DOE/ET/27081-7

MASTER

DOE/ET/27081--7

DE82 006996

FINAL REPORT
GODCHAUX WELL NO. 1
VERMILION PARISH, LOUISIANA

COMPLETION AND TESTING

TESTING GEOPRESSURED GEOTHERMAL RESERVOIRS IN EXISTING WELLS

PREPARED FOR
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
UNDER CONTRACT NO. DE-AC08-80ET27081

EATON OPERATING COMPANY, INC.
3104 EDLOE, SUITE 200
HOUSTON, TEXAS 77027
713-627-9764

DISCLAIMER

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GODCHAUX WELL NO. 1

TABLE OF EXHIBITS

1.0 EXECUTIVE SUMMARY

Eaton Operating Company, Inc. operates the Wells of Opportunity program under contract with the Department of Energy, Division of Geothermal Energy, to evaluate potential alternative energy sources in geopressured-geothermal (GEO^2) aquifers along the Texas and Louisiana Gulf Coast. This report covers the re-entry of the C & K Petroleum, Inc., Frank Godchaux, III, Well No. 1, about 30 miles south southeast of Lafayette, Louisiana. This was the eighth well acquired for testing under Eaton's contract.

The Godchaux Well No. 1 was originally drilled to a total depth of 16,000 feet in January, 1981 by C & K Petroleum, Inc. and was temporarily abandoned. The well was re-entered by Eaton on 6 August 1981 in an effort to clean out the original open hole below the 7-5/8 inch liner and test a section of the Planulina sand at a depth ranging from 15,584 to 15,692 feet. The reservoir pressure was estimated to be 14,480 psi, and the temperature of the formation water was expected to be 298°F. The water salinity was predicted to be 70,000 ppm. The well was expected to produce up to 20,000 BWPD, with a gas content of 44 SCF per barrel. An optional test of a zone from 14,905 to 15,006 feet was also proposed in the detailed completion prognosis, which preceded the attempted test.

In the process of drilling the cement plug set by the original operators, the drill string became side-tracked from the original hole. While drilling at 14,510 feet a severe loss of circulation of drilling fluid occurred through a hole in the intermediate casing. The reduction in hydrostatic head resulting from lost circulation caused the open hole to close around and stick the drill string. Efforts to repair the intermediate casing and return to normal operations were estimated to be prohibitively expensive in view of the expected poor probability of success; accordingly, the decision to plug and abandon was carried out on September 12, 1981.

2.0 INTRODUCTION AND BACKGROUND

2.1 Events Leading to Project Initiation

This report covers the acquisition and attempted completion of a geopressured-geothermal (GEO^2) well by Eaton Operating Company, Inc. under contract with the United States Department of Energy, Division of Geothermal Energy (DOE-DGE). The work performed by Eaton is a continuation of the Wells of Opportunity (WOO) program. This program was initiated in 1977 to take advantage of the relatively low cost of testing the energy potential of geopressured-geothermal aquifers in wells previously drilled by industry for oil and gas. Geopressured-geothermal resources could make an important contribution to our nation's energy supply if it should become commercially feasible to produce saltwater reservoirs and to extract the dissolved hydrocarbons, heat, and kinetic energy.

The Frank Godchaux, III, Well No. 1 acquired for this particular test was drilled by C & K Petroleum, Inc. at a cost of approximately $3,000,000. The well was temporarily abandoned as a dry hole at a depth of 16,000 feet and was offered to Eaton for GEO^2 testing. Contracts with C & K and Godchaux were executed March 20, 1981, and April 9, 1981, respectively. Field operations were initiated on August 6, 1981.

2.2 Location and Geography

The Godchaux Well No. 1 test site is approximately 30 miles south southeast of Lafayette, Louisiana and about 11 miles south of Abbeville, Louisiana. Lafayette is a rapidly growing city and the center of Louisiana's oil and gas industry. Abbeville is a small community whose principal industry is agriculture. The specific well location is in Section 88, Township 14-South, and Range 3-East. The well is on Live Oak Plantation, a private hunting preserve, as well as an active rice farm and cattle ranch. The land is of low elevation, bordered on the west by the Vermilion river and on the south by the Intracoastal Waterway and Gulf of Mexico. Access to the location was provided by an extensive system of oyster shell farm roads.

Exhibit 2-1 indicates the location of Godchaux Well No. 1 in relation to other GEO^2 wells in Louisiana. Exhibit 2-2 is a topographic map of the area.

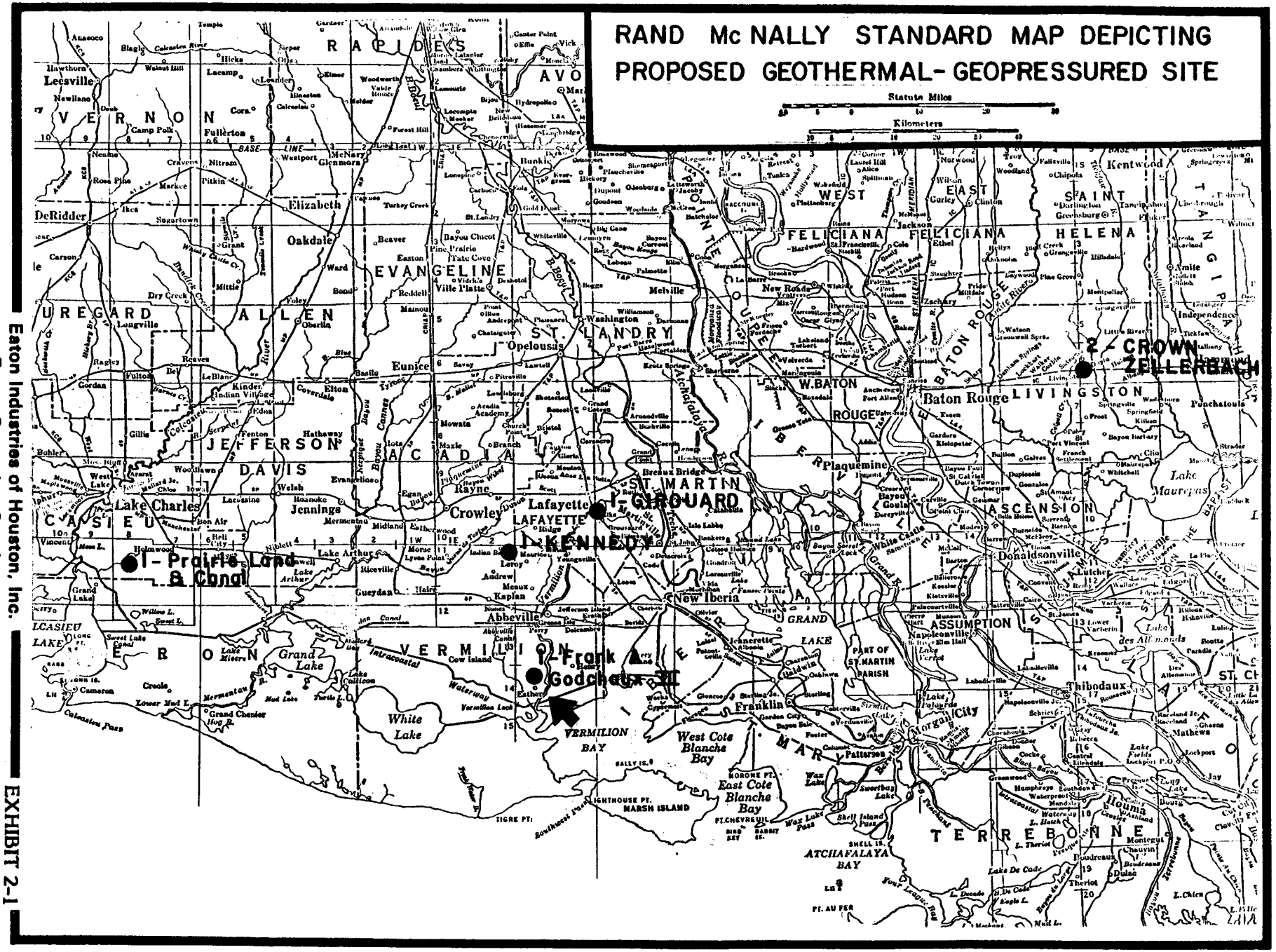
2.3 Operator Contracts and Agreements

C & K Petroleum, Inc. was the original operator of the test well. Drilling of the well was completed January 7, 1981. C & K agreed to temporarily plug the well and give Eaton the option to re-enter the well for a GEO^2 test. Eaton's legal agreement with C & K can be found in Appendix "A." Eaton's agreement with Godchaux is also in Appendix "A."

2.4 Rig Contractor Agreement

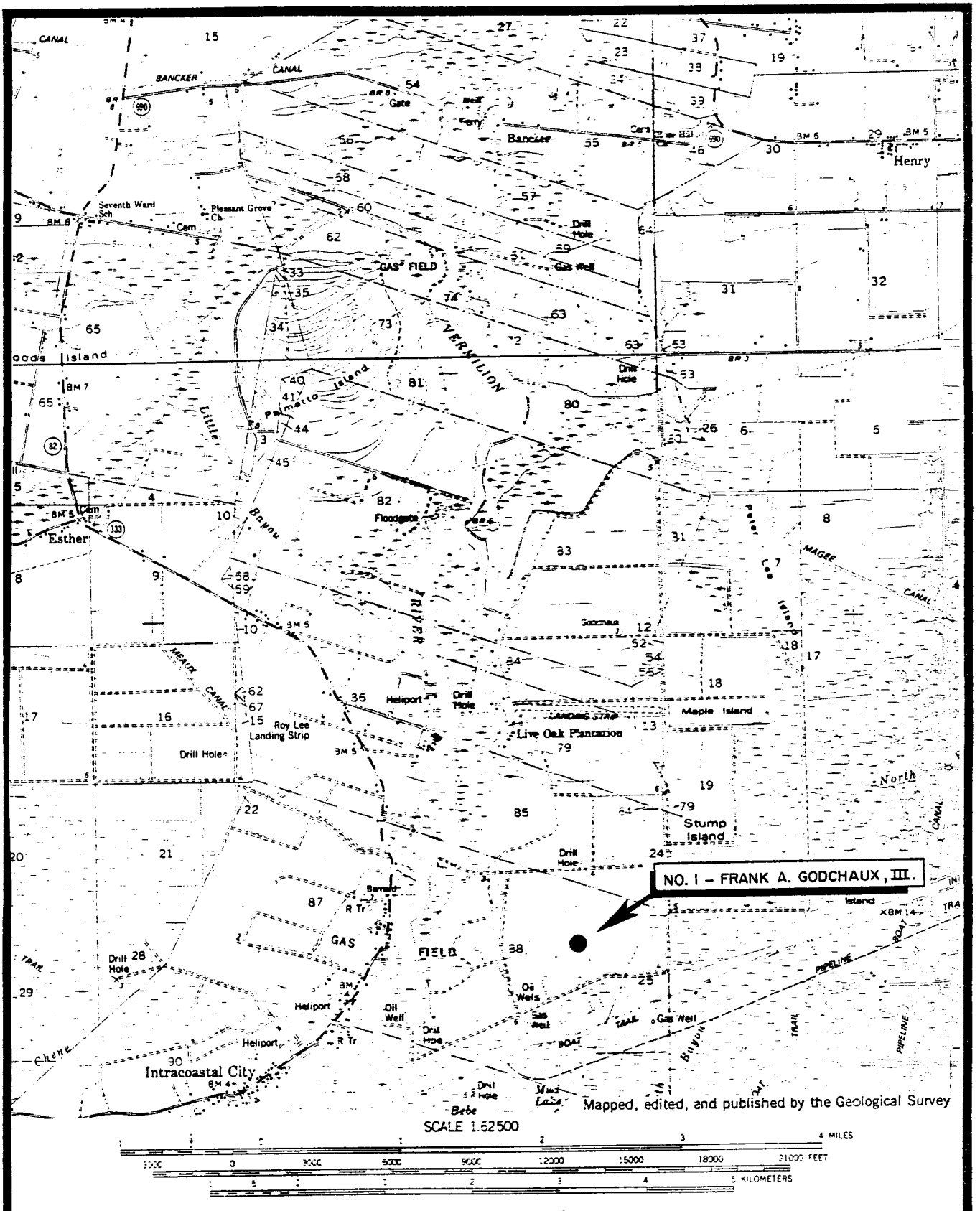
Challenger Drilling Company was awarded the contract to complete the test well and drill a saltwater disposal well. Challenger Rig No. 48 performed the work. The rig description and the drilling contract can be found in Appendix "B."

DOE CONTRACT NO.
DE-AC08-80ET-27081



Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 2-1



TOPOGRAPHIC MAP

ABBEVILLE QUADRANGLE
LOUISIANA—VERMILION PARISH
15 MINUTE SERIES (TOPOGRAPHIC)

Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 2-2

DOE CONTRACT NO.
DE-AC08-80ET-27081

3.0 OBJECTIVES

The "Wells of Opportunity" program was designed to obtain short-term test data from several geopressured-geothermal aquifers in different geologic environments along the Gulf Coast region of Louisiana and Texas.

The task requires the capability to drill, complete, and test wells, the ability to interpret data, knowledge of the regional geology, communication and coordination with oil and gas operators, and a scouting system capable of locating potential GEO^2 wells.

The objectives of the WOO test program in general, and of the Godchaux Well No. 1 test in particular, were to obtain accurate, reliable, short-term information concerning the following:

- The aquifer fluid properties, including in-situ temperature, chemical composition, hydrocarbon content, and pressure.
- The characteristics of geopressured-geothermal reservoirs, including permeability and porosity, extent and distribution of sands and shales, degree of compaction, and rock composition.
- The behavior of fluid and reservoir under conditions of fluid production at moderate and high rates, including pressure/time behavior at different flow rates, fluid characteristics under varying production conditions, and other information related to the reservoir production drive mechanisms and physical and chemical changes that may occur with various production conditions.
- The evaluation of completion techniques and production strategies for geopressured-geothermal wells.
- Analysis of the long-term environmental effects of an extensive commercial application of geopressured-geothermal energy, to the extent determinable during testing.

4.0 REGIONAL GEOLOGY

The Godchaux Well No. 1 is located in the Live Oak Field, Vermilion Parish, Louisiana. The zones of interest were two deep Planulina sands, lower Miocene series of late Tertiary age. The sands lie along the southern reaches of the Mississippi embayment on the Miocene depositional axis of Gulf Coast Geosyncline (Exhibits 4-1 and 4-2). The sediments in this region are primarily medium to fine-grained quartz sand, montmorillonite, and illite clay, with varying quantities of organic debris. These deposits have a sorting range from poor to excellent and an areal extent from a few feet to tens or hundreds of miles (Jones, 1969). The deltaic sediments appear to have been deposited on a broad continental shelf which was characteristic of a portion of the area during much of the Cenozoic Era (Meyerhoff et al., 1968).

4.1 Local Geology

The Planulina sands in the Godchaux Well No. 1 are bounded on the north and south by east-west trending down-to-the-coast growth faults (Exhibit 4-3). These faults lie approximately 4150 and 1150 feet, respectively, from the prospect well. The northern-most fault has a displacement of approximately 800 feet, while that of the southern fault is 500 feet (Exhibits 4-4 and 4-5). The reservoir is restricted towards the west, where the faults merge, but lies open towards the east. The estimated reservoir extent is in excess of three square miles.

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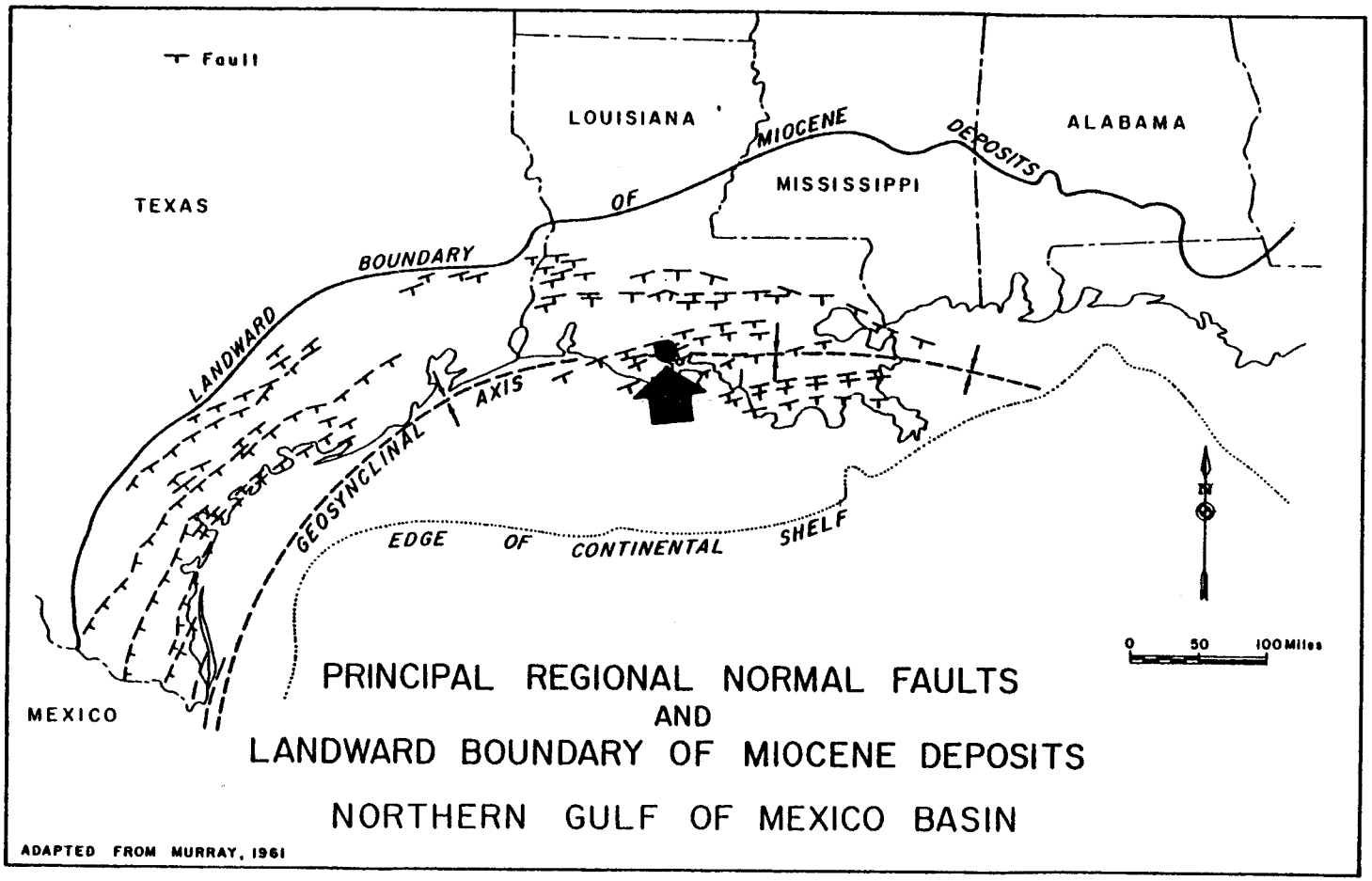
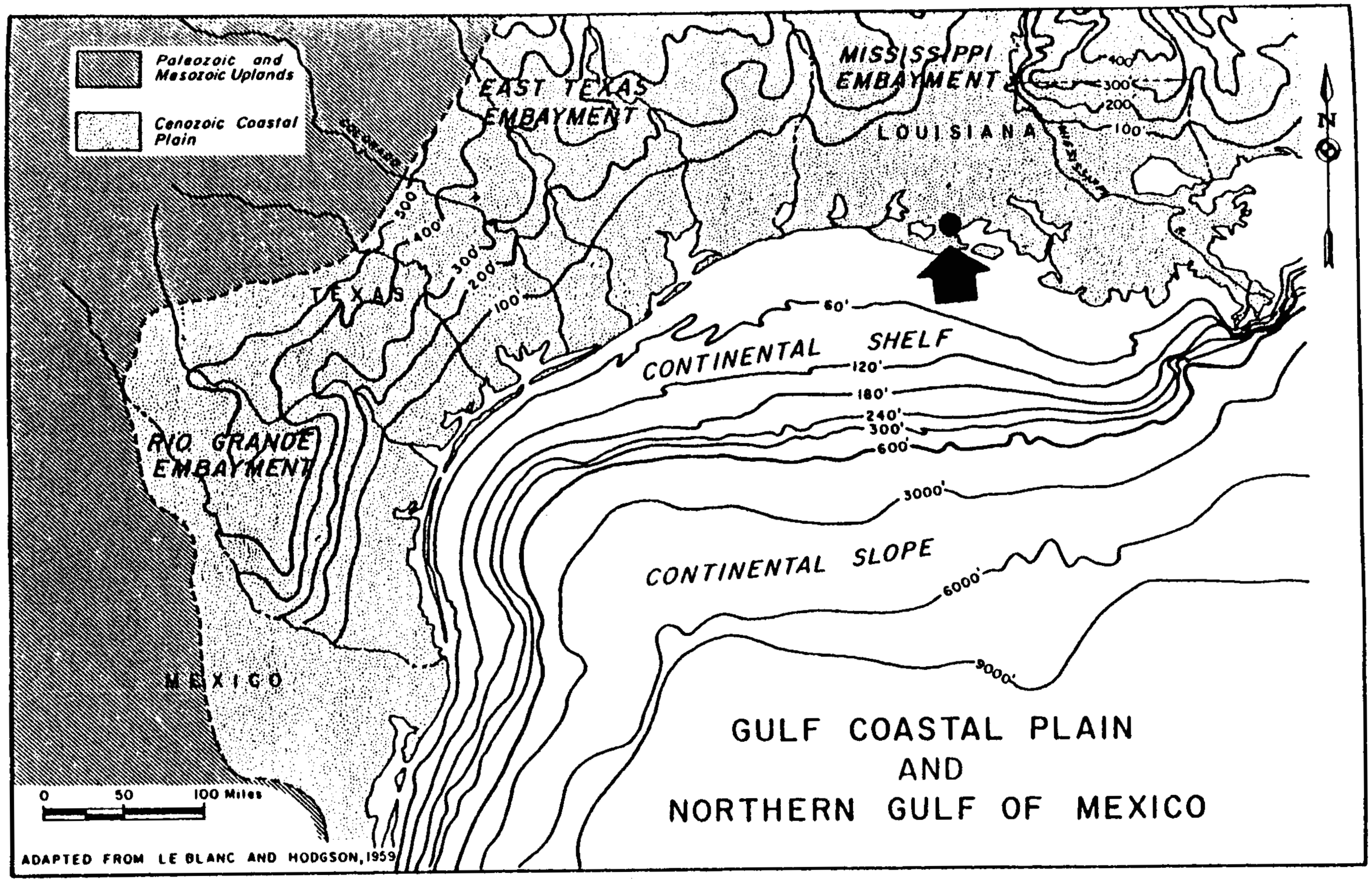


EXHIBIT 4-1

NORTHERN GULF BASIN (Jones, 69)



CENOZOIC GULF GEOSYNCLINE (Jones, 69)

EXHIBIT 4-2

DOE CONTRACT NO.
DE-AC08-80ET-27081

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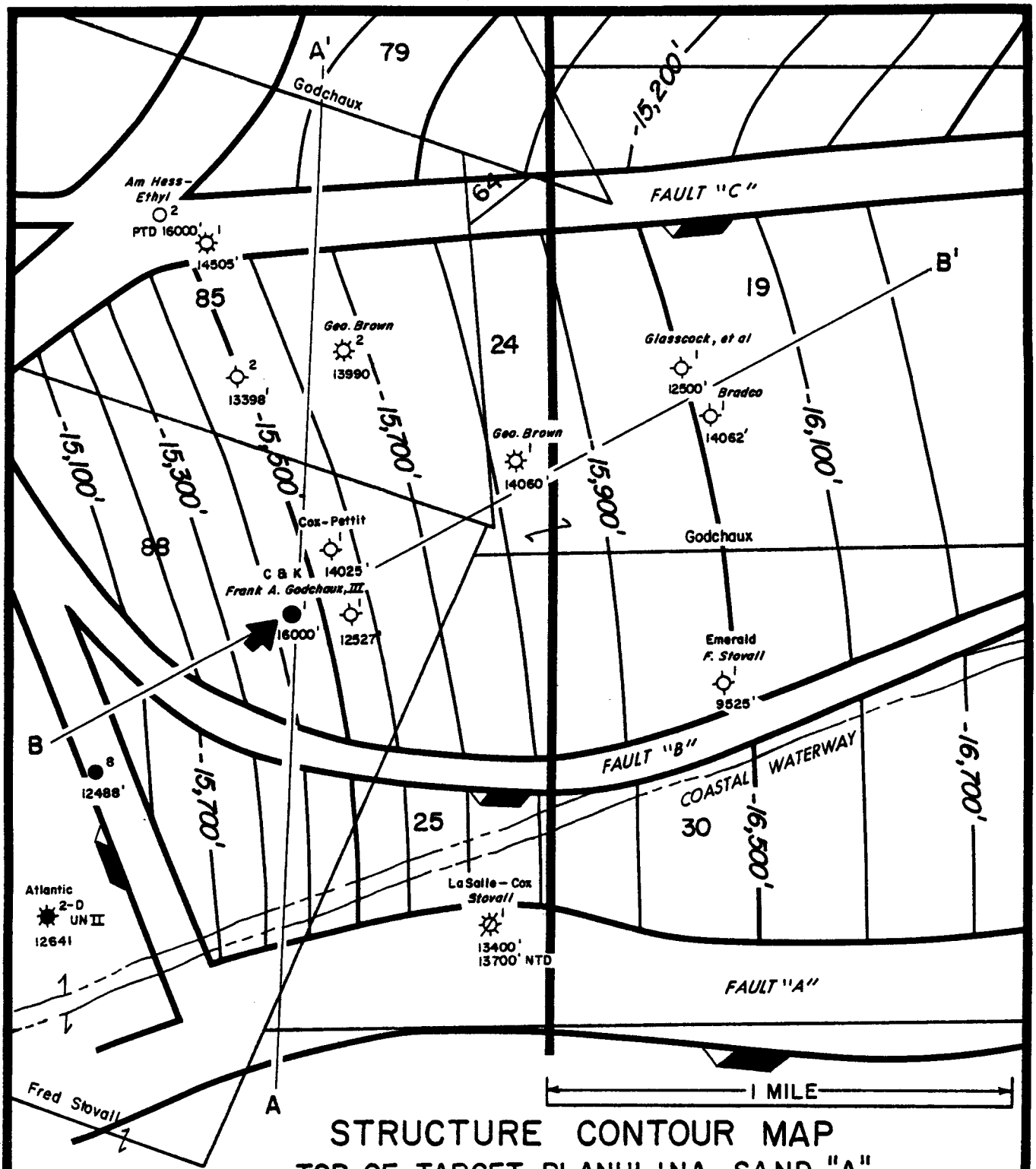
Eaton Operating Co., Inc.



STRUCTURE CONTOUR MAP

TOP OF TARGET PLANULINA SAND "A"

LIVE OAK FIELD

VERMILION PARISH, LOUISIANA

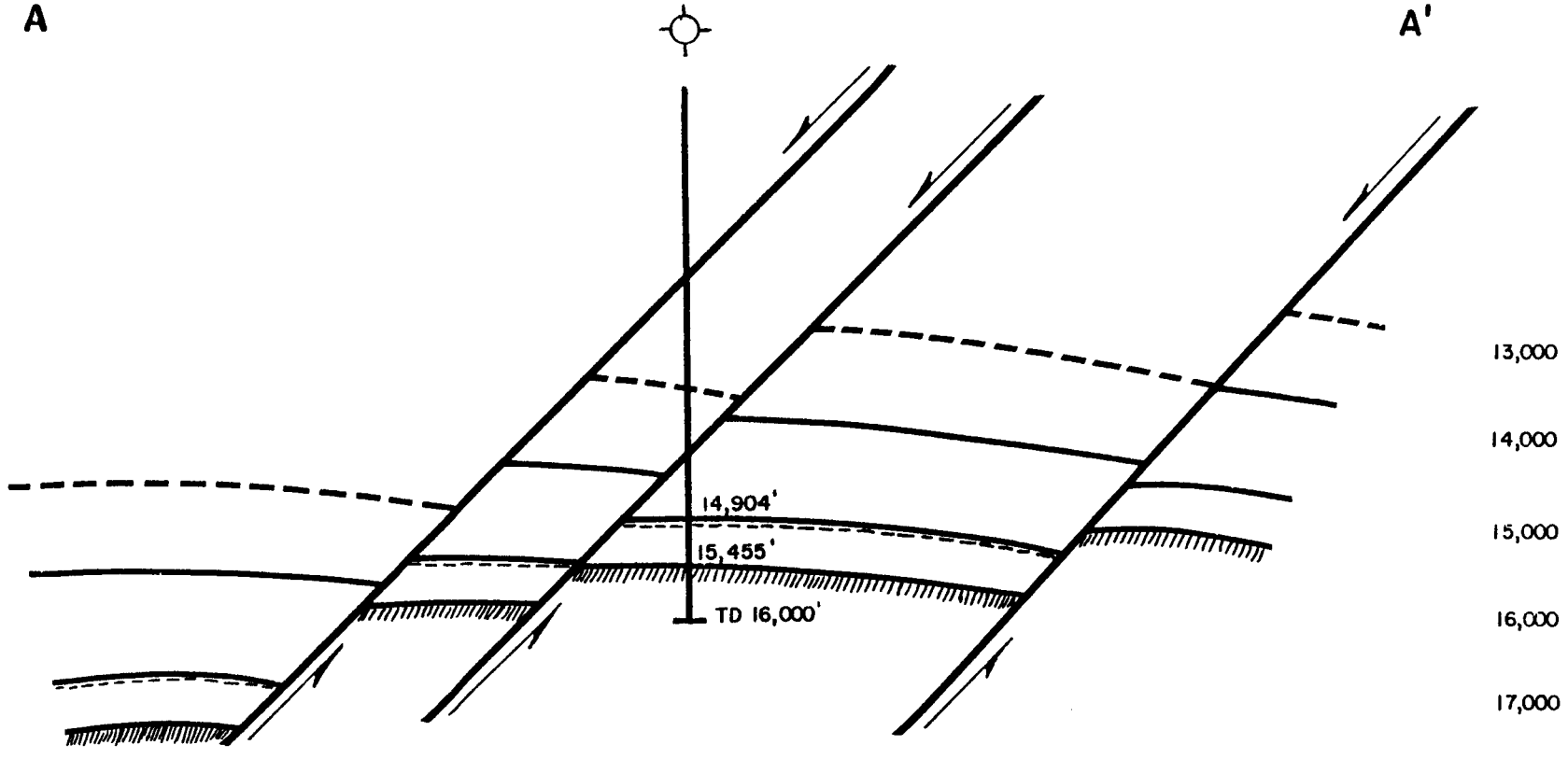
Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 4-3

DOE CONTRACT NO.
DE-AC08-80ET-27081

C & K PETROLEUM, INC.

FRANK A. GODCHAUX, III., NO. 1



GENERALIZED CROSS-SECTION A–A'

LIVE OAK FIELD

VERMILION PARISH, LOUISIANA

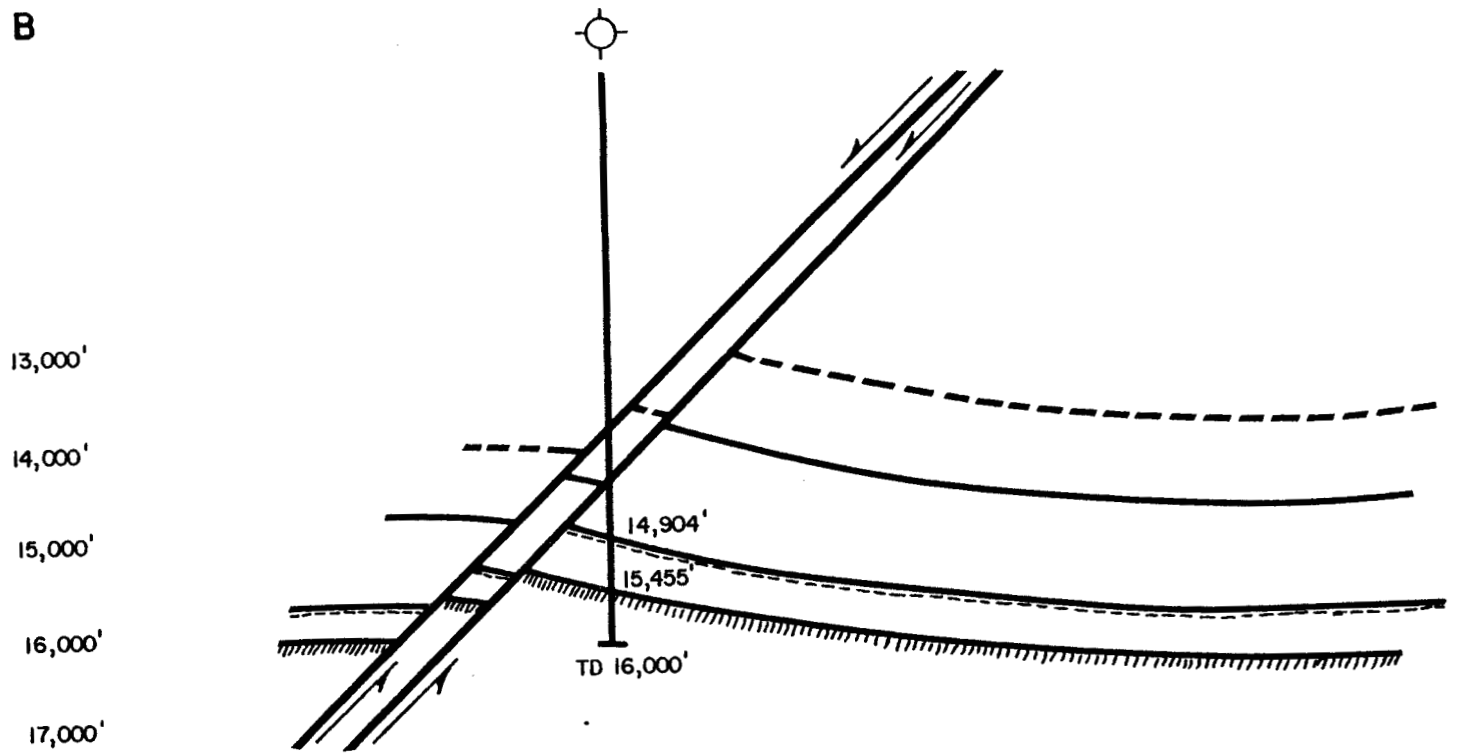
SCALE: 1 = 2000'

DOE CONTRACT NO.
DE-AC08-80ET-27081

Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

C & K PETROLEUM, INC.

FRANK A. GODCHAUX, III., NO. 1



GENERALIZED CROSS-SECTION B–B'

LIVE OAK FIELD

VERMILION PARISH, LOUISIANA

SCALE : 1" = 2000'

MAP DATUM "B" SAND (14,904')

MAP DATUM "A" SAND (15,455')

FAULT — DIP & THROW

EXHIBIT 4-5

5.0 PETROPHYSICS

5.1 Open Hole Log Analysis - Test Well (Sand "A" and Sand "B")

During the drilling stages of the Godchaux Well No. 1 in Vermilion Parish, Louisiana, various downhole surveys were conducted for hydrocarbon evaluation. Upon the determination of a dry hole, the logs were made available to Eaton for use in reservoir evaluation for the Wells of Opportunity program of the DOE. The following logs were used in this evaluation:

- ISF/Sonic Log, 1-inch (Exhibits 5-1 and 5-2).
- ISF/Sonic Log, 5-inch (Exhibits 5-3 and 5-4).

These logs contain information from which the following formation measurements could be determined:

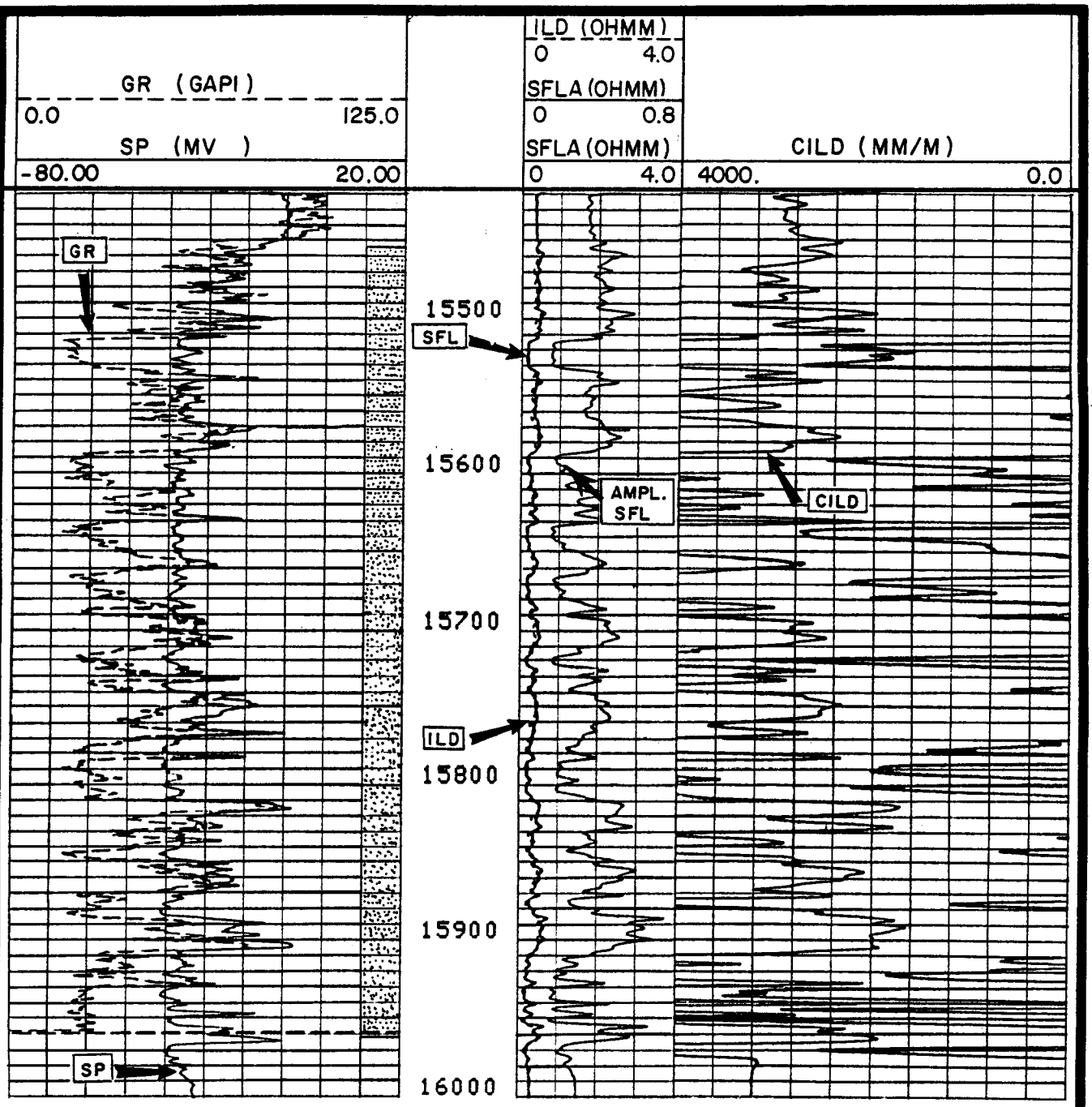
- Spontaneous Potential
- Gamma Ray
- Induction
- Sonic Travel Time
- Computed Apparent Water Resistivity

5.1.1 Porosity

The mean porosity of the net pay sand was 24%, with a range of 17% to 29%. These values were determined from the Sonic Log (Exhibit 5-3) and the Welex "Compaction Correction Chart" (Exhibit 5-5). The porosity value was obtained by a sampling of the sonic time travel on a two-foot interval basis. An observed sand travel time of 98 microseconds/ft and a shale travel time of 130 microseconds/ft were used in the porosity determination.

5.1.2 Sand Thickness (Sand "A")

The gross sand thickness over the geopressured-geothermal reservoir interval of 15,455 to 15,963 feet is 508 feet (Exhibit 5-1). The total net sand thickness is 360 feet. This estimate was determined by analysis of the ISF/Sonic log, using an SP value of -30 millivolts as a cutoff where the maximum shale line is -8 millivolts and the maximum sand line is -40 millivolts.



ISF/SONIC 1" LOG

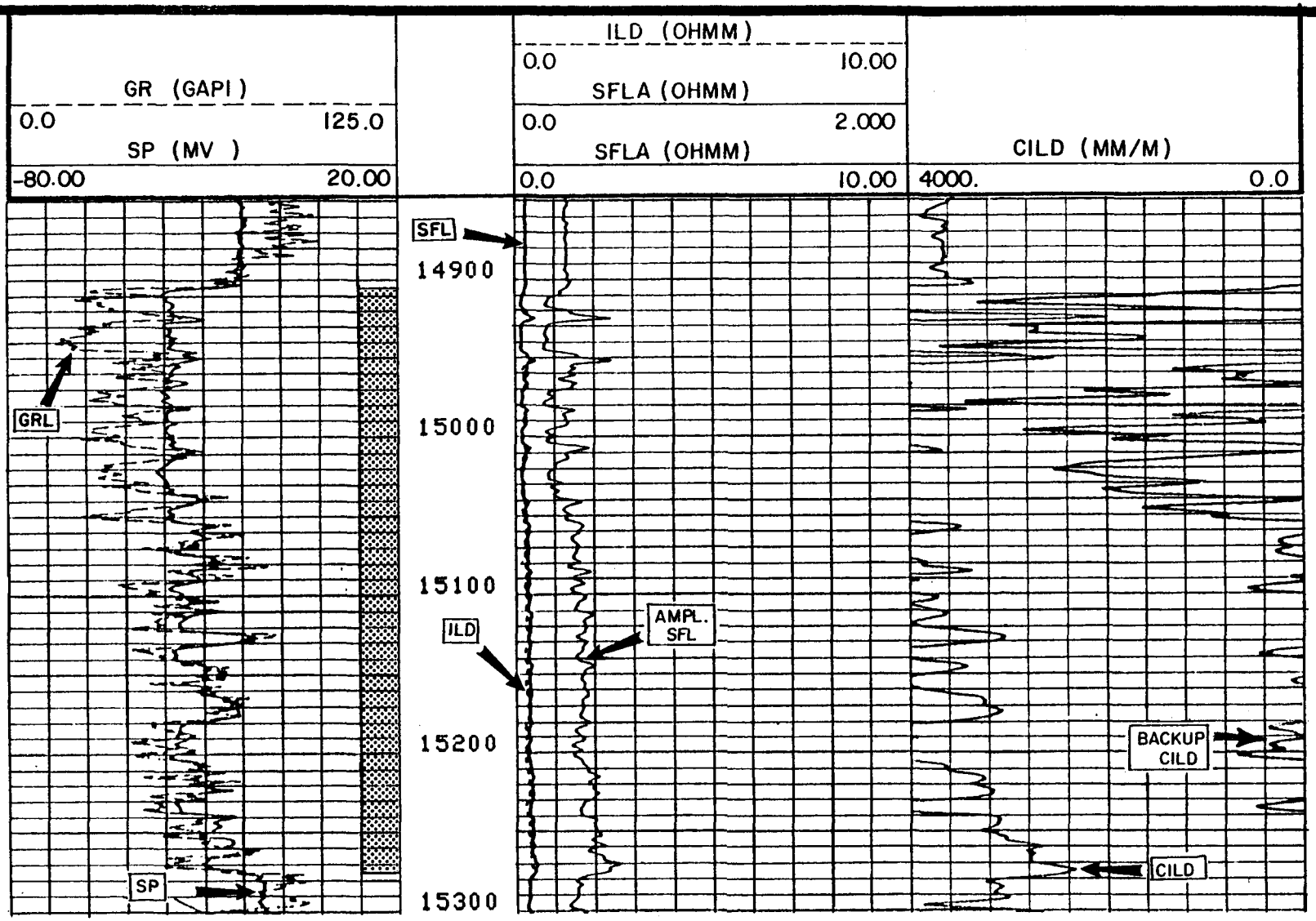
FRANK A. GODCHAUX, III., et al No. 1

TARGET SAND "A"

Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 5-1

DOE CONTRACT NO.
DE-AC08-80ET-27081



ISF/SONIC 1" LOG

FRANK A. GODCHAUX, III., et al No. 1

ALTERNATE TARGET SAND "B"

EXHIBIT 5-2

Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

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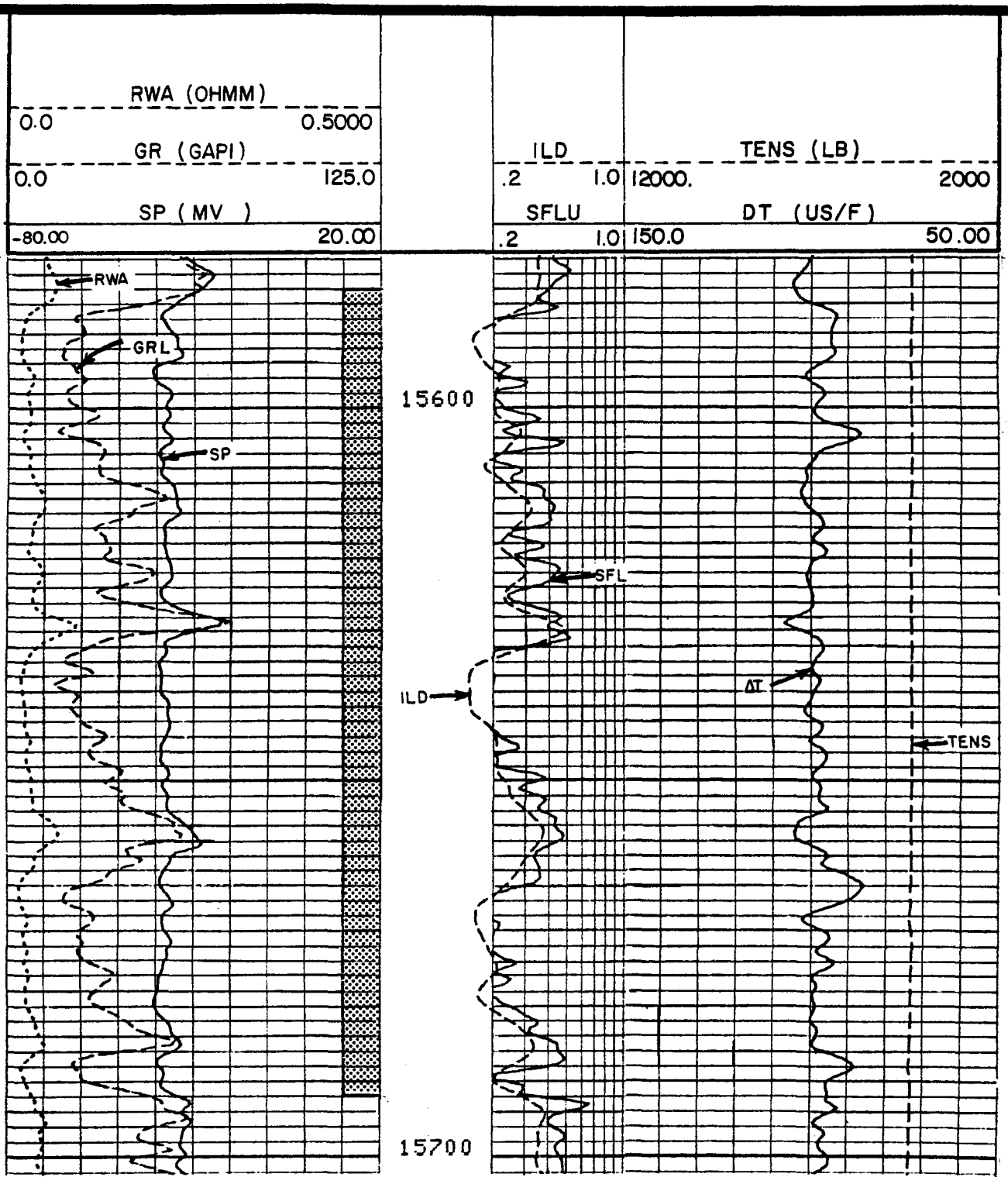
DE-AC08-80ET-27081



ISF/SONIC 5" LOG

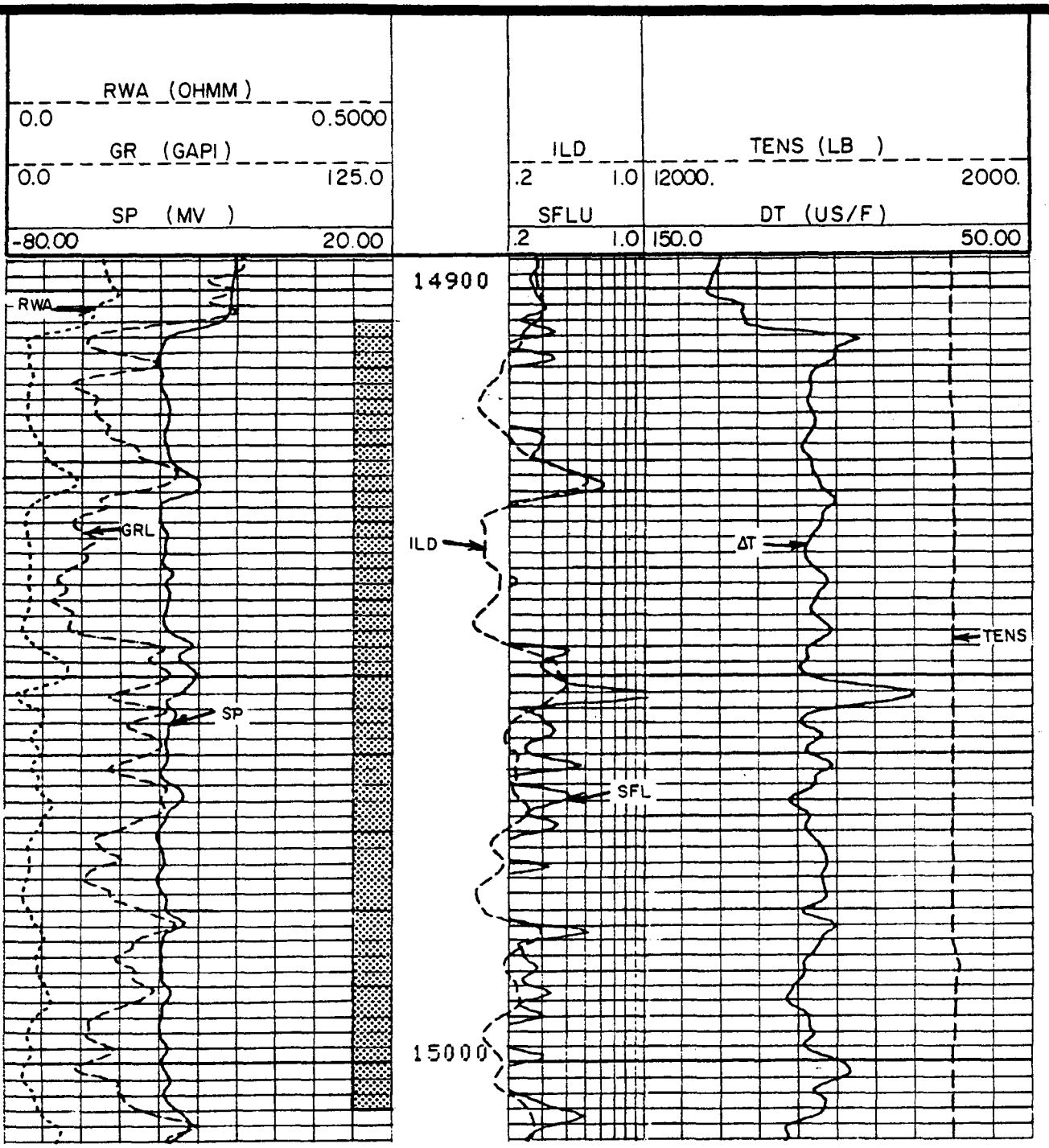
FRANK A. GODCHAUX, III., et al No. 1

TARGET SAND "A"

Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 5-3

DOE CONTRACT NO.
DE-AC08-80ET-27081



ISF/SONIC 5" LOG

FRANK A. GODCHAUX, III., et al No.1

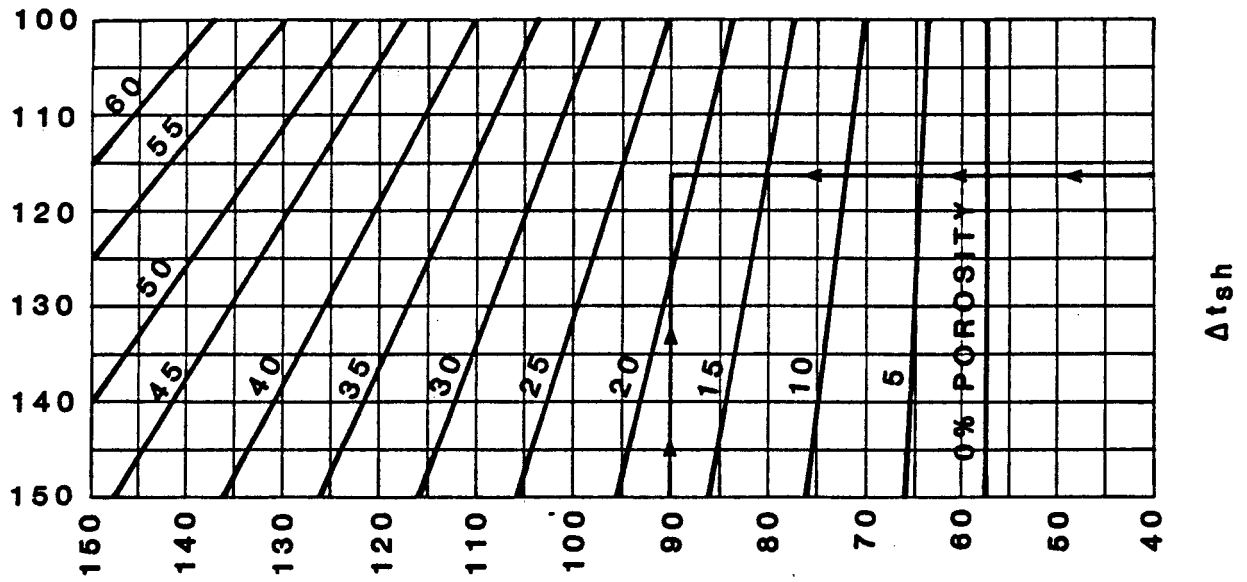
ALTERNATE TARGET SAND "B"

Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 5-4

DOE CONTRACT NO.
DE-AC08-80ET-27081

COMPACTION CORRECTION CHART



EQUATION GRAPHED:

$$\phi = \left[\frac{\Delta t - \Delta t_{ma}}{\Delta t_f - \Delta t_m}\right] \frac{100}{\Delta t_{sh}}$$

Δt_{sh} = ACOUSTIC TRANSIT TIME IN SHALES NEAR ZONE OF INTEREST

Δt_{ma} = MATRIX ACOUSTIC TRANSIT TIME, MICROSECONDS/FOOT

APPLICATION:

WHEN: $\Delta t_{ss} = 90$ AND $\Delta t_{sh} = 116$

THEN: $\phi = 22.5\%$

5.1.3 Permeability

The mean permeability, based upon sidewall core data (Exhibit 5-6), is 143 millidarcies, with a range of 37 to 250 md. The core data denotes the sand as varying from a very fine-grained, laminated, silty calcareous sandstone to a fine-grained silty shaley sandstone.

5.1.4 Salinity

The estimated formation water salinity, based upon log analysis, ranges from 52,000 ppm to 140,000 ppm. These values were determined using the following methods:

- Conventional SP
- R_{wa}
- Dunlap's "K_f"
- Conductivity - Salinity
- Shale Resistivity

5.1.4.1 Conventional SP Method: The estimated salinity using the Conventional SP (spontaneous potential) method is 70,000 ppm. This value was determined by solving for formation fluid resistivity using the maximum SP value from the induction log and then plotting it on the Welex "Resistivity Salinity" graph (Exhibit 5-7). The equations used in determining formation fluid resistivity are as follows:

$$SSP = -(60 + 0.133T_f) \log R_{mf}/R_{we} \qquad \text{(Equation 1)}$$

SSP = Static spontaneous potential - millivolts

T_f = Formation temperature - ^oF

R_{mf} = Resistivity of mud filtrate - ohm-m

R_{we} = Equivalent formation fluid resistivity - ohm-m

and

Maximum SP (uncorrected)	= -35	mv	
Corrected SSP	= -35	mv	(Exhibit 5-8)
Temperature	= 298	^oF	
R_{mf}	= 0.229	ohm-m at 70^oF	
R_{mf}	= 0.06	ohm-m at 298^oF	(Exhibit 5-7)

DOE CONTRACT NO
DE AC08-80ET-27081

CORE ANALYSIS, INC.

PRELIMINARY CORE ANALYSIS

COMPANY C & K PETROLEUM CORPORATION DATE 1-2-80 FILE NO L-1393

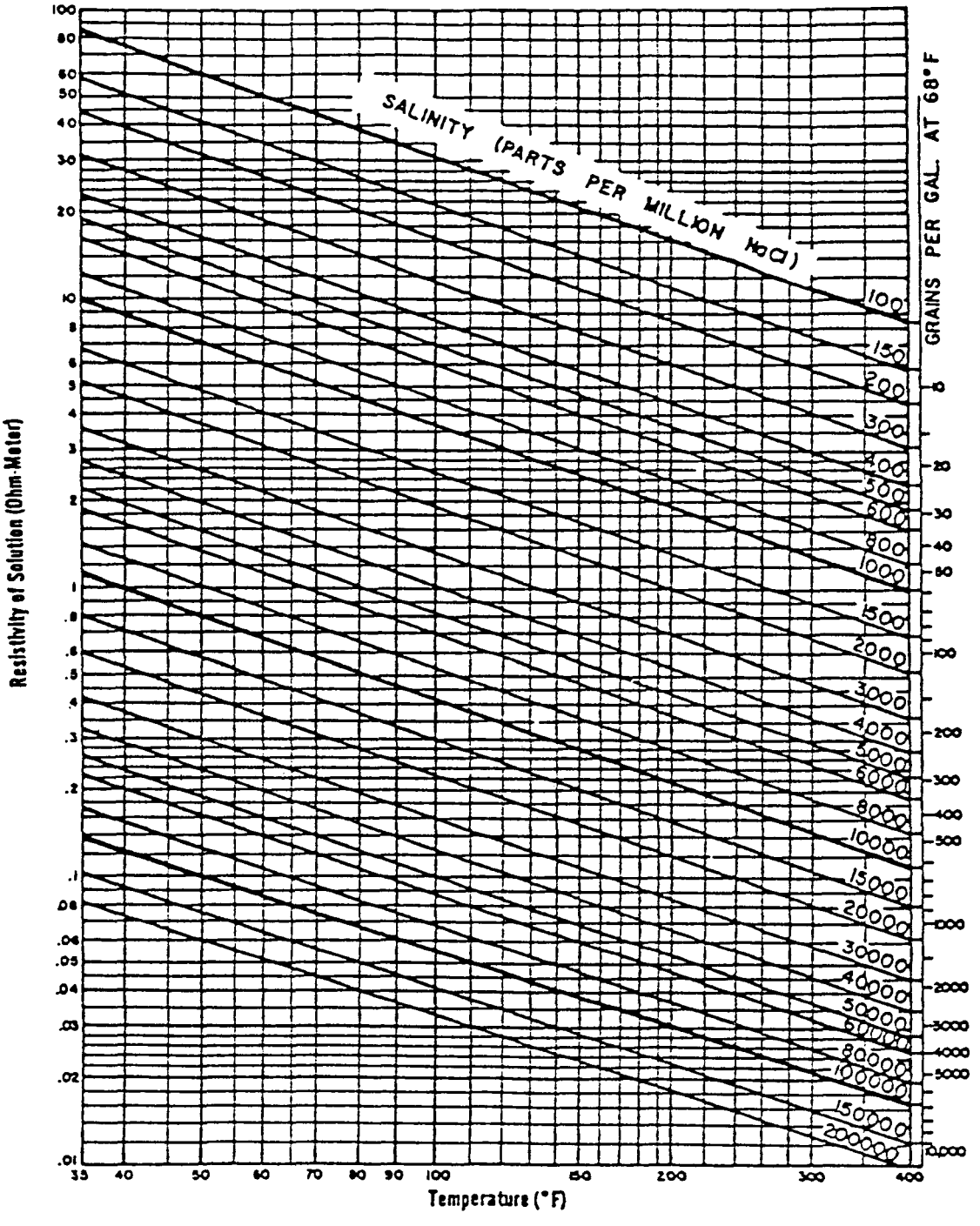
WELL GODCHAUX III NO. 1 FIELD LIVE OAK COUNTY VERMILION STATE LA.

CORES SCHLUMBERGER SIDEWALLS ANALYST E. R. PEACHER

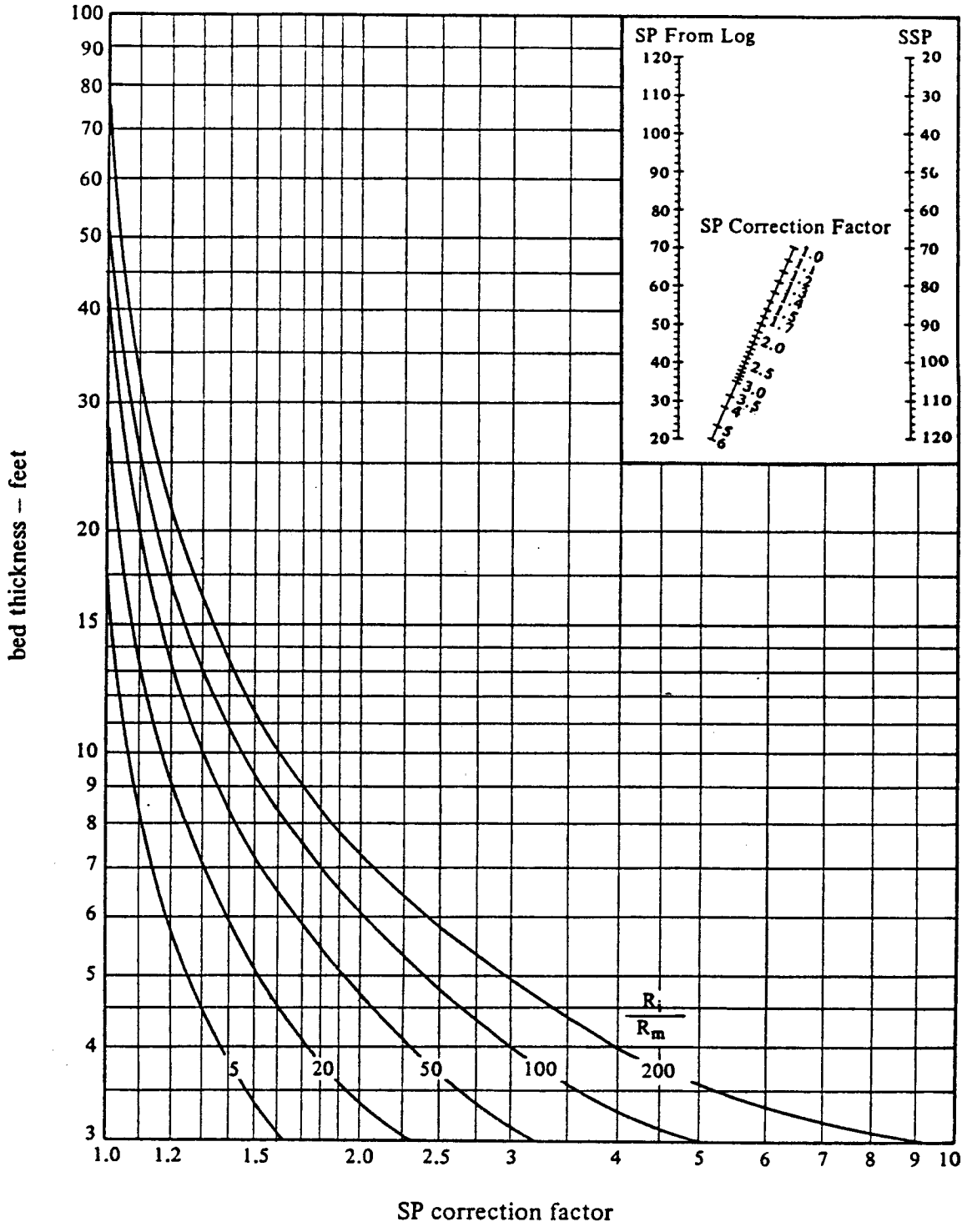
INREC	DEPTH FEET	PERMEABILITY MILLIDARCYS	POROSITY %	OIL % PORE	TOTAL WATER % PORE	PROBABLE PRODUCTION	GAS % PORE	S W	CUT	COMBUSTIBLE GAS UNITS FORMATION DESCRIPTION	↓	ODOR	FLOURESCENCE
1.0	14906									Shale Calc	0		
0.8	14907									Shale Calc	0		
1.0	14908	210.	24.8	0.8	71.4	COND	6.9	43	POOR	Sd. VFgr Sli Shy	0	NO	VFT
0.8	14909	370.	26.1	1.2	59.0	COND.	10.4	40	NO	Sd. VFgr Silty Sli Calc	0	NO	VFT
0.8	14910	265.	25.0	0.8	76.4	WATER	5.7	41	POOR	Sd. VFgr Sli Shy	0	NO	VFT
1.3	15180	15.	19.0	0.0	74.8	WATER	4.8	62	NO	Sd. VFgr Shy Silty Calc	0	NO	NO
1.0	15181	2.6	16.3	0.0	78.1	LOW PERM	3.6	66	NO	Sd. VFgr Shy Silty Calc	0	NO	NO
0.8	15182	96.	23.3	0.0	77.0	WATER	5.4	50	NO	Sd. VFg Silty Calc. (Lam)	0	NO	NO
1.0	15183	50.	21.2	0.0	82.5	WATER	3.8	53	NO	Sd. VFgr Silty Calc	0	NO	NO
0.8	15907	37.	22.5	0.0	85.9	WATER	3.2	58	NO	Sd. VFg Silty (Lam) Calc	0	NO	NO
1.0	15909	250.	23.7	0.0	74.3	WATER	6.1	41	NO	Sd. Fgr Sli Shy	0	NO	NO

Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 5-6



RESISTIVITY — SALINITY — TEMPERATURE CHART



SP CORRECTION CHART — DRESSER ATLAS

R_{we}	=	0.027	ohm-m	(Exhibit 5-9)
R_w	=	0.028	ohm-m	(Exhibit 5-10)
Salinity	=	70,000	ppm	(Exhibit 5-7)

5.1.4.2 R_{wa} Method: An estimated salinity of 52,000 ppm was calculated using the R_{wa} Method and was primarily determined as a function of porosity and true formation resistivity. The mathematical applications follow:

$$F = R_o/R_w \quad \text{(Equation 2)}$$

$$F = 0.81/\phi^2 \quad \text{(Equation 3)}$$

$$R_o/R_w = 0.81/\phi^2 \quad \text{(Equation 4)}$$

$$R_w = R_o\phi^2/0.81 \quad \text{(Equation 5)}$$

where:

F = Formation factor - dimensionless

R_o = 100% water-saturated rock - ohm-m

R_t = True formation resistivity - ohm-m

R_w = Formation water resistivity - ohm-m

ϕ = Porosity - %

and:

R_t = 0.4 ohm-m

ϕ = 27%

Assuming a 100% water-saturated formation where $R_t = R_o$, Equation 5, and the previously listed log-derived parameters, an apparent formation water resistivity of 0.036 ohm-m is obtained. Plotting the formation water resistivity on the Welex "Resistivity Salinity" graph (Exhibit 5-7) yields a salinity of 52,000 ppm.

5.1.4.3 Dunlap's "K_f" Method: Henry Dunlap's "K_f" Method produced an estimated salinity of 115,000 ppm. This value was calculated by obtaining a corrected R_{mf} using Dunlap's $K_f = R_{mf}/R_m$ vs. mud weight, the Geologic Age Salinity Correction Chart I, and the Salinity Correction Chart II (Exhibits 5-11 thru 5-13). The equations used in correcting R_{mf} are as follows:

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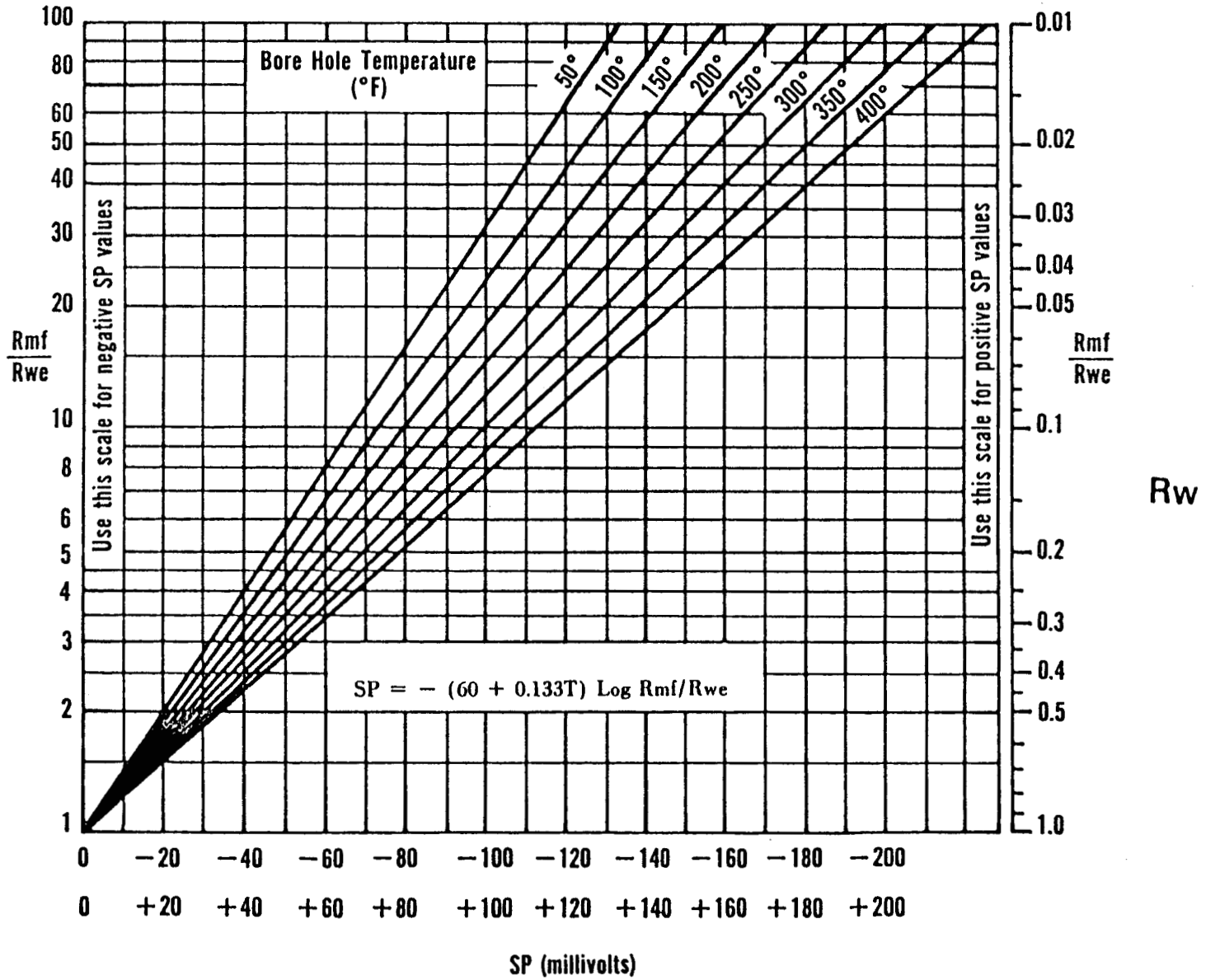
Eaton Operating Co., Inc.

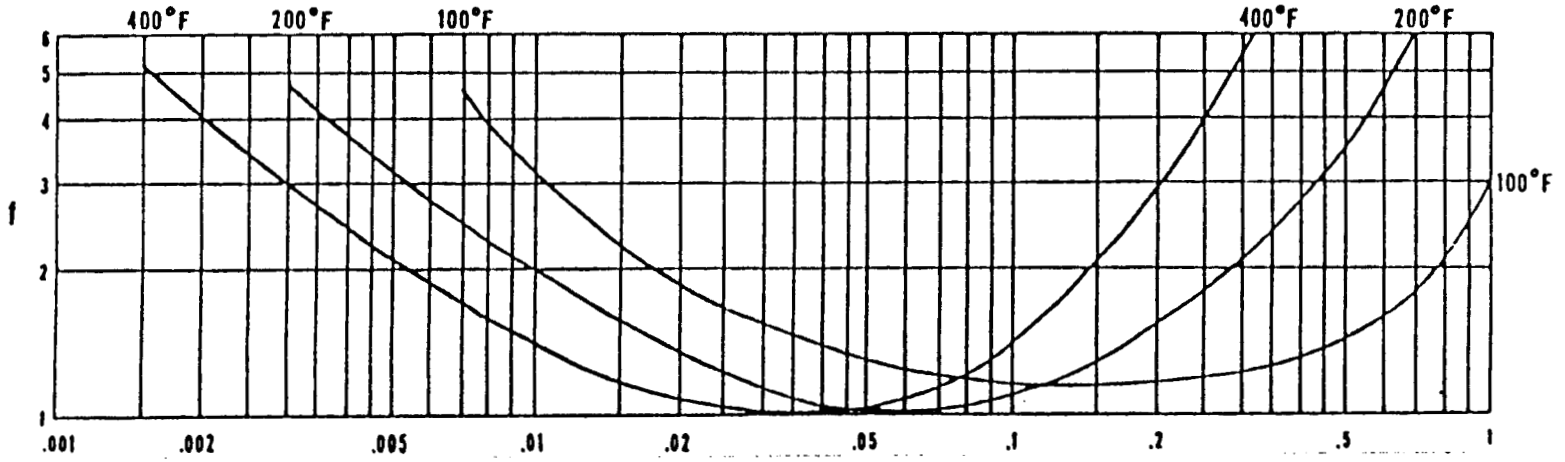
EXHIBIT 5-9

SP—Temperature—Rmf/Rwe Chart

Welex



Rwe Correction Chart

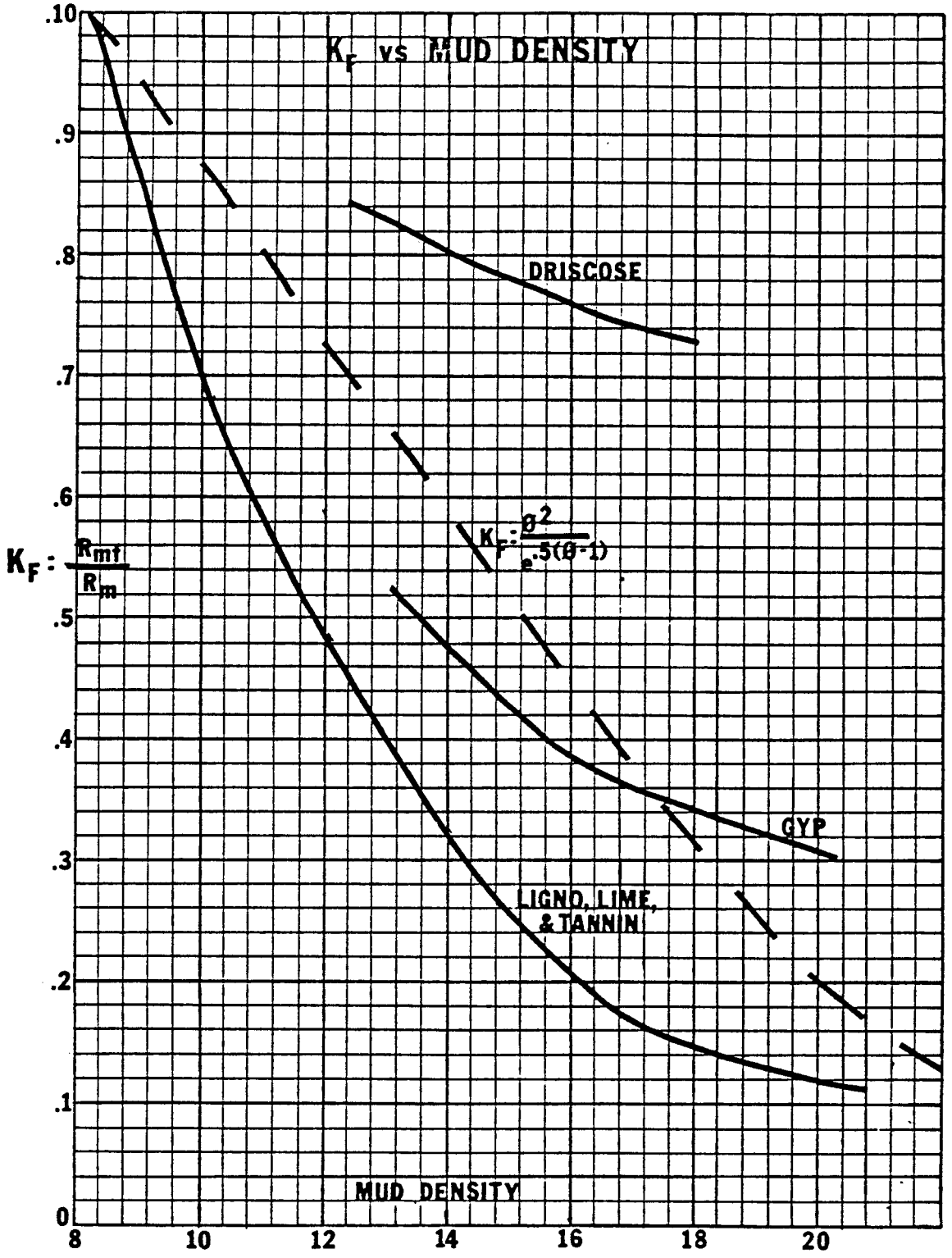


$(Rw = f \times Rwe)$

APPLICATION

From Exhibit 5-7
When: SP = −35 mv
T = 298 °F
Rmf = .06 ohm-meter
Then: Rmf/Rwe = 2.2
and Rwe = .06 ÷ 2.2 = .027 ohm-meter

Using this Exhibit, f = 1.05
Then: Rw = 1.05 x .027 = .028 ohm-meter

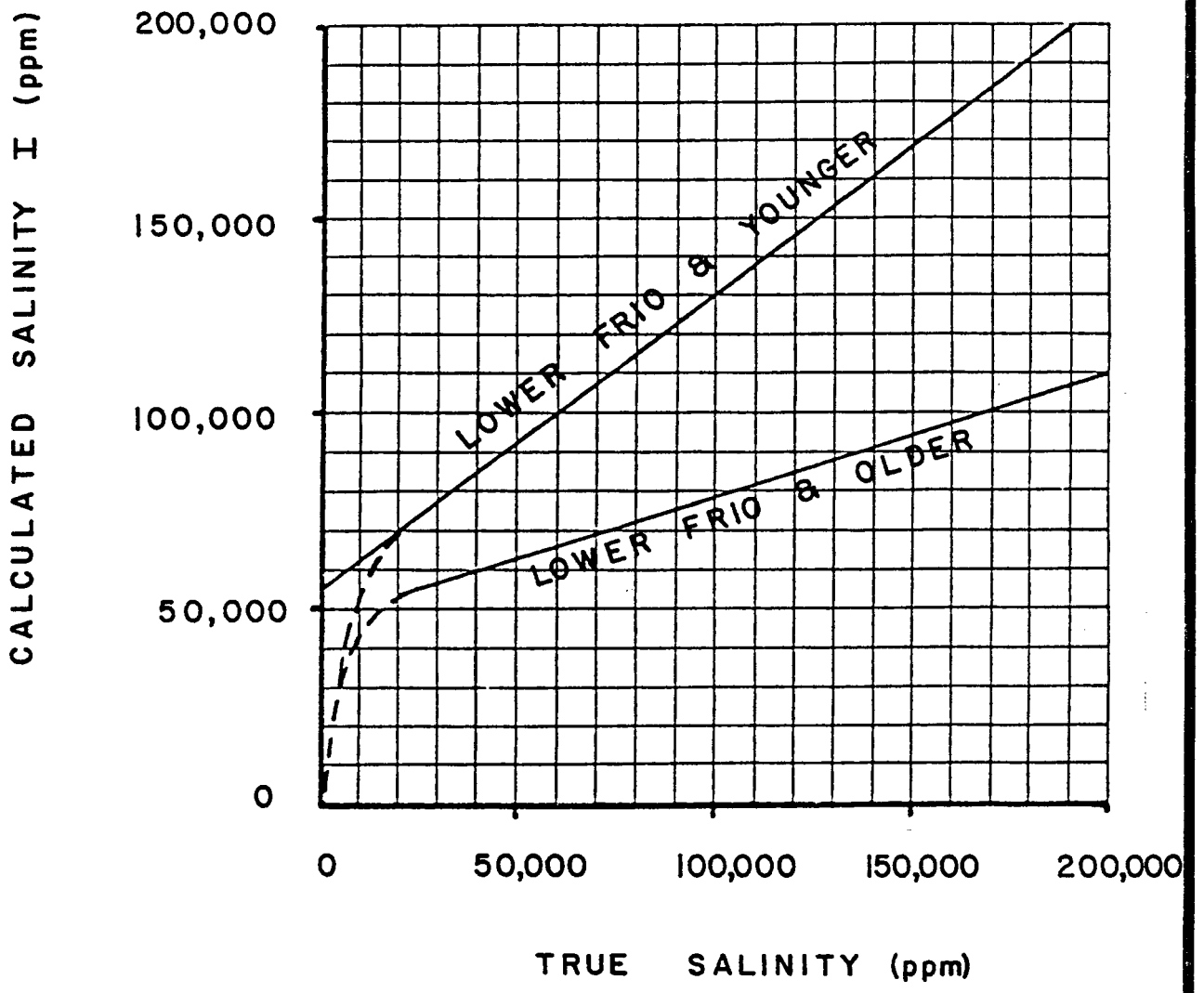


MUD RESISTIVITY CORRECTION CHART
H. F. DUNLAP — AUGUST 1980

Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

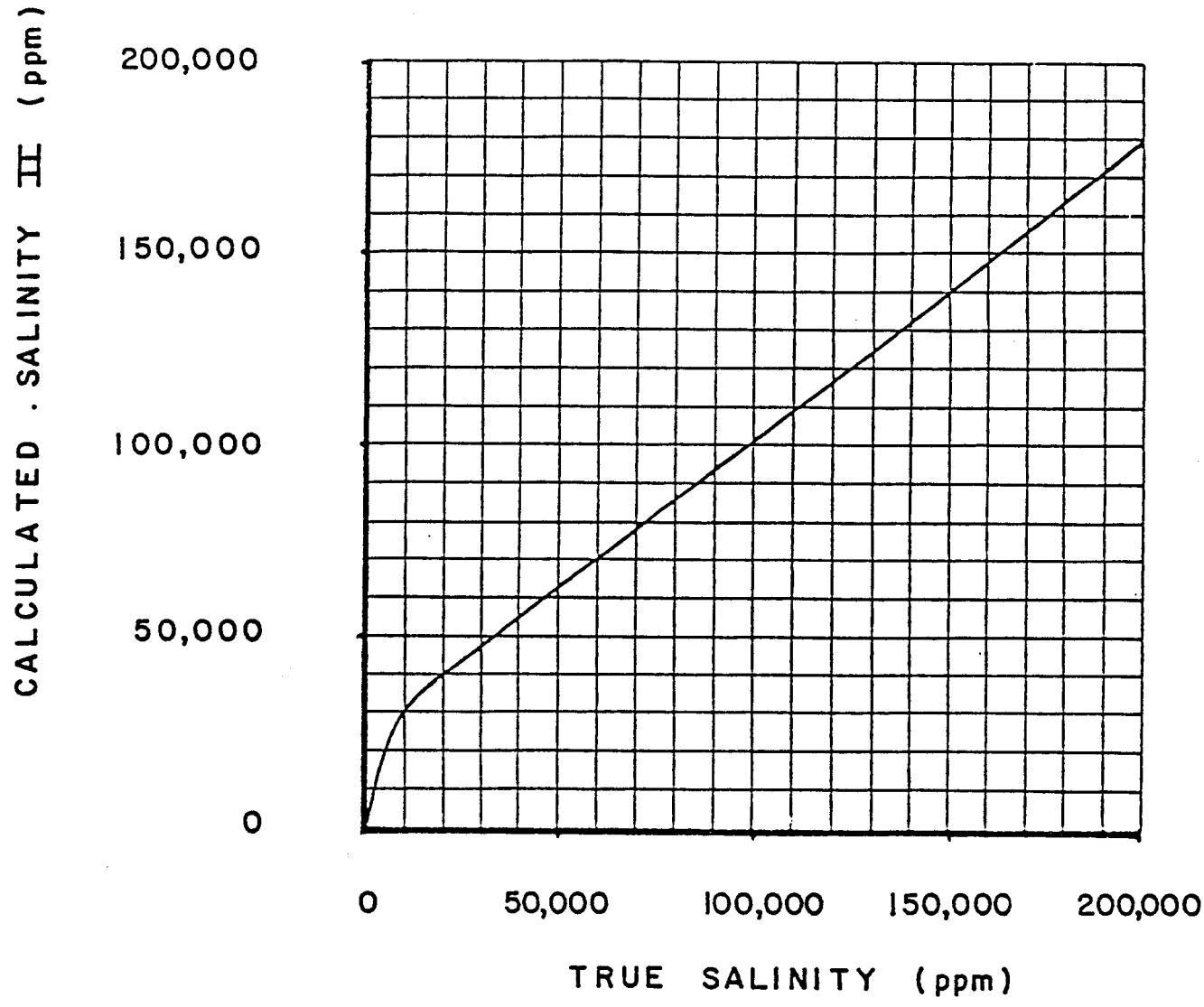
EXHIBIT 5-11

DOE CONTRACT NO.
DE-AC08-80ET-27081



GEOLOGIC AGE SALINITY CORRECTION

H.F. DUNLAP , FEBRUARY 1981



SALINITY CORRECTION CHART II

H.F. DUNLAP - MARCH 1981

$$K_f = R_{mf}/R \quad \text{(Equation 6)}$$

Solving for R_{mf}:

$$R_{mf} = K_f R_m \quad \text{(Equation 7)}$$

where:

R_{mf} = mud filtrate resistivity - ohm-m

R_m = mud resistivity - ohm-m

K_f = constant - dimensionless

MD = mud density - ppg

and:

SP (corrected)	= -35	mv	
R_m (uncorrected)	= 0.534	ohm-m at 68°F	
MD	= 17.8	ppg	
K_f	= 0.150		(Exhibit 5-11)
R_{mf}	= 0.080	ohm-m at 68°F	(Equation 7)
R_{mf}	= 0.024	ohm-m at 298°F	(Exhibit 5-7)
R_{we}	= 0.011	ohm-m	(Exhibit 5-9)
R_w	= 0.017	ohm-m	(Exhibit 5-10)
Salinity (uncorrected)	= 140,000	ppm	(Exhibit 5-7)
Salinity (corrected I)	= 113,000	ppm	(Exhibit 5-12)
Salinity (corrected II)	= 115,000	ppm	(Exhibit 5-13)

5.1.4.4 Conductivity-Salinity Method: A salinity of 80,000 ppm was calculated using the Conductivity-Salinity Method, which is a variation of the R_{wa} Method. In this approach true formation resistivity is back-calculated by using the conductivity of the formation. Once the true formation resistivity is known, applying the R_{wa} Method gives an additional value for formation water salinity. The conductivity was calculated by digitizing each 10-foot interval on the 1-inch ISF/Sonic log (Exhibit 5-1). The equation for determining this value is as follows:

R_t = 1000/C (Equation 8)

where:

R_t = true formation resistivity - ohm-m

C = conductivity - mmhos/m

T_f = formation temperature - ^oF

and:

T_f = 298^oF

ϕ = 27%

C = 3494 mmhos/m

then:

R_t = 0.286 ohm-m (Equation 8)

R_w = 0.026 ohm-m (Equation 5)

Salinity = 80,000 ppm (Exhibit 5-7)

5.1.4.5 Shale Resistivity Method: A salinity measurement of 140,000 ppm was estimated using Dr. Zaki Bassiouni's Shale Resistivity Method. This value was calculated by using parameters from the SP log and solving for R_w using Bassiouni's "Shale Resistivity-SP" graph (Exhibit 5-14). The equations used in this calculation are as follows:

(R_{sh}/R_{mf}) at T_f (Equation 9)

(R_{mf}/R_w) at 75^oF (Equation 10) (Exhibit 5-14)

where:

R_{sh} = shale resistivity - ohm-m

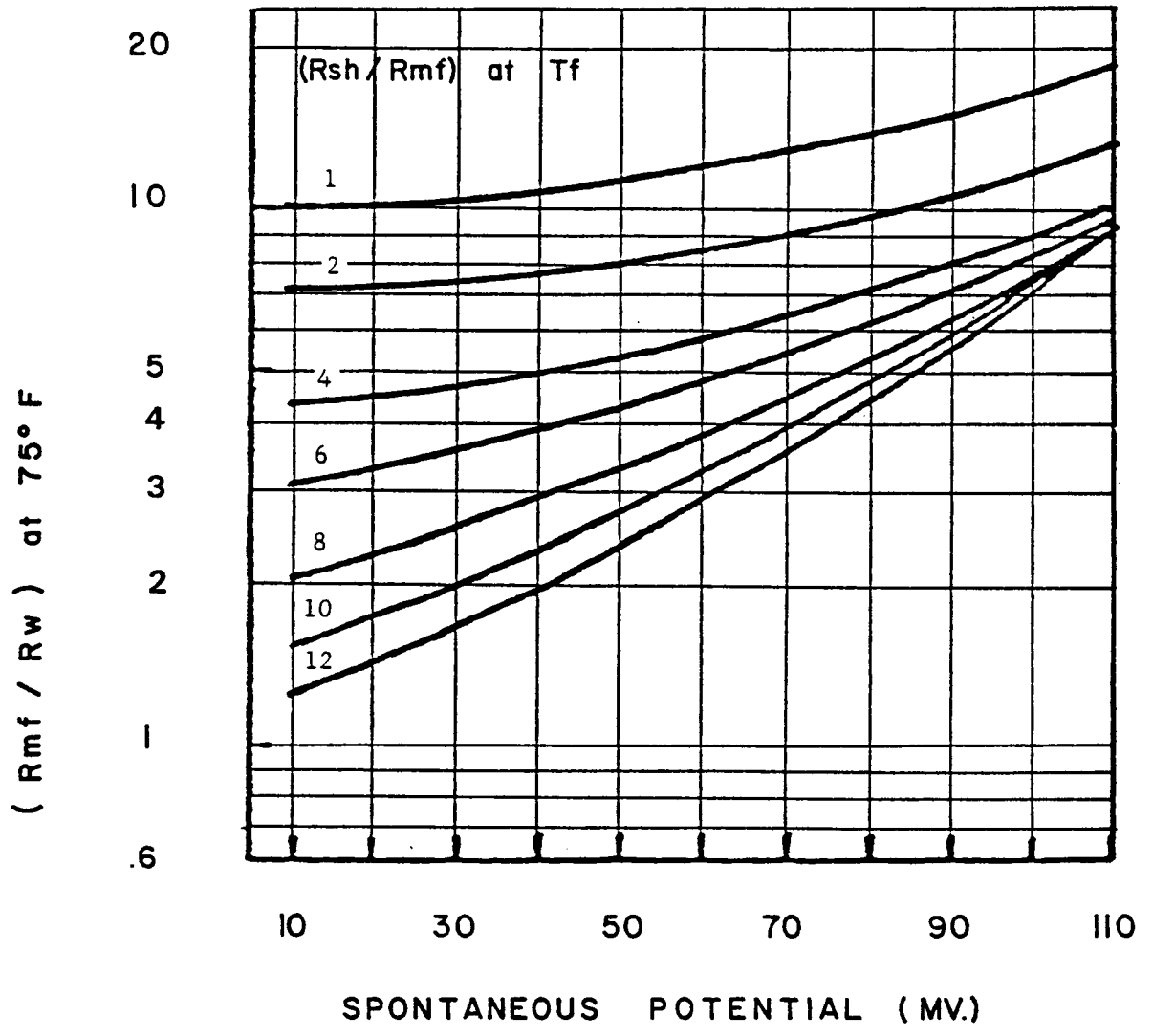
R_{mf} = mud filtrate resistivity - ohm-m

R_w = formation water resistivity - ohm-m

and:

SP = -35 mv

R_{sh} = 0.35 ohm-m



NEW SP CHART

SILVA AND BASSIOUNI JUNE 1981

T_f	=	298	^oF	
R_{mf}	=	0.229	ohm-m at 70^oF	
	=	0.215	ohm-m at 75^oF	
	=	0.06	ohm-m at 298^oF	(Exhibit 5-7)
(0.35/0.06) at 298^oF	=	5.83		(Equation 9)
($0.215/R_w$) at 75^oF	=	3.85		(Exhibit 5-14)
R_w at 75^oF	=	0.056		(Equation 10)
Salinity	=	140,000	ppm	(Exhibit 5-7)

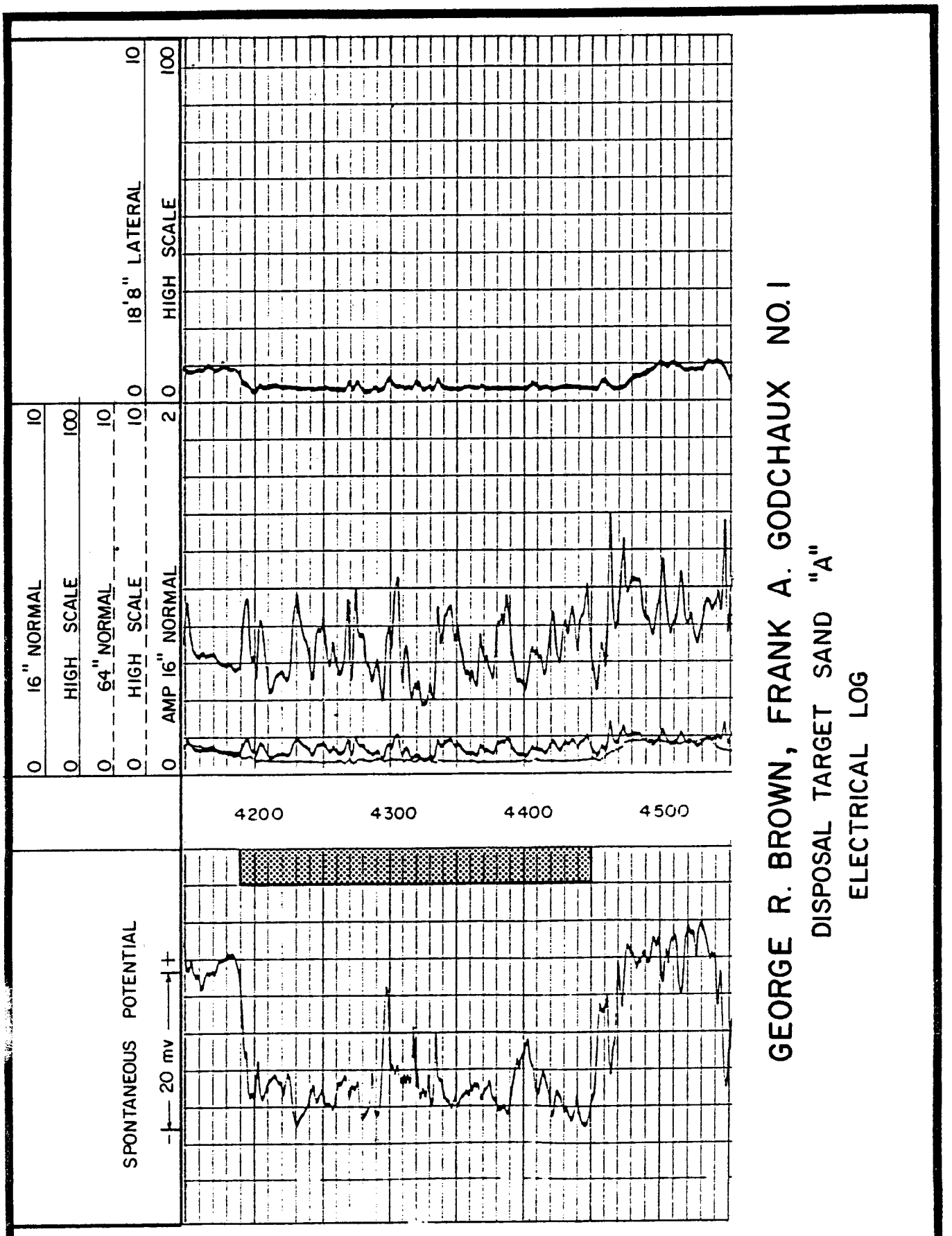
5.2 Sand "B"

The alternate test zone, sand "B," occurs at 14,904 to 15,275 feet (Exhibit 5-4). The calculated parameters for this sand which follow were derived in the same fashion as for sand "A."

•	Porosity		31%
•	Gross Sand		371 Feet
•	Net Sand		300 Feet
•	Permeability	- Mean	144 md
		- Range	2-370 md
•	Salinity	- Conventional SP	67,000 ppm
		R_{wa}	52,000 ppm
		Dunlap "K_f"	115,000 ppm
		Conductivity-Salinity	68,000 ppm
		Shale Resistivity	145,000 ppm

5.3 Open-Hole Log Analysis - Disposal Well

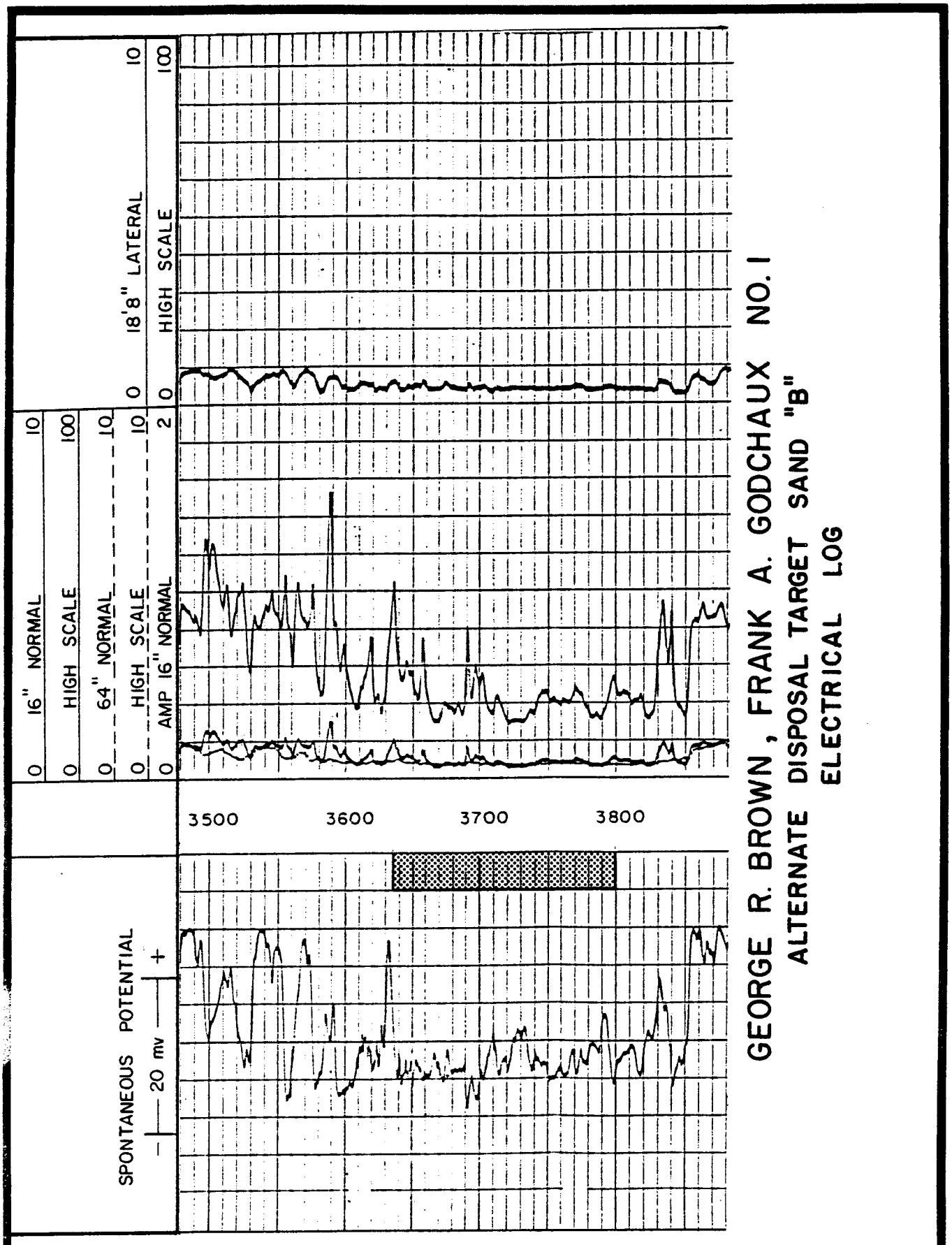
The predicted reservoir characteristics of the target sands for a saltwater disposal well are based on the log analysis of the George R. Brown, Frank A. Godchaux Well No. 1 (Exhibits 5-15 and 5-16). This well lies approximately 3000 feet northeast of the C & K Petroleum, Frank A. Godchaux, III, Well No. 1, the test well.



Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 5-15

DOE CONTRACT NO
DE-AC08-80ET-27081



Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 5-16

DOE CONTRACT NO.
DE-AC08-80ET-27081

	Sand "A"	Sand "B"
Sand Interval	4190' - 4450'	3635' - 3800'
Gross Sand Thickness	260'	165'
Porosity	25%	32%
Pressure	2069 psi	1767 psi
Temperature	110°F	104°F
Salinity (Conv. SP)	200,000 ppm	149,000 ppm

6.0 Re-Entry and Completion Operations - Test Well

6.1 Drill Site and Support Facilities

6.1.1 Site Layout

The location layout shown in Exhibit 6-1 accommodated conventional drilling and workover equipment used for the attempted completion of the test well. The site was covered with boards for the support of rig operations.

Rain water, waste oil, and grease spillage were trapped and drained into a ditch around the location for disposal. The ditch was pumped out into the reserve pit.

6.1.2 Living Facilities and Utilities

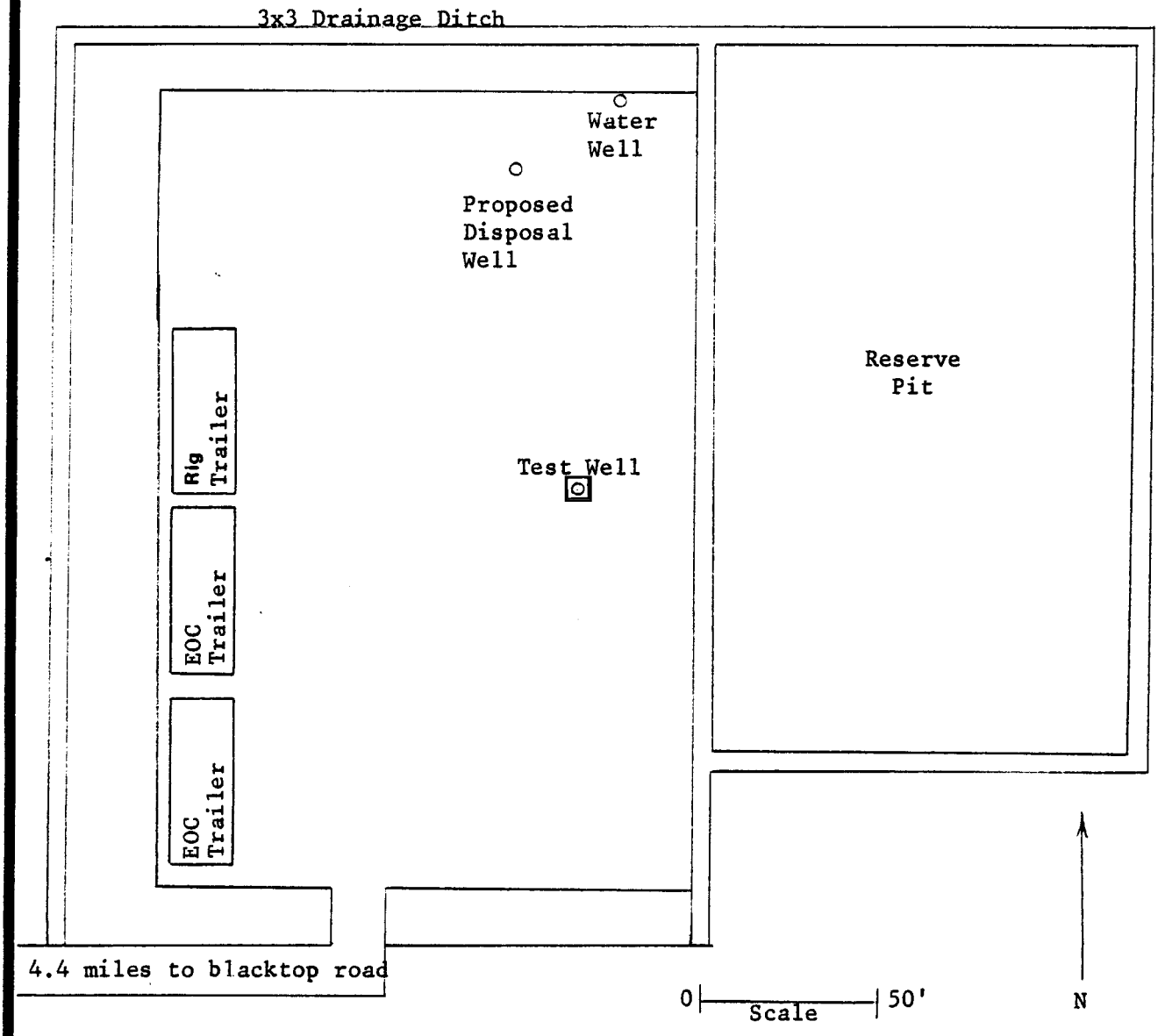
Air-conditioned living facilities were provided for 4 people. The rig contractor brought in living trailers for its personnel. Water for drilling and other operations was obtained from a freshwater well drilled on site. Drinking water was brought to the site by a local water delivery service.

Two telephones were installed in the Eaton house-trailers. Electrical power was obtained from the rig generators.

6.2 Re-Entry Operations

The Challenger Rig No. 48 was moved to the location on 6 August 1981 to commence completion operations on the test well. Exhibit 6-2 is a schematic of the well at the time of Eaton takeover. A blowout preventer stack approved by Eaton was installed on the well and tested. A cement mill and casing scraper were run in the hole to 12,626 feet, and the top of the 7-5/8 inch liner was dressed. A Dia-log casing inspection survey run from 12,626 feet to the surface indicated the 9-5/8 inch casing to be in good condition. The hole was cleaned out to 14,295 feet, where a multi-shot directional survey was run to confirm that the hole had deviated from the original hole. This survey showed that the hole had deviated at 13,448 feet and that the bottom of the new hole was approximately 91 feet from the original hole at a depth of 14,264. A Dyna-drill assembly with a Strata bit was run in the hole and drilled from 14,295 feet to 14,510 feet. At 14,510 feet, a sudden drop in pump pressure, from about 2600 psi to 600 psi, occurred. The falling mud level in the annulus between the drill pipe and the 9-5/8 inch casing confirmed severe lost circulation, probably through a hole in the 9-5/8 inch casing.

The excess mud in the rig pits and 375 barrels of fresh water were required to fill the casing annulus. The loss of hydrostatic head resulting from the lost circulation caused the open hole to close around and stick the drill string. A pull of 100,000 pounds over the weight of the drill string failed to move the stuck pipe. A freepoint indicator found the drill string 100% stuck below 12,400 feet. A small bridge plug was set in the drill pipe at 13,804 feet, approximately 15 feet above the bottom-hole assembly. An attempt to back off the stuck pipe at 12,383 feet resulted in a back-off at 12,075 feet. A 125-sack cement plug was pumped into the drill pipe by Halliburton and displaced with 56.5



TEST SITE LOCATION LAYOUT

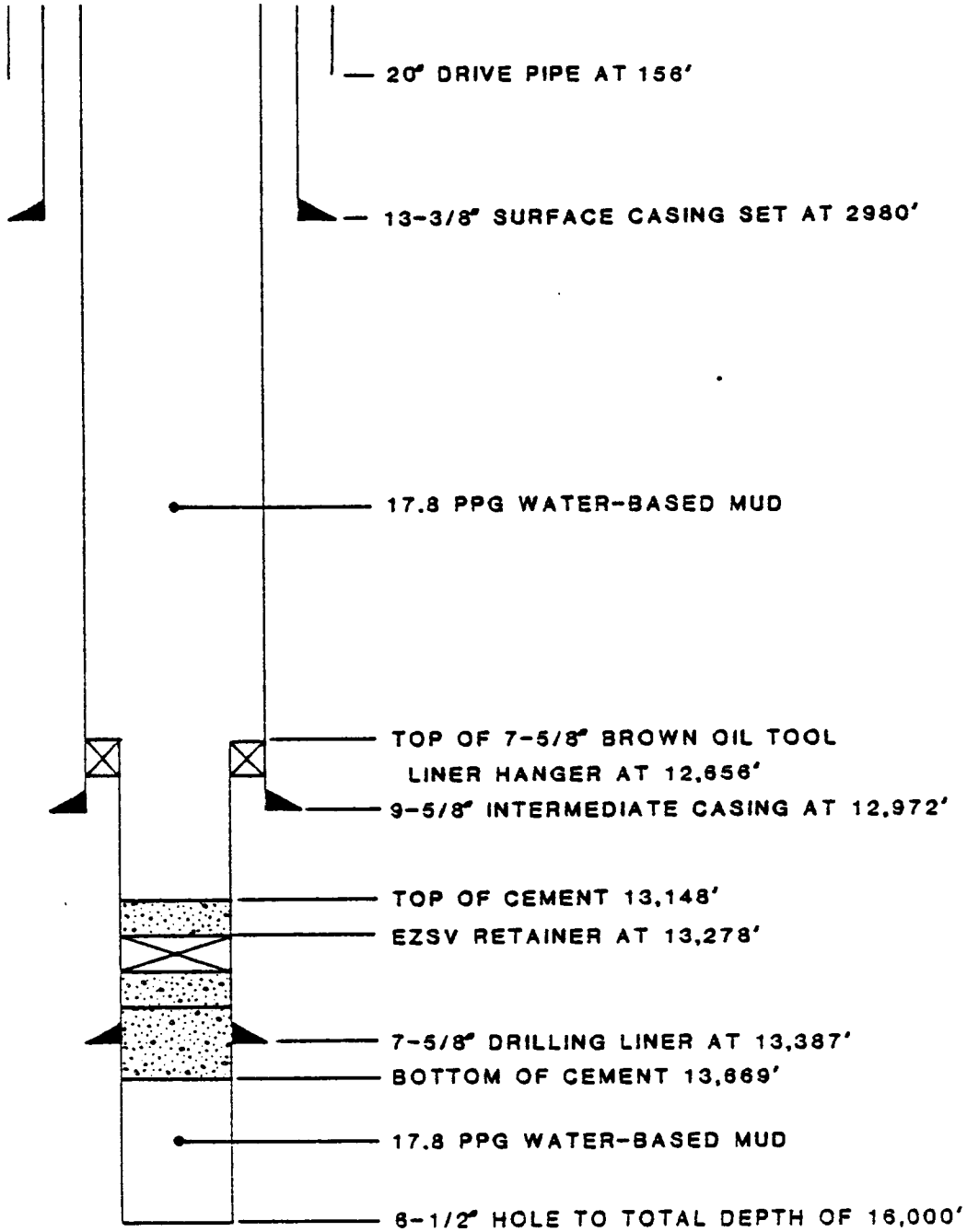
Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 6-1

DOE CONTRACT NO.
DE-AC08-80ET-27081

GODCHAUX WELL NO. 1

CONDITION AT TIME OF EATON TAKEOVER



Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 6-2

DOE CONTRACT NO.
DE-AC08-80ET-27081

barrels of 18-ppg mud and 21.5 barrels of water. The cement set up prematurely in the drill pipe, with estimated top and bottom of cement at 9021 feet and 10,980 feet, respectively. Lab tests indicated almost 4 hours of pumping time available for the slurry pumped, but the cement set in less than 1-3/4 hours. The drill pipe was pulled out of the hole and the cemented drill pipe layed down. A junk basket with a gauge ring was run in the well on wireline, but could not go below 4930 feet. Small pieces of soft cement were found in the junk basket. A casing survey was run in an attempt to locate the hole in the casing but could not get deeper than 5340 feet. The casing survey from this depth to the surface did not reveal any holes in the 9-5/8 inch casing. Exhibit 6-3 is a tubular goods summary at the time Eaton took over the well.

6.2.1 Failure of 9-5/8" Casing

The mechanical failure of the 9-5/8 inch casing string in this well led to the abandonment of the project. The exact location and nature of the failure were not determined due to the risk of additional problems and expense that might be caused by further attempts to investigate.

The type of failure can be narrowed down by a logical analysis of conditions within the drilling system and probable conditions outside the 9-5/8 inch casing. A casing inspection log in the 9-5/8 inch run prior to drilling out the temporary plug in the 7-5/8 inch liner showed no abnormal wear in the 9-5/8 inch string. While drilling out the 7-5/8 inch liner, and later in open hole, some metal cuttings were recovered. The cuttings, plus an unusually slow penetration rate, were originally thought to be the result of junk in the hole, but part or all of the iron cuttings could have come from casing wear.

Even with reduction of wall thickness due to wear, collapse can be eliminated. The maximum mud weight outside was 12.0 ppg (when the pipe was run), and at the time of failure the well was being cleaned out with 18.0-ppg mud inside. On the other hand, a failure in burst was entirely possible, since the pressure of the 18.0-ppg mud approached the pipe's limits, if the back-up mud weight outside is ignored. This situation could have existed where a section of the hole (outside the 9-5/8 inch) might have been isolated from hydrostatic pressure by a bridge of cement or formation.

A failure in tension or buckling are also possibilities but are more dependent on excessive wear. Small amounts of metal were recovered during operations, but not enough to indicate excessive wear. No matter what type failure occurred, wear could have contributed to some extent.

The location of the hole (failure) cannot be determined exactly but the range of possibilities can be narrowed down by events following the failure and during plugging operations. An attempt to locate the hole in the casing with a casing inspection tool was stopped when the tool hung up at around 5300' while going in the hole. The log from 5300' to the surface showed no abnormal casing conditions.

During abandonment operations a bottom plug was set from around 12,000' to 11,000' and another from about 8500' to 7500'. The second plug stopped the leak, leading to the conclusion that the leak was between 7500' and 11,000'. Events immediately following the failure lead to somewhat similar conclusions.

GODCHAUX WELL NO. 1
TUBULAR GOODS SUMMARY

Tubular	O.D. Size (in.)	Depth From (Ft.)	Depth To (Ft.)	Weight lb/Ft.	Minimum Drift (in.)	Casing Description Grade	Casing Description Thread	Casing Safety Factors During Re-Entry Burst	Collapse	Tension
Conductor Pipe	20	0	134	0.375 W.T.	-	-	-	-	-	-
Surface Casing	13-3/8	0	2,980	68.0	12.259	K-55	STC	*	*	*
Intermediate Casing	9-5/8	0	3,371	53.5	8.500	P-110	BUT	6.87	4.31	3.07
		3,371	8,108	47.0	8.525	N-80	BUT	1.80	1.53	2.68
		8,108	9,364	53.5	8.500	N-80	LTC	1.80	2.55	4.89
		9,364	10,948	53.5	8.500	P-110	LTC	2.11	3.97	**
		10,948	12,930	53.5	8.500	S-95	LTC	1.55	7.38	**
Drilling Liner	7-5/8	12,656	13,387	33.7	6.640	P-110	SFJ	1.72	2.01	**

Casing	Size (in.)	O.D. Hole Size (in.)	CEMENTING SUMMARY
	13-3/8	17-1/2	Cemented with 2330 sx. TLW + 3% salt and 500 sx. class H + 3% salt. Had cement returns to surface.
Intermediate	9-5/8	12-1/4	Cemented with 2575 sx., 12.0 ppg cement and 500 sx. class B, 16.2 ppg cement. Had pump failure. Squeezed shoe with cement several times.
Liner	7-5/8	8-1/2	Cemented with 150 sx. class H + 35% SF + 0.75% CFR-2 + 0.6% Halad 22-A + 0.10% HR-5. Tested liner lap with 3000 psi. Squeezed shoe with 462 sx.

Note: All casing was cemented by operator.

* Tubulars in place and no longer exposed to wellbore conditions.

** Safety factors very high.

A sudden and severe loss of pump pressure was the first indication that a problem existed. This fact, along with a falling fluid level in the annulus between the drill pipe and the 9-5/8 inch casing, confirmed a relatively shallow lost circulation zone (not in open hole). The annulus was filled with fresh water on top of the falling 18.0 ppg mud. It took 375 bbls to catch up with the mud fluid level. This amount of water will fill about 7400 feet of casing-drill pipe annulus. A mud column of 18 ppg would fracture unprotected normal or slightly pressured formations found in this well to a depth below 12,000 feet, and an average hydrostatic head of 15.0 ppg, or less, would continue to propagate the fracture. For example, the formation at 10,000' in this well would support a hydrostatic head consisting of approximately 6000' of 18 ppg mud and 4000' of 8.9 ppg water after once being fractured by a solid column of the heavy mud. A more exact location of the casing failure could be made by analysis with fracture initiation and propagation calculations, except for one complicating factor. The hole in the casing could be at, 10,000 feet, for example, and the thief zone at 8000 feet or some other depth. The location of the hole need not correlate to the calculated fracture gradient where the casing failed. Fracture gradients are a function of depth as well as pore pressure. The height of cement outside the 9-5/8 inch casing is unknown but is not believed to be very high. All of the primary cement on the 9-5/8 inch casing string was left inside the pipe, and the shoe was squeezed several times before the operator drilled ahead. The 7-5/8" x 9-5/8" liner lap was also squeezed by the operator before drilling out below the 7-5/8 inch. Exhibit 6-4 shows the condition of the well at the time of the casing failure.

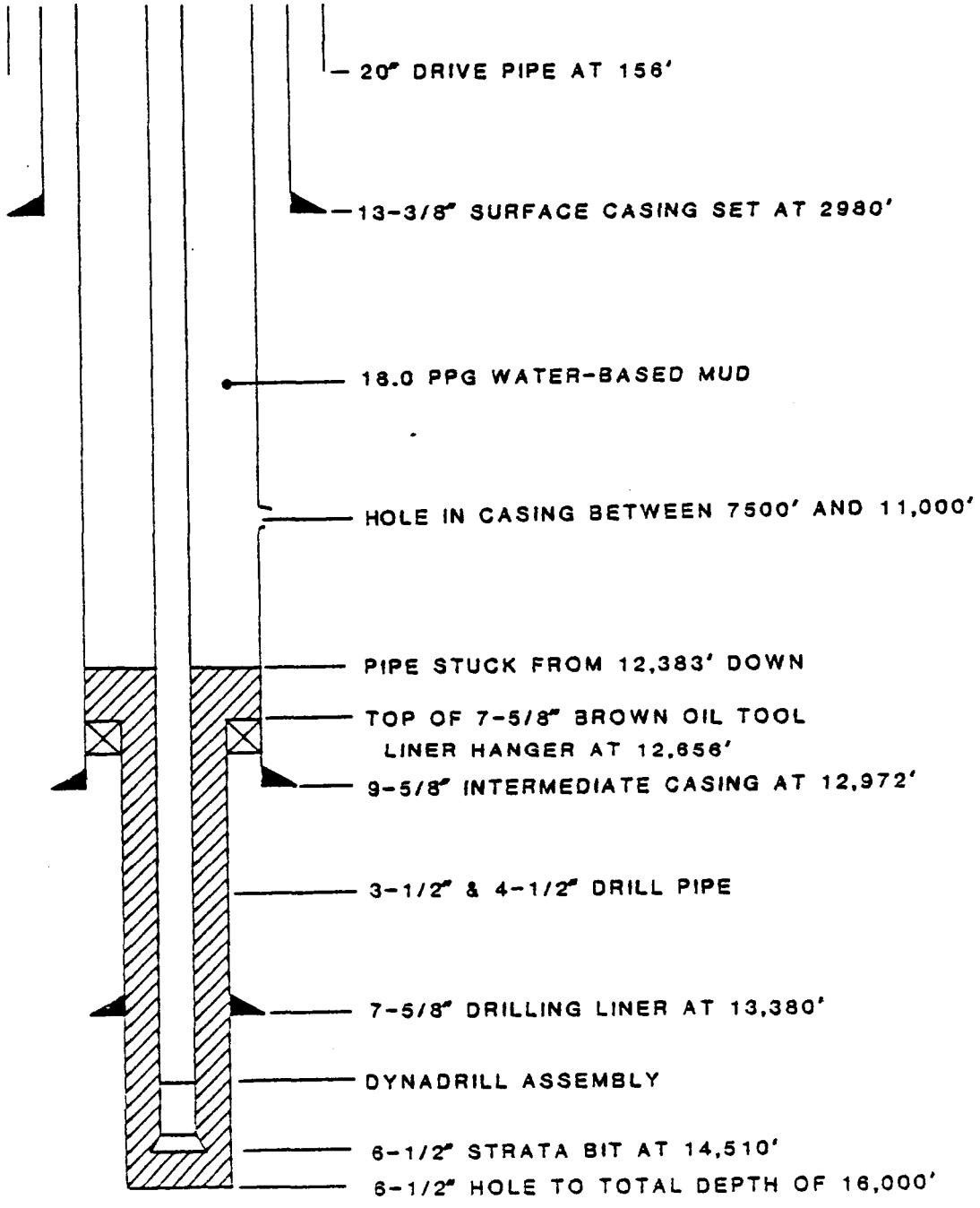
6.3 Abandonment of Well

Eaton recommended on 6 September 1981 that re-entry operations be terminated and that the test well be plugged and abandoned. The DOE concurred.

A cement plug was spotted from 12,064 feet to 11,000 feet by pumping 400 sacks of cement out of the open ended drill pipe. After pulling out of the hole to 8530 feet and laying down a portion of the drill pipe, a second cement plug, 370 sacks of cement, was spotted from 8540 feet to 7470 feet. The remaining drill pipe was pulled out of the hole, and a Halliburton EZSV cement retainer was set at 4278 feet. The cement plug from 8540 feet to 7470 feet was pressure tested with 500 psi and held pressure. A 200-sack cement plug was spotted on top of the cement retainer from 4278 feet to 3753 feet. Drill pipe was laid down, and a 75-sack surface plug was spotted from 204 feet to 10 feet below the surface. The remaining drill pipe was laid down, the blowout preventers were nippled down, and the rig was released at 10:00 am on September 12, 1981. Exhibit 6-5 shows the condition of the well after plugging and abandonment.

GODCHAUX WELL NO. 1

CONDITION AT TIME PIPE BECAME STUCK

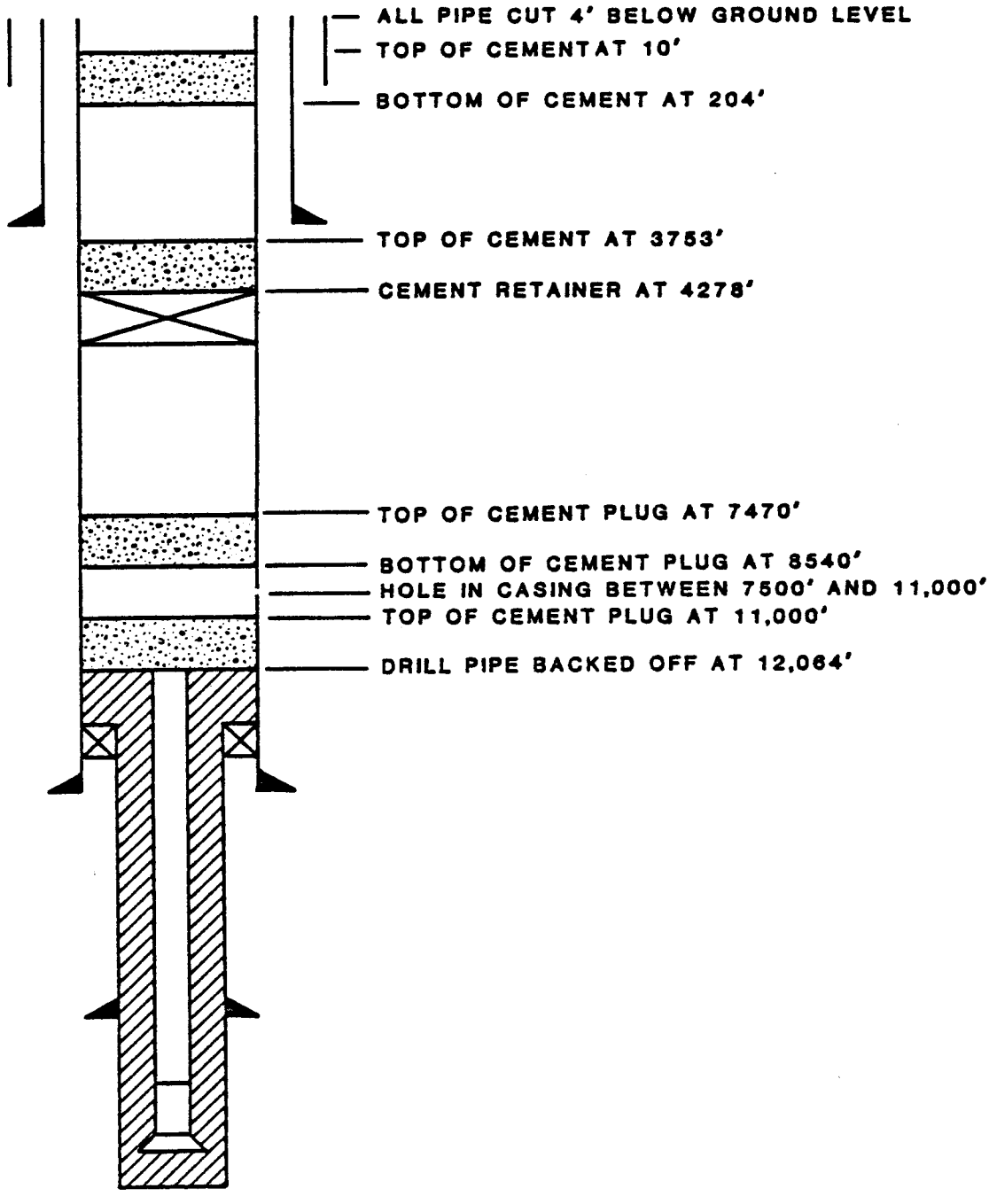


Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 6-4

GODCHAUX WELL NO. 1

CONDITION OF WELL AFTER PLUG AND ABANDONMENT



Eaton Industries of Houston, Inc.
Eaton Operating Co., Inc.

EXHIBIT 6-5

DOE CONTRACT NO.
DE-AC08-80ET-27081

7.0 TEST OBJECTIVES

The test equipment and procedures for the Godchaux Well No. 1 were designed to obtain the maximum information within the time and funds allotted.

Specific information desired was the following:

- Gas Content and Solubility
- Well Deliverability
- Formation Flow Capacity
- Aquifer Geometry
- Distance to Existing Boundaries
- Chemical Composition of Produced Fluids
- Physical Properties of Produced Fluids
- Performance of Downhole Equipment
- Performance of Surface Test Equipment
- Scaling and Corrosion Potential
- Formation Sand Production
- Disposal Well Injectivity

None of the above objectives were accomplished due to the mechanical problems encountered during the attempt to clean out and complete the well.

8.0 CONCLUSIONS

- The loss of the Godchaux Well No. 1 was a result of mechanical failure of the 9-5/8 inch intermediate casing. The casing failure was probably aggravated by wear while drilling out a cement plug, causing failure in burst. The hydrostatic pressure of the 18.0-ppg mud approached the pipe design limits without back-up mud outside the casing. This situation could have occurred if a section of the casing were isolated from hydrostatic pressure by a bridge of cement, formation, or dehydrated mud.

- The exact location of the casing failure cannot be determined accurately with the information available. A casing caliper inspection survey run prior to re-entry indicated the 9-5/8 inch casing to be in good condition. Metal filings recovered during drilling operations may have come from casing wear, rather than junk in the hole as originally suspected.

- The hole in the casing occurred between 7500 feet and 11,000 feet. This conclusion is based on information gained during plugging operations. The cement plug with its top at 11,000 feet would not hold pressure, but the cement plug with its top at 7500 feet did, which placed the hole in this 3500-foot interval.

- The drill string became stuck due to the severe lost circulation above the open hole section. The loss of drilling fluid reduced the hydrostatic head, and the geopressured formation in the open hole closed around the drill string. The pipe could not be moved up or down. Attempts to recover the stuck pipe and repair the casing were considered high risk. Eaton recommended the well be plugged and abandoned, and the DOE concurred.

9.0 REFERENCES

1. Bassiouni, A.; Silva P. 1981. "A New Approach to the Determination of Formation Water Resistivity from the SP Log," SPWLA, The Log Analyst, June.

2. Dunlap, H.F. 1980. "Study of Log Derived Water Resistivity Data in Geo Formations," Center for Energy Studies. Sixth Progress Report.

3. Dunlap, H.F. 1981. "Study of Log Derived Water Resistivity Data in Geo Formation," Center for Energy Studies. Twelfth Progress Report.

4. Jones, P.J. 1969. Hydrology of Neogene Deposits in the Northern Gulf of Mexico Basin. Baton Rouge, Louisiana, Louisiana State University.

5. Meyerhoff, A.A. 1968. "Geology of Natural Gas in South Louisiana," Natural Gases of North America (B.W. Beebe, ed.). Am. Assoc. Petrol. Geologists (in press).

6. Welex, 1968. "Charts for the Interpretation of Well WGS."

APPENDIX A

OPERATOR CONTRACTS AND AGREEMENTS

AGREEMENT WITH

C & K PETROLEUM, INC.

EATON OPERATING COMPANY, INC.

March 12, 1981

C & K Petroleum, Inc.
3900 Capitol Bank Plaza
Houston, Texas 77002

Re: #1 Frank Godchaux III
Section 88, Township 14 South,
Range 3 East
Vermilion Parish, Louisiana

Gentlemen:

This letter, if accepted by you, and two (2) signed copies thereof are returned to the undersigned by the 1st day of April, 1981, the effective date of this agreement, shall constitute an agreement between C & K Petroleum, Inc. (hereinafter referred to as "C & K"), and Eaton Operating Company, Inc. (hereinafter referred to as "Eaton") as to the following matters:

1. Pursuant to a contract with the Division of Geothermal Energy, Department of Energy (hereinafter referred to as "DOE"), Eaton has agreed to carry out, among other things, research, field testing, evaluation and reporting on selected sites in the Texas-Louisiana Frio Miocene Trend, where reservoir and production data can be obtained to assess the energy potential of Gulf Coast Geopressured-Geothermal Aquifers. C & K has made a decision to plug and abandon the Godchaux #1 Well, Section 88, Township 14 South, Range 3 East, Vermilion Parish, Louisiana (hereinafter referred to as "well"). Eaton has expressed an interest in using the bore of the well in which to conduct experimental tests of the geopressured sand sections disclosed in the well.

2. Eaton and C & K agree and contract as follows:

a. C & K agrees to delay the proposed plugging operation of the well for a period of ninety (90) days from effective date of this letter agreement.

b. Eaton shall have the option for a period of ninety (90) days from the effective date hereof to take over the well and conduct its research pursuant to its contract with the DOE, subject to landowner's consent, to be obtained by Eaton with assistance from C & K.

PHONE 713-627-9764
TWX 910-881-1793
EDEC-HEC-HOU

3100 EDLOE, SUITE 205
HOUSTON, TEXAS 77027

U.S. DEPARTMENT OF ENERGY
CONTRACT NO.
DE-AC08-80ET27081

c. At the end of ninety (90) days, or within ten (10) days of commencement of Eaton's operations, whichever is the earliest, Eaton shall pay to C & K the sum certain of Seventy-Five Thousand Dollars ($75,000.00), which sum is the consideration for the option granted herein.

d. C & K shall be the sole corporation liable to fairly and equitably distribute the payment made by Eaton to other working interest owners, if any, and C & K agrees to hold Eaton harmless from such distribution.

e. If Eaton does, in fact, test said well and exercise its option, it will be necessary for Eaton to drill a saltwater disposal well in close proximity to the Godchaux well. After testing, Eaton will plug and abandon both wells in accordance with the requirement of the Louisiana Department of Conservation and clean up the well sites.

f. Eaton will begin re-entry operations on the Godchaux well within 90 days of the date hereof.

g. Any hydrocarbons recovered and sold during Eaton's operations shall remain the property of C & K.

3. After Eaton (DOE) has completed its geothermal testing, C & K has the right (but not obligation) to take operations of the Frank Godchaux III No. 1 for additional testing for hydrocarbon potential.

a. If C & K exercises said option, C & K agrees to defend and hold Eaton harmless for any and all claims and demands of whatsoever nature arising out of, or in any manner connected with C & K's testing operations.

b. If the testing is successful, then the remainder of Eaton's responsibility under the option agreement would terminate and revert back to C & K as stated in the original lease.

c. If the testing is unsuccessful, then all plugging and clean up operations once again become Eaton's responsibility.

4. Eaton expressly agrees that neither Eaton, DOE, or their respective servants, agents, employees, successors, or assigns shall acquire any ownership rights in (i) the leasehold interest owned by C & K, or (ii) the real property, or (iii) the minerals on or under said land, or (iv) any production attributable hereto.

5. Eaton expressly agrees that the test well and disposal well are its only interest, and said wells are expressly for research and evaluation only. All water, if any, shall be reinjected and all associated gas, if any, shall be flared and burned.

6. If Eaton exercises its option, Eaton shall assume all liability for location clean-up, back-filling, road restoration, etc.

7. Eaton shall assume responsibility for filing necessary State permits, to cover re-entry and testing operations, and upon conclusion, to file necessary State P&A reports.

8. Eaton shall maintain insurance coverage in the following amounts, to-wit:

a. General liability and third party liability in the policy amount of Eighty Million Dollars ($80,000,000).

b. Cost of well control in the policy amount of Twenty-Five Million Dollars ($25,000,000).

9. Eaton pledges and agrees that all information as to flow rates, gas content, water analyses, reservoir evaluation, and any and all information of whatsoever kind shall be furnished to C & K as said information becomes available to Eaton.

10. C & K expressly represents that it owns or, in its capacity as Operator, represents the owners of a one hundred percent (100%) interest in and to the well. C & K does not represent that it owns any rights with respect to any minerals, including geothermal energy.

11. Eaton agrees to defend and hold C & K harmless from any and all claims and demands of whatsoever nature arising out of, or in any manner connected therewith, Eaton's use of the well, and C & K and its partners shall be named additional assureds in Eaton's insurance coverage listed in item 8 above.

Whenever notice is required or permitted under the terms of this agreement, same shall be in writing and shall be deemed to have been given if sent by telegram, registered, or certified mail to the respective parties as follows:

C & K Petroleum, Inc.
3900 Capital Bank Plaza
Houston, Texas 77002

Eaton Operating Company, Inc.
3104 Edloe, Suite 200
Houston, Texas 77027

This agreement shall be binding upon the heirs, successors, and assigns of the parties hereto.

Attached hereto are the following documents, incorporated by reference herein as set out and marked as Exhibit I and Exhibit II.

If the above conforms to your understanding of the agreement between us, please sign and return two (2) copies to us in the time specified above.

Very truly yours,

EATON OPERATING COMPANY, INC.

By B A Eaton
B. A. Eaton
President and Project Manager

ACCEPTED AND AGREED TO THIS 20TH DAY OF March, 1981.

C & K PETROLEUM, INC.

By E R Manson
Name E.R. Manson
Title Vice President

AGREEMENT WITH

GODCHAUX

EATON OPERATING COMPANY, INC.

March 13, 1981

Mr. Charles Godchaux
P.O. Box 278
Abbeville, Louisiana 70510

Mr. Frank A. Godchaux, III
P.O. Box 278
Abbeville, Louisiana 70510

Re: Frank Godchaux, III Well No. 1
Section 88-14S-3E
Live Oak Field
Vermilion Parish, Louisiana

Gentlemen:

I.

Eaton Operating Company, Inc. (hereinafter referred to as "EATON"), a Texas corporation, is a party to a written contract with the Department of Energy (hereinafter referred to as "D.O.E.") which calls for EATON to carry out research, field testing and evaluation of well sites in the Louisiana - Texas Gulf Coast area where reservoir and production data can be obtained to assess the energy potential of the Gulf Geopressured-Geothermal Aquifers.

EATON is seeking well locations which, if they are not presently productive of oil or gas, can be taken for a short test when the operator has made the decision to plug and abandon such a well.

C & K Petroleum, Inc. (hereinafter referred to as "C & K") has drilled the above referenced well to a projected total depth of approximately Sixteen Thousand Feet (16,000 ft.) and has elected to plug the well as non-commercial.

II.

EATON is of the opinion that the subject well qualifies as a well of opportunity candidate within the definition of the EATON-D.O.E. contract, and EATON recommends a production test of one or more aquifers within the well bore for D.O.E. approval, sponsorship and sole financial support.

III.

EATON has acquired from C & K an option to use the Frank Godchaux, III Well No. 1 for geothermal testing. The option gives EATON the right (but not obligation) to develop the Frank Godchaux, III Well No. 1 for test purposes; operations to begin on or before June 30, 1981, the expiration date of the option. The agreement between EATON and C & K is subject to a satisfactory agreement between EATON and the landowner.

PHONE 713-627-9764
TWX 910-881-1793
EDEC-HEC-HOU

3100 EDLOE, SUITE 205
HOUSTON, TEXAS 77027

U.S. DEPARTMENT OF ENERGY
CONTRACT NO.
DE-AC08-80ET27081

IV.

Frank Godchaux, III and Charles R. Godchaux (hereinafter referred to as "GODCHAUX") are the owners of record for that portion of Section 88-14S-3E, Vermilion Parish, Louisiana, upon which the C & K Frank Godchaux, III Well No. 1 is located.

V.

Should EATON exercise the option with C & K for geothermal testing, EATON agrees to the following:

1. Obtain all federal, state and local governmental permits required for such operations.

2. Provide insurance coverage through the length of testing and research, at limits of $80,000,000.00 liability and $25,000,000.00, cost of well control.

3. Begin development operations on or before June 30, 1981.

4. Drill a saltwater disposal well near the Frank Godchaux, III Well No. 1 to dispose of all brines produced during the testing.

5. At the conclusion of all tests, both the Godchaux, III Well No. 1 and the saltwater disposal well will be plugged and abandoned in compliance with applicable governmental regulations. The drill sites and access roads will be restored to as near original condition as practicable.

6. At the conclusion of geothermal testing, C & K has the option to conduct additional tests to determine hydrocarbon potential. If C & K exercises their option, EATON shall be released of all liabilities associated with the Frank Godchaux, III Well No. 1, during C & K's testing operations.

VI.

If the option granted to EATON by C & K is not exercised by June 30, 1981, all responsibility for plugging the Frank Godchaux, III Well No. 1, as well as restoring the well site and roads, will be the sole responsibility of C & K.

VII.

GODCHAUX will provide EATON with:

1. Access to the drill site and the right to conduct geothermal-geopressured testing on the well site and in the aquifers below same.

2. Approval to drill a saltwater disposal well on GODCHAUX's land near the site of the Frank Godchaux, III Well No. 1, as herein described.

3. Approval for EATON's reasonable use of the surface rights surrounding the well bore and disposal well location site.

VIII.

This agreement does not convey to EATON any ownership interest in the land, nor does EATON have any vested interest in any minerals or energy resources produced during any of the tests, and it is expressly agreed between EATON and GODCHAUX that no energy resources will be saved or sold.

IX.

EATON further expressly states that any and all portions of this agreement or the exhibits attached hereto and incorporated by reference herein, shall be subject to the approval of the D.O.E. and should said agency disapprove any of this agreement in whole or in part, then this agreement shall be null and void.

X.

This agreement shall be binding on the legal representatives, successors and assigns of the parties hereto.

XI.

Attached hereto are the following documents incorporated by reference herein as set out and marked as Exhibit I and II, III and IV.

XII.

With reference to Paragraph (11) on Page 4 of Exhibit III, incorporated herein as stated above, the parties do agree that the four inches of road topping type shell therein referred to is defined to mean either clam shell or limestone aggregate, and that all road topping work shall be completed no less than thirty (30) days after the termination of EATON's operations hereunder.

This letter when accepted and agreed to by GODCHAUX shall, subject to the conditions stipulated herein, be evidence of agreement between EATON and GODCHAUX.

Sincerely,

EATON OPERATING COMPANY, INC.

BY: B A Eaton
B. A. Eaton, President and Project Manager

ACCEPTED AND AGREED TO THIS 9th DAY OF April, 1981.

GODCHAUX BROS.

BY: Charles R Godchaux
FRANK A. GODCHAUX, III or
CHARLES R. GODCHAUX

EXHIBIT I

TERMS AND CONDITIONS OF PURCHASE ORDER

1. INSPECTION AND ACCEPTANCE — Inspection and acceptance will be at destination, unless otherwise provided. Until delivery and acceptance, and after any rejections, risk of loss will be on the Contractor unless loss results from negligence of the Purchaser.

2. VARIATION IN QUANTITY — No variation in the quantity of any item called for by this contract will be accepted unless such variation has been caused by conditions of loading, shipping, or packing, or allowances in manufacturing processes, and then only to the extent, if any, specified elsewhere in this contract.

3. DISCOUNTS —Discount time will be computed from date of delivery at place of acceptance or from receipt of correct invoice at the office specified by the Purchaser, whichever is later. Payment is made, for discount purposes, when check is mailed.

4. FOREIGN SUPPLIES — This contract is subject to the Buy American Ace (41 CFR-1-6.10405).

5. CONVICT LABOR — In connection with the performance of work under this contract, the Supplier agrees not to employ any person undergoing sentence of imprisonment except as provided by (41 CFR-1-11.204).

6. OFFICIALS NOT TO BENEFIT — No member of, or delegate to, Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

7. COVENANT AGAINST CONTINGENT FEES — The Supplier warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon any agreement or understanding for a commission, percentage, brokerage, or contingent fees, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Supplier for the purpose of securing business. For breach or violation of this warranty the Purchaser shall have the right to annul this contract without liability or in its discretion to deduct from the contract price or consideration, or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

8. FEDERAL, STATE AND LOCAL TAXES — Except as may be otherwise provided in this contract, the contract price includes all applicable Federal, State, and local taxes and duties in effect on the date of this contract but does not include any taxes from which the Purchaser, the Supplier on this transaction is exempt.

9. Goods must be shipped as per instructions; otherwise any extra handling charge will be billed back to seller.

Approved By: _____

Title: _____

Date: _____

ADDITIONAL
TERMS AND CONDITIONS OF PURCHASE ORDER

Except where the word "Contractor" is used, substitute the word "Subcontractor", and where the word "Government is used, substitute the word "Purchaser".

Applies to Subcontracts or purchase orders which exceed $2,500

1. "Employment of the Handicapped" (41-CFR-1-12.904)

Applies to Subcontracts or purchase orders which exceed $10,000

1. "Notice and Assistance Regarding Patent and Copyright Infringement" (41-CFR-9-9.104)
2. "Utilization of Small Business Concerns" (41-CFR-1-1.710-3)
3. "Utilization of Labor Surplus Area Concerns" (41-CFR-1-1.805-3)
4. "Utilization of Minority Business Enterprises" (41-CFR-1-1.1310.2)
5. "Equal Opportunity" (41-CFR-1-12.803.12)
6. "Disabled Veterans and Veterans of the Vietnam Era"
7. "Termination for Convenience of the Government"(41-CFR-1-8.705-1)
8. "Pricing Adjustment"(41-CFR-1-7.102-20)
9. "Walsh Healy Public Contracts Act"(41-CFR-1-12.605)

Applies to Subcontracts or purchase orders which provide for the performance of Service

1. "Contract Work Hours and Safety Standard Act - Overtime Compensation" (41-CFR-1-12.303)
2. "Service Contract Act of 1965 - As Amended" (41-CFR-1-12.904)

Applies to Subcontracts or purchase orders which exceed $100,000

1. "Cost Accounting Standard" (41-CFR-1-3.1204-1)
2. "Authorization and Consent" (41-CFR-9-9.102-1)
3. "Examination of Records" (41-CFR-1-7.103-3)
4. "Audit and Record" (41-CFR-1-3.814.2)
5. "Subcontractor Cost and Pricing Data" (41-CFR-1-3.814-3)
6. "Price Reduction for Defective Cost or Pricing Data" (41-CFR-1-3.814-1)
7. "Notice of Labor Disputes"

EXHIBIT III

GEOTHERMAL TESTING ENERGY CONTRACT

THIS AGREEMENT is made and entered into as of the 30th day of June, 1981, by and between:

GODCHAUX BROS., a partnership composed of Frank A. Godchaux, III and Charles R. Godchaux (hereinafter referred to as "GODCHAUX),

AND

EATON OPERATING COMPANY, INC.

(hereinafter referred to as "GRANTEE");

W I T N E S S E T H:

GODCHAUX, for and in consideration of Ten Dollars and no/100 ($10.00) DOLLARS and other valuable consideration, paid by GRANTEE to GODCHAUX, the receipt and adequacy of which are hereby acknowledged, and in consideration of the covenants and agreements hereinafter set forth, grants unto GRANTEE the right to enter upon GODCHAUX'S property, which is described on Exhibit "A" hereto, and there to conduct appropriate tests to determine the energy potential of any geopressured-geothermal aquifers located within the well also described on Exhibit "A", all on the following terms and conditions.

TERMS AND CONDITIONS

(1) GRANTEE shall have the right of ingress and egress across GODCHAUX'S lands and road system for the passage of personnel, vehicles and equipment, but in exercising said right, GRANTEE shall be responsible for any damage it causes to the road system and land, and the crops growing thereon, as hereinafter provided and it shall not, in any event, obstruct drainage. Upon termination of this agreement, the surface of said land affected by the right of ingress and egress shall be returned to the same condition as it now exists, and further, GRANTEE shall pay GODCHAUX for any and all damage to crops. In exercising this right, GRANTEE recognizes that GODCHAUX has on its property known as "Live

Oak Plantation" an extensive system of improved roadways consisting of approximately twenty (20) miles of well shelled roads and timbered bridges. Therefore, in exercising its rights herein granted, GRANTEE shall take care to see that its operations result in minimum damage to such road systems. GRANTEE agrees, so long as it exercises the rights granted hereunder, to maintain and repair any damage it causes to the existing roads and bridges located upon the property of GODCHAUX and leading to the aforesaid premises and used by GRANTEE; provided that GRANTEE shall repair all roads and bridges located upon the property of GODCHAUX which may become damaged or destroyed by GRANTEE in exercising its rights of ingress and egress to and from the premises. The right of ingress and egress shall be a reasonable use and shall not be exclusive, GODCHAUX having the right, along with its agents, employees, assigns, licensees, or other persons permitted by it to traverse and use such roads. Such right of use is also conditioned on the provisions of Paragraph (11) hereafter.

(2) GRANTEE shall have the right to use the same surface portion of the GODCHAUX premises as was heretofore used by C & K Petroleum, Inc. in drilling the oil or gas well described on Exhibit "A". In addition to using the same portion of the surface, GRANTEE shall have the right to use the bore hole of the said well to test the energy potential of any geopressured-geothermal aquifers located therein, using such conventional oil field drilling rigs, equipment, methods and techniques as GRANTEE may deem suitable, with the right to re-enter, re-drill, deepen and test said test well with free use of any existing pipe, casing, tubing, liners and equipment located therein and thereon, to add to, reset, remove, replace or modify any or all of such pipe, casing, tubing, liners and equipment, and for testing purposes to produce, test, store, utilize, process, convert, treat and

dispose of all or any part of such test well's effluence of extractable minerals, gases, hot springs, hot water, hot brines and salt water, thermal energy, geothermal water and/or steam resulting from or created by or extracted from the natural heat of the earth or the heat below the surface of the earth or due to magmatic differentiation, in whatever form such heat or energy occurs from the rocks, fluids, rock-fluid systems and energy in the aquifers,and all purposes incident thereto, such as erecting buildings, tanks, dams, gas lines, water lines, pipe lines, booster stations and such other buildings or structures as may be necessary for GRANTEE to properly and efficiently engage in such operations.

(3) This permit shall be for a term of Three (3) months from the date EATON exercises its option with C & K Petroleum, Inc., and so long thereafter as operations are being conducted in the test well, but not to exceed a total period of Six (6) months from the date EATON exercises its option with C & K Petroleum Inc., after which all rights of GRANTEE in the premises shall cease.

(4) GRANTEE agrees to maintain the leased premises and any improvements thereon in good, clean condition at all times and to permit no waste or injury to said premises or the property of GODCHAUX adjacent and contiguous thereto. Upon the termination of this lease, GRANTEE agrees to clean up and restore said premises to as near its present condition as is practicable, smoothing and leveling the surface, and removing therefrom all trash and debris, and refinishing roads as described in paragraph (11) below. All structures or improvements placed on the premises by GRANTEE shall be removed therefrom within sixty (60) days. The test well shall be plugged and abandoned in such a manner as to satisfy the requirements of the Louisiana Department of Conservation.

(5) In the event there is an increase in the ad valorem taxes of the land due to erection of improvements on said land,

GRANTEE, shall be obligated to reimburse GODCHAUX for any such taxes. Further, if any improvements erected by GRANTEE on said land are taxed separate and apart from the land, GRANTEE agrees and obligates itself to pay said ad valorem taxes.

(6) GRANTEE acknowledges that it has examined the premises and that it is familiar therewith, and GRANTEE assumes responsibility for the condition of the premises during the term of this contract and all liability for damage to person or property of itself, its agents or employees or any person going on or being upon the premises as a result of GRANTEE's activities, during the term of this agreement and will indemnify and hold GODCHAUX harmless from any and all claims or demands, including GODCHAUX's court costs and attorney's fees, of whatsoever nature or kind for loss or damage to person or property of itself, its agents, employees or third persons situated on the premises, arising out of or resulting from any work or construction undertaken or done by GRANTEE or out of or in anyway connected with the use of or operations on the premises by GRANTEE, provided further that this and all other liabilities and indemnifications on the part of GRANTEE herein shall be limited by the provisions of Section V 2, of the letter agreement to which this Exhibit III is attached.

(7) This grant is made without warranty and expressly subject to any and all rights in any third party, whomsoever.

(8) The rights herein granted to GRANTEE may not be assigned, either in whole or in part, without the express written concurrence of GODCHAUX.

(9) GODCHAUX shall at all times be entitled to examine and to receive copies of any and all information and reports relative to GRANTEE's testing activities on the premises, including, but not limited to, seismic reports, geological reports and geophysical reports.

(10) GRANTEE shall own no interest in any oil, gas or other substance produced from the test well and shall not be

obligated to account for or pay any royalty with respect thereto. GRANTEE shall drill a salt water disposal well on the leased premises and inject such substances therein below any fresh water sands, and shall take care not to harm the surface and subsurface lands of GODCHAUX, all subject to the rules and regulations of the Louisiana Department of Conservation.

(11) As an essential condition of this agreement, GRANTEE agrees that, upon termination of its operations hereunder, it will place a minimum of Four (4) inches of road topping type shell, at the direction of said landowner, at a cost not to exceed Twenty Five Thousand ($25,000.00) dollars, on roadways which are marked in red on the map which is attached hereto and made part hereof, and marked Exhibit IV, and will further make such road or bridge repairs as may be shown on drawings or specifications which are attached hereto, signed for identification herewith and thus made a part hereof.

IN WITNESS WHEREOF, this instrument is executed as of the day first above written.

WITNESSES:

GODCHAUX BROS.

BY: _____
CHARLES R. GODCHAUX or
FRANK A. GODCHAUX, III

EATON OPERATING CO. INC.

BY: _____

STATE OF LOUISIANA

PARISH OF VERMILION

On this 13th day of July, 1981, before me personally came and appeared Charles R. Godchaux, to me known to be the person described in and who executed the foregoing instrument on behalf of the partnership, Godchaux Bros., and who acknowledged to me that he executed the same as the free act and deed of said partnership.

NOTARY PUBLIC

STATE OF TEXAS

PARISH (OR COUNTY) OF HARRIS

On this 24th day of June, 1981, before me appeared B. A. Eaton, to me personally known, who being by me duly sworn, did say that he is the President of Eaton Operating Co., Inc., and that said instrument was signed in behalf of said corporation by authority of its Board of Directors and the said Ben A. Eaton acknowledged said instrument to be the free act and deed of said corporation.

Thomas E. Lucas
NOTARY PUBLIC

THOMAS E. LUCAS
Notary Public State of Texas
My Commission Expires November 30, 1984
Bonded by L. Alexander Lovett, Lawyers Surety Corp.

APPENDIX B

RIG CONTRACTOR AGREEMENT

Subcontract No. 0656-80

OFFER

In compliance with the Solicitation, the undersigned offers and agrees, if this offer is accepted within _____ calendar days (60 calendar days unless a different period is inserted by the offeror) from the date for receipt of offers specified in the Solicitation, to furnish any or all items upon which prices are offered at the price set opposite each item, within the time specified in the schedule.

Discount for prompt payment:

1½ % 10 calendar days; 1¼ % 20 calendar days; 1 % 30 calendar days;

_____ % _____ calendar days

NAME AND ADDRESS OF OFFEROR: (Street, City, County, ZIP Code, Area Code, and Telephone)

Challenger Drilling Company
340 East North Belt, Ste 140
Houston TX 77027

(713) 820-9700

NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or Print)

Richard Self
Typed Name

General Manager
Title

Richard Self
Signature

July 17, 1981
Offer Date

RECEIPT OF AMENDMENTS: The undersigned acknowledges receipt of the following amendments of the invitation for bids, drawings, and/or specifications, etc. (Give number and date of each):

_____

Subcontract No. 0656-80

AWARD

Amount $429,800.00

Submit Invoices (Four Copies Unless Otherwise Specified) to Address:

Eaton Operating Company, Inc.
3104 Edloe, Suite 200
Houston, Texas 77027

Administered By:

Eaton Operating Company, Inc.

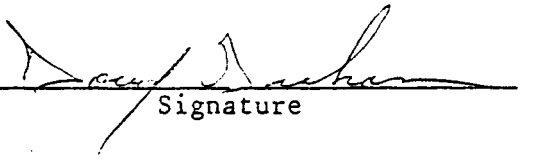
Payment Will be Made By:

Eaton Operating Company, Inc.

Awarded By:

Eaton Operating Company, Inc.

Doug Graham
Name


Signature

Purchasing Manager
Title

2/20/81
Award Date

DATA OF PERSONNEL

CHALLENGER DRILLING, INC.

July 17, 1981

The bidder or offeror must also furnish with his bid or proposal a list of supervisory personnel that he intends to use in performance of the Contract in the event that he is awarded the job. This list will be by name, number of years with the company, and technical background of each individual.

Operations Manager - George Davis - 30 years drilling experience as maintenance engineer and Operations Manager world wide.

Ass't. Operations Manager - Dewain Wise - 18 years experience in oilfield - 5 years as driller, 6 yrs. as toolpusher, and as Assistant Drilling Superintendent and Field Superintendent with experience both United States and overseas.

Equipment Supt. - Lee Howard - 14 years experience as Equipment Manager, Applications Engineer and Mechanical Designer in construction of oilfield equipment.

Drilling Engineer - Robert Newman - Degree in Mechanical Enginnering, 7 years experience as Sales and Industrial Engineer in Canada.

Drilling Superintendent - Rick Storey - 5 years experience in oilfield as Driller, Toolpusher and Drilling Superintendent in United States.

Toolpusher - Jerry Walker - 5 years oilfield experience as Driller and Toolpusher in United States.

Toolpusher - John Fontenot - 7 years oilfield experience in United States and overseas as Rig Superintendent and Tool Superintendent.

DATA ON EXPERIENCE

CHALLENGER DRILLING, INC.
Company

July 17, 1981
Date

The bidder or offeror shall submit a brief statement showing conclusively that he has had prior experience in this type of work.

Challenger Drilling, Inc. has 28 rigs in the United States drilling Oil/Gas/ Disposal wells for the industry. We employ over 600 people who are experienced in the Drilling Contracting industry.

CHALLENGER DRILLING, INC.
A Division of Challenger International Services Ltd.
340 E. North Belt, Suite 166
Houston, Texas 77060
Telephone (713) 820-9700

CHALLENGER

CHALLENGER RIG # 48 - Contract Inventory

NOTE: The maximum allowable load limits for all equipment shall be 80 percent of the manufacturers load rating as listed.

Drawworks: Unit model U-36 c/w Parkersburg hydromatic brake, Koomey crownsaver, Bear automatic driller, and 1 1/8" drilling line.

Prime Movers: 2 - CAT D3408PC turbo-charged and aftercooled diesel engines c/w twin disc torque convertors and 2 engine input compound for drawworks and single pump drive.

Light Plants: 2 - CAT D3408PC turbo-charged and after cooled diesel engines c/w CAT SR4, 275 KW AC generators.

Derrick : Superior Derrick Services 131 ft. cantilever mast, rated for 600,000 lbs. GNC and 428,000 lbs. with 10 lines.

Hook & Blocks: Ideco "Shorty" hook & block combination, rated for 260 tons.

Swivel: National N-69 rated for 300 tons, API bearing rating 150 tons (100 RPM)

Rotary Table: Ideco 23" rated for 475 tons static load, 300 tons rotating load.

Substructure: Custom Structures box on box 43'0" x 27'8" x 16'0" high.
Table beam base elevation 13'10" c/w built in pump parts storage and changehouse.

Mud Pumps: 1 - Gardner Denver PZ-7 triplex mud pump , rated for 550 HP, compound driven.

1 - Gardner Denver PZ-7 triplex mud pump , rated for 550 HP independently driven by CAT D 379 diesel engine

Standard liner sizes - 6"

Mud Tanks: 2 - Drill Systems tanks c/w hopper, mud guns, plumbing and agitators (4).

Total usable volume 900 bbls.

Shale Shaker: Hutchinson Hayes Rumba single. Screen sizes provided up to 80 mesh.

Degasser: Poorboy type 24" diameter x 10'0" long.

Desilter: Sweco c/w 12 - 4" Sweco Cones

Desander: Sweco 210 c/w 2 - 12" Sweco cones

Centrifugal Pumps :

2 -	Mixing/Charge Pumps	75 HP	6 x 8 x 12
1 -	Desander Pump	50 HP	5 x 6 x 9½
1 -	Desilter Pump	50 HP	5 x 6 x 9½
2 -	Water	20 HP	2 x 3 x 13
2 -	Fuel	5 HP	1" x 2"

.....Continued

CHALLENGER RIG # 48 - Contract Inventory (cont'd)

BOP's: Annular 1 - Hydril GK 10" x 5,000 psi, flanged.
Single Gate 2 - Cameron QRC 10" x 5,000 psi, flanged.
Rams provided for 4½" drill pipe and blind.

BOP Accessories: HCR valve 1 - Cameron 4" x 5,000 psi
Inside BOP 1 - Gray c/w 4½" XH connections
Upper Kelly Cock 1 - Omsco
Lower Kelly Cock 1 - Omsco c/w 4½" XH connections
Choke Manifold 2" & 4" x 10,000 psi c/w Flowcon 2" x 10,000 psi manual choke

Accumulator: Koomey c/w 160 gallons storage, 5 stations, triplex charge pump, auxilliary air / hydraulic pump and remote panel located on the drill floor.

Kelly: 5 1/4" Hexagonal

Kelly Spinner: International Tool Co. Type AGC - 2

Drill Collars: 20 - 6¼" drill collars c/w 4½" XH threads.

Drill Pipe: 322 - 4½" Grade E 16.60 lbs. per foot

Buildings Etc: Fuel tank (8500 gallons), water tank (300 bbls.), doghouse, engine house coverings, toolhouse and change houses (built into substructure), junk box c/w slide from drill floor, 2 section catwalk, pipe ramp, mud mixing area (as part of Tank No. 1), derrick stand, toolpusher's quarters and bunkhouse.

Miscellaneous Equipment : Air Compressors (2), suitcases c/w BOP lines, floor winch, survey unit, pipe racks (4 sets), matting under sub boxes and pumps, drilling line stand and mud bucket.

CONDITIONS AND TECHNICAL PROVISIONS

CTP-01. LOCATION

Well Name and Number Frank A. Godchaux III, No. 1 County Vermilion Parish State Louisiana Field Name Live Oak Field Well Location and Land Description From the northeast corner of irregular Section 88, Township 14S and Range 3E, go south 23 degrees 42 mintues west 1600' and north 66 degrees 18 minutes west 1500'.

CTP-02. COMMENCEMENT AND COMPLETION

The Subcontractor shall complete mobilization within five (5) calendar days after the date of receipt of Notice to Proceed and shall complete the entire work under the Unit Price Schedule _____ days after the date of receipt of Notice to Proceed. The contract completion date will be extended by the amount of time spent on Contractor-Directed Operations and Standby, to the extent that is deemed necessary.

CTP-03. STATEMENT OF WORK

A. General Description of Work. The Subcontractor's work consists of furnishing all personnel, equipment, materials and services, and supplies as specified herein, for conducting the following work: See Tentative Drilling Program, Attachment ____

Test Well - Re-enter existing well and clean out to 16,000'. Run and cement 16,000' of 5-1/2" casing. Run tubing string.

B. Minimum Equipment and Services. The minimum equipment, facilities, services, and items required to complete the work is specified in CTP-07. All contractor-furnished items will be delivered to and picked up from the drill site by others. The minimum equipment and services designated to be furnished and operated by the Subcontractor will be at no additional cost to the Contractor.

C. Workweek and Personnel Requirement. The Subcontractor shall furnish minimum **five** man qualified drilling crew, including toolpusher, to maintain a 24-hour day, 7-day week operation.

CTP-04. MUD PROGRAM

Contractor agrees to furnish all mud additives and chemicals and will arrange to purchase all necessary engineering services. Mud program will be designed as dictated by hole conditions.

CTP-05. STRAIGHT HOLE SPECIFICATIONS

Except as authorized by the Contractor, the maximum allowable deviation of the hole is not to exceed one degree per 100-feet and not to exceed five degrees total depth.

CTP-06. PROPOSED CORING PROGRAM

CTP-07. MINIMUM EQUIPMENT AND SERVICES

	To Be Provided By And At Expense Of	
	Contractor	Subcontractor
1. Trucking service and other transportation, hauling or winching services as required to move Subcontractor's property to location, rig up Subcontractor's rig, and remove all of Subcontractor's property from location.		XX
2. Drilling bits, reamers, stabilizers, reamer cutters, and other drilling tools as required.	XX	
3. Fishing tool services and fishing tool rental.	XX	
4. Derrick timbers.		XX
5. Normal strings of drill pipe and drill collars. (See Items No. 43 and 44)		XX
6. Conventional drift indicator.		XX
7. Earthen mud pits and reserve pits.	XX	
8. Steel mud tanks if required.		XX
9. Necessary pipe racks and rigging up material.		XX
10. Normal storage for mud and chemicals.		XX
11. Necessary spools, flanges and fittings to connect blowout preventers.		XX

		To Be Provided By And At Expense of	
		Contractor	Subcontractor
12.	Furnish and maintain adequate roadway to location, rights-of-way, including rights-of-way for fuel and water lines, river crossings, highway crossing, gates and cattle guards.	XX	
13.	Staked, levelled and compacted location, including earth pits.	XX	
14.	Rat and mouse holes to meet subcontractor's requirement.		XX
15.	Test tanks with pipe and fittings.	XX	
16.	Separator with pipe and fittings.	XX	
17.	Labor to connect and disconnect Subcontractor's mud tank.		XX
18.	Labor to disconnect and clean test tanks and separator.	XX	
19.	Drilling mud, chemicals, lost circulation materials and other additives.	XX	
20.	All tubular goods, miscellaneous line pipe and fittings.	XX	
21.	All testing tools including inflatable and retrievable packers.	XX	
22.	Special tools, casing scraper, etc.	XX	
23.	Special mud pump capacity in excess of rig requirements.	XX	
24.	Wireline split and conventional core barrels and wireline core catchers: two each ten-feet long split core barrel; one each twenty-feet long conventional barrel.	N/A	
25.	Conventional core bits, barrels and catchers.	XX	
26.	Diamond wireline core bits.	N/A	
27.	Cement and cementing service.	XX	
28.	Logging services.	XX	

		To Be Provided By And At Expense Of	
		Contractor	Subcontractor
29.	Directional, caliper, or other special services.	XX	
30.	Gun or jet perforating services.	XX	
31.	Core boxes, wrapping supplies, and storage facilities.	XX	
32.	Formation testing, hydraulic fracturing, acidizing, and other related services.	XX	
33.	Equipment for drill stem testing.	XX	
34.	Mud Logging Services.	XX	
35.	Sidewall Coring Services.	XX	
36.	Welding Service (Except for Subcontractor's equipment).	XX	
37.	Casing, tubing, liners, screen, float collars, guide and float shoes, and associated equipment.	XX	
38.	Casing scratchers and centralizers.	XX	
39.	Wellhead and connections for all equipment to be installed in or on well or on the premises for use in connection of well.	XX	
40.	Water at Source and Water Hauling Service.	XX	
41.	Water storage tanks 1000 gallon capacity.		XX
42.	Fuel and lubricants for Subcontractor's equipment. [illegible]	XX	
43	Drill pipe. See attached rig inventory -- Anything else to be furnished by		XX
44.	Drill collars. contractor.	XX	
45.	Handling tools, clamps, etc., for each drilling assembly. As per 43 & 44.	XX	XX
46.	Weight indicator.		XX

	To Be Provided By And At Expense Of	
	Contractor	Subcontractor
47. If applicable, drill pipe protectors for Kelly joint and each joint of drill pipe running inside of casing for use with normal strings of drill pipe.	XX	
48. Automatic driller (Optional).	N/A	
49. Materials for "boxing in" rig and derrick.	N/A	
50. Conventional core barrel.	XX	
51. Drilling recorder-minimum 2-pin.	XX	
52. Extra labor for running and cementing casing.	XX	
53. Casing tools.	XX	
54. Running of casing-conductor.	XX	
55. Running of casing-surface.	XX	
56. Running of casing protection, if applicable.	XX	
57. Running of casing production, if applicable.	XX	
58. Running of casing liner, if applicable.	XX	
59. Power casing tongs.	XX	
60. Tubing tools.	XX	
61. Power tubing tong.	XX	
62. Swabbing unit with swabbing line	XX	
63. Swab.	XX	
64. Swab lubricator.	XX	
65. Swab rubbers.	XX	
66. Light plant-adequate capacity for night-time operations, Subcontractor requirements.		XX

	To Be Provided By And At Expense Of	
	Contractor	Subcontractor
67. Drill rig-minimum failing 1500 rotary rig or approved equal for continuous wireline coring and drilling to ± 1500 feet.	N/A	
68. Two adequate circulating pumps and adequate mud mixing pumps.		XX
69. 1000 gallon water truck with driver for hauling water within two miles of work sites.	N/A	
70. Minimum of one two-way communications system.	N/A	
71. IADC Daily Drilling Report, Bit Record and Tally Forms.		XX

The above Subcontractor designated items are the minimum acceptable requirements for the Subcontractor drilling equipment. This is not intended to be a complete list of items to be furnished by the Subcontractor. The Subcontractor is required to furnish all drilling maintenance tools, materials, and equipment not herein designated, but which are normal components for a complete drilling rig required for drilling and testing operations described in these specifications.

CTP-08. UNIT PRICE SCHEDULE ITEMS DEFINED

Paragraph headings in this Special Condition correspond to items of the Unit Price Schedule.

1. Mobilization. The Subcontractor shall move in and rig up his equipment, rig up any lower-tier Subcontractor's equipment, and pick up first drilling assembly. Mobilization shall be considered complete when all the equipment is on location and rigged up ready to ~~xxxxx~~ * The Subcontractor shall be paid for the above mobilization work under Item 1 of the Unit Price Schedule.

*make up of first bit.

2. Contractor-Directed Operations. Operations under this category shall include, but are not limited to: Contractor-furnished surveying, plug backs, drilling, coring, reaming, hydrologic testing, inserting and retrieving casing, placing cement and regaining lost circulation. All operations will be done as directed by the Contractor. All work on an hourly rate basis shall be performed with a full complement of operating personnel and at the direction of the Contractor. If it becomes necessary to shut down Subcontractor's rig for repairs while performing work on an hourly rate basis, Subcontractor shall be allowed compensation for such repair time at the applicable hourly rate. The number of hours devoted to repair work for which the Subcontractor may be compensated shall be limited to an accumulated total of 12 hours for each 15 day period.

Contractor-directed operations will be paid for Item 02. of the Unit Price Schedule.

3. Standby Ready. When directed by the Contractor, the Subcontractor shall cease all operations and standby in a ready condition. A full complement of personnel and equipment shall be maintained at the work site ready to resume operations immediately. Operations under this category shall include Geophysical Logging, Cement Hardening Time, or any operations not requiring the use of rig engines or drill assembly. Standby ready time will be paid under Item 03. of the Unit Price Schedule.

4. Demobilization. Upon completion of the work under this Subcontract, the Subcontractor shall remove all rubbish and debris from the drill site and shall remove all of his equipment within ten calendar days. The Subcontractor will not be responsible for levelling the work site or draining and backfilling pits. Demobilization will be paid under Item 04. of the Unit Price Schedule.

CTP-09. RECORDS AND OBSERVATIONS

Providing the following records and observations shall be a part of the Subcontractor's general responsibility for which no additional payment will be made.

1. A Daily Drilling Report shall be kept on the IADC official Standard Daily Drilling Report. The Unit Price Schedule quantities for pay estimate purpose will be taken from the IDAC Daily Drilling Report. The general remarks section shall contain an accurate record of hole conditions, work performed, and time required for all work to the nearest quarter-hour. The original and two copies of the Daily Drilling Report shall be submitted to the Contractor or his authorized representative.

2. Bit Records shall be maintained daily and posted in the doghouse. A complete bit record shall be furnished the Contractor at the completion of a hole. Records must show bit types, sizes, footages, depths, rotary speeds, bit weights, manufacturer, and serial number.

3. Accurate Pipe Tallies shall be the Subcontractor's responsibility and shall be available at the drill site for inspection at all times. Copies of steel tape measurements of drill pipe and casing shall be furnished by the Contractor.

CTP-10. SUBSURFACE INFORMATION

1. The subsurface information and data furnished both in these specifications and at the Contractor's office are not intended as representations or warranties, but are furnished for information only.

2. It is anticipated that the information contained herein generally represents the conditions that will be encountered in the performance of the Subcontract; however, any interpretation or conclusion reached by the Subcontractor in preparing his Unit Price Schedules will be his sole responsibility.

CTP-11. ACCOMMODATIONS

The Subcontractor will be required to make his own arrangements with his employees for housing and feeding. The Subcontractor may locate toolpusher's house trailer near the drilling location, as designated by the Contractor.

CTP-12. DERRICK MISALIGHMENT

If, at any time, the Subcontractor's derrick becomes misaligned over a hole, the Subcontractor shall be required to commence realignment operations within eight hours of the misalignment. If such misalignment occurs as the result of fault or negligence on the part of the Subcontractor, the Subcontractor shall receive no compensation for the time or cost spent in realignment. If the misalignment is not the fault of, or caused by, Subcontractor negligence, the Subcontractor shall be compensated under Item 2. of the Unit Price Schedule.

CTP-13. LOSS OF HOLE

A hole shall be termed "lost" if the Contractor determines that the condition of the hole will prevent its successful completion, or if for any reason the Contractor deems it impractical to continue drilling. If the Contractor determines that a hole has been lost before required depth has been attained, and that further attempts to complete it will be impractical, he shall order work on the hole stopped, shall investigate the circumstances in contributing to its loss, and shall notify the Subcontractor of his decision in writing. The Contractor may, at his option, order the commencement of work at an alternate location.

Contractor shall assume liability, while work is being performed under Contractor-directed operations, for loss of, damage to, or destruction of the hole, Subcontractor's in-hole equipment, including, but not limited to, drill pipe, drill collars, subs, stabilizers, and bits, unless such loss, damage, or destruction shall be caused by the Subcontractor's fault or negligence.

CTP-14. ABANDONMENT

In the event that, prior to completion of the work required, a hole covered by this Subcontract is abandoned, upon direction of the Contractor, the Subcontractor will be paid for work performed under the applicable items of the Unit Price Schedule.

The term "abandonment" as used in this paragraph shall mean abandonment to suit the convenience of the Contractor, as directed by the Contractor, under conditions which do not come within the scope of the paragraph entitled "Loss of Hole" of these specifications.

CTP-15. STANDARD FOR PRESSURE VESSELS

All Subcontractor's compressed air equipment and accessories shall be designed, fabricated, inspected, and certified in accordance with the SAME Boiler and

Pressure Vessel Code, Section VIII. For equipment fabricated under the 1968 Code, either Division I or Division II (but not both) of the Code may be used.

CTP-16. PRESERVATION OF ANTIQUITIES, WILDLIFE, AND LAND AREAS

Federal law provides for the protection of antiquities located on land owned or controlled by the U. S. Government. Antiquities include Indian graves, or campsites, relics, and artifacts. The Subcontractor shall control the movements of his personnel and his Subcontractor's personnel at the jobsite to ensure that any existing antiquities discovered thereon will not be disturbed or destroyed by such personnel. It shall be the duty of the Subcontractor to report the existence of any antiquities so discovered. The Subcontractor shall also preserve all vegetation except where such vegetation must be removed for survey or construction purposes. Further, all wildlife shall be protected.

CTP-17. RESPONSIBILITY FOR LOSS OF OR DAMAGE TO EQUIPMENT

1. Subcontractor's Surface Equipment. Subcontractor shall be liable at all times for damage to or destruction of Subcontractor's surface equipment including all drilling tools, machinery, and appliances for use above the surface and for any other type of equipment including in-hole equipment when such in-hole equipment is above the surface, regardless of when or how such damage or destruction occurs. The Contractor shall be under no liability to compensate the Subcontractor for any such loss except loss of damage thereto caused by negligence of the Contractor, its agents, or employees.

2. Loss of Tools in the Hole

   a. Contractor-Directed Operations. When it is necessary to fish for tools in the hole, while working under Contractor-Directed Operations, the Subcontractor shall notify the Contractor or his authorized representative of the existing conditions immediately, to be confirmed in writing as soon as practicable, and initiate such action as is required to commence fishing operations as soon as practicable. The Contractor will review and evaluate the circumstances resulting in the loss of tools in the hole.

      i. If the investigation by the Contractor shows that the Subcontractor was neither negligent nor in violation of good drilling practice, the Subcontractor will not be held responsible for costs resulting from the loss of tools or for costs of fishing efforts conducted to recover lost tools. The value of Subcontractor-owned tools lost or damaged in the hole during hourly rate operations will be equitably compensated.

      ii. If the Contractor's investigation shows that the Subcontractor was negligent or was in violation of good drilling practice in the performance of his duties, the Subcontractor will not be compensated for the value of Subcontractor-owned tools or equipment which may have been lost or damaged. Additionally, the Subcontractor

will be held responsible to the Contractor for the value of any Contractor-furnished tools or equipment which may be lost or damaged. All costs incident to such loss of or damage to the Contractor-furnished tools or equipment will be determined by the negotiated agreement of the parties.

iii. Any dispute concerning a question of fact under this paragraph iii. shall be subject to Article 11, "Disputes", of the General Provisions.

b. Contractor-Furnished Equipment. Except as provided for in paragraph ii. above, "Loss of Tools in the Hole", all machinery, tools, materials and equipment furnished by the Contractor, shall, at the completion or abandonment of the hole, be returned to the Contractor in as good condition as when received by the Subcontractor, ordinary wear and tear excepted. The Subcontractor shall be liable to the Contractor for any loss or damage to such equipment beyond such ordinary wear and tear, and for loss or damage due to the negligence or carelessness of the Subcontractor.

CTP-18. CONTRACTOR MINIMUM EQUIPMENT REQUIREMENTS AND STANDARDS

The following American Petroleum Institute Standards and Recommended Practices of the latest issue, as of the date of bid opening, are a part of these specifications whenever applicable to standardized equipment.

1.	API Std. 4A	Specifications for Steel Derricks
2.	API Std. 4E	Specifications for Drilling and Servicing Structures
3.	API Std. 7	Specification for Rotary Drilling Equipment
4.	API Std. 8A	Specification for Hoisting Equipment
5.	API Std. 9A	Specification for Wire Rope
6.	API RP-5C1	Recommended Practice for Care and Use of Casing, Drill Pipe and Tubing
7.	API RP-9B	Recommended Practice on Application, Care and Use of Wire Rope for Oil Field Service
8.	API RP-13B	Recommended Practice and Standard Procedures for Testing Drilling Fluids
9.		Manufacturer's Ratings Shall Apply for Equipment not Covered by the API Standards.

APPENDIX C

SUMMARY OF RIG OPERATIONS

APPENDIX C

Summary of Rig Operations

Frank A. Godchaux Well No. 1

Attempted Re-Entry and Plug and Abandonment of Test Well

Daily Drilling Report Date	Day No.	Operations
8/6/81	1	Completed rigging up Challenger Rig No. 48. Picked up eighteen 4-3/4 inch drill collars, casing scraper, and an 8-1/2 inch tapered mill. Ran in hole with bottom-hole assembly on 3-1/2 inch drill pipe to 2053 feet, where the mill stopped. Circulated and attempted to wash down. Pulled out of hole and picked up 8-1/8 inch tapered mill and scraper and started in the hole.
8/7/81	2	Finished in hole to tight spot at 2051 feet, milled approximately 3 feet. Slugged pipe and pulled out of hole. Picked up flat-bottom mill and went in hole. Continued in hole with flat-bottom mill on 3-1/2 inch drill pipe. Circulated and conditioned mud at 4000 feet. Continued in hole to 4500 feet and started picking up 4-1/2 inch drill pipe.
8/8/81	3	Continued in hole to 8000 feet. Circulated and conditioned mud to 17.8 ppg. Mixed slug and pulled out of hole with flat-bottom mill. Picked up tapered mill and 9-5/8 inch scraper and started in hole.
8/9/81	4	Continued in hole and broke circulation. Circulated and conditioned mud. Continued in hole to 10,000 feet and circulated mud. Continued in hole to 12,626 feet. Dressed top of 7-5/8 inch liner and conditioned mud to run casing inspection survey.
8/10/81	5	Circulated and conditioned mud. Slugged pipe. Pulled out of hole measuring pipe with steel tape. Rigged up Dia-Log and ran casing inspection survey from 12,626 feet to surface. Rigged down Dia-Log and installed degasser. Picked up 6-5/8 inch flat-bottom mill and started in hole. Hydromatic went out.

Daily Drilling Report Date	Day No.	Operations
8/11/81	6	Changed out blowout preventer rams from 3-1/2 inch to 4-1/2 inch. Worked on hydromatic and water pump. Went in hole to 12,465 feet. Circulated mud. Rigged up to pick up 4-1/2 inch drill pipe. Picked up 6 joints. Drill pipe stuck. Worked pipe free. Mixed and pumped slug. Pulled out of hole with flat-bottom mill.
8/12/81	7	Picked up 6-5/8 inch bit. Went in hole with bottom-hole assembly and 2 stands of pipe. Worked on brake water pump. Continued in hole. Finished in hole to 12,673 feet. Dropped block. Drilling line parted.
8/13/81	8	Changing out 1-1/8 inch drill line. Changed out blocks and restrung to 10 lines.
8/14/81	9	Finished stringing up blocks. Trying to drill in 7-5/8 inch casing at 12,662 feet. Slipped 12 more wraps on drum. Pulling out of hole strapping pipe.
8/15/81	10	Started in hole. Finished going in hole to top of liner. Washed down 3 joints inside liner. Repaired hull on draw works and put 17 wraps on.
8/16/81	11	Picked up pipe. Washed and reamed to 13,086 feet. Circulated and conditioned mud to 18.0 ppg. Drilled cement to 13,268 feet.
8/17/81	12	Drilled on retainer. Circulated mud. Slugged pipe. Started out of hole. Changed pipe rams. Continued pulling out of hole. Made up bit No. 3 and stabilizers and started in the hole.
8/18/81	13	Went in hole to 13,273 feet. Drilled cement to 13,506 feet. Mud cut to 17.0 ppg. Circulated and conditioned mud to 18.0 ppg. Drilled cement to 13,526 feet.
8/19/81	14	Drilled cement to 13,542 feet. Hit drilling break and checked flow. Closed hydril and pumped through choke. Stripped out of hole checking for washout. Circulated and conditioned mud. Drilled to 13,602 feet.

Daily Drilling Report Date	Day No.	Operation
8/20/81	15	Drilled to 13,612 feet. Circulated and conditioned mud. Down for repair on water coupling union on main drum.
8/21/81	16	Circulated mud. Pulled out of hole. Changed bit and calipered stabilizers. Went in hole, circulated for 1/2-hour, and started drilling.
8/22/81	17	Drilled from 13,592 feet to 13,612 feet. Circulated and conditioned mud and slugged pipe for trip. Pulled out of hole. Started in hole with 6-1/2 inch mill and 39 stands. Cut drill line. Continued in hole.
8/23/81	18	Continued in hole. Pulled out of hole to change mill and went back in hole. Drilled to 13,631 feet.
8/24/81	19	Drilled to 13,650 feet. Circulated bottoms-up. Drilled to 13,689 feet.
8/25/81	20	Down for repairs. Calibrating and repairing torque and stroke counter gauges and replacing rotary chain. Milled on hard junk. Down for repairs. Bearing burned up on No. 2 engine.
8/26/81	21	Down for repairs.
8/27/81	22	Repairing bearing on compound side of No. 2 engine. Milled with 6-1/2 inch mill from 13,726 feet to 13,740 feet. Circulated bottoms-up. Milled with 6-1/2 inch mill.
8/28/81	23	Milled 6-1/2 inch hole from 13,740 feet to 13,760 feet. Circulated and conditioned mud for trip. Slugged pipe. Pulled out of hole strapping pipe. Rigged up Greene's Pressure Testing Service.
8/29/81	24	Tested blowout preventer and choke manifold. Repaired downhole drums. Started in hole. Repaired breakout and makeup catheads. Continued in hole with drill collars and drill pipe. Slipped and cut 90 feet of drill line. Continued in hole. Repaired break on cathead. Continued in hole and broke circulation. Drilled from 13,750 feet to 13,775 feet (corrected depths).

Daily Drilling Report Date	Day No.	Operation
8/30/81	25	Drilled from 13,775 feet to 14,043 feet.
8/31/81	26	Reamed from 14,075 feet to 14,090 feet. Circulated and conditioned mud. Made wiper trip to casing shoe. Circulated and conditioned mud. Pulled out of hole.
9/1/81	27	Waited on Smith FDT 6-1/2 inch bit. Went in hole. Circulated and conditioned mud. Drilled to 14,162 feet.
9/2/81	28	Drilled to 14,222 feet. Conditioned mud. Mud had cut to 15.0 ppg because of water valve leaking on mud pit.
9/3/81	29	Drilled from 14,222 feet to 14,280 feet. Conditioned mud and slugged pipe. Pulled out of hole. Tested blowout preventers (reset pressure switches, replaced pop-off, and changed out hydraulic fluid).
9/4/81	30	Finished in hole with monel drill collar. Circulated and conditioned mud. Dropped multi-shot survey tool and mixed and pumped slug. Ran multi-shot survey from total depth to 7-5/8 inch liner shoes. Pulled out of hole. Laid down monel collar. Changed pump liners from 5-1/2 inches to 5 inches on No. 1 pump. Picked up 6-1/2 inch Strata bit and Dyna-Drill assembly. Started in hole.
9/5/81	31	Finished in hole. Broke circulation and conditioned mud. Drilled from 14,280 feet to 14,495 feet.
9/6/81	32	Drilled to 14,510 feet. Lost circulation, pump pressure dropped from 2550 psi to 600 psi, and bit weight dropped to 0 psi. Pulled up 75 feet off bottom. Could not move pipe up or down. Pumped pits dry trying to fill hole. Pumped 375 barrels of fresh water down annulus. Fluid level standing at surface. Pulled on stuck pipe to 100,000 lb over weight of drill string. Filled pits with 18.0 ppg mud from storage. Cleaned out cellar. Checked for pressure in 13-5/6 inch and 9-5/8 inch annulus. No pressure. Rigged up Dia-Log and ran freepoint. Found pipe free at 9510 feet and partially free

Daily Drilling Report Date	Day No.	Operation
9/6/81	32	down to 12,000 feet. Rigged down Dia-Log. Waited on orders. Kept hole full of fresh water. Fluid level dropped approximately 15 feet per hour. Conditioned mud in pits.
9/7/81	33	Waited on orders. Drill pipe pressure increased to 400 psi at 1400 hours. Bled off to 0 psi. Estimate 1/2-barrel bleed-off until flow stopped. Pressure built up to 580 psi within 2 minutes. Continued to monitor and bleed-off. Rigged up McCollough and tested tools. Waited on high-pressure lubricator. Drill pipe pressure and fluid level were stable while rigging up lubricator. Ran 2.187-inch Magna Range bridge plug to 13,804 feet and set same in 3-1/2 inch drill pipe (approximately 15 feet above bottom-hole assembly).
9/8/81	34	Reheaded McCollough wireline. Ran in hole with freepoint and back-off shot. Found freepoint at 12,383 feet. Waited on hydraulic tongs. Pulled back-off shot out of hole. Rigged up hydraulic tongs and ran back-off shot back in hole. Attempted to back-off at 12,383 feet. Pipe backed off at 12,075 feet. Pumped 80 barrels of fresh water down drill pipe. Pulled wireline out of hole. Rigged down McCollough. Rigged up Halliburton. Pumped 125-sack cement plug down drill pipe. Displaced with 56-1/2 barrels of 18.0-ppg mud and 21-1/2 barrels of water. Cement set up in drill pipe. Lab tests indicated 3 hours and 50 minutes pumping time. Cement set in 1-3/4 hours. Estimated top and bottom of cement was 9021 feet and 10,980 feet, respectively. Rigged down Halliburton. Started out of hole.
9/9/81	35	Pulled out of hole to cemented drill pipe (95 stands and 2 singles). Rigged up lay-down machine. Laid down cemented drill pipe (38 joints 4-1/2 inch and 27 joints 3-1/2 inch). Pulled and stood backs remaining of 3-1/2 inch drill pipe (11 stands). Rigged down lay-down machine. Rigged up McCollough. Ran junk basket and gauge ring to 4963 feet. Recovered small pieces of soft cement. Ran casing inspection log from 5340 feet to surface. (Tool would not go below 5340.) Log did not indicate hole in casing. Rigged down McCollough. Picked up and strapped 60 joints of 3-1/2 inch drill pipe. Started in hole strapping pipe.

Daily Drilling Report Date	Day No.	Operation
9/10/81	36	Finished in hole open ended. Picked up kelly and balanced fluid columns. Finished in hole with 4-1/2 inch drill pipe. Cut 140 feet off drill line. Picked up 8 joints 4-1/2 inch drill pipe and tagged fish at 12,078 feet. Waited on Halliburton lab test and final cement blend. Rigged down and released miscellaneous rental items. Rigged up Halliburton. Pumped 10 barrels preflush water, 75 barrels (420 cu. ft) Class H cement 35% Oklahoma No. 1, 0.75% CFR-2, and 0.2% HR-5 at 16.4 ppg. Lab test indicated 4-1/2 hours pumpability.
9/11/81	37	Finished displacing cement plug from 11,000 feet to 12,064 feet. Pulled out of hole to 8530 feet. Waited on cement and lay-down machine. Pressure tested bottom plug to 250 psi, bled off to 50 psi in 1-1/2 minutes. Repressured to 200 psi and lost pressure in 1 minute. Spotted 370 sacks Class H, 0.75% CFR-2, 1% HR-5 at 16.2 ppg cement plug from 7470 feet to 8540 feet. Pulled out of hole laying down drill pipe. Repaired power tongs and waited on Halliburton to return with correct size EZSV cement retainer.
9/12/81	38	Rigged up power tongs. Set EZSV retainer at 4278 feet. Pressure tested cement plug at 7470 feet to 8540 feet with 500 psi for 15 minutes. No pressure loss noted. Maintained 700 psi on 4-1/2 inch drill pipe/9-5/8 inch casing annulus during test of cement plug. Spotted 200 sacks Class H, 0.1% HR-5 at 16.2 ppg from 3753 feet to 4278 feet. Pulled 10 stands and layed down drill pipe. Ran 13 stands in hole. Broke out kelly and subs. Layed down drill pipe. Spotted 75-sack surface cement plug from 10 feet to 204 feet. Layed down drill pipe. Rigged down Halliburton and lay-down machine. Nippled down blowout preventers and cleaned mud tanks.
9/13/81	39	Nippled down and washed mud pits. Released rig at 10:00 a.m. on September 12, 1981.