86 Quartz Drive
Bellefonte, Pennsylvania 16823
814.380.7126
doug.mckee@mckeeenviro.com

August 25, 2020

Ms. Jennie Goodyear
ICF International
4000 Vine Street
Middletown, PA 17057

Re: Remedial Action Summary Report
Park Station
29558 Great Cove Road
Fort Littleton, Fulton County, Pennsylvania
PADEP Facility ID No. 29-60120
USTIF Claim Number: 20190039

Jennie:

McKee Environmental, Inc. (MEI) is pleased to submit this summary report detailing the recent remedial actions completed at the Park Station facility located in Fort Littleton, PA (site).

BACKGROUND

The site potable well has been impacted by a fuel release on the property. Prior to converting the well to a recovery well for the proposed treatment system and installation of a replacement potable well, MEI recommended logging the well using borehole geophysics to collect subsurface data. ARM Geophysics of Hershey, Pennsylvania (ARM), performed the logging of the potable well. Details of the test and the data is presented below.

MEI also recommended installation of carbon treatment units on the potable water line per PaDEP request.

POTABLE WELL LOGGING

The main objective of the well logging was to determine characteristics of the well construction along with geologic data from the exposed bedrock. On August 8, 2020, ARM personnel mobilized to the site to perform the geophysical logging of the site potable well. The well pump was removed on August 5th to allow sufficient time for the water to equalize and sediment to settle out allow allow for clear imaging.

The first part of the logging process was the Optical Televiewer (OTV) and consisted of lowering a camera into the well to record images. The video was interpreted by the geophysicist during the logging and determined that the well was approximately 63 feet below ground surface as denoted by the finish floor elevation. The well casing itself begins approximately three feet below the finished floor, but the floor was used as ground surface as it is proximal to the top of well casing of MW-1 located outside of the site convenience store.

Upon review, the video showed the casing advanced to within an inch or two of the bottom of the borehole. A black viscous material was shown at the very bottom indicating sediment accumulation.

Extending casing to the terminus of a borehole within bedrock is quite unusual as it likely cuts off the water supply fractures. However, at the time of the logging, the static water level was recorded at 21.5 feet below finish floor. Therefore, more than 40 feet of standing water was inside the well.

To verify the video provided by the OTV, ARM utilized a three-arm Caliper tool to verify the inside diameter of the well. The Caliper is a tool with three arms that extend to the interior extents of the borehole and record the diameter. When raised to the surface, the arms continue to record the diameter and typically identify where the open borehole meets the casing and a different measurement is recorded. In this well, the Caliper confirmed the interior of the well was consistently 5.5 inches from bottom to top, further confirming the well was cased throughout.

Finally, ARM performed an Acoustic Televiewer (ATV) test on the well to confirm the data from the previous two tests. The ATV provides an acoustic image of the borehole using ultrasonic pulses transmitted from the tool. This process only works within the standing water column, so it was used from the bottom of the well to approximately 21 feet below finish floor. As a result, the ATV confirmed that the well is cased to at least that extent.

Please see the attached ARM report complete with logs and further explanation.

POTABLE WELL TREATMENT

In its approval of the submitted remedial action plan, the PADEP required treatment be installed on the potable water line while it remains in use until a replacement well can be installed. Furthermore, the impacted well should be converted to a recovery well for the proposed groundwater treatment system.

On August 19, 2020, MEI installed the two granulated activated carbon units in series along the potable water line inside the site convenience store. The potable water line had to be cut and transitioned from existing type and diameter to match that of the units and back again to the potable line. Once complete, the potable water pump was activated and the water was treated prior to discharge throughout the convenience store. The raw water contained a black viscous material with a strong fuel odor as observed during the geophysical logging of the well. The treated water appeared clear with no odor.

CONCLUSIONS AND RECOMMENDATIONS

The results of the geophysical logging of the potable well indicate that the borehole is drilled to approximately 63 feet below finish floor elevation and includes 5.5 inch diameter casing all the way to the bottom. Groundwater enters the well presumably from the small area beneath the casing and fills the well to approximately 21 feet below finished floor. The owners stated that although they do not use a large volume of water, the well has not been dewatered since they have operated the site.

Based on the fact that the water within the potable well is impacted as confirmed by the fuel odor and black viscous mater at the bottom of the borehole, it is believed that the shallow overburden groundwater that has been characterized is migrating through the bedrock and into the potable well. The bedrock interface has been identified at approximately 30 feet below ground surface in groundwater monitoring wells located a short distance from the potable well behind the site building. Therefore, it is believed that the shallow groundwater plume has migrated through approximately 30 feet of bedrock and into the potable well drilled approximately 63 feet below ground surface. The information provided from this geophysical logging will be used in designing the specifics for the replacement potable well at its PADEP-approved location.

It is unknown what affect the potable water will have on the carbon treatment units. Should significant siltation accumulate on the carbon surface it could clog the unit and not allow for passage through or limit the required residence time. The units will be monitored weekly during the groundwater well maintenance.

The carbon treatment units will remain in place until the replacement well is installed and connected to the site water supply line. Following completion, the carbon units will be utilized in the proposed groundwater treatment system.

MEI appreciates the opportunity to work with you and submit this summary report. Should you have any questions or comments regarding this request, please contact me by phone: 814.380.7126 or by email: doug.mckee@mckeeenviro.com.

MCKEE ENVIRONMENTAL, INC.

DSMcK

Douglas S. McKee, MEPC, P.G.

cc: Chris O'Neill

Enclosures

August 19, 2020

Mr. Doug McKee
McKee Environmental, Inc.
86 Quartz Dr
Bellefonte, PA 16823

Subject: Results of Geophysical Borehole Logging
One Borehole (Potable Well)
Ft. Littleton, PA
ARM Project: 20010503

Dear Mr. McKee,

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 August 8, 2020. The objectives of the logging were to identify well structure. 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
3-Arm Caliper
Optical Televiewer (OTV)
Acoustic Televiewer (ATV)

ARM has provided a summary of these logging methods in Attachment A. ARM acquired all the logs using a Matrix acquisition system 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 (floor of foundation) 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 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.

RESULTS AND DISCUSSION

The acoustic and optical televiewer images show evidence of casing to bottom of well. The 3-arm caliper indicates the potable well has a diameter of 5.5 inches. Natural gamma and acoustic caliper logs were extracted from the televiewer logs to provide additional data to determine the depth for the bottom of casing. Bottom of casing indicators are typically (but not limited to) a deviation in the caliper, acoustic caliper, and/or natural gamma data sets. A transition of acoustic amplitude in acoustic log, and/or visual transition in the optical log are evidence of this transition from casing to open borehole. None of these indicators were observed in the data sets.

Depth to the top of water was approximately 21.5 feet and casing joints can be seen in the acoustic amplitude log at approximately 22.3 and 43.2 feet.

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Voice: (717) 533 - 8600 • Fax: (717) 533 - 8605

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

FIGURES

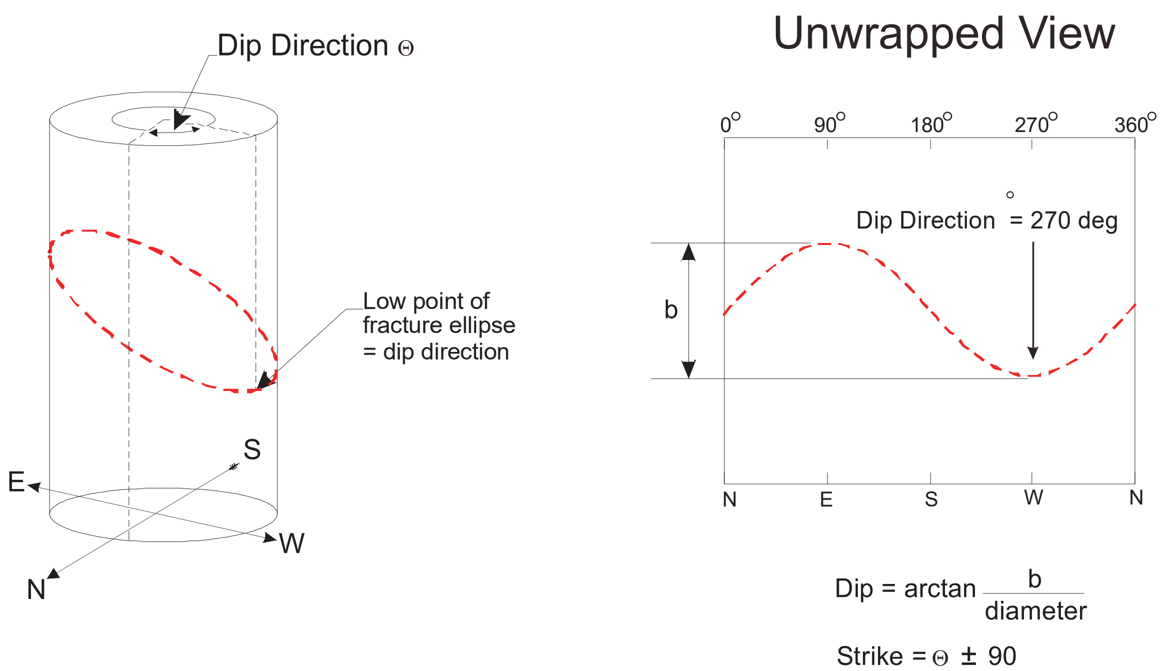

Figure 1: Diagram illustrating unwrapped view of fracture signature.

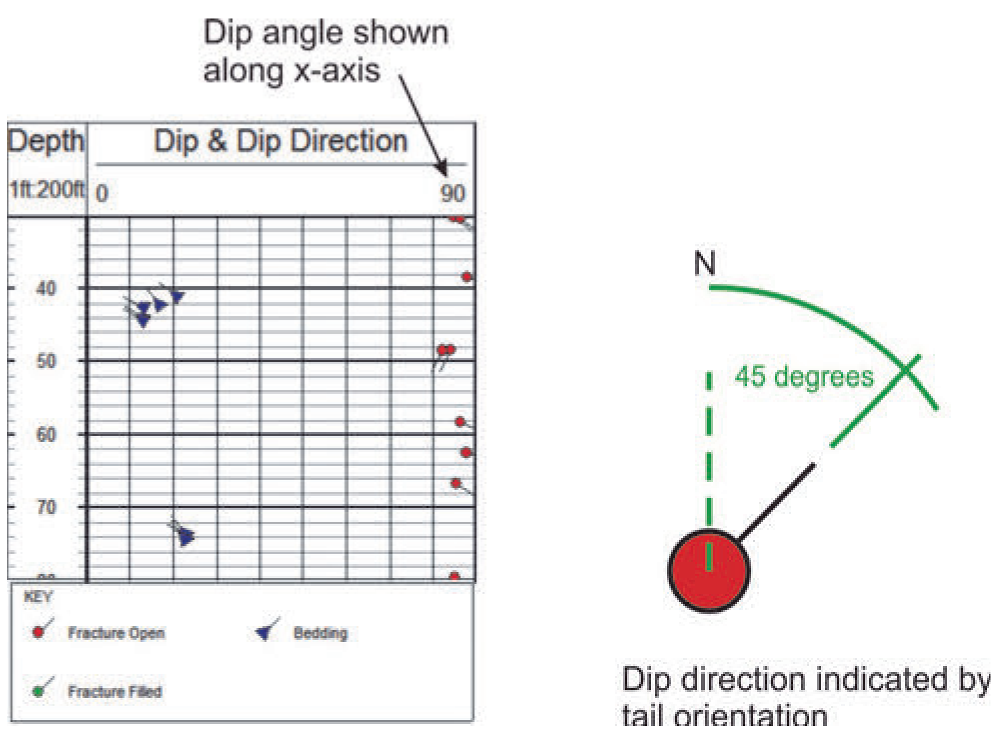

Figure 2: Dip & dip direction determination from the tadpole plot.

1m

ATTACHMENT A
LOGGING METHODS

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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.

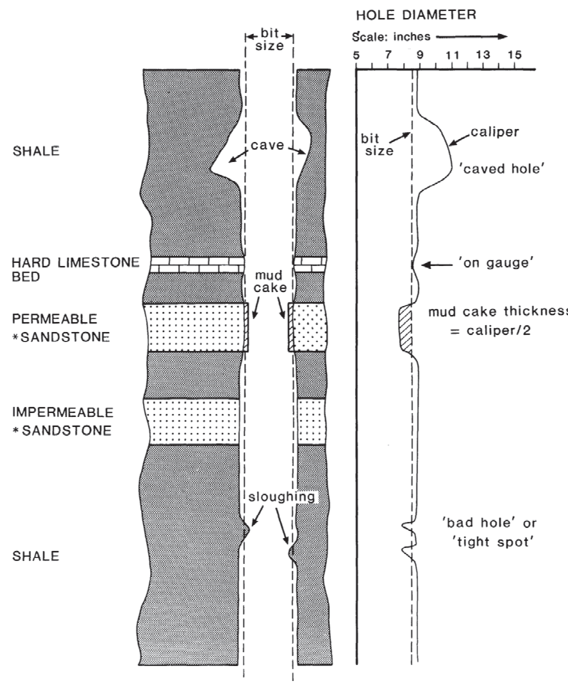


Figure A- 1: The caliper log showing some typical responses. (From Rider, 2002).

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.

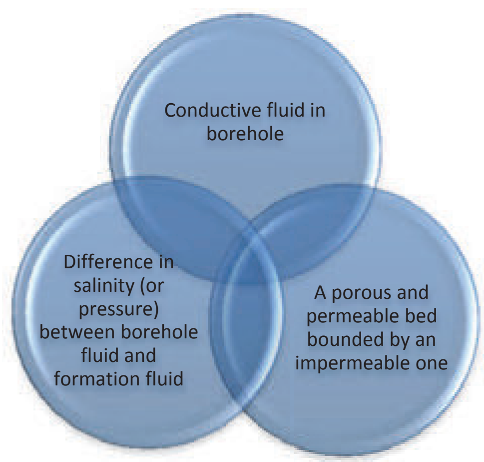


Figure A- 2: Conditions required to produce an SP response.

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.

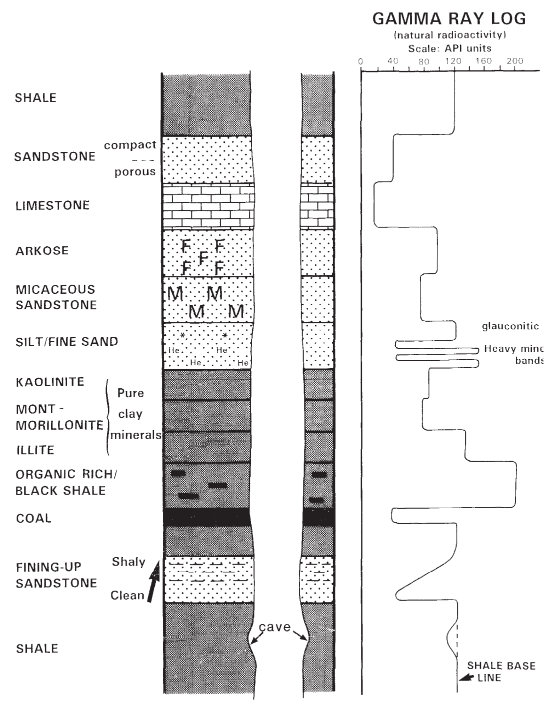


Figure A- 3: Characteristic gamma ray responses. (From Rider, 2002).

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.

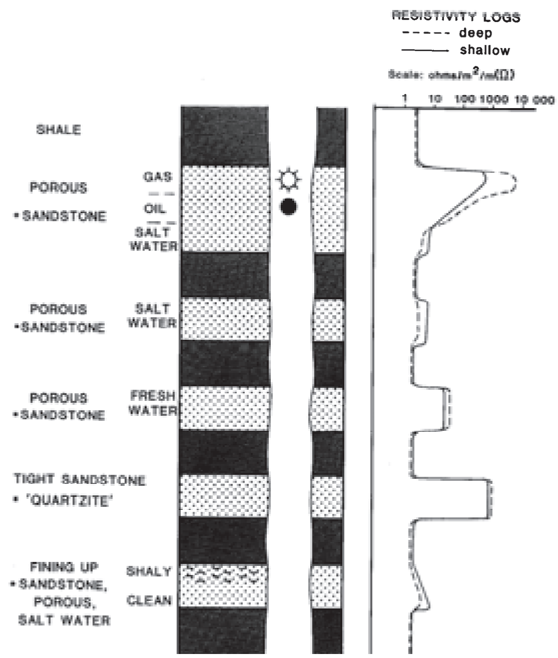


Figure A- 4: Characteristic resistivity responses. (From Rider, 2002)

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.

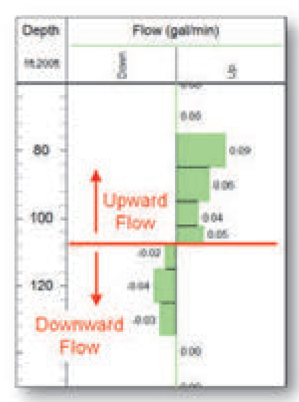


Figure A- 5: Example heat pulse flowmeter log.

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.

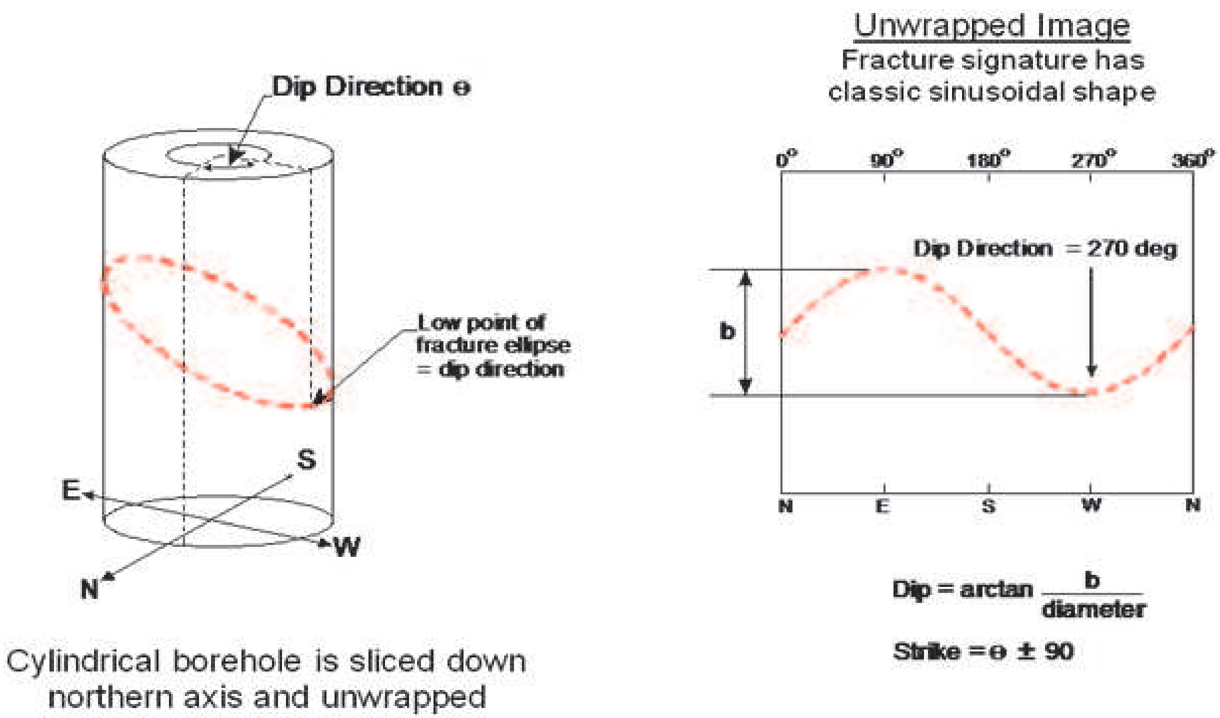


Figure A- 6: Schematic showing the sinusoidal fracture signature in the unwrapped borehole view.

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.

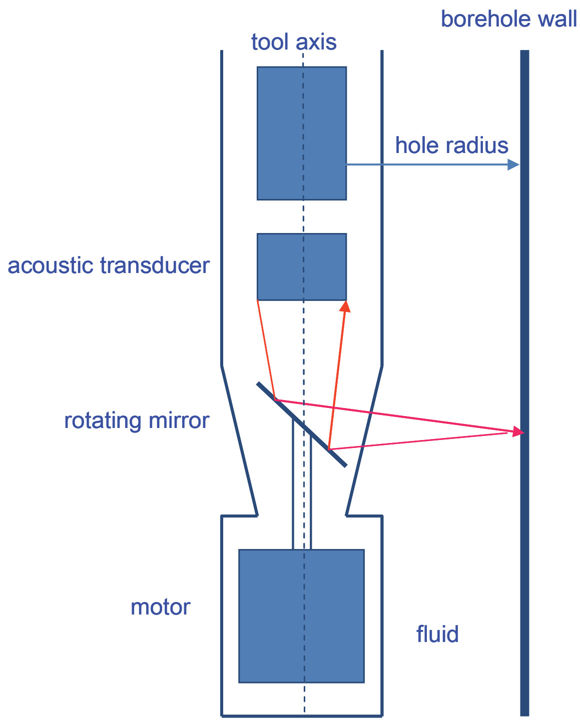


Figure A- 7: Schematic of the acoustic televiewer tool.

ATTACHMENT B
BOREHOLE LOGS

POTABLE WELL

Optical Televiewer
Acoustic Televiewer
3 - Arm Caliper

COMP	McKee Environmental		
WELL	Potable		
SITE	Gas Station		
CITY	Fort Littleton		
CNTY	Fulton		
STATE	PA		
ARM	20010503		

COMPANY:	McKee Environmental	COUNTY:	Fulton
WELL ID:	Potable	STATE:	PA
SITE:	Gas Station	ARM NO.:	20010503
CITY:	Fort Littleton	WEATHER:	

LOCATION:
LATITUDE:
LONGITUDE:
NORTHING:
EASTING:

ACQUSITION SETUP
Portable Gear

PERMANENT DATUM: Ground Surface (Floor) ELEVATION:
LOG MEASURED FROM: Ground Surface (Floor) ABOVE PERM. DATUM:
DRILLING MEAS. FROM: STICK UP: 0

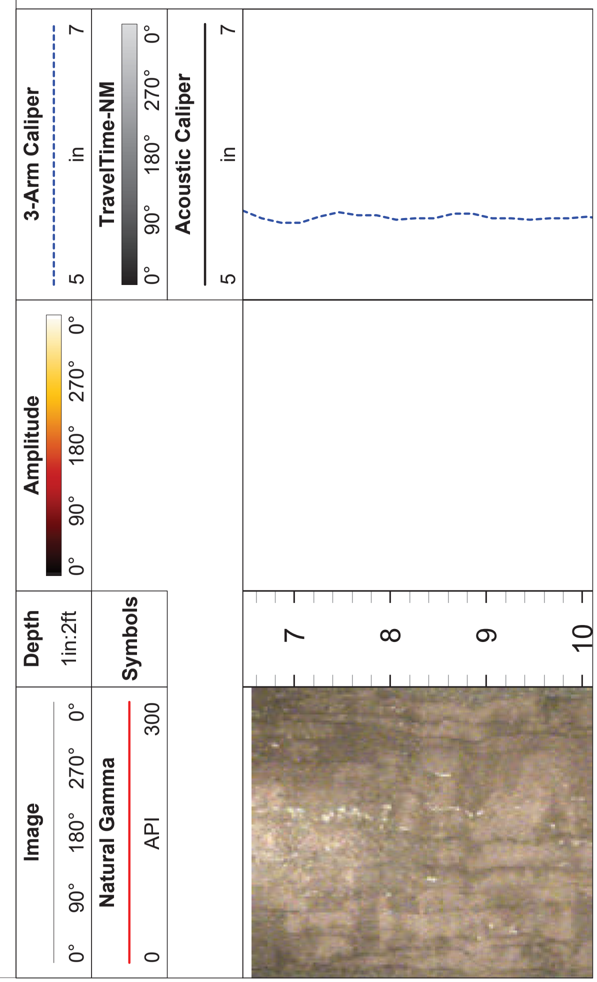
BIT SIZE:
ROD SIZE:

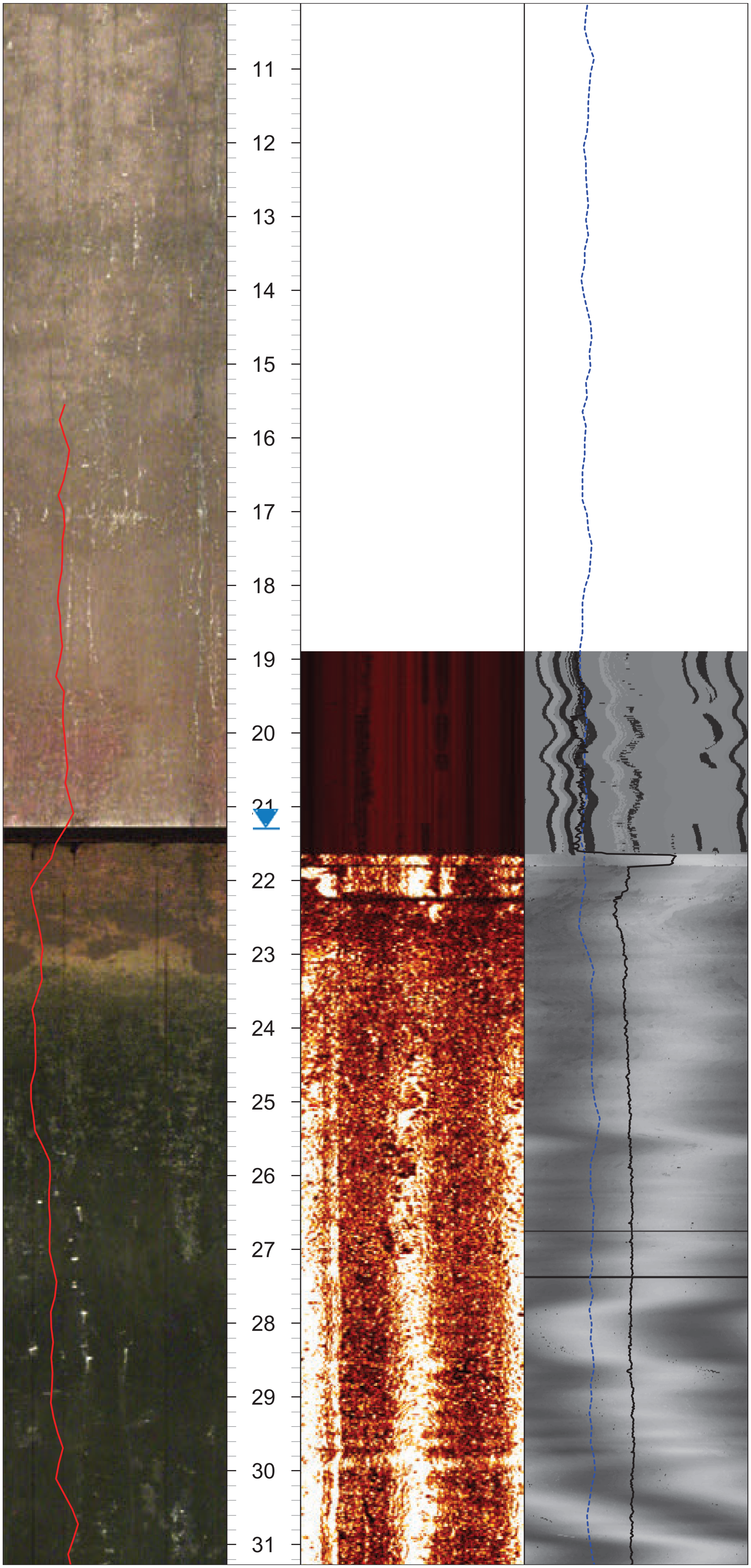
LOGGING DATE	08.11.2020	08.11.2020	08.11.2020		
RUN NO	1	2	3		
TYPE LOG	OTV.GR	CAL	ATV.GR		
DRILLER DEPTH (FT)					
ARM DEPTH (FT)	63.3	63.8	63.6		
BTM LOGGED INTERVAL (FT)	63.3	63.8	63.6		
TOP LOGGED INTERVAL (FT)	6.7	6.7	19.5		
CASING SIZE (IN)	5.5	5.5	5.5		
CASING DEPTH (FT)					
ARM CASING DEPTH (FT)					
FLUID LEVEL IN HOLE (FT)	21.5	21.5	21.5		
MAG. DECLINATION (DEG)					
RECORDED BY	R. Gecelosky	R. Gecelosky	R. Gecelosky		
WITNESSED BY	C. Setlock	C. Setlock	C. Setlock		

REMARKS:

Symbols

Fluid Level

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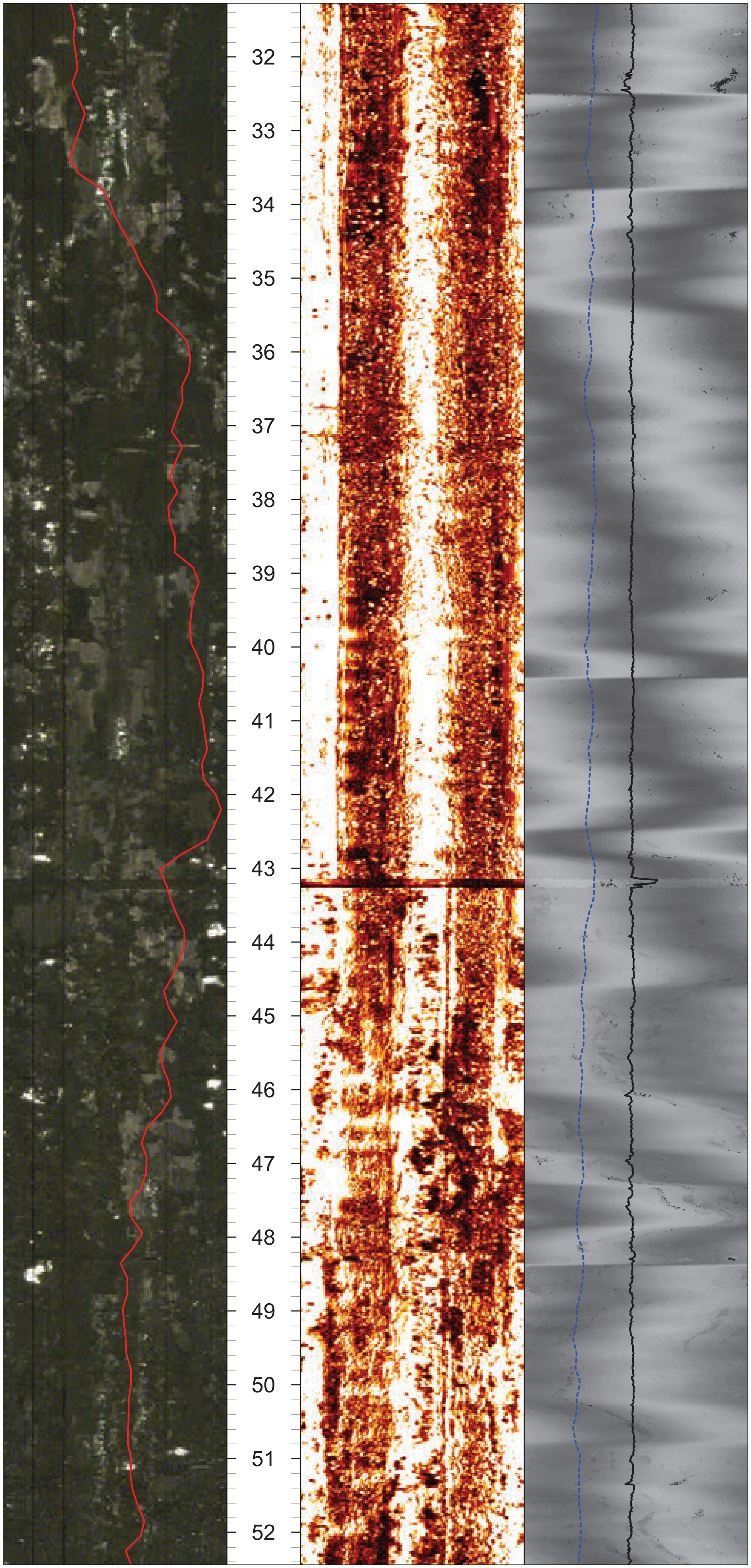
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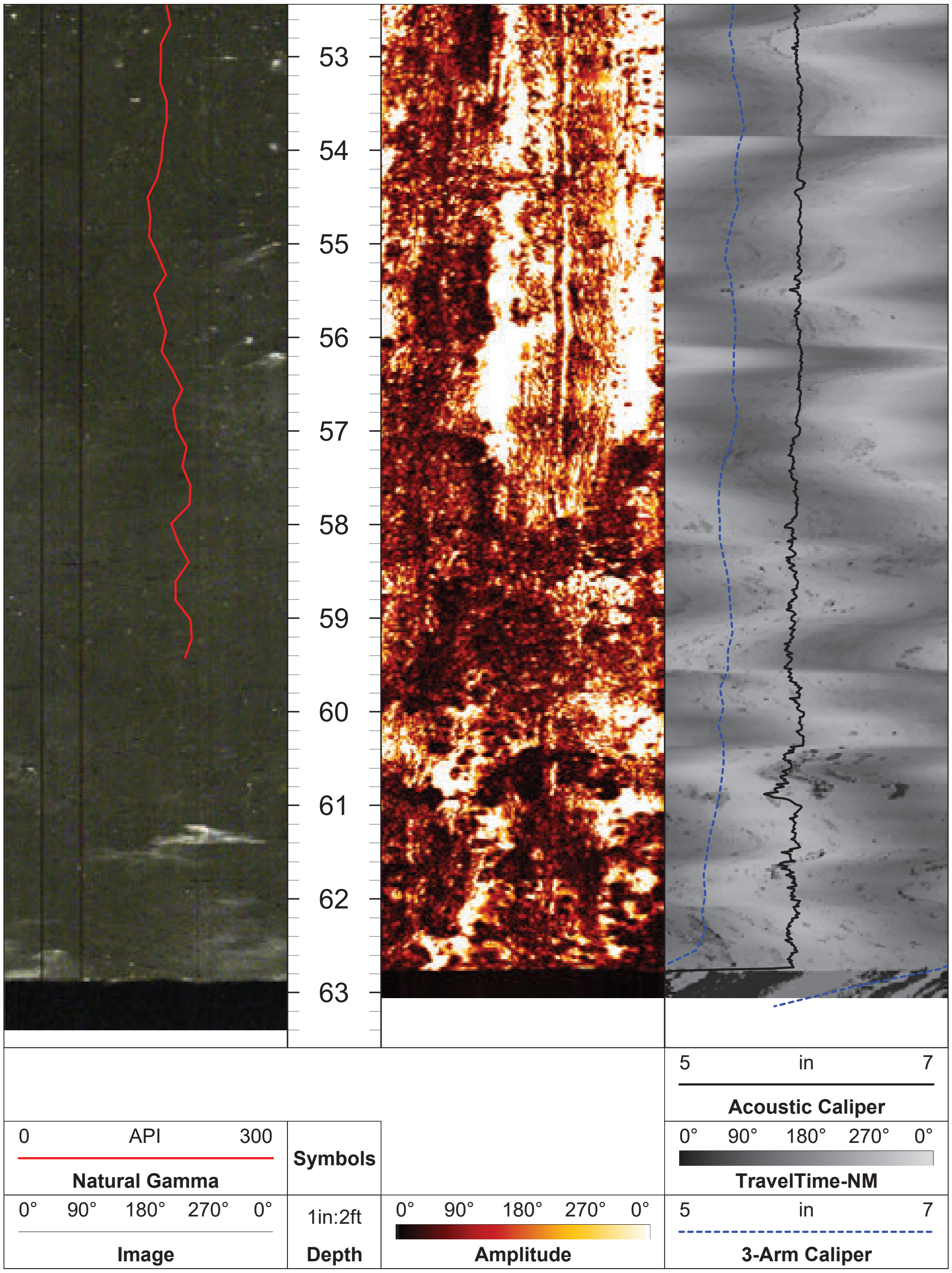
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5 in 7
Acoustic Caliper
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Natural Gamma
Symbols
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TravelTime-NM
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Depth
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Amplitude
5 in 7
3-Arm Caliper