Fugro Engineering Services

Client:	Scottish and Southern Energy PLC	Log Type:	Acoustic Televiewer Log
Borehole:	BH6		

Project: CON103001 Sloy Power Station

Approved: [redacted]

Location: Sloy | Grid Reference: | Elevation:

Drilled Depth:	35m	Date:	05/03/2010
Logged Depth:	33.73m	Recorded By:	[redacted]
Logging Datum:	Ground Level		
Logged Interval:			
Fluid Level:			

Remarks:

North reference is magnetic, Tadpole log and tabulated data is corrected for borehole deviation

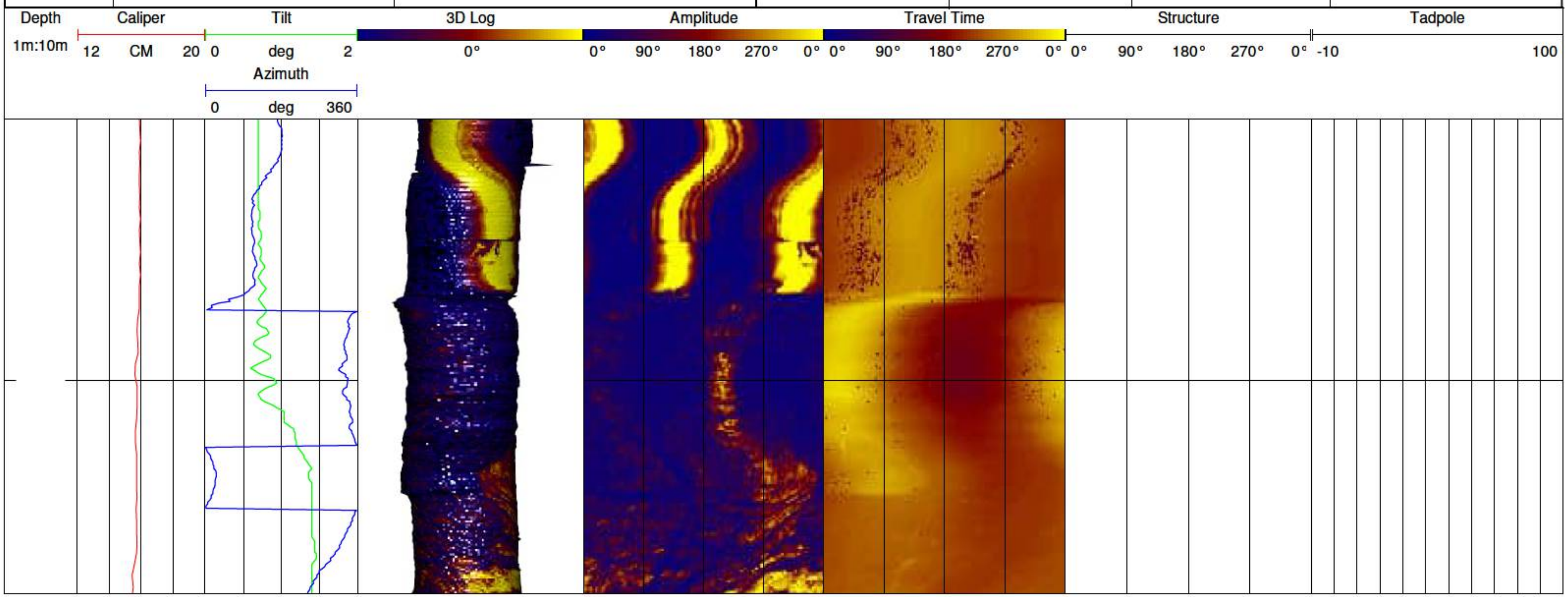
Structure Key: Foliation — Fracture — Vein

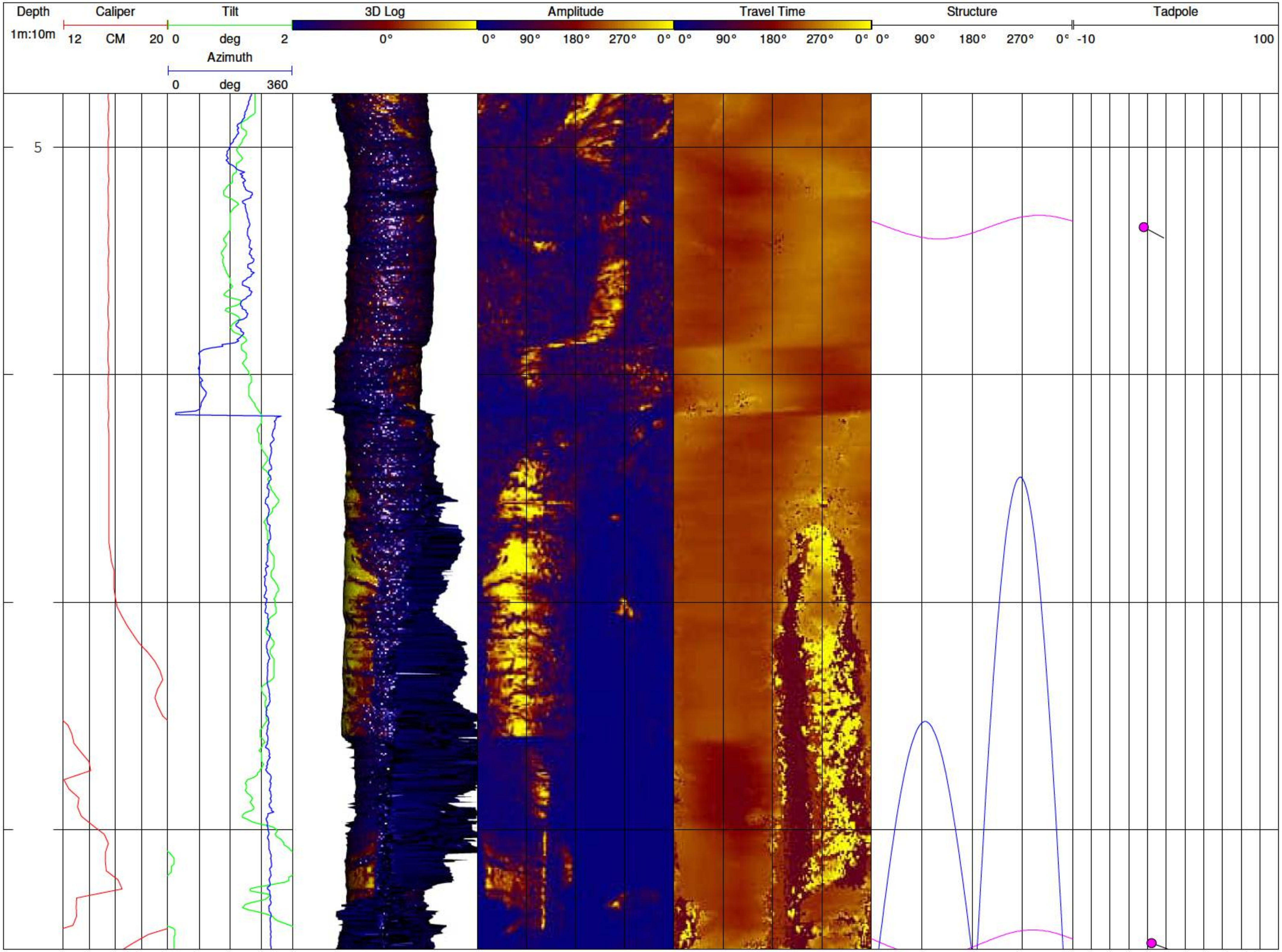
BOREHOLE RECORD

Bit Diameter:	From:	To:
150mm	0m	4.5m
120mm	4.5m	35.0m

CASING RECORD

Type	Size	From	To
Steel	150mm	0m	4.5m

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1m:10m
Caliper
12 CM 20
Tilt
0 deg 2
Azimuth
0 deg 360
3D Log
0°
Amplitude
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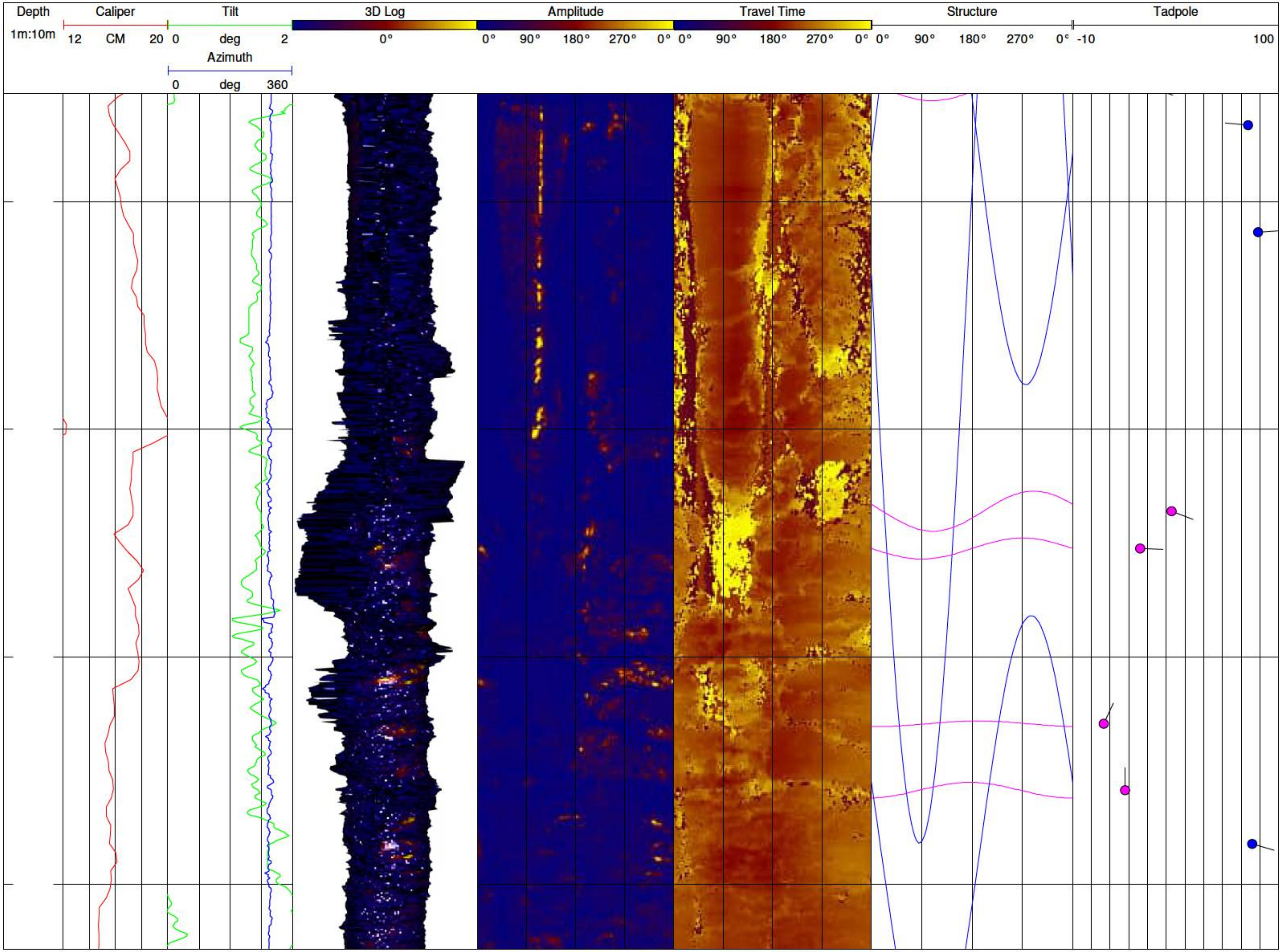
Travel Time
0° 90° 180° 270° 0°
Structure
0° 90° 180° 270° 0°
Tadpole
-10 100
5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Azimuth
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3D Log
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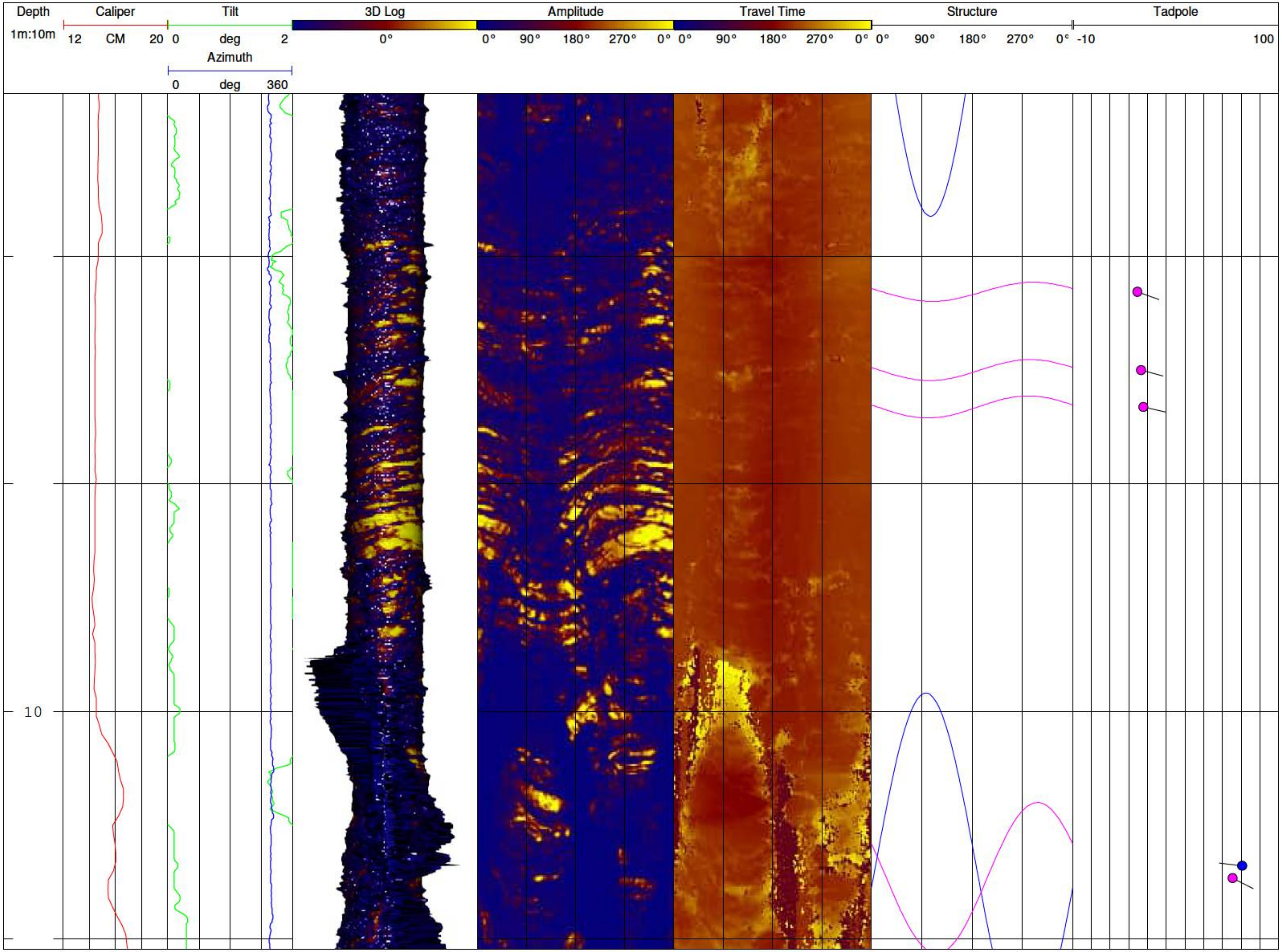
Travel Time
0° 90° 180° 270° 0°
Structure
0° 90° 180° 270° 0°
Tadpole
-10 100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Travel Time
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Structure
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Tadpole
-10 100
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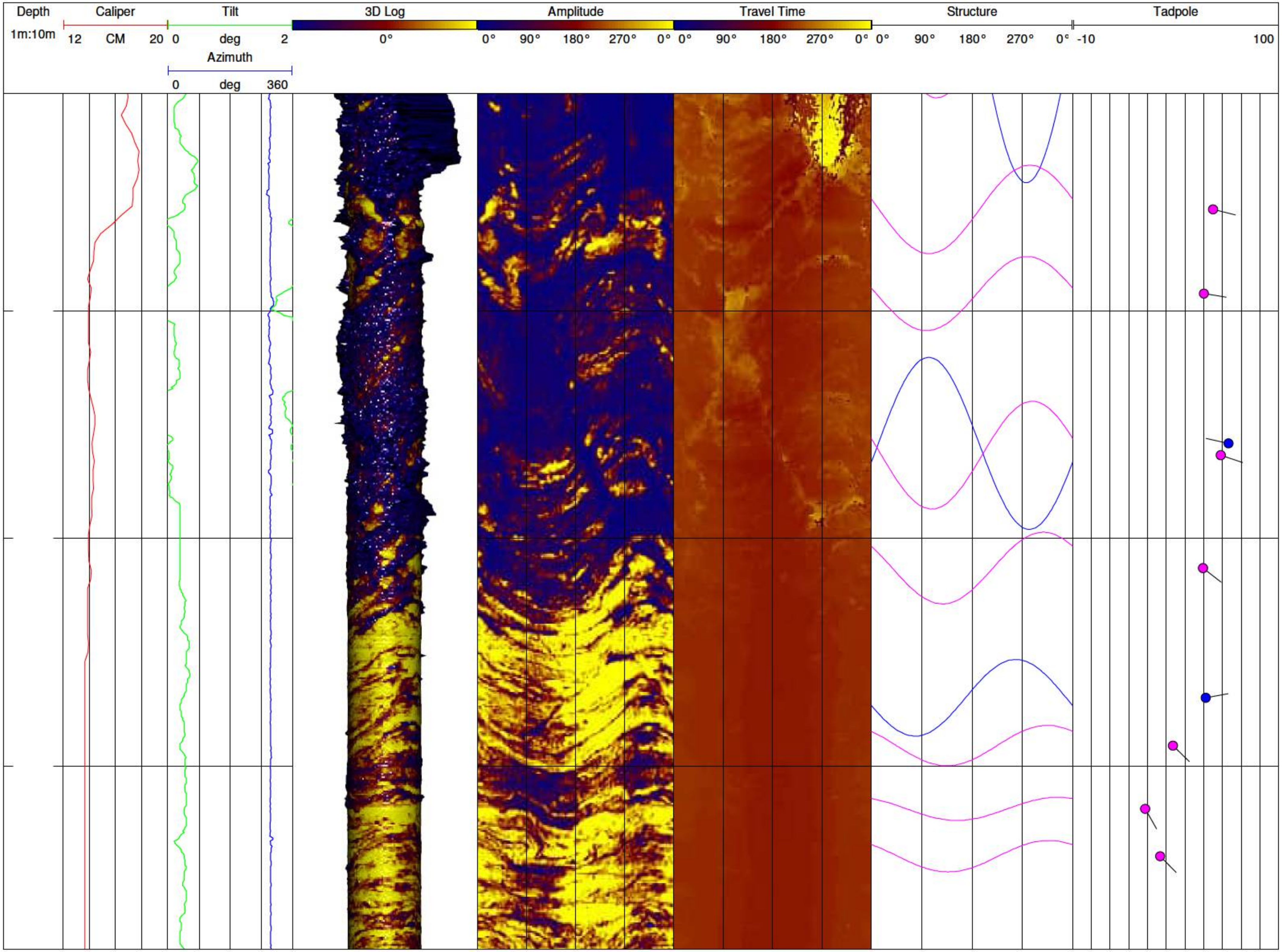

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Caliper
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Azimuth
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3D Log
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Travel Time
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Structure
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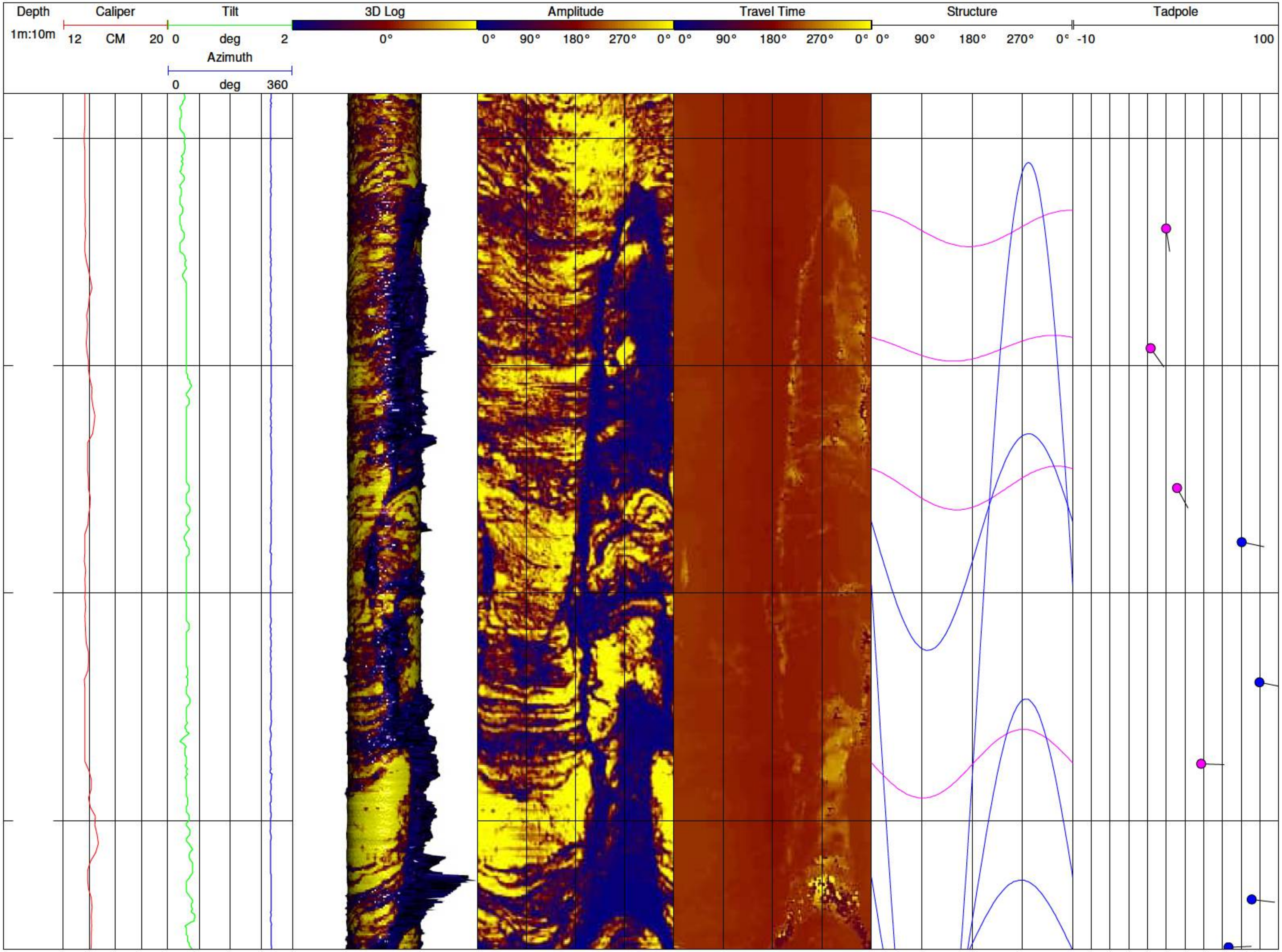
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CM
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Tilt
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deg
2
Azimuth
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3D Log
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Amplitude
0°
90°
180°
270°
0°
Travel Time
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180°
270°
0°
Structure
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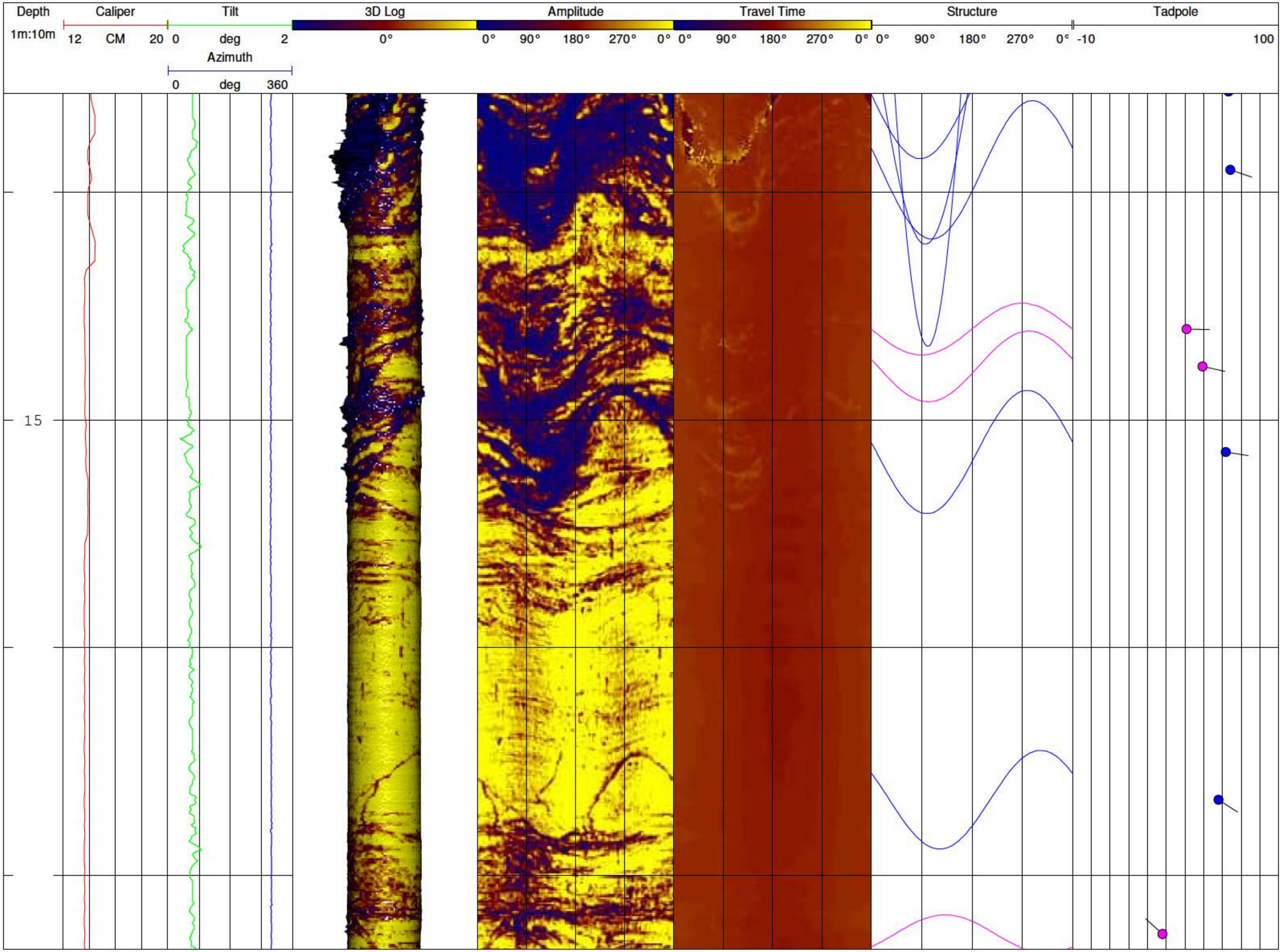
270°
0°
Tadpole
-10
100



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Caliper
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Azimuth
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3D Log
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Travel Time
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Structure
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Tadpole
-10 100
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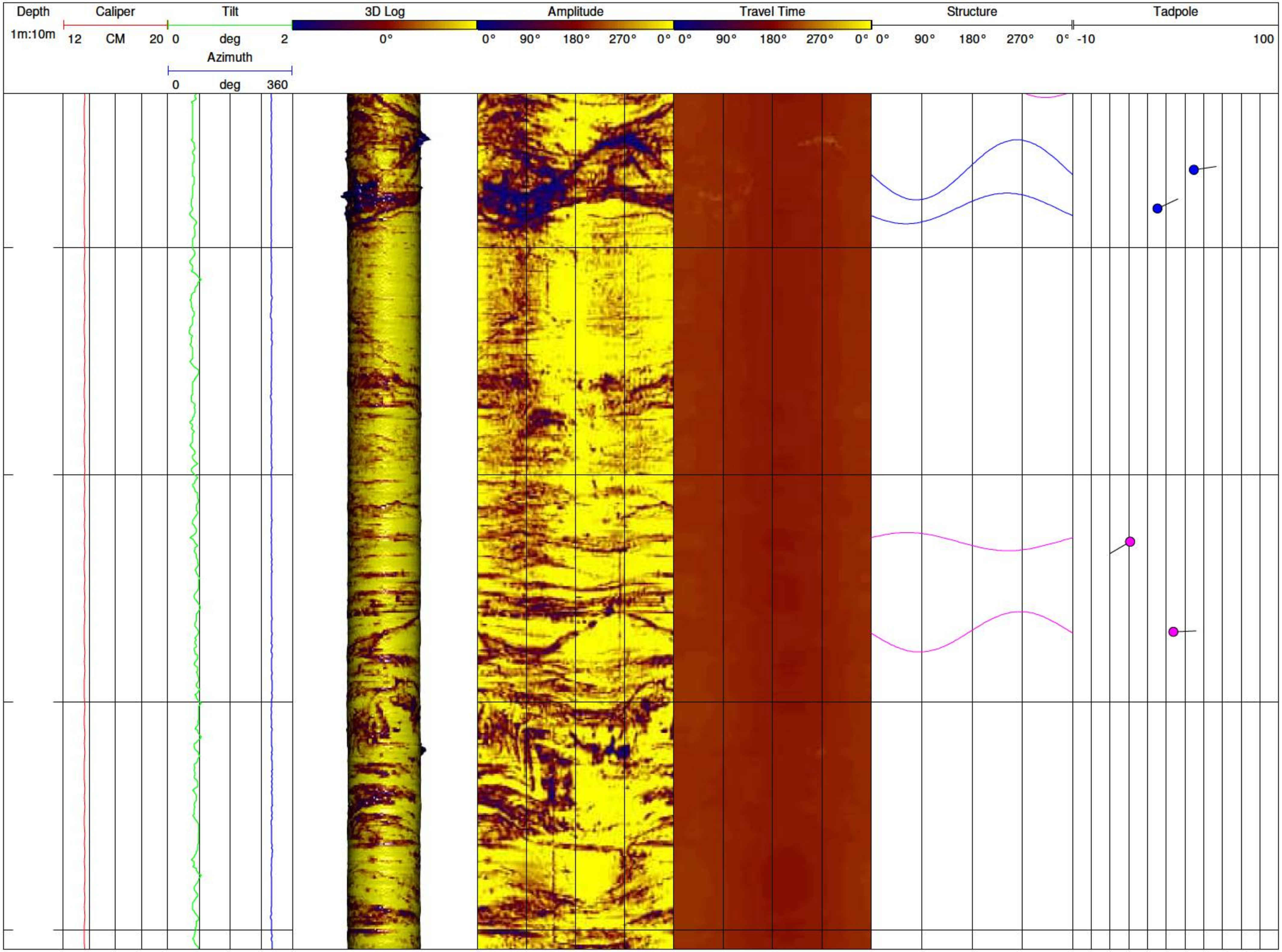
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Structure
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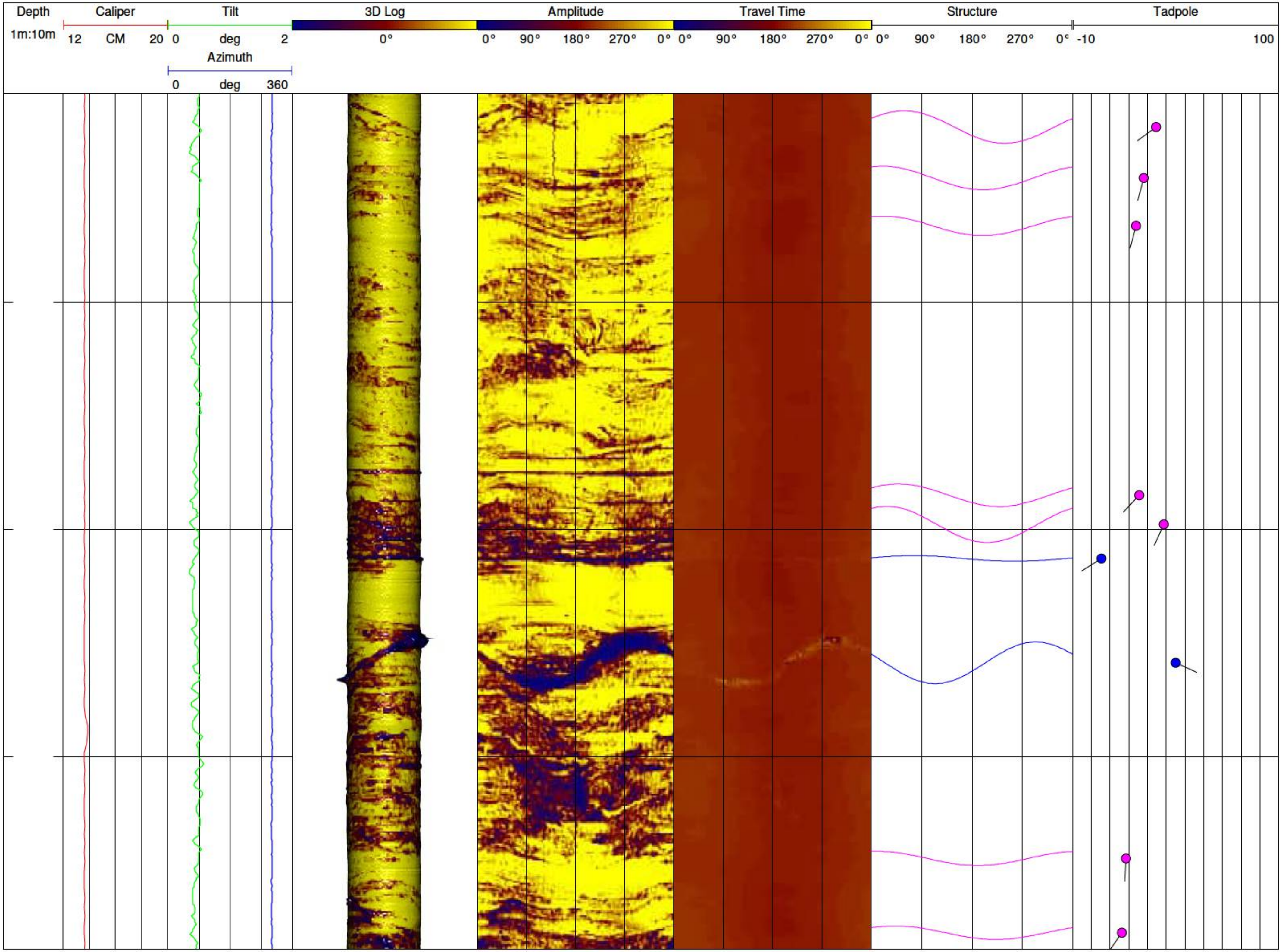
Tadpole
-10 100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Structure
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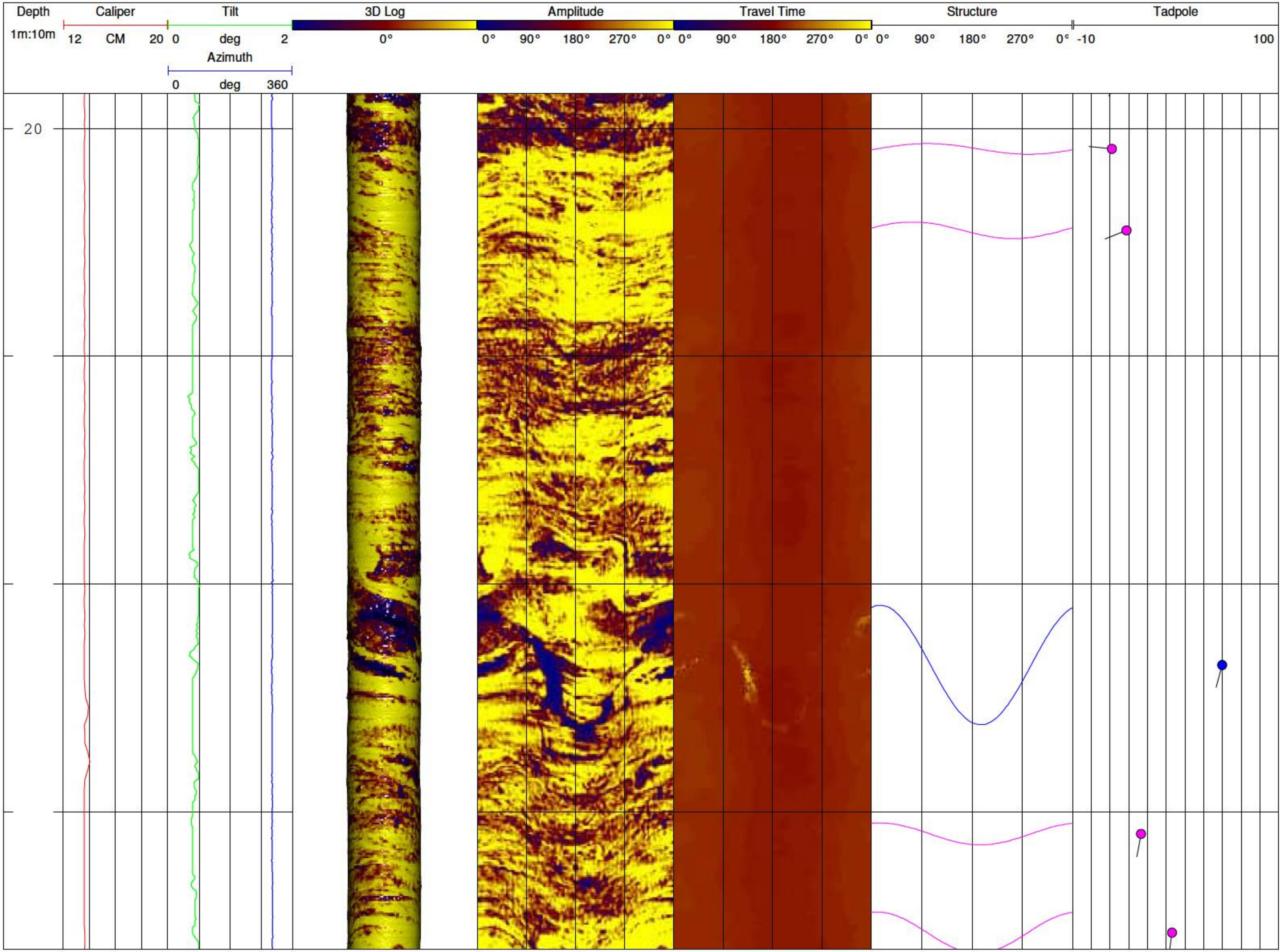
Tadpole
-10 100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Structure
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Tadpole
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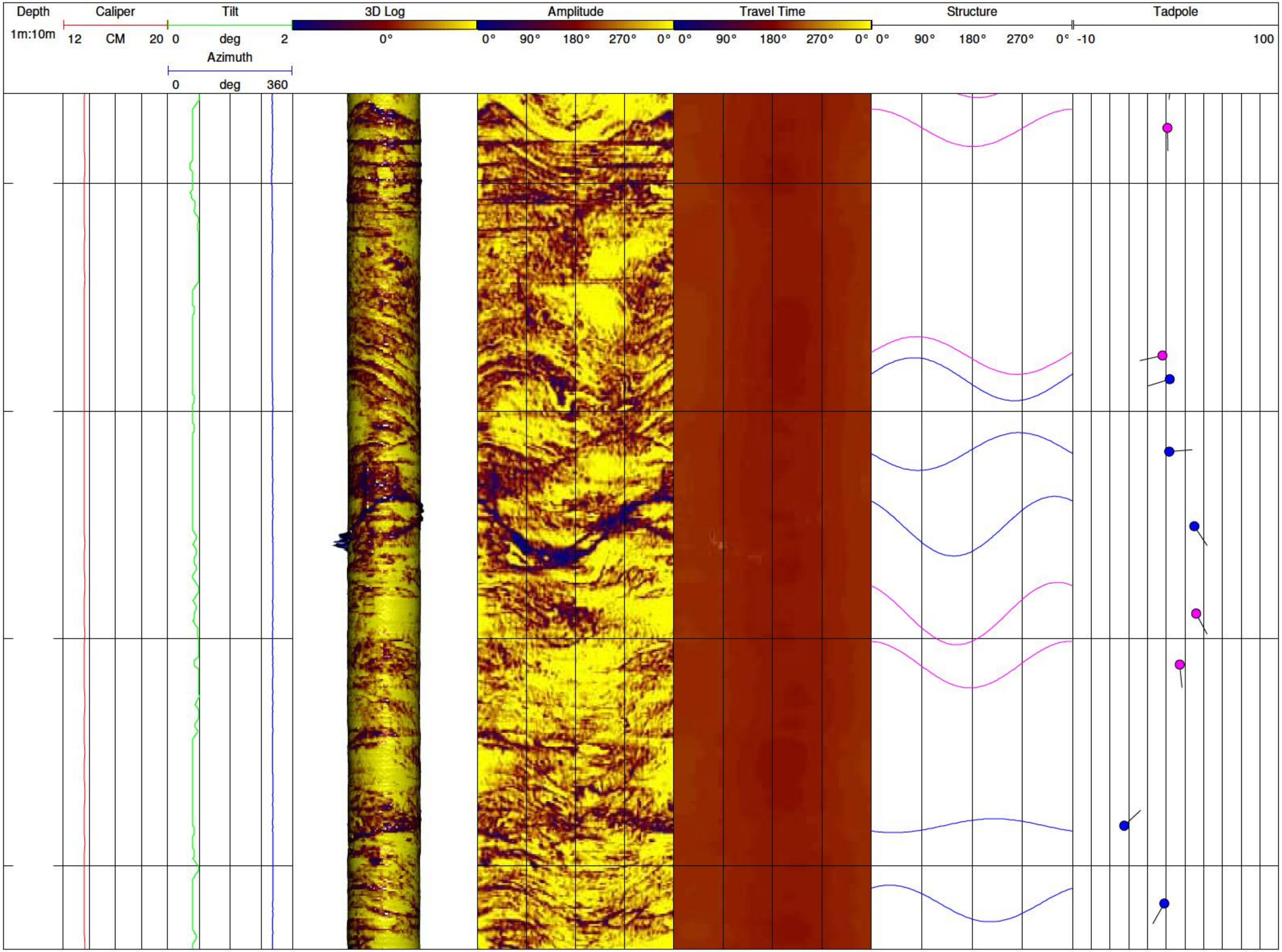

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Structure
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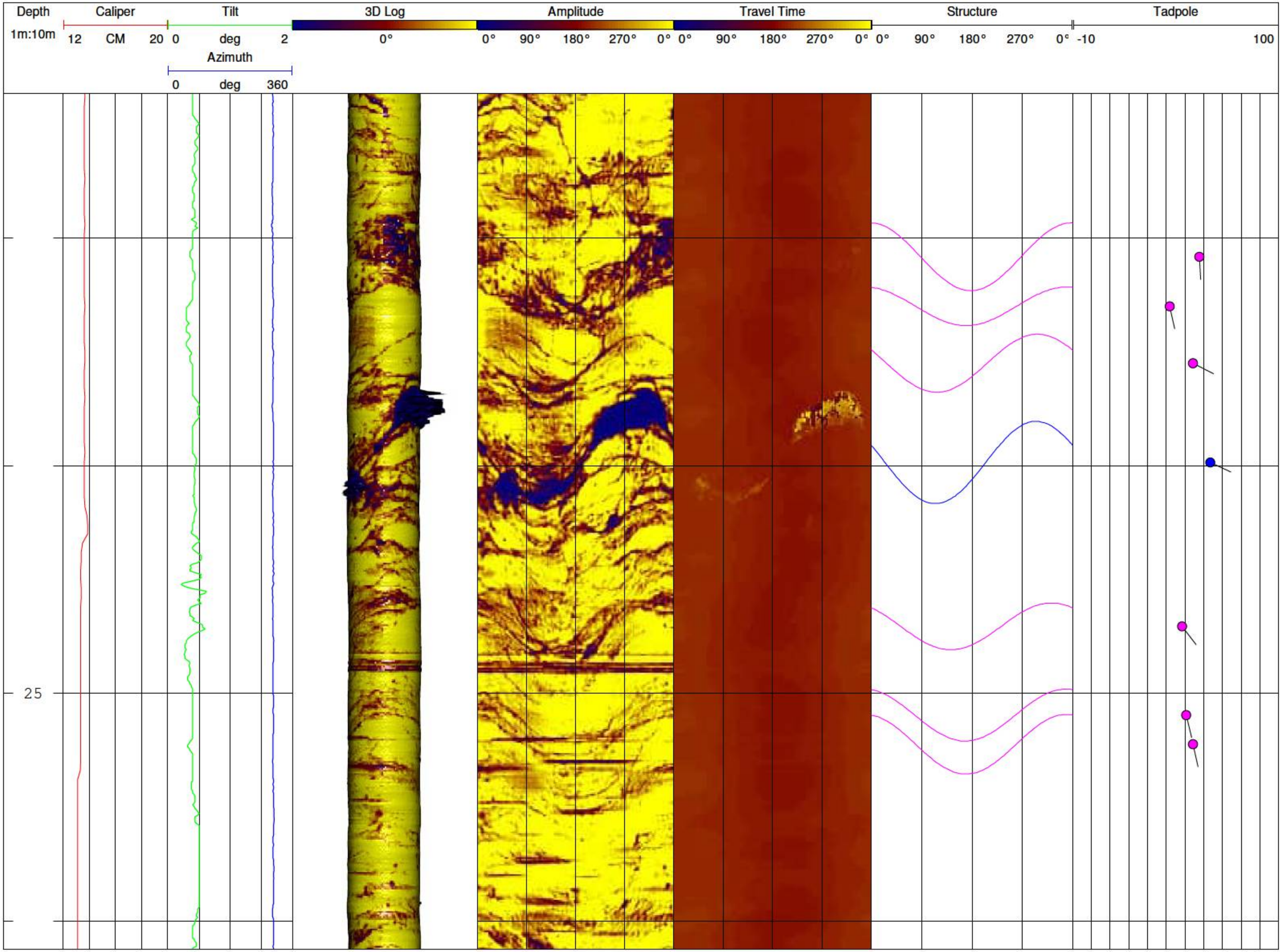
Tadpole
-10 100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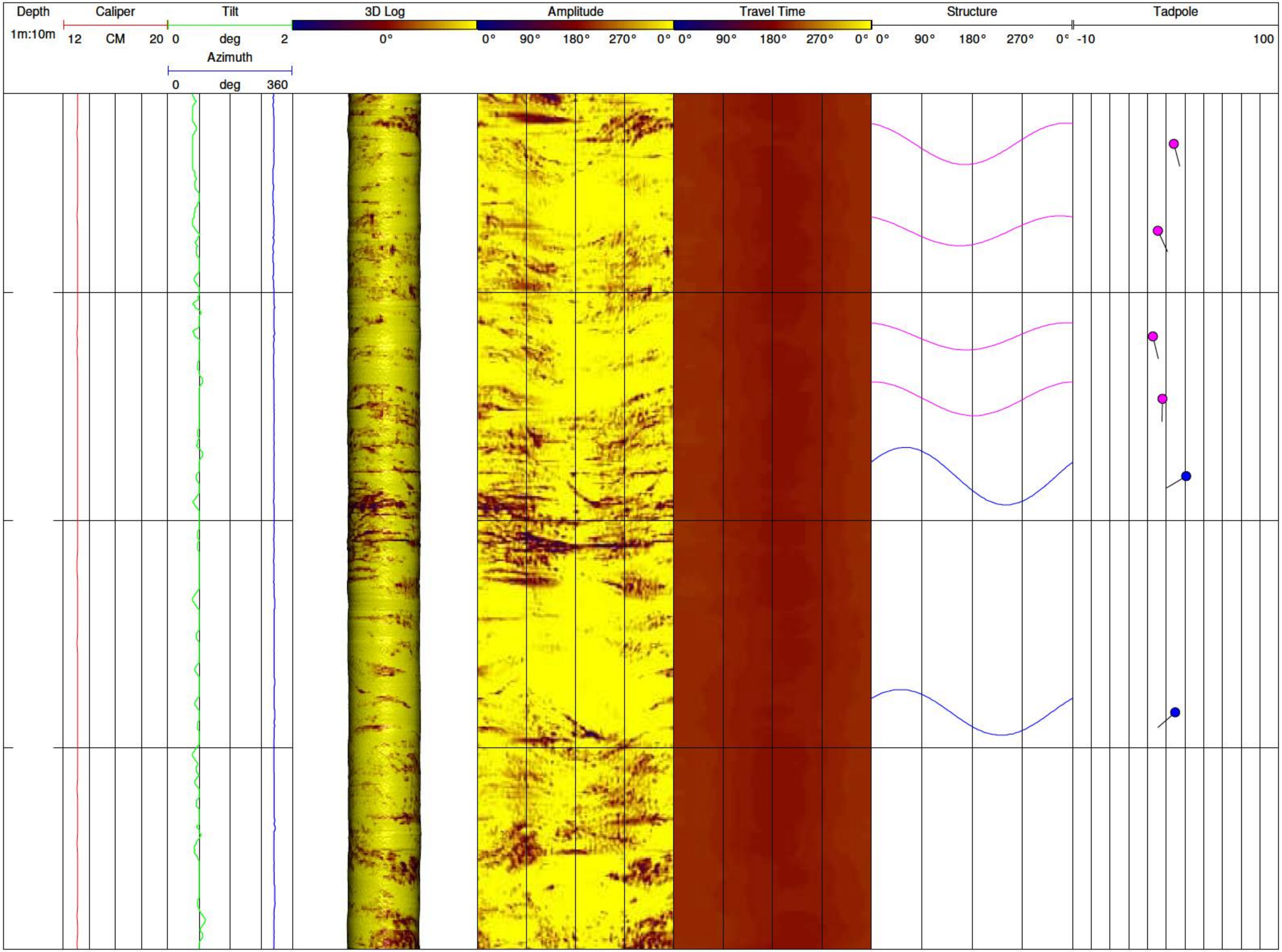
Tadpole
-10 100
25



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Travel Time
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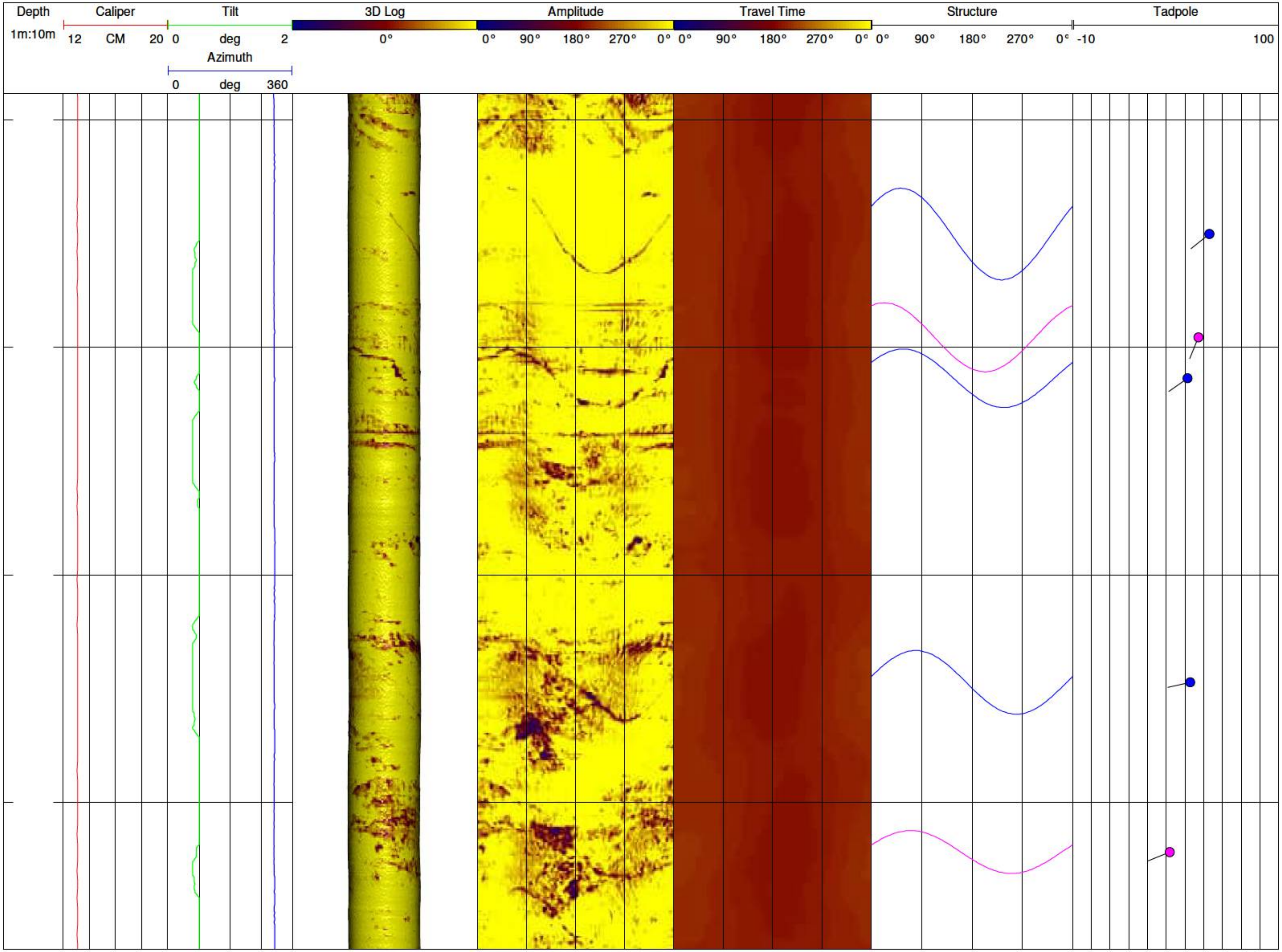
Structure
0° 90° 180° 270° 0°
Tadpole
-10 100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Structure
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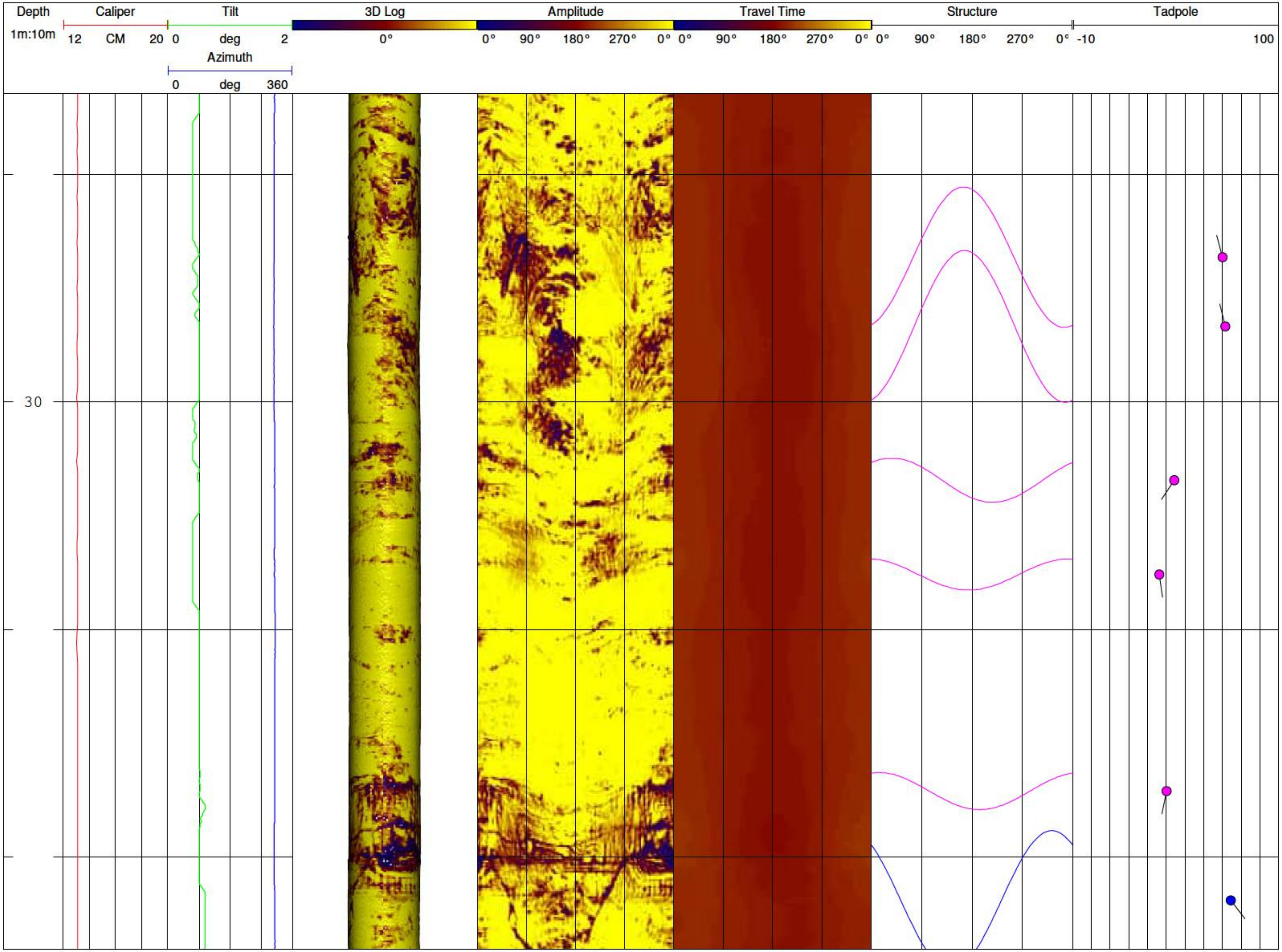
Tadpole
-10 100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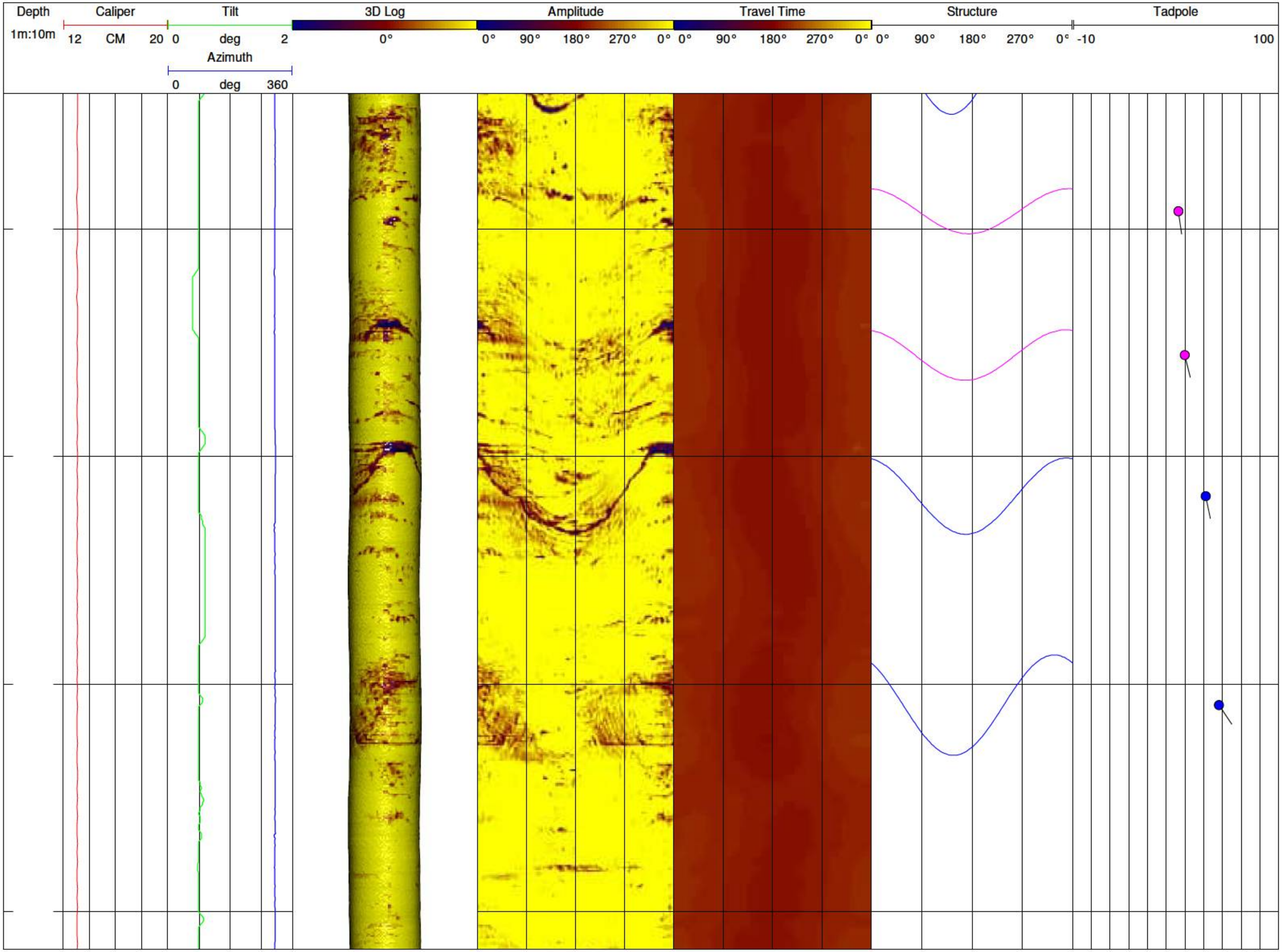
Tadpole
-10 100
30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Azimuth
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Travel Time
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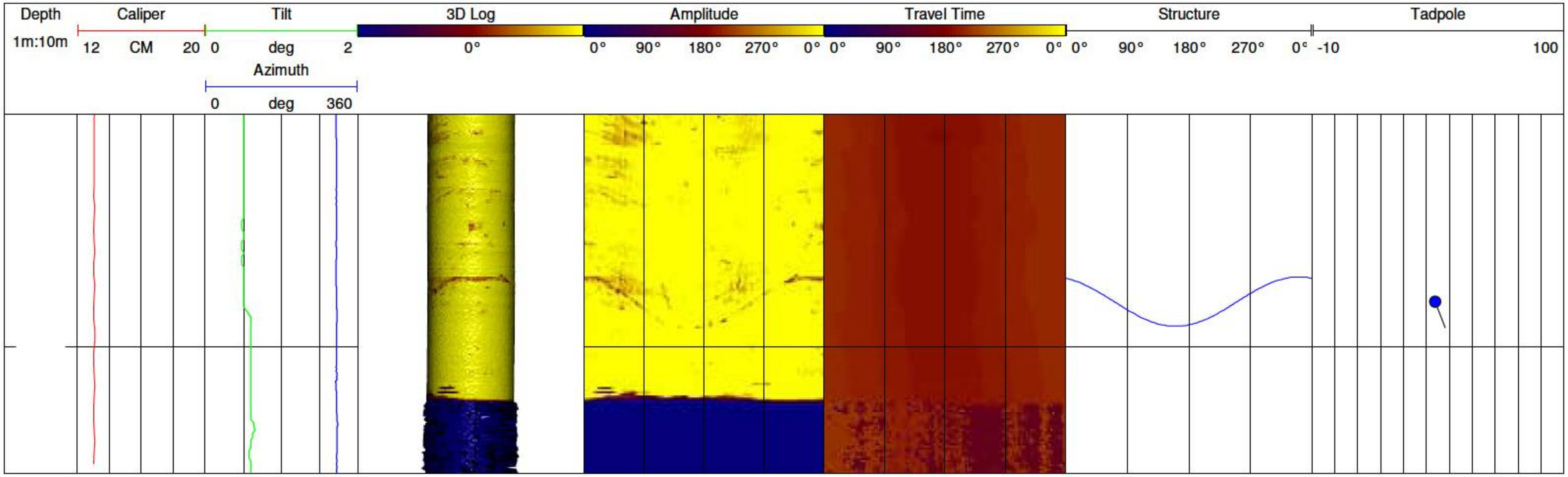
Structure
0° 90° 180° 270° 0°
Tadpole
-10 100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Azimuth
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0°
Amplitude
0° 90° 180° 270° 0°
Travel Time
0° 90° 180° 270° 0°
Structure
0° 90° 180° 270° 0°
Tadpole
-10 100

Fugro Engineering Services

Client:	Scottish and Southern Energy PLC	Log Type: Acoustic Televiewer Log
Borehole:	BH7	

Project: CON103001 Sloy Power Station — Approved: [redacted]

Location: Sloy Power Station — Grid Reference: — Elevation:

Drilled Depth:	8.0m	Date:	04/03/2010
Logged Depth:	7.3m	Recorded By:	[redacted]
Logging Datum:	Ground Level		
Logged Interval:			
Fluid Level:			

Structure Key: Foliation, Fracture, Vein

Remarks:

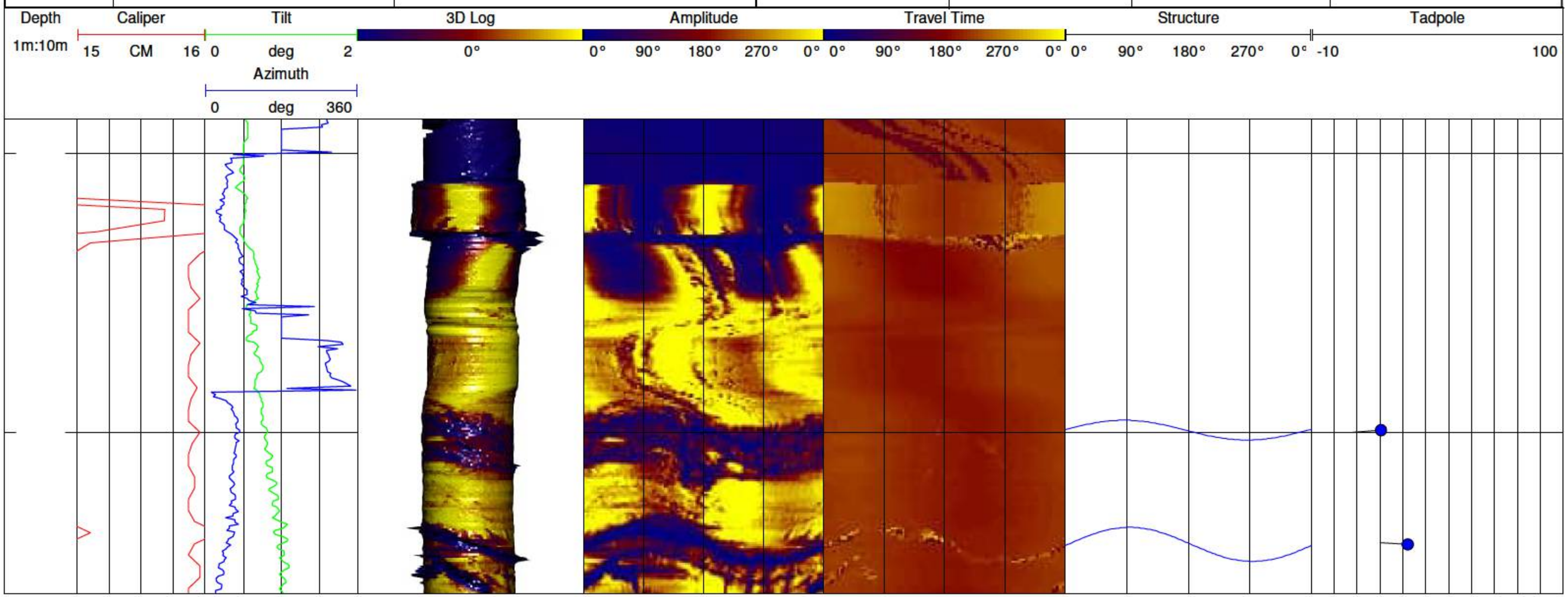
North reference is magnetic, Tadpole log and tabulated data is corrected for borehole deviation

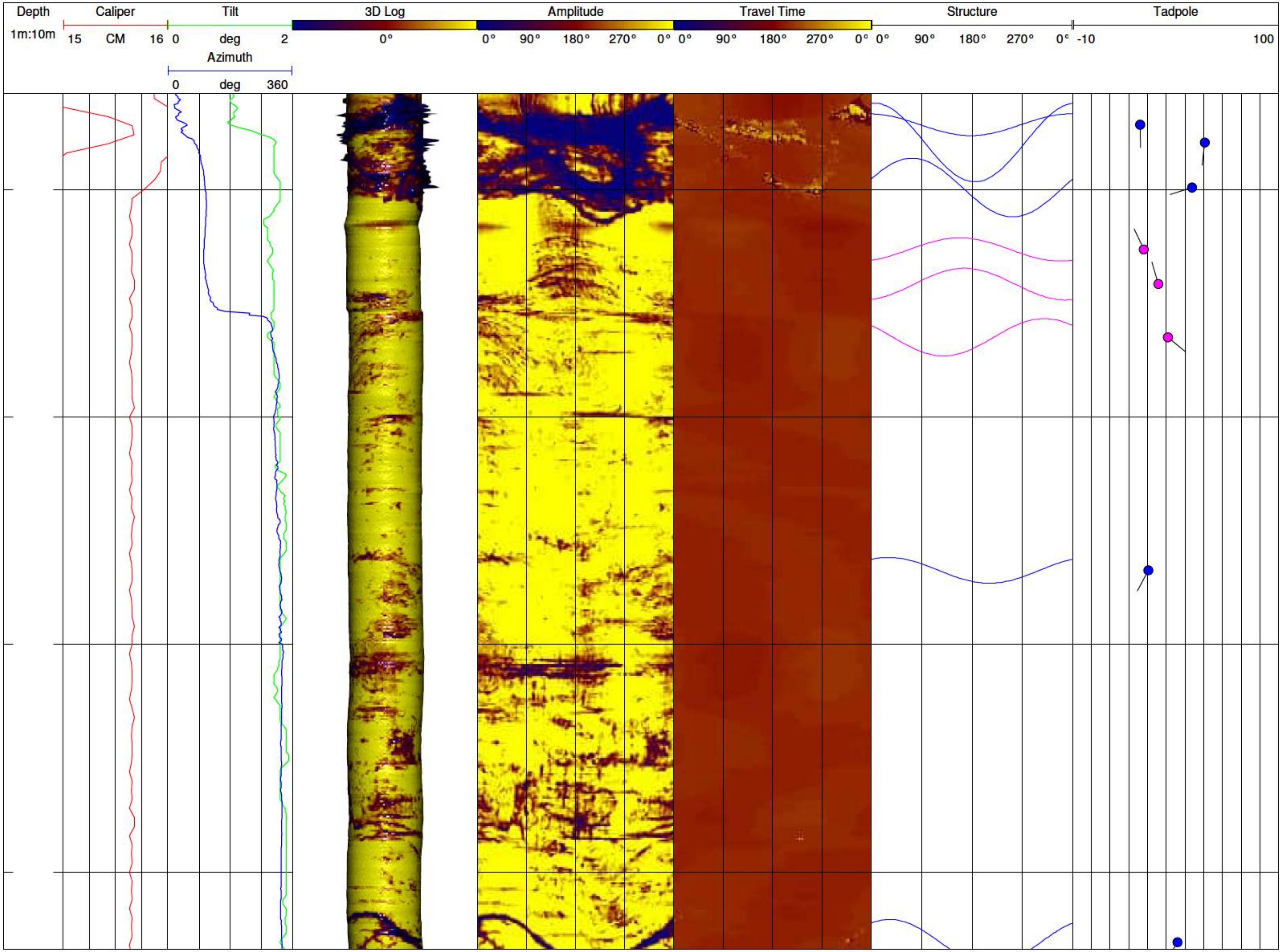
BOREHOLE RECORD

Bit Diameter:	From:	To:
150mm	0m	1.7m
120mm	1.7m	8.0m

CASING RECORD

Type	Size	From	To
Steel	150mm	0m	1.7m




Depth
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Caliper
15
CM
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Tilt
0
deg
2
Azimuth
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deg
360
3D Log
0°
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0°
90°
180°
270°
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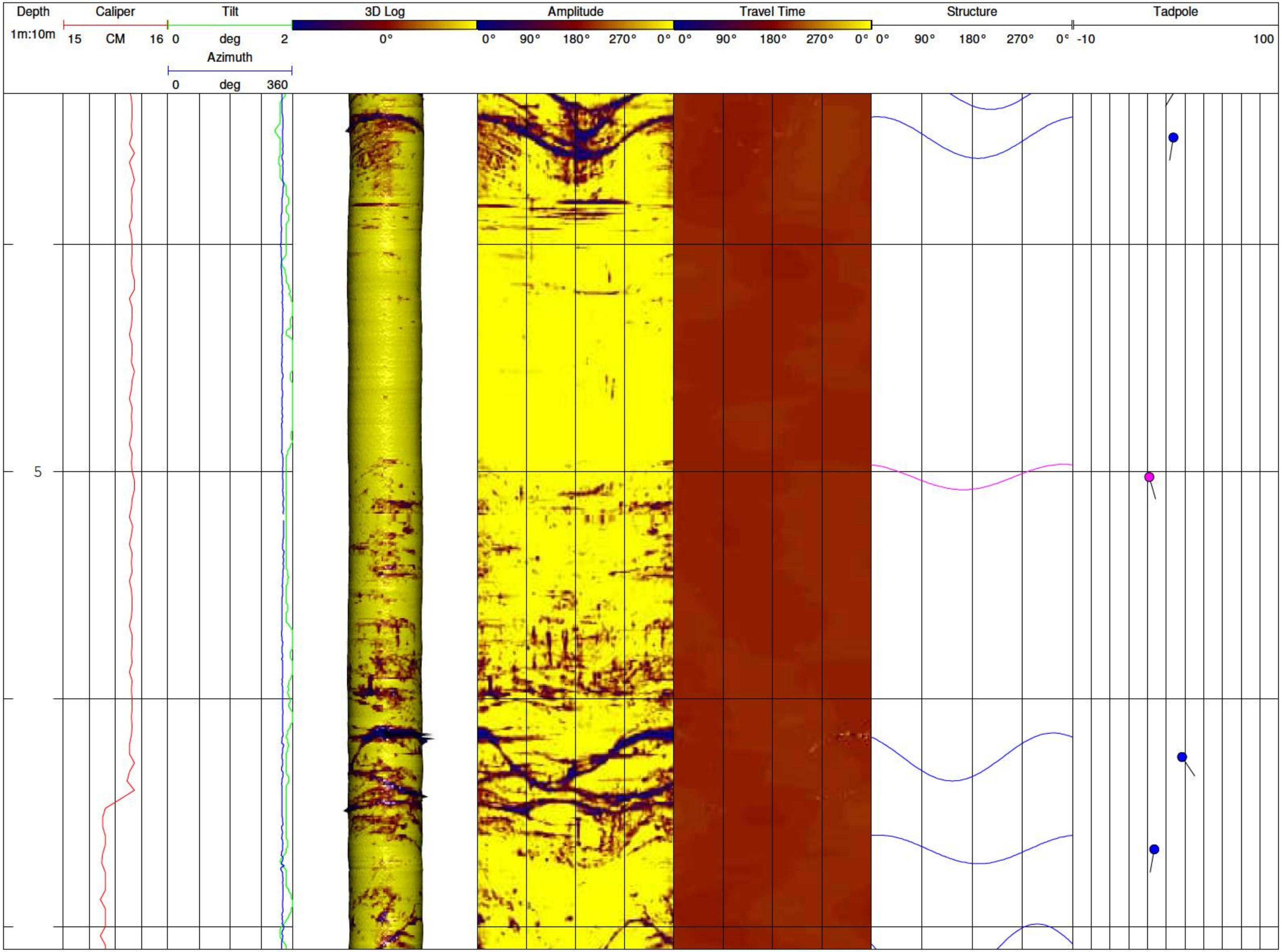
0°
Tadpole
-10
100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Caliper
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Azimuth
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3D Log
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Amplitude
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Travel Time
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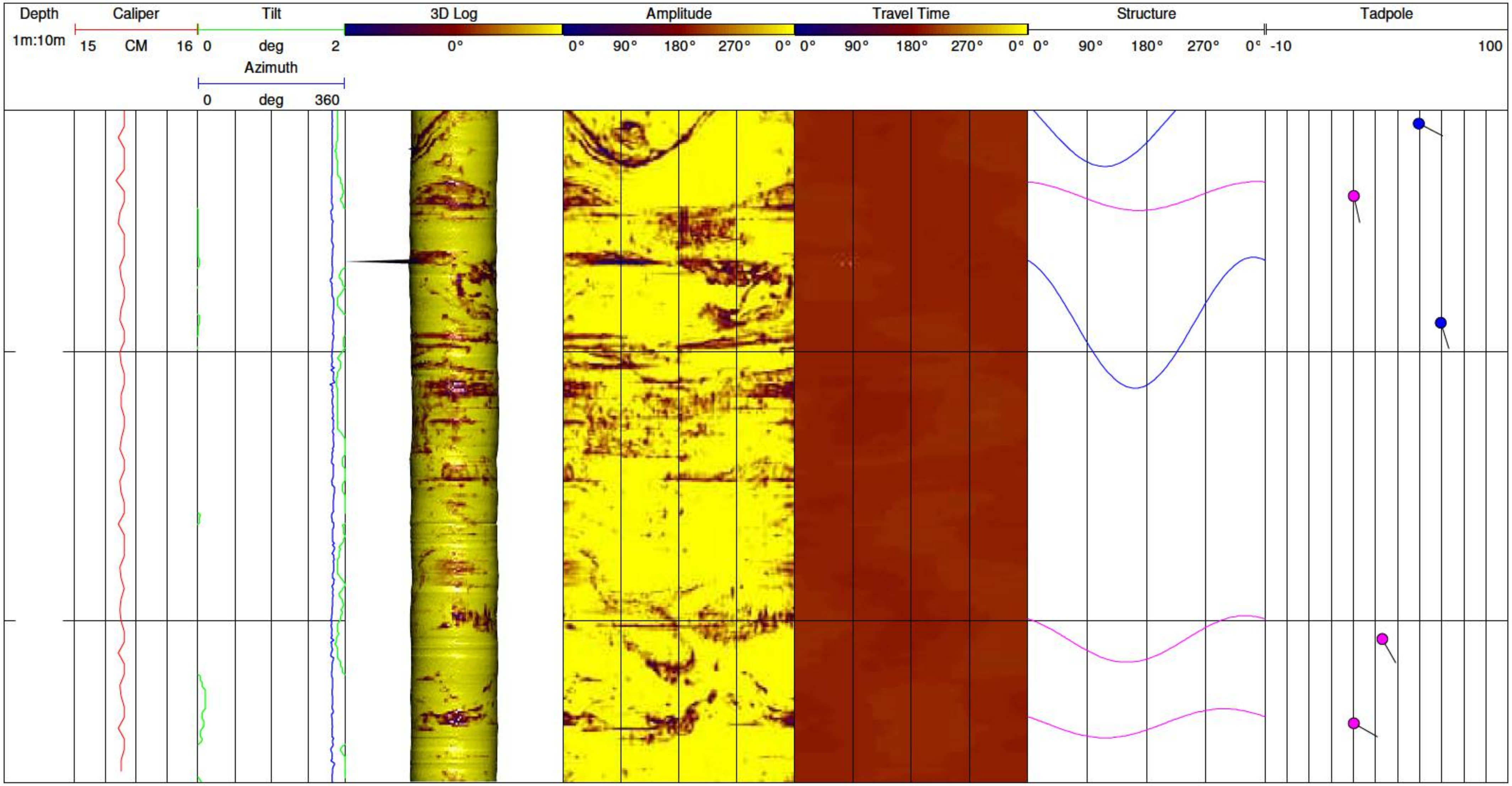
Structure
0° 90° 180° 270° 0°
Tadpole
-10 100
5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Caliper
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Azimuth
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3D Log
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Amplitude
0° 90° 180° 270° 0°
Travel Time
0° 90° 180° 270° 0°
Structure
0° 90° 180° 270° 0°
Tadpole
-10 100

Fugro Engineering Services

Client:	Scottish and Southern Energy PLC	Log Type: Acoustic Televiewer Log
Borehole:	BH12	

Project: CON103001 Sloy Power Station | Approved: [redacted]

Location: SLoy | Grid Reference: | Elevation:

Drilled Depth:	35m	Date:	05/03/2010
Logged Depth:	34.51m	Recorded By:	[redacted]

Logging Datum: Ground Level

Logged Interval:

Fluid Level:

Structure Key: Foliation, Fracture, Vein

Remarks:

North reference is magnetic, Tadpole log and tabulated data is corrected for borehole deviation

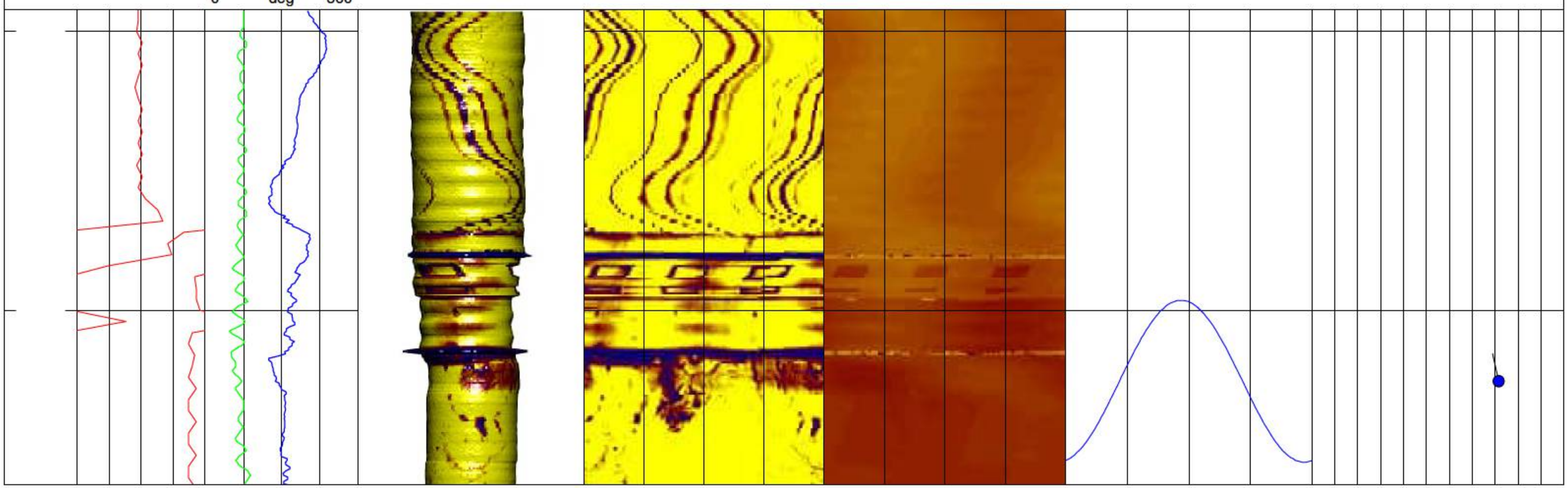
BOREHOLE RECORD

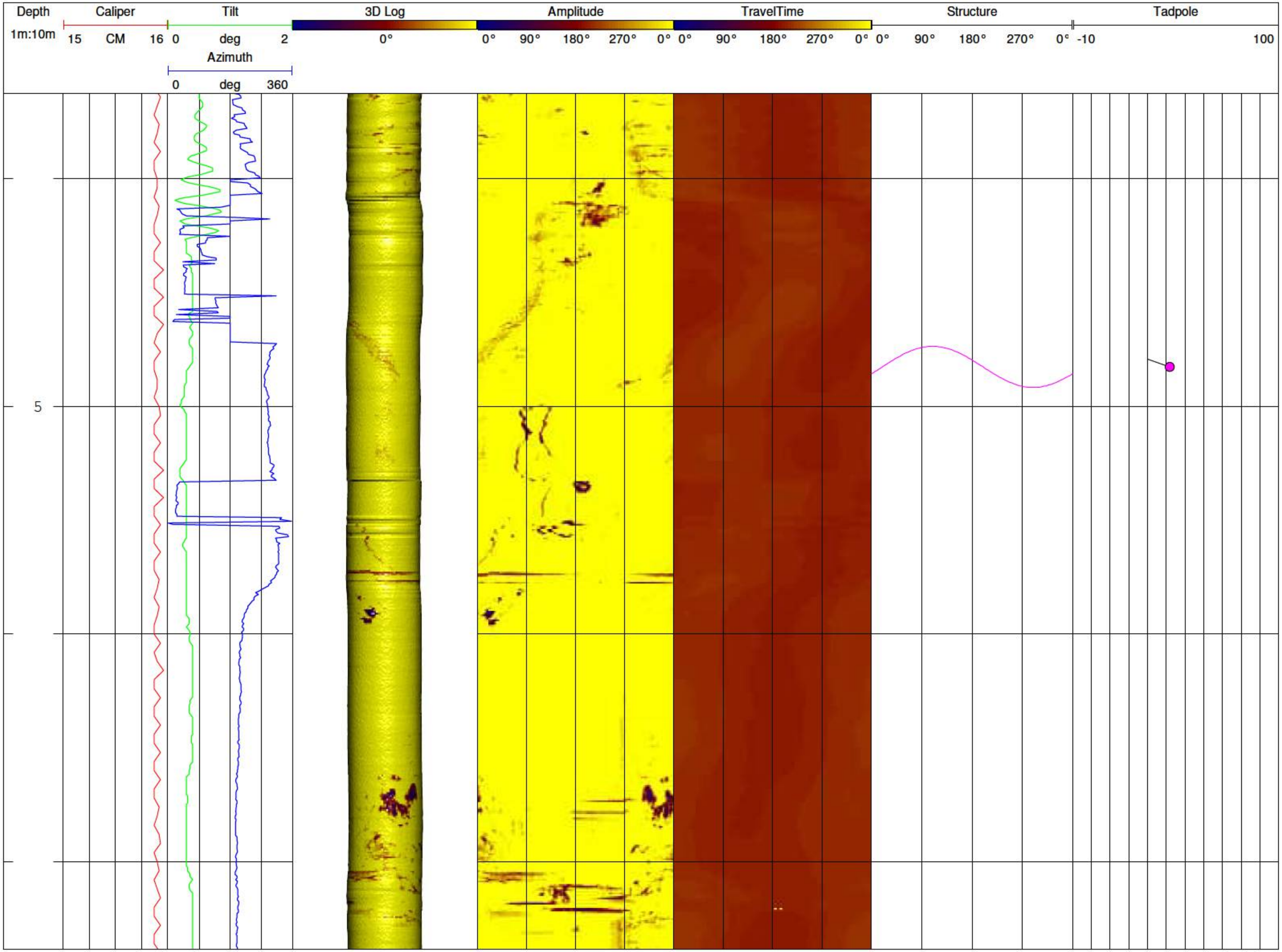
Bit Diameter:	From:	To:
150mm	0m	4.1m
120mm	4.1m	35.0m

CASING RECORD

Type	Size	From	To
Steel	150mm	0m	4.1m

Depth	Caliper	Tilt	3D Log	Amplitude	TravelTime	Structure	Tadpole
1m:10m	15 CM 16	0 deg 2 Azimuth 0 deg 360	0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-10 100

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Caliper
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Tilt
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Azimuth
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3D Log
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Amplitude
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TravelTime
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Structure
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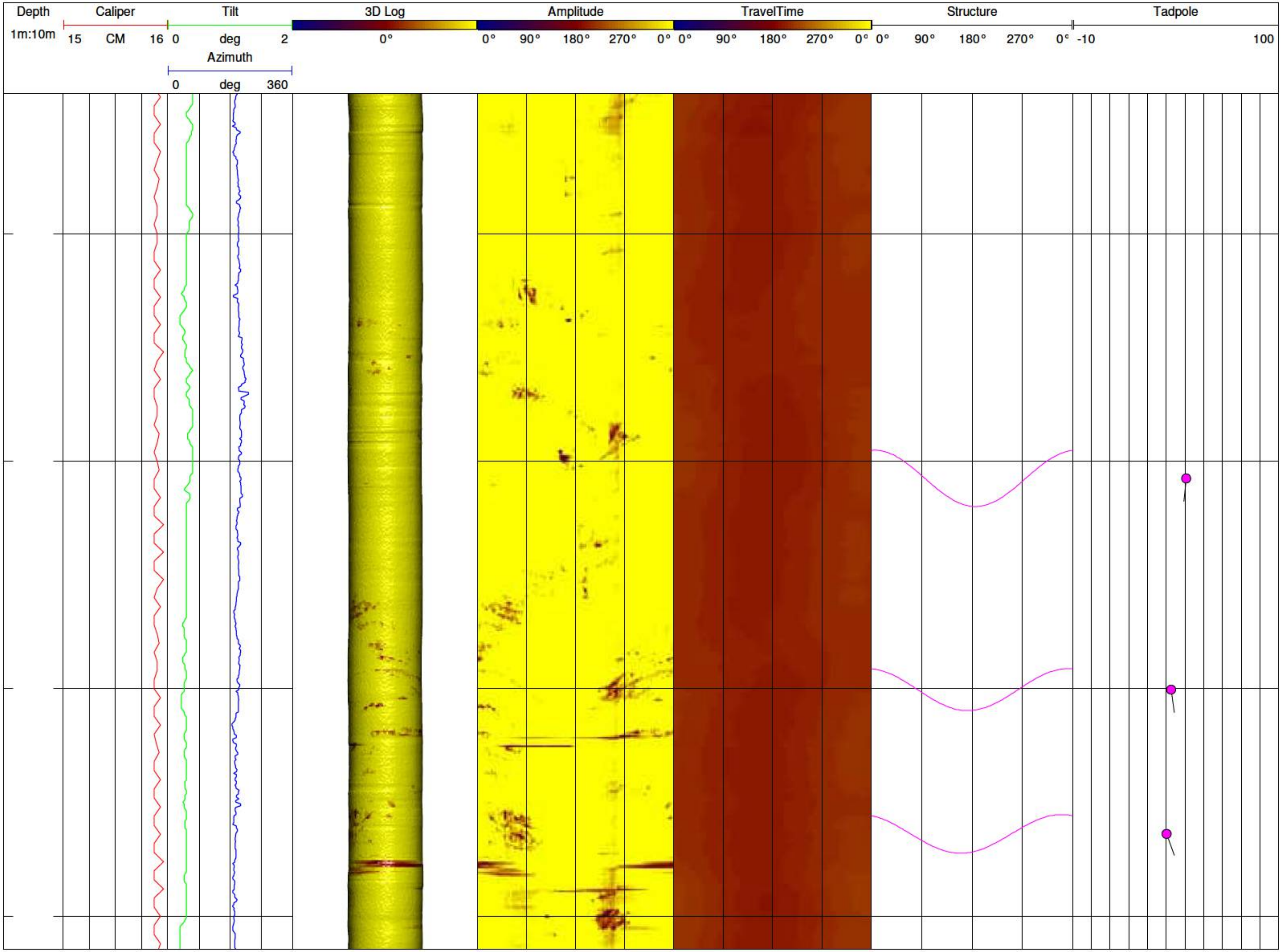
Tadpole
-10 100
5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TravelTime
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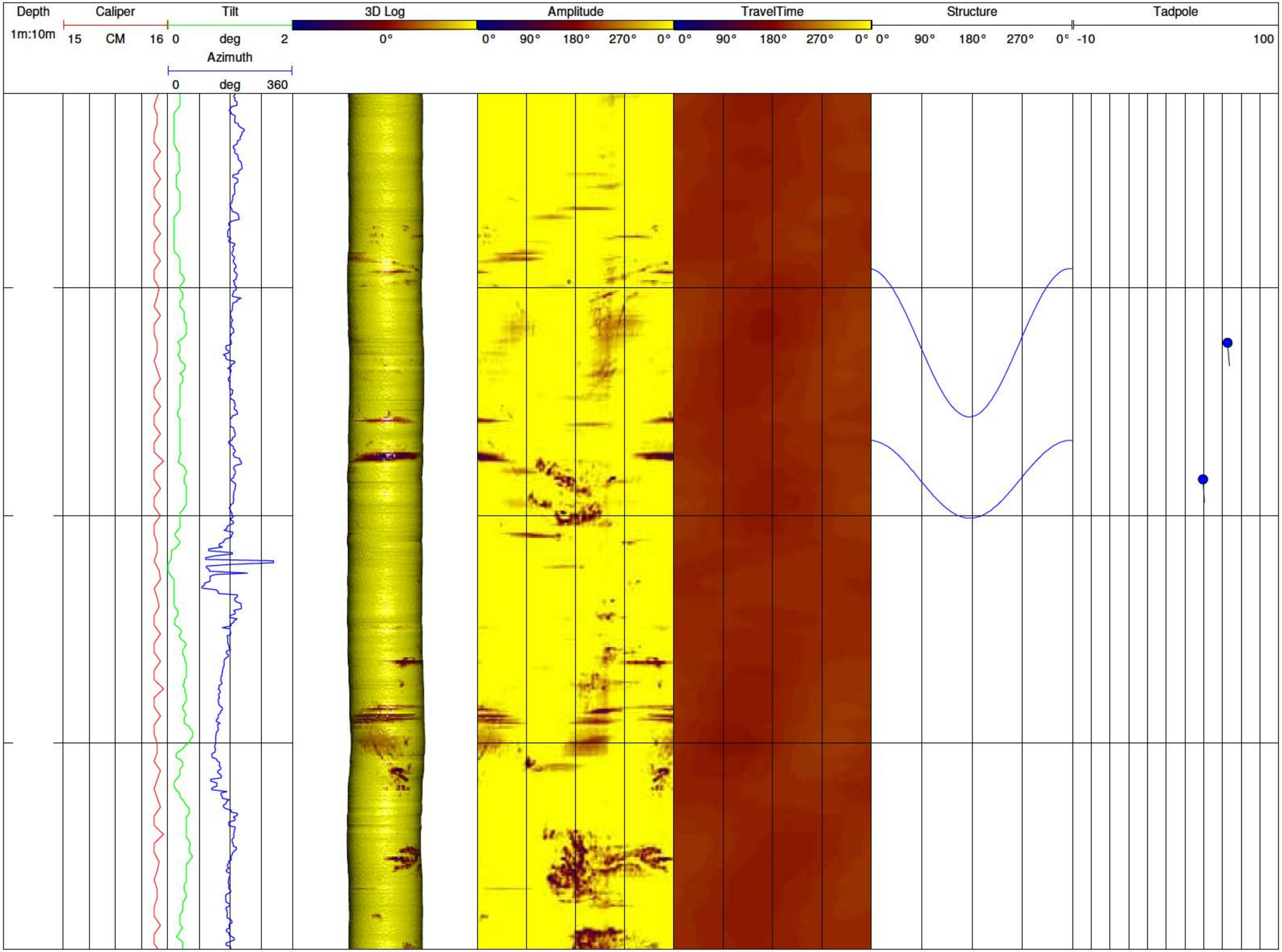
Tadpole
-10 100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TravelTime
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Structure
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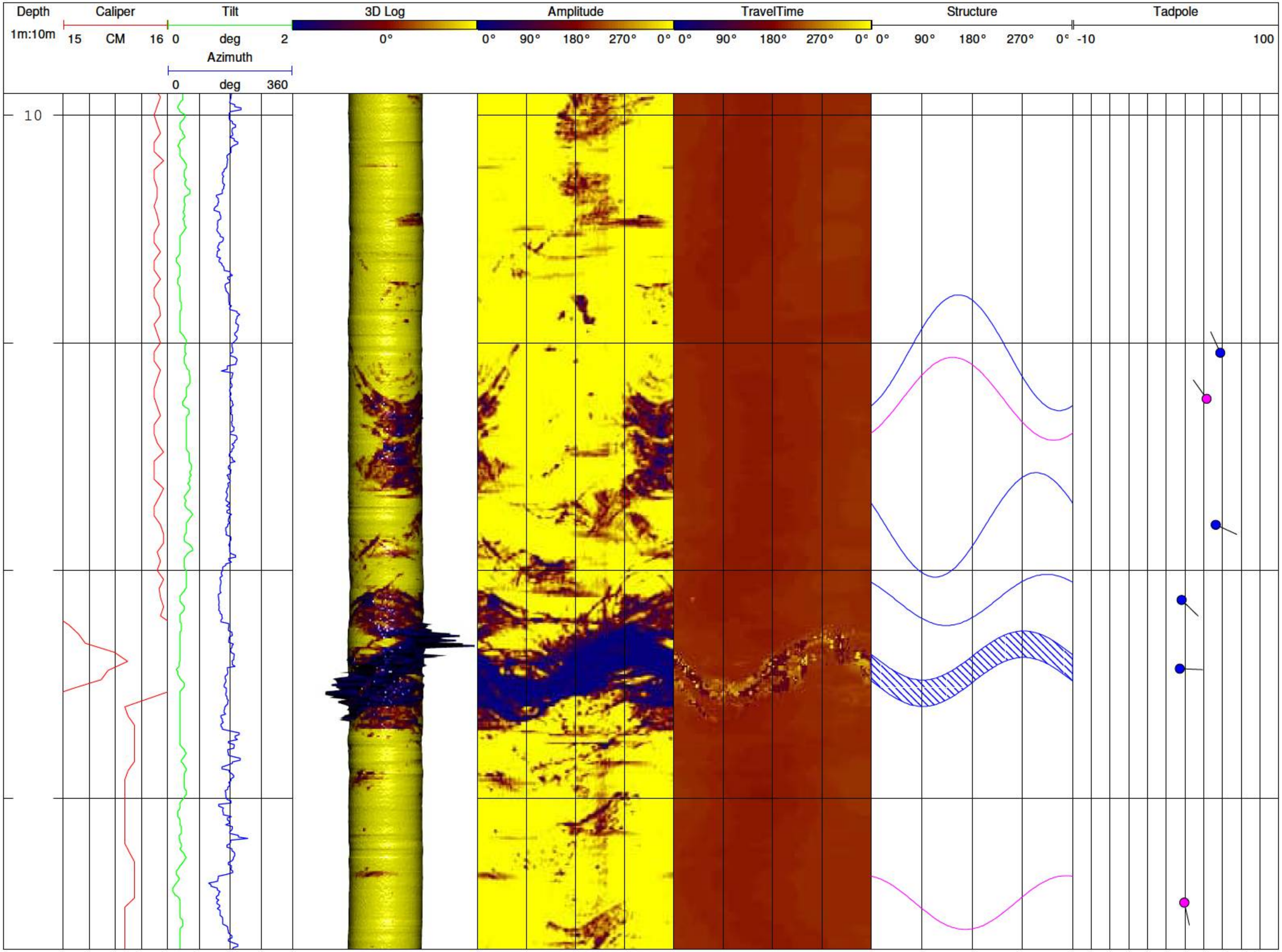
Tadpole
-10 100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Tilt
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TravelTime
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Structure
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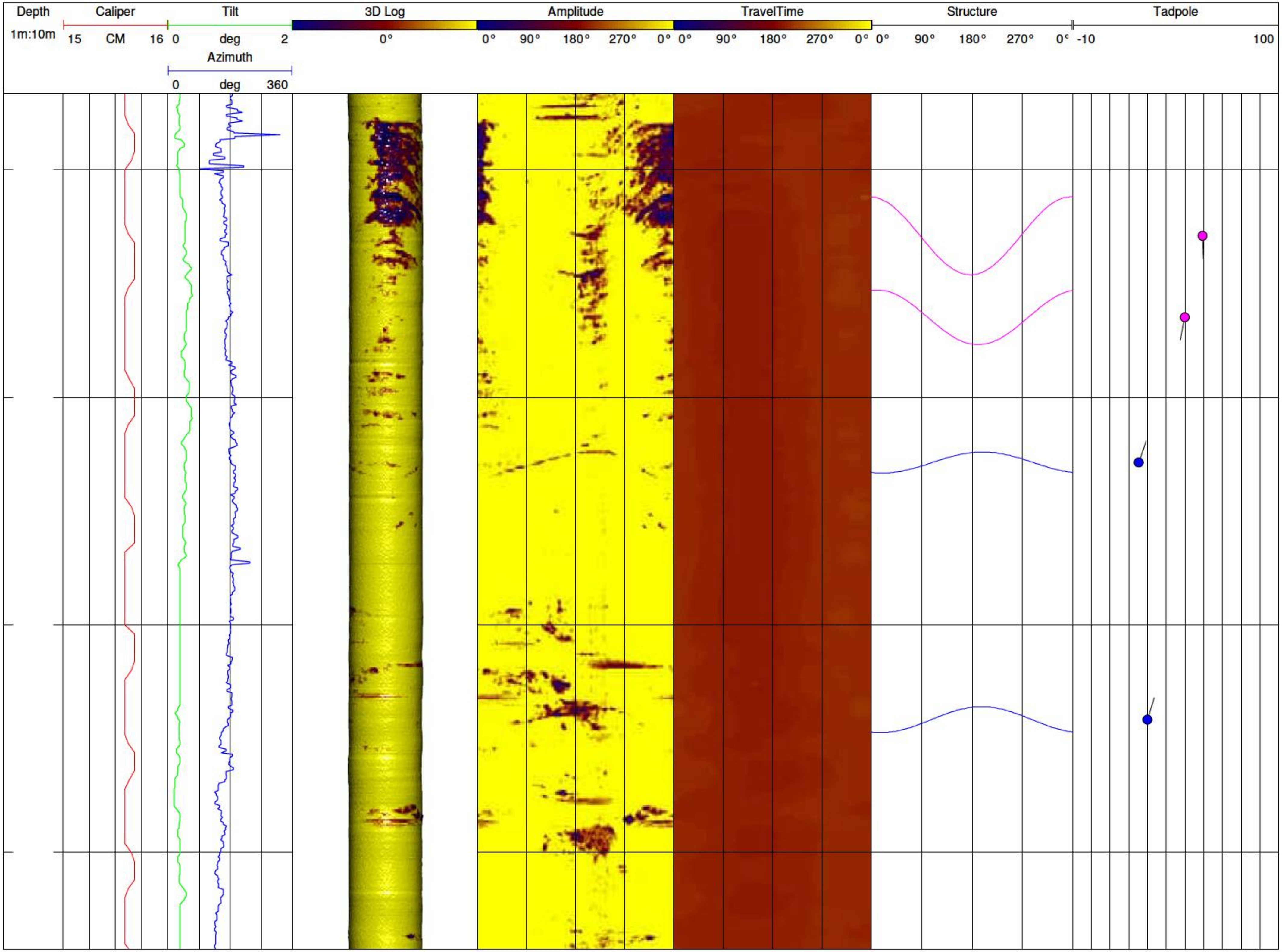
Tadpole
-10 100
10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Structure
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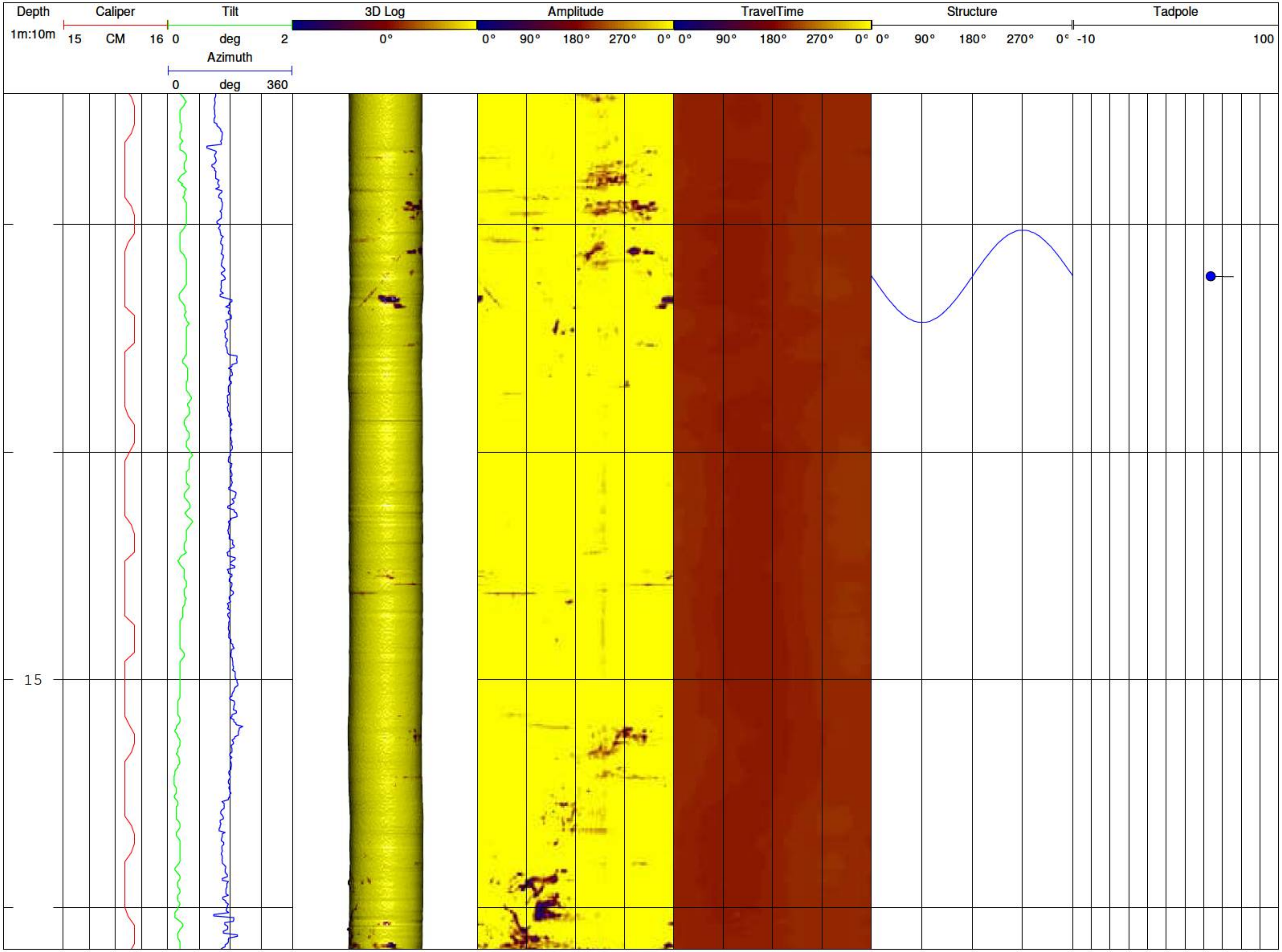
Tadpole
-10 100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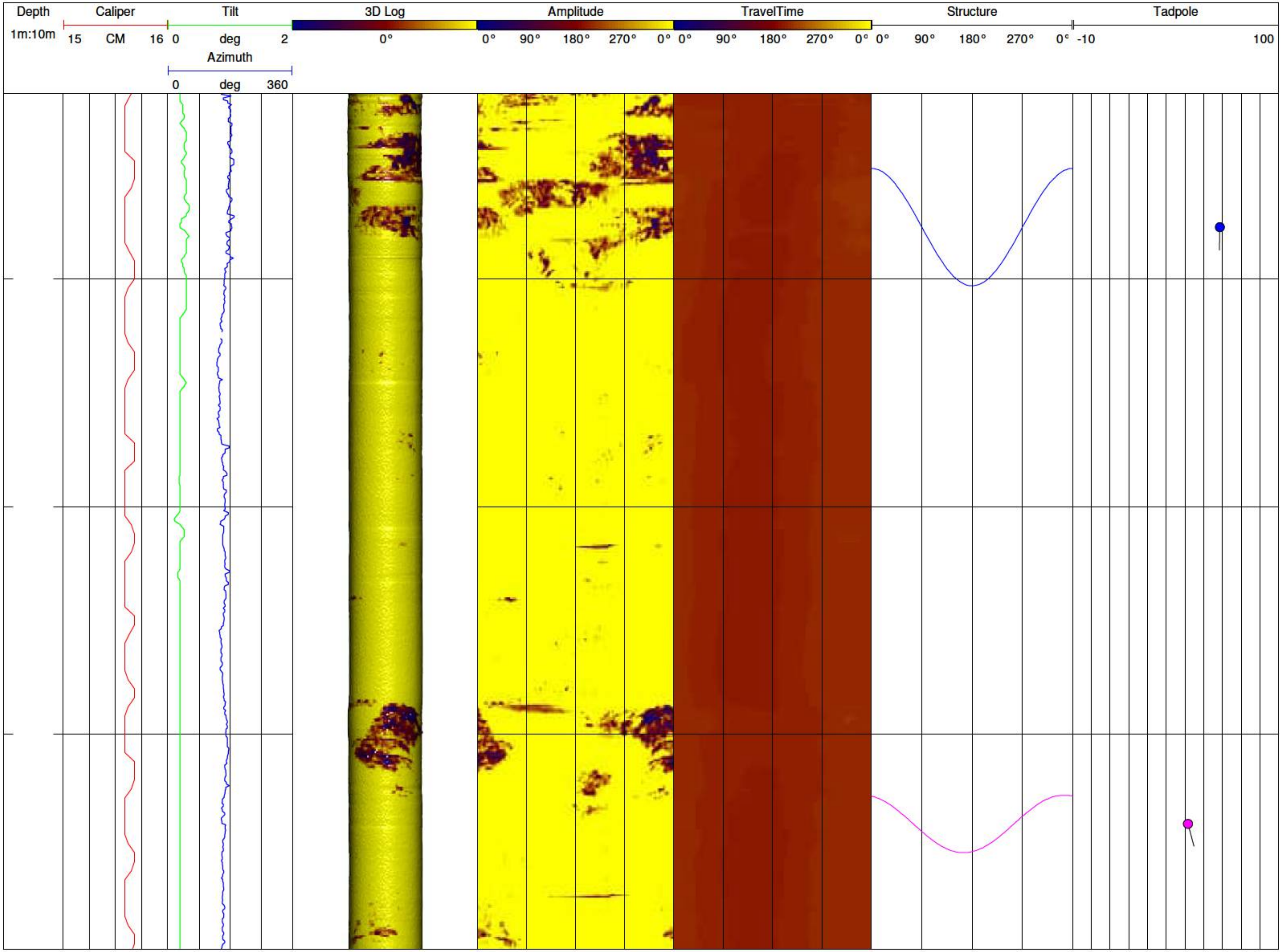
Tadpole
-10 100
15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Tadpole
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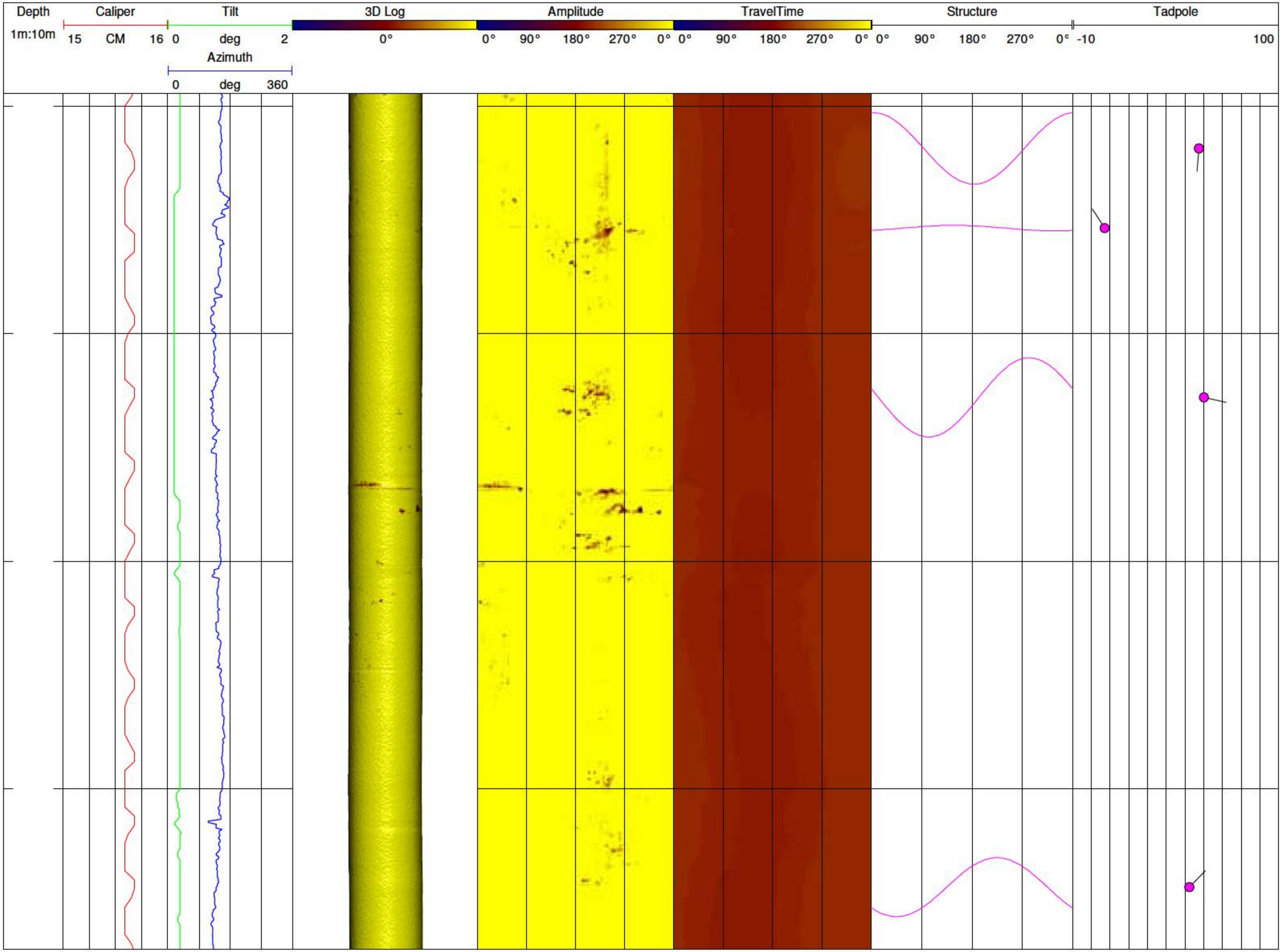
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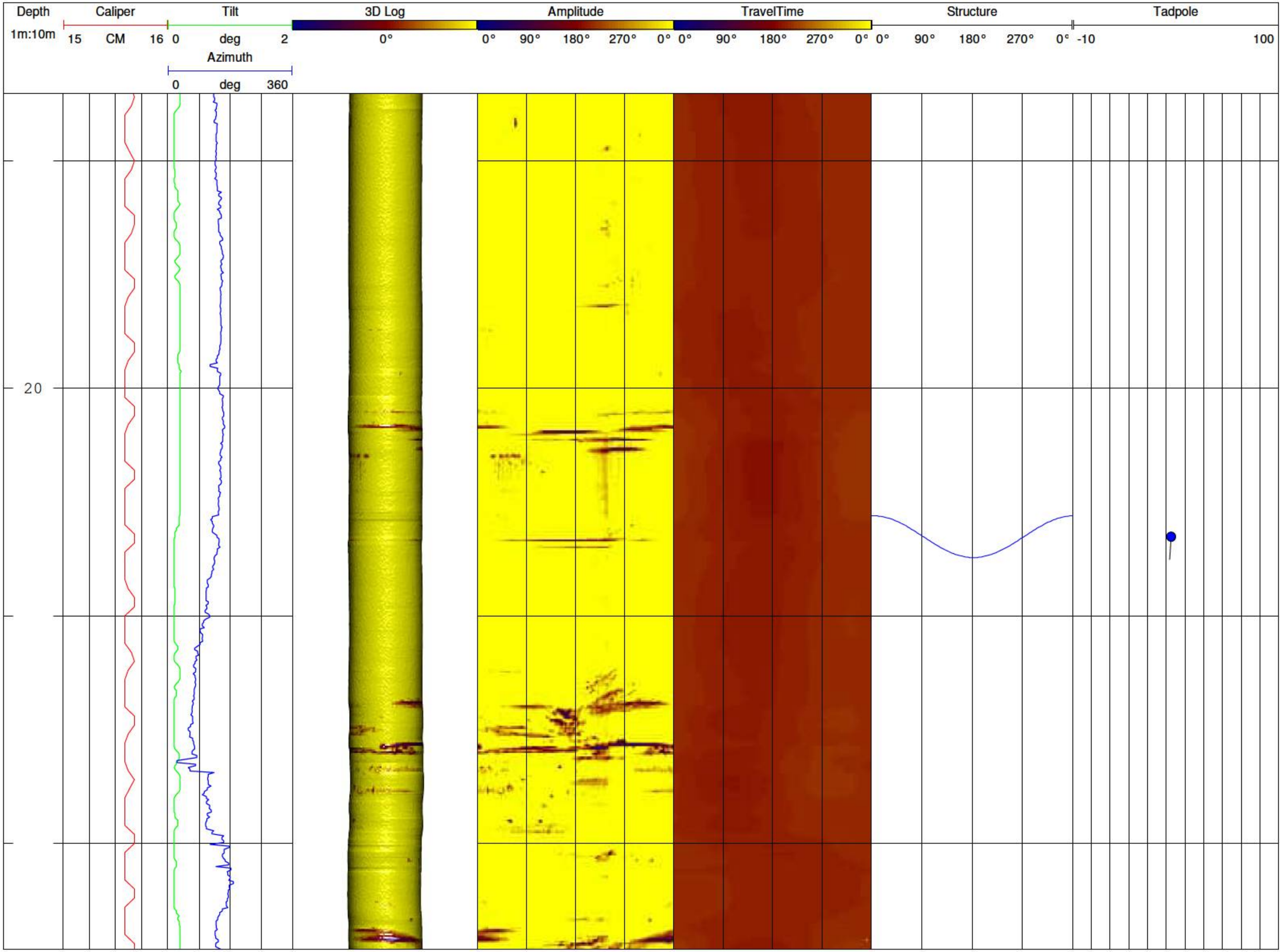
Tadpole
-10 100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Tadpole
-10
100
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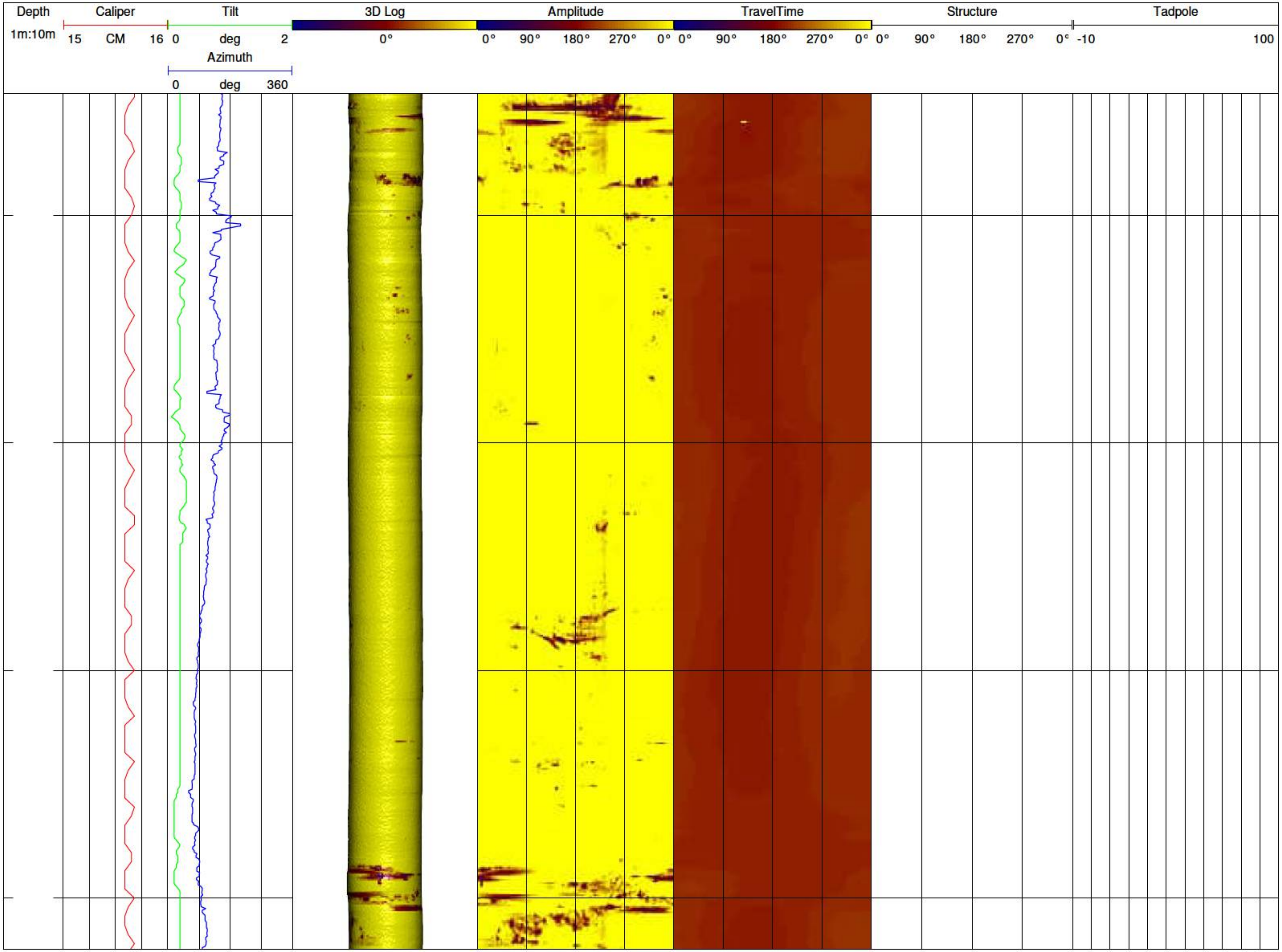
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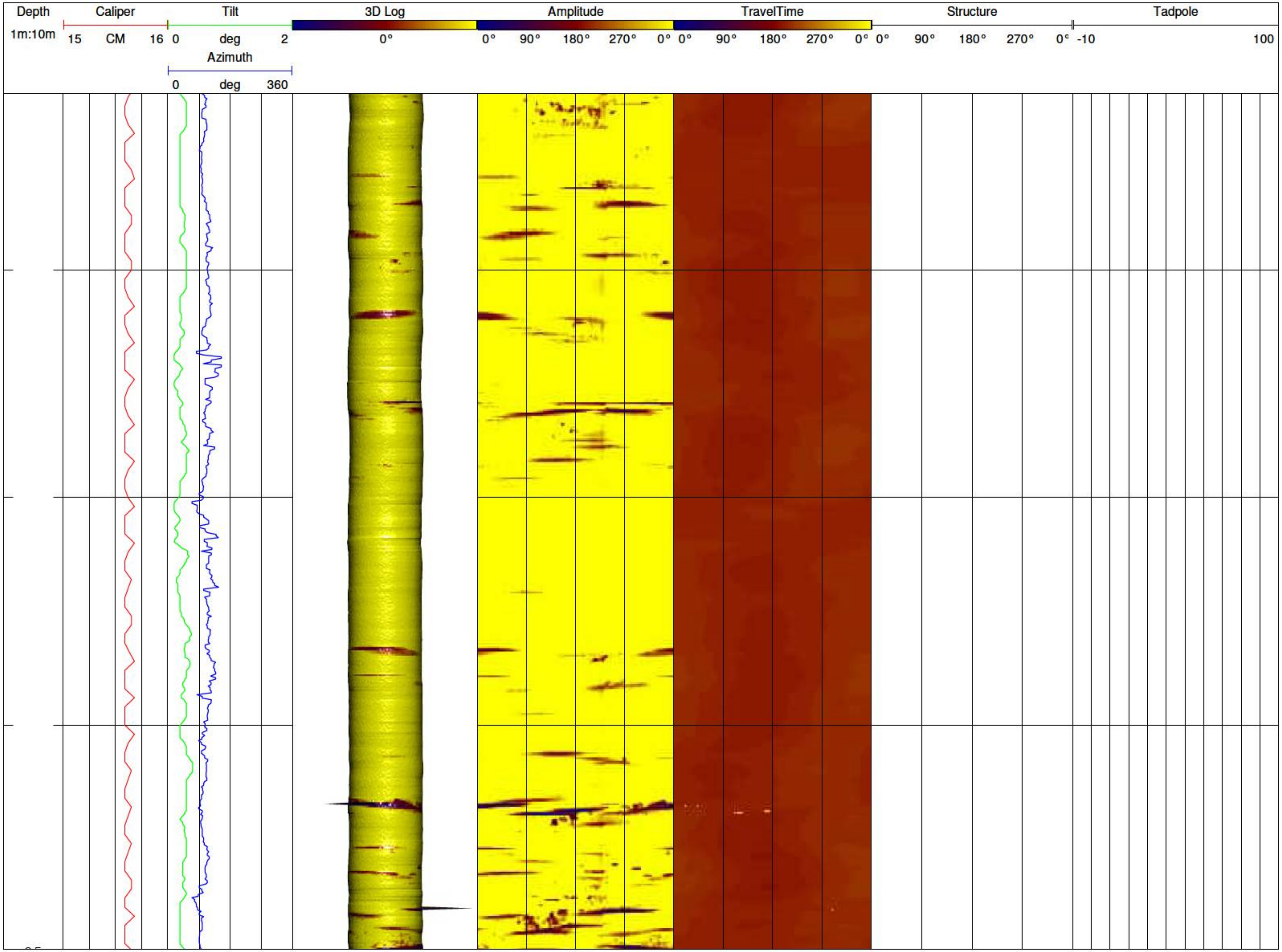
TravelTime
0° 90° 180° 270° 0°
Structure
0° 90° 180° 270° 0°
Tadpole
-10 100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CM
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deg
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Azimuth
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deg
360
3D Log
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Amplitude
0°
90°
180°
270°
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TravelTime
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270°
0°
Structure
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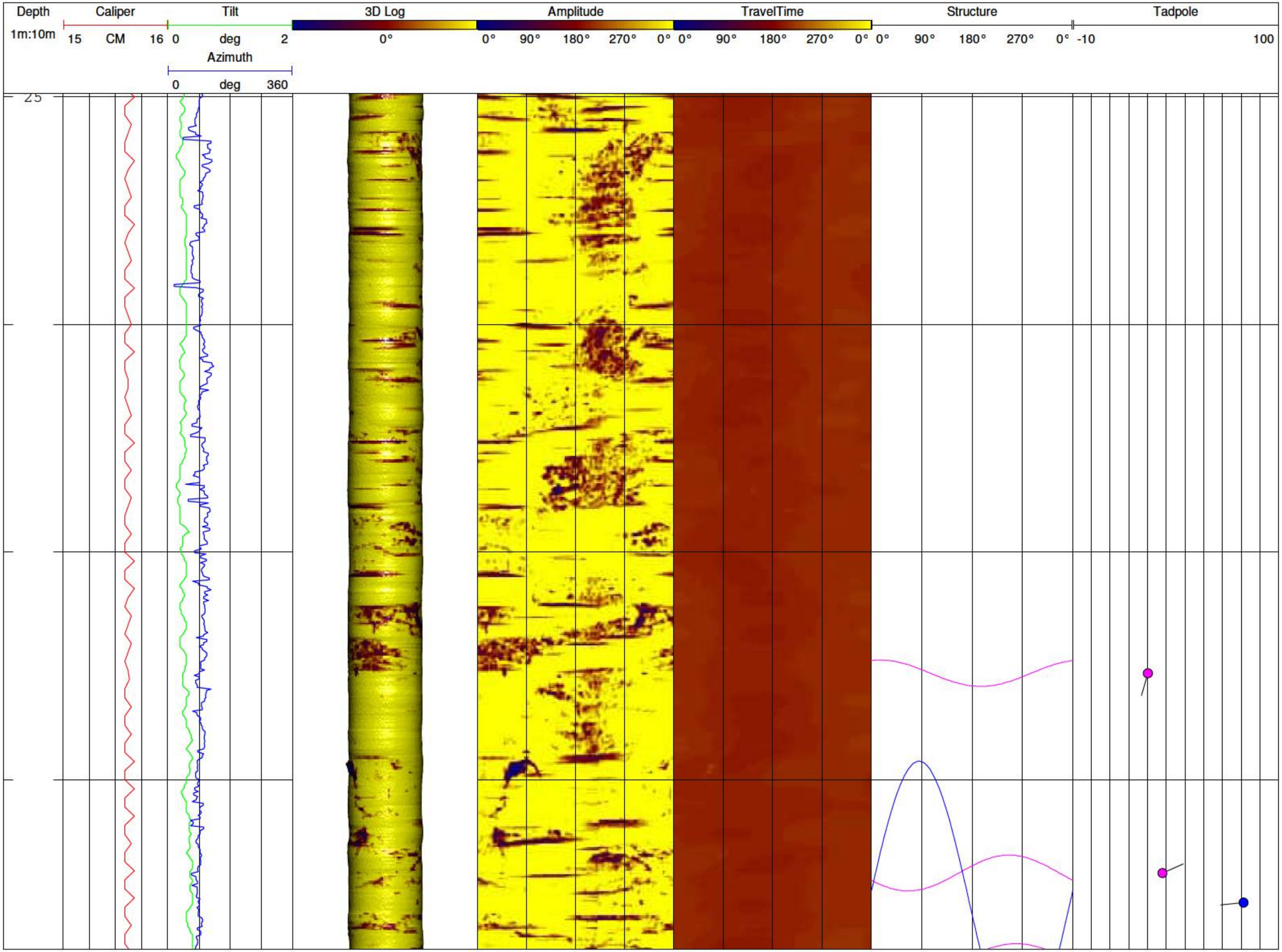
180°
270°
0°
Tadpole
-10
100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Tilt
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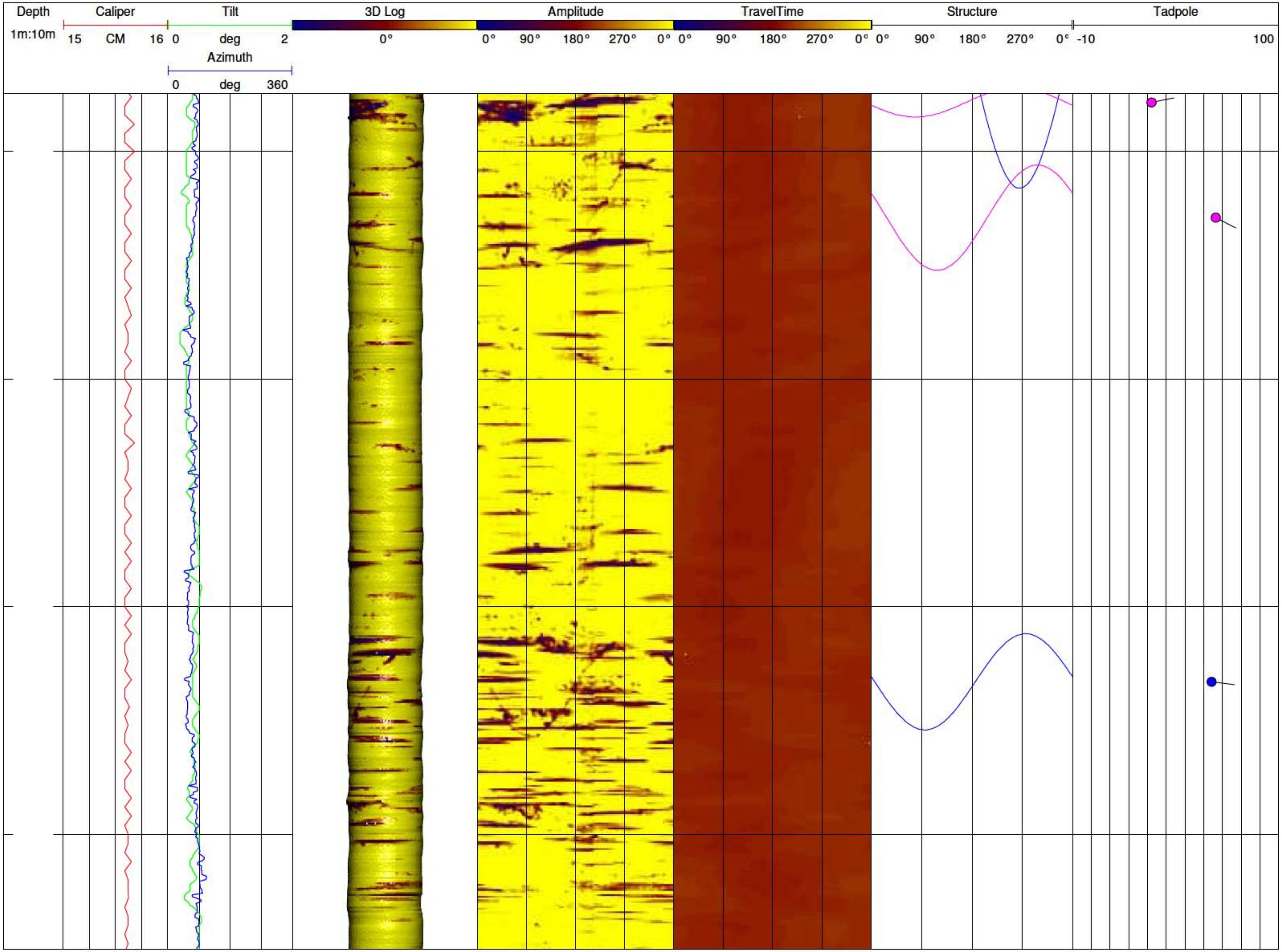
0° 90° 180° 270° 0°
Structure
0° 90° 180° 270° 0°
Tadpole
-10 100
25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Structure
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Tadpole
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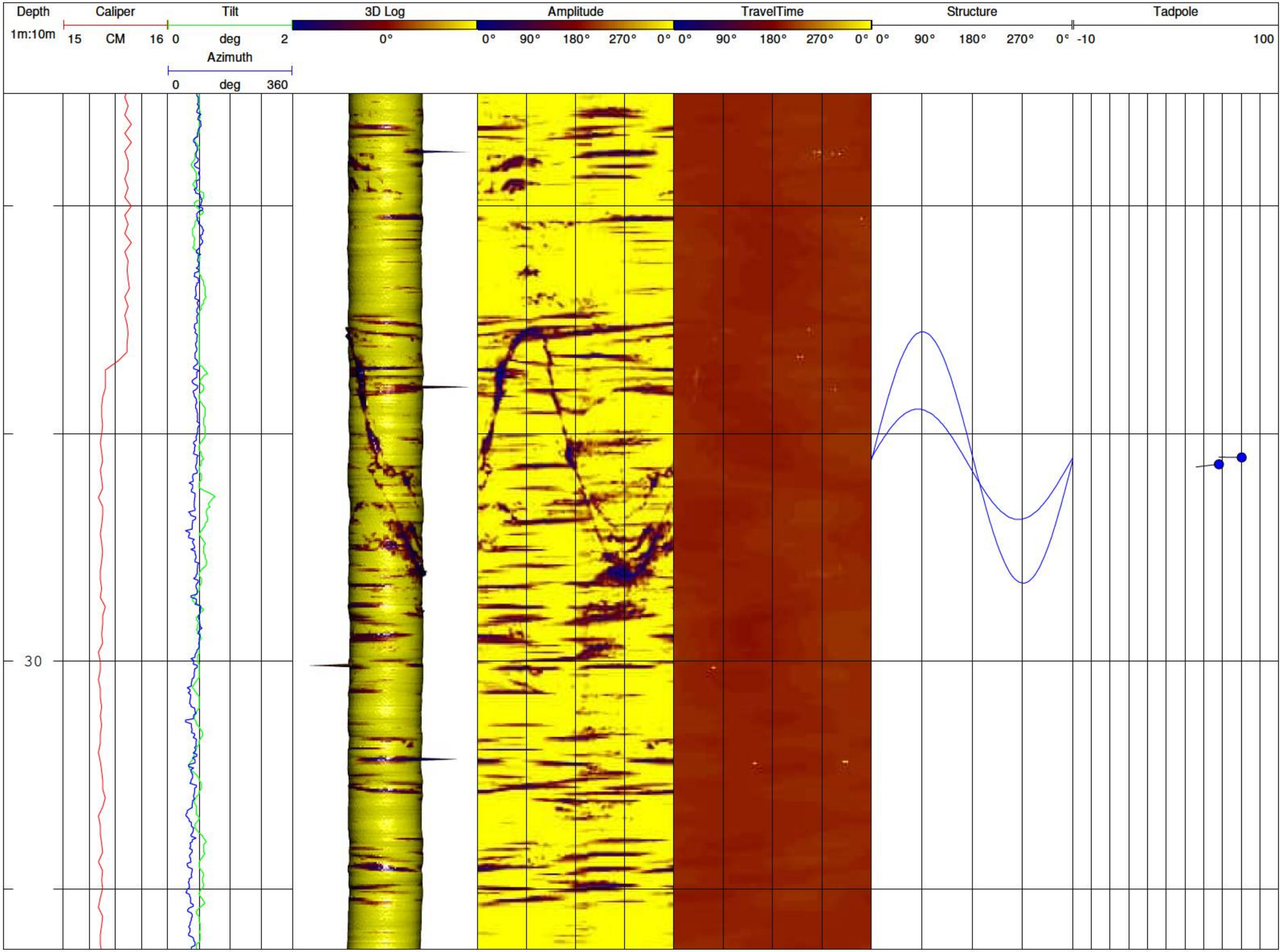
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TravelTime
0° 90° 180° 270° 0°
Structure
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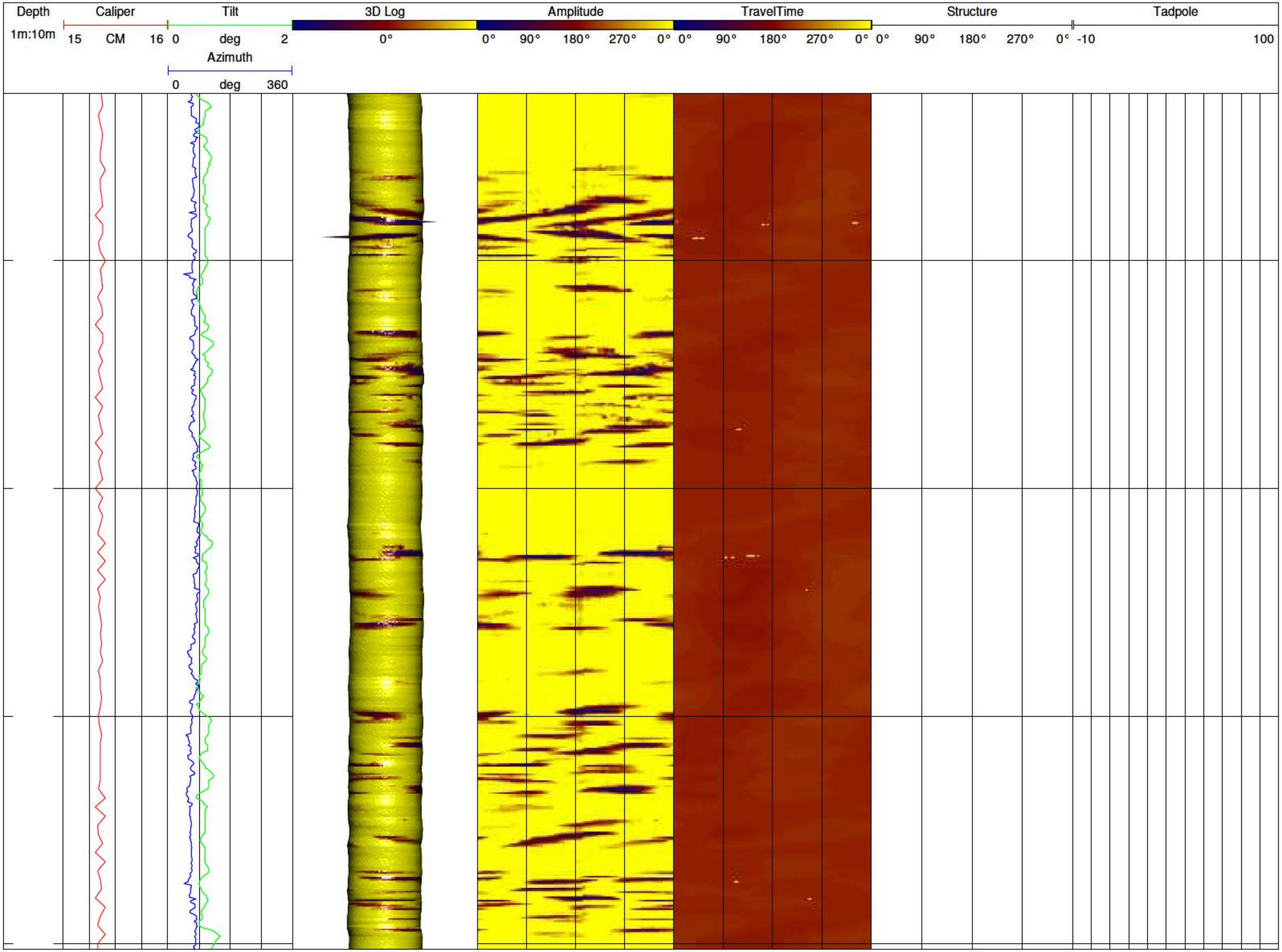
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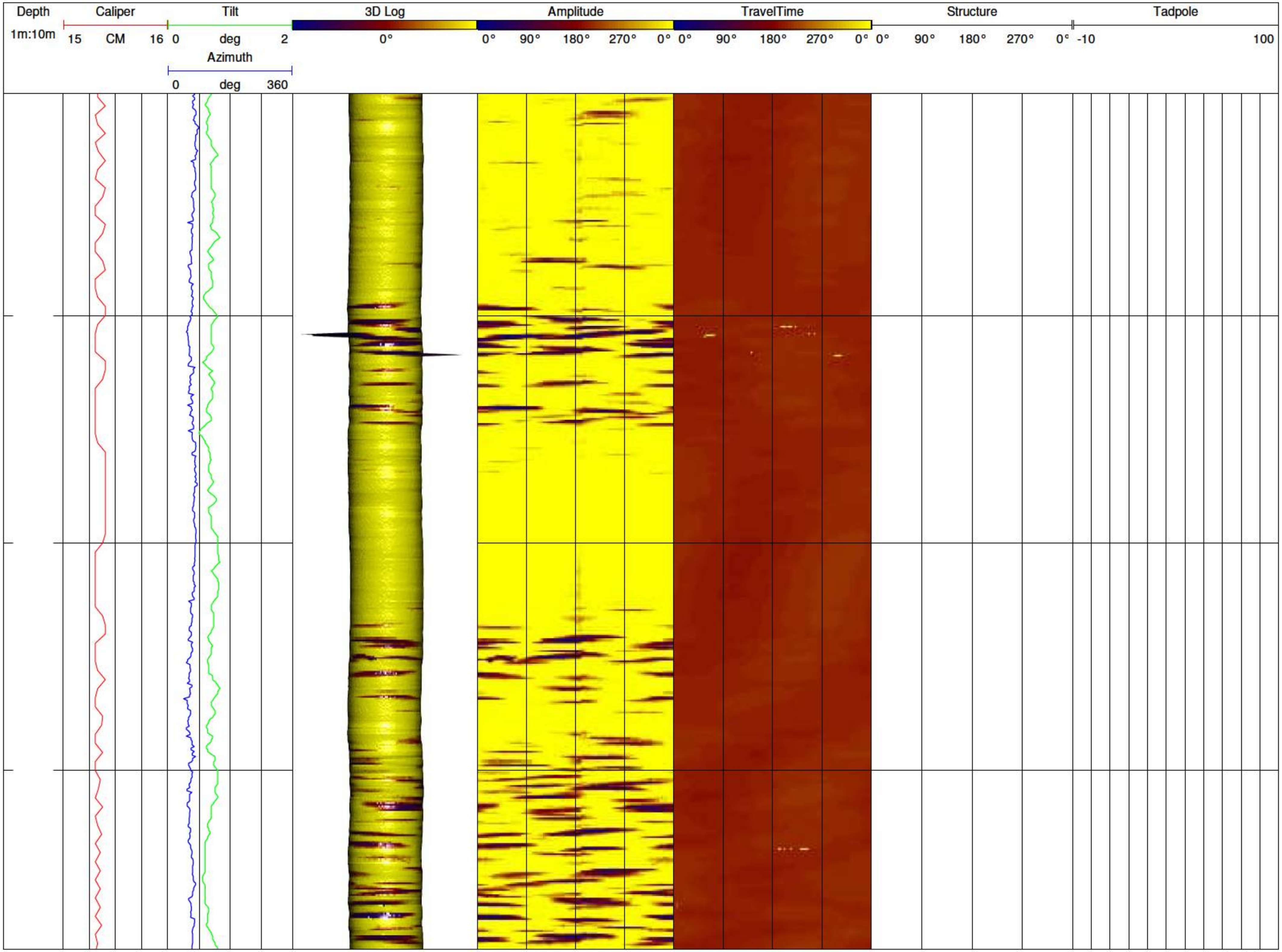

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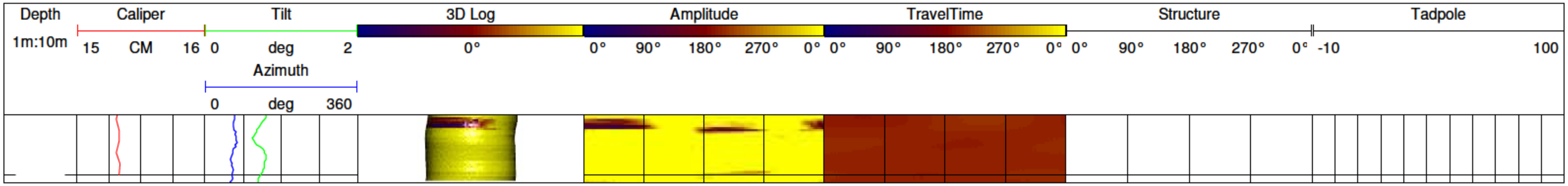
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TravelTime
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Structure
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Tadpole
-10
100

APPENDIX D Cross Hole Geophysics

Fugro Aperio Report Reference 3525

CLIENT: SCOTTISH & SOUTHERN ENERGY

ENGINEER: JACOBS ENGINEERING UK LIMITED

REPORT ISSUE STATUS

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Issue	Date	Description	Prepared	Checked	Approved (Printed)	Approved (Signature)

[redacted]	[redacted]
[redacted]	[redacted]
SENIOR GEOPHYSICIST	DIVISION HEAD

EXECUTIVE SUMMARY

- This report documents a seismic cross-hole tomography survey carried out at Sloy Pumping Station, Inveruglas.
- The brief was to provide seismic P wave velocity data of ground materials between a five boreholes to provide an indication of rippability and isotropy of the rock.
- To achieve this objective a seismic tomographic cross-hole approach was carried out.
- The survey was carried out between 8th-10th March 2010 using a Geometric Geode recording system, a Geotomographie Sparker seismic source and a 24 channel Geospace hydrophone string.
- Sensitivity analyses were carried out to assess the affect of typical first arrival recognition. It was established that such errors could lead to a velocity error of ~ 2%. It was concluded that, data were satisfactory for both direct and tomographic analyses.
- It was established that a relatively low velocity (<4500 m/s) layer was present across the area of investigation generally above an elevation of 5m. Local increases in thickness (up to 9m) of this layer were identified. This layer was interpreted as being related to upper superficial deposits and/or a variable, weathered or fractured upper bedrock surface.
- Below an elevation of ~5 m velocities were predominantly in excess of 5000 m/s
- Notable areas of relatively lower velocity (~4850-5150 m/s; equivalent to up to ~10% reduction) were noted on section BH6-BH12, BH6-BH12, BH2-BH3 and BH2-BH12.
- The data indicated a general increase in seismic velocity was apparent towards the north eastern part of the investigation area.
- Below about 5 m elevation the analyses indicate velocities in excess of 4000 m/s Reference to standard rippability charts (Appendix D) would indicate that velocities of this magnitude, in metamorphic rock can be classified as non-rippable.

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List of Drawings

Appendices

1. INTRODUCTION

1.1 General

1.1.1 This report documents a geophysical investigation that comprised of a shallow seismic cross-hole tomography survey. The work was carried out between five boreholes (BH2, BH3, BH4, BH6 & BH12) drilled to a maximum depth of ~35 m.

1.2 The Brief

1.2.1 The brief was to establish the in-situ seismic signal propagation/attenuation characteristics for two source types over a range of travel paths in order to assess the feasibility of the technique for deep investigation of potential collapsed zones.

1.3 Terms of Reference

1.3.1 This investigation was conducted by Fugro Aperio Limited on behalf of Fugro Engineering Services Limited for Scottish & Southern Energy and is based on seismic data collected on site between 8th and 10th March 2010.

1.3.2 The findings presented within this report are the result of the measurement and interpretation of acoustic signals. As such any results derived from the geophysical investigation should be taken in the context of and in reference to the complete ground investigation.

1.3.3 Additionally with specific reference to seismic data and respective derived parameters, the following constraints apply. Seismic velocities are derived from calculations resulting from the identification of appropriate seismic waveforms and their time of travel along a source-receiver path from source to receiver. The shape and phase characteristics of a received compressional waveforms and associated arrival time selection may be influenced by frequency-selective attenuation, dispersion, reflection, refraction, scattering, mode conversion processes and source and receiver coupling effects dependent on variations in ground conditions along the corresponding source-receiver travel path. In the derivation of velocities or associated properties apparent variations arising from both the relative and absolute influence of these processes along a particular source-receiver path may not be known or be calculable.

1.3.4 This draft report supersedes any previous reports, whether written or oral.

1.4 Service Constraints

1.4.1 Appendix A (Service Constraints) outlines the limitations of this report in terms of a range of considerations including, but not limited to, its purpose, its scope, the data on which it is based, its use by Third Parties, possible future changes in design procedures and possible changes in the conditions at the site with time. Appendix A represents a clear exposition of the constraints, which apply to all reports issued by Fugro Aperio Limited. It should be noted that the Service Constraints do not in any way supersede the terms and conditions of the contract between Fugro Aperio Limited or Fugro Engineering Services Limited and the Client.

2. BACKGROUND INFORMATION

2.1 General

2.1.1 The site is located adjacent to the existing Sloy Hydro-electric power station in Inveruglas. The area of investigation covered a roughly circular area approximately 30 m diameter. Four number boreholes were located around the perimeter (BH2, 3, 4 and 6) and the fifth borehole (BH12) was located roughly in the centre.

2.1.2 The location of all test boreholes is provided on drawing 3525-01.

2.1.3 The local geology was understood to comprise of 2-3 m of superficial deposits over highly metamorphosed Schist (to at least 35 m). Anecdotal evidence received on site indicated a potential increase in fracturing within the area adjacent to the existing power station, possibly linked to blasting operations during construction.

2.1.4 The survey was initially commenced in open hole boreholes, however, during acquisition of the first dataset the source tool became stuck at ~ 12m (BH12). It was thought that rock fragment(s) from the borehole wall had become wedged between the tool and the borehole wall. The tool was retrieved and a decision made to carry out testing in ungrouted plastic cased holes.

2.1.5 The testing was carried out successfully. The presence of ungrouted plastic casing did not detrimentally affect the quality of the raw seismic data.

2.1.6 Measurements were made at 1 m increments between all available boreholes as described in Table 1 below:

Source Borehole	Receiver Borehole	Start Depth	End Depth	Inter borehole distance (m)
BH2	BH3	3	35	17.94
BH2	BH6	3	35	19.52
BH4	BH3	3	34	14.59
BH4	BH6	3	34	22.25
BH12	BH2	3	35	10.66
BH12	BH3	3	35	12.15
BH12	BH4	3	35	9.67
BH12	BH6	3	35	19.60

Table 1 – Tomographic dataset details

2.1.7 Coordinates and elevations for each test borehole were provided relative to survey control point 2 provided by the Client.

BH	Easting	Northing	Ground Level
SCP2	232109.64	709873.71	15.501
BH2	232144.10	709839.35	11.97
BH3	232162.01	709840.49	12.04
BH4	232157.68	709854.43	13.15
BH6	232134.51	709856.35	12.33
BH12	232151.67	709846.86	12.38

Table 2 – Borehole coordinates

3. DATA ACQUISITION

3.1 General

3.1.1 The seismic cross-hole survey was carried out between 8th and 10th March 2010 Specifications for the equipment are provided in Appendix C.

3.2 Cross-hole tomography

3.2.1 For seismic techniques in general, stress applied at the surface of an elastic media creates the conditions for the associated strains to propagate as compressive elastic waves in the subsurface material as a pattern of particle deformation travelling with velocities that are dependent on the elastic properties and densities of the media through which they travel.

3.2.2 P-wave tomography involves initiating elastic waves at a known point, within a borehole, and determining at a number of other known positions the arrival times of the seismic energy that has refracted, reflected or directly travelled through subsurface material back to the surface from discontinuities or interfaces between subsurface layers.

3.2.3 The objective of the P-wave tomography survey was, primarily, to establish P wave seismic velocities of rock material to provide an indication of rippability and isotropy of the rock.

3.2.4 In practice this was performed by measuring, between two source and receiver locations, the in-situ primary (compression) P wave velocities.

3.2.5 Field testing was performed by measuring the P wave at a number of source-receiver configurations.

3.2.6 A typical cross-hole seismic spread used for tomography is presented on Drawing No. 3525-02.

3.3 Survey Rationale & Methodology

3.3.1 The purpose of the trial was to ascertain seismic P wave velocity characteristics of the rock mass material at the Sloy site.

3.3.2 The location of the boreholes was specified by the Client to provide coverage within the area proposed for excavation of a shaft associated with proposed pumping station infrastructure.

3.3.3 Seismic energy was created in each source borehole by deployment of a borehole sparker system.

3.3.4 The compression wave energy generated by the borehole source was transmitted through the ground material and detected by a series of hydrophones placed in the receiver borehole. The seismic data was recorded using a seismograph and saved in industry standard SEG-2 format for office based processing.

3.3.5 For each borehole pair, shots were carried out at 1 m increments along the full length of the borehole (excluding the top 2-3 m due to steel casing/groundwater levels) for hydrophone positions at depths of 1 m to 24 m. The shooting process was repeated with hydrophone positions at 11 m to 35 m to ensure full coverage for the full length of the boreholes (3 - 35 m).

3.3.6 Acquisition parameters were established on site based upon an initial assessment of approximate velocities and ambient site noise. The following were applied:

Record length	100 ms
Pre trigger	10 ms
Sample interval	20.833 µs
Acquisition filters	None
Stacks	Multiple (typically 3 to 10)

3.3.7 Where necessary individual shots were stacked to improve signal-noise ratio.

3.4 Borehole verticality

3.4.1 In order to analyse cross-hole seismic data and determine velocities it was necessary to obtain 3D coordinates for all source and receiver locations. Since these positions are located within the borehole at depth it was necessary to measure the verticality (or deviation away from the vertical) of each drilled hole. This information was measured through use of a verticality tool used primarily for wireline logging. All source and receiver boreholes were logged by Fugro Engineering Services Limited during the course of the geophysical survey.

3.4.2 Coordinates for each source and receiver location were calculated by applying the measured deviation to the respective surface coordinates.

4. PROCESSING

4.1 General

4.1.1 All seismic data were recorded as digital SEG-2 format shot records to enable office based processing to be carried out. Basic trace operations were applied, including bandpass filtering, to improve signal-noise ration for each shot record prior to time break analysis and full inversion.

4.2 Shot records

4.2.1 Individual shot records from each borehole pair acquired with both source types were analysed and compared to provide an assessment of signal propagation characteristics.

4.2.2 It was found that for all borehole pairs of ~30 m, signal propagation from the sparker source was generally sufficient to enable first arrival recognition.

4.2.3 An example shot record is provided below on Figure 1 taken from the BH4-BH6 (largest inter borehole spacing). For the purposes of clarity and comparison a single source-receiver trace has been isolated.

4.2.4 Inspection of the trace would indicate an arrival time for first break P-wave energy of approximately 4.39 ms, equating to a seismic velocity of ~5050 m/s.

4.2.5 Analysis of the incident sparker energy would indicate a dominant frequency of ~1350 Hz.

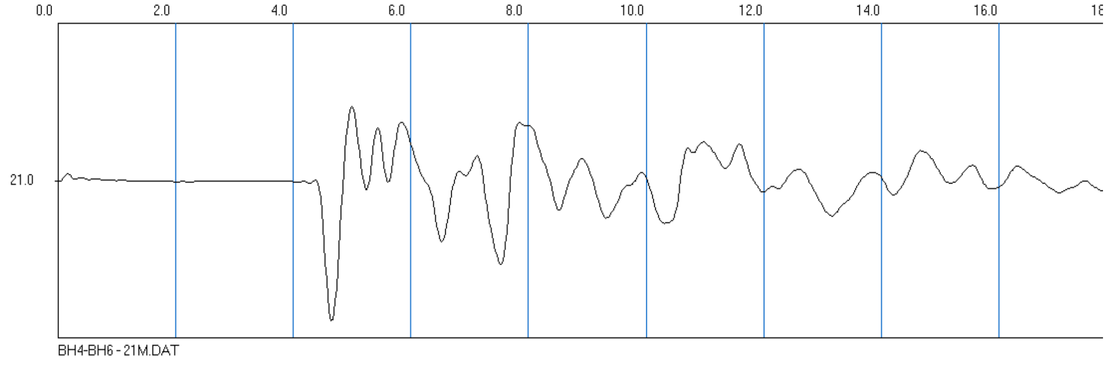


Figure 1 – BH4-BH6 : Sparker Source, Test Depth 21 m, Inter borehole spacing ~22.25 m (Lo-cut (100 Hz) and high cut (4000 Hz) applied)

4.3 Time zero determination

4.3.1 Accurate determination of time zero is essential in order that reliable velocity measurements and variations may be determined from a seismic data set. The time zero for the sparker system was determined during acquisition by a trigger impulse generated by the control unit at the moment of firing.

4.3.2 To assess any potential time zero errors or ‘trigger jitter’ a series of three single repeat shots were carried out at a fixed depth. The resulting waveforms for the consecutive shot records are provided overleaf on Figure 2. Assuming no trigger jitter the waveforms should theoretically be identical with arrival of incident P wave energy identifiable at a consistent time.

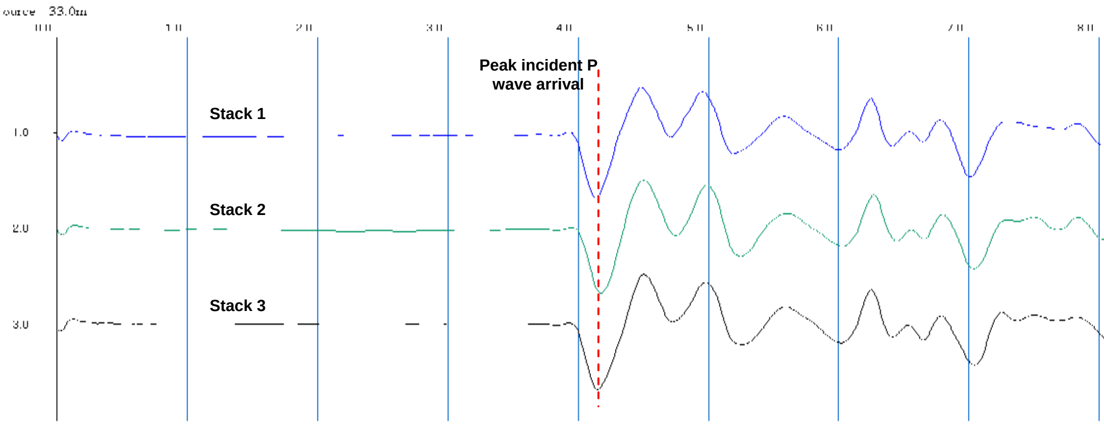


Figure 2 – BH12-BH6 : Repeat sparker source shot records, Test Depth 33 m, Inter borehole spacing ~19.60m (Lo-cut (100 Hz) and high cut (3000 Hz) applied)

4.3.3 Analysis of the test records above would indicate consistent, repeatable incident P wave energy at ~4.156 ms. The test data indicate that trigger jitter was <0.025 ms.

4.4 First arrival recognition accuracy

4.4.1 Recognition of first arrival energy ('pick point) and the a.ccuracy ('error window') at which such recognition can be made is critical to any seismic velocity investigation.

4.4.2 Using the example sparker shot records provided in section 4.2.5 an assessment of likely picking accuracy can be made. The relevant section of the shot record is provided below on Figure 3.

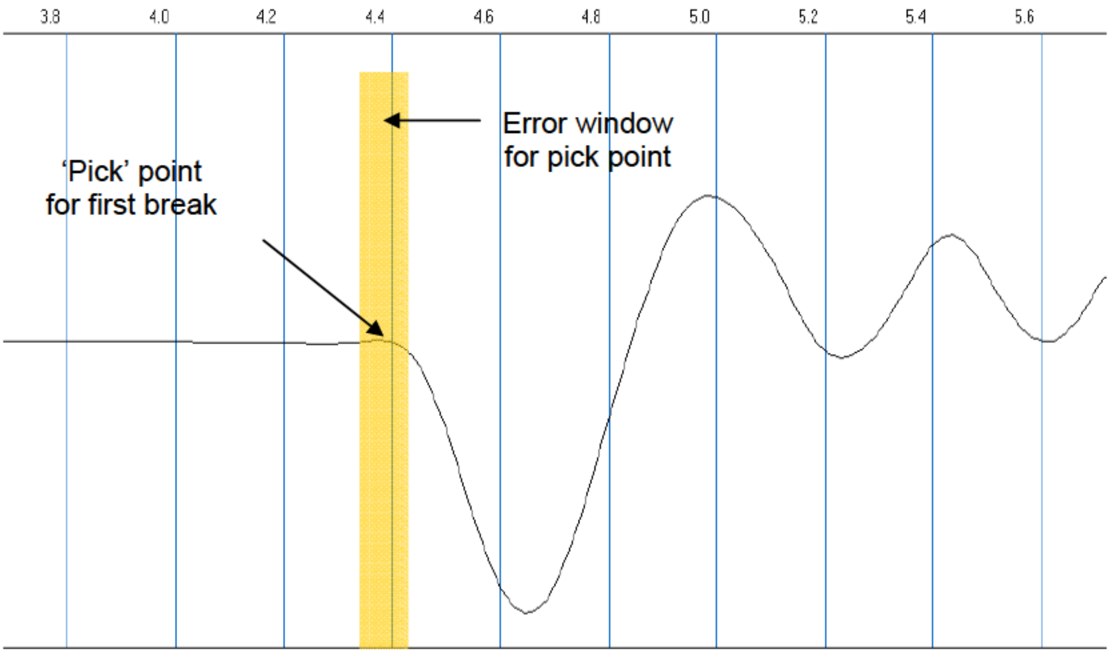


Figure 3 - First arrival P wave energy (BH4-BH6)

4.4.3 The data example provided from the BH4-BH6 dataset would indicate a 'pick point' of 4.39 ms with a corresponding error window of +/- 0.05 ms. The straight line raypath distance for this record was 22.25 m.

4.4.4 The tomographic data would therefore indicate a first arrival recognition error window (i.e. trigger jitter + picking error) of approximately +/- 0.075 ms over a source-receiver separation of ~ 23 m.

4.5 Direct Velocities

4.5.1 A basic velocity analysis of the tomographic dataset was carried out to establish direct raypath velocity profiles as a function depth. Velocities were calculated for source-receiver raypaths at equal depths below ground level for each dataset. Direct raypath velocity profiles for each borehole set are presented on in Appendix B (Figures B1-B8 respectively). A composite profile showing all direct velocities is provided in Appendix B, Figure B9.

4.5.2 A basic analysis of the profiles indicated a range of P-wave velocities between ~4500 and 5800 m/s, generally increasing with depth. Below about 5 m elevation the majority of direct velocity values were between 5150 m/s and 5600 m/s. It is considered that the lower velocities above 5 m elevation are likely to be attributed to a weathered upper bedrock surface.

4.5.3 All datasets showed relatively consistent velocity distributions as a function of depth. The dataset for BH2-BH6 showed relatively lower P wave velocities (5000-5200 m/s) between -10 m and -21 m elevation. This equated to a reduction in velocity of ~ 7.5% in comparison to the other datasets.

4.6 Tomographic analysis

4.6.1 Further tomographic analysis of each dataset was carried out using Divine v4.70 Mk3.

4.6.2 Raypath modelling using a 3D wavefield propagation algorithm to determine least time raypaths for specific source-receiver geometries was performed.

4.6.3 Traveltime inversion using a SIRT (simultaneous iterative reconstruction technique) algorithm was then applied to attempt to reconstruct the starting velocity model.

4.6.4 The results of each tomographic analysis are provided in Drawing 3525-03. Tomographic data were combined into a 3-D volume to enable 3-D representation. The results are provided at 4 different projections (NW, NE, SE, SW) on Drawing 3525-04.

4.6.5 Tomography panels have been relocated and presented to provide a continuous cross-section for BH6-BH12- B3 and for BH2-BH12-BH4. Similarly tomographic panels have been relocated and presented to provide a continuous cross-section around the perimeter boreholes (i.e. BH6- BH2- BH3- BH4- BH6). Note that the individual perimeter sections were acquired in different planes as a function of the borehole layout.

4.6.6 The tomographic analyses for datasets show a generally consistent velocity distribution to that described by the basic direct velocity analyses (section 4.5). In general velocities were in the range 2500 m/s to 5750 m/s and generally increased as a function of depth.

4.6.7 The majority of the low velocity (<4750 m/s) velocities were noted in a laterally continuous upper layer. The thickness of this upper layer was noted to vary between ~ 2m and ~9 m with notable increases in thickness apparent on tomographic panels BH6 to BH2, BH12 to B3 and BH2 to BH12. It is considered that this relatively low velocity layer may relate to upper superficial deposits and/or a variable, weathered or fractured upper bedrock surface.

4.6.8 Typically, below an elevation of ~5 m, the tomographic sections show velocity in excess of 5000 m/s (predominantly 5000-5500 m/s). Notable areas of relatively lower velocity (~4850-5150 m/s; equivalent to up to ~10% reduction) were noted on section BH6-BH12. This observation was consistent with the relatively lower velocities identified from the basic direct velocity analysis for this dataset.

4.6.9 Additional, similar low velocity regions were identified on sections BH6-BH12, BH2-BH3 and BH2-BH12.

4.6.10 In general, relatively higher velocities (>5250 m/s) were noted on sections BH4-BH6, BH12-BH4 and BH3-BH4.

5. CONCLUSIONS

5.1 General

5.1.1 Cross-hole seismic data were acquired between five boreholes (BH2, BH3, BH4, BH6 and BH12) within an area adjacent to the existing Sloy power

5.2 Data Quality

5.2.1 Data quality was monitored on site and shot records were appropriately stacked to improve signal-noise ratios. Analysis of the shot records indicated good signal-noise interborehole spacing of up to ~23 m sufficient to allow visual recognition of first arrivals. Data quality was sufficient to enable basic direct and tomographic analyses to be undertaken.

5.3 First arrival recognition

5.3.1 Basic analysis of the shot records indicated a higher than expected velocity for bedrock material (~5000 m/s). The commensurate reduction in absolute transit time necessitated a critical analysis of the potential errors associated with recognition of first arrival events.

5.3.2 The trial data sets acquired with the sparker tool would indicate that first arrivals may be confidently identified within error bounds of approximately +/- 0.075 ms over a source-receiver separation of ~ 23 m. Based upon an average material velocity of 5000 m/s, first arrival recognition errors may have contributed to final velocity errors of approximately +/- 2%.

5.4 Velocity analysis of trial data

5.4.1 Basic direct raypath velocity analysis was carried out on all datasets (Appendix B). Consistent seismic velocities were identified in all datasets in the range between 5150 m/s and 5600 m/s below about 5 m elevation. Velocity values were generally noted to increase a function of depth. A relative decrease in seismic velocity of ~7.5% was noted below -10 m and -21 m elevation in dataset BH6-BH2 .

5.4.2 Tomographic analysis of each dataset was carried out and section presented accordingly (Drawing 3525-03). The tomographic panels were generally consistent with the velocities derived from the basic direct raypath analysis.

5.4.3 Tomographic data were combined into a 3-D volume to enable 3-D representation. The results are provided at 4 different projections (NW, NE, SE, SW) on Drawing 3525-04.

5.4.4 The majority of the low velocity (<4750 m/s) velocities were noted in a laterally continuous upper layer. The thickness of this upper layer was noted to vary between ~ 2m and ~9 m with notable increases in thickness apparent on tomographic panels BH6 to BH2, BH12 to B3 and BH2 to BH12. It is considered that this relatively low velocity layer may relate to upper superficial deposits and/or a variable, weathered or fractured upper bedrock surface.

5.4.5 Typically, below an elevation of ~5 m, the tomographic sections show velocity in excess of 5000 m/s (predominantly 5000-5500 m/s). Notable areas of relatively lower velocity (~4850-5150 m/s; equivalent to up to ~10% reduction) were noted on section BH6-BH12. This observation was consistent with the relatively lower velocities identified from the basic direct velocity analysis for this dataset.

5.4.6 Additional, similar low velocity regions were identified on sections BH6-BH12, BH2-BH3 and BH2-BH12.

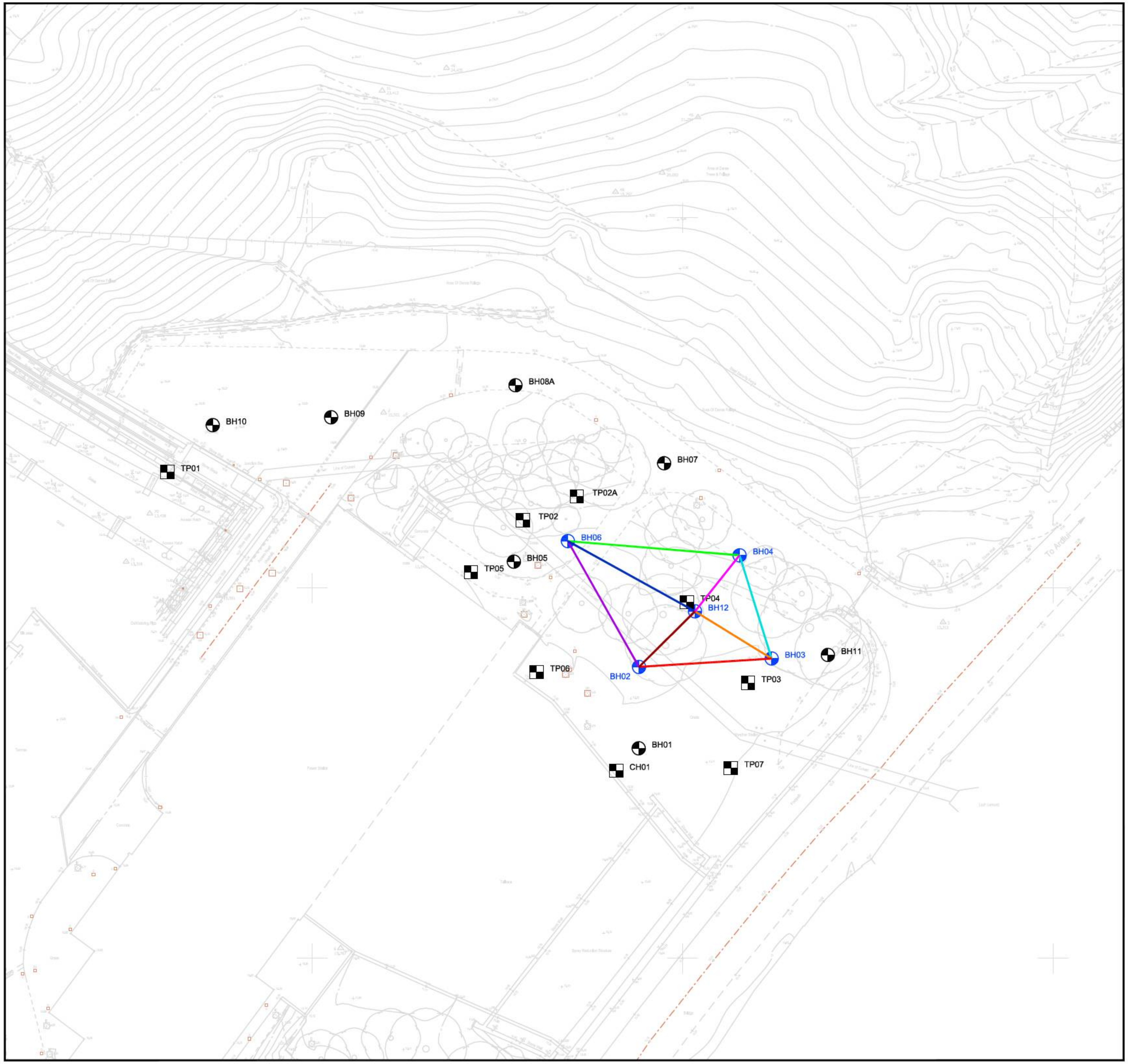
5.4.7 In general, relatively higher velocities (>5250 m/s) were noted on sections BH4-BH6, BH12-BH4 and BH3-BH4.

5.4.8 It can be concluded from these analyses that a general increase in seismic velocity was apparent towards the north eastern part of the investigation area (i.e. away from the existing infrastructure). This conclusion is consistent with the suspected increase in fracturing due to blast damage for the area adjacent to the existing power station (between BH2, BH3 and BH6).

5.4.9 Below about 5 m elevation the analyses indicate velocities in excess of 4000 m/s Reference to standard rippability charts (Appendix D) would indicate that velocities of this magnitude, in metamorphic rock can be classified as non-rippable. In summary, both the basic direct raypath and tomographic analyses indicated seismic velocities in the range 4400-5500 m/s. In generally the lower velocities were identified within the near surface (<10-15 m) rock material and are thought to be related to near surface weathering.

5.4.10 It must be emphasised that geophysical methods can only identify areas yielding results that are different, i.e. anomalous to the site norm. The interpretation of the cause of such anomalies is inevitably based on assumptions utilising the best information available on the nature of the site. Positive identification of these anomalies can only be made by visual or physical sampling methods.

LIST OF DRAWINGS



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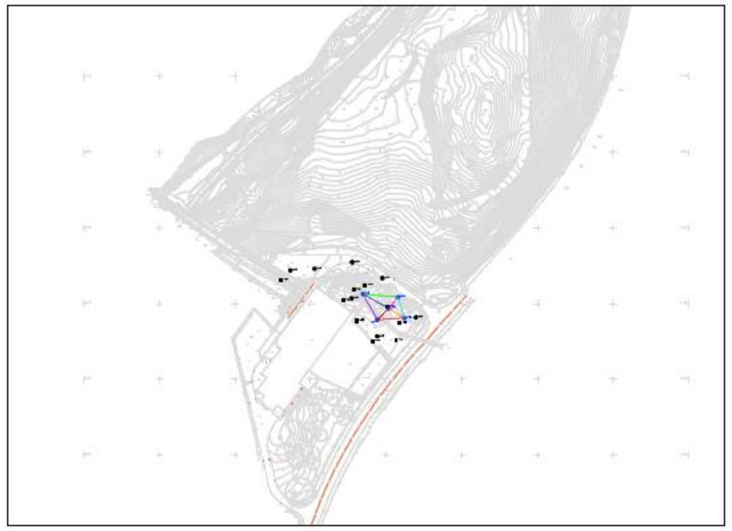

GENERAL LOCATION PLAN SCALE :

Scale 1 : 5000

0 50 100 150 200 250

MAIN PLAN SCALE :

Scale 1 : 500

0 5 10 15 20 25

LEGEND :

- Boreholes
- Trial Pits
- Cross-hole tomography test boreholes
- Cross-hole tomography panel BH2-BH3
- Cross-hole tomography panel BH2-BH6
- Cross-hole tomography panel BH4-BH3
- Cross-hole tomography panel BH4-BH6
- Cross-hole tomography panel BH12-BH2
- Cross-hole tomography panel BH12-BH3
- Cross-hole tomography panel BH12-BH4
- Cross-hole tomography panel BH12-BH6

CLIENT :

SCOTTISH AND SOUTHERN ENERGY

PROJECT :

SLOY PUMPING STATION

TITLE :

LOCATION OF TEST BOREHOLES

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CHECKED BY : [redacted]	DATE: 08/04/2010	APPROVED BY: [redacted]	DATE : 08/04/2010
REPORT No. : J3525		DRAWING 3525-01	

CAD FILE NAME : J3525-01
PLOTTED DRAWING SIZE : A3 (420 X 297)

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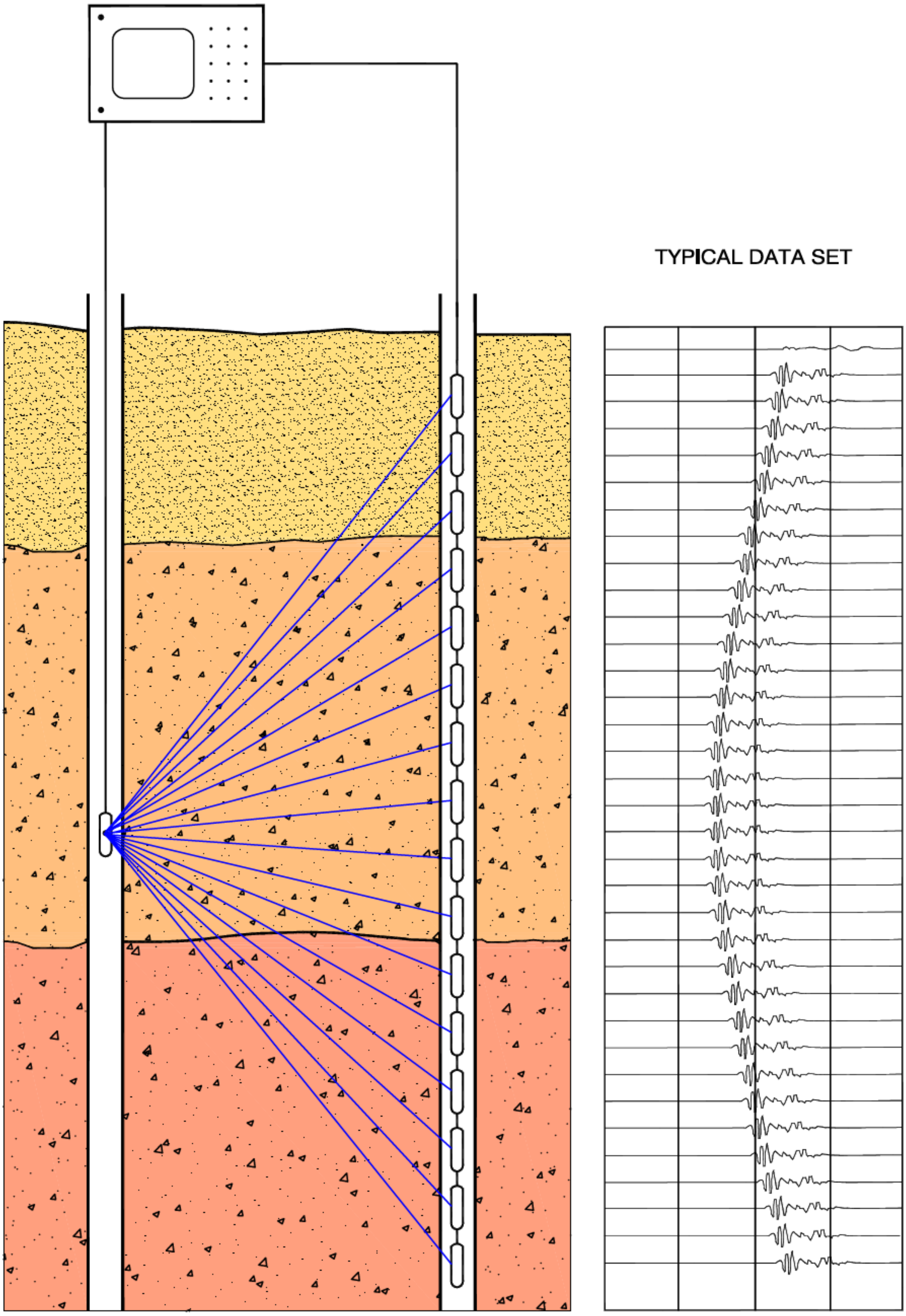
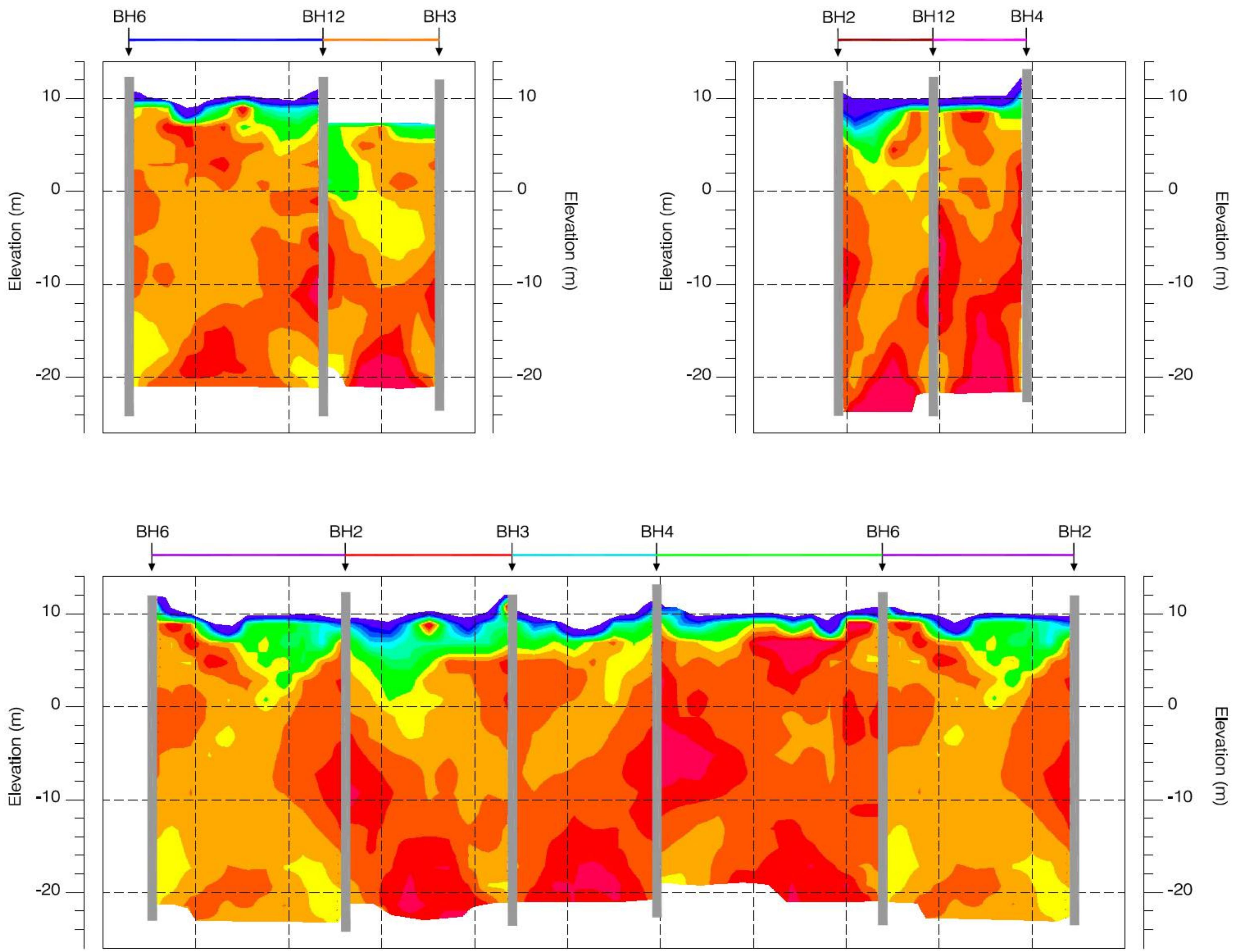


SCHEMATIC ILLUSTRATION OF THE CROSS HOLE P WAVE TOMOGRAPHY TECHNIQUE



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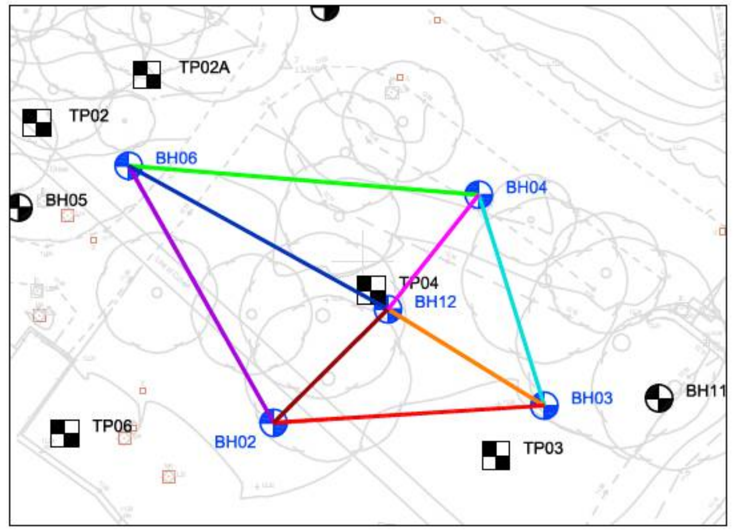

SCALE :

Scale 1 : 500

0 5 10 15 20 25

P WAVE VELOCITY SCALE :

2500 3000 3500 4000 4500 5000 5500 6000 (m/s)

LEGEND :

- Boreholes
- Trial Pits
- Cross-hole tomography test boreholes
- Cross-hole tomography panel BH2-BH3
- Cross-hole tomography panel BH2-BH6
- Cross-hole tomography panel BH4-BH3
- Cross-hole tomography panel BH4-BH6
- Cross-hole tomography panel BH12-BH2
- Cross-hole tomography panel BH12-BH3
- Cross-hole tomography panel BH12-BH4
- Cross-hole tomography panel BH12-BH6

CLIENT :

SCOTTISH AND SOUTHERN ENERGY

PROJECT :

SLOY PUMPING STATION

TITLE :

CROSS-HOLE TOMOGRAPHY PANELS

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CHECKED BY : [redacted]	DATE: 08/04/2010	APPROVED BY: [redacted]	DATE : 08/04/2010

REPORT No. : J3525 DRAWING 3525-03

CAD FILE NAME : J3525-01
PLOTTED DRAWING SIZE : A3 (420 X 297)

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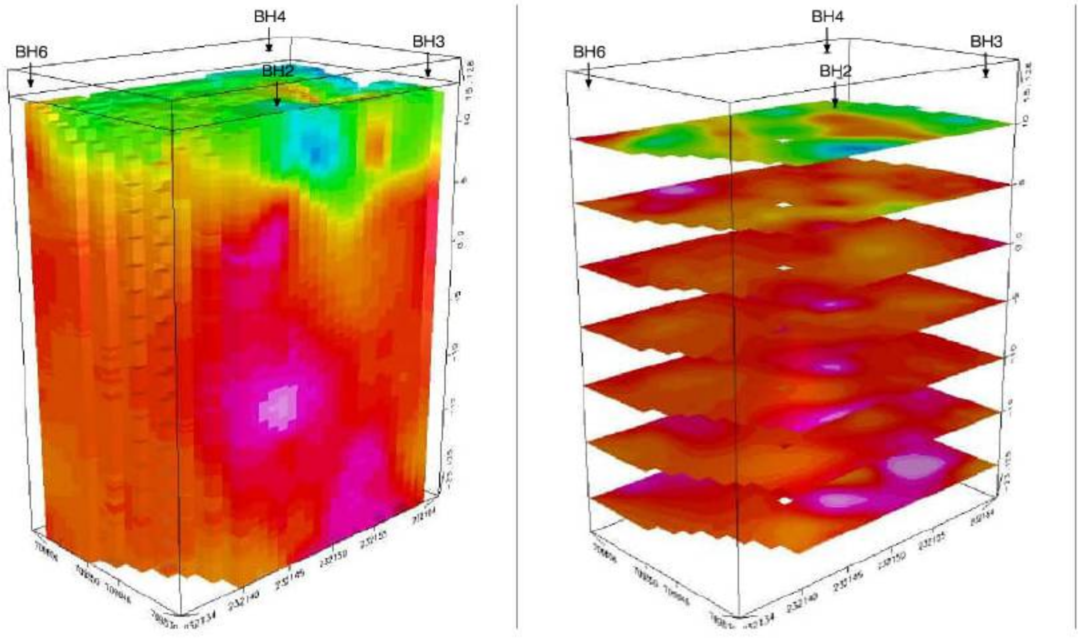

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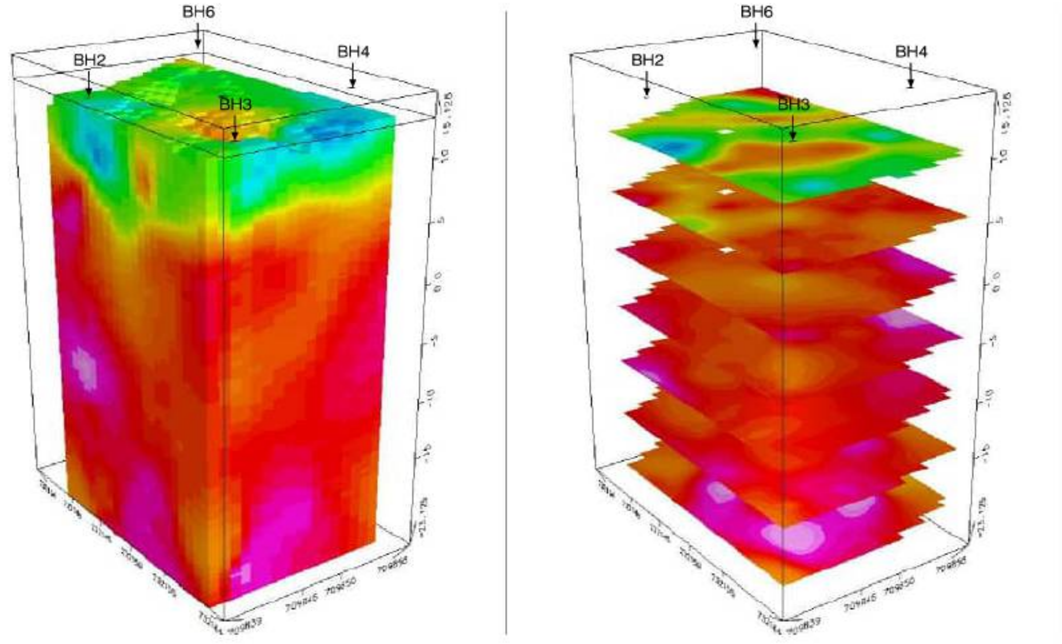

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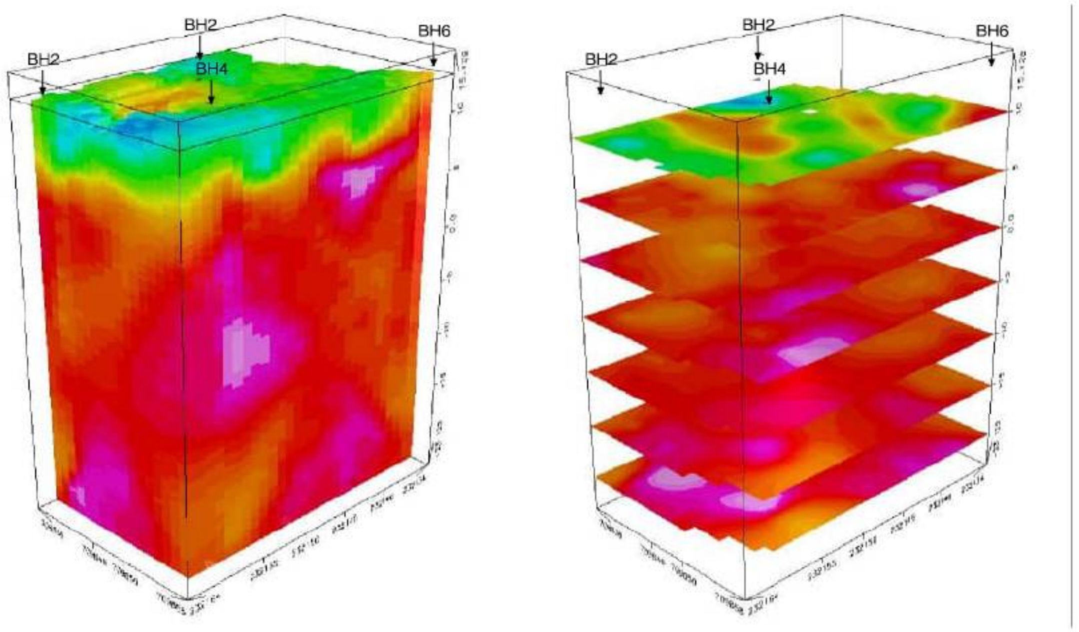
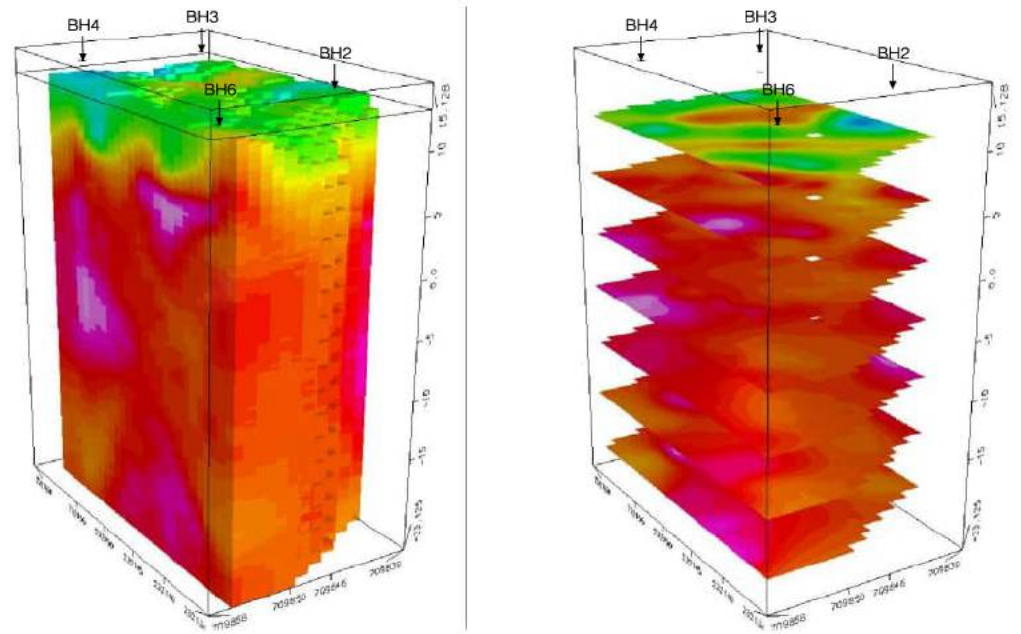
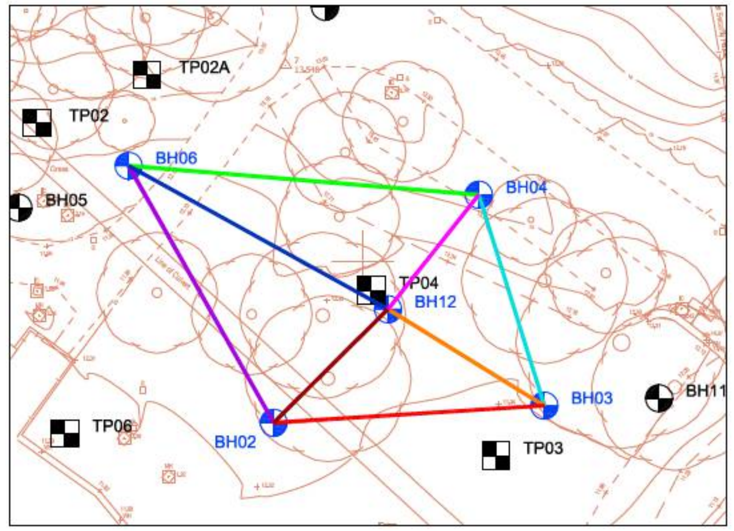


PROJECTION FACING SOUTH-WEST

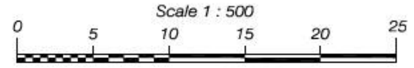


PROJECTION FACING SOUTH-EAST

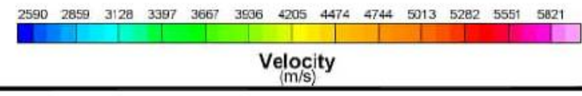
GENERAL LOCATION PLAN :



SCALE :



P WAVE VELOCITY SCALE :



LEGEND :

- Boreholes
- Trial Pits
- Cross-hole tomography test boreholes
- Cross-hole tomography panel BH2-BH3
- Cross-hole tomography panel BH2-BH6
- Cross-hole tomography panel BH4-BH3
- Cross-hole tomography panel BH4-BH6
- Cross-hole tomography panel BH12-BH2
- Cross-hole tomography panel BH12-BH3
- Cross-hole tomography panel BH12-BH4
- Cross-hole tomography panel BH12-BH6

CLIENT :

SCOTTISH AND SOUTHERN ENERGY

PROJECT :

SLOY PUMPING STATION

TITLE :

CROSS-HOLE TOMOGRAPHY PANELS
3-D REPRESENTATION

INTERP. BY : [redacted]	DATE: 26/04/2010	DRAWN BY: [redacted]	DATE : 26/04/2010
CHECKED BY : [redacted]	DATE: 26/04/2010	APPROVED BY: [redacted]	DATE : 08/04/2010

REPORT No. : J3525 | DRAWING 3525-04

CAD FILE NAME : J3525-01
PLOTTED DRAWING SIZE : A3 (420 X 297)

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APPENDIX A

SERVICE CONSTRAINTS

Service Constraints

1. This report and the assessment carried out in connection with the report (together the “Services”) were compiled and carried out by Fugro Aperio Limited on behalf of Fugro Engineering Services for Scottish & Southern Energy (the “Client”) in accordance with the terms of a contract between Fugro Aperio Limited and the Client. The Services were performed by Fugro Aperio Limited with the skill and care ordinarily exercised by a reasonable specialist at the time the Services were performed. Further, and in particular, the Services were performed by Fugro Aperio Limited taking into account the limits of the scope of works required by the Client, the time scale involved and the resources, including financial and manpower resources, agreed between Fugro Aperio Limited and the Client.

2. Other than that expressly contained in paragraph 1 above, Fugro Aperio Limited provides no other representation or warranty whether express or implied, in relation to the Services.

3. The Services were performed by Fugro Aperio Limited exclusively for the purposes of the Client. Fugro Aperio Limited is not aware of any interest of or reliance by any party other than the Client in or on the Services. Unless expressly provided in writing, Fugro Aperio Limited does not authorise, consent or condone any party other than the Client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and Fugro Aperio Limited disclaims any liability to such party. Any such party would be advised to seek independent advice from a competent specialist and / or lawyer.

4. It is Fugro Aperio Limited’s understanding that this report is to be used for the purpose described in Section 2 - “Introduction” of this report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, and/or should the Client’s proposed development or use of the site change (including in particular any change in any design and/or specification relating to the proposed use or development of the site), this report may no longer be valid or appropriate and any further use of or reliance upon the report in those circumstances by the Client without Fugro Aperio Limited’s review and advice shall be at the Client’s sole and own risk. Should Fugro Aperio Limited be requested, and Fugro Aperio Limited agree, to review the report after the date hereof, Fugro Aperio Limited shall be entitled to additional payment at the then existing rates or such other terms as may be agreed between Fugro Aperio Limited and the Client.

5. The passage of time may result in changes (whether man-made or otherwise) in site conditions and changes in regulatory or other legal provisions, technology, methods of analysis, or economic conditions which could render the report inaccurate or unreliable. The information, recommendations and conclusions contained in this report should not be relied upon if any such changes have taken place or after a period of 2 years from the date of this report or such other period as maybe expressly stated in the report, without the written agreement of Fugro Aperio Limited. In the absence of such written agreement of Fugro Aperio Limited, reliance on the report after any such changes have occurred or after the period of 2 years has expired shall be at the Client’s own and sole risk. Should Fugro Aperio Limited agree to review the report after the period of 2 years has expired, Fugro Aperio Limited shall be entitled to additional payment at the then existing rates or such other terms as may be agreed between Fugro Aperio Limited and the Client.

6. The observations, recommendations and conclusions in this report are based solely upon the Services, which were provided pursuant to the contract between the Client and Fugro Aperio Limited. Fugro Aperio Limited has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the Client and Fugro Aperio Limited. Fugro Aperio Limited is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services.

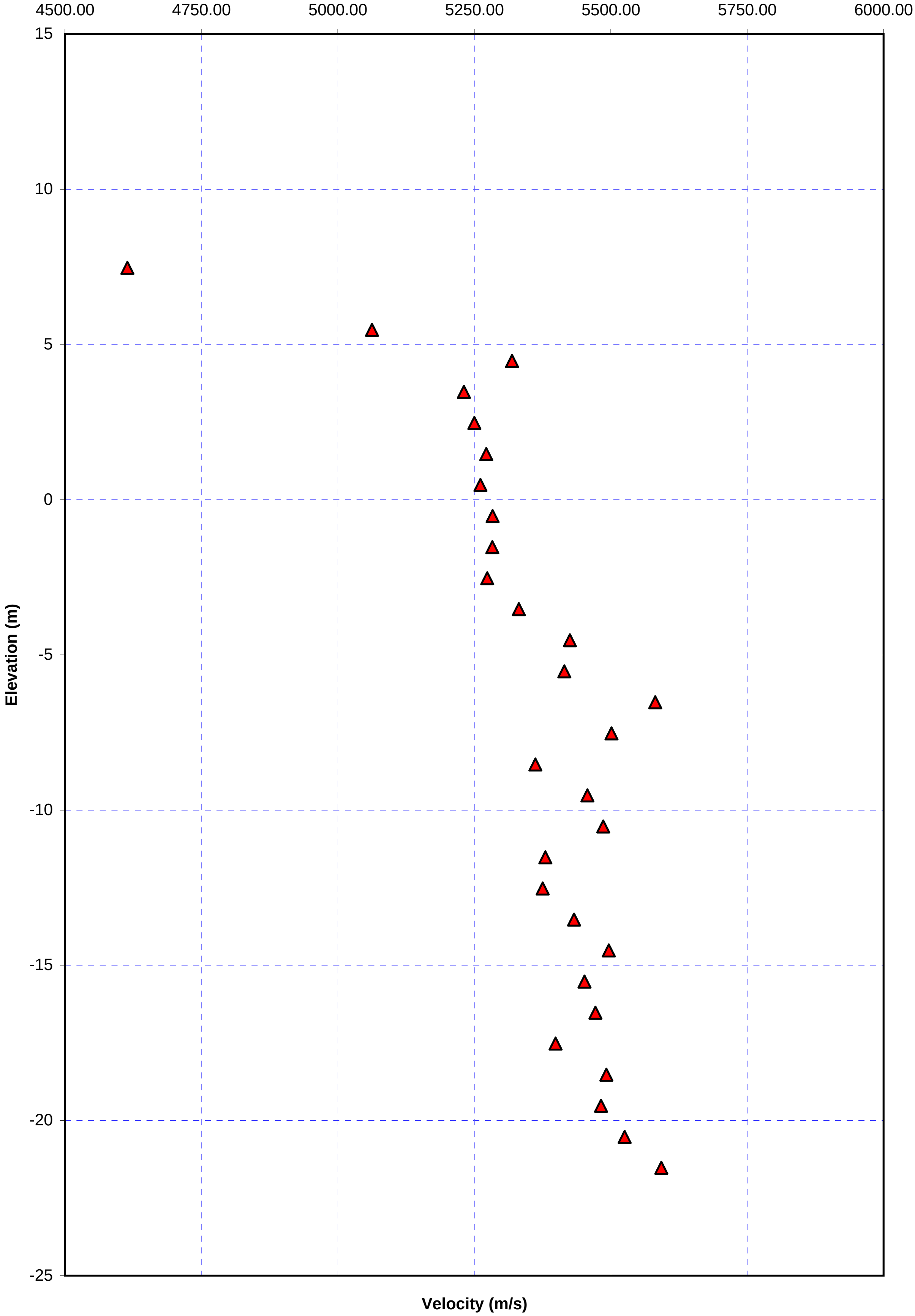
7. Where the Services have involved Fugro Aperio Limited’s interpretation and/or other use of any information (including documentation or materials, analysis, recommendations and conclusions) provided by third parties (including independent testing and/or information services or laboratories)

or the Client and upon which Fugro Aperio Limited was reasonably entitled to rely or involved Fugro Aperio Limited's observations of existing physical conditions of any site involved in the Services, then the Services clearly are limited by the accuracy of such information and the observations which were reasonably possible of the said site. Unless otherwise stated, Fugro Aperio Limited was not authorised and did not attempt to independently verify the accuracy or completeness of such information, received from the Client or third parties during the performance of the Services. Fugro Aperio Limited is not liable for any inaccuracies (including any incompleteness) in the said information, the discovery of which inaccuracies required the doing of any act including the gathering of any information which it was not reasonably possible for Fugro Aperio Limited to do including the doing of any independent investigation of the information provided to Fugro Aperio Limited save as otherwise provided in the terms of the contract between the Client and Fugro Aperio Limited.

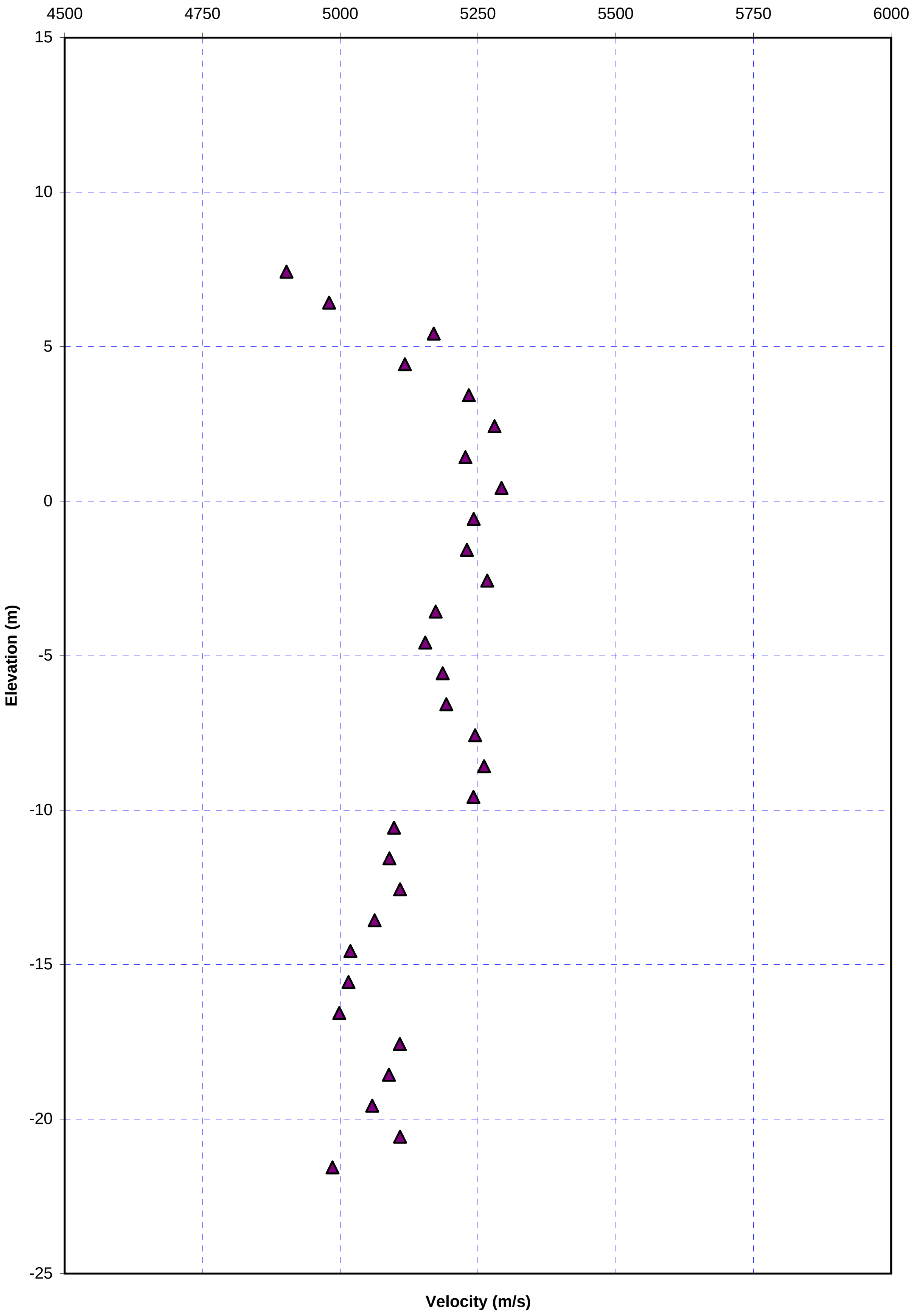
APPENDIX B

DIRECT VELOCITY PROFILES

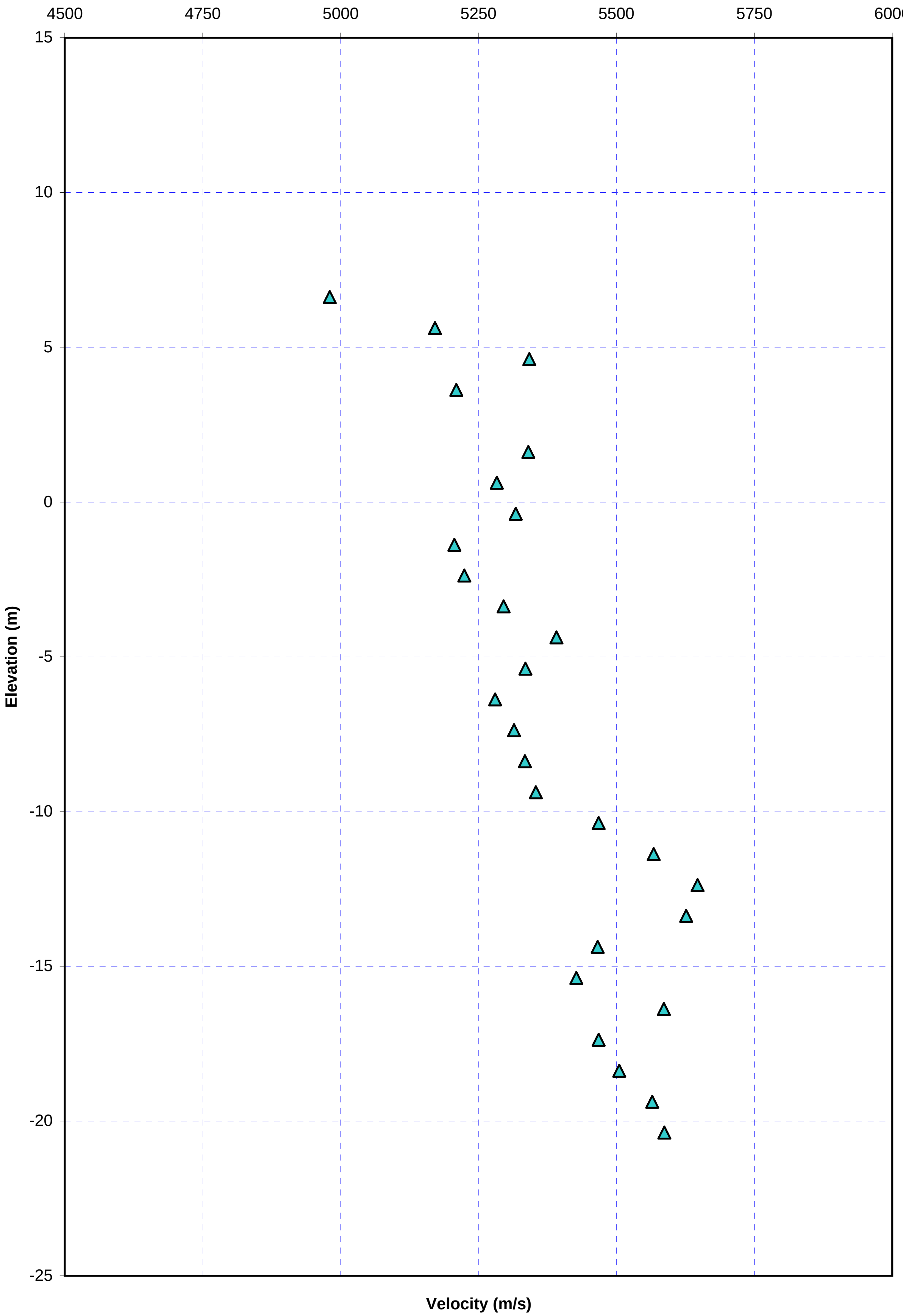
Direct P-wave Velocity - BH2-BH3



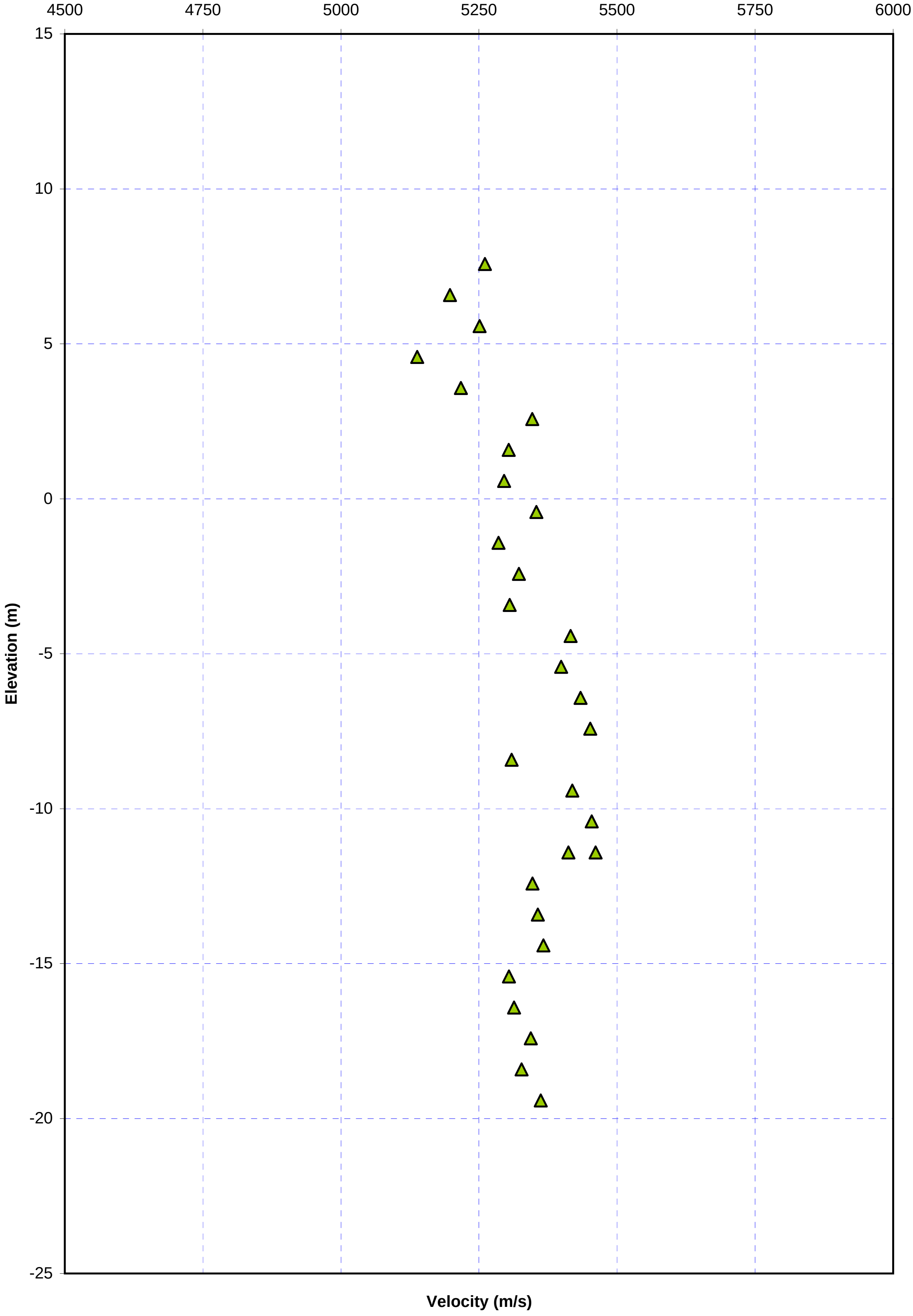
Direct P-wave Velocity - BH2-BH6

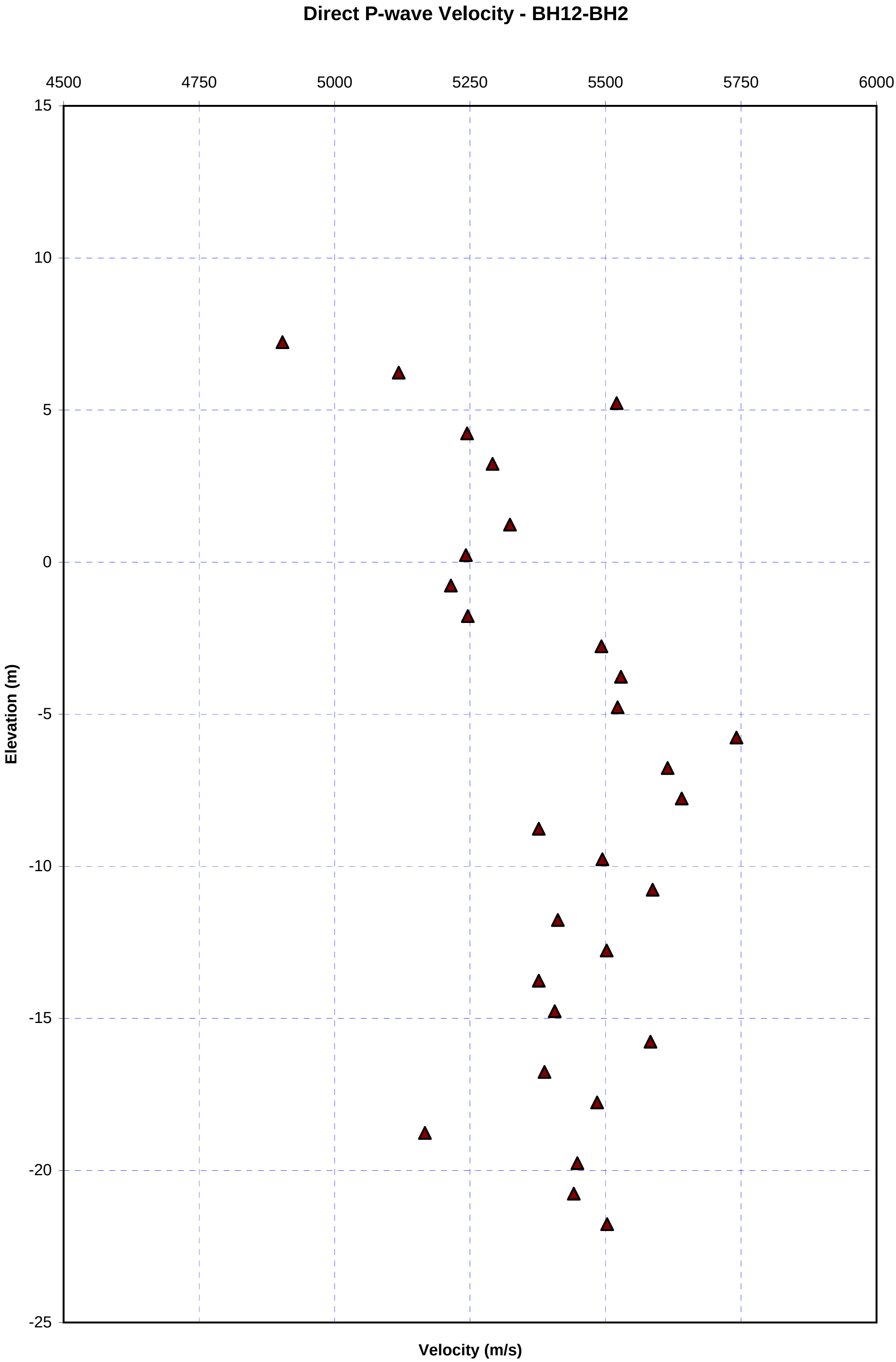


Direct P-wave Velocity - BH4-BH3

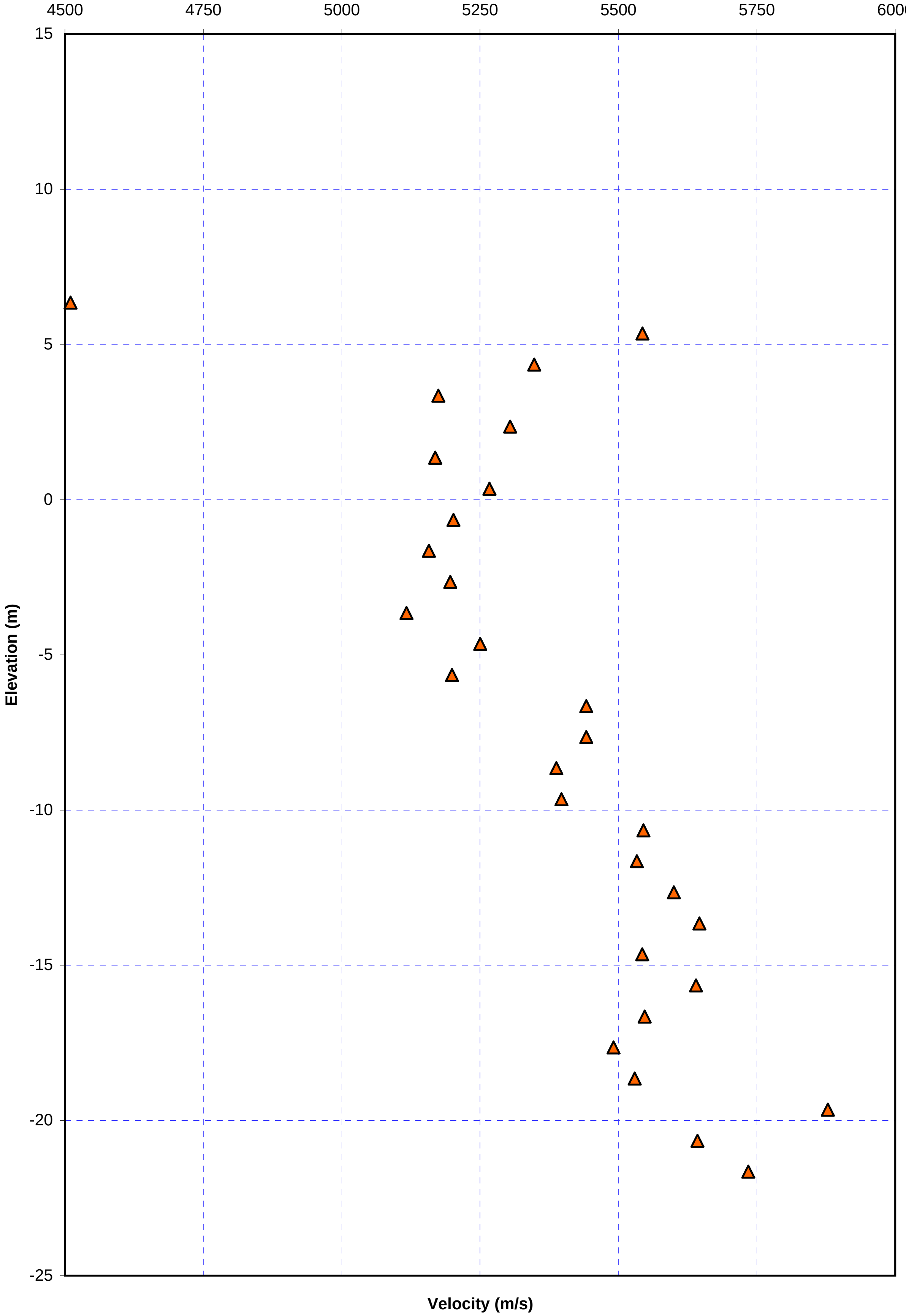


Direct P-wave Velocity - BH4-BH6

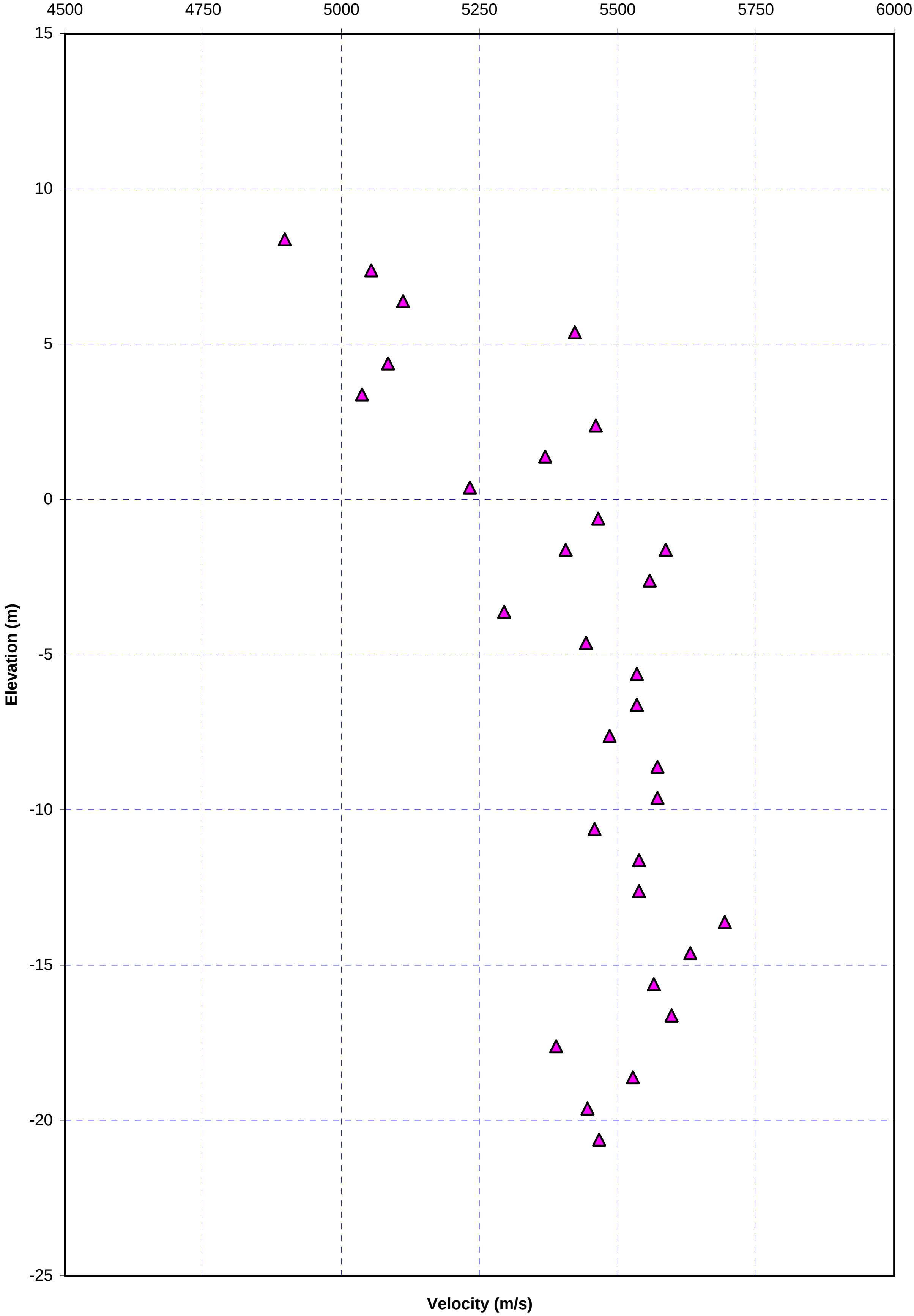



Direct P-wave Velocity - BH12-BH2
4500
4750
5000
5250
5500
5750
6000
15
10
5
0
-5
-10
-15
-20
-25
Elevation (m)
Velocity (m/s)

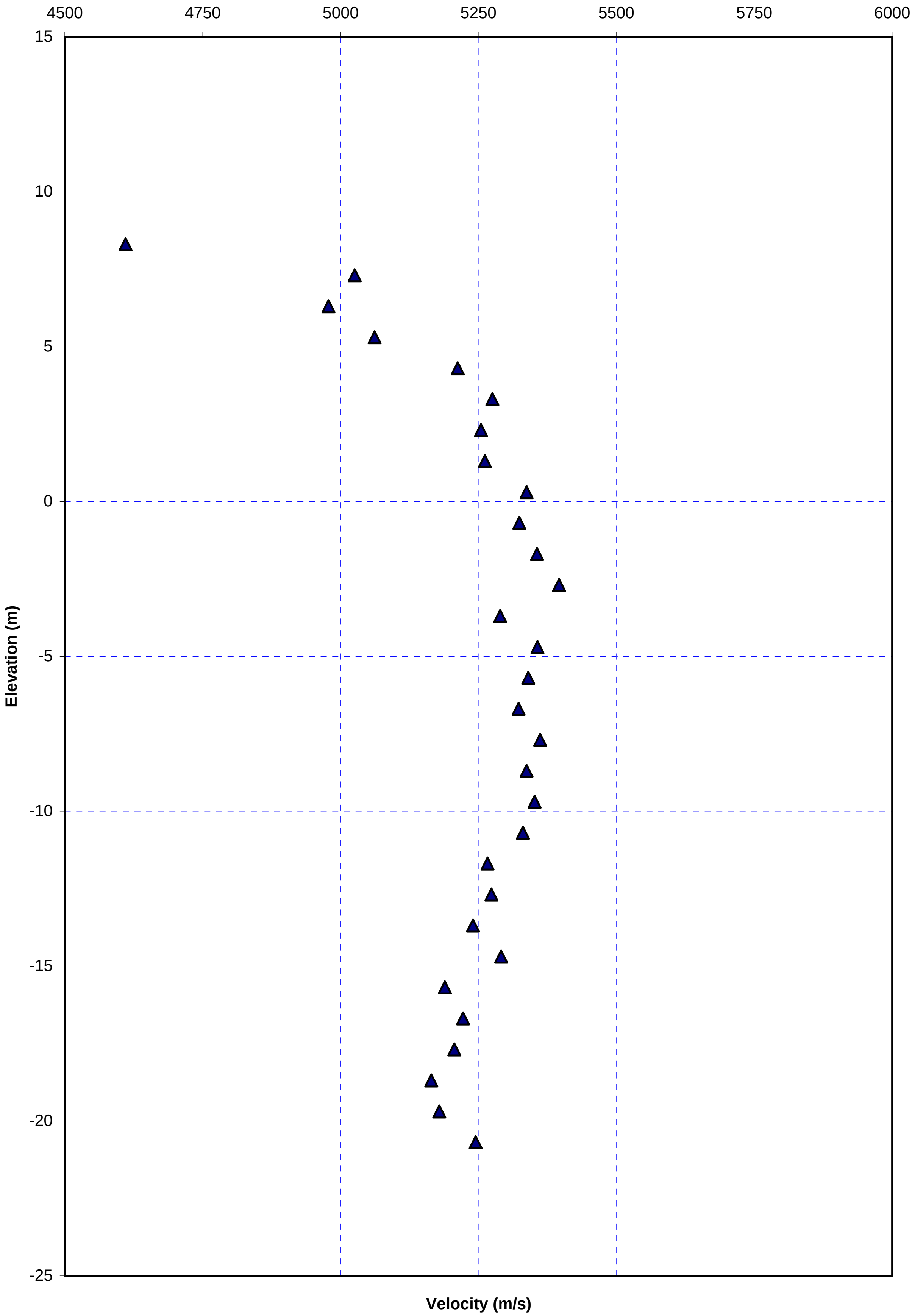
Direct P-wave Velocity - BH12-BH3



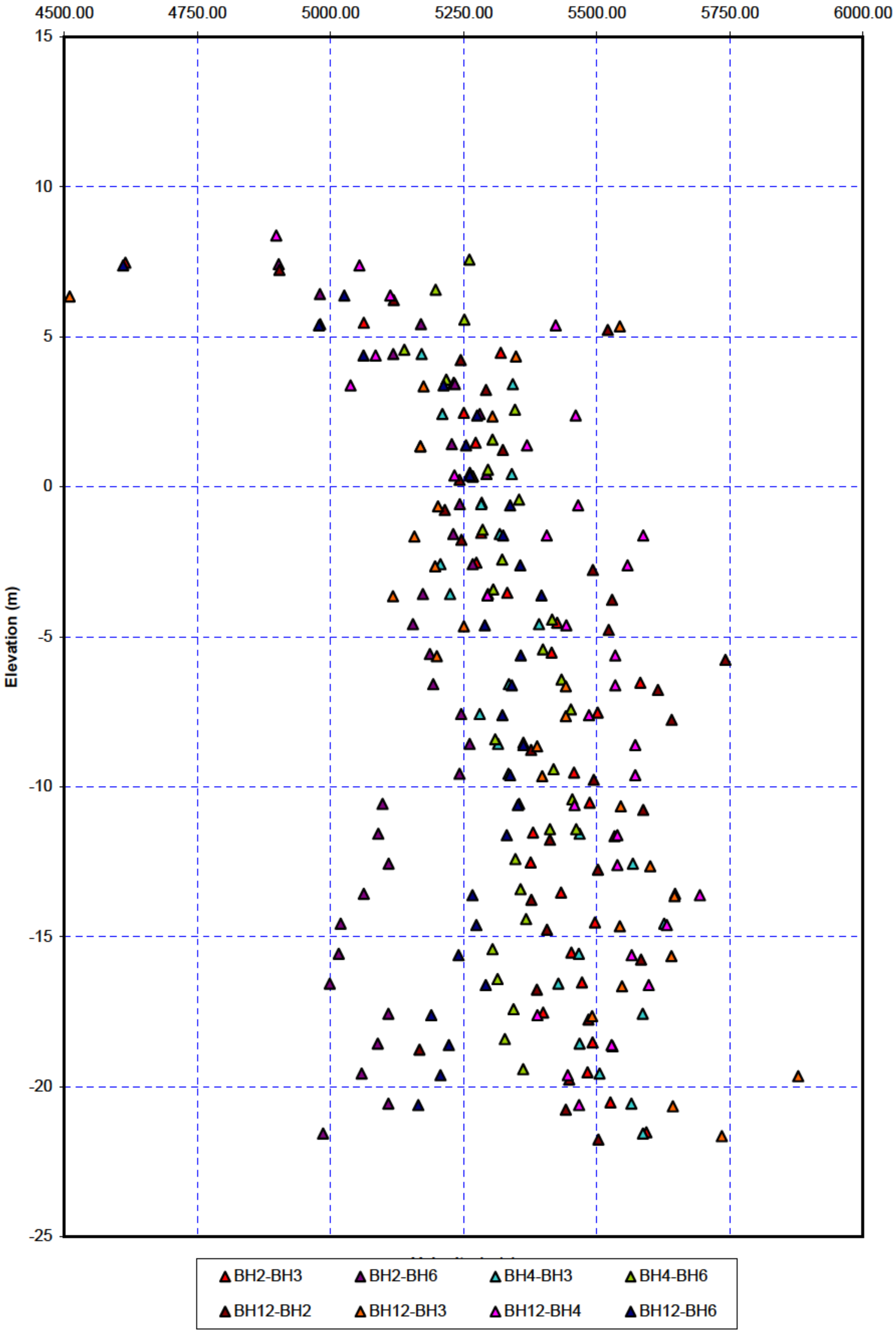
Direct P-wave Velocity - BH12-BH4



Direct P-wave Velocity - BH12-BH6



Direct P-wave Velocity - All boreholes



APPENDIX C

EQUIPMENT SPECIFICATIONS

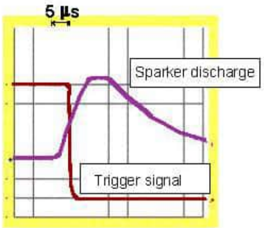
Geotomographie

P-wave sparker equipment

The basic seismic crosshole source equipment consists of the electric surge generator IPG and the remote control unit RCU. To the surge generator various seismic sparker sources can be connected. Triggering of the seismic aquisition system is performed by the remote unit.

IPG 1005

<u>Technical data IPG 1005</u>
Impulse voltage: 5 KV
Impuls energy: 1000 J
Repetition rate: from 4 to 7 s
Power supply: 230 V 50 Hz 2,5 A
Dimensions: 52 x 25 x 50 cm
Weight: ~ 52 Kg
Working Mode: Manual/Continuous
Emergency OFF button
Safety key switch



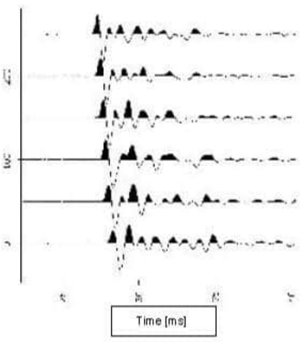
The remote control unit RCU converts the reference signal of the surge generator to a trigger signal (right). Sparker pulses are released through manual or automatic triggering of the generator by the remote unit. The background noise can be recorded automatically and used to interrupt data aquisition if the noise level is to high. Trigger accuracy is below 10 µs (left).

RCU

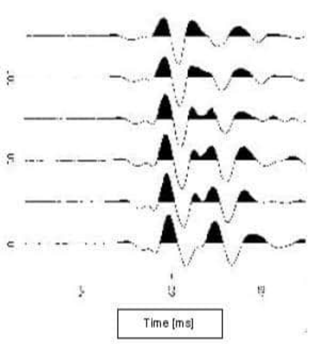
<u>Technical data RCU</u>
TTL Low/High trigger output
Trigger test option
Trigger level adjustment
Impulse Counting
Single shot release
Continuous shot release
(with variable repetition rate from 4..7 sec.)
Emergency OFF button
Safety key switch

To generate the sparker pulses within the borehole the p-wave sparker probe **SBS 42** is used (left). The SBS 42 consists of a probe tube and a rubber tube system. The sparker predominantly produces high frequency p-waves even over large distances as shown below.

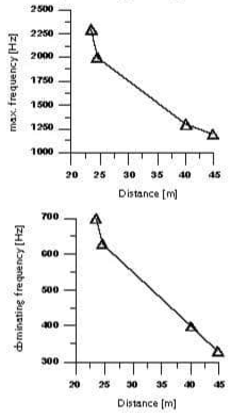
Borehole distance 45 m



Borehole distance 95 m

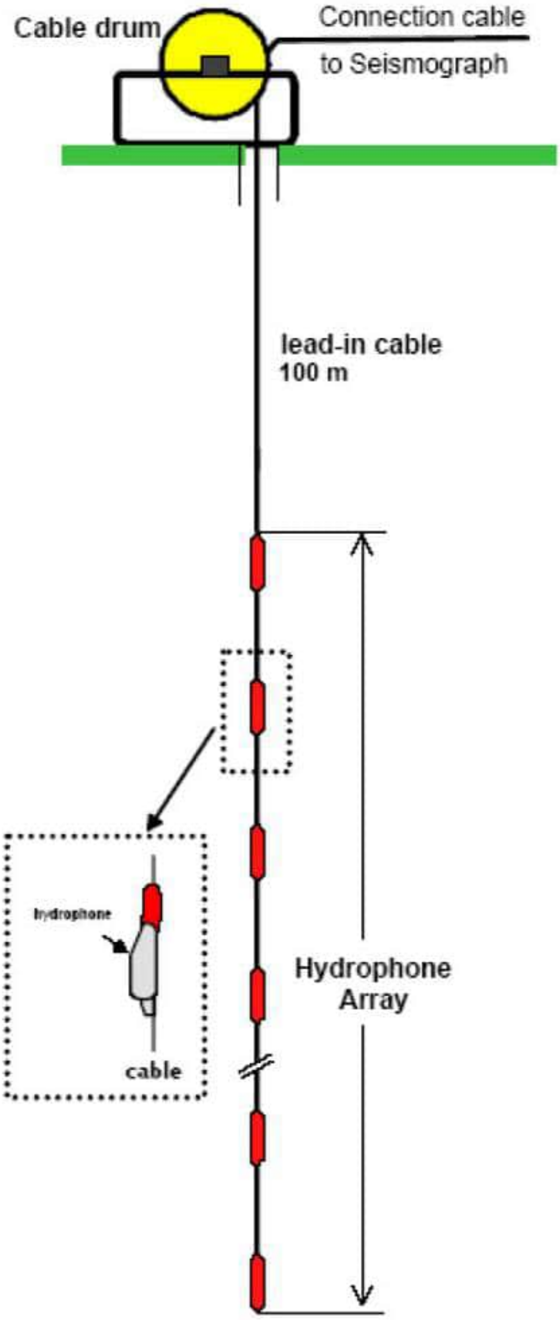


Frequency response



Geotomographie Am Tonnenberg 18 Germany 56567 Neuwied geotomo@t-online.de www.geotomographie.de

Borehole Hydrophone String (24No. @ 1m separation Geospace MP25)



The Borehole Hydrophone Chain 2 is a compact seismic receiver system of up to 24 hydrophones having fixed spacings, e.g. 1 m.

In the standard version Geospace MP25 hydrophones are used, which have a maximum operation depth of about 200 m. Other types of hydrophones can be delivered on request.

For running the hydrophone string in an open hole, an additional pulling rope with sinker bar can be used. These accessories will be delivered together with the borehole hydrophone chain.

An OYO Geospace Company

PRODUCTS | REQUEST INFO | SUPPORT | CONTACT INFORMATION | NEWS & EVENTS

Geophysical
Sensors
Geophones
Hydrophones
MP18
MP24
MP25
MP24R
MP25R
MP26
MP-8D & MP-8F
Multi-Component
Geophysical Acquisition Systems
Telemetry Cable & Leader Wire
Connectors
Adaptors
Geophone Cases/Splices/Ts
Accessories

Industrial/Geophones
Seismology
Marine Seismic Solutions

MP-25

>Easy method to check polarity
>6 months warranty
>High output
>Acceleration noise canceling configuration

The MP-25 is a high output, pressure sensitive detector for use in swamps, rivers, bans and transition zones.

The MP-25 is transformer-coupled and has 8 piezoelectric crystals connected in an acceleration-canceling arrangement with each crystal operating in the high sensitivity bender mode. The crystals and transformer are permanently molded in a durable polyurethane case. This sealed unit has a thermoplastic resin outer case with easy access ports for polarity testing. The Sidewinder version does not have the outer case.

>Specs

The MP-25 Sidewinder version is designed for easy mounting to bay cable and reduction of leader cable stress. Its tapered design positions the leader flush with the cable thereby greatly reducing the friction in this area as the hydrophone travels through the squirter.

Anchor slots have been provided for tie wrapping the hydrophone to the bay cable thus facilitating the process of taping the unit to the cable.

seismic exploration GEOSPACE TECHNOLOGIES
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PRODUCTS | REQUEST INFO | SUPPORT | CONTACT INFORMATION | NEWS & EVENTS

Geophysical
Sensors
Geophones
Hydrophones
MP18
MP24
MP25
MP24R
MP25R
MP26
MP-8D & MP-8F
Multi-Component
Geophysical Acquisition Systems
Telemetry Cable & Leader Wire
Connectors
Adaptors
Geophone Cases/Splices/Ts
Accessories

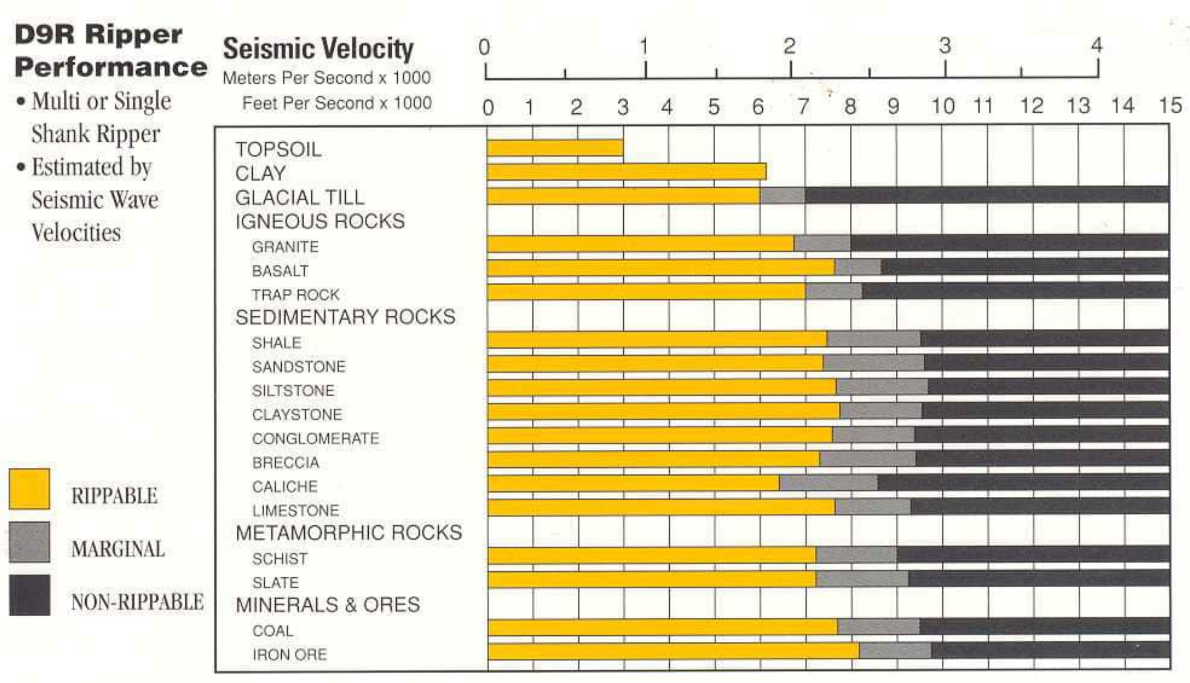
Industrial/Geophones
Seismology
Marine Seismic Solutions

MP-25 Specifications

	MP-25-250	MP-25-350	MP-25-656
Natural Frequency ± 15 *	10 Hz	10 Hz	10 Hz
Voltage Sensitivity ± 1.5 dB	11.2 Volts/Bar	8.0 Volts/Bar	6.4 Volts/Bar
Impedance	250 Ohms	250 Ohms	250 Ohms
DC Resistance ± 10%	160 Ohms	160 Ohms	160 Ohms
Operating Temperature Range	0-35°C	0-35°C	0-35°C
Operational Depth	1-250 ft (.30-76 m)	1-350 ft (.30-107 m)	1-656 ft (.30-200 m)
Dimensions:	Without Outer Case	With Outer Case	Sidewinder
Length:	4.75 in (12.07 cm)	5.50 in (13.97 cm)	6.60 in (16.76 cm)
Diameter:	2.00 in (5.08 cm)	2.40 in (6.10 cm)	2.00 in (5.08 cm)
Weight:	.52 lbs (236 g)	.77 lbs (349 g)	.58 lbs (263 g)

APPENDIX D

D9R CATERPILLAR RIPPABILITY CHART



Caterpillar 'D9R Rippability Chart'

APPENDIX E Geotechnical Laboratory Test Results

Schedule of Accreditation
issued by
United Kingdom Accreditation Service
21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

UKAS TESTING **1483** **Accredited to ISO/IEC 17025:2005**	**Fugro Engineering Services Limited** **Issue No:** 016 **Issue date:** 15 November 2006

Armstrong House Unit 43
Number One Industrial Estate
Medomsley Road
Consett
Co Durham
DH8 6TW

Contact: [redacted]
Tel: [redacted]
Fax: [redacted]
E-Mail: [redacted]
Website: www.fes.co.uk

Testing performed at the above address only

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
ROCK	Point load strength and anisotropy indices	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985
	Water content	ISRM Suggested Methods - Rock Characterisation Testing and Monitoring. Ed E T Brown 1981
	Porosity and density - by saturation and calliper techniques	ISRM Suggested Methods - Rock Characterisation Testing and Monitoring. Ed E T Brown 1981
	Porosity and density - by saturation and buoyancy techniques	ISRM Suggested Methods - Rock Characterisation Testing and Monitoring. Ed E T Brown 1981
	Slake-durability index	ISRM Suggested Methods - Rock Characterisation Testing and Monitoring. Ed E T Brown 1981
SOILS for civil engineering purposes	California Bearing Ratio (CBR)	BS 1377:Part 4:1990
	Unconfined compressive strength - load frame method	BS 1377:Part 7:1990
	Undrained shear strength - triaxial compression without measurement of pore pressure	BS 1377:Part 7:1990

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
SOILS for civil engineering purposes (Cont'd)	Undrained shear strength - triaxial compression with multistage loading and without measurement of pore pressure	BS 1377:Part 7:1990
	Moisture content - oven drying method	BS 1377:Part 2:1990
	Saturation moisture content of chalk	BS 1377:Part 2:1990
	Liquid limit - cone penetrometer	BS 1377:Part 2:1990
	Liquid limit - cone penetrometer - one point	BS 1377:Part 2:1990
	Plastic limit	BS 1377:Part 2:1990
	Plasticity index and liquidity index	BS 1377:Part 2:1990
	Density - linear measurement	BS 1377:Part 2:1990
	Density - immersion in water	BS 1377:Part 2:1990
	Density - water displacement	BS 1377:Part 2:1990
	Particle density - gas jar	BS 1377:Part 2:1990
	Particle size distribution - wet sieving	BS 1377:Part 2:1990
	Particle size distribution - dry sieving	BS 1377:Part 2:1990
	Particle size distribution - sedimentation - pipette method	BS 1377:Part 2:1990
	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377:Part 4:1990
	Dry density/moisture content relationship (4.5 kg rammer)	BS 1377:Part 4:1990
	Dry density/moisture content relationship (vibrating hammer)	BS 1377:Part 4:1990

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
SOILS for civil engineering purposes (Cont'd	Moisture condition value (MCV)	BS 1377:Part 4:1990
	Chalk crushing value	BS 1377:Part 4:1990
	One-dimensional consolidation properties	BS 1377:Part 5:1990

END

GENERAL NOTES ON LABORATORY TEST RESULTS

1. TEST METHODS

The tests reported on the following sheets have been carried out in accordance with the methods given in BS 1377:1990 'Methods of test for soils for civil engineering purposes', subject to a small number of variances as described below under the respective headings. These notes also serve as keysheets to any notation used in reporting the laboratory tests.

2. KEY TO NOTATION OF SAMPLE TYPE

D	Small disturbed sample
B	Bulk disturbed sample
U	General purpose open drive tube sample
P	Piston sample
TW	Thin wall sample
C	Rotary core sample

3. CLASSIFICATION TESTS

% passing 425µm:	this figure is only correctly reported when 'WS' is shown in the 'Method of preparation' column. For 'HP' and 'AR', the reported figure is an estimate only.
WS	sample prepared by Wet Sieving
HP	sample prepared by Hand Picking (removal) of gravel sized fragments
AR	sample tested "As Received"
NP:	non-plastic

4. COMPACTION RELATED TESTS

Sample preparation: **Individual** indicates test carried out on individual sub-samples

Single indicates test carried out on a single sample

Assumed values of particle density are reported in brackets e.g. (2.67)

5. SAMPLE DESCRIPTIONS

The sample descriptions shown on the test report sheets are the technician's visual descriptions of the test samples, in accordance with Clause 9.1 of Part 1 of BS 1377:1990 and do not necessarily comply with the requirements of BS 5930:1999 or BS EN ISO 14688-1:2002. For a more comprehensive description of the soil samples to these standards, reference should be made to the exploratory hole records, or an engineering description can be provided on request.

6. INTERPRETATION OF TEST RESULTS

Laboratory test results in this report give the soil properties of individual specimens tested under specified conditions. Individual results or groups of results may not be appropriate for use as design parameters for some geotechnical analyses. The samples may be non-representative, disturbed internally, or prepared and tested under conditions suited for different geotechnical applications. Unless the selection of design parameters is discussed in this report, it is recommended that the advice of an appropriately qualified and experienced specialist is sought.

7. U100 DRIVEN OPEN TUBE SAMPLES

It should be noted that the sampling method generally gives Class 2 samples, ie for use for laboratory classification, moisture content and density testing. BS5930 states that the U100 sampling procedure may sometimes give Class 1 samples (strength, deformation and consolidation testing as well as Class 2 type testing) in non sensitive fine cohesive soils of stiff or lower consistency, but more often provides Class 2 samples. In brittle or closely fissured materials such as hard clays, the sampling method gives Class 3 samples, ie for use for laboratory classification and moisture content testing.

Scottish and Southern Energy
SLOY PUMPING STATION

SUMMARY OF SOIL CLASSIFICATION TESTS

BS : 1377 Part 2 : 1990

Hole	Sample No	Type	Depth	Bulk Density (Mg/m^3)	Moisture Content (%)	Dry Density (Mg/m^3)	Particle Density (Mg/m^3)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	% passing 425 µm	Method	Description
BH2	6	B	3.00		4								Brown slightly silty cobbly sandy GRAVEL
BH3	4	B	1.20		18			27	21	6	47	HP	Brown slightly gravelly sandy clayey SILT
BH3	4	B	1.20		17								Brown silty very gravelly SAND
BH4	6	B	3.00		3								Brown slightly silty sandy GRAVEL and COBBLES
BH10	5	B	2.00		2								Brown COBBLES
BH10	7	B	3.00		9								Brown slightly clayey slightly cobbly very sandy GRAVEL

Remarks	[redacted]					
Prepared By		Checked By	[redacted]	Date	29/04/2010	Project No	CON103001

FES/LR/04/01

Figure No.	LT1/ 1	Sheet	

Scottish and Southern Energy
SLOY PUMPING STATION

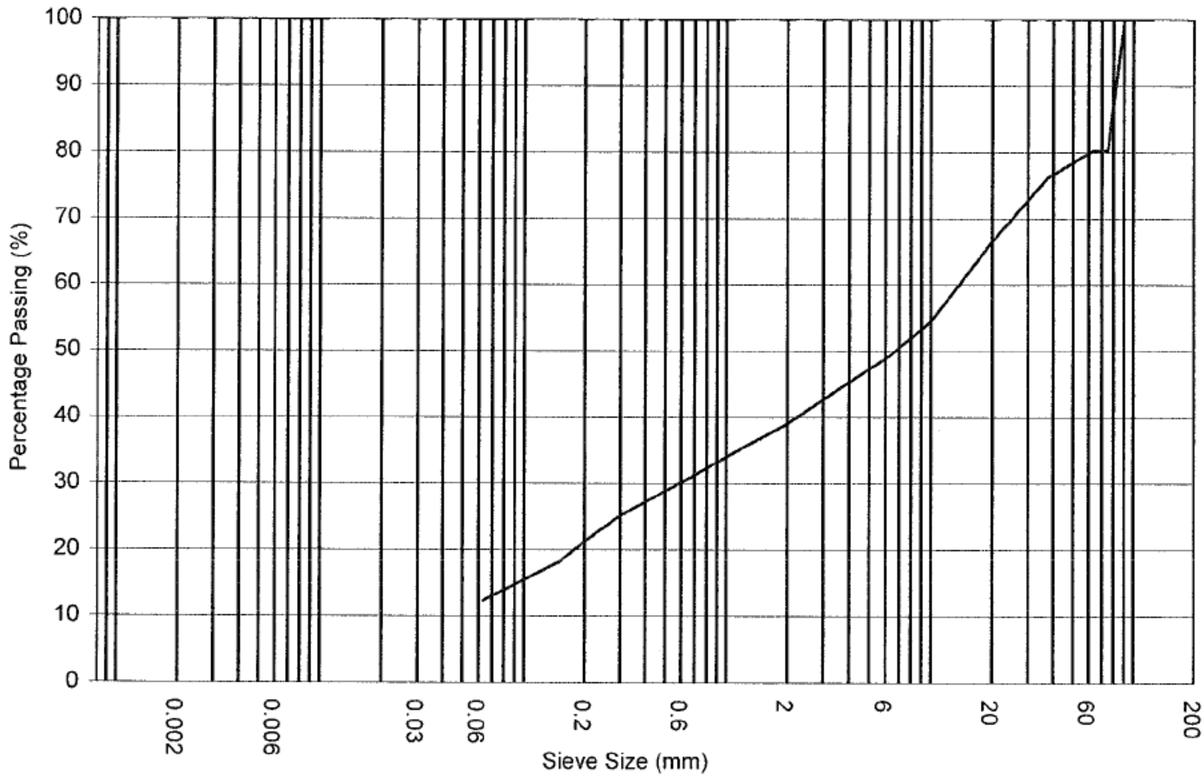
PARTICLE SIZE DISTRIBUTION
BS 1377 : Part 2 : 1990 : Test 9.2 ~~& 9.4~~

Hole No. : BH1 | Sample No. : 1 | Sample Type : B | Depth (m) : 0.50

Specimen Details

Test Date : 26/04/2010
Loss on Pretreatment : Not applicable

Soil Description : Brown silty cobbly very sandy GRAVEL



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SUMMARY

CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)	COBBLES (%)
	12	27	41	20

Uniformity Coefficient : Not Applicable

Remarks : Insufficient material to comply with BS1377. Treat results with caution.

Notes : If no value given for percentage clay, all fines included in percentage silt

Prepared By	[redacted]	Checked By	[redacted]	Date	29/04/2010	Project No	CON103001

FES/LR/04/02

Figure No.	LT2/ 1	Sheet	

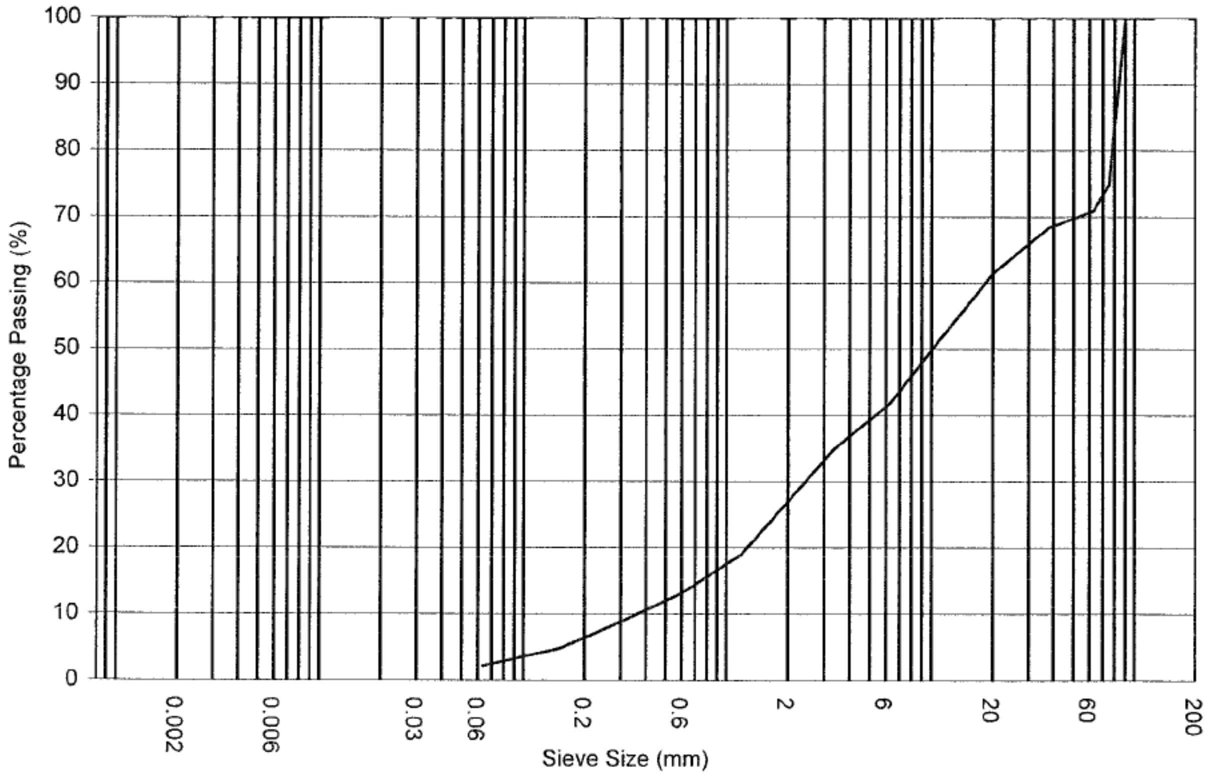
Scottish and Southern Energy
SLOY PUMPING STATION

PARTICLE SIZE DISTRIBUTION
BS 1377 : Part 2 : 1990 : Test 9.2 ~~& 9.4~~

Hole No. : BH1 Sample No. : 4 Sample Type : B Depth (m) : 2.00

Specimen Details
Test Date : 26/04/2010
Loss on Pretreatment : Not applicable

Soil Description : Brown slightly silty very sandy very cobbly GRAVEL



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

SUMMARY

CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)	COBBLES (%)
	2	25	44	29
Uniformity Coefficient :		48.8		
Remarks : Insufficient material to comply with BS1377. Treat results with caution.				
Notes : If no value given for percentage clay, all fines included in percentage silt				

Prepared By	[redacted]	Checked By	[redacted]	Date	29/04/2010	Project No	CON103001

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Figure No.	LT2/ 2	Sheet	