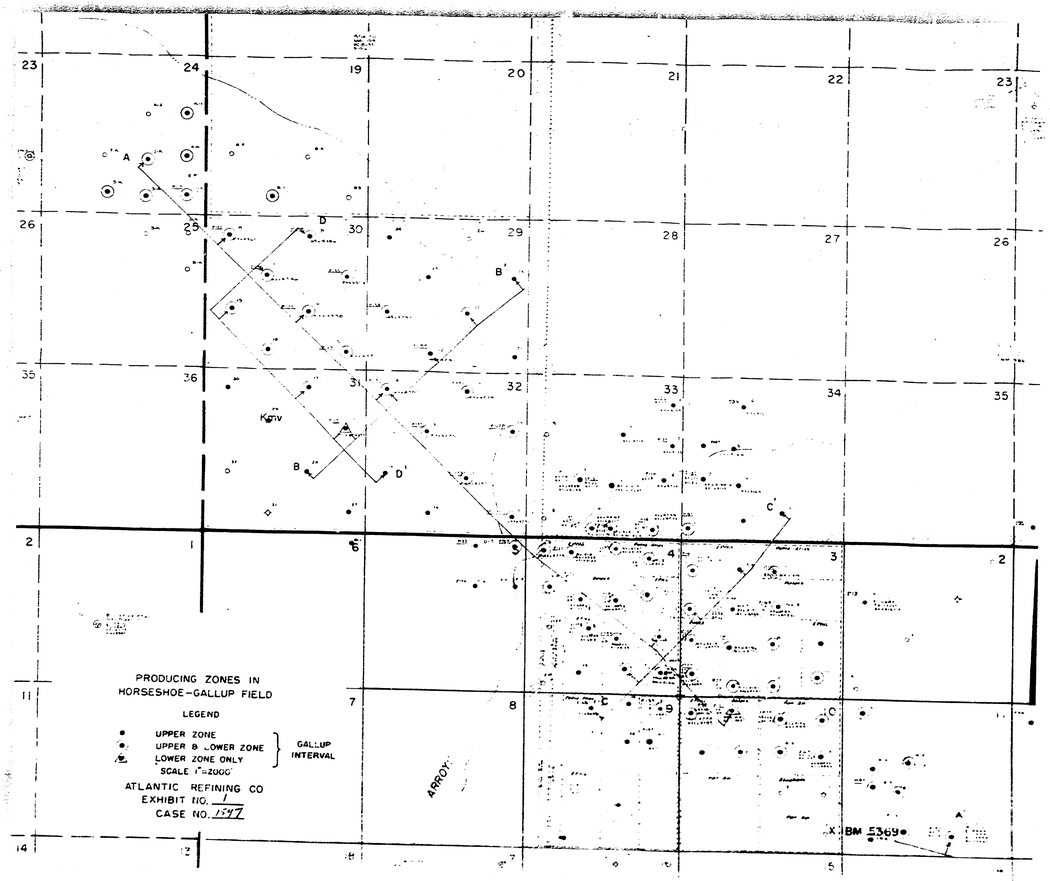
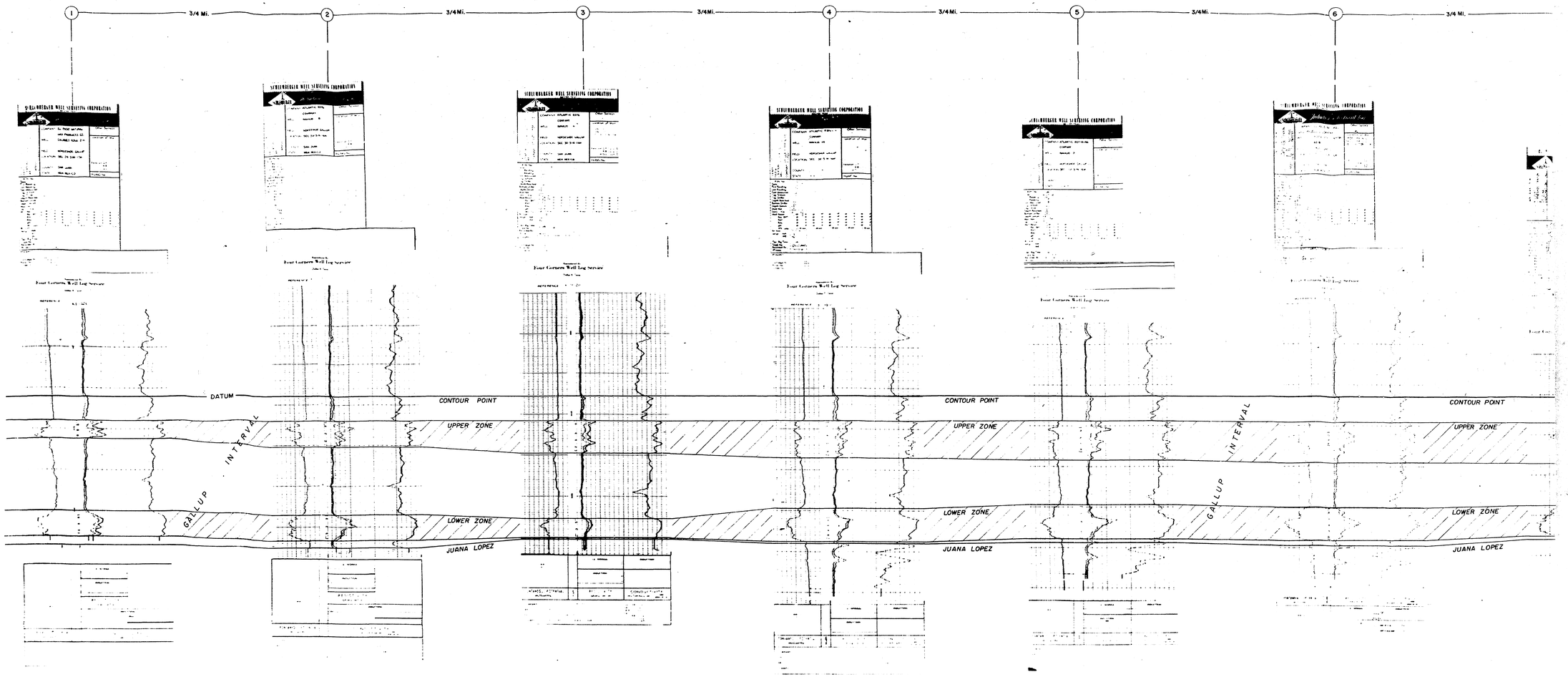

A
A'
B
B'
C
C'
D
D'
Kmv
ARROYO
BM 5369
PRODUCING ZONES IN
HORSESHOE-GALLUP FIELD
LEGEND
UPPER ZONE
UPPER & LOWER ZONE
LOWER ZONE ONLY
GALLUP INTERVAL
SCALE 1"=2000'
ATLANTIC REFINING CO
EXHIBIT NO. 1
CASE NO. 1597

73

A

NW

1 — 3/4 Mi. — 2 — 3/4 Mi. — 3 — 3/4 Mi. — 4 — 3/4 Mi. — 5 — 3/4 Mi. — 6 — 3/4 Mi.

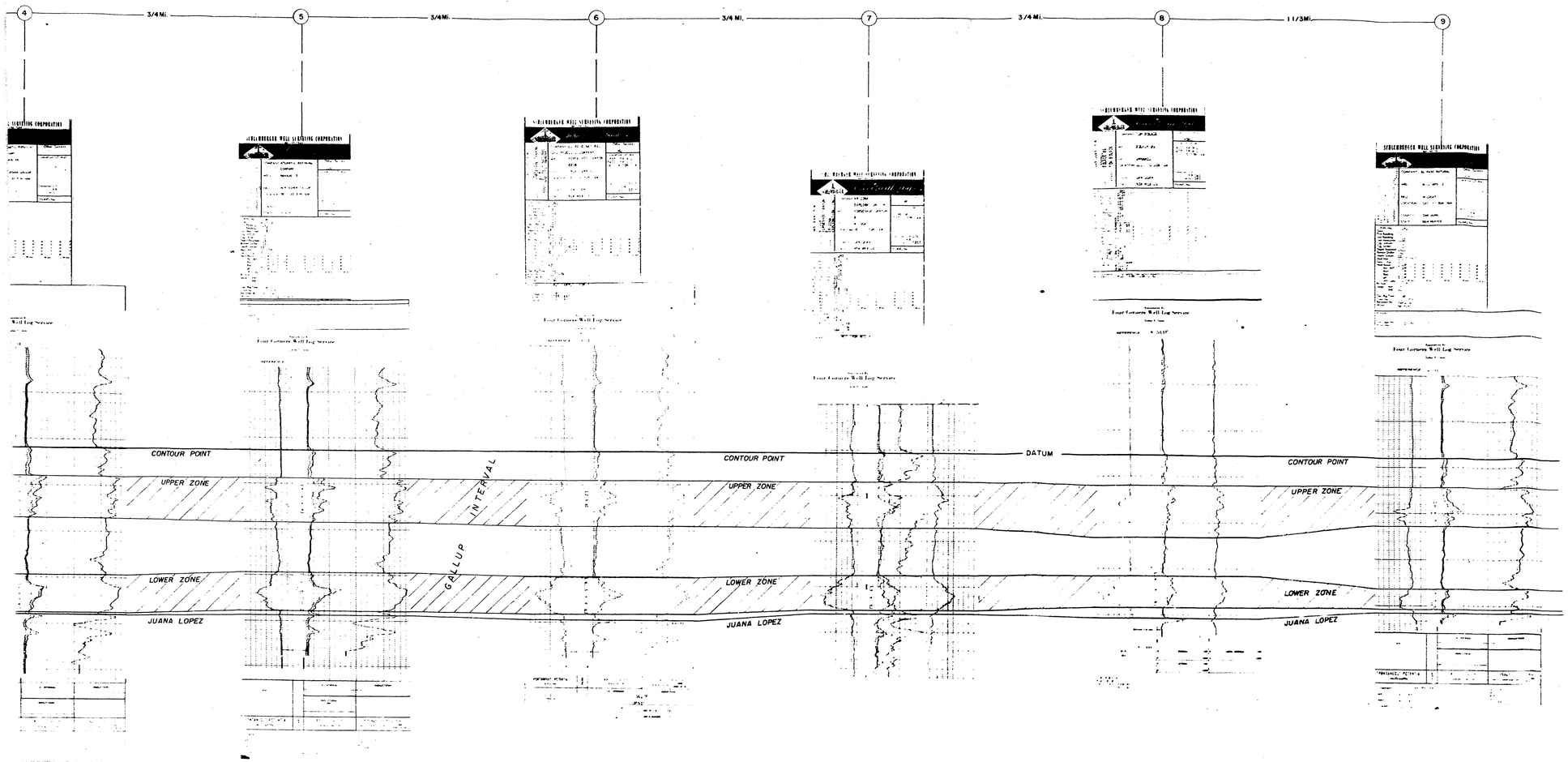


74

A'

SE

4 — 3/4 Mi. — 5 — 3/4 Mi. — 6 — 3/4 Mi. — 7 — 3/4 Mi. — 8 — 1 1/3 Mi. — 9



CROSS SECTION A-A'

GALLUP POOL
NW SE CROSS SECTION
OF THE GALLUP INTERVAL
San Juan Co., New Mexico

Horizontal Scale: None
Vertical Scale: 50' = 1"
Geology By: D. Adams - Jan 1958
Drafted By: J. Lucas & L. Williams

THE ATLANTIC REFINING CO.
EXHIBIT IV
CASE NO.

75

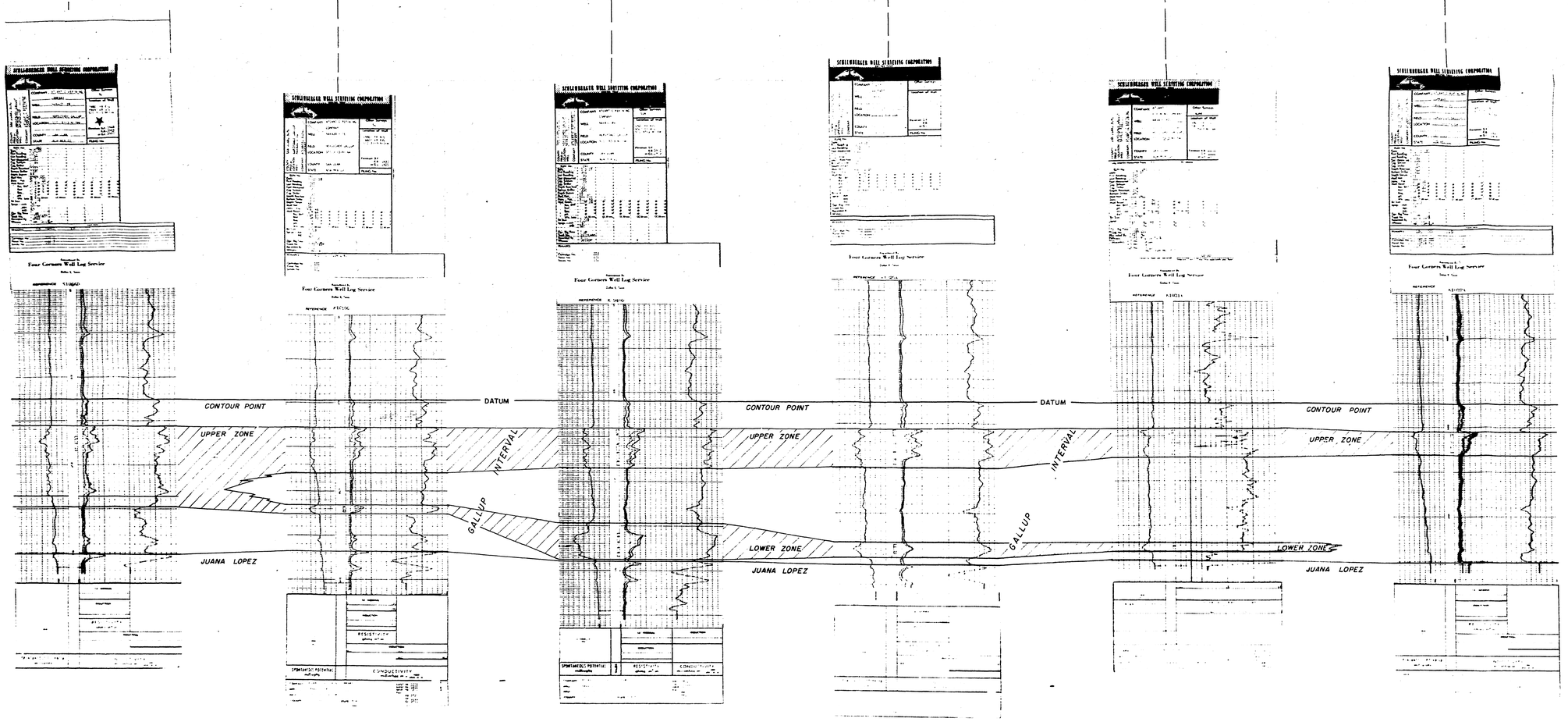
B

SW

1 — 80 Ac. — 2 — 80 Ac. — 3 — 80 Ac. — 4 — 80 Ac. — 5 — 80 Ac. — 6

B'

NE



CROSS SECTION B — B'

76

SW

C

C'

NE

80 ac.

40 ac.

40 ac.

80 ac

80 ac

1

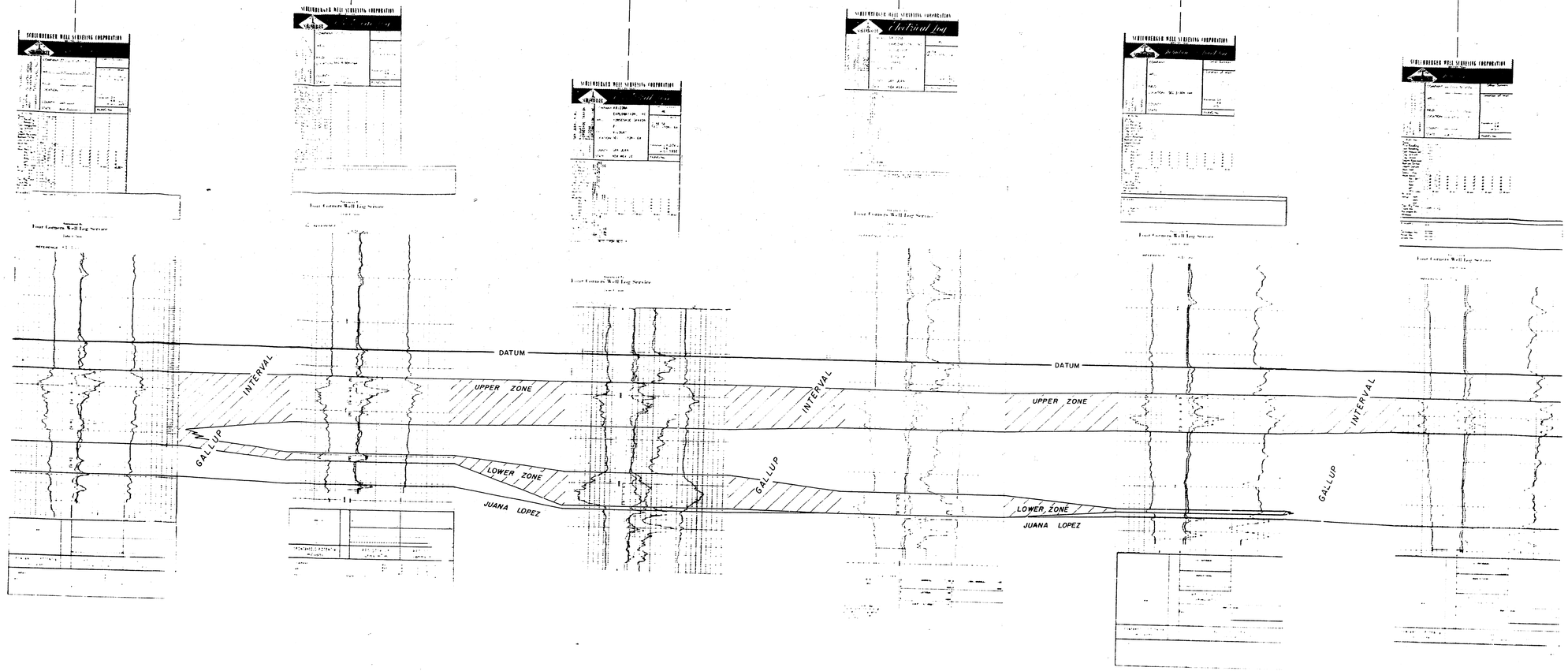
2

3

4

5

6



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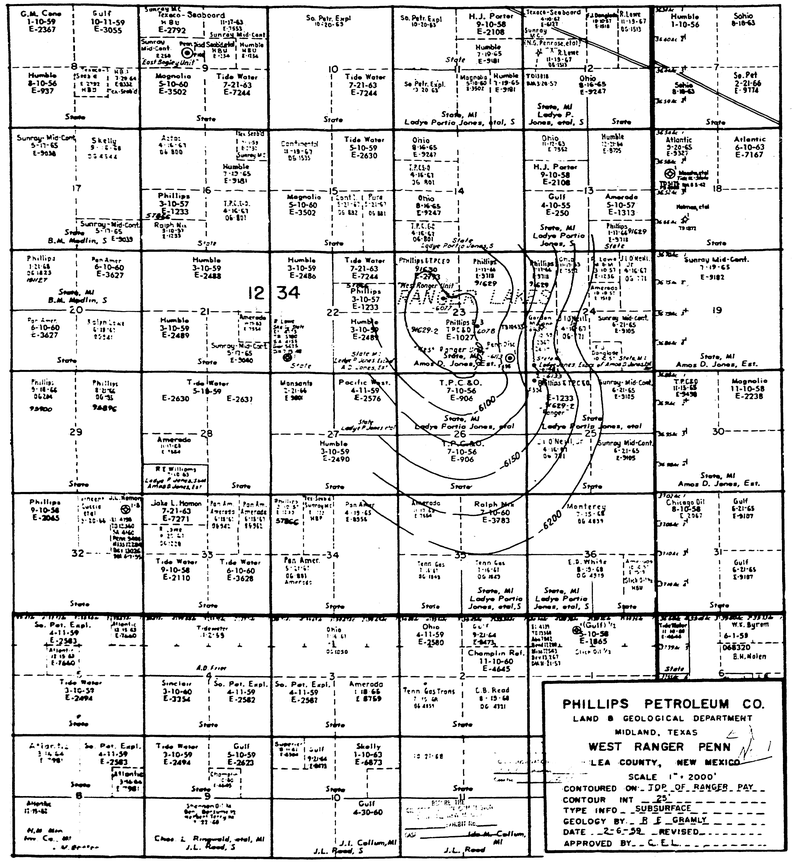
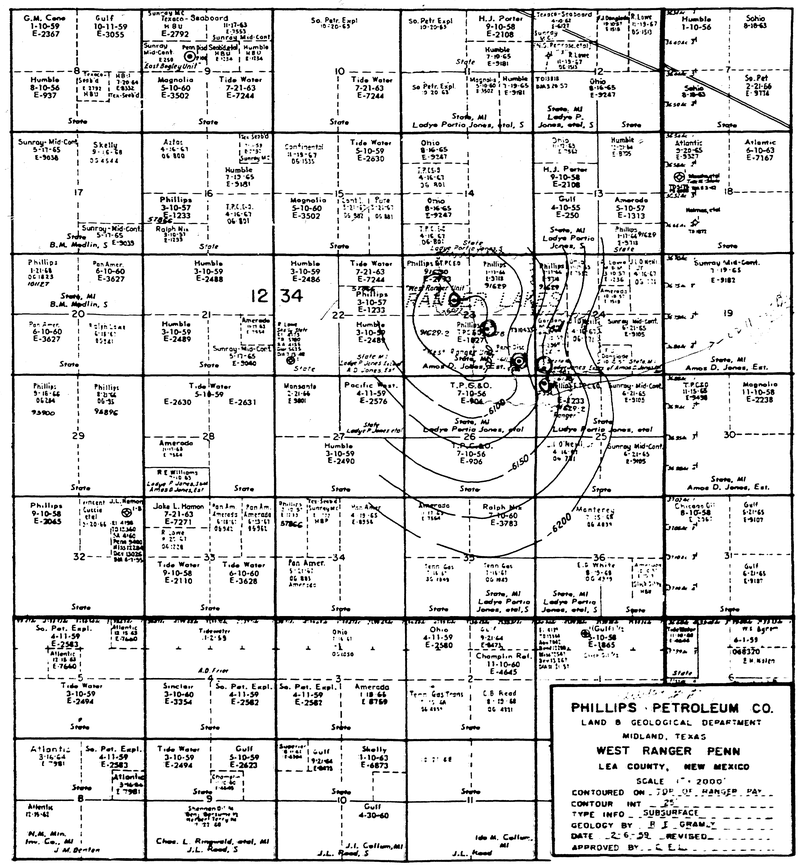

PHILLIPS PETROLEUM CO.
LAND & GEOLOGICAL DEPARTMENT
MIDLAND, TEXAS
WEST RANGER PENN
LEA COUNTY, NEW MEXICO
SCALE 1" = 2000'
CONTOURED ON TOP OF RANGER PAY
CONTOUR INT 25'
TYPE INFO SUBSURFACE
GEOLOGY BY B. F. GRAMLY
DATE 2-6-59 REVISED
APPROVED BY C.E.L.
RANGER LAKE
6100
6150
6200


PHILLIPS PETROLEUM CO.
LAND & GEOLOGICAL DEPARTMENT
MIDLAND, TEXAS
WEST RANGER PENN
LEA COUNTY, NEW MEXICO
SCALE 1" = 2000'
CONTOURED ON TOP OF RANGER PAY
CONTOUR INT 25'
TYPE INFO SUBSURFACE
GEOLOGY BY B. F. GRAMLY
DATE 2-6-59 REVISED
APPROVED BY C.E.L.
RANGER LAKE
6100
6150
6200

78

NORTHWEST — SOUTHEAST CROSS SECTION

RANGER LAKE PENNSYLVANIAN POOL

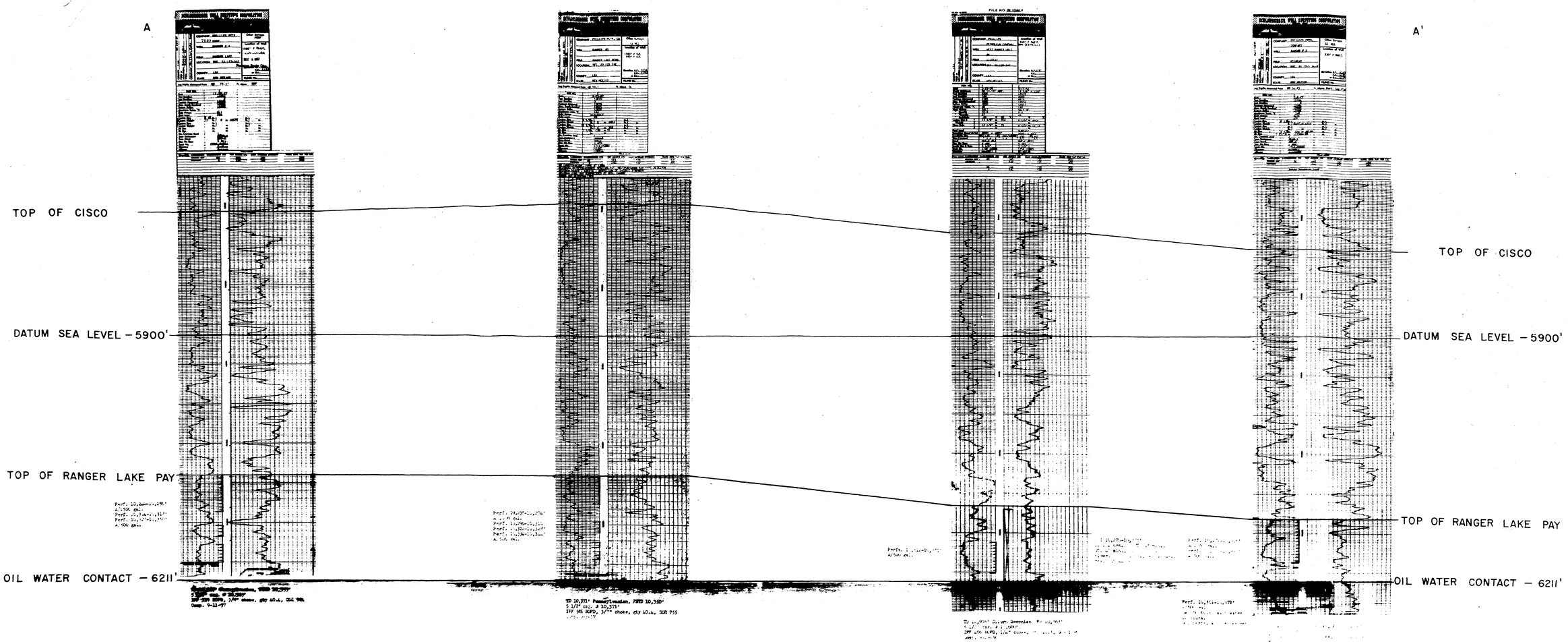
T-12-S, R-34-E

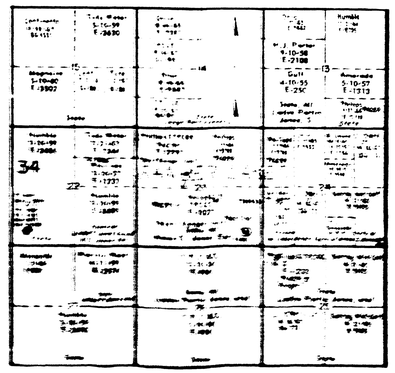
LEA, CO., NEW MEXICO

SCALE

HORIZONTAL 1" = 150'

VERTICAL 1" = 40'



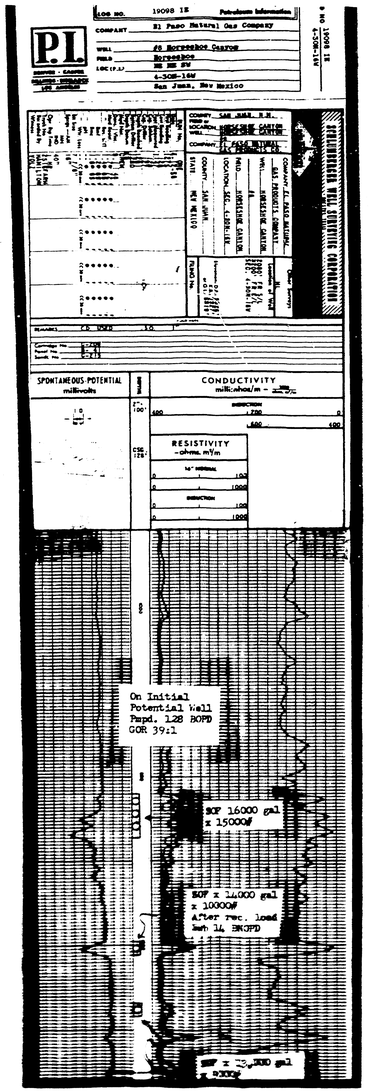


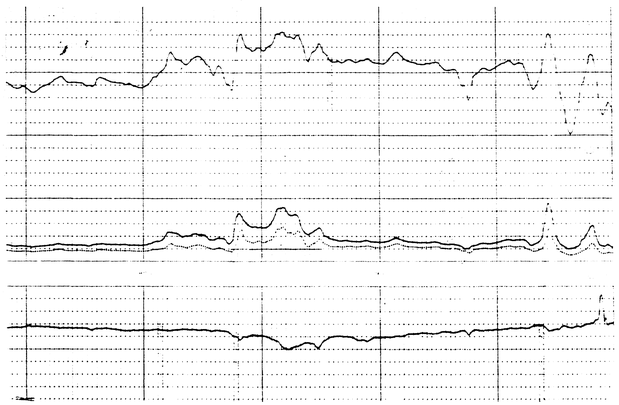
GEOLOGY BY: R. E. GRAMLY

DRAFTSMAN: DAVID BIZZELL

DATE: 2-9-59

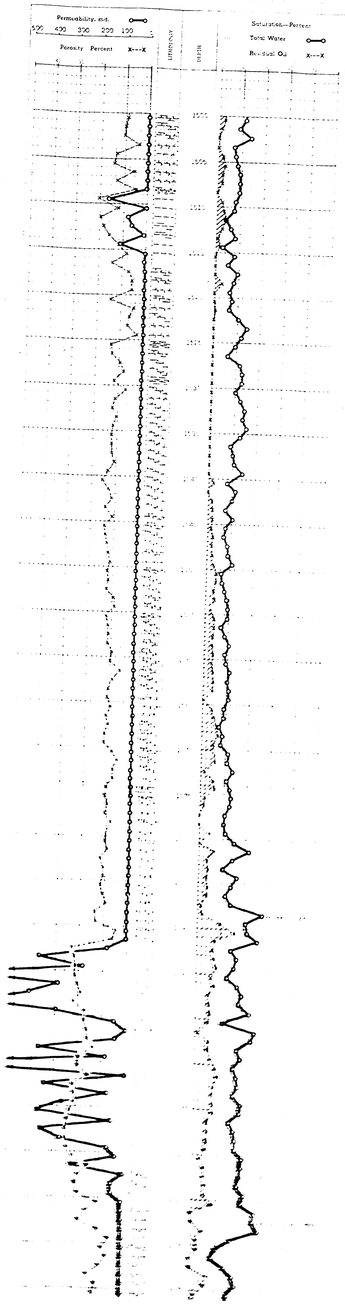
79





COREGRAPH

Company: El Paso Natural Gas Products Company
Well: Horseshoe Canyon No. 4
Field: Horseshoe Canyon
Reservoir: Lower Gallup Sand
County: San Juan
State: New Mexico
Elev: --
File: SP-3037
Date: April 15, 1958
Drilling Fluid: -
Remarks: Cored Using Rotary Tools



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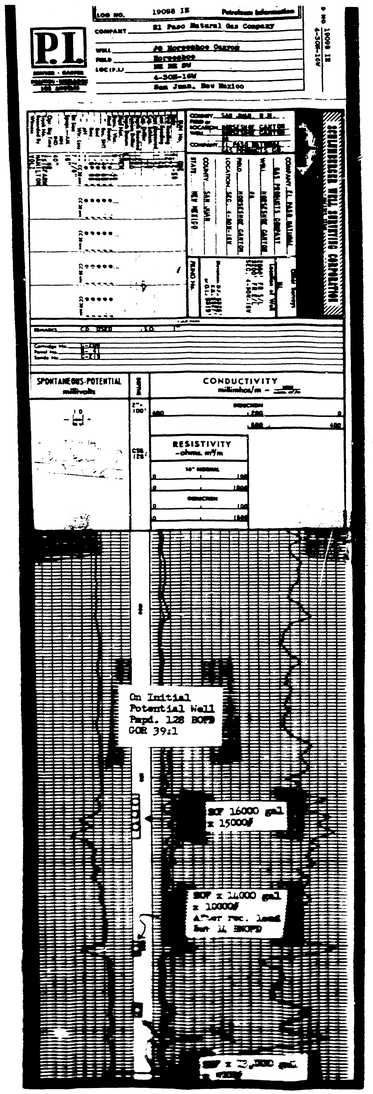
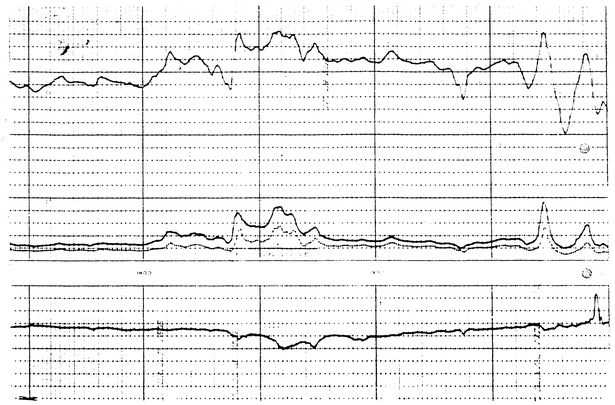
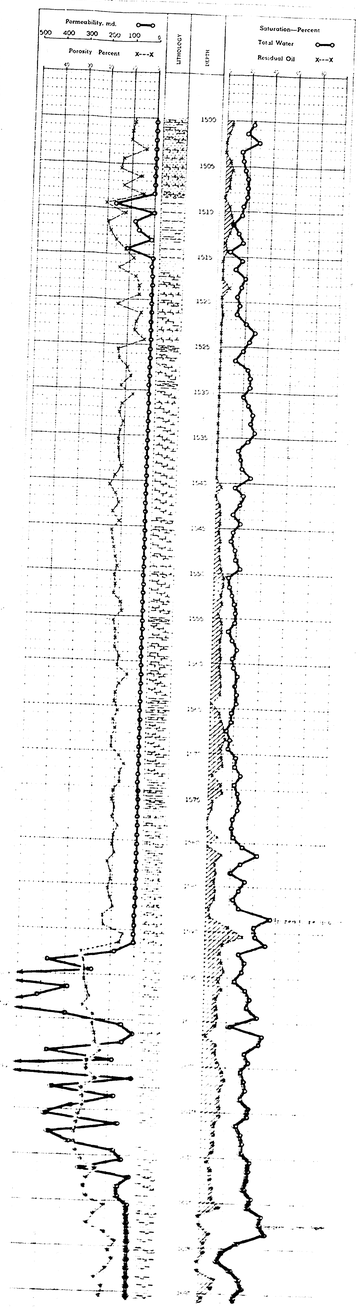
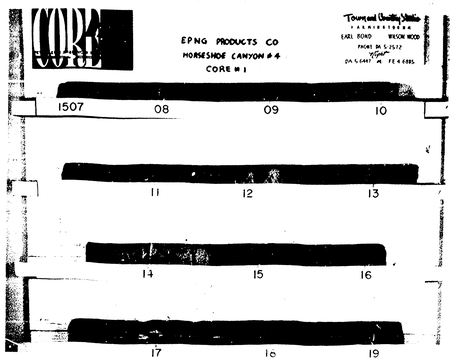
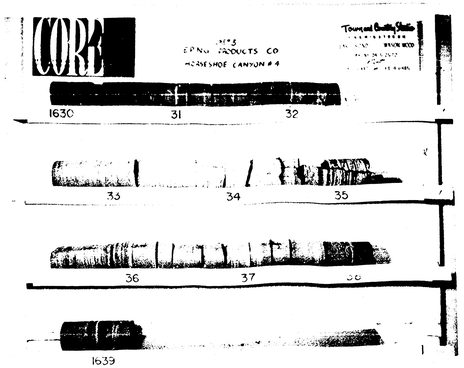

Log no. 19098 IE
Petroleum Information
COMPANY El Paso Natural Gas Company
WELL #4 Horseshoe Canyon
FIELD Horseshoe
LOC (F.L.) 4-30N-16W
San Juan, New Mexico
SPONTANEOUS-POTENTIAL millivolts
CONDUCTIVITY millimhos/m
RESISTIVITY ohmm. m²/m
On Initial Potential Well Pmpd. 128 BOPD GOR 391:1
SWF 16000 gal x 15000#
SWF x 14000 gal x 10000#
SWF x 12,000 gal




COREGRAPH
Company: El Paso Natural Gas Products Company
Well: Horseshoe Canyon No. 4
Field: Horseshoe Canyon
Reservoir: Lower Gallup Sand
County: San Juan
State: New Mexico
Elev: --
File: EP-3037
Date: April 15, 1958
Drilling Fluid: -
Remarks: Cored Using Rotary Tools
Permeability, md.
500 400 300 200 100 5
Porosity Percent X---X
LITHOLOGY
DEPTH
Saturation—Percent
Total Water
Residual Oil X---X
1500
1505
1510
1515
1520
1525
1530
1535
1540
1545
1550

80


CORE
EPNG PRODUCTS CO
HORSESHOE CANYON # 4
CORE # 1
1507 08 09 10
11 12 13
14 15 16
17 18 19


CORE
EPNG PRODUCTS CO
HORSESHOE CANYON # 4
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36 37 38
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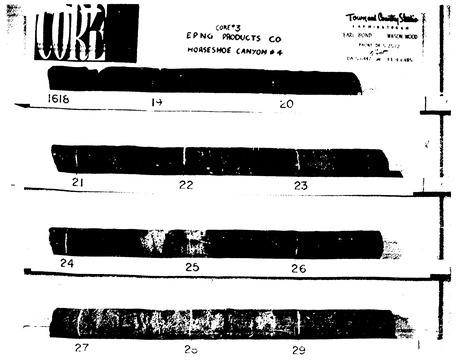
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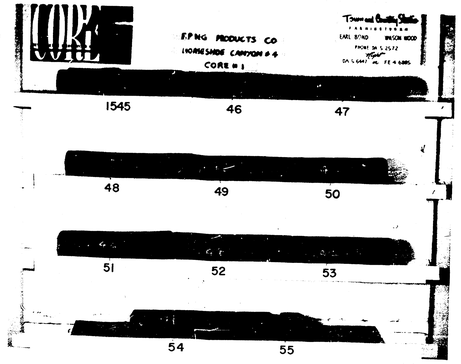
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HORSESHOE CANYON # 4
CORE # 1
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48 49 50
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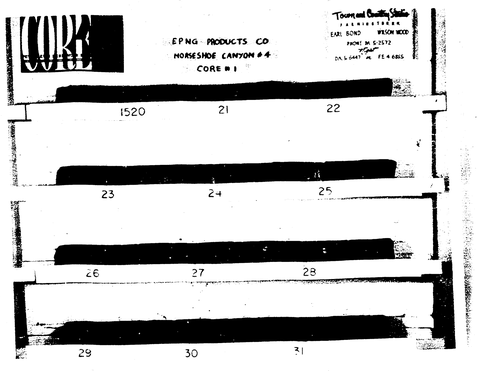
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HORSESHOE CANYON # 4
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23 24 25
26 27 28
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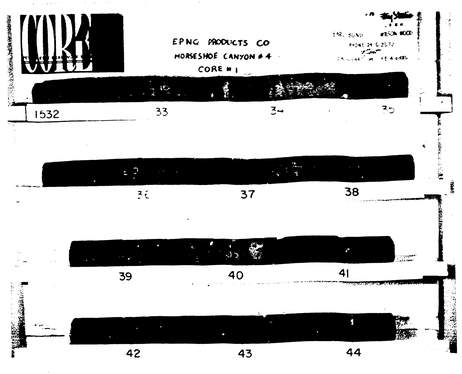
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HORSESHOE CANYON # 4
CORE # 1
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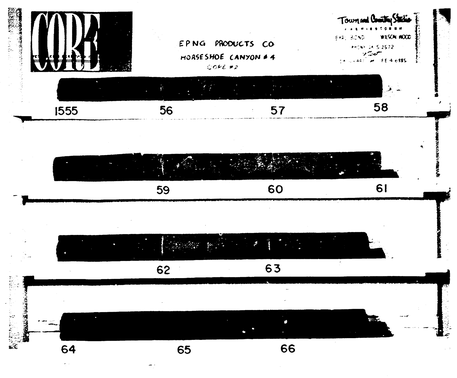
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HORSESHOE CANYON # 4
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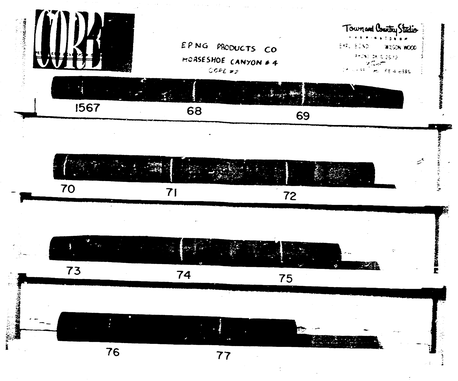
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HORSESHOE CANYON # 4
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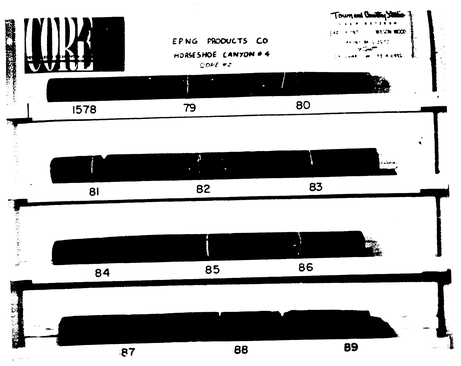
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EPNG PRODUCTS CO
HORSESHOE CANYON # 4
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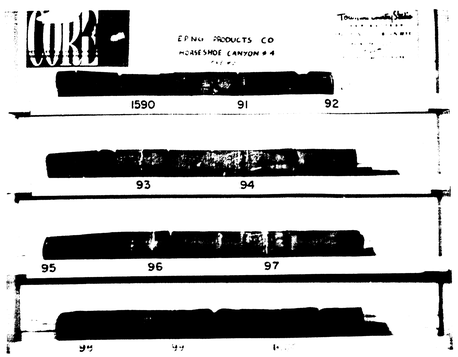
87 88 89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EPNG PRODUCTS CO
HORSESHOE CANYON # 4
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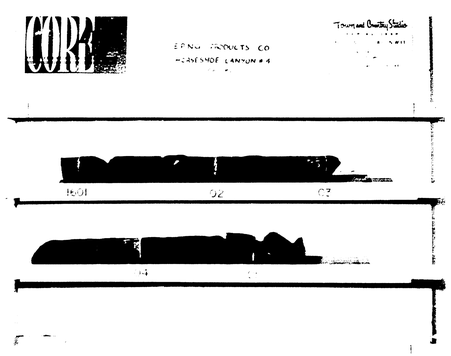
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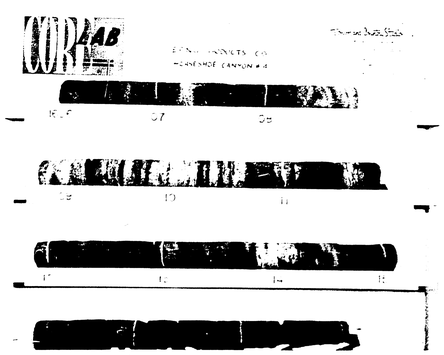
HORSESHOE CANYON # 4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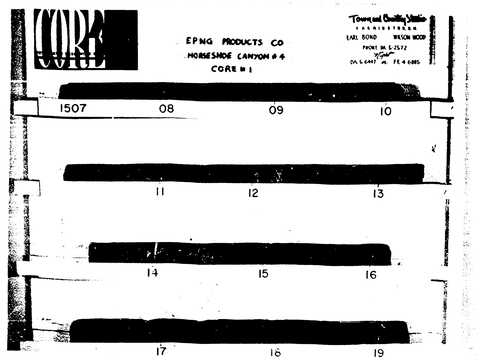
EPNG PRODUCTS CO
HORSESHOE CANYON # 4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HORSESHOE CANYON # 4
CORE # 1
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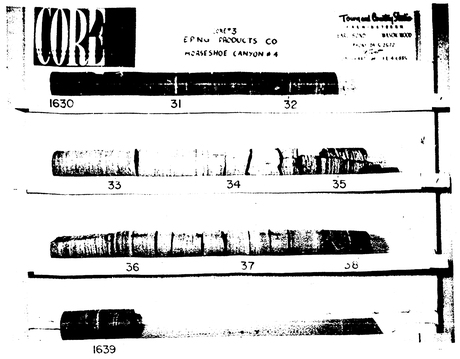
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EPNG PRODUCTS CO
HORSESHOE CANYON # 4
1630 31 32
33 34 35
36 37 38
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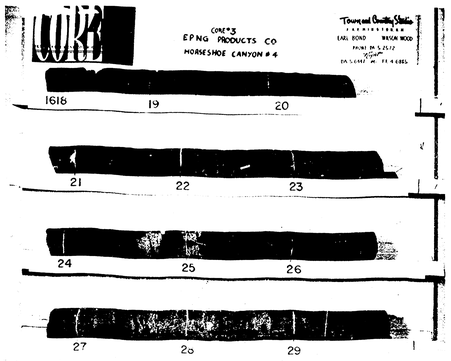
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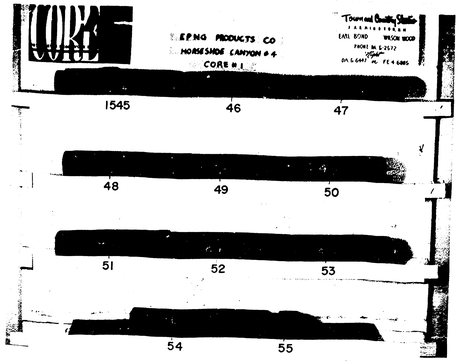
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HORSESHOE CANYON # 4
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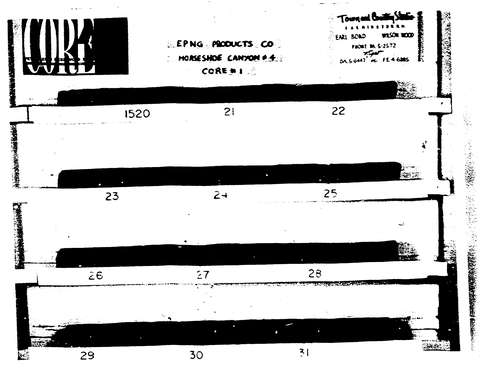
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HORSESHOE CANYON # 4
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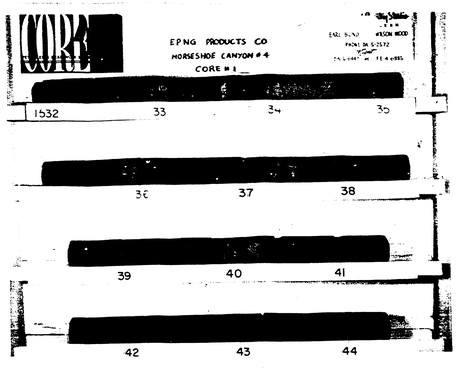
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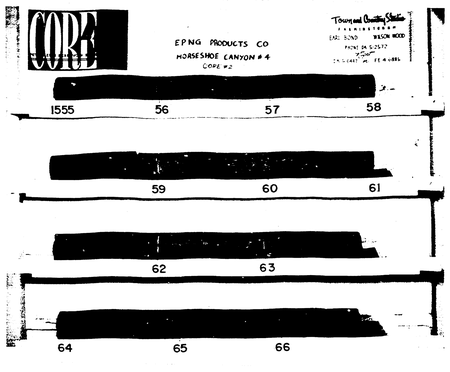
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HORSESHOE CANYON # 4
CORE # 2
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62 63
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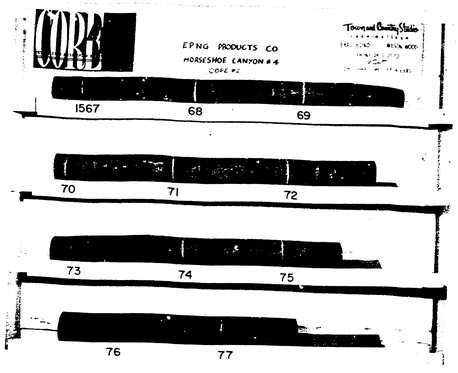
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HORSESHOE CANYON # 4
CORE # 2
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70 71 72
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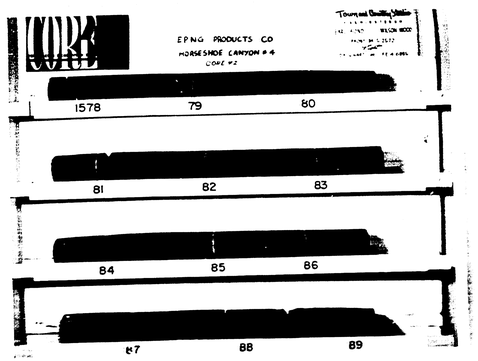
76 77


CORE
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HORSESHOE CANYON # 4
CORE # 2
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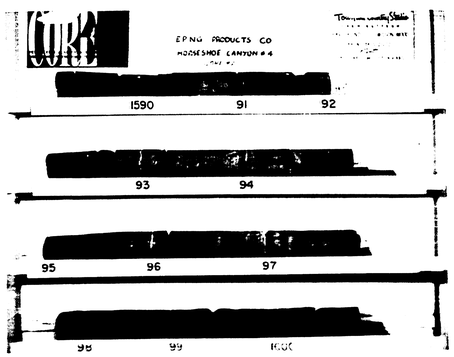
81 82 83
84 85 86
87 88 89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HORSESHOE CANYON # 4
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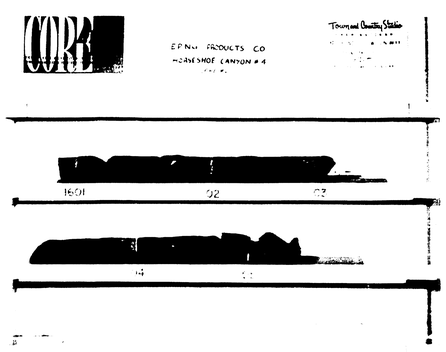
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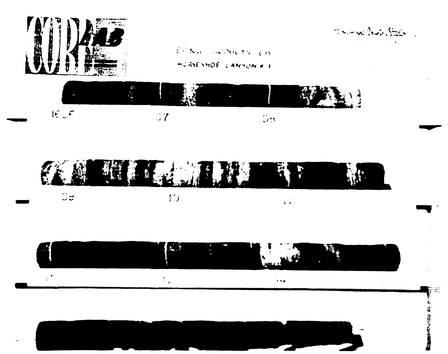
HORSESHOE CANYON # 4


CORE
EPNG PRODUCTS CO
HORSESHOE CANYON # 4

82

SCHLUMBERGER WELL SURVEYING CORPORATION

HOUSTON, TEXAS

Induction-Electrical Log

COMPANY	El Paso Nat Gas Products Co
WELL	Williams 1-A
FIELD	W C
LOCATION	Sec 12-30N-16W 660/N&W
COUNTY	San Juan
STATE	New Mexico

Other Surveys: MRS

Location of Well

Elevation: D.F.: 5500; K.B.: ; or G.L.: 5493

FILING No.

RUN No.	One
Date	10-14-58
First Reading	2283
Last Reading	126
Feet Measured	2158
Csg. Schlum.	125
Csg. Driller	128
Depth Reached	2289
Bottom Driller	2240
Depth Datum	KB
Mud Nat.	Chem
Dens. Visc.	9.4 44
Mud Resist.	2.7 @ 64 F
Res. BHT	1.4 @ 92 F
Rmf	@ F
Rmc	@ F
pH	@ F
Wtr. Loss	13.2 CC 30 min
Bit Size	7 7/8
Spcgs.—AM	16"
IND.	40"
Opr. Rig Time	1 hr
Truck No.	2510
Recorded By	Hamilton
Witness	Volz

REMARKS

Cartridge No. 84; Panel No. 74; Sonde No. 212

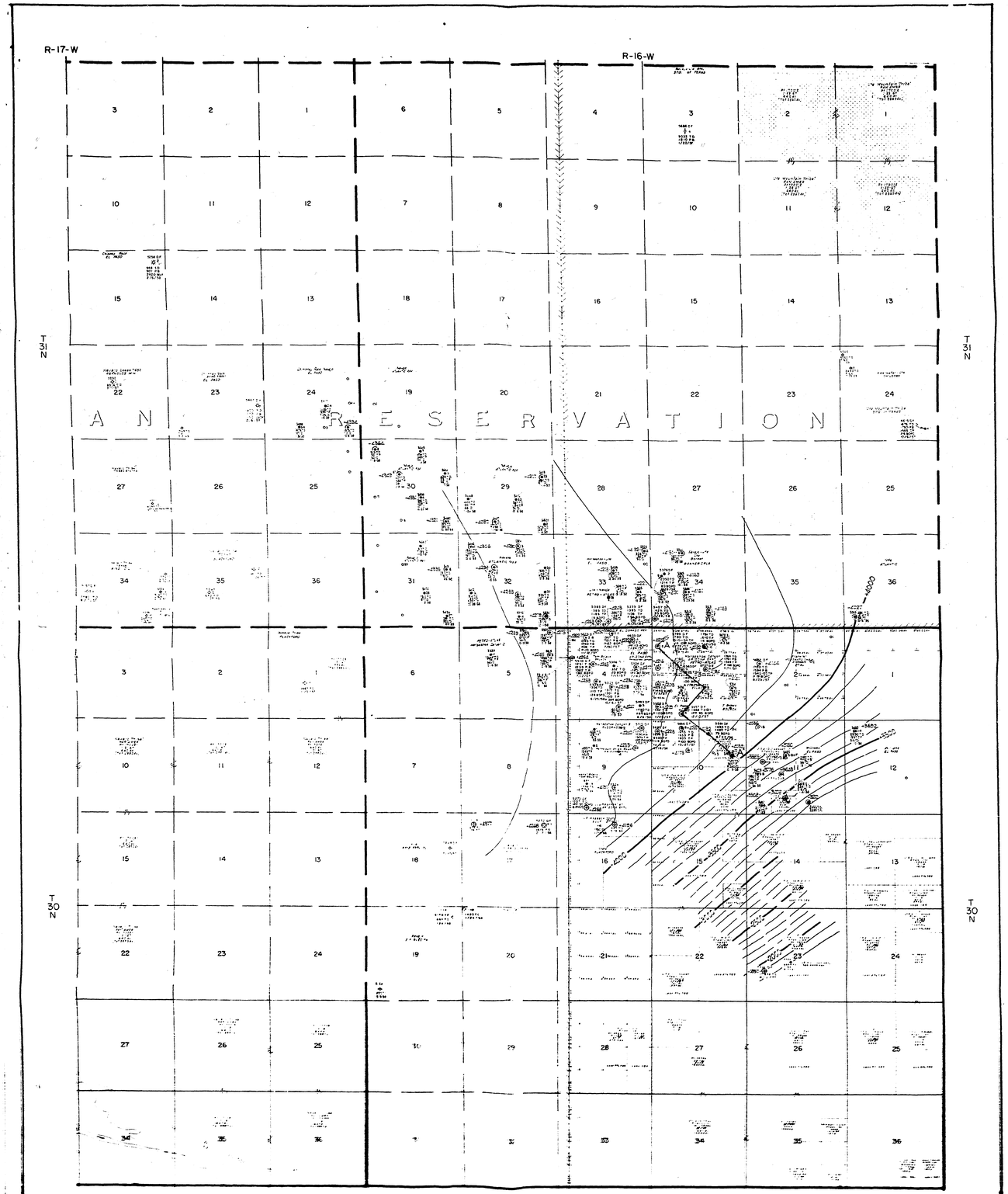
CONDUCTIVITY millimhos/m — INDUCTION 0 … 200 … 600 — 1000 ohms. m m

RESISTIVITY -ohms. m²/m — 16" NORMAL 0 … 10 … 100 — INDUCTION 0 … 10 … 100

DEPTHS

SPONTANEOUS-POTENTIAL millivolts — 10 — + —

OIL CONS. COMM. BEFORE THE … Santa Fe … Exhibit No. 9-A Case 1596


R-17-W
R-16-W
T 31 N
T 30 N
A N
R E S E R V A T I O N
STRUCTURE MAP
HORSESHOE GALLUP FIELD
TOP OF GALLUP
SAN JUAN CO., NEW MEXICO
SCALE 1" = 2000'

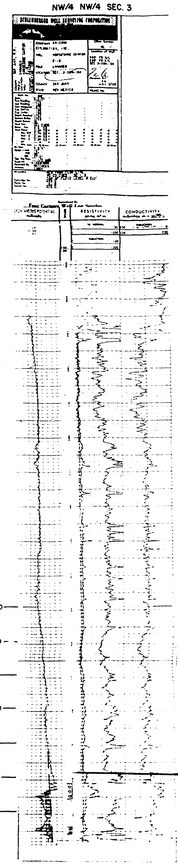
83

CROSS SECTION A-A'

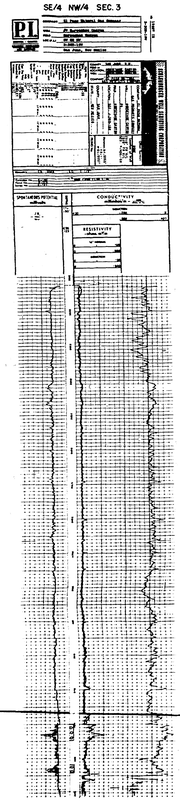
HORSESHOE GALLUP FIELD

SAN JUAN CO., NEW MEXICO

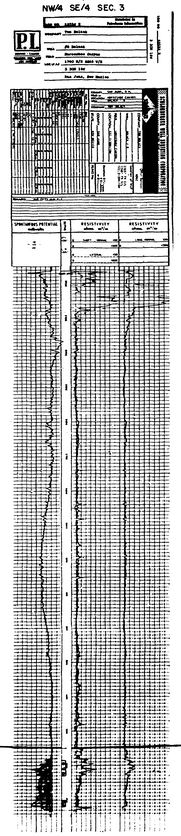
EL PASO NATURAL GAS PRODUCTS CO.
HORSESHOE CANYON NO. 1-B
T-30-N, R-16-W
NW/4 NW/4 SEC. 3



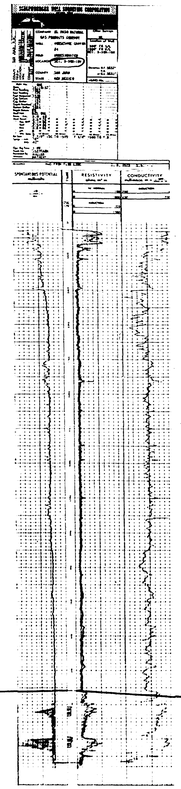
EL PASO NATURAL GAS PRODUCTS CO.
HORSESHOE CANYON NO. 9
T-30-N, R-16-W
SE/4 NW/4 SEC. 3



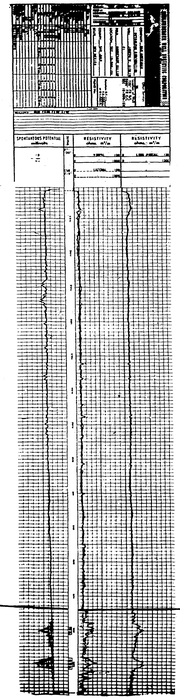
TOM BOLACK
BOLACK NO. 8
T-30-N, R-16-W
NW/4 SE/4 SEC. 3



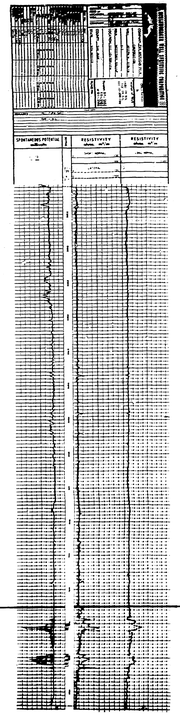
EL PASO NATURAL GAS PRODUCTS CO.
HORSESHOE CANYON NO. 4
T-30-N, R-16-W
SE/4 SW/4 SEC. 3



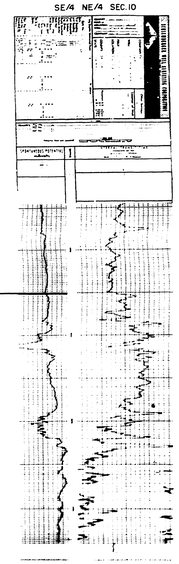
PAN AMERICAN
JOSEPH W. AIDLIN "A" NO. 1
T-30-N, R-16-W
NW/4 NE/4 SEC. 10



PAN AMERICAN
JOSEPH W. AIDLIN "A" NO. 2
T-30-N, R-16-W
SE/4 NE/4 SEC. 10



PAN AMERICAN
JOSEPH W. AIDLIN "A" NO. 2
T-30-N, R-16-W
SE/4 NE/4 SEC. 10



+4700
+4600
+4500
+4400
+4300
+4200
+4100

T. GALLUP

T. GALLUP

CHANGE IN VERTICAL SCALE

DENOTES SAND

84

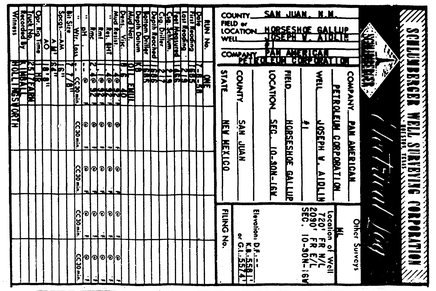
LOG - CORE CORRELATION

PAN AMERICAN

JOSEPH W. AIDLIN "A" NO. 1

T-30-N, R-16-W

NW/4 NE/4 SEC. 10



PERMEABILITY MD

POROSITY %

DENOTES VERTICAL FRACTURING

CORE DESCRIPTION

1480-83 TIGHT SAND W/SHALE LAMINATIONS

1483-93 SHALE W/SCATTERED SAND LAMINATIONS

1493-97 TIGHT TO MED GRAINED SAND W/SCATTERED SHALE LAMINATIONS
1497-99 MED GRAINED SAND W/SHALE INTRUSIONS
1499-1502 TIGHT TO MED GRAINED SAND W/SHALE LAMINATIONS
1502-06 MED GRAINED SAND W/SHALE INTRUSIONS & LAMINATIONS
1506-09 TIGHT TO MED SAND W/SHALE LAMINATIONS
1509-12 TIGHT GRAINED SAND W/SHALE LAMINATIONS & VERTICAL FRACTURES
1512-19 SHALE W/TIGHT SAND LAMINATIONS
1519-21 SHALE TIGHT GRADED SAND
1521-30 SHALE W/THIN SCATTERED SAND LAMINATIONS

1578-88 SHALE, SLIGHTLY CALCAREOUS, VERY SLIGHT SAND INCLUSIONS & LAMINATIONS

1588-96 TIGHT SAND W/OILY SHALE LAMINATIONS. BLEEDING GAS & OIL

1596-1605 MED GRAINED SAND W/SHALE LAMINATIONS (SCATTERED) BLEEDING GAS & OIL

1605-11 TIGHT SAND W/SHALE LAMINATIONS (SCATTERED)

1611-23 SHALE W/SCATTERED THIN SAND LAMINATIONS
1623-25 TIGHT SAND W/SHALE LAMINATIONS
1625-30 SHALE W/SCATTERED THIN SAND LAMINATIONS W/VERTICAL FRACTURES
1630-36 POWER CHIP SHALE, TIGHT FOSSILIFEROUS

85

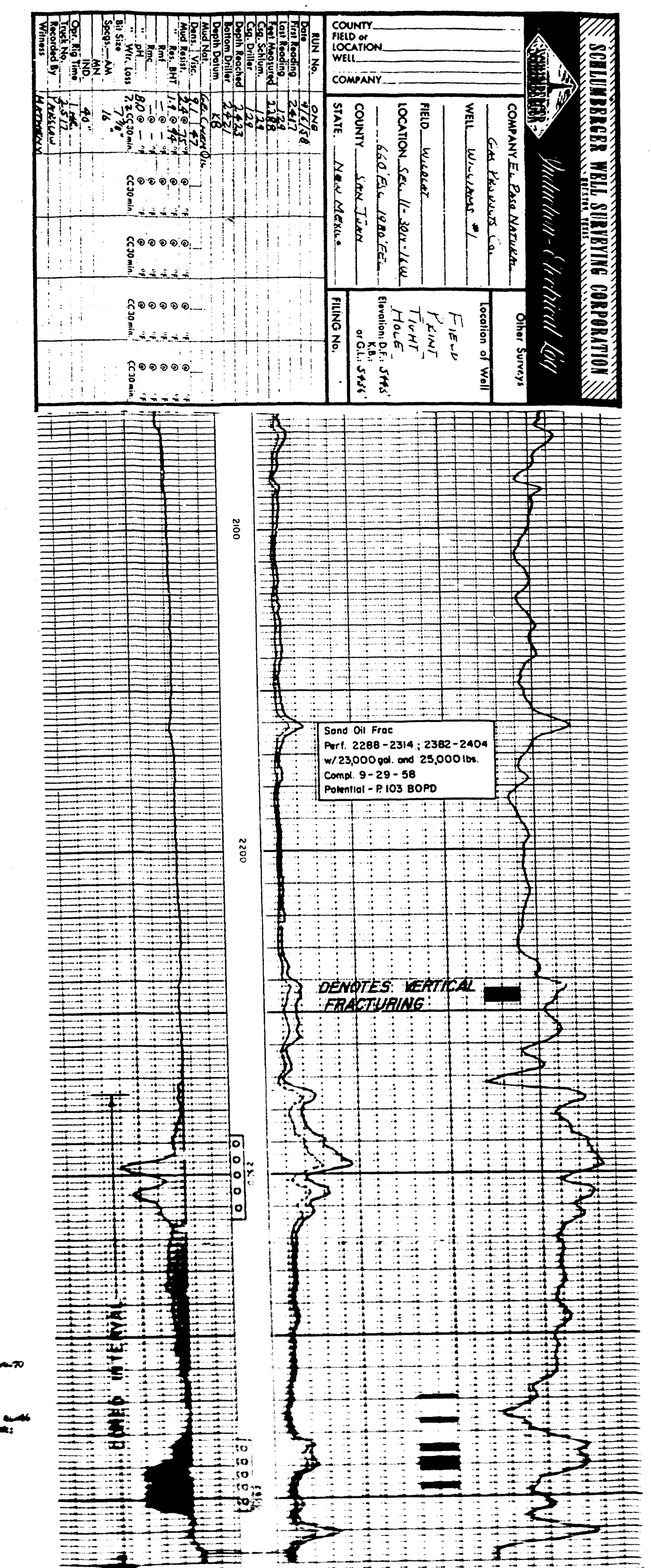
INDUCTION - ELECTRIC LOG

EL PASO NATURAL GAS PRODUCTS CO.

WILLIAMS NO. 1

T-30-N, R-16-W

SW/4 SE/4 SEC. 11



CORE DESCRIPTION

El Paso Natural Gas Products Company's #1 Williams, Section 11, T-30-N, R-16-W

Core #1: 2275-2311', Recovered 36'
2' sh, dk gy, hd, calc; w/thin stks & blebs lt gy, fn gluc ss
1' Ss, lt gy, fn, hd, calc cmtd, glauc; w/stks sh as above
4' Sh, as above; w/thin stks & blebs ss as above
2' Sh as above; w/thicker ss stks, med-cse, more glauc, w/sh pellets
2' Sh as above; w/v/thin stks fn, hd, glauc ss as before, no pellets
7' Ss, wh, med-cse, glauc, tgt, calc cmtd to shly, w/thin sh stks & blebs, occas. sh pellets & sh matrix inclus.
4' Ss, as above, clean, por, oil sat, v/sl/bldg, few sh blebs
5' Ss, as above, tgt, calc cmtd to shly matrix; w/interbeds dk gy sh
4' Ss, as above, clean, por, sat as above - (sl/less por?)
5' Ss, as above, tgt, calc cmtd to shly matrix; w/interbeded dk gy sh

Core #2: 2311-2369, Recovered 58'
2' Ss, gy, fn-cse, glauc, tgt, shly; w/stks tissn cmtd ss & dk gy sh.
1' Sh, dk gy, hd; w/v/thin stks, fn, glauc ss
3' Sh, dk gy, sdy & glauc
3' Sh, dk gy, v/sdy - almost shly ss.
3' Sh, dk gy, sdy
2' Sh, dk gy, v/sdy - almost shly ss.
8' Sh, dk gy, sdy
2' Sh, dk gy, hd; w/thin stks fn glauc ss
11' Sh, dk gy, hd; sdy & glauc
3' Sh, dk gy, hd; w/thin stks fn glauc ss
11' Sh, dk gy, hd; sl/sdy & glauc
8' Sh, dk gy, hd; w/v/thin stks fn glauc ss
1' Sh, dk gy, hd; sl/sdy

Core #3: 2369-2402', Recovered 33'
10' Sh, dk gy, hd, sl/sdy & glauc; w/few [illegible] stks & blebs glauc ss; vert frac 44-70 & 76-77
2' Ss and sh as above, interbedded
2' Ss, med-cse, [illegible], tgt, [illegible], fluor; w/thin stks dk gy sh
3' Ss & sh, as above, interbedded [illegible] fluor
3' Ss as above; w/sl/por [illegible] fluor [illegible] within sh stks; vert fracs w/fluor [illegible]
[illegible] Ss as above; clean, por, oil sat, fluor; [illegible] tgt shly [illegible]; vert fracs w/fluor [illegible]
3' Ss as above, tgt, shly; fluor [illegible]; vert/frac w/fluor [illegible]
3' Ss as above, clean, [illegible], sl/por, [illegible], fair fluor
2' No recovery

Core #4: [illegible], Recovered [illegible]
[illegible] Ss, [illegible], glauc shly
[illegible] Sh, dk gy, [illegible]
[illegible] Ss, [illegible], fn [illegible]
[illegible] Sh, as above; w/v/thin [illegible]
[illegible] No recovery

86

Black Ex. #1

BROWN TYPE "A" ZONE SELECTOR

in dual completions . . .

Eliminates

- **OUTSIDE SERVICE CREWS**
- **ZONES CO-MINGLING**
- **KILLING WELL AND PULLING TUBING**
- **DISTURBING PACKER SETTING**

This versatile tool provides the means to perform many necessary operations in dually completed and single zone wells either while flowing or pumping. With the Brown Type A Zone Selector installed in the tubing string above packer you have the versatility and desired features of a conventional ported nipple and wireline pack-off assemblies. A simple manipulation by the well operator at the surface controls its operation and eliminates the need of outside crews with special equipment when flow courses are changed.

Its applications are: (1) In a dual zone well, independent bottom hole pressure and temperature surveys as well as flow potentials can be taken through the tubing. (2) Acidizing and formation fracturing - treating the upper zone without disturbing the lower. (3) "Unloading" the annulus through the tubing and circulating hot oil or other solvents to wash out paraffin. (4) Pumping two zones intermittently with a single pump. (5) In single completion wells, when zone selector is run with packer mud can be left on top of packer and well brought in through tubing, also permitting circulation above packer to kill well.

BROWN OIL TOOLS, INC.

7314 CAMPBELL ST.

HOUSTON, TEXAS

BROWN TYPE "A" ZONE SELECTOR

in dual completions . . .

Eliminates

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- **ZONES CO-MINGLING**
- **KILLING WELL AND PULLING TUBING**
- **DISTURBING PACKER SETTING**

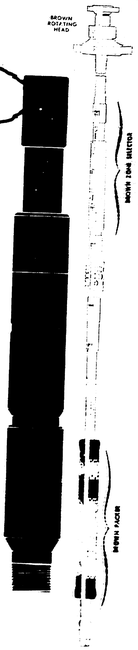
This versatile tool provides the means to perform many necessary operations in dually completed and single zone wells either while flowing or pumping. With the Brown Type A Zone Selector installed in the tubing string above packer you have the versatility and desired features of a conventional ported nipple and wireline pack-off assemblies. A simple manipulation by the well operator at the surface controls its operation and eliminates the need of outside crews with special equipment when flow courses are changed.

Its applications are: (1) In a dual zone well, independent bottom hole pressure and temperature surveys as well as flow potentials can be taken through the tubing. (2) Acidizing and formation fracturing - treating the upper zone without disturbing the lower. (3) "Unloading" the annulus through the tubing and circulating hot oil or other solvents to wash out paraffin. (4) Pumping two zones intermittently with a single pump. (5) In single completion wells, when zone selector is run with packer mud can be left on top of packer and well brought in through tubing, also permitting circulation above packer to kill well.

BROWN OIL TOOLS, INC.

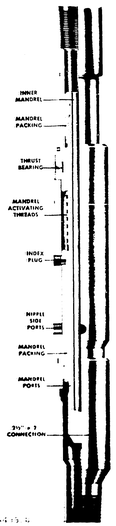
7314 CAMPBELL ST.

HOUSTON, TEXAS



87

BROWN TYPE "A" ZONE SELECTOR



This versatile and economical tool provides the means of performing a number of necessary operations in dually-completed as well as single zone wells, either while flowing or pumping. With this Selector installed in the tubing string above the packer, you have the versatility and desired features of conventional pinned nipples and push-off assemblies. But users only a simple manipulation by the well operator at the surface is required for its operation, the usual extra expense of calling in an outside crew with special equipment is not necessary when flow sources are to be changed. Neither is it necessary to kill the well, pull tubing or disturb the packer setting.

OPERATION

To operate this tool, only rotation of the tubing to the right or left is required. Thrust bearing in the top of the tool makes for ease in rotation, and W-packing seal in the bottom prevents communication between the zones above and below the packer. This rotation causes a transverse motion in the activating threads as shown in drawing. Rotating to the left moves the parts in the mandrel upward and opposite the outside ports in the nipple, thus opening the upper zone into the tubing and closing off the lower zone. Rotation to the right moves the mandrel down, pushing off the side ports in the nipple and lowering the ported section of the mandrel below the packing seal, which isolates and directs the lower zone up the tubing and the upper zone through the casing in the conventional manner.

APPLICATIONS

(1) In completing a dual-zone well, the Zone Selector is made up in the tubing string above the packer and run in while the well is still loaded. Packer can be set and surface connections, including a Brown Retaining Tubing Head, permanently installed. Then, each zone may be brought in separately by swabbing or unloading. With the nipple side ports open, the upper zone is brought in through the tubing. Then, by rotating to the right, the lower zone is opened and brought in up the tubing, while the upper zone is confined to the tubing-casing annulus. In this manner, the two zones are never allowed to commingle and are kept segregated at all times.

(2) Bottom hole pressure and temperature surveys may be taken of each zone independently through the tubing, as well as flow potentials.

(3) Acidizing and Fracturation treatering can be accomplished, treating the upper zone separately and directly down the tubing.

(4) When both zones are to be pumped intermittently with a single pump, the Zone Selector provides a dependable means of pumping either zone through the tubing while blanking off the other, and to change over when desired by merely rotating the tubing at the surface.

(5) In the event that the casing "heads up", the Zone Selector can be used to unload the annulus through the smaller diameter tubing. If the casing pressures up, the Zone Selector provides a means of circulating hot oil or other solvents to wash out the paraffine.

(6) In a single completion well where the Zone Selector is run with packer, mud can be left on top the packer and the well brought in through the tubing. This also permits conditioning of the mud above the packer, or killing the well by circulation.

ADVANTAGES

(1) Many desired operations are made easier, faster and more economical with the Zone Selector — without killing the well, pulling tubing or disturbing the packer setting.
(2) At no time are the producing zones allowed to commingle after packer is set.
(3) Outside service crews with special equipment are not required

ENGINEERING DATA

NOTE: Drawing shows Zone Selector equipped for 2" tubing. To convert to 2½", remove bottom swage and make up to top connection.

SIZE	2"	2½"
(1) Maximum O.D. of Nipple Body	2-11/16"	3-11/16"
(2) Nipple Ports	4 — 2/4" holes	4 — 2/4" holes
(3) Opening thru Mandrel	1 sq. in.	1 sq. in.
(4) Flow Openings thru Mandrel	2 — 9/16" holes	3 — 9/16" holes
(5) No. turns to change zones	8	8
Length over all	35-5/8"	35-5/8"
Approx. Weight	632	662

PARTS & PRICE LIST

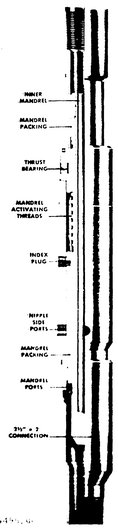
2" ~~Price~~ $499.00 2½" ~~Price~~ $[illegible]

BROWN OIL TOOLS, INC.
2214 CAMPBELL ST.
HOUSTON, TEXAS

DRAWING SHOWS TUBING OPEN AND NIPPLE SIDE PORTS CLOSED OFF FROM CASING

87

BROWN TYPE "A" ZONE SELECTOR



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OPERATION

To operate this tool, only rotation of the tubing to the right or left is required. Thrust bearing in the top of the tool makes for ease in rotation, and W-packing seal in the bottom prevents communication between the zones above and below the packer. This rotation causes a transverse motion in the activating threads as shown in drawing. Rotating to the left moves the parts in the mandrel upward and opposite the outside ports in the nipple, thus opening the upper zone into the tubing and closing off the lower zone. Rotation to the right moves the mandrel down, pushing off the side ports in the nipple and lowering the ported section of the mandrel below the packing seal, which isolates and directs the lower zone up the tubing and the upper zone through the casing in the conventional manner.

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ENGINEERING DATA

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SIZE	2"	2½"
(1) Maximum O.D. of Nipple Body	2-11/16"	3-11/16"
(2) Nipple Ports	4 — 2/4" holes	4 — 2/4" holes
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(4) Flow Openings thru Mandrel	2 — 9/16" holes	3 — 9/16" holes
(5) No. turns to change zones	8	8
Length over all	35-5/8"	35-5/8"
Approx. Weight	632	662

PARTS & PRICE LIST

2" ~~Price~~ $499.00 2½" ~~Price~~ $[illegible]

BROWN OIL TOOLS, INC.
2214 CAMPBELL ST.
HOUSTON, TEXAS

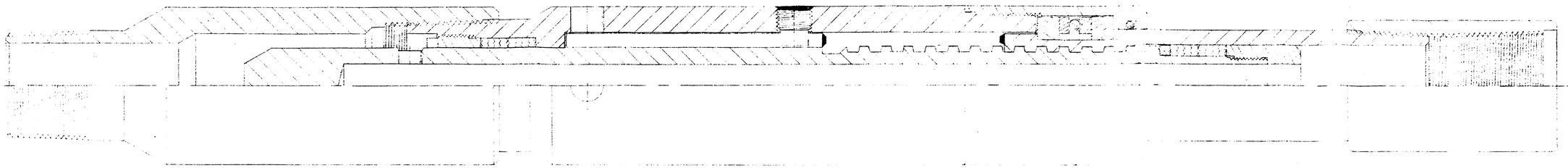
DRAWING SHOWS TUBING OPEN AND NIPPLE SIDE PORTS CLOSED OFF FROM CASING

BROWN TYPE A ZONE SELECTOR

PROPERTY OF
BROWN OIL TOOLS INC.

DESIGN BY C.C.BROWN DRAWN 9-23-54 BY JNS

SKETCH NO. 1808 FILE NO. E E-3-3



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BROWN DUO PAK PACKER, HYDRAULIC HOLD DOWN,
TYPE A, ZONE SELECTOR AND ROTATING TUBING HEAD
PROPERTY OF
BROWN OIL TOOLS, INC.
DESIGN BY C.C. BROWN DRAWN 10-1-54 BY W.L.F.
SKETCH NO. 829 REVISED 12-5-56

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
CASE NO. 1543
EXHIBIT NO. 2

89

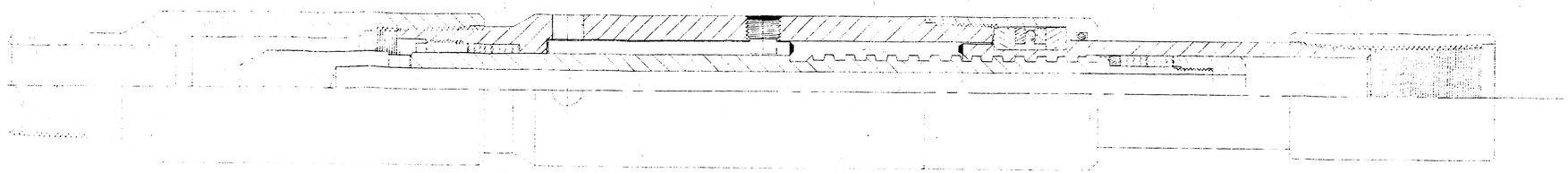
BROWN TYPE A ZONE SELECTOR

PROPERTY OF

BROWN OIL TOOLS INC.

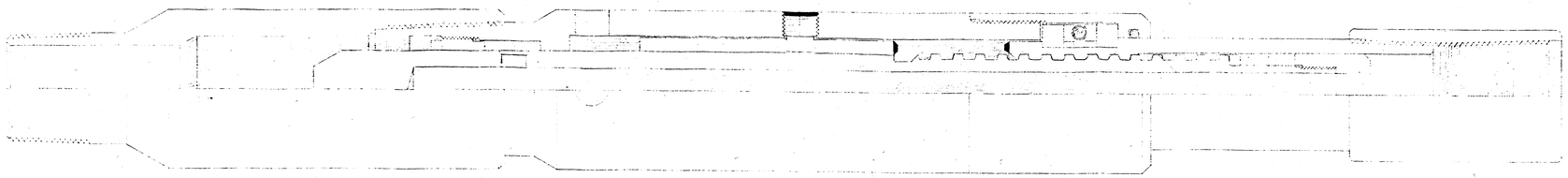
DESIGN BY C.C.BROWN DRAWN 9-23-54 BY JNS

SKETCH NO. 1808 FILE NO. E E-3-3



BROWN TYPE A ZONE SELECTOR

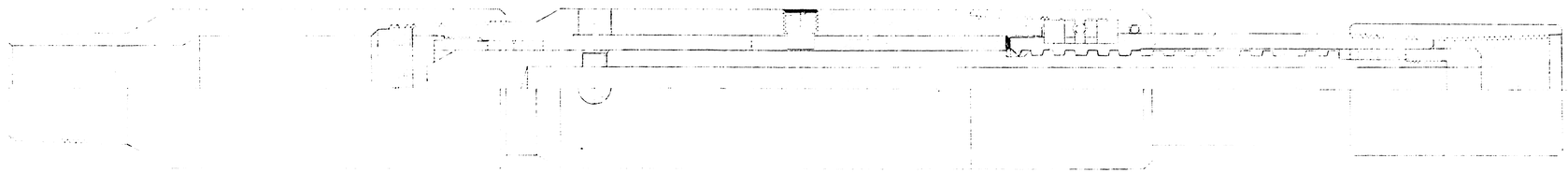
PROPERTY OF
BROWN OIL TOOLS INC.
DESIGN BY C.C.BROWN DRAWN 4-21-58 BY O.G.C.
SKETCH NO. 1808 FILE NO. EE-3-3



BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
CASE No. 4

BROWN TYPE A ZONE SELECTOR

PROPERTY OF
BROWN OIL TOOLS INC.
DESIGN BY C.C. BROWN DRAWN 4-22-58 BY O.G.C.
SKETCH NO. 1808 FILE NO. EE-3-3



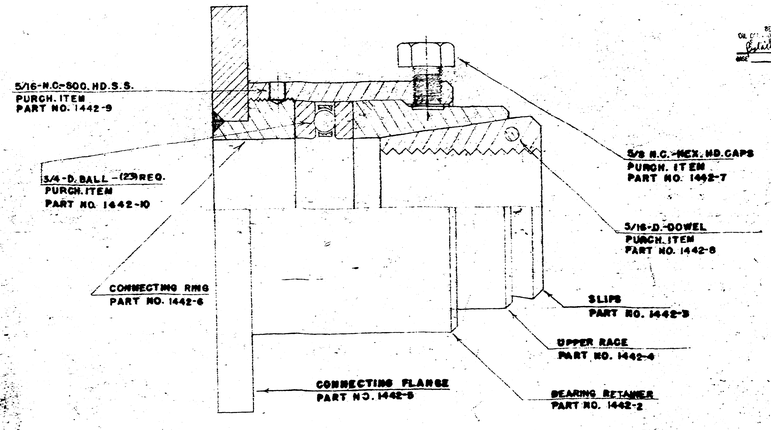
BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
CASE No. 5

91

2- EUE- ROTATING SLIP ASSEMBLY
PROPERTY OF
BROWN OIL TOOLS, INC.

DESIGN BY - C.C.BROWN DATE - 8-8-51 DRAWN BY - J.R.B.

SKETCH NO. 1410 FILE NO. Y-1-6
BOOK NO. 1442



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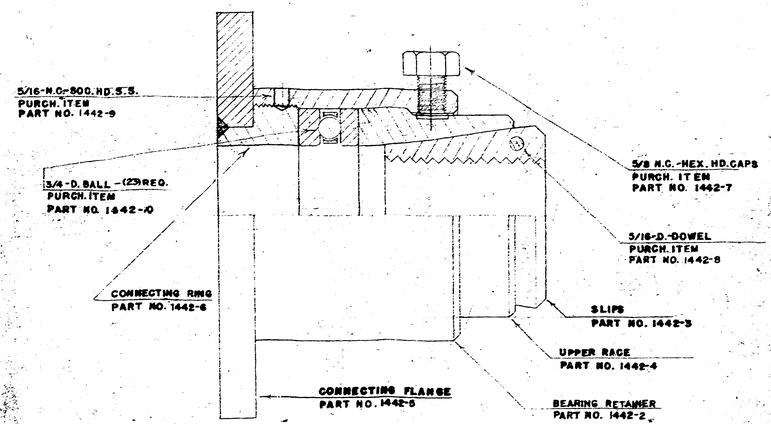
DESIGN BY - C.C.BROWN DATE - 8-8-51 DRAWN BY - J.R.B.

SKETCH NO. 1410 FILE NO. Y-1-6
BOOK NO. 1442



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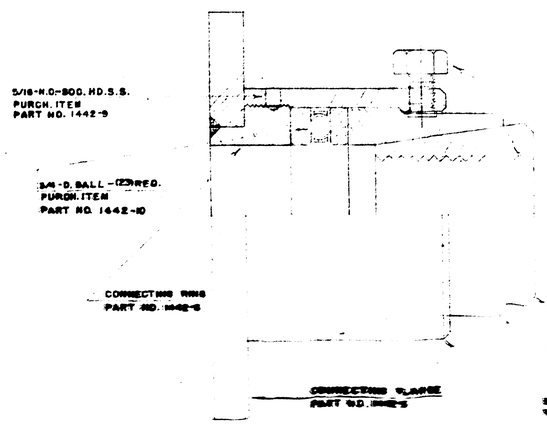
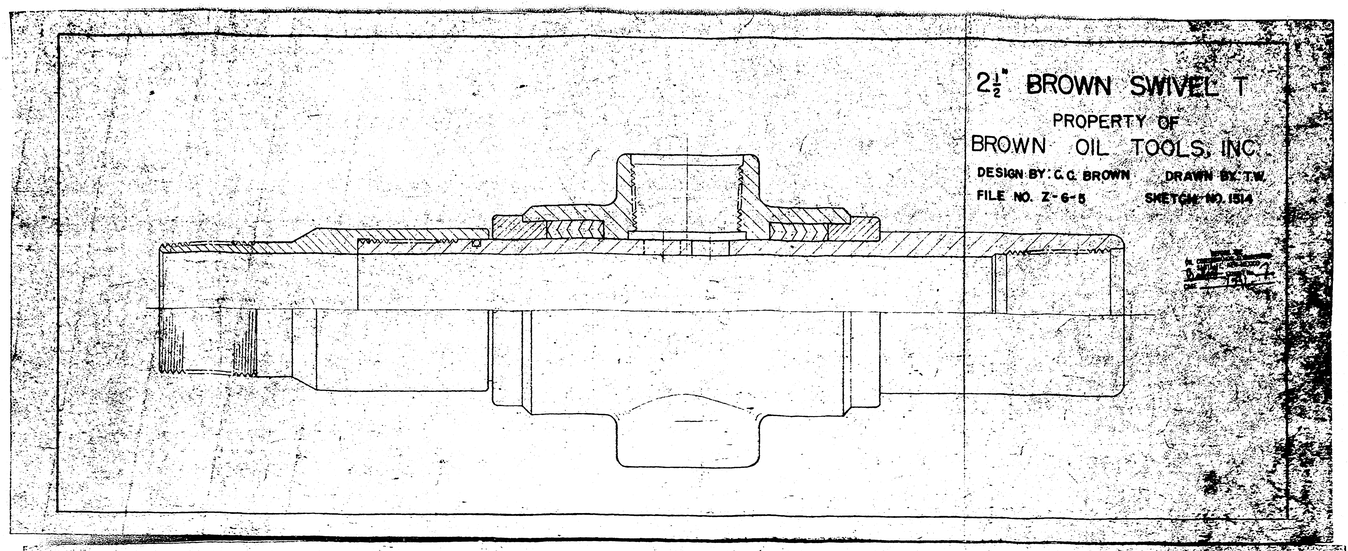
BROWN OIL TOOLS, INC.

DESIGN BY - C.C.BROWN DATE - 8-8-51 DRAWN BY - J.R.B.

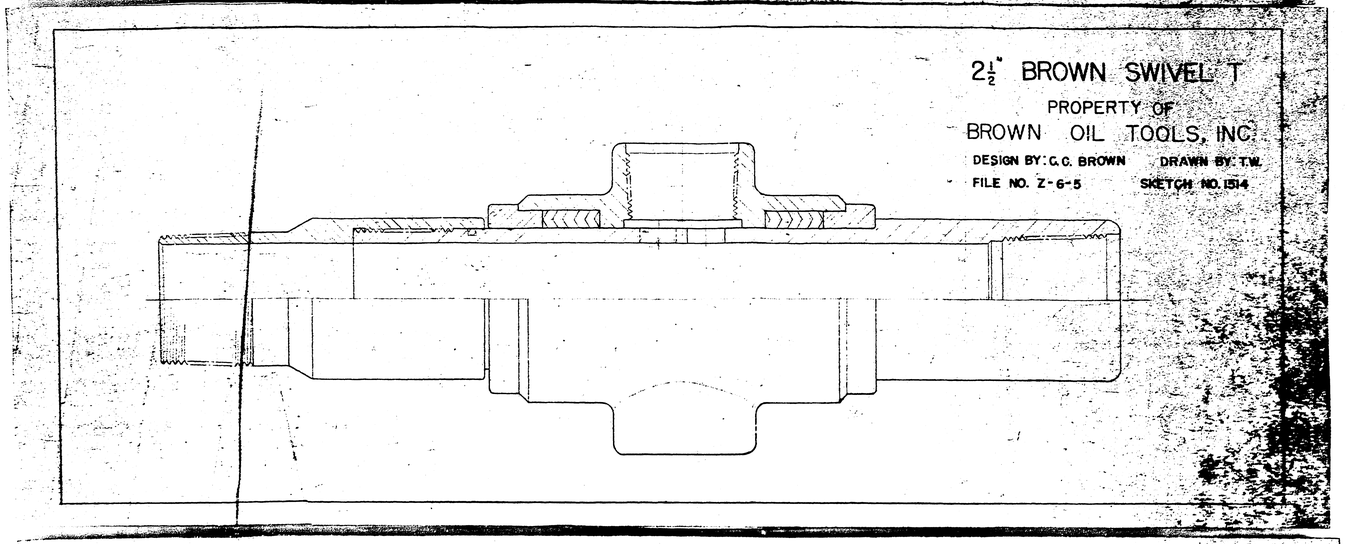
SKETCH NO. 1410 FILE NO. Y-1-6
BOOK NO. 1442



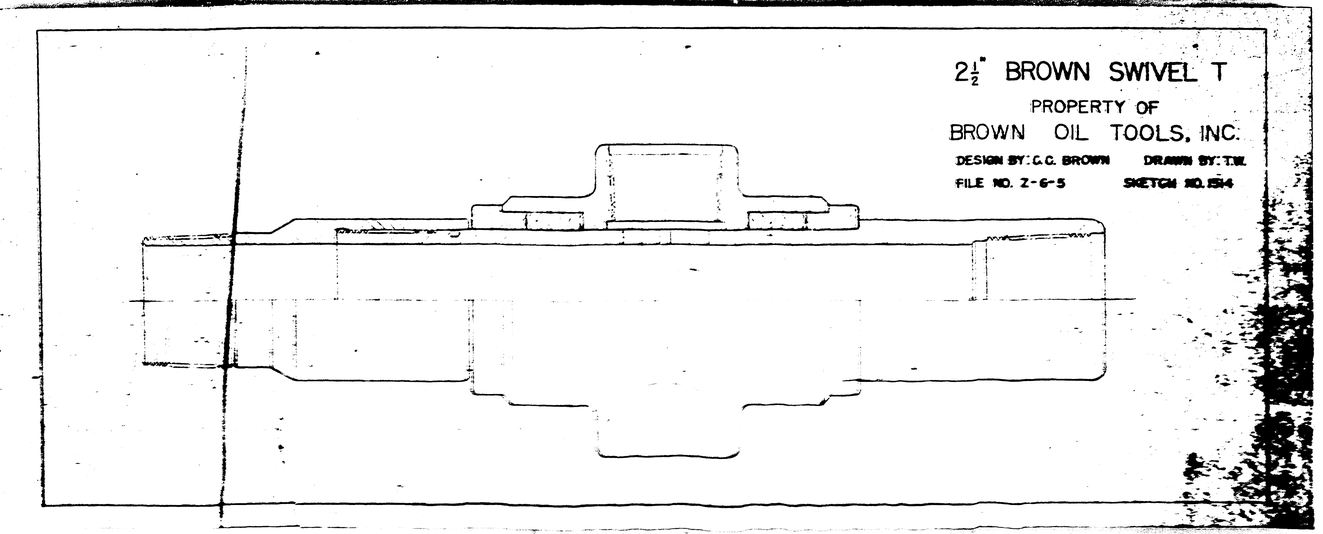
92



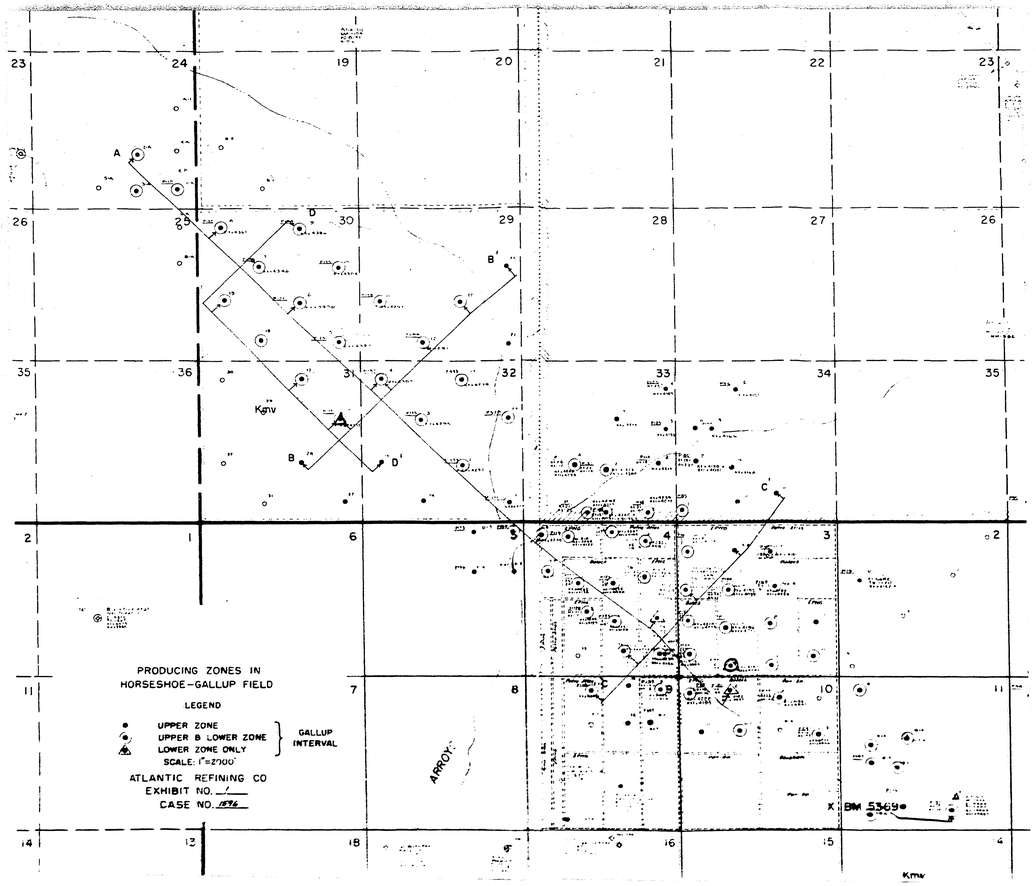
2½" BROWN SWIVEL T
PROPERTY OF
BROWN OIL TOOLS, INC.
DESIGN BY: C.C. BROWN DRAWN BY: T.W.
FILE NO. Z-6-5 SKETCH NO. 1514



2½" BROWN SWIVEL T
PROPERTY OF
BROWN OIL TOOLS, INC.
DESIGN BY: C.C. BROWN DRAWN BY: T.W.
FILE NO. Z-6-5 SKETCH NO. 1514



2½" BROWN SWIVEL T
PROPERTY OF
BROWN OIL TOOLS, INC.
DESIGN BY: C.C. BROWN DRAWN BY: T.W.
FILE NO. Z-6-5 SKETCH NO. 1514


A
B
C
D
A'
B'
C'
D'
Kgnv
Kmv
ARROYO
BM 5369
PRODUCING ZONES IN
HORSESHOE-GALLUP FIELD
LEGEND
UPPER ZONE
UPPER & LOWER ZONE
LOWER ZONE ONLY
GALLUP INTERVAL
SCALE: 1"=2000'
ATLANTIC REFINING CO
EXHIBIT NO. 1
CASE NO. 1576

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CORE ANALYSIS REPORT
FOR
TOM BOLACK

BOLACK 6
SAN JUAN COUNTY, NEW MEXICO
LOCATION: SEC. 10-T30N-R16W

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

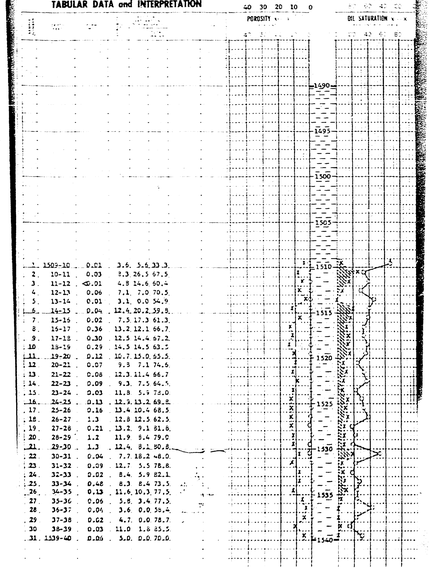
COMPANY	TOM BOLACK		DATE ON	10/19/57	FILE NO RP-3-627 PC
WELL	BOLACK 6		DATE OFF	10/20/57	ENGRS. WJC,JE
FIELD			FORMATION	MANCOS	ELEV.
COUNTY	SAN JUAN	STATE NEW MEX.	DRLG FLD	OIL EMULSION	CORES DIAMOND
LOCATION	SEC 10-T30N-R16W		REMARKS	SAMPLED BY REPRESENTATIVE OF CLIENT	

SAND · LIMESTONE · CONGLOMERATE · CHERT
SHALE · DOLOMITE

TABULAR DATA and INTERPRETATION

COMPLETION COREGRAPH

PERMEABILITY ○—○ 60 30 20 10 0 · POROSITY % · TOTAL WATER ○—○ 40 30 20 10 0 · OIL SATURATION % · 0 20 40 60 80



1	1509-10	0.01	3.6	3.6	33.3
2	10-11	0.03	8.3	26.5	67.5
3	11-12	<0.01	4.8	14.6	60.4
4	12-13	0.06	7.1	7.0	70.5
5	13-14	0.01	3.1	0.0	54.9
6	14-15	0.04	12.6	20.2	39.5
7	15-16	0.02	7.5	17.3	61.3
8	16-17	0.36	13.2	12.1	66.7
9	17-18	0.30	12.5	14.4	67.2
10	18-19	0.29	14.5	14.5	63.5
11	19-20	0.12	10.7	15.0	65.5
12	20-21	0.07	9.5	7.1	74.6
13	21-22	0.08	12.3	11.4	66.7
14	22-23	0.09	9.3	7.5	64.5
15	23-24	0.03	11.8	5.9	72.0
16	24-25	0.13	12.9	13.2	69.8
17	25-26	0.16	13.4	10.4	68.5
18	26-27	1.3	12.8	12.5	62.5
19	27-28	0.21	13.2	9.1	81.8
20	28-29	1.2	11.9	9.4	79.0
21	29-30	1.3	12.4	8.1	80.8
22	30-31	0.04	7.7	18.2	48.0
23	31-32	0.59	12.7	5.5	78.8
24	32-33	0.02	8.4	5.9	82.1
25	33-34	0.48	8.3	8.4	73.5
26	34-35	0.13	11.6	10.3	77.5
27	35-36	0.06	5.8	3.4	77.5
28	36-37	0.04	3.6	0.0	39.4
29	37-38	0.02	4.7	0.0	78.7
30	38-39	0.03	11.0	1.8	65.5
31	1539-40	0.06	5.0	0.0	70.0

95

CORE ANALYSIS REPORT
FOR
TOM BOLACK

BOLACK 6
SAN JUAN COUNTY, NEW MEXICO
LOCATION: SEC. 10-T30N-R16W

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

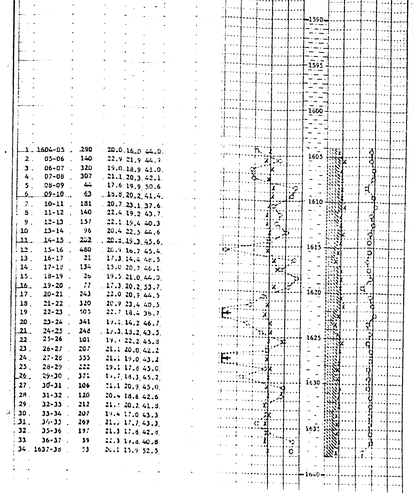
COMPANY	TOM BOLACK		DATE ON	10/20/57	FILE NO RP-3-628 PC
WELL	BOLACK 6		DATE OFF	10/20/57	ENGRS. WJC, JE
FIELD			FORMATION	MANCOS	ELEV. 5654' GL
COUNTY	SAN JUAN	STATE NEW MEX.	DRLG FLD	OIL EMULSION	CORES DIAMOND
LOCATION	SEC 10-T30N-R16W		REMARKS	SAMPLED BY REPRESENTATIVE OF CLIENT	

SAND · LIMESTONE · CONGLOMERATE · CHERT
SHALE · DOLOMITE

TABULAR DATA and INTERPRETATION

COMPLETION COREGRAPH

PERMEABILITY ○—○ 600 300 200 100 0 · POROSITY % · TOTAL WATER ○—○ 40 30 20 10 0 · OIL SATURATION % · 0 20 40 60 80



1	1604-05	290	20.0	16.0	44.0
2	05-06	140	22.9	21.9	44.3
3	06-07	320	19.0	18.9	43.0
4	07-08	307	21.1	20.3	42.1
5	08-09	44	17.6	19.9	50.6
6	09-10	63	19.6	20.2	41.4
7	10-11	181	20.7	23.1	37.6
8	11-12	140	22.4	19.2	43.7
9	12-13	157	22.1	19.6	40.3
10	13-14	96	20.4	22.5	44.6
11	14-15	222	20.2	15.3	45.6
12	15-16	480	20.9	14.7	45.4
13	16-17	21	17.3	14.4	46.5
14	17-18	134	19.0	20.7	46.1
15	18-19	26	19.5	21.0	44.0
16	19-20	77	17.3	20.2	53.7
17	20-21	243	21.0	20.9	44.5
18	21-22	320	20.9	23.4	40.5
19	22-23	505	22.7	18.5	39.7
20	23-24	341	19.1	14.2	48.7
21	24-25	242	17.3	18.2	43.5
22	25-26	101	19.7	22.2	45.8
23	26-27	207	21.1	20.6	42.2
24	27-28	555	21.1	19.0	43.4
25	28-29	222	19.1	17.6	43.0
26	29-30	371	19.7	14.3	45.2
27	30-31	104	21.1	20.9	45.0
28	31-32	120	20.4	16.6	42.6
29	32-33	212	21.7	20.2	41.8
30	33-34	207	19.4	17.0	43.3
31	34-35	269	21..	17.7	43.2
32	35-36	197	21.3	17.6	42.8
33	36-37	19	22.3	14.6	40.8
34	1637-38	53	20.1	13.9	52.5

CORE LABORATORIES INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

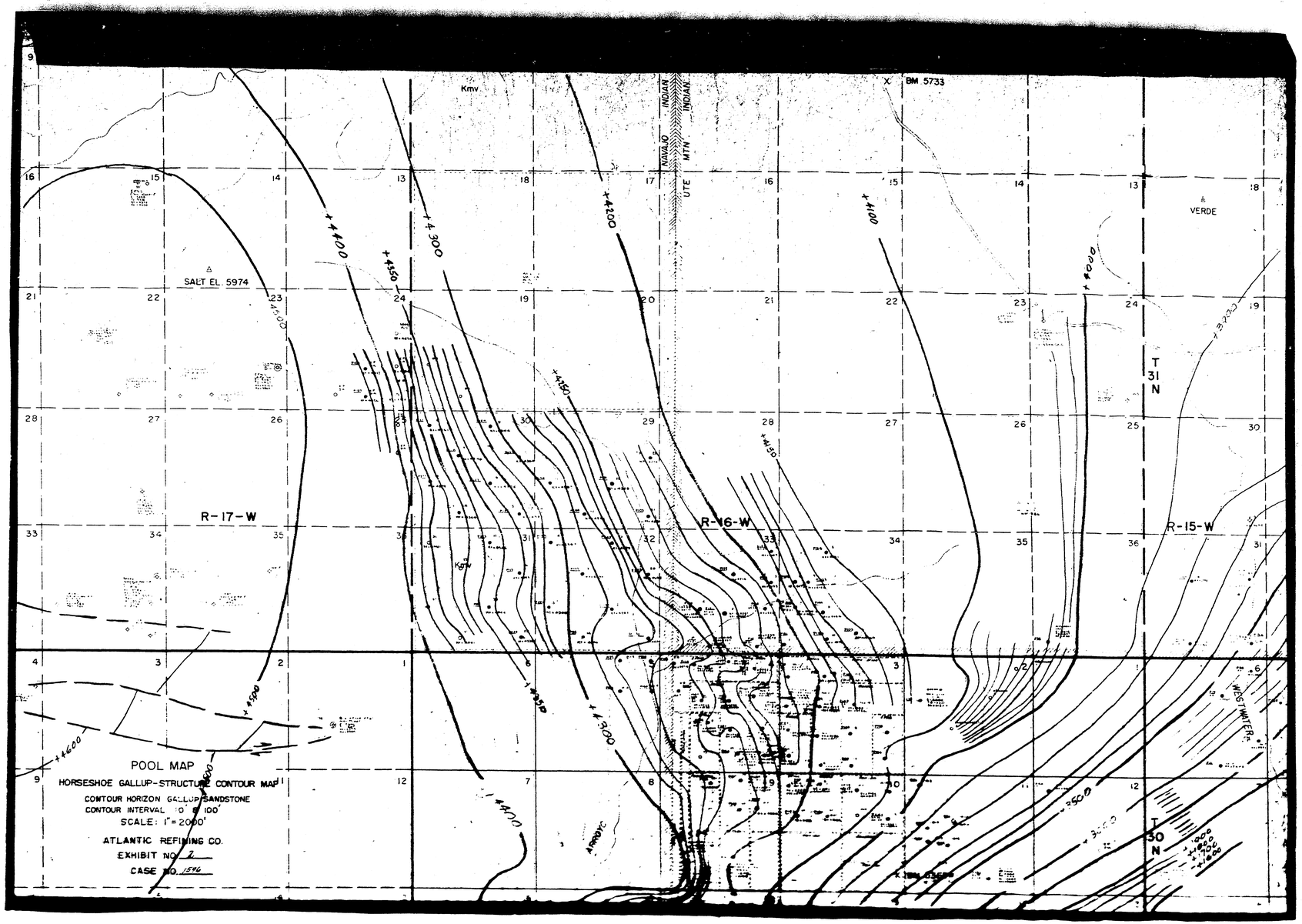
Mr. Tom Bolack
[illegible]
Farmington, New Mexico

Subject: Core Analysis
Bolack #6
San Juan County, New Mexico
Location: Sec. 10-T30N-R16W

Gentlemen:

[illegible]

Very truly yours,
CORE LABORATORIES, INC.
[illegible]



POOL MAP

HORSESHOE GALLUP-STRUCTURE CONTOUR MAP

CONTOUR HORIZON GALLUP SANDSTONE

CONTOUR INTERVAL 10' & 100'

SCALE: 1" = 2000'

ATLANTIC REFINING CO.

EXHIBIT NO. 2

CASE NO. 1596

96

Exhibit 7
Case 1596

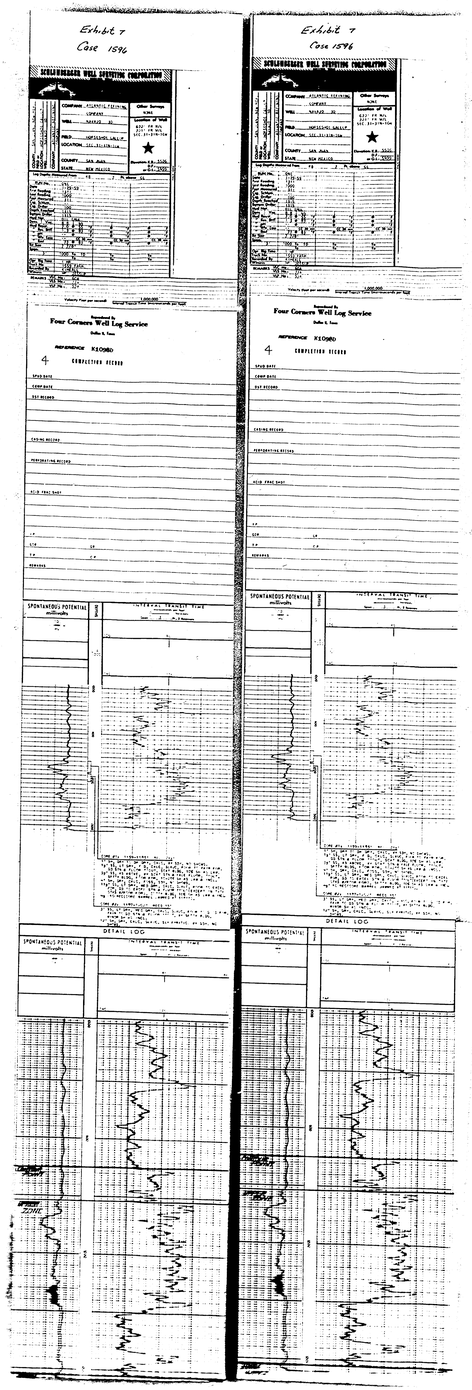
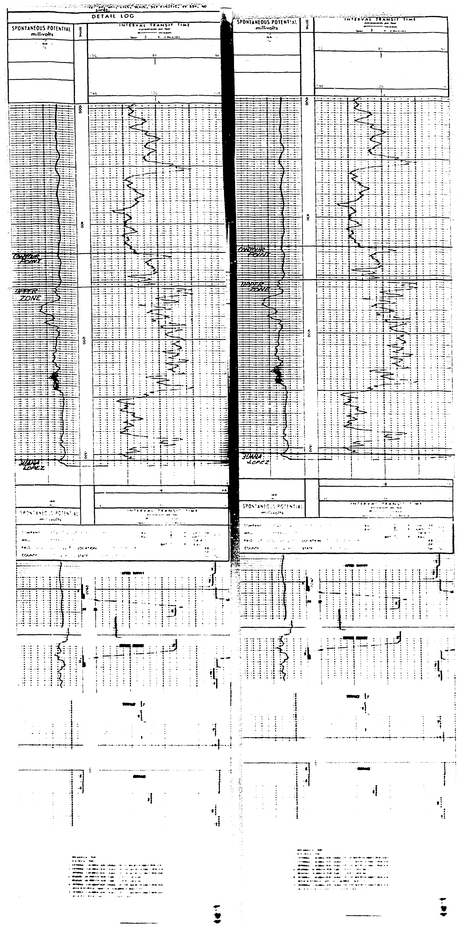


Exhibit 7
Case 1596


DETAIL LOG
SPONTANEOUS POTENTIAL
millivolts
INTERVAL TRANSIT TIME
microseconds per foot
CARBON POINT
UPPER ZONE
LOWER ZONE

SCHLUMBERGER WELL SURVEYING CORPORATION
HOUSTON, TEXAS

Sonic Log

COMPANY	ATLANTIC REFINING COMPANY
WELL	NAVAJO
FIELD	HORSESHOE GALLUP
LOCATION	SEC. 31-31N-16W
COUNTY	SAN JUAN
STATE	NEW MEXICO

Other Surveys: NONE

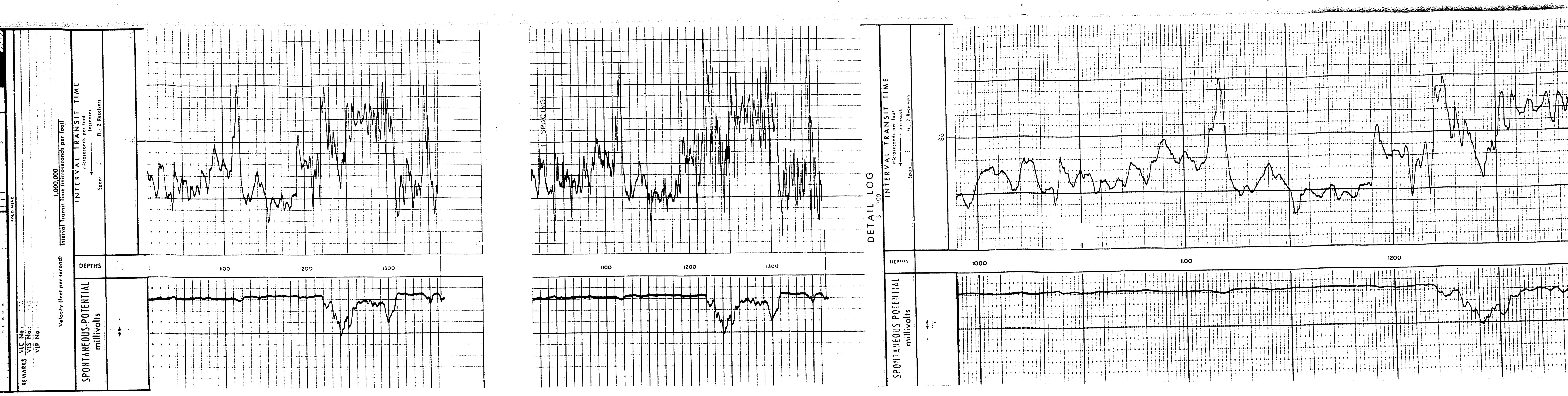
Location of Well

Elevation: K.B.: D.F.: or G.L.:

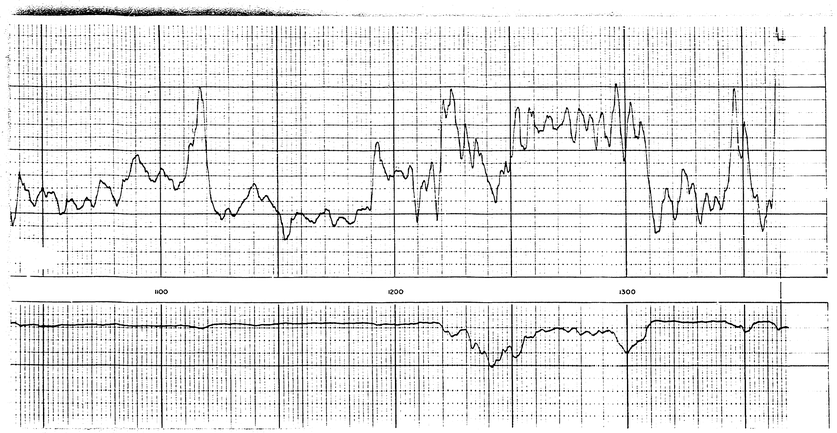
Log Depths Measured From ... Ft. above ...

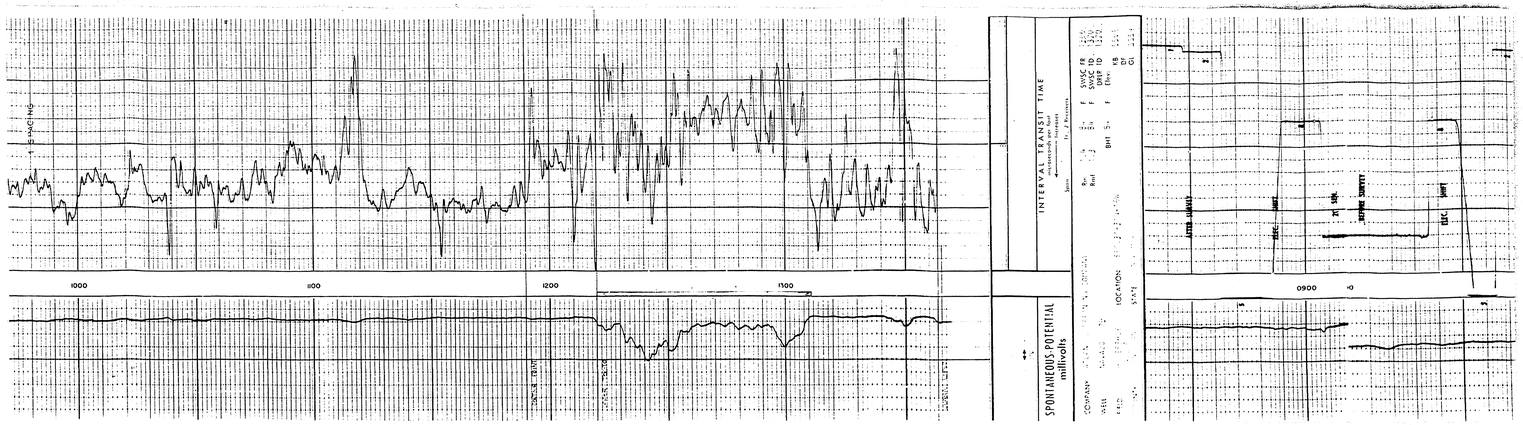
RUN No.	ONE
Date	
First Reading	1366
Last Reading	1000
Feet Measured	366
Csg. Schlum.	- -
Csg. Driller	
Depth Reached	1370
Bottom Driller	1370
Mud Nat.	
Dens. Visc.	
Mud Resist.	@ °F
Res. BHT	@ 54 °F
pH	- - @ °F
Wtr. Loss	- - CC 30 min
Rmf	@ 54 °F
Bit Size	
Span:	To
Opr. Rig Time	
Truck No.	
Recorded By	
Witness	

REMARKS VLC No.: VIS No.: VIP No.:



99


1100
1200
1300


1000
1100
1200
1300
INTERVAL TRANSIT TIME
microseconds per foot
SPONTANEOUS POTENTIAL
millivolts
0900
10

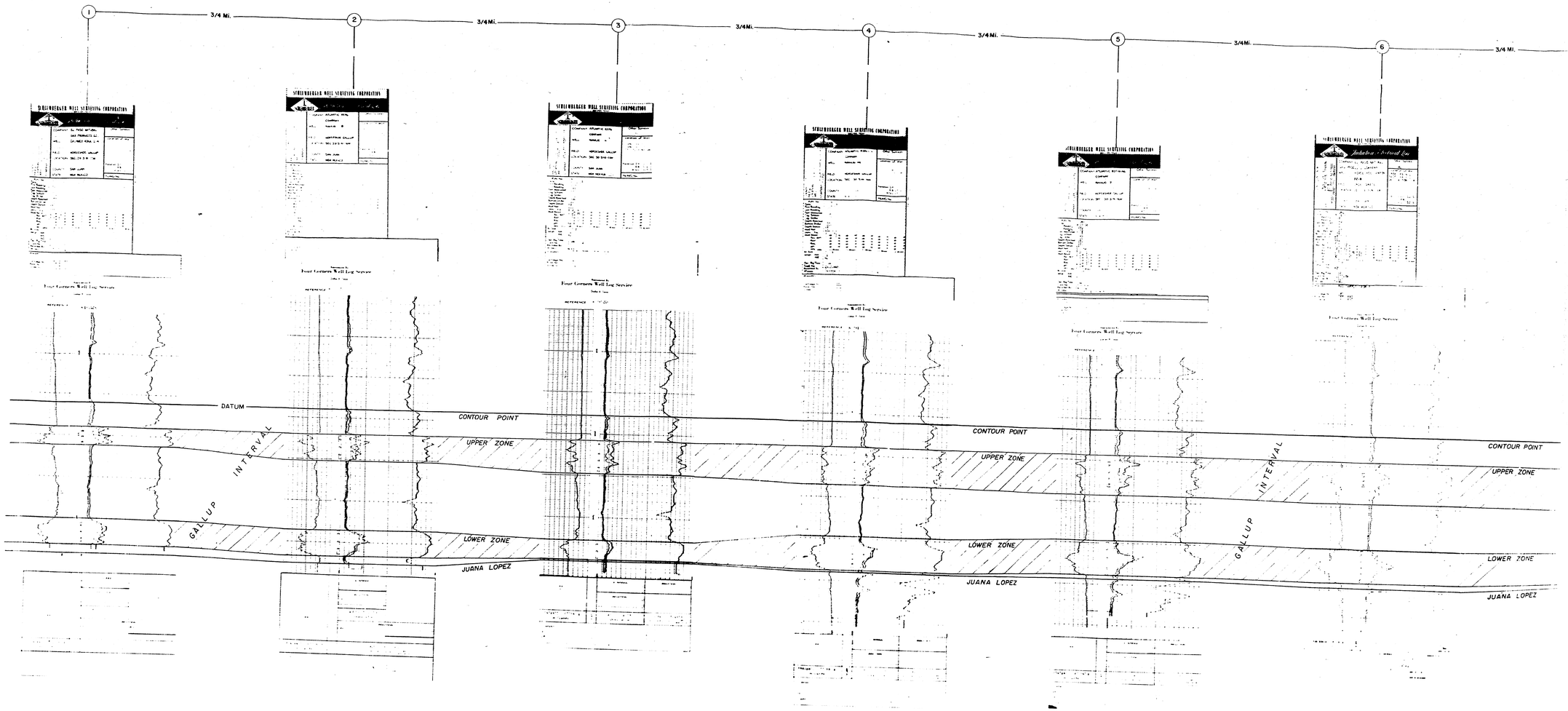
100

INTERVAL TRANSIT TIME
SPONTANEOUS POTENTIAL
millivolts
COMPANY
WELL
FIELD
COUNTY
LOCATION
STATE
SURFACE
0900
0000

A

NW

1 — 3/4 Mi. — 2 — 3/4 Mi. — 3 — 3/4 Mi. — 4 — 3/4 Mi. — 5 — 3/4 Mi. — 6 — 3/4 Mi.

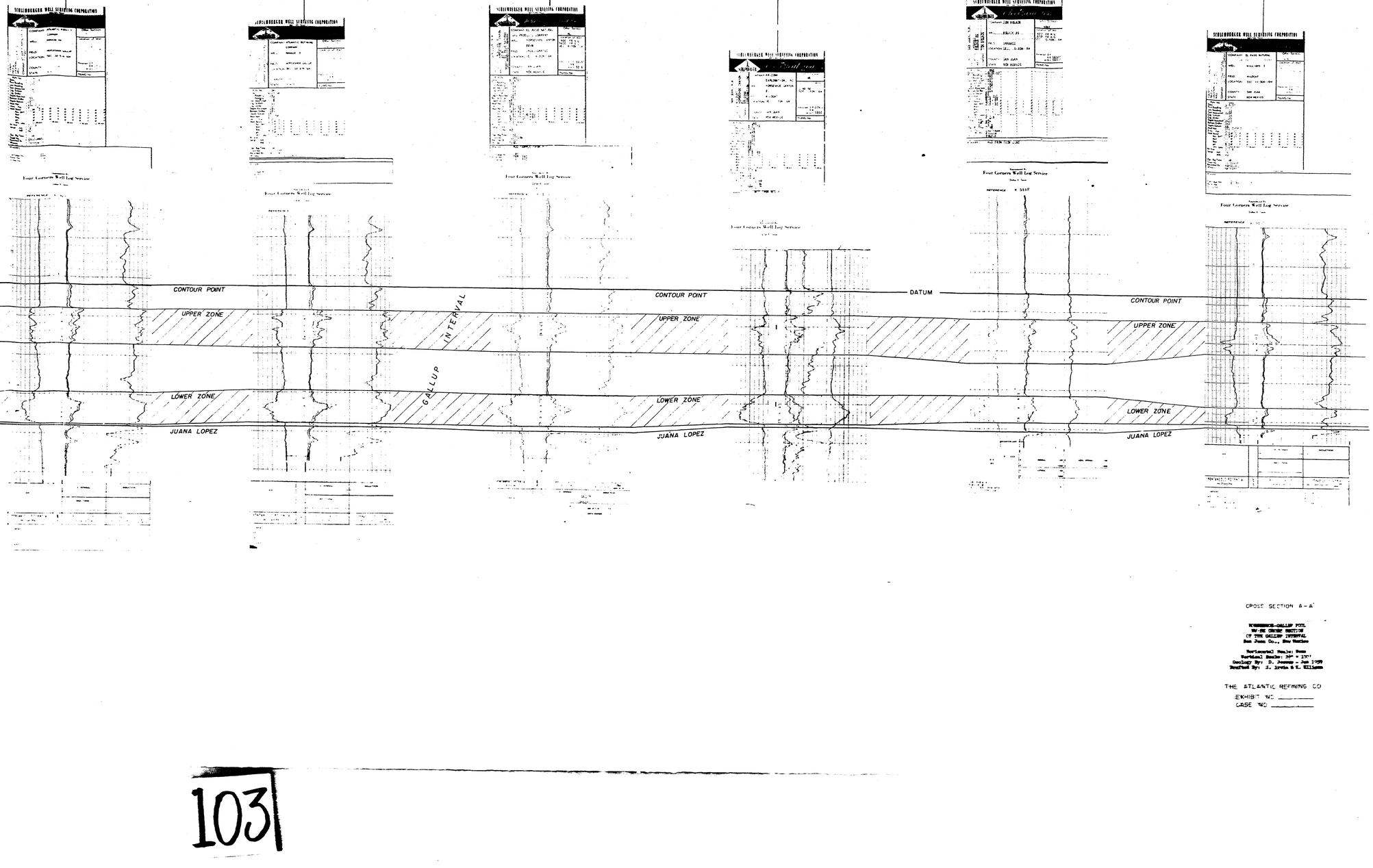


102

A'

SE

4 — 3/4 Mi. — 5 — 3/4 Mi. — 6 — 3/4 Mi. — 7 — 3/4 Mi. — 8 — 1 1/3 Mi. — 9



CROSS SECTION A-A'

WAMSUTTER-GALLUP POOL
NW-SE CROSS SECTION
OF THE GALLUP INTERVAL
San Juan Co., New Mexico

Horizontal Scale: None
Vertical Scale: 20' = 1"
Develop By: D. Jessee - Jan 1959
Redrawn By: J. Jordan & L. Williams

THE ATLANTIC REFINING CO
EXHIBIT NO. _____
CASE NO. _____

103

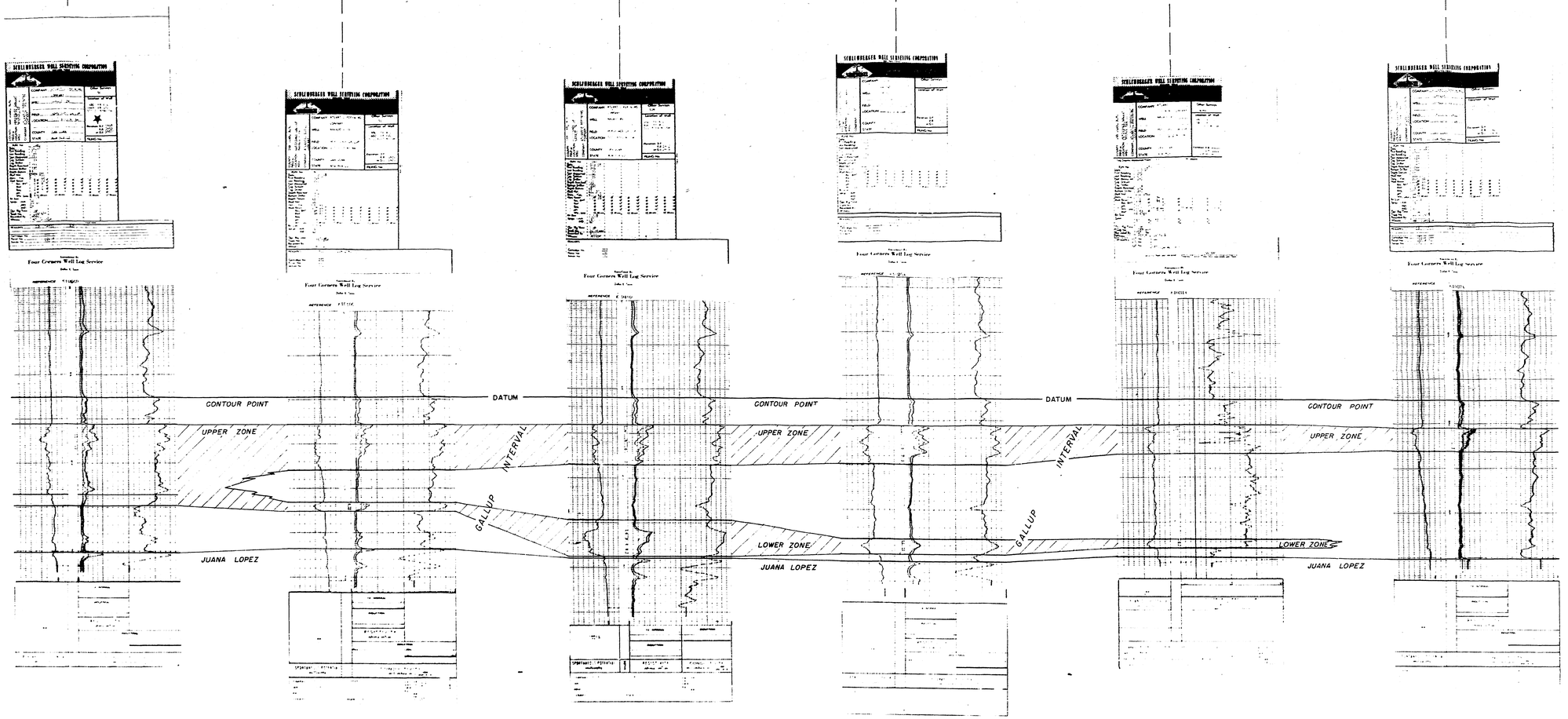
B

SW

B'

NE

① 80 Ac. ② 80 Ac. ③ 80 Ac. ④ 80 Ac. ⑤ 80 Ac. ⑥



CROSS SECTION B — B'

104

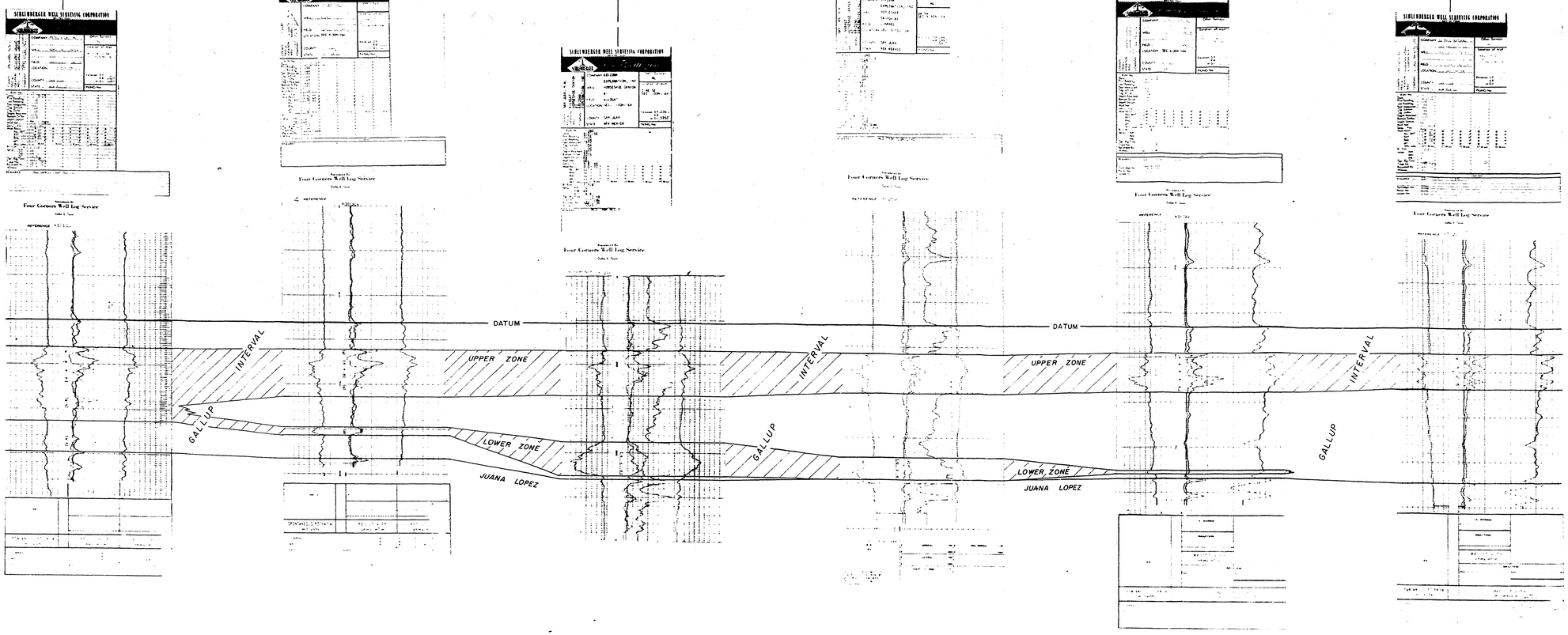
C

SW

C'

NE

1 — 80 ac. — 2 — 40 ac. — 3 — 40 ac. — 4 — 80 ac — 5 — 80 ac — 6



105

NE

D

SW

D'

SE

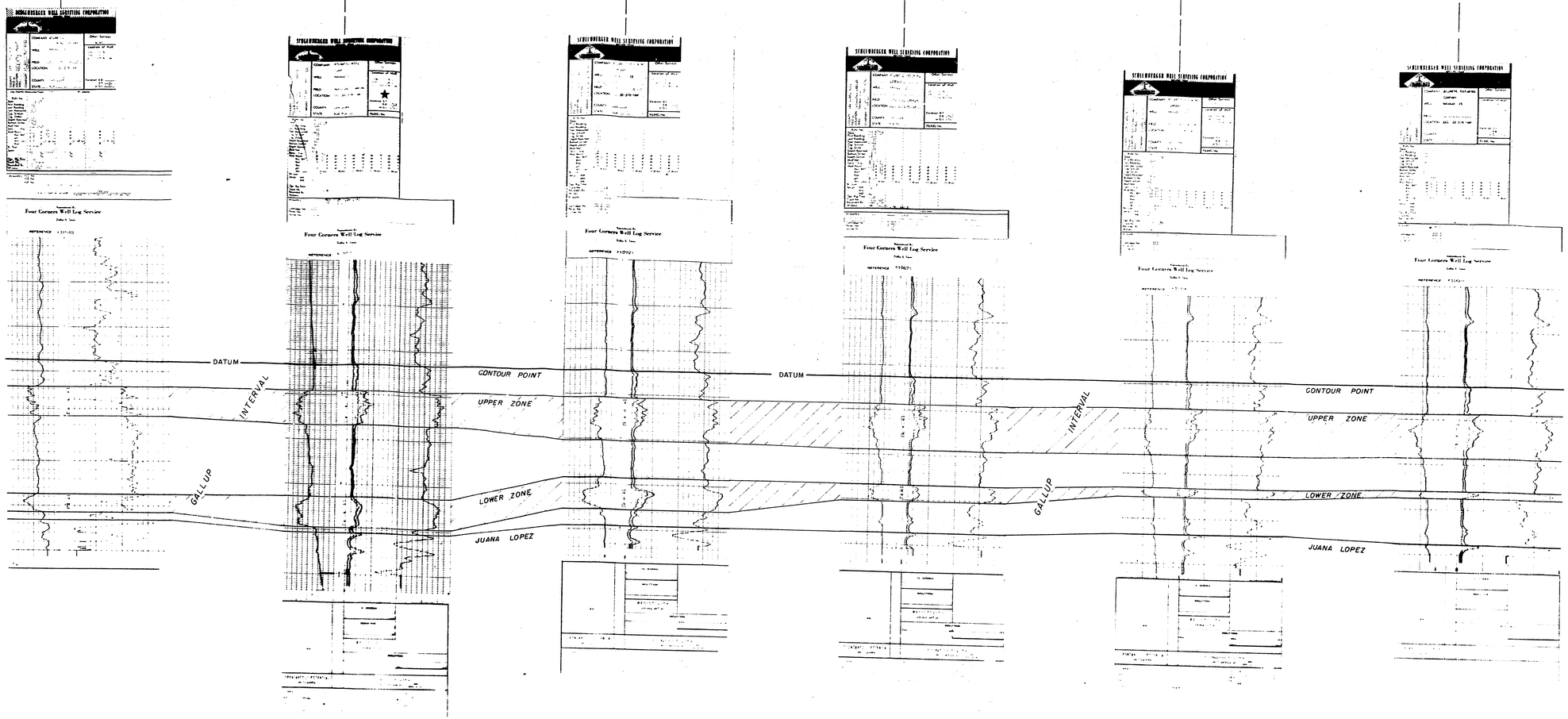
Appx 1/3 Mi

Appx 1/3 Mi

Appx 1/3 Mi

Appx 1/3 Mi

Appx 1/3 Mi



106

SW

C

C'

NE

① 80 ac. ② 40 ac. ③ 40 ac. ④ 80 ac ⑤ 80 ac ⑥

DATUM

DATUM

INTERVAL

UPPER ZONE

GALLUP

LOWER ZONE

JUANA LOPEZ

INTERVAL

UPPER ZONE

GALLUP

LOWER ZONE

JUANA LOPEZ

INTERVAL

GALLUP

CROSS SECTION C-C'
SOUTHEASTERN-GALLUP POOL
SAN JUAN COUNTY, NEW MEXICO
OF THE GALLUP INTERVAL
San Juan Co., New Mexico

Horizontal Scale: None
Vertical Scale: 1" = 200'
Drawn By: D. Jennings - Jan 1970
Checked By: J. Irvin & E. Williams

THE ATLANTIC REFINING CO
EXHIBIT NO. 5
CASE NO. 5

107