DOGAMI #503

Schlumberger

FORMATION DENSITY COMPENSATED NEUTRON GAMMA RAY 5"

COUNTY	COLUMBIA
FIELD	MIST GAS STORAGE
LOCATION	N 03-03-15 E 2291.54 & S 86-56-45 E
WELL	IW 22H-22-65
COMPANY	NORTHWEST NATURAL GAS

COMPANY NORTHWEST NATURAL GAS

WELL IW 22H-22-65

FIELD MIST GAS STORAGE

COUNTY: COLUMBIA **STATE:** OREGON

LOCATION
N 03-03-15 E 2291.54' & S 86-56-45 E
1907.87' FROM SW CORNER OF SEC 22

Other Services:
INDUCTION
SONIC
LDT
CNL
GR

API SERIAL NO.	SECT.	TWP.	RANGE
36-009-00323	22	T1	R6

Permanent Datum	GROUND LEVEL	**Elev.**	580.6 F		**Elev.: K.B.** 596.6 F
Log Measured From	KELLY BUSHING	16.0 F	**above Perm. Datum**		**D.F.**
Drilling Measured From	KELLY BUSHING				**G.L.** 580.6 F

Date	21-OCT-1997				
Run No.	ONE				
Depth Driller	1825.0 F				
Depth Logger (Schl.)	1820.0 F				
Btm. Log Interval	1784.0 F				
Top Log Interval	320.0 F				
Casing-Driller	13 3/8" @ 332.0 F		@	@	
Casing-Logger	332.0 F				
Bit Size	@		@	@	
Type Fluid in Hole	LSND				
Dens. / **Visc.**	10.00 LB/G	55.0 S			
pH / **Fld. Loss**	8.0				
Source of Sample	FLOWLINE				
Rm @ Meas. Temp.	2.000 OHMM @ 68.0 DEGF		@		
Rmf @ Meas. Temp.	1.140 OHMM @ 66.0 DEGF		@		
Rmc @ Meas. Temp.	.880 OHMM @ 66.0 DEGF		@		
Source: Rmf / **Rmc**	CELL	CELL			
Rm @ BHT	1.613 OHMM @ 86.0 DEGF		@		
TIME Circulation Ended	15:30 10-21-97				
TIME Logger on Bottom	SEE LOG				
Max. Rec. Temp.	86.0 DEGF				
Equip. / **Location**	8303	BAKERSFIELD			
Recorded By	GREG PERRY				
Witnessed By	MR. MEYER / MR. THOMAS				

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.

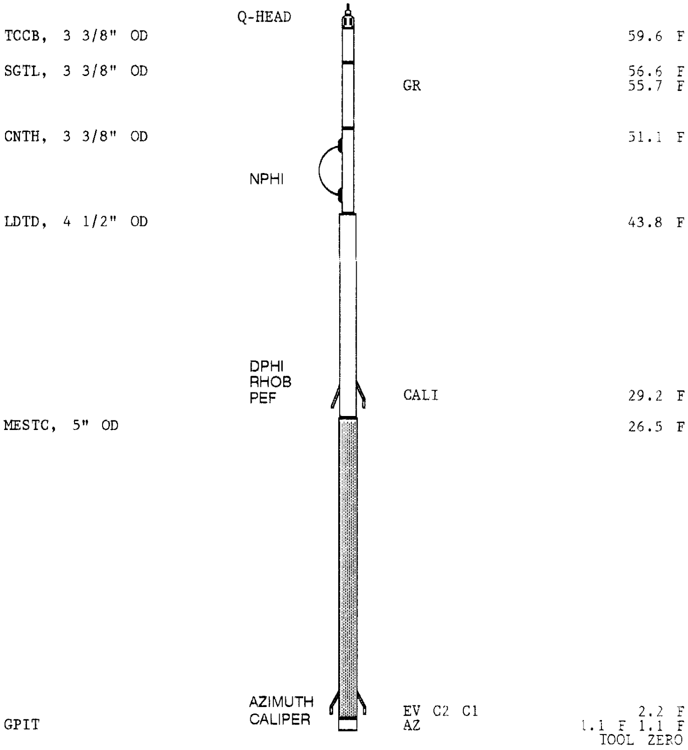
Run No.	ONE	
Service Order No.		
Drilling Fluid Level	0.0 F	
Salinity		
Rmf @ BHT	.895 OHMM @ 86.0 DEGF	@
Rmc @ BHT	.691 OHMM @ 86.0 DEGF	@
Logging Speed	1800.0 F/HR	
EQUIPMENT DATA		
Tool Number 1	DIS 151	
Tool Number 2	DIC 159	
Tool Number 3	SLS	
Tool Number 4	SLC	
Tool Number 5	SGC 483	
Tool Number 6	TCC 1289	
Tool Number 7	LDT 4768	
Tool Number 8	CNL 1345	
Tool Number 9	NSC 2979	
Tool Number 10		
Tool Number 11		
Tool Number 12		

REMARKS:

RAN CENTRALIZERS ON THE INDUCTION AND THE SONIC
TOOL TURNERS RAN ON THE CNL AND THE LDT.
FLEX JOINTS RAN ABOVE THE DIT,SLT AND THE CNL.
DIDNOT TAG UP ON BOTTOM DUE TO TLC PUSHDOWN.

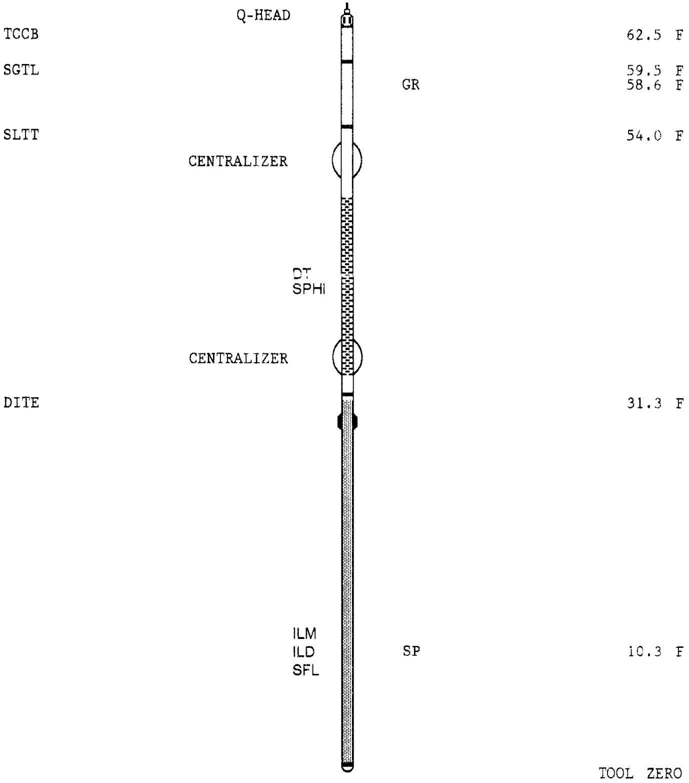
CREW: DAN LEE.
TLC MAN: DAVID BLYTHE.

LOGGING TOOL STRING SKETCH



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

LOGGING TOOL STRING SKETCH



TOTAL TOOL STRING LENGTH IS 64.7 F.
TOTAL TOOL STRING WEIGHT IS 1032. LB IN AIR.

MAIN PASS

FILES SPLICED	SPLICE DEPTH
82 TO 72	1286.0 F

ACCUMULATED INTEGRATION VALUES SUMMARY:

```
Integrated Transit Time:   .196406 S     FROM 1817.50 F    TO 311.500 F
Integrated Hole Volume:    1543.05 F3    FROM 1817.50 F    TO 311.500 F
Integrated Cement Volume:  924.895 F3    FROM 1817.50 F    TO 311.500 F
  (ASSUMING 8.67500 IN   O.D. CASING)
```

DRHO(G/C3)
-.2500 25000

TENS(LBF)
10000. 0.0

CALI(IN)
10.000 20.000

GR(GAPI)
0.0 150.00

DPHI(V/V)
.60000 0.0

NPHI(V/V)
.60000 0.0

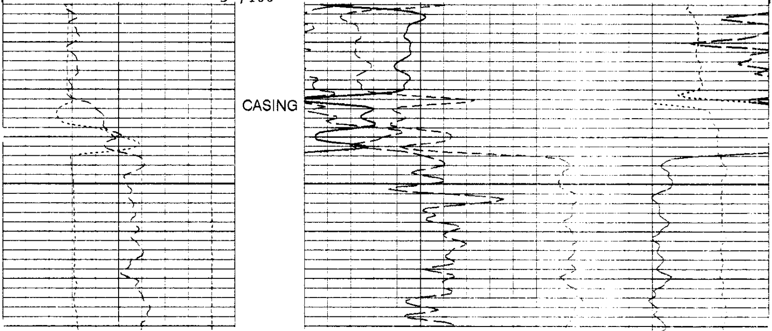
RHOB(G/C3)
3.0000 2.0000

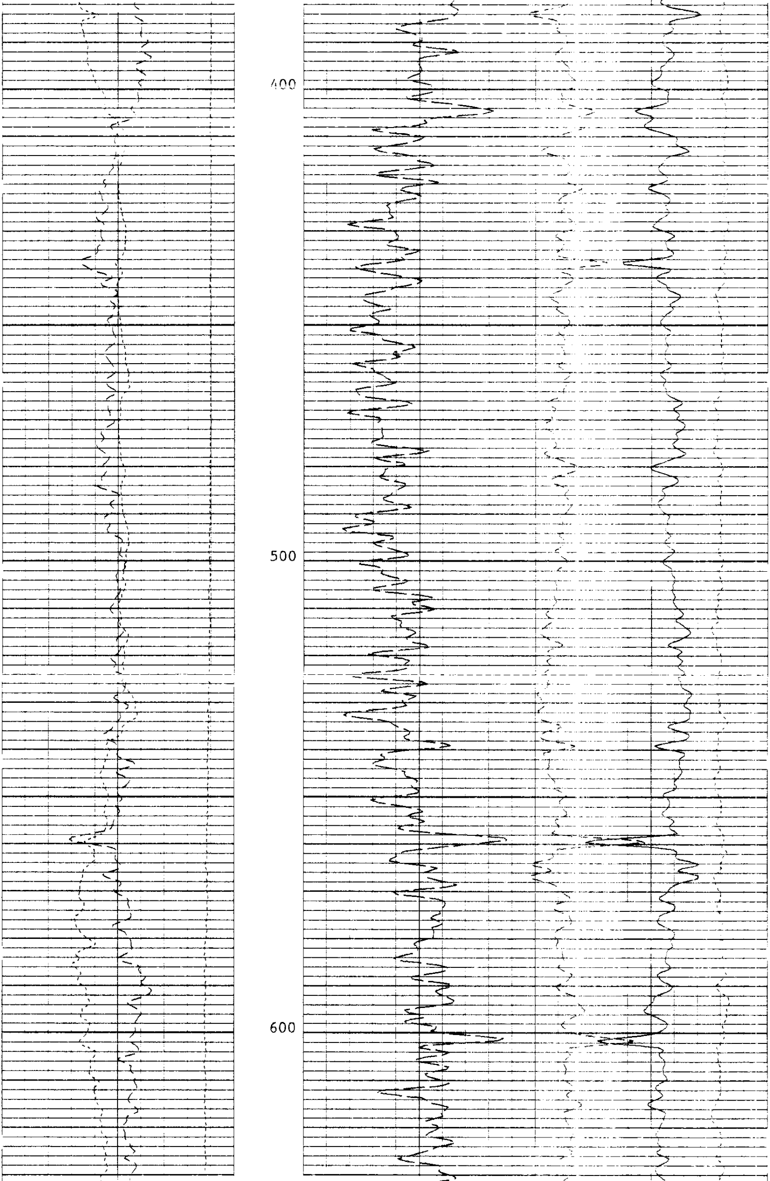
CROSSOVER

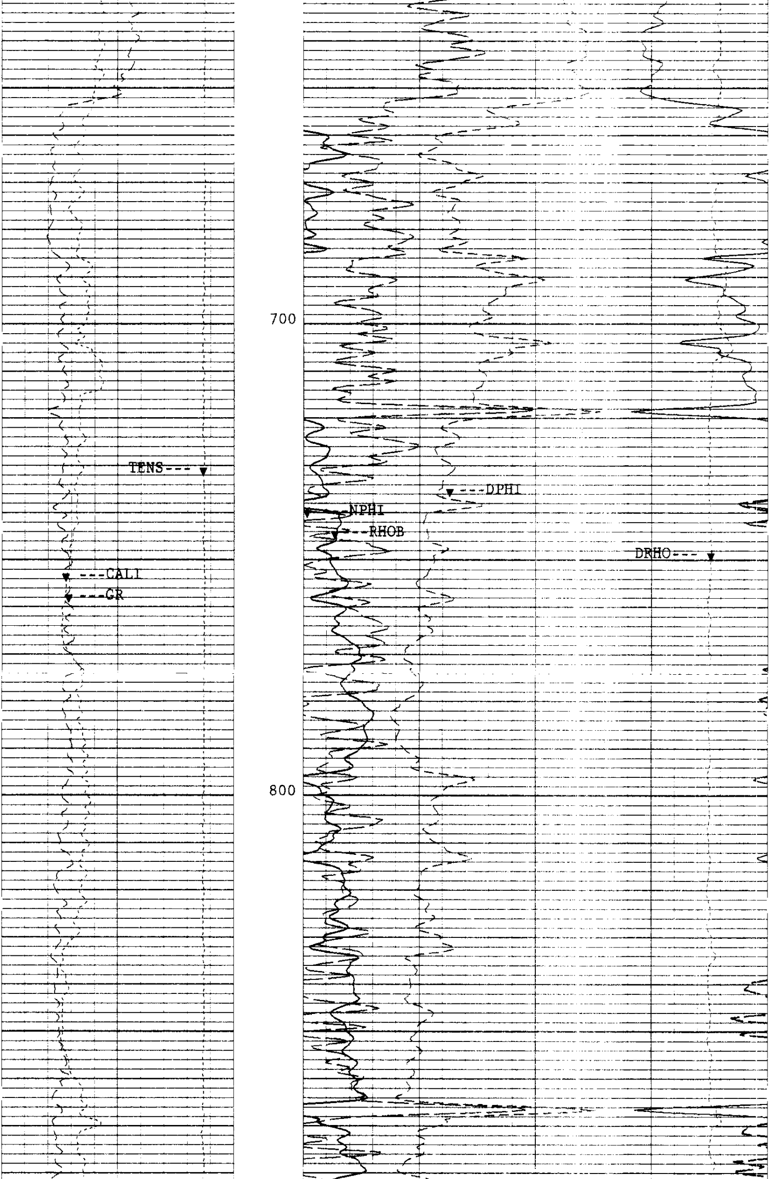
CP 44.2 FILE 83 22-OCT-1997 12:41

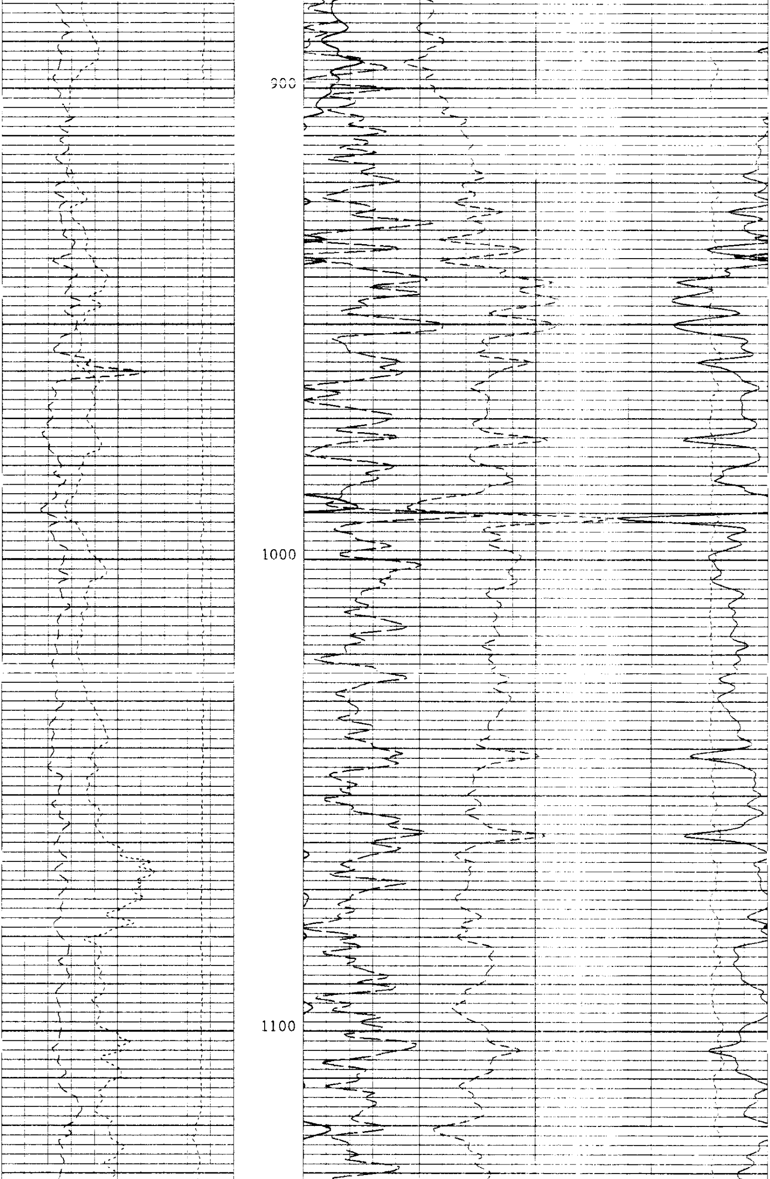
INPUT FILE(S) 72 CREATION DATE 22-OCT-1997 01:13

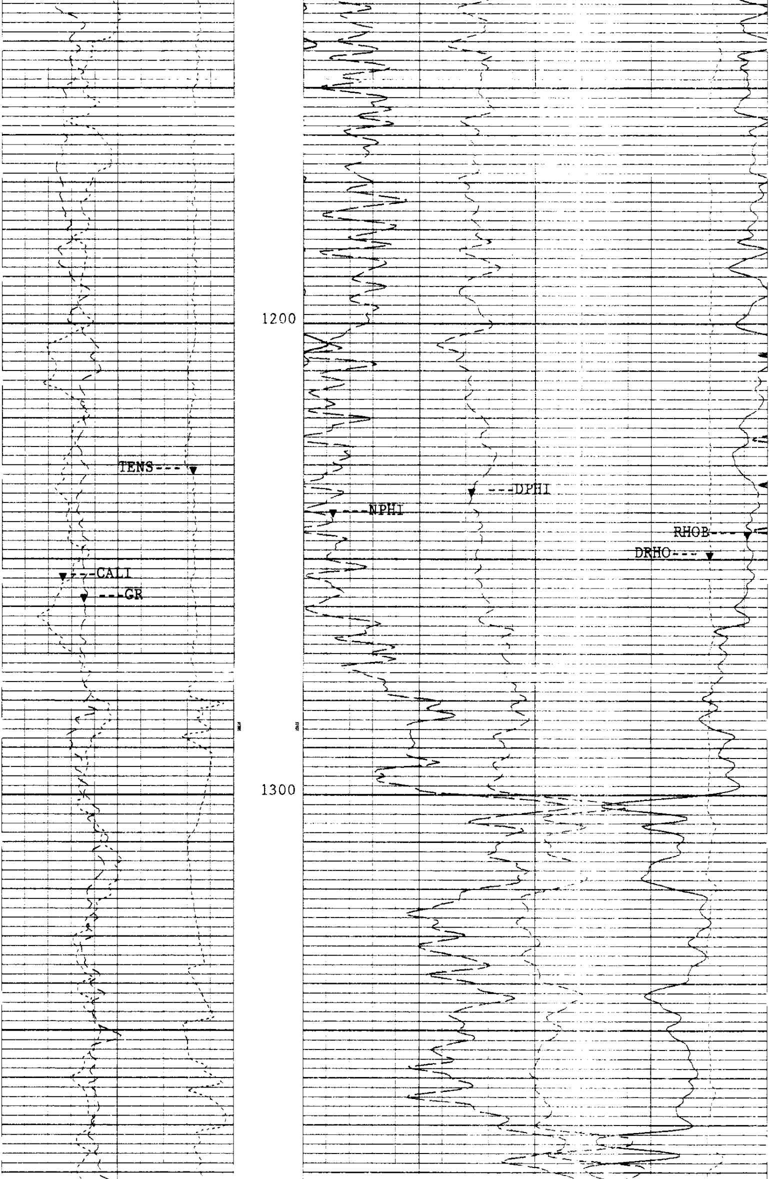
5"/100'

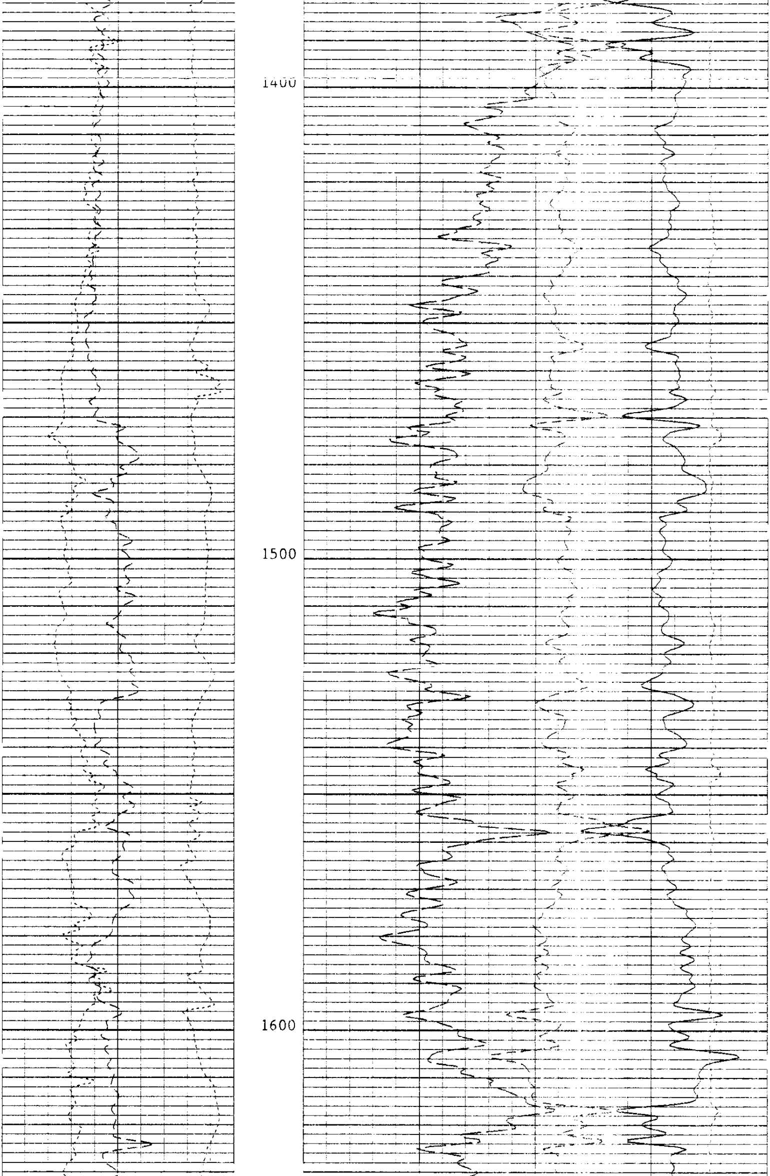


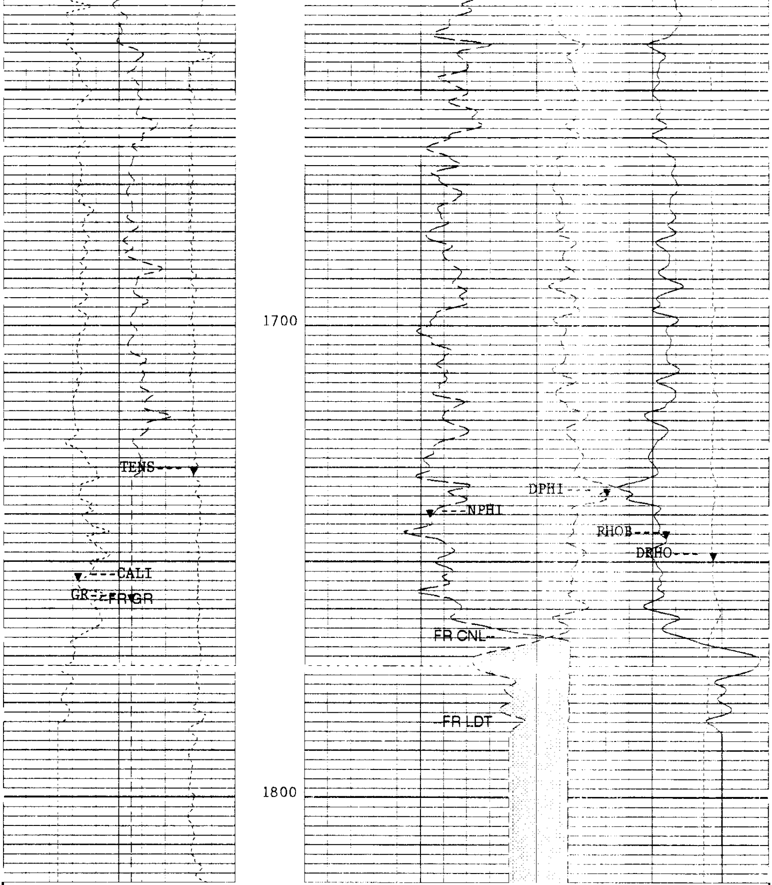












5"/100'

CP 44.2 FILE 83 22-OCT-1997 12:29

INPUT FILE(S) CREATION DATE
82 22-OCT-1997 12:23

		CROSSOVER
		DRHO(G/C3) -.2500 .25000
TENS(LBF) 10000. 0.0		DPHI(V/V) .60000 0.0
CALI(IN) 10.000 20.000		NPHI(V/V) .60000 0.0
GR(GAPI) 0.0 150.00		RHOB(G/C3) 3.0000 2.0000

SENSOR MEASURE POINT TO TOOL ZERO

DITE	10.3	FEET	SGTL	89.2	FEET
DTT	3.0	FEET	LDTD	36.0	FEET
AMS	98.4	FEET	CNTH	54.0	FEET
SLTT	68.2	FEET			

PARAMETERS

NAME	VALUE	UNIT	NAME	VALUE	UNIT
SMB	DISA		VDLR	2IN	
TOCA	DISA		RATE	15	HZ
DG	AUTO		DETE	E2	
NMSG	180	US	CBLG	35	US
AMPL	2		CBL	2	
WFM	1		SS	FAST	
TOD	DISA		SLC	UA	
DTF	189.000	US/F	DTM	56.0000	US/F
CDTS	100.000		SPFS	R-H	
PP	RECO		DO	0.0	F
WMUD	10.0000	LB/G	TD	32768.0	F
FCD	8.67500	IN	DHC	BS	
BFM	LIQU		MDEN	2.65000	G/C3
FD	1.00000	G/C3	DPPM	STAN	
MATR	SAND		HC	CALI	
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	
IFRS	20	KHZ	SBR	1.00000	OHMM
MXE2	39.0062	MM/M	DXE2	124.493	MM/M
MRE2	17.0971	MM/M	DRE2	11.5626	MM/M
MPH2	-1.08185	DEG	DPH2	-.001757	DEG
MGF2	1.05831		DGF2	1.00935	
DESP	DISA		SFLE	ALLO	
DCAS	-50000.0	F	ITEN	ALLO	
DEVI	80.0000	DEG	DSES	H48	
IPRO	STAN		IPHA	NORM	
DWCO	512		DSIN	5	US
DDEL	200	US	CDSE	RHOB	
CNPS	NPHI		NCJT	GSRY	
GTSE	TEMP		SHT	55.0000	DEGF
BHT	86.0000	DEGF	DTCI	0.0	F
SPAE	DISA		DFD	10.0000	LB/G
RMFS	1.14000	OHMM	MFST	66.0000	DEGF
BS	12.2500	IN	BHS	OPEN	

REPEAT SECTION

```
ACCUMULATED INTEGRATION VALUES SUMMARY:

Integrated Hole Volume:   332.073 F3    FROM 1418.50 F    TO 1090.50 F
Integrated Cement Volume: 197.444 F3    FROM 1418.50 F    TO 1090.50 F
  (ASSUMING 8.67500 IN   O.D. CASING)
```

DRHO(G/C3)
-.2500 .25000

TENS(LBF)
10000. 0.0

CALI(IN)
10.000 20.000

GR(GAPI)
0.0 150.00

DPHI(V/V)
60000 0.0

NPHI(V/V)
60000 0.0

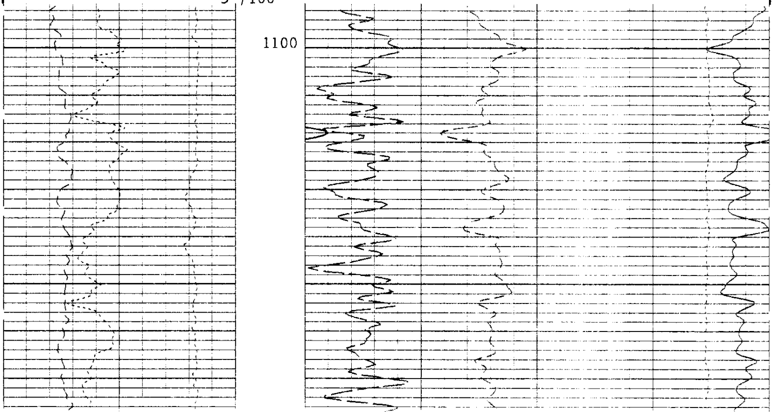
RHOB(G/C3)
3.0000 2.0000

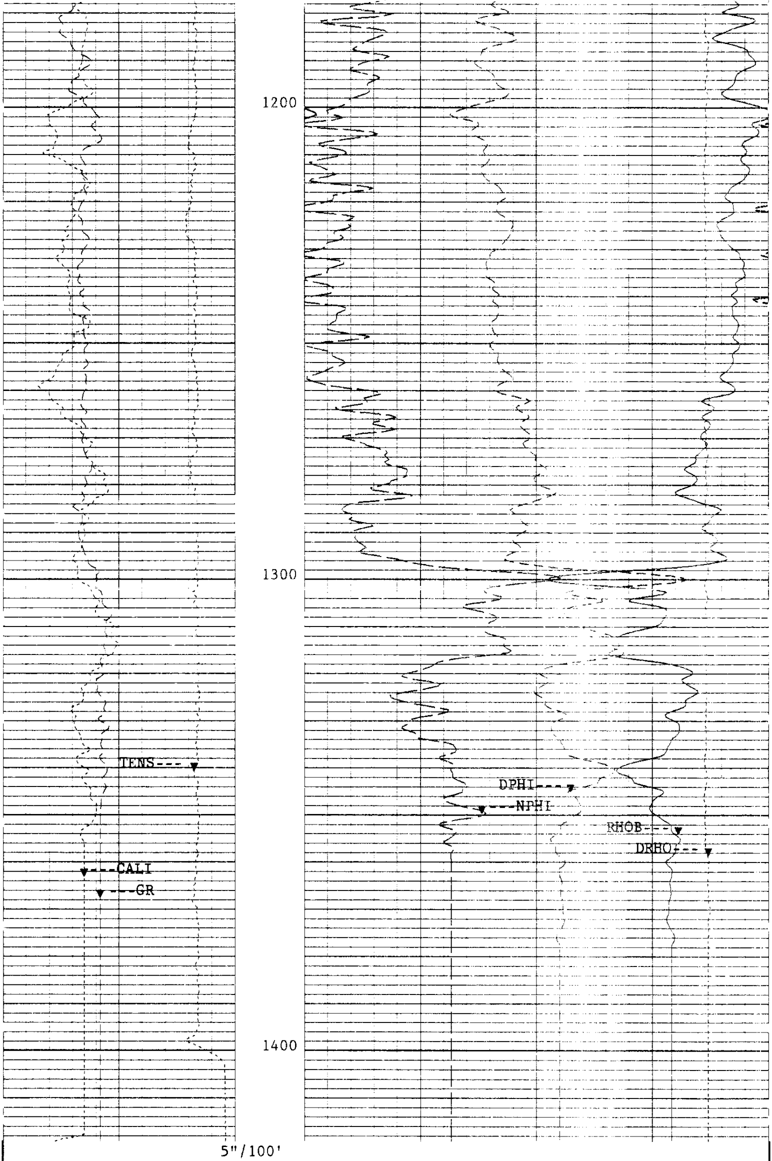
CROSSOVER

```
   CP 44.2          FILE   84       22-OCT-1997 12:44

                    INPUT FILE(S)   CREATION DATE
                          59        21-OCT-1997 20:39

                    5"/100'
```





CP 44.2 FILE 84 22-OCT-1997 12:42

INPUT FILE(S)	CREATION DATE
59	21-OCT-1997 20:39

CROSSOVER

TENS(LBF)		DPHI(V/V)	DRHO(G/C3) -.2500 .25000
10000.	0.0	.60000	0.0
CALI(IN)		NPHI(V/V)	
10.000	20.000	.60000	0.0
GR(GAPI)		RHOB(G/C3)	
0.0	150.00	3.0000	2.0000

SENSOR MEASURE POINT TO TOOL ZERO

DITE 10.3 FEET
DTT -2.9 FEET
AMS 98.4 FEET
SLTT 68.2 FEET

SGTL 89.2 FEET
LDTD 36.0 FEET
CNTH 54.0 FEET

PARAMETERS

NAME	VALUE	UNIT	NAME	VALUE	UNIT
SMB	DISA		VDLR	2IN	
TOCA	DISA		RATE	15	HZ
DG	AUTO		DETE	E2	
NMSG	180	US	CBLG	35	US
AMPL	2		CBL	2	
WFM	1		SS	FAST	
TOD	DISA		SLC	UA	
DTF	189.000	US/F	DTM	56.0000	US/F
CDIS	100.000		SPFS	R-H	
PP	NORM		DO	0.0	F
WMUD	10.0000	LB/G	TD	32768.0	F
FCD	8.67500	IN	DHC	BS	
BFM	LIQU		MDEN	2.65000	G/C3
FD	1.00000	G/C3	DPPM	STAN	
MATR	SAND		HC	CALI	
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	
IFRS	20	KHZ	SBR	1.00000	OHMM
MXE2	39.0062	MM/M	DXE2	124.493	MM/M
MRE2	17.0971	MM/M	DRE2	11.5626	MM/M
MPH2	-1.08185	DEG	DPH2	-.001757	DEG
MGF2	1.05831		DGF2	1.00935	
DESP	DISA		SFLE	ALLO	
DCAS	-50000.0	F	ITEN	ALLO	
DEVI	80.0000	DEG	DSES	H48	
IPRO	STAN		IPHA	NORM	
DWCO	512		DSIN	5	US
DDEL	200	US	CDSE	RHOB	
CNPS	NPHI		NCJT	GSRY	
GTSE	TEMP		SHT	55.0000	DEGF
BHT	86.0000	DEGF	DTCI	0.0	F
SPAE	DISA		DFD	10.0000	LB/G
RMFS	1.14000	OHMM	MFST	66.0000	DEGF
BS	12.2500	IN	BHS	OPEN	

CALIBRATIONS

```
               BEFORE SURVEY CALIBRATION Summary


  Performed:    21-OCT-1997 20:33
  Program File: NSDIP  (Version    44.2    95/07/25  95/07/25)


MEST            Caliper Calibration Summary

            MEASURED                      CALIBRATED
          Small    Large              Small      Large        UNITS
    C1    8.69    12.73               8.00      11.88          IN
    C2    8.99    12.89               8.00      11.88          IN

Small: 21-OCT-1997 20:29 Large: 21-OCT-1997 20:30 Comp: 21-OCT-1997 20:30


GPIC            Calibration Summary

 MAGNETOMETER MANUFACTURER CODE:                  3
 MAGNETOMETER SERIAL NUMBER:                     10
 MAGNETOMETER REFERENCE TEMPERATURE :            20.0  DEGC


GPIC            Calibration Summary

 ACCELEROMETER MANUFACTURER CODE:                  3
 ACCELEROMETER SERIAL NUMBER:                    339
 ACCELEROMETER REFERENCE TEMPERATURE :            20.0  DEGC


CNTH            Detector Calibration Summary

     Neutron Cartridge Number     : 1345
     Neutron Source Number        : 2576
     Thermal Housing Number       : 4431
     Alpha detectors              : Yes

         Input     Plus      Shop    Gain      Shop      Before     Tol.
                 Reference   Tank                Bkg       Bkg       Bkg
                  Counts    Counts             Counts    Counts    Counts

         CNTC    6031.00   5998.75   1.005    24.754    24.678     3.713
         CFTC    2793.00   2640.31   1.058    30.245    31.108     4.537

         Ratio     2.159     2.272


Before Survey Calibrations done: 21-OCT-1997 20:21


LDTD            Detector Calibration Summary

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

                Measured       Shop  Values
                  Bkgd        Al+Fe    Al        Units
           LL     19.7         91.5  100.0        CPS
           LU     76.1        137.2  150.3        CPS
           LS     57.8        160.1  175.1        CPS
          LITH     5.6         42.3   66.5        CPS
          SS1     18.1        174.5  191.0        CPS
```

```
          SS2      12.3        250.6  271.1      CPS

            HV Settings          Detector Resolutions
          HV LS:  1234.0 V            LS:  8.7 %
          HV SS:  1208.4 V            SS:  8.7 %

Wellsite Calibration done: 21-OCT-1997 20:27


SGTL            Detector Calibration Summary

             MEASURED
           BKGD    JIG         CALIBRATED         UNITS
    GR       0       0            0               GAPI

Back:                     Jig:                      Comp:


LDTD            Caliper Calibration Summary

             MEASURED                    CALIBRATED
           Small   Large                 Small     Large       UNITS
  CALI      .80     .80                  2.59      2.59         IN

Small: 27-SEP-1997 15:47 Large: 27-SEP-1997 15:46 Comp: 27-SEP-1997 15:46

   CP 44.2             FILE   58       21-OCT-1997 20:31
```

```
                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			**SCHL.**	**FR** 1784.0 F
				SCHL.	**TD** 1820.0 F
WELL	IW 22H-22-65			**DRLR.**	**TD** 1925.0 F
FIELD	MIST GAS STORAGE			**Elev:**	**KB** 596.6 F
					DF
COUNTY:	COLUMBIA	**STATE:**	OREGON		**GL** 580.6 F

Schlumberger

FORMATION DENSITY
COMPENSATED NEUTRON
GAMMA RAY 5"