



FINAL REPORT

BORING GEOPHYSICS

**BORINGS A-7, A-8, A-19, A-20, I-1, I-2, I-3,
I-4, I-5, I-6, I-7, I-8, I-9, AND I-10**

PROGRESS ENERGY FLORIDA

LEVY NUCLEAR PLANT

COMBINED OPERATING LICENSE APPLICATION

Report 7087-01 Rev 2

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**PROGRESS ENERGY FLORIDA
LEVY NUCLEAR PLANT
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May 13, 2008

Prepared for:

**CH2M HILL, Inc
15010 Conference Center Drive, Suite 200
Chantilly, Virginia 20151
(703) 376-5000**

Prepared by

**GEOVision Geophysical Services
1151 Pomona Road, Unit P
Corona, California 92882
(951) 549-1234**

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INTRODUCTION

Boring geophysical measurements were collected in four uncased and ten PVC cased borings located at the proposed Progress Energy Florida (PEF) Levy County nuclear power plant (LNP) site. Geophysical data acquisition was performed between February 25, 2007 and May 4, 2007 by Robert Steller, Charles Carter and Antony Martin of **GEOVision**. Data analysis was performed by Robert Steller, Charles Carter and Antony Martin, and reviewed by John Diehl of **GEOVision**. Report preparation was performed by Robert Steller and reviewed by John Diehl. The work was performed under subcontract with CH2M HILL, Inc., (CH2M) with Suresh Parashar serving as the Project Manager for CH2M, and Jen Schaeffer as the on-site contact for CH2M.

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 February 25, 2007 and May 4, 2007, in fourteen borings, as detailed in Table 1, below. The purpose of these studies was to supplement stratigraphic information obtained during CH2M's soil and rock sampling program and to acquire shear wave velocities and compressional wave velocities as a function of depth, and in-situ rock condition, as a component of the PEF - LNP Combined Operating License Application (COLA) Project.

BORING DESIGNATION	DATES LOGGED	COORDINATES - FEET		ELEVATION - FT MSL
		NORTHING	EASTING	
A-7	3/1/07, 3/10/07	1724100.76	457649.39	42.30
A-8	3/13/07, 3/21/07	1724017.18	457734.11	42.10
A-19	3/27/07	1723149.85	457976.41	43.10
A-20	5/2/07	1723068.13	458060.91	42.30
I-1	2/26/07	1724110.30	457635.30	42.50
I-2	3/10/07, 5/1/07	1724046.46	457700.57	42.30
I-3	3/25/07, 5/4/07	1723978.77	457771.70	42.10
I-4	5/4/07	1723902.28	457585.56	41.60
I-5	2/25/07, 5/3/07	1724148.79	457804.46	42.20
I-6	3/13/07	1723163.00	457960.60	42.30
I-7	3/11/07, 5/2/07	1723097.83	458026.50	42.40
I-8	3/23/07	1723054.99	458076.81	42.50
I-9	3/22/07	1722958.55	457888.42	42.40
I-10	5/3/07, 5/4/07	1723172.15	458130.66	42.00

Referenced to NAD 83 & NGVD83

Table 1. Boring locations and logging dates

The main feature of the OYO/Robertson PS Suspension velocity logging system is that the source travels with two receivers through the boring as a single unit, suspended in the boring fluid in a fixed configuration with the source in the same orientation as the receivers. Source energy is transmitted through the fluid to the borehole wall where it is converted to compressional (P) and horizontal shear (S_H) waves. Part of this energy travels through formation up the soil column. As the waves pass by the receivers fixed one meter apart, the travel time, and therefore the velocity can be directly measured.

The OYO/Robertson Suspension PS Suspension velocity logging system was used to obtain in-situ P – and S_H - wave velocity measurements in 14 borings at 1.6 foot intervals. The acquired data was analyzed and a profile of velocity versus depth was produced for both P- and S_H -waves.

The Robertson High Resolution Acoustic Televiewer (HiRAT) was used to collect acoustic images of the boring walls. The acquired data was analyzed to determine dip angle and azimuth of major features, as well as deviation data and 4 arm caliper data in the four uncased A- series borings. In the ten PVC cased I-series borings, only deviation data was collected.

The Downhole Seismic velocity logging system was also used at this site. In this method, the source remains stationary at the surface, while a single receiver travels down the boring. Source energy is transmitted down the soil column from the surface and velocity is calculated from first arrival travel time and receiver depth. The acquired data was analyzed and a profile of velocity versus depth was produced for both P- and S_H -waves, as a validation of the suspension velocity data

INSTRUMENTATION

Suspension Instrumentation

Suspension soil and rock velocity measurements were performed in fourteen borings using the suspension PS logging system, manufactured by the Robertson Geologging Division of OYO Corporation. This system directly determines the average velocity of a 3.3 foot high segment of the soil and rock 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/Robertson Suspension PS Logger Borehole Probe, includes:
Telemetry Unit Model 3403 S/N 160023, S/N 160024
Receiver/Sensor Model 3385 S/N 12008, S/N 30086
Isolation tube, 1m Model 3387B S/N 28072, S/N 300083
Source Model 3304 S/N 19043, S/N 21050, S/N 470151
Driver Model 3386A S/N S/N 490157
Weight Model 3302W S/N 22050, S/N 470151

Table 2. Suspension equipment

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 amplified 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 are recorded as a different channel on the recording system. The suspension system has six channels (two simultaneous recording channels), each with a 1024 sample record. The recorded data is displayed on a CRT or LCD display as six channels with a common time scale. Data is 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 digital recorder is performed every twelve months using a NIST traceable frequency source and counter, as outlined in Appendix E.

Downhole Instrumentation

Downhole measurements were performed in I-2, I-5, I-7, and I-10 using a Geostuff BHG-3, 3-component borehole geophone, serial number B-3015. This system orients the downhole geophones parallel to the axis of excitation at the surface, insuring that signals received at the downhole geophones are of maximum amplitude, and are not subject to errors in travel time caused by incorrect phase of first arrival picks, as found with non-orientable downhole probes. The downhole probe consists of horizontal and vertical geophones mounted on a rotatable structure with a fluxgate magnetometer compass sensor. The structure can be pre-set on the surface to match the azimuth of the horizontal geophone axis with the azimuth of the surface shear wave source whenever power is applied to the compass sensor and orientation servo mechanism. The probe receives control signals from, and sends the geophone signals to, instrumentation on the surface via cable. Cable travel is measured to provide probe depth data. The probe is locked into the boring using a motor driven clamp mechanism. The BHGC-1 or -4 controller directs the voltages to control the clamping mechanism and orientation mechanism. A meter monitors motor current to indicate the clamping action and force.

The S_H -wave energy source consists of 16 or 20-pound sledge hammer blows against the ends of a steel capped traction plank. The traction plank is weighted by placing under the wheel of a truck. The P-wave energy source consists of 16 or 20-pound sledge hammer blows against the top surface of the plank or a separate aluminum plate. A hammer switch mounted on the sledgehammer is used to provide consistent triggering from each hammer blow. During logging operations, a repeatable pattern of impulses, similar to that produced by the suspension source, is generated at each measurement depth as follows:

1. The plank is struck with the hammer laterally in one direction, producing dominantly horizontal shear with some vertical compression, and the signals generated by the horizontal receivers are recorded. The signals are checked, and repeated (stacked) as needed.

2. The plank is struck in the opposite direction and the horizontal signals are recorded, and stacked as needed.
3. The plank or plate is struck on top, and the signals generated by the vertical receivers are recorded. The repeated source pattern facilitates the picking of the P- and S_H -wave arrivals, since the reversal of the source direction changes the polarity of the S_H -wave pattern but not that of the P-wave pattern.

The signals from the BHG-3 geophone were recorded on a Geometrics Geode seismograph, controlled by a laptop computer. Geode S/N 3458 was used on all four borings. The Geode is a 24-bit exploration seismograph with 113dB dynamic range. Triggered by the hammer switch (see procedure, Appendix G) the seismograph recorded the response of the borehole sensor. Data was reviewed on the computer screen, and stored internally on hard disk. Multiple hammer blows can be summed to improve the signal-to-noise ratio of the signals. Review of the displayed data on the screen allows the operator to set the gains, filters, sample rate, and summing number in order to optimize the quality of the data before recording to disk for later processing.

Acoustic Televiewer / Boring Deviation Instrumentation

An acoustic image was collected in the four A-series borings, and deviation only data was collected in the 10 I-series cased borings, using a High Resolution Acoustic Televiewer probe (HiRAT), serial number 5174 or 4727, manufactured by Robertson Geologging, Ltd. This probe is 7.58 feet long, and 1.9 inches in diameter, and is fitted with upper and lower four-band centralizers.

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

- Determination of need to correct soil and geophysical log depths to true vertical depths
- Acoustic imaging of the boring wall to identify fractures, and determine dip and azimuth of these features
- 4 arm caliper data (not NIST traceable) locates washouts, cavities or karst formations

The probe receives control signals from, and sends the digitized measurement values to, a Robertson Micrologger II, 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.

This system produces images of the boring wall based upon the amplitude and travel time of an ultrasonic beam reflected from the formation wall. The ultrasonic energy is generated by a piezoelectric transducer at a frequency of 1.4 MHz. A periodic acoustic energy wave is emitted by the transducer and travels through the acoustic head and boring fluid until it reaches the interface between the boring fluid and the boring wall. Here a portion of the energy is reflected back to the transducer, the remainder continuing on into the formation. By careful time sequencing, the piezoelectric transducer acts as both the transmitter of the ultrasonic pulse and receiver of the reflected wave. The travel time of the energy wave is the period between transmission of the source energy pulse and the return of the reflected wave measured at the point of maximum wave amplitude. The magnitude of the wave energy is measured in dB, a unit-less ratio of the detected echo wave amplitude divided by the amplitude of the transmitted wave. The strength of the reflected signal depends primarily upon the impedance contrast of the boring fluid and the boring wall formation. In these rock borings, the contrast between the clear water filling the boring and the rock formation generally provides high contrast. The changes in contrast between native rock and dikes provide imaging of fracture fillings.

The acoustic wave propagates along the axis of the probe and then is reflected perpendicular to this axis by a reflector that focuses the beam to a 0.1-inch diameter spot about 2 inches from the central axis of the probe. This reflector is mounted on the shaft of a stepper motor enabling the position of the measurement to be rotated through 360°. Sampling rates of 90, 180 and 360 measured points per revolution are available. During the surveys in un-cased borings, data were collected at 360 samples per revolution. It should be noted that during logging the probe is moving in the boring, so that the measured points describe a very fine pitch spiral.

The probe contains a fluxgate magnetometer to monitor magnetic north, and all raw televiewer data are referenced to magnetic north. Also, a three-axis accelerometer is enclosed in the probe, and boring deviation data are recorded during the logging runs, to permit correction of structure dip angle from apparent dip, (referenced to boring axis), to true dip (referenced to a vertical axis) in non-vertical borings.

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

Four borings were logged as uncased borings, and ten were logged as 4-inch PVC cased borings, filled with clear water or polymer based drilling mud. Several of the uncased borings had HQ steel core rod placed to case off the softer soils above bedrock contact, as shown in Table 3. Measurements followed the **GEOVision** Procedure for P-S Suspension Seismic Velocity Logging, revision 1.31. This procedure was supplied and approved in advance of the work, and incorporated in the CH2M Project Work Plan, and are reproduced in Appendix G. 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 8.2 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 3.

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 was printed on paper tape, checked, and recorded on diskette 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, and after survey depth error (ASDE) was calculated and recorded on the field log. Field data were backed up to CD-ROM each day upon completion of data acquisition.

Downhole Measurement Procedures

Measurements followed the GEOVision Procedure for Downhole Seismic Velocity Logging, revision 1.1. This procedure was supplied and approved in advance of the work, and is presented in Appendix G. I-2, I-5, I-7 and I-10 were logged as 4-inch PVC cased holes. Prior to performing the downhole method surveys, the downhole probe compass azimuth was checked at the surface, and preset to the azimuth of the traction plank S_H -wave source. A fiberglass tape measure was attached to the probe cable to provide depth reference. The probe was then lowered to the bottom of the boring at 2.5-foot intervals to 20 feet and 5.0-foot intervals to 150 feet, with 10.0-foot intervals below 150 feet. At each desired depth, the probe was locked in place by driving the locking spring bail outward. The compass/geophone assembly was then rotated to match the azimuth of the surface S_H source.

At each sampling depth the measurement sequence of two opposite horizontal records and one vertical record was performed, and the gains adjusted as required. P-wave data was obtained as the probe was lowered down the borehole, and S_H -wave data was acquired as the probe was raised. The waveform data from each depth was checked and recorded on disk before moving to the next depth. All field data were saved to hard disk and documented on field data acquisition forms. Field data were backed up to CD-ROM each day upon completion of data acquisition.

Acoustic Televiwer / Boring Deviation Measurement Procedures

Four borings were logged as uncased borings, and ten were logged as 4-inch PVC cased borings, filled with clear water or polymer based drilling mud. Several of the uncased borings had HQ steel core rod placed to case off the softer soils above bedrock contact, as shown in Table 3. Although the acoustic televiwer cannot image through PVC casing, the logs were run in the I-series borings to provide deviation logs for the borings. Measurements followed the **GEOVision** Procedure for using the Robertson High Resolution Acoustic Televiwer (HiRAT), revision 1.0. This procedure was supplied and approved in advance of the work, and is presented in Appendix G.

Prior to and following each log, 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 3.0 feet/minute, collecting data continuously at 0.008 foot intervals for acoustic televiwer logs, or at 10.0 feet/minute, collecting data continuously at 0.04 foot intervals for deviation only logs, as summarized in Table 3.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring, and after survey depth error (ASDE) was calculated and recorded on the field log. The images log was reviewed in the field, and the un-processed log images, in .htm web-browser format was supplied to the client with the raw data on CD-ROM at the end of each field day.

BORING NUMBER	TOOL AND RUN NUMBER	DEPTH RANGE (FEET)	TOTAL DEPTH AS DRILLED (FEET)	DEPTH TO BOTTOM OF CASING (FEET)	SAMPLE INTERVAL (FEET)	DATE LOGGED
A-7	SUSPENSION 1	75.5 – 80.4	106	76 - STEEL	1.6	3/1/07
A-7	ACOUSTIC TELEVIEWER 1	95.0 – 74.9	106	76 - STEEL	.008	3/1/07
A-7	SUSPENSION 2	105.0 – 251.0	266	101 - STEEL	1.6	3/10/07
A-7	ACOUSTIC TELEVIEWER 2	264.4 – 98.64	266	101 - STEEL	.008	3/10/07
A-8	SUSPENSION 1	18.0 – 52.5	66	14 - STEEL	1.6	3/13/07
A-8	ACOUSTIC TELEVIEWER 1	64.4 – 13.1	66	14 - STEEL	.008	3/13/07
A-8	SUSPENSION 2	68.9 – 249.3	263	66 - STEEL	1.6	3/21/07
A-8	ACOUSTIC TELEVIEWER 2	260.4 – 64.3	263	66 - STEEL	.008	3/21/07
A-19	SUSPENSION	39.4 – 249.3	266	36 – STEEL	1.6	3/27/07
A-19	ACOUSTIC TELEVIEWER	108.5 – 30.0	266	36 – STEEL	.008	3/27/07
A-20	SUSPENSION	39.4 – 251.0	265	35 – STEEL	1.6	5/2/07
A-20	ACOUSTIC TELEVIEWER	262.0 3.0	265	35 – STEEL	.008	5/2/07
I-1	SUSPENSION	8.2 – 242.5	257	257 – 4" PVC	1.6	2/26/07
I-1	DEVIATION	255.0 – 5.0	257	257 – 4" PVC	.040	2/26/07
I-2	SUSPENSION	6.6 – 288.7	300	300 – 4" PVC	1.6	3/1/07
I-2	DEVIATION	301.8 – 5.0	300	300 – 4" PVC	.040	3/1/07
I-2	DOWNHOLE	0 – 295.0	300	300 – 4" PVC	2.5/5.0/10.0	5/1/07
I-3	SUSPENSION 1	6.6 - 172.2	266	266 – 4" PVC	1.6	3/25/07
I-3	DEVIATION	264.9 – 2.6	266	266 – 4" PVC	.040	3/25/07
I-3	SUSPENSION 2	6.6 - 252.6	266	266 – 4" PVC	1.6	5/4/07
I-4	SUSPENSION	6.6 – 252.6	266	266 – 4" PVC	1.6	5/4/07
I-4	DEVIATION	266.1 – 2.7	266	266 - 4" PVC	.040	5/4/07
I-5	SUSPENSION	6.6 – 252.3	265.5	265.5 – 4" PVC	1.6	2/25/07
I-5	DEVIATION	264.8 – 5.0	265.5	265.5 – 4" PVC	.040	2/25/07
I-5	DOWNHOLE	0 – 262.0	265.5	265.5 – 4" PVC	2.5/5.0/10.0	5/3/07
I-6	SUSPENSION	6.6 – 251.0	266	266 – 4" PVC	1.6	3/13/07
I-6	DEVIATION	264.7 – 2.8	266	266 – 4" PVC	.040	3/13/07
I-7	SUSPENSION	6.6 – 288.7	303	303 – 4" PVC	1.6	3/11/07
I-7	DEVIATION	300.0 – 2.7	303	303 – 4" PVC	.040	3/11/07
I-7	DOWNHOLE	0 – 300.0	303	303 – 4" PVC	2.5/5.0/10.0	5/2/07
I-8	SUSPENSION	8.2 – 252.6	266	266 – 4" PVC	1.6	3/23/07
I-8	DEVIATION	265.7 – 3.6	266	266 – 4" PVC	.040	3/23/07
I-9	SUSPENSION	6.6 – 231.3	266	266 – 4" PVC	1.6	3/22/07
I-9	DEVIATION	243.7 – 3.1	266	266 – 4" PVC	.040	3/22/07
I-10	SUSPENSION	6.6 – 254.3	266	266 – 4" PVC	1.6	5/4/07
I-10	DEVIATION	266.1 – 2.8	266	266 – 4" PVC	.040	5/4/07
I-10	DOWNHOLE	0 – 264.0	266	266 – 4" PVC	2.5/5.0/10.0	5/3/07

Table 3. Logging dates and depth ranges

Regarding the field logs, it should be noted that during processing, the depth range of the log may change from what is reported in the field log due to: (1) removing irrelevant data (such as inside steel casing) or (2) rounding of depth indications by the operator in the field, and (3) Information provided to GEOVision in the field and recorded in the field log does not agree with actual data. The most accurate depth range data is what is measured electronically and presented in the report.

DATA ANALYSIS

Suspension Analysis

Using the proprietary OYO program PSLOG.EXE version 1.0, included in the root directory of the data DVD-R (Report 7087-02) that accompanies 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 of the data DVD-R (Report 7087-02) that accompanies 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 4000 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 as a component of **GEOVision'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.

Downhole Analysis

Using PICKWIN95, developed by OYO Corporation, the recorded digital records were studied to establish the arrival 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' hammer blows are very nearly inverted images of each other. The first arrival of the S_H -wave pulses was picked, as shown for I-5, in Figure 4. Digital FFT-IFFT lowpass filtering was used to remove the higher frequency P-wave signal from the S_H -wave signal, as well as high frequency noise from the P-wave records.

The recorded digital records were also analyzed to locate the first arrival of P-wave energy. P-wave arrivals on the horizontal axis records were used to verify the velocities determined from the vertical axis data.

Once the first arrival of P- and S_H -wave pulses was picked, the raw travel time picks were transferred into an EXCEL template (EXCEL version 2003 SP2) to complete the velocity calculations based upon the arrival time picks made in PICKWIN95. The EXCEL analysis files are included in the boring specific directories of the data DVD-R (Report 7087-02) that accompanies this report. The EXCEL template corrected for the actual travel distance using the measured separation between the surface source and the boring. These corrected travel times were plotted,

and the slope of each interactively picked segment of the travel time curve was calculated, using the EXCEL “slope” function, providing the average velocity for that segment of the soil/rock column.

These data and analysis were reviewed by John Diehl as a component of **GEOVision**’s in-house QA-QC program.

Acoustic Televiwer / Boring Deviation Analysis

The collected acoustic televiwer data was processed with Robertson Geologging’s RGLDIP program, version 6.2, to identify boring features and to extract boring deviation data and produce ASCII files and plots of deviation data and boring radii. Deviation data in the steel cased borings was extrapolated to the surface from below the casing, as the fluxgate magnetometer providing orientation reference to magnetic north does not function in steel casing. The site declination of 4.5 degrees west, as obtained from the National Geophysical Data Center web site, was used to reference all data to true north.

Sinusoidal projections of planar fractures in the boring walls were interactively picked on the acoustic reflection image or acoustic travel time image, and are presented as red sinusoids superimposed over the acoustic amplitude image. Bedding planes were picked on the same images, and are presented on the logs as green sinusoids. The sinusoidal projections were processed to correct for the plunge of the borings using the recorded data from the tiltmeters located in the probe, and presented in tadpole format, with true dip indicated by the tadpole position across the plot. Direction of dip (not strike) is indicated by the direction of the tadpole tail, with true north being “up”. These values are presented numerically in columns to the left of the tadpole plots. These depth and dip data of the fractures and bedding are also presented as .txt files in the boring specific sub-directories of the data DVD-R (Report 7087-02) that accompanies this report.

The acoustic televiwer images were processed to create a simulated core image of the borings. It should be considered that the pseudo-core represents a core that would have the full 3.9-inch diameter of the boring, not the 2.5-inch diameter of the cores removed during drilling, so that direct

comparison is not possible. Also, the unwrapped image is viewed from the perspective of an observer in the center of the boring looking outward. The simulated core image is viewed from the “outside” of the boring looking inward, so there is a reversal of the position of east and west relative to north between the two images.

The acoustic travel time recorded by the acoustic televiewer was used to determine the radii of the boring at North, East, South and West, and to produce an oriented 4 arm caliper plot for the four uncased borings. These radii data are also presented as .txt files in the boring specific sub-directories of the data DVD-R (Report 7087-02) that accompanies this report. These data are not NIST traceable.

RESULTS

Suspension Results

Suspension R1-R2 P- and S_H -wave velocities are plotted in Figures 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29 and 31. The suspension velocity data in these figures are also presented in Tables 5 - 18. The PSLOG and EXCEL analysis files for each boring are included in the boring specific directories of the data DVD-R (Report 7087-02) that accompanies 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-15 to aid in visual comparison. It must be noted that R1-R2 data is an average velocity over a 3.3 foot segment of the soil column; S-R1 data is 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-15, and included in the EXCEL analysis files for each boring in the boring specific directories of the data DVD-R (Report 7087-02) that accompanies this report.

Calibration procedures and records for the suspension measurement system are presented in Appendix E.

The **GEOVision** standard field log sheets for all borings are reproduced in Appendix F.

The approved **GEOVision** standard field procedures, contained in the CH2M Project Work Plan, are reproduced in Appendix G.

Downhole Results

P- and S_H -wave velocity measurements using the downhole method were collected in I-2, I-5, I-7 and I-10 to a maximum depth of 300 feet below grade, and are presented in Appendix B. These data are generally of fair quality, due to poor transmission of the surface generated signal into the underlying hard rock, and conversion of the S_H -waves to other modes at the shallow fracture zones. In addition, coupling of the casing to the surrounding soil and rock is questionable, particularly in I-7 and I-10, due to the presence of significant tube waves in these data sets.

Downhole filtered waveforms and arrival picks for I-2, I-5, I-7 and I-10 are presented in Figures B-1, B-6, B-7, B-11, B-12, B-16 and B-17. The downhole travel time curves are presented with suspension derived travel time curves for I-2, I-5, I-7 and I-10 in Figures B-3, B-8, B-13 and B-18, respectively. Comparisons of the downhole layered models with suspension R1-R2 data are presented in Figures B-4, B-9, B-14 and B-19. Comparisons of the downhole layered models with suspension layered models are presented in Figures B-5, B-10, B-15 and B-20. Tables B-1 through B-4 present the downhole layer depths and velocities, as well as Poisson's Ratio for each layer. All tables and figures are included in the EXCEL analysis files for each boring in the boring specific directories of the data DVD-R (Report 7087-02) that accompanies this report.

Calibration procedures and records for the downhole measurement system are presented in Appendix E.

The **GEOVision** standard field log sheets for all borings are reproduced in Appendix F.

The approved **GEOVision** standard field procedures, as included in the CH2M Project Work Plan, are reproduced in Appendix G.

Acoustic Televiwer / Boring Deviation Results

Acoustic televiwer amplitude images and simulated core images are presented in Appendix C, with identified features super-imposed on the images. The same logs are presented in .pdf format in the boring specific sub-directories of the data DVD-R (Report 7087-02) that accompanies this report. Fracture and bedding depth, dip angle and azimuth of dip data are provided numerically on the log sheets, as well as in text format in the boring specific sub-directories of the data DVD-R (Report 7087-02) that accompanies this report.

Boring deviation data is presented graphically in Figures 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30 and 32, and summarized in Table 4. Deviation data plots in Acrobat format and deviation data at 1.0 foot stations are presented in text format in the boring specific sub-directories of the data DVD-R (Report 7087-02) that accompanies this report.

Acoustic televiwer amplitude images and calculated 4-arm caliper data are presented in Appendix D. The same logs are presented in .pdf format in the boring specific sub-directories of the data DVD-R (Report 7087-02) that accompanies this report. The boring radii presented graphically on the plots in Appendix D are available in text format in the boring specific sub-directories of the data DVD-R (Report 7087-02) that accompanies this report.

SUMMARY

Discussion of Suspension Results

Suspension velocity data is ideally collected in an uncased fluid filled boring, drilled with rotary mud (rotary wash) methods. The lower portions (below nominal 60 foot depth) of the un-cased borings at this site were well suited for collection of suspension velocity data. The upper portion of the borings provided mixed results due to collapse, erosion and the presence of casing. The I-series borings generally produced poor or uninterpretable data due to signal degradation caused by the erosion of the soft rock by the sonic drilling method used, and poor coupling of the PVC casings due to grout loss and possible bridging.

Suspension 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.

The 4 uncased A-series borings show a fairly consistent velocity profile below rock contact at approximately 50 foot depth. These data are of good quality, exhibiting all of the above listed criteria, with limited consistency between adjacent depth intervals due to the presence of hard and soft layers only a few inches thick. Above 50 feet depth the boring conditions are quite variable, with eroded soft zones, and consistency of data between adjacent depth intervals further degrades and the data quality drops significantly.

The 10 PVC cased I-series borings where suspension data was interpreted show a fairly consistent velocity profile below rock contact at approximately 50 foot depth. These data are of fair to poor quality, exhibiting several of the above listed criteria, but with limited consistency between adjacent depth intervals due to the presence of hard and soft layers only a few inches thick, as well as unclear wave onsets and substantial ringing of later oscillations. Much of the data in these borings were not interpretable due to these issues, which are indicative of poorly coupled casing.

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 S_H -wave measurements are very reliable with estimated precision of $\pm 5\%$. Due to the difficulty in picking weak signals, which can be seen in the greater scatter of P-wave arrivals, P-wave measurements have an estimated precision of $\pm 10\%$. Standardized field procedures and quality assurance checks contribute to the reliability of these data.

Discussion of Downhole Results

P- and S_H -wave velocity measurements using the downhole method were collected in four sonic drilled, PVC cased borings to a maximum depth of 300 feet below grade. These data are generally of fair quality, due to poor transmission of the surface generated signal into the underlying harder rock, and conversion of the S_H -waves to other modes at the shallow fracture zones. The first S_H -wave arrivals are of very low amplitude, and a later phase was picked for the deeper velocity layers.

For boreholes I-2 and I-10, P-wave arrivals were picked on the horizontal (S_H -wave) records because the soils near the boreholes were very soft, causing the P-wave plate to sink. This necessitated relocation of the plate numerous times during data collection, resulting in timing shifts in the P-wave first arrivals.

Borings I-7 and I-10, located at the south site, both exhibited a significant tube wave traveling in the casing at velocity similar to the S_H -wave velocity. A low pass filter of 35 Hz was used to help separate the S_H -wave arrivals from the tube wave arrivals in these borings.

Downhole velocity data quality is judged based upon 5 criteria:

1. Good signal to noise ratio.
2. Clarity of P-wave and S_H -wave onset, as well as damping of later oscillations
3. Consistent waveforms between adjacent depth stations.
4. Consistent relationship between P-wave and S_H -wave (excluding transition to saturated soils)
5. Consistency of profile between adjacent borings, if available.

At this site, the shear plank was placed on top of a thick soft soil layer overlying rock. This resulted in low quality S_H -wave data due to poor coupling of the surface energy into the deeper rock, and consequently poor signal to noise ratio. These data show fair correlation between P-wave and S_H -wave velocities. S_H -wave onsets are weak and broad, while P-wave arrivals are better defined. The downhole P-wave layer velocities match the suspension data closely, generally within 10%. Downhole S_H -wave layer velocities differ from suspension layer velocities by up to 20%.

P- and S_H -wave velocity measurements using the downhole method measure average velocities based on changes in travel time over a 2.5 to 10.0 foot interval of depth. If data quality is good, individual S_H -wave measurements (combining picking errors of adjacent measurements) in soft soil can have a precision of $\pm 5\%$. However, poor data quality can quickly decrease reliability to as much as $\pm 20\%$. Also, as P- and S_H -wave velocities increase, changes in travel time are difficult to pick over small intervals due to the low frequencies of source energy, hence the decrease in measurement resolution at depth.

Discussion of Acoustic Televiwer / Boring Deviation Results

The acoustic televiwer data quality in the four uncased borings is good, providing clear images of fractures, bedding planes and eroded zones. In most cases of eroded layers, the eroded zone is limited to a diameter smaller than the 8 inch maximum diameter of the televiwer imaging range. In no case is a void space more than one foot in height.

All borings were inclined at 2.6 degrees, or less, from vertical, and the maximum error in depth value was 0.2 feet in 260.2 feet, or less than 0.1%, as presented in Table 4. This error is less than the 0.4% after survey depth error required by ASTM D5753-05, "Planning and Conducting Borehole Geophysical Surveys", and no adjustment of log depths is indicated.

BORING NUMBER	MEAN DEVIATION AND AZIMUTH (DEGREES)	SURVEY DEPTH (FEET)	VERTICAL DEPTH (FEET)	DEPTH ERROR (FEET)	HORIZONTAL OFFSET (FEET)
A-7	1.3 – N232.5	264.5	264.4.0	0.1	5.8
A-8	2.6 – N161.6	260.4	260.2	0.2	11.7
A-19	1.8 – N59.6	108.3	108.3	0.0	3.4
A-20	1.6 – N56.3	261.9	261.8	0.1	7.4
I-1	1.1 – N11.4	254.9	254.8	0.1	4.7
I-2	0.9 – N124.7	301.7	301.7	0.0	4.8
I-3	1.2 – N62.6	264.9	264.9	0.0	5.6
I-4	2.2 – N318.2	266.1	265.8	0.2	10.1
I-5	1.2 – N319.8	263.8	263.7	0.1	5.6
I-6	0.9 – N75.6	264.8	264.7	0.1	4.1
I-7	1.2 – N74.1	300.0	299.9	0.1	6.1
I-8	0.8 – N64.7	265.7	265.7	0.0	3.6
I-9	0.2 – N51.1	243.7	243.7	0.0	1.0
I-10	0.6 – N131.1	266.1	266.1	0.0	2.8

Table 4. Boring Deviation Data Summary

It should be noted, that the comments regarding the accuracy of field logs with respect to borehole range and depth of surveys provided on page 20 (Table 3) are also relevant here.

Quality Assurance

These boring geophysical measurements were performed using industry-standard or better methods for measurements and analyses. All work was performed under CH2M and **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.

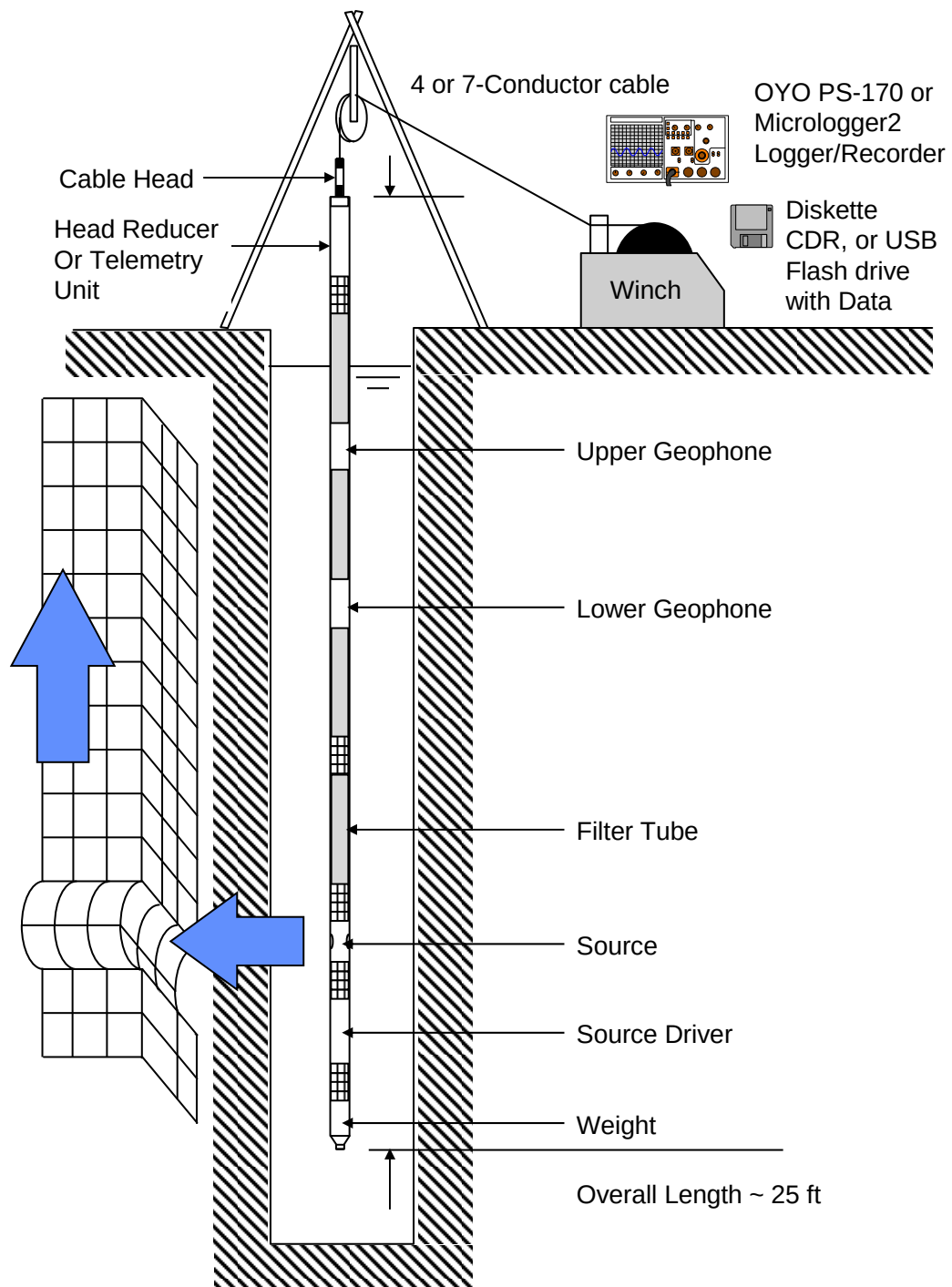


Figure 1: Concept illustration of Suspension logging system

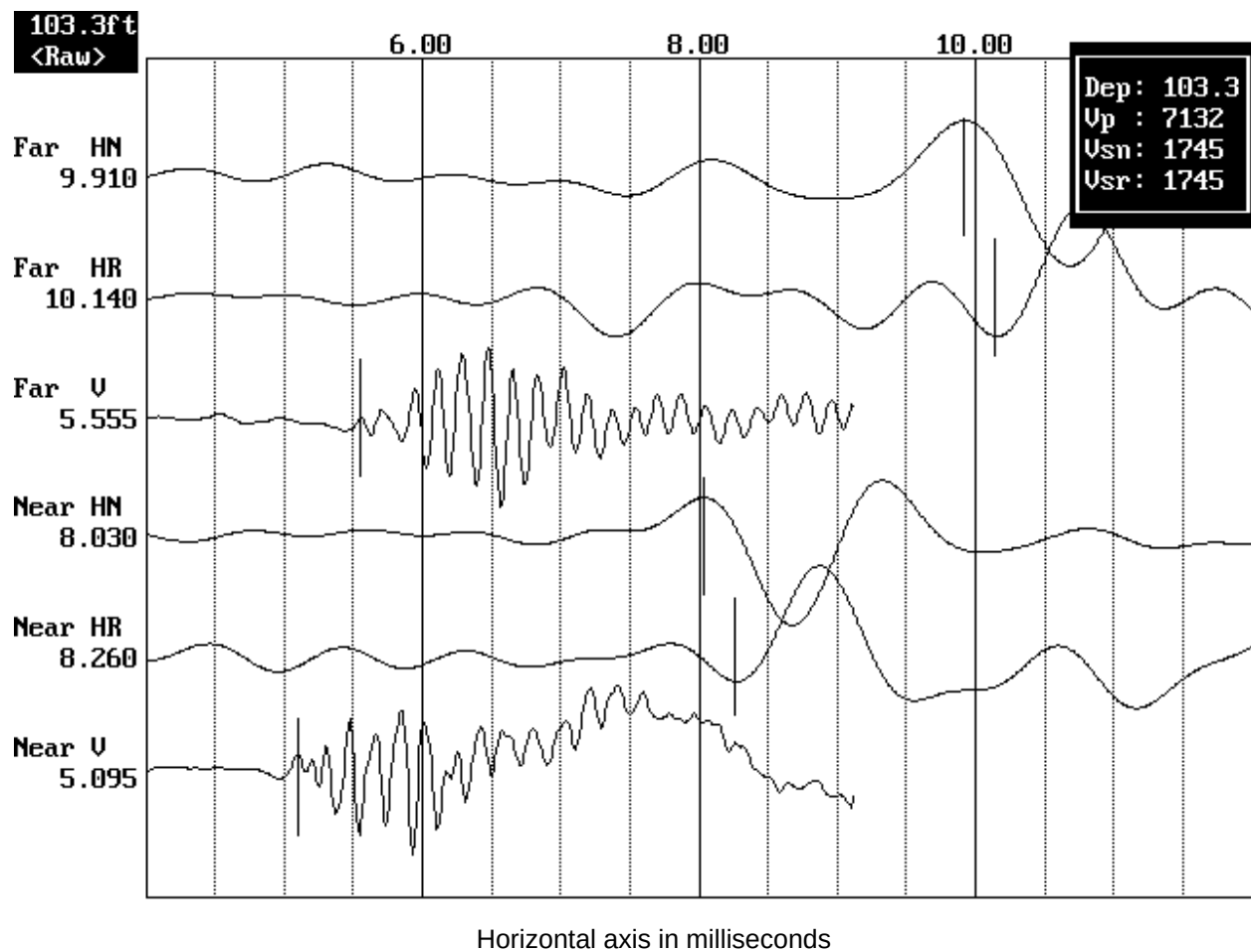


Figure 2: Example of filtered (1400 Hz lowpass) record

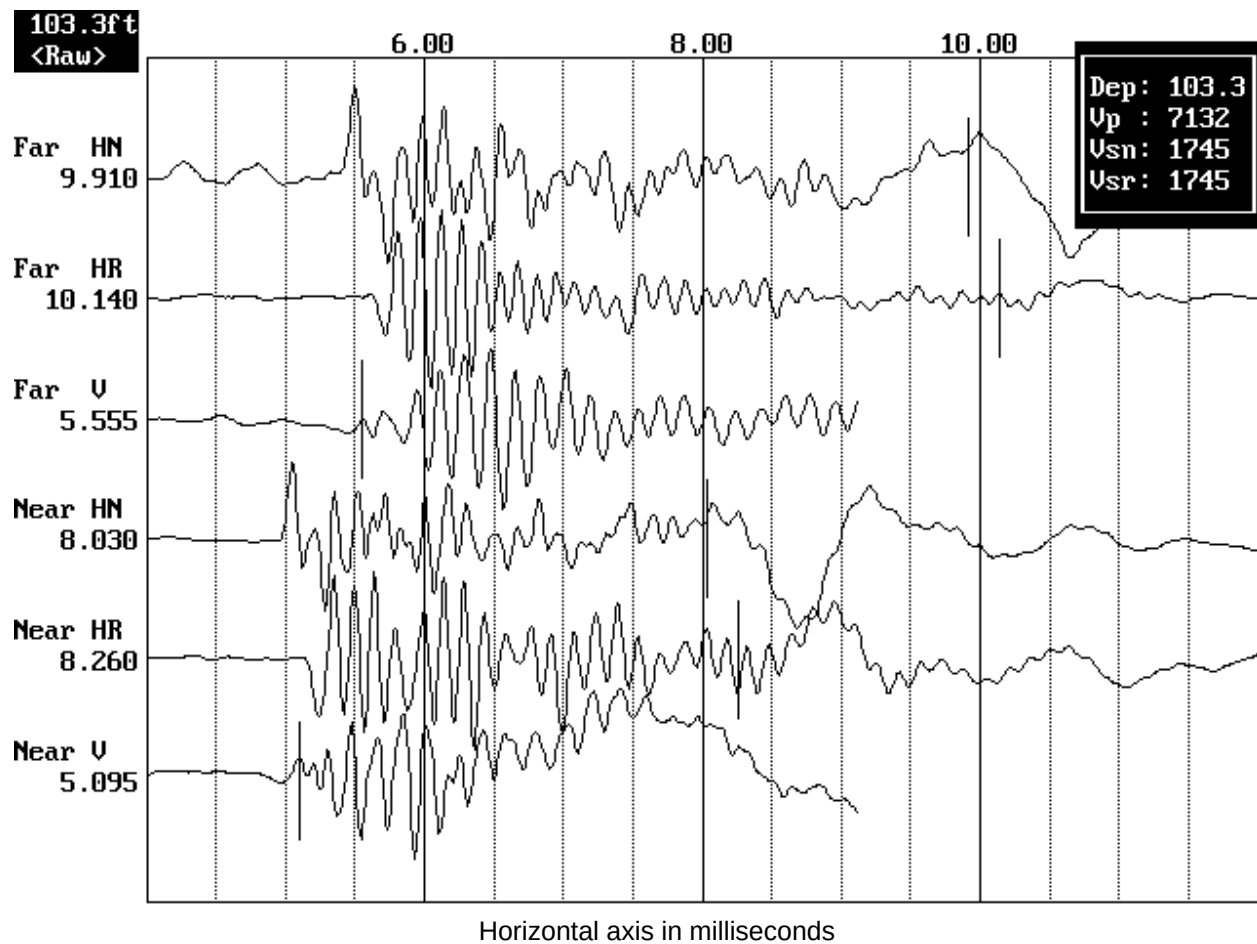


Figure 3. Example of unfiltered record

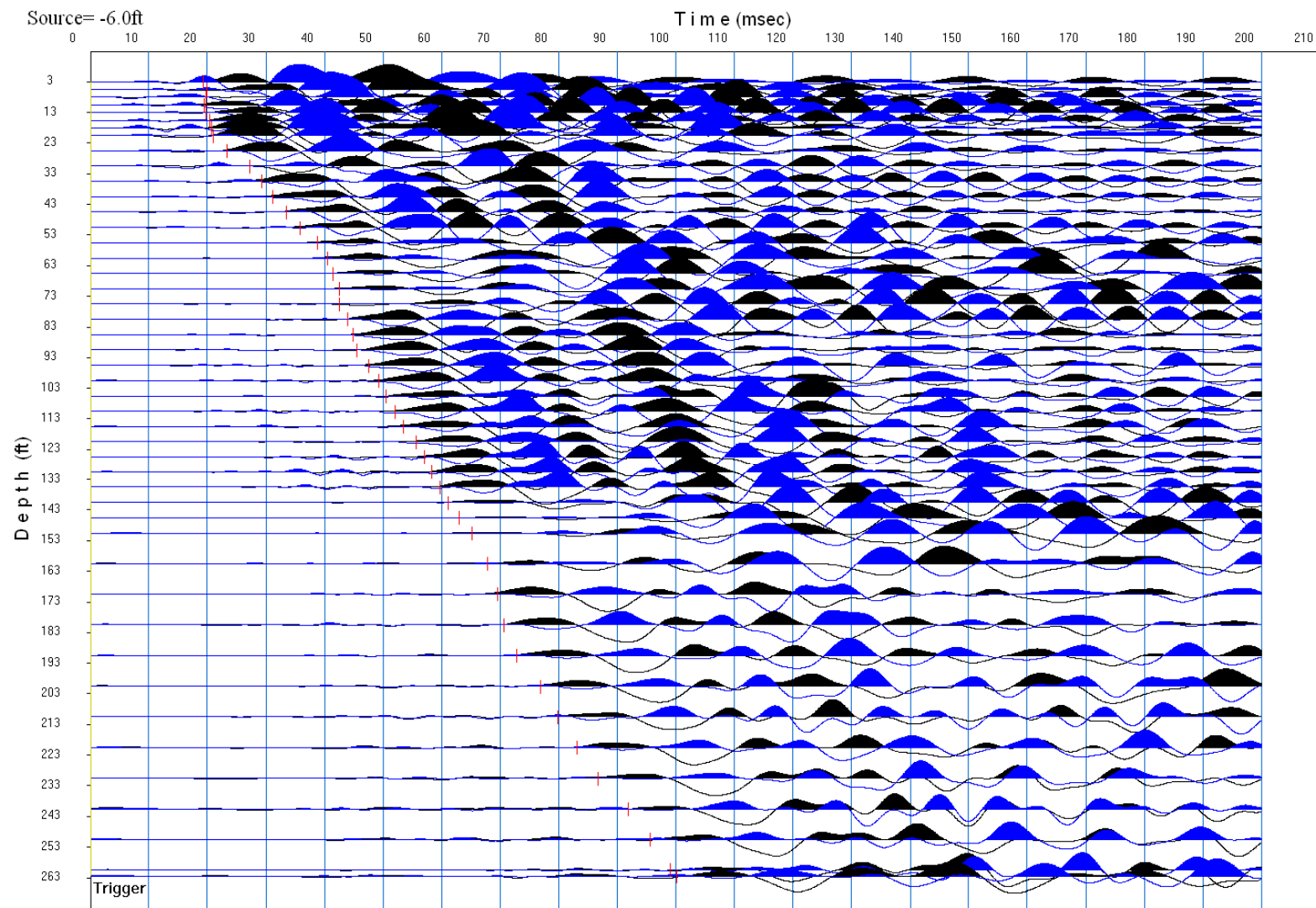


Figure 4: Boring I-5, Downhole Vs 100 Hz filtered waveforms and picks

LEVY COUNTY COLA BORING A-7 (ROTARY MUD, UNCASD)
Receiver to Receiver V_s and V_p Analysis

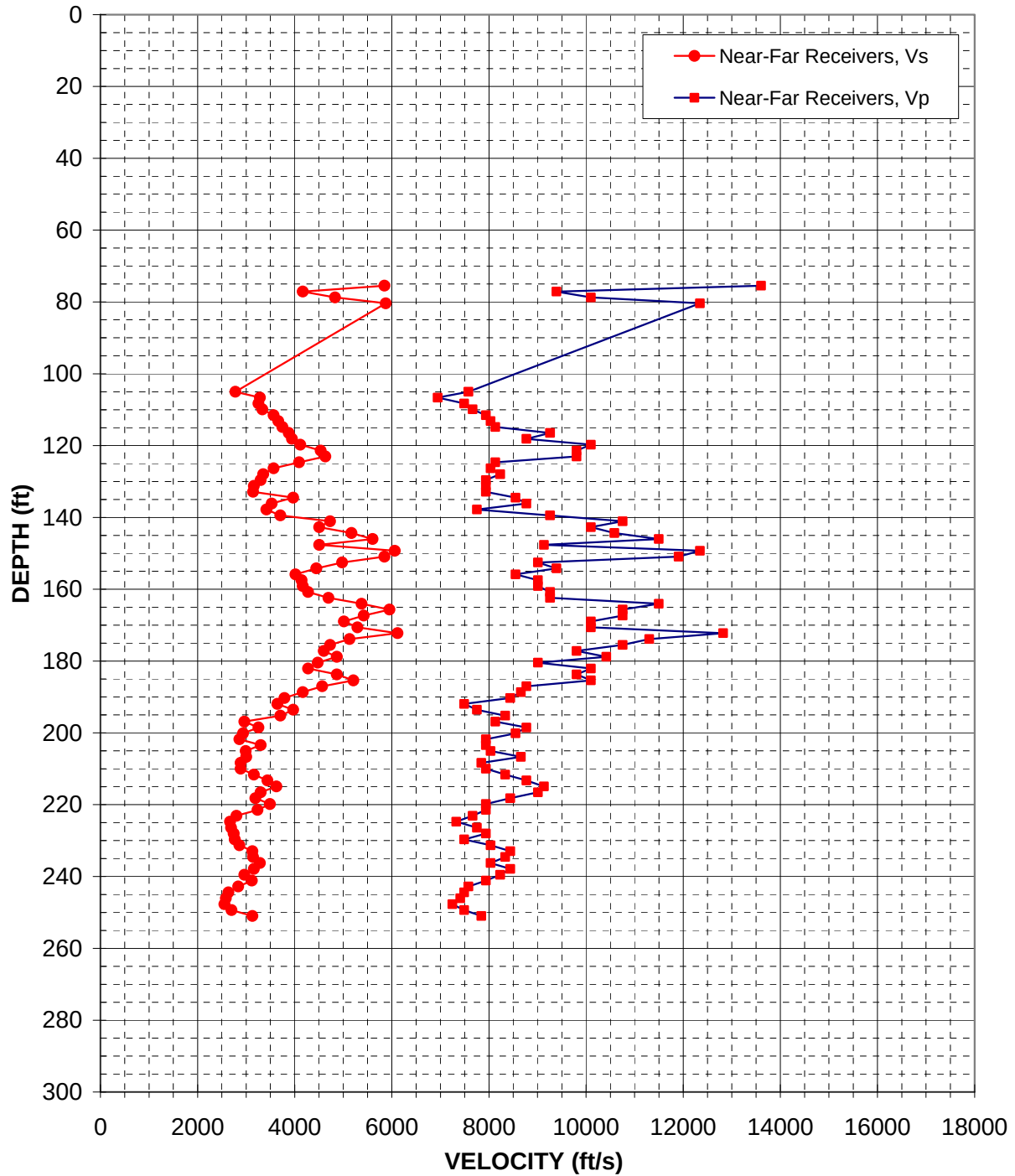


Figure 5: Boring A-7, Suspension R1-R2 P- and S_H -wave velocities

Table 5. Boring A-7, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-7**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
75.5	5850	13610	0.39
77.1	4170	9390	0.38
78.7	4830	10100	0.35
80.4	5870	12350	0.35
105.0	2780	7580	0.42
106.6	3280	6940	0.36
108.3	3250	7490	0.38
109.9	3330	7660	0.38
111.6	3570	7940	0.37
113.2	3660	8030	0.37
114.8	3750	8130	0.37
116.5	3880	9260	0.39
118.1	3940	8770	0.37
119.8	4120	10100	0.40
121.4	4540	9800	0.36
123.0	4630	9800	0.36
124.7	4090	8130	0.33
126.3	3570	8030	0.38
128.0	3350	8230	0.40
129.6	3300	7940	0.40
131.2	3160	7940	0.41
132.9	3140	7940	0.41
134.5	3970	8550	0.36
136.2	3530	8770	0.40
137.8	3420	7750	0.38
139.4	3700	9260	0.40
141.1	4730	10750	0.38
142.7	4500	10100	0.38
144.4	5170	10580	0.34
146.0	5600	11490	0.34
147.6	4500	9130	0.34
149.3	6060	12350	0.34
150.9	5850	11900	0.34
152.6	4980	9010	0.28
154.2	4440	9390	0.36
155.8	4020	8550	0.36

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
23.0	1780	4150	0.39
23.5	1270	2860	0.38
24.0	1470	3080	0.35
24.5	1790	3760	0.35
32.0	850	2310	0.42
32.5	1000	2120	0.36
33.0	990	2280	0.38
33.5	1020	2340	0.38
34.0	1090	2420	0.37
34.5	1120	2450	0.37
35.0	1140	2480	0.37
35.5	1180	2820	0.39
36.0	1200	2670	0.37
36.5	1250	3080	0.40
37.0	1380	2990	0.36
37.5	1410	2990	0.36
38.0	1250	2480	0.33
38.5	1090	2450	0.38
39.0	1020	2510	0.40
39.5	1010	2420	0.40
40.0	960	2420	0.41
40.5	960	2420	0.41
41.0	1210	2610	0.36
41.5	1080	2670	0.40
42.0	1040	2360	0.38
42.5	1130	2820	0.40
43.0	1440	3280	0.38
43.5	1370	3080	0.38
44.0	1580	3230	0.34
44.5	1710	3500	0.34
45.0	1370	2780	0.34
45.5	1850	3760	0.34
46.0	1780	3630	0.34
46.5	1520	2750	0.28
47.0	1350	2860	0.36
47.5	1220	2610	0.36

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-7**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
157.5	4140	9010	0.37
159.1	4170	9010	0.36
160.8	4270	9260	0.36
162.4	4690	9260	0.33
164.0	5380	11490	0.36
165.7	5950	10750	0.28
167.3	5420	10750	0.33
169.0	5010	10100	0.34
170.6	5290	10100	0.31
172.2	6120	12820	0.35
173.9	5130	11300	0.37
175.5	4730	10750	0.38
177.2	4600	9800	0.36
178.8	4870	10420	0.36
180.5	4470	9010	0.34
182.1	4270	10100	0.39
183.7	4870	9800	0.34
185.4	5210	10100	0.32
187.0	4570	8770	0.31
188.7	4170	8660	0.35
190.3	3790	8440	0.37
191.9	3640	7490	0.35
193.6	3970	7750	0.32
195.2	3700	8330	0.38
196.9	2960	8130	0.42
198.5	3250	8770	0.42
200.1	2940	8550	0.43
201.8	2860	7940	0.43
203.4	3300	7940	0.40
205.1	2990	8030	0.42
206.7	3000	8660	0.43
208.3	2890	7840	0.42
210.0	2890	7940	0.42
211.6	3160	8330	0.42
213.3	3440	8770	0.41
214.9	3620	9130	0.41
216.5	3300	9010	0.42
218.2	3190	8440	0.42
219.8	3490	7940	0.38

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
48.0	1260	2750	0.37
48.5	1270	2750	0.36
49.0	1300	2820	0.36
49.5	1430	2820	0.33
50.0	1640	3500	0.36
50.5	1810	3280	0.28
51.0	1650	3280	0.33
51.5	1530	3080	0.34
52.0	1610	3080	0.31
52.5	1860	3910	0.35
53.0	1560	3440	0.37
53.5	1440	3280	0.38
54.0	1400	2990	0.36
54.5	1480	3180	0.36
55.0	1360	2750	0.34
55.5	1300	3080	0.39
56.0	1480	2990	0.34
56.5	1590	3080	0.32
57.0	1390	2670	0.31
57.5	1270	2640	0.35
58.0	1150	2570	0.37
58.5	1110	2280	0.35
59.0	1210	2360	0.32
59.5	1130	2540	0.38
60.0	900	2480	0.42
60.5	990	2670	0.42
61.0	900	2610	0.43
61.5	870	2420	0.43
62.0	1010	2420	0.40
62.5	910	2450	0.42
63.0	920	2640	0.43
63.5	880	2390	0.42
64.0	880	2420	0.42
64.5	960	2540	0.42
65.0	1050	2670	0.41
65.5	1100	2780	0.41
66.0	1010	2750	0.42
66.5	970	2570	0.42
67.0	1060	2420	0.38

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-7**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
221.5	3240	7940	0.40
223.1	2800	7660	0.42
224.7	2670	7330	0.42
226.4	2690	7750	0.43
228.0	2740	7940	0.43
229.7	2770	7490	0.42
231.3	2860	8030	0.43
232.9	3130	8440	0.42
234.6	3140	8330	0.42
236.2	3280	8030	0.40
237.9	3160	8440	0.42
239.5	2960	8230	0.43
241.1	3120	7940	0.41
242.8	2840	7580	0.42
244.4	2640	7490	0.43
246.1	2580	7410	0.43
247.7	2550	7250	0.43
249.3	2700	7490	0.43
251.0	3130	7840	0.41

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
67.5	990	2420	0.40
68.0	850	2340	0.42
68.5	810	2230	0.42
69.0	820	2360	0.43
69.5	840	2420	0.43
70.0	840	2280	0.42
70.5	870	2450	0.43
71.0	950	2570	0.42
71.5	960	2540	0.42
72.0	1000	2450	0.40
72.5	960	2570	0.42
73.0	900	2510	0.43
73.5	950	2420	0.41
74.0	860	2310	0.42
74.5	800	2280	0.43
75.0	790	2260	0.43
75.5	780	2210	0.43
76.0	820	2280	0.43
76.5	950	2390	0.41

Notes: "-" means no data available at that particular interval of depth.

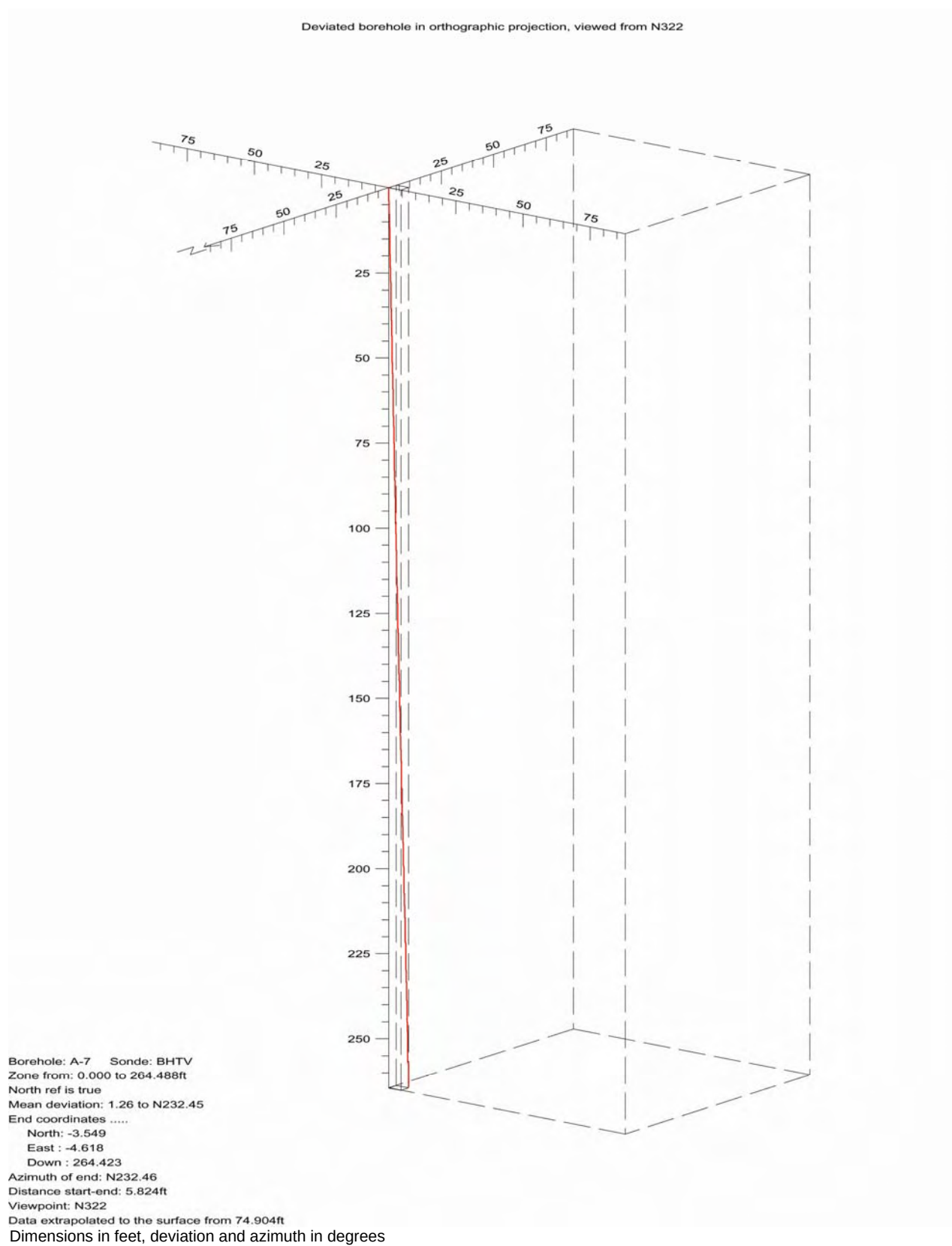


Figure 6: Boring A-7, Deviation Orthographic Projection

LEVY COUNTY COLA BORING A-8 (UNCASED)
Receiver to Receiver V_s and V_p Analysis

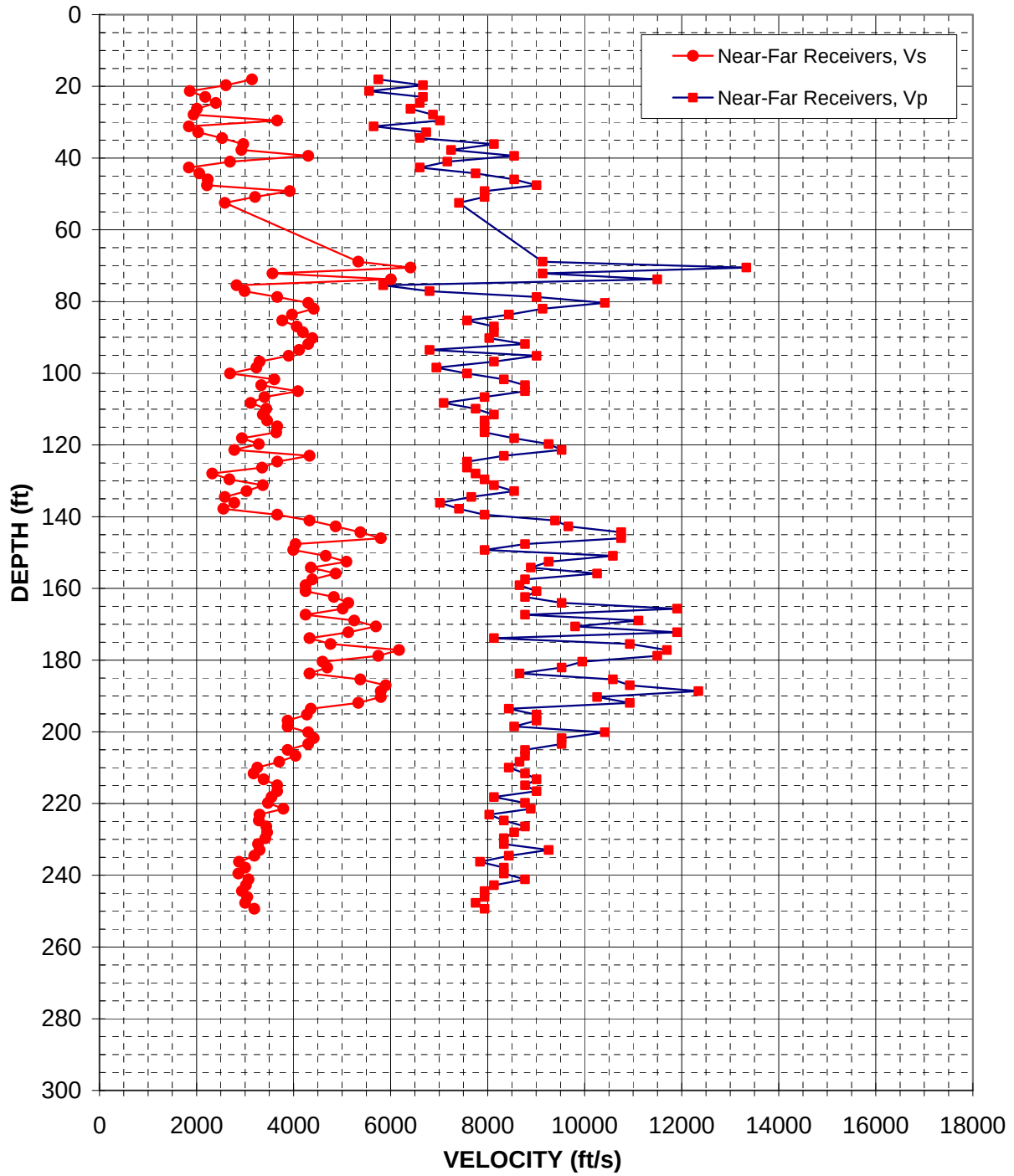


Figure 7: Boring A-8, Suspension R1-R2 P- and S_H -wave velocities

Table 6. Boring A-8, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-8**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
18.0	3140	5750	0.29
19.7	2600	6670	0.41
21.3	1860	5560	0.44
23.0	2180	6670	0.44
24.6	2400	6600	0.42
26.3	2010	6410	0.45
27.9	1940	6870	0.46
29.5	3660	7020	0.31
31.2	1840	5650	0.44
32.8	2030	6730	0.45
34.5	2530	6600	0.41
36.1	2960	8130	0.42
37.7	2920	7250	0.40
39.4	4300	8550	0.33
41.0	2690	7170	0.42
42.7	1840	6600	0.46
44.3	2060	7750	0.46
45.9	2230	8550	0.46
47.6	2210	9010	0.47
49.2	3920	7940	0.34
50.9	3210	7940	0.40
52.5	2580	7410	0.43
68.9	5330	9130	0.24
70.5	6410	13330	0.35
72.2	3570	9130	0.41
73.8	6010	11490	0.31
75.5	2820	5850	0.35
77.1	2990	6800	0.38
78.7	3660	9010	0.40
80.4	4300	10420	0.40
82.0	4420	9130	0.35
83.7	3970	8440	0.36
85.3	3770	7580	0.34
86.9	4070	8130	0.33
88.6	4190	8130	0.32
90.2	4390	8030	0.29
91.9	4300	8770	0.34

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
5.5	960	1750	0.29
6.0	790	2030	0.41
6.5	570	1690	0.44
7.0	660	2030	0.44
7.5	730	2010	0.42
8.0	610	1950	0.45
8.5	590	2090	0.46
9.0	1120	2140	0.31
9.5	560	1720	0.44
10.0	620	2050	0.45
10.5	770	2010	0.41
11.0	900	2480	0.42
11.5	890	2210	0.40
12.0	1310	2610	0.33
12.5	820	2180	0.42
13.0	560	2010	0.46
13.5	630	2360	0.46
14.0	680	2610	0.46
14.5	680	2750	0.47
15.0	1200	2420	0.34
15.5	980	2420	0.40
16.0	790	2260	0.43
21.0	1630	2780	0.24
21.5	1950	4060	0.35
22.0	1090	2780	0.41
22.5	1830	3500	0.31
23.0	860	1780	0.35
23.5	910	2070	0.38
24.0	1120	2750	0.40
24.5	1310	3180	0.40
25.0	1350	2780	0.35
25.5	1210	2570	0.36
26.0	1150	2310	0.34
26.5	1240	2480	0.33
27.0	1280	2480	0.32
27.5	1340	2450	0.29
28.0	1310	2670	0.34

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-8**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
93.5	4120	6800	0.21
95.1	3900	9010	0.38
96.8	3300	8130	0.40
98.4	3240	6940	0.36
100.1	2690	7580	0.43
101.7	3600	8330	0.38
103.4	3330	8770	0.42
105.0	4090	8770	0.36
106.6	3400	7940	0.39
108.3	3120	7090	0.38
109.9	3440	7750	0.38
111.6	3370	8130	0.40
113.2	3450	7940	0.38
114.8	3660	7940	0.36
116.5	3640	7940	0.37
118.1	2940	8550	0.43
119.8	3280	9260	0.43
121.4	2780	9520	0.45
123.0	4330	8330	0.32
124.7	3660	7580	0.35
126.3	3350	7580	0.38
128.0	2320	7750	0.45
129.6	2680	7940	0.44
131.2	3370	8130	0.40
132.9	3030	8550	0.43
134.5	2580	7660	0.44
136.2	2780	7020	0.41
137.8	2550	7410	0.43
139.4	3660	7940	0.36
141.1	4330	9390	0.37
142.7	4870	9660	0.33
144.4	5380	10750	0.33
146.0	5800	10750	0.30
147.6	4040	8770	0.37
149.3	3990	7940	0.33
150.9	4660	10580	0.38
152.6	5090	9260	0.28
154.2	4360	8890	0.34
155.8	4870	10260	0.35

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
28.5	1250	2070	0.21
29.0	1190	2750	0.38
29.5	1010	2480	0.40
30.0	990	2120	0.36
30.5	820	2310	0.43
31.0	1100	2540	0.38
31.5	1020	2670	0.42
32.0	1250	2670	0.36
32.5	1040	2420	0.39
33.0	950	2160	0.38
33.5	1050	2360	0.38
34.0	1030	2480	0.40
34.5	1050	2420	0.38
35.0	1120	2420	0.36
35.5	1110	2420	0.37
36.0	900	2610	0.43
36.5	1000	2820	0.43
37.0	850	2900	0.45
37.5	1320	2540	0.32
38.0	1120	2310	0.35
38.5	1020	2310	0.38
39.0	710	2360	0.45
39.5	820	2420	0.44
40.0	1030	2480	0.40
40.5	920	2610	0.43
41.0	790	2340	0.44
41.5	850	2140	0.41
42.0	780	2260	0.43
42.5	1120	2420	0.36
43.0	1320	2860	0.37
43.5	1480	2940	0.33
44.0	1640	3280	0.33
44.5	1770	3280	0.30
45.0	1230	2670	0.37
45.5	1220	2420	0.33
46.0	1420	3230	0.38
46.5	1550	2820	0.28
47.0	1330	2710	0.34
47.5	1480	3130	0.35

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-8**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
157.5	4390	8770	0.33
159.1	4250	8660	0.34
160.8	4250	9010	0.36
162.4	4830	8770	0.28
164.0	5130	9520	0.30
165.7	5010	11900	0.39
167.3	4250	8770	0.35
169.0	5250	11110	0.36
170.6	5700	9800	0.24
172.2	5130	11900	0.39
173.9	4330	8130	0.30
175.5	4760	10930	0.38
177.2	6170	11700	0.31
178.8	5750	11490	0.33
180.5	4600	9950	0.36
182.1	4690	9520	0.34
183.7	4330	8660	0.33
185.4	5380	10580	0.33
187.0	5900	10930	0.29
188.7	5800	12350	0.36
190.3	5800	10260	0.27
191.9	5330	10930	0.34
193.6	4360	8440	0.32
195.2	4270	9010	0.35
196.9	3880	9010	0.39
198.5	3880	8550	0.37
200.1	4300	10420	0.40
201.8	4420	9520	0.36
203.4	4300	9520	0.37
205.1	3880	8770	0.38
206.7	4040	8770	0.37
208.3	3700	8660	0.39
210.0	3250	8440	0.41
211.6	3170	8770	0.42
213.3	3380	9010	0.42
214.9	3660	8770	0.39
216.5	3660	9010	0.40
218.2	3550	8130	0.38
219.8	3470	8770	0.41

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
48.0	1340	2670	0.33
48.5	1290	2640	0.34
49.0	1290	2750	0.36
49.5	1470	2670	0.28
50.0	1560	2900	0.30
50.5	1530	3630	0.39
51.0	1290	2670	0.35
51.5	1600	3390	0.36
52.0	1740	2990	0.24
52.5	1560	3630	0.39
53.0	1320	2480	0.30
53.5	1450	3330	0.38
54.0	1880	3560	0.31
54.5	1750	3500	0.33
55.0	1400	3030	0.36
55.5	1430	2900	0.34
56.0	1320	2640	0.33
56.5	1640	3230	0.33
57.0	1800	3330	0.29
57.5	1770	3760	0.36
58.0	1770	3130	0.27
58.5	1630	3330	0.34
59.0	1330	2570	0.32
59.5	1300	2750	0.35
60.0	1180	2750	0.39
60.5	1180	2610	0.37
61.0	1310	3180	0.40
61.5	1350	2900	0.36
62.0	1310	2900	0.37
62.5	1180	2670	0.38
63.0	1230	2670	0.37
63.5	1130	2640	0.39
64.0	990	2570	0.41
64.5	970	2670	0.42
65.0	1030	2750	0.42
65.5	1120	2670	0.39
66.0	1120	2750	0.40
66.5	1080	2480	0.38
67.0	1060	2670	0.41

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-8**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
221.5	3790	8890	0.39
223.1	3300	8030	0.40
224.7	3280	8330	0.41
226.4	3440	8770	0.41
228.0	3450	8550	0.40
229.7	3420	8330	0.40
231.3	3270	8330	0.41
232.9	3300	9260	0.43
234.6	3190	8440	0.42
236.2	2870	7840	0.42
237.9	3000	8330	0.43
239.5	2860	8330	0.43
241.1	3070	8770	0.43
242.8	3020	8130	0.42
244.4	2940	7940	0.42
246.1	3040	7940	0.41
247.7	3000	7750	0.41
249.3	3190	7940	0.40

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
67.5	1150	2710	0.39
68.0	1010	2450	0.40
68.5	1000	2540	0.41
69.0	1050	2670	0.41
69.5	1050	2610	0.40
70.0	1040	2540	0.40
70.5	1000	2540	0.41
71.0	1010	2820	0.43
71.5	970	2570	0.42
72.0	880	2390	0.42
72.5	920	2540	0.43
73.0	870	2540	0.43
73.5	940	2670	0.43
74.0	920	2480	0.42
74.5	900	2420	0.42
75.0	930	2420	0.41
75.5	920	2360	0.41
76.0	970	2420	0.40

Notes: "-" means no data available at that particular interval of depth.

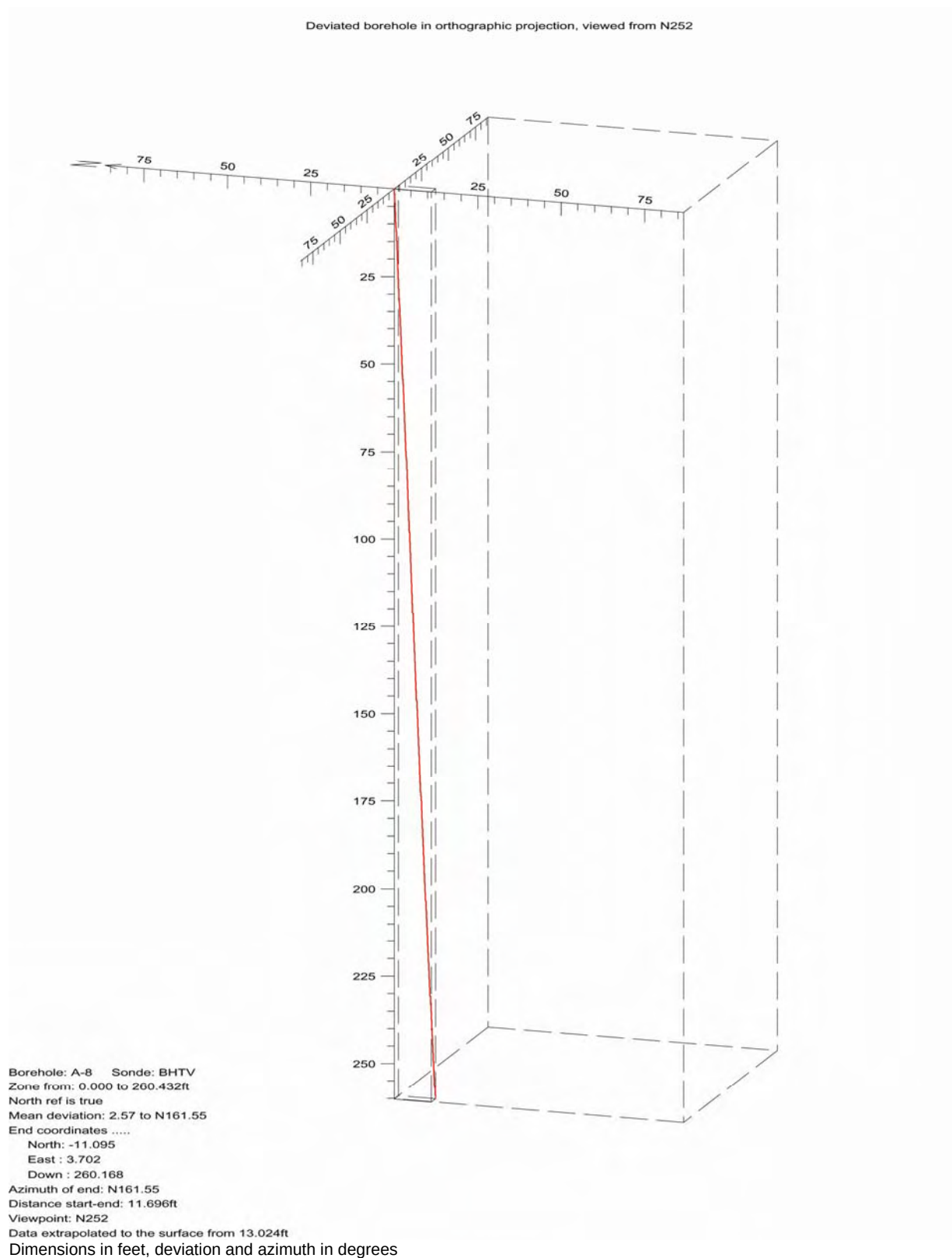


Figure 8: Boring A-8, Deviation Orthographic Projection

LEVY COUNTY COLA BORING A-19 (UNCASED)
Receiver to Receiver V_s and V_p Analysis

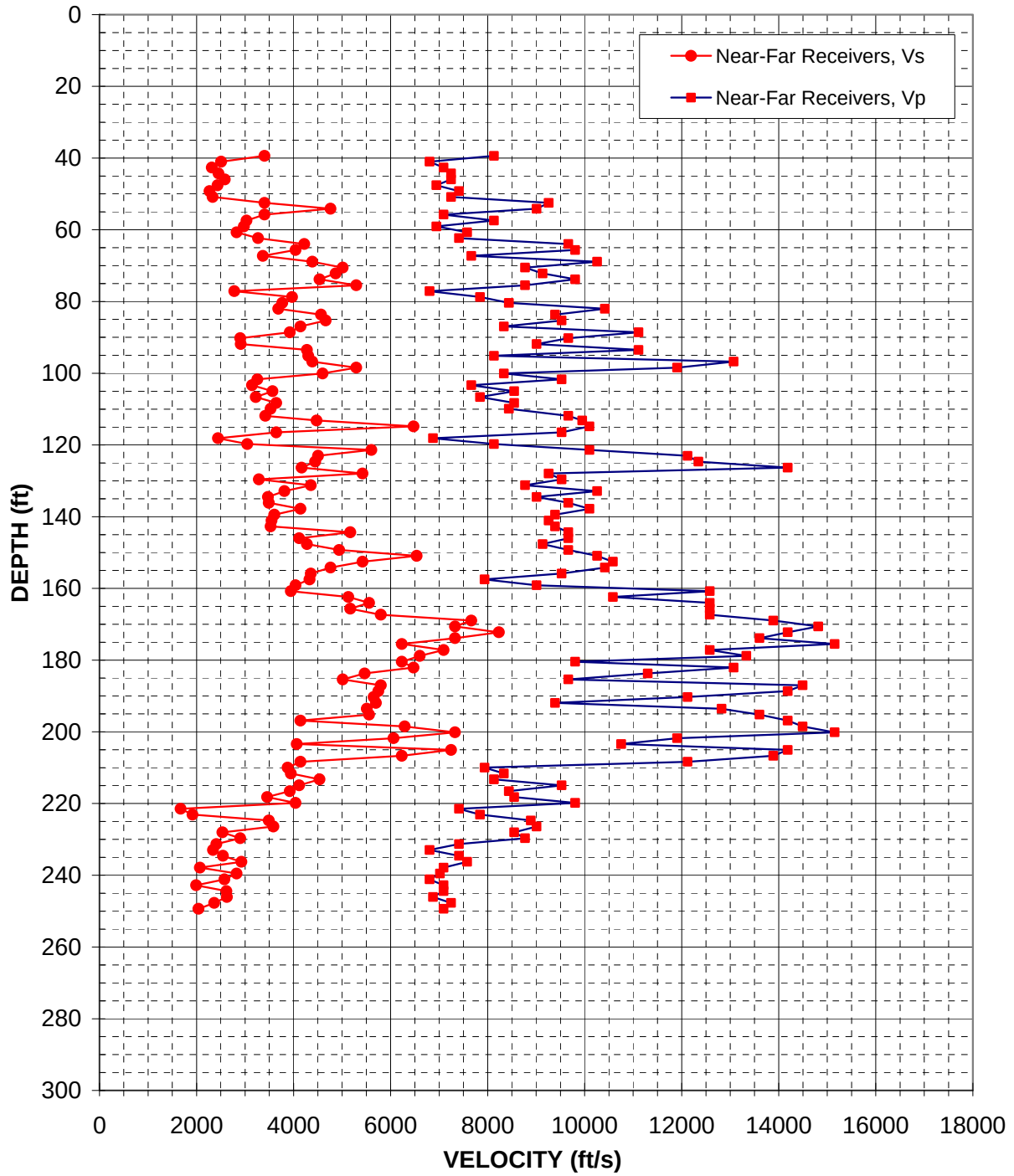


Figure 9: Boring A-19, Suspension R1-R2 P- and S_H -wave velocities

Table 7. Boring A-19, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-19**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
39.4	3400	8130	0.39
41.0	2510	6800	0.42
42.7	2310	7090	0.44
44.3	2450	7250	0.44
45.9	2580	7250	0.43
47.6	2430	6940	0.43
49.2	2270	7410	0.45
50.9	2330	7250	0.44
52.5	3400	9260	0.42
54.1	4760	9010	0.31
55.8	3400	7090	0.35
57.4	3030	8130	0.42
59.1	2980	6940	0.39
60.7	2820	7580	0.42
62.3	3270	7410	0.38
64.0	4220	9660	0.38
65.6	4040	9800	0.40
67.3	3370	7660	0.38
68.9	4390	10260	0.39
70.5	5010	8770	0.26
72.2	4870	9130	0.30
73.8	4540	9800	0.36
75.5	5290	8770	0.21
77.1	2780	6800	0.40
78.7	3970	7840	0.33
80.4	3770	8440	0.38
82.0	3680	10420	0.43
83.7	4570	9390	0.35
85.3	4660	9520	0.34
86.9	4140	8330	0.34
88.6	3920	11110	0.43
90.2	2900	9660	0.45
91.9	2910	9010	0.44
93.5	4270	11110	0.41
95.1	4300	8130	0.31
96.8	4390	13070	0.44
98.4	5290	11900	0.38

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
12.0	1040	2480	0.39
12.5	760	2070	0.42
13.0	710	2160	0.44
13.5	750	2210	0.44
14.0	790	2210	0.43
14.5	740	2120	0.43
15.0	690	2260	0.45
15.5	710	2210	0.44
16.0	1040	2820	0.42
16.5	1450	2750	0.31
17.0	1040	2160	0.35
17.5	920	2480	0.42
18.0	910	2120	0.39
18.5	860	2310	0.42
19.0	1000	2260	0.38
19.5	1290	2940	0.38
20.0	1230	2990	0.40
20.5	1030	2340	0.38
21.0	1340	3130	0.39
21.5	1530	2670	0.26
22.0	1480	2780	0.30
22.5	1380	2990	0.36
23.0	1610	2670	0.21
23.5	850	2070	0.40
24.0	1210	2390	0.33
24.5	1150	2570	0.38
25.0	1120	3180	0.43
25.5	1390	2860	0.35
26.0	1420	2900	0.34
26.5	1260	2540	0.34
27.0	1200	3390	0.43
27.5	880	2940	0.45
28.0	890	2750	0.44
28.5	1300	3390	0.41
29.0	1310	2480	0.31
29.5	1340	3980	0.44
30.0	1610	3630	0.38

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-19**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
100.1	4600	8330	0.28
101.7	3250	9520	0.43
103.4	3140	7660	0.40
105.0	3570	8550	0.39
106.6	3220	7840	0.40
108.3	3640	8550	0.39
109.9	3530	8440	0.39
111.9	3420	9660	0.43
113.2	4470	9950	0.37
114.8	6470	10100	0.15
116.5	3640	9520	0.41
118.1	2440	6870	0.43
119.8	3040	8130	0.42
121.4	5600	10100	0.28
123.0	4500	12120	0.42
124.7	4440	12350	0.43
126.3	4170	14180	0.45
128.0	5420	9260	0.24
129.6	3280	9520	0.43
131.2	4360	8770	0.34
132.9	3810	10260	0.42
134.5	3470	9010	0.41
136.2	3490	9660	0.42
137.8	4140	10100	0.40
139.4	3600	9390	0.41
141.1	3550	9260	0.41
142.7	3530	9390	0.42
144.4	5170	9660	0.30
146.0	4120	9660	0.39
147.6	4270	9130	0.36
149.3	4940	9660	0.32
150.9	6540	10260	0.16
152.6	5420	10580	0.32
154.2	4760	10420	0.37
155.8	4360	9520	0.37
157.5	4330	7940	0.29
159.1	4040	9010	0.37
160.8	3940	12580	0.45
162.4	5130	10580	0.35

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
30.5	1400	2540	0.28
31.0	990	2900	0.43
31.5	960	2340	0.40
32.0	1090	2610	0.39
32.5	980	2390	0.40
33.0	1110	2610	0.39
33.5	1080	2570	0.39
34.1	1040	2940	0.43
34.5	1360	3030	0.37
35.0	1970	3080	0.15
35.5	1110	2900	0.41
36.0	740	2090	0.43
36.5	930	2480	0.42
37.0	1710	3080	0.28
37.5	1370	3690	0.42
38.0	1350	3760	0.43
38.5	1270	4320	0.45
39.0	1650	2820	0.24
39.5	1000	2900	0.43
40.0	1330	2670	0.34
40.5	1160	3130	0.42
41.0	1060	2750	0.41
41.5	1060	2940	0.42
42.0	1260	3080	0.40
42.5	1100	2860	0.41
43.0	1080	2820	0.41
43.5	1080	2860	0.42
44.0	1580	2940	0.30
44.5	1250	2940	0.39
45.0	1300	2780	0.36
45.5	1510	2940	0.32
46.0	1990	3130	0.16
46.5	1650	3230	0.32
47.0	1450	3180	0.37
47.5	1330	2900	0.37
48.0	1320	2420	0.29
48.5	1230	2750	0.37
49.0	1200	3830	0.45
49.5	1560	3230	0.35

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-19**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
164.0	5560	12580	0.38
165.7	5170	12580	0.40
167.3	5800	12580	0.37
169.0	7660	13890	0.28
170.6	7330	14810	0.34
172.2	8230	14180	0.25
173.9	7330	13610	0.30
175.5	6230	15150	0.40
177.2	7090	12580	0.27
178.8	6600	13330	0.34
180.5	6230	9800	0.16
182.1	6470	13070	0.34
183.7	5460	11300	0.35
185.4	5010	9660	0.32
187.0	5800	14490	0.40
188.7	5750	14180	0.40
190.3	5650	12120	0.36
191.9	5700	9390	0.21
193.6	5510	12820	0.39
195.2	5560	13610	0.40
196.9	4140	14180	0.45
198.5	6290	14490	0.38
200.1	7330	15150	0.35
201.8	6060	11900	0.33
203.4	4070	10750	0.42
205.1	7250	14180	0.32
206.7	6230	13890	0.37
208.3	4140	12120	0.43
210.0	3880	7940	0.34
211.6	3940	8330	0.36
213.3	4540	8130	0.27
214.9	4120	9520	0.39
216.5	3920	8440	0.36
218.2	3450	8550	0.40
219.8	4040	9800	0.40
221.5	1670	7410	0.47
223.1	1920	7840	0.47
224.7	3490	8890	0.41
226.4	3580	9010	0.41

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
50.0	1690	3830	0.38
50.5	1580	3830	0.40
51.0	1770	3830	0.37
51.5	2340	4230	0.28
52.0	2230	4520	0.34
52.5	2510	4320	0.25
53.0	2230	4150	0.30
53.5	1900	4620	0.40
54.0	2160	3830	0.27
54.5	2010	4060	0.34
55.0	1900	2990	0.16
55.5	1970	3980	0.34
56.0	1670	3440	0.35
56.5	1530	2940	0.32
57.0	1770	4420	0.40
57.5	1750	4320	0.40
58.0	1720	3690	0.36
58.5	1740	2860	0.21
59.0	1680	3910	0.39
59.5	1690	4150	0.40
60.0	1260	4320	0.45
60.5	1920	4420	0.38
61.0	2230	4620	0.35
61.5	1850	3630	0.33
62.0	1240	3280	0.42
62.5	2210	4320	0.32
63.0	1900	4230	0.37
63.5	1260	3690	0.43
64.0	1180	2420	0.34
64.5	1200	2540	0.36
65.0	1380	2480	0.27
65.5	1250	2900	0.39
66.0	1200	2570	0.36
66.5	1050	2610	0.40
67.0	1230	2990	0.40
67.5	510	2260	0.47
68.0	580	2390	0.47
68.5	1060	2710	0.41
69.0	1090	2750	0.41

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole A-19**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
228.0	2530	8550	0.45
229.7	2900	8770	0.44
231.3	2410	7410	0.44
232.9	2340	6800	0.43
234.6	2540	7410	0.43
236.2	2920	7580	0.41
237.9	2070	7090	0.45
239.5	2820	7020	0.40
241.1	2570	6800	0.42
242.8	1990	7090	0.46
244.4	2610	7090	0.42
246.1	2620	6870	0.41
247.7	2360	7250	0.44
249.3	2040	7090	0.45

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
69.5	770	2610	0.45
70.0	880	2670	0.44
70.5	730	2260	0.44
71.0	710	2070	0.43
71.5	780	2260	0.43
72.0	890	2310	0.41
72.5	630	2160	0.45
73.0	860	2140	0.40
73.5	780	2070	0.42
74.0	610	2160	0.46
74.5	800	2160	0.42
75.0	800	2090	0.41
75.5	720	2210	0.44
76.0	620	2160	0.45

Notes: "-" means no data available at that particular interval of depth.

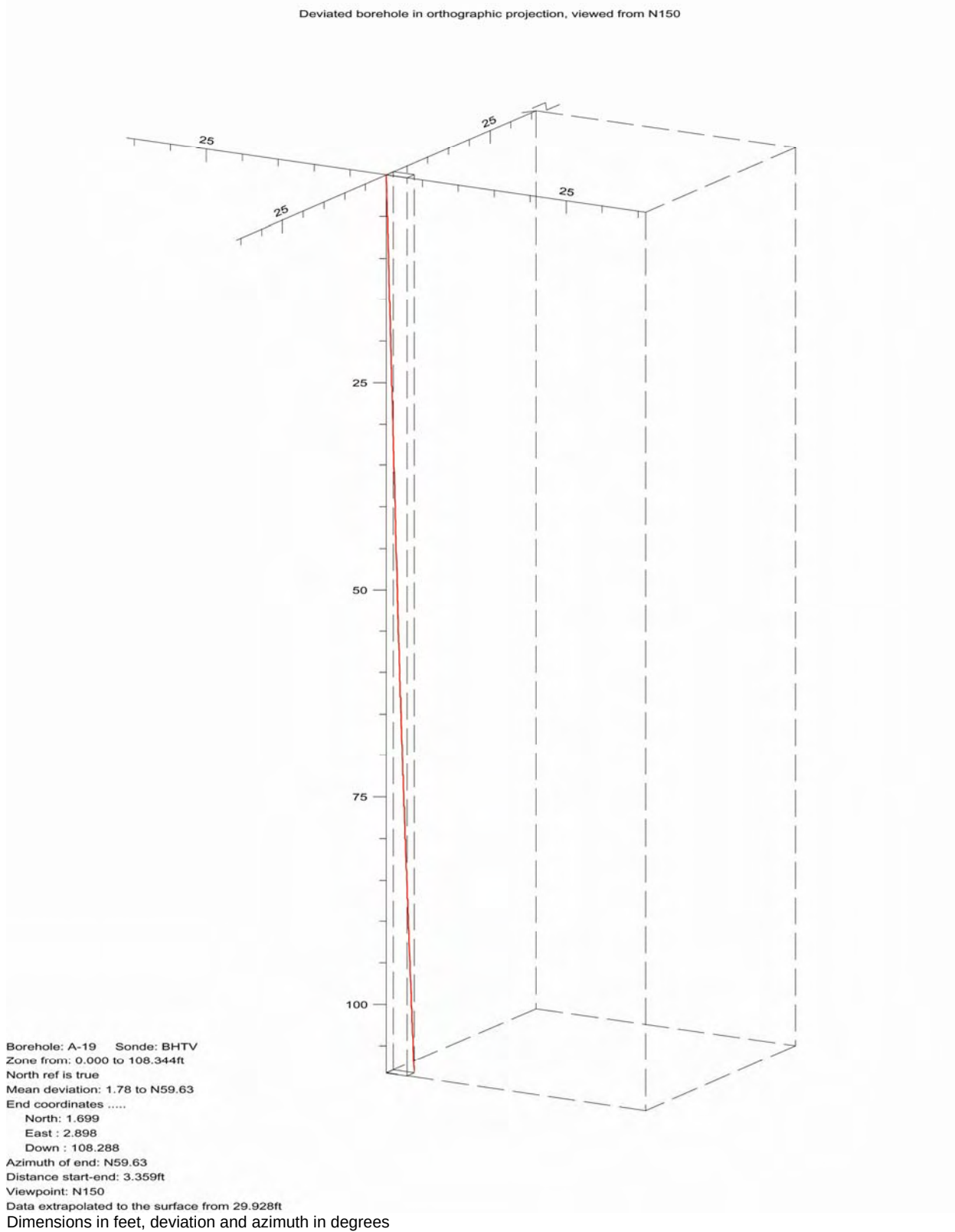


Figure 10: Boring A-19, Deviation Orthographic Projection

LEVY COUNTY COLA BORING A-20 (UNCASED)
Receiver to Receiver V_s and V_p Analysis

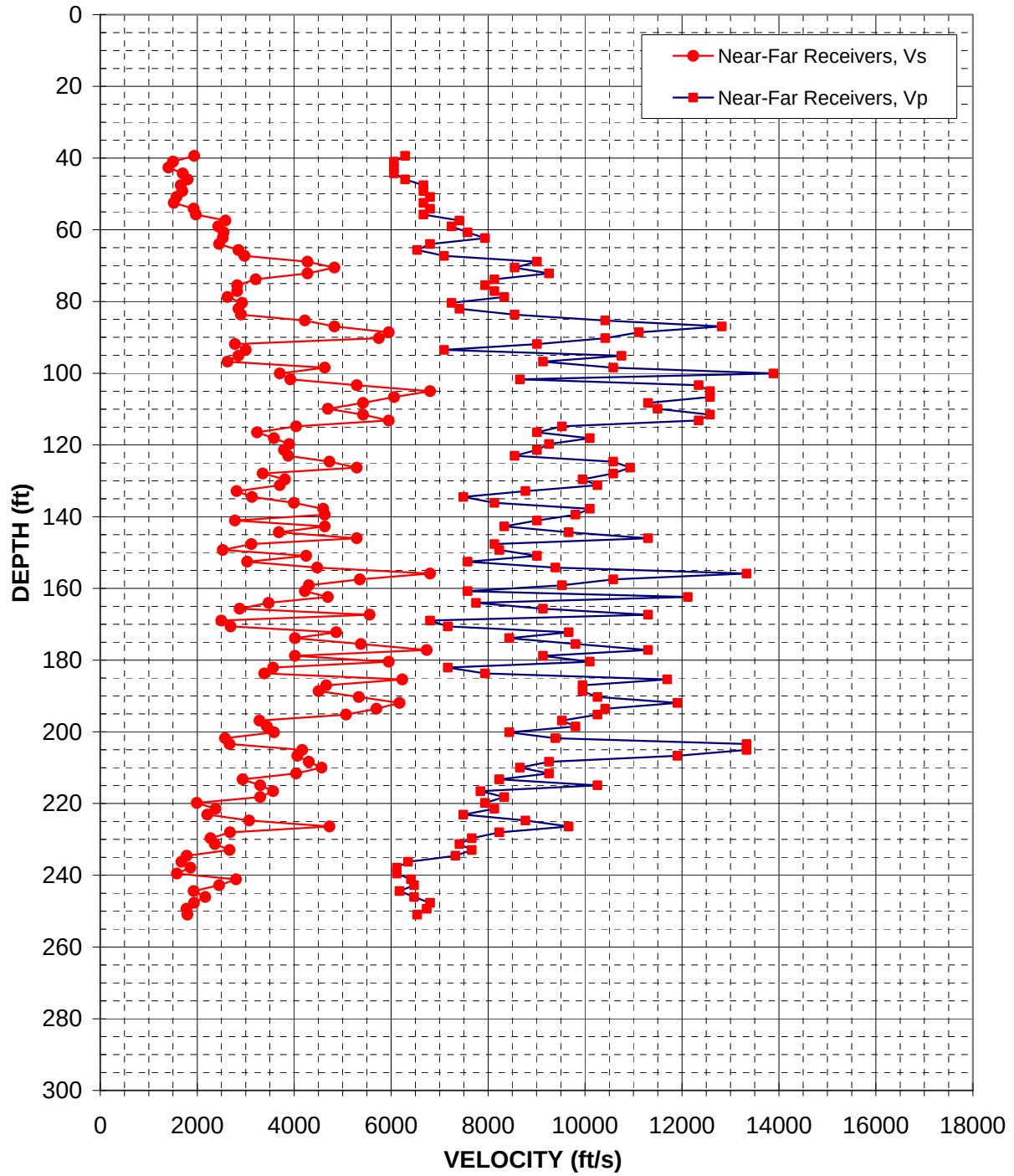


Figure 11: Boring A-20, Suspension R1-R2 P- and S_H -wave velocities

Table 8. Boring A-20, Suspension R1-R2 depths and P- and S_H-wave velocities

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio							
Based on Receiver-to-Receiver Travel Time Data - Borehole A-20							
American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
(ft)	V _s (ft/s)	V _p (ft/s)		(m)	V _s (m/s)	V _p (m/s)	
39.4	1940	6290	0.45	12.0	590	1920	0.45
41.0	1500	6060	0.47	12.5	460	1850	0.47
42.7	1410	6060	0.47	13.0	430	1850	0.47
44.3	1700	6060	0.46	13.5	520	1850	0.46
45.9	1800	6290	0.46	14.0	550	1920	0.46
47.6	1660	6670	0.47	14.5	510	2030	0.47
49.2	1690	6670	0.47	15.0	520	2030	0.47
50.9	1570	6800	0.47	15.5	480	2070	0.47
52.5	1520	6670	0.47	16.0	460	2030	0.47
54.1	1930	6800	0.46	16.5	590	2070	0.46
55.8	1970	6670	0.45	17.0	600	2030	0.45
57.4	2580	7410	0.43	17.5	790	2260	0.43
59.1	2430	7250	0.44	18.0	740	2210	0.44
60.7	2540	7580	0.44	18.5	780	2310	0.44
62.3	2530	7940	0.44	19.0	770	2420	0.44
64.0	2450	6800	0.43	19.5	750	2070	0.43
65.6	2850	6540	0.38	20.0	870	1990	0.38
67.3	2980	7090	0.39	20.5	910	2160	0.39
68.9	4270	9010	0.35	21.0	1300	2750	0.35
70.5	4830	8550	0.27	21.5	1470	2610	0.27
72.2	4270	9260	0.36	22.0	1300	2820	0.36
73.8	3210	8130	0.41	22.5	980	2480	0.41
75.5	2820	7940	0.43	23.0	860	2420	0.43
77.1	2820	8130	0.43	23.5	860	2480	0.43
78.7	2620	8330	0.44	24.0	800	2540	0.44
80.4	2920	7250	0.40	24.5	890	2210	0.40
82.0	2850	7410	0.41	25.0	870	2260	0.41
83.7	2900	8550	0.44	25.5	880	2610	0.44
85.3	4220	10420	0.40	26.0	1290	3180	0.40
86.9	4830	12820	0.42	26.5	1470	3910	0.42
88.6	5950	11110	0.30	27.0	1810	3390	0.30
90.2	5750	10420	0.28	27.5	1750	3180	0.28
91.9	2780	9010	0.45	28.0	850	2750	0.45
93.5	3000	7090	0.39	28.5	920	2160	0.39
95.1	2850	10750	0.46	29.0	870	3280	0.46
96.8	2620	9130	0.45	29.5	800	2780	0.45
98.4	4630	10580	0.38	30.0	1410	3230	0.38
100.1	3700	13890	0.46	30.5	1130	4230	0.46

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio							
Based on Receiver-to-Receiver Travel Time Data - Borehole A-20							
American Units					Metric Units		
Depth at	Velocity		Poisson's Ratio		Depth at	Velocity	
Midpoint Between Receivers	V _s	V _p			Midpoint Between Receivers	V _s	Poisson's Ratio
(ft)	(ft/s)	(ft/s)			(m)	(m/s)	(m/s)
101.7	3920	8660	0.37		31.0	1200	2640
103.4	5290	12350	0.39		31.5	1610	3760
105.0	6800	12580	0.29		32.0	2070	3830
106.6	6060	12580	0.35		32.5	1850	3830
108.3	5420	11300	0.35		33.0	1650	3440
109.9	4690	11490	0.40		33.5	1430	3500
111.6	5420	12580	0.39		34.0	1650	3830
113.2	5950	12350	0.35		34.5	1810	3760
114.8	4040	9520	0.39		35.0	1230	2900
116.5	3240	9010	0.43		35.5	990	2750
118.1	3580	10100	0.43		36.0	1090	3080
119.8	3900	9260	0.39		36.5	1190	2820
121.4	3790	9010	0.39		37.0	1150	2750
123.0	3880	8550	0.37		37.5	1180	2610
124.7	4730	10580	0.38		38.0	1440	3230
126.3	5290	10930	0.35		38.5	1610	3330
128.0	3350	10580	0.44		39.0	1020	3230
129.6	3810	9950	0.41		39.5	1160	3030
131.2	3700	10260	0.43		40.0	1130	3130
132.9	2810	8770	0.44		40.5	860	2670
134.5	3130	7490	0.39		41.0	950	2280
136.2	3990	8130	0.34		41.5	1220	2480
137.8	4600	10100	0.37		42.0	1400	3080
139.4	4630	9800	0.36		42.5	1410	2990
141.1	2780	9010	0.45		43.0	850	2750
142.7	4630	8330	0.28		43.5	1410	2540
144.4	3680	9660	0.41		44.0	1120	2940
146.0	5290	11300	0.36		44.5	1610	3440
147.6	3120	8130	0.41		45.0	950	2480
149.3	2530	8230	0.45		45.5	770	2510
150.9	4250	9010	0.36		46.0	1290	2750
152.6	3030	7580	0.40		46.5	920	2310
154.2	4470	9390	0.35		47.0	1360	2860
155.8	6800	13330	0.32		47.5	2070	4060
157.5	5350	10580	0.33		48.0	1630	3230
159.1	4300	9520	0.37		48.5	1310	2900
160.8	4220	7580	0.28		49.0	1290	2310
162.4	4690	12120	0.41		49.5	1430	3690
164.0	3470	7750	0.37		50.0	1060	2360
165.7	2870	9130	0.45		50.5	880	2780

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio							
Based on Receiver-to-Receiver Travel Time Data - Borehole A-20							
American Units					Metric Units		
Depth at	Velocity		Poisson's Ratio		Depth at	Velocity	
Midpoint Between Receivers	V _s	V _p			Midpoint Between Receivers	V _s	Poisson's Ratio
(ft)	(ft/s)	(ft/s)			(m)	(m/s)	(m/s)
167.3	5560	11300	0.34		51.0	1690	3440
169.0	2500	6800	0.42		51.5	760	2070
170.6	2690	7170	0.42		52.0	820	2180
172.2	4870	9660	0.33		52.5	1480	2940
173.9	4020	8440	0.35		53.0	1220	2570
175.5	5380	9800	0.28		53.5	1640	2990
177.2	6730	11300	0.22		54.0	2050	3440
178.8	4020	9130	0.38		54.5	1220	2780
180.5	5950	10100	0.23		55.0	1810	3080
182.1	3570	7170	0.34		55.5	1090	2180
183.7	3380	7940	0.39		56.0	1030	2420
185.4	6230	11700	0.30		56.5	1900	3560
187.0	4660	9950	0.36		57.0	1420	3030
188.7	4500	9950	0.37		57.5	1370	3030
190.3	5330	10260	0.31		58.0	1630	3130
191.9	6170	11900	0.32		58.5	1880	3630
193.6	5700	10420	0.29		59.0	1740	3180
195.2	5070	10260	0.34		59.5	1550	3130
196.9	3280	9520	0.43		60.0	1000	2900
198.5	3440	9800	0.43		60.5	1050	2990
200.1	3580	8440	0.39		61.0	1090	2570
201.8	2570	9390	0.46		61.5	780	2860
203.4	2670	13330	0.48		62.0	810	4060
205.1	4170	13330	0.45		62.5	1270	4060
206.7	4070	11900	0.43		63.0	1240	3630
208.3	4300	9260	0.36		63.5	1310	2820
210.0	4570	8660	0.31		64.0	1390	2640
211.6	4040	9260	0.38		64.5	1230	2820
213.3	2940	8230	0.43		65.0	900	2510
214.9	3300	10260	0.44		65.5	1010	3130
216.5	3570	7840	0.37		66.0	1090	2390
218.2	3300	8330	0.41		66.5	1010	2540
219.8	1990	7940	0.47		67.0	610	2420
221.5	2380	8130	0.45		67.5	730	2480
223.1	2210	7490	0.45		68.0	670	2280
224.7	3070	8770	0.43		68.5	940	2670
226.4	4730	9660	0.34		69.0	1440	2940
228.0	2680	8230	0.44		69.5	820	2510
229.7	2280	7660	0.45		70.0	690	2340
231.3	2360	7410	0.44		70.5	720	2260

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio							
Based on Receiver-to-Receiver Travel Time Data - Borehole A-20							
American Units					Metric Units		
Depth at	Velocity		Poisson's Ratio		Depth at	Velocity	
Midpoint Between Receivers	V _s	V _p			Midpoint Between Receivers	V _s	Poisson's Ratio
(ft)	(ft/s)	(ft/s)			(m)	(m/s)	(m/s)
232.9	2670	7660	0.43		71.0	810	2340
234.6	1780	7330	0.47		71.5	540	2230
236.2	1680	6350	0.46		72.0	510	1940
237.9	1860	6120	0.45		72.5	570	1860
239.5	1580	6120	0.46		73.0	480	1860
241.1	2800	6410	0.38		73.5	850	1950
242.8	2450	6470	0.42		74.0	750	1970
244.4	1930	6170	0.45		74.5	590	1880
246.1	2160	6470	0.44		75.0	660	1970
247.7	1930	6800	0.46		75.5	590	2070
249.3	1780	6730	0.46		76.0	540	2050
251.0	1800	6540	0.46		76.5	550	1990
Notes:	"-" means no data available at that particular interval of depth.						

Deviated borehole in orthographic projection, viewed from N146

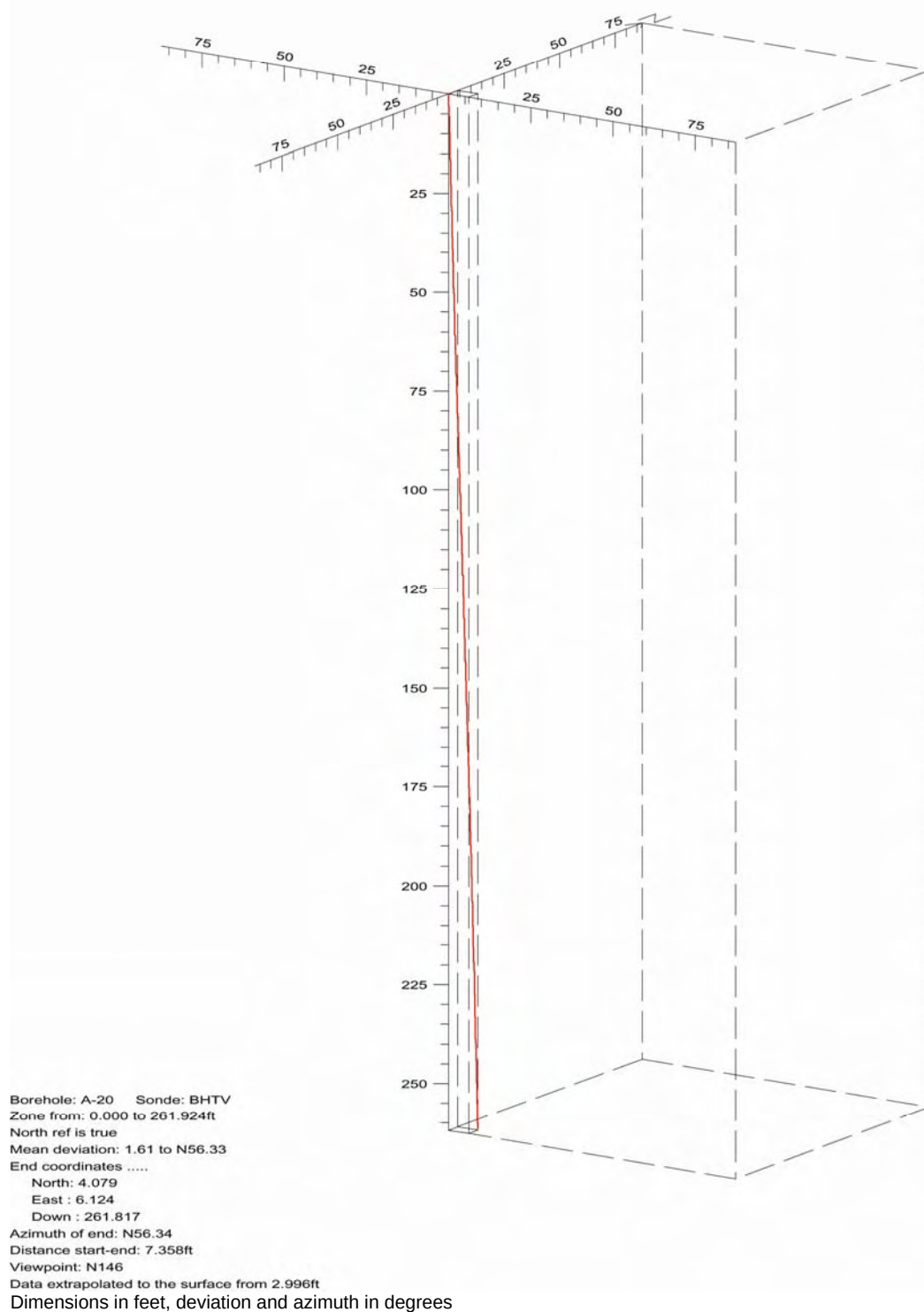


Figure 12: Boring A-20, Deviation Orthographic Projection

LEVY COUNTY COLA BORING I-1 (SONIC, CASED)
Receiver to Receiver V_s and V_p Analysis

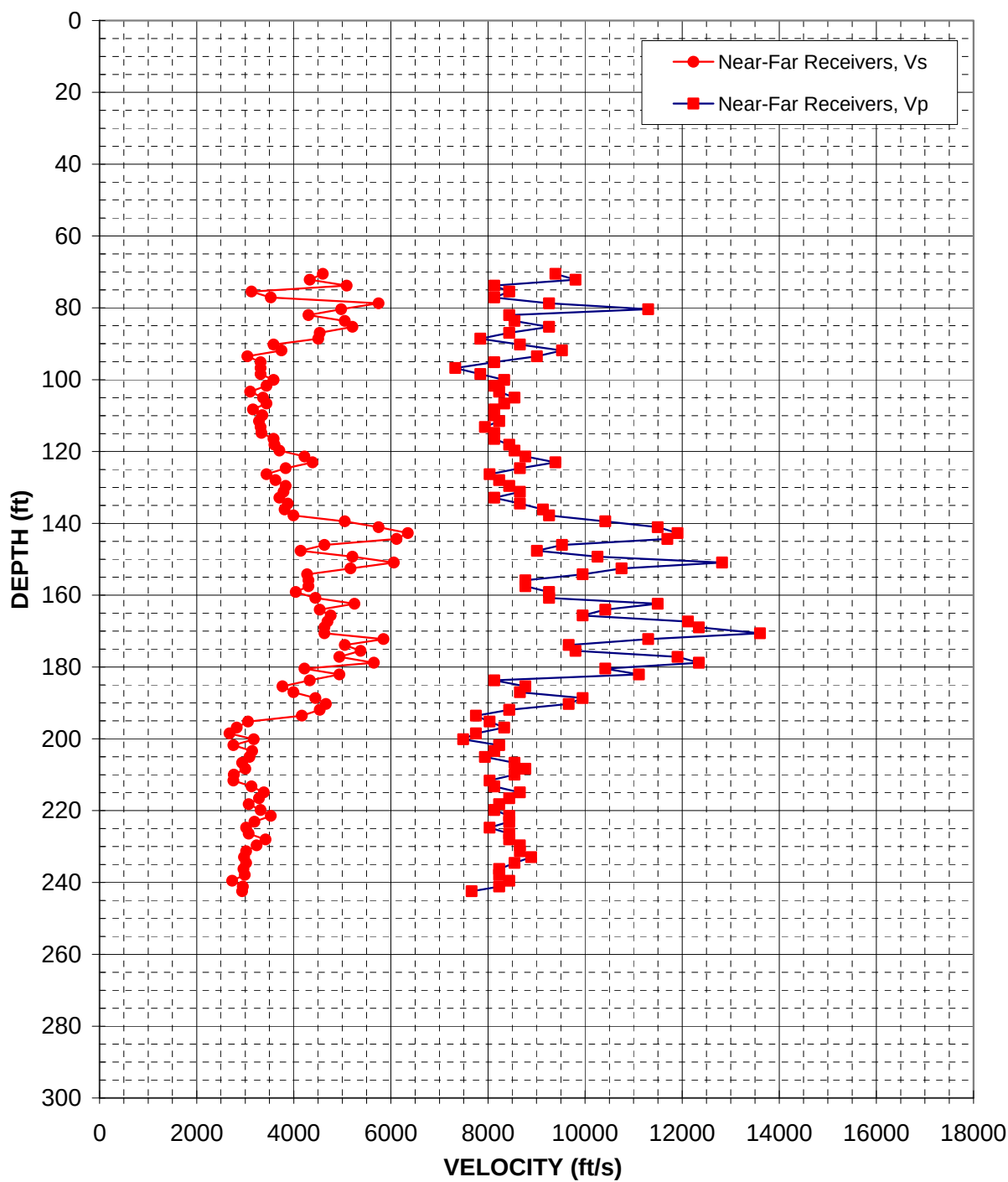


Figure 13: Boring I-1, Suspension R1-R2 P- and S_H -wave velocities

Table 9. Boring I-1, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-1**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
	(ft/s)	(ft/s)	
8.2	-	-	-
9.8	-	-	-
11.5	-	-	-
13.1	-	-	-
14.8	-	-	-
16.4	-	-	-
18.0	-	-	-
19.7	-	-	-
21.3	-	-	-
23.0	-	-	-
24.6	-	-	-
26.3	-	-	-
27.9	-	-	-
29.5	-	-	-
31.2	-	-	-
32.8	-	-	-
34.5	-	-	-
36.1	-	-	-
37.7	-	-	-
39.4	-	-	-
41.0	-	-	-
42.7	-	-	-
44.3	-	-	-
45.9	-	-	-
47.6	-	-	-
49.2	-	-	-
50.9	-	-	-
52.5	-	-	-
54.1	-	-	-
55.8	-	-	-
57.4	-	-	-
59.1	-	-	-
60.7	-	-	-
62.3	-	-	-
64.0	-	-	-
65.6	-	-	-
67.3	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
	(m/s)	(m/s)	
2.5	-	-	-
3.0	-	-	-
3.5	-	-	-
4.0	-	-	-
4.5	-	-	-
5.0	-	-	-
5.5	-	-	-
6.0	-	-	-
6.5	-	-	-
7.0	-	-	-
7.5	-	-	-
8.0	-	-	-
8.5	-	-	-
9.0	-	-	-
9.5	-	-	-
10.0	-	-	-
10.5	-	-	-
11.0	-	-	-
11.5	-	-	-
12.0	-	-	-
12.5	-	-	-
13.0	-	-	-
13.5	-	-	-
14.0	-	-	-
14.5	-	-	-
15.0	-	-	-
15.5	-	-	-
16.0	-	-	-
16.5	-	-	-
17.0	-	-	-
17.5	-	-	-
18.0	-	-	-
18.5	-	-	-
19.0	-	-	-
19.5	-	-	-
20.0	-	-	-
20.5	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-1**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
68.9	-	-	-
70.5	4600	9390	0.34
72.2	4330	9800	0.38
73.8	5090	8130	0.18
75.5	3130	8440	0.42
77.1	3530	8130	0.38
78.7	5750	9260	0.19
80.4	4980	11300	0.38
82.0	4300	8440	0.32
83.7	5050	8550	0.23
85.3	5210	9260	0.27
86.9	4540	8440	0.30
88.6	4500	7840	0.25
90.2	3580	8660	0.40
91.9	3750	9520	0.41
93.5	3040	9010	0.44
95.1	3320	8130	0.40
96.8	3320	7330	0.37
98.4	3320	7840	0.39
100.1	3580	8330	0.39
101.7	3440	8130	0.39
103.4	3100	8230	0.42
105.0	3370	8550	0.41
106.6	3440	8330	0.40
108.3	3160	8130	0.41
109.9	3350	8130	0.40
111.6	3280	8230	0.41
113.2	3320	7940	0.39
114.8	3330	8130	0.40
116.5	3580	8130	0.38
118.1	3600	8440	0.39
119.8	3700	8550	0.38
121.4	4220	8770	0.35
123.0	4390	9390	0.36
124.7	3830	8660	0.38
126.3	3440	8030	0.39
128.0	3620	8230	0.38
129.6	3830	8440	0.37
131.2	3790	8660	0.38

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
21.0	-	-	-
21.5	1400	2860	0.34
22.0	1320	2990	0.38
22.5	1550	2480	0.18
23.0	950	2570	0.42
23.5	1080	2480	0.38
24.0	1750	2820	0.19
24.5	1520	3440	0.38
25.0	1310	2570	0.32
25.5	1540	2610	0.23
26.0	1590	2820	0.27
26.5	1380	2570	0.30
27.0	1370	2390	0.25
27.5	1090	2640	0.40
28.0	1140	2900	0.41
28.5	930	2750	0.44
29.0	1010	2480	0.40
29.5	1010	2230	0.37
30.0	1010	2390	0.39
30.5	1090	2540	0.39
31.0	1050	2480	0.39
31.5	950	2510	0.42
32.0	1030	2610	0.41
32.5	1050	2540	0.40
33.0	960	2480	0.41
33.5	1020	2480	0.40
34.0	1000	2510	0.41
34.5	1010	2420	0.39
35.0	1020	2480	0.40
35.5	1090	2480	0.38
36.0	1100	2570	0.39
36.5	1130	2610	0.38
37.0	1290	2670	0.35
37.5	1340	2860	0.36
38.0	1170	2640	0.38
38.5	1050	2450	0.39
39.0	1100	2510	0.38
39.5	1170	2570	0.37
40.0	1150	2640	0.38

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-1**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
132.9	3700	8130	0.37
134.5	3880	8660	0.37
136.2	3810	9130	0.39
137.8	3990	9260	0.39
139.4	5050	10420	0.35
141.1	5750	11490	0.33
142.7	6350	11900	0.30
144.4	6120	11700	0.31
146.0	4630	9520	0.35
147.6	4140	9010	0.37
149.3	5210	10260	0.33
150.9	6060	12820	0.36
152.6	5170	10750	0.35
154.2	4270	9950	0.39
155.8	4300	8770	0.34
157.5	4300	8770	0.34
159.1	4040	9260	0.38
160.8	4440	9260	0.35
162.4	5250	11490	0.37
164.0	4540	10420	0.38
165.7	4760	9950	0.35
167.3	4690	12120	0.41
169.0	4630	12350	0.42
170.6	4630	13610	0.43
172.2	5850	11300	0.32
173.9	5050	9660	0.31
175.5	5380	9800	0.28
177.2	4940	11900	0.40
178.8	5650	12350	0.37
180.5	4220	10420	0.40
182.1	4940	11110	0.38
183.7	4330	8130	0.30
185.4	3770	8770	0.39
187.0	3990	8660	0.37
188.7	4440	9950	0.38
190.3	4660	9660	0.35
191.9	4540	8440	0.30
193.6	4170	7750	0.30
195.2	3060	8030	0.42

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.5	1130	2480	0.37
41.0	1180	2640	0.37
41.5	1160	2780	0.39
42.0	1220	2820	0.39
42.5	1540	3180	0.35
43.0	1750	3500	0.33
43.5	1940	3630	0.30
44.0	1860	3560	0.31
44.5	1410	2900	0.35
45.0	1260	2750	0.37
45.5	1590	3130	0.33
46.0	1850	3910	0.36
46.5	1580	3280	0.35
47.0	1300	3030	0.39
47.5	1310	2670	0.34
48.0	1310	2670	0.34
48.5	1230	2820	0.38
49.0	1350	2820	0.35
49.5	1600	3500	0.37
50.0	1380	3180	0.38
50.5	1450	3030	0.35
51.0	1430	3690	0.41
51.5	1410	3760	0.42
52.0	1410	4150	0.43
52.5	1780	3440	0.32
53.0	1540	2940	0.31
53.5	1640	2990	0.28
54.0	1510	3630	0.40
54.5	1720	3760	0.37
55.0	1290	3180	0.40
55.5	1510	3390	0.38
56.0	1320	2480	0.30
56.5	1150	2670	0.39
57.0	1220	2640	0.37
57.5	1350	3030	0.38
58.0	1420	2940	0.35
58.5	1380	2570	0.30
59.0	1270	2360	0.30
59.5	930	2450	0.42

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-1**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
196.9	2820	8330	0.44
198.5	2680	7750	0.43
200.1	3170	7490	0.39
201.8	2750	8230	0.44
203.4	3140	8130	0.41
205.1	3090	7940	0.41
206.7	2940	8550	0.43
208.3	3000	8770	0.43
210.0	2770	8550	0.44
211.6	2750	8030	0.43
213.3	3130	8130	0.41
214.9	3380	8660	0.41
216.5	3280	8440	0.41
218.2	3070	8230	0.42
219.8	3320	8130	0.40
221.5	3530	8440	0.39
223.1	3190	8440	0.42
224.7	3020	8030	0.42
226.4	3070	8440	0.42
228.0	3420	8440	0.40
229.7	3240	8660	0.42
231.3	3020	8660	0.43
232.9	2980	8890	0.44
234.6	3020	8550	0.43
236.2	2960	8230	0.43
237.9	2990	8230	0.42
239.5	2730	8440	0.44
241.1	2950	8230	0.43
242.5	2940	7660	0.41

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
60.0	860	2540	0.44
60.5	820	2360	0.43
61.0	970	2280	0.39
61.5	840	2510	0.44
62.0	960	2480	0.41
62.5	940	2420	0.41
63.0	900	2610	0.43
63.5	920	2670	0.43
64.0	840	2610	0.44
64.5	840	2450	0.43
65.0	950	2480	0.41
65.5	1030	2640	0.41
66.0	1000	2570	0.41
66.5	940	2510	0.42
67.0	1010	2480	0.40
67.5	1080	2570	0.39
68.0	970	2570	0.42
68.5	920	2450	0.42
69.0	940	2570	0.42
69.5	1040	2570	0.40
70.0	990	2640	0.42
70.5	920	2640	0.43
71.0	910	2710	0.44
71.5	920	2610	0.43
72.0	900	2510	0.43
72.5	910	2510	0.42
73.0	830	2570	0.44
73.5	900	2510	0.43
73.9	900	2340	0.41

Notes: "-" means no data available at that particular interval of depth.

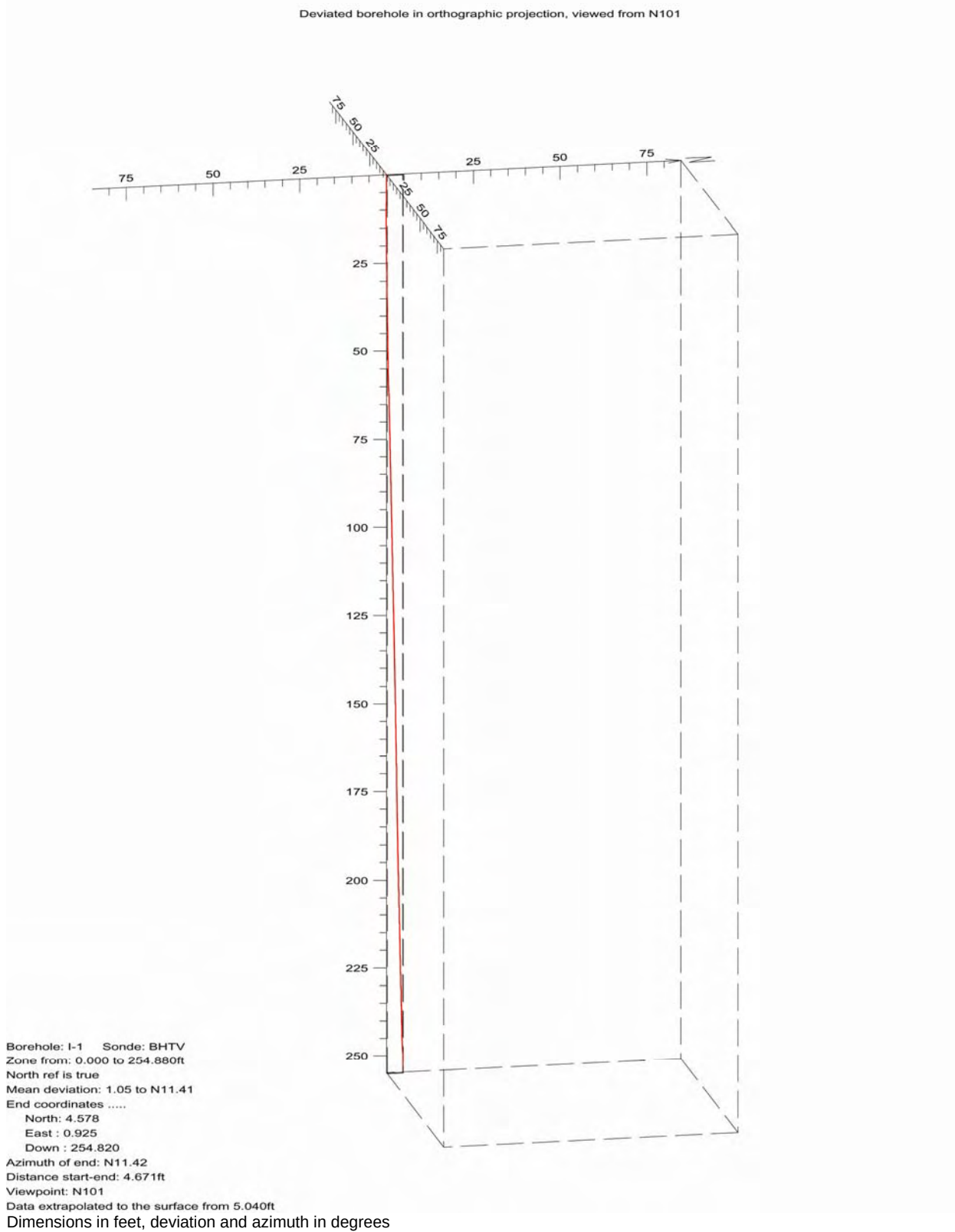


Figure 14: Boring I-1, Deviation Orthographic Projection

LEVY COUNTY COLA BORING I-2 (SONIC, CASED)
Receiver to Receiver V_s and V_p Analysis

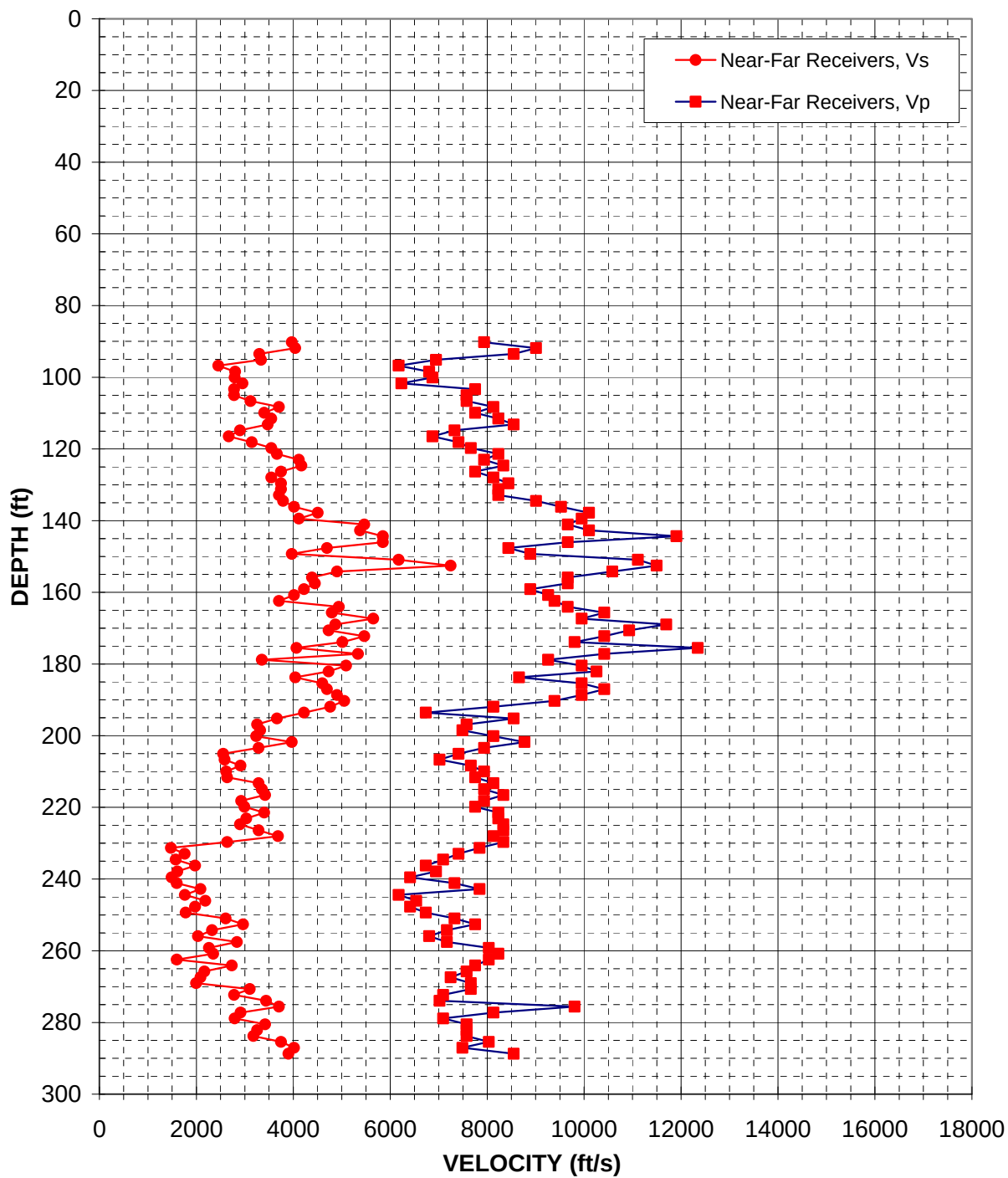


Figure 15: Boring I-2, Suspension R1-R2 P- and S_H -wave velocities

Table 10. Boring I-2, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-2**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
	(ft/s)	(ft/s)	
6.6	-	-	-
8.2	-	-	-
9.8	-	-	-
11.5	-	-	-
13.1	-	-	-
14.8	-	-	-
16.4	-	-	-
18.0	-	-	-
19.7	-	-	-
21.3	-	-	-
23.0	-	-	-
24.6	-	-	-
26.3	-	-	-
27.9	-	-	-
29.5	-	-	-
31.2	-	-	-
32.8	-	-	-
34.5	-	-	-
36.1	-	-	-
37.7	-	-	-
39.4	-	-	-
41.0	-	-	-
42.7	-	-	-
44.3	-	-	-
45.9	-	-	-
47.6	-	-	-
49.2	-	-	-
50.9	-	-	-
52.5	-	-	-
54.1	-	-	-
55.8	-	-	-
57.4	-	-	-
59.1	-	-	-
60.7	-	-	-
62.3	-	-	-
64.0	-	-	-
65.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
	(m/s)	(m/s)	
2.0	-	-	-
2.5	-	-	-
3.0	-	-	-
3.5	-	-	-
4.0	-	-	-
4.5	-	-	-
5.0	-	-	-
5.5	-	-	-
6.0	-	-	-
6.5	-	-	-
7.0	-	-	-
7.5	-	-	-
8.0	-	-	-
8.5	-	-	-
9.0	-	-	-
9.5	-	-	-
10.0	-	-	-
10.5	-	-	-
11.0	-	-	-
11.5	-	-	-
12.0	-	-	-
12.5	-	-	-
13.0	-	-	-
13.5	-	-	-
14.0	-	-	-
14.5	-	-	-
15.0	-	-	-
15.5	-	-	-
16.0	-	-	-
16.5	-	-	-
17.0	-	-	-
17.5	-	-	-
18.0	-	-	-
18.5	-	-	-
19.0	-	-	-
19.5	-	-	-
20.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-2**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
67.3	-	-	-
68.9	-	-	-
70.5	-	-	-
72.2	-	-	-
73.8	-	-	-
75.5	-	-	-
77.1	-	-	-
78.7	-	-	-
80.4	-	-	-
82.0	-	-	-
83.7	-	-	-
85.3	-	-	-
86.9	-	-	-
88.6	-	-	-
90.2	3970	7940	0.33
91.9	4040	9010	0.37
93.5	3300	8550	0.41
95.1	3330	6940	0.35
96.8	2450	6170	0.41
98.4	2800	6800	0.40
100.1	2790	6870	0.40
101.7	2950	6230	0.36
103.4	2780	7750	0.43
105.0	2780	7580	0.42
106.6	3120	7580	0.40
108.3	3700	8130	0.37
109.9	3400	7750	0.38
111.6	3550	8230	0.39
113.2	3470	8550	0.40
114.8	2900	7330	0.41
116.5	2670	6870	0.41
118.1	3140	7410	0.39
119.8	3550	7660	0.36
121.4	3660	8230	0.38
123.0	4120	7940	0.32
124.7	4170	8330	0.33
126.3	3750	7750	0.35
128.0	3550	8130	0.38
129.6	3750	8440	0.38

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
20.5	-	-	-
21.0	-	-	-
21.5	-	-	-
22.0	-	-	-
22.5	-	-	-
23.0	-	-	-
23.5	-	-	-
24.0	-	-	-
24.5	-	-	-
25.0	-	-	-
25.5	-	-	-
26.0	-	-	-
26.5	-	-	-
27.0	-	-	-
27.5	1210	2420	0.33
28.0	1230	2750	0.37
28.5	1010	2610	0.41
29.0	1020	2120	0.35
29.5	750	1880	0.41
30.0	850	2070	0.40
30.5	850	2090	0.40
31.0	900	1900	0.36
31.5	850	2360	0.43
32.0	850	2310	0.42
32.5	950	2310	0.40
33.0	1130	2480	0.37
33.5	1040	2360	0.38
34.0	1080	2510	0.39
34.5	1060	2610	0.40
35.0	880	2230	0.41
35.5	810	2090	0.41
36.0	960	2260	0.39
36.5	1080	2340	0.36
37.0	1120	2510	0.38
37.5	1250	2420	0.32
38.0	1270	2540	0.33
38.5	1140	2360	0.35
39.0	1080	2480	0.38
39.5	1140	2570	0.38

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-2**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
131.2	3750	8230	0.37
132.9	3700	8230	0.37
134.5	3790	9010	0.39
136.2	4020	9520	0.39
137.8	4500	10100	0.38
139.4	4120	9950	0.40
141.1	5460	9660	0.26
142.7	5380	10100	0.30
144.4	5850	11900	0.34
146.0	5850	9660	0.21
147.6	4690	8440	0.28
149.3	3970	8890	0.38
150.9	6170	11110	0.28
152.6	7250	11490	0.17
154.2	4900	10580	0.36
155.8	4390	9660	0.37
157.5	4440	9660	0.37
159.1	4220	8890	0.35
160.8	4020	9260	0.38
162.4	3700	9390	0.41
164.0	4940	9660	0.32
165.7	4800	10420	0.37
167.3	5650	9950	0.26
169.0	4870	11700	0.40
170.6	4730	10930	0.38
172.2	5460	10420	0.31
173.9	5010	9800	0.32
175.5	4070	12350	0.44
177.2	5330	10420	0.32
178.8	3350	9260	0.42
180.5	5090	9950	0.32
182.1	4730	10260	0.37
183.7	4040	8660	0.36
185.4	4600	9950	0.36
187.0	4690	10420	0.37
188.7	4900	9950	0.34
190.3	5050	9390	0.30
191.9	4760	8130	0.24
193.6	4220	6730	0.18

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.0	1140	2510	0.37
40.5	1130	2510	0.37
41.0	1150	2750	0.39
41.5	1220	2900	0.39
42.0	1370	3080	0.38
42.5	1250	3030	0.40
43.0	1670	2940	0.26
43.5	1640	3080	0.30
44.0	1780	3630	0.34
44.5	1780	2940	0.21
45.0	1430	2570	0.28
45.5	1210	2710	0.38
46.0	1880	3390	0.28
46.5	2210	3500	0.17
47.0	1490	3230	0.36
47.5	1340	2940	0.37
48.0	1350	2940	0.37
48.5	1290	2710	0.35
49.0	1220	2820	0.38
49.5	1130	2860	0.41
50.0	1510	2940	0.32
50.5	1460	3180	0.37
51.0	1720	3030	0.26
51.5	1480	3560	0.40
52.0	1440	3330	0.38
52.5	1670	3180	0.31
53.0	1530	2990	0.32
53.5	1240	3760	0.44
54.0	1630	3180	0.32
54.5	1020	2820	0.42
55.0	1550	3030	0.32
55.5	1440	3130	0.37
56.0	1230	2640	0.36
56.5	1400	3030	0.36
57.0	1430	3180	0.37
57.5	1490	3030	0.34
58.0	1540	2860	0.30
58.5	1450	2480	0.24
59.0	1290	2050	0.18

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-2**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
195.2	3660	8550	0.39
196.9	3250	7580	0.39
198.5	3320	7490	0.38
200.1	3240	8130	0.41
201.8	3970	8770	0.37
203.4	3280	7940	0.40
205.1	2550	7410	0.43
206.7	2580	7020	0.42
208.3	2910	7660	0.42
210.0	2610	7940	0.44
211.6	2640	7750	0.43
213.3	3280	8130	0.40
214.9	3350	7940	0.39
216.5	3420	8330	0.40
218.2	2920	7940	0.42
219.8	2990	7750	0.41
221.5	3400	8230	0.40
223.1	3030	8230	0.42
224.7	2900	8330	0.43
226.4	3280	8330	0.41
228.0	3680	8130	0.37
229.7	2640	8330	0.44
231.3	1470	7840	0.48
232.9	1760	7410	0.47
234.6	1570	7090	0.47
236.2	1970	6730	0.45
237.9	1610	6940	0.47
239.5	1490	6410	0.47
241.1	1590	7330	0.48
242.8	2080	7840	0.46
244.4	1760	6170	0.46
246.1	2190	6540	0.44
247.7	1970	6410	0.45
249.3	1780	6730	0.46
251.0	2600	7330	0.43
252.6	2960	7750	0.41
254.3	2320	7170	0.44
255.9	2030	6800	0.45
257.6	2840	7170	0.41

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
59.5	1120	2610	0.39
60.0	990	2310	0.39
60.5	1010	2280	0.38
61.0	990	2480	0.41
61.5	1210	2670	0.37
62.0	1000	2420	0.40
62.5	780	2260	0.43
63.0	790	2140	0.42
63.5	890	2340	0.42
64.0	800	2420	0.44
64.5	800	2360	0.43
65.0	1000	2480	0.40
65.5	1020	2420	0.39
66.0	1040	2540	0.40
66.5	890	2420	0.42
67.0	910	2360	0.41
67.5	1040	2510	0.40
68.0	920	2510	0.42
68.5	880	2540	0.43
69.0	1000	2540	0.41
69.5	1120	2480	0.37
70.0	800	2540	0.44
70.5	450	2390	0.48
71.0	540	2260	0.47
71.5	480	2160	0.47
72.0	600	2050	0.45
72.5	490	2120	0.47
73.0	450	1950	0.47
73.5	490	2230	0.48
74.0	640	2390	0.46
74.5	540	1880	0.46
75.0	670	1990	0.44
75.5	600	1950	0.45
76.0	540	2050	0.46
76.5	790	2230	0.43
77.0	900	2360	0.41
77.5	710	2180	0.44
78.0	620	2070	0.45
78.5	860	2180	0.41

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-2**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
259.2	2260	8030	0.46
260.8	2350	8230	0.46
262.5	1590	8030	0.48
264.1	2730	7750	0.43
265.8	2160	7580	0.46
267.4	2080	7250	0.45
269.0	2000	7660	0.46
270.7	3100	7660	0.40
272.3	2780	7090	0.41
274.0	3440	7020	0.34
275.6	3700	9800	0.42
277.2	2910	8130	0.43
278.9	2790	7090	0.41
280.5	3420	7580	0.37
282.2	3250	7580	0.39
283.8	3170	7580	0.39
285.4	3750	8030	0.36
287.1	4020	7490	0.30
288.7	3900	8550	0.37

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
79.0	690	2450	0.46
79.5	720	2510	0.46
80.0	490	2450	0.48
80.5	830	2360	0.43
81.0	660	2310	0.46
81.5	640	2210	0.45
82.0	610	2340	0.46
82.5	950	2340	0.40
83.0	850	2160	0.41
83.5	1050	2140	0.34
84.0	1130	2990	0.42
84.5	890	2480	0.43
85.0	850	2160	0.41
85.5	1040	2310	0.37
86.0	990	2310	0.39
86.5	970	2310	0.39
87.0	1140	2450	0.36
87.5	1220	2280	0.30
88.0	1190	2610	0.37

Notes: "-" means no data available at that particular interval of depth.

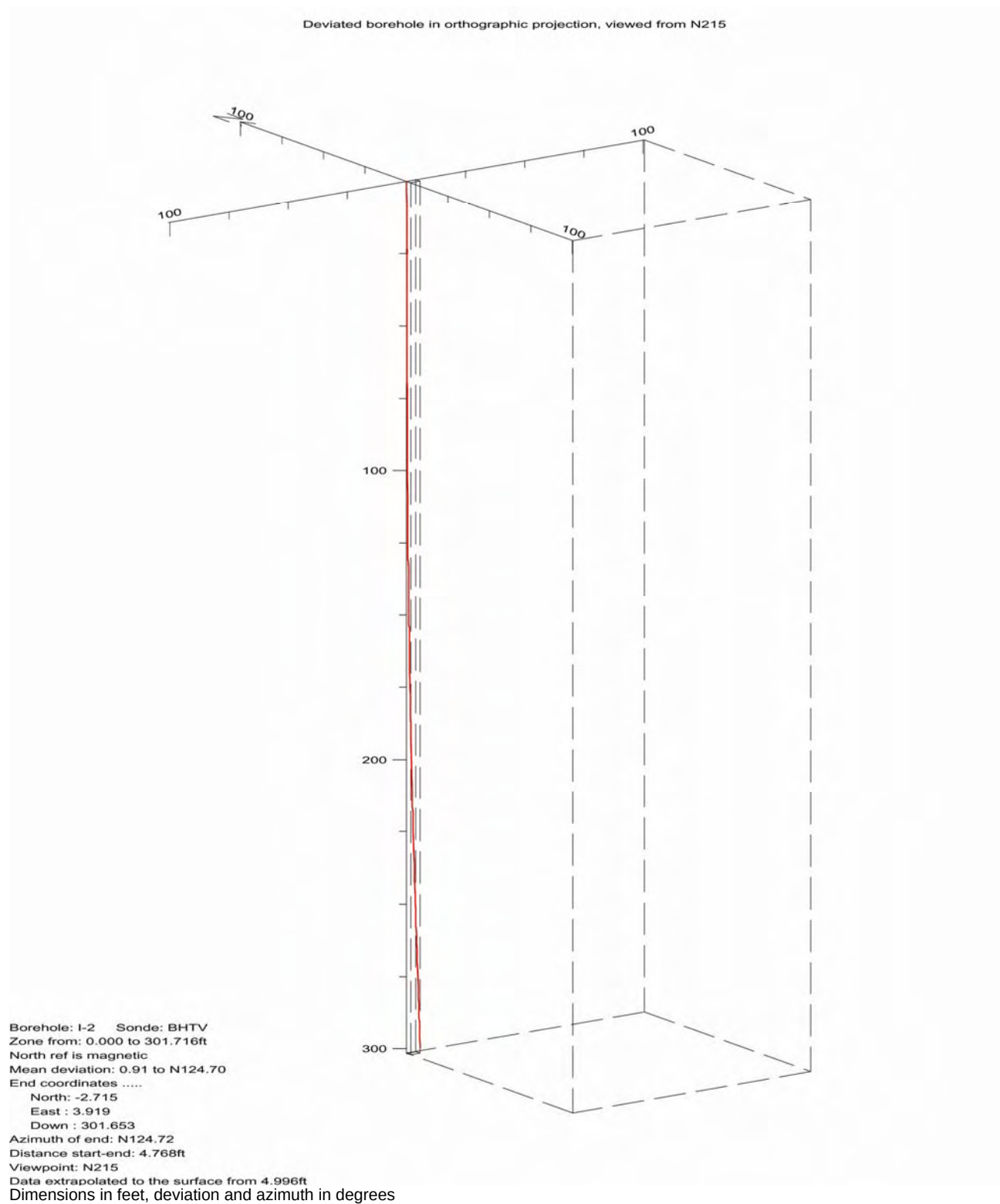


Figure 16: Boring I-2, Deviation Orthographic Projection

LEVY COUNTY COLA BORING I-3 (SONIC, CASED)
Receiver to Receiver V_s and V_p Analysis

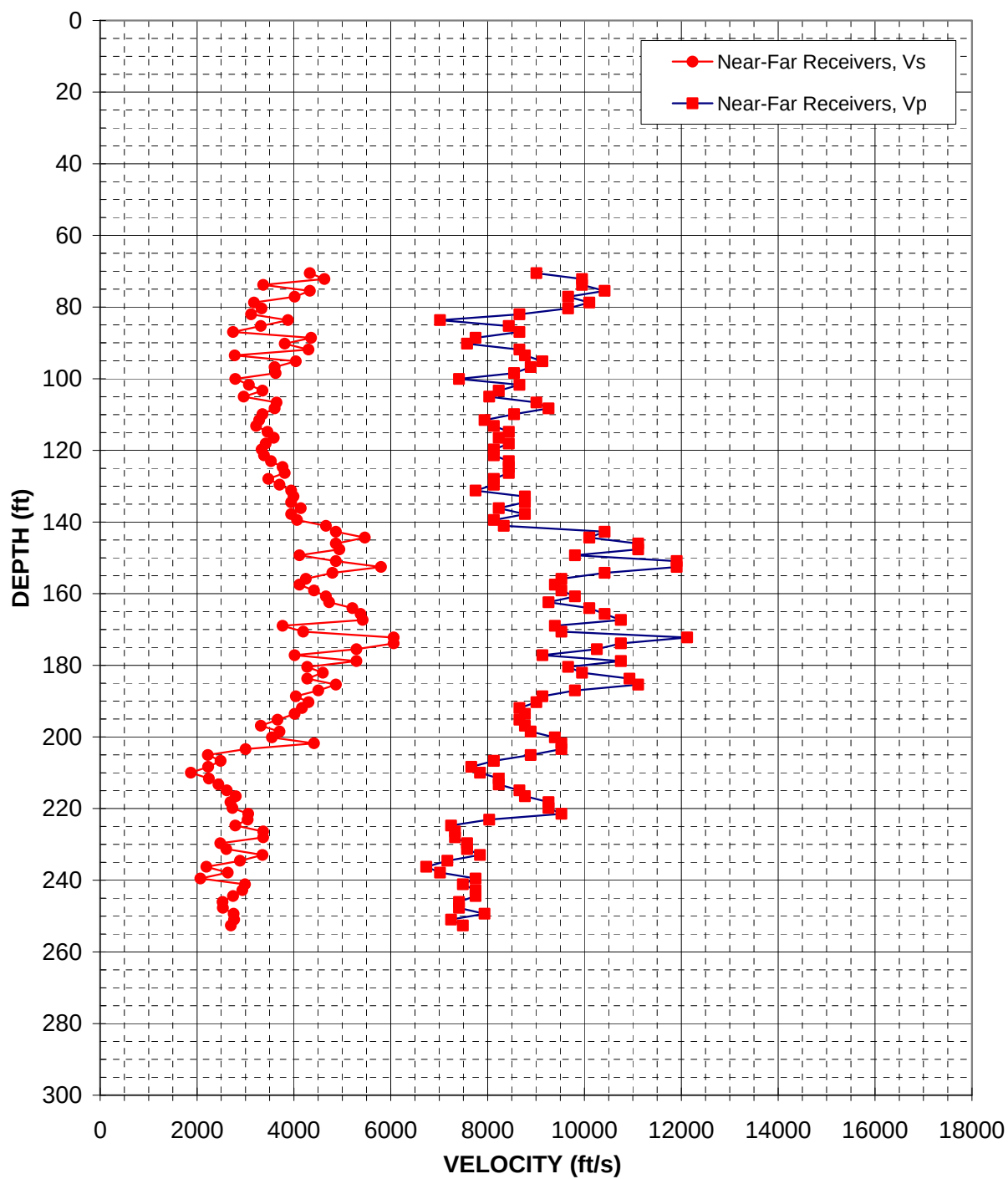


Figure 17: Boring I-3, Suspension R1-R2 P- and S_H -wave velocities

Table 11. Boring I-3, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-3**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
	(ft/s)	(ft/s)	
6.6	-	-	-
8.2	-	-	-
9.8	-	-	-
11.5	-	-	-
13.1	-	-	-
14.8	-	-	-
16.4	-	-	-
18.0	-	-	-
19.7	-	-	-
21.3	-	-	-
23.0	-	-	-
24.6	-	-	-
26.3	-	-	-
27.9	-	-	-
29.5	-	-	-
31.2	-	-	-
32.8	-	-	-
34.5	-	-	-
36.1	-	-	-
37.7	-	-	-
39.4	-	-	-
41.0	-	-	-
42.7	-	-	-
44.3	-	-	-
45.9	-	-	-
47.6	-	-	-
49.2	-	-	-
50.9	-	-	-
52.5	-	-	-
54.1	-	-	-
55.8	-	-	-
57.4	-	-	-
59.1	-	-	-
60.7	-	-	-
62.3	-	-	-
64.0	-	-	-
65.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
	(m/s)	(m/s)	
2.0	-	-	-
2.5	-	-	-
3.0	-	-	-
3.5	-	-	-
4.0	-	-	-
4.5	-	-	-
5.0	-	-	-
5.5	-	-	-
6.0	-	-	-
6.5	-	-	-
7.0	-	-	-
7.5	-	-	-
8.0	-	-	-
8.5	-	-	-
9.0	-	-	-
9.5	-	-	-
10.0	-	-	-
10.5	-	-	-
11.0	-	-	-
11.5	-	-	-
12.0	-	-	-
12.5	-	-	-
13.0	-	-	-
13.5	-	-	-
14.0	-	-	-
14.5	-	-	-
15.0	-	-	-
15.5	-	-	-
16.0	-	-	-
16.5	-	-	-
17.0	-	-	-
17.5	-	-	-
18.0	-	-	-
18.5	-	-	-
19.0	-	-	-
19.5	-	-	-
20.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-3**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
67.3	-	-	-
68.9	-	-	-
70.5	4330	9010	0.35
72.2	4630	9950	0.36
73.8	3370	9950	0.44
75.5	4330	10420	0.40
77.1	4020	9660	0.40
78.7	3170	10100	0.45
80.4	3330	9660	0.43
82.0	3120	8660	0.43
83.7	3880	7020	0.28
85.3	3320	8440	0.41
86.9	2740	8660	0.44
88.6	4360	7750	0.27
90.2	3810	7580	0.33
91.9	4300	8660	0.34
93.5	2780	8770	0.44
95.1	4040	9130	0.38
96.8	3600	8890	0.40
98.4	3620	8550	0.39
100.1	2790	7410	0.42
101.7	3070	8660	0.43
103.4	3350	8230	0.40
105.0	2960	8030	0.42
106.6	3640	9010	0.40
108.3	3600	9260	0.41
109.9	3350	8550	0.41
111.6	3280	7940	0.40
113.2	3220	8130	0.41
114.8	3450	8440	0.40
116.5	3580	8230	0.38
118.1	3420	8440	0.40
119.8	3330	8130	0.40
121.4	3380	8130	0.40
123.0	3530	8440	0.39
124.7	3770	8440	0.38
126.3	3810	8440	0.37
128.0	3470	8130	0.39
129.6	3700	8130	0.37

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
20.5	-	-	-
21.0	-	-	-
21.5	1320	2750	0.35
22.0	1410	3030	0.36
22.5	1030	3030	0.44
23.0	1320	3180	0.40
23.5	1220	2940	0.40
24.0	970	3080	0.45
24.5	1020	2940	0.43
25.0	950	2640	0.43
25.5	1180	2140	0.28
26.0	1010	2570	0.41
26.5	840	2640	0.44
27.0	1330	2360	0.27
27.5	1160	2310	0.33
28.0	1310	2640	0.34
28.5	850	2670	0.44
29.0	1230	2780	0.38
29.5	1100	2710	0.40
30.0	1100	2610	0.39
30.5	850	2260	0.42
31.0	940	2640	0.43
31.5	1020	2510	0.40
32.0	900	2450	0.42
32.5	1110	2750	0.40
33.0	1100	2820	0.41
33.5	1020	2610	0.41
34.0	1000	2420	0.40
34.5	980	2480	0.41
35.0	1050	2570	0.40
35.5	1090	2510	0.38
36.0	1040	2570	0.40
36.5	1020	2480	0.40
37.0	1030	2480	0.40
37.5	1080	2570	0.39
38.0	1150	2570	0.38
38.5	1160	2570	0.37
39.0	1060	2480	0.39
39.5	1130	2480	0.37

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-3**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
131.2	3940	7750	0.33
132.9	3990	8770	0.37
134.5	3940	8770	0.37
136.2	4140	8230	0.33
137.8	3940	8770	0.37
139.4	4070	8130	0.33
141.1	4660	8330	0.27
142.7	4870	10420	0.36
144.4	5460	10100	0.29
146.0	4870	11110	0.38
147.6	4940	11110	0.38
149.3	4120	9800	0.39
150.9	4870	11900	0.40
152.6	5800	11900	0.34
154.2	4800	10420	0.37
155.8	4250	9520	0.38
157.5	4120	9390	0.38
159.1	4420	9520	0.36
160.8	4660	9800	0.35
162.4	4730	9260	0.32
164.0	5210	10100	0.32
165.7	5380	10420	0.32
167.3	5420	10750	0.33
169.0	3770	9390	0.40
170.6	4190	9520	0.38
172.2	6060	12120	0.33
173.9	6060	10750	0.27
175.5	5290	10260	0.32
177.2	4020	9130	0.38
178.8	5290	10750	0.34
180.5	4270	9660	0.38
182.1	4600	9950	0.36
183.7	4270	10930	0.41
185.4	4870	11110	0.38
187.0	4500	9800	0.37
188.7	4040	9130	0.38
190.3	4300	9010	0.35
191.9	4170	8660	0.35
193.6	4020	8770	0.37

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.0	1200	2360	0.33
40.5	1220	2670	0.37
41.0	1200	2670	0.37
41.5	1260	2510	0.33
42.0	1200	2670	0.37
42.5	1240	2480	0.33
43.0	1420	2540	0.27
43.5	1480	3180	0.36
44.0	1670	3080	0.29
44.5	1480	3390	0.38
45.0	1510	3390	0.38
45.5	1250	2990	0.39
46.0	1480	3630	0.40
46.5	1770	3630	0.34
47.0	1460	3180	0.37
47.5	1290	2900	0.38
48.0	1250	2860	0.38
48.5	1350	2900	0.36
49.0	1420	2990	0.35
49.5	1440	2820	0.32
50.0	1590	3080	0.32
50.5	1640	3180	0.32
51.0	1650	3280	0.33
51.5	1150	2860	0.40
52.0	1280	2900	0.38
52.5	1850	3690	0.33
53.0	1850	3280	0.27
53.5	1610	3130	0.32
54.0	1220	2780	0.38
54.5	1610	3280	0.34
55.0	1300	2940	0.38
55.5	1400	3030	0.36
56.0	1300	3330	0.41
56.5	1480	3390	0.38
57.0	1370	2990	0.37
57.5	1230	2780	0.38
58.0	1310	2750	0.35
58.5	1270	2640	0.35
59.0	1220	2670	0.37

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-3**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
195.2	3660	8660	0.39
196.9	3320	8770	0.42
198.5	3700	8890	0.39
200.1	3550	9390	0.42
201.8	4420	9520	0.36
203.4	3000	9520	0.44
205.1	2220	8890	0.47
206.7	2490	8130	0.45
208.3	2230	7660	0.45
210.0	1870	7840	0.47
211.6	2240	8230	0.46
213.3	2440	8230	0.45
214.9	2610	8660	0.45
216.5	2800	8770	0.44
218.2	2690	9260	0.45
219.8	2730	9260	0.45
221.5	3060	9520	0.44
223.1	3040	8030	0.42
224.7	2790	7250	0.41
226.4	3370	7330	0.37
228.0	3370	7330	0.37
229.7	2480	7580	0.44
231.3	2600	7580	0.43
232.9	3350	7840	0.39
234.6	2890	7170	0.40
236.2	2190	6730	0.44
237.9	2640	7020	0.42
239.5	2070	7750	0.46
241.1	2990	7490	0.41
242.8	2940	7750	0.42
244.4	2740	7750	0.43
246.1	2530	7410	0.43
247.7	2530	7410	0.43
249.3	2750	7940	0.43
251.0	2770	7250	0.41
252.6	2700	7490	0.43

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
59.5	1120	2640	0.39
60.0	1010	2670	0.42
60.5	1130	2710	0.39
61.0	1080	2860	0.42
61.5	1350	2900	0.36
62.0	920	2900	0.44
62.5	680	2710	0.47
63.0	760	2480	0.45
63.5	680	2340	0.45
64.0	570	2390	0.47
64.5	680	2510	0.46
65.0	740	2510	0.45
65.5	800	2640	0.45
66.0	850	2670	0.44
66.5	820	2820	0.45
67.0	830	2820	0.45
67.5	930	2900	0.44
68.0	930	2450	0.42
68.5	850	2210	0.41
69.0	1030	2230	0.37
69.5	1030	2230	0.37
70.0	760	2310	0.44
70.5	790	2310	0.43
71.0	1020	2390	0.39
71.5	880	2180	0.40
72.0	670	2050	0.44
72.5	800	2140	0.42
73.0	630	2360	0.46
73.5	910	2280	0.41
74.0	900	2360	0.42
74.5	840	2360	0.43
75.0	770	2260	0.43
75.5	770	2260	0.43
76.0	840	2420	0.43
76.5	840	2210	0.41
77.0	820	2280	0.43

Notes: "-" means no data available at that particular interval of depth.

Deviated borehole in orthographic projection, viewed from N153

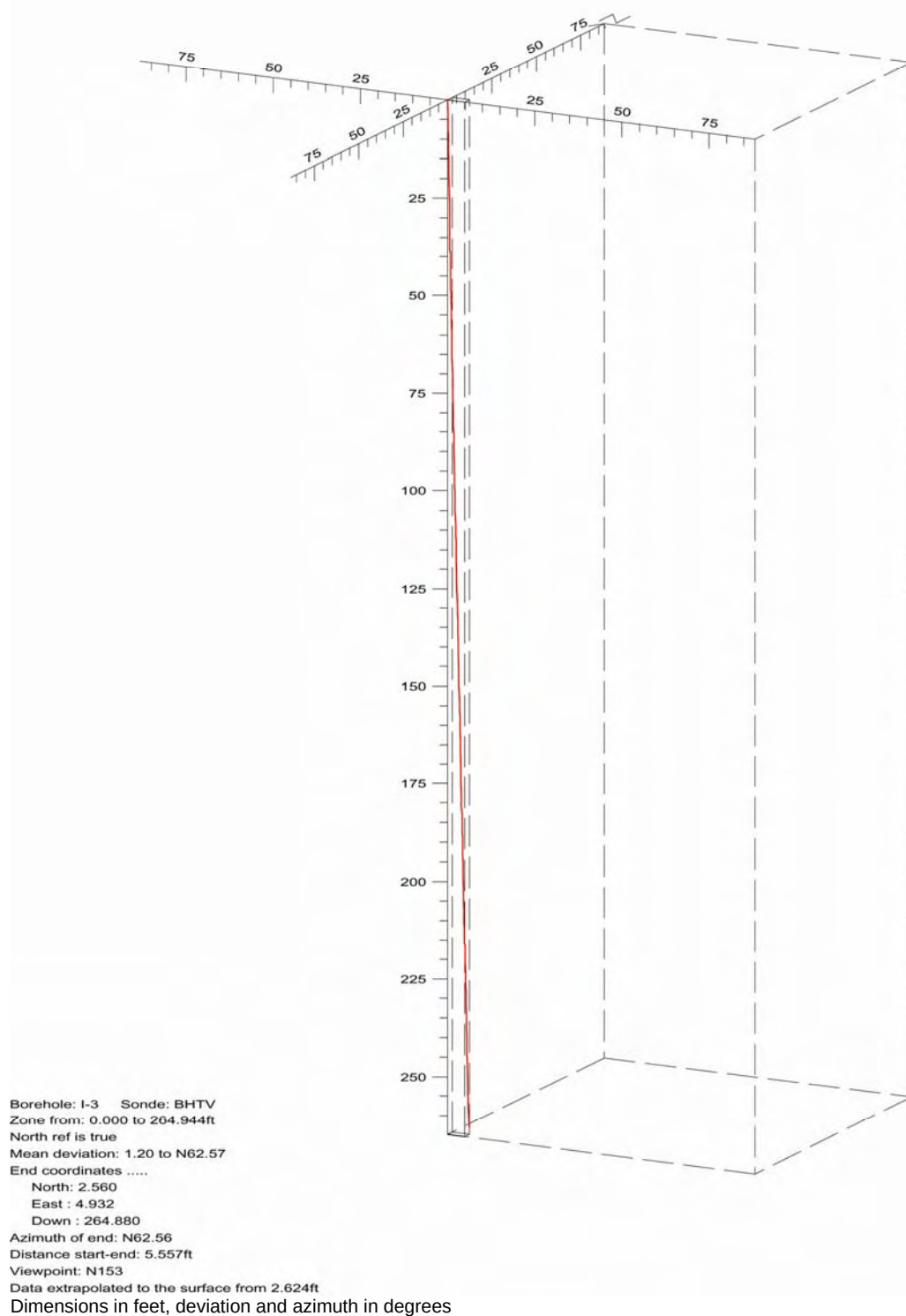


Figure 18: Boring I-3, Deviation Orthographic Projection

LEVY COUNTY COLA BORING I-4 (SONIC, CASED)
Receiver to Receiver V_s and V_p Analysis

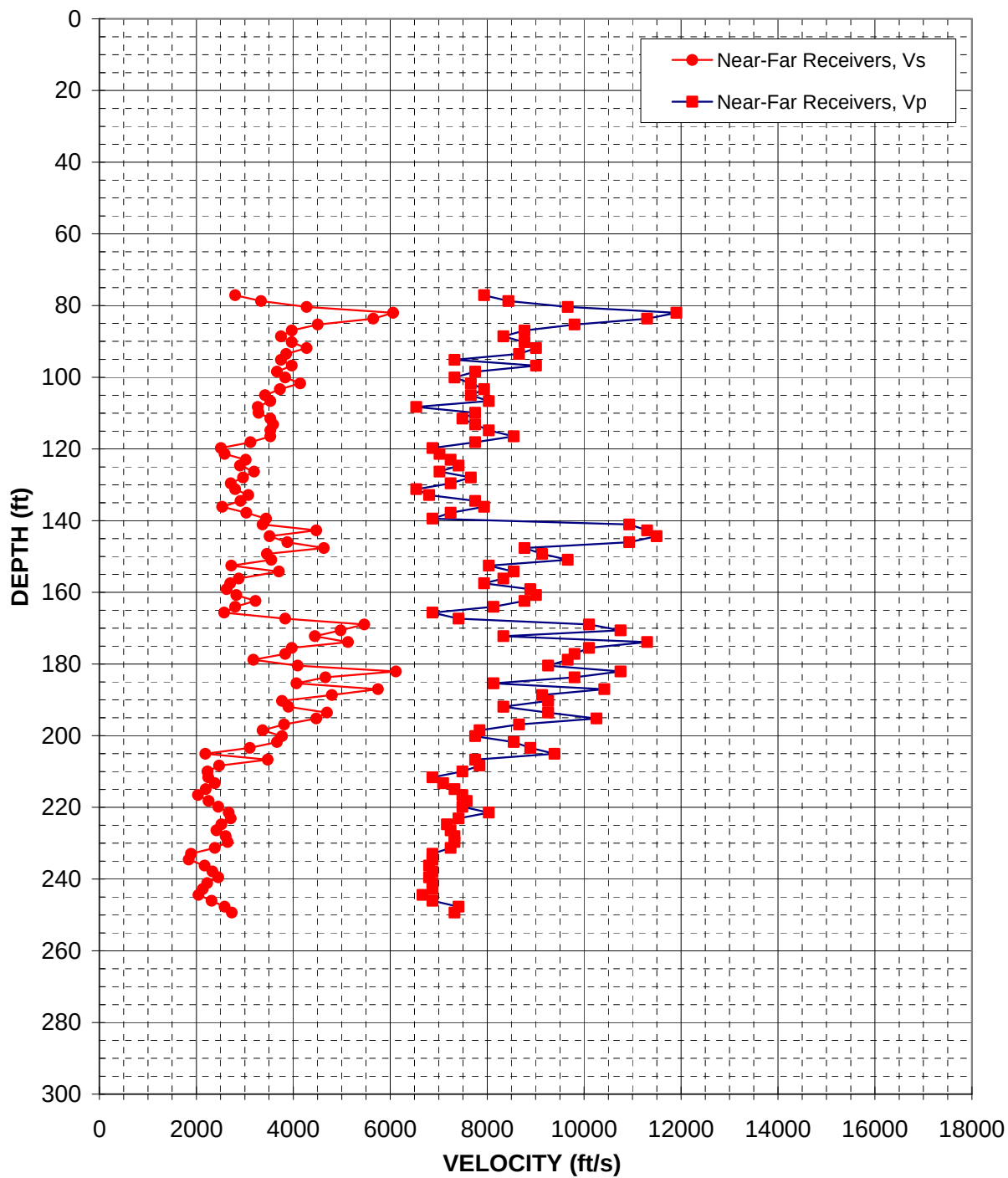


Figure 19: Boring I-4, Suspension R1-R2 P- and S_H -wave velocities

Table 12. Boring I-4, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-4**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
6.6	-	-	-
8.2	-	-	-
9.8	-	-	-
11.5	-	-	-
13.1	-	-	-
14.8	-	-	-
16.4	-	-	-
18.0	-	-	-
19.7	-	-	-
21.3	-	-	-
23.0	-	-	-
24.6	-	-	-
26.3	-	-	-
27.9	-	-	-
29.5	-	-	-
31.2	-	-	-
32.8	-	-	-
34.5	-	-	-
36.1	-	-	-
37.7	-	-	-
39.4	-	-	-
41.0	-	-	-
42.7	-	-	-
44.3	-	-	-
45.9	-	-	-
47.6	-	-	-
49.2	-	-	-
50.9	-	-	-
52.5	-	-	-
54.1	-	-	-
55.8	-	-	-
57.4	-	-	-
59.1	-	-	-
60.7	-	-	-
62.3	-	-	-
64.0	-	-	-
65.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
2.0	-	-	-
2.5	-	-	-
3.0	-	-	-
3.5	-	-	-
4.0	-	-	-
4.5	-	-	-
5.0	-	-	-
5.5	-	-	-
6.0	-	-	-
6.5	-	-	-
7.0	-	-	-
7.5	-	-	-
8.0	-	-	-
8.5	-	-	-
9.0	-	-	-
9.5	-	-	-
10.0	-	-	-
10.5	-	-	-
11.0	-	-	-
11.5	-	-	-
12.0	-	-	-
12.5	-	-	-
13.0	-	-	-
13.5	-	-	-
14.0	-	-	-
14.5	-	-	-
15.0	-	-	-
15.5	-	-	-
16.0	-	-	-
16.5	-	-	-
17.0	-	-	-
17.5	-	-	-
18.0	-	-	-
18.5	-	-	-
19.0	-	-	-
19.5	-	-	-
20.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-4**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
67.3	-	-	-
68.9	-	-	-
70.5	-	-	-
72.2	-	-	-
73.8	-	-	-
75.5	-	-	-
77.1	2800	7940	0.43
78.7	3330	8440	0.41
80.4	4270	9660	0.38
82.0	6060	11900	0.33
83.7	5650	11300	0.33
85.3	4500	9800	0.37
86.9	3970	8770	0.37
88.6	3750	8330	0.37
90.2	3970	8770	0.37
91.9	4270	9010	0.35
93.5	3850	8660	0.38
95.1	3750	7330	0.32
96.8	3970	9010	0.38
98.4	3660	7750	0.36
100.1	3830	7330	0.31
101.7	4140	7660	0.29
103.4	3720	7940	0.36
105.0	3420	7660	0.38
106.6	3530	8030	0.38
108.3	3270	6540	0.33
109.9	3280	7750	0.39
111.6	3530	7490	0.36
113.2	3580	7750	0.36
114.8	3530	8030	0.38
116.5	3530	8550	0.40
118.1	3120	7750	0.40
119.8	2510	6870	0.42
121.4	2580	7020	0.42
123.0	3020	7250	0.40
124.7	2900	7410	0.41
126.3	3190	7020	0.37
128.0	2960	7660	0.41
129.6	2710	7250	0.42

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
20.5	-	-	-
21.0	-	-	-
21.5	-	-	-
22.0	-	-	-
22.5	-	-	-
23.0	-	-	-
23.5	850	2420	0.43
24.0	1020	2570	0.41
24.5	1300	2940	0.38
25.0	1850	3630	0.33
25.5	1720	3440	0.33
26.0	1370	2990	0.37
26.5	1210	2670	0.37
27.0	1140	2540	0.37
27.5	1210	2670	0.37
28.0	1300	2750	0.35
28.5	1170	2640	0.38
29.0	1140	2230	0.32
29.5	1210	2750	0.38
30.0	1120	2360	0.36
30.5	1170	2230	0.31
31.0	1260	2340	0.29
31.5	1140	2420	0.36
32.0	1040	2340	0.38
32.5	1080	2450	0.38
33.0	1000	1990	0.33
33.5	1000	2360	0.39
34.0	1080	2280	0.36
34.5	1090	2360	0.36
35.0	1080	2450	0.38
35.5	1080	2610	0.40
36.0	950	2360	0.40
36.5	760	2090	0.42
37.0	790	2140	0.42
37.5	920	2210	0.40
38.0	880	2260	0.41
38.5	970	2140	0.37
39.0	900	2340	0.41
39.5	830	2210	0.42

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-4**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
131.2	2800	6540	0.39
132.9	3070	6800	0.37
134.5	2910	7750	0.42
136.2	2530	7940	0.44
137.8	3030	7250	0.39
139.4	3440	6870	0.33
141.1	3370	10930	0.45
142.7	4470	11300	0.41
144.4	3510	11490	0.45
146.0	3880	10930	0.43
147.6	4630	8770	0.31
149.3	3450	9130	0.42
150.9	3550	9660	0.42
152.6	2720	8030	0.44
154.2	3700	8550	0.38
156.2	2870	8330	0.43
157.5	2700	7940	0.43
159.1	2620	8890	0.45
160.8	2820	9010	0.45
162.4	3220	8770	0.42
164.0	2800	8130	0.43
165.7	2570	6870	0.42
167.3	3830	7410	0.32
169.0	5460	10100	0.29
170.6	4980	10750	0.36
172.2	4440	8330	0.30
173.9	5130	11300	0.37
175.5	3970	10100	0.41
177.2	3830	9800	0.41
178.8	3170	9660	0.44
180.5	4090	9260	0.38
182.1	6120	10750	0.26
183.7	4660	9800	0.35
185.4	4070	8130	0.33
187.0	5750	10420	0.28
188.7	4800	9130	0.31
190.3	3770	9260	0.40
191.9	3900	8330	0.36
193.6	4690	9260	0.33

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.0	850	1990	0.39
40.5	940	2070	0.37
41.0	890	2360	0.42
41.5	770	2420	0.44
42.0	920	2210	0.39
42.5	1050	2090	0.33
43.0	1030	3330	0.45
43.5	1360	3440	0.41
44.0	1070	3500	0.45
44.5	1180	3330	0.43
45.0	1410	2670	0.31
45.5	1050	2780	0.42
46.0	1080	2940	0.42
46.5	830	2450	0.44
47.0	1130	2610	0.38
47.6	880	2540	0.43
48.0	820	2420	0.43
48.5	800	2710	0.45
49.0	860	2750	0.45
49.5	980	2670	0.42
50.0	850	2480	0.43
50.5	780	2090	0.42
51.0	1170	2260	0.32
51.5	1670	3080	0.29
52.0	1520	3280	0.36
52.5	1350	2540	0.30
53.0	1560	3440	0.37
53.5	1210	3080	0.41
54.0	1170	2990	0.41
54.5	970	2940	0.44
55.0	1250	2820	0.38
55.5	1860	3280	0.26
56.0	1420	2990	0.35
56.5	1240	2480	0.33
57.0	1750	3180	0.28
57.5	1460	2780	0.31
58.0	1150	2820	0.40
58.5	1190	2540	0.36
59.0	1430	2820	0.33

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-4**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
195.2	4470	10260	0.38
196.9	3810	8660	0.38
198.5	3370	7840	0.39
200.1	3770	7750	0.35
201.8	3660	8550	0.39
203.4	3100	8890	0.43
205.1	2190	9390	0.47
206.7	3470	7750	0.37
208.3	2470	7840	0.44
210.0	2230	7490	0.45
211.6	2240	6870	0.44
213.3	2380	7090	0.44
214.9	2190	7330	0.45
216.5	2030	7490	0.46
218.2	2250	7580	0.45
219.8	2450	7490	0.44
221.5	2670	8030	0.44
223.1	2710	7410	0.42
224.7	2520	7170	0.43
226.4	2420	7250	0.44
228.0	2600	7330	0.43
229.7	2650	7330	0.43
231.3	2380	7250	0.44
232.9	1890	6870	0.46
234.6	1840	6870	0.46
236.2	2170	6800	0.44
237.9	2330	6870	0.44
239.5	2450	6800	0.43
241.1	2220	6870	0.44
242.8	2130	6870	0.45
244.4	2040	6670	0.45
246.1	2310	6870	0.44
247.7	2580	7410	0.43
249.3	2730	7330	0.42
251.0	-	-	-
252.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
59.5	1360	3130	0.38
60.0	1160	2640	0.38
60.5	1030	2390	0.39
61.0	1150	2360	0.35
61.5	1120	2610	0.39
62.0	950	2710	0.43
62.5	670	2860	0.47
63.0	1060	2360	0.37
63.5	750	2390	0.44
64.0	680	2280	0.45
64.5	680	2090	0.44
65.0	730	2160	0.44
65.5	670	2230	0.45
66.0	620	2280	0.46
66.5	690	2310	0.45
67.0	750	2280	0.44
67.5	810	2450	0.44
68.0	830	2260	0.42
68.5	770	2180	0.43
69.0	740	2210	0.44
69.5	790	2230	0.43
70.0	810	2230	0.43
70.5	730	2210	0.44
71.0	580	2090	0.46
71.5	560	2090	0.46
72.0	660	2070	0.44
72.5	710	2090	0.44
73.0	750	2070	0.43
73.5	680	2090	0.44
74.0	650	2090	0.45
74.5	620	2030	0.45
75.0	710	2090	0.44
75.5	790	2260	0.43
76.0	830	2230	0.42
76.5	-	-	-
77.0	-	-	-

Notes: "-" means no data available at that particular interval of depth.

Deviated borehole in orthographic projection, viewed from N48

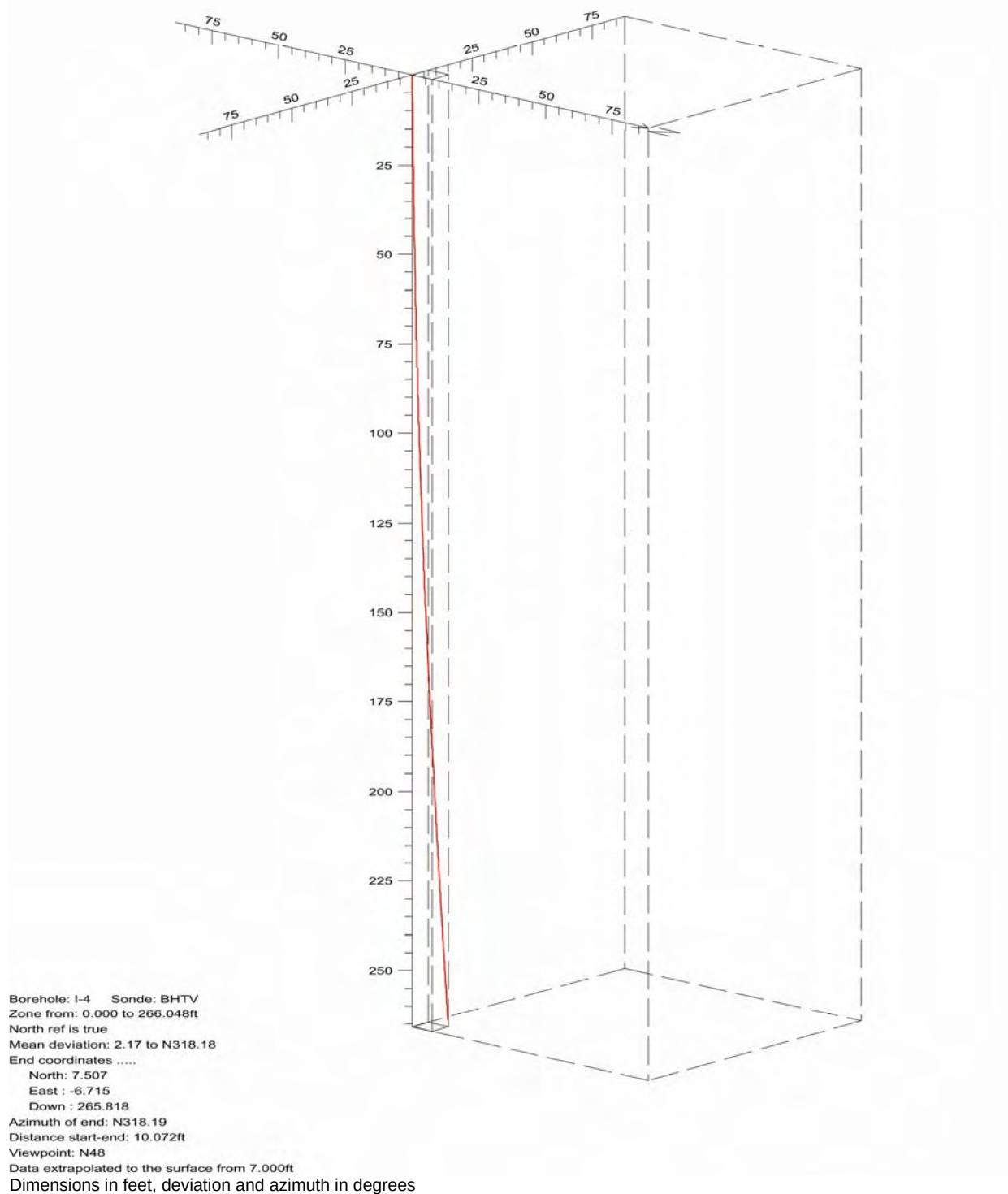


Figure 20: Boring I-4, Deviation Orthographic Projection

LEVY COUNTY COLA BORING I-5 (SONIC, CASED)
Receiver to Receiver V_s and V_p Analysis

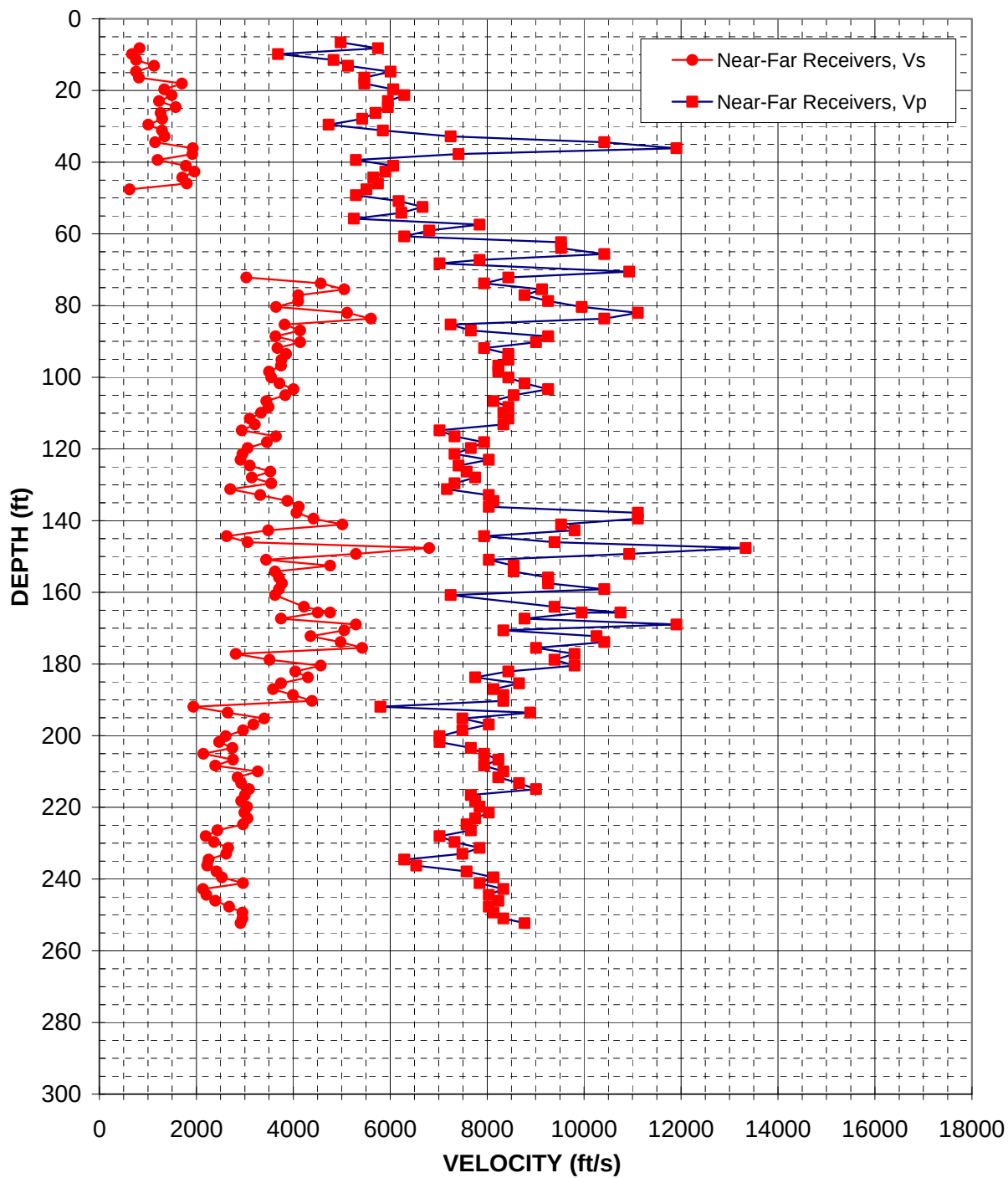


Figure 21: Boring I-5, Suspension R1-R2 P- and S_H -wave velocities

Table 13. Boring I-5, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-5**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
6.6	-	4980	-
8.2	830	5750	0.49
9.8	670	3680	0.48
11.5	760	4830	0.49
13.1	1130	5130	0.47
14.8	760	6010	0.49
16.4	810	5460	0.49
18.0	1700	5460	0.45
19.7	1340	6060	0.47
21.3	1490	6290	0.47
23.0	1230	5950	0.48
24.6	1570	5950	0.46
26.3	1260	5700	0.47
27.9	1300	5420	0.47
29.5	1010	4730	0.48
31.2	1290	5850	0.47
32.8	1350	7250	0.48
34.5	1150	10420	0.49
36.1	1930	11900	0.49
37.7	1920	7410	0.46
39.4	1200	5290	0.47
41.0	1780	6060	0.45
42.7	1960	5900	0.44
44.3	1710	5650	0.45
45.9	1800	5750	0.45
47.6	620	5510	0.49
49.2	-	5290	-
50.9	-	6170	-
52.5	-	6670	-
54.1	-	6230	-
55.8	-	5250	-
57.4	-	7840	-
59.1	-	6800	-
60.7	-	6290	-
62.3	-	9520	-
64.0	-	9520	-
65.6	-	10420	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
2.0	-	1520	-
2.5	250	1750	0.49
3.0	200	1120	0.48
3.5	230	1470	0.49
4.0	340	1560	0.47
4.5	230	1830	0.49
5.0	250	1670	0.49
5.5	520	1670	0.45
6.0	410	1850	0.47
6.5	450	1920	0.47
7.0	370	1810	0.48
7.5	480	1810	0.46
8.0	380	1740	0.47
8.5	400	1650	0.47
9.0	310	1440	0.48
9.5	390	1780	0.47
10.0	410	2210	0.48
10.5	350	3180	0.49
11.0	590	3630	0.49
11.5	580	2260	0.46
12.0	370	1610	0.47
12.5	540	1850	0.45
13.0	600	1800	0.44
13.5	520	1720	0.45
14.0	550	1750	0.45
14.5	190	1680	0.49
15.0	-	1610	-
15.5	-	1880	-
16.0	-	2030	-
16.5	-	1900	-
17.0	-	1600	-
17.5	-	2390	-
18.0	-	2070	-
18.5	-	1920	-
19.0	-	2900	-
19.5	-	2900	-
20.0	-	3180	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-5**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
67.3	-	7840	-
68.2	-	7020	-
70.5	-	10930	-
72.2	3030	8440	0.43
73.8	4570	7940	0.25
75.5	5050	9130	0.28
77.1	4100	8770	0.36
78.7	4100	9260	0.38
80.4	3640	9950	0.42
82.0	5110	11110	0.37
83.7	5600	10420	0.30
85.3	3820	7250	0.31
86.9	4140	7660	0.29
88.6	3630	9260	0.41
90.2	4140	9010	0.37
91.9	3670	7940	0.36
93.5	3850	8440	0.37
95.1	3760	8440	0.38
96.8	3750	8230	0.37
98.4	3500	8230	0.39
100.1	3550	8440	0.39
101.7	3710	8770	0.39
103.4	4000	9260	0.38
105.0	3830	8550	0.37
106.6	3450	8130	0.39
108.3	3490	8440	0.40
109.9	3330	8330	0.40
111.6	3100	8440	0.42
113.2	3210	8330	0.41
114.8	2940	7020	0.39
116.5	3640	7330	0.34
118.1	3450	7940	0.38
119.8	3060	7660	0.41
121.4	2950	7330	0.40
123.0	2910	8030	0.42
124.7	3100	7410	0.39
126.3	3530	7580	0.36
128.0	3140	7750	0.40
129.6	3550	7330	0.35

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
20.5	-	2390	-
20.8	-	2140	-
21.5	-	3330	-
22.0	920	2570	0.43
22.5	1390	2420	0.25
23.0	1540	2780	0.28
23.5	1250	2670	0.36
24.0	1250	2820	0.38
24.5	1110	3030	0.42
25.0	1560	3390	0.37
25.5	1710	3180	0.30
26.0	1160	2210	0.31
26.5	1260	2340	0.29
27.0	1110	2820	0.41
27.5	1260	2750	0.37
28.0	1120	2420	0.36
28.5	1170	2570	0.37
29.0	1140	2570	0.38
29.5	1140	2510	0.37
30.0	1070	2510	0.39
30.5	1080	2570	0.39
31.0	1130	2670	0.39
31.5	1220	2820	0.38
32.0	1170	2610	0.37
32.5	1050	2480	0.39
33.0	1060	2570	0.40
33.5	1020	2540	0.40
34.0	950	2570	0.42
34.5	980	2540	0.41
35.0	900	2140	0.39
35.5	1110	2230	0.34
36.0	1050	2420	0.38
36.5	930	2340	0.41
37.0	900	2230	0.40
37.5	890	2450	0.42
38.0	950	2260	0.39
38.5	1080	2310	0.36
39.0	960	2360	0.40
39.5	1080	2230	0.35

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-5**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
131.2	2700	7170	0.42
132.9	3320	8030	0.40
134.5	3880	8130	0.35
136.2	4120	8030	0.32
137.8	4070	11110	0.42
139.4	4420	11110	0.41
141.1	5010	9520	0.31
142.7	3480	9800	0.43
144.4	2620	7940	0.44
146.0	3060	9390	0.44
147.6	6800	13330	0.32
149.3	5290	10930	0.35
150.9	3440	8030	0.39
152.6	4760	8550	0.27
154.2	3620	8550	0.39
155.8	3700	9260	0.40
157.5	3770	9260	0.40
159.1	3700	10420	0.43
160.8	3620	7250	0.33
164.0	4220	9390	0.37
165.7	4760	10750	0.38
165.7	4500	9950	0.37
167.3	3750	8770	0.39
169.0	5290	11900	0.38
170.6	5050	8330	0.21
172.2	4360	10260	0.39
173.9	4980	10420	0.35
175.5	5420	9010	0.22
177.2	2810	9800	0.46
178.8	3510	9390	0.42
180.5	4570	9800	0.36
182.1	4040	8440	0.35
183.7	4300	7750	0.28
185.4	3750	8660	0.38
187.0	3580	8130	0.38
188.7	3990	8330	0.35
190.3	4390	8330	0.31
191.9	1940	5800	0.44
193.6	2650	8890	0.45

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.0	820	2180	0.42
40.5	1010	2450	0.40
41.0	1180	2480	0.35
41.5	1250	2450	0.32
42.0	1240	3390	0.42
42.5	1350	3390	0.41
43.0	1530	2900	0.31
43.5	1060	2990	0.43
44.0	800	2420	0.44
44.5	930	2860	0.44
45.0	2070	4060	0.32
45.5	1610	3330	0.35
46.0	1050	2450	0.39
46.5	1450	2610	0.27
47.0	1100	2610	0.39
47.5	1130	2820	0.40
48.0	1150	2820	0.40
48.5	1130	3180	0.43
49.0	1100	2210	0.33
50.0	1290	2860	0.37
50.5	1450	3280	0.38
50.5	1370	3030	0.37
51.0	1140	2670	0.39
51.5	1610	3630	0.38
52.0	1540	2540	0.21
52.5	1330	3130	0.39
53.0	1520	3180	0.35
53.5	1650	2750	0.22
54.0	860	2990	0.46
54.5	1070	2860	0.42
55.0	1390	2990	0.36
55.5	1230	2570	0.35
56.0	1310	2360	0.28
56.5	1140	2640	0.38
57.0	1090	2480	0.38
57.5	1220	2540	0.35
58.0	1340	2540	0.31
58.5	590	1770	0.44
59.0	810	2710	0.45

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-5**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
195.2	3400	7490	0.37
196.9	3170	8030	0.41
198.5	2960	7490	0.41
200.1	2600	7020	0.42
201.8	2470	7020	0.43
203.4	2740	7660	0.43
205.1	2140	7940	0.46
206.7	2750	8230	0.44
208.3	2390	7940	0.45
210.0	3270	8330	0.41
211.6	2850	8230	0.43
213.3	2920	8660	0.44
214.9	3090	9010	0.43
216.5	3000	7660	0.41
218.2	2920	7750	0.42
219.8	3040	7840	0.41
221.5	2990	8030	0.42
223.1	3060	7750	0.41
224.7	2960	7580	0.41
226.4	2430	7660	0.44
228.0	2190	7020	0.45
229.7	2360	7330	0.44
231.3	2660	7840	0.44
232.9	2610	7490	0.43
234.6	2250	6290	0.43
236.2	2220	6540	0.43
237.9	2420	7580	0.44
239.5	2530	8130	0.45
241.1	2960	7840	0.42
242.8	2140	8330	0.46
244.4	2210	8030	0.46
246.1	2390	8230	0.45
247.7	2680	8030	0.44
249.3	2950	8130	0.42
251.0	2950	8330	0.43
252.3	2910	8770	0.44

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
59.5	1040	2280	0.37
60.0	970	2450	0.41
60.5	900	2280	0.41
61.0	790	2140	0.42
61.5	750	2140	0.43
62.0	840	2340	0.43
62.5	650	2420	0.46
63.0	840	2510	0.44
63.5	730	2420	0.45
64.0	1000	2540	0.41
64.5	870	2510	0.43
65.0	890	2640	0.44
65.5	940	2750	0.43
66.0	920	2340	0.41
66.5	890	2360	0.42
67.0	930	2390	0.41
67.5	910	2450	0.42
68.0	930	2360	0.41
68.5	900	2310	0.41
69.0	740	2340	0.44
69.5	670	2140	0.45
70.0	720	2230	0.44
70.5	810	2390	0.44
71.0	800	2280	0.43
71.5	690	1920	0.43
72.0	680	1990	0.43
72.5	740	2310	0.44
73.0	770	2480	0.45
73.5	900	2390	0.42
74.0	650	2540	0.46
74.5	670	2450	0.46
75.0	730	2510	0.45
75.5	820	2450	0.44
76.0	900	2480	0.42
76.5	900	2540	0.43
76.9	890	2670	0.44

Notes: "-" means no data available at that particular interval of depth.

Deviated borehole in orthographic projection, viewed from N50

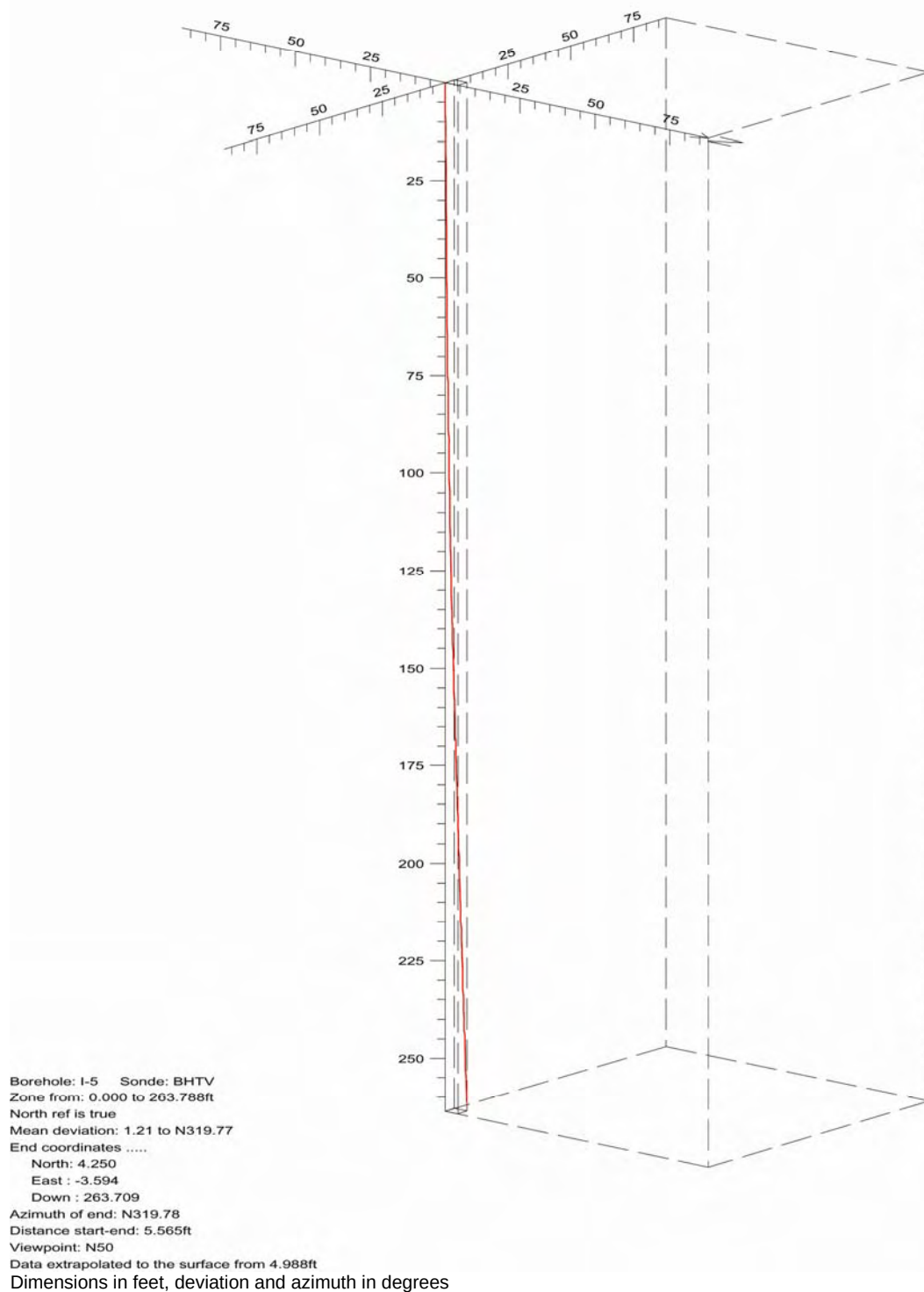


Figure 22: Boring I-5, Deviation Orthographic Projection

LEVY COUNTY COLA BORING I-6 (SONIC, CASED)
Receiver to Receiver V_s and V_p Analysis

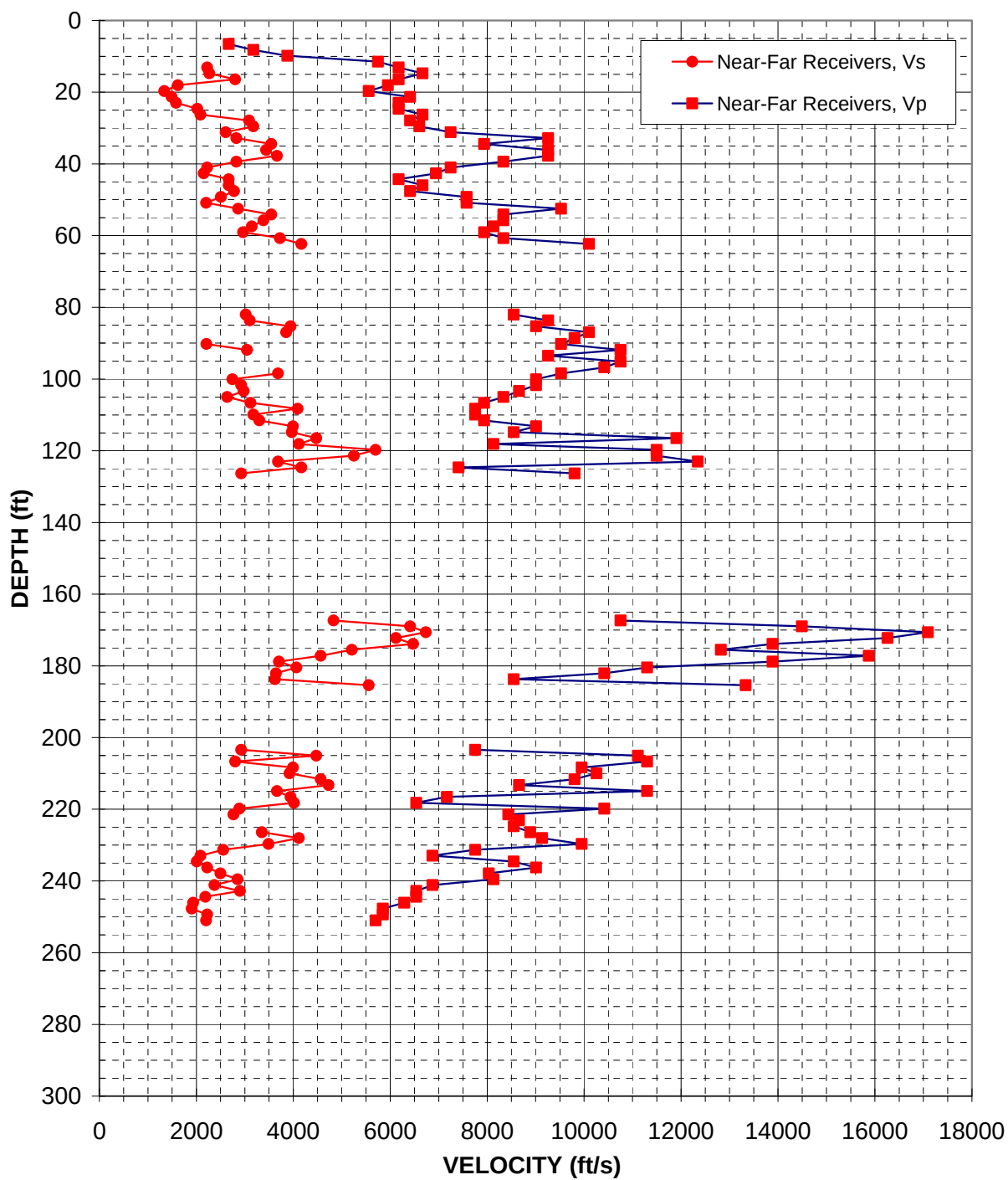


Figure 23: Boring I-6, Suspension R1-R2 P- and S_H -wave velocities

Table 14. Boring I-6, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-6**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
6.6	-	2670	-
8.2	-	3170	-
9.8	-	3880	-
11.5	-	5750	-
13.1	2220	6170	0.43
14.8	2270	6670	0.43
16.4	2800	6170	0.37
18.0	1620	5950	0.46
19.7	1340	5560	0.47
21.3	1490	6410	0.47
23.0	1580	6170	0.46
24.6	2020	6170	0.44
26.3	2080	6670	0.45
27.9	3090	6410	0.35
29.5	3170	6600	0.35
31.2	2600	7250	0.43
32.8	2820	9260	0.45
34.5	3550	7940	0.38
36.1	3440	9260	0.42
37.7	3660	9260	0.41
39.4	2820	8330	0.44
41.0	2220	7250	0.45
42.7	2150	6940	0.45
44.3	2670	6170	0.39
45.9	2670	6670	0.40
47.6	2780	6410	0.38
49.2	2510	7580	0.44
50.9	2200	7580	0.45
52.5	2860	9520	0.45
54.1	3550	8330	0.39
55.8	3380	8330	0.40
57.4	3140	8130	0.41
59.1	2960	7940	0.42
60.7	3720	8330	0.38
62.3	4170	10100	0.40
64.0	-	-	-
65.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
2.0	-	810	-
2.5	-	970	-
3.0	-	1180	-
3.5	-	1750	-
4.0	680	1880	0.43
4.5	690	2030	0.43
5.0	850	1880	0.37
5.5	490	1810	0.46
6.0	410	1690	0.47
6.5	450	1950	0.47
7.0	480	1880	0.46
7.5	620	1880	0.44
8.0	640	2030	0.45
8.5	940	1950	0.35
9.0	970	2010	0.35
9.5	790	2210	0.43
10.0	860	2820	0.45
10.5	1080	2420	0.38
11.0	1050	2820	0.42
11.5	1120	2820	0.41
12.0	860	2540	0.44
12.5	680	2210	0.45
13.0	660	2120	0.45
13.5	810	1880	0.39
14.0	810	2030	0.40
14.5	850	1950	0.38
15.0	760	2310	0.44
15.5	670	2310	0.45
16.0	870	2900	0.45
16.5	1080	2540	0.39
17.0	1030	2540	0.40
17.5	960	2480	0.41
18.0	900	2420	0.42
18.5	1140	2540	0.38
19.0	1270	3080	0.40
19.5	-	-	-
20.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-6**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
67.3	-	-	-
68.9	-	-	-
70.5	-	-	-
72.2	-	-	-
73.8	-	-	-
75.5	-	-	-
77.1	-	-	-
78.7	-	-	-
80.4	-	-	-
82.0	3020	8550	0.43
83.7	3100	9260	0.44
85.3	3940	9010	0.38
86.9	3850	10100	0.41
88.6	-	9800	-
90.2	2210	9520	0.47
91.9	3040	10750	0.46
93.5	-	9260	-
95.1	-	10750	-
96.8	-	10420	-
98.4	3680	9520	0.41
100.1	2740	9010	0.45
101.7	2920	9010	0.44
103.4	2980	8660	0.43
105.0	2640	8330	0.44
106.6	3120	7940	0.41
108.3	4090	7750	0.31
109.9	3170	7750	0.40
111.6	3300	7940	0.40
113.2	3990	9010	0.38
114.8	3970	8550	0.36
116.5	4470	11900	0.42
118.1	4120	8130	0.33
119.8	5700	11490	0.34
121.4	5250	11490	0.37
123.0	3680	12350	0.45
124.7	4170	7410	0.27
126.3	2920	9800	0.45
128.0	-	-	-
129.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
20.5	-	-	-
21.0	-	-	-
21.5	-	-	-
22.0	-	-	-
22.5	-	-	-
23.0	-	-	-
23.5	-	-	-
24.0	-	-	-
24.5	-	-	-
25.0	920	2610	0.43
25.5	950	2820	0.44
26.0	1200	2750	0.38
26.5	1170	3080	0.41
27.0	-	2990	-
27.5	670	2900	0.47
28.0	930	3280	0.46
28.5	-	2820	-
29.0	-	3280	-
29.5	-	3180	-
30.0	1120	2900	0.41
30.5	840	2750	0.45
31.0	890	2750	0.44
31.5	910	2640	0.43
32.0	800	2540	0.44
32.5	950	2420	0.41
33.0	1250	2360	0.31
33.5	970	2360	0.40
34.0	1010	2420	0.40
34.5	1220	2750	0.38
35.0	1210	2610	0.36
35.5	1360	3630	0.42
36.0	1250	2480	0.33
36.5	1740	3500	0.34
37.0	1600	3500	0.37
37.5	1120	3760	0.45
38.0	1270	2260	0.27
38.5	890	2990	0.45
39.0	-	-	-
39.5	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-6**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
131.2	-	-	-
132.9	-	-	-
134.5	-	-	-
136.2	-	-	-
137.8	-	-	-
139.4	-	-	-
141.1	-	-	-
142.7	-	-	-
144.4	-	-	-
146.0	-	-	-
147.6	-	-	-
149.3	-	-	-
150.9	-	-	-
152.6	-	-	-
154.2	-	-	-
155.8	-	-	-
157.5	-	-	-
159.1	-	-	-
160.8	-	-	-
162.4	-	-	-
164.0	-	-	-
165.7	-	-	-
167.3	4830	10750	0.37
169.0	6410	14490	0.38
170.6	6730	17090	0.41
172.2	6120	16260	0.42
173.9	6470	13890	0.36
175.5	5210	12820	0.40
177.2	4570	15870	0.45
178.8	3700	13890	0.46
180.5	4070	11300	0.43
182.1	3640	10420	0.43
183.7	3620	8550	0.39
185.4	5560	13330	0.39
187.0	-	-	-
188.7	-	-	-
190.3	-	-	-
191.9	-	-	-
193.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.0	-	-	-
40.5	-	-	-
41.0	-	-	-
41.5	-	-	-
42.0	-	-	-
42.5	-	-	-
43.0	-	-	-
43.5	-	-	-
44.0	-	-	-
44.5	-	-	-
45.0	-	-	-
45.5	-	-	-
46.0	-	-	-
46.5	-	-	-
47.0	-	-	-
47.5	-	-	-
48.0	-	-	-
48.5	-	-	-
49.0	-	-	-
49.5	-	-	-
50.0	-	-	-
50.5	-	-	-
51.0	1470	3280	0.37
51.5	1950	4420	0.38
52.0	2050	5210	0.41
52.5	1860	4960	0.42
53.0	1970	4230	0.36
53.5	1590	3910	0.40
54.0	1390	4840	0.45
54.5	1130	4230	0.46
55.0	1240	3440	0.43
55.5	1110	3180	0.43
56.0	1100	2610	0.39
56.5	1690	4060	0.39
57.0	-	-	-
57.5	-	-	-
58.0	-	-	-
58.5	-	-	-
59.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-6**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
195.2	-	-	-
196.9	-	-	-
198.5	-	-	-
200.1	-	-	-
201.8	-	-	-
203.4	2920	7750	0.42
205.1	4470	11110	0.40
206.7	2800	11300	0.47
208.3	3990	9950	0.40
210.0	3920	10260	0.41
211.6	4570	9800	0.36
213.3	4730	8660	0.29
214.9	3660	11300	0.44
216.5	3940	7170	0.28
218.2	4020	6540	0.20
219.8	2890	10420	0.46
221.5	2770	8440	-
223.1	-	8660	-
224.7	-	8550	-
226.4	3350	8890	0.42
228.0	4120	9130	0.37
229.7	3490	9950	0.43
231.3	2550	7750	0.44
232.9	2080	6870	0.45
234.6	2010	8550	0.47
236.2	2220	9010	0.47
237.9	2500	8030	0.45
239.5	2850	8130	0.43
241.1	2370	6870	0.43
242.8	2900	6540	0.38
244.4	2190	6540	0.44
246.1	1930	6290	0.45
247.7	1900	5850	0.44
249.3	2220	5850	0.42
251.0	2200	5700	0.41

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
59.5	-	-	-
60.0	-	-	-
60.5	-	-	-
61.0	-	-	-
61.5	-	-	-
62.0	890	2360	0.42
62.5	1360	3390	0.40
63.0	850	3440	0.47
63.5	1220	3030	0.40
64.0	1200	3130	0.41
64.5	1390	2990	0.36
65.0	1440	2640	0.29
65.5	1120	3440	0.44
66.0	1200	2180	0.28
66.5	1220	1990	0.20
67.0	880	3180	0.46
67.5	840	2570	-
68.0	-	2640	-
68.5	-	2610	-
69.0	1020	2710	0.42
69.5	1250	2780	0.37
70.0	1060	3030	0.43
70.5	780	2360	0.44
71.0	640	2090	0.45
71.5	610	2610	0.47
72.0	680	2750	0.47
72.5	760	2450	0.45
73.0	870	2480	0.43
73.5	720	2090	0.43
74.0	880	1990	0.38
74.5	670	1990	0.44
75.0	590	1920	0.45
75.5	580	1780	0.44
76.0	680	1780	0.42
76.5	670	1740	0.41

Notes: "-" means no data available at that particular interval of depth.

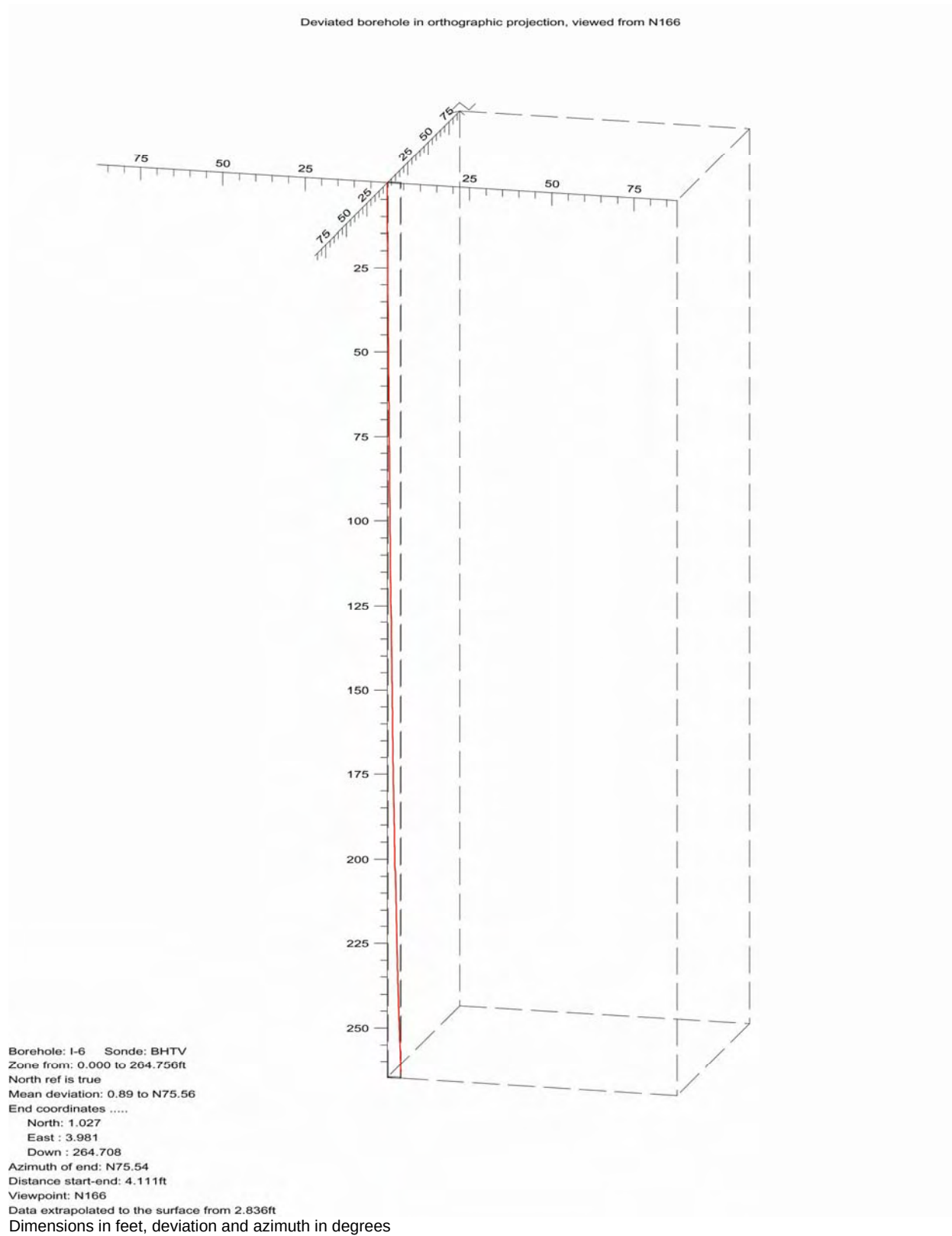


Figure 24: Boring I-6, Deviation Orthographic Projection

LEVY COUNTY COLA BORING I-7 (SONIC, CASED) **Receiver to Receiver V_s and V_p Analysis**

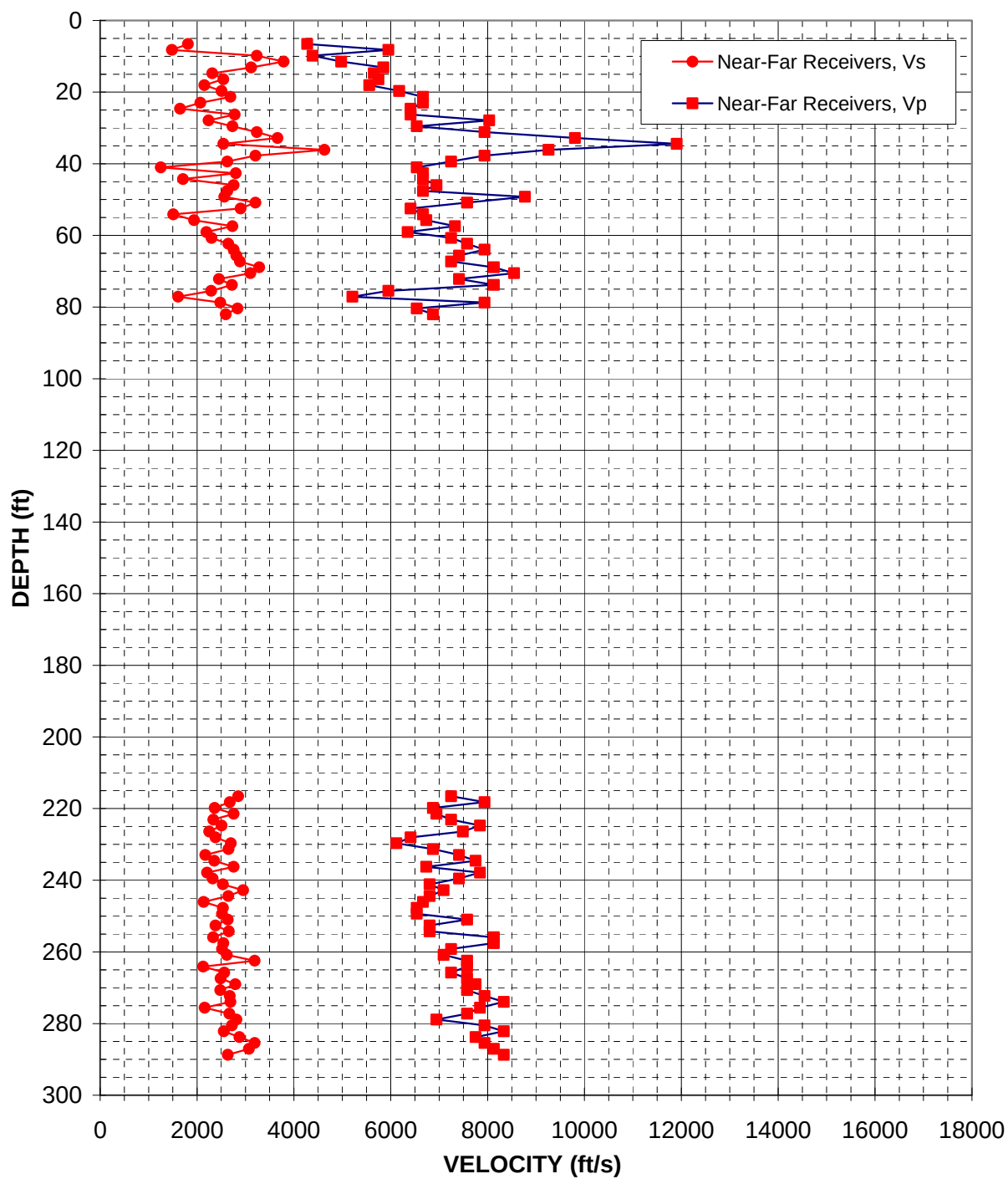


Figure 25: Boring I-7, Suspension R1-R2 P- and S_H -wave velocities

Table 15. Boring I-7, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-7**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
6.6	1810	4270	0.39
8.2	1480	5950	0.47
9.8	3240	4390	-0.10
11.5	3790	4980	-0.19
13.1	3120	5850	0.30
14.8	2310	5650	0.40
16.4	2540	5750	0.38
18.0	2150	5560	0.41
19.7	2510	6170	0.40
21.3	2690	6670	0.40
23.0	2070	6670	0.45
24.6	1650	6410	0.46
26.3	2780	6410	0.38
27.9	2240	8030	0.46
29.5	2730	6540	0.39
31.2	3240	7940	0.40
32.8	3660	9800	0.42
34.5	2540	11900	0.48
36.1	4630	9260	0.33
37.7	3210	7940	0.40
39.4	2620	7250	0.42
41.0	1250	6540	0.48
42.7	2800	6670	0.39
44.3	1710	6670	0.46
45.9	2750	6940	0.41
47.6	2620	6670	0.41
49.2	2560	8770	0.45
50.9	3210	7580	0.39
52.5	2900	6410	0.37
54.1	1510	6670	0.47
55.8	1940	6730	0.45
57.4	2730	7330	0.42
59.1	2190	6350	0.43
60.7	2300	7250	0.44
62.3	2650	7580	0.43
64.0	2750	7940	0.43
65.6	2810	7410	0.42

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
2.0	550	1300	0.39
2.5	450	1810	0.47
3.0	990	1340	-0.10
3.5	1150	1520	-0.19
4.0	950	1780	0.30
4.5	710	1720	0.40
5.0	780	1750	0.38
5.5	660	1690	0.41
6.0	760	1880	0.40
6.5	820	2030	0.40
7.0	630	2030	0.45
7.5	500	1950	0.46
8.0	850	1950	0.38
8.5	680	2450	0.46
9.0	830	1990	0.39
9.5	990	2420	0.40
10.0	1120	2990	0.42
10.5	780	3630	0.48
11.0	1410	2820	0.33
11.5	980	2420	0.40
12.0	800	2210	0.42
12.5	380	1990	0.48
13.0	850	2030	0.39
13.5	520	2030	0.46
14.0	840	2120	0.41
14.5	800	2030	0.41
15.0	780	2670	0.45
15.5	980	2310	0.39
16.0	880	1950	0.37
16.5	460	2030	0.47
17.0	590	2050	0.45
17.5	830	2230	0.42
18.0	670	1940	0.43
18.5	700	2210	0.44
19.0	810	2310	0.43
19.5	840	2420	0.43
20.0	860	2260	0.42

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-7**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
67.3	2890	7250	0.41
68.9	3280	8130	0.40
70.5	3100	8550	0.42
72.2	2450	7410	0.44
73.8	2720	8130	0.44
75.5	2290	5950	0.41
77.1	1610	5210	0.45
78.7	2480	7940	0.45
80.4	2840	6540	0.38
82.0	2590	6870	0.42
83.7	-	-	-
85.3	-	-	-
86.9	-	-	-
88.6	-	-	-
90.2	-	-	-
91.9	-	-	-
93.5	-	-	-
95.1	-	-	-
96.8	-	-	-
98.4	-	-	-
100.1	-	-	-
101.7	-	-	-
103.4	-	-	-
105.0	-	-	-
106.6	-	-	-
108.3	-	-	-
109.9	-	-	-
111.6	-	-	-
113.2	-	-	-
114.8	-	-	-
116.5	-	-	-
118.1	-	-	-
119.8	-	-	-
121.4	-	-	-
123.0	-	-	-
124.7	-	-	-
126.3	-	-	-
128.0	-	-	-
129.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
20.5	880	2210	0.41
21.0	1000	2480	0.40
21.5	950	2610	0.42
22.0	750	2260	0.44
22.5	830	2480	0.44
23.0	700	1810	0.41
23.5	490	1590	0.45
24.0	760	2420	0.45
24.5	860	1990	0.38
25.0	790	2090	0.42
25.5	-	-	-
26.0	-	-	-
26.5	-	-	-
27.0	-	-	-
27.5	-	-	-
28.0	-	-	-
28.5	-	-	-
29.0	-	-	-
29.5	-	-	-
30.0	-	-	-
30.5	-	-	-
31.0	-	-	-
31.5	-	-	-
32.0	-	-	-
32.5	-	-	-
33.0	-	-	-
33.5	-	-	-
34.0	-	-	-
34.5	-	-	-
35.0	-	-	-
35.5	-	-	-
36.0	-	-	-
36.5	-	-	-
37.0	-	-	-
37.5	-	-	-
38.0	-	-	-
38.5	-	-	-
39.0	-	-	-
39.5	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-7**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
131.2	-	-	-
132.9	-	-	-
134.5	-	-	-
136.2	-	-	-
137.8	-	-	-
139.4	-	-	-
141.1	-	-	-
142.7	-	-	-
144.4	-	-	-
146.0	-	-	-
147.6	-	-	-
149.3	-	-	-
150.9	-	-	-
152.6	-	-	-
154.2	-	-	-
155.8	-	-	-
157.5	-	-	-
159.1	-	-	-
160.8	-	-	-
162.4	-	-	-
164.0	-	-	-
165.7	-	-	-
167.3	-	-	-
169.0	-	-	-
170.6	-	-	-
172.2	-	-	-
173.9	-	-	-
175.5	-	-	-
177.2	-	-	-
178.8	-	-	-
180.5	-	-	-
182.1	-	-	-
183.7	-	-	-
185.4	-	-	-
187.0	-	-	-
188.7	-	-	-
190.3	-	-	-
191.9	-	-	-
193.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.0	-	-	-
40.5	-	-	-
41.0	-	-	-
41.5	-	-	-
42.0	-	-	-
42.5	-	-	-
43.0	-	-	-
43.5	-	-	-
44.0	-	-	-
44.5	-	-	-
45.0	-	-	-
45.5	-	-	-
46.0	-	-	-
46.5	-	-	-
47.0	-	-	-
47.5	-	-	-
48.0	-	-	-
48.5	-	-	-
49.0	-	-	-
49.5	-	-	-
50.0	-	-	-
50.5	-	-	-
51.0	-	-	-
51.5	-	-	-
52.0	-	-	-
52.5	-	-	-
53.0	-	-	-
53.5	-	-	-
54.0	-	-	-
54.5	-	-	-
55.0	-	-	-
55.5	-	-	-
56.0	-	-	-
56.5	-	-	-
57.0	-	-	-
57.5	-	-	-
58.0	-	-	-
58.5	-	-	-
59.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-7**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
195.2	-	-	-
196.9	-	-	-
198.5	-	-	-
200.1	-	-	-
201.8	-	-	-
203.4	-	-	-
205.1	-	-	-
206.7	-	-	-
208.3	-	-	-
210.0	-	-	-
211.6	-	-	-
213.3	-	-	-
214.9	-	-	-
216.5	2850	7250	0.41
218.2	2680	7940	0.44
219.8	2360	6870	0.43
221.5	2750	6940	0.41
223.1	2340	7250	0.44
224.7	2510	7840	0.44
226.4	2250	7490	0.45
228.0	2380	6410	0.42
229.7	2700	6120	0.38
231.3	2650	6870	0.41
232.9	2170	7410	0.45
234.6	2360	7750	0.45
236.2	2750	6730	0.40
237.9	2210	7840	0.46
239.5	2320	7410	0.45
241.1	2530	6800	0.42
242.8	2950	7090	0.40
244.4	2650	6800	0.41
246.1	2140	6670	0.44
247.7	2530	6540	0.41
249.3	2520	6540	0.41
251.0	2640	7580	0.43
252.6	2380	6800	0.43
254.3	2660	6800	0.41
255.9	2330	8130	0.46
257.6	2540	8130	0.45

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
59.5	-	-	-
60.0	-	-	-
60.5	-	-	-
61.0	-	-	-
61.5	-	-	-
62.0	-	-	-
62.5	-	-	-
63.0	-	-	-
63.5	-	-	-
64.0	-	-	-
64.5	-	-	-
65.0	-	-	-
65.5	-	-	-
66.0	870	2210	0.41
66.5	820	2420	0.44
67.0	720	2090	0.43
67.5	840	2120	0.41
68.0	710	2210	0.44
68.5	760	2390	0.44
69.0	690	2280	0.45
69.5	730	1950	0.42
70.0	820	1860	0.38
70.5	810	2090	0.41
71.0	660	2260	0.45
71.5	720	2360	0.45
72.0	840	2050	0.40
72.5	670	2390	0.46
73.0	710	2260	0.45
73.5	770	2070	0.42
74.0	900	2160	0.40
74.5	810	2070	0.41
75.0	650	2030	0.44
75.5	770	1990	0.41
76.0	770	1990	0.41
76.5	800	2310	0.43
77.0	730	2070	0.43
77.5	810	2070	0.41
78.0	710	2480	0.46
78.5	780	2480	0.45

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-7**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
259.2	2520	7250	0.43
260.8	2610	7090	0.42
262.5	3190	7580	0.39
264.1	2130	7580	0.46
265.8	2560	7250	0.43
267.4	2490	7580	0.44
269.0	2790	7750	0.43
270.7	2480	7580	0.44
272.3	2680	7940	0.44
274.0	2690	8330	0.44
275.6	2160	7840	0.46
277.2	2670	7580	0.43
278.9	2810	6940	0.40
280.5	2720	7940	0.43
282.2	2550	8330	0.45
283.8	2870	7750	0.42
285.4	3190	7940	0.40
287.1	3070	8130	0.42
288.7	2640	8330	0.44

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
79.0	770	2210	0.43
79.5	800	2160	0.42
80.0	970	2310	0.39
80.5	650	2310	0.46
81.0	780	2210	0.43
81.5	760	2310	0.44
82.0	850	2360	0.43
82.5	760	2310	0.44
83.0	820	2420	0.44
83.5	820	2540	0.44
84.0	660	2390	0.46
84.5	810	2310	0.43
85.0	860	2120	0.40
85.5	830	2420	0.43
86.0	780	2540	0.45
86.5	880	2360	0.42
87.0	970	2420	0.40
87.5	940	2480	0.42
88.0	800	2540	0.44

Notes: "-" means no data available at that particular interval of depth.

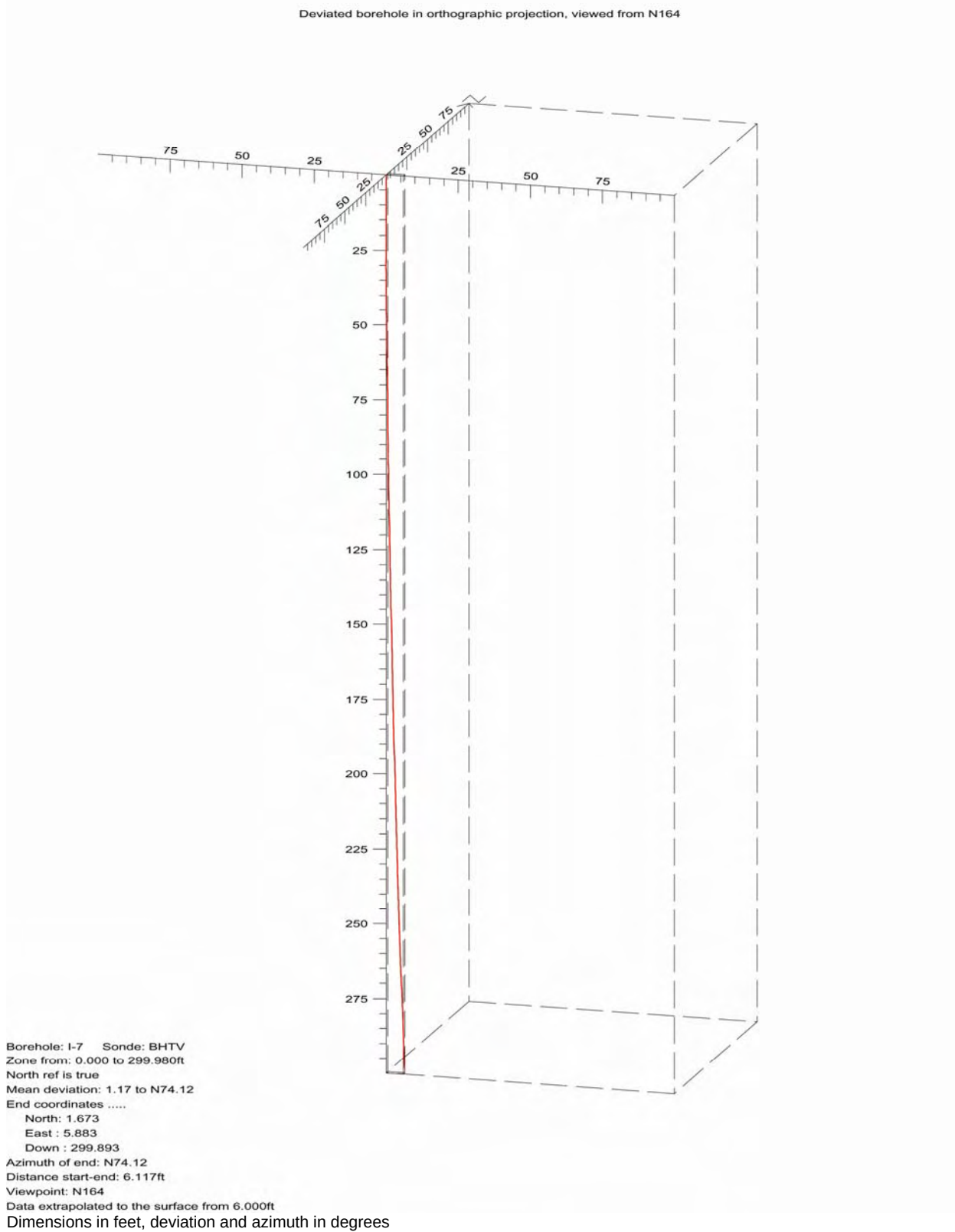


Figure 26: Boring I-7, Deviation Orthographic Projection

LEVY COUNTY COLA BORING I-8 (SONIC, CASED)
Receiver to Receiver V_s and V_p Analysis

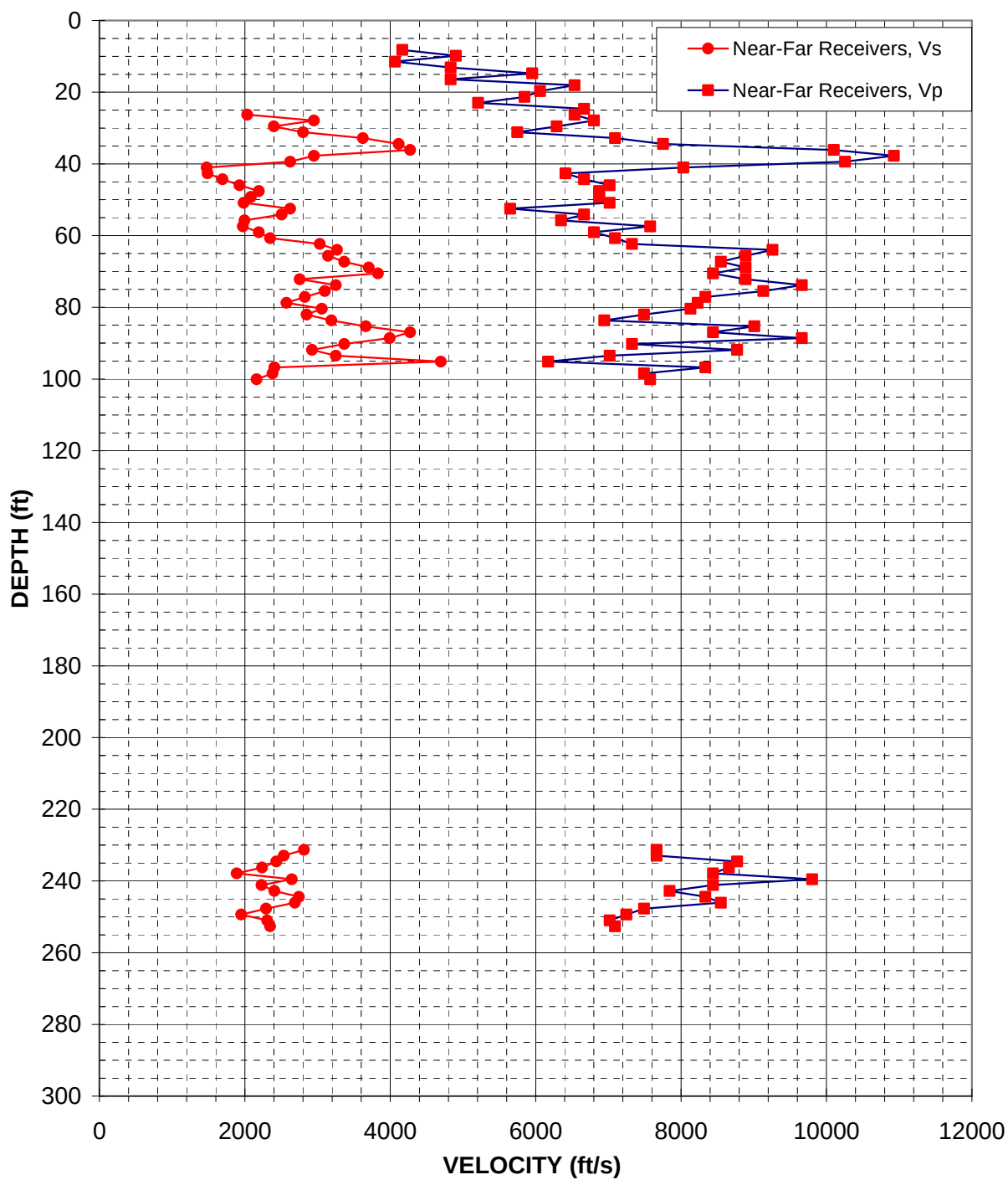


Figure 27: Boring I-8, Suspension R1-R2 P- and S_H -wave velocities

Table 16. Boring I-8, Suspension R1-R2 depths and P- and S_H-wave velocities

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio							
Based on Receiver-to-Receiver Travel Time Data - Borehole I-8							
American Units				Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio	Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
(ft)	V _s (ft/s)	V _p (ft/s)		(m)	V _s (m/s)	V _p (m/s)	
8.2	-	4170	-	2.5	-	1270	-
9.8	-	4900	-	3.0	-	1490	-
11.5	-	4070	-	3.5	-	1240	-
13.1	-	4830	-	4.0	-	1470	-
14.8	-	5950	-	4.5	-	1810	-
16.4	-	4830	-	5.0	-	1470	-
18.0	-	6540	-	5.5	-	1990	-
19.7	-	6060	-	6.0	-	1850	-
21.3	-	5850	-	6.5	-	1780	-
23.0	-	5210	-	7.0	-	1590	-
24.6	-	6670	-	7.5	-	2030	-
26.3	2030	6540	0.45	8.0	620	1990	0.45
27.9	2950	6800	0.38	8.5	900	2070	0.38
29.5	2400	6290	0.41	9.0	730	1920	0.41
31.2	2800	5750	0.34	9.5	850	1750	0.34
32.8	3620	7090	0.32	10.0	1100	2160	0.32
34.5	4120	7750	0.30	10.5	1250	2360	0.30
36.1	4270	10100	0.39	11.0	1300	3080	0.39
37.7	2950	10930	0.46	11.5	900	3330	0.46
39.4	2620	10260	0.46	12.0	800	3130	0.46
41.0	1470	8030	0.48	12.5	450	2450	0.48
42.7	1490	6410	0.47	13.0	450	1950	0.47
44.3	1690	6670	0.47	13.5	520	2030	0.47
45.9	1930	7020	0.46	14.0	590	2140	0.46
47.6	2190	6870	0.44	14.5	670	2090	0.44
49.2	2080	6870	0.45	15.0	640	2090	0.45
50.9	1980	7020	0.46	15.5	600	2140	0.46
52.5	2620	5650	0.36	16.0	800	1720	0.36
54.1	2510	6670	0.42	16.5	760	2030	0.42
55.8	2000	6350	0.45	17.0	610	1940	0.45
57.4	1970	7580	0.46	17.5	600	2310	0.46
59.1	2190	6800	0.44	18.0	670	2070	0.44
60.7	2350	7090	0.44	18.5	720	2160	0.44
62.3	3030	7330	0.40	19.0	920	2230	0.40
64.0	3270	9260	0.43	19.5	1000	2820	0.43
65.6	3140	8890	0.43	20.0	960	2710	0.43
67.3	3370	8550	0.41	20.5	1030	2610	0.41
68.9	3700	8890	0.39	21.0	1130	2710	0.39

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio									
Based on Receiver-to-Receiver Travel Time Data - Borehole I-8									
American Units					Metric Units				
Depth at	Velocity		Poisson's Ratio		Depth at	Velocity		Poisson's Ratio	
Midpoint Between Receivers	V _s	V _p			Midpoint Between Receivers	V _s	V _p		
(ft)	(ft/s)	(ft/s)			(m)	(m/s)	(m/s)		
70.5	3830	8440	0.37		21.5	1170	2570	0.37	
72.2	2750	8890	0.45		22.0	840	2710	0.45	
73.8	3250	9660	0.44		22.5	990	2940	0.44	
75.5	3100	9130	0.43		23.0	950	2780	0.43	
77.1	2820	8330	0.44		23.5	860	2540	0.44	
78.7	2570	8230	0.45		24.0	780	2510	0.45	
80.4	3060	8130	0.42		24.5	930	2480	0.42	
82.0	2850	7490	0.42		25.0	870	2280	0.42	
83.7	3190	6940	0.37		25.5	970	2120	0.37	
85.3	3660	9010	0.40		26.0	1120	2750	0.40	
86.9	4270	8440	0.33		26.5	1300	2570	0.33	
88.6	3990	9660	0.40		27.0	1220	2940	0.40	
90.2	3370	7330	0.37		27.5	1030	2230	0.37	
91.9	2920	8770	0.44		28.0	890	2670	0.44	
93.5	3250	7020	0.36		28.5	990	2140	0.36	
95.1	4690	6170	-		29.0	1430	1880	-	
96.8	2410	8330	0.45		29.5	730	2540	0.45	
98.4	2380	7490	0.44		30.0	730	2280	0.44	
100.1	2160	7580	0.46		30.5	660	2310	0.46	
101.7	-	-	-		31.0	-	-	-	
103.4	-	-	-		31.5	-	-	-	
105.0	-	-	-		32.0	-	-	-	
106.6	-	-	-		32.5	-	-	-	
108.3	-	-	-		33.0	-	-	-	
109.9	-	-	-		33.5	-	-	-	
111.6	-	-	-		34.0	-	-	-	
113.2	-	-	-		34.5	-	-	-	
114.8	-	-	-		35.0	-	-	-	
116.5	-	-	-		35.5	-	-	-	
118.1	-	-	-		36.0	-	-	-	
119.8	-	-	-		36.5	-	-	-	
121.4	-	-	-		37.0	-	-	-	
123.0	-	-	-		37.5	-	-	-	
124.7	-	-	-		38.0	-	-	-	
126.3	-	-	-		38.5	-	-	-	
128.0	-	-	-		39.0	-	-	-	
129.6	-	-	-		39.5	-	-	-	
131.2	-	-	-		40.0	-	-	-	
132.9	-	-	-		40.5	-	-	-	
134.5	-	-	-		41.0	-	-	-	

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio												
Based on Receiver-to-Receiver Travel Time Data - Borehole I-8												
American Units						Metric Units						
Depth at		Velocity		Poisson's Ratio		Depth at		Velocity		Poisson's Ratio		
Midpoint Between Receivers		V _s	V _p			Midpoint Between Receivers		V _s	V _p			
(ft)		(ft/s)	(ft/s)				(m)		(m/s)		(m/s)	
136.2		-	-	-		41.5		-	-	-		
137.8		-	-	-		42.0		-	-	-		
139.4		-	-	-		42.5		-	-	-		
141.1		-	-	-		43.0		-	-	-		
142.7		-	-	-		43.5		-	-	-		
144.4		-	-	-		44.0		-	-	-		
146.0		-	-	-		44.5		-	-	-		
147.6		-	-	-		45.0		-	-	-		
149.3		-	-	-		45.5		-	-	-		
150.9		-	-	-		46.0		-	-	-		
152.6		-	-	-		46.5		-	-	-		
154.2		-	-	-		47.0		-	-	-		
155.8		-	-	-		47.5		-	-	-		
157.5		-	-	-		48.0		-	-	-		
159.1		-	-	-		48.5		-	-	-		
160.8		-	-	-		49.0		-	-	-		
162.4		-	-	-		49.5		-	-	-		
164.0		-	-	-		50.0		-	-	-		
165.7		-	-	-		50.5		-	-	-		
167.3		-	-	-		51.0		-	-	-		
169.0		-	-	-		51.5		-	-	-		
170.6		-	-	-		52.0		-	-	-		
172.2		-	-	-		52.5		-	-	-		
173.9		-	-	-		53.0		-	-	-		
175.5		-	-	-		53.5		-	-	-		
177.2		-	-	-		54.0		-	-	-		
178.8		-	-	-		54.5		-	-	-		
180.5		-	-	-		55.0		-	-	-		
182.1		-	-	-		55.5		-	-	-		
183.7		-	-	-		56.0		-	-	-		
185.4		-	-	-		56.5		-	-	-		
187.0		-	-	-		57.0		-	-	-		
188.7		-	-	-		57.5		-	-	-		
190.3		-	-	-		58.0		-	-	-		
191.9		-	-	-		58.5		-	-	-		
193.6		-	-	-		59.0		-	-	-		
195.2		-	-	-		59.5		-	-	-		
196.9		-	-	-		60.0		-	-	-		
198.5		-	-	-		60.5		-	-	-		
200.1		-	-	-		61.0		-	-	-		

Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio								
Based on Receiver-to-Receiver Travel Time Data - Borehole I-8								
American Units					Metric Units			
Depth at	Velocity		Poisson's Ratio		Depth at	Velocity		Poisson's Ratio
Midpoint Between Receivers	V _s	V _p			Midpoint Between Receivers	V _s	V _p	
(ft)	(ft/s)	(ft/s)			(m)	(m/s)	(m/s)	
201.8	-	-	-		61.5	-	-	-
203.4	-	-	-		62.0	-	-	-
205.1	-	-	-		62.5	-	-	-
206.7	-	-	-		63.0	-	-	-
208.3	-	-	-		63.5	-	-	-
210.0	-	-	-		64.0	-	-	-
211.6	-	-	-		64.5	-	-	-
213.3	-	-	-		65.0	-	-	-
214.9	-	-	-		65.5	-	-	-
216.5	-	-	-		66.0	-	-	-
218.2	-	-	-		66.5	-	-	-
219.8	-	-	-		67.0	-	-	-
221.5	-	-	-		67.5	-	-	-
223.1	-	-	-		68.0	-	-	-
224.7	-	-	-		68.5	-	-	-
226.4	-	-	-		69.0	-	-	-
228.0	-	-	-		69.5	-	-	-
229.7	-	-	-		70.0	-	-	-
231.3	2810	7660	0.42		70.5	860	2340	0.42
232.9	2530	7660	0.44		71.0	770	2340	0.44
234.6	2430	8770	0.46		71.5	740	2670	0.46
236.2	2240	8660	0.46		72.0	680	2640	0.46
237.9	1890	8440	0.47		72.5	580	2570	0.47
239.5	2650	9800	0.46		73.0	810	2990	0.46
241.1	2230	8440	0.46		73.5	680	2570	0.46
242.8	2410	7840	0.45		74.0	730	2390	0.45
244.4	2740	8330	0.44		74.5	840	2540	0.44
246.1	2690	8550	0.45		75.0	820	2610	0.45
247.7	2290	7490	0.45		75.5	700	2280	0.45
249.3	1950	7250	0.46		76.0	590	2210	0.46
251.0	2310	7020	0.44		76.5	700	2140	0.44
252.6	2350	7090	0.44		77.0	720	2160	0.44
Notes:	"-" means no data available at that particular interval of depth.							

Deviated borehole in orthographic projection, viewed from N155

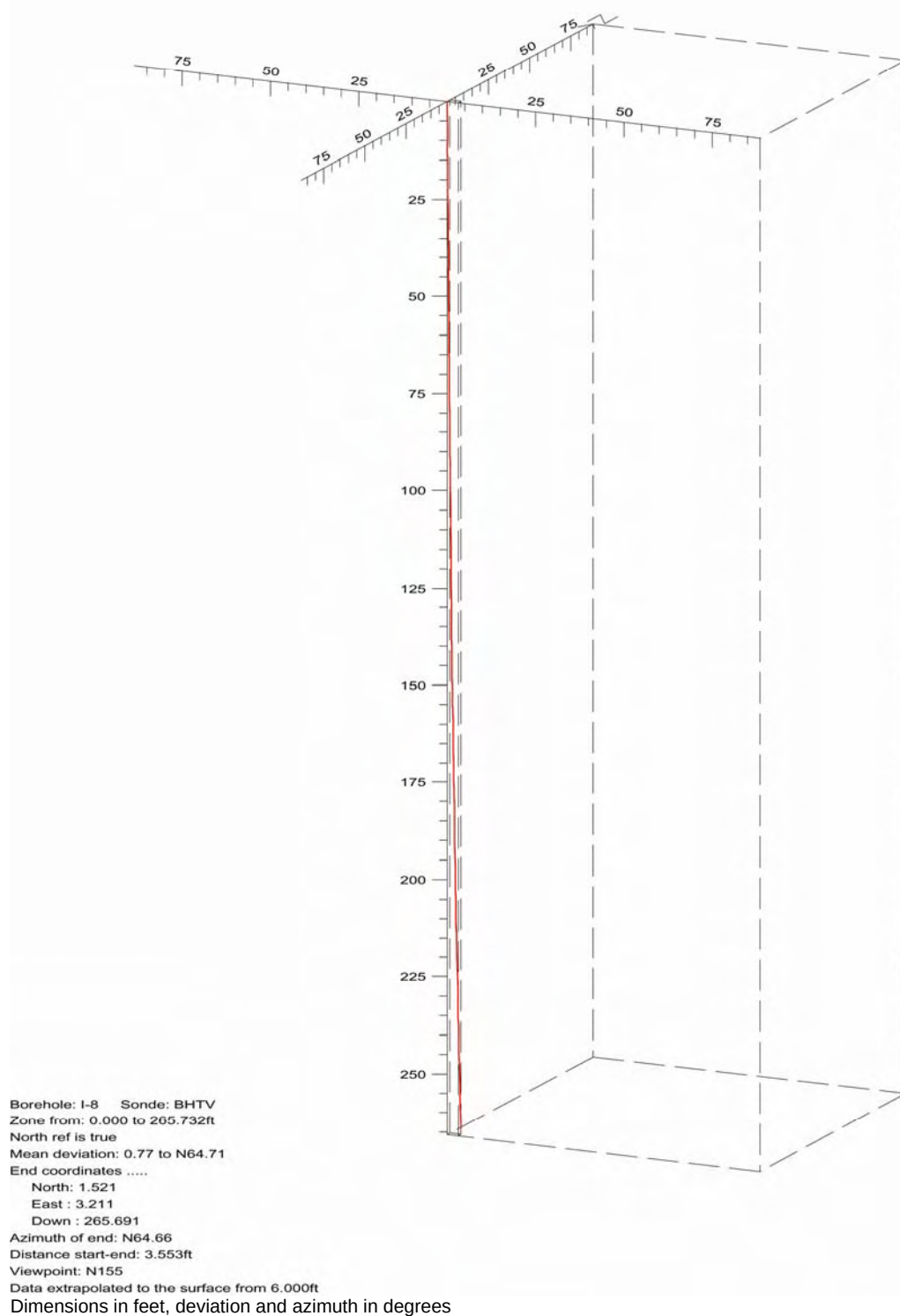


Figure 28: Boring I-8, Deviation Orthographic Projection

LEVY COUNTY COLA BORING I-9 (SONIC, CASED)
Receiver to Receiver V_s and V_p Analysis

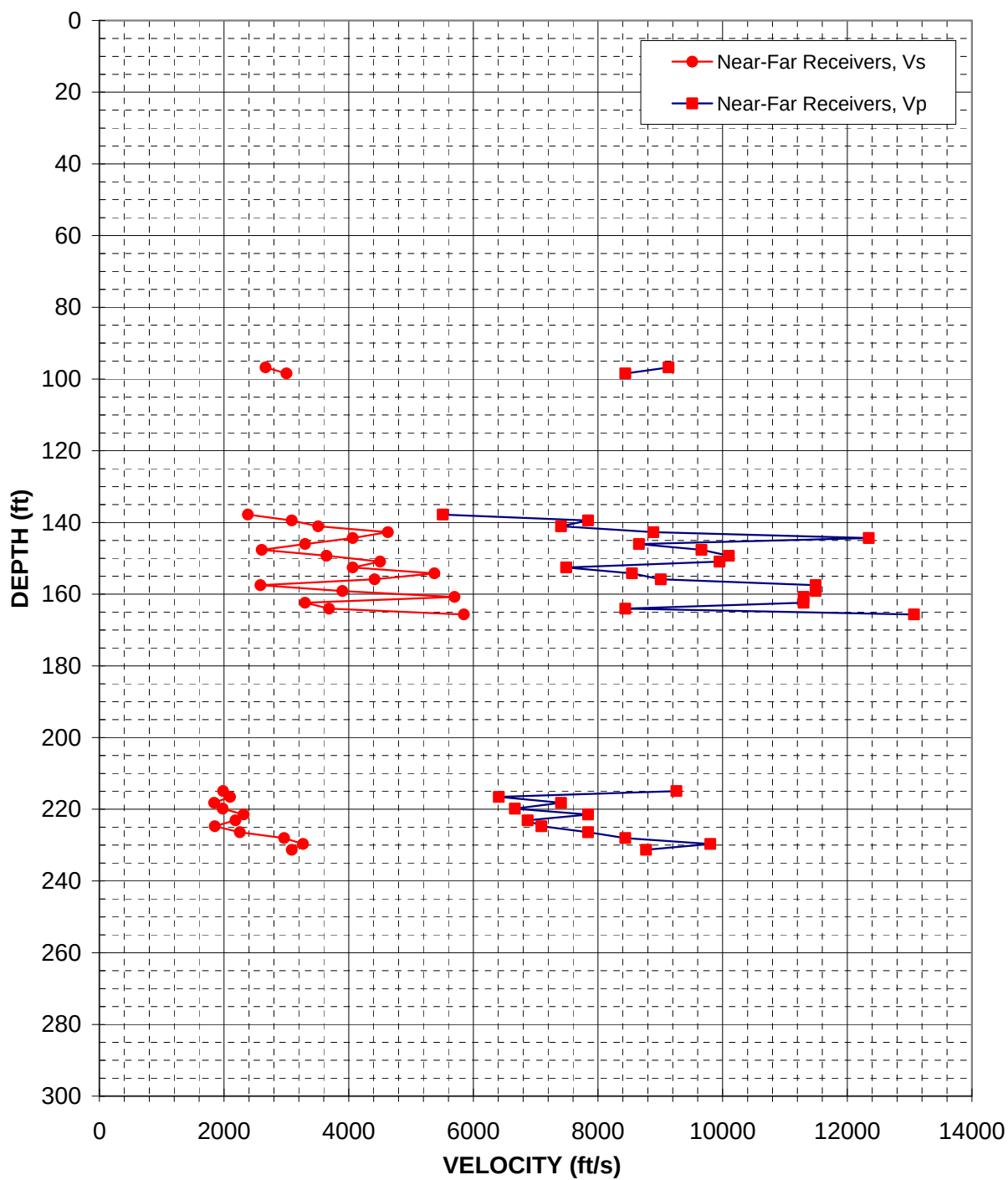


Figure 29: Boring I-9, Suspension R1-R2 P- and S_H -wave velocities

Table 17. Boring I-9, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-9**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
6.6	-	-	-
8.2	-	-	-
9.8	-	-	-
11.5	-	-	-
13.1	-	-	-
14.8	-	-	-
16.4	-	-	-
18.0	-	-	-
19.7	-	-	-
21.3	-	-	-
23.0	-	-	-
24.6	-	-	-
26.3	-	-	-
27.9	-	-	-
29.5	-	-	-
31.2	-	-	-
32.8	-	-	-
34.5	-	-	-
36.1	-	-	-
37.7	-	-	-
39.4	-	-	-
41.0	-	-	-
42.7	-	-	-
44.3	-	-	-
45.9	-	-	-
47.6	-	-	-
49.2	-	-	-
50.9	-	-	-
52.5	-	-	-
54.1	-	-	-
55.8	-	-	-
57.4	-	-	-
59.1	-	-	-
60.7	-	-	-
62.3	-	-	-
64.0	-	-	-
65.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
2.0	-	-	-
2.5	-	-	-
3.0	-	-	-
3.5	-	-	-
4.0	-	-	-
4.5	-	-	-
5.0	-	-	-
5.5	-	-	-
6.0	-	-	-
6.5	-	-	-
7.0	-	-	-
7.5	-	-	-
8.0	-	-	-
8.5	-	-	-
9.0	-	-	-
9.5	-	-	-
10.0	-	-	-
10.5	-	-	-
11.0	-	-	-
11.5	-	-	-
12.0	-	-	-
12.5	-	-	-
13.0	-	-	-
13.5	-	-	-
14.0	-	-	-
14.5	-	-	-
15.0	-	-	-
15.5	-	-	-
16.0	-	-	-
16.5	-	-	-
17.0	-	-	-
17.5	-	-	-
18.0	-	-	-
18.5	-	-	-
19.0	-	-	-
19.5	-	-	-
20.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-9**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
67.3	-	-	-
68.9	-	-	-
70.5	-	-	-
72.2	-	-	-
73.8	-	-	-
75.5	-	-	-
77.1	-	-	-
78.7	-	-	-
80.4	-	-	-
82.0	-	-	-
83.7	-	-	-
85.3	-	-	-
86.9	-	-	-
88.6	-	-	-
90.2	-	-	-
91.9	-	-	-
93.5	-	-	-
95.1	-	-	-
96.8	2670	9130	0.45
98.4	3000	8440	0.43
100.1	-	-	-
101.7	-	-	-
103.4	-	-	-
105.0	-	-	-
106.6	-	-	-
108.3	-	-	-
109.9	-	-	-
111.6	-	-	-
113.2	-	-	-
114.8	-	-	-
116.5	-	-	-
118.1	-	-	-
119.8	-	-	-
121.4	-	-	-
123.0	-	-	-
124.7	-	-	-
126.3	-	-	-
128.0	-	-	-
129.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
20.5	-	-	-
21.0	-	-	-
21.5	-	-	-
22.0	-	-	-
22.5	-	-	-
23.0	-	-	-
23.5	-	-	-
24.0	-	-	-
24.5	-	-	-
25.0	-	-	-
25.5	-	-	-
26.0	-	-	-
26.5	-	-	-
27.0	-	-	-
27.5	-	-	-
28.0	-	-	-
28.5	-	-	-
29.0	-	-	-
29.5	810	2780	0.45
30.0	920	2570	0.43
30.5	-	-	-
31.0	-	-	-
31.5	-	-	-
32.0	-	-	-
32.5	-	-	-
33.0	-	-	-
33.5	-	-	-
34.0	-	-	-
34.5	-	-	-
35.0	-	-	-
35.5	-	-	-
36.0	-	-	-
36.5	-	-	-
37.0	-	-	-
37.5	-	-	-
38.0	-	-	-
38.5	-	-	-
39.0	-	-	-
39.5	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-9**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
131.2	-	-	-
132.9	-	-	-
134.5	-	-	-
136.2	-	-	-
137.8	2380	5510	0.39
139.4	3090	7840	0.41
141.1	3510	7410	0.36
142.7	4630	8890	0.31
144.4	4070	12350	0.44
146.0	3300	8660	0.41
147.6	2600	9660	0.46
149.3	3640	10100	0.43
150.9	4500	9950	0.37
152.6	4070	7490	0.29
154.2	5380	8550	0.17
155.8	4420	9010	0.34
157.5	2580	11490	0.47
159.1	3900	11490	0.44
160.8	5700	11300	0.33
162.4	3300	11300	0.45
164.0	3680	8440	0.38
165.7	5850	13070	0.37
167.3	-	-	-
169.0	-	-	-
170.6	-	-	-
172.2	-	-	-
173.9	-	-	-
175.5	-	-	-
177.2	-	-	-
178.8	-	-	-
180.5	-	-	-
182.1	-	-	-
183.7	-	-	-
185.4	-	-	-
187.0	-	-	-
188.7	-	-	-
190.3	-	-	-
191.9	-	-	-
193.6	-	-	-

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.0	-	-	-
40.5	-	-	-
41.0	-	-	-
41.5	-	-	-
42.0	730	1680	0.39
42.5	940	2390	0.41
43.0	1070	2260	0.36
43.5	1410	2710	0.31
44.0	1240	3760	0.44
44.5	1010	2640	0.41
45.0	790	2940	0.46
45.5	1110	3080	0.43
46.0	1370	3030	0.37
46.5	1240	2280	0.29
47.0	1640	2610	0.17
47.5	1350	2750	0.34
48.0	790	3500	0.47
48.5	1190	3500	0.44
49.0	1740	3440	0.33
49.5	1010	3440	0.45
50.0	1120	2570	0.38
50.5	1780	3980	0.37
51.0	-	-	-
51.5	-	-	-
52.0	-	-	-
52.5	-	-	-
53.0	-	-	-
53.5	-	-	-
54.0	-	-	-
54.5	-	-	-
55.0	-	-	-
55.5	-	-	-
56.0	-	-	-
56.5	-	-	-
57.0	-	-	-
57.5	-	-	-
58.0	-	-	-
58.5	-	-	-
59.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-9**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
195.2	-	-	-
196.9	-	-	-
198.5	-	-	-
200.1	-	-	-
201.8	-	-	-
203.4	-	-	-
205.1	-	-	-
206.7	-	-	-
208.3	-	-	-
210.0	-	-	-
211.6	-	-	-
213.3	-	-	-
214.9	1980	9260	0.48
216.5	2100	6410	0.44
218.2	1840	7410	0.47
219.8	1980	6670	0.45
221.5	2310	7840	0.45
223.1	2180	6870	0.44
224.7	1850	7090	0.46
226.4	2250	7840	0.46
228.0	2960	8440	0.43
229.7	3270	9800	0.44
231.3	3090	8770	0.43

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
59.5	-	-	-
60.0	-	-	-
60.5	-	-	-
61.0	-	-	-
61.5	-	-	-
62.0	-	-	-
62.5	-	-	-
63.0	-	-	-
63.5	-	-	-
64.0	-	-	-
64.5	-	-	-
65.0	-	-	-
65.5	600	2820	0.48
66.0	640	1950	0.44
66.5	560	2260	0.47
67.0	600	2030	0.45
67.5	710	2390	0.45
68.0	670	2090	0.44
68.5	560	2160	0.46
69.0	690	2390	0.46
69.5	900	2570	0.43
70.0	1000	2990	0.44
70.5	940	2670	0.43

Notes: "-" means no data available at that particular interval of depth.

Deviated borehole in orthographic projection, viewed from N141

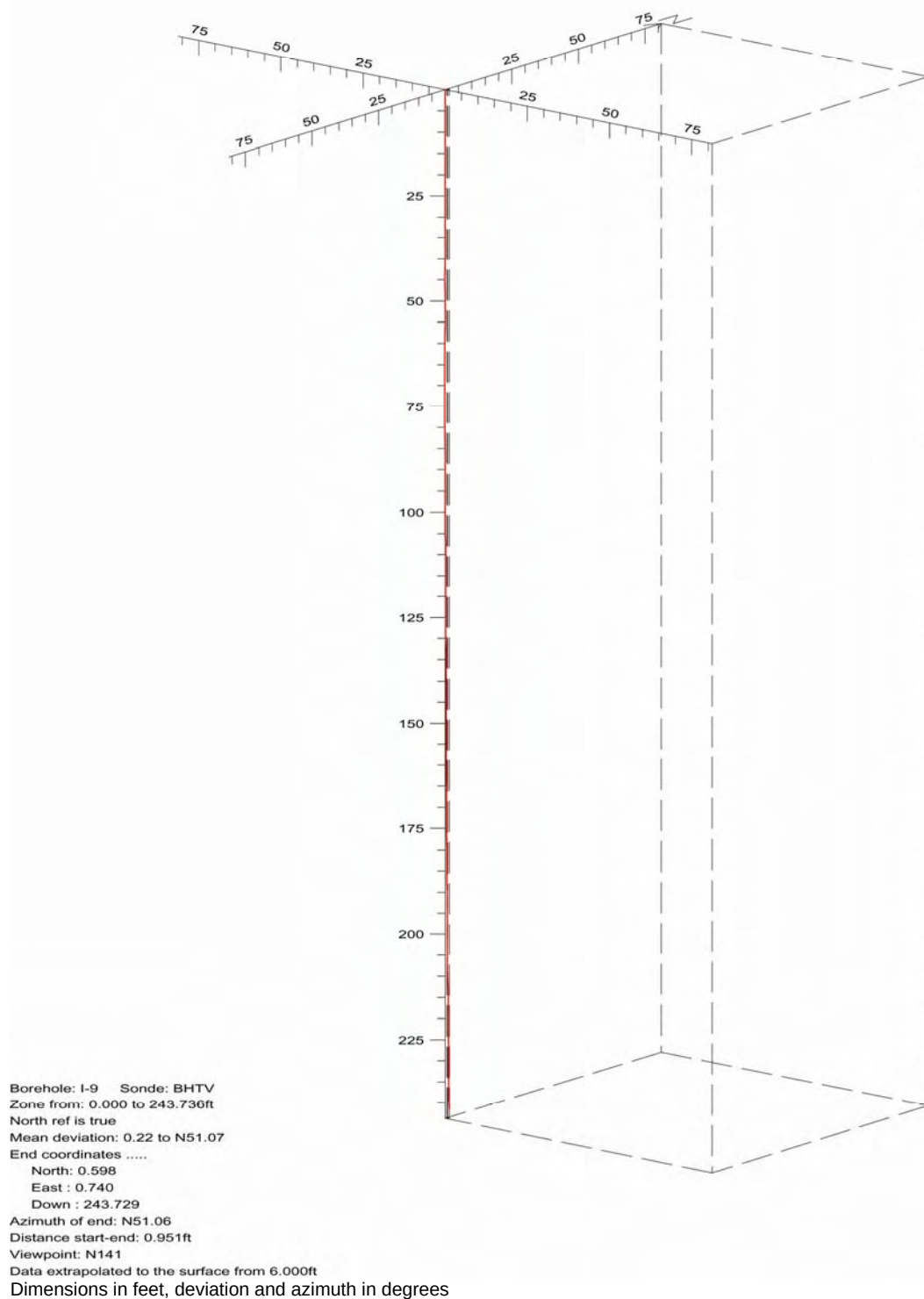


Figure 30: Boring I-9, Deviation Orthographic Projection

LEVY COUNTY COLA BORING I-10 (SONIC, CASED)
Receiver to Receiver V_s and V_p Analysis

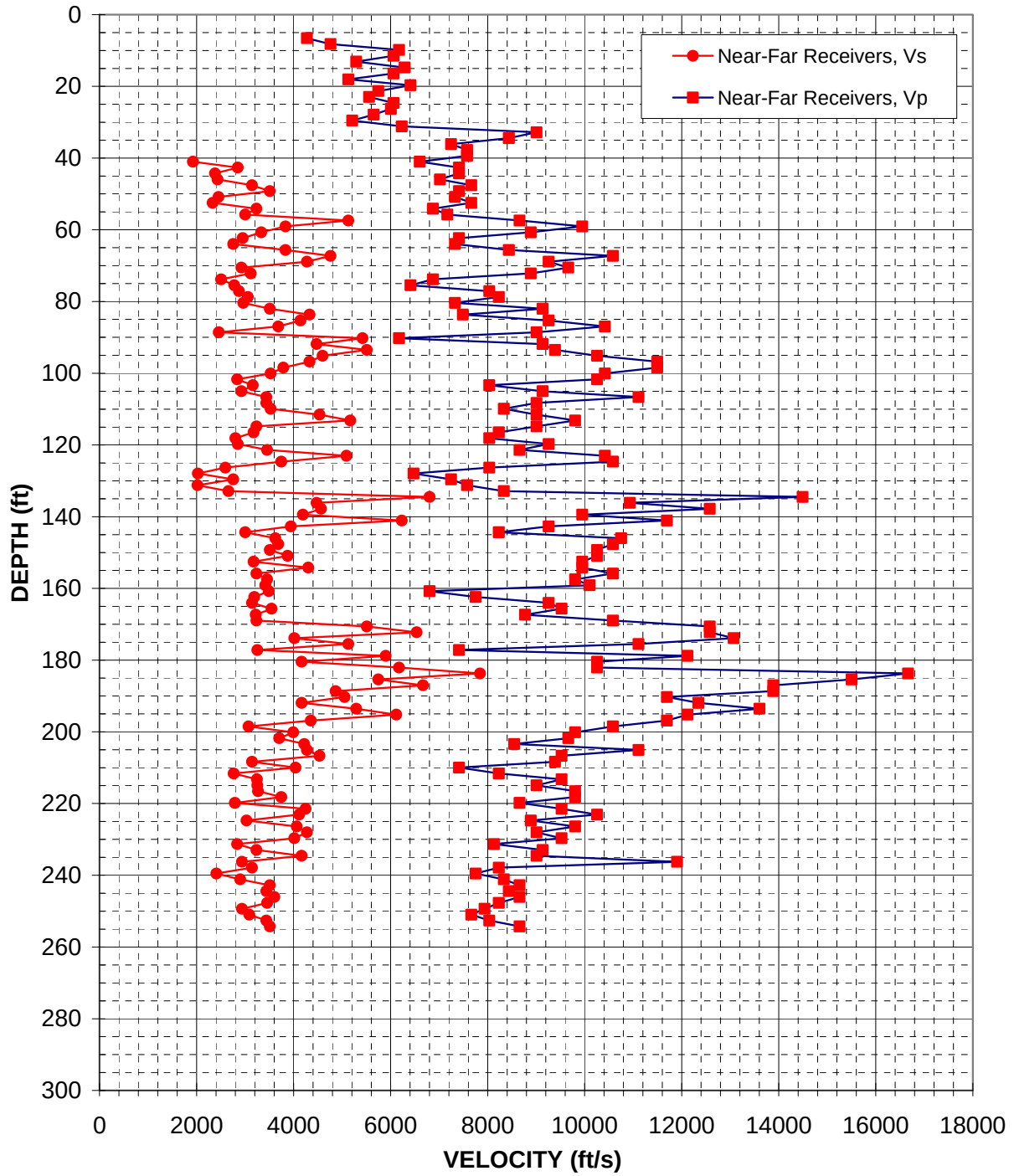


Figure 31: Boring I-10, Suspension R1-R2 P- and S_H -wave velocities

Table 18. Boring I-10, Suspension R1-R2 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-10**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
6.6	-	4270	-
8.2	-	4760	-
9.8	-	6170	-
11.5	-	6060	-
13.1	-	5290	-
14.8	-	6290	-
16.4	-	6060	-
18.0	-	5130	-
19.7	-	6410	-
21.3	-	5750	-
23.0	-	5560	-
24.6	-	6060	-
26.3	-	6010	-
27.9	-	5650	-
29.5	-	5210	-
31.2	-	6230	-
32.8	-	9010	-
34.5	-	8440	-
36.1	-	7250	-
37.7	-	7580	-
39.4	-	7580	-
41.0	1930	6600	0.45
42.7	2850	7410	0.41
44.3	2380	7410	0.44
45.9	2430	7020	0.43
47.6	3140	7660	0.40
49.2	3510	7410	0.36
50.9	2450	7330	0.44
52.5	2330	7660	0.45
54.1	3240	6870	0.36
55.8	3000	7170	0.39
57.4	5130	8660	0.23
59.1	3830	9950	0.41
60.7	3330	8890	0.42
62.3	2950	7410	0.41
64.0	2750	7330	0.42
65.6	3830	8440	0.37

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
2.0	-	1300	-
2.5	-	1450	-
3.0	-	1880	-
3.5	-	1850	-
4.0	-	1610	-
4.5	-	1920	-
5.0	-	1850	-
5.5	-	1560	-
6.0	-	1950	-
6.5	-	1750	-
7.0	-	1690	-
7.5	-	1850	-
8.0	-	1830	-
8.5	-	1720	-
9.0	-	1590	-
9.5	-	1900	-
10.0	-	2750	-
10.5	-	2570	-
11.0	-	2210	-
11.5	-	2310	-
12.0	-	2310	-
12.5	590	2010	0.45
13.0	870	2260	0.41
13.5	730	2260	0.44
14.0	740	2140	0.43
14.5	960	2340	0.40
15.0	1070	2260	0.36
15.5	750	2230	0.44
16.0	710	2340	0.45
16.5	990	2090	0.36
17.0	920	2180	0.39
17.5	1560	2640	0.23
18.0	1170	3030	0.41
18.5	1020	2710	0.42
19.0	900	2260	0.41
19.5	840	2230	0.42
20.0	1170	2570	0.37

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-10**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
67.3	4760	10580	0.37
68.9	4270	9260	0.36
70.5	2920	9660	0.45
72.2	3120	8890	0.43
73.8	2510	6870	0.42
75.5	2780	6410	0.38
77.1	2870	8030	0.43
78.7	3060	8230	0.42
80.4	2960	7330	0.40
82.0	3510	9130	0.41
83.7	4330	7490	0.25
85.3	4140	9260	0.38
86.9	3680	10420	0.43
88.6	2460	9010	0.46
90.2	5420	6170	-1.18
91.9	4470	9130	0.34
93.5	5510	9390	0.24
95.1	4600	10260	0.37
96.8	4330	11490	0.42
98.4	3790	11490	0.44
100.1	3530	10420	0.44
101.7	2840	10260	0.46
103.4	3160	8030	0.41
105.0	2920	9130	0.44
106.6	3440	11110	0.45
108.3	3440	9010	0.41
109.9	3530	8330	0.39
111.6	4540	9010	0.33
113.2	5170	9800	0.31
114.8	3240	9010	0.43
116.5	3170	8230	0.41
118.1	2800	8030	0.43
119.8	2850	9260	0.45
121.4	3450	8660	0.41
123.0	5090	10420	0.34
124.7	3750	10580	0.43
126.3	2590	8030	0.44
128.0	2030	6470	0.45
129.6	2750	7250	0.42

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
20.5	1450	3230	0.37
21.0	1300	2820	0.36
21.5	890	2940	0.45
22.0	950	2710	0.43
22.5	760	2090	0.42
23.0	850	1950	0.38
23.5	880	2450	0.43
24.0	930	2510	0.42
24.5	900	2230	0.40
25.0	1070	2780	0.41
25.5	1320	2280	0.25
26.0	1260	2820	0.38
26.5	1120	3180	0.43
27.0	750	2750	0.46
27.5	1650	1880	-1.18
28.0	1360	2780	0.34
28.5	1680	2860	0.24
29.0	1400	3130	0.37
29.5	1320	3500	0.42
30.0	1150	3500	0.44
30.5	1080	3180	0.44
31.0	860	3130	0.46
31.5	960	2450	0.41
32.0	890	2780	0.44
32.5	1050	3390	0.45
33.0	1050	2750	0.41
33.5	1080	2540	0.39
34.0	1380	2750	0.33
34.5	1580	2990	0.31
35.0	990	2750	0.43
35.5	970	2510	0.41
36.0	850	2450	0.43
36.5	870	2820	0.45
37.0	1050	2640	0.41
37.5	1550	3180	0.34
38.0	1140	3230	0.43
38.5	790	2450	0.44
39.0	620	1970	0.45
39.5	840	2210	0.42

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-10**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
131.2	2020	7580	0.46
132.9	2660	8330	0.44
134.5	6800	14490	0.36
136.2	4470	10930	0.40
137.8	4570	12580	0.42
139.4	4190	9950	0.39
141.1	6230	11700	0.30
142.7	3940	9260	0.39
144.4	3000	8230	0.42
146.0	3620	10750	0.44
147.6	3680	10580	0.43
149.3	3510	10260	0.43
150.9	3880	10260	0.42
152.6	3170	9950	0.44
154.2	4300	9950	0.39
155.8	3240	10580	0.45
157.5	3450	9800	0.43
159.1	3420	10100	0.44
160.8	3490	6800	0.32
162.4	3190	7750	0.40
164.0	3140	9260	0.43
165.7	3550	9520	0.42
167.3	3220	8770	0.42
169.0	3240	10580	0.45
170.6	5510	12580	0.38
172.2	6540	12580	0.32
173.9	4020	13070	0.45
175.5	5130	11110	0.36
177.2	3250	7410	0.38
178.8	5900	12120	0.34
180.5	4170	10260	0.40
182.1	6170	10260	0.22
183.7	7840	16670	0.36
185.4	5750	15500	0.42
187.0	6670	13890	0.35
188.7	4870	13890	0.43
190.3	5050	11700	0.39
191.9	4170	12350	0.44
193.6	5290	13610	0.41

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.0	620	2310	0.46
40.5	810	2540	0.44
41.0	2070	4420	0.36
41.5	1360	3330	0.40
42.0	1390	3830	0.42
42.5	1280	3030	0.39
43.0	1900	3560	0.30
43.5	1200	2820	0.39
44.0	920	2510	0.42
44.5	1100	3280	0.44
45.0	1120	3230	0.43
45.5	1070	3130	0.43
46.0	1180	3130	0.42
46.5	970	3030	0.44
47.0	1310	3030	0.39
47.5	990	3230	0.45
48.0	1050	2990	0.43
48.5	1040	3080	0.44
49.0	1060	2070	0.32
49.5	970	2360	0.40
50.0	960	2820	0.43
50.5	1080	2900	0.42
51.0	980	2670	0.42
51.5	990	3230	0.45
52.0	1680	3830	0.38
52.5	1990	3830	0.32
53.0	1220	3980	0.45
53.5	1560	3390	0.36
54.0	990	2260	0.38
54.5	1800	3690	0.34
55.0	1270	3130	0.40
55.5	1880	3130	0.22
56.0	2390	5080	0.36
56.5	1750	4730	0.42
57.0	2030	4230	0.35
57.5	1480	4230	0.43
58.0	1540	3560	0.39
58.5	1270	3760	0.44
59.0	1610	4150	0.41

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Receiver-to-Receiver Travel Time Data - Borehole I-10**

American Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
195.2	6120	12120	0.33
196.9	4360	11700	0.42
198.5	3070	10580	0.45
200.1	3990	9800	0.40
201.8	3700	9660	0.41
203.4	4220	8550	0.34
205.1	4270	11110	0.41
206.7	4540	9520	0.35
208.3	3140	9390	0.44
210.0	4040	7410	0.29
211.6	2770	8230	0.44
213.3	3240	9520	0.43
214.9	3250	9010	0.43
216.5	3270	9800	0.44
218.2	3750	9800	0.41
219.8	2790	8660	0.44
221.5	4250	9520	0.38
223.1	4120	10260	0.40
224.7	3030	8890	0.43
226.4	4070	9800	0.40
228.0	4270	9010	0.35
229.7	4020	9520	0.39
231.3	2840	8130	0.43
232.9	3240	9130	0.43
234.6	4170	9010	0.36
236.2	2940	11900	0.47
237.9	3140	8230	0.41
239.5	2410	7750	0.45
241.1	2900	8330	0.43
242.8	3510	8660	0.40
244.4	3440	8440	0.40
246.1	3600	8660	0.40
247.7	3450	8230	0.39
249.3	2940	7940	0.42
251.0	3090	7660	0.40
252.6	3440	8030	0.39
254.3	3510	8660	0.40

Metric Units			
Depth at Midpoint Between Receivers	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
59.5	1860	3690	0.33
60.0	1330	3560	0.42
60.5	940	3230	0.45
61.0	1220	2990	0.40
61.5	1130	2940	0.41
62.0	1290	2610	0.34
62.5	1300	3390	0.41
63.0	1380	2900	0.35
63.5	960	2860	0.44
64.0	1230	2260	0.29
64.5	840	2510	0.44
65.0	990	2900	0.43
65.5	990	2750	0.43
66.0	1000	2990	0.44
66.5	1140	2990	0.41
67.0	850	2640	0.44
67.5	1290	2900	0.38
68.0	1250	3130	0.40
68.5	920	2710	0.43
69.0	1240	2990	0.40
69.5	1300	2750	0.35
70.0	1220	2900	0.39
70.5	860	2480	0.43
71.0	990	2780	0.43
71.5	1270	2750	0.36
72.0	900	3630	0.47
72.5	960	2510	0.41
73.0	730	2360	0.45
73.5	880	2540	0.43
74.0	1070	2640	0.40
74.5	1050	2570	0.40
75.0	1100	2640	0.40
75.5	1050	2510	0.39
76.0	900	2420	0.42
76.5	940	2340	0.40
77.0	1050	2450	0.39
77.5	1070	2640	0.40

Notes: "-" means no data available at that particular interval of depth.

Deviated borehole in orthographic projection, viewed from N221

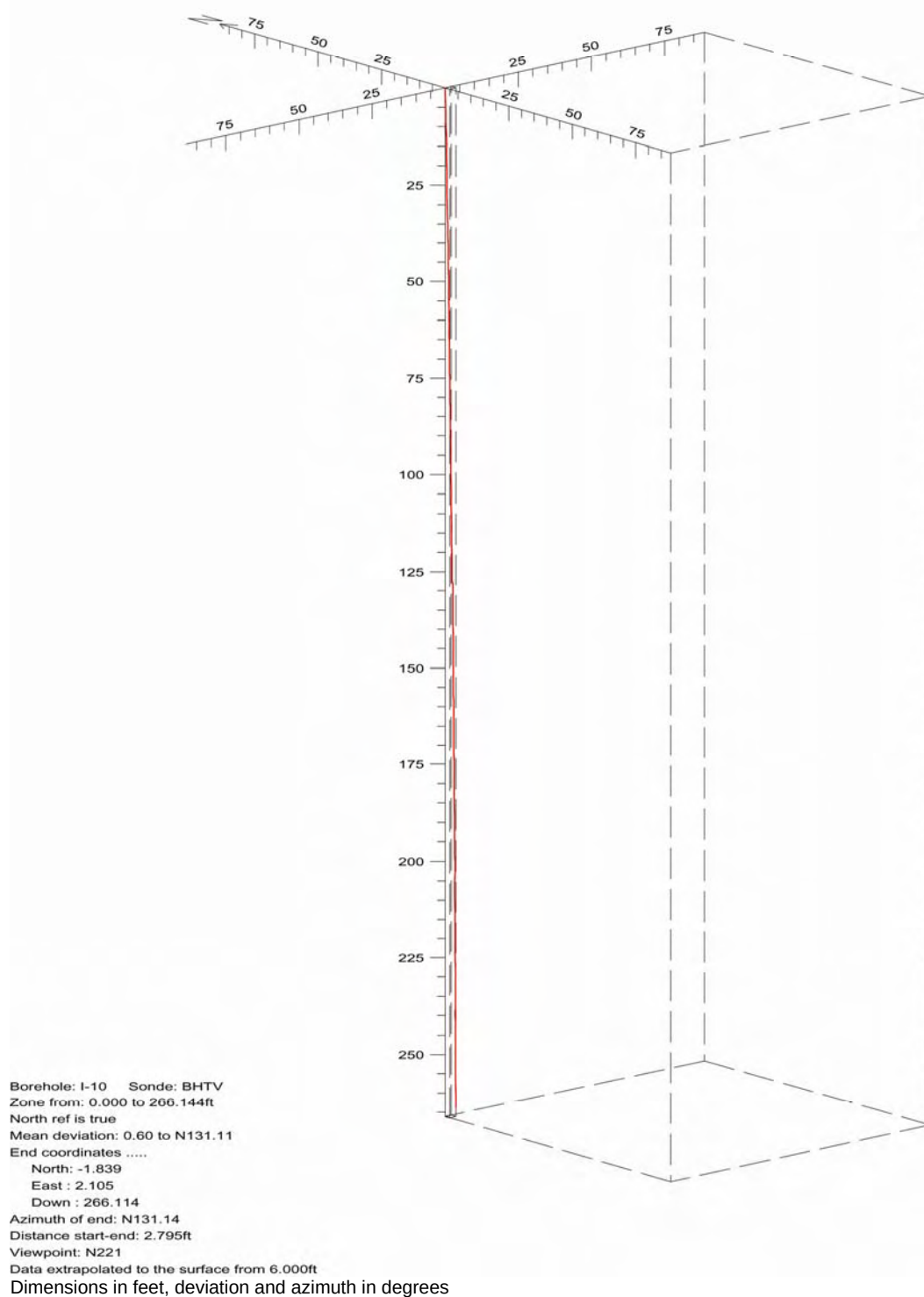


Figure 32: Boring I-10, Deviation Orthographic Projection

REFERENCES

A detailed reference for the suspension 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.

APPENDIX A

SUSPENSION VELOCITY MEASUREMENT QUALITY ASSURANCE SUSPENSION SOURCE TO RECEIVER ANALYSIS RESULTS

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LEVY COUNTY COLA BORING A-7 (ROTARY MUD, UNCASSED)
Source to Receiver and Receiver to Receiver Analysis

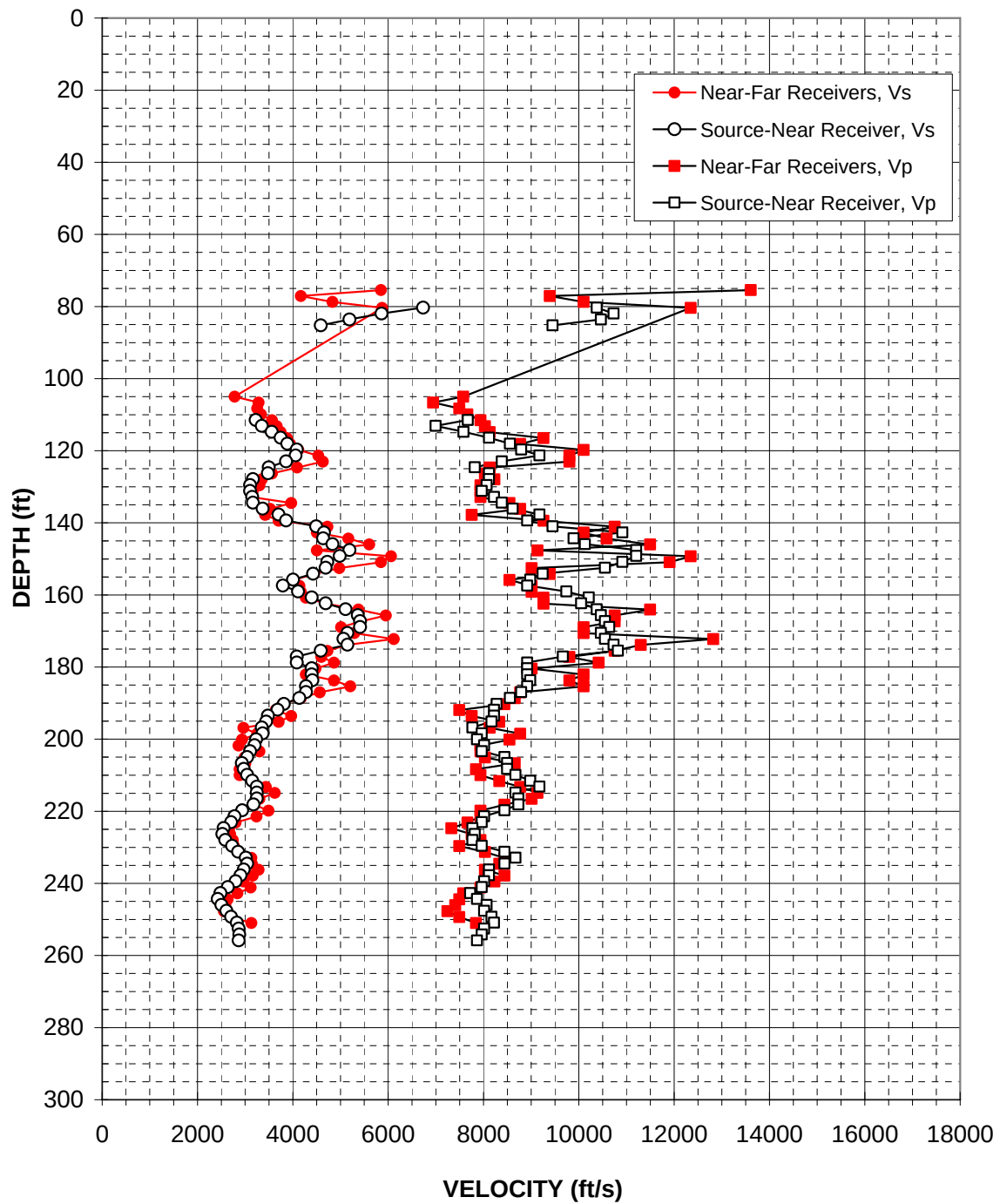


Figure A-1: Boring A-7, Suspension S-R1 P- and S_H -wave velocities

Table A-1. Boring A-7, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-7**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
	(ft/s)	(ft/s)	
80.3	6730	10380	0.14
81.9	5860	10730	0.29
83.6	5190	10460	0.34
85.2	4590	9450	0.35
-	-	-	-
111.5	3220	7670	0.39
113.1	3350	6990	0.35
114.7	3560	7580	0.36
116.4	3750	8120	0.36
118.0	3880	8550	0.37
119.7	4080	8790	0.36
121.3	4060	9170	0.38
122.9	3860	8380	0.37
124.6	3500	7810	0.37
126.2	3480	8120	0.39
127.9	3170	8120	0.41
129.5	3100	8060	0.41
131.1	3100	7960	0.41
132.8	3150	8220	0.41
134.4	3170	8380	0.42
136.1	3370	8610	0.41
137.7	3700	9170	0.40
139.3	3860	8920	0.38
141.0	4490	9450	0.35
142.6	4650	10910	0.39
144.3	4640	9890	0.36
145.9	4830	10130	0.35
147.6	5190	11200	0.36
149.2	4980	11200	0.38
150.8	4720	10910	0.38
152.5	4690	10550	0.38
154.1	4430	9240	0.35
155.8	4010	8980	0.38
157.4	3790	8920	0.39
159.0	4110	9740	0.39
160.7	4400	10210	0.39
162.3	4690	10050	0.36

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
	(m/s)	(m/s)	
24.5	2050	3160	0.14
25.0	1790	3270	0.29
25.5	1580	3190	0.34
26.0	1400	2880	0.35
-	-	-	-
34.0	980	2340	0.39
34.5	1020	2130	0.35
35.0	1080	2310	0.36
35.5	1140	2470	0.36
36.0	1180	2610	0.37
36.5	1240	2680	0.36
37.0	1240	2800	0.38
37.5	1180	2560	0.37
38.0	1070	2380	0.37
38.5	1060	2470	0.39
39.0	960	2470	0.41
39.5	950	2460	0.41
40.0	950	2430	0.41
40.5	960	2510	0.41
41.0	960	2560	0.42
41.5	1030	2630	0.41
42.0	1130	2800	0.40
42.5	1180	2720	0.38
43.0	1370	2880	0.35
43.5	1420	3330	0.39
44.0	1410	3010	0.36
44.5	1470	3090	0.35
45.0	1580	3410	0.36
45.5	1520	3410	0.38
46.0	1440	3330	0.38
46.5	1430	3220	0.38
47.0	1350	2820	0.35
47.5	1220	2740	0.38
48.0	1160	2720	0.39
48.5	1250	2970	0.39
49.0	1340	3110	0.39
49.5	1430	3060	0.36

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-7**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
164.0	5100	10380	0.34
165.6	5360	10460	0.32
167.2	5410	10550	0.32
168.9	5410	10640	0.33
170.5	5150	10460	0.34
172.2	5060	10550	0.35
173.8	5150	10730	0.35
175.4	4590	10820	0.39
177.1	4080	9660	0.39
178.7	4080	8920	0.37
180.4	4400	8920	0.34
182.0	4400	8920	0.34
183.6	4410	8980	0.34
185.3	4280	8920	0.35
186.9	4280	8790	0.34
188.6	4140	8550	0.35
190.2	3810	8270	0.37
191.8	3680	8220	0.37
193.5	3480	8220	0.39
195.1	3440	8170	0.39
196.8	3350	7770	0.39
198.4	3370	7960	0.39
200.0	3230	7860	0.40
201.7	3200	8010	0.41
203.3	3100	7960	0.41
205.0	3040	8440	0.43
206.6	2930	8500	0.43
208.2	2970	8500	0.43
209.9	3040	8670	0.43
211.5	3150	8980	0.43
213.2	3250	9170	0.43
214.8	3250	8670	0.42
216.4	3250	8730	0.42
218.1	3170	8730	0.42
219.7	2940	8440	0.43
221.4	2780	8010	0.43
223.0	2710	7960	0.43
224.7	2550	7770	0.44
226.3	2520	7810	0.44

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
50.0	1560	3160	0.34
50.5	1640	3190	0.32
51.0	1650	3220	0.32
51.5	1650	3240	0.33
52.0	1570	3190	0.34
52.5	1540	3220	0.35
53.0	1570	3270	0.35
53.5	1400	3300	0.39
54.0	1240	2950	0.39
54.5	1240	2720	0.37
55.0	1340	2720	0.34
55.5	1340	2720	0.34
56.0	1340	2740	0.34
56.5	1300	2720	0.35
57.0	1300	2680	0.34
57.5	1260	2610	0.35
58.0	1160	2520	0.37
58.5	1120	2510	0.37
59.0	1060	2510	0.39
59.5	1050	2490	0.39
60.0	1020	2370	0.39
60.5	1030	2430	0.39
61.0	980	2400	0.40
61.5	970	2440	0.41
62.0	950	2430	0.41
62.5	930	2570	0.43
63.0	890	2590	0.43
63.5	910	2590	0.43
64.0	930	2640	0.43
64.5	960	2740	0.43
65.0	990	2800	0.43
65.5	990	2640	0.42
66.0	990	2660	0.42
66.5	970	2660	0.42
67.0	900	2570	0.43
67.5	850	2440	0.43
68.0	820	2430	0.43
68.5	780	2370	0.44
69.0	770	2380	0.44

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-7**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
227.9	2580	7770	0.44
229.6	2730	7960	0.43
231.2	2850	8440	0.44
232.9	3010	8670	0.43
234.5	3040	8440	0.43
236.1	2970	8120	0.42
237.8	2900	8120	0.43
239.4	2800	8010	0.43
241.1	2640	7960	0.44
242.7	2480	7720	0.44
244.3	2430	7860	0.45
246.0	2500	8060	0.45
247.6	2600	8010	0.44
249.3	2710	8170	0.44
250.9	2830	8220	0.43
252.5	2860	8010	0.43
254.2	2880	7960	0.42
255.8	2860	7860	0.42

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
69.5	790	2370	0.44
70.0	830	2430	0.43
70.5	870	2570	0.44
71.0	920	2640	0.43
71.5	930	2570	0.43
72.0	910	2470	0.42
72.5	890	2470	0.43
73.0	850	2440	0.43
73.5	800	2430	0.44
74.0	760	2350	0.44
74.5	740	2400	0.45
75.0	760	2460	0.45
75.5	790	2440	0.44
76.0	820	2490	0.44
76.5	860	2510	0.43
77.0	870	2440	0.43
77.5	880	2430	0.42
78.0	870	2400	0.42

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING A-8 (UNCASED) **Source to Receiver and Receiver to Receiver Analysis**

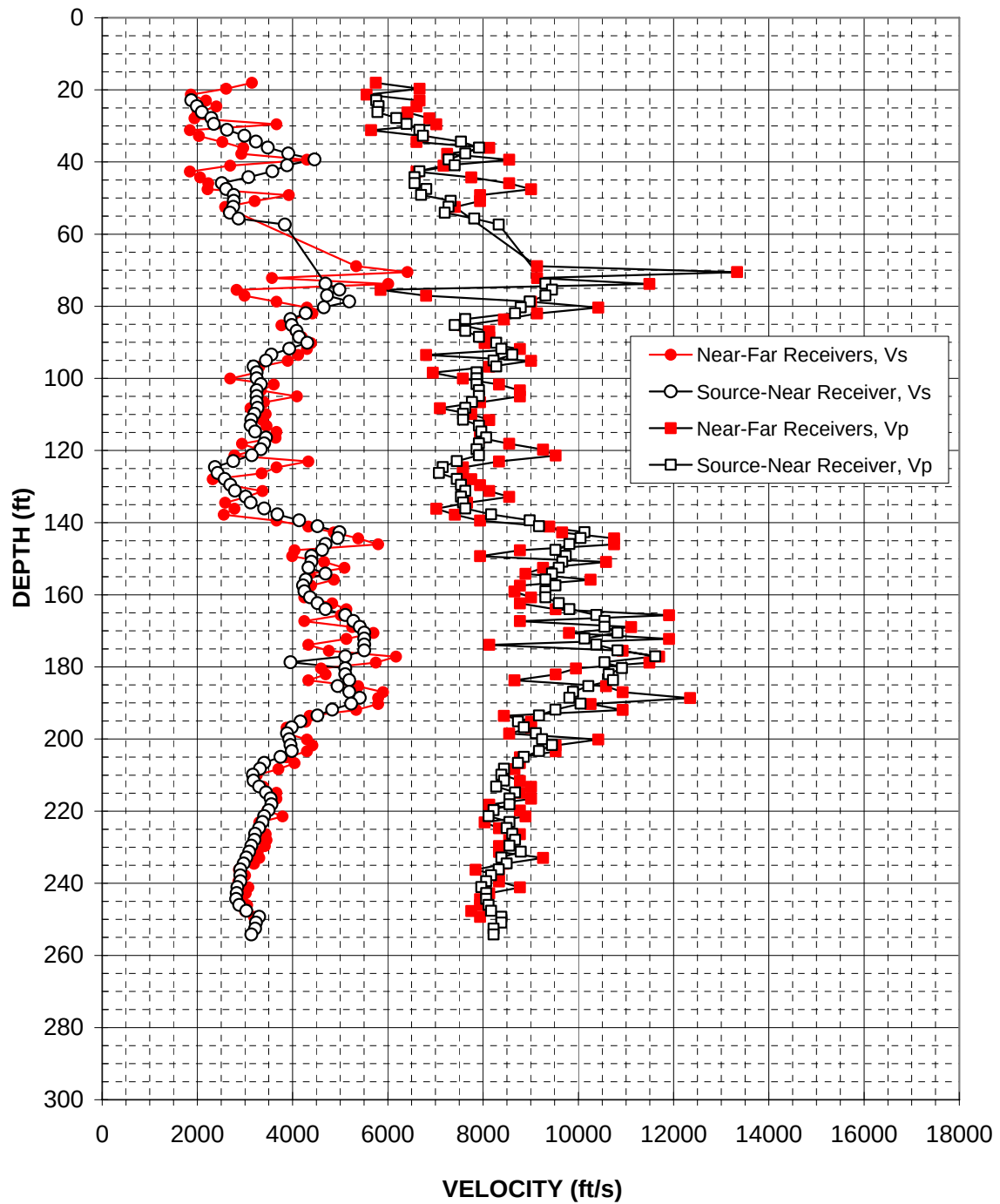


Figure A-2: Boring A-8, Suspension S-R1 P- and S_H-wave velocities

Table A-2. Boring A-8, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-8**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's s Ratio
	V _s	V _p			V _s	V _p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
22.9	1870	5750	0.44	7.0	570	1750	0.44
24.5	1990	5810	0.43	7.5	610	1770	0.43
26.2	2090	5780	0.42	8.0	640	1760	0.42
27.8	2290	6180	0.42	8.5	700	1880	0.42
29.4	2340	6390	0.42	9.0	710	1950	0.42
31.1	2620	6660	0.41	9.5	800	2030	0.41
32.7	2990	6730	0.38	10.0	910	2050	0.38
34.4	3230	7540	0.39	10.5	980	2300	0.39
36.0	3480	7910	0.38	11.0	1060	2410	0.38
37.6	3910	7630	0.32	11.5	1190	2320	0.32
39.3	4460	7280	0.20	12.0	1360	2220	0.20
40.9	3880	7400	0.31	12.5	1180	2260	0.31
42.6	3580	6660	0.30	13.0	1090	2030	0.30
44.2	3070	6560	0.36	13.5	940	2000	0.36
45.8	2510	6560	0.41	14.0	770	2000	0.41
47.5	2600	6810	0.41	14.5	790	2070	0.41
49.1	2760	6700	0.40	15.0	840	2040	0.40
50.8	2760	7320	0.42	15.5	840	2230	0.42
52.4	2750	7280	0.42	16.0	840	2220	0.42
54.0	2680	7190	0.42	16.5	820	2190	0.42
55.7	2860	7810	0.42	17.0	870	2380	0.42
57.3	3840	8330	0.37	17.5	1170	2540	0.37
73.7	4690	9310	0.33	22.5	1430	2840	0.33
75.4	4980	9450	0.31	23.0	1520	2880	0.31
77.0	4720	9310	0.33	23.5	1440	2840	0.33
78.7	5190	8980	0.25	24.0	1580	2740	0.25
80.3	4650	8790	0.31	24.5	1420	2680	0.31
81.9	4280	8670	0.34	25.0	1300	2640	0.34
83.6	3960	7630	0.32	25.5	1210	2320	0.32
85.2	3980	7400	0.30	26.0	1210	2260	0.30
86.9	4080	7630	0.30	26.5	1240	2320	0.30
88.5	4140	7910	0.31	27.0	1260	2410	0.31
90.1	4310	8270	0.31	27.5	1310	2520	0.31
91.8	3930	8380	0.36	28.0	1200	2560	0.36
93.4	3560	8610	0.40	28.5	1080	2630	0.40
95.1	3440	8220	0.39	29.0	1050	2510	0.39
96.7	3180	8270	0.41	29.5	970	2520	0.41

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-8**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
98.3	3250	7860	0.40
100.0	3250	7860	0.40
101.6	3330	7860	0.39
103.3	3250	7910	0.40
104.9	3250	7910	0.40
106.5	3250	7770	0.39
108.2	3260	7630	0.39
109.8	3200	7580	0.39
111.5	3130	7580	0.40
113.1	3120	7910	0.41
114.7	3210	7960	0.40
116.4	3440	8060	0.39
118.0	3400	7910	0.39
119.7	3330	7860	0.39
121.3	3140	7910	0.41
122.9	2750	7450	0.42
124.6	2370	7150	0.44
126.2	2430	7070	0.43
127.9	2570	7450	0.43
129.5	2690	7540	0.43
131.1	2790	7630	0.42
132.8	3010	7540	0.40
134.4	3120	7580	0.40
136.1	3400	7630	0.38
137.7	3680	8170	0.37
139.3	4140	8980	0.37
141.0	4520	9170	0.34
142.6	4980	10130	0.34
144.3	4950	10050	0.34
145.9	4690	9810	0.35
147.6	4620	9520	0.35
149.2	4400	9740	0.37
150.8	4400	9660	0.37
152.5	4340	9590	0.37
154.1	4690	9450	0.34
155.8	4280	9310	0.37
157.4	4220	9520	0.38
159.0	4250	9310	0.37
160.7	4370	9310	0.36

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
30.0	990	2400	0.40
30.5	990	2400	0.40
31.0	1020	2400	0.39
31.5	990	2410	0.40
32.0	990	2410	0.40
32.5	990	2370	0.39
33.0	990	2320	0.39
33.5	970	2310	0.39
34.0	960	2310	0.40
34.5	950	2410	0.41
35.0	980	2430	0.40
35.5	1050	2460	0.39
36.0	1040	2410	0.39
36.5	1020	2400	0.39
37.0	960	2410	0.41
37.5	840	2270	0.42
38.0	720	2180	0.44
38.5	740	2160	0.43
39.0	780	2270	0.43
39.5	820	2300	0.43
40.0	850	2320	0.42
40.5	920	2300	0.40
41.0	950	2310	0.40
41.5	1040	2320	0.38
42.0	1120	2490	0.37
42.5	1260	2740	0.37
43.0	1380	2800	0.34
43.5	1520	3090	0.34
44.0	1510	3060	0.34
44.5	1430	2990	0.35
45.0	1410	2900	0.35
45.5	1340	2970	0.37
46.0	1340	2950	0.37
46.5	1320	2920	0.37
47.0	1430	2880	0.34
47.5	1300	2840	0.37
48.0	1290	2900	0.38
48.5	1290	2840	0.37
49.0	1330	2840	0.36

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-8**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
162.3	4520	9590	0.36
164.0	4690	9810	0.35
165.6	5100	10380	0.34
167.2	5280	10550	0.33
168.9	5410	10550	0.32
170.5	5500	10820	0.33
172.2	5500	10130	0.29
173.8	5500	10380	0.30
175.4	5500	10820	0.33
177.1	5100	11610	0.38
178.7	3960	10550	0.42
180.4	5100	10910	0.36
182.0	5100	10640	0.35
183.6	5190	10730	0.35
185.3	4950	10210	0.35
186.9	5190	9890	0.31
188.6	5410	9810	0.28
190.2	5230	10050	0.31
191.8	4830	9520	0.33
193.5	4520	9170	0.34
195.1	4160	8730	0.35
196.8	3980	8850	0.37
198.4	3880	9110	0.39
200.0	3930	9240	0.39
201.7	3960	9450	0.39
203.3	3980	9170	0.38
205.0	3750	8850	0.39
206.6	3400	8730	0.41
208.2	3310	8440	0.41
209.9	3170	8380	0.42
211.5	3180	8440	0.42
213.2	3300	8270	0.41
214.8	3440	8670	0.41
216.4	3540	8550	0.40
218.1	3560	8550	0.40
219.7	3500	8220	0.39
221.4	3400	8120	0.39
223.0	3370	8550	0.41
224.7	3300	8500	0.41

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
49.5	1380	2920	0.36
50.0	1430	2990	0.35
50.5	1560	3160	0.34
51.0	1610	3220	0.33
51.5	1650	3220	0.32
52.0	1680	3300	0.33
52.5	1680	3090	0.29
53.0	1680	3160	0.30
53.5	1680	3300	0.33
54.0	1560	3540	0.38
54.5	1210	3220	0.42
55.0	1560	3330	0.36
55.5	1560	3240	0.35
56.0	1580	3270	0.35
56.5	1510	3110	0.35
57.0	1580	3010	0.31
57.5	1650	2990	0.28
58.0	1590	3060	0.31
58.5	1470	2900	0.33
59.0	1380	2800	0.34
59.5	1270	2660	0.35
60.0	1210	2700	0.37
60.5	1180	2780	0.39
61.0	1200	2820	0.39
61.5	1210	2880	0.39
62.0	1210	2800	0.38
62.5	1140	2700	0.39
63.0	1040	2660	0.41
63.5	1010	2570	0.41
64.0	960	2560	0.42
64.5	970	2570	0.42
65.0	1000	2520	0.41
65.5	1050	2640	0.41
66.0	1080	2610	0.40
66.5	1080	2610	0.40
67.0	1070	2510	0.39
67.5	1040	2470	0.39
68.0	1030	2610	0.41
68.5	1000	2590	0.41

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-8**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
226.3	3210	8610	0.42
227.9	3200	8670	0.42
229.6	3130	8550	0.42
231.2	3090	8790	0.43
232.9	3030	8380	0.42
234.5	2970	8500	0.43
236.1	2900	8330	0.43
237.8	2900	8170	0.43
239.4	2900	8060	0.43
241.1	2840	7960	0.43
242.7	2830	8060	0.43
244.3	2810	8060	0.43
246.0	2880	8120	0.43
247.6	3030	8170	0.42
249.3	3300	8380	0.41
250.9	3230	8380	0.41
252.5	3210	8220	0.41
254.2	3130	8220	0.41

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
69.0	980	2630	0.42
69.5	970	2640	0.42
70.0	960	2610	0.42
70.5	940	2680	0.43
71.0	920	2560	0.42
71.5	910	2590	0.43
72.0	890	2540	0.43
72.5	890	2490	0.43
73.0	890	2460	0.43
73.5	870	2430	0.43
74.0	860	2460	0.43
74.5	860	2460	0.43
75.0	880	2470	0.43
75.5	920	2490	0.42
76.0	1000	2560	0.41
76.5	980	2560	0.41
77.0	980	2510	0.41
77.5	960	2510	0.41

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING A-19 (UNCASED)
Source to Receiver and Receiver to Receiver Analysis

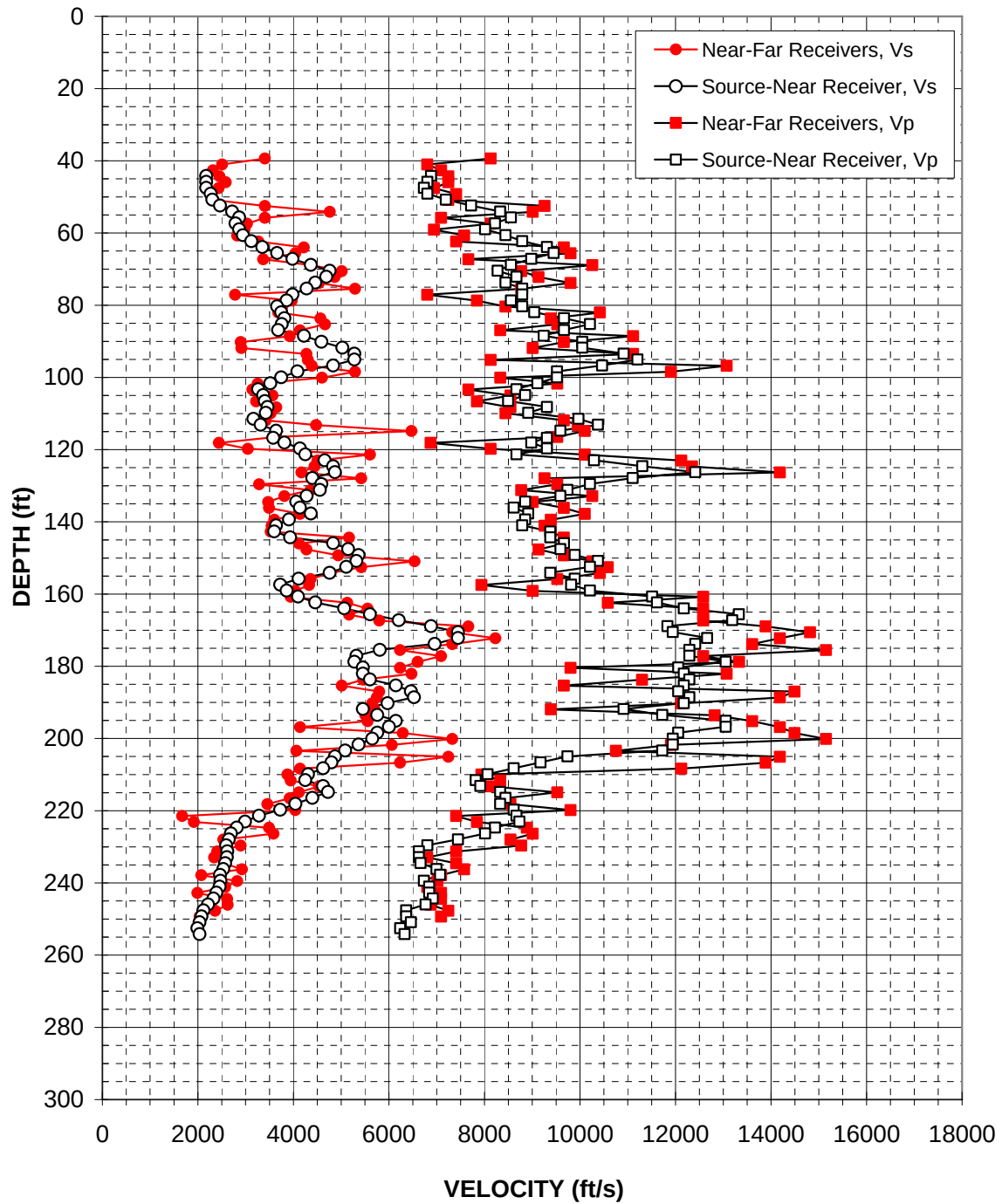


Figure A-3. Boring A-19, Suspension S-R1 P- and S_H -wave velocities

Table A-3. Boring A-19, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-19**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
44.2	2180	6880	0.44	13.5	660	2100	0.44
45.8	2180	6810	0.44	14.0	660	2070	0.44
47.5	2180	6730	0.44	14.5	660	2050	0.44
49.1	2270	6810	0.44	15.0	690	2070	0.44
50.8	2300	7190	0.44	15.5	700	2190	0.44
52.4	2460	7720	0.44	16.0	750	2350	0.44
54.0	2720	8330	0.44	16.5	830	2540	0.44
55.7	2860	8550	0.44	17.0	870	2610	0.44
57.3	2790	8220	0.43	17.5	850	2510	0.43
59.0	2860	8010	0.43	18.0	870	2440	0.43
60.6	2940	8440	0.43	18.5	900	2570	0.43
62.2	3120	8790	0.43	19.0	950	2680	0.43
63.9	3350	9310	0.43	19.5	1020	2840	0.43
65.5	3660	9450	0.41	20.0	1120	2880	0.41
67.2	3980	8980	0.38	20.5	1210	2740	0.38
68.8	4370	8550	0.32	21.0	1330	2610	0.32
70.5	4760	8270	0.25	21.5	1450	2520	0.25
72.1	4690	8670	0.29	22.0	1430	2640	0.29
73.7	4460	8440	0.31	22.5	1360	2570	0.31
75.4	4280	8790	0.34	23.0	1300	2680	0.34
77.0	3980	8790	0.37	23.5	1210	2680	0.37
78.7	3860	8550	0.37	24.0	1180	2610	0.37
80.3	3660	8790	0.40	24.5	1120	2680	0.40
81.9	3750	9040	0.40	25.0	1140	2760	0.40
83.6	3810	9660	0.41	25.5	1160	2950	0.41
85.2	3760	10210	0.42	26.0	1150	3110	0.42
86.9	3680	9660	0.42	26.5	1120	2950	0.42
88.5	4220	9240	0.37	27.0	1290	2820	0.37
90.1	4590	10050	0.37	27.5	1400	3060	0.37
91.8	5020	10050	0.33	28.0	1530	3060	0.33
93.4	5280	10910	0.35	28.5	1610	3330	0.35
95.1	5280	11200	0.36	29.0	1610	3410	0.36
96.7	4830	10460	0.36	29.5	1470	3190	0.36
98.3	4080	9520	0.39	30.0	1240	2900	0.39
100.0	3750	9520	0.41	30.5	1140	2900	0.41
101.6	3520	9110	0.41	31.0	1070	2780	0.41

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-19**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
103.3	3260	8670	0.42
104.9	3370	8850	0.42
106.5	3400	8500	0.40
108.2	3460	9310	0.42
109.8	3420	8920	0.41
111.5	3170	9970	0.44
113.1	3310	10380	0.44
114.7	3640	9590	0.42
116.7	3580	9310	0.41
118.0	3810	8980	0.39
119.7	4140	9310	0.38
121.3	4250	8670	0.34
122.9	4650	10290	0.37
124.6	4830	11300	0.39
126.2	4870	12410	0.41
127.9	4400	11110	0.41
129.5	4590	10210	0.37
131.1	4550	9740	0.36
132.8	4280	9590	0.38
134.4	4060	8850	0.37
136.1	4140	8610	0.35
137.7	4370	8920	0.34
139.3	3910	8850	0.38
141.0	3640	8790	0.40
142.6	3600	9380	0.41
144.3	3930	9380	0.39
145.9	4830	9660	0.33
147.6	5150	9590	0.30
149.2	5360	9890	0.29
150.8	5320	10380	0.32
152.5	5100	10210	0.33
154.1	4760	9380	0.33
155.8	4110	9890	0.40
157.4	3720	9810	0.42
159.0	3860	10210	0.42
160.7	4100	11510	0.43
162.3	4460	11610	0.41
164.0	5060	12170	0.40
165.6	5600	13330	0.39

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
31.5	990	2640	0.42
32.0	1030	2700	0.42
32.5	1040	2590	0.40
33.0	1050	2840	0.42
33.5	1040	2720	0.41
34.0	960	3040	0.44
34.5	1010	3160	0.44
35.0	1110	2920	0.42
35.6	1090	2840	0.41
36.0	1160	2740	0.39
36.5	1260	2840	0.38
37.0	1290	2640	0.34
37.5	1420	3140	0.37
38.0	1470	3450	0.39
38.5	1480	3780	0.41
39.0	1340	3380	0.41
39.5	1400	3110	0.37
40.0	1390	2970	0.36
40.5	1300	2920	0.38
41.0	1240	2700	0.37
41.5	1260	2630	0.35
42.0	1330	2720	0.34
42.5	1190	2700	0.38
43.0	1110	2680	0.40
43.5	1100	2860	0.41
44.0	1200	2860	0.39
44.5	1470	2950	0.33
45.0	1570	2920	0.30
45.5	1640	3010	0.29
46.0	1620	3160	0.32
46.5	1560	3110	0.33
47.0	1450	2860	0.33
47.5	1250	3010	0.40
48.0	1130	2990	0.42
48.5	1180	3110	0.42
49.0	1250	3510	0.43
49.5	1360	3540	0.41
50.0	1540	3710	0.40
50.5	1710	4060	0.39

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-19**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
167.2	6210	13190	0.36
168.9	6880	11830	0.24
170.5	7450	11940	0.18
172.2	7450	12660	0.24
173.8	6960	12410	0.27
175.4	5810	12290	0.36
177.1	5320	12290	0.38
178.7	5280	13050	0.40
180.4	5460	12060	0.37
182.0	5460	12170	0.37
183.6	5600	12290	0.37
185.3	6150	12170	0.33
186.9	6460	12060	0.30
188.6	6530	12290	0.30
190.2	5970	12170	0.34
191.8	5460	10910	0.33
193.5	5750	11720	0.34
195.1	6150	13050	0.36
196.8	6000	13050	0.37
198.4	5750	12060	0.35
200.0	5650	11940	0.36
201.7	5360	11940	0.37
203.3	5080	11720	0.38
205.0	4870	9740	0.33
206.6	4800	9170	0.31
208.2	4620	8610	0.30
209.9	4310	8060	0.30
211.5	4250	7810	0.29
213.2	4620	7910	0.24
214.8	4720	8330	0.26
216.4	4400	8440	0.31
218.1	4040	8330	0.35
219.7	3720	8610	0.39
221.4	3280	8670	0.42
223.0	2990	8730	0.43
224.7	2810	8220	0.43
226.3	2690	8010	0.44
227.9	2650	7450	0.43
229.6	2590	6810	0.42

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
51.0	1890	4020	0.36
51.5	2100	3610	0.24
52.0	2270	3640	0.18
52.5	2270	3860	0.24
53.0	2120	3780	0.27
53.5	1770	3750	0.36
54.0	1620	3750	0.38
54.5	1610	3980	0.40
55.0	1660	3680	0.37
55.5	1660	3710	0.37
56.0	1710	3750	0.37
56.5	1870	3710	0.33
57.0	1970	3680	0.30
57.5	1990	3750	0.30
58.0	1820	3710	0.34
58.5	1660	3330	0.33
59.0	1750	3570	0.34
59.5	1870	3980	0.36
60.0	1830	3980	0.37
60.5	1750	3680	0.35
61.0	1720	3640	0.36
61.5	1640	3640	0.37
62.0	1550	3570	0.38
62.5	1480	2970	0.33
63.0	1460	2800	0.31
63.5	1410	2630	0.30
64.0	1310	2460	0.30
64.5	1290	2380	0.29
65.0	1410	2410	0.24
65.5	1440	2540	0.26
66.0	1340	2570	0.31
66.5	1230	2540	0.35
67.0	1130	2630	0.39
67.5	1000	2640	0.42
68.0	910	2660	0.43
68.5	860	2510	0.43
69.0	820	2440	0.44
69.5	810	2270	0.43
70.0	790	2070	0.42

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-19**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
231.2	2620	6630	0.41
232.9	2600	6630	0.41
234.5	2570	6660	0.41
236.1	2530	6990	0.42
237.8	2460	7070	0.43
239.4	2470	6730	0.42
241.1	2450	6840	0.43
242.7	2390	6840	0.43
244.3	2330	6920	0.44
246.0	2210	6770	0.44
247.6	2120	6360	0.44
249.3	2080	6360	0.44
250.9	2040	6460	0.44
252.5	1990	6240	0.44
254.2	2040	6330	0.44

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
70.5	800	2020	0.41
71.0	790	2020	0.41
71.5	780	2030	0.41
72.0	770	2130	0.42
72.5	750	2160	0.43
73.0	750	2050	0.42
73.5	750	2090	0.43
74.0	730	2090	0.43
74.5	710	2110	0.44
75.0	670	2060	0.44
75.5	650	1940	0.44
76.0	630	1940	0.44
76.5	620	1970	0.44
77.0	610	1900	0.44
77.5	620	1930	0.44

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING A-20 (UNCASED) **Source to Receiver and Receiver to Receiver Analysis**

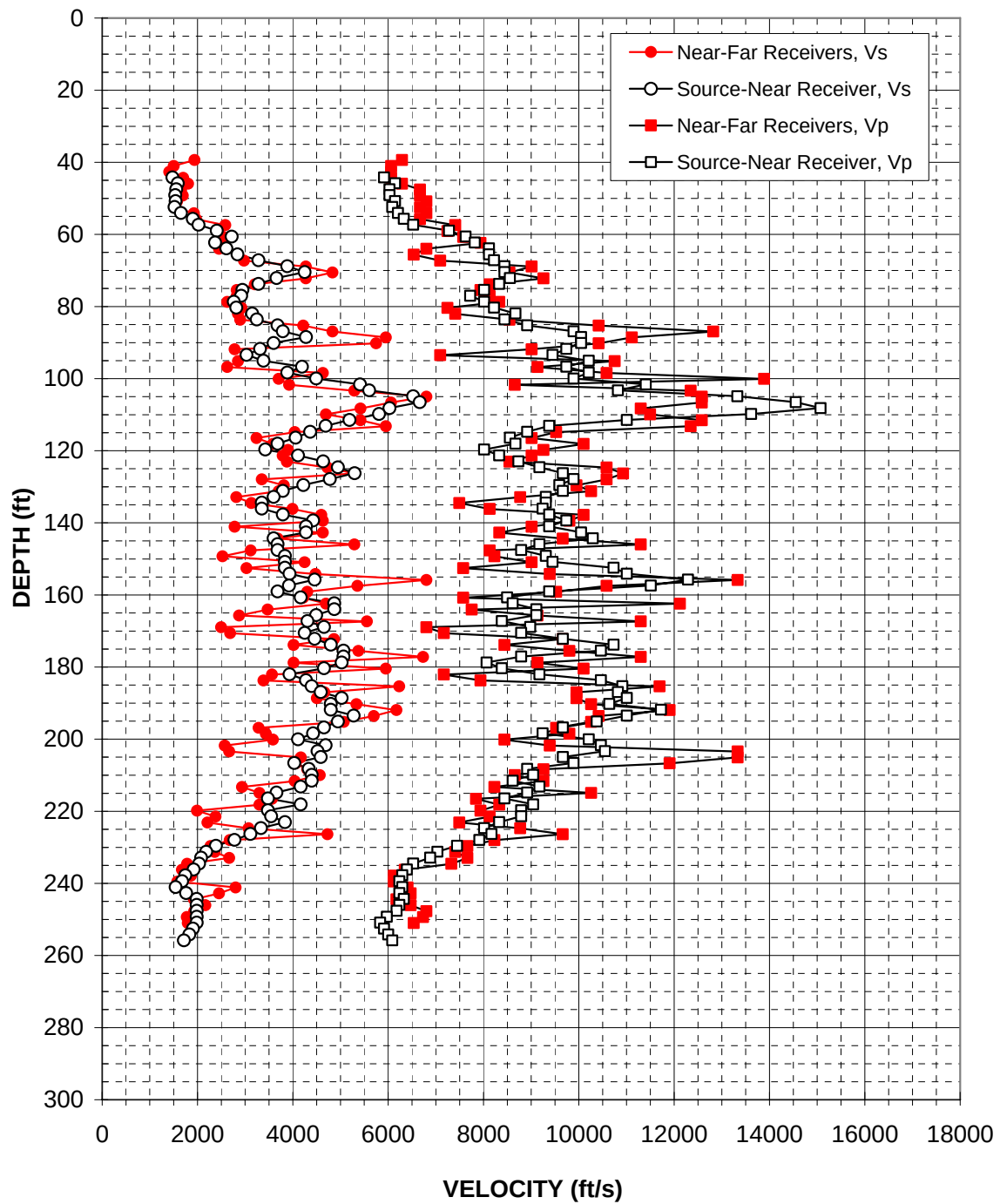


Figure A-4. Boring A-20, Suspension S-R1 P- and S_H -wave velocities

Table A-4. Boring A-20, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-20**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
	(ft/s)	(ft/s)			(m/s)	(m/s)	
44.2	1480	5920	0.47	13.5	450	1800	0.47
45.8	1590	6150	0.46	14.0	480	1870	0.46
47.5	1560	6030	0.46	14.5	470	1840	0.46
49.1	1530	6030	0.47	15.0	470	1840	0.47
50.8	1540	6150	0.47	15.5	470	1870	0.47
52.4	1520	6090	0.47	16.0	460	1860	0.47
54.0	1650	6210	0.46	16.5	500	1890	0.46
55.7	1900	6330	0.45	17.0	580	1930	0.45
57.3	2020	6530	0.45	17.5	620	1990	0.45
59.0	2410	7280	0.44	18.0	730	2220	0.44
60.6	2720	7630	0.43	18.5	830	2320	0.43
62.2	2370	7810	0.45	19.0	720	2380	0.45
63.9	2600	8120	0.44	19.5	790	2470	0.44
65.5	2840	8120	0.43	20.0	870	2470	0.43
67.2	3280	8220	0.41	20.5	1000	2510	0.41
68.8	3880	8440	0.37	21.0	1180	2570	0.37
70.5	4250	8440	0.33	21.5	1290	2570	0.33
72.1	3660	8550	0.39	22.0	1120	2610	0.39
73.7	3280	8330	0.41	22.5	1000	2540	0.41
75.4	2940	8010	0.42	23.0	900	2440	0.42
77.0	2920	7720	0.42	23.5	890	2350	0.42
78.7	2760	8010	0.43	24.0	840	2440	0.43
80.3	2810	8220	0.43	24.5	860	2510	0.43
81.9	3150	8670	0.42	25.0	960	2640	0.42
83.6	3250	8440	0.41	25.5	990	2570	0.41
85.2	3680	8920	0.40	26.0	1120	2720	0.40
86.9	3790	9890	0.41	26.5	1160	3010	0.41
88.5	4280	10050	0.39	27.0	1300	3060	0.39
90.1	3600	10050	0.43	27.5	1100	3060	0.43
91.8	3310	9740	0.43	28.0	1010	2970	0.43
93.4	3030	9450	0.44	28.5	920	2880	0.44
95.1	3390	10210	0.44	29.0	1030	3110	0.44
96.7	4190	9740	0.39	29.5	1280	2970	0.39
98.3	3880	10210	0.42	30.0	1180	3110	0.42
100.0	4490	9890	0.37	30.5	1370	3010	0.37
101.6	5410	11410	0.35	31.0	1650	3480	0.35

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-20**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
103.3	5600	10820	0.32
104.9	6530	13330	0.34
106.5	6660	14550	0.37
108.2	6030	15070	0.40
109.8	5810	13610	0.39
111.5	5190	11010	0.36
113.1	4690	9380	0.33
114.7	4370	8920	0.34
116.4	4060	8550	0.35
118.0	3680	8670	0.39
119.7	3420	8010	0.39
121.3	4110	8330	0.34
122.9	4640	8730	0.30
124.6	4950	9170	0.30
126.2	5300	9660	0.29
127.9	4780	9890	0.35
129.5	4220	9590	0.38
131.1	3790	9660	0.41
132.8	3600	9310	0.41
134.4	3350	9310	0.43
136.1	3350	9240	0.42
137.7	3790	9380	0.40
139.3	4430	9740	0.37
141.0	4280	9380	0.37
142.6	4280	10050	0.39
144.3	3600	10290	0.43
145.9	3680	9170	0.40
147.6	3680	8790	0.39
149.2	3840	9310	0.40
150.8	3840	9450	0.40
152.5	3840	10730	0.43
154.1	3930	11010	0.43
155.8	4460	12290	0.42
157.4	3920	11510	0.43
159.0	3680	9380	0.41
160.7	4160	8500	0.34
162.3	4870	8610	0.27
164.0	4870	9110	0.30
165.6	4490	9110	0.34

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
31.5	1710	3300	0.32
32.0	1990	4060	0.34
32.5	2030	4440	0.37
33.0	1840	4590	0.40
33.5	1770	4150	0.39
34.0	1580	3360	0.36
34.5	1430	2860	0.33
35.0	1330	2720	0.34
35.5	1240	2610	0.35
36.0	1120	2640	0.39
36.5	1040	2440	0.39
37.0	1250	2540	0.34
37.5	1410	2660	0.30
38.0	1510	2800	0.30
38.5	1610	2950	0.29
39.0	1460	3010	0.35
39.5	1290	2920	0.38
40.0	1160	2950	0.41
40.5	1100	2840	0.41
41.0	1020	2840	0.43
41.5	1020	2820	0.42
42.0	1160	2860	0.40
42.5	1350	2970	0.37
43.0	1300	2860	0.37
43.5	1300	3060	0.39
44.0	1100	3140	0.43
44.5	1120	2800	0.40
45.0	1120	2680	0.39
45.5	1170	2840	0.40
46.0	1170	2880	0.40
46.5	1170	3270	0.43
47.0	1200	3360	0.43
47.5	1360	3750	0.42
48.0	1190	3510	0.43
48.5	1120	2860	0.41
49.0	1270	2590	0.34
49.5	1480	2630	0.27
50.0	1480	2780	0.30
50.5	1370	2780	0.34

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-20**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
167.2	4310	8380	0.32
168.9	4650	8980	0.32
170.5	4250	8790	0.35
172.2	4460	9660	0.36
173.8	4800	10730	0.38
175.4	5060	10460	0.35
177.1	5060	8790	0.25
178.7	5020	8060	0.18
180.4	4650	8380	0.28
182.0	3930	9170	0.39
183.6	4280	10460	0.40
185.3	4400	10910	0.40
186.9	4590	10820	0.39
188.6	5020	11010	0.37
190.2	4800	10640	0.37
191.8	4800	11720	0.40
193.5	5280	11010	0.35
195.1	4950	10380	0.35
196.8	4650	9660	0.35
198.4	4430	9240	0.35
200.0	4110	10210	0.40
201.7	4690	10460	0.37
203.3	4520	10550	0.39
205.0	4590	9660	0.35
206.6	4030	9890	0.40
208.2	4340	8920	0.35
209.9	4400	9040	0.35
211.5	4400	8610	0.32
213.2	4160	9170	0.37
214.8	3660	8920	0.40
216.4	3480	8440	0.40
218.1	4160	9040	0.37
219.7	3480	8790	0.41
221.4	3550	8790	0.40
223.0	3840	8330	0.37
224.7	3330	8010	0.40
226.3	3110	8170	0.42
227.9	2780	7910	0.43
229.6	2390	7450	0.44

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
51.0	1310	2560	0.32
51.5	1420	2740	0.32
52.0	1290	2680	0.35
52.5	1360	2950	0.36
53.0	1460	3270	0.38
53.5	1540	3190	0.35
54.0	1540	2680	0.25
54.5	1530	2460	0.18
55.0	1420	2560	0.28
55.5	1200	2800	0.39
56.0	1300	3190	0.40
56.5	1340	3330	0.40
57.0	1400	3300	0.39
57.5	1530	3360	0.37
58.0	1460	3240	0.37
58.5	1460	3570	0.40
59.0	1610	3360	0.35
59.5	1510	3160	0.35
60.0	1420	2950	0.35
60.5	1350	2820	0.35
61.0	1250	3110	0.40
61.5	1430	3190	0.37
62.0	1380	3220	0.39
62.5	1400	2950	0.35
63.0	1230	3010	0.40
63.5	1320	2720	0.35
64.0	1340	2760	0.35
64.5	1340	2630	0.32
65.0	1270	2800	0.37
65.5	1120	2720	0.40
66.0	1060	2570	0.40
66.5	1270	2760	0.37
67.0	1060	2680	0.41
67.5	1080	2680	0.40
68.0	1170	2540	0.37
68.5	1020	2440	0.40
69.0	950	2490	0.42
69.5	850	2410	0.43
70.0	730	2270	0.44

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole A-20**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
231.2	2180	7030	0.45
232.9	2080	6880	0.45
234.5	2040	6530	0.45
236.1	1920	6390	0.45
237.8	1740	6300	0.46
239.4	1680	6240	0.46
241.1	1540	6300	0.47
242.7	1760	6240	0.46
244.3	1980	6330	0.45
246.0	1980	6240	0.44
247.6	1980	6180	0.44
249.3	1980	5970	0.44
250.9	1980	5830	0.43
252.5	1910	5920	0.44
254.2	1830	6000	0.45
255.8	1720	6090	0.46

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
70.5	670	2140	0.45
71.0	630	2100	0.45
71.5	620	1990	0.45
72.0	580	1950	0.45
72.5	530	1920	0.46
73.0	510	1900	0.46
73.5	470	1920	0.47
74.0	540	1900	0.46
74.5	600	1930	0.45
75.0	600	1900	0.44
75.5	600	1880	0.44
76.0	600	1820	0.44
76.5	600	1780	0.43
77.0	580	1800	0.44
77.5	560	1830	0.45
78.0	520	1860	0.46

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING I-1 (SONIC, CASED)
Source to Receiver and Receiver to Receiver Analysis

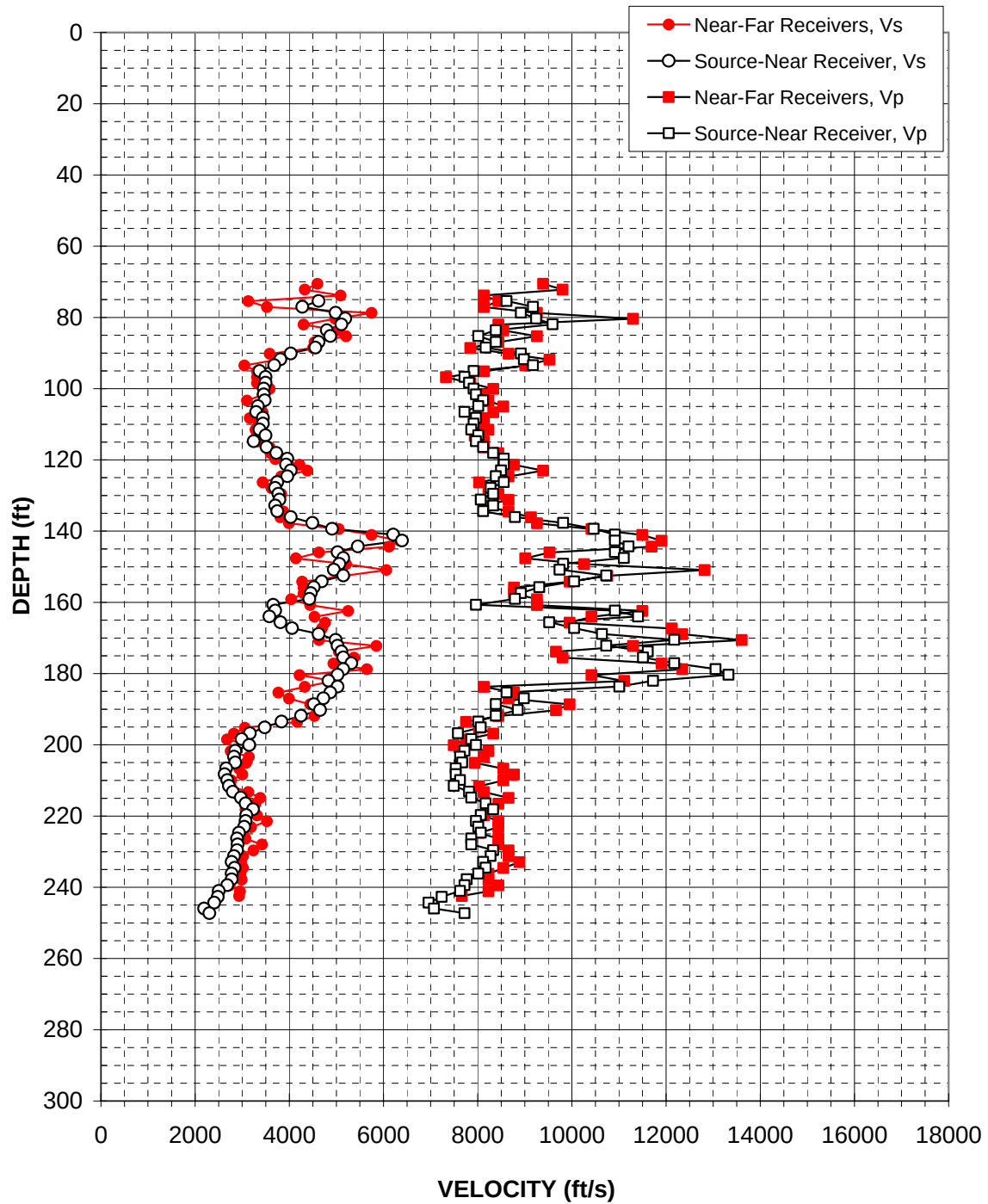


Figure A-5. Boring I-1, Suspension S-R1 P- and S_H -wave velocities

Table A-5. Boring I-1, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-1**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
	(ft/s)	(ft/s)			(m/s)	(m/s)	
13.0	-	-	-	4.0	-	-	-
14.7	-	-	-	4.5	-	-	-
16.3	-	-	-	5.0	-	-	-
18.0	-	-	-	5.5	-	-	-
19.6	-	-	-	6.0	-	-	-
21.2	-	-	-	6.5	-	-	-
22.9	-	-	-	7.0	-	-	-
24.5	-	-	-	7.5	-	-	-
26.2	-	-	-	8.0	-	-	-
27.8	-	-	-	8.5	-	-	-
29.4	-	-	-	9.0	-	-	-
31.1	-	-	-	9.5	-	-	-
32.7	-	-	-	10.0	-	-	-
34.4	-	-	-	10.5	-	-	-
36.0	-	-	-	11.0	-	-	-
37.6	-	-	-	11.5	-	-	-
39.3	-	-	-	12.0	-	-	-
40.9	-	-	-	12.5	-	-	-
42.6	-	-	-	13.0	-	-	-
44.2	-	-	-	13.5	-	-	-
45.8	-	-	-	14.0	-	-	-
47.5	-	-	-	14.5	-	-	-
49.1	-	-	-	15.0	-	-	-
50.8	-	-	-	15.5	-	-	-
52.4	-	-	-	16.0	-	-	-
54.0	-	-	-	16.5	-	-	-
55.7	-	-	-	17.0	-	-	-
57.3	-	-	-	17.5	-	-	-
59.0	-	-	-	18.0	-	-	-
60.6	-	-	-	18.5	-	-	-
62.2	-	-	-	19.0	-	-	-
63.9	-	-	-	19.5	-	-	-
65.5	-	-	-	20.0	-	-	-
67.2	-	-	-	20.5	-	-	-
68.8	-	-	-	21.0	-	-	-
70.5	-	-	-	21.5	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-1**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
72.1	-	-	-
73.7	-	-	-
75.4	4620	8610	0.30
77.0	4280	9170	0.36
78.7	4980	8920	0.27
80.3	5190	9240	0.27
81.9	5100	9590	0.30
83.6	4800	8380	0.26
85.2	4870	8010	0.21
86.9	4620	8380	0.28
88.5	4550	8170	0.27
90.1	4030	8920	0.37
91.8	3810	8980	0.39
93.4	3680	9170	0.40
95.1	3370	7910	0.39
96.7	3500	7720	0.37
98.3	3500	7810	0.37
100.0	3460	7910	0.38
101.6	3460	7960	0.38
103.3	3480	8120	0.39
104.9	3330	8010	0.40
106.5	3300	7720	0.39
108.2	3440	7960	0.39
109.8	3440	7910	0.38
111.5	3370	7860	0.39
113.1	3500	8010	0.38
114.7	3250	7960	0.40
116.4	3520	8120	0.38
118.0	3720	8330	0.38
119.7	3960	8550	0.36
121.3	3930	8550	0.37
122.9	4030	8500	0.35
124.6	3960	8380	0.36
126.2	3750	8550	0.38
127.9	3700	8270	0.37
129.5	3770	8330	0.37
131.1	3790	8060	0.36
132.8	3700	8330	0.38
134.4	3750	8120	0.36

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
22.0	-	-	-
22.5	-	-	-
23.0	1410	2630	0.30
23.5	1300	2800	0.36
24.0	1520	2720	0.27
24.5	1580	2820	0.27
25.0	1560	2920	0.30
25.5	1460	2560	0.26
26.0	1480	2440	0.21
26.5	1410	2560	0.28
27.0	1390	2490	0.27
27.5	1230	2720	0.37
28.0	1160	2740	0.39
28.5	1120	2800	0.40
29.0	1030	2410	0.39
29.5	1070	2350	0.37
30.0	1070	2380	0.37
30.5	1050	2410	0.38
31.0	1050	2430	0.38
31.5	1060	2470	0.39
32.0	1020	2440	0.40
32.5	1000	2350	0.39
33.0	1050	2430	0.39
33.5	1050	2410	0.38
34.0	1030	2400	0.39
34.5	1070	2440	0.38
35.0	990	2430	0.40
35.5	1070	2470	0.38
36.0	1130	2540	0.38
36.5	1210	2610	0.36
37.0	1200	2610	0.37
37.5	1230	2590	0.35
38.0	1210	2560	0.36
38.5	1140	2610	0.38
39.0	1130	2520	0.37
39.5	1150	2540	0.37
40.0	1160	2460	0.36
40.5	1130	2540	0.38
41.0	1140	2470	0.36

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-1**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
136.1	4030	8790	0.37
137.7	4490	9810	0.37
139.3	4910	10460	0.36
141.0	6210	10910	0.26
142.6	6390	10910	0.24
144.3	5460	11200	0.34
145.9	5020	10910	0.37
147.6	5150	11110	0.36
149.2	5060	9810	0.32
150.8	4950	9740	0.33
152.5	5150	10730	0.35
154.1	4690	10050	0.36
155.8	4520	9310	0.35
157.4	4460	8920	0.33
159.0	4430	8790	0.33
160.7	3660	7960	0.37
162.3	3700	10910	0.44
164.0	3580	11410	0.45
165.6	3810	9520	0.40
167.2	4060	10050	0.40
168.9	4620	10640	0.38
170.5	4980	12170	0.40
172.2	5020	10730	0.36
173.8	5100	11610	0.38
175.4	5150	11510	0.38
177.1	5320	12170	0.38
178.7	5150	13050	0.41
180.4	5020	13330	0.42
182.0	4830	11720	0.40
183.6	5020	11010	0.37
185.3	4870	8610	0.27
186.9	4720	8980	0.31
188.6	4520	8380	0.29
190.2	4650	8850	0.31
191.8	4250	8380	0.33
193.5	3840	8010	0.35
195.1	3480	8060	0.39
196.8	3170	7580	0.39
198.4	2990	7860	0.42

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
41.5	1230	2680	0.37
42.0	1370	2990	0.37
42.5	1500	3190	0.36
43.0	1890	3330	0.26
43.5	1950	3330	0.24
44.0	1660	3410	0.34
44.5	1530	3330	0.37
45.0	1570	3380	0.36
45.5	1540	2990	0.32
46.0	1510	2970	0.33
46.5	1570	3270	0.35
47.0	1430	3060	0.36
47.5	1380	2840	0.35
48.0	1360	2720	0.33
48.5	1350	2680	0.33
49.0	1120	2430	0.37
49.5	1130	3330	0.44
50.0	1090	3480	0.45
50.5	1160	2900	0.40
51.0	1240	3060	0.40
51.5	1410	3240	0.38
52.0	1520	3710	0.40
52.5	1530	3270	0.36
53.0	1560	3540	0.38
53.5	1570	3510	0.38
54.0	1620	3710	0.38
54.5	1570	3980	0.41
55.0	1530	4060	0.42
55.5	1470	3570	0.40
56.0	1530	3360	0.37
56.5	1480	2630	0.27
57.0	1440	2740	0.31
57.5	1380	2560	0.29
58.0	1420	2700	0.31
58.5	1290	2560	0.33
59.0	1170	2440	0.35
59.5	1060	2460	0.39
60.0	960	2310	0.39
60.5	910	2400	0.42

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-1**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
200.0	3150	7960	0.41
201.7	2850	7720	0.42
203.3	2830	7630	0.42
205.0	2850	7670	0.42
206.6	2660	7540	0.43
208.2	2630	7540	0.43
209.9	2680	7630	0.43
211.5	2720	7490	0.42
213.2	2800	7810	0.43
214.8	2970	7860	0.42
216.4	3070	8170	0.42
218.1	3230	8330	0.41
219.7	3090	8060	0.41
221.4	3070	7960	0.41
223.0	3040	8010	0.42
224.7	2930	8060	0.42
226.3	2890	7860	0.42
227.9	2900	7860	0.42
229.6	2890	8330	0.43
231.2	2830	8270	0.43
232.9	2780	8120	0.43
234.5	2840	8170	0.43
236.1	2780	8010	0.43
237.8	2780	7770	0.43
239.4	2680	7720	0.43
241.1	2500	7630	0.44
242.7	2480	7230	0.43
244.3	2410	6960	0.43
246.0	2190	7070	0.45
247.3	2300	7720	0.45

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
61.0	960	2430	0.41
61.5	870	2350	0.42
62.0	860	2320	0.42
62.5	870	2340	0.42
63.0	810	2300	0.43
63.5	800	2300	0.43
64.0	820	2320	0.43
64.5	830	2280	0.42
65.0	850	2380	0.43
65.5	910	2400	0.42
66.0	940	2490	0.42
66.5	980	2540	0.41
67.0	940	2460	0.41
67.5	940	2430	0.41
68.0	930	2440	0.42
68.5	890	2460	0.42
69.0	880	2400	0.42
69.5	890	2400	0.42
70.0	880	2540	0.43
70.5	860	2520	0.43
71.0	850	2470	0.43
71.5	870	2490	0.43
72.0	850	2440	0.43
72.5	850	2370	0.43
73.0	820	2350	0.43
73.5	760	2320	0.44
74.0	760	2210	0.43
74.5	730	2120	0.43
75.0	670	2160	0.45
75.4	700	2350	0.45

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING I-2 (SONIC, CASED)
Source to Receiver and Receiver to Receiver Analysis

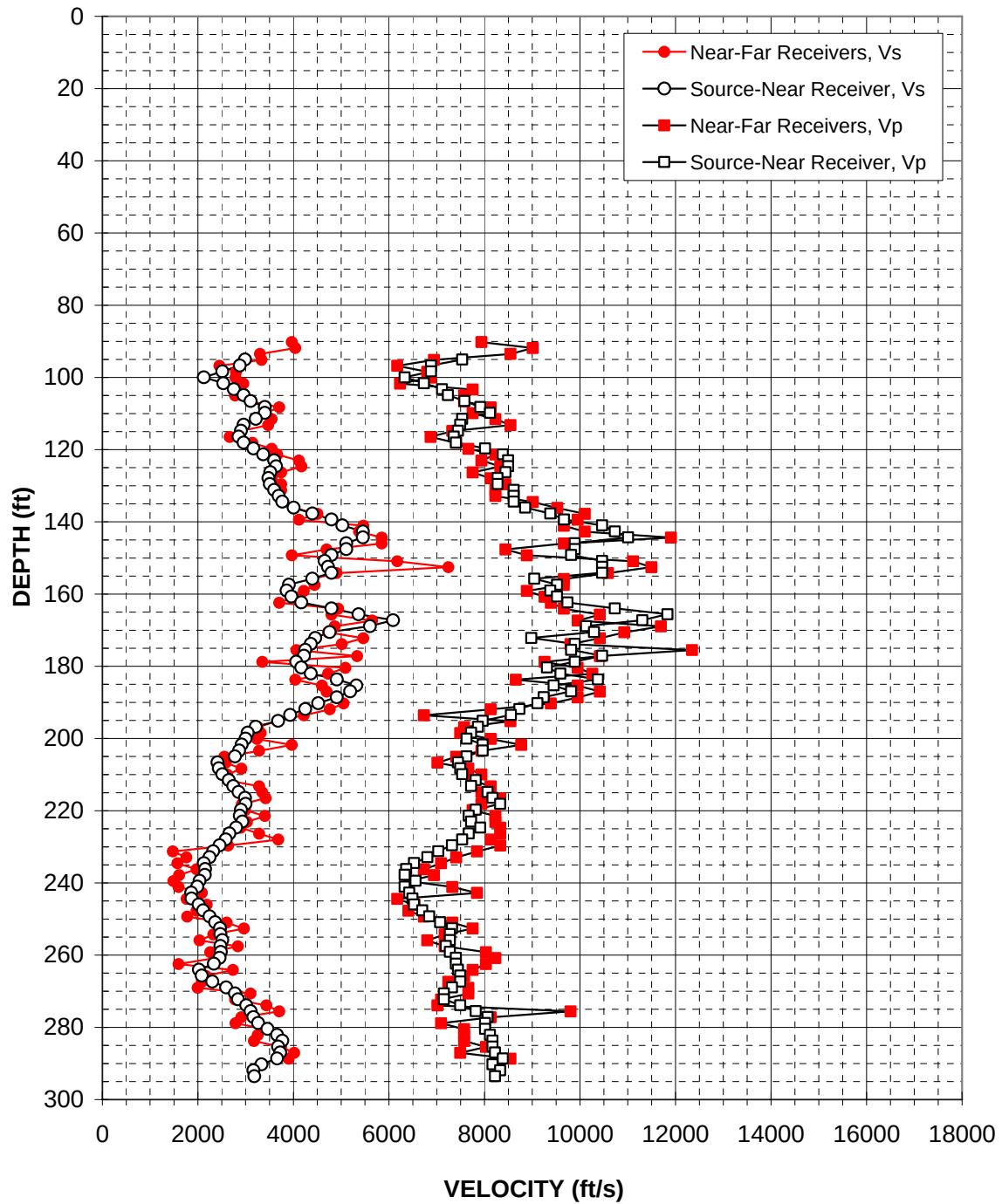


Figure A-6. Boring I-2, Suspension S-R1 P- and S_H -wave velocities

Table A-6. Boring I-2, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-2**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
	(ft/s)	(ft/s)			(m/s)	(m/s)	
11.4	-	-	-	3.5	-	-	-
13.0	-	-	-	4.0	-	-	-
14.7	-	-	-	4.5	-	-	-
16.3	-	-	-	5.0	-	-	-
18.0	-	-	-	5.5	-	-	-
19.6	-	-	-	6.0	-	-	-
21.2	-	-	-	6.5	-	-	-
22.9	-	-	-	7.0	-	-	-
24.5	-	-	-	7.5	-	-	-
26.2	-	-	-	8.0	-	-	-
27.8	-	-	-	8.5	-	-	-
29.4	-	-	-	9.0	-	-	-
31.1	-	-	-	9.5	-	-	-
32.7	-	-	-	10.0	-	-	-
34.4	-	-	-	10.5	-	-	-
36.0	-	-	-	11.0	-	-	-
37.6	-	-	-	11.5	-	-	-
39.3	-	-	-	12.0	-	-	-
40.9	-	-	-	12.5	-	-	-
42.6	-	-	-	13.0	-	-	-
44.2	-	-	-	13.5	-	-	-
45.8	-	-	-	14.0	-	-	-
47.5	-	-	-	14.5	-	-	-
49.1	-	-	-	15.0	-	-	-
50.8	-	-	-	15.5	-	-	-
52.4	-	-	-	16.0	-	-	-
54.0	-	-	-	16.5	-	-	-
55.7	-	-	-	17.0	-	-	-
57.3	-	-	-	17.5	-	-	-
59.0	-	-	-	18.0	-	-	-
60.6	-	-	-	18.5	-	-	-
62.2	-	-	-	19.0	-	-	-
63.9	-	-	-	19.5	-	-	-
65.5	-	-	-	20.0	-	-	-
67.2	-	-	-	20.5	-	-	-
68.8	-	-	-	21.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-2**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
70.5	-	-	-
72.1	-	-	-
73.7	-	-	-
75.4	-	-	-
77.0	-	-	-
78.7	-	-	-
80.3	-	-	-
81.9	-	-	-
83.6	-	-	-
85.2	-	-	-
86.9	-	-	-
88.5	-	-	-
90.1	-	-	-
91.8	-	-	-
93.4	-	-	-
95.1	2990	7540	0.41
96.7	2880	6880	0.39
98.3	2510	6880	0.42
100.0	2120	6330	0.44
101.6	2530	6730	0.42
103.3	2750	7110	0.41
104.9	2960	7230	0.40
106.5	3100	7580	0.40
108.2	3400	7910	0.39
109.8	3400	8120	0.39
111.5	3210	7540	0.39
113.1	2960	7490	0.41
114.7	2900	7450	0.41
116.4	2850	7360	0.41
118.0	2960	7400	0.41
119.7	3170	8010	0.41
121.3	3370	8380	0.40
122.9	3600	8500	0.39
124.6	3640	8500	0.39
126.2	3520	8440	0.39
127.9	3480	8270	0.39
129.5	3510	8270	0.39
131.1	3600	8610	0.39
132.8	3690	8610	0.39

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
21.5	-	-	-
22.0	-	-	-
22.5	-	-	-
23.0	-	-	-
23.5	-	-	-
24.0	-	-	-
24.5	-	-	-
25.0	-	-	-
25.5	-	-	-
26.0	-	-	-
26.5	-	-	-
27.0	-	-	-
27.5	-	-	-
28.0	-	-	-
28.5	-	-	-
29.0	910	2300	0.41
29.5	880	2100	0.39
30.0	770	2100	0.42
30.5	650	1930	0.44
31.0	770	2050	0.42
31.5	840	2170	0.41
32.0	900	2210	0.40
32.5	950	2310	0.40
33.0	1040	2410	0.39
33.5	1040	2470	0.39
34.0	980	2300	0.39
34.5	900	2280	0.41
35.0	890	2270	0.41
35.5	870	2240	0.41
36.0	900	2260	0.41
36.5	960	2440	0.41
37.0	1030	2560	0.40
37.5	1100	2590	0.39
38.0	1110	2590	0.39
38.5	1070	2570	0.39
39.0	1060	2520	0.39
39.5	1070	2520	0.39
40.0	1100	2630	0.39
40.5	1130	2630	0.39

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-2**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
134.4	3770	8610	0.38
136.1	4010	8850	0.37
137.7	4400	9380	0.36
139.3	4800	9660	0.34
141.0	5020	10460	0.35
142.6	5460	10730	0.33
144.3	5460	11010	0.34
145.9	5100	9890	0.32
147.6	5100	9890	0.32
149.2	4800	9810	0.34
150.8	4650	10460	0.38
152.5	4720	10460	0.37
154.1	4800	10460	0.37
155.8	4400	9040	0.35
157.4	3910	9520	0.40
159.0	3860	9380	0.40
160.7	3960	9520	0.40
162.3	4160	9740	0.39
164.0	4800	10730	0.38
165.6	5360	11830	0.37
167.2	6090	11300	0.30
168.9	5600	10130	0.28
170.5	4760	10290	0.36
172.2	4460	8980	0.34
173.8	4370	9890	0.38
175.4	4250	9810	0.38
177.1	4220	10460	0.40
178.7	4060	9890	0.40
180.4	4160	9310	0.37
182.0	4370	9590	0.37
183.6	4910	10380	0.36
185.3	5320	9450	0.27
186.9	5190	9810	0.31
188.6	4910	9240	0.30
190.2	4520	9110	0.34
191.8	4250	8730	0.34
193.5	3930	8550	0.37
195.1	3680	7960	0.36
196.8	3210	7860	0.40

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
41.0	1150	2630	0.38
41.5	1220	2700	0.37
42.0	1340	2860	0.36
42.5	1460	2950	0.34
43.0	1530	3190	0.35
43.5	1660	3270	0.33
44.0	1660	3360	0.34
44.5	1560	3010	0.32
45.0	1560	3010	0.32
45.5	1460	2990	0.34
46.0	1420	3190	0.38
46.5	1440	3190	0.37
47.0	1460	3190	0.37
47.5	1340	2760	0.35
48.0	1190	2900	0.40
48.5	1180	2860	0.40
49.0	1210	2900	0.40
49.5	1270	2970	0.39
50.0	1460	3270	0.38
50.5	1640	3610	0.37
51.0	1860	3450	0.30
51.5	1710	3090	0.28
52.0	1450	3140	0.36
52.5	1360	2740	0.34
53.0	1330	3010	0.38
53.5	1290	2990	0.38
54.0	1290	3190	0.40
54.5	1240	3010	0.40
55.0	1270	2840	0.37
55.5	1330	2920	0.37
56.0	1500	3160	0.36
56.5	1620	2880	0.27
57.0	1580	2990	0.31
57.5	1500	2820	0.30
58.0	1380	2780	0.34
58.5	1290	2660	0.34
59.0	1200	2610	0.37
59.5	1120	2430	0.36
60.0	980	2400	0.40

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-2**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
198.4	3040	7720	0.41
200.0	3000	7630	0.41
201.7	2920	7960	0.42
203.3	2860	7960	0.43
205.0	2780	7630	0.42
206.6	2410	7450	0.44
208.2	2440	7490	0.44
209.9	2510	7540	0.44
211.5	2650	7810	0.44
213.2	2740	7720	0.43
214.8	2850	8060	0.43
216.4	2990	8170	0.42
218.1	3000	8330	0.43
219.7	2900	7810	0.42
221.4	2880	7670	0.42
223.0	2930	7720	0.42
224.7	2800	7910	0.43
226.3	2660	7670	0.43
227.9	2580	7540	0.43
229.6	2450	7320	0.44
231.2	2320	7030	0.44
232.9	2240	6810	0.44
234.5	2120	6530	0.44
236.1	2150	6360	0.44
237.8	2150	6330	0.44
239.4	2040	6560	0.45
241.1	1990	6330	0.45
242.7	1860	6430	0.45
244.3	1870	6490	0.45
246.0	2020	6530	0.45
247.6	2110	6700	0.44
249.3	2240	6840	0.44
250.9	2360	7070	0.44
252.5	2460	7320	0.44
254.2	2470	7280	0.43
255.8	2510	7280	0.43
257.5	2470	7190	0.43
259.1	2480	7280	0.43
260.7	2450	7400	0.44

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
60.5	930	2350	0.41
61.0	910	2320	0.41
61.5	890	2430	0.42
62.0	870	2430	0.43
62.5	850	2320	0.42
63.0	740	2270	0.44
63.5	740	2280	0.44
64.0	770	2300	0.44
64.5	810	2380	0.44
65.0	840	2350	0.43
65.5	870	2460	0.43
66.0	910	2490	0.42
66.5	910	2540	0.43
67.0	890	2380	0.42
67.5	880	2340	0.42
68.0	890	2350	0.42
68.5	850	2410	0.43
69.0	810	2340	0.43
69.5	790	2300	0.43
70.0	750	2230	0.44
70.5	710	2140	0.44
71.0	680	2070	0.44
71.5	650	1990	0.44
72.0	660	1940	0.44
72.5	650	1930	0.44
73.0	620	2000	0.45
73.5	610	1930	0.45
74.0	570	1960	0.45
74.5	570	1980	0.45
75.0	610	1990	0.45
75.5	640	2040	0.44
76.0	680	2090	0.44
76.5	720	2160	0.44
77.0	750	2230	0.44
77.5	750	2220	0.43
78.0	770	2220	0.43
78.5	750	2190	0.43
79.0	760	2220	0.43
79.5	750	2260	0.44

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-2**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
262.4	2340	7400	0.44
264.0	2020	7450	0.46
265.7	2080	7490	0.46
267.3	2300	7490	0.45
268.9	2590	7320	0.43
270.6	2780	7150	0.41
272.2	2840	7150	0.41
273.9	3010	7490	0.40
275.5	3100	7810	0.41
277.1	3170	8060	0.41
278.8	3260	8010	0.40
280.4	3460	8010	0.39
282.1	3660	8120	0.37
283.7	3770	8170	0.36
285.3	3680	8170	0.37
287.0	3720	8220	0.37
288.6	3660	8380	0.38
290.3	3330	8170	0.40
291.9	3170	8330	0.42
293.5	3180	8220	0.41

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
80.0	710	2260	0.44
80.5	620	2270	0.46
81.0	630	2280	0.46
81.5	700	2280	0.45
82.0	790	2230	0.43
82.5	850	2180	0.41
83.0	870	2180	0.41
83.5	920	2280	0.40
84.0	950	2380	0.41
84.5	960	2460	0.41
85.0	990	2440	0.40
85.5	1050	2440	0.39
86.0	1120	2470	0.37
86.5	1150	2490	0.36
87.0	1120	2490	0.37
87.5	1130	2510	0.37
88.0	1120	2560	0.38
88.5	1020	2490	0.40
89.0	960	2540	0.42
89.5	970	2510	0.41

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING I-3 (SONIC, CASED) **Source to Receiver and Receiver to Receiver Analysis**

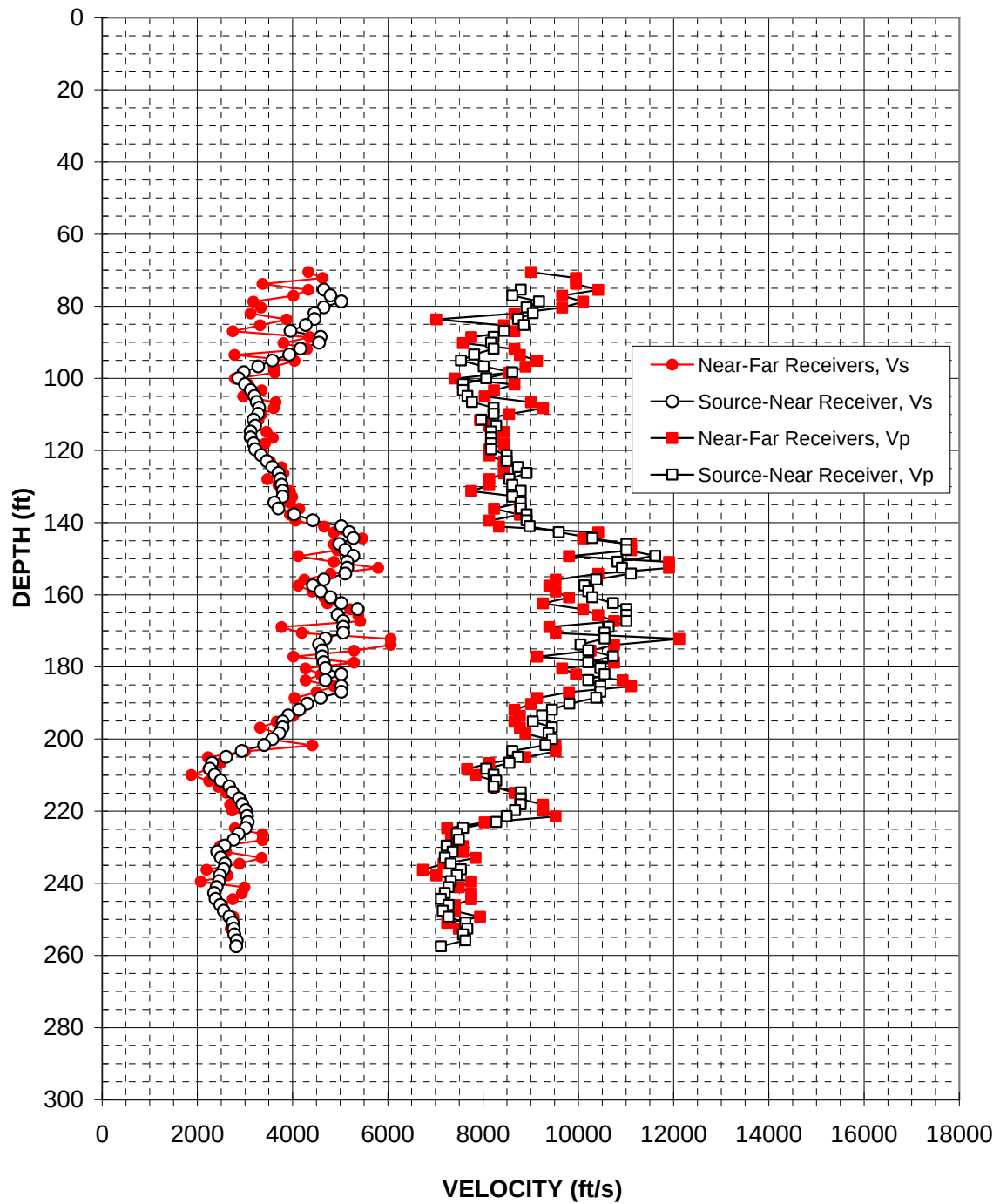


Figure A-7: Boring I-3, Suspension S-R1 P- and S_H -wave velocities

Table A-7. Boring I-3, Suspension S-R1 depths and P- and SH-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-3**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
	(ft/s)	(ft/s)			(m/s)	(m/s)	
11.4	-	-	-	3.5	-	-	-
13.0	-	-	-	4.0	-	-	-
14.7	-	-	-	4.5	-	-	-
16.3	-	-	-	5.0	-	-	-
18.0	-	-	-	5.5	-	-	-
19.6	-	-	-	6.0	-	-	-
21.2	-	-	-	6.5	-	-	-
22.9	-	-	-	7.0	-	-	-
24.5	-	-	-	7.5	-	-	-
26.2	-	-	-	8.0	-	-	-
27.8	-	-	-	8.5	-	-	-
29.4	-	-	-	9.0	-	-	-
31.1	-	-	-	9.5	-	-	-
32.7	-	-	-	10.0	-	-	-
34.4	-	-	-	10.5	-	-	-
36.0	-	-	-	11.0	-	-	-
37.6	-	-	-	11.5	-	-	-
39.3	-	-	-	12.0	-	-	-
40.9	-	-	-	12.5	-	-	-
42.6	-	-	-	13.0	-	-	-
44.2	-	-	-	13.5	-	-	-
45.8	-	-	-	14.0	-	-	-
47.5	-	-	-	14.5	-	-	-
49.1	-	-	-	15.0	-	-	-
50.8	-	-	-	15.5	-	-	-
52.4	-	-	-	16.0	-	-	-
54.0	-	-	-	16.5	-	-	-
55.7	-	-	-	17.0	-	-	-
57.3	-	-	-	17.5	-	-	-
59.0	-	-	-	18.0	-	-	-
60.6	-	-	-	18.5	-	-	-
62.2	-	-	-	19.0	-	-	-
63.9	-	-	-	19.5	-	-	-
65.5	-	-	-	20.0	-	-	-
67.2	-	-	-	20.5	-	-	-
68.8	-	-	-	21.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-3**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
70.5	-	-	-
72.1	-	-	-
73.7	-	-	-
75.4	4650	8790	0.31
77.0	4800	8610	0.28
78.7	5020	9170	0.29
80.3	4650	8920	0.31
81.9	4460	9040	0.34
83.6	4460	8730	0.32
85.2	4280	8850	0.35
86.9	3960	8440	0.36
88.5	4590	8220	0.27
90.1	4550	8170	0.27
91.8	4160	8220	0.33
93.4	3930	7810	0.33
95.1	3580	7540	0.35
96.7	3280	8010	0.40
98.3	2970	8610	0.43
100.0	2860	8060	0.43
101.6	3000	7580	0.41
103.3	3120	7580	0.40
104.9	3200	7670	0.39
106.5	3250	7770	0.39
108.2	3300	8220	0.40
109.8	3280	8220	0.41
111.5	3180	7960	0.41
113.1	3210	8270	0.41
114.7	3120	8170	0.41
116.4	3120	8170	0.41
118.0	3180	8170	0.41
119.7	3210	8170	0.41
121.3	3340	8500	0.41
122.9	3460	8500	0.40
124.6	3580	8730	0.40
126.2	3700	8920	0.40
127.9	3750	8550	0.38
129.5	3770	8610	0.38
131.1	3790	8790	0.39
132.8	3790	8610	0.38

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
21.5	-	-	-
22.0	-	-	-
22.5	-	-	-
23.0	1420	2680	0.31
23.5	1460	2630	0.28
24.0	1530	2800	0.29
24.5	1420	2720	0.31
25.0	1360	2760	0.34
25.5	1360	2660	0.32
26.0	1300	2700	0.35
26.5	1210	2570	0.36
27.0	1400	2510	0.27
27.5	1390	2490	0.27
28.0	1270	2510	0.33
28.5	1200	2380	0.33
29.0	1090	2300	0.35
29.5	1000	2440	0.40
30.0	910	2630	0.43
30.5	870	2460	0.43
31.0	910	2310	0.41
31.5	950	2310	0.40
32.0	970	2340	0.39
32.5	990	2370	0.39
33.0	1000	2510	0.40
33.5	1000	2510	0.41
34.0	970	2430	0.41
34.5	980	2520	0.41
35.0	950	2490	0.41
35.5	950	2490	0.41
36.0	970	2490	0.41
36.5	980	2490	0.41
37.0	1020	2590	0.41
37.5	1050	2590	0.40
38.0	1090	2660	0.40
38.5	1130	2720	0.40
39.0	1140	2610	0.38
39.5	1150	2630	0.38
40.0	1160	2680	0.39
40.5	1160	2630	0.38

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-3**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
134.4	3620	8790	0.40
136.1	3700	8790	0.39
137.7	4030	8920	0.37
139.3	4430	8920	0.34
141.0	5020	8980	0.27
142.6	5190	9590	0.29
144.3	5280	10290	0.32
145.9	4980	11010	0.37
147.6	5100	11010	0.36
149.2	5280	11610	0.37
150.8	5150	10820	0.35
152.5	5150	10910	0.36
154.1	5100	11110	0.37
155.8	4650	10380	0.37
157.4	4430	10130	0.38
159.0	4590	10210	0.37
160.7	4800	10290	0.36
162.3	5020	10730	0.36
164.0	5360	11010	0.34
165.6	4950	11010	0.37
167.2	5060	11010	0.37
168.9	5060	10640	0.35
170.5	5060	10550	0.35
172.2	4690	10550	0.38
173.8	4550	10050	0.37
175.4	4620	10210	0.37
177.1	4620	10730	0.39
178.7	4650	10210	0.37
180.4	4690	10460	0.37
182.0	5020	10550	0.35
183.6	4690	10210	0.37
185.3	5020	10460	0.35
186.9	5020	10460	0.35
188.6	4590	10380	0.38
190.2	4310	9810	0.38
191.8	4140	9450	0.38
193.5	3910	9240	0.39
195.1	3790	9040	0.39
196.8	3790	9450	0.40

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
41.0	1100	2680	0.40
41.5	1130	2680	0.39
42.0	1230	2720	0.37
42.5	1350	2720	0.34
43.0	1530	2740	0.27
43.5	1580	2920	0.29
44.0	1610	3140	0.32
44.5	1520	3360	0.37
45.0	1560	3360	0.36
45.5	1610	3540	0.37
46.0	1570	3300	0.35
46.5	1570	3330	0.36
47.0	1560	3380	0.37
47.5	1420	3160	0.37
48.0	1350	3090	0.38
48.5	1400	3110	0.37
49.0	1460	3140	0.36
49.5	1530	3270	0.36
50.0	1640	3360	0.34
50.5	1510	3360	0.37
51.0	1540	3360	0.37
51.5	1540	3240	0.35
52.0	1540	3220	0.35
52.5	1430	3220	0.38
53.0	1390	3060	0.37
53.5	1410	3110	0.37
54.0	1410	3270	0.39
54.5	1420	3110	0.37
55.0	1430	3190	0.37
55.5	1530	3220	0.35
56.0	1430	3110	0.37
56.5	1530	3190	0.35
57.0	1530	3190	0.35
57.5	1400	3160	0.38
58.0	1310	2990	0.38
58.5	1260	2880	0.38
59.0	1190	2820	0.39
59.5	1160	2760	0.39
60.0	1160	2880	0.40

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-3**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
198.4	3720	9380	0.41
200.0	3580	9450	0.42
201.7	3400	9310	0.42
203.3	2930	8610	0.43
205.0	2600	8730	0.45
206.6	2310	8550	0.46
208.2	2260	8060	0.46
209.9	2360	8220	0.46
211.5	2490	8270	0.45
213.2	2670	8220	0.44
214.8	2740	8790	0.45
216.4	2880	8790	0.44
218.1	2940	8790	0.44
219.7	3010	8670	0.43
221.4	3040	8500	0.43
223.0	3060	8270	0.42
224.7	3010	7580	0.41
226.3	2860	7450	0.41
227.9	2760	7490	0.42
229.6	2570	7230	0.43
231.2	2420	7360	0.44
232.9	2490	7190	0.43
234.5	2580	7320	0.43
236.1	2550	7540	0.44
237.8	2470	7450	0.44
239.4	2450	7320	0.44
241.1	2410	7280	0.44
242.7	2350	7190	0.44
244.3	2380	7110	0.44
246.0	2480	7280	0.43
247.6	2550	7150	0.43
249.3	2670	7280	0.42
250.9	2740	7630	0.43
252.5	2760	7670	0.43
254.2	2780	7580	0.42
255.8	2830	7630	0.42
257.5	2810	7110	0.41

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
60.5	1130	2860	0.41
61.0	1090	2880	0.42
61.5	1040	2840	0.42
62.0	890	2630	0.43
62.5	790	2660	0.45
63.0	700	2610	0.46
63.5	690	2460	0.46
64.0	720	2510	0.46
64.5	760	2520	0.45
65.0	810	2510	0.44
65.5	840	2680	0.45
66.0	880	2680	0.44
66.5	900	2680	0.44
67.0	920	2640	0.43
67.5	930	2590	0.43
68.0	930	2520	0.42
68.5	920	2310	0.41
69.0	870	2270	0.41
69.5	840	2280	0.42
70.0	780	2210	0.43
70.5	740	2240	0.44
71.0	760	2190	0.43
71.5	790	2230	0.43
72.0	780	2300	0.44
72.5	750	2270	0.44
73.0	750	2230	0.44
73.5	730	2220	0.44
74.0	720	2190	0.44
74.5	730	2170	0.44
75.0	760	2220	0.43
75.5	780	2180	0.43
76.0	810	2220	0.42
76.5	840	2320	0.43
77.0	840	2340	0.43
77.5	850	2310	0.42
78.0	860	2320	0.42
78.5	860	2170	0.41

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING I-4 (SONIC, CASED)
Source to Receiver and Receiver to Receiver Analysis

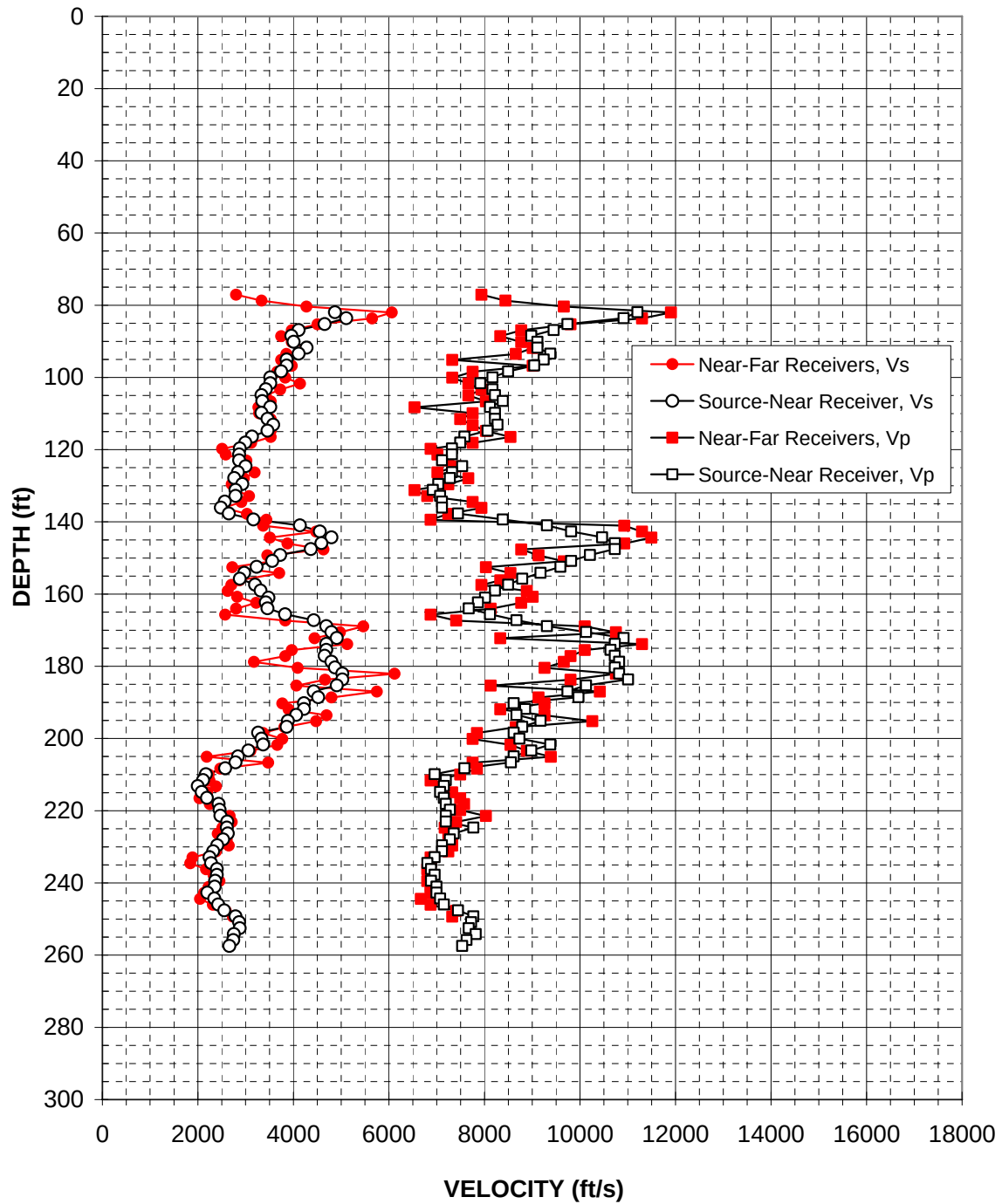


Figure A-8: Boring I-4, Suspension S-R1 P- and S_H -wave velocities

Table A-8. Boring I-4, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-4**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
11.4	-	-	-	3.5	-	-	-
13.0	-	-	-	4.0	-	-	-
14.7	-	-	-	4.5	-	-	-
16.3	-	-	-	5.0	-	-	-
18.0	-	-	-	5.5	-	-	-
19.6	-	-	-	6.0	-	-	-
21.2	-	-	-	6.5	-	-	-
22.9	-	-	-	7.0	-	-	-
24.5	-	-	-	7.5	-	-	-
26.2	-	-	-	8.0	-	-	-
27.8	-	-	-	8.5	-	-	-
29.4	-	-	-	9.0	-	-	-
31.1	-	-	-	9.5	-	-	-
32.7	-	-	-	10.0	-	-	-
34.4	-	-	-	10.5	-	-	-
36.0	-	-	-	11.0	-	-	-
37.6	-	-	-	11.5	-	-	-
39.3	-	-	-	12.0	-	-	-
40.9	-	-	-	12.5	-	-	-
42.6	-	-	-	13.0	-	-	-
44.2	-	-	-	13.5	-	-	-
45.8	-	-	-	14.0	-	-	-
47.5	-	-	-	14.5	-	-	-
49.1	-	-	-	15.0	-	-	-
50.8	-	-	-	15.5	-	-	-
52.4	-	-	-	16.0	-	-	-
54.0	-	-	-	16.5	-	-	-
55.7	-	-	-	17.0	-	-	-
57.3	-	-	-	17.5	-	-	-
59.0	-	-	-	18.0	-	-	-
60.6	-	-	-	18.5	-	-	-
62.2	-	-	-	19.0	-	-	-
63.9	-	-	-	19.5	-	-	-
65.5	-	-	-	20.0	-	-	-
67.2	-	-	-	20.5	-	-	-
68.8	-	-	-	21.0	-	-	-
70.5	-	-	-	21.5	-	-	-
72.1	-	-	-	22.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-4**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
	(ft/s)	(ft/s)			(m/s)	(m/s)	
73.7	-	-	-	22.5	-	-	-
75.4	-	-	-	23.0	-	-	-
77.0	-	-	-	23.5	-	-	-
78.7	-	-	-	24.0	-	-	-
80.3	-	-	-	24.5	-	-	-
81.9	4870	11200	0.38	25.0	1480	3410	0.38
83.6	5100	10910	0.36	25.5	1560	3330	0.36
85.2	4650	9740	0.35	26.0	1420	2970	0.35
86.9	4110	9450	0.38	26.5	1250	2880	0.38
88.5	3960	8980	0.38	27.0	1210	2740	0.38
90.1	4010	9110	0.38	27.5	1220	2780	0.38
91.8	4280	9110	0.36	28.0	1300	2780	0.36
93.4	4110	9380	0.38	28.5	1250	2860	0.38
95.1	3860	9240	0.39	29.0	1180	2820	0.39
96.7	3860	9040	0.39	29.5	1180	2760	0.39
98.3	3750	8500	0.38	30.0	1140	2590	0.38
100.0	3520	8170	0.39	30.5	1070	2490	0.39
101.6	3520	7910	0.38	31.0	1070	2410	0.38
103.3	3420	8170	0.39	31.5	1040	2490	0.39
104.9	3330	8220	0.40	32.0	1020	2510	0.40
106.5	3350	8380	0.41	32.5	1020	2560	0.41
108.2	3520	8120	0.38	33.0	1070	2470	0.38
109.8	3330	8220	0.40	33.5	1020	2510	0.40
111.5	3460	8220	0.39	34.0	1050	2510	0.39
113.1	3580	8270	0.39	34.5	1090	2520	0.39
114.7	3460	8060	0.39	35.0	1050	2460	0.39
116.4	3130	7580	0.40	35.5	960	2310	0.40
118.0	2990	7490	0.41	36.0	910	2280	0.41
119.7	2880	7320	0.41	36.5	880	2230	0.41
121.3	2860	7320	0.41	37.0	870	2230	0.41
122.9	2860	7110	0.40	37.5	870	2170	0.40
124.6	3000	7540	0.41	38.0	910	2300	0.41
126.2	2840	7320	0.41	38.5	870	2230	0.41
127.9	2760	7280	0.42	39.0	840	2220	0.42
129.5	2930	7030	0.39	39.5	890	2140	0.39
131.1	2790	6920	0.40	40.0	850	2110	0.40
132.8	2790	7070	0.41	40.5	850	2160	0.41
134.4	2560	7110	0.43	41.0	780	2170	0.43
136.1	2480	7110	0.43	41.5	760	2170	0.43
137.7	2650	7450	0.43	42.0	810	2270	0.43

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-4**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
	(ft/s)	(ft/s)			(m/s)	(m/s)	
139.3	3170	8380	0.42	42.5	960	2560	0.42
141.0	4140	9310	0.38	43.0	1260	2840	0.38
142.6	4550	9810	0.36	43.5	1390	2990	0.36
144.3	4800	10460	0.37	44.0	1460	3190	0.37
145.9	4590	10730	0.39	44.5	1400	3270	0.39
147.6	4370	10730	0.40	45.0	1330	3270	0.40
149.2	3720	10210	0.42	45.5	1130	3110	0.42
150.8	3560	9810	0.42	46.0	1080	2990	0.42
152.5	3230	9590	0.44	46.5	980	2920	0.44
154.1	2970	9170	0.44	47.0	910	2800	0.44
155.8	2880	8790	0.44	47.5	880	2680	0.44
157.4	3200	8500	0.42	48.0	970	2590	0.42
159.0	3310	8220	0.40	48.5	1010	2510	0.40
161.0	3480	8010	0.38	49.1	1060	2440	0.38
162.3	3420	7860	0.38	49.5	1040	2400	0.38
164.0	3460	7670	0.37	50.0	1050	2340	0.37
165.6	3820	8120	0.36	50.5	1170	2470	0.36
167.2	4430	8670	0.32	51.0	1350	2640	0.32
168.9	4690	9310	0.33	51.5	1430	2840	0.33
170.5	4800	10130	0.36	52.0	1460	3090	0.36
172.2	4910	10910	0.37	52.5	1500	3330	0.37
173.8	4690	10730	0.38	53.0	1430	3270	0.38
175.4	4690	10640	0.38	53.5	1430	3240	0.38
177.1	4650	10730	0.38	54.0	1420	3270	0.38
178.7	4800	10820	0.38	54.5	1460	3300	0.38
180.4	4870	10730	0.37	55.0	1480	3270	0.37
182.0	5020	10820	0.36	55.5	1530	3300	0.36
183.6	5020	11010	0.37	56.0	1530	3360	0.37
185.3	4910	10130	0.35	56.5	1500	3090	0.35
186.9	4430	9740	0.37	57.0	1350	2970	0.37
188.6	4520	9970	0.37	57.5	1380	3040	0.37
190.2	4220	8610	0.34	58.0	1290	2630	0.34
191.8	4220	8850	0.35	58.5	1290	2700	0.35
193.5	4060	8670	0.36	59.0	1240	2640	0.36
195.1	3880	9170	0.39	59.5	1180	2800	0.39
196.8	3860	8790	0.38	60.0	1180	2680	0.38
198.4	3260	8610	0.42	60.5	990	2630	0.42
200.0	3330	8730	0.41	61.0	1020	2660	0.41
201.7	3370	9380	0.43	61.5	1030	2860	0.43
203.3	3060	8980	0.43	62.0	930	2740	0.43

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-4**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
	(ft/s)	(ft/s)			(m/s)	(m/s)	
205.0	2840	8610	0.44	62.5	870	2630	0.44
206.6	2790	8550	0.44	63.0	850	2610	0.44
208.2	2570	7580	0.43	63.5	780	2310	0.43
209.9	2170	6960	0.45	64.0	660	2120	0.45
211.5	2110	7190	0.45	64.5	640	2190	0.45
213.2	2000	7150	0.46	65.0	610	2180	0.46
214.8	2080	7070	0.45	65.5	630	2160	0.45
216.4	2190	7150	0.45	66.0	670	2180	0.45
218.1	2430	7190	0.44	66.5	740	2190	0.44
219.7	2450	7280	0.44	67.0	750	2220	0.44
221.4	2470	7190	0.43	67.5	750	2190	0.43
223.0	2620	7190	0.42	68.0	800	2190	0.42
224.7	2600	7770	0.44	68.5	790	2370	0.44
226.3	2630	7360	0.43	69.0	800	2240	0.43
227.9	2530	7280	0.43	69.5	770	2220	0.43
229.6	2410	7110	0.44	70.0	730	2170	0.44
231.2	2320	7110	0.44	70.5	710	2170	0.44
232.9	2240	6960	0.44	71.0	680	2120	0.44
234.5	2280	6810	0.44	71.5	690	2070	0.44
236.1	2400	6880	0.43	72.0	730	2100	0.43
237.8	2400	6960	0.43	72.5	730	2120	0.43
239.4	2360	6880	0.43	73.0	720	2100	0.43
241.1	2350	6990	0.44	73.5	720	2130	0.44
242.7	2200	6990	0.45	74.0	670	2130	0.45
244.3	2340	7070	0.44	74.5	710	2160	0.44
246.0	2430	7150	0.44	75.0	740	2180	0.44
247.6	2550	7450	0.43	75.5	780	2270	0.43
249.3	2790	7770	0.43	76.0	850	2370	0.43
250.9	2860	7720	0.42	76.5	870	2350	0.42
252.5	2880	7670	0.42	77.0	880	2340	0.42
254.2	2750	7810	0.43	77.5	840	2380	0.43
255.8	2740	7630	0.43	78.0	840	2320	0.43
257.5	2660	7540	0.43	78.5	810	2300	0.43

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING I-5 (SONIC, CASED)
Source to Receiver and Receiver to Receiver Analysis

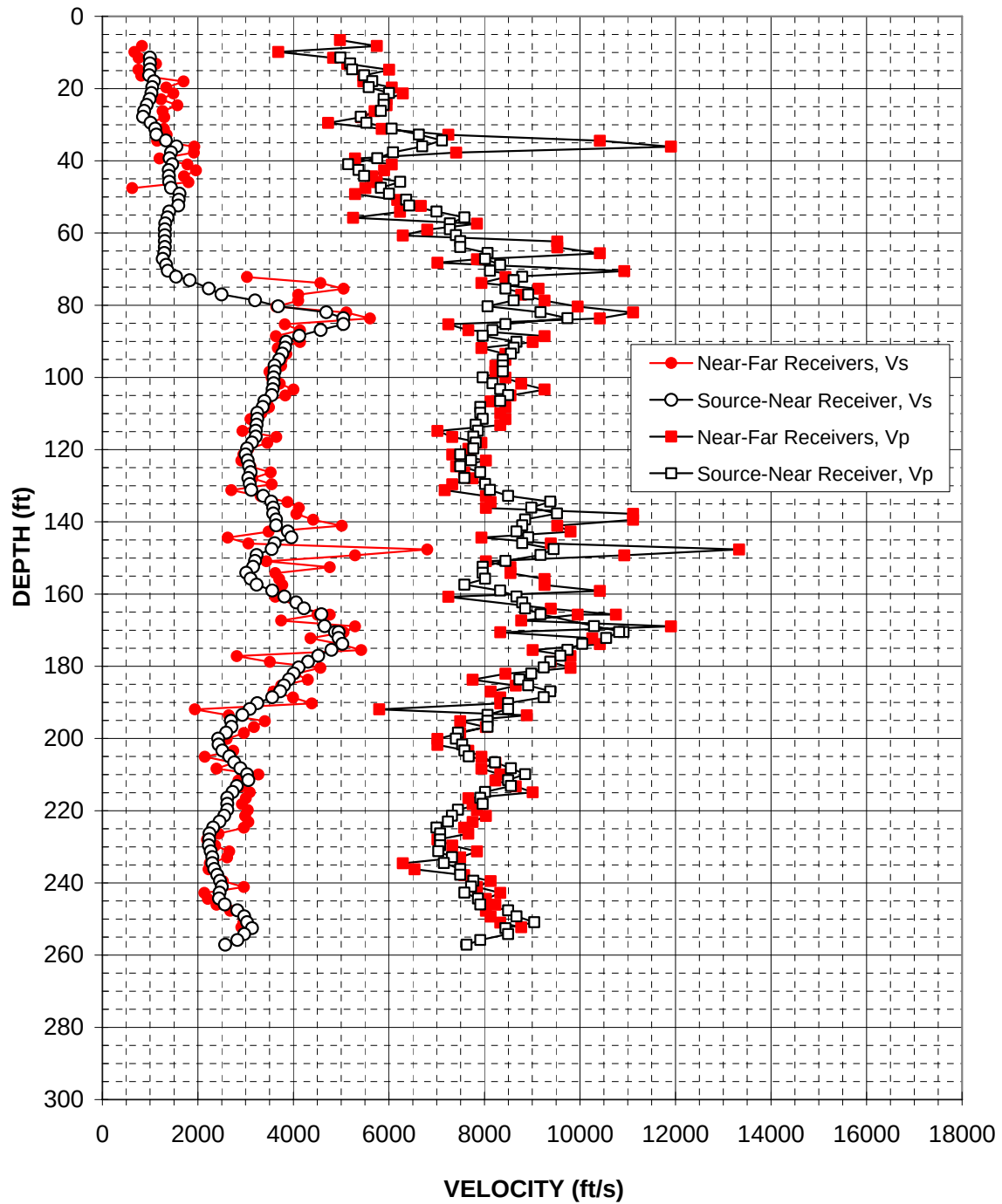


Figure A-9: Boring I-5, Suspension S-R1 P- and S_H -wave velocities

Table A-9. Boring I-5, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-5**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
	(ft/s)	(ft/s)	
11.4	1000	4980	0.48
13.0	1000	5190	0.48
14.7	1000	5230	0.48
16.3	980	5480	0.48
18.0	1080	5650	0.48
19.6	1040	5580	0.48
21.2	1030	6000	0.48
22.9	990	5890	0.49
24.5	930	5890	0.49
26.2	880	5830	0.49
27.8	850	5410	0.49
29.4	1010	5530	0.48
31.1	1110	6060	0.48
32.7	1130	6630	0.49
34.4	1330	7110	0.48
36.0	1550	6700	0.47
37.6	1440	6090	0.47
39.3	1410	5750	0.47
40.9	1470	5150	0.46
42.6	1390	5360	0.46
44.2	1390	5480	0.47
45.8	1400	6240	0.47
47.5	1440	5830	0.47
49.1	1610	6000	0.46
50.8	1600	6360	0.47
52.4	1590	6430	0.47
54.0	1400	6990	0.48
55.7	1360	7580	0.48
57.3	1320	7280	0.48
59.0	1310	7280	0.48
60.6	1310	7400	0.48
62.2	1310	7490	0.48
63.9	1310	7490	0.48
65.5	1300	8060	0.49
67.2	1270	8010	0.49
68.8	1340	8330	0.49

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
	(m/s)	(m/s)	
3.5	300	1520	0.48
4.0	300	1580	0.48
4.5	300	1590	0.48
5.0	300	1670	0.48
5.5	330	1720	0.48
6.0	320	1700	0.48
6.5	310	1830	0.48
7.0	300	1790	0.49
7.5	280	1790	0.49
8.0	270	1780	0.49
8.5	260	1650	0.49
9.0	310	1690	0.48
9.5	340	1850	0.48
10.0	340	2020	0.49
10.5	410	2170	0.48
11.0	470	2040	0.47
11.5	440	1860	0.47
12.0	430	1750	0.47
12.5	450	1570	0.46
13.0	420	1640	0.46
13.5	420	1670	0.47
14.0	430	1900	0.47
14.5	440	1780	0.47
15.0	490	1830	0.46
15.5	490	1940	0.47
16.0	480	1960	0.47
16.5	430	2130	0.48
17.0	420	2310	0.48
17.5	400	2220	0.48
18.0	400	2220	0.48
18.5	400	2260	0.48
19.0	400	2280	0.48
19.5	400	2280	0.48
20.0	400	2460	0.49
20.5	390	2440	0.49
21.0	410	2540	0.49

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-5**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
70.5	1370	8120	0.49
72.1	1540	8790	0.48
73.1	1830	8610	0.48
75.4	2230	8440	0.46
77.0	2500	8920	0.46
78.7	3200	8610	0.42
80.3	3680	8060	0.37
81.9	4690	9170	0.32
83.6	5040	9740	0.32
85.2	5040	8440	0.22
86.9	4570	8170	0.27
88.5	4120	7960	0.32
90.1	3850	8670	0.38
91.8	3820	8610	0.38
93.4	3770	8550	0.38
95.1	3700	8380	0.38
96.7	3610	8380	0.39
98.3	3610	8380	0.39
100.0	3590	7960	0.37
101.6	3590	8170	0.38
103.3	3570	8330	0.39
104.9	3550	8500	0.39
106.5	3390	8330	0.40
108.2	3360	7910	0.39
109.8	3250	7910	0.40
111.5	3250	7960	0.40
113.1	3230	7810	0.40
114.7	3210	7860	0.40
116.4	3210	7770	0.40
118.0	3130	7810	0.40
119.7	3030	7770	0.41
121.3	3000	7490	0.40
122.9	3040	7720	0.41
124.6	3070	7490	0.40
126.2	3100	7910	0.41
127.9	3060	7580	0.40
129.5	3090	8010	0.41
131.1	3120	8120	0.41
132.8	3370	8500	0.41

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
21.5	420	2470	0.49
22.0	470	2680	0.48
22.3	560	2630	0.48
23.0	680	2570	0.46
23.5	760	2720	0.46
24.0	970	2630	0.42
24.5	1120	2460	0.37
25.0	1430	2800	0.32
25.5	1540	2970	0.32
26.0	1540	2570	0.22
26.5	1390	2490	0.27
27.0	1260	2430	0.32
27.5	1170	2640	0.38
28.0	1170	2630	0.38
28.5	1150	2610	0.38
29.0	1130	2560	0.38
29.5	1100	2560	0.39
30.0	1100	2560	0.39
30.5	1090	2430	0.37
31.0	1090	2490	0.38
31.5	1090	2540	0.39
32.0	1080	2590	0.39
32.5	1030	2540	0.40
33.0	1020	2410	0.39
33.5	990	2410	0.40
34.0	990	2430	0.40
34.5	980	2380	0.40
35.0	980	2400	0.40
35.5	980	2370	0.40
36.0	960	2380	0.40
36.5	920	2370	0.41
37.0	910	2280	0.40
37.5	930	2350	0.41
38.0	940	2280	0.40
38.5	950	2410	0.41
39.0	930	2310	0.40
39.5	940	2440	0.41
40.0	950	2470	0.41
40.5	1030	2590	0.41

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-5**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
134.4	3540	9380	0.42
136.1	3580	8980	0.41
137.7	3580	9520	0.42
139.3	3640	8850	0.40
141.0	3640	8790	0.40
142.6	3880	8670	0.37
144.3	3960	8920	0.38
145.9	3610	8790	0.40
147.6	3550	9450	0.42
149.2	3230	9170	0.43
150.8	3200	8440	0.42
152.5	3160	7960	0.41
154.1	3010	7960	0.42
155.8	3100	8010	0.41
157.4	3230	7580	0.39
159.0	3560	8330	0.39
160.7	3810	8670	0.38
162.3	4060	8790	0.36
164.0	4220	8850	0.35
165.6	4590	9170	0.33
168.9	4650	10290	0.37
170.5	4870	10910	0.38
170.5	4950	10820	0.37
172.2	4950	10550	0.36
173.8	5020	10050	0.33
175.4	4800	9740	0.34
177.1	4520	9590	0.36
178.7	4310	9380	0.37
180.4	4110	9240	0.38
182.0	4010	8980	0.38
183.6	3910	8730	0.37
185.3	3800	8920	0.39
186.9	3720	9380	0.41
188.6	3560	9240	0.41
190.2	3250	8500	0.41
191.8	3090	8500	0.42
193.5	2930	8060	0.42
195.1	2690	8060	0.44
196.8	2710	8060	0.44

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
41.0	1080	2860	0.42
41.5	1090	2740	0.41
42.0	1090	2900	0.42
42.5	1110	2700	0.40
43.0	1110	2680	0.40
43.5	1180	2640	0.37
44.0	1210	2720	0.38
44.5	1100	2680	0.40
45.0	1080	2880	0.42
45.5	980	2800	0.43
46.0	970	2570	0.42
46.5	960	2430	0.41
47.0	920	2430	0.42
47.5	950	2440	0.41
48.0	980	2310	0.39
48.5	1080	2540	0.39
49.0	1160	2640	0.38
49.5	1240	2680	0.36
50.0	1290	2700	0.35
50.5	1400	2800	0.33
51.5	1420	3140	0.37
52.0	1480	3330	0.38
52.0	1510	3300	0.37
52.5	1510	3220	0.36
53.0	1530	3060	0.33
53.5	1460	2970	0.34
54.0	1380	2920	0.36
54.5	1310	2860	0.37
55.0	1250	2820	0.38
55.5	1220	2740	0.38
56.0	1190	2660	0.37
56.5	1160	2720	0.39
57.0	1130	2860	0.41
57.5	1080	2820	0.41
58.0	990	2590	0.41
58.5	940	2590	0.42
59.0	890	2460	0.42
59.5	820	2460	0.44
60.0	820	2460	0.44

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-5**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
198.4	2590	7450	0.43
200.0	2430	7400	0.44
201.7	2430	7540	0.44
203.3	2510	7580	0.44
205.0	2660	7670	0.43
206.6	2760	8220	0.44
208.2	2890	8550	0.44
209.9	3030	8850	0.43
211.5	3060	8500	0.43
213.2	2810	8550	0.44
214.8	2730	8010	0.43
216.4	2620	7910	0.44
218.1	2620	7960	0.44
219.7	2620	7450	0.43
221.4	2550	7320	0.43
223.0	2450	7230	0.44
224.7	2320	6990	0.44
226.3	2240	7070	0.44
227.9	2240	7070	0.44
229.6	2230	7070	0.44
231.2	2270	7030	0.44
232.9	2300	7320	0.45
234.5	2300	7150	0.44
236.1	2340	7490	0.45
237.8	2410	7490	0.44
239.4	2460	7770	0.44
241.1	2500	7720	0.44
242.7	2450	7580	0.44
244.3	2440	7860	0.45
246.0	2560	7910	0.44
247.6	2830	8500	0.44
249.3	2970	8670	0.43
250.9	3030	9040	0.44
252.5	3130	8440	0.42
254.2	2970	8500	0.43
255.8	2830	7910	0.43
257.1	2570	7630	0.44

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
60.5	790	2270	0.43
61.0	740	2260	0.44
61.5	740	2300	0.44
62.0	770	2310	0.44
62.5	810	2340	0.43
63.0	840	2510	0.44
63.5	880	2610	0.44
64.0	920	2700	0.43
64.5	930	2590	0.43
65.0	860	2610	0.44
65.5	830	2440	0.43
66.0	800	2410	0.44
66.5	800	2430	0.44
67.0	800	2270	0.43
67.5	780	2230	0.43
68.0	750	2210	0.44
68.5	710	2130	0.44
69.0	680	2160	0.44
69.5	680	2160	0.44
70.0	680	2160	0.44
70.5	690	2140	0.44
71.0	700	2230	0.45
71.5	700	2180	0.44
72.0	710	2280	0.45
72.5	730	2280	0.44
73.0	750	2370	0.44
73.5	760	2350	0.44
74.0	750	2310	0.44
74.5	740	2400	0.45
75.0	780	2410	0.44
75.5	860	2590	0.44
76.0	910	2640	0.43
76.5	920	2760	0.44
77.0	960	2570	0.42
77.5	910	2590	0.43
78.0	860	2410	0.43
78.4	780	2320	0.44

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING I-6 (SONIC, CASED) **Source to Receiver and Receiver to Receiver Analysis**

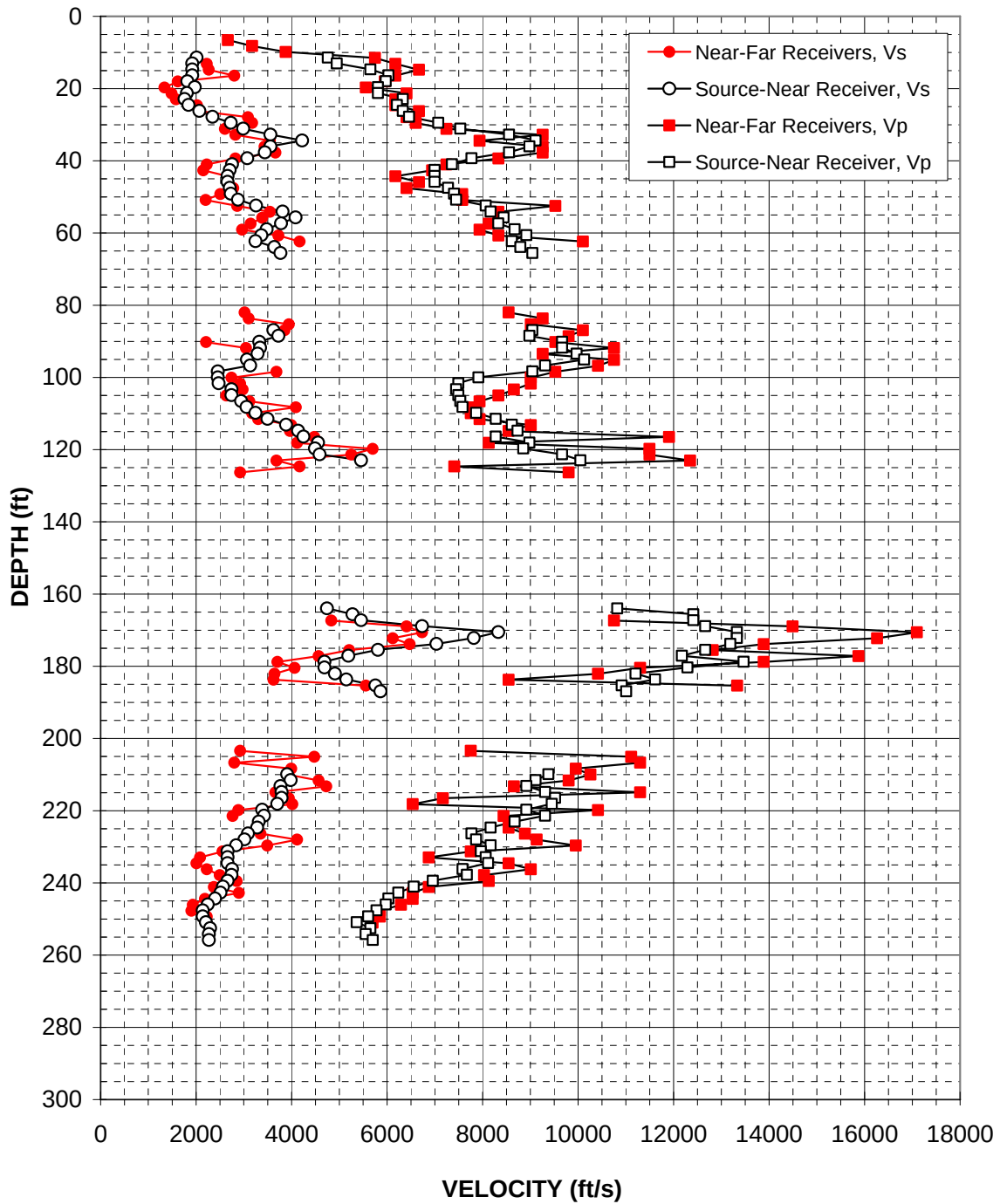


Figure A-10: Boring I-6, Suspension S-R1 P- and S_H -wave velocities

Table A-10. Boring I-6, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-6**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
	(ft/s)	(ft/s)			(m/s)	(m/s)	
11.4	2010	4760	0.39	3.5	610	1450	0.39
13.0	1920	4950	0.41	4.0	580	1510	0.41
14.7	1920	5650	0.43	4.5	580	1720	0.43
16.3	1920	6030	0.44	5.0	580	1840	0.44
18.0	1820	5970	0.45	5.5	550	1820	0.45
19.6	1970	5810	0.43	6.0	600	1770	0.43
21.2	1810	5810	0.45	6.5	550	1770	0.45
22.9	1760	6330	0.46	7.0	540	1930	0.46
24.5	1840	6210	0.45	7.5	560	1890	0.45
26.2	2070	6330	0.44	8.0	630	1930	0.44
27.8	2340	6460	0.42	8.5	710	1970	0.42
29.4	2730	7070	0.41	9.0	830	2160	0.41
31.1	2990	7540	0.41	9.5	910	2300	0.41
32.7	3560	8550	0.40	10.0	1080	2610	0.40
34.4	4220	9110	0.36	10.5	1290	2780	0.36
36.0	3560	8980	0.41	11.0	1080	2740	0.41
37.6	3440	8550	0.40	11.5	1050	2610	0.40
39.3	3070	7770	0.41	12.0	940	2370	0.41
40.9	2750	7360	0.42	12.5	840	2240	0.42
42.6	2710	6990	0.41	13.0	820	2130	0.41
44.2	2660	6990	0.42	13.5	810	2130	0.42
45.8	2660	6990	0.42	14.0	810	2130	0.42
47.5	2710	7280	0.42	14.5	820	2220	0.42
49.1	2730	7400	0.42	15.0	830	2260	0.42
50.8	2880	7450	0.41	15.5	880	2270	0.41
52.4	3250	8060	0.40	16.0	990	2460	0.40
54.0	3810	8170	0.36	16.5	1160	2490	0.36
55.7	4080	8440	0.35	17.0	1240	2570	0.35
57.3	3780	8330	0.37	17.5	1150	2540	0.37
59.0	3480	8670	0.40	18.0	1060	2640	0.40
60.6	3370	8920	0.42	18.5	1030	2720	0.42
62.2	3250	8610	0.42	19.0	990	2630	0.42
63.9	3640	8790	0.40	19.5	1110	2680	0.40
65.5	3770	9040	0.39	20.0	1150	2760	0.39
67.2	-	-	-	20.5	-	-	-
68.8	-	-	-	21.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-6**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
70.5	-	-	-
72.1	-	-	-
73.7	-	-	-
75.4	-	-	-
77.0	-	-	-
78.7	-	-	-
80.3	-	-	-
81.9	-	-	-
83.6	-	-	-
85.2	-	-	-
86.9	3620	9040	0.40
88.5	3720	8980	0.40
90.1	3320	9660	0.43
91.8	3340	9660	0.43
93.4	3290	9970	0.44
95.1	3070	10130	0.45
96.7	3130	9310	0.44
98.3	2450	9040	0.46
100.0	2450	7910	0.45
101.6	2470	7490	0.44
103.3	2740	7450	0.42
104.9	2740	7490	0.42
106.5	2940	7540	0.41
108.2	3060	7580	0.40
109.8	3250	7860	0.40
111.5	3500	8270	0.39
113.1	3880	8610	0.37
114.7	4140	8730	0.36
116.4	4250	8270	0.32
118.0	4550	8980	0.33
119.7	4490	8850	0.33
121.3	4590	9660	0.35
122.9	5460	10050	0.29
124.6	-	-	-
126.2	-	-	-
127.9	-	-	-
129.5	-	-	-
131.1	-	-	-
132.8	-	-	-

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
21.5	-	-	-
22.0	-	-	-
22.5	-	-	-
23.0	-	-	-
23.5	-	-	-
24.0	-	-	-
24.5	-	-	-
25.0	-	-	-
25.5	-	-	-
26.0	-	-	-
26.5	1100	2760	0.40
27.0	1130	2740	0.40
27.5	1010	2950	0.43
28.0	1020	2950	0.43
28.5	1000	3040	0.44
29.0	930	3090	0.45
29.5	960	2840	0.44
30.0	750	2760	0.46
30.5	750	2410	0.45
31.0	750	2280	0.44
31.5	840	2270	0.42
32.0	840	2280	0.42
32.5	900	2300	0.41
33.0	930	2310	0.40
33.5	990	2400	0.40
34.0	1070	2520	0.39
34.5	1180	2630	0.37
35.0	1260	2660	0.36
35.5	1290	2520	0.32
36.0	1390	2740	0.33
36.5	1370	2700	0.33
37.0	1400	2950	0.35
37.5	1660	3060	0.29
38.0	-	-	-
38.5	-	-	-
39.0	-	-	-
39.5	-	-	-
40.0	-	-	-
40.5	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-6**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
134.4	-	-	-
136.1	-	-	-
137.7	-	-	-
139.3	-	-	-
141.0	-	-	-
142.6	-	-	-
144.3	-	-	-
145.9	-	-	-
147.6	-	-	-
149.2	-	-	-
150.8	-	-	-
152.5	-	-	-
154.1	-	-	-
155.8	-	-	-
157.4	-	-	-
159.0	-	-	-
160.7	-	-	-
162.3	-	-	-
164.0	4740	10820	0.38
165.6	5280	12410	0.39
167.2	5460	12410	0.38
168.9	6730	12660	0.30
170.5	8330	13330	0.18
172.2	7810	13330	0.24
173.8	7030	13190	0.30
175.4	5810	12660	0.37
177.1	5190	12170	0.39
178.7	4690	13470	0.43
180.4	4690	12290	0.41
182.0	4910	11200	0.38
183.6	5150	11610	0.38
185.3	5750	10910	0.31
186.9	5860	11010	0.30
188.6	-	-	-
190.2	-	-	-
191.8	-	-	-
193.5	-	-	-
195.1	-	-	-
196.8	-	-	-

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
41.0	-	-	-
41.5	-	-	-
42.0	-	-	-
42.5	-	-	-
43.0	-	-	-
43.5	-	-	-
44.0	-	-	-
44.5	-	-	-
45.0	-	-	-
45.5	-	-	-
46.0	-	-	-
46.5	-	-	-
47.0	-	-	-
47.5	-	-	-
48.0	-	-	-
48.5	-	-	-
49.0	-	-	-
49.5	-	-	-
50.0	1450	3300	0.38
50.5	1610	3780	0.39
51.0	1660	3780	0.38
51.5	2050	3860	0.30
52.0	2540	4060	0.18
52.5	2380	4060	0.24
53.0	2140	4020	0.30
53.5	1770	3860	0.37
54.0	1580	3710	0.39
54.5	1430	4110	0.43
55.0	1430	3750	0.41
55.5	1500	3410	0.38
56.0	1570	3540	0.38
56.5	1750	3330	0.31
57.0	1790	3360	0.30
57.5	-	-	-
58.0	-	-	-
58.5	-	-	-
59.0	-	-	-
59.5	-	-	-
60.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-6**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
198.4	-	-	-
200.0	-	-	-
201.7	-	-	-
203.3	-	-	-
205.0	-	-	-
206.6	-	-	-
208.2	-	-	-
209.9	3910	9380	0.39
211.5	3980	9110	0.38
213.2	3770	8920	0.39
214.8	3790	9310	0.40
216.4	3790	9520	0.41
218.1	3700	9450	0.41
219.7	3390	8920	0.42
221.4	3420	9310	0.42
223.0	3310	8670	0.41
224.7	3280	8170	0.40
226.3	3090	7770	0.41
227.9	3010	7860	0.41
229.6	2840	8170	0.43
231.2	2660	7960	0.44
232.9	2660	8060	0.44
234.5	2660	8120	0.44
236.1	2750	7580	0.42
237.8	2740	7670	0.43
239.4	2660	6960	0.41
241.1	2560	6560	0.41
242.7	2510	6240	0.40
244.3	2400	6030	0.41
246.0	2240	5970	0.42
247.6	2140	5780	0.42
249.3	2140	5600	0.41
250.9	2210	5360	0.40
252.5	2290	5650	0.40
254.2	2270	5550	0.40
255.8	2270	5700	0.41

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
60.5	-	-	-
61.0	-	-	-
61.5	-	-	-
62.0	-	-	-
62.5	-	-	-
63.0	-	-	-
63.5	-	-	-
64.0	1190	2860	0.39
64.5	1210	2780	0.38
65.0	1150	2720	0.39
65.5	1160	2840	0.40
66.0	1160	2900	0.41
66.5	1130	2880	0.41
67.0	1030	2720	0.42
67.5	1040	2840	0.42
68.0	1010	2640	0.41
68.5	1000	2490	0.40
69.0	940	2370	0.41
69.5	920	2400	0.41
70.0	870	2490	0.43
70.5	810	2430	0.44
71.0	810	2460	0.44
71.5	810	2470	0.44
72.0	840	2310	0.42
72.5	840	2340	0.43
73.0	810	2120	0.41
73.5	780	2000	0.41
74.0	770	1900	0.40
74.5	730	1840	0.41
75.0	680	1820	0.42
75.5	650	1760	0.42
76.0	650	1710	0.41
76.5	670	1640	0.40
77.0	700	1720	0.40
77.5	690	1690	0.40
78.0	690	1740	0.41

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING I-7 (SONIC, CASED)
Source to Receiver and Receiver to Receiver Analysis

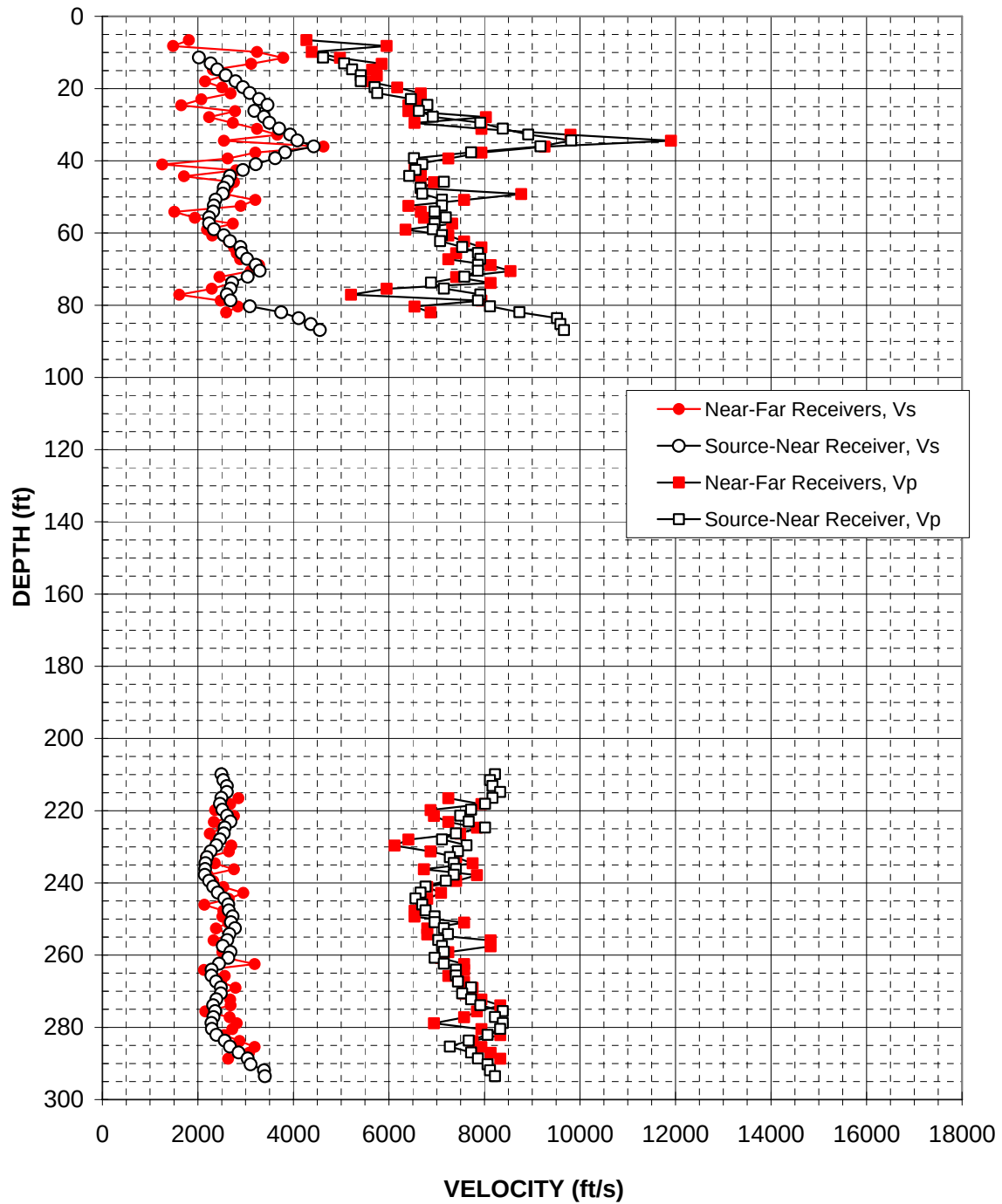


Figure A-11: Boring I-7, Suspension S-R1 P- and S_H -wave velocities

Table A-11. Boring I-7, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-7**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's s Ratio
	V _s	V _p			V _s	V _p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
11.4	2020	4620	0.38	3.5	620	1410	0.38
13.0	2270	5060	0.37	4.0	690	1540	0.37
14.7	2410	5230	0.37	4.5	730	1590	0.37
16.3	2580	5410	0.35	5.0	790	1650	0.35
18.0	2790	5410	0.32	5.5	850	1650	0.32
19.6	2940	5700	0.32	6.0	900	1740	0.32
21.2	3090	5750	0.30	6.5	940	1750	0.30
22.9	3280	6460	0.33	7.0	1000	1970	0.33
24.5	3460	6810	0.33	7.5	1050	2070	0.33
26.2	3180	6630	0.35	8.0	970	2020	0.35
27.8	3390	6920	0.34	8.5	1030	2110	0.34
29.4	3500	7910	0.38	9.0	1070	2410	0.38
31.1	3700	8380	0.38	9.5	1130	2560	0.38
32.7	3930	8920	0.38	10.0	1200	2720	0.38
34.4	4080	9810	0.40	10.5	1240	2990	0.40
36.0	4430	9170	0.35	11.0	1350	2800	0.35
37.6	3820	7720	0.34	11.5	1170	2350	0.34
39.3	3620	6530	0.28	12.0	1100	1990	0.28
40.9	3210	6700	0.35	12.5	980	2040	0.35
42.6	2940	6560	0.37	13.0	900	2000	0.37
44.2	2670	6430	0.40	13.5	810	1960	0.40
45.8	2630	7150	0.42	14.0	800	2180	0.42
47.5	2540	6660	0.41	14.5	770	2030	0.41
49.1	2520	6700	0.42	15.0	770	2040	0.42
50.8	2370	7110	0.44	15.5	720	2170	0.44
52.4	2340	7110	0.44	16.0	710	2170	0.44
54.0	2320	6960	0.44	16.5	710	2120	0.44
55.7	2240	7190	0.45	17.0	680	2190	0.45
57.3	2240	6960	0.44	17.5	680	2120	0.44
59.0	2340	6920	0.44	18.0	710	2110	0.44
60.6	2540	7110	0.43	18.5	770	2170	0.43
62.2	2670	7070	0.42	19.0	810	2160	0.42
63.9	2890	7540	0.41	19.5	880	2300	0.41
65.5	2920	7860	0.42	20.0	890	2400	0.42
67.2	3030	7910	0.41	20.5	920	2410	0.41

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-7**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
68.8	3210	7860	0.40
70.5	3300	7860	0.39
72.1	3040	7580	0.40
73.7	2720	6880	0.41
75.4	2680	7150	0.42
77.0	2600	7910	0.44
78.7	2680	7860	0.43
80.3	3090	8120	0.42
81.9	3750	8730	0.39
83.6	4110	9520	0.39
85.2	4370	9590	0.37
86.9	4550	9660	0.36
88.5	-	-	-
90.1	-	-	-
91.8	-	-	-
93.4	-	-	-
95.1	-	-	-
96.7	-	-	-
98.3	-	-	-
100.0	-	-	-
101.6	-	-	-
103.3	-	-	-
104.9	-	-	-
106.5	-	-	-
108.2	-	-	-
109.8	-	-	-
111.5	-	-	-
113.1	-	-	-
114.7	-	-	-
116.4	-	-	-
118.0	-	-	-
119.7	-	-	-
121.3	-	-	-
122.9	-	-	-
124.6	-	-	-
126.2	-	-	-
127.9	-	-	-
129.5	-	-	-
131.1	-	-	-

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
21.0	980	2400	0.40
21.5	1000	2400	0.39
22.0	930	2310	0.40
22.5	830	2100	0.41
23.0	820	2180	0.42
23.5	790	2410	0.44
24.0	820	2400	0.43
24.5	940	2470	0.42
25.0	1140	2660	0.39
25.5	1250	2900	0.39
26.0	1330	2920	0.37
26.5	1390	2950	0.36
27.0	-	-	-
27.5	-	-	-
28.0	-	-	-
28.5	-	-	-
29.0	-	-	-
29.5	-	-	-
30.0	-	-	-
30.5	-	-	-
31.0	-	-	-
31.5	-	-	-
32.0	-	-	-
32.5	-	-	-
33.0	-	-	-
33.5	-	-	-
34.0	-	-	-
34.5	-	-	-
35.0	-	-	-
35.5	-	-	-
36.0	-	-	-
36.5	-	-	-
37.0	-	-	-
37.5	-	-	-
38.0	-	-	-
38.5	-	-	-
39.0	-	-	-
39.5	-	-	-
40.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-7**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
132.8	-	-	-
134.4	-	-	-
136.1	-	-	-
137.7	-	-	-
139.3	-	-	-
141.0	-	-	-
142.6	-	-	-
144.3	-	-	-
145.9	-	-	-
147.6	-	-	-
149.2	-	-	-
150.8	-	-	-
152.5	-	-	-
154.1	-	-	-
155.8	-	-	-
157.4	-	-	-
159.0	-	-	-
160.7	-	-	-
162.3	-	-	-
164.0	-	-	-
165.6	-	-	-
167.2	-	-	-
168.9	-	-	-
170.5	-	-	-
172.2	-	-	-
173.8	-	-	-
175.4	-	-	-
177.1	-	-	-
178.7	-	-	-
180.4	-	-	-
182.0	-	-	-
183.6	-	-	-
185.3	-	-	-
186.9	-	-	-
188.6	-	-	-
190.2	-	-	-
191.8	-	-	-
193.5	-	-	-
195.1	-	-	-

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.5	-	-	-
41.0	-	-	-
41.5	-	-	-
42.0	-	-	-
42.5	-	-	-
43.0	-	-	-
43.5	-	-	-
44.0	-	-	-
44.5	-	-	-
45.0	-	-	-
45.5	-	-	-
46.0	-	-	-
46.5	-	-	-
47.0	-	-	-
47.5	-	-	-
48.0	-	-	-
48.5	-	-	-
49.0	-	-	-
49.5	-	-	-
50.0	-	-	-
50.5	-	-	-
51.0	-	-	-
51.5	-	-	-
52.0	-	-	-
52.5	-	-	-
53.0	-	-	-
53.5	-	-	-
54.0	-	-	-
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55.0	-	-	-
55.5	-	-	-
56.0	-	-	-
56.5	-	-	-
57.0	-	-	-
57.5	-	-	-
58.0	-	-	-
58.5	-	-	-
59.0	-	-	-
59.5	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-7**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
196.8	-	-	-
198.4	-	-	-
200.0	-	-	-
201.7	-	-	-
203.3	-	-	-
205.0	-	-	-
206.6	-	-	-
208.2	-	-	-
209.9	2490	8220	0.45
211.5	2530	8120	0.45
213.2	2600	8170	0.44
214.8	2600	8330	0.45
216.4	2490	8170	0.45
218.1	2460	8010	0.45
219.7	2510	7720	0.44
221.4	2610	7490	0.43
223.0	2680	7670	0.43
224.7	2560	8010	0.44
226.3	2540	7400	0.43
227.9	2460	7110	0.43
229.6	2390	7630	0.45
231.2	2270	7450	0.45
232.9	2190	7280	0.45
234.5	2160	7360	0.45
236.1	2150	7400	0.45
237.8	2150	7360	0.45
239.4	2240	7190	0.45
241.1	2320	6770	0.43
242.7	2420	6660	0.42
244.3	2550	6560	0.41
246.0	2640	6700	0.41
247.6	2650	6770	0.41
249.3	2730	6960	0.41
250.9	2690	6960	0.41
252.5	2780	7150	0.41
254.2	2660	7230	0.42
255.8	2620	7030	0.42
257.5	2520	7110	0.43
259.1	2680	7150	0.42

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
60.0	-	-	-
60.5	-	-	-
61.0	-	-	-
61.5	-	-	-
62.0	-	-	-
62.5	-	-	-
63.0	-	-	-
63.5	-	-	-
64.0	760	2510	0.45
64.5	770	2470	0.45
65.0	790	2490	0.44
65.5	790	2540	0.45
66.0	760	2490	0.45
66.5	750	2440	0.45
67.0	770	2350	0.44
67.5	800	2280	0.43
68.0	820	2340	0.43
68.5	780	2440	0.44
69.0	770	2260	0.43
69.5	750	2170	0.43
70.0	730	2320	0.45
70.5	690	2270	0.45
71.0	670	2220	0.45
71.5	660	2240	0.45
72.0	660	2260	0.45
72.5	650	2240	0.45
73.0	680	2190	0.45
73.5	710	2060	0.43
74.0	740	2030	0.42
74.5	780	2000	0.41
75.0	800	2040	0.41
75.5	810	2060	0.41
76.0	830	2120	0.41
76.5	820	2120	0.41
77.0	850	2180	0.41
77.5	810	2210	0.42
78.0	800	2140	0.42
78.5	770	2170	0.43
79.0	820	2180	0.42

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-7**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
260.7	2640	6960	0.42	79.5	800	2120	0.42
262.4	2440	7150	0.43	80.0	740	2180	0.43
264.0	2290	7400	0.45	80.5	700	2260	0.45
265.7	2290	7400	0.45	81.0	700	2260	0.45
267.3	2380	7450	0.44	81.5	730	2270	0.44
268.9	2480	7720	0.44	82.0	760	2350	0.44
270.6	2480	7540	0.44	82.5	760	2300	0.44
272.2	2390	7720	0.45	83.0	730	2350	0.45
273.9	2320	7910	0.45	83.5	710	2410	0.45
275.5	2360	8380	0.46	84.0	720	2560	0.46
277.1	2330	8220	0.46	84.5	710	2510	0.46
278.8	2290	8380	0.46	85.0	700	2560	0.46
280.4	2290	8330	0.46	85.5	700	2540	0.46
282.1	2390	8060	0.45	86.0	730	2460	0.45
283.7	2560	7670	0.44	86.5	780	2340	0.44
285.3	2670	7280	0.42	87.0	810	2220	0.42
287.0	2850	7720	0.42	87.5	870	2350	0.42
288.6	3040	7860	0.41	88.0	930	2400	0.41
290.3	3100	8060	0.41	88.5	950	2460	0.41
291.9	3390	8120	0.39	89.0	1030	2470	0.39
293.5	3400	8220	0.40	89.5	1040	2510	0.40

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING I-8 (SONIC, CASED)
Source to Receiver and Receiver to Receiver Analysis

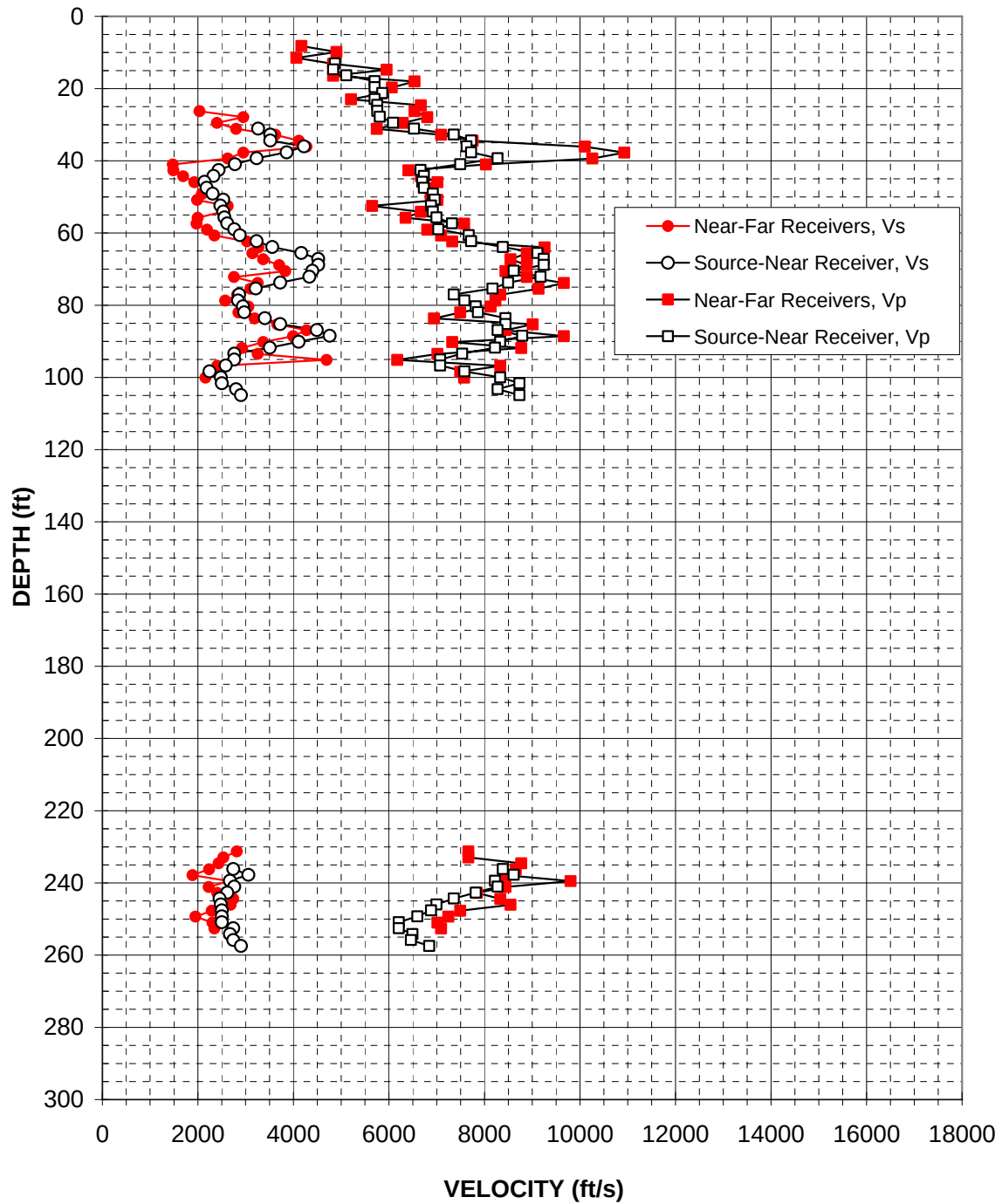


Figure A-12: Boring I-8, Suspension S-R1 P- and S_H -wave velocities

Table A-12. Boring I-8, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-8**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
13.0	-	4870	-	4.0	-	1480	-
14.7	-	4830	-	4.5	-	1470	-
16.3	-	5100	-	5.0	-	1560	-
18.0	-	5700	-	5.5	-	1740	-
19.6	-	5700	-	6.0	-	1740	-
21.2	-	5860	-	6.5	-	1790	-
22.9	-	5700	-	7.0	-	1740	-
24.5	-	5750	-	7.5	-	1750	-
26.2	-	5750	-	8.0	-	1750	-
27.8	-	5810	-	8.5	-	1770	-
29.4	-	6090	-	9.0	-	1860	-
31.1	3260	6530	0.33	9.5	990	1990	0.33
32.7	3520	7360	0.35	10.0	1070	2240	0.35
34.4	3520	7720	0.37	10.5	1070	2350	0.37
36.0	4220	7630	0.28	11.0	1290	2320	0.28
37.6	3860	7720	0.33	11.5	1180	2350	0.33
39.3	3230	8270	0.41	12.0	980	2520	0.41
40.9	2780	7490	0.42	12.5	850	2280	0.42
42.6	2430	6660	0.42	13.0	740	2030	0.42
44.2	2330	6730	0.43	13.5	710	2050	0.43
45.8	2140	6700	0.44	14.0	650	2040	0.44
47.5	2180	6730	0.44	14.5	670	2050	0.44
49.1	2310	6920	0.44	15.0	700	2110	0.44
50.8	2530	6960	0.42	15.5	770	2120	0.42
52.4	2470	6880	0.43	16.0	750	2100	0.43
54.0	2530	6920	0.42	16.5	770	2110	0.42
55.7	2560	6990	0.42	17.0	780	2130	0.42
57.3	2620	7320	0.43	17.5	800	2230	0.43
59.0	2760	7030	0.41	18.0	840	2140	0.41
60.6	2880	7670	0.42	18.5	880	2340	0.42
62.2	3230	7720	0.39	19.0	980	2350	0.39
63.9	3560	8380	0.39	19.5	1080	2560	0.39
65.5	4160	9110	0.37	20.0	1270	2780	0.37
67.2	4520	9240	0.34	20.5	1380	2820	0.34
68.8	4520	9240	0.34	21.0	1380	2820	0.34

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-8**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
70.5	4400	8610	0.32
72.1	4340	9170	0.36
73.7	3720	8500	0.38
75.4	3210	8170	0.41
77.0	2860	7360	0.41
78.7	2840	7580	0.42
80.3	2940	7810	0.42
81.9	2970	7860	0.42
83.6	3400	8440	0.40
85.2	3720	8440	0.38
86.9	4490	8270	0.29
88.5	4760	8790	0.29
90.1	4110	8330	0.34
91.8	3510	8220	0.39
93.4	2760	7540	0.42
95.1	2760	7070	0.41
96.7	2580	7070	0.42
98.3	2240	7580	0.45
100.0	2480	8330	0.45
101.6	2500	8730	0.46
103.3	2800	8270	0.44
104.9	2900	8730	0.44
106.5	-	-	-
108.2	-	-	-
109.8	-	-	-
111.5	-	-	-
113.1	-	-	-
114.7	-	-	-
116.4	-	-	-
118.0	-	-	-
119.7	-	-	-
121.3	-	-	-
122.9	-	-	-
124.6	-	-	-
126.2	-	-	-
127.9	-	-	-
129.5	-	-	-
131.1	-	-	-
132.8	-	-	-

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
21.5	1340	2630	0.32
22.0	1320	2800	0.36
22.5	1130	2590	0.38
23.0	980	2490	0.41
23.5	870	2240	0.41
24.0	870	2310	0.42
24.5	900	2380	0.42
25.0	910	2400	0.42
25.5	1040	2570	0.40
26.0	1130	2570	0.38
26.5	1370	2520	0.29
27.0	1450	2680	0.29
27.5	1250	2540	0.34
28.0	1070	2510	0.39
28.5	840	2300	0.42
29.0	840	2160	0.41
29.5	790	2160	0.42
30.0	680	2310	0.45
30.5	760	2540	0.45
31.0	760	2660	0.46
31.5	850	2520	0.44
32.0	890	2660	0.44
32.5	-	-	-
33.0	-	-	-
33.5	-	-	-
34.0	-	-	-
34.5	-	-	-
35.0	-	-	-
35.5	-	-	-
36.0	-	-	-
36.5	-	-	-
37.0	-	-	-
37.5	-	-	-
38.0	-	-	-
38.5	-	-	-
39.0	-	-	-
39.5	-	-	-
40.0	-	-	-
40.5	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-8**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
134.4	-	-	-
136.1	-	-	-
137.7	-	-	-
139.3	-	-	-
141.0	-	-	-
142.6	-	-	-
144.3	-	-	-
145.9	-	-	-
147.6	-	-	-
149.2	-	-	-
150.8	-	-	-
152.5	-	-	-
154.1	-	-	-
155.8	-	-	-
157.4	-	-	-
159.0	-	-	-
160.7	-	-	-
162.3	-	-	-
164.0	-	-	-
165.6	-	-	-
167.2	-	-	-
168.9	-	-	-
170.5	-	-	-
172.2	-	-	-
173.8	-	-	-
175.4	-	-	-
177.1	-	-	-
178.7	-	-	-
180.4	-	-	-
182.0	-	-	-
183.6	-	-	-
185.3	-	-	-
186.9	-	-	-
188.6	-	-	-
190.2	-	-	-
191.8	-	-	-
193.5	-	-	-
195.1	-	-	-
196.8	-	-	-

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
41.0	-	-	-
41.5	-	-	-
42.0	-	-	-
42.5	-	-	-
43.0	-	-	-
43.5	-	-	-
44.0	-	-	-
44.5	-	-	-
45.0	-	-	-
45.5	-	-	-
46.0	-	-	-
46.5	-	-	-
47.0	-	-	-
47.5	-	-	-
48.0	-	-	-
48.5	-	-	-
49.0	-	-	-
49.5	-	-	-
50.0	-	-	-
50.5	-	-	-
51.0	-	-	-
51.5	-	-	-
52.0	-	-	-
52.5	-	-	-
53.0	-	-	-
53.5	-	-	-
54.0	-	-	-
54.5	-	-	-
55.0	-	-	-
55.5	-	-	-
56.0	-	-	-
56.5	-	-	-
57.0	-	-	-
57.5	-	-	-
58.0	-	-	-
58.5	-	-	-
59.0	-	-	-
59.5	-	-	-
60.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-8**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
198.4	-	-	-	60.5	-	-	-
200.0	-	-	-	61.0	-	-	-
201.7	-	-	-	61.5	-	-	-
203.3	-	-	-	62.0	-	-	-
205.0	-	-	-	62.5	-	-	-
206.6	-	-	-	63.0	-	-	-
208.2	-	-	-	63.5	-	-	-
209.9	-	-	-	64.0	-	-	-
211.5	-	-	-	64.5	-	-	-
213.2	-	-	-	65.0	-	-	-
214.8	-	-	-	65.5	-	-	-
216.4	-	-	-	66.0	-	-	-
218.1	-	-	-	66.5	-	-	-
219.7	-	-	-	67.0	-	-	-
221.4	-	-	-	67.5	-	-	-
223.0	-	-	-	68.0	-	-	-
224.7	-	-	-	68.5	-	-	-
226.3	-	-	-	69.0	-	-	-
227.9	-	-	-	69.5	-	-	-
229.6	-	-	-	70.0	-	-	-
231.2	-	-	-	70.5	-	-	-
232.9	-	-	-	71.0	-	-	-
234.5	-	-	-	71.5	-	-	-
236.1	2740	8380	0.44	72.0	840	2560	0.44
237.8	3060	8610	0.43	72.5	930	2630	0.43
239.4	2670	8220	0.44	73.0	810	2510	0.44
241.1	2760	8270	0.44	73.5	840	2520	0.44
242.7	2620	7810	0.44	74.0	800	2380	0.44
244.3	2450	7360	0.44	74.5	750	2240	0.44
246.0	2480	6990	0.43	75.0	760	2130	0.43
247.6	2500	6880	0.42	75.5	760	2100	0.42
249.3	2500	6590	0.42	76.0	760	2010	0.42
250.9	2500	6210	0.40	76.5	760	1890	0.40
252.5	2740	6210	0.38	77.0	840	1890	0.38
254.2	2670	6490	0.40	77.5	810	1980	0.40
255.8	2740	6460	0.39	78.0	840	1970	0.39
257.5	2900	6840	0.39	78.5	890	2090	0.39

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING I-9 (SONIC, CASED) **Source to Receiver and Receiver to Receiver Analysis**

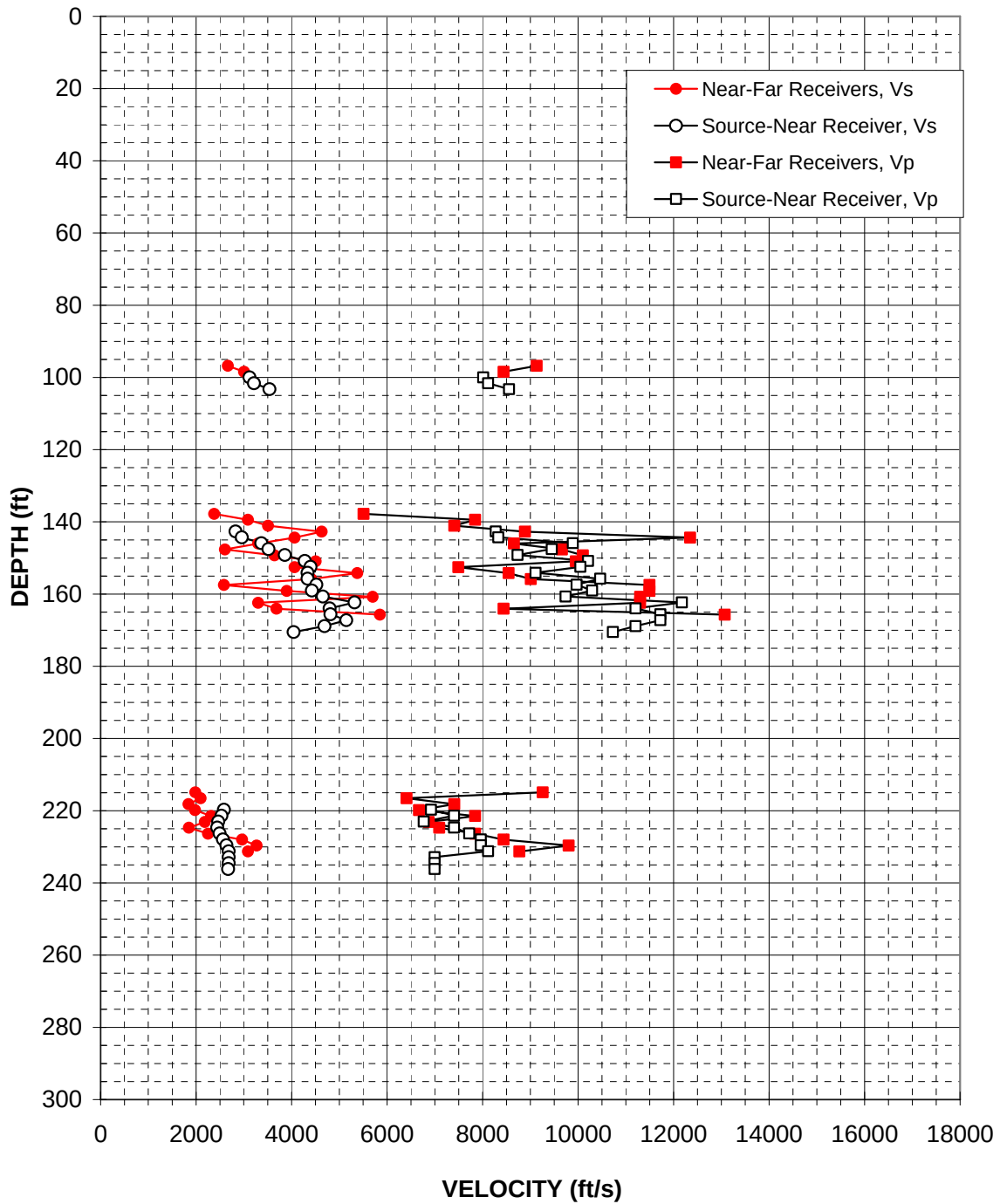


Figure A-13: Boring I-9, Suspension S-R1 P- and S_H-wave velocities

Table A-13. Boring I-9, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-9**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
11.4	-	-	-	3.5	-	-	-
13.0	-	-	-	4.0	-	-	-
14.7	-	-	-	4.5	-	-	-
16.3	-	-	-	5.0	-	-	-
18.0	-	-	-	5.5	-	-	-
19.6	-	-	-	6.0	-	-	-
21.2	-	-	-	6.5	-	-	-
22.9	-	-	-	7.0	-	-	-
24.5	-	-	-	7.5	-	-	-
26.2	-	-	-	8.0	-	-	-
27.8	-	-	-	8.5	-	-	-
29.4	-	-	-	9.0	-	-	-
31.1	-	-	-	9.5	-	-	-
32.7	-	-	-	10.0	-	-	-
34.4	-	-	-	10.5	-	-	-
36.0	-	-	-	11.0	-	-	-
37.6	-	-	-	11.5	-	-	-
39.3	-	-	-	12.0	-	-	-
40.9	-	-	-	12.5	-	-	-
42.6	-	-	-	13.0	-	-	-
44.2	-	-	-	13.5	-	-	-
45.8	-	-	-	14.0	-	-	-
47.5	-	-	-	14.5	-	-	-
49.1	-	-	-	15.0	-	-	-
50.8	-	-	-	15.5	-	-	-
52.4	-	-	-	16.0	-	-	-
54.0	-	-	-	16.5	-	-	-
55.7	-	-	-	17.0	-	-	-
57.3	-	-	-	17.5	-	-	-
59.0	-	-	-	18.0	-	-	-
60.6	-	-	-	18.5	-	-	-
62.2	-	-	-	19.0	-	-	-
63.9	-	-	-	19.5	-	-	-
65.5	-	-	-	20.0	-	-	-
67.2	-	-	-	20.5	-	-	-
68.8	-	-	-	21.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-9**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
70.5	-	-	-	21.5	-	-	-
72.1	-	-	-	22.0	-	-	-
73.7	-	-	-	22.5	-	-	-
75.4	-	-	-	23.0	-	-	-
77.0	-	-	-	23.5	-	-	-
78.7	-	-	-	24.0	-	-	-
80.3	-	-	-	24.5	-	-	-
81.9	-	-	-	25.0	-	-	-
83.6	-	-	-	25.5	-	-	-
85.2	-	-	-	26.0	-	-	-
86.9	-	-	-	26.5	-	-	-
88.5	-	-	-	27.0	-	-	-
90.1	-	-	-	27.5	-	-	-
91.8	-	-	-	28.0	-	-	-
93.4	-	-	-	28.5	-	-	-
95.1	-	-	-	29.0	-	-	-
96.7	-	-	-	29.5	-	-	-
98.3	-	-	-	30.0	-	-	-
100.0	3120	8010	0.41	30.5	950	2440	0.41
101.6	3210	8120	0.41	31.0	980	2470	0.41
103.3	3540	8550	0.40	31.5	1080	2610	0.40
104.9	-	-	-	32.0	-	-	-
106.5	-	-	-	32.5	-	-	-
108.2	-	-	-	33.0	-	-	-
109.8	-	-	-	33.5	-	-	-
111.5	-	-	-	34.0	-	-	-
113.1	-	-	-	34.5	-	-	-
114.7	-	-	-	35.0	-	-	-
116.4	-	-	-	35.5	-	-	-
118.0	-	-	-	36.0	-	-	-
119.7	-	-	-	36.5	-	-	-
121.3	-	-	-	37.0	-	-	-
122.9	-	-	-	37.5	-	-	-
124.6	-	-	-	38.0	-	-	-
126.2	-	-	-	38.5	-	-	-
127.9	-	-	-	39.0	-	-	-
129.5	-	-	-	39.5	-	-	-
131.1	-	-	-	40.0	-	-	-
132.8	-	-	-	40.5	-	-	-
134.4	-	-	-	41.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-9**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
(ft)	(ft/s)	(ft/s)		(m)	(m/s)	(m/s)	
136.1	-	-	-	41.5	-	-	-
137.7	-	-	-	42.0	-	-	-
139.3	-	-	-	42.5	-	-	-
141.0	-	-	-	43.0	-	-	-
142.6	2830	8270	0.43	43.5	860	2520	0.43
144.3	2960	8330	0.43	44.0	900	2540	0.43
145.9	3370	9890	0.43	44.5	1030	3010	0.43
147.6	3520	9450	0.42	45.0	1070	2880	0.42
149.2	3860	8730	0.38	45.5	1180	2660	0.38
150.8	4280	10210	0.39	46.0	1300	3110	0.39
152.5	4400	10050	0.38	46.5	1340	3060	0.38
154.1	4340	9110	0.35	47.0	1320	2780	0.35
155.8	4340	10460	0.40	47.5	1320	3190	0.40
157.4	4520	9970	0.37	48.0	1380	3040	0.37
159.0	4430	10290	0.39	48.5	1350	3140	0.39
160.7	4650	9740	0.35	49.0	1420	2970	0.35
162.3	5320	12170	0.38	49.5	1620	3710	0.38
164.0	4800	11200	0.39	50.0	1460	3410	0.39
165.6	4810	11720	0.40	50.5	1470	3570	0.40
167.2	5150	11720	0.38	51.0	1570	3570	0.38
168.9	4690	11200	0.39	51.5	1430	3410	0.39
170.5	4040	10730	0.42	52.0	1230	3270	0.42
172.2	-	-	-	52.5	-	-	-
173.8	-	-	-	53.0	-	-	-
175.4	-	-	-	53.5	-	-	-
177.1	-	-	-	54.0	-	-	-
178.7	-	-	-	54.5	-	-	-
180.4	-	-	-	55.0	-	-	-
182.0	-	-	-	55.5	-	-	-
183.6	-	-	-	56.0	-	-	-
185.3	-	-	-	56.5	-	-	-
186.9	-	-	-	57.0	-	-	-
188.6	-	-	-	57.5	-	-	-
190.2	-	-	-	58.0	-	-	-
191.8	-	-	-	58.5	-	-	-
193.5	-	-	-	59.0	-	-	-
195.1	-	-	-	59.5	-	-	-
196.8	-	-	-	60.0	-	-	-
198.4	-	-	-	60.5	-	-	-
200.0	-	-	-	61.0	-	-	-

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-9**

American Units				Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio	Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p			V _s	V _p	
	(ft/s)	(ft/s)			(m/s)	(m/s)	
201.7	-	-	-	61.5	-	-	-
203.3	-	-	-	62.0	-	-	-
205.0	-	-	-	62.5	-	-	-
206.6	-	-	-	63.0	-	-	-
208.2	-	-	-	63.5	-	-	-
209.9	-	-	-	64.0	-	-	-
211.5	-	-	-	64.5	-	-	-
213.2	-	-	-	65.0	-	-	-
214.8	-	-	-	65.5	-	-	-
216.4	-	-	-	66.0	-	-	-
218.1	-	-	-	66.5	-	-	-
219.7	2580	6920	0.42	67.0	790	2110	0.42
221.4	2530	7400	0.43	67.5	770	2260	0.43
223.0	2460	6770	0.42	68.0	750	2060	0.42
224.7	2440	7400	0.44	68.5	740	2260	0.44
226.3	2490	7720	0.44	69.0	760	2350	0.44
227.9	2560	7960	0.44	69.5	780	2430	0.44
229.6	2640	7960	0.44	70.0	800	2430	0.44
231.2	2680	8120	0.44	70.5	820	2470	0.44
232.9	2680	6990	0.41	71.0	820	2130	0.41
234.5	2680	6990	0.41	71.5	820	2130	0.41
236.1	2670	6990	0.41	72.0	810	2130	0.41

Notes: "-" means no data available at that particular interval of depth.

LEVY COUNTY COLA BORING I-10 (SONIC, CASED)
Source to Receiver and Receiver to Receiver Analysis

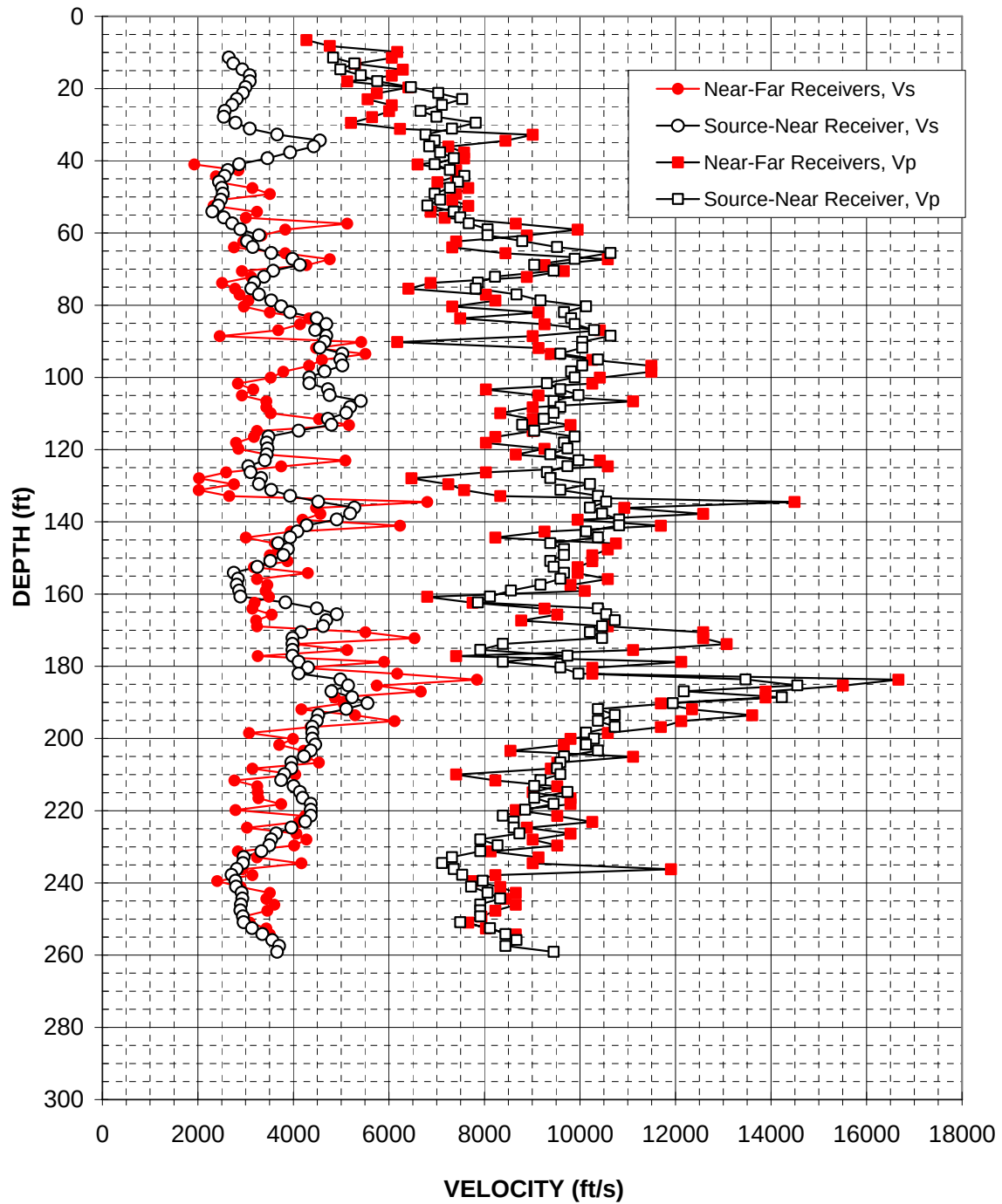


Figure A-14: Boring I-10, Suspension S-R1 P- and S_H-wave velocities

Table A-14. Boring I-10, Suspension S-R1 depths and P- and S_H-wave velocities

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-10**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
11.4	2650	4830	0.29
13.0	2740	5280	0.32
14.7	2930	4980	0.24
16.3	3090	5410	0.26
18.0	3090	5750	0.30
19.6	3000	6460	0.36
21.2	2940	7030	0.39
22.9	2810	7540	0.42
24.5	2720	7110	0.41
26.2	2560	6660	0.41
27.8	2540	6990	0.42
29.4	2790	7810	0.43
31.1	3090	7320	0.39
32.7	3660	6770	0.29
34.4	4550	6960	0.12
36.0	4430	6840	0.14
37.6	3930	7070	0.28
39.3	3460	7360	0.36
40.9	2860	6960	0.40
42.6	2630	7280	0.43
44.2	2560	7580	0.44
45.8	2440	7450	0.44
47.5	2500	7280	0.43
49.1	2520	6960	0.42
50.8	2480	7070	0.43
52.4	2430	6810	0.43
54.0	2300	7360	0.45
55.7	2540	7490	0.43
57.3	2720	7670	0.43
59.0	2890	8060	0.43
60.6	3280	8060	0.40
62.2	3030	8790	0.43
63.9	3150	9520	0.44
65.5	3540	10640	0.44
67.2	3980	9890	0.40

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
3.5	810	1470	0.29
4.0	840	1610	0.32
4.5	890	1520	0.24
5.0	940	1650	0.26
5.5	940	1750	0.30
6.0	910	1970	0.36
6.5	900	2140	0.39
7.0	860	2300	0.42
7.5	830	2170	0.41
8.0	780	2030	0.41
8.5	770	2130	0.42
9.0	850	2380	0.43
9.5	940	2230	0.39
10.0	1120	2060	0.29
10.5	1390	2120	0.12
11.0	1350	2090	0.14
11.5	1200	2160	0.28
12.0	1050	2240	0.36
12.5	870	2120	0.40
13.0	800	2220	0.43
13.5	780	2310	0.44
14.0	740	2270	0.44
14.5	760	2220	0.43
15.0	770	2120	0.42
15.5	760	2160	0.43
16.0	740	2070	0.43
16.5	700	2240	0.45
17.0	770	2280	0.43
17.5	830	2340	0.43
18.0	880	2460	0.43
18.5	1000	2460	0.40
19.0	920	2680	0.43
19.5	960	2900	0.44
20.0	1080	3240	0.44
20.5	1210	3010	0.40

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-10**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
68.8	4140	9040	0.37
70.5	3580	9450	0.42
72.1	3390	8220	0.40
73.7	3180	7860	0.40
75.4	3120	7810	0.41
77.0	3280	8670	0.42
78.7	3540	9170	0.41
80.3	3750	10130	0.42
81.9	3930	9660	0.40
83.6	4490	9810	0.37
85.2	4690	9890	0.36
86.9	4460	10290	0.38
88.5	4690	10640	0.38
90.1	4650	10050	0.36
91.8	4550	10050	0.37
93.4	5020	9590	0.31
95.1	4980	10380	0.35
96.7	5020	10050	0.33
98.3	4650	9810	0.35
100.0	4340	9890	0.38
101.6	4340	9310	0.36
103.3	4720	9590	0.34
104.9	4760	9970	0.35
106.5	5410	9450	0.26
108.2	5190	9590	0.29
109.8	5100	9450	0.29
111.5	4720	9240	0.32
113.1	4800	8790	0.29
114.7	4110	9040	0.37
116.4	3480	9890	0.43
118.0	3440	9660	0.43
119.7	3460	9740	0.43
121.3	3440	9380	0.42
122.9	3400	9970	0.43
124.6	3060	9740	0.45
126.2	3100	9310	0.44
127.9	3320	9380	0.43
129.5	3280	10210	0.44
131.1	3540	9590	0.42

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
21.0	1260	2760	0.37
21.5	1090	2880	0.42
22.0	1030	2510	0.40
22.5	970	2400	0.40
23.0	950	2380	0.41
23.5	1000	2640	0.42
24.0	1080	2800	0.41
24.5	1140	3090	0.42
25.0	1200	2950	0.40
25.5	1370	2990	0.37
26.0	1430	3010	0.36
26.5	1360	3140	0.38
27.0	1430	3240	0.38
27.5	1420	3060	0.36
28.0	1390	3060	0.37
28.5	1530	2920	0.31
29.0	1520	3160	0.35
29.5	1530	3060	0.33
30.0	1420	2990	0.35
30.5	1320	3010	0.38
31.0	1320	2840	0.36
31.5	1440	2920	0.34
32.0	1450	3040	0.35
32.5	1650	2880	0.26
33.0	1580	2920	0.29
33.5	1560	2880	0.29
34.0	1440	2820	0.32
34.5	1460	2680	0.29
35.0	1250	2760	0.37
35.5	1060	3010	0.43
36.0	1050	2950	0.43
36.5	1050	2970	0.43
37.0	1050	2860	0.42
37.5	1040	3040	0.43
38.0	930	2970	0.45
38.5	950	2840	0.44
39.0	1010	2860	0.43
39.5	1000	3110	0.44
40.0	1080	2920	0.42

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-10**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
132.8	3930	10380	0.42
134.4	4520	10550	0.39
136.1	5280	10210	0.32
137.7	5190	10460	0.34
139.3	4910	10820	0.37
141.0	4280	10820	0.41
142.6	4080	10130	0.40
144.3	3930	10380	0.42
145.9	3680	9380	0.41
147.6	3880	9660	0.40
149.2	3790	9660	0.41
150.8	3520	9380	0.42
152.5	3250	9450	0.43
154.1	2750	9660	0.46
155.8	2840	9590	0.45
157.4	2810	9170	0.45
159.0	2860	8550	0.44
160.7	2890	8120	0.43
162.3	3840	7860	0.34
164.0	4490	10380	0.38
165.6	4910	10550	0.36
167.2	4690	10730	0.38
168.9	4620	10460	0.38
170.5	4160	10210	0.40
172.2	3980	10460	0.42
173.8	3980	8380	0.35
175.4	3980	7910	0.33
177.1	3980	9740	0.40
178.7	4110	8380	0.34
180.4	4310	9590	0.37
182.0	4110	9970	0.40
183.6	4980	13470	0.42
185.3	5150	14550	0.43
186.9	4800	12170	0.41
188.6	5230	14220	0.42
190.2	5550	11940	0.36
191.8	5100	10380	0.34
193.5	4520	10730	0.39
195.1	4490	10380	0.38

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
40.5	1200	3160	0.42
41.0	1380	3220	0.39
41.5	1610	3110	0.32
42.0	1580	3190	0.34
42.5	1500	3300	0.37
43.0	1300	3300	0.41
43.5	1240	3090	0.40
44.0	1200	3160	0.42
44.5	1120	2860	0.41
45.0	1180	2950	0.40
45.5	1160	2950	0.41
46.0	1070	2860	0.42
46.5	990	2880	0.43
47.0	840	2950	0.46
47.5	870	2920	0.45
48.0	860	2800	0.45
48.5	870	2610	0.44
49.0	880	2470	0.43
49.5	1170	2400	0.34
50.0	1370	3160	0.38
50.5	1500	3220	0.36
51.0	1430	3270	0.38
51.5	1410	3190	0.38
52.0	1270	3110	0.40
52.5	1210	3190	0.42
53.0	1210	2560	0.35
53.5	1210	2410	0.33
54.0	1210	2970	0.40
54.5	1250	2560	0.34
55.0	1310	2920	0.37
55.5	1250	3040	0.40
56.0	1520	4110	0.42
56.5	1570	4440	0.43
57.0	1460	3710	0.41
57.5	1590	4340	0.42
58.0	1690	3640	0.36
58.5	1560	3160	0.34
59.0	1380	3270	0.39
59.5	1370	3160	0.38

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-10**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V _s	V _p	
(ft)	(ft/s)	(ft/s)	
196.8	4400	10730	0.40
198.4	4400	10130	0.38
200.0	4400	10290	0.39
201.7	4460	10130	0.38
203.3	4370	10380	0.39
205.0	4220	9660	0.38
206.6	3960	9590	0.40
208.2	3960	9520	0.40
209.9	3810	9590	0.41
211.5	3750	9170	0.40
213.2	4010	9040	0.38
214.8	4140	9740	0.39
216.4	4190	9040	0.36
218.1	4370	9450	0.36
219.7	4370	8850	0.34
221.4	4370	8380	0.31
223.0	4250	8610	0.34
224.7	3960	8610	0.37
226.3	3640	8730	0.39
227.9	3540	7910	0.38
229.6	3500	8270	0.39
231.2	3330	7910	0.39
232.9	2960	7320	0.40
234.5	2940	7110	0.40
236.1	2810	7360	0.41
237.8	2710	7540	0.43
239.4	2790	7960	0.43
241.1	2800	7720	0.42
242.7	2920	8060	0.42
244.3	2930	8330	0.43
246.0	2900	7910	0.42
247.6	2890	7910	0.42
249.3	2940	7910	0.42
250.9	2960	7490	0.41
252.5	3130	8120	0.41
254.2	3350	8440	0.41
255.8	3560	8670	0.40
257.5	3700	8440	0.38
259.1	3660	9450	0.41

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V _s	V _p	
(m)	(m/s)	(m/s)	
60.0	1340	3270	0.40
60.5	1340	3090	0.38
61.0	1340	3140	0.39
61.5	1360	3090	0.38
62.0	1330	3160	0.39
62.5	1290	2950	0.38
63.0	1210	2920	0.40
63.5	1210	2900	0.40
64.0	1160	2920	0.41
64.5	1140	2800	0.40
65.0	1220	2760	0.38
65.5	1260	2970	0.39
66.0	1280	2760	0.36
66.5	1330	2880	0.36
67.0	1330	2700	0.34
67.5	1330	2560	0.31
68.0	1290	2630	0.34
68.5	1210	2630	0.37
69.0	1110	2660	0.39
69.5	1080	2410	0.38
70.0	1070	2520	0.39
70.5	1020	2410	0.39
71.0	900	2230	0.40
71.5	900	2170	0.40
72.0	860	2240	0.41
72.5	820	2300	0.43
73.0	850	2430	0.43
73.5	850	2350	0.42
74.0	890	2460	0.42
74.5	890	2540	0.43
75.0	890	2410	0.42
75.5	880	2410	0.42
76.0	900	2410	0.42
76.5	900	2280	0.41
77.0	960	2470	0.41
77.5	1020	2570	0.41
78.0	1080	2640	0.40
78.5	1130	2570	0.38
79.0	1120	2880	0.41

**Summary of Compressional Wave Velocity, Shear Wave Velocity, and Poisson's Ratio
Based on Source-to-Receiver Travel Time Data - Borehole I-10**

American Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson's Ratio
	V_s	V_p	
(ft)	(ft/s)	(ft/s)	

Metric Units			
Depth at Midpoint Between Source and Near Receiver	Velocity		Poisson' s Ratio
	V_s	V_p	
(m)	(m/s)	(m/s)	

Notes: "-" means no data available at that particular interval of depth.

APPENDIX B

DOWNHOLE VELOCITY MEASUREMENT

RESULTS

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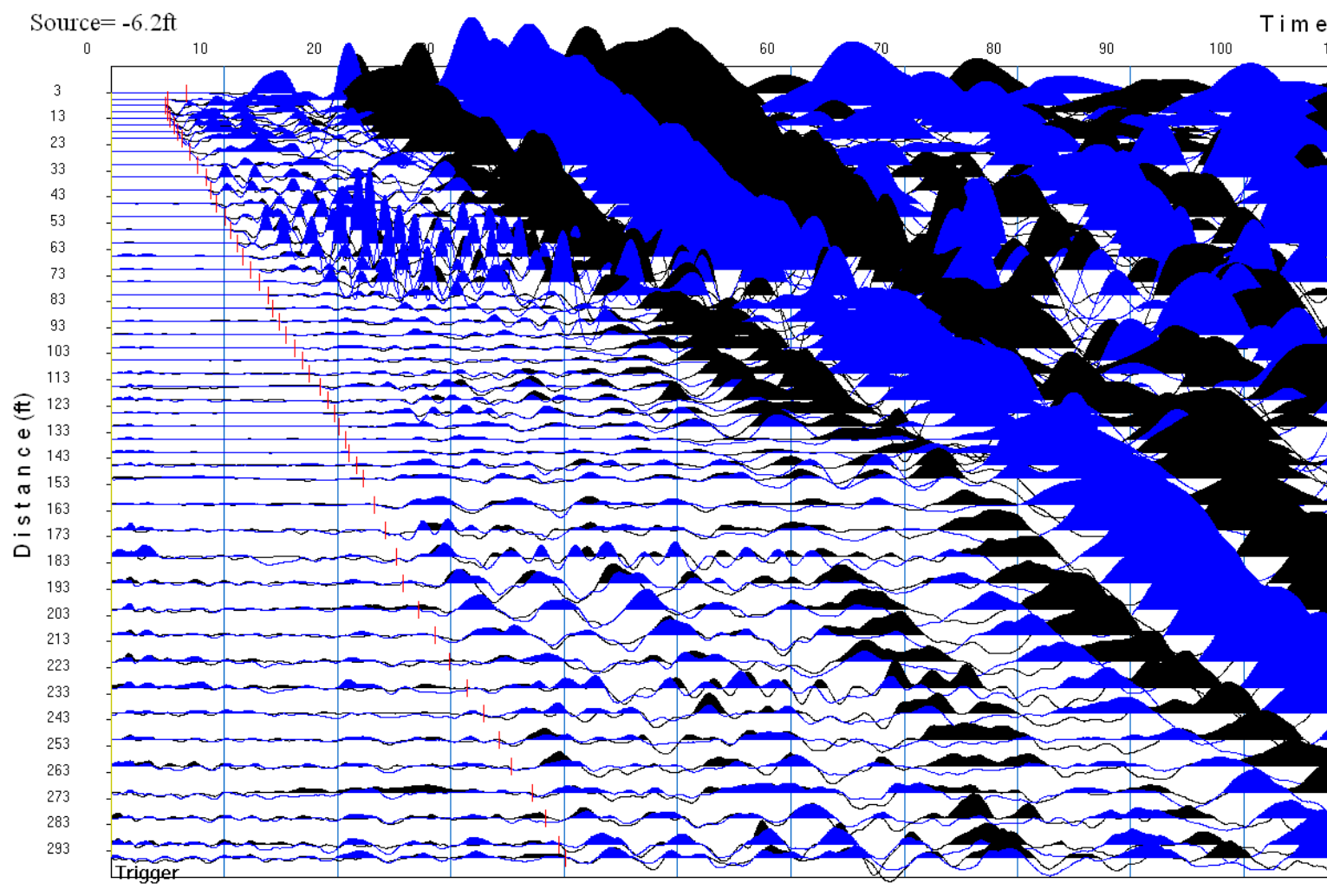


Figure B-1: Boring I-2, Downhole Vp 500 Hz filtered waveforms and picks (on Vs records due to timing shifts in Vp records caused by settlement of P-wave striking plate in soft surficial soils)

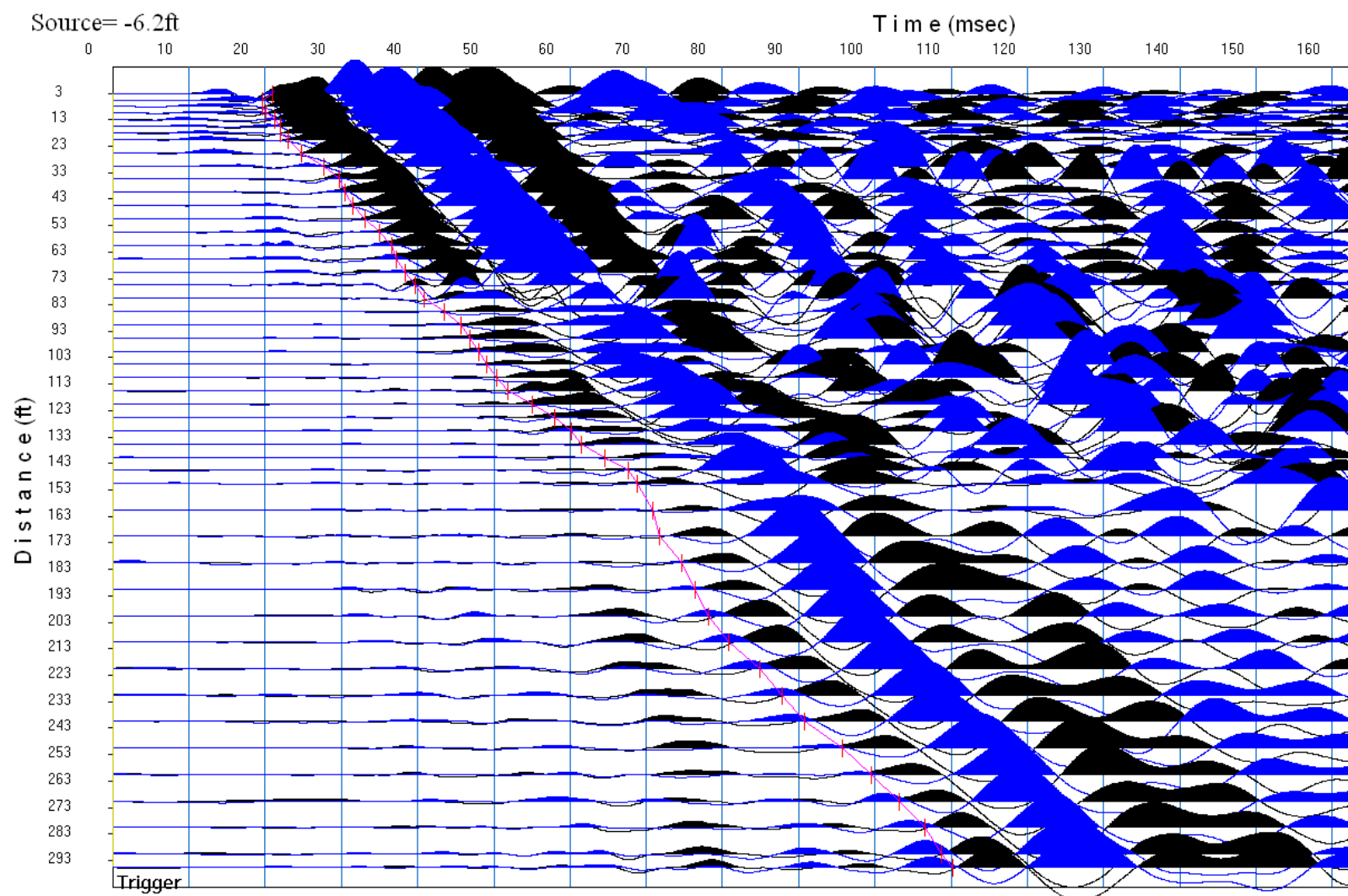


Figure B-2: Boring I-2, Downhole Vs 75 Hz filtered waveforms and picks

LEVY COUNTY COLA BORING I-2 (SONIC, CASED)
Downhole and Receiver to Receiver Analysis

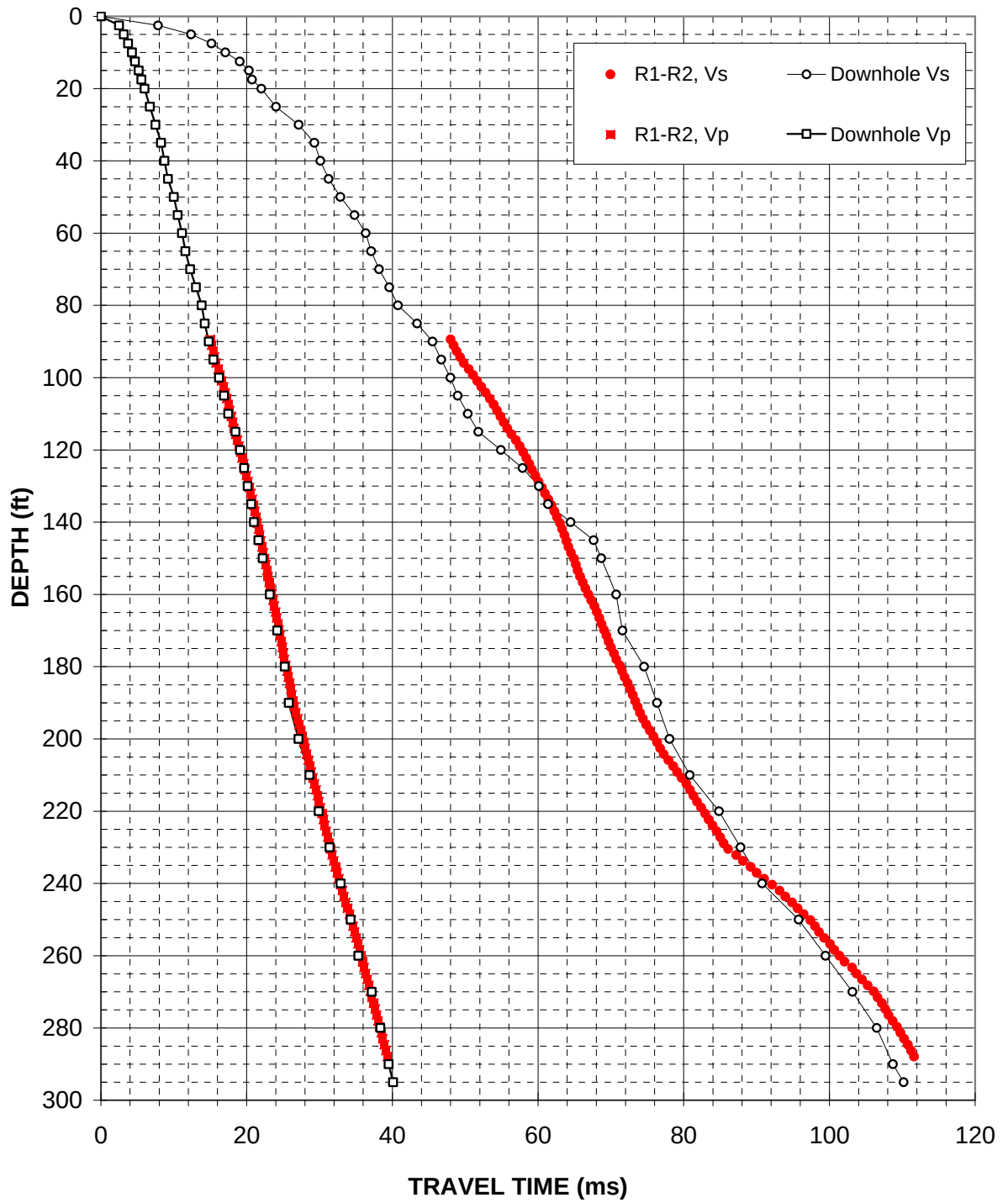


Figure B-3: Boring I-2, Downhole and Suspension R1-R2 Travel Time Plots

Table B-1. Boring I-2, Downhole Layer P- and S_H-wave velocities

**Layered Velocity Model for Vs and Vp
Based on Downhole Travel Time Data - Borehole I-2**

American Units					
Layer Number	Layer Depth			Layer Velocity	
	Top	Bottom	Thickness	V _s	V _p
	(ft)	(ft)	(ft)	(ft/s)	(ft/s)
1	0.0	10.0	10.0	790	4230
2	10.0	30.0	20.0	2110	6200
3	30.0	145.0	115.0	2970	7930
4	145.0	190.0	45.0	5160	10430
5	190.0	240.0	50.0	3290	7060
6	240.0	295.0	55.0	2860	7510

Metric						
Layer Number	Layer Depth			Layer Velocity		Poisson's Ratio
	Top	Bottom	Thickness	V _s	V _p	
	(m)	(m)	(m)	(m/s)	(m/s)	
1	0.0	3.0	3.0	240	1290	0.48
2	3.0	9.1	6.1	640	1890	0.43
3	9.1	44.2	35.1	900	2420	0.42
4	44.2	57.9	13.7	1570	3180	0.34
5	57.9	73.2	15.2	1000	2150	0.36
6	73.2	89.9	16.8	870	2290	0.42

(rounded to the nearest 10fps, three significant digits)

LEVY COUNTY COLA BORING I-2 (SONIC, CASED) R1-R2 and Downhole Layered Model Velocities

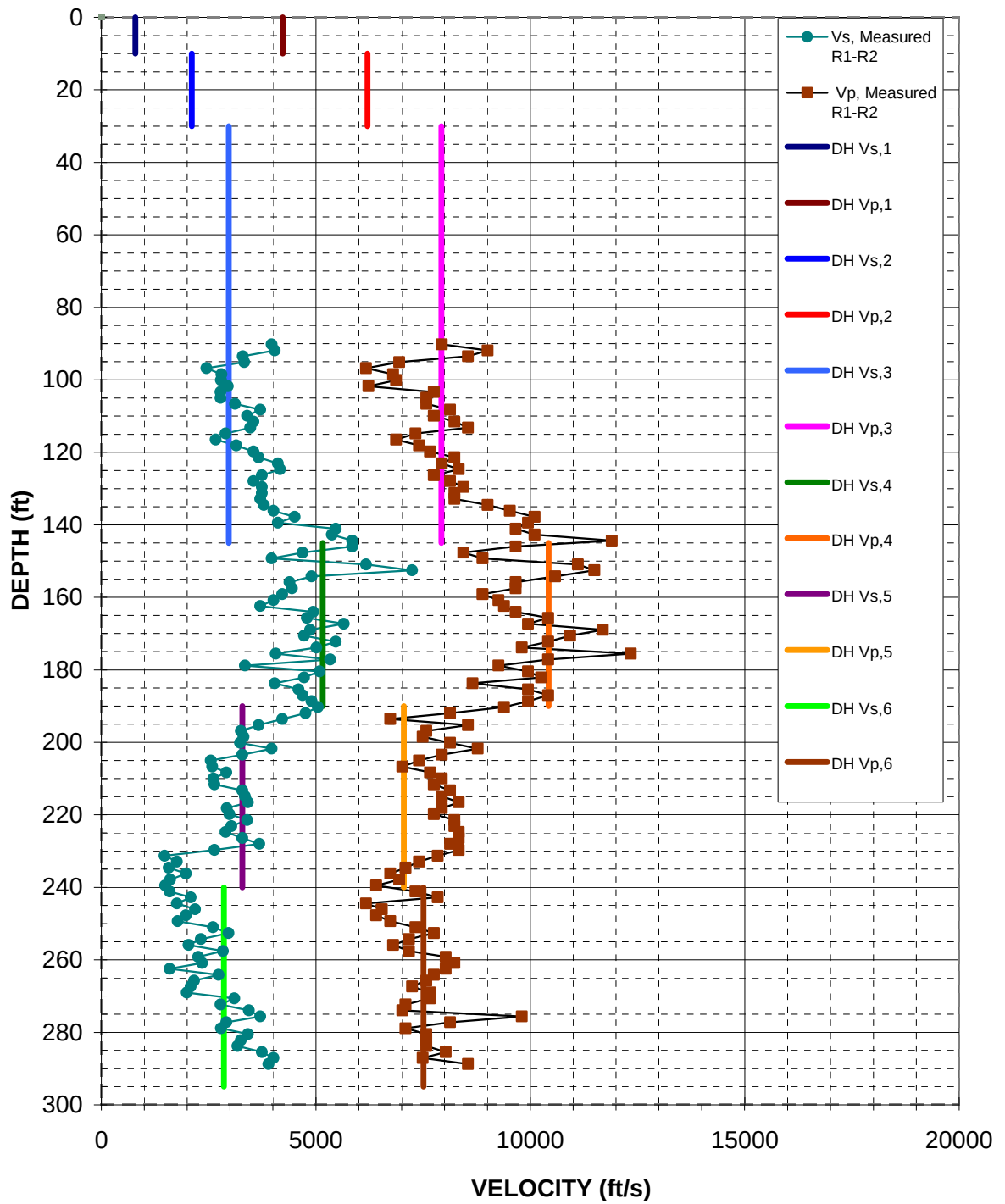


Figure B-4: Boring I-2, Comparison of Downhole Layered Model with Suspension R1-R2 Results

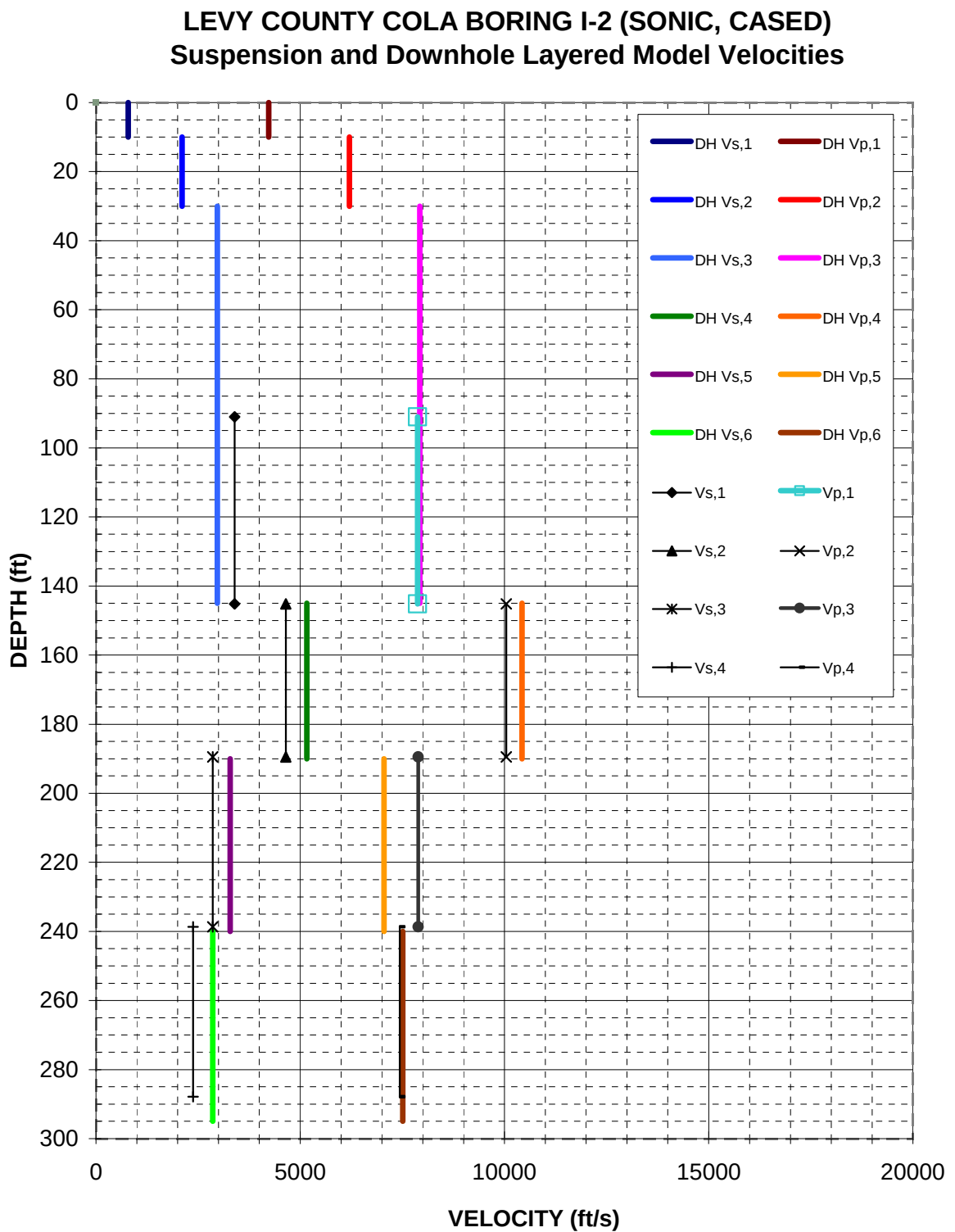


Figure B-5: Boring I-5, Comparison of Suspension and Downhole Layered Model Velocities

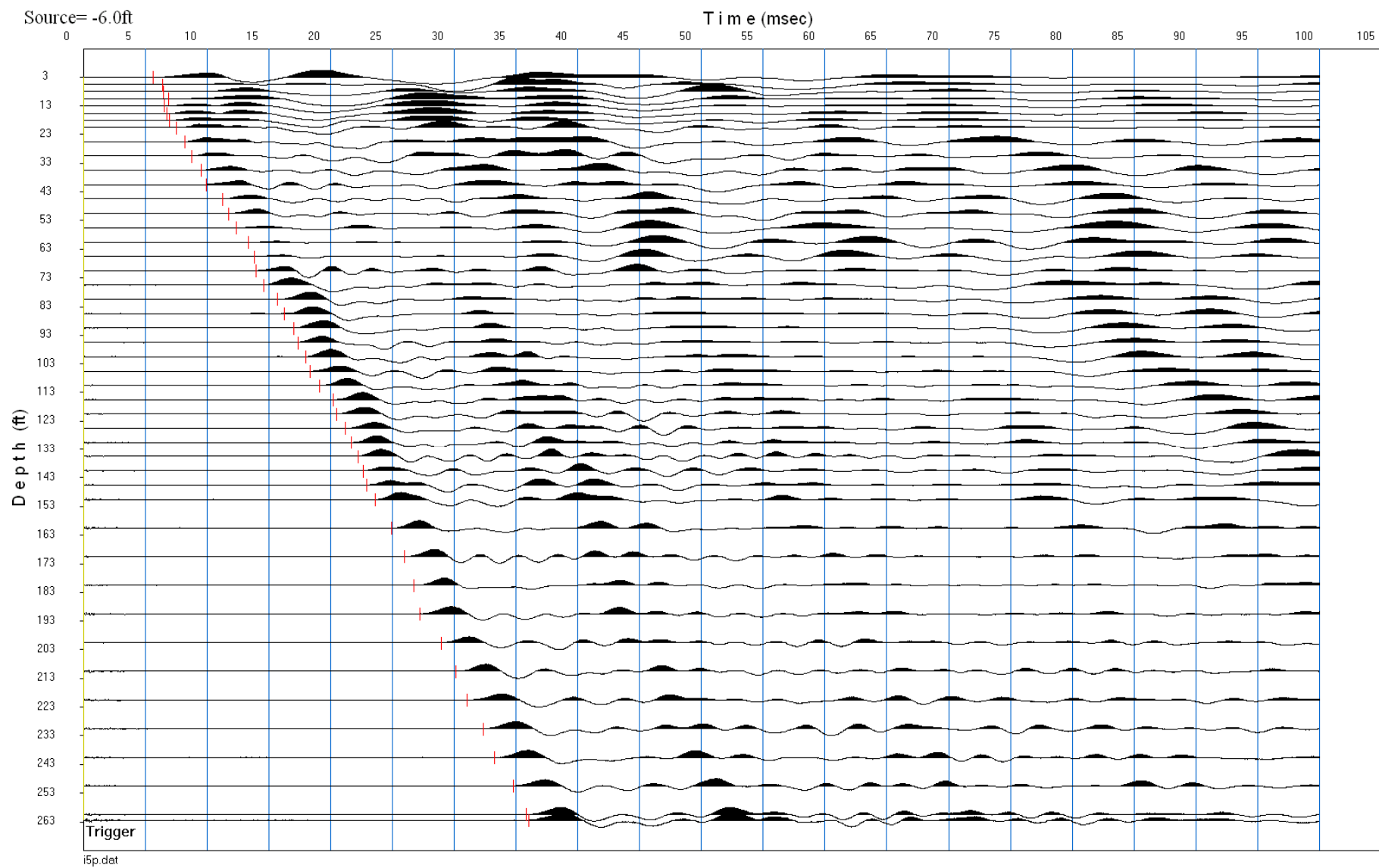


Figure B-6: Boring I-5, Downhole Vp 200 Hz filtered waveforms and picks

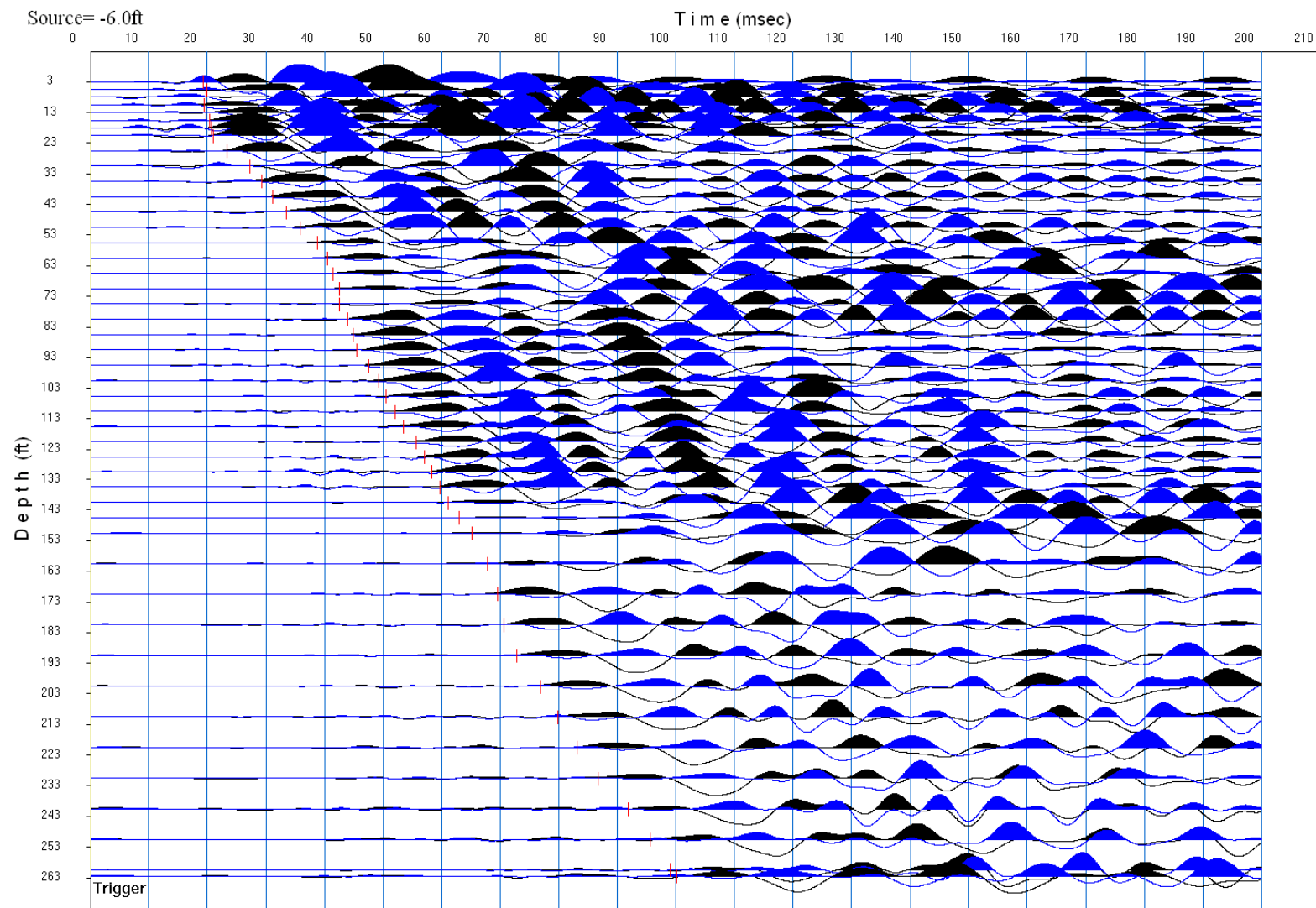


Figure B-7: Boring I-5, Downhole Vs 100 Hz filtered waveforms and picks

LEVY COUNTY COLA BORING I-5 (SONIC, CASED)
Downhole and Receiver to Receiver Analysis

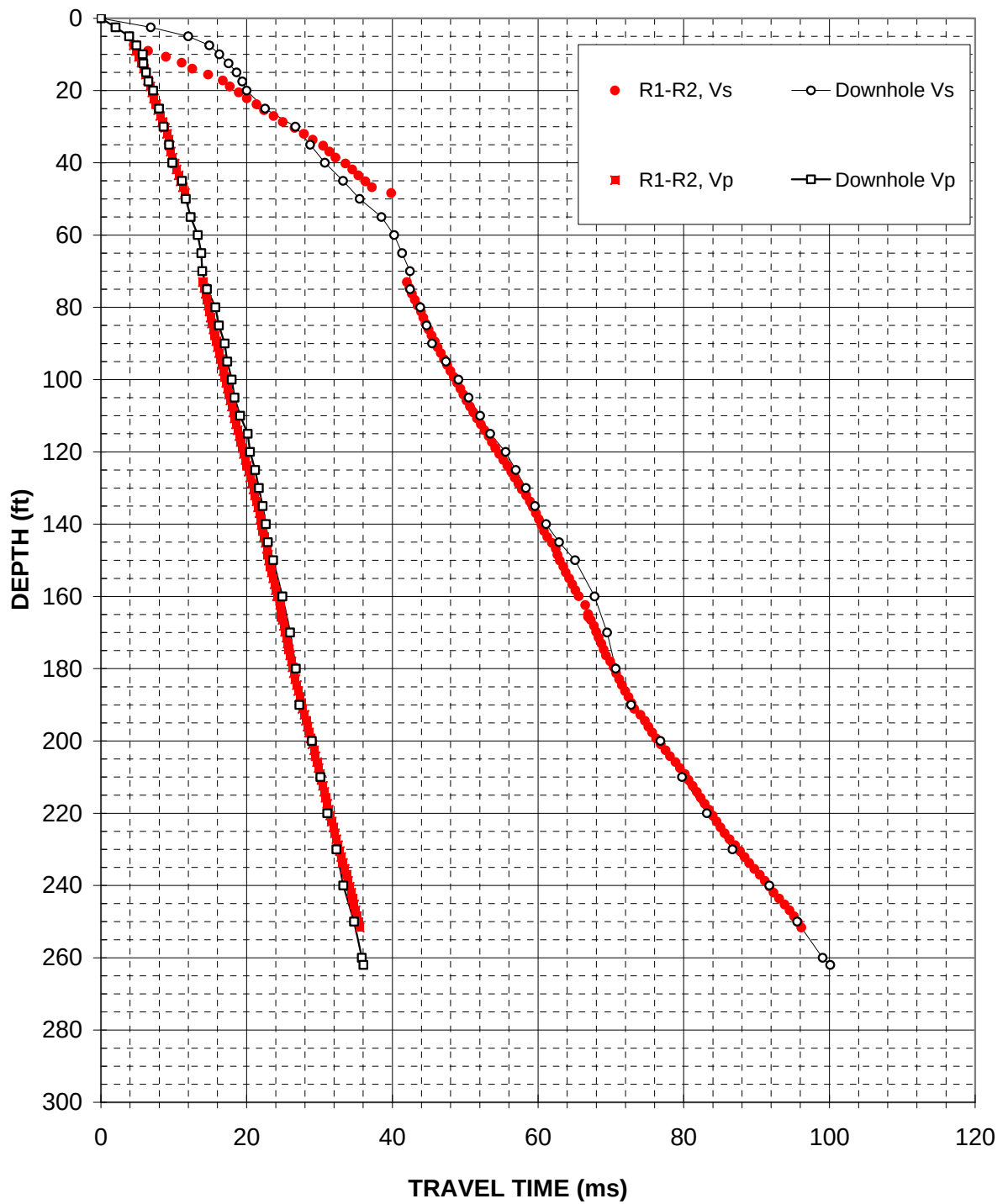


Figure B-8: Boring I-5, Downhole and Suspension R1-R2 Travel Time Plots

Table B-2. Boring I-5, Downhole Layer P- and S_H-wave velocities

Layered Velocity Model for Vs and Vp
Based on Downhole Travel Time Data - Borehole I-5

American Units					
Layer Number	Layer Depth			Layer Velocity	
	Top	Bottom	Thickness	V _s	V _p
	(ft)	(ft)	(ft)	(ft/s)	(ft/s)
1	0.0	7.5	7.5	610	1700
2	7.5	65.0	57.5	2070	6500
3	65.0	150.0	85.0	3460	8300
4	150.0	190.0	40.0	5370	10680
5	190.0	262.0	72.0	2620	8430

Metric						
Layer Number	Layer Depth			Layer Velocity		Poisson's Ratio
	Top	Bottom	Thickness	V _s	V _p	
	(m)	(m)	(m)	(m/s)	(m/s)	
1	0.0	2.3	2.3	180	520	0.36
2	2.3	19.8	17.5	630	1980	0.32
3	19.8	45.7	25.9	1060	2530	0.42
4	45.7	57.9	12.2	1640	3260	0.50
5	57.9	79.9	21.9	800	2570	0.31

(rounded to the nearest 10fps, three significant digits)

LEVY COUNTY COLA BORING I-5 (SONIC, CASED) R1-R2 and Downhole Layered Model Velocities

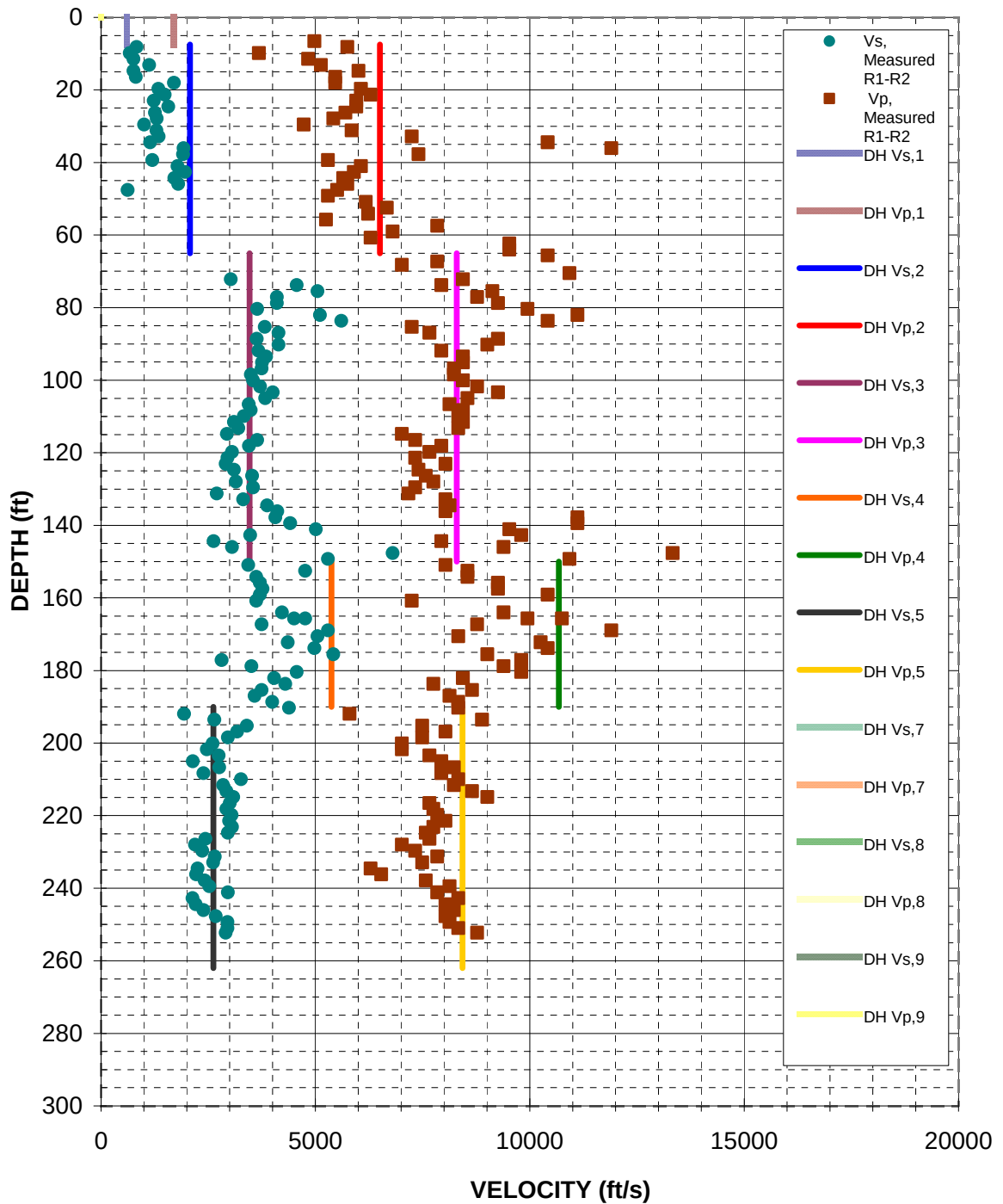


Figure B-9: Boring I-5, Comparison of Downhole Layered Model with Suspension R1-R2 Results

Figure B-10: Boring I-5, Comparison of Suspension and Downhole Layered Model Velocities

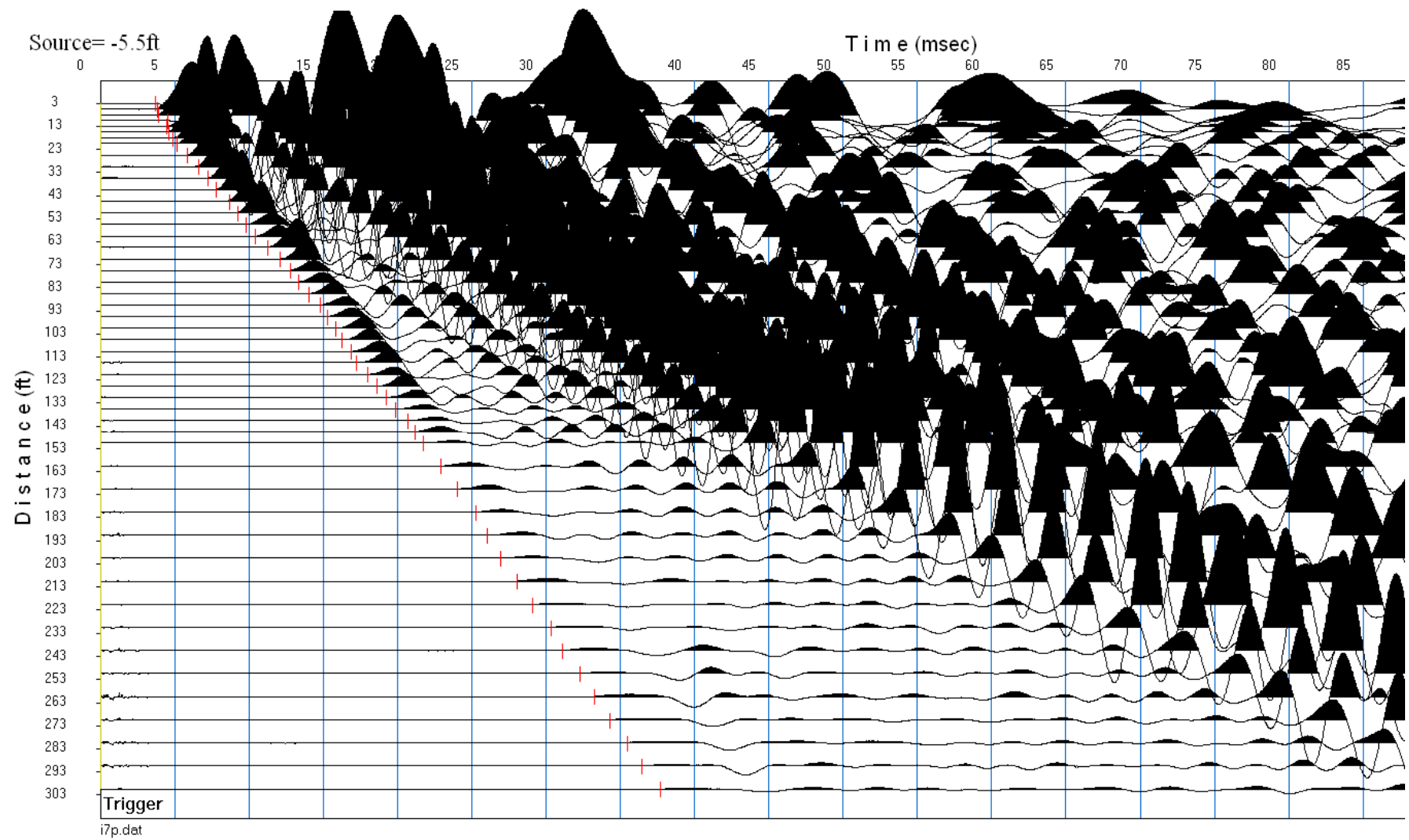


Figure B-11: Boring I-7, Downhole Vp unfiltered waveforms and picks

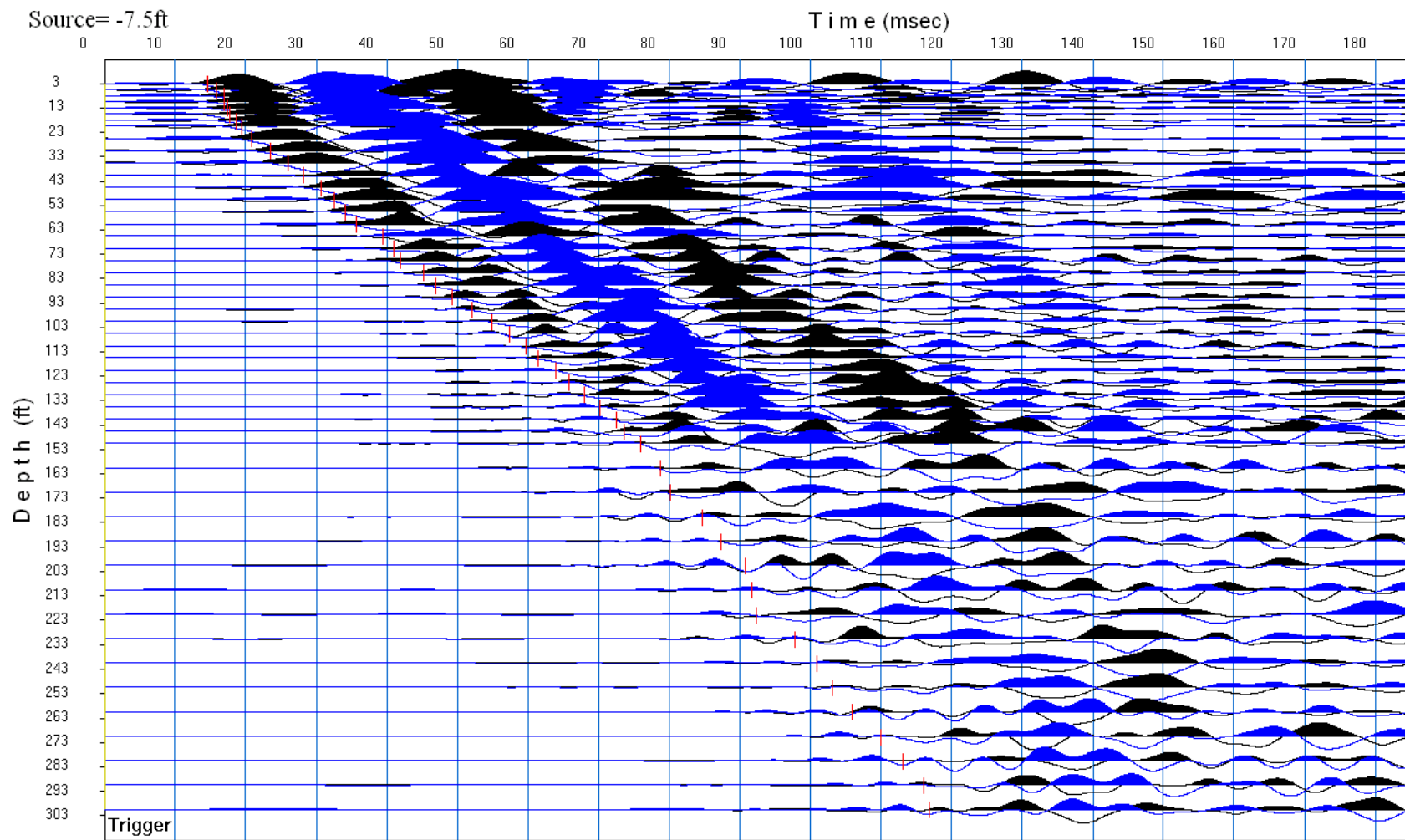


Figure B-12: Boring I-7, Downhole Vs 35 Hz filtered waveforms and picks

LEVY COUNTY COLA BORING I-7 (SONIC, CASED)
Downhole and Receiver to Receiver Analysis

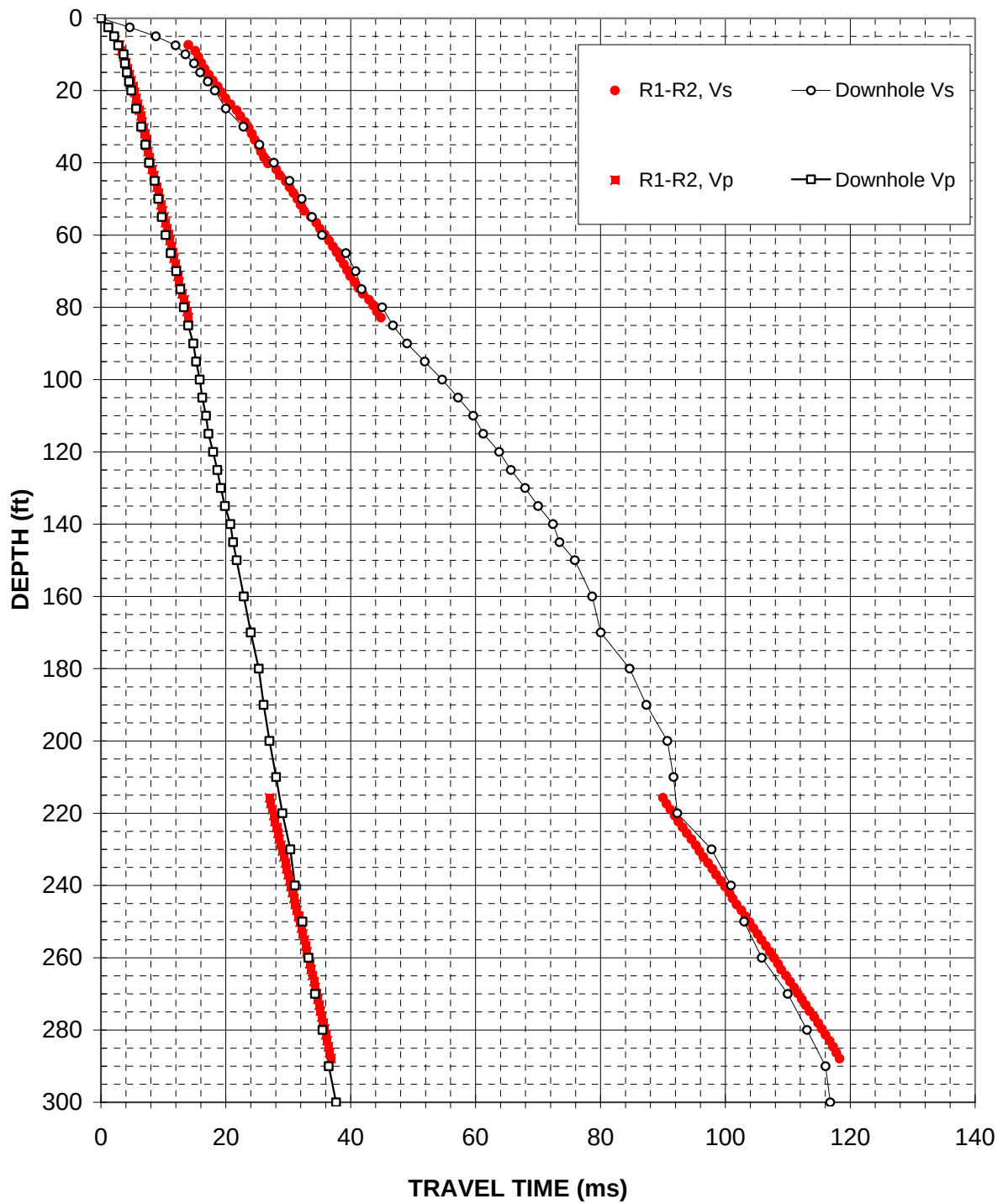


Figure B-13: Boring I-7, Downhole and Suspension R1-R2 Travel Time Plots

Table B-3. Boring I-7, Downhole Layer P- and S_H-wave velocities

**Layered Velocity Model for Vs and Vp
Based on Downhole Travel Time Data - Borehole I-7**

American Units					
Layer Number	Layer Depth			Layer Velocity	
	Top	Bottom	Thickness	V _s	V _p
	(ft)	(ft)	(ft)	(ft/s)	(ft/s)
1	0.0	7.5	7.5	680	3090
2	7.5	90.0	82.5	2240	7070
3	90.0	105.0	15.0	1820	10200
4	105.0	190.0	85.0	2800	8380
5	190.0	210.0	20.0	4180	9970
6	210.0	300.0	90.0	3270	9430

Metric						
Layer Number	Layer Depth			Layer Velocity		Poisson's Ratio
	Top	Bottom	Thickness	V _s	V _p	
	(m)	(m)	(m)	(m/s)	(m/s)	
1	0.0	2.3	2.3	210	940	0.47
2	2.3	27.4	25.1	680	2160	0.44
3	27.4	32.0	4.6	560	3120	0.48
4	32.0	57.9	25.9	860	2550	0.44
5	57.9	64.0	6.1	1270	3040	0.39
6	64.0	91.4	27.4	1000	2880	0.43

(rounded to the nearest 10fps, three significant digits)

LEVY COUNTY COLA BORING I-7 (SONIC, CASED) R1-R2 and Downhole Layered Model Velocities

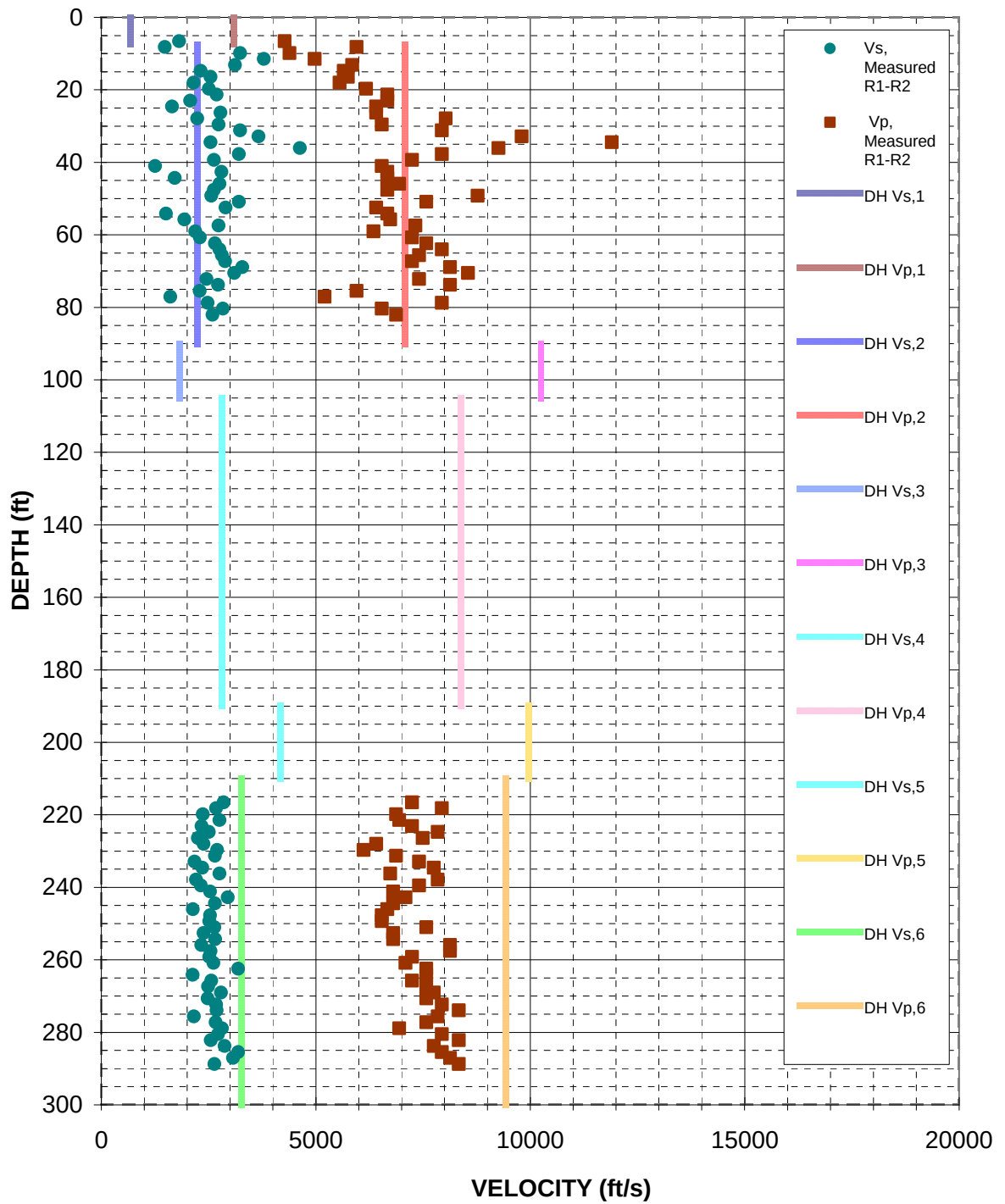


Figure B-14: Boring I-7, Comparison of Downhole Layered Model with Suspension R1-R2 Results

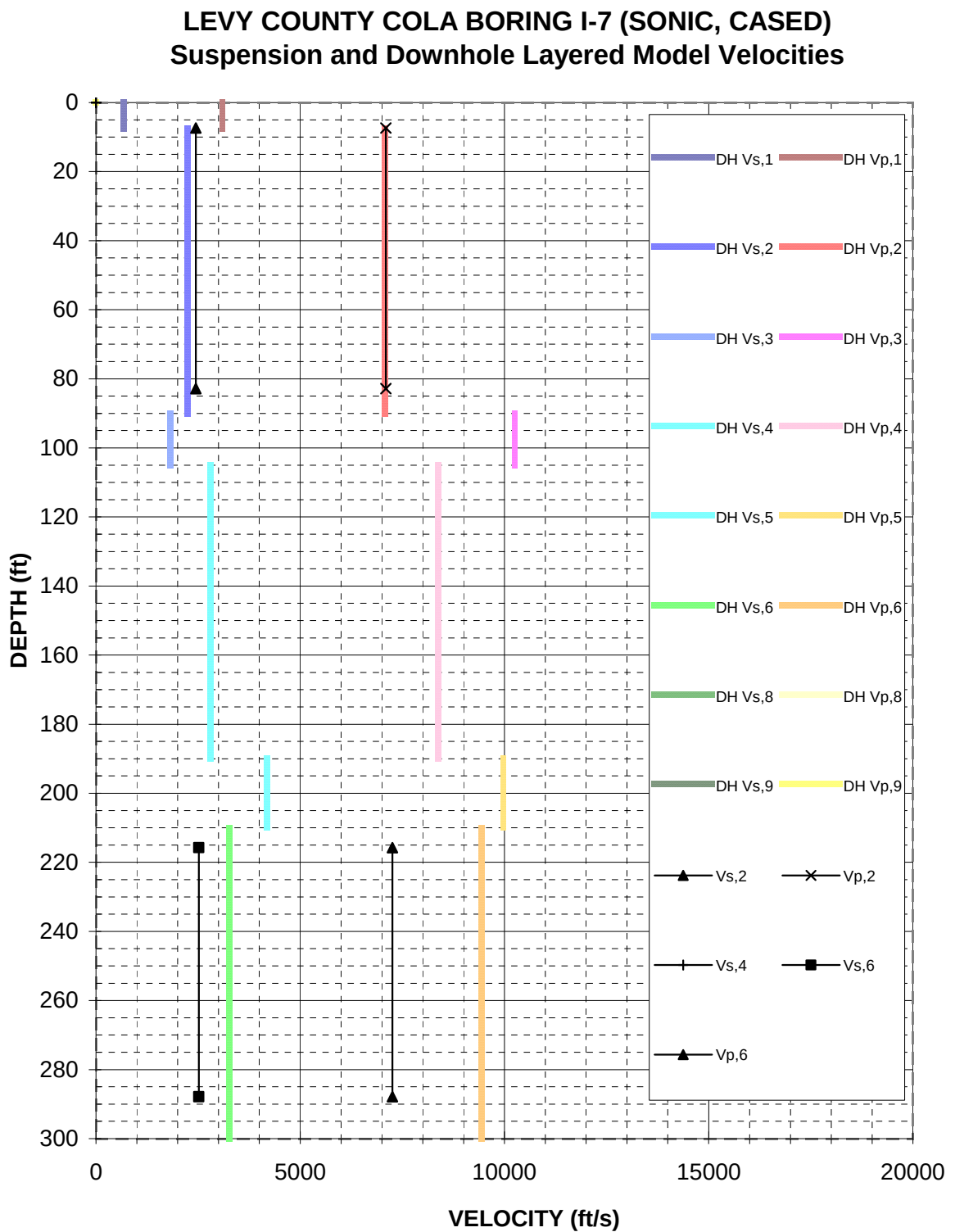


Figure B-15: Boring I-7, Comparison of Suspension and Downhole Layered Model Velocities

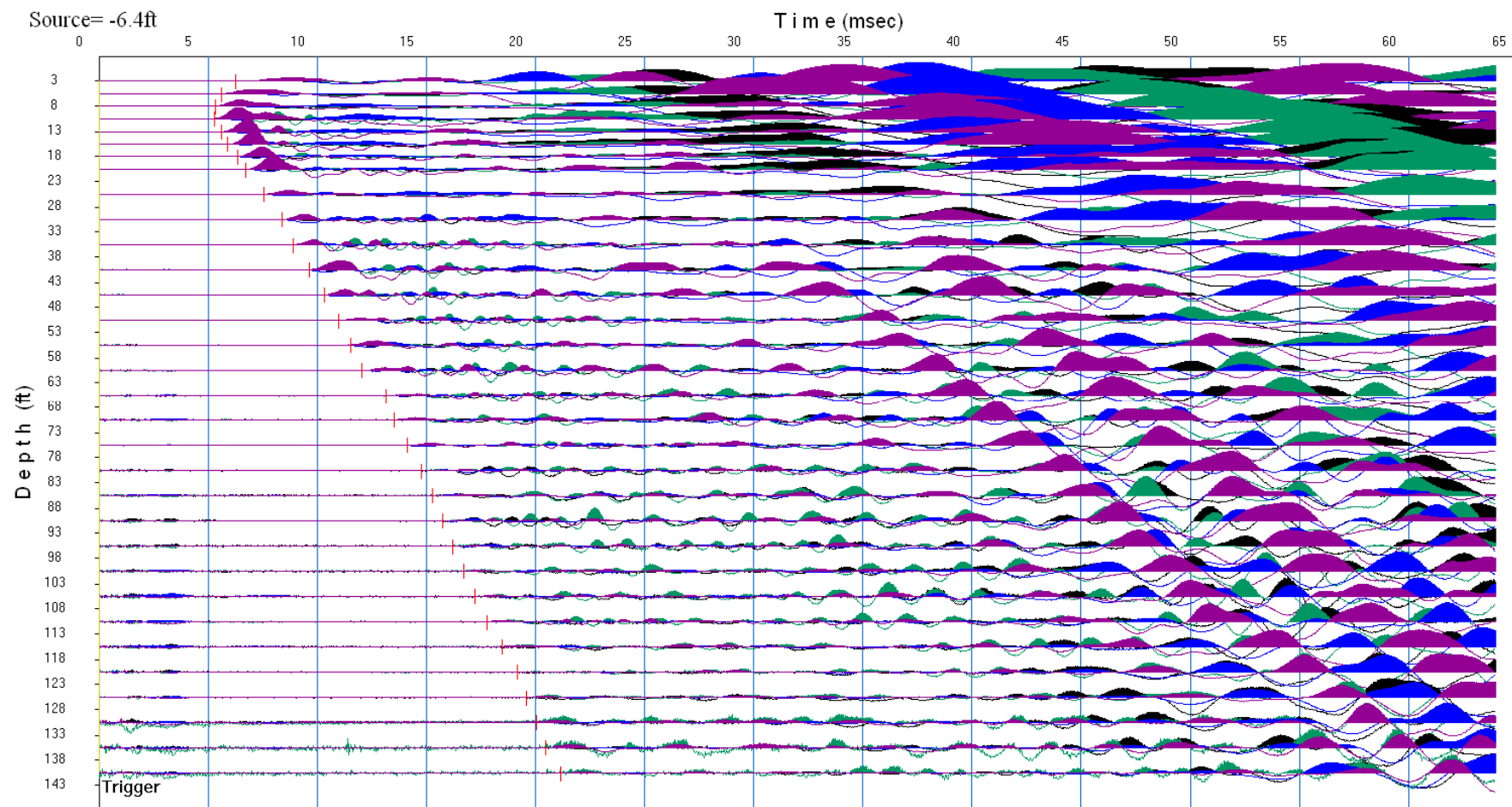


Figure B-16: Boring I-10, Downhole Vp unfiltered waveforms and picks (on Vs records due to timing shifts in Vp records caused by settlement of P-wave striking plate in soft surficial soils)

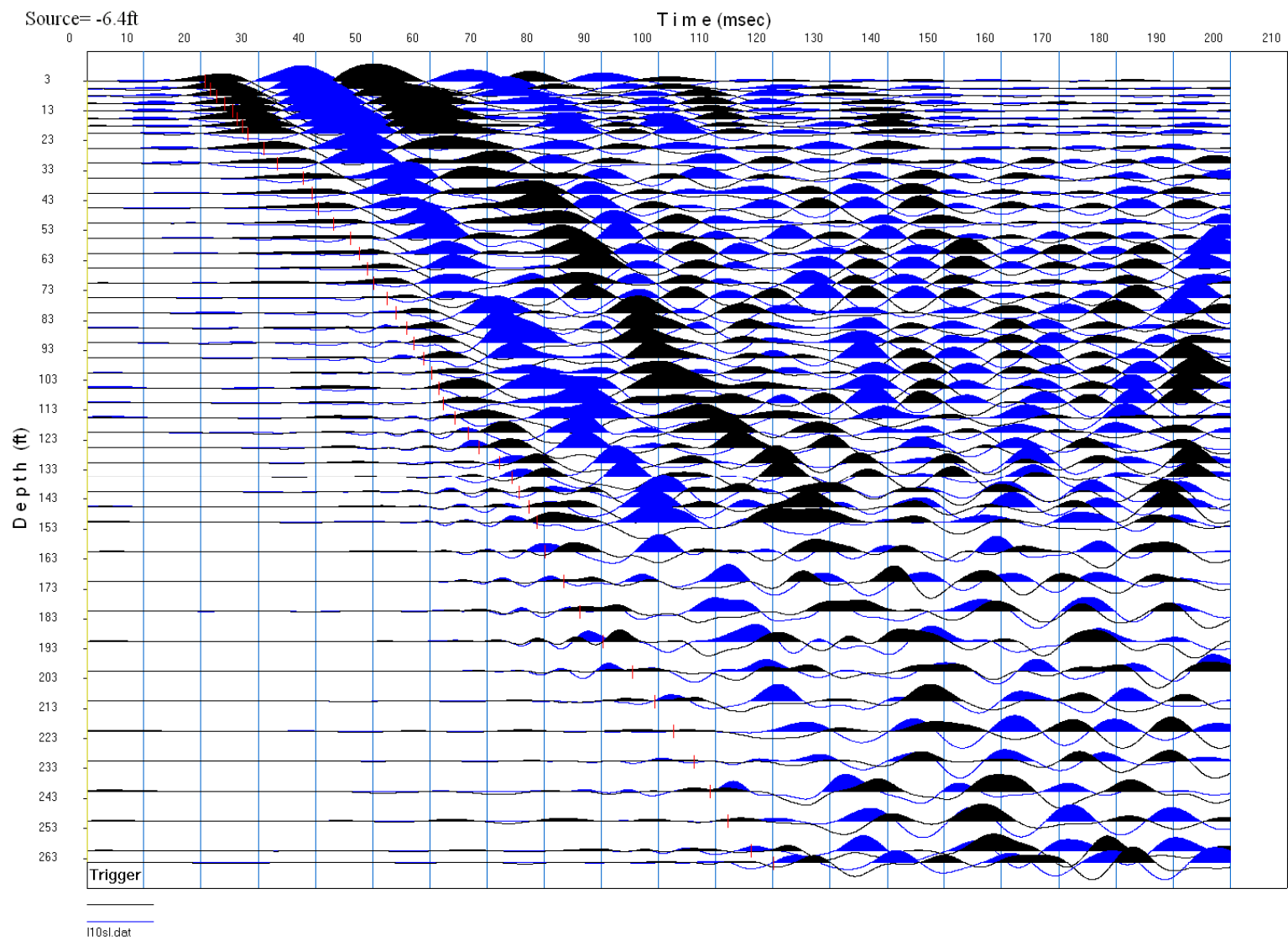


Figure B-17: Boring I-10, Downhole Vs 35 Hz filtered waveforms and picks

LEVY COUNTY COLA BORING I-10 (SONIC, CASED)
Downhole and Receiver to Receiver Analysis

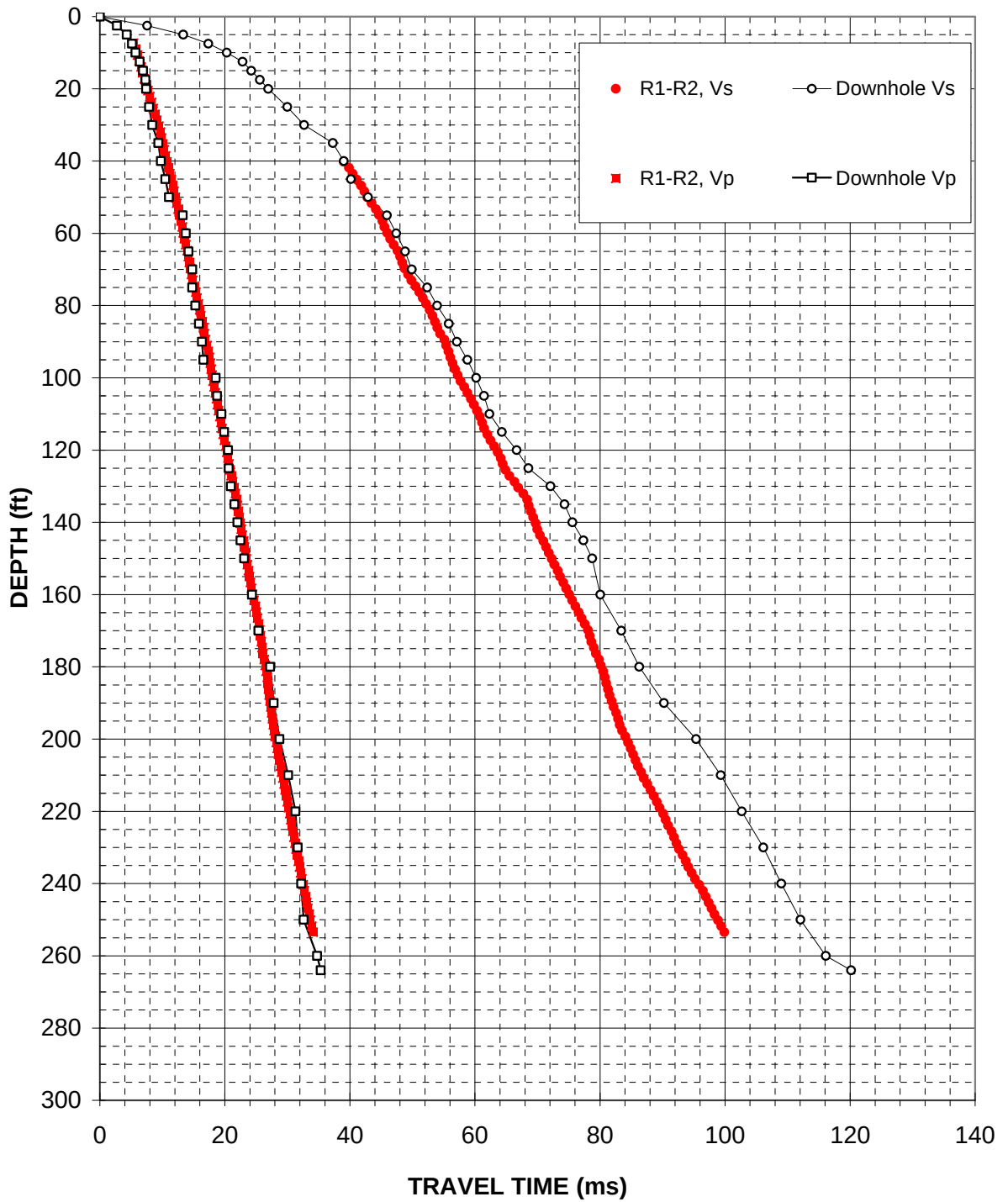


Figure B-18: Boring I-10, Downhole and Suspension R1-R2 Travel Time Plots

Table B-4. Boring I-10, Downhole Layer P- and S_H-wave velocities

**Layered Velocity Model for Vs and Vp
Based on Downhole Travel Time Data - Borehole I-10**

American Units					
Layer Number	Layer Depth			Layer Velocity	
	Top	Bottom	Thickness	V _s	V _p
	(ft)	(ft)	(ft)	(ft/s)	(ft/s)
1	0.0	20.0	20.0	880	3640
2	20.0	30.0	10.0	1740	10100
3	30.0	50.0	20.0	2020	7630
4	50.0	65.0	15.0	2490	4260
5	65.0	120.0	55.0	3170	7940
6	120.0	125.0	5.0	2660	55600
7	125.0	190.0	65.0	3290	8520
8	190.0	264.0	74.0	2680	10400

Metric						
Layer Number	Layer Depth			Layer Velocity		Poisson's Ratio
	Top	Bottom	Thickness	V _s	V _p	
	(m)	(m)	(m)	(m/s)	(m/s)	
1	0.0	6.1	6.1	270	1110	0.47
2	6.1	9.1	3.0	530	3090	0.48
3	9.1	15.2	6.1	620	2330	0.46
4	15.2	19.8	4.6	760	1300	0.24
5	19.8	36.6	16.8	970	2420	0.40
6	36.6	38.1	1.5	810	16900	0.50
7	38.1	57.9	19.8	1000	2600	0.41
8	57.9	80.5	22.6	820	3160	0.46

(rounded to the nearest 10fps, three significant digits)

LEVY COUNTY COLA BORING I-10 (SONIC, CASED) R1-R2 and Downhole Layered Model Velocities

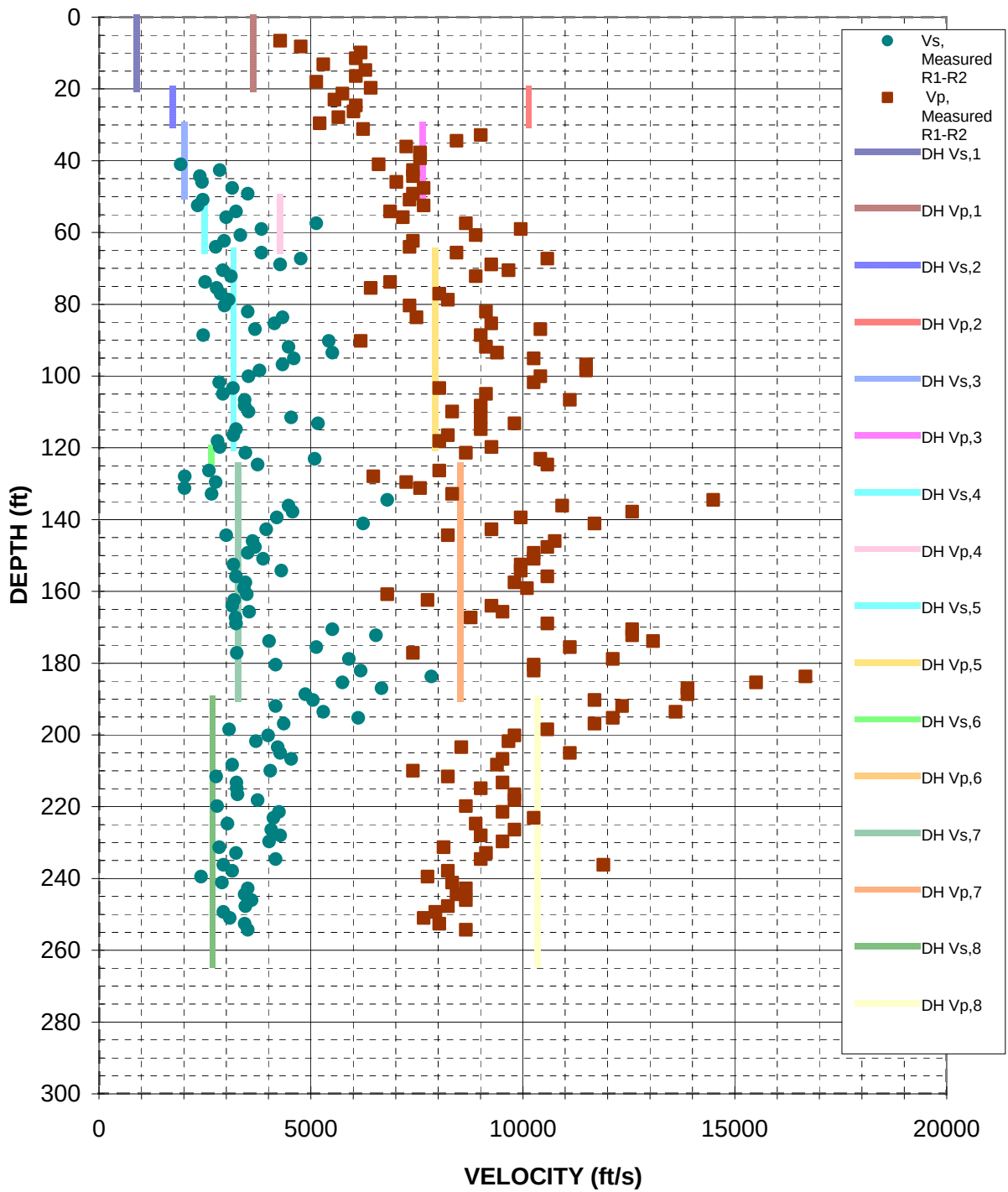


Figure B-19: Boring I-10, Comparison of Downhole Layered Model with Suspension R1-R2 Results

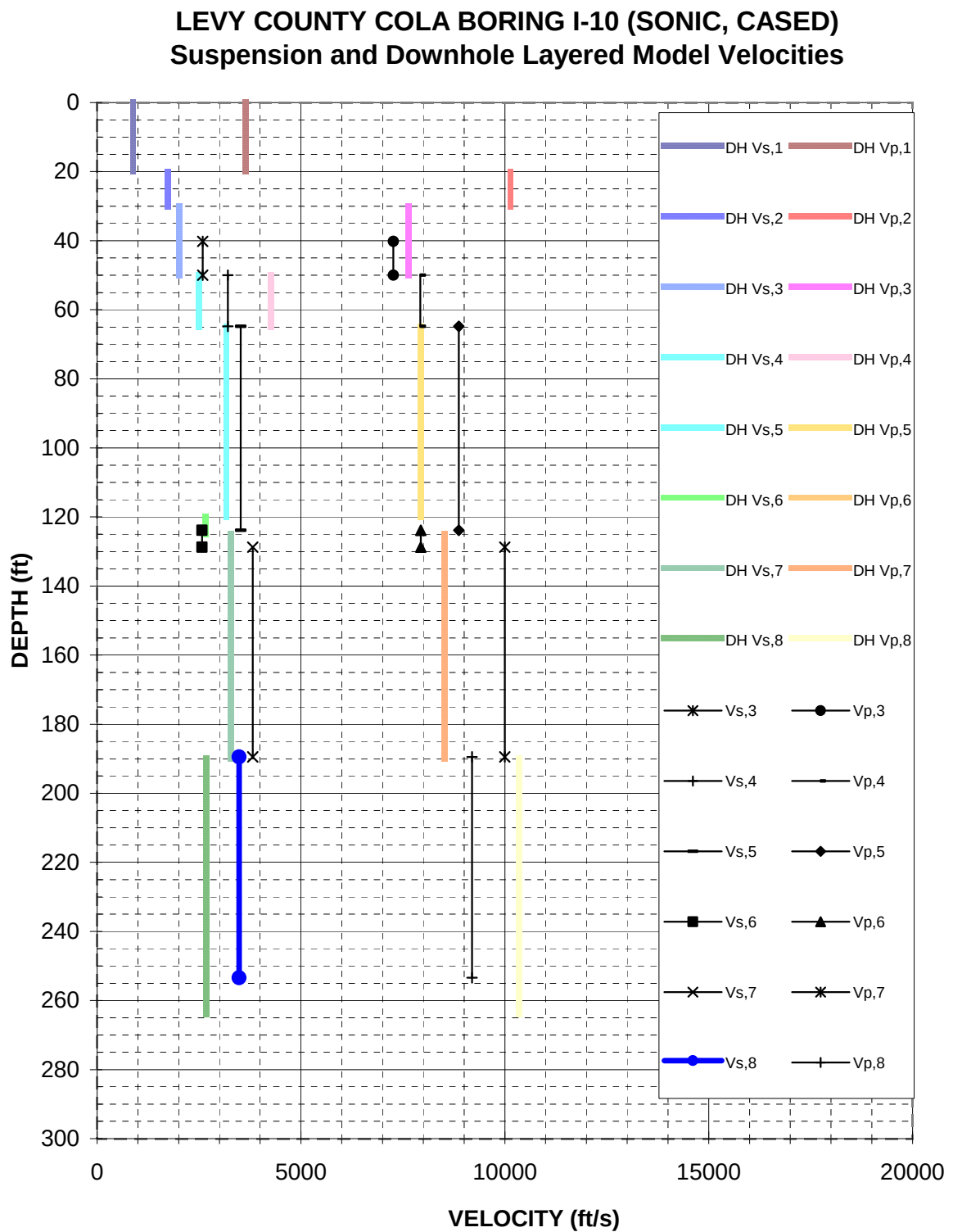


Figure B-20: Boring I-10, Comparison of Suspension and Downhole Layered Model Velocities

APPENDIX C

ACOUSTIC TELEVIEWER DIP LOGS

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CH2M HILL

Borehole: A-7

PEF-LNP COLA

top of borehole.....

East: _

North: _

Elev: _

North ref. is grid

Depth units are feet

Vertical scale: 1/10

Horiz scale = 1.00x Vert scale

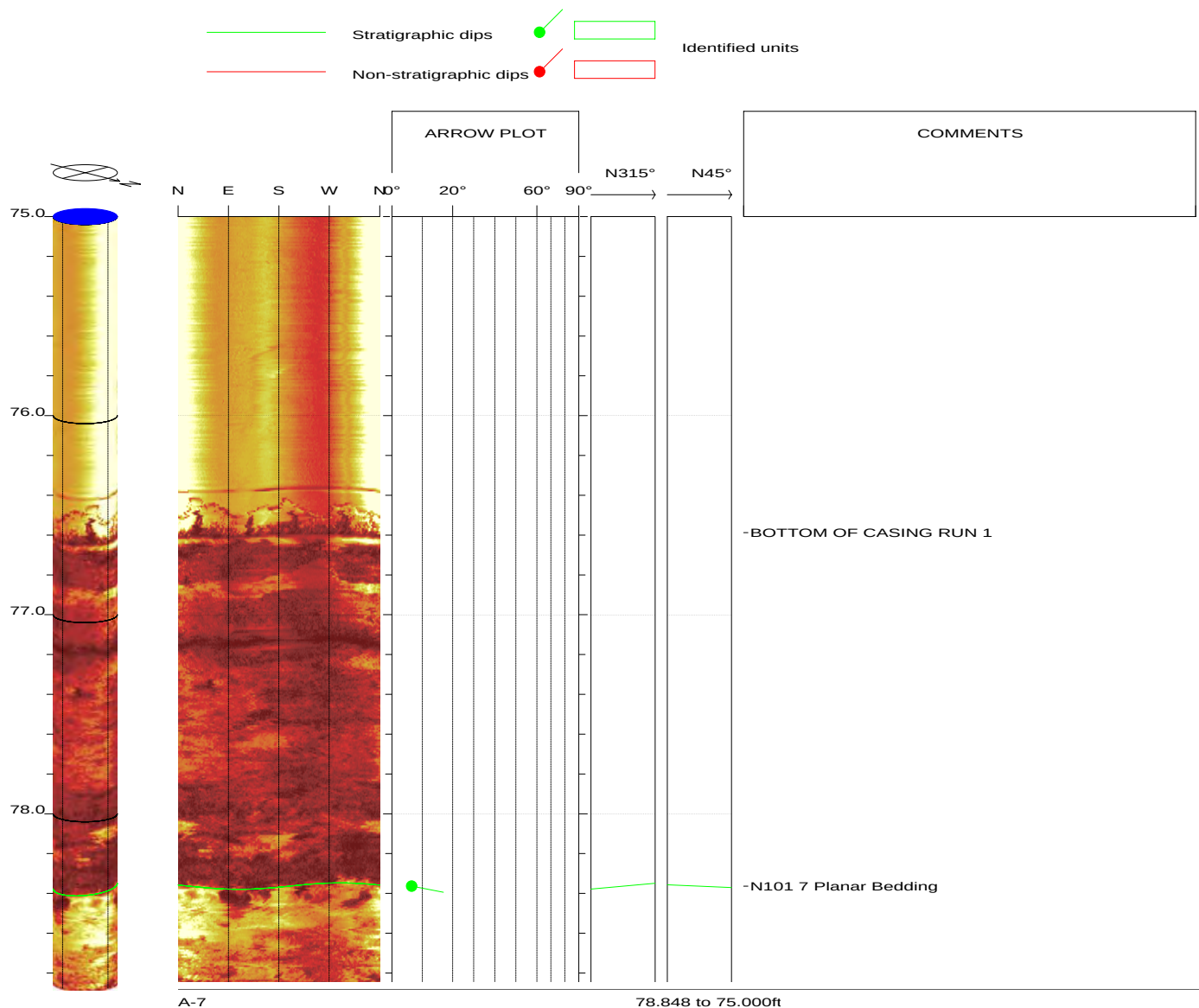
Zone from 264.484 to 75.000ft

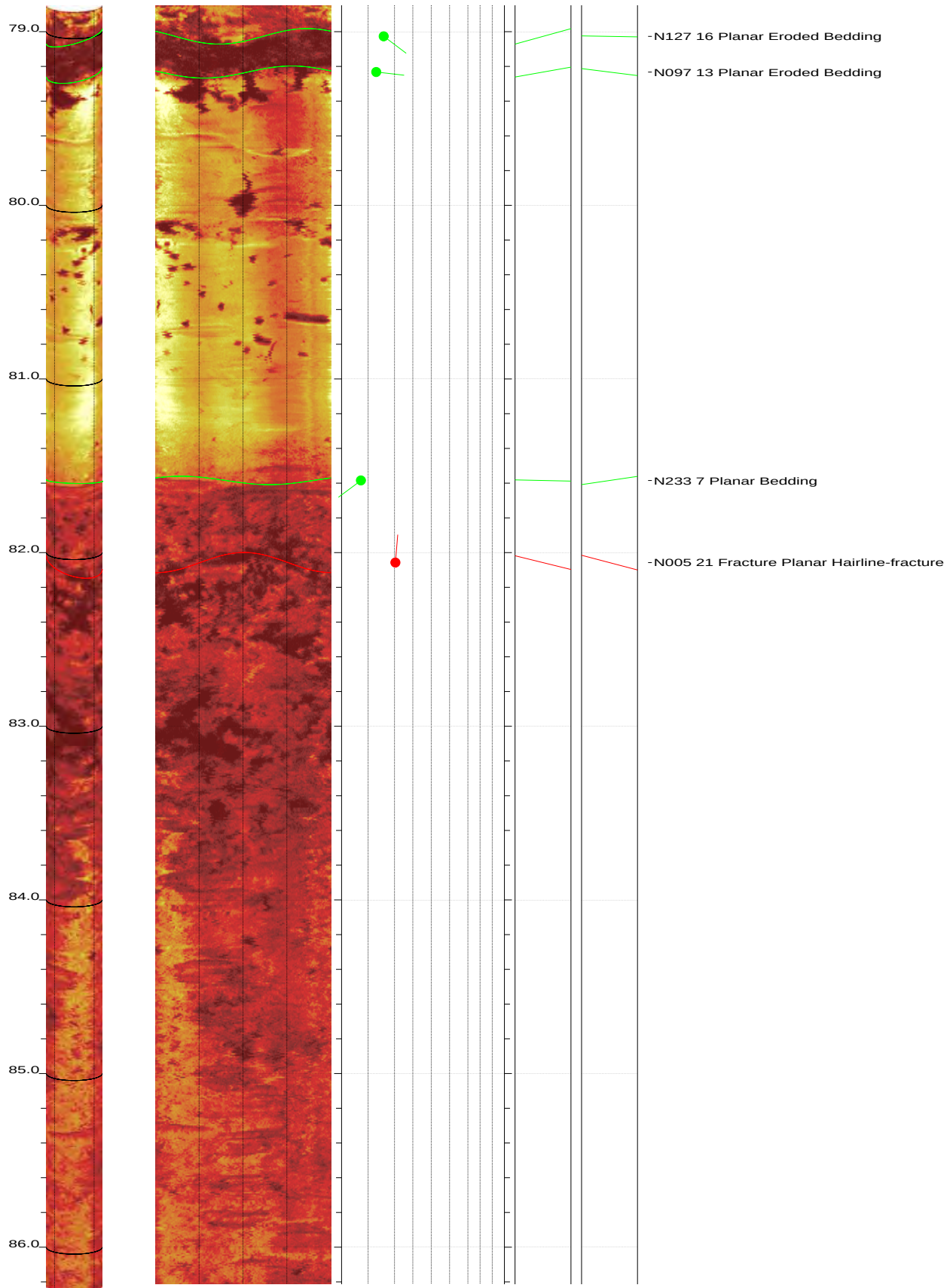
Format: BHTV-NESWN

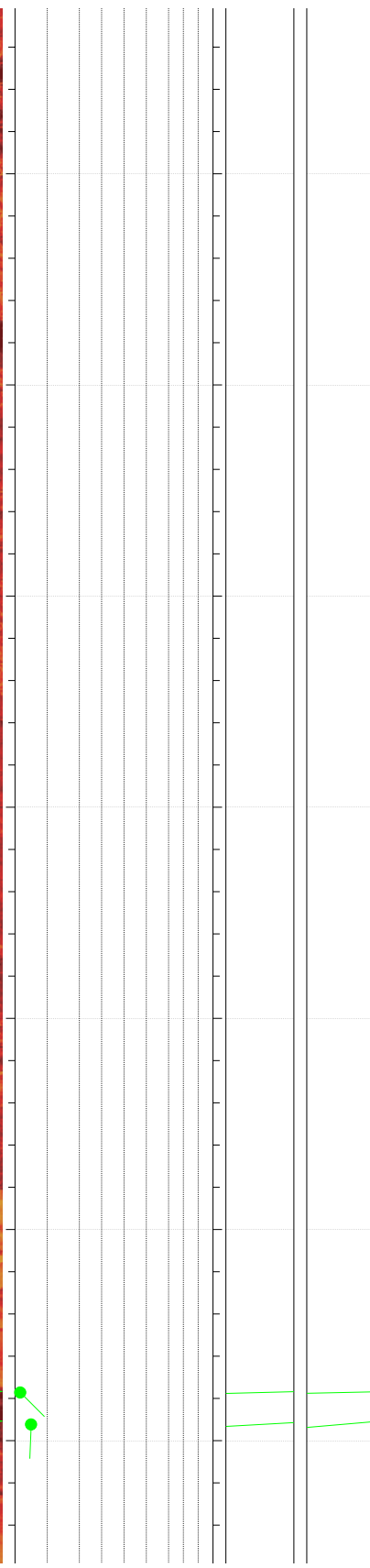
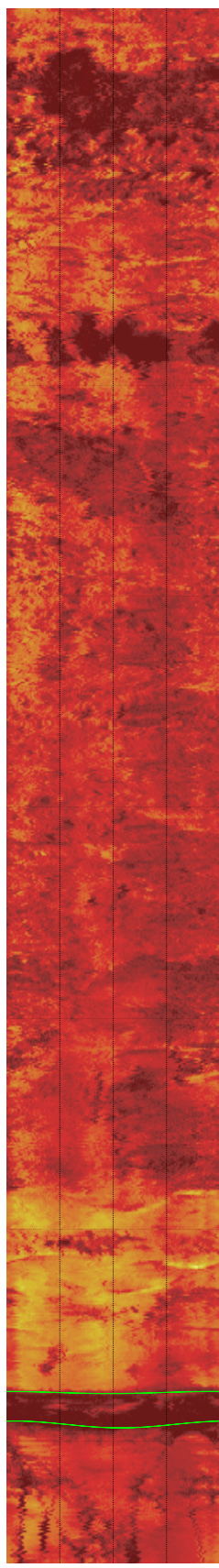
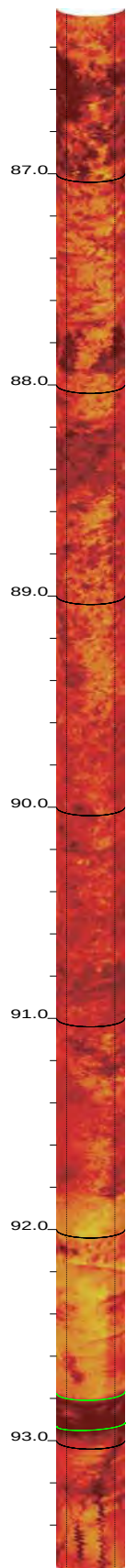
Borehole diam: 3.864inch

Vertical = borehole-axis

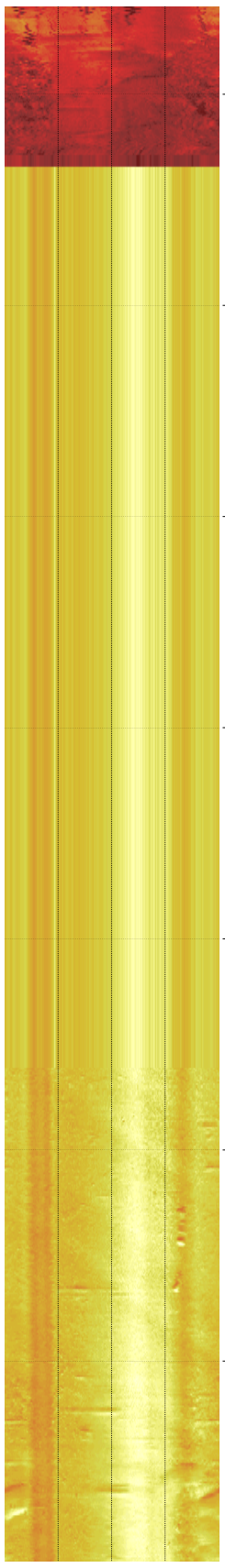
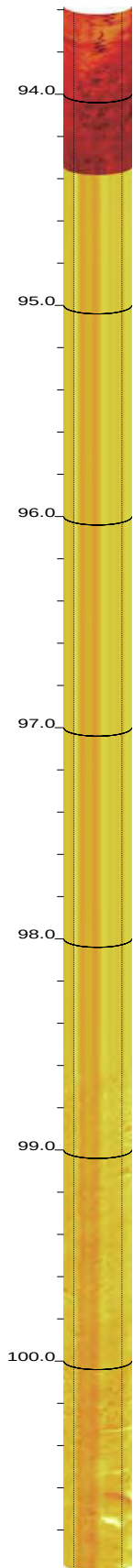
Image: Amplitude



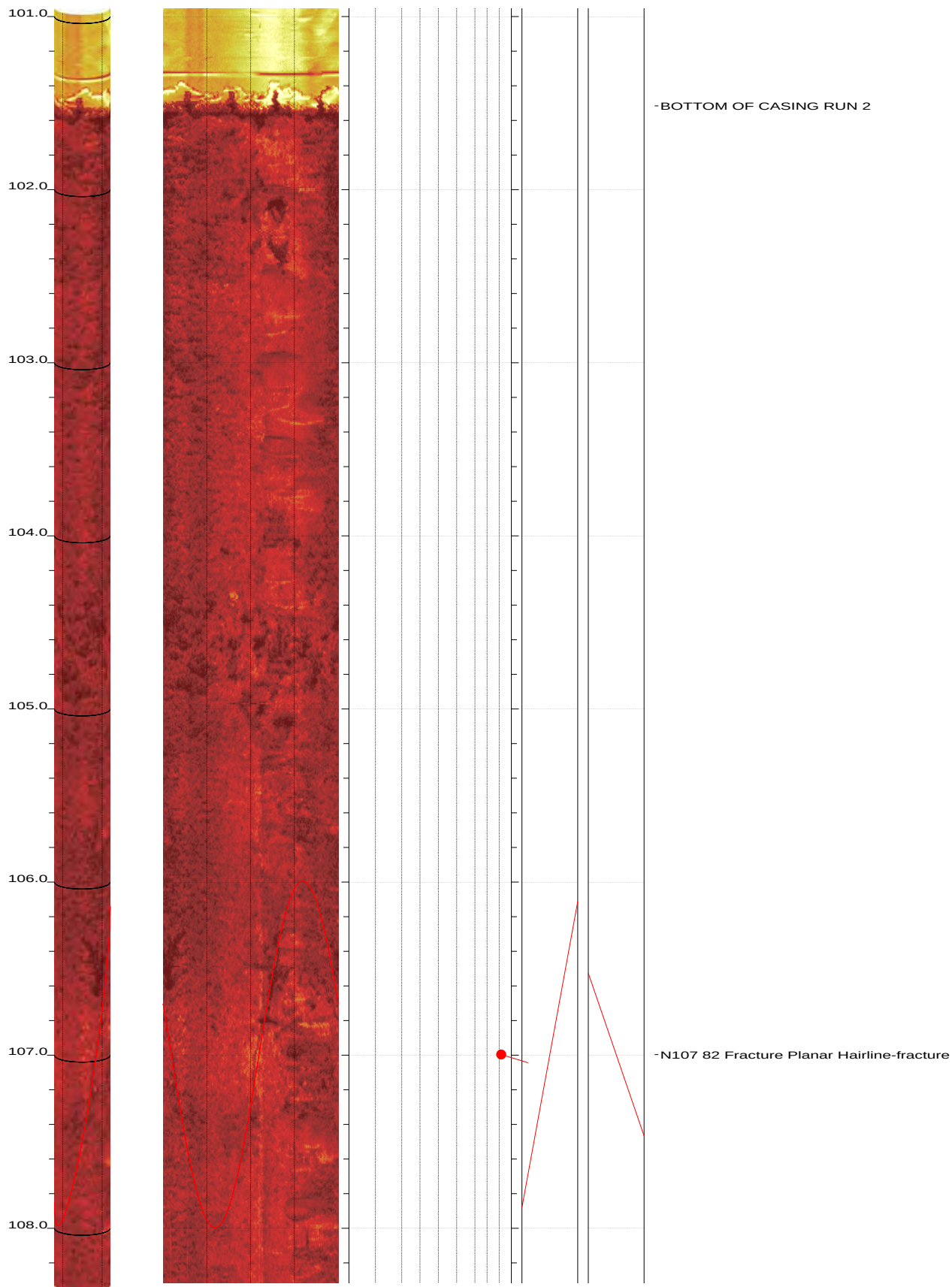


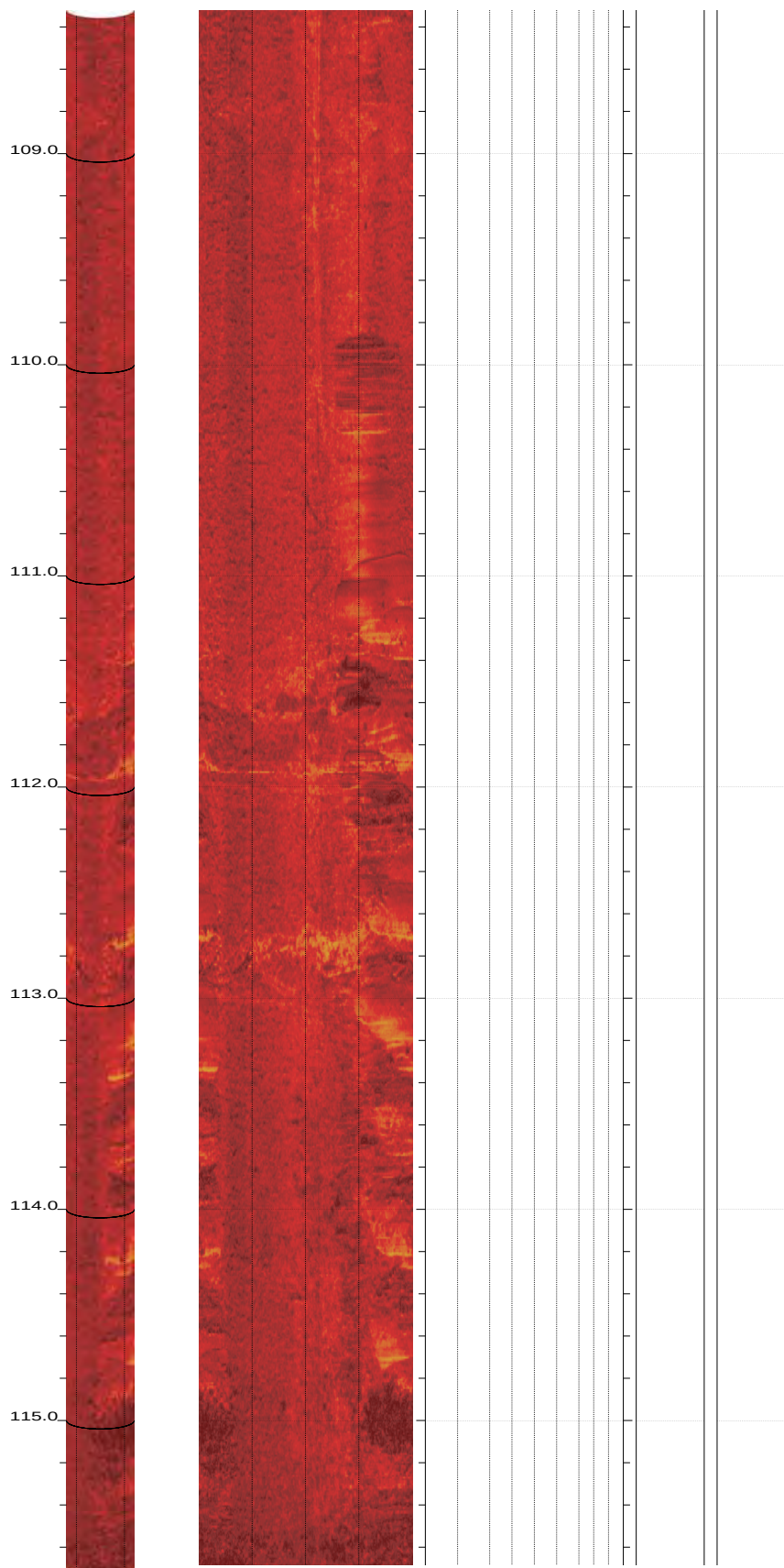


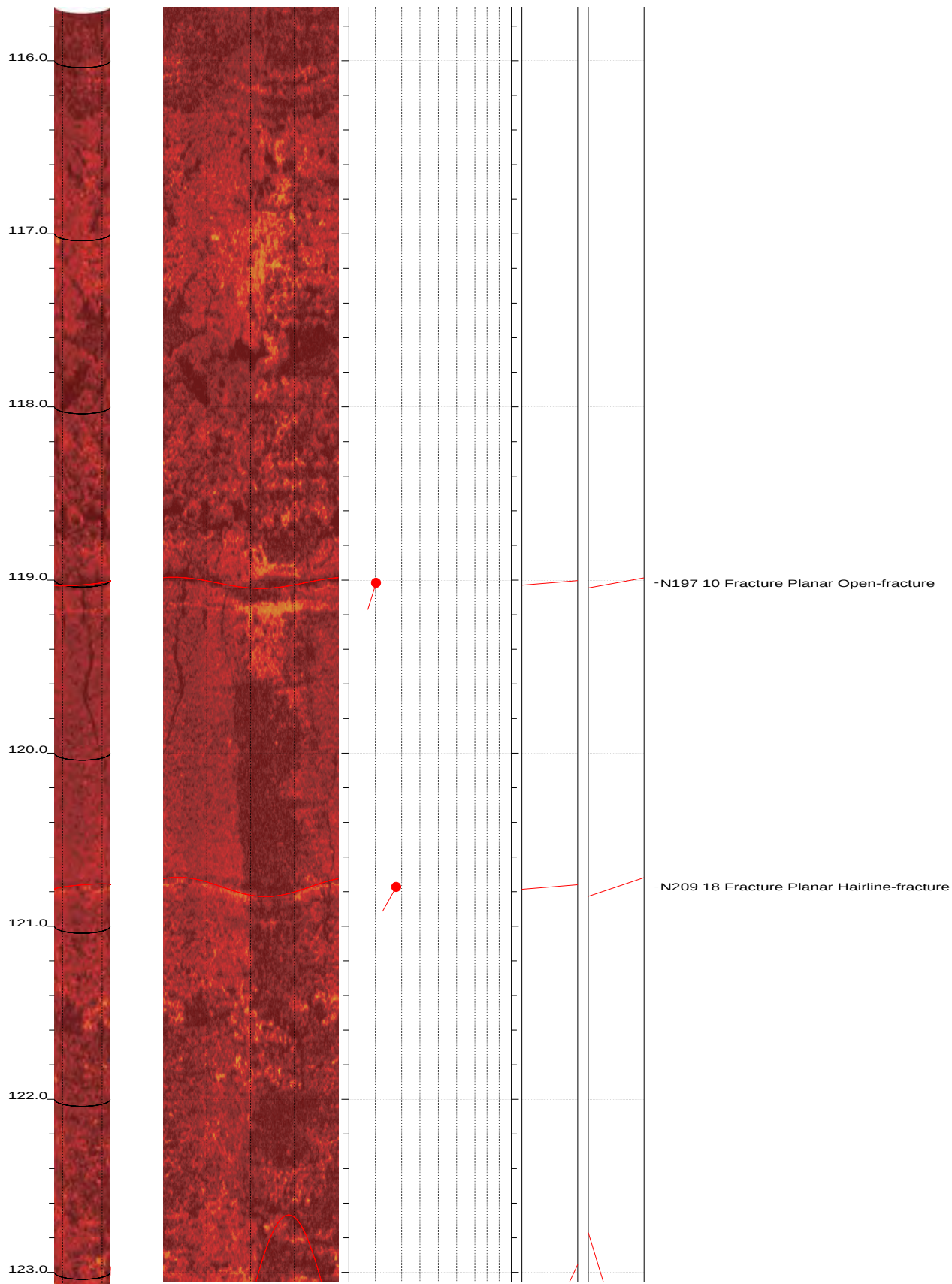
-N135 2 Planar Eroded Bedding
-N182 5 Planar Eroded Bedding

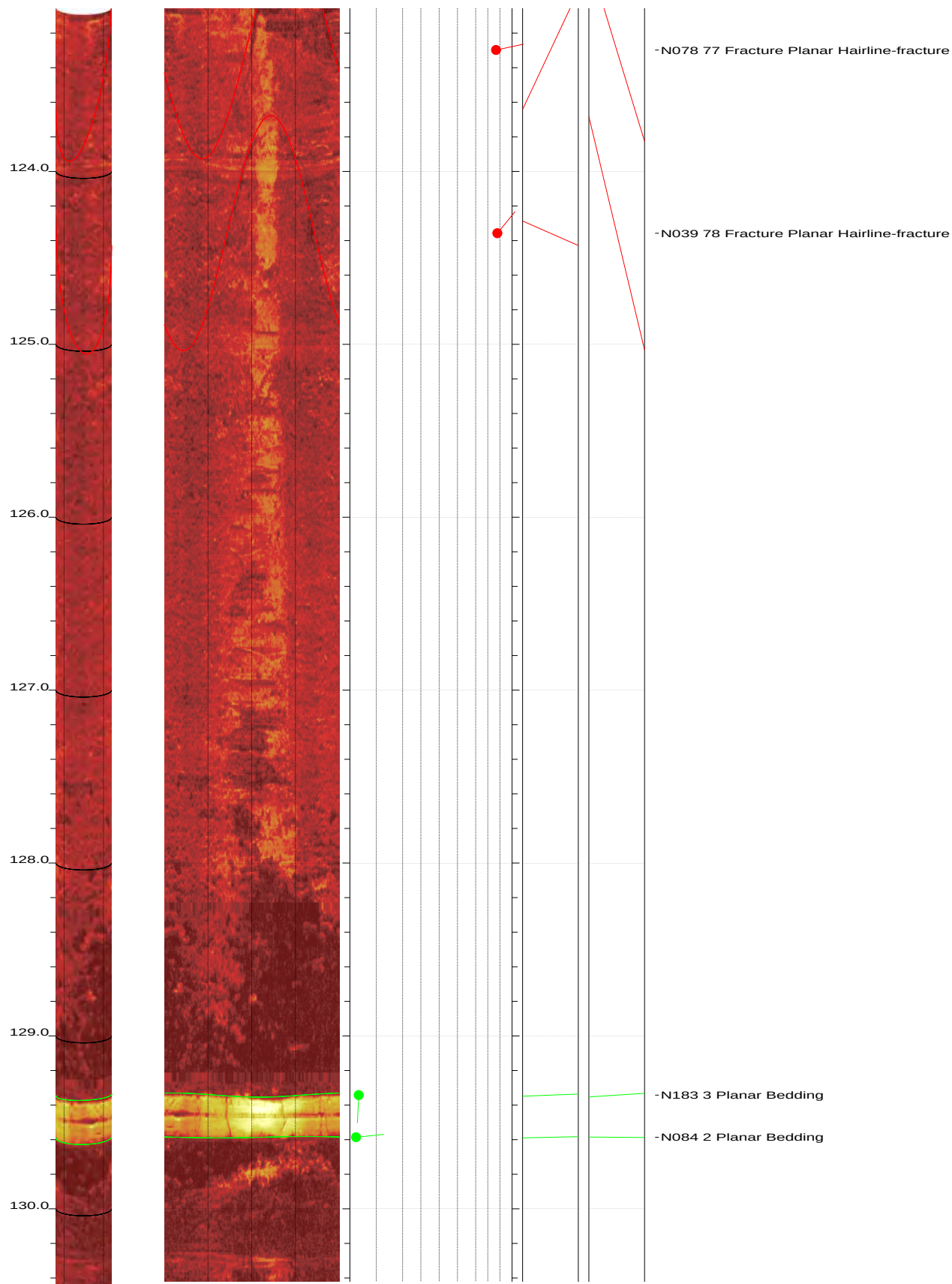


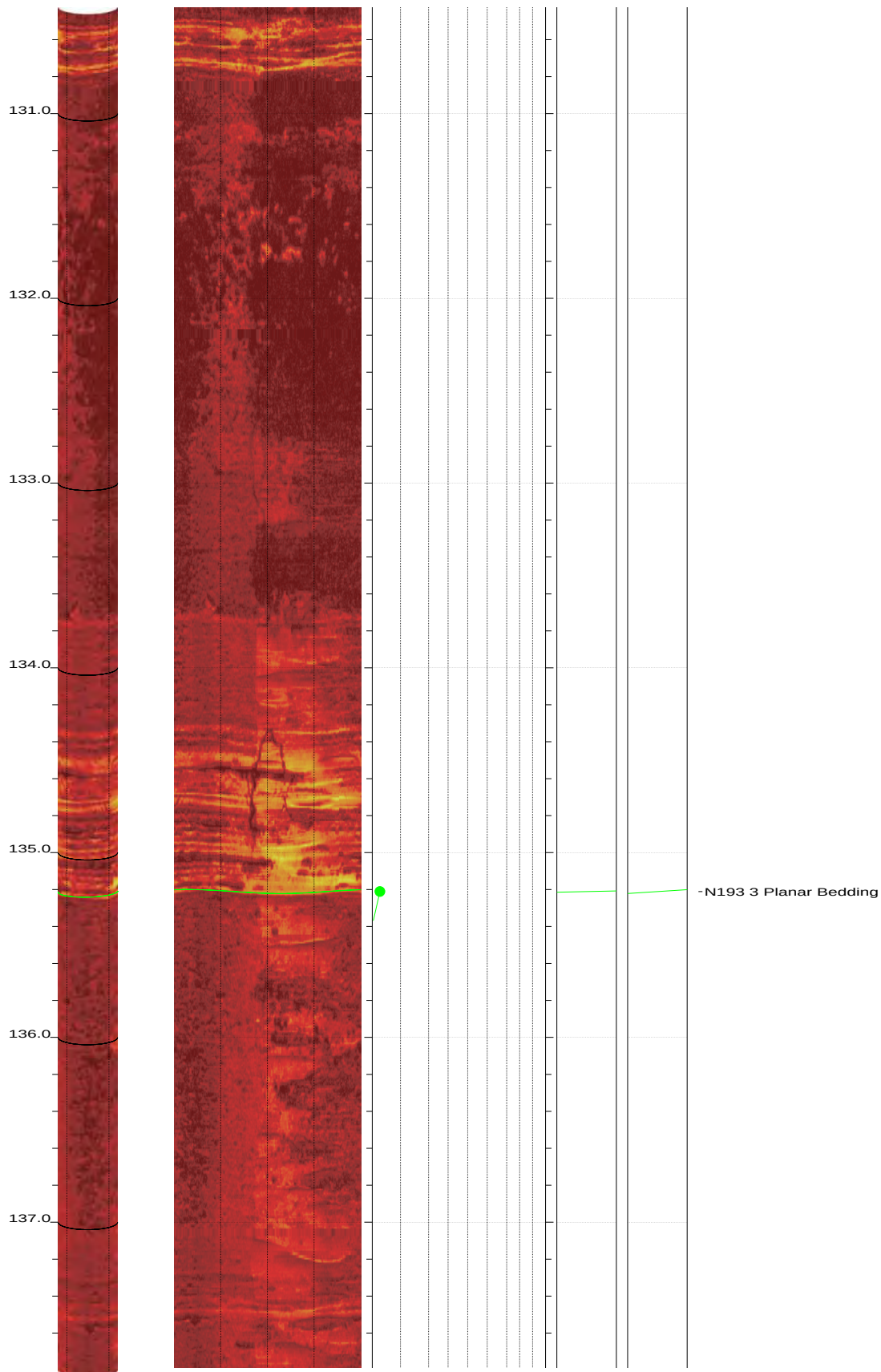
-BOTTOM OF RUN 1

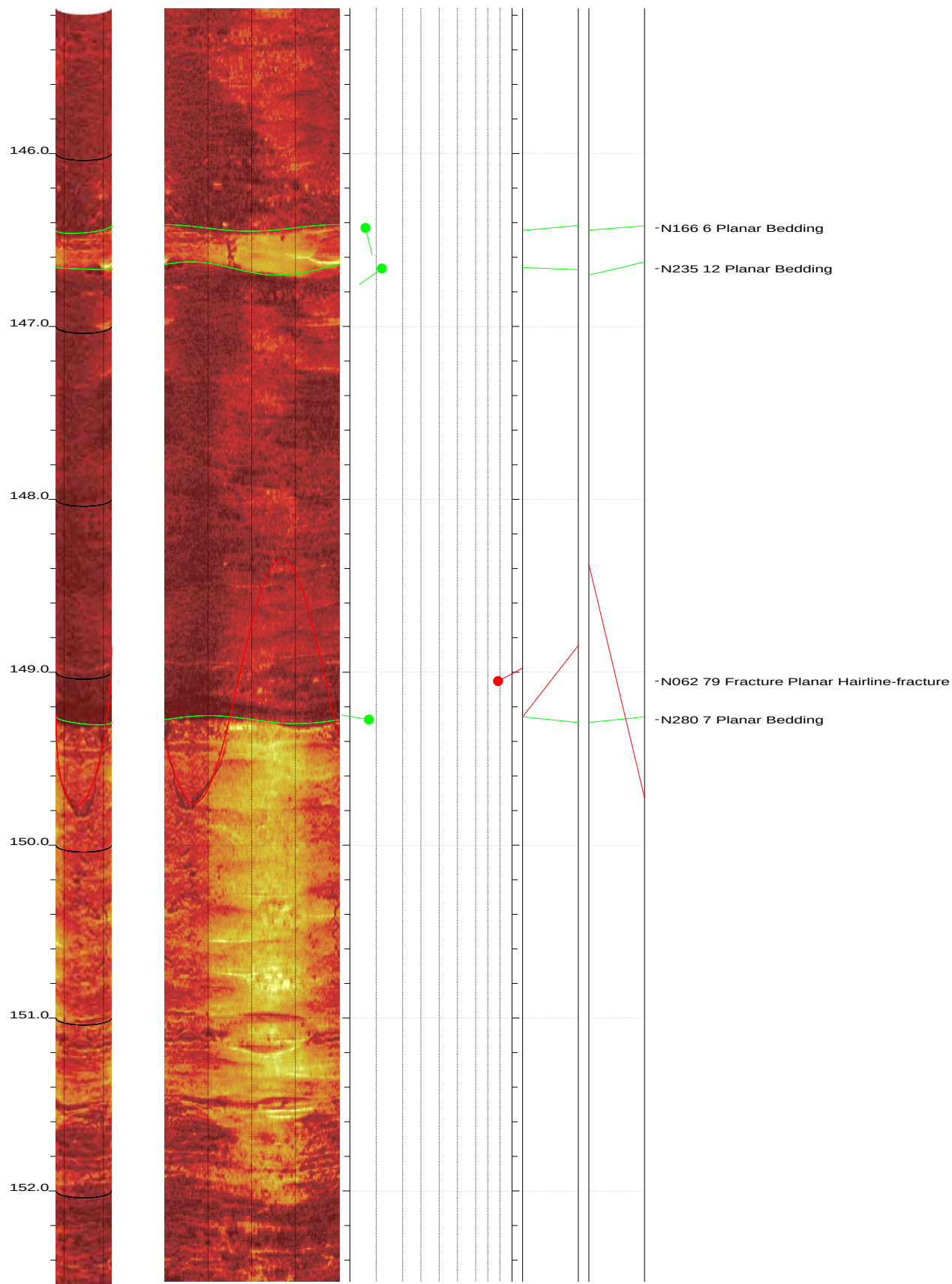


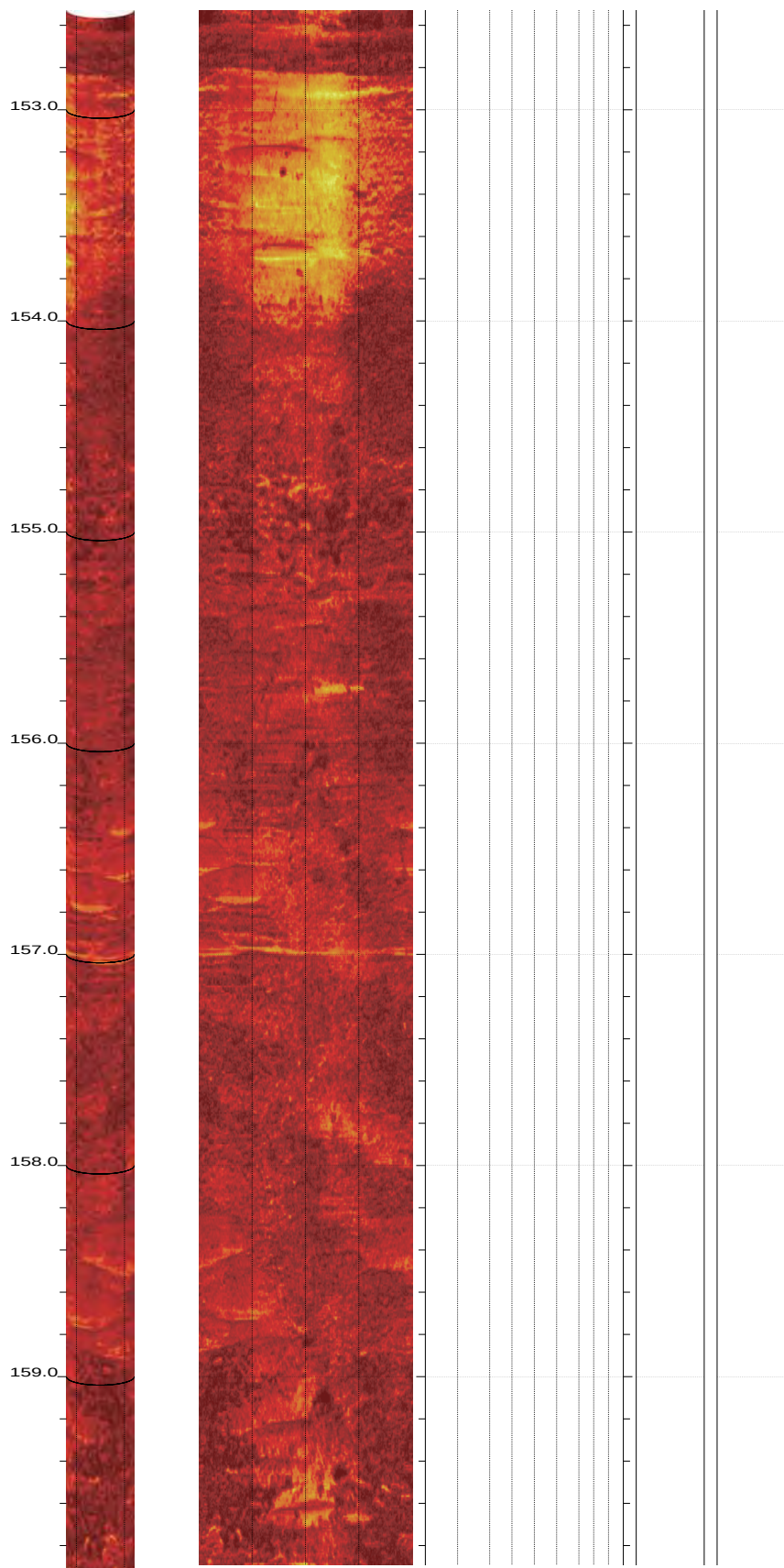


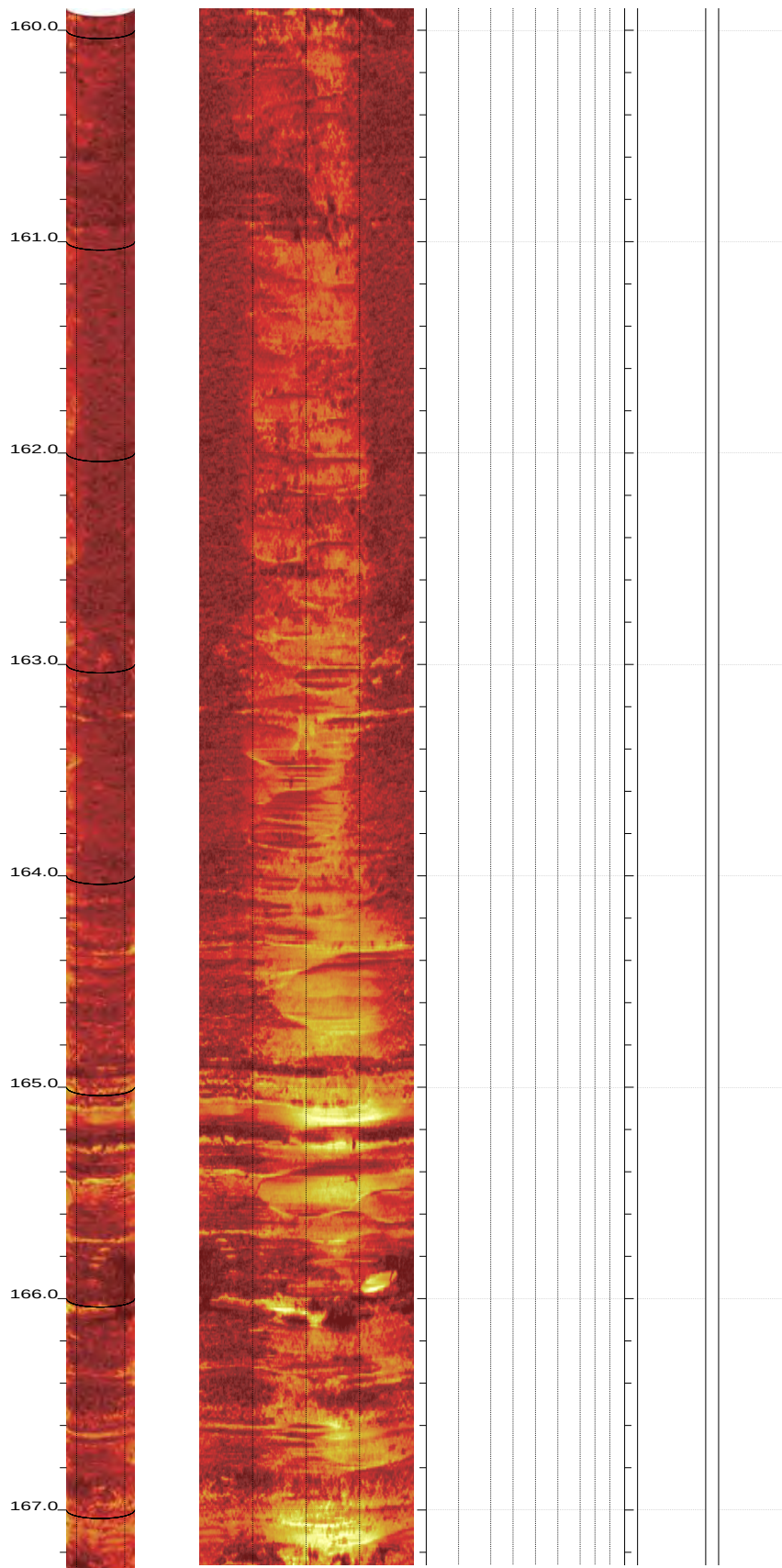


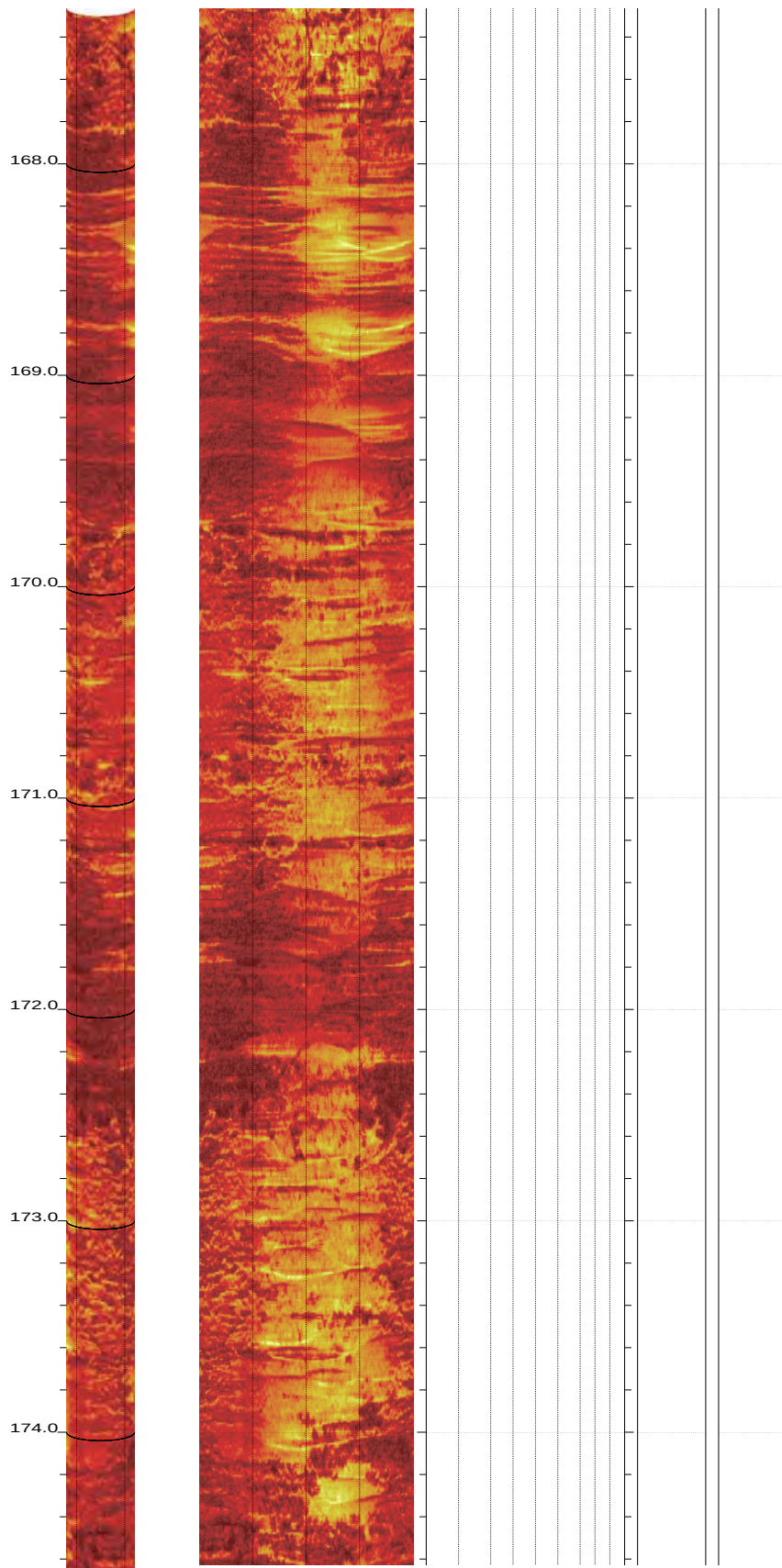


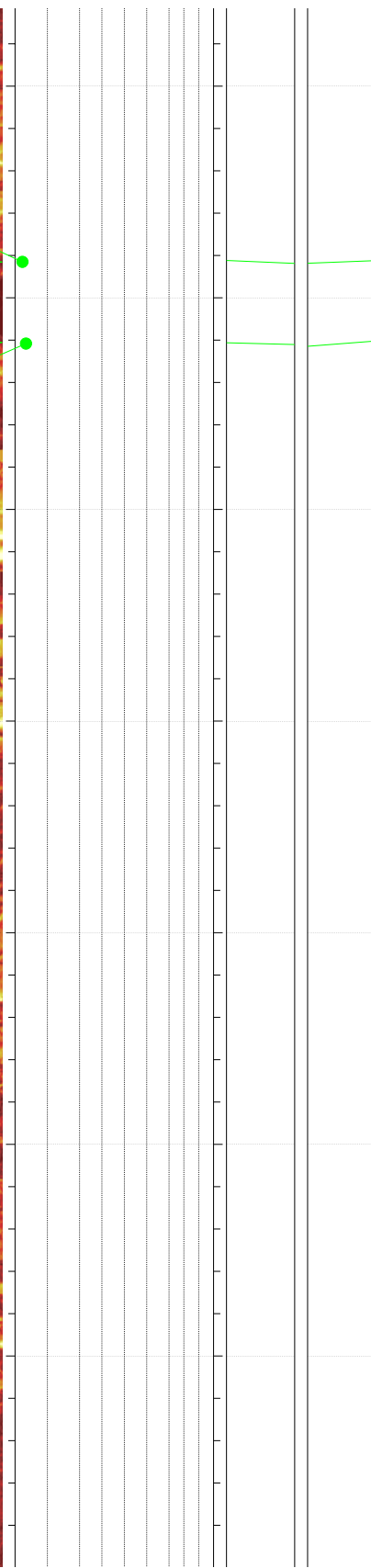
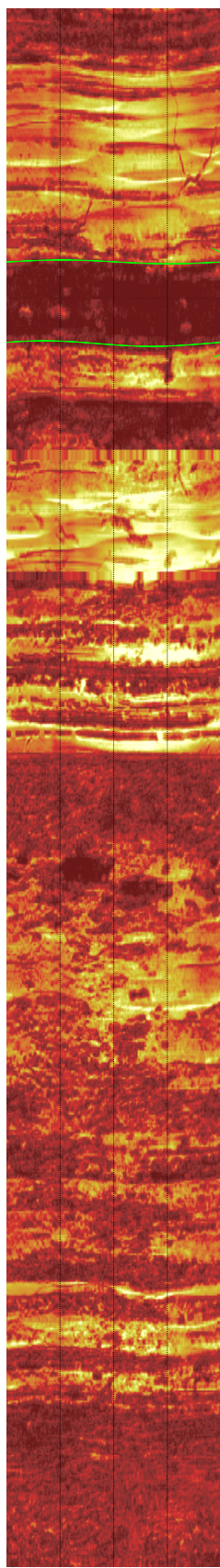
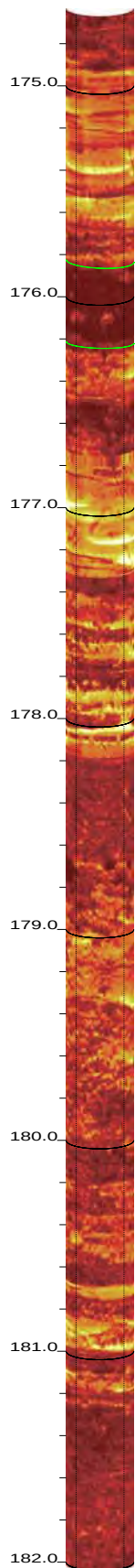






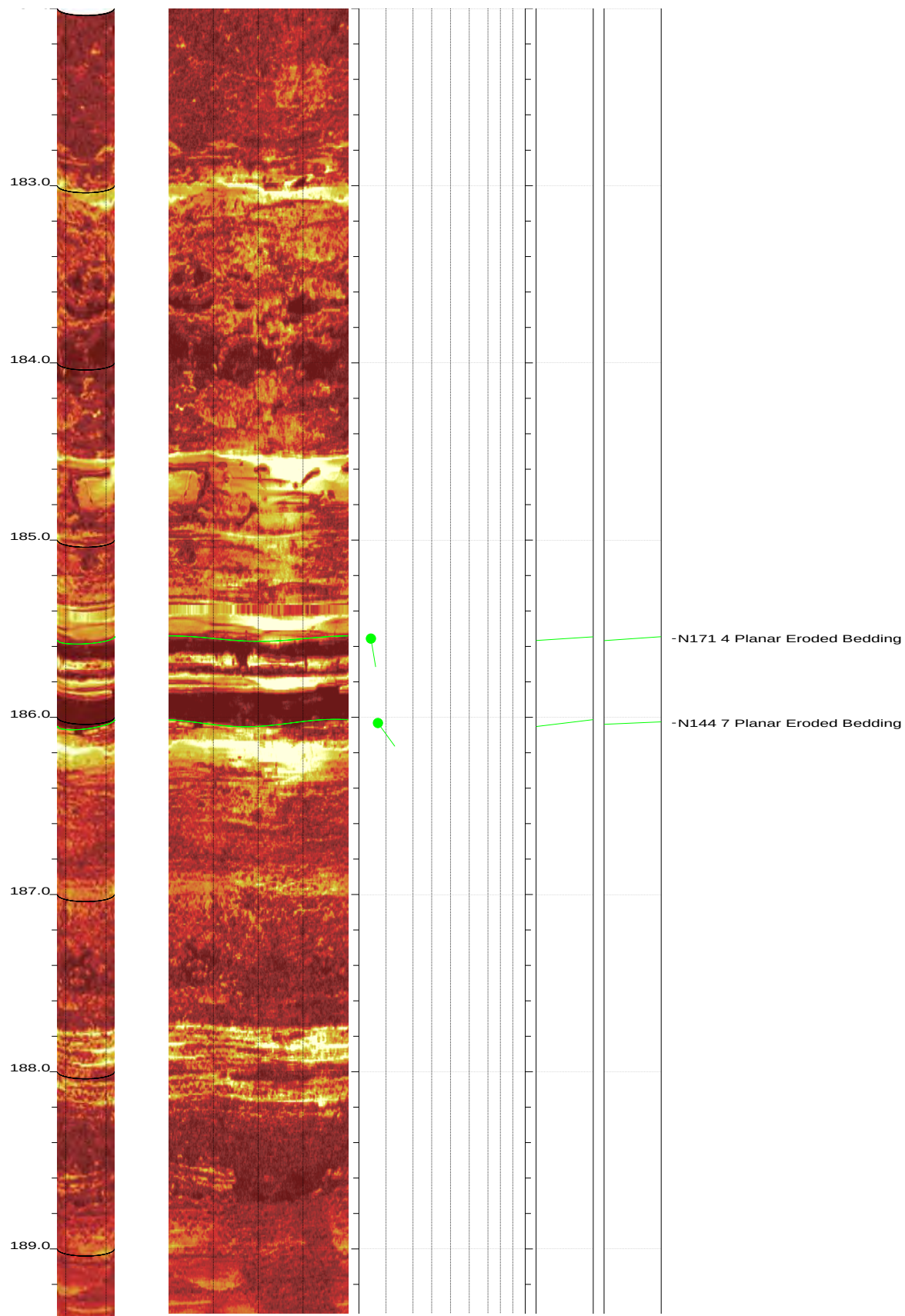


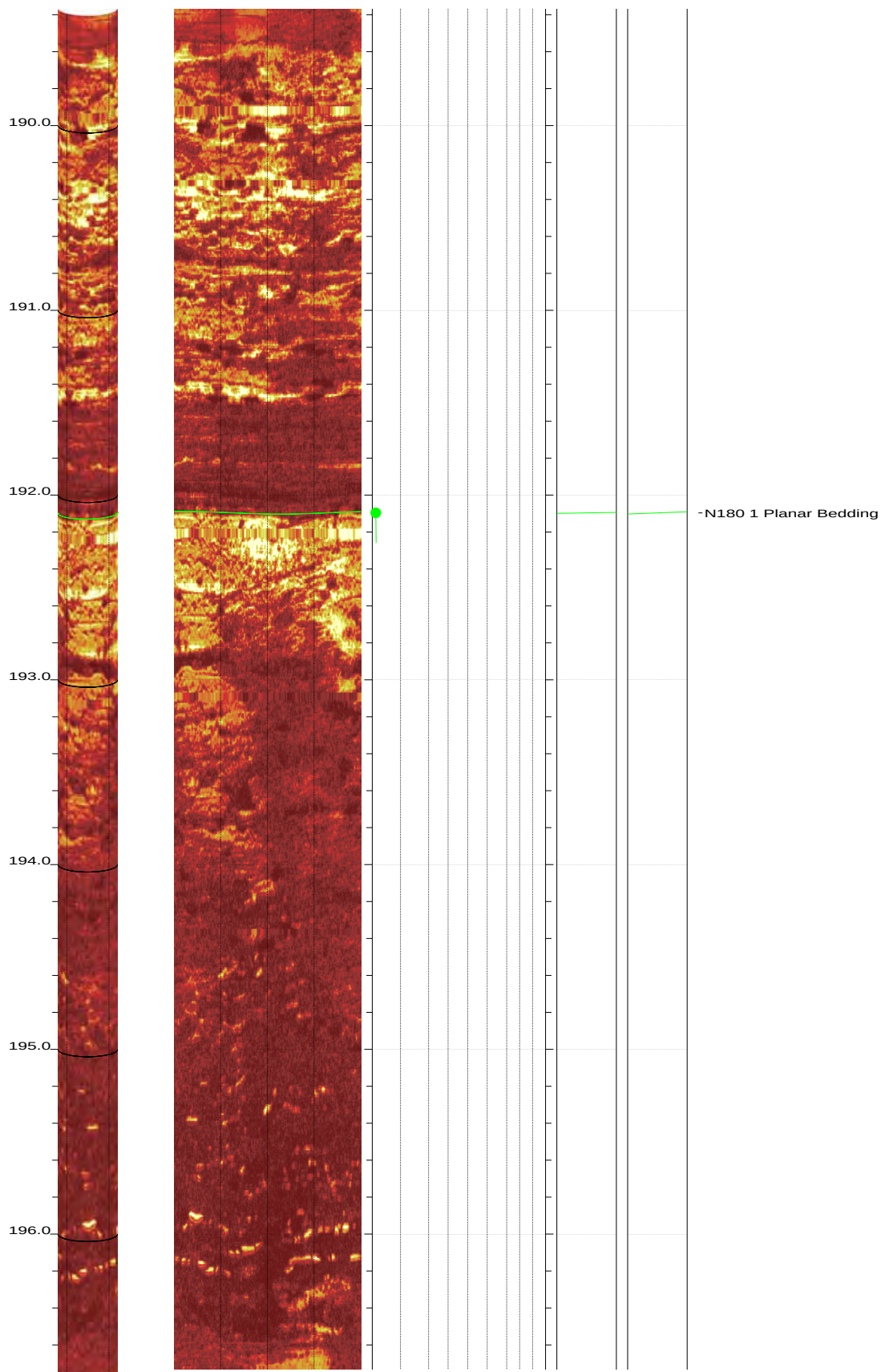


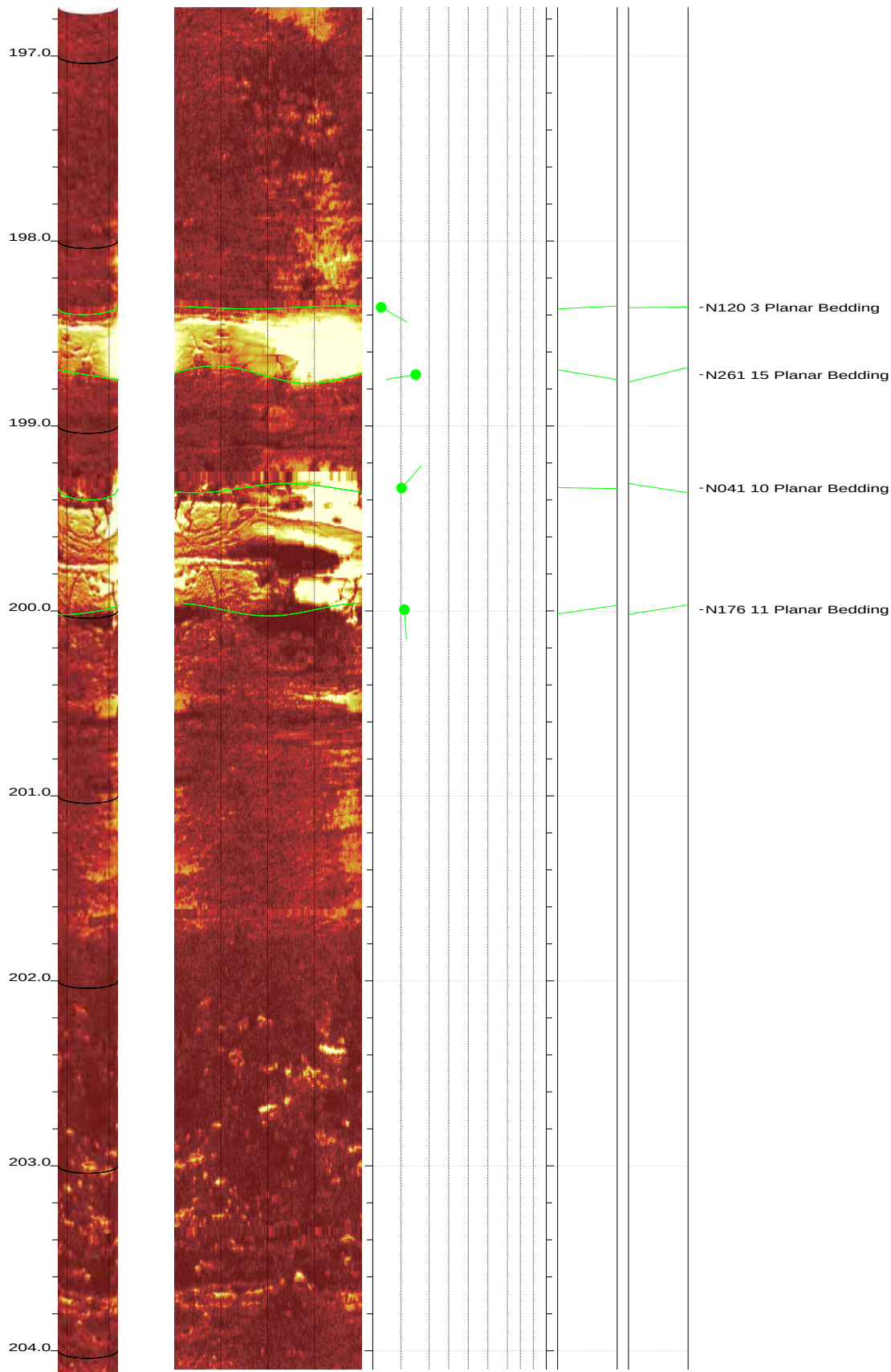


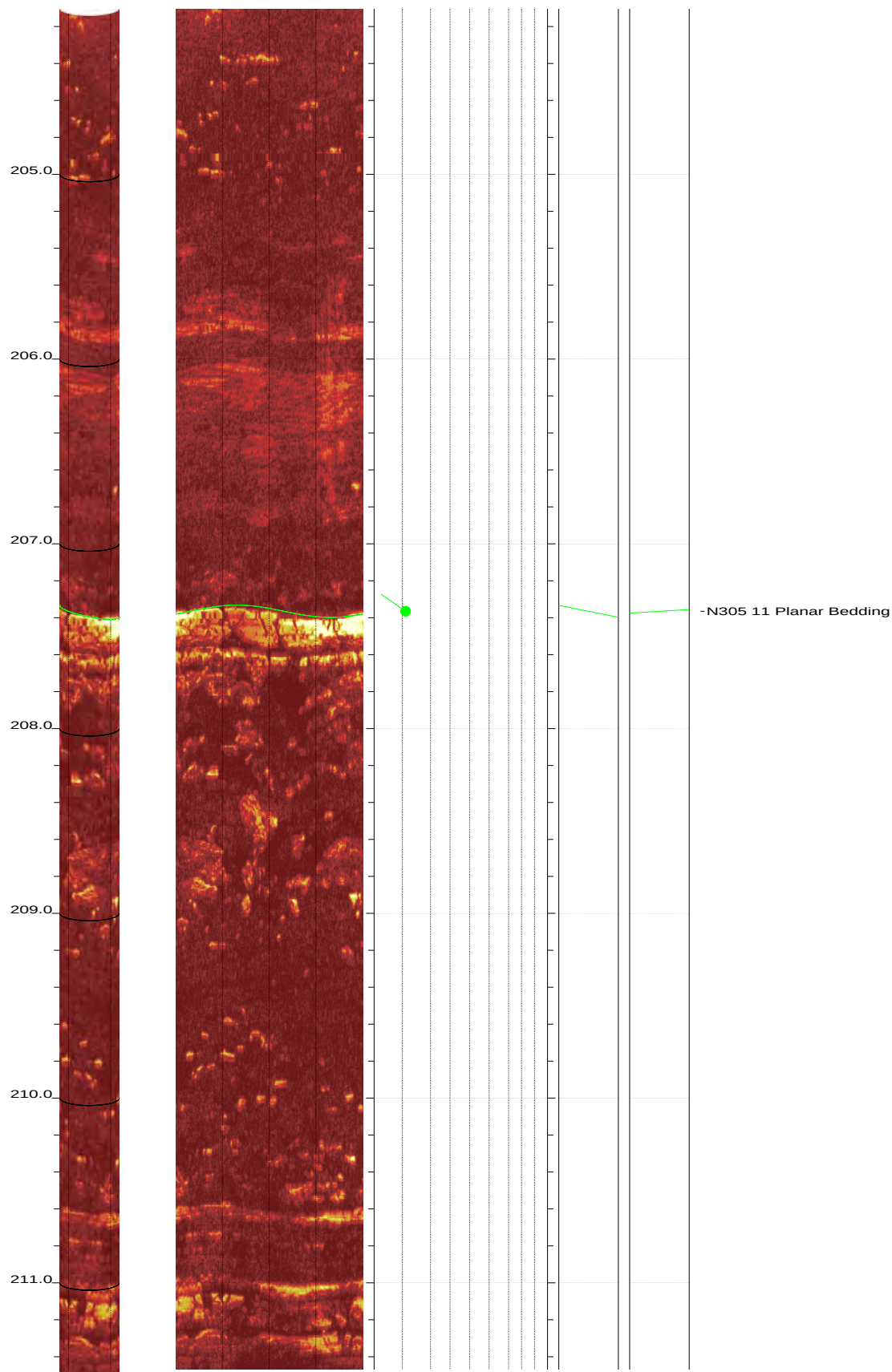
-N295 2 Planar Eroded Bedding

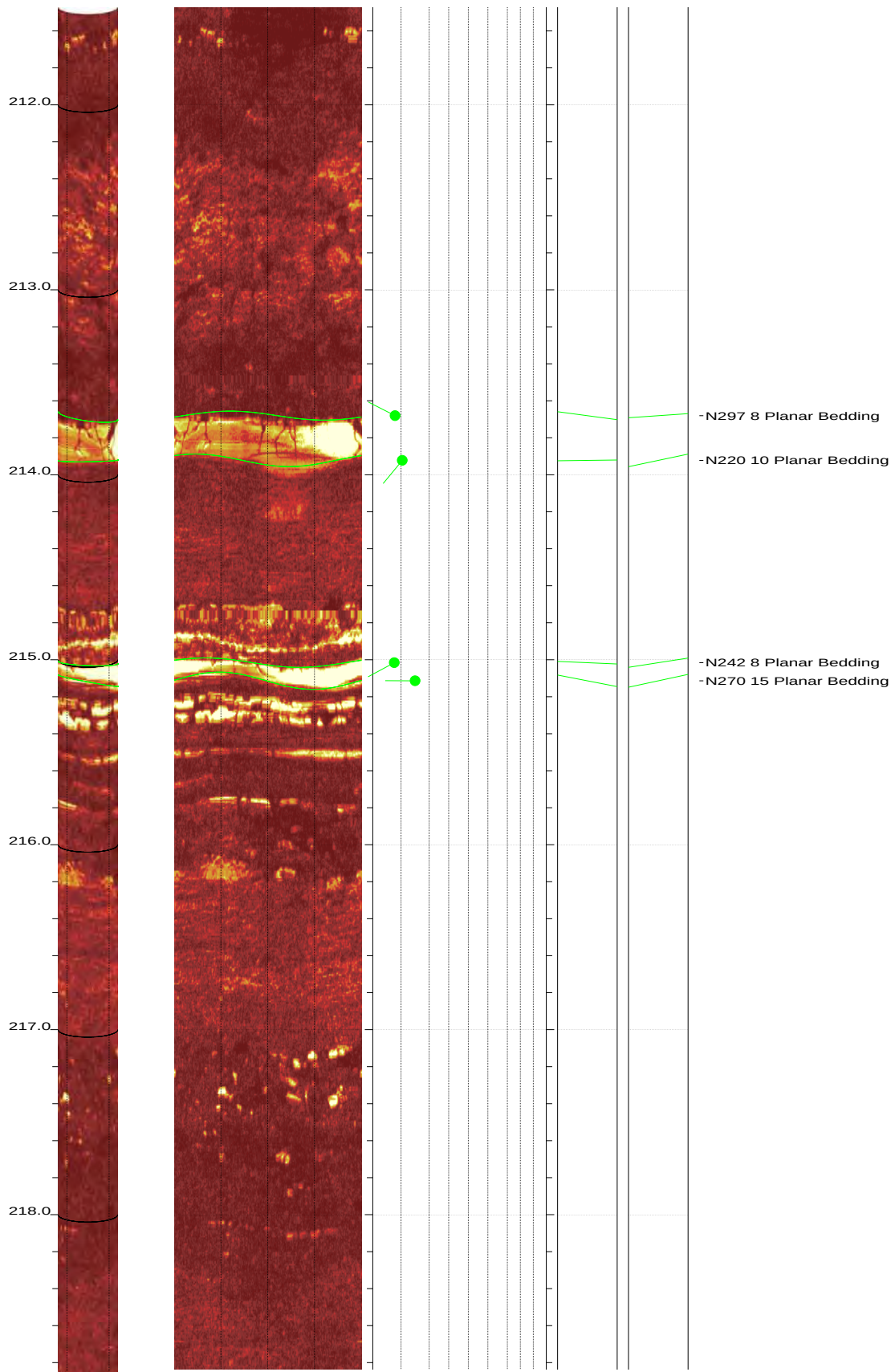
-N247 3 Planar Eroded Bedding

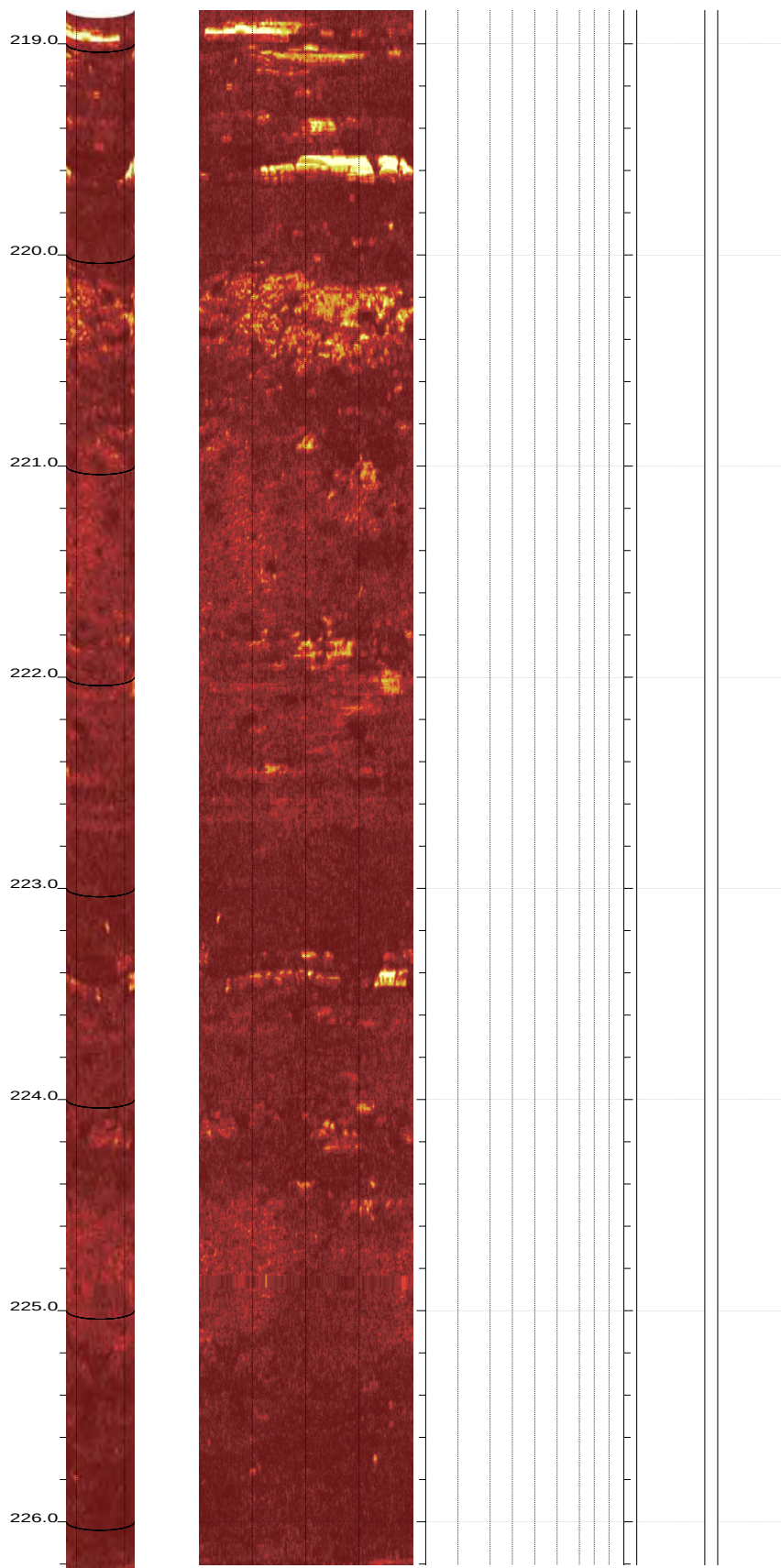


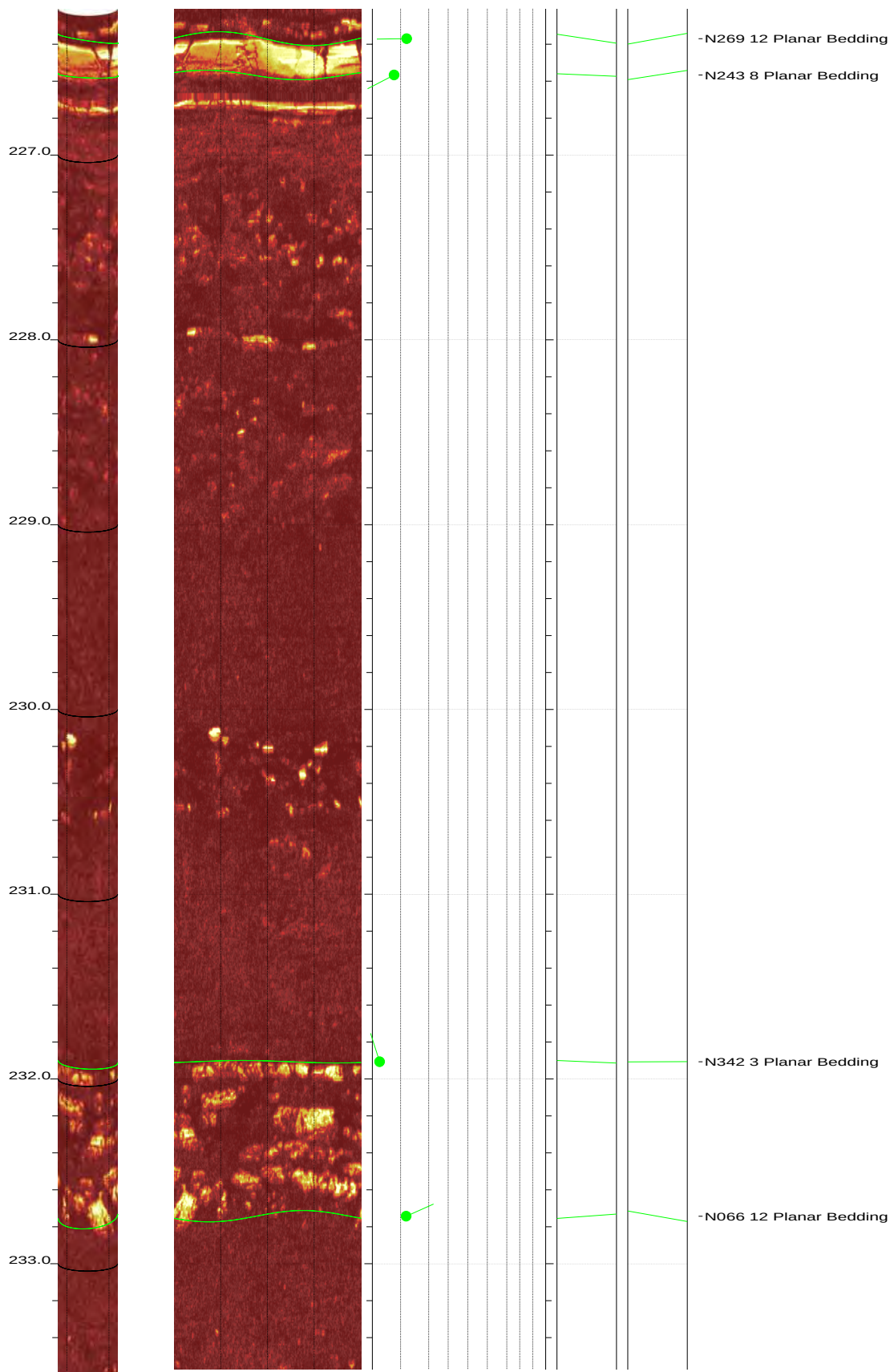


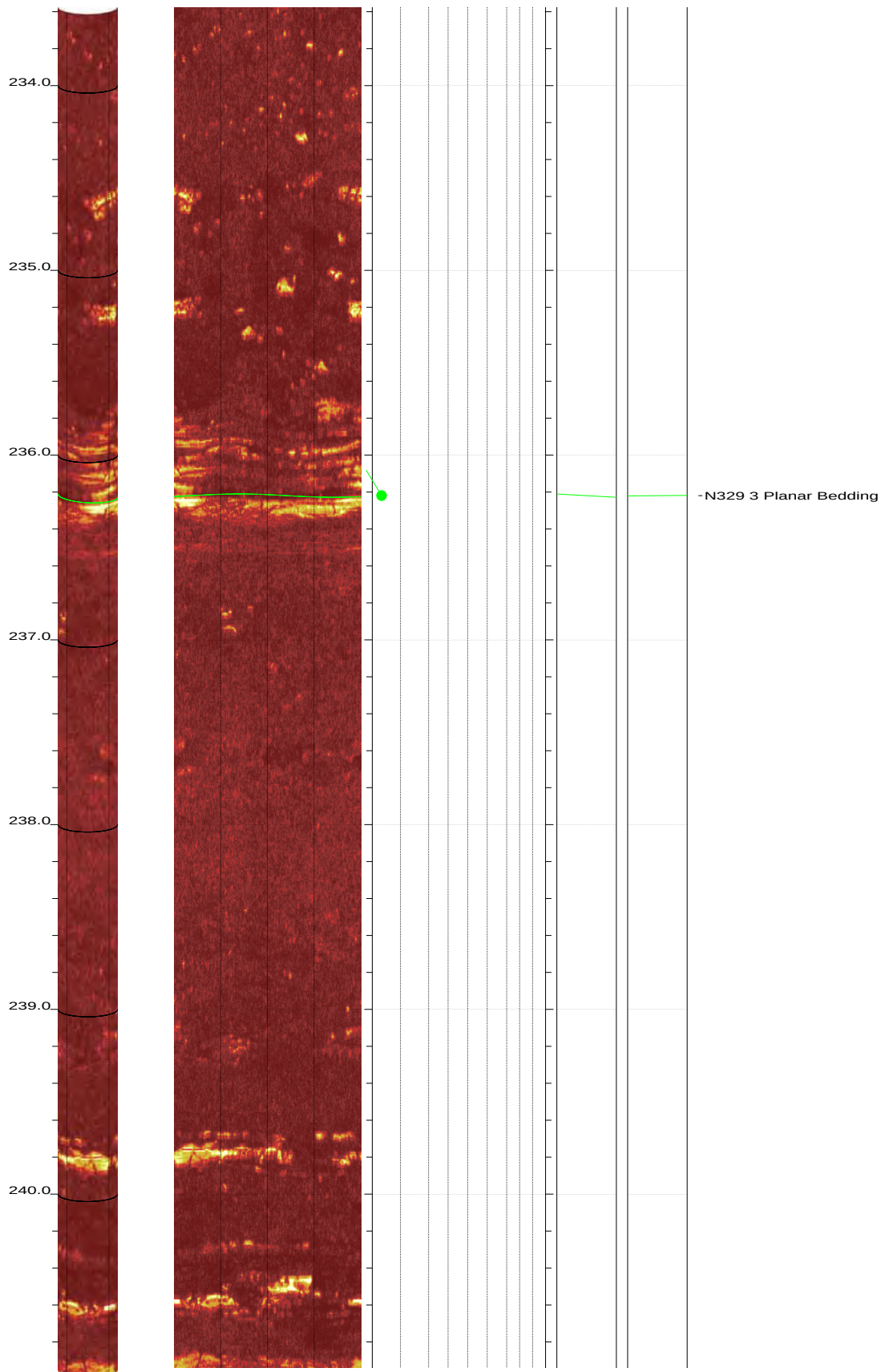


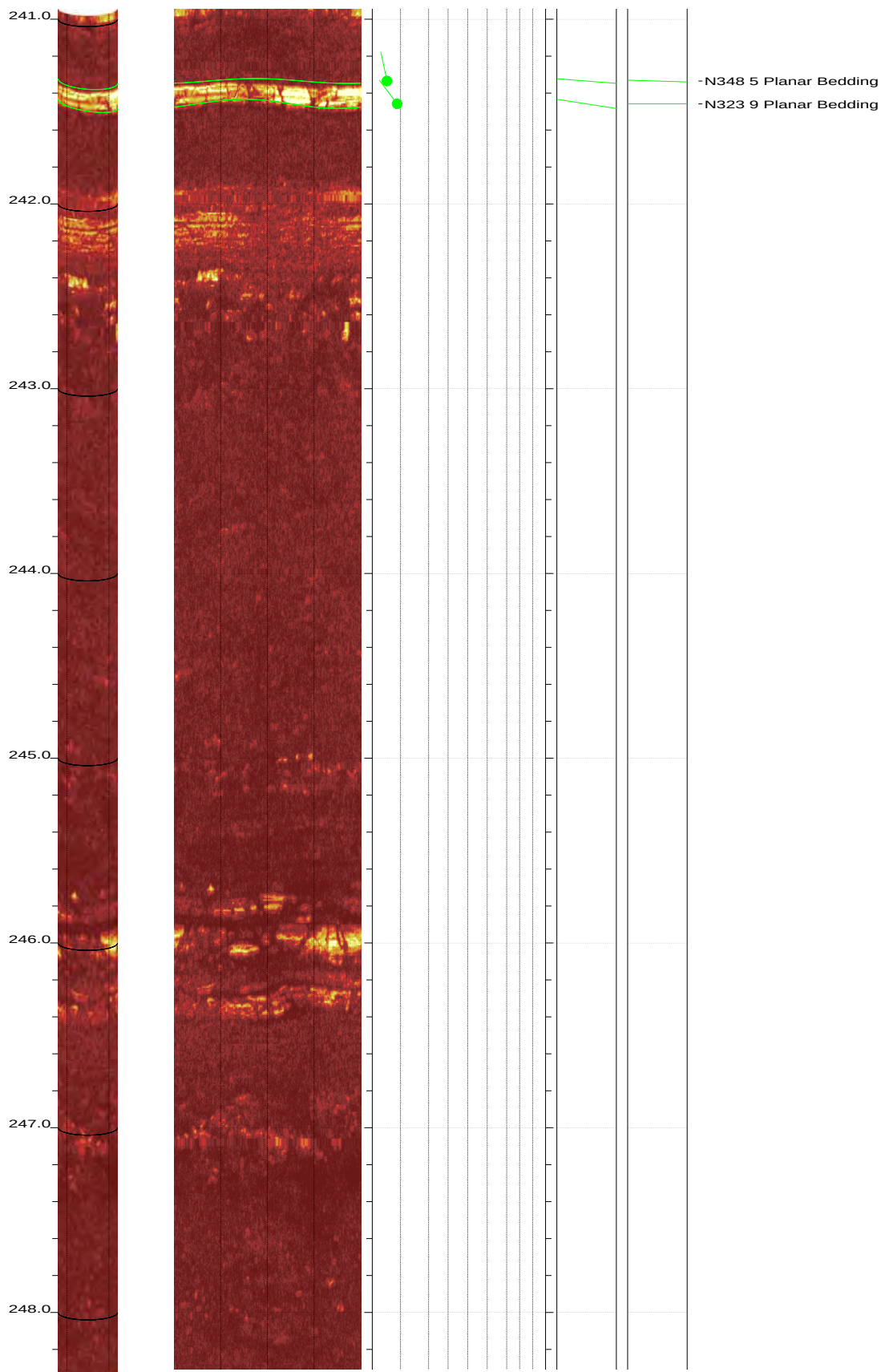


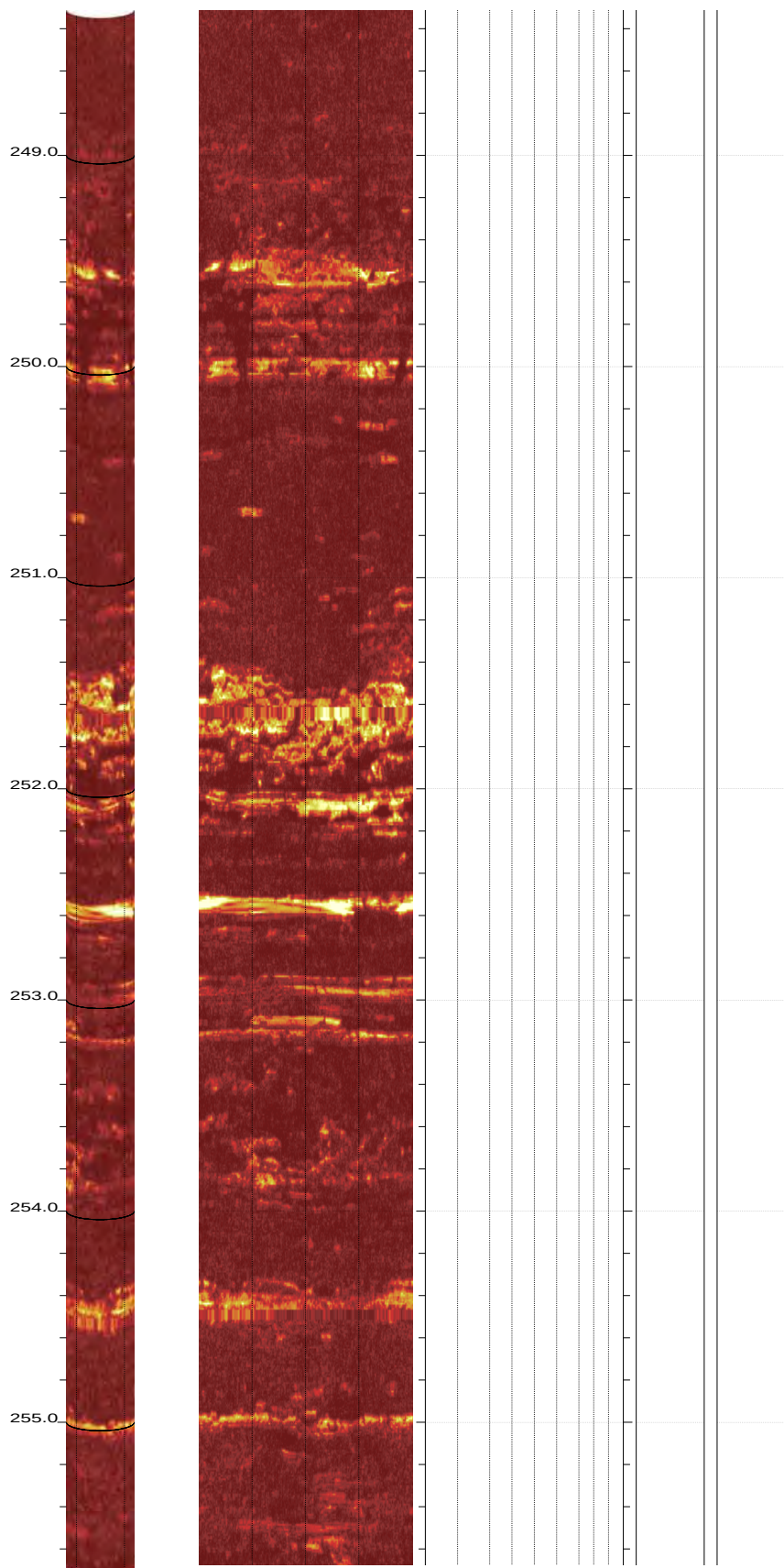


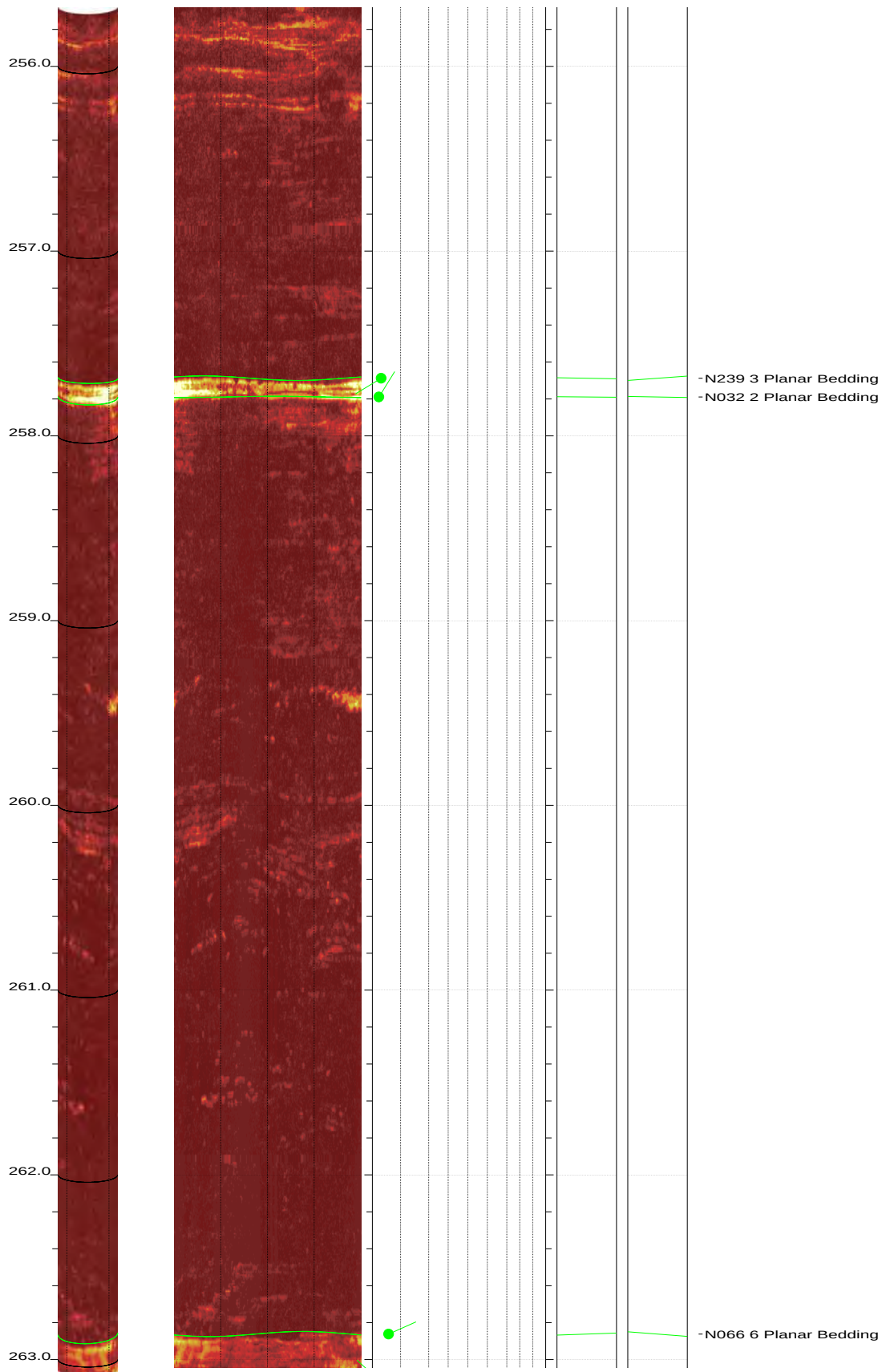


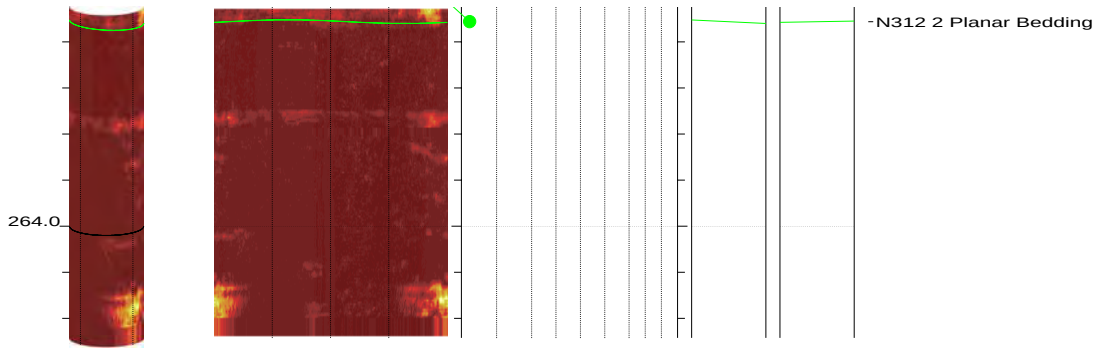














CH2M HILL

Borehole: A-8

PEF-LNP COLA

top of borehole.....

East: _

North: _

Elev: _

North ref. is true

Depth units are feet

Vertical scale: 1/10

Horiz scale = 1.00x Vert scale

Zone from 260.400 to 14.000ft

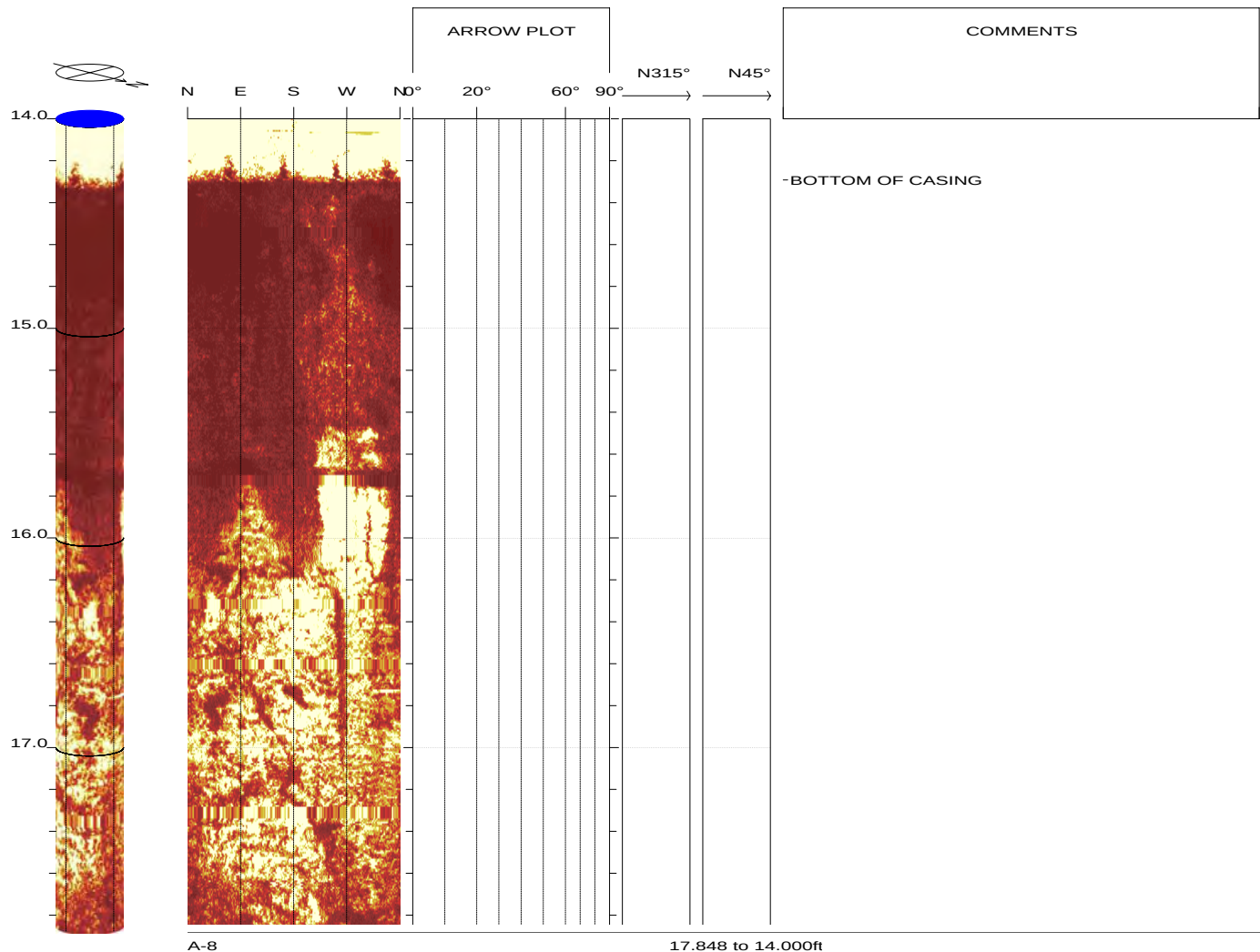
Format: BHTV-NESWN

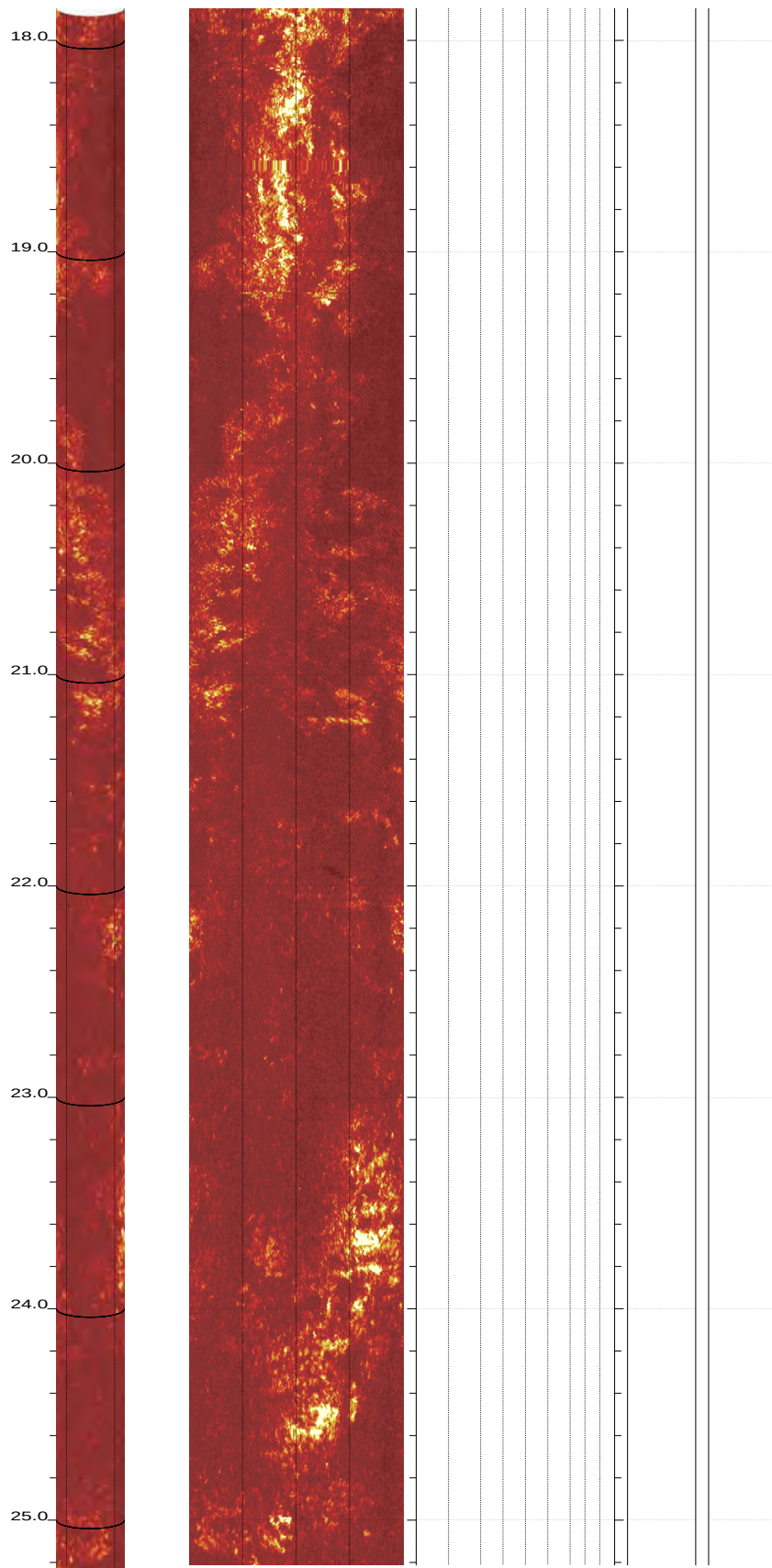
Borehole diam: 3.864inch

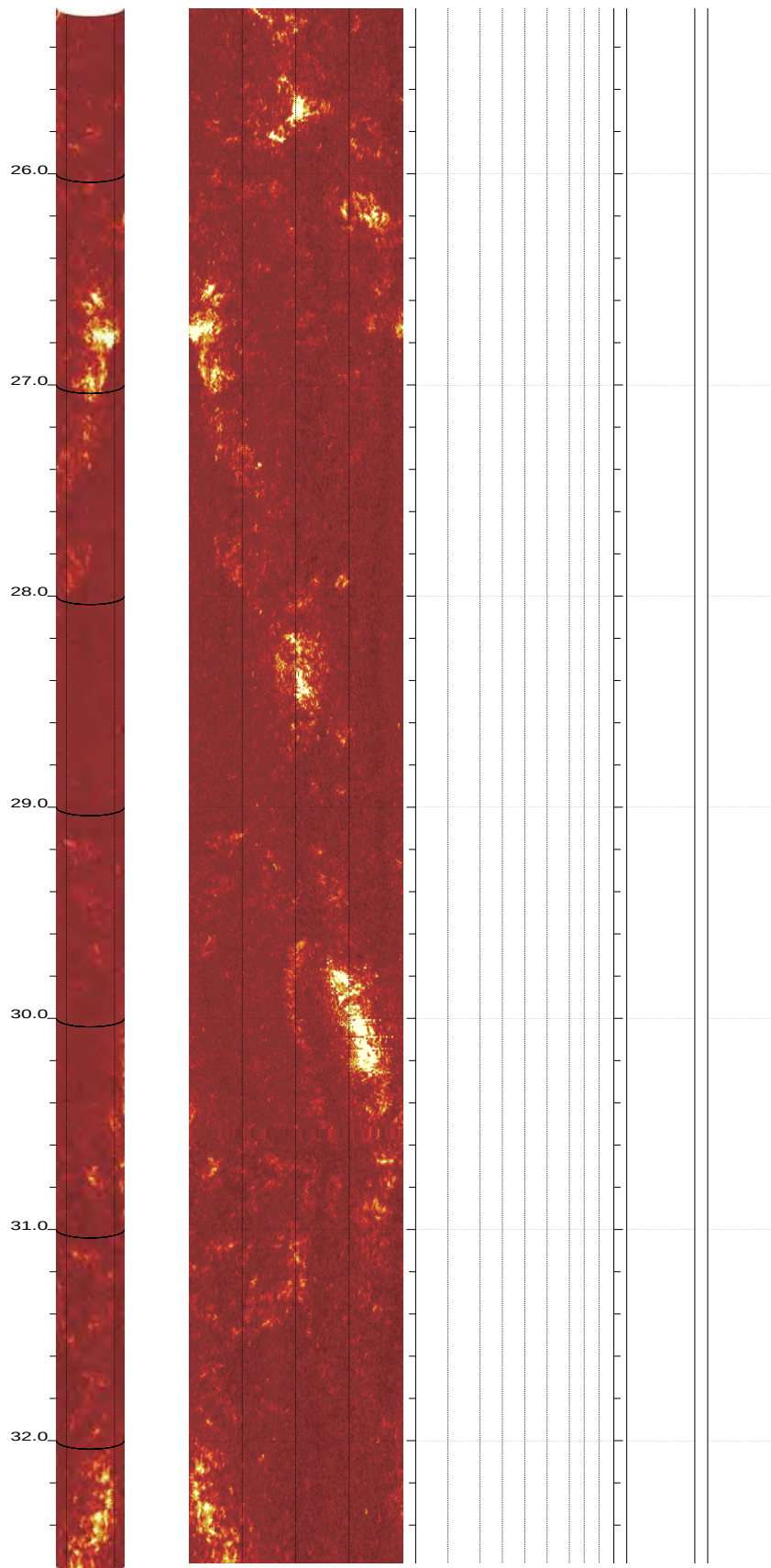
Vertical = borehole-axis

Image: Amplitude

— Stratigraphic dips ● Identified units
— Non-stratigraphic dips ●

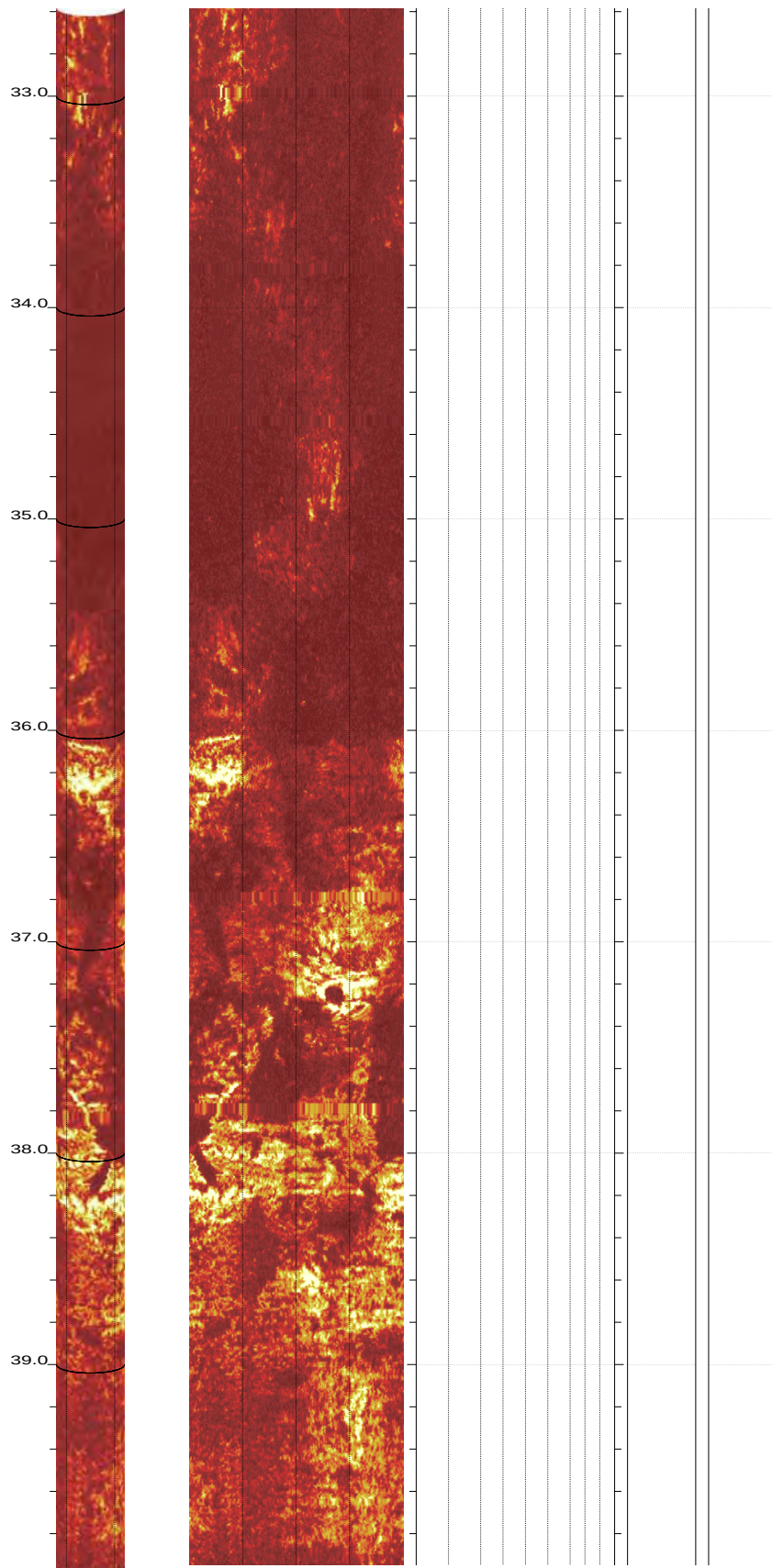






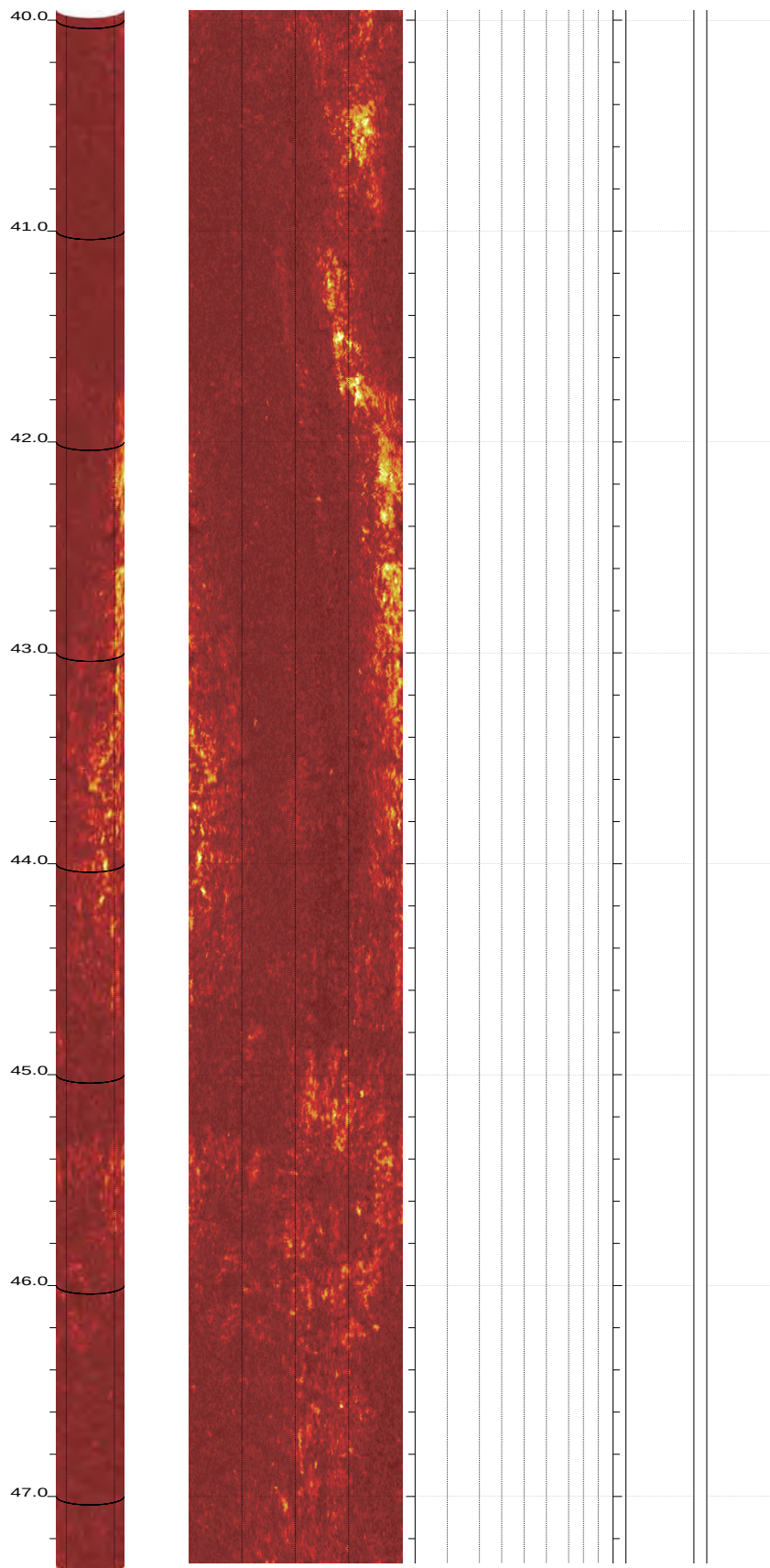
A-8

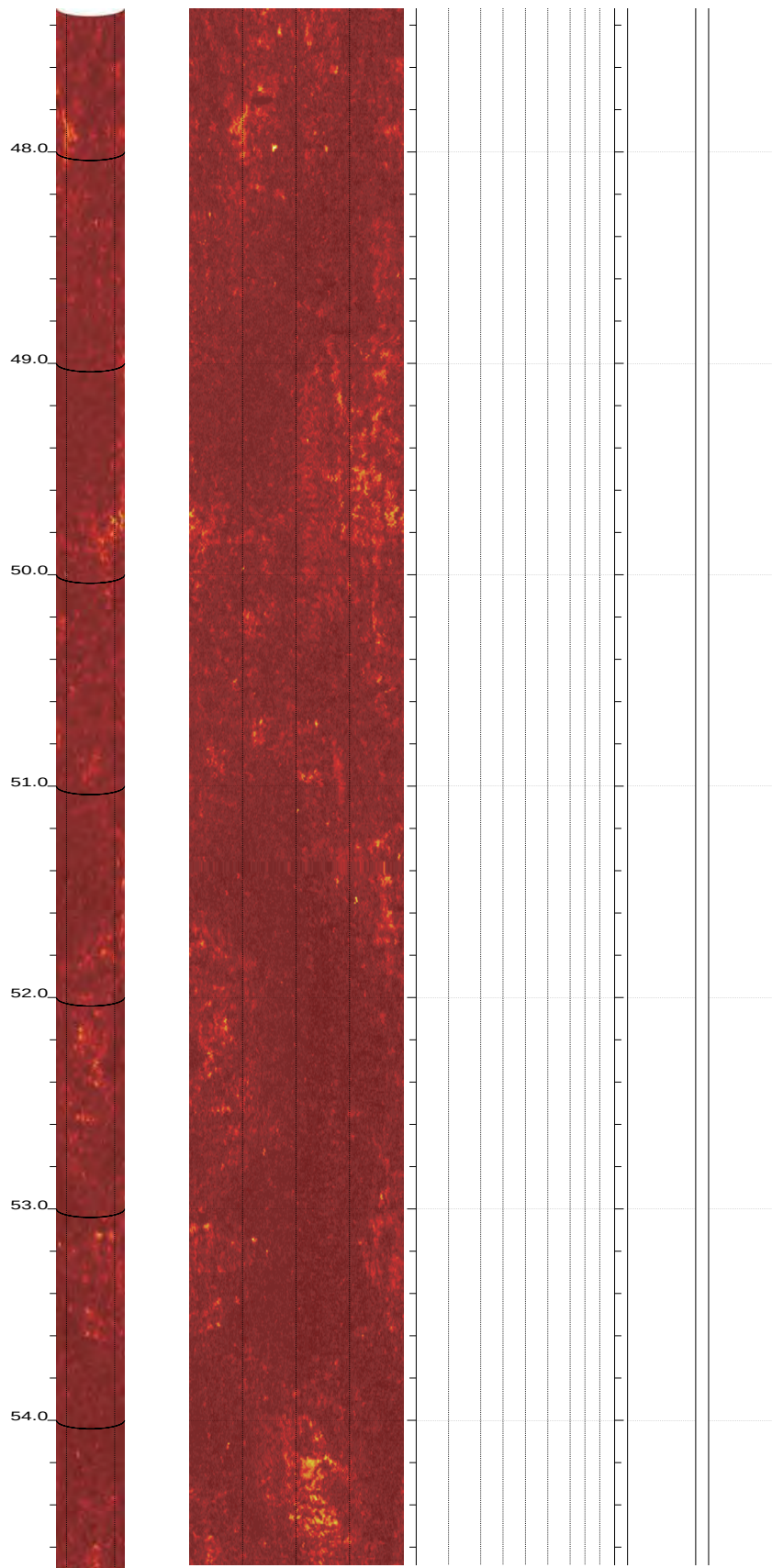
32.584 to 25.216ft



A-8

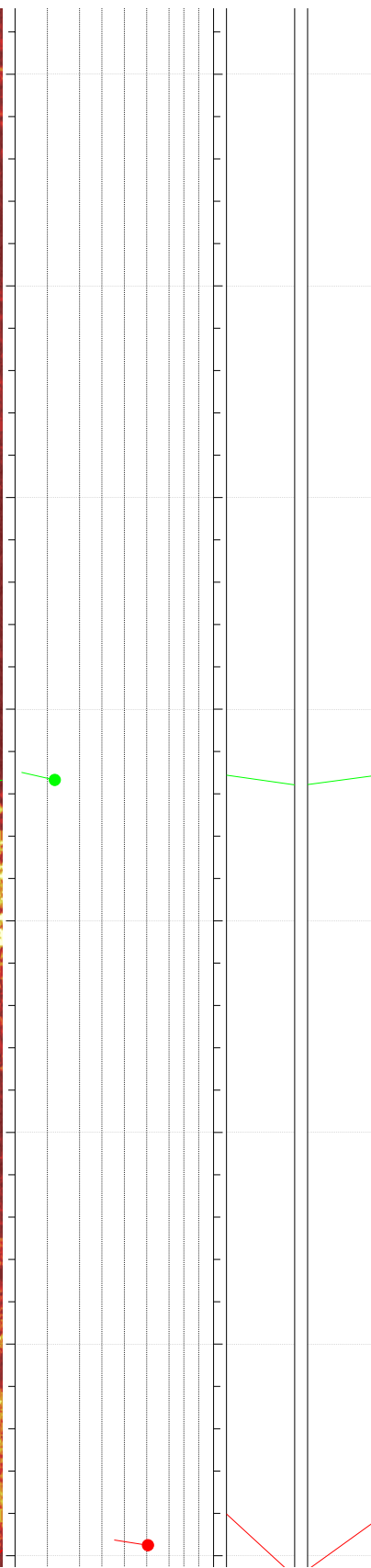
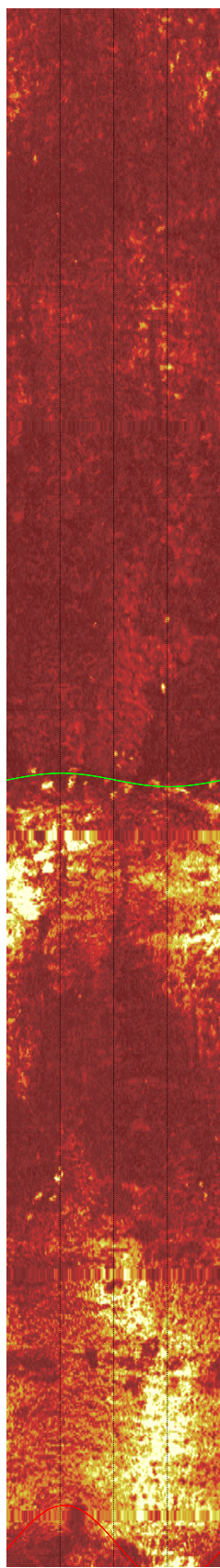
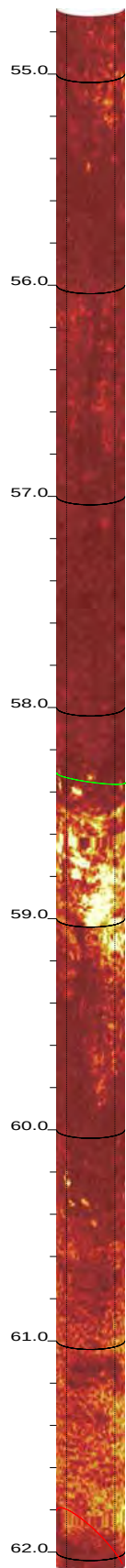
39.952 to 32.584ft





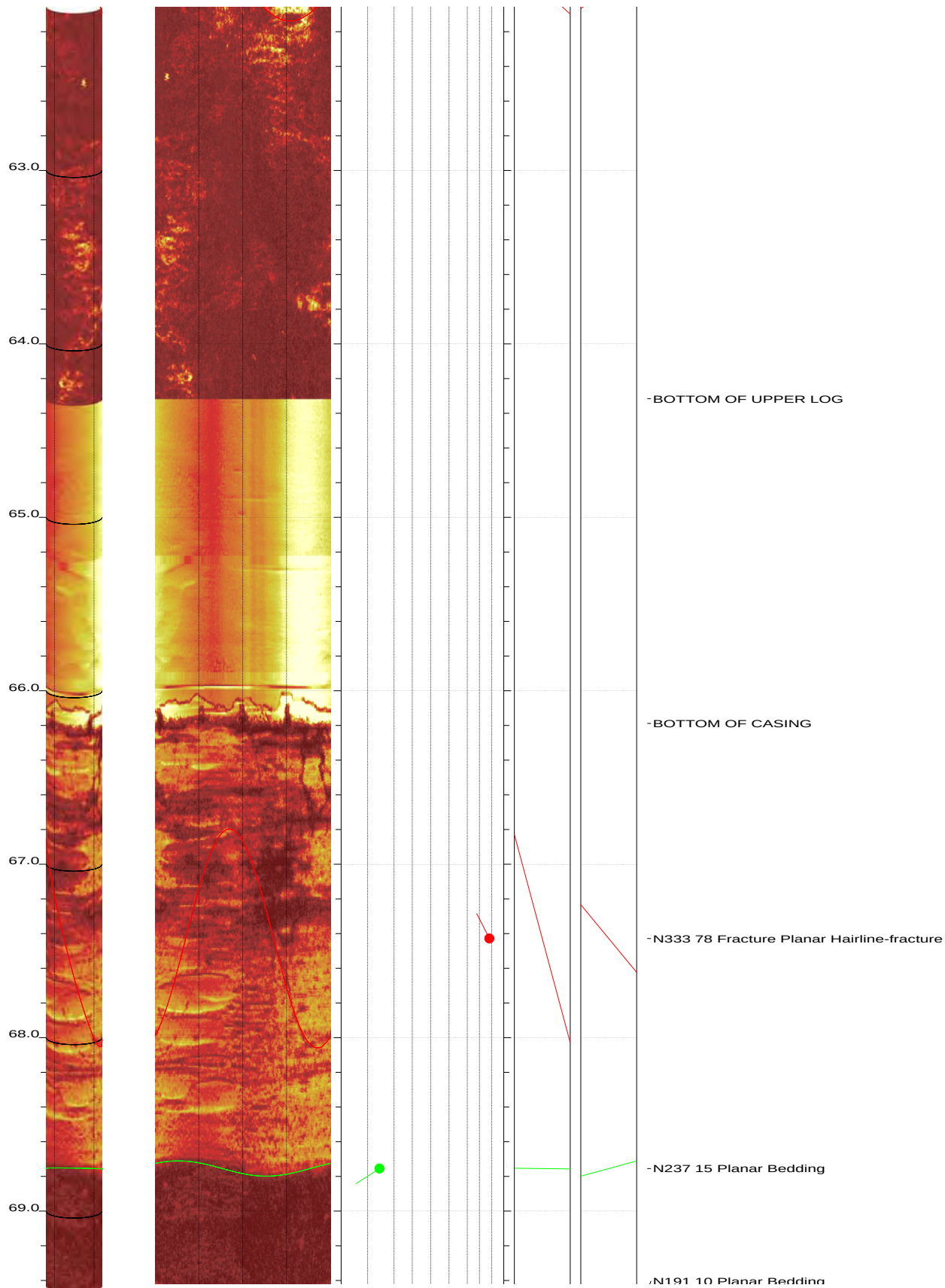
A-8

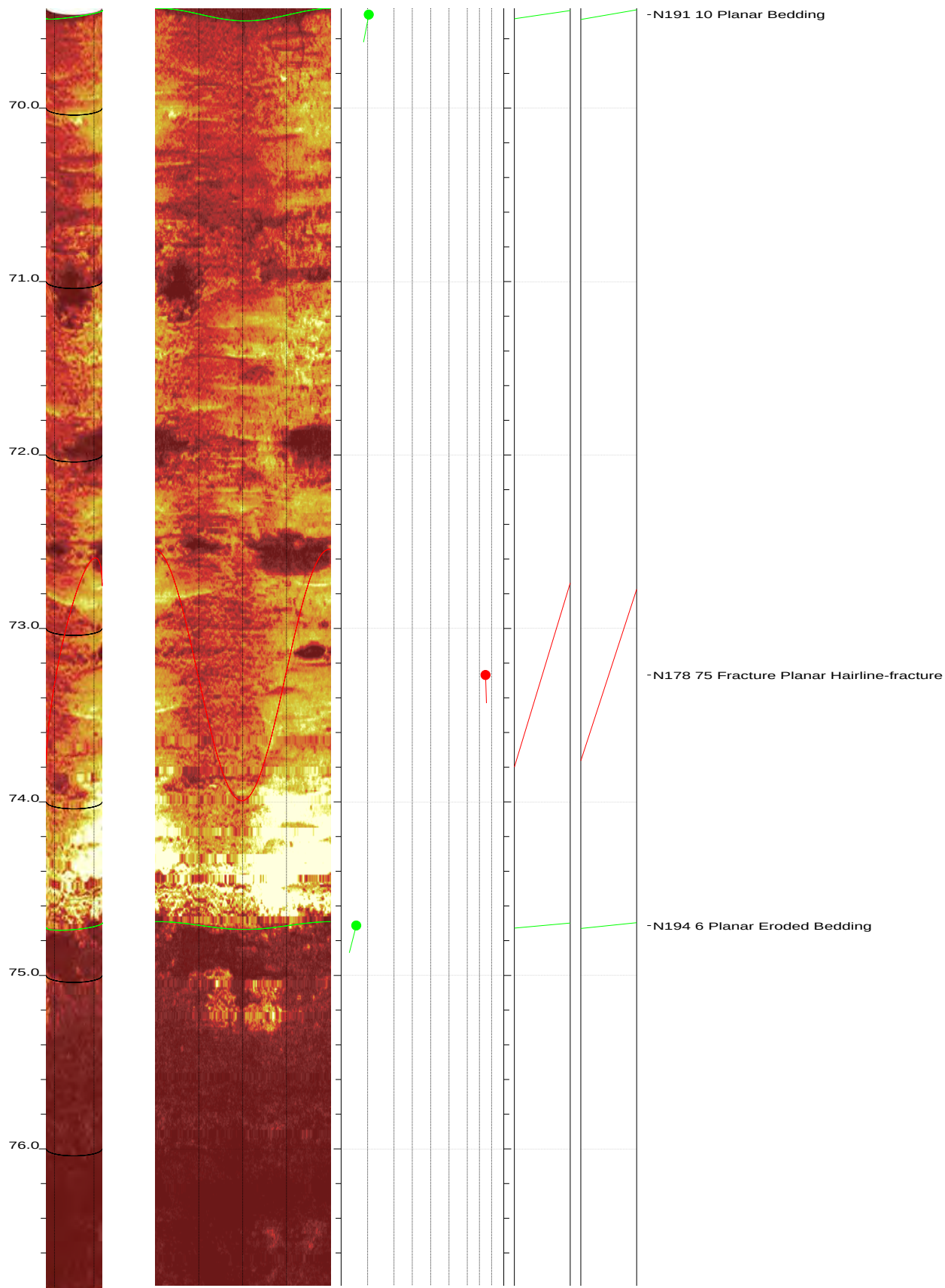
54.688 to 47.320ft

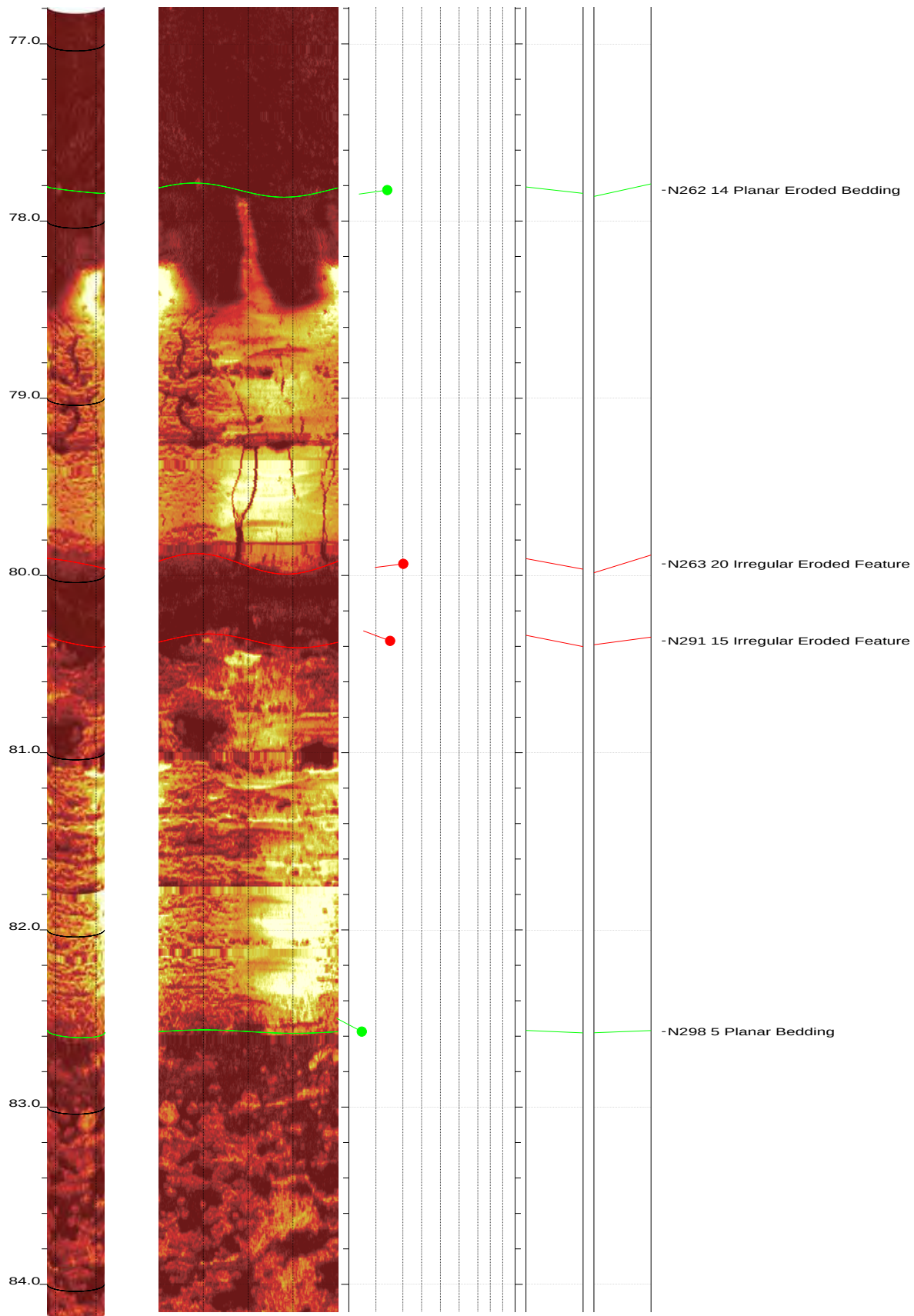


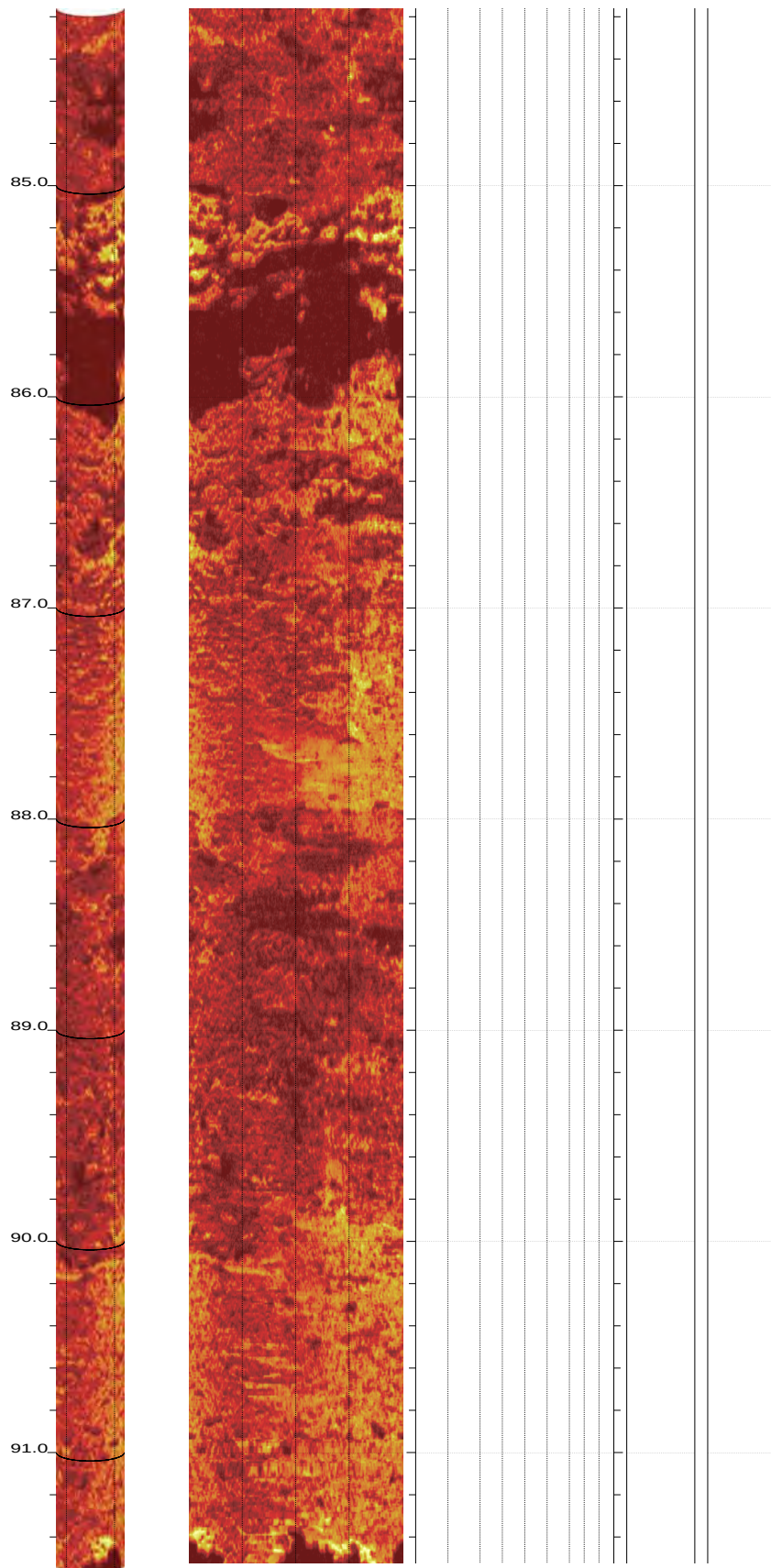
-N283 12 Planar Bedding

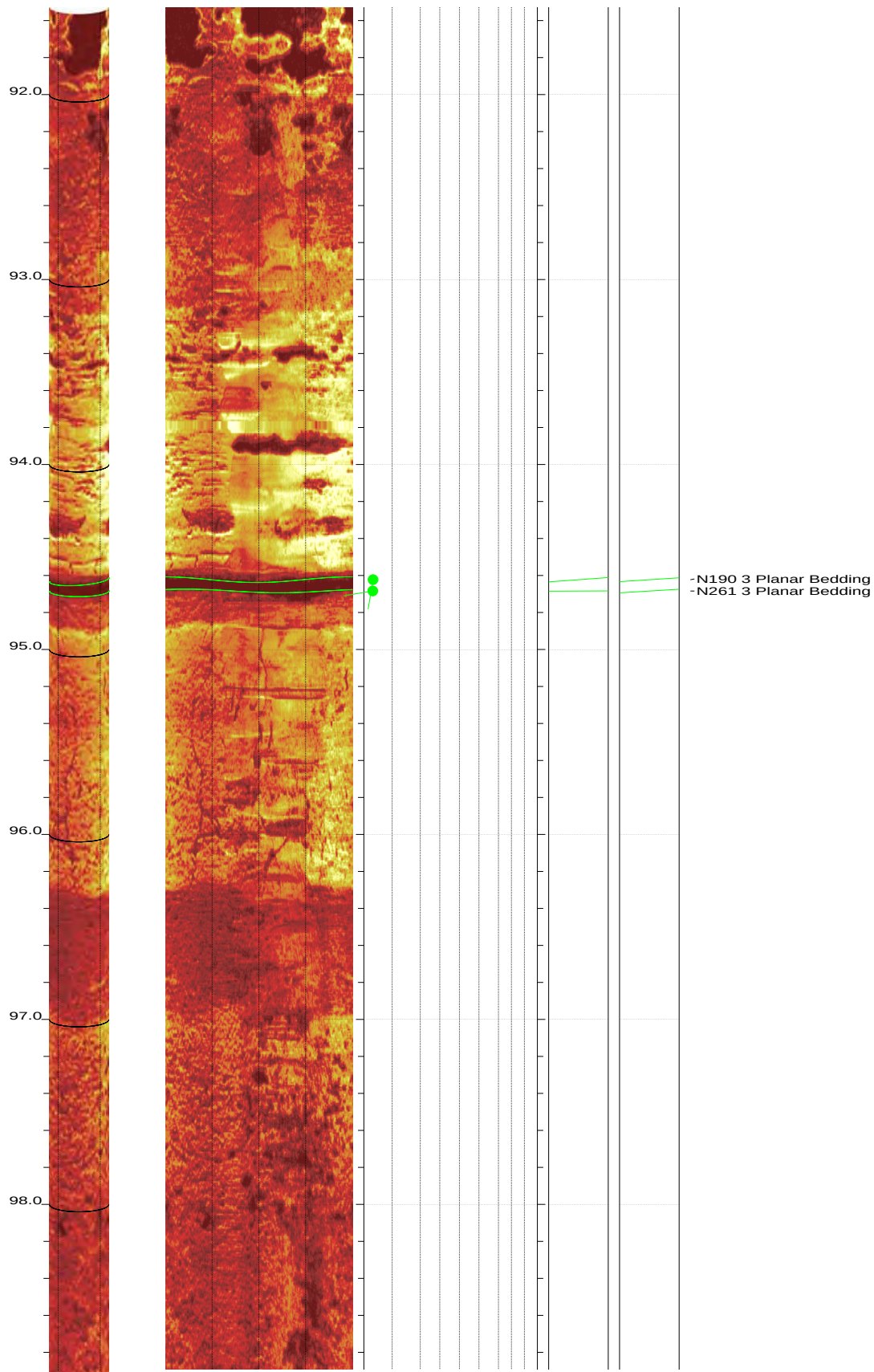
-N279 51 Irregular Eroded Feature

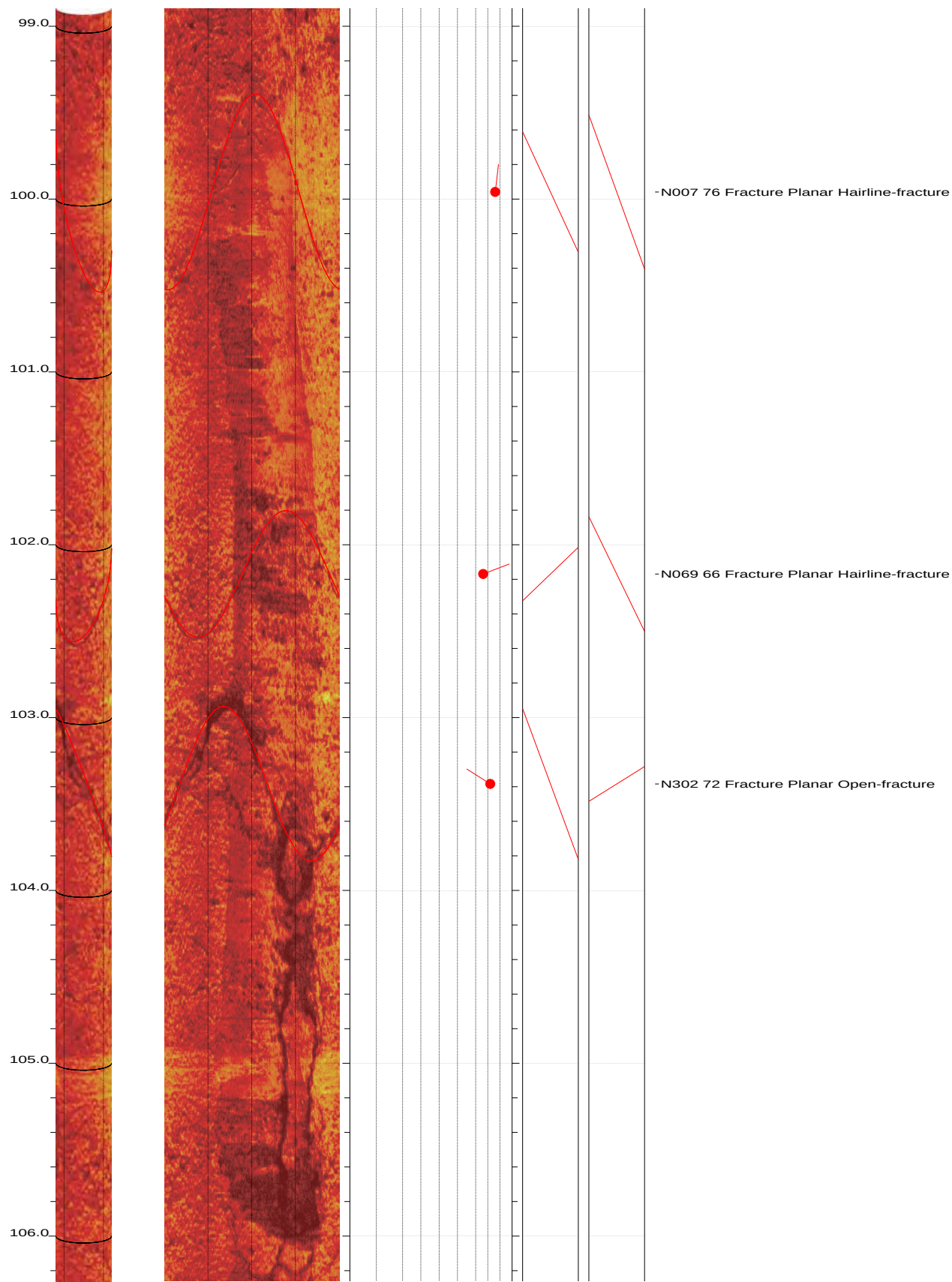


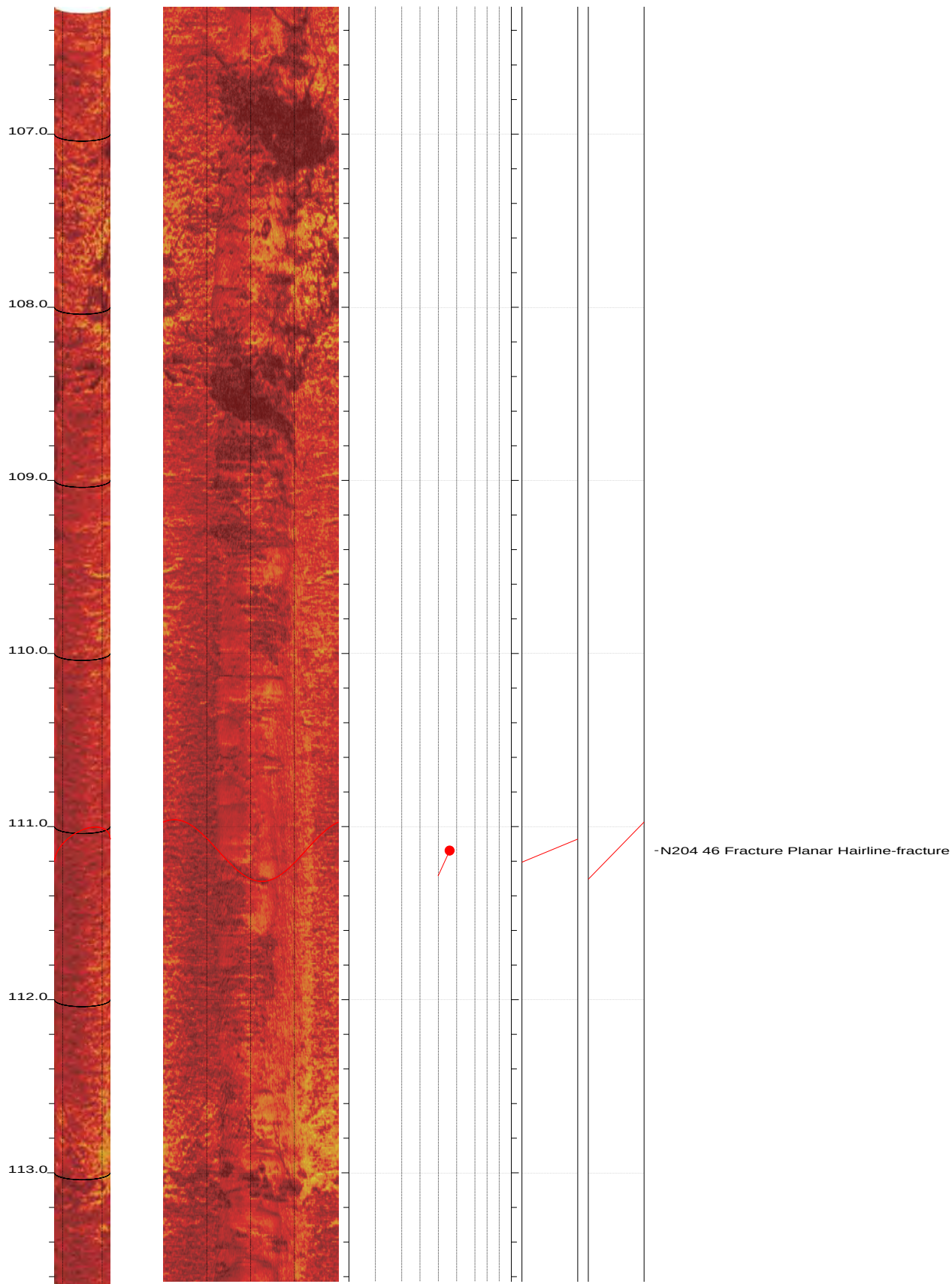


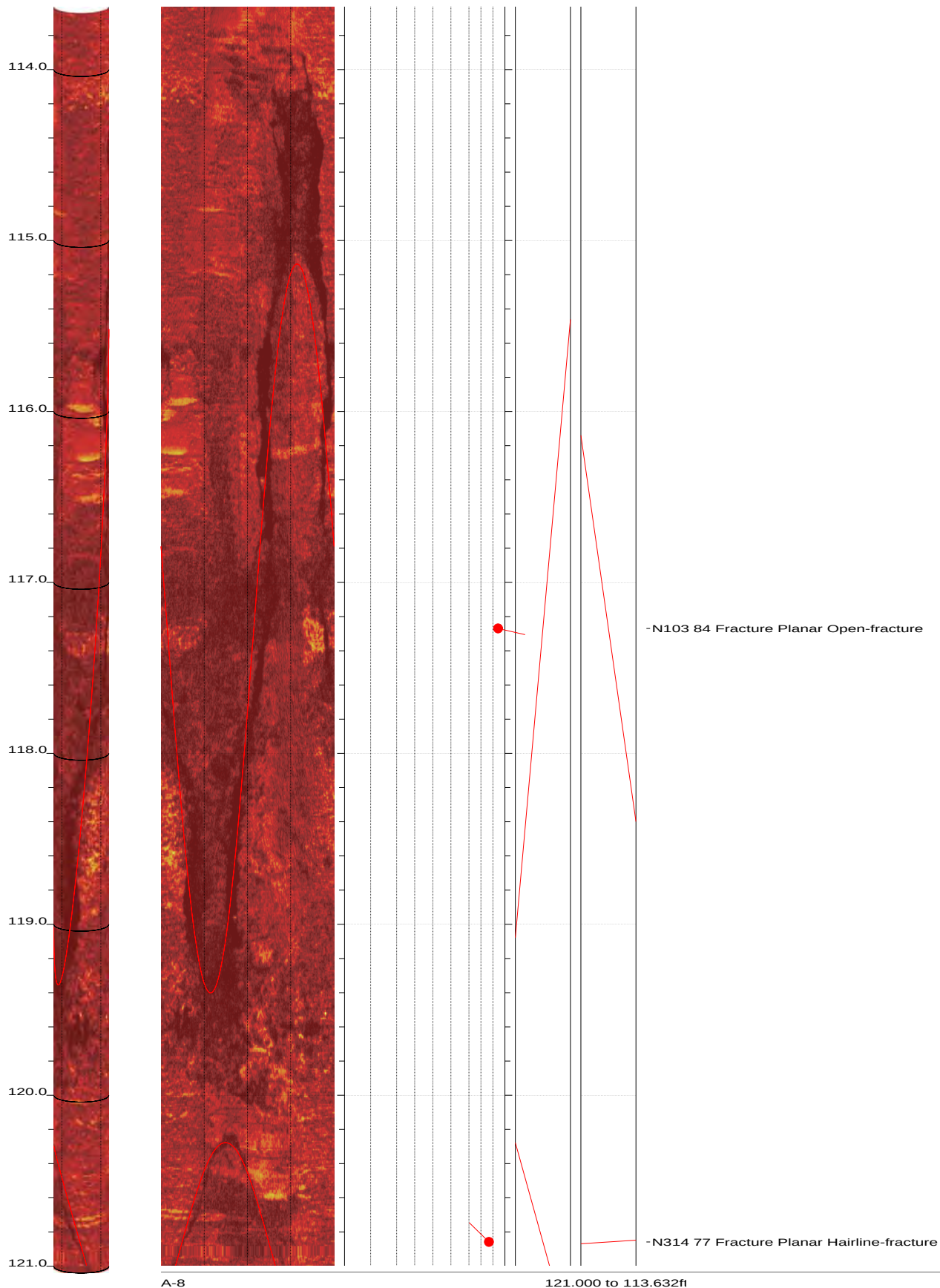


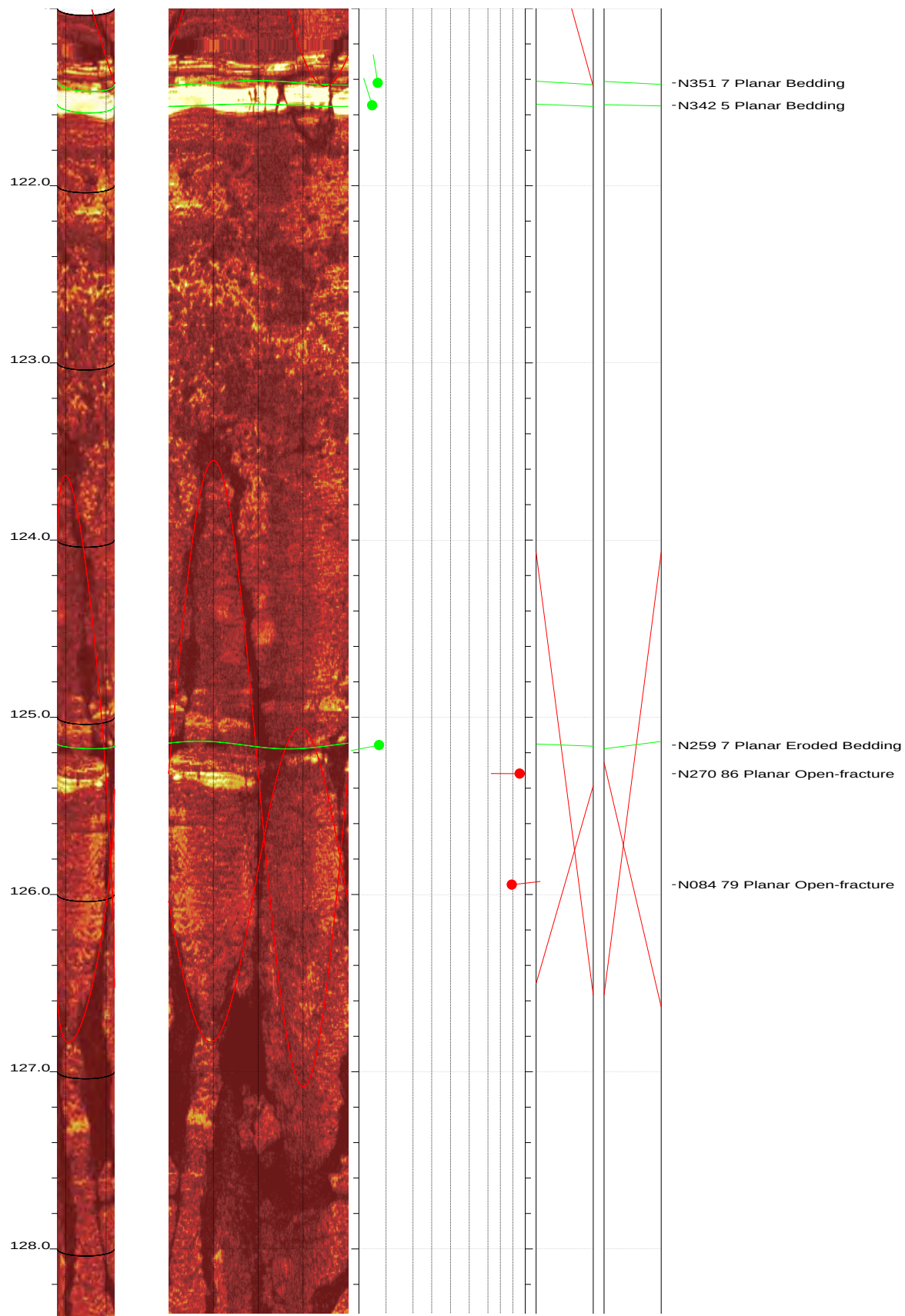


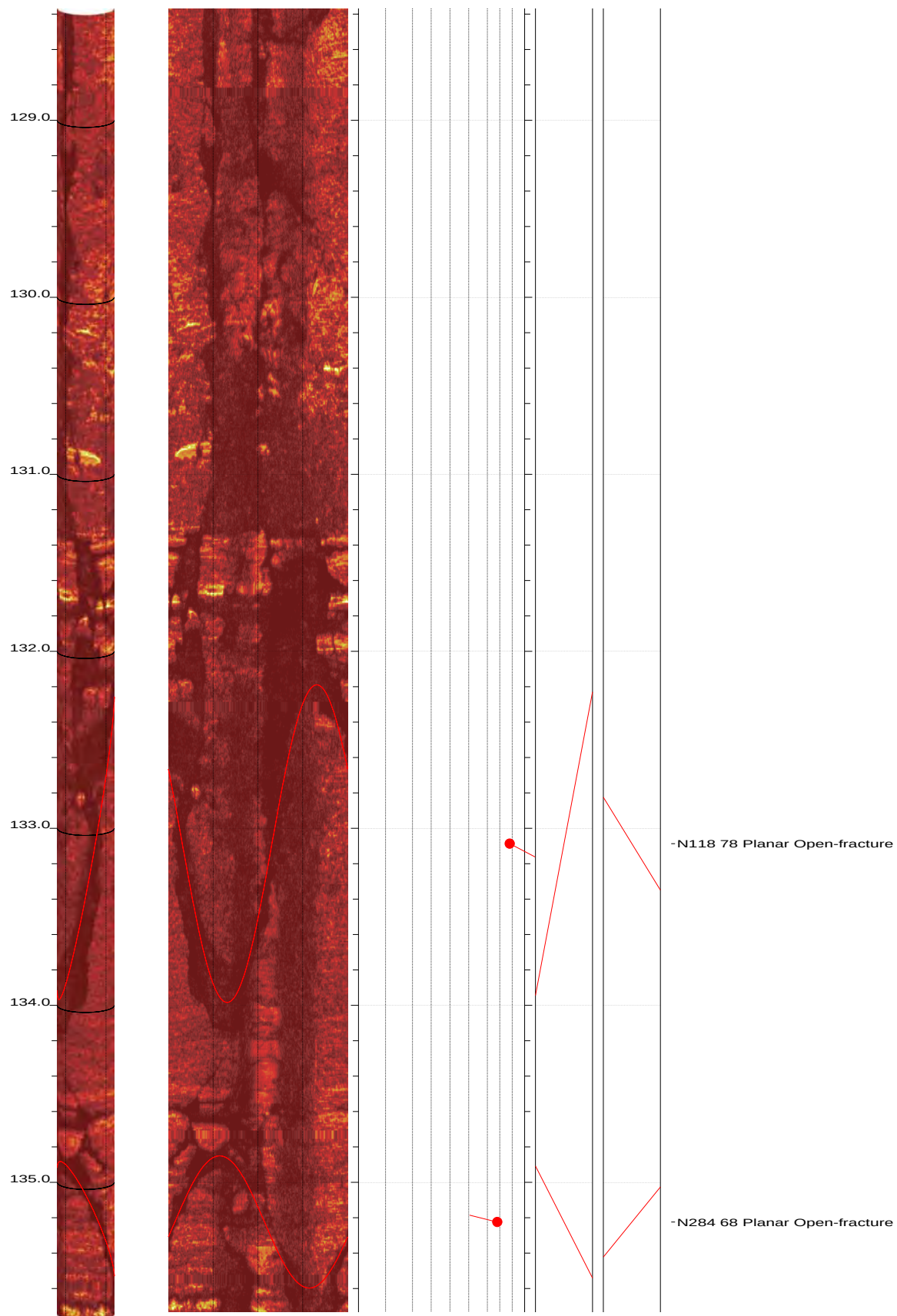


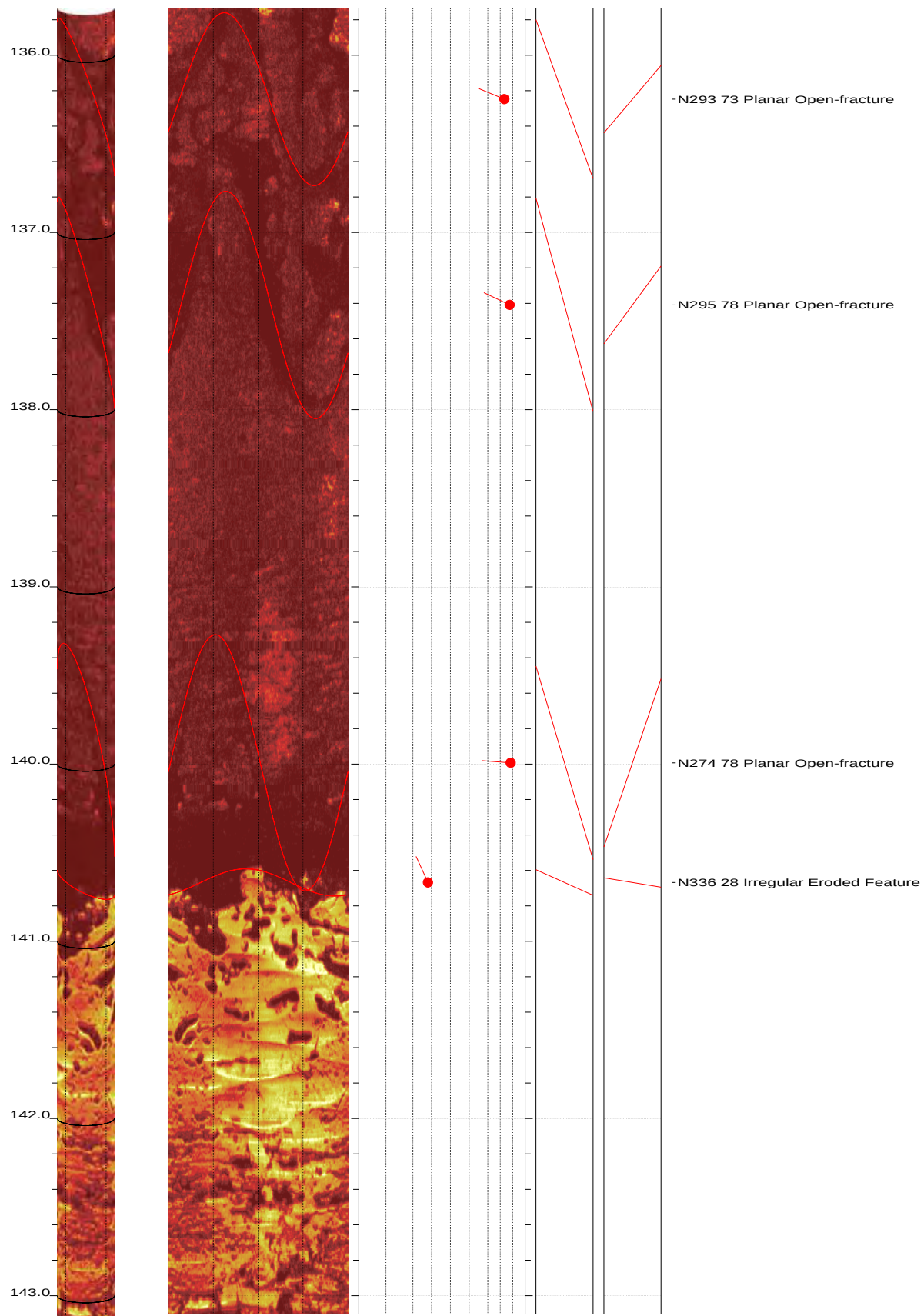


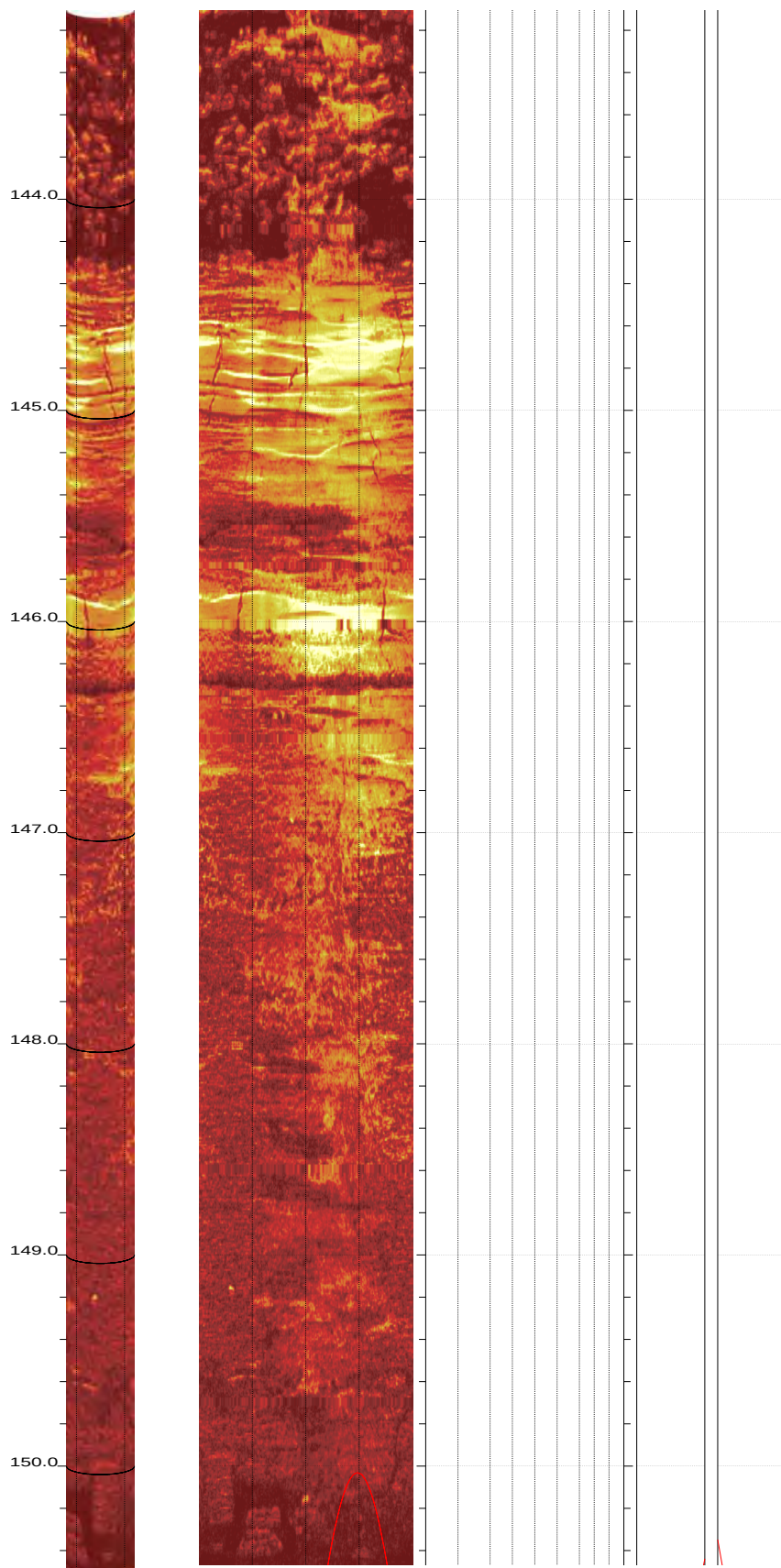






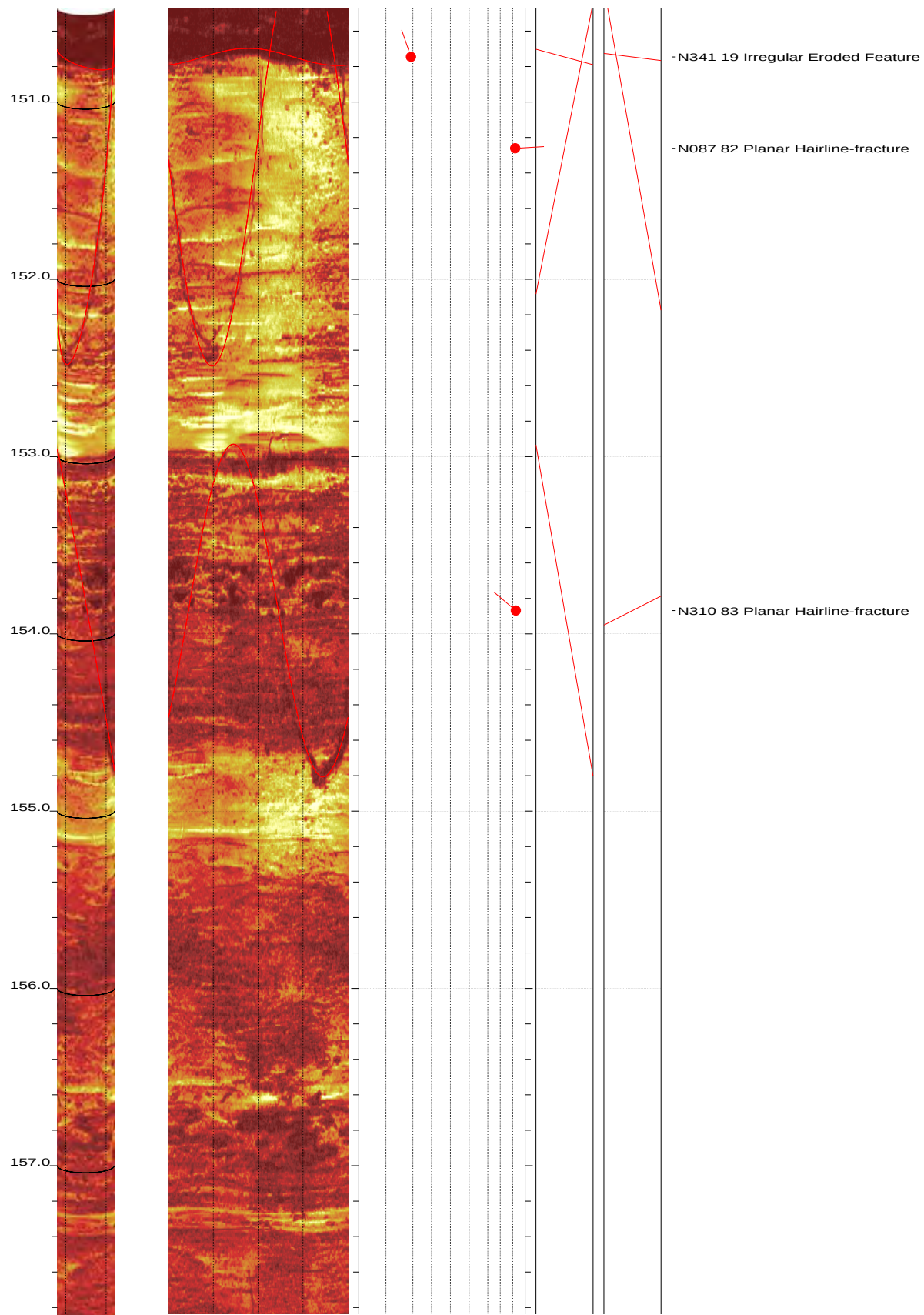


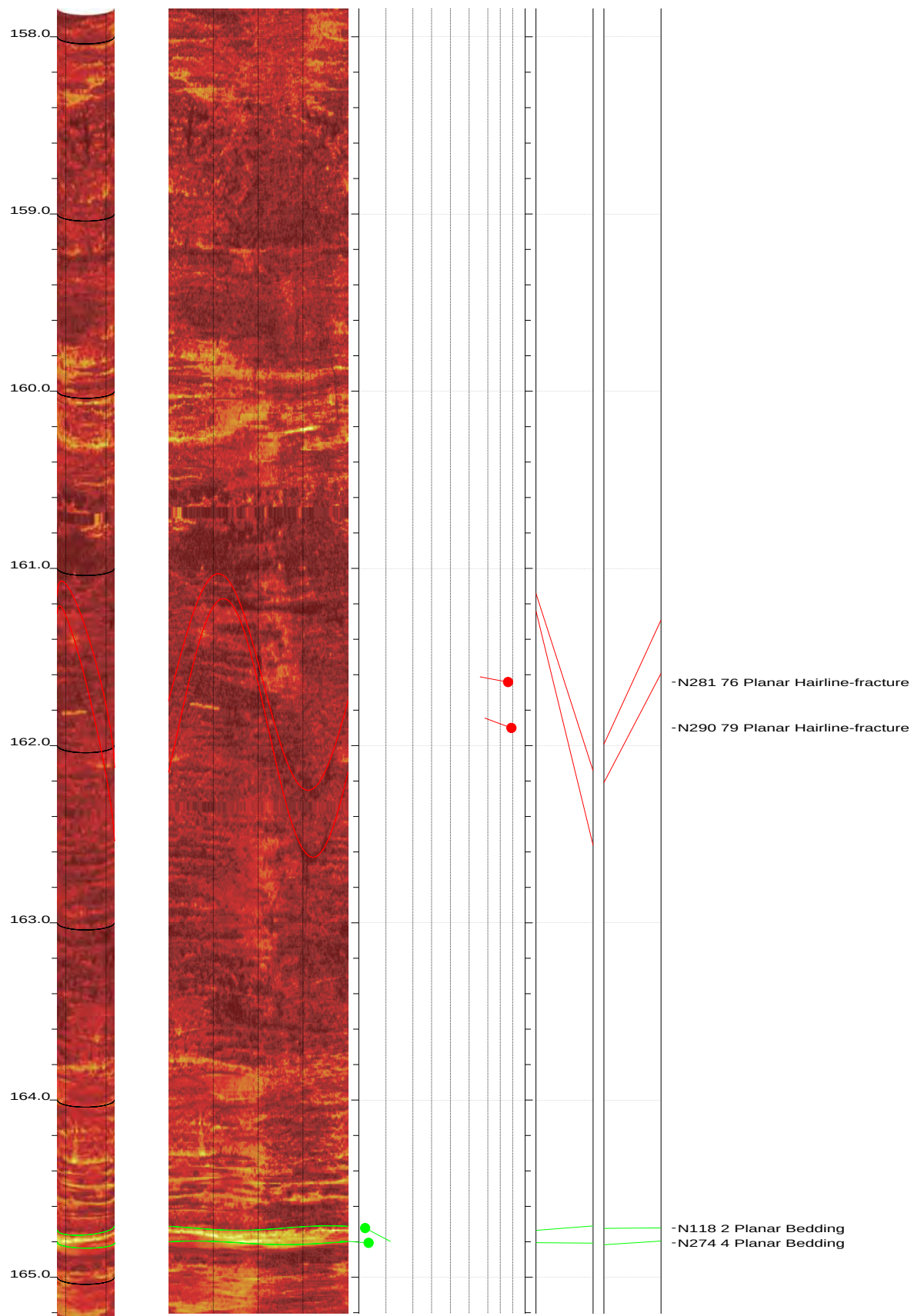


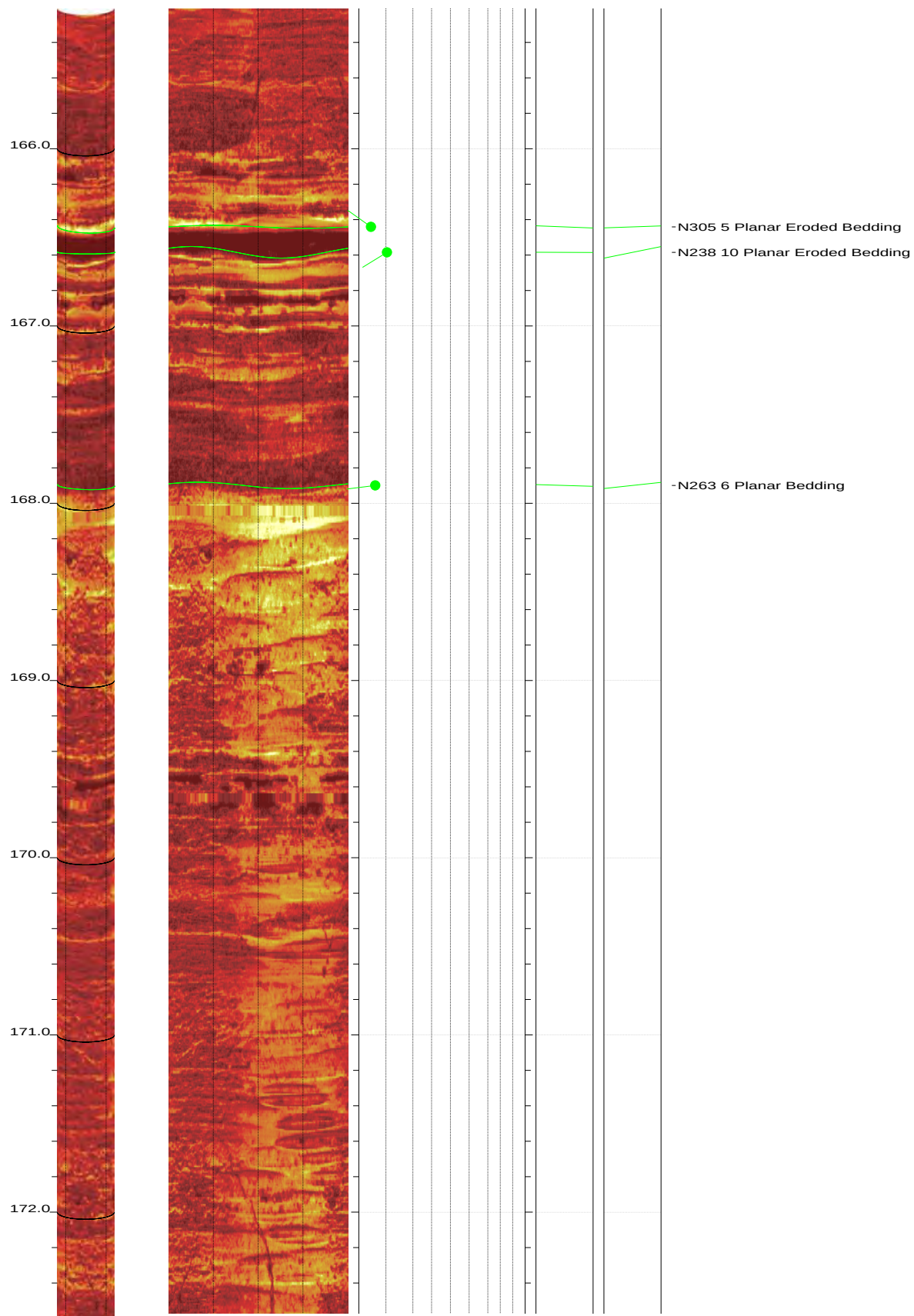


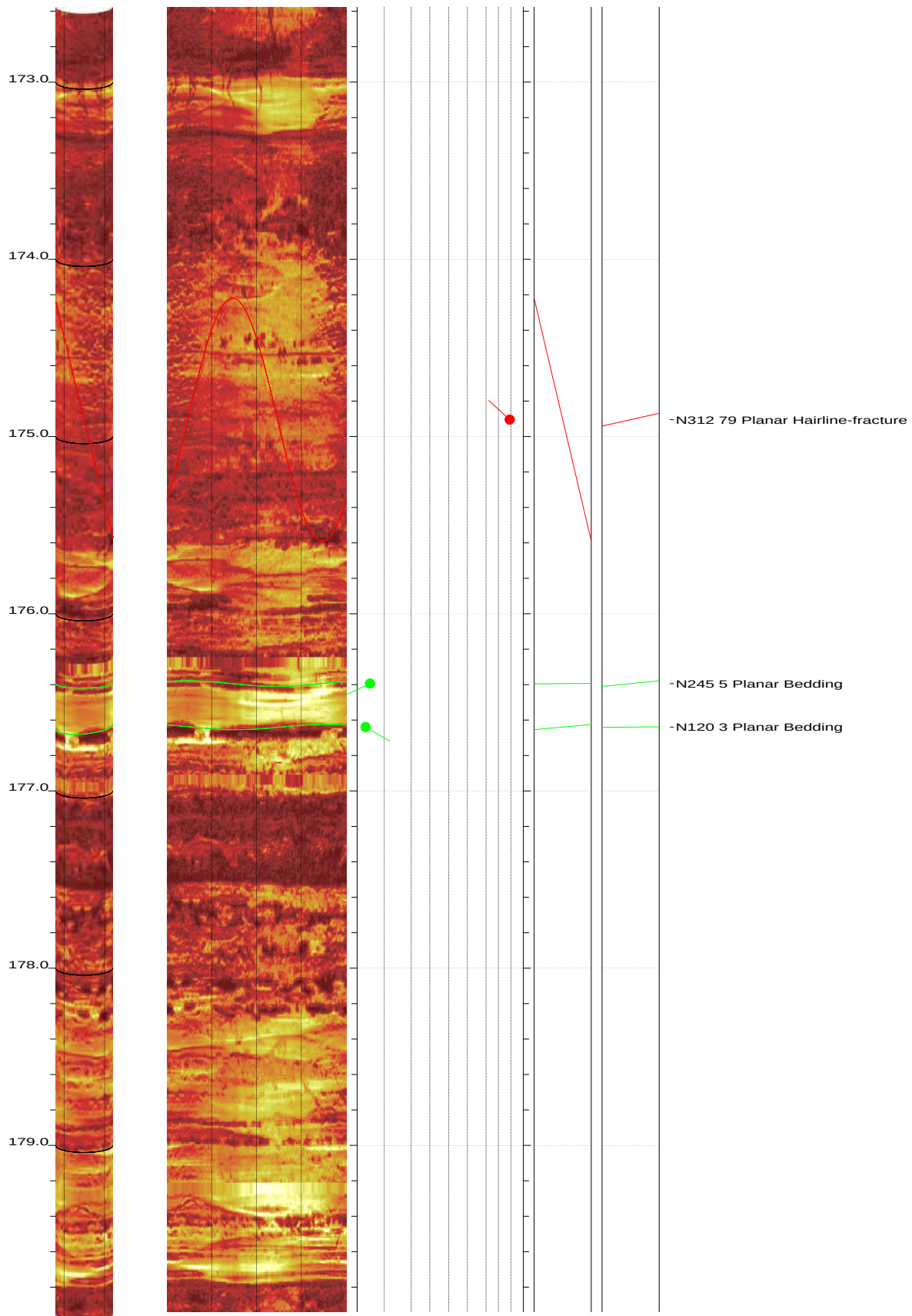
A-8

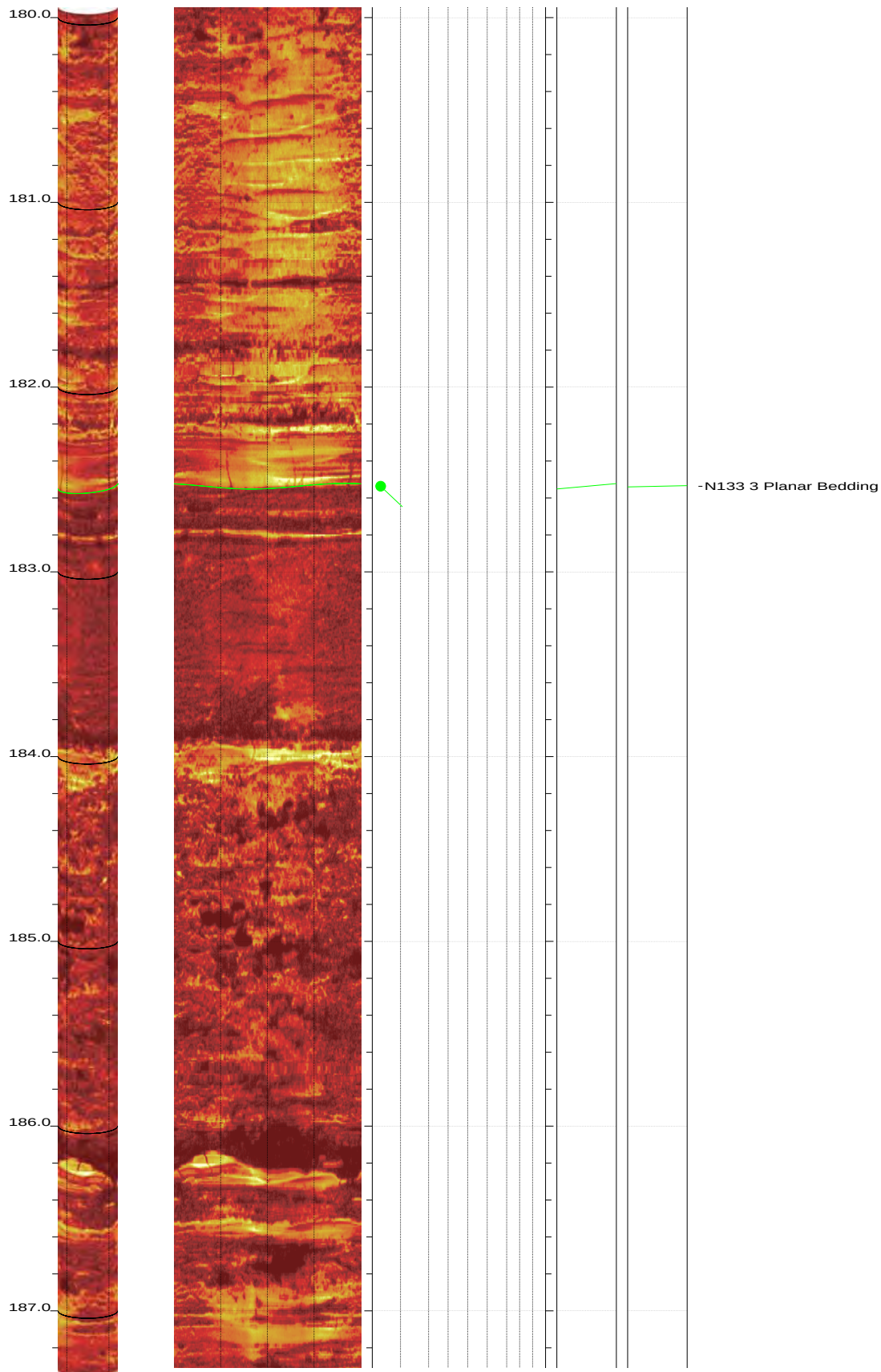
150.472 to 143.104ft

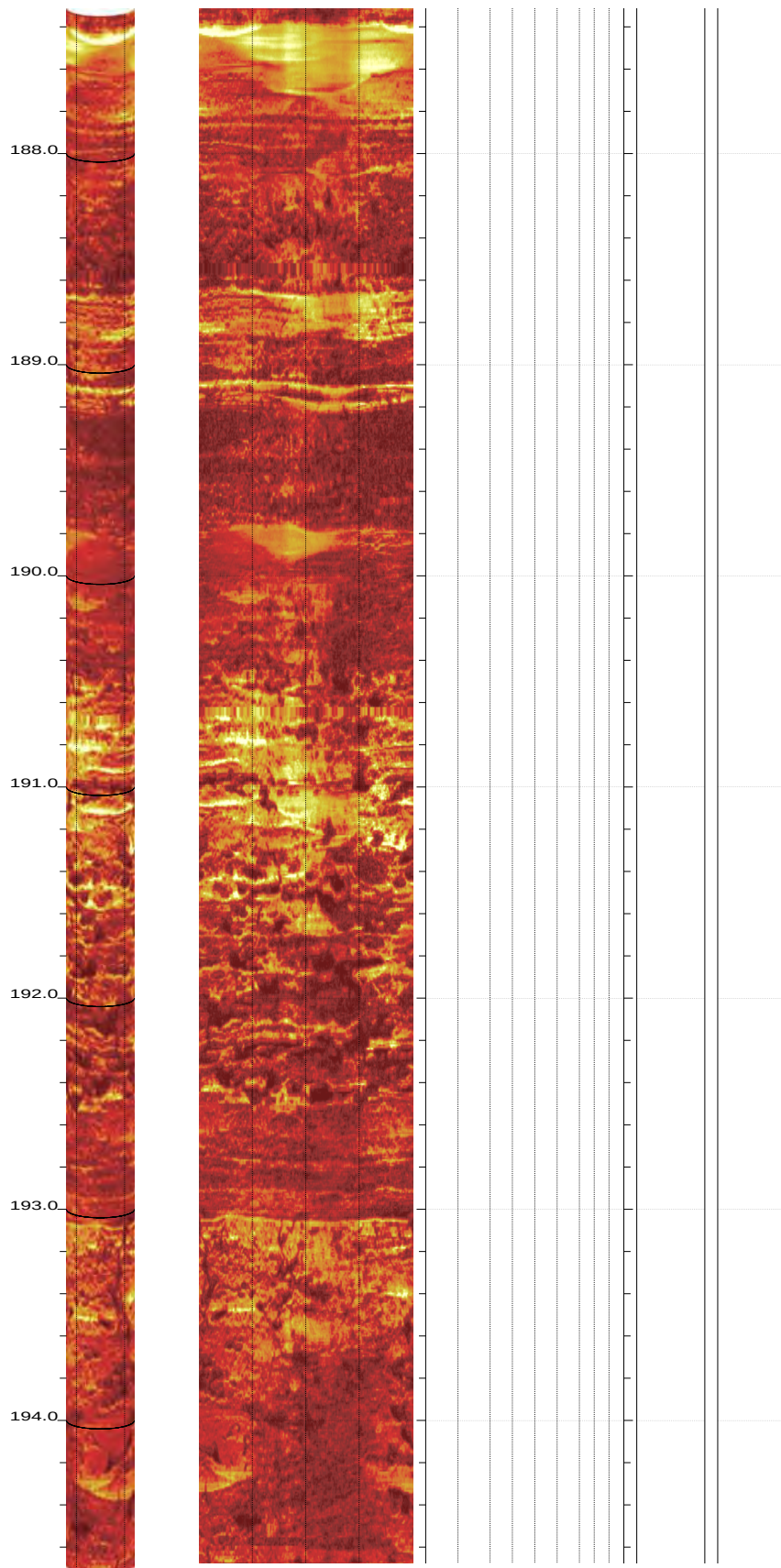


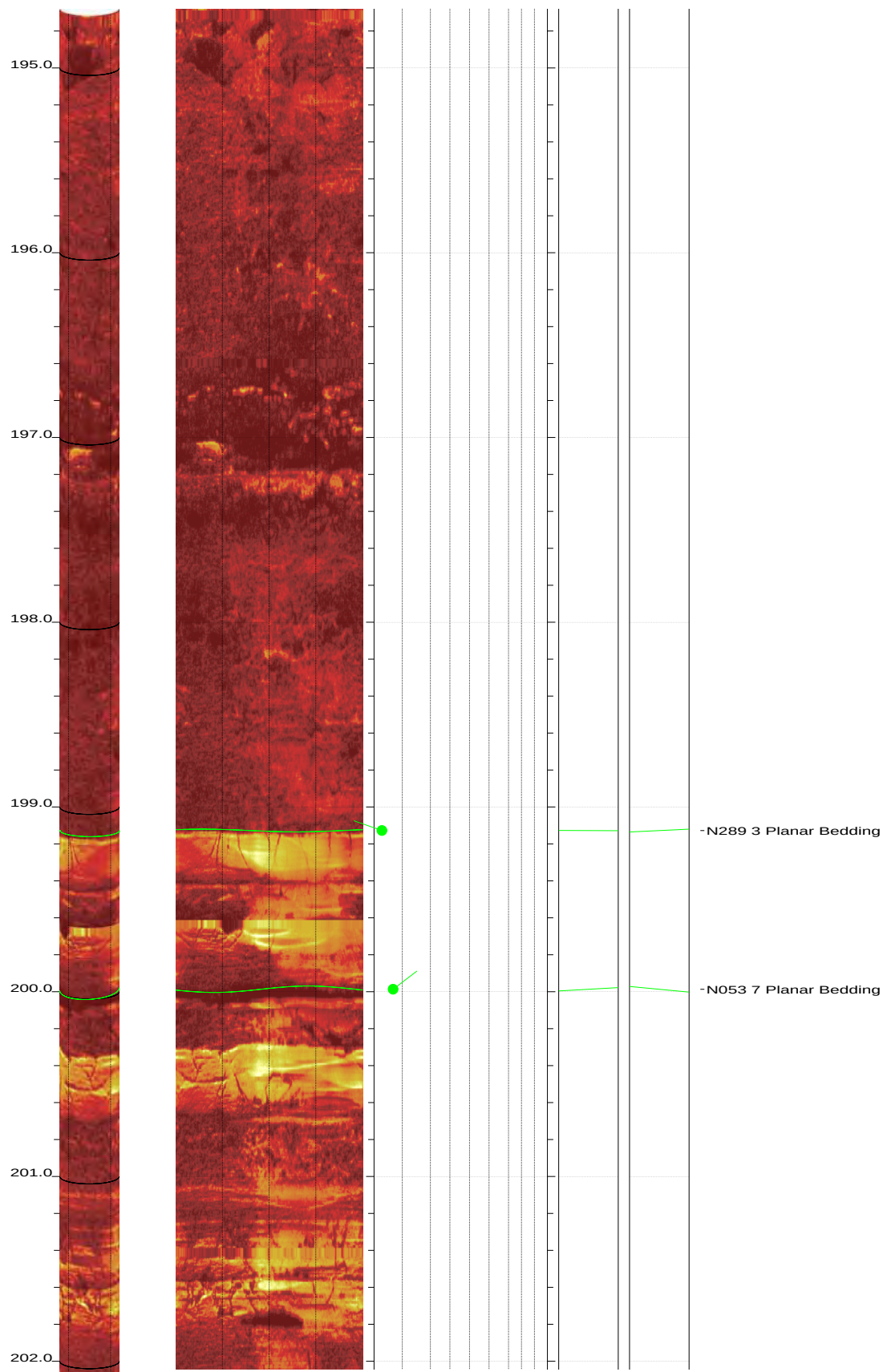


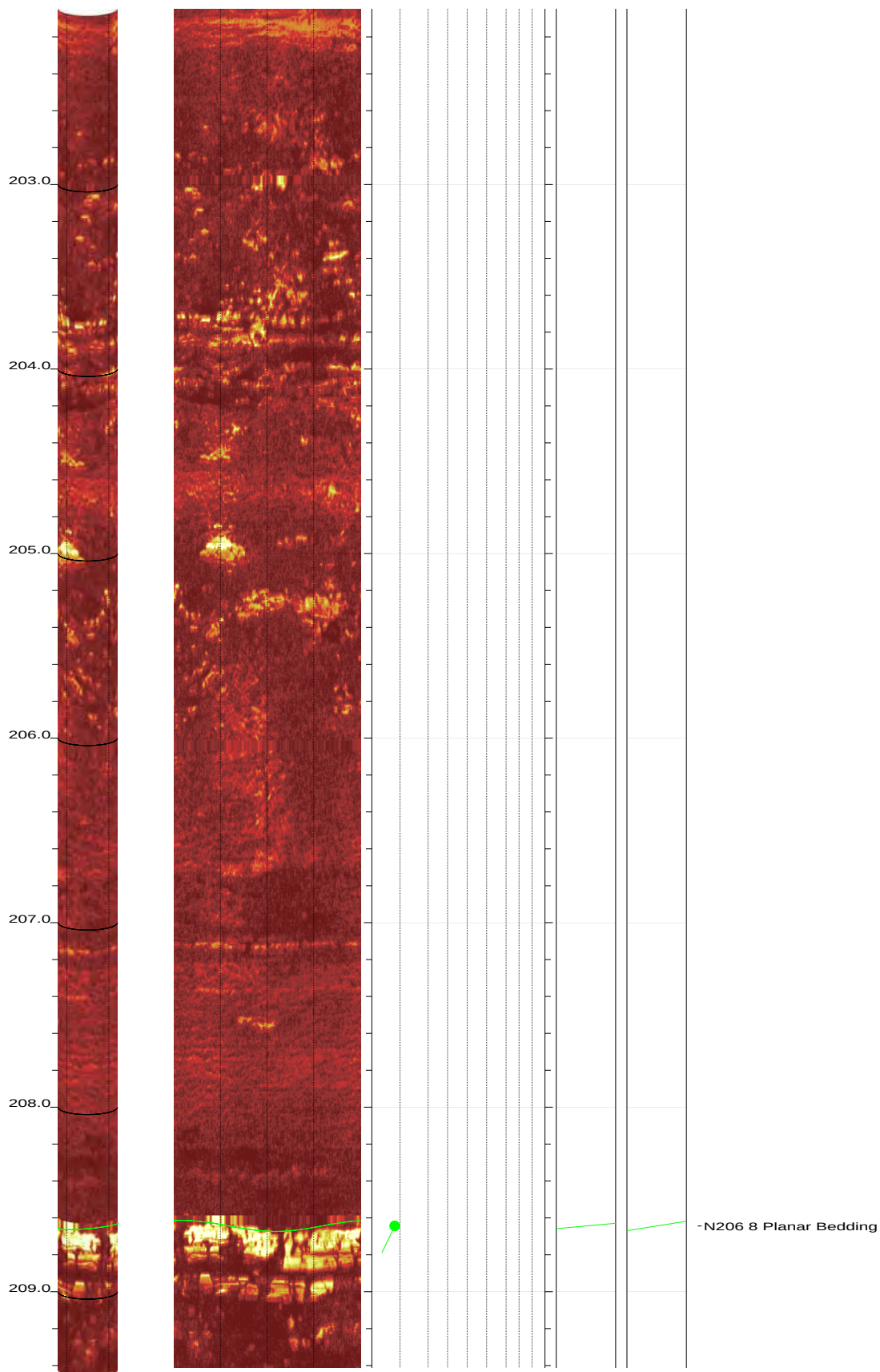


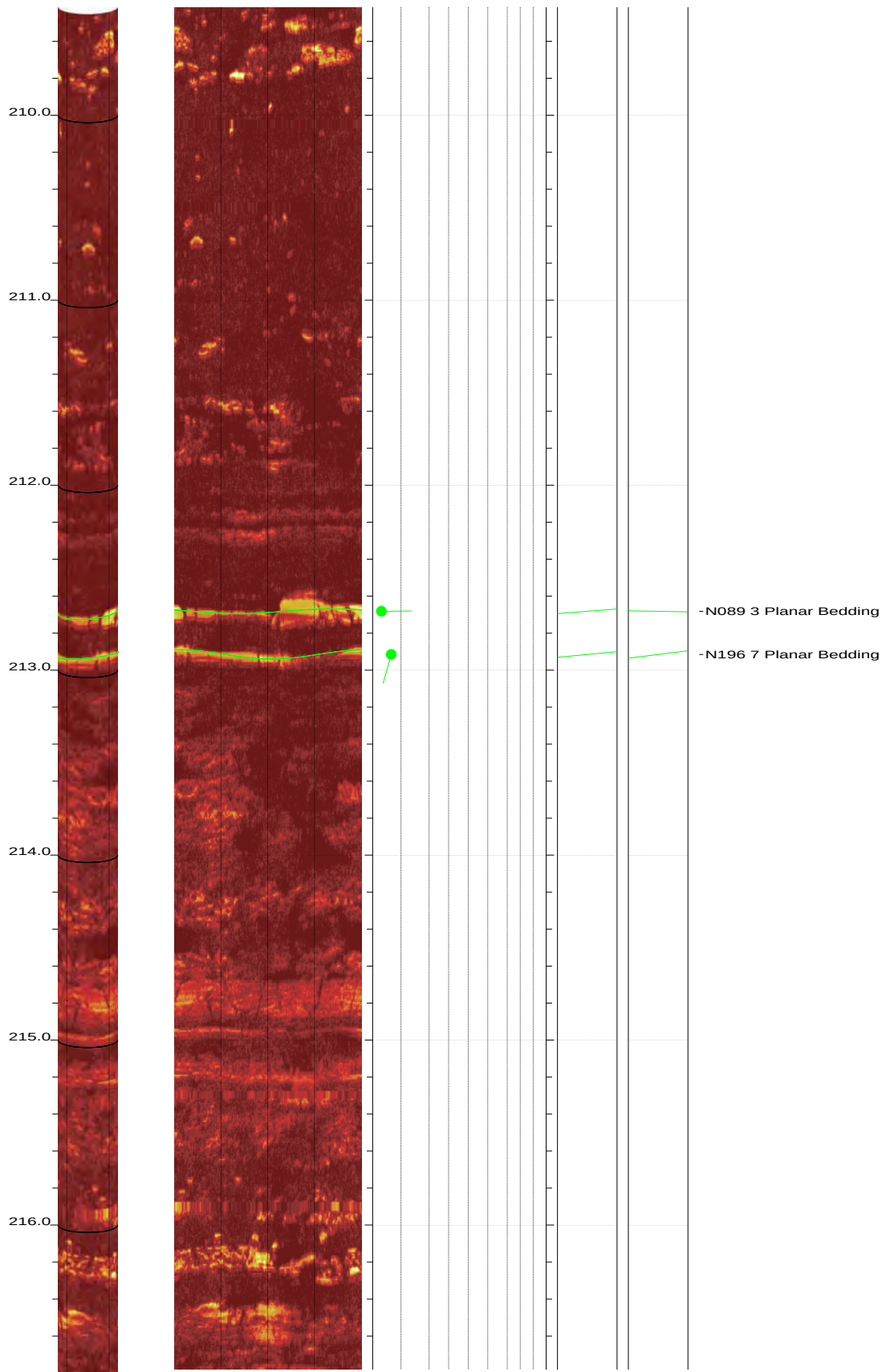


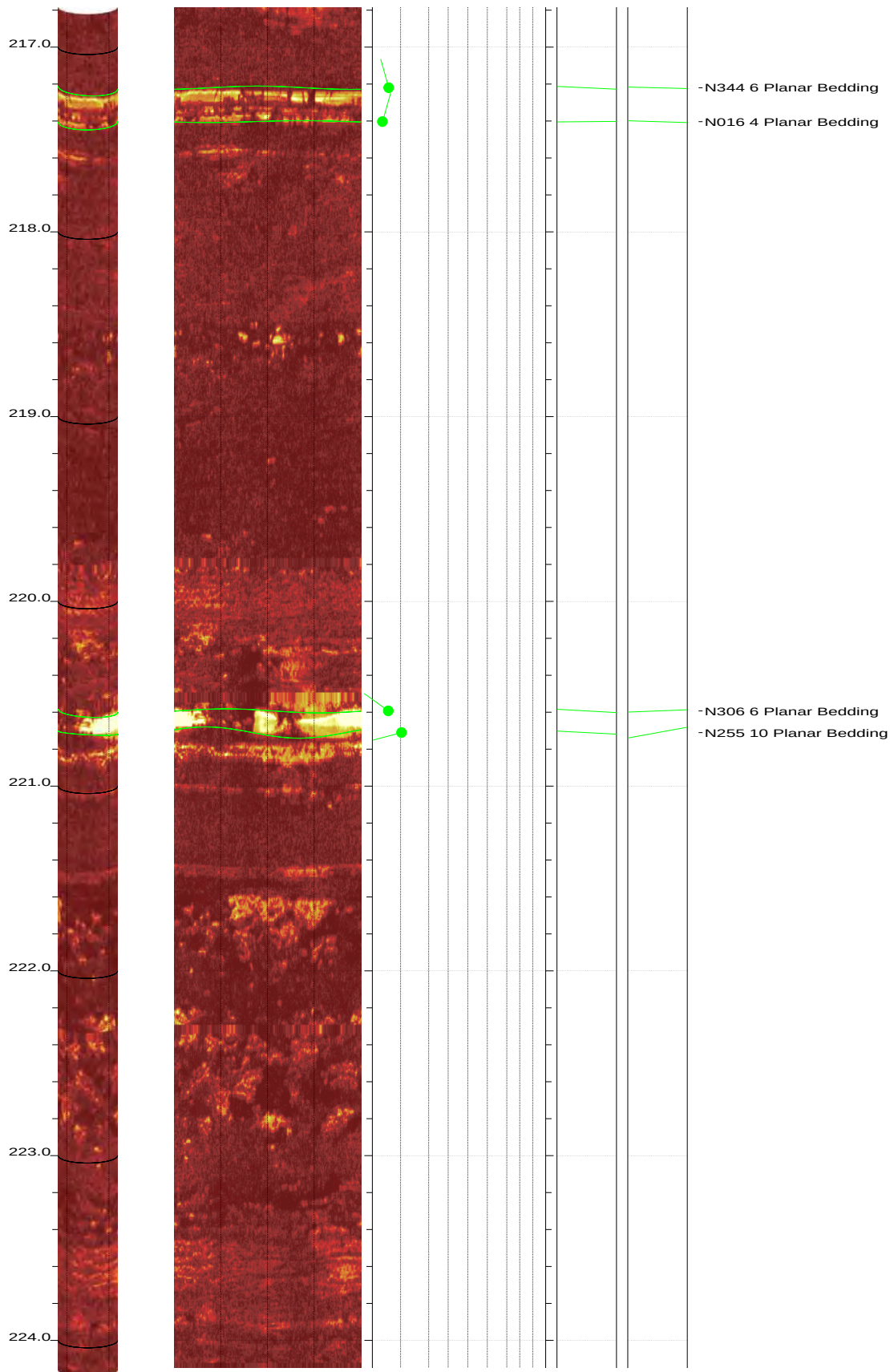


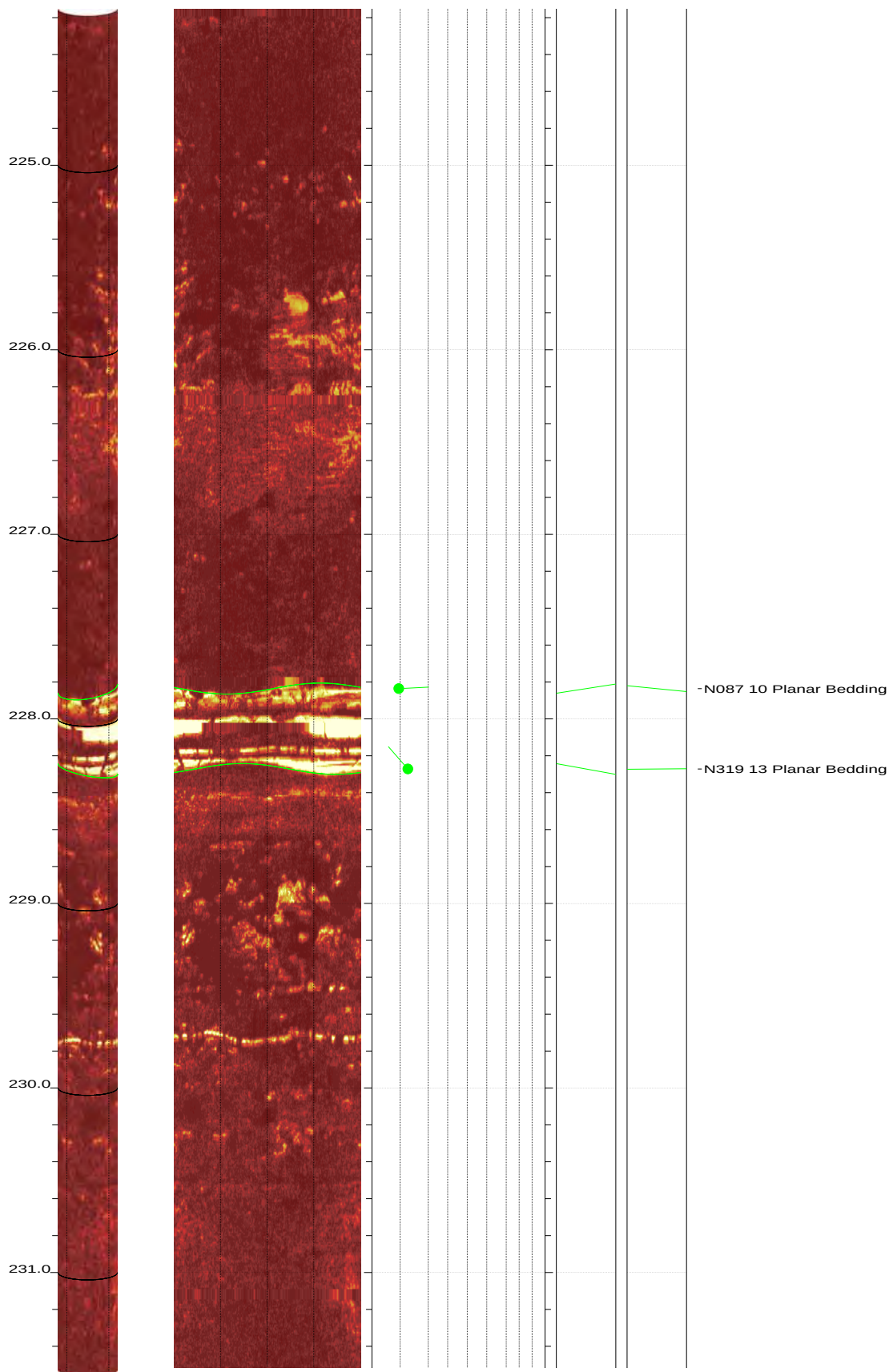


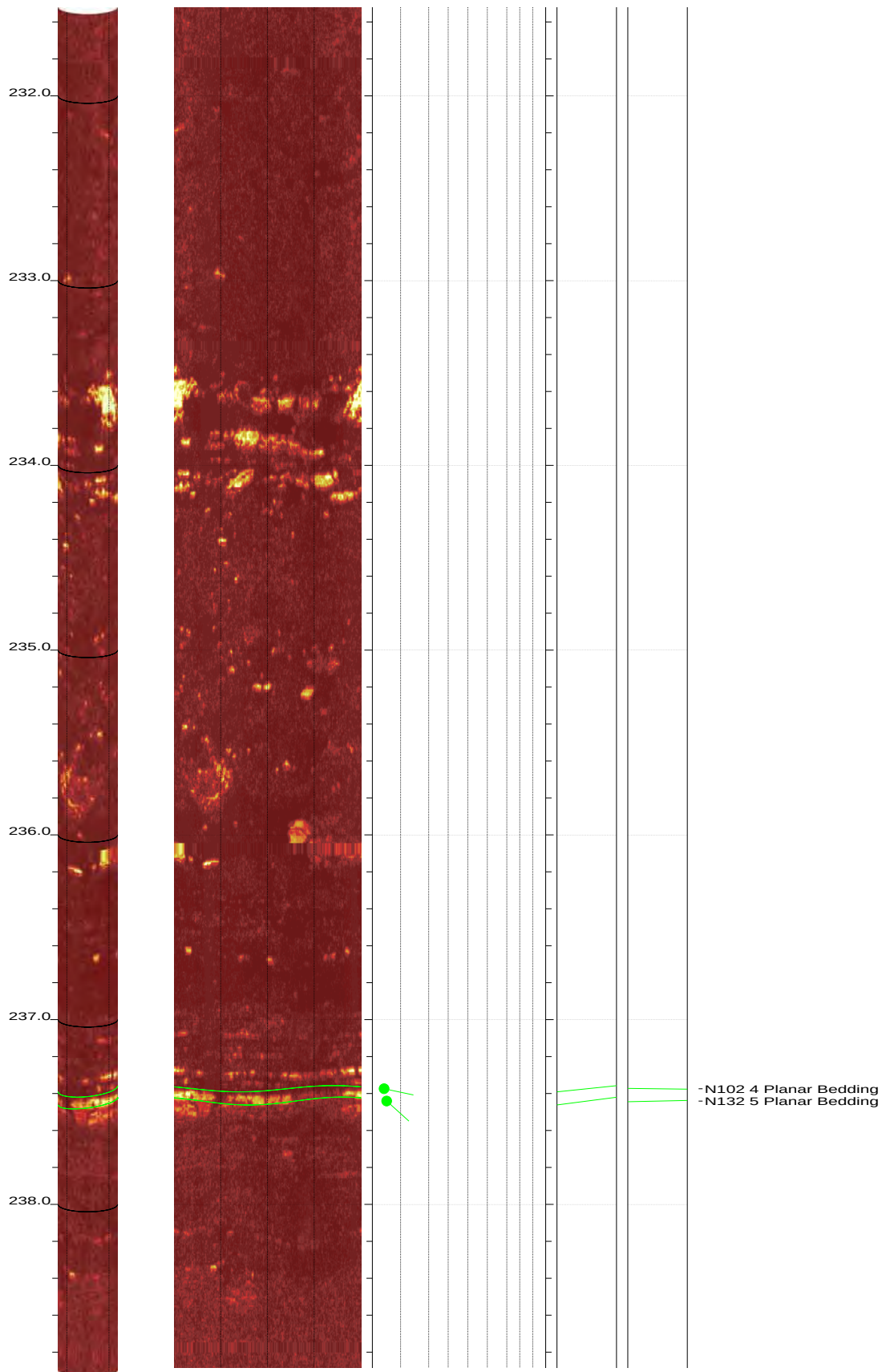


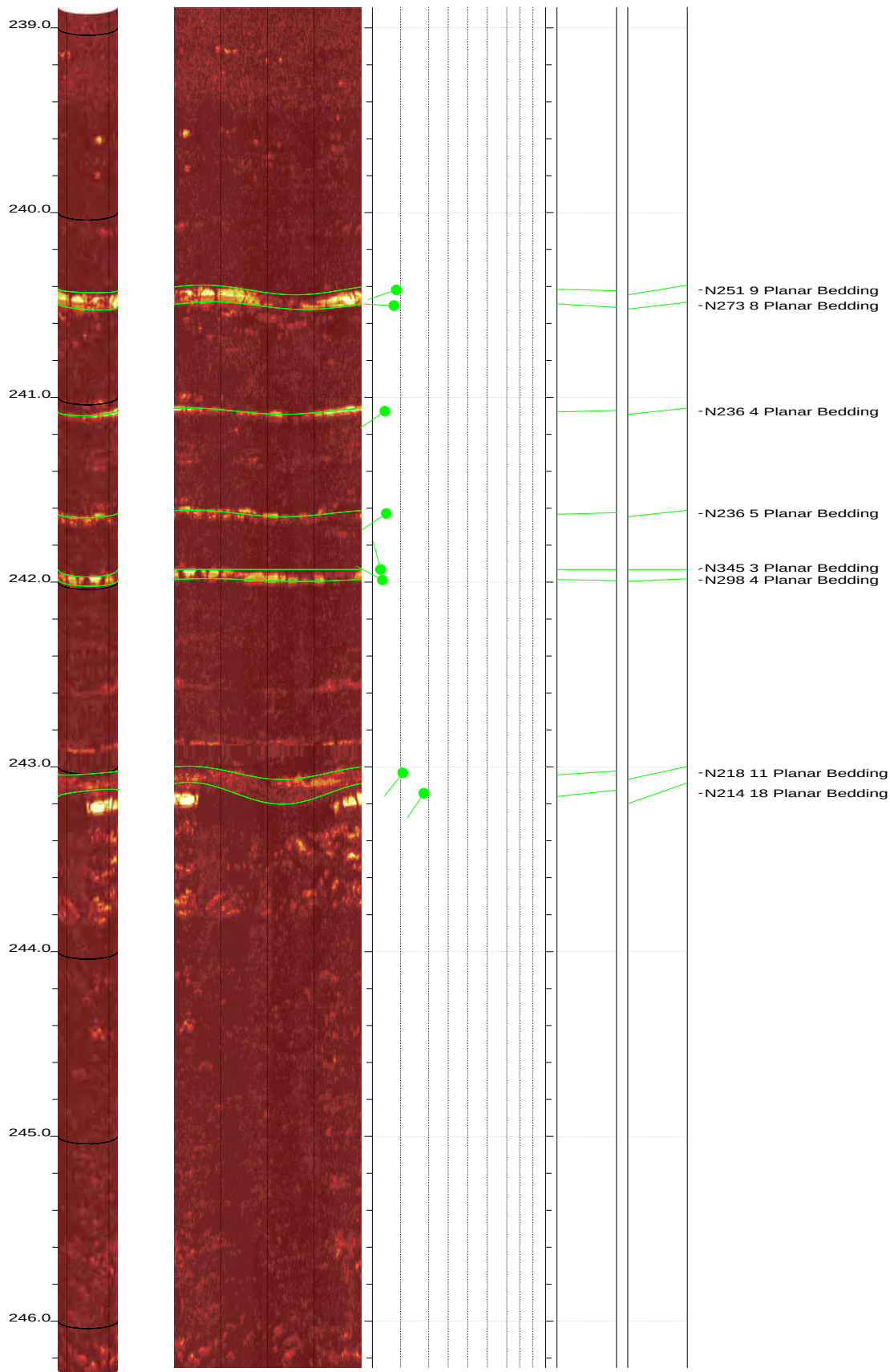


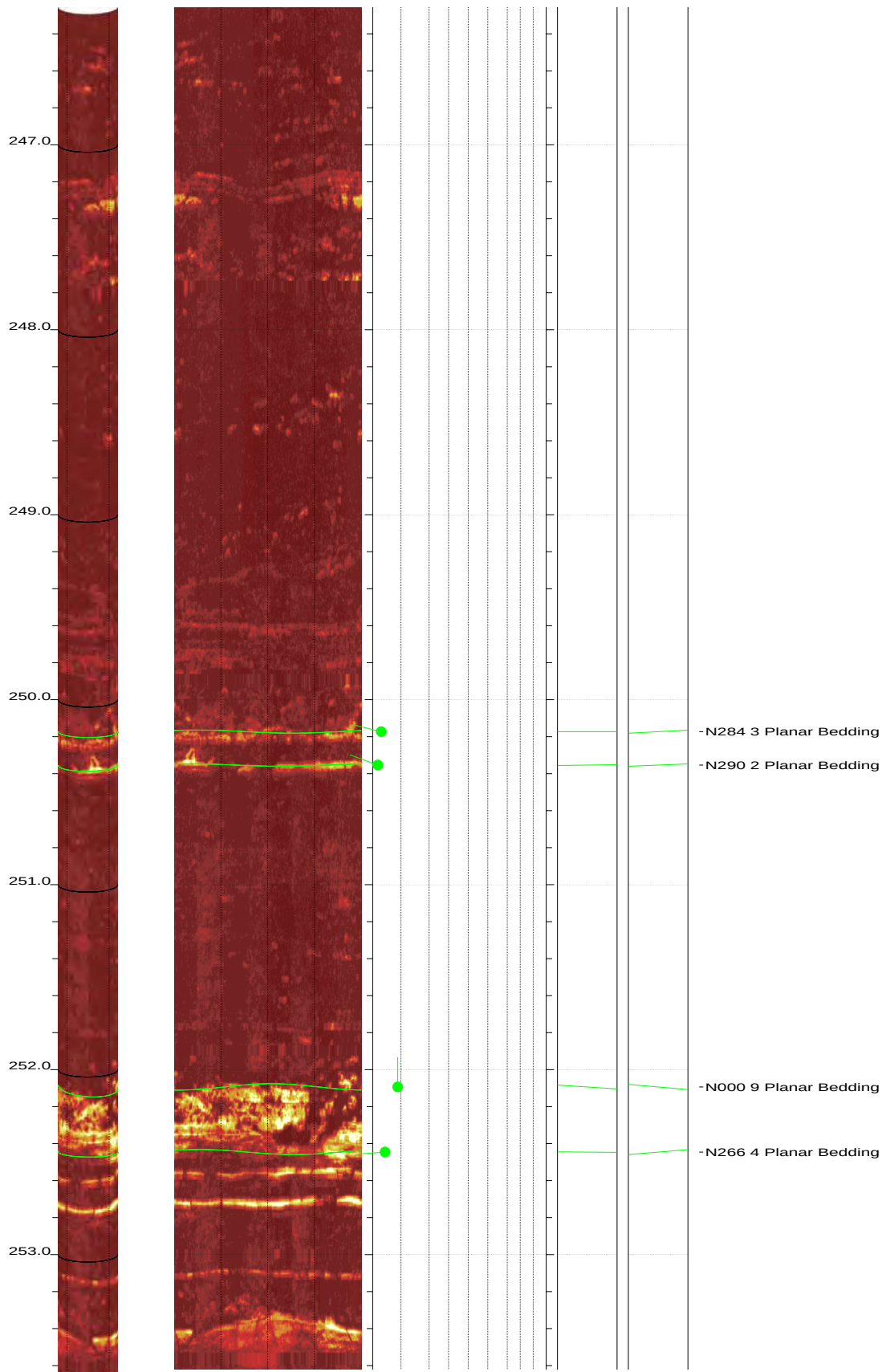


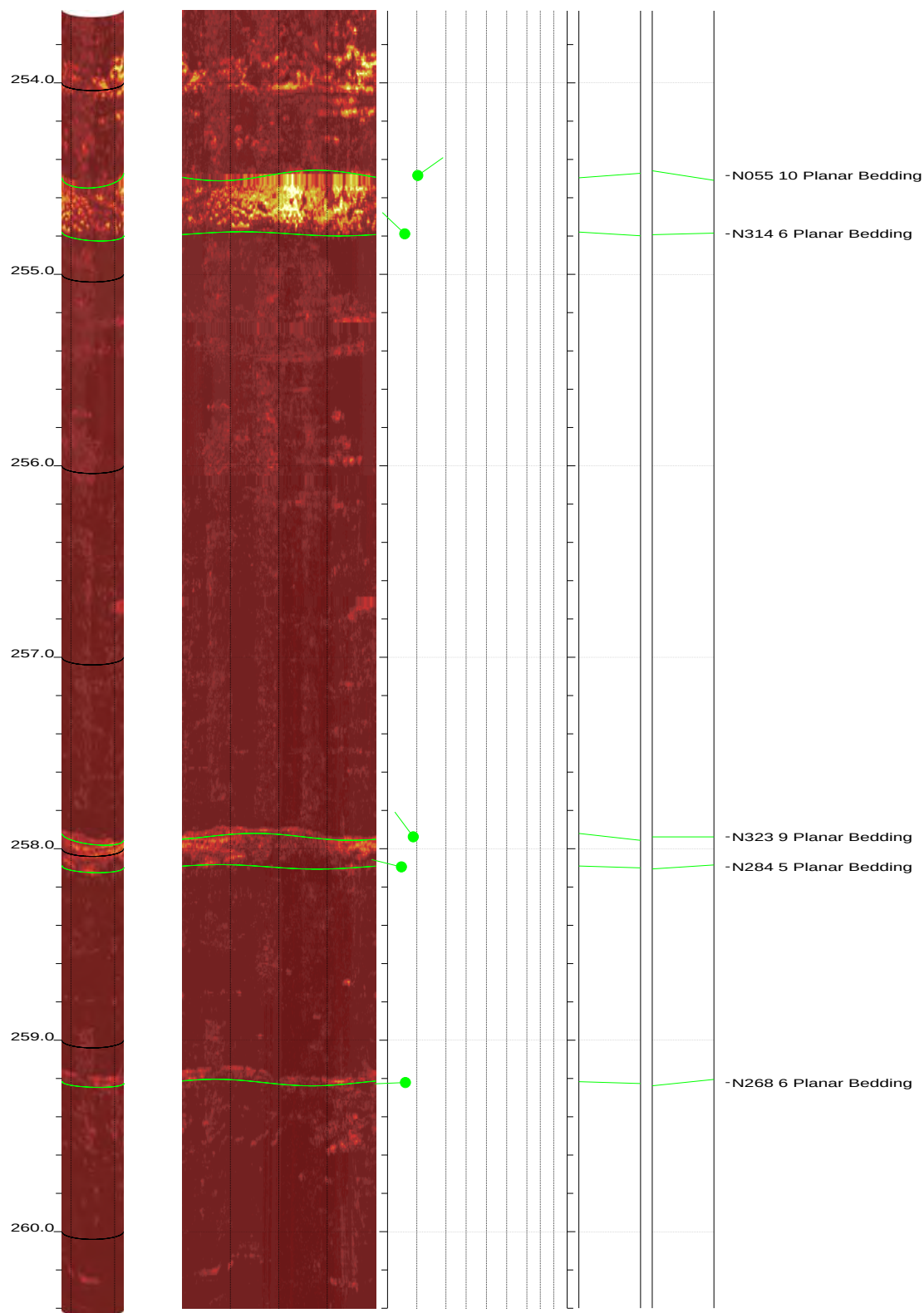














CH2M HILL

Borehole: A-19

PEF-LNP COLA

top of borehole.....

East: _

North: _

Elev: _

North ref. is true

Depth units are feet

Vertical scale: 1/10

Horiz scale = 1.00x Vert scale

Zone from 108.200 to 35.000ft

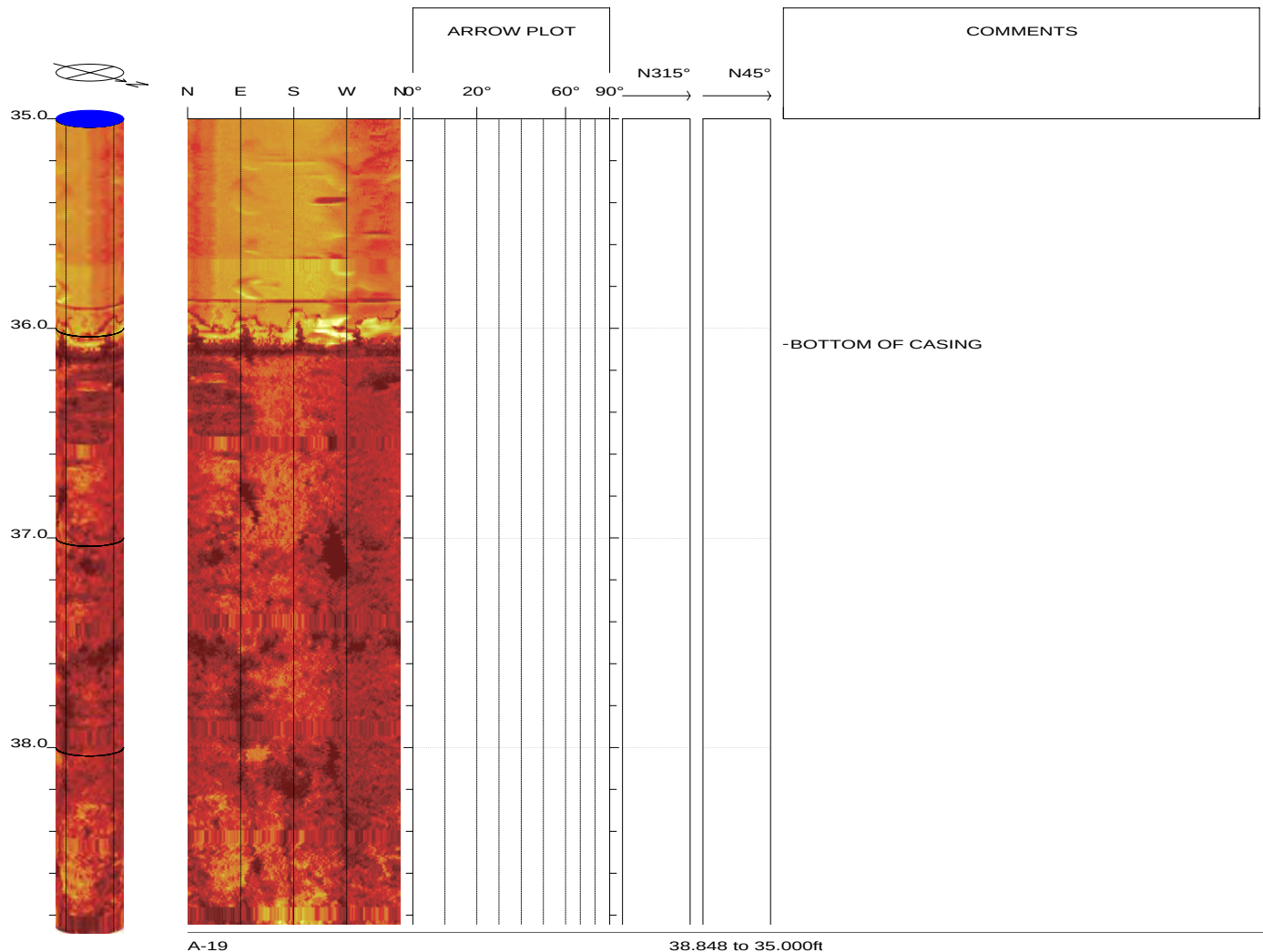
Format: BHTV-NESWN

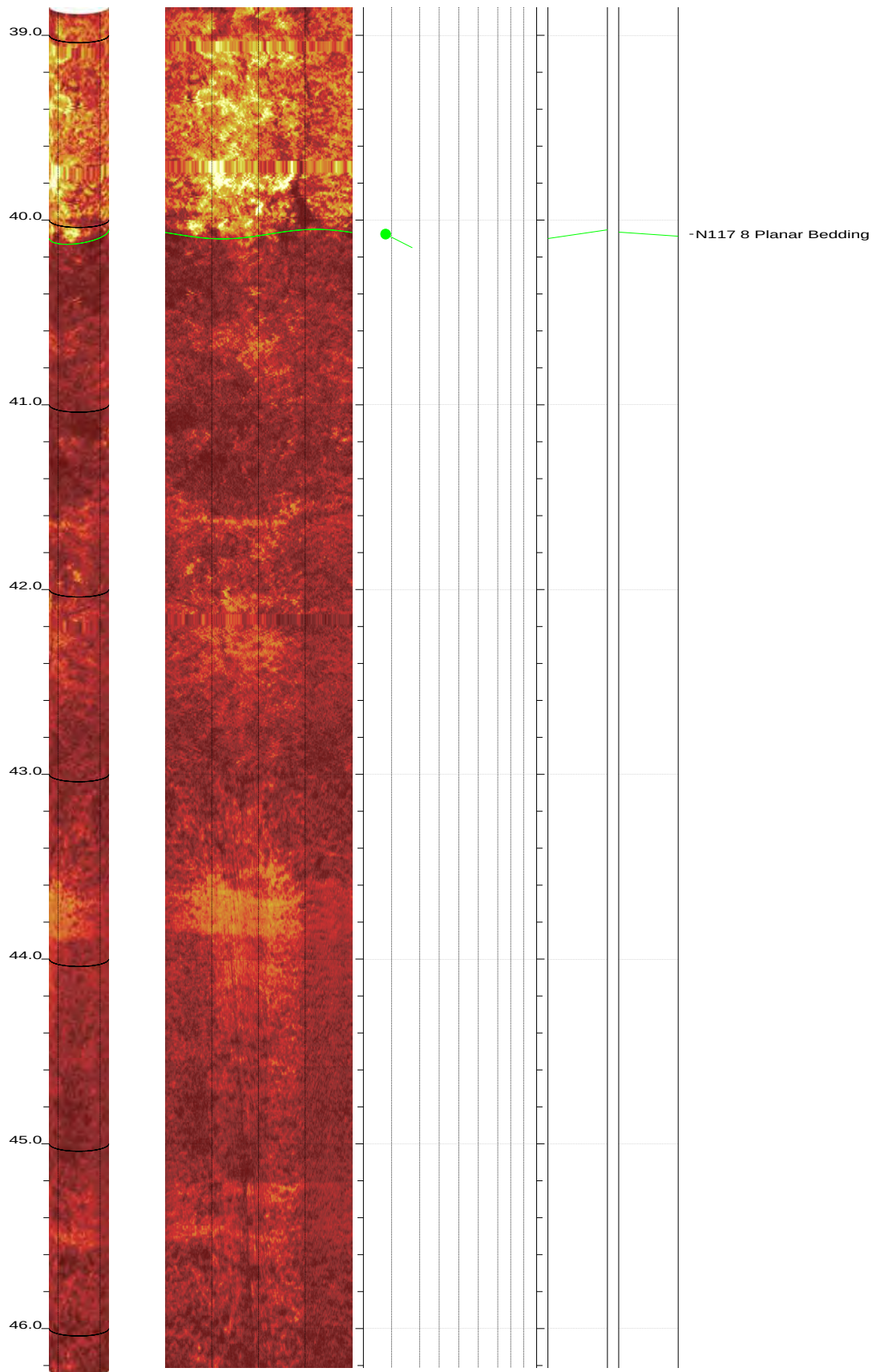
Borehole diam: 3.864inch

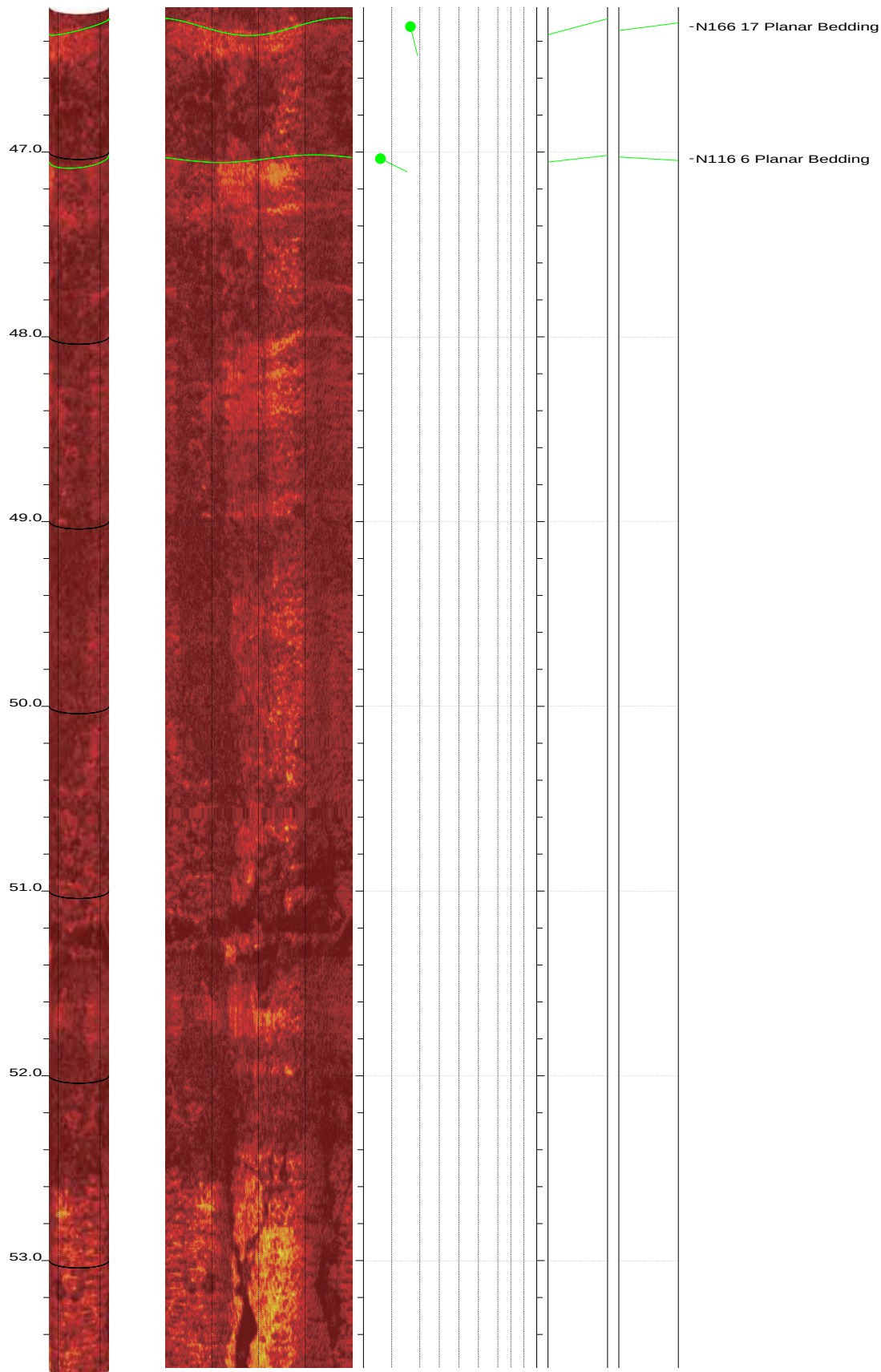
Vertical = borehole-axis

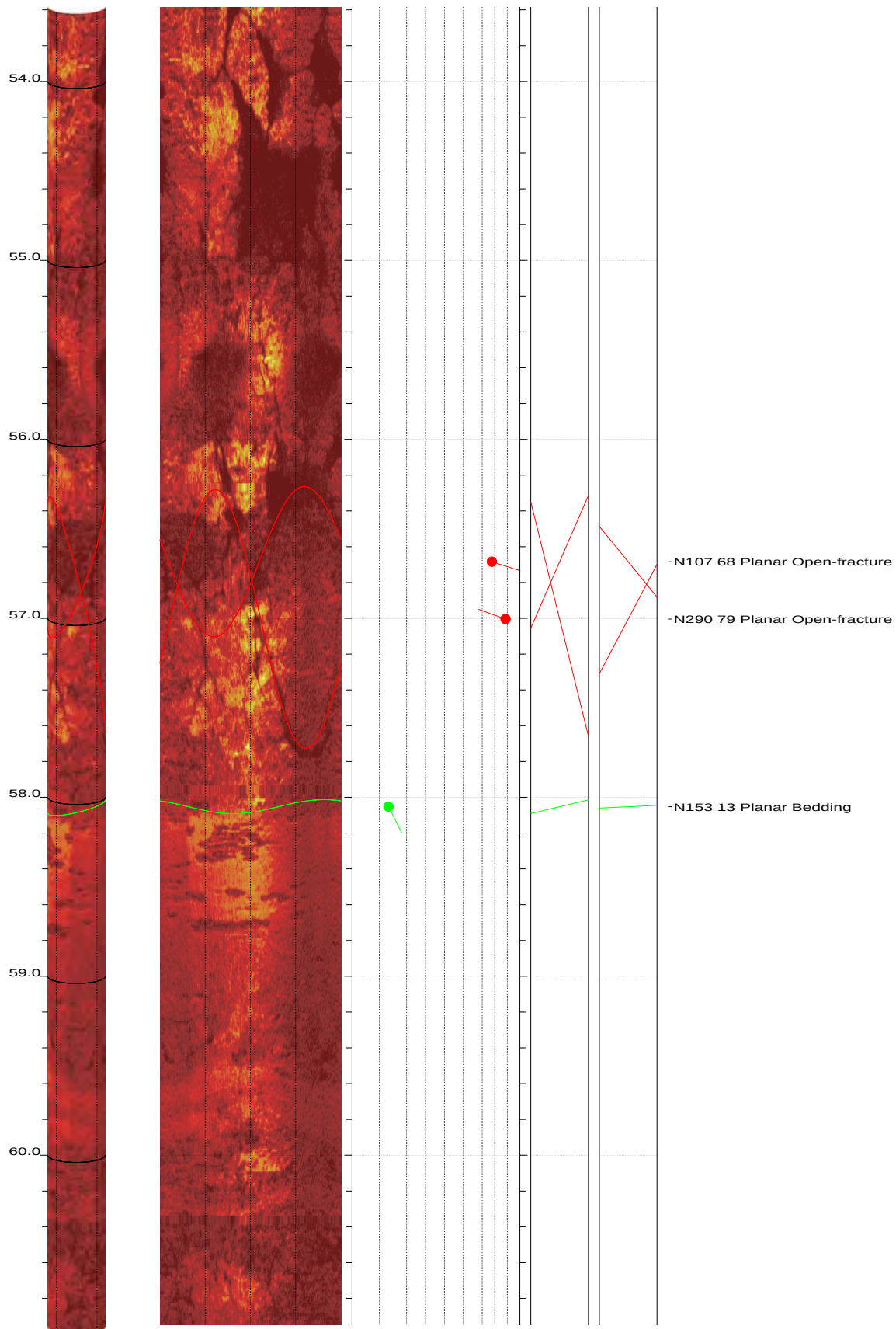
Image: Amplitude

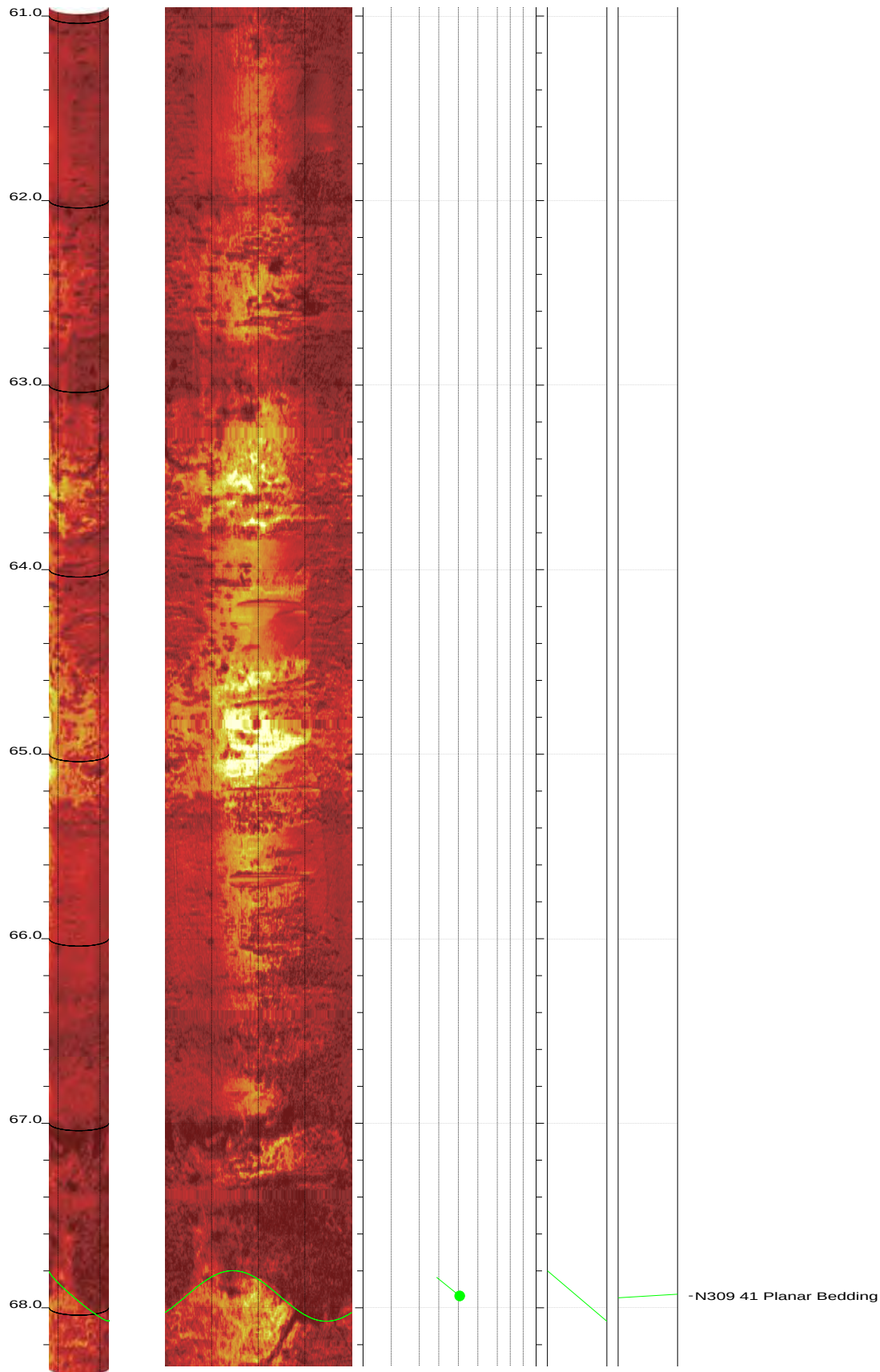
— Stratigraphic dips ● Identified units
— Non-stratigraphic dips ●

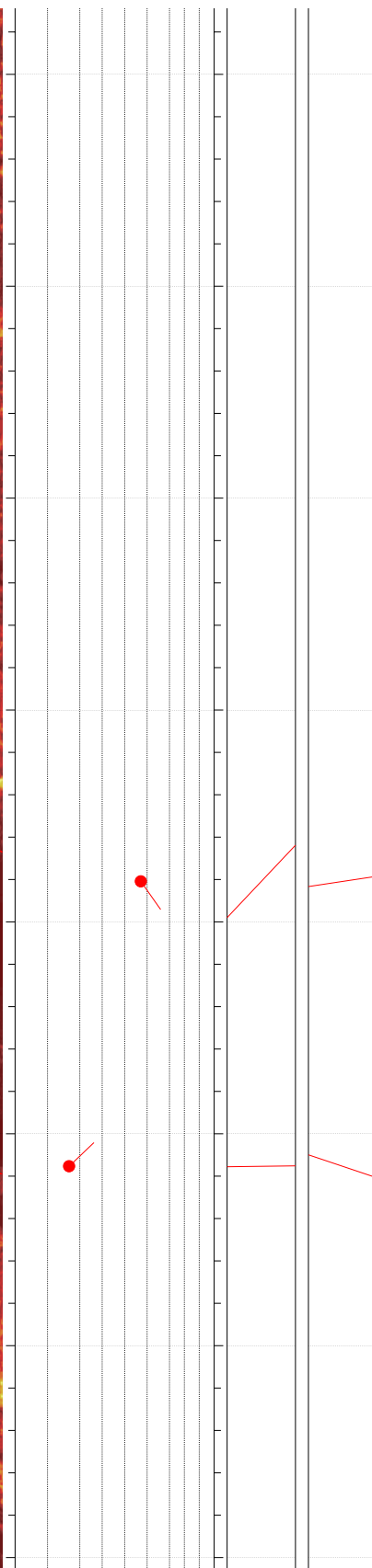
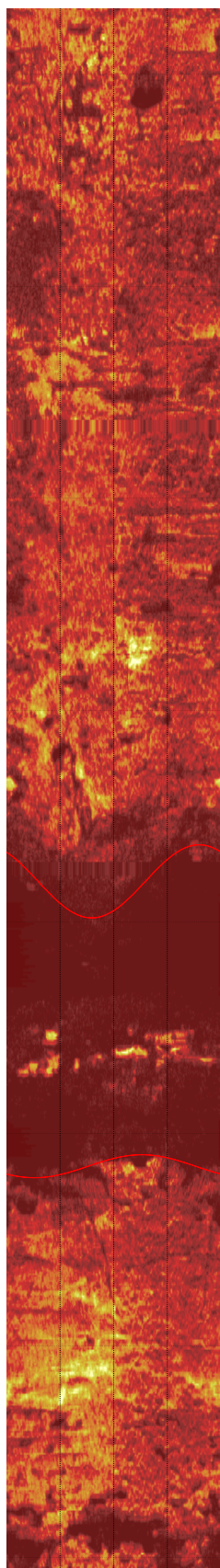
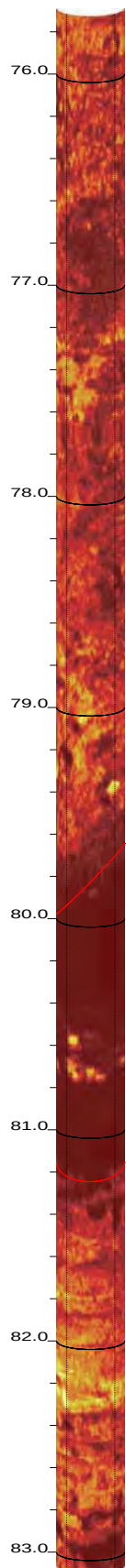






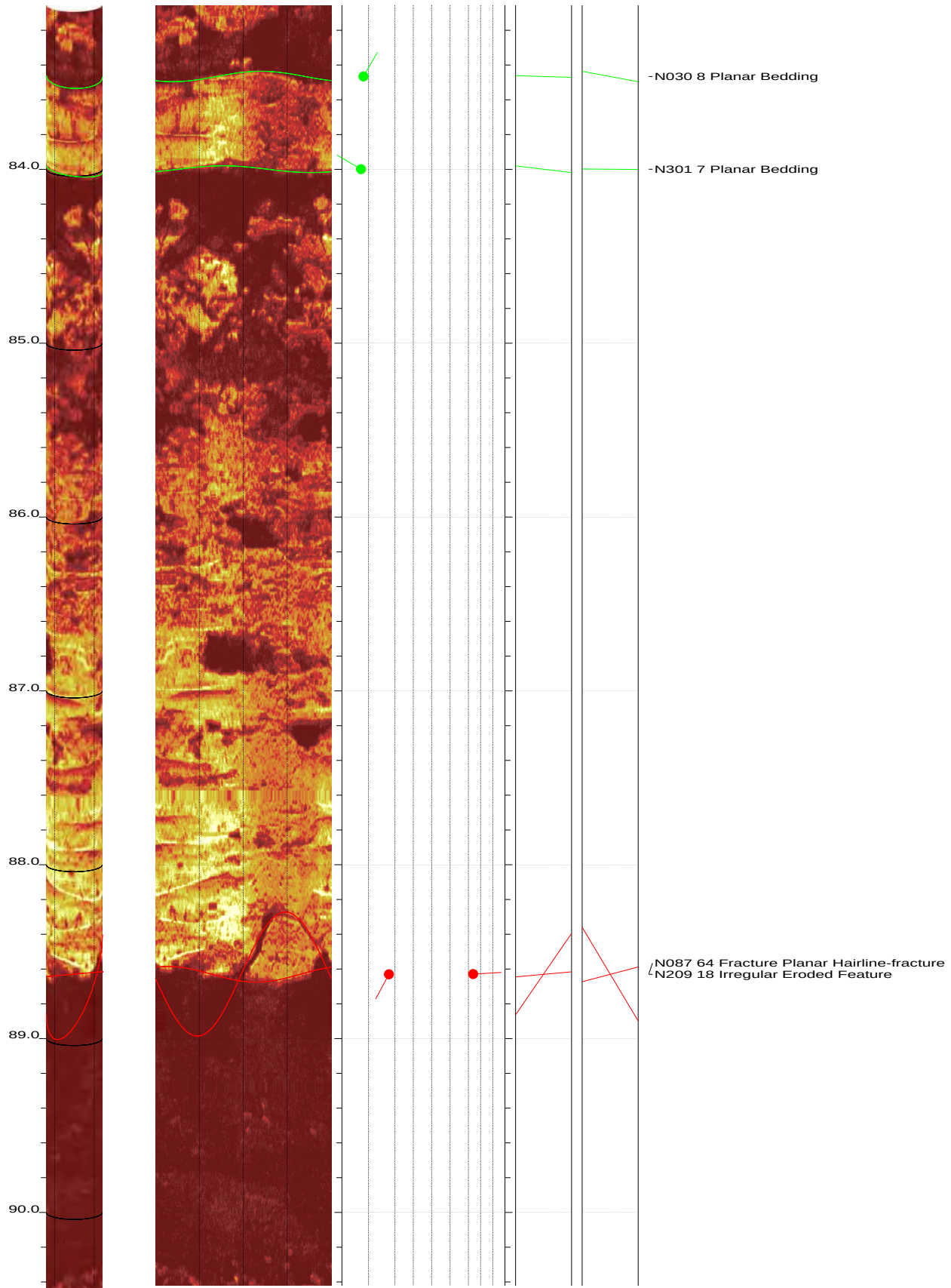


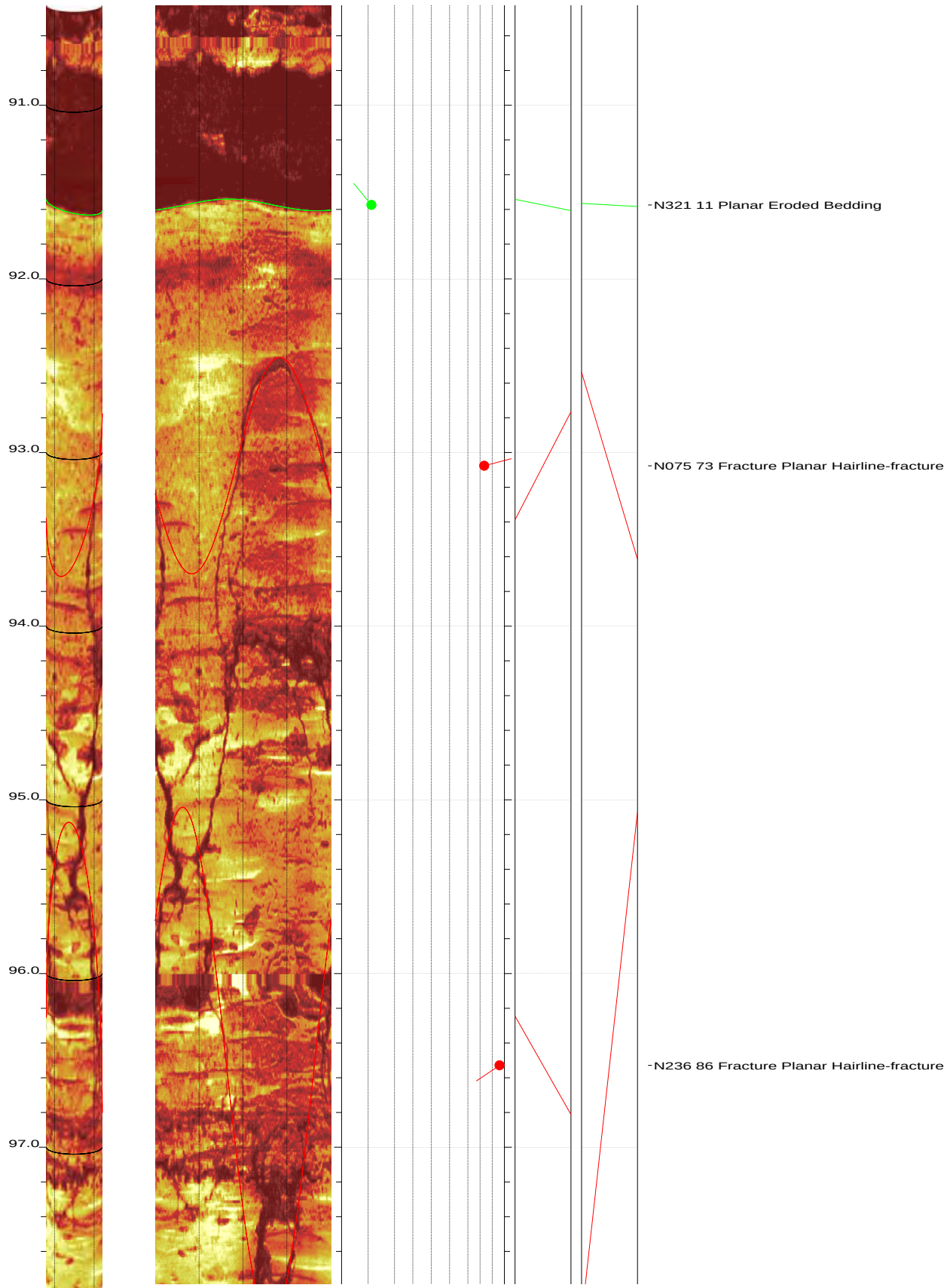


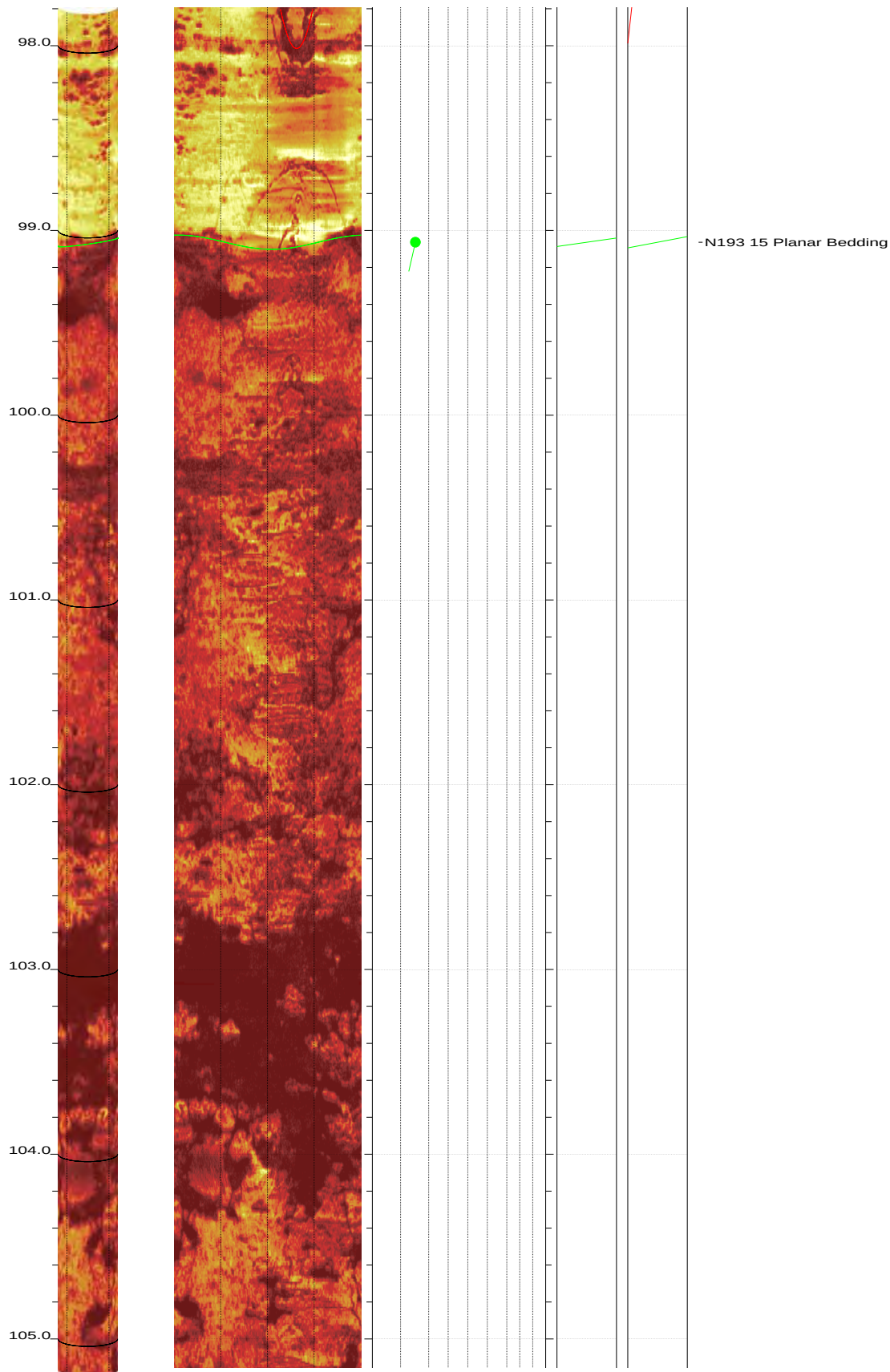


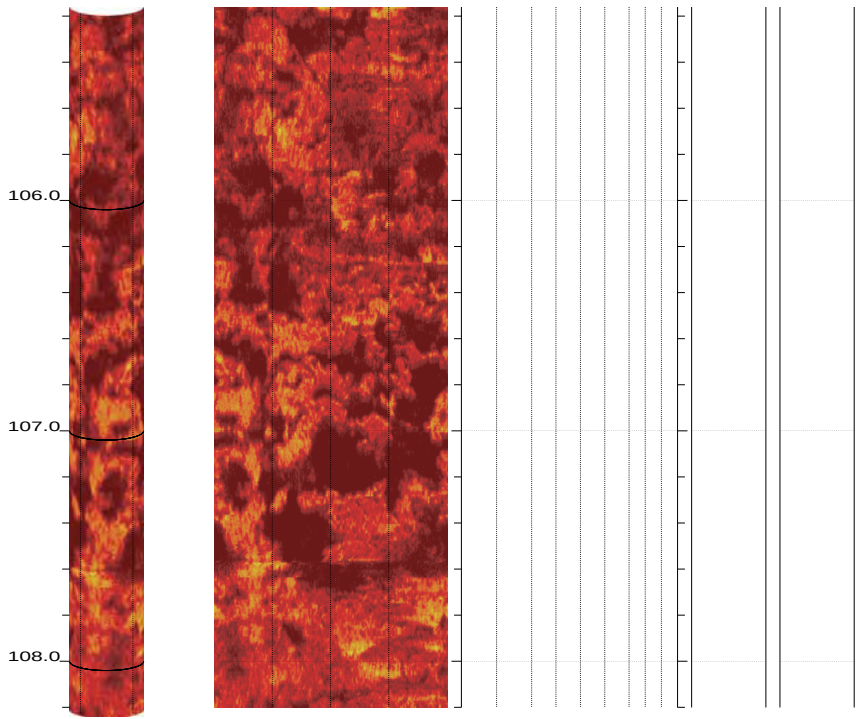
-N145 47 Irregular Eroded Feature

-N046 17 Irregular Eroded Feature











CH2M HILL

Borehole: A-20

PEF-LNP COLA

top of borehole.....

East: _

North: _

Elev: _

North ref. is true

Depth units are feet

Vertical scale: 1/10

Horiz scale = 1.00x Vert scale

Zone from 261.800 to 35.000ft

Format: BHTV-NESWN

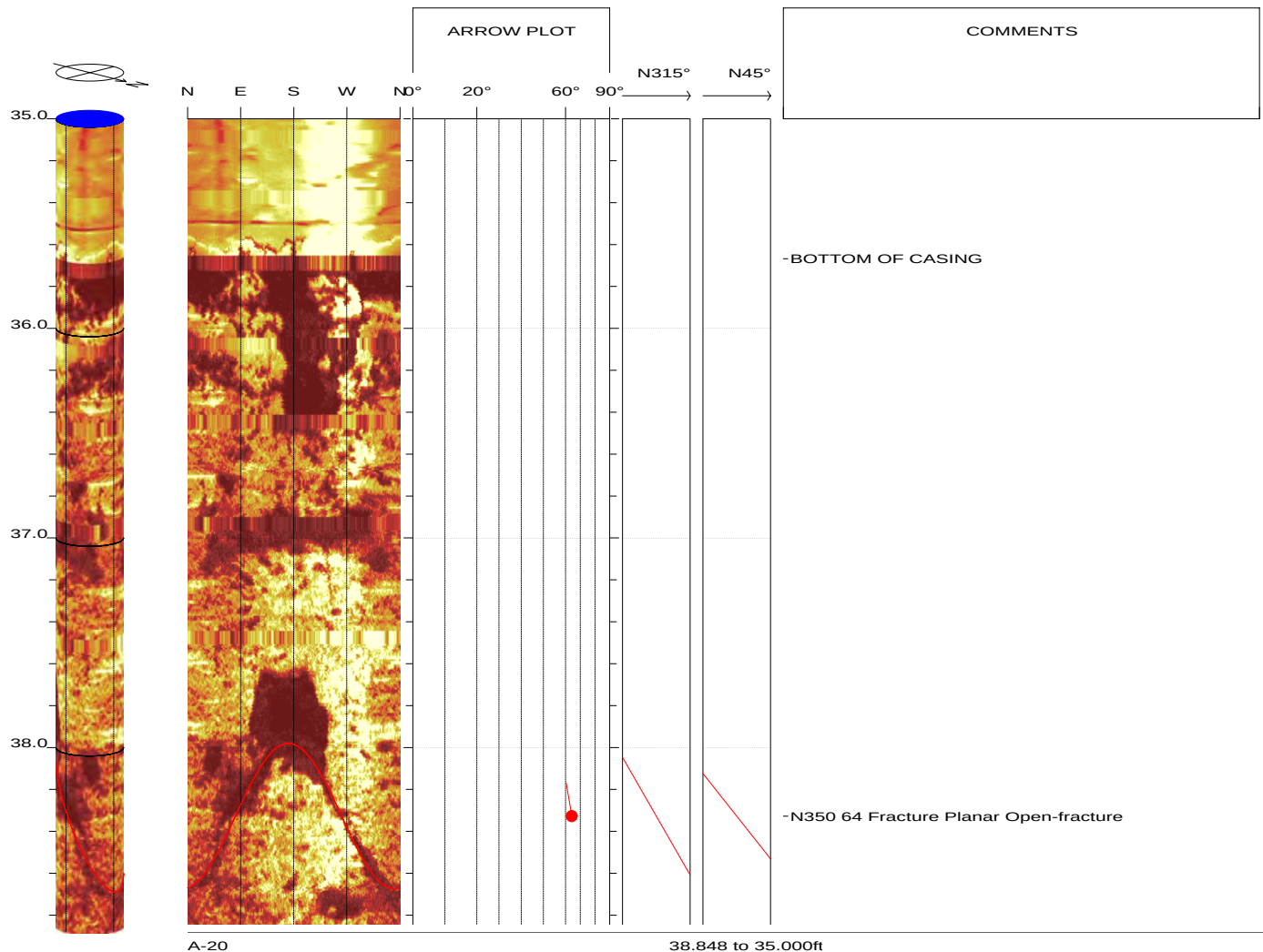
Borehole diam: 3.864inch

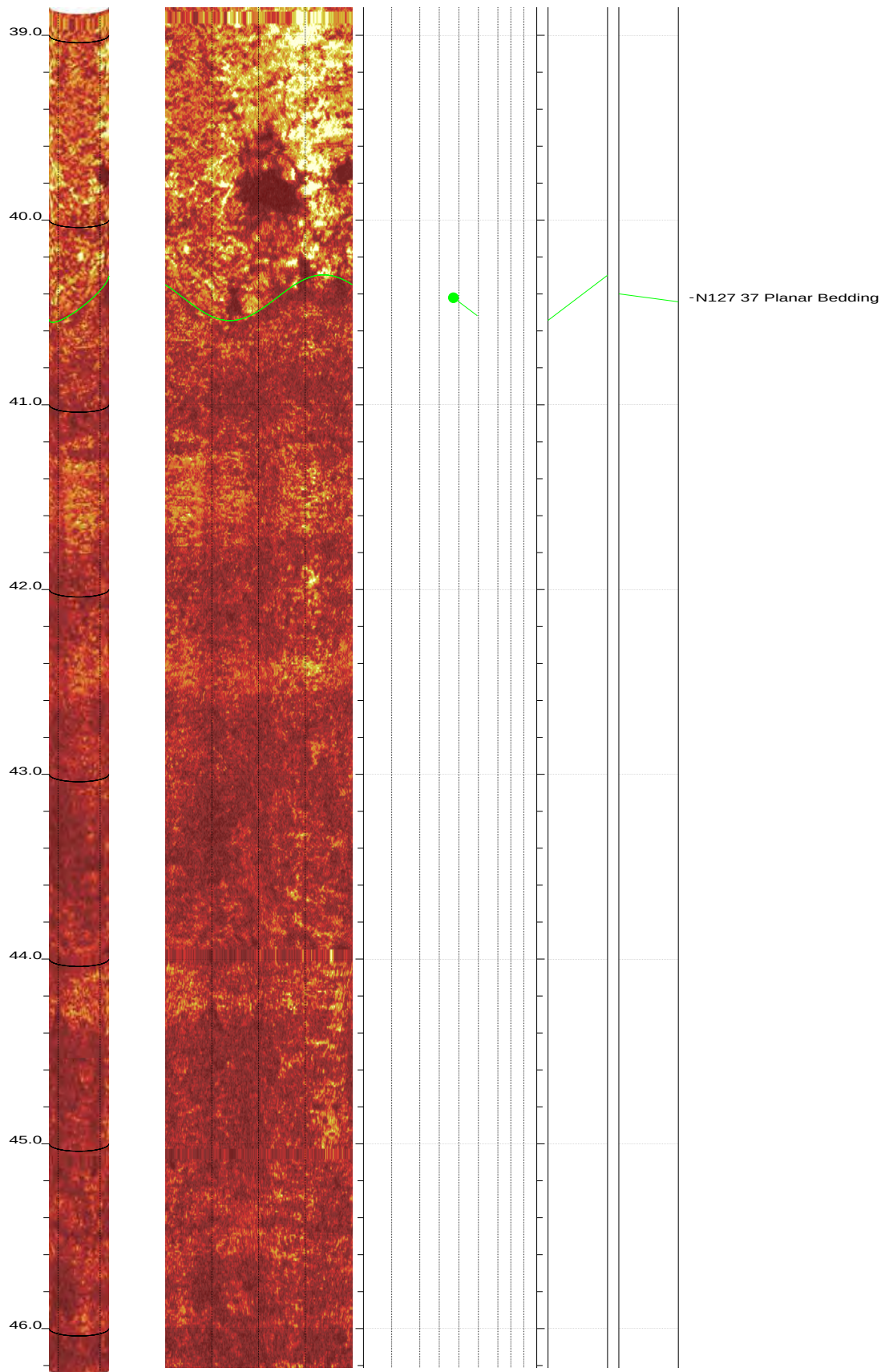
Vertical = borehole-axis

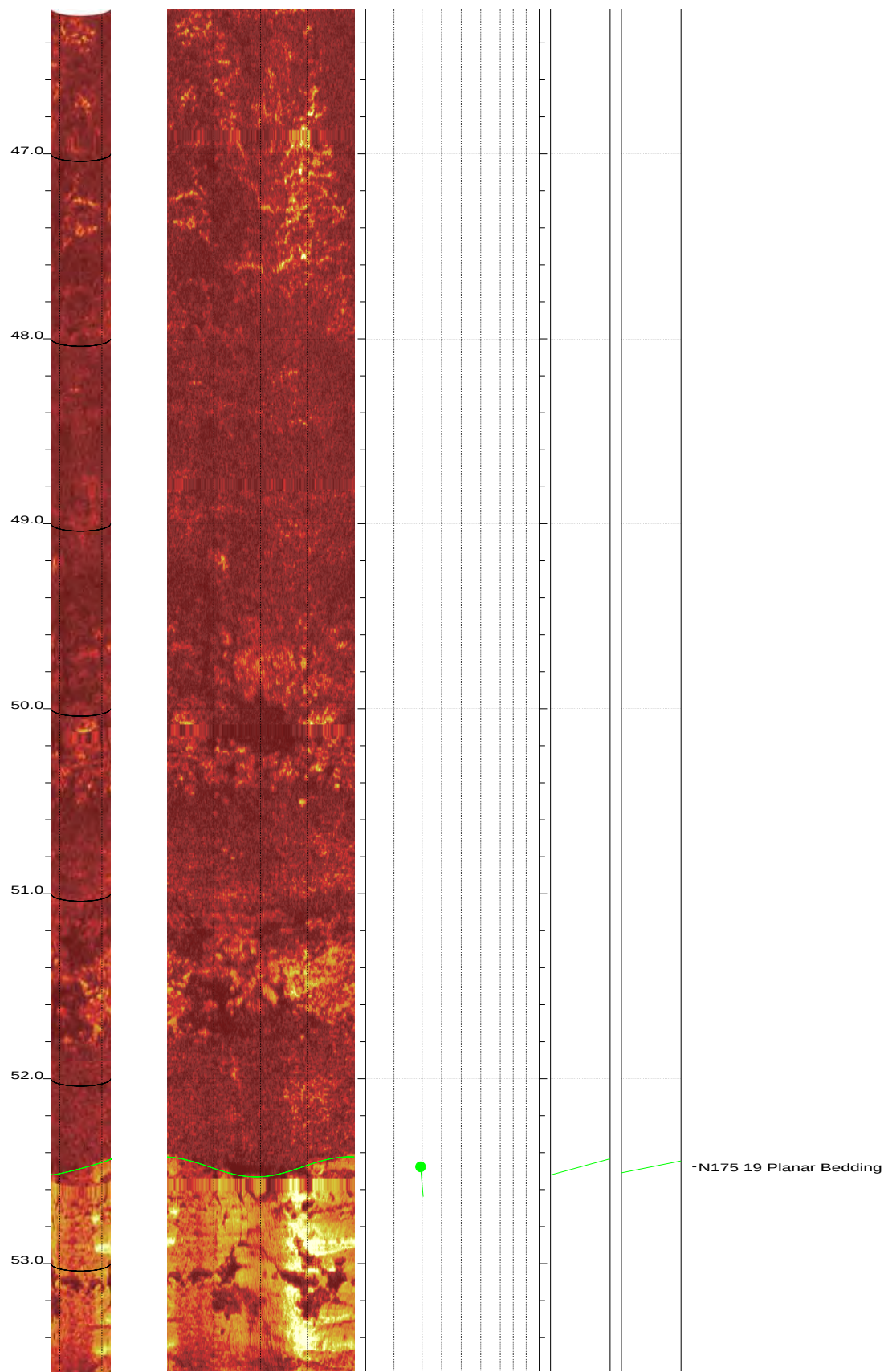
Image: Amplitude

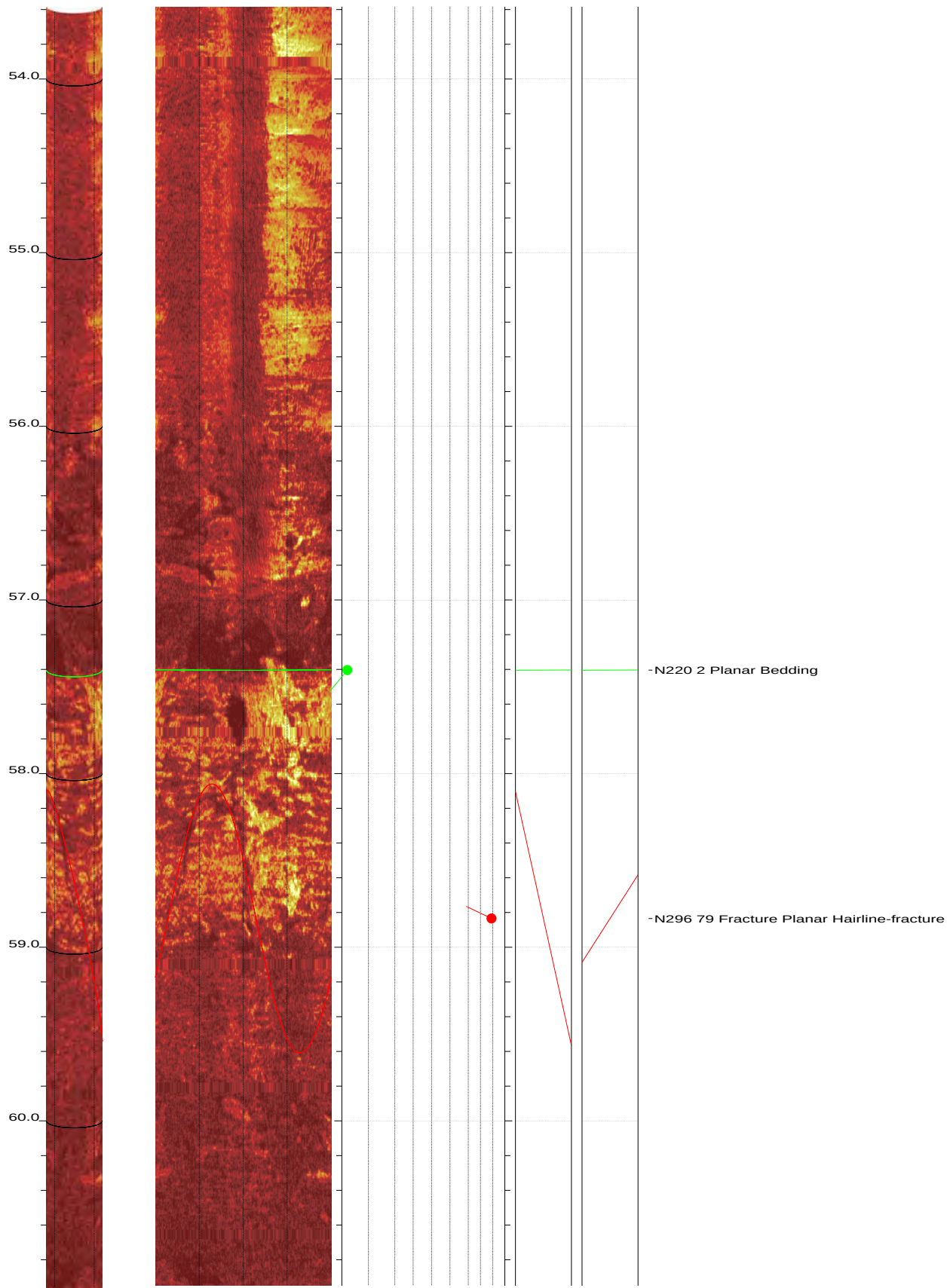
Stratigraphic dips
Non-stratigraphic dips

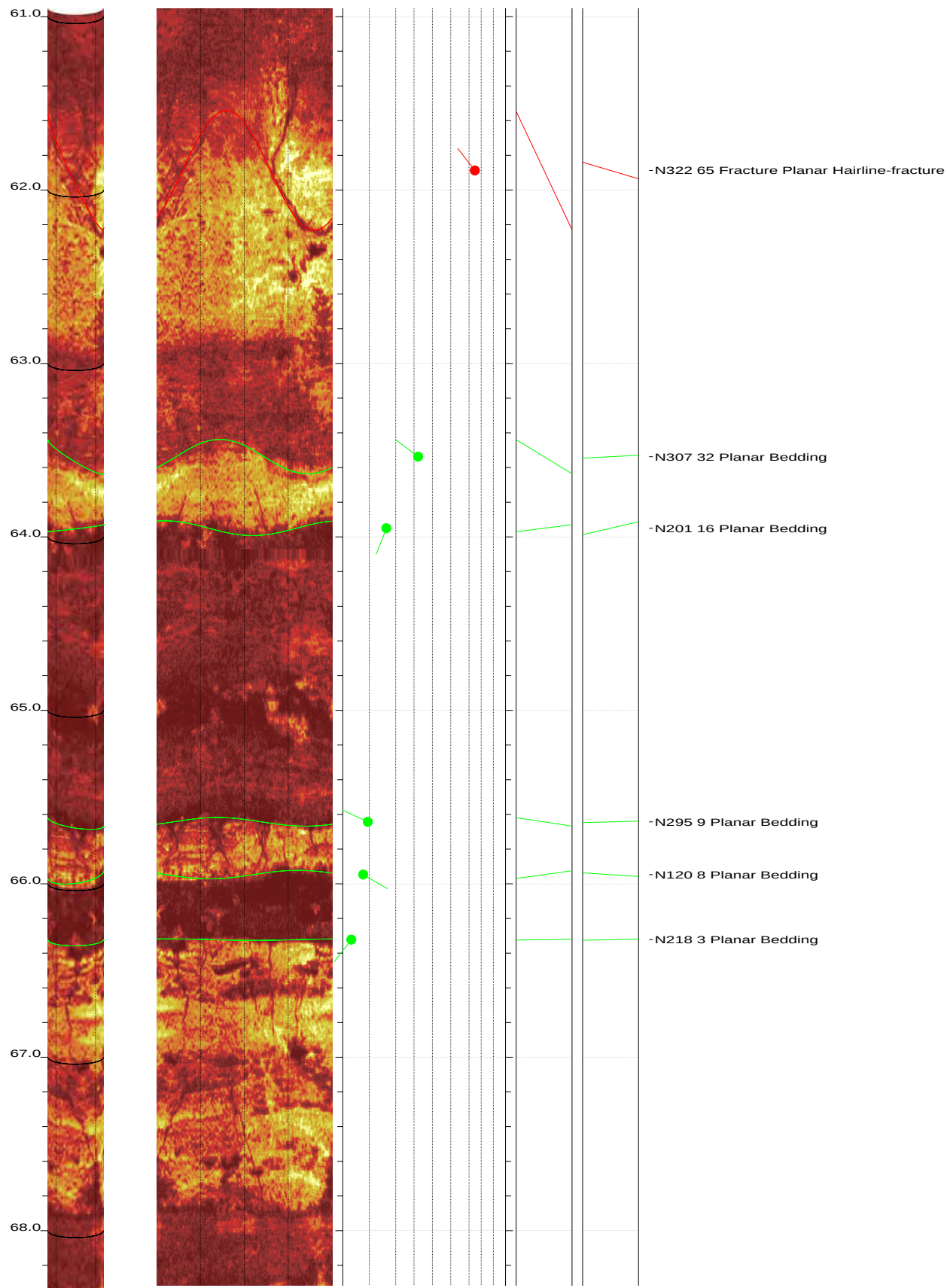
Identified units

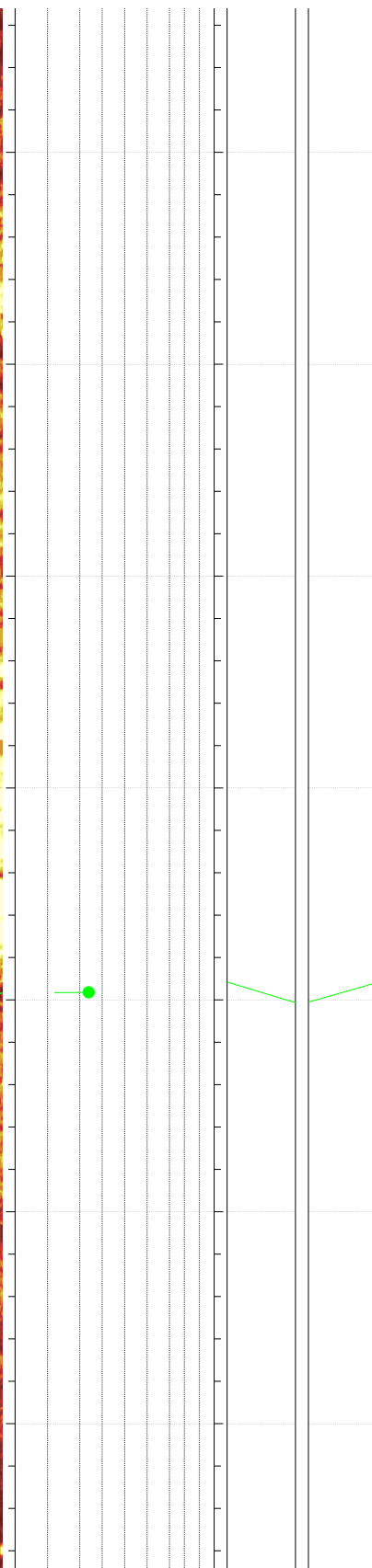
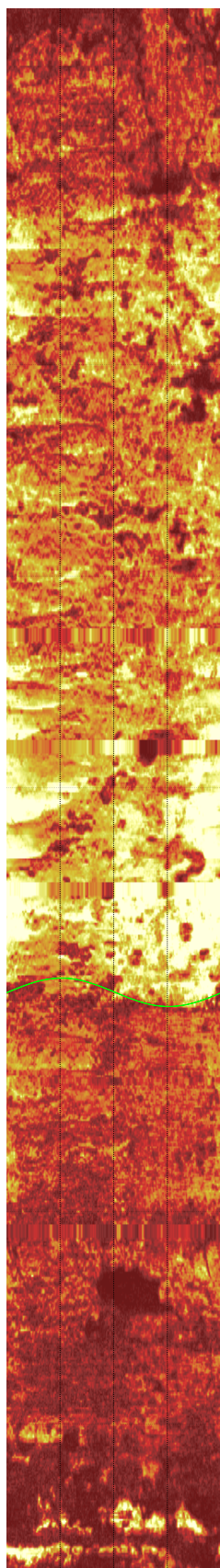
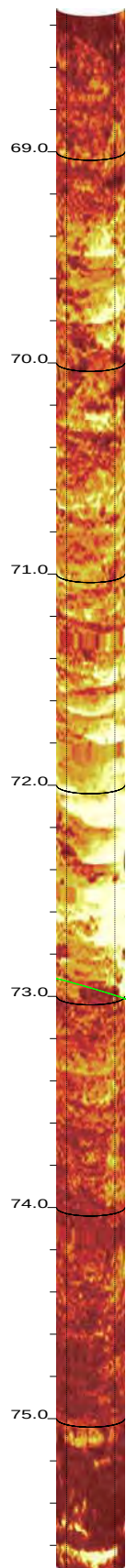




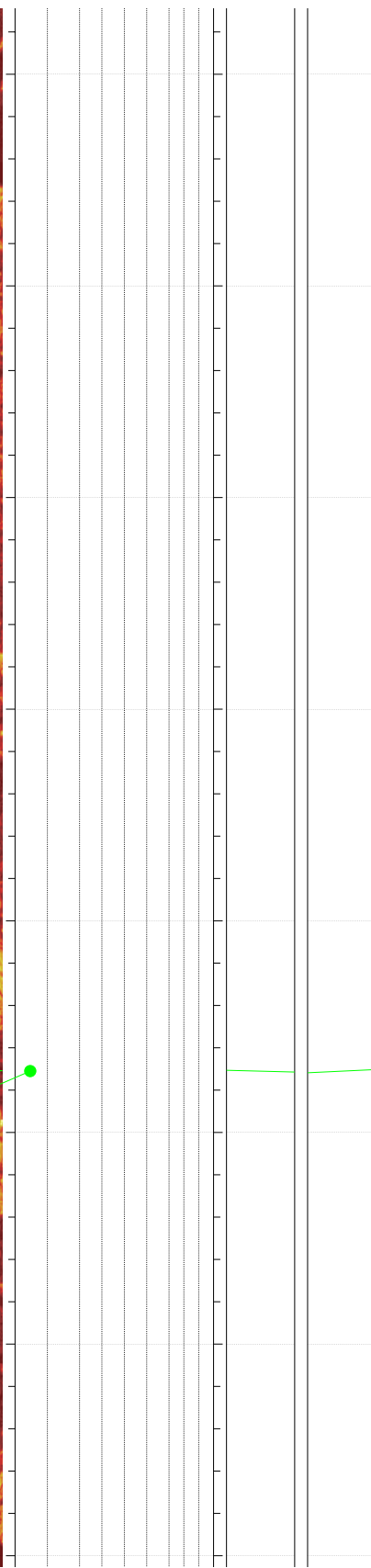
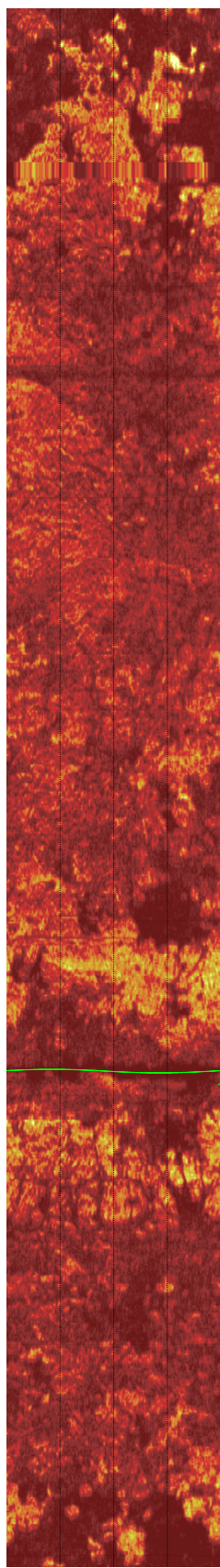
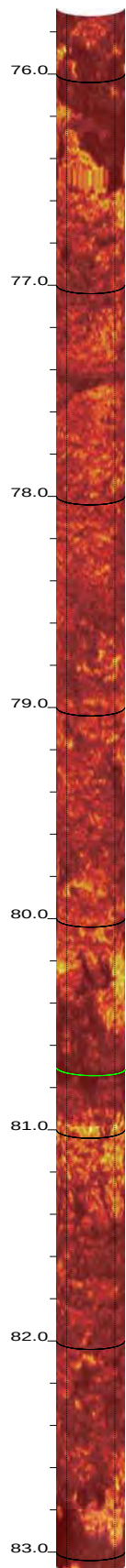




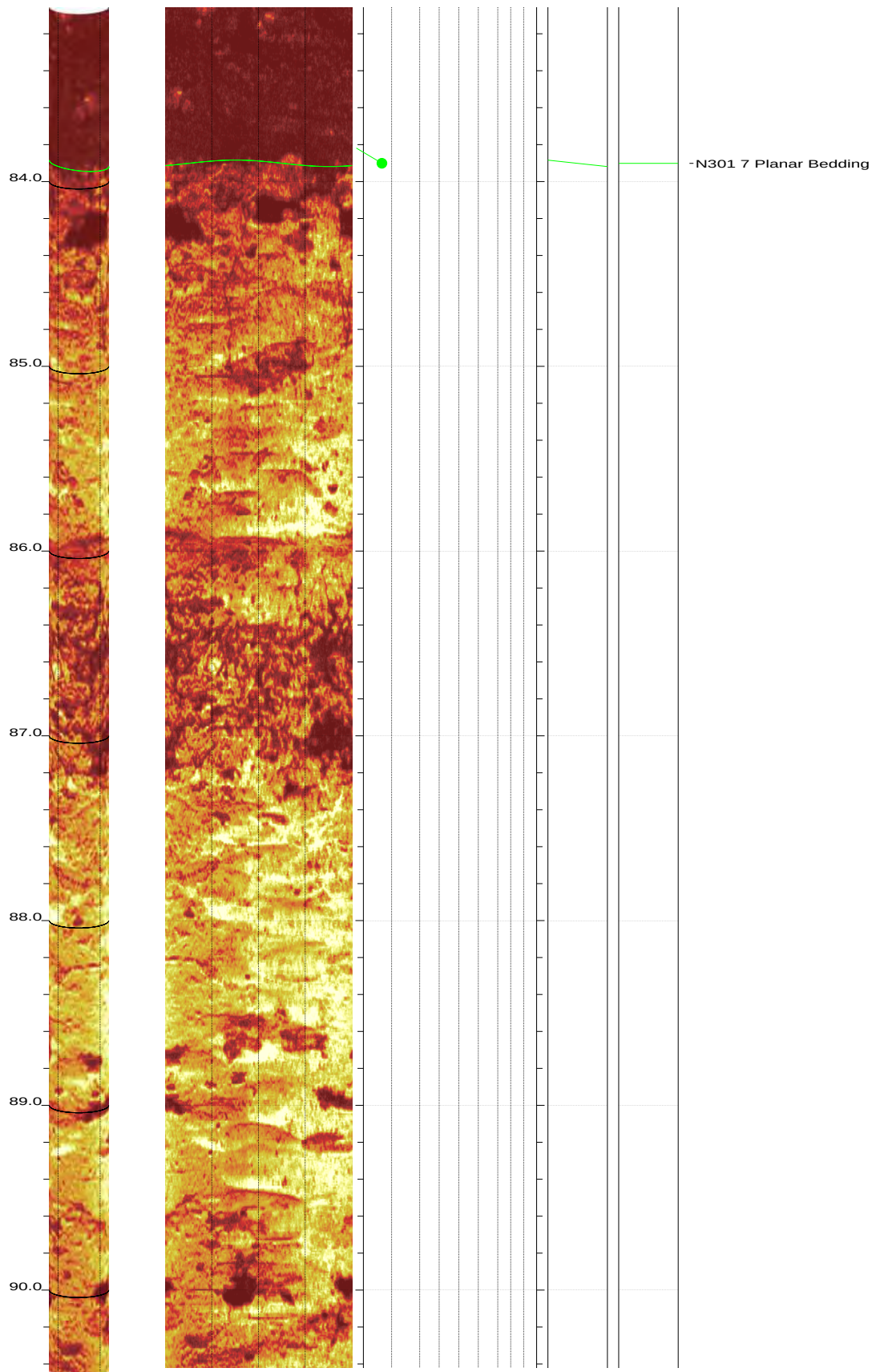


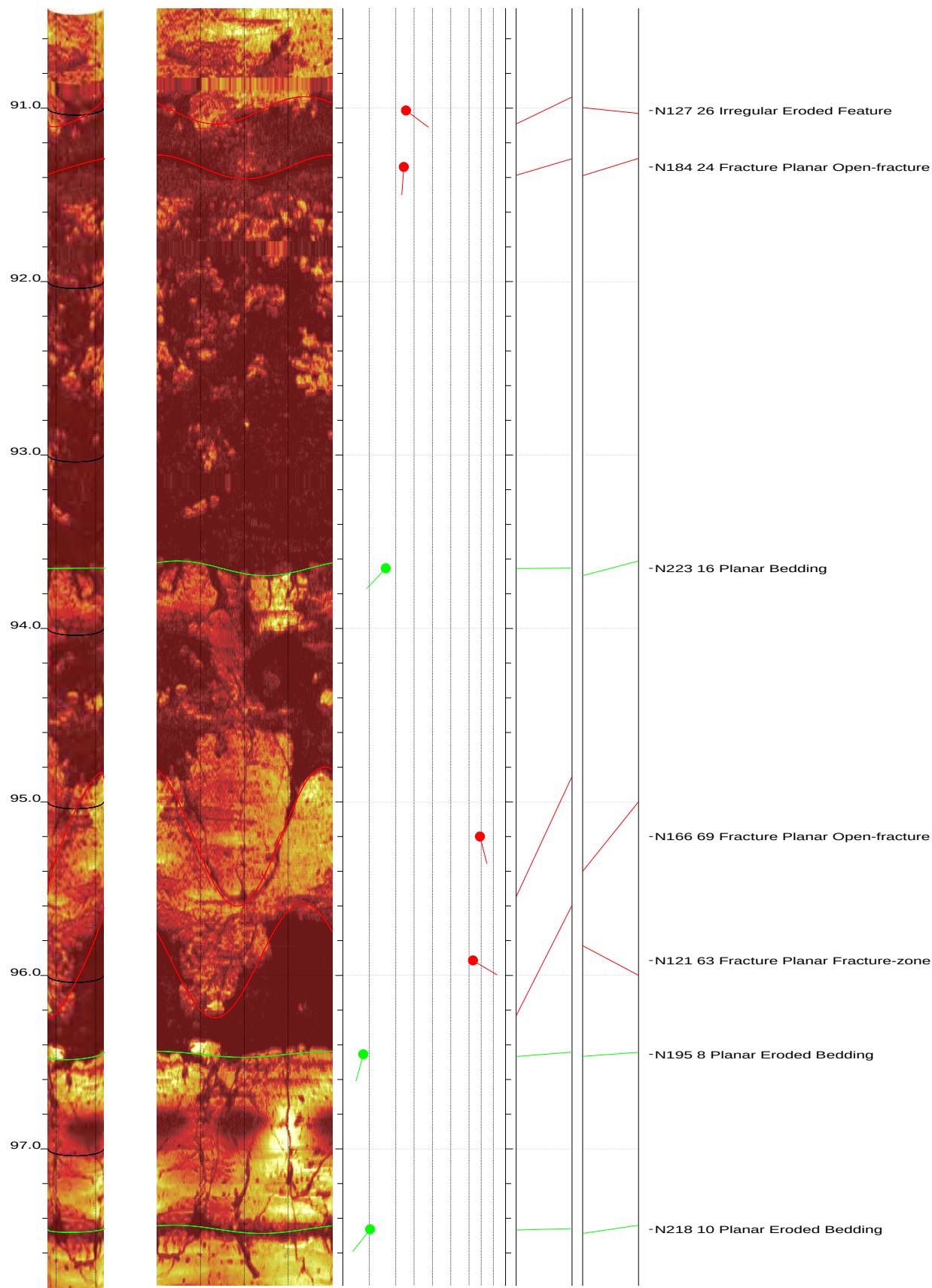


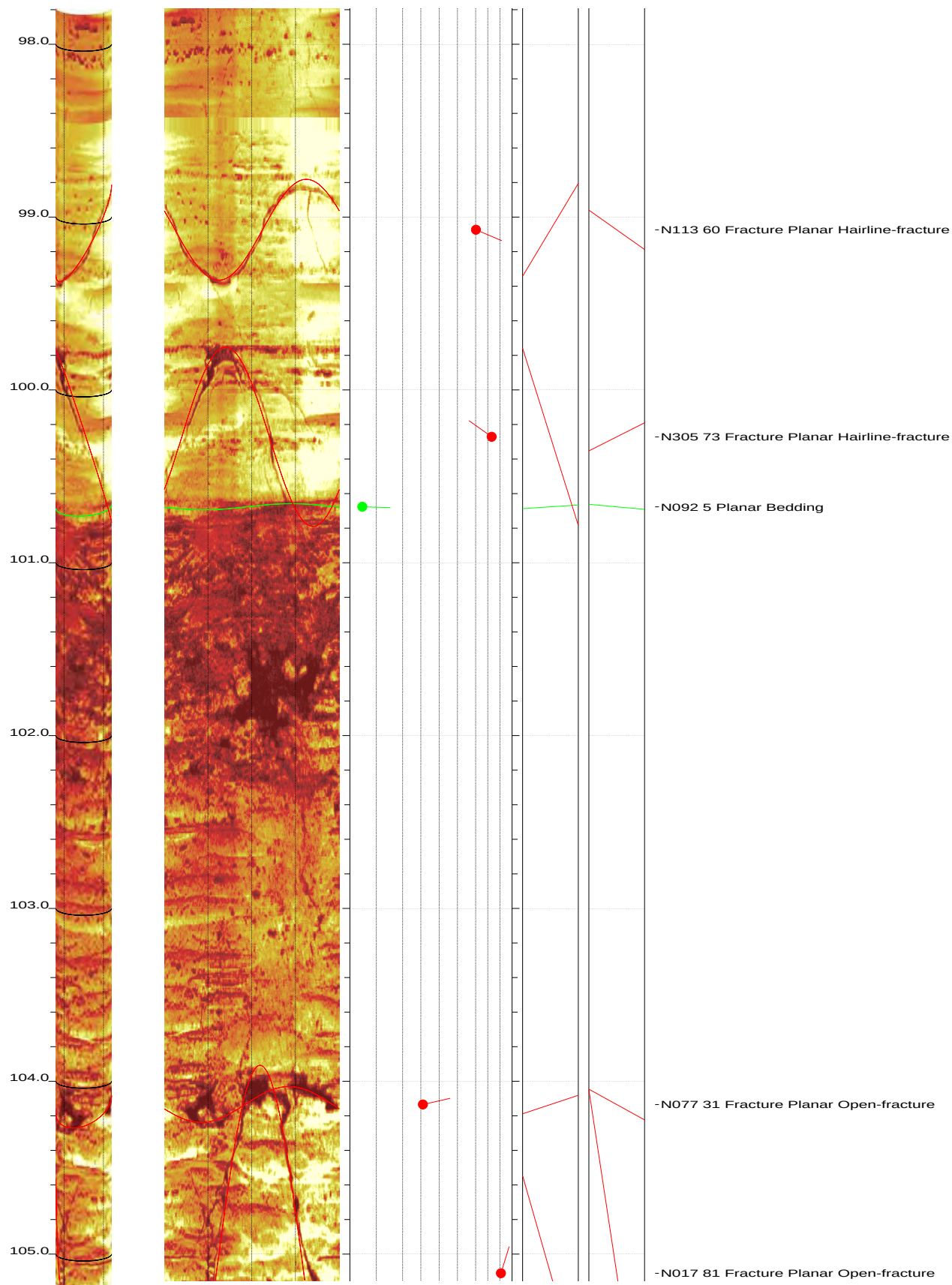
-N269 24 Planar Bedding

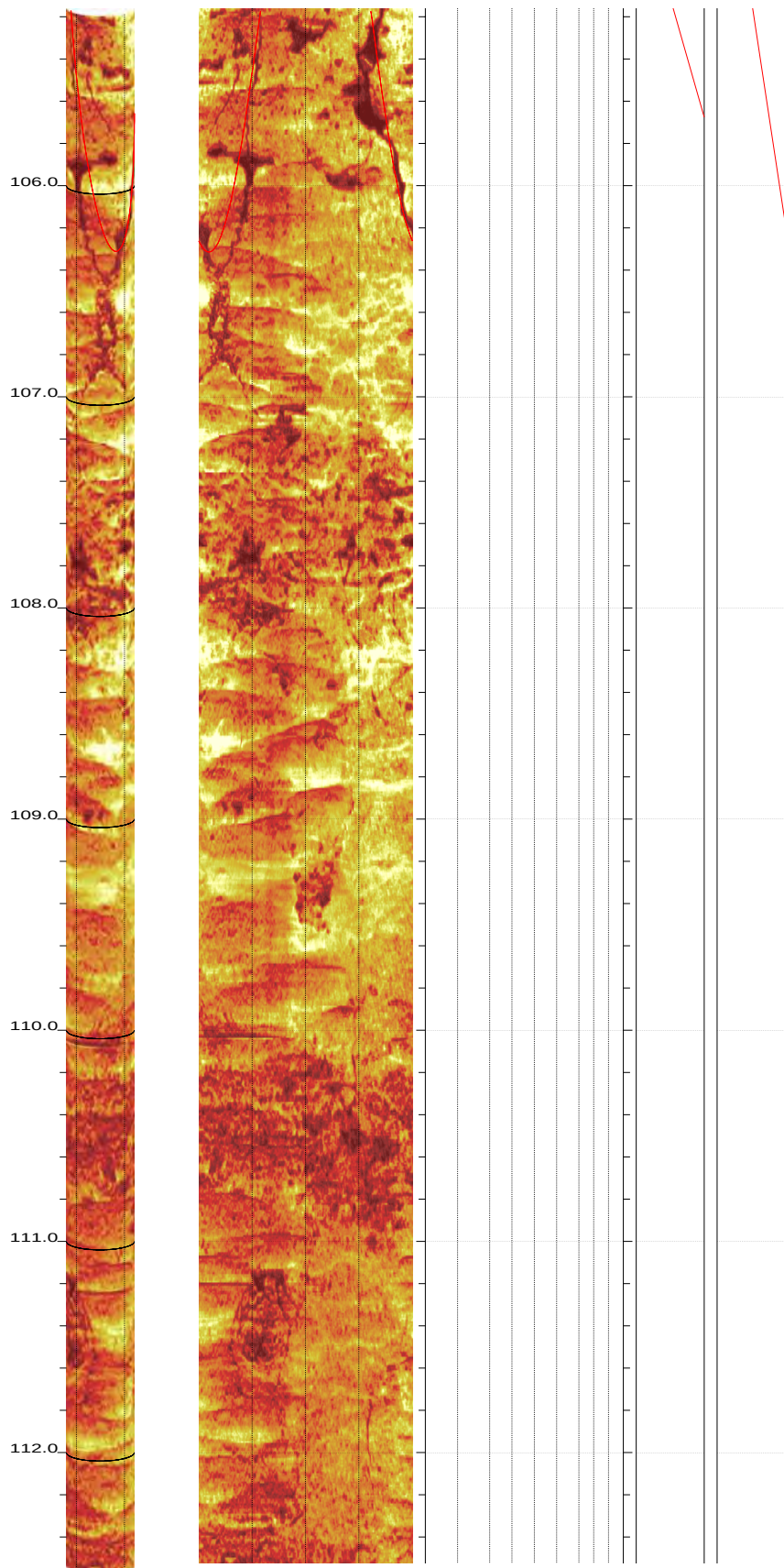


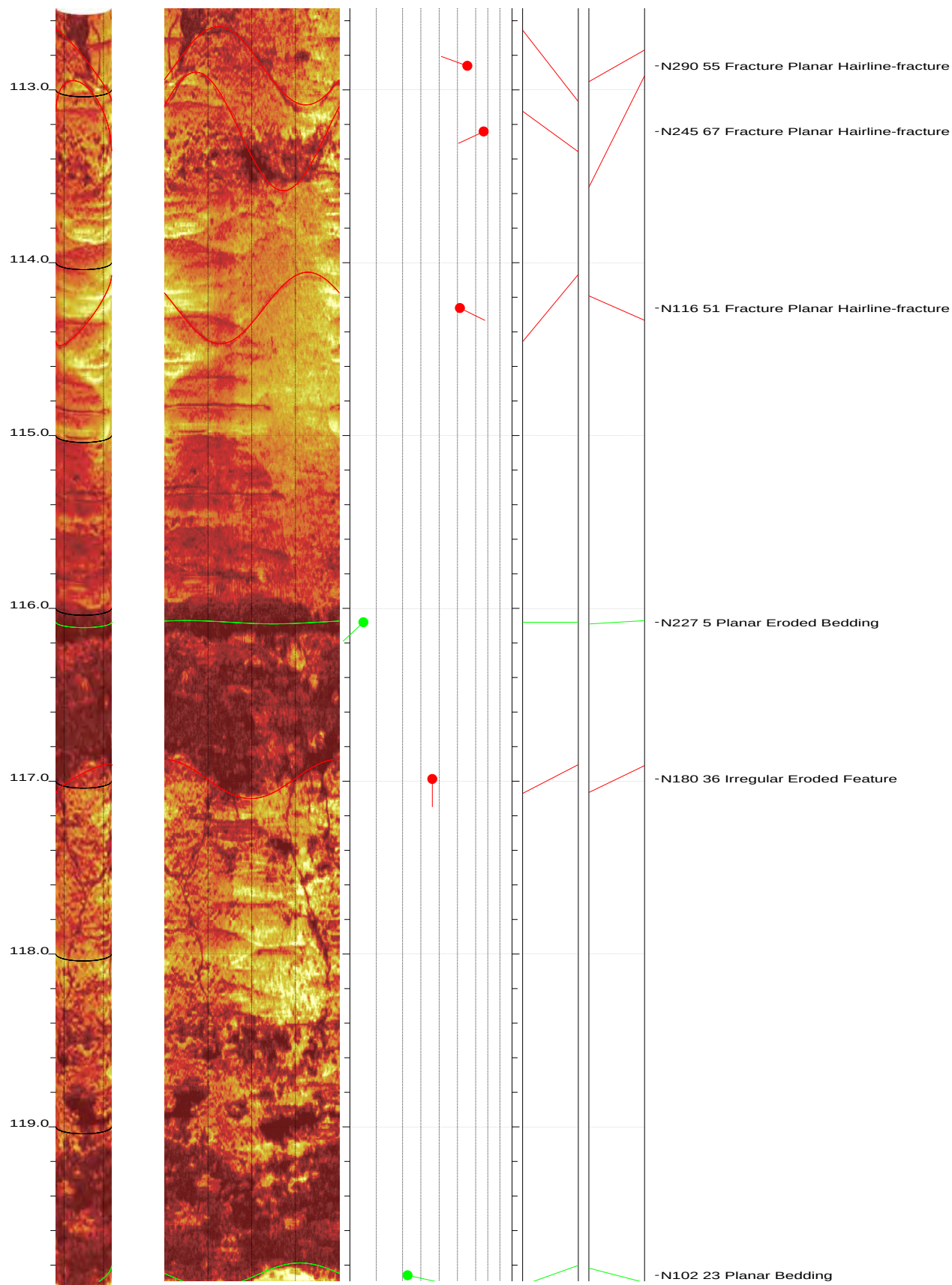
-N247 5 Planar Eroded Bedding

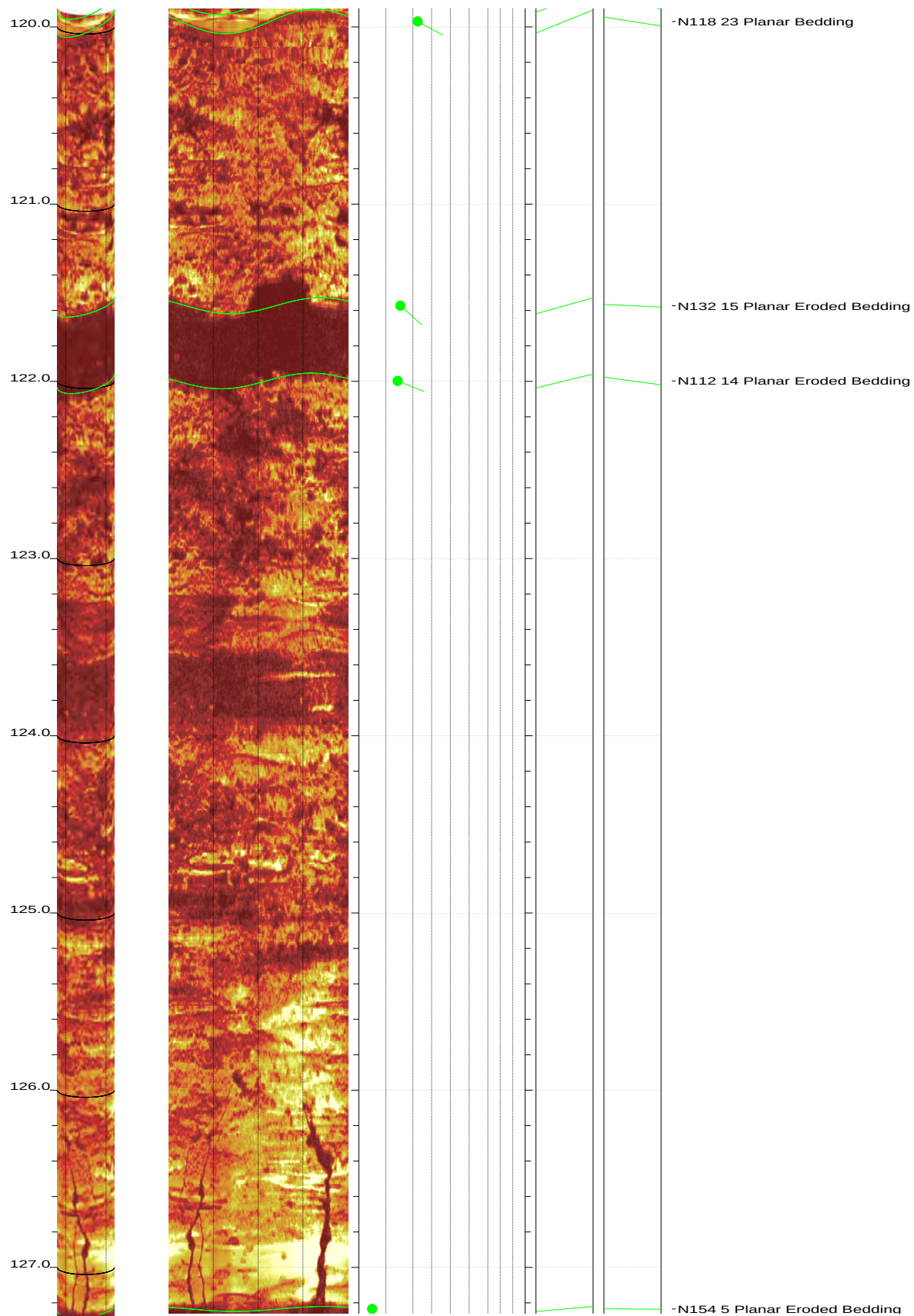


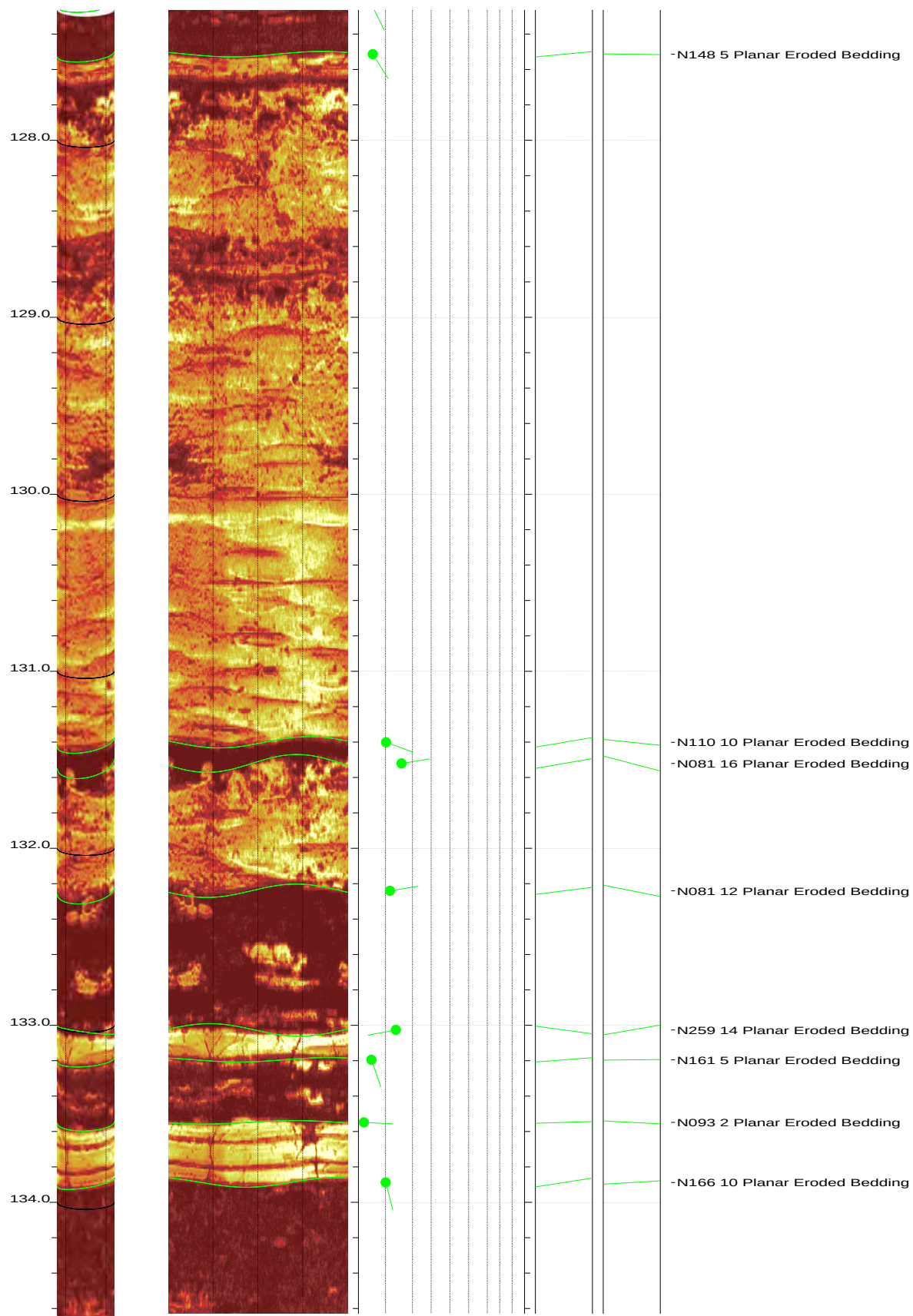


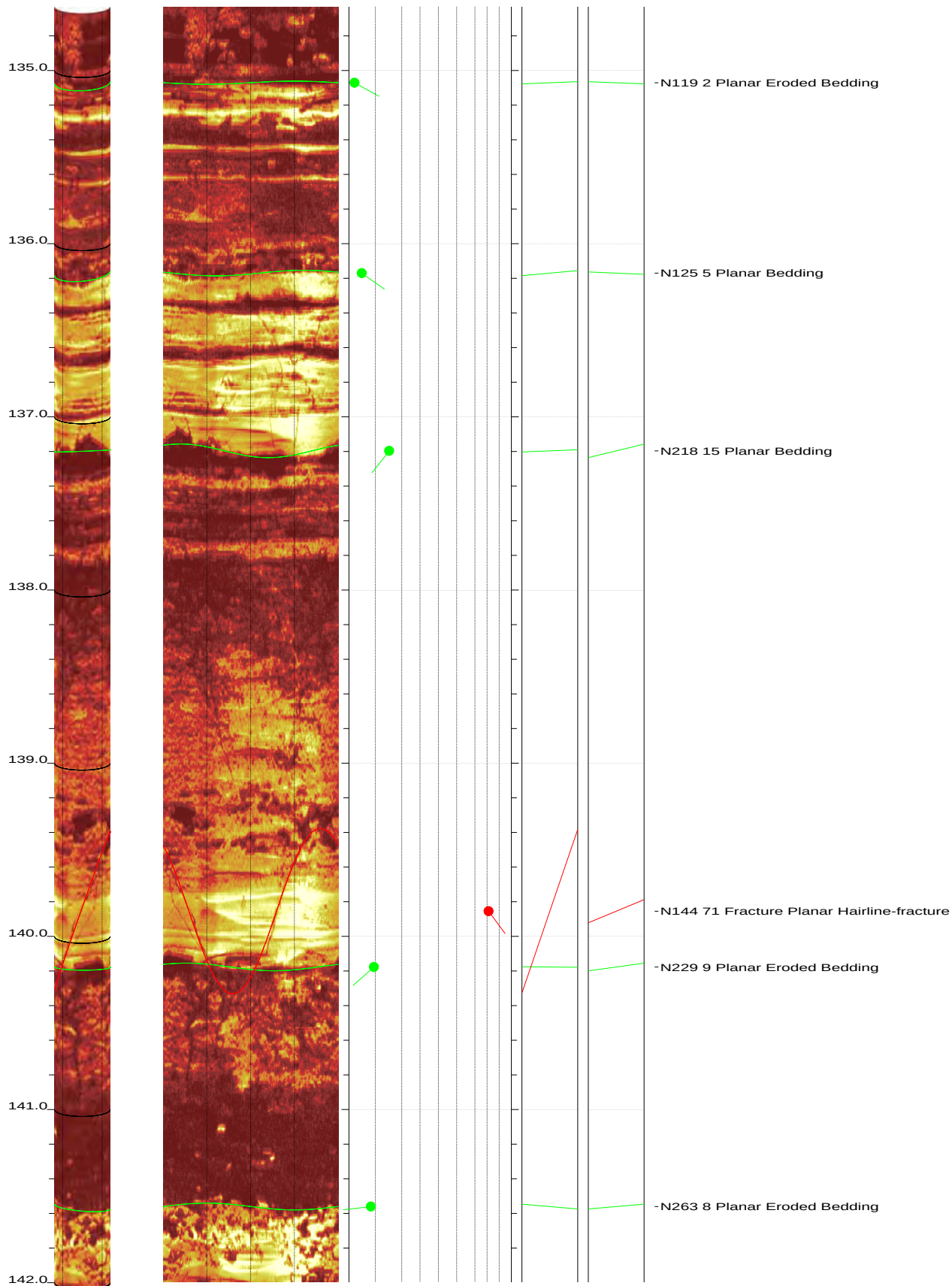


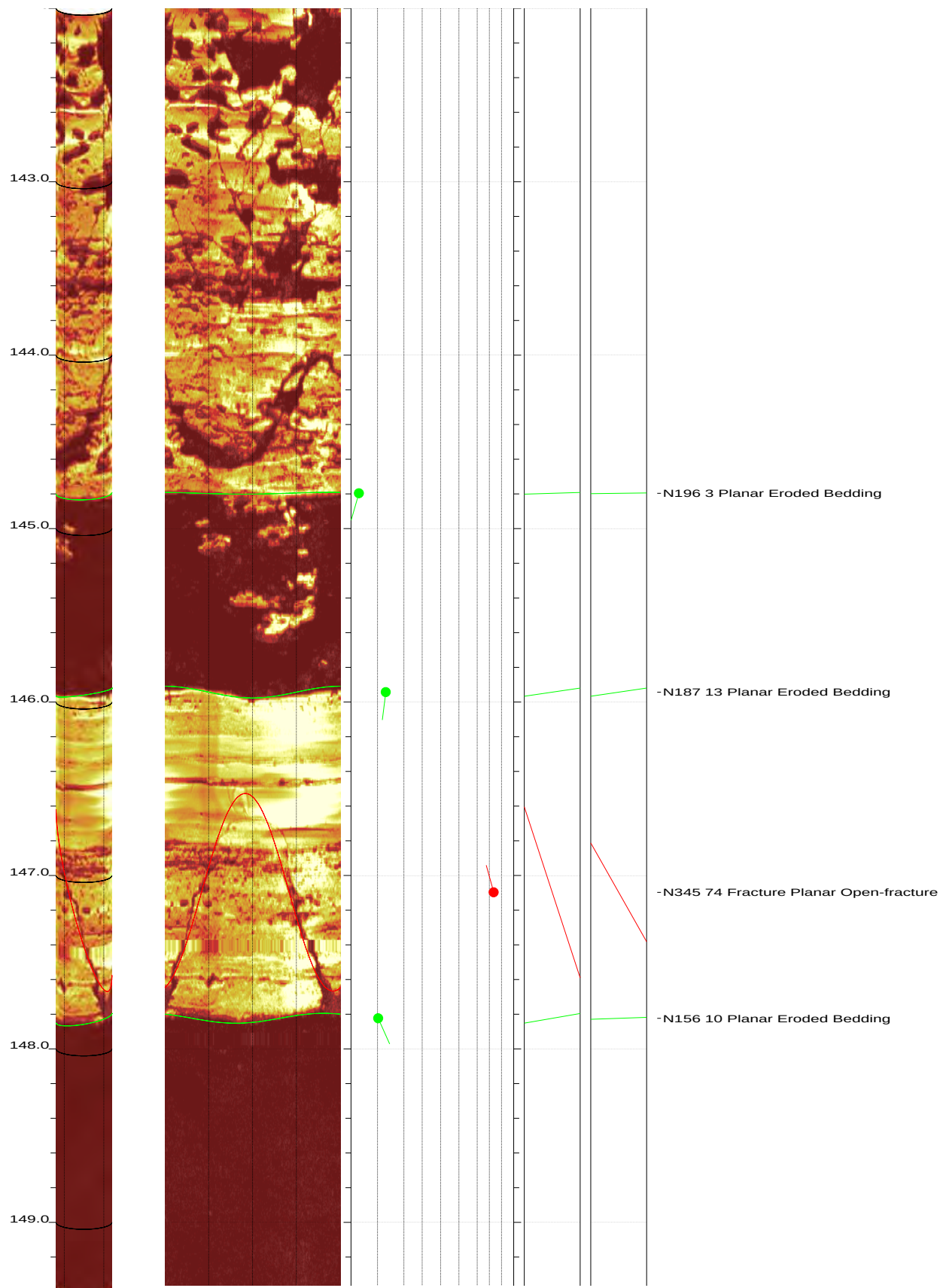


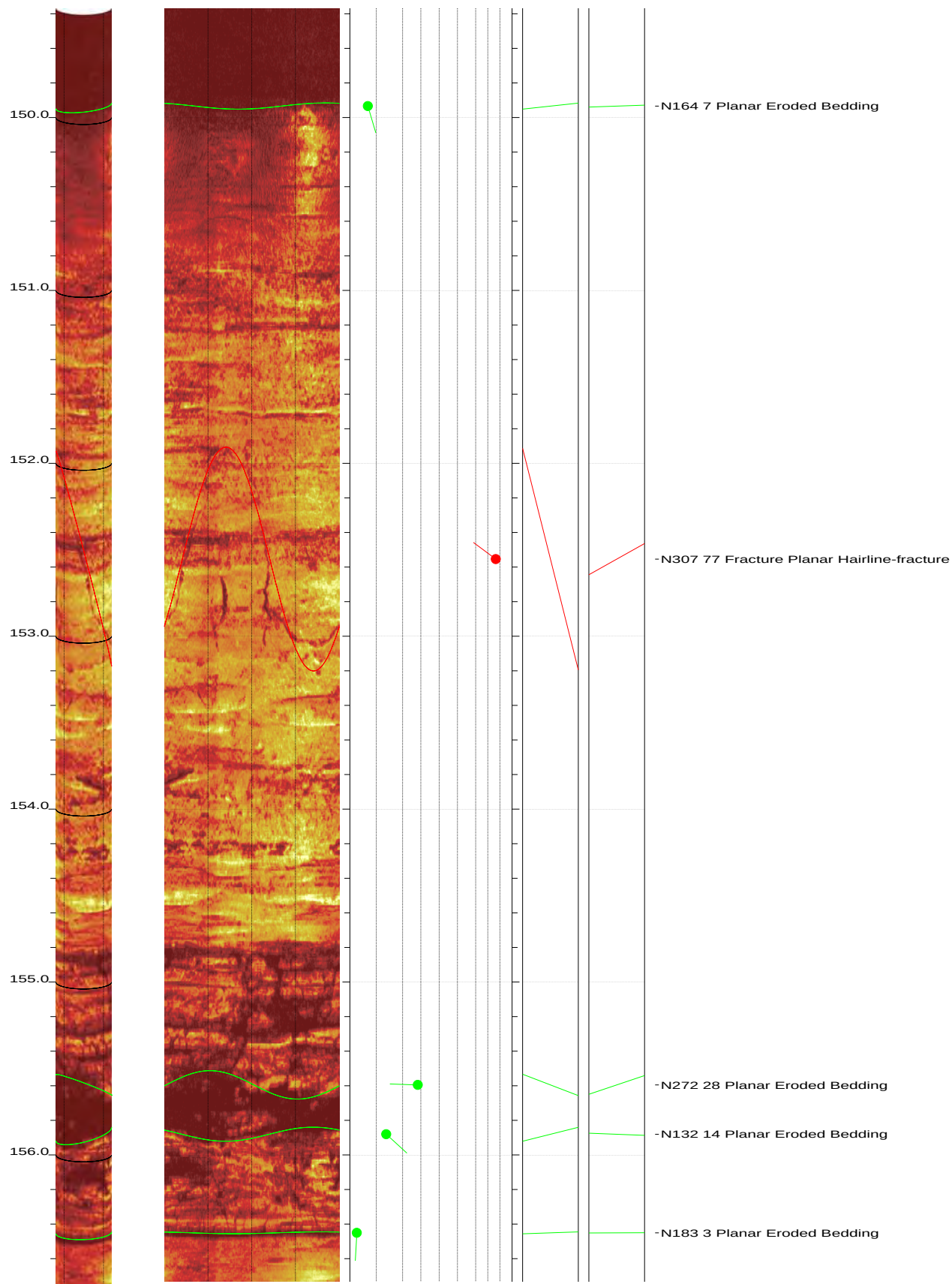


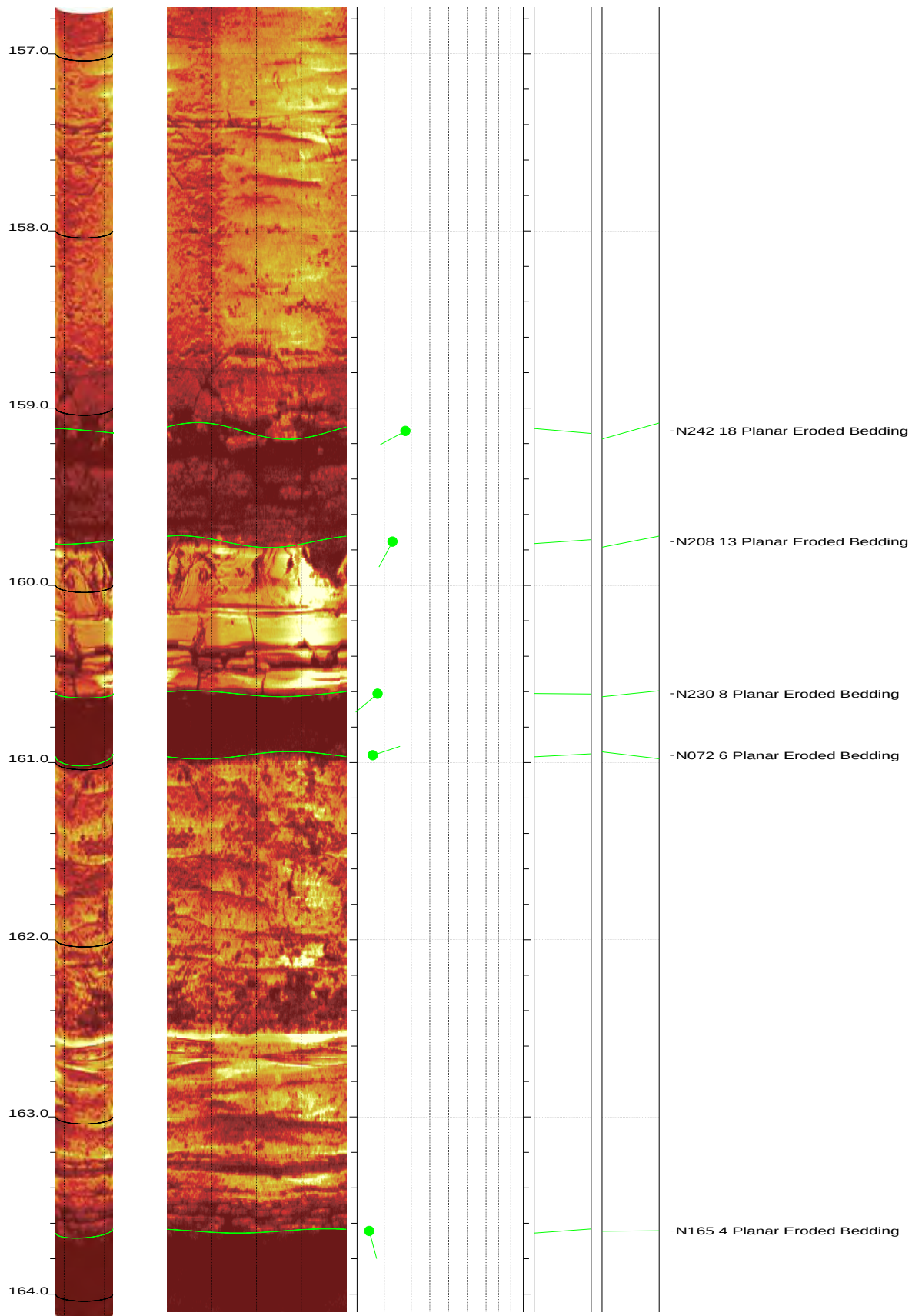


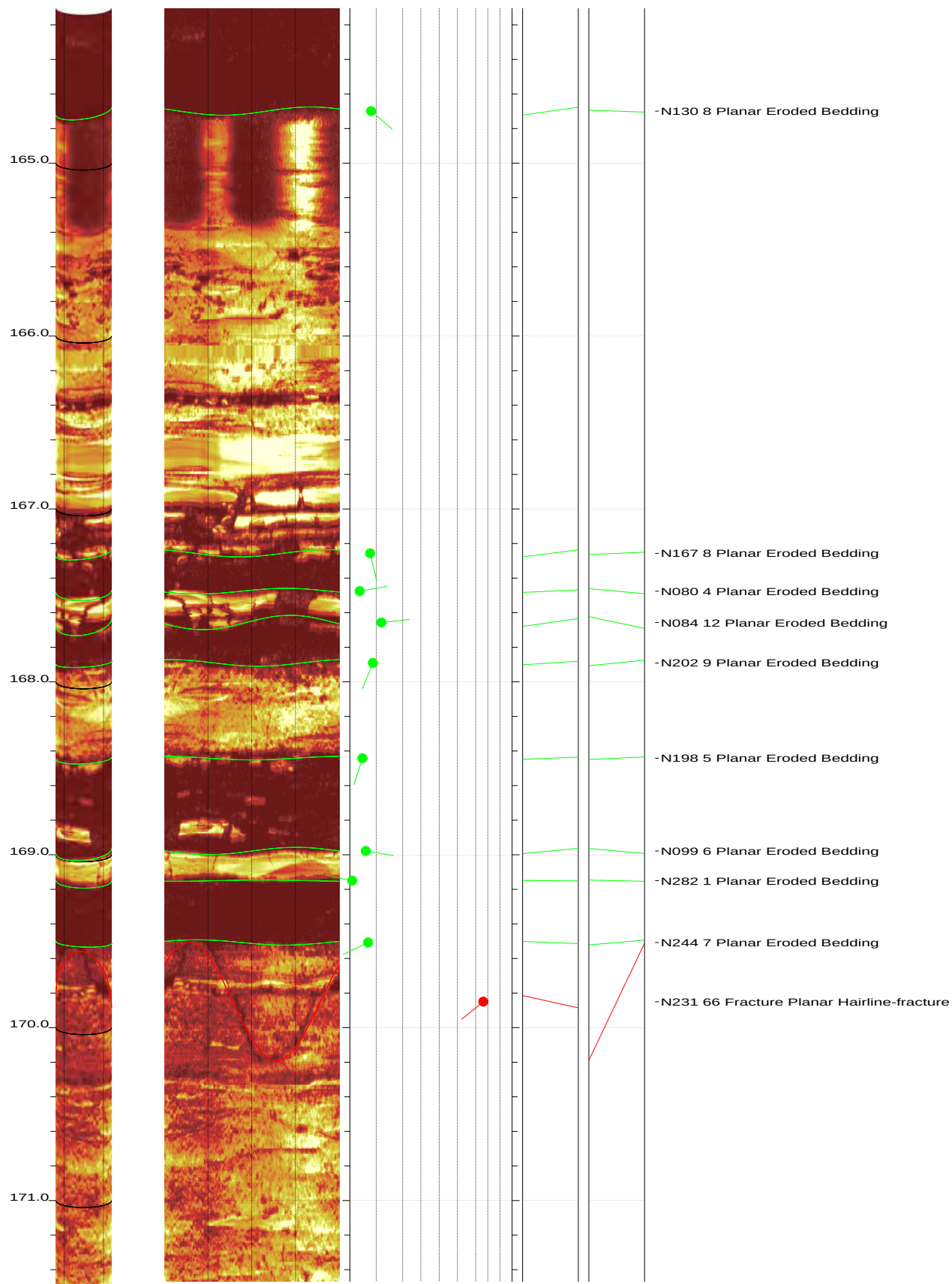


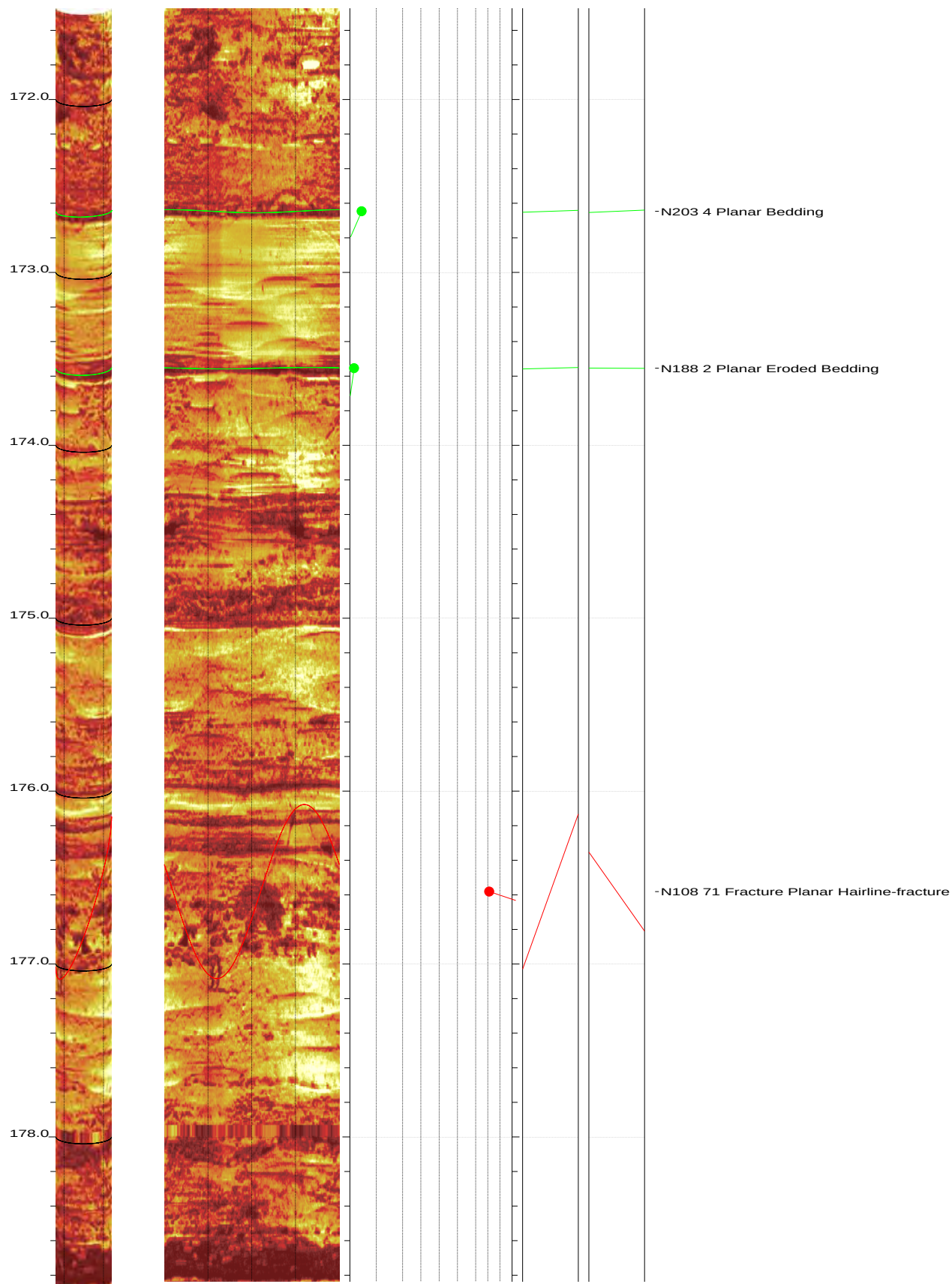


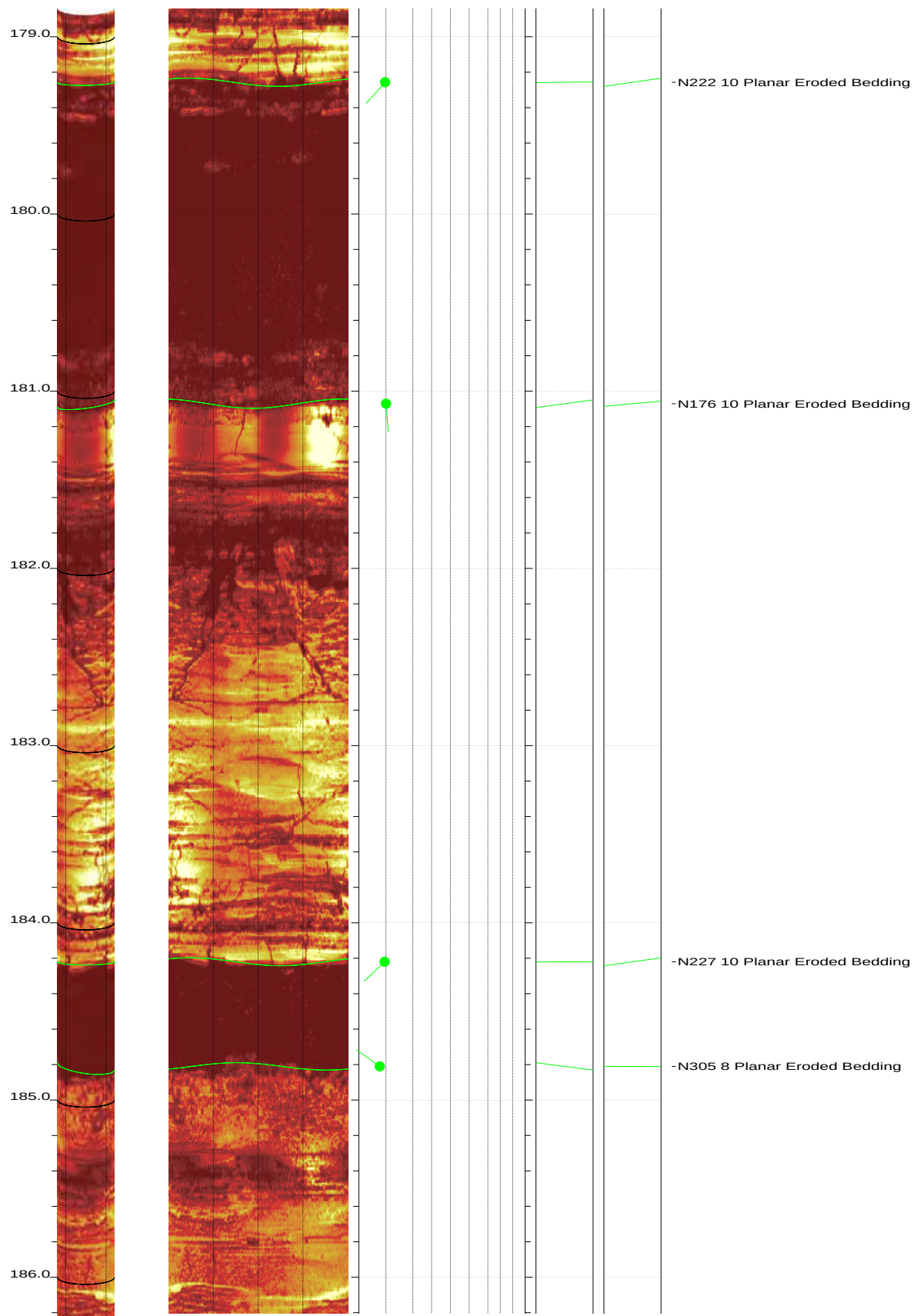


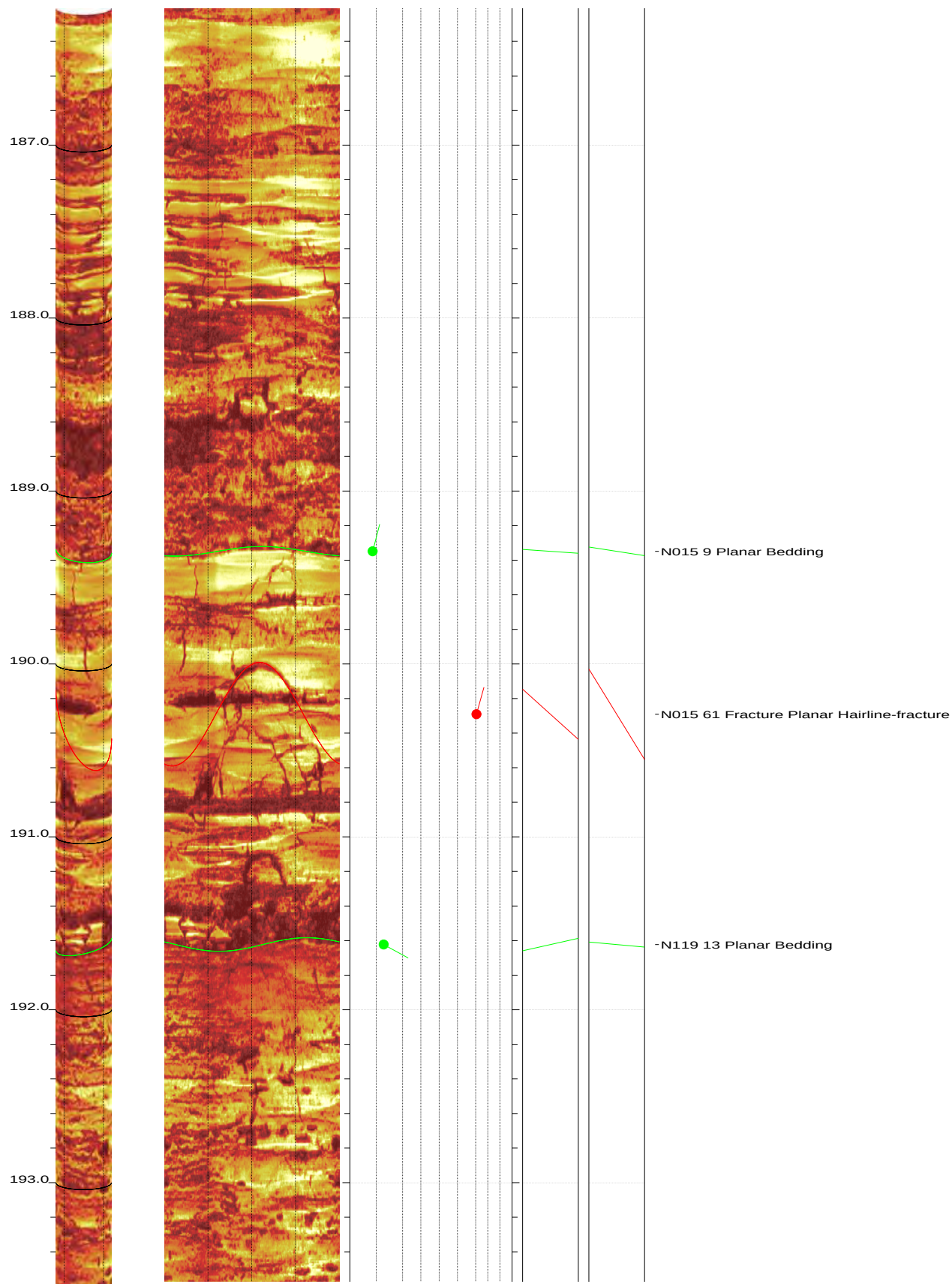


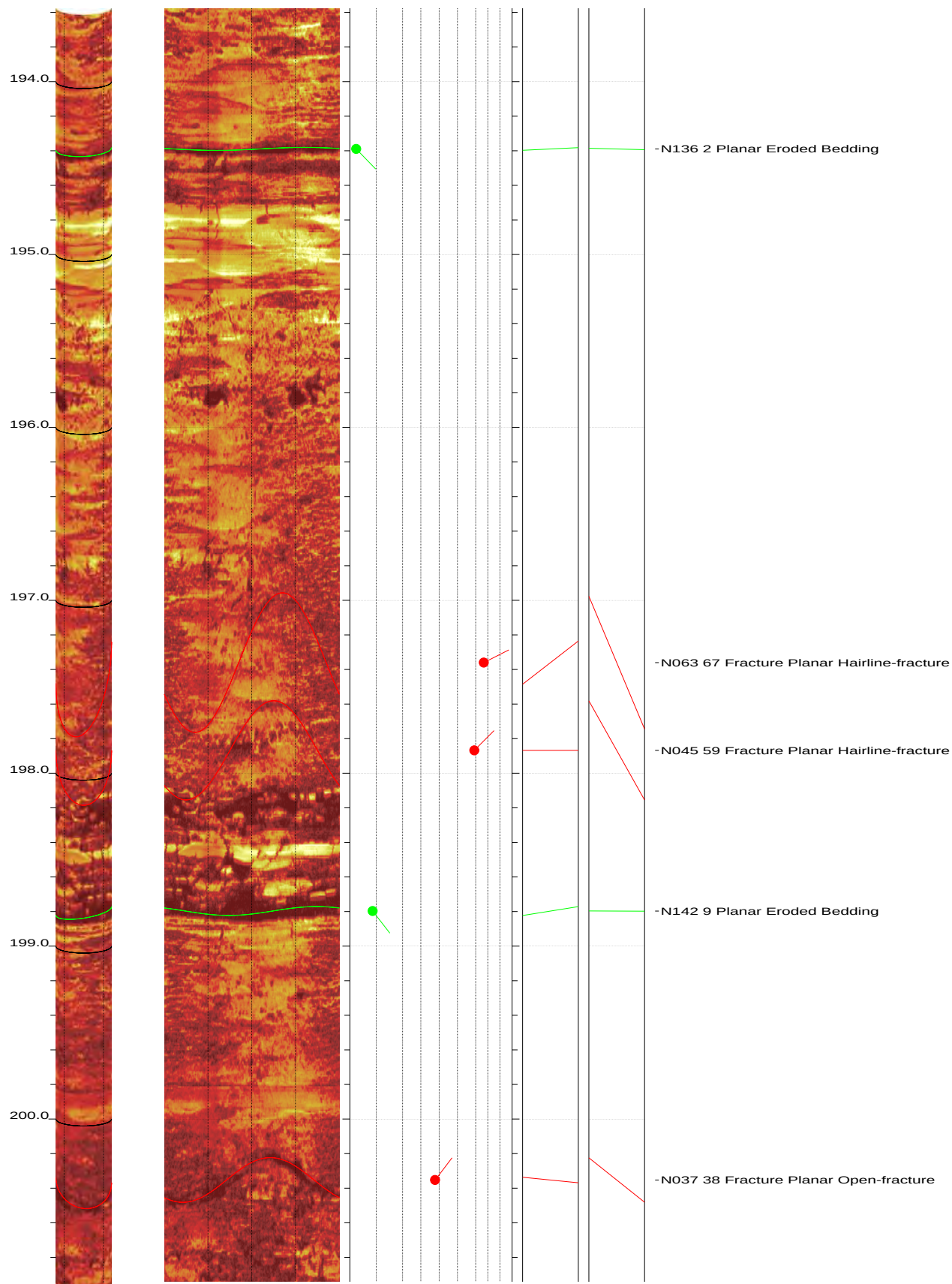


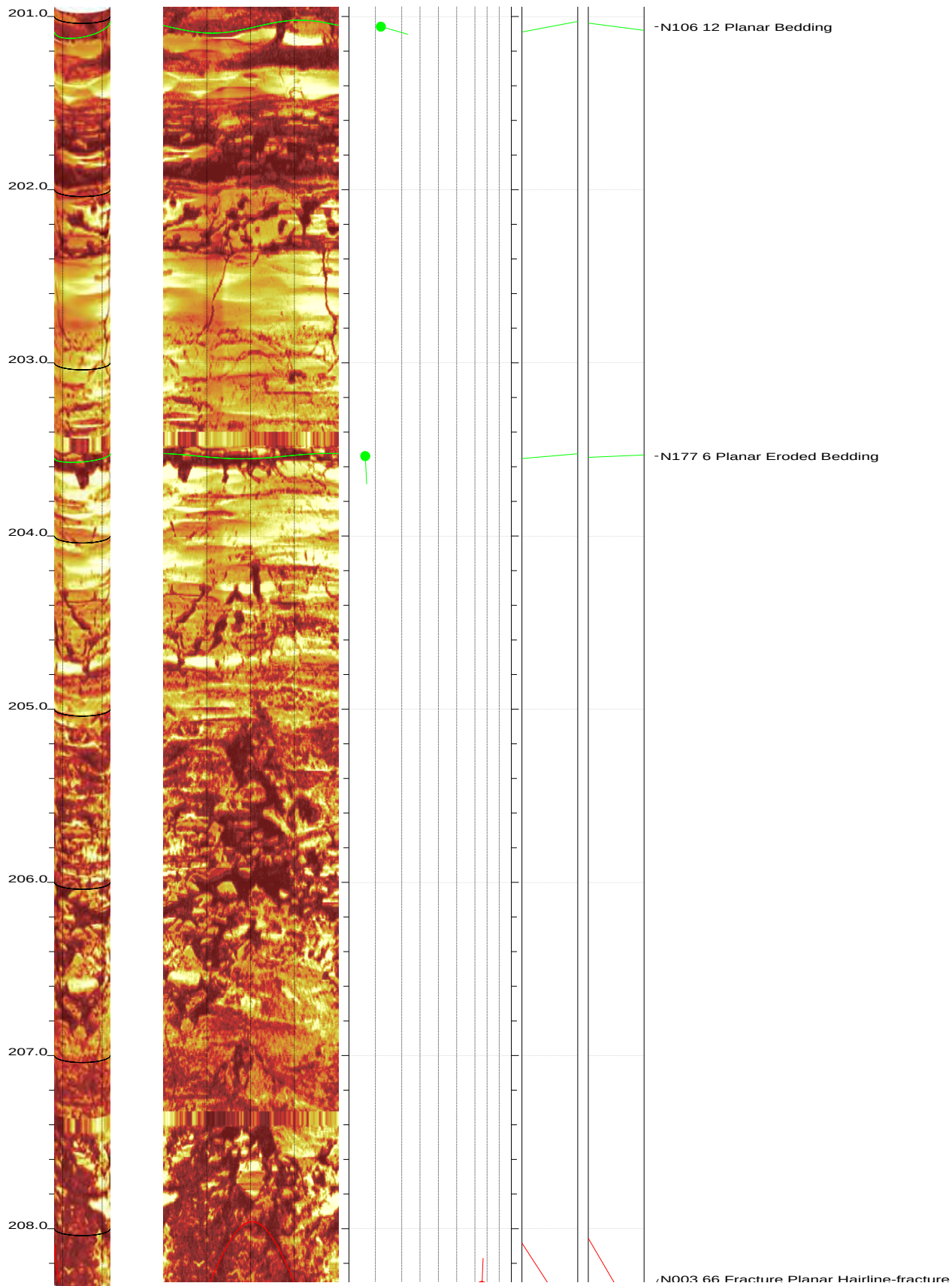


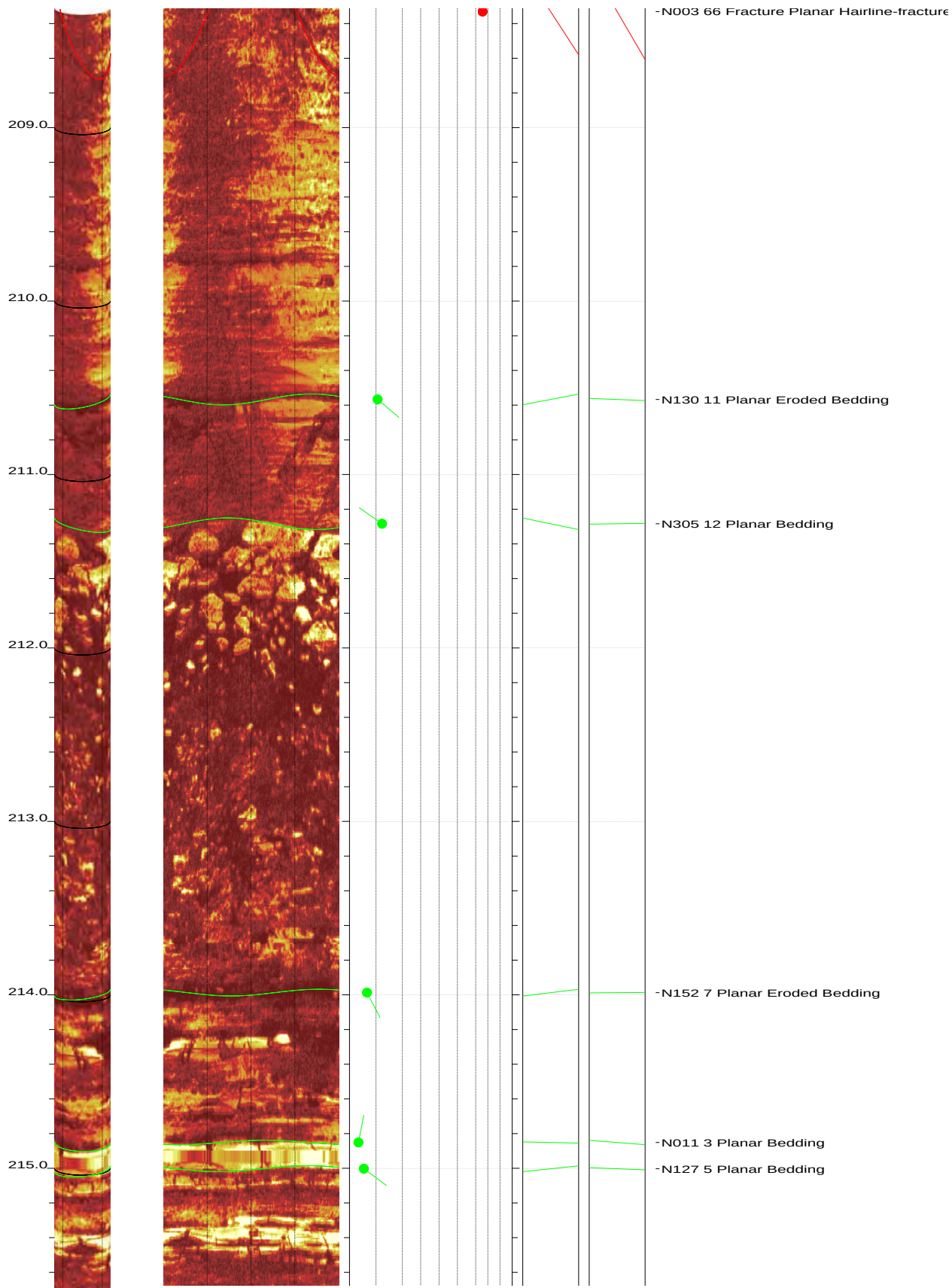


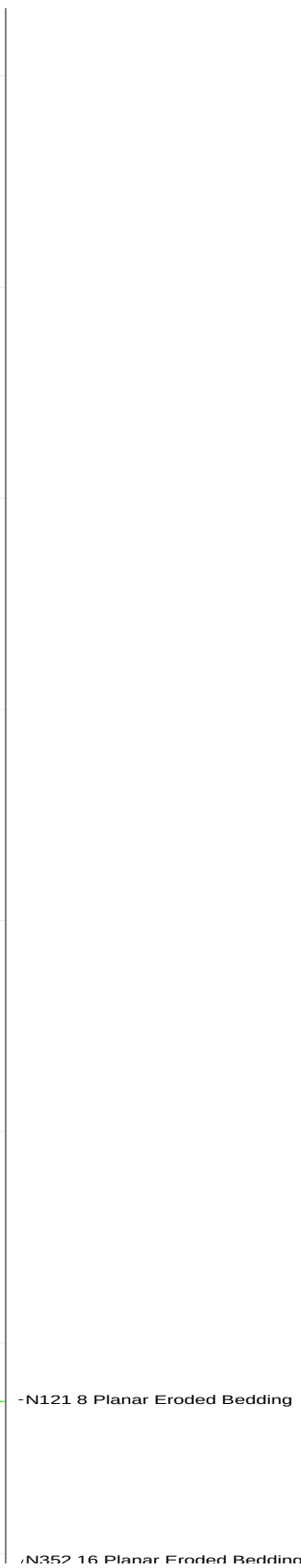
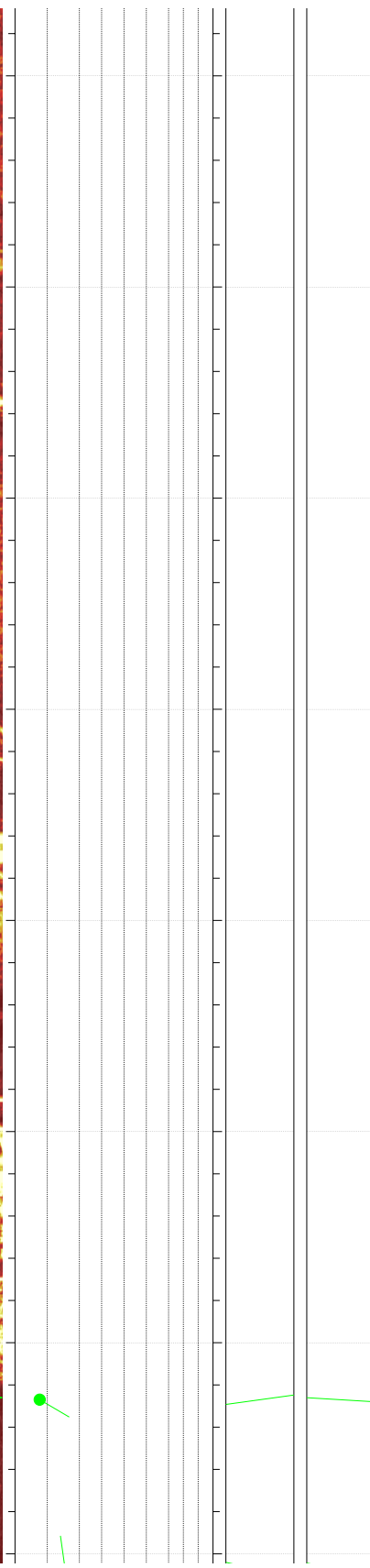
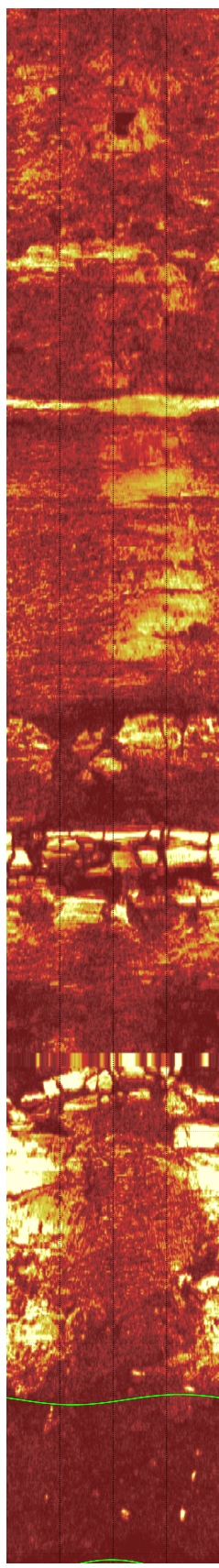
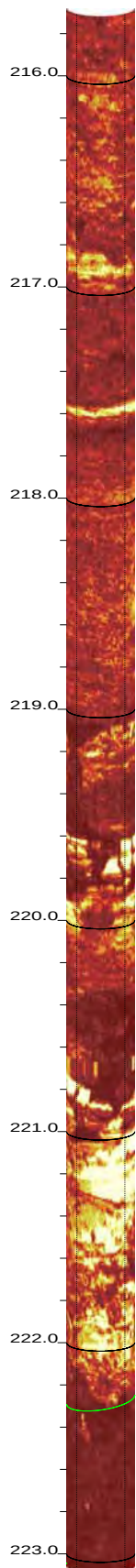


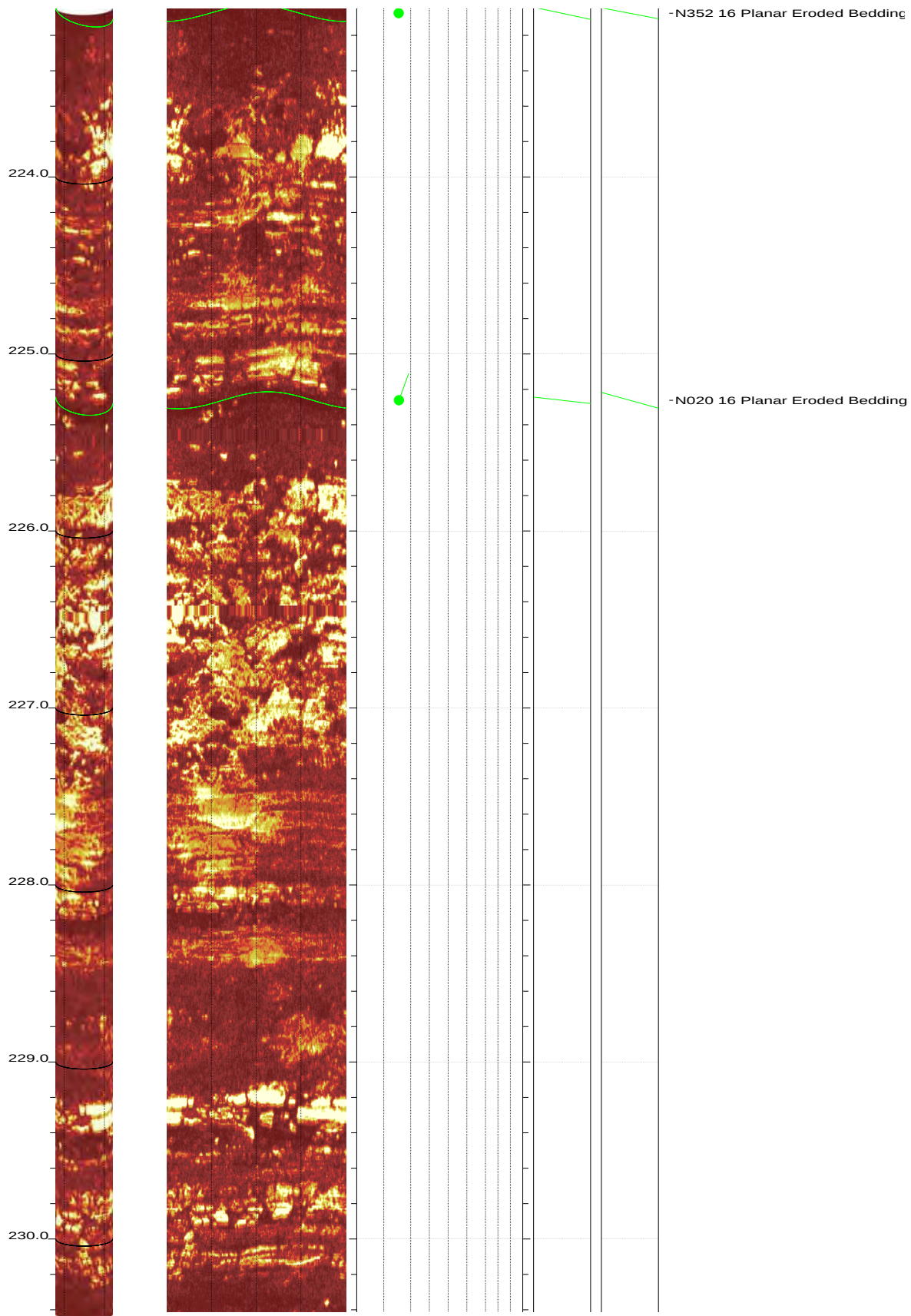


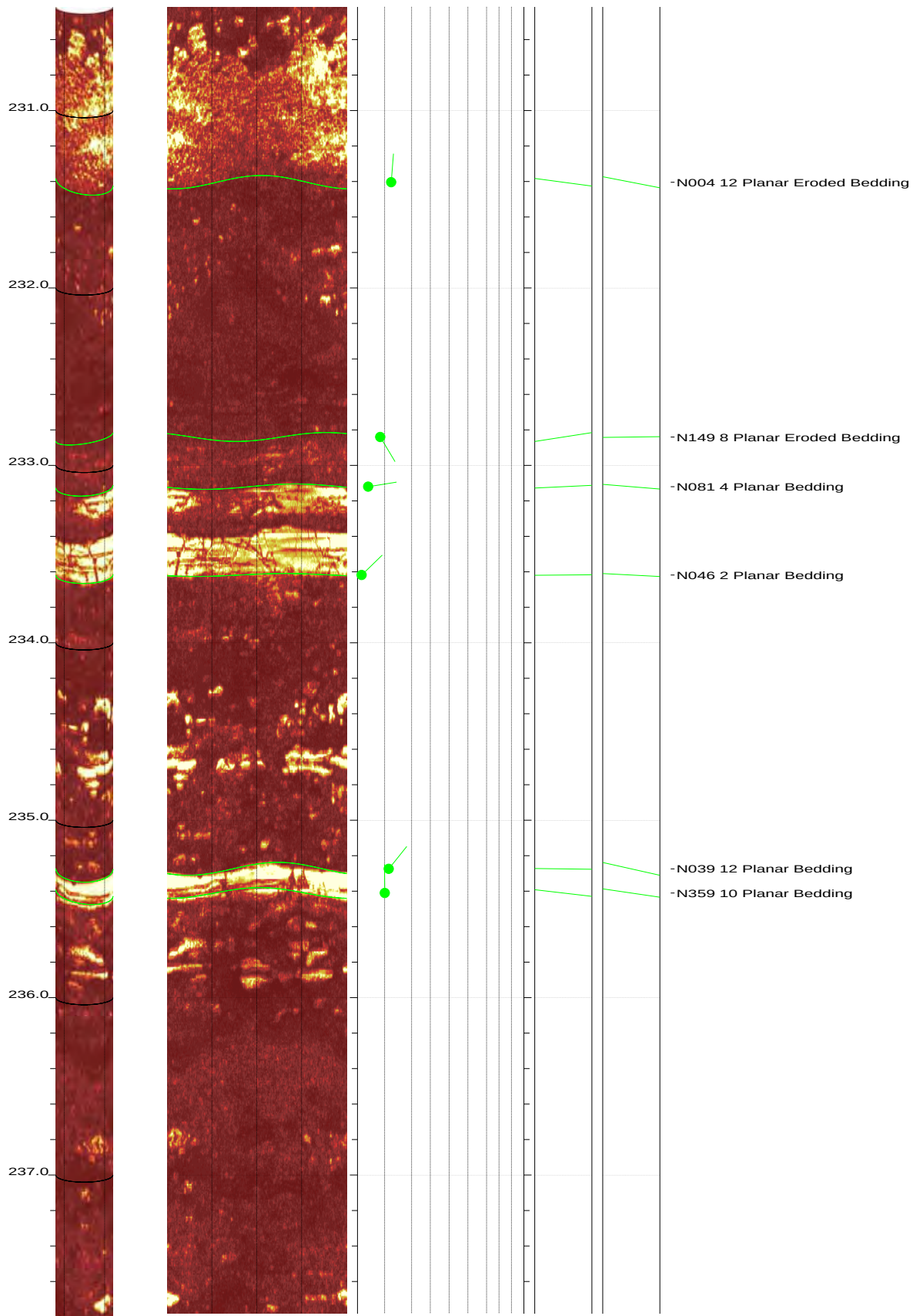


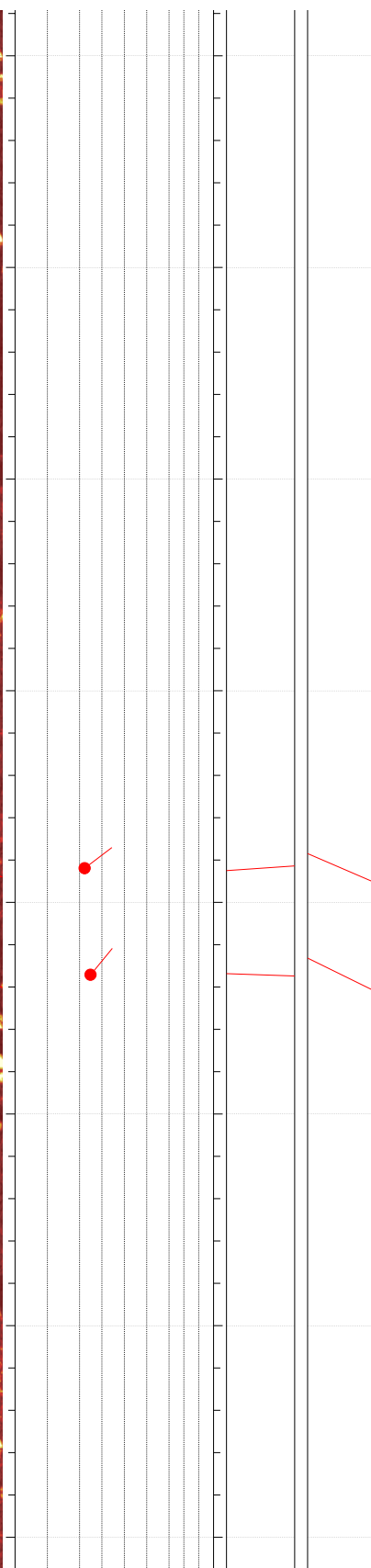
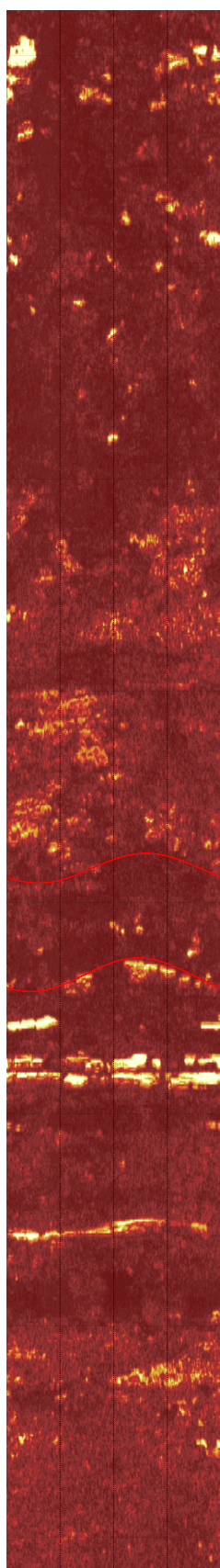
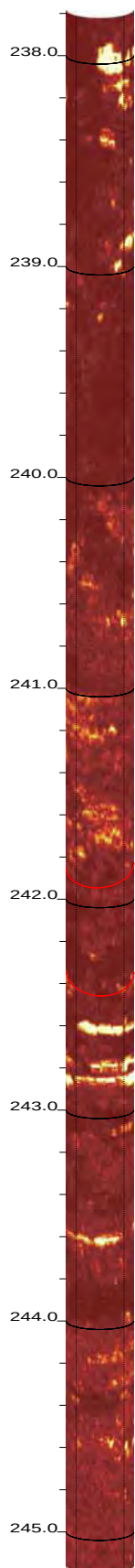






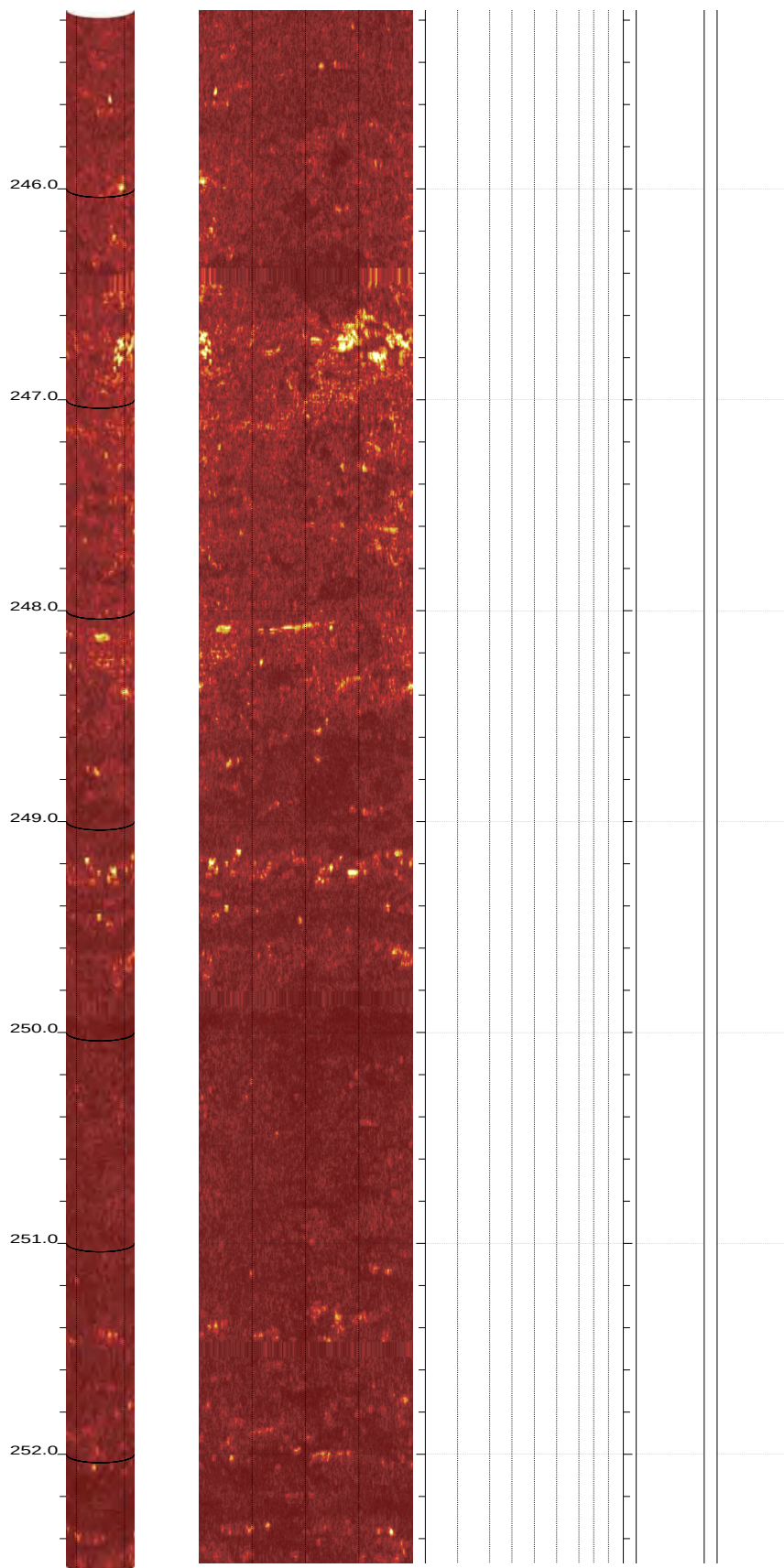


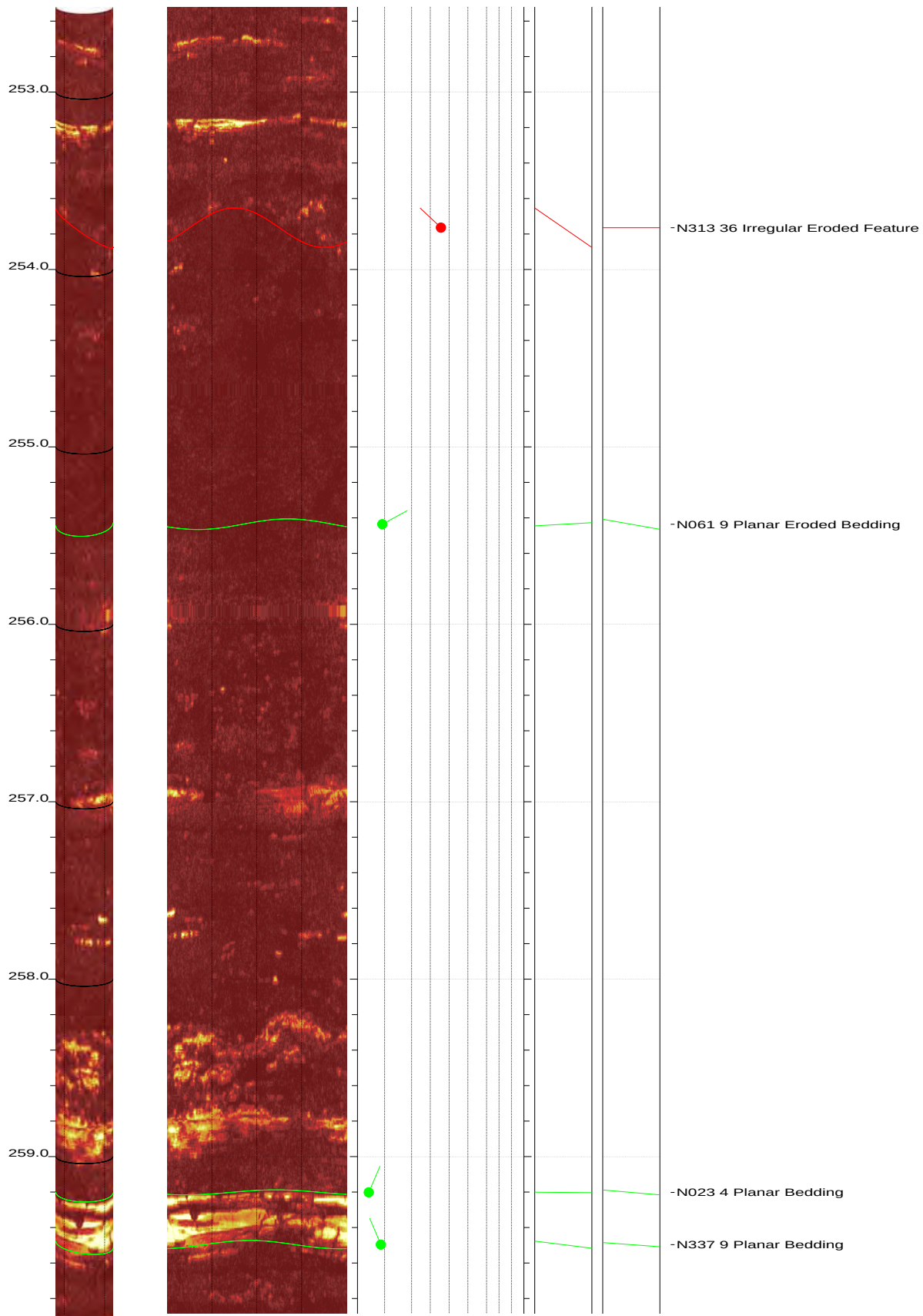


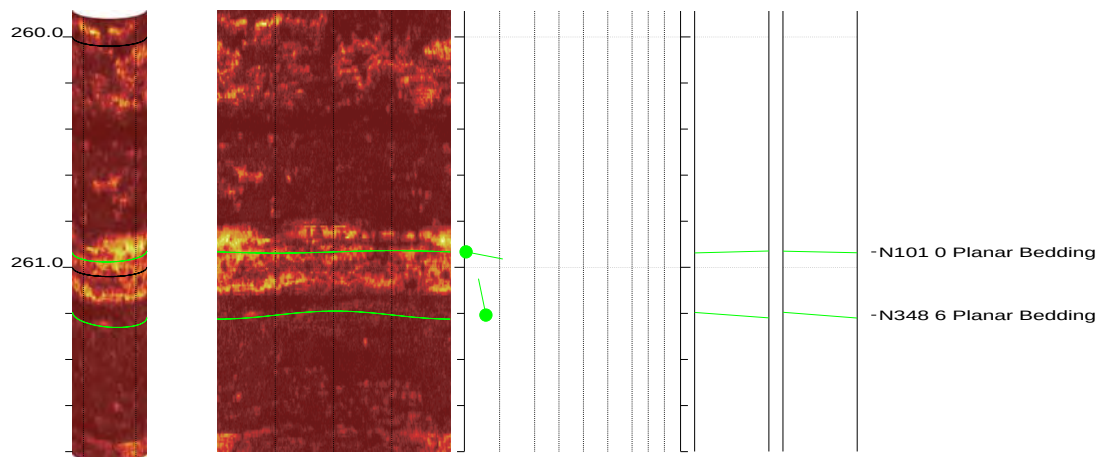


-N053 22 Irregular Eroded Feature

-N039 25 Irregular Eroded Feature







APPENDIX D

ACOUSTIC TELEVIEWER BASED CALIPER LOGS

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ROBERTSON
GEOLOGGING
LIMITED

ROBERTSON GEOLOGGING TECHNOLOGY

RGLDIP vsn 6.2 15 Dec 2007

BHTV ACOUSTIC CALIPER LOG 1/10

COMPANY CH2M HILL
WELL A-7
FIELD PEC LEVY COUNTY COLA
COUNTRY
LATITUDE -
LONGITUDE -
PROJECT LEVY

OTHER SERVICES

PERM. DATUM
LOG DATUM
DRILL DATUM
ELEVATION

-

KELLY BUSHING 0ft
DRILL FLOOR 0ft
GROUND LEVEL 0ft

	RunNo1	RunNo2	RunNo3
DATE	10 Mar 2007	10 Mar 2007	10 Mar 2007
RUN#	0	0	0
TYPE OF LOG			ACOUSTIC
DEPTH DRILLER	0	0	266
DEPTH LOGGER	0	0	265
LOG DEEPEST	0	0	265
LOG SHALLOW	0	0	100
FLUID IN HOLE			DRILLING MUD
SALINITY			
DENSITY			
LEVEL			
MAX TEMP (C)	0	0	0
RIG TIME			
RECORDED BY			C. CARTER
WITNESSED BY			

RUN#

BIT

BIT RECORD
FROM

TO

SIZE

CASING RECORD
WEIGHT

FROM

TO

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

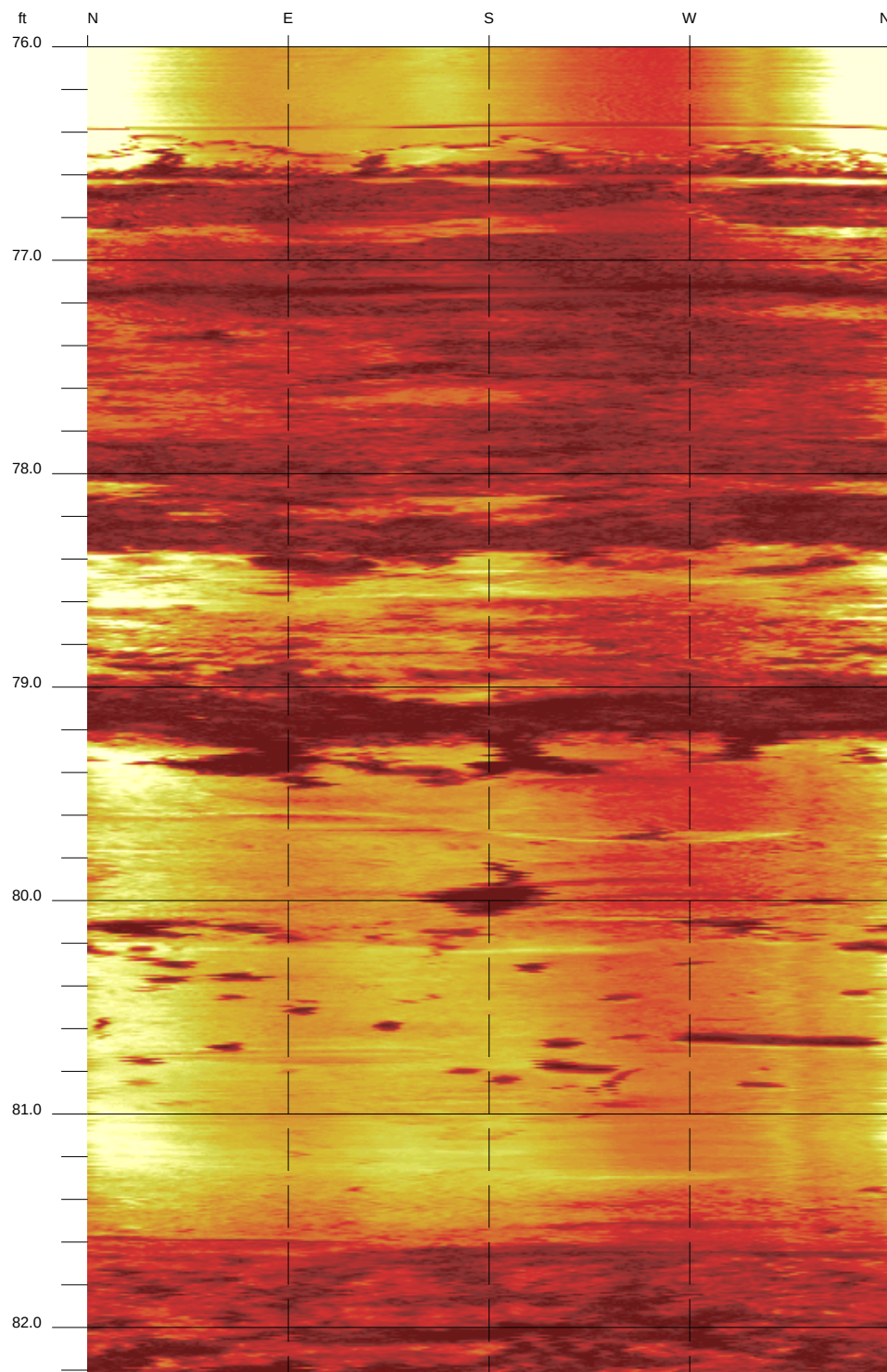
REMARKS

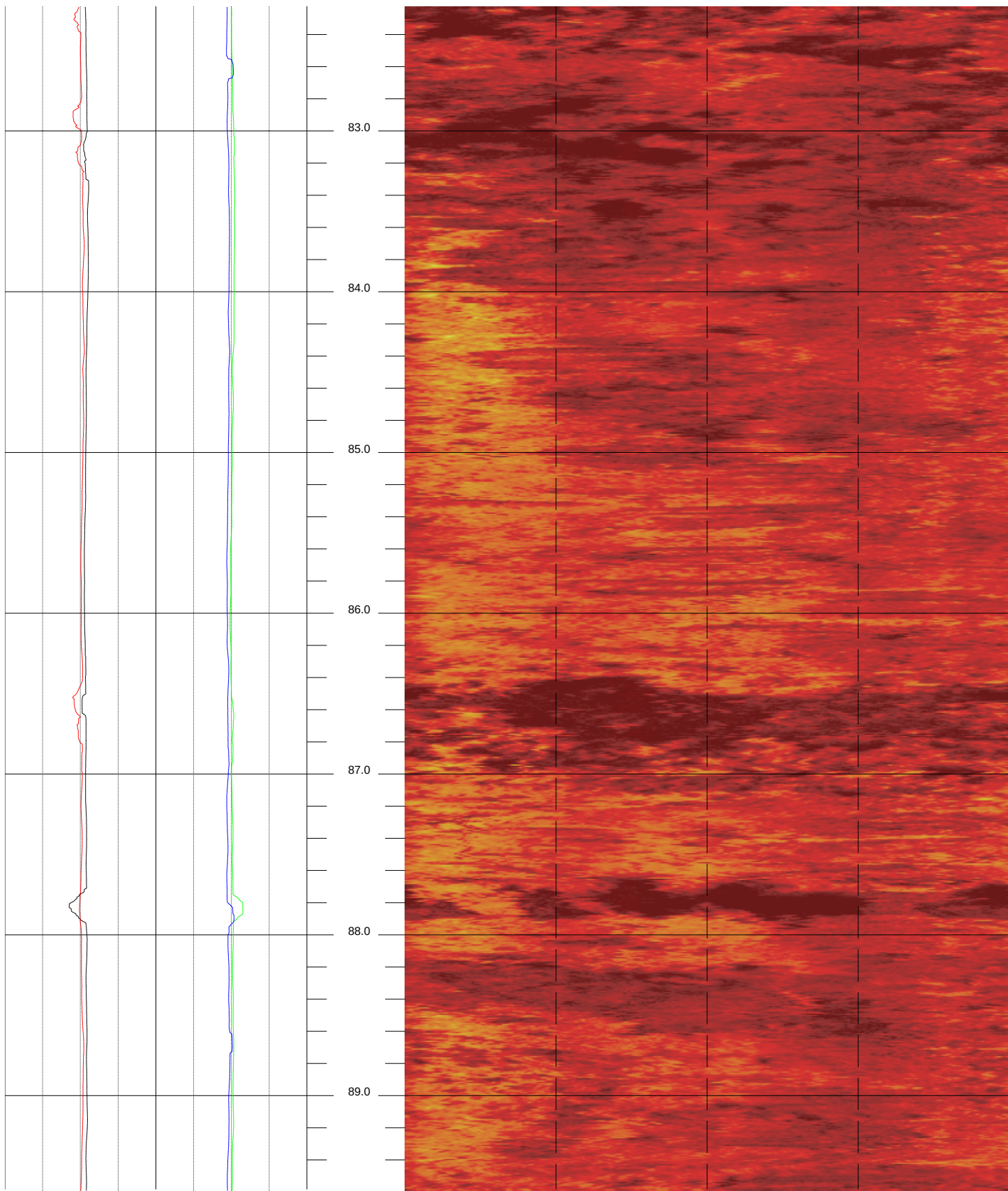
LOG FILE: C:\Rgldip\Well\Data\A7AUUP01UP02.btv
264.484 to 76.000ft

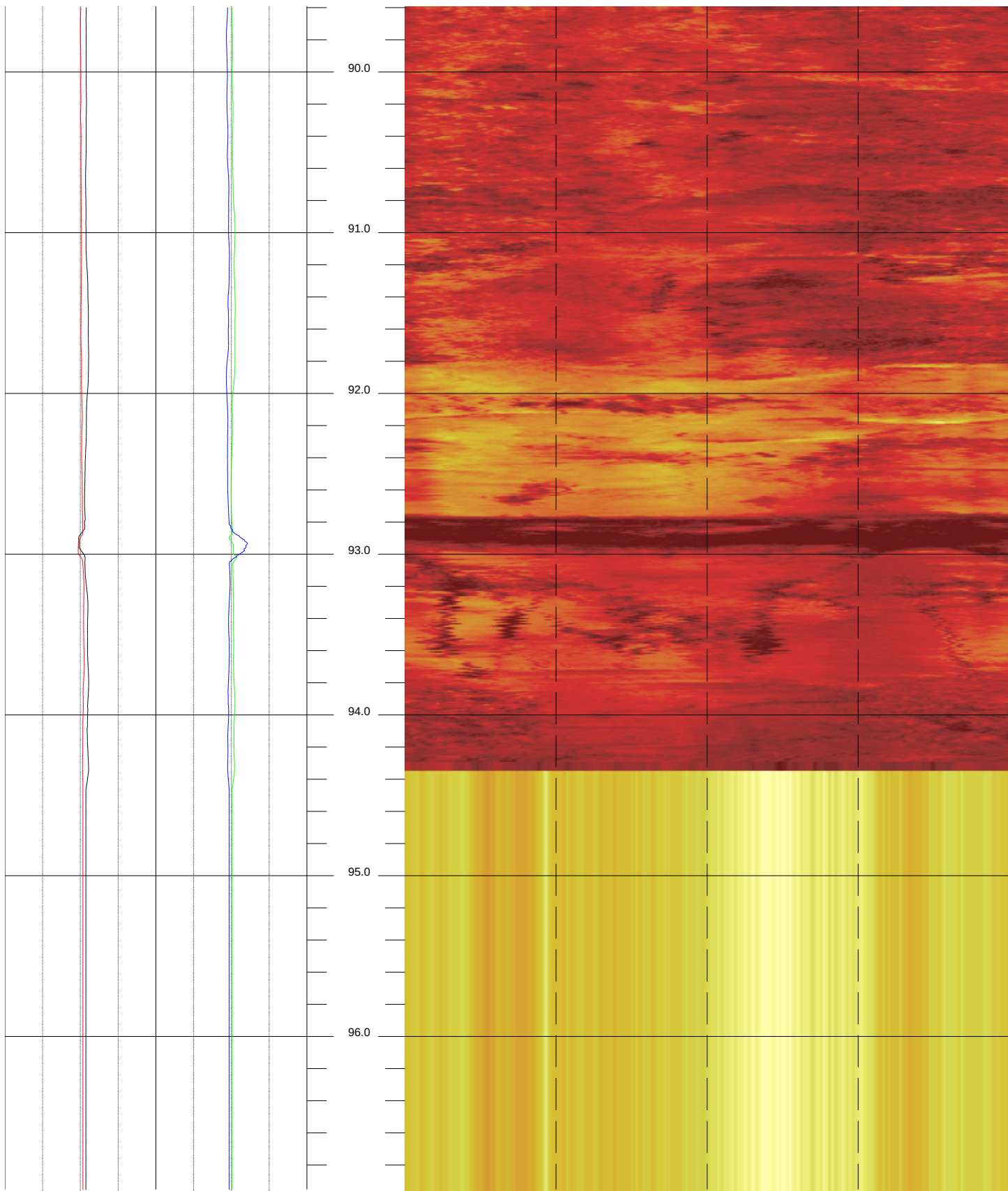
REFLECTANCE

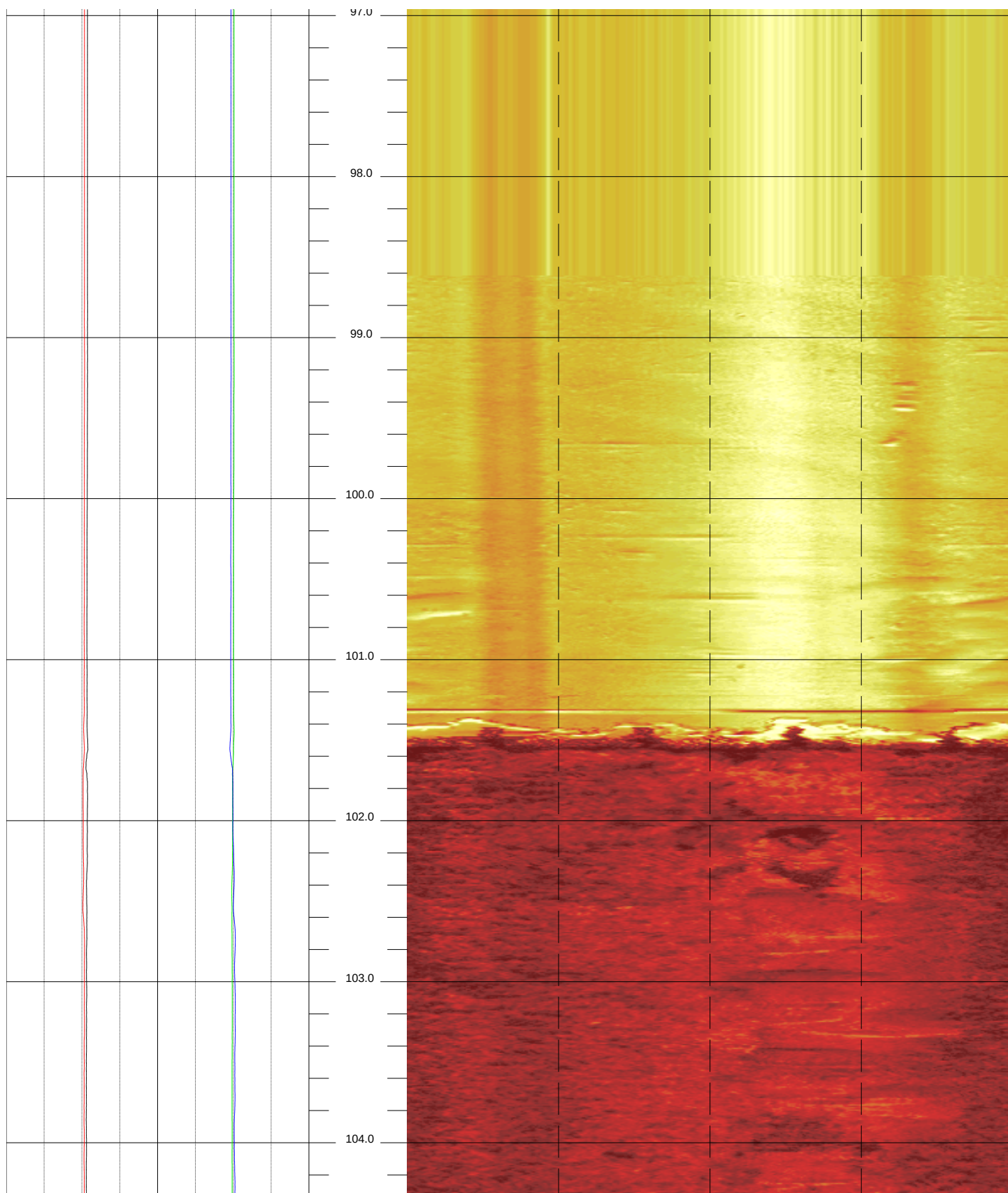


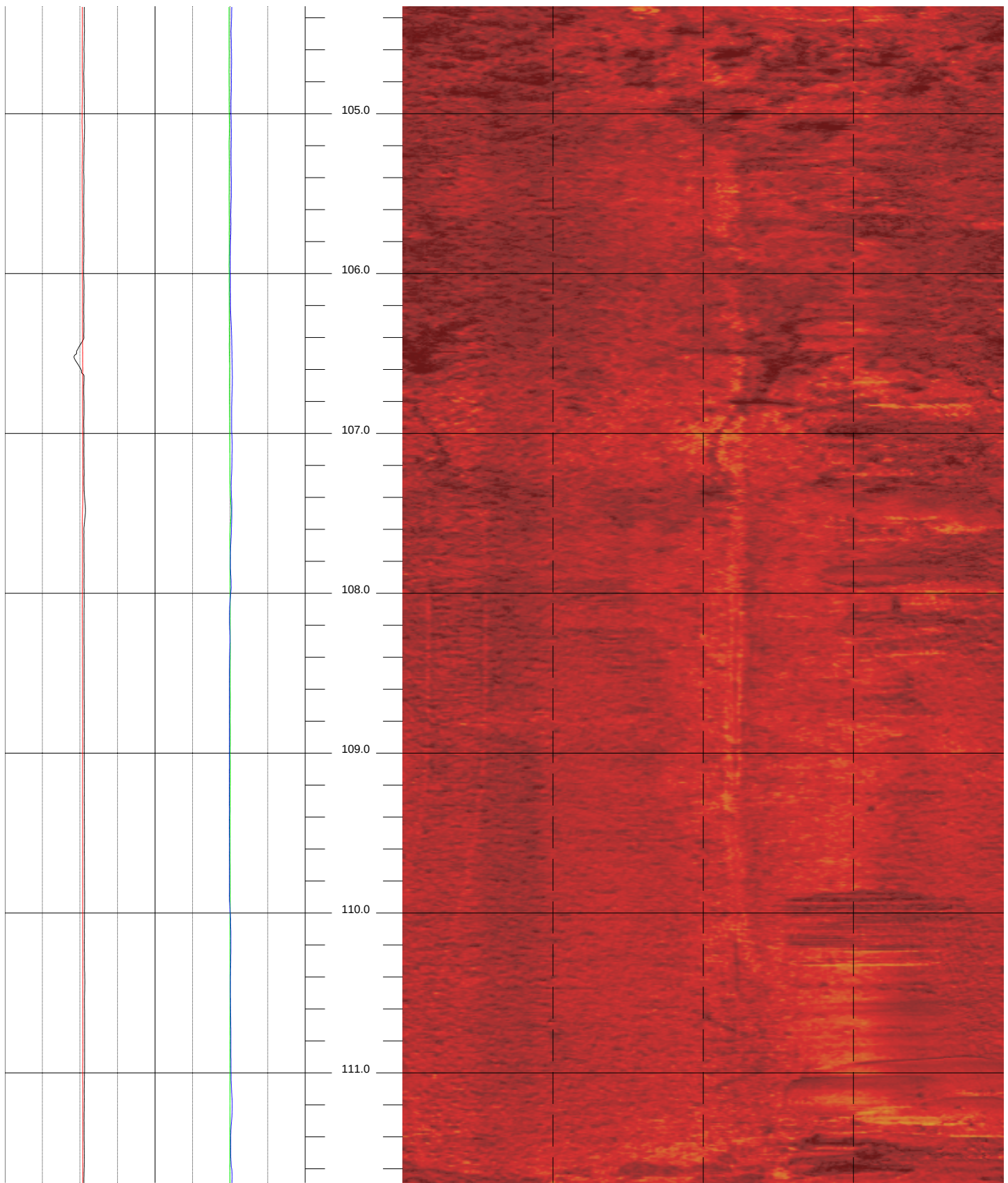
255

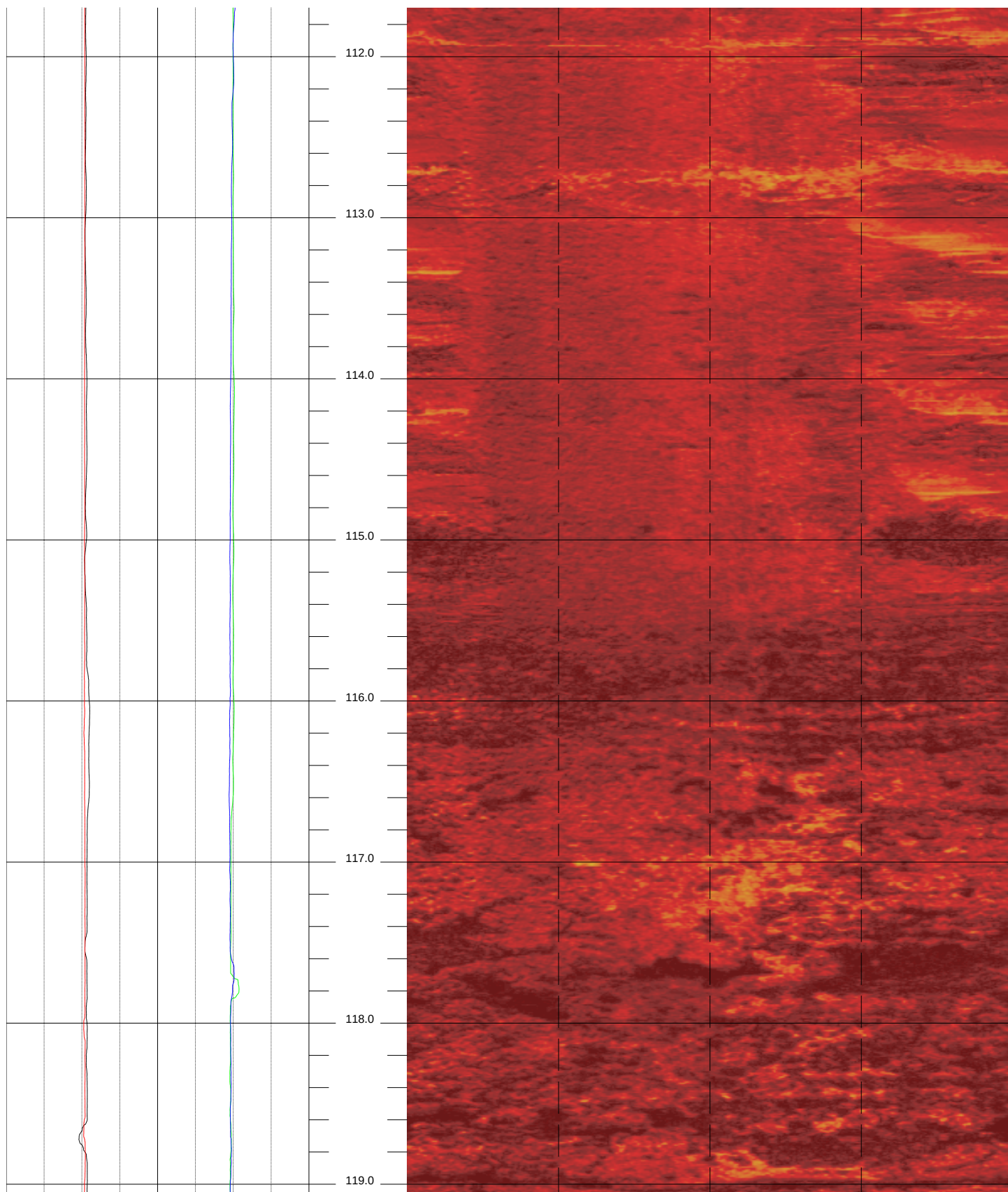


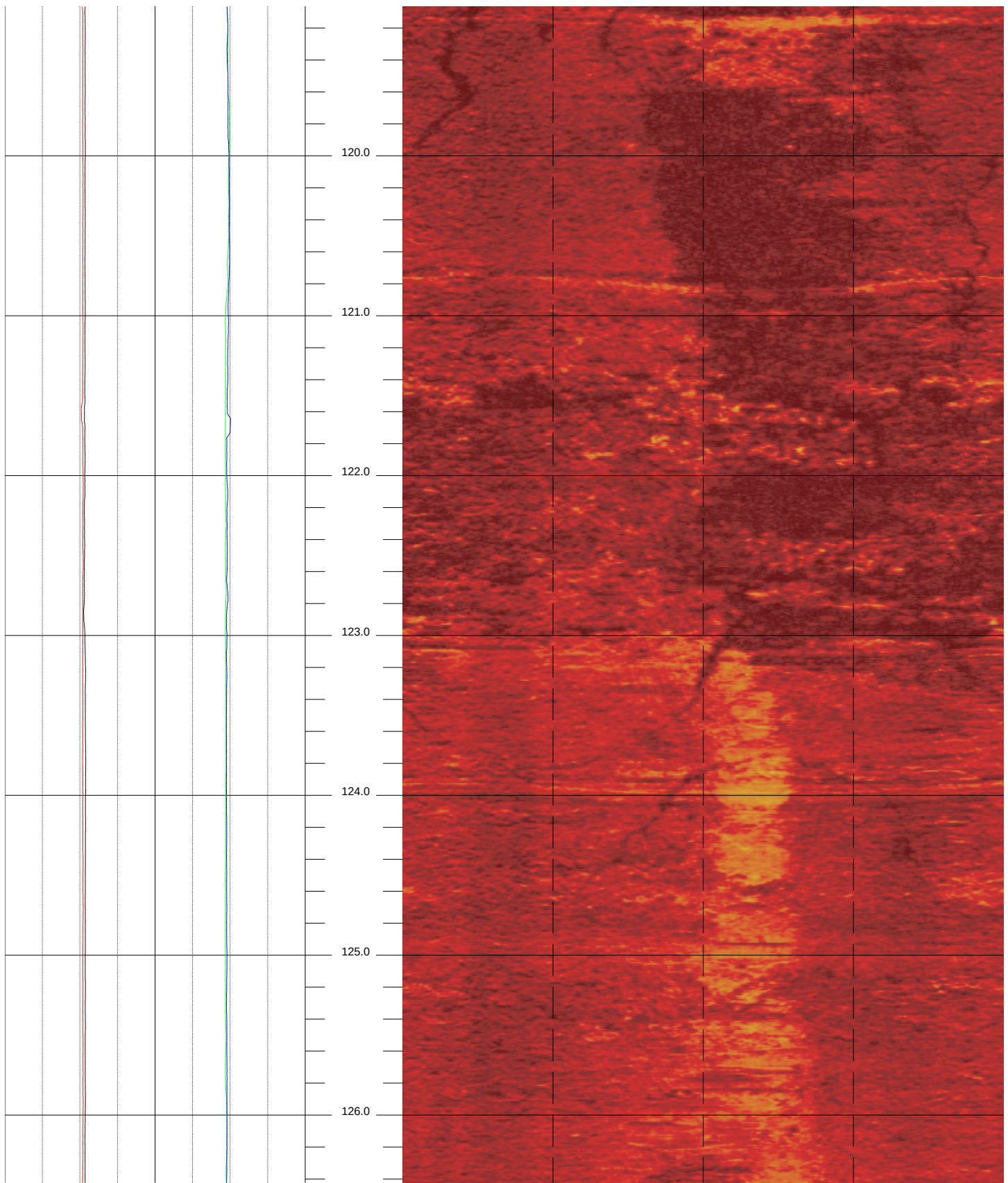


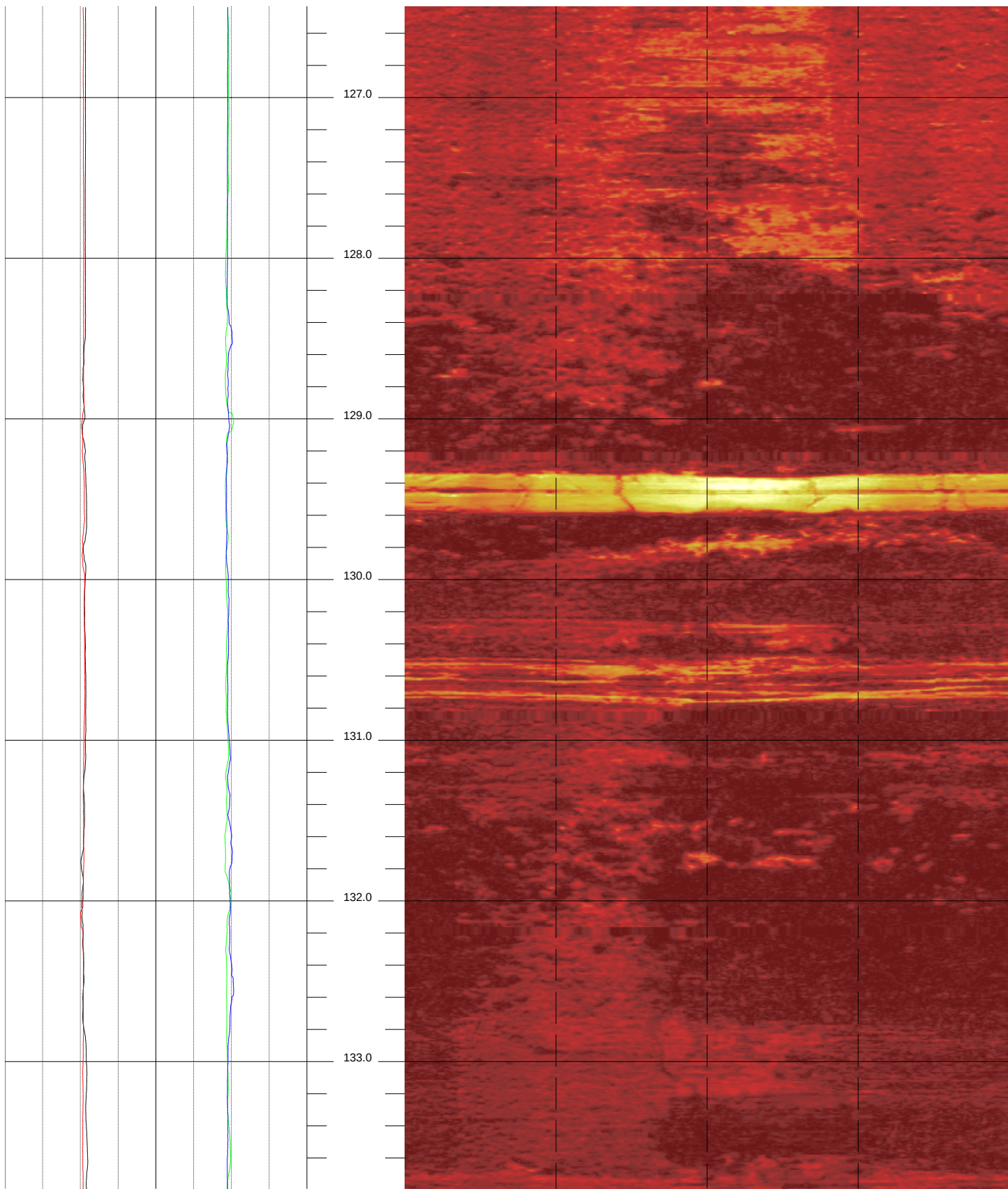


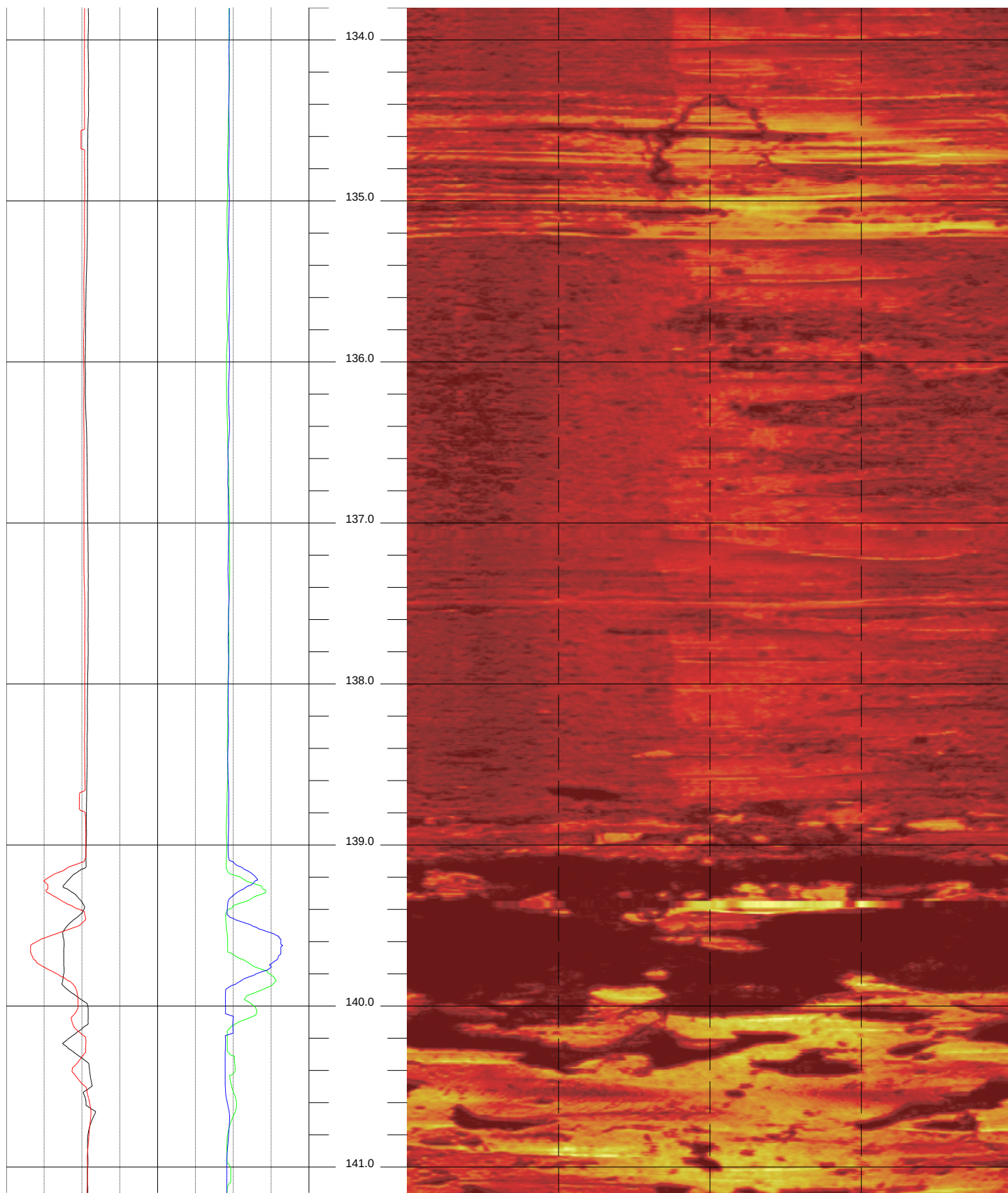


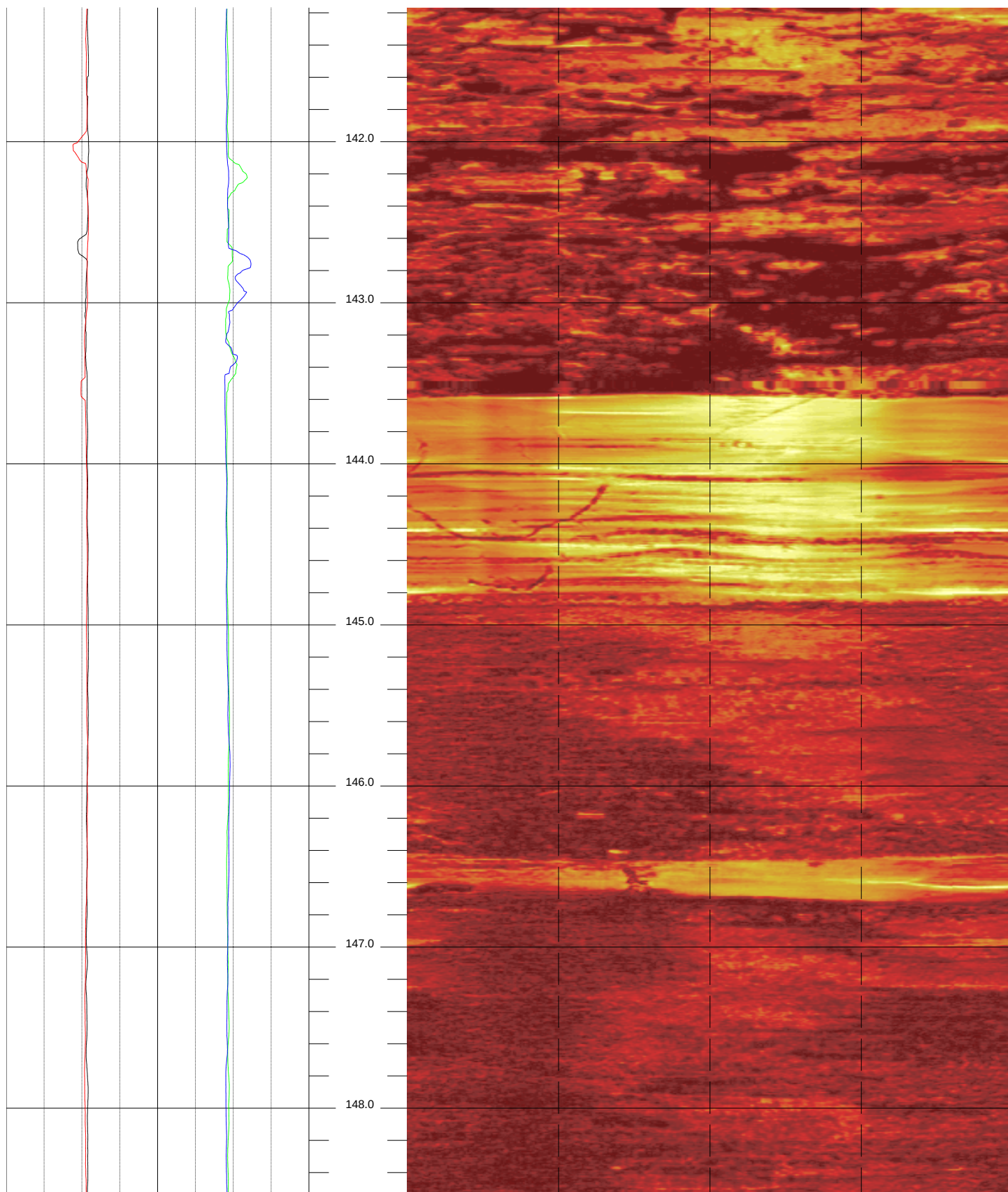


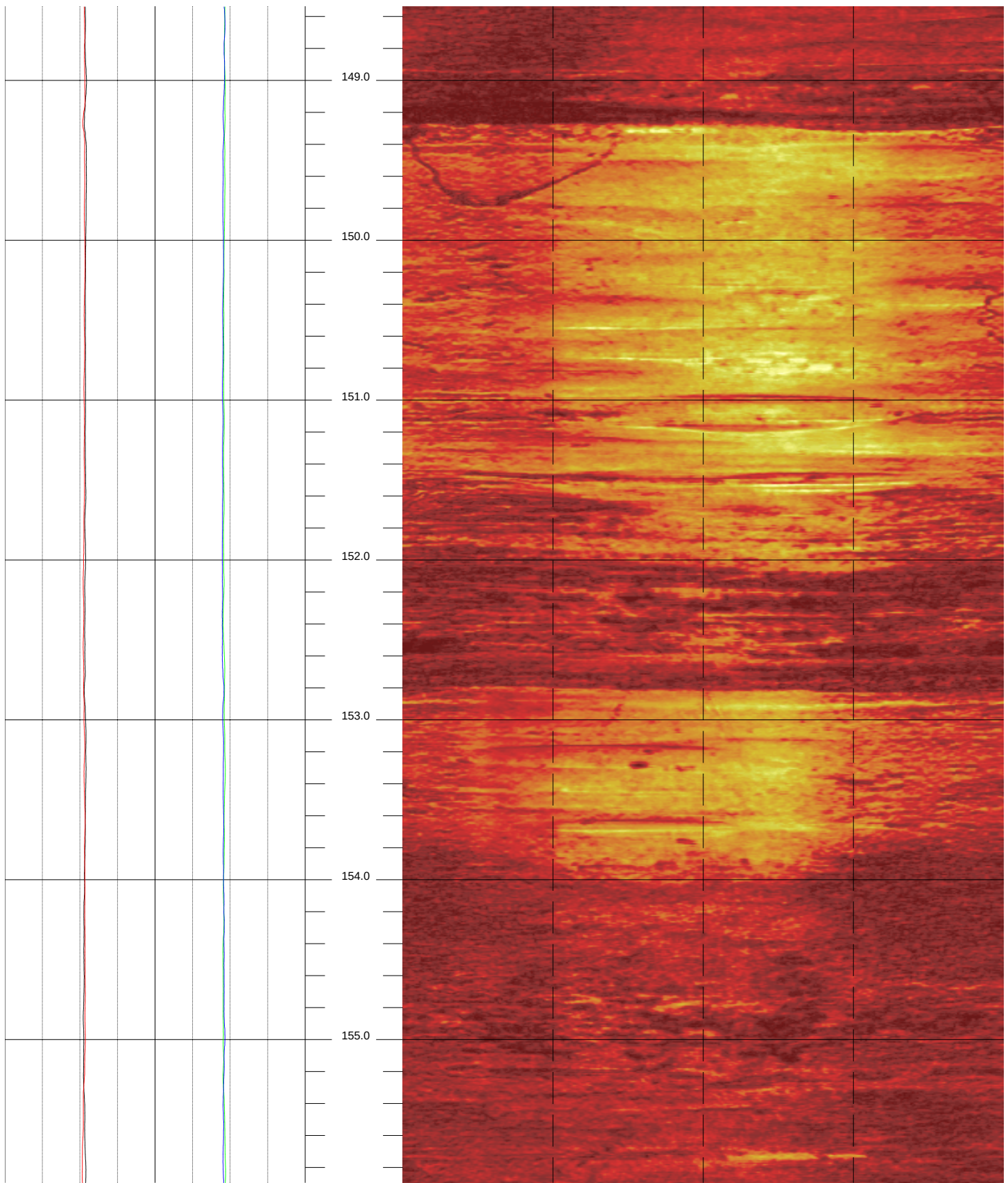


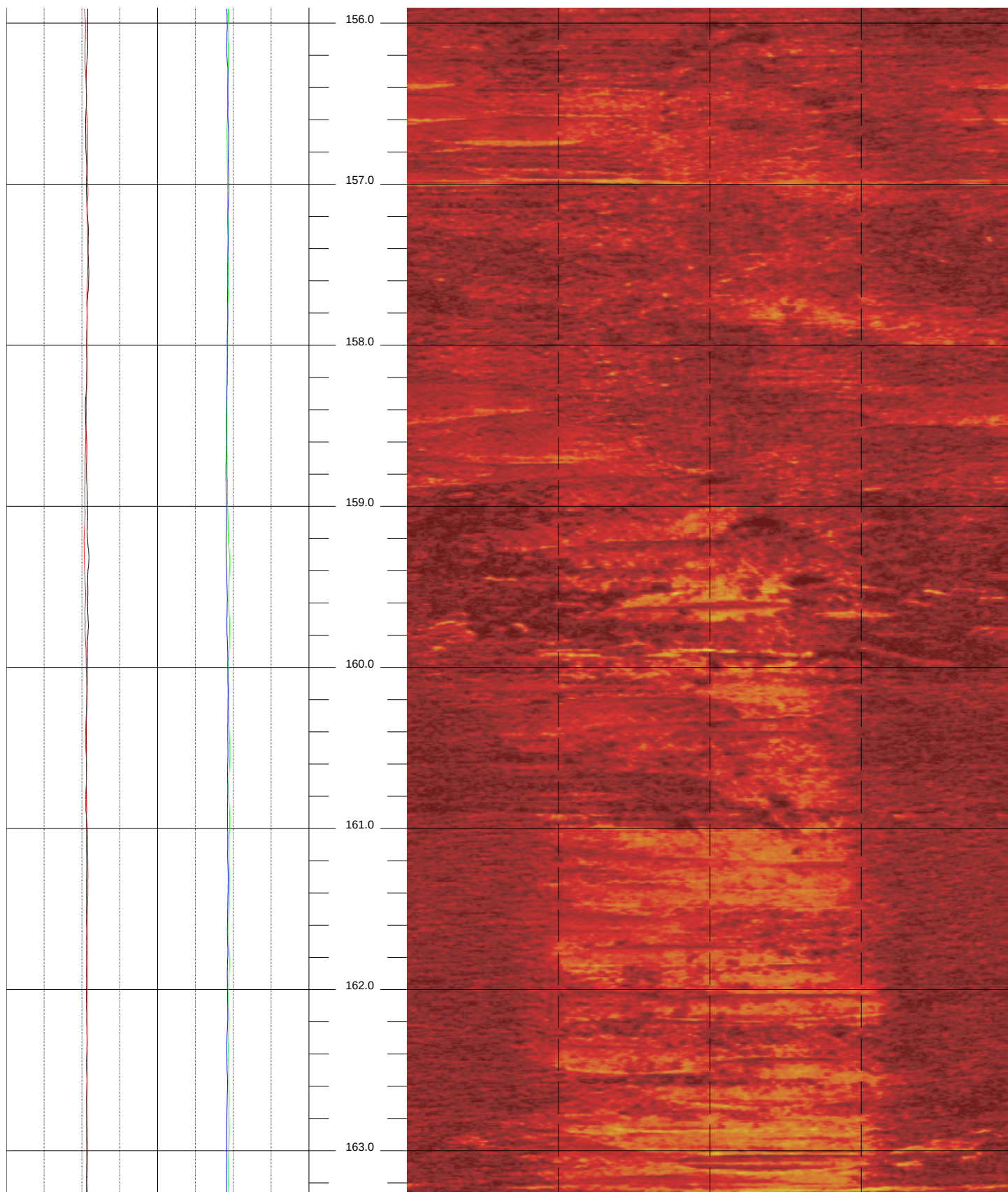


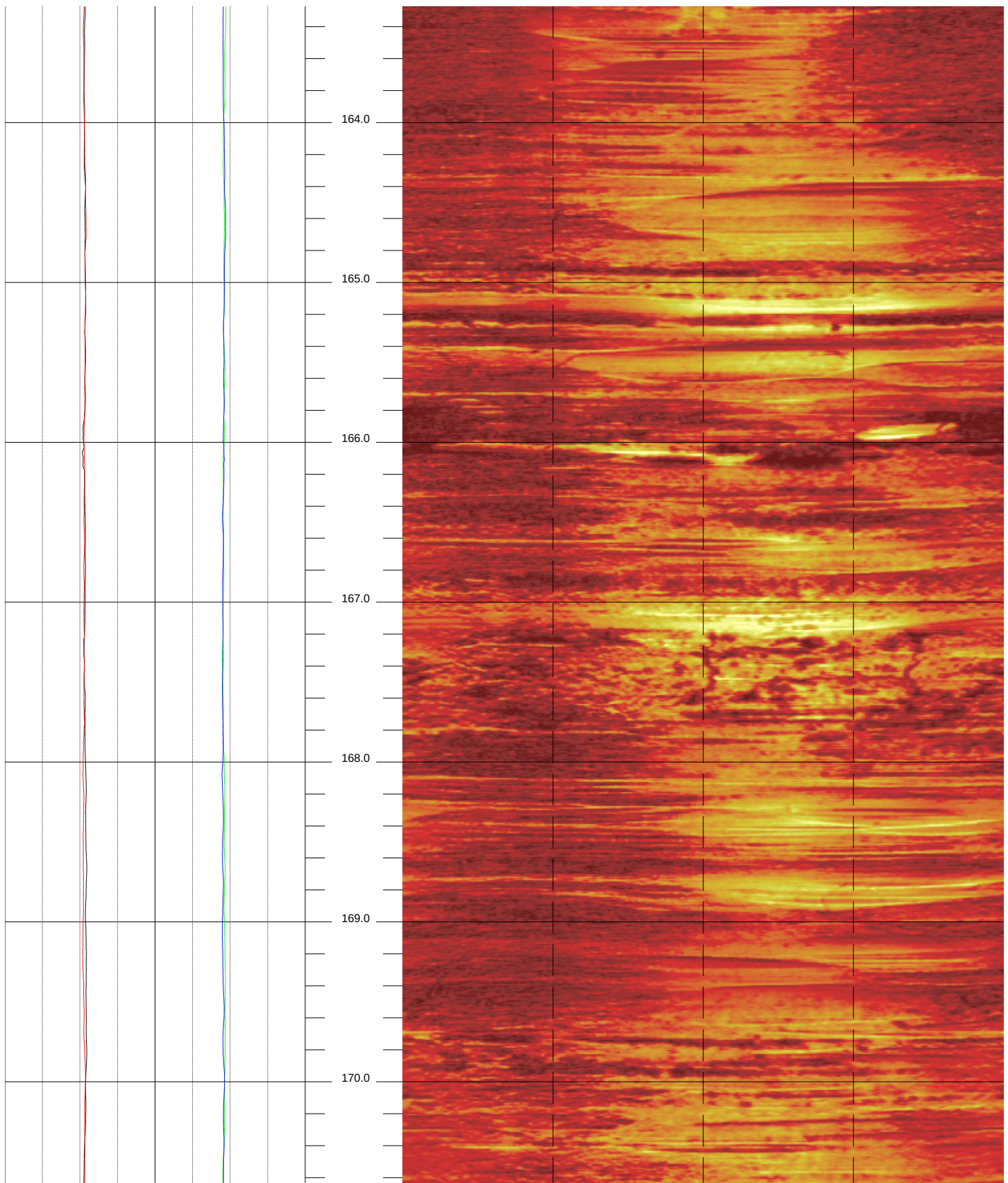


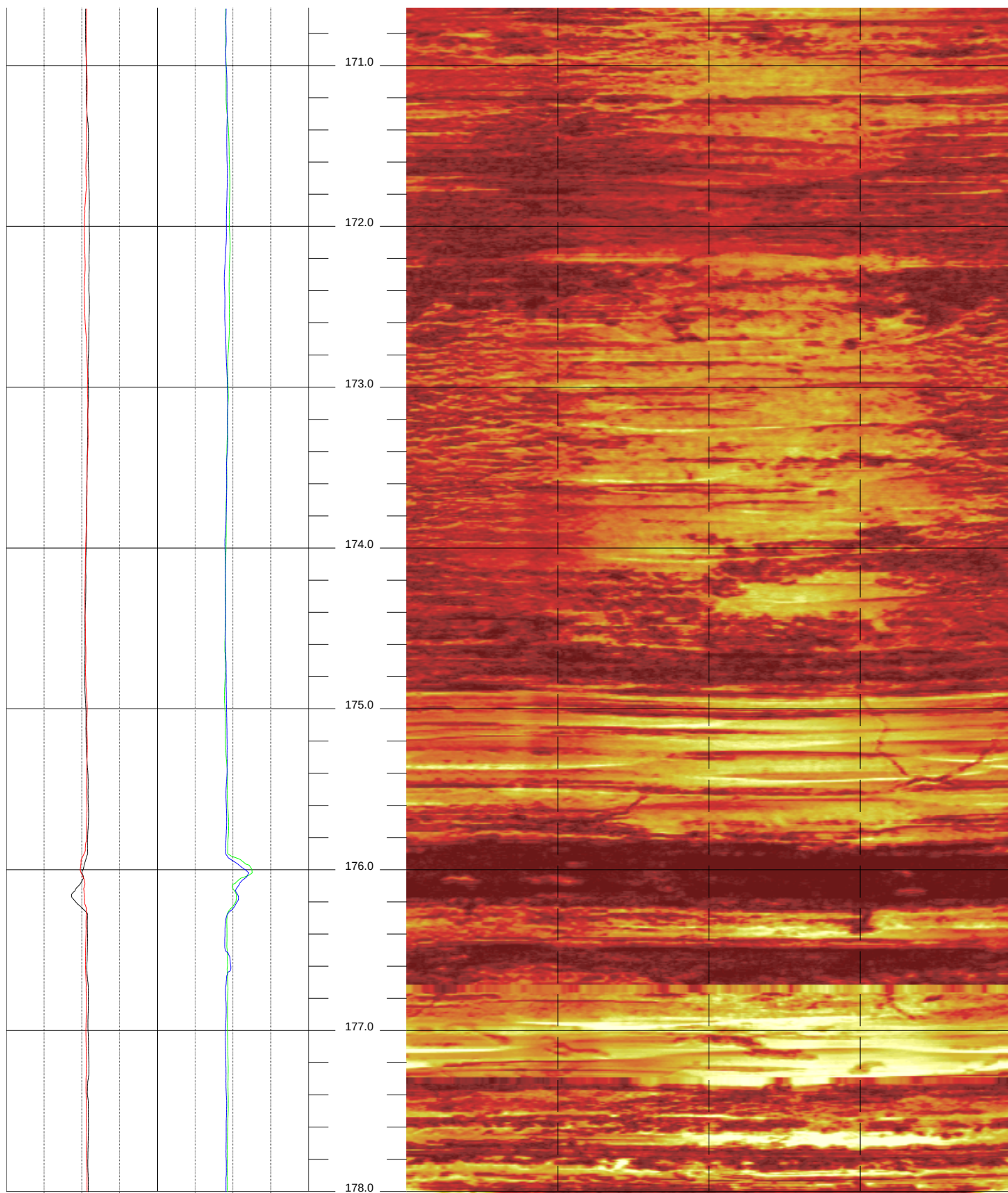


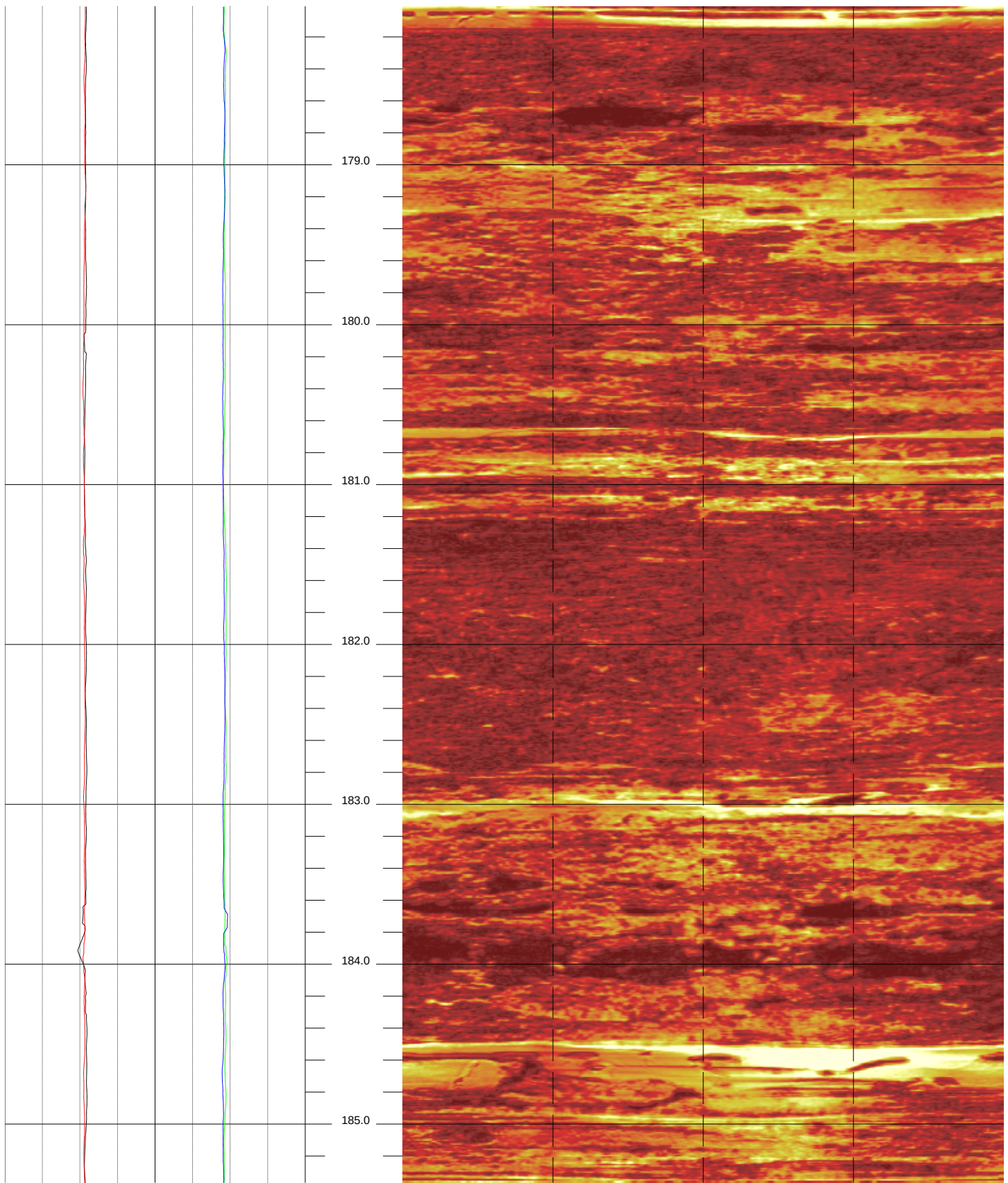


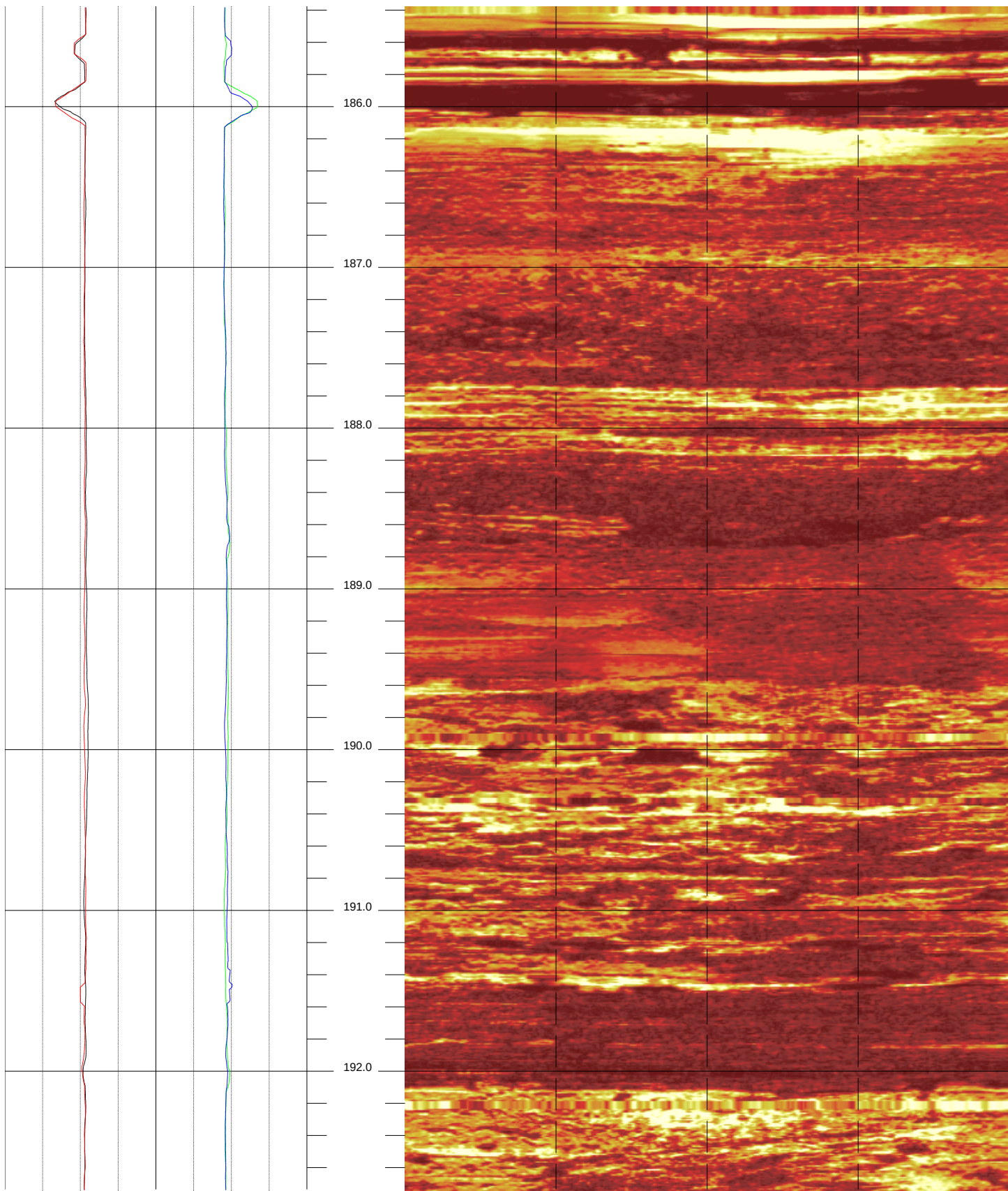


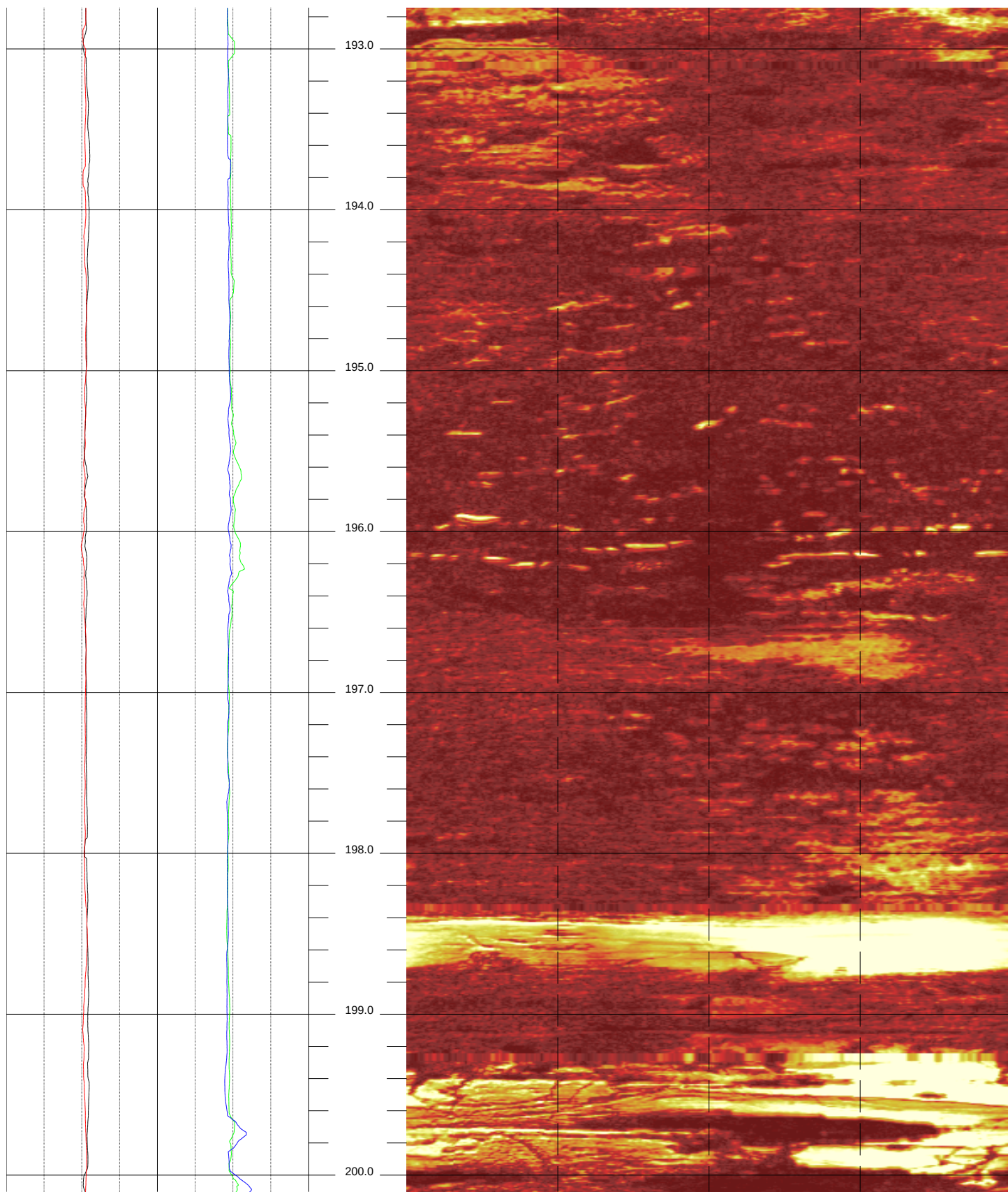


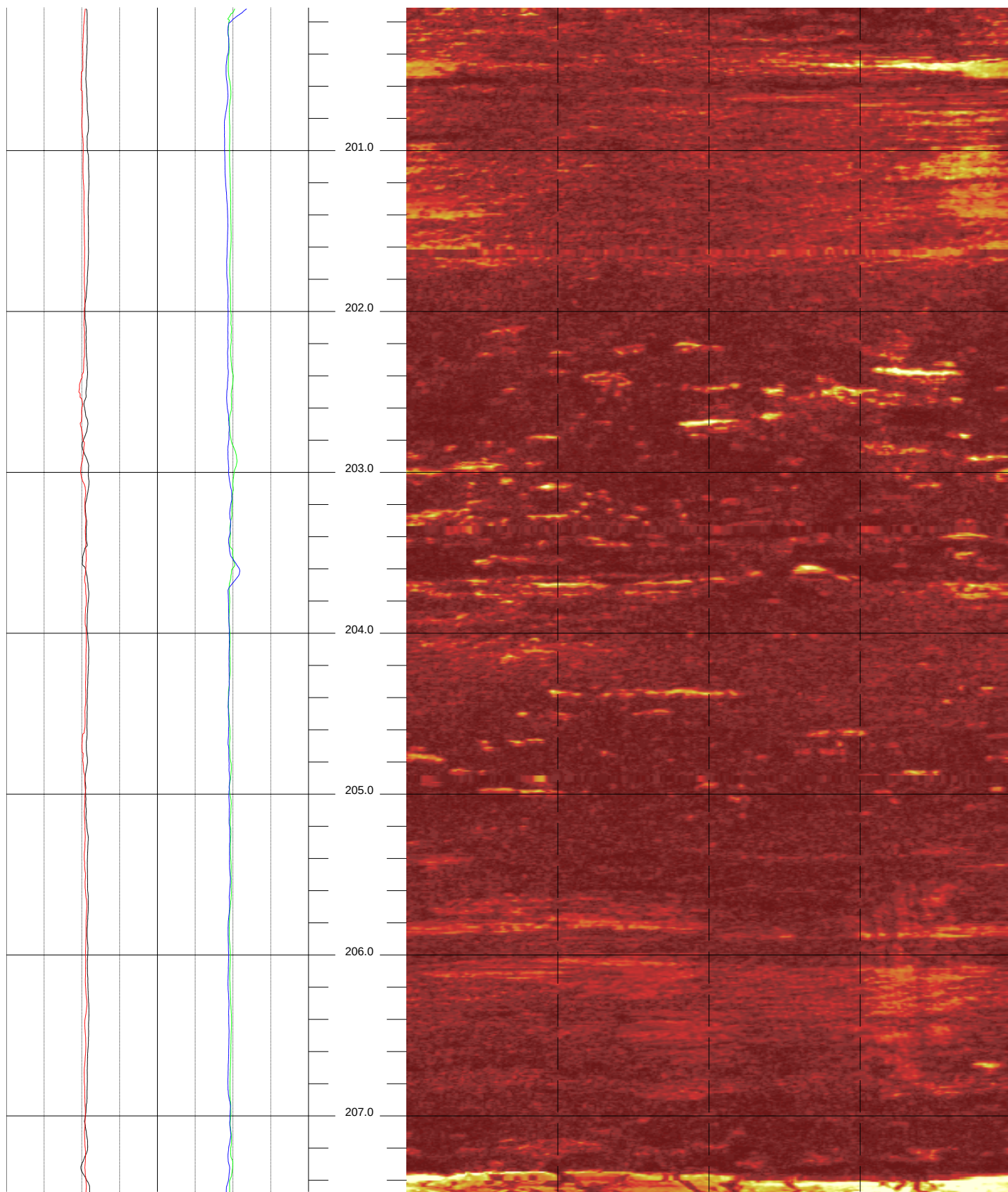


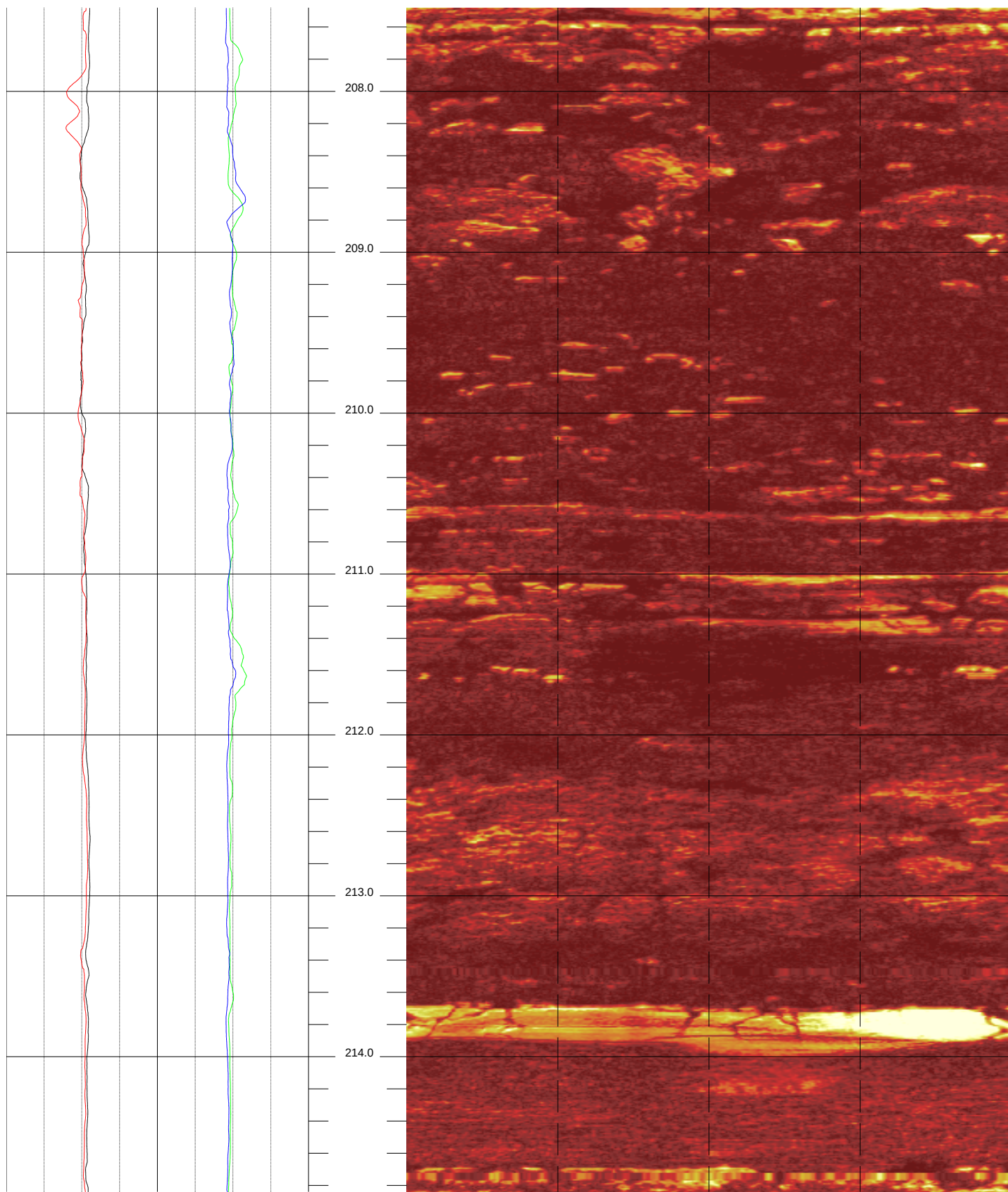


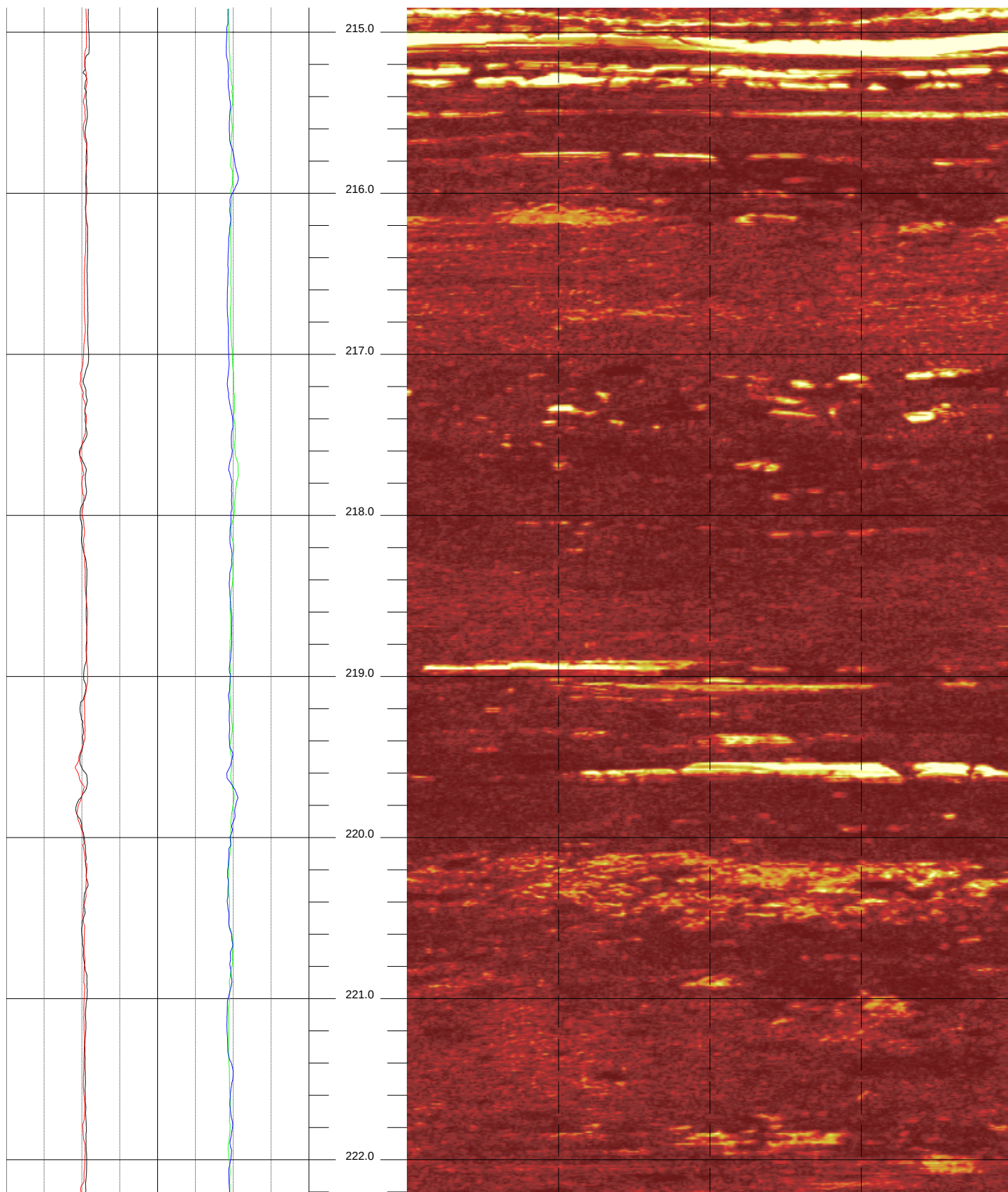


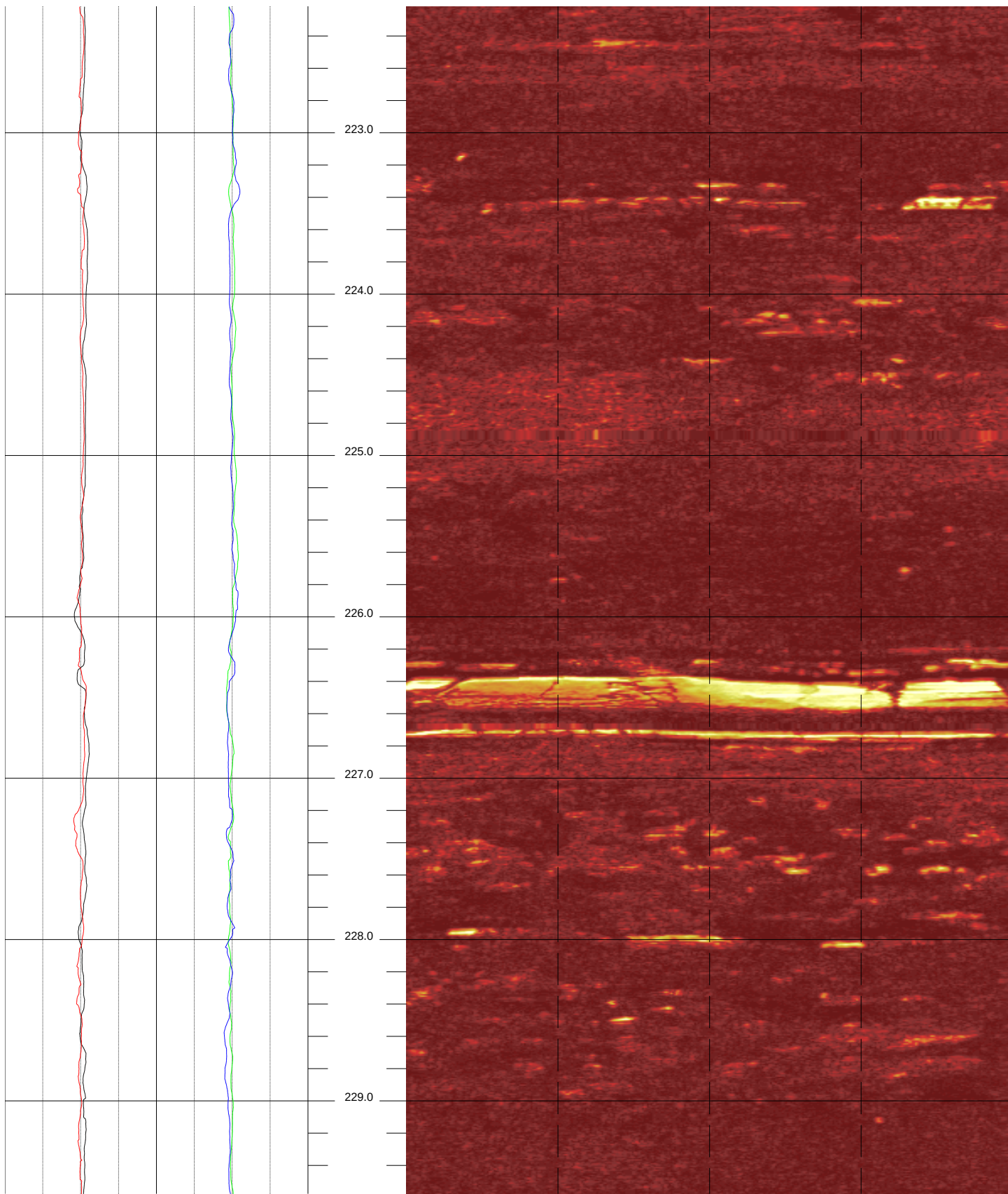


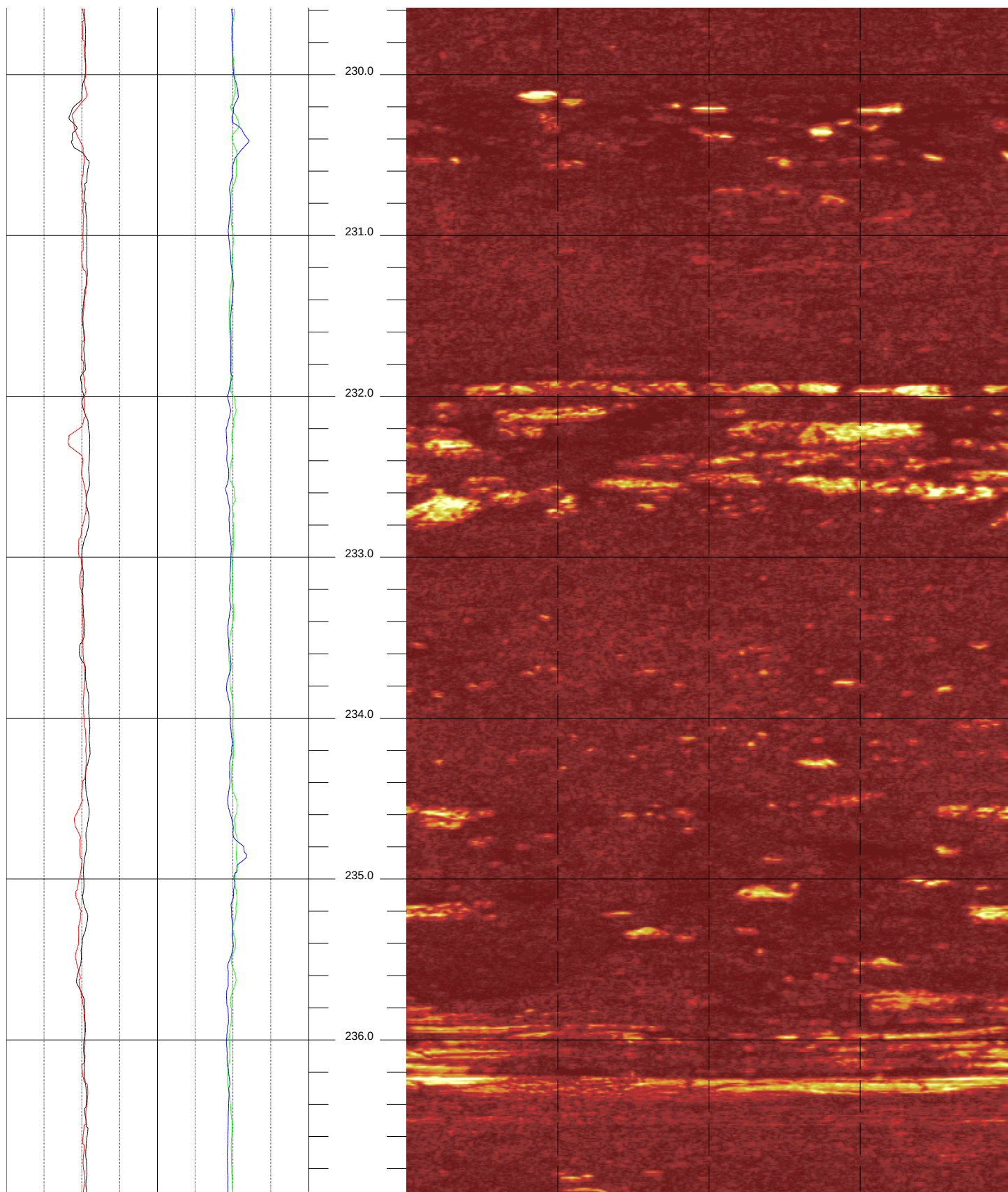


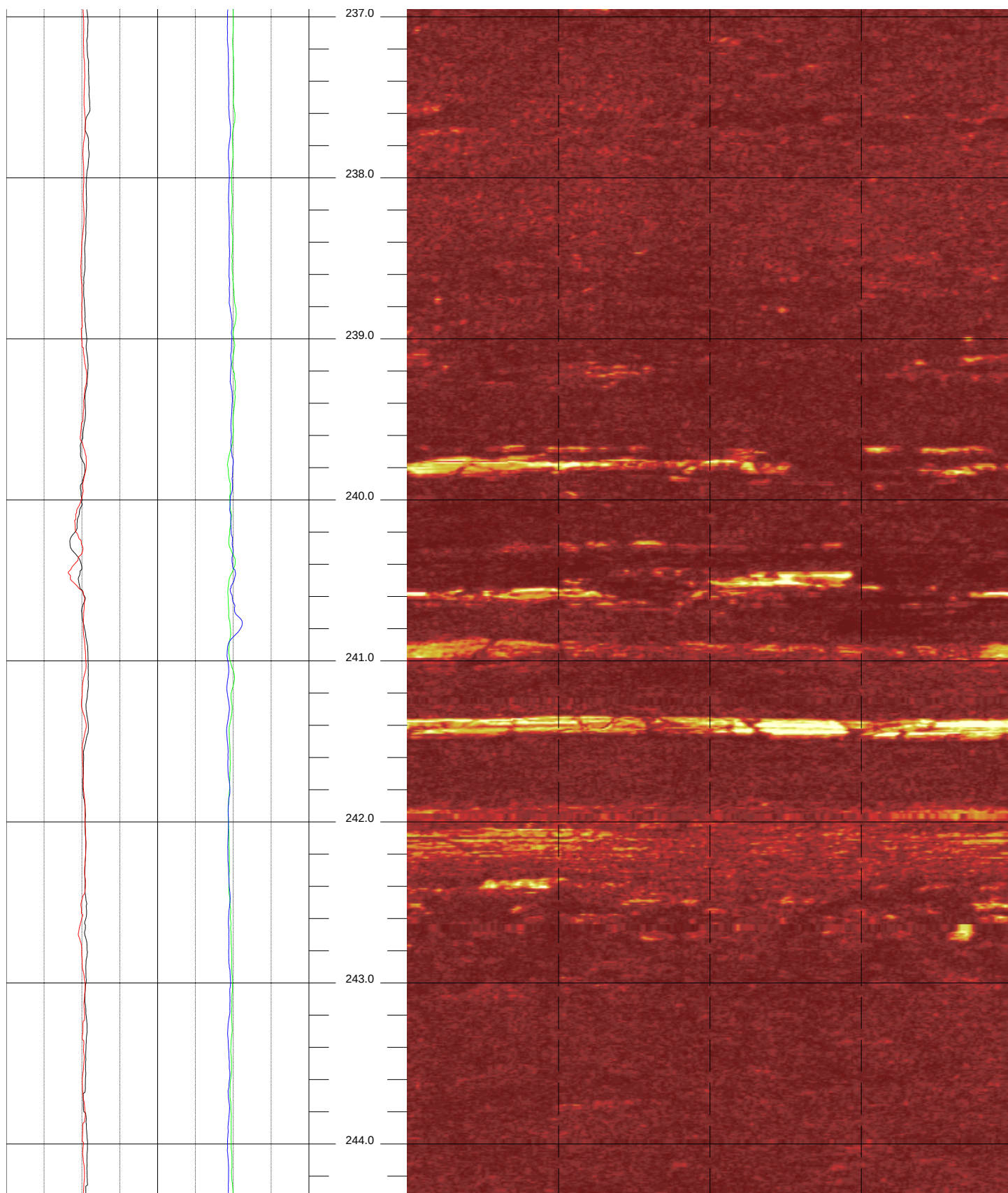


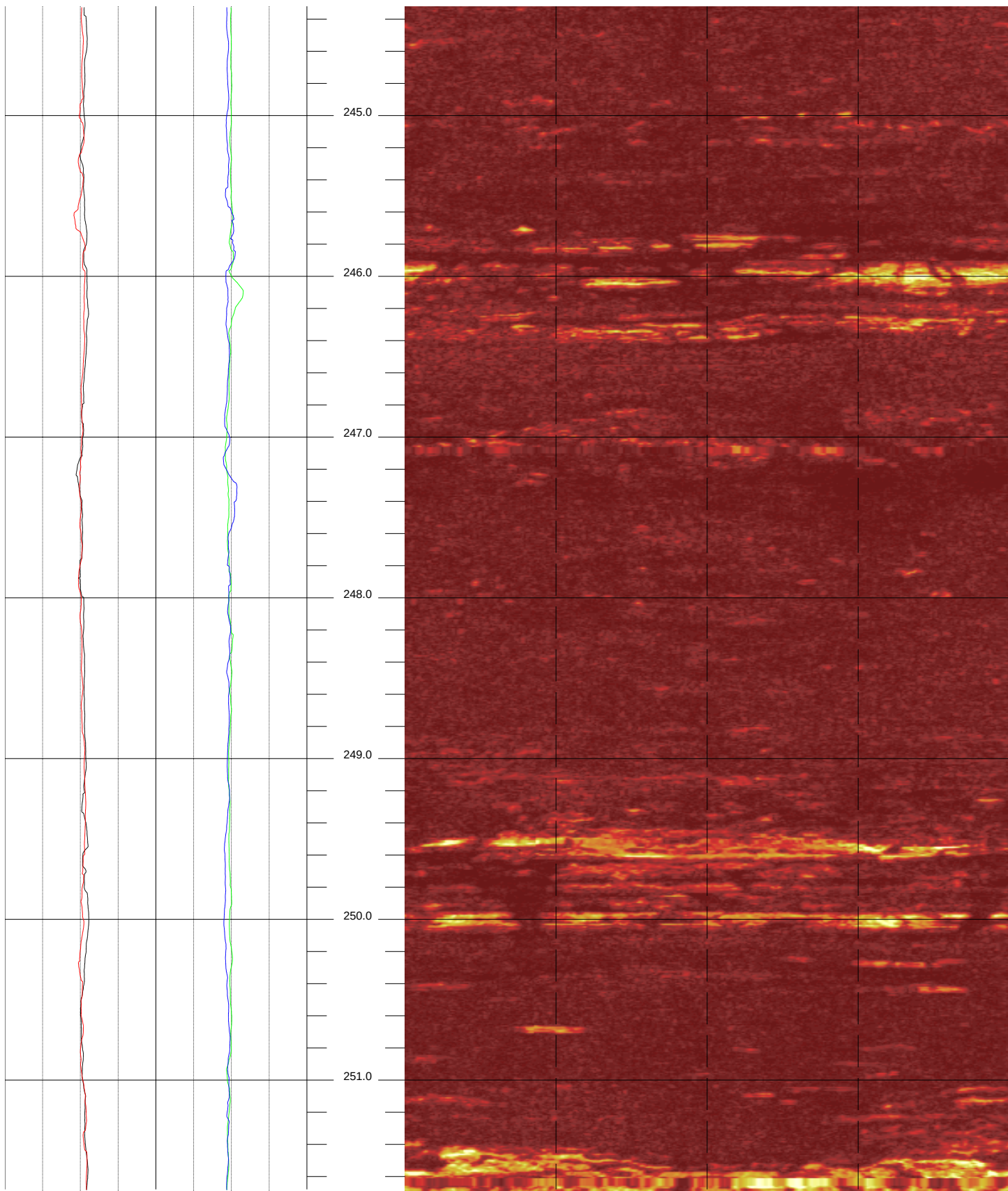


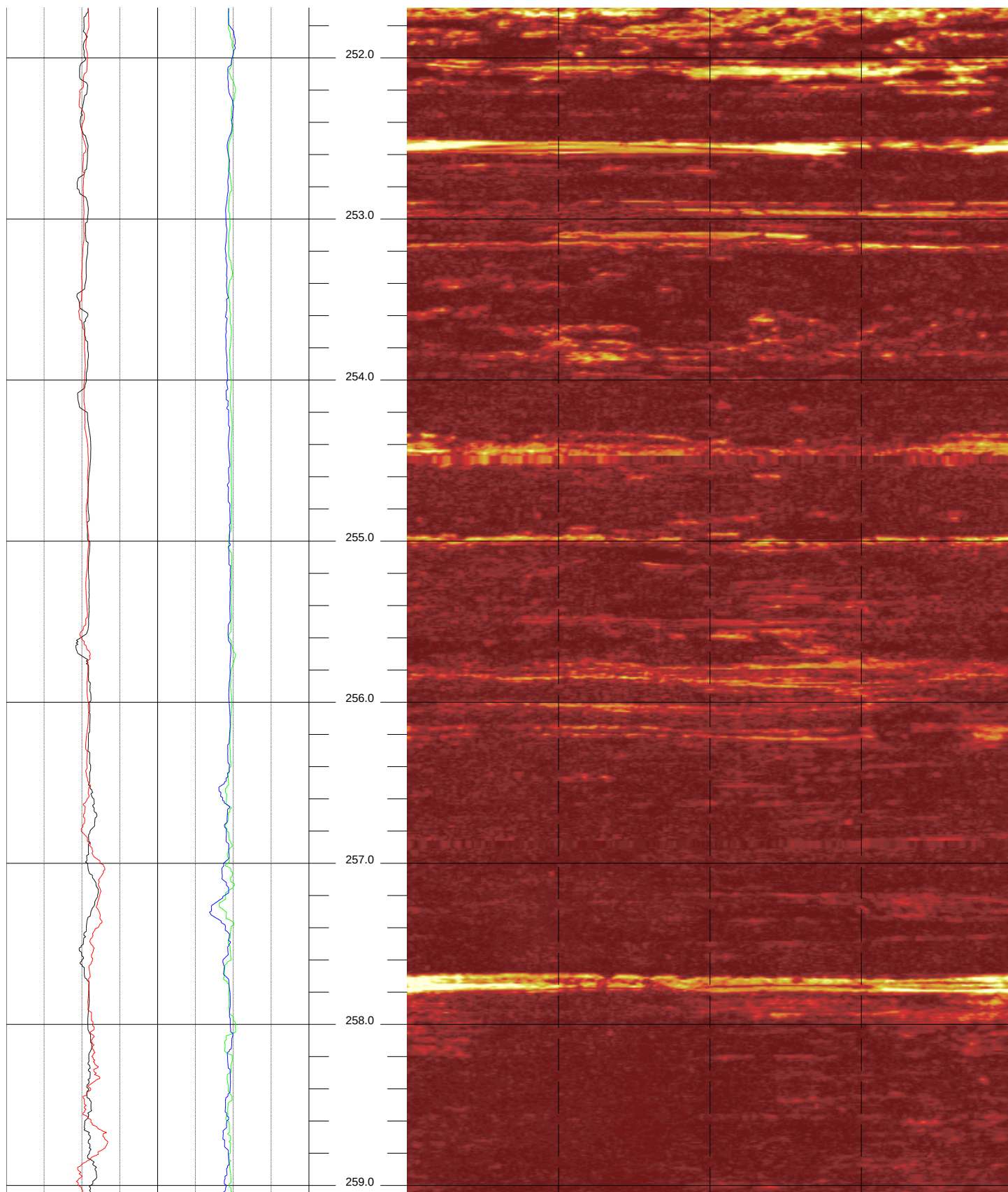


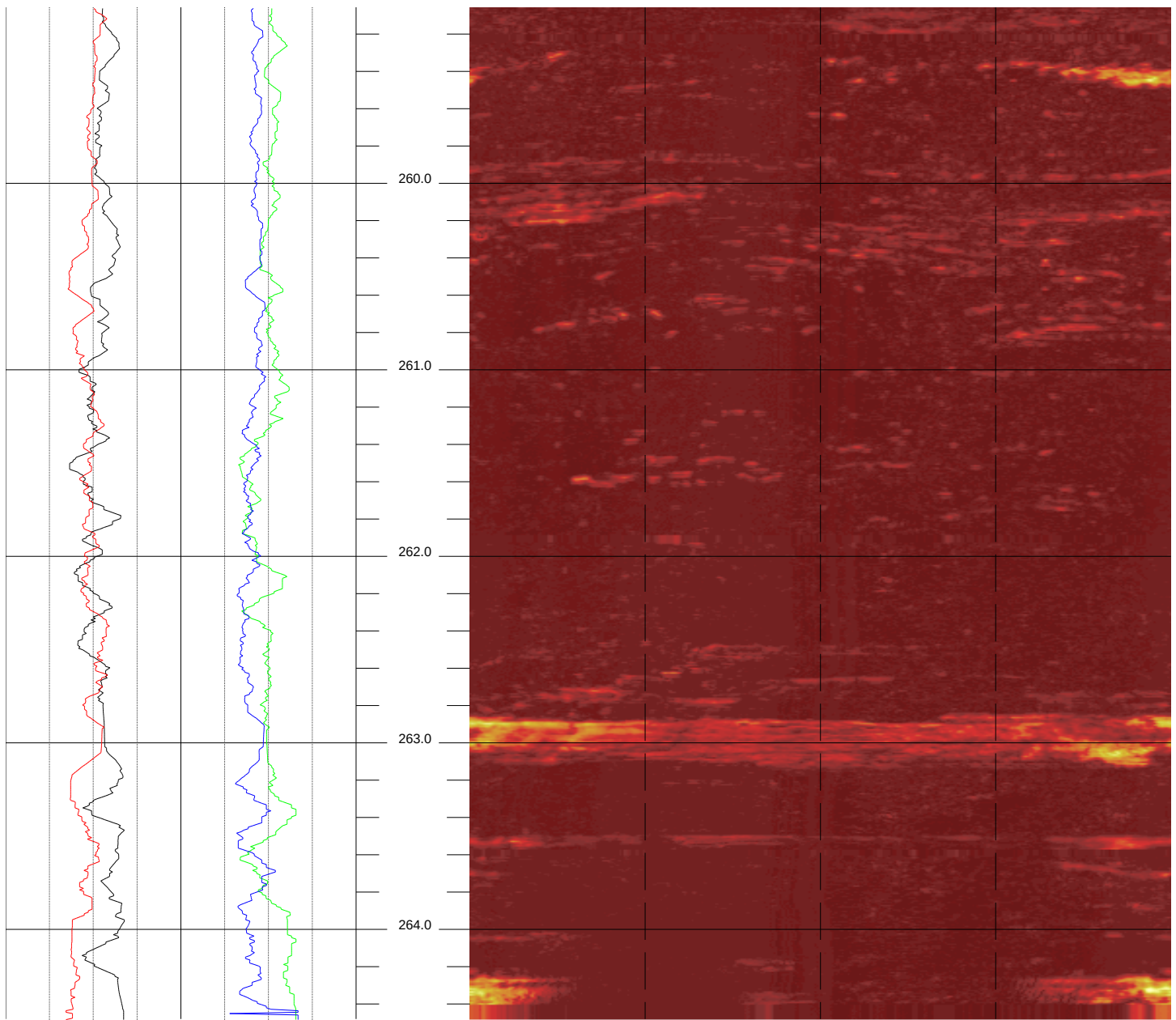








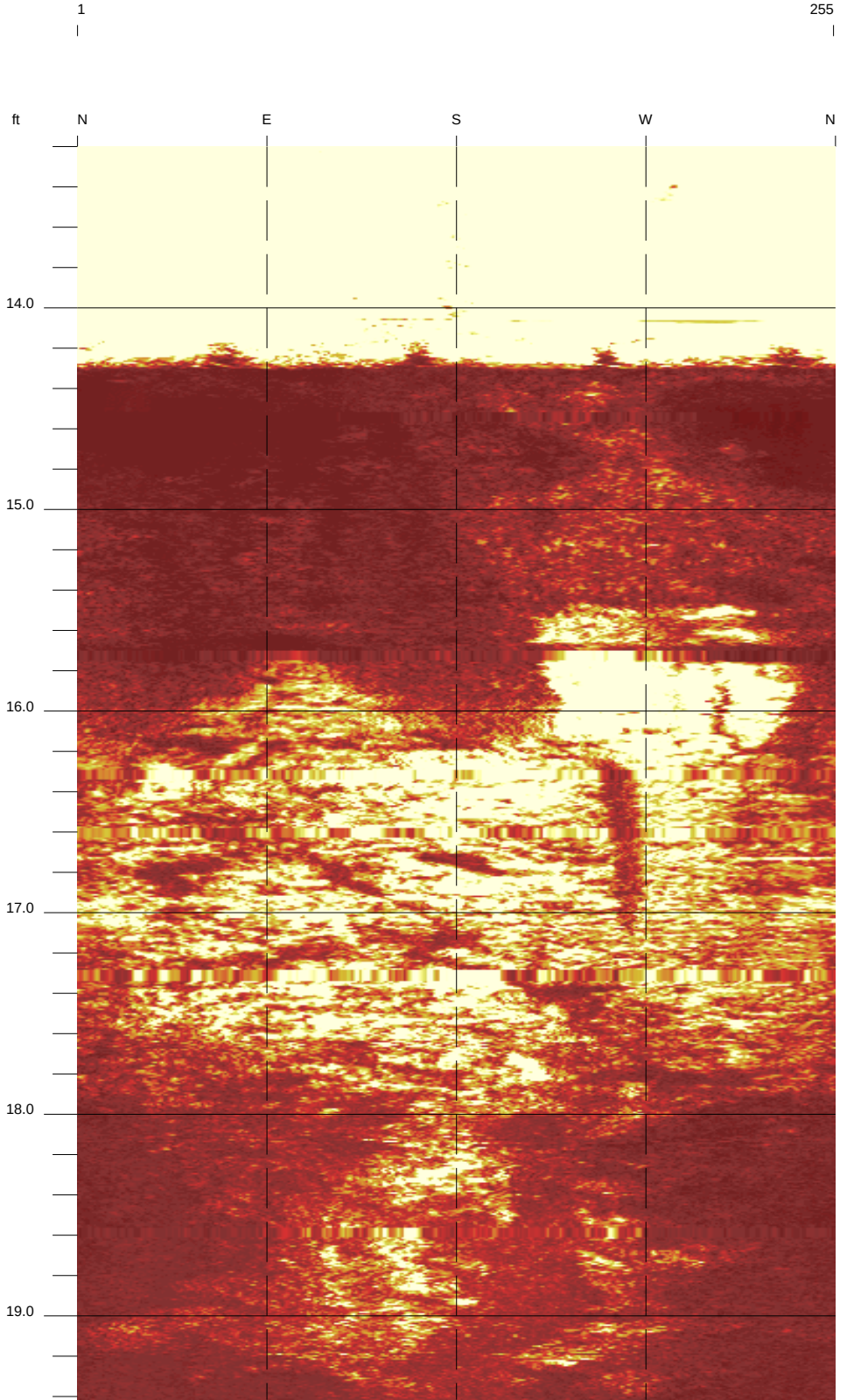
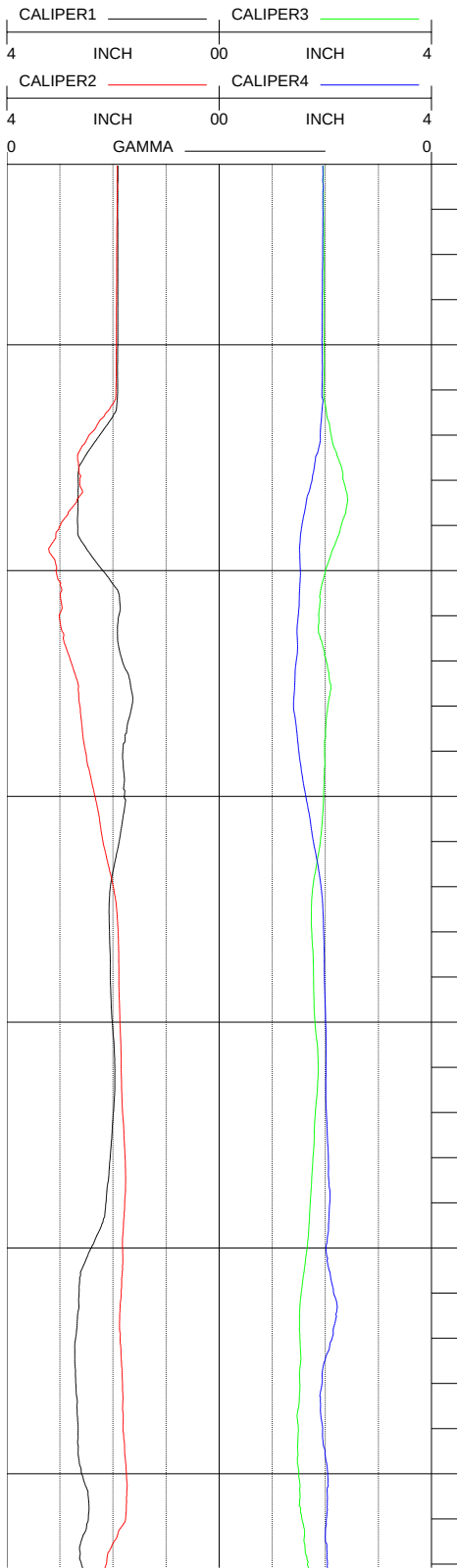


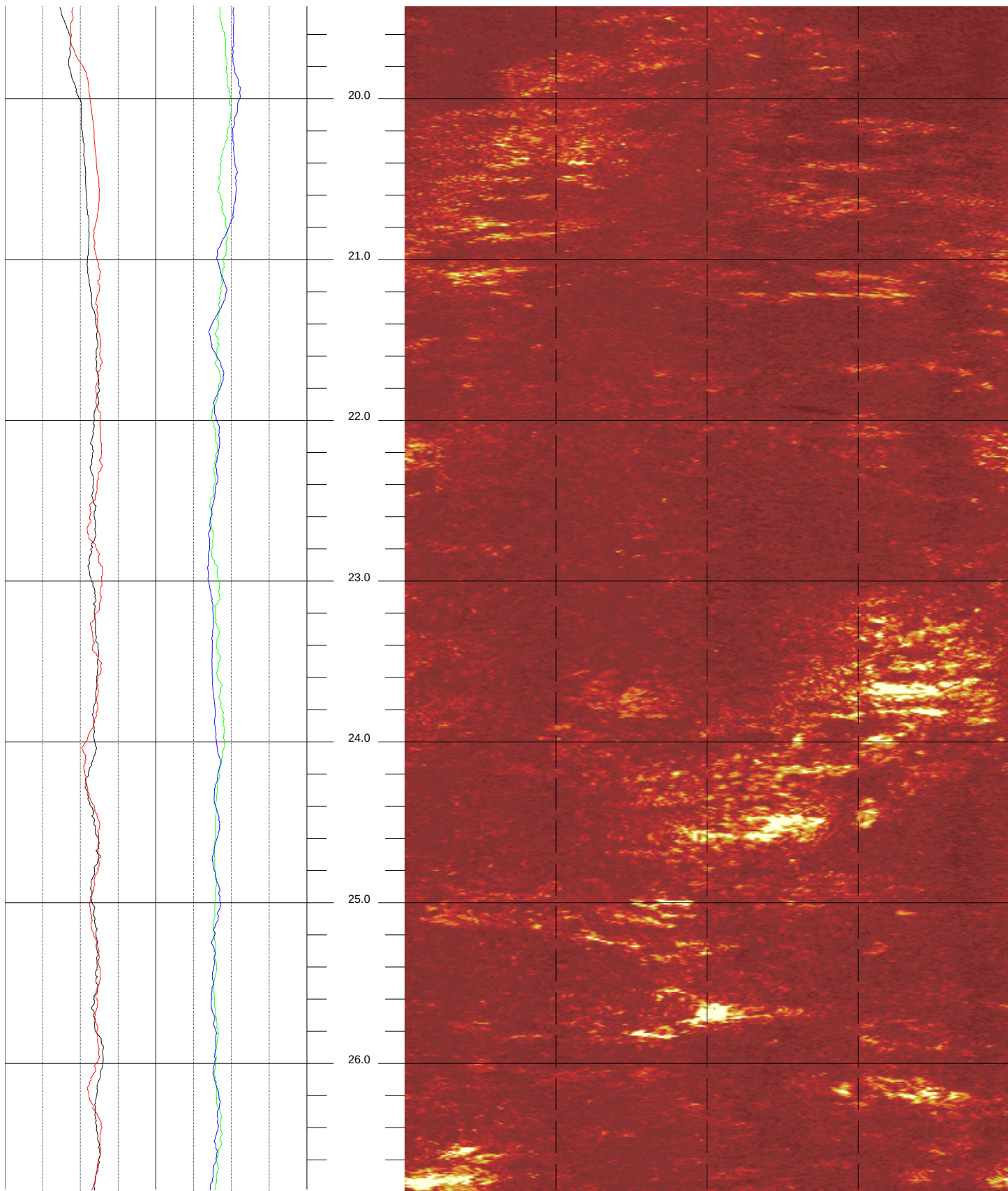


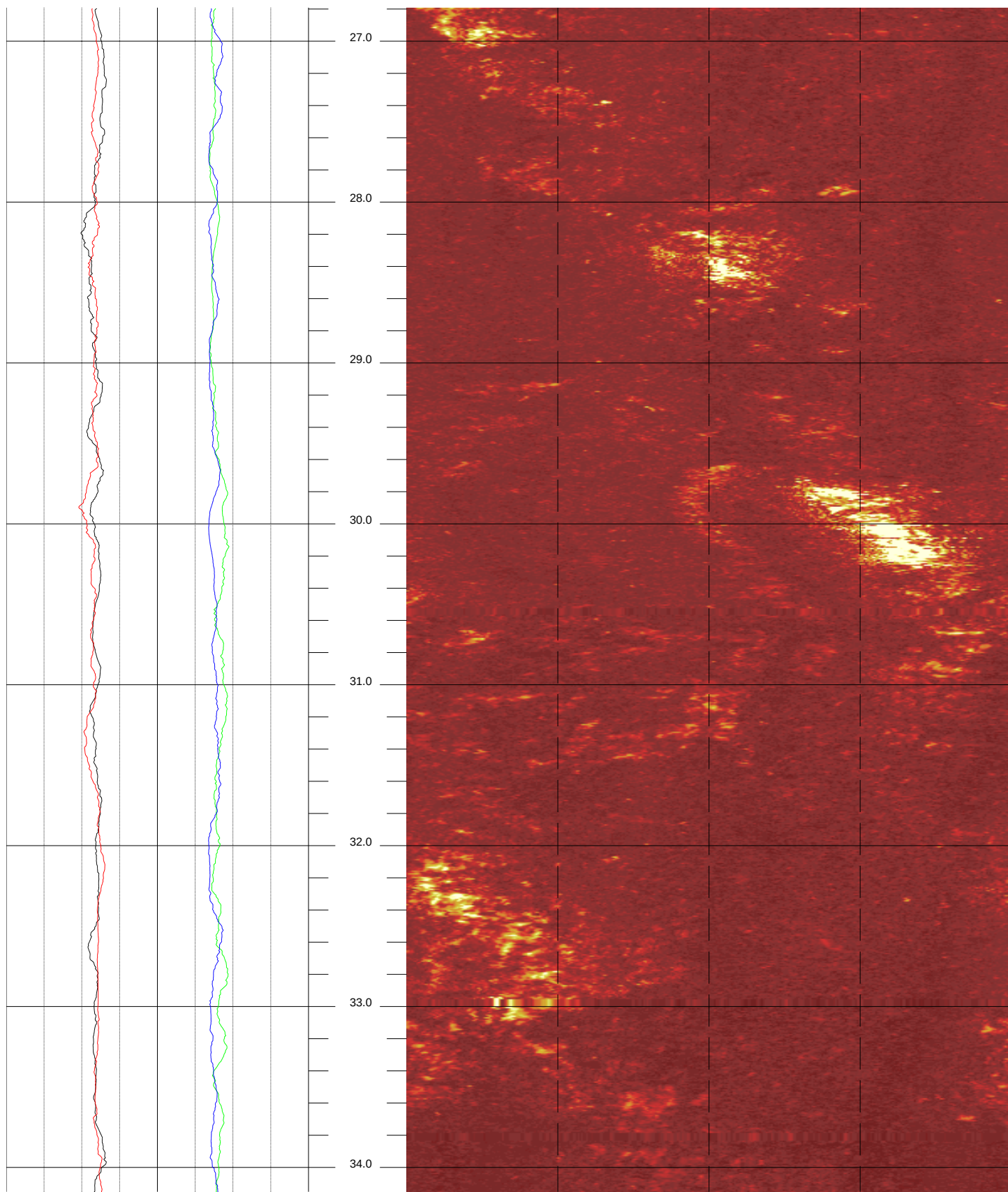
 ROBERTSON GEOLOGGING LIMITED	ROBERTSON GEOLOGGING TECHNOLOGY RGLDIP vsn 6.2 10 May 2008								
	BHTV ACOUSTIC CALIPER LOG 1/10								
COMPANY CH2M HILL WELL A-8 FIELD PEC LEVY COUNTY COLA COUNTRY LATITUDE - LONGITUDE - PROJECT PEF COLA				OTHER SERVICES					
PERM. DATUM LOG DATUM DRILL DATUM ELEVATION -				KELLY BUSHING 0ft DRILL FLOOR 0ft GROUND LEVEL 0ft					
		RunNo1		RunNo2		RunNo3			
DATE		21 Mar 2007		21 Mar 2007		21 Mar 2007			
RUN#		0		0		2			
TYPE OF LOG						ACOUSTIC			
DEPTH DRILLER		0		0		265			
DEPTH LOGGER		0		0		263			
LOG DEEPEST		0		0		260			
LOG SHALLOW		0		0		3			
FLUID IN HOLE						DRILLING MUD			
SALINITY									
DENSITY									
LEVEL									
MAX TEMP (C)		0		0		0			
RIG TIME									
RECORDED BY						C. CARTER			
WITNESSED BY									
RUN#	BIT RECORD			CASING RECORD					
	BIT	FROM	TO	SIZE	WEIGHT	FROM	TO		
0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0		
2	0	0	0	0	0	0	0		
REMARKS LOG FILE: C:\Rgldip\Well\Data\A8AUUP01AUUP02.btv 260.400 to 13.200ft									

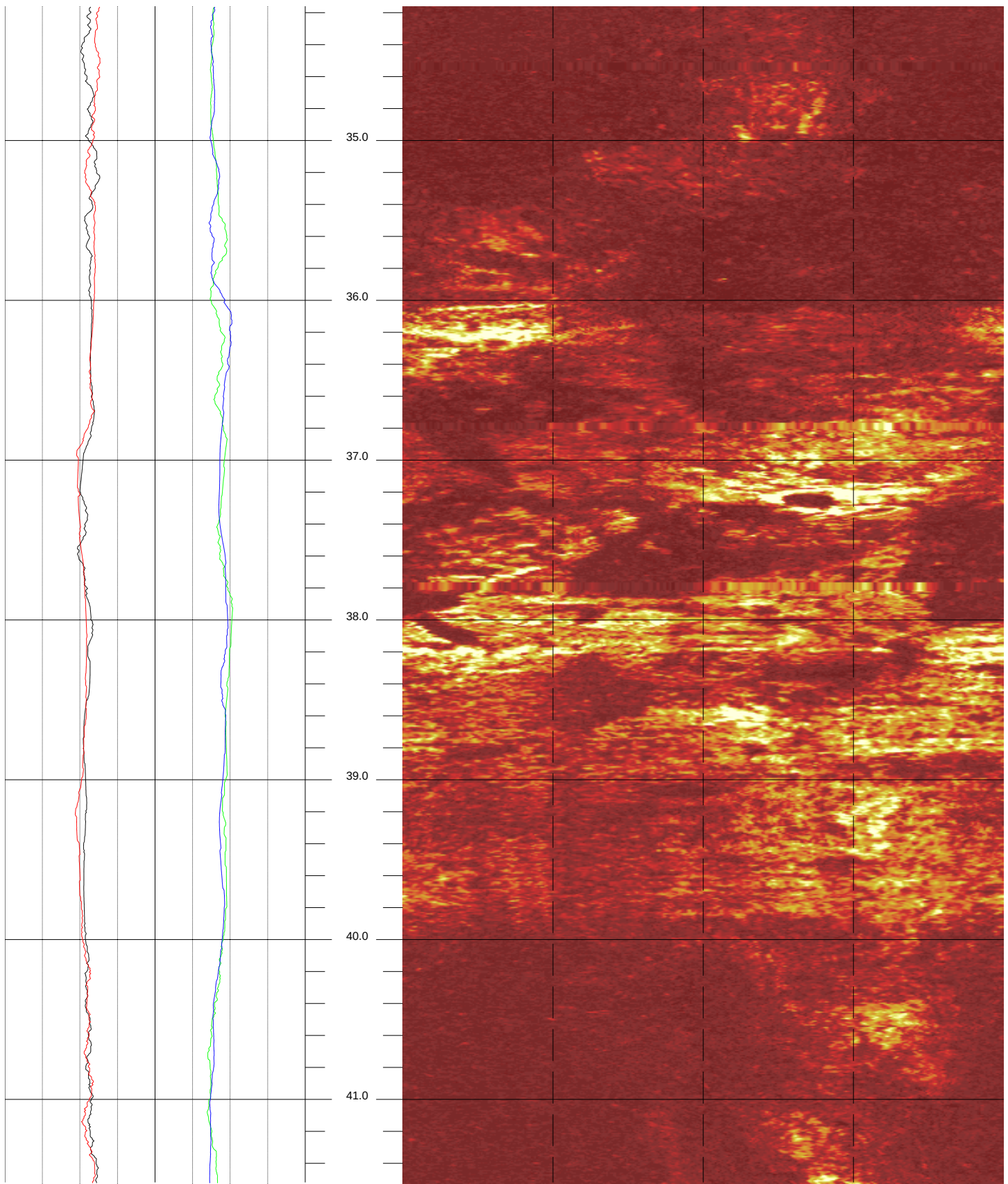
Depth interval 0.008ft, Filter length 0.248ft

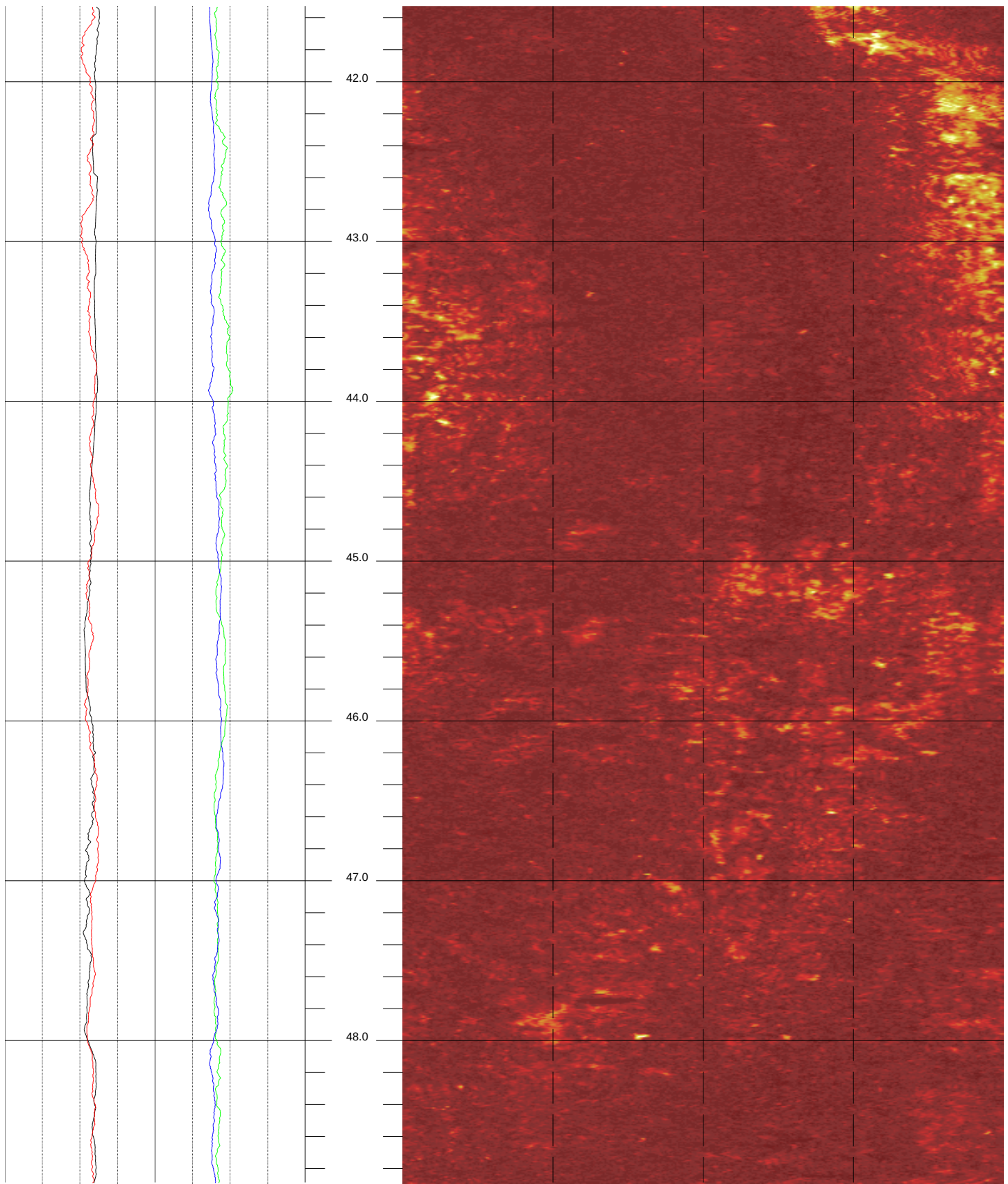
REFLECTANCE

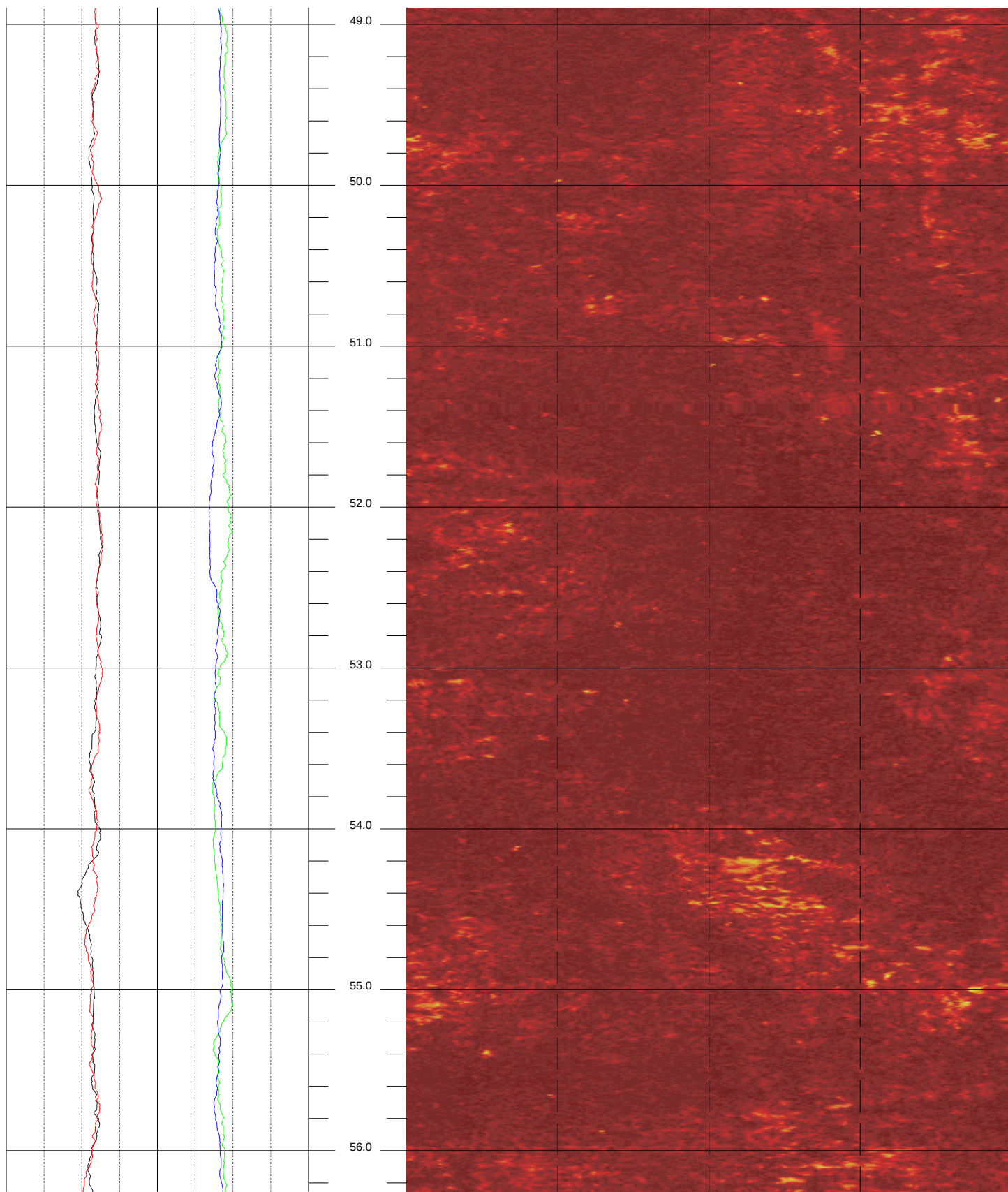


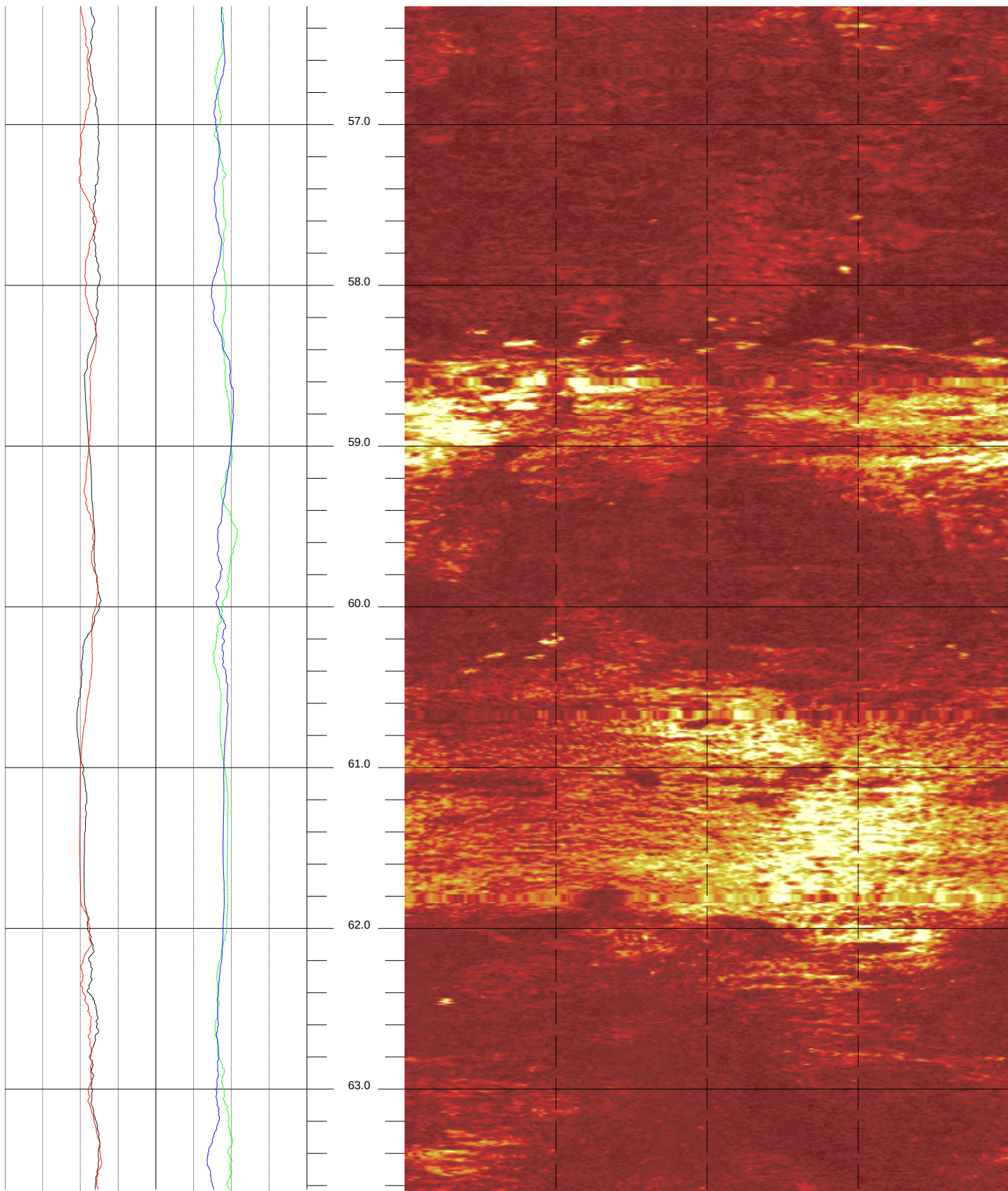


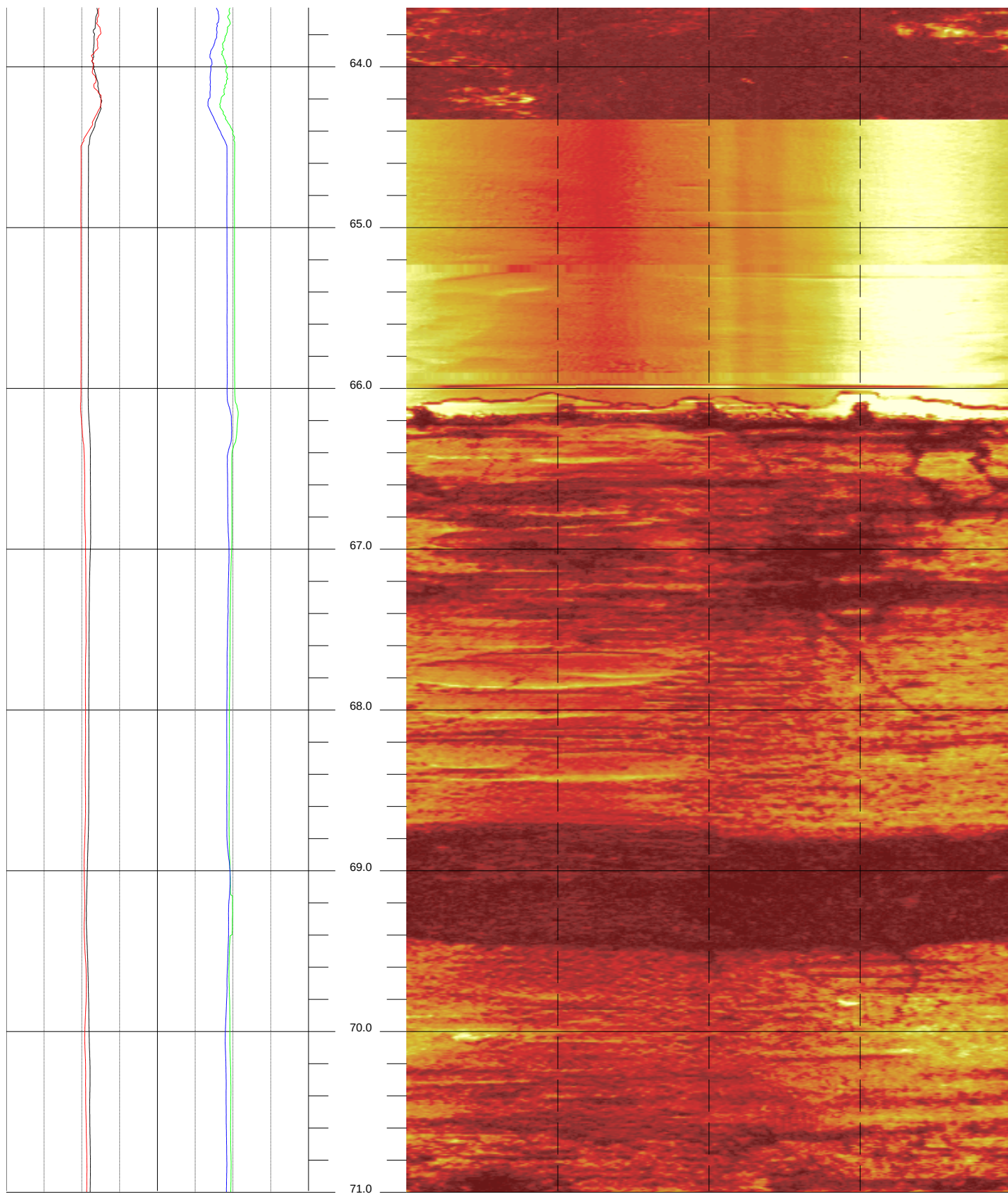


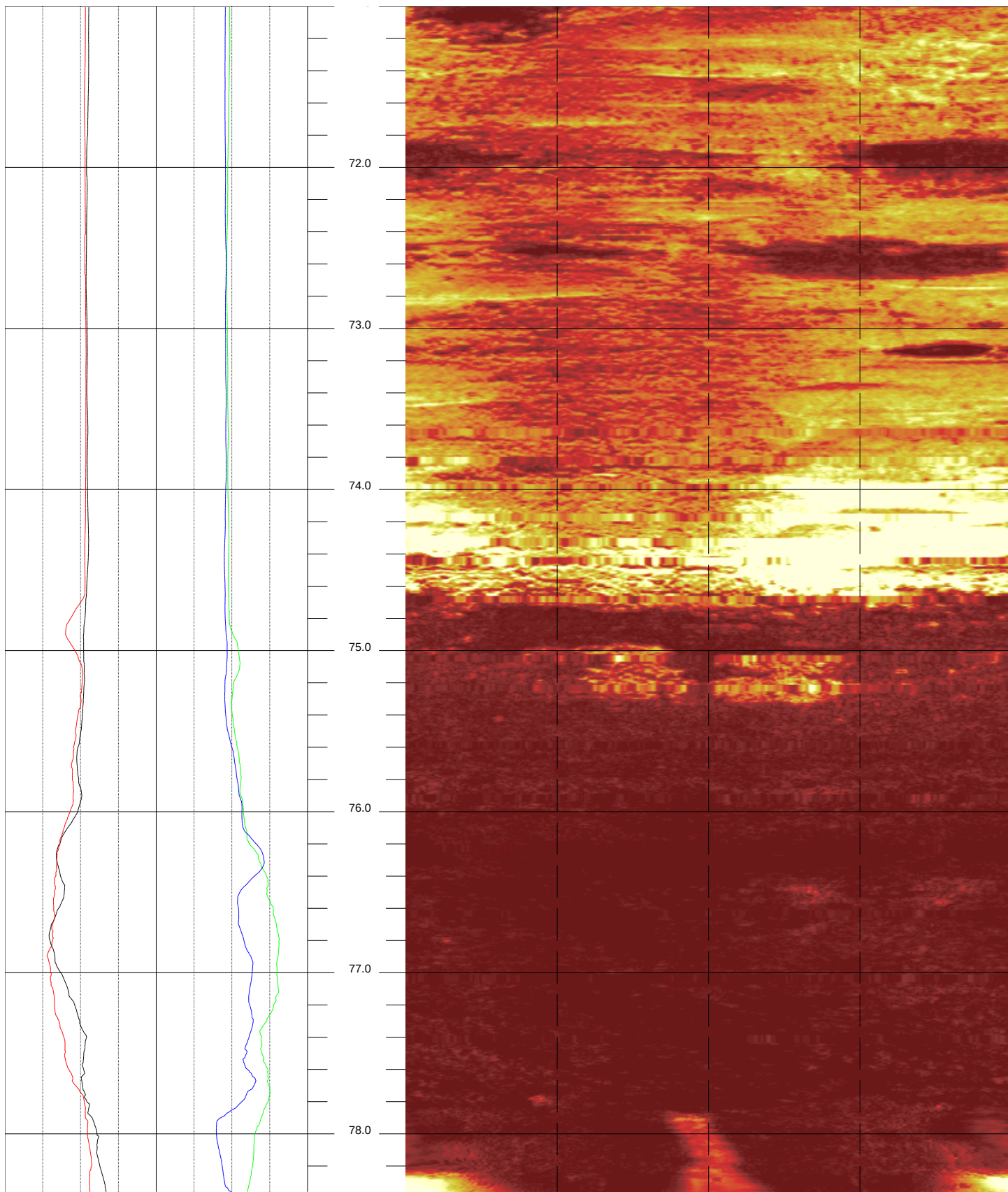


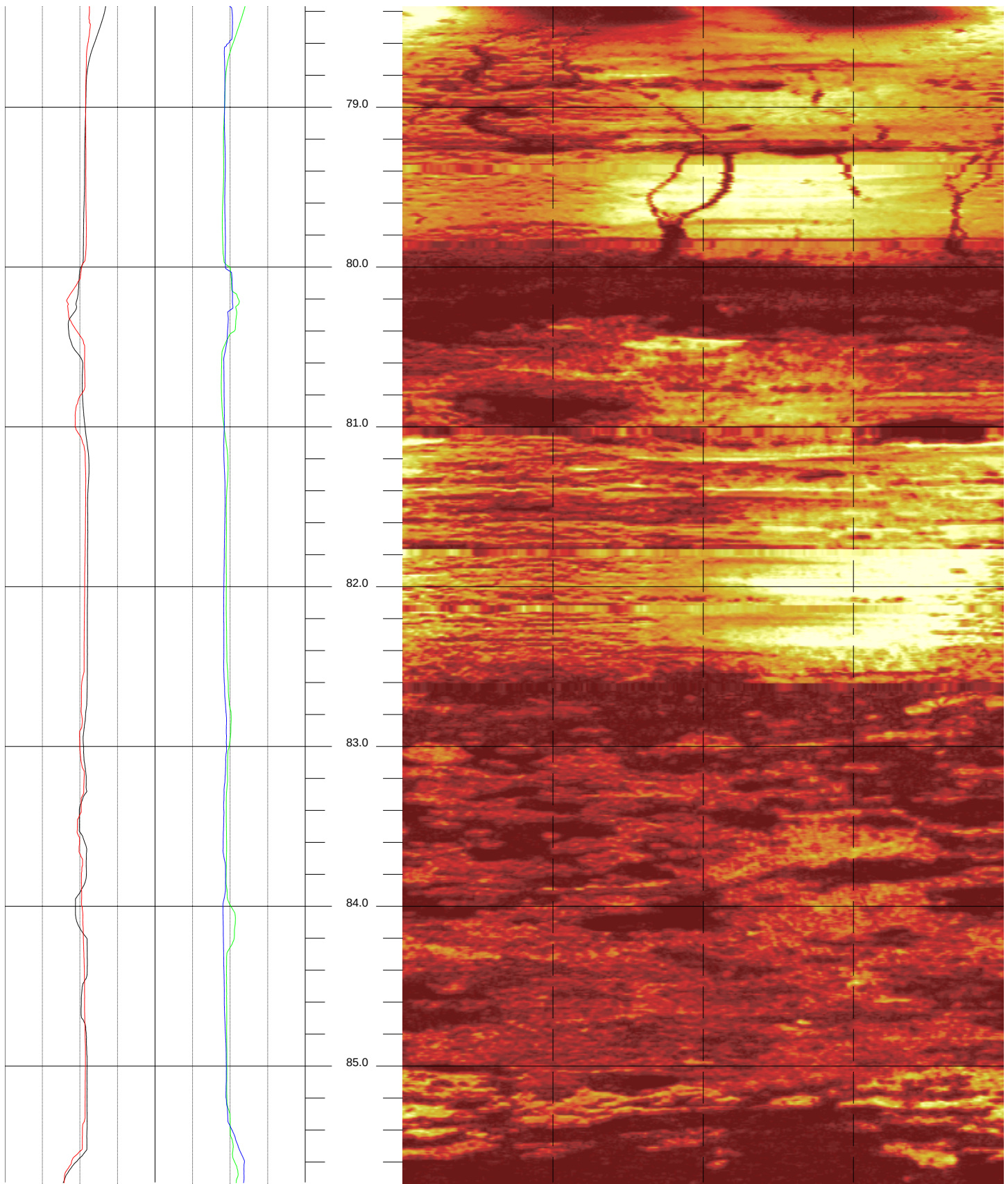


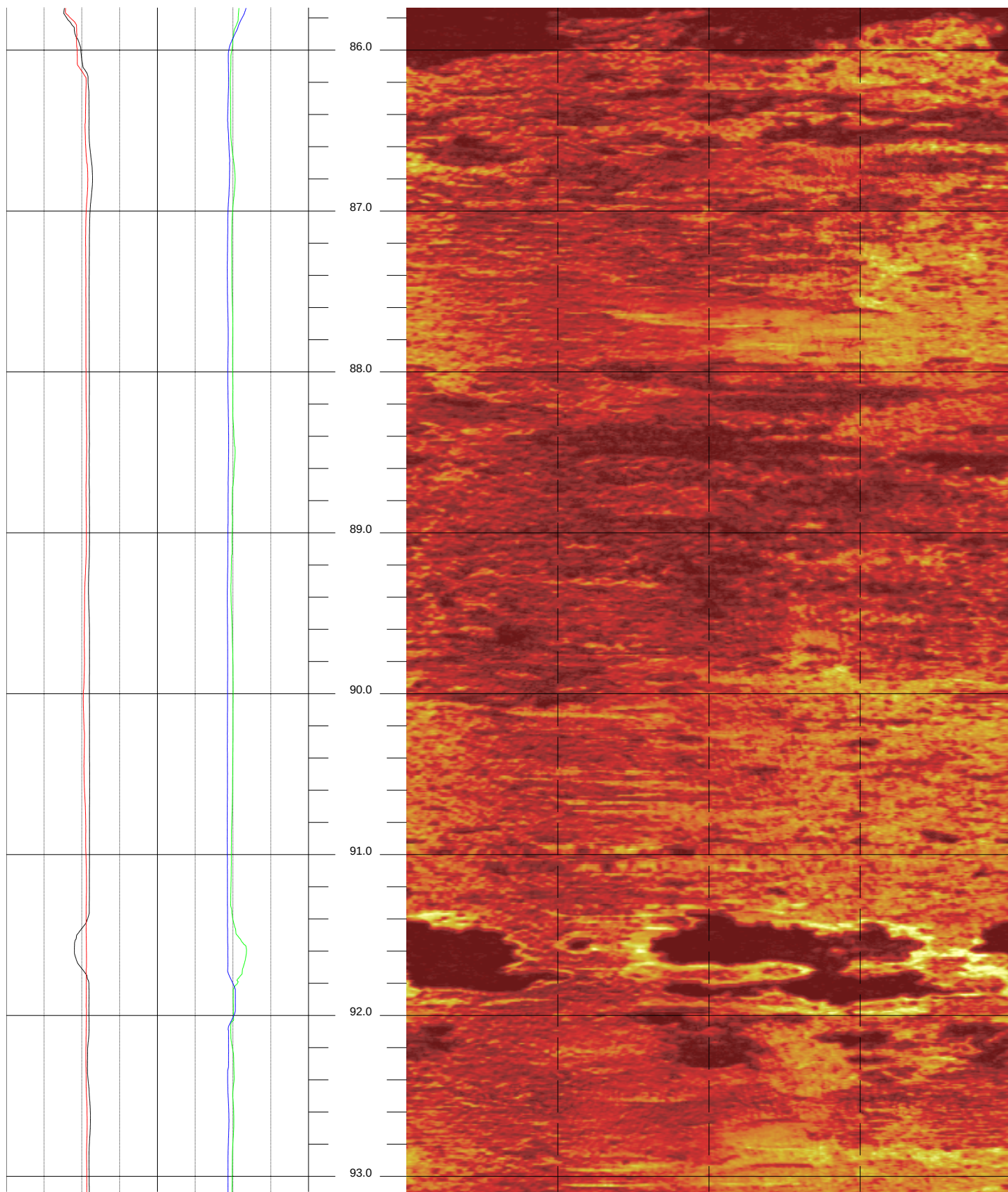


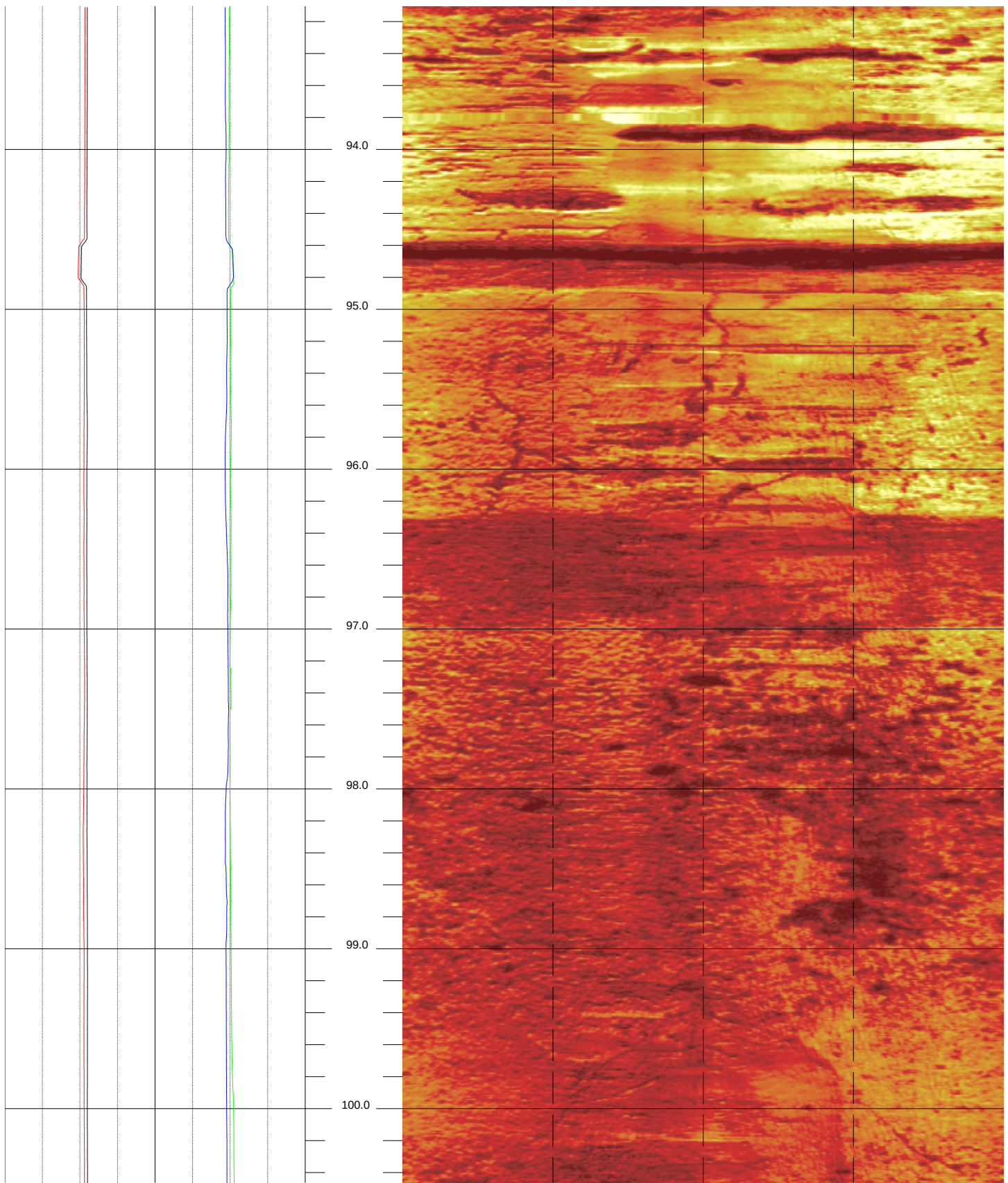


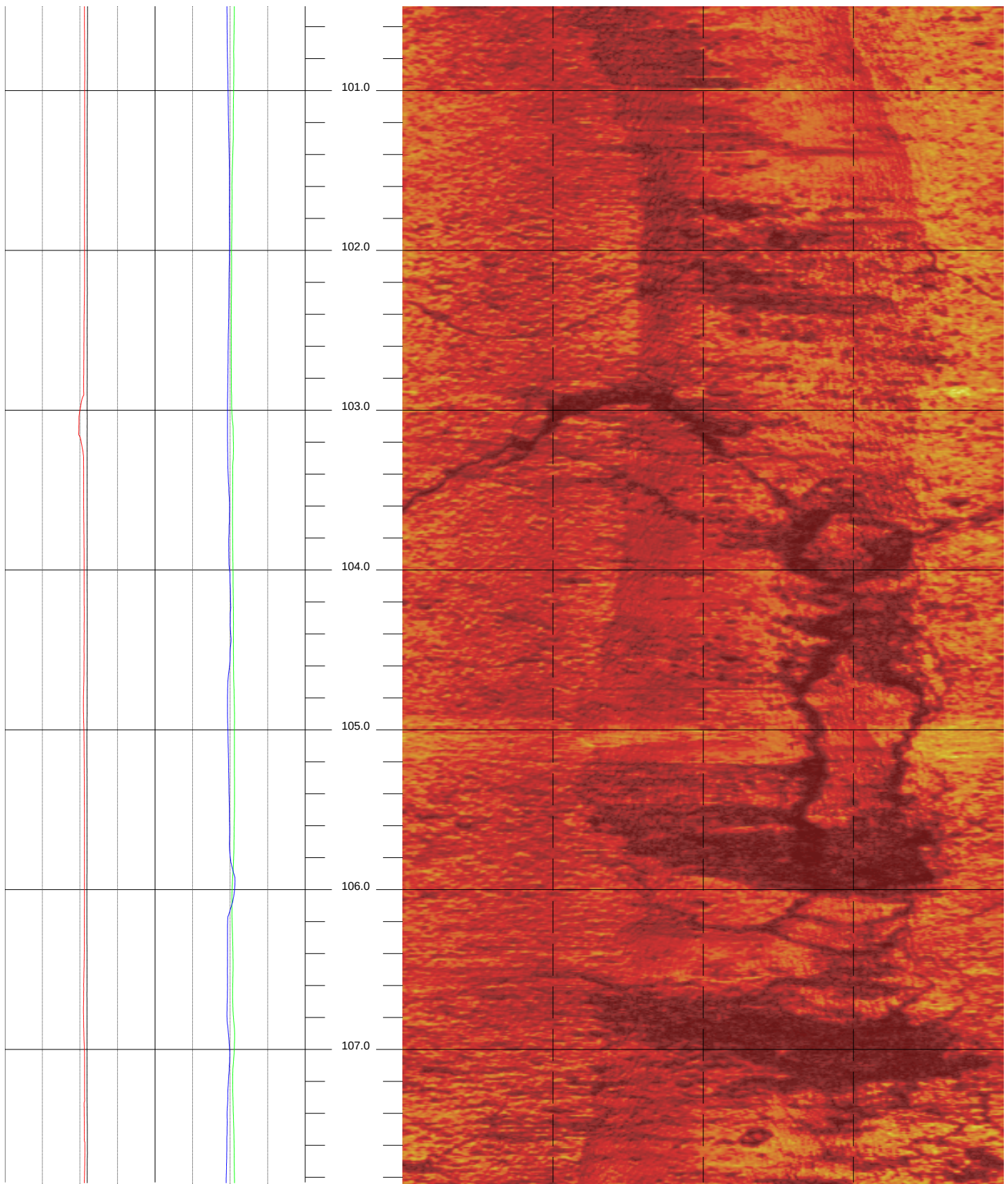


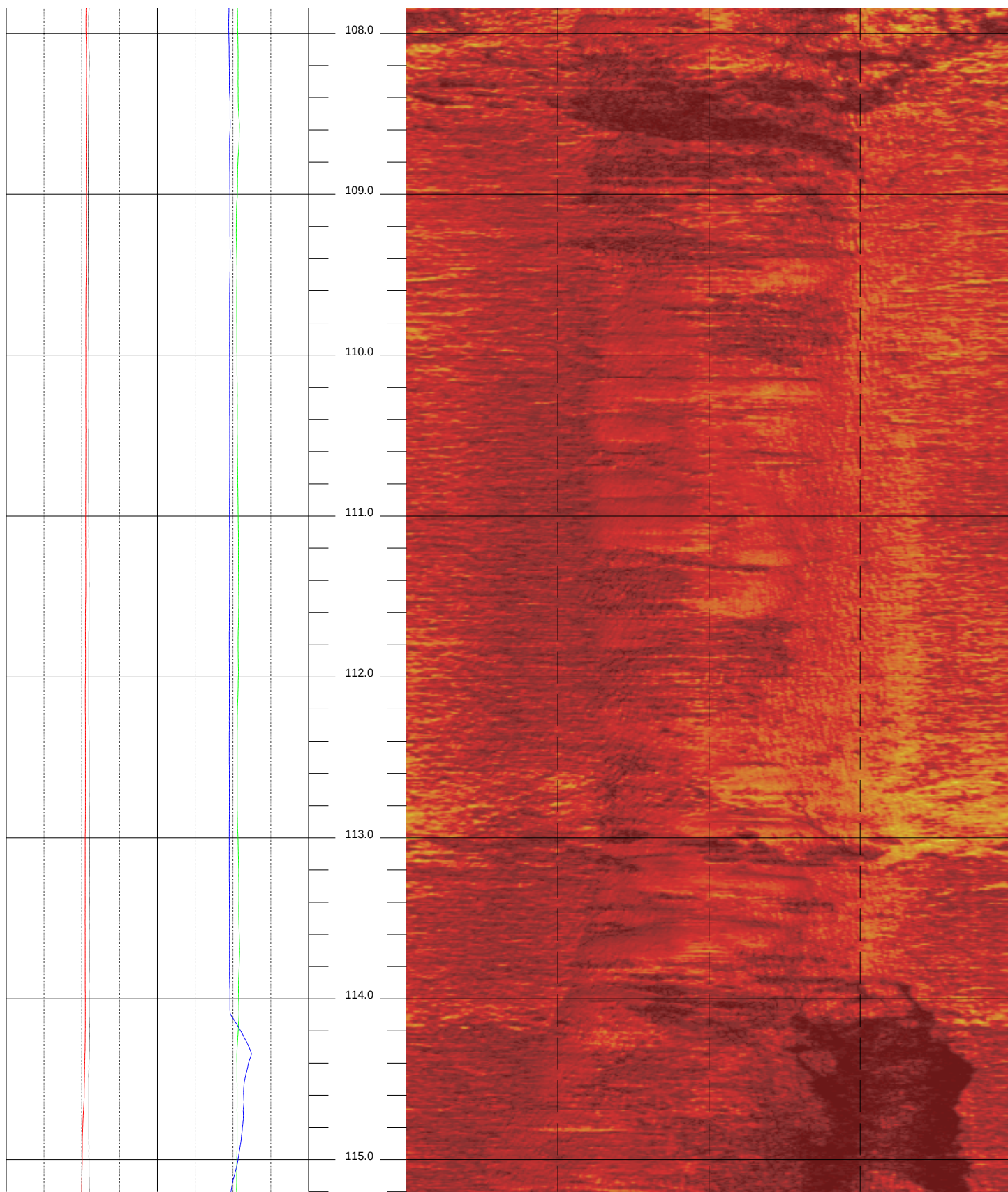


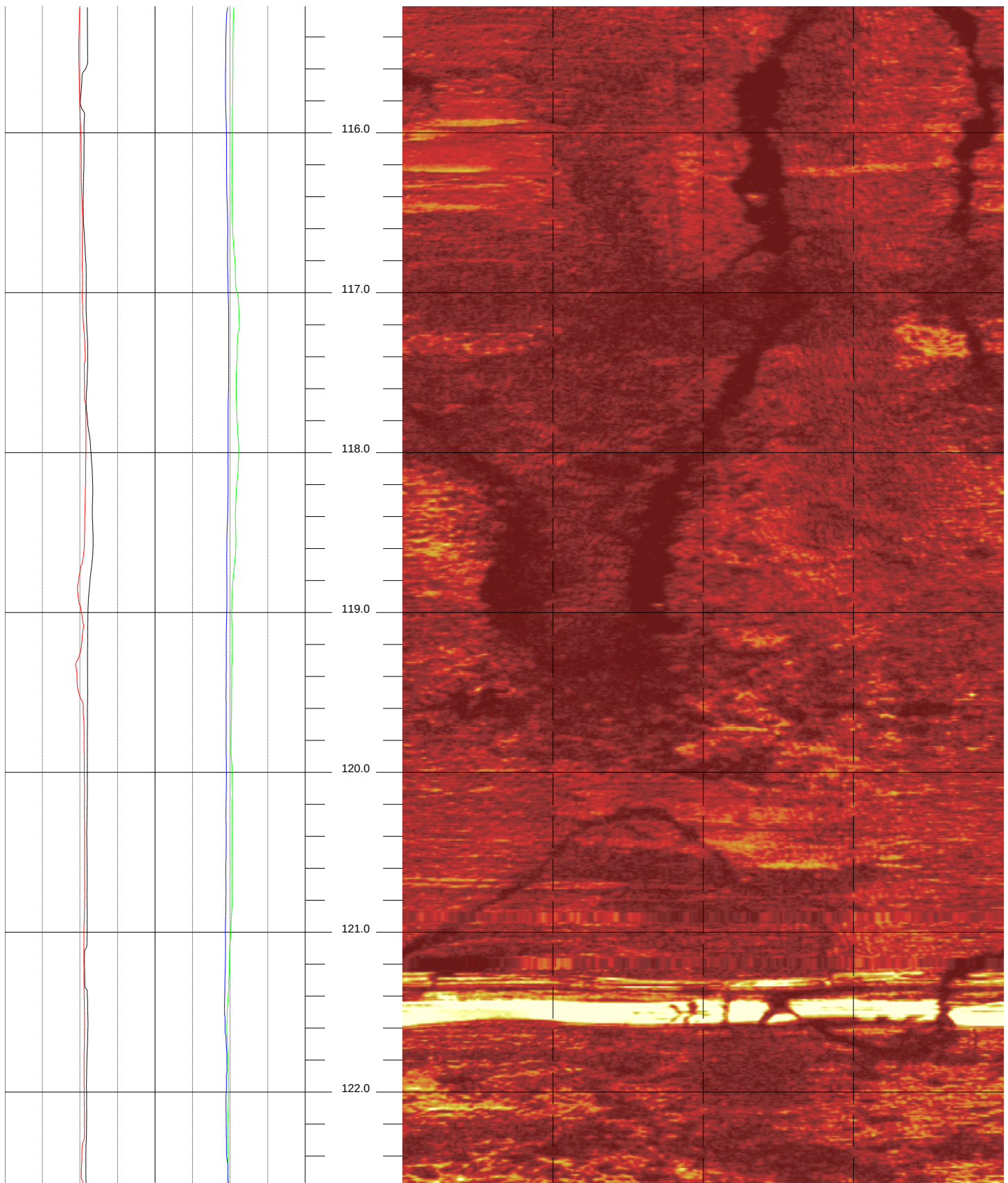


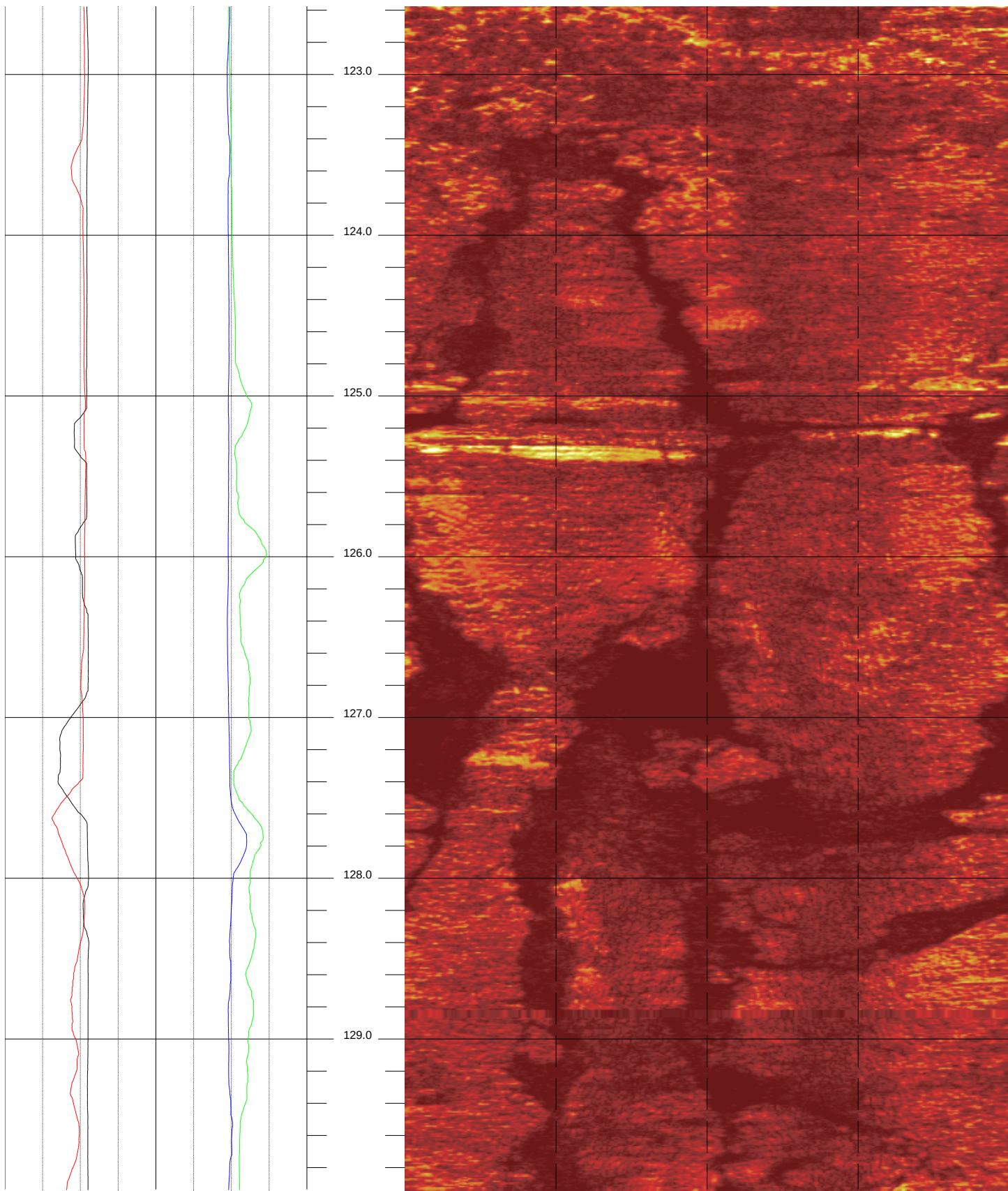


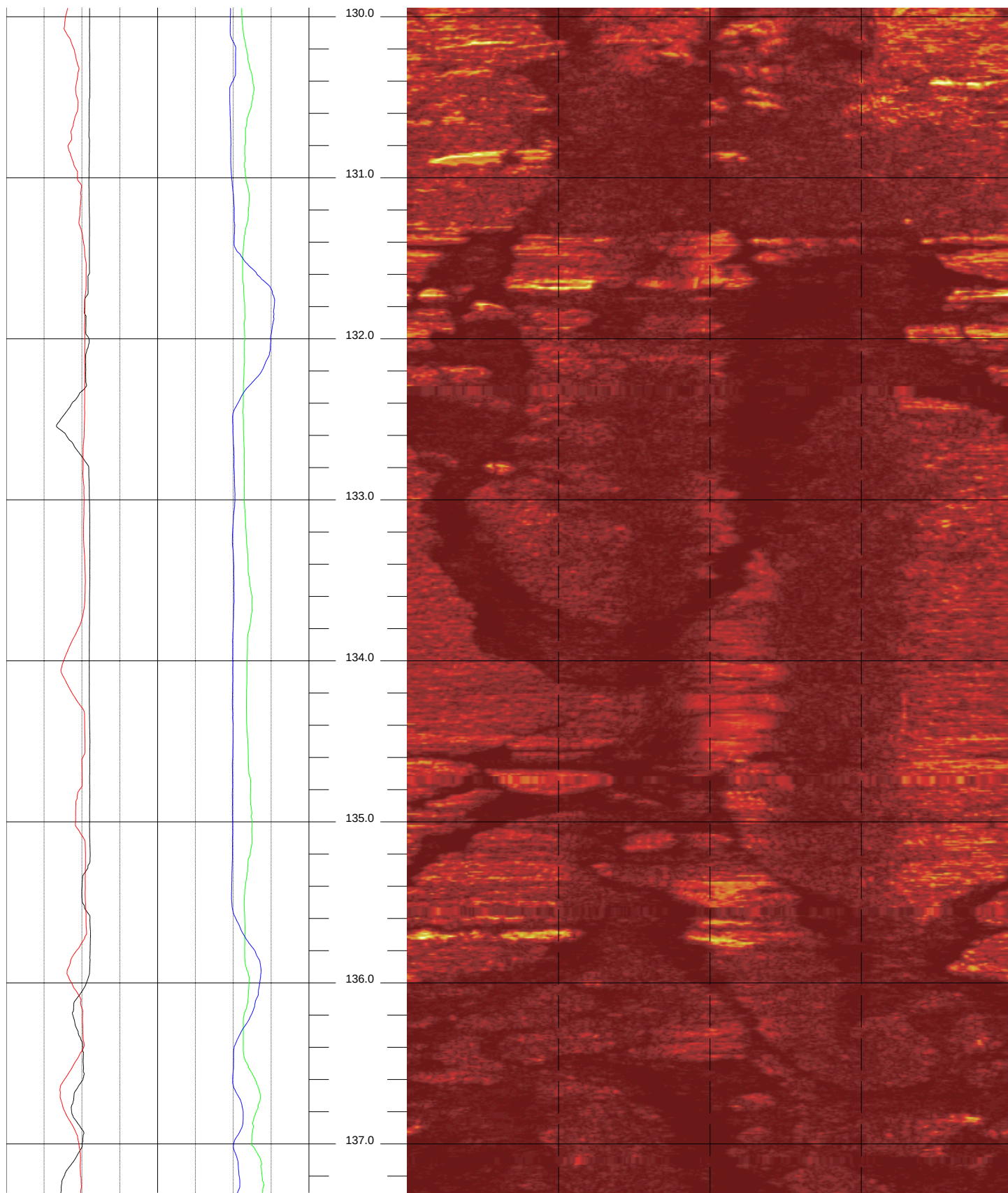


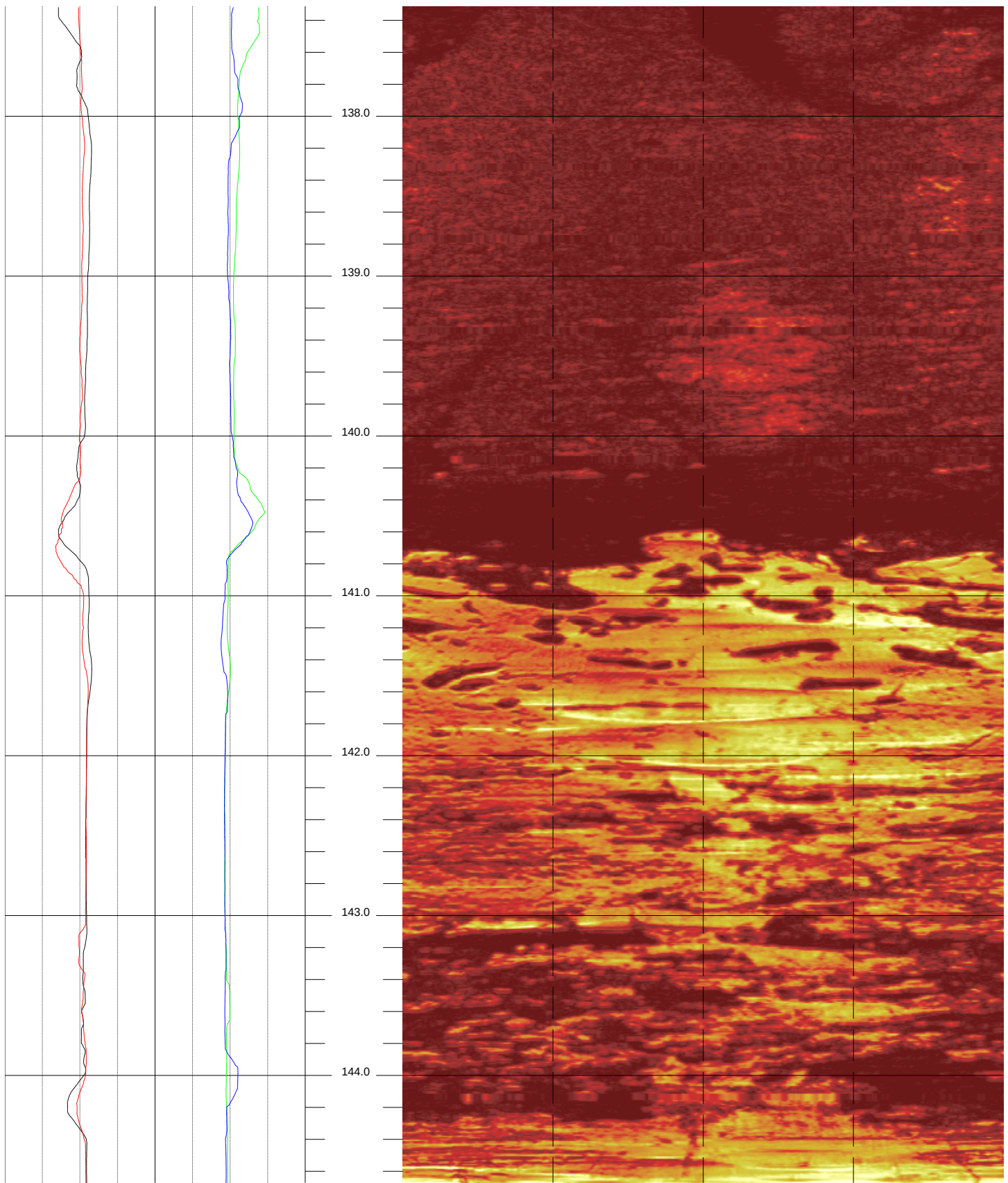


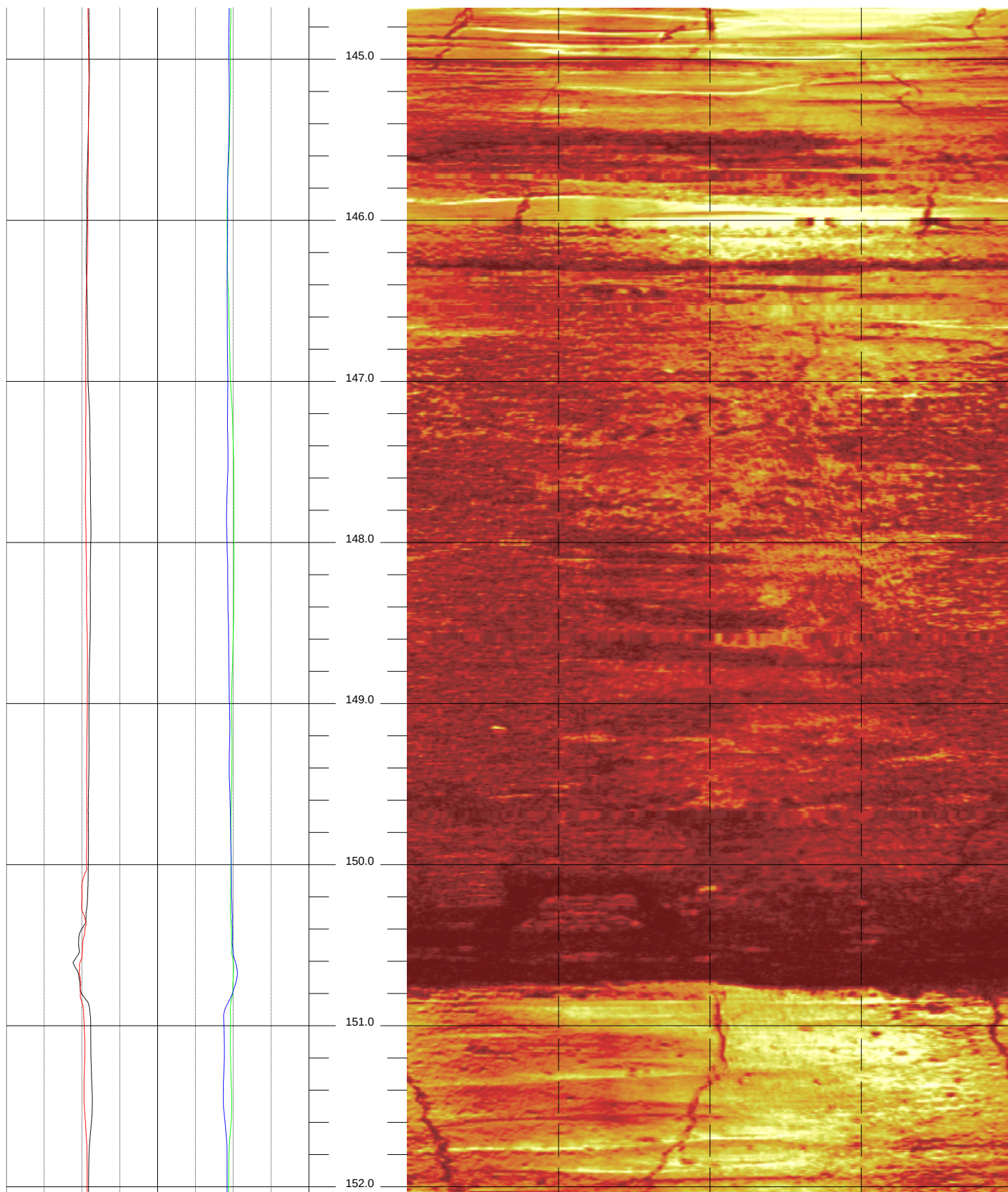


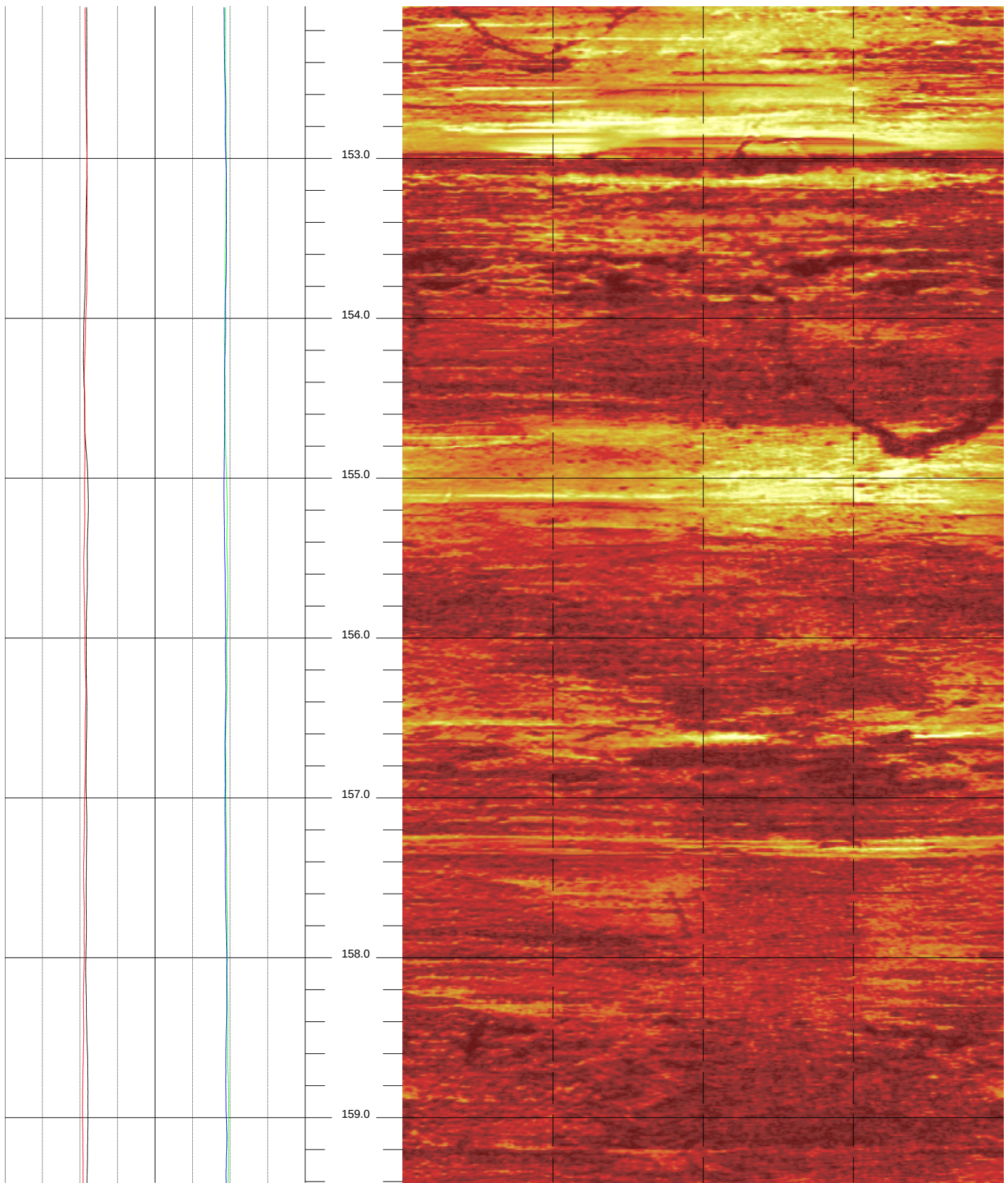


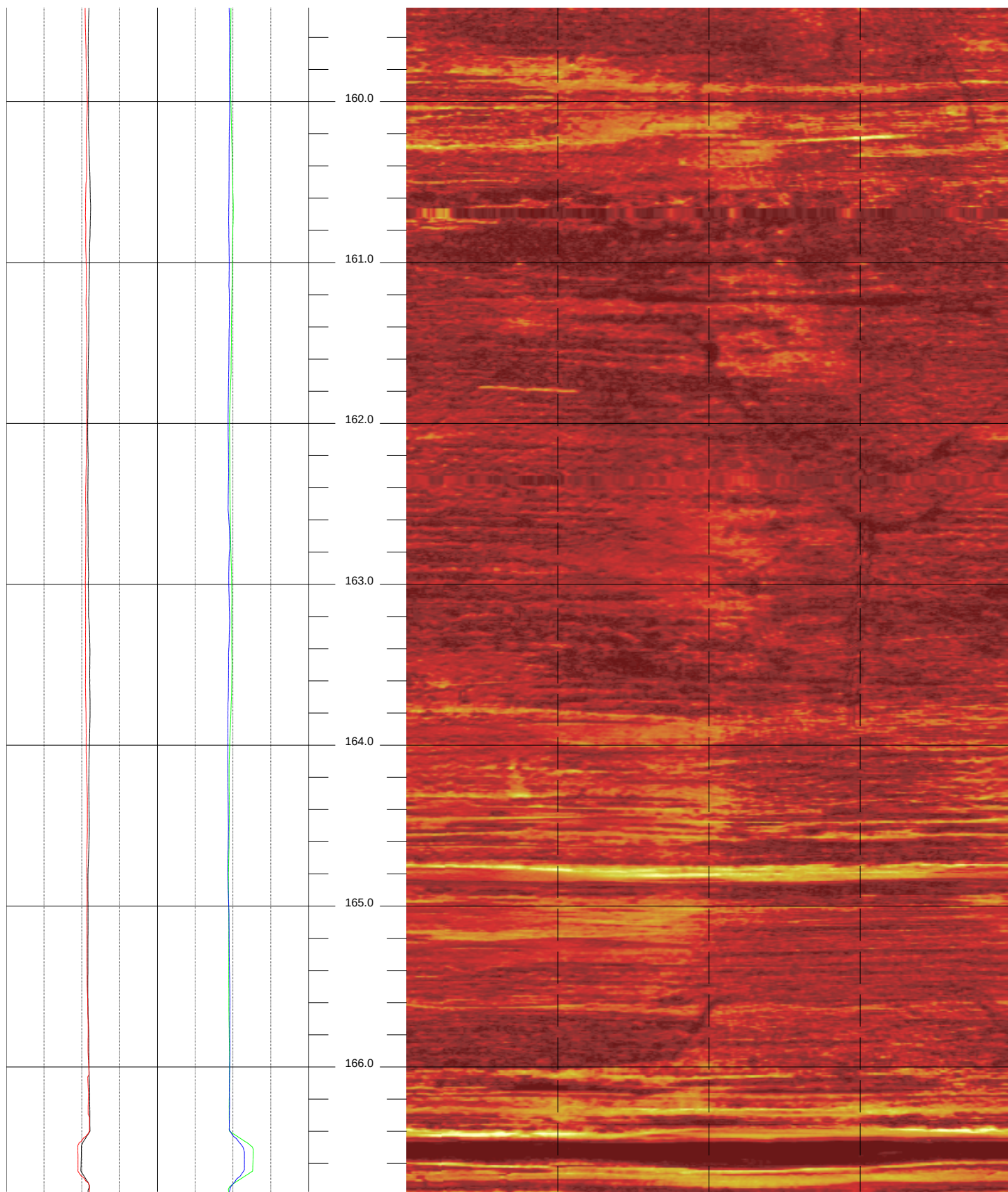


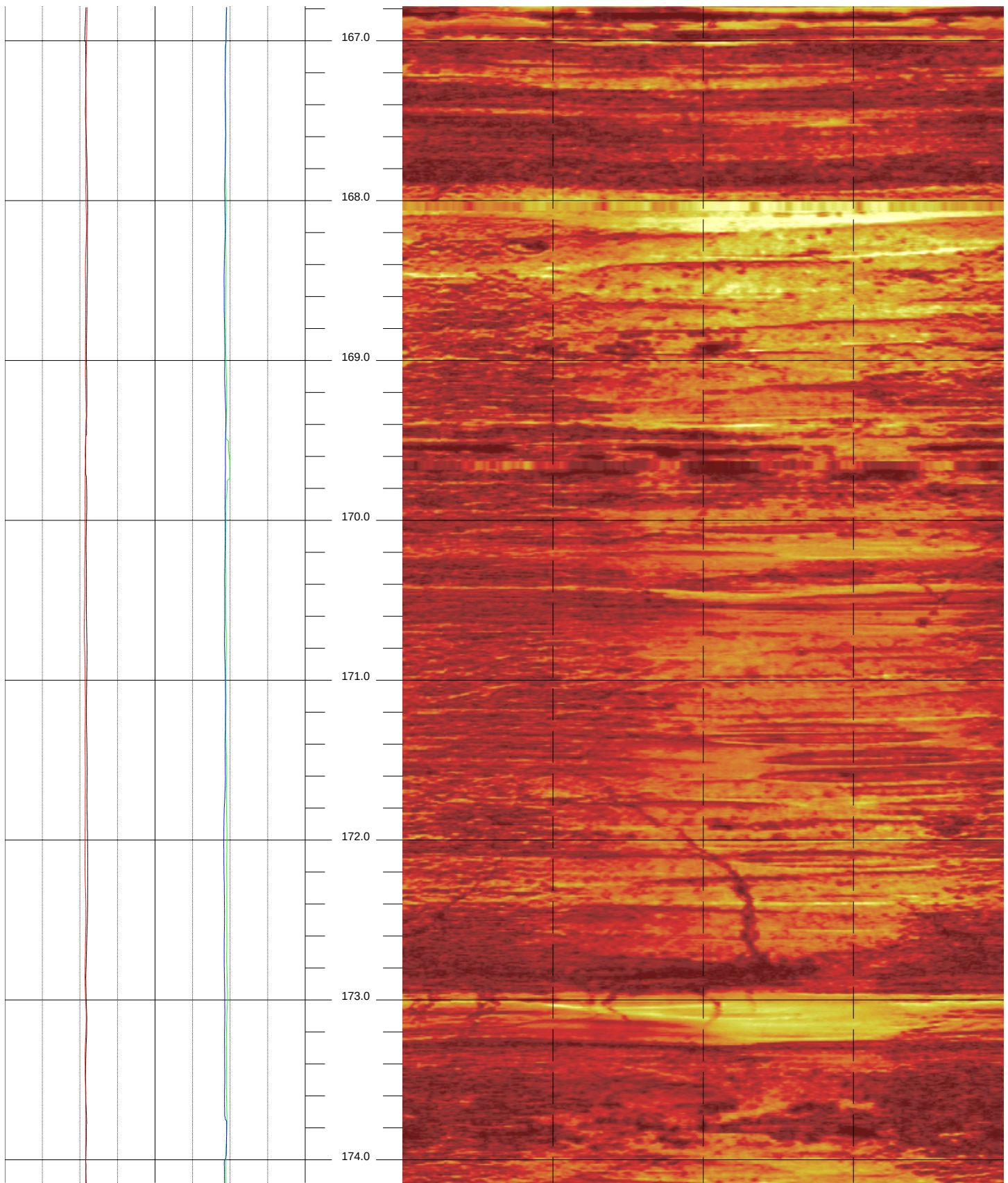


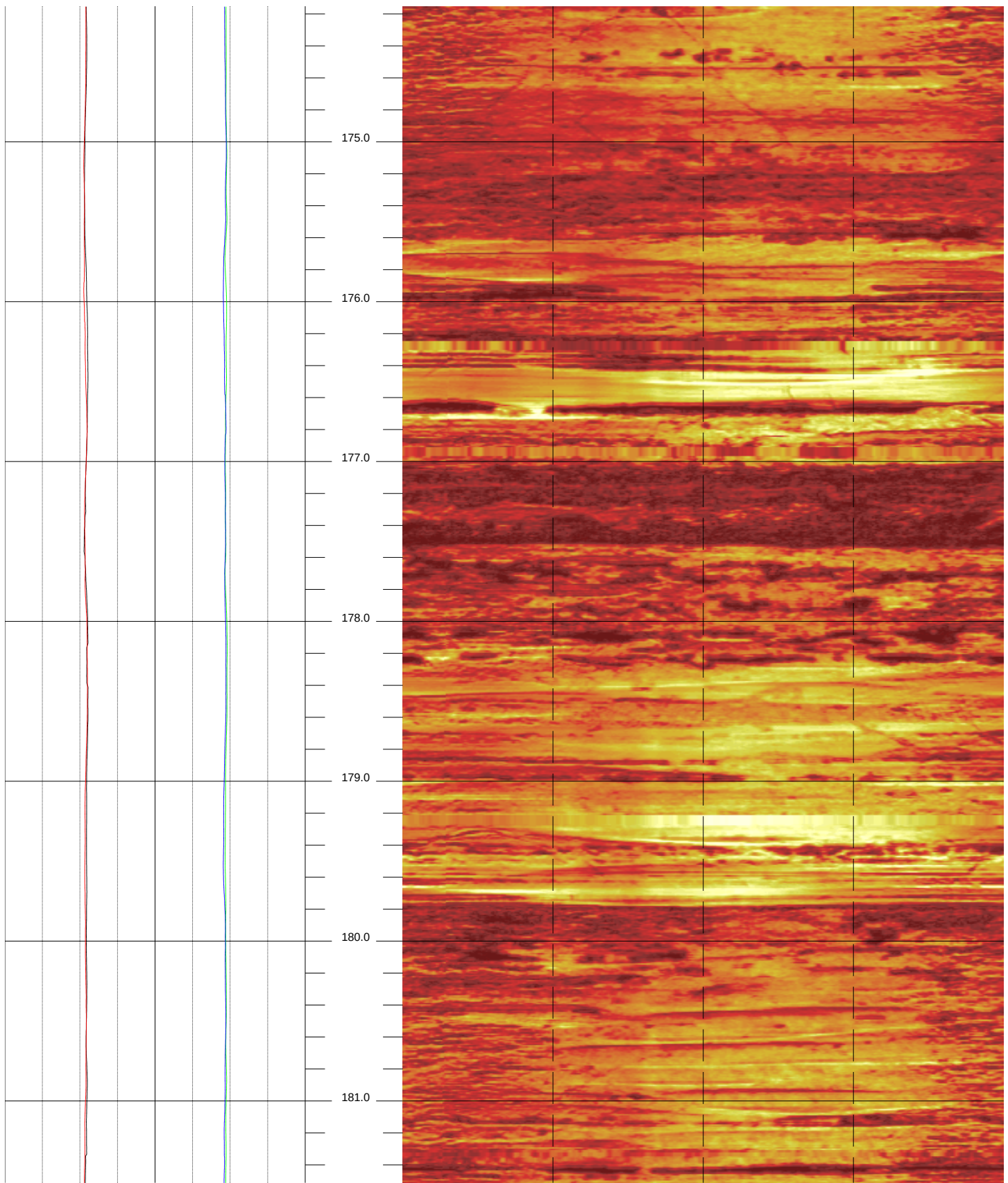


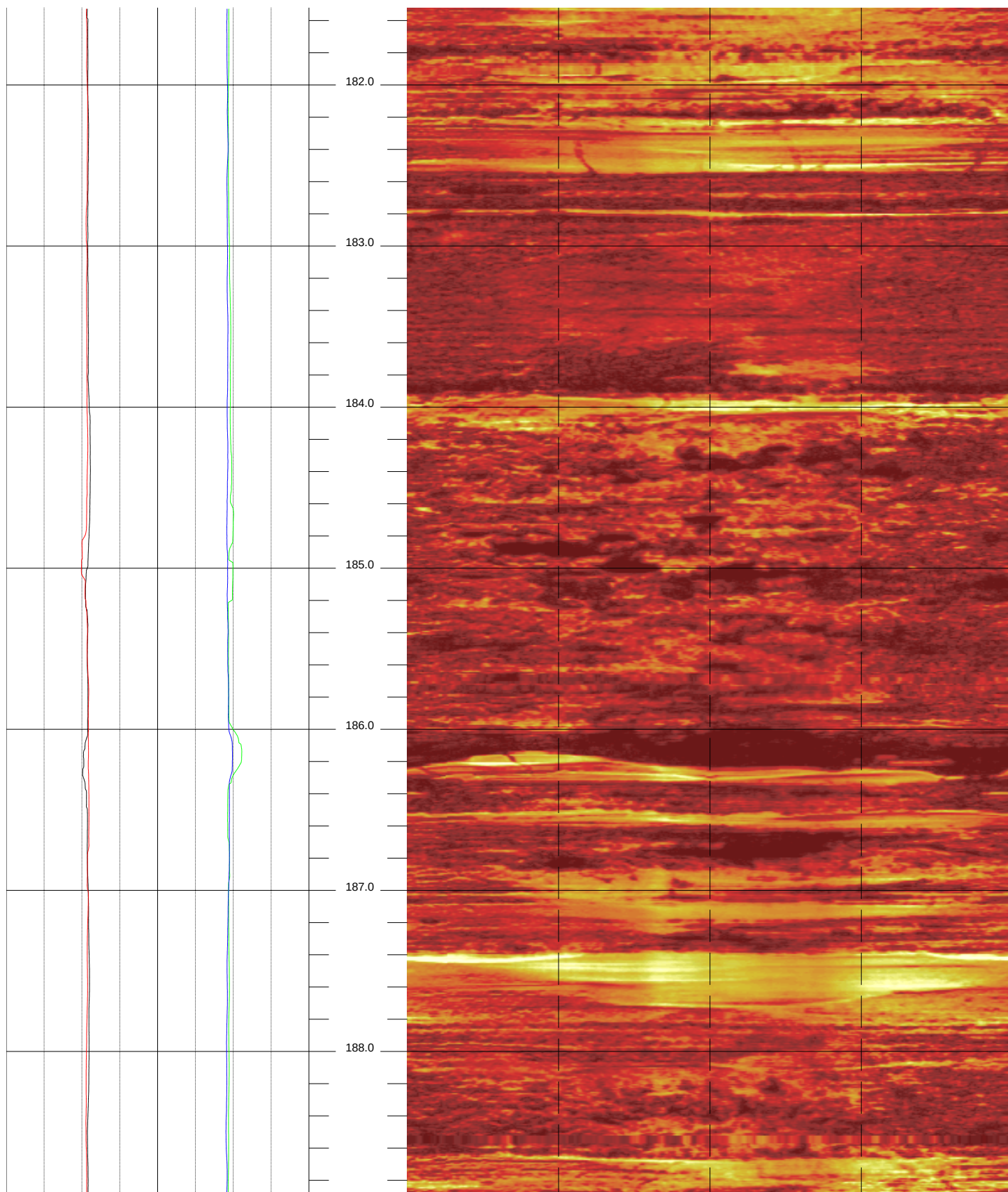


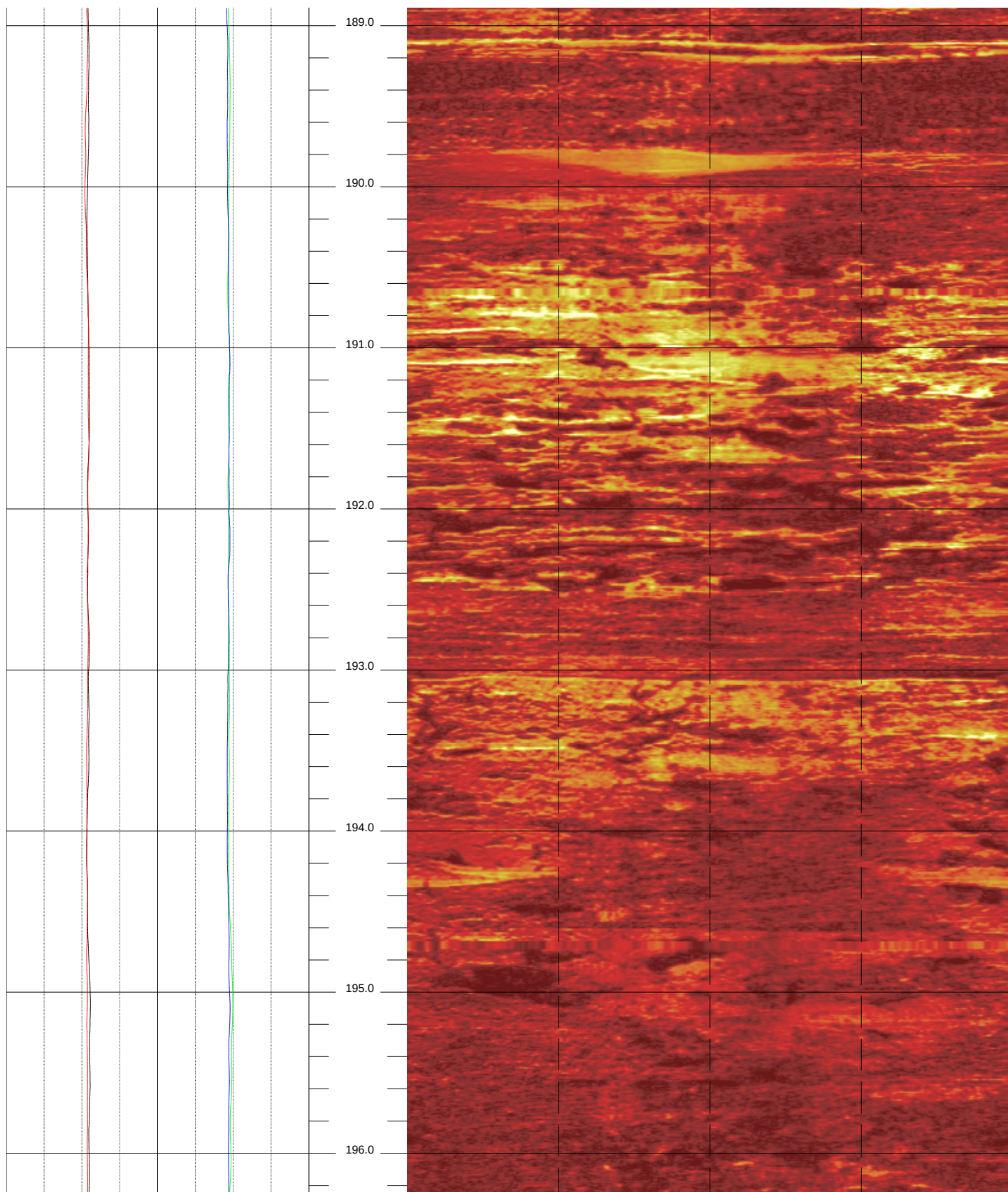


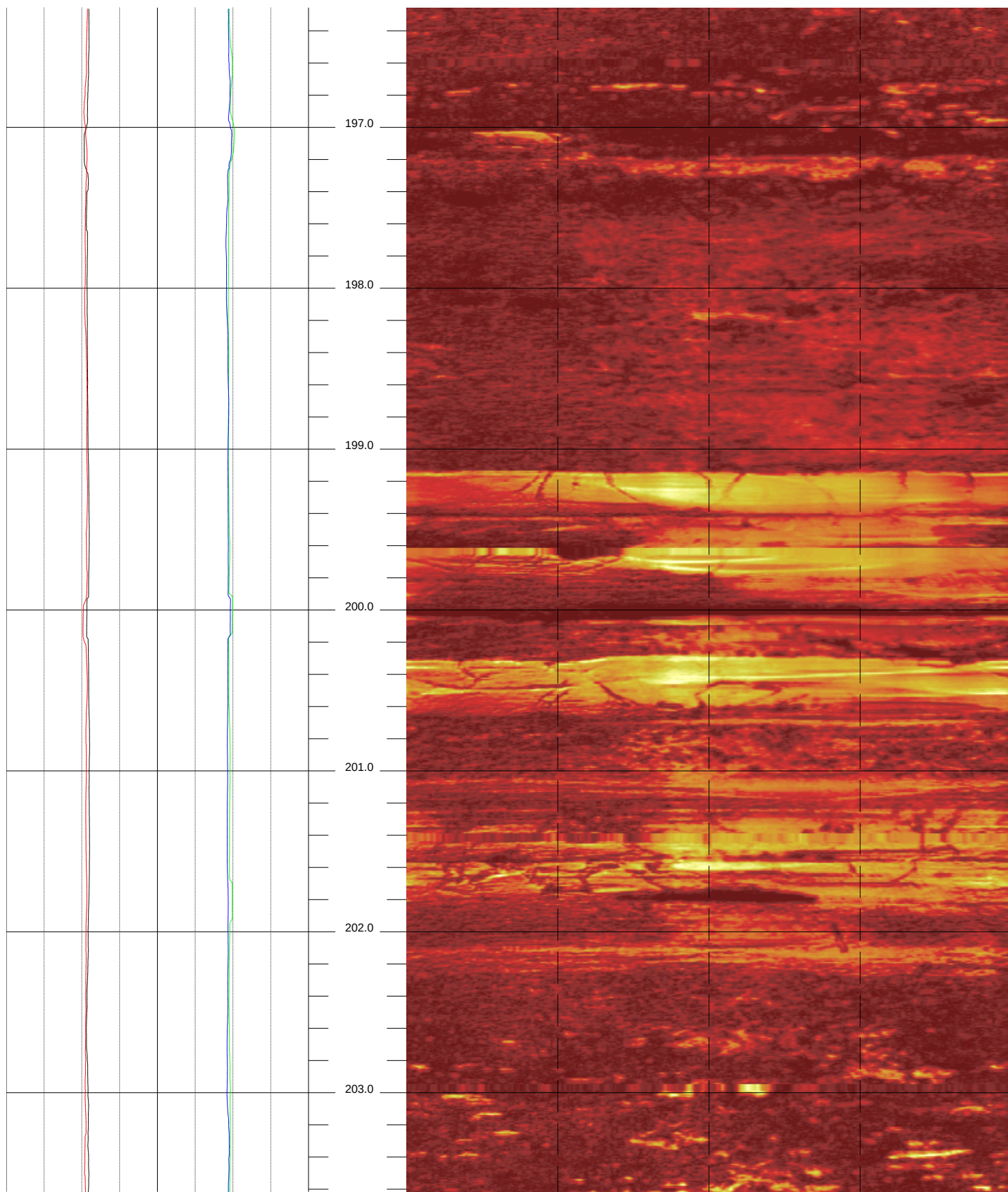


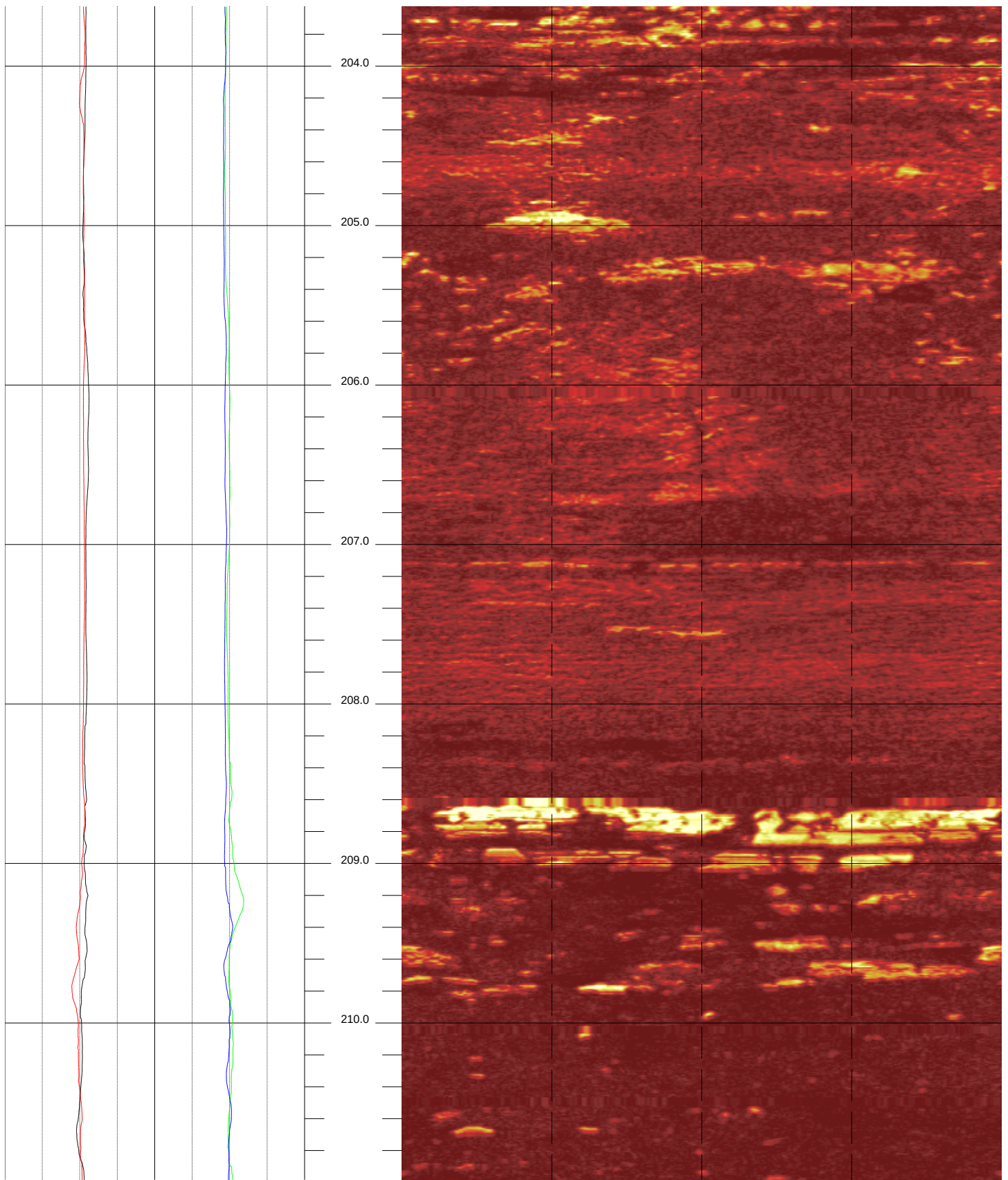


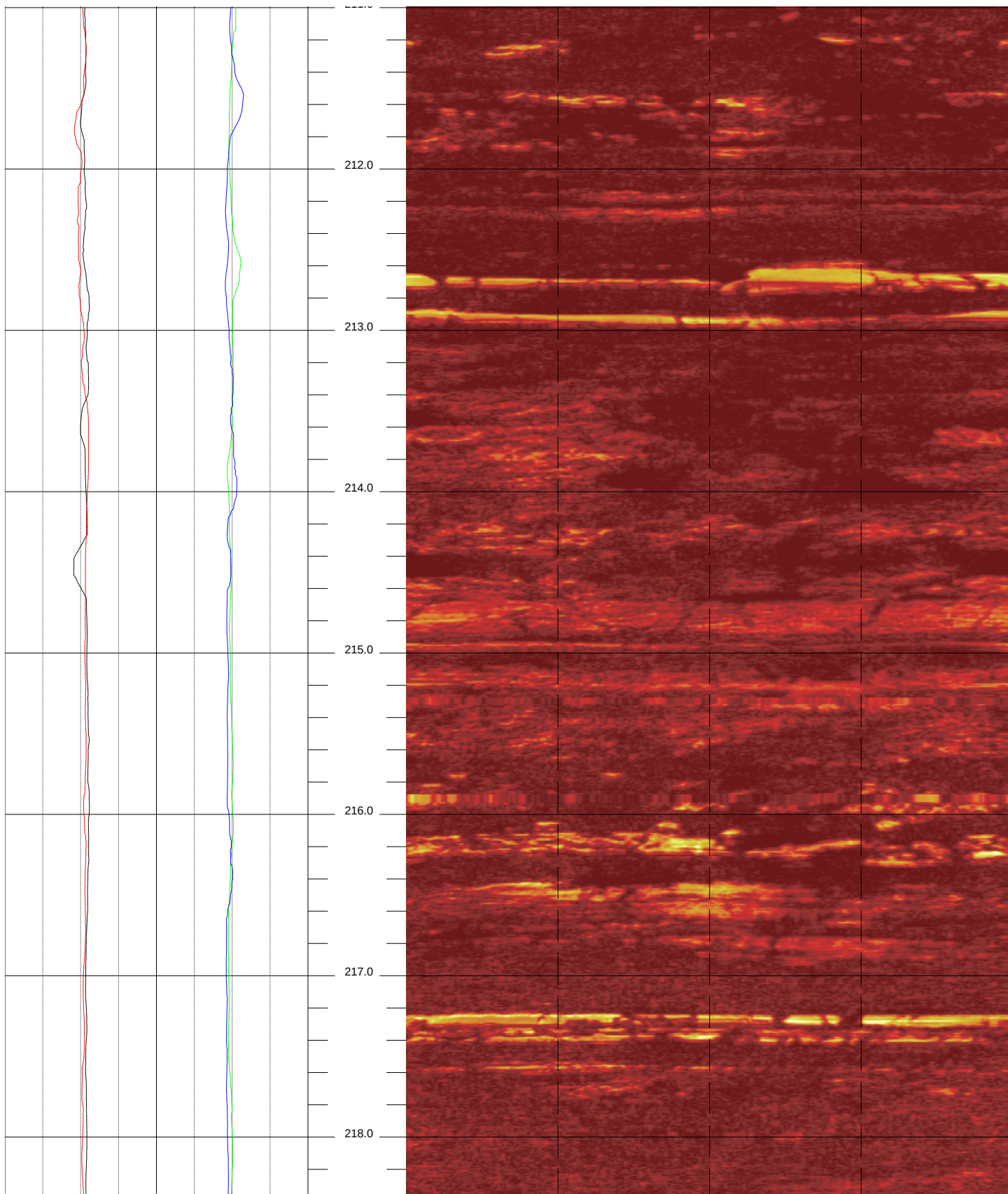


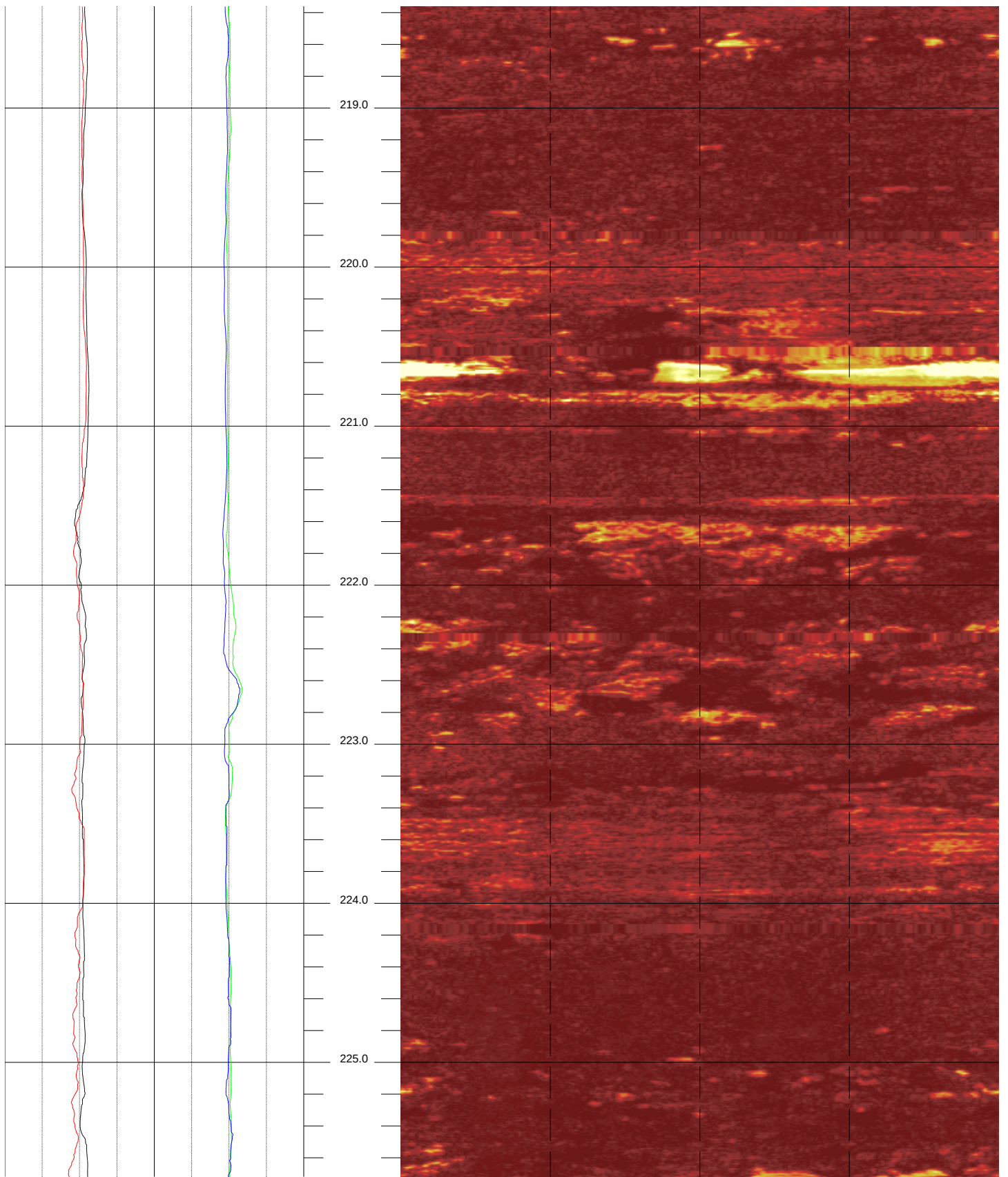


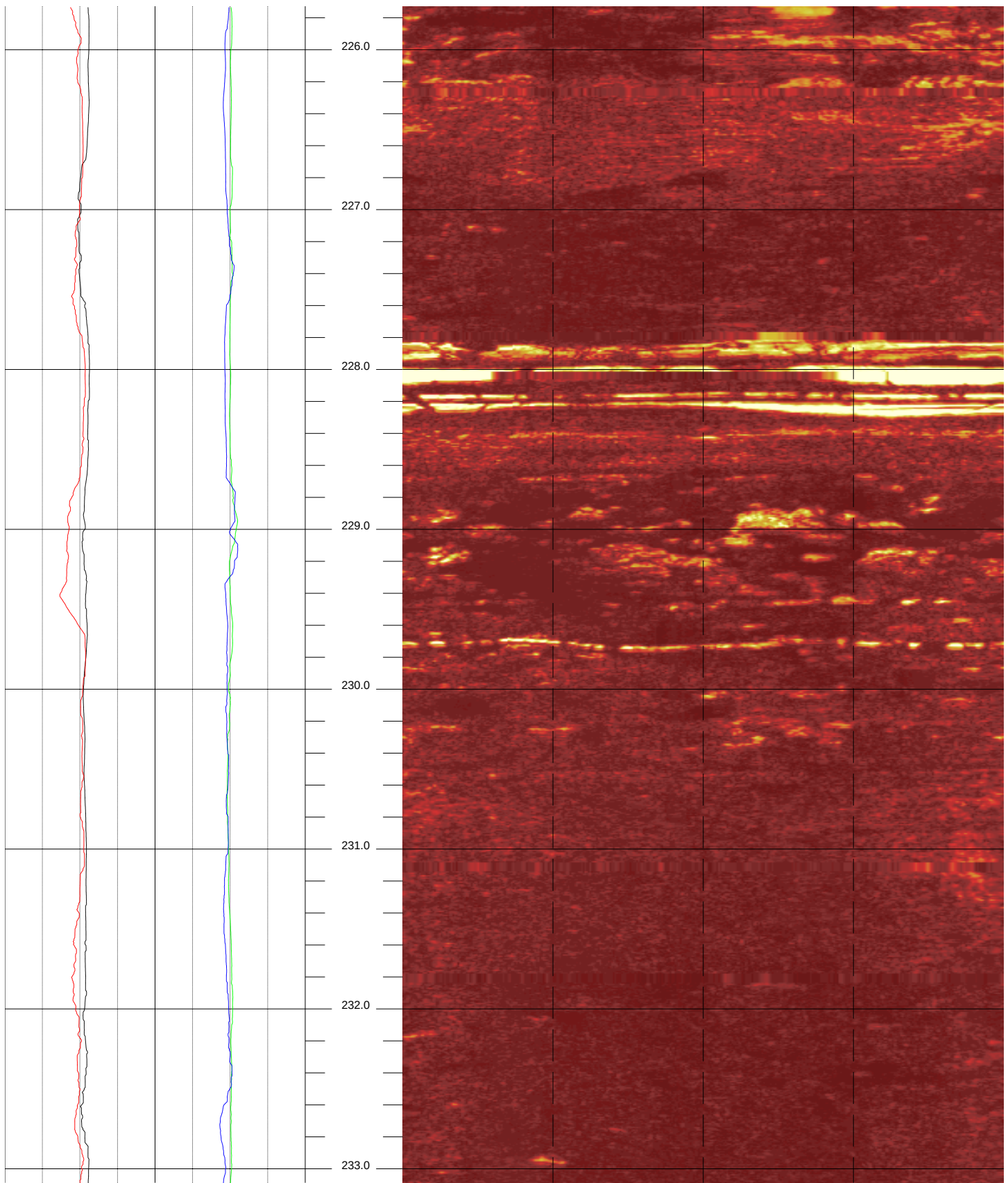


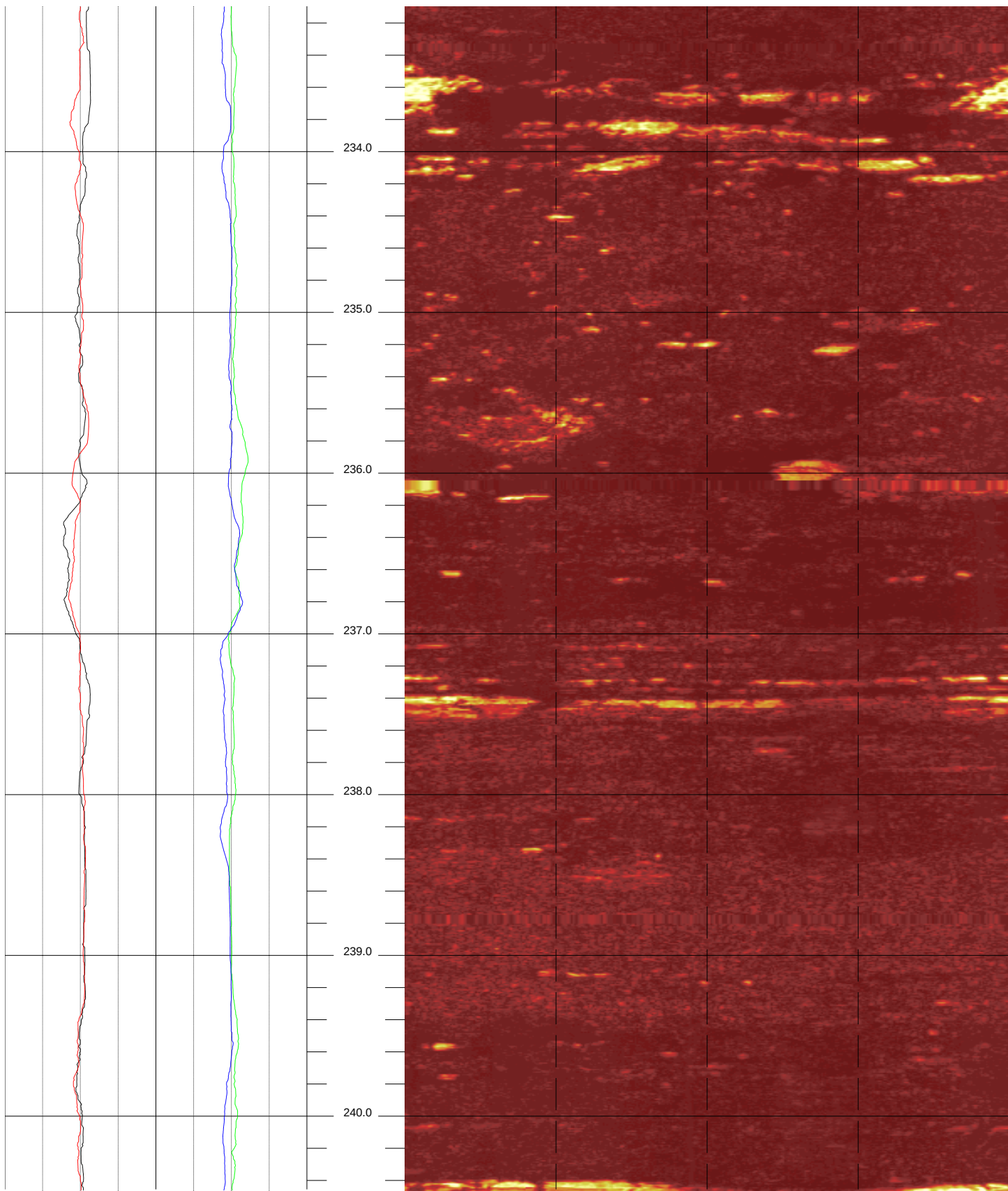


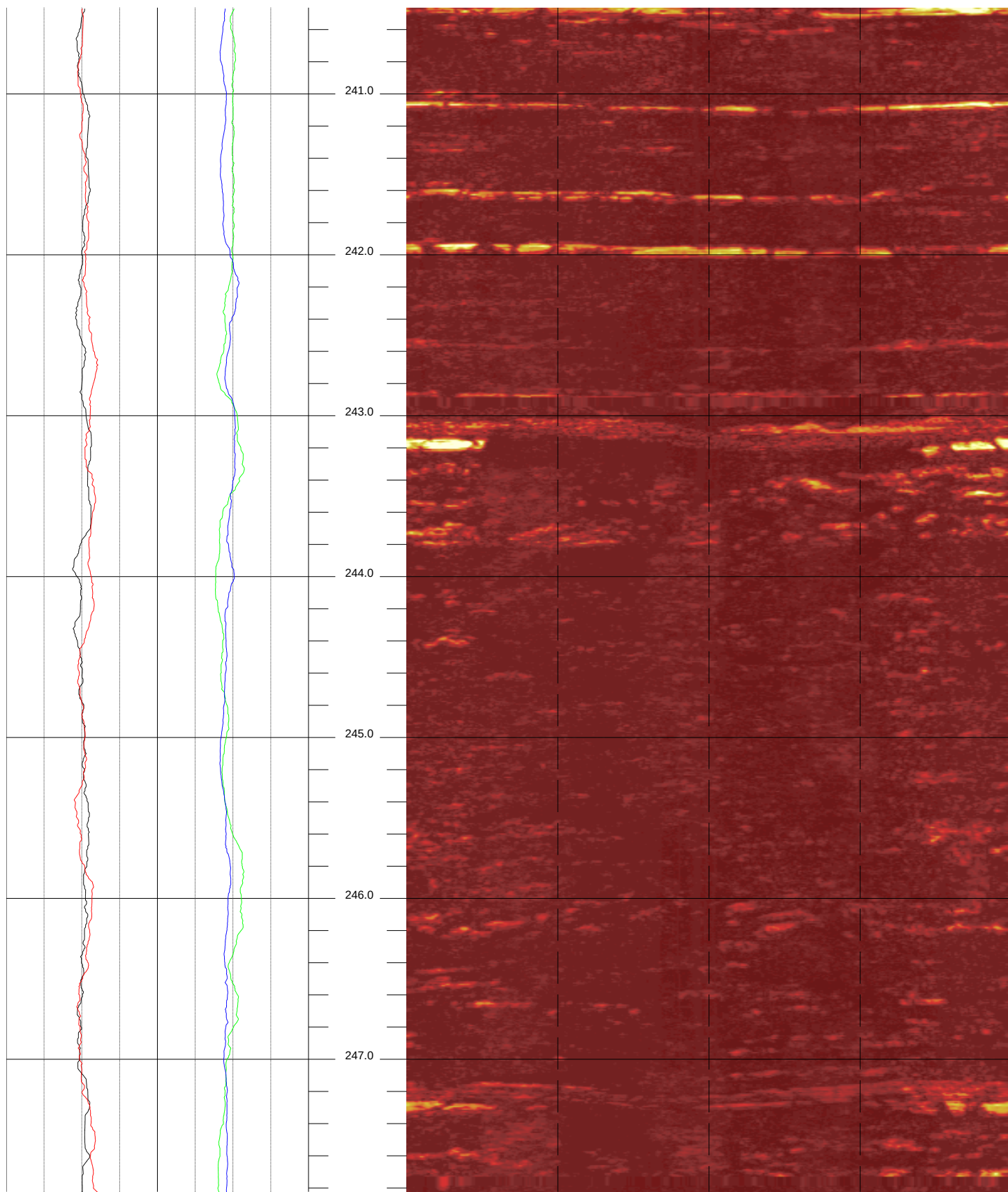


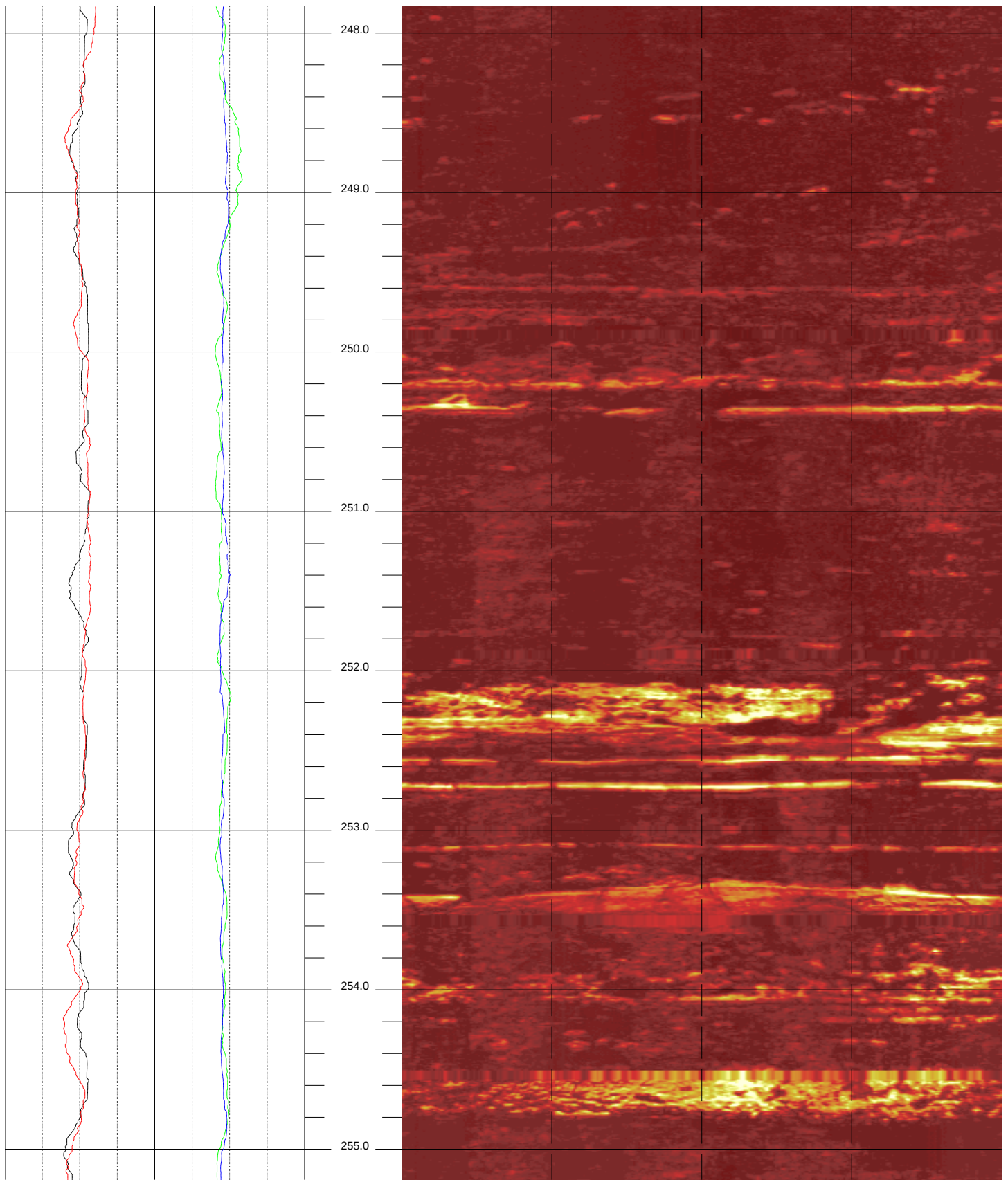


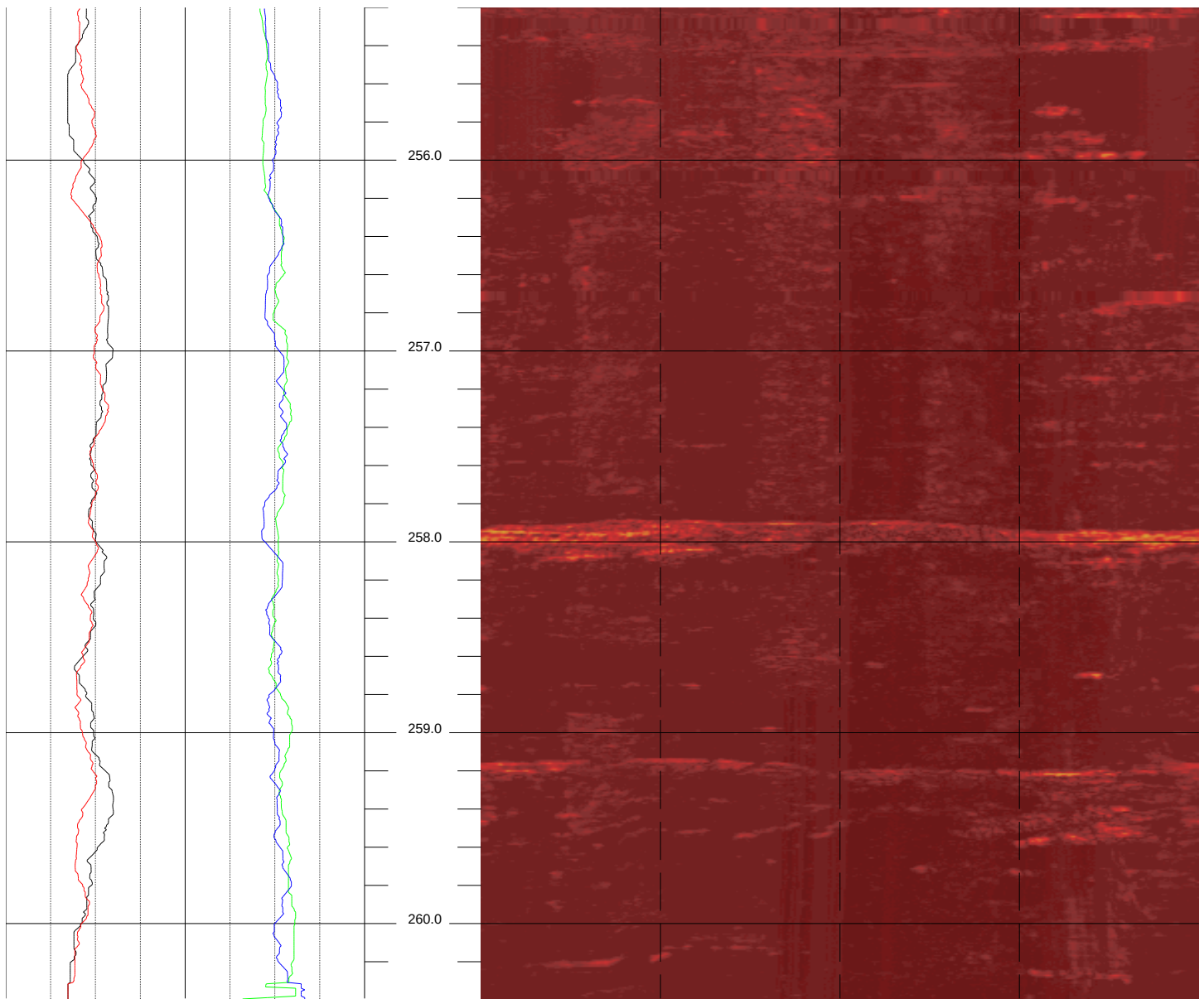














ROBERTSON
GEOLOGGING
LIMITED

ROBERTSON GEOLOGGING TECHNOLOGY

RGLDIP vsn 6.2 13 Dec 2007

BHTV ACOUSTIC CALIPER LOG 1/10

COMPANY CH2M HILL
WELL A-19
FIELD PEC LEVY COUNTY COLA
COUNTRY
LATITUDE -
LONGITUDE -
PROJECT PEF COLA

OTHER SERVICES

PERM. DATUM
LOG DATUM
DRILL DATUM
ELEVATION

-

KELLY BUSHING 0ft
DRILL FLOOR 0ft
GROUND LEVEL 0ft

	RunNo1	RunNo2	RunNo3
DATE	27 Mar 2007	27 Mar 2007	27 Mar 2007
RUN#	0	0	2
TYPE OF LOG			ACOUSTIC
DEPTH DRILLER	0	0	266
DEPTH LOGGER	0	0	110
LOG DEEPEST	0	0	110
LOG SHALLOW	0	0	3
FLUID IN HOLE			DRILLING MUD
SALINITY			
DENSITY			
LEVEL			
MAX TEMP (C)	0	0	0
RIG TIME			
RECORDED BY			C. CARTER
WITNESSED BY			

RUN#

BIT

BIT RECORD
FROM

TO

SIZE

CASING RECORD
WEIGHT

FROM

TO

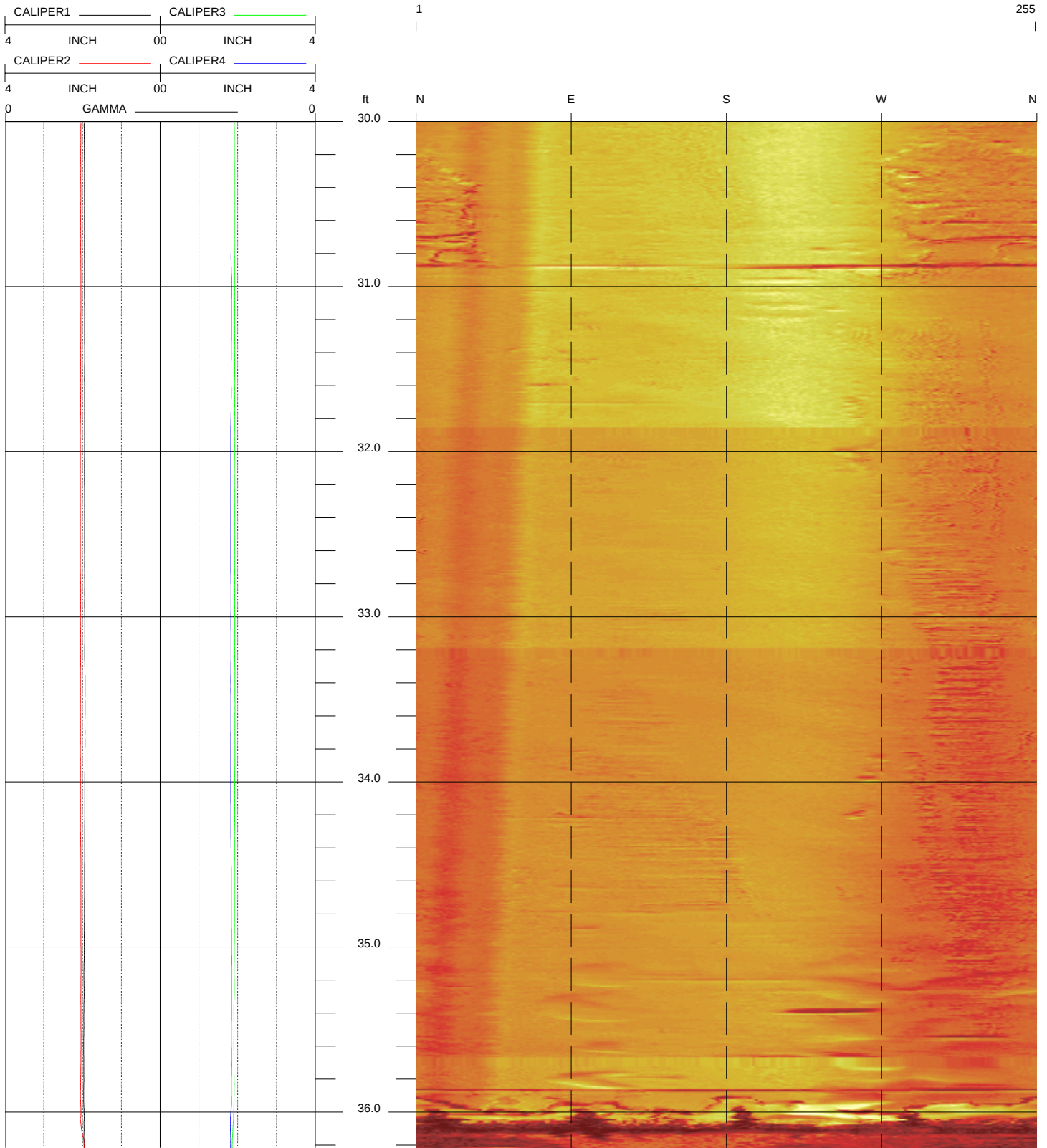
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0

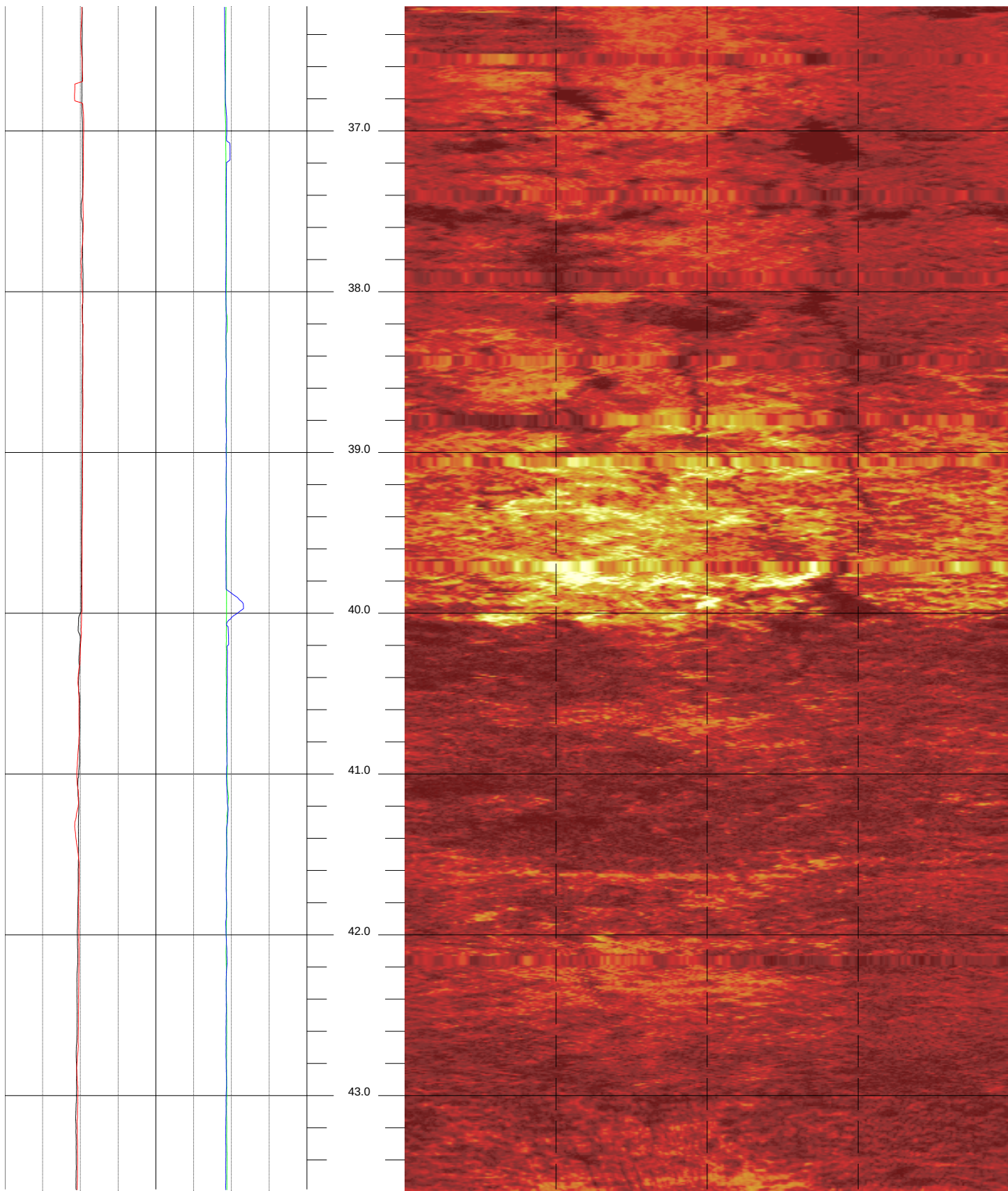
REMARKS

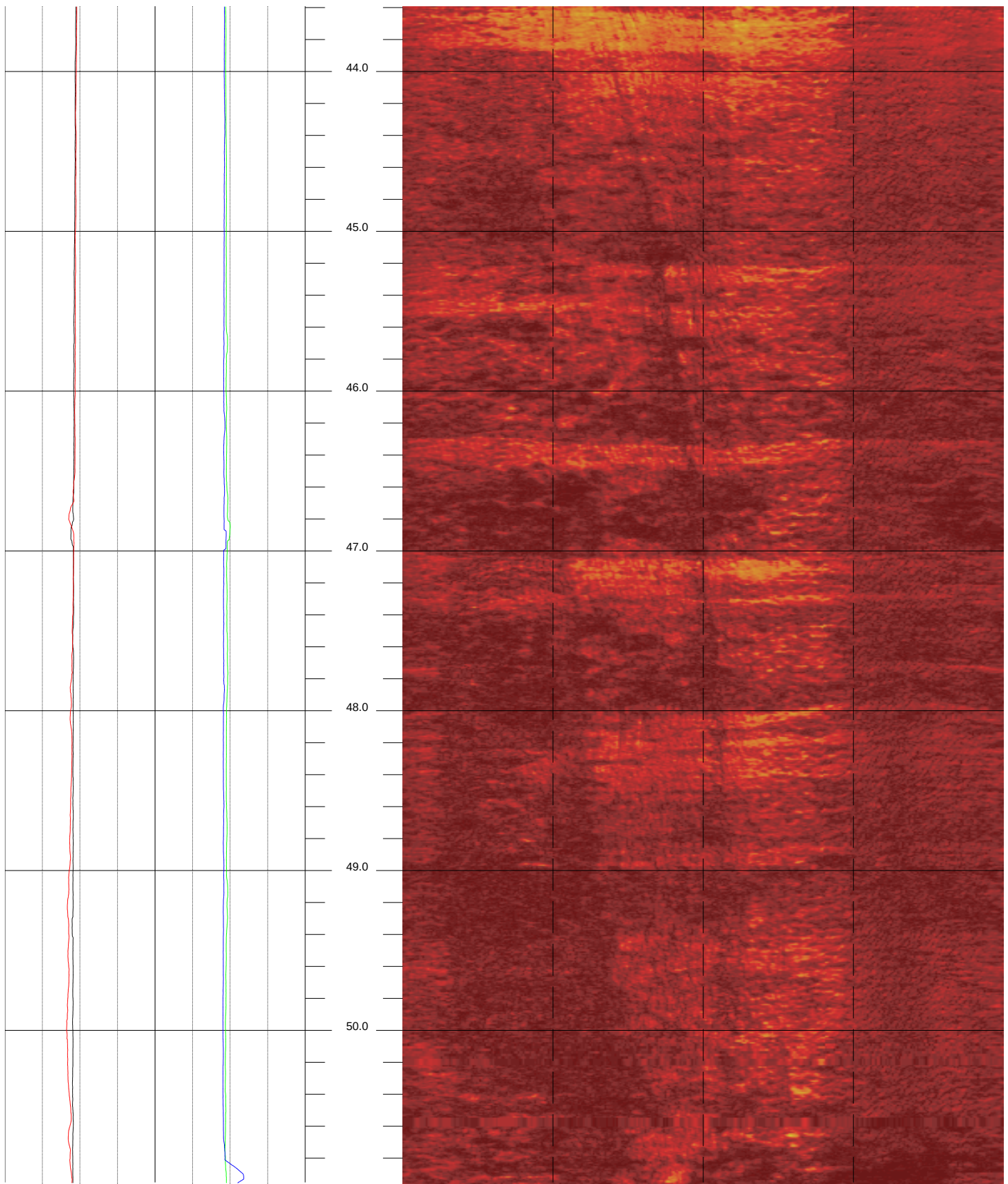
LOG FILE: C:\Rgldip\Well\Data\A19AUUP01.btv
108.340 to 30.000ft

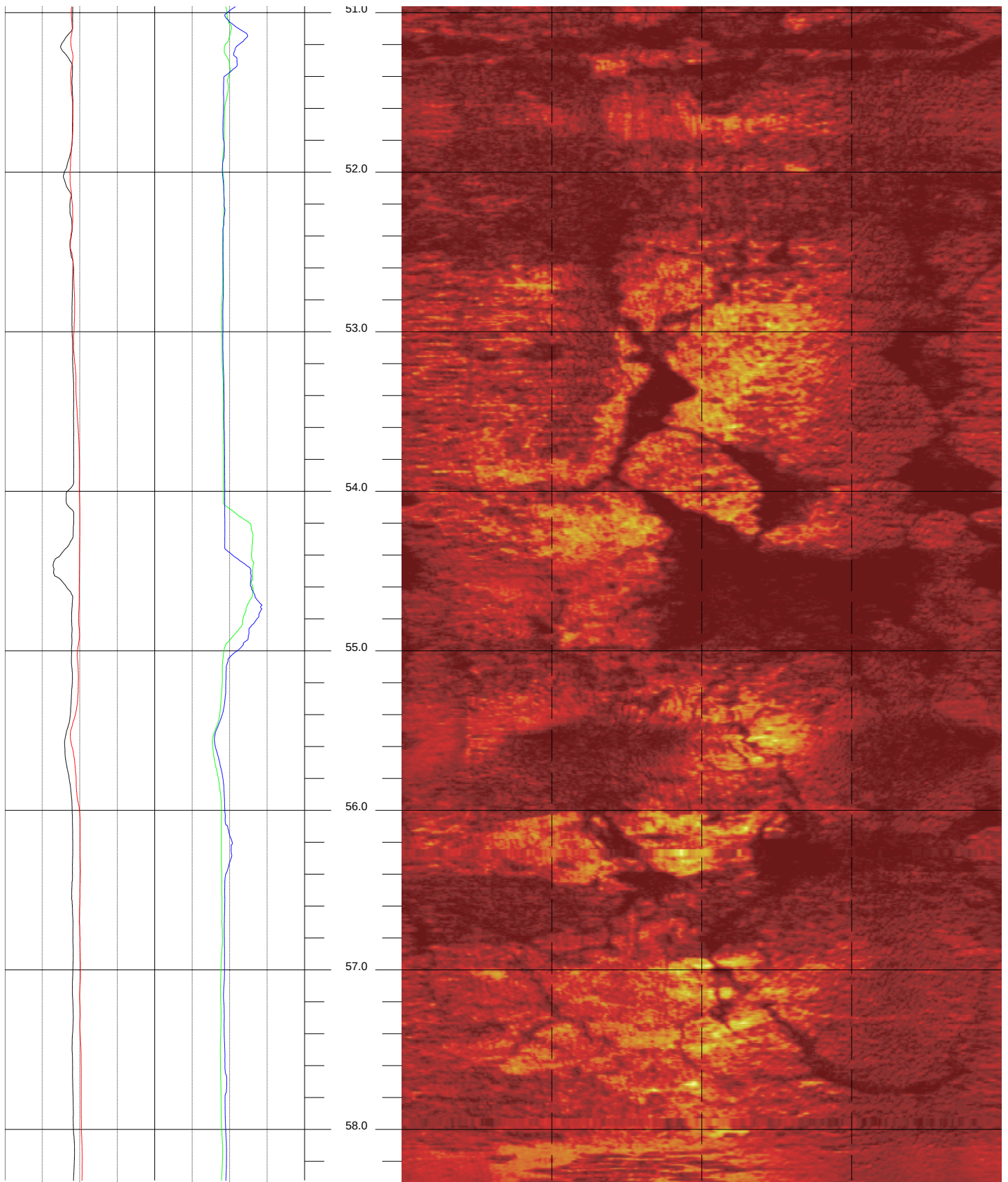
Depth interval 0.008ft, Filter length 0.120ft

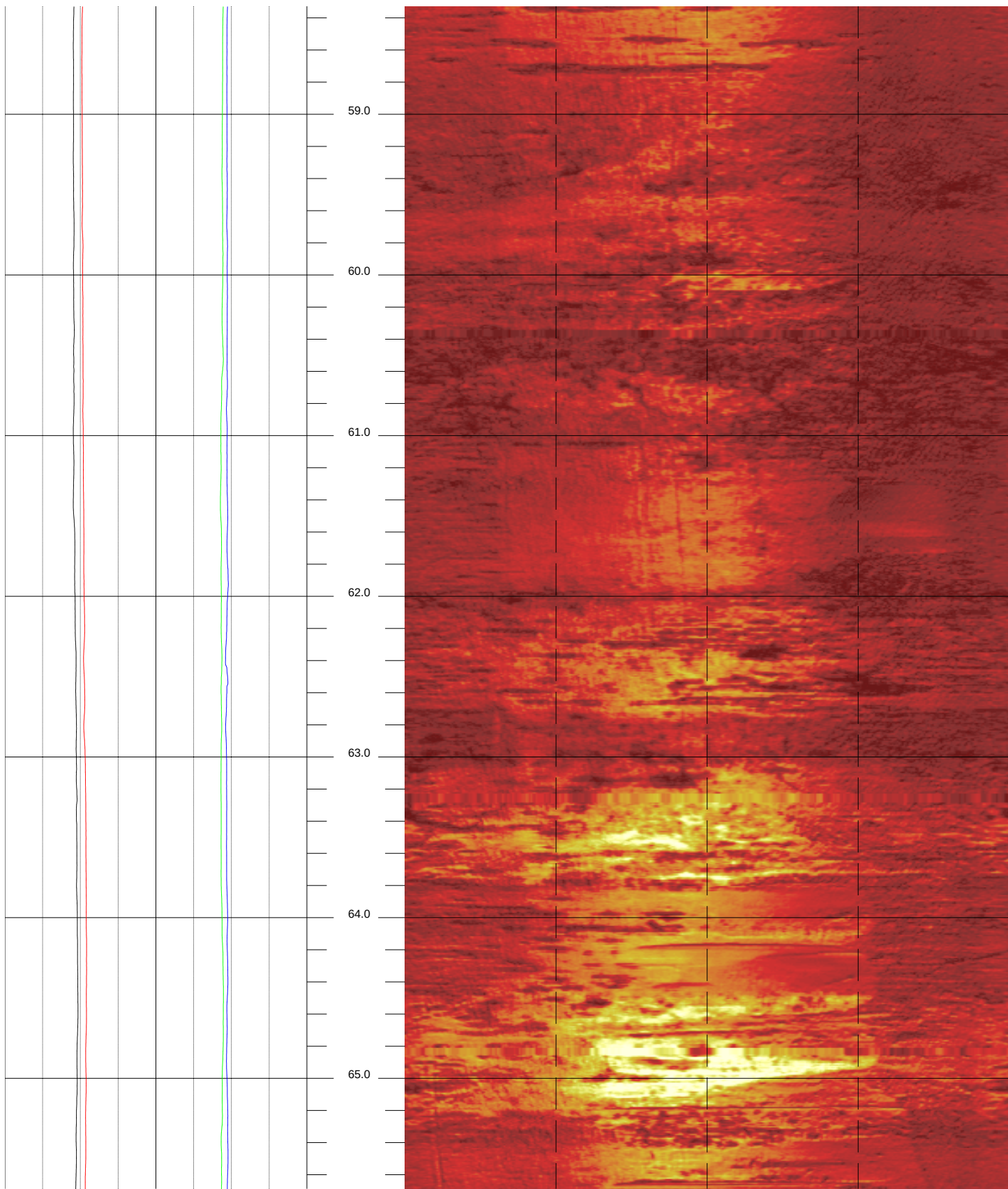
REFLECTANCE

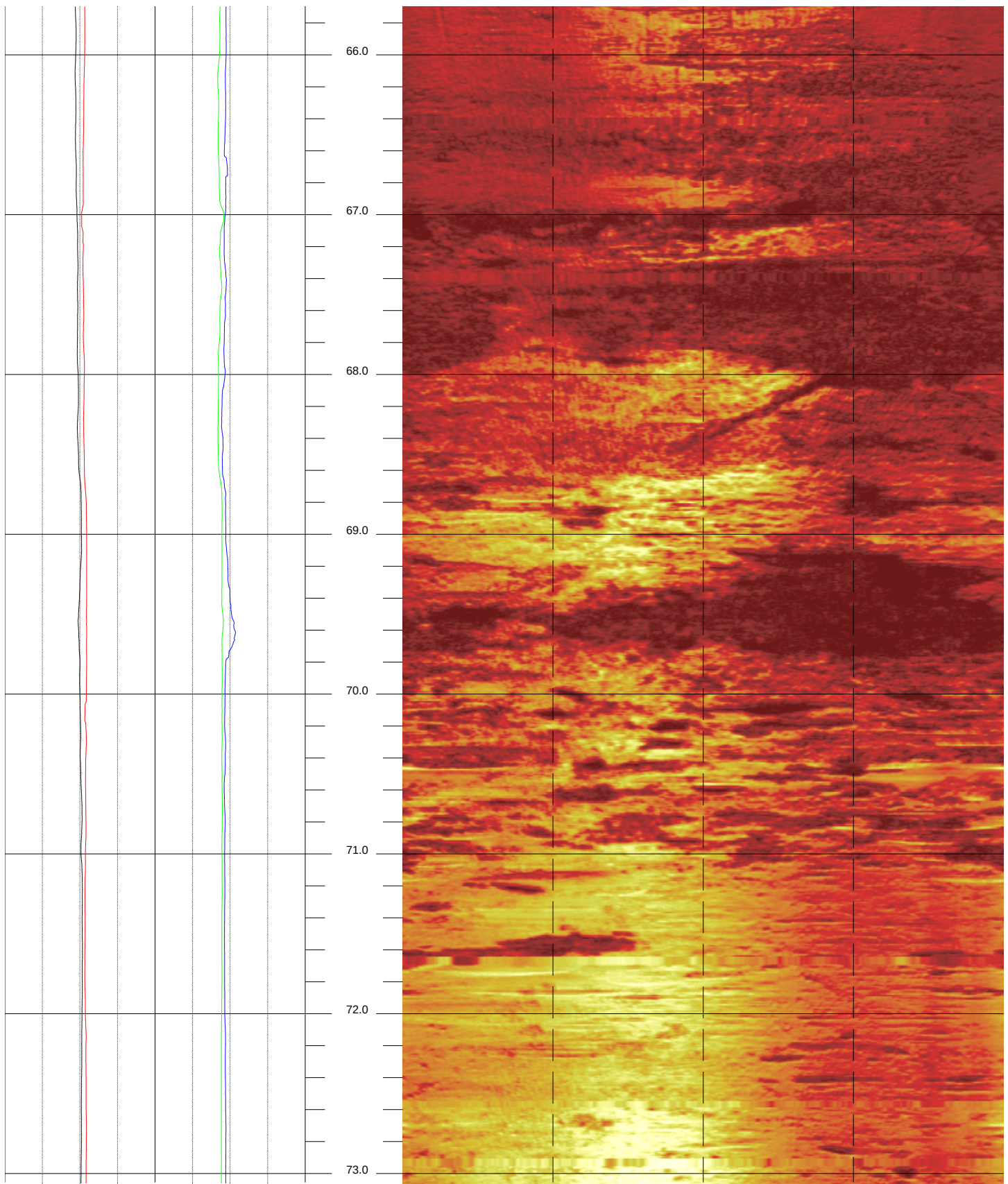


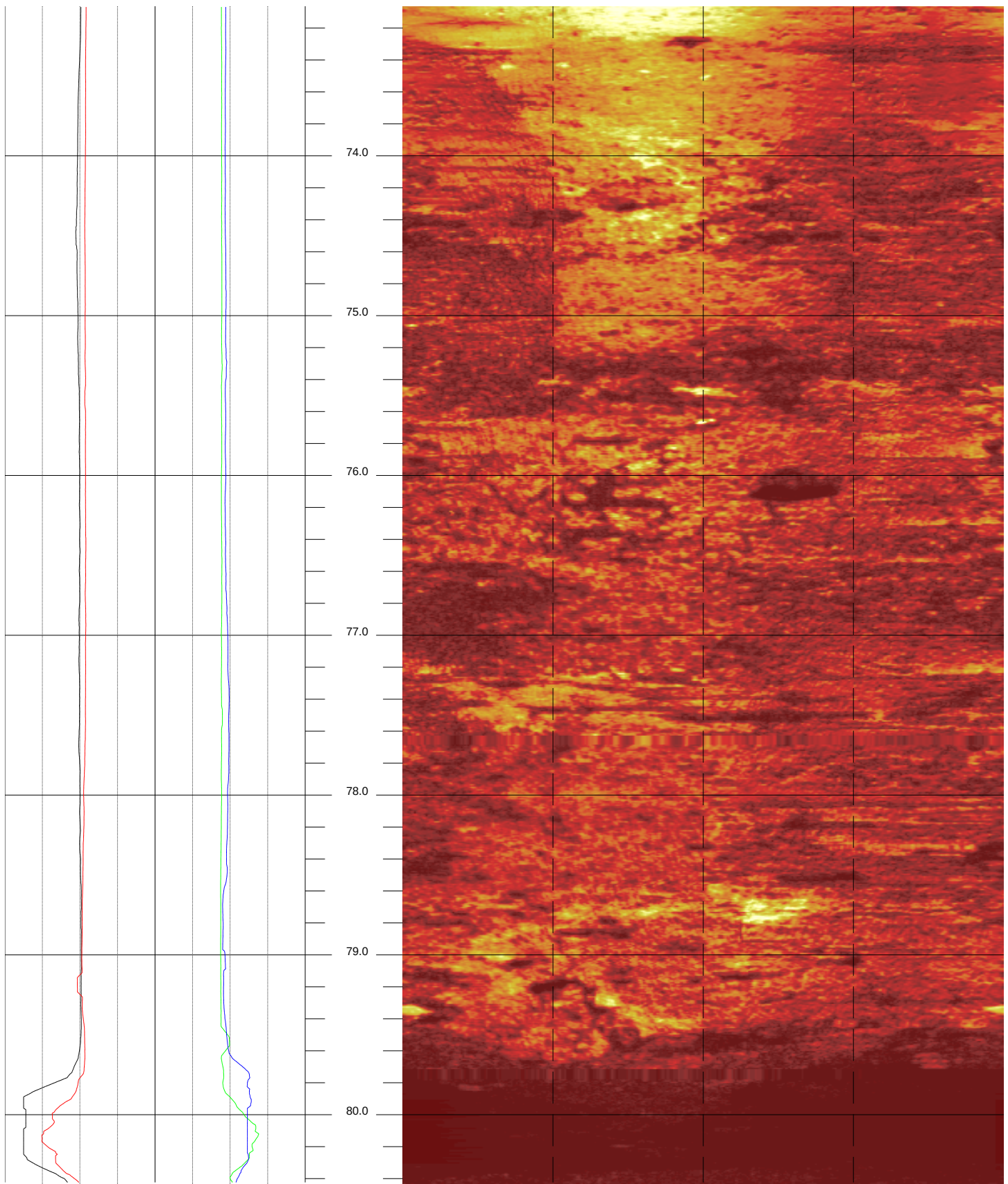


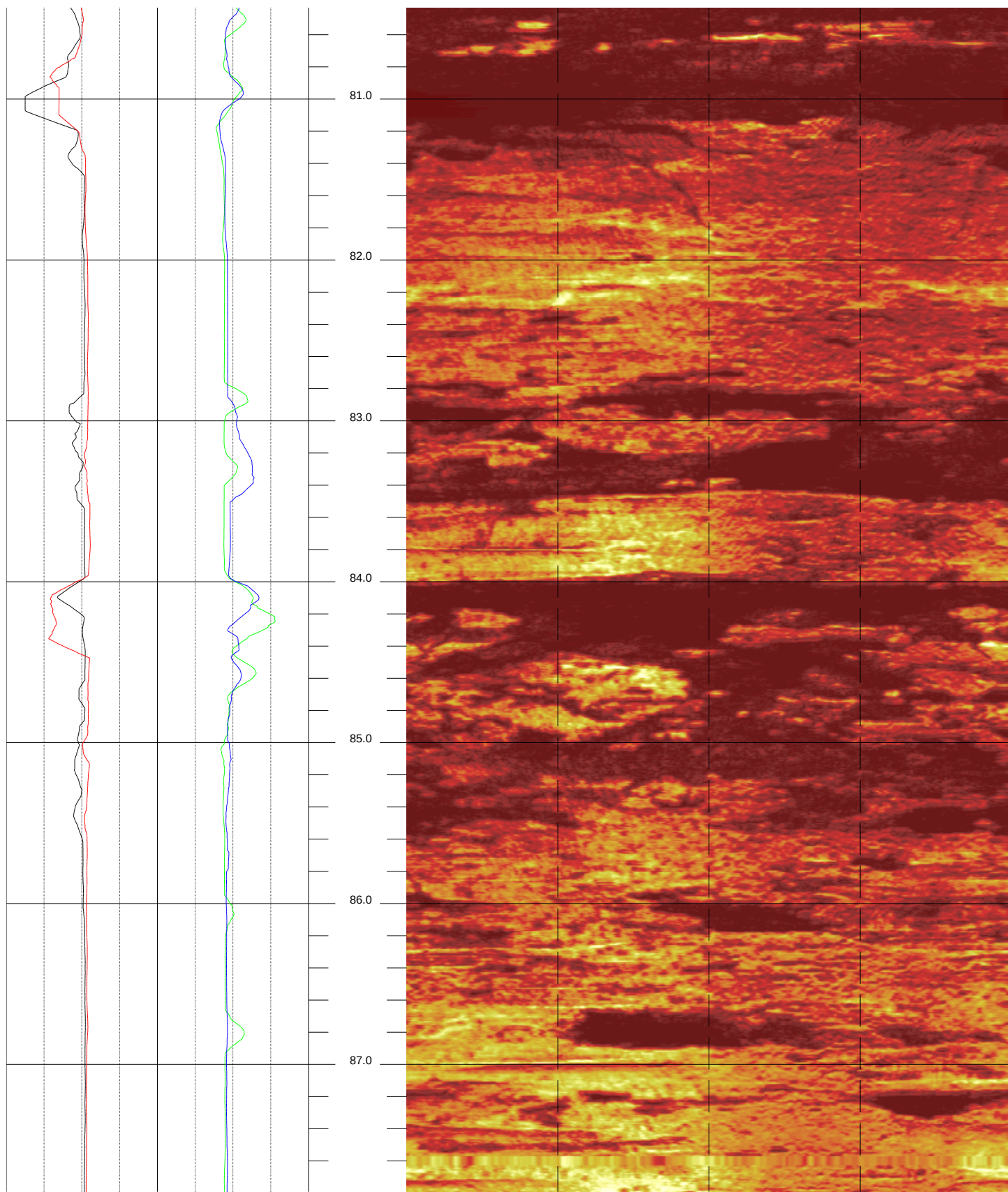


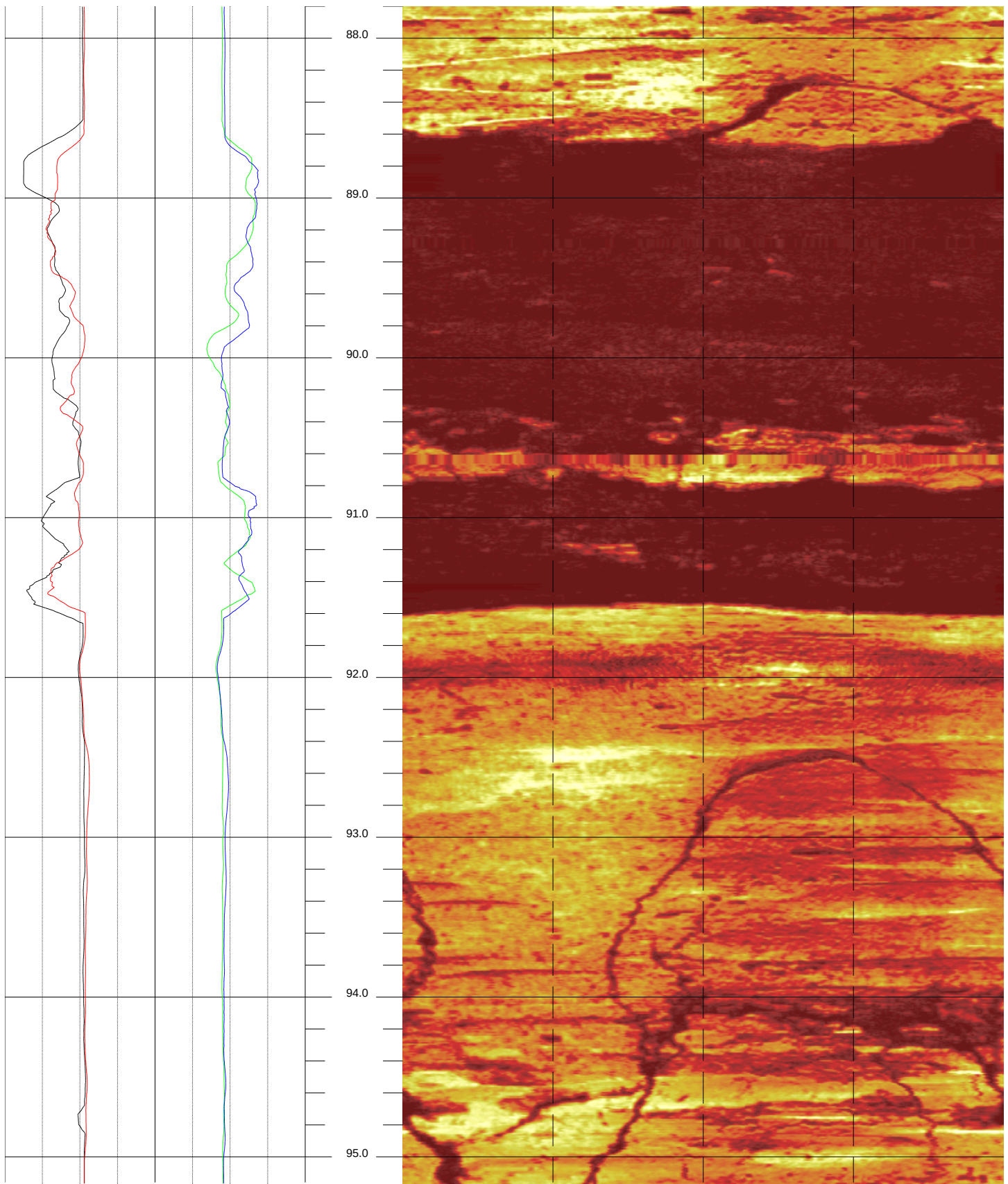


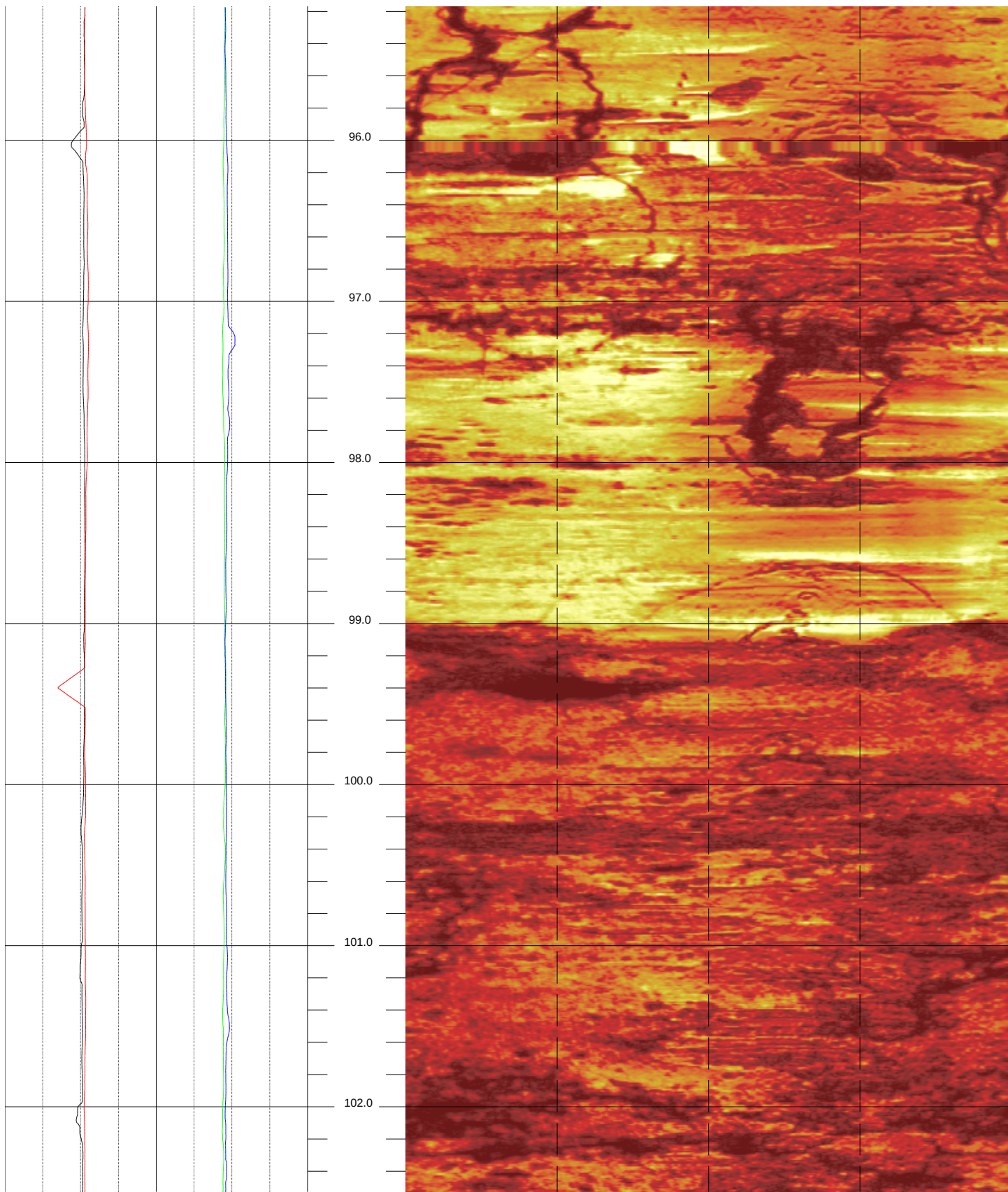














ROBERTSON
GEOLOGGING
LIMITED

ROBERTSON GEOLOGGING TECHNOLOGY
RGLDIP vsn 6.2 13 Dec 2007

BHTV ACOUSTIC CALIPER LOG 1/10

COMPANY CH2M HILL
WELL A-20
FIELD PEC LEVY COUNTY COLA
COUNTRY
LATITUDE -
LONGITUDE -
PROJECT PEF COLA

OTHER SERVICES

PERM. DATUM
LOG DATUM
DRILL DATUM
ELEVATION

-

KELLY BUSHING 0ft
DRILL FLOOR 0ft
GROUND LEVEL 0ft

	RunNo1	RunNo2	RunNo3
DATE	2 May 2007	2 May 2007	2 May 2007
RUN#	0	0	2
TYPE OF LOG			ACOUSTIC
DEPTH DRILLER	0	0	265
DEPTH LOGGER	0	0	265
LOG DEEPEST	0	0	265
LOG SHALLOW	0	0	3
FLUID IN HOLE			DRILLING MUD
SALINITY			
DENSITY			
LEVEL			
MAX TEMP (C)	0	0	0
RIG TIME			
RECORDED BY			C CARTER
WITNESSED BY			

RUN#

BIT

BIT RECORD
FROM TO

SIZE

CASING RECORD
WEIGHT FROM TO

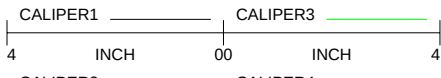
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0

REMARKS

LOG FILE: C:\Rgldip\Well\Data\A20AUUP01.btv
261.920 to 35.000ft

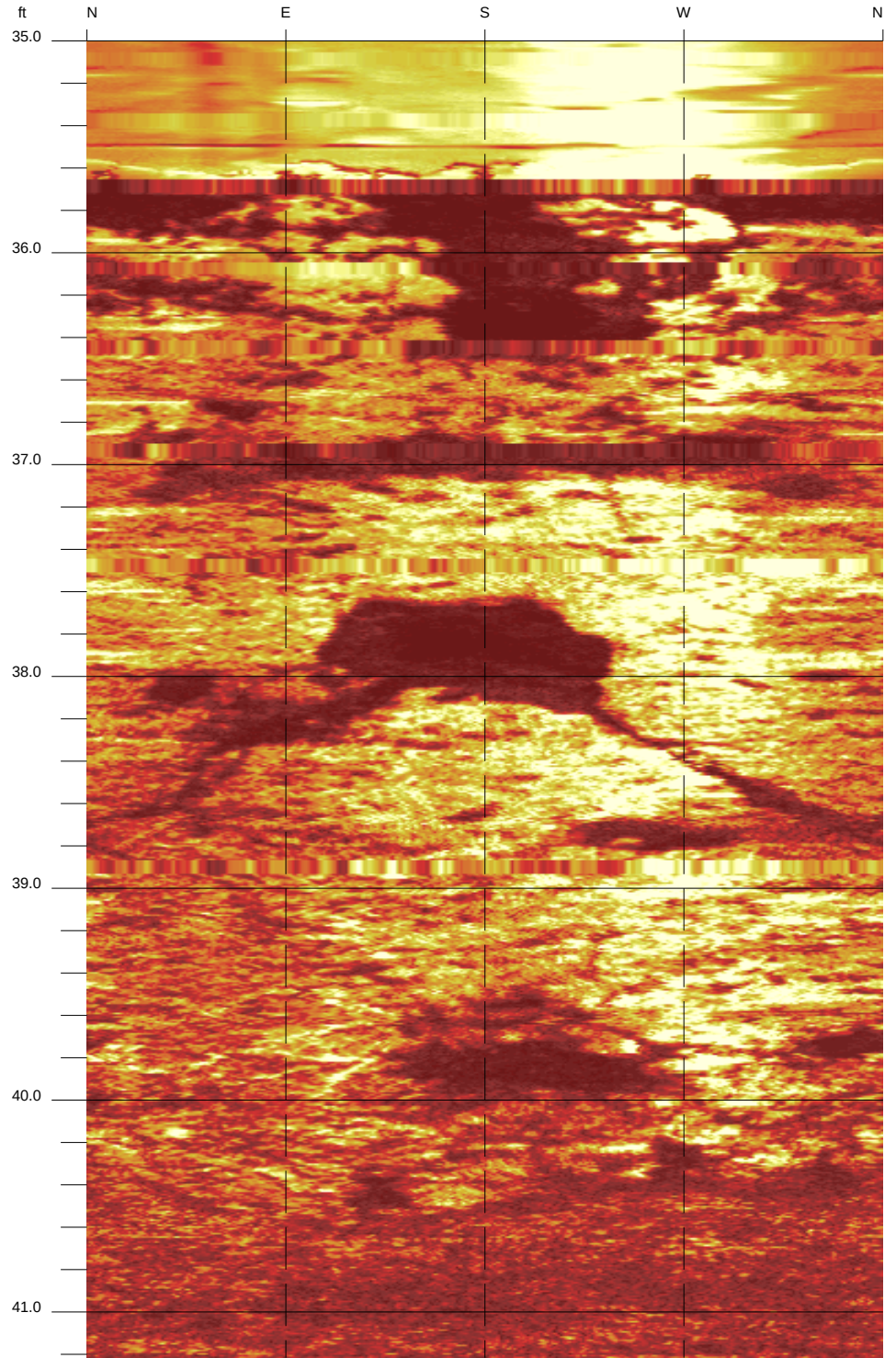
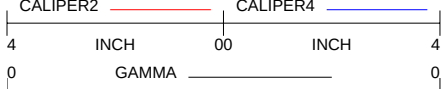
Depth interval 0.008ft, Filter length 0.120ft

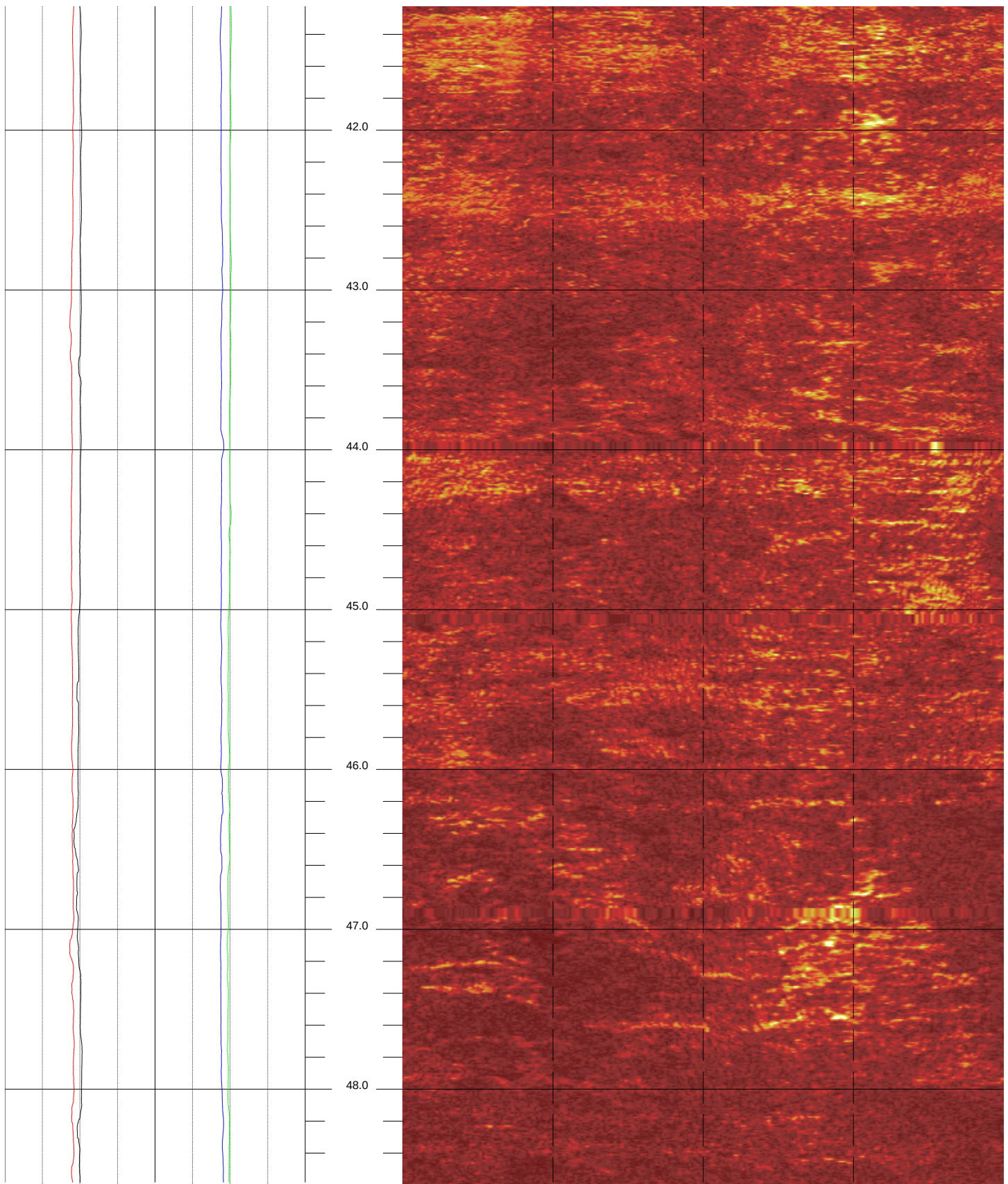
REFLECTANCE

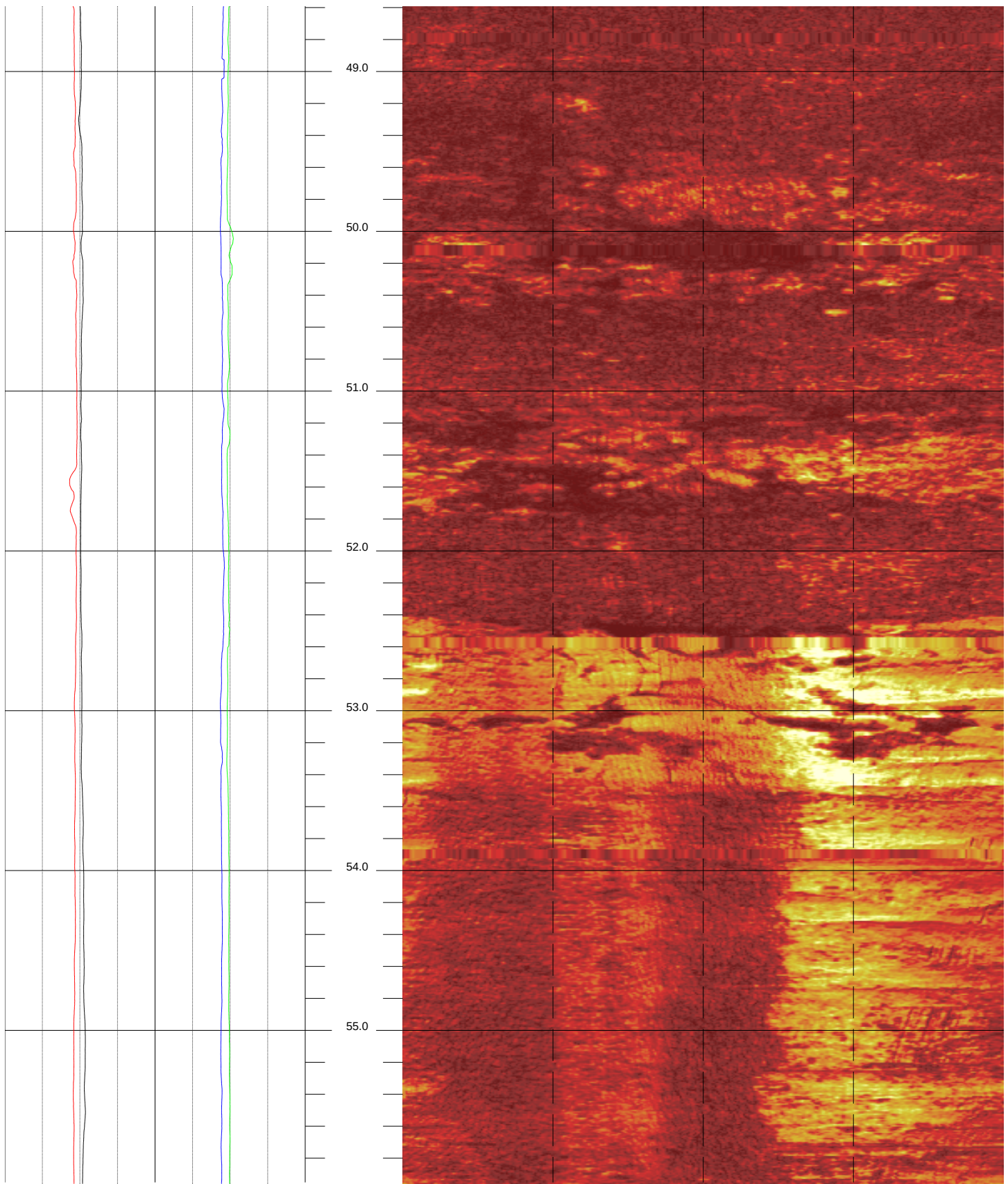


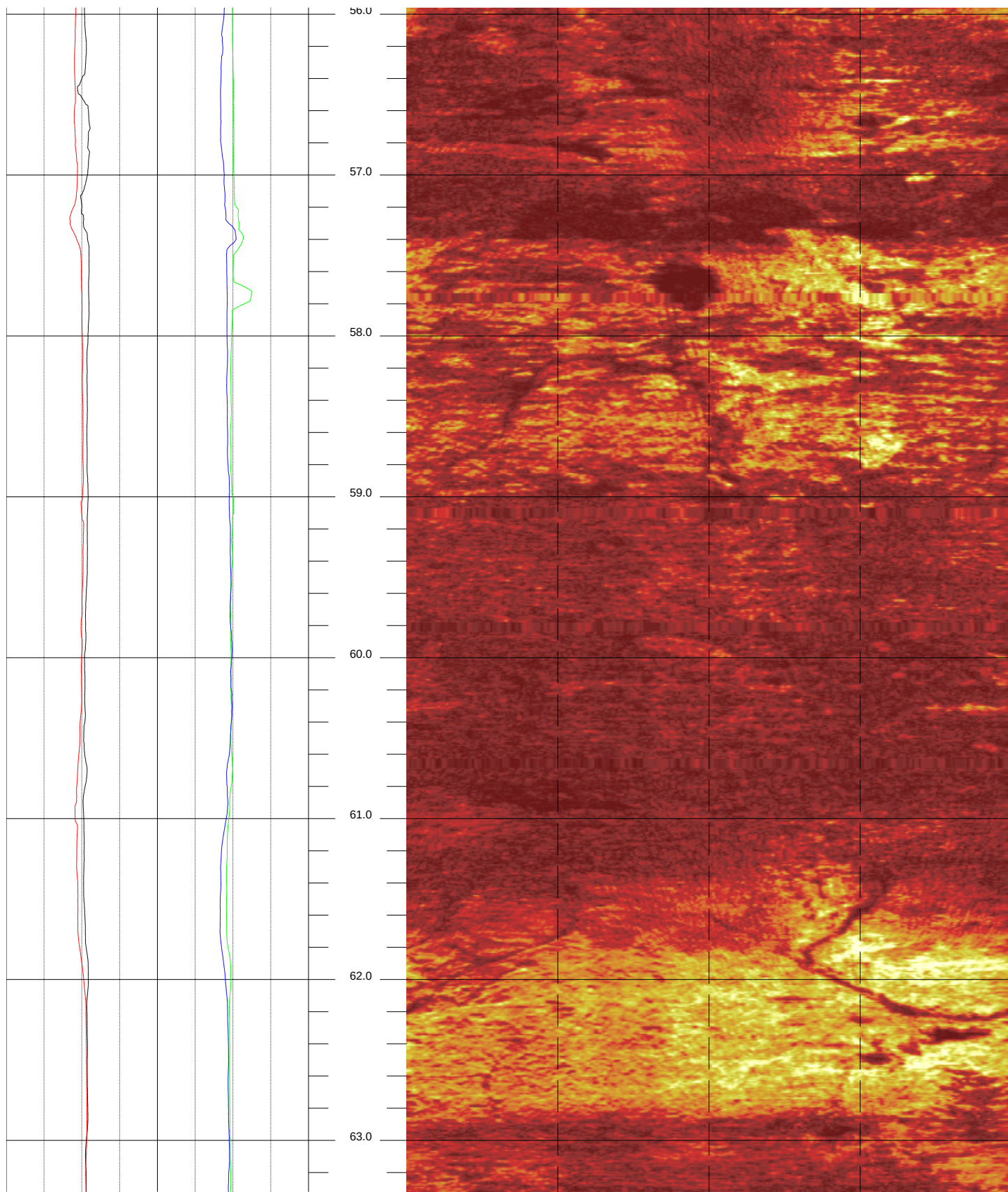
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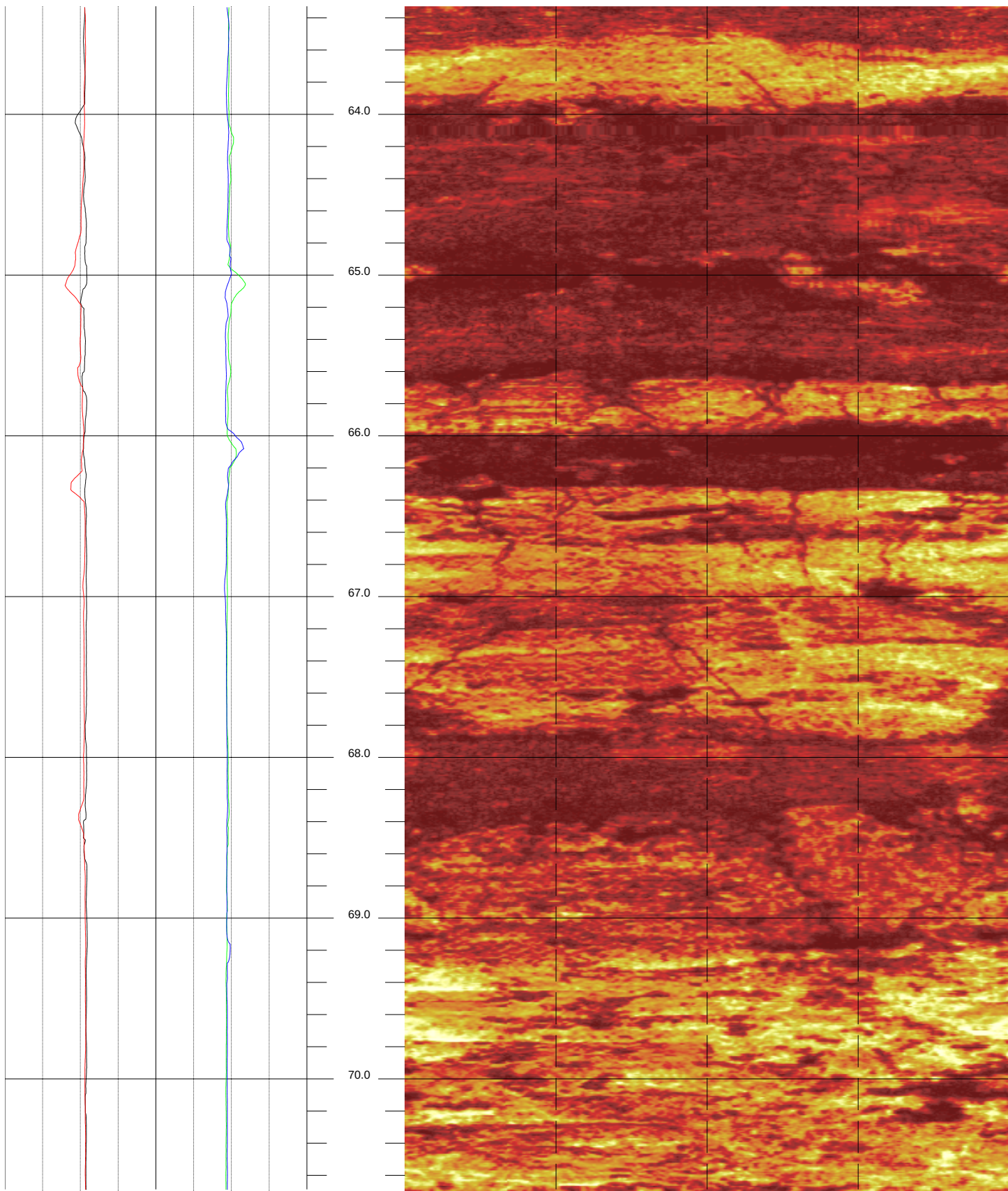
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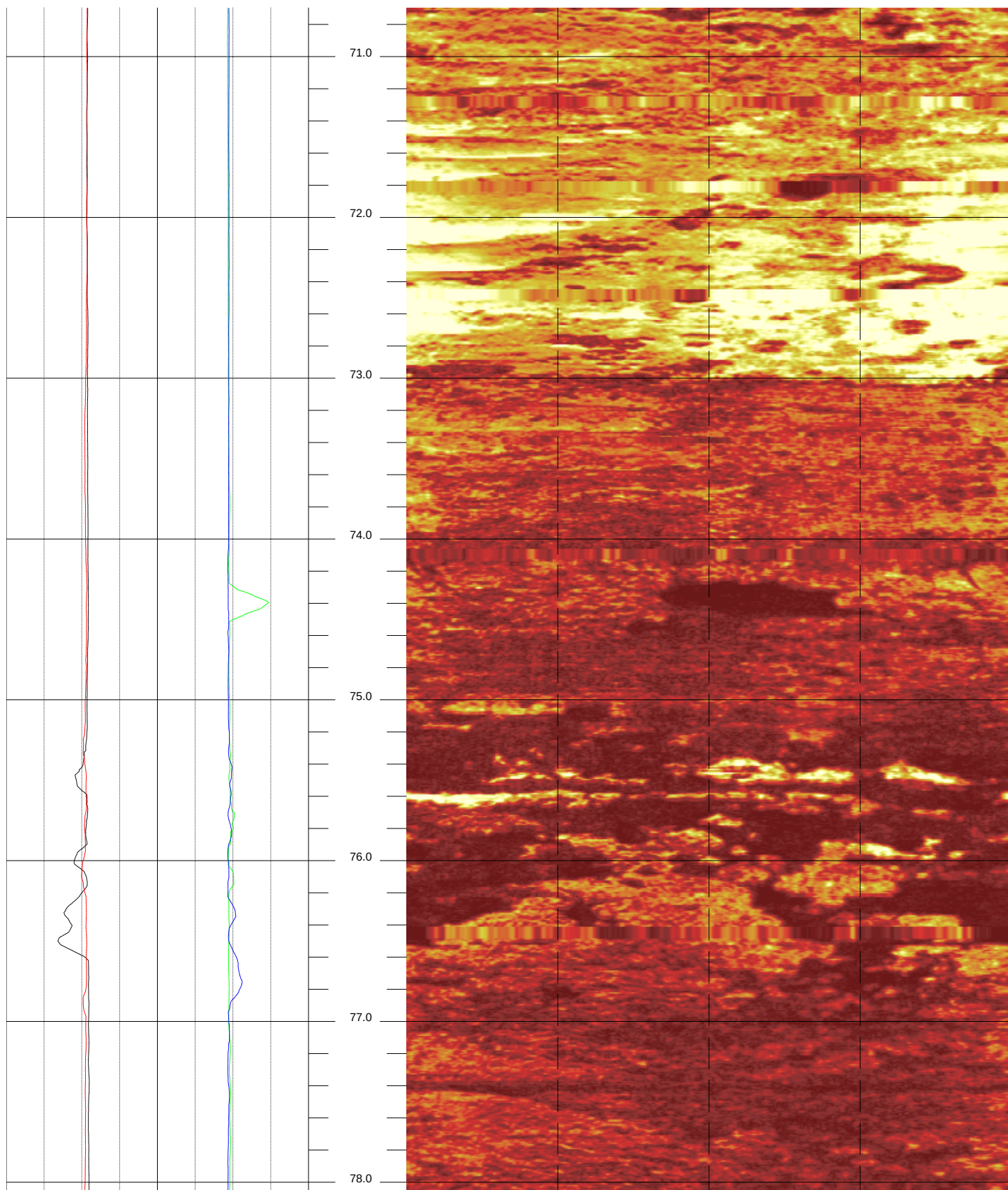


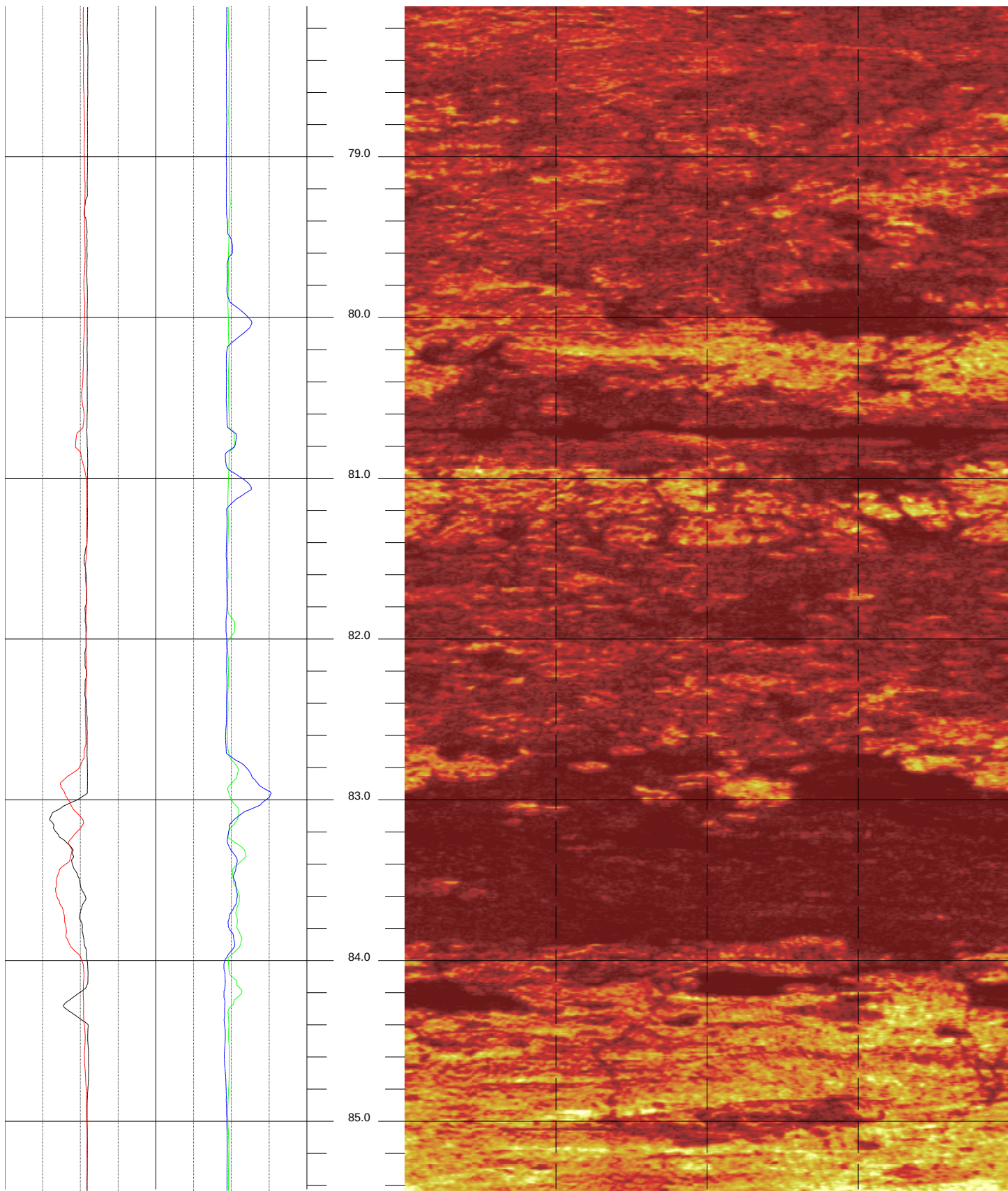


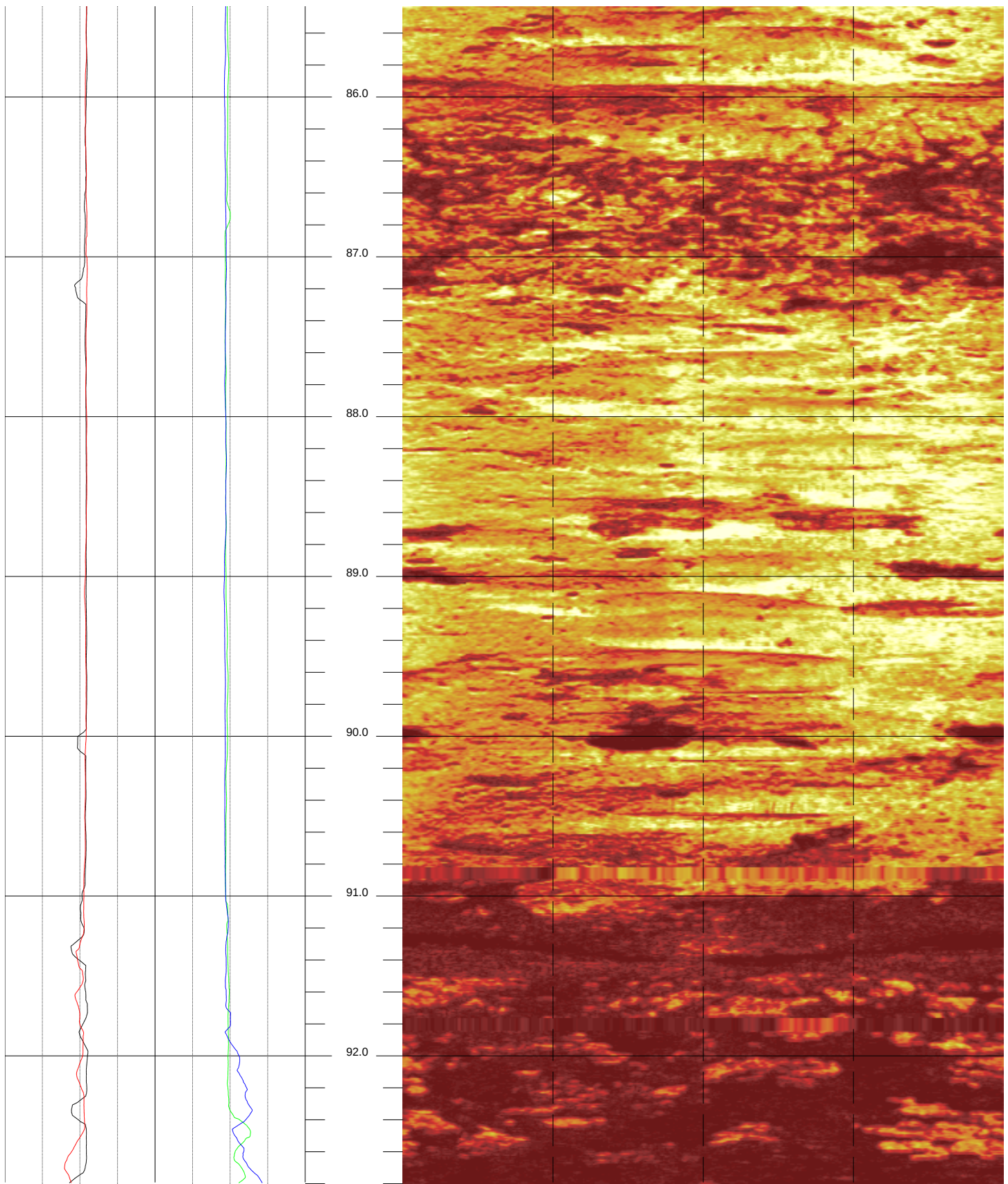


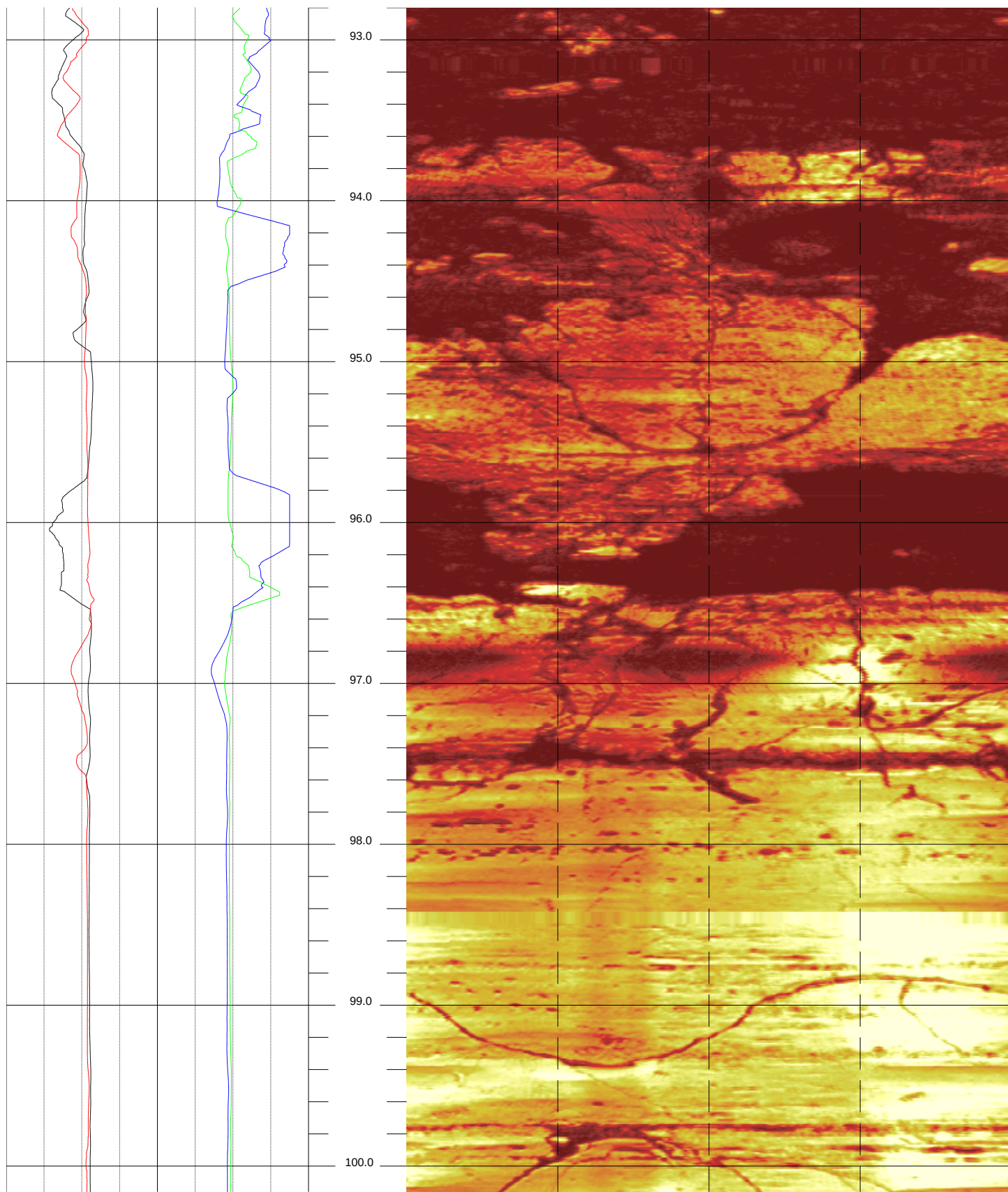


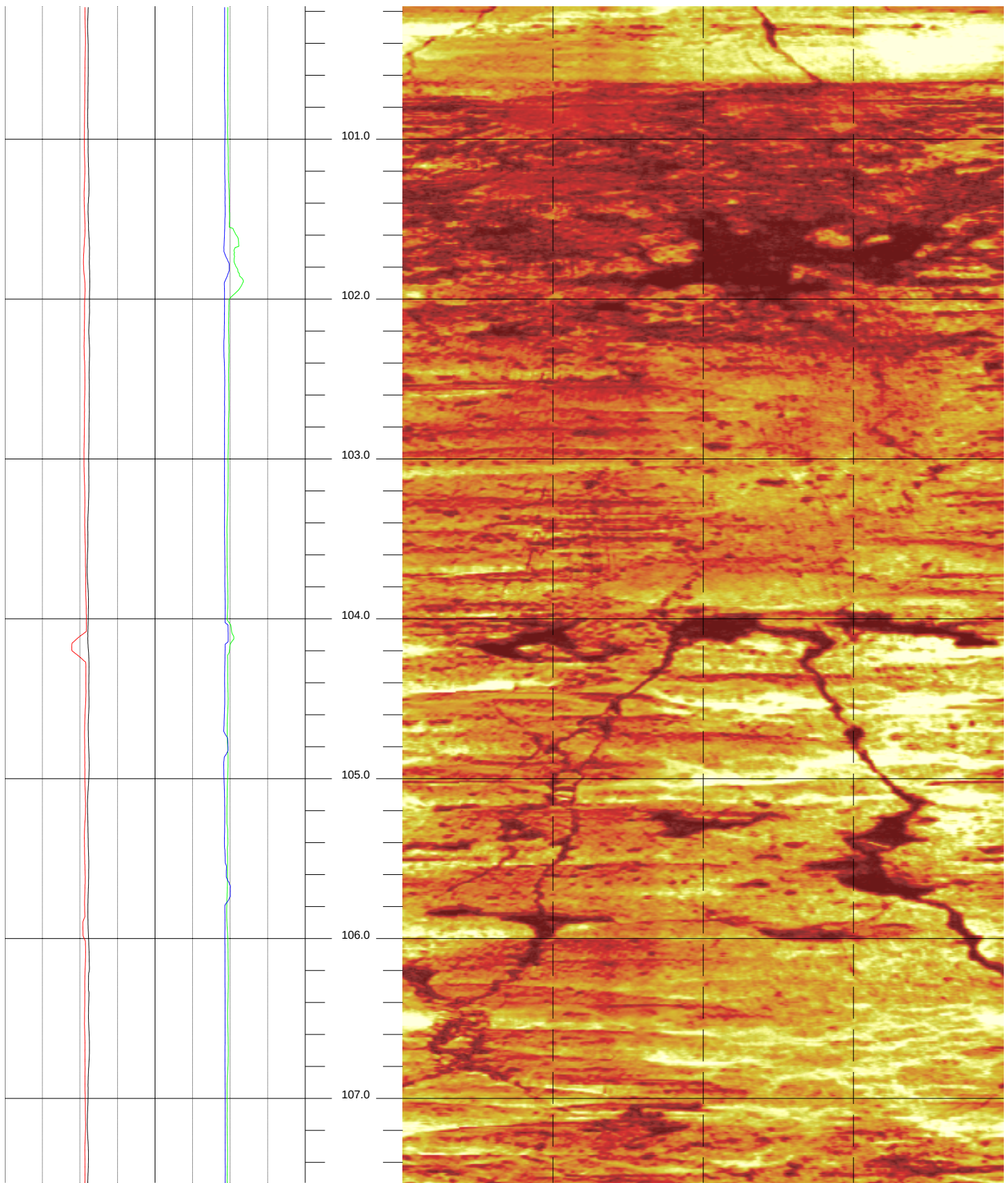


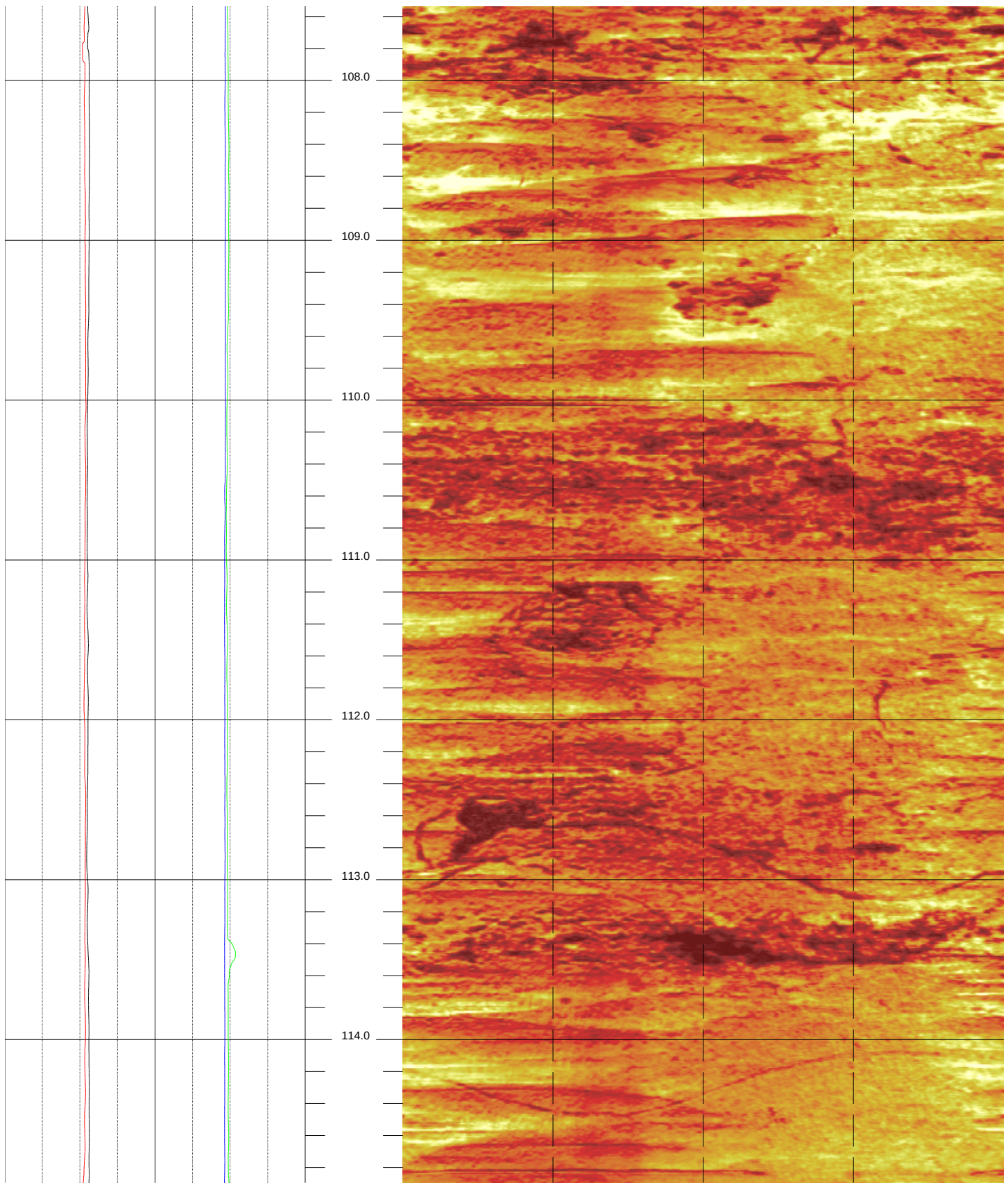


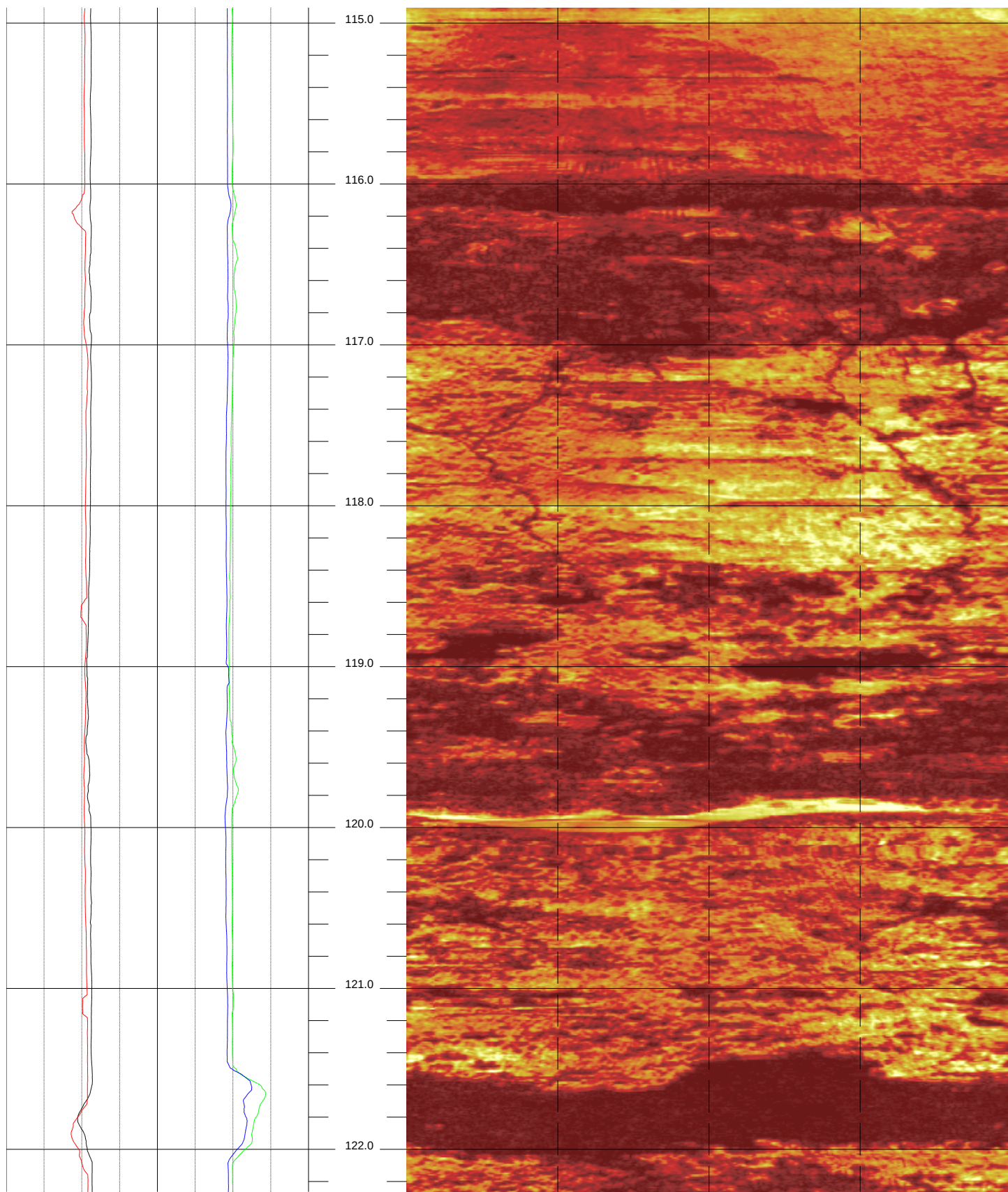


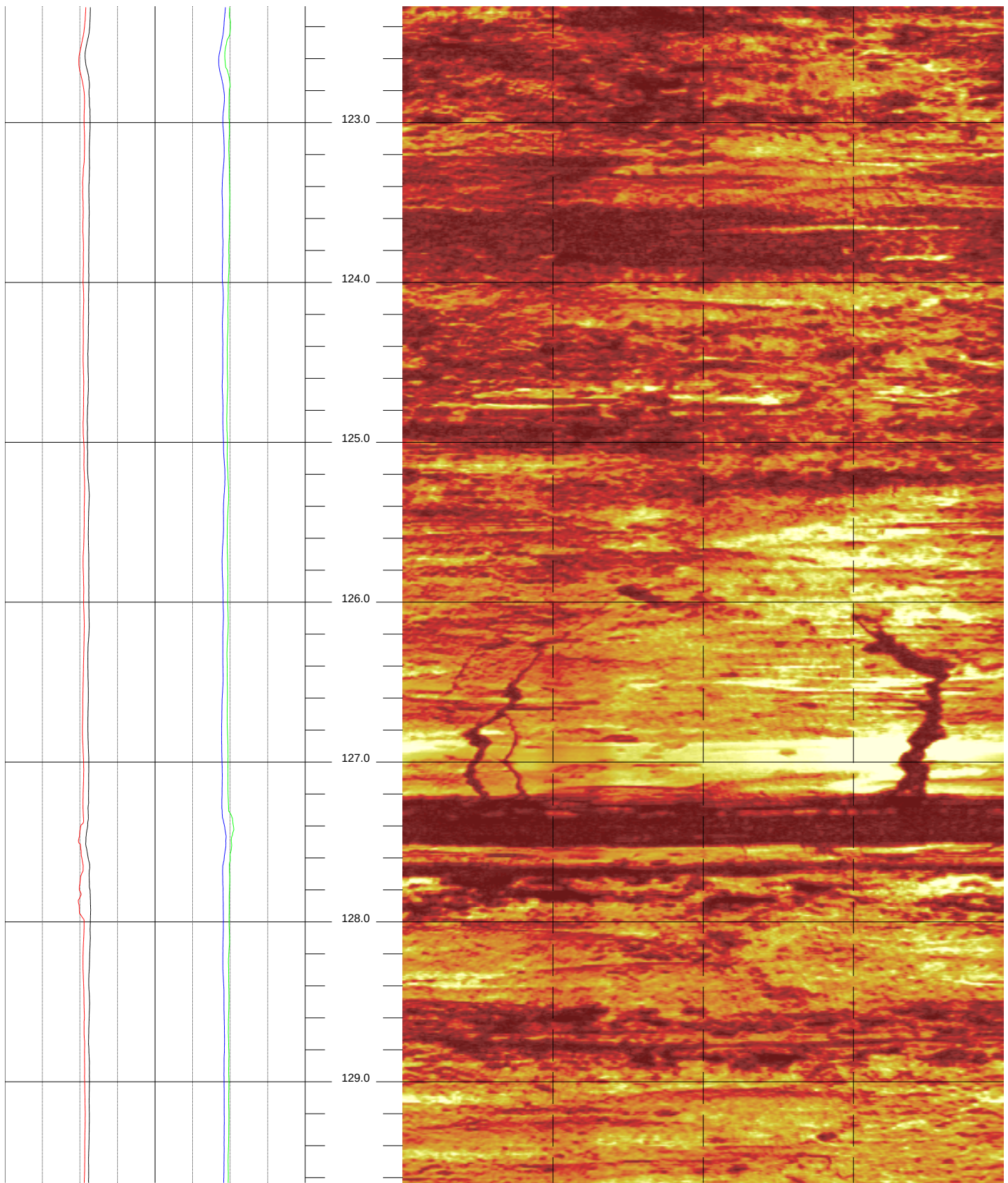


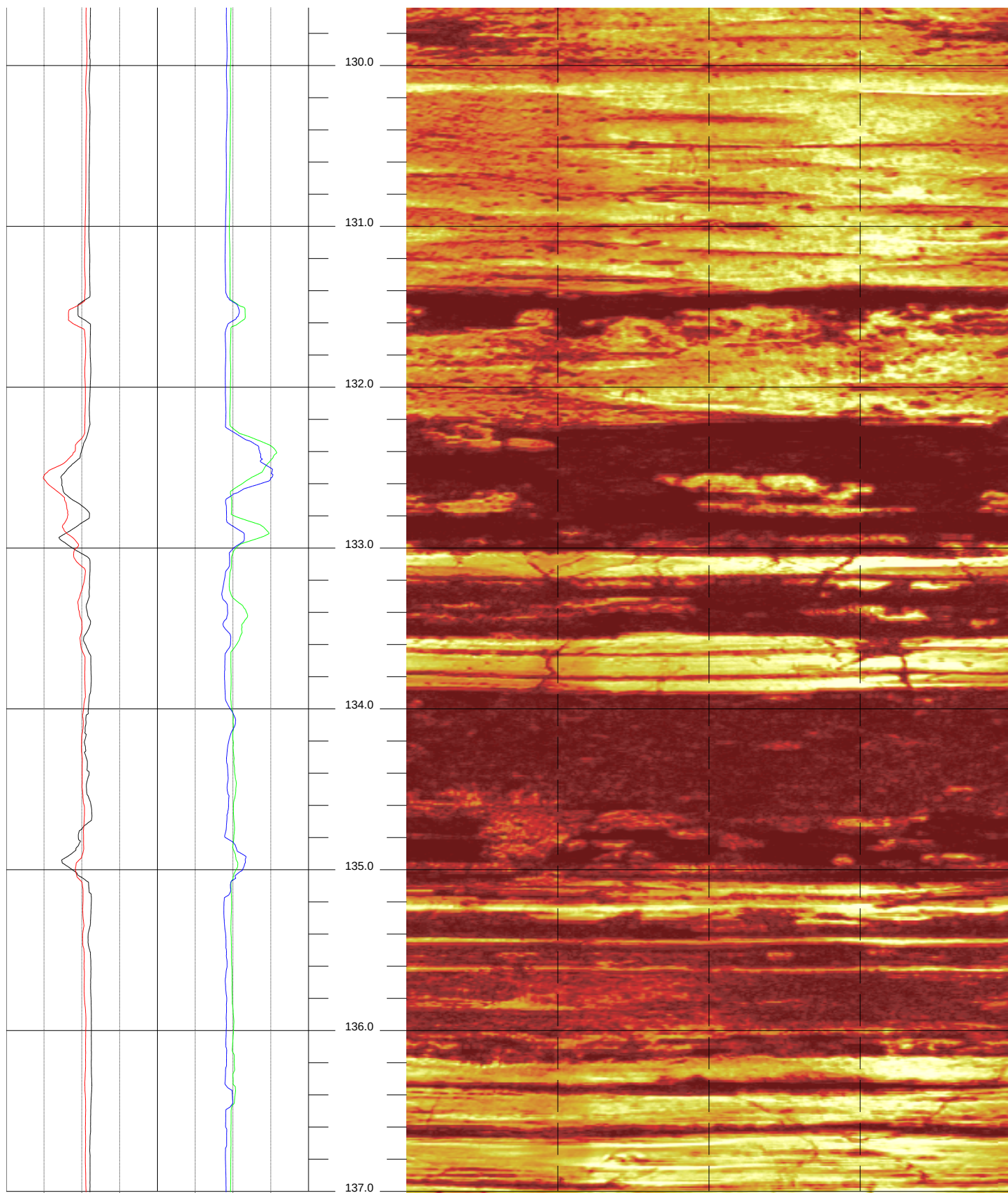


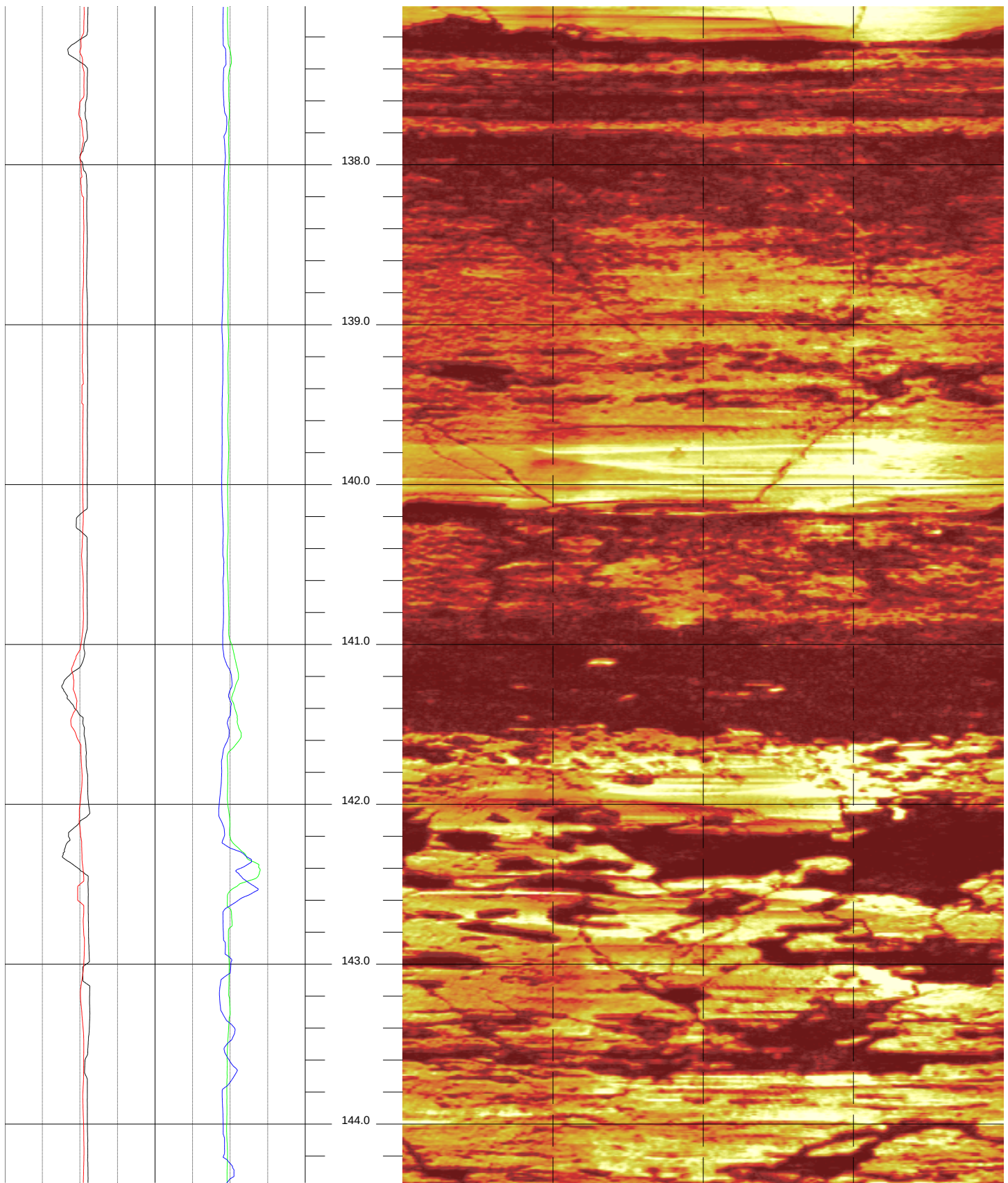


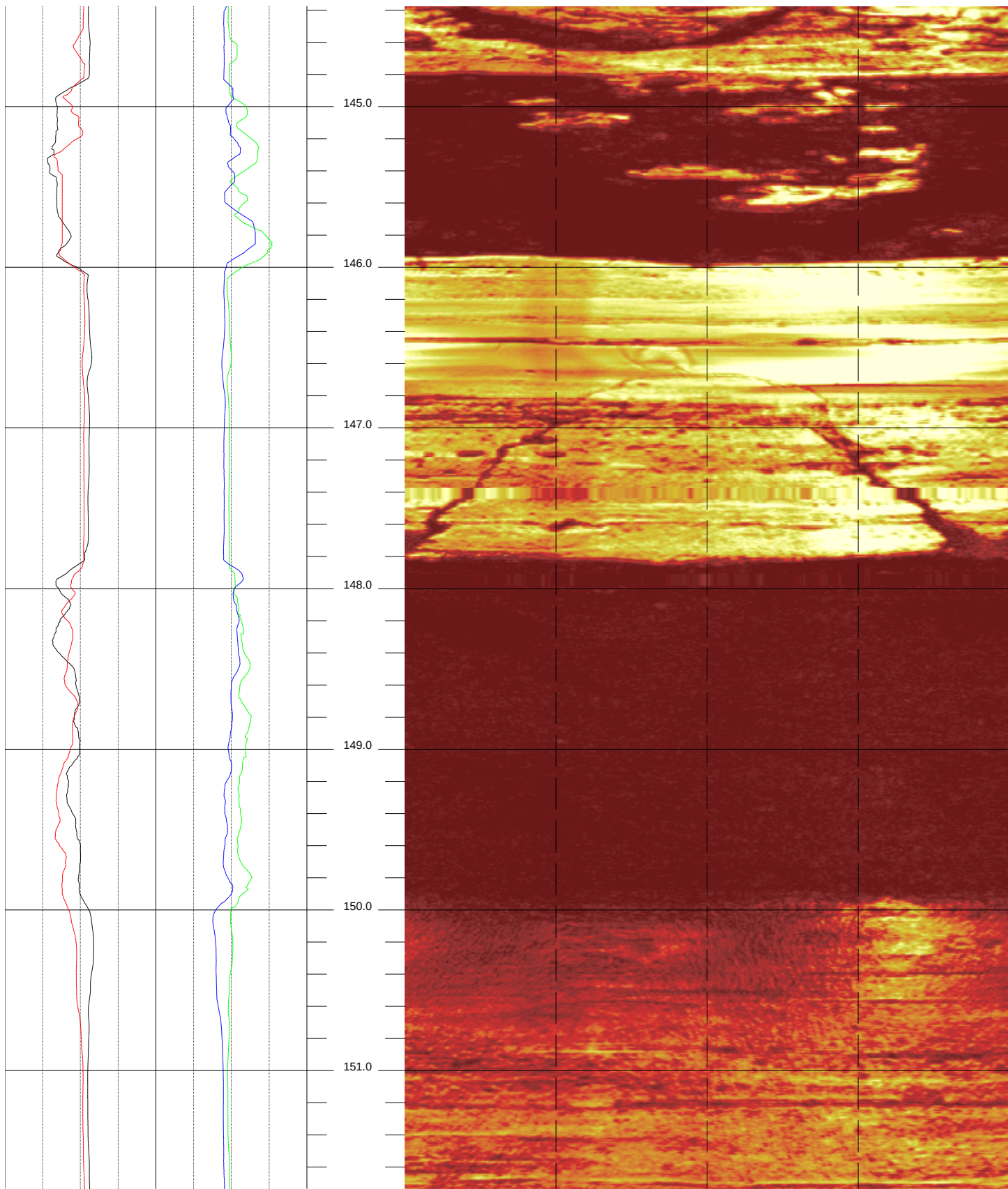


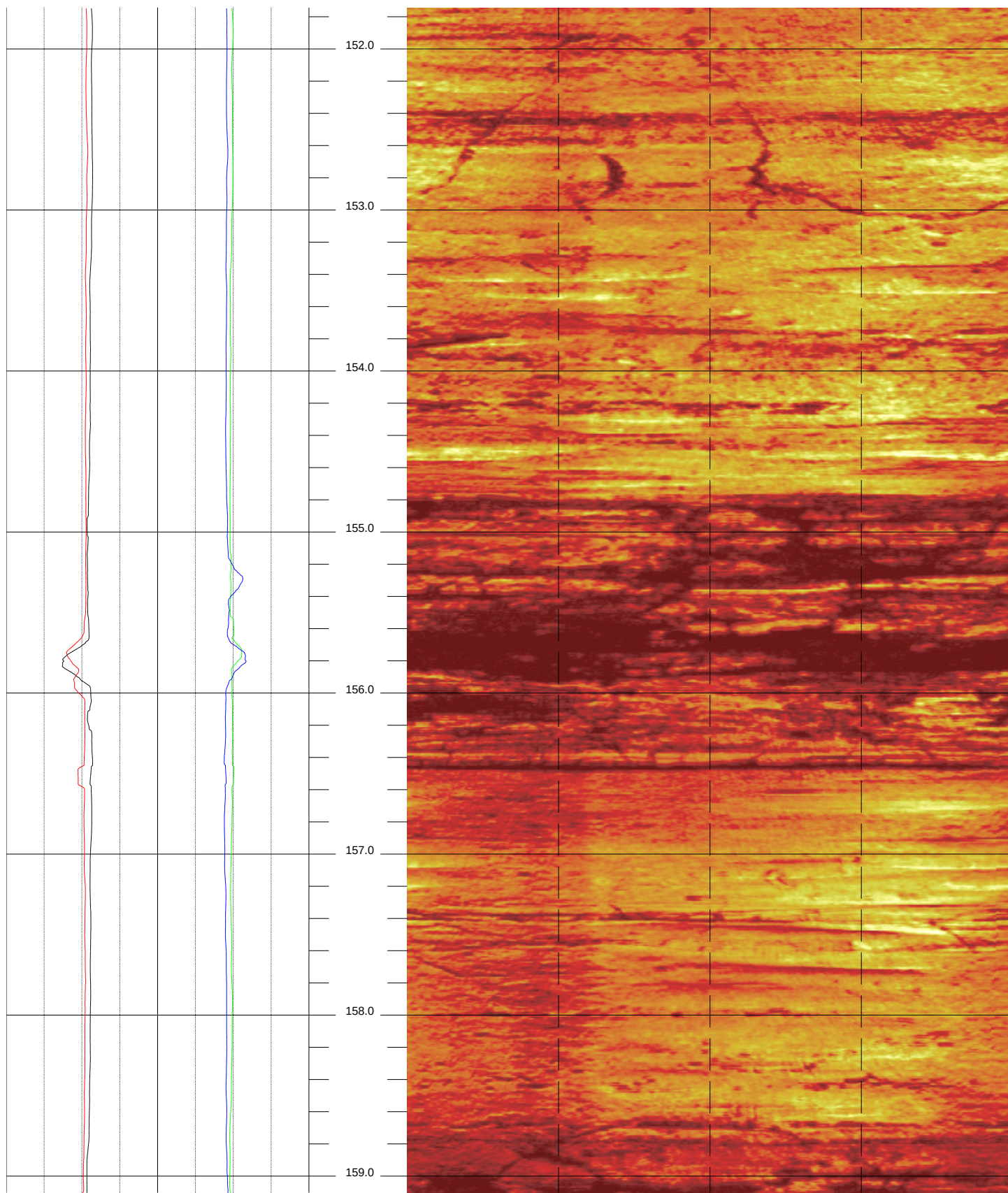


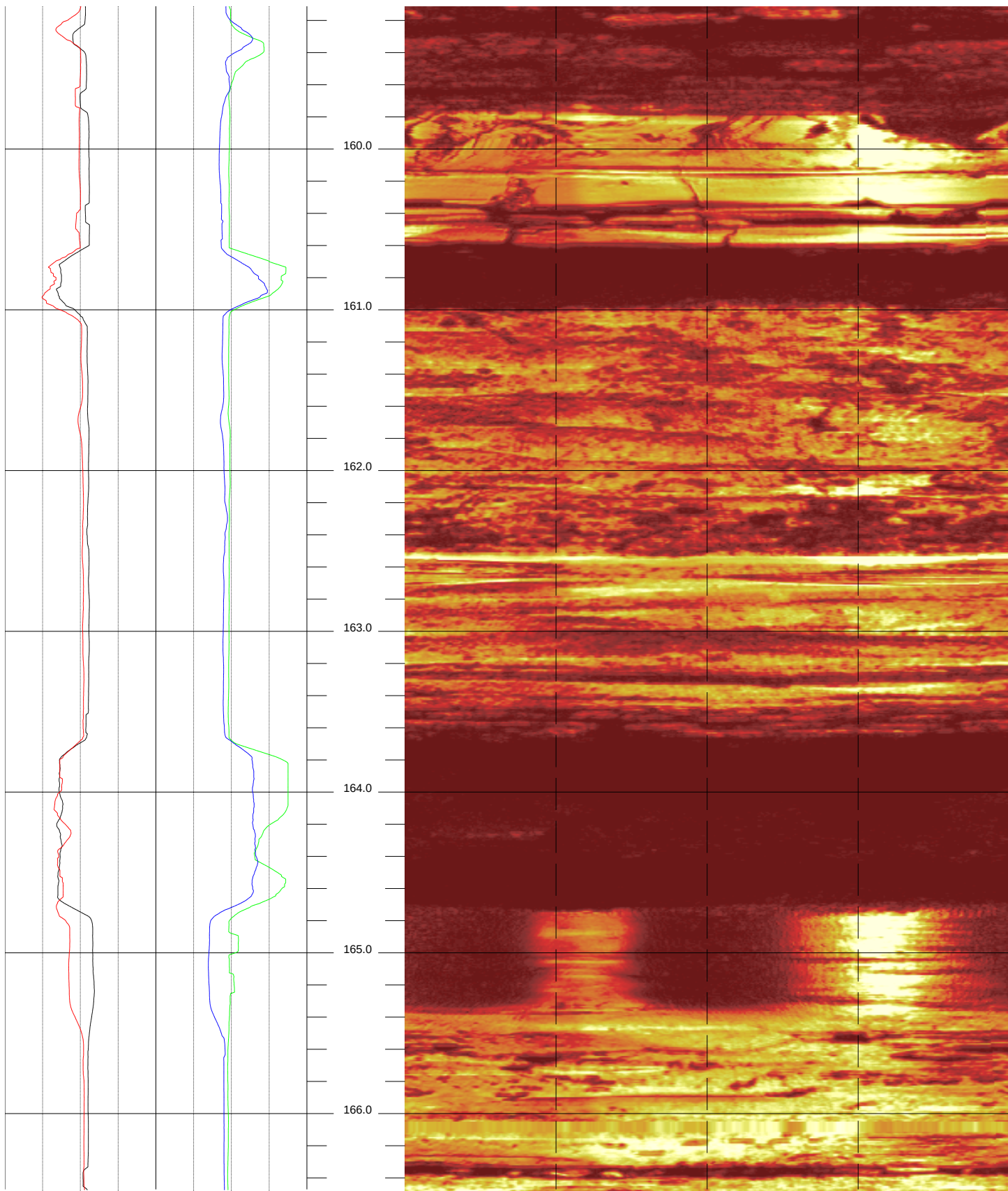


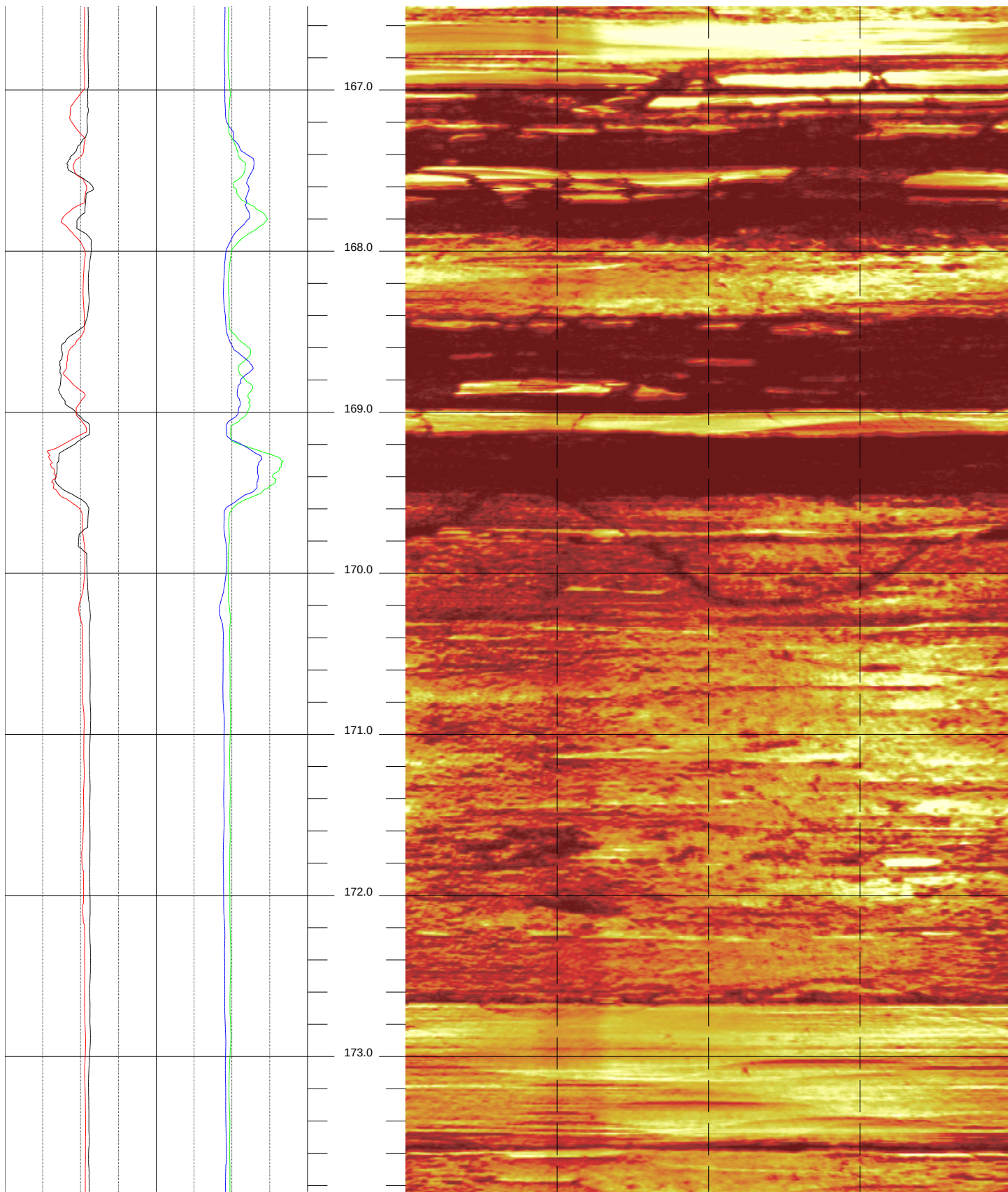


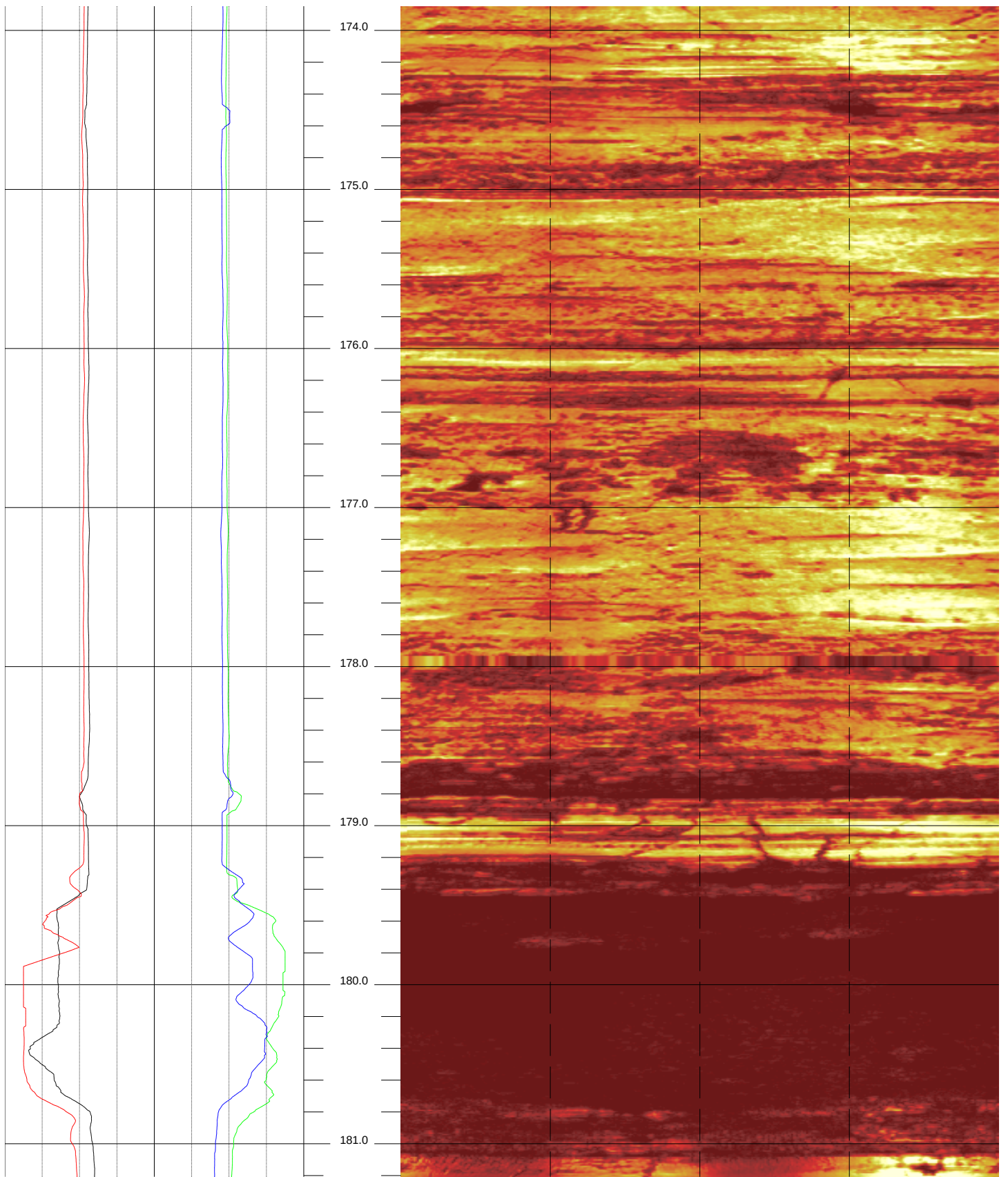


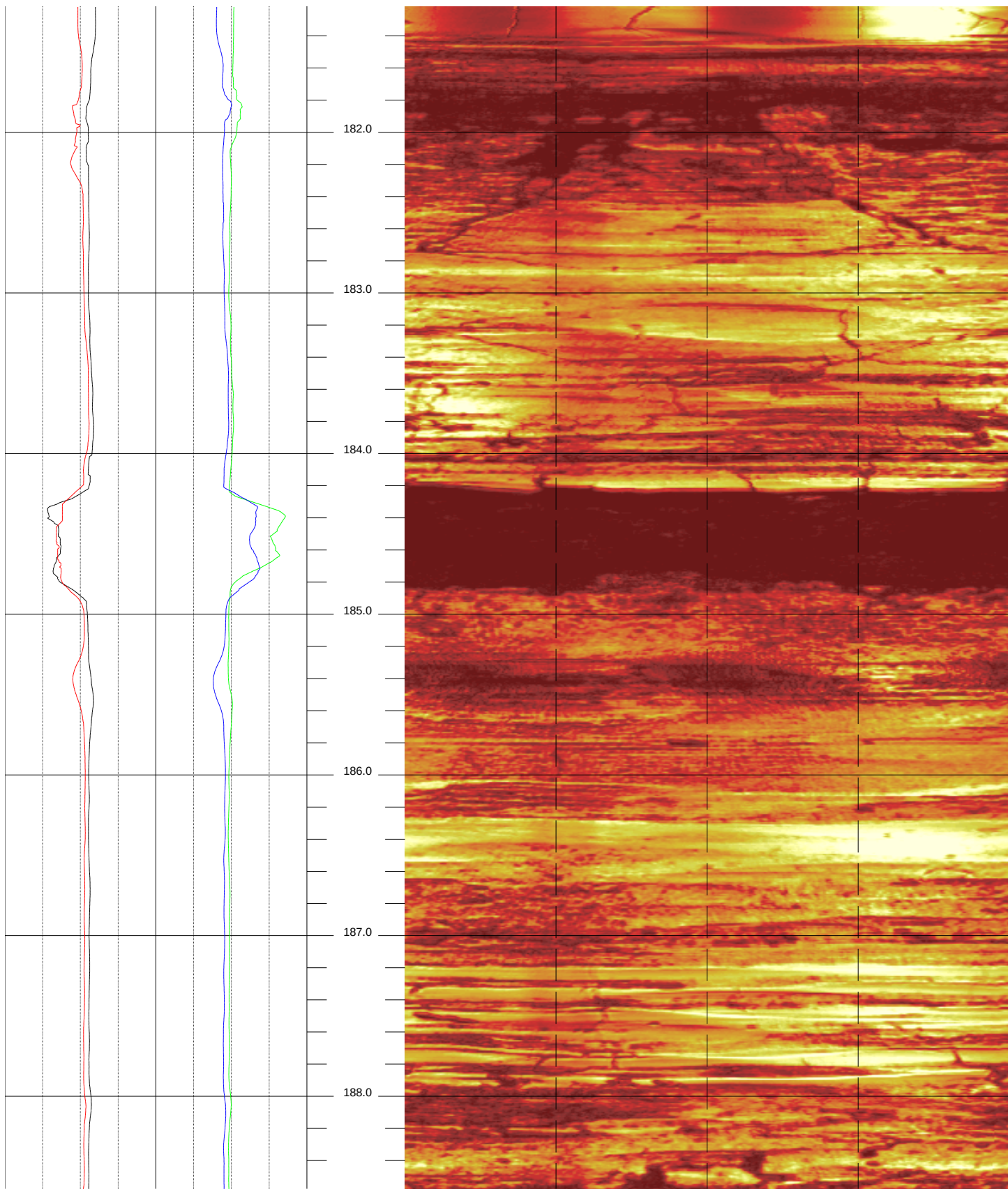


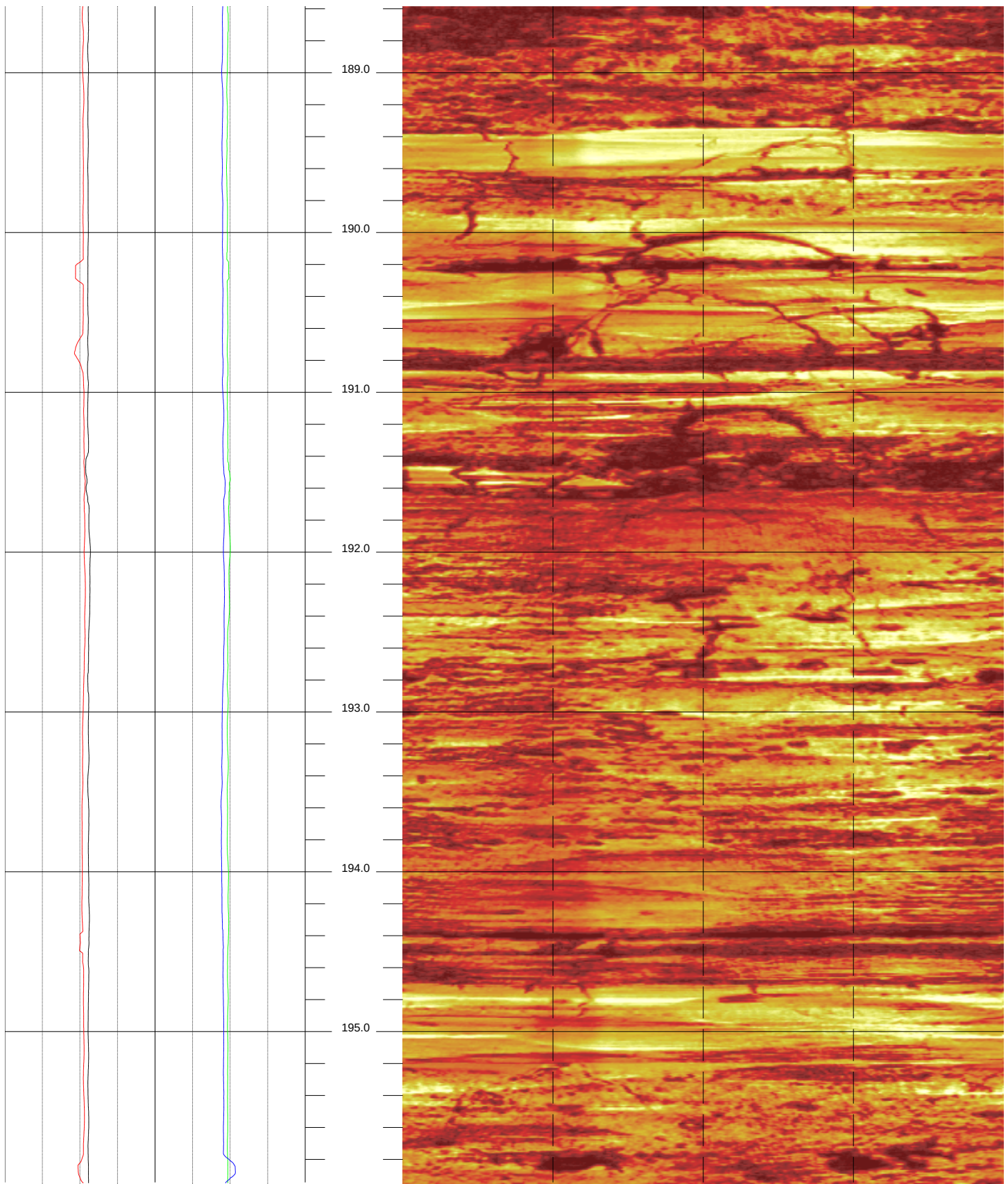


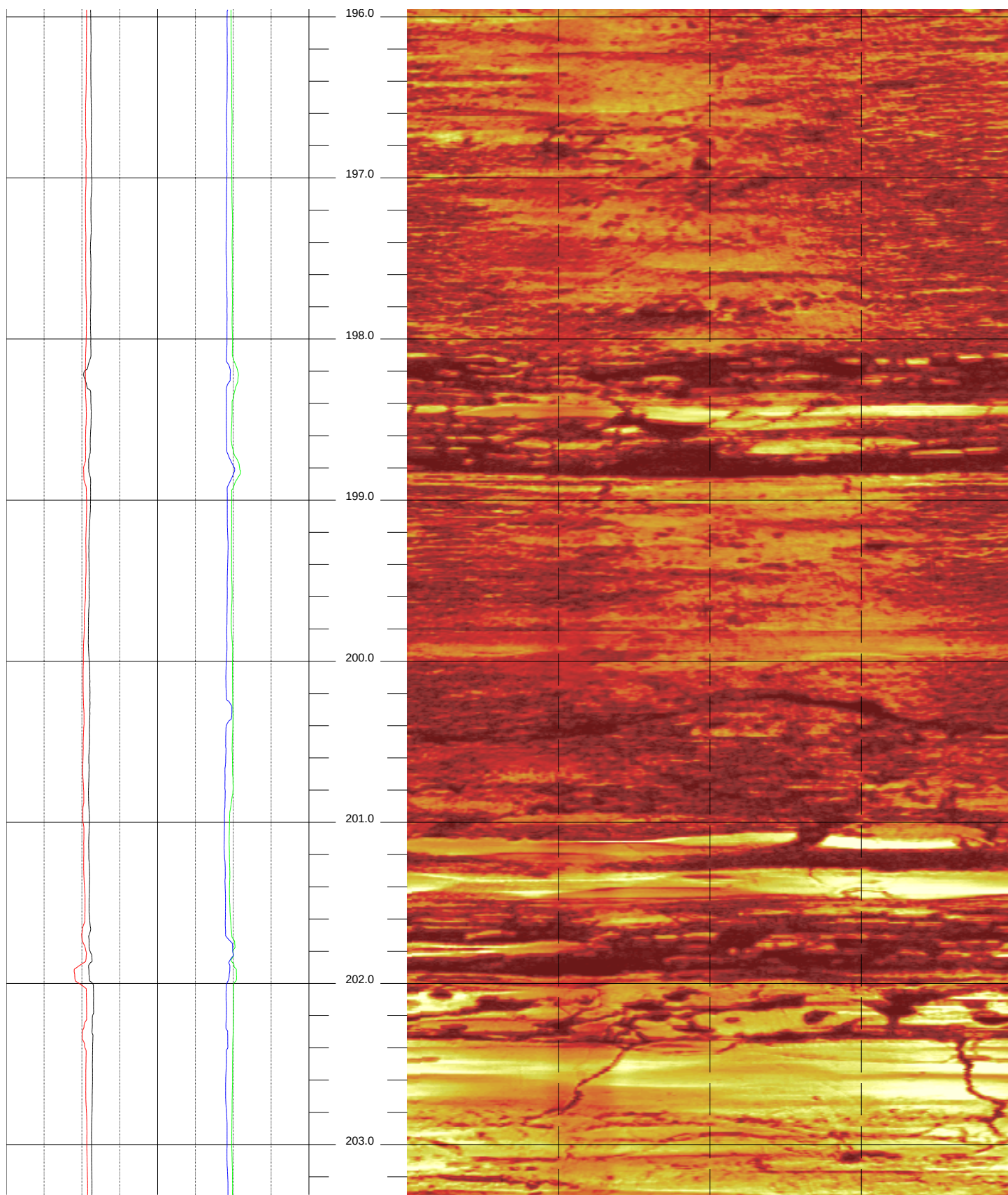


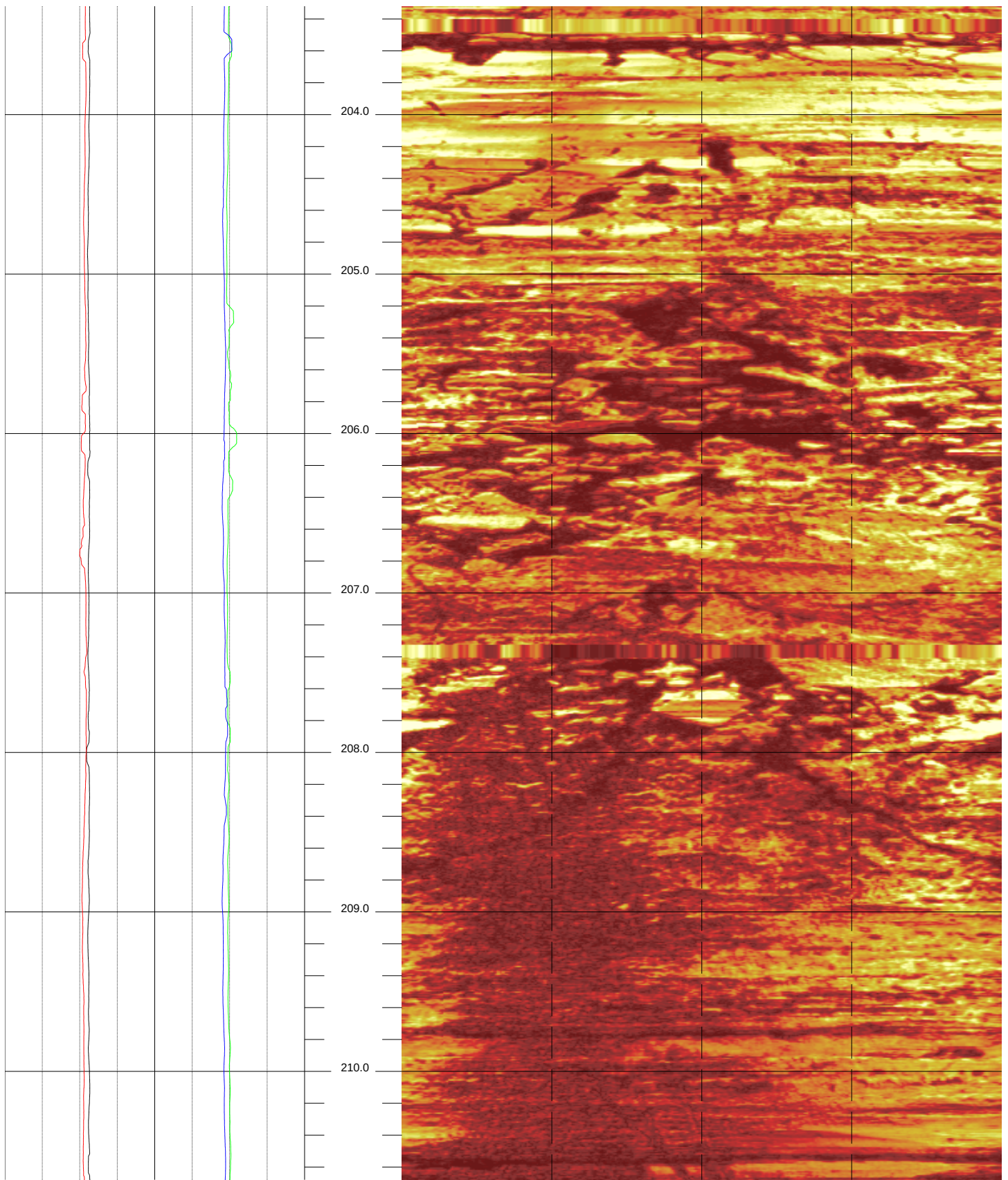


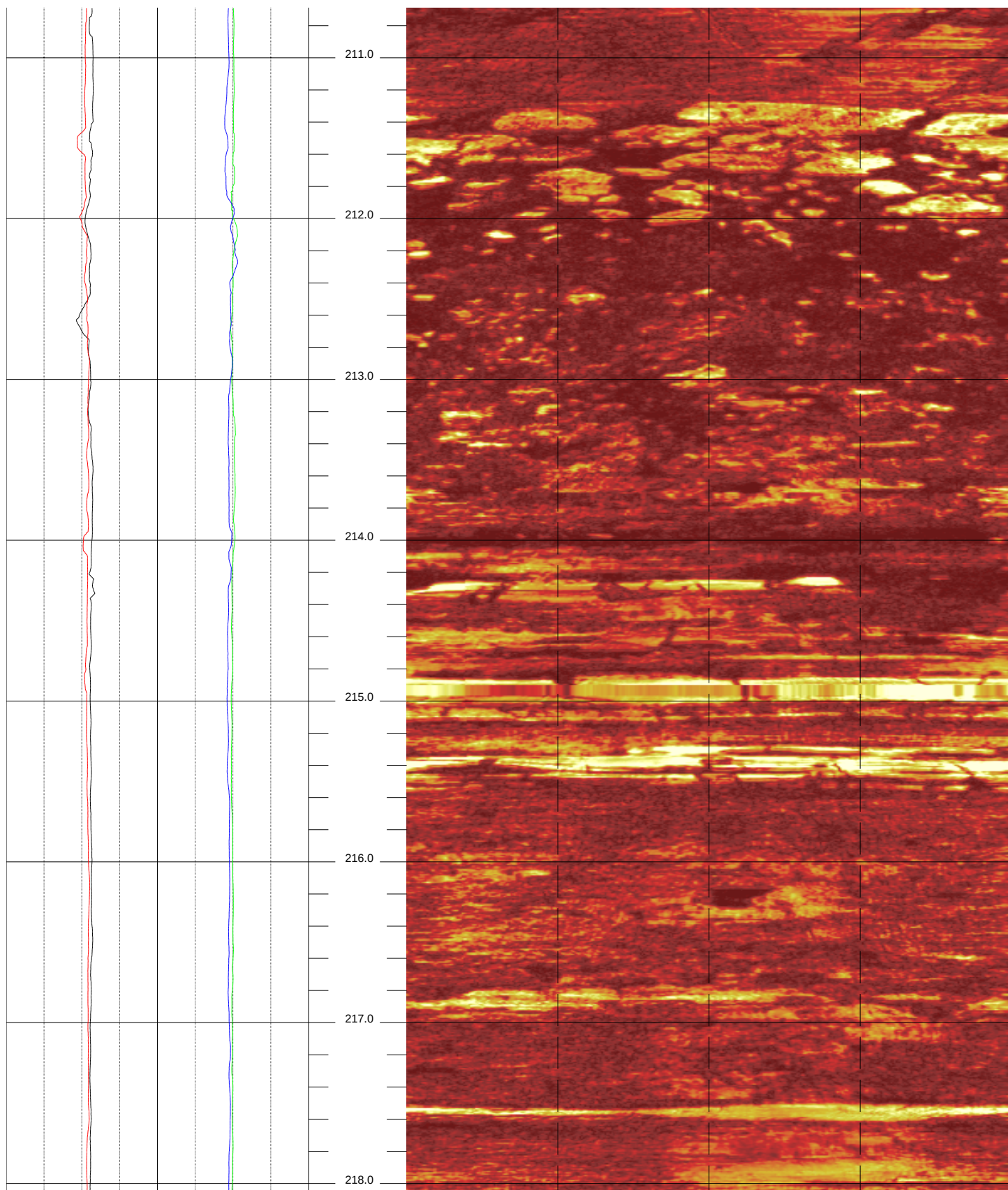


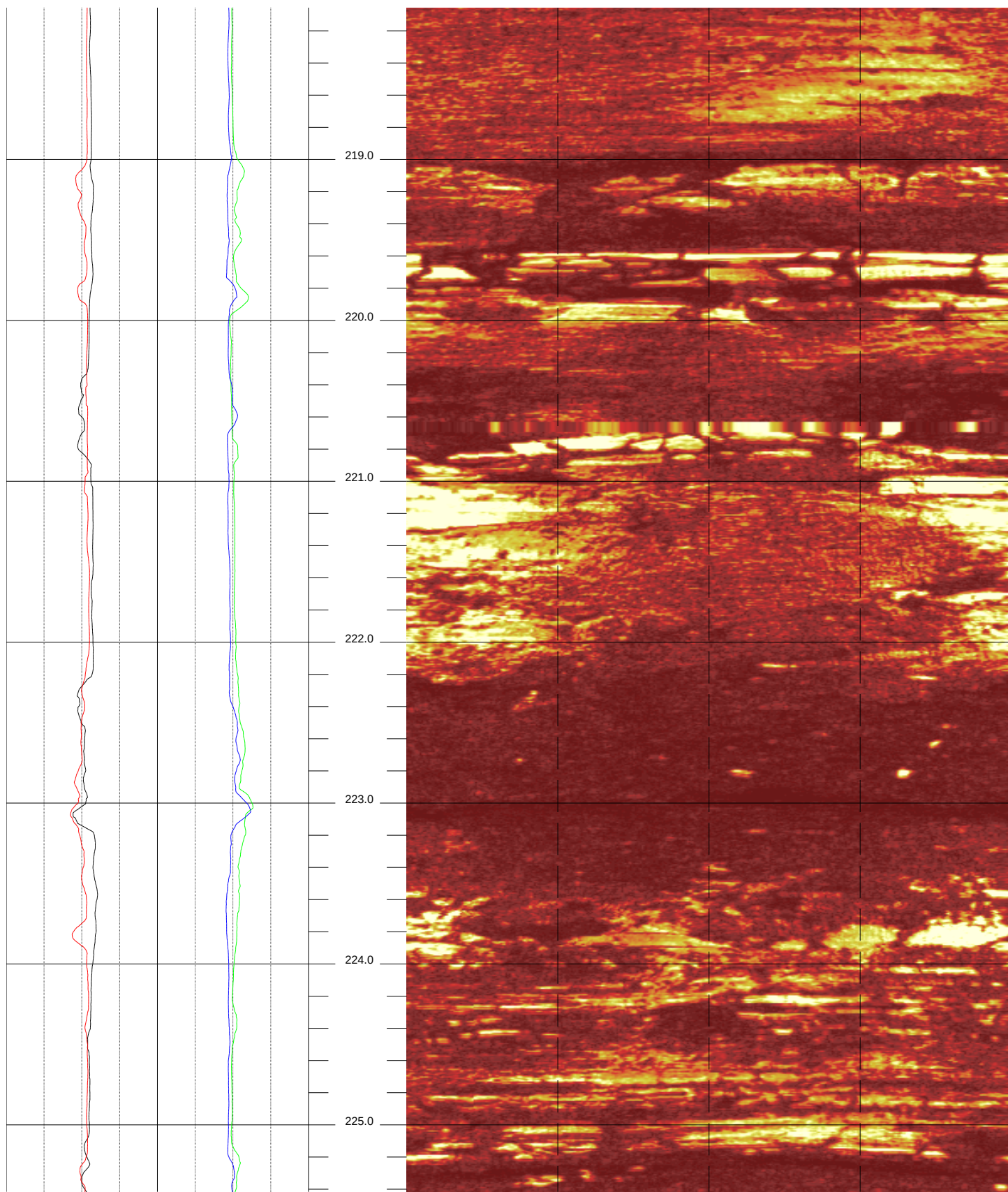


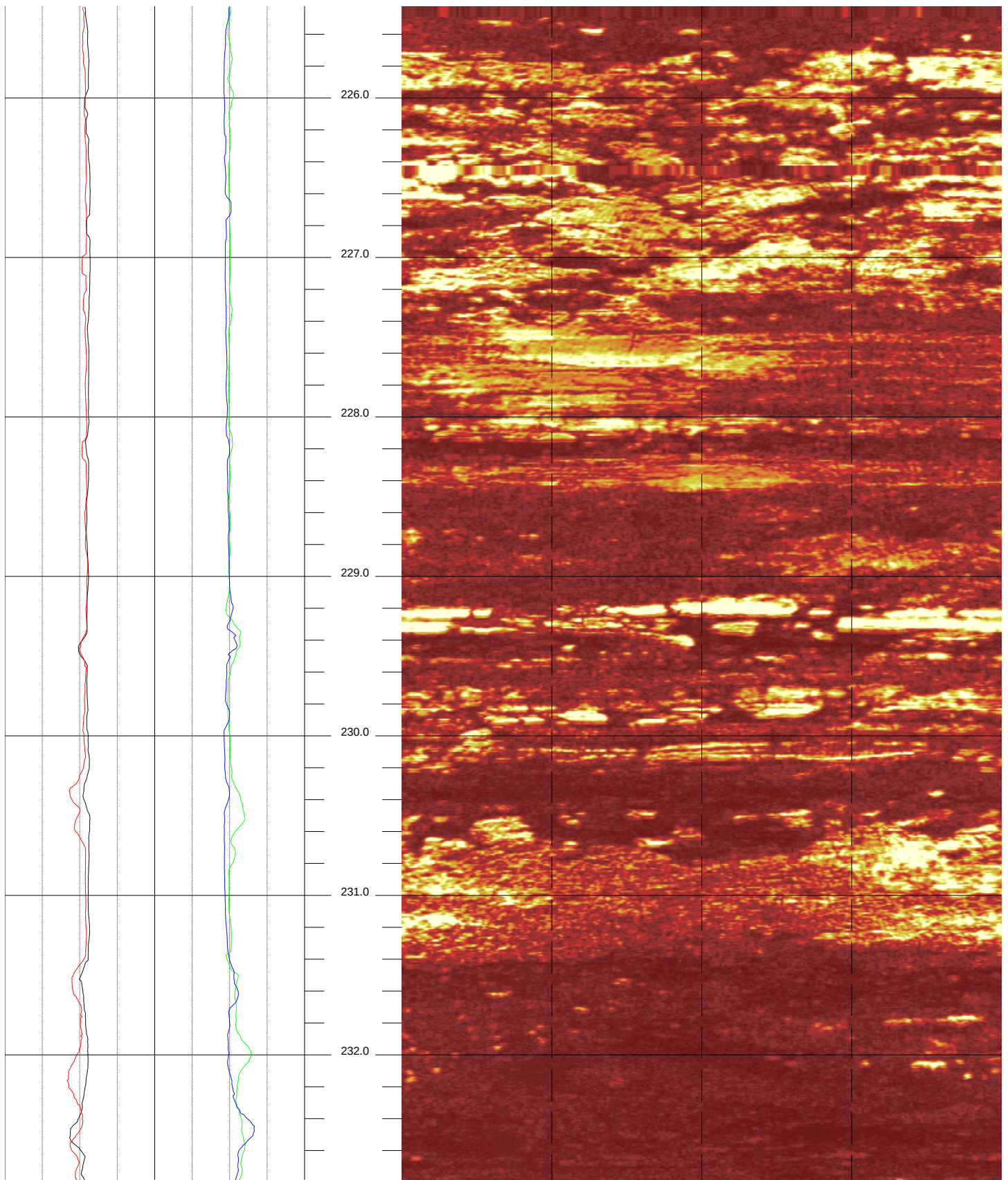


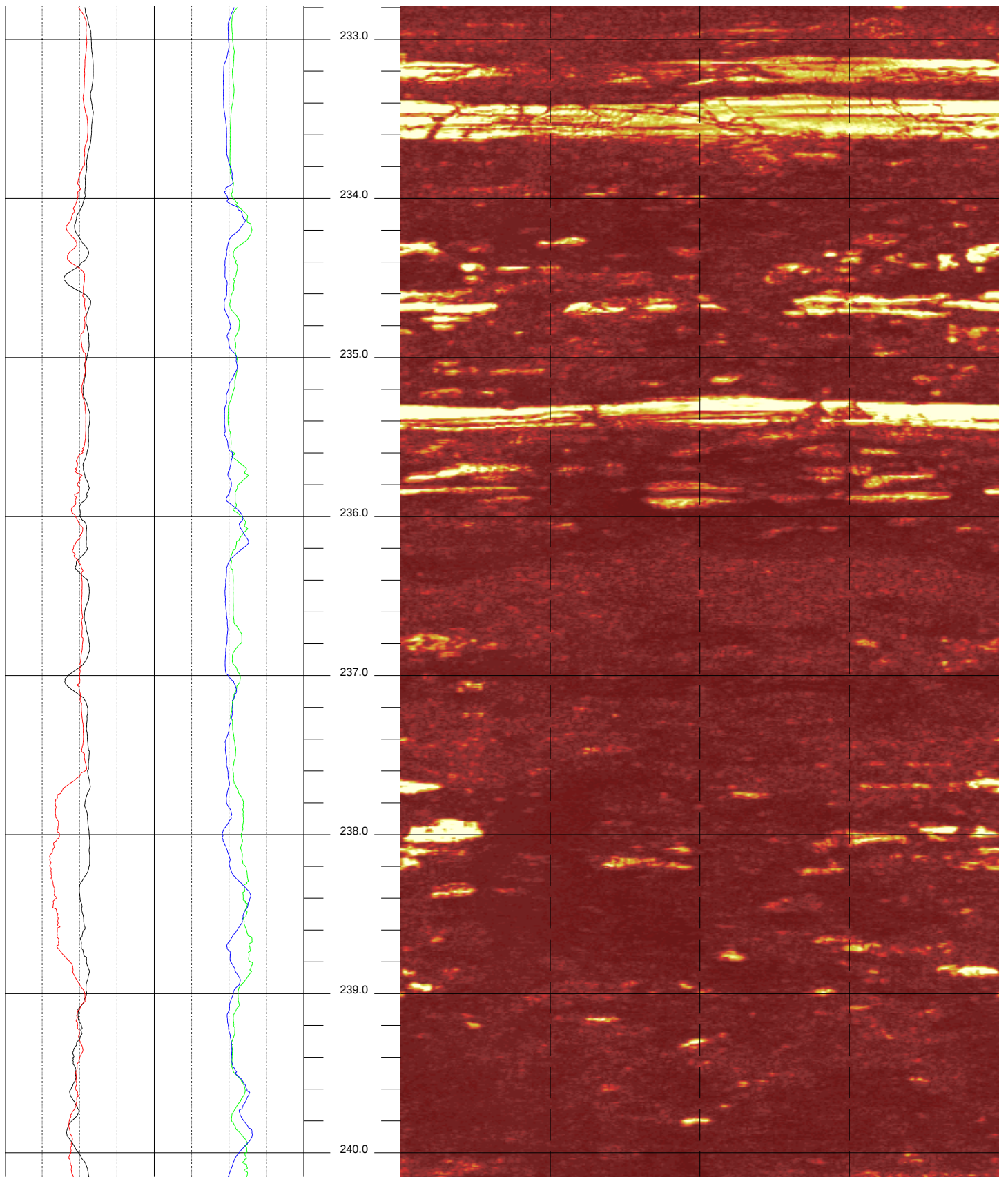


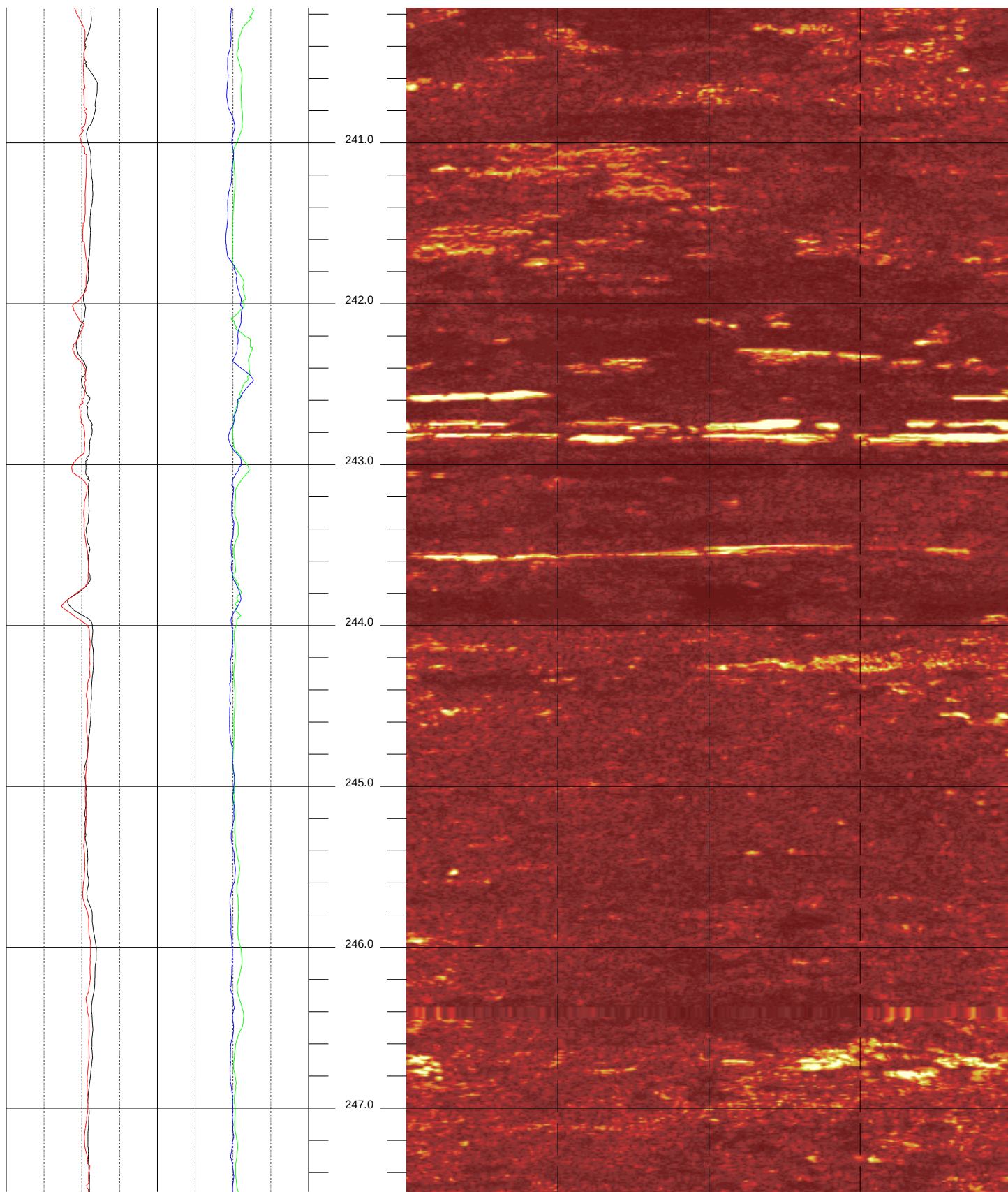


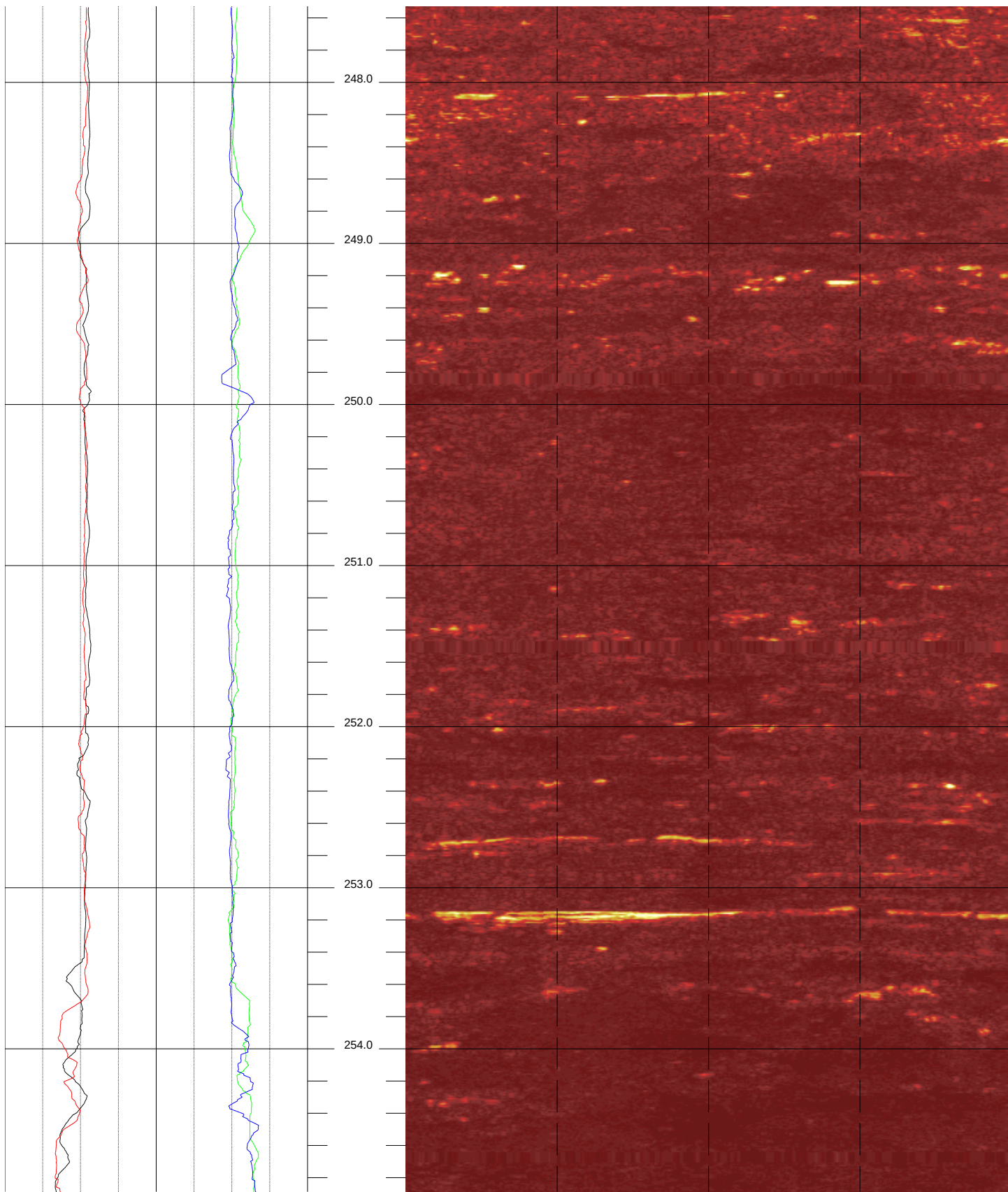


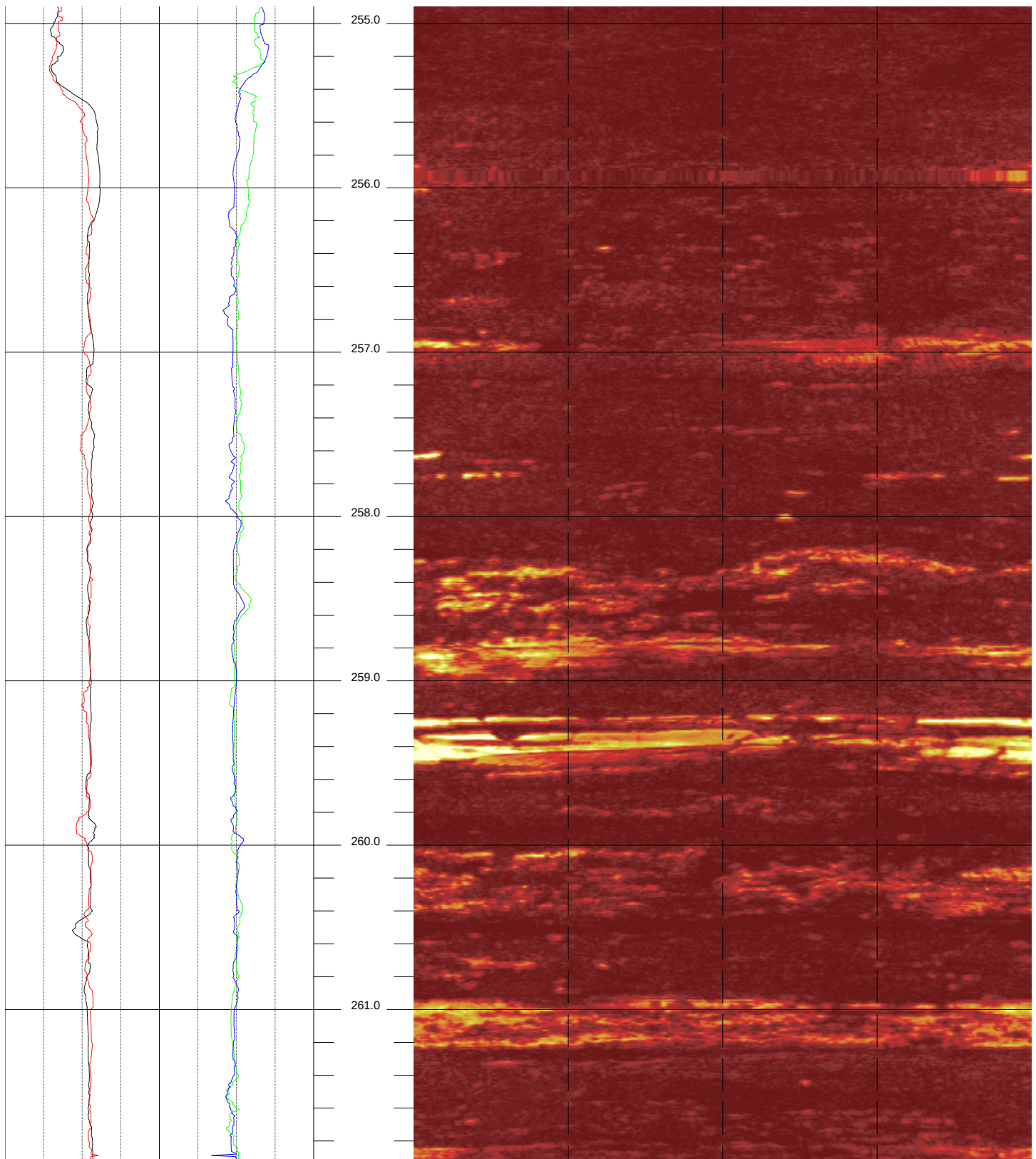












APPENDIX E

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.

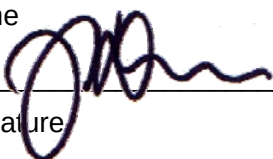
If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

Procedure Approval

Approved by:

John G. Diehl

Name



Signature

President

Title

April 6, 2006

Date

Client Approval (if required):

Name

Title

Signature

Date



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
Model Number: 3403
Description: Unit, Suspension Telemetry,
Asset Number: 160023
Serial Number: 160023

Calibration Date: 04/21/2006
Calibration Due Date: 04/21/2007
Calibration Interval: 12 Months
Condition As Found: In Tolerance
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

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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
SQUARE	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	<i>Rob Steller</i>
	NAME	DATE	SIGNATURE

**EDISON ESI**

A SOUTHERN CALIFORNIA EDISON Company

METROLOGY7300 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

501204

Manufacturer: Oyo
Model Number: 3403
Description: Unit, Suspension Telemetry,
Asset Number: 160024
Serial Number: 160024**Calibration Date:** 04/21/2006
Calibration Due Date: 04/21/2007
Calibration Interval: 12 Months
Condition As Found: In Tolerance
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	Man	04-21-06
Name		Title	Name	Date

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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:

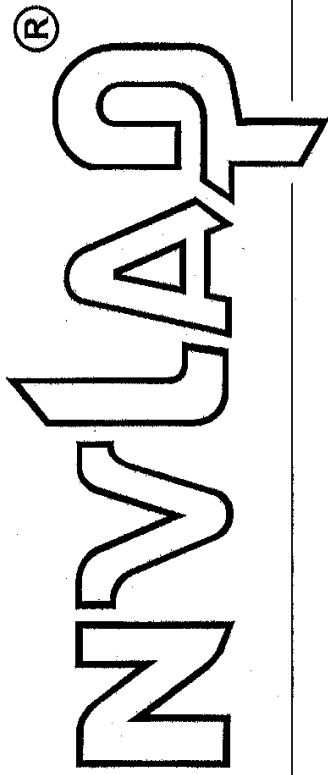
SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISK AND PAPER TAPE, IF AVAILABLE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES, IF AVAILABLE, TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND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

United States Department of Commerce
National Institute of Standards and Technology



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



A handwritten signature in cursive script, appearing to read "C. D. Larson".

For the National Institute of Standards and Technology



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 ($\pm$) 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

Effective dates

For the National Institute of Standards and Technology



National Voluntary Laboratory Accreditation Program



CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

Nominal Length in mm

Best Uncertainty ($\pm$) 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 ($\pm$) in μ in ^{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

Best Uncertainty ($\pm$) in ppm ^{note 1} Frequency in Hz

Range	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

For the National Institute of Standards and Technology



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
	<i>10</i>	<i>20</i>	<i>40</i>	<i>400 to 5 k</i>	<i>10 k</i>			
1A	270	199	127	116	130			
	<i>10</i>	<i>20</i>	<i>40</i>	<i>400 to 10 k</i>				
2A	271	200	129	118				
3A	271	200	129	118				
	<i>10</i>	<i>20</i>	<i>40</i>	<i>400 to 5 k</i>	<i>10 k</i>			
5A	286	209	142	132	148			
	<i>10</i>	<i>20</i>	<i>40</i>	<i>400</i>	<i>1 k</i>	<i>5 k</i>	<i>10 k</i>	
10A	273	233	132	121	121	143		143
								<i>400 to 10 k</i>
20A								144

NVLAP Code: 20/E05
DC Current

Range

Best Uncertainty ($\pm$) in ppm^{note 1}

10 nA	2.9
100 nA	2.3
1 μ A	2.0
10 μ A	2.0
100 μ A	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

C. D. Faison

For the National Institute of Standards and Technology



National Voluntary Laboratory Accreditation Program



CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

DC Resistance

<i>Nominal Value in Ω</i>	<i>Best Uncertainty ($\pm$) in ppm^{note 1}</i>	<i>Remarks</i>
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

<i>Range</i>	<i>Best Uncertainty ($\pm$) in ppm^{notes 1,2}</i>	<i>Remarks</i>
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 ($\pm$) 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 ($\pm$) ^{note 1}	Remarks
10 MHz	1.2×10^{-12}	GPS Receiver

MECHANICAL

NVLAP Code: 20/M05
Flow Rate

Nominal Flow Rate	Best Uncertainty ($\pm$) 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 ($\pm$) ^{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 ($\pm$) 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

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 ($\pm$) 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: $\text{uncert.} = (A + B/mVDC^2)^{0.5}$ (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



EDISON ESISM

A SOUTHERN CALIFORNIA EDISON[®] Company

Metrology

7300 Fenwick Lane
Westminster, CA 92683
Phone: 866-723-2257

Calibration Report

NVLAP Accredited

Calibration

GEOVision Geophysical Services

1151 Pomona Road, Unit P
Corona, CA 92882



Lab Code:105014-0

Manufacturer: Oyo
Model Number: 3403
Description: Unit, Suspension Telemetry,
Asset Number: 160023
Serial Number: 160023
PO Number: 7087-070315-01

Condition As Found: In Tolerance
Condition As Left: In Tolerance
Calibration Date: 04/13/2007
Calibration Due Date: 04/13/2008
Calibration Interval: 12 Months

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. Frequency is accredited. Please see attached data.

Standards Utilized

I.D. No.	Mfg.	Model No.	Description	Cal. Date	Due Date
S1-03092	Hewlett Packard	5335A OPT 020, 30,40	Counter, Universal,	12/12/2006	06/12/2007
S1-03355	Hewlett Packard	3325B OPT 001, 002	Generator, Function, Synthesizer	11/08/2006	11/08/2007
S1-03686	Fluke	910	Standard, Frequency, Controlled, Gps	01/18/2007	01/18/2008

Procedure: Customer
Temperature: 23° C
Humidity: 38% RH
Test No.: 527438

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A	Cx3	Metrologist	<i>Chance Co Stroman</i>	4/13/07
Name		Title	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. This calibration is in compliance with NVLAP laboratory accreditation criteria established by NIST/NVLAP under the specific scope of accreditation for lab code 105014-0.



SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR: OYO	MODEL NO.: 3403
SERIAL NO.: 160023	CALIBRATION DATE: 04/13/2007
BY: ROBERT STELLER	DUE DATE: 04/13/2008
COUNTER MFR: HEWLETT PACKARD	MODEL NO.: 5335A
SERIAL NO.: 2626A10854	CALIBRATION DATE: 12/12/2006
BY: SCE #S1-03092	DUE DATE: 06/12/2007
FCTN GEN MFR: HEWLETT PACKARD	MODEL NO.: 3325B
SERIAL NO.: 2847A14447	CALIBRATION DATE: 11/08/2006
BY: SCE #S1-03355	DUE DATE: 11/08/2007

SYSTEM SETTINGS:

GAIN:	2
FILTER:	10 KHZ
RANGE:	100 MILLISEC
DELAY:	0
STACK: 1 (STD)	1
PULSE:	1.6
DISPLAY:	NA
SYSTEM: DATE = CORRECT DATE & TIME	04/13/2007,09:50AM

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	90.0	90.0	90.0	100.0
SINE	404	100.0	90.0	90.0	90.0	100.0

CALIBRATED BY:	ROBERT STELLER	04/13/2007	<i>Robert Steller</i>
	NAME	DATE	SIGNATURE



EDISON ESISM

A SOUTHERN CALIFORNIA EDISON[®] Company

Metrology

7300 Fenwick Lane
Westminster, CA 92683
Phone: 866-723-2257

Calibration Report

NVLAP Accredited

Calibration

GEOVision Geophysical Services

1151 Pomona Road, Unit P
Corona, CA 92882



527439



Lab Code:105014-0

Manufacturer: Oyo
Model Number: 3403
Description: Unit, Suspension Telemetry,
Asset Number: 160024
Serial Number: 160024
PO Number: 7087-070315-01

Condition As Found: In Tolerance
Condition As Left: In Tolerance
Calibration Date: 04/13/2007
Calibration Due Date: 04/13/2008
Calibration Interval: 12 Months

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. Frequency is accredited. Please see attached data.

Standards Utilized

I.D. No.	Mfg.	Model No.	Description	Cal. Date	Due Date
S1-03092	Hewlett Packard	5335A OPT 020, 30,40	Counter, Universal,	12/12/2006	06/12/2007
S1-03355	Hewlett Packard	3325B OPT 001, 002	Generator, Function, Synthesizer	11/08/2006	11/08/2007
S1-03686	Fluke	910	Standard, Frequency, Controlled, Gps	01/18/2007	01/18/2008

Procedure: Customer
Temperature: 23° C
Humidity: 38% RH
Test No.: 527439

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A	<i>CX3</i>	Metrologist	<i>Craig A Branson</i>	4/13/07
Name		Title	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. This calibration is in compliance with NVLAP laboratory accreditation criteria established by NIST/NVLAP under the specific scope of accreditation for lab code 105014-0.



SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR: OYO	MODEL NO.: 3403
SERIAL NO.: 160024	CALIBRATION DATE: 04/13/2007
BY: ROBERT STELLER	DUE DATE: 04/13/2008
COUNTER MFR: HEWLETT PACKARD	MODEL NO.: 5335A
SERIAL NO.: 2626A10854	CALIBRATION DATE: 12/12/2006
BY: SCE #S1-03092	DUE DATE: 06/12/2007
FCTN GEN MFR: HEWLETT PACKARD	MODEL NO.: 3325B
SERIAL NO.: 2847A14447	CALIBRATION DATE: 11/08/2006
BY: SCE #S1-03355	DUE DATE: 11/08/2007

SYSTEM SETTINGS:

GAIN:	2
FILTER:	10 KHZ
RANGE:	100 MILLISEC
DELAY:	0
STACK: 1 (STD)	1
PULSE:	1.6
DISPLAY:	NA
SYSTEM: DATE = CORRECT DATE & TIME	04/13/2007,10:13AM

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	501	100.0	90.0	90.0	90.0	100.0
SQUARE	502	100.0	90.0	90.0	90.0	100.0
SINE	503	100.0	90.0	90.0	90.0	100.0
SINE	504	100.0	90.0	90.0	90.0	100.0

CALIBRATED BY:	ROBERT STELLER	04/13/2007	<i>Rob Steller</i>
	NAME	DATE	SIGNATURE



**National Voluntary
Laboratory Accreditation Program**



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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

Scope Revised : 2007-04-20

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 ($\pm$) 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

2007-04-01 through 2008-03-31

Effective dates

Sally S. Bruce

For the National Institute of Standards and Technology



National Voluntary Laboratory Accreditation Program



CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

Scope Revised : 2007-04-20

Nominal Length in mm

Best Uncertainty ($\pm$) 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 ($\pm$) in μ in ^{note 1}

Remarks

0.040 to 0.825	10	Comparison to gage blocks
> 0.825 to 1.510	8	Comparison to gage blocks
> 1.510 to 2.510	9	Comparison to gage blocks
> 2.510 to 4.510	14	Comparison to gage blocks
> 4.510 to 6.510	21	Comparison to gage blocks
> 6.510 to 9.010	29	Comparison to gage blocks
> 9.010 to 12.010	40	Comparison to gage blocks
> 12.010 to 13.25	44	Comparison to gage blocks

ELECTROMAGNETICS - DC/LOW FREQUENCY

NVLAP Code: 20/E02

AC Current

Best Uncertainty ($\pm$) in ppm ^{note 1}

Frequency in Hz

Range	10	20	40	400 to 10 k
10 mA	278	209	142	132
20 mA	278	209	142	132
30 mA	278	209	142	132
50 mA	300	202	124	109
100 mA	278	209	142	132

2007-04-01 through 2008-03-31

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Scope Revised : 2007-04-20

200 mA		278		209		142		132
300 mA		278		209		142		132
500 mA		300		203		124		109
	10	20	40	400 to 5 k	10 k			
1A	300	203	125	110	112			
	10	20	40	400 to 10 k				
2A	305	200	127	113				
3A	305	200	127	113				
	10	20	40	400 to 5 k	10 k			
5A	309	210	134	120	123			
	10	20	40	400	1 k	5 k	10 k	
10A	318	216	140	127	127	127		128
								400 to 10 k
20A								135

NVLAP Code: 20/E05

DC Current

Range

Best Uncertainty ($\pm$) in ppm^{note 1}

10 nA	4.0
100 nA	3.6
1 μ A	3.0
10 μ A	2.3
100 μ A	1.9
1 mA	1.9
10 mA	1.9
100 mA	1.9
1 A	10.4
10 A	10.4
30 A	20.6

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DC Resistance

<i>Nominal Value in Ω</i>	<i>Best Uncertainty ($\pm$) in ppm ^{note 1}</i>	<i>Remarks</i>
100 μ	6.1	Automated DC Resistance Calibration System
1 m	4.1	Automated DC Resistance Calibration System
10 m	3.1	Automated DC Resistance Calibration System
100 m	0.3	Automated DC Resistance Calibration System
1	0.2	Automated DC Resistance Calibration System
10	0.2	Automated DC Resistance Calibration System
25	0.3	Automated DC Resistance Calibration System
100	0.3	Automated DC Resistance Calibration System
1 k	0.3	Automated DC Resistance Calibration System
10 k	0.4	Automated DC Resistance Calibration System
100 k	1.2	Automated DC Resistance Calibration System
1 M	1.7	Automated DC Resistance Calibration System
10 M	2.1	Automated DC Resistance Calibration System
100 M	2.6	Automated DC Resistance Calibration System

NVLAP Code: 20/E06

DC Voltage

<i>Range</i>	<i>Best Uncertainty ($\pm$) in ppm ^{notes 1,2}</i>	<i>Remarks</i>
1.018 V	1.1	Automated DC Calibration System
10.00 V	0.4	Automated DC Calibration System
1.000 V	1.1	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	0.4	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage

2007-04-01 through 2008-03-31

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

Scope Revised : 2007-04-20

10.0 V	0.4	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage
20.0 V	0.6	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage
100.0 V	0.4	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage
1000.0 V	0.8	Ratiometric Measurement Techniques performed by voltage transfer utilizing a high precision voltage

NVLAP Code: 20/E09

LF AC Voltage

*Best Uncertainty ($\pm$) in ppm ^{notes 1,3,4}
Frequency in Hz*

Range	10	20	40	100	1 k	5 kHz	10 k	15 kHz	20 k	25 kHz
2 mV	306	893	835	873	376	599	854	889	854	825
10 mV	109	166	96	176	188	180	166	169	166	175
20 mV	79	69	65	65	65	66	66	69	66	81
30 mV	131	123	84	105	65	72	86	75	70	78
100 mV	33	37	22	33	33	32	31	32	32	34
190 mV	35	27	29	21	24	23	23	20	19	22
300 mV	47	47	23	23	27	23	19	22	26	27
1 V	120	34	18	9	12	12	12	12	11	12
1.9 V	36	22	19	10	8	8	8	8	8	9
3 V	31	34	25	17	16	15	15	15	15	17
10 V	21	33	19	11	10	10	11	11	12	11
19 V	31	23	20	11	10	10	10	10	11	11
30 V	29	34	25	16	16	17	18	18	18	20
100 V	85	36	20	16	15	15	16	14	12	15
190 V	45	24	20	19	13	13	13	15	17	16
300 V			36	29	18	22	27	24	22	23
500 V			30	25	17	18	19	19	19	21

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Scope Revised : 2007-04-20

700 V	27	23	18	18	18	18	18	22
1000 V	26	25	22	21	21	21	22	25

Range	30 kHz	50 k	60 kHz	100 k	300 k	500 K	700 kHz	800 k	1M
2 mV	730	395	529	1020	1237	2090	2308	2419	2419
10 mV	182	205	233	299	234	631	459	373	403
20 mV	94	128	167	202	301	451	371	333	373
30 mV	87	127	144	216	342	515	560	590	643
100 mV	35	42	49	76	156	201	247	271	192
190 mV	26	41	49	81	137	119	208	252	191
300 mv	29	37	42	64	120	155	172	189	152
1 V	13	18	18	11	70	90	103	95	75
1.9 V	10	15	14	14	90	95	85	81	82
3 V	19	27	24	24	90	94	96	97	112
10 V	11	11	11	12	70	95	99	104	100
19 V	11	11	12	16	84	91	89	93	104
30 V	22	31	31	31	91				
100 V	18	31	28	17					
190 V	16	18	18	21					
300 V	24	28	31	43					
500 V	24	35	37	51					
700 V	25	40	42	58					
1 kV	29								

TIME AND FREQUENCY

NVLAP Code: 20/F01

Frequency Dissemination

Range	Best Uncertainty ($\pm$) ^{note 1}	Remarks
10 MHz	1.2×10^{-12}	GPS Receiver

2007-04-01 through 2008-03-31

Effective dates

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0
Scope Revised : 2007-04-20

MECHANICAL

NVLAP Code: 20/M05
Flow Rate

Nominal Flow Rate

Best Uncertainty ($\pm$) in percent ^{notes 1, 5}

(0.8 to 30) L/s

0.3

(0.1 to 800) mL/s

0.4

NVLAP Code: 20/M06
Force

Nominal Force in lb

Best Uncertainty ($\pm$) ^{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

> 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 ($\pm$) 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

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

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

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105014-0

Scope Revised : 2007-04-20

THERMODYNAMIC

NVLAP Code: 20/T05

Pressure

<i>Range in psi</i>	<i>Best Uncertainty ($\pm$) in ppm^{note 1}</i>	<i>Remarks</i>
0 to 50	25	Gas
> 50 to 1450	48	Gas
> 1450 to 16 000	90	Gas
> 1000 to 10 000	62	Oil
> 10 000 to 30 000	113	Oil
> 30 000 to 50 000	213	Oil

NVLAP Code: 20/T07

Resistance Thermometry

	<i>Range</i>	<i>Best Uncertainty ($\pm$) in mK^{note 1}</i>	<i>Remarks</i>
77.348 K	-195.80 °C	4.0	BP LN ₂ by Comparison
234.3156 K	-38.83 °C	0.7	TPHg
273.16 K	0.01 °C	0.6	TPW
505.078 K	231.93 °C	1.6	FPSn
692.77 K	419.53 °C	2.3	FPZn

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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: $\text{uncert.} = (A + B/mVDC^2)^{0.5}$ (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.

2007-04-01 through 2008-03-31

Effective dates

For the National Institute of Standards and Technology

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 hysteresis in rubber section approximately +/- 0.01’ or +/- 0.003m.



APPENDIX F

BORING GEOPHYSICAL LOGGING

FIELD DATA LOGS

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geophysical services

A-7 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY _____ DATE: 3/1/87 _____
CLIENT: CH2M HILL _____ JOB: 7087 _____
AUTHOR: R. STELLER _____ PAGE 1 OF 1

CONTACT: JEN SCHAEFFER _____ CELL _____ PHONE: 540-558-8786 _____

BOREHOLE CONSTRUCTION: CASED _____ UNCASD ☒
DIAMETERS AND DEPTH RANGES: 4 0 TO 106'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 106'
CONDUCTOR CASING?: YES ☒ DEPTH TO BOTTOM OF CASING 76'; NO _____
DEPTH TO BEDROCK: ± 76'
BOREHOLE FLUID: WATER _____; FRESH WATER MUD ☒; SALT WATER MUD _____

LOGGING CREW: R. STELLER

[illegible]



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY A-57 ²¹¹³ 3/1/07 DATE: 3/1/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 4

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-5 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED _____ UNCASD ☒

DIAMETERS AND DEPTH RANGES: 4" 0 TO 96'; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 96' (collapsed from 101')

CONDUCTOR CASING?: YES ☒ DEPTH TO BOTTOM OF CASING 76'; NO _____

DEPTH TO BEDROCK: ~76' DEPTH TO WATER TABLE: _____

BOREHOLE FLUID: WATER _____; FRESH WATER MUD ☒; SALT WATER MUD _____

OTHER: _____

DEPTH TO BOREHOLE FLUID: 0' TIME SINCE LAST CIRCULATION: 6 12 HR



2ms 3/1/07

SITE: LEVY COUNTY ~~A-5~~ A-7 DATE: 3/1/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 2 OF 4

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 06:40
ARRIVED ON SITE: 07:10
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 08:50 LOGGING COMPLETED: 09:02
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 28ms = 2.5m - 0.5m = 2.0m

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-7 DATE: 3/1/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 3 OF 4

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: LEVY COUNTY A-7 DATE: 3/1/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER, C. Carter 5/21 PAGE 4 OF 4

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	1		STEEL CASE TO 76'
23.5	77.10	2		
24.0	78.74	3		
24.5	80.38	4		
25.0	82.02			
25.5	83.66			Bottom measurement?
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			T.D.
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	005		2:25 pm (3/10)
33.5	109.91	6		
34.0	111.55	7		
34.5	113.19	8		
35.0	114.83	9		
35.5	116.47	10		
36.0	118.11	11		
36.5	119.75	12		
37.0	121.39	13		
37.5	123.03	14		
38.0	124.67	15		
38.5	126.31	16		
39.0	127.95	17		
39.5	129.59	18		
40.0	131.23	19		



A-7 ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 8/1/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: <u>JEN SCHAEFFER</u>	OFFICE PHONE: _____
	CELL PHONE: <u>540-558-8786</u>
CONTACT: _____	OFFICE PHONE: _____
	PHONE: _____
CONTACT: _____	PHONE: _____
	PHONE: _____
CONTACT: _____	PHONE: _____
	PHONE: _____
DRILLER: _____	PHONE: _____
COMPANY: _____	PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-7 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED _____ UNCASD ☒

DIAMETERS AND DEPTH RANGES: 4" 0 TO 96'; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 96'

CONDUCTOR CASING?: YES ☒ DEPTH TO BOTTOM OF CASING 76'; NO _____

DEPTH TO BEDROCK: 76' DEPTH TO WATER TABLE: 28'

BOREHOLE FLUID: WATER _____; FRESH WATER MUD ☒; SALT WATER MUD _____

OTHER: _____

DEPTH TO BOREHOLE FLUID: 28' TIME SINCE LAST CIRCULATION: 12HR



LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 06:40
ARRIVED ON SITE: 07:10
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 09:30 LOGGING COMPLETED: 09:40

PROBE TILT TEST	<u>86.1°</u>	BRUNTON TILT	<u>86°</u>	
PROBE TILT TEST	<u>85°</u>	BRUNTON TILT	<u>8°</u>	
PROBE TILT TEST	<u>89.1°</u>	BRUNTON TILT	<u>89°</u>	AFTER LOG
PROBE AZIMUTH TEST	<u>117.3</u>	BRUNTON AZIMUTH	<u>112°</u>	
PROBE AZIMUTH TEST	<u>215.2</u>	BRUNTON AZIMUTH	<u>220°</u>	
PROBE AZIMUTH TEST	<u>119.4°</u>	BRUNTON AZIMUTH	<u>116°</u>	AFTER LOG

[illegible]

MAINTENANCE PERFORMED ON SITE: _____

EQUIPMENT PROBLEMS OR FAILURES: _____

SUGGESTIONS, ADDITIONS, CHANGES: _____



A-7

SITE: LEVY COUNTY DATE: 3/16/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21 PAGE 1 OF 1
CONTACT: JEN SCHAEFFER CELL PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASED _____ UNCASD X
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 161'; NO _____
DEPTH TO BEDROCK: _____
BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;

LOGGING CREW: ~~R. STELLER~~ C. Carter 5/21

[illegible]



A-7 ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 3/10/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 3/21 PAGE 1 OF 2

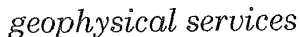
CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-7 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED _____ UNCASED X
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 101; NO _____
DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: _____
BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: 48 hrs



LOGGING CREW: ~~R. STELLER~~ C. Carter s/s
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0730
ARRIVED ON SITE: 0800
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 12:14 pm LOGGING COMPLETED: 1:14 pm

① PROBE TILT TEST	<u>81.37</u>	BRUNTON TILT	<u>9</u>	
2 PROBE TILT TEST	<u>83.5</u>	BRUNTON TILT	<u>6</u>	
③ PROBE TILT TEST	<u>88.6</u>	BRUNTON TILT	<u>1</u>	1 ft. log
① PROBE AZIMUTH TEST	<u>71.0</u>	BRUNTON AZIMUTH	<u>73.0</u>	
2 PROBE AZIMUTH TEST	<u>270.6</u>	BRUNTON AZIMUTH	<u>272</u>	
③ PROBE AZIMUTH TEST	<u>98.7</u>	BRUNTON AZIMUTH	<u>104</u>	1 ft. log

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
A7100P02	264.4	12:14 pm	98.6	1:14 pm

GEOVision Geophysical Services

1151 Pomona Road, Unit P, Corona, CA 92882

Ph (951) 549-1234 Fx (951) 549-1236



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY A-7 DATE: 3/10/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21 PAGE 1 OF 5

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A7 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED _____ UNCASD X

DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft

CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 101; NO _____

DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: _____

BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;

OTHER: _____

DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 48 hrs



SITE: LEVY COUNTY A-7 DATE: 3/10/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter s/r PAGE 2 OF 45

LOGGING CREW: R. STELLER C. Carter s/r
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0730
ARRIVED ON SITE: 0800
STANDBY TIME: CAUSE:
LOGGING STARTED: 2:25 pm LOGGING COMPLETED: 3:40 pm
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOLIBIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES ; NO x ; 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: RP (top of drill pipe) 2.2 m
RP after Run 1 2.16 m

HR: 160023, Rec: 30086, Im Iso 28072, Source: 470151, SD: 490157, WB 22050

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-7 DATE: 3/16/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21 PAGE 43 OF 25

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			
30.0	98.43			
30.5	100.07			
31.0	101.71			
31.5	103.35			
32.0	104.99	94		
32.5	106.63	93		
33.0	108.27	5		
33.5	109.91	6		
34.0	111.55	7		
34.5	113.19	8		
35.0	114.83	9		
35.5	116.47	10		
36.0	118.11	11		
36.5	119.75	12		
37.0	121.39	13		
37.5	123.03	14		
38.0	124.67	15		
38.5	126.31	16		
39.0	127.95	17		
39.5	129.59	18		
40.0	131.23	19		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-7 DATE: 3/10/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter s/l PAGE 4 OF 5

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	20		
41.0	134.51	21		
41.5	136.15	22		
42.0	137.80	23		
42.5	139.44	24		
43.0	141.08	25		
43.5	142.72	26		
44.0	144.36	27		
44.5	146.00	28		
45.0	147.64	29		
45.5	149.28	30		
46.0	150.92	31		
46.5	152.56	32		
47.0	154.20	33		
47.5	155.84	34		
48.0	157.48	35		
48.5	159.12	36		
49.0	160.76	37		
49.5	162.40	38		
50.0	164.04	39		
50.5	165.68	40		
51.0	167.32	41		
51.5	168.96	42		
52.0	170.60	43		
52.5	172.24	44		
53.0	173.88	45		
53.5	175.52	46		
54.0	177.17	47		
54.5	178.81	48		
55.0	180.45	49		
55.5	182.09	50		
56.0	183.73	51		
56.5	185.37	52		
57.0	187.01	53		
57.5	188.65	54		
58.0	190.29	55		
58.5	191.93	56		
59.0	193.57	57		
59.5	195.21	58		
60.0	196.85	59		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-7 DATE: 3/10/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21 PAGE 5 OF 5

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	60		
61.0	200.13	61		
61.5	201.77	62		
62.0	203.41	63		
62.5	205.05	64		
63.0	206.69	65		
63.5	208.33	66		
64.0	209.97	67		
64.5	211.61	68		
65.0	213.25	69		
65.5	214.90	70		
66.0	216.54	71		
66.5	218.18	72		
67.0	219.82	73		
67.5	221.46	74		
68.0	223.10	75		
68.5	224.74	76		
69.0	226.38	77		
69.5	228.02	78		
70.0	229.66	79		
70.5	231.30	80		
71.0	232.94	81		
71.5	234.58	82		
72.0	236.22	83		
72.5	237.86	84		
73.0	239.50	85		
73.5	241.14	86		
74.0	242.78	87		
74.5	244.42	88		
75.0	246.06	89		
75.5	247.70	90		
76.0	249.34	91		
76.5	250.98	92		3:40 Hit bottom @ 76.7
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			



A-8 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 3/13/07 3/21/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 1

CONTACT: JEN SCHAEFFER CELL PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASED _____ UNCASD X
DIAMETERS AND DEPTH RANGES: 3.88" 0 TO 66 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 66 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 14 ft; NO _____
DEPTH TO BEDROCK: N/A
BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;

LOGGING CREW: ~~R. STELLER~~ C. Carter 5/21/07

[illegible]



A-8

ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 3/21/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 3/21/07 PAGE 1 OF 2

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-8 LOCATION: _____
COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED _____ UNCASED X
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 66'; NO _____
DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: _____
BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: _____ TIME SINCE LAST CIRCULATION: ~ 3 hrs

GEOVision

geophysical services

SITE: LEVY COUNTY A-8 DATE: 3/21/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter 5/21/07
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
 ARRIVED ON SITE: 0700
 STANDBY TIME: 7-12 pm CAUSE: Drillers still drilling
 LOGGING STARTED: 3:39 pm LOGGING COMPLETED: 4:50 pm

WINCH: COMPROBE SILVER OYO OTHER R6 Mini
 MICROLOGGER 5310 5772 X
 TELEVIEWER ACOUSTIC #5174 X OTHER

1 PROBE TILT TEST 88.66 BRUNTON TILT 1
 2 PROBE TILT TEST 87.43 BRUNTON TILT 2
 PROBE TILT TEST 85.63 BRUNTON TILT 4 *After log*
 1 PROBE AZIMUTH TEST 254.4 BRUNTON AZIMUTH 252
 2 PROBE AZIMUTH TEST 171 BRUNTON AZIMUTH 166
 PROBE AZIMUTH TEST 251.1 BRUNTON AZIMUTH 251 *After log*

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>1.33</u>
DEPTH REF. OFFSET AT START	<u>3.39</u>
DEPTH REF. OFFSET AT END	<u>3.36</u>
AFTER SURVEY DEPTH ERROR	<u>.03 cc 5/21/07</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>18AVUPO2</u>	<u>260.4'</u>	<u>3:39 pm</u>	<u>64.3 ft</u>	<u>4:50 pm</u>

MAINTENANCE PERFORMED ON SITE: _____
 EQUIPMENT PROBLEMS OR FAILURES: _____
 SUGGESTIONS, ADDITIONS, CHANGES: _____



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY A-8 DATE: 3/21/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: B. STELLER C. Carter 3/21/07 PAGE 1 OF 5

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-8 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED _____ UNCASD X

DIAMETERS AND DEPTH RANGES: 4" 0 TO 263 ft; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 263 ft

CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 66'; NO _____

DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: _____

BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;

OTHER: _____

DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 2 hrs



SITE: LEVY COUNTY 1-8 DATE: 3/21/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 3/21/07 PAGE 2 OF 5

LOGGING CREW: R. STELLER C. Carter 3/21/07
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
 ARRIVED ON SITE: 0700
 STANDBY TIME: 7-12 CAUSE: Drillers completing hole
 LOGGING STARTED: 1:29 pm LOGGING COMPLETED: 2:48 pm
 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: Hole collapsed @ 15.13m* on Run #2

* w/ RP @ 15.13m

SUGGESTIONS, ADDITIONS, CHANGES: _____

COMMENTS: Top of drill pipe = .40m
RP = 2.48m - .4m = 2.08m
2.02m @ 3:05 pm
Run #2: RP = 2.48 - .95m = 1.53

HR: 160023, Rec 30086, Int'lso: 28072, Source 21050, SD 490157, WB: 22050

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-8 DATE: 3/21/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 3 OF 5

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26			
21.0	68.90	23		1:29 pm
21.5	70.54	24		
22.0	72.18	25		
22.5	73.82	26		
23.0	75.46	27		
23.5	77.10	28		
24.0	78.74	29		
24.5	80.38	30		
25.0	82.02	31		
25.5	83.66	32		
26.0	85.30	33		
26.5	86.94	34		
27.0	88.58	35		
27.5	90.22	36		
28.0	91.86	37		
28.5	93.50	38		
29.0	95.14	39		
29.5	96.78	40		
30.0	98.43	41		
30.5	100.07	42		
31.0	101.71	43		
31.5	103.35	44		
32.0	104.99	45		
32.5	106.63	46		
33.0	108.27	47		
33.5	109.91	48		
34.0	111.55	49		
34.5	113.19	50		
35.0	114.83	51		
35.5	116.47	52		
36.0	118.11	53		
36.5	119.75	54		
37.0	121.39	55		
37.5	123.03	56		
38.0	124.67	57		
38.5	126.31	58		
39.0	127.95	59		
39.5	129.59	60		
40.0	131.23	61		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-8 DATE: 3/21/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 3/21/07 PAGE 4 OF 5

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	62		
41.0	134.51	63		
41.5	136.15	64		
42.0	137.80	65		
42.5	139.44	66		
43.0	141.08	67		
43.5	142.72	68		
44.0	144.36	69		
44.5	146.00	70		
45.0	147.64	71		
45.5	149.28	72		
46.0	150.92	73		
46.5	152.56	74		
47.0	154.20	75		
47.5	155.84	76		
48.0	157.48	77		
48.5	159.12	78		
49.0	160.76	79		
49.5	162.40	80		
50.0	164.04	81		
50.5	165.68	82		
51.0	167.32	83		
51.5	168.96	84		
52.0	170.60	85		
52.5	172.24	86		
53.0	173.88	87		
53.5	175.52	88		
54.0	177.17	89		
54.5	178.81	90		
55.0	180.45	91		
55.5	182.09	92		
56.0	183.73	93		
56.5	185.37	94		
57.0	187.01	95		
57.5	188.65	96		
58.0	190.29	97		
58.5	191.93	98		
59.0	193.57	99		
59.5	195.21	100		
60.0	196.85	101		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-8 DATE: 3/21/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 3/21/07 PAGE 5 OF 5

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	102		
61.0	200.13	103		
61.5	201.77	104		
62.0	203.41	105		
62.5	205.05	106		
63.0	206.69	107		
63.5	208.33	108		
64.0	209.97	109		
64.5	211.61	110		
65.0	213.25	111		
65.5	214.90	112		
66.0	216.54	113		
66.5	218.18	114		
67.0	219.82	115		
67.5	221.46	116		
68.0	223.10	117		
68.5	224.74	118		
69.0	226.38	119		
69.5	228.02	120		
70.0	229.66	121		
70.5	231.30	122		
71.0	232.94	123		
71.5	234.58	124		
72.0	236.22	125		
72.5	237.86	126		
73.0	239.50	127		
73.5	241.14	128		
74.0	242.78	129		
74.5	244.42	130		
75.0	246.06	131		
75.5	247.70	132		
76.0	249.34	133		2:48 pm hit bottom past 76.0m
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			



A-8

ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 3/13/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 2

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-8 LOCATION: _____

COUNTY: LEVY RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED _____ UNCASD X
DIAMETERS AND DEPTH RANGES: 3.88 0 TO 66.5 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 66.5 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 14'; NO _____
DEPTH TO BEDROCK: N/A DEPTH TO WATER TABLE: _____
BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: 2 hrs



SITE: LEVY COUNTY A-8 DATE: 3/13/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter 5/21/07
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
 ARRIVED ON SITE: 0730
 STANDBY TIME: _____ CAUSE: _____
 LOGGING STARTED: 1:40pm LOGGING COMPLETED: 1:58pm

WINCH: _____ COMPROBE SILVER OYO _____ OTHER RG mini
 MICROLOGGER 5310 5772 X
 TELEVIEWER ACOUSTIC #5174 X OTHER _____

① PROBE TILT TEST 79.2 BRUNTON TILT 41
 2 PROBE TILT TEST 86.36 BRUNTON TILT 4
 3 PROBE TILT TEST 87.09 BRUNTON TILT 3 *After log*
 ① PROBE AZIMUTH TEST 123.1 BRUNTON AZIMUTH 122
 2 PROBE AZIMUTH TEST 50.4 BRUNTON AZIMUTH 53
 3 PROBE AZIMUTH TEST 224.0 BRUNTON AZIMUTH 225 *After log*

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>1.08</u>
DEPTH REF. OFFSET AT START	<u>3.64</u>
DEPTH REF. OFFSET AT END	<u>3.63</u>
AFTER SURVEY DEPTH ERROR	<u>.01 cc/s/m</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>ABANDONED</u>	<u>64.4 ft</u>	<u>1:40pm</u>	<u>13.1 ft</u>	<u>1:58pm</u>

MAINTENANCE PERFORMED ON SITE: _____
 EQUIPMENT PROBLEMS OR FAILURES: _____
 SUGGESTIONS, ADDITIONS, CHANGES: _____



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY A-8 DATE: 3/13/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 3

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: OFFICE PHONE: _____
PHONE: _____
CONTACT: PHONE: _____
PHONE: _____
CONTACT: PHONE: _____
PHONE: _____
DRILLER: PHONE: _____
COMPANY: PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-8 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED _____ UNCASD X

DIAMETERS AND DEPTH RANGES: 3.88" 0 TO 66 ft; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 66 ft

CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 14'; NO _____

DEPTH TO BEDROCK: N/A DEPTH TO WATER TABLE: _____

BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;

OTHER: _____

DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: 3 hrs



SITE: LEVY COUNTY A-8 DATE: 3/13/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 3

LOGGING CREW: R. STELLER C. Carter 5/21/07

VEHICLE(S) USED AND MILEAGE: RENTAL

MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630

ARRIVED ON SITE: 0700

STANDBY TIME: _____ CAUSE: _____

LOGGING STARTED: 2:42pm LOGGING COMPLETED: 3:00pm

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: Top of mud box = 0.33 m RP = 2.48 - 0.33 m = 2.15 m
2.15 m @ 3:09 pm
HR: 160023, Rec: 30086, Im Iso: 28072, Source: 470151
SD: 490151 WB: 22050

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-8 ca 5/21/07 DATE: 3/13/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE: 3 OF 3

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	051		2:42pm
6.0	19.69	2		
6.5	21.33	3		
7.0	22.97	4		
7.5	24.61	5		
8.0	26.25	6		
8.5	27.89	7		
9.0	29.53	8		
9.5	31.17	9		
10.0	32.81	10		
10.5	34.45	11		
11.0	36.09	12		
11.5	37.73	13		
12.0	39.37	14		
12.5	41.01	15		
13.0	42.65	16		
13.5	44.29	17		
14.0	45.93	18		
14.5	47.57	19		
15.0	49.21	20		
15.5	50.85	21		
16.0	52.49	22		3:00pm
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			



A-19 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 3/27/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R-STELLER C. Carter 3/21/07 PAGE 1 OF 1

CONTACT: JEN SCHAEFFER _____ CELL _____ PHONE: 540-558-8786 _____

BOREHOLE CONSTRUCTION: CASED _____ UNCASD X
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 36 ft; NO _____
DEPTH TO BEDROCK: _____
BOREHOLE FLUID: WATER ~~X~~; FRESH WATER MUD X; SALT WATER MUD _____;

LOGGING CREW: ~~R. STELLER~~ C. Carter 5/21/07

[illegible]



A-19 ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 3/27/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 3/27/07 PAGE 1 OF 2

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-19 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED X UNCASED _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES 6 DEPTH TO BOTTOM OF CASING 36'; NO _____
DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: _____
BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: 36 hrs



geophysical services

SITE: LEVY COUNTY A-19 cc sh/167 DATE: 3/27/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter sh/167 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter sh/167
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 6:40 am
ARRIVED ON SITE: 7:10 am
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 5:23 pm LOGGING COMPLETED: 5:46 pm

WINCH: _____ COMPROBE _____ SILVER _____ OYO _____ OTHER RG
MICROLOGGER 5310 _____ 5772 X
TELEVIEWER ACOUSTIC #5174 X OTHER _____

1 PROBE TILT TEST 109.3 BRUNTON TILT 15
2 PROBE TILT TEST 89.03 BRUNTON TILT 1
3 PROBE TILT TEST 90.3 BRUNTON TILT 1 After log
1 PROBE AZIMUTH TEST 23.4 BRUNTON AZIMUTH 24
2 PROBE AZIMUTH TEST 322.8 BRUNTON AZIMUTH 323
3 PROBE AZIMUTH TEST 41.8 BRUNTON AZIMUTH 41 After log

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>1.5</u>
DEPTH REF. OFFSET AT START	<u>3.22</u>
DEPTH REF. OFFSET AT END	<u>3.21</u>
AFTER SURVEY DEPTH ERROR	<u>.01</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>A184UUP01</u>	<u>108.5</u>	<u>5:23 pm</u>	<u>30 ft</u>	<u>5:46 pm</u>

MAINTENANCE PERFORMED ON SITE: _____

EQUIPMENT PROBLEMS OR FAILURES: _____

SUGGESTIONS, ADDITIONS, CHANGES: _____



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY A-19 at 5/21/07 DATE: 3/27/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 7

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-19 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED _____ UNCASD X

DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft

CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 36'; NO _____

DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: _____

BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;

OTHER: _____

DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: _____



SITE: LEVY COUNTY A-19 cc 5/21/07 DATE: 3/27/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 7

LOGGING CREW: R. STELLER C. Carter 5/21/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0640
ARRIVED ON SITE: 071 am
STANDBY TIME: CAUSE:
LOGGING STARTED: 3:21 pm LOGGING COMPLETED: 4:40 pm
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOLIBIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES ; NO ☒ ; STORED WITH NEW
WINCH COMPROBE ☐ GREY ☐ OYO ☐ RG ☒ cc ☒ 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: RP = Top of casing = 0.45m

RP = 2.03
2.00 @ 4:53 pm

Im Iso: 300083, Source 470151, SD: 490157, WB: 22050

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-19 DATE: 3/27/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 3 OF 7

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			Bottom of casing
11.5	37.73			
12.0	39.37	001		3:21
12.5	41.01	2		
13.0	42.65	3		
13.5	44.29	4		
14.0	45.93	5		
14.5	47.57	6		
15.0	49.21	7		
15.5	50.85	8		
16.0	52.49	9		
16.5	54.13	10		
17.0	55.77	11		
17.5	57.41	12		
18.0	59.06	13		
18.5	60.70	14		
19.0	62.34	15		
19.5	63.98	16		
20.0	65.62	17		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-19 DATE: 3/27/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 4 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26	18		
21.0	68.90	19		
21.5	70.54	20		
22.0	72.18	21		
22.5	73.82	22		
23.0	75.46	23		
23.5	77.10	24		
24.0	78.74	25		
24.5	80.38	26		
25.0	82.02	27		
25.5	83.66	28		
26.0	85.30	29		
26.5	86.94	30		
27.0	88.58	31		
27.5	90.22	32		
28.0	91.86	33		
28.5	93.50	34		
29.0	95.14	35		
29.5	96.78	36		
30.0	98.43	37		
30.5	100.07	48		
31.0	101.71	49		
31.5	103.35	40		
32.0	104.99	41		
32.5	106.63	42		
33.0	108.27	43		
33.5	109.91	44		
34.0	111.55	45		34.1
34.5	113.19	46		
35.0	114.83	47		
35.5	116.47	48		
36.0	118.11	49		
36.5	119.75	50		
37.0	121.39	51		
37.5	123.03	52		
38.0	124.67	53		
38.5	126.31	54		
39.0	127.95	55		
39.5	129.59	56		
40.0	131.23	57		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-19 cc 5/21/07 DATE: 3/27/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 6 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	58		
41.0	134.51	59		
41.5	136.15	60		
42.0	137.80	61		
42.5	139.44	62		
43.0	141.08	63		
43.5	142.72	64		
44.0	144.36	65		
44.5	146.00	66		
45.0	147.64	67		
45.5	149.28	68		
46.0	150.92	69		
46.5	152.56	70		
47.0	154.20	71		
47.5	155.84	72		
48.0	157.48	73		
48.5	159.12	74		
49.0	160.76	75		
49.5	162.40	76		
50.0	164.04	77		
50.5	165.68	78		
51.0	167.32	79		
51.5	168.96	80		
52.0	170.60	81		
52.5	172.24	82		
53.0	173.88	83		
53.5	175.52	84		
54.0	177.17	85		
54.5	178.81	86		
55.0	180.45	87		
55.5	182.09	88		
56.0	183.73	89		
56.5	185.37	90		
57.0	187.01	91		
57.5	188.65	92		
58.0	190.29	93		
58.5	191.93	94		
59.0	193.57	95		
59.5	195.21	96		
60.0	196.85	97		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-19 cc 5/21/07 DATE: 3/27/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R-STELLER C. Carter 5/21/07 PAGE 7 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	98		
61.0	200.13	99		
61.5	201.77	100		
62.0	203.41	101		
62.5	205.05	102		
63.0	206.69	103		
63.5	208.33	104		
64.0	209.97	105		
64.5	211.61	106		
65.0	213.25	107		
65.5	214.90	108		
66.0	216.54	109		
66.5	218.18	110		
67.0	219.82	111		
67.5	221.46	112		
68.0	223.10	113		
68.5	224.74	114		
69.0	226.38	115		
69.5	228.02	116		
70.0	229.66	117		
70.5	231.30	118		
71.0	232.94	119		
71.5	234.58	120		
72.0	236.22	121		
72.5	237.86	122		
73.0	239.50	123		
73.5	241.14	124		
74.0	242.78	125		
74.5	244.42	126		
75.0	246.06	127		
75.5	247.70	128		
76.0	249.34	129		4:40
76.5	250.98			hit @ 76.3
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			



A-20 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 5/2/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/2/07 PAGE 1 OF 1

CONTACT: JEN SCHAEFFER CELL: _____ PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASED _____ UNCASD X
DIAMETERS AND DEPTH RANGES: 3.78" 0 TO 265 ft; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 265 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 35 ft; NO _____
DEPTH TO BEDROCK: 35 ft
BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD _____;

LOGGING CREW: ~~R. STELLER~~ C. Carter skul07

[illegible]



A-20

ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 5/2/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Gutter 5/2/07 PAGE 1 OF 2

CONTACT: <u>JEN SCHAEFFER</u>	OFFICE	PHONE: _____
	CELL	PHONE: <u>540-558-8786</u>
CONTACT: _____	OFFICE	PHONE: _____
		PHONE: _____
CONTACT: _____		PHONE: _____
		PHONE: _____
CONTACT: _____		PHONE: _____
		PHONE: _____
DRILLER: _____		PHONE: _____
COMPANY: _____		PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-20 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED _____ UNCASD X
DIAMETERS AND DEPTH RANGES: 3.78" 0 TO 265'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 265'
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 35'; NO _____
DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: _____
BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD 2;
OTHER: _____
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: 3 hrs

GEOVision

geophysical services

SITE: LEVY COUNTY A-20 cc 5/21/07 DATE: 5/21/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter cc 5/21/07 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter 5/21/07
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
 ARRIVED ON SITE: 0700
 STANDBY TIME: _____ CAUSE: _____
 LOGGING STARTED: 11:54am LOGGING COMPLETED: 1:00pm

WINCH: _____ COMPROBE _____ SILVER _____ OYO _____ OTHER RG min. 6
 MICROLOGGER 5310 X 5772
 TELEVIEWER _____ ACOUSTIC #5174 X OTHER _____

1 PROBE TILT TEST 89.88 BRUNTON TILT 0
 2 PROBE TILT TEST 85.1 BRUNTON TILT 5
 3 PROBE TILT TEST 88.64 BRUNTON TILT 1 After log
 1 PROBE AZIMUTH TEST 260.8 BRUNTON AZIMUTH 261
 2 PROBE AZIMUTH TEST 156.7 BRUNTON AZIMUTH 156
 3 PROBE AZIMUTH TEST 185.2 BRUNTON AZIMUTH 183 after log

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>1.67 ft</u>
DEPTH REF. OFFSET AT START	<u>3.05</u>
DEPTH REF. OFFSET AT END	<u>2.99</u>
AFTER SURVEY DEPTH ERROR	<u>.06</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>A20 AVUP01</u>	<u>262</u>	<u>11:54am</u>	<u>3 ft</u>	<u>1:00 pm</u>

MAINTENANCE PERFORMED ON SITE: hit bottom @ 262.8

EQUIPMENT PROBLEMS OR FAILURES: _____

SUGGESTIONS, ADDITIONS, CHANGES: _____



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY A-20 cc 5/21/07 DATE: 5/2/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 6 cc 5/21/07

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: A-20 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED _____ UNCASD ☒

DIAMETERS AND DEPTH RANGES: 3.75" TO 265; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 265 ft

CONDUCTOR CASING?: YES ☒ DEPTH TO BOTTOM OF CASING 35'; NO _____

DEPTH TO BEDROCK: 35 ft DEPTH TO WATER TABLE: 4 ft

BOREHOLE FLUID: WATER _____; FRESH WATER MUD ☒; SALT WATER MUD _____

OTHER: _____

DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: 1 hr



SITE: LEVY COUNTY A-20 cc 5/21/07 DATE: 5/2/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 6

LOGGING CREW: R. STELLER C. Carter 5/21/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
ARRIVED ON SITE: 0700
STANDBY TIME: CAUSE:
LOGGING STARTED: 0859 LOGGING COMPLETED: 1040
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOLIZED 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 ☐ 26086 ☐ 11001 ☐ 23053 ☐ 30086 ☐

MAINTENANCE PERFORMED ON SITE: _____

EQUIPMENT PROBLEMS OR FAILURES: _____

SUGGESTIONS, ADDITIONS, CHANGES: _____

COMMENTS: Top of drill pipe = 51cm above ground

RP = 1.97m
RP = 1.95m @ 10:56am

1m Iso tube: 300083, Source 19043, SD: 490157, WB: 470151

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-20 cc 5/21/07 DATE: 5/2/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 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	001		8:59am
12.5	41.01	2		
13.0	42.65	3		
13.5	44.29	4		
14.0	45.93	5		
14.5	47.57	6		
15.0	49.21	007		
15.5	50.85	8		
16.0	52.49	9		
16.5	54.13	10		
17.0	55.77	11		
17.5	57.41	12		
18.0	59.06	13		
18.5	60.70	14		
19.0	62.34	15		
19.5	63.98	16		
20.0	65.62	17		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-20 cc 5/21/07 DATE: 5/2/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 4 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26	18		
21.0	68.90	19		
21.5	70.54	20		
22.0	72.18	21		
22.5	73.82	22		
23.0	75.46	23		
23.5	77.10	24		
24.0	78.74	25		
24.5	80.38	26		
25.0	82.02	27		
25.5	83.66	28		
26.0	85.30	29		
26.5	86.94	30		
27.0	88.58	31		
27.5	90.22	32		
28.0	91.86	33		
28.5	93.50	34		
29.0	95.14	35		
29.5	96.78	36		
30.0	98.43	37		
30.5	100.07	38		
31.0	101.71	39		
31.5	103.35	40		
32.0	104.99	41		
32.5	106.63	42		
33.0	108.27	43		
33.5	109.91	44		
34.0	111.55	45		
34.5	113.19	46		
35.0	114.83	47		
35.5	116.47	48		
36.0	118.11	49		
36.5	119.75	50		
37.0	121.39	51		
37.5	123.03	52		
38.0	124.67	53		
38.5	126.31	54		
39.0	127.95	55		
39.5	129.59	56		
40.0	131.23	57		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY A-20 cc 5/21/07 DATE: 5/2/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	58		
41.0	134.51	59		
41.5	136.15	60		
42.0	137.80	61		
42.5	139.44	62		
43.0	141.08	63		
43.5	142.72	64		
44.0	144.36	65		
44.5	146.00	66		
45.0	147.64	67		
45.5	149.28	68		
46.0	150.92	69		
46.5	152.56	70		
47.0	154.20	71		
47.5	155.84	72		
48.0	157.48	73		
48.5	159.12	74		
49.0	160.76	75		
49.5	162.40	76		
50.0	164.04	77		
50.5	165.68	78		
51.0	167.32	79		
51.5	168.96	80		
52.0	170.60	81		
52.5	172.24	82		
53.0	173.88	83		
53.5	175.52	84		
54.0	177.17	85		
54.5	178.81	86		
55.0	180.45	87		
55.5	182.09	88		
56.0	183.73	89		
56.5	185.37	90		
57.0	187.01	91		
57.5	188.65	92		
58.0	190.29	93		
58.5	191.93	94		
59.0	193.57	95		
59.5	195.21	96		
60.0	196.85	97		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY Carter A-20 cc 5/21/07 DATE: 5/2/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 6 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	98		
61.0	200.13	99		
61.5	201.77	100		
62.0	203.41	101		
62.5	205.05	102		
63.0	206.69	103		
63.5	208.33	104		
64.0	209.97	105		
64.5	211.61	106		
65.0	213.25	107		
65.5	214.90	108		
66.0	216.54	109		
66.5	218.18	110		
67.0	219.82	111		
67.5	221.46	112		
68.0	223.10	113		
68.5	224.74	114		
69.0	226.38	115		
69.5	228.02	116		
70.0	229.66	117		
70.5	231.30	118		
71.0	232.94	119		
71.5	234.58	120		
72.0	236.22	121		
72.5	237.86	122		
73.0	239.50	123		
73.5	241.14	124		
74.0	242.78	125		
74.5	244.42	126		
75.0	246.06	127		
75.5	247.70	128		
76.0	249.34	129		
76.5	250.98	130		10:40am
77.0	252.62			fractile sand
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			



I-1 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 2/26/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: JEN SCHAEFFER _____ CELL _____ PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASSED ☒ UNCASSED ☐ 4" PVC
DIAMETERS AND DEPTH RANGES: 4" 0 TO 257'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 257'
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: 660'
BOREHOLE FLUID: WATER _____; FRESH WATER MUD ☒; SALT WATER MUD _____;

LOGGING CREW: R. STELLER

[illegible]



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY I-1 DATE: 2/26/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 6

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-1 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED ☒ UNCASED ☐ 4" PVC

DIAMETERS AND DEPTH RANGES: 4" 0 TO 257'; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 257

CONDUCTOR CASING?: YES ☐ DEPTH TO BOTTOM OF CASING _____; NO ☒

DEPTH TO BEDROCK: 60' DEPTH TO WATER TABLE: 20'

BOREHOLE FLUID: WATER ☒; FRESH WATER MUD ☐; SALT WATER MUD ☐

OTHER: _____

DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: NA



SITE: LEVY COUNTY I-1 DATE: 2/26/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 2 OF 6

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 06:40
ARRIVED ON SITE: 07:10
STANDBY TIME: CAUSE:
LOGGING STARTED: 08:46 LOGGING COMPLETED: 10:24
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 - 0.0m = 2.50m
END 2200 = 2.51m.

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-1 DATE: 2/26/02
 CLIENT: CH2M HILL JOB: 7087
 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	001		
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: LEVY COUNTY I - 1 DATE: 2/26/07
 CLIENT: CH2M HILL JOB: 7087
 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	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		
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: LEVY COUNTY I-5 I-1 DATE: 2/26/07
 CLIENT: CH2M HILL pas 2/20/07 JOB: 7087
 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	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: LEVY COUNTY I-4 DATE: 2/26/07
 CLIENT: CH2M HILL JOB: 7087
 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	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		
73.9 74.0	242.78	144, 145		HIT BOTTOM @ 74.0 m.
74.5	244.42			BOTTOM MEASUREMENT?
75.0	246.06			DONOT USE # 144.
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			T.O. @ 257'
79.0	259.19			
79.5	260.83			
80.0	262.47			



I-1 ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 2/26/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-1 LOCATION: _____
COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 257'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 257'
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: 260' DEPTH TO WATER TABLE: _____
BOREHOLE FLUID: WATER ☒; FRESH WATER MUD _____; SALT WATER MUD _____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: N/A

GEOVision

geophysical services

SITE: LEVY COUNTY I-1 DATE: 2/26/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 2 OF 2

LOGGING CREW: R. STELLER
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 06:45
 ARRIVED ON SITE: 07:10
 STANDBY TIME: _____ CAUSE: _____
 LOGGING STARTED: 11:25 LOGGING COMPLETED: 11:37

WINCH: _____ COMPROBE _____ SILVER _____ OYO ☒ OTHER _____
 MICROLOGGER 5310 _____ 5772 ☒ ran 5/6/07
 TELEVIEWER _____ ACOUSTIC #5174 _____ OTHER 4727

PROBE TILT TEST 96.6° BRUNTON TILT 97°
 PROBE TILT TEST 8.7° BRUNTON TILT 9°
 PROBE TILT TEST 0.2° BRUNTON TILT 0° AFTER LOG.
 PROBE AZIMUTH TEST 348.8° BRUNTON AZIMUTH 350°
 PROBE AZIMUTH TEST 158.7° BRUNTON AZIMUTH 160°
 PROBE AZIMUTH TEST 6.5° BRUNTON AZIMUTH 9° AFTER LOG.

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>0</u>
DEPTH REF. OFFSET AT START	<u>4.72</u>
DEPTH REF. OFFSET AT END	<u>4.64</u>
AFTER SURVEY DEPTH ERROR	<u>-0.08</u> LESS THAN 0.4%? <u>YES</u>

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>ISUPDIAMU01</u>	<u>255.0'</u>	<u>11:23</u>	<u>6.0'</u>	<u>11:37'</u>

MAINTENANCE PERFORMED ON SITE: _____
 EQUIPMENT PROBLEMS OR FAILURES: _____
 SUGGESTIONS, ADDITIONS, CHANGES: _____



I-2 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 5/5/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: JEN SCHAEFFER CELL PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASED X UNCASD _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 300'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 300'
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO X
DEPTH TO BEDROCK: ~ 76'
BOREHOLE FLUID: WATER X; FRESH WATER MUD _____; SALT WATER MUD _____;

LOGGING CREW: R. STELLER

[illegible]



I-2 ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 3/1/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-2 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 360'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 360'
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: 360' DEPTH TO WATER TABLE: 26'
BOREHOLE FLUID: WATER ☒; FRESH WATER MUD _____; SALT WATER MUD _____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: 0' TIME SINCE LAST CIRCULATION: ND



SITE: LEVY COUNTY I-2 DATE: 3/1/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 2 OF 2

LOGGING CREW: R. STELLER
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 06:40
 ARRIVED ON SITE: 07:10
 STANDBY TIME: CAUSE:
 LOGGING STARTED: LOGGING COMPLETED:

WINCH: COMPROBE SILVER OYO OTHER RG mini winch
 MICROLOGGER 5310 5772 ☒
 TELEVIEWER ACOUSTIC #5174 OTHER 4727

PROBE TILT TEST 92.8° BRUNTON TILT 93°
 PROBE TILT TEST 11.5° BRUNTON TILT 11°
 PROBE TILT TEST 8.9° BRUNTON TILT 9° AFTER LOG
 PROBE AZIMUTH TEST 0.9° BRUNTON AZIMUTH 0°
 PROBE AZIMUTH TEST 224.4° BRUNTON AZIMUTH 222°
 PROBE AZIMUTH TEST 357.4° BRUNTON AZIMUTH 359° AFTER LOG

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>2.5</u>
DEPTH REF. OFFSET AT START	<u>2.22'</u>
DEPTH REF. OFFSET AT END	<u>2.10'</u>
AFTER SURVEY DEPTH ERROR	<u>-0.12'</u> LESS THAN 0.4%? <u>YES.</u>

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>IZAMUPOI</u>	<u>361.8'</u>	<u>10:32</u>	<u>5.0'</u>	<u>10:40</u>

MAINTENANCE PERFORMED ON SITE: _____
 EQUIPMENT PROBLEMS OR FAILURES: _____
 SUGGESTIONS, ADDITIONS, CHANGES: _____



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY I-2 DATE: 3/1/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 7 RA 5/10/07

CONTACT: <u>JEN SCHAEFFER</u>	OFFICE PHONE: _____
	CELL PHONE: <u>540-558-8786</u>
CONTACT: _____	OFFICE PHONE: _____
	PHONE: _____
CONTACT: _____	PHONE: _____
	PHONE: _____
CONTACT: _____	PHONE: _____
	PHONE: _____
DRILLER: _____	PHONE: _____
COMPANY: _____	PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-2 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____

DIAMETERS AND DEPTH RANGES: 4" 0 TO 300'; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 300'

CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒

DEPTH TO BEDROCK: 276' DEPTH TO WATER TABLE: 28'

BOREHOLE FLUID: WATER ☒; FRESH WATER MUD _____; SALT WATER MUD _____;

OTHER: _____

DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: NA



SITE: LEVY COUNTY I-2 DATE: 3/1/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 2 OF 7 RM 5/12/07

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 06:40
ARRIVED ON SITE: 07:10
STANDBY TIME: CAUSE:
LOGGING STARTED: 11:03 LOGGING COMPLETED: 12:40
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOLIBIZED 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: STANDARD 2.5m - 0.76m = 1.74m
END " " = 1.75m
AS DE = +0.01m

GEOVISION SUSPENSION LOGGING FIELD NOTES

 SITE: LEVY COUNTY
I. 2

 DATE: 3/1/07

 CLIENT: CH2M HILL

 JOB: 7087

 AUTHOR: R. STELLER

 PAGE 3

 OF 7

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	1		
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	7		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22, 23		DO NOT USE #22
13.0	42.65	23, 24	3/1/07	
13.5	44.29	24, 25		
14.0	45.93	25, 26		
14.5	47.57	27		
15.0	49.21	28		
15.5	50.85	29		
16.0	52.49	30		
16.5	54.13	31		
17.0	55.77	32		
17.5	57.41	33		
18.0	59.06	34		
18.5	60.70	35		
19.0	62.34	36		
19.5	63.98	37		
20.0	65.62	38		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-2 RAS 5/10/07 DATE: 5/1/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 4 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26	39		
21.0	68.90	40		
21.5	70.54	41		
22.0	72.18	42		
22.5	73.82	43		
23.0	75.46	44		
23.5	77.10	45		
24.0	78.74	46		
24.5	80.38	47		
25.0	82.02	48		
25.5	83.66	49		
26.0	85.30	50		
26.5	86.94	51		
27.0	88.58	52		
27.5	90.22	53		
28.0	91.86	54		
28.5	93.50	55		
29.0	95.14	56		
29.5	96.78	57		
30.0	98.43	58		
30.5	100.07	59		
31.0	101.71	60		
31.5	103.35	61		
32.0	104.99	62		
32.5	106.63	63		
33.0	108.27	64		
33.5	109.91	65		
34.0	111.55	66		
34.5	113.19	67		
35.0	114.83	68		
35.5	116.47	69		
36.0	118.11	70		
36.5	119.75	71		
37.0	121.39	72		
37.5	123.03	73		
38.0	124.67	74		
38.5	126.31	75		
39.0	127.95	76		
39.5	129.59	77		
40.0	131.23	78		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-2 DATE: 3/1/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 5 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	79		
41.0	134.51	80		
41.5	136.15	81		
42.0	137.80	82		
42.5	139.44	83		
43.0	141.08	84		
43.5	142.72	85		
44.0	144.36	86		
44.5	146.00	87		
45.0	147.64	88		
45.5	149.28	89		
46.0	150.92	90		
46.5	152.56	91		
47.0	154.20	92		
47.5	155.84	93		
48.0	157.48	94		
48.5	159.12	95		
49.0	160.76	96		
49.5	162.40	97		
50.0	164.04	98		
50.5	165.68	99		
51.0	167.32	100		
51.5	168.96	101		
52.0	170.60	102		
52.5	172.24	103		
53.0	173.88	104		
53.5	175.52	105		
54.0	177.17	106		
54.5	178.81	107		
55.0	180.45	108		
55.5	182.09	109		
56.0	183.73	110		
56.5	185.37	111		
57.0	187.01	112		
57.5	188.65	113		
58.0	190.29	114		
58.5	191.93	115		
59.0	193.57	116		
59.5	195.21	117		
60.0	196.85	118		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY J-2 DATE: 3/1/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 6 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	119		
61.0	200.13	120		
61.5	201.77	121		
62.0	203.41	122		
62.5	205.05	123		
63.0	206.69	124		
63.5	208.33	125		
64.0	209.97	126		
64.5	211.61	127		
65.0	213.25	128		
65.5	214.90	129		
66.0	216.54	130		
66.5	218.18	131		
67.0	219.82	132		
67.5	221.46	133		
68.0	223.10	134		
68.5	224.74	135		
69.0	226.38	136		
69.5	228.02	137		
70.0	229.66	138		
70.5	231.30	139		
71.0	232.94	140		
71.5	234.58	141		
72.0	236.22	142		
72.5	237.86	143		
73.0	239.50	144		
73.5	241.14	145		
74.0	242.78	146		
74.5	244.42	147		
75.0	246.06	148		
75.5	247.70	149		
76.0	249.34	150		
76.5	250.98	151		
77.0	252.62	152		
77.5	254.27	153		
78.0	255.91	154		
78.5	257.55	155		
79.0	259.19	156		
79.5	260.83	157		
80.0	262.47	158		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-2 DATE: 3/1/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 7 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

80.5	264.11	159		
81.0	265.75	160		
81.5	267.39	161		
82.0	269.03	162		
82.5	270.67	163		
83.0	272.31	164		
83.5	273.95	165		
84.0	275.59	166		
84.5	277.23	167		
85.0	278.87	168		
85.5	280.51	169		
86.0	282.15	170		
86.5	283.79	171		
87.0	285.43	172		
87.5	287.07	173		
88.0	288.71	174		Bottom measurement?
88.5	290.35			411 BOTTOM @ 88.2 m
89.0	291.99			
89.5	293.64			
90.0	295.28			
90.5	296.92			
91.0	298.56			
91.5	300.20			T.O. @ 300'
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			



DOWNHOLE VELOCITY FIELD LOG

SITE: LEWY COUNTY, FLORIDA (PEF COLA) DATE: 5/1/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: A. MARTIN ajm 5/1/07 PAGE 1 OF 4

CONTACT: JEN SCHAEFFER OFFICE PHONE: 540-558-8786
PHONE: _____
CONTACT: KAREN OLSON (H&S) OFFICE PHONE: 303-886-0637
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: UNDERSTANDING INC. Santa Cruz CA 5/1/07 PHONE: _____
PROSPECT

DIRECTIONS TO SITE: Site located ~ 5 miles North of Inglis, FL

GENERAL SITE CONDITIONS/LOCATION: _____

EA#: _____
BOREHOLE DESIGNATION: I-2 LOCATION: _____

COUNTY: LEWY RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: Cased ☒ UNCased ☐ 4" casing to ~ 300ft

BOREHOLE DIAMETERS AND DEPTH RANGES: 4 5/8" 0 TO 317ft ; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 317ft

CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒

DEPTH TO BEDROCK: see sonoboring log DEPTH TO WATER TABLE: < 6ft.

BOREHOLE FLUID: WATER _____; FRESH WATER MUD _____; SALT WATER MUD _____;

OTHER: N/A ROTOSONIC DRILLING METHOD

DEPTH TO BOREHOLE FLUID: N/A TIME SINCE LAST CIRCULATION: N/A

GEOVision

geophysical services

SITE: LEWY COUNTY, FLORIDA DATE: 5/1/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: A. MARTIN cgmrk 5/1/07 PAGE 2 OF 4

LOGGING CREW: ANTHONY MARTIN / CHARLES CARTER
 VEHICLE(S) USED AND MILEAGE: RED ; BLUE ; WHITE RENTAL
 MOBILIZED FROM: Crystal River, FL DEPARTURE TIME: 0645hrs
 ARRIVED ON SITE: 0700
 STANDBY TIME: 5hrs CAUSE: Training, lunch
 LOGGING STARTED: 1400hrs LOGGING COMPLETED: 1900hrs
 STANDBY TIME: CAUSE:
 LOGGING STARTED: LOGGING COMPLETED:
 DEMOBILIZED TO: Crystal River ARRIVAL TIME: 1920hrs
 ADDITIONAL DEMOB TIME: REASON:

WINCH COMPROBE HAND ✓ Oyo
 INSTRUMENT 12004 15014 Geode 3458 (slr)
 GEOPHONE Geostuff Model BHG-3 S/A B3015

Plank Orientation: S-N (Magnetic) Sh Source Offset 6.2 ft P Source Offset 6 ft

MAINTENANCE PERFORMED ON SITE: None

EQUIPMENT PROBLEMS OR FAILURES: None

SUGGESTIONS, ADDITIONS, CHANGES: None

COMMENTS: ① 2.5 ft measurement spacing 25-20 ft, 5 ft spacing 25-150 ft, 10 ft spacing after 150 ft

② Drilling within 100 ft borehole, do not acquire data when drilling hammer sampler used

GEOVISION DOWNHOLE LOGGING FIELD NOTES

SITE: LEVY COUNTY - BOREHOLE I-2 DATE: 5/1/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: A. MARTIN CPM 5/1/07 PAGE 3 OF 4

DEPTH (Feet)	SH Source Offset (ft)	Sh Channel Number	SH File Number	P Source Offset (ft)	P Channel Number	P File Number
-----------------	--------------------------	----------------------	-------------------	-------------------------	---------------------	------------------

L(N)/T(E)		S N S E			channel #		1454 hrs
DEPTH	SH Source	Sh Channel	SH File	P Source	P Channel	P File	
2.5'	6.2'	2/3	148 149 2	6'	1 2	1	1454 hrs
5.0			146 147 2	12' 11" 11" 11"	1 2	2	
7.5			144 145 2		1 2	3	
10			142 143 2		1 2	4	
12.5			140 141 2			5	
15			138 139 2			6	
17.5			136 137 2			7	
20			134 135 2			8	
25			132 133 3			9	
30			130 131 3			10	
35			128 129 3			11	
40			126 127 3			12	
45			124 125 3			13	
50			122 123 3	12' 11" 11" 11"		14	
55			120 121 3			15	
60			118 119 3			16	
65			116 117 3	6' 6' 6' 6'	6' 6' 6' 6'	17	
70			114 115 3	6' 6' 6' 6'	6' 6' 6' 6'	18	
75			112 113 3			19	
80			110 114 3			20	
85			108 109 3			21	
90			106 107 3			22	
95			104 105 3			23	
100			102 103 3			24	
105			100 101 3			25	
110			98 99 3			26	
115			96 97 3			27	
120			94 95 3			28	
125			92 93 3			29	
130			90 91 3			30	
135			88 89 3			31	
140			86 87 3	12' 11" 11" 11"		32	
145			84 85 3			33	
150			82 83 3			34	
160			80 81 3			35	
170	6.2'	2/3	78 79 3		1 2	36	

GEOVISION DOWNHOLE LOGGING FIELD NOTES

SITE: LEVY COUNTY - BOREHOLE I-2

DATE: 5/1/07

CLIENT: CH2M HILL

JOB: 7087

AUTHOR: A. M. MARTIN *agmarta* 5/1/07

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OF 4

DEPTH (Feet)	SH Source Offset (ft)	Sh Channel Number	SH File Number	P Source Offset (ft)	P Channel Number	P File Number
		L/T	S N #stacks		channel #stacks	
180	62'	2/3	76 77 3	6'	1 2	37
190			74 75 3			38
200			72 73 3			39
210			70 71 4			40
220			68 69 4			41
230			66 67 4			42
240			64 65 4			43
250			62 63 4	main plank	1 2 main plank	44
260			60 61 4			45
270			58 59 4			46
280			56 57 4			47
290			54* 55 4			48
295	62'	2/3	50 ^{ca} 51 ^{ca} 5	6'	1 2	49 1627/15
			52 53 5	no sh		
		TDE 295'	MERGE ALL LONG COMP.			MERGE ALL FILES ↓ I2P.DAT
			FILES - N = Compl, S = Compl			
			LDASH.DAT			
			NOTES			
			S = Strike south side plank			
			N = Strike north side plank			
			Note: geophone orientation S-N, therefore do not need Transverse component. However			
			save as channel 3			
			channel 1 P-wave (vertical)			
			channel 2 Longitudinal (S-N)			
			channel 3 Transverse (E-W)			
			P-wave - Sample rate (SR) = 0.03125ms			
			Record length (RL) = 0.15sec			
			S-wave - SR = 0.03125ms			
			RL = 0.25sec			
			* edit geophone location in data file			



I-3 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 3/25/07, 5/4/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 1

CONTACT: JEN SCHAEFFER CELL PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: Cased ☒ UNCased ☐
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES ☐ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: _____
BOREHOLE FLUID: WATER ☒; FRESH WATER MUD _____; SALT WATER MUD _____;

LOGGING CREW: ~~R. STELLER~~ C. Carter cc 5/21/07

[illegible]



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY I-3 DATE: 5/4/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/2/07 PAGE 1 OF 6

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-3 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED X UNCASD _____

DIAMETERS AND DEPTH RANGES: 3.78" 0 TO 266 ft; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft

CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO X

DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: 26'

BOREHOLE FLUID: WATER X; FRESH WATER MUD _____; SALT WATER MUD _____;

OTHER: _____

DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: UA



SITE: LEVY COUNTY I-3 DATE: 5/4/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 6

LOGGING CREW: R. STELLER C. Carter 5/21/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
ARRIVED ON SITE: 0700
STANDBY TIME: CAUSE:
LOGGING STARTED: 1:36 pm LOGGING COMPLETED: 3:18 pm
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOBILIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES NO X; 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: Top of casing = .65m

RP = 1.83 m

RP = 1.80 m @ 3:31

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-3 cc 5/21/07 DATE: 5/4/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 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	001		1:36
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	007		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		
13.5	44.29	24		
14.0	45.93	25		
14.5	47.57	26		
15.0	49.21	27		
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		
20.0	65.62	37		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-3 ca 5/21/07 DATE: 5/4/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 4 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26	38		
21.0	68.90	39		
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76		
40.0	131.23	77		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-3 cc 5/21/07 DATE: 5/4/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter cc 5/21/07 PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	78		
41.0	134.51	79		
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		
44.5	146.00	86		
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		
46.5	152.56	90		
47.0	154.20	91		
47.5	155.84	92		
48.0	157.48	93		
48.5	159.12	94		
49.0	160.76	95		
49.5	162.40	96		
50.0	164.04	97		
50.5	165.68	98		
51.0	167.32	99		
51.5	168.96	100		
52.0	170.60	101		
52.5	172.24	102		
53.0	173.88	103		
53.5	175.52	104		
54.0	177.17	105		
54.5	178.81	106		
55.0	180.45	107		
55.5	182.09	108		
56.0	183.73	109		
56.5	185.37	110		
57.0	187.01	111		
57.5	188.65	112		
58.0	190.29	113		
58.5	191.93	114		
59.0	193.57	115		
59.5	195.21	116		
60.0	196.85	117		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-3 05/11/07 DATE: 5/14/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 05/14/07 PAGE 6 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	118		
61.0	200.13	119		
61.5	201.77	120		
62.0	203.41	121		
62.5	205.05	122 152		152 @ 3:18pm
63.0	206.69	123		
63.5	208.33	124		
64.0	209.97	125		
64.5	211.61	126		
65.0	213.25	127		
65.5	214.90	128		
66.0	216.54	129		
66.5	218.18	130		
67.0	219.82	131		
67.5	221.46	132		
68.0	223.10	133		
68.5	224.74	134		
69.0	226.38	135		
69.5	228.02	136		
70.0	229.66	137		
70.5	231.30	138		
71.0	232.94	139		
71.5	234.58	140		
72.0	236.22	141		
72.5	237.86	142		
73.0	239.50	143		
73.5	241.14	144		
74.0	242.78	145		
74.5	244.42	146		
75.0	246.06	147		
75.5	247.70	148		
76.0	249.34	149		
76.5	250.98	150		
77.0	252.62	151		
77.5	254.27			77.18 hit bottom @ 3:14pm
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			



I-3 ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 3/25/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 2

CONTACT: <u>JEN SCHAEFFER</u>	OFFICE	PHONE:
	CELL	PHONE: <u>540-558-8786</u>
CONTACT: _____	OFFICE	PHONE: _____
		PHONE: _____
CONTACT: _____		PHONE: _____
		PHONE: _____
CONTACT: _____		PHONE: _____
		PHONE: _____
DRILLER: _____		PHONE: _____
COMPANY: _____		PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-3 LOCATION: _____

COUNTY: LEVY RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft ; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
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: 6 TIME SINCE LAST CIRCULATION: NA



SITE: LEVY COUNTY I-3 DATE: 3/25/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter 5/21/07
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 10:00am
 ARRIVED ON SITE: 10:30am
 STANDBY TIME: _____ CAUSE: _____
 LOGGING STARTED: 12:11 pm LOGGING COMPLETED: 12:38 pm

WINCH: _____ COMPROBE _____ SILVER _____ OYO _____ OTHER RG mini
 MICROLOGGER 5310 _____ 5772 X _____
 TELEVIEWER ACOUSTIC #5174 X OTHER _____

- 1) PROBE TILT TEST 90.23 BRUNTON TILT 0
- 2) PROBE TILT TEST 94.54 BRUNTON TILT 5
- 3) PROBE TILT TEST 95.26 BRUNTON TILT 5 After log
- 1) PROBE AZIMUTH TEST 285.9 BRUNTON AZIMUTH 284
- 2) PROBE AZIMUTH TEST 220.0 BRUNTON AZIMUTH 220
- 3) PROBE AZIMUTH TEST 256.2 BRUNTON AZIMUTH 254 After log

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>2.08</u>
DEPTH REF. OFFSET AT START	<u>2.64 ft</u>
DEPTH REF. OFFSET AT END	<u>2.59</u>
AFTER SURVEY DEPTH ERROR	<u>.05</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>I34UUP01</u>	<u>264.9 ft</u>	<u>12:11 pm</u>	<u>2.6 ft</u>	<u>12:38 pm</u>

MAINTENANCE PERFORMED ON SITE: _____
 EQUIPMENT PROBLEMS OR FAILURES: _____
 SUGGESTIONS, ADDITIONS, CHANGES: _____



I-3 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 3/25/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 3/21/07 PAGE 1 OF 1
CONTACT: JEN SCHAEFFER CELL: _____ PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASED ☒ UNCASD _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: _____
BOREHOLE FLUID: WATER ☒; FRESH WATER MUD _____; SALT WATER MUD _____

LOGGING CREW: R. STELLER C. Carter 3/21/07

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
I3AVUP01				
Acoustic Tele	I3AVUP01	264.9 ft - 2.6 ft	3/25/07	12:11pm - 12:38pm



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY DATE: 3/25/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/4/07 PAGE 1 OF 5 cc 5/24/07

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-3 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____

DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft

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: 0 TIME SINCE LAST CIRCULATION: 1A



SITE: LEVY COUNTY I-3 DATE: 3/25/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 5 cc 5/21/07

LOGGING CREW: R. STELLER C. Carter 5/21/07
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 10:00 am
 ARRIVED ON SITE: 10:30 am
 STANDBY TIME: CAUSE:
 LOGGING STARTED: 1:14 pm LOGGING COMPLETED: 2:40 pm
 STANDBY TIME: CAUSE:
 LOGGING STARTED: LOGGING COMPLETED:
 DEMOBILIZED TO: ARRIVAL TIME:
 ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES ; NO X ; 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: Logging stopped @ 52.5m because water
got in telemetry unit. cc 5/21

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: RP = top of casing = 0.64m
RP = 1.84m
1.77m @ 2:50pm

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-3 DATE: 3/25/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 3 OF 5 cc 5/21/07

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56	001		1:14 pm
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	007		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		
13.5	44.29	24		
14.0	45.93	25		
14.5	47.57	26		
15.0	49.21	27		
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		
20.0	65.62	37		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-3 DATE: 3/25/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 4 OF 5 cc 5/21/07

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

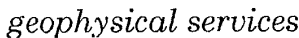
20.5	67.26	38		
21.0	68.90	39		
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76		
40.0	131.23	77		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-3 DATE: 3/25/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 5 OF 5 cc 5/21/07

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	78		
41.0	134.51	79		
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		
44.5	146.00	86		
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		
46.5	152.56	90		
47.0	154.20	91		
47.5	155.84	92		
48.0	157.48	93		
48.5	159.12	94		
49.0	160.76	95		
49.5	162.40	96		
50.0	164.04	97		
50.5	165.68	98		
51.0	167.32	99		
51.5	168.96	100		
52.0	170.60	101		
52.5	172.24	102		2140
53.0	173.88			complete failure
53.5	175.52			
54.0	177.17			
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			



SITE: LEVY COUNTY DATE: 5/4/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter cc 5/21/07 PAGE 1 OF 1
CONTACT: JEN SCHAEFFER CELL: _____ PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASSED X UNCASSED _____
DIAMETERS AND DEPTH RANGES: 3.78" 0 TO 266 ft ; cc sh/1, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO X
DEPTH TO BEDROCK: _____
BOREHOLE FLUID: WATER X; FRESH WATER MUD _____; SALT WATER MUD _____;

LOGGING CREW: ~~R. STELLER~~ C. Carter 5/21/07

[illegible]



I-4

ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 5/14/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: B. STELLER C. Carter 5/21/07 PAGE 1 OF 2

CONTACT: <u>JEN SCHAEFFER</u>	OFFICE PHONE: _____
	CELL PHONE: <u>540-558-8786</u>
CONTACT: _____	OFFICE PHONE: _____
	PHONE: _____
CONTACT: _____	PHONE: _____
	PHONE: _____
CONTACT: _____	PHONE: _____
	PHONE: _____
DRILLER: _____	PHONE: _____
COMPANY: _____	PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-4 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED X UNCASED
DIAMETERS AND DEPTH RANGES: 3.78" 0 TO 266 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO X
DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: _____
BOREHOLE FLUID: WATER X; FRESH WATER MUD _____; SALT WATER MUD _____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: N/A



geophysical services

SITE: LEVY COUNTY I-4 cc 5/21/07 DATE: 5/4/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter 5/21/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 6630
ARRIVED ON SITE: 0700
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:

WINCH: COMPROBE SILVER OYO OTHER RG Mini
MICROLOGGER 5310 X 5772
TELEVIEWER ACOUSTIC #5174 X OTHER

1 PROBE TILT TEST 78.8 BRUNTON TILT 11
2 PROBE TILT TEST 85.1 BRUNTON TILT 5
3 PROBE TILT TEST 91.99 BRUNTON TILT 2 *After log*
1 PROBE AZIMUTH TEST 69.7 BRUNTON AZIMUTH 68
2 PROBE AZIMUTH TEST 357.9 BRUNTON AZIMUTH 351
3 PROBE AZIMUTH TEST 43.2 BRUNTON AZIMUTH 43 *After log*

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>-2.0</u>
DEPTH REF. OFFSET AT START	<u>2.72</u>
DEPTH REF. OFFSET AT END	<u>2.70</u>
AFTER SURVEY DEPTH ERROR	<u>.02</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>I4A00P01</u>	<u>266.1 ft</u>	<u>8:48am</u>	<u>2.7 ft</u>	<u>9:17am</u>

MAINTENANCE PERFORMED ON SITE: _____

EQUIPMENT PROBLEMS OR FAILURES: _____

SUGGESTIONS, ADDITIONS, CHANGES: _____



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY I-4 cc 5/1/07 DATE: 5/4/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/1/07 PAGE 1 OF 6

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-4 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____

DIAMETERS AND DEPTH RANGES: 3.78" 0 TO 266'; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft

CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒

DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: ~ 6 ft

BOREHOLE FLUID: WATER ☒; FRESH WATER MUD _____; SALT WATER MUD _____;

OTHER: _____

DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: NA



SITE: LEVY COUNTY I-4 cc 5/21/07 DATE: 5/4/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 6

LOGGING CREW: R. STELLER C. Carter 5/21/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
ARRIVED ON SITE: 0706
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 10:10 am LOGGING COMPLETED: 11:59 am
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: Casing is 61cm above ground
RP = 1.87m
RP = 1.83m @ 12:12pm

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-4 at 5/24/07

DATE: 5/4/07

CLIENT: CH2M HILL

JOB: 7087

AUTHOR: R. STELLER C. Carter 5/24/07

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	001		10:10 am
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	007		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		
13.5	44.29	24		
14.0	45.93	25		
14.5	47.57	26		
15.0	49.21	27		
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		
20.0	65.62	37		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-4 at 5/4/07 DATE: 5/4/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/4/07 PAGE 4 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26	38		
21.0	68.90	39		
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76		
40.0	131.23	77		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-4 cc 5/21/07 DATE: 5/4/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
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40.5	132.87	78		
41.0	134.51	79		
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		DSP error
44.5	146.00	86		14 Down SUSP DOWN 02
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		
46.5	152.56	90		
47.0	154.20	91		
47.5	155.84	92		
48.0	157.48	93		
48.5	159.12	94		
49.0	160.76	95		
49.5	162.40	96		
50.0	164.04	97		
50.5	165.68	98		
51.0	167.32	99		
51.5	168.96	100		
52.0	170.60	101		
52.5	172.24	102		
53.0	173.88	103		
53.5	175.52	104		
54.0	177.17	105		
54.5	178.81	106		
55.0	180.45	107		
55.5	182.09	108		
56.0	183.73	109		
56.5	185.37	110		
57.0	187.01	111		
57.5	188.65	112		
58.0	190.29	113		
58.5	191.93	114		
59.0	193.57	115		
59.5	195.21	116		
60.0	196.85	117		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-4 at 5/21/07 DATE: 5/4/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 6 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	118		
61.0	200.13	119		
61.5	201.77	120		
62.0	203.41	121		
62.5	205.05	122		
63.0	206.69	123		
63.5	208.33	124		
64.0	209.97	125		
64.5	211.61	126		
65.0	213.25	127		
65.5	214.90	159		11:59
66.0	216.54	158		
66.5	218.18	157		
67.0	219.82	156		
67.5	221.46	155		
68.0	223.10	154		
68.5	224.74	153		
69.0	226.38	152		
69.5	228.02	151		
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		11:51
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			



1-5 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 2/25/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 1

CONTACT: JEN SCHAEFFER _____ CELL _____ PHONE: 540-558-8786 _____

BOREHOLE CONSTRUCTION: CASED ☒ UNCASD ☐
DIAMETERS AND DEPTH RANGES: 1" 0 TO 265.5'; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 265.5'
CONDUCTOR CASING?: YES ☐ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: 156'
BOREHOLE FLUID: WATER ☒; FRESH WATER MUD _____; SALT WATER MUD _____;

LOGGING CREW: R. STELLER

[illegible]



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY I-5 DATE: 2/25/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 7

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786

CONTACT: _____ OFFICE PHONE: _____
PHONE: _____

CONTACT: _____ PHONE: _____

CONTACT: _____ PHONE: _____

CONTACT: _____ PHONE: _____

CONTACT: _____ PHONE: _____

DRILLER: _____ PHONE: _____

COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-5 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED ☒ UNCASD ☐

DIAMETERS AND DEPTH RANGES: 4" 0 TO 265.5 ; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 265.5

CONDUCTOR CASING?: YES ☒ DEPTH TO BOTTOM OF CASING _____; NO ☒

DEPTH TO BEDROCK: 256' DEPTH TO WATER TABLE: 26

BOREHOLE FLUID: WATER ☒; FRESH WATER MUD _____; SALT WATER MUD _____;

OTHER: _____

DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: NA



SITE: LEVY COUNTY I-S DATE: 2/25/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 2 OF 7

LOGGING CREW: R. STELLER
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 06:40
 ARRIVED ON SITE: 07:10
 STANDBY TIME: _____ CAUSE: _____
 LOGGING STARTED: 09:45 LOGGING COMPLETED: 13:10
 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: Red gravel 0.50' Bentonite chips 10' ↑
WA-234 lots of gravel comp.
START 2.5m - 0.3m = 2.2m
END 2.2m = 2.2m

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-5 DATE: 2/25/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 3 OF 7

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	1		
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	7		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		FAST ? ↓
13.5	44.29	24		
14.0	45.93	25		
14.5	47.57	26		
15.0	49.21	27		
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		
20.0	65.62	37		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-5 DATE: 2/25/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 4 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26	30		
21.0	68.90	39		END 28-3 - CHECK?
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		UNSUPPORTED CASE? ↓
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76		
40.0	131.23	77		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-5 DATE: 2/25/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 5 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	78		
41.0	134.51	79		
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		
44.5	146.00	86		
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		
46.5	152.56	90		
47.0	154.20	91		
47.5	155.84	92		
48.0	157.48	93		
48.5	159.12	94		
49.0	160.76	95		
49.5	162.40	96		
50.0	164.04	97		
50.5	165.68	98		
51.0	167.32	99		
51.5	168.96	100		
52.0	170.60	101		
52.5	172.24	102		
53.0	173.88	103		
53.5	175.52	104		
54.0	177.17	105		
54.5	178.81	106		
55.0	180.45	107		
55.5	182.09	108		
56.0	183.73	109		
56.5	185.37	110		
57.0	187.01	111		
57.5	188.65	112		
58.0	190.29	113		
58.5	191.93	114		
59.0	193.57	115		
59.5	195.21	116		
60.0	196.85	117		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-5 DATE: 2/25/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 6 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	118		
61.0	200.13	119		
61.5	201.77	120		
62.0	203.41	121		
62.5	205.05	122		
63.0	206.69	123		
63.5	208.33	124		
64.0	209.97	125		
64.5	211.61	126		
65.0	213.25	127		R23, R24
65.5	214.90	128		
66.0	216.54	129		
66.5	218.18	130		
67.0	219.82	131		
67.5	221.46	132		
68.0	223.10	133		
68.5	224.74	134		
69.0	226.38	135		
69.5	228.02	136		
70.0	229.66	137		
70.5	231.30	138		
71.0	232.94	139		
71.5	234.58	140		
72.0	236.22	141		
72.5	237.86	142		
73.0	239.50	143		
73.5	241.14	144		
74.0	242.78	145		
74.5	244.42	146		
75.0	246.06	147		
75.5	247.70	148		
76.0	249.34	149		
76.5	250.98	150		
76.9	252.62	151		Bottom measurement? Hit Bottom @ 77.0m.
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-5 DATE: 2/25/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER PAGE 7 OF 7

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			T.O. @ 265.5'
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			
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			



I-5 ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 2/25/02
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 1 OF 2

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-5 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED _____ UNCASD ✓
DIAMETERS AND DEPTH RANGES: 4" 0 TO 265.5'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 265.5'
CONDUCTOR CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 265.5'; NO _____
DEPTH TO BEDROCK: 256' DEPTH TO WATER TABLE: 20'
BOREHOLE FLUID: WATER ✓; FRESH WATER MUD _____; SALT WATER MUD _____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: NA



SITE: LEVY COUNTY I-5 DATE: 2/25/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER PAGE 2 OF 2

LOGGING CREW: R. STELLER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 06:40
ARRIVED ON SITE: 07:10
STANDBY TIME: CAUSE:
LOGGING STARTED: 14:28 LOGGING COMPLETED: 14:44

WINCH: COMPROBE SILVER OYO ☒ OTHER
MICROLOGGER 5310 5772 ☒
TELEVIEWER ACOUSTIC #5174 OTHER 4727

PROBE TILT TEST 91.4° BRUNTON TILT 92°
PROBE TILT TEST 20.0 BRUNTON TILT 20°
PROBE TILT TEST 9.5° BRUNTON TILT 9° AFTER LOG
PROBE AZIMUTH TEST 279.3° BRUNTON AZIMUTH 280°
PROBE AZIMUTH TEST 354.5° BRUNTON AZIMUTH 352°
PROBE AZIMUTH TEST 293.0° BRUNTON AZIMUTH 293° AFTER LOG

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>1.6'</u>
DEPTH REF. OFFSET AT START	<u>3.12'</u>
DEPTH REF. OFFSET AT END	<u>3.03'</u>
AFTER SURVEY DEPTH ERROR	<u>- 0.09</u> LESS THAN 0.4%? <u>YES</u>

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>I5 Aug 01</u>	<u>264.0</u>	<u>14:28</u>	<u>5.0'</u>	<u>14:44</u>
	<u>264.0</u>			
	<u>264.0</u>			
	<u>264.0</u>			
	<u>264.0</u>			
	<u>264.0</u>			
	<u>264.0</u>			

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES: T.O. - Bottom = 263.9'



DOWNHOLE VELOCITY FIELD LOG

SITE: LEWY COUNTY, FLORIDA (PER CoA) DATE: 5/3/07
CLIENT: C H2M HILL JOB: 7037
AUTHOR: A. MARTIN cont 5/3/07 PAGE 1 OF 4

CONTACT: JEN SUTAEFFER OFFICE PHONE: 540-558-8786
PHONE: _____
CONTACT: KAREN OLSON (HGS) OFFICE PHONE: 303-886-0637
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: UNIVERSAL DRILLING, LLC PHONE: _____
Prosser

DIRECTIONS TO SITE: 2.5 miles north of Inglis, FL

GENERAL SITE CONDITIONS/LOCATION: _____

EA#:

BOREHOLE DESIGNATION: I-5 LOCATION: _____

COUNTY: LEWY RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASSED ☒ UNCASSED 4" casing to 271 ft, or less, water filled
DIAMETERS AND DEPTH RANGES: 4.56" 0 TO 271 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 271 ft
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: see sub survey log DEPTH TO WATER TABLE: 26 ft
BOREHOLE FLUID: WATER _____; FRESH WATER MUD _____; SALT WATER MUD _____;
OTHER: N/A ROTOSOL DRILLING METHOD
DEPTH TO BOREHOLE FLUID: _____ TIME SINCE LAST CIRCULATION: _____

GEOVision

geophysical services

SITE: PEP COLA BOREHOLE I-5 DATE: 5/3/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: A. MARTIN Optimization PAGE 2 OF 4

LOGGING CREW: ANTHONY MARTIN / C. CARTER
 VEHICLE(S) USED AND MILEAGE: RED ; BLUE ; WHITE RENTAL
 MOBILIZED FROM: Crystal River, FL DEPARTURE TIME: 06:15 hrs
 ARRIVED ON SITE: 07:05 hrs
 STANDBY TIME: CAUSE: PS/TELEVIEWER LOGGING
 LOGGING STARTED: setup @ 07:30 hrs, skip 00:15 hrs LOGGING COMPLETED: 11:15 hrs
 STANDBY TIME: CAUSE:
 LOGGING STARTED: LOGGING COMPLETED:
 DEMOBILIZED TO: ARRIVAL TIME:
 ADDITIONAL DEMOB TIME: REASON:

WINCH COMPROBE HAND ✓ Oyo
 INSTRUMENT 12004 15014 Geode SLN 3458
 GEOPHONE Geostuff Model 3HC-3 SLN B3015

Plank Orientation: S-N (magnetic) Sh Source Offset 6.6' P Source Offset 6'

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: 1) 2.5 ft measurement spacing 2.5-20 ft, 5 ft spacing 25-150 ft,
10 ft spacing 150 ft to 300 ft

2) Drilling activities (grouting) within 10 ft of borehole
grouting

GEOVISION DOWNHOLE LOGGING FIELD NOTES

SITE: PEP COLA BOREHOLE I-5 DATE: 5/3/01
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: A. MARTIN apm 5/1/01 PAGE 3 OF 4

DEPTH (Feet)	SH Source Offset (ft)	Sh Channel Number	SH File Number	P Source Offset (ft)	P Channel Number	P File Number
L(N) (TLE) S N ^{to} _{stack} channel ^{to} _{stack}						
25'	66'	213	139 140 2	6'	1 2	1 082740
5			137 138			2
7.5			135 136			3
10			133 134			4
12.5			131 132			5
15			129 130			6
17.5			127 128			7
20			125 126			8
25			123 124			9
30			121 122			10
35			119 120			11
40			117 118			12
45			115 116			13
50			113 114			14
55			111 112			15
60			109 110			16
65			107 108			17
70			105 106			18
75			103 104			19
80			101 102			20
85			99 100			21
90			97 98			22
95			95 96			23
100			93 94			24
105			91 92			25
110			89 90			26
115			87 88			27
120			85 86			28
125			83 84			29
130			81 82			30
135			79 80			31
140			77 78			32
145			75 76			33
150			73 74			34
160	✓	✓	71 72	✓	✓	35
170	66'	213	69 70	6'	1 2	36

GEOVISION DOWNHOLE LOGGING FIELD NOTES

SITE: PER COLA BOREHOLE I-5 DATE: 5/3/07
 CLIENT: CH2M HILL JOB: 7007
 AUTHOR: A-MARTIN gym 9/26/07 PAGE 4 OF 7

DEPTH (Feet)	SH Source Offset (ft)	Sh Channel Number	SH File Number	P Source Offset (ft)	P Channel Number	P File Number
-----------------	--------------------------	----------------------	-------------------	-------------------------	---------------------	------------------

		<u>L/T</u>	<u>S N</u> <u>#</u> <u>Stack</u>		<u>Channel</u> <u>#</u> <u>Stack</u>	
180	6-6'	2/3	67 68 4	6'	1 2	37
190			65 66			38
200			61 62			39
210			59, 63, 64, 64			40
220			57 58			41
230			55 56			42
240			53 54			43
250			51 52			44
260			49 50 4			45
262 TD	66'	2/3	47 48 4	75' 6'	1 2	46 09231A

Comments

- Repeat S-wave @ 210 ft, repeatable
- Ignore shot location in header for S-wave

NOTES

S = strike south side plank
 N = strike north side plank

Do not need transverse component (T)

because S-N plank & geophone

orientation; however source channel 3

channel 1 vertical (P-wave)

channel 2 horizontal longitudinal (S-W) (L)

channel 3 horizontal transverse (E-W) (T)

P-wave - record length (RL) = 0.15; Sample rate (SR) = 0.03125 m

Source - " " " = 0.25; " " " = " "

* edit geophone location in data file before merging files



I-6 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 3/13/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 1
CONTACT: JEN SCHAEFFER CELL PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASED ☒ UNCASD ☐
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: _____
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: N/A as sh/b
BOREHOLE FLUID: WATER ☒ FRESH WATER MUD _____; SALT WATER MUD _____;

LOGGING CREW: ~~R. STELLER~~ C. Carter 5/4/07

[illegible]



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY I-6 DATE: 3-13-07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/2/07 PAGE 1 OF 6

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-6 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO ~~305'~~; 266' cc 5/2/07 TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266-ft cc 5/2/07
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: 0 TIME SINCE LAST CIRCULATION: N/A



SITE: LEVY COUNTY 1-6 DATE: 3/13/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 3/12/07 PAGE 2 OF 6

LOGGING CREW: R. STELLER C. Carter 3/12/07
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
 ARRIVED ON SITE: 0700
 STANDBY TIME: _____ CAUSE: _____
 LOGGING STARTED: 8:38am LOGGING COMPLETED: 10:28am
 STANDBY TIME: _____ CAUSE: _____
 LOGGING STARTED: _____ LOGGING COMPLETED: _____
 DEMOBILIZED TO: _____ ARRIVAL TIME: _____
 ADDITIONAL DEMOB TIME: _____ REASON: _____

BATTERIES CHANGED BEFORE LOGGING: YES _____; NO X; 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: RP = top of pipe stick up (2.48m - .56m) = 1.92m
1.96m @ 10:43am
HR: 160023, Rec: 30086, Im Iso: 28072, Source: 470151, SD: 490157, WB: 22050

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-6 DATE: 3/13/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 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	001		8:38am
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	7		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		
13.5	44.29	24		
14.0	45.93	25		
14.5	47.57	26		
15.0	49.21	27		
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		Ring ing ?
20.0	65.62	37		16

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-6 DATE: 3/13/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 4 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26	38		
21.0	68.90	39		
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		less ringing
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76		
40.0	131.23	77		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-6 DATE: 3/13/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter sk/07 PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	78		
41.0	134.51	79		
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		
44.5	146.00	86		
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		
46.5	152.56	90		
47.0	154.20	91		
47.5	155.84	92		
48.0	157.48	93		
48.5	159.12	94		
49.0	160.76	95		
49.5	162.40	96		
50.0	164.04	97		
50.5	165.68	98		
51.0	167.32	99		
51.5	168.96	100		
52.0	170.60	101		
52.5	172.24	102		
53.0	173.88	103		
53.5	175.52	104		
54.0	177.17	105		
54.5	178.81	106		
55.0	180.45	107		
55.5	182.09	108		
56.0	183.73	109		
56.5	185.37	110		
57.0	187.01	111		
57.5	188.65	112		
58.0	190.29	113		
58.5	191.93	114		
59.0	193.57	115		
59.5	195.21	116		
60.0	196.85	117		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-6 DATE: 3/13/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 6 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	118		
61.0	200.13	119		
61.5	201.77	120		
62.0	203.41	121		
62.5	205.05	122		
63.0	206.69	123		
63.5	208.33	124		
64.0	209.97	125		
64.5	211.61	126		
65.0	213.25	127		
65.5	214.90	128		
66.0	216.54	129		
66.5	218.18	130		
67.0	219.82	131		
67.5	221.46	132		
68.0	223.10	133		
68.5	224.74	134		
69.0	226.38	135		
69.5	228.02	136		
70.0	229.66	137		
70.5	231.30	138		
71.0	232.94	139		
71.5	234.58	140		
72.0	236.22	141		
72.5	237.86	142		
73.0	239.50	143		
73.5	241.14	144		
74.0	242.78	145		
74.5	244.42	146		
75.0	246.06	147		
75.5	247.70	148		
76.0	249.34	149		
76.5	250.98	150		10:28 am
77.0	252.62			on bottom
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			



I-6

ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 3/13/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 2

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-6 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ☒ UNCASED
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____ 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: 0 TIME SINCE LAST CIRCULATION: N/A



SITE: LEVY COUNTY I-6 DATE: 3/13/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter 5/21/07
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
 ARRIVED ON SITE: 0700
 STANDBY TIME: _____ CAUSE: _____
 LOGGING STARTED: _____ LOGGING COMPLETED: _____

WINCH: _____ COMPROBE SILVER OYO _____ OTHER RG mini
 MICROLOGGER 5310 5772 X
 TELEVIEWER ACOUSTIC #5174 X OTHER _____

① PROBE TILT TEST 91.3 BRUNTON TILT 2
 ② PROBE TILT TEST 81.5 BRUNTON TILT 8
 ③ PROBE TILT TEST 91.1 BRUNTON TILT 1 *After log*
 ① PROBE AZIMUTH TEST 296.9 BRUNTON AZIMUTH 294
 ② PROBE AZIMUTH TEST 38.6 BRUNTON AZIMUTH 39
 ③ PROBE AZIMUTH TEST 164.1 BRUNTON AZIMUTH 163 *After log*

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>1.83 ft</u>
DEPTH REF. OFFSET AT START	<u>2.89 ft</u>
DEPTH REF. OFFSET AT END	<u>2.84 ft</u>
AFTER SURVEY DEPTH ERROR	<u>.05</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>16A00P01</u>	<u>264.7 ft</u>	<u>11:22am</u>	<u>2.8 ft</u>	<u>11:49am</u>

MAINTENANCE PERFORMED ON SITE: _____

EQUIPMENT PROBLEMS OR FAILURES: _____

SUGGESTIONS, ADDITIONS, CHANGES: _____



I-7 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 3/11/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Curker 5/24/07 PAGE 1 OF 1

CONTACT: JEN SCHAEFFER CELL PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASED ☒ UNCASD _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 303'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 303.1'
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: _____
BOREHOLE FLUID: WATER ☒; FRESH WATER MUD _____; SALT WATER MUD _____;

LOGGING CREW: ~~R. STELLER~~ C. Carter 5/21/07

[illegible]



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY I-7 DATE: 3/11/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 7

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-7 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED X UNCASED _____

DIAMETERS AND DEPTH RANGES: 4" 0 TO 303'; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 303'

CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO X

DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: _____

BOREHOLE FLUID: WATER X; FRESH WATER MUD _____; SALT WATER MUD _____;

OTHER: _____

DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: N/A



SITE: LEVY COUNTY I-7 DATE: 3/11/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 7

LOGGING CREW: R. STELLER C. Carter 5/21/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
ARRIVED ON SITE: 0700
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 11:46 LOGGING COMPLETED: 2:00pm
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: _____ LOGGING COMPLETED: _____
DEMOLIZED 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: RP = top of casing (0.58m above ground) = 1.9m
1.88m 2:17pm

HR: 160023, Rec: 30086, 1m Iso 28072, Source 470151, SD 470157, WB 22050

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-7 DATE: 3/11/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: B. STELLER C. Carter 3/21/07 PAGE 3 OF 7

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	001		11:46 am
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	007		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		
13.5	44.29	24		
14.0	45.93	25		
14.5	47.57	26		
15.0	49.21	27		
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		
20.0	65.62	37		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-7 DATE: 3/11/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 3/21/07 PAGE 4 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26	38		
21.0	68.90	39		
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76		
40.0	131.23	77		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-7 DATE: 3/11/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. SPILLER C. Carter 3/21/07 PAGE 5 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	78		
41.0	134.51	79		
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		
44.5	146.00	86		
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		
46.5	152.56	90		
47.0	154.20	91		
47.5	155.84	92		
48.0	157.48	93		
48.5	159.12	94		
49.0	160.76	95		
49.5	162.40	96		
50.0	164.04	97		
50.5	165.68	98		
51.0	167.32	99		
51.5	168.96	100		
52.0	170.60	101		
52.5	172.24	102		
53.0	173.88	103		
53.5	175.52	104		
54.0	177.17	105		
54.5	178.81	106		
55.0	180.45	107		
55.5	182.09	108		
56.0	183.73	109		
56.5	185.37	110		
57.0	187.01	111		
57.5	188.65	112		
58.0	190.29	113		
58.5	191.93	114		
59.0	193.57	115		
59.5	195.21	116		
60.0	196.85	117		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-7 DATE: 3/11/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 3/21/07 PAGE 6 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	118		
61.0	200.13	119		
61.5	201.77	120		
62.0	203.41	121		
62.5	205.05	122		
63.0	206.69	123		
63.5	208.33	124		
64.0	209.97	125		
64.5	211.61	126		
65.0	213.25	127		
65.5	214.90	128		
66.0	216.54	129		
66.5	218.18	130		
67.0	219.82	131		
67.5	221.46	132		
68.0	223.10	133		
68.5	224.74	134		
69.0	226.38	135		
69.5	228.02	136		
70.0	229.66	137		
70.5	231.30	138		
71.0	232.94	139		
71.5	234.58	140		
72.0	236.22	141		
72.5	237.86	142		
73.0	239.50	143		
73.5	241.14	144		
74.0	242.78	145		
74.5	244.42	146		
75.0	246.06	147		
75.5	247.70	148		
76.0	249.34	149		
76.5	250.98	150		
77.0	252.62	151		
77.5	254.27	152		
78.0	255.91	153		
78.5	257.55	154		
79.0	259.19	155		
79.5	260.83	156		
80.0	262.47	157		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-7 DATE: 3/11/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/12/07 PAGE 7 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

80.5	264.11	158		
81.0	265.75	159		
81.5	267.39	160		
82.0	269.03	161		
82.5	270.67	162		
83.0	272.31	163		
83.5	273.95	164		
84.0	275.59	165		
84.5	277.23	166		
85.0	278.87	167		
85.5	280.51	168		
86.0	282.15	169		
86.5	283.79	170		
87.0	285.43	171		
87.5	287.07	172		
88.0	288.71	173		2:00 pm
88.5	290.35			
89.0	291.99			
89.5	293.64			
90.0	295.28			
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			



I-7

ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 3/11/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STEELER C. Carters/11/07 PAGE 1 OF 2

CONTACT: <u>JEN SCHAEFFER</u>	OFFICE PHONE: _____
	CELL PHONE: <u>540-558-8786</u>
CONTACT: _____	OFFICE PHONE: _____
	PHONE: _____
CONTACT: _____	PHONE: _____
	PHONE: _____
CONTACT: _____	PHONE: _____
	PHONE: _____
DRILLER: _____	PHONE: _____
COMPANY: _____	PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-7 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 302'; _____ 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: 0 TIME SINCE LAST CIRCULATION: _____



SITE: LEVY COUNTY I-7 cc 5/21/07 DATE: 3/11/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter 5/21/07
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
 ARRIVED ON SITE: 0700
 STANDBY TIME: _____ CAUSE: _____
 LOGGING STARTED: 9:42am LOGGING COMPLETED: 10:14am

WINCH: _____ COMPROBE _____ SILVER _____ OYO _____ OTHER R6 mini
 MICROLOGGER 5310 5772 x
 TELEVIEWER _____ ACOUSTIC #5174 x cc 5/21/07 OTHER _____

1) PROBE TILT TEST 91.4 BRUNTON TILT 2
 2) PROBE TILT TEST 62.07 BRUNTON TILT 29
 3) PROBE TILT TEST 92.07 BRUNTON TILT 2 *After log*
 1) PROBE AZIMUTH TEST 134.1 BRUNTON AZIMUTH 136
 2) PROBE AZIMUTH TEST 205.3 BRUNTON AZIMUTH 207
 3) PROBE AZIMUTH TEST 131.6 BRUNTON AZIMUTH 135 *After log*

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>1.92</u>
DEPTH REF. OFFSET AT START	<u>2.8</u>
DEPTH REF. OFFSET AT END	<u>2.66</u>
AFTER SURVEY DEPTH ERROR	<u>.14 cc 5/21/07</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>17A00P01</u>	<u>300'</u>	<u>9:42am</u>	<u>2.7'</u>	<u>10:14am</u>

MAINTENANCE PERFORMED ON SITE: _____
 EQUIPMENT PROBLEMS OR FAILURES: _____
 SUGGESTIONS, ADDITIONS, CHANGES: _____



DOWNHOLE VELOCITY FIELD LOG

SITE: PEE COVA (LEWY COUNTY, FLORIDA) DATE: 5/2/07
CLIENT: CH2M HILL JOB: 1087
AUTHOR: A. MARTIN Q/mr. b 5/2/07 PAGE 1 OF 4

CONTACT: JEN SCHAEFFER OFFICE PHONE: 540-558-8786
PHONE: _____
CONTACT: KAREN OLSON (NRS) OFFICE PHONE: 303-826-0637
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: CONVEGA INC. - SEISMIC PHONE: _____
PROSPECT

DIRECTIONS TO SITE: 2 miles north of Hwy 10, FL.

GENERAL SITE CONDITIONS/LOCATION: _____

EA#: _____
BOREHOLE DESIGNATION: I-7 LOCATION: _____

COUNTY: LEWY RANGE: _____ TOWNSHIP: _____ SECTION: 36 51-1-1
BOREHOLE CONSTRUCTION: Cased _____ UNCased _____ 4" casing to 300 ft bottom ±
DIAMETERS AND DEPTH RANGES: 4.56" 0 TO 307 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 307 ft
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: see south boundary DEPTH TO WATER TABLE: 2.6'
BOREHOLE FLUID: WATER _____; FRESH WATER MUD _____; SALT WATER MUD _____
OTHER: N/A ROTASONIC DRILLING TECHNIQUE
DEPTH TO BOREHOLE FLUID: N/A TIME SINCE LAST CIRCULATION: N/A

GEOVision

geophysical services

SITE: PEF COLA BOREHOLE I-7 DATE: 5/2/07
 CLIENT: Chumley JOB: 7087
 AUTHOR: A. MARTIN CGR 5/1/07 PAGE 2 OF 4

LOGGING CREW: ANTHONY MARTIN / C. CARTER
 VEHICLE(S) USED AND MILEAGE: RED ; BLUE ; WHITE RENTAL
 MOBILIZED FROM: Crystal River FL DEPARTURE TIME: 0645hr
 ARRIVED ON SITE: 0700hr
 STANDBY TIME: CAUSE:
 LOGGING STARTED: setup @ 1330hr state Moshu LOGGING COMPLETED: 1715hr
 STANDBY TIME: CAUSE:
 LOGGING STARTED: LOGGING COMPLETED:
 DEMOBILIZED TO: ARRIVAL TIME:
 ADDITIONAL DEMOB TIME: REASON:

WINCH COMPROBE HAND ✓ Oyo
 INSTRUMENT 12004 15014 Geode SL 3458
 GEOPHONE Geostuff Model BHG-3 SL 83015

Plank Orientation: S-N (magnetic) Sh Source Offset 7.5' P Source Offset 5.5'

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: 2.5 ft measurement spacing 25-20 ft, 5 ft spacing 25-15 ft,
10 ft spacing 15 ft to ID

GEOVISION DOWNHOLE LOGGING FIELD NOTES

SITE: DEF COLA BOREHOLE J-7

DATE: 5/2/07

CLIENT: CH2M HILL

JOB: 7087

AUTHOR: A. MARTIN

Completed 5/2/07

PAGE 3 OF 4

DEPTH (Feet)	SH Source Offset (ft)	Sh Channel Number	SH File Number	P Source Offset (ft)	P Channel Number	P File Number
		LLN/TLE)	S N ^{IF} _{Stech}		Channel ^{IF} _{Stech}	
2.5'	7.5'	2/3	148 149 2	5.5'	1 2	1 147ha
5			146 147			2
7.5			144 145			3
10			142 143			4
12.5			140 141			5
15			138 139			6
17.5			136 137			7
20			134 135			8
25			132 133			9
30			130 131 2			10
35			128 129 2			11
40			126 127 3			12
45			124 125			13
50			122 123			14
55			120 121			15
60			118 119			16
65			116 117			17
70			114 115			18
75			112 113			19
80			110 111			20
85			108 109			21
90			106 107			22
95			104 105			23
100			102 103 3			24
105			100 101 4			25
110			98 99			26
115			96 97			27
120			94 95			28
125			92 93			29
130			90 91			30
135			88 89			31
140			86 87			32
145			84 85			33
150			82 83			34
160	✓	✓	80 81	✓	✓	35
170	7.5'	2/7	78 79 4	5.5'	1 2	36 1473ha

GEOVISION DOWNHOLE LOGGING FIELD NOTES

SITE: PER COLA BOREHOLE I-7

DATE:

CLIENT: CARMINE

JOB: 7087

AUTHOR: A. MARTIN CGmed 5/2/07

PAGE 4 OF 4

DEPTH (Feet)	SH Source Offset (ft)	Sh Channel Number	SH File Number	P Source Offset (ft)	P Channel Number	P File Number
180	7.5'	2/3	76 77 4	5.5'	1 2	37
190			74 75			38
200			72 73			39
210			70 71			40
220			68 69			41
230			66 67			42
240			64 65			43
250			62 63			44
260			60 61			45
270			58 59			46
280			56 57			47
290			54 55			48
300	7.5'	2/3	52 53	5.5'	1 4	49
			MERGE LONG. COMPONENTS (N = Component 1, S = component 2) ↓ ITSL.DAT			↓ MERGE ↓ ITP.DAT
			NOTES			
			S = Strike south side plank			
			N = " north " "			
			Do not need transverse component (T) because S-N plank & geophone orientation; however some ch channel 3			
			channel 1 vertical (P-wave)			
			channel 2 horizontal longitudinal (L)			S-N
			channel 3 " transverse (T)			E-W
			P-wave record length (RL) ≥ 0.15; sample rate (SR) = 0.01 Hz			
			Swave " " " ≥ 0.25; " " " " " " "			
			* edit geophone location in data file header before merging files			
			NO CORRECTIONS NECESSARY			



I-8 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 3/23/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 1

CONTACT: JEN SCHAEFFER CELL PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASED X UNCASD _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO X
DEPTH TO BEDROCK: _____
BOREHOLE FLUID: WATER X; FRESH WATER MUD _____; SALT WATER MUD _____;

LOGGING CREW: ~~R. STELLER~~ C. Carter 5/24/07

[illegible]



I-8

ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 3/23/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/24/07 PAGE 1 OF 2

CONTACT: <u>JEN SCHAEFFER</u>	OFFICE PHONE: _____
	CELL PHONE: <u>540-558-8786</u>
CONTACT: _____	OFFICE PHONE: _____
	PHONE: _____
CONTACT: _____	PHONE: _____
	PHONE: _____
CONTACT: _____	PHONE: _____
	PHONE: _____
DRILLER: _____	PHONE: _____
COMPANY: _____	PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-8 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
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: Ø TIME SINCE LAST CIRCULATION: NA



SITE: LEVY COUNTY I-8 at 5/21/07 DATE: 3/23/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter 5/21/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
ARRIVED ON SITE: 0700
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 9:10 am LOGGING COMPLETED: 9:39 am

WINCH: _____ COMPROBE _____ SILVER _____ OYO _____ OTHER RG mini
MICROLOGGER 5310 _____ 5772 X _____
TELEVIEWER ACOUSTIC #5174 X OTHER _____

1 PROBE TILT TEST 86.0 BRUNTON TILT 4
2 PROBE TILT TEST 87.4 BRUNTON TILT 3
3 PROBE TILT TEST 89.66 BRUNTON TILT 0 after log
1 PROBE AZIMUTH TEST 81.2 BRUNTON AZIMUTH 81
2 PROBE AZIMUTH TEST 357.3 BRUNTON AZIMUTH 357
3 PROBE AZIMUTH TEST 101.4 BRUNTON AZIMUTH 101 after log

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>1.08'</u>
DEPTH REF. OFFSET AT START	<u>3.64'</u>
DEPTH REF. OFFSET AT END	<u>3.63'</u>
AFTER SURVEY DEPTH ERROR	<u>.01</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>I8AUC001</u>	<u>265.7'</u>	<u>9:10am</u>	<u>3.6'</u>	<u>9:39 am</u>

MAINTENANCE PERFORMED ON SITE: _____
EQUIPMENT PROBLEMS OR FAILURES: _____
SUGGESTIONS, ADDITIONS, CHANGES: _____



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY I-8 DATE: 3/23/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 3/21/07 PAGE 1 OF 6

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-8 LOCATION: _____

COUNTY: LEVY RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
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: 0 TIME SINCE LAST CIRCULATION: NA



SITE: LEVY COUNTY I-8 DATE: 3/23/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 6

LOGGING CREW: R. STELLER C. Carter 5/21/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
ARRIVED ON SITE: 0700
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 10:27am LOGGING COMPLETED: 12:20pm
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: Pipe stick up = .33m

RP = 2.15m
RP = 2.14m @ 12:42pm

UR: 160023, Rec: 30086, Im Iso: 28072, Source: 21051, SD: 490157, WB: 22050

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-8 DATE: 3/23/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 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	001		10:27 am
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		Better SH
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		4: freq
19.5	63.98	35		
20.0	65.62	36		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-8 cc 5/21/07 DATE: 3/23/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 4 OF 6

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		
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		lower frog
33.0	108.27	62		
33.5	109.91	63		
34.0	111.55	64		
34.5	113.19	65		↑ frog
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: LEVY COUNTY I-8 DATE: 3/23/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

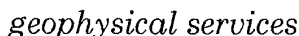
40.5	132.87	77		
41.0	134.51	78		
41.5	136.15	79		
42.0	137.80	80		
42.5	139.44	81		
43.0	141.08	82		
43.5	142.72	83		
44.0	144.36	84		
44.5	146.00	85		
45.0	147.64	86		
45.5	149.28	87		
46.0	150.92	88		
46.5	152.56	89		
47.0	154.20	90		
47.5	155.84	91		
48.0	157.48	92		
48.5	159.12	93		
49.0	160.76	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		winch pulled forward
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: LEVY COUNTY I-8 DATE: 3/23/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 6 OF 6

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		12:20pm
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			



I-9

SITE: LEVY COUNTY

DATE: 3/22/07

CLIENT: CH2M HILL

JOB: 7087

AUTHOR: ~~R. STELLER~~ C. Carter 5/21/07

PAGE 1 OF 1

CONTACT: JEN SCHAEFFER

CELL

PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASED ☒ UNCASED ☐

x

UNCASED

DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft ; TO

4'

0 TO 266 ft

TC

BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft

266 ft

CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____ ; NO ☒

DE

G

x

DEPTH TO BEDROCK:

BOREHOLE FLUID: WATER ☒ ; FRESH WATER MUD ☐ ; SALT WATER MUD ☐ ;

X

0

3

LOGGING CREW: B. STELLER

C. Carter 5/21/07

LOG TYPE

FILE NAME

DEPTH RANGE

DATE _____

TIMES

Deviation

T9AUUP01

043.7' - 3.1'

3/22/07

9:15 am - 9:40 am

P 5.4.1.1.1

505-221-4413

20	205
----	-----

11-1-1	11-1-2
11-1-3	11-1-4

1.1.1 am	1.1.1 am
1.1.1.1	1.1.1.1



I-9

ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 3/22/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 2

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-9 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ☒ UNCASED _____
DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft cc 5/21/07, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft cc 5/21/07
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: Ø TIME SINCE LAST CIRCULATION: N/A

GE Vision

geophysical services

SITE: LEVY COUNTY I-9 DATE: 3/22/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter 5/21/07
 VEHICLE(S) USED AND MILEAGE: RENTAL
 MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
 ARRIVED ON SITE: 0700
 STANDBY TIME: _____ CAUSE: _____
 LOGGING STARTED: 9:15 am LOGGING COMPLETED: 9:40 am

WINCH: _____ COMPROBE _____ SILVER _____ OYO _____ OTHER RG Mini
 MICROLOGGER 5310 _____ 5772 X _____
 TELEVIEWER ACOUSTIC #5174 X OTHER _____

1 PROBE TILT TEST 74.7 BRUNTON TILT 15
 2 PROBE TILT TEST 93.18 BRUNTON TILT 3
 3 PROBE TILT TEST 88.43 BRUNTON TILT 10 After log
 1 PROBE AZIMUTH TEST 347.5 BRUNTON AZIMUTH 345
 2 PROBE AZIMUTH TEST 39.6 BRUNTON AZIMUTH 41
 3 PROBE AZIMUTH TEST 256.1 BRUNTON AZIMUTH 254 After log

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>1.67 ft</u>
DEPTH REF. OFFSET AT START	<u>3.05 ft</u>
DEPTH REF. OFFSET AT END	<u>3.07 ft</u>
AFTER SURVEY DEPTH ERROR	<u>.02</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>I9AUUP01</u>	<u>243.7</u>	<u>9:15 am</u>	<u>3.1 ft</u>	<u>9:40 am</u>

MAINTENANCE PERFORMED ON SITE: _____

EQUIPMENT PROBLEMS OR FAILURES: _____

SUGGESTIONS, ADDITIONS, CHANGES: _____



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY I-9 DATE: 3/22/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 3/21/07 PAGE 1 OF 6

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-9 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED ☒ UNCASED

DIAMETERS AND DEPTH RANGES: 4" 0 TO 266 ft ca 3/21/07 TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft ca 3/21/07

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: 0 TIME SINCE LAST CIRCULATION: NA



SITE: LEVY COUNTY I-9 DATE: 3/22/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 6

LOGGING CREW: R. STELLER C. Carter 5/21/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
ARRIVED ON SITE: 0700
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 10:46am LOGGING COMPLETED: 12:23pm
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: _____ LOGGING COMPLETED: _____
DEMOLIZED TO: _____ ARRIVAL TIME: _____
ADDITIONAL DEMOB TIME: _____ REASON: _____

BATTERIES CHANGED BEFORE LOGGING: YES _____; NO X; 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: 7. pi stick up = 0.51m
RP = 1.97m
1.95m @ 12:57

HR: 160023, Rec: 30086, In Iso: 28072, SD: 490157, Source: 470151, WB: 22050

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-9 DATE: 3/22/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 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	001		10:46
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	7		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		ringing
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		Good record
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		H1/H2 clipping
13.5	44.29	24		↓
14.0	45.93	25		1
14.5	47.57	26		
15.0	49.21	27		1
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		✓
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		
20.0	65.62	37		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-9 DATE: 3/22/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 4 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26	38		
21.0	68.90	39		
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76		
40.0	131.23	77		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-9 DATE: 3/22/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	78		
41.0	134.51	79		
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		
44.5	146.00	86		
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		
46.5	152.56	90		
47.0	154.20	91		
47.5	155.84	92		
48.0	157.48	93		
48.5	159.12	94		
49.0	160.76	95		
49.5	162.40	96		
50.0	164.04	97		
50.5	165.68	98		
51.0	167.32	99		
51.5	168.96	100		
52.0	170.60	101		
52.5	172.24	102		
53.0	173.88	103		
53.5	175.52	104		
54.0	177.17	105		
54.5	178.81	106		
55.0	180.45	107		
55.5	182.09	108		
56.0	183.73	109		
56.5	185.37	110		
57.0	187.01	111		
57.5	188.65	112		
58.0	190.29	113		
58.5	191.93	114		
59.0	193.57	115		
59.5	195.21	116		
60.0	196.85	117		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY 5-9 DATE: 3/22/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter s/m PAGE 6 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	118		
61.0	200.13	119		
61.5	201.77	120		
62.0	203.41	121		
62.5	205.05	122		
63.0	206.69	123		
63.5	208.33	124		
64.0	209.97	125		
64.5	211.61	126		
65.0	213.25	127		
65.5	214.90	128		
66.0	216.54	129		
66.5	218.18	130		
67.0	219.82	131		
67.5	221.46	132		
68.0	223.10	133		
68.5	224.74	134		
69.0	226.38	135		
69.5	228.02	136		
70.0	229.66	137		
70.5	231.30	138		12:23
71.0	232.94			
71.5	234.58			
72.0	236.22			
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			



I-10 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE: LEVY COUNTY DATE: 5/4/07, 5/5/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 1

CONTACT: JEN SCHAEFFER CELL PHONE: 540-558-8786

BOREHOLE CONSTRUCTION: CASED X UNCASD _____
DIAMETERS AND DEPTH RANGES: 3.78" 0 TO 266 ft; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO X
DEPTH TO BEDROCK: _____
BOREHOLE FLUID: WATER X; FRESH WATER MUD _____; SALT WATER MUD _____;

LOGGING CREW: ~~R. STELLER~~ C-Carter 5/21/07

[illegible]



I-10

ACOUSTIC TELEVIEWER FIELD LOG

SITE: LEVY COUNTY DATE: 5/4/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 1 OF 2

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: _____ OFFICE PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
CONTACT: _____ PHONE: _____
PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-10 LOCATION: _____
COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED X UNCASED ~~X~~
DIAMETERS AND DEPTH RANGES: 3.78" 0 TO 266 ft; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft
CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO X
DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: ~6 ft
BOREHOLE FLUID: WATER X; FRESH WATER MUD _____; SALT WATER MUD _____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: NA



geophysical services

SITE: LEVY COUNTY I-10 cc 5/2/07 DATE: 5/4/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/2/07 PAGE 2 OF 2

LOGGING CREW: R. STELLER C. Carter 5/2/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
ARRIVED ON SITE: 0700
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 4:48pm LOGGING COMPLETED: _____

WINCH: _____ COMPROBE SILVER OYO _____ OTHER R6 mini
MICROLOGGER 5310 X 5772
TELEVIEWER ACOUSTIC #5174 X OTHER _____

1 PROBE TILT TEST 84.0 BRUNTON TILT 6
2 PROBE TILT TEST 87.9 BRUNTON TILT 2
3 PROBE TILT TEST 85.16 BRUNTON TILT 4 After log
1 PROBE AZIMUTH TEST 82.5 BRUNTON AZIMUTH 81
2 PROBE AZIMUTH TEST 160.1 BRUNTON AZIMUTH 164
3 PROBE AZIMUTH TEST 132.1 BRUNTON AZIMUTH 134 After log

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	<u>-1.17</u>
DEPTH REF. OFFSET AT START	<u>3.55'</u>
DEPTH REF. OFFSET AT END	<u>3.53'</u>
AFTER SURVEY DEPTH ERROR	<u>.02</u> LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
<u>I10AVUP01</u>	<u>266.1 ft</u>	<u>4:48pm</u>	<u>2.8 ft</u>	<u>5:15pm</u>

MAINTENANCE PERFORMED ON SITE: _____

EQUIPMENT PROBLEMS OR FAILURES: _____

SUGGESTIONS, ADDITIONS, CHANGES: _____



P-S SUSPENSION VELOCITY FIELD LOG

SITE: LEVY COUNTY I-10 DATE: 5/5/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter skulor PAGE 1 OF 6

CONTACT: JEN SCHAEFFER OFFICE PHONE: _____
CELL PHONE: 540-558-8786
CONTACT: OFFICE PHONE: _____
PHONE: _____
CONTACT: PHONE: _____
PHONE: _____
CONTACT: PHONE: _____
PHONE: _____
DRILLER: PHONE: _____
COMPANY: PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: I-10 LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION: CASED X UNCASD _____

DIAMETERS AND DEPTH RANGES: 3.78" 0 TO 266 ft; _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED: 266 ft

CONDUCTOR CASING?: YES _____ DEPTH TO BOTTOM OF CASING _____; NO X

DEPTH TO BEDROCK: _____ DEPTH TO WATER TABLE: 26 ft

BOREHOLE FLUID: WATER X; FRESH WATER MUD _____; SALT WATER MUD _____

OTHER: _____

DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: NA



SITE: LEVY COUNTY I-10 DATE: 5/5/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 2 OF 6

LOGGING CREW: R. STELLER C. Carter 5/21/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: CRYSTAL RIVER, FL DEPARTURE TIME: 0630
ARRIVED ON SITE: 0750
STANDBY TIME: CAUSE:
LOGGING STARTED: 8:09am LOGGING COMPLETED: 9:43am
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMobilized TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

BATTERIES CHANGED BEFORE LOGGING: YES ; NO X ; STORED WITH NEW
WINCH COMPROMISE ☐ 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: Top of casing = 36cm above ground
RP = 2.12m
RP = 2.12m @ 9:58am

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-10 DATE: 5/5/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 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	001		8:07am
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	7		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		
13.5	44.29	24		
14.0	45.93	25		
14.5	47.57	26		
15.0	49.21	27		
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		
20.0	65.62	37		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-10 DATE: 5/5/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/1/07 PAGE 4 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

20.5	67.26	38		
21.0	68.90	39		
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76		
40.0	131.23	77		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-10 DATE: 5/5/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 5 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

40.5	132.87	78		
41.0	134.51	79		
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		
44.5	146.00	86		
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		
46.5	152.56	90		
47.0	154.20	91		
47.5	155.84	92		
48.0	157.48	93		
48.5	159.12	94		
49.0	160.76	95		
49.5	162.40	96		
50.0	164.04	97		
50.5	165.68	98		
51.0	167.32	99		
51.5	168.96	100		
52.0	170.60	101		
52.5	172.24	102		
53.0	173.88	103		
53.5	175.52	104		
54.0	177.17	105		
54.5	178.81	106		
55.0	180.45	107		
55.5	182.09	108		
56.0	183.73	109		
56.5	185.37	110		
57.0	187.01	111		
57.5	188.65	112		
58.0	190.29	113		
58.5	191.93	114		
59.0	193.57	115		
59.5	195.21	116		
60.0	196.85	117		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: LEVY COUNTY I-10 DATE: 5/5/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: R. STELLER C. Carter 5/21/07 PAGE 6 OF 6

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
-----------------	---------------	------------------------	----------------------	--------------------------------------

60.5	198.49	118		
61.0	200.13	119		
61.5	201.77	120		
62.0	203.41	121		
62.5	205.05	122		
63.0	206.69	123		
63.5	208.33	124		
64.0	209.97	125		
64.5	211.61	126		
65.0	213.25	127		
65.5	214.90	128		
66.0	216.54	129		
66.5	218.18	130		
67.0	219.82	131		
67.5	221.46	132		
68.0	223.10	133		
68.5	224.74	134		
69.0	226.38	135		
69.5	228.02	136		
70.0	229.66	137		
70.5	231.30	138		
71.0	232.94	139		
71.5	234.58	140		
72.0	236.22	141		
72.5	237.86	142		
73.0	239.50	143		
73.5	241.14	144		
74.0	242.78	145		
74.5	244.42	146		
75.0	246.06	147		
75.5	247.70	148		
76.0	249.34	149		
76.5	250.98	150		
77.0	252.62	151		
77.5	254.27	152		9:43 am
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			



DOWNHOLE VELOCITY FIELD LOG

SITE: LEVY COUNTY, FLORIDA DATE: 5/3/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: A. MARTIN *approved 5/3/07* PAGE 1 OF 4

CONTACT: JEN SCHAEFFER OFFICE PHONE: 540-558-8786
PHONE: _____
CONTACT: KAREN OLSON (HKS) OFFICE PHONE: _____
PHONE: 303-886-0637
CONTACT: _____ PHONE: _____
CONTACT: _____ PHONE: _____
DRILLER: _____ PHONE: _____
COMPANY: PROSON PHONE: _____

DIRECTIONS TO SITE: ~ 5 miles north of Inglis, FL

GENERAL SITE CONDITIONS/LOCATION: _____

EA#: _____
BOREHOLE DESIGNATION: I-10 LOCATION: _____

COUNTY: LEVY RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASING ☒ UNCASING ☐ 4' casing to 267' or less, water-filled
DIAMETERS AND DEPTH RANGES: 4.6" 0 TO 267'; _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 267'
CONDUCTOR CASING?: YES ☐ DEPTH TO BOTTOM OF CASING _____; NO ☒
DEPTH TO BEDROCK: see soil boring log DEPTH TO WATER TABLE: 267'
BOREHOLE FLUID: WATER ☐; FRESH WATER MUD ☐; SALT WATER MUD ☐;
OTHER: N/A ROTATIONAL DRILLING TECHNIQUE
DEPTH TO BOREHOLE FLUID: N/A TIME SINCE LAST CIRCULATION: _____

GEOVision

geophysical services

SITE: PEP COA BOREHOLE I-10 DATE: 5/3/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: A. MARTIN 5/3/07 PAGE 2 OF 4

LOGGING CREW: ANTHONY MARTIN / CHUCK CARTER
 VEHICLE(S) USED AND MILEAGE: RED ; BLUE ; WHITE RENTAL
 MOBILIZED FROM: Crystal River FL DEPARTURE TIME: 0645 hrs
 ARRIVED ON SITE: 0700 hrs
 STANDBY TIME: CAUSE:
 LOGGING STARTED: 1245 hrs LOGGING COMPLETED: 1530 hrs
 STANDBY TIME: CAUSE:
 LOGGING STARTED: LOGGING COMPLETED:
 DEMOBILIZED TO: ARRIVAL TIME:
 ADDITIONAL DEMOB TIME: REASON:

WINCH COMPROBE HAND Oyo
 INSTRUMENT 12004 15014 Geode 5/2 3458
 GEOPHONE Geostuck Model BH9-3 5/2 B3015

Plank Orientation: S-N (magnetic) Sh Source Offset 6.4' P Source Offset 6.5' ca 5/3/07

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: 2.5 ft measurement spacing 2.5-20 ft, 5 ft spacing 25-150 ft,
10 ft spacing from 15 ft to 20 ft

GEOVISION DOWNHOLE LOGGING FIELD NOTES

SITE: PER COLA Borehole I-10 DATE: 5/3/07
 CLIENT: CH2M HILL JOB: 7087
 AUTHOR: A. MARTIN Cymba-5/3/07 PAGE 3 OF 4

DEPTH (Feet)	SH Source Offset (ft)	Sh Channel Number	SH File Number	P Source Offset (ft)	P Channel Number	P File Number
		LLN)/T(LR)	S N ^{stach}		channel ^{stach}	
2.5'	6.4'	2/3	139 140 2	5'	1 2	1* 124sh
5			137 138			2
7.5			135 136			3
10			133 134			4/5*
12.5			131 132			5/6
15			129 130			7
17.5			127 128			8
20			125 126			9
25			123 124			10
30			121 122			11
35			119 120			12
40			117 118			13
45			115 116			14
50			113 114		2	15
55			111 112		more stach	16
60			109 110			17
65			107 108			18
70			105 106			19
75			103 104			20
80			101 102			21
85		NOTE →	99 100			22
90			96 97 98			23
95			94 95 2		2	24
100			92 93 3		more stach	25
105			90 91			26
110			88 89			27
115			86 87			28
120			84 85			29
125			82 83			30
130			80 81			31 ^{5/3/07}
135			78 79			32
140			76 77			33
145			74 75			34
150			72 73			35
160	6.4'	2/3	70 71 3	5'	1 2	36

NOTE: move source between files 4&5 (3" electro - difference)
 use file 4

GEOVISION DOWNHOLE LOGGING FIELD NOTES

SITE: PEP COLA BOREHOLE I-10 DATE: 5/3/07
CLIENT: CH2M HILL JOB: 7087
AUTHOR: A. Martin cmh PAGE 4 OF 4
5/3/07

[illegible]

APPENDIX G

BORING GEOPHYSICAL LOGGING

FIELD MEASUREMENT PROCEDURES

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 digital data files transmitted in Excel, Word or ASCII format.

Instrumentation

1. OYO Model 170 Digital Logging Recorder or equivalent
2. OYO P-S Suspension Logger probe or equivalent, 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 P-S Logger 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 4 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 4 or 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 seismograph has at least six channels (two simultaneous recording channels), each with at least a 12 bit 1024 sample record. Newer seismographs may have longer record lengths. The recorded data is displayed on a CRT or LCD display and possibly on paper tape output as six channels with a common time scale. Data is stored on digital media for further processing. Up to 8 sampling sequences can be stacked (averaged) to improve the signal to noise ratio of the signals.

Review of the data on the display 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 digital media) 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

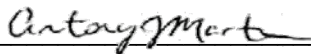
value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

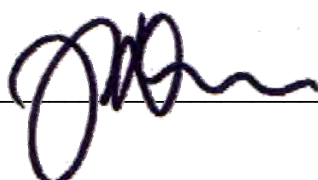
In Figure 2, the time difference over the 1-meter interval of 1.70 millisecond is equivalent to a SH-wave velocity of 588 m/sec. Whenever possible, time differences are determined from several phase points on the S_H -wave pulse trains to verify the data obtained from the first arrival of the S_H -wave 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 V_s and V_p 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  Date 9/11/06

QA Review  Date 9/11/06

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

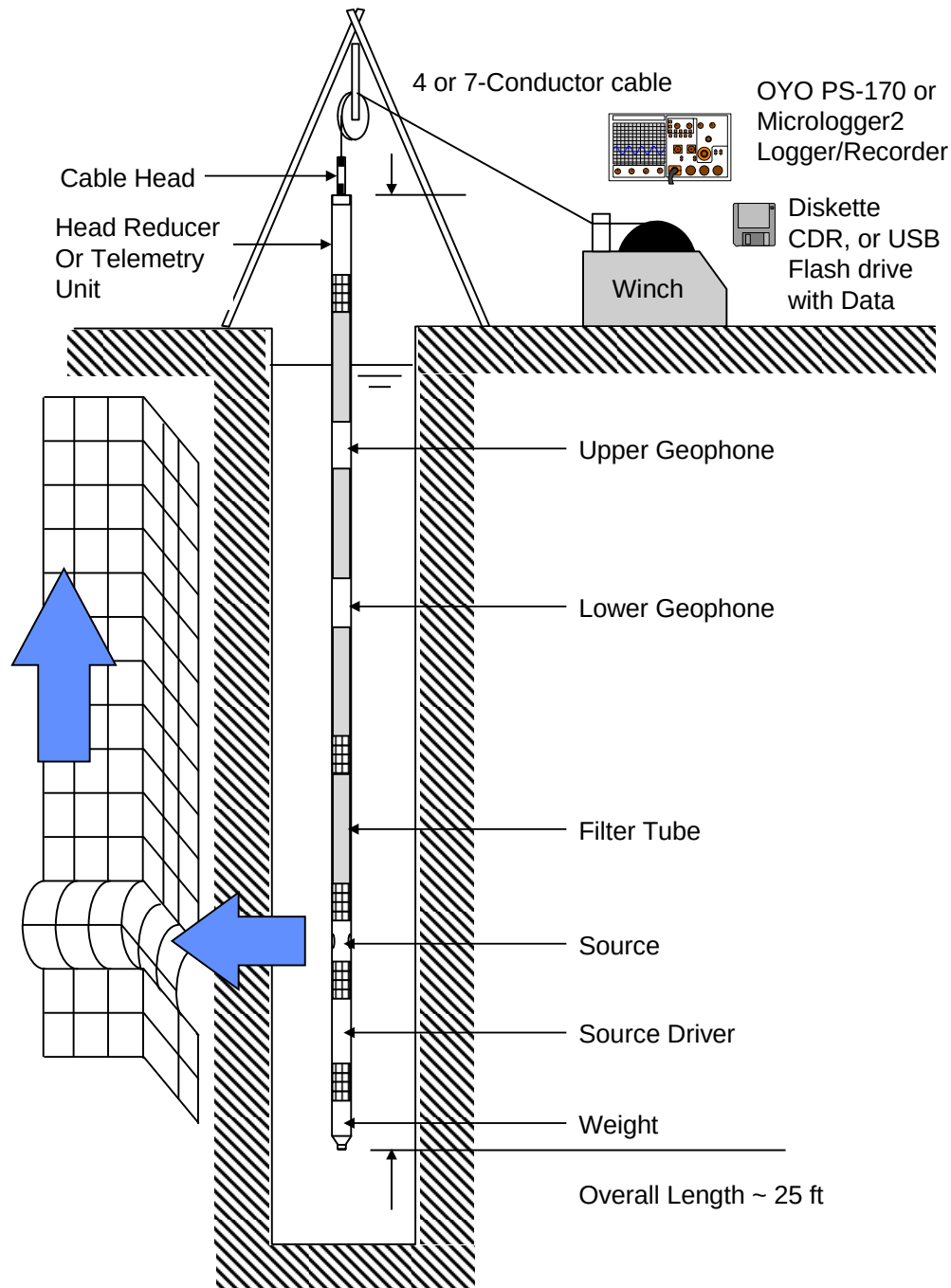


Figure 1. Suspension PS logging method setup

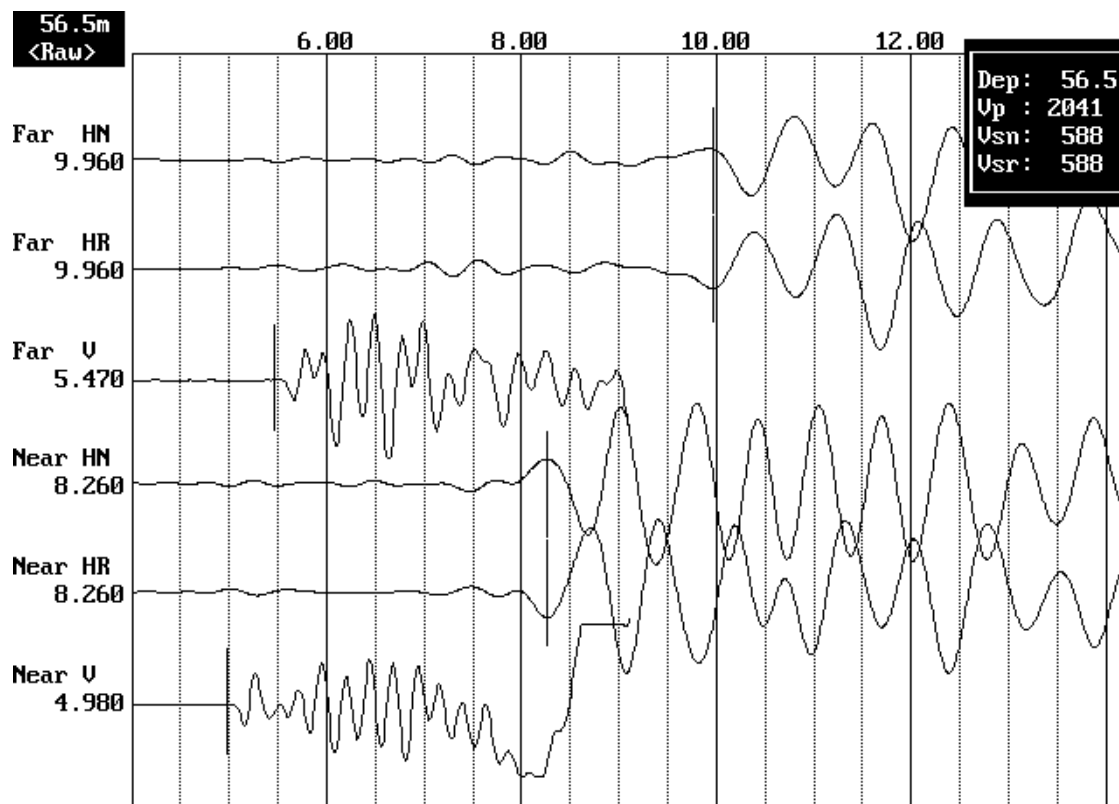


Figure 2. Sample suspension method waveform data showing horizontal normal and reversed (HR and HN), and vertical (V) waveforms received at the near (bottom 3 channels) and far (top 3 channels) geophones. The arrivals in milliseconds for each pick are shown on the left. The box in the upper right corner shows the depth in the borehole and the velocities calculated based on the picks.

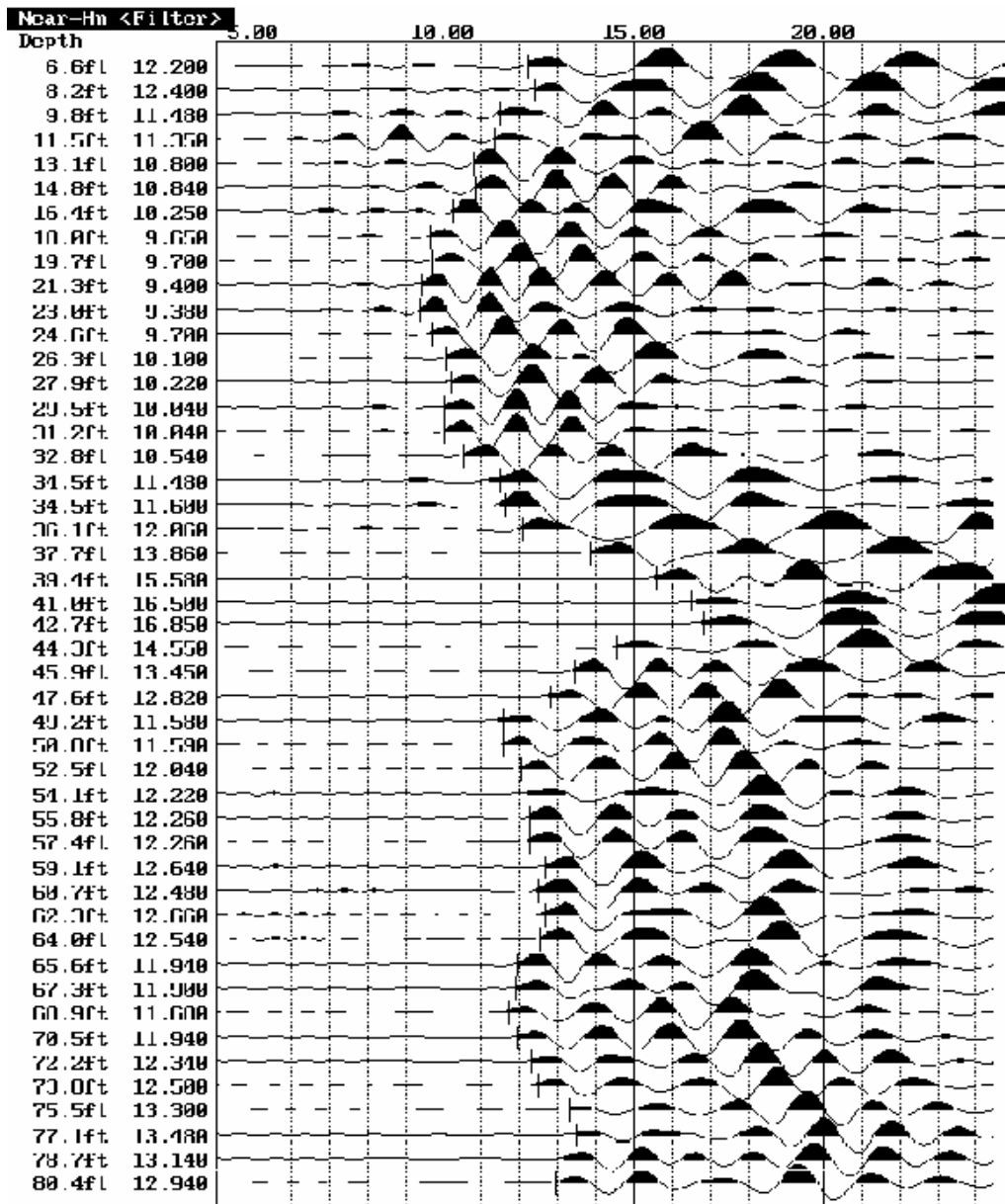


Figure 3. Sample composite waveform plot for normal shear waves received at the near geophone in a single borehole



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 _____ UNCASD _____

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: _____



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: _____

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			

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			

PROCEDURE FOR DOWNHOLE SEISMIC VELOCITY LOGGING

Background

This procedure describes a method for measuring shear and compressional wave velocities in soil and rock. The Downhole Method is applied by generating shear and compressional waves at the surface and measuring the travel time between the surface and the borehole.

Objective

The outcome of this procedure is a plot and table of P and S_H wave velocity versus depth for each borehole. Alternatively or additionally, travel time plots may also be produced. Data is presented in report format, with ASCII data files and digital records transmitted on disk.

Instrumentation

1. OYO Model 170 Digital Seismograph, Geometrics Strataview or equivalent
2. Downhole probe, including horizontal and vertical geophones, fluxgate compass for orientation downhole, and system for locking probe against the side of the borehole
3. Sledge hammer with impulse switch to trigger recording
4. Winch and logging cable
5. Batteries to operate seismograph and controls for downhole probe
6. Various cables

Downhole soil velocities are measured using a variable azimuth downhole geophone and a seismograph. This system orients the downhole geophones parallel to the axis of excitation at the surface, insuring that signals received at the downhole geophones are of maximum amplitude, and are not subject to errors in travel time caused by incorrect phase of first arrival picks, as found with non-orientable downhole probes.

The downhole probe consists of a horizontal and vertical geophone mounted on a rotatable structure with a fluxgate magnetometer compass sensor. The compass/geophone assembly is mounted with preamplifiers and compass drive circuitry inside a 2.5 inch diameter case approximately 30 inches in length. The compass/geophone assembly can be rotated from the surface control module to match the azimuth of the horizontal geophone axis with the azimuth of the surface shear wave source. The probe receives control signals from, and sends the amplified geophone signals to, instrumentation on the surface via a 4- or 7-conductor cable. Cable travel is measured to provide probe depth data. The probe is locked into the borehole by inflation of an external rubber bladder or motor-driven spring clamp that runs the length of the probe.

Sledge hammer blows against the ends of a steel capped traction plank are used as an S_H -wave energy source. The traction plank is weighted by placing under the wheel or wheels of a truck. Sledge hammer blows against a striker plate on the surface are used as a P-wave energy source. System triggering is performed by a hammer switch mounted on the sledgehammer handle.

In operation, the S_H -wave produced by swinging the hammer in one direction produces an output at the downhole horizontal geophones which is digitized and recorded. The hammer is then swung in the opposite direction, and the horizontal output signals are again recorded, producing a shear-wave record of polarity opposite to the previous record. A vertical hammer blow is executed, and the response of the vertical geophone to the resultant P-wave is recorded.

The signal from each geophone generated by each hammer blow is recorded as a different channel on the recording system. The recorded data is displayed on the seismograph display. Data and all system parameters are stored on disk for further processing. Multiple hammer blows can be summed to improve the signal-to-noise ratio of the signals.

Review of the displayed data on the display allows the operator to set the gains, filters, sample rate, and summing number in order to optimize the quality of the data before recording to disk.

Environmental Conditions

For best results, the borehole should be between 7.5 and 17 cm in diameter, or 3 to 6 inches.

The locking method requires that soil boreholes be cased with PVC for best results. Casing is not required in hard rock boreholes. If installed, the casing must be properly installed and grouted. The best method is using a tremie tube to pump grout from the bottom. 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).

The seismograph must be protected from rain. The downhole probe may or may not be submersible (depending on type). The procedure below provides for emptying the borehole of water.

Calibration

Calibration of the seismograph is required.

Downhole Measurement Procedure

Prior to performing downhole measurements each borehole casing may be emptied using a submersible pump or bailer. The downhole probe compass azimuth is checked at the surface, and compared to the azimuth of the traction plank S_H -wave source. The mechanical or electronic depth encoders are set to zero with the geophones located at ground level. The probe is then lowered to the bottom of the borehole at the desired intervals. At each desired depth, the probe is locked in place. The compass/geophone assembly is then rotated to match the azimuth of the surface S_H -source. At each sampling depth a minimum of two opposite horizontal records and one vertical record is acquired, and the gains adjusted as necessary to get good signal to noise ratio. The waveform data from each depth is checked on the display, and recorded before moving to the next depth. Upon removal of the probe from the borehole, depth indications are re-checked with the geophones located at ground level.

Typical depth spacing for measurements is 1.5 meters, or 5 feet. Alternative spacing is 1 meter, or 3 feet.

Deviations From Above Written Methods And Procedures

It is permissible for on-site personnel to deviate from this procedure with respect to the size and number of sledge hammers, the size of the traction plank, the weight of the truck, removing water from the borehole (not needed for submersible geophone packages), or the use of a winch (manual lowering is acceptable for shallow depths), and sequence of horizontal and vertical records, provided adequate waveforms are obtained.

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) Offset of centerpoint of plank and P-wave striker plate from the borehole collar
 - f) Any deviations from test plan and action taken as a result
 - g) Field check of data validity, performed by tester during data collection
 - h) List of record ID numbers (for data on disk) and corresponding depth
- 2) Data on hard disk with backup copies of data on removable media, labeled with borehole designation, record ID numbers, date, and tester name.

Downhole Analysis

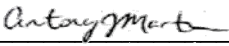
Records are analyzed to locate the first arrival of energy on each downhole geophone record. The horizontal records are studied to verify the presence of clear S_H -wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the shear-wave signals from the 'normal' and 'reverse' hammer blows are very nearly inverted images of each other. Digital low-pass filtering may be used to remove the higher frequency converted P-wave signal and cultural noise from the S_H -wave signal.

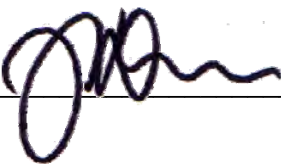
Total travel time is corrected for changes in path length due to offset of the source from the borehole collar, and then plotted versus depth.

Results are further presented in the form of velocity profiles with depth for both P- and S_H-wave velocities.

QA Review

This procedure has been reviewed and approved by the undersigned.

Registered Geophysicist  Date 04/12/06

QA Review  Date 04/12/06

References:

1. "Standard test Methods for Crosshole Seismic Testing", ASTM Standard D4428/D4428M-91, July 1991, Philadelphia, PA

PROCEDURE FOR USING THE ROBERTSON GEOLOGGING HI-RESOLUTION ACOUSTIC TELEVIEWER (HiRAT)

Reviewed 2/13/06

Background

The acoustic televiewer is a device for producing a qualitative image of the wall of a borehole. Because it uses ultrasound rather than visible light it is able to work in dirty or opaque borehole fluids, although heavy drilling mud will cause excessive dispersion of the acoustic beam. The picture below shows the sonde's lower nylon section, and one of the bowspring attachments which are used to centralize the sonde in the borehole.



Pulses of ultrasound (0.5 - 1.5MHz) are generated by a piezo-electric resonator. The pulses are transmitted through the oil in which the resonator is immersed, through the wall of the acoustic housing, then propagate through the borehole fluid and are reflected from the wall of the borehole. The reflected energy is picked up by the same transducer, from which is recorded both the **amplitude** of the returned pulse and the **travel-time** which have elapsed. Blanking must be applied to prevent the transducer from registering reflections from the inside surface of the acoustic housing. The material of the housing is chosen so that its acoustic properties are similar to the oil which fills it. The housing is not designed to withstand borehole fluid pressures, but has a piston device to allow equalization between inside and outside pressure.

The **amplitude** of the returned pulse is a function of the acoustic reflectivity of the borehole wall. If the beam strikes a hard borehole wall normally to the surface the energy will be returned to the transducer and a strong return will be recorded. If the formation is softer, then less energy will be reflected. Also, if the surface of the borehole is rough, or effectively missing because of the presence of a fracture or other structure, then energy will be dispersed and a poor return will be recorded.

The **travel-time** is a simple function of the diameter of the borehole and the velocity of sound in the borehole fluid (typically 1.5Km/sec). An A/D converter monitors the output from the transducer once the blanking period has expired and a comparator is used to detect the peak amplitude during the sampling window.

The coaxially-mounted transducer has a planar radiating surface, but the vibration characteristics are such that the acoustic pulse is emitted as a 'pencil' beam. The emitted beam is deflected by a planar mirror so that it leaves the acoustic housing at right angles to the sonde axis. The mirror is rotated to scan the borehole wall. The ultrasound pulses are synchronized with rotation of the mirror so that up to 360 pulses are emitted in every revolution. Because of the time which must elapse for the two-way transit of the borehole fluid, there is an upper limit upon the number of radial samples that may be acquired from a borehole of a particular radius. In larger boreholes, therefore, it may be necessary to reduce the number of radial samples. The sonde is able to operate at 90, 180 or 360 samples per revolution.

An image of the borehole wall is produced by moving the sonde along the borehole axis while it is scanning radially. By the same logic as shown above, it can be seen that any horizontal point will be imaged by more than one sweep of the acoustic beam so long as the axial movement of the sonde during one complete sweep is no greater than the beam diameter. An upper limit is therefore imposed upon the logging speed which will be a function of the rotational speed of the transducer, the radial sampling interval and borehole diameter.

Objective

The objective of this procedure is to provide a pseudo “core” of the borehole, and map the orientation and angles of cracks and voids in rock boreholes.

Instrumentation

This procedure is written specifically for the Robertson Geologging High-Resolution Acoustic Televiwer (HiRAT). The required equipment includes:

1. The Robertson High-Resolution Acoustic Televiwer (HiRAT) sonde with centralizers
2. A 4-conductor wire-line winch with cable at least 30m (100ft) longer than the depth of the borehole (RG Smart Winch or equivalent. GEOVision has adapted all our 4-conductor winches)
3. A sheave with depth encoder with minimum 500 pulse/revolution
4. A Robertson Geologging Micrologger II
5. A laptop with Winlogger installed and the following minimum system requirements:
 - Windows 98SE or above
 - 64M System memory
 - 800x600x24 SVGA Display with DirectX 8.0
 - 500Mhz CPU
 - USB 2.0 connection
6. Battery power supply with cables

Environmental Conditions

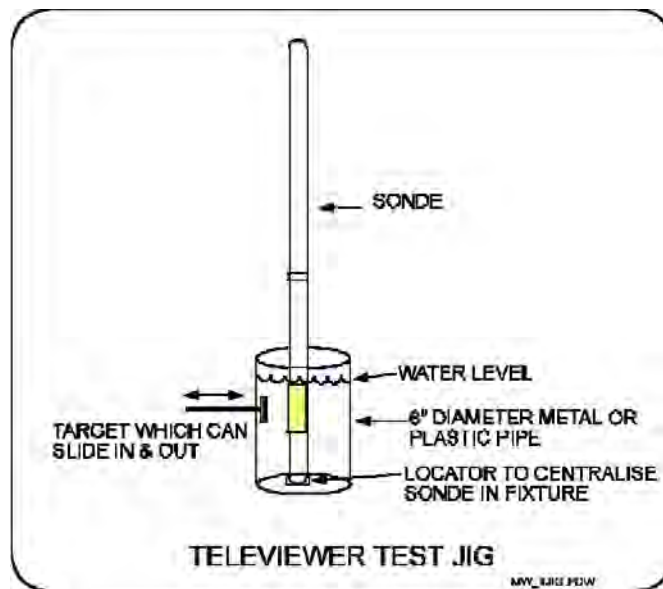
This tool is designed for fluid-filled boreholes between 67 and 150mm (3-6in) in rock. Since fine cracks are usually not visible in the walls of soil borings, the televiwers add very little information from a soil boring than a simple video. Now if the boring has soil AND rock, televiwer visuals in the soil may still be useful.

Calibration

The acoustic televiewer uses the variability in reflectance and the travel time to make an image of the borehole wall, mostly resulting from relative differences of materials and the physical characteristics of the wall. Since these are relative measurements, no field calibration of the sonde is required. However, it is important that the same location in the borehole be checked at the start and finish of the logging to make sure that the response or functionality haven't changed during the measurement.

A test fixture may be used to check function of the acoustic televiewer prior to use. This test fixture should comprise a plastic pipe, with a known internal diameter between 3 and 6 inches. This should be filled with water and the sonde stood upright in the fixture. A target made of metal or metal foil is glued on the inside of the container, or optionally on a seal and shaft so that it can be moved in and out on a line radial to the center-line of the pipe. A representation of this is shown in the figure below.

The purpose of this test fixture is to check the ability of the sonde to differentiate between materials of different acoustic reflectances, and different travel times, and to check the calibration of the caliper function of the sensor using the measured diameter of the pipe. However, if calibrated caliper measurements are required, it is recommended that a mechanical 3-arm caliper tool be used for this purpose because it can be calibrated in the field prior to use. The HiRAT will give very accurate results but this procedure does not cover calibration.

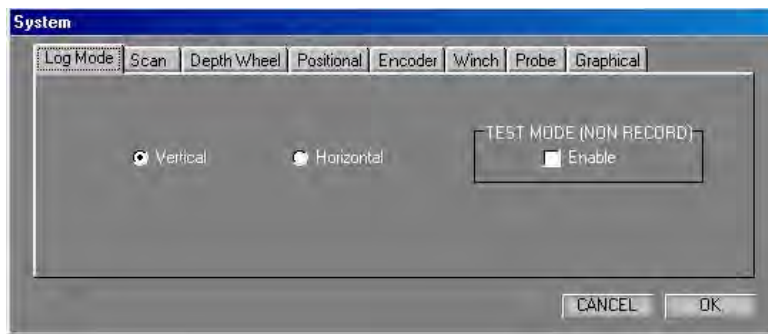


Hi-RAT Field Procedure

Because the logging software is a standalone module, there are a number of settings which must be initialized independently of the WinLogger software. These include the depth measurement subsystem and sonde operating modes. Click on 'System' on the menu bar to show the following dialog boxes:

1.0 Log Mode

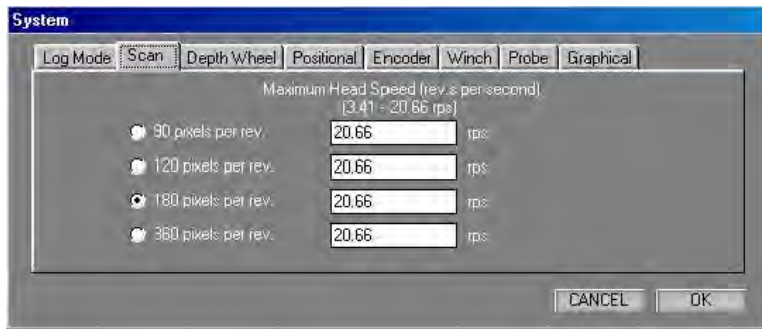
The sonde can operate in three distinct modes:



- Vertical mode is used for boreholes which are drilled from the surface and are deviated at less than 70 degrees from the vertical. Most exploration boreholes will fall into this class. In this mode the image is orientated according to compass directions (magnetic co-ordinates).
- Horizontal mode is used for boreholes which are sub-horizontal so their inclination will probably exceed 70 degrees from the vertical. Boreholes in this class would normally be drilled as part of ground investigations for tunneling and mining, drilling ahead of a drive to determine the nature and extent of fracturing. In this mode the image is orientated according to gravitational coordinates (up/down) since there is no unique point of the image circle which can be orientated to North with any precision.
- Test mode is used to exercise all sonde functions without creating a log. The image will scroll on the screen in the normal fashion, and orientation readouts will be refreshed continuously.

2.0 Scan Parameters

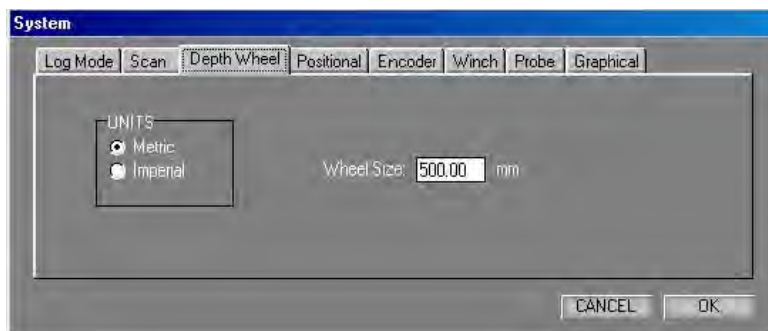
The scan parameters control the radial sampling of the borehole. The values will be retained between logging sessions, so the sonde will be initialized correctly at power-on. There are three parameters in the dialog:



- The radial sampling rate can be set to one of 90, 120, 180, 360 samples per revolution. There is a relationship between the logging speed and the radial sampling rate, since the time taken to send the dataset to the surface depends upon its length. The size of the log file is also determined by the radial sampling rate. The probe will always try to use the maximum head speed entered. If limited by a low Baud rate or a large 'window' setting then the probe will reduce its head speed automatically to compensate - see sonde operation section.

3.0 Depth Wheel Configuration

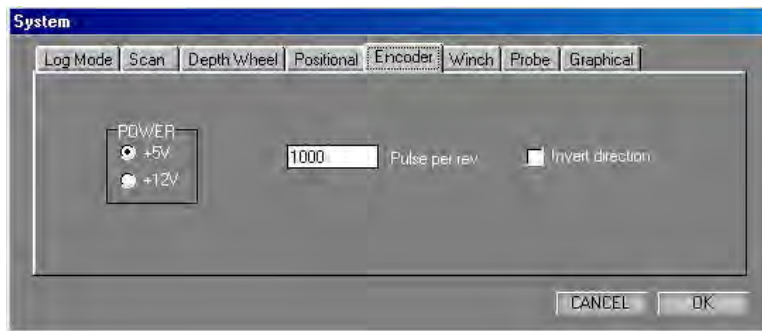
The depth measurement system is dependent upon the combination of depth measurement wheel with its calibrated groove, and the shaft encoder which translates rotation into pulses which are counted by the logging system controller. Two parameters are therefore required: depth wheel circumference and encoder pulse rate. The encoder parameters are covered in a subsequent topic.



- Select Metric or Imperial depth measurement units from the left-hand pane.
- Type the circumference of the depth measurement wheel into the 'wheel size' box. The standard sizes of GEOVision wheels are 1000mm. If you are measuring in Imperial units (or changing back to metric units), the standard wheel size can be converted automatically by clicking the left mouse button and choosing the appropriate conversion. The size is always specified in units of 1/1000 of the depth unit i.e. millimetres (mm) or millifeet (mft).

4.0 Encoder Configuration

The depth measurement system is dependent upon the combination of depth measurement wheel with its calibrated groove, and the shaft encoder which translates rotation into pulses which are counted by the logging system controller. The depth wheel circumference is covered in a previous topic. In order to accommodate a variety of encoders, their operational characteristics can be configured in the software.



- Select supply voltage from the radio buttons in the left-hand pane. The options are 5 Volt and 12 Volt. GEOVision encoders are always specified for 5 Volt operation.
- Type the number of pulses emitted per revolution into the central box. The standard values for all GEOVision winches are 500 pulses/rev.
- The logical direction of movement can be reversed if required to accommodate the directional characteristics (phase lead or lag) of the different encoder types.

5.0 Winch and Cable Configuration

Support for remote control of the RG Smart Winch is provided, and can be enabled by checking the **Enable** control in the left-hand Smart Winch pane. If the Smart Winch control is enabled, it is also necessary to select the measure units in force - select **Metric** or **Imperial** from the radio buttons on offer.



The Baud settings can be chosen to match the *quality* of the communication channel. The channel will be effected by cable type and length. Typically a Baudrate of 312.5K is used. The remaining controls in the dialog relate to the communications parameters. The operation is entirely compatible with the WinLogger software operation and the values would be expected to be the same as those in force for logging six-channel type sondes with that software. (Certain probe types may be fitted with a digital interface that does not require set-up and in this case the parameter edit boxes will not appear.)

- **Cable Option** is used to select the logging cable type which is available on the winch. The options are *Not Connected*, *Std. 4 Core*, *Differential* and *Monocable*. The only cable types used in GEOVision systems is Std. 4 Core. Select the appropriate type from the drop-down menu box. Note this value can only be changed when the probe power is turned off.
- **Gain** is related to cable length and uphole signal attenuation. Gain values range from 0-3 and control the amplification applied to the incoming signal. Use the *Scope* dialog to visualize the incoming signals. Gain should be set so that the signal reaches between 70% and 100% of the height of the display, generally obtained with a setting of 0 for GEOVision winches. If the peak height exceeds this level, clipping will result in artifacts which will be detected erroneously. Click *Apply* to set the parameters before proceeding to the *Scope* dialog.
- **Threshold** is the level at which the incoming signals are detected. Gain and Threshold are related, and can be visualized using the *Scope* dialog. Set the gain so that the signal reaches between 70% and 100% of the height of the display. Then adjust the threshold so that it is between 50% and 70% of the height of the pulses displayed and clear of any region of 'overshoot' of the positive and negative pulses. This will ensure that peaks are detected and noise is ignored. Generally a setting of 25 is used for GEOVision winches. When the scope dialog is displayed, the position of the mouse is reported as a threshold value to make it simpler to infer the correct setting. The scope option is greyed out when the probe power is turned off.
- **Drive** sets the strength of the downhole signal. It is not possible to visualize the downhole signal, but the effect of insufficient drive is to disable downhole communication, which will result in the commands being ignored by the sonde. Values range from 0 -127, and for GEOVision winches will be around 10. Increase the drive for longer cables.
- **Pulse Width** This is the width of the transmitted communication pulses in 100nS steps. The default is 25 equivalent to 2.5uS. The range is from 8 to 64. The pulse width can be reduced to prevent signal overshoot on short cables. The default value is used in most cases. Note any changes only come into effect during a log. (Note setting too large a pulse width when using the highest Baud rates will automatically be prevented within the probe and the pulse width reduced.)

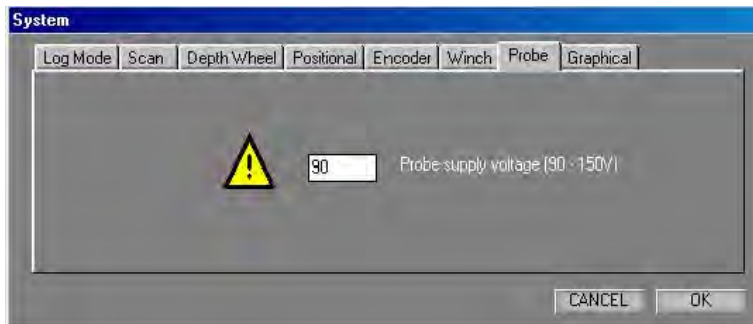
IMPORTANT Please note the effects of changing 'Baud' will not appear until the first new log is made. The setting for 'threshold' may be effected by an increase in the 'Baud' rate please recheck 'threshold' if 'Baud' is altered using the 'Scope' function after making a short test log.

The parameters which are entered will be applied automatically if you close the dialog with **OK**. The above parameters once set correctly will be remembered by the system and should never need to be altered.

6.0 Probe Configuration

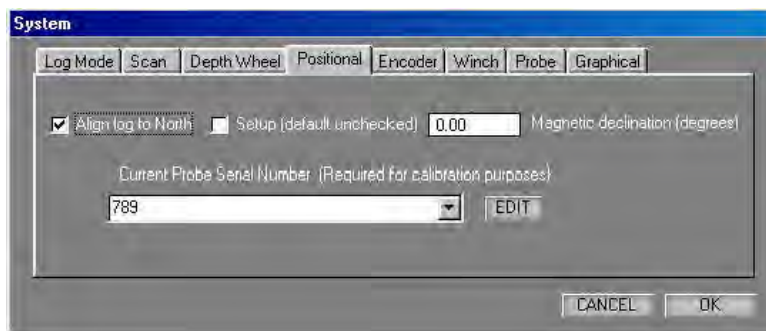
The probe is normally energized at 90 Volts from the surface. However, it may be necessary to compensate for voltage drop on longer cables due to the higher power draw of this sonde. The voltage at

the surface may be increased in order to deliver 90 Volts at the sonde. Simply type the value into the text box provided. The voltage should be set at 90V for all GEOVision winches. Values outside the indicated range will be rejected.



7.0 Positional Configuration

The probe includes a 3-axis orientation package, and is capable of producing a borehole image aligned to geographic North. This is achieved by determining and applying two image rotation parameters:



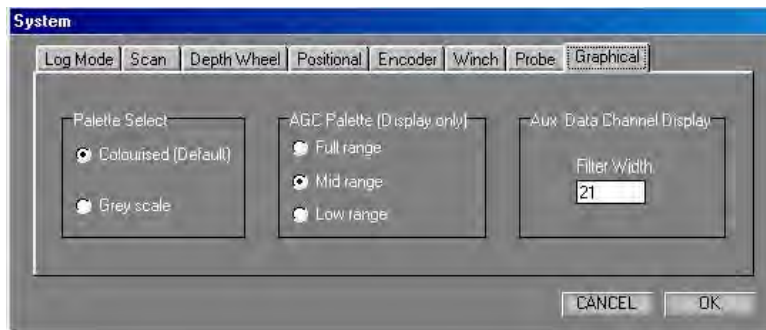
- **Magnetic Declination** is used to correct for the difference between Magnetic North and True North. The value varies from place to place, so the local value must be inserted here if you wish to perform this correction during data collection. This correction may also be made during processing. If the value is zero, the log will be referred to Magnetic North.
- **Align to North** is a check-box used to select image rotation to start at Magnetic North. If in addition a value is set for Magnetic Declination (see above) the image will be rotated to start at True North. If the box is not checked, the image will not be oriented to geographic co-ordinates, but will use the local co-ordinate frame of the sonde (X, Y, Z axis of the orientation module). This mode may be used to inspect the inside of magnetic casing, where an orientated image would be subjected to random effects caused by the metalwork.
- Set-up mode is selected by checking the **Setup** box, and is used to determine the required image rotation offset to correct for the angle between the axis of the orientation package and the index mark of the rotating transducer section. In set-up mode the normal sonde azimuth display is modified, and will instead show the 'relative bearing' which is measured between the high side of the borehole and the orientation sensor index. Check **Setup**, then OK to close the dialog. The icon adjacent to the sonde azimuth readout at the top of the screen is modified with the legend CAL when the system is in set-up mode. The sonde must now be placed in a stand or jig so that it

is inclined at about 20 degrees to the vertical, and adjacent to a target fixed to the jig so that it is directly above the transducer in the vertical plane. Lower the sonde with its attachment into a large bucket of water so that the transducer and target are fully immersed. Start the radial amplitude display, when it will be possible to see the strong signal returning from the target. Rotate the sonde so that the image of the target moves to the top of the display. When the two are coincident, the 'relative bearing' reads out the image rotation offset. This value is fixed for the sonde unless it is disassembled and rebuilt, at which point the procedure MUST be repeated. Please see the additional topic on the Radial Amplitude Display for further details.

- The **Serial Number** list box is used to select the sonde which is in use. When the appropriate sonde is selected, the image rotation offset determined by the above procedure is selected. To edit the image offset click the '**Edit**' and enter the new offset. Several serial numbers and associated offsets can be stored and selected as required.

8.0 Graphical

The palette can be changed between a colored and grey scale setting. The changes affect the log screen palette display and are also applied when replaying a log. Selecting Full range in the 'AGC Palette' will cause the software to spread the palette over the full 16bit signal. 'Mid range' will spread the palette over the first quarter of the 16bit range and 'Low range' will spread the palette over the first eighth of the 16 bit range. In most cases the 'Low range' selection is used. Note these settings do not affect the stored log data in any way. The 'Filter Width' is applied to the Natural Gamma trace data and is a simply running average filter. The range of the filter width is from 1 to 50 (x 10 millidepth units ie. mm or mft).



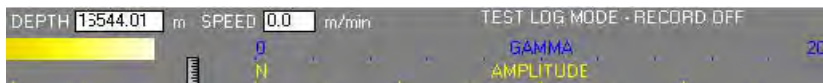
9.0 Sonde Operation

When the operations specified above have been reviewed and the correct settings have been selected, the system is ready for use. The main screen area is divided into 3 horizontal elements. At the top is the depth and orientation readout, together with the scale headings for the scrolling display of unwrapped borehole image.

On the left side of the depth track is the travel time display, with text boxes for sonde inclination, azimuth and head temperature.



On the right side is the display of amplitude and indication of current operating mode. Located in the center above the depth track are the text boxes for depth and cable speed (computed at the surface). The ranges for the 'Natural Gamma' channel overlay (optional) are shown above the Amplitude.



The central area is utilized for the scrolling display of unwrapped borehole data. The display is orientated with the left edge corresponding to North point of the aligned image data (if orientation is selected) according to the outputs of the sonde's orientation package.

The lower area has controls for the winch (applicable to RG Smart Winch only), depth initialization and sonde control.



The winch control area is only displayed when RG SmartWinch operation is enabled - see section 5 - and has four controls. Set Target Speed by typing the required speed into the window and pressing Enter.

Cable movement is initiated by clicking on either the UP or DOWN arrow control.

Cable movement is halted by clicking on the square STOP control.



Depth is initialized by typing the required value into the entry box and pressing Enter. The entry box is not available at times when the system is in logging mode and the depth should not be changed by user entry.

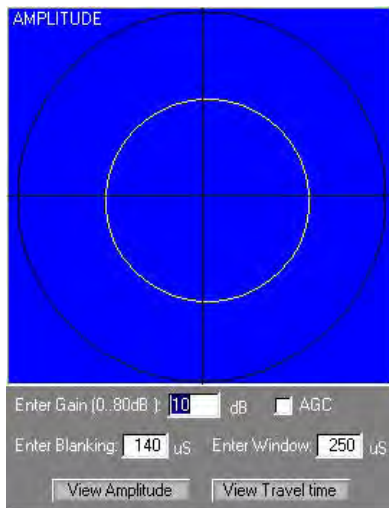
Sonde power is applied by clicking on the green-colored 1 button. Power is turned off by clicking on the red-colored 0 button. There is no indicator for the state of the power supply on the desktop, so the external indicators should be observed for this purpose.

To make a log ensure that the Test Mode is disabled - see section 1, Log Mode setting. Click File|New Log and select a filename. Old logs may be overwritten if necessary -TAKE CARE. The header editor will be started automatically. A previous set of header data may be loaded by clicking LOAD and choosing a template.

To start logging, click on the red Record (circle) control. The log data will start to scroll down the screen after a brief pause for synchronization. The messages "DSP2: Detecting data stream" and "Updating probe settings" will be observed at the bottom of the screen during this process. Note that the screen scrolling direction is not affected by the actual direction of movement of the sonde. To cease logging, click on the black STOP control (square). The data should be immediately backed up to a USB drive, CD, or other data storage prior to beginning another log.

If the data display from a probe which is properly connected appears to occupy only half of the track area,

with the remainder filled with random colors such as green which are not part of the regular palette, then it is most likely that the downhole data communication is not functioning properly. This symptom is due to the fact that the probe settings cannot be communicated properly, and it is operating in its default power-up mode. If this is the case, the Drive setting of the System|Winch dialog should be increased or decreased accordingly. See section 5 for full details.



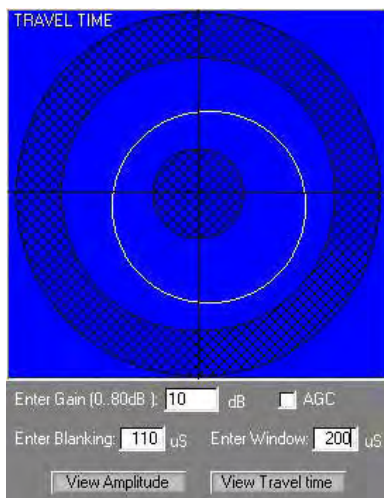
To adjust the sonde gain it is necessary to use the Radial Amplitude plot, which is enabled by clicking on the circle with cross-hairs symbol. When the dialog is active a new window will open on top of the unwrapped data display. In this display, the data is presented as a 'polar' plot. Press the 'View Amplitude' button to display the amplitude plot. This plot shows amplitude increasing towards the outside of the circle and the compass direction following the sweep of the transducer. The line indicating the data is drawn in the regular palette, so that high amplitudes are drawn in white and low amplitudes in black/brown. The picture here shows the image of the inside of a cylinder.

If the data is concentrated in a small circle at the center, the gain is too low and should be increased. If the data is obviously clipped at the outside of the circle, then the gain should be reduced. Type the new gain value into the entry box and press Enter. The ideal would be to set a gain value which allows the peak values to be displayed without clipping, with the majority of the data around the half-way level. It may also be necessary to adjust the blanking to ensure that internal reflections from the acoustic housing are not detected at the new gain value. This will be apparent in the unwrapped data display as pronounced patterning unrelated to the true target. The AGC option causes the probe to set gain automatically thus preventing signal saturation in most cases. (The gain is varied in 6dB steps

Blanking Period and window length can be set independently. Blanking is set to avoid reflections from the housing of the acoustic transducer or random reflections from a rugose borehole, and window length is set to accommodate the range of borehole radius that might be expected. An error will be indicated if the sum of the blanking period and window length would be greater than 409 microseconds, which is the maximum range of the timer. The default value for the blanking period is 145 microseconds, which is the minimum required for the two-way transit from the transceiver to the outer surface of the acoustic housing. It is not advisable to reduce this value beyond the default setting, although it may be increased for larger boreholes at the rate of 1.5mm of one-way travel per microsecond.

Window Length (sample time) defines the period during which the arrival gate remains open to detect the returned acoustic pulse. The acoustic pulse will travel in water at a speed of approximately 1.5mm per microsecond. The default window length is 150 microseconds, which is equivalent to 225 mm of (two-way) travel in the borehole fluid, or approximately 110mm of borehole diameter. If this is added to the default blanking period, which is equivalent to the outside diameter of the acoustic housing, it can be seen that the default set-up will be correct for boreholes up to 150mm. An error will be indicated if the sum of the blanking period and window length would be greater than 409 microseconds, which is the maximum range of the timer. Choose your window setting to best match the borehole diameter.

Pressing the 'View Travel time' button changes the display to that shown below:



The unhatched ring between the two cross hatched zones represents the sample window. The width of this ring will vary with window length value. The profile of a cylinder is represented here appearing as a circle in the sample window.



Pressing this button displays the following dialog box:

This box allows you to enable the Natural Gamma option by checking the 'Enable Overlay' check box. The Overlay appears as a trace upon the Amplitude plot. The trace range and color can also be set by

this dialog. The level of filtering can also be altered (see section 8) (note that any displayed trace data is automatically aligned with the acoustic scan data but only when logging up. The Natural Gamma sensor occupies a higher position in the probe so sufficient data has to be prebuffered so that the acoustic data can depth aligned with gamma. The prebuffering results in a delay at the start of a log before correct gamma data appears this is normal.)

Data Analysis and Interpretation

RG-DIP, the manufacturer's image interpretation package, offers manual and automatic feature recognition options. Feature orientations (dip/strike and azimuth) are automatically calculated. Display options include stereographic projections of zone axes, orientation frequency plots and 'synthetic cores' for comparison with real core data. The last option is invaluable for orientating core samples, particularly in the case of incomplete recovery.

Reporting

The final report will include the objective and scope of the survey, location of the boreholes, discussion of instrumentation and procedures in the field and lab. For each borehole there will be a plot showing the dip/strike and azimuth of features. The next page shows an example.

Assumptions and limitations of the results will be discussed. Supporting references will be listed as necessary

Required Field Records

Field log for each borehole showing

- a) Location and description of the borehole
- b) Date of test
- c) Field personnel
- d) Instrumentation
- e) Any deviations from test plan and action taken as a result

This procedure has been reviewed and approved by the undersigned:

Professional Geophysicist Antony Martin Date Feb 13. 2006

QA Review [Signature] Date Feb 13. 2006

