ENVIROSCAN INC

Final Report
Geophysical Survey – USTs and Utilities
Point Store Property
5867 SR522, ~1/3-Acre Property
McClure, PA
Enviroscan Reference Number 091623

Prepared For: Mountain Research, LLC
Prepared By: Enviroscan, Inc.
September 30, 2016

1051 Columbia Avenue • Lancaster, PA 17603 • 717.396.8922 • Fax 717.396.8746 • email@enviroscan.com • www.enviroscan.com

ENVIROSCAN INC

September 30, 2016

Mr. Michael Crowe, PG
Mountain Research, LLC
825 25th Street
Altoona, PA 15801

RE: Geophysical Survey – USTs and Utilities
Point Store Property
5867 SR522, ~1/3-Acre Property
McClure, PA
Enviroscan Reference Number 091623

Dear Mr. Crowe:

Pursuant to your request, Enviroscan, Inc. conducted a subsurface utility survey at the above-referenced site on September 28, 2016. The purpose of the survey was to detect and delineate suspected buried metallic or non-metallic underground storage tanks (USTs) and associated piping – as well as utilities, backfilled excavation pits, or other structures that might acts as preferred migration pathways. Generally, the site was asphalt- and gravel-covered parking areas and grass lawn.

Methods

The survey was completed using standard and/or routinely accepted practices of the geophysical industry and equipment representing the best available technology, including:

- a Radiodetection RD8000 Multi-Frequency pipe and cable tracer;
- a Radiodetection C.A.T. and Genny pipe and cable locator/tracer;
- a Fisher TW-6 electromagnetic (EM) pipe and cable locator/tracer;
- a GSSI UtilityScan DF ground penetrating radar (GPR) system; and

The principles of these techniques are detailed below.

Mr. Crowe
September 30, 2016
Page 2

RD8000

Utility tracing was conducted using a Radiodetection RD8000 digital cable and pipe tracer. The transmitter can be directly (conductively) coupled to exposed portions of a metallic pipe, cable or wire, or indirectly (inductively) to a subsurface metallic utility of known location/orientation. The transmitter remains stationary and energizes the metallic utility at a frequency selected by the operator (512 Hz, 8 kHz, 33 kHz, or 65 kHz), which is received at the ground surface by the digital locator. When the transmitter is directly coupled to the metallic utility, the digital receiver can also calculate the depth of the utility to an accuracy of ±10% of its actual depth. Please note the close proximity to bends in the traced line, or poor signal strength, can result in erroneous depth estimations.

C.A.T. and Genny

The survey areas were also scanned with a Radiodetection C.A.T. and Genny pipe and cable locator and tracer. In Power mode, the C.A.T. detects the 50 to 60 Hertz (Hz) electromagnetic field generated by live power cables and other metallic utilities to which a live line is grounded. In Radio mode, the C.A.T. detects buried conductors (cables or metallic pipes) as they conduct and re-transmit commercial broadcast radio energy. In Genny mode, the C.A.T. detects signal generated by the Genny transmitter. The Genny transmitter can be coupled directly (conductively) to exposed portions of a metallic pipe, cable or wire, or indirectly (inductively) to a subsurface metallic utility with known location and orientation.

TW-6

In order to detect unknown utilities, Enviroscan employed a Fisher TW-6 pipe and cable locator and tracer. In pipe and cable search mode, the TW-6 is essentially a deep-sensing metal detector that detects any highly electrically conductive materials (e.g. metals) by creating an electromagnetic field with a transmitting coil. A receiving coil at a fixed separation from the transmitter measures the field strength. As the instrument is swept along the ground surface, subsurface metallic bodies distort the transmitted field. The change in field strength/orientation is sensed by the receiver, setting off an audible alarm and/or causing deflection of an analog meter. The TW-6 can nominally detect a 2-inch metal pipe to a depth of 8 feet, and a 10-inch metal pipe to a depth of 14 feet.

GPR

GPR systems produce cross-sectional images of subsurface features and layers by continuously emitting pulses of radar-frequency energy from a scanning antenna as it is towed along a survey profile. The radar pulses are reflected by interfaces between materials with differing dielectric properties. The reflections return to the antenna and are displayed on a video monitor as a continuous cross section in real time. Since the electrical properties of metal are distinctly different from soil and backfill materials, metallic pipes and other structures commonly produce dramatic and characteristic reflections. Fiberglass, plastic, concrete, and terra-cotta pipes and structures also produce recognizable, but less dramatic, reflections. Scanning was performed using a GSSI UtilityScan DF GPR controller with an internal hard drive and a color display, and a high-resolution 300/800 megaHertz scanning antenna.

Results Summary

The client-designated areas were scanned using the methods described above. Figure 1 illustrates the results of the combined techniques. Electric lines were located using the CAT in passive mode and confirmed using GPR. The sanitary piping (plastic) was identified with GPR only. GPR signal penetration across the site was estimated at a depth of approximately 5 to 6 feet. Several (reportedly abandoned) vent/fill lines were identified and presumed to be associated with previously removed USTs. Conductive tracing of these lines was attempted using the RD 8000, but no signal was detected. This indicates the subsurface portion of these lines may have been removed during UST excavation activities.

The site was scanned with the TW-6 and GPR to detect any undocumented USTs. The TW-6 signal was saturated with background interference on about half of the accessible portions of the site. In suitable areas, no metallic signal response was observed. Several areas of "disturbance" were identified with the GPR in areas where excavations were reported. These areas are illustrated on Figure 1.

Limitations

The above-referenced geophysical survey was completed using standard and/or routinely accepted practices of the geophysical industry and equipment representing the best available technology. Enviroscan does not accept responsibility for survey limitations due to inherent technological limitations, or unforeseen site-specific conditions. However, we make every effort to identify and notify the client of such limitations or conditions. In particular, please note the following specific limitations and recommendations:

- Enviroscan's field markings should be given a clearance of approximately +/-18 inches for single lines. In contrast, since electromagnetic tracing of duct banks provides only a centerline, banks may extend for 2 to 3 feet beyond the marked trace.

- The completion of this survey does not relieve any party of applicable legal obligations to notify the appropriate One-Call center prior to digging or drilling.

As always, we appreciate this opportunity to have worked with you again. If you have any questions, please do not hesitate to contact me.

Sincerely,
Enviroscan, Inc.

Robert J. Krause
Geophysics Project Manager

Technical Review By:
Enviroscan, Inc.

Felicia Kegel Bechtel, M.Sc., P.G.
President

enc.: Figure 1: Geophysical Survey Results

Notes:

Base map image from USGS Arcgis Services, 1 foot Ortho Historic Aerial Photographs

Target locations from DGPS survey and Enviroscan, Inc. personnel field notes

Former excavation locations from client provided plan

Geophysical Survey Legend

- GPR Anomalies
- Electric/Power
- Sanitary
- Former Excavations

Scale (ft)

0 15 30 45 60

Prepared by:	Title:	Project Location:		Figure
Enviroscan, Inc. 1051 Columbia Ave. Lancaster PA 17603 717-396-8922 www.enviroscan.com	Geophysical Survey Results	Point Store Property 5867 SR522 McClure, PA		1
		Project Number: 091623	Revision/Issue: 09/30/2016	
		Original Scale: 1" = 30'	Survey Ending Date: 09/28/2016	Drawn by: RJK / Approved by: FKB

ARM GEOPHYSICS
Surface & Borehole Services

February 16, 2018

Mr. Ben Azar
Mountain Research, LLC
825 25th Street
Altoona, PA 16601

Subject: Results of Geophysical Borehole Logging
Two Boreholes (Mellott & Storewell)
McClure, PA
ARM Project: 180159

Dear Mr. Azar,

ARM Geophysics (ARM) is pleased to present this letter report that summarizes the results of geophysical borehole logging performed at the above referenced site on January 26, 2018. The objectives of the logging were to identify water-bearing zones and to measure the depth and orientation of fractures and bedding planes in the above mentioned boreholes. To achieve these objectives, ARM acquired standard borehole logs and images as discussed below.

LOGGING METHODS

The logs that ARM completed for this investigation include:

- Natural Gamma
- Fluid Temperature
- Fluid Conductivity
- 3-Arm Caliper
- Optical Televiewer (OTV)
- Acoustic Televiewer (ATV)
- Heat Pulse Flowmeter (HPFM) under ambient & pumping conditions

ARM has provided a summary of these logging methods in Attachment A. ARM acquired all the logs using a Matrix acquisition system and tools manufactured by Mount Sopris Instrument Company.

INTERPRETATION

BASIC LOG DESCRIPTIONS

The geophysical borehole logs acquired during this investigation are presented in Attachment B. All log depths are referenced to ground surface as indicated in the header of each log. The majority of the acquired data are presented as standard curves that represent the change in measured parameter with depth. The format of the heat pulse flowmeter and televiewer logs are discussed in the following paragraphs.

The Vertical Flow track in the Hydro Log provides a record of the rate of vertical fluid movement derived from the heat pulse flowmeter tool. The X-axis represents the magnitude of flow in gallons/min that was recorded at depths indicated by the posted value. It is calculated during acquisition by dividing the distance between the grid and thermistors by the travel time. Negative and positive values indicate downward and upward flow, respectively.

The televiewer logs contain borehole images and structural information obtained from the OTV tool. The *Optical View* track is an "unwrapped" photographic image of the borehole wall (Figure 1). In this case, the cylindrical borehole surface is unzipped along the north azimuth and unrolled to a flat strip. The compass orientation (with respect to true north) is presented at the top of the log. The unwrapped format is distorted like any projection of a curved surface on a flat one. Horizontal and vertical planes will be undistorted. However, dipping planes will be represented as a sine wave: the greater the dip, the greater the wave amplitude.

The Plane Projection track presents the fracture signatures that are digitized from the unwrapped *Optical View* track. The *Dip & Dip Direction* log is a presentation in which the vertical axis is depth and the horizontal is dip angle from 0° to 90°. As shown in Figure 2, the dip direction is indicated by the orientation of the tadpole tail, measured in a clockwise direction from north.

1129 West Governor Road • PO Box 797 • Hershey, PA 17033-0797
Voice: (717) 533 - 8600 • Fax: (717) 533 - 8605

INTERPRETATION OF STRUCTURAL DIAGRAMS

The structural data are presented on polar and rose diagrams for statistical analysis and pattern visualization. Polar diagrams are used in this report to plot the dip and dip direction of planar features. Zero degree dip is represented at the center of the diagram and 90° at the circumference. The dip direction is indicated by the compass azimuth, measured clockwise from north (0°), as shown in Figure 3. This format is sometimes referred to as a dip vector plot but it is essentially the same as a stereonet with an upper hemisphere projection.

The rose diagram graphically illustrates the strike distribution of a set of planes. Radiating rays are drawn with lengths proportional to number of strike measurements within each 10° sector. It is important to recognize that in this report, the polar diagram represents dip and dip direction, whereas the rose diagram represents strike. Using the right-hand-rule convention, strike equals the dip direction minus 90°.

RESULTS AND DISCUSSION

ORIENTATION ANALYSIS OF PLANAR FEATURES

The optical and acoustic images were used to measure the depth and orientations of bedding and fracture planes. The digitized planar features were corrected for borehole deviation and magnetic declination. The measured plane projections and orientations are shown in the plane projection logs. A tabulated listing of the bedding and fracture orientations is presented in Attachment C. Stereographic analysis was performed on the planar orientation data acquired from the image logs. A listing of the calculated mean orientations of all bedding and fracture planes are presented in Table 1. The results from the boreholes are presented in the polar and rose diagrams, and charts shown in Figure 4 through 9. Predominant groups or "sets" are indicated by the clustering of data points in the polar diagrams.

Figure 4 presents a polar diagram showing the dip and dip direction of all planes measured during this investigation. ARM has classified the planes by symbols corresponding to bedding and fracture plane sets. Figure 5 presents the same data, with the data set(s) categorized by borehole.

ARM used statistical contouring to identify windows in which to calculate the mean orientation of all bedding and fracture planes. Figure 6 presents a polar diagram with statistical contouring of bedding plane orientations. The mean bedding dip/dip directions are shown to the right of the diagram. The rose diagram in Figure 8 shows a predominant ENE/WSW strike direction.

Figure 7 presents a polar diagram with statistical contouring of all fracture plane orientations. The mean fracture plane dip/dip directions are shown to the right of the diagram. Similarity in the bedding set 1 and the fracture set orientations suggest the latter may be bedding partings. The rose diagram in Figure 9 shows a predominant ENE/WSW strike direction.

The mean orientations for all bedding planes and fracture sets are shown in Table 1.

Table 1: Statistical mean of dip and dip direction of bedding and fracture planes.

Planes	Dip	Dip Direction	Strike/Dip
Bedding Set 1	3	346	N76E/3NW
Bedding Set 2	66	338	N68E/66NW
Fracture	4	12	N78W/4NE

INTERPRETATION OF WATER PRODUCING OR RECEIVING ZONES

Water producing or receiving zones are typically identified in the acquired logs by a combination of the following parameters:

A. Start or increase in upward or downward fluid flow identified by heat pulse flowmeter data suggests water-producing zone.
B. End or decrease in upward or downward fluid flow identified by heat pulse flowmeter data suggests water-receiving zone.
C. Open fractures observed in televiewer data.
D. Deflections in caliper curve (suggests fractures).
E. Deflections or change in slope in fluid temperature or fluid resistivity curve.
F. Decrease in formation resistivity.

Table 2 presents the interpreted flow zones based on the indicators above. The most convincing evidence of water producing or receiving zones are heat pulse flowmeter, fluid temperature, and fluid resistivity deflections since they can indicate flow in the borehole. Fractures observed in televiewer images or caliper curves can indicate water-bearing zones although the evidence is more indirect. A fracture may be observed in the borehole wall that may have been opened or enlarged during the drilling process but may be tight and contain little or no water a short distance into the formation. A decrease in formation resistivity may be caused by an increase in water content but may also be caused by lithologic changes such as an increase in clay mineral content. For this reason, resistivity deflections are compared to the gamma ray curve to identify lithologic changes. A combination of the above indicators provides the highest level of confidence for identifying water-bearing zones.

No flow was detected in Storewell under ambient or pumping conditons. Upflow was detected in Mellott under both ambient & pumping conditions. Interpreted zone types can be found in Table 2 below.

Table 2: Interpreted water producing or receiving zones and indicators. Letters in Indicators column correspond to the selection parameters shown below.

Borehole	Depth (Feet)	Indicators	Type
Mellott	65-70	B, C, D	Receiving zone
Mellott	78-81*	A, C	Producing zone
Mellott	97-102	A, C	Producing zone
Mellott	153-168**	B, C, D, E	Receiving zone
Mellott	168-170**	A	Producing zone

*Ambient Conditions Only
**Pumping Conditions Only

CLOSING

The data collection and interpretation methodologies used in this investigation are consistent with standard practices applied to similar geophysical investigations. The correlation of geophysical responses with probable subsurface features is based on the past results of similar surveys although it is possible that some variation could exist at this site.

Please contact us if you have any questions regarding this survey. We appreciate your business and look forward to working with you again.

Kind regards,
ARM Geophysics

Roy M. Gecelosky
Project Geophysicist II

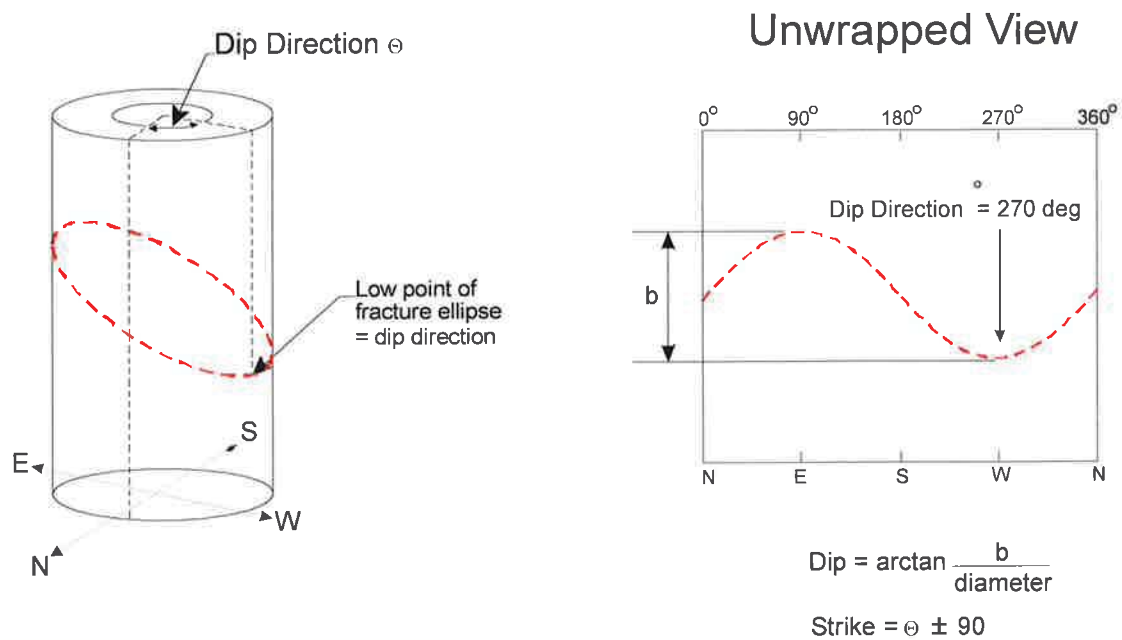


Figure 1: Diagram illustrating unwrapped view of fracture signature.

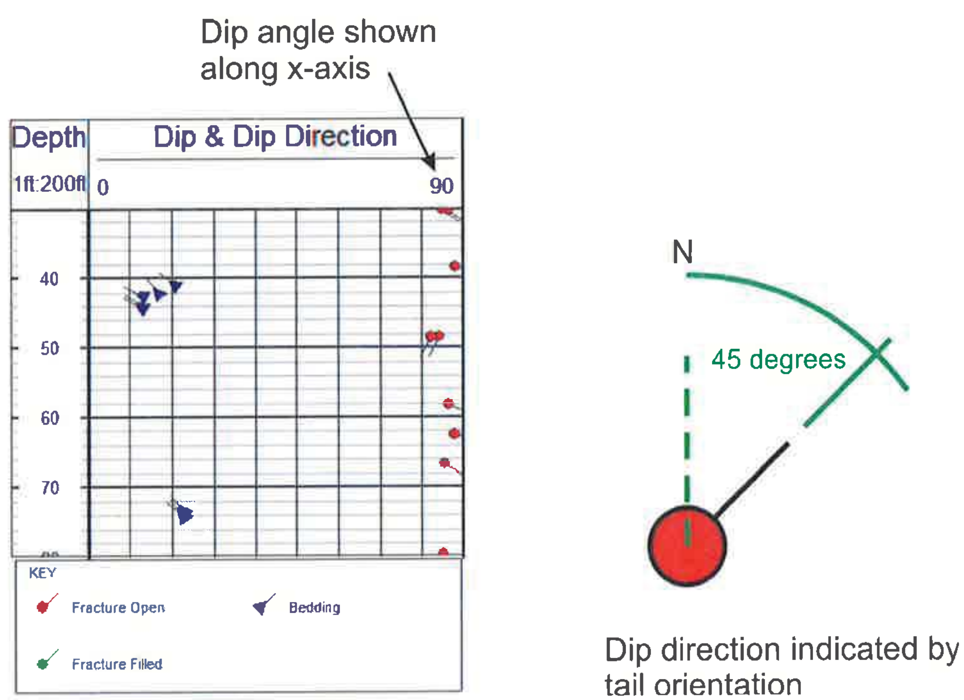


Figure 2: Dip & dip direction determination from the tadpole plot.

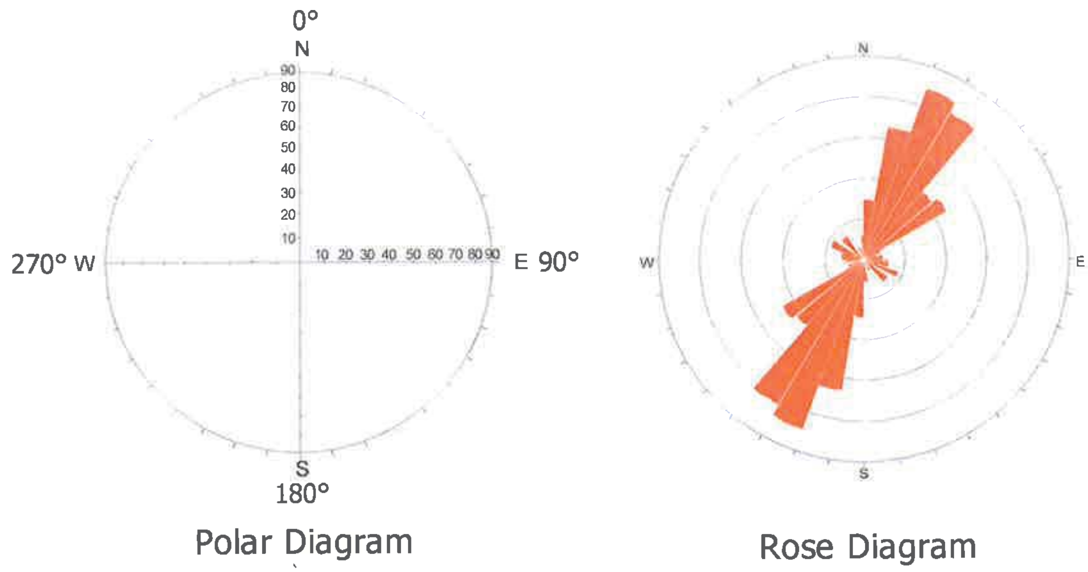


Figure 3: Example polar and rose diagrams. Polar diagram is used in this report for plotting dip and dip direction. Rose diagrams are used for plotting the frequency or number of strike measurements per sector.

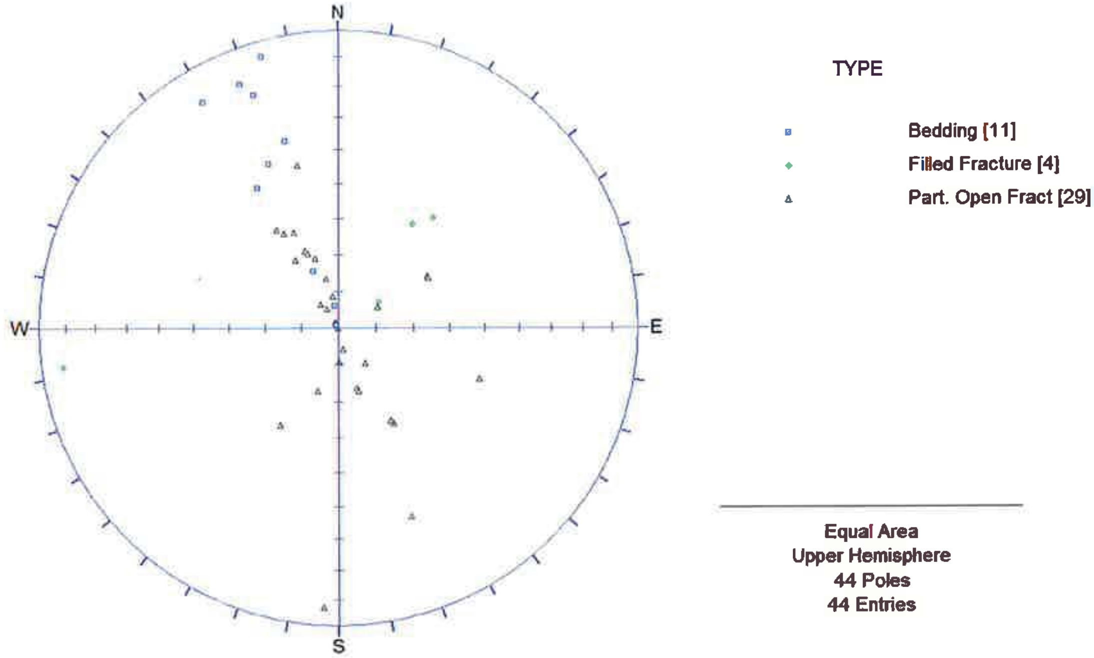


Figure 4: A polar diagram plotting dip and dip direction of all planes categorized by plane type.

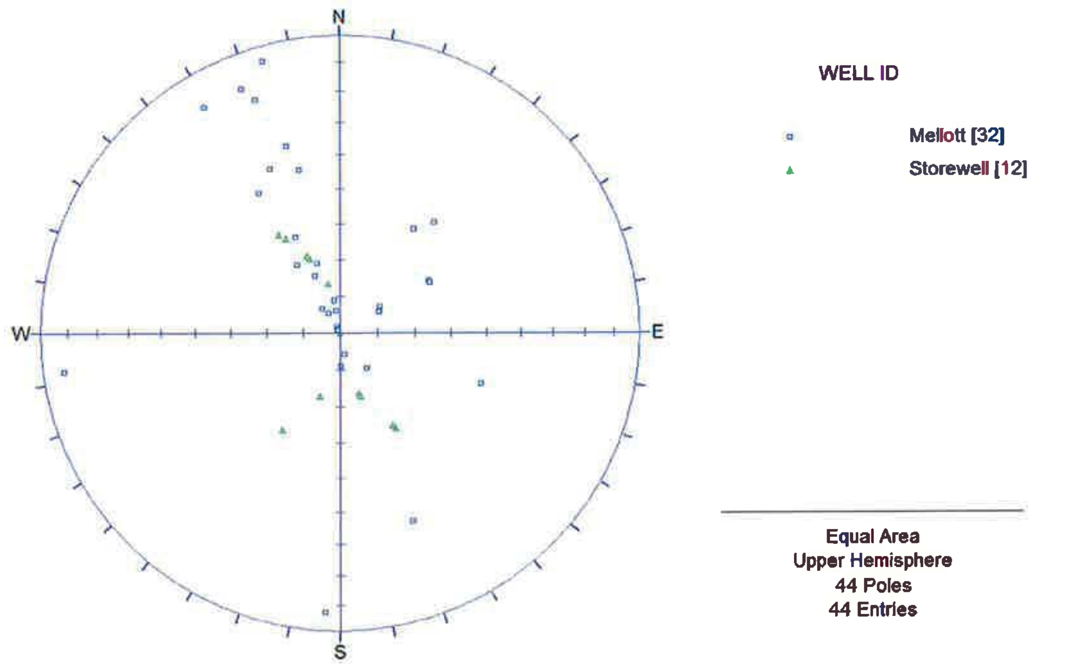


Figure 5: A polar diagram plotting dip and dip direction of all planes categorized by borehole.

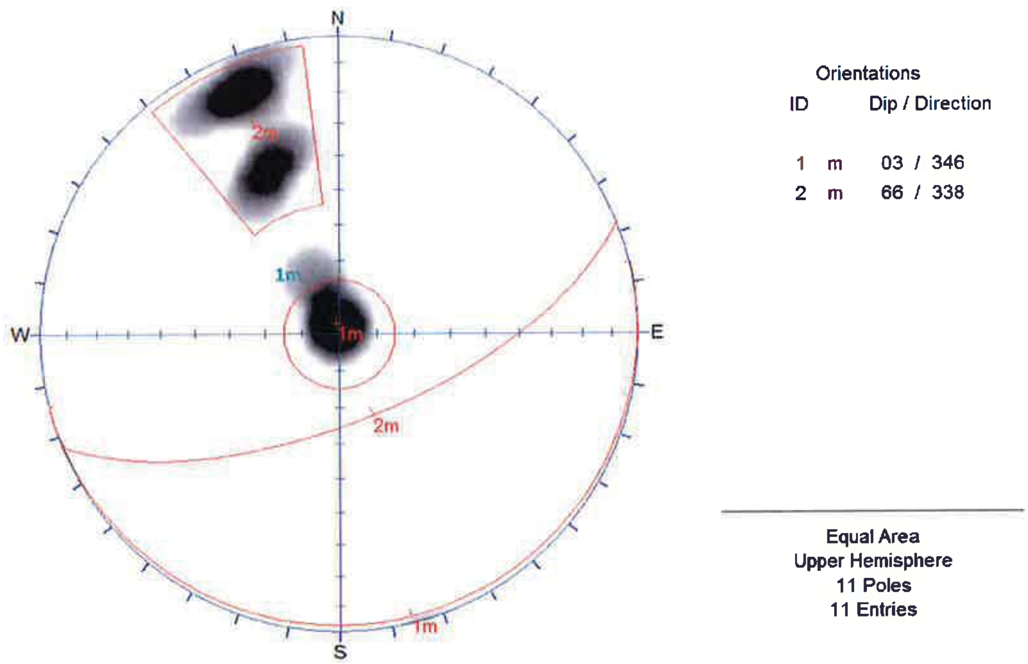


Figure 6: A polar diagram with statistical contouring of all bedding planes. The calculated mean dip angle and direction is shown at the right of the diagram.

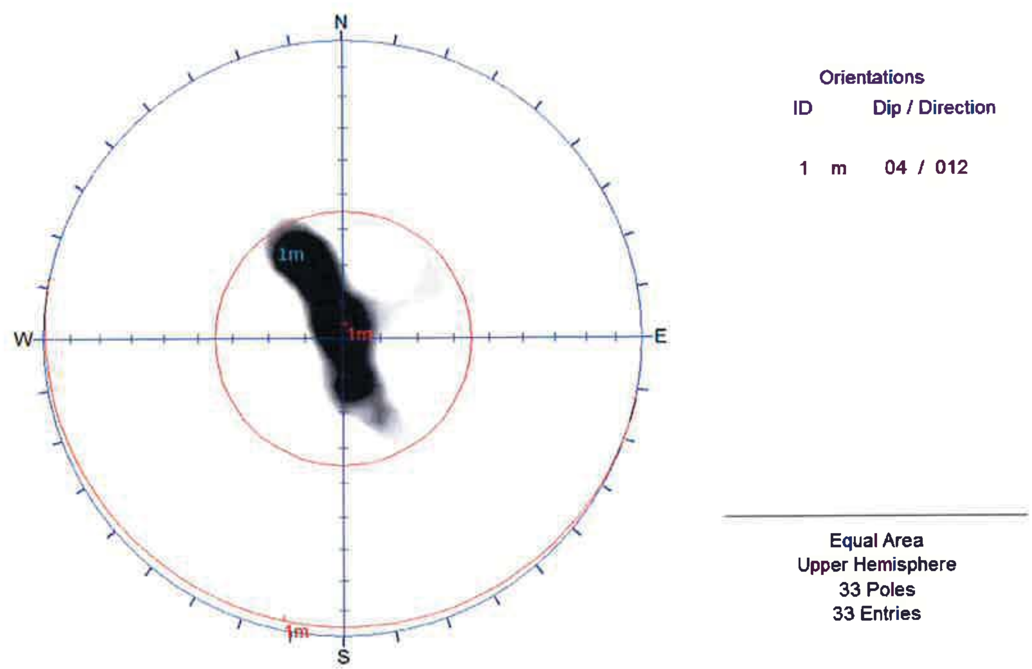


Figure 7: A polar diagram with statistical contouring of all fracture planes. The calculated mean dip angle and direction is shown at the right of the diagram.

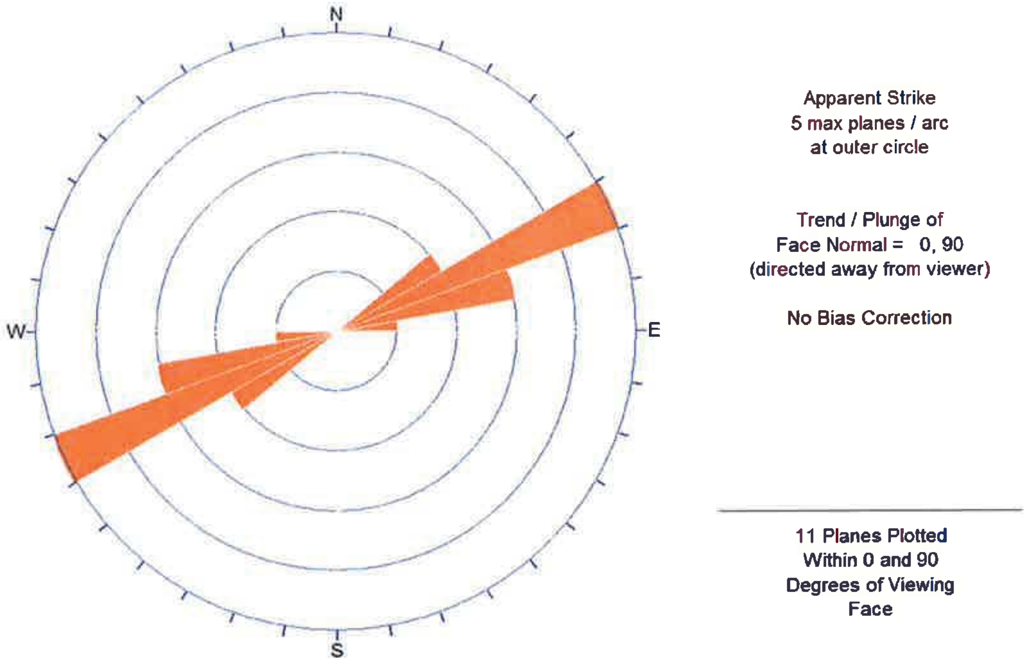


Figure 8: A rose diagram illustrating strike distribution of all bedding planes.

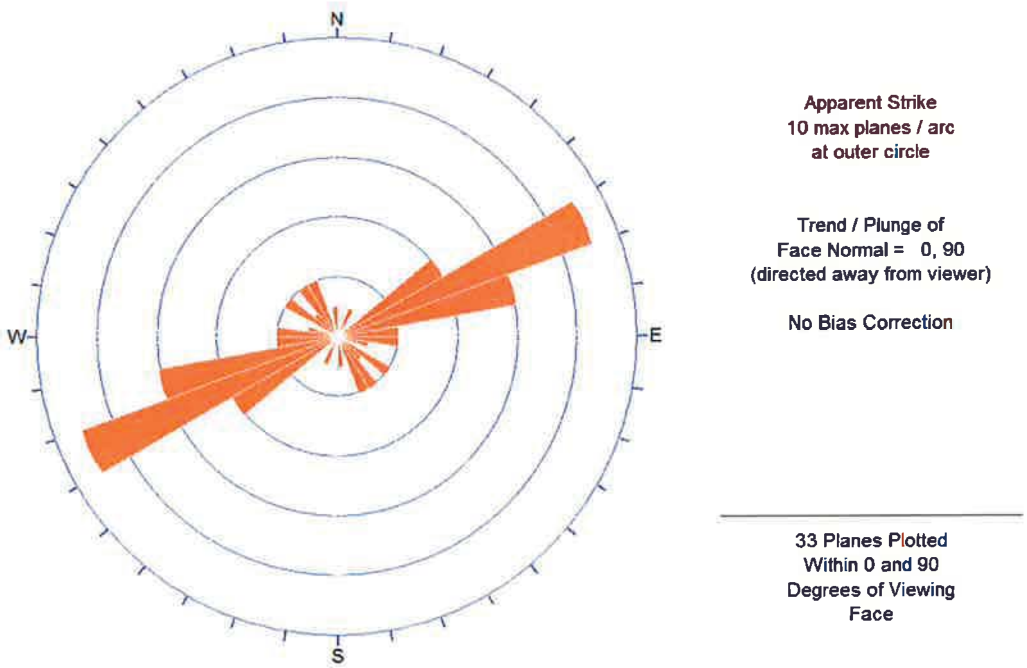


Figure 9: A rose diagram illustrating strike distribution of all fracture planes.

ATTACHMENT A

LOGGING METHODS

1129 West Governor Road, PO Box 797
Hershey, PA 17033-0797
Voice: (717) 533 - 8600
Fax: (717) 533 - 8605

APPENDIX A: OVERVIEW OF LOGGING METHODS

CALIPER LOGS

The caliper log measures variations in borehole size as a function of depth in a well. Some example responses of in a caliper log is shown in Figure A- 1 (Rider, 2002[1]) The log data enables (a) the detection of competent or fractured geologic units, (b) the location of washouts or tight zones, (c) the optimal placement of well screen, sand, and bentonite, and (d) the establishment of appropriate borehole correction factors to be applied to other well log curves. Further, when run in combination with other logs, the caliper log may be an indicator of lithologic makeup and degree of consolidation. The typical caliper response in a fractured, weathered, or karstic unit is a relatively abrupt increase in borehole size.

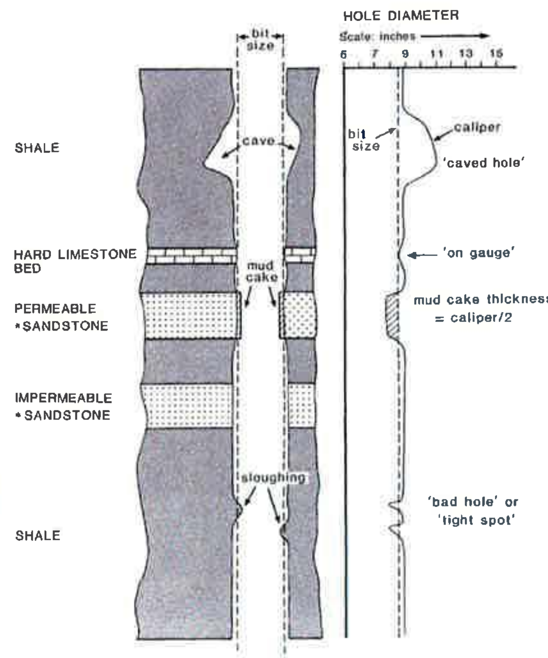


Figure A- 1: The caliper log showing some typical responses. (From Rider, 2002).

SPONTANEOUS POTENTIAL (SP) LOGS

The SP log measures the natural voltages that are created within the borehole due to the presence of borehole fluids, formation fluids, and formation matrix materials. It is recorded by measuring the difference in electrical potential in millivolts between an electrode in the borehole and a grounded electrode at the surface. The SP log is commonly used to 1) detect permeable beds, 2) detect boundaries of permeable beds, 3) determine formation water resistivity, and 4) determine the volume of shale in permeable beds. The constant SP readings observed in thicker shale units define the shale base line, a reference line from which further formation matrix and formation fluid property calculations may be completed. Although this log is consistently used in oil and gas applications, its effectiveness in water wells is limited since the method requires a contrast in salinity between borehole and formation fluids (Figure A- 2). This condition is often not met in ground water wells.

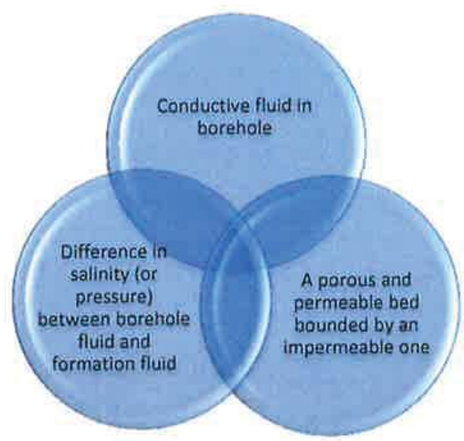


Figure A- 2: Conditions required to produce an SP response.

---

1 Rider, M. (2006) The Geological Interpretation of Well Logs, *Rider-French Consulting, Ltd.*, 280pp.

The SP log can be qualitatively used for permeability recognition. SP deflections from the shale base line commonly indicate the presence of a permeable bed. The magnitude and direction of the deflection is dependent upon the relative resistivity (or salinity) values of the borehole fluid and the formation fluid. If the formation fluid resistivity is less than the borehole fluid resistivity, then the relative SP values will decrease in a porous, coarse-grained unit. Alternately, if the formation fluid resistivity is greater than the borehole fluid resistivity, the relative SP values will increase in the same body, and the curve shape is referred to as a "reversed SP". If both fluid resistivities are equal, no SP deflection will occur.

GAMMA RAY LOGS

The gamma ray log is a passive instrument that measures the amount of naturally occurring radioactivity from geologic units within the borehole. Commonly occurring radioelements include potassium, thorium, and uranium; the two former elements are predominant within a common fine-grained rock sequence. The gamma ray log is also an excellent lithologic indicator because fine-grained clays and shales contain a higher radioelement concentration than limestones or sands. Gamma ray values are often used to assess the percentage of clay materials (indurated or non-indurated) that are present within a formation by utilizing empirically derived equations and sand-shale base line information.

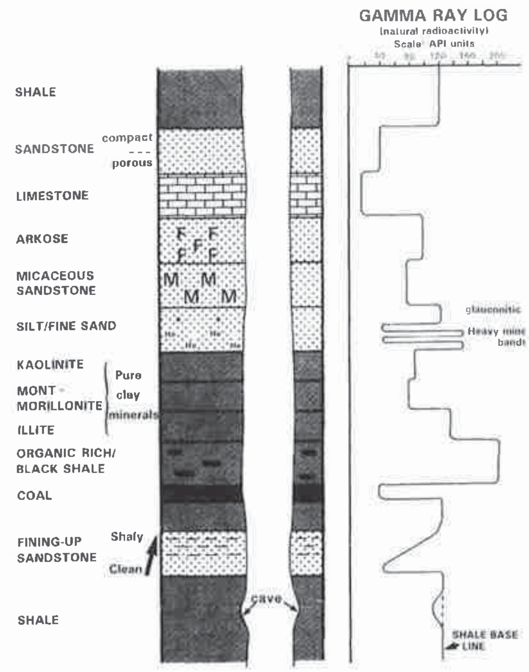


Figure A- 3: Characteristic gamma ray responses. (From Rider, 2002).

NORMAL RESISTIVITY LOGS

Resistivity is a measure of how well an electric current passes through a material. Formation resistivity is an intrinsic property of rocks and depends on the porosity and resistivity of the interstitial fluid and rock matrix. The spacing between the transmitter and receiver on the tool determines the depth of investigation into the surrounding formation; the greater the spacing, the deeper the penetration of electrical current into the formation.

In sedimentary rocks, the resistivity values of shales (5 - 30 ohm-m) is generally lower than the resistivity of sandstone (30 – 100 ohm-m), which is lower than the resistivity limestone (75 – 300 ohm-m). The resistivity log often shows a picture of the overall depositional sequence in sedimentary environment. Resistivity of igneous and metamorphic rocks is extremely high when compared to resistivity in sedimentary rocks, with values that are commonly thousands of ohm-meters. Example resistivity log responses are shown in Figure A- 4.

FLUID RESISTIVITY LOGS

Fluid resistivity, which is the reciprocal of fluid conductivity, provides data related to the concentration of dissolved solids in the fluid column. Although the quality of the fluid column may not reflect the quality of adjacent interstitial fluids, information can be quite useful when combined with other logs. For example, change in fluid resistivity associated with a water-producing zone that is corroborated by other logs may indicate the inflow of ground water.

SINGLE-POINT RESISTANCE LOGS

Single point resistance measurements are made by passing a constant current between two electrodes and recording the voltage fluctuations as the probe is moved up the borehole. The resistance variations measured in the borehole is primarily due to variations in the immediate vicinity of the downhole electrode.

The resistance log is strongly affected by the resistance of the drilling fluid and variations in borehole diameter. It is extremely useful for detecting fractures in boreholes with relatively constant diameter. In sedimentary environments, the resistance log generally follows the variations in resistivity of the formation. Shales in clay generally exhibit low values, sandstones have intermediate values, while coal and limestone beds have high resistance values.

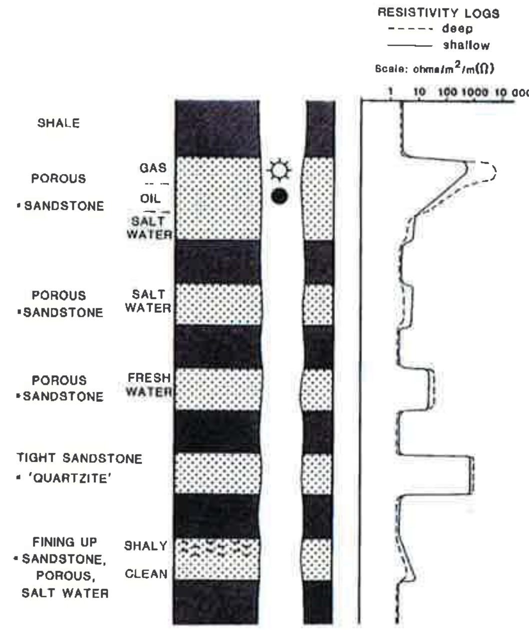


Figure A- 4: Characteristic resistivity responses. (From Rider, 2002)

TEMPERATURE LOGS

Temperature logs measure the change in fluid temperature within the borehole as a function of depth. This log can indicate the location of water- producing strata or fracture zones within the well. The inherent assumption of this technique is that the fluids entering the borehole from water producing zones are either cooler or warmer than the fluid in the borehole. In this case, it is possible to relate a temperature anomaly to a depth range in which waters of different temperature are emanating from a water-producing/receiving or fractured lithologic unit.

HEAT PULSE FLOWMETER (HPFM) LOGS

The heat pulse flowmeter measures the vertical flow rates within a borehole. The log may be used to identify contributing fracture zones under natural and pumping conditions. The system operates by heating a wire grid that is located between two thermistors. The heated body of water moves toward one of the thermistors under the effect of the vertical component of flow within the well. Positive and negative values on the log represent upward and downward flow, respectively. Measurements are recorded while the tool is stationary and the logs are presented as a bar graph (mud log) as shown in Figure A- 5.

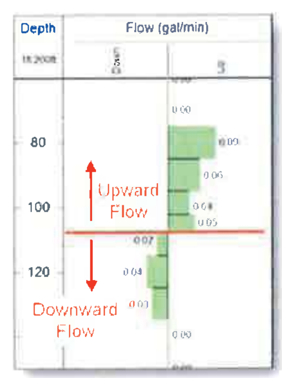


Figure A- 5: Example heat pulse flowmeter log.

A number of techniques have been attempted for measuring horizontal flow in wells without much success. The techniques may not represent the true hydrogeologic conditions due to variations in flow caused by the well.

OPTICAL TELEVIEWER (OTV) LOGS

The optical televiewer probe combines the axial view of a downward looking digital imaging system with a precision ground hyperbolic mirror to obtain an undistorted 360° view of the borehole wall. The probe records one 360° line of pixels at 0.003-ft depth intervals. The sample circle can be divided into 720 or 360 radial samples to give 0.5° or 1° radial resolution. For this investigation, the highest radial resolution (0.5°) was used. The line of pixels is aligned with respect to True North and digitally stacked to construct a complete, undistorted, and oriented image of the borehole walls. The data are 24 -bit true color and may be used for lithologic determination as part of the interpretation. Since the acquired image is digitized and properly oriented with respect to borehole deviation and tool rotation, it allows data processing to provide accurate strike and dip information of structural features. The borehole image is often shown as an "unwrapped" 360° image in which the cylindrical borehole image is sliced down the northern axis and flattened out as shown in Figure A- 6.

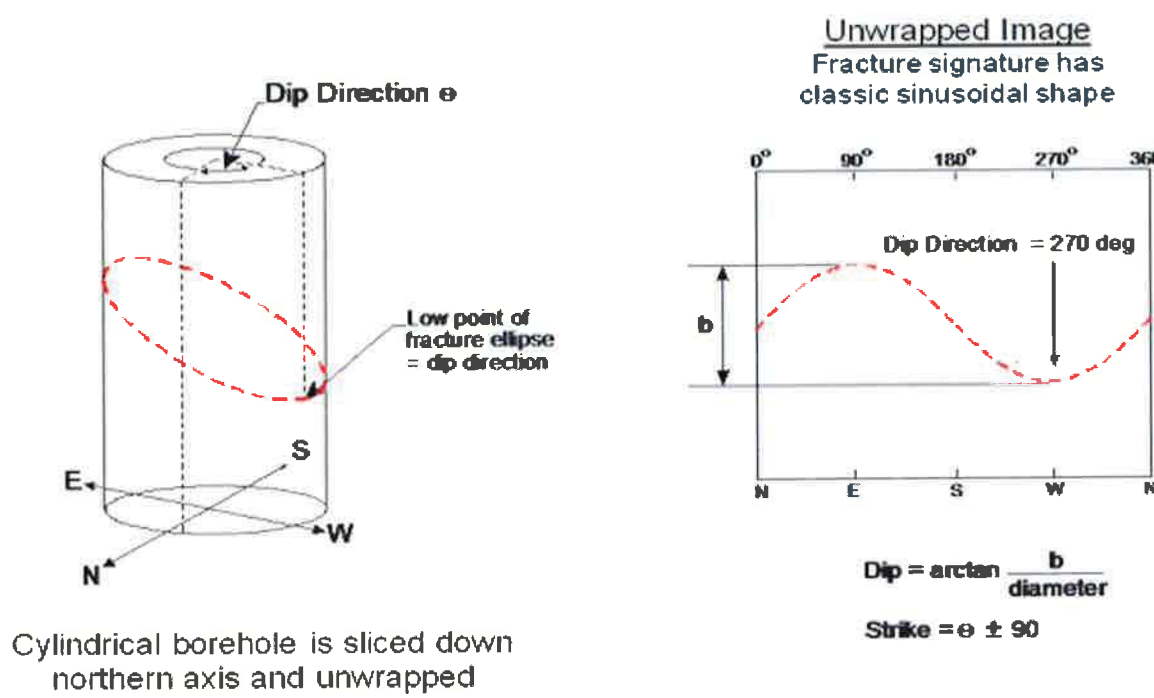


Figure A- 6: Schematic showing the sinusoidal fracture signature in the unwrapped borehole view.

ACOUSTIC TELEVIEWER (ATV) LOGS

Acoustic televiewer provides a 360° acoustic image of the borehole walls that can be used to identify and determine the orientation of planar features such as bedding and fractures. The data can also indicate the relative degree of hardness of formation materials. As shown in Figure A-7, Ultrasonic pulses are transmitted from a rotating transducer inside the tool. The transmitted pulses reflect off the borehole wall and return to the tool where the travel time and amplitude of the acoustic signal are measured. In order for the acoustic waves to travel to and from the borehole wall, the well must be fluid filled. Greater travel time can indicate openings in the rock. Strong amplitude suggests smooth, competent rock. Weaker amplitudes suggest rough or less competent rock.

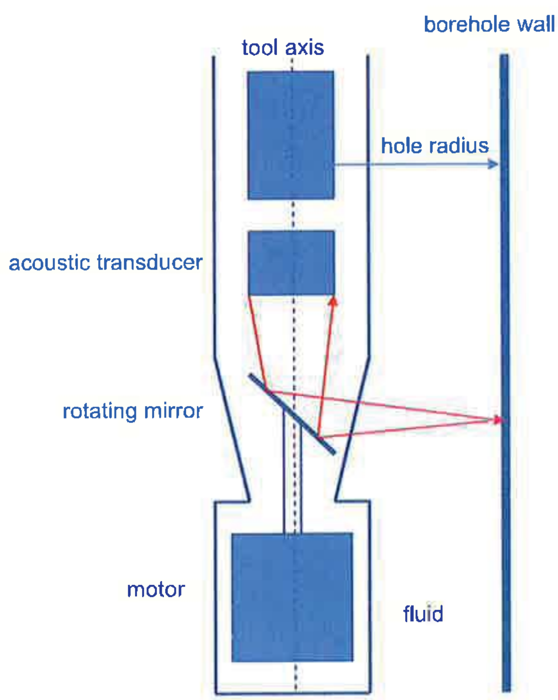


Figure A- 7: Schematic of the acoustic televiewer tool.

ATTACHMENT B
BOREHOLE LOGS

Hydro Log

COMP	Mountain Research, LLC
WELL	Mellott
FLD	McClure
CNTY	Snyder
STAT	PA
ARM	180159
API	N/A

COMPANY:	Mountain Research, LLC	STATE:	PA
WELL ID:	Mellott	ARM NO.:	180159
FIELD/SITE:	McClure	API NO.:	N/A
COUNTY:	Snyder		

LOCATION:
NORTHING:
EASTING:
SEC: TWP: QUAD:

OTHER SERVICES

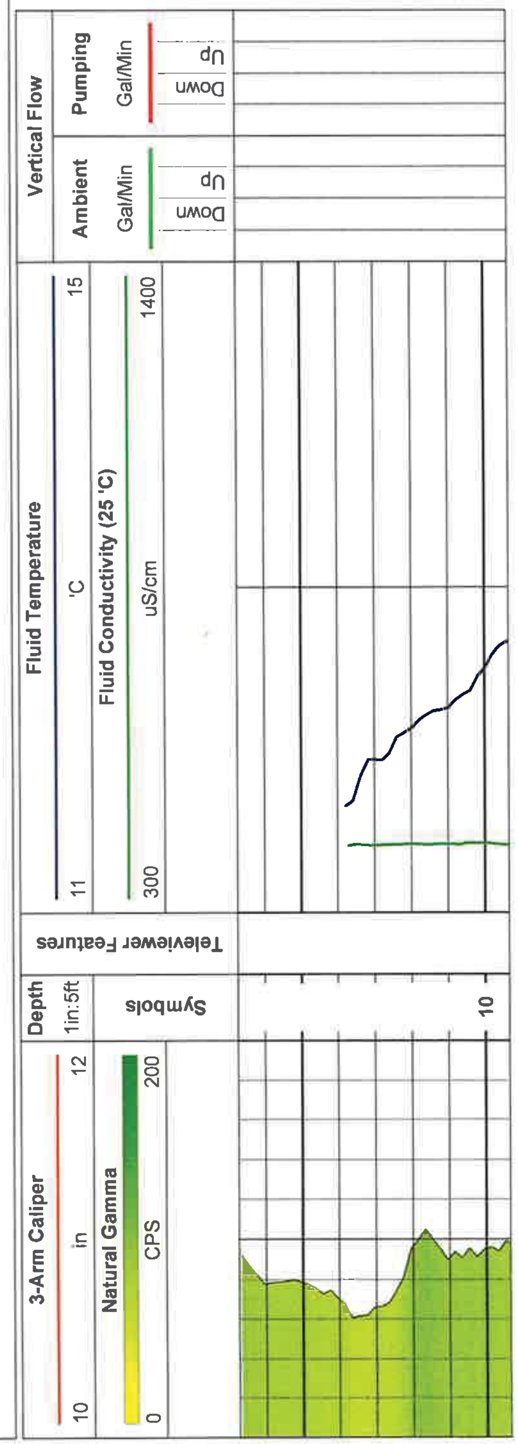
PERMANENT DATUM: Top of Casing ELEVATION: K.B.
LOG MEASURED FROM: Top of Casing ABOVE PERM. DATUM: D.F.
DRILLING MEAS. FROM: STICK UP: 0 G.L.

LOGGING DATE	01.26.2018	01.26.2018	01.26.2018	01.26.2018	
RUN NO	1	4	5	6	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	180	180	180	180	
ARM DEPTH (FT)	182.95	182.99	N/A	N/A	
BTM LOGGED INTERVAL (FT)	182.95	182.99	174	174	
TOP LOGGED INTERVAL (FT)	6.13		39	39	
CASING SIZE (IN)/DEPTH (FT)	6/40	6/40	6/40	6/40	
CASING ARM (FT)	39.89	39.89	39.89	39.89	
BIT SIZE (IN)					
FLUID LEVEL IN HOLE (FT)					
MAG. DECLINATION (DEG)	11.05 W	11.05 W	11.05 W	11.05 W	
RECORDED BY	C. Lash	C. Lash	C. Lash	C. Lash	
WITNESSED BY					

REMARKS:

Symbols

Bottom of Casing



Televiewer Logs

COMP	Mountain Research, LLC
WELL	Mellott
FLD	McClure
CNTY	Snyder
STAT	PA
ARM	180159
API	N/A

COMPANY: Mountain Research, LLC STATE: PA
WELL ID: Mellott ARM NO.: 180159
FIELD/SITE: McClure API NO.: N/A
COUNTY: Snyder

LOCATION:
NORTHING:
EASTING:
SEC: TWP: QUAD:

OTHER SERVICES

PERMANENT DATUM: Top of Casing ELEVATION: K.B.
LOG MEASURED FROM: Top of Casing ABOVE PERM. DATUM: D.F.
DRILLING MEAS. FROM: STICK UP: 0 G.L.

LOGGING DATE	01.26.2018	01.26.2018			
RUN NO	2	3			
TYPE LOG	OTV.GR	ATV.GR			
DRILLER DEPTH (FT)	180	180			
ARM DEPTH (FT)	182.32	182.5			
BTM LOGGED INTERVAL (FT)	182.32	182.5			
TOP LOGGED INTERVAL (FT)	5.15	5.58			
CASING SIZE (IN)/DEPTH (FT)	6/40	6/40			
CASING ARM (FT)	39.89	39.89			
BIT SIZE (IN)					
FLUID LEVEL IN HOLE (FT)					
MAG. DECLINATION (DEG)	11.05 W	11.05 W			
RECORDED BY	C. Lash	C. Lash			
WITNESSED BY					

REMARKS:

Symbols

Bottom of Casing

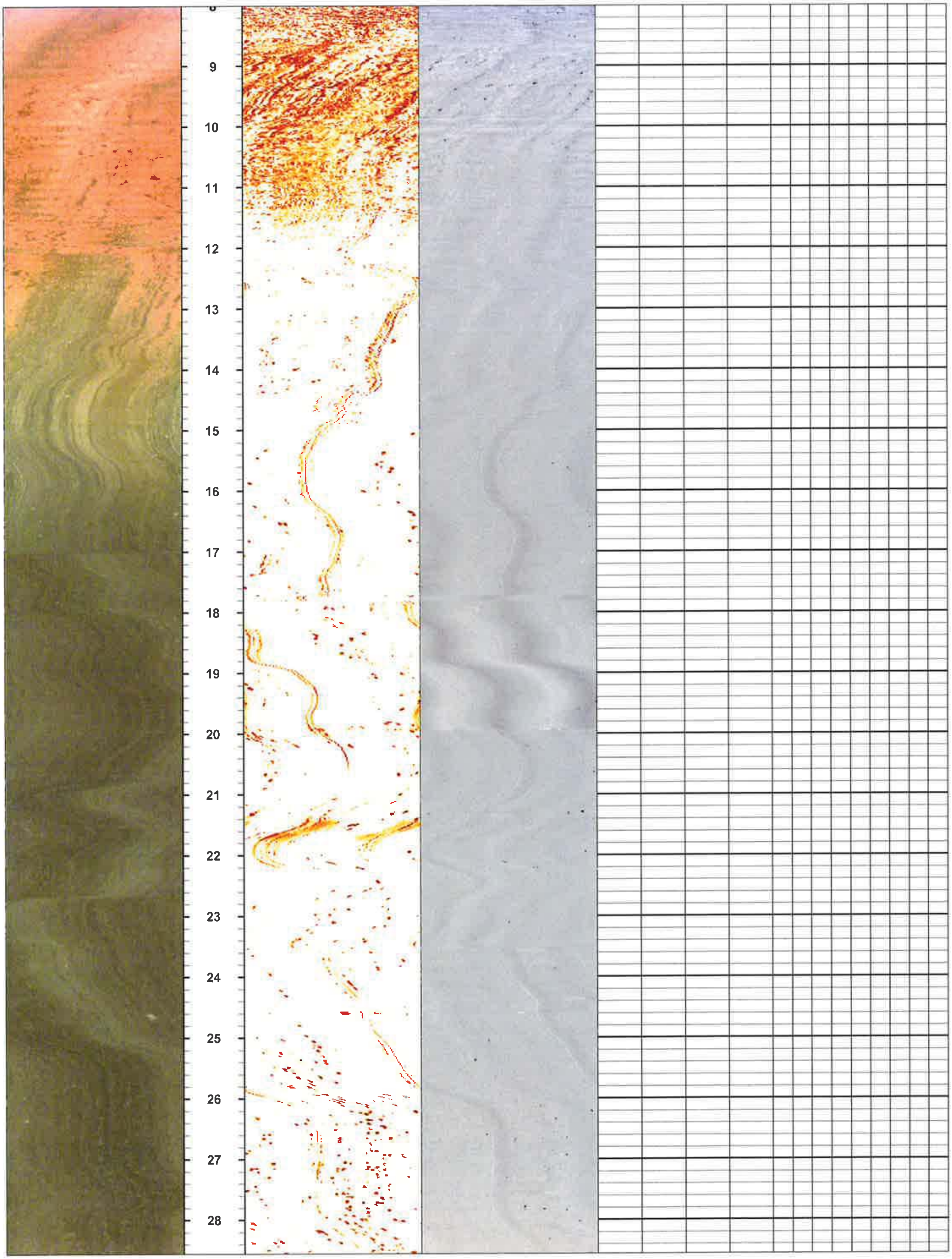
Structure

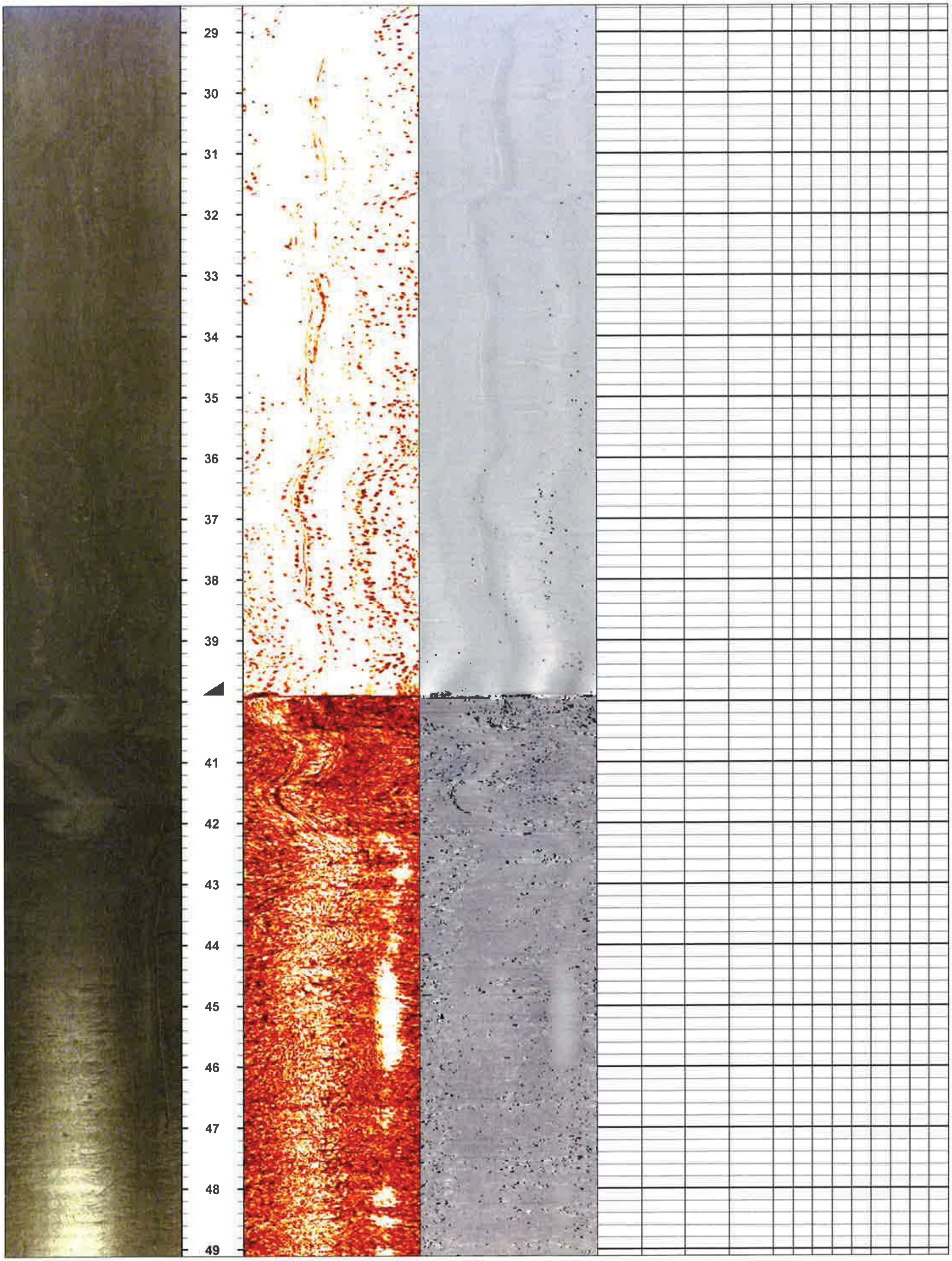
Bedding

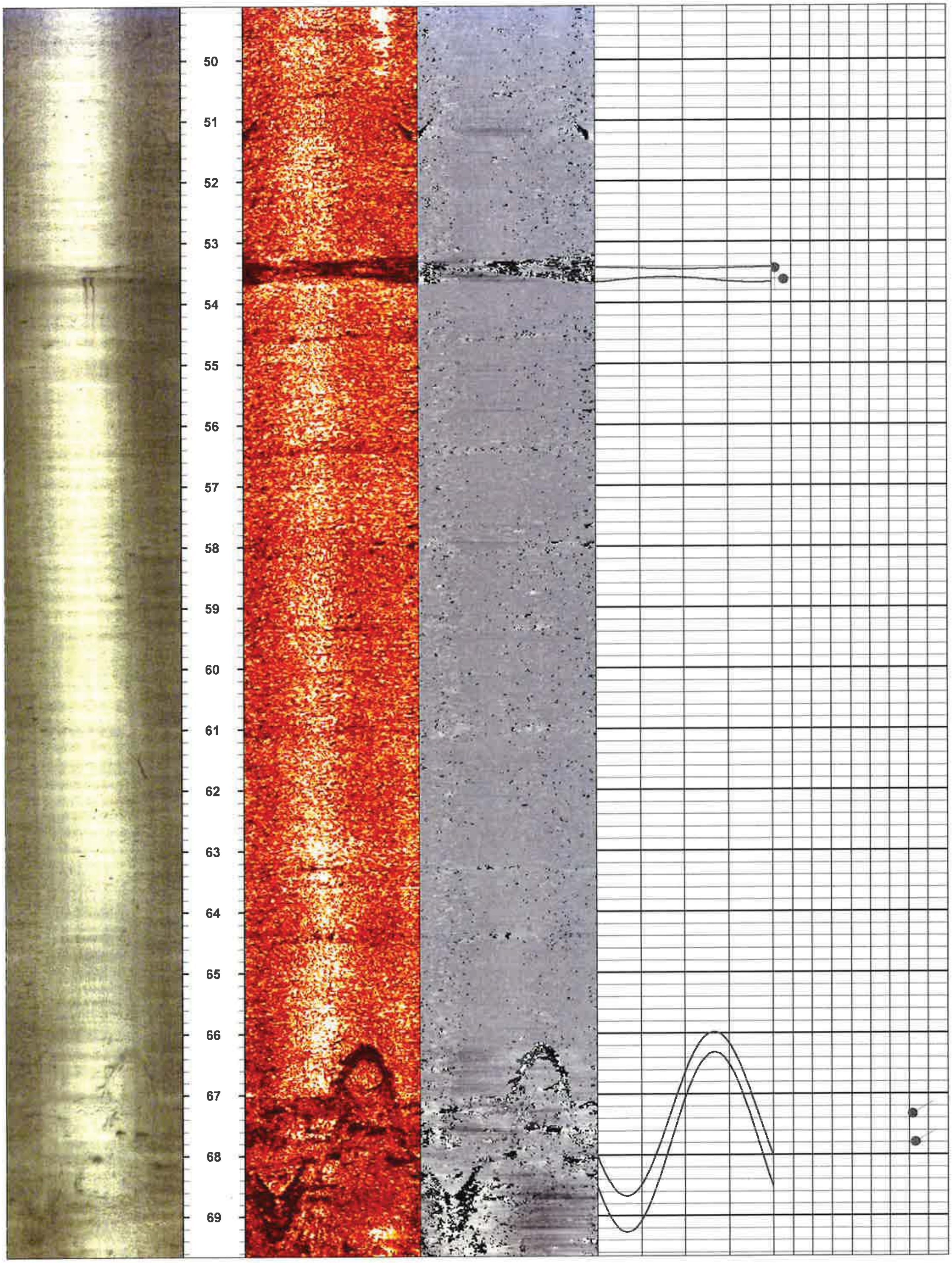
Part. Open Fract

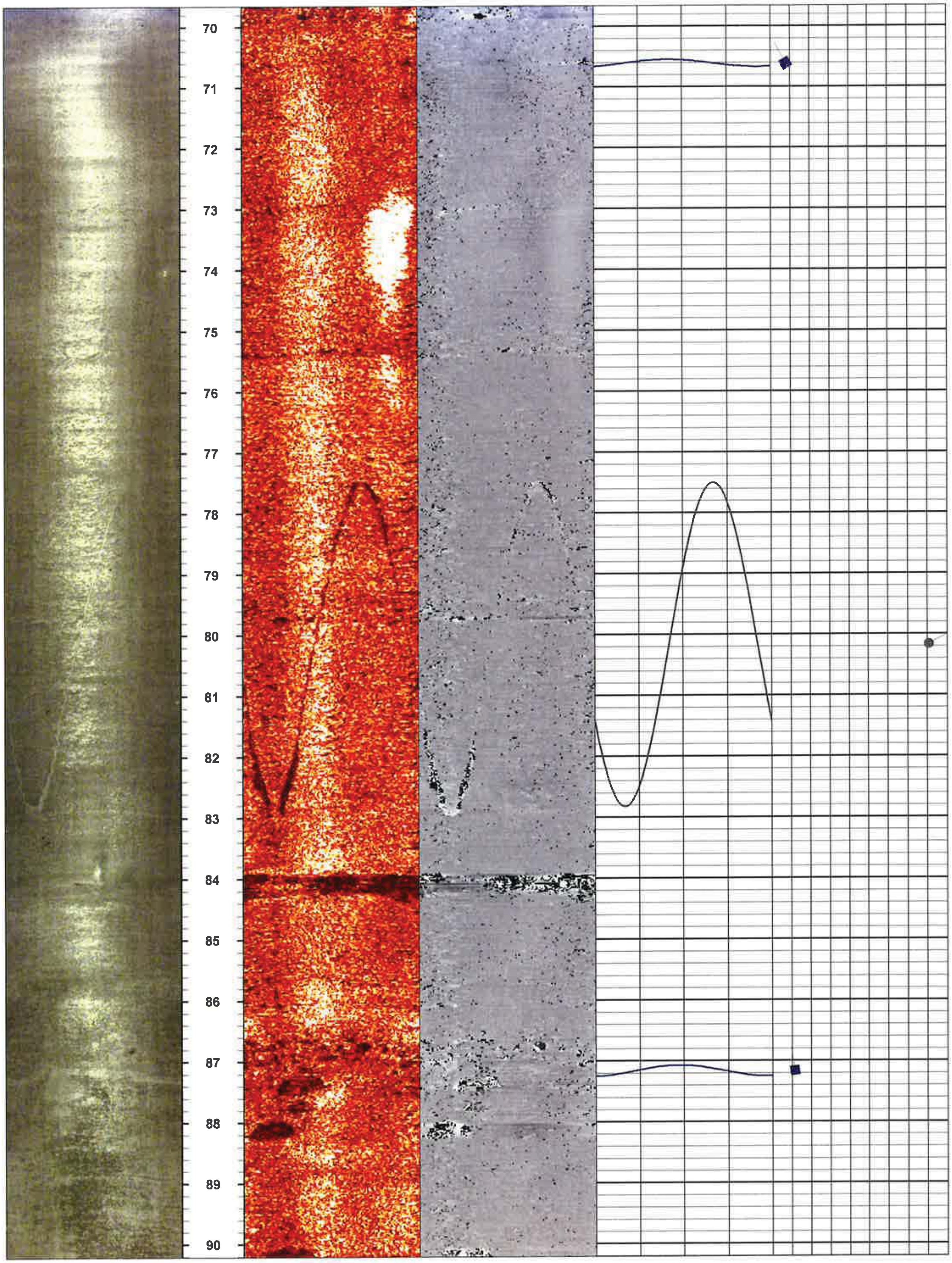
Filled Fracture

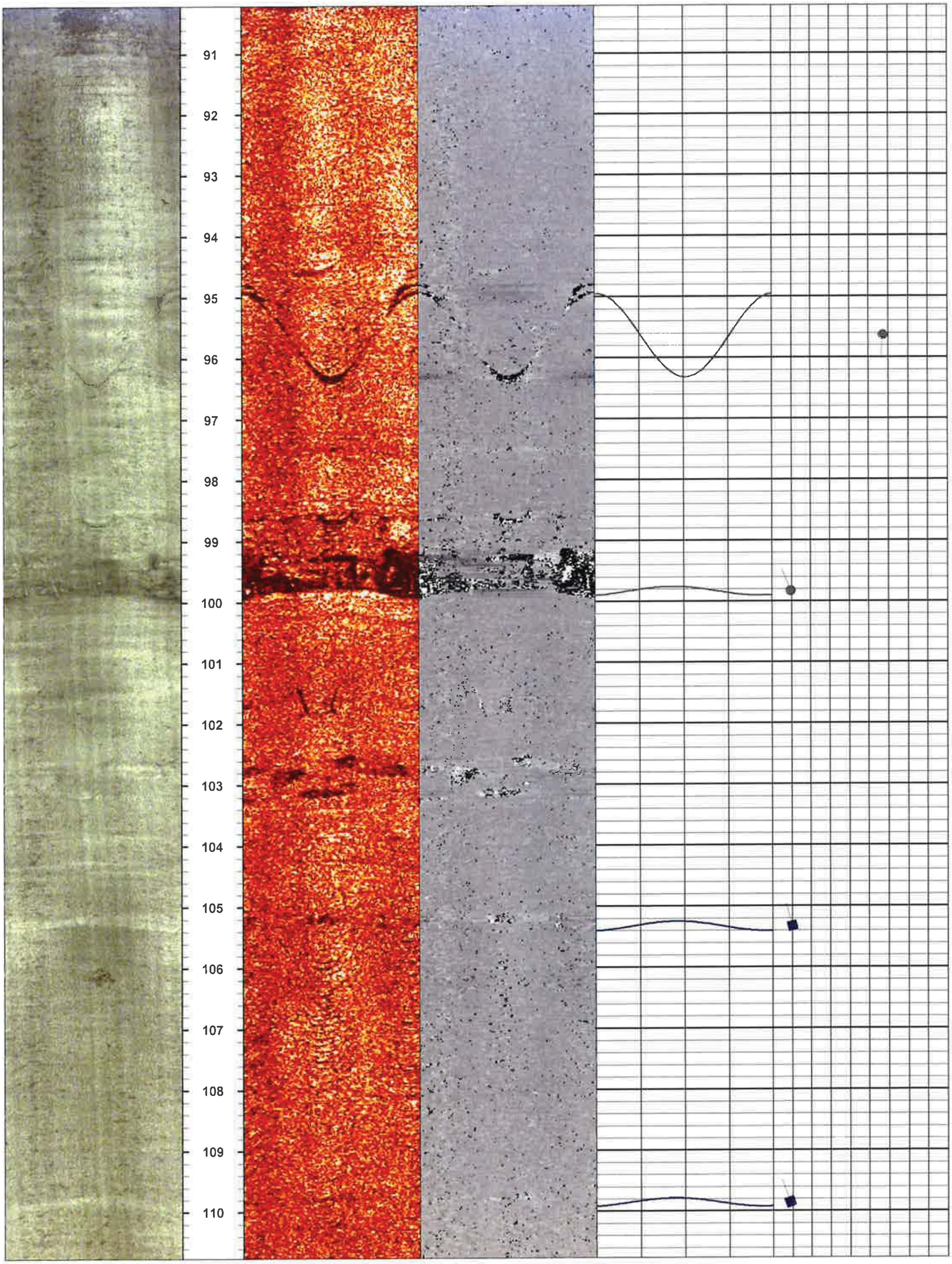
Optical Image	Depth	Acoustic Amplitude	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
	Symbols				

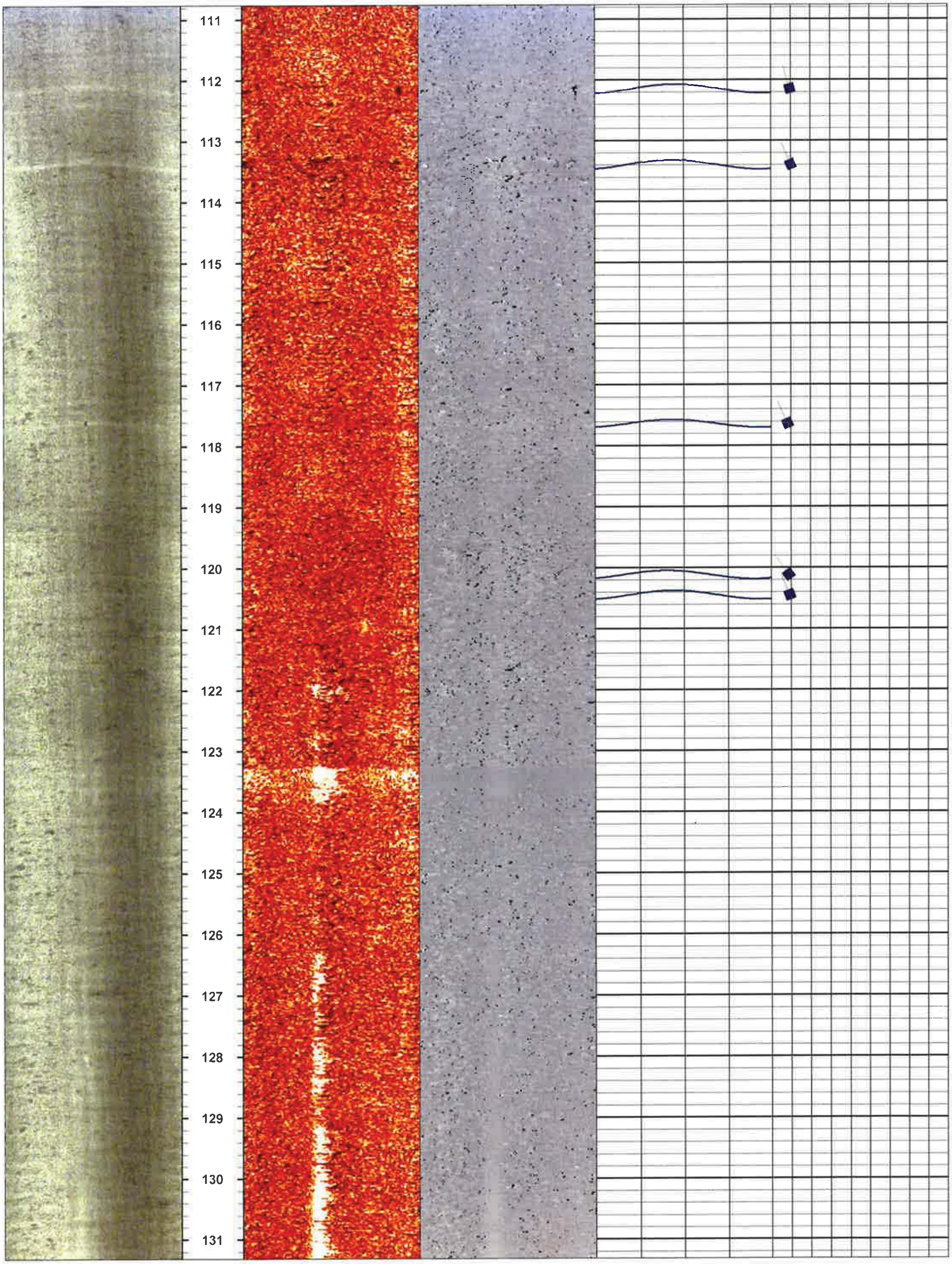

9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

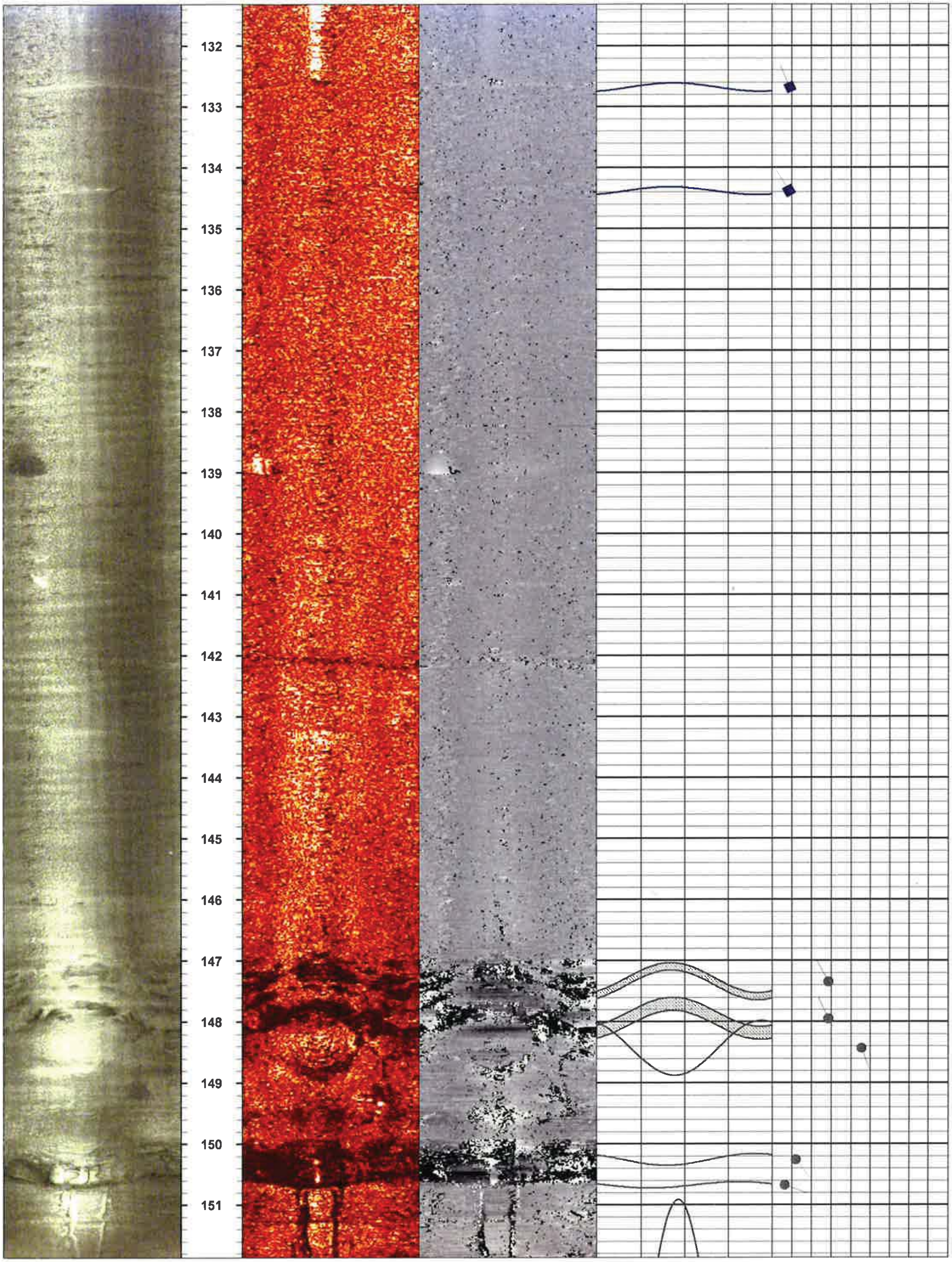

29
30
31
32
33
34
35
36
37
38
39
41
42
43
44
45
46
47
48
49

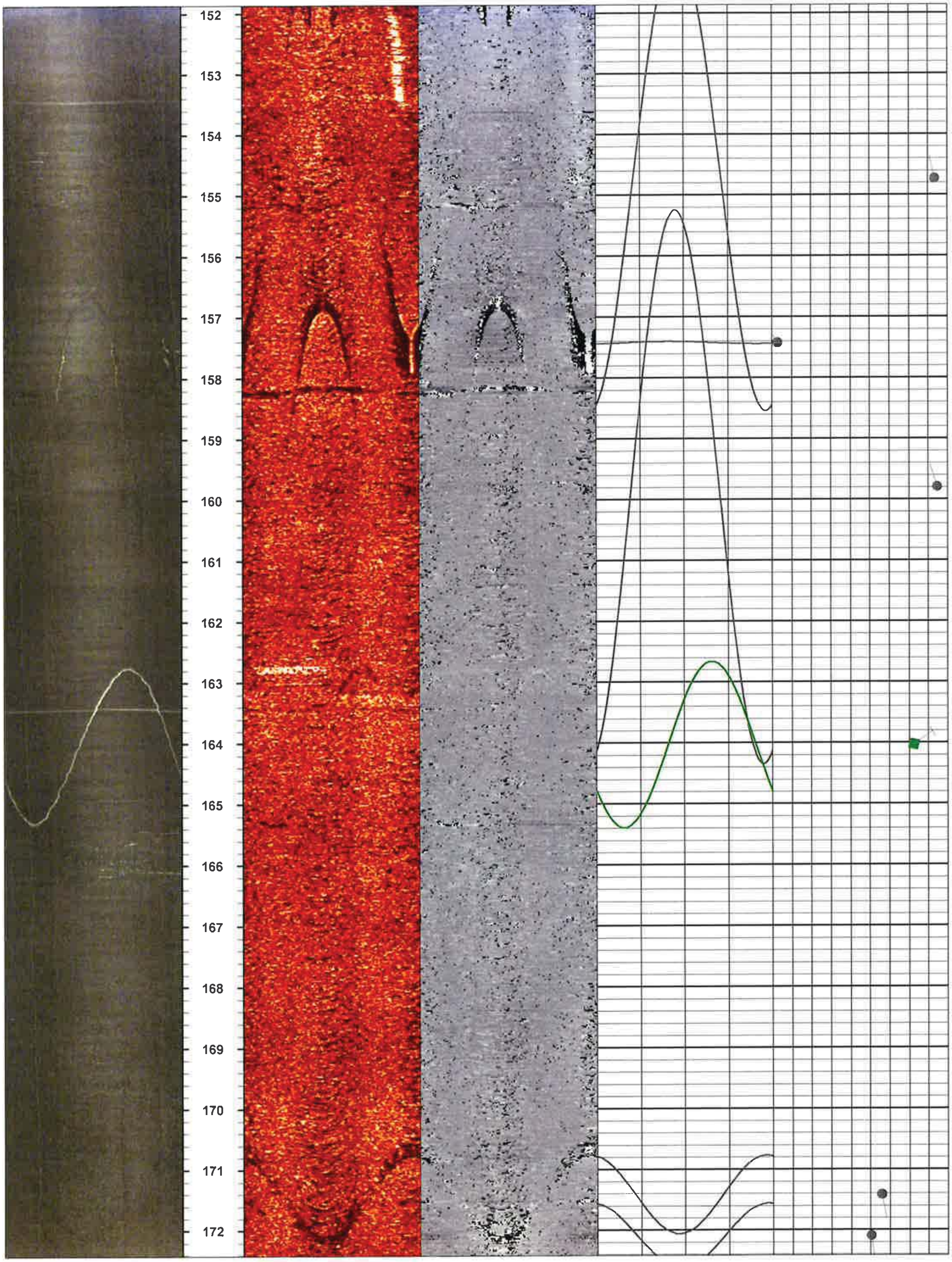

50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69

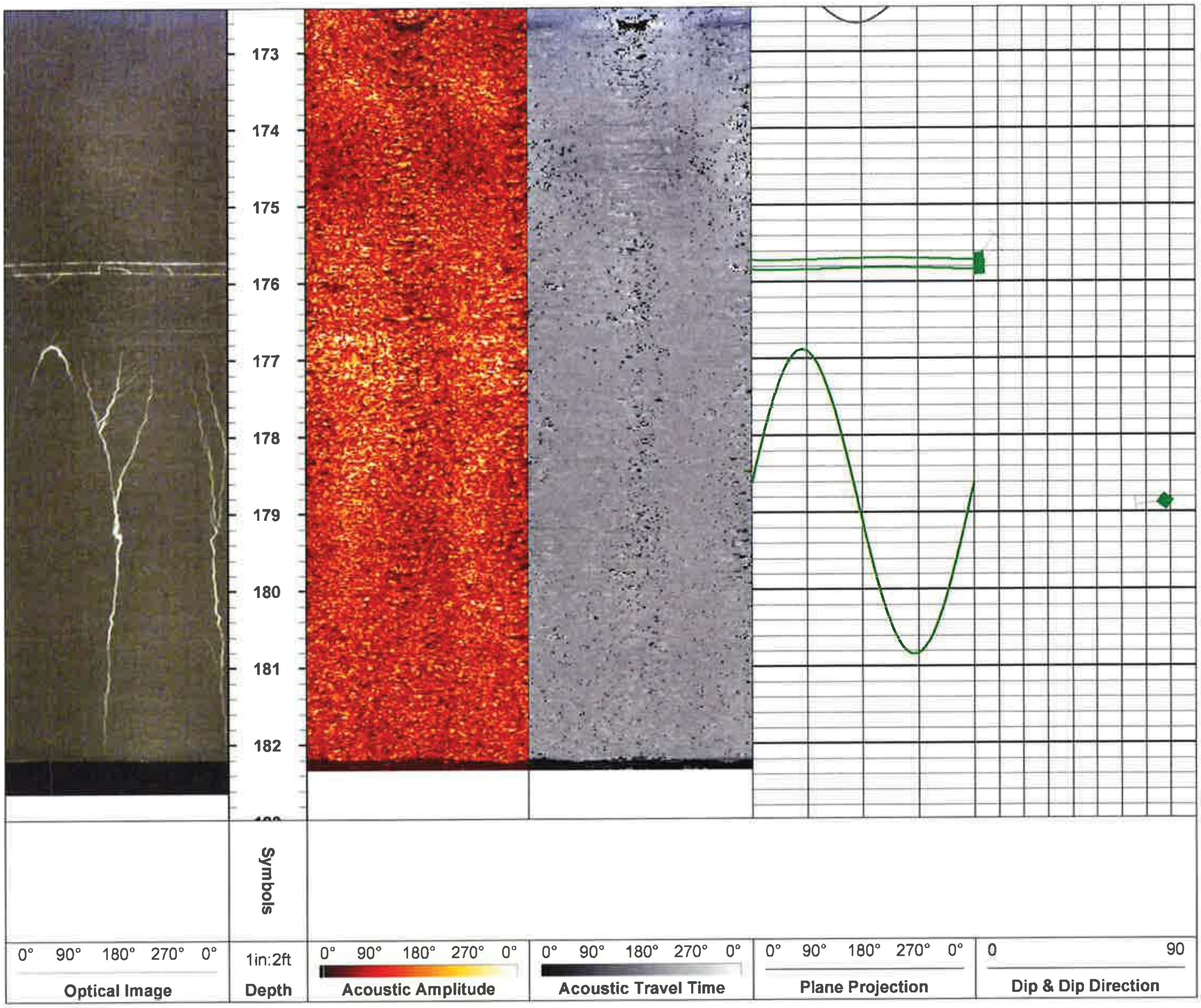

70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90


91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110

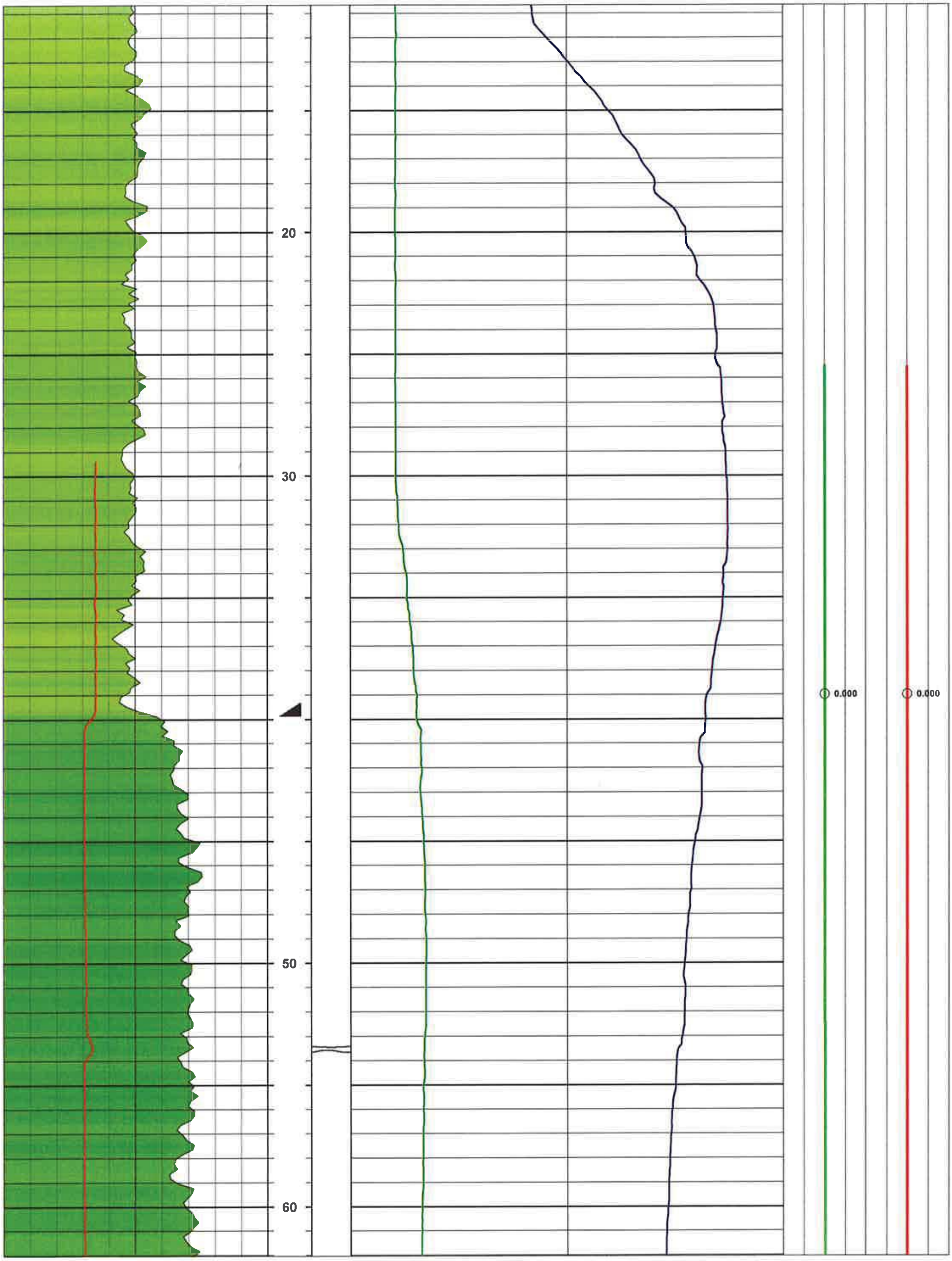

111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131

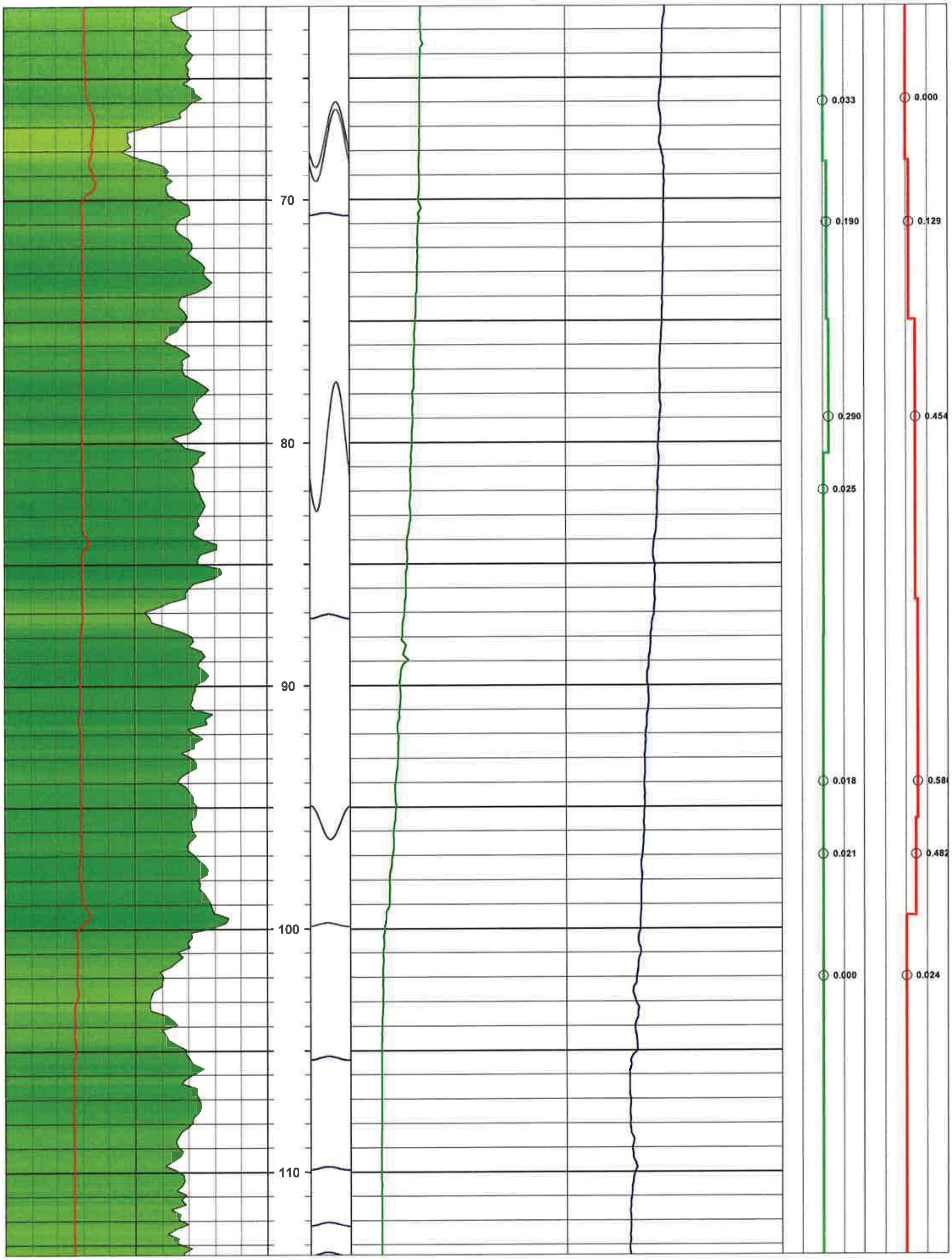

132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151

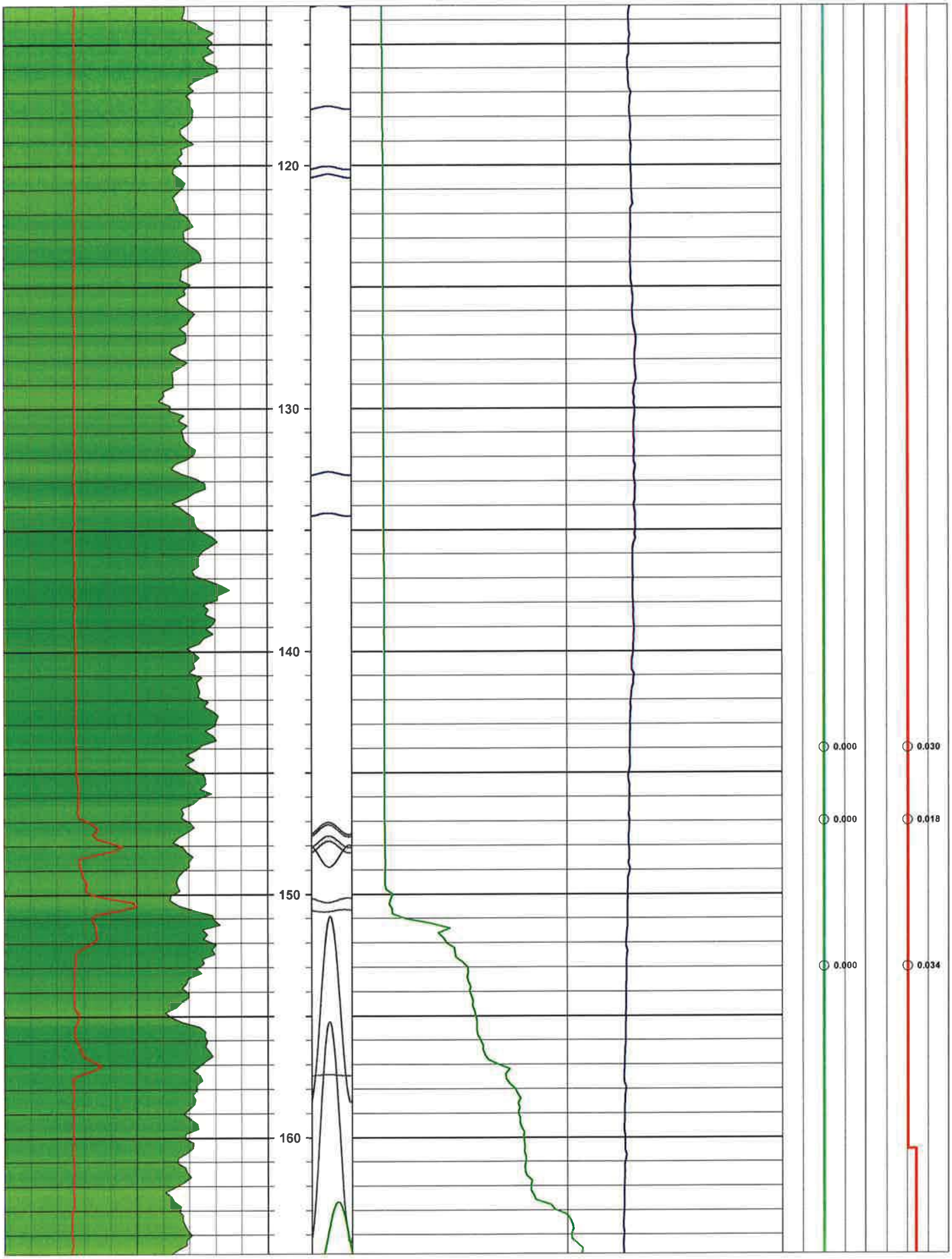

152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172

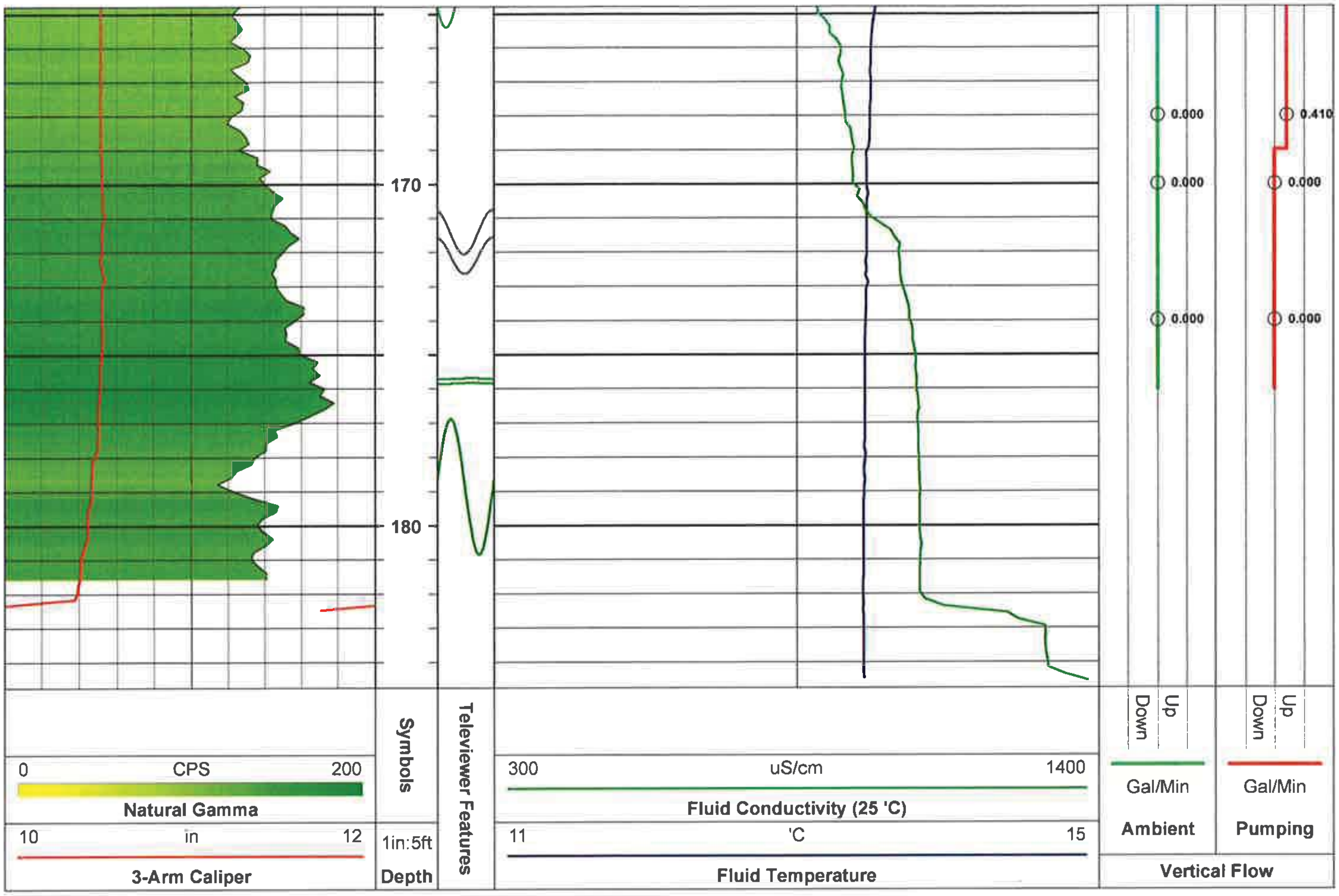


173
174
175
176
177
178
179
180
181
182
Symbols
0° 90° 180° 270° 0°
Optical Image
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Amplitude
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0
90
Dip & Dip Direction


20
30
50
60
0.000
0.000


70
80
90
100
110
0.033
0.000
0.190
0.129
0.290
0.454
0.025
0.018
0.021
0.482
0.000
0.024


120
130
140
150
160
0.000
0.030
0.000
0.018
0.000
0.034



0.000
0.410
0.000
0.000
0.000
0.000
170
180
Symbols
Televiewer Features
Up
Down
Up
Down
0
CPS
200
Natural Gamma
10
in
12
3-Arm Caliper
1in:5ft
Depth
300
uS/cm
1400
Fluid Conductivity (25 'C)
11
'C
15
Fluid Temperature
Gal/Min
Ambient
Gal/Min
Pumping
Vertical Flow

Hydro Log

ARM GEOPHYSICS
Surface & Borehole Services

COMP Mountain Research, LLC
WELL Storewell
FLD McClure
CNTY Snyder
STAT PA
ARM 180159
API N/A

COMPANY:	Mountain Research, LLC	STATE:	PA
WELL ID:	Storewell	ARM NO.:	180159
FIELD/SITE:	McClure	API NO.:	N/A
COUNTY:	Snyder		

LOCATION:
NORTHING:
EASTING:
SEC: TWP: QUAD:

OTHER SERVICES

PERMANENT DATUM:	Top of Casing	ELEVATION:		K.B.
LOG MEASURED FROM:	Top of Casing	ABOVE PERM. DATUM:		D.F.
DRILLING MEAS. FROM:		STICK UP:	0	G.L.

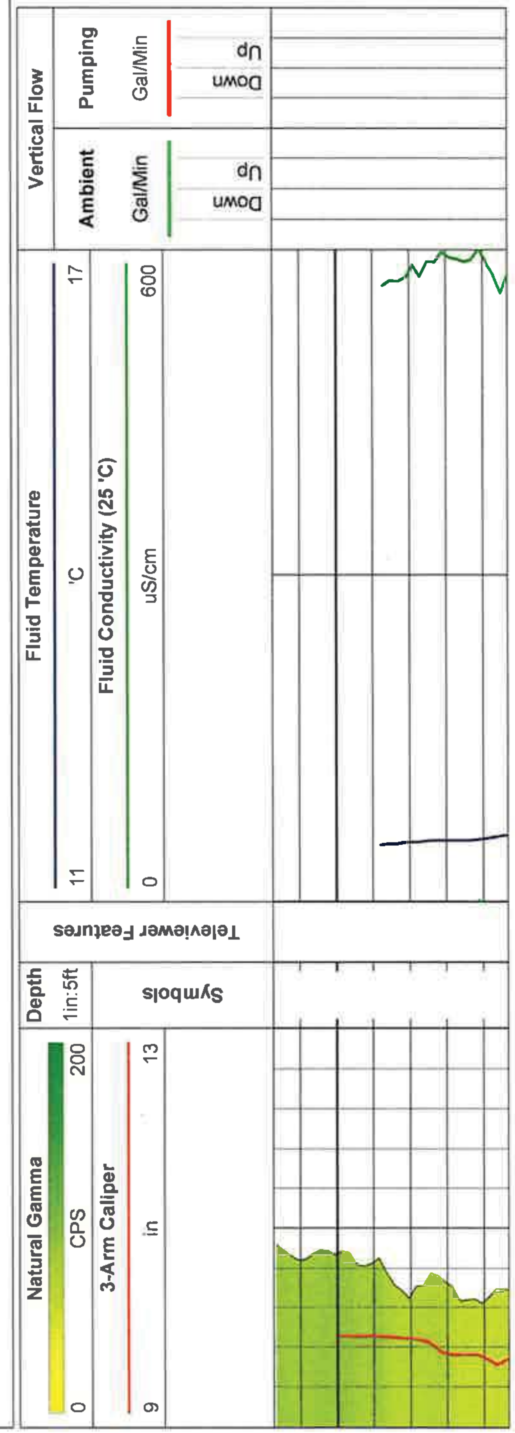
LOGGING DATE	01.26.2018	01.26.2018	01.26.2018	01.26.2018	
RUN NO	1	4	5	6	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	58	58	58	58	
ARM DEPTH (FT)	58.03	58.41	N/A	N/A	
BTM LOGGED INTERVAL (FT)	58.03	58.41	48	48	
TOP LOGGED INTERVAL (FT)	6.13		23	23	
CASING SIZE (IN)/DEPTH (FT)	6/22	6/22	6/22	6/22	
CASING ARM (FT)	22.26	22.26	22.26	22.26	
BIT SIZE (IN)					
FLUID LEVEL IN HOLE (FT)	11.23				
MAG. DECLINATION (DEG)	11.05 W	11.05 W	11.05 W	11.05 W	
RECORDED BY	C. Lash	C. Lash	C. Lash	C. Lash	
WITNESSED BY					

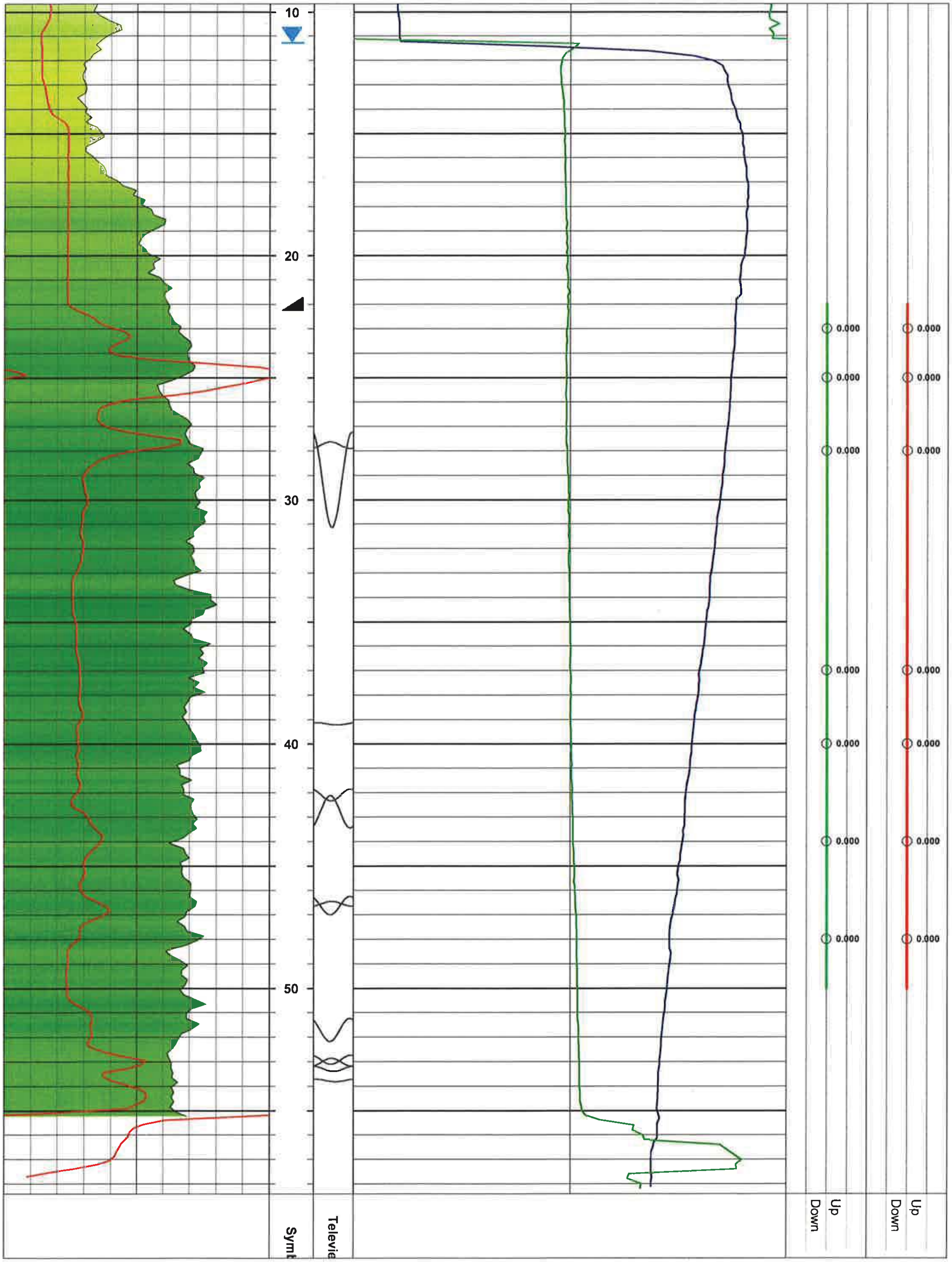
REMARKS:

Symbols

Bottom of Casing

Fluid Level




10
20
30
40
50
Symb
Televie
0.000
Up
Down
Up
Down

3-Arm Caliper / Natural Gamma	ols	wer Features	Fluid Conductivity (25 'C) / Fluid Temperature	Vertical Flow	
9 in 13			0 uS/cm 600	Gal/Min	Gal/Min
3-Arm Caliper			Fluid Conductivity (25 'C)	Ambient	Pumping
0 CPS 200	1in:5ft		11 'C 17		
Natural Gamma	Depth		Fluid Temperature	Vertical Flow	

Televiewer Logs

ARM GEOPHYSICS
Surface & Borehole Services

COMP	Mountain Research, LLC
WELL	Storewell
FLD	McClure
CNTY	Snyder
STAT	PA
ARM	180159
API	N/A

COMPANY: Mountain Research, LLC STATE: PA
WELL ID: Storewell ARM NO.: 180159
FIELD/SITE: McClure API NO.: N/A
COUNTY: Snyder

LOCATION:
NORTHING:
EASTING:

OTHER SERVICES

SEC: TWP: QUAD:

PERMANENT DATUM: Top of Casing ELEVATION: K.B.
LOG MEASURED FROM: Top of Casing ABOVE PERM. DATUM: D.F.
DRILLING MEAS. FROM: STICK UP: 0 G.L.

LOGGING DATE	01.26.2018	01.26.2018			
RUN NO	2	3			
TYPE LOG	OTV.GR	ATV.GR			
DRILLER DEPTH (FT)	58	58			
ARM DEPTH (FT)	55	55.92			
BTM LOGGED INTERVAL (FT)	55	55.92			
TOP LOGGED INTERVAL (FT)	5.15	5.58			
CASING SIZE (IN)/DEPTH (FT)	6/22	6/22			
CASING ARM (FT)	22.26	22.26			
BIT SIZE (IN)					
FLUID LEVEL IN HOLE (FT)	11.06				
MAG. DECLINATION (DEG)	11.05 W	11.05 W			
RECORDED BY	C. Lash	C. Lash			
WITNESSED BY					

REMARKS:

Symbols

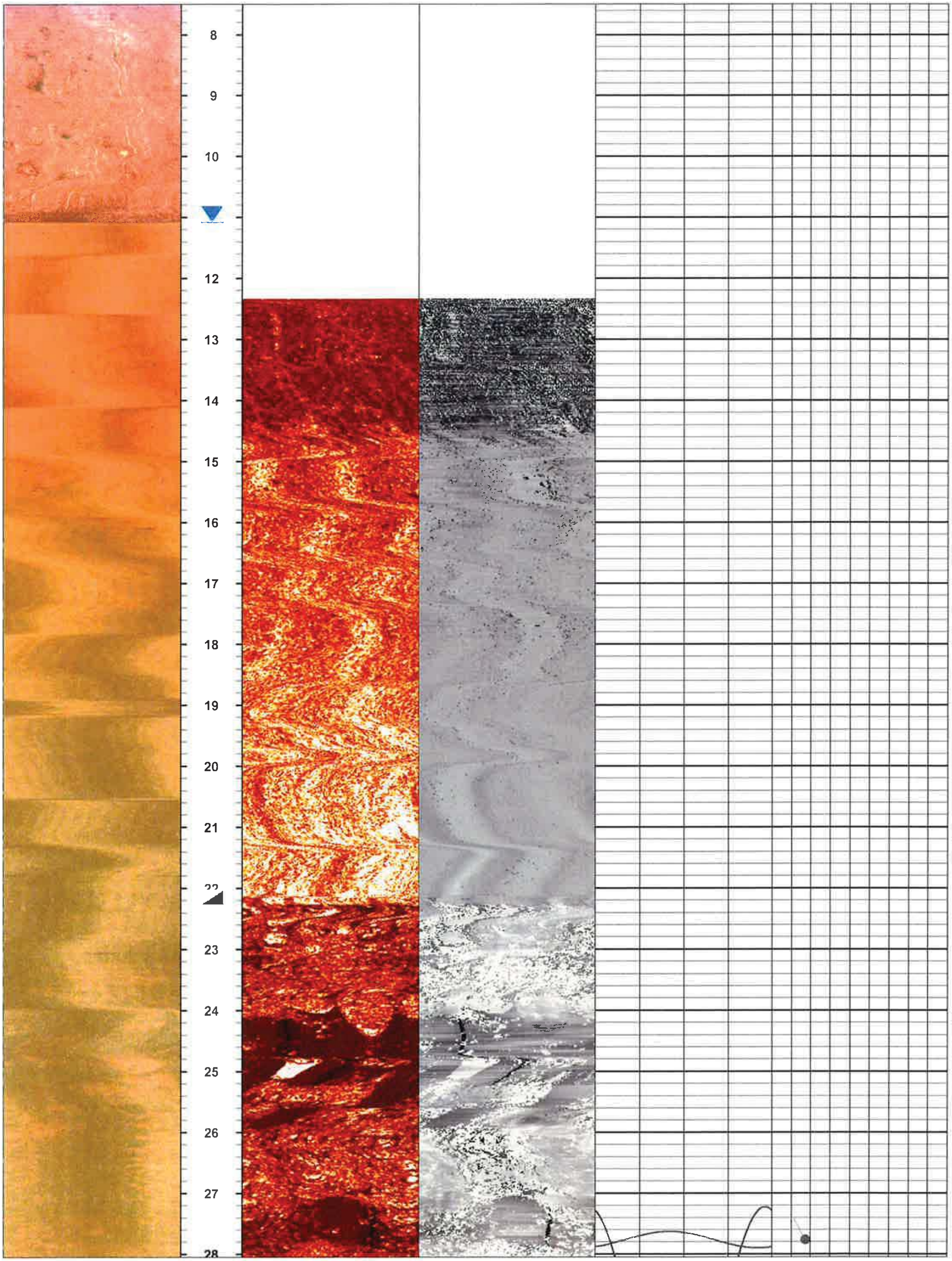
- Bottom of Casing
- Fluid Level

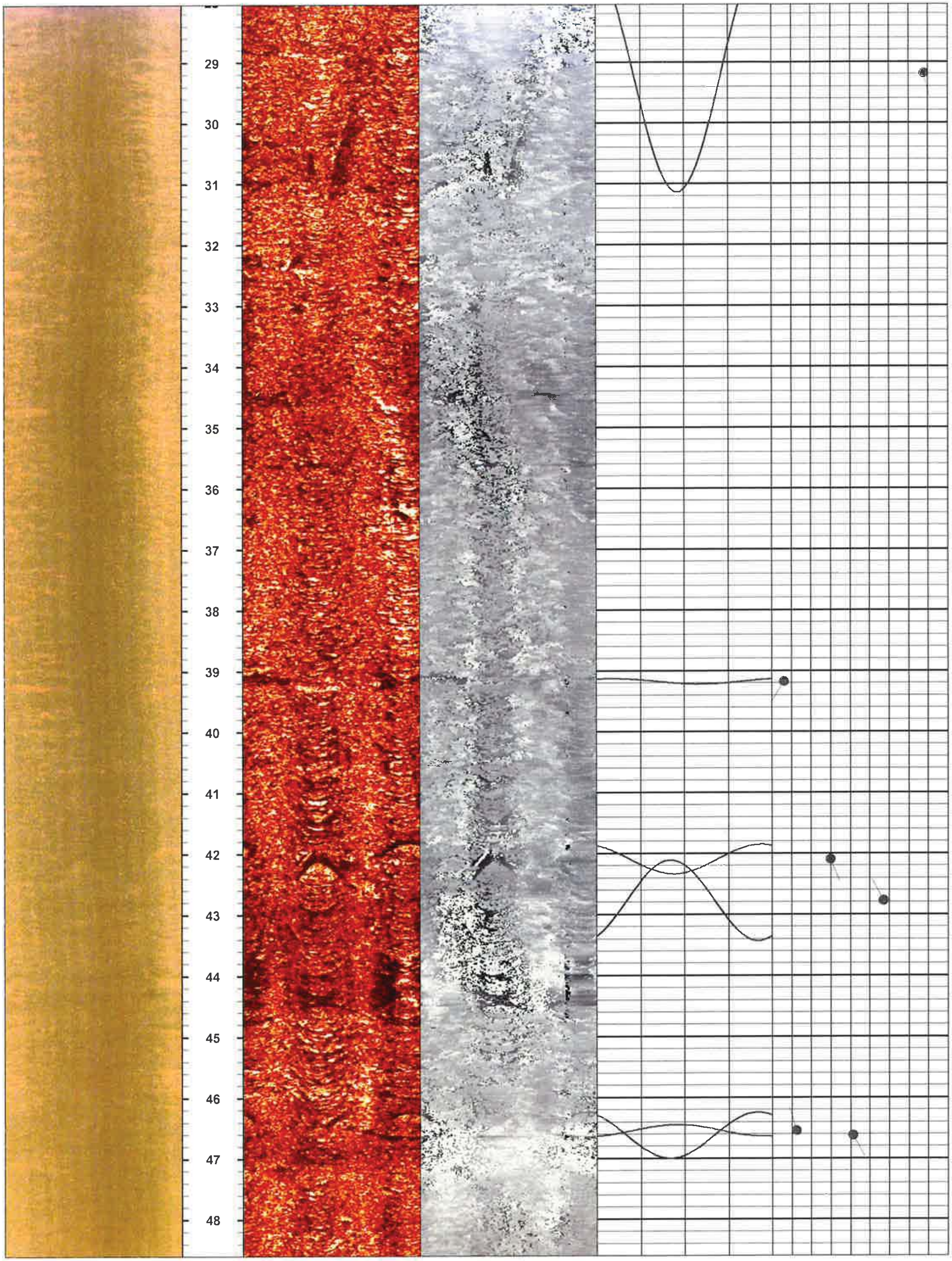
Structure

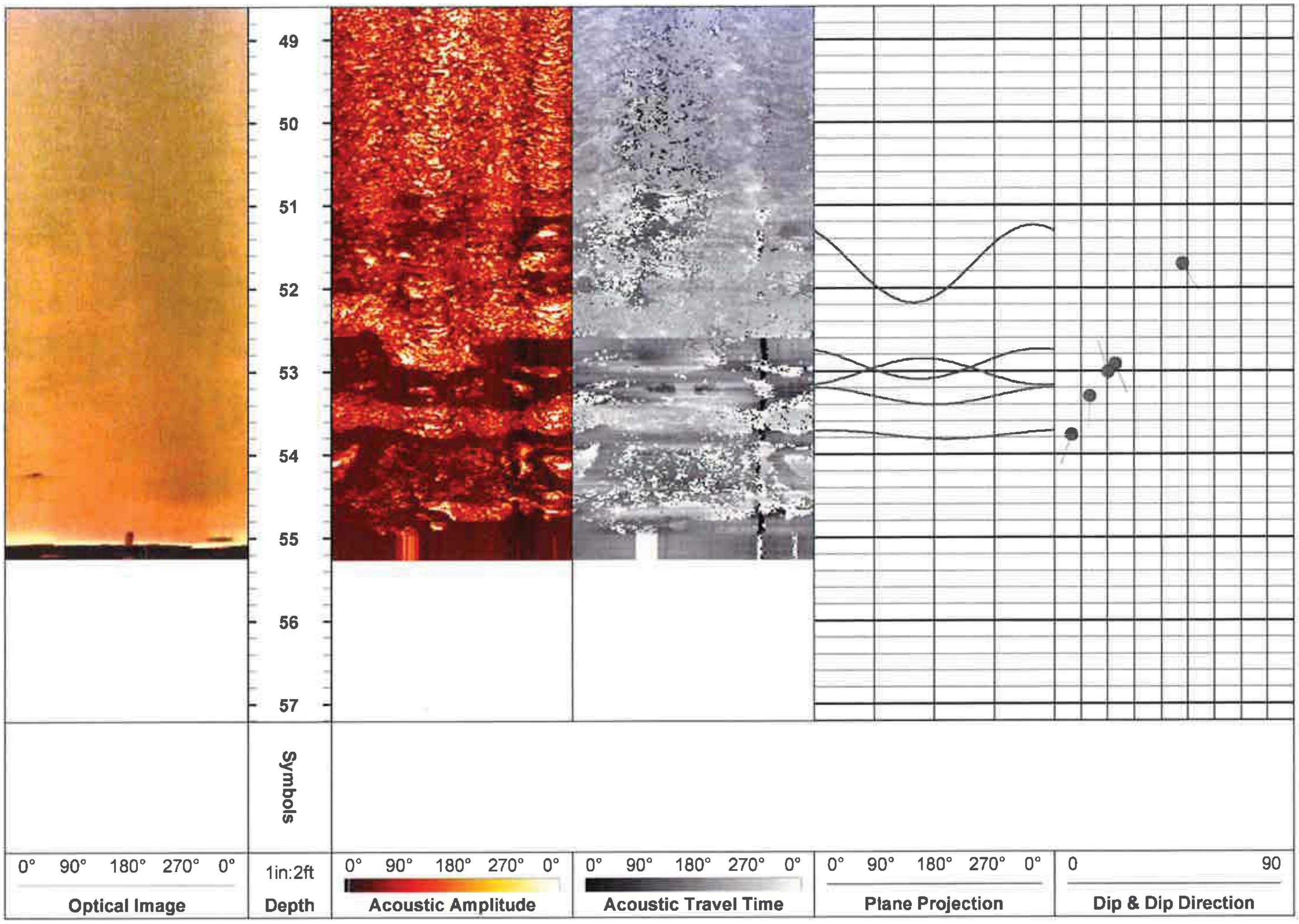
- Part. Open Fract

Optical Image	Depth	Acoustic Amplitude	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
	Symbols				

5
6
7


8
9
10
12
13
14
15
16
17
18
19
20
21
23
24
25
26
27


29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48


49
50
51
52
53
54
55
56
57
Symbols
0° 90° 180° 270° 0°
Optical Image
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Amplitude
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0
90
Dip & Dip Direction