Case No.

2125

Large Exhibits


BROWN OIL
TOOLS, INC
RETRIEVABLE PACKER

OPERATION

The HS-16-1 Hydraulic Set Packer is made up in the tubing string and run in the hole in the conventional manner (same as any hookwall packer). The tubing hanger is then landed, blowout preventors removed, and the well head installed. With the packer in the unset position, the well fluid can be conventionally or reverse circulated. After the desired fluid changeover is accomplished, the packer is ready for setting.

SETTING

The packer is constructed with two opposing sets of slips, cones, and seal assemblies. Each seal assembly is composed of a rubber sealing element (1) confined and protected by lead seals (2) on each side of the rubber. One setting assembly (slips (3), cones (4), and seal assembly) is connected to the cylinder (5) and the other to the piston (6).

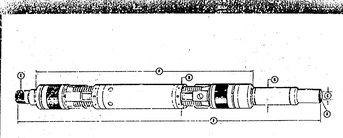
A setting ball is dropped down the tubing. The ball may be pumped, or it may be allowed to fall to the seating shoulder in the catcher sub (refer to catcher sub data). With the ball on its seat, pressure in the tubing sets the packer.

Tubing pressure enters the ports (7) in the packer stem, passing to the pressure chamber (8). Continued pressure build-up causes the shear pins (9), which hold the two setting assemblies in the retracted position, to shear. The slips travel up their respective cones simultaneously setting the seals. The wedge action of the slips between the casing wall and cones holds the packer in the set position.

RETRIEVING

To retrieve the packer, right hand rotation is applied to the tubing string. After twelve turns at the packer, the top connection (10) has moved up the coarse pitch left-hand threads (11) on the outside of the releasing stem. This exposes the by-pass ports (12) in the releasing stem. These ports permit equalization between tubing and casing and also provide a fluid by-pass when the packer is being retrieved.

Continued right-hand rotation for twenty-eight turns fully releases the packer. The seal mandrels (13 & 14) are moved away from the seal assemblies, thereby relaxing them. Next, the cones move away from the slips, freeing the slips from their engagement with the casing wall. The packer can then be retrieved.



HS-16-1 PACKER ENGINEERING DATA

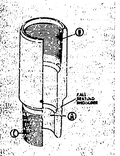
Casing O.D., In.	Casing Weight, Lb/Ft	Top Box Connection	Minimum I.D. In Packer, Inches	Packer O.D., In.	Bottom Pin Connection	Overall Length	Slip Area	Bypass Area, Sq. In. (Minimum)	Packer Length	Approx. Packer Weight
4½	9.50-11.60	As Specified	3⅞	1⅝	3⅞	15½" EUE 10 Rd.	42	29.30	9.56-9.15 11.60-11.05	30½	123
4½	13.50-16.60	As Specified	3¾	1⅝	3⅞	15½" EUE 10 Rd.	42	30.50	13.50-13.25 15.60-15.12	30½	122
5	13.00-15.00	As Specified	3½	1⅝	4⅛	3" EUE 8 Rd.	53½	25.30	13.00-12.50 15.00-14.50	38¾	122
5	18.00-21.00	As Specified	3½	1⅝	3⅞	3" EUE 8 Rd.	53½	35.30	18.00-17.50 21.00-20.70	30¾	122
5½	15.00-23.00	As Specified	3½	2	4⅛	3" EUE 8 Rd.	48¾	29.00	15.00-14.50 17.00-16.50 20.00-19.50 23.00-22.70	36¾	160
5½	17.00-23.00	As Specified	3½	2	4⅛	3" EUE 8 Rd.	48¾	29.00	17.00-16.50 20.00-19.50 23.00-22.70	36¾	160
6⅝	24.00-32.00	As Specified	4¼	2⅛	3⅞	2⅞" EUE 8 Rd. 3" EUE 8 Rd.	73½	57.50	24.00-23.50 28.00-27.50	51¾	260
6⅝	24.00-32.00	As Specified	4⅝	2⅛	3⅞	2⅞" EUE 8 Rd. 3" EUE 8 Rd.	73½	57.50	24.00-23.50 32.00-31.60	51¾	260
7	23.00-32.00	As Specified	4¼	1⅝	3⅞	2⅞" EUE 8 Rd. 3" EUE 8 Rd.	73½	57.50	23.00-22.50 26.00-25.60	50¾	290
7	29.00-32.00	As Specified	4⅛	2⅛	3⅞	2⅞" EUE 8 Rd. 3" EUE 8 Rd.	73½	57.50	29.00-28.60 32.00-31.60	50¾	290
7⅝	26.40-29.70	As Specified	4⅝	2⅛	4⅛	2⅞" EUE 8 Rd. 3" EUE 8 Rd.	73½	45.80	26.40-25.90 29.70-29.20	51¾	310
7⅝	29.70-39.00	As Specified	4¼	2⅛	4⅛	2⅞" EUE 8 Rd. 3" EUE 8 Rd.	73½	45.80	33.70-33.20 39.00-38.70	51¾	370
8⅝	43.00-49.00	As Specified	5⅛	2⅞	4⅛	As Specified	68½	71.50	43.00-42.00 47.00-46.50 49.00-48.50	59⅛	530
9⅝	40.00-43.50	As Specified	5¼	2⅞	4⅛	As Specified	83½	73.50	40.00-39.10 43.50-43.00	58	685
9⅝	47.00-53.50	As Specified	5¼	3⅛	4⅛	As Specified	83½	73.50	47.00-46.50 53.50-53.00	58	685

*The dimensions across the bore through packer, for minimum restriction of tubing string refer to catcher sub data and tubular connections.

BROWN CATCHER SUBS

The purpose of the catcher sub is to act as a receptacle and a seat for the setting ball or wire-line-retrievable setting plug. The size ball or plug used is determined by the minimum restriction of the tubing string above the sub.

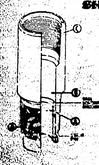
CATCHER SUB



. . . is designed for use where it is desirous of flowing the plastic setting ball back to the surface. A setting plug may also be used in this sub, but it must be retrieved by wire-line manipulation.

Plastic Ball O.D., Inches	A Minimum I.D., Inches (Ball Seat)	B Top Box Thread Connection	C Bottom Pin Thread Connection	C Setting Plug O.D., Inches	C Plug Seal Bore
1⅛	1	1¼" CS Hydril	1¼" CS Hydril	1.188	⅜
1⅜	1.250	2⅛" EUE 8 Rd.	2" EUE 8 Rd.	1.390	⅜
1⅜	1.250	2⅛" EUE 10 Rd.	2⅛" EUE 10 Rd.	1.375	⅜
1⅜	1.250	1¼" CS Hydril	1¼ Reg. 10 Rd.	1.313	⅜
1⅝	1⅝	2½" CS Hydril	2½" CS Hydril	1.625	1⅜
1⅝	1⅝	2⅜" EUE 8 Rd.	2" EUE 8 Rd.	1⅝	1⅜
1⅝	1⅝	2½" EUE 8 Rd.	2⅜" EUE 8 Rd.	1⅝	1⅜
1⅝	1⅝	2⅜" EUE 8 Rd.	2" EUE 8 Rd.	1⅝	1⅜
1⅝	1⅝	2½" EUE 8 Rd.	2" EUE 8 Rd.	1⅝	1⅜
1⅝	1⅝	2½" CS Hydril	2¼" CS Hydril	1⅝	1⅜

SHEAR SLEEVE CATCHER SUB



. . . is used with a bronze ball or setting plug. After the packer has been set, applying additional pressure to the tubing causes the shear sleeve, which acts as a seat for the ball, to shear. Both the ball and sleeve fall to the bottom of the hole. This Catcher Sub also has a permanent seat for use of a wire-line-retrievable setting plug, in lieu of the ball and shear sleeve.

Bronze Ball O.D., Inches	A Minimum I.D., Inches Before Shear (Ball Seat)	A After Shear	C Top Box Thread Connection	D Bottom Pin Thread Connection	D Setting Plug O.D., Inches	D Plug Seal Bore
1⅜	1	1¼	2" EUE 8 Rd.	2" EUE 8 Rd.	1⅜	⅜
1⅝	1⅜	1⅝	2½" EUE 8 Rd.	2½" EUE 8 Rd.	1⅝	1⅜
1⅝	1⅜	1⅝	2⅜" EUE 8 Rd.	2" EUE 8 Rd.	1⅝	1⅜
1⅝	1⅜	1⅝	2½" EUE 8 Rd.	2⅜" EUE 8 Rd.	1⅝	1⅜
1⅝	1⅜	1⅝	2½" CS Hydril	2¼" CS Hydril	1⅝	1⅜



OPERATIONAL AND PERFORMANCE FEATURES

Economical

- Savings in rig time while running and setting. Ample by-pass area allows free flow of well fluid around the packer for faster running.
- A fully retrievable packer, the HS-16-1 can be rerun after servicing. The cost of drilling and replacing a permanent-set packer is eliminated.
- Circulation with the well head in place, and before setting the packer eliminates most wire line work.
- Design eliminates the possibility of premature setting.
- The "hydraulically-set" feature minimizes the problem of spacing out.

Safe

- Positive well control is achieved since the well head is installed before the packer is set or drilling fluid displaced.
- Producing zones may be washed after the well head is installed.
- Swabbing action while pulling is minimized by the built-in equalizing valve (see "Retrieving" section) and the ample by-pass area around the packer.

Multi-Purpose

- As a packer for single zone completion
- As a packer for single-string dual completion
- As the lower packer in a multiple-string completion
- As the packers (any number in the same well) for multiple alternate-zone installations.

Versatile

- The HS-16-1 is easily run in straight or deviated holes.
- Set at any depth as no tubing weight is required when setting. Hydraulic setting allows the tubing to remain in tension due to its own weight.
- An excellent packer where acidizing or fracturing is being done. Dual slips enable the packer to withstand high differential pressures from either side.
- Treating fluid may be spotted across the producing zone before the packer is set.
- No difficulty in running the packer into the top of a liner.
- The HS-16-1 is ideal in wells where a high degree of H_2S is encountered. This is due to the absence of wiper springs or blocks. In addition lead seals protect the rubber sealing element on both sides.

BROWN OIL TOOLS

Leader in production tools for over a quarter century . . .

This is the record set by Brown through continuous design development based on field experience and sound engineering principles. A working part of our design program is the Brown Test Well. This is a complete rig which extends our laboratory facilities. Here we can duplicate a full range of field conditions for quick and conclusive tests.

The most modern manufacturing facilities available are used to produce the high standards which we demand — for peak field performance. But we don't stop here — skilled Brown technicians supervise the running, setting, and retrieving of our equipment on your location to assure maximum efficiency and safety wherever our equipment is making and saving money.

RETRIEVABLE HYDRAULICALLY SET PACKERS FOR SINGLE, DUAL, TRIPLE, AND QUADRUPLE STRING COMPLETIONS

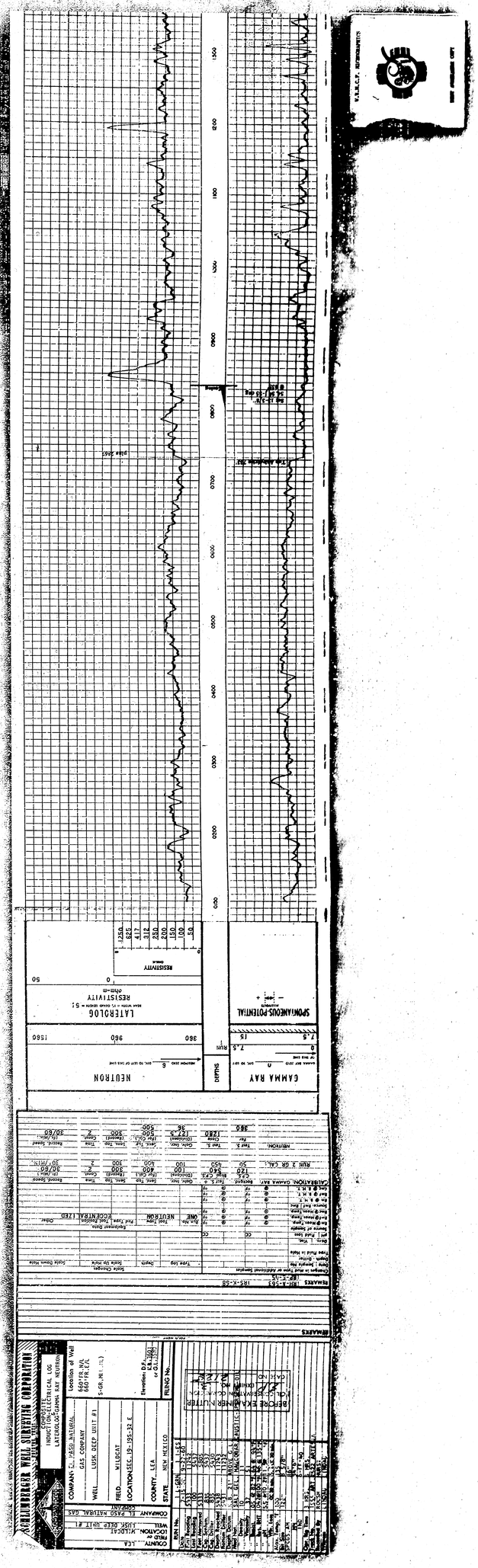
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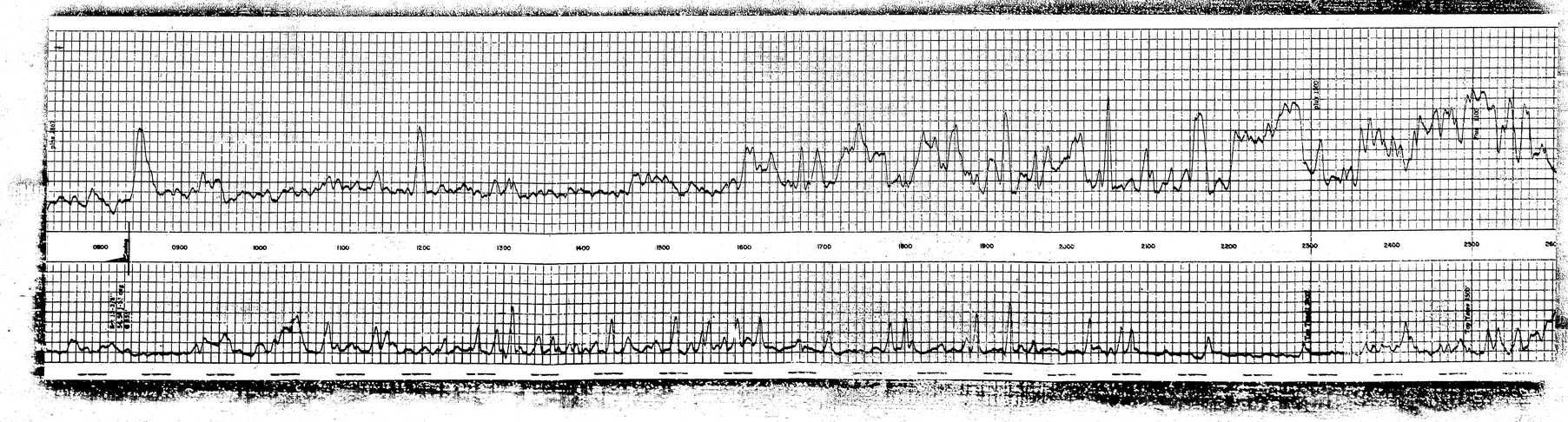
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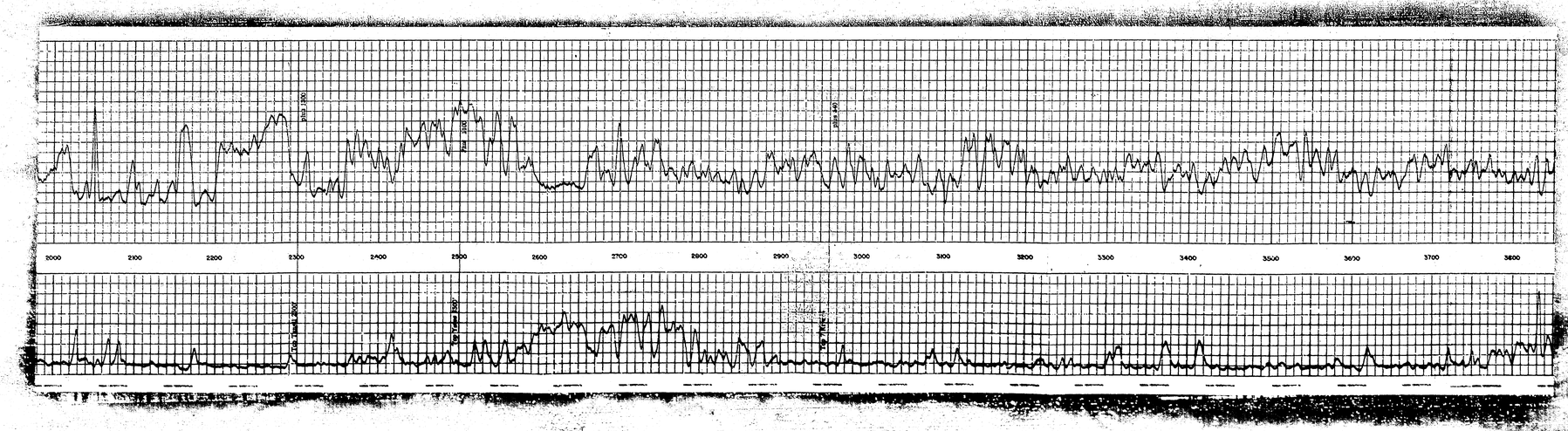
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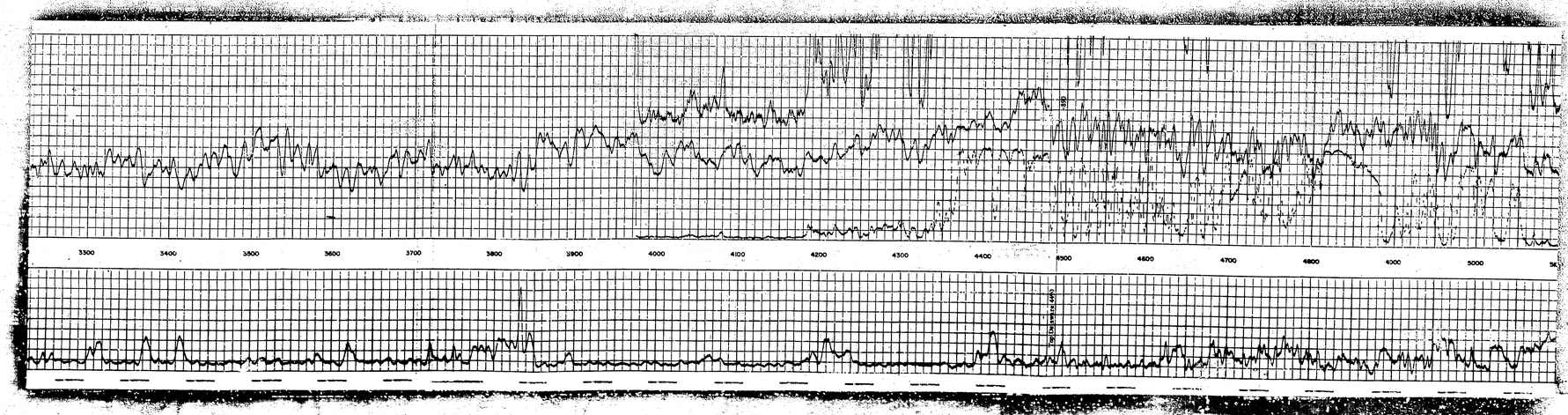
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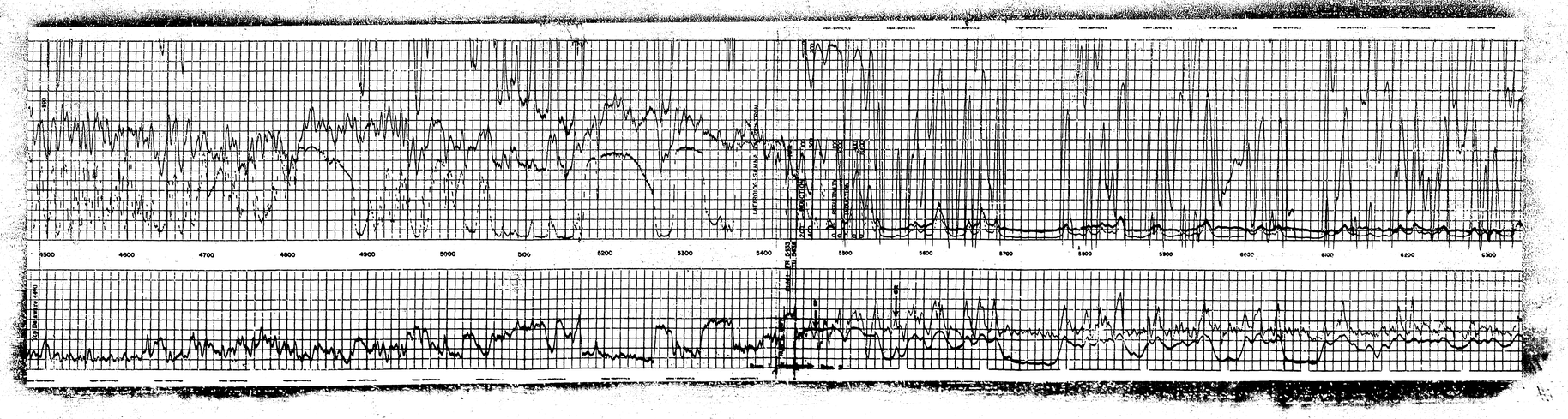
W.N.C.F. MICROGRAPHICS
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SCHLUMBERGER WELL SURVEYING CORPORATION
INDUCTION-ELECTRICAL LOG
LATEROLOG-GAMMA RAY NEUTRON
COMPANY EL PASO NATURAL GAS COMPANY
WELL LUSK DEEP UNIT #1
FIELD WILDCAT
COUNTY LEA
STATE NEW MEXICO
Location of Well
660 FR. N/S
660 FR. E/W
S-GR. (MI. ⊥)
Elevation D.F. 3661
G.L. 3644
FILING No.
REMARKS
IRS-X-58
GAMMA RAY
NEUTRON
LATEROLOG
SPONTANEOUS POTENTIAL
RESISTIVITY
CALIBRATION GAMMA RAY
RUN 2 GR CAL.
NEUTRON
RUN No.
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Depth-Driller
Depth-Logger
Bottom Logged Interval
Type Log
Casing-Driller
Casing-Logger
Bit Size
Type Fluid in Hole
Density
Viscosity
pH
Fluid Loss
Source of Sample
Rm @ Meas. Temp
Rmf @ Meas. Temp
Rmc @ Meas. Temp
Source of Rmf
Source of Rmc
Rm @ BHT
Time Since Circ.
Max. Rec. Temp.
Equipment Location
Recorded By
Witnessed By
WELL LOCATION
COUNTY LEA
WILDCAT
LUSK DEEP UNIT #1
COMPANY EL PASO NATURAL GAS COMPANY
SEC. 20 TWP. 19S RGE. 32E
Other Services
Permanent Datum
Log Measured From
Drilling Measured From
Elev.: K.B.
D.F.
G.L.
Date
Run No.
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Depth-Logger
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Top Logged Interval
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Salinity, PPM Cl
Density
Viscosity
pH
Fluid Loss
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Rmf @ Meas. Temp
Rmc @ Meas. Temp
Source of Rmf
Source of Rmc
Rm @ BHT
Time Since Circ.
Max. Rec. Temp.
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Witnessed By
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Viscosity
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Fluid Loss
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Source of Rmc
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Source of Rmc
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W.A.I.C.P. INSTRUMENTS
MADE IN UNITED STATES OF AMERICA

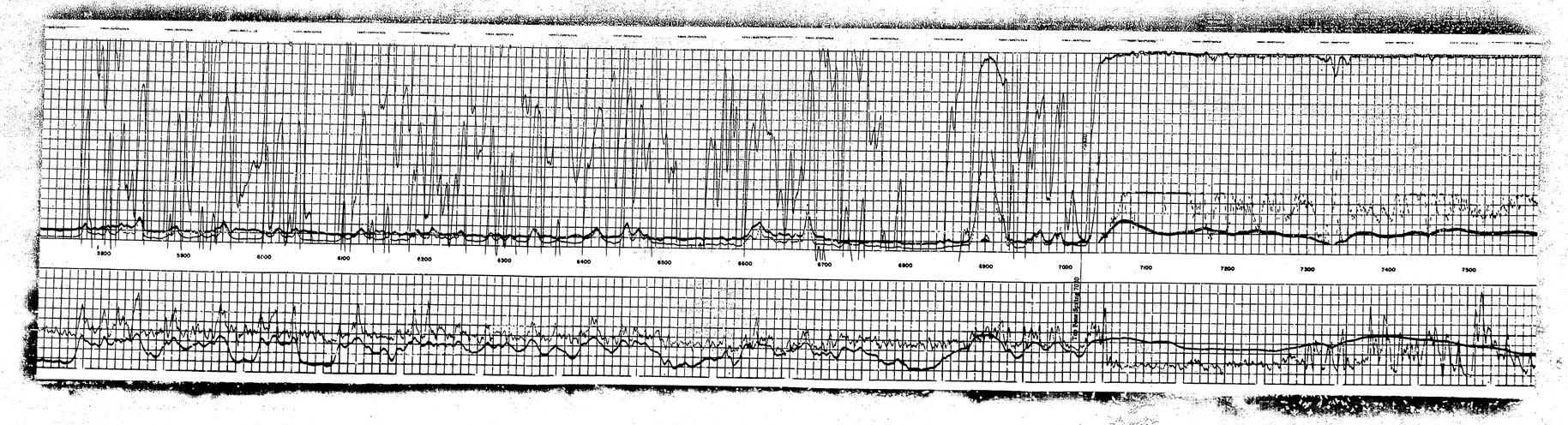

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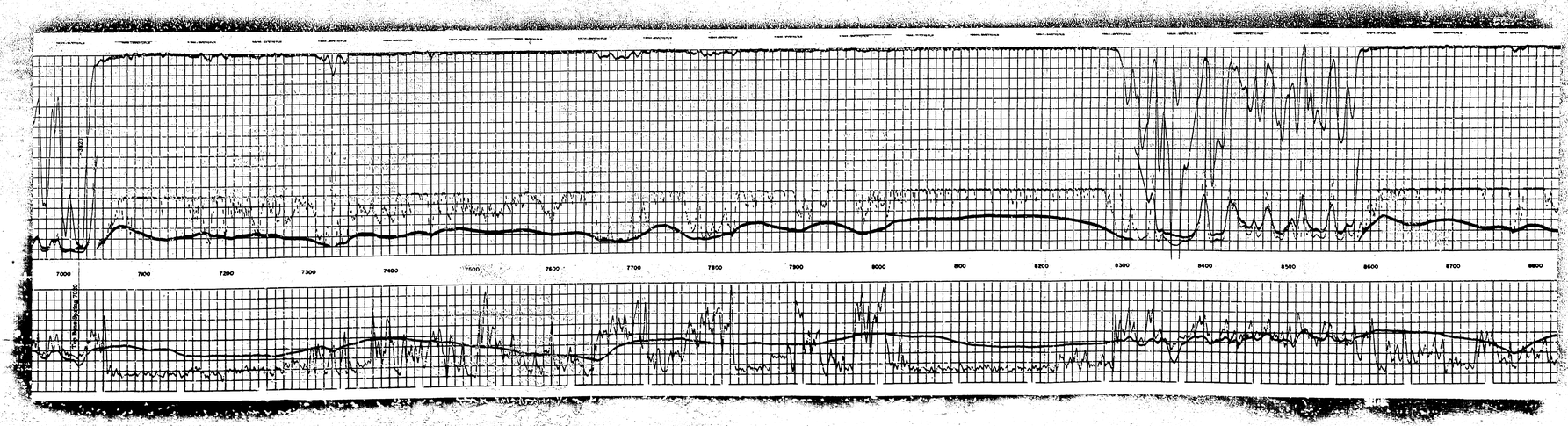

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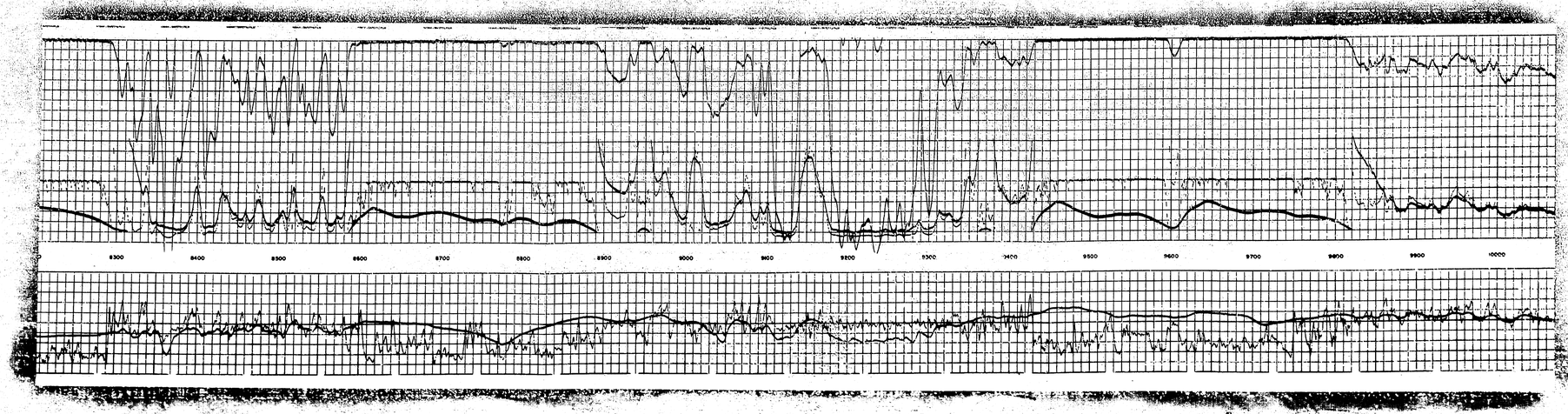
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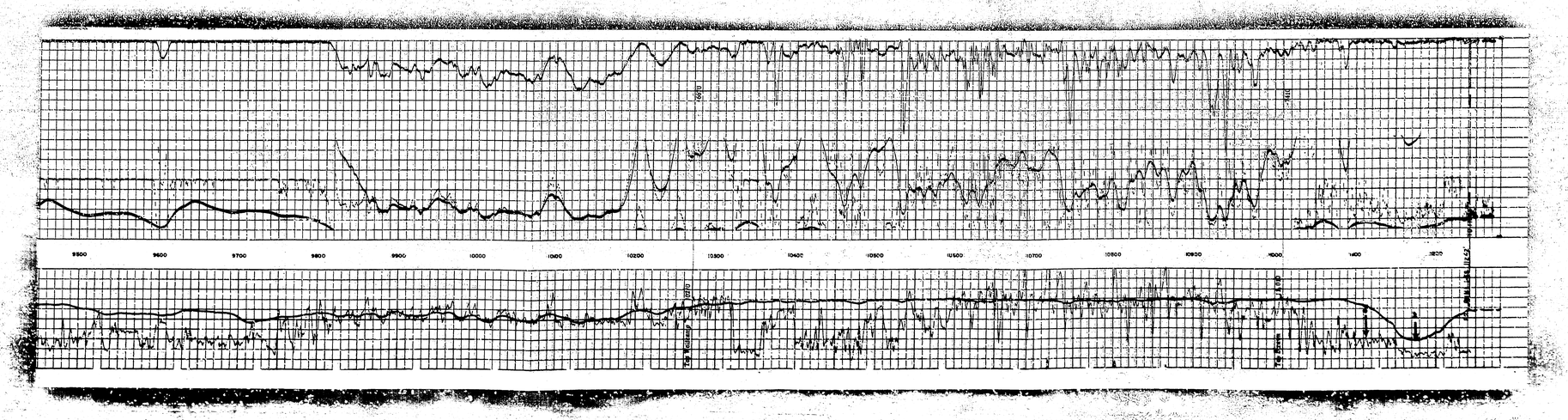


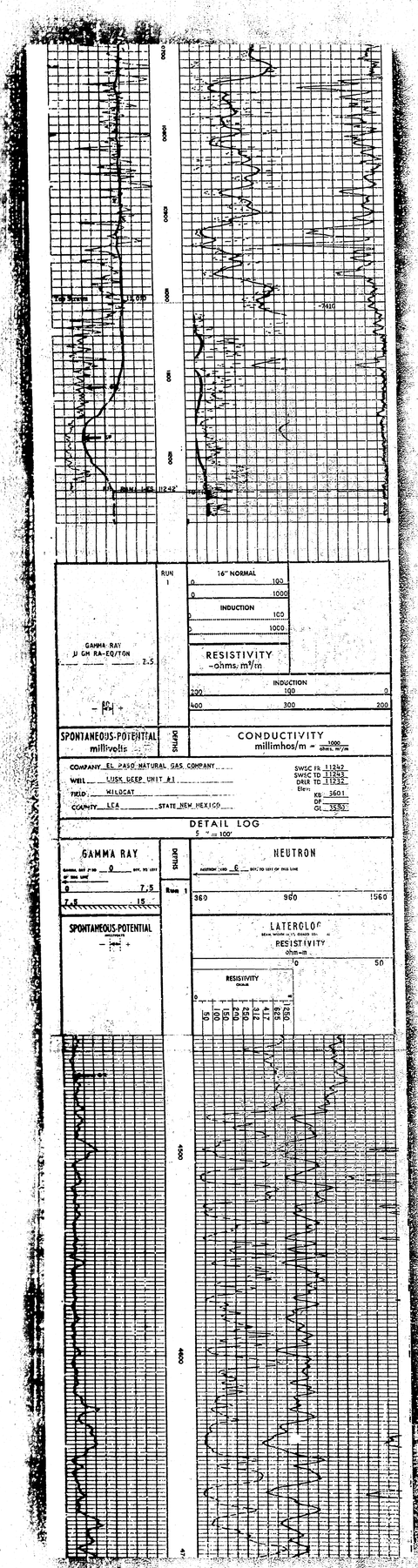
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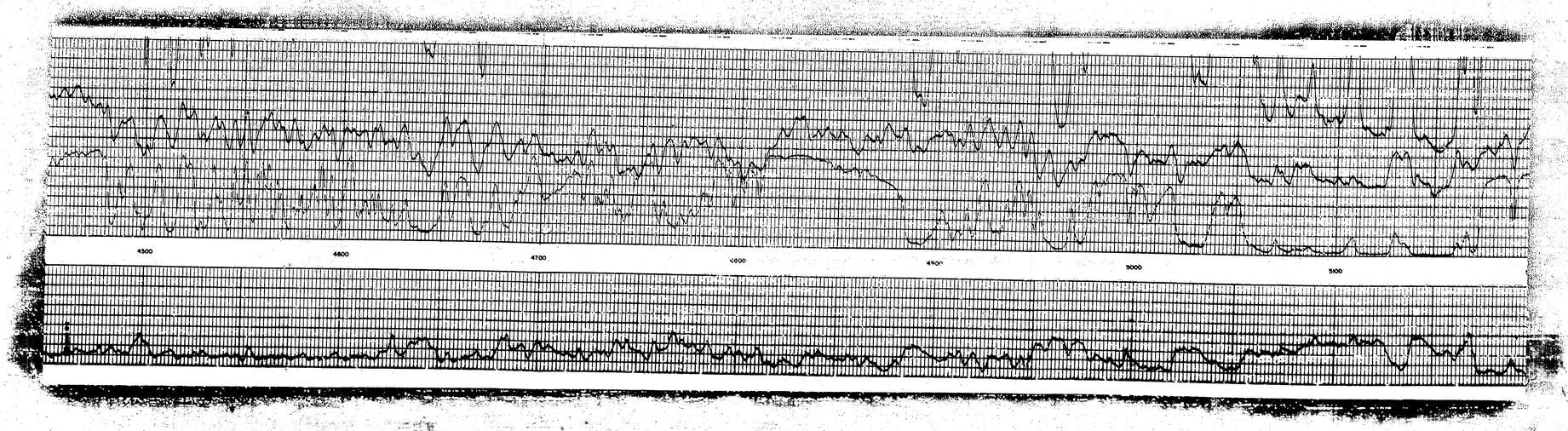

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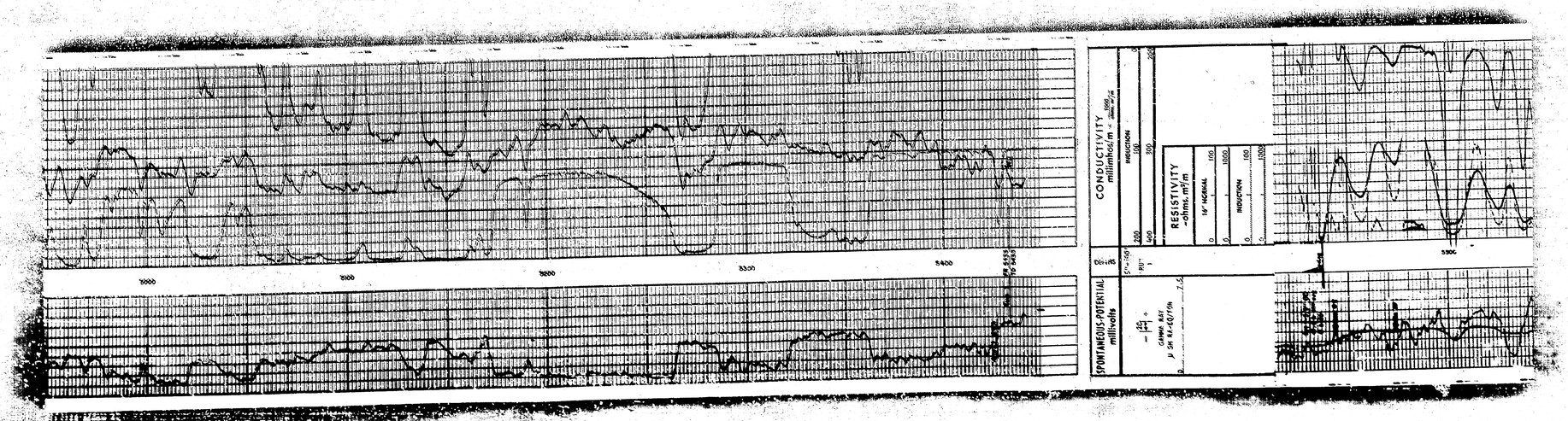

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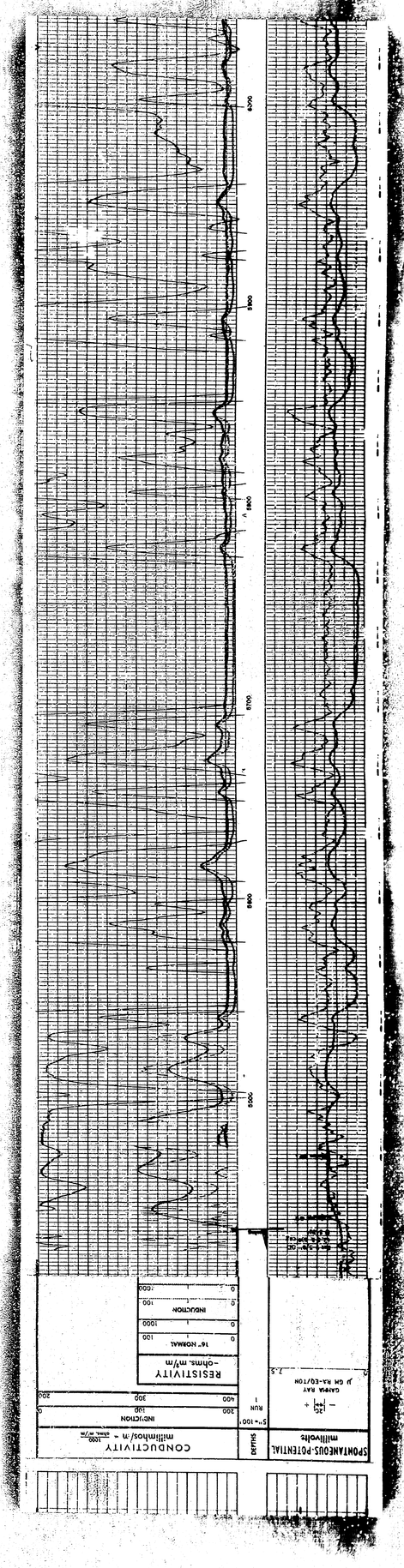

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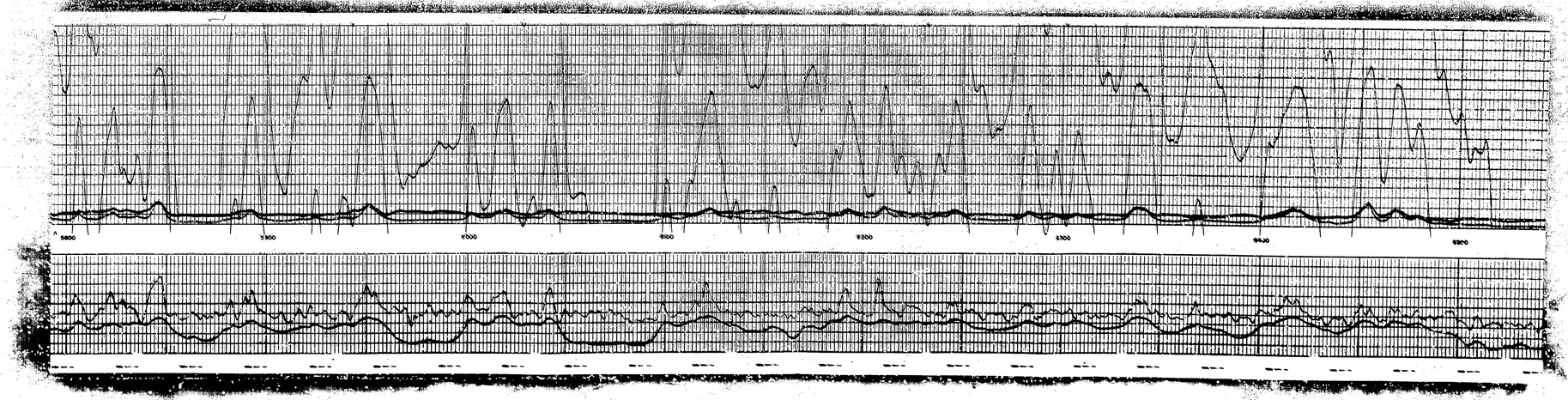

RUN 1
16" NORMAL
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INDUCTION
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0 1000
GAMMA RAY
μ GM RA-EQ/TON
0 7.5
RESISTIVITY
-ohms, m²/m
INDUCTION
200 100 0
400 300 200
SPONTANEOUS-POTENTIAL
millivolts
DEPTHS
CONDUCTIVITY
millimhos/m = 1000/ohms, m²/m
COMPANY EL PASO NATURAL GAS COMPANY
WELL LUSK DEEP UNIT #1
FIELD WILDCAT
COUNTY LEA STATE NEW MEXICO
SWSC Fr 11242
SWSC TD 11263
DRLR TD 11232
Elev:
KB 3601
DF
GL 3580
DETAIL LOG
5 " = 100'
GAMMA RAY
0 7.5
7.5 15
DEPTHS
Run 1
NEUTRON
360 960 1560
SPONTANEOUS-POTENTIAL
LATEROLOG
RESISTIVITY
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4600

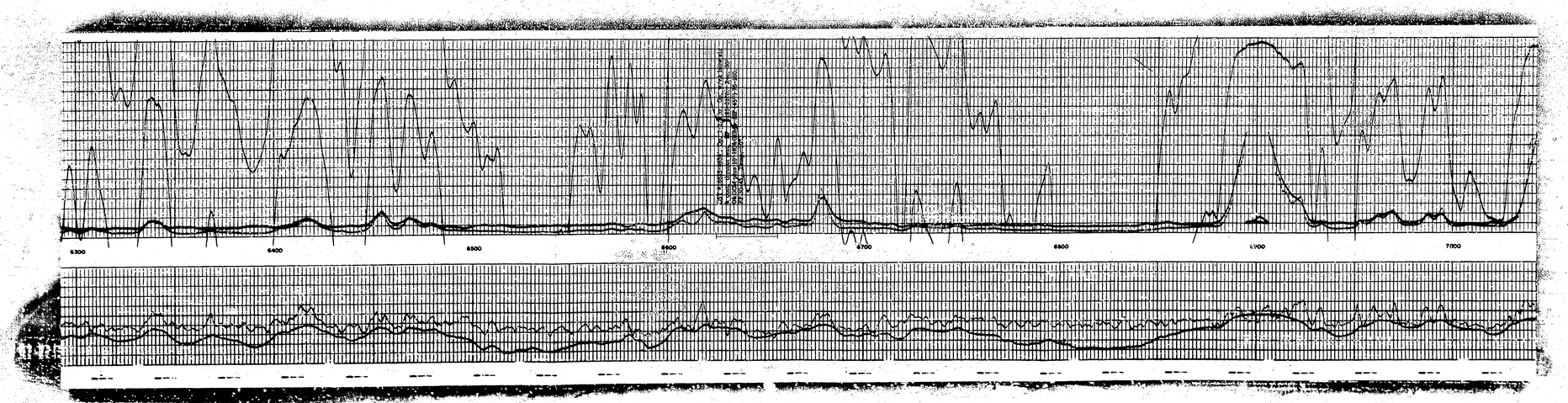


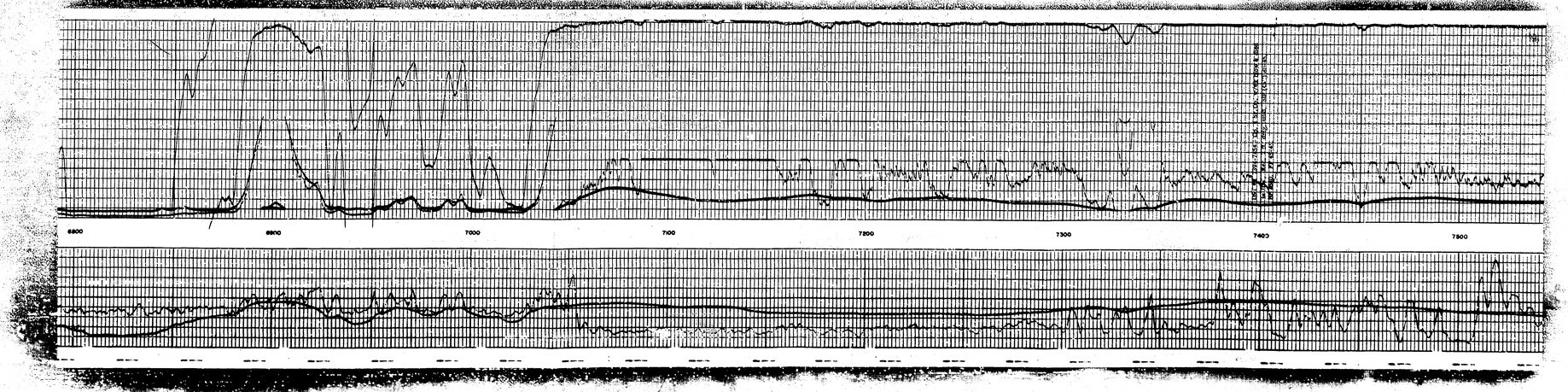
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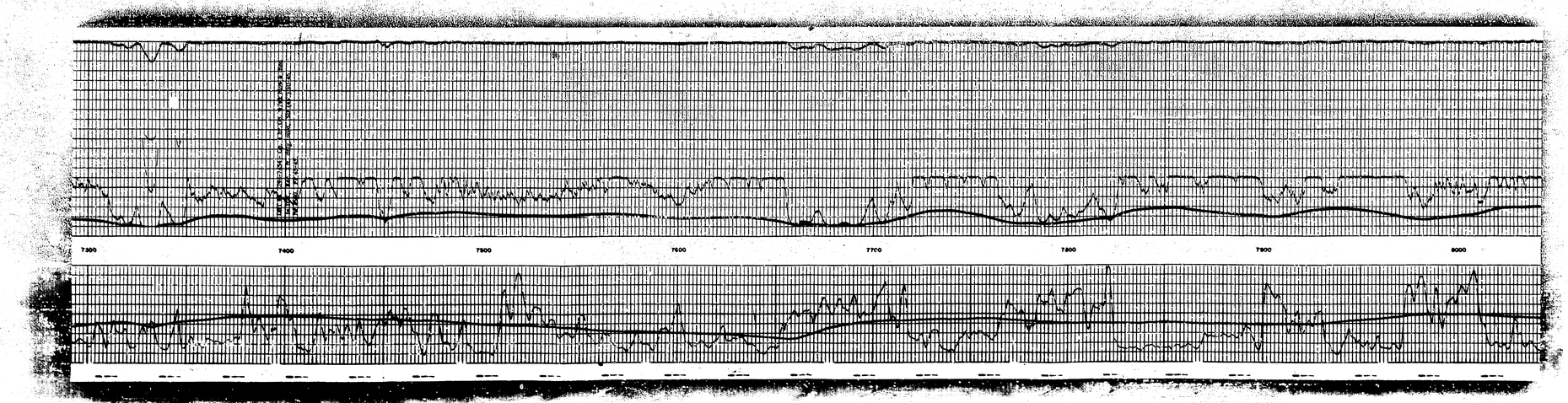

CONDUCTIVITY
millimhos/m
INDUCTION
RESISTIVITY
-ohms, m²/m
16" NORMAL
INDUCTION
SPONTANEOUS-POTENTIAL
millivolts
5000
5100
5200
5300
5400
5500

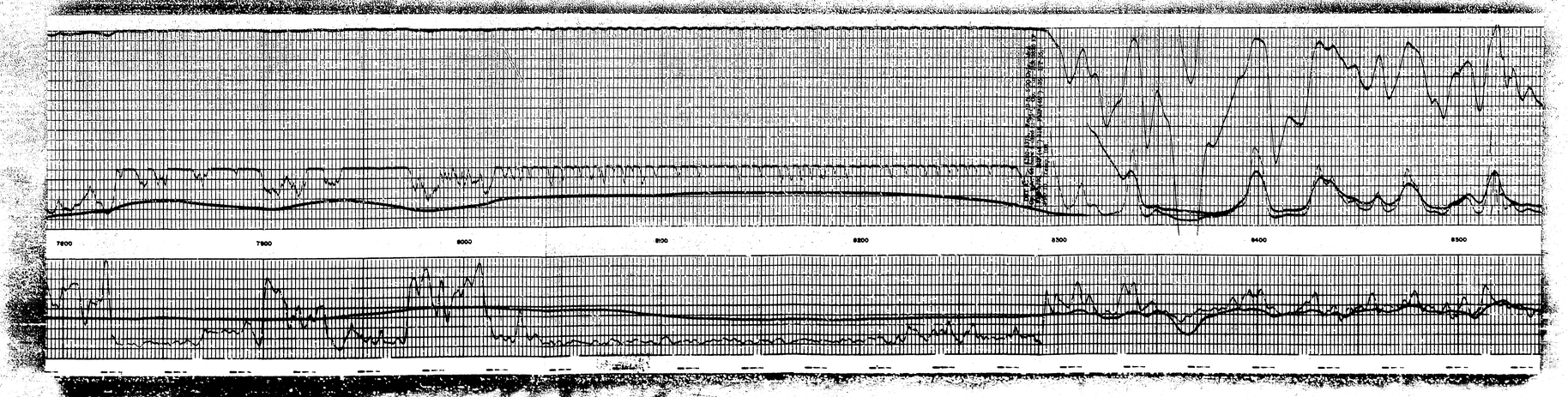

SPONTANEOUS-POTENTIAL
millivolts
SHALE
CONDUCTIVITY
millimhos/m
INDUCTION
RESISTIVITY
-ohms. m²/m
16" NORMAL
INDUCTION
5000
5100
5200
5300
5400
5500
5600
5700
5800
5900

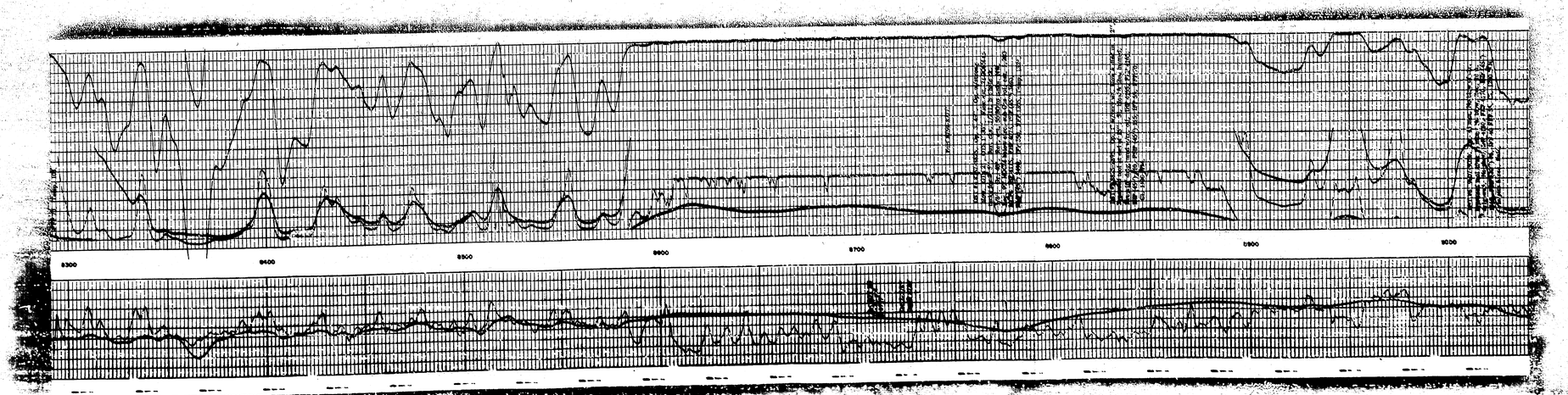

5800
5900
6000
6100
6200
6300
6400
6500

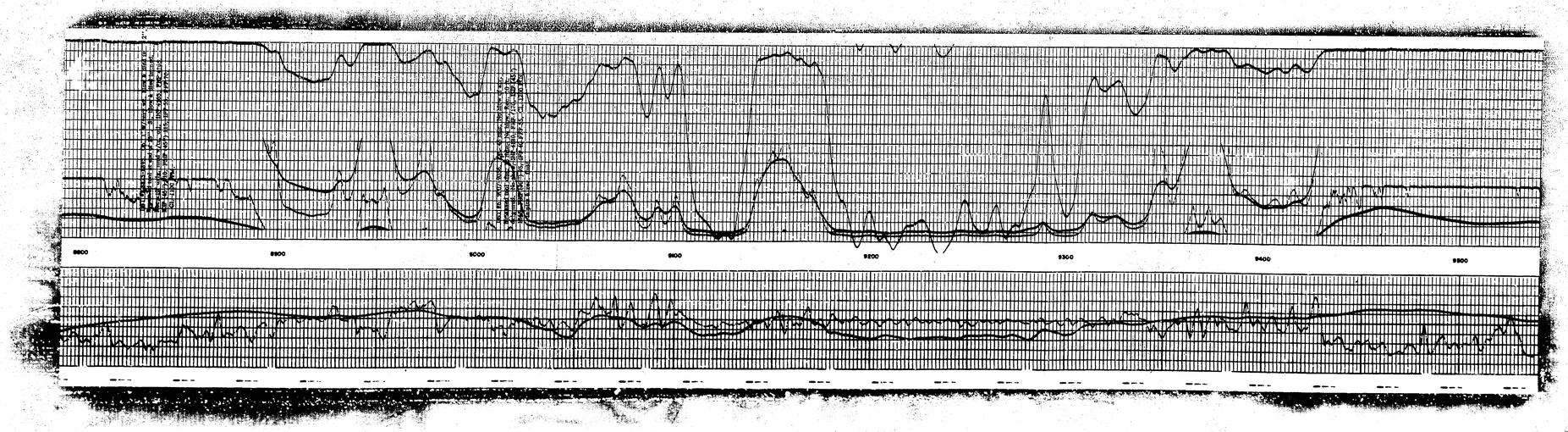

6300
6400
6500
6600
6700
6800
6900
7000


6800
6900
7000
7100
7200
7300
7400
7500

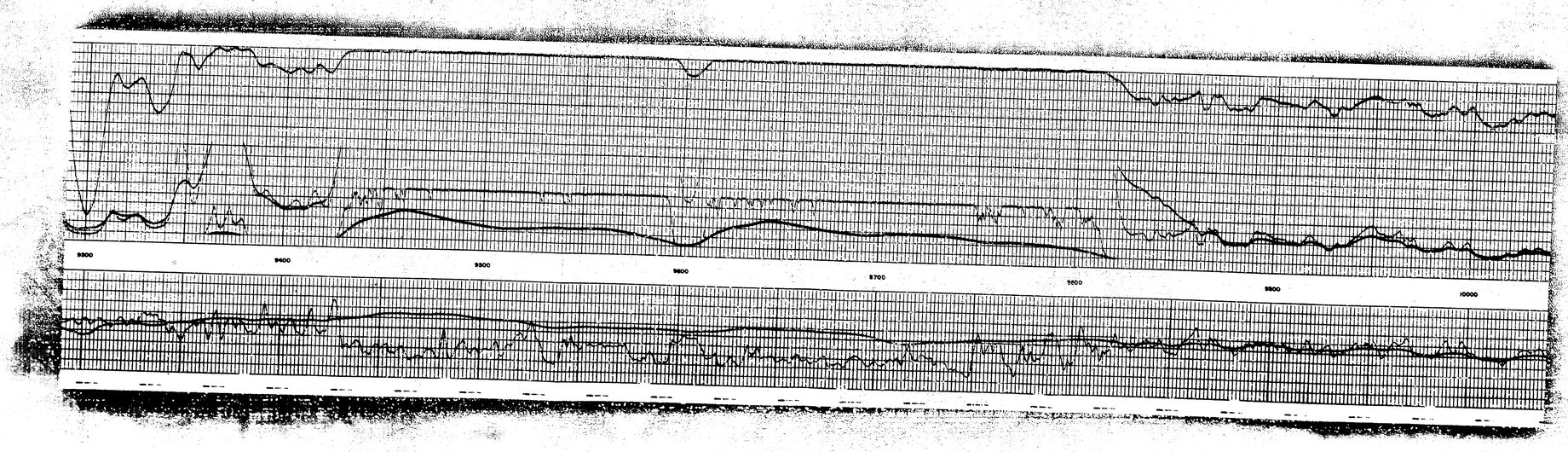

7300
7400
7500
7600
7700
7800
7900
8000

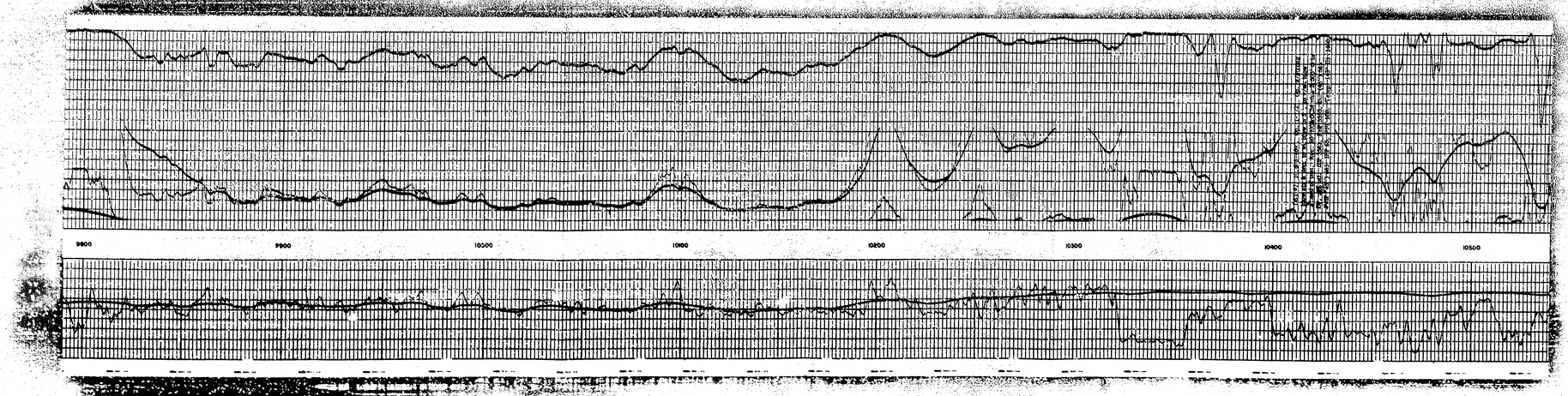

7800
7900
8000
8100
8200
8300
8400
8500


9300
9400
9500
9600
9700
9800
9900
10000

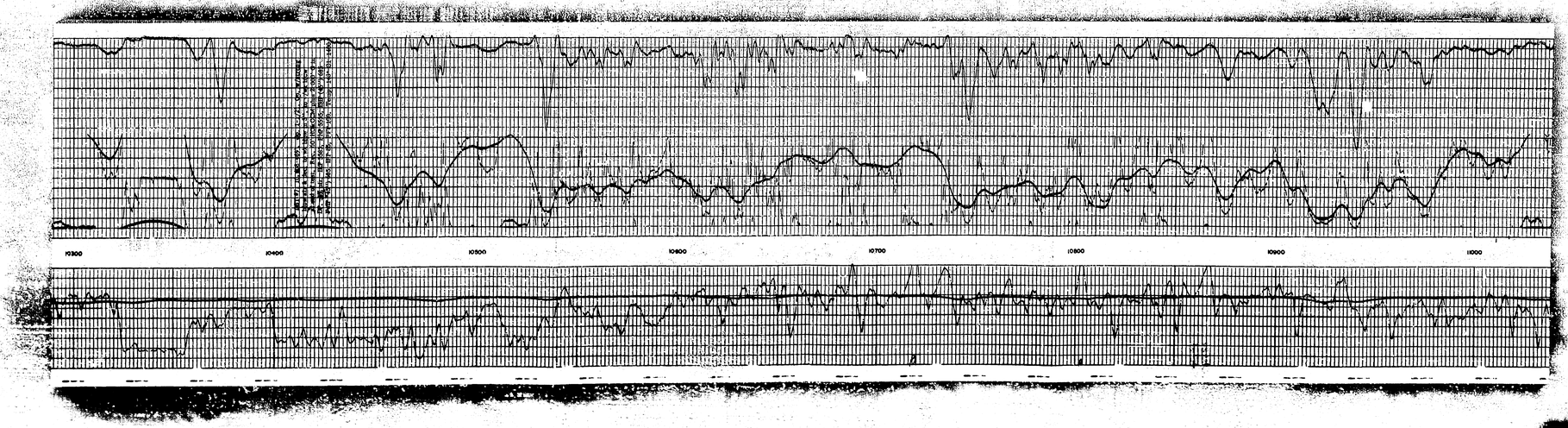


V.S.R.C.P. RICHMAPHICS

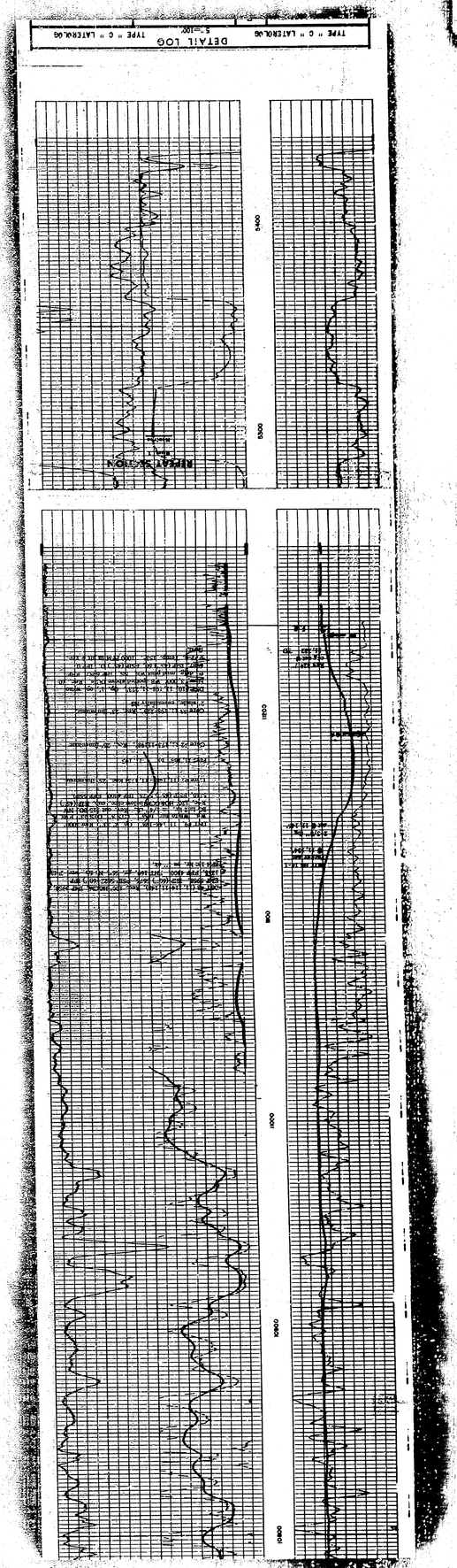

9300
9400
9500
9600
9700
9800
9900
10000

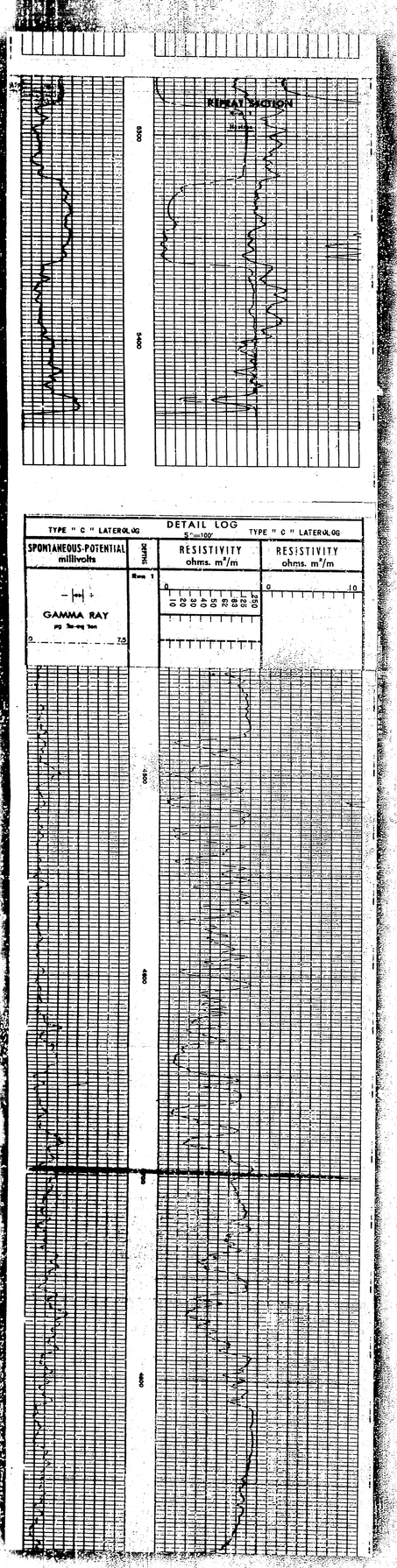


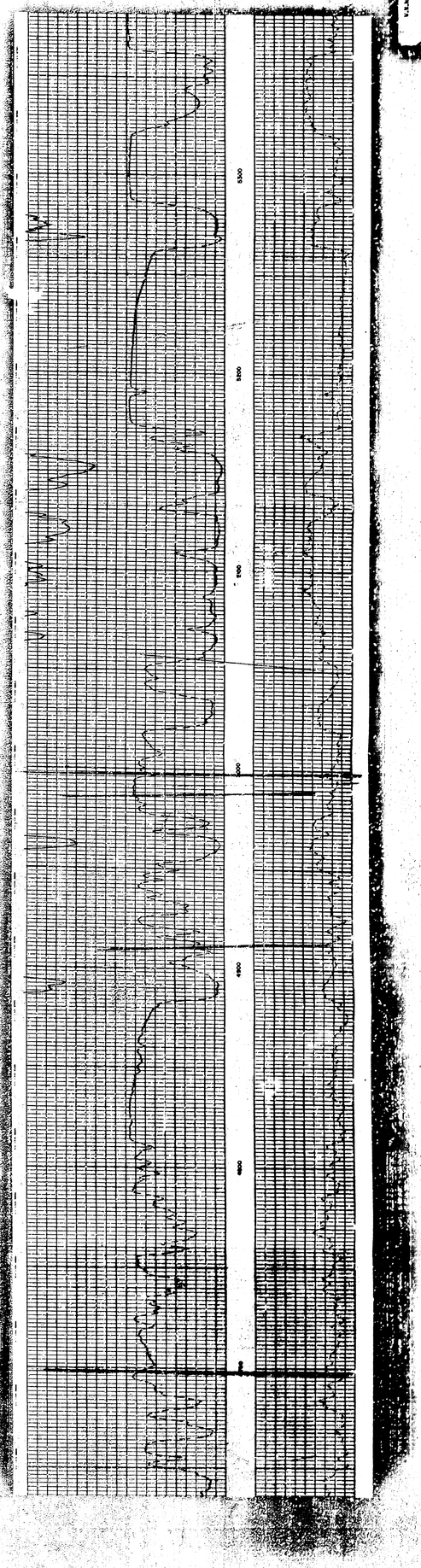
U.S.N.C.F. MICROGRAPHICS

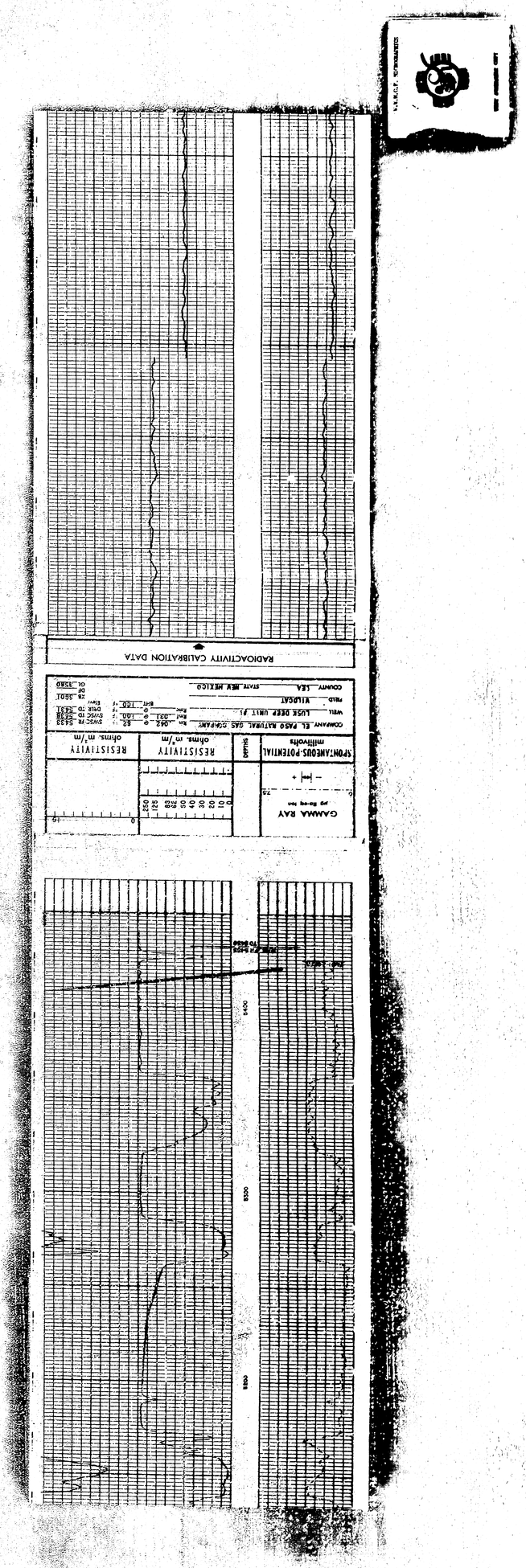

10300
10400
10500
10600
10700
10800
10900
11000


V.E.B.C.F. HIGRAPHOS


DETAIL LOG
TYPE " C " LATEROL.OG
5"=100'
TYPE " C " LATEROL.OG
5300
5400
5500
6000
6100


REPEAT SECTION
DETAIL LOG
TYPE " C " LATEROLOG
TYPE " C " LATEROLOG
SPONTANEOUS-POTENTIAL
millivolts
RESISTIVITY
ohms. m²/m
RESISTIVITY
ohms. m²/m
GAMMA RAY
DEPTHS
5000
5100
5200


5300
5200
5100
5000
4900
4800


GAMMA RAY
SPONTANEOUS POTENTIAL
millivolts
SHALE
RESISTIVITY
ohms. m²/m
RESISTIVITY
ohms. m²/m
COMPANY EL PASO NATURAL GAS COMPANY
WELL LUSK DEEP UNIT #1
FIELD WILDCAT
COUNTY LEA STATE NEW MEXICO
RADIOACTIVITY CALIBRATION DATA
8500
8550
8600
8650

