**COMPANY:** **NORTHWEST NATURAL GAS**

**WELL:** **IW-24BH-23-65**

**FIELD:** **MIST**

**COUNTY:** **COLUMBIA** **STATE:** **OREGON**

COUNTY: COLUMBIA
Field: MIST
Location: 976.5' NORTH, 1256.3' EAST
Well: IW-24BH-23-65
Company: NORTHWEST NATURAL GAS

**Schlumberger**

## ULTRA SONIC IMAGING TOOL
## GR/ CCL
## SCALE: 5" = 100'

LOCATION

976.5' NORTH, 1256.3' EAST
FROM THE SW SECTION CORNOR

Elev.: K.B. 923 ft
G.L. 905 ft
D.F. 923 ft

Permanent Datum: GROUND LEVEL Elev.: 905 ft
Log Measured From: KB 18.0 ft above Perm. Datum
Drilling Measured From: KB

| API Serial No. | SECTION | TOWNSHIP | RANGE |
|---|---|---|---|
| 36-009-00351 | 23 | 6N | 5W |

| | Run 1 | Run 2 | Run |
|---|---|---|---|
| **PVT DATA** | | | |
| Oil Density | | | |
| Water Salinity | 1900 ppm | | |
| Gas Gravity | | | |
| Bo | | | |
| Bw | | | |
| 1/Bg | | | |
| Bubble Point Pressure | | | |
| Bubble Point Temperature | | | |
| Solution GOR | | | |
| Maximum Deviation | | | |
| **CEMENTING DATA** | | | |
| Primary/Squeeze | Primary | | |
| Casing String No | 2 | | |
| Lead Cement Type | MICROBOND | | |
| Volume | 440 ft3 | | |
| Density | 13.7 lbm/gal | | |
| Water Loss | | | |
| Additives | | | |
| Tail Cement Type | | | |
| Volume | | | |
| Density | | | |
| Water Loss | | | |
| Additives | | | |
| Expected Cement Top | 0 ft | | |

| | | | | |
|---|---|---|---|---|
| Logging Date | 17-JUN-2000 | | | |
| Run Number | 1 | | | |
| Depth Driller | 1890 ft | | | |
| Schlumberger Depth | 1890 ft | | | |
| Bottom Log Interval | 1835 ft | | | |
| Top Log Interval | 100 ft | | | |
| Casing Fluid Type | DMA | | | |
| Salinity | 1900 ppm | | | |
| Density | 8.5 lbm/gal | | | |
| Fluid Level | 0 ft | | | |
| BIT/CASING/TUBING STRING | | | | |
| Bit Size | 12.250 in | | | |
| From | 429 ft | | | |
| To | 1890 ft | | | |
| Casing/Tubing Size | 8.625 in | | | |
| Weight | 32 lbm/ft | | | |
| Grade | J-55 | | | |
| From | 0 ft | | | |
| To | 1835 ft | | | |
| Maximum Recorded Temperatures | 68 degF | 68 | 68 | |
| Logger On Bottom / Time | 17-JUN-2000 | | 10:00 | |
| Unit Number / Location | 3152 | SACRAMENTO | | |
| Recorded By | M.KHAN | | | |
| Witnessed By | CLAYTON ROTH | | | |

| | | |
|---|---|---|
| Logging Date | | |
| Run Number | | |
| Depth Driller | | |
| Schlumberger Depth | | |
| Bottom Log Interval | | |
| Top Log Interval | | |
| Casing Fluid Type | | |
| Salinity | | |
| Density | | |
| Fluid Level | | |
| BIT/CASING/TUBING STRING | | |
| Bit Size | | |
| From | | |
| To | | |
| Casing/Tubing Size | | |
| Weight | | |
| Grade | | |
| From | | |
| To | | |
| Maximum Recorded Temperatures | | |
| Logger On Bottom / Time | | |
| Unit Number / Location | | |
| Recorded By | | |
| Witnessed By | | |

3

Run 4

DISCLAIMER
THE USE OF AND RELIANCE UPON THIS RECORDED-DATA BY THE HEREIN NAMED COMPANY (AND ANY OF ITS AFFILIATES, PARTNERS, REPRESENTATIVES, AGENTS, CONSULTANTS AND EMPLOYEES) IS SUBJECT TO THE TERMS AND CONDITIONS AGREED UPON BETWEEN SCHLUMBERGER AND THE COMPANY, INCLUDING: (a) RESTRICTIONS ON USE OF THE RECORDED-DATA; (b) DISCLAIMERS AND WAIVERS OF WARRANTIES AND REPRESENTATIONS REGARDING COMPANY'S USE OF AND RELIANCE UPON THE RECORDED-DATA; AND (c) CUSTOMER'S FULL AND SOLE RESPONSIBILITY FOR ANY INFERENCE DRAWN OR DECISION MADE IN CONNECTION WITH THE USE OF THIS RECORDED-DATA.

| | |
|---|---|
| OTHER SERVICES1 | OTHER SERVICES2 |
| OS1: NONE | OS1: |
| OS2: | OS2: |
| OS3: | OS3: |
| OS4: | OS4: |
| OS5: | OS5: |
| REMARKS: RUN NUMBER 1 | REMARKS: RUN NUMBER 2 |

MAXIMUM HOLE DEVIATION: 73 DEG

CEMENT DATA:

STAGE 1; 440 SACKS, HALLIBURTON TYPE III MICROBOND CEMENT , 13 LBS/GAL

STAGE2; 210 SACKS OF TYPE III MICROBOND CEMENT 14.8 LBS/GAL

| RUN 1 | | RUN 2 | |
|---|---|---|---|
| SERVICE ORDER #: | | SERVICE ORDER # | |
| PROGRAM VERSION | 9C0-303 | PROGRAM VERSION | |
| FLUID LEVEL: | 0 ft | FLUID LEVEL: | |

| LOGGED INTERVAL | START | STOP | LOGGED INTERVAL | START | STOP |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

# EQUIPMENT DESCRIPTION

| RUN 1 | RUN 2 |
|---|---|

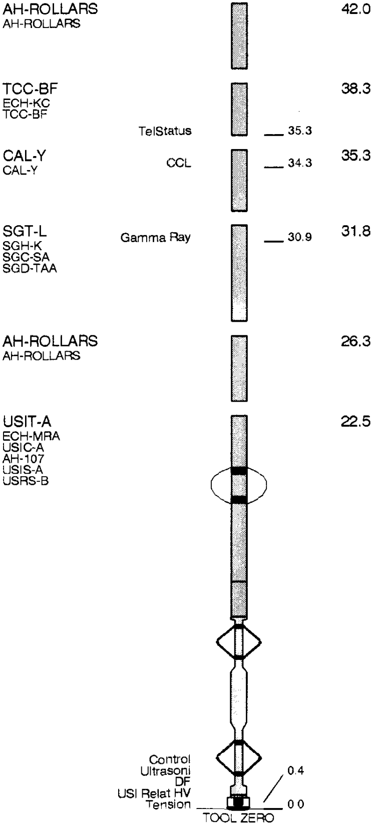
## SURFACE EQUIPMENT

GSR-U/Y
WITM (CTS)-A

## DOWNHOLE EQUIPMENT

LEH-QT
LEH-QT

45.0



MAXIMUM STRING DIAMETER 7.50 IN
MEASUREMENTS RELATIVE TO TOOL ZERO
ALL LENGTHS IN FEET

## Input DLIS Files

| | | | | | |
|---|---|---|---|---|---|
| DEFAULT | USIT .045 | FN:38 PRODUCER | 15-Jun-2000 17:30 | 1835.0 FT | 101.6 FT |

## OP System Version: 9C1-303

**MCM**

| | | | |
|---|---|---|---|
| USIT-A | OP91-KP1a | SGT-L | OP91-KP1a |
| CAL-Y | 9C1-303 | TCC-BF | OP91-KP1a |

Gas or Dry MicroA

Micro-debonding

Liquid

Bonded

Image rotation (UCAZ) (DEG)

0 360

-500.0000
-6.0000
-5.6000
-5.2000
-4.8000
-4.4000
-4.0000
-3.6000
-3.2000
-2.8000
-2.4000
-2.0000
-1.6000
-1.2000
-0.8000
-0.4000
0.5000

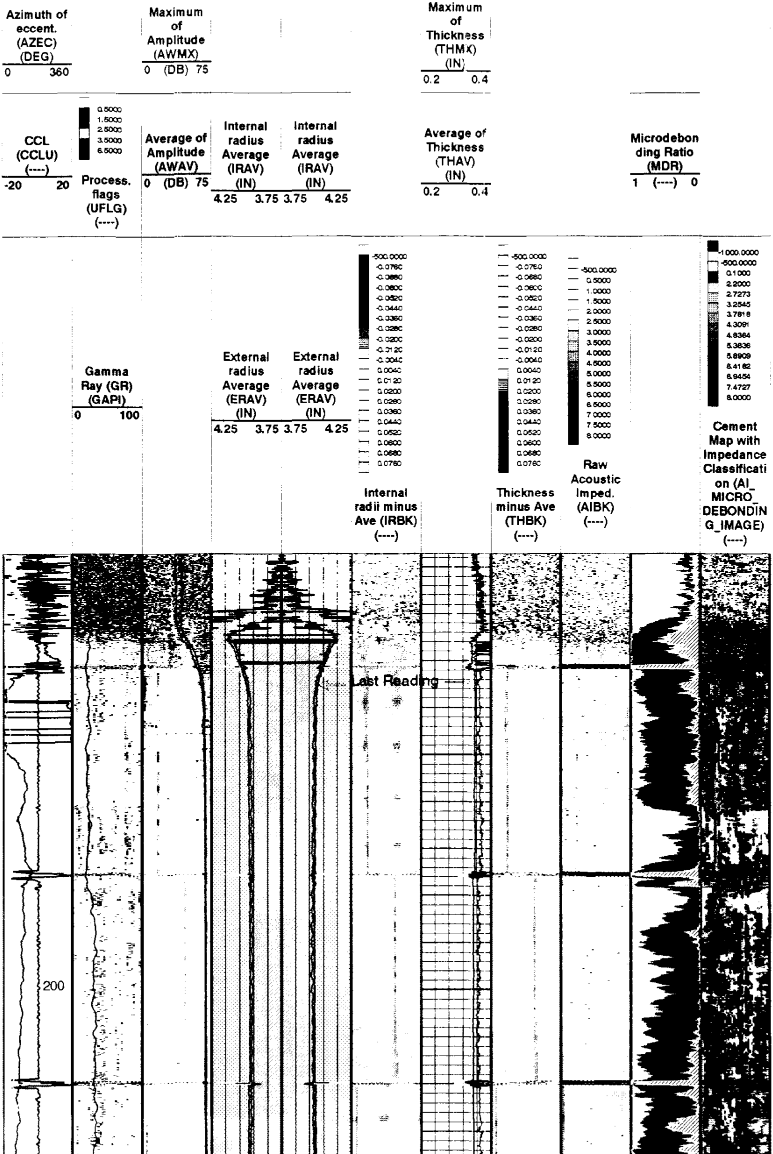
Amplitude of echo minus Max (AWBK) (----)

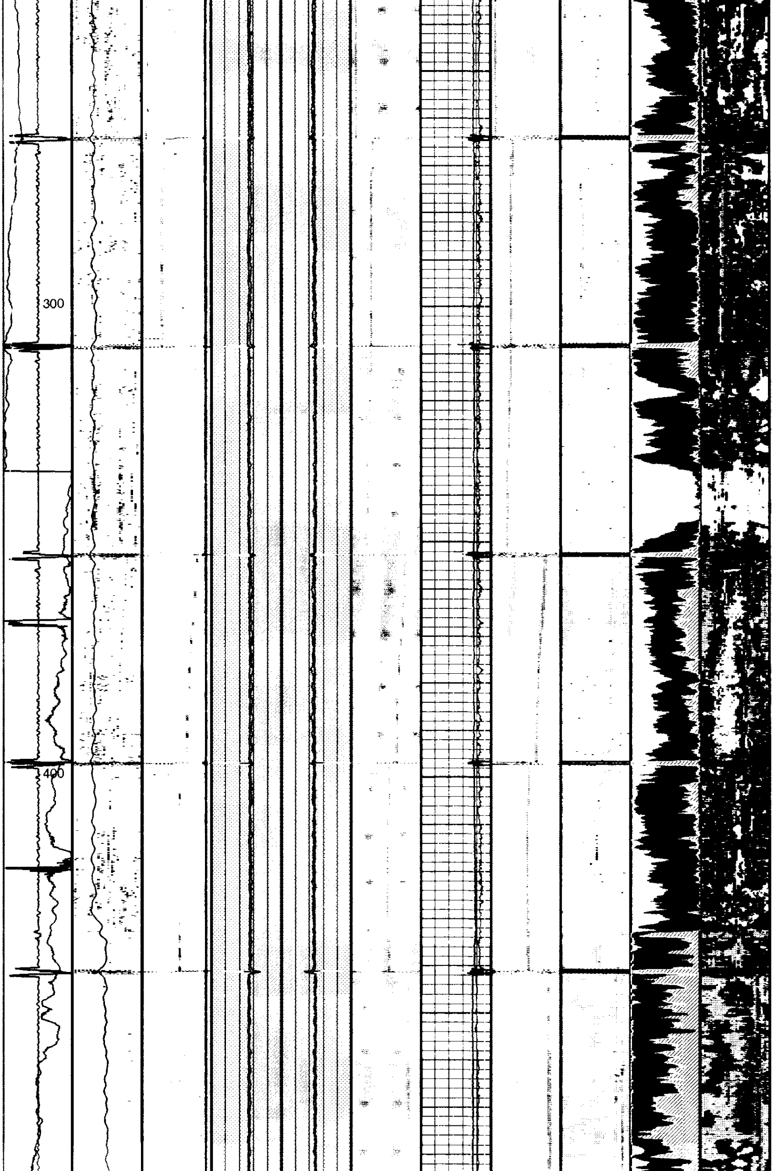
Min of Internal radius (IRMN) (IN)

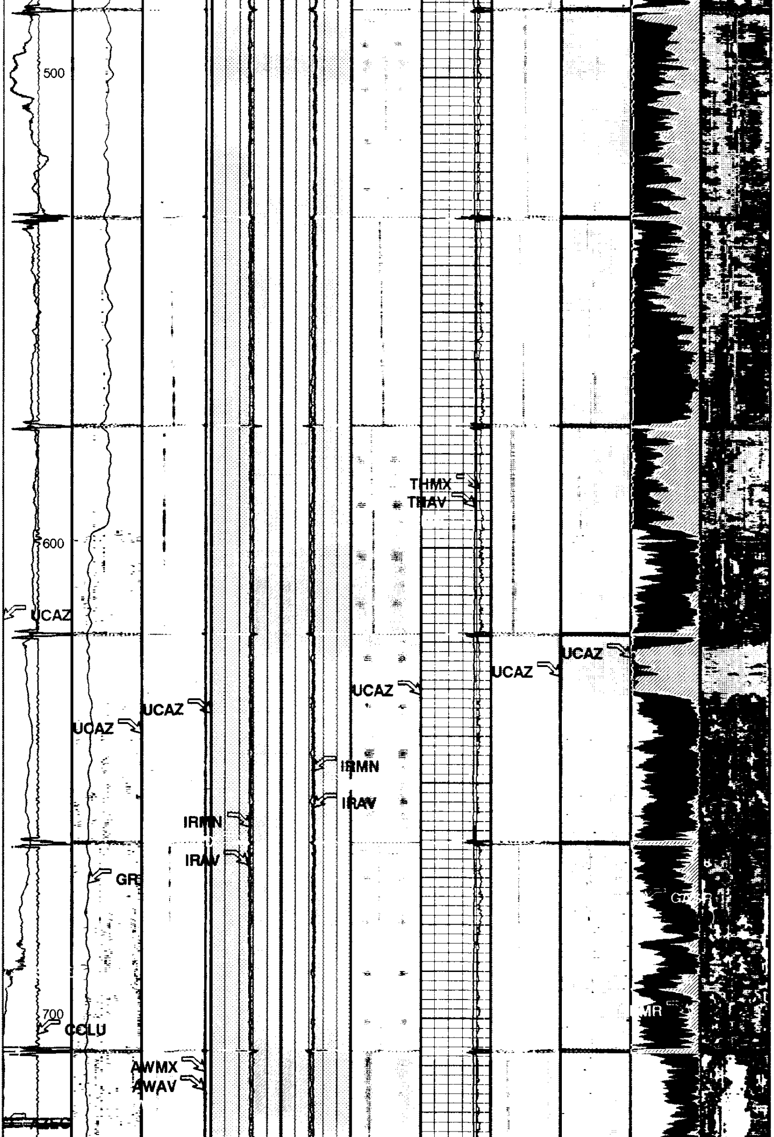
4.25 3.75

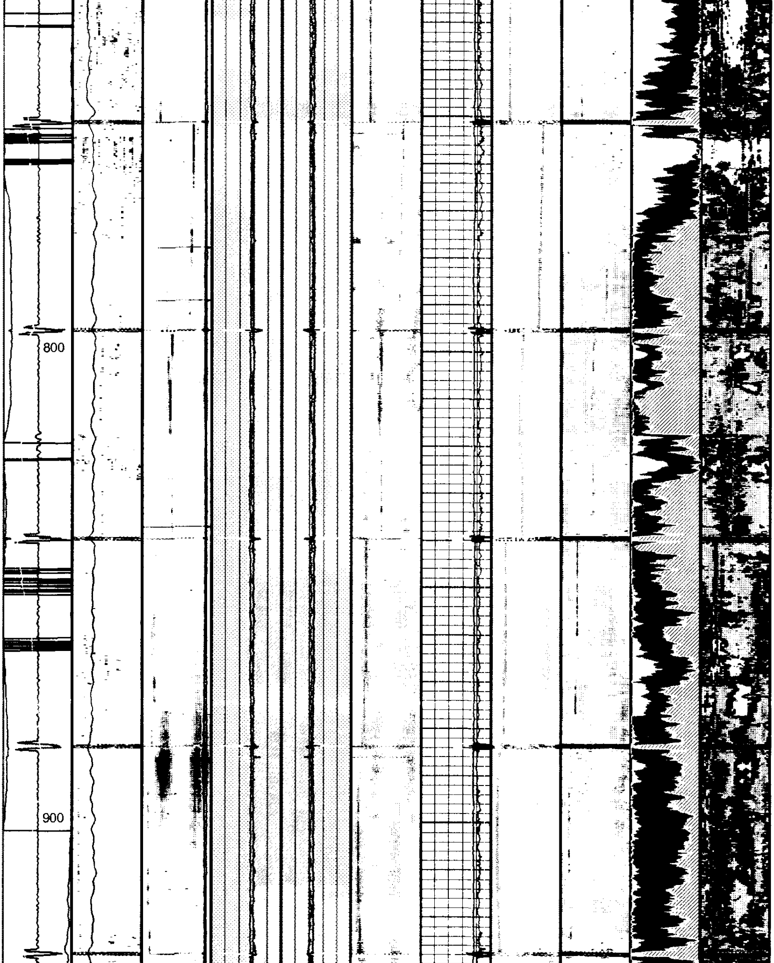
Min of Internal radius (IRMN) (IN)

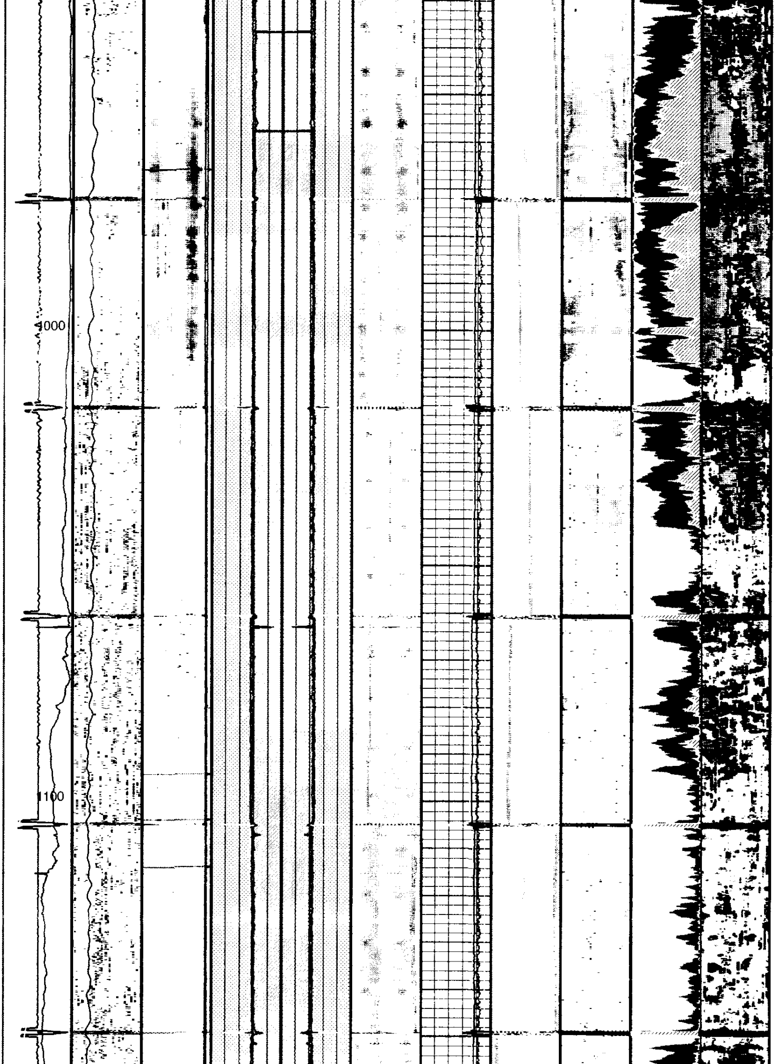
3.75 4.25

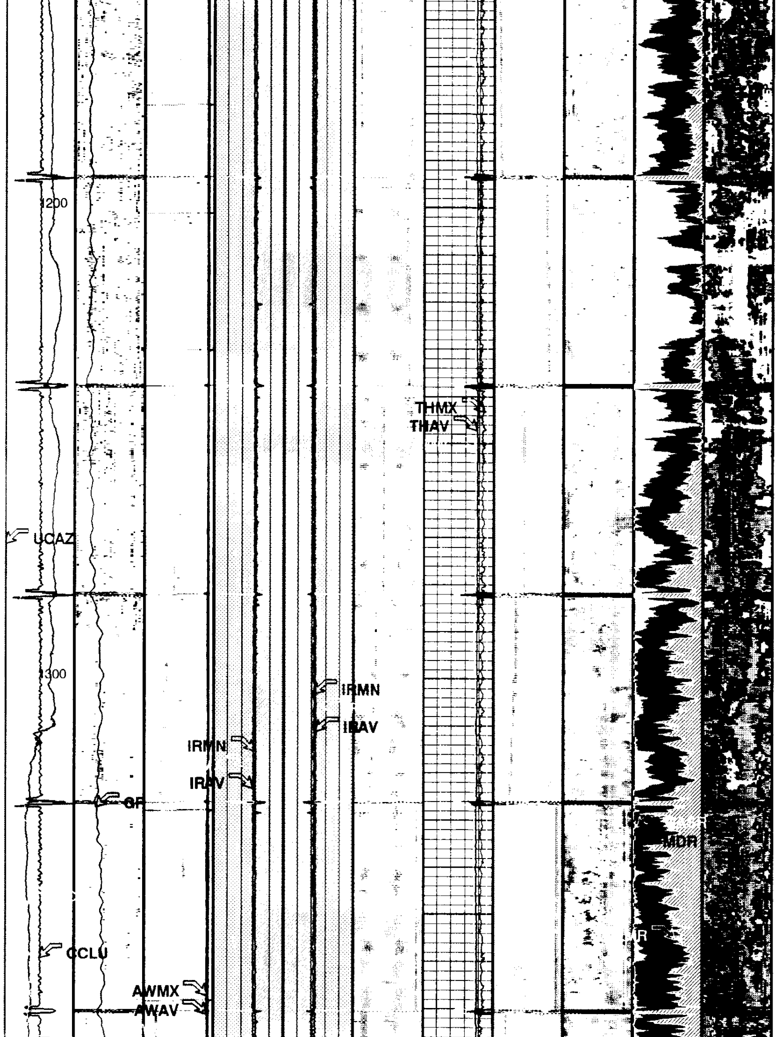


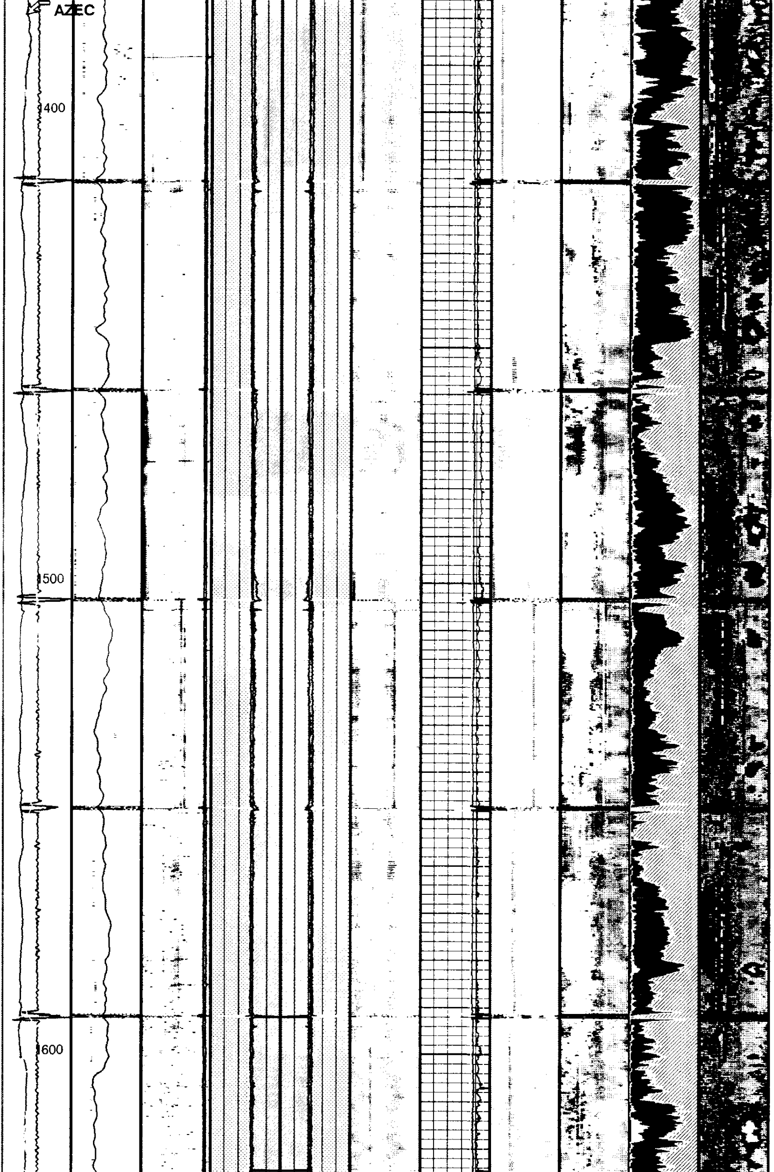


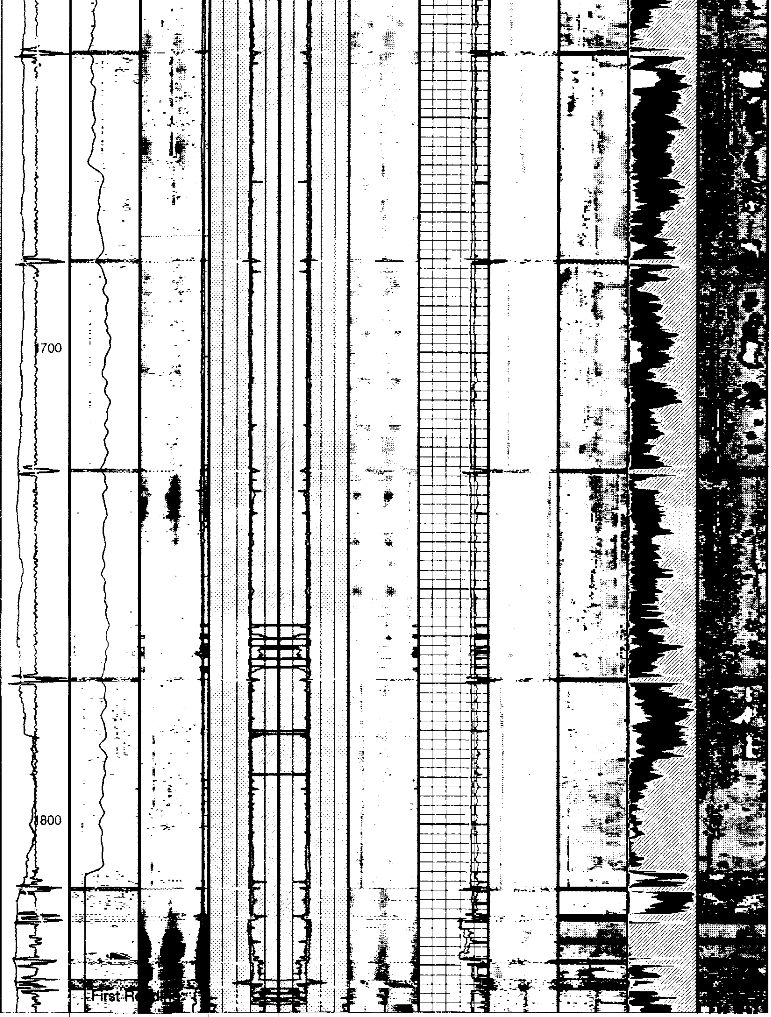












**Gamma Ray (GR) (GAPI)**
0 100

**External radius Average (ERAV) (IN)**
4.25 3.75

**External radius Average (ERAV) (IN)**
3.75 4.25

-500.0000
-0.0760
-0.0680
-0.0600
-0.0520
-0.0440
-0.0360
-0.0280
-0.0200
-0.0120
-0.0040
0.0040
0.0120
0.0200
0.0280
0.0360
0.0440
0.0520
0.0600
0.0680
0.0760

**Internal radii minus Ave (IRBK) (----)**

-500.0000
-0.0760
-0.0680
-0.0600
-0.0520
-0.0440
-0.0360
-0.0280
-0.0200
-0.0120
-0.0040
0.0040
0.0120
0.0200
0.0280
0.0360
0.0440
0.0520
0.0600
0.0680
0.0760

**Thickness minus Ave (THBK) (----)**

-500.0000
0.5000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000
5.5000
6.0000
6.5000
7.0000
7.5000
8.0000

**Raw Acoustic Imped. (AIBK) (----)**

-1000.0000
-500.0000
0.1000
2.2000
2.7273
3.2545
3.7818
4.3091
4.8364
5.3636
5.8909
6.4182
6.9454
7.4727
8.0000

**Cement Map with Impedance Classification (AI_MICRO_DEBONDING_IMAGE) (----)**

**CCL (CCLU) (----)**
-20 20

0.5000
1.5000
2.5000
3.5000
6.5000

**Process. flags (UFLG) (----)**

**Average of Amplitude (AWAV)**
0 (DB) 75

**Internal radius Average (IRAV) (IN)**
4.25 3.75

**Internal radius Average (IRAV) (IN)**
3.75 4.25

**Average of Thickness (THAV) (IN)**
0.2 0.4

**Microdebonding Ratio (MDR)**
1 (----) 0

**Azimuth of eccent. (AZEC) (DEG)**
0 360

**Maximum of Amplitude (AWMX)**
0 (DB) 75

**Maximum of Thickness (THMX) (IN)**
0.2 0.4

**Image rotation (UCAZ) (DEG)**
0 360

-500.0000
-6.0000
-5.6000
-5.2000
-4.8000
-4.4000
-4.0000
-3.6000
-3.2000
-2.8000
-2.4000
-2.0000
-1.6000
-1.2000
-0.8000
-0.4000
0.5000

**Amplitude of echo minus Max (AWBK) (----)**

**Min of Internal radius (IRMN) (IN)**
4.25 3.75

**Min of Internal radius (IRMN) (IN)**
3.75 4.25

**Bonded**

**Liquid**

**Micro-debonding**

**Gas or Dry MicroA**

Format: USI_Composite    Vertical Scale: 5" per 100'    Graphics File Created: 15-Jun-2000 20:00

## OP System Version: 9C1-303

MCM

| | | | |
|---|---|---|---|
| USIT-A | OP91-KP1a | SGT-L | OP91-KP1a |
| CAL-Y | 9C1-303 | TCC-BF | OP91-KP1a |

## COMPUTATION FLAGS LABELLING

| | | |
|---|---|---|
| (0 - 1.5) | UFLG 1 | UTIM error |
| (1.5 - 2.5) | UFLG 2 | Pulse origin not detected |
| (2.5 - 3.5) | UFLG 3 | WINLEN error |
| (3.5 - 6.5) | UFLG 4 UFLG 5 UFLG 6 | CASING THICKNESS error |
| (6.5 - 10) | UFLG 7 UFLG 8 UFLG 9 | LOOP PROCESSING error |

USI : LOW Frequency Compression Mode Used For Logging.

Recommended casing thickness range for optimum cement impedance measurement : 0.27 to 0.6 IN.

## Parameters

| DLIS Name | Description | Value | |
|---|---|---|---|
| AGMN | Minimum gain of cartridge | -4 | DB |
| AGMX | Maximum gain of cartridge | 20 | DB |
| BERJ | Bad Echo Rejection | ON | |
| CDIA | Casing outer diameter | 8.635 | IN |
| CSDE | Casing Density | 486.94 | LBCF |
| CSID | Casing internal diameter | 7.9361 | IN |
| CWEI | Casing Weight | 32.00 | LB/F |
| DFVL | Default fluid velocity | 196 | US/F |
| DO | Depth Offset for Logical Unit 1 | 5.0 | FT |
| DOT | Diameter of Transducer sensor | 2.874 | IN |
| EMXV | Value for EMEX voltage | 35 | V |
| FDII | FPM Data Interpolation Interval | 0 | FT |
| IMAR | Image Rotation | OFF | |
| MW | Mud weight | 8.5 | LB/G |
| PP | Playback Processing | NORMAL | |
| RCOD | Reference calibrator Outer diameter | 7 | IN |
| RCSO | Reference calibrator standoff | 1.1811 | IN |
| RCTH | Reference calibrator thickness | 0.2952 | IN |
| SDNV | Acoustic Impedance Std Deviation Vertical Range | 5 | |
| SDTHOR | Acoustic Impedance Std Deviation Horizontal Threshold | 0.5 | |
| SDTVER | Acoustic Impedance Std Deviation Vertical Threshold | 0.3 | |
| TCUB | T^3 Processing level | Vax_Loop | |
| THDH | Maximum search thickness (percentage of nominal) | 140 | |
| THDL | Minimum search thickness (percentage of nominal) | 80 | |
| THNO | Nominal thickness of casing | 0.349449 | IN |
| UMAO | USIT Measurement Angular Offset | -10 | DEG |
| USTO | Ultrasonic Time Offset | -2 | US |
| USUB | USIT Sub identifier | Sub_7_inch | |
| UWKM | Current working mode | 10DEG_1_5IN_LF | |
| VCAS | Velocity of sound in casing | 51.4 | US/F |
| WLEN | T^3 processing length | 20.9552 | US |
| ZCAS | Acoustical Impedance of casing | 46.25 | MRAY |
| ZINI | Initial z value | -1 | MRAY |
| ZMUD | Acoustical Impedance of mud | 1.48 | MRAY |
| ZTCM | Acoustical Impedance threshold for Cement | 2.2 | MRAY |
| ZTGS | Acoustical Impedance threshold for Gas | 0.1 | MRAY |

## Input DLIS Files

| | | | | | |
|---|---|---|---|---|---|
| DEFAULT | USIT .045 | FN:38 PRODUCER | 15-Jun-2000 17:30 | 1835.0 FT | 101.6 FT |

Schlumberger

# REPEAT SECTION

MAXIS 500 Field Log

## Input DLIS Files

| | | | | | |
|---|---|---|---|---|---|
| DEFAULT | USIT .044 | FN:37 PRODUCER | 15-Jun-2000 17:14 | 1829.5 FT | 1558.0 FT |

## OP System Version: 9C1-303

MCM

| | | | |
|---|---|---|---|
| USIT-A | OP91-KP1a | SGT-L | OP91-KP1a |
| CAL-Y | 9C1-303 | TCC-BF | OP91-KP1a |

Gas or Dry MicroA

Micro-debonding

Liquid

Bonded

-500.0000
-6.0000
-5.6000
-5.2000
-4.8000
-4.4000
-4.0000
-3.6000
-3.2000
-2.8000
-2.4000
-2.0000
-1.6000
-1.2000
-0.8000
-0.4000
0.5000

Image rotation (UCAZ) (DEG)
0 360

Min of Internal radius (IRMN) (IN)
4.25 3.75

Min of Internal radius (IRMN) (IN)
3.75 4.25

REPEAT SECTION

Amplitude of echo minus Max (AWBK) (----)

Azimuth of eccent. (AZEC) (DEG)
0 360

Maximum of Amplitude (AWMX)
0 (DB) 75

Maximum of Thickness (THMX) (IN)
0.2 0.4

0.5000
1.5000
2.5000
3.5000
6.5000

CCL (CCLU) (----)
-20 20

Process. flags (UFLG) (----)

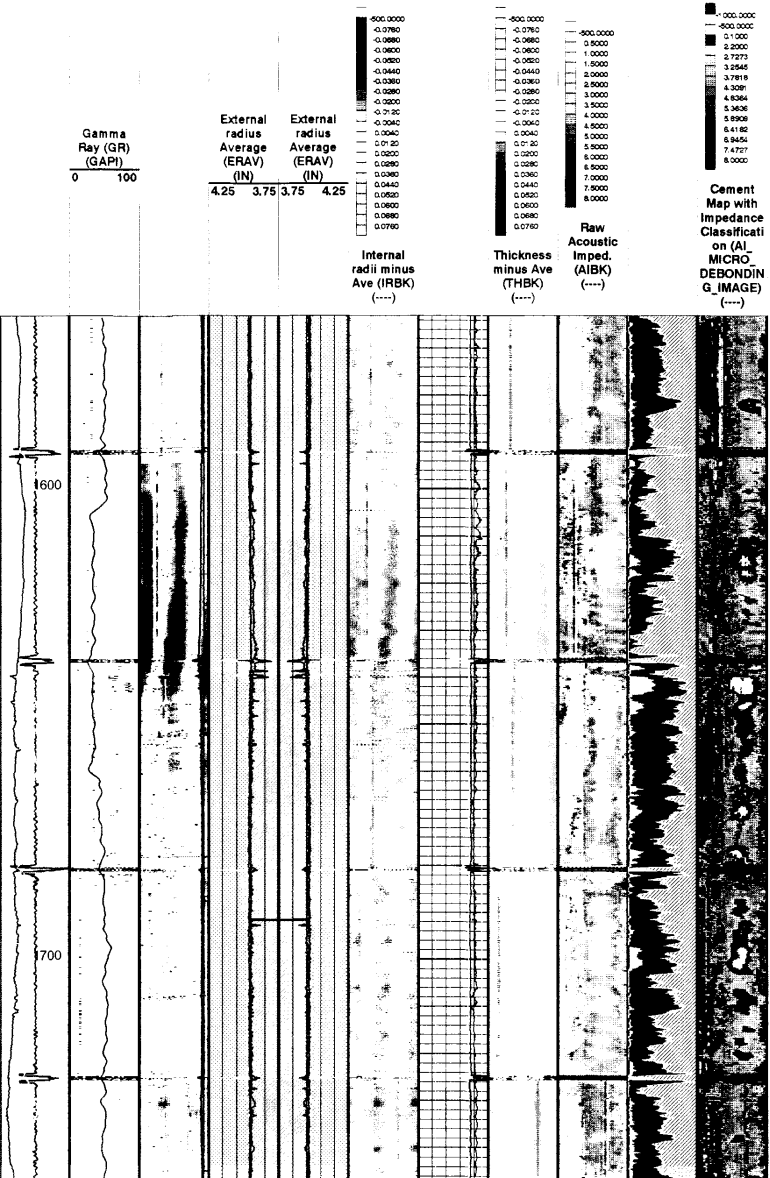
Average of Amplitude (AWAV)
0 (DB) 75

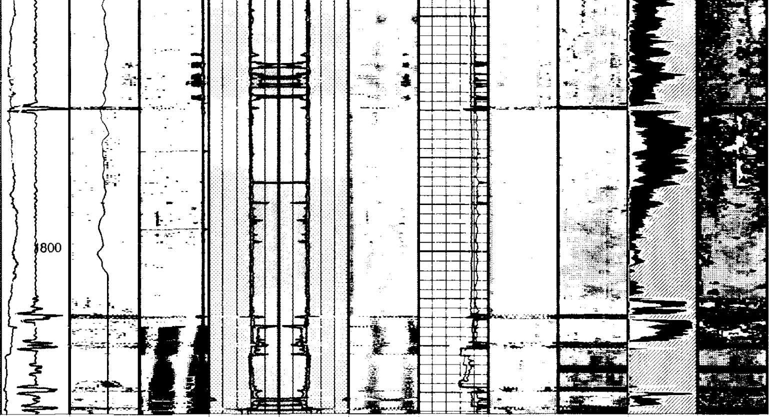
Internal radius Average (IRAV) (IN)
4.25 3.75

Internal radius Average (IRAV) (IN)
3.75 4.25

Average of Thickness (THAV) (IN)
0.2 0.4

Microdebonding Ratio (MDR)
1 (----) 0





**Gamma Ray (GR) (GAPI)**
0 100

**External radius Average (ERAV) (IN)**
4.25 3.75

**External radius Average (ERAV) (IN)**
3.75 4.25

**Internal radii minus Ave (IRBK) (----)**
-500.0000
-0.0760
-0.0680
-0.0600
-0.0520
-0.0440
-0.0360
-0.0280
-0.0200
-0.0120
-0.0040
0.0040
0.0120
0.0200
0.0280
0.0360
0.0440
0.0520
0.0600
0.0680
0.0760

**Thickness minus Ave (THBK) (----)**
-500.0000
-0.0760
-0.0680
-0.0600
-0.0520
-0.0440
-0.0360
-0.0280
-0.0200
-0.0120
-0.0040
0.0040
0.0120
0.0200
0.0280
0.0360
0.0440
0.0520
0.0600
0.0680
0.0760

**Raw Acoustic Imped. (AIBK) (----)**
-500.0000
0.5000
1.0000
1.5000
2.0000
2.5000
3.0000
3.5000
4.0000
4.5000
5.0000
5.5000
6.0000
6.5000
7.0000
7.5000
8.0000

**Cement Map with Impedance Classification (AI_MICRO_DEBONDING_IMAGE) (----)**
-1000.0000
-500.0000
0.1000
2.2000
2.7273
3.2545
3.7818
4.3091
4.8364
5.3636
5.8909
6.4182
6.9454
7.4727
8.0000

**CCL (CCLU) (----)**
-20 20

**Process. flags (UFLG) (----)**
0.5000
1.5000
2.5000
3.5000
6.5000

**Average of Amplitude (AWAV)**
0 (DB) 75

**Internal radius Average (IRAV) (IN)**
4.25 3.75

**Internal radius Average (IRAV) (IN)**
3.75 4.25

**Average of Thickness (THAV) (IN)**
0.2 0.4

**Microdebonding Ratio (MDR)**
1 (----) 0

**Azimuth of eccent. (AZEC) (DEG)**
0 360

**Maximum of Amplitude (AWMX)**
0 (DB) 75

**Maximum of Thickness (THMX) (IN)**
0.2 0.4

**Image rotation (UCAZ) (DEG)**
0 360

-500.0000
-6.0000
-5.6000
-5.2000
-4.8000
-4.4000
-4.0000
-3.6000
-3.2000
-2.8000
-2.4000
-2.0000
-1.6000
-1.2000
-0.8000
-0.4000
0.8000

**Min of Internal radius (IRMN) (IN)**
4.25 3.75

**Min of Internal radius (IRMN) (IN)**
3.75 4.25

**REPEAT SECTION**

Bonded

Amplitude
of echo
minus Max
(AWBK)
(----)

Liquid

Micro-debonding

Gas or
Dry
MicroA

**Format: USI_Composite** **Vertical Scale: 5" per 100'** **Graphics File Created: 15-Jun-2000 20:11**

## OP System Version: 9C1-303

**MCM**

| | | | |
|---|---|---|---|
| USIT-A | OP91-KP1a | SGT-L | OP91-KP1a |
| CAL-Y | 9C1-303 | TCC-BF | OP91-KP1a |

## COMPUTATION FLAGS LABELLING

| | | |
|---|---|---|
| (0 - 1.5) | UFLG 1 | UTIM error |
| (1.5 - 2.5) | UFLG 2 | Pulse origin not detected |
| (2.5 - 3.5) | UFLG 3 | WINLEN error |
| (3.5 - 6.5) | UFLG 4 UFLG 5 UFLG 6 | CASING THICKNESS error |
| (6.5 - 10) | UFLG 7 UFLG 8 UFLG 9 | LOOP PROCESSING error |

USI : LOW Frequency Compression Mode Used For Logging.

Recommended casing thickness range for optimum cement impedance measurement : 0.27 to 0.6 IN.

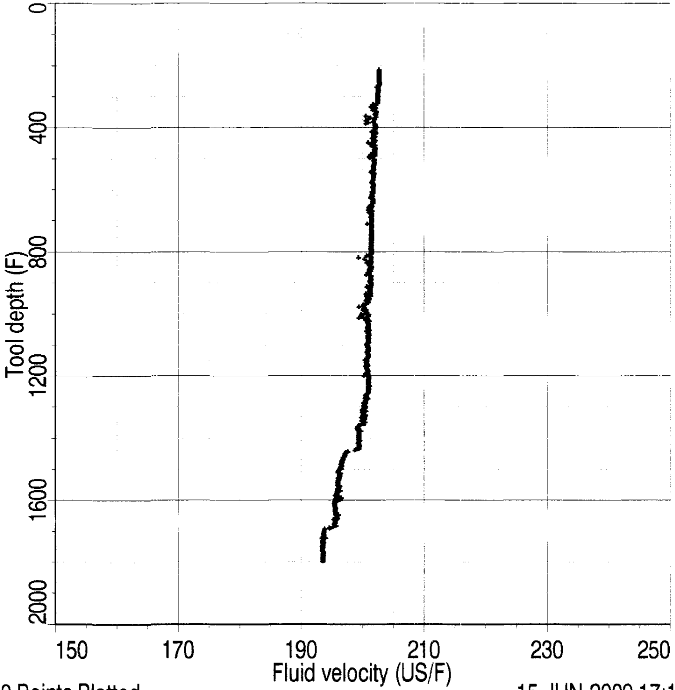
## Parameters

| DLIS Name | Description | Value | |
|---|---|---|---|
| AGMN | Minimum gain of cartridge | -4 | DB |
| AGMX | Maximum gain of cartridge | 20 | DB |
| BERJ | Bad Echo Rejection | ON | |
| CDIA | Casing outer diameter | 8.635 | IN |
| CSDE | Casing Density | 486.94 | LBCF |
| CSID | Casing internal diameter | 7.9361 | IN |
| CWEI | Casing Weight | 32.00 | LB/F |
| DFVL | Default fluid velocity | 196 | US/F |
| DO | Depth Offset for Logical Unit 1 | 5.0 | FT |
| DOT | Diameter of Transducer sensor | 2.874 | IN |
| EMXV | Value for EMEX voltage | 35 | V |
| FDII | FPM Data Interpolation Interval | 0 | FT |
| IMAR | Image Rotation | OFF | |
| MW | Mud weight | 8.5 | LB/G |
| PP | Playback Processing | NORMAL | |
| RCOD | Reference calibrator Outer diameter | 7 | IN |
| RCSO | Reference calibrator standoff | 1.1811 | IN |
| RCTH | Reference calibrator thickness | 0.2952 | IN |
| SDNV | Acoustic Impedance Std Deviation Vertical Range | 5 | |
| SDTHOR | Acoustic Impedance Std Deviation Horizontal Threshold | 0.5 | |
| SDTVER | Acoustic Impedance Std Deviation Vertical Threshold | 0.3 | |
| TCUB | T^3 Processing level | Vax_Loop | |
| THDH | Maximum search thickness (percentage of nominal) | 140 | |
| THDL | Minimum search thickness (percentage of nominal) | 80 | |
| THNO | Nominal thickness of casing | 0.349449 | IN |
| UMAO | USIT Measurement Angular Offset | -10 | DEG |
| USTO | Ultrasonic Time Offset | -2 | US |
| USUB | USIT Sub identifier | Sub_7_inch | |
| UWKM | Current working mode | 10DEG_1_5IN_LF | |
| VCAS | Velocity of sound in casing | 51.4 | US/F |
| WLEN | T^3 processing length | 20.9552 | US |
| ZCAS | Acoustical Impedance of casing | 46.25 | MRAY |
| ZINI | Initial z value | -1 | MRAY |
| ZMUD | Acoustical Impedance of mud | 1.48 | MRAY |
| ZTCM | Acoustical Impedance threshold for Cement | 2.2 | MRAY |
| ZTGS | Acoustical Impedance threshold for Gas | 0.1 | MRAY |

## Input DLIS Files

| | | | | | |
|---|---|---|---|---|---|
| DEFAULT | USIT .044 | FN:37 PRODUCER | 15-Jun-2000 17:14 | 1829.5 FT | 1558.0 FT |

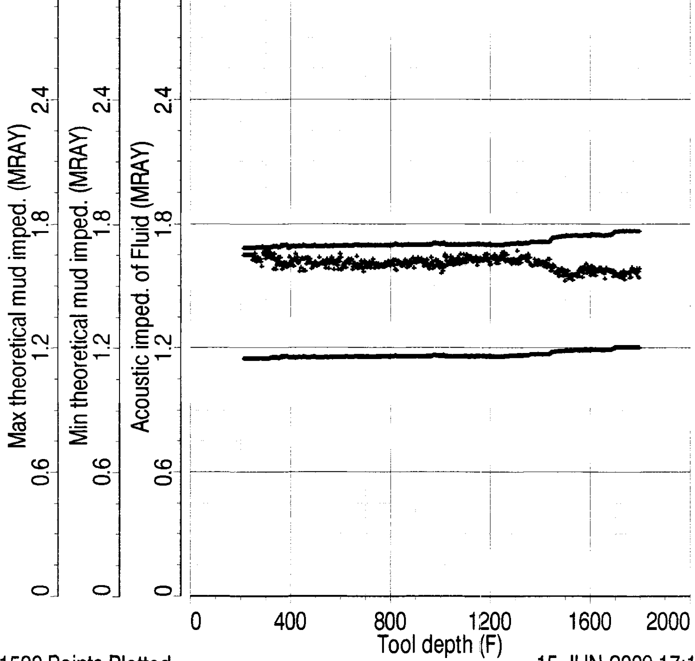
Index: 213.0 - 1800.0 FT



530 Points Plotted

15-JUN-2000 17:11

Index: 213.0 - 1800.0 FT



1590 Points Plotted

15-JUN-2000 17:11

| | | | |
|---|---|---|---|
| **COMPANY:** | **NORTHWEST NATURAL GAS** | BOTTOM LOG INTERVAL | 1835 ft |
| | | SCHLUMBERGER DEPTH | 1890 ft |
| **WELL:** | **IW-24BH-23-65** | DEPTH DRILLER | 1890 ft |
| **FIELD:** | **MIST** | KELLY BUSHING | 923 ft |
| **COUNTY:** | **COLUMBIA** | DRILL FLOOR | 923 ft |
| **STATE:** | **OREGON** | GROUND LEVEL | 905 ft |

**Schlumberger**

**ULTRA SONIC IMAGING TOOL**
**GR/ CCL**
**SCALE: 5" = 100'**