DOGAMI #508

Schlumberger

FORMATION DENSITY COMPENSATED NEUTRON GAMMA RAY 5"

COUNTY:	COLUMBIA
FIELD	MIST GAS STORAGE
LOCATION	N 03-03-15 E 2286.41' & S 86-56-45
WELL	IW 22DH-22-65
COMPANY	NORTHWEST NATURAL GAS CO.

COMPANY NORTHWEST NATURAL GAS CO.

WELL IW 22DH-22-65

FIELD MIST GAS STORAGE

COUNTY: COLUMBIA **STATE:** OREGON

SCANNED

LOCATION
N 03-03-15 E 2286.41' & S 86-56-45
1915.16' FROM THE SW CORNER OF SEC. 22

API SERIAL NO.	SECT.	TWP.	RANGE
36-009-00328	22	6N	5W

Other Services:
INDUCTION
SONIC
FMS
DENSITY
NEUTRON
GAMMA RAY

Permanent Datum	GROUND LEVEL	**Elev.** 579.7 F		**Elev.:** K.B. 595.7 F
Log Measured From	KELLY BUSHING	16.0 F	**above Perm. Datum**	D.F.
Drilling Measured From	KELLY BUSHING			G.L. 579.7 F

Date		16-JAN-1998		23-JAN-1998	
Run No.		ONE		TWO	
Depth Driller		1995.0 F		2746.0 F	
Depth Logger (Schl.)		1990.0 F		2735.0 F	
Btm. Log Interval		1980.0 F		2725.0 F	
Top Log Interval		0.0 F		1990.0 F	
Casing-Driller		13 3/8" @ 426.0 F	8 5/8" @ 1992.0 F	@	
Casing-Logger		422.0 F	1992.0 F		
Bit Size		@	@	@	
Type Fluid in Hole		LSND		FLO-PRO	
Dens.	**Visc.**	9.80 LB/G	47.0 S	8.50 LB/G	
pH	**Fld. Loss**	8.5		10.0	
Source of Sample		FLOWLINE		FLOWLINE	
Rm @ Meas. Temp.		2.620 OHMM @ 64.0 DEGF		.245 OHMM @ 69.0 DEGF	
Rmf @ Meas. Temp.		1.560 OHMM @ 62.0 DEGF		.122 OHMM @ 67.0 DEGF	
Rmc @ Meas. Temp.		1.320 OHMM @ 62.0 DEGF		.134 OHMM @ 67.0 DEGF	
Source: Rmf	**Rmc**	CELL	CELL	CELL	CELL
Rm @ BHT		1.806 OHMM @ 96.0 DEGF		.176 OHMM @ 99.0 DEGF	
TIME **Circulation Ended**		2:00 16-JAN-98		18:30 22-JAN-98	
TIME **Logger on Bottom**		SEE LOG			
Max. Rec. Temp.		96.0 DEGF		99.0 DEGF	
Equip.	**Location**	8303	BAKERSFIELD	8303	BAKERSFIELD
Recorded By		GREG PERRY		GREG PERRY	
Witnessed By		MR. MEYER / MR. THOMAS		MR. ROTH	

The well name, location and borehole reference data were furnished by the customer.

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretations made by any of our officers, agents or employees. These interpretations are also subject to Clause 4 of our General Terms and Conditions as set out in our current Price Schedule.

Run No.	ONE	TWO
Service Order No.		
Drilling Fluid Level	0.0 F	
Salinity		
Rmf @ BHT	1.045 OHMM @ 96.0 DEGF	.085 OHMM @ 99.0 DEGF
Rmc @ BHT	.884 OHMM @ 96.0 DEGF	.094 OHMM @ 99.0 DEGF
Logging Speed	1800.0 F/HR	
EQUIPMENT DATA		
Tool Number 1	DIS 151	
Tool Number 2	DIC 159	
Tool Number 3	SLSWA	
Tool Number 4	SLC 432	
Tool Number 5	SGC 483	
Tool Number 6	TCCB 1289	
Tool Number 7	.	
Tool Number 8	AMS	
Tool Number 9	SHE	
Tool Number 10		
Tool Number 11		
Tool Number 12		

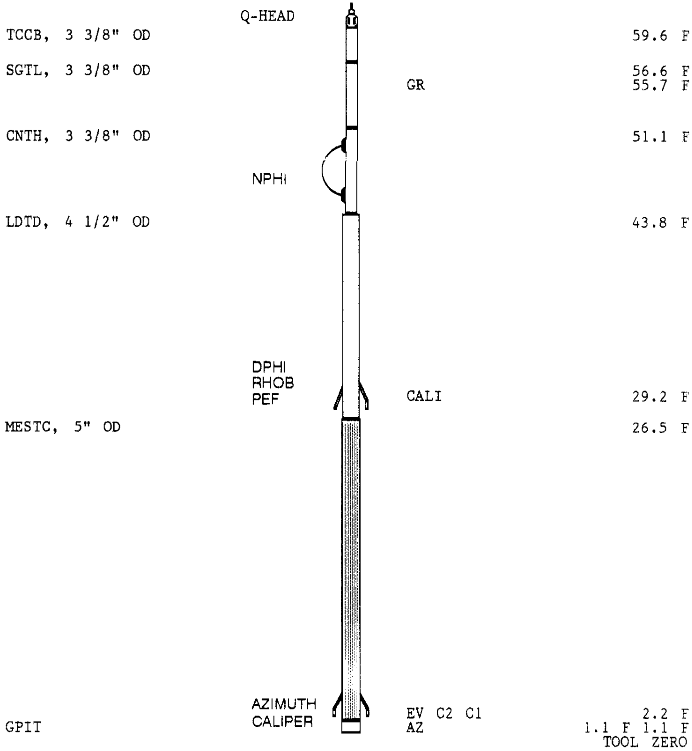
REMARKS:
RAN FLEX JOINTS ON INDUCTION AND SONIC. .
RAN 6 ARM FINS ON SONIC.

RAN FLEX JOINTS ABOVE FMS AND ABOVE AMS.
DID NOT TAG TD DUE TO PUSH DOWN TOOLS. .

CREW: DAN LEE.

THANKS FOR CHOOSING SCHLUMBERGER!!!!!!

LOGGING TOOL STRING SKETCH



TOTAL TOOL STRING LENGTH IS 61.6 F.
TOTAL TOOL STRING WEIGHT IS 1115. LB IN AIR.

MAIN PASS

FILES SPLICED	SPLICE DEPTH
101 TO 102	2319.0 F
102 TO 91	1985.0 F

```
ACCUMULATED INTEGRATION VALUES SUMMARY:

Integrated Hole Volume:   1906.53 F3    FROM 2750.50 F    TO 410.000 F
Integrated Cement Volume: 1520.37 F3    FROM 2750.50 F    TO 410.000 F
  (ASSUMING 5.50000 IN   O.D. CASING)
```

```
EVENT MARK SUMMARY:

OUTPUT                       INTERVAL       DEPTH TRACK
                             BETWEEN PIPS   EDGE

Integrated Hole Volume       10.0000 F3     LEFT EDGE
Integrated Cement Volume     10.0000 F3     RIGHT EDGE
```

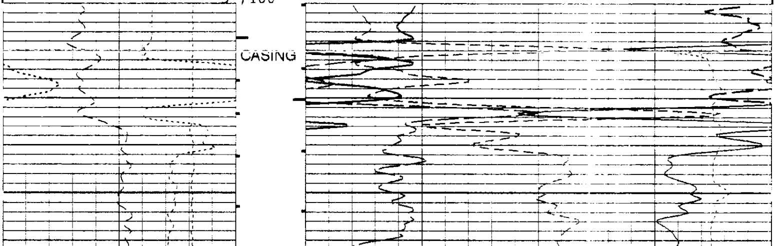
```
                          CHANGED PARAMETERS

NAME  VALUE       UNIT  DEPTH ( F )     NAME  VALUE      UNIT  DEPTH ( F )

DO    0.0         F       1986.0
```

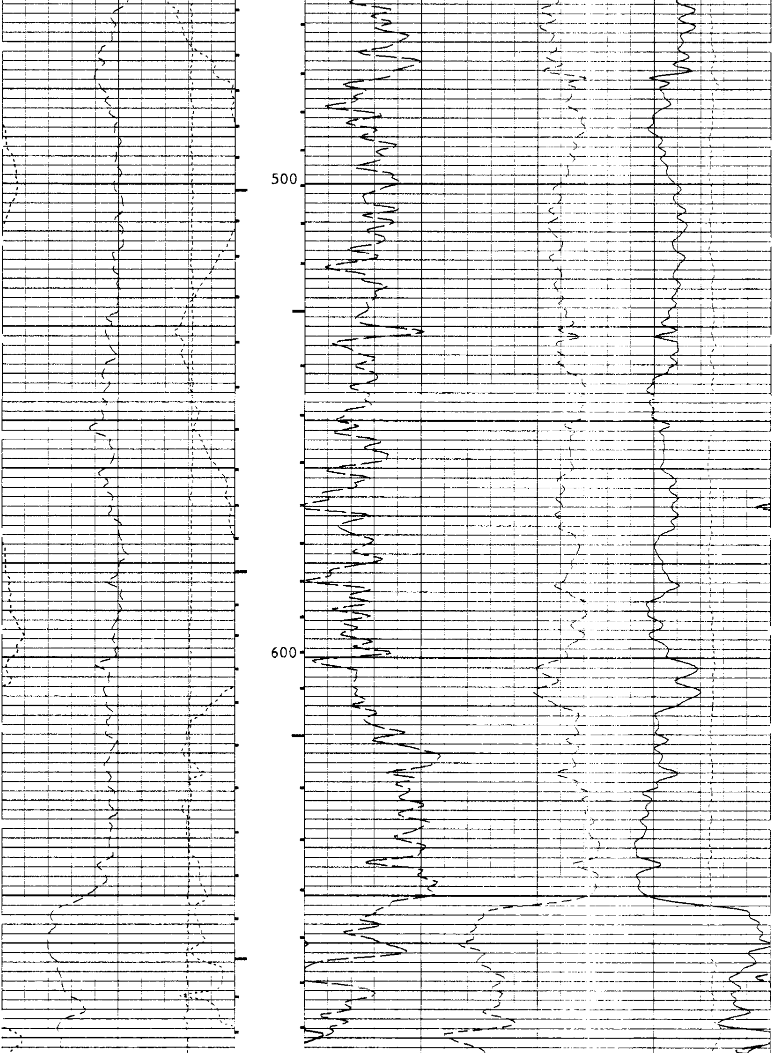
TENS(LBF)	10000.	0.0
GR(GAPI)	0.0	150.00
CALI(IN)	6.0000	16.000
DRHO(G/C3)	-.2500	.25000
RHOB(G/C3)	3.0000	2.0000
NPHI(V/V)	.60000	0.0
DPHI(V/V)	.60000	0.0

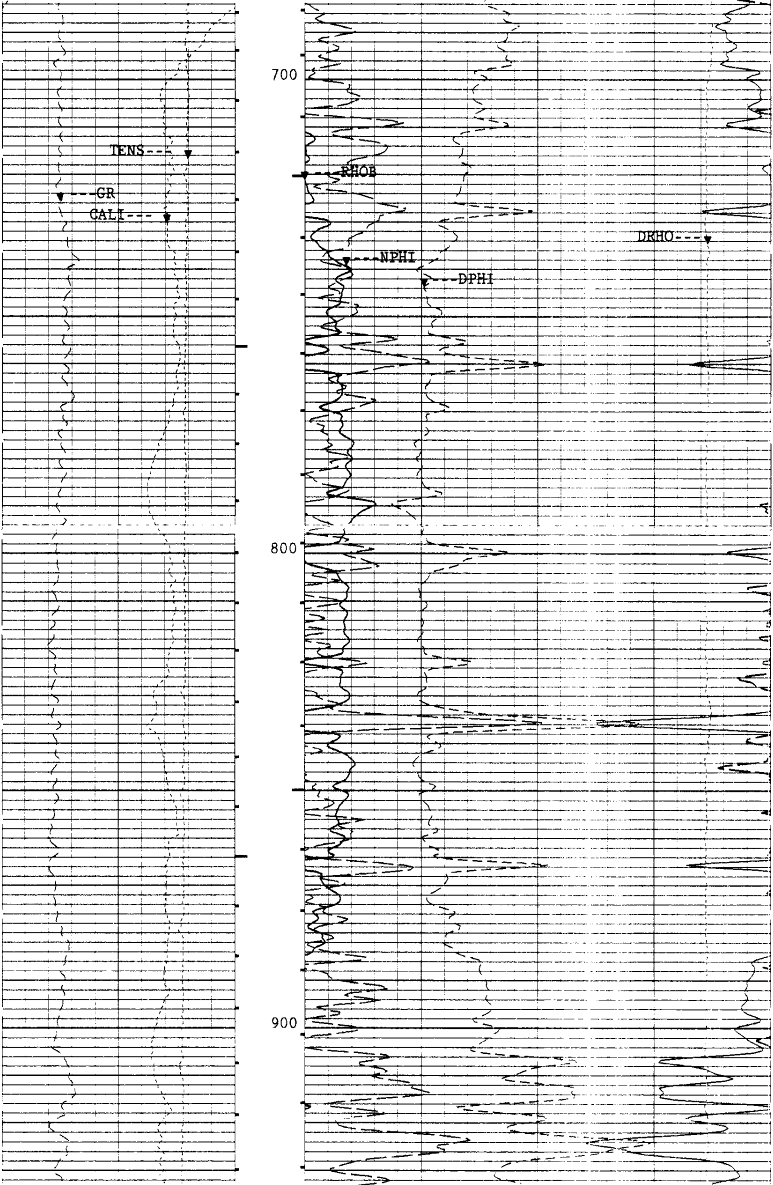
▨ CROSSOVER

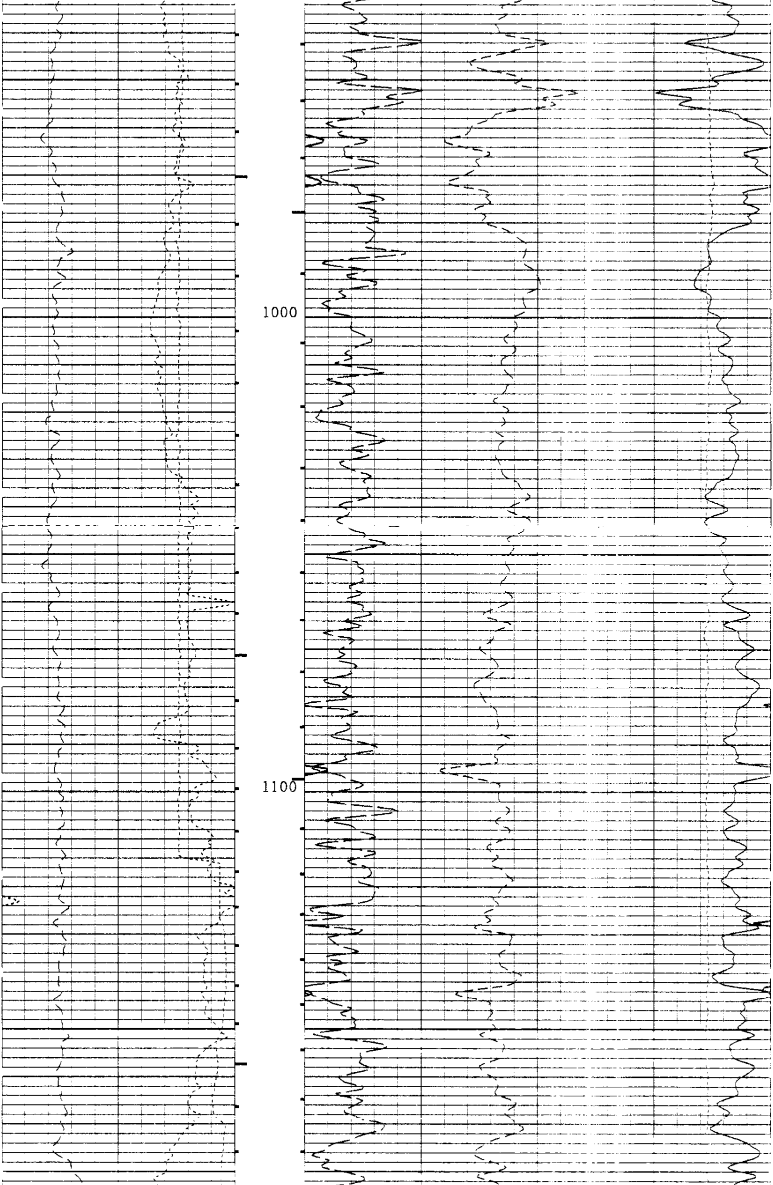
```
    CP 44.2            FILE  105       23-JAN-1998 16:31

                       INPUT FILE(S)   CREATION DATE
                           91          17-JAN-1998
```

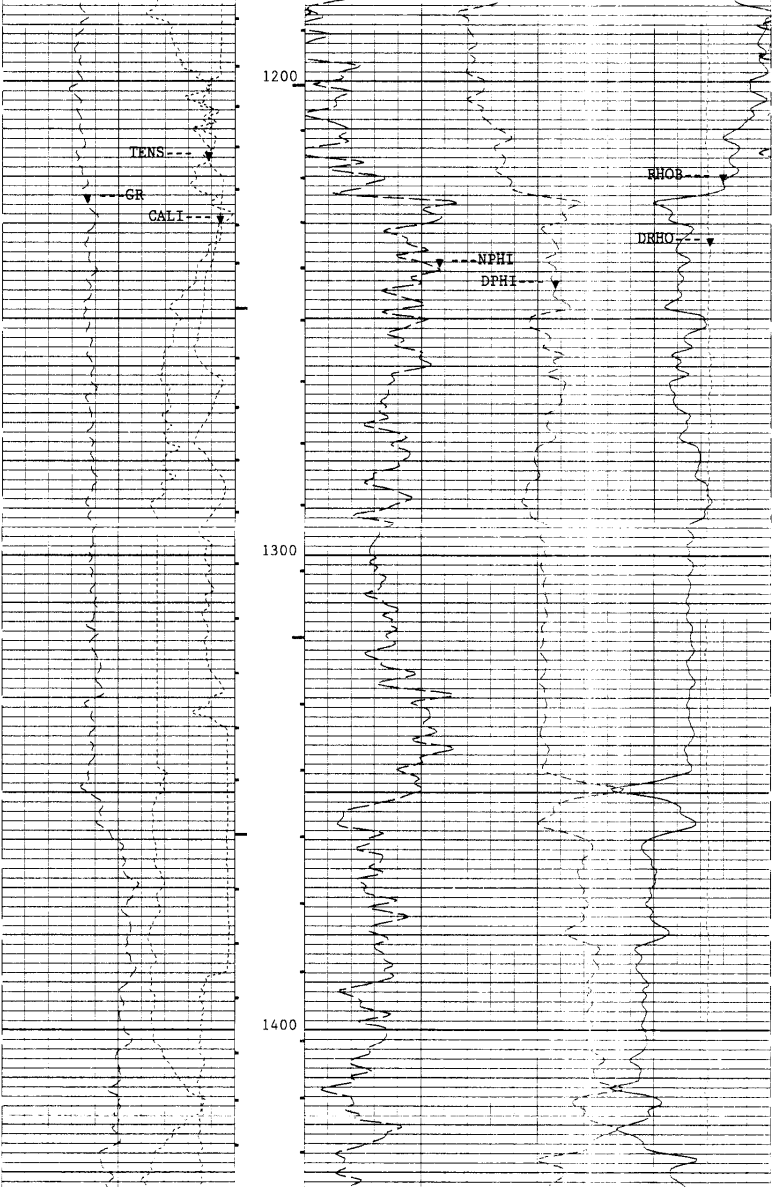
5"/100'

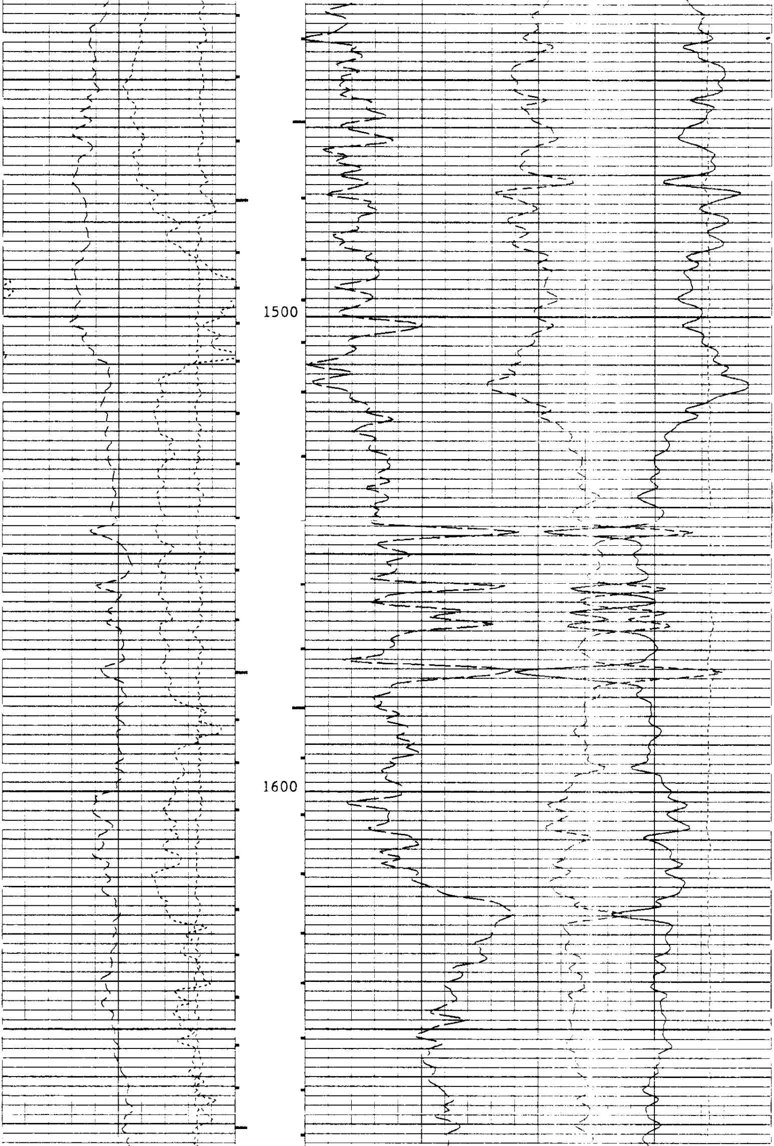


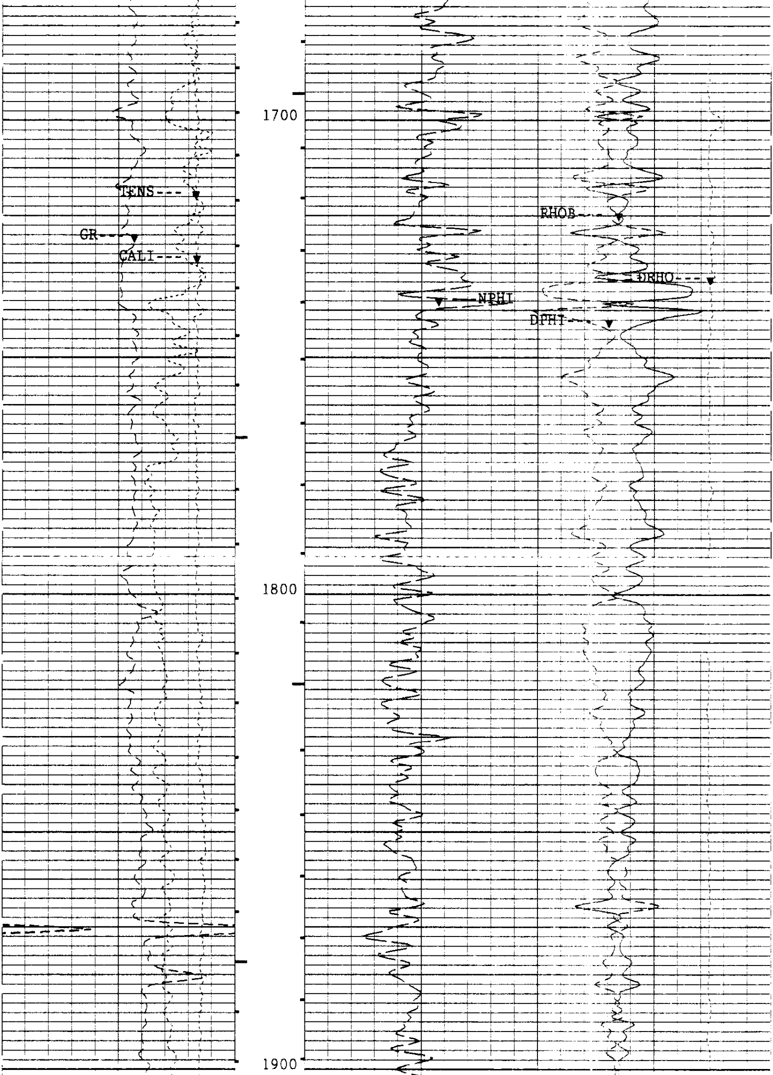


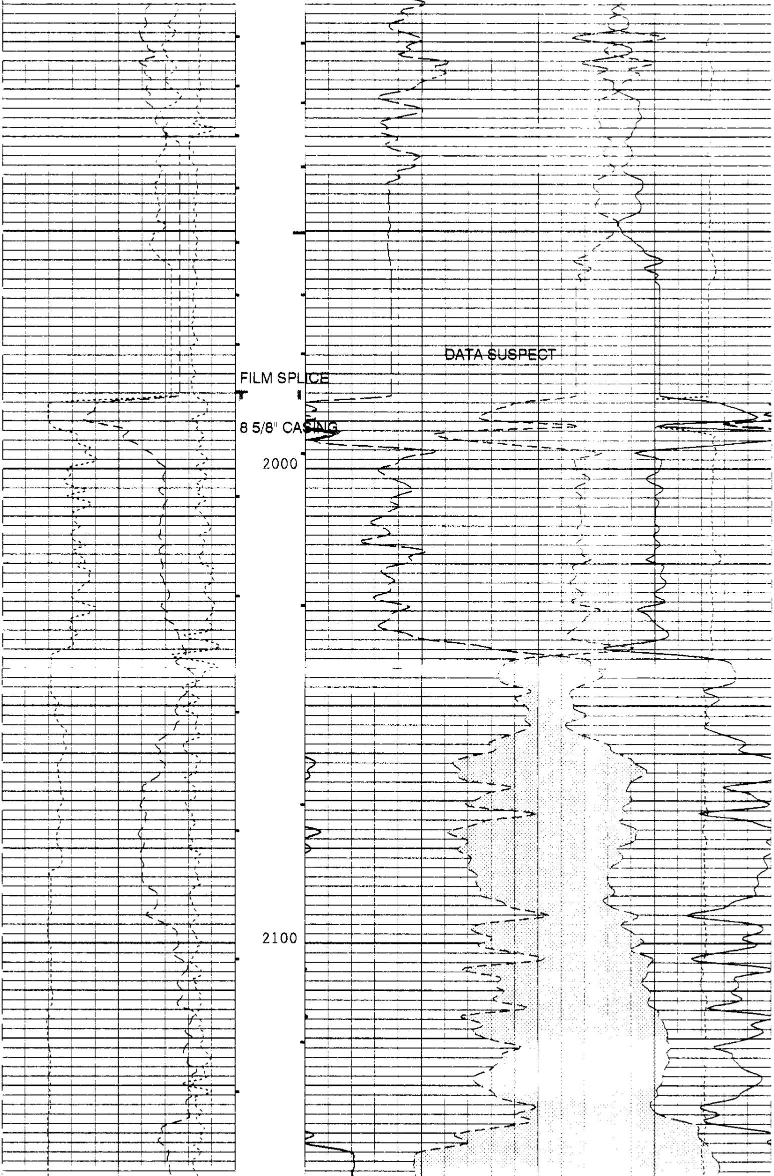


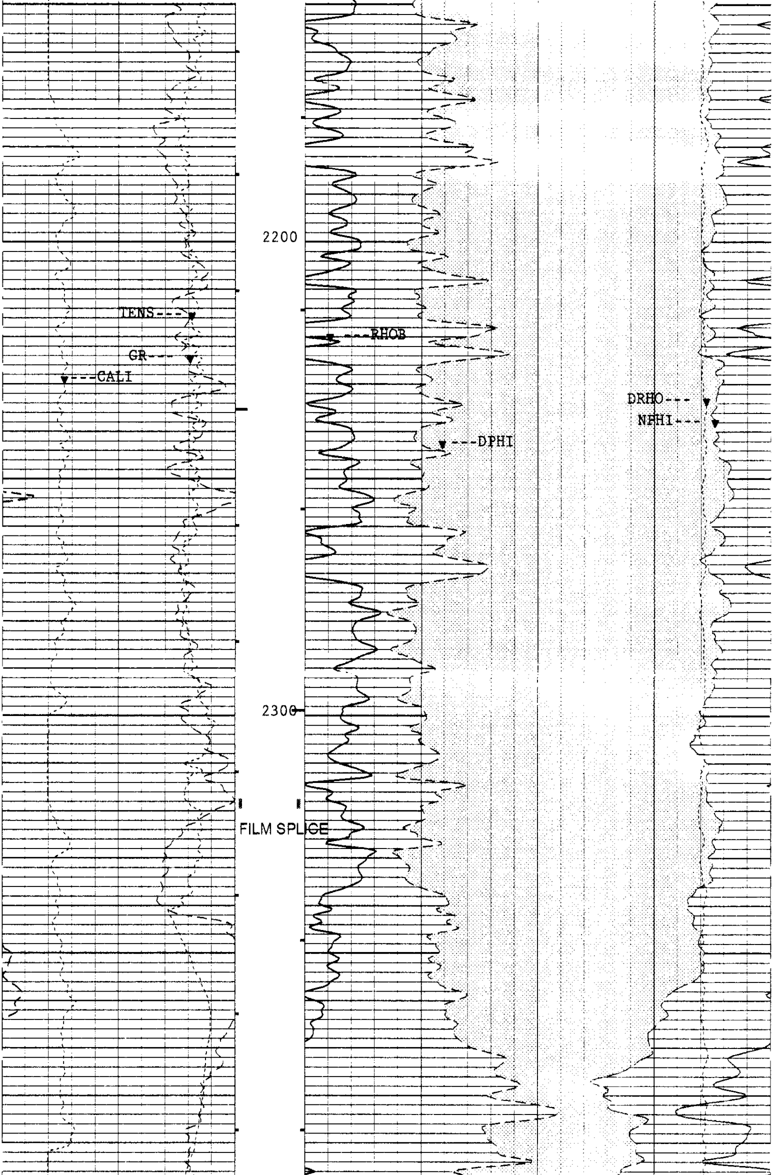


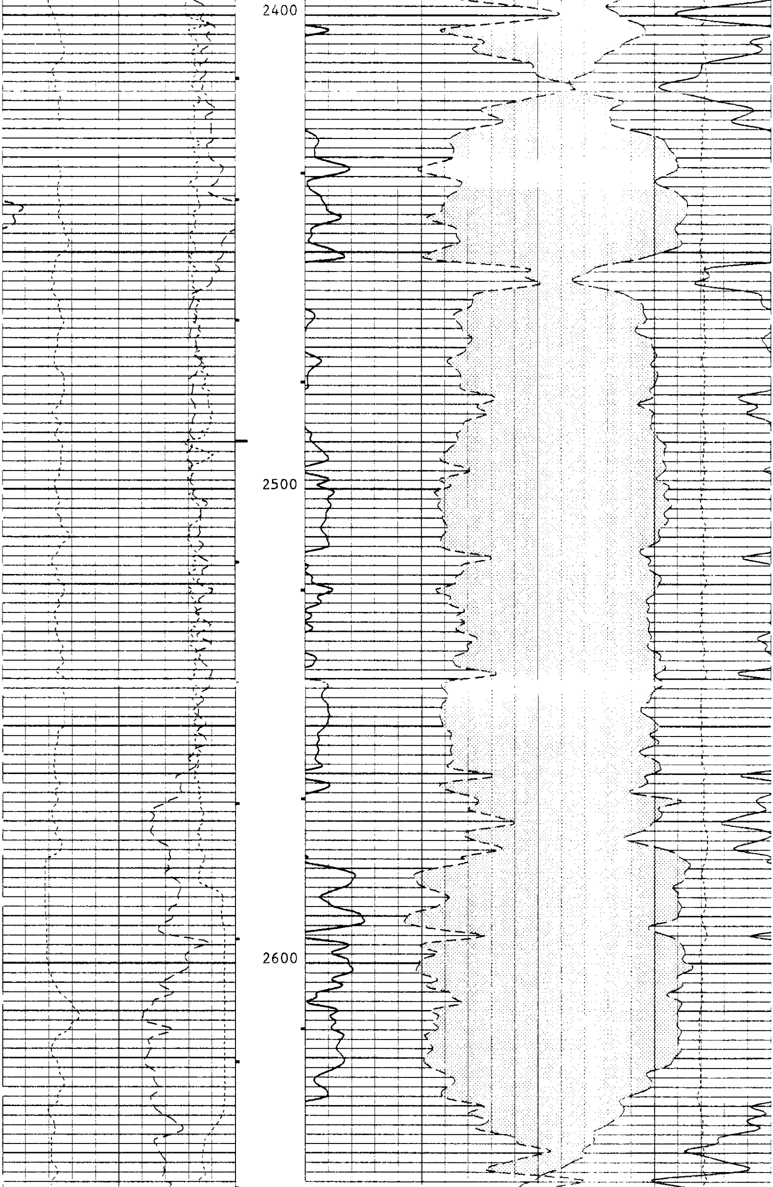


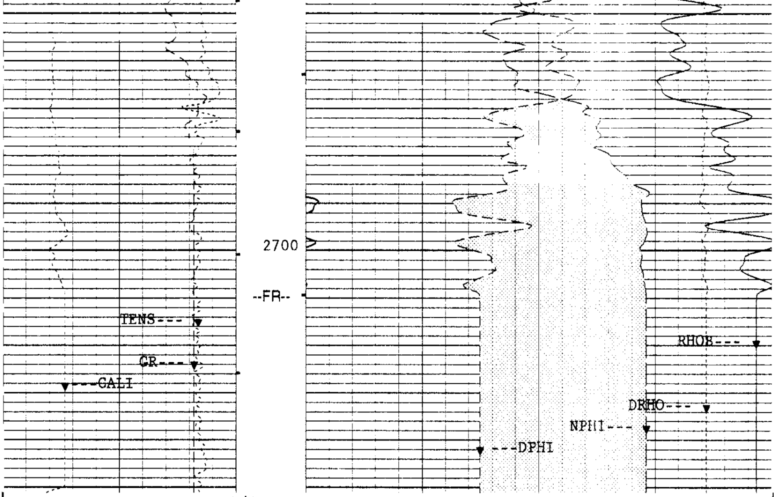












5"/100'

CP 44.2 FILE 105 23-JAN-1998 16:21

INPUT FILE(S) CREATION DATE
101 23-JAN-1998 13:32

CROSSOVER

		DRHO(G/C3)	
		- 2500	25000
TENS(LBF)		RHOB(G/C3)	
10000.	0.0	3.0000	2.0000
GR(GAPI)		NPHI(V/V)	
0.0	150.00	.60000	0.0
CALI(IN)		DPHI(V/V)	
6.0000	16.000	.60000	0.0

SENSOR MEASURE POINT TO TOOL ZERO

LDTD	2.7	FEET	SGTL	31.2	FEET
CNTH	20.7	FEET	DTT	-2.9	FEET
AMS	40.4	FEET			

PARAMETERS

NAME	VALUE	UNIT	NAME	VALUE	UNIT

```
PP   NORM                             DO   4.00000      F
WMUD 8.50000     LB/G                 NCJT GSRY
DHC  BS                               BFM  LIQU
NPDC 0                                HSCO YES
SOCO NO                               MCCO NO
BSCO NO                               FSCO NO
MWCO NO                               PTCO NO
CCCO NO                               SDAT SOCN
MCOR NATU                             SOCN .500000      IN
FSAL -50000.0    PPM                  ANGL 0.0          DEG
GGRD .0100000    DF/F                 BHFL WATE
MDEN 2.65000     G/C3                 FD   1.00000      G/C3
DPPM STAN                             MATR SAND
HC   CALI                             DTCI 0.0          F
FCD  5.50000     IN                   DFD  9.80000      LB/G
RMFS 1.56000     OHMM                 MFST 62.0000      DEGF
BS   7.87500     IN                   BHS  OPEN
```

REPEAT SECTION

```
SPEED CORRECTION NOT APPLIED
```

```
ACCUMULATED INTEGRATION VALUES SUMMARY:

Integrated Hole Volume:   278.351 F3    FROM 654.000 F    TO 392.500 F
Integrated Cement Volume: 171.222 F3    FROM 654.000 F    TO 392.500 F
  (ASSUMING 8.67500 IN   O.D. CASING)
```

```
EVENT MARK SUMMARY:

OUTPUT                        INTERVAL       DEPTH TRACK
                              BETWEEN PIPS   EDGE

Integrated Hole Volume        10.0000 F3     LEFT EDGE
Integrated Cement Volume      10.0000 F3     RIGHT EDGE
```

DRHO(G/C3)
-.2500 .25000

TENS(LBF)
10000. 0.0

GR(GAPI)
0.0 150.00

CALI(IN)
10.000 20.000

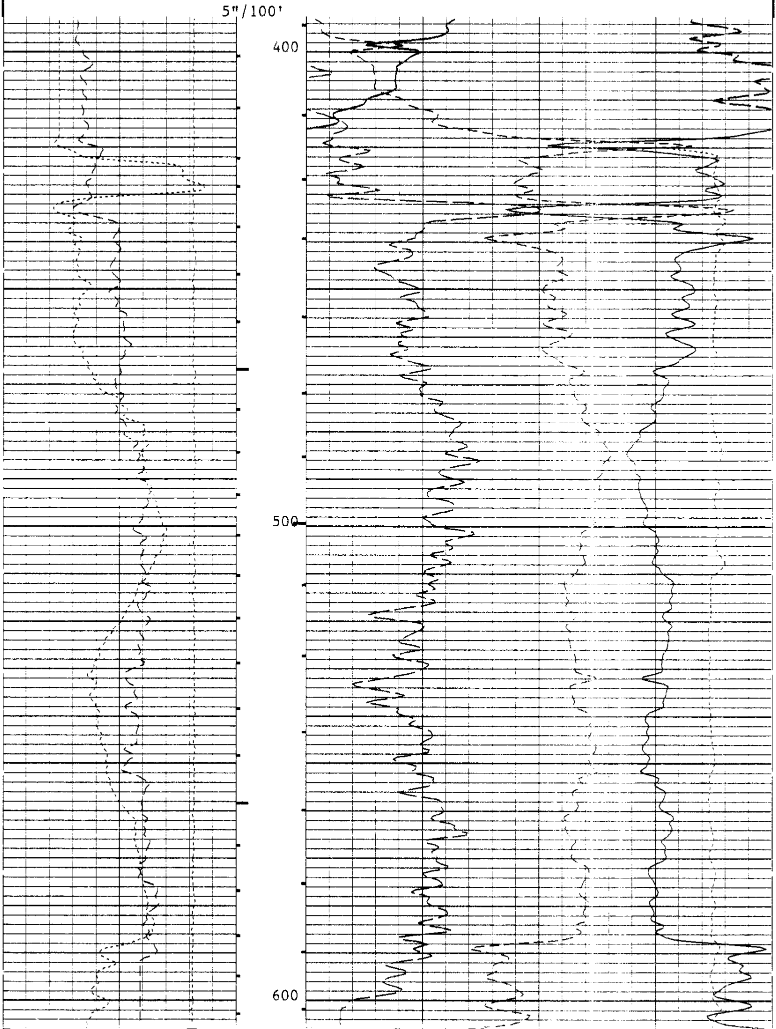
RHOB(G/C3)
3.0000 2.0000

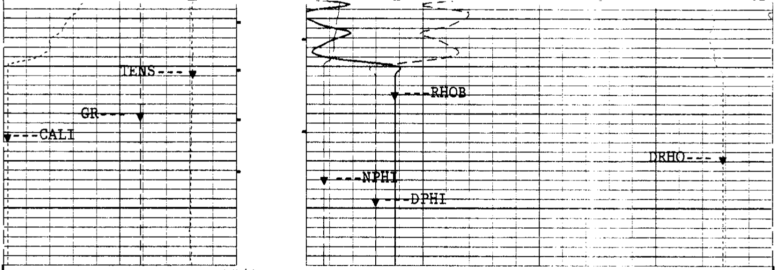
NPHI(V/V)
.60000 0.0

DPHI(V/V)
.60000 0.0

▨ CROSSOVER

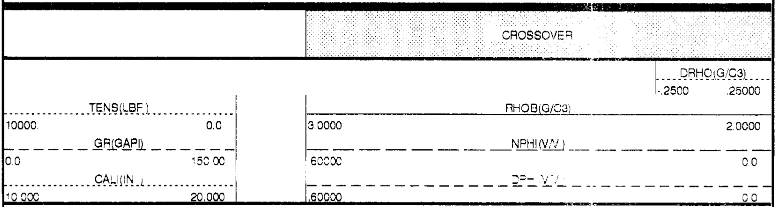
```
CP 44.2          FILE   64      16-JAN-1998 07:58      (UP)
```





5"/100'

CP 44.2 FILE 64 16-JAN-1998 07:43 (UP)



SENSOR MEASURE POINT TO TOOL ZERO

CNTC	48.2	FEET	CFTC	48.7	FEET
LL	31.1	FEET	LITH	31.1	FEET
LU	31.1	FEET	LS	31.1	FEET
SS1	30.6	FEET	PARI	30.6	FEET
GR	59.7	FEET	SS2	30.6	FEET
TENS	-10.9	FEET	CALI	31.2	FEET
C2	2.2	FEET	C1	2.2	FEET
MRPD	2.2	FEET	MDRB	2.2	FEET
MRPB	2.2	FEET	MRPC	2.2	FEET
AX	1.1	FEET	MRPA	2.2	FEET
AZ	1.1	FEET	AY	1.1	FEET
FY	1.1	FEET	FX	1.1	FEET
FCAX	1.1	FEET	FZ	1.1	FEET
FCAZ	1.1	FEET	FCAY	1.1	FEET
TNRA	49.2	FEET	FTIM	1.1	FEET

PARAMETERS

NAME	VALUE	UNIT	NAME	VALUE	UNIT
PADT	0.0	DEG	WMUD	9.80000	LB/G
NCJT	GSRY		DHC	BS	
BFM	LIQU		NPDC	0	
HSCO	YES		SOCO	NO	
MCCO	NO		BSCO	NO	
FSCO	NO		MWCO	NO	
PTCO	NO		CCCO	NO	
SDAT	SOCN		MCOR	NATU	
SOCN	.500000	IN	FSAL	-50000.0	PPM
ANGL	0.0	DEG	GGRD	.0100000	DF/F
BHFL	WATE		MDEN	2.65000	G/C3
FD	1.00000	G/C3	FCSR	0.1"	
AFMO	HAMM		ICMO	AUTO	
MDEC	18.6240	DEG	GLM	DIPM	
ICSD	-50000.0	F	RBS	AUTO	

```
PTYP MEC                            MLM  1800
SOFF -1.00000    IN                 CSR  .6"
ODFO RAW                            XMOD AUTO
XGAI 3                              XOFF 0
DPPM STAN                           MATR SAND
HC   CALI                           FCD  8.67500     IN
SPCR DISA                           DSCA 40          DEG
SBUT 8                              INT  4.00000     F
STEP 2.00000     F                  SPAN 4
SANG 35.0000                        DPAD AUTO
DMAX 90          DEG                ELRA .500000     IN
SDFA .900000                        HQUA 14
LQUA 6                              STDI 0.0         DEG
STDA 0.0         DEG                CSBL 2
STEM 45.0000     DEGF               DFD  10.0000     LB/G
RMFS .880000     OHMM               RMS  1.51000     OHMM
MST  85.0000     DEGF               MFST 68.0000     DEGF
BS   12.2500     IN                 BHS  OPEN
```

CALIBRATIONS

```
                SHOP Summary


  Performed:    20-OCT-1997 09:46
  Program File: CCSHOP (Version    44.2    95/07/25  95/07/25


DITE            Calibration Summary

Sonde Serial Number: 151
Cartridge Serial Number: 159


                        SHOP CONSTANTS

Test Loop Calibration:  Calibration of internal reference
                        to test loop standard


        Cons.   Gain    Valid Range     Cons.   Phase   Valid Range
                (---)     (---)                 ( DEG )   ( DEG )

10KHz:
  ILD:  DGF1     .999   .900 => 1.100   DPH1      .15  -1.50 =>  1.50
  ILM:  MGF1    1.054   .900 => 1.100   MPH1     -.32  -1.50 =>  1.50

20KHz:
  ILD:  DGF2    1.009   .900 => 1.100   DPH2     -.00  -2.00 =>  2.00
  ILM:  MGF2    1.058   .900 => 1.100   MPH2    -1.08  -3.00 =>  1.00

40KHz:
  ILD:  DGF4    1.023   .900 => 1.100   DPH4    -1.09  -4.00 =>  2.00
  ILM:  MGF4    1.083   .900 => 1.100   MPH4    -2.65  -5.00 =>  1.00

Sonde Error Corrections:  Correction for sonde response in Zero
                          Conductivity Environments

            Cons.  Sonde Error    Valid Range
                   Correction
                     (MM/M )        (MM/M )
```

```
10KHz:
   IRD SEC:  DRE1      31.60      -50.0 => 125.0
   IXD SEC:  DXE1     221.33     -250.0 => 350.0
   IRM SEC:  MRE1      63.89      -50.0 => 140.0
   IXM SEC:  MXE1      27.25    -1300.0 =>1300.0

20KHz:
   IRD SEC:  DRE2      11.56      -30.0 =>  30.0
   IXD SEC:  DXE2     124.49     -125.0 => 200.0
   IRM SEC:  MRE2      17.10      -50.0 =>  50.0
   IXM SEC:  MXE2      39.01     -650.0 => 650.0

40KHz:
   IRD SEC:  DRE4       1.24      -15.0 =>  15.0
   IXD SEC:  DXE4      79.27      -75.0 => 125.0
   IRM SEC:  MRE4       3.45      -30.0 =>  30.0
   IXM SEC:  MXE4      46.63     -350.0 => 350.0


NOTE: All Sonde Error Corrections have been normalized to 25 DegC.


                    Shop Electronic Calibration Summary

Electronic Calibration:  Calibration of System Electronics
                         using the internal reference

Induction Electronics:

         Offset    Valid Range     Gain  Valid Range     Phase   Valid Range
         (MM/M )    (MM/M )        (--)     (---)        (DEG.)    (DEG.)

10 KHz:
   IRD    20.1 -375. => 375.     .936   .75 => 1.25
   IXD    47.4 -375. => 375.     .942   .75 => 1.25     10.99  -5.00 => 20.00
   IRM    64.2 -900. => 900.     .954   .75 => 1.25
   IXM     1.5 -900. => 900.     .917   .75 => 1.25      8.98  -5.00 => 20.00

20 KHz:
   IRD     8.0 -150. => 150.     .983   .75 => 1.25
   IXD    19.6 -150. => 150.     .989   .75 => 1.25      9.11  -5.00 => 20.00
   IRM    26.2 -350. => 350.     .997   .75 => 1.25
   IXM      .7 -350. => 350.     .958   .75 => 1.25      8.51  -5.00 => 20.00

40 KHz:
   IRD     5.2 -100. => 100.     .979   .75 => 1.25
   IXD    13.1 -100. => 100.     .984   .75 => 1.25     24.78 -10.00 => 35.00
   IRM    17.0 -200. => 200.    1.003   .75 => 1.25
   IXM      .5 -200. => 200.     .964   .75 => 1.25     25.13 -10.00 => 35.00

SFL Electronics:

          Offset  Valid Range     Units      Gain   Valid Range

   SFV      .5  -16.0 => 16.0     MV          .988   .75 => 1.25
   SFC     -.0     -.7 =>   .7    MA          .987   .75 => 1.25


DITE                Electronics Calibration Summary

Sonde SN#: 151
Cartridge SN#: 159
Induction Freq: 20  KHz

Induction Electronics:

         Offset    Valid Range     Gain  Valid Range     Phase   Valid Range
         (MM/M )    (MM/M )        (--)     (---)        (DEG.)    (DEG.)

   IRD     8.0 -117. => 133.     .982   .84 => 1.18
   IXD    19.6 -105. => 145.     .988   .84 => 1.19      9.13  -5.89 => 24.11
   IRM    26.2 -199. => 251.     .995   .85 => 1.20
   IXM      .7 -224. => 226.     .956   .81 => 1.15      8.57  -6.49 => 23.51
```

```
SFL Electronics:

       Offset  Valid Range    Units      Gain   Valid Range

  SFV     .5   -14.5 => 15.5    MV         .99   .84 => 1.19
  SFC    -.0     -.6 =>   .6    MA         .99   .84 => 1.18

   CP 44.2          FILE    0      20-OCT-1997 09:45



                SHOP Summary


  Performed:    12-AUG-1997 11:13
  Program File: CCSHOP (Version    44.2    95/07/25  95/07/25


CNTH            Detector Calibration Summary

      CNC #                 : 4431
      Neutron Source #      : 2576
      Thermal Housing #     : 4431
      Alpha detectors       : Yes

          Input     Plus      Shop    Gain     Shop
                 Reference    Tank             Bkg
                   Counts    Counts           Counts

          CNTC    6031.00   5998.75   1.005    24.754
          CFTC    2793.00   2640.31   1.058    30.245

          RATIO     2.159     2.272

          Shop Counts temperature and housing size corrected

Shop Tank Calibration done: 12-AUG-1997 11:13

   CP 44.2          FILE    0      12-AUG-1997 11:13



                SHOP Summary


  Performed:    12-AUG-1997 14:06
  Program File: CCSHOP (Version    44.2    95/07/25  95/07/25


LDTD            Detector Calibration Summary

        Density Resistivity Sonde Number     :  4768
        Nuclear Service Cartridge Number     :  2979
        Powered Detector Housing Number      :  1989
        Powered Gamma-Gamma Detector Number  :  1989
        LDT Logging Source Number            :  1925
        LDT Calibration Mode                 :  WATE

                         Master Calibrated
                        Bkgd    Al+Fe     Al   Units
                  LL    19.9     91.5   100.0   CPS
                  LU    76.0    137.2   150.3   CPS
                  LS    58.0    160.1   175.1   CPS
                LITH     5.6     42.3    66.5   CPS
                 SS1    18.2    174.5   191.0   CPS
                 SS2    12.4    250.6   271.1   CPS

          HV Settings            Detector Resolutions
        HV LS:  1230.1 V              LS:  8.7 %
        HV SS:  1201.1 V              SS:  8.7 %
```

```
                  Spectrum Quality Ratios
          Computed Value       Nominal Value   Tolerance
   QRLS         .666              0.65           +/- 0.05
   QRSS         .704              0.72           +/- 0.10
   QRLI         .380              0.39           +/- 0.06
   QLIR        1.436              1.39           +/- 0.06
   QR          1.000              1.00           +/- 0.02

Shop Block Calibration done: 12-AUG-1997 13:57

   CP 44.2          FILE    0      12-AUG-1997 14:06
```

COMPANY	NORTHWEST NATURAL GAS CO.		
WELL	IW 22DH-22-65		
FIELD	MIST GAS STORAGE		
COUNTY:	COLUMBIA	**STATE:**	OREGON

SCHL.	**FR**	2725.0 F
SCHL.	**TD**	2735.0 F
DRLR.	**TD**	2746.0 F
Elev:	**KB**	595.7 F
	DF	
	GL	579.7 F

Schlumberger

FORMATION DENSITY COMPENSATED NEUTRON GAMMA RAY 5"