DOGAMI #503

Schlumberger

SONIC / GAMMA RAY SP LOG

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	~~T7~~ 6N	~~R6~~ 5W

Permanent Datum GROUND LEVEL Elev. 580.6 F
Log Measured From KELLY BUSHING 16.0 F above Perm. Datum
Drilling Measured From KELLY BUSHING

Elev.: K.B. 596.6 F
D.F.
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	1752.0 F		
Top Log Interval	0.0 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	@	
?mc @ Meas. Temp.	.880 OHMM @ 66.0 DEGF	@	
urce: Rmf | Rmc	CELL | CELL		
@ BHT	1.613 OHMM @ 86.0 DEGF	@	
irculation Ended	15:30 10-21-97		
ogger on Bottom	SEE LOG		
Rec. Temp.	86.0 DEGF		
. | Location	8303 | BAKERSFIELD		
rded By	GREG PERRY		
ed 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 willful 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

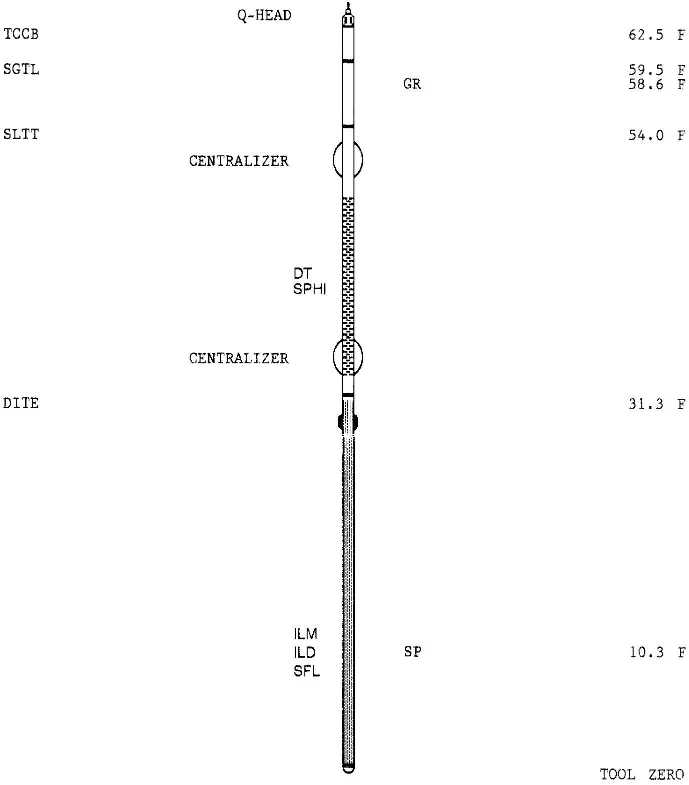
Run No.	ONE	
Service Order No.		
Drilling Fluid Level	0.0 F	
Salinity		
Rmf @ BHT	.895 OHMM @ 86.0 DEGF	@
Rmc @ BHT	.691 OHMM @ 86.0 DEGF	@
Logging Speed	1800.0 F/HR	
EQUIPMENT DATA		
Tool Number 1	DIS 151	
Tool Number 2	DIC 159	
Tool Number 3	SLS	
Tool Number 4	SLC	
Tool Number 5	SGC 483	
Tool Number 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 64.7 F.
TOTAL TOOL STRING WEIGHT IS 1032. LB IN AIR.
```

MAIN PASS

```
FILES SPLICED       SPLICE DEPTH

82  TO 76            1099.0 F
```

```
ACCUMULATED INTEGRATION VALUES SUMMARY:

Integrated Transit Time:  .185456 S     FROM 1817.50 F    TO 1.50000 F
Integrated Hole Volume:   1987.42 F3    FROM 1817.50 F    TO  .50000 F
Integrated Cement Volume: 1242.00 F3    FROM 1817.50 F    TO 1.50000 F
  (ASSUMING 8.67500 IN   O.D. CASING)
```

```
EVENT MARK SUMMARY:

OUTPUT                      INTERVAL        DEPTH TRACK
                            BETWEEN PIPS    EDGE

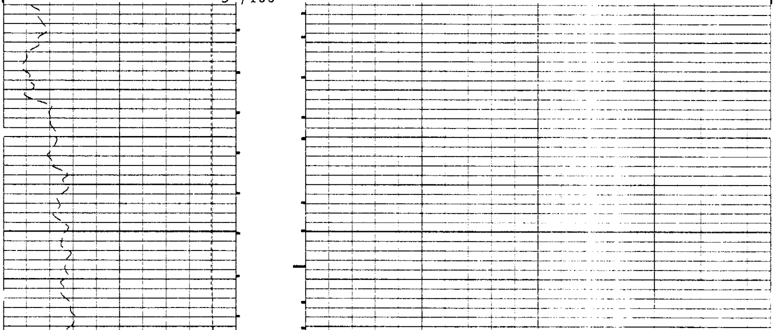
Integrated Transit Time     .00100000 S     RIGHT EDGE
Integrated Hole Volume      10.0000 F3      LEFT EDGE
Integrated Cement Volume    10.0000 F3      RIGHT EDGE
```

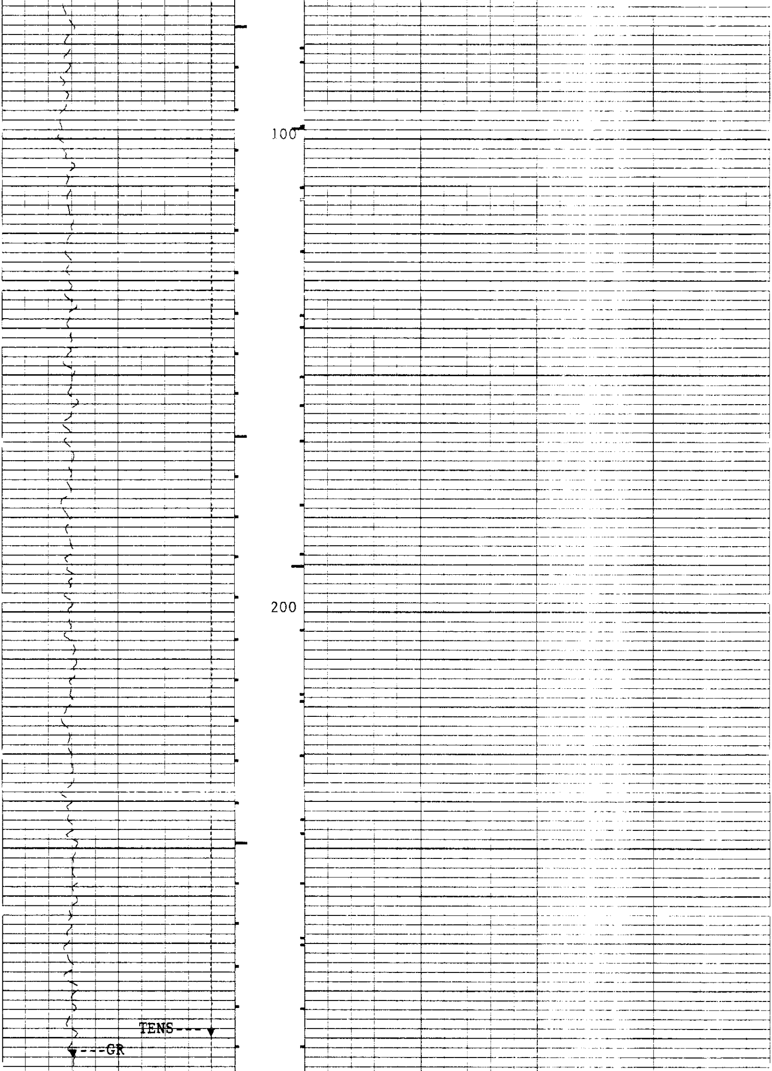
TENS(LBF)	
10000.	0.0
GR(GAPI)	
0.0	150.00

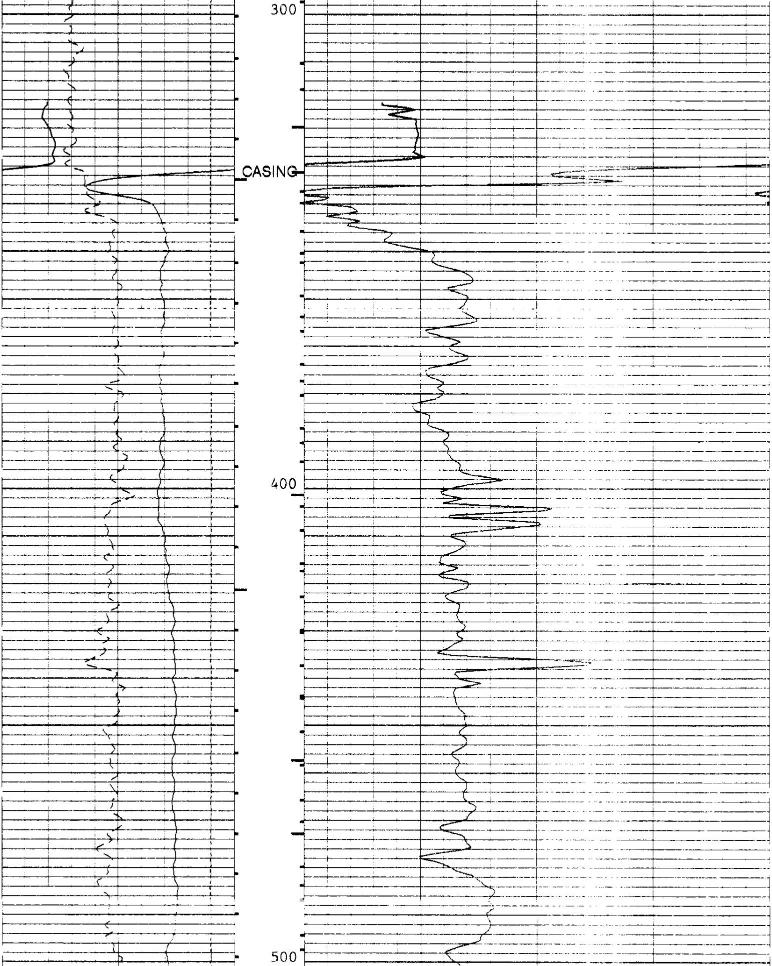
```
CP 44.2          FILE   86       22-OCT-1997 13:28

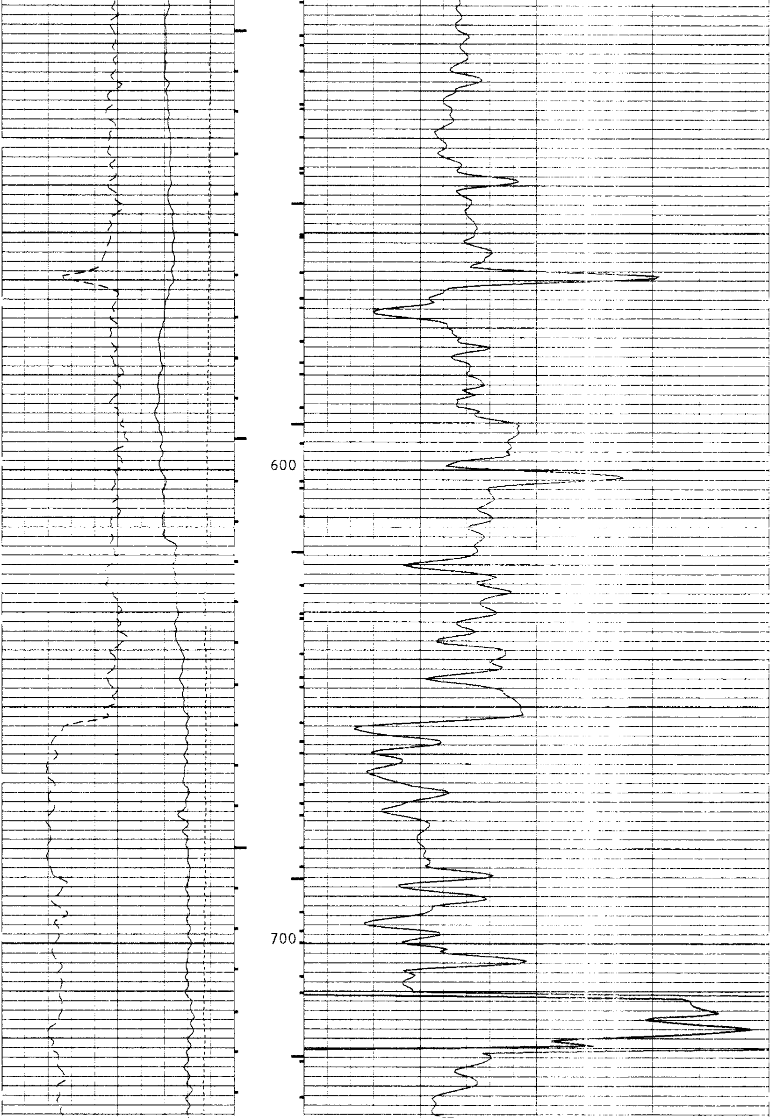
                 INPUT FILE(S)   CREATION DATE
                      76         22-OCT-1997 01:31

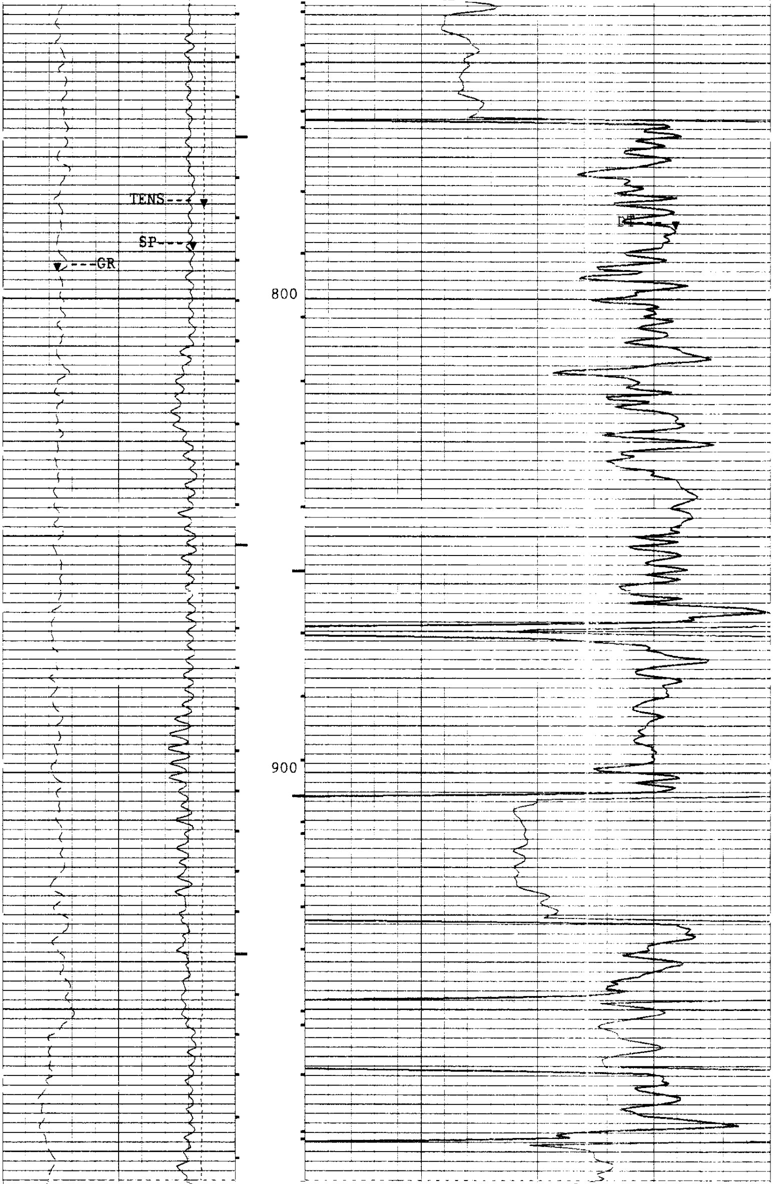
                 5"/100'
```

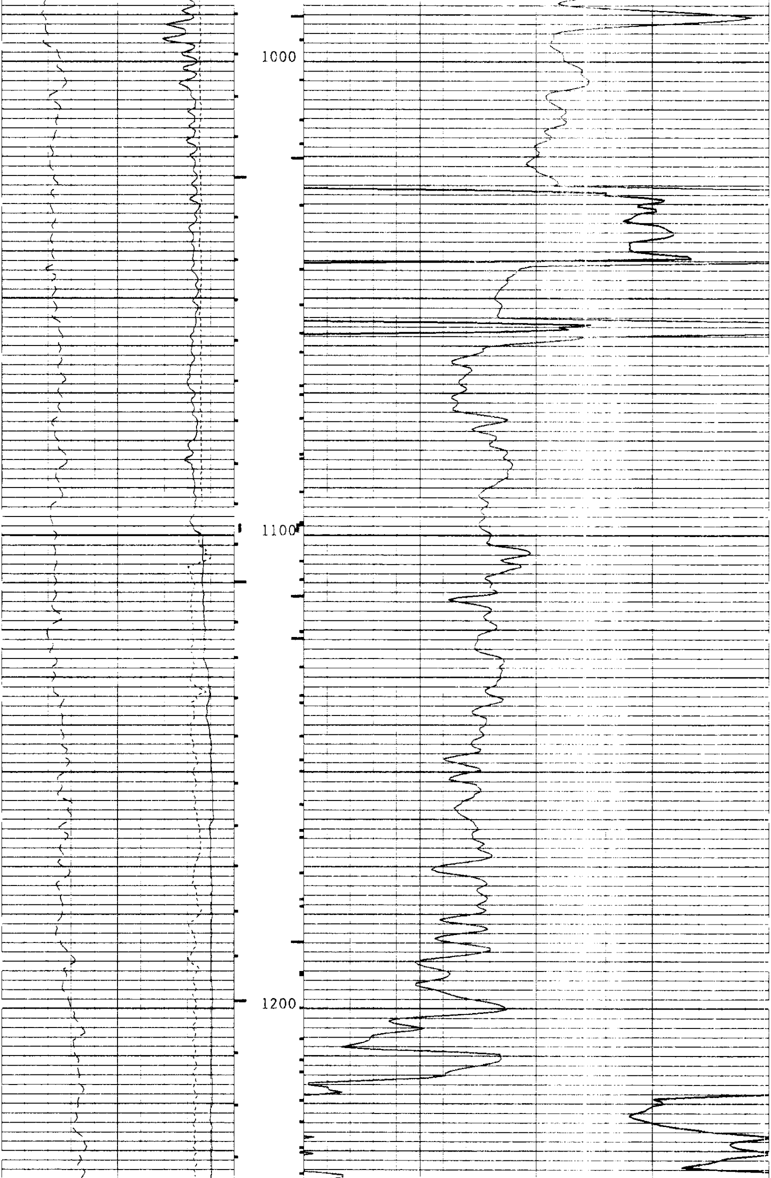


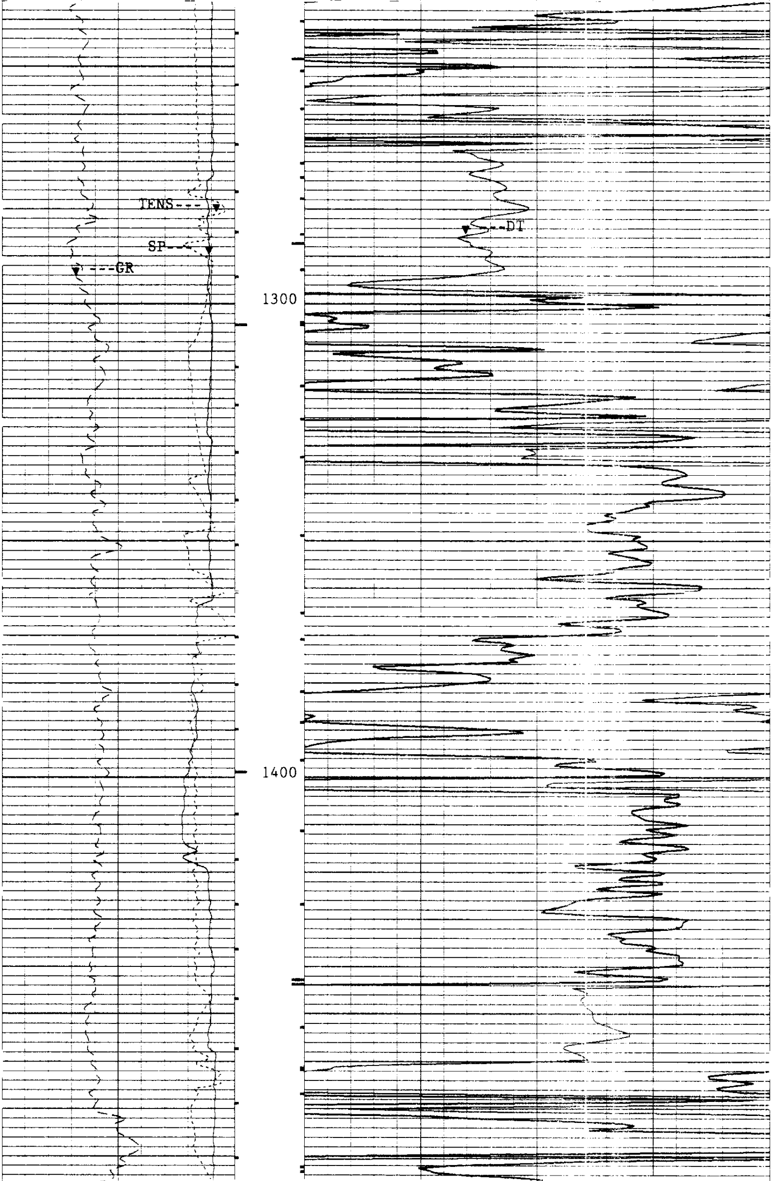


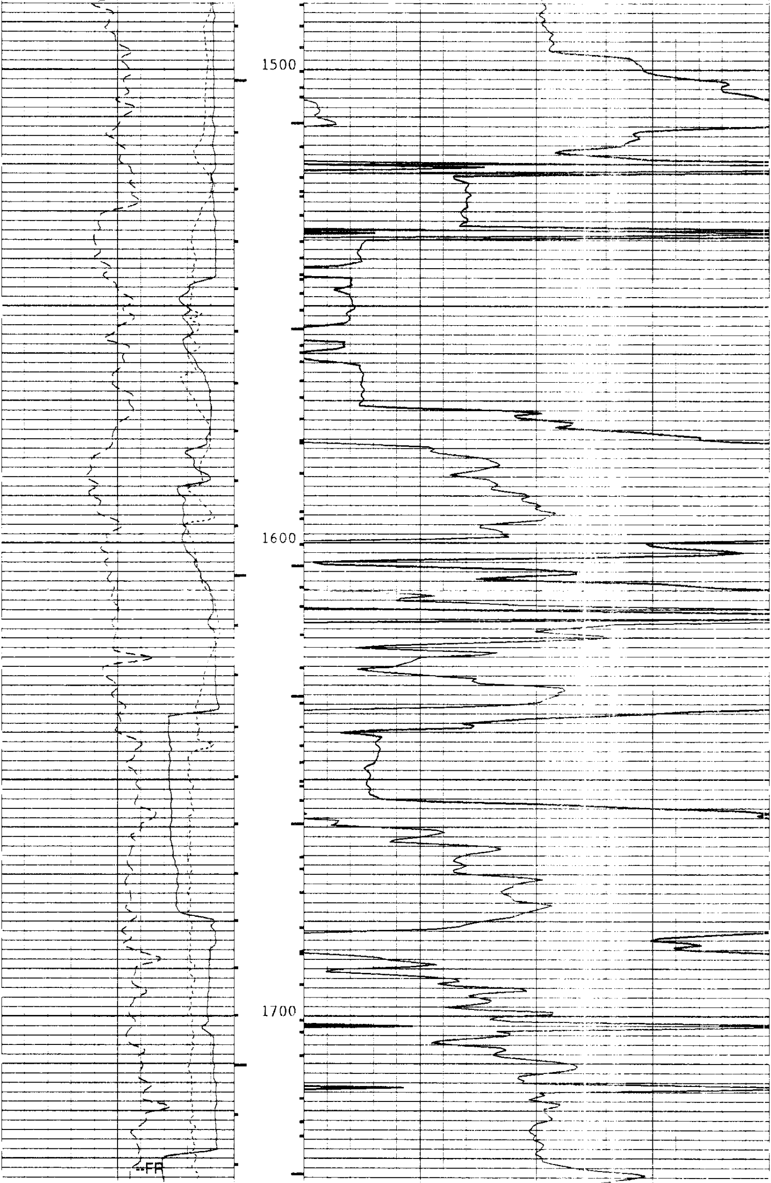


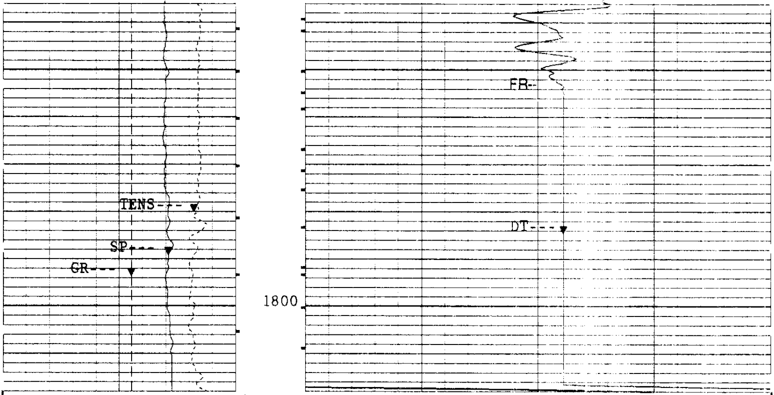












5"/100'

CP 44.2   FILE 86   22-OCT-1997 13:17

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

Curve	Left	Right
TENS(LBF)	10000	0.0
SP(MV)	-10.00	90.000
GR(GAPI)	0.0	150.00
DT(US/F)	175.00	75.000

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	NORM		DO	0.0	F
WMUD	10.0000	LB/G	TD	32768.0	F
FCD	8.67500	IN	DHC	BS	
BFM	LIOU		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 Transit Time:  .0320768 S    FROM 1120.00 F    TO 900.000 F
Integrated Hole Volume:   180.061 F3    FROM 1120.00 F    TO 900.000 F
Integrated Cement Volume: 89.7613 F3    FROM 1120.00 F    TO 900.000 F
  (ASSUMING 8.67500 IN   O.D. CASING)
```

```
EVENT MARK SUMMARY:

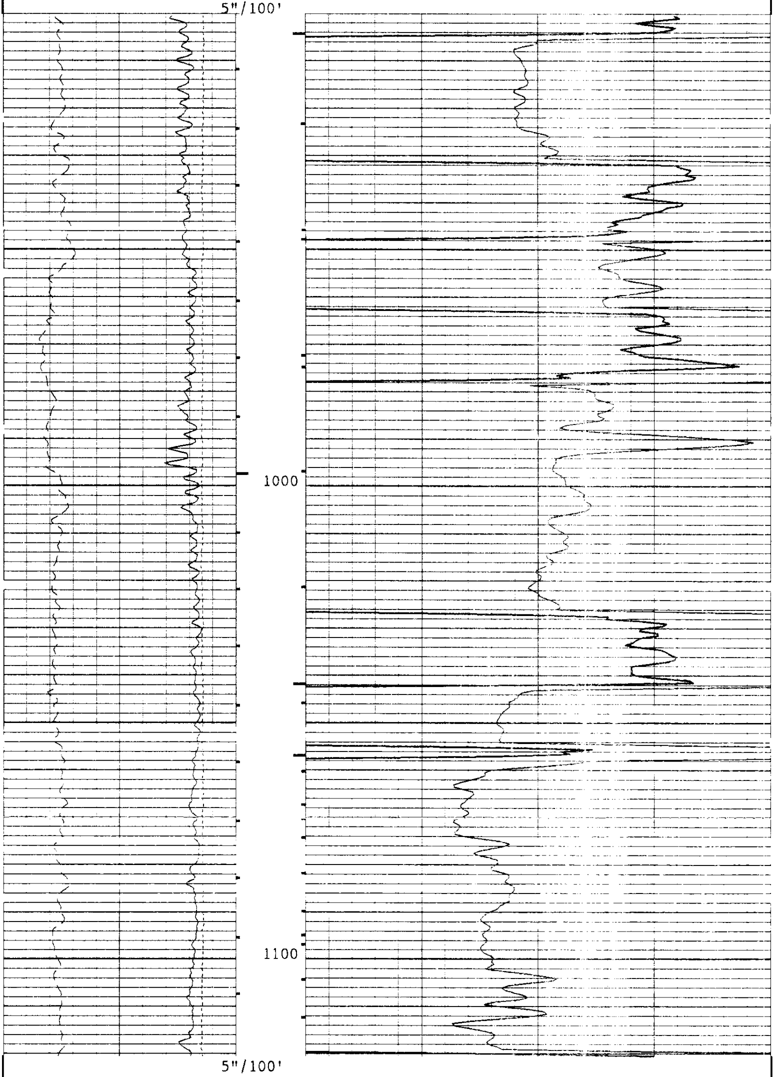
OUTPUT                       INTERVAL       DEPTH TRACK
                             BETWEEN PIPS   EDGE

Integrated Transit Time      .00100000 S    RIGHT EDGE
Integrated Hole Volume       10.0000 F3     LEFT EDGE
Integrated Cement Volume     10.0000 F3     RIGHT EDGE
```

```
            TENS(LBF)
10000.                    0.0
             SP(MV )
-10.00                 90.000
            GR(GAPI)                                      DT(US/F)
0.0                    150.00         175.00                                   75.000
```

```
CP 44.2           FILE    88       22-OCT-1997 13:33

                  INPUT FILE(S)   CREATION DATE
                       76         22-OCT-1997 01:31
```



CP 44.2   FILE   88   22-OCT-1997 13:32

INPUT FILE(S)   CREATION DATE
76   22-OCT-1997 01:31

TENS(LBF)			
10000.	0.0		
SP(MV)			
-10.00	90.000		
GR(GAPI)		DT(US/F)	
0.0	150.00	175.00	75.000

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	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 18:25
  Program File:  TOH     (Version    44.2    95/07/25  95/07/25)


SGTL             Detector Calibration Summary

            MEASURED
          BKGD    JIG          CALIBRATED          UNITS
    GR     35     192             165              GAPI

Back: 29-AUG-1997 10:04   Jig: 29-AUG-1997 10:08   Comp: 29-AUG-1997 10:08


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    7.9 -117. => 133.    .984   .84 => 1.18
  IXD   20.3 -105. => 145.    .991   .84 => 1.19     8.55   -5.89 => 24.11
  IRM   25.8 -199. => 251.    .996   .85 => 1.20
  IXM     .1 -224. => 226.    .956   .81 => 1.15     8.05   -6.49 => 23.51

SFL Electronics:

      Offset  Valid Range     Units      Gain   Valid Range

  SFV     .4   -14.5 => 15.5   MV          .98   .84 => 1.19
  SFC    -.0     -.6 =>   .6   MA          .98   .84 => 1.18

Plus Measurement performed at: 21-OCT-1997 18:24

Shop cals used were performed: 29-AUG-1997 11:39

   CP 44.2           FILE     0       21-OCT-1997 18:25



                 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
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```
   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**	1752.0 F
				SCHL.	**TD**	1820.0 F
WELL	IW 22H-22-65			**DRLR.**	**TD**	1825.0 F
				Elev:	**KB**	596.6 F
FIELD	MIST GAS STORAGE				**DF**	
COUNTY:	COLUMBIA	**STATE:**	OREGON		**GL**	580.6 F

Schlumberger

SONIC / GAMMA RAY
SP LOG