory instrumentation
- Use of standard field data logs
- Use of independent verification of velocity data by comparison of receiver-to-receiver and source-to-receiver velocities
- Independent review of calculations and results by a registered professional engineer, geologist, or geophysicist.

Suspension Data Reliability

P- and S_H-wave velocity measurement using the Suspension Method gives average velocities over a 3.3 foot interval of depth. This high resolution results in the scatter of values shown in the graphs. Individual measurements are very reliable with estimated precision of +/- 5%. Standardized field procedures and quality assurance checks contribute to the reliability of these data.

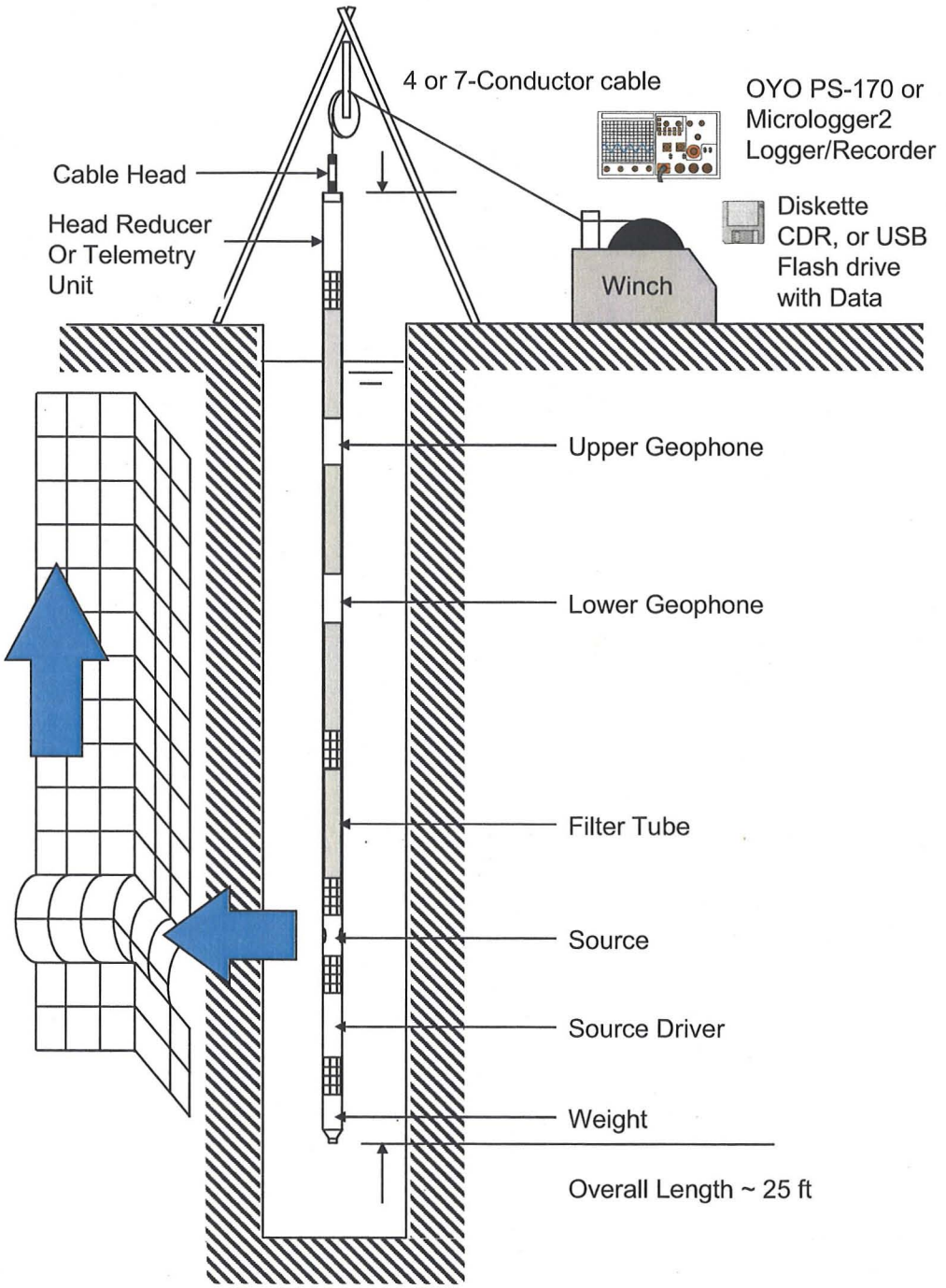


Figure 2: Concept illustration of P-S logging system

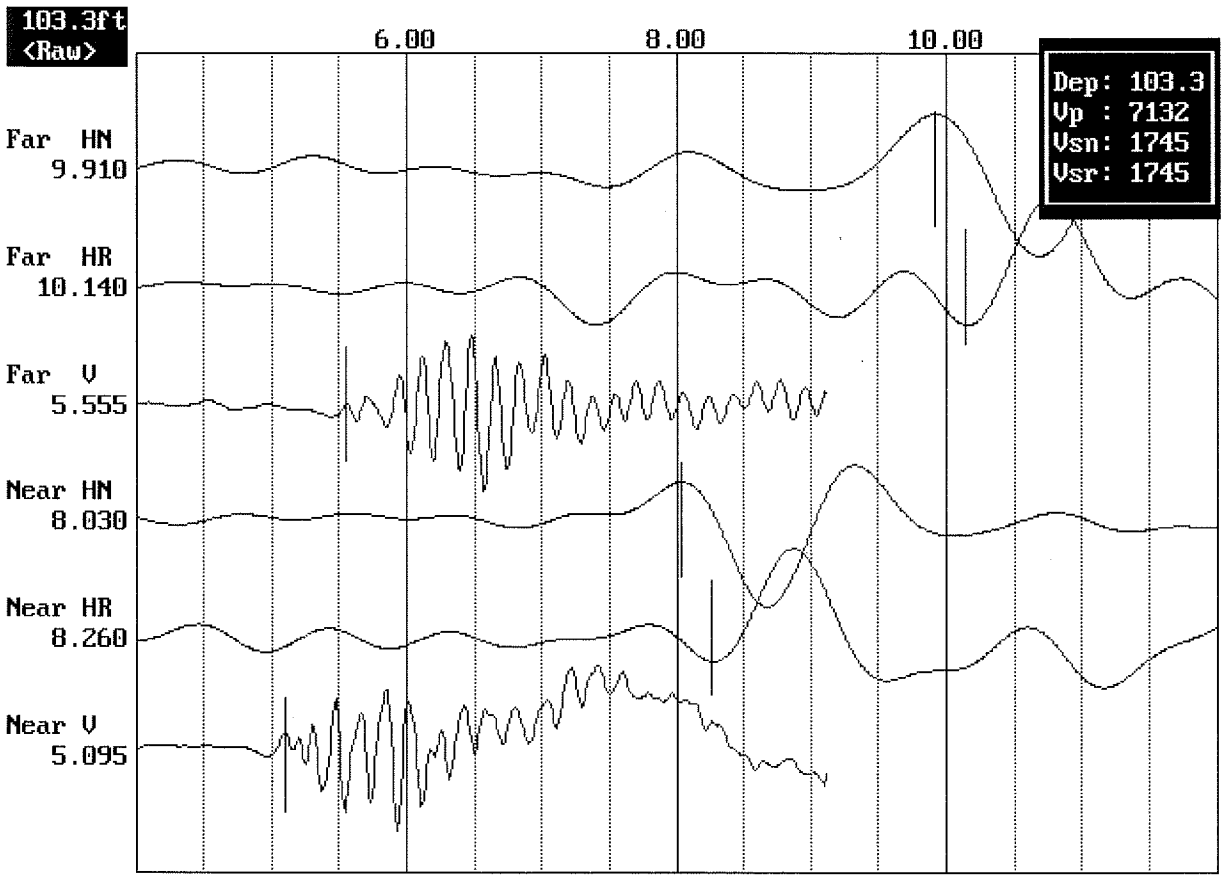


Figure 3: Example of filtered (1400 Hz lowpass) record

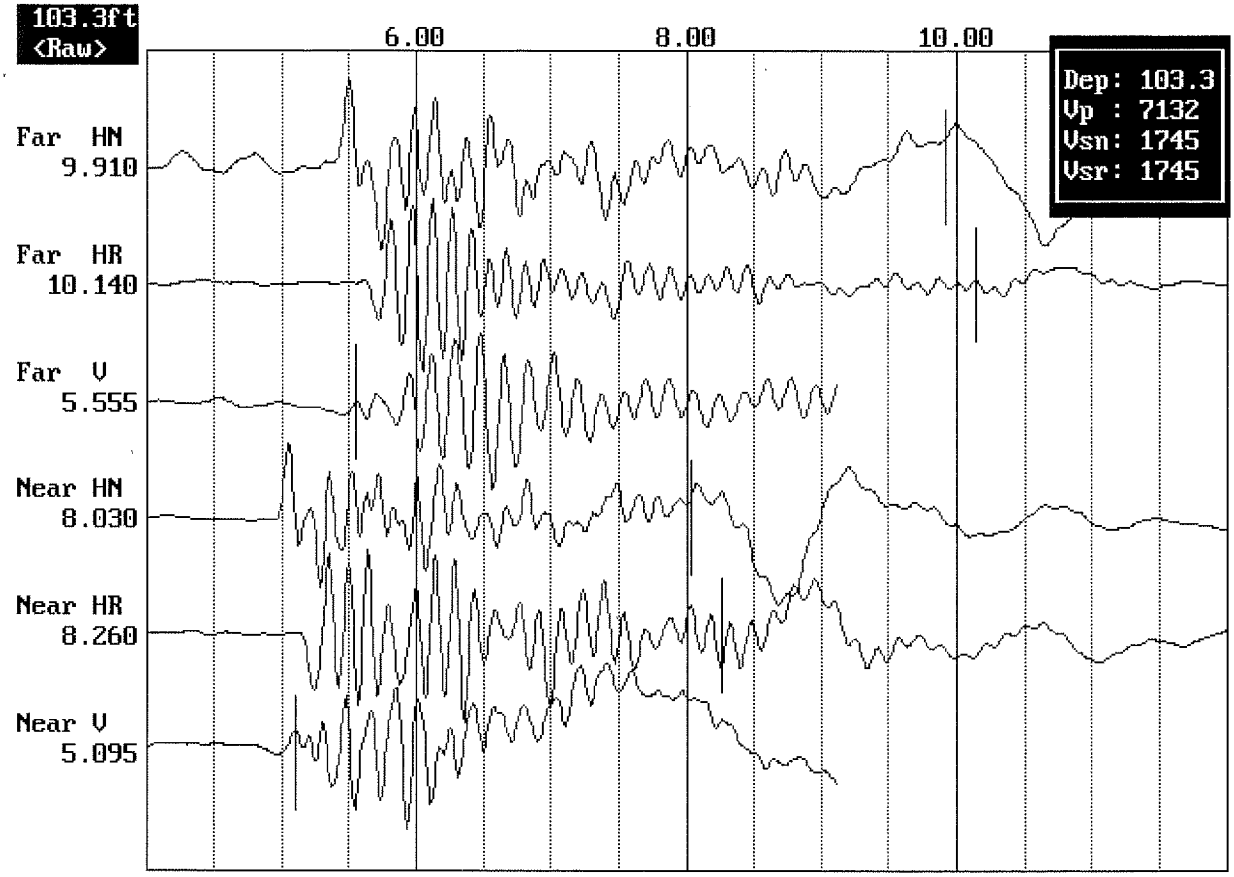


Figure 4. Example of unfiltered record

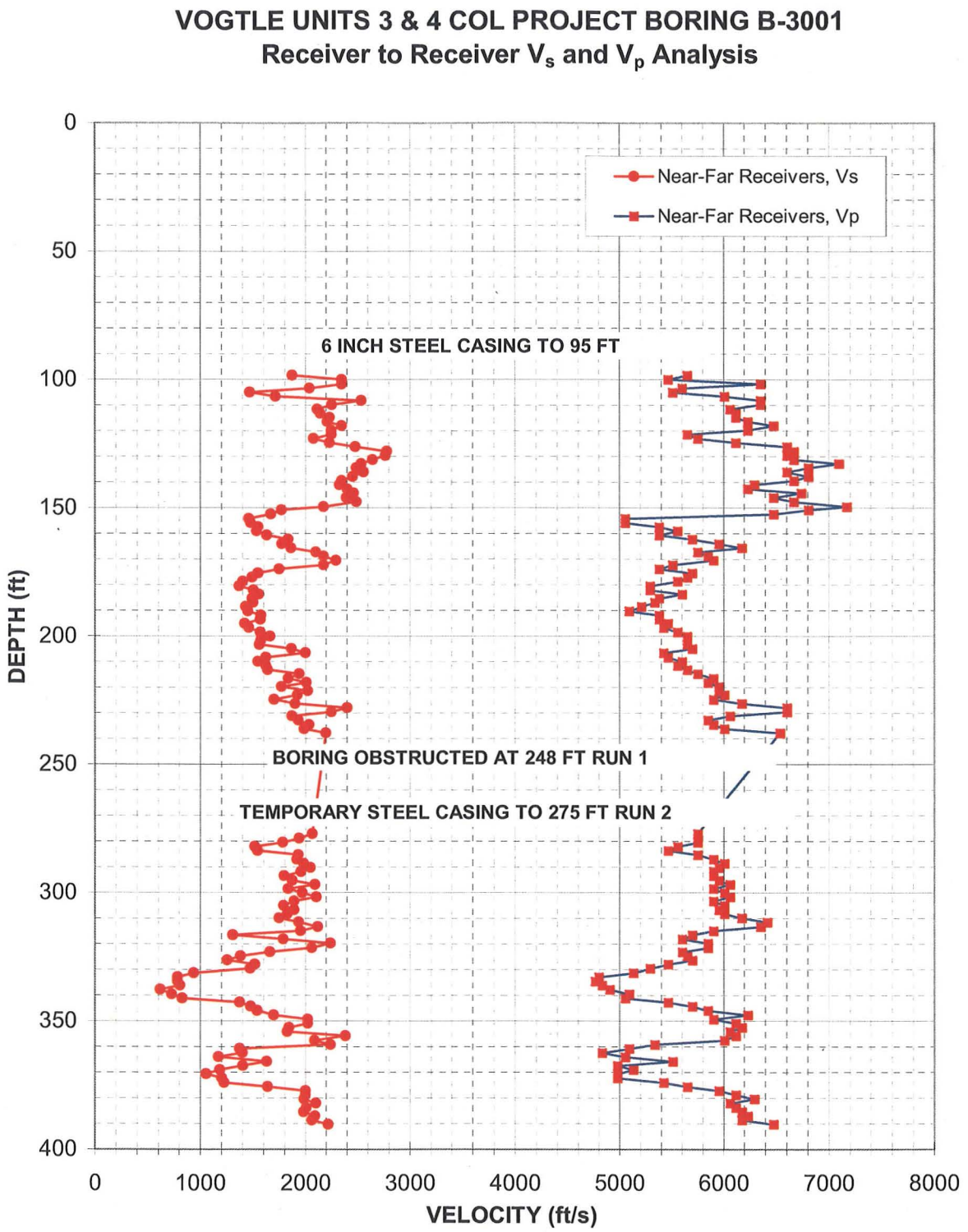


Figure 5: Boring B-3001, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
98.4	1870	5650
100.1	2350	5460
101.7	2350	6350
103.4	2040	5600
105.0	1470	5510
106.6	1710	6010
108.3	2530	6350
109.9	2250	6350
111.6	2110	6060
113.2	2140	6120
114.8	2230	6120
116.5	2210	6230
118.1	2350	6470
119.8	2240	6230
121.4	2240	5650
123.0	2080	5750
124.7	2230	6120
126.3	2480	6600
128.0	2780	6670
129.6	2770	6600
131.2	2650	6670
132.9	2530	7090
134.5	2490	6800
136.2	2550	6600
137.8	2450	6800
139.4	2350	6670
141.1	2320	6290
142.7	2400	6230
144.4	2460	6730
146.0	2390	6470
147.6	2490	6670
149.6	2170	7170
150.9	1770	6800
152.6	1670	6470
154.2	1460	5050
155.8	1470	5050
157.5	1540	5380
159.1	1530	5560
160.8	1630	5380
162.4	1830	5700
164.0	1770	5950
165.7	1860	6170
167.3	2100	5750
169.0	2170	5850
170.6	2290	5900
172.2	2170	5510
173.9	1750	5380
175.5	1540	5700
177.2	1490	5650
178.8	1400	5560

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
180.5	1370	5290
182.1	1500	5290
183.7	1550	5600
185.4	1490	5380
187.0	1490	5330
188.7	1420	5210
190.3	1450	5090
191.9	1570	5380
193.6	1560	5380
195.2	1420	5460
196.9	1460	5420
198.5	1560	5560
200.1	1660	5650
201.8	1570	5650
203.4	1560	5650
205.1	1860	5700
206.7	2000	5420
208.3	1620	5460
210.0	1540	5600
211.6	1620	5560
213.3	1630	5650
214.9	1940	5750
216.5	1830	5900
218.2	2010	5850
219.8	1770	5950
221.5	2020	5950
223.1	1920	6010
224.7	1700	5900
226.4	1900	6170
228.0	2400	6600
229.7	2240	6600
231.3	1870	6060
232.9	1930	5850
234.6	2030	5900
236.2	1980	6010
237.9	2190	6540
277.2	2060	5750
278.9	1940	5750
280.5	1780	5750
282.2	1510	5560
283.8	1540	5460
285.4	1930	5750
287.1	1920	5900
288.7	1980	6010
290.4	2040	5950
292.0	1960	5900
293.6	1790	5900
295.3	1870	5950
296.9	2090	6060
298.6	1830	5900

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
300.2	1970	6010
301.8	2100	6060
303.5	1890	5900
305.1	1790	6010
306.8	1890	5950
308.4	1820	6010
310.0	1750	6170
311.7	1930	6410
313.3	2120	6350
315.0	1950	5900
316.6	1300	5700
318.2	1780	5600
319.9	2240	5850
321.5	2060	5850
323.2	1660	5600
324.8	1380	5650
326.4	1250	5700
328.1	1520	5460
329.7	1470	5290
331.4	930	5130
333.0	780	4800
334.7	780	4760
336.3	800	4830
337.9	620	4900
339.6	720	5090
341.2	830	5050
342.9	1370	5460
344.5	1470	5700
346.1	1540	5850
347.8	1690	6230
349.4	2020	5900
351.1	2020	6120
352.7	1840	6170
354.3	1820	6060
356.0	2380	6120
357.6	2080	6010
359.3	2240	5330
360.9	1370	5090
362.5	1390	4830
364.2	1170	5050
365.8	1630	5510
367.5	1400	4980
369.1	1180	5130
370.7	1050	4980
372.4	1200	4980
374.0	1220	5420
375.7	1630	5650
377.3	2000	5950
378.9	2000	6120
380.6	1980	6290

Table 5. Boring B-3001, Suspension R1-R2 depths and P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
382.2	2100	6060
383.9	2010	6120
385.5	1980	6170
387.1	2090	6230
388.8	2060	6170
390.4	2210	6470

Table 5, continued. Boring B-3001, Suspension R1-R2 depths and P- and S_H-wave velocities

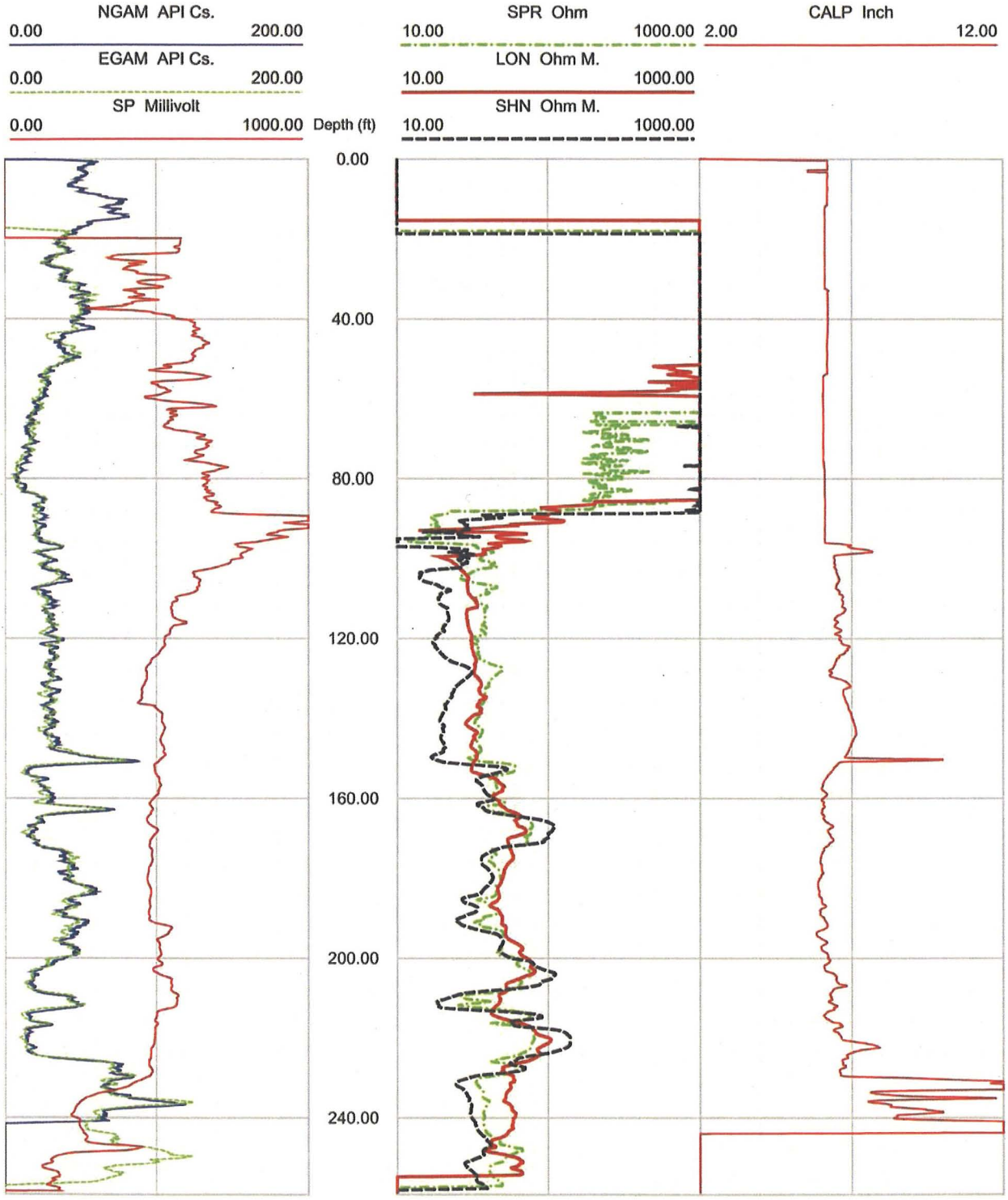


Figure 6. Boring B-3001, Upper Section, Caliper, Natural gamma, Resistivity and SP logs

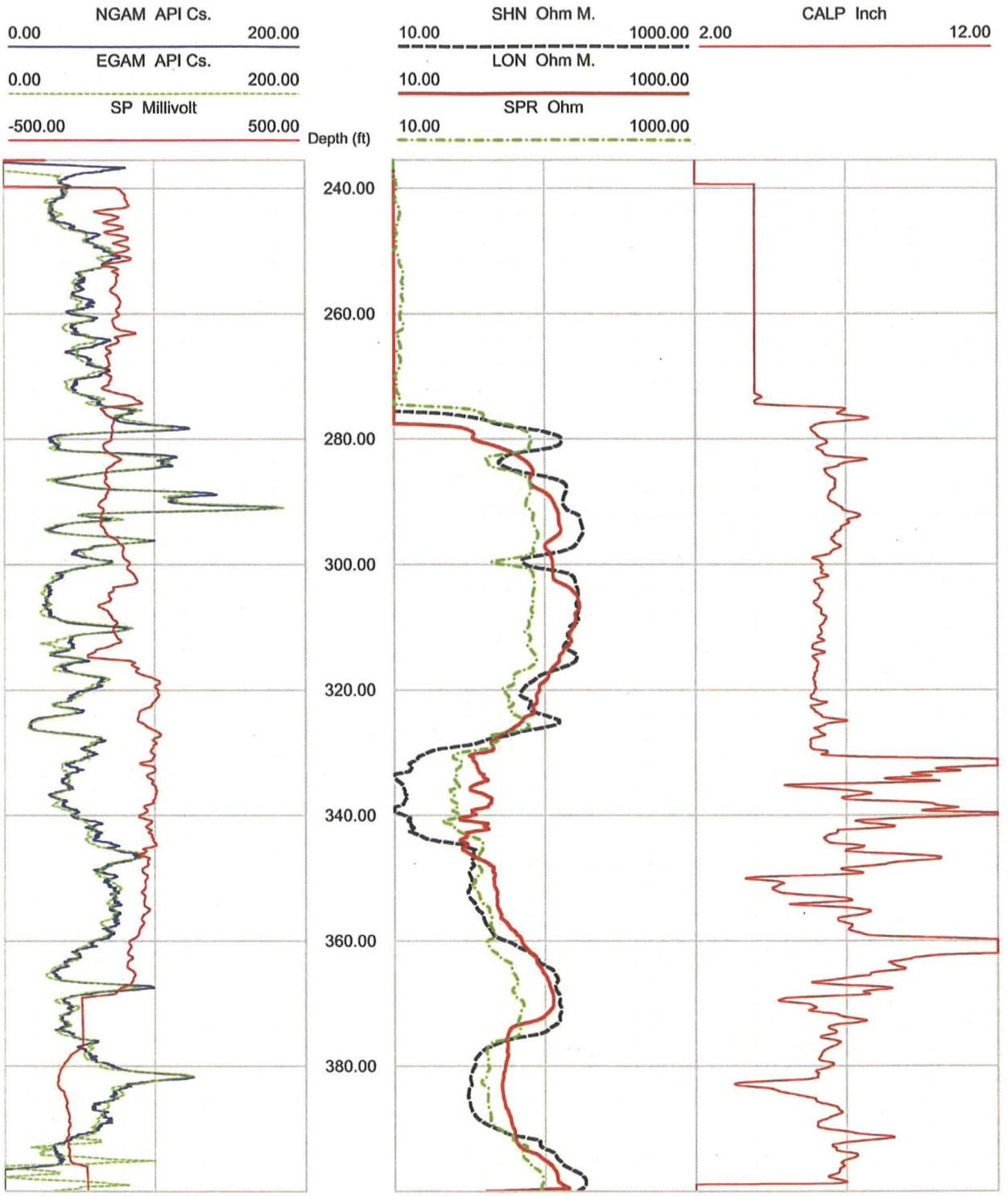
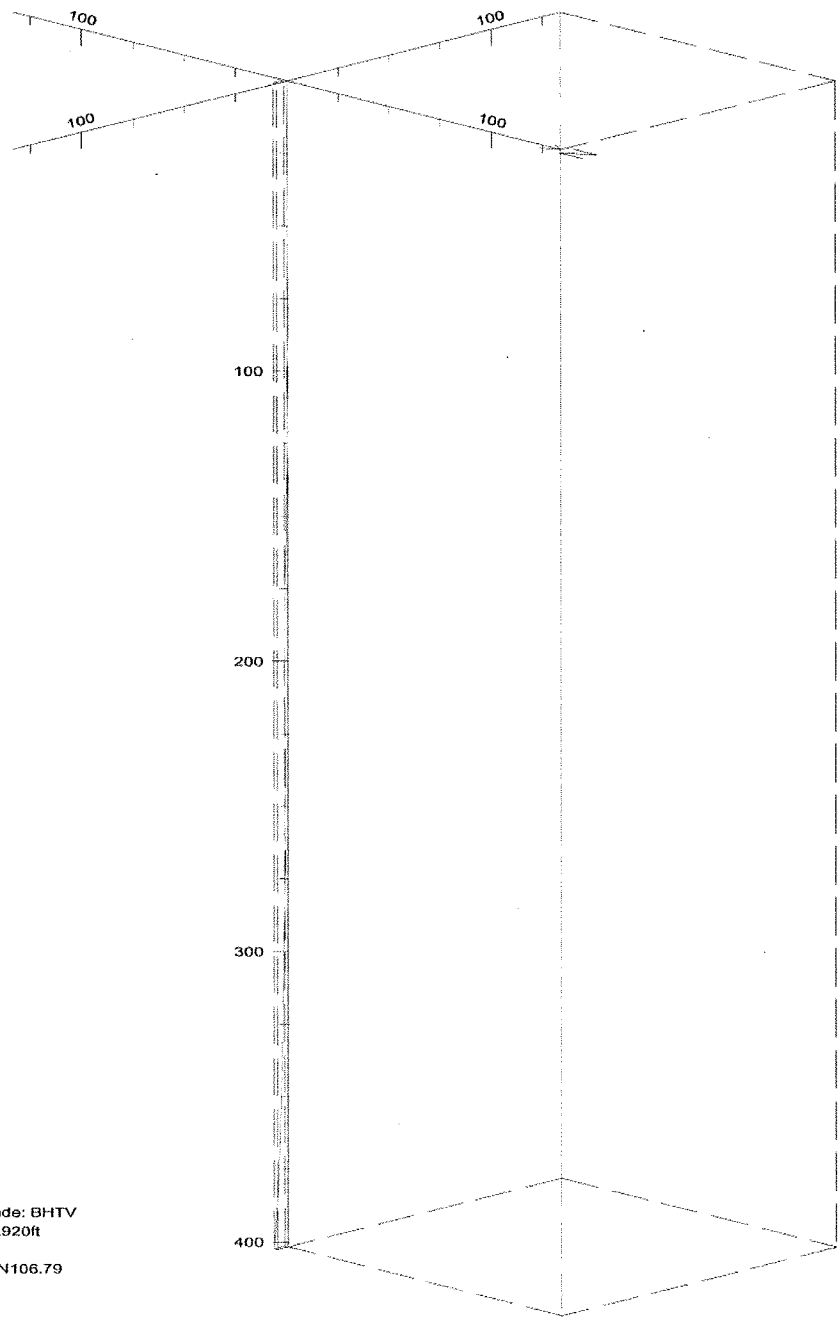


Figure 7. Boring B-3001, Lower Section, Caliper, Natural gamma, Resistivity and SP logs

Deviated borehole in orthographic projection, viewed from N45



Borehole: B-3001 Sonde: BHTV
Zone from: 0.080 to 401.920ft
North ref is true
Mean deviation: 0.77 to N106.79
End coordinates .....
North: -1.561
East : 5.165
Down : 401.711
Azimuth of end: N106.81
Distance start-end: 5.396ft
Viewpoint: N45
Data extrapolated to the surface from 0.080ft

Figure 8. Boring B-3001, Deviation Projection (dimensions in feet)

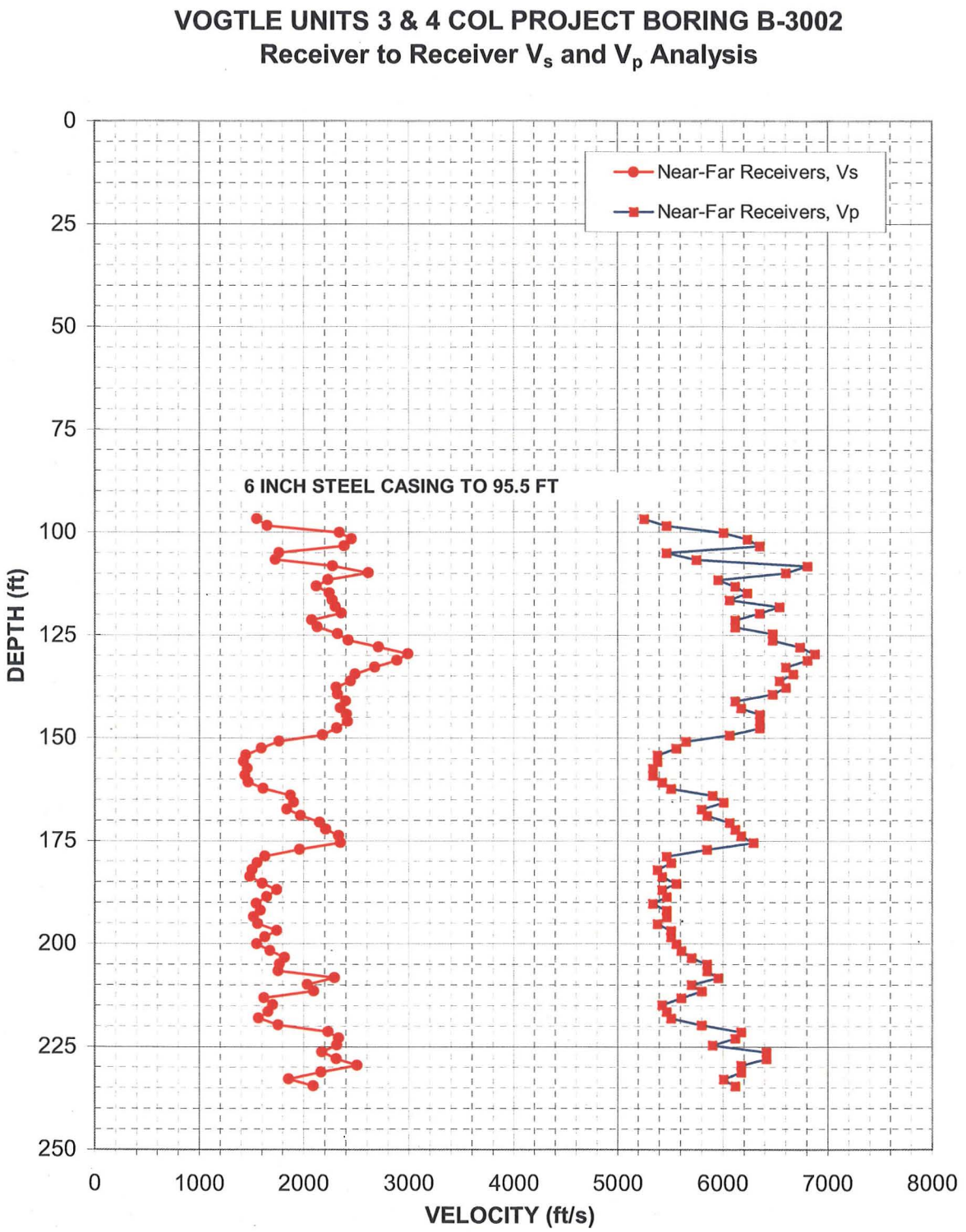


Figure 9. Boring B-3002, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
96.8	1550	5250
98.4	1650	5460
100.1	2340	6010
101.7	2450	6230
103.4	2380	6350
105.0	1760	5460
106.6	1730	5750
108.3	2280	6800
109.9	2610	6600
111.6	2230	5950
113.2	2120	6120
114.8	2240	6230
116.5	2270	6060
118.1	2300	6540
119.8	2360	6350
121.4	2080	6120
123.0	2130	6120
124.7	2320	6470
126.3	2420	6470
128.0	2710	6730
129.6	2990	6870
131.2	2890	6800
132.9	2680	6600
134.5	2490	6670
136.2	2440	6540
137.8	2310	6600
139.4	2320	6470
141.1	2400	6120
142.7	2350	6170
144.4	2410	6350
146.0	2420	6350
147.6	2310	6350
149.3	2180	6060
150.9	1760	5650
152.6	1590	5560
154.2	1440	5380
155.8	1420	5380
157.5	1460	5330
159.1	1440	5330
160.8	1470	5420
162.4	1610	5510
164.0	1870	5900
165.7	1900	6010
167.3	1840	5800
169.0	1970	5850
170.6	2150	6060
172.2	2210	6120
173.9	2330	6170
175.5	2350	6290
177.2	1960	5850

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
178.8	1630	5460
180.5	1550	5510
182.1	1500	5380
183.7	1480	5420
185.4	1600	5560
187.0	1740	5420
188.7	1650	5460
190.3	1550	5330
191.9	1580	5460
193.6	1520	5460
195.2	1560	5380
196.9	1740	5510
198.5	1630	5510
200.1	1550	5560
201.8	1680	5600
203.4	1820	5700
205.1	1770	5850
206.7	1750	5850
208.3	2290	5950
210.0	2030	5700
211.6	2100	5800
213.3	1620	5600
214.9	1700	5420
216.5	1660	5460
218.2	1560	5510
219.8	1750	5800
221.5	2230	6170
223.1	2330	6120
224.7	2310	5900
226.4	2170	6410
228.0	2310	6410
229.7	2510	6170
231.3	2160	6170
232.9	1860	6010
234.6	2090	6120

Table 6. Boring B-3002, Suspension R1-R2 depths and P- and S_H-wave velocities

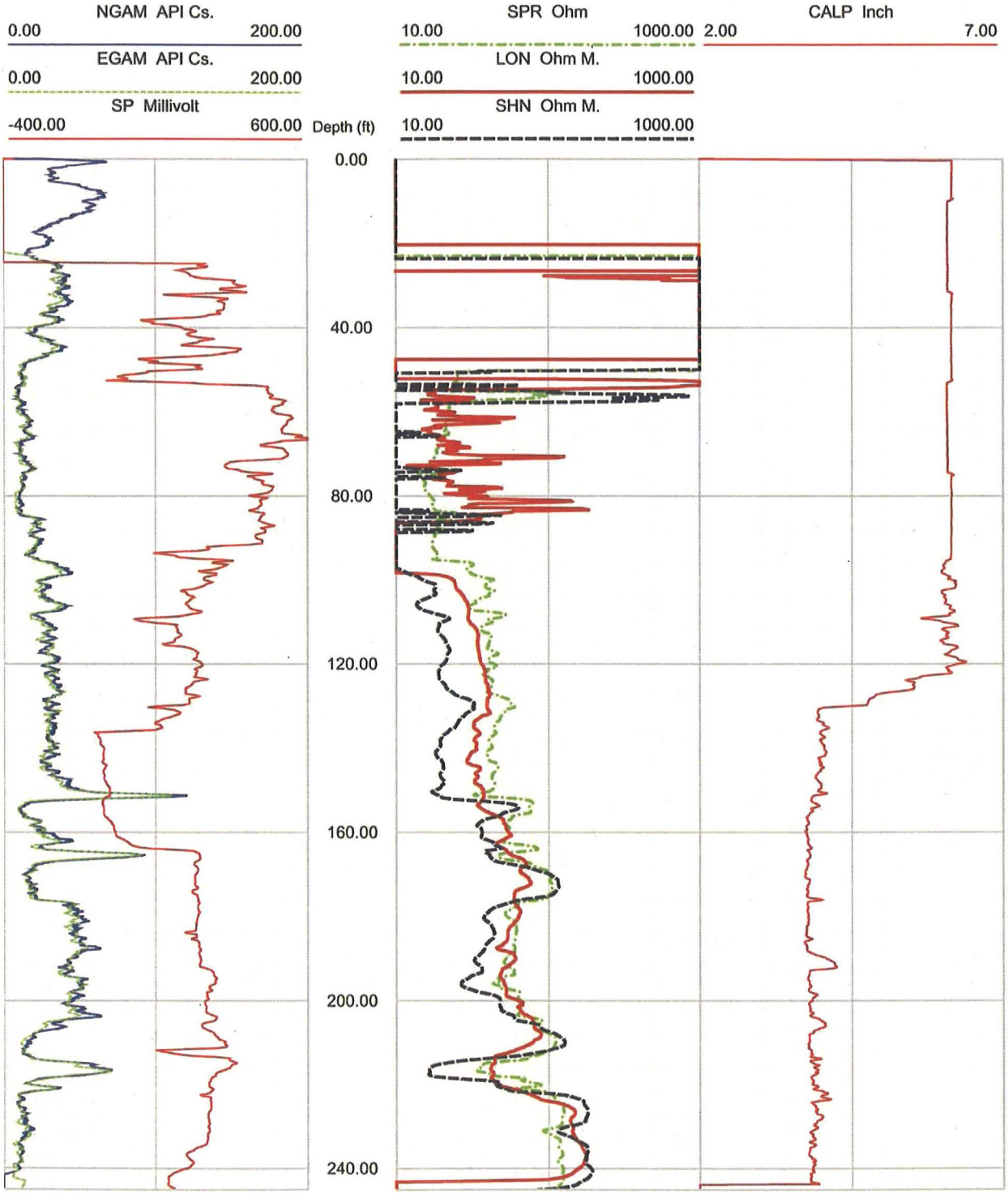
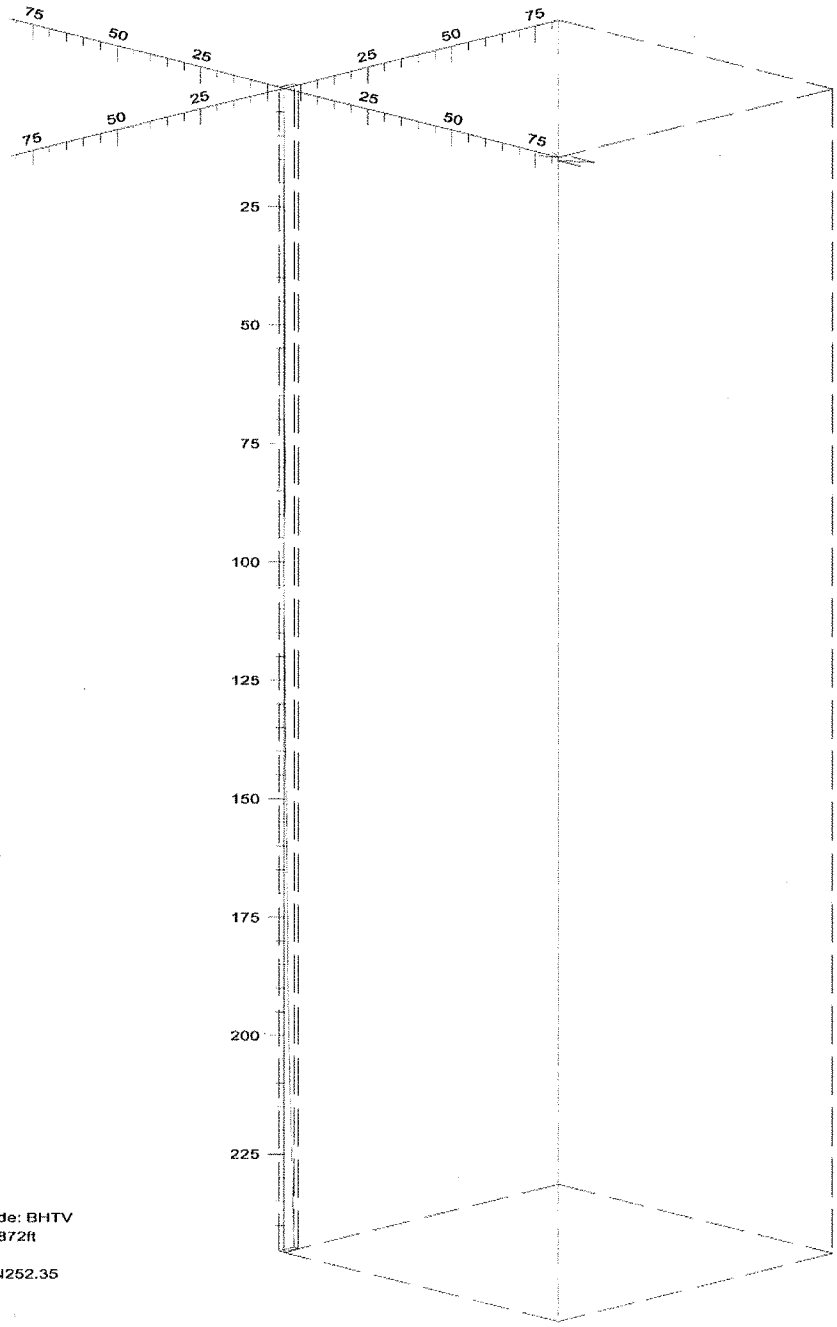


Figure 10. Boring B-3002, Caliper, Natural gamma, Resistivity and SP logs

Deviated borehole in orthographic projection, viewed from N45



Borehole: B-3002 Sonde: BHTV
Zone from: 0.032 to 245.872ft
North ref is true
Mean deviation: 1.05 to N252.35
End coordinates .....
North: -1.361
East : -4.290
Down : 245.742
Azimuth of end: N252.40
Distance start-end: 4.501ft
Viewpoint: N45
Data extrapolated to the surface from 0.032ft

Figure 11. Boring B-3002, Deviation Projection (dimensions in feet)

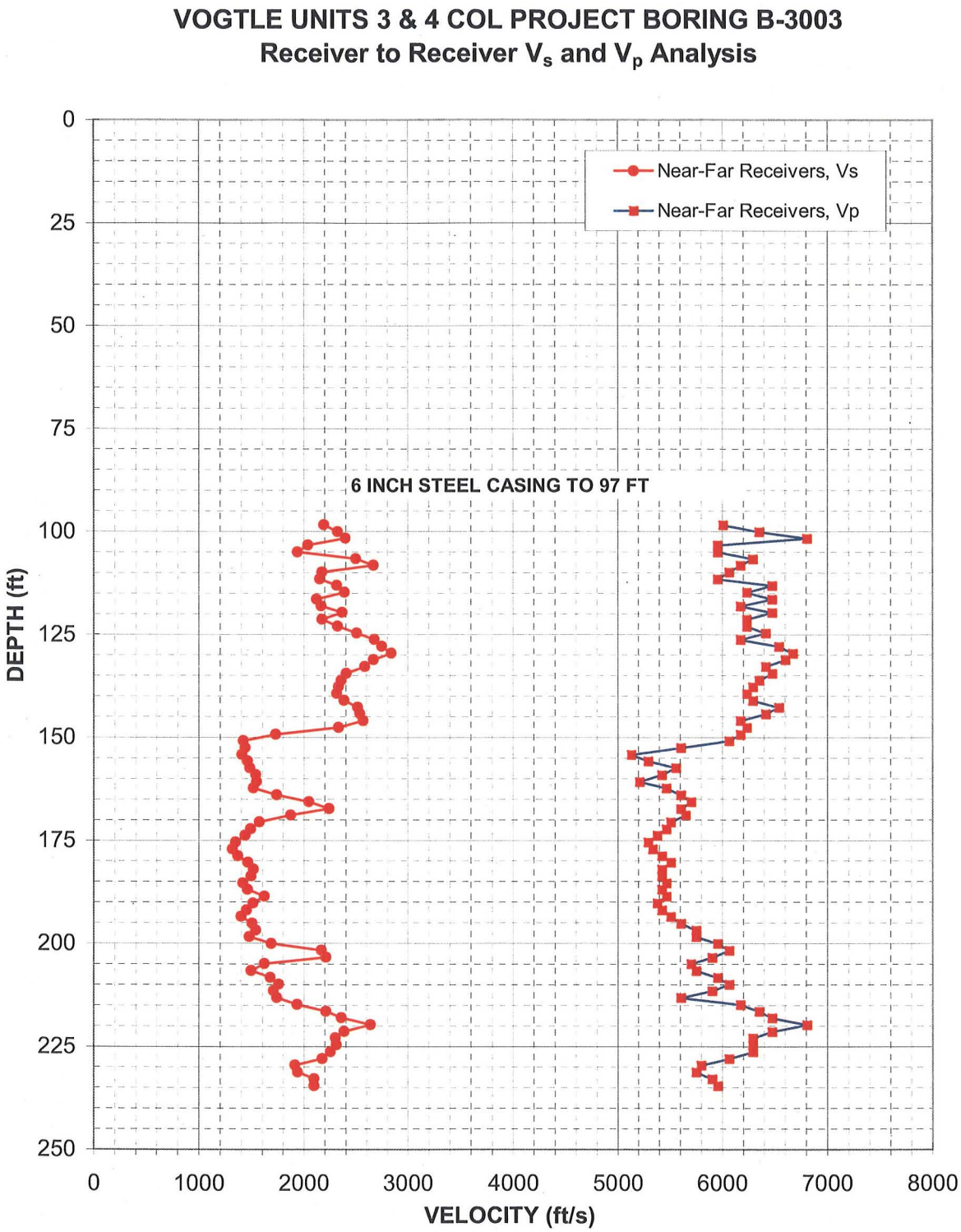


Figure 12. Boring B-3003, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
98.4	2190	6010
100.1	2320	6350
101.7	2400	6800
103.4	2040	5950
105.0	1940	5950
106.6	2500	6290
108.3	2670	6170
109.9	2170	6060
111.6	2150	5950
113.2	2310	6470
114.8	2390	6230
116.5	2120	6470
118.1	2160	6170
119.8	2360	6470
121.4	2170	6230
123.0	2320	6230
124.7	2510	6410
126.3	2680	6170
128.0	2740	6540
129.6	2840	6670
131.2	2670	6600
132.9	2580	6410
134.5	2410	6470
136.2	2360	6350
137.8	2330	6290
139.4	2310	6230
141.1	2380	6290
142.7	2520	6540
144.4	2530	6410
146.0	2560	6170
147.6	2330	6230
149.3	1730	6170
150.9	1420	6060
152.6	1440	5600
154.2	1410	5130
155.8	1460	5290
157.5	1480	5560
159.1	1540	5420
160.8	1540	5210
162.4	1520	5460
164.0	1740	5600
165.7	2040	5700
167.3	2240	5600
169.0	1870	5650
170.6	1570	5510
172.2	1490	5460
173.9	1440	5380
175.5	1340	5290
177.2	1310	5330
178.8	1370	5420

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
180.5	1460	5510
182.1	1520	5420
183.7	1490	5420
185.4	1410	5460
187.0	1460	5420
188.7	1620	5460
190.3	1510	5380
191.9	1450	5420
193.6	1390	5510
195.2	1500	5600
196.9	1540	5750
198.5	1470	5750
200.1	1680	5950
201.8	2160	6060
203.4	2210	5900
205.1	1620	5700
206.7	1490	5750
208.3	1680	5950
210.0	1750	6060
211.6	1710	5900
213.3	1740	5600
214.9	1930	6170
216.5	2210	6350
218.2	2360	6470
219.8	2640	6800
221.5	2380	6470
223.1	2300	6290
224.7	2310	6290
226.4	2250	6290
228.0	2170	6060
229.7	1910	5800
231.3	1940	5750
232.9	2100	5900
234.6	2100	5950

Table 7. Boring B-3003, Suspension R1-R2 depths and P- and S_H-wave velocities

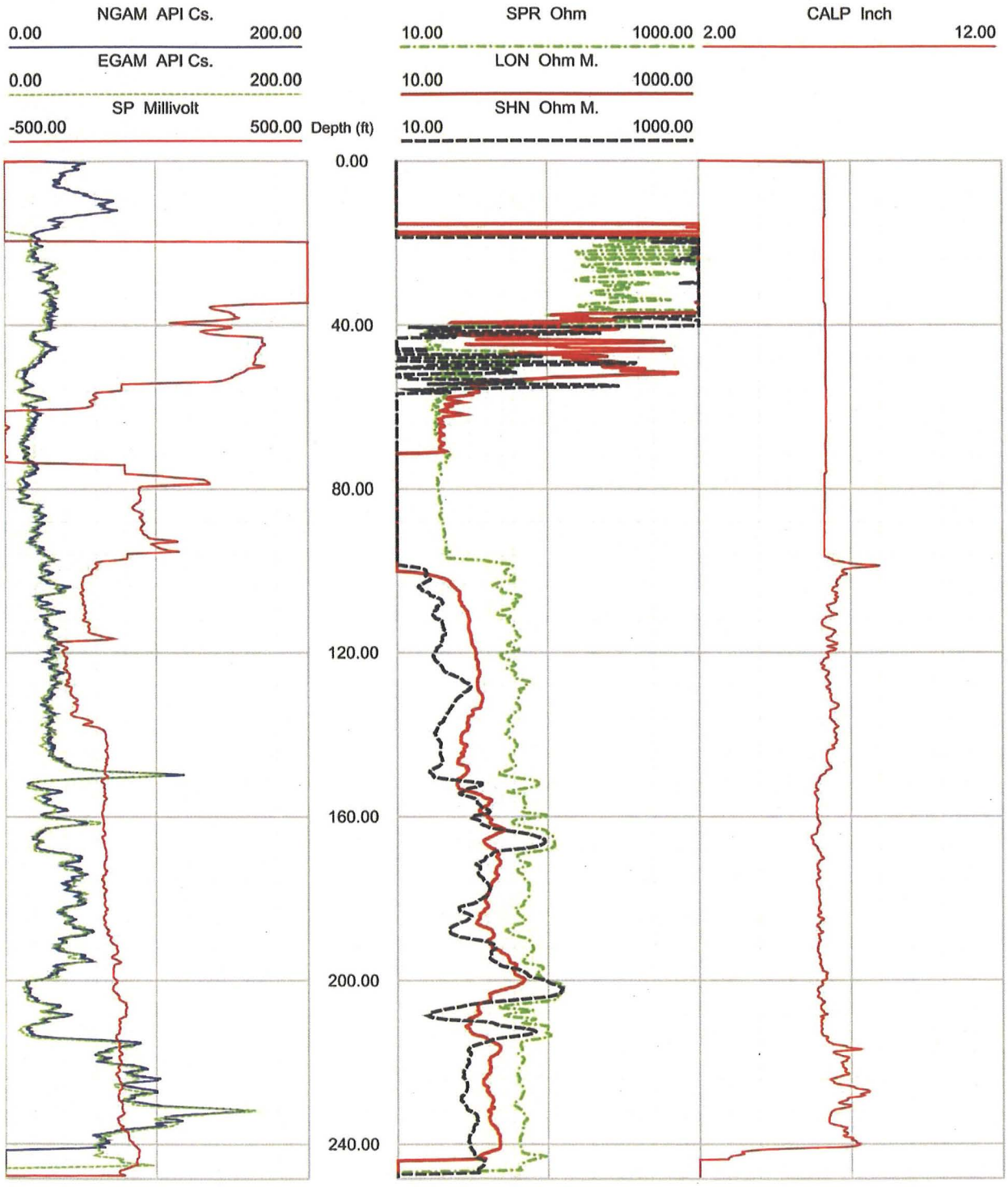
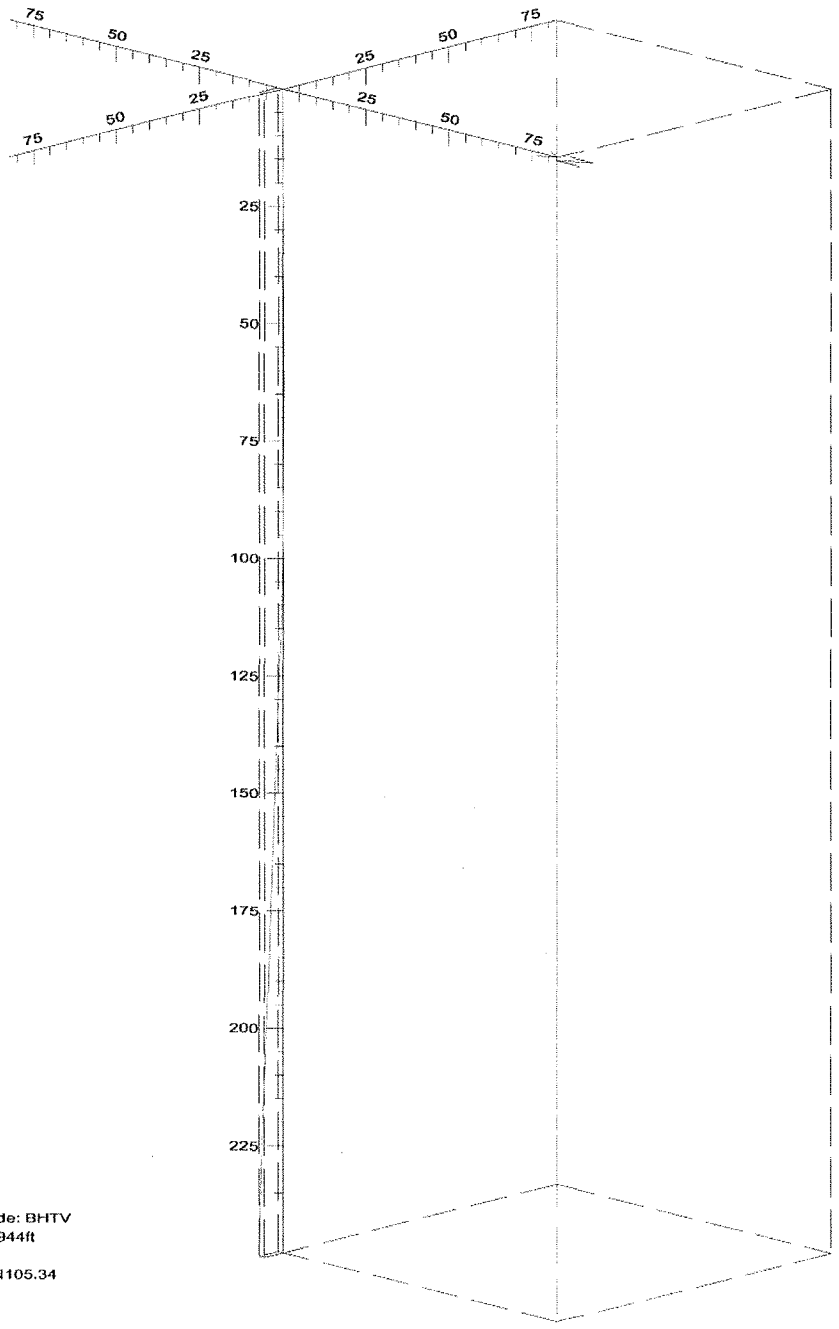


Figure 13. Boring B-3003, Caliper, Natural gamma, Resistivity and SP logs

Deviated borehole in orthographic projection, viewed from N45



Borehole: B-3003 Sonde: BHTV
Zone from: 0.024 to 247.944ft
North ref is true
Mean deviation: 1.34 to N105.34
End coordinates .....
North: -1.526
East : 5.595
Down : 247.779
Azimuth of end: N105.25
Distance start-end: 5.800ft
Viewpoint: N45
Data extrapolated to the surface from 0.024ft

Figure 14. Boring B-3003, Deviation Projection (dimensions in feet)

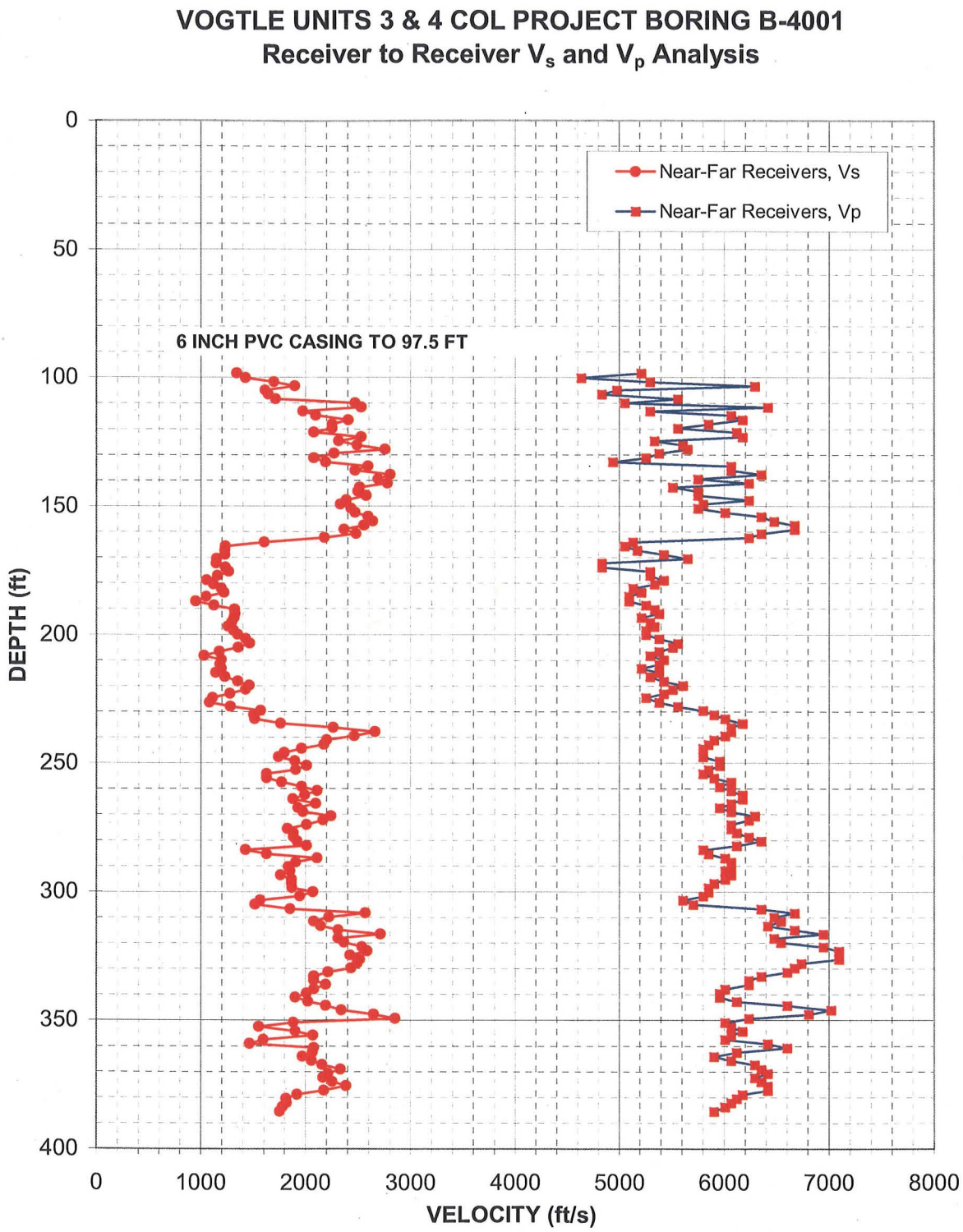


Figure 15. Boring B-4001, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
98.4	1340	5210
100.1	1420	4630
101.7	1690	5290
103.4	1890	6290
105.0	1610	4980
106.6	1640	4830
108.3	1710	5560
109.9	2470	5050
111.6	2530	6410
113.2	1970	5290
114.8	2100	6060
116.5	2410	6170
118.1	2250	5850
119.8	2250	5560
121.4	2080	6120
123.0	2530	6170
124.7	2310	5330
126.3	2490	5600
128.0	2750	5650
129.6	2270	5380
131.2	2080	5250
132.9	2190	4940
134.5	2590	6060
136.2	2470	6060
137.8	2800	6350
139.4	2690	5750
141.1	2780	6230
142.7	2520	5510
144.4	2500	5750
146.0	2570	5750
147.6	2390	6230
149.3	2330	5800
150.9	2430	5750
152.6	2470	6010
154.2	2590	6350
155.8	2640	6470
157.5	2550	6670
159.1	2360	6670
160.8	2480	6350
162.4	2180	6230
164.0	1600	5130
165.7	1230	5050
167.3	1230	5170
169.0	1230	5420
170.6	1150	5650
172.2	1150	4830
173.9	1230	4830
175.5	1260	5290
177.2	1160	5290
178.8	1050	5420

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
180.5	1120	5330
182.1	1190	5130
183.7	1220	5210
185.4	1050	5090
187.0	950	5090
188.7	1120	5250
190.3	1320	5330
191.9	1320	5380
193.6	1310	5210
195.2	1290	5290
196.9	1260	5330
198.5	1310	5250
200.1	1350	5250
201.8	1420	5380
203.4	1460	5560
205.1	1360	5510
206.7	1170	5380
208.3	1030	5290
210.0	1190	5420
211.6	1180	5380
213.3	1190	5210
214.9	1140	5380
216.5	1230	5290
218.2	1350	5420
219.8	1460	5600
221.5	1420	5510
223.1	1270	5420
224.7	1110	5250
226.4	1080	5380
228.0	1280	5560
229.7	1560	5800
231.3	1500	5900
232.9	1510	6010
234.6	1760	6170
236.2	2260	6060
237.9	2660	6060
239.5	2460	6010
241.1	2200	5900
242.8	2170	5850
244.4	1960	5800
246.1	1790	5800
247.7	1740	5800
249.3	1890	5950
251.0	2010	5950
252.6	1900	5850
254.3	1620	5800
255.9	1620	5900
257.6	1770	6060
259.2	1960	5950
260.8	2110	6060

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
262.5	1990	6170
264.1	1880	6170
265.8	2100	6060
267.4	1930	5950
269.0	1970	6060
270.7	2240	6290
272.3	2160	6230
274.0	2010	6060
275.6	1830	6060
277.2	1880	6120
278.9	1880	6230
280.5	1920	6350
282.2	2010	6120
283.8	1420	5800
285.4	1620	5850
287.1	2110	6010
288.7	1900	6060
290.4	1830	6060
292.0	1850	6010
293.6	1760	6060
295.3	1860	6010
296.9	1860	5900
298.6	1870	5850
300.2	2070	5850
301.8	1940	5800
303.5	1560	5600
305.1	1520	5700
306.8	1850	6350
308.4	2560	6670
310.0	2220	6470
311.7	2080	6540
313.3	2140	6410
315.0	2310	6670
316.6	2710	6940
318.2	2310	6470
319.9	2360	6540
321.5	2530	6940
323.2	2580	7090
324.8	2420	7090
326.4	2520	7090
328.1	2490	6730
329.7	2430	6670
331.4	2210	6600
333.0	2080	6350
334.7	2080	6230
336.3	2190	6230
337.9	2080	6010
339.6	2010	5950
341.2	1900	5950
342.9	2020	6120

Table 8. Boring B-4001, Suspension R1-R2 depths and P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
344.5	2190	6600
346.1	2340	7020
347.8	2650	6800
349.4	2850	6230
351.1	1880	6010
352.7	1550	6060
354.3	1900	6170
356.0	2070	6060
357.6	1590	6010
359.3	1460	6410
360.9	2080	6600
362.5	2060	6120
364.2	1970	5900
365.8	2060	6060
367.5	2160	6290
369.1	2330	6350
370.7	2210	6410
372.4	2160	6290
374.0	2250	6350
375.7	2380	6410
377.3	2170	6410
378.9	1920	6170
380.6	1810	6120
382.2	1820	6060
383.9	1780	6010
385.5	1750	5900

Table 8, continued. Boring B-4001, Suspension R1-R2 depths and P- and S_H-wave velocities

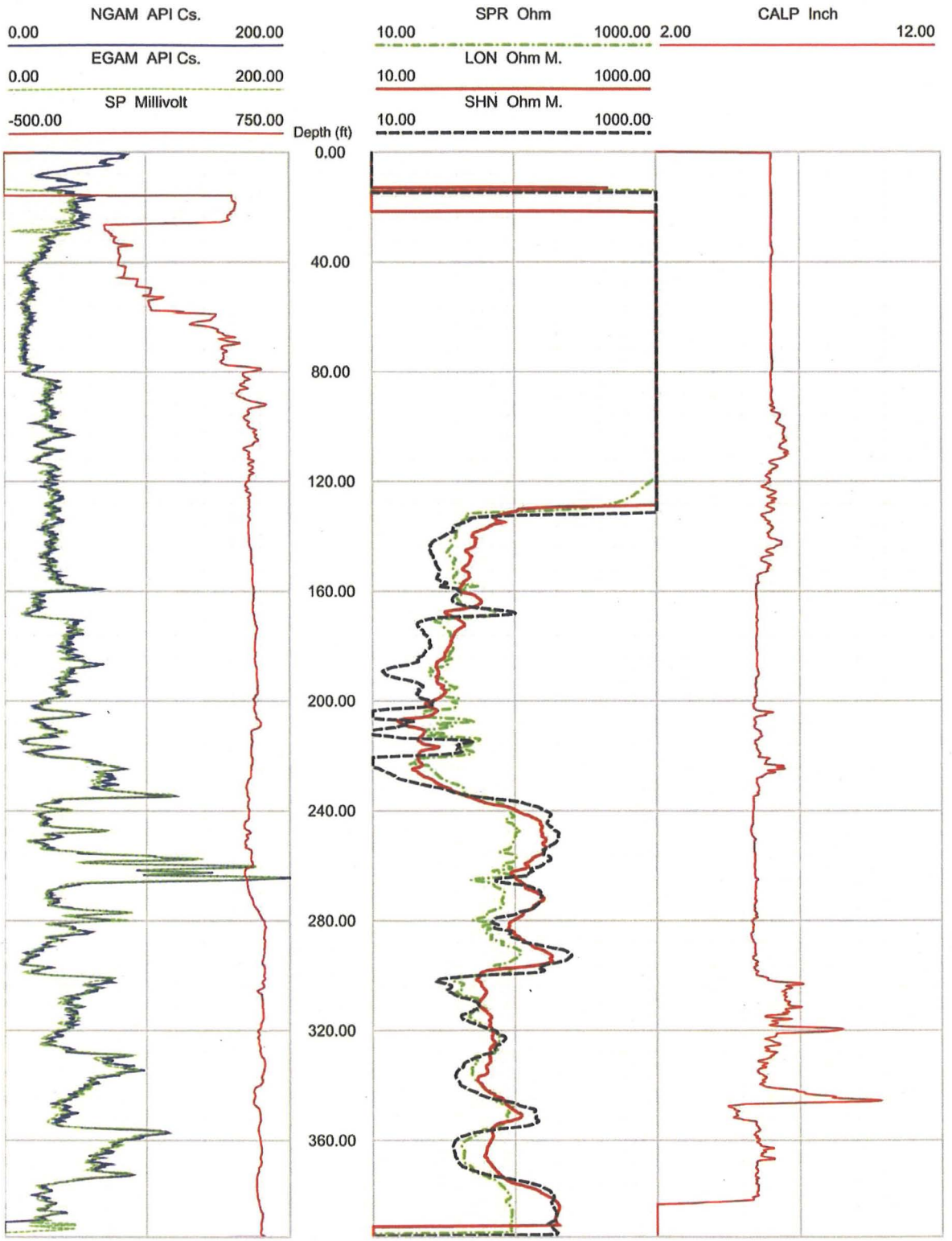
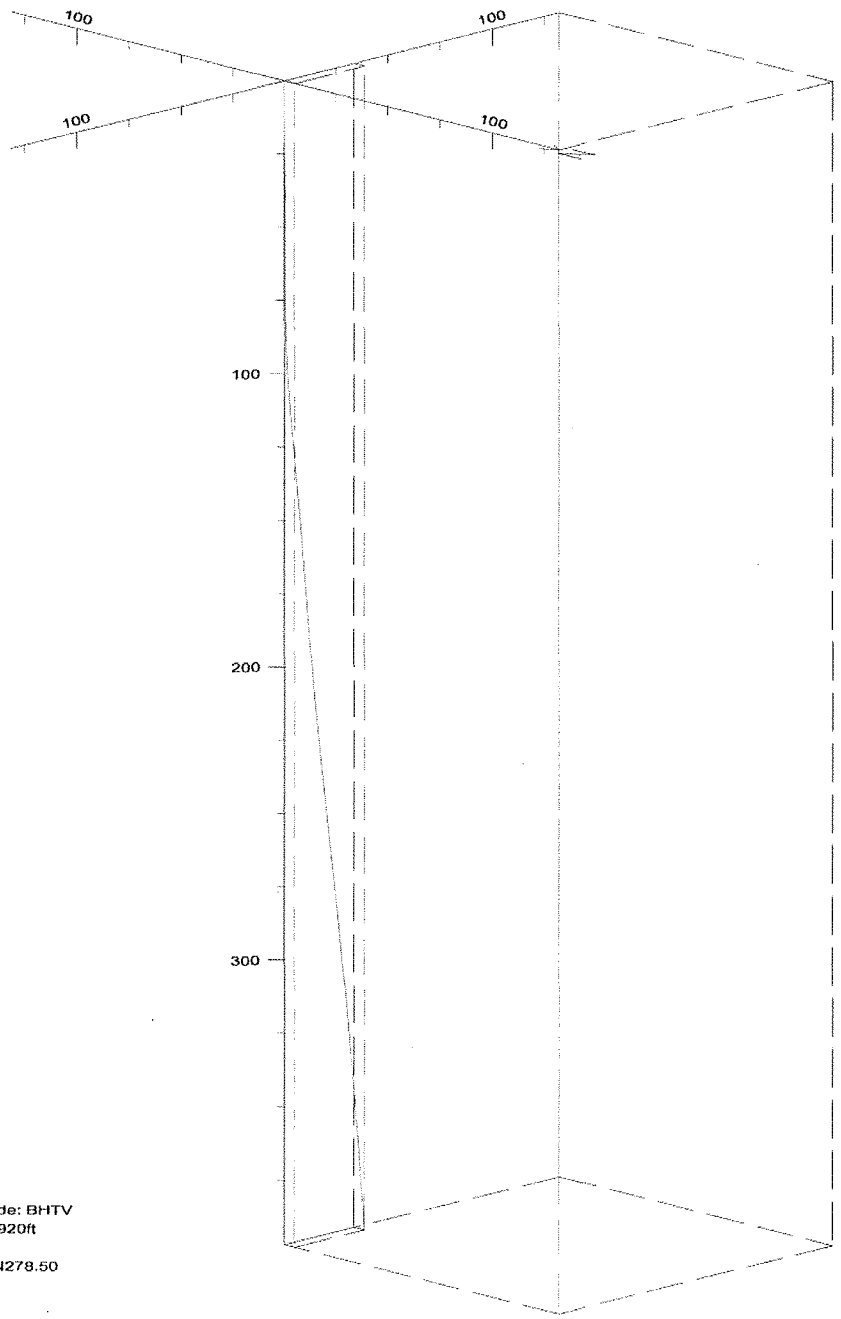


Figure 16. Boring B-4001, Caliper, Natural gamma, Resistivity and SP logs

Deviated borehole in orthographic projection, viewed from N45



Borehole: B-4001 Sonde: BHTV
Zone from: 0.120 to 398.920ft
North ref is true
Mean deviation: 4.90 to N278.50
End coordinates .....
North: 5.025
East : -33.639
Down : 396.983
Azimuth of end: N278.50
Distance start-end: 34.012ft
Viewpoint: N45
Data extrapolated to the surface from 0.120ft

Figure 17. Boring B-4001, Deviation Projection (dimensions in feet)

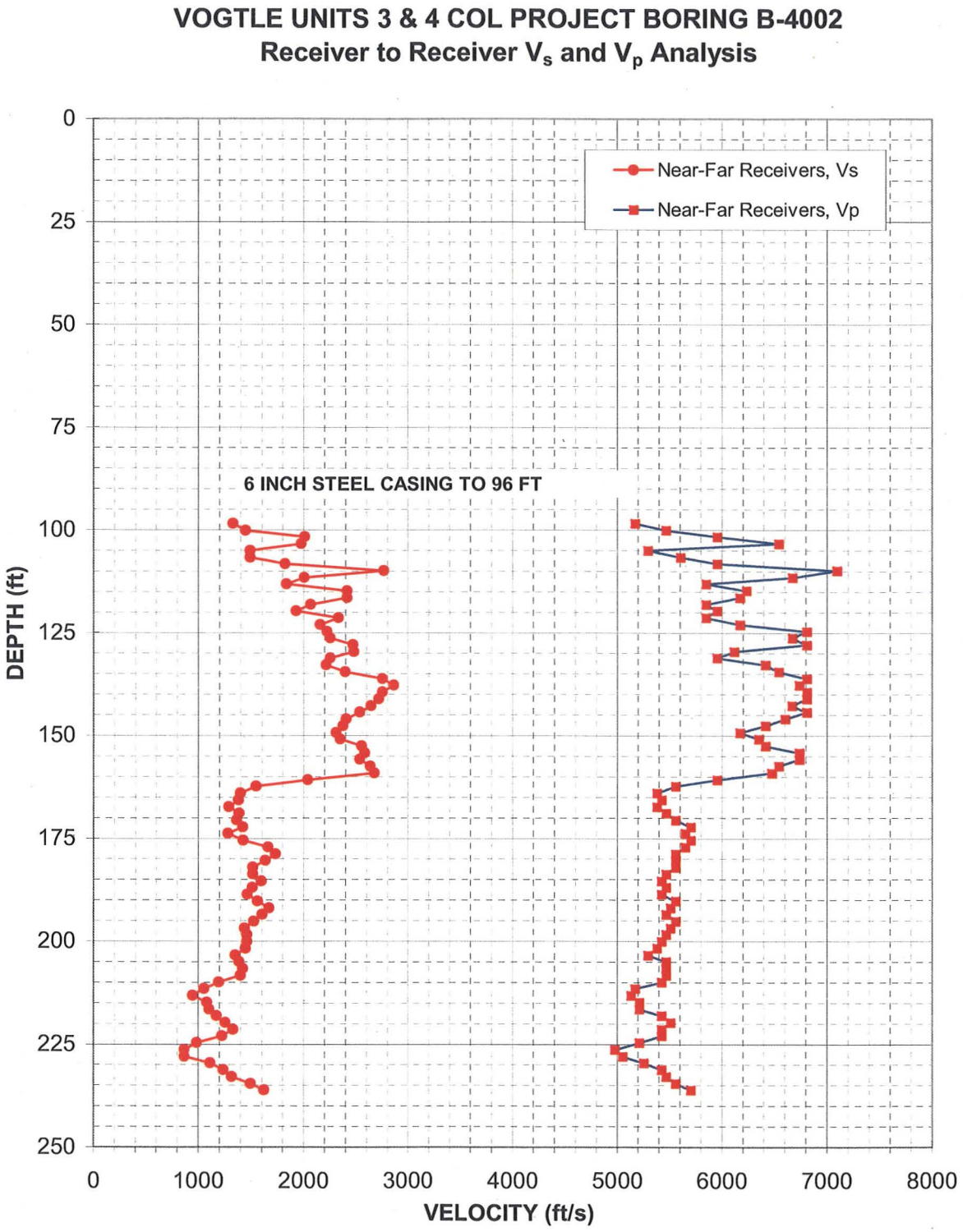


Figure 18. Boring B-4002, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
98.4	1330	5170
100.1	1440	5460
101.7	2010	5950
103.4	1970	6540
105.0	1490	5290
106.6	1490	5600
108.3	1820	5950
109.9	2770	7090
111.6	2000	6670
113.2	1830	5850
114.8	2420	6230
116.5	2420	6170
118.1	2060	5850
119.8	1930	5950
121.4	2330	5850
123.0	2160	6170
124.7	2220	6800
126.3	2250	6670
128.0	2470	6800
129.6	2480	6120
131.2	2250	5950
132.9	2210	6410
134.5	2400	6540
136.2	2750	6800
137.8	2860	6730
139.4	2750	6800
141.1	2720	6800
142.7	2650	6670
144.4	2530	6800
146.0	2410	6600
147.6	2370	6410
149.3	2310	6170
150.9	2350	6350
152.6	2550	6410
154.2	2580	6730
155.8	2530	6730
157.5	2640	6540
159.1	2680	6470
160.8	2040	5950
162.4	1540	5560
164.0	1390	5380
165.7	1380	5420
167.3	1290	5380
169.0	1380	5460
170.6	1360	5560
172.2	1420	5700
173.9	1280	5650
175.5	1420	5700
177.2	1660	5650
178.8	1730	5560

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
180.5	1630	5560
182.1	1520	5560
183.7	1520	5460
185.4	1590	5420
187.0	1510	5460
188.7	1460	5420
190.3	1560	5560
191.9	1670	5510
193.6	1600	5460
195.2	1520	5560
196.9	1440	5510
198.5	1460	5460
200.1	1460	5420
201.8	1440	5380
203.4	1350	5290
205.1	1380	5460
206.7	1420	5460
208.3	1390	5460
210.0	1190	5420
211.6	1050	5170
213.3	940	5130
214.9	1080	5210
216.5	1100	5210
218.2	1170	5420
219.8	1250	5510
221.5	1330	5420
223.1	1220	5420
224.7	980	5210
226.4	860	4980
228.0	870	5050
229.7	1110	5250
231.3	1230	5420
232.9	1310	5460
234.6	1490	5560
236.2	1620	5700

Table 9. Boring B-4002, Suspension R1-R2 depths and P- and S_H-wave velocities

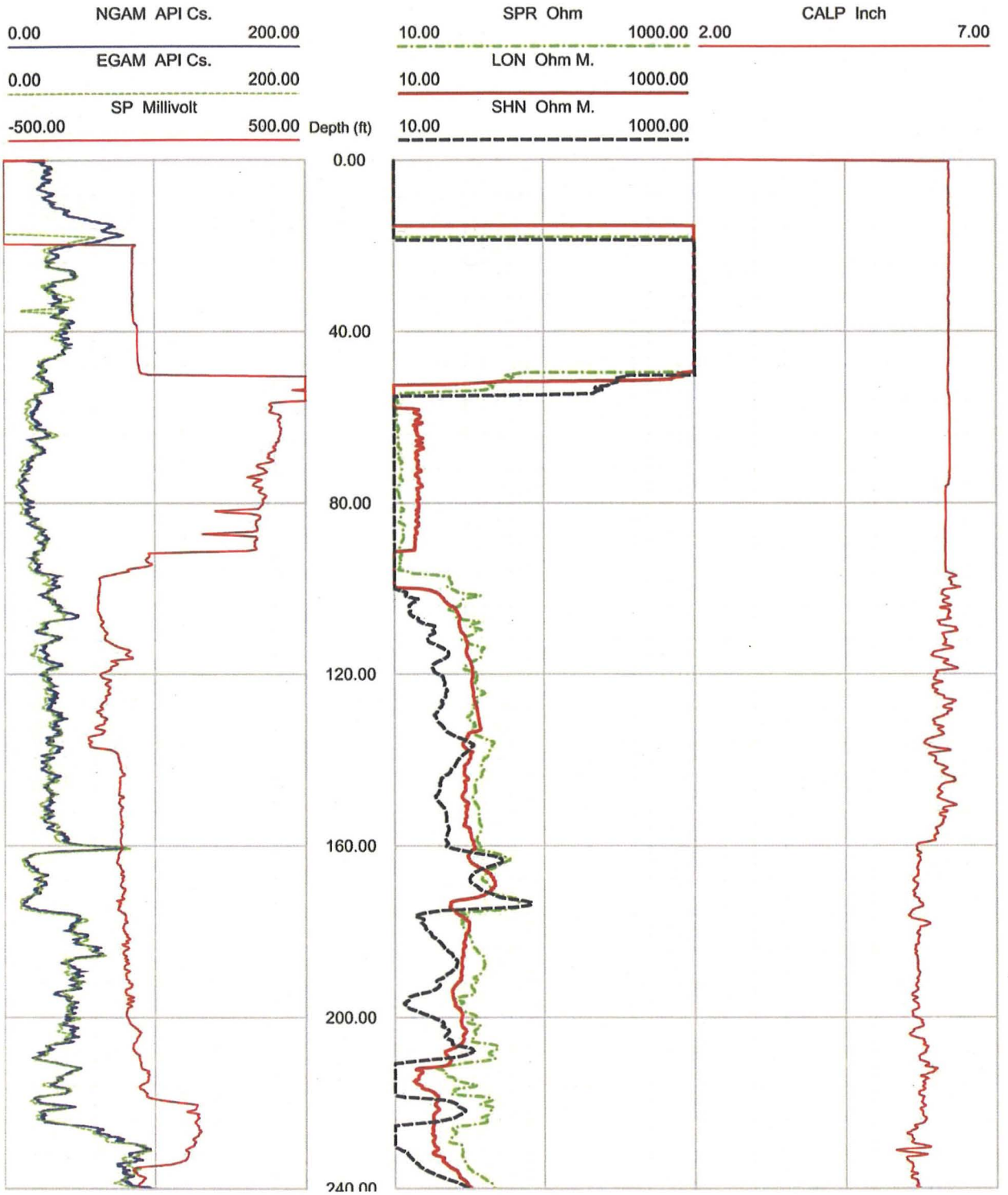
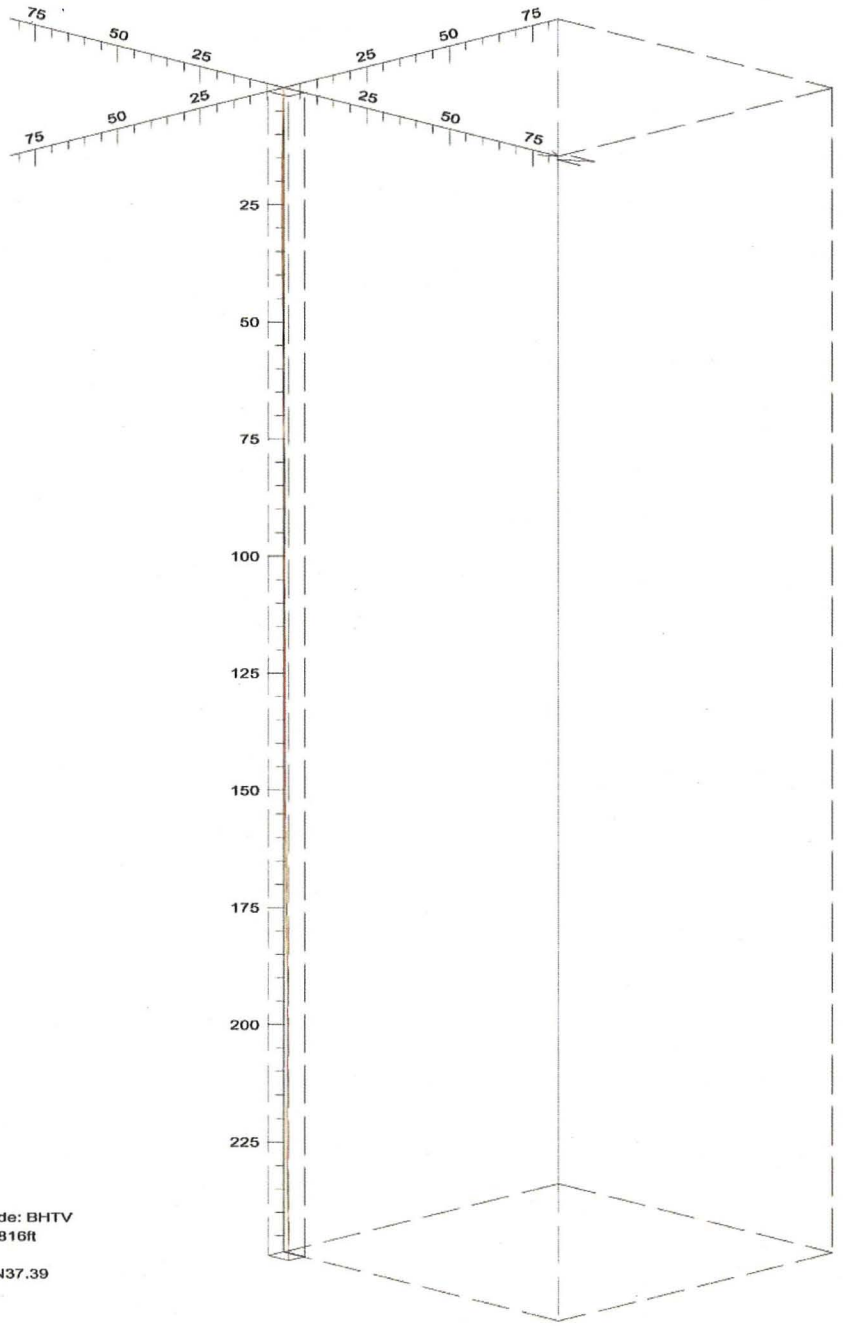


Figure 19. Boring B-4002, Caliper, Natural gamma, Resistivity and SP logs

Deviated borehole in orthographic projection, viewed from N45



Borehole: B-4002 Sonde: BHTV
Zone from: 0.016 to 248.816ft
North ref is true
Mean deviation: 1.79 to N37.39
End coordinates .....
North: 6.159
East : 4.704
Down : 248.479
Azimuth of end: N37.37
Distance start-end: 7.750ft
Viewpoint: N45
Data extrapolated to the surface from 0.016ft

Figure 20. Boring B-4002, Deviation Projection (dimensions in feet)

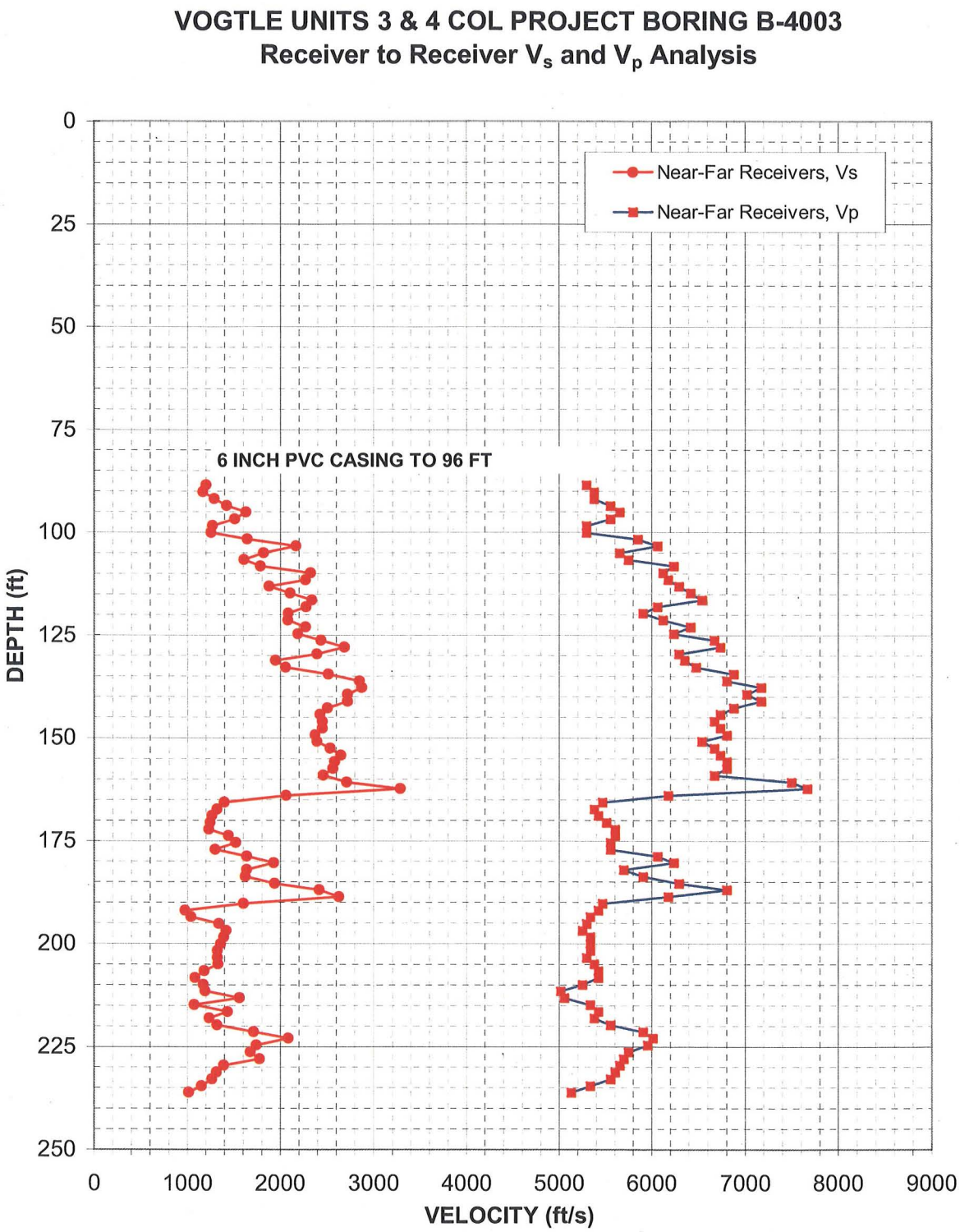


Figure 21: Boring B-4003, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
85.3	-	-
86.9	-	-
88.6	1200	5290
90.2	1170	5380
91.9	1290	5380
93.5	1420	5560
95.1	1630	5650
96.8	1510	5560
98.4	1270	5290
100.1	1250	5290
101.7	1640	5850
103.4	2160	6060
105.0	1820	5650
106.6	1610	5750
108.3	1780	6230
109.9	2320	6120
111.6	2270	6170
113.2	1880	6290
114.8	2100	6410
116.5	2340	6540
118.1	2280	6060
119.8	2080	5900
121.4	2080	6120
123.0	2270	6410
124.7	2190	6230
126.3	2430	6670
128.0	2690	6730
129.6	2390	6290
131.2	1940	6350
132.9	2050	6470
134.5	2520	6870
136.2	2850	6800
137.8	2870	7170
139.4	2720	7020
141.1	2720	7170
142.7	2510	6870
144.4	2420	6730
146.0	2450	6670
147.6	2450	6730
149.3	2370	6800
150.9	2390	6540
152.6	2530	6670
154.2	2650	6730
155.8	2580	6800
157.5	2560	6800
159.1	2460	6670
160.8	2710	7490
162.4	3280	7660
164.0	2060	6170
165.7	1390	5460

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
167.3	1320	5380
169.0	1260	5420
170.6	1240	5510
172.2	1230	5600
173.9	1440	5600
175.5	1520	5560
177.2	1300	5560
178.8	1630	6060
180.5	1930	6230
182.1	1630	5700
183.7	1620	5900
185.4	1930	6290
187.0	2420	6800
188.7	2620	6170
190.3	1600	5460
191.9	970	5420
193.6	1040	5330
195.2	1330	5290
196.9	1410	5250
198.5	1390	5330
200.1	1360	5330
201.8	1320	5330
203.4	1320	5290
205.1	1330	5380
206.7	1180	5420
208.3	1080	5420
210.0	1170	5250
211.6	1190	5010
213.3	1560	5050
214.9	1070	5330
216.5	1430	5420
218.2	1230	5380
219.8	1320	5560
221.5	1710	5900
223.1	2080	6010
224.7	1740	5950
226.4	1680	5750
228.0	1770	5700
229.7	1390	5650
231.3	1310	5600
232.9	1260	5560
234.6	1150	5330
236.2	1010	5130

Table 10. Boring B-4003, Suspension R1-R2 depths and P- and SH-wave velocities

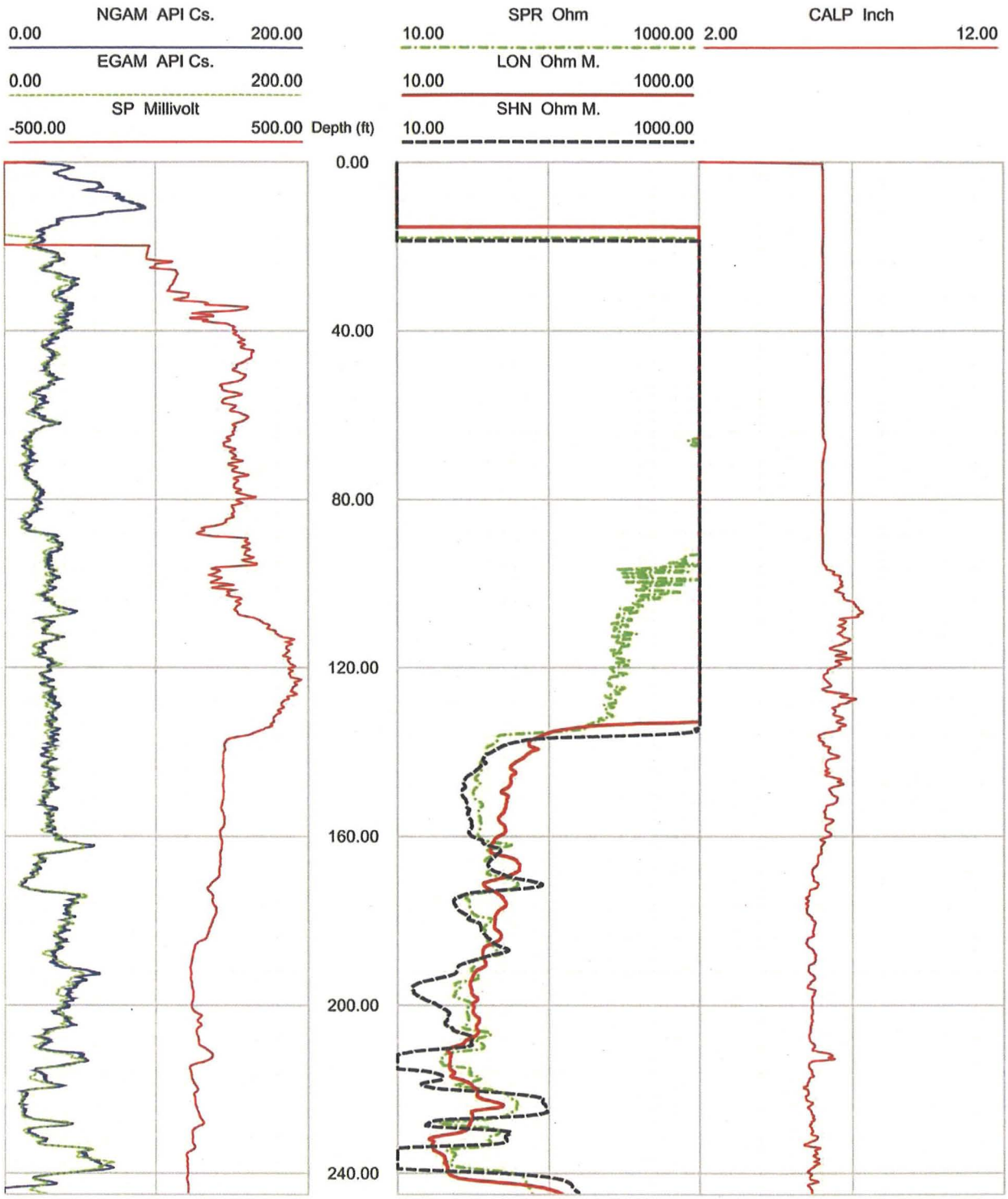
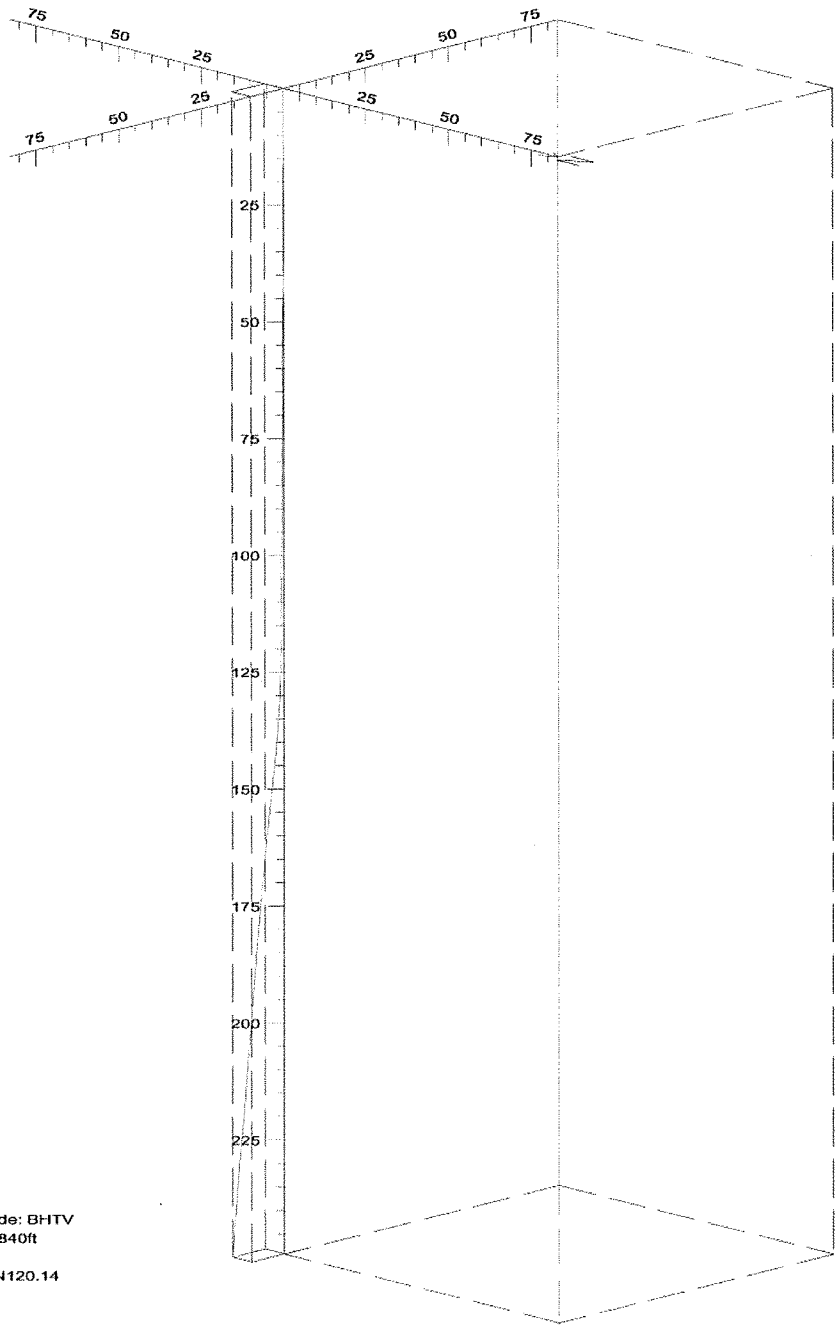


Figure 22. Boring B-4003, Caliper, Natural gamma, Resistivity and SP logs

Deviated borehole in orthographic projection, viewed from N45



Borehole: B-4003 Sonde: BHTV
Zone from: 0.080 to 249.840ft
North ref is true
Mean deviation: 2.64 to N120.14
End coordinates .....
North: -5.784
East : 9.961
Down : 249.295
Azimuth of end: N120.14
Distance start-end: 11.519ft
Viewpoint: N45
Data extrapolated to the surface from 0.080ft

Figure 23. Boring B-4003, Deviation Projection (dimensions in feet)

APPENDIX A

SUSPENSION VELOCITY MEASUREMENT QUALITY ASSURANCE SUSPENSION SOURCE TO RECEIVER ANALYSIS RESULTS

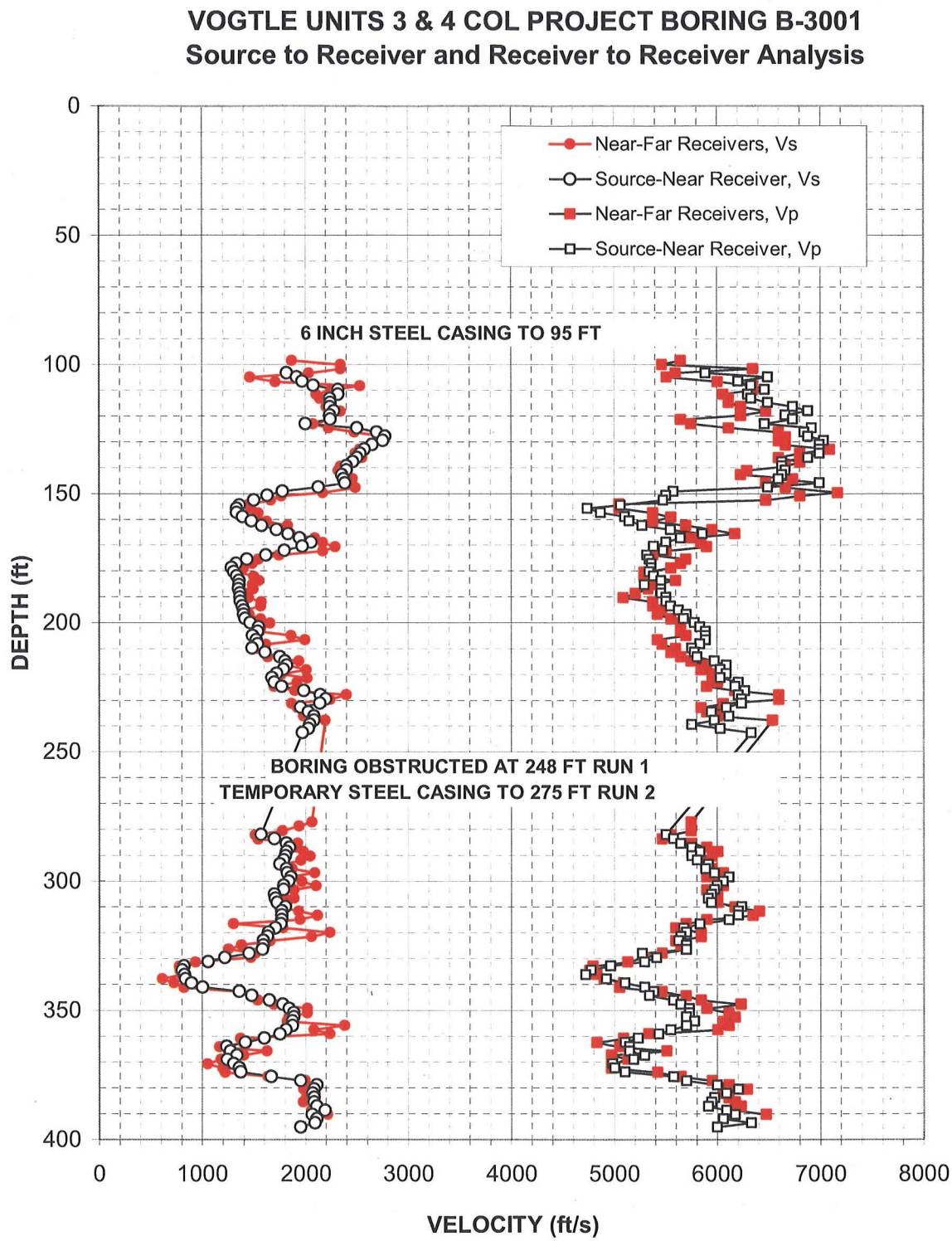


Figure A-1. Boring B-3001, R1 - R2 high resolution analysis and S - R1 quality assurance analysis P- and S_H-wave data

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
103.3	1820	5890
104.9	1920	6490
106.5	1970	6210
108.2	2080	6330
109.8	2320	6460
111.5	2320	6300
113.1	2240	6330
114.7	2240	6490
116.4	2240	6730
118.0	2280	6880
119.7	2240	6660
121.3	2240	6730
122.9	2000	6460
124.6	2500	6920
126.2	2690	6840
127.9	2780	6880
129.5	2750	7030
131.1	2650	6990
132.8	2570	6990
134.4	2530	6990
136.1	2500	6880
137.7	2460	6630
139.3	2400	6630
141.0	2400	6660
142.6	2350	6630
144.3	2370	6590
145.9	2380	6990
147.6	2130	6490
149.2	1780	5580
150.8	1630	5500
152.5	1500	5480
154.4	1360	5060
155.8	1340	4740
157.4	1340	4870
159.0	1390	5100
160.7	1480	5150
162.3	1570	5280
164.0	1720	5550
165.6	1830	5860
167.2	1940	5650
168.9	2060	5500
170.5	1970	5390
172.2	1790	5480
173.8	1610	5320
175.4	1430	5340
177.1	1330	5360
178.7	1280	5360
180.4	1310	5340
182.0	1340	5390
183.6	1360	5460

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
185.3	1360	5300
186.9	1350	5460
188.6	1360	5460
190.2	1360	5500
191.8	1370	5500
193.5	1390	5550
195.1	1400	5630
196.8	1400	5700
198.4	1410	5680
200.0	1470	5780
201.7	1540	5830
203.3	1540	5890
205.0	1490	5890
206.6	1520	5890
208.2	1540	5830
209.9	1480	5750
211.5	1610	5780
213.2	1750	5810
214.8	1800	5970
216.4	1820	6090
218.1	1790	6030
219.7	1720	6090
221.4	1670	6030
223.0	1700	6210
224.7	1770	6180
226.3	1980	6270
227.9	2150	6210
229.6	2200	6240
231.2	2140	6240
232.9	1950	6090
234.5	2030	5940
236.1	2080	6120
237.8	2080	5970
239.4	2040	5750
241.1	2030	6030
242.7	1970	6330
282.1	1570	5500
283.7	1700	5580
285.3	1810	5650
287.0	1850	5750
288.6	1810	5830
290.3	1800	5750
291.9	1790	5810
293.5	1750	5920
295.2	1810	5890
296.8	1820	5970
298.5	1860	6120
300.1	1830	6060
301.8	1790	6000
303.4	1790	5970

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
305.0	1700	5940
306.7	1710	5920
308.3	1720	5940
310.0	1800	6240
311.6	1770	6210
313.2	1770	6210
314.9	1770	6120
316.5	1760	5830
318.2	1710	5680
319.8	1640	5700
321.4	1630	5650
323.1	1590	5630
324.7	1590	5700
326.4	1580	5700
328.0	1450	5280
329.6	1220	5410
331.3	1060	5300
332.9	820	4960
334.6	810	4780
336.2	830	4720
337.8	840	4930
339.5	900	5100
341.1	1000	5300
342.8	1360	5390
344.4	1480	5340
346.0	1650	5580
347.7	1780	5650
349.3	1840	5730
351.0	1880	5730
352.6	1880	5700
354.2	1870	5780
355.9	1870	5700
357.5	1810	5550
359.2	1750	5430
360.8	1600	5230
362.4	1410	5100
364.1	1240	5150
365.7	1270	5150
367.4	1340	5300
369.0	1240	5190
370.6	1300	4980
372.3	1360	5000
373.9	1370	5100
375.6	1670	5580
377.2	1950	5700
378.9	2110	6000
380.5	2080	6210
382.1	2070	6090
383.8	2080	5970
385.4	2080	5940

Table A-1. Boring B-3001, S - R1 quality assurance analysis P- and S_H-wave data

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
387.1	2110	5920
388.7	2190	6090
390.3	2060	6180
392.0	2110	6060
393.6	2090	6330
395.3	1950	6000

Table A-1, continued. Boring B-3001, S - R1 quality assurance analysis P- and S_H-wave data

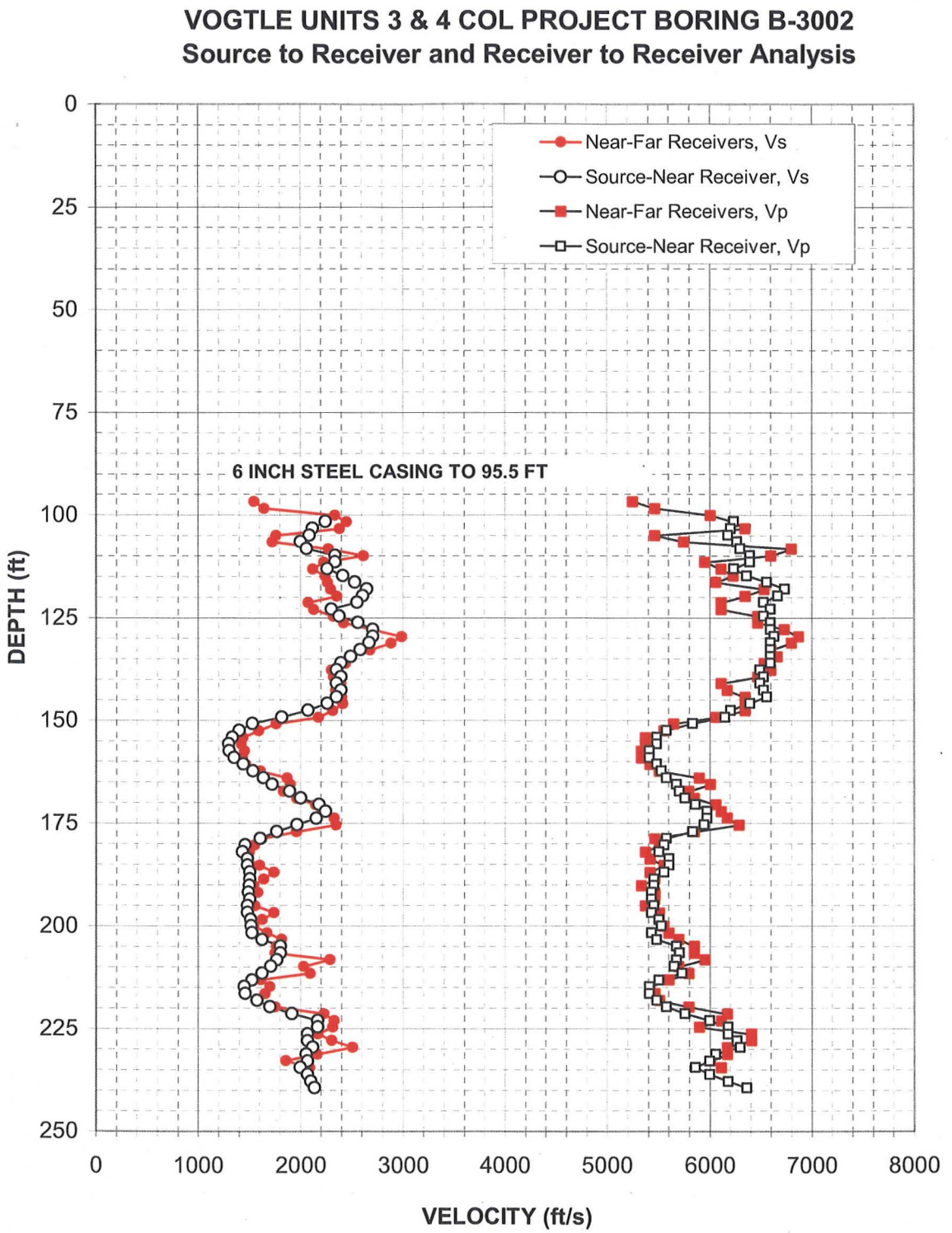


Figure A-2. Boring B-3002, R1 - R2 high resolution analysis and S - R1 quality assurance analysis P- and S_H-wave data

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
101.6	2240	6240
103.3	2120	6210
104.9	2090	6180
106.5	2000	6270
108.2	2060	6300
109.8	2340	6390
111.5	2340	6390
113.1	2260	6240
114.7	2420	6360
116.4	2530	6560
118.0	2650	6730
119.7	2600	6660
121.3	2550	6530
122.9	2300	6590
124.6	2380	6530
126.2	2560	6590
127.9	2710	6590
129.5	2710	6630
131.1	2670	6590
132.8	2580	6590
134.4	2490	6590
136.1	2400	6590
137.7	2350	6490
139.3	2400	6530
141.0	2350	6490
142.6	2400	6530
144.3	2350	6560
145.9	2260	6390
147.6	2080	6210
149.2	1820	6150
150.8	1530	5830
152.5	1400	5580
154.1	1340	5480
155.8	1300	5480
157.4	1300	5410
159.0	1350	5410
160.7	1440	5480
162.3	1540	5530
164.0	1640	5580
165.6	1720	5680
167.2	1900	5700
168.9	2000	5750
170.5	2180	5860
172.2	2240	5970
173.8	2150	5970
175.4	1970	5940
177.1	1770	5830
178.7	1610	5580
180.4	1460	5550
182.0	1440	5500

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
183.6	1480	5600
185.3	1480	5600
186.9	1510	5550
188.6	1510	5460
190.2	1500	5460
191.8	1490	5430
193.5	1510	5430
195.1	1480	5460
196.8	1480	5430
198.4	1520	5500
200.0	1520	5530
201.7	1530	5430
203.3	1630	5480
205.0	1800	5680
206.6	1800	5700
208.2	1770	5680
209.9	1710	5650
211.5	1630	5730
213.2	1530	5500
214.8	1450	5410
216.4	1460	5410
218.1	1580	5480
219.7	1700	5580
221.4	1920	5750
223.0	2170	6000
224.7	2170	6180
226.3	2070	6180
227.9	2070	6270
229.6	2120	6300
231.2	2060	6060
232.9	2070	6000
234.5	2000	5860
236.1	2070	6000
237.8	2100	6180
239.4	2140	6360

Table A-2. Boring B-3002, S - R1 quality assurance analysis
P- and S_H-wave data

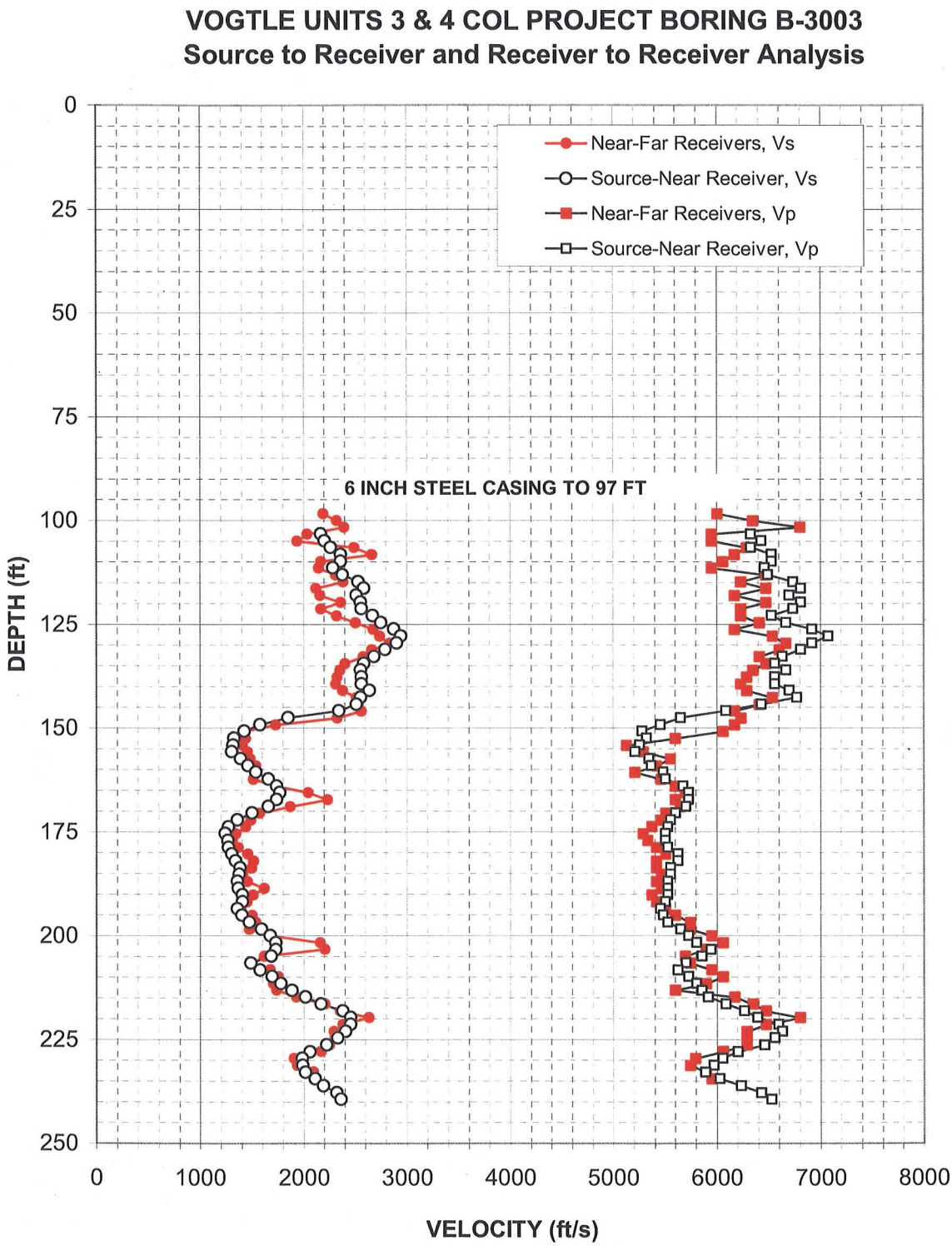


Figure A-3. Boring B-3003, R1 - R2 high resolution analysis and S - R1 quality assurance analysis P- and S_H-wave data

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
103.3	2170	6330
104.9	2210	6430
106.5	2260	6330
108.2	2360	6530
109.8	2360	6530
111.5	2290	6460
113.1	2380	6490
114.7	2530	6730
116.4	2580	6810
118.0	2510	6700
119.7	2550	6810
121.3	2560	6730
122.9	2670	6530
124.6	2750	6660
126.2	2880	6920
127.9	2940	7070
129.5	2900	6920
131.1	2790	6810
132.8	2680	6630
134.4	2580	6560
136.1	2550	6660
137.7	2560	6560
139.3	2560	6560
141.0	2640	6700
142.6	2550	6770
144.3	2510	6430
145.9	2340	6090
147.6	1850	5650
149.2	1580	5460
150.8	1420	5280
152.5	1320	5320
154.1	1320	5250
155.8	1300	5210
157.4	1390	5340
159.0	1460	5360
160.7	1540	5480
162.3	1660	5500
164.0	1740	5680
165.6	1770	5730
167.2	1740	5730
168.9	1660	5700
170.5	1500	5600
172.2	1360	5550
173.8	1270	5530
175.4	1240	5500
177.1	1270	5500
178.7	1270	5530
180.4	1300	5630
182.0	1340	5630
183.6	1380	5550

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
185.3	1380	5550
186.9	1360	5530
188.6	1360	5530
190.2	1410	5530
191.8	1410	5500
193.5	1360	5460
195.1	1400	5480
196.8	1470	5530
198.4	1590	5650
200.0	1670	5730
201.7	1730	5810
203.3	1730	5940
205.0	1680	5860
206.6	1490	5700
208.2	1570	5630
209.9	1690	5730
211.5	1780	5810
213.2	1880	5860
214.8	2020	5920
216.4	2170	6090
218.1	2380	6270
219.7	2450	6390
221.4	2450	6590
223.0	2410	6630
224.7	2330	6560
226.3	2220	6460
227.9	2060	6210
229.6	1980	6060
231.2	1990	5970
232.9	2020	5890
234.5	2110	6030
236.1	2190	6240
237.8	2320	6430
239.4	2360	6530

Table A-3. Boring B-3003, S - R1 quality assurance analysis
P- and S_H-wave data

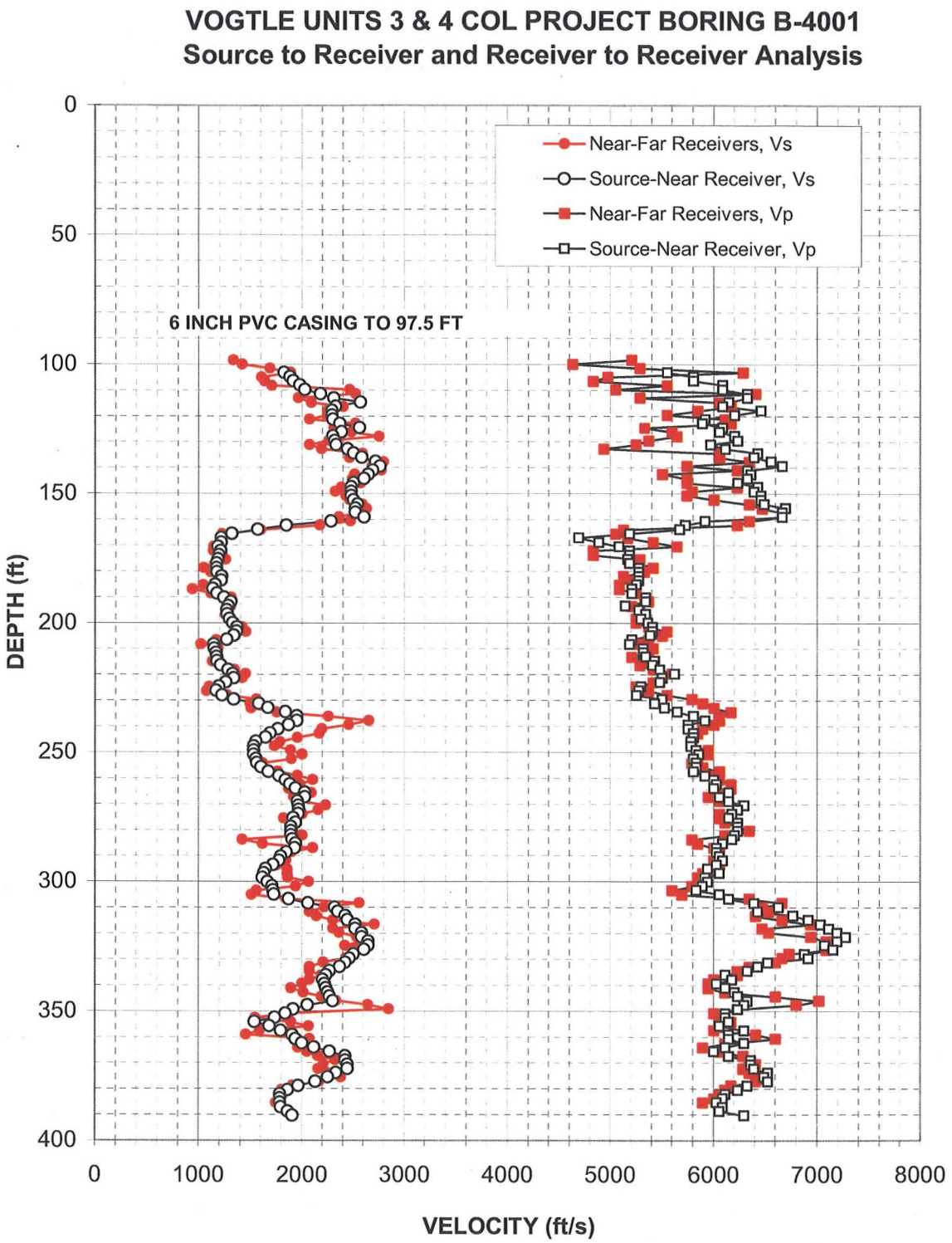


Figure A-4. Boring B-4001, R1 - R2 high resolution analysis and S - R1 quality assurance analysis P- and S_H-wave data

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
103.3	1830	5550
104.9	1880	5810
106.5	1920	5810
108.2	1980	6090
109.8	2030	6090
111.5	2180	6330
113.1	2310	6330
114.7	2570	6150
116.4	2330	6090
118.0	2290	6460
119.7	2290	6210
121.3	2300	5920
122.9	2370	5890
124.6	2560	6090
126.2	2390	6060
127.9	2300	6210
129.5	2320	6240
131.1	2340	5970
132.8	2440	6120
134.4	2500	6430
136.1	2580	6390
137.7	2720	6560
139.3	2760	6660
141.0	2690	6330
142.6	2650	6360
144.3	2600	6330
145.9	2500	6240
147.6	2480	6430
149.2	2480	6390
150.8	2480	6460
152.5	2500	6460
154.1	2540	6490
155.8	2520	6700
157.4	2520	6660
159.0	2600	6660
160.7	2290	5920
162.3	1850	5730
164.0	1570	5680
165.6	1320	5190
167.2	1220	4690
168.9	1220	4890
170.5	1190	5080
172.2	1210	5190
173.8	1190	5190
175.4	1190	5170
177.1	1170	5190
178.7	1170	5280
180.4	1180	5280
182.0	1220	5280
183.6	1220	5280

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
185.3	1160	5250
186.9	1140	5210
188.6	1180	5210
190.2	1250	5340
191.8	1310	5340
193.5	1290	5150
195.1	1270	5280
196.8	1280	5340
198.4	1300	5300
200.0	1330	5360
201.7	1370	5410
203.3	1360	5410
205.0	1340	5390
206.6	1270	5210
208.2	1150	5190
209.9	1150	5320
211.5	1170	5320
213.2	1170	5340
214.8	1180	5430
216.4	1210	5410
218.1	1290	5480
219.7	1330	5630
221.4	1340	5500
223.0	1260	5480
224.7	1190	5300
226.3	1170	5280
227.9	1230	5250
229.6	1340	5500
231.2	1580	5430
232.9	1670	5530
234.5	1840	5650
236.1	1950	5810
237.8	1950	5920
239.4	1870	5750
241.1	1770	5750
242.7	1690	5810
244.3	1650	5810
246.0	1560	5780
247.6	1530	5780
249.3	1530	5830
250.9	1530	5860
252.5	1560	5810
254.2	1560	5830
255.8	1600	5830
257.5	1670	5810
259.1	1780	5920
260.7	1840	6000
262.4	1880	6030
264.0	1940	6000
265.7	2030	6150

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
267.3	2030	6060
268.9	1960	6150
270.6	1970	6300
272.2	1970	6240
273.9	1970	6180
275.5	1920	6150
277.1	1940	6240
278.8	1900	6240
280.4	1900	6240
282.1	1900	6210
283.7	1910	6180
285.3	1940	6090
287.0	1930	6030
288.6	1850	6030
290.3	1800	6060
291.9	1780	6090
293.5	1720	6030
295.2	1650	5940
296.8	1630	6060
298.5	1610	5920
300.1	1670	5940
301.8	1710	5890
303.4	1720	5830
305.0	1730	6060
306.7	1870	6150
308.3	2060	6390
310.0	2320	6630
311.6	2350	6430
313.2	2430	6770
314.9	2440	6920
316.5	2520	7030
318.2	2520	7110
319.8	2580	7190
321.4	2580	7280
323.1	2650	7190
324.7	2650	7070
326.4	2600	7150
328.0	2500	6880
329.6	2460	6920
331.3	2430	6530
332.9	2370	6430
334.6	2270	6330
336.2	2240	6120
337.8	2210	6180
339.5	2220	6030
341.1	2240	6120
342.8	2250	6210
344.4	2270	6240
346.0	2300	6330
347.7	2060	6300

Table A-4. Boring B-4001, S - R1 quality assurance analysis P- and S_H-wave data

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
349.3	1920	6240
351.0	1840	6120
352.6	1740	6120
354.2	1540	6150
355.9	1680	6060
357.5	1800	6300
359.2	1910	6150
360.8	1940	6150
362.4	2000	6300
364.1	2120	6120
365.7	2270	6000
367.4	2430	6150
369.0	2430	6360
370.6	2440	6360
372.3	2440	6390
373.9	2340	6530
375.6	2250	6490
377.2	2130	6530
378.9	1970	6330
380.5	1860	6240
382.1	1790	6120
383.8	1790	6090
385.4	1790	6030
387.1	1800	6090
388.7	1860	6060
390.3	1910	6300

Table A-4, continued. Boring B-4001, S - R1 quality assurance analysis P- and S_H-wave data

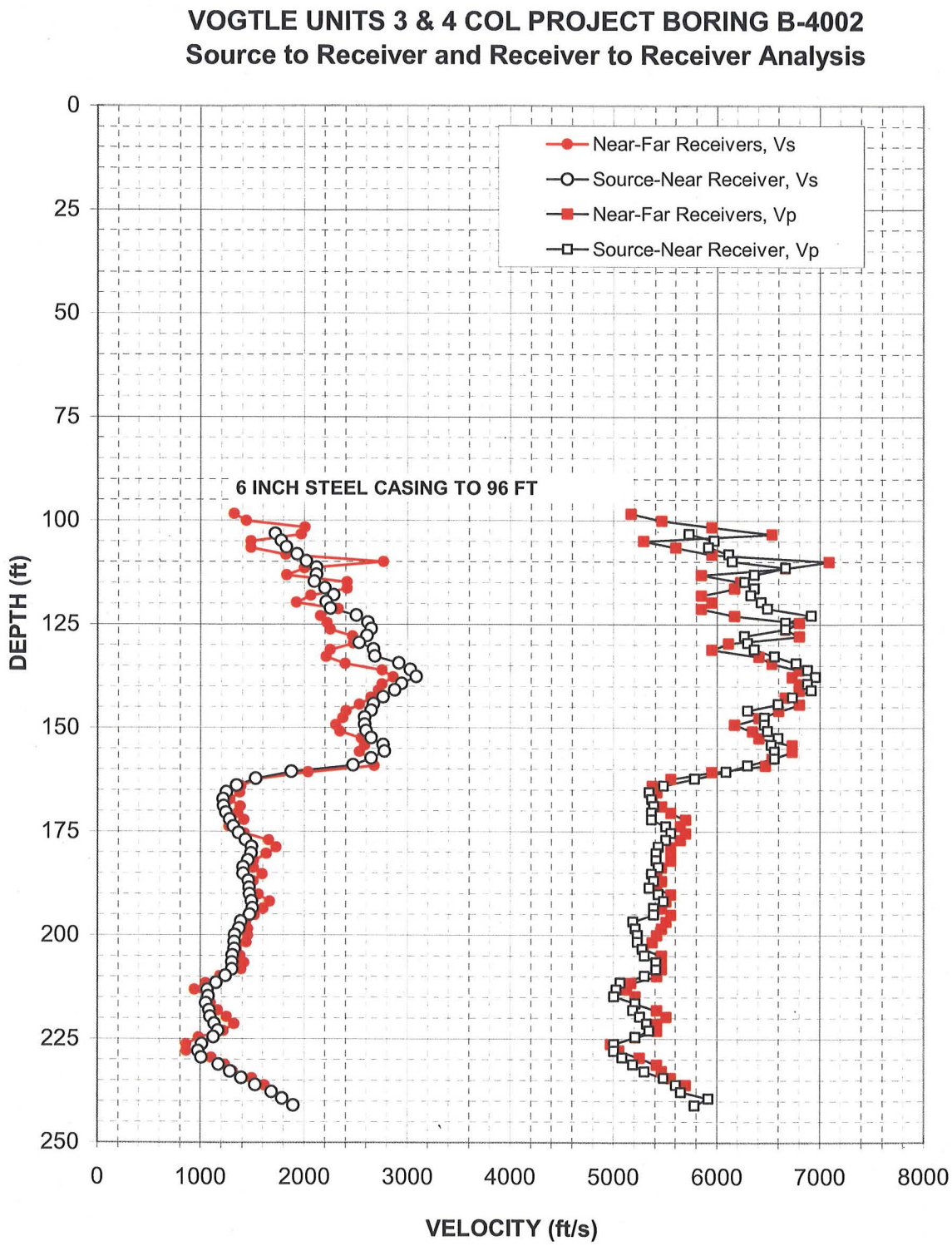


Figure A-5. Boring B-4002, R 1 - R2 high resolution analysis and S - R1 quality assurance analysis P- and S_H-wave data

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
103.3	1720	5730
104.9	1780	5970
106.5	1830	5920
108.2	1930	6120
109.8	2020	6150
111.5	2120	6660
113.1	2120	6360
114.7	2100	6270
116.4	2200	6360
118.0	2290	6330
119.7	2210	6430
121.3	2250	6490
122.9	2500	6920
124.6	2620	6660
126.2	2650	6660
127.9	2600	6270
129.5	2530	6300
131.1	2670	6360
132.8	2680	6560
134.4	2920	6770
136.1	3030	6880
137.7	3090	6960
139.3	2940	6880
141.0	2880	6920
142.6	2760	6730
144.3	2670	6590
145.9	2650	6300
147.6	2580	6460
149.2	2580	6460
150.8	2600	6490
152.5	2650	6590
154.1	2760	6530
155.8	2780	6560
157.4	2650	6560
159.0	2470	6300
160.7	1880	6090
162.3	1530	5780
164.0	1350	5480
165.6	1250	5340
167.2	1220	5360
168.9	1220	5390
170.5	1250	5360
172.2	1280	5360
173.8	1320	5500
175.4	1360	5550
177.1	1430	5500
178.7	1490	5430
180.4	1490	5410
182.0	1460	5410
183.6	1410	5430

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
185.3	1410	5360
186.9	1460	5390
188.6	1470	5340
190.2	1470	5430
191.8	1490	5480
193.5	1500	5390
195.1	1470	5390
196.8	1390	5190
198.4	1370	5210
200.0	1330	5230
201.7	1320	5230
203.3	1320	5280
205.0	1310	5300
206.6	1300	5410
208.2	1300	5410
209.9	1240	5300
211.5	1150	5060
213.2	1070	5020
214.8	1080	5000
216.4	1050	5210
218.1	1080	5190
219.7	1100	5250
221.4	1130	5320
223.0	1170	5340
224.7	1120	5210
226.3	1010	5000
227.9	980	5000
229.6	1010	5080
231.2	1170	5190
232.9	1290	5300
234.5	1390	5480
236.1	1530	5600
237.8	1680	5650
239.4	1790	5920
241.1	1900	5780

Table A-5. Boring B-4002, S - R1 quality assurance analysis P- and S_H-wave data

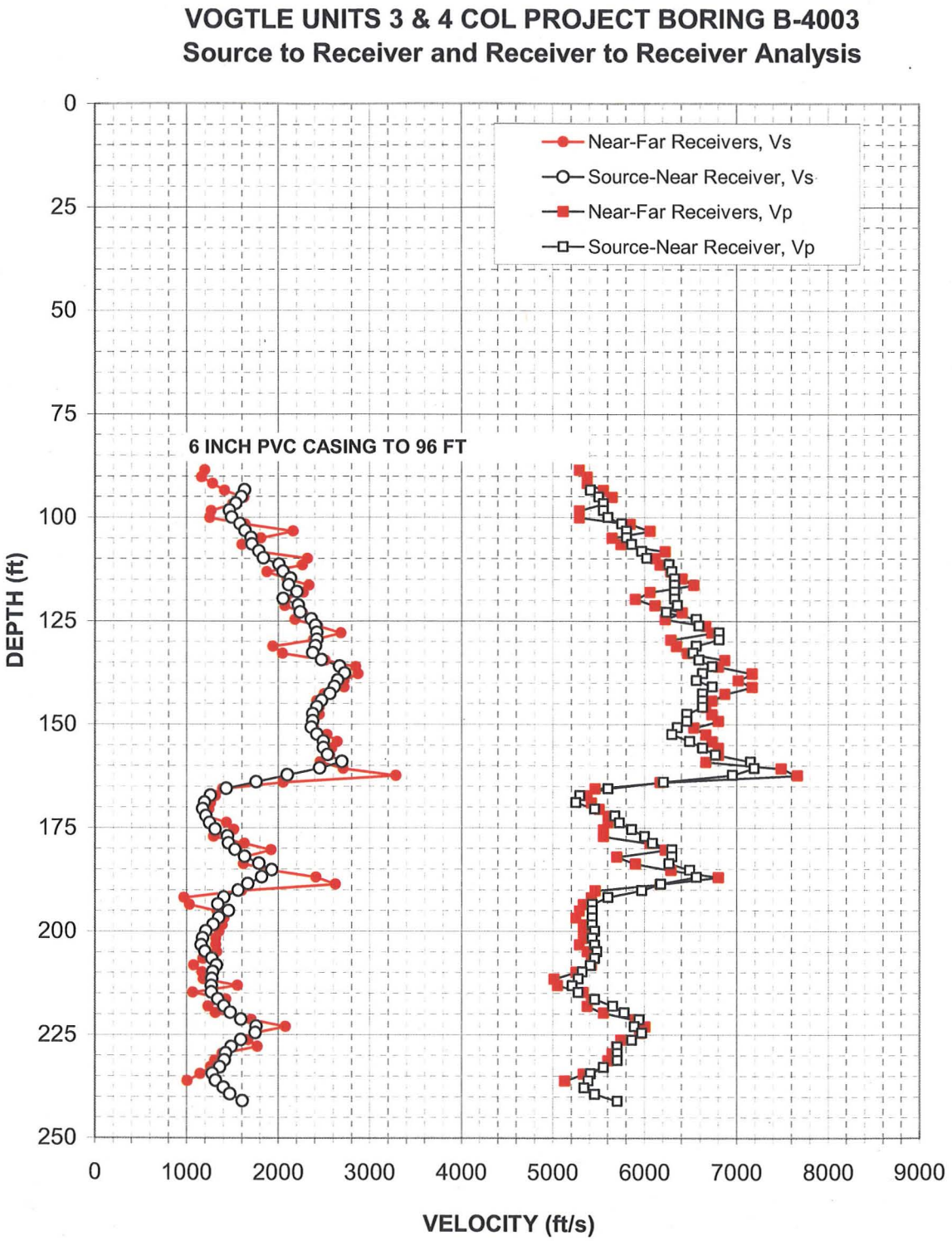


Figure A-6. Boring B-4003, R1 - R2 high resolution analysis and S - R1 quality assurance analysis P- and S_H-wave data

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
90.1	-	-
91.8	-	-
93.4	1630	5410
95.1	1600	5500
96.7	1540	5550
98.3	1470	5550
100.0	1490	5600
101.6	1580	5750
103.3	1640	5810
104.9	1700	5810
106.5	1710	5860
108.2	1790	5970
109.8	1840	6030
111.5	2010	6270
113.1	2060	6300
114.7	2140	6330
116.4	2120	6330
118.0	2210	6330
119.7	2060	6330
121.3	2220	6360
122.9	2240	6240
124.6	2360	6560
126.2	2410	6590
127.9	2430	6810
129.5	2430	6810
131.1	2410	6560
132.8	2380	6530
134.4	2470	6590
136.1	2670	6730
137.7	2730	6630
139.3	2650	6560
141.0	2620	6730
142.6	2560	6630
144.3	2470	6630
145.9	2430	6630
147.6	2380	6460
149.2	2380	6460
150.8	2360	6360
152.5	2430	6300
154.1	2490	6490
155.8	2490	6630
157.4	2540	6770
159.0	2690	7150
160.7	2450	7190
162.3	2100	6960
164.0	1760	6210
165.6	1430	5600
167.2	1260	5300
168.9	1200	5250
170.5	1180	5460

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
172.2	1210	5680
173.8	1250	5730
175.4	1310	5860
177.1	1450	6000
178.7	1460	6090
180.4	1530	6300
182.0	1630	6300
183.6	1790	6270
185.3	1930	6490
186.9	1820	6560
188.6	1670	6180
190.2	1560	5970
191.8	1410	5600
193.5	1340	5430
195.1	1460	5430
196.8	1350	5430
198.4	1290	5430
200.0	1210	5460
201.7	1180	5430
203.3	1160	5460
205.0	1200	5480
206.6	1280	5460
208.2	1320	5410
209.9	1290	5320
211.5	1280	5280
213.2	1270	5210
214.8	1270	5280
216.4	1340	5460
218.1	1410	5650
219.7	1480	5780
221.4	1590	5940
223.0	1760	5890
224.7	1750	5970
226.3	1590	5860
227.9	1490	5700
229.6	1430	5700
231.2	1410	5700
232.9	1360	5550
234.5	1280	5410
236.1	1310	5390
237.8	1400	5340
239.4	1470	5460
241.1	1610	5700

Table A-6. Boring B-4003, S - R1 quality assurance analysis P- and S_H-wave data

APPENDIX B

CALIPER, NATURAL GAMMA, RESISTIVITY, AND SPONTANEOUS POTENTIAL LOGS

ROBERTSON GEOLOGGING LIMITED

VOGTLE COL

B3001CALUP01

ROBERTSON GEOLOGGING TECHNOLOGY

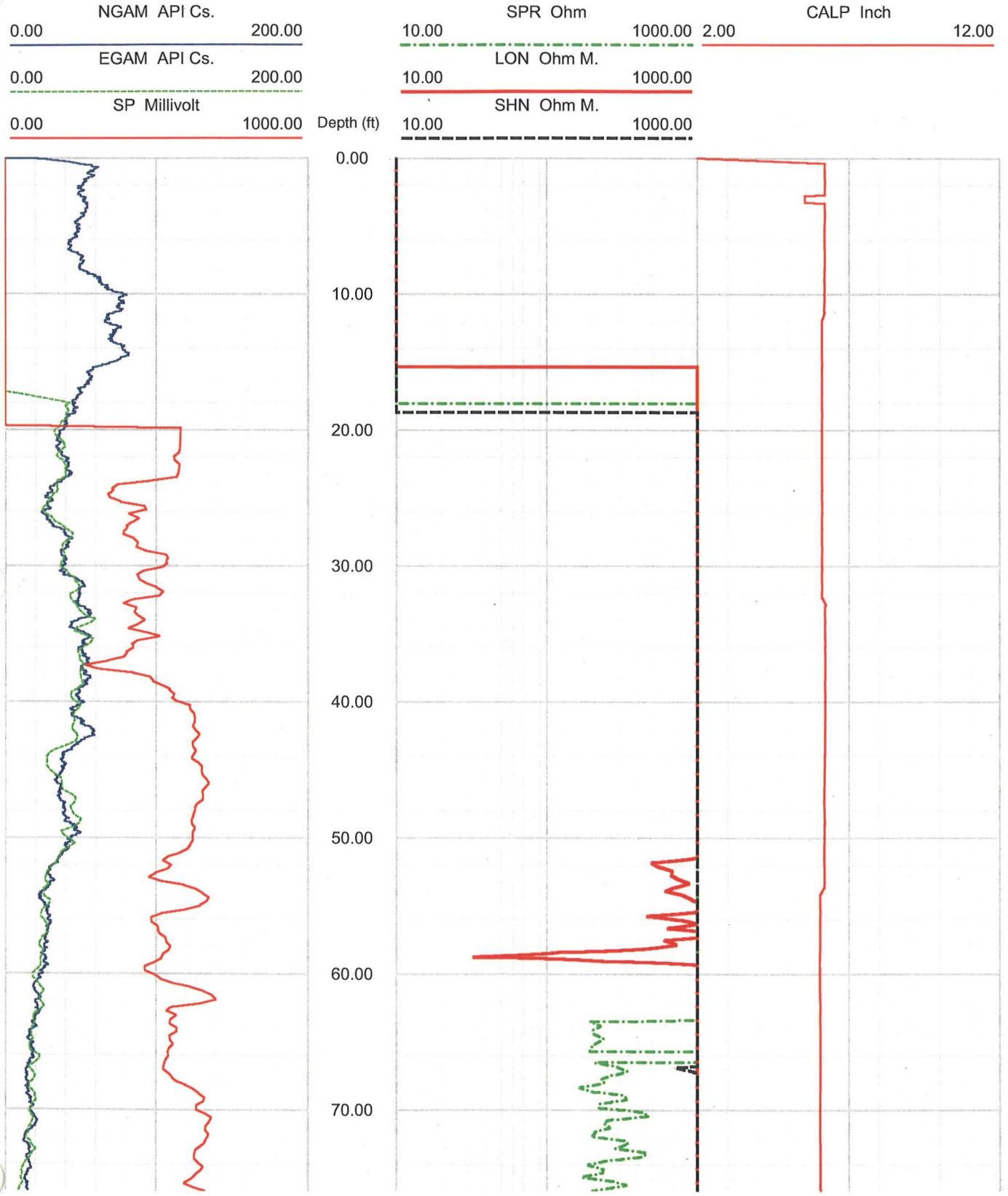
REMARKS (C:\Data\PS\Vogtle\B-3001 12-13 Feb 2007 bor..

COMPANY	GEOVISION	OTHER SERVICES	
WELL	B-3001		
FIELD			
COUNTRY			
STATE			
COUNTY			
LAT.:			
LONG.:			

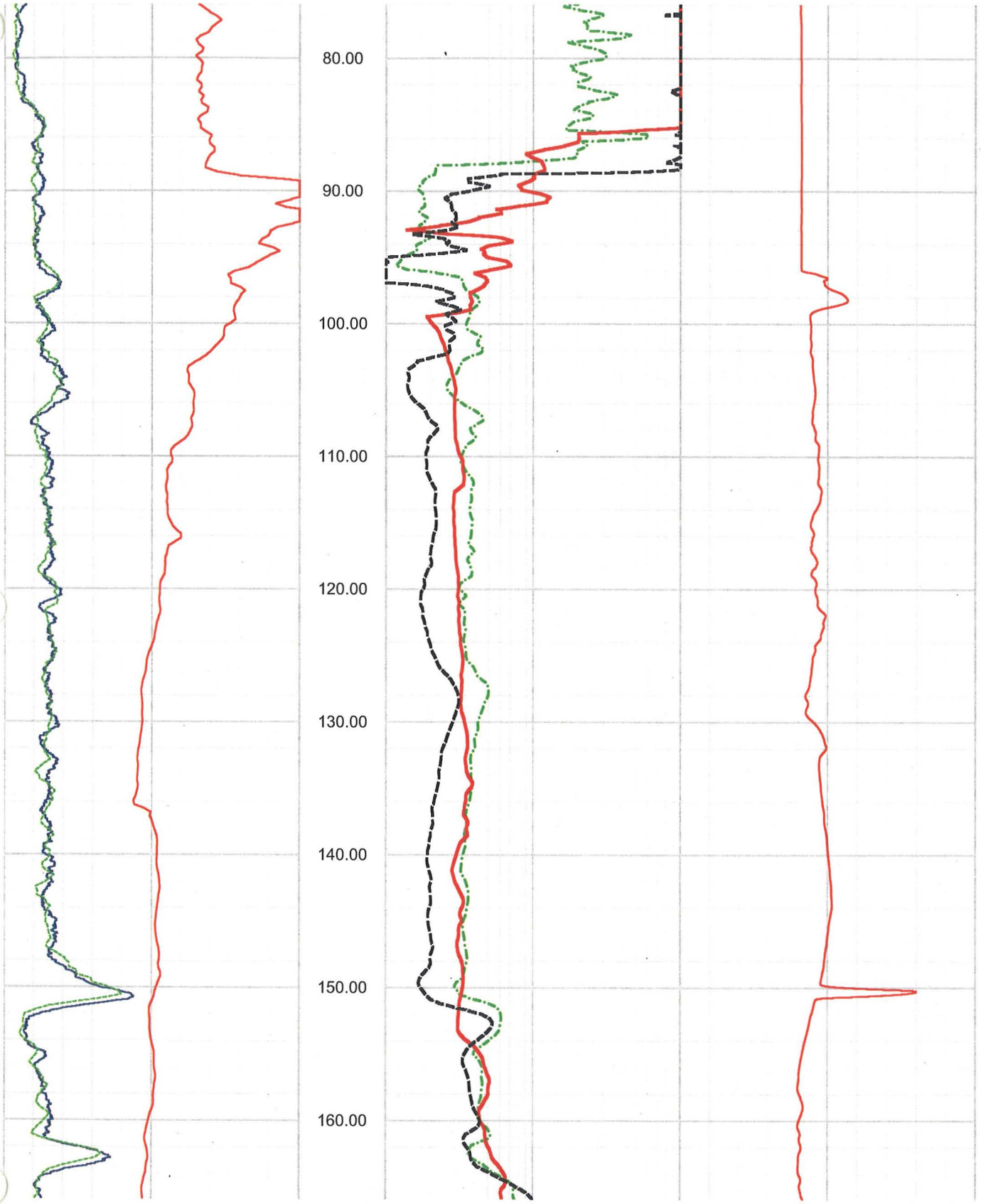
Perm. Da..	Elev	KB	0.00
Log. Da..		DF	0.00
Drill Datum		GL	0.00

DATE	12 Feb 07	15 Dec 06	15 Dec 06
RUN#	5	0	0
TYPE OF LOG	CALIPER		
DEPTH DRILLER	420.00	0.00	0.00
DEPTH LOGGER	248.00	0.00	0.00
LOG DEEPEST	245.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	DRILLING MUD		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP °C	0.00	0.00	0.00
RIG TIME			
RECORDED BY	R. STELLER		
WITNESSED BY			

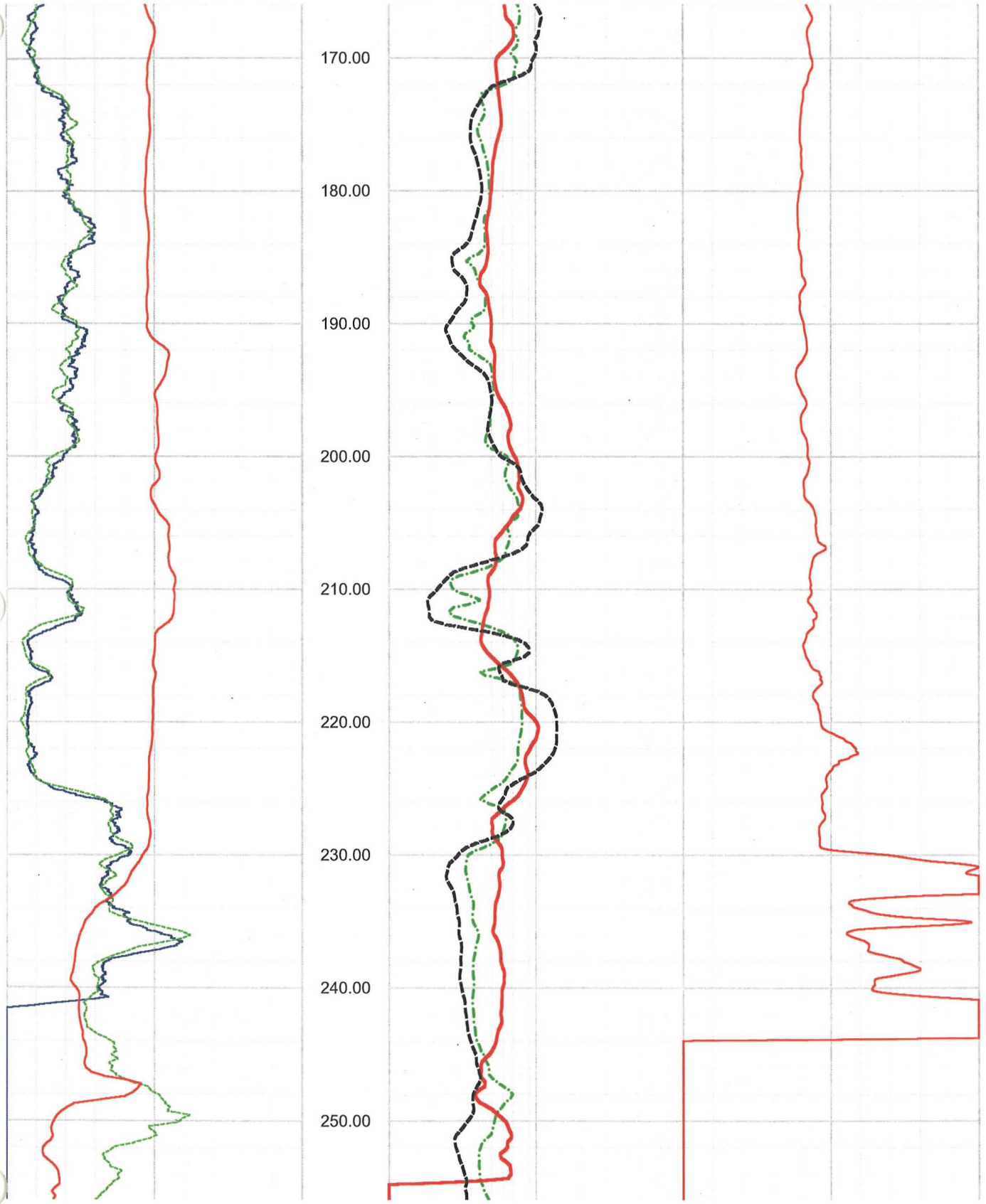
RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00



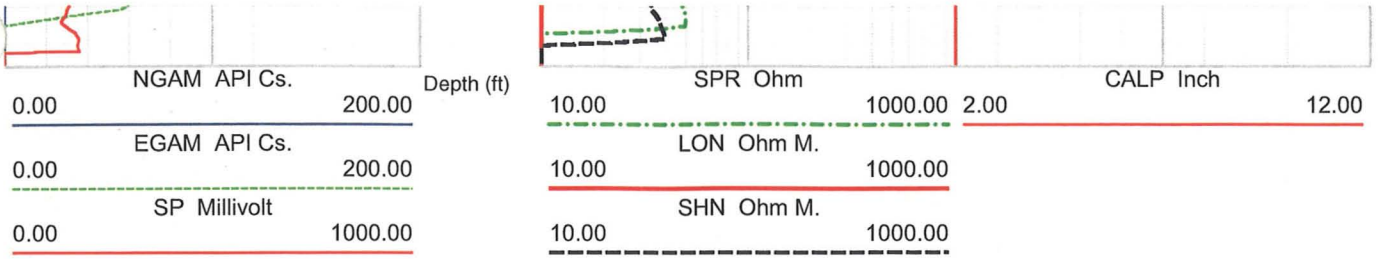
VOGTLE Units 3 & 4 Boring B-3001 ELOG, Caliper and Gamma, Upper Section, rev 1 Sheet 2 of 5



VOGTLE Units 3 & 4 Boring B-3001 ELOG, Caliper and Gamma, Upper Section, rev 1 Sheet 3 of 5



VOGTLE Units 3 & 4 Boring B-3001 ELOG, Caliper and Gamma, Upper Section, rev 1 Sheet 4 of 5



VOGTLE Units 3 & 4 Boring B-3001 ELOG, Caliper and Gamma, Upper Section, rev 1 Sheet 5 of 5

ROBERTSON GEOLOGGING LIMITED

VOGTLE COL

B3001CALUP02

ROBERTSON GEOLOGGING TECHNOLOGY

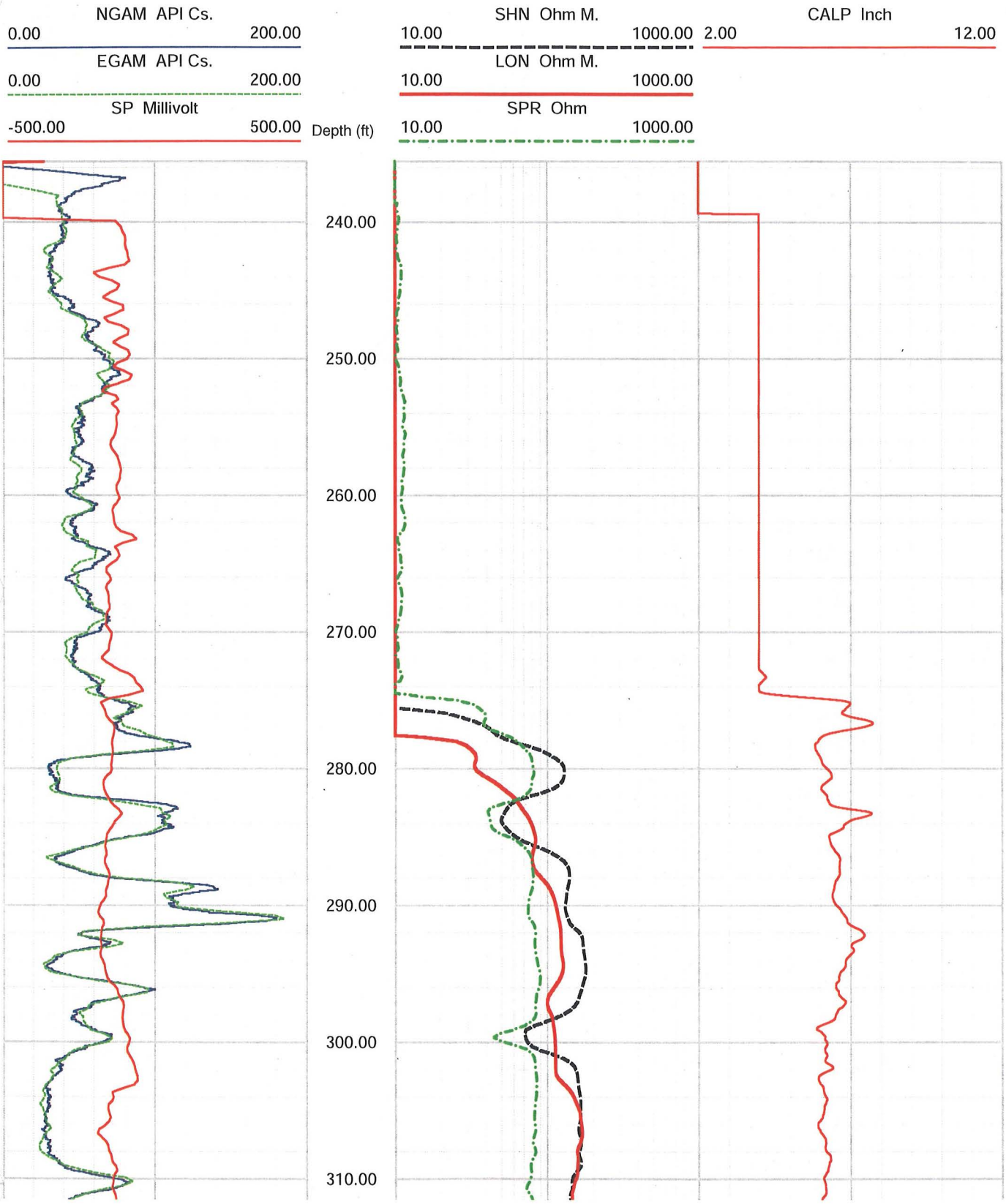
REMARKS (C:\Data\PS\Vogtle\B-3001 12-13 Feb 2007 bor..

COMPANY	GEOVISION	OTHER SERVICES	
WELL	B-3001		
FIELD			
COUNTRY			
STATE			
COUNTY			
LAT.:			
LONG.:			

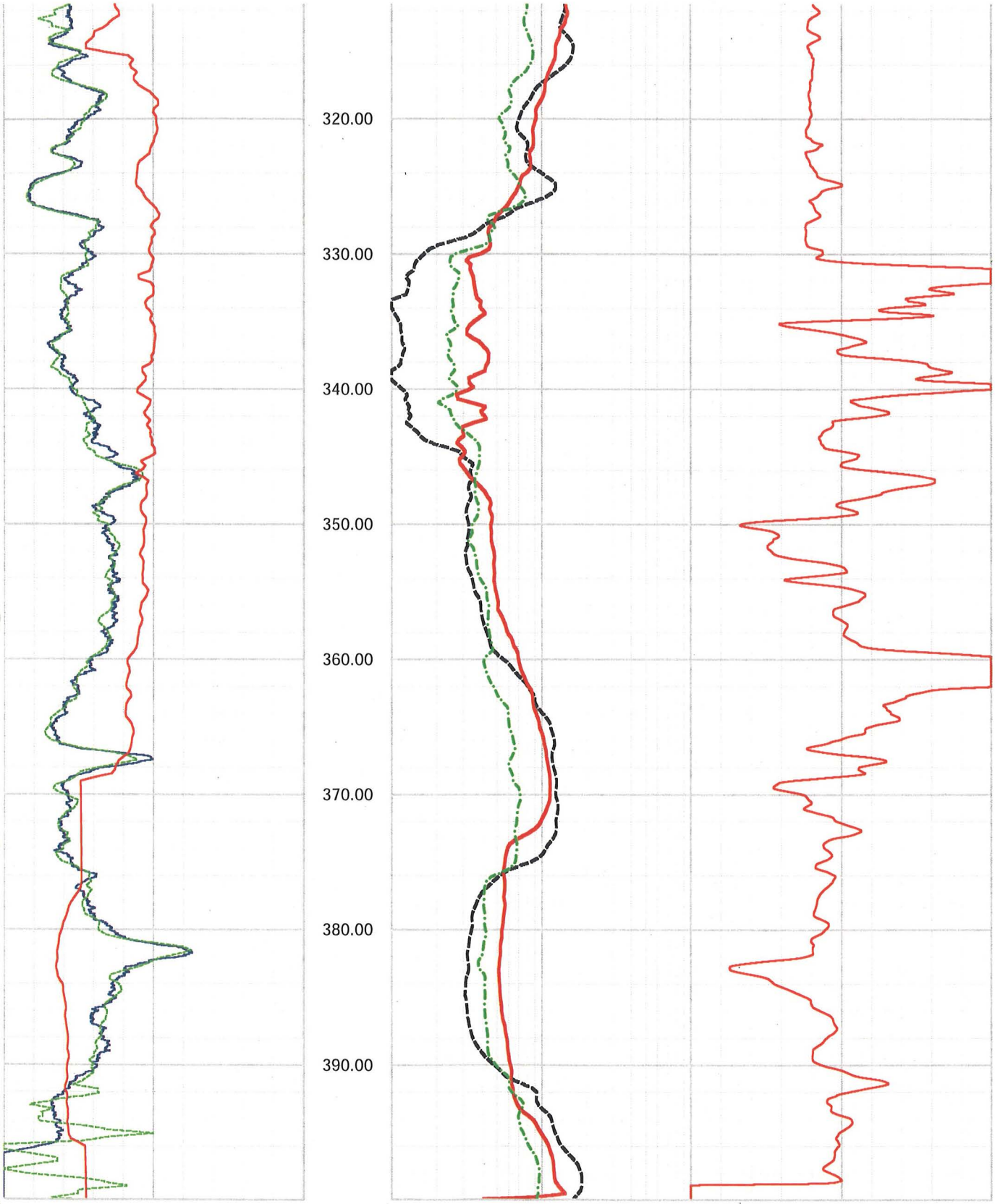
Perm. Da..	Elev	KB	0.00
Log. Da..		DF	0.00
Drill Datum		GL	0.00

DATE	13 Feb 07	15 Dec 06	15 Dec 06
RUN#	6	0	0
TYPE OF LOG	CALIPER		
DEPTH DRILLER	420.00	0.00	0.00
DEPTH LOGGER	404.00	0.00	0.00
LOG DEEPEST	400.00	0.00	0.00
LOG SHALLOW	240.00	0.00	0.00
FLUID IN HOLE	DRILLING MUD		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP °C	0.00	0.00	0.00
RIG TIME			
RECORDED BY	R. STELLER		
WITNESSED BY			

RUN#	BIT RECORD			CASING RECORD			
	SIZE	FROM	TO	SIZE	WEIGHT	FROM	TO
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00



VOGTLE Units 3 & 4 COL Boring B-3001 ELOG, Caliper and Gamma, Lower Section, rev 1 Sheet 2 of 4



VOGTLE Units 3 & 4 COL Boring B-3001 ELOG, Caliper and Gamma, Lower Section, rev 1 Sheet 3 of 4

	NGAM API Cs.				SHN Ohm M.			CALP Inch
0.00		200.00	Depth (ft)	10.00		1000.00	2.00	12.00
	EGAM API Cs.				LON Ohm M.			
0.00		200.00		10.00		1000.00		
	SP Millivolt				SPR Ohm			
-500.00		500.00		10.00		1000.00		

VOGTLE Units 3 & 4 COL Boring B-3001 ELOG, Caliper and Gamma, Lower Section, rev 1 Sheet 4 of 4

ROBERTSON GEOLOGGING LIMITED

VOGTLE COL

B3002CALUP01

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Data\PS\Vogtle\B-3002 15 Feb 2007 boring ..

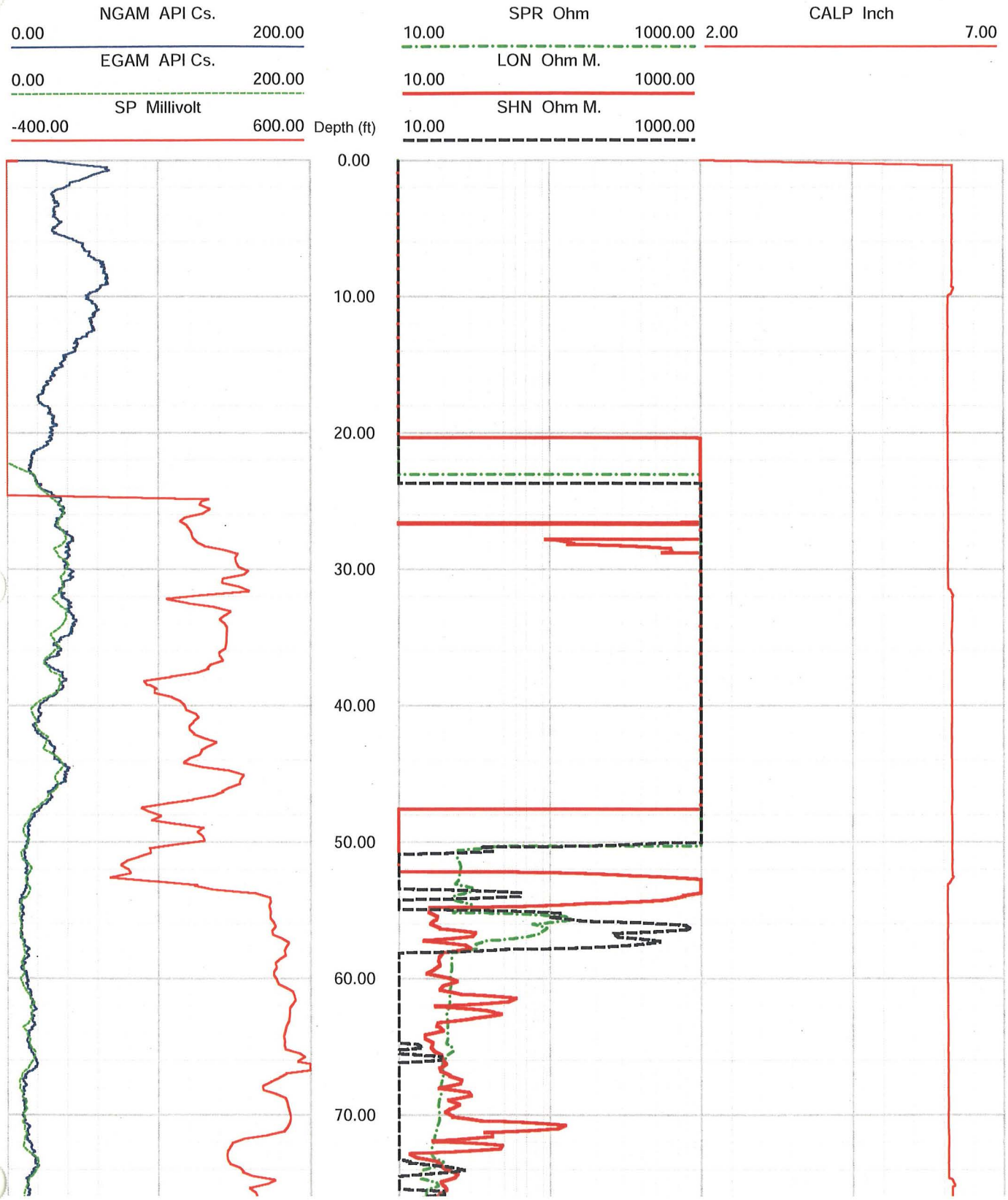
COMPANY	GEOVISION	OTHER SERVICES	
WELL	B-3002		
FIELD			
COUNTRY			
STATE			
COUNTY			
LAT.:			
LONG.:			

Perm. Da..	Elev	KB	0.00
Log. Da..		DF	0.00
Drill Datum		GL	0.00

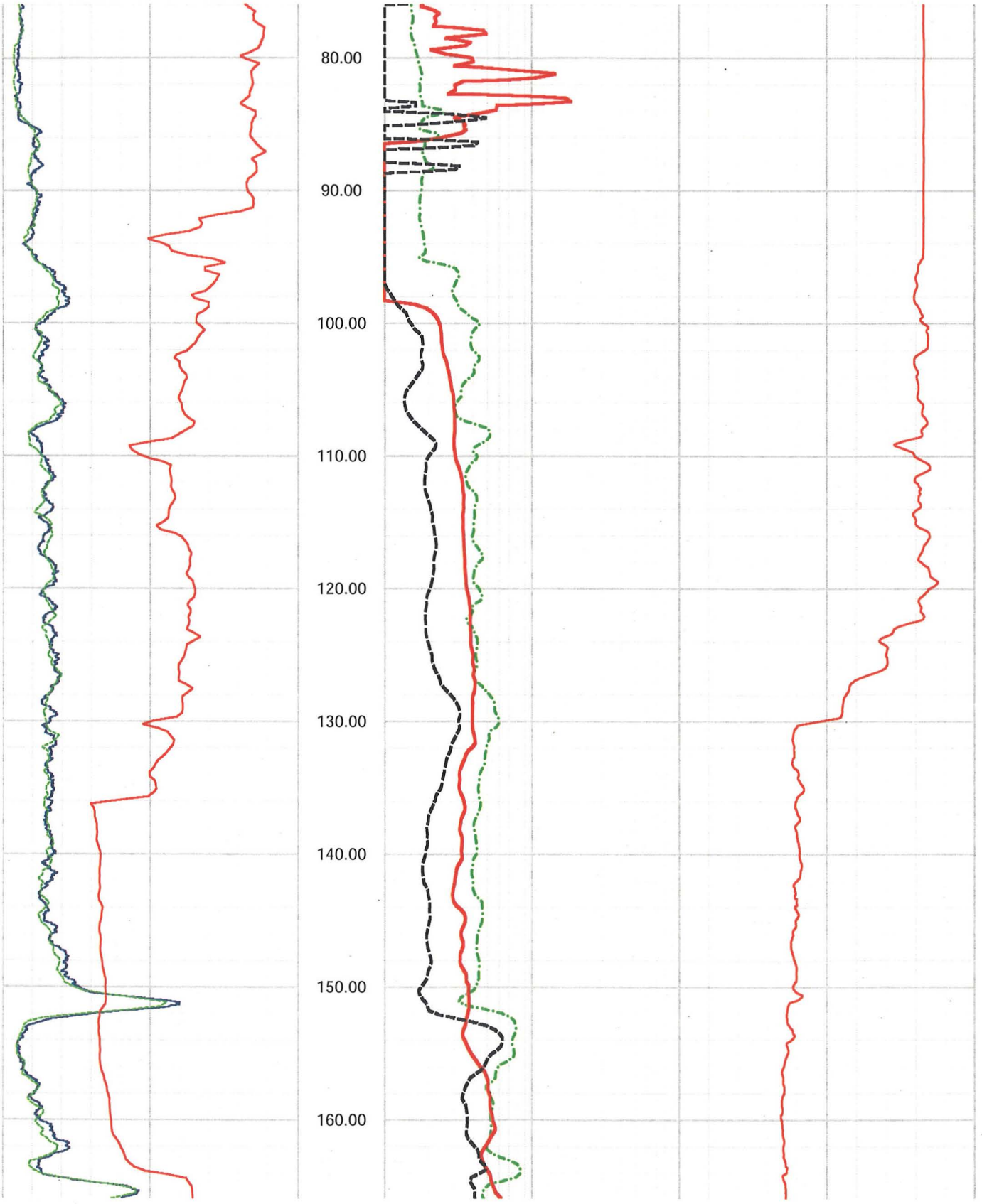
DATE	15 Feb 07	15 Dec 06	15 Dec 06
RUN#	6	0	0
TYPE OF LOG	CALIPER		
DEPTH DRILLER	250.00	0.00	0.00
DEPTH LOGGER	250.00	0.00	0.00
LOG DEEPEST	245.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	DRILLING MUD		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP °C	0.00	0.00	0.00
RIG TIME			
RECORDED BY	R. STELLER		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

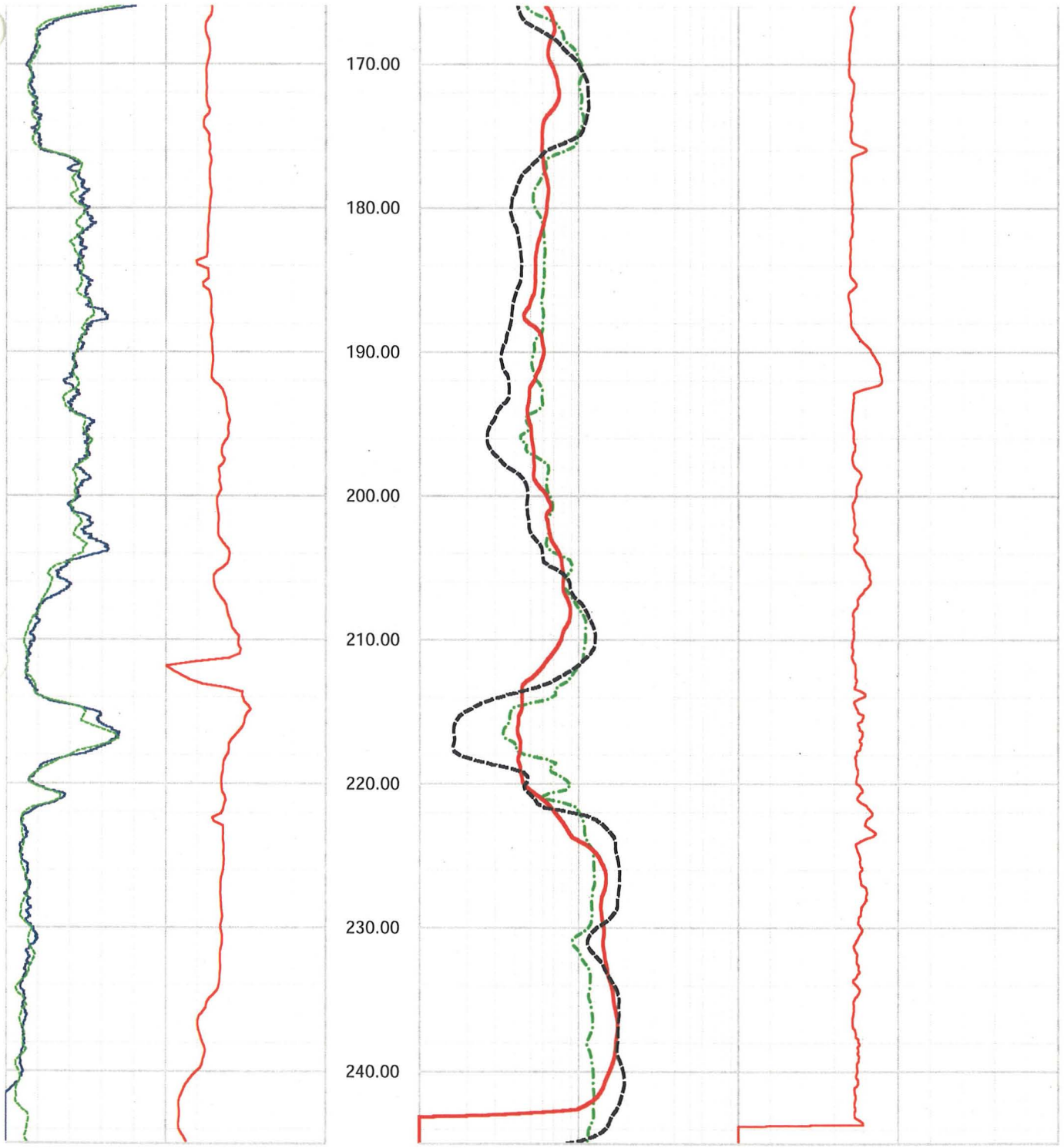
VOGTLE Units 3 & 4 Boring B-3002 ELOG, Caliper and Gamma rev 1 Sheet 1 of 5



VOGTLE Units 3 & 4 Boring B-3002 ELOG, Caliper and Gamma rev 1 Sheet 2 of 5



VOGTLE Units 3 & 4 Boring B-3002 ELOG, Caliper and Gamma rev 1 Sheet 3 of 5



VOGTLE Units 3 & 4 Boring B-3002 ELOG, Caliper and Gamma rev 1 Sheet 4 of 5

NGAM API Cs.		Depth (ft)	SPR Ohm		CALP Inch	
0.00	200.00		10.00	1000.00	2.00	7.00
EGAM API Cs.			LON Ohm M.			
0.00	200.00		10.00	1000.00		
SP Millivolt			SHN Ohm M.			
-400.00	600.00		10.00	1000.00		

VOGTLE Units 3 & 4 Boring B-3002 ELOG, Caliper and Gamma rev 1 Sheet 5 of 5

ROBERTSON GEOLOGGING LIMITED

VOGTLE COL

B3003CALUP01

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Data\PS\Vogtle\B-3003 16 Feb 2007 boring ..

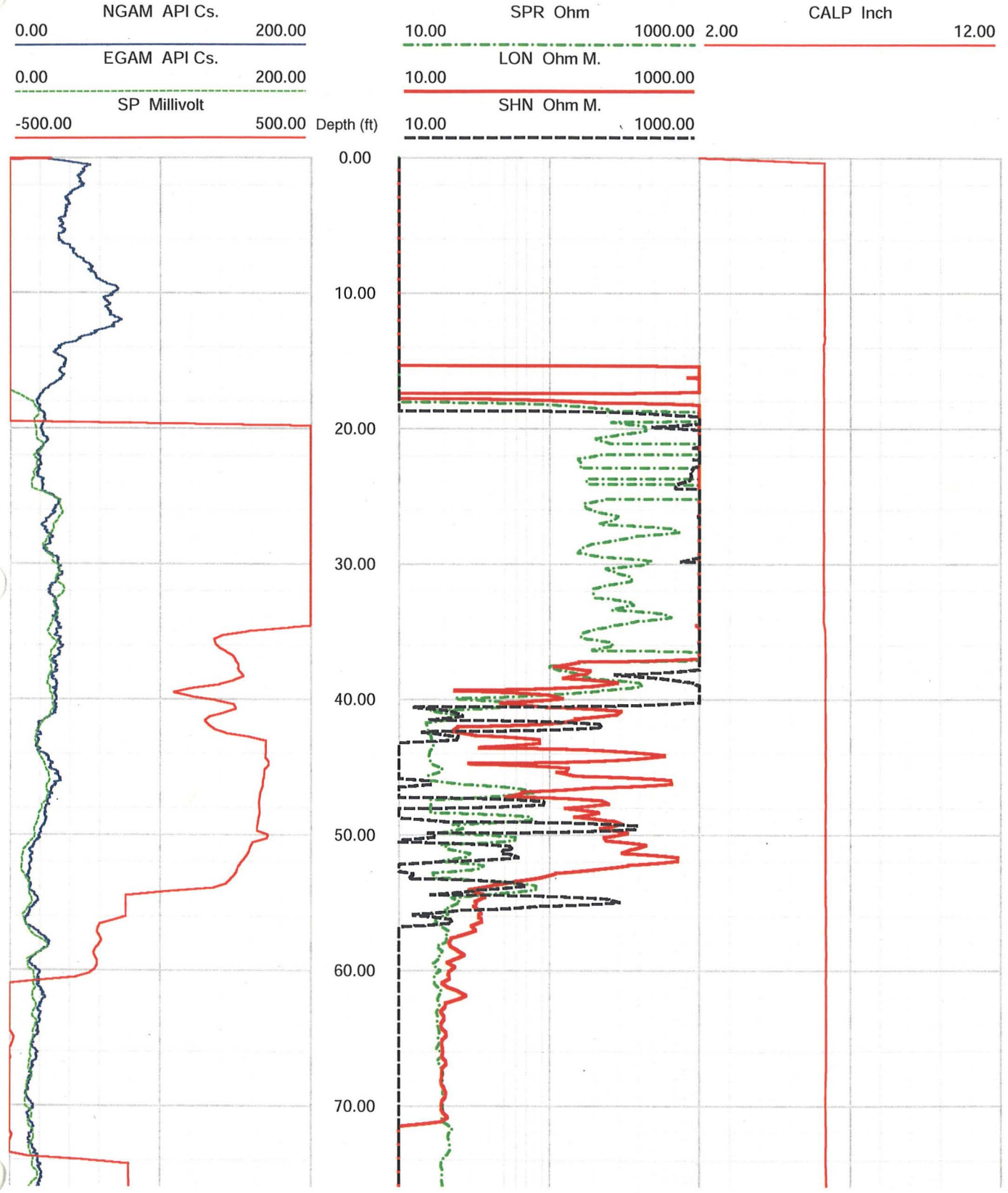
COMPANY	GEOVISION	OTHER SERVICES	
WELL	B-3003		
FIELD			
COUNTRY			
STATE			
COUNTY			
LAT.:			
LONG.:			

Perm. Da..	Elev	KB	0.00
Log. Da..		DF	0.00
Drill Datum		GL	0.00

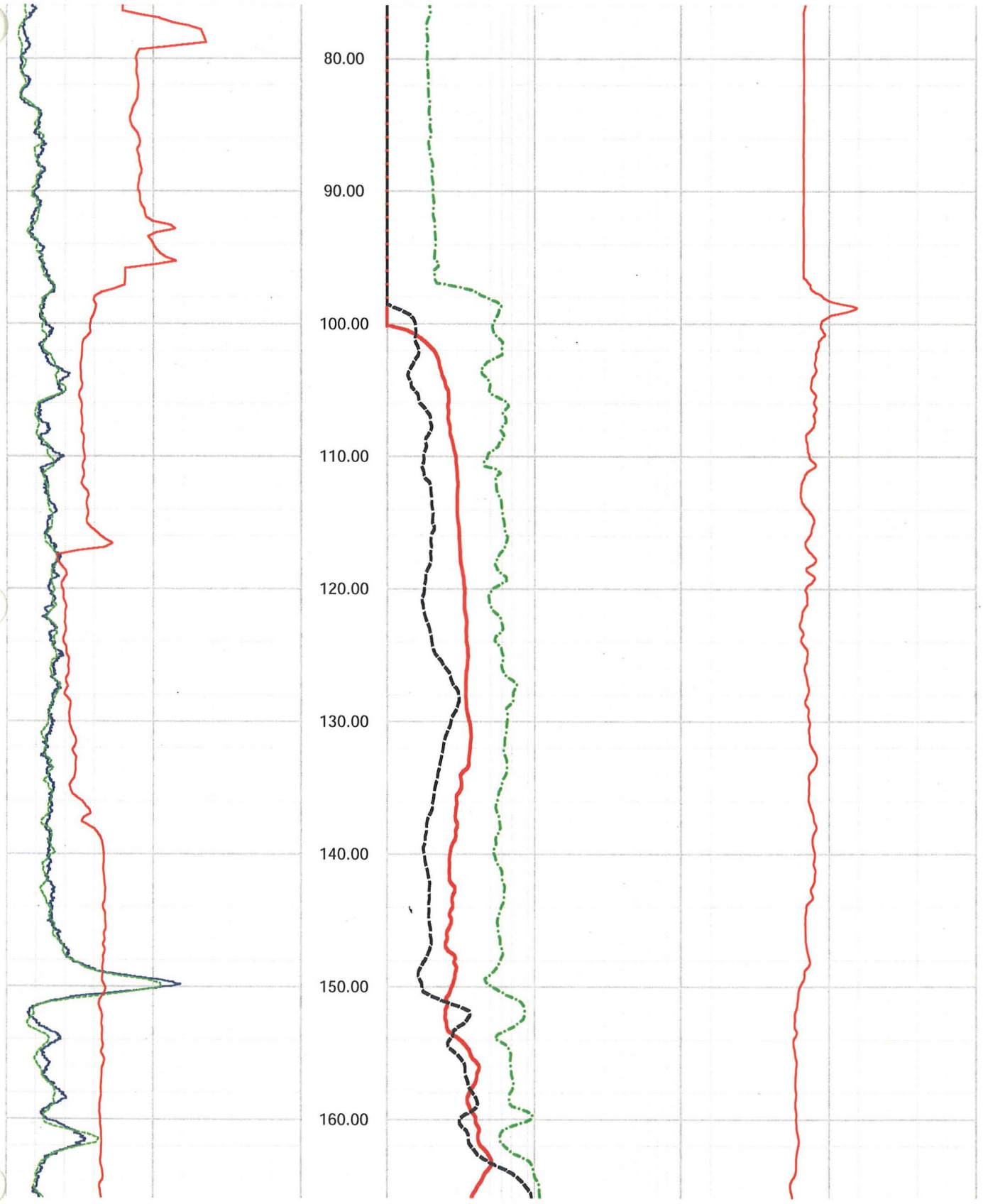
DATE	16 Feb 07	15 Dec 06	15 Dec 06
RUN#	5	0	0
TYPE OF LOG	CALIPER		
DEPTH DRILLER	250.00	0.00	0.00
DEPTH LOGGER	250.00	0.00	0.00
LOG DEEPEST	245.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	DRILLING MUD		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP °C	0.00	0.00	0.00
RIG TIME			
RECORDED BY	R. STELLER		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

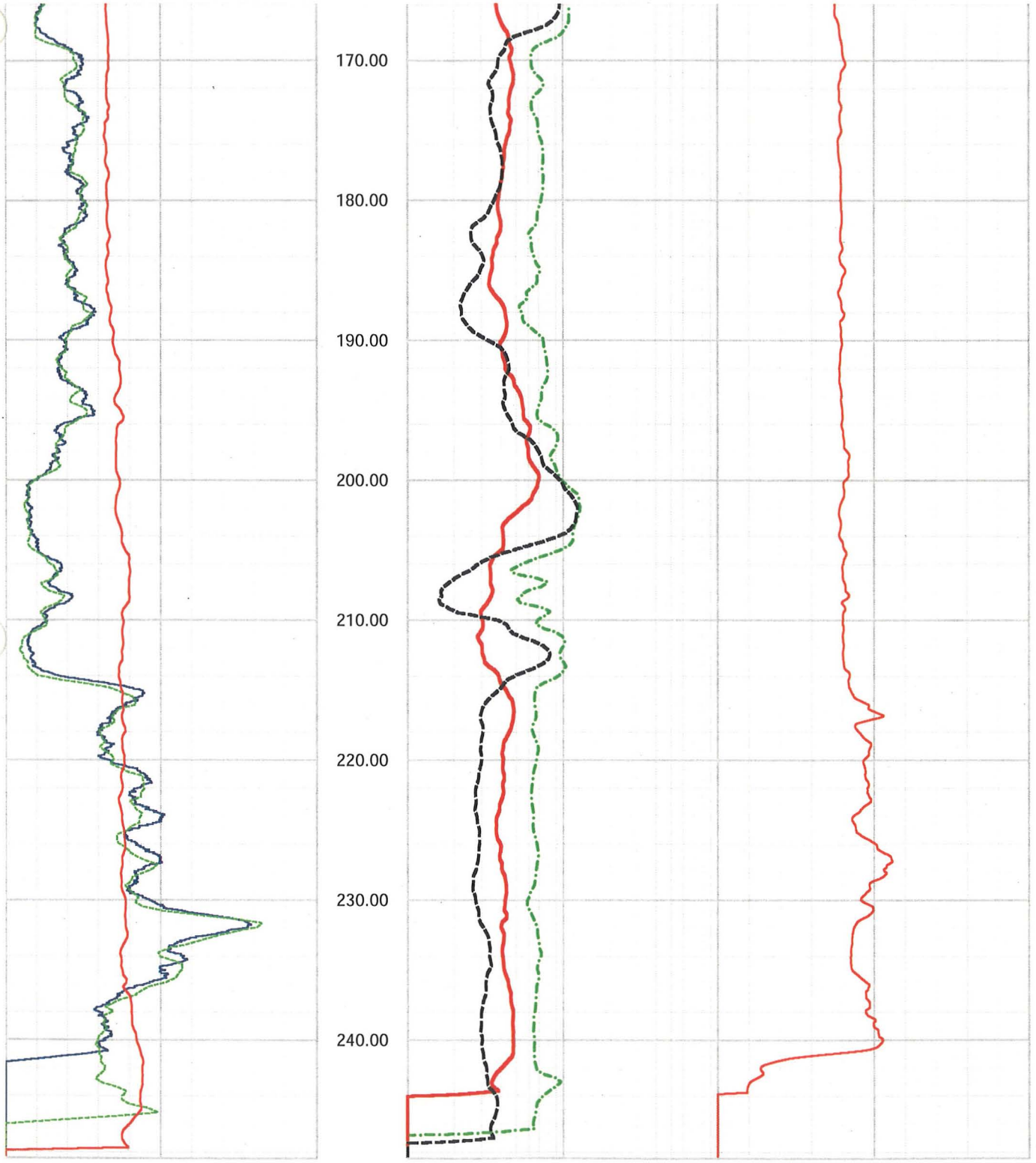
VOGTLE Units 3 & 4 COL Boring B-3003 ELOG, Caliper and Gamma rev 1 Sheet 1 of 5



VOGTLE Units 3 & 4 COL Boring B-3003 ELOG, Caliper and Gamma rev 1 Sheet 2 of 5



VOGTLE Units 3 & 4 COL Boring B-3003 ELOG, Caliper and Gamma rev 1 Sheet 3 of 5



VOGTLE Units 3 & 4 COL Boring B-3003 ELOG, Caliper and Gamma rev 1 Sheet 4 of 5

NGAM API Cs.		Depth (ft)	SPR Ohm		CALP Inch	
0.00	200.00		10.00	1000.00	2.00	12.00
EGAM API Cs.			LON Ohm M.			
0.00	200.00		10.00	1000.00		
SP Millivolt			SHN Ohm M.			
-500.00	500.00		10.00	1000.00		

VOGTLE Units 3 & 4 COL Boring B-3003 ELOG, Caliper and Gamma rev 1 Sheet 5 of 5

ROBERTSON GEOLOGGING LIMITED

VOGTLE COL

B4001CALUP02

ROBERTSON GEOLOGGING TECHNOLOGY

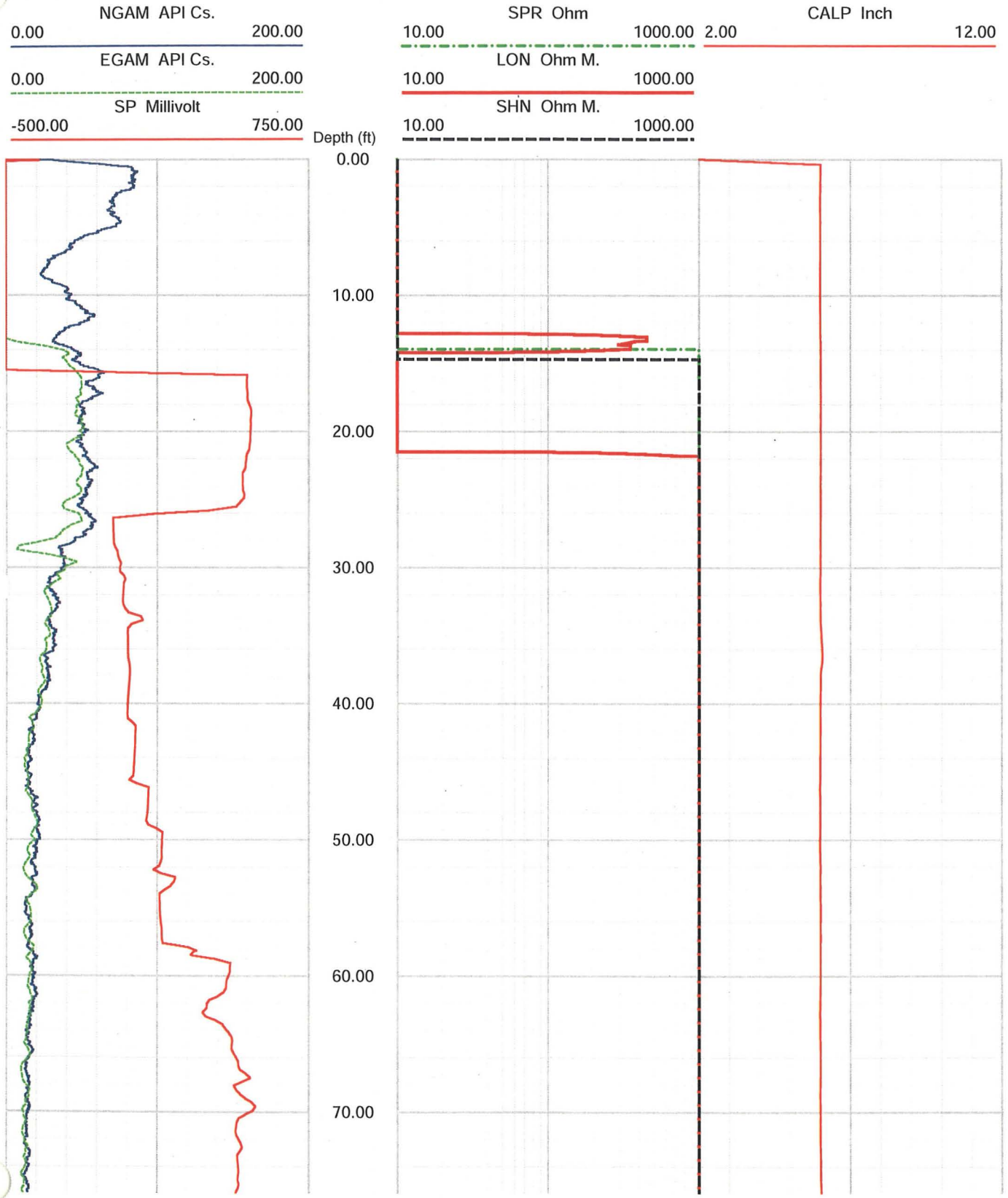
REMARKS (C:\Data\PS\Vogtle\B-4001 9-10 Jan 13 Feb 20..

COMPANY	GEOVISION	OTHER SERVICES	
WELL	B-4001		
FIELD			
COUNTRY			
STATE			
COUNTY			
LAT.:			
LONG.:			

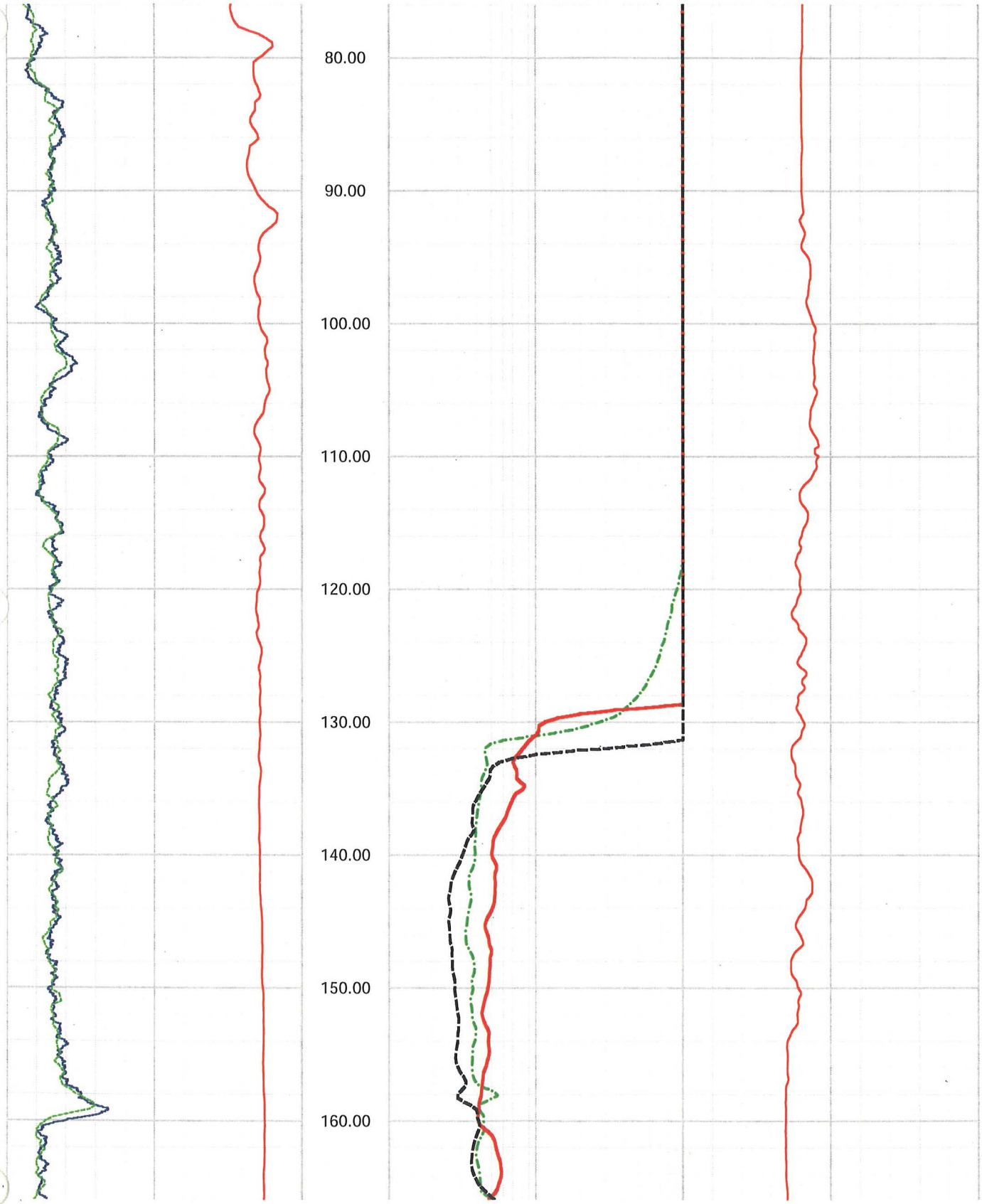
Perm. Da..	Elev	KB	0.00
Log. Da..		DF	0.00
Drill Datum		GL	0.00

DATE	13 Feb 07	15 Dec 06	15 Dec 06
RUN#	4	0	0
TYPE OF LOG	CALIPER		
DEPTH DRILLER	400.00	0.00	0.00
DEPTH LOGGER	400.00	0.00	0.00
LOG DEEPEST	400.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	DRILLING MUD		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP °C	0.00	0.00	0.00
RIG TIME			
RECORDED BY	R. STELLER		
WITNESSED BY			

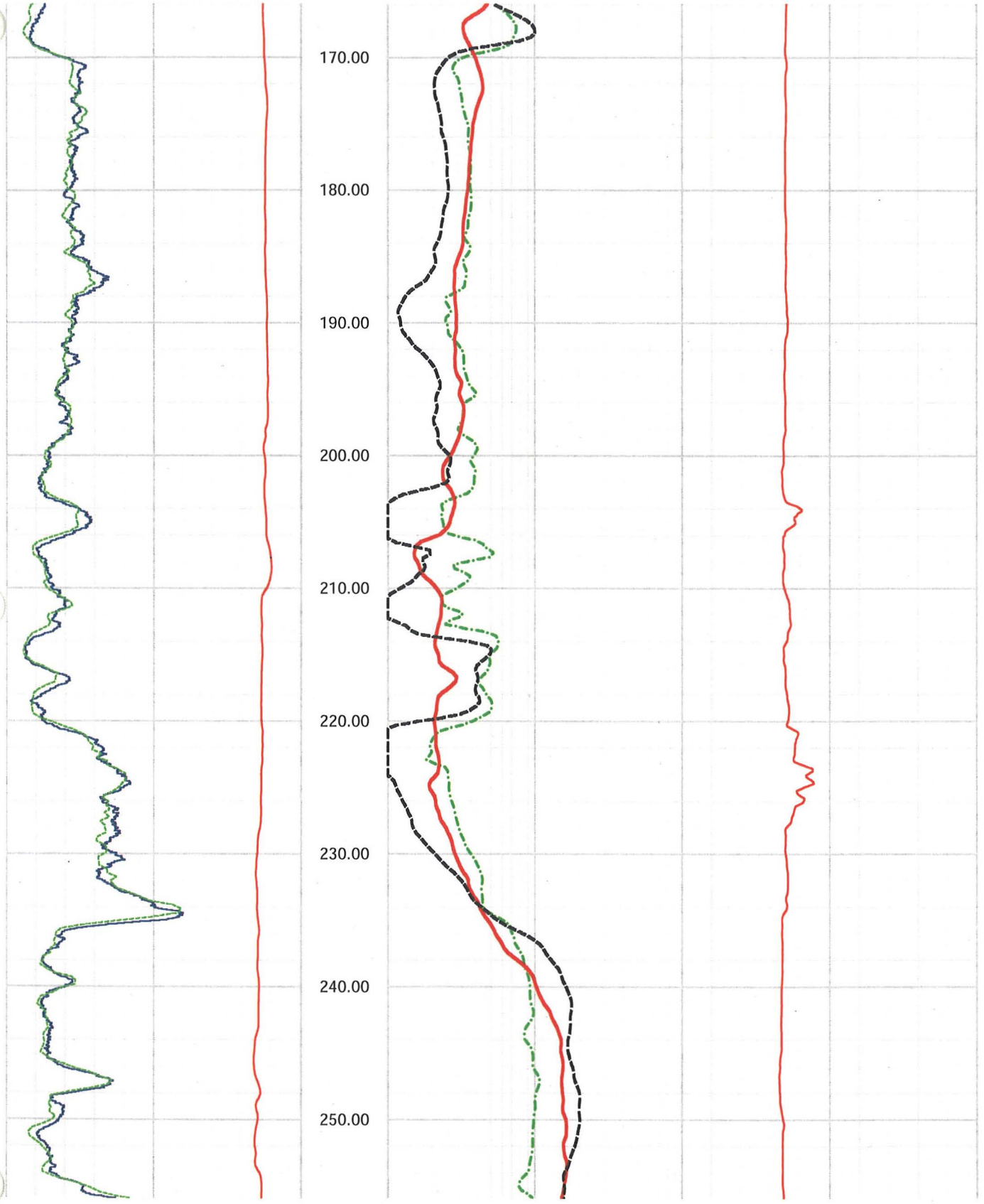
RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00



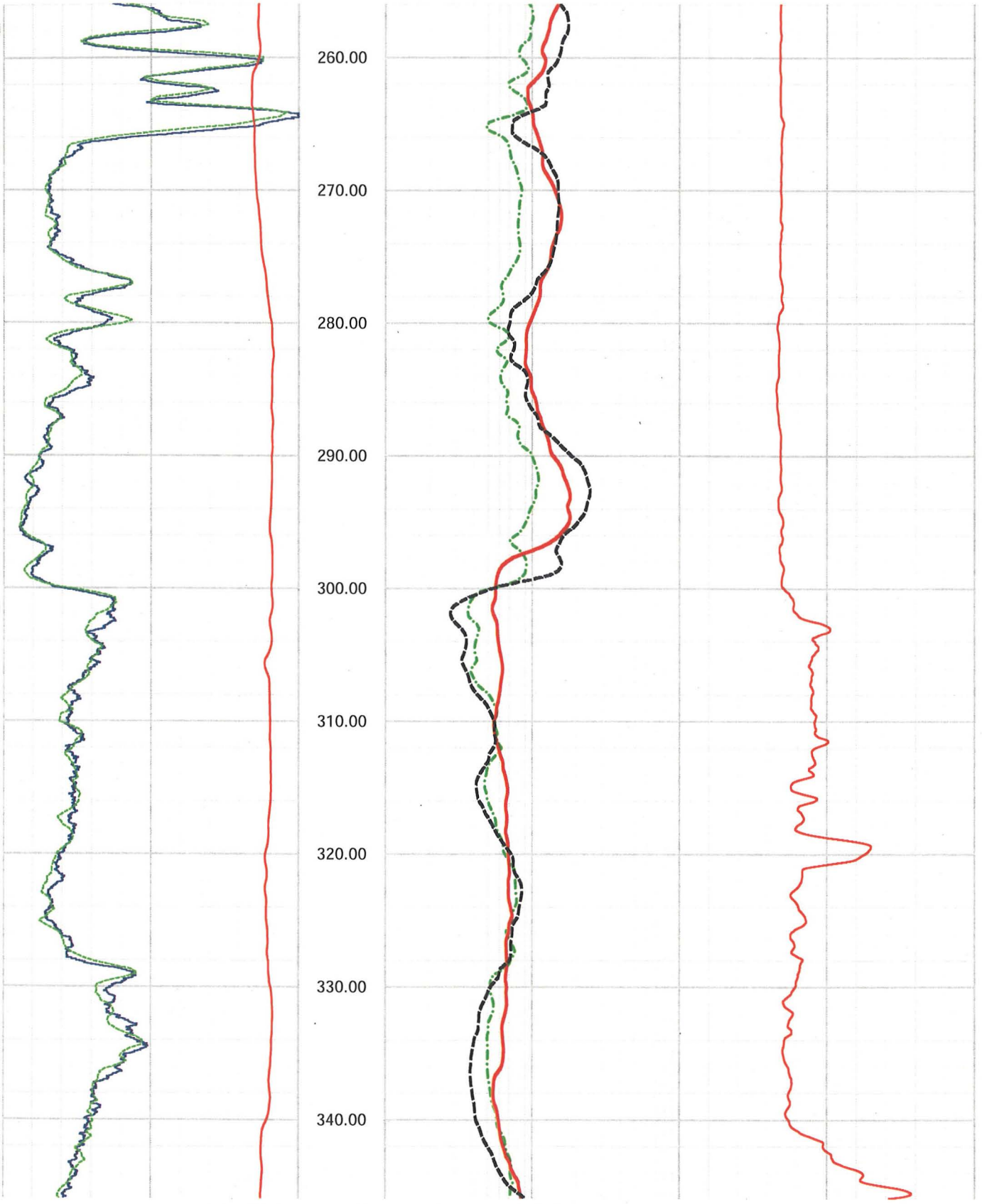
VOGTLE Units 3 & 4 COL Boring B-4001 ELOG, Caliper and Gamma rev 1 Sheet 2 of 6



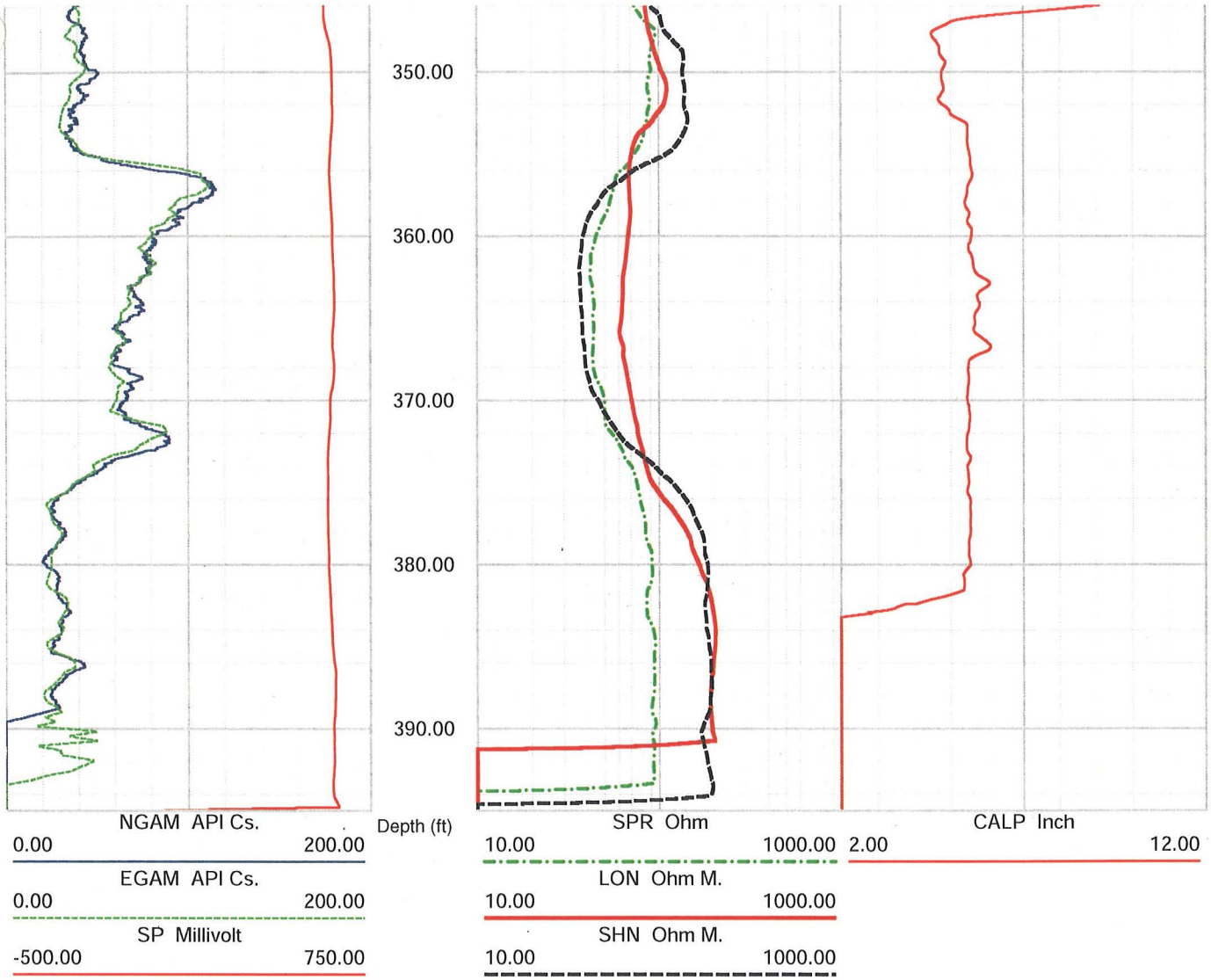
VOGTLE Units 3 & 4 COL Boring B-4001 ELOG, Caliper and Gamma rev 1 Sheet 3 of 6



VOGTLE Units 3 & 4 COL Boring B-4001 ELOG, Caliper and Gamma rev 1 Sheet 4 of 6



VOGTLE Units 3 & 4 COL Boring B-4001 ELOG, Caliper and Gamma rev 1 Sheet 5 of 6



VOGTLE Units 3 & 4 COL Boring B-4001 ELOG, Caliper and Gamma rev 1 Sheet 6 of 6

ROBERTSON GEOLOGGING LIMITED

VOGTLE COL

B4002CALUP01

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Data\PS\Vogtle\B-4002 15 Feb 2007 boring ..

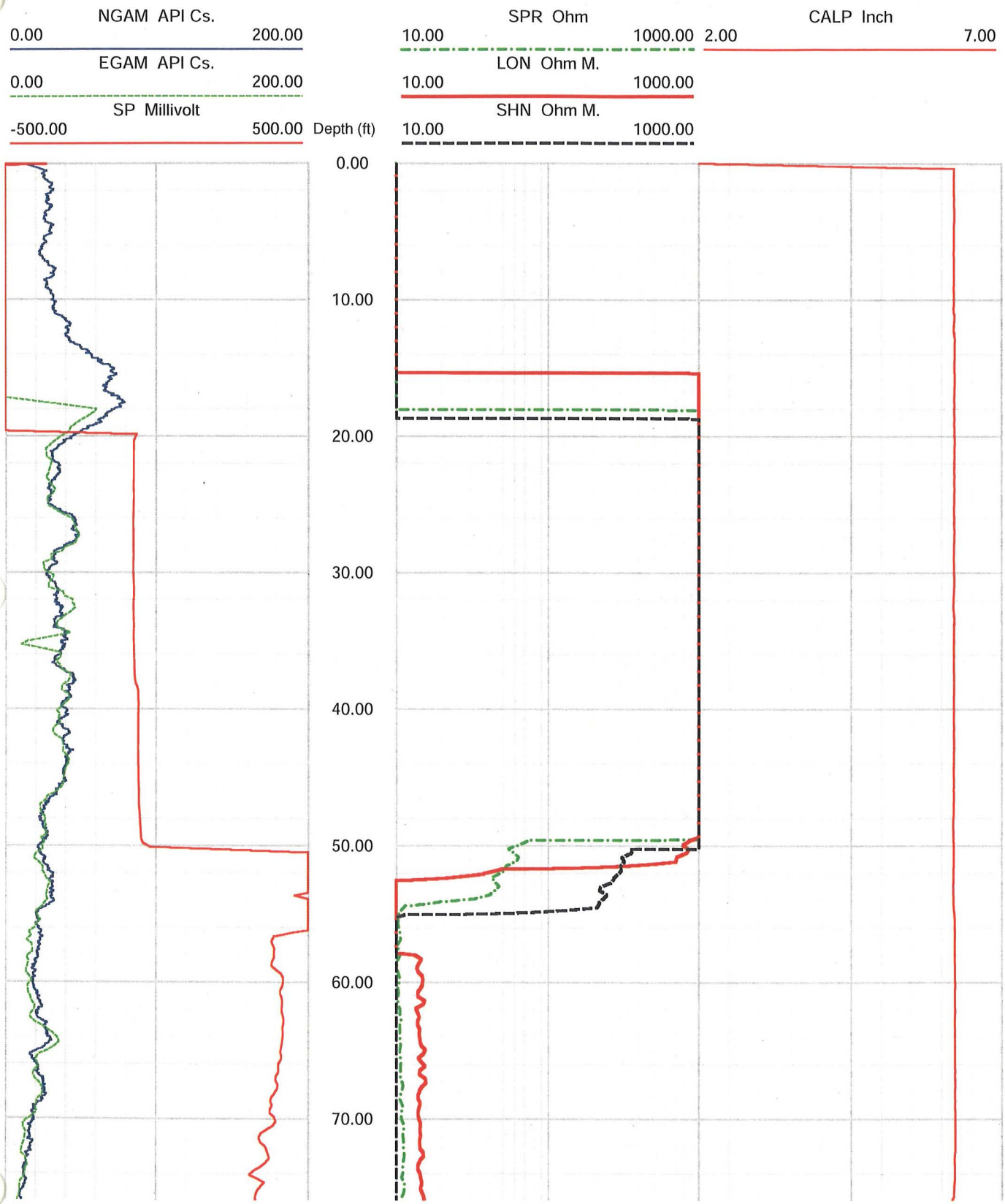
COMPANY	GEOVISION	OTHER SERVICES	
WELL	B-4002		
FIELD			
COUNTRY			
STATE			
COUNTY			
LAT.:			
LONG.:			

Perm. Da..	Elev	KB	0.00
Log. Da..		DF	0.00
Drill Datum		GL	0.00

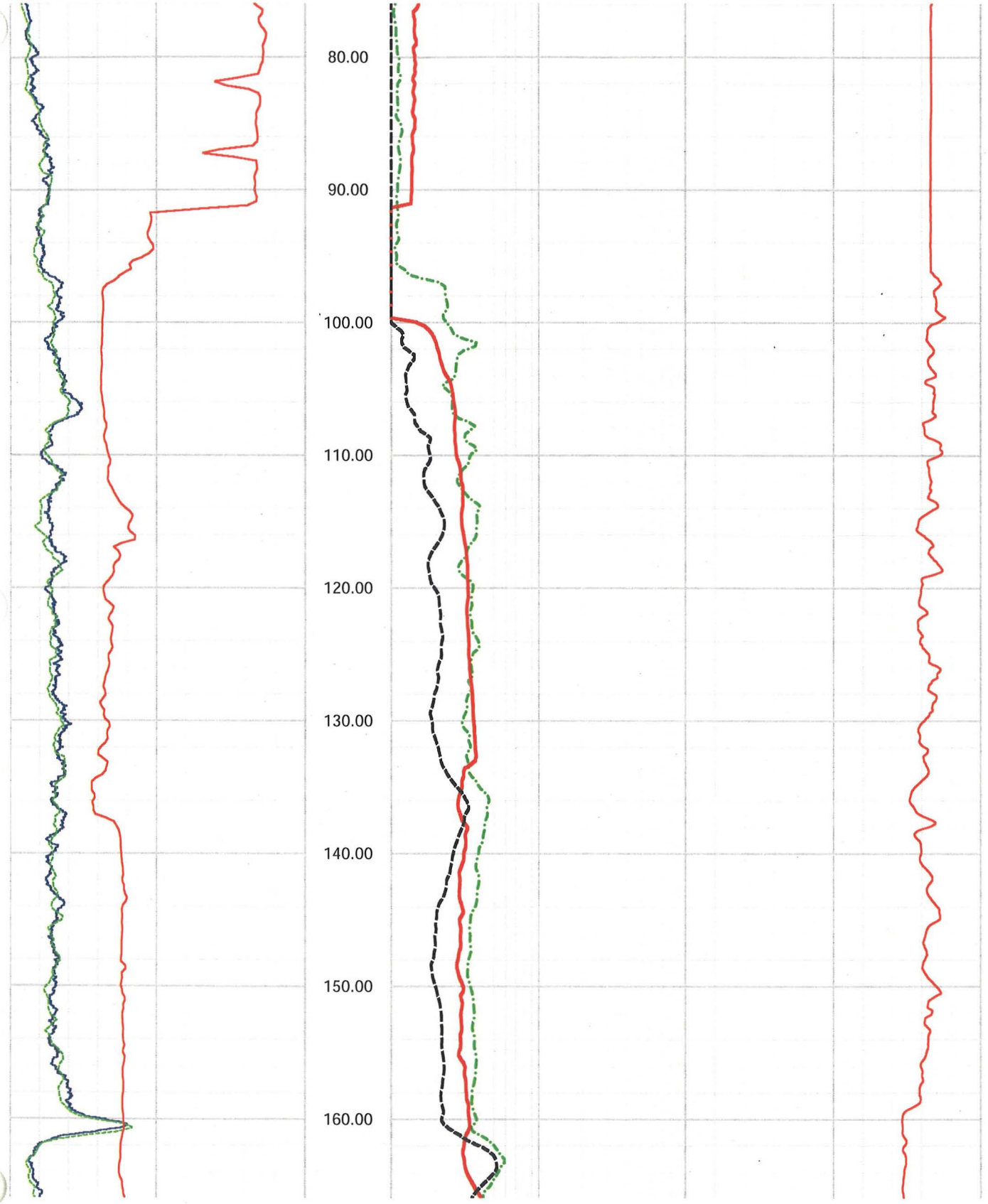
DATE	15 Feb 07	15 Dec 06	15 Dec 06
RUN#	6	0	0
TYPE OF LOG	CALIIPER		
DEPTH DRILLER	250.00	0.00	0.00
DEPTH LOGGER	250.50	0.00	0.00
LOG DEEPEST	247.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	DRILLING MUD		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP °C	0.00	0.00	0.00
RIG TIME			
RECORDED BY	R. STELLER		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

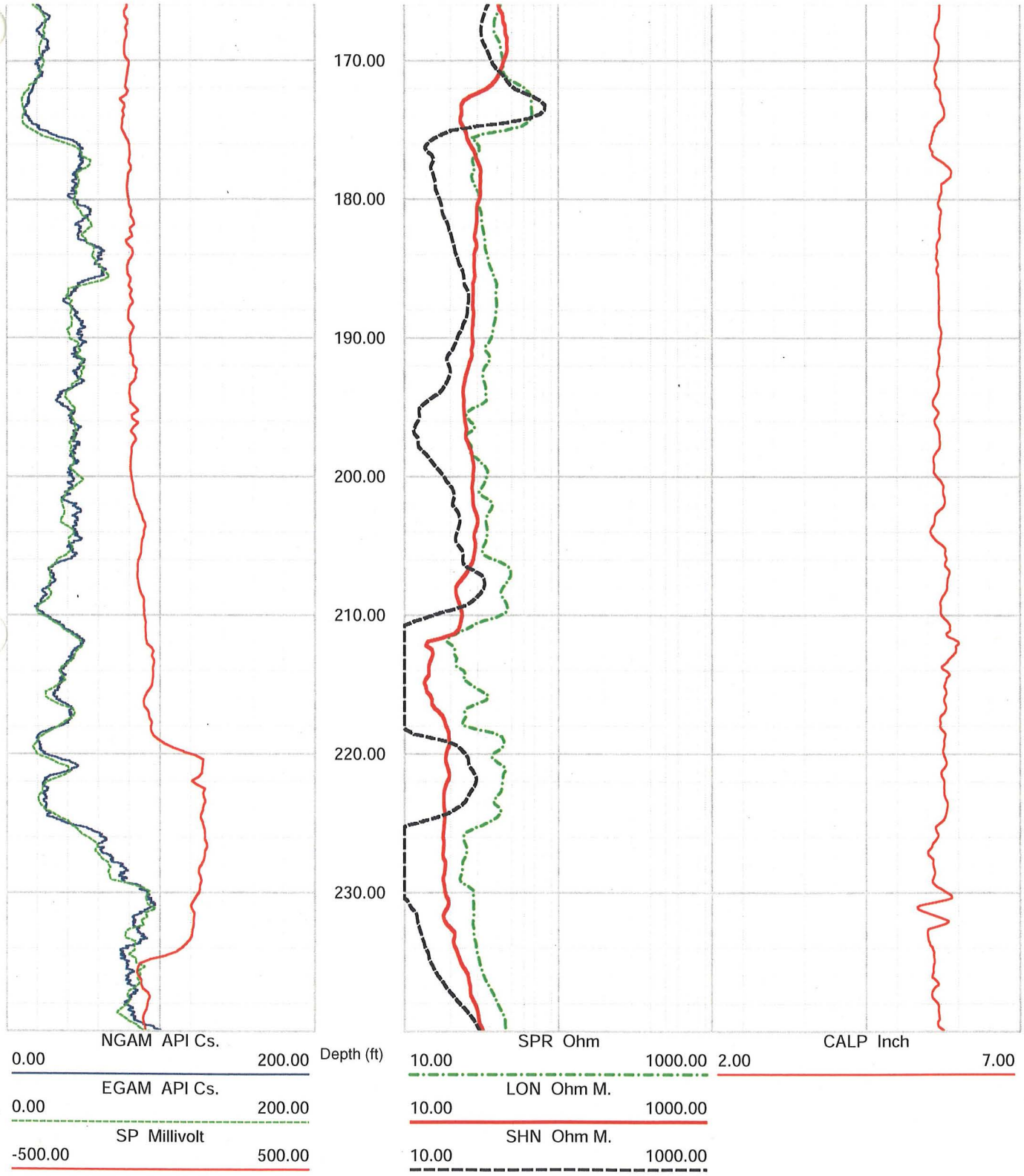
VOGTLE Units 3 & 4 COL Boring B-4002 ELOG, Caliper and Gamma rev 1 Sheet 1 of 4



VOGTLE Units 3 & 4 COL Boring B-4002 ELOG, Caliper and Gamma rev 1 Sheet 2 of 4



VOGTLE Units 3 & 4 COL Boring B-4002 ELOG, Caliper and Gamma rev 1 Sheet 3 of 4



VOGTLE Units 3 & 4 COL Boring B-4002 ELOG, Caliper and Gamma rev 1 Sheet 4 of 4

ROBERTSON GEOLOGGING LIMITED

VOGTLE COL

B4003CALUP01

ROBERTSON GEOLOGGING TECHNOLOGY

REMARKS (C:\Data\PS\Vogtle\B-4003 14 Feb 2007 boring ..

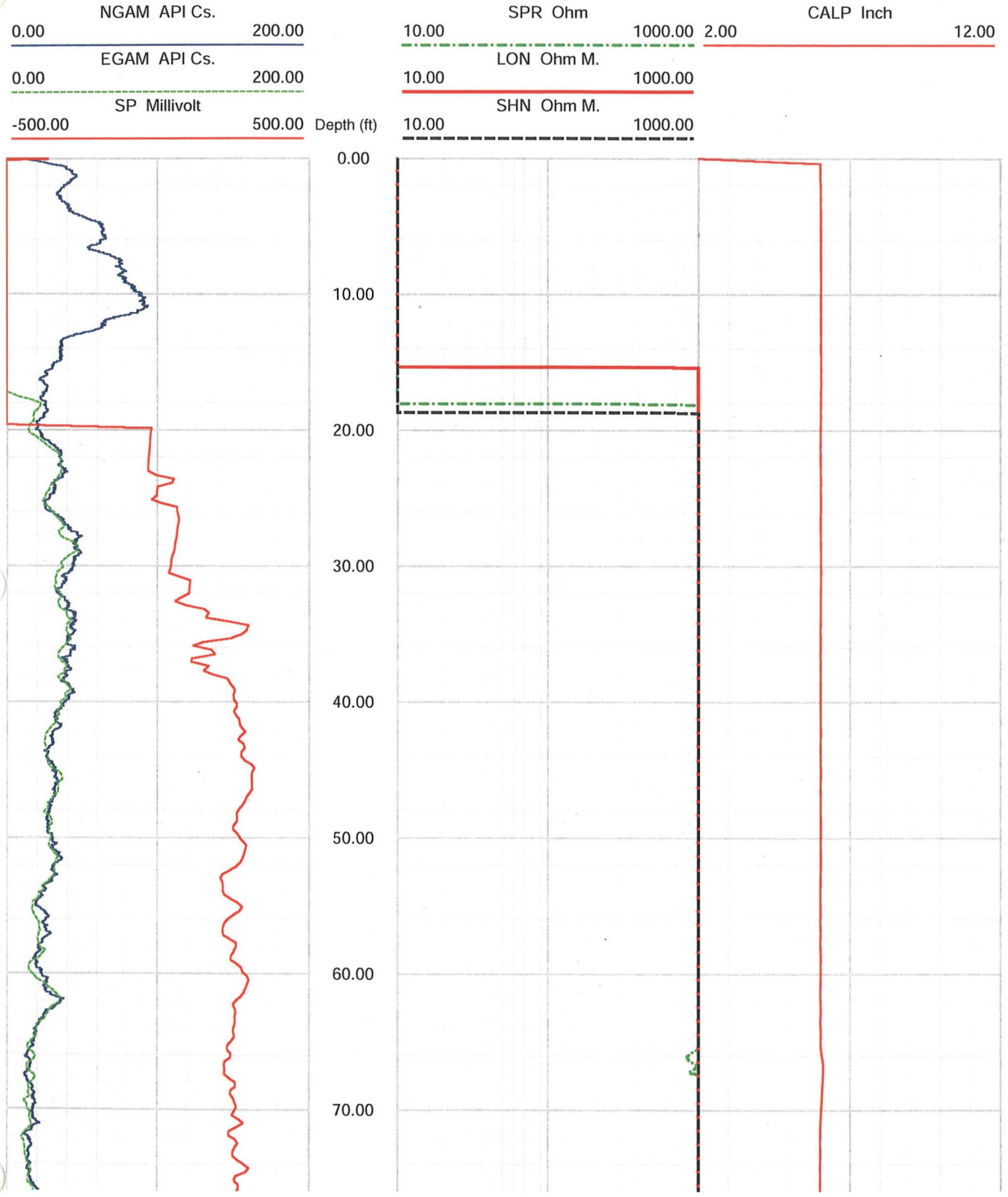
COMPANY	GEOVISION	OTHER SERVICES
WELL	B-4003	
FIELD		
COUNTRY		
STATE		
COUNTY		
LAT.:		
LONG.:		

Perm. Da..	Elev	KB	0.00
Log. Da..		DF	0.00
Drill Datum		GL	0.00

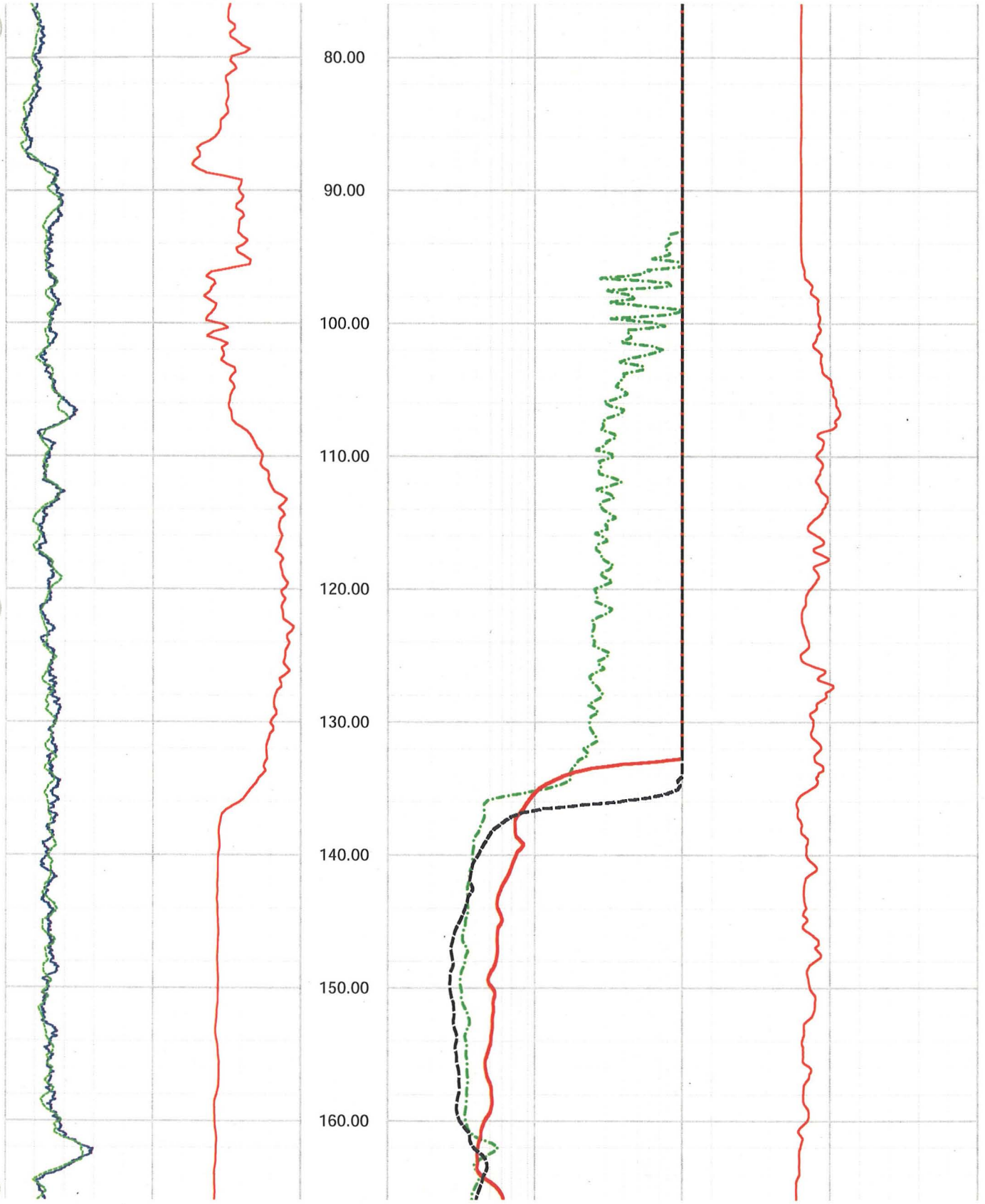
DATE	14 Feb 07	15 Dec 06	15 Dec 06
RUN#	7	0	0
TYPE OF LOG	ELOG		
DEPTH DRILLER	250.00	0.00	0.00
DEPTH LOGGER	250.00	0.00	0.00
LOG DEEPEST	247.00	0.00	0.00
LOG SHALLOW	0.00	0.00	0.00
FLUID IN HOLE	DRILLING MUD		
SALINITY			
DENSITY			
LEVEL			
MAX TEMP °C	0.00	0.00	0.00
RIG TIME			
RECORDED BY	R. STELLER		
WITNESSED BY			

RUN#	BIT RECORD SIZE	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

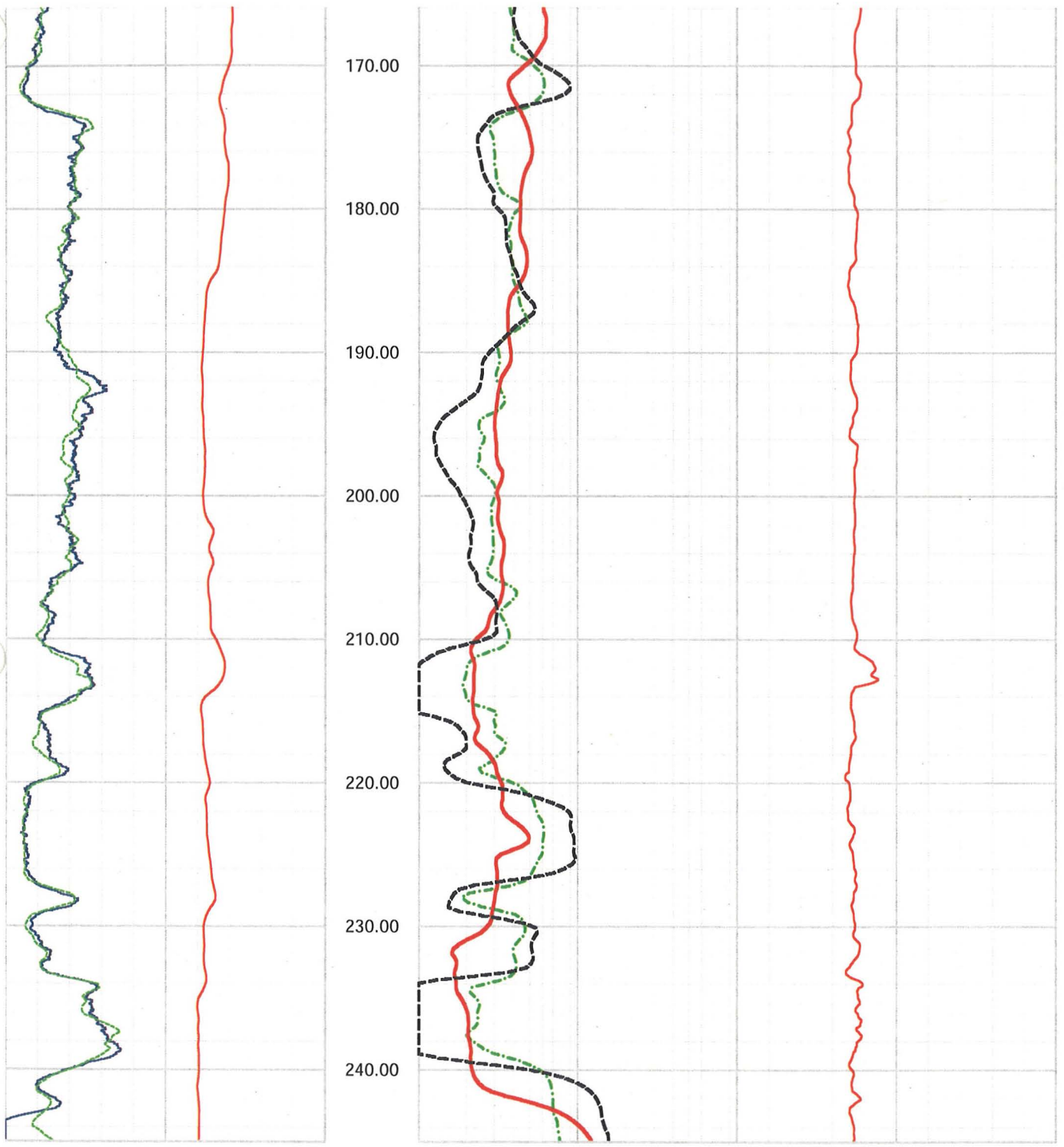
VOGTLE Units 3 & 4 COL Boring B-4003 ELOG, Caliper and Gamma rev 1 Sheet 1 of 5



VOGTLE Units 3 & 4 COL Boring B-4003 ELOG, Caliper and Gamma rev 1 Sheet 2 of 5



VOGTLE Units 3 & 4 COL Boring B-4003 ELOG, Caliper and Gamma rev 1 Sheet 3 of 5



VOGTLE Units 3 & 4 COL Boring B-4003 ELOG, Caliper and Gamma rev 1 Sheet 4 of 5

NGAM API Cs.			SPR Ohm			CALP Inch	
0.00	200.00	Depth (ft)	10.00	1000.00	2.00		12.00
EGAM API Cs.			LON Ohm M.				
0.00	200.00		10.00	1000.00			
SP Millivolt			SHN Ohm M.				
-500.00	500.00		10.00	1000.00			

APPENDIX C

BORING GEOPHYSICAL LOGGING SYSTEMS - NIST TRACEABLE CALIBRATION PROCEDURES AND CALIBRATION RECORDS

CALIBRATION PROCEDURE FOR

GEOVision SEISMIC RECORDER/LOGGER

Reviewed 4/6/06

Objective

The timing/sampling accuracy of seismic recorders or data loggers is required for several GEOVision field procedures including Seismic Refraction, Downhole Seismic Velocity Logging, and P-S Suspension Logging. This procedure describes the method for measuring the timing accuracy of a seismic data logger, such as the OYO Model 170, OYO/Robertson Model 3403, Geometrics Strataview or Geometrics Geode. The objective of this procedure is to verify that the timing accuracy of the recorder is accurate to within 1%.

Frequency of Calibration

The calibration of each GEOVision seismic data logger is twelve (12) months. In the case of rented seismic data loggers, calibration must be performed prior to use.

Test Equipment Required

The following equipment is required. Item #2 must have current NIST traceable calibration.

1. Function generator, Krohn Hite 5400B or equivalent
2. Frequency counter, HP 5315A or equivalent
3. Test cables, from item 1 to item 2, and from item 1 to subject data logger.

Procedure

This procedure is designed to be performed using the accompanying Seismograph Calibration Data Sheet with the same revision number. All data must be entered and the procedure signed by the technician performing the test.

1. Record all identification data on the form provided.
2. Connect function generator to data logger (such as OYO Model 170) using test cable
3. Connect the function generator to the frequency counter using test cable.

4. Set up generator to produce a 100.0 Hz, 0.25 volt (amplitude is approximate, modify as necessary to yield less than full scale waveforms on logger display) peak square wave or sine wave. Verify frequency using the counter and initial space on the data sheet.

5. Initialize data logger and record a data record of at least 0.1 second using a 100 microsecond or less sample period.

6. Measure the recorded square wave frequency by measuring the duration of 9 cycles of data. This measurement can be made using the data logger display device, or by printing out a paper tape. If a paper tape can be printed, the resulting printout must be attached to this procedure. Record the data in the space provided.

7. Repeat steps 5 and 6 three more times using separate files.

Criteria

The duration for 9 cycles in any file must be 90.0 milliseconds plus or minus 0.9 milliseconds, corresponding to an average frequency for the nine cycles of 100.0 Hz plus or minus 1 Hz (obtained by dividing 9 cycles by the duration in milliseconds).

If the results are outside this range, the data logger must be marked with a GEOVision REJECT tag until it can be repaired and retested.

If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

Procedure Approval

Approved by:

John G. Diehl	President
Name	Title
	April 6, 2006
Signature	Date

Client Approval (if required):

Name	Title
Signature	Date

TEST NUMBER
501203

EDISON ESI
A SOUTHERN CALIFORNIA EDISON® Company

Calibration Report

METROLOGY
7300 Fenwick Lane
Westminster, CA 92683
866-723-2257
edisonmetrology.com

GEOVision Geophysical Services
1151 Pomona Road, Unit P
Corona, CA 92882
P.O. No.: 6162-060414-01

Manufacturer:	Oyo	**Calibration Date:**	04/21/2006
Model Number:	3403	**Calibration Due Date:**	04/21/2007
Description:	Unit, Suspension Telemetry,	**Calibration Interval:**	12 Months
Asset Number:	160023	**Condition As Found:**	In Tolerance
Serial Number:	160023	**Condition As Left:**	In Tolerance

Remarks:
The UUT (unit under test) was calibrated using the customer's procedure. The UUT was operated by the customer's personnel and data collection was observed by SCE personnel. The UUT was found to be in tolerance to customer supplied specifications. The reference standards used are in compliance with ISO/IEC 17025:1999 and laboratory accreditation criteria established by NIST/NVLAP under the specific scope of accreditation for lab code 105014-0. Frequency is accredited.
Please see attached data.

Standards Utilized

I.D. No.	Mfg.	Model No.	Description	Cal. Date	Due Date
S1-01252	Hewlett Packard	5335A OPT 010,203040	Counter, Universal	12/09/2005	06/09/2006
S1-03355	Hewlett Packard	3325B OPT 001, 002	Generator, Function, Synthesizer	11/03/2005	11/03/2006
S1-03686	Fluke	910	Standard, Frequency, Controlled, Gps	01/16/2006	01/16/2007

Procedure: Customer
Temperature: 23° C
Humidity: 40% RH
Test No.: 501203

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A	Metrologist	714-895-0714		04-21-06
Name	Title	Phone	Name	Date

This report may not be reproduced, except in full, without written permission of this laboratory. This report may not be used to claim product endorsement by NVLAP or any agency of the US Government. The results stated in this report relate only to the items tested or calibrated. Measurements reported herein are traceable to SI units via national standards maintained by NIST and were performed in compliance with MIL-STD-45662A, ANSI/NCSL Z540-1-1994, 10CFR50, Appendix B, and ISO 9002-94.

GEOVision
geophysical services

SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR:	OYO	MODEL NO.:	3403
SERIAL NO..	160023	CALIBRATION DATE:	4/21/2006
BY:	ROBERT STELLER	DUE DATE:	4/21/2007
COUNTER MFR:	HEWLETT PACKARD	MODEL NO.:	5335A
SERIAL NO.:	2626A09881	CALIBRATION DATE:	12/9/2005
BY:	SCE #S1-01252	DUE DATE:	6/9/2006
FCTN GEN MFR:	HEWLETT PACKARD	MODEL NO.:	3325B
SERIAL NO.:	2847A14447	CALIBRATION DATE:	11/3/2005
BY:	SCE #S1-03355	DUE DATE:	11/3/2006

SYSTEM SETTINGS:

GAIN:	2
FILTER:	10 KHZ
RANGE:	100 MILLISEC, 100 MICROSECOND SAMPLE RATE
DELAY:	0
STACK. 1 (STD)	1
PULSE:	1.6
DISPLAY:	NA
SYSTEM: DATE = CORRECT DATE & TIME	4/21/2006, 11:07AM

PROCEDURE:

SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISK AND PAPER TAPE, IF AVAILABLE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES, IF AVAILABLE, TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0 AS LEFT 100.0

WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	305	100.0	90.0	90.0	90.0	100.0
SQUARF	306	100.0	90.0	90.0	90.0	100.0
SINE	307	100.0	90.0	90.0	90.0	100 0
SINE	308	100.0	90.1	90.0	90.0	100.0

CALIBRATED BY: ROBERT STELLER 4/21/2006 Robt Steller
NAME DATE SIGNATURE

Seismic recorder/Logger Calibration Data Sheet Rev 1.30 4-6-06

TEST NUMBER
501204

EDISON ESI
A SOUTHERN CALIFORNIA EDISON Company

METROLOGY
7300 Fenwick Lane
Westminster, CA 92683
866-723-2257
edisonmetrology.com

Calibration Report

GEOVision Geophysical Services
1151 Pomona Road, Unit P
Corona, CA 92882
P.O. No.: 6162-060414-01

Manufacturer:	Oyo	**Calibration Date:**	04/21/2006
Model Number:	3403	**Calibration Due Date:**	04/21/2007
Description:	Unit, Suspension Telemetry,	**Calibration Interval:**	12 Months
Asset Number:	160024	**Condition As Found:**	In Tolerance
Serial Number:	160024	**Condition As Left:**	In Tolerance

Remarks:
The UUT (unit under test) was calibrated using the customer's procedure. The UUT was operated by the customer's personnel and data collection was observed by SCE personnel. The UUT was found to be in tolerance to customer supplied specifications. The reference standards used are in compliance with ISO/IEC 17025:1999 and laboratory accreditation criteria established by NIST/NVLAP under the specific scope of accreditation for lab code 105014-0. Frequency is accredited.
Please see attached data.

Standards Utilized

I.D. No.	Mfg.	Model No.	Description	Cal. Date	Due Date
S1-01252	Hewlett Packard	5335A OPT 010,203040	Counter, Universal	12/09/2005	06/09/2006
S1-03355	Hewlett Packard	3325B OPT 001, 002	Generator, Function, Synthesizer	11/03/2005	11/03/2006
S1-03686	Fluke	910	Standard, Frequency, Controlled, Gps	01/16/2006	01/16/2007

Procedure: Customer
Temperature: 23° C
Humidity: 40% RH
Test No.: 501204

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A CAB	Metrologist	714-895-0714		04-21-06
Name	Title	Phone	Name	Date

This report may not be reproduced, except in full, without written permission of this laboratory. This report may not be used to claim product endorsement by NVLAP or any agency of the US Government. The results stated in this report relate only to the items tested or calibrated. Measurements reported herein are traceable to SI units via national standards maintained by NIST and were performed in compliance with MIL-STD-45662A, ANSI/NCSL Z540-1-1994, 10CFR50, Appendix B, and ISO 9002-94.

GEOVision
geophysical services

SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR:	OYO	MODEL NO.:	3403
SERIAL NO.:	160024	CALIBRATION DATE:	4/21/2006
BY:	ROBERT STELLER	DUE DATE:	4/21/2007
COUNTER MFR:	HEWLETT PACKARD	MODEL NO.:	5335A
SERIAL NO.:	2626A09881	CALIBRATION DATE:	12/9/2005
BY:	SCE #S1-01252	DUE DATE:	6/9/2006
FCTN GEN MFR:	HEWLETT PACKARD	MODEL NO.:	3325B
SERIAL NO.:	2847A14447	CALIBRATION DATE:	11/3/2005
BY:	SCE #S1-03355	DUE DATE:	11/3/2006

SYSTEM SETTINGS:

GAIN:	2
FILTER.	10 KHZ
RANGE:	100 MILLISEC, 100 MICROSECOND SAMPLE RATE
DELAY:	0
STACK: 1 (STD)	1
PULSE:	1.6
DISPLAY:	NA
SYSTEM: DATE = CORRECT DATE & TIME	4/21/2006, 11:30AM

PROCEDURE:
SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISK AND PAPER TAPE, IF AVAILABLE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES, IF AVAILABLE, TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0 AS LEFT 100.0

WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	401	100.0	90.0	90.0	90.0	100.0
SQUARE	402	100.0	90.0	90.0	90.0	100.0
SINE	403	100.0	89.9	90.0	90.1	100.0
SINE	404	100.0	90.0	90.1	90.1	99.9

CALIBRATED BY: ROBERT STELLER 4/21/2006 Rob Steller
NAME DATE SIGNATURE

Seismic recorder/Logger Calibration Data Sheet Rev 1 30 4-6-06

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:1999

NVLAP LAB CODE: 105014-0

Southern California Edison Company

Westminster, CA

is recognized by the National Voluntary Laboratory Accreditation Program for conformance with criteria set forth in NIST Handbook 150:2001 and all requirements of ISO/IEC 17025:1999.
Accreditation is granted for specific services, listed on the Scope of Accreditation, for:

CALIBRATION LABORATORIES

2006-04-01 through 2007-03-31

Effective dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2005-05-19)

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999

Southern California Edison Company
7300 Fenwick Lane
Westminster, CA 92683
Ms. Jennifer E. Smith
Phone: 714-895-0133 Fax: 714-895-0781
E-mail: Jennifer.Smith@sce.com
URL: http://www.edisonmetrology.com

CALIBRATION LABORATORIES **NVLAP LAB CODE 105014-0**

NVLAP Code: 20/A01 ANSI/NCSL Z540-1-1994; Part 1 Compliant

DIMENSIONAL

NVLAP Code: 20/D03
Gage Blocks

Nominal Length in in	*Best Uncertainty (±) in µin* [note 1]
0.01 to < 0.05	1.9
0.05 to < 0.1	1.7
0.1 to < 1.0	1.2
1.0	1.4
2.0	1.8
3.0	2.2
4.0	2.9
5.0	5.4
6.0	5.6
7.0	5.8
8.0	6.0
10.0	6.8
12.0	7.2
16.0	8.1
20.0	9.4

2006-04-01 through 2007-03-31
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Nominal Length in mm	*Best Uncertainty (±) in nm* [note 1]
0.5 to < 1.0	52
1.0 to < 2.5	44
2.5 to < 25.0	39
25.0	44
50.0	47
75.0	60
100.0	80

NVLAP Code: 20/D11
Spherical Diameter; Ring Gages

Range in inches	*Best Uncertainty (±) in µin* [note 1]	*Remarks*
0.040 to 0.825	6	Comparison to gage blocks
> 0.825 to 1.510	7	Comparison to gage blocks
> 1.510 to 2.510	8	Comparison to gage blocks
> 2.510 to 4.510	12	Comparison to gage blocks
> 4.510 to 6.510	14	Comparison to gage blocks
> 6.510 to 9.010	16	Comparison to gage blocks
> 9.010 to 12.010	19	Comparison to gage blocks
> 12.010 to 13.25	31	Comparison to gage blocks

ELECTROMAGNETICS - DC/LOW FREQUENCY

NVLAP Code: 20/E02
AC Current

Range	*Best Uncertainty (±) in ppm* [note 1] *Frequency in Hz*			
	10	*20*	*40*	*400 to 10 k*
10 mA	270	199	127	116
20 mA	270	199	127	116
30 mA	270	199	127	116
50 mA	286	208	141	130
100 mA	270	199	127	116

2006-04-01 through 2007-03-31

Effective dates

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National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 105014-0**

200 mA	270	199	127	116	
300 mA	270	199	127	116	
500 mA	270	208	141	130	

	10	*20*	*40*	*400 to 5 k*	*10 k*
1A	270	199	127	116	130

	10	*20*	*40*	*400 to 10 k*
2A	271	200	129	118
3A	271	200	129	118

	10	*20*	*40*	*400 to 5 k*	*10 k*
5A	286	209	142	132	148

	10	*20*	*40*	*400*	*1 k*	*5 k*	*10 k*
10A	273	233	132	121	121	143	143

	400 to 10 k
20A	144

NVLAP Code: 20/E05
DC Current

Range	*Best Uncertainty (±) in ppm* [note 1]
10 nA	2.9
100 nA	2.3
1 µA	2.0
10 µA	2.0
100 µA	2.0
1 mA	1.9
10 mA	1.9
100 mA	1.9
1 A	10.4
10 A	10.4
30 A	20.6

2006-04-01 through 2007-03-31

Effective dates

For the National Institute of Standards and Technology

National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 105014-0**

DC Resistance

Nominal Value in Ω	*Best Uncertainty (±) in ppm* [note 1]	*Remarks*
100 μ	8.20	Automated DC Resistance Calibration System
1 m	5.50	Automated DC Resistance Calibration System
10 m	3.70	Automated DC Resistance Calibration System
100 m	2.10	Automated DC Resistance Calibration System
1	0.40	Automated DC Resistance Calibration System
10	0.40	Automated DC Resistance Calibration System
25	0.50	Automated DC Resistance Calibration System
100	0.50	Automated DC Resistance Calibration System
1 k	0.50	Automated DC Resistance Calibration System
10 k	0.50	Automated DC Resistance Calibration System
100 k	1.50	Automated DC Resistance Calibration System
1 M	2.30	Automated DC Resistance Calibration System
10 M	3.30	Automated DC Resistance Calibration System
100 M	4.00	Automated DC Resistance Calibration System

NVLAP Code: 20/E06
DC Voltage

Range	*Best Uncertainty (±) in ppm* [notes 1,2]	*Remarks*
1.018 V	0.80	Automated DC Calibration System
10.00 V	0.20	Automated DC Calibration System
1.000 V	0.80	Automated DC Calibration System
1 mV to 100 mV	1.3 [note 6]	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage
100 mV	0.7	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage
1.0 V	0.3	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage

2006-04-01 through 2007-03-31
Effective dates

For the National Institute of Standards and Technology

National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 105014-0**

10.0 V	0.3	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage
20.0 V	0.5	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage
100.0 V	0.3	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage
1000.0 V	0.7	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage

NVLAP Code: 20/E09
LF AC Voltage

Best Uncertainty (±) in ppm *notes 1,3,4*
Frequency in Hz

Range	*10*	*20*	*40*	*100*	*1k*	*10k*	*20k*	*50k*	*100k*	*300k*	*500k*	*800k*	*1M*
2 mV	448	912	889	969	379	865	1073	405	1131	1265	2116	2595	2938
10 mV	119	230	102	177	245	169	180	220	343	243	676	425	488
20 mV	83	70	67	67	66	76	76	165	261	361	521	372	442
30 mV	134	111	80	78	62	63	71	133	219	345	535	688	791
100 mV	36	72	23	42	34	35	34	43	77	169	220	287	225
190 mV	36	31	22	20	21	26	21	42	80	136	124	264	215
300 mV	46	61	30	32	34	19	28	36	59	116	143	189	205
1 V	120	36	18	10	13	12	11	25	14	87	102	104	98
1.9 V	36	22	22	9	9	9	8	18	11	94	101	85	89
3 V	26	34	25	17	14	14	13	27	14	100	108	95	97
10 V	20	42	19	10	10	9	10	11	16	80	100	111	100
19 V	26	23	20	11	9	9	10	11	16	98	109	82	82
30 V	30	37	26	19	15	16	19	37	44	118			
100 V	140	46	20	16	15	19	11	40	22				
190 V	47	27	20	20	13	13	13	41	26				
300 V			37	29	18	27	22	29	46				
500 V			33	25	17	20	19	38	52				

2006-04-01 through 2007-03-31
Effective dates

For the National Institute of Standards and Technology

National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 105014-0**

700 V	29	23	18	17	19	44	54
1000 V	22	23	21	19	22		

TIME AND FREQUENCY

NVLAP Code: 20/F01
Frequency Dissemination

Range	*Best Uncertainty (±)* [note 1]	*Remarks*
10 MHz	1.2×10^{-12}	GPS Receiver

MECHANICAL

NVLAP Code: 20/M05
Flow Rate

Nominal Flow Rate	*Best Uncertainty (±) in percent* [notes 1, 5]
(0.8 to 30) L/s	0.3
(0.1 to 800) mL/s	0.4
(0.006 to 0.1) mL/s	0.7

NVLAP Code: 20/M06
Force

Nominal Force in lb	*Best Uncertainty (±)* [note 1]	*Remarks*
2 to 200	0.025 %	Dead Weight
> 200 to 300	0.086 lb	Proving Ring
> 300 to 500	0.14 lb	Proving Ring
> 500 to 1000	0.28 lb	Proving Ring
> 1000 to 2000	0.55 lb	Proving Ring
> 2000 to 5000	0.84 lb	Proving Ring
> 5000 to 10 000	1.7 lb	Proving Ring
> 10 000 to 20 000	5.5 lb	Proving Ring
> 20 000 to 35 000	5.8 lb	Proving Ring
> 35 000 to 50 000	13 lb	Proving Ring

2006-04-01 through 2007-03-31
Effective dates

For the National Institute of Standards and Technology

National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 105014-0**

> 50 000 to 60 000	16 lb	Proving Ring
> 60 000 to 100 000	26 lb	Proving Ring
> 100 000 to 300 000	113 lb	Proving Ring

NVLAP Code: 20/M08
Mass

Range	*Best Uncertainty (±) in mg* [notes 1,2]	*Remarks*
10 kg	2.3	Echelon I
5 kg	0.93	Echelon I
3 kg	0.65	Echelon I
2 kg	0.43	Echelon I
1 kg	0.052	Echelon I
500 g	0.043	Echelon I
300 g	0.041	Echelon I
200 g	0.034	Echelon I
100 g	0.020	Echelon I
50 g	0.013	Echelon I
30 g	0.013	Echelon I
20 g	0.0095	Echelon I
10 g	0.0073	Echelon I
5 g	0.0048	Echelon I
3 g	0.0038	Echelon I
2 g	0.0029	Echelon I
1 g	0.0030	Echelon I
500 mg	0.0017	Echelon I
300 mg	0.0013	Echelon I
200 mg	0.0010	Echelon I
100 mg	0.0009	Echelon I
50 mg	0.0007	Echelon I
30 mg	0.0007	Echelon I
20 mg	0.0005	Echelon I
10 mg	0.0005	Echelon I
5 mg	0.0006	Echelon I
3 mg	0.0006	Echelon I

2006-04-01 through 2007-03-31
Effective dates

C D Larson
For the National Institute of Standards and Technology

National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 105014-0**

2 mg	0.0005	Echelon I
1 mg	0.0005	Echelon I
30 kg	56	Echelon II
20 kg	22	Echelon II

THERMODYNAMIC

NVLAP Code: 20/T05
Pressure

Range	*Best Uncertainty (±) in ppm* [note 1]	*Remarks*
> 1.5 to 50	20	Gas
> 50 to 1450	45	Gas
> 1450 to 16 000	90	Gas
> 1000 to 10 000	60	Oil
> 10 000 to 30 000	110	Oil
> 30 000 to 50 000	210	Oil

1. Represents an expanded uncertainty using a coverage factor, k = 2, at an approximate level of confidence of 95 %.
2. Approximate value. Actual value determined by the test statistics.
3. All ACV measurements performed via AC/DC transfer system.
4. Uncertainties listed are representative of the laboratory's accredited capabilities within the stated ranges. Accreditation is not limited to only those fixed values shown.
5. Dependent upon principle of operation of device being calibrated and its performance relative to standards at the time of the test.
6. The equation: uncert. = $(A + B/mVDC^2)^{0.5}$ (where A = 0.16 and B = 0.013333) is provided in order for potential customers to calculate approximate uncertainties for values down to 1 mV. Example: uncertainty at 1 mVDC would calculate to approximately ±115.47 ppm.
7. The laboratory maintains Echelon II capability for ranges 20 kg to 1 mg and separate Echelon III for all ranges.
8. Avoirdupois mass calibration services are available by comparison to equivalent metric standards. Uncertainties may be appropriately larger.

2006-04-01 through 2007-03-31

Effective dates

For the National Institute of Standards and Technology

Calibration Report

MICRO PRECISION CALIBRATION INC.
12686 Hoover Street, Garden Grove, CA 92841
Ph. (714) 901-5659 Fax (714) 901-5649

Customer: **GEOVISION**
Corona CA 92882
Account#: **15214**
Cust.PO#:
Page 1 of 2

MPC Ctrl#: AM6766
Report#: **199974**
Print Date: **041006**
MPC Job#: **L25384**

Instrument: **Caliper Calibration Plate**

Mfg: **Robertson Geo Logging**
Model: **N/A**
Size:
Res.:

Serial#: **201**
Cust Ctrl#:
Location:
Department:

Work Performed: **Inspected, cleaned, and calibrated.**
Parts Replaced: **None**

Calibration Condition as Received: **In tolerance**
Calibration Condition as Returned: **In tolerance**

Functions/Parameters Tested

Actual Values (inch)	As Measured
1.969	1.965
3.937	3.939
8.000	7.995
12.00	11.9965

Unless noted otherwise, Pass/Fail criteria is based on published manufacturer specifications and, unless noted otherwise, this instrument meets these specifications.
Services provided comply with ISO 17025:1999, ISO 9001:2000, MPC QM rev.3, MPC CSD rev.2 and customer purchase order requirements as required.

Calibration standards used for performance testing:

MPC#	Instrument	Due Date	Traceability
K3263	Pratt & Whitney C Super Micrometer	060706	192068
I2111	Mitutoyo 516-126 Gage Block Set	082406	397060

Environmental: 69 Deg / 40% Rh
Accuracy Ratio: 4:1
Cal Procedure: 33K6-4-552-1
Technician: CHRIS SPANGLER

Cal Int.: **12**
Cal Date: **040606**
Due Date: **040607**
Quality Approval: QC 32

Form Cert 04-25-05

All standards used are either traceable to the National Institute of Standards and Technology or have intrinsic accuracy. All services performed have used proper manufacturer and industrial service techniques and are warranted for no less than (30) days. This report may not be reproduced in part without written permission of Micro Precision's Quality Assurance Manager.

GEOVision Borehole Geophysics depth wheel verification

Performed by Robert Steller on September 23, 2006

	Depth reading in #1	Depth reading out	Depth reading in #2
Depth wheel S/N 101 500 pulse/revolution Circumference = 983mm (3225.07 millifeet)	100.1 feet (30.51 m)	99.95 feet (30.46 m)	100.05 feet (30.50 m)
Depth wheel S/N 102 500 pulse/revolution Circumference = 994mm (3261.15 millifeet)	100.00 feet (30.48) m	100.05 feet (30.50 m)	100.00 feet (30.48) m
Aries winch 200 pulse/revolution Circumference = 305.9mm (1003.51 millifeet)	100.05 feet (30.50) m	100.05 feet (30.50 m)	100.00 feet (30.48) m
Depth wheel S/N 103 500 pulse/revolution Circumference = 1000mm (3.281 feet)			
Comprobe winch 500 pulse/revolution Circumference = 1000mm (3.281 feet)			

All measurements taken with a Stanley 100ft flexible stainless steel tape model number 34-130, and a Keeson 300 foot fiberglass tape, both marked in feet, inches and 1/8ths of inches. Enough cable was spooled off of the winch to allow the cable and tape measures to be laid flat on the parking lot surface side-by-side. A permanent marker was used to mark a 100.0 foot interval on the cable, and the marks were also tagged with electrical tape for visibility. The cable was then spooled back onto the winch. When the first mark was at the top of the measuring wheel, a matching permanent mark was placed, and the recording system (Robertson Micrologger) was set to 0.0 feet depth. The cable was spooled in to the second mark, and the distance was recorded. The recording system was set to 0.0 feet again, and the cable spooled out to the first mark again, and the distance was recorded. The process was repeated one more time to spool the cable back onto the winch, and the distance was recorded.

Estimated accuracy is of these measurements is +/- 0.1 foot or +/- 0.03m.

GEOVision Suspension PS probe Receiver 1–Receiver 2 (R1-R2) spacing verification

Performed by Robert Steller on September 23, 2006

	R2 center to R1 center hanging dry	R2 center to R1 center hanging submerged	R1 bottom to source center hanging submerged with 1m isolation tube S/N 280068
Receiver S/N 30086	40.2in 1.02m	40.0in 1.02m	76.0in 1.93m
Receiver S/N 20042	39.8in 1.01m	39.6in 1.01m	75.7in 1.92m
Receiver S/N 12008	40.2in 1.02m	40.0in 1.02m	76.0in 1.93m

All measurements taken with a Lufkin 3.7m flexible steel tape model number HV1034DM, marked in mm and 100th of feet. Probe suspended in 3-inch diameter clear PVC pipe, using chain clamp placed between bottom and center of Receiver 2 hard section (See Figure). Probe "bounced" to establish unrestricted hanging length before measurement. Probe allowed to relax for 5 minutes prior to each measurement. Water level set to submerge bottom of Receiver 2 hard section.. Estimated accuracy due to hysterisis in rubber section approximately +/- 0.01' or +/- 0.003m.

APPENDIX D

BORING GEOPHYSICAL LOGGING FIELD DATA LOGS

GEOVision
geophysical services

B-3001 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: VOGTLE COL DATE: 2/12, 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: MATT COOKE CELL _____ PHONE: 803-261-5792

BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 420' ; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 420'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 95 ON 2/12/07; NO ____
DEPTH TO BEDROCK: NA 275' ON 2/13/07
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;

LOGGING CREW: R. STELLER

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
ELOG TEST	B3001ELOGTEST01	Ø	2/12/07	09:30 - 09:33
ELOG/GAMMA	B3001ELOGUP01	262.0 - 20.0'	"	10:44 - 11:08
SUSPENSION PS	B301-001 → 086.006	98.4 - 237.9'	"	15:30 - 16:20
CALIPER TEST	B3001CALTEST01	Ø	"	16:43 - 16:46
CALIPER/GAMMA	B3001CALUP01	245.0 - Ø	"	16:55 - 17:22
CALIPER TEST	B3001CALTEST02	Ø	"	17:23 - 17:28
DEVIATION	B3001AMUP01	247.0 - Ø	"	17:52 - 18:12
ELOG TEST	B3001ELOGTEST02	Ø	2/13/07	13:38 - 13:41
ELOG/GAMMA	B3001ELOGUP02	405.0 - 240.0'	"	13:56 - 14:21
ELOG/GAMMA	B3001ELOGUP03	404.0 - 240.0'	"	14:26 - 14:44
SUSPENSION PS	B301-188 → 257.006	277.2 - 394.0'	"	15:09 - 15:47
CALIPER TEST	B3001CALTEST03	Ø	"	16:06 - 16:09
CALIPER/GAMMA	B3001CALUP02	400.0' - 240.0'	"	16:20 - 16:37
CALIPER TEST	B3001CALTEST04	Ø	"	16:45 - 16:48
DEVIATION	B3001AMUP02	402.0 - 240.0'	"	17:07 - 17:18

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B-3001 ELOG FIELD LOG

SITE: VOGTLE COL DATE: 2/12/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL CONTACT: MATT COOKE
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 420 ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 420
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 95' 6" STEEL ; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ½ HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:20
ARRIVED ON SITE: 08:00
STANDBY TIME: CAUSE:
LOGGING STARTED: 09:30 LOGGING COMPLETED: 11:08

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SITE:_VOGTLE COL B-3001 DATE: 2/12/07
CLIENT:_MACTEC JOB:_6517
AUTHOR:_R. STELLER PAGE 2 OF 2

WINCH: COMPROBE_____ SILVER ✓ OYO_____ OTHER_____
MICROLOGGER ~~5310~~ 5301 ✓ 5772_____ OTHER_____
ELOG PROBE 5490 ✓ OTHER_____

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)	+ 32.8'	
MINUS CASING STICK-UP	- 2.3'	
DEPTH REF. OFFSET AT START	38.7'	
DEPTH REF. OFFSET AT END	38.35' Run 1	
AFTER SURVEY DEPTH ERROR	.35	LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3001ELOGTEST01	Ø	9:30	Ø	9:33
B3001ELOG ul 01	262.0	10:44	20.0	11:08

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

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GEOVision geophysical services

P-S SUSPENSION VELOCITY FIELD LOG

SITE: VOGTLE COL B-3001 DATE: 2/12/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 6

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 420' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 420'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 95' ; NO 6" STEEL
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: 270
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: 270' TIME SINCE LAST CIRCULATION: 1/2 HR

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SITE: VOGTLE COL B-3001 DATE: 2/12/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 6

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:20
ARRIVED ON SITE: 08:00
STANDBY TIME: CAUSE:
LOGGING STARTED: 15:30 LOGGING COMPLETED: 16:20
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOBILIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES ✓; NO ____; STORED WITH NEW ____

WINCH	COMPROBE ☐		GREY ☐	OYO ☐	RG ☐	OTH ☑		
INSTRUMENT	OYO 12004 ☐	15014 ☐	19029 ☐		RG 160023 ☐	160024 ☑		
RECEIVER S/N	12008 ☐	20042 ☐	26066 ☐	11001 ☐	23053 ☐	30086 ☑		

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: DEPTH ZERO = 2.5m - .71 m = 1.79m.
EXIT = 1.79m

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3001 DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 3 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56			
2.5	8.20			
3.0	9.84			
3.5	11.48			
4.0	13.12			
4.5	14.76			
5.0	16.40			
5.5	18.04			
6.0	19.69			
6.5	21.33			
7.0	22.97			
7.5	24.61			
8.0	26.25			
8.5	27.89			
9.0	29.53			
9.5	31.17			
10.0	32.81			
10.5	34.45			
11.0	36.09			
11.5	37.73			
12.0	39.37			
12.5	41.01			
13.0	42.65			
13.5	44.29			
14.0	45.93			
14.5	47.57			
15.0	49.21			
15.5	50.85			
16.0	52.49			
16.5	54.13			
17.0	55.77			
17.5	57.41			
18.0	59.06			
18.5	60.70			
19.0	62.34			
19.5	63.98			
20.0	65.62			

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3001 DATE: 2/12/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 4 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26			
21.0	68.90			
21.5	70.54			
22.0	72.18			
22.5	73.82			
23.0	75.46			
23.5	77.10			
24.0	78.74			
24.5	80.38			
25.0	82.02			
25.5	83.66			
26.0	85.30			
26.5	86.94			
27.0	88.58			
27.5	90.22			
28.0	91.86			
28.5	93.50			
29.0	95.14			
29.5	96.78		6"	STEEL TO 96'
30.0	98.43	001		
30.5	100.07	2		
31.0	101.71	3		
31.5	103.35	4		
32.0	104.99	5		
32.5	106.63	6		
33.0	108.27	7		
33.5	109.91	8		
34.0	111.55	9		
34.5	113.19	10		
35.0	114.83	11		
35.5	116.47	12		
36.0	118.11	13		
36.5	119.75	14		
37.0	121.39	15		
37.5	123.03	16		
38.0	124.67	17		
38.5	126.31	18		
39.0	127.95	19		
39.5	129.59	20		
40.0	131.23	21		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3001 DATE: 2/12/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	22		
41.0	134.51	23		
41.5	136.15	24		
42.0	137.80	25		
42.5	139.44	26		
43.0	141.08	27		
43.5	142.72	28		
44.0	144.36	29		
44.5	146.00	30		
45.0	147.64	31		
45.5	149.28	32		
46.0	150.92	33		
46.5	152.56	34		
47.0	154.20	35		
47.5	155.84	36		
48.0	157.48	37		
48.5	159.12	38		
49.0	160.76	39		
49.5	162.40	40		
50.0	164.04	41		
50.5	165.68	42		
51.0	167.32	43		
51.5	168.96	44		
52.0	170.60	45		
52.5	172.24	46		
53.0	173.88	47		
53.5	175.52	48		
54.0	177.17	49		
54.5	178.81	50		
55.0	180.45	51		
55.5	182.09	52		
56.0	183.73	53		
56.5	185.37	54		
57.0	187.01	55		
57.5	188.65	56		
58.0	190.29	57		
58.5	191.93	58		
59.0	193.57	59		
59.5	195.21	60		
60.0	196.85	61		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3001 DATE: 2/12/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 6 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	62		
61.0	200.13	63		
61.5	201.77	64		
62.0	203.41	65		
62.5	205.05	66		
63.0	206.69	67		
63.5	208.33	68		
64.0	209.97	69		
64.5	211.61	70		
65.0	213.25	71		
65.5	214.90	72		
66.0	216.54	73		
66.5	218.18	74		
67.0	219.82	75		
67.5	221.46	76		
68.0	223.10	77		
68.5	224.74	78		
69.0	226.38	79		
69.5	228.02	80		
70.0	229.66	81		
70.5	231.30	82		
71.0	232.94	83		
71.5	234.58	84	HR @ 71.7 m.	BOTTOM MEASUREMENT ?
72.0	236.22	85		DOWN USE #85 OR #86.
72.5	237.86	86		
73.0	239.50			
73.5	241.14			
74.0	242.78			
74.5	244.42			
75.0	246.06			
75.5	247.70			HOLE OBSTRUCTED @ 60.8' CMW,
76.0	249.34			
76.5	250.98			
77.0	252.62			
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			

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B-3001 CALIPER FIELD LOG

SITE: VOGTLE COL DATE: 2/12/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 420' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 420' 6" STEEL
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96' ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE:
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ~70' TIME SINCE LAST CIRCULATION: ≈1.5 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:20
ARRIVED ON SITE: 08:00
STANDBY TIME: CAUSE:
LOGGING STARTED: 16:43 LOGGING COMPLETED: 17:28

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SITE: VOGTLE COL B-3001 DATE: 2/12/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ✓ OYO ____ OTHER ____
MICROLOGGER 5310 ~~5304~~ ✓ 5772 ____ OTHER ____
CALIPER PROBE 5368 ✓ OTHER ____

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX	
MINUS CASING STICK-UP	-2.3'	
DEPTH REF. OFFSET AT START	4.52'	
DEPTH REF. OFFSET AT END	4.50'	
AFTER SURVEY DEPTH ERROR	-0.02'	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3001 CALTEST 01	0	16:43	0	16:46
B3001 CALUP 01	245.0	16:55	0	17:22
B3001 CALTEST 02	0	17:23	0	17:28

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.507 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.	B3001 CALTEST 01	1.97	3.94	8.00	4.50
AS MEAS.	B3001 CALTEST 02	1.97	3.92	8.00	4.51
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: ____

SUGGESTIONS, ADDITIONS, CHANGES: ____

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B-3001 ACOUSTIC TELEVIEWER FIELD LOG

SITE: VOGTLE COL B-3001 DATE: 2/12/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 420' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 420'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96'; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70
BOREHOLE FLUID: WATER; FRESH WATER MUD ✓; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ≈ 2.5 HR

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SITE: VOGTLE COL B-3001 DATE: 2/12/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:20
ARRIVED ON SITE: 08:00
STANDBY TIME: CAUSE:
LOGGING STARTED: 17:52 LOGGING COMPLETED: 18:12

WINCH: COMPROBE ___ SILVER ✓ OYO ___ OTHER ___
MICROLOGGER 5310 ~~5301~~ ✓ 5772 ___
TELEVIEWER ACOUSTIC #5174 ✓ OTHER ___

PROBE TILT TEST 91.1° BRUNTON TILT 91°
PROBE TILT TEST 68.3° BRUNTON TILT 67°
PROBE TILT TEST 30.4° BRUNTON TILT 26° AFTER LOG
PROBE AZIMUTH TEST 4.60° BRUNTON AZIMUTH 1°
PROBE AZIMUTH TEST 303.8° BRUNTON AZIMUTH 304
PROBE AZIMUTH TEST 24.60° BRUNTON AZIMUTH 20° AFTER LOG

PROBE OFFSET	1.44M(4.72FT)	
MINUS CASING STICK-UP	2.3	
DEPTH REF. OFFSET AT START	2.42'	
DEPTH REF. OFFSET AT END	2.52	
AFTER SURVEY DEPTH ERROR	+0.1'	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3001AuuP01	247.10	17:52	Ø	18:12

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

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B-3001 ELOG FIELD LOG

SITE: VOGTLE COL DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL CONTACT: MATT COOKE
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 420' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 420'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 275' 4" STEEL ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ≈1 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 08:20
ARRIVED ON SITE: 09:00
STANDBY TIME: CAUSE:
LOGGING STARTED: 13:38 LOGGING COMPLETED: 14:44

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SITE: VOGTLE COL B - 3001 DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ✓ OYO ____ OTHER ____
MICROLOGGER 5310 ~~5301~~ ✓ 5772 ____ OTHER ____
ELOG PROBE 5490 ✓ OTHER ____

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)	+32.8'	
MINUS CASING STICK-UP	-2.3	
DEPTH REF. OFFSET AT START	38.7'	
DEPTH REF. OFFSET AT END	38.5'	
AFTER SURVEY DEPTH ERROR	-0.2'	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3001ELOG TEST 02	Ø	13:38	Ø	13:41
B3001 ELOG UP 02	405.0	13:56	240.0'	14:21
B3001 ELOG UP 03	405.0	14:26	240.0'	14:44

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: ____

SUGGESTIONS, ADDITIONS, CHANGES: Hung @ 315 ↑

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P-S SUSPENSION VELOCITY FIELD LOG

SITE: VOGTLE COL B-3001 DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 5

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 420 ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 420'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 275' ; NO ____ 4" STEEL
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ≈24 hr

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SITE: VOGTLE COL B-3001 DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 5

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 08:00
ARRIVED ON SITE: 09:00
STANDBY TIME: CAUSE:
LOGGING STARTED: 15:09 LOGGING COMPLETED: 15:47
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOBILIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES ____; NO ✓; STORED WITH NEW ____

WINCH		COMPROBE ☐		GREY ☐	OYO ☐	RG ☐	OTH ☑	
INSTRUMENT	OYO 12004 ☐	15014 ☐	19029 ☐		RG 160023 ☐	160024 ☑		
RECEIVER S/N	12008 ☐	20042 ☐	26066 ☐	11001 ☐	23053 ☐	30086 ☑		

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: DEPTH ZERO = 2.5 m − .71 m = 1.79 m
EXM ZERO = 1.78 m

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3001 DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 3 OF 5

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
80.5	264.11			
81.0	265.75			
81.5	267.39			
82.0	269.03			
82.5	270.67			
83.0	272.31			
83.5	273.95			
84.0	275.59			STEEL CASE TO 275'
84.5	277.23	188		
85.0	278.87	189		
85.5	280.51	190		
86.0	282.15	191		
86.5	283.79	192		
87.0	285.43	193		
87.5	287.07	194		
88.0	288.71	195		
88.5	290.35	196		
89.0	291.99	197		
89.5	293.64	198		
90.0	295.28	199		
90.5	296.92	200		
91.0	298.56	201		
91.5	300.20	202		
92.0	301.84	203		
92.5	303.48	204		
93.0	305.12	205		
93.5	306.76	206		
94.0	308.40	207		
94.5	310.04	208		
95.0	311.68	209		
95.5	313.32	210		
96.0	314.96	211		
96.5	316.60	212		
97.0	318.24	213		
97.5	319.88	214		
98.0	321.52	215		
98.5	323.16	216		
99.0	324.80	217		
99.5	326.44	218		
100.0	328.08	219		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3001 DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 4 OF 5

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
100.5	329.72	220		
101.0	331.36	221		
101.5	333.01	222		
102.0	334.65	223		
102.5	336.29	224		
103.0	337.93	225		
103.5	339.57	226		
104.0	341.21	227		
104.5	342.85	228		
105.0	344.49	229		
105.5	346.13	230		
106.0	347.77	231		
106.5	349.41	232		
107.0	351.05	233		
107.5	352.69	234		
108.0	354.33	235		
108.5	355.97	236		
109.0	357.61	237		
109.5	359.25	238		
110.0	360.89	239		
110.5	362.53	240		
111.0	364.17	241		
111.5	365.81	242		
112.0	367.45	243		
112.5	369.09	244		
113.0	370.73	245		
113.5	372.38	246		
114.0	374.02	247		
114.5	375.66	248		
115.0	377.30	249		
115.5	378.94	250		
116.0	380.58	251		
116.5	382.22	252		
117.0	383.86	253		
117.5	385.50	254		
118.0	387.14	255		
118.5	388.78	256		
119.0	390.42	257		
119.5	392.06			BOTTOM MEASUREMENT ?
120.0	393.70			HIT @ 119.4 m

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL DATE:
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 5 OF 5

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
120.5	395.34			
121.0	396.98			
121.5	398.62			
122.0	400.26			
122.5	401.90			
123.0	403.54			ELOG OBSTRUCTED @ 405'
123.5	405.18			
124.0	406.82			
124.5	408.46			
125.0	410.10			
125.5	411.75			
126.0	413.39			
126.5	415.03			
127.0	416.67			
127.5	418.31			
128.0	419.95			
128.5	421.59			
129.0	423.23			
129.5	424.87			
130.0	426.51			
130.5	428.15			
131.0	429.79			
131.5	431.43			
132.0	433.07			
132.5	434.71			
133.0	436.35			
133.5	437.99			
134.0	439.63			
134.5	441.27			
135.0	442.91			
135.5	444.55			
136.0	446.19			
136.5	447.83			
137.0	449.48			
137.5	451.12			
138.0	452.76			
138.5	454.40			
139.0	456.04			
139.5	457.68			
140.0	459.32			

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B-3001 CALIPER FIELD LOG

SITE: VOGTLE COL DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 420' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 420' 4" STEEL
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 275'; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ≈3 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 08:20
ARRIVED ON SITE: 09:00
STANDBY TIME: CAUSE:
LOGGING STARTED: 16:06 LOGGING COMPLETED: 16:48

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SITE: VOGTLE COL B-3001 DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ✓ OYO ____ OTHER ____
MICROLOGGER 5310 ~~5301~~ ____ 5772 ____ OTHER ____
CALIPER PROBE 5368 ✓ OTHER ____

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX	
MINUS CASING STICK-UP	2.3	
DEPTH REF. OFFSET AT START	4.52'	
DEPTH REF. OFFSET AT END	4.50	
AFTER SURVEY DEPTH ERROR	-0.02	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3001CALTEST03	Ø	16:06	Ø	16:09
B3001CALUP02	400.0'	16:20	240.0'	16:37
B3001CALTEST04	Ø	16:45	Ø	16:48

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.507 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.	B3001CALTEST03	1.97	3.96	8.02	4.49
AS MEAS.	B3001CALTEST04	1.96	3.93	8.00	4.50
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: ____

SUGGESTIONS, ADDITIONS, CHANGES: ____

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B-3001 ACOUSTIC TELEVIEWER FIELD LOG

SITE: VOGTLE COL DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 420' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 420' 4" STEEL
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 275' ; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈ 70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈ 70' TIME SINCE LAST CIRCULATION: ≈ 4HR

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SITE: VOGTLE COL B-3001 DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 08:20
ARRIVED ON SITE: ~~08:~~ 09:00 RAS 2/13/07
STANDBY TIME: CAUSE:
LOGGING STARTED: 17:07 LOGGING COMPLETED: 17:18

WINCH: COMPROBE ___ SILVER ✓ OYO ___ OTHER ___
MICROLOGGER 5310 ~~5304~~ ✓ 5772 ___
TELEVIEWER ACOUSTIC #5174 ✓ OTHER ___

PROBE TILT TEST 90.5° BRUNTON TILT 90°
PROBE TILT TEST 13.5° BRUNTON TILT 14°
PROBE TILT TEST 0.6° BRUNTON TILT 0° AFTER LOG
PROBE AZIMUTH TEST 2.3° BRUNTON AZIMUTH 0°
PROBE AZIMUTH TEST 250.0 BRUNTON AZIMUTH 257°
PROBE AZIMUTH TEST 177.2° BRUNTON AZIMUTH 180° AFTER LOG

PROBE OFFSET	1.44M(4.72FT)	
MINUS CASING STICK-UP	2.3	
DEPTH REF. OFFSET AT START	2.42'	
DEPTH REF. OFFSET AT END	2.22'	
AFTER SURVEY DEPTH ERROR	-0.2'	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3001AMUP02	402.0'	17:07	240.0'	17:18

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

GEOVision Geophysical Services *1151 Pomona Road, Unit P, Corona, CA 92882* *Ph (951) 549-1234 Fx (951) 549-1236*

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B-3002 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: VOGTLE COL DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: MATT COOKE CELL PHONE: 803-261-5792

BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250' 6" STEEL
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 95.5' ; NO ____
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓ ; SALT WATER MUD ____;

LOGGING CREW: R. STELLER

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
ELOG TEST	B3002ELOGTEST01	∅	2/15/07	08:50 - 08:53
ELOG/GAMMA	B3002ELOGUP01	248.0 - 25.0'	"	09:20 - 09:43
ELOG/GAMMA	B3002ELOGUP01	248.0 - 25.0'	"	09:49 - 10:12
SUSPENSION PS	B302_001→086.ORG	96.8 - 236.2'	"	10:25 - 11:04
CALIPER TEST	B3002CALTEST01	∅	"	11:20 - 11:23
CALIPER/GAMMA	B3002CALUP01	245.0 - ∅'	"	11:34 - 12:00
CALIPER TEST	B3002CALTEST02	∅	"	12:05 - 12:08
DEVIATION	B3002ALLUP01	246.0 - ∅	"	12:23 - 12:36

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B-3002 ELOG FIELD LOG

SITE: VOGTLE COL DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL CONTACT: MATT COOKE
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3002 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 95.5' 6" STEEL ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE:
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: TIME SINCE LAST CIRCULATION: 1/2 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 08:50 LOGGING COMPLETED: 10:12

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SITE: VOGTLE COL B-3002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ✓ OYO ____ OTHER ____
MICROLOGGER ~~5310~~ ~~5301~~ ✓ 5772 ____ OTHER ____
ELOG PROBE 5490 ✓ OTHER ____

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)	+ 32.8	
MINUS CASING STICK-UP	- 1.5'	
DEPTH REF. OFFSET AT START	39.5'	
DEPTH REF. OFFSET AT END	39.45'	
AFTER SURVEY DEPTH ERROR	-0.05	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3002ELOG TEST01	Ø	08:50	Ø	08:53
B3002ELOG.UP01	248.0'	09:20	25.0'	09:43
B3002ELOG.UP02	248.0'	09:49	25.0'	10:12

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: ____

SUGGESTIONS, ADDITIONS, CHANGES: ____

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P-S SUSPENSION VELOCITY FIELD LOG

SITE: VOGTLE COL B-3002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 6

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3002 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 95.5' ; NO ____ 6" STEEL
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ≈2 HR

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SITE: VOGTLE COL B-3002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 6

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 10:25 LOGGING COMPLETED: 11:04
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOBILIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES ____; NO ✓; STORED WITH NEW ____

WINCH	COMPROBE ☐		GREY ☐	OYO ☐		RG ☐	OTH ☑	
INSTRUMENT	OYO 12004 ☐	15014 ☐	19029 ☐		RG 160023 ☐		160024 ☑	
RECEIVER S/N	12008 ☐	20042 ☐	26066 ☐	11001 ☐	23053 ☐		30086 ☑	

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: DEPTH ZERO @ 2.5m - 0.5m = 2.0m
" " @ EXIT = 2.0 m

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GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 3 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56			
2.5	8.20			
3.0	9.84			
3.5	11.48			
4.0	13.12			
4.5	14.76			
5.0	16.40			
5.5	18.04			
6.0	19.69			
6.5	21.33			
7.0	22.97			
7.5	24.61			
8.0	26.25			
8.5	27.89			
9.0	29.53			
9.5	31.17			
10.0	32.81			
10.5	34.45			
11.0	36.09			
11.5	37.73			
12.0	39.37			
12.5	41.01			
13.0	42.65			
13.5	44.29			
14.0	45.93			
14.5	47.57			
15.0	49.21			
15.5	50.85			
16.0	52.49			
16.5	54.13			
17.0	55.77			
17.5	57.41			
18.0	59.06			
18.5	60.70			
19.0	62.34			
19.5	63.98			
20.0	65.62			

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 4 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26			
21.0	68.90			
21.5	70.54			
22.0	72.18			
22.5	73.82			
23.0	75.46			
23.5	77.10			
24.0	78.74			
24.5	80.38			
25.0	82.02			
25.5	83.66			
26.0	85.30			
26.5	86.94			
27.0	88.58			
27.5	90.22			
28.0	91.86			
28.5	93.50			
29.0	95.14			
29.5	96.78	1		STEEL CASING TO 95.5
30.0	98.43	2		
30.5	100.07	3		
31.0	101.71	4		
31.5	103.35	5		
32.0	104.99	6		
32.5	106.63	7		
33.0	108.27	8		
33.5	109.91	9		
34.0	111.55	10		
34.5	113.19	11		
35.0	114.83	12		
35.5	116.47	13		
36.0	118.11	14		
36.5	119.75	15		
37.0	121.39	16		
37.5	123.03	17		
38.0	124.67	18		
38.5	126.31	19		
39.0	127.95	20		
39.5	129.59	21		
40.0	131.23	22		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3002 DATE: 2/15/02
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	23		
41.0	134.51	24		
41.5	136.15	25		
42.0	137.80	26		
42.5	139.44	27		
43.0	141.08	28		
43.5	142.72	29		
44.0	144.36	30		
44.5	146.00	31		
45.0	147.64	32		
45.5	149.28	33		
46.0	150.92	34		
46.5	152.56	35		
47.0	154.20	36		
47.5	155.84	37		
48.0	157.48	38		
48.5	159.12	39		
49.0	160.76	40		
49.5	162.40	41		
50.0	164.04	42		
50.5	165.68	43		
51.0	167.32	44		
51.5	168.96	45		
52.0	170.60	46		
52.5	172.24	47		
53.0	173.88	48		
53.5	175.52	49		
54.0	177.17	50		
54.5	178.81	51		
55.0	180.45	52		
55.5	182.09	53		
56.0	183.73	54		
56.5	185.37	55		
57.0	187.01	56		
57.5	188.65	57		
58.0	190.29	58		
58.5	191.93	59		
59.0	193.57	60		
59.5	195.21	61		
60.0	196.85	62		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 6 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	63		
61.0	200.13	64		
61.5	201.77	65		
62.0	203.41	66		
62.5	205.05	67		
63.0	206.69	68		
63.5	208.33	69		
64.0	209.97	70		
64.5	211.61	71		
65.0	213.25	72		
65.5	214.90	73		
66.0	216.54	74		
66.5	218.18	75		
67.0	219.82	76		
67.5	221.46	77		
68.0	223.10	78		
68.5	224.74	79		
69.0	226.38	80		
69.5	228.02	81		
70.0	229.66	82		
70.5	231.30	83		
71.0	232.94	84		
71.5	234.58	85		
72.0	236.22	86		HIT BOTTOM @ 72.0 m
72.5	237.86			BOTTOM MEASUREMENT?
73.0	239.50			DO NOT USE # 86.
73.5	241.14			
74.0	242.78			
74.5	244.42			
75.0	246.06			
75.5	247.70			
76.0	249.34			
76.5	250.98			T.D. @ 250'
77.0	252.62			
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			

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B-3002 CALIPER FIELD LOG

SITE: VOGTLE COL DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3002 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 95.5' (6" STEEL); NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ≈3HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 11:20 LOGGING COMPLETED: 12:08

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SITE: VOGTLE COL B-3002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ✓ OYO ____ OTHER ____
MICROLOGGER 5316 ~~5301~~ ✓ 5772 ____ OTHER ____
CALIPER PROBE 5368 ✓ OTHER ____

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX	
MINUS CASING STICK-UP	-1.5	
DEPTH REF. OFFSET AT START	5.32'	
DEPTH REF. OFFSET AT END	5.30'	
AFTER SURVEY DEPTH ERROR		LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3002CALTEST01	Ø	11:20	Ø	11:23
B3002 CALUP01	245.0'	11:34	Ø	12:00
B3002 CAL TEST02	Ø	12:05	Ø	12:08

CALIBRATION PLATE S/N 201		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.507 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.	B3002CALTEST01	1.99	3.96	7.97	4.49
AS MEAS.	B3002 CALTEST02	1.98	3.93	7.99	4.51
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: ____

SUGGESTIONS, ADDITIONS, CHANGES: ____

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B-3002 ACOUSTIC TELEVIEWER FIELD LOG

SITE: VOGTLE COL DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3002 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 95.5 ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ≈ 4 hr

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SITE: VOGTLE COL B-3002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME:
ARRIVED ON SITE:
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
RAS 2/15/07

WINCH: COMPROBE ✓ SILVER ✓ OYO ____ OTHER ____
MICROLOGGER 5310 ~~5304~~ ✓ 5772 ____
TELEVIEWER ACOUSTIC #5174 ✓ OTHER ____

PROBE TILT TEST 88.6° BRUNTON TILT 89°
PROBE TILT TEST 16.1° BRUNTON TILT 15°
PROBE TILT TEST 0.6° BRUNTON TILT 0°
PROBE AZIMUTH TEST 351.9° BRUNTON AZIMUTH 350°
PROBE AZIMUTH TEST 224.4° BRUNTON AZIMUTH 227°
PROBE AZIMUTH TEST 353.6 BRUNTON AZIMUTH 350°

PROBE OFFSET	1.44M(4.72FT)	
MINUS CASING STICK-UP	1.5'	
DEPTH REF. OFFSET AT START	3.22'	
DEPTH REF. OFFSET AT END	3.20	
AFTER SURVEY DEPTH ERROR	-0.02	LESS THAN 0.4%? YES.

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3002 Aunp 01	246.0'	12:23	Ø	12:36

MAINTENANCE PERFORMED ON SITE: 4π bottom @ 248.5'

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

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B-3003 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: VOGTLE COL DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: MATT COOKE CELL PHONE: 803-261-5792

BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97'; NO ____
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;

LOGGING CREW: R. STELLER

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
ELOG TEST	B3003 ELOGTEST01	Ø	2/16/07	09:02 - 09:05
ELOG/GAMMA	B3003 ELOGUP01	249.0 - 20.0'	"	11:03 - 11:26
SUSPENSION PS	B303_001 → 005.029	98.4 - 236.2	"	11:45 - 12:30
CALIPER TEST	B3003CALTEST01	Ø	"	12:49 - 12:52
CALIPER/GAMMA	B3003CALUP01	245.0 - Ø	"	13:02 - 13:27
CALIPER TEST	B3003CALTEST02	Ø	"	13:39 - 13:42
DEVIATION	B3003 ALLUP01	248.0 - Ø	"	14:00 - 14:12

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B-3003 ELOG FIELD LOG

SITE: VOGTLE COL DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL CONTACT: MATT COOKE
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3003 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: ~~250'~~ 6" 0 TO 250' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97' 6" STEEL; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: 670'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ~20' TIME SINCE LAST CIRCULATION: 1/2 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 9:02 LOGGING COMPLETED: 11:26

GEOVision Geophysical Services *1151 Pomona Road, Unit P, Corona, CA 92882* *Ph (951) 549-1234 Fx (951) 549-1236*

SITE:_VOGTLE COL B-3003 DATE: 2/16/07
CLIENT:_MACTEC JOB:_6517
AUTHOR:_R. STELLER PAGE 2 OF 2

WINCH: COMPROBE_____ SILVER ✓ OYO_____ OTHER_____
MICROLOGGER 5310 ~~5304~~ ✓ 5772_____ OTHER_____
ELOG PROBE 5490 ✓ OTHER_____

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)	32.8	
MINUS CASING STICK-UP	-1.5	
DEPTH REF. OFFSET AT START	39.5'	
DEPTH REF. OFFSET AT END	39.4'	
AFTER SURVEY DEPTH ERROR	-0.1'	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3003ELOGTEST01	Ø	9:02	Ø	9:05
B3003ELOGUP01	29.0	11:03	20.0'	11:26

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

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P-S SUSPENSION VELOCITY FIELD LOG

SITE: VOGTLE COL B-3003 DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 6

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3003 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97' 6" STEEL ; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈ 20' TIME SINCE LAST CIRCULATION: ≈ 1 HR

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SITE: VOGTLE COL B-3003 DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 6

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 11:45 LOGGING COMPLETED: 12:30
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOBILIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES ____; NO ✓; STORED WITH NEW ____

WINCH	COMPROBE ☐		GREY ☐	OYO ☐		RG ☐	OTH ☑	
INSTRUMENT	OYO 12004 ☐	15014 ☐	19029 ☐		RG 160023 ☐		160024 ☑	
RECEIVER S/N	12008 ☐	20042 ☐	26066 ☐	11001 ☐	23053 ☐		30086 ☑	

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: DEPTH 2800 = 2.5 m − 0.5m = 2.00m
EXIT 2800 = 2.01 m.

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GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3003 DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 3 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56			
2.5	8.20			
3.0	9.84			
3.5	11.48			
4.0	13.12			
4.5	14.76			
5.0	16.40			
5.5	18.04			
6.0	19.69			
6.5	21.33			
7.0	22.97			
7.5	24.61			
8.0	26.25			
8.5	27.89			
9.0	29.53			
9.5	31.17			
10.0	32.81			
10.5	34.45			
11.0	36.09			
11.5	37.73			
12.0	39.37			
12.5	41.01			
13.0	42.65			
13.5	44.29			
14.0	45.93			
14.5	47.57			
15.0	49.21			
15.5	50.85			
16.0	52.49			
16.5	54.13			
17.0	55.77			
17.5	57.41			
18.0	59.06			
18.5	60.70			
19.0	62.34			
19.5	63.98			
20.0	65.62			

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3003 DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 4 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26			
21.0	68.90			
21.5	70.54			
22.0	72.18			
22.5	73.82			
23.0	75.46			
23.5	77.10			
24.0	78.74			
24.5	80.38			
25.0	82.02			
25.5	83.66			
26.0	85.30			
26.5	86.94			
27.0	88.58			
27.5	90.22			
28.0	91.86			
28.5	93.50			
29.0	95.14			
29.5	96.78			STEEL CASING
30.0	98.43	001		
30.5	100.07	2		
31.0	101.71	3		
31.5	103.35	4		
32.0	104.99	5		
32.5	106.63	6		
33.0	108.27	7		
33.5	109.91	8		
34.0	111.55	9		
34.5	113.19	10		
35.0	114.83	11		
35.5	116.47	12		
36.0	118.11	13		
36.5	119.75	14		
37.0	121.39	15		
37.5	123.03	16		
38.0	124.67	17		
38.5	126.31	18		
39.0	127.95	19		
39.5	129.59	20		
40.0	131.23	21		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3003 DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	22		
41.0	134.51	23		
41.5	136.15	24		
42.0	137.80	25		
42.5	139.44	26		
43.0	141.08	27		
43.5	142.72	28		
44.0	144.36	29		
44.5	146.00	30		
45.0	147.64	31		
45.5	149.28	32		
46.0	150.92	33		
46.5	152.56	34		
47.0	154.20	35		
47.5	155.84	36		
48.0	157.48	37		
48.5	159.12	38		
49.0	160.76	39		
49.5	162.40	40		
50.0	164.04	41		
50.5	165.68	42		
51.0	167.32	43		
51.5	168.96	44		
52.0	170.60	45		
52.5	172.24	46		
53.0	173.88	47		
53.5	175.52	48		
54.0	177.17	49		
54.5	178.81	50		
55.0	180.45	51		
55.5	182.09	52		
56.0	183.73	53		
56.5	185.37	54		
57.0	187.01	55		
57.5	188.65	56		
58.0	190.29	57		
58.5	191.93	58		
59.0	193.57	59		
59.5	195.21	60		
60.0	196.85	61		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-3003 DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 6 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	62		
61.0	200.13	63		
61.5	201.77	64		
62.0	203.41	65		
62.5	205.05	66		
63.0	206.69	67		
63.5	208.33	68		
64.0	209.97	69		
64.5	211.61	70		
65.0	213.25	71		
65.5	214.90	72		
66.0	216.54	73		
66.5	218.18	74		
67.0	219.82	75		
67.5	221.46	76		
68.0	223.10	77		
68.5	224.74	78		
69.0	226.38	79		
69.5	228.02	80		
70.0	229.66	81		
70.5	231.30	82		
71.0	232.94	83		
71.5	234.58	84		
72.0	236.22	85		HIT BOTTOM @ 71.95m.
72.5	237.86			BOTTOM MEASUREMENT!
73.0	239.50			DO NOT USE #85.
73.5	241.14			
74.0	242.78			
74.5	244.42			
75.0	246.06			
75.5	247.70			
76.0	249.34			
76.5	250.98			T.D. @ 250'
77.0	252.62			
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			

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B-3003 CALIPER FIELD LOG

SITE: VOGTLE COL DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3003 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97' 6" STEEL ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: 220'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: 230' TIME SINCE LAST CIRCULATION: 3 HC

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 12:49 LOGGING COMPLETED: 13:42

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SITE: VOGTLE COL B-3003 DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ✓ OYO ____ OTHER ____
MICROLOGGER 5310 ~~5301~~ ✓ 5772 ____ OTHER ____
CALIPER PROBE 5368 ✓ OTHER ____

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX	
MINUS CASING STICK-UP	-1.5	
DEPTH REF. OFFSET AT START	5.32'	
DEPTH REF. OFFSET AT END	5.30'	
AFTER SURVEY DEPTH ERROR	-0.02'	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3003CALTEST01	Ø	12:49	Ø	12:52
B3003CALUP01	245.0'	13:02	Ø	13:27
B3003CALTEST02	Ø	13:39	Ø	~~13:42~~ 13:42

RAS 2/16/07

CALIBRATION PLATE S/N 201		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.507 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.	B3003CALTEST01	1.97	3.94	8.00	4.51
AS MEAS.	B3003CALTEST02	1.99	3.97	8.00	4.53
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: ____

SUGGESTIONS, ADDITIONS, CHANGES: ____

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B-3003 ACOUSTIC TELEVIEWER FIELD LOG

SITE: VOGTLE COL DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-3003 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97' ; NO 6" STEEL
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~20'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ~30' TIME SINCE LAST CIRCULATION: ~4 HR

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SITE: VOGTLE COL B-3003 DATE: 2/16/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 14:00 LOGGING COMPLETED: 14:12

WINCH: COMPROBE ✓ SILVER ____ OYO ____ OTHER ____
MICROLOGGER 5310 ~~5301~~ ✓ 5772 ____
TELEVIEWER ACOUSTIC #5174 ✓ OTHER ____

PROBE TILT TEST 91.6° BRUNTON TILT 91°
PROBE TILT TEST 5.6° BRUNTON TILT 5°
PROBE TILT TEST 0.5° BRUNTON TILT 0° AFTER LOG
PROBE AZIMUTH TEST 306° BRUNTON AZIMUTH 21°
PROBE AZIMUTH TEST 207.4 BRUNTON AZIMUTH 216°
PROBE AZIMUTH TEST 123.4 BRUNTON AZIMUTH 120° AFTER LOG

PROBE OFFSET	1.44M(4.72FT)	
MINUS CASING STICK-UP	1.5	
DEPTH REF. OFFSET AT START	3.22'	
DEPTH REF. OFFSET AT END	3.15	
AFTER SURVEY DEPTH ERROR	-0.07'	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B3003AMUP01	248.0'	14:00	Φ	14:12

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

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B-4001 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: VOGTLE COL DATE: 1/9/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: MATT COOKE CELL PHONE: 803-261-5792

BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 400' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 400'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97.5'; NO ____
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;

LOGGING CREW: R. STELLER

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
ELOG TEST	B4001ELOGTEST01	Ø	1/9/07	12:45 - 12:50
ELOG/GAMMA	B4001ELOGUP01	399.2' - 340.0'	"	13:50 - 14:05
ELOG/GAMMA	B4001ELOGUP02	340.0' - 319.6'	"	14:08 - 14:18
ELOG/GAMMA	B4001ELOGUP03	330.0' - 288.6'	"	14:25 - 14:30
ELOG/GAMMA	B4001ELOGUP04	300.0' - Ø	"	14:38 - 15:21
ELOG TEST	B4001ELOGTEST02	Ø	"	15:31 - 15:35
CALIPER TEST	B4001CALTEST01	Ø	"	15:50 - 15:56
CALIPER/GAMMA	B4001CALLUP01	395.0' - 343.3'	"	16:20 - 16:27

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B-4001 ELOG FIELD LOG

SITE: VOGTLE COL DATE: 1/9/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL CONTACT: MATT COOKE
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 400' ; 6" , TO 400'
BOREHOLE TOTAL DEPTH AS DRILLED: 400'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97.5' ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: ≈3½ hr

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 06:30
ARRIVED ON SITE: 07:30
STANDBY TIME: CAUSE:
LOGGING STARTED: 12:45 LOGGING COMPLETED: 15:35

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SITE: VOGTLE COL B-4001 DATE: 1/9/06
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ____ OYO ____ OTHER RG
MICROLOGGER 5301 ____ 5772 ✓ OTHER ____
ELOG PROBE 5490 ____ OTHER 30800

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)	–	
MINUS CASING STICK-UP	-2.0'	
DEPTH REF. OFFSET AT START	6.2'	
DEPTH REF. OFFSET AT END	6.5'	
AFTER SURVEY DEPTH ERROR	+0.3	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4001 ELOG TEST01	Ø	12:45	Ø	12:50
B4001 ELOGUP01	399.2'	13:50	340	14:05
B4001 ELOGUP02	340	14:08	319.6	14:13
B4001 ELOGUP03	330	14:25	289.6	14:30
B4001 ELOGUP04	300	14:38	~~15:21~~ Ø	15:21
B4001 ELOG TEST02	Ø	15:31	RAS Ø 1/9/06	15:35

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: LONG & SHORT RESITIVITY DATA MISSING - PROBE CURRENT JUMPED FROM 44 MA TO 100 MA - LOST COMM.

SUGGESTIONS, ADDITIONS, CHANGES: ____

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B-4001 CALIPER FIELD LOG

SITE: VOGTLE COL DATE: 1/9/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 400' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 400'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 92.5' ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE:
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: TIME SINCE LAST CIRCULATION: ≈ 4 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 06:30
ARRIVED ON SITE: 07:30
STANDBY TIME: CAUSE:
LOGGING STARTED: 15:50 LOGGING COMPLETED: 16:27

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SITE: VOGTLE COL B-400 DATE: 1/9/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ____ OYO ____ OTHER Reg
MICROLOGGER 5301 ____ 5772 ✓ OTHER ____
CALIPER PROBE 5368 ____ OTHER 2915

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX	
MINUS CASING STICK-UP	2.0'	
DEPTH REF. OFFSET AT START	4.82'	
DEPTH REF. OFFSET AT END	4.80'	
AFTER SURVEY DEPTH ERROR	-0.02'	LESS THAN 0.4%? YES.

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4001 CALTEST01	0	15:50	0	15:56
B4001 CALUP01	345	16:20	343.3	16:27

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		205 1.968 IN	3.937 IN	7.87" ~~8.000~~ IN	4.507 IN
	FILE NAME	52 (~~50~~ MM)	(100 MM)	200 (~~203~~.2 MM)	(114.3 MM)
AS MEAS.	B4001 CALTEST01	2.05	3.93	7.83	4.53
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: ____

SUGGESTIONS, ADDITIONS, CHANGES: ____

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B-4001 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: VOGTLE COL DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: MATT COOKE CELL PHONE: 803-261-5792

BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 400' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 400'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97.5'; NO ____
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;

LOGGING CREW: R. STELLER

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
ELOG TEST	B4001ELOGTEST03	Ø	1/10/07	09:10 - 09:13
ELOG/GAMMA	B4001ELOGLUP05	399.5' - 111.5'	"	09:55 - 10:26
ELOG/GAMMA	B4001ELOGDOWN01	Ø - 61.9'	"	10:46 - 10:52
DEVIATION	B4001AMUP01	399.0 - Ø	"	11:40 - 12:00
SUSPENSION PS	B401_001 - 231.DAS	8.2' - 385.5'	"	12:35 - 14:43

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B-4001 ELOG FIELD LOG

SITE: VOGTLE COL DATE: 1/18/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL CONTACT: MATT COOKE
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 400' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 400'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97.5' ; NO ____
DEPTH TO BEDROCK: NK DEPTH TO WATER TABLE:
BOREHOLE FLUID: WATER ____ ; FRESH WATER MUD ✓ ; SALT WATER MUD ____ ;
OTHER:
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: 1/2 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: NK CAUSE:
LOGGING STARTED: 09:10 LOGGING COMPLETED: 10:52

GEOVision Geophysical Services *1151 Pomona Road, Unit P, Corona, CA 92882* *Ph (951) 549-1234 Fx (951) 549-1236*

SITE: VOGTLE COL B-4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE____ SILVER____ OYO____ OTHER RG MINIWINCH
MICROLOGGER 5301___ 5772 ✓ OTHER____
ELOG PROBE 5490___ OTHER 3080

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)	Ø	
MINUS CASING STICK-UP	-2.0	
DEPTH REF. OFFSET AT START	6.2'	
DEPTH REF. OFFSET AT END	6.0'	
AFTER SURVEY DEPTH ERROR	-0.2'	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4001 ELOGTEST03	Ø	09:10	Ø	09:13
B4001 ELOGUP05	319.5	09:55	111.5	10:26
B4001 ELOGDOWN01	Ø	10:46	61.9	10:52

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

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B-4001 ACOUSTIC TELEVIEWER FIELD LOG

SITE: VOGTLE COL DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 400' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 400'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97.5'; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER; FRESH WATER MUD ✓; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈20' TIME SINCE LAST CIRCULATION: ≈2HR

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SITE: VOGTLE COL B-4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 11:40 LOGGING COMPLETED: 12:00

WINCH: COMPROBE ___ SILVER ___ OYO ___ OTHER RG MINI WINCH
MICROLOGGER 5301 ___ 5772 ✓
TELEVIEWER ACOUSTIC #5174 ___ OTHER 4727

PROBE TILT TEST 88.24° BRUNTON TILT 89°
PROBE TILT TEST 0.4° BRUNTON TILT 0° HANGING FREE.
PROBE TILT TEST 0.4° BRUNTON TILT 0° AFTER LOGGING RUNS
PROBE AZIMUTH TEST 192.4 BRUNTON AZIMUTH 191°
PROBE AZIMUTH TEST 83.4° BRUNTON AZIMUTH 83°
PROBE AZIMUTH TEST 114.8° BRUNTON AZIMUTH 114°

PROBE OFFSET	1.44M(4.72FT)		
MINUS CASING STICK-UP	2'		
DEPTH REF. OFFSET AT START	2.72'		
DEPTH REF. OFFSET AT END	2.45'		
AFTER SURVEY DEPTH ERROR	-0.27'	LESS THAN 0.4%?	YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4001 AMUP 01	399	11:40	0	12:00

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

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P-S SUSPENSION VELOCITY FIELD LOG

SITE: VOGTLE COL B-4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 9

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 400' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 400'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97.5'; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: 8 TIME SINCE LAST CIRCULATION: ≈ 3 hr

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SITE: VOGTLE COL B-4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 9

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 12:35 LOGGING COMPLETED: 14:43
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOBILIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES ✓; NO ____; STORED WITH NEW ____

WINCH	COMPROBE ☐		GREY ☐	OYO ☐	RG ☑	OTH ☐		
INSTRUMENT	OYO 12004 ☐	15014 ☐	19029 ☐		RG 160023 ☐	160024 ☑		
RECEIVER S/N	12008 ☑	20042 ☐	26066 ☐	11001 ☐	23053 ☐	30086 ☐		

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: DEPTH OFFSET = 2.5 m - .7m = 1.8m
" " ON EXIT = 1.77m
ASDE = -0.03 m

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 3 OF 9

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			STEEL TO ≈ 5'
2.0	6.56			
2.5	8.20	1		
3.0	9.84	2		
3.5	11.48	3		
4.0	13.12	4		
4.5	14.76	5		
5.0	16.40	6		
5.5	18.04	7		
6.0	19.69	8		
6.5	21.33	9		
7.0	22.97	10		
7.5	24.61	11		
8.0	26.25	12		
8.5	27.89	13		
9.0	29.53	14		
9.5	31.17	15		
10.0	32.81	16		
10.5	34.45	17		
11.0	36.09	18		
11.5	37.73	19		
12.0	39.37	20		
12.5	41.01	21		
13.0	42.65	22		
13.5	44.29	23		
14.0	45.93	24		
14.5	47.57	25		
15.0	49.21	26		
15.5	50.85	27		
16.0	52.49	28		
16.5	54.13	29		
17.0	55.77	30		
17.5	57.41	31		
18.0	59.06	32		
18.5	60.70	33		
19.0	62.34	34		
19.5	63.98	35		
20.0	65.62	36		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 4 OF 9

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26	37		
21.0	68.90	38		
21.5	70.54	39		
22.0	72.18	40		
22.5	73.82	41		
23.0	75.46	42		
23.5	77.10	43		
24.0	78.74	44		
24.5	80.38	45		
25.0	82.02	46		
25.5	83.66	47		
26.0	85.30	48		
26.5	86.94	49		
27.0	88.58	50		
27.5	90.22	51		
28.0	91.86	52		
28.5	93.50	53		
29.0	95.14	54		
29.5	96.78	55		6" PVC CASE TO 97.5'
30.0	98.43	56		
30.5	100.07	57		
31.0	101.71	58		
31.5	103.35	59		
32.0	104.99	60		
32.5	106.63	61		
33.0	108.27	62		
33.5	109.91	63		
34.0	111.55	64		
34.5	113.19	65		
35.0	114.83	66		
35.5	116.47	67		
36.0	118.11	68		
36.5	119.75	69		
37.0	121.39	70		
37.5	123.03	71		
38.0	124.67	72		
38.5	126.31	73		
39.0	127.95	74		
39.5	129.59	75		
40.0	131.23	76		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 5 OF 9

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	77		
41.0	134.51	78		
41.5	136.15	79		
42.0	137.80	80		
42.5	139.44	81		
43.0	141.08	82		
43.5	142.72	83		
44.0	144.36	84		
44.5	146.00	85		
45.0	147.64	86		
45.5	149.28	87		
46.0	150.92	88		
46.5	152.56	89		
47.0	154.20	90		
47.5	155.84	91		
48.0	157.48	92		
48.5	159.12	93		
49.0	160.76	94		
49.5	162.40	95		
50.0	164.04	96		
50.5	165.68	97		
51.0	167.32	98		
51.5	168.96	99		
52.0	170.60	100		
52.5	172.24	101		
53.0	173.88	102		
53.5	175.52	103		
54.0	177.17	104		
54.5	178.81	105		
55.0	180.45	106		
55.5	182.09	107		
56.0	183.73	108		
56.5	185.37	109		
57.0	187.01	110		
57.5	188.65	111		
58.0	190.29	112		
58.5	191.93	113		
59.0	193.57	114		
59.5	195.21	115		
60.0	196.85	116		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 6 OF 9

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	117		
61.0	200.13	118		
61.5	201.77	119		
62.0	203.41	120		
62.5	205.05	121		
63.0	206.69	122		
63.5	208.33	123		
64.0	209.97	124		
64.5	211.61	125		
65.0	213.25	126		
65.5	214.90	127		
66.0	216.54	128		
66.5	218.18	129		
67.0	219.82	130		
67.5	221.46	131		
68.0	223.10	132		
68.5	224.74	133		
69.0	226.38	134		
69.5	228.02	135		
70.0	229.66	136		
70.5	231.30	137		
71.0	232.94	138		
71.5	234.58	139		
72.0	236.22	140		
72.5	237.86	141		
73.0	239.50	142		
73.5	241.14	143		
74.0	242.78	144		
74.5	244.42	145		
75.0	246.06	146		
75.5	247.70	147		
76.0	249.34	148		
76.5	250.98	149		
77.0	252.62	150		
77.5	254.27	151		
78.0	255.91	152		
78.5	257.55	153		
79.0	259.19	154		
79.5	260.83	155		
80.0	262.47	156		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 7 OF 9

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
80.5	264.11	157		
81.0	265.75	158		
81.5	267.39	159		
82.0	269.03	160		
82.5	270.67	161		
83.0	272.31	162		
83.5	273.95	163		
84.0	275.59	164		
84.5	277.23	165		
85.0	278.87	166		
85.5	280.51	167		
86.0	282.15	168		
86.5	283.79	169		
87.0	285.43	170		
87.5	287.07	171		
88.0	288.71	172		
88.5	290.35	173		
89.0	291.99	174		
89.5	293.64	175		
90.0	295.28	176		
90.5	296.92	177		
91.0	298.56	178		
91.5	300.20	179		
92.0	301.84	180		
92.5	303.48	181		
93.0	305.12	182		
93.5	306.76	183		
94.0	308.40	184		
94.5	310.04	185		
95.0	311.68	186		
95.5	313.32	187		
96.0	314.96	188		
96.5	316.60	189		
97.0	318.24	190		
97.5	319.88	191		
98.0	321.52	192		
98.5	323.16	193		
99.0	324.80	194		
99.5	326.44	195		
100.0	328.08	196		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B - 4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 8 OF 9

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
100.5	329.72	197		
101.0	331.36	198		
101.5	333.01	199		
102.0	334.65	200		
102.5	336.29	201		
103.0	337.93	202		
103.5	339.57	203		
104.0	341.21	204		
104.5	342.85	205		
105.0	344.49	206		
105.5	346.13	207		
106.0	347.77	208		
106.5	349.41	209		
107.0	351.05	210		
107.5	352.69	211		
108.0	354.33	212		
108.5	355.97	213		
109.0	357.61	214		
109.5	359.25	215		
110.0	360.89	216		
110.5	362.53	217		
111.0	364.17	218		
111.5	365.81	219		
112.0	367.45	220		
112.5	369.09	221		
113.0	370.73	222		
113.5	372.38	223		
114.0	374.02	224		
114.5	375.66	225		
115.0	377.30	226		
115.5	378.94	227		
116.0	380.58	228		
116.5	382.22	229		
117.0	383.86	230		
117.5	385.50	231		HIT BOTTOM @ 117.7 m.
118.0	387.14			BOTTOM MEASUREMENT?
118.5	388.78			
119.0	390.42			
119.5	392.06			
120.0	393.70			

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B - 4001 DATE: 1/10/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 7 OF 9

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
120.5	395.34			
121.0	396.98			
121.5	398.62			
122.0	400.26			T.D. @ 400'
122.5	401.90			
123.0	403.54			
123.5	405.18			
124.0	406.82			
124.5	408.46			
125.0	410.10			
125.5	411.75			
126.0	413.39			
126.5	415.03			
127.0	416.67			
127.5	418.31			
128.0	419.95			
128.5	421.59			
129.0	423.23			
129.5	424.87			
130.0	426.51			
130.5	428.15			
131.0	429.79			
131.5	431.43			
132.0	433.07			
132.5	434.71			
133.0	436.35			
133.5	437.99			
134.0	439.63			
134.5	441.27			
135.0	442.91			
135.5	444.55			
136.0	446.19			
136.5	447.83			
137.0	449.48			
137.5	451.12			
138.0	452.76			
138.5	454.40			
139.0	456.04			
139.5	457.68			
140.0	459.32			

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B-4001 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: VOGTLE COL DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: MATT COOKE CELL PHONE: 803-261-5792

BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 400' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 400'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97.5' ; NO ____
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;

LOGGING CREW: R. STELLER

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
ELOG TEST	B4001ELOGTEST04	Ø	2/13/07	10:01 – 10:06
ELOG/GAMMA	B4001ELOGUP06	399.5 - 20.0'	"	10:33 - 11:12
CALIPER TEST	B4001CALTEST02	Ø	"	11:25 - 11:27
CALIPER/GAMMA	B4001 CALUP 02	397.0 - Ø'	"	11:40 - 12:23
CALIPER TEST	B4001CALTEST03	Ø	"	12:30 - 12:33

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B-4001 ELOG FIELD LOG

SITE: VOGTLE COL DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL CONTACT: MATT COOKE
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 400' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 400'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97.5' ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~70'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 1/2 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 08:00
ARRIVED ON SITE: 09:00
STANDBY TIME: CAUSE:
LOGGING STARTED: 10:01 LOGGING COMPLETED: 11:12

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SITE:_VOGTLE COL B-4001 DATE: 6/13/07
CLIENT:_MACTEC JOB:_6517
AUTHOR:_R. STELLER PAGE 2 OF 2

WINCH: COMPROBE_____ SILVER ✓ OYO_____ OTHER_____
MICROLOGGER 5510 ~~5301~~ ✓ 5772_____ OTHER_____
ELOG PROBE 5490 ✓ OTHER_____

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)	32.8'	
MINUS CASING STICK-UP	-2.2	
DEPTH REF. OFFSET AT START	38.8'	
DEPTH REF. OFFSET AT END	38.7'	
AFTER SURVEY DEPTH ERROR	-0.1'	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4001 ELOG TEST04	Ø	10:01	Ø	10:06
B4001 ELOG UP06	399.5	10:33	20.0'	11:12

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

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B-4001 CALIPER FIELD LOG

SITE: VOGTLE COL DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4001 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 400' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 400'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 97.5'; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER; FRESH WATER MUD ✓; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: ≈ 2 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 08:00
ARRIVED ON SITE: 09:00
STANDBY TIME: CAUSE:
LOGGING STARTED: 11:25 LOGGING COMPLETED: 12:33

GEOVision Geophysical Services *1151 Pomona Road, Unit P, Corona, CA 92882* *Ph (951) 549-1234 Fx (951) 549-1236*

SITE: VOGTLE COL B-4001 DATE: 2/13/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ✓ OYO ____ OTHER ____
MICROLOGGER ~~5310~~ ~~5301~~ ✓ 5772 ____ OTHER ____
CALIPER PROBE 5368 ✓ OTHER ____

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX	
MINUS CASING STICK-UP	-2.2'	
DEPTH REF. OFFSET AT START	4.62'	
DEPTH REF. OFFSET AT END	4.60'	
AFTER SURVEY DEPTH ERROR	-0.02'	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4001CALTEST02	Ø	11:25	Ø	11:27
B4001 CALUP02	397.0	11:40	Ø	12:23
B4001 CALTEST03	Ø	12:30	Ø	12:35

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.507 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.	B4001CALTEST02	1.97	3.97	8.02	4.51
AS MEAS.	B4001 CALTEST03	1.95	3.93	8.00	4.49
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: ____

SUGGESTIONS, ADDITIONS, CHANGES: ____

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B-4002 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: VOGTLE COL DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: MATT COOKE CELL PHONE: 803-261-5792

BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96' ; NO ____
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;

LOGGING CREW: R. STELLER

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
ELOG TEST	B4002ELOGTEST01	Ø	2/15/07	13:09 – 13:11
ELOG/GAMMA	B4002ELOGUP01	250.7 – 20.0'	"	13:28 – 13:53
SUSPENSION PS	B402_001 → 085.029	98.4 – 236.2	"	14:59 – 15:46
CALIPER TEST	B4002CALTEST01	Ø	"	16:07 – 16:10
CALIPER/GAMMA	B4002CALUP01	247.0 – Ø	"	16:17 – 16:44
CALIPER TEST	B4002CALTEST02	Ø	"	16:50 – 16:53
DEVIATION	B4002ALLUP01	248.0 – Ø	"	17:07 – 17:18

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B4002 ELOG FIELD LOG

SITE: VOGTLE COL DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL CONTACT: MATT COOKE
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4002 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 256'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96' ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ≈1/2 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 13:09 LOGGING COMPLETED: 14:25

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SITE: VOGTLE COL B-4002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ✓ OYO ____ OTHER ____
MICROLOGGER 5510 ~~5301~~ ✓ 5772 ____ OTHER ____
ELOG PROBE 5490 ✓ OTHER ____

PROBE LENGTH	2.50M(8.20 FT)
PLUS YOKE 10.0M (32.8 FT)	+ 32.8
MINUS CASING STICK-UP	-2.4
DEPTH REF. OFFSET AT START	38.6
DEPTH REF. OFFSET AT END	38.4' RUN1 & RUN 2
AFTER SURVEY DEPTH ERROR	-0.2' LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4002 ELOG TEST01	Ø	13:09	Ø	13:11
B4002 ELOG UP01	250.75	13:28	20.0'	13:53
B4002 ELOG UP02	250.0	14:02	20.0'	14:25

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: ____

SUGGESTIONS, ADDITIONS, CHANGES: ____

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P-S SUSPENSION VELOCITY FIELD LOG

SITE: VOGTLE COL B-4002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 6

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4002 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96' ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈ 70'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ≈ 2 HR

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SITE: VOGTLE COL B-4002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 6

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 14:59 LOGGING COMPLETED: 15:46
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOBILIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES____; NO ✓; STORED WITH NEW____

WINCH		COMPROBE	☐	GREY	☐	OYO	☐	RG	☐	OTH	☑
INSTRUMENT	OYO	12004	☐	15014	☐	19029	☐	RG	160023	☐	160024 ☑
RECEIVER S/N		12008	☐	20042	☐	26066	☐	11001	☐	23053 ☐	30086 ☑

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: DEPTH ZERO = 2.5m - .73m = 1.77m.
EXIT ZERO = 1.75m

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GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL ~~B-4003~~ B-4002 DATE: 2/15/07
CLIENT: MACTEC RDS 2/15/07 JOB: 6517
AUTHOR: R. STELLER PAGE 3 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56			
2.5	8.20			
3.0	9.84			
3.5	11.48			
4.0	13.12			
4.5	14.76			
5.0	16.40			
5.5	18.04			
6.0	19.69			
6.5	21.33			
7.0	22.97			
7.5	24.61			
8.0	26.25			
8.5	27.89			
9.0	29.53			
9.5	31.17			
10.0	32.81			
10.5	34.45			
11.0	36.09			
11.5	37.73			
12.0	39.37			
12.5	41.01			
13.0	42.65			
13.5	44.29			
14.0	45.93			
14.5	47.57			
15.0	49.21			
15.5	50.85			
16.0	52.49			
16.5	54.13			
17.0	55.77			
17.5	57.41			
18.0	59.06			
18.5	60.70			
19.0	62.34			
19.5	63.98			
20.0	65.62			

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B- 4002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 4 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26			
21.0	68.90			
21.5	70.54			
22.0	72.18			
22.5	73.82			
23.0	75.46			
23.5	77.10			
24.0	78.74			
24.5	80.38			
25.0	82.02			
25.5	83.66			
26.0	85.30			
26.5	86.94			
27.0	88.58			
27.5	90.22			
28.0	91.86			
28.5	93.50			
29.0	95.14			
29.5	96.78			STEEL TO 96'
30.0	98.43	001		
30.5	100.07	2		
31.0	101.71	3		
31.5	103.35	4		
32.0	104.99	5		
32.5	106.63	6		
33.0	108.27	7		
33.5	109.91	8		
34.0	111.55	9		
34.5	113.19	10		
35.0	114.83	11		
35.5	116.47	12		
36.0	118.11	13		
36.5	119.75	14		
37.0	121.39	15		
37.5	123.03	16		
38.0	124.67	17		
38.5	126.31	18		
39.0	127.95	19		
39.5	129.59	20		
40.0	131.23	21		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	22		
41.0	134.51	23		
41.5	136.15	24		
42.0	137.80	25		
42.5	139.44	26		
43.0	141.08	27		
43.5	142.72	28		
44.0	144.36	29		
44.5	146.00	30		
45.0	147.64	31		
45.5	149.28	32		
46.0	150.92	33		
46.5	152.56	34		
47.0	154.20	35		
47.5	155.84	36		
48.0	157.48	37		
48.5	159.12	38		
49.0	160.76	39		
49.5	162.40	40		
50.0	164.04	41		
50.5	165.68	42		
51.0	167.32	43		
51.5	168.96	44		
52.0	170.60	45		
52.5	172.24	46		
53.0	173.88	47		
53.5	175.52	48		
54.0	177.17	49		
54.5	178.81	50		
55.0	180.45	51		
55.5	182.09	52		
56.0	183.73	53		
56.5	185.37	54		
57.0	187.01	55		
57.5	188.65	56		
58.0	190.29	57		
58.5	191.93	58		
59.0	193.57	59		
59.5	195.21	60		
60.0	196.85	61		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 6 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	62		
61.0	200.13	63		
61.5	201.77	64		
62.0	203.41	65		
62.5	205.05	66		
63.0	206.69	67		
63.5	208.33	68		
64.0	209.97	69		
64.5	211.61	70		
65.0	213.25	71		
65.5	214.90	72		
66.0	216.54	73		
66.5	218.18	74		
67.0	219.82	75		
67.5	221.46	76		
68.0	223.10	77		
68.5	224.74	78		
69.0	226.38	79		
69.5	228.02	80		
70.0	229.66	81		
70.5	231.30	82		
71.0	232.94	83		
71.5	234.58	84		
72.0	236.22	85		HR BOTTOM @ 72.3m ⇒ TPR 249.5
72.5	237.86			BOTTOM MEASUREMENT ?
73.0	239.50			
73.5	241.14			
74.0	242.78			
74.5	244.42			
75.0	246.06			
75.5	247.70			
76.0	249.34			
76.5	250.98			T.D. @ 250
77.0	252.62			
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			

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B-4002 CALIPER FIELD LOG

SITE: VOGTLE COL DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4002 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96'; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈ 70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈ 70' TIME SINCE LAST CIRCULATION: ≈ 3 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 16:07 LOGGING COMPLETED: 16:53

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SITE: VOGTLE COL B-4002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER ✓ OYO ____ OTHER ____
MICROLOGGER ~~5310~~ ~~5304~~ ✓ 5772 ____ OTHER ____
CALIPER PROBE 5368 ✓ OTHER ____

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX	
MINUS CASING STICK-UP	-2.4	
DEPTH REF. OFFSET AT START	4.42'	
DEPTH REF. OFFSET AT END	4.40	
AFTER SURVEY DEPTH ERROR	-0.02	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4002CALTEST01	Ø	16:07	Ø	16:10
B4002CALUP01	247.0	16:17	Ø	16:44
B4002 CALTEST02	Ø	16:50	Ø	16:53

CALIBRATION PLATE S/N 201		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.507 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.	B4002CALTEST01	1.98	3.96	7.98	4.52
AS MEAS.	B4002 CALTEST02	1.98	3.93	8.00	4.52
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE: ____

EQUIPMENT PROBLEMS OR FAILURES: ____

SUGGESTIONS, ADDITIONS, CHANGES: ____

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B-4002 ACOUSTIC TELEVIEWER FIELD LOG

SITE: VOGTLE COL DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4002 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96' ; NO ____
DEPTH TO BEDROCK: UK DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓ ; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈70' TIME SINCE LAST CIRCULATION: ≈4 HR

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SITE: VOGTLE COL B-4002 DATE: 2/15/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 07:00
ARRIVED ON SITE: 07:45
STANDBY TIME: CAUSE:
LOGGING STARTED: 17:07 LOGGING COMPLETED: 17:18

WINCH: COMPROBE ___ SILVER ✓ OYO ___ OTHER ___
MICROLOGGER 5310 ~~5301~~ ✓ 5772 ___
TELEVIEWER ACOUSTIC #5174 ✓ OTHER ___

PROBE TILT TEST 90.5° BRUNTON TILT 91°
PROBE TILT TEST 4.1° BRUNTON TILT 4°
PROBE TILT TEST 0.6° BRUNTON TILT 0° AFTER LOG
PROBE AZIMUTH TEST 292.8° BRUNTON AZIMUTH 296°
PROBE AZIMUTH TEST 168.4 BRUNTON AZIMUTH 169°
PROBE AZIMUTH TEST 96.3 BRUNTON AZIMUTH 95° AFTER LOG

PROBE OFFSET	1.44M(4.72FT)	
MINUS CASING STICK-UP	-2.4	
DEPTH REF. OFFSET AT START	2.32'	
DEPTH REF. OFFSET AT END	2.33	
AFTER SURVEY DEPTH ERROR	+0.01	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4002AMUP01	248.0'	17:07	Ø	17:18

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

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B-4003 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: VOGTLE COL DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: MATT COOKE CELL PHONE: 803-261-5792

BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96' , 6" PVC ; NO ____
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;

LOGGING CREW: R. STELLER

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
ELOG TEST	B4003ELOGTEST01	Ø	12/14/07	08:54 - 08:57
ELOG/GAMMA	B4003ELOGUP01	250.8 - 20.0'	"	09:45 - 10:09
SUSPENSION PS	B403_001 → 129.0DG	3.3 - 211.6'	"	10:40 - 12:16
SUSPENSION PS	B403_130 → 173.0DG	167.3 - 237.9'	"	15:20 - 15:44
CALIPER TEST	B4003 CALTEST01	Ø	"	16:03 - 16:06
CALIPER/GAMMA	B4003 CALUP01	247.0 - Ø'	"	16:14 - 16:38
CALIPER TEST	B4003CALTEST02	Ø	"	16:47 - 16:51
DEVIATION	B4003AUBP01	250.0 - Ø	"	17:08 - 17:22
DEVIATION	B4003AUBP02	250.0 - Ø	"	17:27 - 17:38

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B-4003 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: VOGTLE COL DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: MATT COOKE CELL PHONE: 803-261-5792

BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96' 6" PVC ; NO ____
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;

LOGGING CREW: R. STELLER

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
ELOG TEST	B4003ELOGTEST01	Ø	12/14/07	08:54 - 08:57
ELOG/GAMMA	B4003ELOGUP01	250.8 - 20.0'	"	09:45 - 10:09
SUSPENSION PS	B403_001 → 129.0PG	3.3 - 211.6'	"	10:40 - 12:16
SUSPENSION PS	B403_130 → 178.0PG	167.3 - 237.9'	"	15:20 - 15:44
CALIPER TEST	B4003 CALTEST01	Ø	"	16:03 - 16:06
CALIPER/GAMMA	B4003 CALUP01	247.0 - Ø'	"	16:14 - 16:38
CALIPER TEST	B4003CALTEST02	Ø	"	16:47 - 16:51
DEVIATION	B4003AUEUP01	250.0 - Ø	"	17:08 - 17:22
DEVIATION	B4003AUEUP02	250.0 - Ø	"	17:27 - 17:38

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B-4003 ELOG FIELD LOG

SITE: VOGTLE COL DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL CONTACT: MATT COOKE
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4003 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96' ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: 70'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ∅ TIME SINCE LAST CIRCULATION: 1 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 06:45
ARRIVED ON SITE: 07:30
STANDBY TIME: CAUSE:
LOGGING STARTED: 08:54 LOGGING COMPLETED: 10:09

GEOVision Geophysical Services *1151 Pomona Road, Unit P, Corona, CA 92882* *Ph (951) 549-1234 Fx (951) 549-1236*

SITE:_VOGTLE COL B - 4003 DATE: 2/14/07
CLIENT:_MACTEC JOB:_6517
AUTHOR:_R. STELLER PAGE 2 OF 2

WINCH: COMPROBE_____ SILVER ✓ OYO_____ OTHER_____
MICROLOGGER 5310 ~~5301~~ ✓ 5772_____ OTHER_____
ELOG PROBE 5490 ✓ OTHER_____

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)	+ 32.8	
MINUS CASING STICK-UP	- 2.5	
DEPTH REF. OFFSET AT START	38.5'	
DEPTH REF. OFFSET AT END	38.45'	
AFTER SURVEY DEPTH ERROR	-0.05	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4003 ELOG TEST01	∅	08:54	∅	08:57
B4003 ELOG UP 01	250.8	09:45	20.0'	10:09

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

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P-S SUSPENSION VELOCITY FIELD LOG

SITE: VOGTLE COL B-4003 DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 6

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4003 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96' 6" PVC ; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: ≈2HR

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SITE: VOGTLE COL B-4003 DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 6

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 06:45
ARRIVED ON SITE: 07:30
STANDBY TIME: CAUSE:
LOGGING STARTED: 10:40 LOGGING COMPLETED: 12:16
STANDBY TIME: CAUSE:
RUN 3 LOGGING STARTED: 15:20 LOGGING COMPLETED: 15:44
DEMOBILIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES ✓; NO ____; STORED WITH NEW ____

WINCH	COMPROBE ☐		GREY ☐	OYO ☐	RG ☐	OTH ☑		
INSTRUMENT	OYO 12004 ☐	15014 ☐	19029 ☐	RG 160023 ☐	160024 ☑			
RECEIVER S/N	12008 ☐	20042 ☐	26066 ☐	11001 ☐	23053 ☐	30086 ☑		

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES: HIT OBSTACLE @ 51.0 m - SPUDDED & BROKE SHOT CONTROL WIRE IN RECEIVER OR ISOLATION TUBE. REWIRED & DATA COLLECTED TO BOTTOM OF HOLE.

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: DEPTH REF @ START = 2.5 m - .76 m = 1.74 m
@ EXIT RUN 1 = 1.70 m
@ EXIT RUN 2 = 1.73 m
@ EXIT RUN 3 = 1.72 m

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GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4003 DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 3 OF ~~5~~ 6
RAS 2/14/07

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28	1		
1.5	4.92	2		
2.0	6.56	3		
2.5	8.20	4		
3.0	9.84	5		
3.5	11.48	6		
4.0	13.12	7		
4.5	14.76	8		
5.0	16.40	9		
5.5	18.04	10		
6.0	19.69	11		
6.5	21.33	12		
7.0	22.97	13		
7.5	24.61	14		
8.0	26.25	15		
8.5	27.89	16		
9.0	29.53	17		
9.5	31.17	18		
10.0	32.81	19		
10.5	34.45	20		
11.0	36.09	21 22		DO NOT USE RECORD 21.
11.5	37.73	23		
12.0	39.37	24		
12.5	41.01	25		
13.0	42.65	26		
13.5	44.29	27		
14.0	45.93	28		
14.5	47.57	29		
15.0	49.21	30		
15.5	50.85	31		
16.0	52.49	32		GOOD SH SIGNAL ✓
16.5	54.13	33		
17.0	55.77	34		
17.5	57.41	35		
18.0	59.06	36		
18.5	60.70	37		
19.0	62.34	38		
19.5	63.98	39		
20.0	65.62	40		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4003 DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 4 OF ~~5~~ 6 RAS 2/14/07

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26	41		
21.0	68.90	42		
21.5	70.54	43		
22.0	72.18	44		
22.5	73.82	45		
23.0	75.46	46		
23.5	77.10	47		
24.0	78.74	48		
24.5	80.38	49		
25.0	82.02	50		
25.5	83.66	51		
26.0	85.30	52		
26.5	86.94	53		
27.0	88.58	54		
27.5	90.22	55		
28.0	91.86	56		
28.5	93.50	57		GOOD RECORDS - TOP OF MARL?
29.0	95.14	58		
29.5	96.78	59		
30.0	98.43	60		
30.5	100.07	61		
31.0	101.71	62		
31.5	103.35	63		
32.0	104.99	64		
32.5	106.63	65		
33.0	108.27	66		
33.5	109.91	67		
34.0	111.55	68		
34.5	113.19	69		
35.0	114.83	70		
35.5	116.47	71		
36.0	118.11	72		
36.5	119.75	73		
37.0	121.39	74		
37.5	123.03	75		
38.0	124.67	76		
38.5	126.31	77		
39.0	127.95	78		
39.5	129.59	79		
40.0	131.23	80		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4003 DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE ~~4~~ 5 OF ~~5~~ 6 RAS 2/14/07

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.		FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	81			
41.0	134.51	82			
41.5	136.15	83			
42.0	137.80	84			
42.5	139.44	85			
43.0	141.08	86			
43.5	142.72	87			
44.0	144.36	88			
44.5	146.00	89			
45.0	147.64	90			
45.5	149.28	91			
46.0	150.92	92			
46.5	152.56	93			
47.0	154.20	94			
47.5	155.84	95			
48.0	157.48	96			
48.5	159.12	97			
49.0	160.76	98			
49.5	162.40	99			
50.0	164.04	100			
50.5	165.68	101			
51.0	167.32	102	130		HIT OBSTACLE.
51.5	168.96	103	131		PROBE FAILURE -
52.0	170.60	104	132		SOURCE REVERSAL NOT
52.5	172.24	105	133		FUNCTIONAL - DATA CONTINUED
53.0	173.88	106	134		AS SH ARRIVAL IS UNAMBIGIOUS.
53.5	175.52	107	135		
54.0	177.17	108	136		
54.5	178.81	109	137		
55.0	180.45	110	138		
55.5	182.09	111	139		
56.0	183.73	112	140		
56.5	185.37	113	141		
57.0	187.01	114	142		
57.5	188.65	115	143		
58.0	190.29	116	144		
58.5	191.93	117	145		
59.0	193.57	118	146		
59.5	195.21	119	147		
60.0	196.85	120	148		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: VOGTLE COL B-4003 DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE ~~5~~ 6 OF ~~5~~ 6
RAS 2/14/07

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	121 149		
61.0	200.13	122 150		
61.5	201.77	123 151		
62.0	203.41	124 152		
62.5	205.05	125 153		
63.0	206.69	126 154		
63.5	208.33	127 155		
64.0	209.97	128 156		
64.5	211.61	129 157		HIT OBSTACLE @ 65 m. => TP @ 225'
65.0	213.25	~~130~~ 158		
65.5	214.90	RAS 159		
66.0	216.54	2/14/07 160		
66.5	218.18	161		
67.0	219.82	162		
67.5	221.46	163		
68.0	223.10	164		
68.5	224.74	165		
69.0	226.38	166		
69.5	228.02	167		
70.0	229.66	168		
70.5	231.30	169		
71.0	232.94	170		
71.5	234.58	171		
72.0	236.22	172		
72.5	237.86	173		BOTTOM MEASUREMENT?
73.0	239.50			HK BOTTOM @ 72.5
73.5	241.14			DO NOT USE 173.
74.0	242.78			
74.5	244.42			
75.0	246.06			
75.5	247.70			
76.0	249.34			
76.5	250.98			T.D. @ 250'
77.0	252.62			
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			

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B-4003 CALIPER FIELD LOG

SITE: VOGTLE COL DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4003 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250 ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 250'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96 ; NO ____ 6" PVC
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓ ; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ∅ TIME SINCE LAST CIRCULATION: ≈1 HR

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 06:45
ARRIVED ON SITE: 07:30
STANDBY TIME: CAUSE:
LOGGING STARTED: 16:03 LOGGING COMPLETED: 16:51

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SITE:_VOGTLE COL B-4003 DATE: 12/14/07
CLIENT:_MACTEC JOB:_6517
AUTHOR:_R. STELLER PAGE 2 OF 2

WINCH: COMPROBE_____ SILVER ✓ OYO_____ OTHER_____
MICROLOGGER 5310 ~~5301~~ ✓ 5772_____ OTHER_____
CALIPER PROBE 5368 ✓ OTHER_____

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX	
MINUS CASING STICK-UP	2.5	
DEPTH REF. OFFSET AT START	4.32'	
DEPTH REF. OFFSET AT END	4.30	
AFTER SURVEY DEPTH ERROR	-0.02	LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4003 CALTEST01	Ø	16:03	Ø	16:06
B4003 CALUP01	247.0'	16:14	Ø	16:38
B4003 CALTEST02	Ø	16:47	Ø	16:51

CALIBRATION PLATE S/N 201		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.507 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.	B4003 CALTEST01	1.97	3.93	8.00	4.53
AS MEAS.	B4003CALTEST02	1.97	3.93	8.00	4.51
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

GEOVision Geophysical Services *1151 Pomona Road, Unit P, Corona, CA 92882* *Ph (951) 549-1234 Fx (951) 549-1236*

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B-4003 ACOUSTIC TELEVIEWER FIELD LOG

SITE: VOGTLE COL DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: MATT COOKE OFFICE PHONE:
CELL PHONE: 803-261-5792
CONTACT: OFFICE PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
CONTACT: PHONE:
PHONE:
DRILLER: PHONE:
COMPANY: PHONE:

DIRECTIONS TO SITE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-4003 LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED ✓
DIAMETERS AND DEPTH RANGES: 6" 0 TO 250' ; , TO
BOREHOLE TOTAL DEPTH AS DRILLED: 250' 6" PVC
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 96' ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈70'
BOREHOLE FLUID: WATER ; FRESH WATER MUD ✓ ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: ≈30' TIME SINCE LAST CIRCULATION: ≈24 hr

GEOVision Geophysical Services *1151 Pomona Road, Unit P, Corona, CA 92882* *Ph (951) 549-1234 Fx (951) 549-1236*

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SITE: VOGTLE COL B-4003 DATE: 2/14/07
CLIENT: MACTEC JOB: 6517
AUTHOR: R. STELLER PAGE 2 OF 2

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: AUGUSTA, GA DEPARTURE TIME: 06:45
ARRIVED ON SITE: 07:30
STANDBY TIME: CAUSE:
LOGGING STARTED: 17:08 LOGGING COMPLETED: 17:38

WINCH: COMPROBE ___ SILVER ✓ OYO ___ OTHER ___
MICROLOGGER ~~5310~~ ~~5301~~ ✓ 5772 ___
TELEVIEWER ACOUSTIC #5174 ✓ OTHER ___

PROBE TILT TEST 90.3° BRUNTON TILT 90°
PROBE TILT TEST 24.4° BRUNTON TILT 24°
PROBE TILT TEST 0.5° BRUNTON TILT 0° AFTER LOG
PROBE AZIMUTH TEST 330.1° BRUNTON AZIMUTH 331°
PROBE AZIMUTH TEST 192.9° BRUNTON AZIMUTH 193°
PROBE AZIMUTH TEST 179.1° BRUNTON AZIMUTH 180° AFTER LOG

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	2.5
DEPTH REF. OFFSET AT START	2.22
DEPTH REF. OFFSET AT END	2.20, 2.10 RUN 2
AFTER SURVEY DEPTH ERROR	-0.02, -0.12' LESS THAN 0.4%? YES.

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B4003AUUP01	250.0'	17:08	Ø	17:22
B4003AUUP02	250.0'	17:27	Ø	17:38

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

GEOVision Geophysical Services *1151 Pomona Road, Unit P, Corona, CA 92882* *Ph (951) 549-1234 Fx (951) 549-1236*

APPENDIX E

BORING GEOPHYSICAL LOGGING FIELD MEASUREMENT PROCEDURES

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Fax: (404) 817- 0207

Copy 4 - Cooke

VOGTLE ELECTRIC GENERATING PLANT UNITS 3 & 4 COL GEOTECHNICAL WORK PLAN REVISION 0

This Work Plan meets the Quality Assurance Program requirements for this project.

Controlled Document

Document Control No.: VGCOL-10
74 pages

APPROVALS:

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Principal Geotechnical Engineer (MACTEC)
Date: 10/26/06

Wm. Allen Lancaster, P.E.
Project Manager (MACTEC)
Date: 10/26/06

John Jedrosko, QAR.
Quality Assurance Representative (MACTEC)
Date: 10/26/06

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1 INTRODUCTION

This Work Plan for Subsurface Investigation and Laboratory Testing describes the planned geotechnical activities, based on the Bechtel Technical Specification, to be used for the inputs in preparation of the Combined Construction & Operation License (COL) application at the site of the Vogtle Electric Generating Plant – Units 3 and 4.

The scope of the program is contained in the Technical Specification for Subsurface Investigation, which is Bechtel Specification AR01-0000-XGS-2001, latest Revision.

1.1 DEFINITIONS

Approved Subcontractors List - a list of potential Subcontractor(s) that adequately meet the requirements of MACTEC's QAPD and QA procedures.

Client – Southern Nuclear Operating Company.

Project Geotechnical Engineer – Bechtel Power Corporation (BECHTEL)

CONTRACTOR – MACTEC Engineering and Consulting, Inc (MACTEC).

Document Control Center - A centralized location remote from the Project Site which is responsible for issuing unique document identification numbers and collecting the project records and data for archival and transmittal purposes.

SNC – Southern Nuclear Operating Company. SNC is the sponsor and Owner of this project.

Project Geotechnical Services - Those services necessary to accomplish the scope of work prescribed by the Specification. These services include drilling, well installation, surface and downhole geophysical testing, and laboratory testing.

Project Principal - Individual(s) assigned by MACTEC, having technical authority for MACTEC activities, technical work products, documentation, and quality.

Quality Assurance (QA) - Those planned and systematic actions necessary to provide adequate confidence that a system or component will perform satisfactorily in service.

Rig Geologist - Individual(s) assigned by MACTEC with responsibility for supervision/ observation of the drilling activities performed by their assigned crew, performing rig safety checks, documentation of work activities, and implementation of the Work Plan.

Rig Geotechnical Engineer – Same function as Rig Geologist, except individual is a geotechnical engineer by education or experience rather than a geologist.

Site Coordinator – See Site Superintendent.

Site Superintendent - Name applied to Site Coordinator function by the Specifications. Individual(s) assigned by MACTEC with responsibility for daily supervision of MACTEC and its

Subcontractor personnel, ongoing coordination of work activities, and implementation of the Work Plan.

Subcontractor - A person or firm that may be selected from MACTEC's Approved Subcontractors List.

Work Instruction - A written description of the assigned task to be performed in accordance with the Specification. The work instruction also identifies the procedures/methods to utilize in accordance with the Work Plan.

Work Plan - This written description of how the scope of work is to be performed. Includes labor, Subcontractors, equipment, and materials supplied by MACTEC.

Specification – Bechtel Technical Specification AR01-0000-XGS-2001, Version 1 Issued 9/20/06 Subsurface Investigation and Laboratory Testing. The specification describes the activities, location, type and number of tests (scope of work).

Subsurface Investigation Location Plan – Part of Specification consisting of Bechtel Drawings 0-CY-0000-00001, Revision A, and 0-CY-0000-00002, Revision A (SNC Drawings AR01-0000-XG-2004, Version A, and AR01-0000-XG-2005, Version A).

1.2 ACRONYMS/ABBREVIATIONS

AP1000	Nuclear Technology by Westinghouse
ASTM	American Society for Testing and Materials
COC	Chain of Custody
COL	Combined Construction and Operating License
CPT	Cone Penetration Test or Sounding
DCC	Document Control Center
Bechtel	Bechtel Power Corporation
EPA	Environmental Protection Agency
gINT	Geotechnical Data Presentation Software
GPS	Global Positioning System
MACTEC	MACTEC Engineering and Consulting, Inc.
M&TE	Measuring and Test Equipment
MSDS	Material Safety Data Sheet
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Agency
OW	Observation Well
PM	Project Manager
QA	Quality Assurance
QAPD	Quality Assurance Project Document
QAR	Quality Assurance Representative

SPT	Standard Penetration Test
SSI	Soil Structure Interaction
USACE	US Army Corps of Engineers
WI	Work Instruction

2 SCOPE OF SERVICES

The scope of services, described in the Specification and in this work plan will consist of field exploration, laboratory testing, and geotechnical testing. One or more Geotechnical Data Report(s) will be prepared to provide the data from which engineering properties of soils can be evaluated.

The following sections describe the scope for implementing the field exploration program, laboratory testing and reporting activities.

2.1 PLANNING AND PERMITTING

Working conditions are identified and addressed prior to the start of field activities. The work sequence and schedule are outlined in a separate document from this Work Plan because the sequence and schedule are subject to updates as the work progresses. Planning and Permitting Activities include:

1. Obtaining permits necessary to perform the work, including permission for site access and right of way.
2. Preparing and submitting a Quality Assurance Project Document (QAPD);
3. Establishment of a Document Control Center (DCC);
4. Evaluating resource availability for supervision, labor, equipment, tools, supplies, and materials necessary to perform the scope of work described in the Specification which is the basis for this document;
5. Coordinating exploration efforts and schedule with Bechtel;
6. QA Evaluation of Subcontractors and qualification for site work; and
7. Preparing a Work Activity Schedule.

2.2 SURVEYING

Surveying will be performed by the SNC. We understand that test locations identified in the Boring Location Plan of the Specification will initially be field-located using GPS or field measurement methods by SNC Surveyors. The precise locations will be established based on accessibility by the drilling and geophysical testing equipment. If boring or test locations must be relocated due to access limitations, the relocation must be approved by Bechtel and SNC. A field sketch or written description will be prepared indicating the field-located boring or test locations showing distances to the specified points established prior to MACTEC's work. All field-located points will be marked for precise survey location (see below).

After the field exploration, we understand surveying will be performed by SNC to locate the borings, CPTs, test pits, electrical resistivity tests, and other reference points as necessary. The surveying to establish the as-drilled locations and elevations of each test location will be performed under a separate work plan and quality assurance program by others (See Attachment 1).

2.3 UNDERGROUND UTILITY LOCATION AND CLEARING

Underground utilities will be evaluated as noted in Attachment 2, Drilling and Sampling Procedures.

Following layout of the boring and CPT locations, access roads will be cleared to the proposed locations and work pads cleared or constructed, as needed. MACTEC understands that SNC can provide a bulldozer and operator for this purpose. Some areas are wooded with planted pine trees. We understand that we have permission to cut these trees to facilitate access to the boring and cone penetration test locations. Specific boring locations may require clearing, construction of roads, and placement of some bridging soils and/or periodic improvements during the course of the investigation. We understand that SNC personnel and equipment will be available for this, as needed.

Borings for the raw water intake structure are located at low elevations in the floodplain of the Savannah River near sensitive wetland areas. MACTEC will make every effort to minimize disturbance in these areas. However, some felling of trees and other hand clearing may be required to provide access to our drilling equipment. MACTEC will coordinate with SNC and Bechtel regarding specific measures required for access into this area. Mechanized (bulldozer) clearing will not be performed in these areas unless specifically authorized by SNC.

2.4 FIELD EXPLORATION

The field testing methods may include:

- Standard Penetration Testing (SPT);
- Undisturbed Sampling using Shelby Tube or Pitcher Samplers;
- Seismic borehole velocity measurements (P-S logging);
- Borehole Geophysical Logging
- Cone Penetration Test (CPT) Soundings with pore water pressure measurements, pore pressure dissipation tests (select locations), and downhole seismic tests (select locations);
- Field Electrical Resistivity Testing;
- Refraction Microtremor Testing
- Surveying of the borings and other test locations (by SNC);
- Test Pit Excavation;
- Borehole Sealing/Grouting; and
- Technical Observation and Oversight.

The program contained in the Specification is based upon expected or assumed conditions to be found during the field investigation. Revisions during the program may be made by Bechtel depending on actual site-specific subsurface conditions discovered as part of this program.

The specific number of exploratory borings established in the Specification was configured to:

- Obtain data to meet NRC requirements;
- Meet AP1000 vendor recommendations necessary to perform the SSI analyses; and
- Satisfy NRC Regulatory Guide 1.132 criteria related to boring spacing and depth for safety and non-safety facilities.

The boring locations and depths are presented in the Specification, which presents the detailed scope of the subsurface exploration and field-testing program for the primary structures or site elements. The Specification should be viewed in conjunction with this work plan as it lists the specific locations and depths of borings and CPTs. The types of tests associated with the field test locations are also assigned by the Specification. A Work Instruction will be prepared by the Site Coordinator or Project Principal and supplied to the Rig Geologist or Subcontractor before each activity type.

2.5 GEOTECHNICAL SERVICES SCHEDULE

A schedule of geotechnical activities has been developed. The schedule is referenced in this Work Plan rather than included due to its dynamic nature. It is planned that the various geotechnical field data collection tasks will be substantially completed in late February 2007; field activities are scheduled to begin on October 30, 2006. The schedule will be reviewed on an ongoing basis. If inclement weather or other events cause schedule pressure, MACTEC is prepared to mobilize additional resources to the site in order to maintain the project deadlines. Events beyond the control of MACTEC (such as unexpected changed conditions, Client postponement or cease work orders) that cause significant project delays in some activities may cause slippage of the end date even with additional applied resources.

2.6 DRILLING AND SAMPLING

MACTEC will supply drill rig(s) mounted on trucks, ATV-carriers or other rigs capable of performing the expected types of drilling required to execute the proposed borings. Both disturbed and undisturbed samples of soil are planned. Disturbed samples (SPT samples) will be obtained at the depths called for in the Specification. The undisturbed samples will be obtained (or attempted) at the depths to be determined by Bechtel based on the exploration results. Recovered samples will be classified, labeled, sealed and handled as in accordance with Attachment 2 (Drilling and Sampling Procedures) of this work plan.

Depths to fluid levels in boreholes will be made during the drilling activities. During mud rotary wash drilling, it is understood that the fluid levels in the boreholes may not reflect the ground-water level.

Boreholes will be abandoned before final demobilization from the borehole site by placement of a bentonite-cement grout mixture. Borings for geophysical logging may be left open for several days after drilling and before geophysical logging. After completion of geophysical logging activities, these borings will also be abandoned as discussed above. A wooden survey stake will be placed for identification of the as-drilled location by the surveyor.

The field records produced, and the samples collected by the Rig Geologist will be controlled following the procedures provided in Attachment 7 (Field Records and Sample Control Procedures).

2.7 CONE PENETRATION TESTS

Cone penetration tests (CPTs) will be conducted by a Subcontractor at the depths/locations described in the Specification. The CPTs will be pushed to refusal that is estimated to be encountered near a depth of 120 feet. Based on our previous experience at the site, CPT refusal may occur near the top of the Marl layer at depths shallower than 120 feet. If refusal occurs at a depth that is unacceptable to SNC/Bechtel, we will coordinate regarding how to proceed. It may be necessary to advance CPT probes by drilling through hard zones or obstructions. CPT testing will be performed in accordance with the procedures and controls described in Attachment 3 of this Work Plan. The field records produced by the Subcontractor and collected by the Rig Geologist will be controlled following the procedures provided in Attachment 7.

2.8 DOWNHOLE TESTING

Geophysical downhole testing will be conducted by Subcontractors at the depths/locations described in the Specification. The field records produced by the Subcontractor and submitted to the Site Coordinator will be controlled following the procedures provided in Attachment 7.

2.8.1 P-S Seismic Velocity Logging

P-S seismic velocity logging will be conducted by a Subcontractor at the boring locations described in the Specification. P-S logging will be performed in accordance with the procedures described in Attachment 4 of this Work Plan. The field records will be controlled following the procedures provided in Attachment 7.

2.8.2 Geophysical Logging

Geophysical logging consisting of natural gamma, long-and-short – normal resistivity, three arm caliper, and directional survey will be conducted by a Subcontractor at the boring locations described in the specification. The procedures are described in ASTM D 5753, Standard Guide for Planning and Conducting Borehole Geophysical Logging. The field records will be controlled following the procedures provided in Attachment 7.

2.9 SURFACE GEOPHYSICAL TESTING

2.9.1 Field Electrical Resistivity Testing

Surface geophysical testing (Electrical Resistivity testing) will be conducted by MACTEC or a Subcontractor at the locations described in the Specification or as determined by Bechtel. Surface geophysical testing will be performed in accordance with the procedures and control described in Attachment 6 of this Work Plan. The field records will be controlled following the procedures provided in Attachment 7.

2.9.2 Refraction Microtremor Testing (ReMi)

ReMi testing will be conducted by MACTEC or a Subcontractor at the locations described in the Specification or as determined by Bechtel. ReMi testing will be performed in accordance with the

procedures and control described in Attachment 5 of this Work Plan. The field records will be controlled following the procedures provided in Attachment 7.

2.10 FIELD RECORDS

MACTEC will supply a Rig Geologist or Rig Engineer for each drill rig during the drilling and sampling. The Rig Geologist will keep records of drilling conditions as described in Attachment 2. Subcontractors for the cone penetration testing and downhole testing will provide previously qualified individuals to perform the test and create field records of their work in accordance with Attachments 3 and 4. Field recordkeeping will be performed in accordance with the procedures and controls described in Attachment 7 of this Work Plan.

The Site Coordinator will collect and review the field records for conformance to the Specification and to MACTEC's QA requirements.

2.11 INSTRUMENTATION

Long-term monitoring instrumentation will not be utilized during the COL phase of this project.

2.12 LABORATORY TESTING

Description of Materials to be Sampled and Tested

Based on subsurface information obtained on the site during ESP activities conducted in Fall of 2005, we anticipate the following materials will be encountered during drilling activities at the site:

Coastal Plain Soils – We anticipate that the Coastal Plain soils encountered in this exploration will consist of Paleocene to Eocene aged marine and deltaic sediments. We anticipate that the materials encountered will consist of sands with varying silt and clay content, silts, clays, and marl. The deepest borings currently planned on the site (400 feet) will likely terminate in the Paleocene Black Mingo Formation.

Existing Concrete – Portions of the site may contain concrete slabs of former warehouses used during construction of the existing Vogtle Electric Generating Station.

Existing Man-Made Fill Soil – Due to the site's close proximity to the existing power plant, it is possible that site grading may have left some man-made fill soils that will be encountered.

Alluvial Soil - In some portions of the site, soils washed from higher ground may have settled to form alluvial deposits. Significant amounts of alluvial soil are not expected within the power block areas. Significant amounts of alluvial soils may be encountered within the floodplain of the Savannah River in borings for the new raw water intake structure.

The borings will obtain samples of all the preceding materials except possibly the concrete and alluvial soils.

The following sample types are planned or anticipated for each soil type:

- Coastal Plain Soils, Alluvium
  Existing Fill: SPT samples

  SPT <~30 Push tubes (ASTM D 1586)

  SPT >~30 Pitcher Barrel Samples (EM 1110-1-1804, USACE)

- Existing Concrete: No samples planned.

- Groundwater: No samples planned.

Existing Fill or Coastal Plain Soils in Test Pits:

- Test Pits: Bulk samples of each major soil type encountered as directed by Bechtel, with accompanying sealed jar samples.

Laboratory testing will be performed in accordance with the procedures and controls described in Attachment 8 of this Work Plan.

Number of Laboratory Tests Planned

The laboratory testing will involve tests on disturbed and undisturbed soil samples. Tests for compressibility, static strength and dynamic property tests will be performed. The tests will be performed in general accordance with ASTM procedures or other applicable standards (References and Standards in the Attachment).

The laboratory tests will be performed at MACTEC's Atlanta, Georgia, Charlotte, NC, or Raleigh, NC office (except for tests assigned to a MACTEC-qualified Subcontractor). The number and type of specific laboratory tests will be determined by Bechtel from the results of the field exploration program.

Distribution of Test Types

Based on the Specification it is expected that the types of tests that will be performed are those summarized in Table 8.1 of Attachment 8.

The number of tests for each material type is determined by Bechtel based on conditions encountered; at the time of this revision to the Work Plan, the approximate total number of tests planned is shown in Table 8.1. The total number of tests shown in Table 8.1 in Attachment 8 is subject to some change as the work progresses due to such factors as insufficient volume of sample to perform all the tests assigned to that sample.

Specialized laboratory testing will be performed by Subcontract laboratories or University laboratories. It is expected that the following types of specialized tests may be performed:

- Resonant Column/Torsional Shear
- Chemical Analysis (soil pH, chloride, sulfate)

2.13 REPORTING

A data report with Attachments will be developed and issued as a project design basis document. The main elements of the data report will include the following:

1. Introduction
2. Scope of Work
    a. Number of tests or locations
    b. Locations where testing was performed
3. Methodology
    a. How was testing performed (detailed description of field or lab equipment and also of test procedure if not covered by ASTM)
    b. What procedures were used or followed
    c. List of firms who performed the tests
4. QA Procedures
    a. How was quality assurance maintained and documented
5. Results
    a. Data from test or procedure (either in the data report or in an Attachment thereto)
    b. Logs or figures
        - Hard copies (either in the data report or in an Attachment thereto)
        - Electronic Data (either in the data report or in an Attachment thereto)
        - Calibration Reports (Calibration Records will be submitted to Bechtel during the course of the project prior to testing activities as required by the Specification. Copies of these records will be stored in the DCC and will be available upon special request)

3 ENGINEERING ANALYSES

Engineering analyses will not be performed as part of this work plan. Engineering analyses utilizing the results in the Geotechnical Data Reports described in Section 2.15 herein will be performed under a separate work plan and quality assurance plan by others.

4 RESPONSIBILITIES

4.1 PROJECT MANAGEMENT

MACTEC has the project management responsibilities for the geotechnical data collection tasks associated with this work plan.

Attachment 9 presents a chart of the management, staff, and functional groups within the organization that will have direct involvement on this project.

4.1.1 Project Manager

The Project Manager (PM) is to function as the lead management authority responsible for the preparation of the Work Plan and the management, scoping, and execution of the assigned project tasks. The PM will provide assistance during project inception and will have lead responsibility for the management and execution of the project.

The Project Manager (PM) is to function as a centralized authority responsible for the management and execution of the geotechnical services associated with this Work Plan.

Specific responsibilities of the PM include:

- Administer procurement of MACTEC Subcontractors and equipment in accordance with the QAPD;
- Preparation and issuance of project documents, including QAPD and Work Plans;
- Provide appropriate, qualified resources to support the project tasks and schedule;
- Coordinate work among different groups for efficient scheduling;
- Provide procurement contract administration for MACTEC activities and Subcontractor services;
- Process and administer scope of work changes; and
- Communicate with Bechtel and SNC personnel on overall program activities.

4.1.2 Technical Oversight

The Principal Geotechnical Engineer(s) are responsible for:

- Interfacing with representatives of Bechtel and SNC on technical issues;
- Technical requirements for field, laboratory and geotechnical assessment and functions;
- Establishing QA requirements in conjunction with the project QA Representative;
- Technical direction of geotechnical field and laboratory activities, and engineering oversight;
- Technical review of required technical documents including QAPDs;
- Implementation of QA/QC Program Procedures;

- Establishment of the technical and quality requirements for the project;
- Oversight of laboratory testing;
- Providing Bechtel and SNC with copies of draft and final data reports;
- Establishing that the requested tasks will be performed using the procedures invoked by this document and the associated QAPD;
- Assessing the project technical and quality requirements and in consultation with the Project Manager determining MACTEC's capability to properly perform the requested tasks;
- Evaluating the project staff qualifications, MACTEC's capabilities, and assuring that MACTEC and Subcontractor personnel are documented as qualified to perform the work within the project specific requirements; and
- Evaluating with the QAR and/or Project Manager the following criteria to determine capability:

    1. QA Training;
    2. Technical training and qualifications;
    3. Equipment capability;
    4. Proper procedures in place;
    5. Subcontractor status, as applicable;
    6. Need for a Readiness Review.

- Informing the appropriate project personnel of training to be performed or other necessary special actions to be accomplished in support of the project
- Examining the QAPD and ascertain and document that the client requirements and its invoked documents are adequately addressed by the QAPD.
- Ensuring that any special client requirements which are not invoked in the MACTEC QA Program are listed in the QAPD.

4.1.3 Site Coordinator (Site Superintendent)

The Site Coordinator (Site Superintendent) is the on-site technical person in charge of the day-to-day field activities. The Site Coordinator will be responsible for the following:

- Daily supervision of the field drilling crew(s), surface geophysical crew, downhole geophysical Subcontractor(s), cone penetration testing Subcontractor, and other site personnel;
- Coordination of MACTEC activities with Bechtel and SNC site representatives;
- Supervising documentation of the field test results (daily field boring logs and other documents);

- Ongoing coordination of MACTEC work activities, and implementation of the Work Plan;
- Updating Principals and PMs, with periodic progress reports (at least once per work shift, either weekly or 10 days), scheduling impact issues, and the like; and
- Serving as Site Safety Officer for MACTEC.

4.1.4 Rig Geologist

The Rig Geologist (or a Rig Geotechnical Engineer) supplied by MACTEC will be assigned as full-time with a drill rig. The duties of this person include:

- Monitoring the conduct of the drilling or testing operations for conformance to specified procedures;
- Documenting sample or test depths and test results;
- Maintaining a field log for the boring, including classification of materials recovered and recovery.
- Placing samples into the sample storage facility; and
- Providing the Site Coordinator with input for progress reports.

4.1.5 Downhole Geophysicist

The Downhole Geophysicist is one or more employee(s) of the specialty Downhole Geophysical Subcontractor and will be assigned as full-time with a borehole logging rig. Tests consist of P-S velocity logging and geophysical logging. The duties of this person include:

- Monitoring the conduct of the borehole logging operations for conformance to procedures;
- Documenting test depths, procedures and test results;
- Maintaining a field log and electronic record for the operation;
- Providing the Site Coordinator with input for progress reports;
- Providing a duplicate field log and electronic record to the Site Coordinator; and
- Periodic transmission of reduced data to MACTEC project manager.

4.1.6 Surface Geophysicist

The Surface Geophysicist may be a MACTEC employee or a Subcontractor. The duties of the Surface Geophysicist include:

- Monitoring the conduct of or performing the surface geophysics operations for conformance to specified procedures;
- Documenting test locations, procedures and test results;
- Maintaining a field log and electronic record for the test;
- Coordinating transport of duplicates of the data records to the site storage facility and;
- Providing the Site Coordinator with input for progress reports.
- Periodic transmission of data to the MACTEC project manager.

4.1.7 CPT Supervisor

The CPT Supervisor is an employee of the Cone Penetration Test (CPT) Subcontractor. The duties of the CPT Supervisor include:

- Performing the CPT test in accordance with the applicable procedures and at the locations and depths assigned by the Site Coordinator or his representative;
- Providing a field log and duplicate electronic record, including calibration data, to the Site Coordinator;
- Providing the Site Coordinator with input for the progress reports; and
- Periodic transmission of reduced data to the MACTEC PM.

4.1.8 Laboratory Services Manager

The Laboratory Services Manager is the MACTEC technical person in charge of the day-to-day laboratory testing activities. The Laboratory Services Manager will be responsible for the following:

- Supervision of the MACTEC laboratory staff and other MACTEC Subcontractor laboratories,
- Preparation of periodic progress reports;
- Documentation of the laboratory test results;
- Updating Principal and PM with progress reports, scheduling impact issues, and the like.

4.1.9 Survey Party Chief

Surveying will be performed by SNC under a separate quality assurance program. However, the surveyor's duties typically include:

- Locating the as-drilled borings, CPTs, test pits and other reference points as necessary;
- Documenting that the surface elevations will be obtained at the locations referenced to the provided site datum;
- Documenting that horizontal surveying will meet the accuracies required by the Specification;
- Maintaining field notebooks sufficient to reproduce the survey results, if necessary;
- Storage of duplicate field notes at the office trailer/facility for future retrieval;
- Providing the MACTEC Site Coordinator with input for progress reports;
- Providing survey results as Microsoft excel worksheets.

4.1.10 Quality Assurance Representative

The MACTEC Quality Assurance Representative (QAR) is responsible for:

- Performing independent surveillance and inspection of activities (performed as a function of this Work Plan) to assure compliance with applicable procedures, codes and standards;
- Providing Quality Oversight over geotechnical laboratory activities; and
- Review of QAPD and Work Plan.

Copies of these QA documents (latest revision) will be available to project personnel for use as appropriate:

MACTEC QUALITY ASSURANCE MANUAL
MACTEC EQUIPMENT CALIBRATION MANUAL
OFFICE LABORATORY QUALITY SYSTEM MANUAL;
MACTEC Procedure for Quality Assurance Project Document for Nuclear Safety-Related Services
MACTEC COL QAPD
Description of MT&E used for laboratory testing
MACTEC COL Work Plan Number 1
QAP 11-2, Procedure for Control of Software and Hardware
QAP 18-1, Audit Procedure
QAP 18-2, Qualification of Lead Auditor and Other Audit or Surveillance Personnel
QAP 20-1, Qualification of Personnel
QAP 23-1, Procedure for Preparation of a Work Plan
QAP 24-1, Procedure for Preparation of a Work Instruction

4.2 DRILLING SERVICE

The drilling service (MACTEC's drill crew, Subcontractor drill crews, and their drilling manager) will provide services administered by the Project Manager (PM). The Site Coordinator will direct daily drilling operations and set sampling and location priorities to meet the objectives of schedule as set forth in the Work Plan and Specification.

MACTEC will be responsible for:

- Equipment and personnel for field testing activities to include drilling, undisturbed and disturbed sampling, Standard Penetration Tests, casing installation, and borehole abandonment;
- Hammer weight measurement certificate;
- SPT energy measurements; and
- Support activities for the downhole geophysical logging.

4.3 CONE PENETRATION TESTING (CPT) SUBCONTRACTOR

The cone penetration testing Subcontractor will be responsible for:

- Supplying equipment that meets the requirements of the specification and the QAPD and that can reach the desired probing locations;
- Performing electric friction-piezocone penetrometer tests (CPT) at locations and to depths directed in the Specification;
- Performing seismic cone soundings at locations and to depths in the Specification;
- Provide field records and duplicate electronic records for storage at the office facility; and
- Submitting a data report of the testing, including electronic files of the CPT logs on a CD.

4.4 DOWNHOLE GEOPHYSICAL SUBCONTRACTOR

The downhole geophysical Subcontractor will provide seismic velocity measurement services and borehole geophysical services under contract administered by the PM. The Site Coordinator will coordinate downhole geophysical operations. The Downhole Geophysical Subcontractor will be responsible for:

- Equipment and personnel for field testing activities to perform the required measurements in both open or cased boreholes, as needed;
- Provide field records and duplicate electronic records for storage at the facility;
- Data Reduction and Reporting; and
- Providing results and final logs and a report summarizing the activities.

4.5 TEST PIT EXCAVATION

Test pits are to be performed at locations specified by Bechtel (field-located). A MACTEC Subcontractor will provide the backhoe to excavate the pits. MACTEC will document the test pit excavation activity and classify the materials encountered in accordance with Attachment 2. Bechtel will select the materials to be sampled from each test pit. When directed by Bechtel, a Rig Geologist or Rig Engineer of MACTEC will collect and label the samples in accordance with the Specification and Attachment 7. If approved by Bechtel, MACTEC will place the bulk samples in new 5 gallon plastic buckets with lids and with handles for carrying in lieu of plastic-lined canvas bags. A sealed glass jar suitable for moisture content testing and containing the same material will be labeled in accordance with the Specification and Attachment 7 and placed in the bucket. Upon receiving instruction to abandon the test pit either by Bechtel or the Site Coordinator, the MACTEC Subcontractor will backfill the test excavation with the excavated native soils and tamp those materials in-place using the backhoe bucket. The Rig Geologist will be responsible for placing one or more stakes to mark the test pit for later survey location. Density testing of the test pit backfill is not planned.

4.6 SITE RESTORATION

After completion of field activities MACTEC will clean up all drilling and sampling equipment, paper, rags, etc. associated with the drilling operations. Small trees that have been cut will be stacked into brush piles. The drill sites will be returned to the same general condition as found prior to drilling. Drill cuttings and drilling fluids will be spread onto the ground and left. Vegetative ground cover will not be re-established nor will wheel ruts and other ground surface irregularities be repaired. MACTEC understands that discharge of drilling fluids may have to be further controlled in wetland areas near the Savannah River floodplain. We anticipate that this control may include but not be limited to: containerizing drilling fluids and wet cuttings in steel drums, or pumping drilling fluids and wet cuttings to higher elevations for discharge into a temporary mud pit or tank. Specific measures for control of cuttings will be coordinated and approved by SNC and Bechtel prior to MACTEC work in this area.

4.7 PROJECT SURVEY SUBCONTRACTOR

Surveying will be performed by SNC under a separate work plan and quality assurance program

5 QUALITY ASSURANCE PLAN

The MACTEC QA Manual and the QAPD will be applicable to the scope of work delineated in this Work Plan. Attachment 9 presents a chart of the management, staff, and functional groups within the organization that will have direct involvement on this project.

6 REFERENCES AND STANDARDS

The codes, standards and regulations of the following organization in effect January 1, 2006, unless otherwise noted, are a part of the project Work Plan and are listed as follows:

1) ASTM D 420-98; "*Standard Guide to Site Characterization for Engineering, Design and Construction Purposes.*"
2) NRC Regulatory Guide 1.132
3) NRC Regulatory Guide 1.138

Additional codes associated with specific procedures are included in Attachments 1 thru 8.

ATTACHMENT 1

SURVEY DATA CONTROLS

SURVEY DATA CONTROLS

General

Surveying will be performed by SNC under a separate work plan and quality assurance program. We anticipate that the following general survey activities will take place during the course of the project:

Reference points will be established by others nearby the site prior to the start of the MACTEC's work. The planned coordinates of all the test locations are contained in the Boring Location Plan of the Specification. The Surveyor will field locate the test locations based on the specified coordinates to sub-meter accuracy, and the precise locations for borings, CPT tests, wells, test pits and other test locations will be adjusted by the Site Coordinator, with Bechtel's approval, based on site conditions. These locations will be identified by wooden stakes or wire flag, if appropriate, with the test number identified thereon in accordance with the Specification. After the testing has been done, and when requested by the Site Coordinator, the "as-built" locations will be surveyed to establish their horizontal locations and surface elevations. The survey will establish the northing and easting coordinates of the locations in accordance with the State of Georgia coordinate system per the Specification. A qualified licensed land surveyor will perform the survey.

ATTACHMENT 2

DRILLING AND SAMPLING PROCEDURES

DRILLING AND SAMPLING PROCEDURES

General Tasks

Drilling and sampling of soil is anticipated on this site. The borehole designation and location are shown in the Specification. The borings will be initially located by the Surveyor as described in Attachment 1. Test pits will be field-located by Bechtel. Following layout of the boring and CPT locations, access roads will be cleared to the proposed locations and work pads cleared or constructed. Boreholes will be drilled and sampled with truck or all-terrain vehicle mounted drill rigs. A backhoe will be used to excavate the test pits. Groundwater levels will be checked as outlined in the Specification. Boreholes will be abandoned upon completion of drilling or geophysical logging. Survey markers (wooden stakes) will identify the borehole location until a survey of the as-drilled location and elevation is accomplished.

Pre-Mobilization Activities

Drill equipment will be inspected by the MACTEC Rig Geologist or Site Coordinator in conjunction with the drill crew prior to drilling to ensure materials and equipment are suitably clean and in visually good condition. The field inspection will be documented by the Rig Geologist.

Designation of Test Pit/Borehole ID

The designations and names of boreholes and all other test locations will be those contained in the Specification.

Field Borehole Location and Pre-Drilling Activities

The location for a borehole or other test location is derived from the Specification. Prior to drilling, test pit/borehole locations will be marked in the field with a stake and/or flagging. If a survey crew has not located the test pit/borehole prior to start of work, then the locations will be located with a GPS unit or field measurement methods using existing landmarks or survey reference points. Final as-drilled locations will be survey-located as described in Attachment 1. Prior to initiation of drilling or test pit excavation, boring locations will be reviewed by the Site Coordinator in consultation with SNC and screened for possible underground utility conflicts (see below). Some clearing and grading may be required for rig access or to establish a relatively level drilling platform.

MACTEC's utility location subcontractor will locate existing underground utilities within a 10 foot radius of each exploratory boring as outlined in the Specification. Location methods may include survey location from available drawings, use of marking wires and signals, ground penetrating radar (GPR), electromagnetic survey (EM), and hand auger borings. GPR and EM surveys will be conducted and markings placed in accordance with the Specification. We note that available methods for detecting underground utilities have limitations and may not detect all lines, especially deep, small, non-metallic lines. MACTEC will coordinate potential underground obstructions with site drawings to attempt to resolve any uncertainty regarding underground obstructions. If uncertainty then remains, pre-drilling of selected boring locations to depths of 5 to 10 feet utilizing manual hand auger equipment may be performed to verify safe conditions. The use of insulated gloves and shoes during the hand-augering process will be used, if appropriate.

Following the utility detection effort, a report describing the results of the utility detection effort, including a field drawing of known or suspected utility locations in proximity of the planned exploratory points will be prepared and submitted to SNC and Bechtel.

The MACTEC drilling service will provide at the start of work, for each rig that is to perform SPT testing, a signed certificate stating the weight of the SPT hammer measured by a standard traceable to the National Institute of Standards and Technology (NIST), that indicates that the hammer weight falls within the range of 140 ±2 pounds (lbs.).

The certification of Calibration is documentation to ensure that the equipment used was properly calibrated and adequate to perform its function. As a minimum, this certification will include the following:

- Equipment general and unique identification (name and serial or ID number).
- Name and signature of person performing calibration and date performed.
- Acceptance criteria (calibration limits) and, if required, conversion tables or curves.
- Date recalibration is due.
- Calibration equipment used and its traceability to the NIST or a natural physical constant.

Drilling of Boreholes

Hollow stem augers will not be used for drilling in soils below the water table, or for drilling borings in which geophysical and P-S logging will be performed. For all borings used for geotechnical purposes, mud rotary drilling methods and equipment using water with or without bentonite added, as appropriate, will be used. Rotary drilling will be conducted in accordance with ASTM D 5783. The finished hole size will be between approximately 3 and 8 inches in diameter. Drill string advance will be carefully controlled to minimize disturbance to formation soils.

Water losses are anticipated near the top of the Blue Bluff Marl layer (marl). It may be necessary to grout the area of water loss and then drill through the hardened grout or to set steel casing to seal off the zone of water loss. No other zone of water loss is currently identified; although deeper water loss zones may be encountered. The following procedures may be utilized if either shallow or deep water loss zones are encountered, with approval by Bechtel as required:

1. Thicken the drilling fluid
2. Place additives into the drilling fluid
3. Grout the water loss zone and re-drill the grouted zone
4. Set steel or plastic temporary casing

We note that MACTEC's logging contractor, GeoVision, will not be able to perform P-S suspension or geophysical logging through steel casing. Therefore the upper approximately 5 to 10 feet of borings will not be logged, due to near-surface casing routinely installed for mud rotary drilling. If steel casing is required to seal off water losses near the top of the "marl" layer, this section may also be lost to the logging process. If approved by Bechtel and SNC, this may be acceptable since foundations for the ALWR are expected to bear near the top of the 'marl' layer and shallower information may not be necessary. Alternately, if approved by Bechtel and SNC, plastic casing may be set through any water loss zone near the top of the marl, grouted in place, and the boring extended after the grout has hardened. P-S suspension logging and some geophysical logs can be performed through a properly grouted PVC casing. However, in locations with significant loss of circulation, it is sometimes not possible to adequately grout the PVC casing. MACTEC will notify and coordinate with Bechtel and SNC for alternate solutions if such difficulties arise. Solutions may include re-drilling the hole or drilling an offset hole. Drilling and casing installation (if applicable) procedures for the geophysical boreholes will be coordinated with Bechtel prior to the work.

Hammer (SPT) sampling will be performed at close spacing (2.5 ft spacing or two samples every 5 ft, per Bechtel) in the upper 15 ft and thereafter at reasonably constant 5-foot depth intervals (or assigned intervals, if different) in the boreholes. Below the bottom of the Blue Bluff Marl (estimated depth of about 150 feet), SPT will be performed at 10 foot intervals, or as directed by Bechtel. In selected boreholes (150 feet deep or less), the SPT sampling interval at 2.5 ft depth increments will be continued until the borehole termination depth to accomplish continuous sampling. We anticipate that Bechtel may

select at least two boreholes for continuous sampling. SPT testing will be conducted in accordance with ASTM D 1586.

Undisturbed samples will be obtained in accordance with the Specification and at depths and boring locations selected by Bechtel. Samples will be obtained by hydraulic push, or rotary methods (Pitcher, or other rotary sampler approved by Bechtel). Sampling will be coordinated with Bechtel as the hole advances. Undisturbed samples may be obtained between SPT samples, in place of SPT samples, or in offset holes drilled nearby the original hole at depths to be determined by Bechtel. Standard procedures will be followed, but recovery of samples, especially in granular zones below the water table, may be variable. If an undisturbed sample is not recovered, another attempt will be made to recover a sample as soon as possible without interfering with the SPT interval. As previously mentioned, it may also be necessary to drill parallel borings specifically to obtain undisturbed samples. The quantity and quality of undisturbed samples will be coordinated with SNC and Bechtel prior to demobilization of SPT drilling equipment. Undisturbed sampling will be conducted in accordance with ASTM D 1587

Prior to hammer or undisturbed sampling, the borehole bottom will be flushed to remove drill cuttings.

Existing concrete slabs or foundations, if encountered at the boring locations, will be cored or removed by other methods to allow drilling of the borehole. Samples of the existing concrete, if encountered, will not be obtained.

The depth of each sample interval should be established by measurements of the downhole drilling rod length to within 3-inches, and measured from a fixed reference point (such as the top of drill casing or mud tank) with a measuring tape. These measurements will be graphically recorded by the Rig Geologist on the borehole log as the top of each sample. The measurement will be made after the sampler is lightly seated into the bottom of the hole.

Upon retrieval, samples will be inspected and logged by the Rig Geologist/engineer and transferred into suitable containers for storage. Digital photographs of selected samples may be obtained. Sample handling will be performed in accordance with ASTM D 4220 and in accordance with Attachment 7.

Sampling of Boreholes

The on-site soils may be sampled by either hammer drive (SPT) sampling, rotational Pitcher sampling, and/or hydraulic push sampling. The following equipment specified in the following paragraphs is to be used for these techniques.

SPT sampling equipment will meet ASTM specification D1586, and include:

- Delivery system : Automatic-trip hammer; and
- SPT Sampler: 2.0-inch O.D., 1.375-inch I.D., 24-inch to 30-inch interior length, split-spoon sampler. Brass liners will not be used in SPT samplers.

Dimensions are standard for this type of sampler. Drive sampler shoes should be in good condition, i.e. not contain visible deformations, dings, or excessively worn edges.

Equipment for undisturbed sampling will meet ASTM D 1587.

If difficult drilling conditions are encountered, i.e. bridging hole or flowing sands, the sampling program may be modified at the driller's and Rig Geologist/Engineer's joint recommendation and with Bechtel's permission, to allow completion of the hole. If this is necessary, a modification to the Work Instruction may be necessary to document the authorized changes made.

Borehole Logging

Exploratory borings will be logged on Boring Log Sheets that include descriptions of drilling procedures, sampling, geologic materials, and general subsurface information. The following data, as applicable, is to be included on these sheets for the borings:

- Project name and job number;
- Date started and completed;
- Description of drill rig and name of Driller;
- Boring number;
- Type & diameter of boring;
- Elevation of top of hole will not generally be available until the as-built survey is done;
- Boring location if significantly different from the location on the Boring Location Plan in the Specification (may be shown on accompanying sketch with measurements from fixed reference features with a measuring tape and compass); location data to be understood as approximate until provided by the project surveyor (after drilling);
- Sampling method: including all samplers used;
- Sample driving hammer type and drop (ASTM standards for SPT sampling require a 140 lb. hammer with a 30 inch drop);
- Recovery;
- Name of geologist/engineer logging the hole;
- Hammer sample blows per 6-inch drive;
- Description and classification of the soil (see discussion below); and
- Specific notes, as applicable, regarding drilling fluid circulation, casing dimensions, type of grout backfill, etc.

Soil Descriptions/Nomenclature

Descriptive terms and geologic classification of soil material will be based on the following sources:

- ASTM D 2487 standard classification of soils for engineering purposes, D 2488-00 standard practice for description and identification of soils; and
- Munsell soil color charts, 1994.
- Subsurface Stratigraphy established during the Early Site Permit work in 2005.
- Stratigraphy and Depositional Environments of Sediments from Five Cores from Screven and Burke Counties, Georgia (USGS Professional Paper 1603-A).

During drilling, the Rig Geologist will keep records of drilling conditions such as rod drop, water loss or drill chatter as well as standard penetration resistance, sample locations, material types, or any materials or occurrences, which may require additional investigation. Comments from the driller regarding drilling will also be noted. Daily observations will usually include water level at start of day and end of day and drilling progress.

The Daily Field Report for field activities will be kept daily by the Rig Geologist and submitted to the Site Coordinator.

Copies of field records may be submitted to Bechtel as completed on a preliminary basis until the records are finalized.

Well Installation

The installation of ground water monitoring wells is beyond the scope of work for this exploration.

Test Pits

The Specification states that Bechtel (CONTRACTOR) will field-locate the test pits, select the materials to be bulk sampled, and direct the backfilling of the test pits. MACTEC will be responsible for logging the test pit excavation, collection of the bulk samples, the glass jar samples, and labeling and storing the samples in accordance with Attachment 7.

Collection and Transportation of Samples
Samples will be documented and stored in accordance with Attachment 7.

Unexpected Conditions
In the event of a changed condition at the drilling/sampling site-above or below grade (i.e., oil spills, injuries, and encounters with potentially hazardous material) the Site Coordinator will stop the work and notify the Bechtel representative on-site for the purposes of organizational notification. These changes in conditions can include but not be limited to; encounters with unexpected concrete, unexpected metal or unusual material returned in the wash water or drill cuttings. For any of the above, operations will cease regardless of depth of drilling or sampling.

It is anticipated that near-surface concrete and miscellaneous metal may be encountered just below the surface in the former warehouse locations. Such encounters would thus not necessarily be a condition to stop work.

SPT Energy Measurement
An energy measurement will be performed on each SPT drill rig hammer at least once during the 12 month period that includes the work of this rig on the project. An instrumented drill rod of the proper size for the drill rods being used (i.e. "A" or "N" sized, or other) will be used to perform the measurements. The energy measurement does not have to be made prior to the start of work and may be made while the rig is on another project by properly qualified personnel. The SPT energy measurement will be performed in accordance with ASTM D 4633.

Borehole Completion and Restoration
Upon completion of the borings and geophysical logging and extraction of any temporary piezometer casings or drill casings, the boreholes not used as observation wells will be completely backfilled to the ground surface with a bentonite-grout mix installed by the tremie method, and according to local and state requirements for protection of groundwater. Grouting procedures will be documented. For future location by the surveyor, a wooden stake will be placed in the backfill grout at the approximate center of the boreholes and labeled with the specified boring number.

In holes provided with a grouted PVC casing (if required) for the downhole geophysical logging, as approved by Bechtel and SNC, the PVC casing will be left in place and the hole backfilled with grout.

Upon completion of the test pits as directed by Bechtel, the excavations will be completely backfilled to the ground surface with the removed native materials, and compactive effort applied using the backhoe bucket as directed by Bechtel. The test pit will be staked for later survey location.

After completion of field activities MACTEC will clean up all drilling and sampling equipment, paper, rags, etc. associated with the drilling operations. Trees dislocated by bulldozer will be left where deposited by the dozer. Because of the site conditions, the drill sites cannot be returned to the same general condition as found prior to drilling. However, drill cuttings and drilling fluids will be spread onto the ground and left. Vegetative ground cover will not be re-established nor will wheel ruts and other ground surface irregularities be repaired. MACTEC understands that discharge of drilling fluids may have to be further controlled in wetland areas near the Savannah River floodplain. We anticipate that this control may include but not be limited to: containerizing drilling fluids and wet cuttings in steel drums, or pumping drilling fluids and wet cuttings to higher elevations for discharge into a temporary mud pit or

tank. Specific measures for control of cuttings will be coordinated and approved by SNC and Bechtel prior to MACTEC work in this area.

REFERENCES AND STANDARDS

The codes, standards and regulations of the following organization in effect January 1, 2006, unless otherwise noted, are a part of the project Work Plan and are listed as follows:

American Society for Testing and Materials (ASTM).

1) ASTM D 420-98; "*Standard Guide to Site Characterization for Engineering, Design and Construction Purposes.*"
2) ASTM D 1452-80 (2000); "*Standard Practice for Soil Investigation and Sampling by Auger Borings.*"
3) ASTM D 1586-99; "*Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.*"
4) ASTM D 2488-2000; "*Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).*"
5) ASTM D 2487-2000; "*Standard Practice for Classification of Soils for Engineering Purposes.*"
6) ASTM D 4220-95 (2000); "*Practices for Preserving and Transporting Soil Samples.*"
7) D 1587-2000; "*Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes.*"
8) ASTM 4750-*87 (2001); "Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well).*"
9) ASTM D 5778-95 (2000); *"Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils."*
10) ASTM D 4633-*05; "Standard Test Method for Energy Measurement for Dynamic Penetrometers."*

MACTEC

DAILY FIELD REPORT

JOB NAME:	JOB NO.:	PAGE NO.:
CLIENT:	CONTRACTOR:	
LOCATION:	MACTEC REP.:	DATE: __/__/__
ATTACHMENTS:	REFERENCES:	

ACTIVITY TYPES: RESISTIVITY; SPT; CPT; DPT; V_S; ELOG; MWELL; PIEZ; STEST; SRES; GROUT; CON-CORE; R-CORE; GJACK; PACKER; P-S; TELEV; BSEAL; DELAY; UNAVAIL.

LOCATION:	ACTIVITY:	EQUIPMENT, PERSONNEL, QUANTITY:

REVIEWED BY:	DATE:

MACTEC

Boring Summary Sheet

			BORING NO.:
JOB NAME:	JOB NO.:	PAGE NO.:	__/__
LOCATION:	CLIENT:		MACTEC REP.:
CONTRACTOR:	RIG TYPE:	DATE:	__/__/__

DATE STARTED:	DATE FINISHED:	DEPTH ACHIEVED:	EQUIPMENT USED:	NUMBER OF SAMPLES FOR TESTING:	IDENTIFICATION OF SAMPLES FOR TESTING (# AND DEPTH):

FIELD CHECKS:	N/A	ACCEPTABLE	UNACCEPTABLE
1. CERTIFICATE THAT WEIGHT OF HAMMER MEETS ASTM D 1586-84 REQUIREMENTS.			
2. DRILL DEPTH AND INTENDED TEST DEPTH IS ACCEPTABLE.			
3. SPLIT SPOON IS PROPERLY CLEANED.			
4. DRIVE SHOE IS IN GOOD SHAPE (FREE OF PITS AND SMOOTH).			
5. SPLIT SPOON IS PROPERLY ASSEMBLED AND CATCHER IS INSTALLED PROPERLY.			
6. TWO FOOT BLEEDER IS IN PLACE (IF WASH DRILLED).			
7. DEPTH OF SPLIT SPOON IN PLACE IN BORING.			
8. NUMBER OF ROPE TURNS AROUND THE CATHEAD MEETS ASTM D-1586-84 REQUIREMENTS (2).			
9. SIX (6) INCH INCREMENTS ARE MARKED ON THE DRILL ROD.			
10. THIRTY (30) INCH DROP MARK IS MARKED ON THE HAMMER ROD.			
11. HAMMERS FALLS FREELY AND SMOOTHLY.			

ADDITIONAL REMARKS:

REVIEWED BY:	DATE:

MACTEC

CASING INSTALLATION FIELD LOG

			BORING NO.:
JOB NAME:	JOB NO.:	PAGE NO.:	__/__
LOCATION:	CLIENT:		MACTEC REP.:
DRILLER:	RIG TYPE:	DATE:	__/__/__

DATE DRILLED:	
SURFACE ELEV.:	GROUNDWATER DEPTH:
HOLE DIAMETER:	
DRILL METHOD:	NOTES:
DRILL MUD:	
MISC.:	
CASING TYPE:	INSTALLATION DEPTH:
CASING DIAMETER:	TOP OF CASING ELEV.:
TYPE JOINT:	TOTAL GROUT/BOND:

INSTALLATION PROCEDURE

NOTES	**SKETCH:**
GROUT/BOND MIX	**NOTES:**
REFERENCES	**ATTACHMENTS**
REVIEWED BY:	DATE:

ATTACHMENT 3

CONE PENETRATION TEST PROCEDURES

CONE PENETRATION TEST PROCEDURES

CPT – The Cone Penetration Test procedure is described on the following page.

REFERENCES AND STANDARDS

The codes, standards and regulations of the following organization in effect January 1, 2006, unless otherwise noted, are a part of the project Work Plan and are listed as follows:

1) ASTM D 5778-95 (2000); "*Standard Test Method for Performing Electric Friction Cone and Piezocone Penetration Testing of Soils.*"

Cone Penetration Testing Procedure (CPT)

Gregg In Situ, Inc. carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*. The soundings are conducted using a 20 ton capacity cone with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.85.

The cone takes measurements of cone bearing (q_c), sleeve friction (f_s) and dynamic pore water pressure (u_2) at 5-cm intervals during penetration to provide a nearly continuous hydrogeologic log. CPT data reduction and interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored on disk for further analysis and reference. All CPT soundings are performed in accordance with revised (2002) ASTM standards (D 5778-95).

The cone also contains a porous filter element located directly behind the cone tip (u_2), *Figure CPT*. It consists of porous plastic and is 5.0mm thick. The filter element is used to obtain dynamic pore pressure as the cone is advanced as well as Pore Pressure Dissipation Tests (PPDT's) during appropriate pauses in penetration. It should be noted that prior to penetration, the element is fully saturated with silicon oil under vacuum pressure to ensure accurate and fast dissipation.

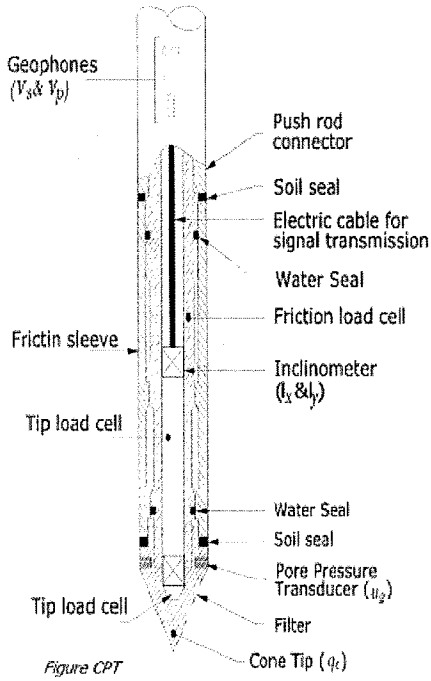

Figure CPT

When the soundings are complete, the test holes are grouted using a Gregg In Situ support rig. The grouting procedure consists of pushing a hollow CPT rod with a "knock out" plug to the termination depth of the test hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

GREGG
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ATTACHMENT 4

DOWNHOLE TEST PROCEDURES

- **4.1 4.2 P-S Logging**
- **4.2 Borehole Geophysical Logging**

4.1 P-S LOGGING TECHNIQUE

4.2 P-S Logging Technique: The Specification includes P-S logging at selected boreholes. A Subcontractor will perform the logging at the selected locations in accordance with the following procedure.

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: _____ DATE: _____
CLIENT: _____ JOB: _____
AUTHOR: _____ PAGE _____ OF _____

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56			
2.5	8.20			
3.0	9.84			
3.5	11.48			
4.0	13.12			
4.5	14.76			
5.0	16.40			
5.5	18.04			
6.0	19.69			
6.5	21.33			
7.0	22.97			
7.5	24.61			
8.0	26.25			
8.5	27.89			
9.0	29.53			
9.5	31.17			
10.0	32.81			
10.5	34.45			
11.0	36.09			
11.5	37.73			
12.0	39.37			
12.5	41.01			
13.0	42.65			
13.5	44.29			
14.0	45.93			
14.5	47.57			
15.0	49.21			
15.5	50.85			
16.0	52.49			
16.5	54.13			
17.0	55.77			
17.5	57.41			
18.0	59.06			

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GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: _____ DATE: _____
CLIENT: _____ JOB: _____
AUTHOR: _____ PAGE _____ OF _____

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
18.5	60.70			
19.0	62.34			
19.5	63.98			
20.0	65.62			
20.5	67.26			
21.0	68.90			
21.5	70.54			
22.0	72.18			
22.5	73.82			
23.0	75.46			
23.5	77.10			
24.0	78.74			
24.5	80.38			
25.0	82.02			
25.5	83.66			
26.0	85.30			
26.5	86.94			
27.0	88.58			
27.5	90.22			
28.0	91.86			
28.5	93.50			
29.0	95.14			
29.5	96.78			
30.0	98.43			
30.5	100.07			
31.0	101.71			
31.5	103.35			
32.0	104.99			
32.5	106.63			
33.0	108.27			
33.5	109.91			
34.0	111.55			
34.5	113.19			
35.0	114.83			
35.5	116.47			
36.0	118.11			

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GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: _____ DATE: _____
CLIENT: _____ JOB: _____
AUTHOR: _____ PAGE _____ OF _____

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
36.5	119.75			
37.0	121.39			
37.5	123.03			
38.0	124.67			
38.5	126.31			
39.0	127.95			
39.5	129.59			
40.0	131.23			
40.5	132.87			
41.0	134.51			
41.5	136.15			
42.0	137.80			
42.5	139.44			
43.0	141.08			
43.5	142.72			
44.0	144.36			
44.5	146.00			
45.0	147.64			
45.5	149.28			
46.0	150.92			
46.5	152.56			
47.0	154.20			
47.5	155.84			
48.0	157.48			
48.5	159.12			
49.0	160.76			
49.5	162.40			
50.0	164.04			
50.5	165.68			
51.0	167.32			
51.5	168.96			
52.0	170.60			
52.5	172.24			
53.0	173.88			
53.5	175.52			
54.0	177.17			

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GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: _____ DATE: _____
CLIENT: _____ JOB: _____
AUTHOR: _____ PAGE _____ OF _____

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
54.5	178.81			
55.0	180.45			
55.5	182.09			
56.0	183.73			
56.5	185.37			
57.0	187.01			
57.5	188.65			
58.0	190.29			
58.5	191.93			
59.0	193.57			
59.5	195.21			
60.0	196.85			
60.5	198.49			
61.0	200.13			
61.5	201.77			
62.0	203.41			
62.5	205.05			
63.0	206.69			
63.5	208.33			
64.0	209.97			
64.5	211.61			
65.0	213.25			
65.5	214.90			
66.0	216.54			
66.5	218.18			
67.0	219.82			
67.5	221.46			
68.0	223.10			
68.5	224.74			
69.0	226.38			
69.5	228.02			
70.0	229.66			
70.5	231.30			
71.0	232.94			
71.5	234.58			
72.0	236.22			

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GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: _____ DATE: _____
CLIENT: _____ JOB: _____
AUTHOR: _____ PAGE _____ OF _____

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
72.5	237.86			
73.0	239.50			
73.5	241.14			
74.0	242.78			
74.5	244.42			
75.0	246.06			
75.5	247.70			
76.0	249.34			
76.5	250.98			
77.0	252.62			
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			
80.5	264.11			
81.0	265.75			
81.5	267.39			
82.0	269.03			
82.5	270.67			
83.0	272.31			
83.5	273.95			
84.0	275.59			
84.5	277.23			
85.0	278.87			
85.5	280.51			
86.0	282.15			
86.5	283.79			
87.0	285.43			
87.5	287.07			
88.0	288.71			
88.5	290.35			
89.0	291.99			
89.5	293.64			
90.0	295.28			

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GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: _____ DATE: _____
CLIENT: _____ JOB: _____
AUTHOR: _____ PAGE _____ OF _____

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
90.5	296.92			
91.0	298.56			
91.5	300.20			
92.0	301.84			
92.5	303.48			
93.0	305.12			
93.5	306.76			
94.0	308.40			
94.5	310.04			
95.0	311.68			
95.5	313.32			
96.0	314.96			
96.5	316.60			
97.0	318.24			
97.5	319.88			
98.0	321.52			
98.5	323.16			
99.0	324.80			
99.5	326.44			
100.0	328.08			
100.5	329.72			
101.0	331.36			
101.5	333.01			
102.0	334.65			
102.5	336.29			
103.0	337.93			
103.5	339.57			
104.0	341.21			
104.5	342.85			
105.0	344.49			
105.5	346.13			
106.0	347.77			
106.5	349.41			
107.0	351.05			
107.5	352.69			
108.0	354.33			

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GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: _____ DATE: _____
CLIENT: _____ JOB: _____
AUTHOR: _____ PAGE _____ OF

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
108.5	355.97			
109.0	357.61			
109.5	359.25			
110.0	360.89			
110.5	362.53			
111.0	364.17			
111.5	365.81			
112.0	367.45			
112.5	369.09			
113.0	370.73			
113.5	372.38			
114.0	374.02			
114.5	375.66			
115.0	377.30			
115.5	378.94			
116.0	380.58			
116.5	382.22			
117.0	383.86			
117.5	385.50			
118.0	387.14			
118.5	388.78			
119.0	390.42			
119.5	392.06			
120.0	393.70			
120.5	395.34			
121.0	396.98			
121.5	398.62			
122.0	400.26			
122.5	401.90			
123.0	403.54			
123.5	405.18			
124.0	406.82			
124.5	408.46			
125.0	410.10			
125.5	411.75			
126.0	413.39			

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CALIBRATION PROCEDURE FOR

GEOVision SEISMIC RECORDER/LOGGER

Reviewed 4/6/06

Objective

The timing/sampling accuracy of seismic recorders or data loggers is required for several GEOVision field procedures including Seismic Refraction, Downhole Seismic Velocity Logging, and P-S Suspension Logging. This procedure describes the method for measuring the timing accuracy of a seismic data logger, such as the OYO Model 170, OYO/Robertson Model 3403, Geometrics Strataview or Geometrics Geode. The objective of this procedure is to verify that the timing accuracy of the recorder is accurate to within 1%.

Frequency of Calibration

The calibration of each GEOVision seismic data logger is twelve (12) months. In the case of rented seismic data loggers, calibration must be performed prior to use.

Test Equipment Required

The following equipment is required. Item #2 must have current NIST traceable calibration.

1. Function generator, Krohn Hite 5400B or equivalent
2. Frequency counter, HP 5315A or equivalent
3. Test cables, from item 1 to item 2, and from item 1 to subject data logger.

Procedure

This procedure is designed to be performed using the accompanying Seismograph Calibration Data Sheet with the same revision number. All data must be entered and the procedure signed by the technician performing the test.

1. Record all identification data on the form provided.
2. Connect function generator to data logger (such as OYO Model 170) using test cable
3. Connect the function generator to the frequency counter using test cable.

GEOVision	Seismic Recorder/Logger Calibration Procedure Revision 1.30 Page 1

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4. Set up generator to produce a 100.0 Hz, 0.25 volt (amplitude is approximate, modify as necessary to yield less than full scale waveforms on logger display) peak square wave or sine wave. Verify frequency using the counter and initial space on the data sheet.

5. Initialize data logger and record a data record of at least 0.1 second using a 100 microsecond or less sample period.

6. Measure the recorded square wave frequency by measuring the duration of 9 cycles of data. This measurement can be made using the data logger display device, or by printing out a paper tape. If a paper tape can be printed, the resulting printout must be attached to this procedure. Record the data in the space provided.

7. Repeat steps 5 and 6 three more times using separate files.

Criteria

The duration for 9 cycles in any file must be 90.0 milliseconds plus or minus 0.9 milliseconds, corresponding to an average frequency for the nine cycles of 100.0 Hz plus or minus 1 Hz (obtained by dividing 9 cycles by the duration in milliseconds).

If the results are outside this range, the data logger must be marked with a GEOVision REJECT tag until it can be repaired and retested.

If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

Procedure Approval

Approved by:

John G. Diehl	President
Name	Title
	April 6, 2006
Signature	Date

Client Approval (if required):

Name	Title
Signature	Date

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OYO P-S Suspension Velocity Logging Procedure REVISION LOG

DATE	REVISION NUMBER	REASON FOR CHANGE	APPROVED
12/7/1998	1.00	NEW GEOVISION PROCEDURE	JGD
		(WAS AGBABIAN PROCEDURE)	
12/8/1998	1.10	MINOR CORRECTIONS TO TEXT	JGD
6/20/2000	1.20	REVIEWED TEXT.	JGD
		REVISED FIELD LOG TO CHANGE LOGO	
		FROM GEOVISION DIV OF AGBABIAN	
		TO GEOVISION DIVISION OF	
		BLACKHAWK GEOMETRICS	
4/6/2006	1.30	- CHANGED TEXT PAGE 1 UNDER	JGD
		INSTRUMENTATION TO REFLECT CURRENT	
		INSTRUMENTS AVAILABLE.	
		- CHANGED THIRD PARAGRAPH P.2	
		WHISKERS "MAY" BE USED - NOT ALWAYS	
		NECESSARY.	
		- CHANGED FIRST PARAGRAPH UNDER	
		ENVIRONMENTAL CONDITIONS P.2	
		TO ALLOW 3IN CASING.	
		- CHANGED TEXT P.3 TO ADD PARAGRAPH	
		HOW MICROLOGGER STORES DATA.	
		ADDED SENTENCE TO PARAGRAPH 5	
		RE DATA VERIFICATION FOR MICRO-	
		LOGGER.	
		- REVISED ITEM 2 UNDER REQUIRED	
		FIELD RECORDS TO STATE THAT	
		PAPER RECORDS NO LONGER	
		REQUIRED.	
		- REVISED ITEM 4 UNDER REQUIRED	
		FIELD RECORDS TO ALLOW CDROM	
		AND USB DRIVES AS ALTERNATE	
		BACKUP STORAGE IN ADDITION	
		TO FLOPPY DISK	
		- REVISED THIRD PARAGRAPH P.5 TO REFLECT	
		THAT VELOCITY CALCS ARE DONE IN EXCEL	
		SPREADSHEET	

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PROCEDURE FOR

OYO P-S SUSPENSION SEISMIC VELOCITY LOGGING

Background

This procedure describes a method for measuring shear and compressional wave velocities in soil and rock. The OYO P-S Suspension Method is applied by generating shear and compressional waves in a borehole using the OYO P-S Suspension Logger borehole tool and measuring the travel time between two receiver geophones or hydrophones located in the same tool.

Objective

The outcome of this procedure is a plot and table of P and S_H wave velocity versus depth for each borehole. Standard analysis is performed on receiver to receiver data. Data is presented in report format, with ASCII data files and digital records transmitted on diskette.

Instrumentation

1. OYO Model 170 Digital Logging Recorder or equivalent
2. OYO P-S Suspension Logger probe, including two sets horizontal and vertical geophones, seismic source, and power supply for the source and receivers
3. Winch and winch controller, with logging cable
4. Batteries to operate OYO 170 and winch

The Suspension P-S Logger system, manufactured by OYO Corporation, or the Robertson Digital P-S Suspension Probe with the Robertson Micrologger2 are currently the only commercially available suspension logging systems. As shown in Figure 1, these systems consists of a borehole probe suspended by a cable and a recording/control electronics package on the surface.

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave generator (S_H) and compressional-wave generator (P), joined to two biaxial geophones by a flexible isolation cylinder. The separation of the two

geophones is one meter, allowing average wave velocity in the region between the geophones to be determined by inversion of the wave travel time between the two geophones. The total length of the probe is approximately 7 meters; the center point of the geophones is approximately 5 meters above the bottom end of the probe.

The probe receives control signals from, and sends the amplified geophone signals to, the instrumentation package on the surface via an armored 7 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured by a rotary encoder to provide probe depth data.

The entire probe is suspended by the cable and may be centered in the borehole by nylon "whiskers." Therefore, source motion is not coupled directly to the borehole walls; rather, the source motion creates a horizontally propagating pressure wave in the fluid filling the borehole and surrounding the source. This pressure wave produces a horizontal displacement of the soil forming the wall of the borehole. This displacement propagates up and down the borehole wall, in turn causing a pressure wave to be generated in the fluid surrounding the geophones as the soil displacement wave passes their location.

Environmental Conditions

The OYO P-S Suspension Logging Method can be used in either cased or uncased boreholes. For best results, the uncased borehole must be between 10 and 20 cm in diameter, or 4 to 8 inches. A cased borehole may be as small as 3 inches, if properly grouted (see below) and the grout annulus does not exceed 1 inch.

Uncased boreholes are preferred because the effects of the casing and grouting are removed. It is recommended that the borehole be drilled using the rotary mud method. This method does little damage to the borehole wall, and the drilling fluid coats and seals the borehole wall reducing fluid loss and wall collapse. The borehole fluid is required for the logging, and must be well circulated prior to logging.

If the borehole must be cased, the casing must be PVC and properly installed and grouted. Any voids in the grout will cause problems with the data. Likewise, large grout bulbs used to fill cavities will also cause problems. The grout must be set before testing. This means the grouting must take place at least 48 hours before testing.

For borehole casing, applicable preparation procedures are presented in ASTM Standard D4428/D4428M-91 Section 4.1 (see ASTM website for copy).

Calibration

Calibration of the digital recorder is required. Calibration is limited to the timing accuracy of the recorder. GEOVision's Seismograph Calibration Procedure or equivalent should be used. Calibration must be performed on an annual basis.

Measurement Procedure

The entire probe is lowered into the borehole to a specific measurement depth by the winch. A measurement sequence is then initiated by the operator from the instrumentation package control panel. No further operator intervention is then needed to complete the measurement sequence described below.

The system electronics activates the SH-wave source in one direction and records the output of the two horizontally oriented geophone axes which are situated parallel to the axis of motion of the source. The source is then activated in the opposite direction, and the horizontal output signals are again recorded, producing a SH-wave record of polarity opposite to the previous record. The source is finally actuated in the first direction again, and the responses of the vertical geophone axes to the resultant P-wave are recorded during this sampling.

The data from each geophone during each source activation is recorded as a different channel on the recording system. The Model 170 has six channels (two simultaneous recording channels), each with a 12 bit 1024 sample record. The recorded data is displayed on a CRT display and on paper tape output as six channels with a common time scale. Data is stored on 3.5-inch floppy diskettes for further processing. Up to 8 sampling sequences can be stacked (averaged) to improve the signal to noise ratio of the signals.

The Robertson Micrologger2 also stores data digitally, but instead of storing it on floppy disk, data is delivered to an adjacent field computer (laptop PC) via USB cable and stored on hard disk. No paper record is generated.

Review of the displayed data on the CRT or paper tape allows the operator to set the gains, filters, delay time, pulse length (energy), sample rate, and stacking number in order to optimize the quality of the data before recording. In the case of the Model 170, printed data is verified by the operator prior to moving the probe. In the case of the Robertson Micrologger2, storage on the hard disk should be verified from time-to-time, certainly before exiting the borehole.

Typical depth spacing for measurements is 1.0 meters, or 3.3 feet. Alternative spacing is 0.5 meter, or 1.6 feet.

Required Field Records

1) Field log for each borehole showing

   a) Borehole identification

   b) Date of test

c) Tester or data recorder

d) Description of measurement

e) Any deviations from test plan and action taken as a result

f) QA Review

2) Paper output records are no longer required, since the Micrologger2 cannot generate them. However, data must be stored in at least 2 places prior to leaving the site

3) List of record ID numbers (for data on diskette) and corresponding depth

4) Diskettes, CDRom, or USB flash drives with backup copies of data on hard disk, labeled with borehole designation, record ID numbers, date, and tester name.

An example Field Log is attached to this procedure.

Analysis

Following completion of field work, the recorded digital records are processed by computer using the OYO Corporation software program PSLOG and interactively analyzed by an experienced geophysicist to produce plots and tables of P and S_H wave velocity versus depth.

The digital time series records from each depth are transferred to a personal computer for analysis. Figure 2 shows a sample of the data from a single depth. These digital records are analyzed to locate the first minima on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between these arrivals is used to calculate the P-wave velocity for that 1-meter interval. When observable, P-wave arrivals on the horizontal axis records are used to verify the velocities determined from the vertical axis data. In addition, the soil velocity calculated from the travel time from source to first receiver is compared to the velocity derived from the travel time between receivers.

The digital records are studied to establish the presence of clear SH-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the SH-wave signals from the 'normal' and 'reverse' source pulses are very nearly inverted images of each other. Digital FFT – IFFT lowpass filtering are used to remove the higher frequency P-wave signal from the SH-wave signal.

The first maxima are picked for the 'normal' signals and the first minima are picked for the 'reverse' signals. The absolute arrival time of the 'normal' and 'reverse' signals may vary by +/- 0.2 milliseconds, due to differences in actuation time of the solenoid source caused by constant mechanical bias in the source or by borehole inclination. This

variation does not affect the velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

In Figure 2, the time difference over the 1-meter interval of 1.70 millisecond is equivalent to a SH-wave velocity of 588 m/sec. Whenever possible, time differences are determined from several phase points on the S_H -wave pulse trains to verify the data obtained from the first arrival of the S_H -wave pulse. In addition, the soil velocity calculated from the travel time from source to first receiver is compared to the velocity derived from the travel time between receivers.

Figure 3 is a sample composite plot of the far normal horizontal geophone records for a range of depths. This plot shows the waveforms at each depth, clearly showing the S-wave arrivals. This display format is used during analysis to observe trends in velocity with changing depth.

Once the proper picks are entered in PSLOG, the picks are transferred to an Excel spreadsheet where Vs and Vp are calculated. The spreadsheet allows output for presentation in charts and tables.

Standard analysis is performed on receiver 1 to receiver 2 data, with separate analysis performed on source to receiver data as a quality assurance procedure.

Registered Geophysicist Antony Martin Date 4/10/06

QA Review Date 4/10/06

References:

1. "In Situ P and S Wave Velocity Measurement", Ohya, S. 1986. Proceedings of In-Situ '86, *Use of In-Situ Tests In Geotechnical Engineering*, an ASCE Specialty Conference sponsored by the Geotechnical Engineering Division of ASCE and co-sponsored by the Civil Engineering Dept of Virginia Tech.

2. Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

3. "Standard test Methods for Crosshole Seismic Testing", ASTM Standard D4428/D4428M-91, July 1991, Philadelphia, PA

OYO SUSPENSION P-S VELOCITY LOGGING SETUP

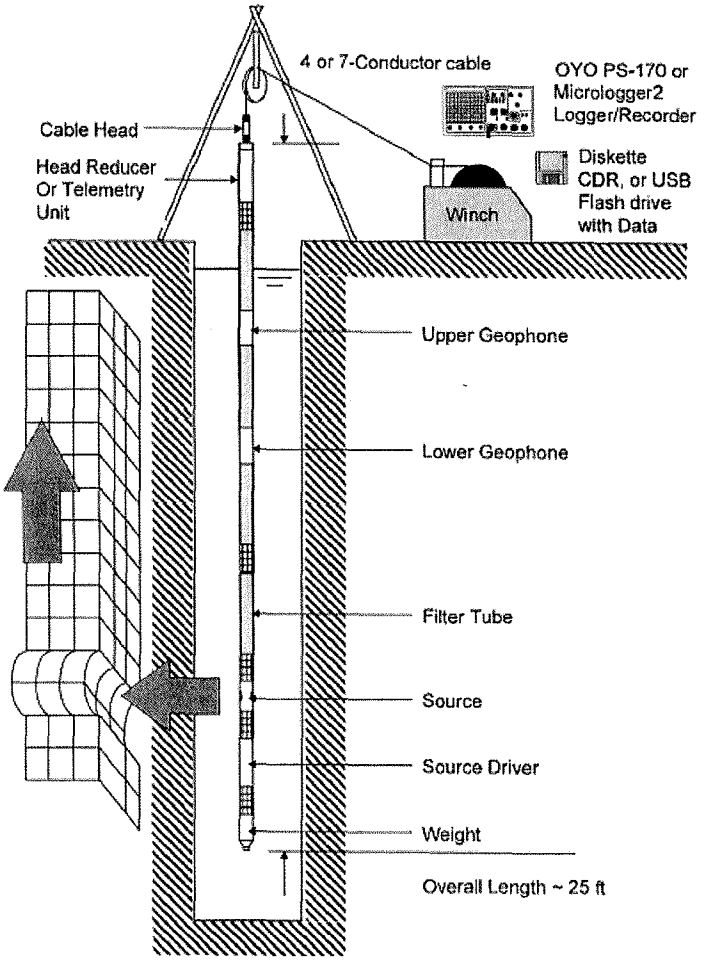

Figure 1. Suspension PS logging method setup

GE Vision	Procedure for OYO P-S Suspension Seismic Velocity Logging Rev 1.3 4/06/06 Page 6

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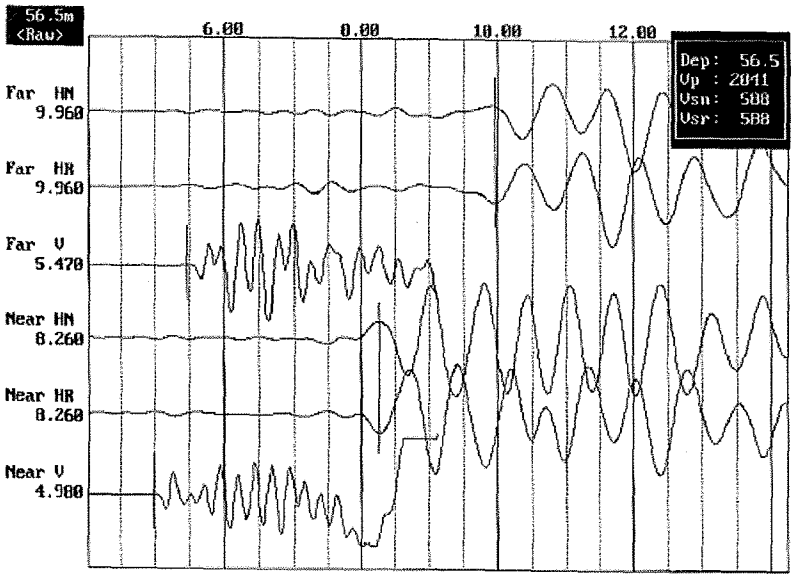

Figure 2. Sample suspension method waveform data showing horizontal normal and reversed (HR and HN), and vertical (V) waveforms received at the near (bottom 3 channels) and far (top 3 channels) geophones. The arrivals in milliseconds for each pick are shown on the left. The box in the upper right corner shows the depth in the borehole and the velocities calculated based on the picks.

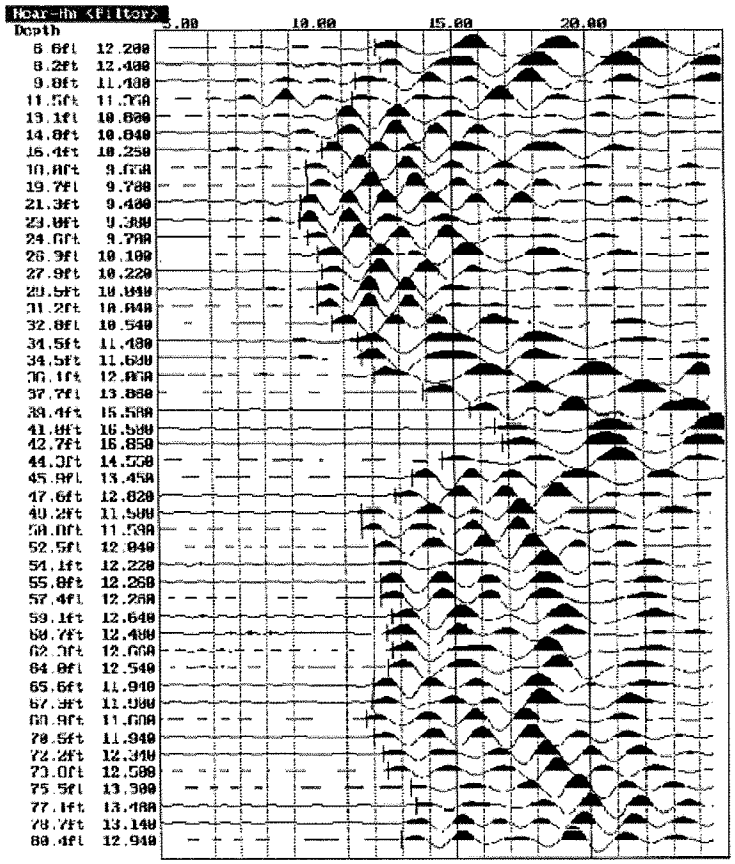

Figure 3. Sample composite waveform plot for normal shear waves received at the near geophone in a single borehole

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P-S SUSPENSION VELOCITY FIELD LOG

SITE:_____ DATE:_____
CLIENT:_____ JOB:_____
AUTHOR:_____ PAGE 1 OF ____

CONTACT:_____ _OFFICE_ PHONE:_____
_____ PHONE:_____
CONTACT:_____ _OFFICE_ PHONE:_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
DRILLER:_____ _____ PHONE:_____
COMPANY:_____ _____ PHONE:_____

DIRECTIONS TO SITE:_____
_____
_____
_____
_____

GENERAL SITE CONDITIONS/LOCATION:_____
_____

EA#:_____
BOREHOLE DESIGNATION:_____LOCATION:_____
_____
COUNTY:_____RANGE:_____TOWNSHIP:_____SECTION:_____
BOREHOLE CONSTRUCTION: CASED_____ UNCASED_____
DIAMETERS AND DEPTH RANGES: _____ 0 TO _____ ; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED:_____
CONDUCTOR CASING?: YES____ DEPTH TO BOTTOM OF CASING_____; NO____
DEPTH TO BEDROCK:_____ DEPTH TO WATER TABLE:_____
BOREHOLE FLUID: WATER_____; FRESH WATER MUD_____; SALT WATER MUD _____;
OTHER:_____
DEPTH TO BOREHOLE FLUID:_____ TIME SINCE LAST CIRCULATION:_____

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SITE:_____ DATE:_____
CLIENT:_____ JOB:_____
AUTHOR:_____ PAGE 2 OF _____

LOGGING CREW:_____
VEHICLE(S) USED AND MILEAGE: _____
MOBILIZED FROM:_____ DEPARTURE TIME:_____
ARRIVED ON SITE:_____
STANDBY TIME:_____ CAUSE:_____
LOGGING STARTED:_____ LOGGING COMPLETED:_____
STANDBY TIME:_____ CAUSE:_____
LOGGING STARTED:_____ LOGGING COMPLETED:_____
DEMOBILIZED TO:_____ ARRIVAL TIME:_____
ADDITIONAL DEMOB TIME:_____ REASON:_____

BATTERIES CHANGED BEFORE LOGGING: YES_____; NO_____; STORED WITH NEW_____

WINCH	COMPROBE ☐		GREY ☐	OYO ☐	RG ☐	OTH ☐		
INSTRUMENT	OYO 12004 ☐	15014 ☐	19029 ☐		RG 160023 ☐	160024 ☐		
RECEIVER S/N	12008 ☐	20042 ☐	26066 ☐	11001 ☐	23053 ☐			

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

COMMENTS:_____

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SEISMOGRAPH CALIBRATION DATA SHEET REVISION LOG

DATE	REVISION NUMBER	REASON FOR CHANGE	APPROVED
4/14/1998	1.00	NEW GEOVISION PROCEDURE	JGD
		(WAS AGBABIAN PROCEDURE)	
12/8/1998	1.10	REVISED 0.25MV TO 0.25V BECAUSE	JGD
		TEST APPARATUS INJECTS SIGNAL	
		AFTER GAIN AMPLIFIERS. ALSO	
		CORRECTED SPELLING ERRORS	
		(COORECT AND SEISMOGRAPG)	
2/16/1999	1.20	REVISED "TEST EQUIPMENT	JGD
		REQUIRED" SECTION TO ONLY REQUIRE	
		NIST TRACEABLE CALIBRATION FOR	
		THE FREQUENCY COUNTER. ALSO	
		ADDED INSTRUCTIONS FOR CREATING	
		CALIB. LABEL PER QA PROGRAM.	
7/11/2002	1.20	CHANGED THE LOGO FROM	JGD
		BLACKHAWK GEOMETRICS TO	
		BLACKHAWK GEOSERVICES. NO	
		CHANGES TO PROCEDURE.	
10/10/2005	1.21	CHANGED LOGO TO REMOVE	JGD
		"DIVISION OF BLACKHAWK" AND ADD	
		REV 1.21 AT BOTTOM OF PAGE	
		CHANGED TITLE OF SIGNATURE IN	
		PROCEDURE FROM VP TO PRESIDENT.	
4/6/2006	1.30	CHANGED "RECORD BOTH ON	JGD
		DISKETTE AND PAPER TAPE.." TO	
		"RECORD BOTH ON DISK AND PAPER	
		TAPE, IF AVAILABLE" AND CHANGED	
		"ATTACH ...PAPER TAPES TO THIS	
		FORM" TO "ATTACH...PAPER TAPES,	
		IF AVAILABLE, TO THIS FORM."	

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4.3 BOREHOLE GEOPHYSICAL LOGGING

Borehole Geophysical Logging

Down-hole geophysical logging will be performed in specified boreholes in accordance with the procedures described in ASTM D 5753, Standard Guide for Planning and Conducting Borehole Geophysical Logging. The following down-hole geophysical logs will be required to be performed in the selected boreholes:

- Natural gamma;
- Long- and short-normal resistivity;
- Three-arm caliper; and
- Directional Survey

The capability to log both open and cased holes with a minimum diameter of 4 inches is required.

Geophysical logging will begin after all drilling tools have been removed from the borehole. Where this would require hourly standby charges from the Geophysical Subcontractor to coordinate with drilling operations, grouted PVC casing may be used to maintain holes open, depending on site/borehole conditions and as necessary, awaiting geophysical logging. The PVC casing would be left in place when the hole is completed by grouting.

Prior to beginning logging activities, information on logging rates, plotting, logging order, and instrument sensitivities will be provided to Bechtel.

Data for all logs will be recorded in a digital format so that the logs can be reproduced at any scale required by subsequent data analysis or presentation. The logs will be interpreted by the Geophysical Subcontractor and the logs and the interpretation will be presented in the data report and transmitted to Bechtel. Interpretation of the logs will include, but not be limited to, information on lithology, water quality, water-bearing zones and fracture zones.

ATTACHMENT 5

REFRACTION MICROTREMOR (REMI) TEST PROCEDURES

DATA ACQUISITION

The data gathering process in the field uses standard refraction seismic equipment to measure site characteristics using ambient vibrations (microtremors) as a seismic source. If ambient noise is low at the time of the test, an active source, which may consist of walking or driving back and forth across the array, is used. The equipment used for the survey includes a SeisDAQ ReMi recording unit capable of storing record lengths up to about 100 seconds and 24 10-Hz vertical P-wave geophones. The data is collected from the 24 receivers (10 Hz. Geophones) set along a relatively straight-line array, with evenly spaced intervals between the receivers. Ten unfiltered 30-second records are recorded along each line.

DATA PROCESSING

The vibration records collected above are processed using proprietary software that uses the refraction microtremor method as explained in Louie, J, N., 2001, "Faster, Better: Shear-wave velocity to 100 meters depth from refraction micrometer arrays, Bulletin of the Seismological Society of America, v. 91, p. 347-364.

For each location, there are three main processing steps:

Step 1: Creating a velocity spectrum (p-f image) from the data: The distinctive slope of dispersive waves is an integral part of the p-f analysis. Other arrivals that appear in microtremor records, such as body waves and airwaves, cannot have such a slope.

Step 2: Rayleigh-wave dispersion picking: Picking is done along a "lowest-velocity envelope" bounding the energy appearing in the p-f image.

Step 3: Shear wave velocity modeling: The refraction microtremor method interactively forward-models the normal-mode dispersion data picked from the p-f images

ATTACHMENT 6

ELECTRICAL RESISTIVITY TEST

FIELD ELECTRICAL RESISTIVITY TESTING

Field Electrical resistivity testing will be performed to determine the in-place electrical resistivity of the foundation materials at the project site. The testing will be performed at the locations shown on the Subsurface Investigation Location Plan of the Specification and at other locations as directed in the field by Bechtel. A Wenner four-electrode resistivity array provided by MACTEC or a Subcontractor will be used for the testing.

The procedure used for the resistivity testing will be in accordance with ASTM G 57. The electrode spacing will be 3, 5, 7.5, 10, 15, 30, 50, 100, 200, and 300 ft, or as approved by Bechtel, to determine the resistivity at increasing depths. The locations shown on the Subsurface Investigation Location Plan of the Specification for the resistivity tests will be the centerpoint of the test. The tests will be conducted in the directions shown on the Subsurface Investigation Location Plan or as directed by Bechtel in the field.

The resistivity data will be interpreted by MACTEC and the results transmitted to Bechtel in the Data Report.

ATTACHMENT 7

FIELD RECORDS AND SAMPLE CONTROL PROCEDURES

FIELD RECORDS AND SAMPLE CONTROL PROCEDURES

Purpose

The purpose of this procedure is to describe the process that will be followed in the field handling of samples, methods of controlling access to the samples and the process for transferring the samples to the laboratories for testing. This procedure also addresses the process that will be followed for controlling field records.

Definitions

Field Record: A field record is created once the act of data collection begins. Field records include: digital photographs, electronic files, paper documents, field notes and journal entries, maps and additional information related to the samples. Such information includes field data CDs or diskettes test reports, monitoring well installation forms, borehole logs, chain of custody forms, results of in-situ tests, data CD's /diskettes and downhole geophysical logging interpretations.

Field Sample: A field sample is a portion of material (solid, liquid or gas) collected from the subject site. Typical field samples will be soil materials (placed in glass jars), undisturbed soil samples (contained in steel Shelby tubes), and bulk samples (placed in plastic buckets or plastic-lined bags).

Office Facility: The actual location of this facility has not been determined. However, this is typically a secured building (or area of a building) which contains the file storage and data processing equipment (copier, fax, telephone). The office facility will be climate-controlled.

On-Site Storage Facility: This will be one or more rooms at or near the site which may also serve as the office facility. The Storage Facility will also be climate-controlled.

Processing of Field Records

Field records will be returned to the office facility on a daily basis. Journal originals may remain with the author, however a copy of that day's entries must be created for the office facility. A copy of field records should be maintained at the site in the office facility. These copies will be stored in a secure file cabinet in the office. The originals (or copies of journals, as appropriate) should be transmitted to the Document Control Center (DCC) on a once per work shift basis by the Site Coordinator or his designee. The Site Coordinator is responsible for maintenance of the field records stored at the office facility.

Formal requests for copies of field records will be submitted to the DCC. Field records are considered to be for information only until they have been reviewed and approved by the Principal Geotechnical Engineer. Any copies received directly from the field office facility will be considered as documents for information only.

Transportation and Storage of Samples

Collected samples will be stored in a manner that will allow future retrieval for examination and laboratory testing. The following procedures will be followed to preserve the sample integrity.

a. ASTM standard D 4220 "Standard practices for preserving and transporting soil samples" will be followed.

b. Samples should be clearly labeled with the job name, job number, borehole number, depth and date collected.

c. SPT sample specimens will be placed in glass sample jars/bottles fitted with moisture-resistant lids and the jars/bottles placed in cardboard boxes.

d. Undisturbed samples will be placed in appropriate padded boxes and kept upright while transported to the Storage Facility in accordance with ASTM 4220. Inside the Storage Facility the samples may be stored upright in appropriate storage racks or kept in their transportation boxes until they are selected to send to the laboratory (see Transportation of Samples to Off-Site Locations).

e. Sample jars, and undisturbed sample tubes, will be clearly marked with the following information in indelible ink:

- Job Name and Project Number
- Date of Sampling
- Borehole Number
- Depth Interval
- Sample Number

Pre-printed adhesive labels will be placed on the sides of the glass sample jars to accommodate the above pertinent information. The above information will be written directly on the sides of the undisturbed sample tubes in indelible ink. Boxes of sample jars (SPT samples) will have the job name, project number, boring number, and range of sample numbers, written on the side of the box in indelible ink.

Field Samples consisting of full boxes of sample jars (SPT samples), and all undisturbed samples will be delivered to the On-Site Storage Facility on a daily basis. Improperly labeled sample containers (e.g., boxes) will not be accepted into the On-Site Storage Facility unless they are only partially filled and scheduled for additional sampling on the following working day.

Partially filled boxes containing sample jars (SPT samples) may be stored in the drill rig cab or truck cab to remain on-site for continued use on the following working day until the box is full and sample container labeling can be properly completed. Boxes of undisturbed samples will be delivered to the Storage Facility on a daily basis.

Access to Field Records and Samples

The Site Coordinator will control access to the On-Site Storage Facility and the office facility field records. The general public will not have access to the On-Site Storage Facility or the office facility.

Transportation of Samples to Off-Site Locations

If a transfer to an off-site facility (e.g., the testing laboratory of MACTEC or one of its Subcontractors) is requested by Bechtel, the MACTEC Site Coordinator or Project Manager will determine when the transfer can be performed. Samples will be prepared for transportation and documented accordingly using a Chain-of-Custody (COC) form. The parties involved in sample transportation will fill in the COC form to completely document the transportation process. The Site Coordinator or his designee will collect the associated chain of custody forms and arrange for transport of the sample containers. Weather protection of the sample containers will be maintained during the transfer. The Site Coordinator or his designee will retain copies of the chain of custody form after relinquishing control to the testing laboratory or to Bechtel at the off-site facility.

ATTACHMENT 8

LABORATORY CONTROL AND PROCEDURES

Laboratory Control and Procedures

The laboratory testing of soil and water samples will be performed in accordance with ASTM procedures or other applicable standards (see attached References & Standards).

The laboratory tests will be performed at MACTEC's Atlanta, GA, Charlotte, NC, or Raleigh, NC office or by a MACTEC-approved Subcontractor. Additional laboratory testing will be performed by subcontract or University laboratories. For soil, this additional testing will include dynamic testing and the chemical analysis tests. The number and type of specific laboratory tests will be determined by Bechtel based on the results of the field exploration program.

REFERENCES AND STANDARDS

The following standards are to be used for performing the laboratory tests on soil and rock samples:

American Society for Testing and Materials (ASTM).

1) ASTM D 1557-02e_1; "Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700kN-m/m3))"

2) ASTM D 854-06; "*Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer.*"
3) ASTM D 1883-05; "*Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils.*"
4) ASTM D 2488-1100; "*Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).*"
5) ASTM D 2487-06 (2006); "*Standard Practice for Classification of Soils for Engineering Purposes.*"
6) ASTM D 422-63 (2002); "*Standard Test Method for Particle-Size Analysis of Soils.*"
7) ASTM D 6913-04e_1; "*Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis" Use in lieu of D422 except for Hydrometer*
8) ASTM D 1586-99; "*Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.*"
9) ASTM D 2166-00; "*Standard Test Method for Unconfined Compressive Strength of Cohesive Soil.*"
10) ASTM D 2216-05; "*Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*".
11) ASTM D 2435-04; "*Standard Test Methods for One-Dimensional Consolidation Properties of Soils using Incremental Loading.*"
12) ASTM D 2850-03 (2003); "*Standard Test Method for Unconslidated-Undrained Triaxial Compression Test on Cohesive Soils.*"

13) ASTM D 3080-04; "*Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions.*"
14) ASTM D 4015-92 (2000); "*Standard Test Methods for Modulus and Damping of Soils by the Resonant-Column Method.*"
15) Test Procedures and Calibration Documentation Associated with the RCTS and URC Tests at the University of Texas at Austin, DCN: UTSD RCTS GR06-4, April 25, 2006, Geotechnical Engineering Center, University of Texas, Austin, Texas

16) ASTM D 4220-95 (2000); *"Standard Practices for Preserving and Transporting Soil Samples."*
17) ASTM D 4318-05; *"Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils."*
18) ASTM D 4767-04 (2004); *"Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils."*

19) EPA Methods Chemical Analysis of Soil Samples (Corrosion)

- *EPA Method SW-846 9056/300.0 (Chlorides)*
- *EPA Method SW-846 8056/300.0 (Sulfates)*
- *EPA Method SW-846 9045 (pH)*

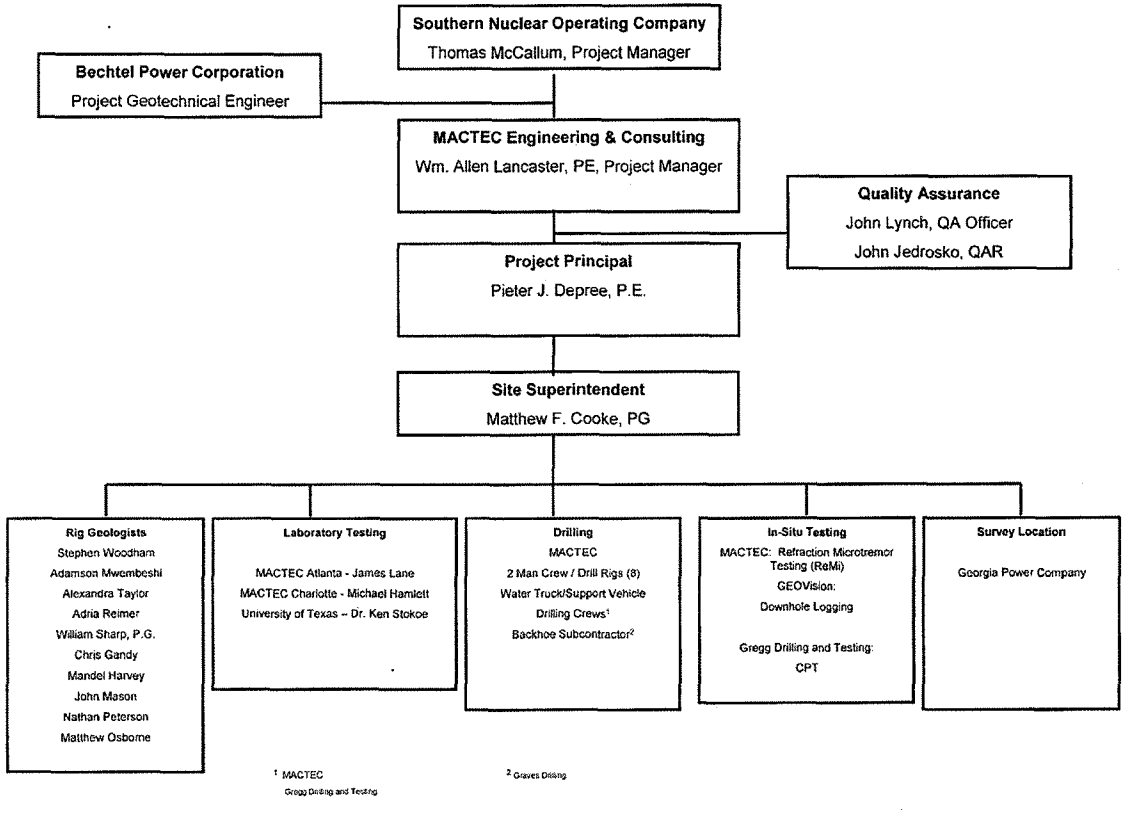
Table 8.1 - Laboratory Testing Program

	Grain Size (Dry)	Grain Size (Hydrometer)	Atterberg Limits	Moisture-Density Mod. Proctor	Moisture Content	Specific Gravity	Triaxial Shear (CU)	Triaxial Shear (UU)	Direct Shear	Consolidation	Corrosion	Unconfined Compression - Soil	Unit Weight - Soil	Resonant Column / Torsional Shear
Total Tests in Program	250	50	150	20	600	50	10	30	0	20	50	0	50	20
SPT														
Existing Fill														
Coastal Plain Soils	•	•	•		•	•					•			
UD Thin-Wall Tube														
Coastal Plain Soils	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Bulk Sample - Test Pits														
Coastal Plain Soils	•	•	•	•	•	•					•			

Notes: Dots indicate samples that may be selected by Bechtel for laboratory testing

ATTACHMENT 9

ORGANIZATION CHART


Southern Nuclear Operating Company
Thomas McCallum, Project Manager
Bechtel Power Corporation
Project Geotechnical Engineer
MACTEC Engineering & Consulting
Wm. Allen Lancaster, PE, Project Manager
Quality Assurance
John Lynch, QA Officer
John Jedrosko, QAR
Project Principal
Pieter J. Depree, P.E.
Site Superintendent
Matthew F. Cooke, PG
Rig Geologists
Stephen Woodham
Adamson Mwembeshi
Alexandra Taylor
Adria Reimer
William Sharp, P.G.
Chris Gandy
Mandel Harvey
John Mason
Nathan Peterson
Matthew Osborne
Laboratory Testing
MACTEC Atlanta - James Lane
MACTEC Charlotte - Michael Hamlett
University of Texas – Dr. Ken Stokoe
Drilling
MACTEC
2 Man Crew / Drill Rigs (8)
Water Truck/Support Vehicle
Drilling Crews[1]
Backhoe Subcontractor[2]
In-Situ Testing
MACTEC: Refraction Microtremor Testing (ReMi)
GEOVision:
Downhole Logging
Gregg Drilling and Testing:
CPT
Survey Location
Georgia Power Company
[1] MACTEC
Gregg Drilling and Testing
[2] Graves Drilling

FINAL REPORT

BORING GEOPHYSICAL LOGGING
BORINGS B-3001, B-3002, B-3003, B-4001, B-4002 AND B-4003

VOGTLE UNITS 3 & 4 COL PROJECT
VOGTLE ELECTRIC GENERATING PLANT

Report 6517-02 vol 2 of 2 (CD-R) rev B

May 18, 2007

Prepared for:

MACTEC Engineering and Consulting, Inc.
396 Plasters Avenue
Atlanta, Georgia 30324
404-873-4761
MACTEC Job number 6141-06-0286

Prepared by

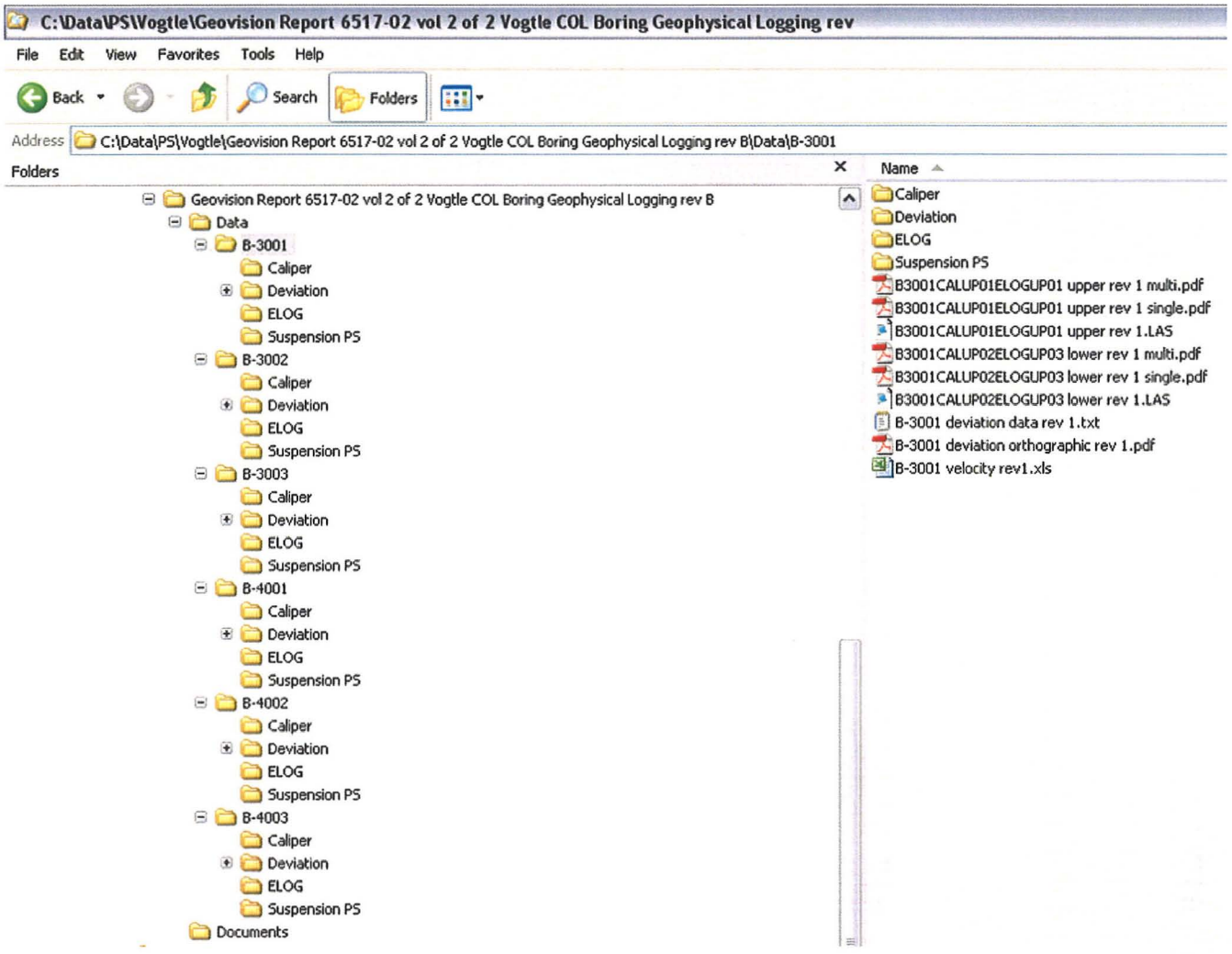
GEOVision Geophysical Services
1151 Pomona Road, Unit P
Corona, California 92882
(951) 549-1234

CONTENTS

The "Data" directory contains boring-specific subdirectories, each containing .XLS, .PDF, .TXT and .LAS files for presentation or further processing, as shown in the Windows Explorer screen grab below. File names and revision level are self explanatory. Each boring-specific subdirectory is further divided by log type, with each sub-directory containing raw data files and intermediate processing steps for those log types.

The PSLOG picking and file viewing program for the Suspension PS data, and directions for its use, are contained in the "Data" directory. It may be run and files viewed directly off the disk.

The "Documents" directory contains the vol 1 of 2 of this report, as well as this vol 2 of 2 cover sheet.



GEOVision Report dated May 7, 2007

Four Electrode Wenner Resistivity Tests

May 7, 2007

GEOVision Project Number 7125

Mr. Matt Cooke
MACTEC Engineering and Consulting
720 Gracem Road, Suite 132
Columbia, South Carolina 29210

Subject: **GEOVision Report 7125-01 Vogtle COL Resistivity rev 0**
Four Electrode Wenner Resistivity Tests
Vogtle Electric Generating Plant
Vogtle Units 3 & 4 COL Geotechnical Data Report Attachment D
Project 6141-06-0286

Dear Mr. Cooke:

A geophysical survey was conducted from March 27, 2007 to March 29, 2007 at the Vogtle Electric Generating Plant near Waynesboro, Georgia. The purpose of the geophysical survey was to measure soil resistivity according to ASTM standard G57-2006. Site conditions consisted of very dry surficial soils with minor to heavy vegetation

METHODOLOGY

Resistivity equipment used during this investigation included an Advanced Geosciences Supersting R8/IP earth resistivity meter Serial Number SS0609199 coupled to 1/4- inch stainless steel electrode stakes with 20 gauge insulated copper wire. A test resistor rated at 19.82 ohms was used to verify the receiver was operating within calibrated levels. The Supersting transmitter is rated at 200W and is capable of continuous output current between 1mA-1A with an output voltage of 800 V peak to peak. The operator may select a maximum output current, which the instrument will automatically reduce as needed depending on soil conditions and ground impedance. The transmitter then maintains a steady current through the measurement cycle, recording input voltage and writing V/I to internal memory.

FIELD PROCEDURES

Before conducting the geophysical survey the battery level was checked on the resistivity meter and found to be within acceptable limits. Ambient temperature and soil conditions were recorded on the field log. Electrode spacing was pre-determined based on information provided by the client.

A test resistor rated at 19.82 ohms was connected to the positive and negative current and potential leads on the Supersting R8/IP immediately before the first sounding and immediately after the final sounding, at each of the survey locations. The resistance value across the test resistor and the time of the test measurement was recorded on the field log.

Resistivity measurements (soundings) were made at ten locations (ER-1103, ER-1104, ER-1105, ER-1106, ER-3001, ER-3002, ER-4001, ER-4002, ER-4003 AND ER-4004) at the selected intervals using a surveyor's measuring tape for spatial control.

Resistivity measurements at ten electrode spacings were made on each line. For each resistivity measurement, four stainless steel electrodes were placed at equal distances (*a* spacing) in a straight line. A current was applied from the outer electrodes, and a potential reading (voltage) was measured across the inner electrodes. The Supersting R8/IP displays the resistance value, which was recorded along with the *a* spacing on a field data sheet and later transferred to a spreadsheet. The instrument also displays a calculated apparent resistivity value, which was also recorded on the field log. However, the Supersting R8/IP performs all internal calculations in metric units prior to display, and some rounding errors may occur. It should be noted that resistance values are unitless and are therefore not affected by any rounding errors during unit conversion. The instrument stores output current, resistance values, and apparent resistivity values in internal memory as well as geometry of the measurement. Two or more measurements were recorded at each station for quality control. If there was significant variation between the first and second measurements the control leads, electrode cable and electrode coupling were field checked to ensure proper survey conditions. After each measurement, the electrodes were moved to the next *a* spacing and another set of measurements was taken. Vegetation, accessibility, and line lengths constrained ER-3001, ER-3002, and ER-4003 to a maximum 200 ft electrode spacing. Data was downloaded at the completion of each field day.

DATA REDUCTION

Ten spreadsheets were generated from the collected resistivity data. Probe spacing (*a*) and resistance reading (ΔV/I), were entered for each resistivity measurement. A generalized form of the four-electrode array is shown in Figure 1.

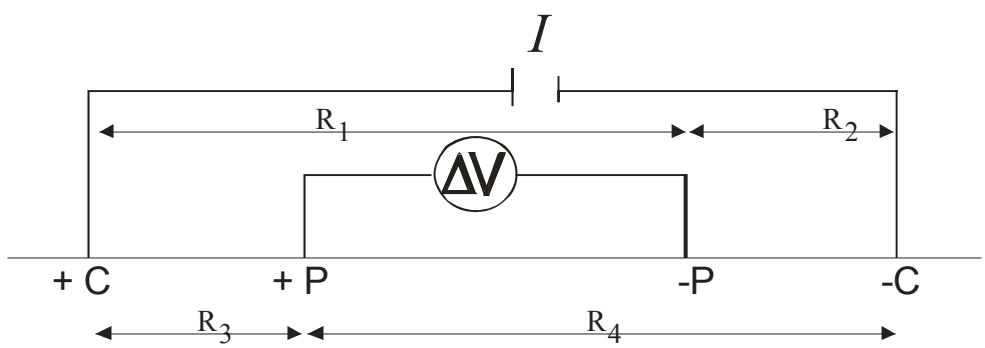


Figure 1: The generalized form of the four electrode array

When the material upon which the current is induced is uniform, the resistivity calculated will be constant independent of electrode configuration. However, in a field investigation where subsurface heterogeneities exist, the calculated resistivity values will vary with electrode array. This calculated resistivity is referred to as apparent resistivity (ρ_a), and can be calculated using the relationship:

$$\rho_a = \frac{2\pi\Delta V}{I\left\{\left(\frac{1}{R_3}-\frac{1}{R_4}\right)-\left(\frac{1}{R_1}-\frac{1}{R_2}\right)\right\}}$$

For the Wenner array, which was used during this investigation, where $R_1 = R_4$; $R_3 = R_2$ and $R_1 = 2R_2 = 2a$, it can be shown that the formula for calculated apparent resistivity can be reduced to the following form:

$$\rho_a = 2\pi a\left(\frac{\Delta V}{I}\right)$$

RESULTS

Data collected from the ten Wenner resistivity arrays are attached as Tables 1-10. Electrode *a* spacing was converted to meters in order to provide an average soil resistivity in ohm-meters. All calculations were conducted using known geometry and measured unitless resistance values; calculated apparent resistance values may vary from values calculated by the Supersting R8/IP, which are recorded on the daily field logs. According to ASTM Standard G57-2006 data is also presented in the ohm-centimeter unit.

Several readings encountered during measurements at ER-1105 and ER-4001 are considered erroneous and should not be used for design purposes. Coarse gravels, extremely dry soils, and poor contact between the electrode stake and native soils are interpreted as contributing factors. The measurements at these locations were repeated. Wire and electrode contacts were checked to ensure proper testing protocols. It should be noted that two techniques or procedures may typically be employed to overcome extreme contact resistances. The first involves increasing the amount of surface area of the electrode with the soil by driving the electrode stake further into the soil or increasing the diameter of the electrode stake, both in contradiction with standard ASTM G57-2006. The second technique entails pouring a sodium-chloride solution in a shallow excavation around the electrode stakes. However, neither of these field procedures are covered in the published standard, and were therefore not used in this project.

All completed data processing forms are retained in project files. All files generated during the processing sequence were archived on CD-ROM.

SUMMARY

Four-electrode soil resistivity measurements were made at the Vogtle Electric Generating Plant according to ASTM standard G57-2006. Soil resistivity values were made at ten locations, using electrode spacings determined by the client. Field measurements and calculated values were consistent and repeatable at all locations, as summarized in Tables 1-10.

If you have any questions concerning this investigation, please call us at 951-549-1234.

Sincerely,
GEO*Vision* Geophysical Services

Vincent Romano

JB Shawver

Submitted by:
Vincent John Romano
Staff Geophysicist

Reviewed and Approved by:
JB Shawver
Senior Project Geophysicist

Attachments:

Table 1: Resistivity Soundings ER-1103
Table 2: Resistivity Soundings ER-1104
Table 3: Resistivity Soundings ER-1105
Table 4: Resistivity Soundings ER-1106
Table 5: Resistivity Soundings ER-3001
Table 6: Resistivity Soundings ER-3002
Table 7: Resistivity Soundings ER-4001
Table 8: Resistivity Soundings ER-4002
Table 9: Resistivity Soundings ER-4003
Table 10: Resistivity Soundings ER-4004
Applied Technical Services, Incorporated Certificate of Calibration
Applied Technical Services, Incorporated Calibration Data Sheet

TABLE #1 ELECTRICAL RESISTIVITY SOUNDING ER-1103

Job Number 7125 Date 28-Mar-07

19.82 ohm Test Resistor Reading

19.83 ohm at 0810 19.83 ohm at 0855

A-Spacing [ft.]	Resistance Reading [Ohm]	Geometric Multiplier [2(pi)A]	Calculated Magnitude [Ohm-ft.]	Converted Magnitude [Ohm-m]	Calculated to Ohm-cm [Ohm-cm]	Repeat Resistance [Ohm]	Repeat Magnitude [Ohm-ft.]	Repeat Conversion [Ohm-m]	Repeat Calculation to Ohm-cm [Ohm-cm]
3.0	842.265	18.850	15876.321	4839.103	483910.271	838.952	15813.873	4820.068	482006.8
5.0	418.706	31.416	13154.037	4009.350	400935.046	418.042	13133.177	4002.992	400299.2
7.5	207.763	47.124	9790.601	2984.175	298417.510	207.561	9781.082	2981.274	298127.4
10.0	133.799	62.832	8406.839	2562.405	256240.456	134.007	8419.908	2566.388	256638.8
15.0	88.277	94.248	8319.940	2535.918	253591.756	88.470	8338.054	2541.439	254143.9
30.0	54.207	188.496	10217.816	3114.390	311439.046	54.373	10249.088	3123.922	312392.2
50.0	38.985	314.159	12247.405	3733.009	373300.896	39.053	12268.799	3739.530	373953.0
100.0	9.3450	628.319	5871.637	1789.675	178967.486	9.430	5925.044	1805.953	180595.3
200.0	0.4837	1256.637	607.835	185.268	18526.821	0.483	606.956	185.000	18500.0
300.0	0.1975	1884.956	372.279	113.471	11347.056	0.239	450.239	137.233	13723.3

TABLE #2 ELECTRICAL RESISTIVITY SOUNDING ER-1104

Job Number 7125 Date 28-Mar-07

19.82 ohm Test Resistor Reading

19.81 ohm at 0945 19.81 ohm at 1030

A-Spacing [ft.]	Resistance Reading [Ohm]	Geometric Multiplier [2(pi)A]	Calculated Magnitude [Ohm-ft.]	Converted Magnitude [Ohm-m]	Calculated to Ohm-cm [Ohm-cm]	Repeat Resistance [Ohm]	Repeat Magnitude [Ohm-ft.]	Repeat Conversion [Ohm-m]	Repeat Calculation to Ohm-cm [Ohm-cm]
3.0	171.443	18.850	3231.624	984.999	98499.912	171.443	3231.624	984.999	98499.9
5.0	169.746	31.416	5332.728	1625.415	162541.545	170.053	5342.373	1628.355	162835.5
7.5	159.804	47.124	7530.586	2295.323	229532.264	159.709	7526.109	2293.958	229395.8
10.0	146.189	62.832	9185.326	2799.687	279968.729	146.148	9182.750	2798.902	279890.2
15.0	116.037	94.248	10936.230	3333.363	333336.278	116.048	10937.266	3333.679	333367.9
30.0	49.719	188.496	9371.830	2856.534	285653.365	49.759	9379.256	2858.797	285879.7
50.0	14.542	314.159	4568.535	1392.490	139248.961	14.538	4567.122	1392.059	139205.9
100.0	0.912	628.319	572.915	174.624	17462.439	0.912	573.032	174.660	17466.0
200.0	0.056	1256.637	70.572	21.510	2151.023	0.057	71.646	21.838	2183.8
300.0	0.054	1884.956	102.117	31.125	3112.529	0.054	101.876	31.052	3105.2

TABLE #3 ELECTRICAL RESISTIVITY SOUNDING ER-1105

Job Number 7125 Date 27-Mar-07

19.82 ohm Test Resistor Reading

19.82 ohm at 1300 19.81 ohm at 1420

A-Spacing [ft.]	Resistance Reading [Ohm]	Geometric Multiplier [2(pi)A]	Calculated Magnitude [Ohm-ft.]	Converted Magnitude [Ohm-m]	Calculated to Ohm-cm [Ohm-cm]	Repeat Resistance [Ohm]	Repeat Magnitude [Ohm-ft.]	Repeat Conversion [Ohm-m]	Repeat Calculation to Ohm-cm [Ohm-cm]
3.0	*2428.000*	*18.850*	*45766.722*	*13949.697*	*1394969.680*	*2428.000*	*45766.722*	*13949.697*	*1394969.7*
5.0	*1240.000*	*31.416*	*38955.749*	*11873.712*	*1187371.227*	*1240.000*	*38955.749*	*11873.712*	*1187371.2*
7.5	647.000	47.124	30489.157	9293.095	929309.496	646.200	30451.458	9281.604	928160.4
10.0	426.000	62.832	26766.369	8158.389	815838.940	426.200	26778.936	8162.220	816222.0
15.0	227.500	94.248	21441.370	6535.330	653532.953	227.200	21413.096	6526.712	652671.2
30.0	73.740	188.496	13899.663	4236.617	423661.714	73.880	13926.052	4244.661	424466.1
50.0	22.650	314.159	7115.707	2168.868	216886.760	22.660	7118.849	2169.825	216982.5
100.0	2.230	628.319	1401.150	427.071	42707.062	2.211	1389.212	423.432	42343.2
200.0	0.404	1256.637	507.556	154.703	15470.298	0.410	514.593	156.848	15684.8
300.0	0.123	1884.956	232.604	70.898	7089.755	0.128	240.332	73.253	7325.3

** Note: Italicied values are considered erroneous and interpreted as being caused by difficulty overcoming high contact resistance*

TABLE #4 ELECTRICAL RESISTIVITY SOUNDING ER-1106

Job Number 7125 Date 27-Mar-07

19.82 ohm Test Resistor Reading

19.81 ohm at 1515 19.81 ohm at 1615

A-Spacing [ft.]	Resistance Reading [Ohm]	Geometric Multiplier [2(pi)A]	Calculated Magnitude [Ohm-ft.]	Converted Magnitude [Ohm-m]	Calculated to Ohm-cm [Ohm-cm]	Repeat Resistance [Ohm]	Repeat Magnitude [Ohm-ft.]	Repeat Conversion [Ohm-m]	Repeat Calculation to Ohm-cm [Ohm-cm]
3.0	934.800	18.850	17620.565	5370.748	537074.817	934.200	17609.255	5367.301	536730.1
5.0	497.500	31.416	15629.423	4763.848	476384.827	497.100	15616.857	4760.018	476001.8
7.5	282.500	47.124	13312.499	4057.650	405764.966	282.600	13317.211	4059.086	405908.6
10.0	199.900	62.832	12560.087	3828.315	382831.465	199.700	12547.521	3824.484	382448.4
15.0	107.800	94.248	10159.911	3096.741	309674.076	101.700	9584.999	2921.508	292150.8
30.0	33.500	188.496	6314.601	1924.690	192469.046	33.480	6310.831	1923.541	192354.1
50.0	11.680	314.159	3669.380	1118.427	111842.709	11.660	3663.097	1116.512	111651.2
100.0	1.903	628.319	1195.690	364.446	36444.636	1.921	1207.000	367.894	36789.4
200.0	0.379	1256.637	475.637	144.974	14497.420	0.382	479.658	146.200	14620.0
300.0	0.054	1884.956	101.788	31.025	3102.486	0.055	103.786	31.634	3163.4

TABLE #5 ELECTRICAL RESISTIVITY SOUNDING ER-3001

Job Number 7125 Date 28-Mar-07

19.82 ohm Test Resistor Reading

19.82 ohm at 1150 19.82 ohm at 1225

A-Spacing [ft.]	Resistance Reading [Ohm]	Geometric Multiplier [2(pi)A]	Calculated Magnitude [Ohm-ft.]	Converted Magnitude [Ohm-m]	Calculated to Ohm-cm [Ohm-cm]	Repeat Resistance [Ohm]	Repeat Magnitude [Ohm-ft.]	Repeat Conversion [Ohm-m]	Repeat Calculation to Ohm-cm [Ohm-cm]
3.0	126.810	18.8496	2390.3122	728.5672	72856.7154	126.764	2389.4451	728.3029	72830.2869
5.0	71.6531	31.4159	2251.0485	686.1196	68611.9591	71.5757	2248.6169	685.3784	68537.8441
7.5	40.8731	47.1239	1926.0995	587.0751	58707.5116	40.8587	1925.4209	586.8683	58686.8283
10.0	30.0764	62.8319	1889.7559	575.9976	57599.7612	30.0909	1890.6670	576.2753	57627.5304
15.0	16.3815	94.2478	1543.9200	470.5868	47058.6817	16.3681	1542.6571	470.2019	47020.1878
30.0	4.6420	188.4956	874.9964	266.6989	26669.8898	4.6410	874.8079	266.6414	26664.1445
50.0	*2.0568*	*314.159*	*646.153*	*196.948*	*19694.754*	*2.0577*	*646.4361*	*197.0337*	*19703.3722*
100.0	0.8117	628.3185	510.0062	155.4499	15544.9875	0.8129	510.7601	155.6797	15567.9689
200.0	0.1708	1256.6371	214.6336	65.4203	6542.0324	0.1708	214.6336	65.4203	6542.0324
300.0	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE #6 ELECTRICAL RESISTIVITY SOUNDING ER-3002

Job Number 7125 Date 28-Mar-07

19.82 ohm Test Resistor Reading

19.81 ohm at 1305 19.81 ohm at 1335

A-Spacing [ft.]	Resistance Reading [Ohm]	Geometric Multiplier [2(pi)A]	Calculated Magnitude [Ohm-ft.]	Converted Magnitude [Ohm-m]	Calculated to Ohm-cm [Ohm-cm]	Repeat Resistance [Ohm]	Repeat Magnitude [Ohm-ft.]	Repeat Conversion [Ohm-m]	Repeat Calculation to Ohm-cm [Ohm-cm]
3.0	377.128	18.850	7108.695	2166.730	216673.034	375.625	7080.364	2158.095	215809.5
5.0	311.754	31.416	9794.041	2985.224	298522.362	310.257	9747.011	2970.889	297088.9
7.5	230.066	47.124	10841.605	3304.521	330452.115	229.889	10833.264	3301.979	330197.9
10.0	173.354	62.832	10892.153	3319.928	331992.825	173.229	10884.299	3317.534	331753.4
15.0	88.775	94.248	8366.809	2550.203	255020.336	88.750	8364.519	2549.505	254950.5
30.0	57.478	188.496	10834.367	3302.315	330231.494	57.477	10834.235	3302.275	330227.5
50.0	31.486	314.159	9891.744	3015.004	301500.366	31.486	9891.744	3015.004	301500.4
100.0	5.621	628.319	3531.483	1076.396	107639.606	5.623	3533.035	1076.869	107686.9
200.0	0.501	1256.637	629.450	191.856	19185.621	0.507	637.241	194.231	19423.1
300.0	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE #7 ELECTRICAL RESISTIVITY SOUNDING ER-4001

Job Number 7125 Date 28-Mar-07

19.82 ohm Test Resistor Reading

19.82 ohm at1425 19.81 ohm at 1500

A-Spacing [ft.]	Resistance Reading [Ohm]	Geometric Multiplier [2(pi)A]	Calculated Magnitude [Ohm-ft.]	Converted Magnitude [Ohm-m]	Calculated to Ohm-cm [Ohm-cm]	Repeat Resistance [Ohm]	Repeat Magnitude [Ohm-ft.]	Repeat Conversion [Ohm-m]	Repeat Calculation to Ohm-cm [Ohm-cm]
3.0	39.110	18.850	737.206	224.700	22470.043	39.110	737.206	224.700	22470.0
5.0	34.280	31.416	1076.938	328.251	32825.069	34.230	1075.367	327.772	32777.2
7.5	32.980	47.124	1554.146	473.704	47370.367	33.020	1556.031	474.278	47427.8
10.0	34.330	62.832	2157.018	657.459	65745.894	34.330	2157.018	657.459	65745.9
15.0	32.960	94.248	3106.407	946.833	94683.280	32.970	3107.349	947.120	94712.0
30.0	28.030	188.496	5283.531	1610.420	161042.010	28.010	5279.761	1609.271	160927.1
50.0	16.370	314.159	5142.787	1567.522	156752.153	16.340	5133.362	1564.649	156464.9
100.0	2.895	628.319	1818.982	554.426	55442.576	2.891	1816.469	553.660	55366.0
200.0	0.468	1256.637	587.980	179.216	17921.645	0.468	587.603	179.102	17910.2
300.0	*-0.040*	*1884.956*	*-74.588*	*-22.734*	*-2273.433*	*-0.040*	*-75.700*	*-23.073*	*-2307.3*

** Note: Italicied values are considered erroneous and interpreted as being caused by difficulty overcoming high contact resistance*

TABLE #8 ELECTRICAL RESISTIVITY SOUNDING ER-4002

Job Number 7125 Date 29-Mar-07

19.82 ohm Test Resistor Reading

19.82 ohm at 1120 19.84 ohm at 1150

A-Spacing [ft.]	Resistance Reading [Ohm]	Geometric Multiplier [2(pi)A]	Calculated Magnitude [Ohm-ft.]	Converted Magnitude [Ohm-m]	Calculated to Ohm-cm [Ohm-cm]	Repeat Resistance [Ohm]	Repeat Magnitude [Ohm-ft.]	Repeat Conversion [Ohm-m]	Repeat Calculation to Ohm-cm [Ohm-cm]
3.0	67.933	18.850	1280.497	390.296	39029.563	67.942	1280.678	390.351	39035.1
5.0	51.935	31.416	1631.599	497.311	49731.129	51.853	1629.010	496.522	49652.2
7.5	50.012	47.124	2356.769	718.343	71834.331	49.973	2354.936	717.785	71778.5
10.0	45.430	62.832	2854.426	870.029	87002.903	45.327	2847.998	868.070	86807.0
15.0	37.232	94.248	3509.062	1069.562	106956.198	37.211	3507.064	1068.953	106895.3
30.0	20.163	188.496	3800.561	1158.411	115841.086	20.193	3806.197	1160.129	116012.9
50.0	8.311	314.159	2610.978	795.826	79582.599	8.288	2603.752	793.624	79362.4
100.0	0.834	628.319	524.143	159.759	15975.888	0.835	524.646	159.912	15991.2
200.0	0.358	1256.637	450.127	137.199	13719.883	0.358	449.499	137.007	13700.7
300.0	0.040	1884.956	75.606	23.045	2304.458	0.040	76.096	23.194	2319.4

TABLE #9 ELECTRICAL RESISTIVITY SOUNDING ER-4003

Job Number 7125 Date 29-Mar-07

19.82 ohm Test Resistor Reading

19.83 ohm at 0915 19.83 ohm at 0945

A-Spacing [ft.]	Resistance Reading [Ohm]	Geometric Multiplier [2(pi)A]	Calculated Magnitude [Ohm-ft.]	Converted Magnitude [Ohm-m]	Calculated to Ohm-cm [Ohm-cm]	Repeat Resistance [Ohm]	Repeat Magnitude [Ohm-ft.]	Repeat Conversion [Ohm-m]	Repeat Calculation to Ohm-cm [Ohm-cm]
3.0	71.668	18.850	1350.908	411.757	41175.679	71.617	1349.947	411.464	41146.4
5.0	55.649	31.416	1748.274	532.874	53287.401	55.648	1748.218	532.857	53285.7
7.5	48.325	47.124	2277.238	694.102	69410.227	48.287	2275.481	693.567	69356.7
10.0	45.240	62.832	2842.494	866.392	86639.223	45.186	2839.126	865.366	86536.6
15.0	36.179	94.248	3409.743	1039.290	103928.976	36.147	3406.812	1038.396	103839.6
30.0	17.868	188.496	3368.095	1026.595	102659.542	17.857	3365.946	1025.940	102594.0
50.0	7.135	314.159	2241.526	683.217	68321.723	7.139	2242.783	683.600	68360.0
100.0	2.285	628.319	1435.708	437.604	43760.375	2.283	1434.451	437.221	43722.1
200.0	0.536	1256.637	672.929	205.109	20510.880	0.535	672.803	205.071	20507.1
300.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TABLE #10 ELECTRICAL RESISTIVITY SOUNDING ER-4004

Job Number 7125 Date 29-Mar-07

19.82 ohm Test Resistor Reading

19.84 ohm at 0745 19.84 ohm at 0815

A-Spacing [ft.]	Resistance Reading [Ohm]	Geometric Multiplier [2(pi)A]	Calculated Magnitude [Ohm-ft.]	Converted Magnitude [Ohm-m]	Calculated to Ohm-cm [Ohm-cm]	Repeat Resistance [Ohm]	Repeat Magnitude [Ohm-ft.]	Repeat Conversion [Ohm-m]	Repeat Calculation to Ohm-cm [Ohm-cm]
3.0	41.796	18.850	787.830	240.131	24013.070	41.835	788.579	240.359	24035.9
5.0	35.448	31.416	1113.638	339.437	33943.688	35.412	1112.498	339.089	33908.9
7.5	33.188	47.124	1563.967	476.697	47669.699	33.156	1562.444	476.233	47623.3
10.0	31.249	62.832	1963.445	598.458	59845.808	31.237	1962.685	598.226	59822.6
15.0	26.802	94.248	2526.048	769.939	76993.938	26.772	2523.239	769.083	76908.3
30.0	25.238	188.496	4757.270	1450.016	145001.583	25.214	4752.802	1448.654	144865.4
50.0	15.509	314.159	4872.296	1485.076	148507.583	15.476	4861.835	1481.887	148188.7
100.0	6.831	628.319	4292.044	1308.215	130821.498	6.830	4291.416	1308.023	130802.3
200.0	1.285	1256.637	1614.779	492.185	49218.452	1.281	1609.752	490.652	49065.2
300.0	0.433	1884.956	816.374	248.831	24883.088	0.435	820.710	250.152	25015.2

CERTIFICATE OF CALIBRATION

ACCREDITED
CERT. # 1888-03

Accredited Calibration

Certificate Number: M505659-1

Manufacturer: **Advanced Geosciences, Inc**
Model No: **Super Sting**
Customer PO No.:

Description: **Auto Resistivity Meter**
Serial No: **SS0609199**
Customer Asset No.: **SS0609199**

Customer:
GeoVision
1151 Pomona Road
Suite P
Corona, CA 92882

Location of Calibration:
Applied Technical Services, Inc.
1049 Triad Court
Marietta, GA 30062

Calibration Procedure: **ATS-1032 Rev. 2: Calibration of Resistance Bridges / MicroOhm Meters**

Date of Calibration: **March 26, 2007**
Temperature: **70° F**
Condition Received: **In Tolerance**

*Next Calibration Due: **March 26, 2008**
Humidity: **40 %**
Condition Returned: **In Tolerance**

This instrument has been calibrated using primary or secondary standards whose calibration is traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST). Some measurements are traceable to natural physical constants, consensus standards or ratio type measurements.

The reported expanded measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a confidence level of approximately 95%. ATS maintains, wherever possible, at least a 4:1 Test Uncertainty Ratio. Statements of compliance, where applicable, are based on test results falling within specified limits with no reduction by the uncertainty of the measurement, unless otherwise allowed by procedure.

All calibrations are performed in accordance with the ATS Quality Manual QM1, Rev. 7 dated July 7, 2006. Applied Technical Services, Inc.'s Quality System complies with the applicable requirements of ANSI/NCSL Z540-1, ISO 9001-2000, 10CFR 50 Appendix B, 10CFR Part 21 and ISO/IEC 17025. ATS is an ISO/IEC 17025 Accredited Calibration Laboratory through A2LA.

The reported data is valid only at the time of the test and related only to the item calibrated. *Calibration due dates appearing on this Certificate of Calibration and calibration label are determined by the client and do not imply continued conformance to specifications.

This certificate shall not be reproduced except in full, without the permission of Applied Technical Services, Inc.

Notes:

Calibration Equipment Used::

Model:	Desc.:	ID No.:	Cal Due Date:
Guildline 9211A	**Master Shunt Box**	**ATS-02014**	**4/25/2007**

Calibrated by: Jeff L. Cook
Electrical Lab Supervisor

Page 1 of 2 **Report Name:** ATS 500, 6-03 **Printed:** March 26, 2007

Applied Technical Services, Inc. 1049 Triad Court, Marietta, GA 30062 (770) 423-1400 www.atslab.com

APPLIED TECHNICAL SERVICES, INCORPORATED

Calibration Data Sheet

Page 2 of 2

Customer : Geovision
Purchase Order No:
Item Name: Automatic Resistivity Meter
Asset No: SS0609199
ATS Reference No: M505659-1
Manufacturer: Advanced Geosciences
Model No Super Sting
Proc. No: 1032
Rev: 1
Serial No: SS0609199
Calibration Date: 03-26-07
Calibration Due Date: 3/26/2008
Reason For Service: ■ Initial Calibration ☐ Due For Calibration ☐ Repair and Calibration

Equipment Used: ATS-02014 Due: 04-25-07 Guidlind Resistance Standard
Due:
Due:
Due:
Due:

Calibrated By: Jeff L Cook

Customer Instrument Under Test

UNCERTAINTY (SEE NOTE)	Function And Range	Applied	TOLERANCE		AS FOUND READING	AS CALIBRATED READING
0.001	Restance m ohms	999.99	989.9901	1009.9899	998.1	998.1
0.001	Restance m ohms	99.99	98.9901	100.9899	99.98	99.98
0.001	Restance m ohms	10.00	9.9000	10.1000	10.01	10.01
0.001	Restance m ohms	1.00	0.9900	1.0100	1.003	1.003
0.001	Restance u ohms	333.33	329.9997	336.6663	332.9	332.9

* Indicates out of tolerance readings

Remarks:

ATS-563, 08/06

Vogtle Units 3 & 4 COL Project

Attachment E
Report of Refraction Microtremor (ReMi) Seismic Shear Wave Measurements

Volume 1 of 1

Job No. 6141-06-0286

MACTEC ENGINEERING AND CONSULTING, INC.

May 31, 2007

Not submitted with ESP Application, results not used in analysis.

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