GEOLOGIC
DATA REPORTS

Book 2 of 4

Attachments to PG&E Letter DIL-01-004
Dated December 21, 2001

DATA REPORT E
BOREHOLE GEOPHYSICAL DATA
(NORCAL Geophysical Consultants, Inc.)

DIABLO CANYON ISFSI

REGISTERED GEOLOGIST
JEFF BACHHUBER
4909
STATE OF CALIFORNIA

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DATA REPORT E
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DCPP ISFSI SAR

Data Report E

Borehole Geophysical Data

(NORCAL Geophysical Consultants, Inc.)

1.0 INTRODUCTION

NORCAL Geophysical Consultants, Inc. (NORCAL) performed downhole geophysical logging surveys in most of the ISFSI site area borings (Figure E-1). The purpose of the geophysical surveys was to locate clay beds, assess bedding dips, evaluate fracture and joint patterns, and help understand the stratigraphy of bedrock at the site. Geophysical surveys were performed during two different periods of drilling. In December 2000, an initial geophysical survey was performed in Borings 00BA-1 and 00BA-2. An initial interpretation of the geophysical data was provided by NORCAL in their December 26, 2000 report. NORCAL later reinterpreted the December data and reissued replacement pages to the December report on May 5, 2001. In April 2001, NORCAL performed additional geophysical surveys in ten borings at the ISFSI and CTF sites, 01-A through 01-I and 01CTF-A. These data are presented in the June 1, 2001 NORCAL report. The geophysical logging in 2000 and 2001 was conducted by William J. Henrich and Dan Jones of NORCAL, with field support provided by Jeff Bachhuber, Charles Brankman, Rich Koehler, and John Helms of William Lettis & Associates, Inc (WLA). The NORCAL reports in this Data Report include copies of the geophysical logs and the televiewer images.

The preparation of this data report was performed under the WLA Work Plan (Rev. 2) dating November 28, 2000 using data collected under that Work Plan and a second WLA Work Plan (Rev. 1) dated September 19, 2001. The geophysical measurements were made under NORCAL Geophysical Consultants Work Plans (Rev. 0, dated December 4, 2000, and Rev. 1, dated April 13, 2001).

2.0 METHODOLOGY

NORCAL produced a suite of geophysical logs at the ISFSI site area. Caliper and optical televiewer (OPTV) logs were produced for all 10 borings drilled in 2001 and 2 borings drilled in 2000. In addition, natural gamma logs were produced for borings 00BA-1 and 00BA-2. The geophysical surveys were designed to measure borehole diameter, gamma intensity, and provide photographic sidewall images that are oriented to magnetic north. The OPTV logs used an interactive computer program to interpret and measure the orientations of fractures observed in the borings.

3.0 RESULTS

The caliper logs in the borings show zones of borehole overbreak. When compared against the OPTV logs, these zones are seen to be located within softer friable dolomite and sandstone, closely fractured zones, or clay beds. For example, the caliper log for boring 00BA-1 clearly shows the location of a prominent 0.7-foot-thick clay bed encountered at a depth of about 55 feet (top of clay), and also show zones of borehole overbreak or raveling that are apparent in the video logs.

Gamma ray surveys were run in boring 00BA-1 and 00BA-2. The gamma plots show significant scatter and gamma spikes with wavelengths on the order of 1 to 4 feet. These variations may reflect varying properties between discrete lithologic beds, or different intensities of jointing. No clear distinction of clay beds from the surrounding bedrock was evident on the gamma logs.

OPTV surveys were run in borings 00BA-1 and -2, 01CTF-A, and 01-A through 01-I. The high-resolution OPTV images show in-situ rock conditions, and clearly record fracture or discontinuity features, changes in color, bedding laminations, and clay beds. Data quality throughout the borings was good to very good, with structural and stratigraphic features clearly imaged and commonly correlatable with features from the

recovered core. Details of the stratigraphy encountered in each boring can be found in the boring logs (Diablo Canyon ISFSI Data Report B). The OPTV surveys proved useful particularly for two things: (1) identification of clay beds in zones of poor or no core recovery; and (2) determining the orientation of bedding, clay beds, and fractures observed in the core. In addition, the OPTV surveys were able to image features that were below the resolution of the gamma probe surveys.

For examples, the OPTV log for boring 00BA-1 shows relatively consistent, fractured dolomite bedrock (Tof_{b-1}) with subhorizontal laminations and joints/bedding partings between 127-128 feet, zones of steep fractures between 71-81 feet, and highly fractured and brecciated zones between 64-70 feet. The OPTV logs also imaged similar features in sandstone bedrock, as in boring 01-B. Clay beds are clearly imaged; an example is the 0.7-foot-thick clay bed in 00BA-1 at 55-foot depth (top of clay), as well as a second, thinner, clay bed at a depth of 105' (top of clay). The lower clay bed was not recovered in the core or recognized in the caliper or gamma probe surveys. Friable zones are also well imaged in the OPTV logs, for example in boring 00BA-2, 0-32 feet.

4.0 REFERENCES

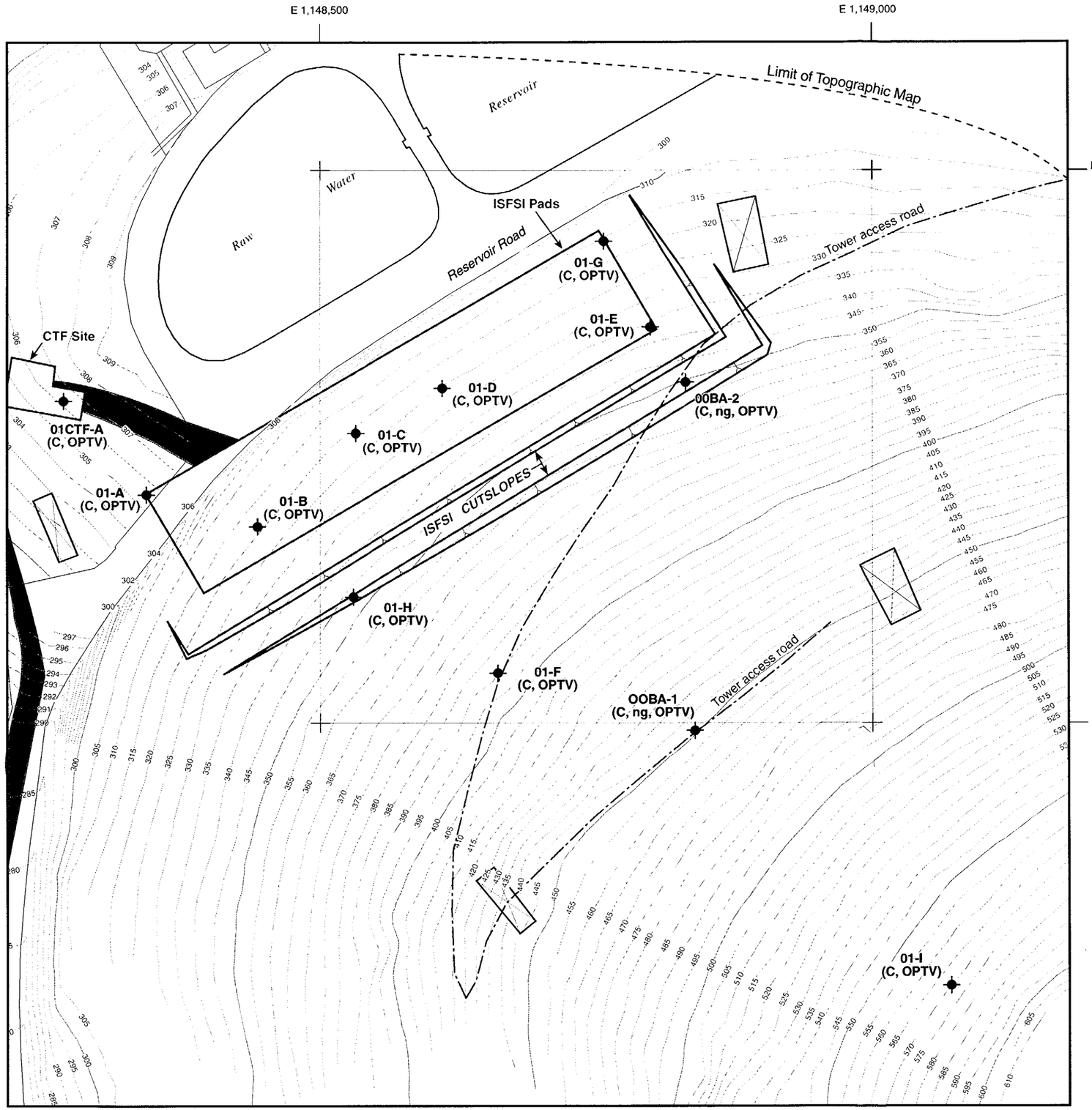
Diablo Canyon ISFSI Data Report B, Borings in ISFSI Site Area, prepared by William Lettis & Associates, Inc., November 5, 2001.

NORCAL Geophysical Consultants Work Plan, Geophysical Investigations for the DCPP ISFSI Ste, Rev. 0, December 4, 2000.

NORCAL Geophysical Consultants Work Plan, Borehole Optical Televiewer and Caliper Surveys for the DCPP ISFSI Ste, Rev. 1, April 13, 2001.

William Lettis & Associates Work Plan, Additional Geologic Mapping, Exploratory Drilling, and Completion of Kinematic Analyses for the Diablo Canyon Power Plant, Independent Spent Fuel Storage Installation Site, Rev. 3, November 28, 2000.

William Lettis & Associates Work Plan, Additional Exploratory Drilling and Geologic Mapping for the DCPP ISFSI Site, Rev. 1, September 19, 2001.



EXPLANATION

- Footprint of 500 kV tower
- Outline of ISFSI Pads
- 01-I — Boring for ISFSI, number indicated (initial is year drilled); geophysical logging indicated: C=Caliper, OPTV=Optical Televiews, ng=natural gamma
- Proposed ISFSI Pads cut slope

N

0 50 100 150 200

Contour interval = 5 feet

SAFETY ANALYSIS REPORT

DIABLO CANYON ISFSI

FIGURE E-1
BORINGS THAT HAVE GEOPHYSICAL AND TELEVIEW LOGGING, ISFSI SITE AREA

ATTACHMENT 1
DATA REPORT E

NORCAL Geophysical Consultants, Inc. Report

"Borehole Geophysical Logging Survey, Interim Spent Fuel Storage Installation, Diablo Canyon Power Plant, San Luis Obispo, CA"

December 26, 2000

NORCAL GEOPHYSICAL CONSULTANTS, INC.

BOREHOLE GEOPHYSICAL LOGGING SURVEY
INTERIM SPENT FUEL STORAGE INSTALLATION
DIABLO CANYON POWER PLANT
SAN LUIS OBISPO, CALIFORNIA

NORCAL Job Number 00-390.02B

A report prepared for

WILLIAM LETTIS AND ASSOCIATES, Inc.
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Walnut Creek, California 94596

Attention: Jeff Bachhuber

by

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California Registered Geophysicist GP-893

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December 26, 2000

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I. INTRODUCTION

A borehole geophysical logging survey was conducted at Pacific Gas and Electric's (PGE) Diablo Canyon Power Plant (DCPP) in San Luis Obispo County, California in support of a geotechnical investigation for a proposed Interim Spent Fuel Storage Installation (ISFSI). The geophysical logging was conducted in two phases; December 5 and 8, 2000 by NORCAL Geophysicist William J. Henrich. Field activities and logistical support was provided by Jeff Bachhuber and John Helms of the William Lettis Associates, Inc.

The purpose of the survey was to characterize bedrock fracture frequency, calculate fracture orientation and identify thinly bedded clay zones in two borings which penetrated the Obispo formation. The following presents a description of the borehole methodologies and results of the survey.

II. SCOPE OF WORK

We conducted a suite of geophysical logs consisting of caliper, natural gamma and optical televiewer (OPTV) in two 2 coreholes. This logging was in accordance with NORCAL Geophysical Consultants Work Plan, Geophysical Investigation for the DCPP ISFSI Site dated December 4, 2000. The work also includes a descriptive report presenting our findings.

III. SITE CONDITIONS

The study site is situated on a north facing slope of Diablo Canyon two to three hundred yards east of the main plant facility. The general geology consists of a thin (2-5 feet) layer of alluvium overlying mostly thin to massively bedded sandstone of the Obispo formation (Tertiary Age). Coreholes were drilled with a nominal 4-inch diamond core bit (HQ-size) which penetrated the underlying rock to depths ranging from 54 to150 feet below grade. Static water levels ranged from 53.6 to 147.5 feet below ground surface. Both coreholes were drilled vertically and included conductor casing collared into stable bedrock. The ground surface at each hole was used as the survey reference datum.

IV. DATA ACQUISITION

Geophysical logging consists of lowering a series of instrumentation (probes) downhole to measure bulk rock formation properties such as gamma intensity, borehole diameter and photographic sidewall images oriented to magnetic north. Our instrumentation for this survey consisted of a Robertson Geologging Ltd. Model *Winlogger* logging system. The system consists of a control console, computer (Windows 98 OS), various digital logging probes (see below), four-conductor logging cable and a portable 12 VDC powered winch. All geophysical logs acquire data in the up-hole direction at speeds ranging from 3 to 12 feet per minute. The data sampling rate was every 0.05 feet for caliper and natural gamma logs, 0.003 feet for the OPTV

logging. Prior to actual logging, log response was calibrated with a series of diameters for the caliper probe and Association of Petroleum Institute (API) gamma sleeve for the natural gamma probe. The value of caliper diameters ranged from 2 to 10 inches. We used 3 different diameters to compute a calibration curve (polynomial fit). Gamma log calibration require a 10 minute gamma background count while the probe was on the surface followed by a sleeve count rate for an additional 10 minutes. A gamma calibration contained a two-point calibration curve (linear fit) with the average background count rate subtracted from the stationary measurements. Exact calibration measurements relating the probe output (counts per second) to calibration values can be found at the base of each log in Appendix A, Natural Gamma and Caliper Logs. We verified OPTV north reference (magnetic north) with a *Brunton* compass.

We checked the repeatability of caliper and natural gamma logs by conducting repeat logs of the lower 50 feet of each borehole, and the lower 25 feet for OPTV logs. In general caliper and natural gamma logs repeated by better than 5 percent of the main log section. OPTV logs were identical with respect to north direction, 0.15 feet difference in depth. (See Appendix A, Natural Gamma and Caliper Logs and Appendix B, OPTV Image Plots). This depth discrepancy was due to the slightly different depth offsets used between logging runs.

V. DATA REDUCTION

Continuous caliper and natural gamma logs were transformed by daily calibration curves and averaged with an 11 and 17 point center box car filter, respectively with the *WINLOGGER (Version 2.01)* output software. The OPTV logs were corrected for true geographic north by adding 15 degrees to raw directional azimuths.

VI. DATA PRESENTATION

We merged continuous caliper and natural gamma logs to form a main log plot for each borehole at a vertical scale of 1 inch equals 10 feet. These plots can be found in Appendix A. The color OPTV images represent the complete oriented "unwrapped" image of the borehole wall. These images can be found in Appendix B. The leftmost axis of the plot represents depth and corresponds to the geographic north position on the unwrapped borehole image. As the OPTV image is unwrapped, the major compass directions left to right are drawn as equal distant vertical lines. These lines represent east, south, west and finally returning to north azimuths. The OPTV image log is presented at a vertical scale of one-inch equal one foot.

VII. INTERPRETATION AND DISCUSSION

1.0 Fracture Analysis

Identification of dip calculation fracture features can be found in Appendix C, Interpreted OPTV Log Plots. These plots contain; (1) a perspective view of the borehole as a core projection, (2)

"unwrapped "oriented OPTV image, (3) arrow (tadpole) plot which represents interpreted fractures in terms of dip magnitude (Y-axis) and azimuth (direction of the tadpole symbol "tail") and (4) a comments column that describes fracture features as planar, irregular or discontinuous. The rightmost graph (5) shows a deviation plot of the borehole trajectory. For the two borings surveyed, the deviation plot indicated borehole deviation was less than 2 degrees from vertical. The details of the above interpretation are presented in a fracture table (Appendix D, Interpreted Fracture Tables), listing the number, depth, dip azimuth, dip angle, number of points moused, and quality parameter fit.

Orientation of fractures was calculated with the interpretation program RGLDIP Version 5.3 written by Robertson Geologging, Ltd. Within this program, OPTV images are presented on a computer screen with the interpreter interactively mousing points along the trace of the fracture feature. Typically, 6 to 15 points were chosen along each fracture trace. The program at this point calculates a" best fit" ellipse that represents the plane of the fracture in terms of dip magnitude and dip direction. This best fit plane in the unwrapped two-dimensional borehole image is plotted as continuous sinusoid that has been superimposed over complete or partially viewable fracture traces. These sinusoids are displayed on the unwrapped OPTV image plot (second plot from the left) shown in Appendix C.

The RGLDIP program assumes that the borehole can be approximated as a cylinder of a constant diameter. Most fracture features were continuous (360 degrees) across the unwrapped OPTV image plot, however, in complexly fractured zones or in areas containing high angle fractures (60 degrees or greater), only segments of fracture traces are observed. Though segmented, the program has the facility to extrapolate a dip magnitude and dip direction to these partial features. Whether continuous or discontinuous, not all fractures traces can be fitted with an exact sinusoid. This is because rock properties are not completely homogeneous and rock fractures will not propagate along an exact plane. Also, borehole enlargements or distortions, decentralization of the probe will make the trace of a fracture feature irregular with respect to a sinusoidal trace representing a best fit ellipse. Not all fracture or fracture like features have been analyzed. As an example, vertical features such as those shown on ISFSI-00ba-1 at depths ranging from 120 to123 feet (see Appendix C) are not tallied because the program can not represent fractures planes greater than 88 degrees. Also, highly fractured intervals such as the one between 98 and 101 in the same Boring are not analyzed because the traces of discrete fractures are discontinuous and eroded.

2.) Clay Bed Identification

We conducted natural gamma logging to help identify thin clay beds within the Obispo formation. The rational for the gamma logging was that clay beds would exhibit higher gamma intensities than the bounding sandstone beds. Though high gamma intensities did correspond to clay beds, the gamma response was not unique. Identification of clay beds can be made more confidently with logged core.

VIII APPENDICES A THROUGH D

Appendix A

NATURAL GAMMA AND CALIPER LOG

BORINGS ISFSI-00BA-1 AND -2

NORCAL

ROBERTSON GEOLOGGING TECHNOLOGY

DIABLO CANYON POWER PLANT

CALIPER AND GAMMA LOGS

COMPANY	LETTIS
WELL	ISFSI00B1A
FIELD	ISFSI
COUNTRY	USA
STATE	CA
COUNTY	SAN LUIS OBISPO
LAT..	
LONG..	

OTHER SERVICES
OPTV

Perm. Datum	0	Elev	UNKNOWN	KB	0.00
Log Datum	GROUND			DF	0.00
Drill Datum	GR			GL	0.00

DATE	05/12/00	12/05/00	1
RUN#	1	2	3
TYPE OF LOG	CALIPER	GLGG	1
DEPTH DRILLER	150.00	150.00	1.00
DEPTH LOGGER	149.00	149.00	1.00
LOG DEEPEST	149.00	149.00	1.00
LOG SHALLOW	10.00	7.00	1.00
FLUID IN HOLE	water	WATER	WATER
SALINITY			1
DENSITY			1
LEVEL	147	147	147
MAX TEMP C	20.00	20.00	20.00
RIG TIME			1
RECORDED BY	W HENRICH	W HENRICH	WJH
WITNESSED BY	J BACHHUBER	J BACHHUBER	1

RUN#	BIT RECORD			CASING RECORD			
	BIT	FROM	TO	SIZE	WEIGHT	FROM	TO
1	3.83	5.00	150.00	6.00	1.00	1.00	5.00
2	3.80	5.00	150.00	6.00	0.00	1.00	5.00
3	3.80	5.00	150.00	6.00	0.00	0.00	5.00

REMARKS (C:\WinLogger\Data\lettisdci\001BA-1J hed)

OPTV LOG BEFORE CALIPER

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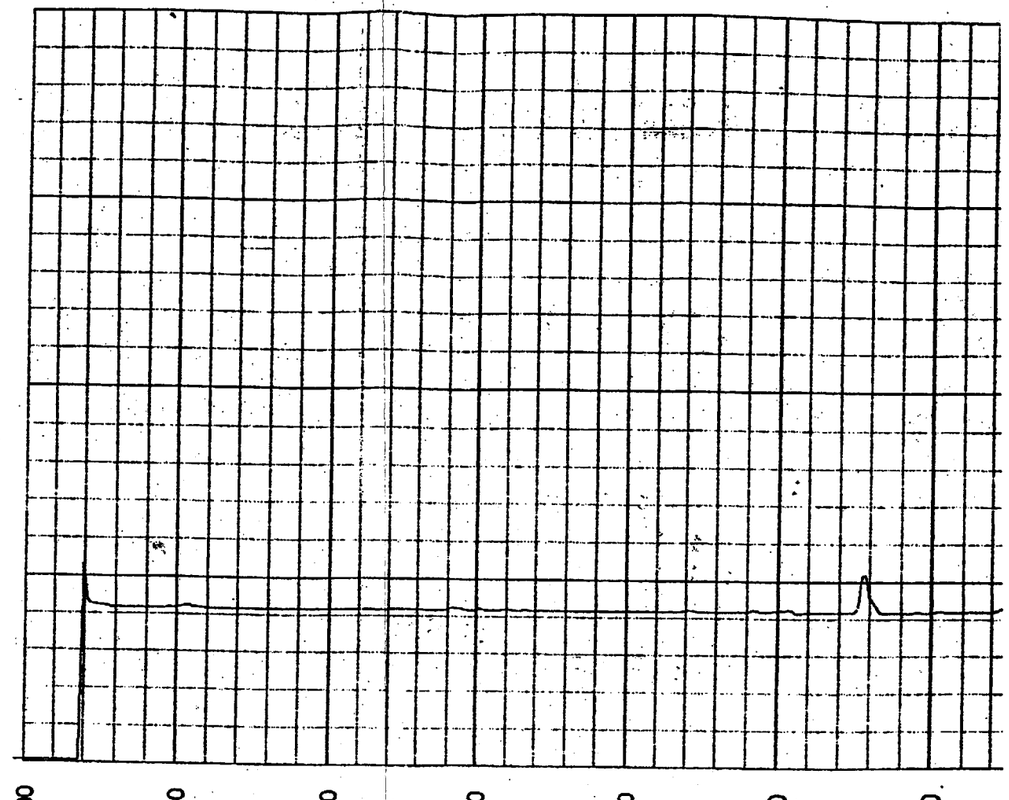
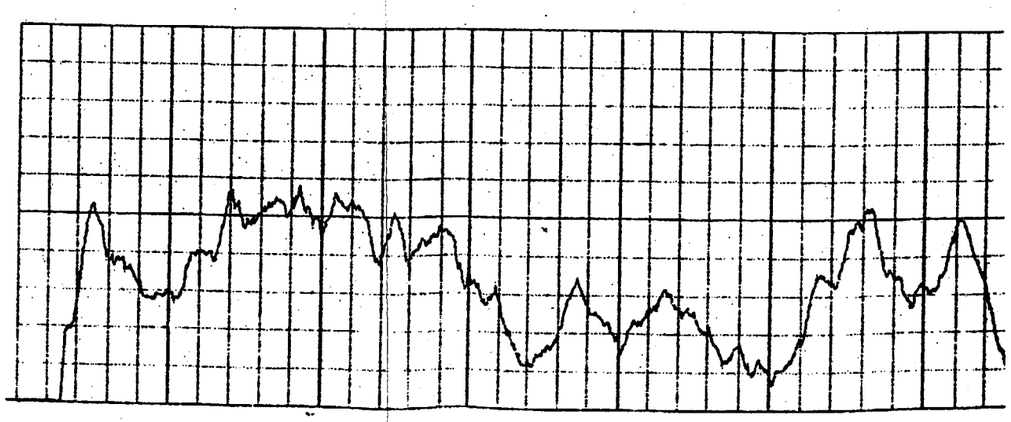
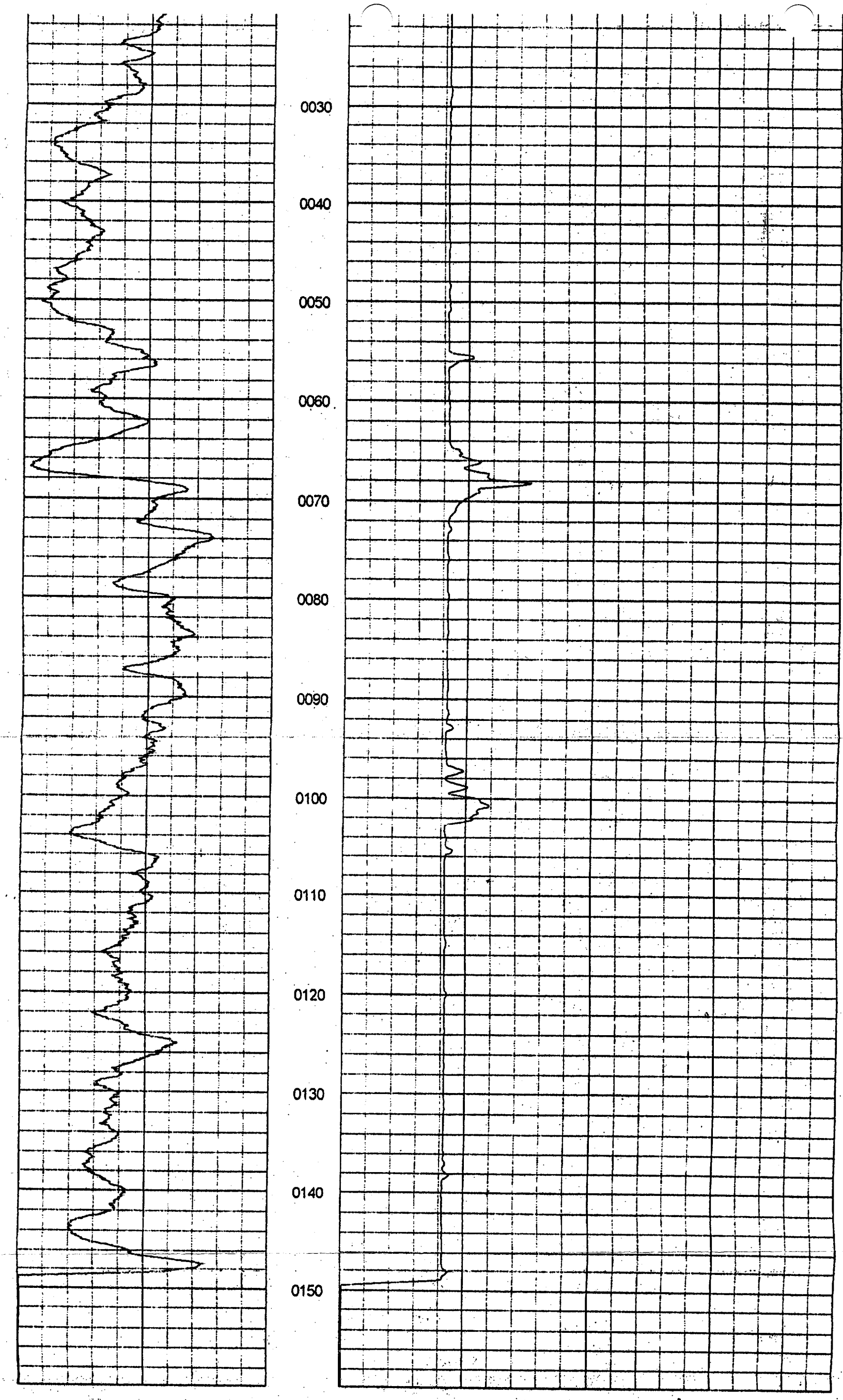


NGAM API Cs. 275.00 75.00

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0080
0090
0100
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0120
0130
0140
0150
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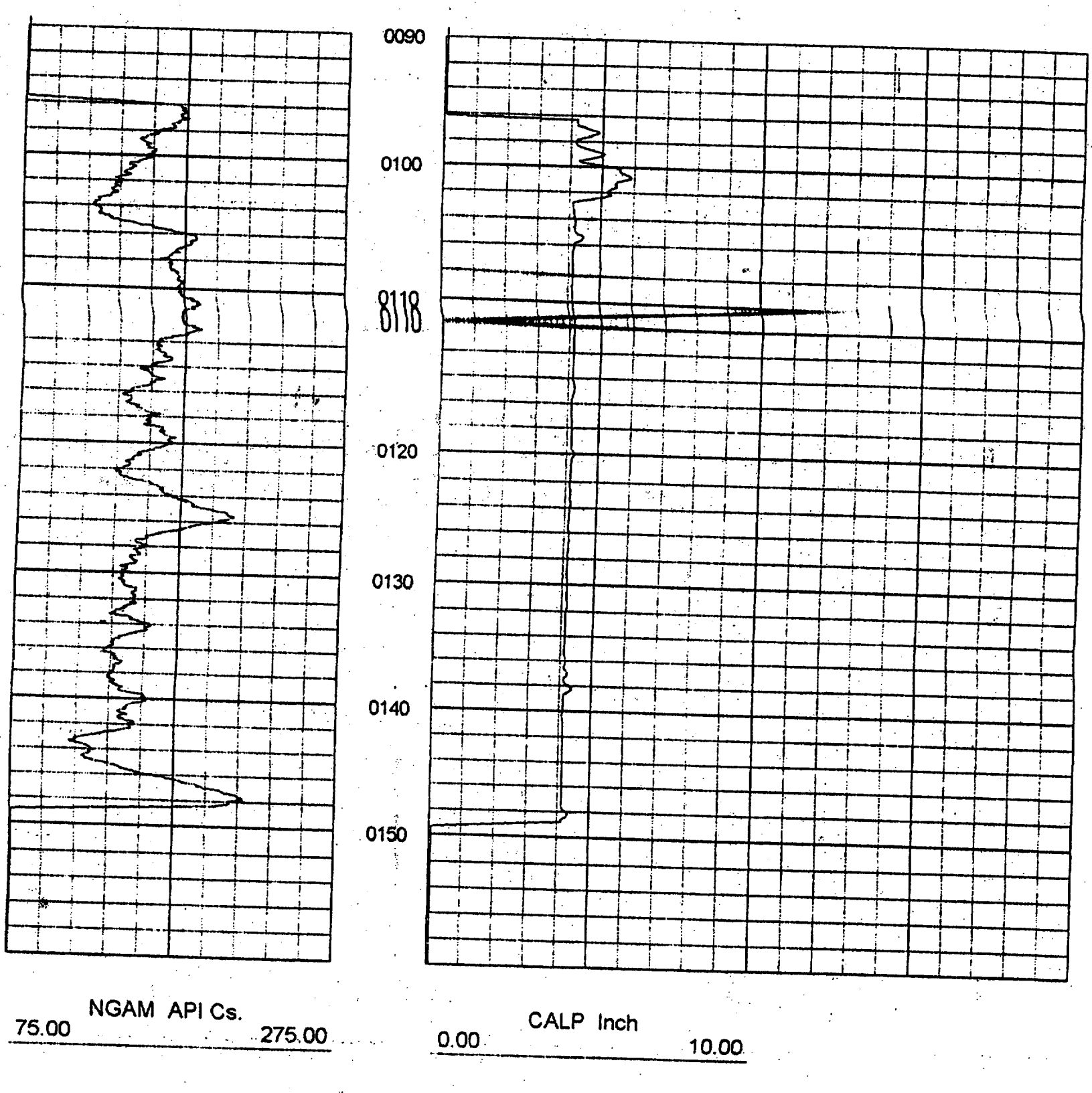
275.00
CALP Inch.
0.00
10.00

NGAM API Cs.
75.00 275.00

CALP Inch
0.00 10.00



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ReferencePoint1=405 CPS at 77 API Cs.

TOOL 5A0.555
[Channel2] CALiper
Calibration Method=Polyn
Coefficient0=-8.695
Coefficient1=0.6013?3
Coefficient2=-1.2699E-?03
Coefficient3=0
ZlyCount=2
ReferencePoint0=6367 CPS at 3 Inch
ReferencePoint1=10144 CPS at 6 Inch
ReferencePoint2=1355. CPS at 10 Inch

NORCAL

ROBERTSON GEOLOGGING TECHNOLOGY

DIABLO CANYON POWER PLANT

NATURAL GAMMA AND CALIPER

OTHER SERVICES
OPTV

COMPANY	WILLIAM LETTIS
WELL	ISFSI00BA-2
FIELD	ISFSI
COUNTRY	USA
STATE	CA
COUNTY	SAN LUIS OBISPO
LAT	
LONG.	

Perm. Datum	0	Elev	UNKNOWN	KB	0.00
Log Datum	GROUND			DF	0.00
Drill Datum	GR			GL	0.00

DATE	12/08/00	12/05/00	1
RUN#	1	2	3
TYPE OF LOG	CALIPER	GLGG	1
DEPTH DRILLER	55.00	55.00	1.00
DEPTH LOGGER	55.00	55.00	1.00
LOG DEEPEST	55.00	55.00	1.00
LOG SHALLOW	5.00	5.00	1.00
FLUID IN HOLE	water	WATER	WATER
SALINITY			1
DENSITY			1
LEVEL	53.78	53.8	1
MAX TEMP C	20.00	20.00	20.00
RIG TIME	J1		1
RECORDED BY	W HENRICH	W HENRICH	WJH
WITNESSED BY	J HELMS	J HELMS	JB

RUN#	BIT RECORD BIT	FROM	TO	CASING RECORD SIZE	WEIGHT	FROM	TO
1	3.83	4.00	55.00	6.00	1.00	1.00	4.00
2	3.80	4.00	55.00	6.00	0.00	1.00	4.00
3	3.80	4.00	55.00	6.00	0.00	0.00	5.00

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OPTV LOG BEFORE CALIPER AND GAMMA LOG

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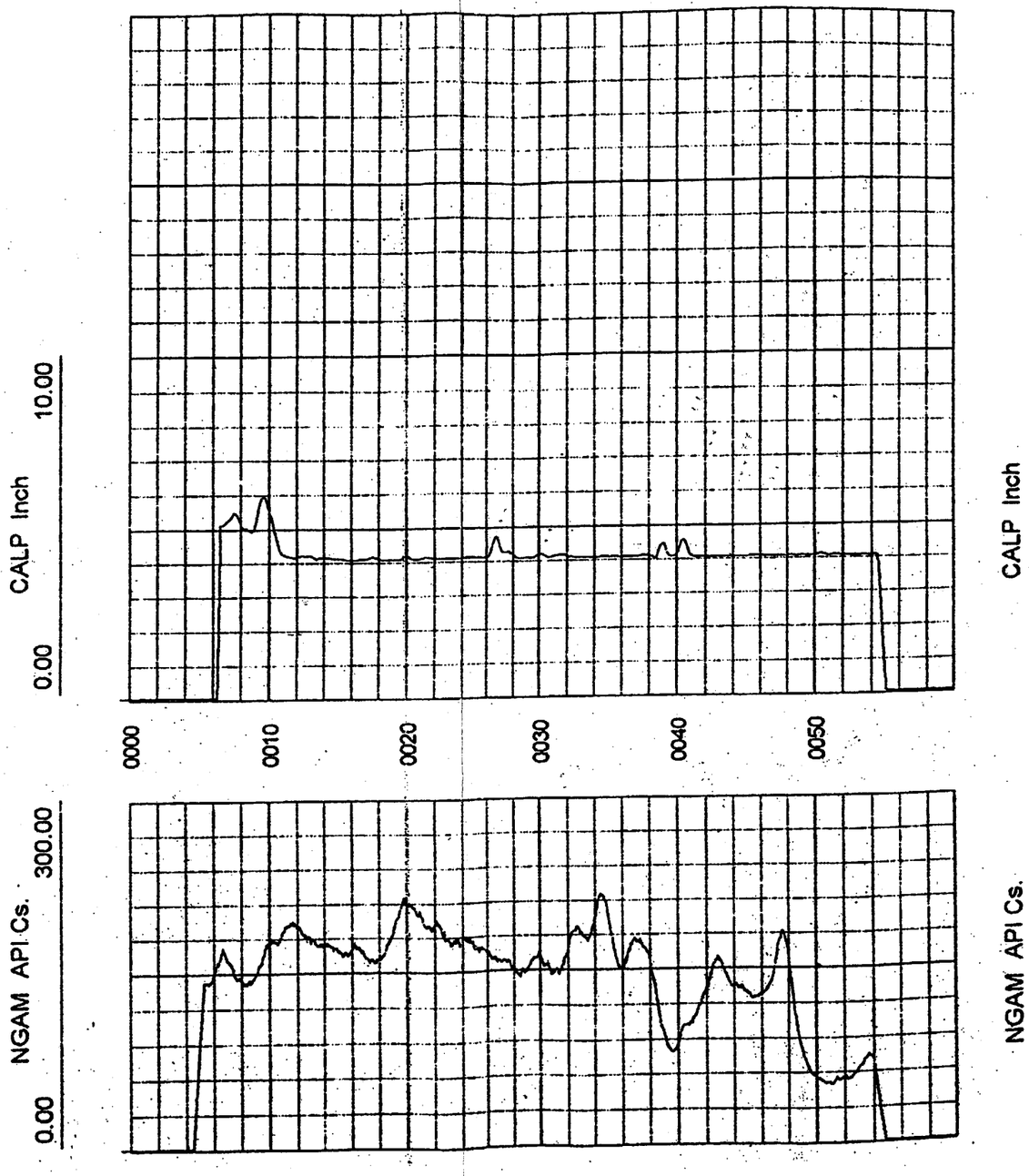

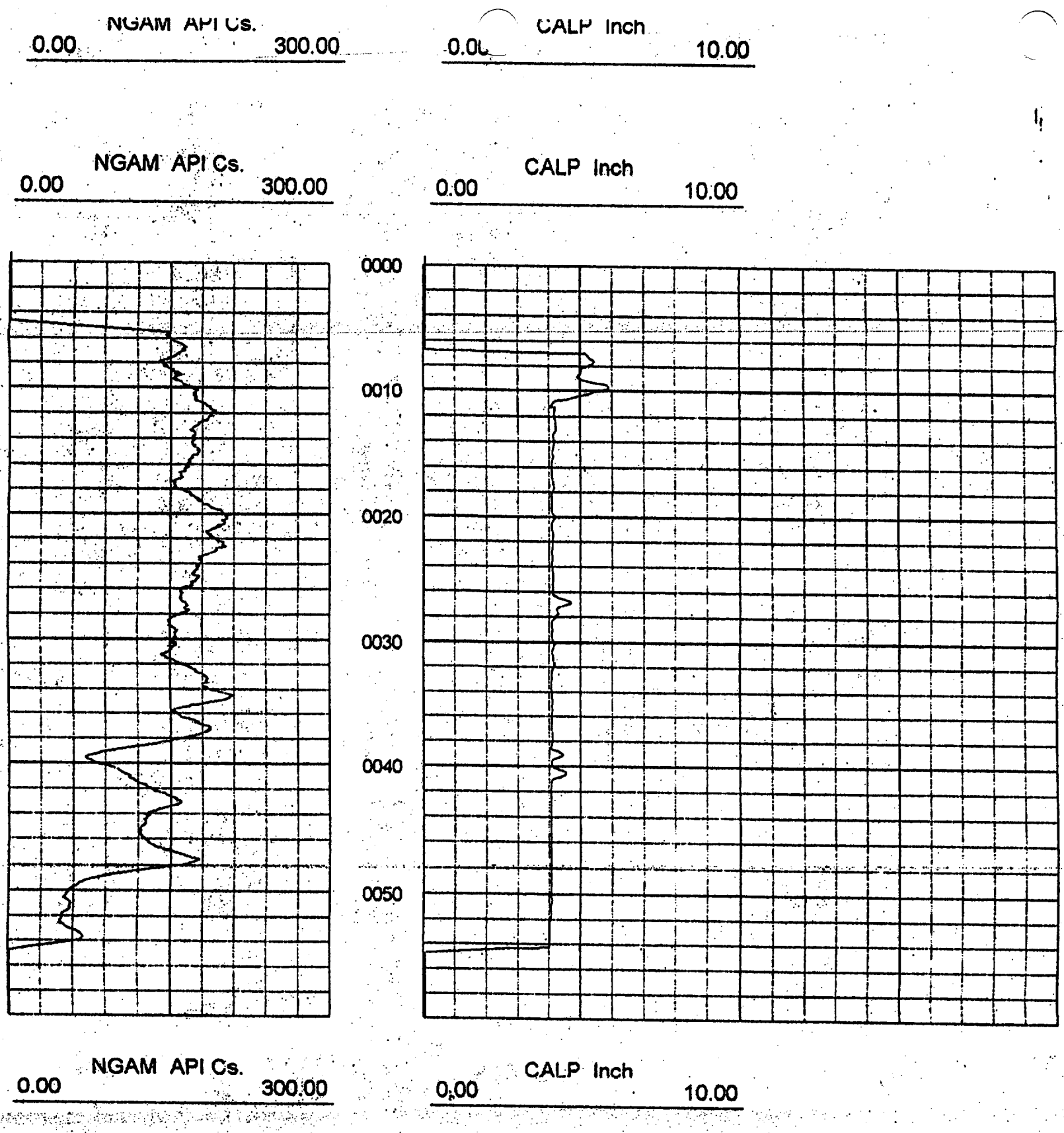

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ReferencePoint1=10144 CPS at 4 Inch
ReferencePoint2=13852 CPS at 6 Inch

Appendix B

OPTV IMAGE PLOTS

BORINGS ISFSI-00BA-1 AND -2

NORCAL GEOPHYSICAL CONSULTANTS, INC.

OPTV DATA PROCESSING
RGLDIP vsn 5.3
BOREHOLE IMAGE LOG

13 Dec 2000

NORCAL GEOPHYSICAL

Borehole: ISFSI-00BA-1

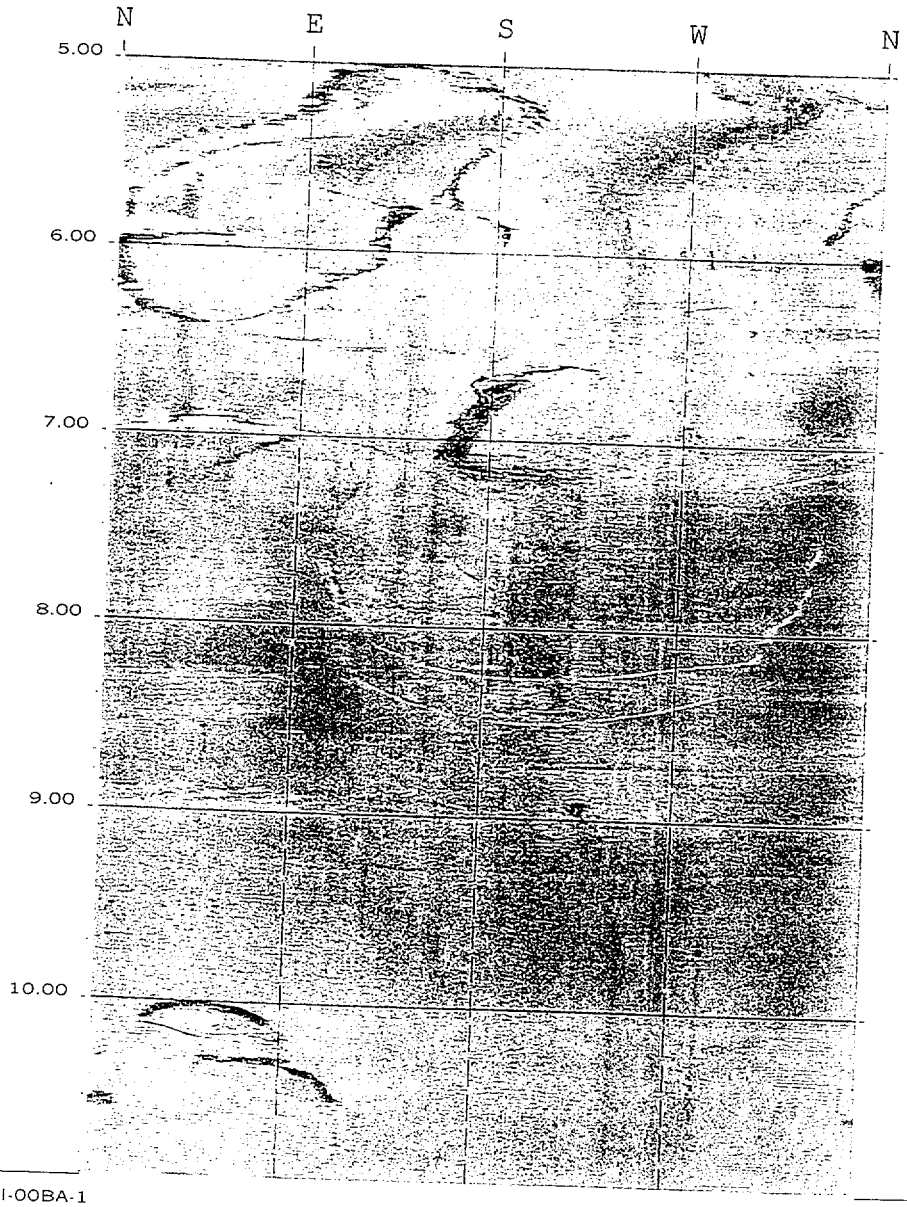
DIABLO CANYON POWER PLANTR

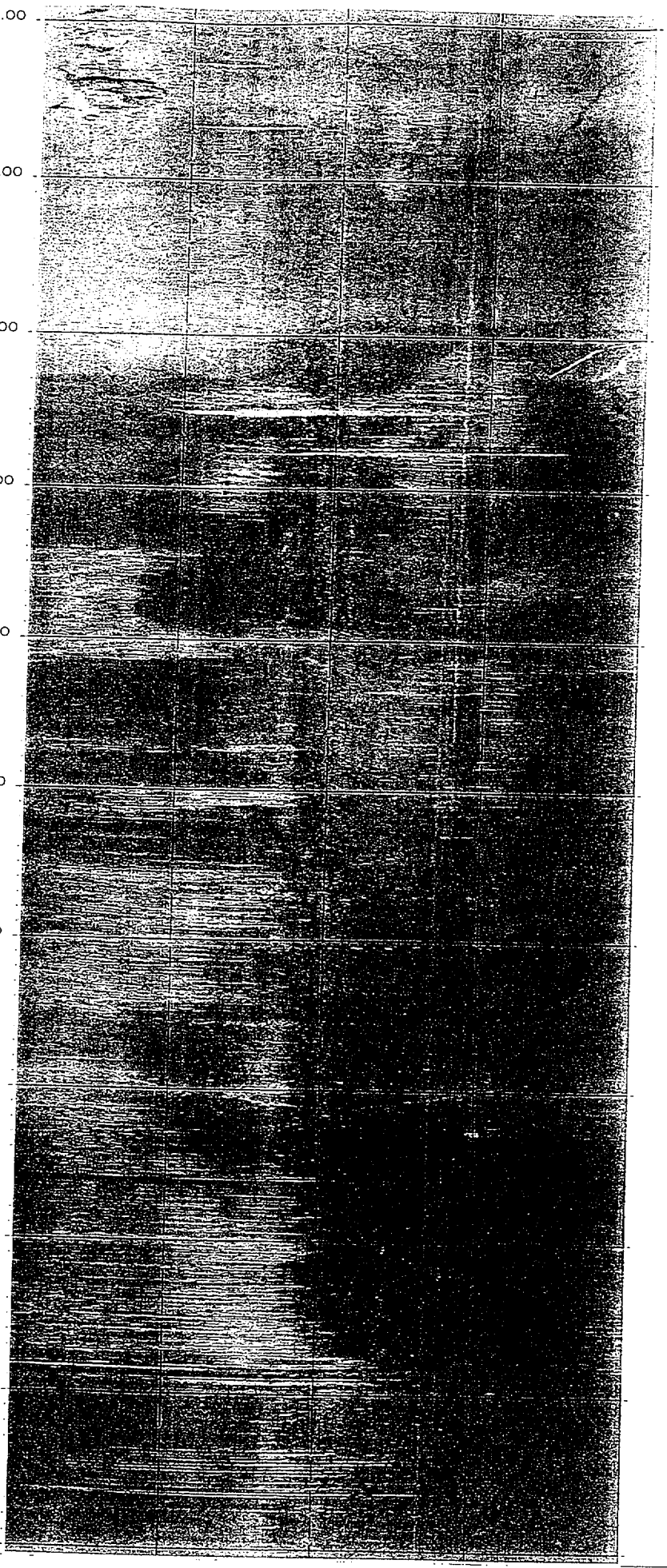
top of borehole.....
East:
North:
Alt:

North ref. is true
Depth units are feet
Vertical scale: 1/12

Zone from 148.8090 to 4.9980ft
Format: BHTV

Borehole diam: 4.000inch
data intervals.....
radial: 0.5000deg
axial: 0.0030ft

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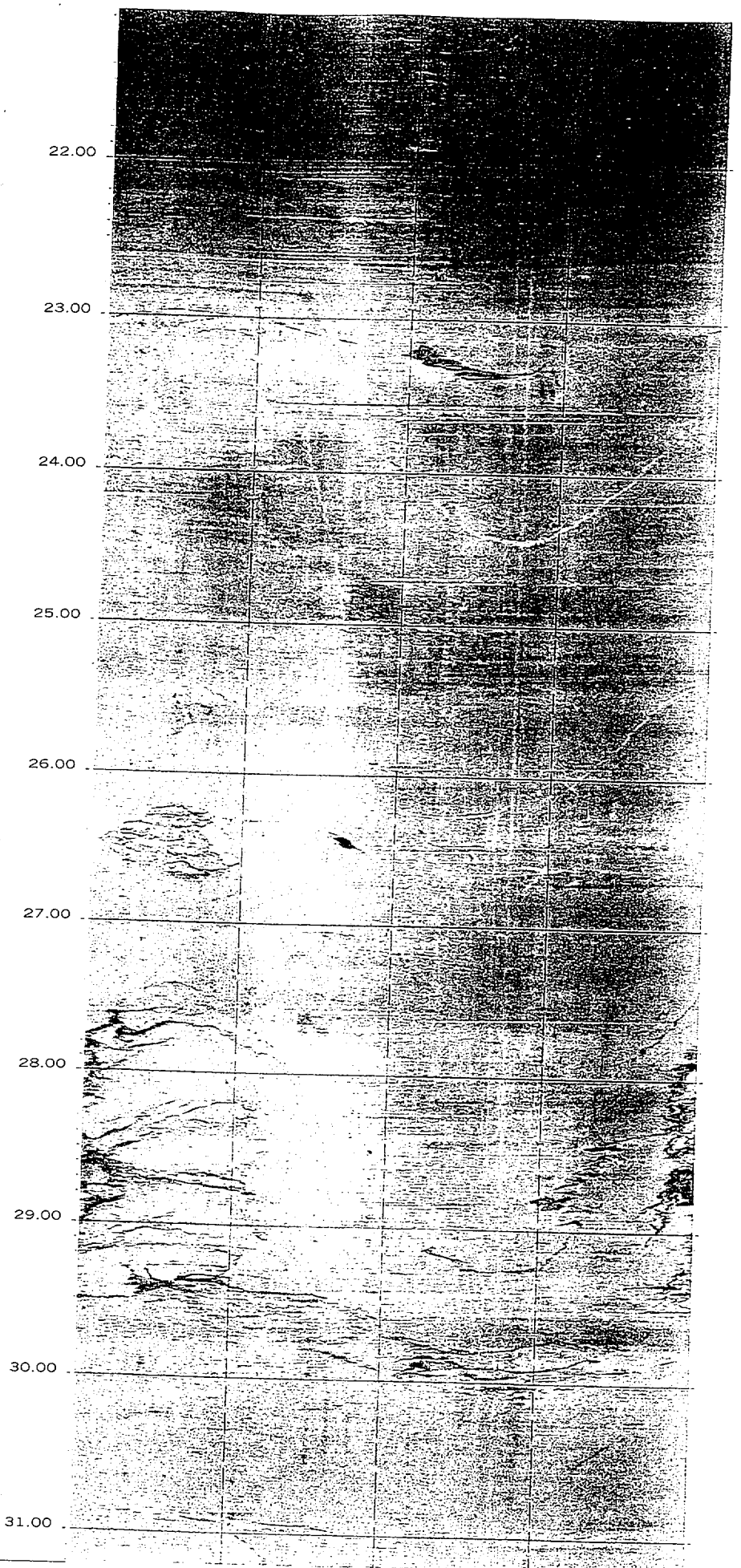
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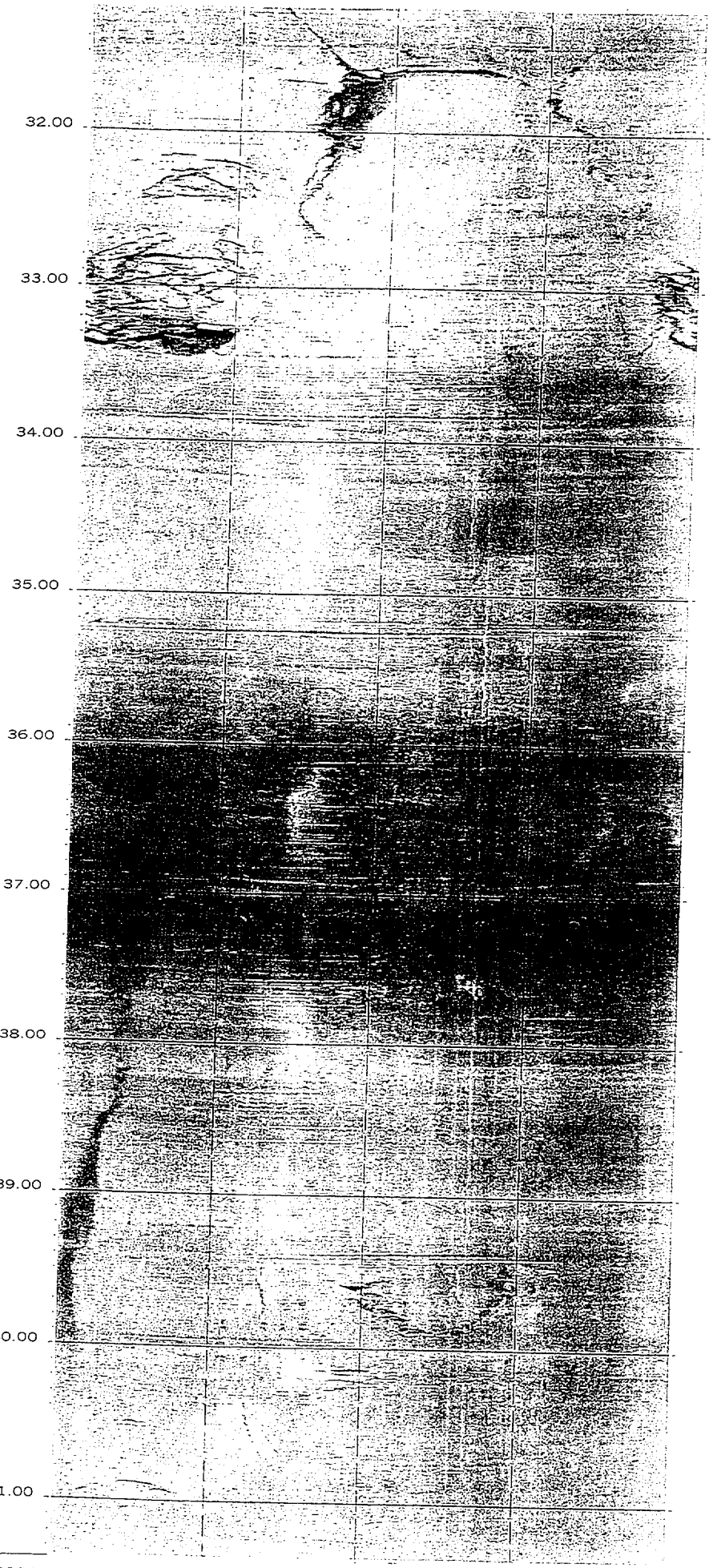

ISFSI-00BA-1

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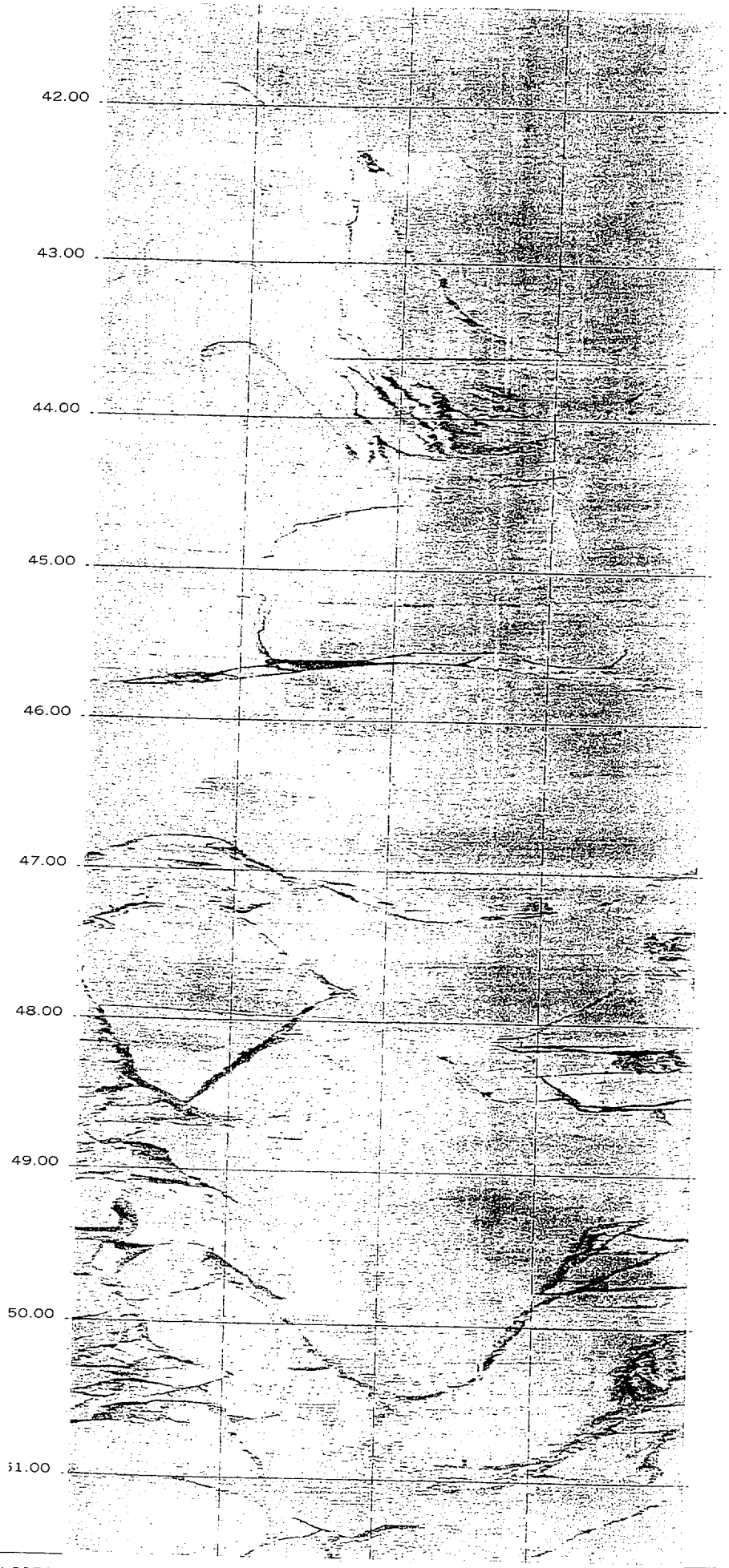
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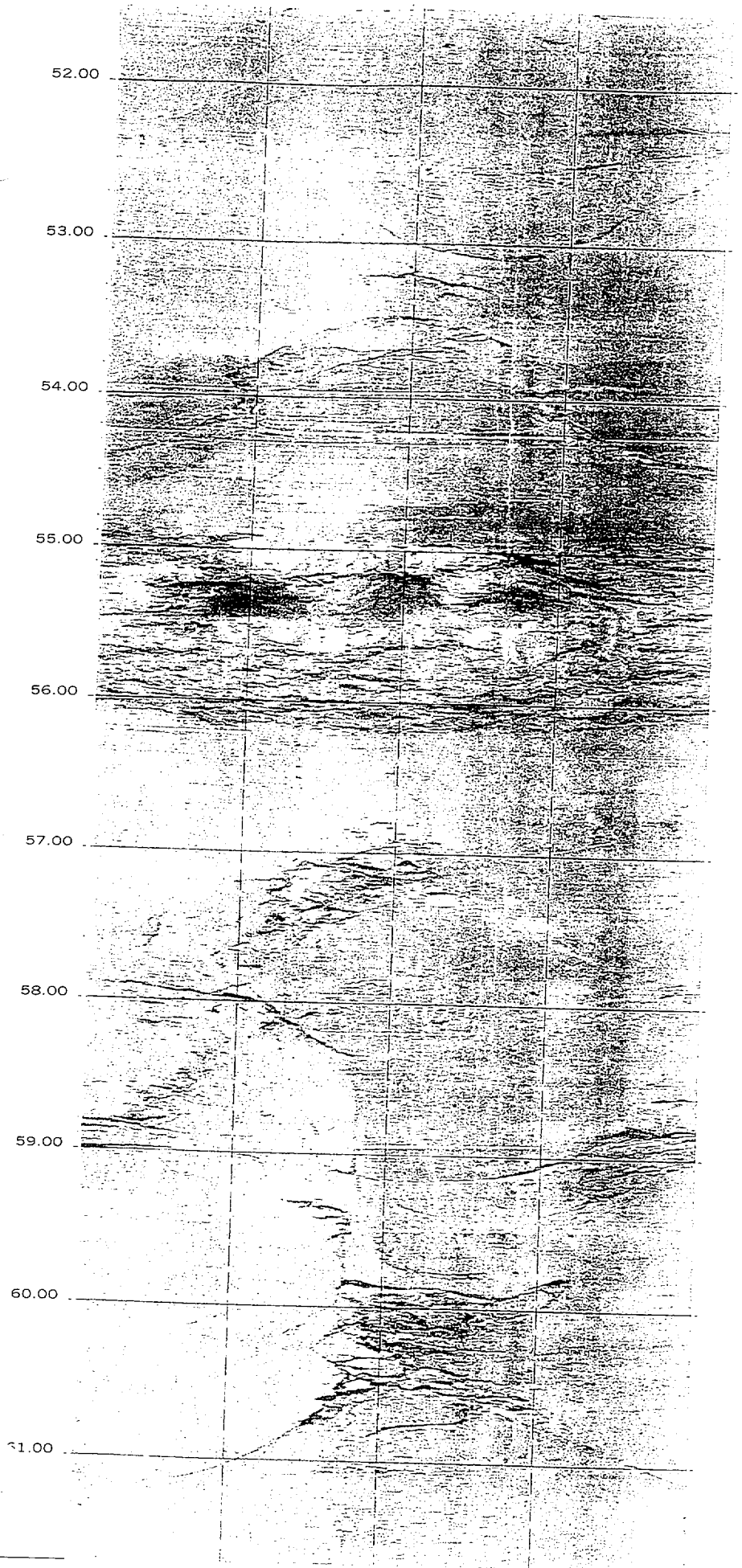
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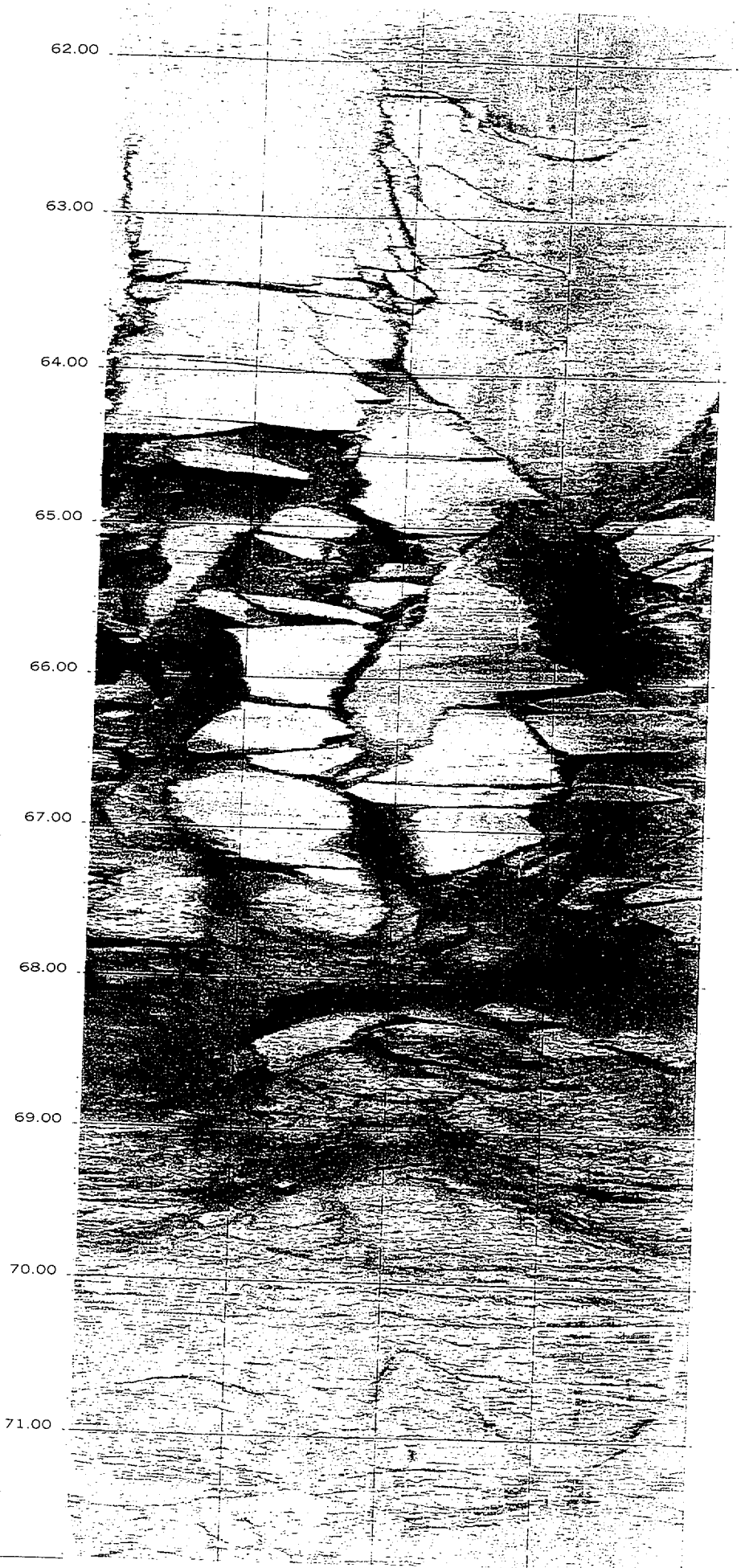
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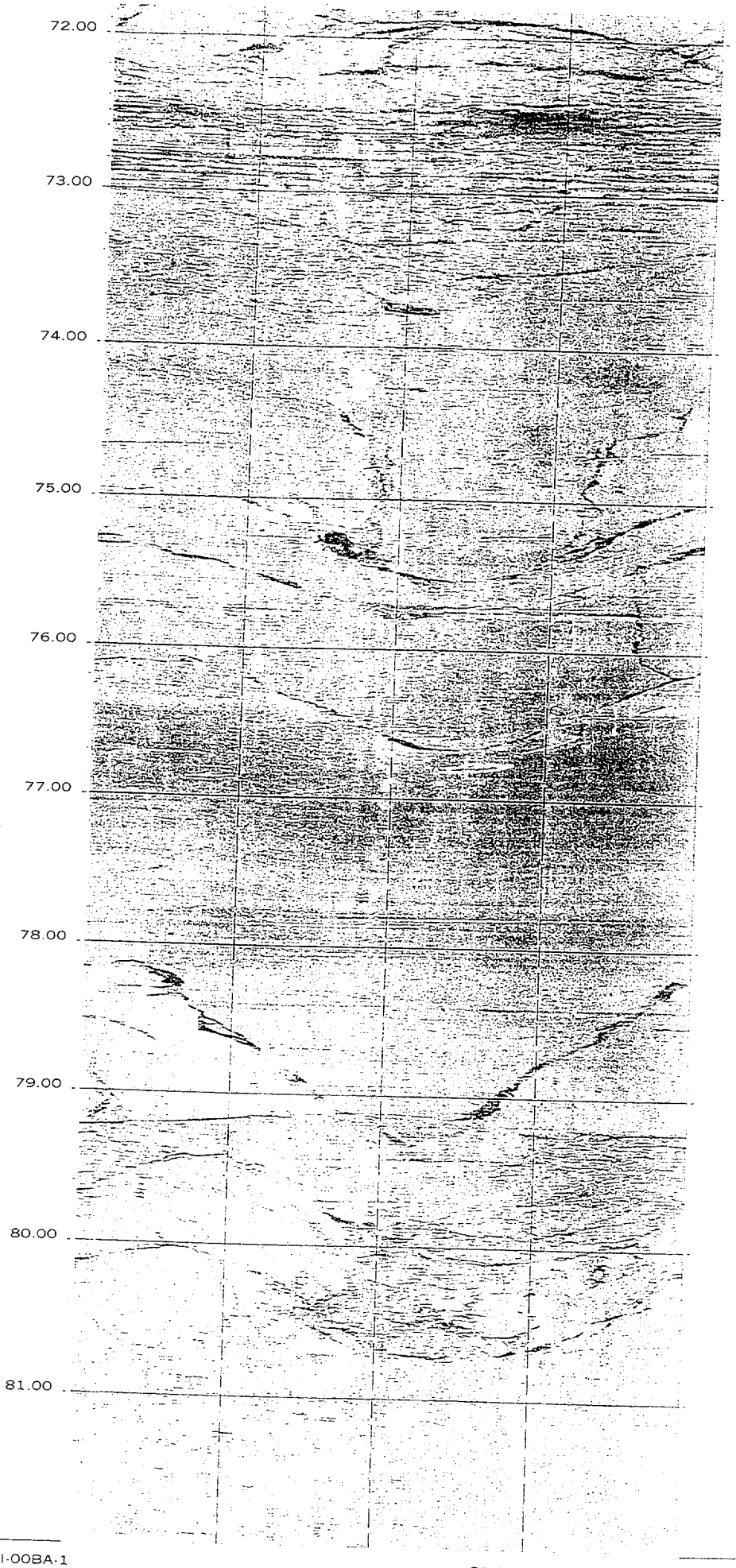
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78.00
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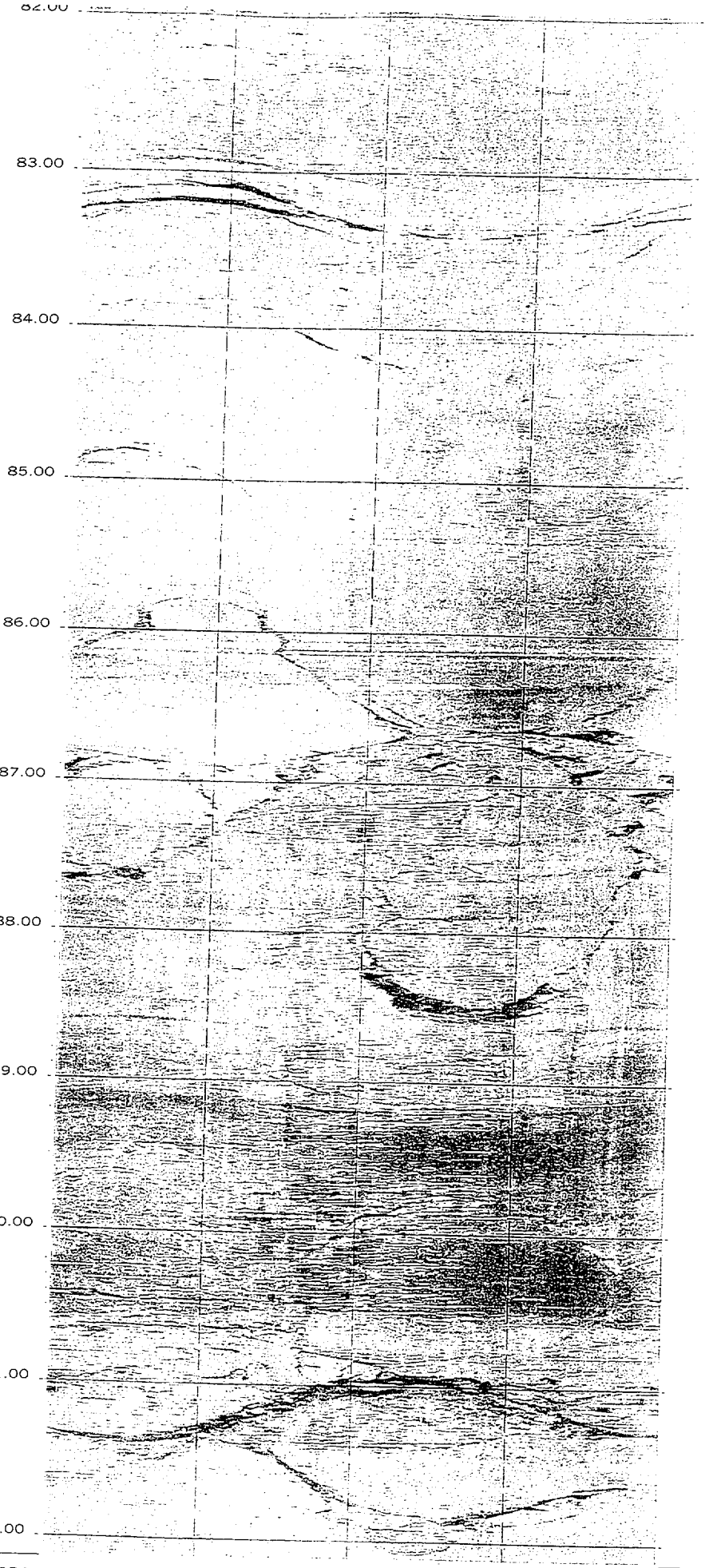
80.00
81.00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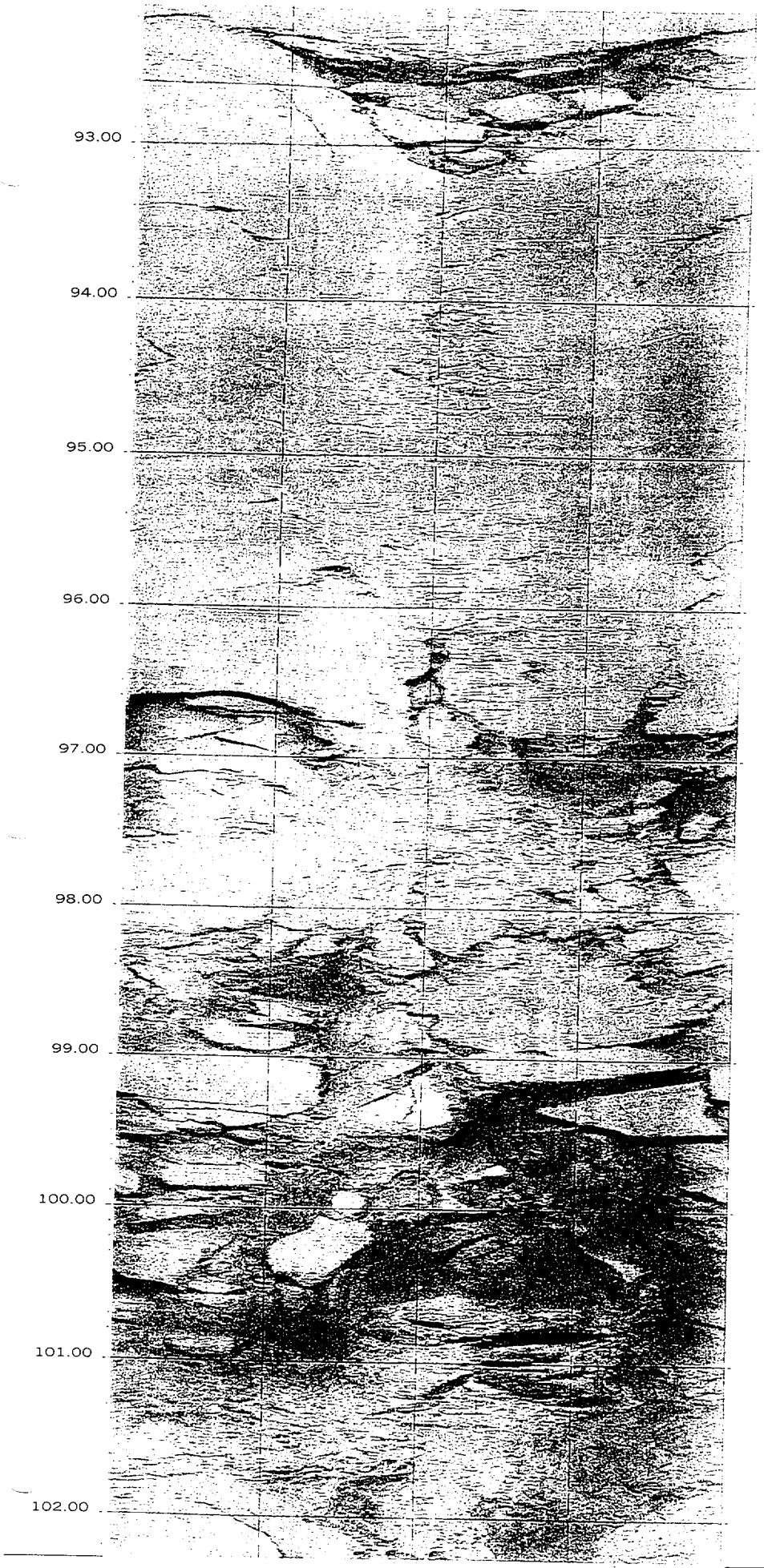
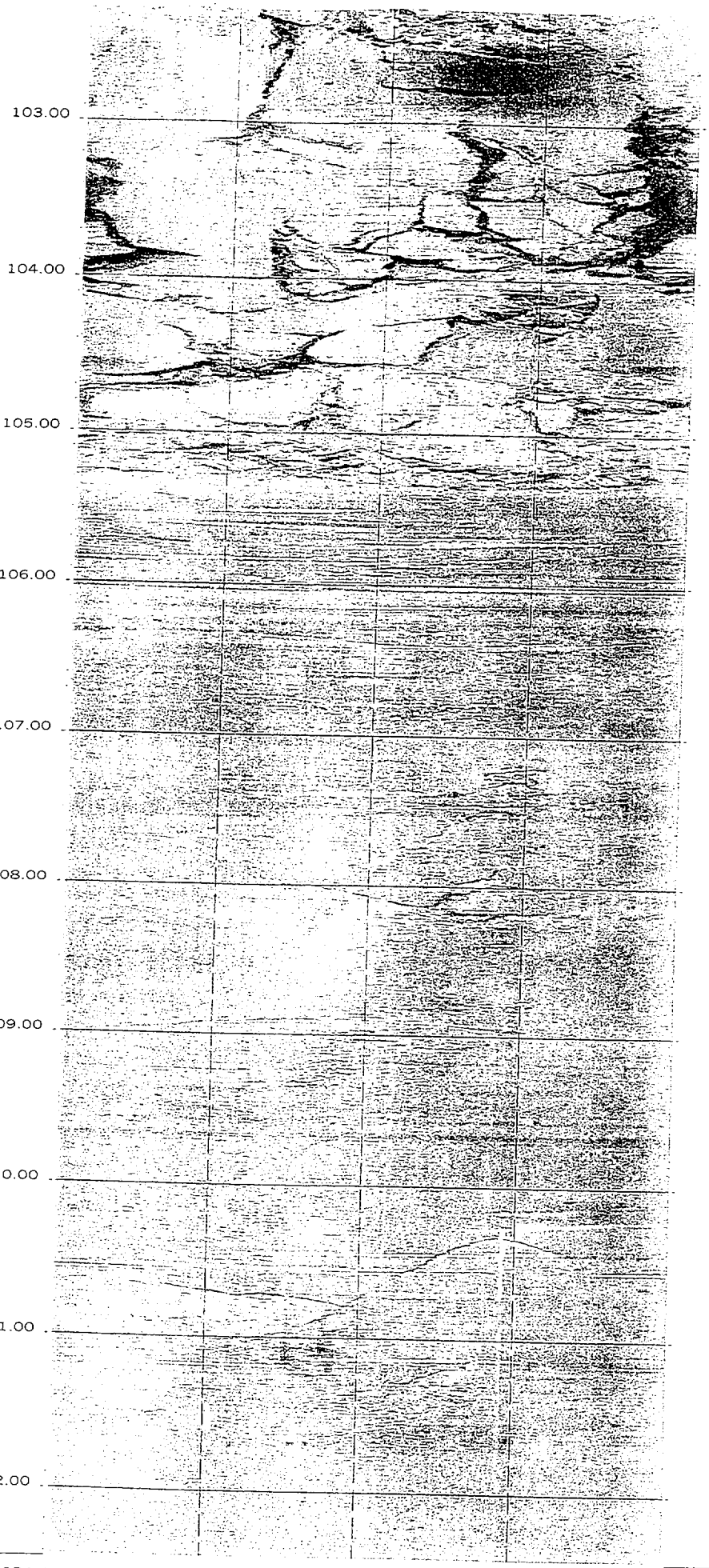
89.00
90.00
91.00
92.00



ISFSI-00BA-1

102.2730 to 92.1210ft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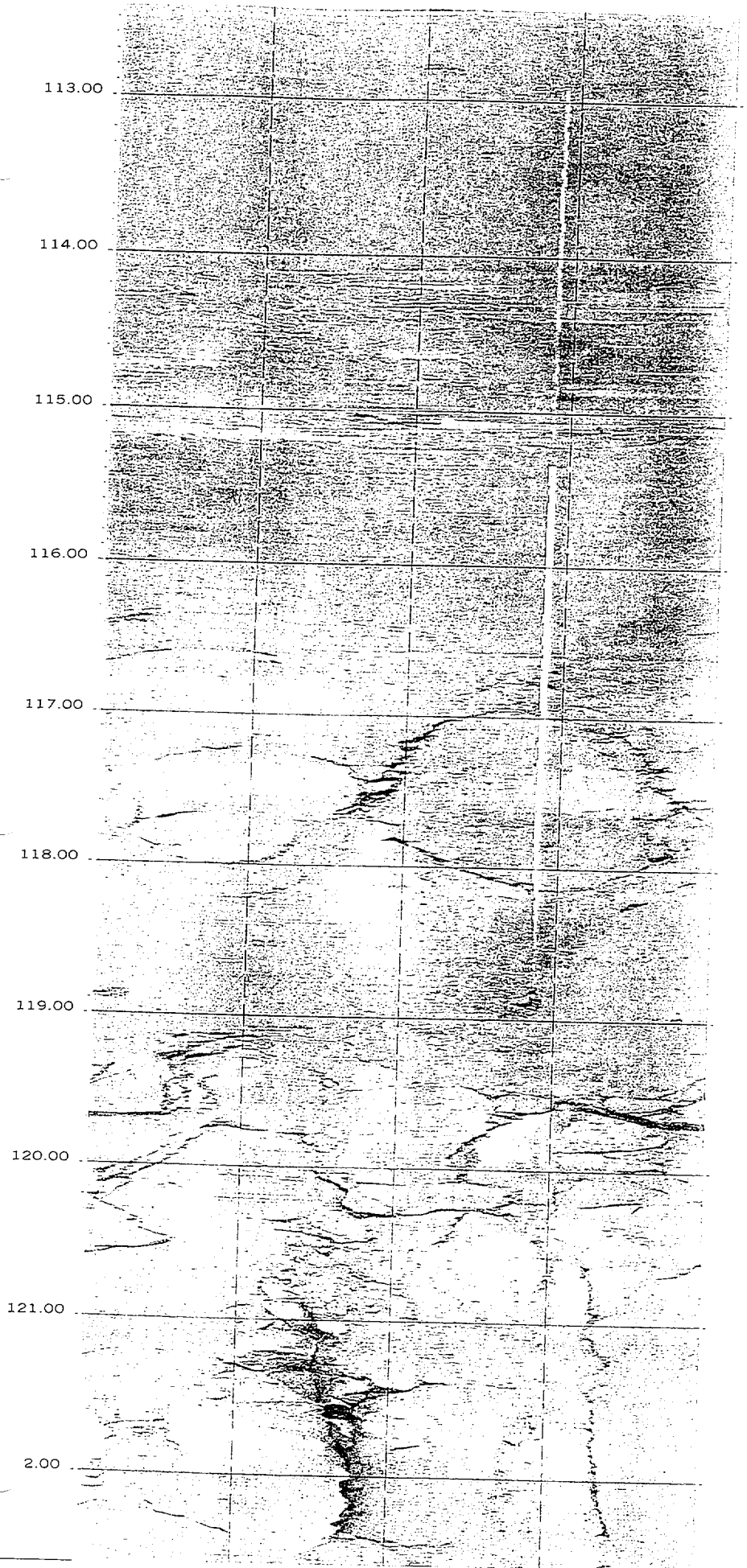
112.00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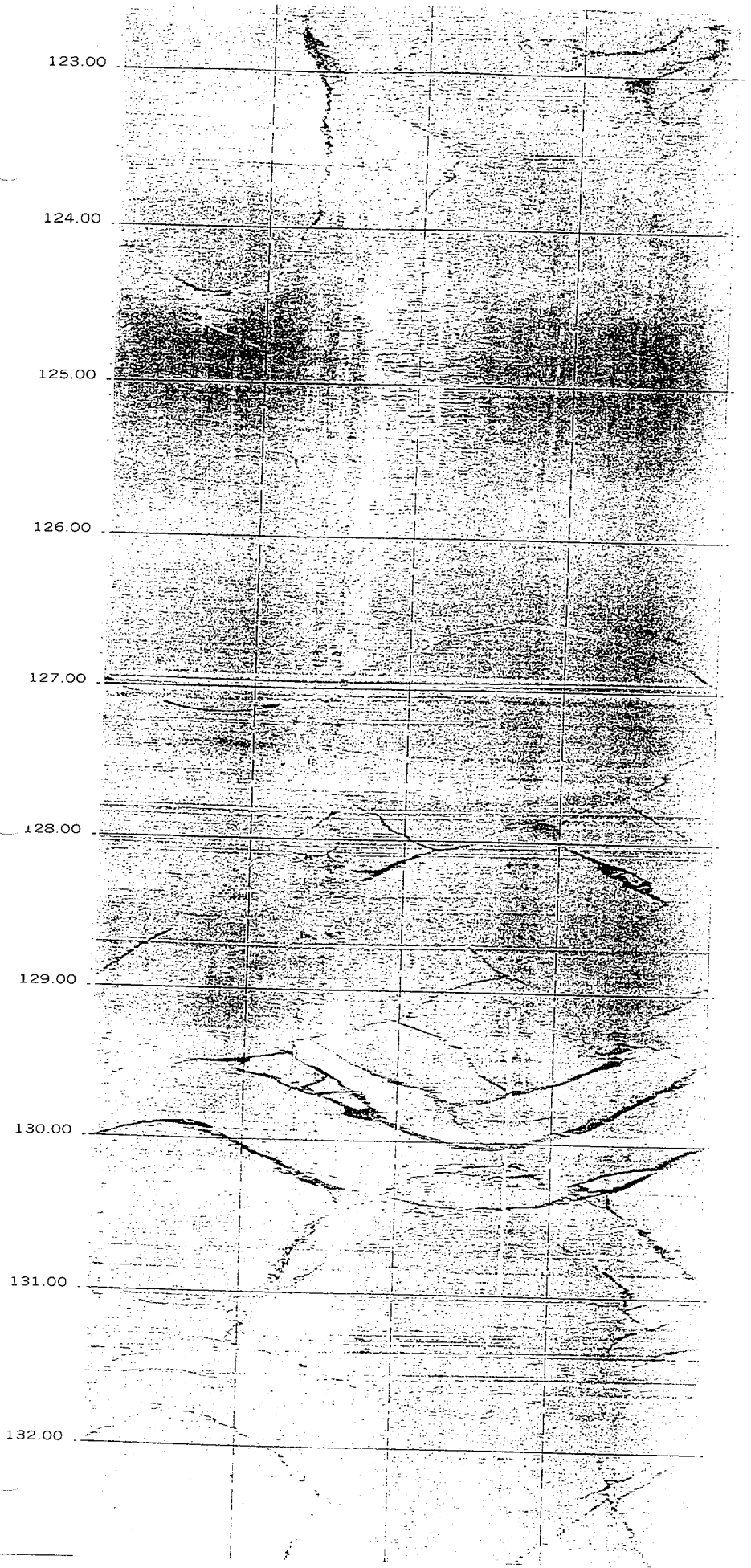
2.00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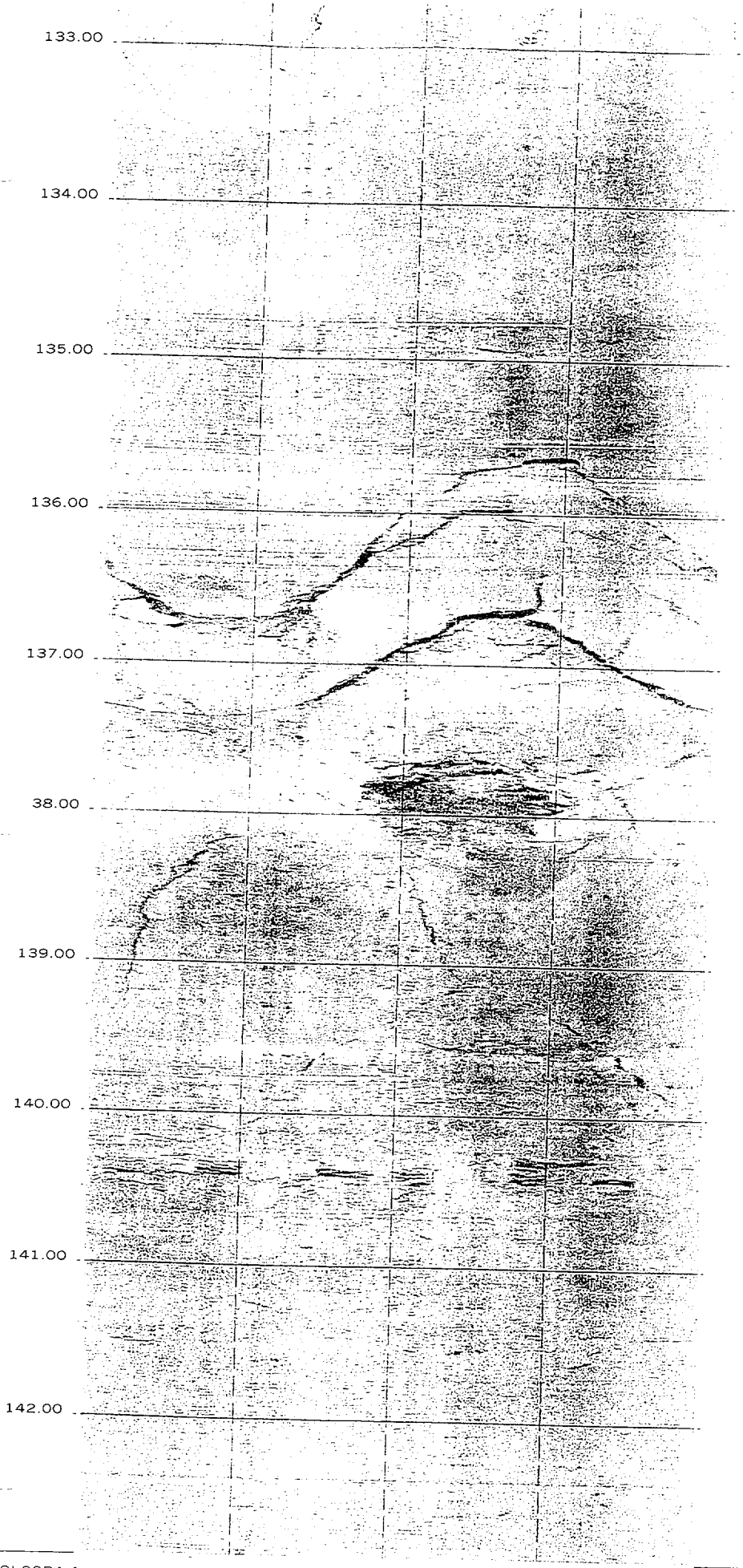
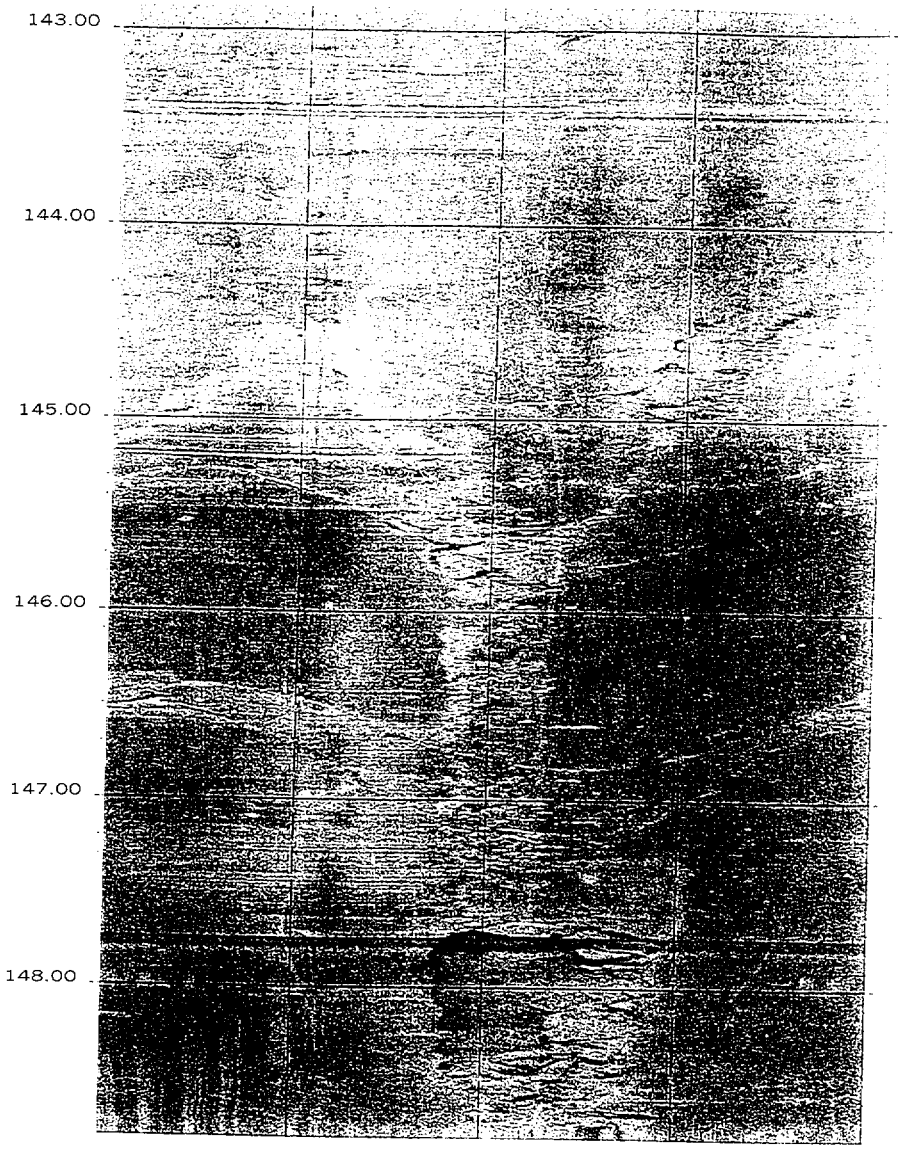
132.00



ISFSI-00BA-1

142.8810 to 132.7290ft

13 Dec 2000


143.00
144.00
145.00
146.00
147.00
148.00

NORCAL GEOPHYSICAL CONSULTANTS, INC.

OPTV DATA PROCESSING
RGLDIP vsn 5.3
BOREHOLE IMAGE LOG

17 Dec 2000

NORCAL GEOPHYSICAL

Borehole: ISFSI-00BA-1 REPEAT

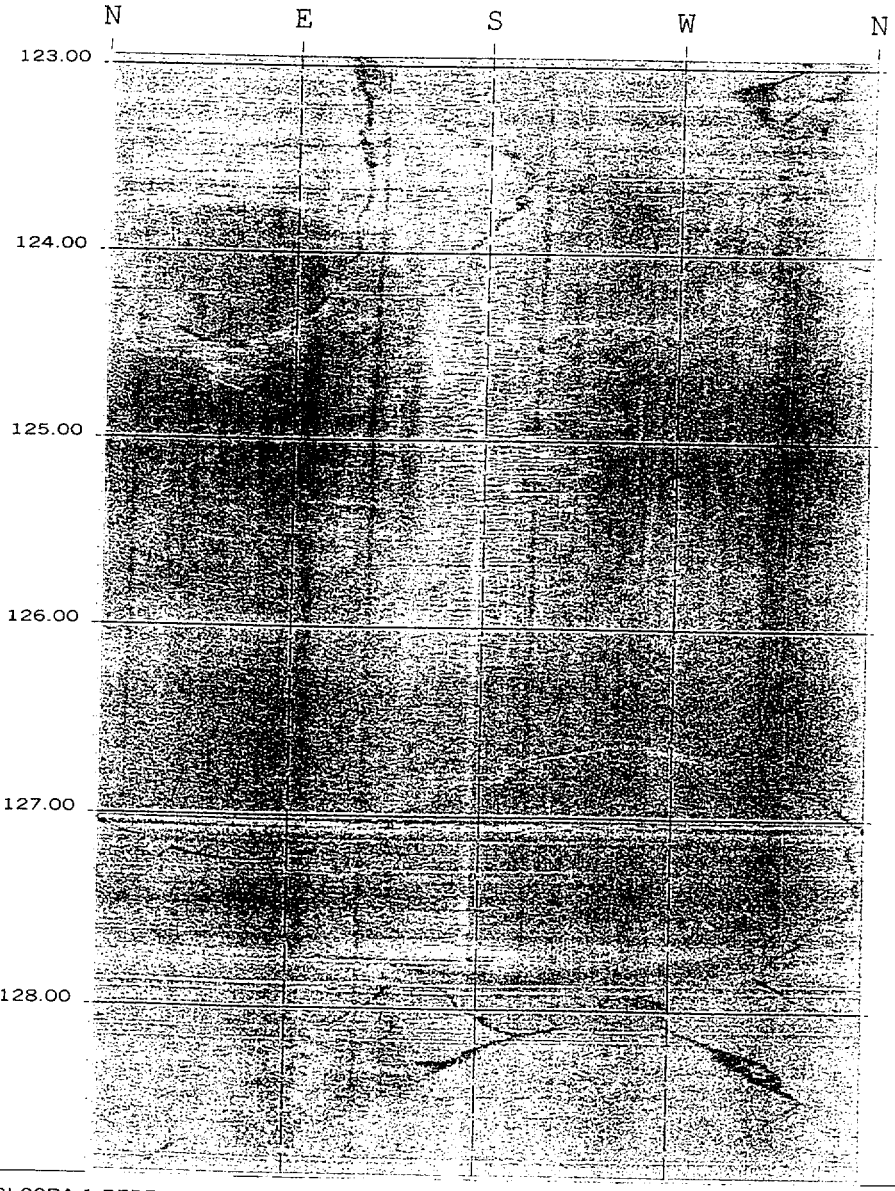
DIABLO CANYON POWER PLANR

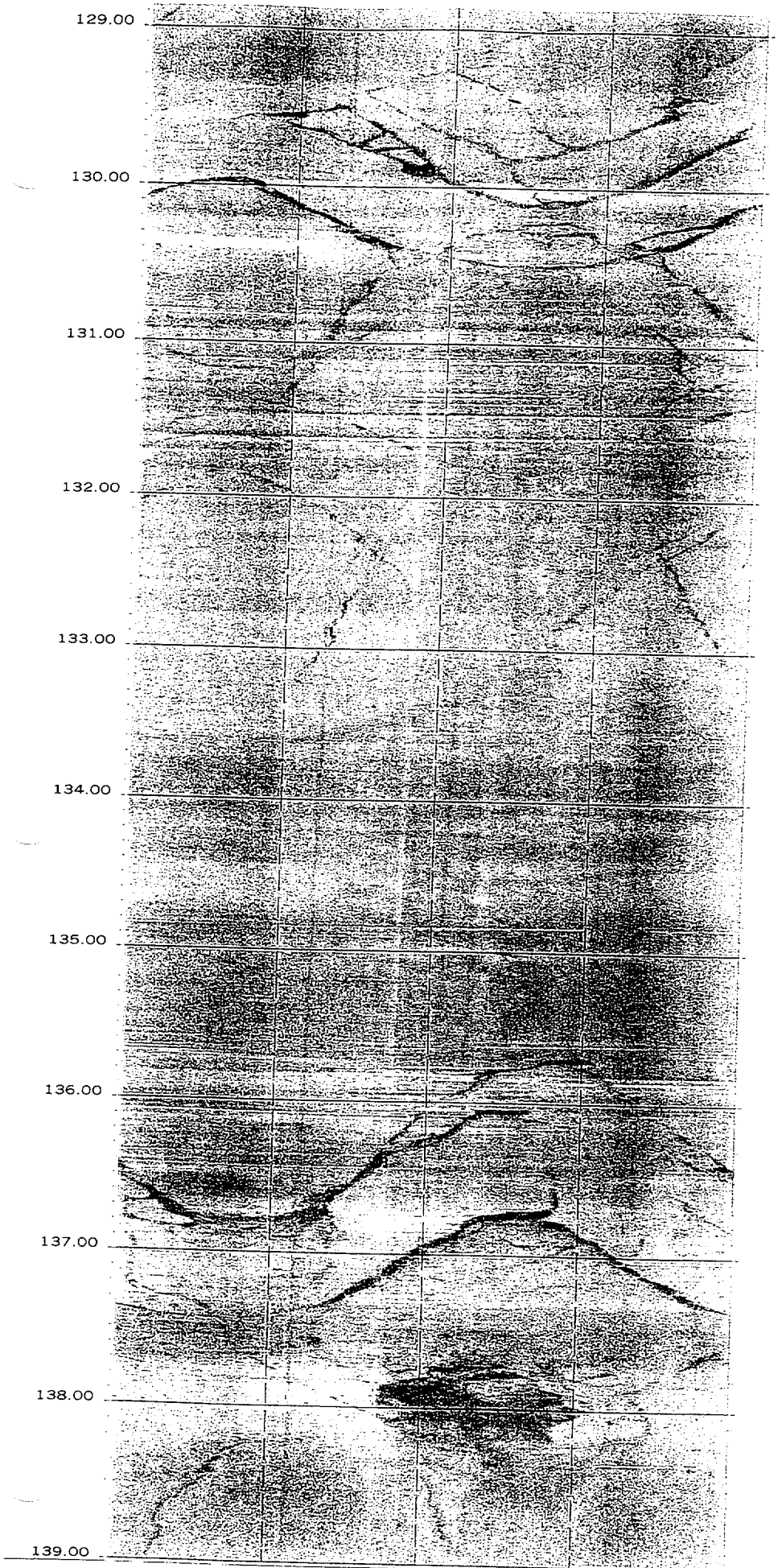
top of borehole.....
East:
North:
Alt:

North ref. is true
Depth units are feet
Vertical scale: 1/12

Zone from 148.9440 to 122.9550ft
Format: BHTV

Borehole diam: 4.000inch
data intervals.....
radial: 0.5000deg
axial: 0.0030ft

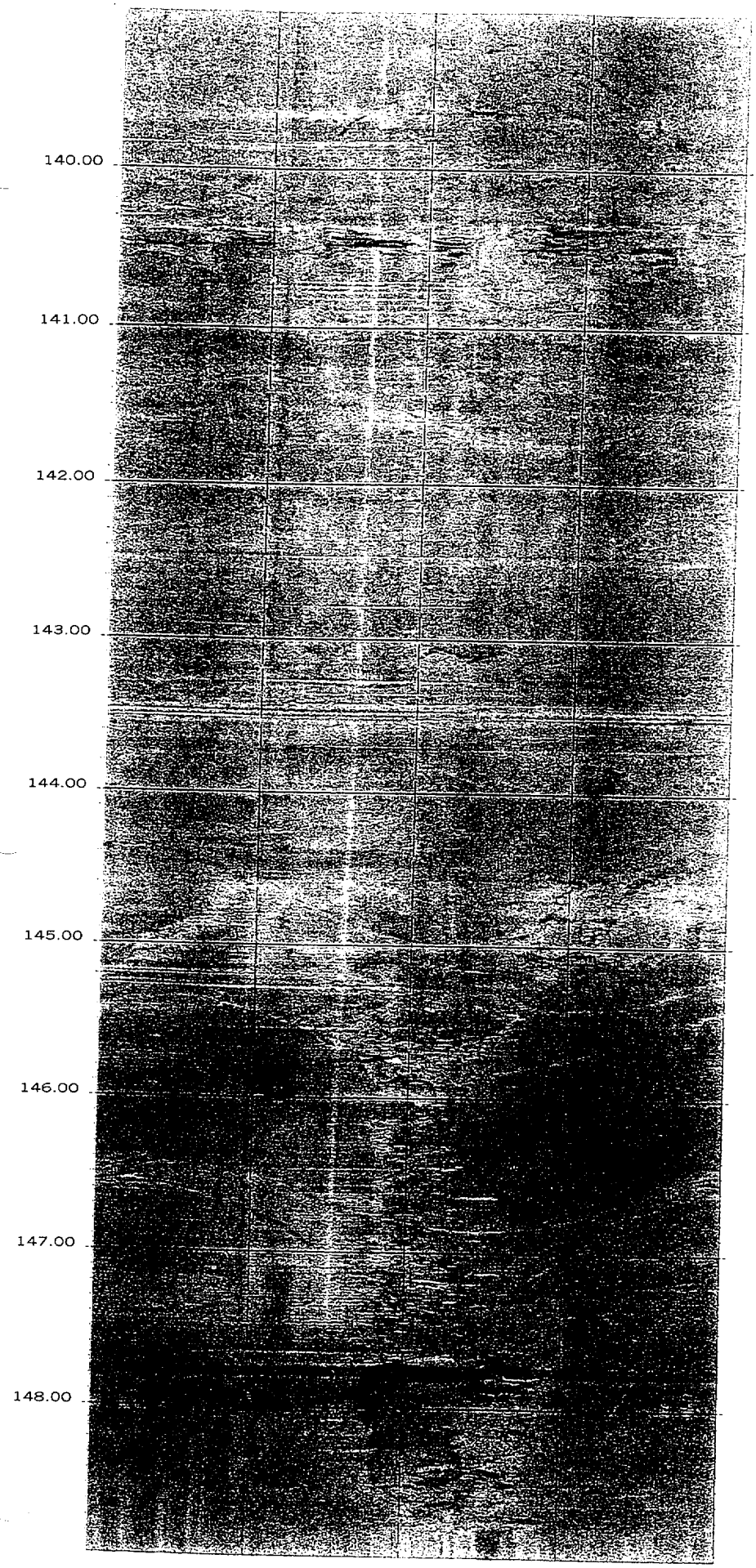




ISFSI-00BA-1 REPEAT

139.0140 to 128.8620ft

17 Dec 2000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142.00
143.00
144.00
145.00
146.00
147.00
148.00

NORCAL GEOPHYSICAL CONSULTANTS, INC.

OPTV DATA PROCESSING
RGLDIP vsn 5.3
BOREHOLE IMAGE LOG

12 Dec 2000

NORCAL GEOPHYSICAL

Borehole: ISFSI00BA-2

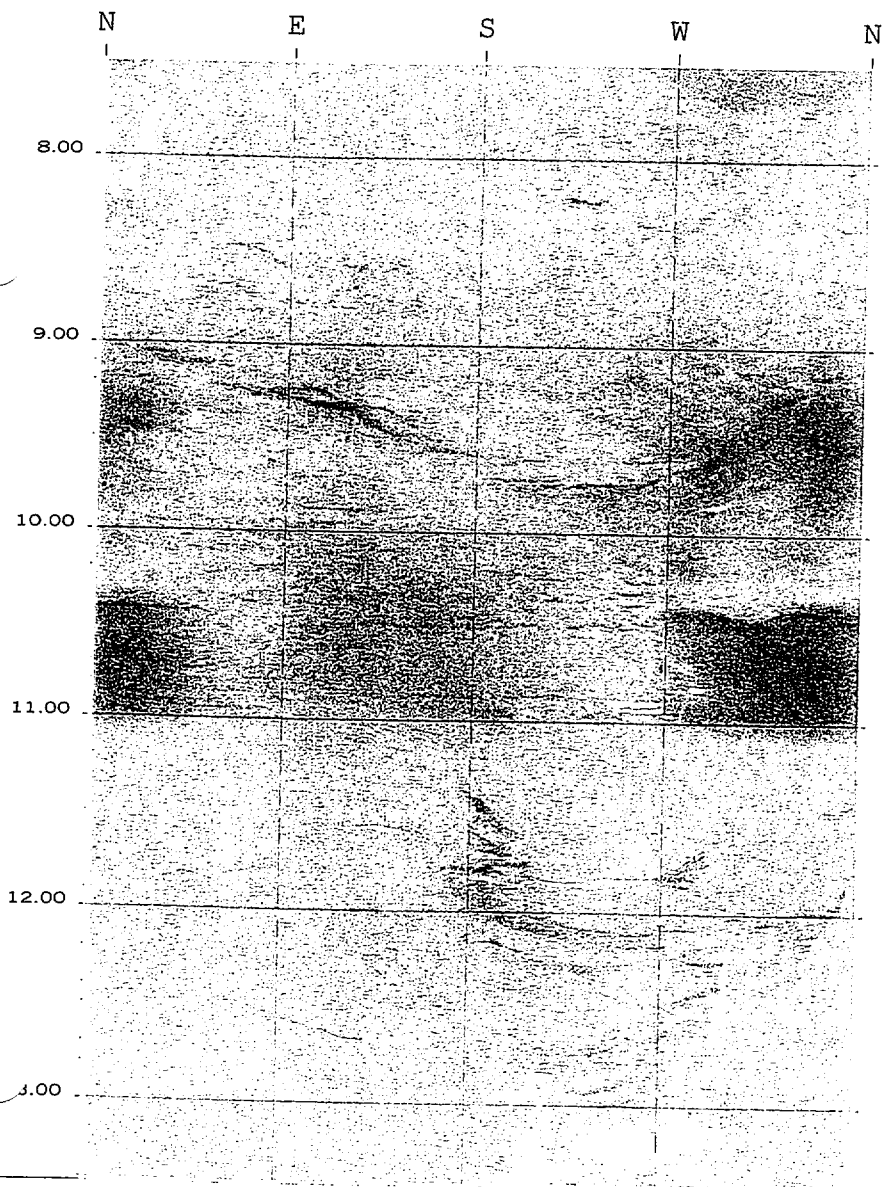
DIABLO CANYON POWER PLANT

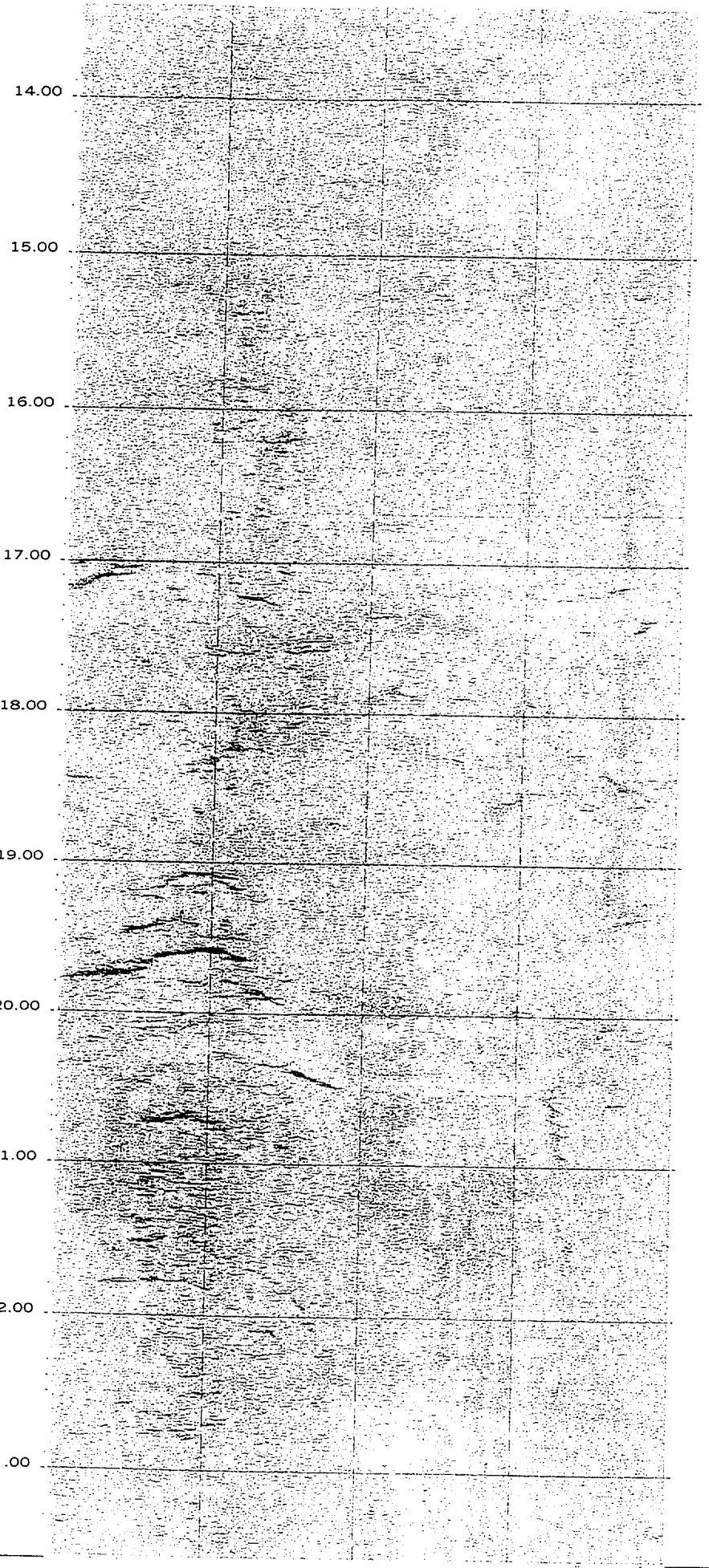
top of borehole.....
East:
North:
Alt:

North ref. is true
Depth units are feet
Vertical scale: 1/12

Zone from 7.5000 to 54.8000ft
Format: BHTV

Borehole diam: 4.000inch
data intervals.....
radial: 0.5000deg
axial: 0.0030ft

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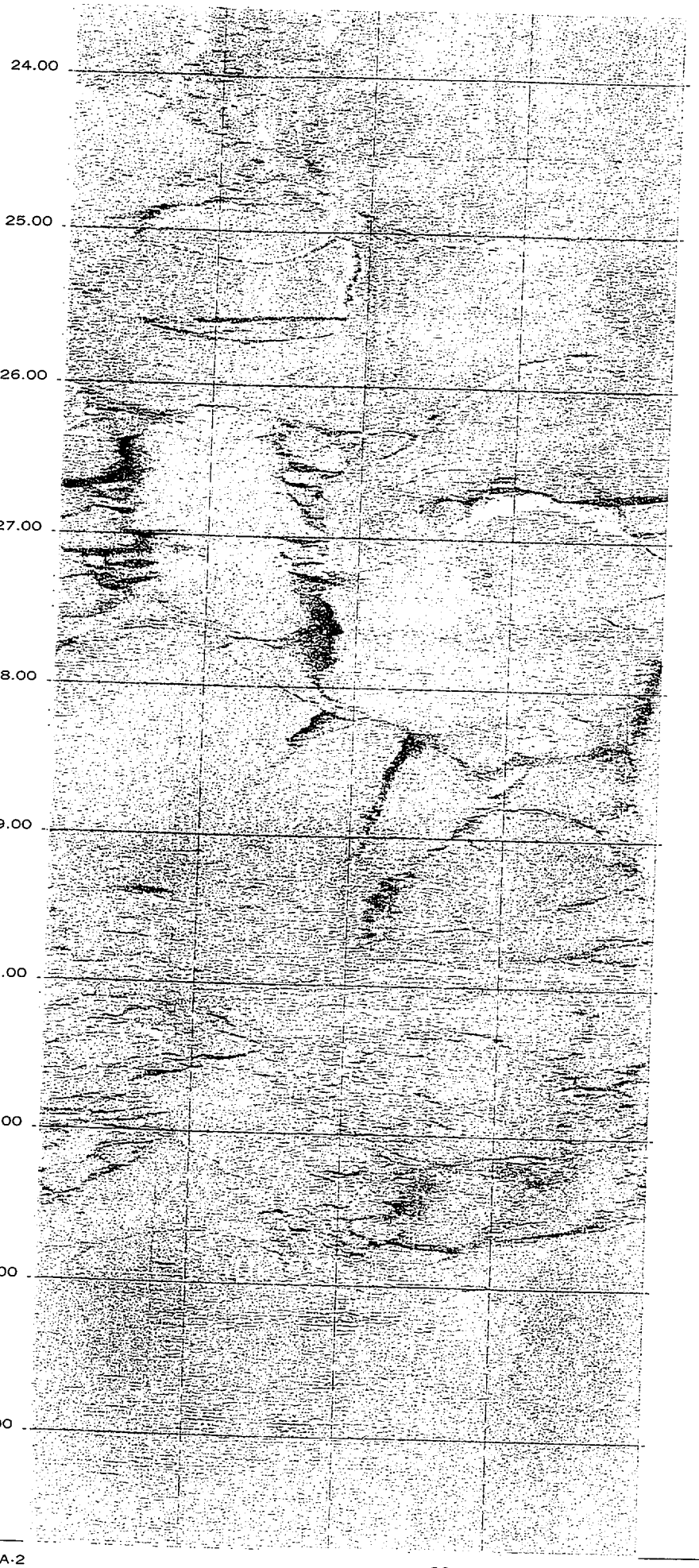
15.00
16.00
17.00
18.00
19.00
20.00
21.00
22.00
.00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25.00
26.00
27.00
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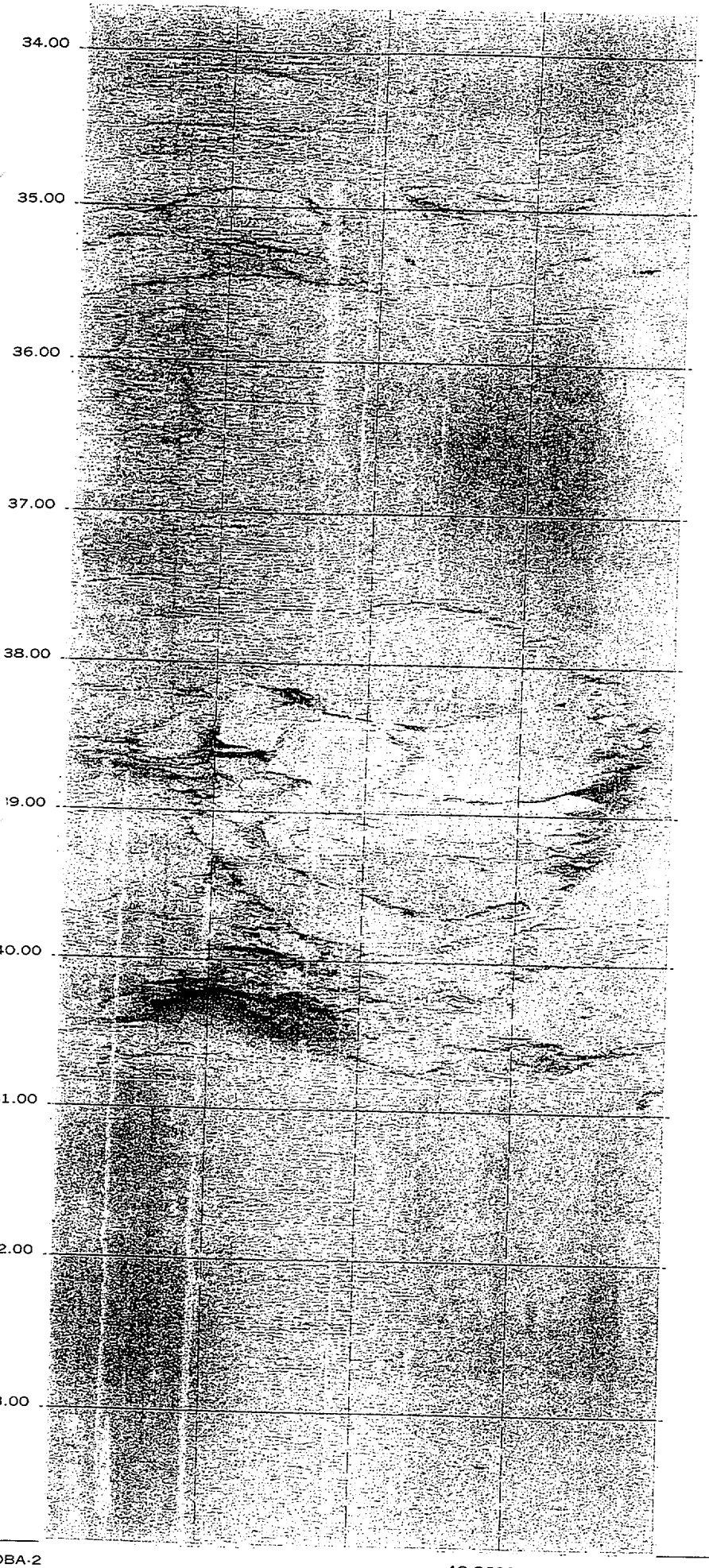
29.00
30.00
31.00
32.00
33.00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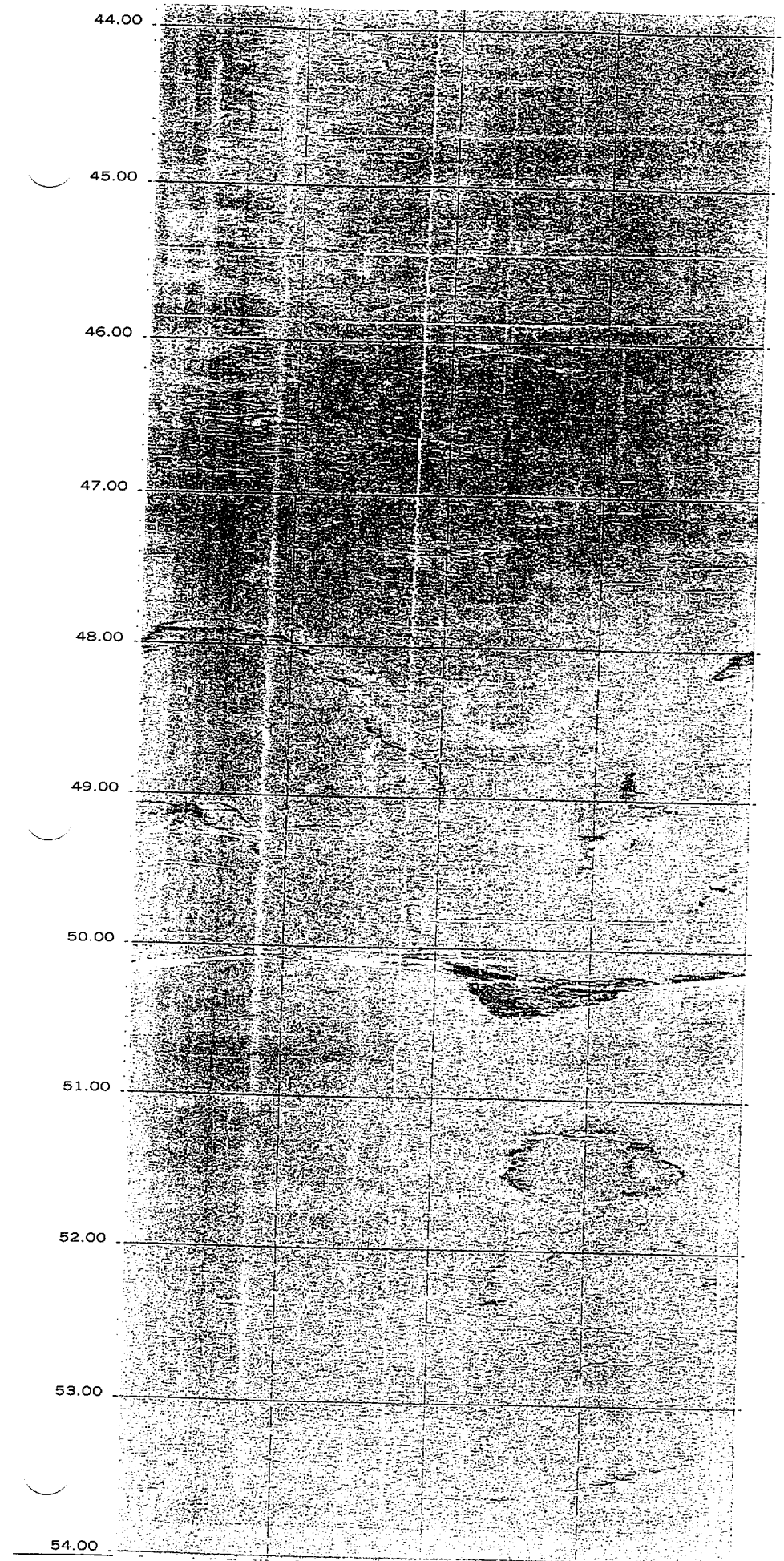
35.00
36.00
37.00
38.00
9.00
40.00
41.00
42.00
43.00


44.00
45.00
46.00
47.00
48.00
49.00
50.00
51.00
52.00
53.00
54.00

NORCAL GEOPHYSICAL CONSULTANTS, INC.

OPTV DATA PROCESSING
RGLDIP vsn 5.3
BOREHOLE IMAGE LOG

17 Dec 2000

NORCAL GEOPHYSICAL

Borehole: ISFS1 00BA-2 REPEAT

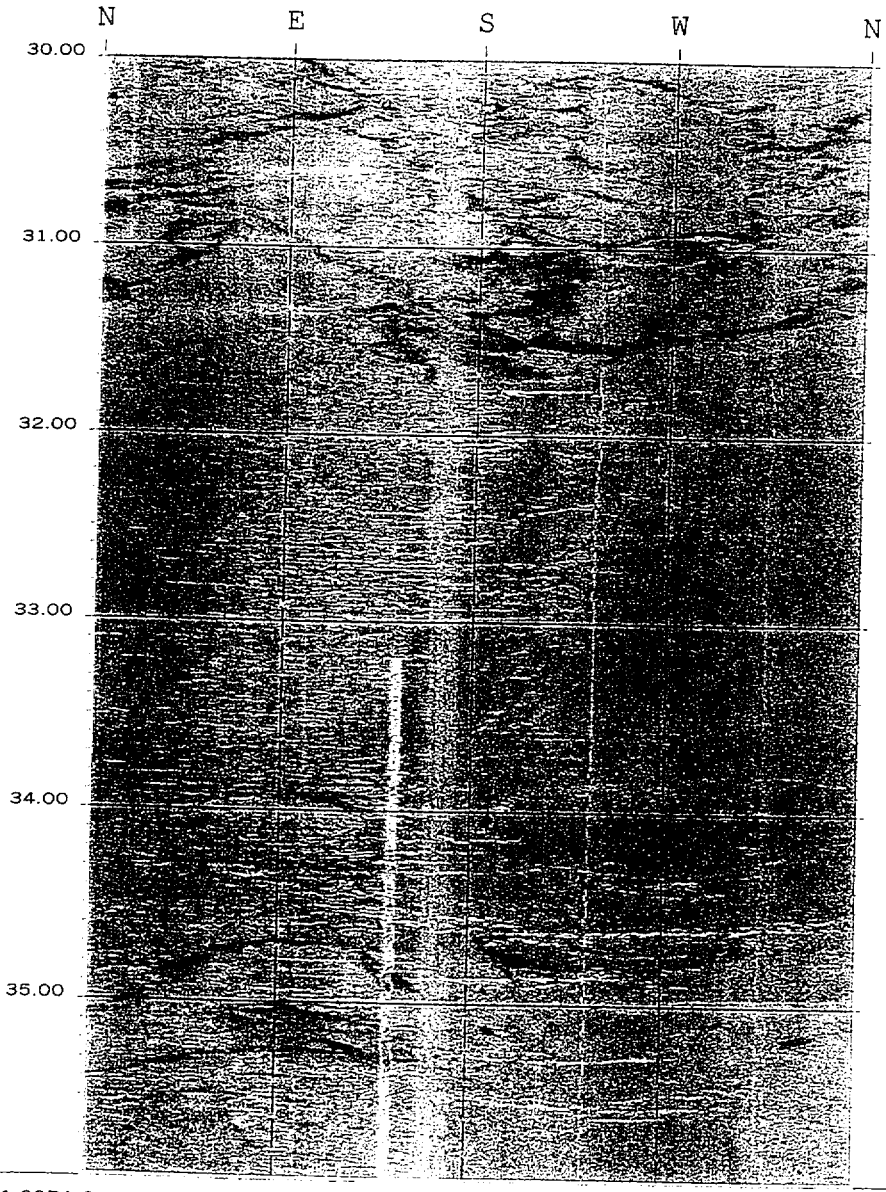
DIABLO CANYON POWER PLANT

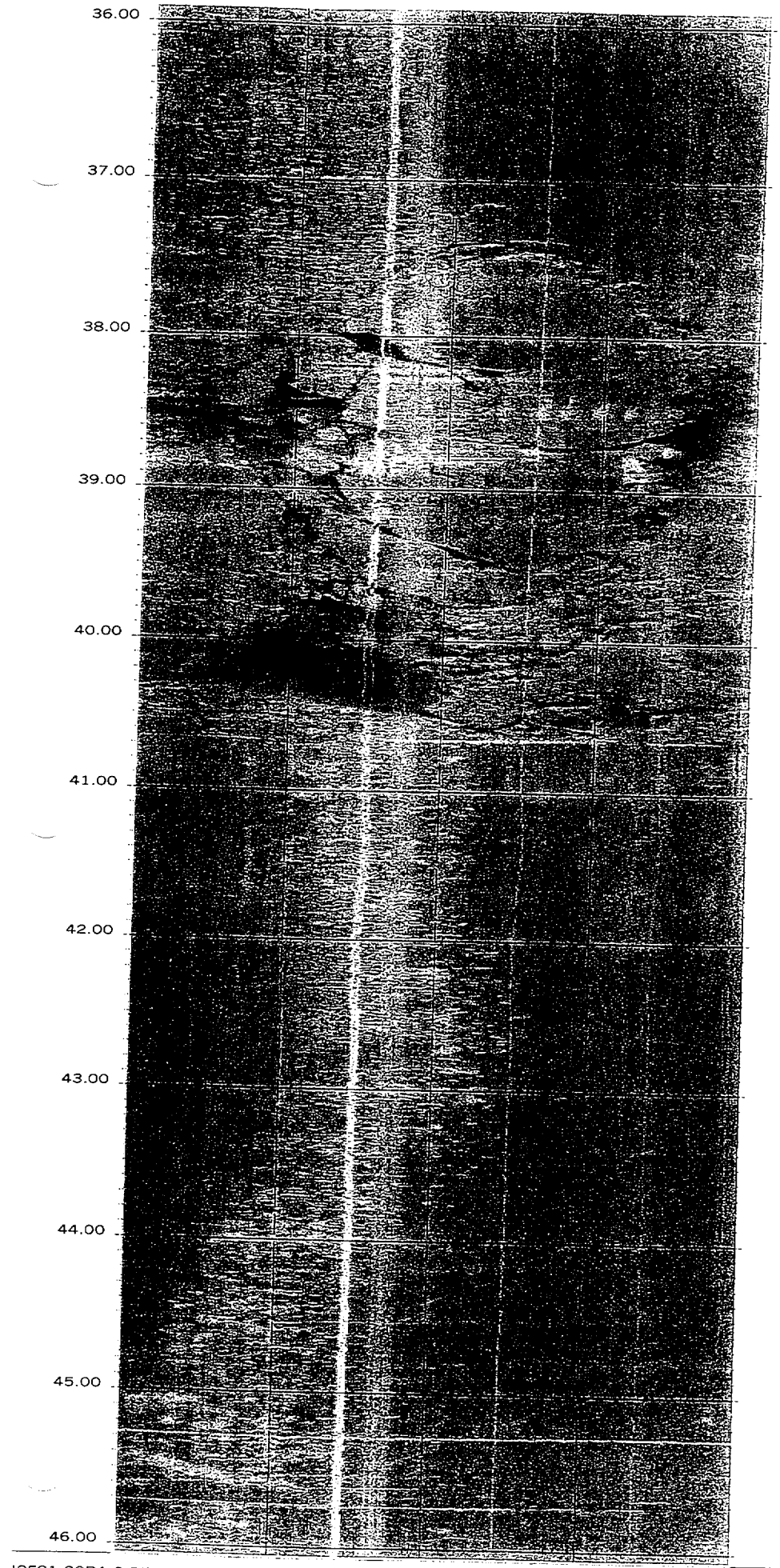
top of borehole.....
East:
North:
Alt:

North ref. is true
Depth units are feet
Vertical scale: 1/12

Zone from 54.3600 to 30.0000ft
Format: BHTV

Borehole diam: 4.000inch
data intervals.....
radial: 0.5000deg
axial: 0.0030ft

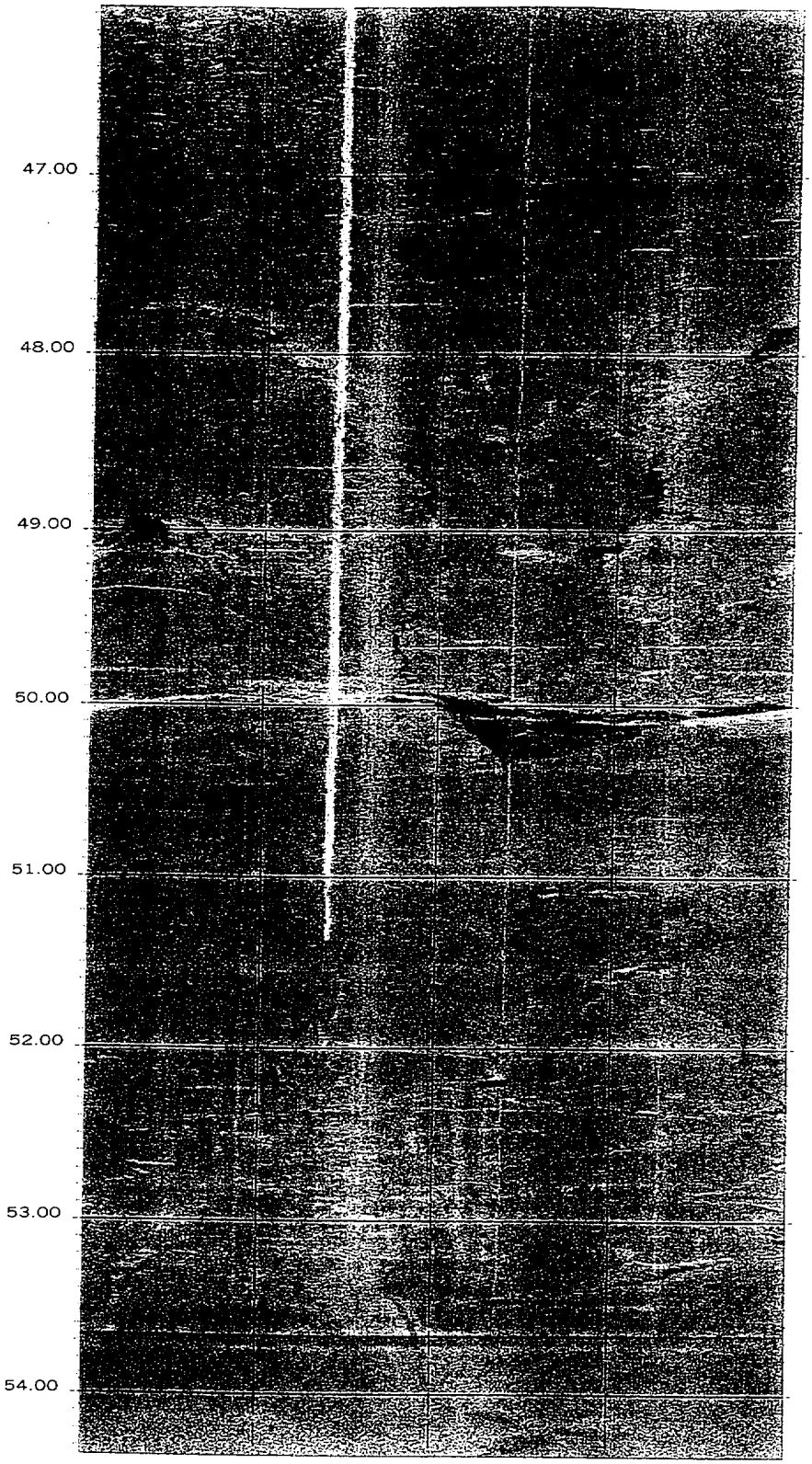




ISFS1 00BA-2 REPEAT

46.0590 to 35.9070ft

17 Dec 2000


47.00
48.00
49.00
50.00
51.00
52.00
53.00
54.00

Appendix C

INTERPRETED OPTV PLOTS

BORINGS ISFSI-00BA-1 AND -2

NORCAL GEOPHYSICAL CONSULTANTS, INC

OPTV DATA PROCESSING
RGLDIP vsn 5.3
INTERPRETED OPTV DIPS LOG

15 Dec 2000

NORCAL GEOPHYSICAL

Borehole: ISFSI-00BA-1

DIABLO CANYON POWER PLANTR

top of borehole.....
East:
North:
Alt:

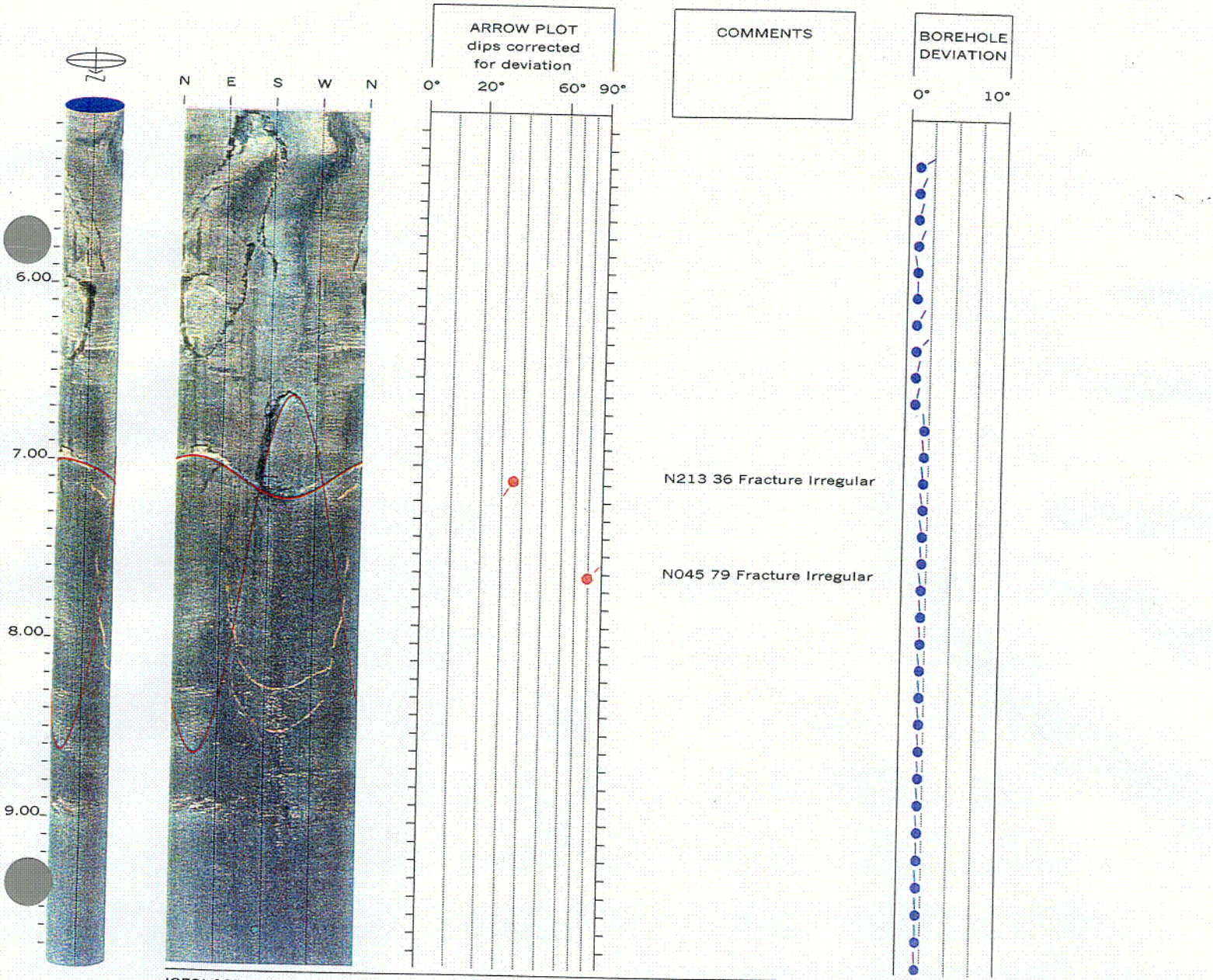
North ref. is true
Depth units are feet
Vertical scale: 1/10
Horiz scale = vert scale

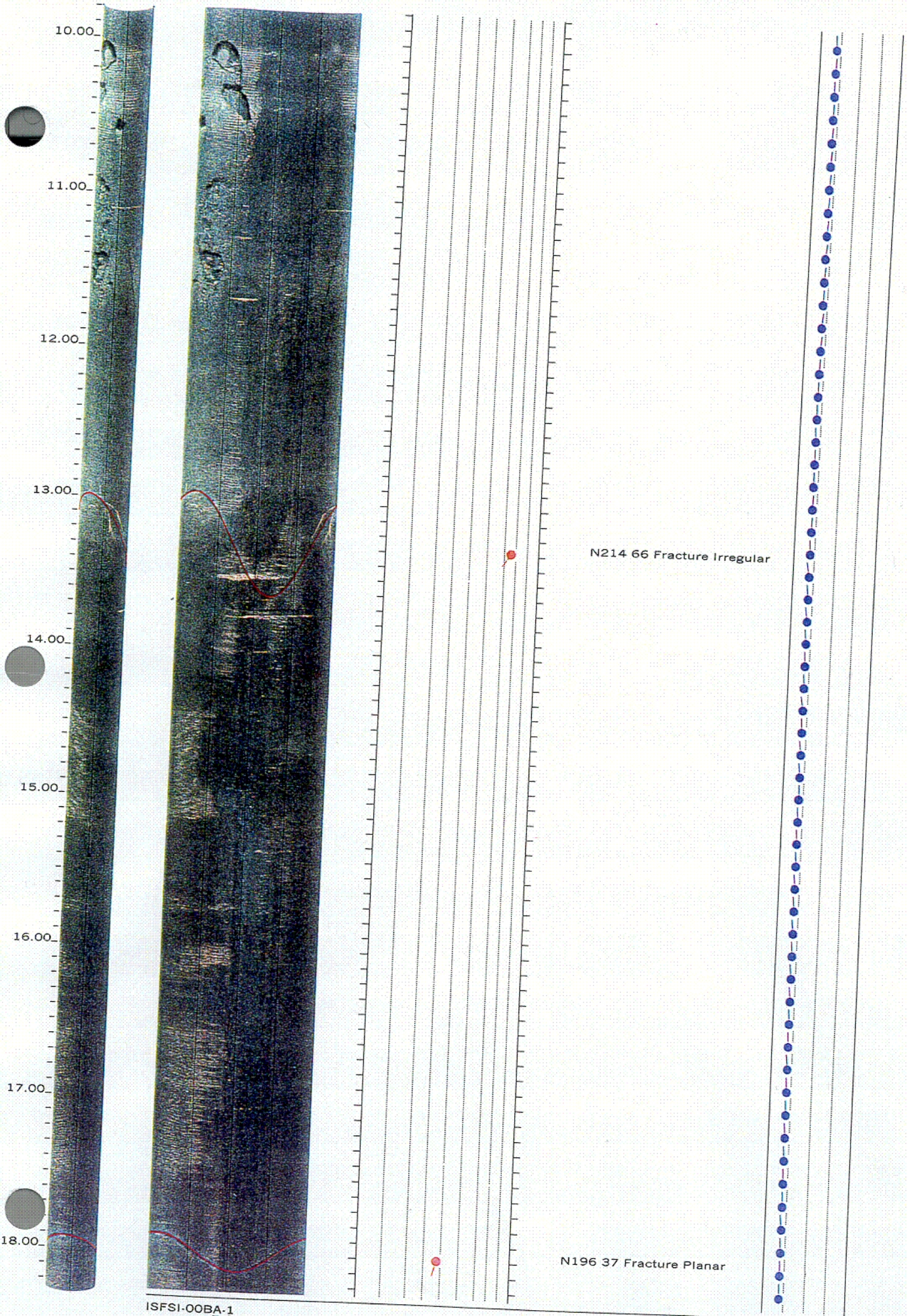
Zone from 148.809 to 4.998ft
Vertical = borehole-axis

Borehole diam: 4.000inch

BEDDING
FRACTURE

Identified units

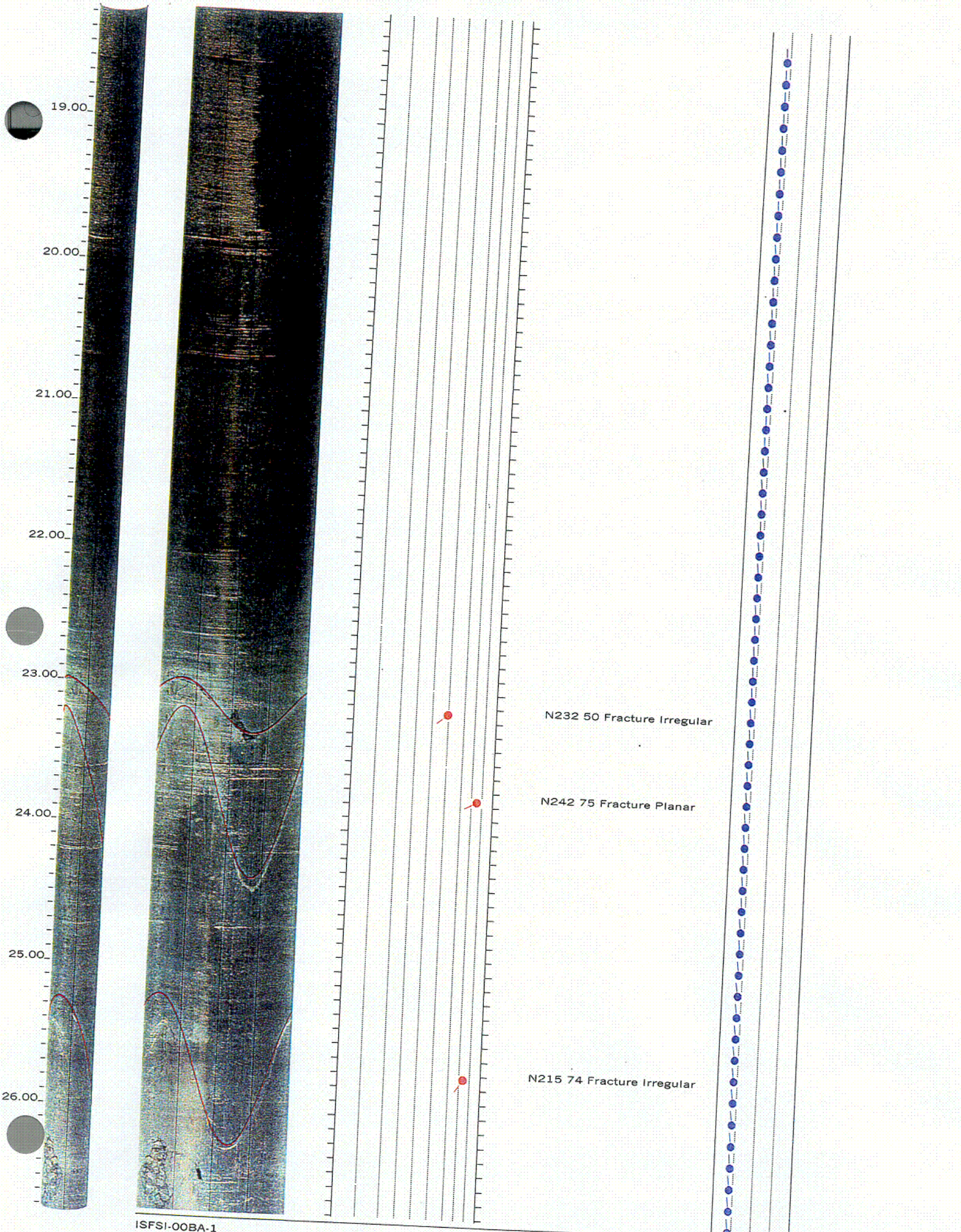




ISFSI-00BA-1

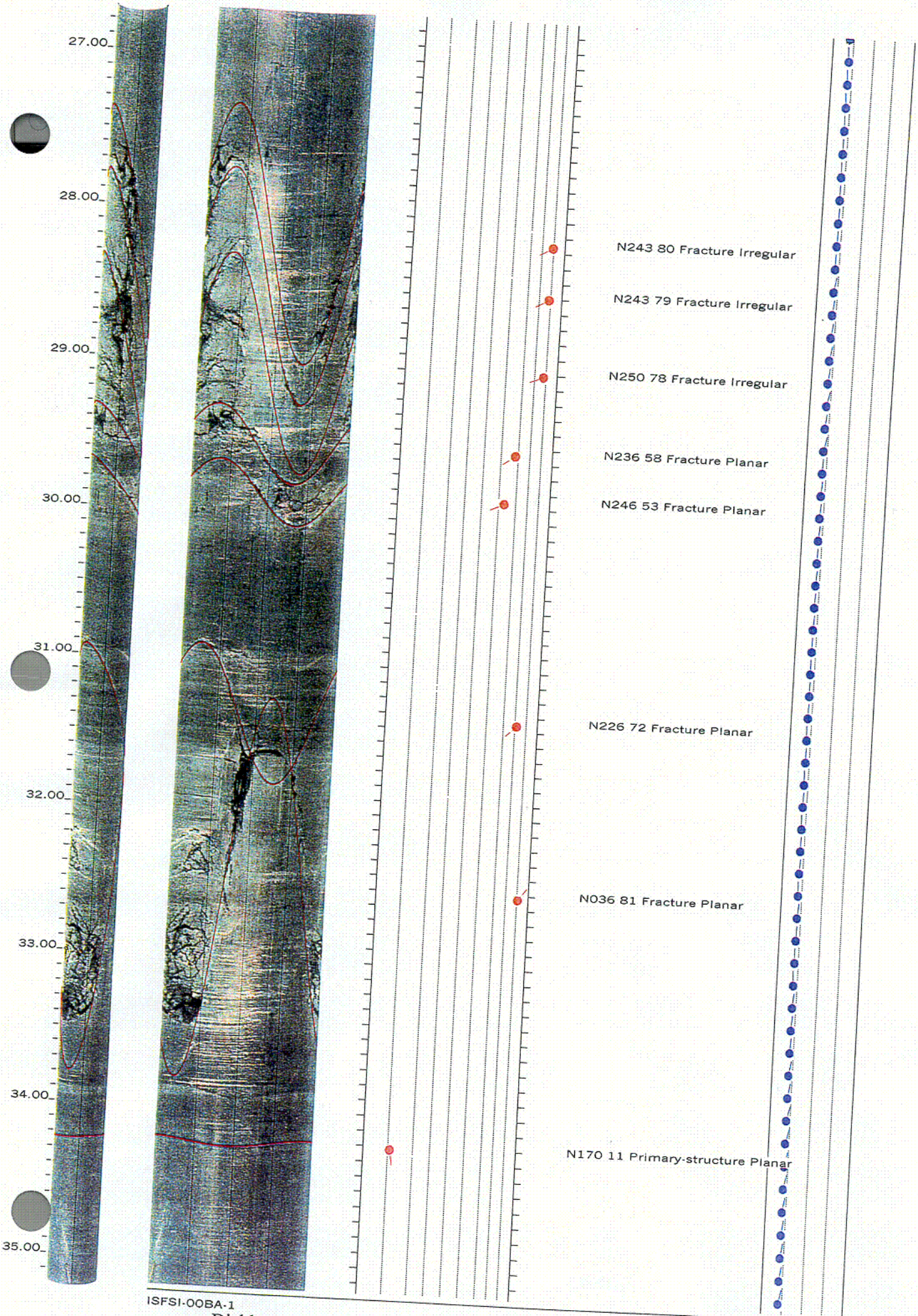
18,252 to 9,792ft

15 Dec 2000

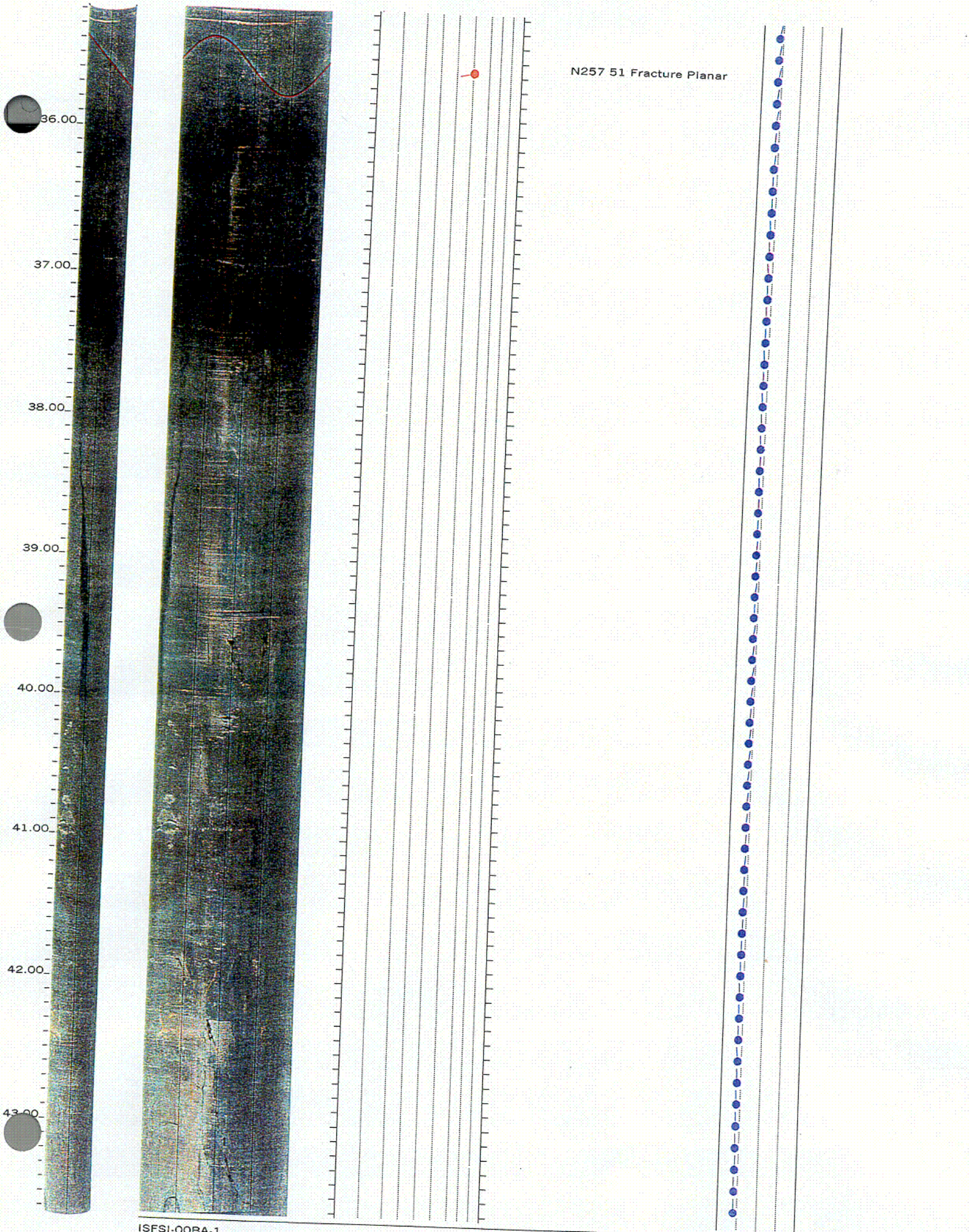


ISFSI-00BA-1

26,712 to 18,252ft

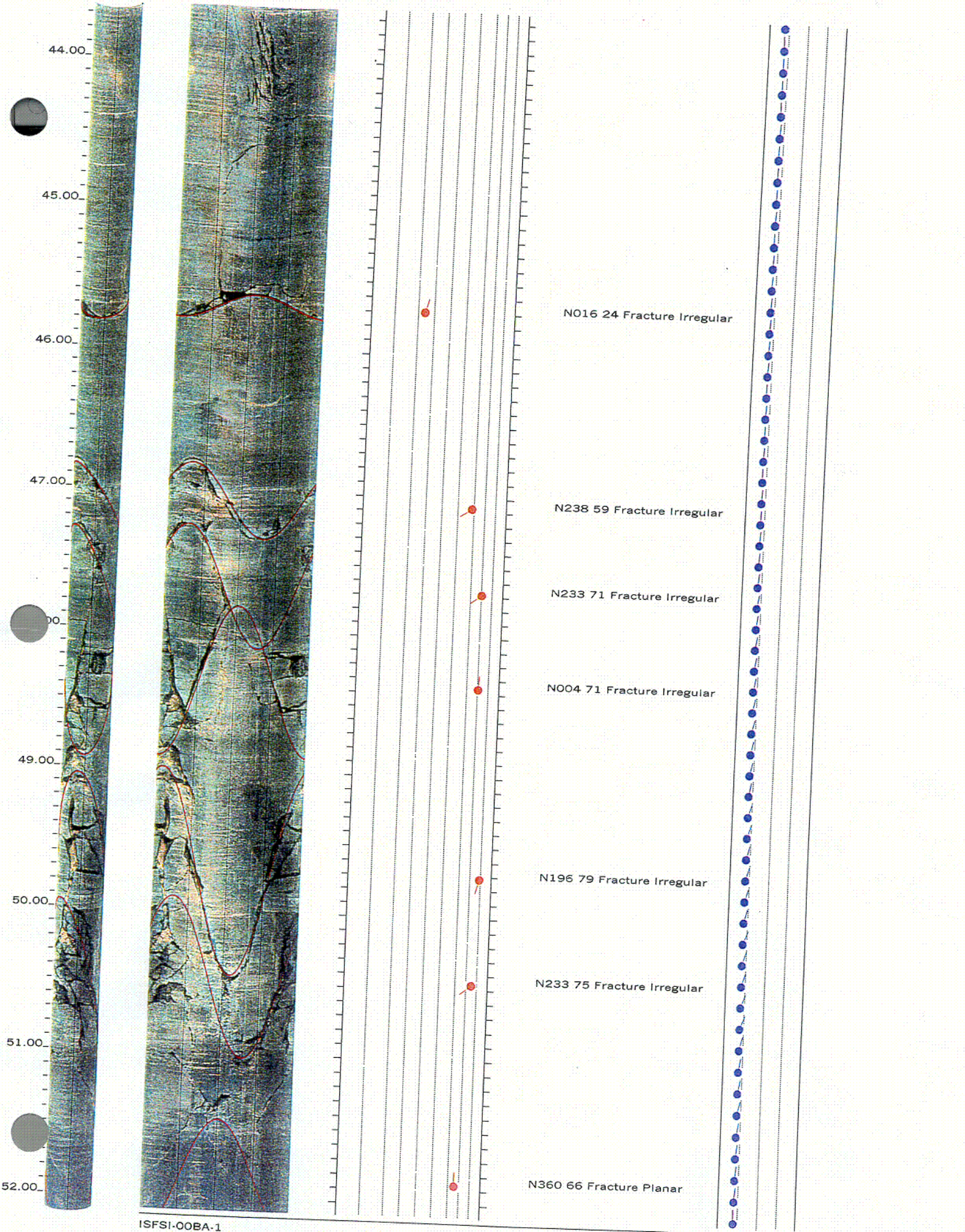

27.00
28.00
29.00
30.00
31.00
32.00
33.00
34.00
35.00
N243 80 Fracture Irregular
N243 79 Fracture Irregular
N250 78 Fracture Irregular
N236 58 Fracture Planar
N246 53 Fracture Planar
N226 72 Fracture Planar
N036 81 Fracture Planar
N170 11 Primary-structure Planar

ISFSI-00BA-1



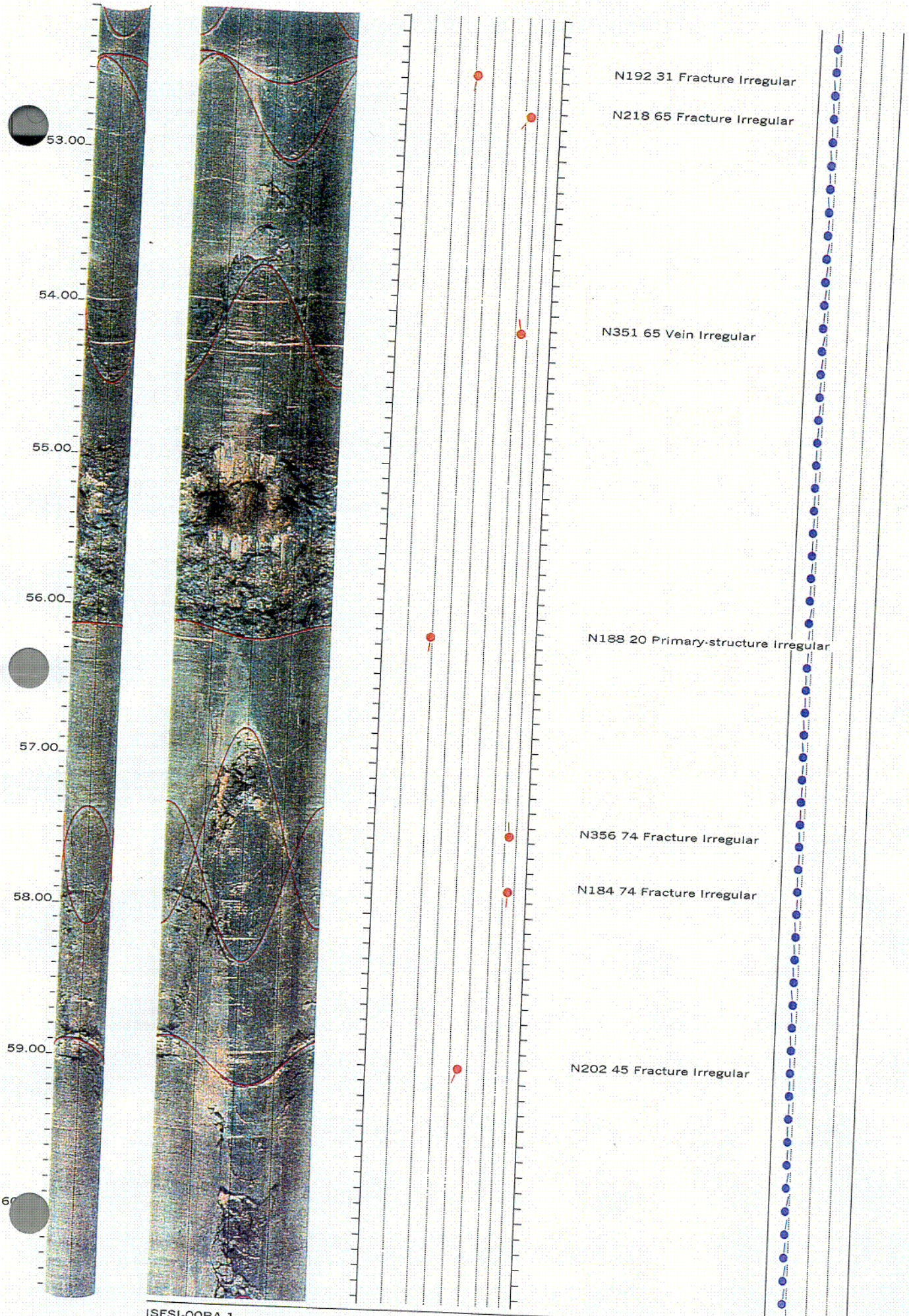
ISFSI-00BA-1

43.632 to 35.172ft



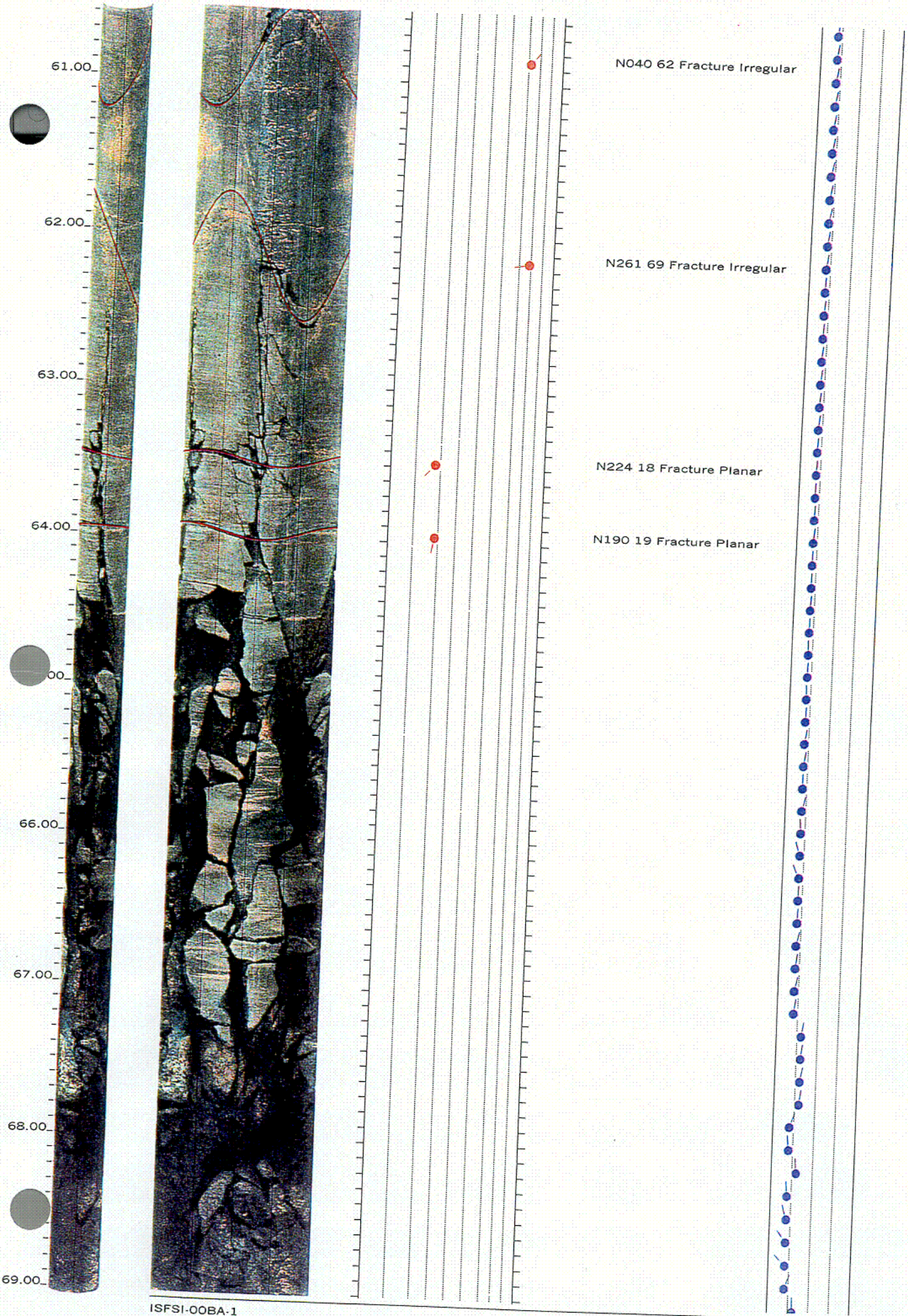
ISFSI-00BA-1

52.092 to 43.632ft



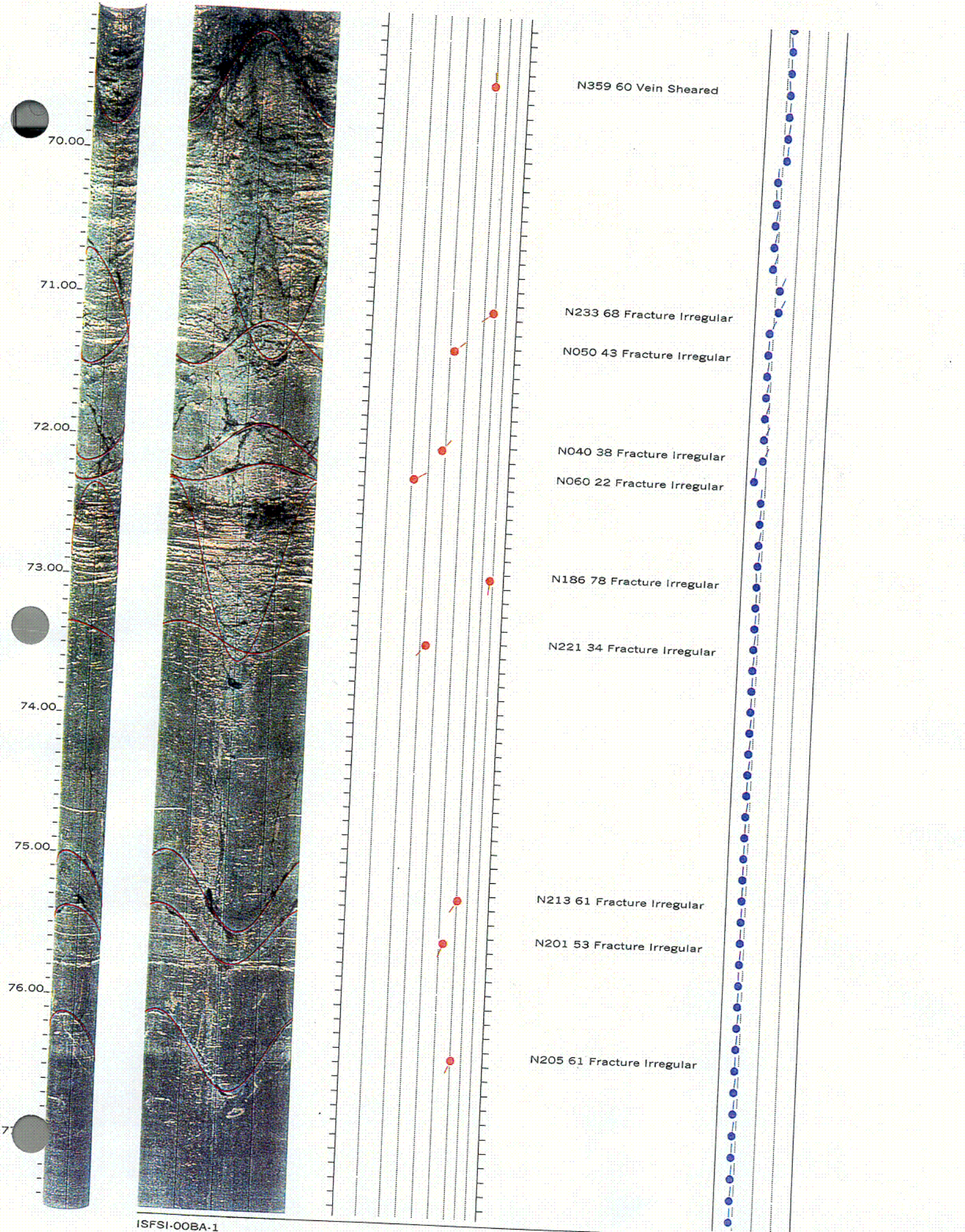
ISFSI-00BA-1

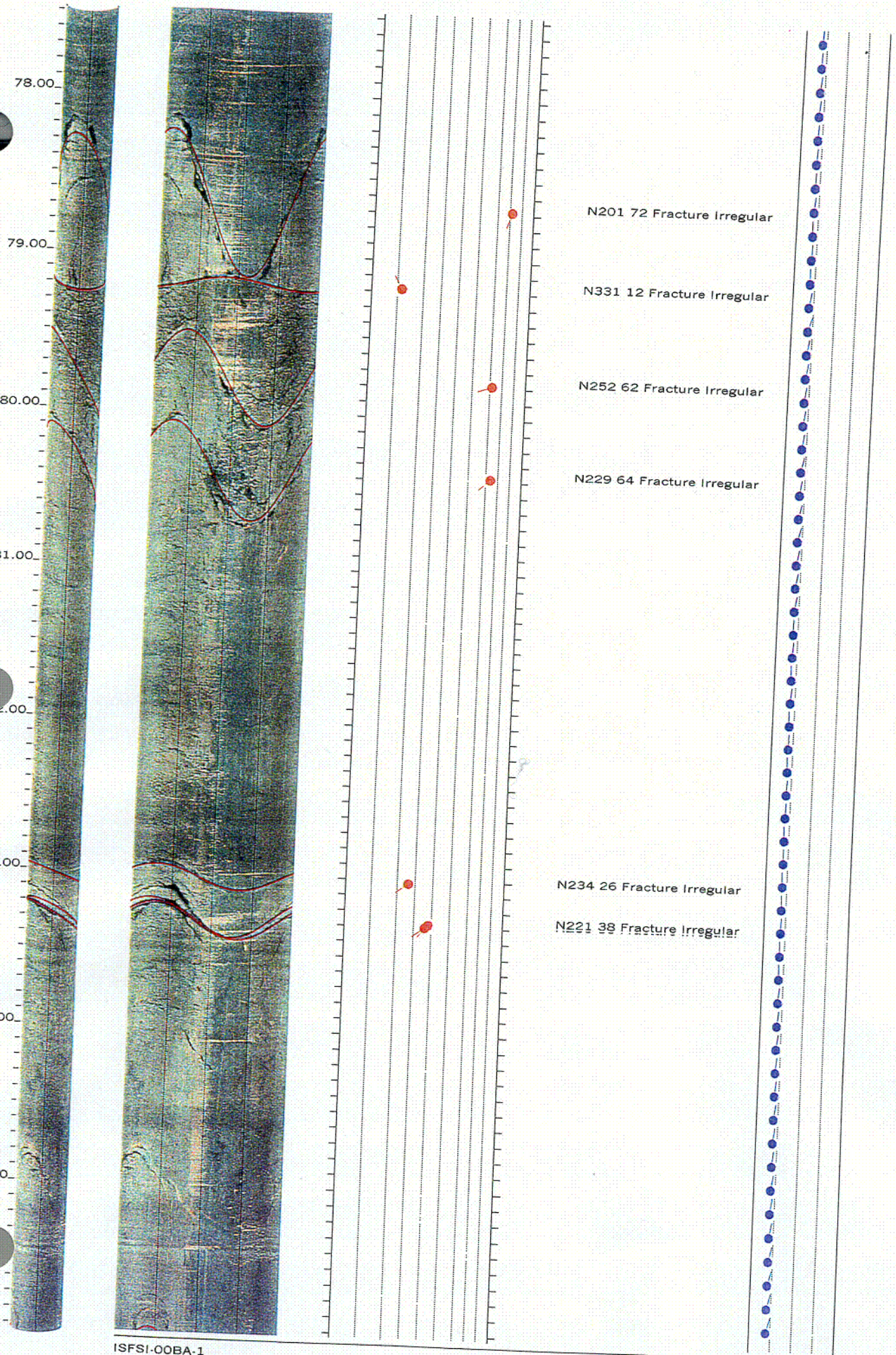
60.552 to 52.092ft



ISFSI-00BA-1

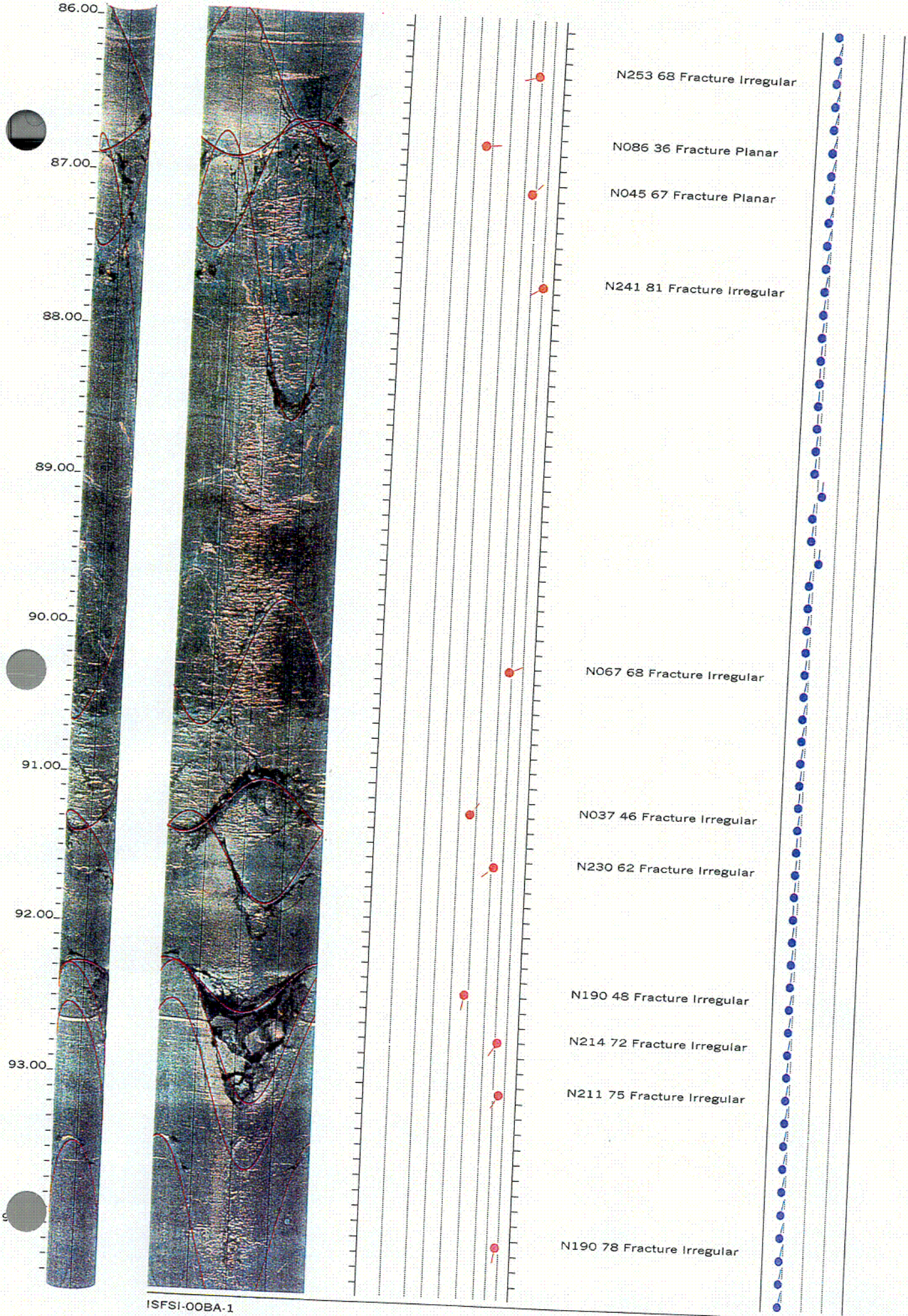
69.012 to 60.552ft


70.00
71.00
72.00
73.00
74.00
75.00
76.00
N359 60 Vein Sheared
N233 68 Fracture Irregular
N050 43 Fracture Irregular
N040 38 Fracture Irregular
N060 22 Fracture Irregular
N186 78 Fracture Irregular
N221 34 Fracture Irregular
N213 61 Fracture Irregular
N201 53 Fracture Irregular
N205 61 Fracture Irregular



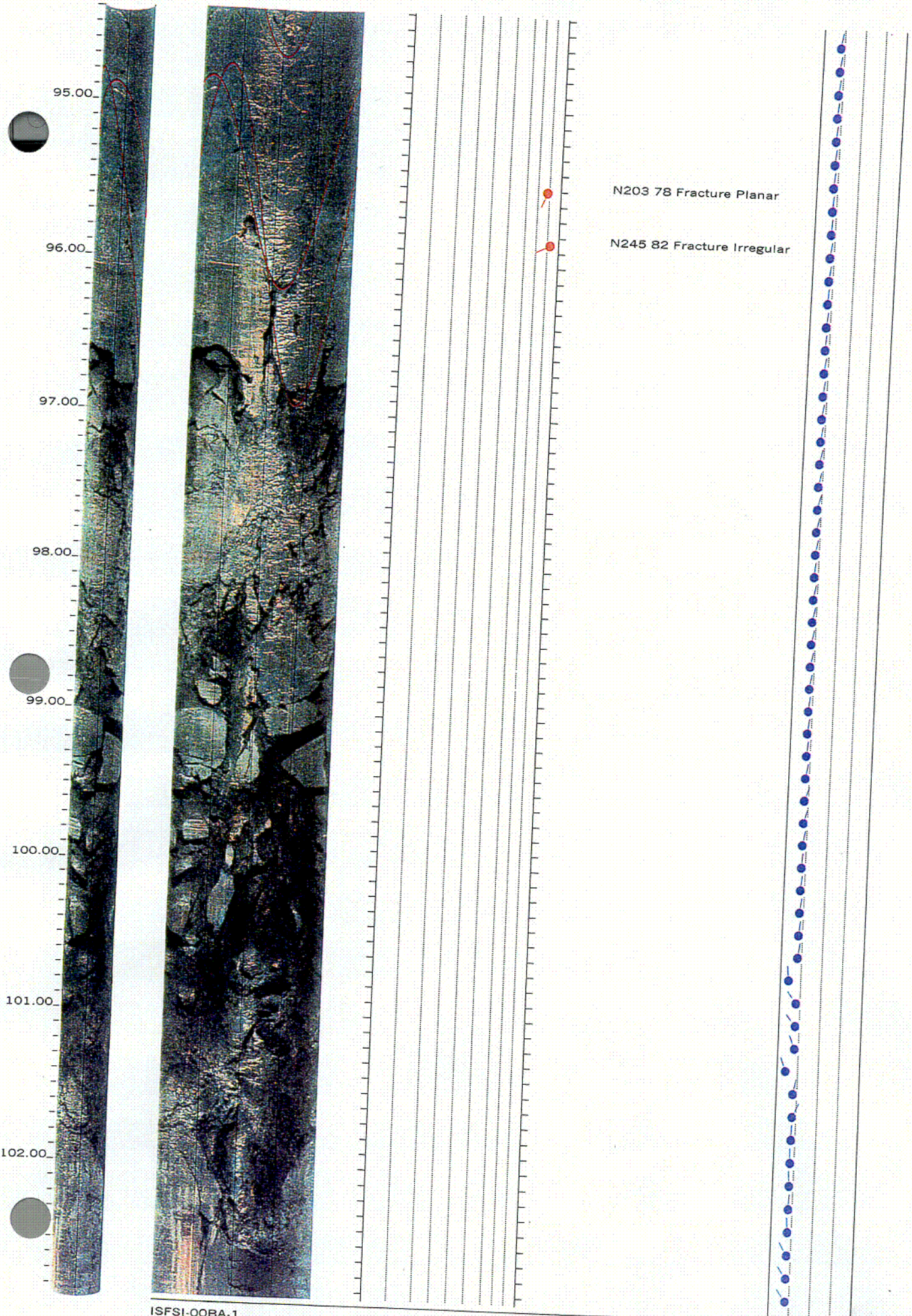
ISFSI-00BA-1

85.932 to 77.472ft

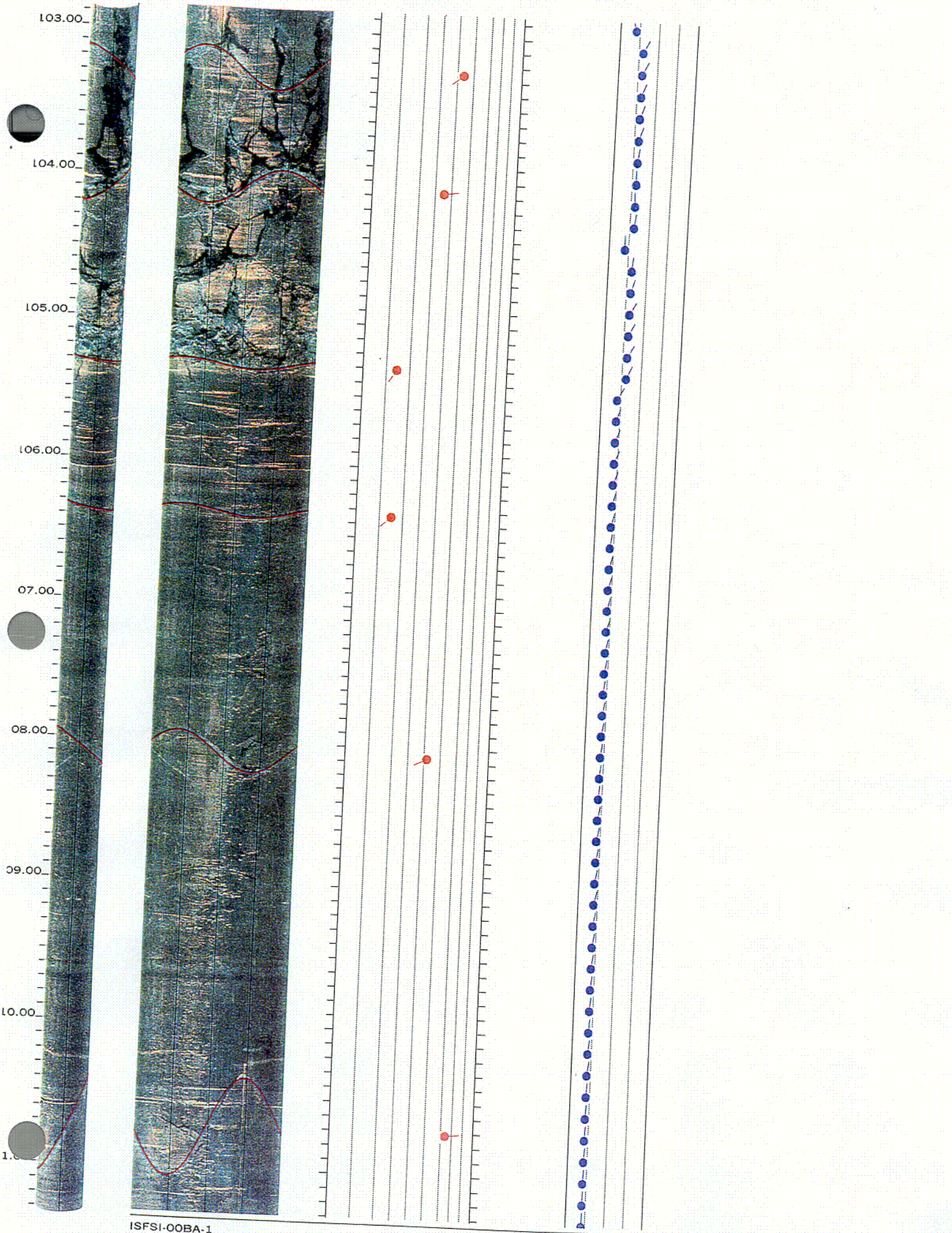


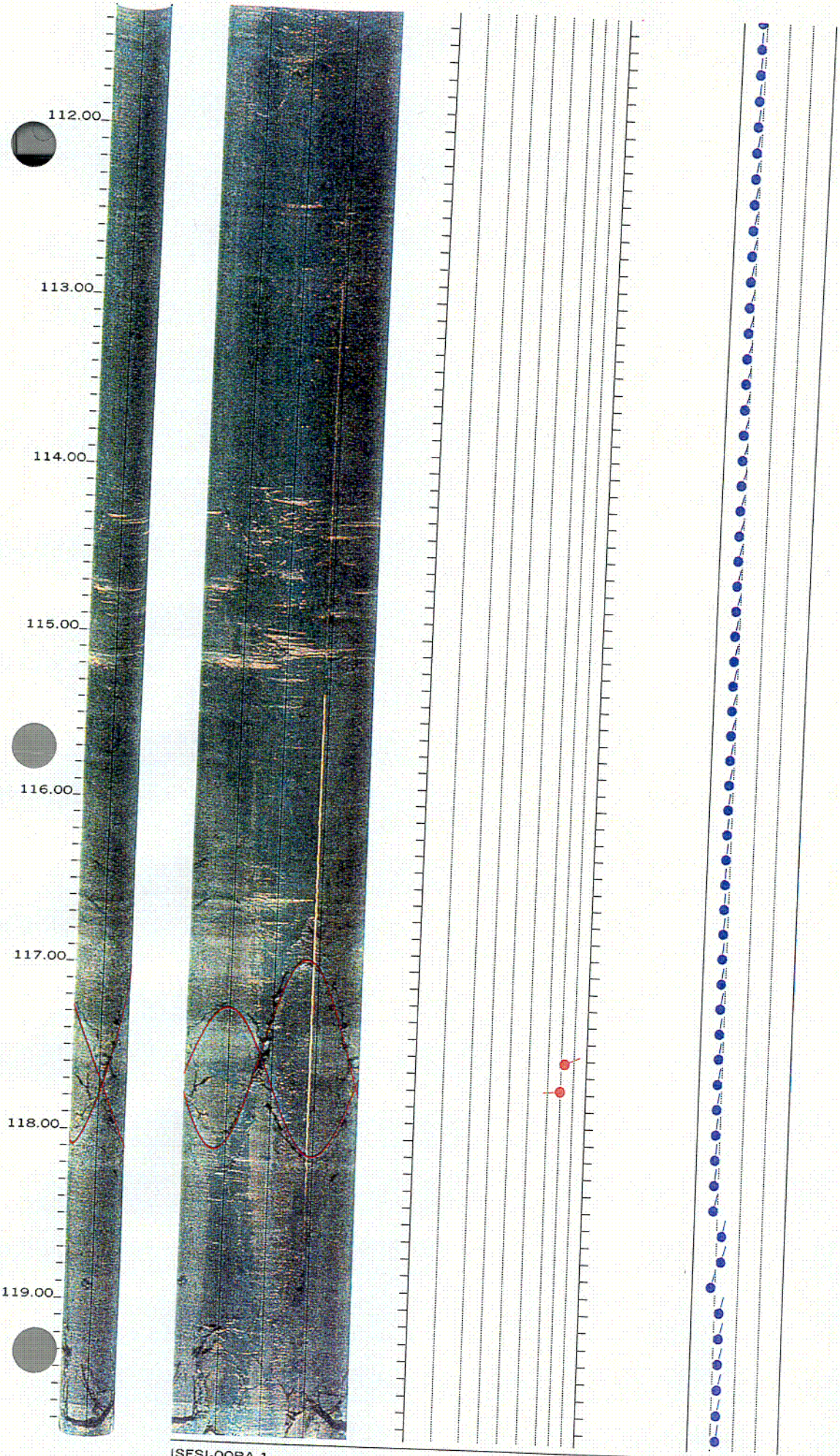
ISFSI-00BA-1

94.392 to 85.932ft


95.00
96.00
97.00
98.00
99.00
100.00
101.00
102.00
N203 78 Fracture Planar
N245 82 Fracture Irregular

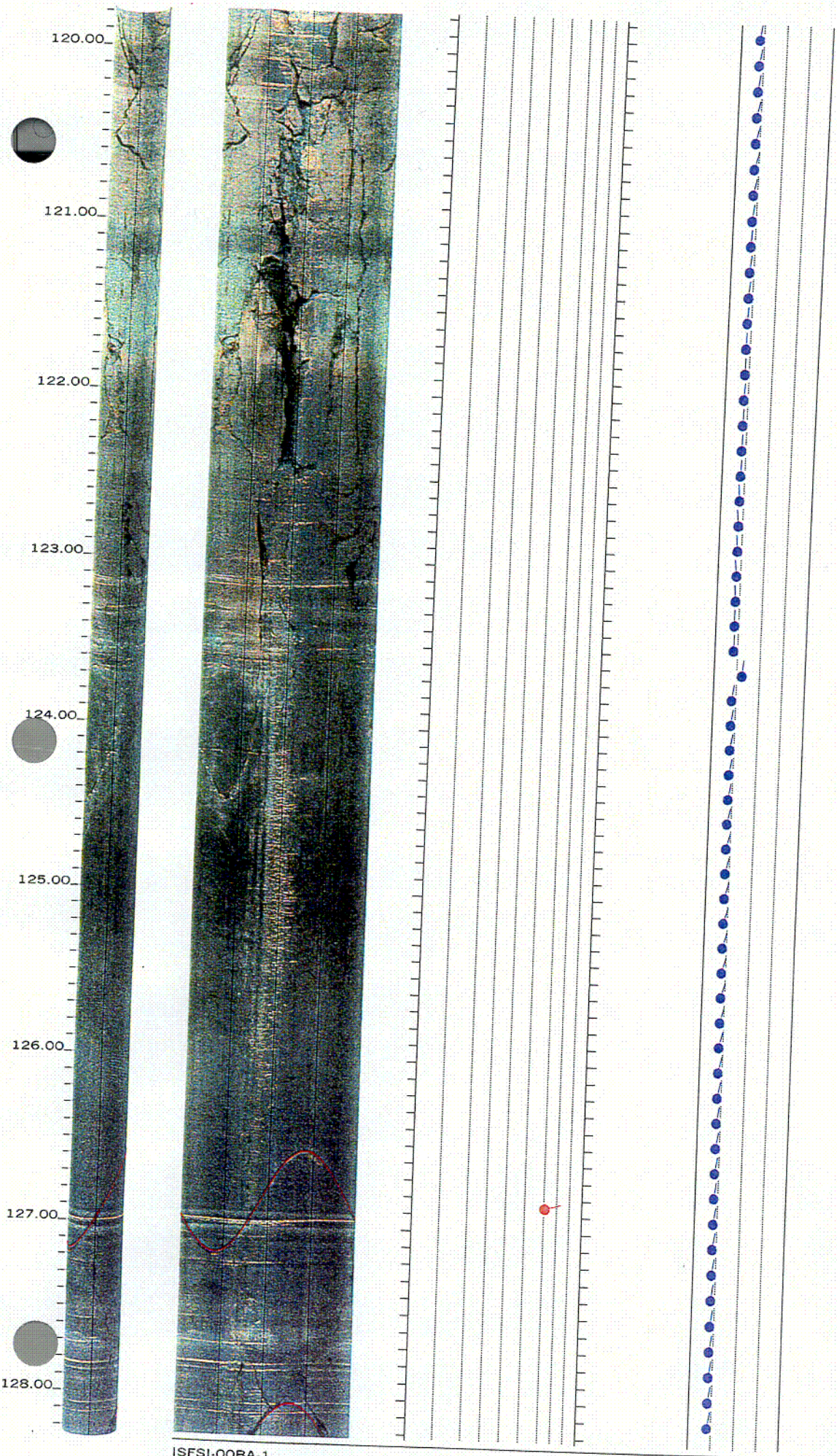
ISFSI-00BA-1


103.00
104.00
105.00
106.00
07.00
08.00
09.00
10.00
ISFSI-00BA-1
111.312 to 102.852ft



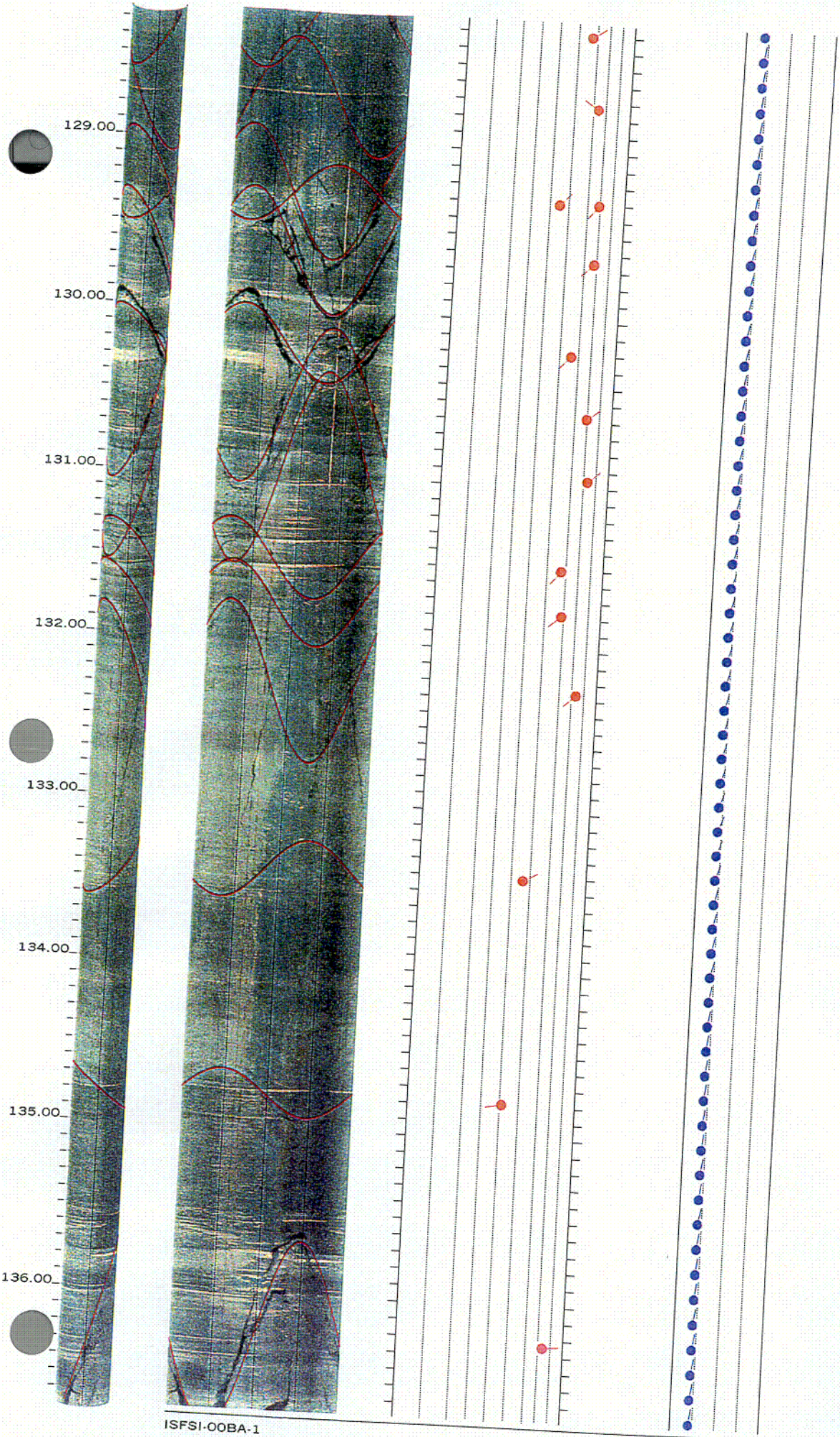
ISFSI-00BA-1

119.772 to 111.312ft



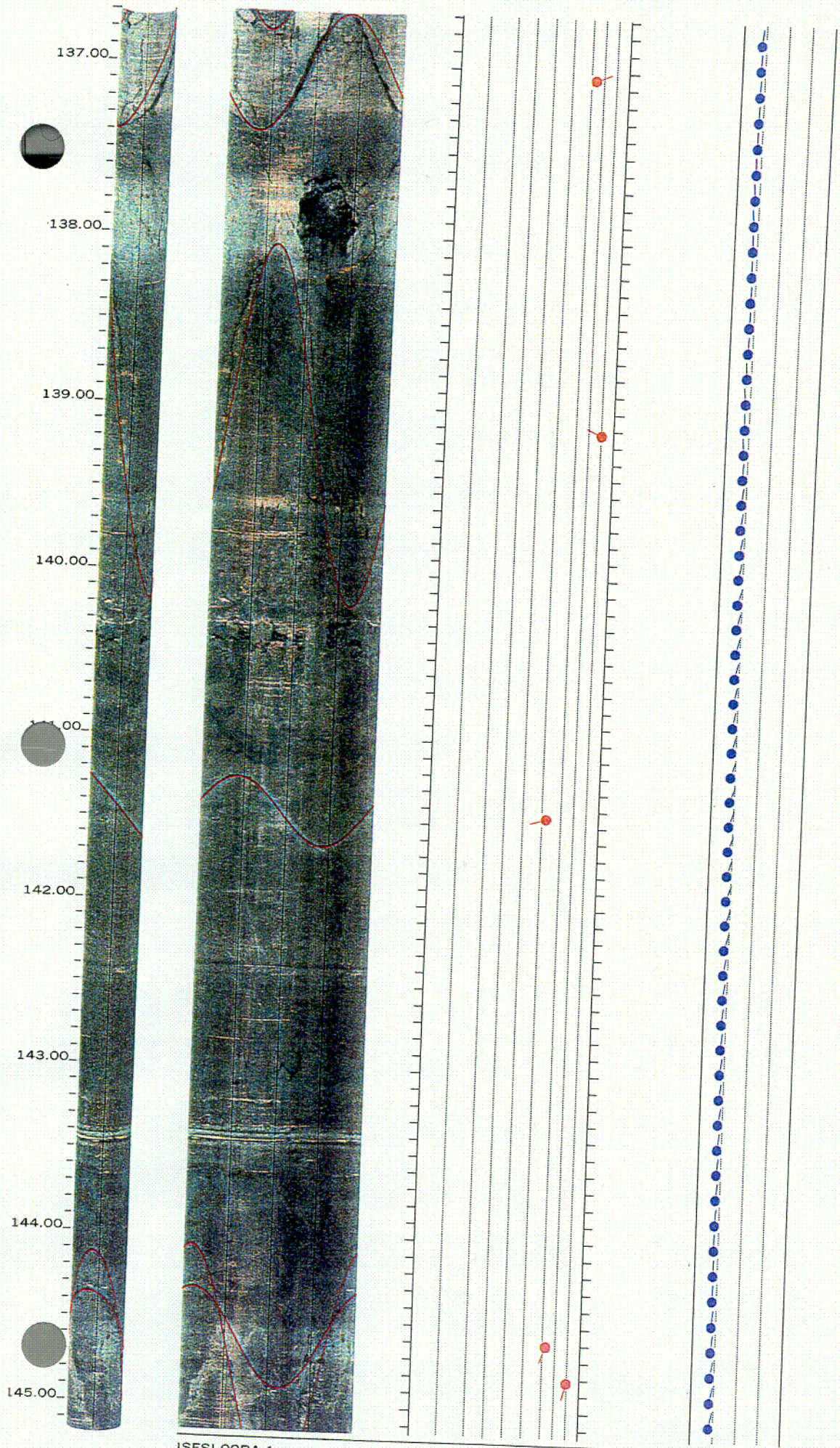
ISFSI-00BA-1

128.232 to 119.772ft



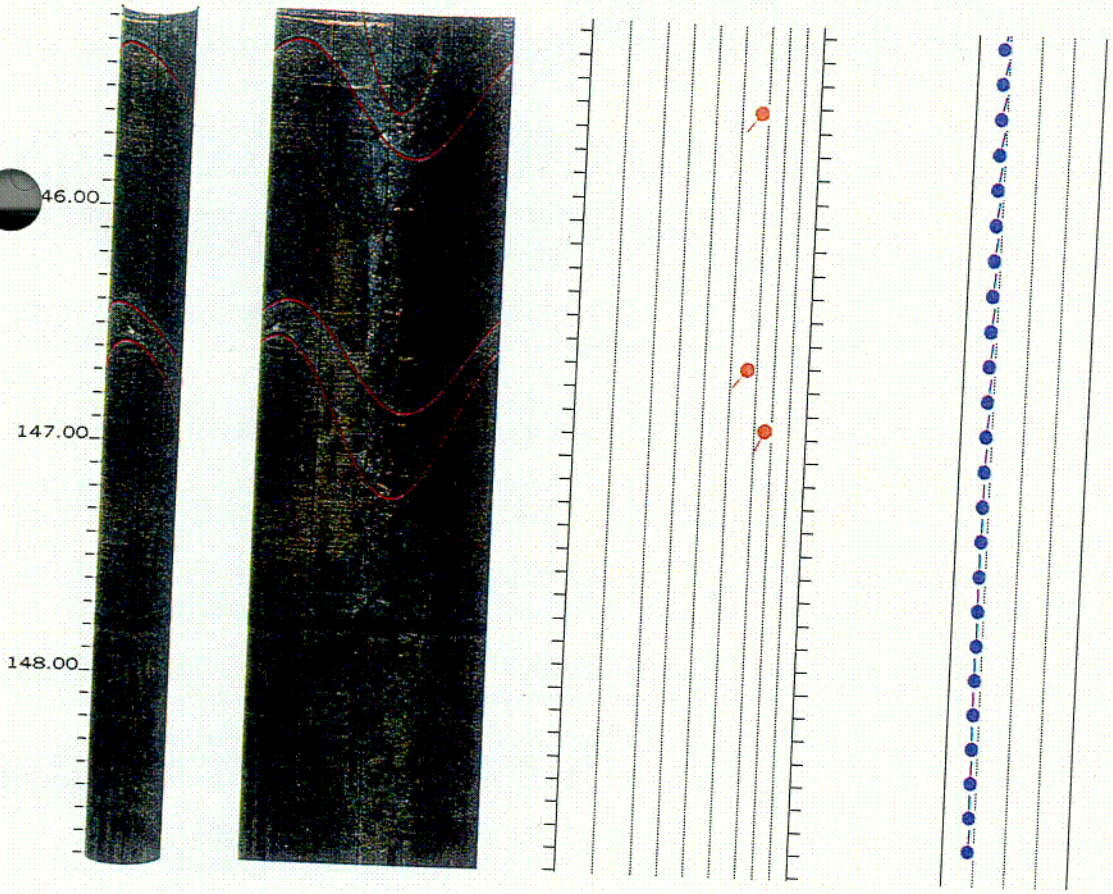
ISFSI-00BA-1

136.692 to 128.232ft



ISFSI-00BA-1

145.152 to 136.692ft


146.00
147.00
148.00

NORCAL GEOPHYSICAL CONSULTANTS, INC.

OPTV DATA PROCESSING
RGLDIP vsn 5.3
INTERPRETED OPTV DIPS LOG

13 Dec 2000

NORCAL GEOPHYSICAL

Borehole: ISFSI00BA-2

DIABLO CANYON POWER PLANT

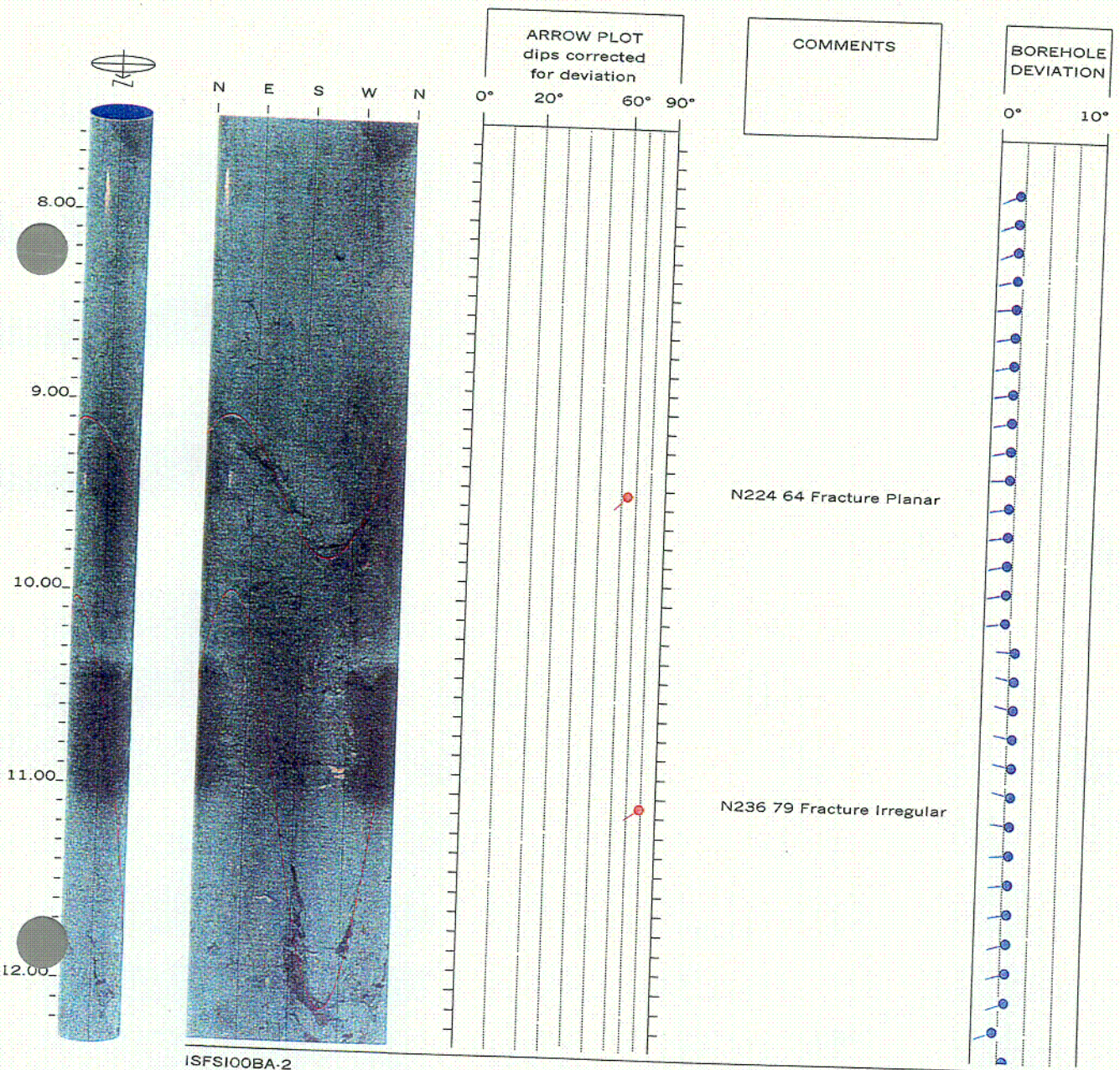
top of borehole.....
East:
North:
Alt:

North ref. is true
Depth units are feet
Vertical scale: 1/10
Horiz scale = vert scale

Zone from 54.801 to 7.500ft
Vertical = borehole-axis

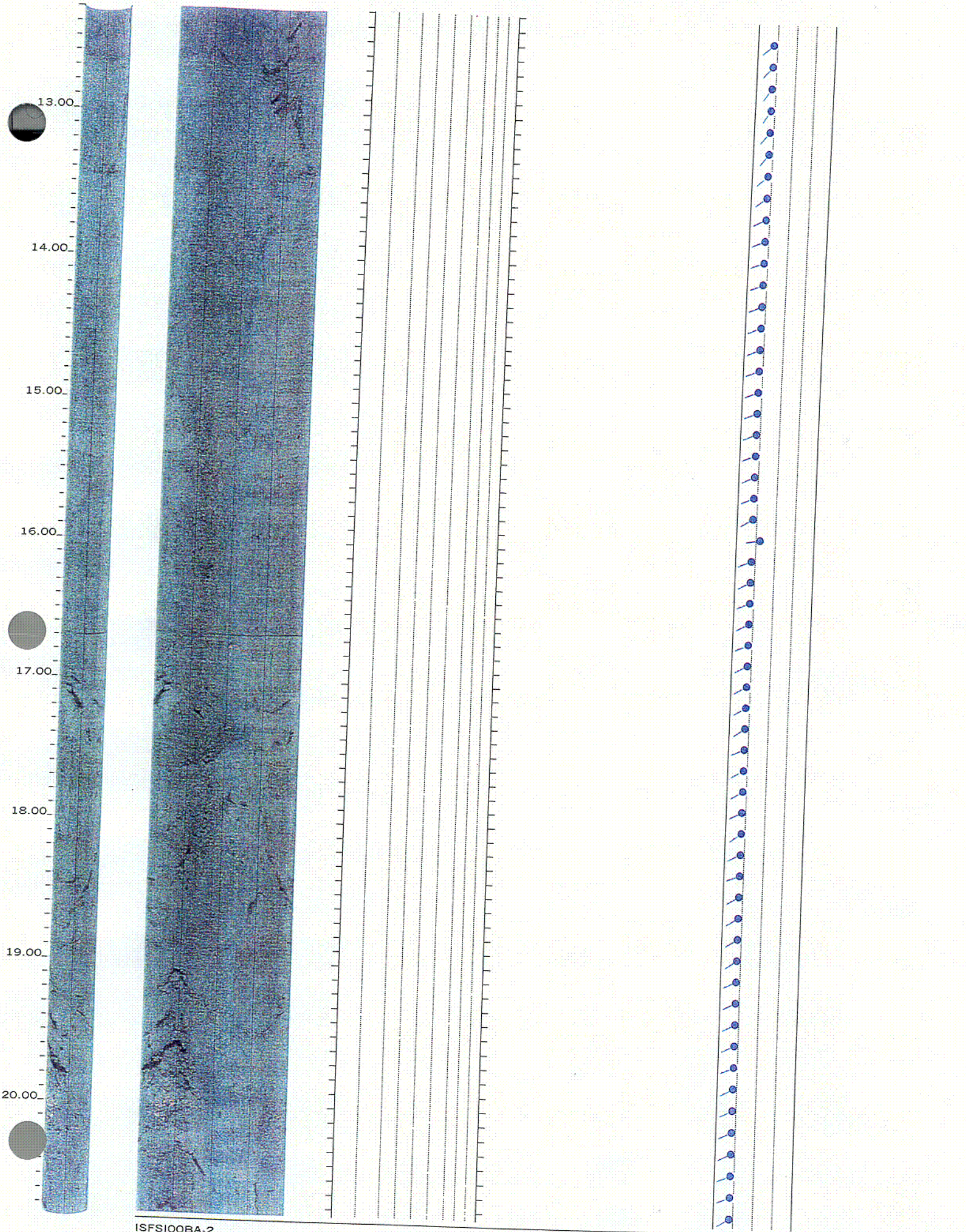
Borehole diam: 4.000inch

BEDDING
FRACTURE
Identified units



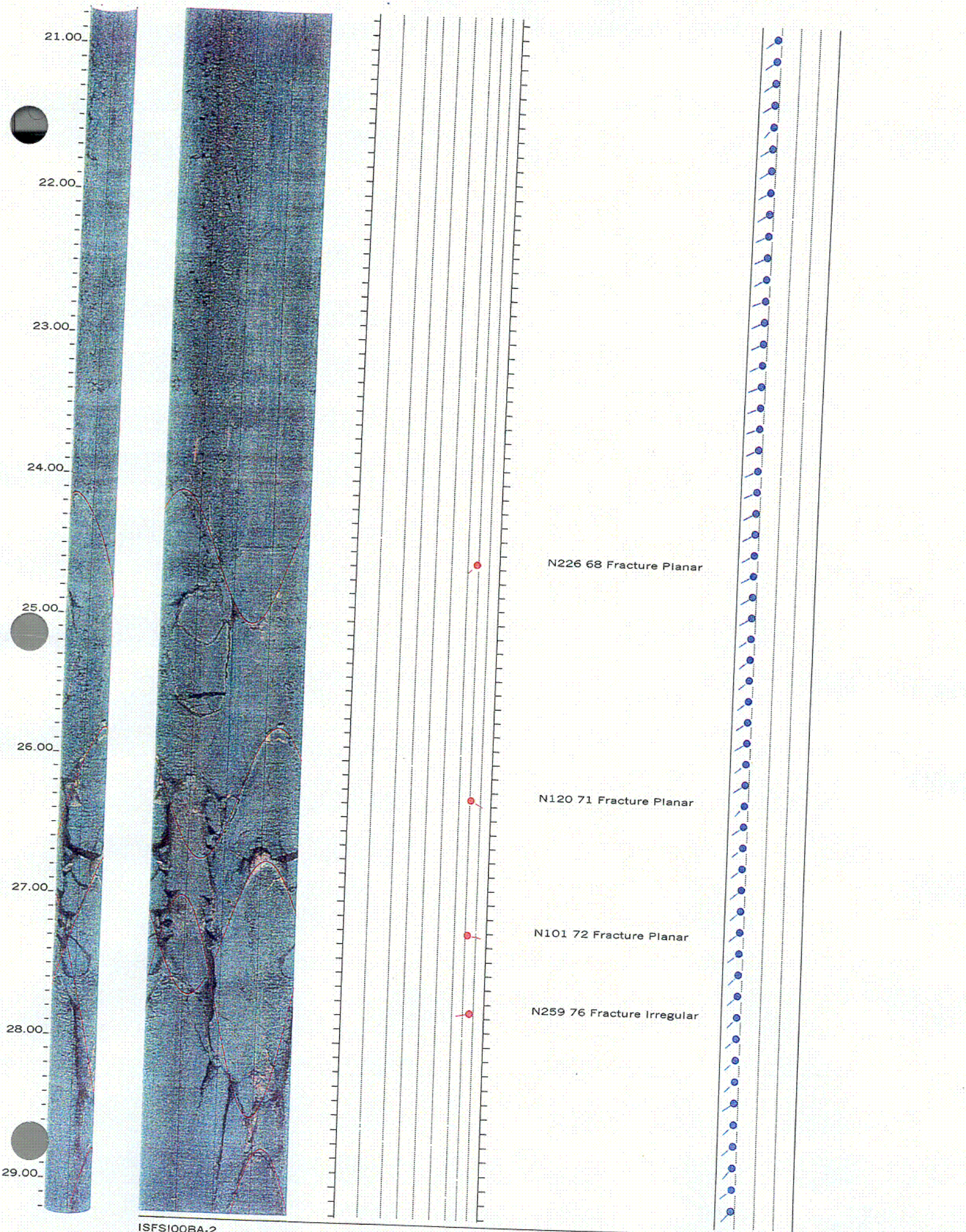
ISFSI00BA-2

12.294 to 7.500ft



ISFSI00BA-2

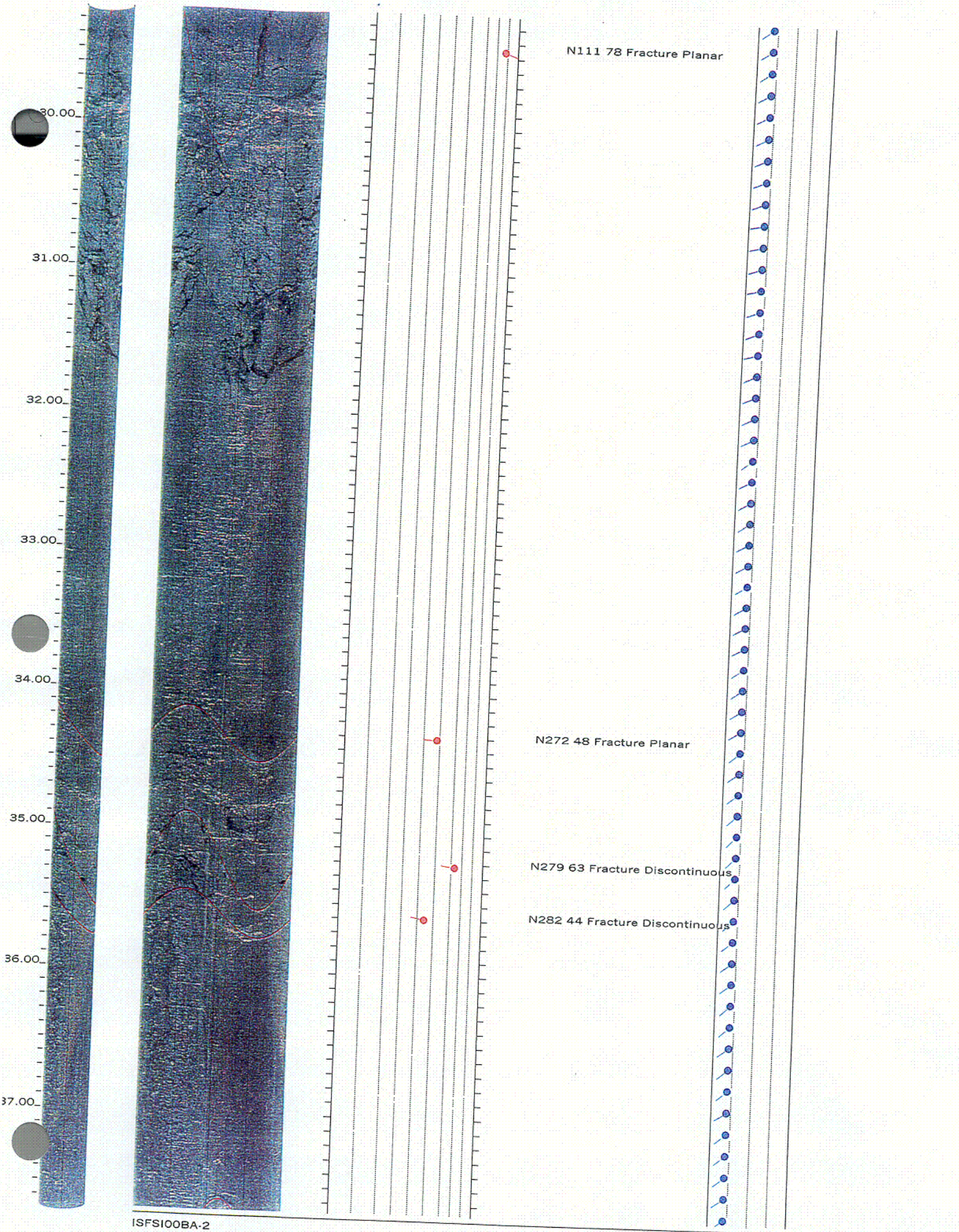
20.754 to 12.294ft



ISFSI00BA-2

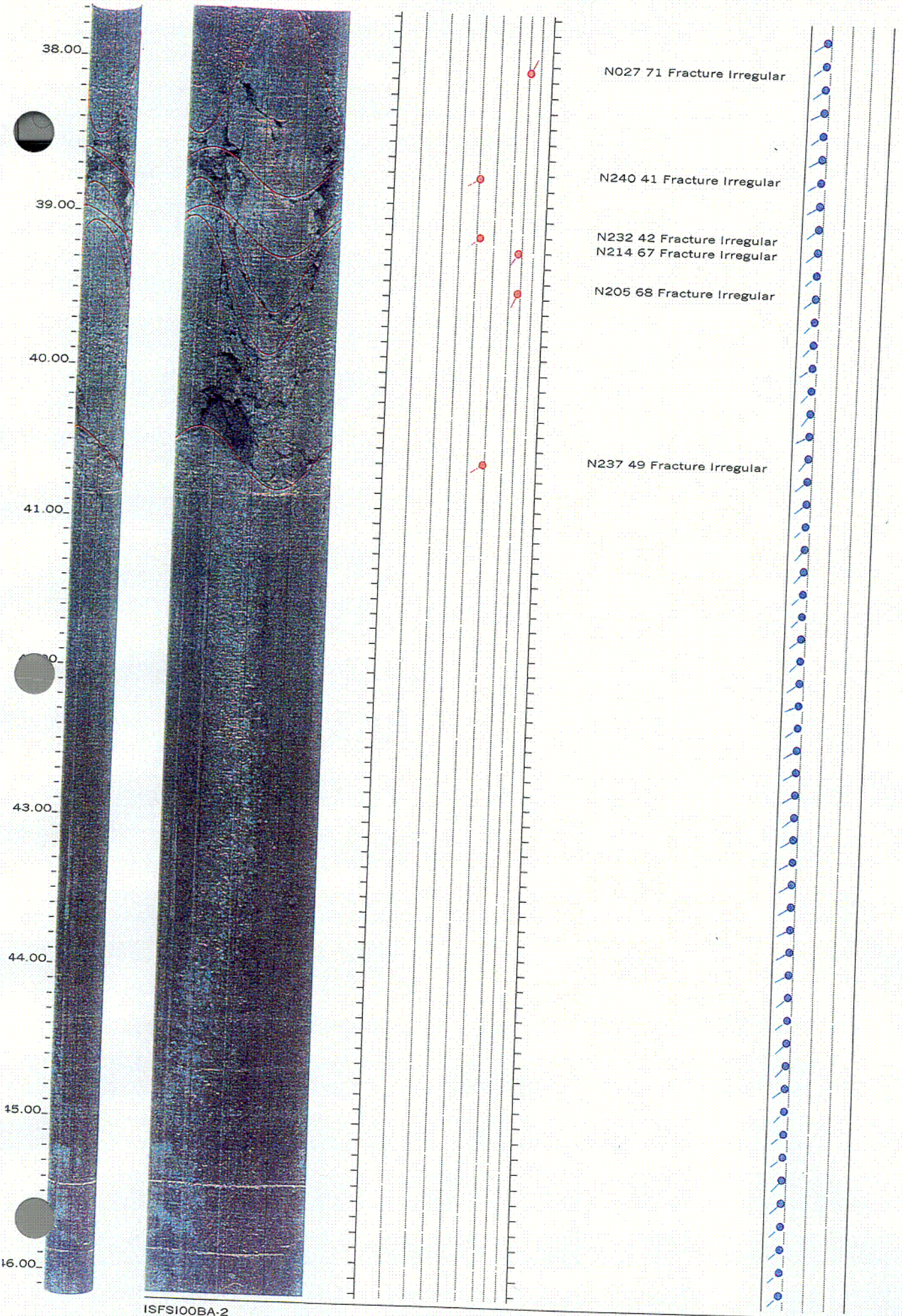
29.214 to 20.754ft

13 Dec 2000

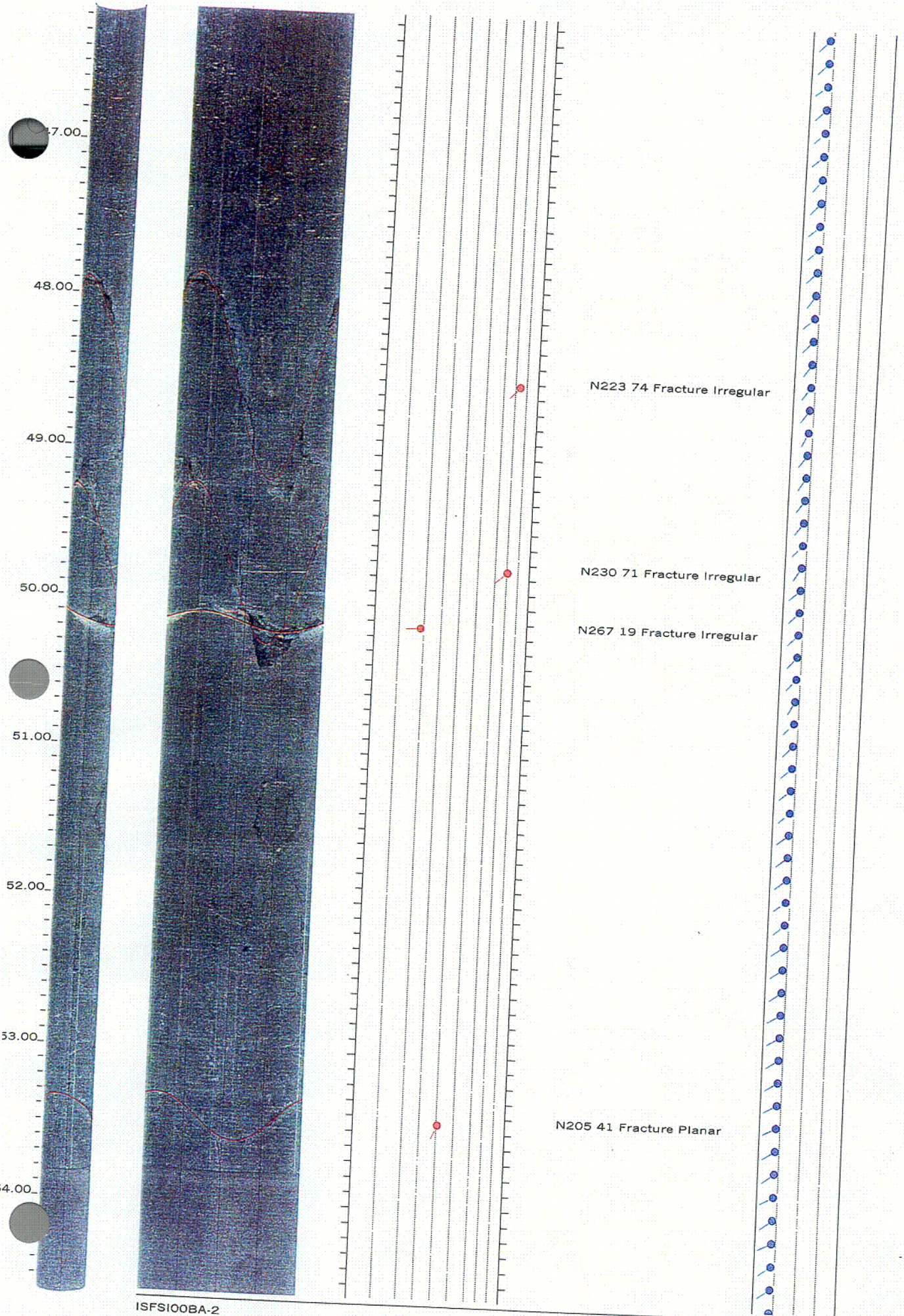


ISFSI00BA-2

37.674 to 29.214ft


38.00
39.00
40.00
41.00
43.00
44.00
45.00
46.00
N027 71 Fracture Irregular
N240 41 Fracture Irregular
N232 42 Fracture Irregular
N214 67 Fracture Irregular
N205 68 Fracture Irregular
N237 49 Fracture Irregular

ISFSI00BA-2



ISFSI00BA-2

54.594 to 46.134ft

Appendix D

INTERPRETED OPTV FRACTURE TABLES

RGLDIPv5.3 OPTV results

K = 0: BEDDING
= 2: FRACTURE

borehole ISFSI-00BA-1 (revised)
zone from 148.809 to 4.998 ft

	Depth	Azimuth	Dip	1-PO/100	n	Q	K	Upper Depth	Lower Depth	Well Diam	Well deviation Azimuth	Dev
1	147.478	47	40.0	0.000	0		2	147.478	147.478	0.000	359.00	2.00
2	146.872	206	65.8	0.000	11		2	146.871	146.872	0.000	5.87	2.00
3	146.613	219	56.2	0.000	6		2	146.613	146.613	0.000	7.66	2.00
4	146.002	198	71.8	0.000	0		2	146.001	146.003	0.000	8.00	2.00
5	145.523	218	57.3	0.000	9		2	145.523	145.523	0.000	12.00	2.00
6	144.822	195	79.5	0.000	12		2	144.821	144.823	0.000	10.80	2.00
7	144.611	201	62.2	0.000	6		2	144.611	144.611	0.000	5.99	2.00
8	141.456	255	52.3	0.000	9		2	141.456	141.456	0.000	18.04	2.00
9	139.666	41	70.7	0.000	0		2	139.666	139.666	0.000	7.08	2.00
10	139.130	295	80.3	0.000	13		2	139.129	139.131	0.000	357.55	2.00
11	137.049	68	63.5	0.000	0		2	137.049	137.049	0.000	3.00	2.00
12	136.372	67	63.6	0.000	0		2	136.372	136.372	0.000	9.93	2.00
13	136.243	62	72.4	0.000	0		2	136.242	136.244	0.000	10.00	2.00
14	134.796	260	40.8	0.000	0		2	134.796	134.796	0.000	7.56	2.00
15	133.425	61	46.0	0.000	0		2	133.425	133.425	0.000	15.90	2.00
16	132.268	229	73.0	0.000	13		2	132.267	132.269	0.000	14.29	2.00
17	131.788	230	58.5	0.000	7		2	131.787	131.788	0.000	15.50	2.00
18	131.512	219	57.2	0.000	12		2	131.512	131.513	0.000	16.68	2.00
19	130.960	50	72.7	0.000	11		2	130.959	130.960	0.000	9.04	2.00
20	130.582	54	69.2	0.000	20		2	130.582	130.583	0.000	8.53	2.00
21	130.211	224	55.8	0.000	18		2	130.210	130.211	0.000	11.99	2.00
22	129.655	229	67.5	0.000	13		2	129.654	129.655	0.000	13.00	2.00
23	129.307	221	68.7	0.000	12		2	129.306	129.307	0.000	9.96	2.00
24	128.736	303	63.5	0.000	11		2	128.735	128.736	0.000	8.16	2.00
25	128.311	56	57.0	0.000	13		2	128.311	128.311	0.000	9.33	2.00
26	126.856	73	60.4	0.000	14		2	126.855	126.856	0.000	8.62	2.00
27	121.888	46	84.9	0.000	0		2	121.886	121.890	0.000	2.01	2.00
28	119.599	27	32.9	0.000	0		2	119.599	119.599	0.000	10.26	3.00
29	117.687	265	69.6	0.000	11		2	117.687	117.688	0.000	9.50	2.00
30	117.523	66	72.6	0.000	12		2	117.522	117.523	0.000	9.40	2.00
31	117.451	80	77.0	0.000	0		2	117.450	117.452	0.000	8.93	2.00
32	116.811	247	57.9	0.000	9		2	116.811	116.811	0.000	5.00	2.00
33	116.509	221	45.7	0.000	0		2	116.509	116.509	0.000	2.65	2.00
34	110.720	84	63.7	0.000	12		2	110.720	110.721	0.000	3.05	2.00
35	108.077	245	41.7	0.000	7		2	108.077	108.077	0.000	6.14	2.00
36	106.846	253	17.9	0.000	0		0	106.846	106.846	0.000	13.55	2.00
37	106.357	248	17.1	0.000	0		0	106.357	106.357	0.000	13.03	2.00
38	105.331	257	12.2	0.000	0		0	105.331	105.331	0.000	24.51	2.87
39	104.920	208	3.0	0.000	0		0	104.920	104.920	0.000	27.84	3.00
40	104.677	344	29.6	0.000	0		2	104.677	104.677	0.000	14.20	3.00
41	104.074	90	41.8	0.000	0		2	104.074	104.074	0.000	357.25	3.00
42	103.266	234	43.6	0.000	6		2	103.266	103.266	0.000	24.20	3.00
43	102.022	226	65.6	0.000	0		2	102.022	102.022	0.000	357.40	2.00
44	95.853	245	82.4	0.000	13		2	95.852	95.854	0.000	6.76	2.00
45	95.511	203	78.1	0.000	12		2	95.510	95.512	0.000	4.34	2.00
46	95.032	237	16.3	0.000	0		0	95.032	95.032	0.000	5.00	2.00
47	94.825	225	16.6	0.000	0		0	94.825	94.825	0.000	6.83	2.00
48	94.048	190	77.5	0.000	18		2	94.047	94.048	0.000	12.00	2.00

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49	93.052	211	75.1	0.000	12	2	93.051	93.052	0.000	8.53	2.00
50	92.707	214	72.1	0.000	9	2	92.706	92.707	0.000	8.96	2.00
51	92.399	190	47.6	0.000	10	2	92.398	92.399	0.000	8.64	2.00
52	91.544	230	62.2	0.000	8	2	91.543	91.544	0.000	3.79	2.00
53	91.195	37	46.3	0.000	11	2	91.195	91.195	0.000	5.77	2.00
54	90.227	67	68.0	0.000	10	2	90.227	90.228	0.000	6.74	2.00
55	88.642	225	20.4	0.000	0	0	88.642	88.642	0.000	4.60	2.00
56	87.667	241	81.1	0.000	20	2	87.666	87.668	0.000	8.16	2.00
57	87.589	222	23.7	0.000	0	0	87.589	87.589	0.000	9.85	2.00
58	87.358	214	22.1	0.000	0	0	87.358	87.358	0.000	11.08	2.00
59	87.062	45	67.0	0.000	15	2	87.062	87.062	0.000	15.33	2.00
60	86.763	86	36.5	0.000	7	2	86.763	86.763	0.000	14.32	2.00
61	86.297	253	68.0	0.000	13	2	86.297	86.298	0.000	14.47	2.00
62	83.310	235	36.2	0.000	9	2	83.309	83.310	0.000	1.05	2.00
63	83.292	221	38.1	0.000	6	2	83.292	83.292	0.000	1.40	2.00
64	83.028	234	26.2	0.000	6	2	83.028	83.029	0.000	358.44	2.00
65	80.387	229	63.7	0.000	13	2	80.386	80.387	0.000	8.68	2.00
66	79.791	252	61.7	0.000	14	2	79.790	79.791	0.000	7.43	2.00
67	79.189	331	11.8	0.000	11	2	79.189	79.189	0.000	7.48	2.00
68	78.688	201	72.0	0.000	16	2	78.687	78.688	0.000	1.46	2.00
69	76.367	205	60.9	0.000	14	2	76.366	76.367	0.000	1.12	2.00
70	75.547	201	52.9	0.000	9	2	75.547	75.548	0.000	2.71	2.00
71	75.241	213	61.0	0.000	10	2	75.241	75.241	0.000	2.00	2.00
72	73.429	221	33.9	0.000	8	2	73.429	73.429	0.000	4.55	2.00
73	72.946	186	77.6	0.000	18	2	72.945	72.947	0.000	358.13	2.00
74	72.246	60	21.8	0.000	8	2	72.246	72.246	0.000	4.77	1.56
75	72.034	40	38.2	0.000	7	2	72.034	72.034	0.000	21.53	1.85
76	71.330	50	42.7	0.000	9	2	71.330	71.330	0.000	3.36	2.00
77	71.055	233	68.5	0.000	13	2	71.054	71.055	0.000	27.00	2.38
78	69.457	353	61.1	0.000	0	2	69.457	69.457	0.000	354.13	3.00
79	67.921	234	38.3	0.000	0	2	67.921	67.921	0.000	1.56	2.00
80	63.972	190	18.7	0.000	6	2	63.972	63.972	0.000	4.00	2.00
81	63.489	224	17.9	0.000	7	2	63.489	63.489	0.000	2.64	2.00
82	62.156	261	68.6	0.000	8	2	62.155	62.156	0.000	6.25	2.00
83	60.866	40	61.6	0.000	9	2	60.866	60.866	0.000	9.39	2.00
84	59.012	202	44.7	0.000	7	2	59.011	59.012	0.000	358.66	2.00
85	57.833	184	74.3	0.000	6	2	57.832	57.833	0.000	359.94	2.00
86	57.464	356	73.9	0.000	11	2	57.463	57.464	0.000	359.04	2.00
87	56.149	188	19.5	0.000	6	2	56.149	56.149	0.000	3.51	2.00
88	54.100	353	63.6	0.000	0	2	54.100	54.100	0.000	6.93	2.00
89	52.725	218	64.6	0.000	13	2	52.724	52.725	0.000	356.00	2.00
90	52.470	192	31.4	0.000	7	2	52.470	52.470	0.000	354.84	2.00
91	51.869	360	65.7	0.000	9	2	51.869	51.869	0.000	5.29	2.00
92	50.470	233	75.1	0.000	10	2	50.469	50.470	0.000	18.15	2.00
93	49.721	196	79.2	0.000	13	2	49.720	49.722	0.000	15.39	2.00
94	48.368	4	70.9	0.000	6	2	48.367	48.368	0.000	10.37	2.00
95	47.689	233	70.7	0.000	11	2	47.688	47.689	0.000	9.38	2.00
96	47.077	238	59.0	0.000	11	2	47.076	47.077	0.000	2.23	2.00
97	45.703	16	24.4	0.000	8	2	45.703	45.704	0.000	4.00	2.00
98	45.205	172	14.7	0.000	0	0	45.205	45.205	0.000	1.57	2.00
99	35.571	257	50.6	0.000	7	2	35.571	35.571	0.000	11.69	2.00
100	34.228	170	10.8	0.000	5	2	34.228	34.228	0.000	12.00	2.00
101	33.877	185	16.1	0.000	0	0	33.877	33.877	0.000	12.07	2.00
102	32.533	36	80.8	0.000	14	2	32.531	32.534	0.000	4.62	2.00
103	31.364	226	71.7	0.000	12	2	31.364	31.365	0.000	358.04	2.00
104	29.873	246	53.3	0.000	9	2	29.872	29.873	0.000	4.07	2.00
105	29.550	236	58.5	0.000	8	2	29.550	29.550	0.000	2.71	2.00
106	29.019	250	78.0	0.000	16	2	29.018	29.020	0.000	8.27	2.00
107	28.510	243	78.9	0.000	17	2	28.509	28.511	0.000	6.04	2.00
108	28.169	243	79.7	0.000	9	2	28.168	28.170	0.000	0.57	2.00

109	26.707	183	14.2	0.000	0	0	26.707	26.707	0.000	353.97	2.00
110	25.729	215	73.7	0.000	11	2	25.728	25.729	0.000	352.00	2.00
111	25.309	169	14.7	0.000	0	0	25.309	25.309	0.000	352.00	2.00
112	24.961	171	11.2	0.000	0	0	24.961	24.961	0.000	352.35	2.00
113	23.770	242	75.3	0.000	16	2	23.769	23.770	0.000	354.61	2.00
114	23.152	232	49.6	0.000	8	2	23.151	23.152	0.000	355.26	2.00
115	22.486	227	62.8	0.000	0	0	22.486	22.486	0.000	355.65	2.00
116	22.282	233	61.6	0.000	0	0	22.282	22.282	0.000	355.60	2.00
117	22.060	232	62.5	0.000	0	2	22.060	22.060	0.000	354.97	2.00
118	18.001	196	37.3	0.000	7	2	18.001	18.001	0.000	358.86	2.00
119	13.289	214	65.5	0.000	8	2	13.289	13.289	0.000	353.41	2.00
120	7.628	45	79.4	0.000	14	2	7.627	7.628	0.000	352.46	2.00
121	7.089	213	35.9	0.000	6	2	7.089	7.089	0.000	352.64	2.00

borehole ISFSI-00BA-1

DIPv5.3 OPTV results

K = 0: BEDDING
K = 2: FRACTURE

borehole ISFSI00BA-2
zone from 7.500 to 54.801 ft

	Depth	Azimuth	Dip	1-P0/100	n	Q	K	Upper Depth	Lower Depth	Well Diam	Well deviation Azimuth	Dev
1	53.453	205	40.5	0.000	11		2	53.310	53.595	0.333	241.42	2.00
2	50.147	267	18.6	0.000	8		2	50.091	50.203	0.333	222.82	2.00
3	49.755	230	70.6	0.000	11		2	49.281	50.229	0.333	224.48	2.00
4	48.521	223	74.1	0.000	20		2	47.934	49.107	0.333	215.45	2.00
5	40.597	237	48.9	0.000	8		2	40.407	40.788	0.333	227.22	2.00
6	39.467	205	67.7	0.000	11		2	39.061	39.872	0.333	229.47	2.00
7	39.208	214	66.8	0.000	10		2	38.819	39.596	0.333	229.61	2.00
8	39.113	232	41.9	0.000	10		2	38.964	39.262	0.333	231.17	2.00
9	38.731	240	40.5	0.000	7		2	38.589	38.873	0.333	239.43	2.00
10	38.045	27	71.2	0.000	9		2	37.556	38.535	0.333	233.28	2.00
11	35.604	282	44.2	0.000	7		2	35.442	35.766	0.333	228.76	2.00
12	35.228	279	63.1	0.000	10		2	34.900	35.557	0.333	225.94	2.00
13	34.321	272	48.1	0.000	8		2	34.136	34.507	0.333	230.12	2.00
14	29.459	111	77.8	0.000	10		2	28.691	30.228	0.333	237.52	2.00
15	27.770	259	76.2	0.000	15		2	27.094	28.447	0.333	224.08	2.00
16	27.219	101	72.0	0.000	11		2	26.707	27.731	0.333	230.62	2.00
17	26.263	120	71.0	0.000	9		2	25.778	26.747	0.333	223.81	2.00
18	24.572	226	68.5	0.000	8		2	24.150	24.994	0.333	240.90	2.00
19	11.056	236	78.9	0.000	14		2	10.207	11.906	0.333	278.68	3.00
20	9.438	224	64.0	0.000	7		2	9.096	9.780	0.333	260.00	2.00