COMPANY NORTHWEST NATURAL GAS
WELL OM 23C-11-65
FIELD MIST (BRUER POOL STORAGE)
COUNTY COLUMBIA STATE OR

HALLIBURTON

EXCELL 2000

ELECTRO MICRO IMAGER MONITOR LOG

5"=100'

Confidential Until 8/30/07

COMPANY NORTHWEST NATURAL GAS
WELL OM 23C-11-65
FIELD MIST (BRUER POOL STORAGE)
COUNTY COLUMBIA STATE OR

API No 036-009-00361
Location 227.3' SOUTH AND
1691.5' EAST OF THE
WEST 1/4 CORNER OF
SECTION 11 WB&M
X = 872393.1
Y = 1294631.2

Sect 11 Twp 6N Rge 5W

Other Services
HRID/BCSD
SDLT/DSNT
NGRT

Permanent Datum G.L. Elev 987.1
Log measured from K.B. 19.0 ft. above perm. datum
Drilling measured from K.B.

Elev. K.B. 1006.1
D.F. ----
G.L. 987.1

Date	AUG-20-2005			
Run No.	ONE			
Depth – Driller	3108'			
Depth – Logger	3086'			
Bottom – Logged Interval	3081'			
Top – Logged Interval	500'			
Casing – Driller	8.63" @ 468'	@	@	@
Casing – Logger	464'			
Bit Size	7.875'			
Type Fluid in Hole	GEL			
Dens. | Visc.	8.8 | 50	|	|	|
Ph | Fluid Loss	---- | ----	|	|	|
Source of Sample	FLOWLINE			
Rm @ Meas. Temp.	1.430 @ 63 F	@	@	@
Rmf @ Meas. Temp.	1.600 @ 53 F	@	@	@
Rmc @ Meas. Temp.	1.860 @ 58 F	@	@	@
Source Rmf | Rmc	MEAS | MEAS	|	|	|
Rm @ BHT	0.854 @ 110 F	@	@	@
Time Since Circ.	2200 08-19			
Time on Bottom	0910 08-20			
Max. Rec. Temp.	110 F @ TD	@	@	@
Equip. | Location	49599 | WDLD	|	|	|
Recorded By	G. ROUSSEAU			
Witnessed By	J MEYER	E. VADER		

Service Ticket No 3886416 API Serial No 036-009-00361 PGM Version XL v5.0

CHANGE IN MUD TYPE OR ADDITIONAL SAMPLES			RESISTIVITY SCALE CHANGES				
Date Sample No			Type Log	Depth	Scale Up Hole	Scale Down Hole	
Depth – Driller							
Type Fluid in Hole							
Dens. | Visc.	|	|					
Ph | Fluid Loss	|	|					
Source of Sample			RESISTIVITY EQUIPMENT DATA				
Rm @ Meas. Temp.	1.430 @ 63 F	@	Run No.	Tool Type & No.	Pad Type	Tool Pos.	Other
Rmf @ Meas. Temp.	1.600 @ 53 F	@	ONE	EMIT-A #10	6-ARM	CENT	NA
Rmc @ Meas. Temp.	1.860 @ 58 F	@					
Source Rmf | Rmc	MEAS | MEAS	|					
Rm @ BHT	0.854 @ 110 F	@					
Rmf @ BHT	0.819 @ 110 F	@					
Rmc @ BHT	1.032 @ 110 F	@					

EQUIPMENT DATA

GAMMA		ACOUSTIC		DENSITY		NEUTRON	
Run No.	ONE	Run No.		Run No.		Run No.	
Serial No.	A-180	Serial No.		Serial No.		Serial No.	
Model No.	NGRT	Model No.		Model No.		Model No.	
Diameter	3.625"	No. of Cent.		Diameter		Diameter	
Detector Model No.	432	Spacing		Log Type		Log Type	
Type	SCINT.			Source Type		Source Type	
Length	4.00"	LSA [Y / N]	NO	Serial No.		Serial No.	
Distance to Source	11.0	FWDA [Y / N]	NO	Strength		Strength	

LOGGING DATA

GENERAL				GAMMA		ACOUSTIC			DENSITY			NEUTRON		
Run	Depth		Speed	Scale		Scale			Scale			Scale		
No.	From	To	Ft / Min	L	R	L	R	Matrix	L	R	Matrix	L	R	Matrix
ONE	3086'	500'	30	0	150									
				API	API									

DIRECTIONAL INFORMATION

Maximum Deviation		deg. @		KOP	

Remarks:

ANNULAR HOLE VOLUME CALCULATED USING 5.50" CASING.

EMIT-NGRT RUN IN COMBINATION.

CREW: M. EMERSON, D. BRIGHT. RIG: TAYLOR NO. 9.

HALLIBURTON DOES NOT GUARANTEE THE ACCURACY OF ANY INTERPRETATION OF THE LOG DATA, CONVERSION OF LOG DATA TO PHYSICAL ROCK PARAMETERS OR RECOMMENDATIONS WHICH MAY BE GIVEN BY HALLIBURTON PERSONNEL OR WHICH APPEAR ON THE LOG OR IN ANY OTHER FORM. ANY USER OF SUCH DATA, INTERPRETATIONS, CONVERSIONS, OR RECOMMENDATIONS AGREES THAT HALLIBURTON IS NOT RESPONSIBLE EXCEPT WHERE DUE TO GROSS NEGLIGENCE OR WILLFUL MISCONDUCT FOR ANY LOSS, DAMAGES, OR EXPENSES RESULTING FROM THE USE THEREOF.

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EXCELL

Version No: 5.6 | hc:3.0
Data File: 0820_0825_s3373_003_.v.cls
Format File: plot_1.1.spc
Plot Time: 2005-08-20 11:18:31
Log Time: 2005-08-20 09:10:23

Top Depth: 457.26
Bottom Depth: 3085.50

	CALIP 1-4		**AHV**		**BUTTONS**			**F1B1**	
6	INCHES	16	FT3 →	0	N-E-S-W-N	360	800		-1200
	CALIP 2-5		**BHV**					**F2B1**	
6	INCHES	16	← FT3				1000		-1000
	CALIP 3-6		**TENSION**					**F3B1**	
6	INCHES	16	1000Lb6000				1200		-800
	GAMMA		SPD COR					**F4B1**	
0	GAPI	150	0 1				1400		-600

ROTATION #1
-40 DEGREES 360

DRIFT AZIM
-40 DEGREES 360

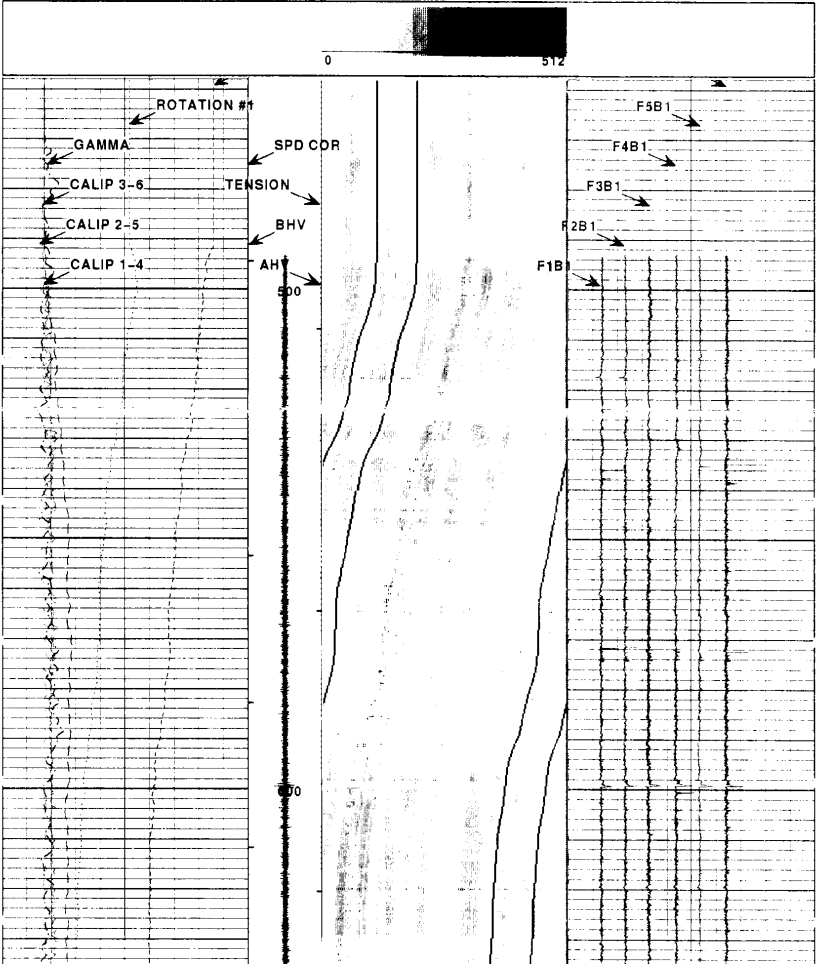
DRIFT ANGLE
-1 DEGREES 9

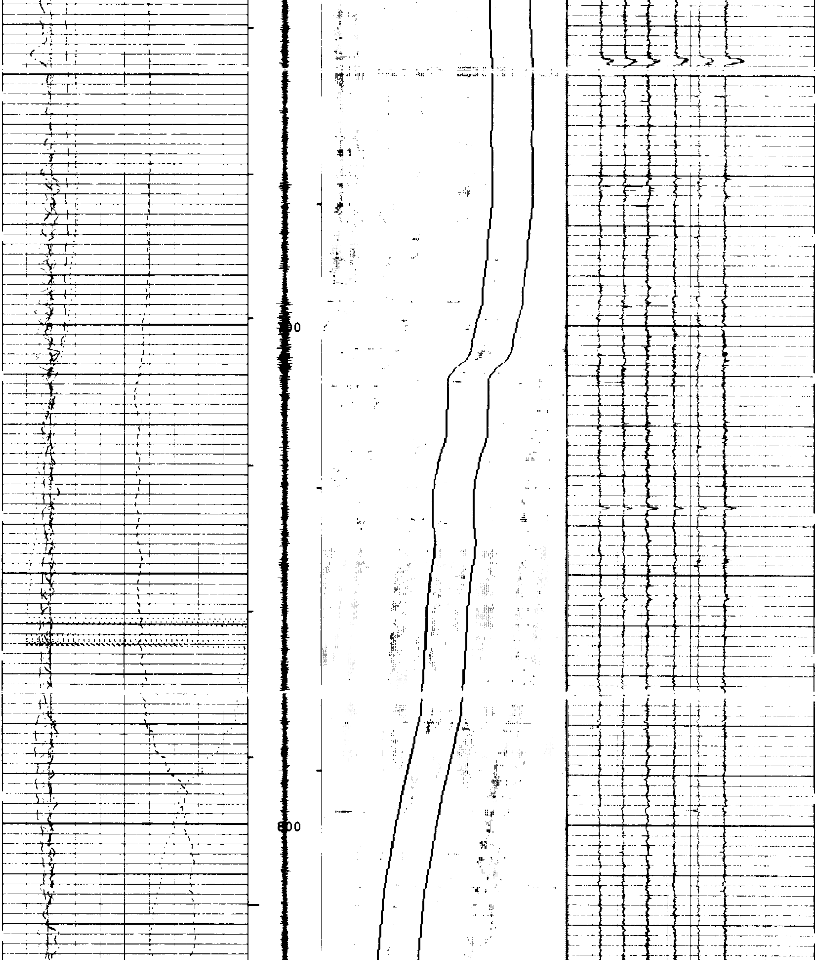
FAST ZACC
.8 1.2

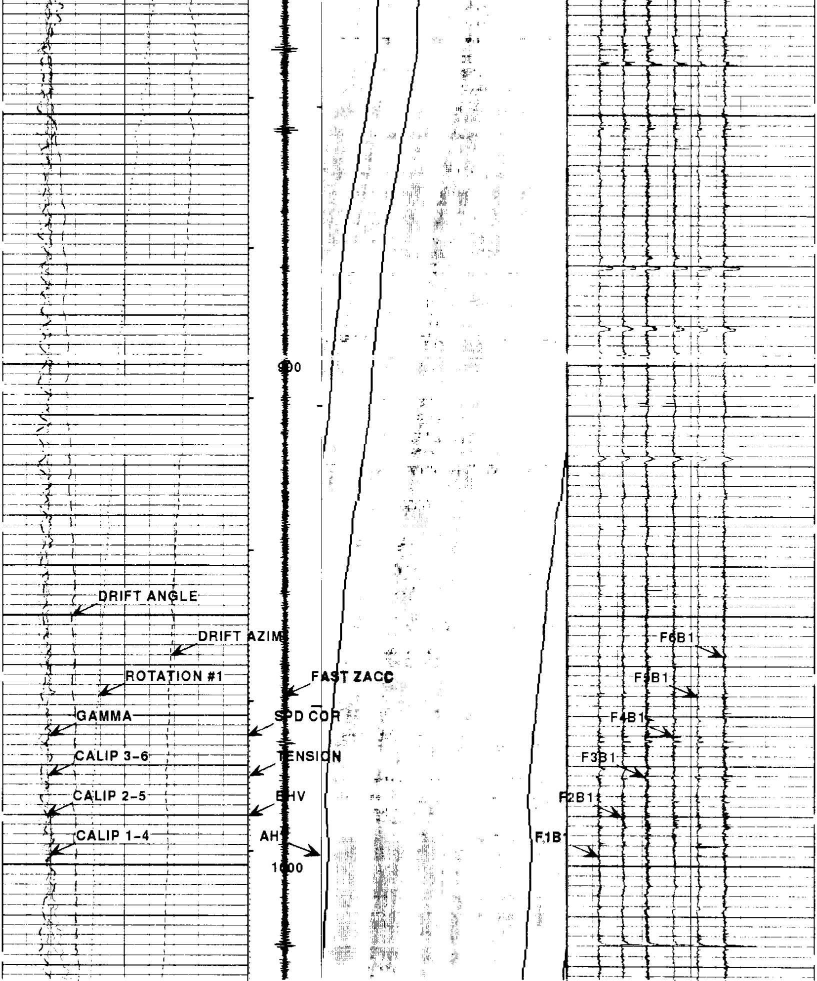
1:240
FT.

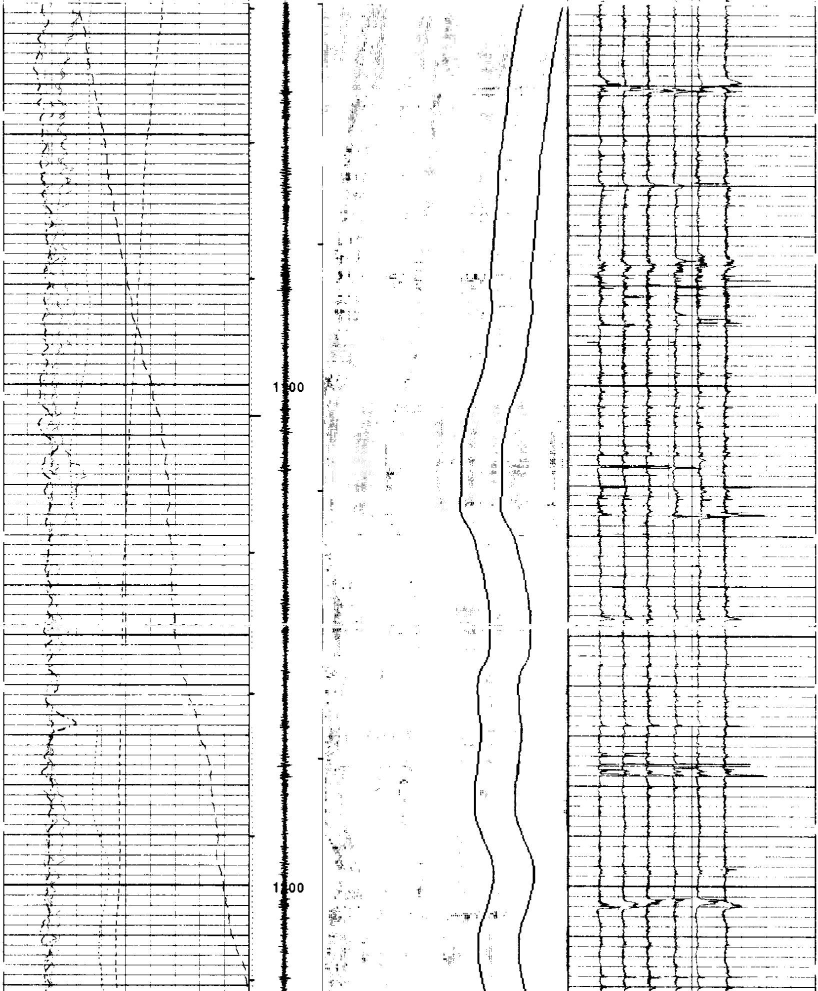
F5B1
1600 -400

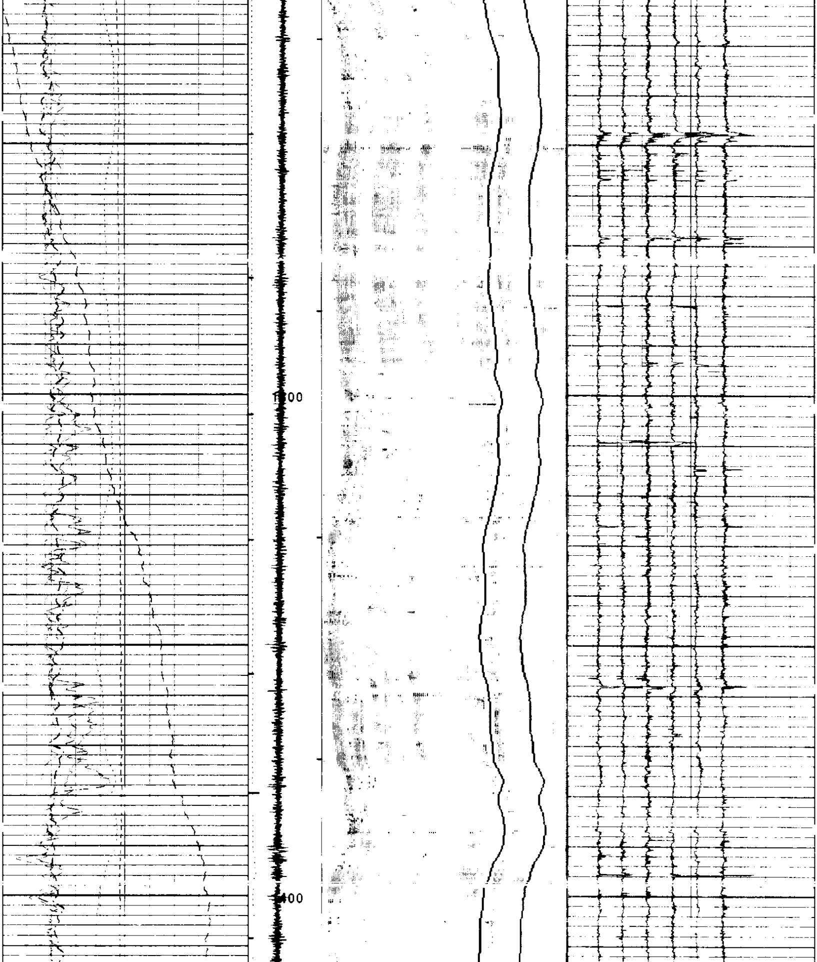
F6B1
1600 -200

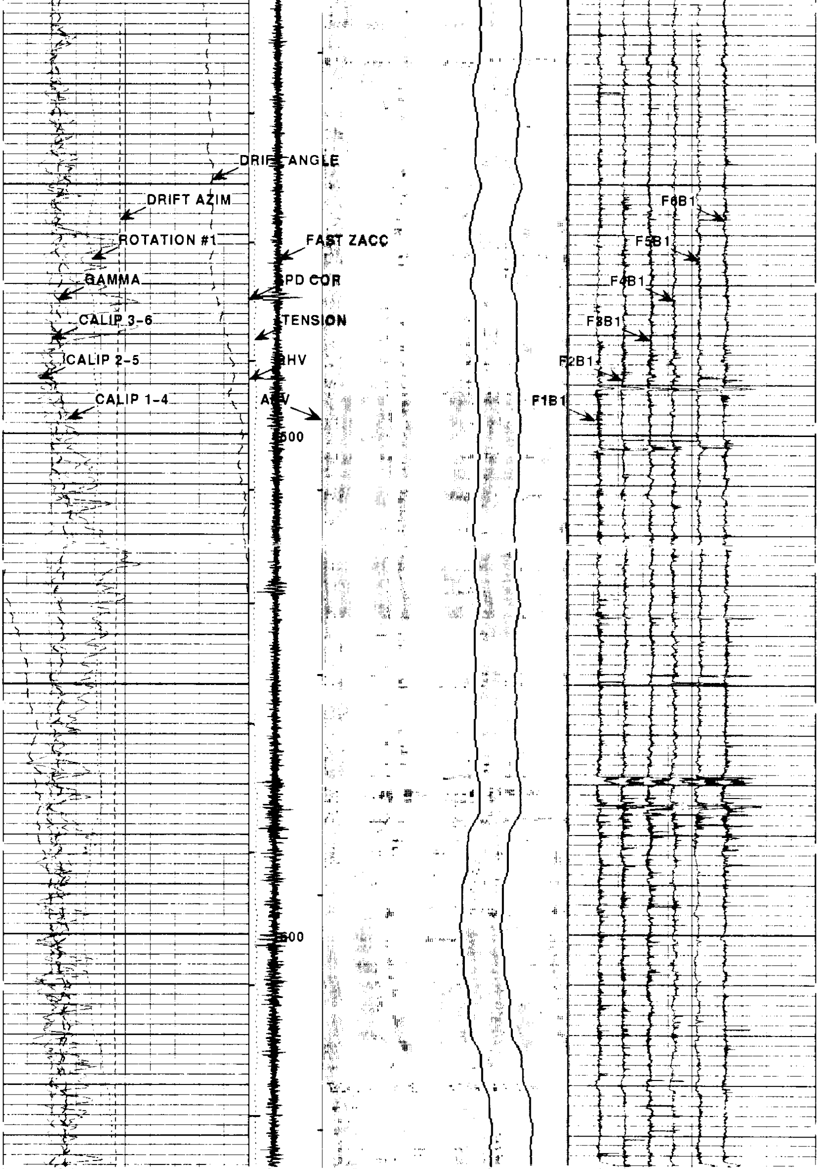


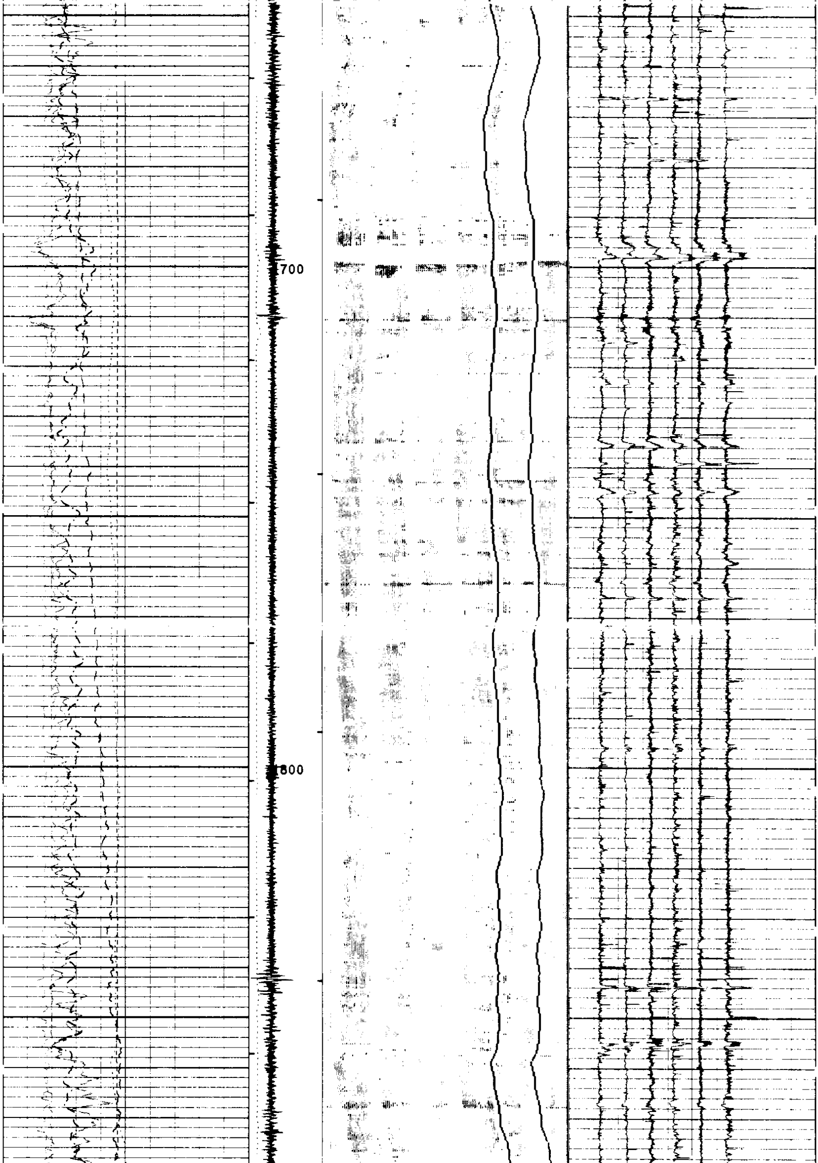


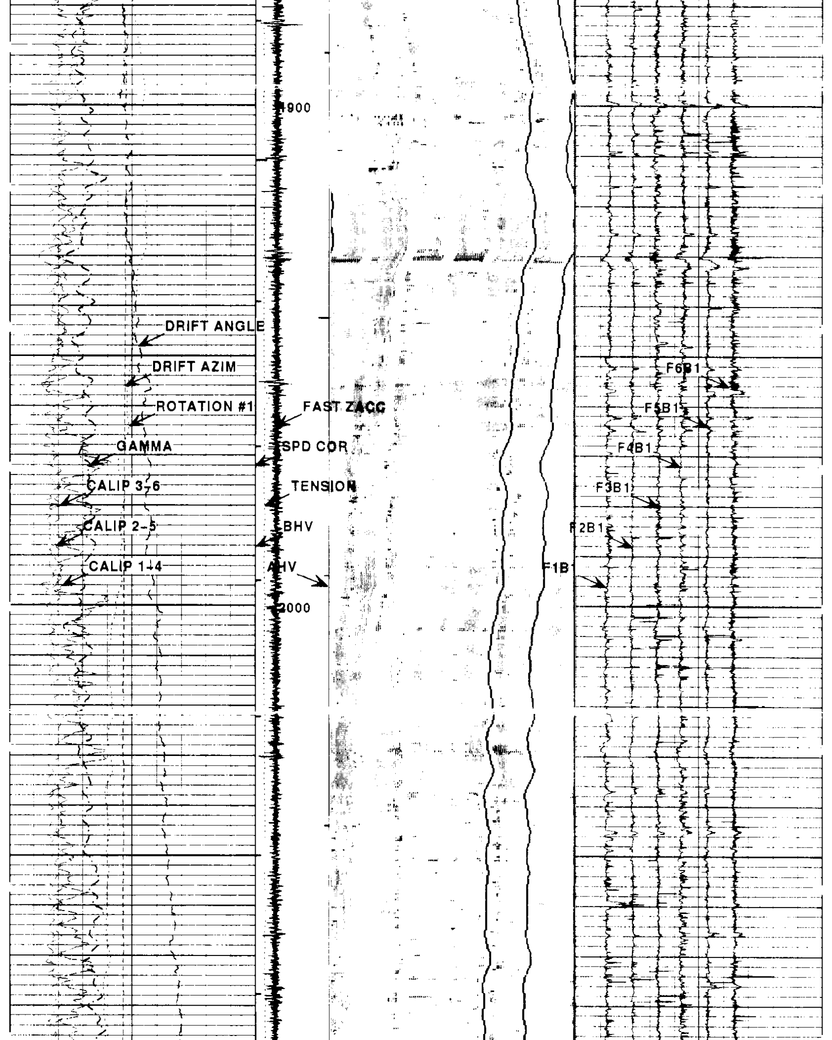


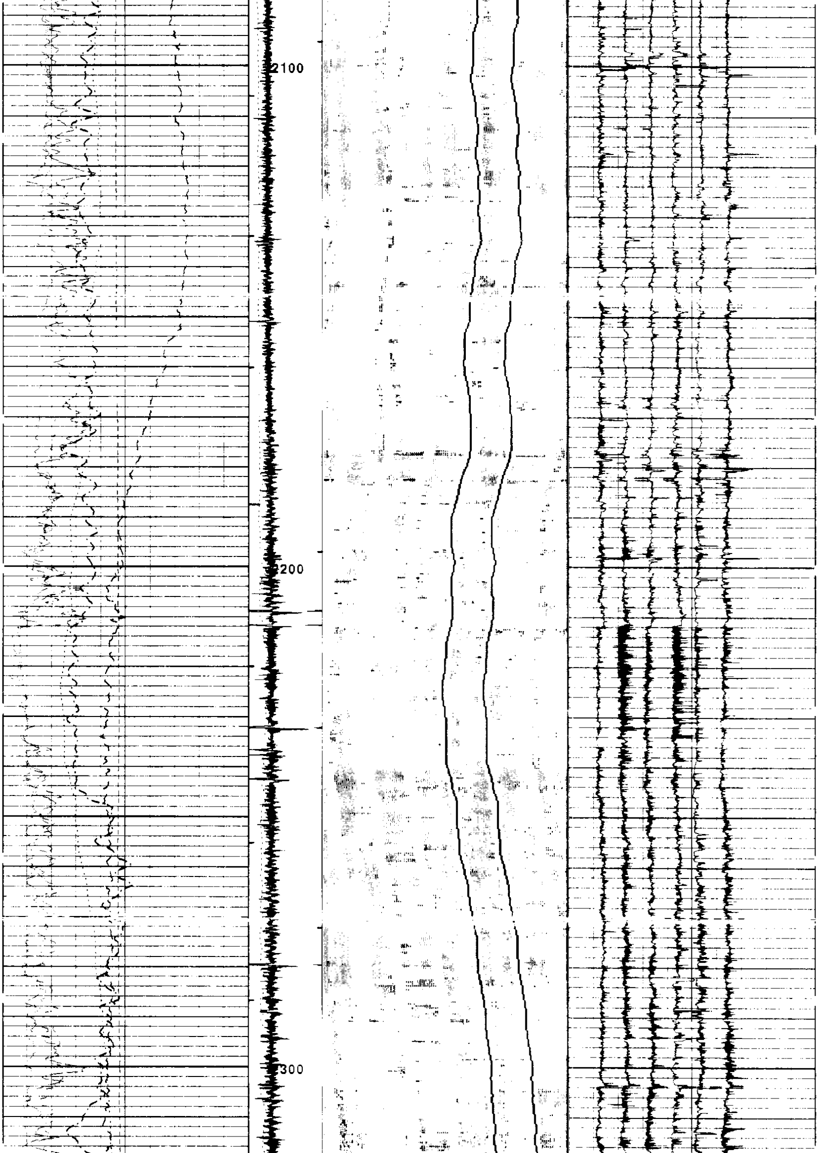


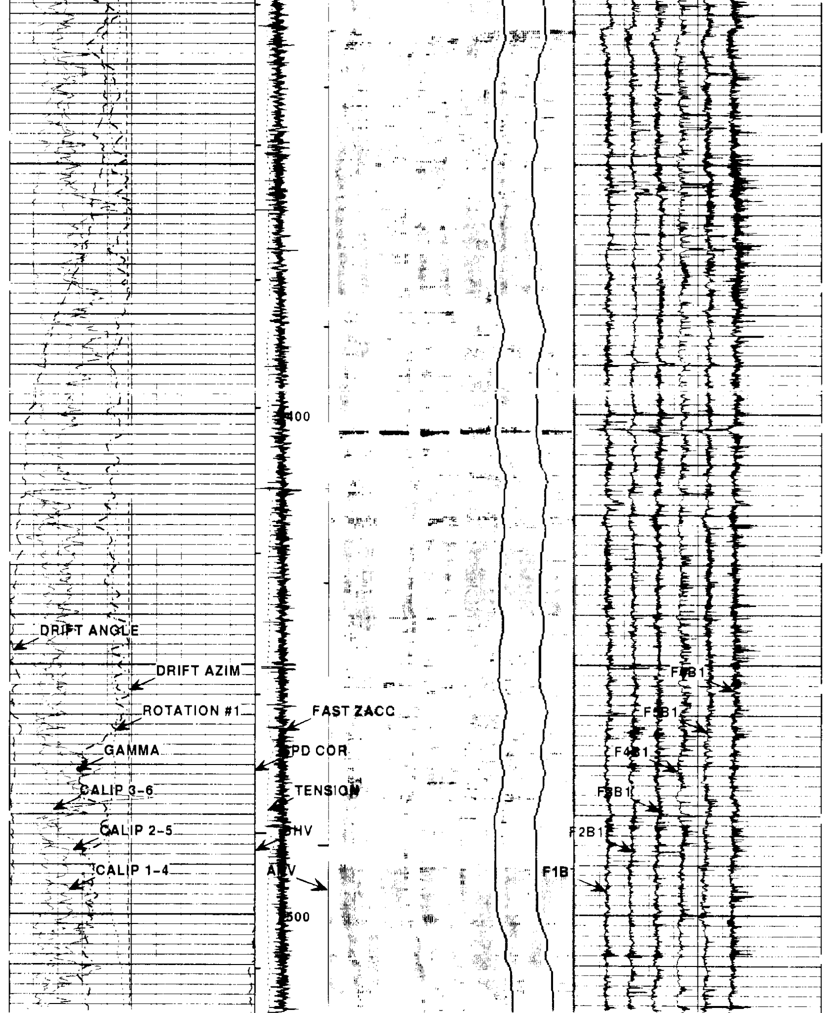


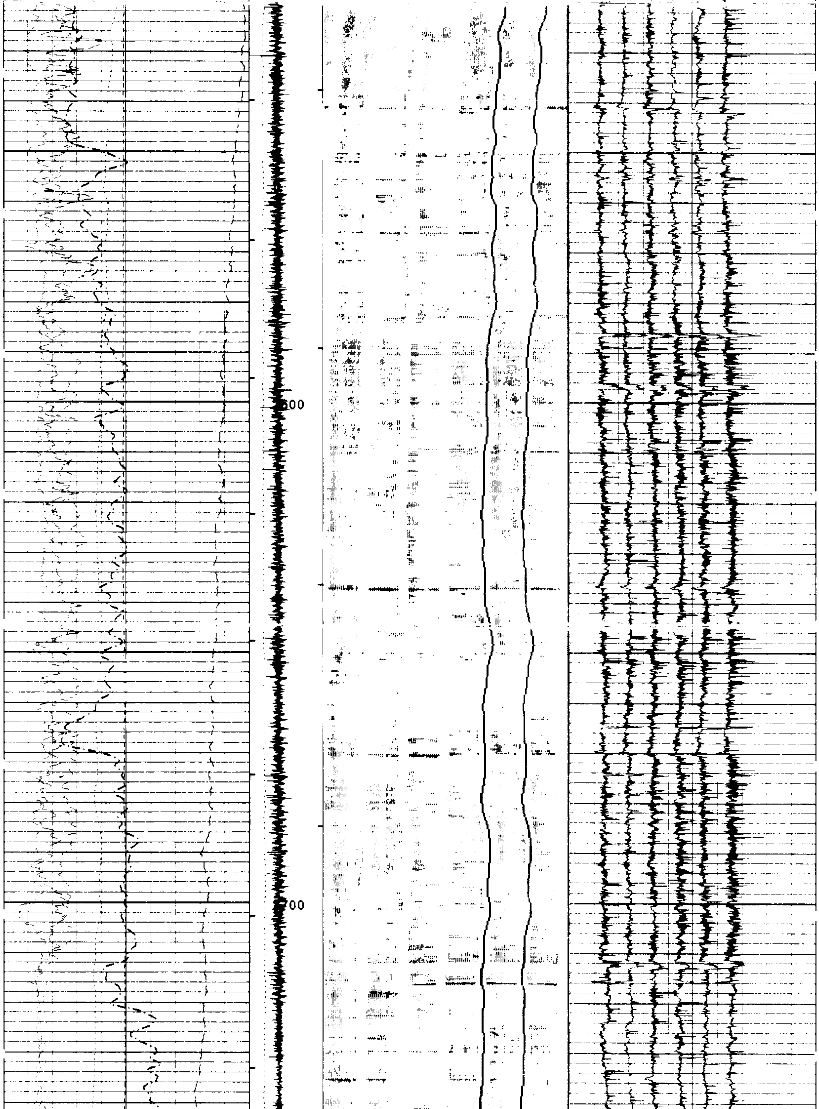


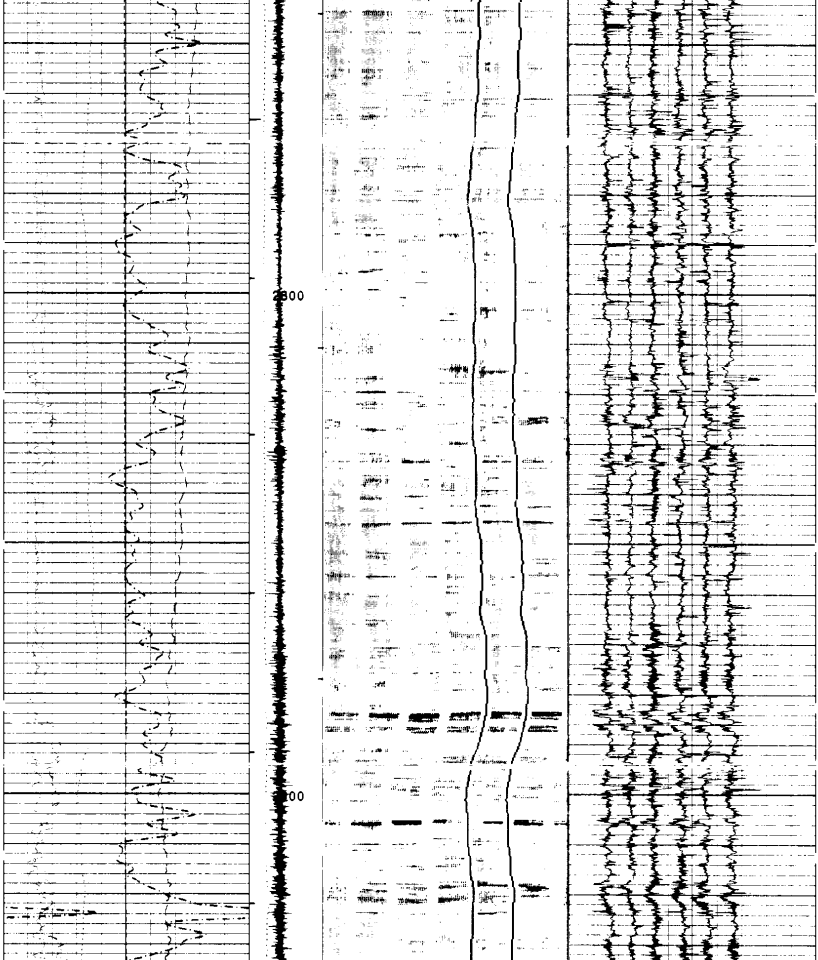


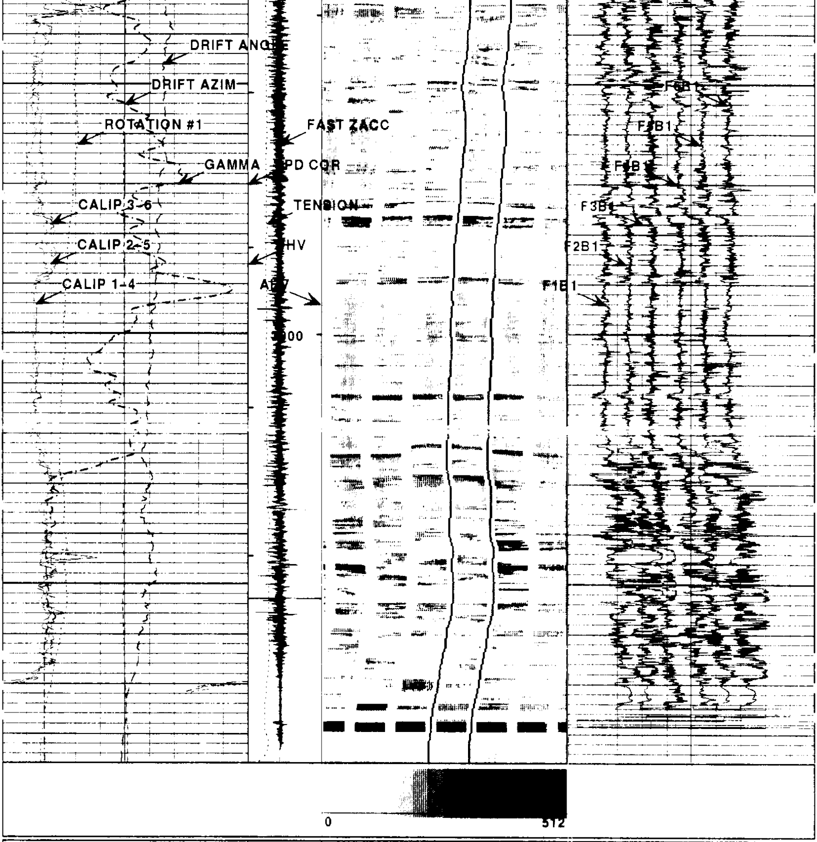












DRIFT ANGLE
-1 DEGREES 9

DRIFT AZIM
-40 DEGREES 360

ROTATION #1
-40 DEGREES 360

GAMMA
0 GAPI 150

1:240
FT.

FAST ZACC
.8 1.2

SPD COR
0 1

F6B1
1800 -200

F5B1
1600 -400

F4B1
1400 -600

CALIP 3-6 6 INCHES 16	TENSION 1000Lb6000		F3B1 1200 -800
CALIP 2-5 6 INCHES 16	BHV ← FT3		F2B1 1000 -1000
CALIP 1-4 6 INCHES 16	AHV FT3 →	BUTTONS 0 N-E-S-W-N 360	F1B1 800 -1200

HALLIBURTON

EXCELL

Version No: 5.6 | hc:3.0
Data File: 0820_0825_s3373_003_.v.cls
Format File: plot_1.1.spc
Plot Time: 2005-08-20 11:10:21
Log Time: 2005-08-20 09:10:23

Top Depth: 457.26
Bottom Depth: 3085.50

REPEAT SECTION

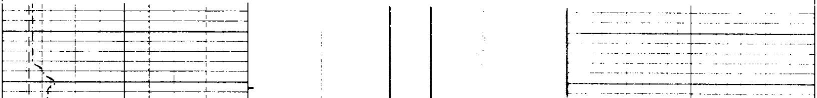
HALLIBURTON

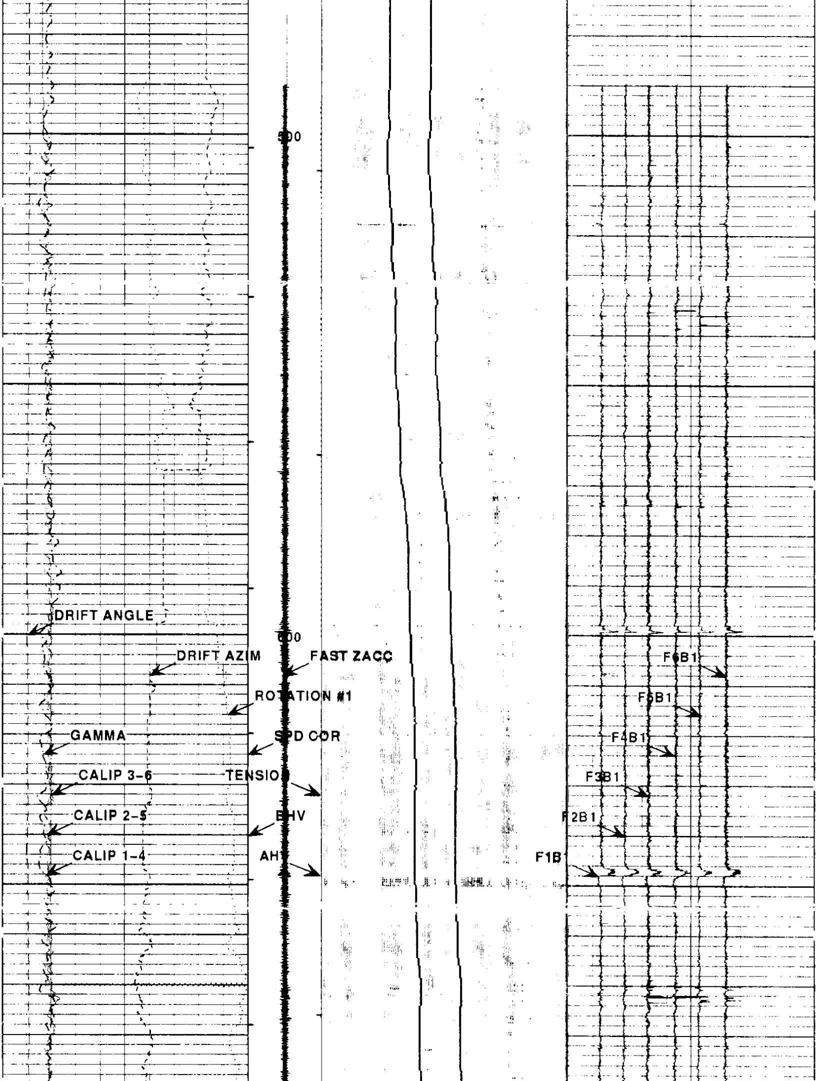
EXCELL

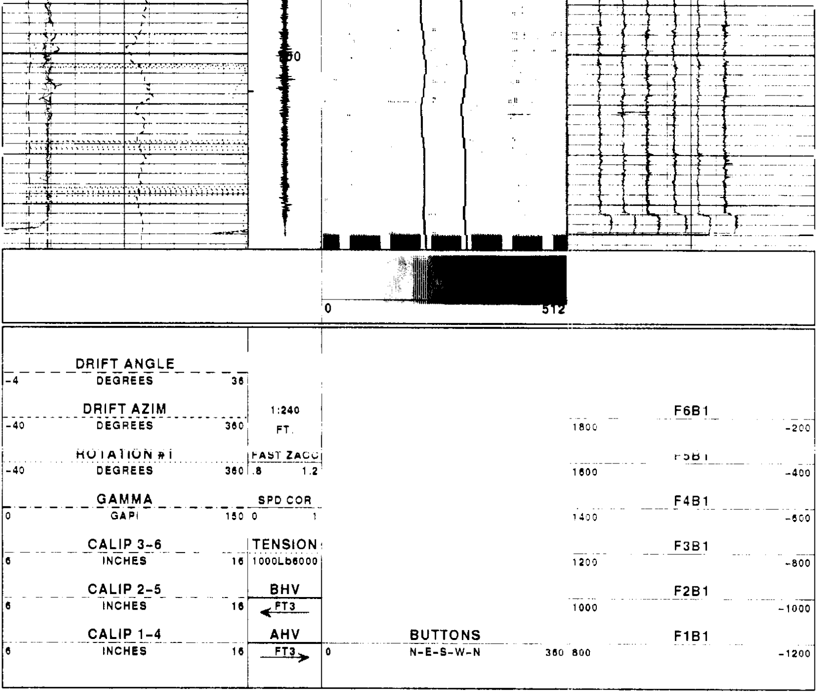
Version No: 5.6 | hc:3.0
Data File: 0820_0825_s3373_002_.v.cls
Format File: plot_1.2.spc
Plot Time: 2005-08-20 11:08:51
Log Time: 2005-08-20 10:47:25

Top Depth: 454.01
Bottom Depth: 738.75

CALIP 1-4 6 INCHES 16	AHV FT3 →	BUTTONS 0 N-E-S-W-N 360	F1B1 800 -1200
CALIP 2-5 6 INCHES 16	BHV ← FT3		F2B1 1000 -1000
CALIP 3-6 6 INCHES 16	TENSION 1000Lb6000		F3B1 1200 -800
GAMMA 0 GAPI 150	SPD COR 0 1		F4B1
ROTATION #1 -40 DEGREES 360	FAST ZACC .8 1.2		F5B1 1600 -400
DRIFT AZIM -40 DEGREES 360	1:240 FT.		F6B1 1800 -200
DRIFT ANGLE -4 DEGREES 36			







HALLIBURTON

EXCELL 2000

Version No: 5.6 | hc:3.0
Data File: 0820_0825_s3373_002_.v.cls
Format File: plot_1.2.spc
Plot Time: 2005-08-20 11:07:55
Log Time: 2005-08-20 10:47:25

Top Depth: 454.01
Bottom Depth: 738.75

Current EXCELL-2000 Parameter Values
Depth: 110.833
Date: 20-Aug-2005 08:53
Service Number: 3373
Software Version: 5.6

Mnemonic	Tool	Parameter Description	Value	Units
PERF	DITSHD	PERFORATED INTERVAL	NO	
TD	DITSHD	TOTAL DEPTH	0.	FT
CS_ANT	DITSHD	CASING DEPTH (FOR ANNOTATION)	0.	FT
GR_OK	GAMMA	DO GAMMA CALCULATIONS?	YES	
CASED	SHARED	CASED HOLE?	NO	
CASEOD	SHARED	CASING DIAMETER (OD)	5.5	Inches
MUDWT	GAMMA	BOREHOLE FLUID WEIGHT	8.8	Pounds/Gal.
GRSO	GAMMA	GAMMA RAY STANDOFF	0.	Inches
BS	SHARED	BIT SIZE	7.875	Inches
DIP_OK	SHARED	DO DIPMETER CALCULATIONS?	YES	

EMI_OK	EMID2A	DO EMI IMAGE CALCULATIONS?	YES
ROTIMG	EMID2A	ROTATE EMI IMAGE (N-E-S-W-N)	YES
COMPAS	EMID2A	WHICH COMPAS FOR ROTATION	EMI
AUTOGN	EMID2A	EMI BUTTON AUTO GAIN	YES
BCOLOR	EMID2A	EMI BUTTON AUTOGAIN COLOR	127.
BFILT	EMID2A	BUTTON AUTO GAIN FILTER	0.02
NAVOK	SHARED	DO NAVIGATION CALCULATIONS?	YES
CAL_OK	EMICAL	DO CALIPER CALCULATIONS?	YES

EXCELL-2000 Calibration Report

Date: 20-Aug-2005 11:22

GAMMA RAY TOOL SHOP CALIBRATION SUMMARY

PERFORMED: 23-Jul-2005 08:06 LAST SHOP CALIBRATION: 15-Jun-2005 10:47
SERIAL NUMBER: A180 MODEL: NGRT-A
BLANKET #: TB-67
TRUCK UNIT NUMBER: 49599 PROGRAM VERSION: 5.0
PERFORMED BY: G. ROUSSEAU

	MEASURED	CALIBRATED	UNITS
BACKGROUND	17	17	GAPI
BACKGROUND+CALIBRATOR	225	222	GAPI
CALIBRATOR	208	205	GAPI
GAPI CONVERSION FACTOR	0.472		GAPI/CPS

GAMMA RAY TOOL BEFORE SURVEY FIELD CHECK SUMMARY

PERFORMED: 20-Aug-2005 03:26 LAST SHOP CALIBRATION: 23-Jul-2005 08:06

	SHOP	FIELD	UNITS
BACKGROUND	17	19	GAPI
BACKGROUND+CALIBRATOR	222	230	GAPI
CALIBRATOR	205	[illegible]	GAPI

GAMMA RAY TOOL AFTER SURVEY FIELD CHECK SUMMARY

PERFORMED: 20-Aug-2005 06:38 LAST SHOP CALIBRATION: 23-Jul-2005 08:06

	BEFORE	AFTER	UNITS
BACKGROUND	19	20	GAPI
BACKGROUND+CALIBRATOR	230	229	GAPI
CALIBRATOR	211	209	GAPI

EMI NAVIGATION ACCELEROMETER SHOP CALIBRATION SUMMARY

PERFORMED: 10-Jul-2005 10:15 LAST SHOP CALIBRATION: 29-Jun-2002 18:40
SERIAL NUMBER: 010 MODEL: EMI-A
TRUCK UNIT NUMBER: PROGRAM VERSION: 5.6
PERFORMED BY: AMADI C.

THIS IS THE SHOP STEP TO ESTABLISH ACCELEROMETER ZERO

	ACCELEROMETER-X		ACCELEROMETER-Y		ACCELEROMETER-Z		
	MEASURED	CALIBRATED	MEASURED	CALIBRATED	MEASURED	CALIBRATED	UNITS
VERTICAL:	-0.0174	0.0000	0.0015	0.0000	0.9991	1.0000	G

	ACCELEROMETER		
	MEASURED	CALIBRATED	UNITS
TOTAL:	0.9993	1.0000	G

```
TEMP:          95.0              DEG F
```

```
             EMI NAVIGATION MAGNETOMETER SHOP CALIBRATION SUMMARY
   PERFORMED: 10-Jul-2005 10:05   LAST SHOP CALIBRATION: 20-Jul-2002 14:47
   SERIAL NUMBER: 010             MODEL: EMI-A
   NAV STAND SN:
   TRUCK UNIT NUMBER:             PROGRAM VERSION: 5.6
   PERFORMED BY: AMADI C.

              MAGNETOMETER-X       MAGNETOMETER-Y       MAGNETOMETER-Z
           MEASURED CALIBRATED  MEASURED CALIBRATED  MEASURED CALIBRATED  UNITS

MINIMUM:   -1.0327   -1.0000    -1.0169   -1.0000    -1.0268   -1.0000      H
MAXIMUM:    1.0242    1.0000     1.0292    1.0000     1.0040    1.0000      H
TOTAL H:   ------------------>   1.0358    1.0038    <-------------------     H

TEMP:          95.0                                                       DEG F
```

```
                EMI CALIPER PACKAGE SHOP CALIBRATION SUMMARY
   PERFORMED: 03-Jul-2005 04:02   LAST SHOP CALIBRATION:
   SERIAL NUMBER: 10_A            MODEL: EMI-A
   LARGE JIG SN: WDLD             SMALL JIG SN: WDLD
   TRUCK UNIT NUMBER: 49599       PROGRAM VERSION: 5.6
   PERFORMED BY: G. ROUSSEAU

                 CALIPER 1-4          CALIPER 2-5          CALIPER 3-6
             MEASURED CALIBRATED  MEASURED CALIBRATED  MEASURED CALIBRATED  UNITS

LARGE 15":    14.830    14.830     14.830    14.830     14.830    14.830    INCH
SMALL  7":     6.923     6.923      6.923     6.923      6.923     6.923    INCH

             PRESSURE PAD
           MEASURED CALIBRATED

CLOSED:      0.000    0.000
OPENED:      0.000    1.000
```

```
           EMI CALIPER PACKAGE BEFORE SURVEY FIELD CHECK SUMMARY
   PERFORMED: 20-Aug-2005 08:30   LAST SHOP CALIBRATION: 03-Jul-2005 04:02

                 CALIPER 1-4          CALIPER 2-5          CALIPER 3-6
               SHOP     FIELD       SHOP     FIELD       SHOP     FIELD     UNITS

FIELD RING:    6.923    6.831       6.923    6.862       6.923    6.850     INCH
```

```
            EMI CALIPER PACKAGE AFTER SURVEY FIELD CHECK SUMMARY
   PERFORMED: 20-Aug-2005 11:15   LAST SHOP CALIBRATION: 03-Jul-2005 04:02

                 CALIPER 1-4          CALIPER 2-5          CALIPER 3-6
              BEFORE    AFTER       BEFORE    AFTER      BEFORE    AFTER     UNITS

FIELD RING:    6.831    6.825       6.862    6.863       6.850    6.850     INCH
```

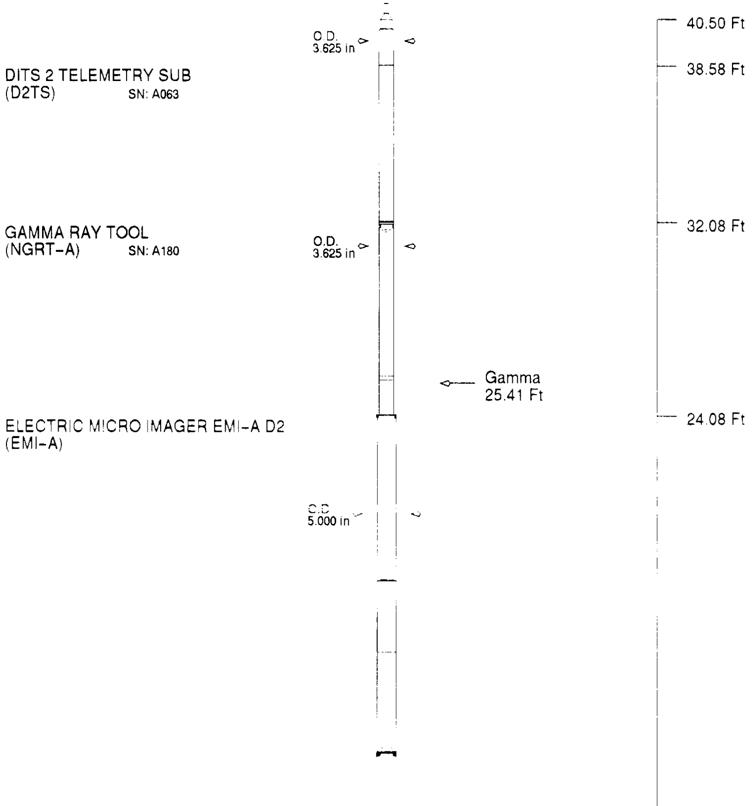
EXCELL-2000 Calibration Summary Table

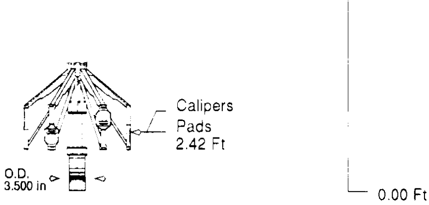
Date: 20-Aug-2005 11:22

Service or Signal	Shop	Before	After	Change	Tolerance
GAMMA	205	211	209	2	+/- 9.0

Excell 2000 Tool String Diagram

ELECTRIC MICRO IMAGER MONITOR LOG





Tool Mnemonic	Length (Ft)	Weight In Air (lbs)	Logging Speed (Ft/min)
D2TS	6.50	100.00	N/A
NGRT-A	8.00	151.80	60.00
EMI-A	24.08	496.00	[illegible]
Tool String	38.58	747.80	30.00

COMPANY	NORTHWEST NATURAL GAS		
WELL	OM 23C-11-65		
FIELD	MIST (BRUER POOL STORAGE)		
COUNTY	COLUMBIA	**STATE**	OR

HALLIBURTON

ELECTRO MICRO IMAGER MONITOR LOG

5"=100