COMPANY CONFIDENTIAL

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PHILLIPS PETROLEUM COMPANY - RESEARCH AND SERVICES REPORT 10142-85
November 25, 1985

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MODIFIED HE POLYMER GEL TREATMENTS IN THE BATES UNIT

by

James H. Hedges
and
David H. Beardmore

SUMMARY

The injectors 5W02 and 4W03 in the Bates Unit near Wellington, Kansas, received 1460 and 1613 bbls, respectively, of Phillips' modified HE (Hostile Environment) polymer mixed in produced brine and crosslinked with chromium propionate. Quality control procedures verified good gel quality as every gel sample taken gelled within design specifications. No decrease in injectivity and no positive oil or water-to-oil ratio response has been observed to date as a result of the treatments. In retrospect, the Bates Unit was most likely not a good candidate to demonstrate this technology because of (1) the lack of established communication between the injectors and producers, (2) the poor completion condition of 4W03, and (3) the potentially large volume of any thief zone (interwell distances of 3000 ft. and up) relative to the volume of gel injected (this assumes that the proposed thief zone is in vertical communication with the rest of the pay zone).

With respect to the operations, the gel log grinding and mixing equipment worked adequately throughout the treatment. However, the

process was very labor intensive and experienced difficulty in providing an exact polymer concentration level. The crosslinker metering system worked very well. A pulsation dampener on the positive displacement metering pump prevented pulses in the chromium level.

To increase the potential for success in future applications of EOR gel technology, we recommend the following: (1) Discover and correct any existing or suspected well problems before the gel treatments. (2) Confirm the presence of a thief zone between wells through the use of a tracer survey. (3) Use the volume to tracer breakthrough as a measure of the thief zone and size the gel treatment to fill most of this volume. Experience has shown that enhanced oil recovery will most likely be realized if a large part of the thief zone is filled with polymer gel. (An exception to this is if the thief zone is vertically isolated from the remainder of the pay.)

S = Summary Only
All other copies complete
12/3/85:sjb

BATES UNIT - Material Listing:

	ITEM	QUANTITY
Bates Unit #1-1:	Casing: 5 1/2" 15.5#	3762'
	Tubing: 2 3/8" 4.7# EUE	3730'
	Sucker rods: 3/4" x 25'	3675'
	Unit: Lufkin Type C-80D-133-48, 80,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Westinghouse, size 2	1
Bates Unit #1-2:	Casing: 5 1/2" 15.5#	3781'
	Tubing: 2 3/8" 4.7# EUE	3728'
	Sucker rods: 3/4" x 25'	3675'
	Unit: Parkersburg Type CH80D, 89,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Federal Pacific, size 2	1
Bates Unit #1-3:	Casing: 5 1/2" 15.5#	3781'
	Tubing: 2 3/8" 4.7# EUE	3720'
	Sucker rods: 3/4" x 25'	3700'
	Unit: Lufkin Type C-80D-133-48, 80,000 in-lb.	1
	Prime mover: 7 1/2 HP, electric motor	1
	Controller: Westinghouse, size 2	1
Bates Unit #1-4:	Casing: 5 1/2" 15.5#	3755'
	Tubing: 2 3/8" 4.7# EUE	3726'
	Sucker rods: 3/4" x 25'	3675'
	Unit: Parkersburg Type CH-80, 89,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Westinghouse, size 2	1
Bates Unit #2-1:	Casing: 5 1/2" 15.5#	3773'
	Tubing: 2 3/8" 4.7# EUE	3730'
	Sucker rods: 3/4" x 25'	3700'
	Unit: American, size D114, 114,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Westinghouse, size 2	1

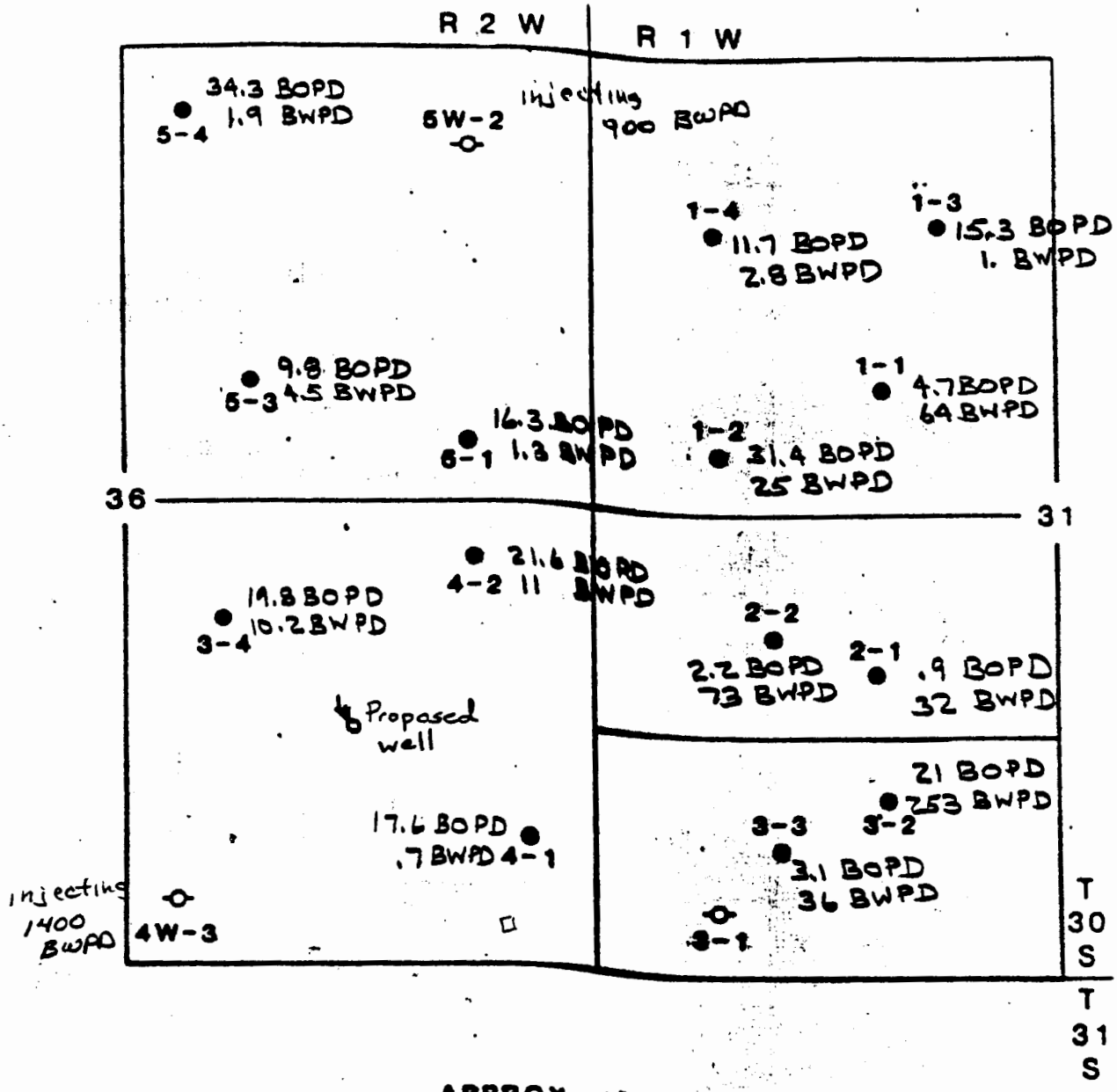
Bates Unit #2-2:	Casing: 5 1/2" 15.5#	3836'
	Tubing: 2 3/8" 4.7# EUE	3749'
	Sucker rods: 3/4" x 25'	3675'
	Unit: Parkersburg Type CH-80-D, 89,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Federal Pacific, size 2	1
Bates Unit #3-2:	Casing: 5 1/2" 15.5#	3741'
	Tubing: 2 3/8" 4.7# EUE	3720'
	Sucker rods: 3/4" x 25'	3675'
	Unit: Parkersburg Type CH80D, 89,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Westinghouse, size 2	1
Bates Unit #3-3:	Casing: 5 1/2" 15.5#	3779'
	Tubing: 2 3/8" 4.7# EUE	3731'
	Sucker rods: 3/4" x 25'	3675'
	Unit: Lufkin Type C-80-D-133-48, 80,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Westinghouse, size 2	1
Bates Unit #3-4:	Casing: 5 1/2" 15.5#	3842'
	Tubing: 2 3/8" 4.7#	3769'
	Sucker rods: 3/4" x 25'	2575'
	7/8" x 25'	1150'
	Unit: Lufkin C-114D-143-64	1
	Prime mover: 10 HP, electric motor	1
	Controller: NEMA, size 2	1
Bates Unit 3S01:	Casing: 5 1/2" 15.5#	2930'
	Tubing: 2 3/8" 4.7# EUE	2700'
	Pump control bldg: 10' wide x 12' long x 9' peak	1
	Switchboard: B.J. Centrilift, size 5CI w/recorder	1
	Cable: round, B.J. Centrilift No. 6	2800'
	flat, B.J. Centrilift No. 7 bronze	55'
	Auto-transformer: B.J. Centrilift type OISC, Model A	1
	REDA Protector: Type 87668-0	1
	REDA motor: Type HU-20-620	1

	REDA pump: Type 65 FL-CT	1
Bates Unit #4-1:	Casing: 5 1/2" 15.5#	3760'
	Tubing: 2 3/8" 4.7# EUE	3722'
	Sucker rods: 3/4" x 25'	3700'
	Unit: Parkersburg Type CH80D, 89,000 in-lb.	1
	Prime mover: Westinghouse, 15 HP, electric motor	1
	Controller: Westinghouse, size 2	1
	Cathodic protection: single phase, Model # AN536F15	1
Bates Unit #4-2:	Casing: 5 1/2" 15.5#	3764'
	Tubing: 2 3/8" 4.7# EUE	3740'
	Sucker rods: 3/4" x 25'	3700'
	Unit: Parkersburg, Type CH80D, 89,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Westinghouse, size 2	1
Bates Unit #4-5:	Casing: 5 1/2" 15.5#	3880'
	Tubing: 2 7/8" 6.5# EUE	3800'
	Sucker rods: 3/4" x 25'	2325'
	7/8" x 25'	1450'
	Unit: Lufkin, size C114, 114,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Size 2	
Bates Unit 4W03:	Casing: 5 1/2" 15.5#	3844'
	Tubing: 2 3/8" 4.7# EUE	3682'
Bates Unit #5-1:	Casing: 5 1/2" 15.5#	3822'
	Tubing: 2 3/8" 4.7# EUE	3751'
	Sucker rods: 3/4" x 25'	3700'
	Unit: Parkersburg, Type CH80D, 89,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Westinghouse, size 2	1

Bates Unit #5-3:	Casing: 5 1/2" 15.5#	3855'
	Tubing: 2 3/8" 4.7# EUE	3774'
	Sucker rods: 3/4" x 25'	2600'
	7/8" x 25'	1125'
	Unit: Parkersburg, Type 48-CH80D-14-W85, 89,000 in-lb.	1
	Prime mover: 15 HP, electric motor	1
	Controller: Westinghouse, size 2	1
Bates Unit #5-4:	Casing: 5 1/2" 15.5#	3824'
	Tubing: 2 3/8" 4.7# EUE	3761'
	Sucker rods: 3/4" x 25'	2575'
	7/8" x 25'	1125'
	Unit: Cabot, Type CT13FM18DC, 103,415 in-lb.	1
	Prime mover: 10 HP, electric motor	1
	Controller: NEMA, size 2	1
Bates Unit 5W02:	Casing: 5 1/2" 14#	3796'
	Tubing: 2 3/8" 4.7# EUE	3732'
Lease Equipment:	Quinplex salt water pump w/30 HP electric motor	1
	Pump control panel: NEMA, size 3	1
	Pump house: 12 x 24 x 7'	1
	Meter: Rockwell Eureka, 3000 psi barrel meter	1
	Heater: 4' x 6' horizontal welded steel	1
	Separator: 30" x 13' National vertical welded steel	1
	L.A.C.T: Sauder Tank Company type CT-1	1
	Stock tanks: 12' x 10', 200 bbl. Sauder welded steel	3
	Water tank: 15'6" x 7'6" redwood	1
	Propane tank: 30" x 88" Bagwell General Steel Co., horizontal welded steel	1
	Receiver: 12' x 20', 400 bbl. welded steel	1

BATES UNIT - Completion & Production Information

WELL NO.	RESERVOIR	OPEN HOLE OR PERFORATIONS	BOPD	BWPD
# 1-1	Mississippi	3735-51' (OH)	3.9	56
# 1-2	Mississippi	3724-42' (OH)	32.6	25
# 1-3	Mississippi	3733-46' (OH)	12.5	7
# 1-4	Mississippi	3729-41' (OH)	9.6	11
# 2-1	Mississippi	3735-43' (OH)	.6	20
# 2-2	Mississippi	3720-35' (Perf)	1.0	61
# 3-2	Mississippi	3724-29' (OH)	19.2	204
# 3-3	Mississippi	3727-41' (OH)	2.8	27
# 3-4	Mississippi	3755-58' (Perf)	19.0	10
# 4-1	Mississippi	3736-52' (OH)	9.3	4
# 4-2	Mississippi	3733-48' (OH)	23.4	8
# 4-5	Mississippi	3737-92' (Perf)	11.2	64
# 5-1	Mississippi	3739-52' (Perf)	15.6	3
# 5-3	Mississippi	3734-46' (Perf)	9.9	6
# 5-4	Mississippi	3756-62' (Perf)	22.2	5
# 4W03	Mississippi	3736-54' (Perf)		
# 5W02	Mississippi	3739-50' (OH)		
# 3S01	wtr supply well	2768-2838' (OH)	(Stalnaker supply well-shut down)	
# 3S02	wtr supply well	44-67' (screen)	(fresh wtr supply well-shut down)	

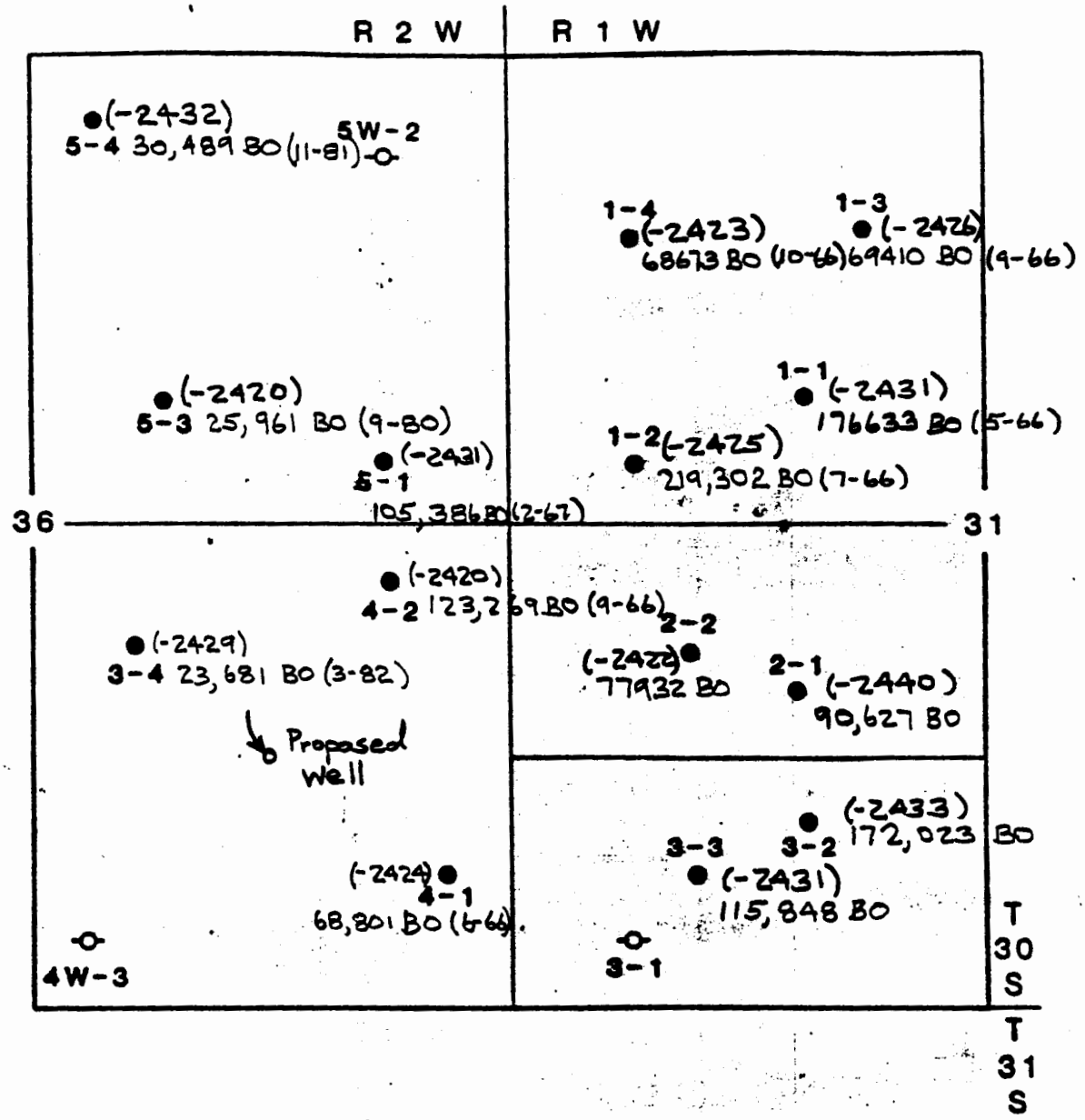


APPROX. 1" = 2000'

Current well tests

BATES UNIT - SUMNER COUNTY, KANSAS

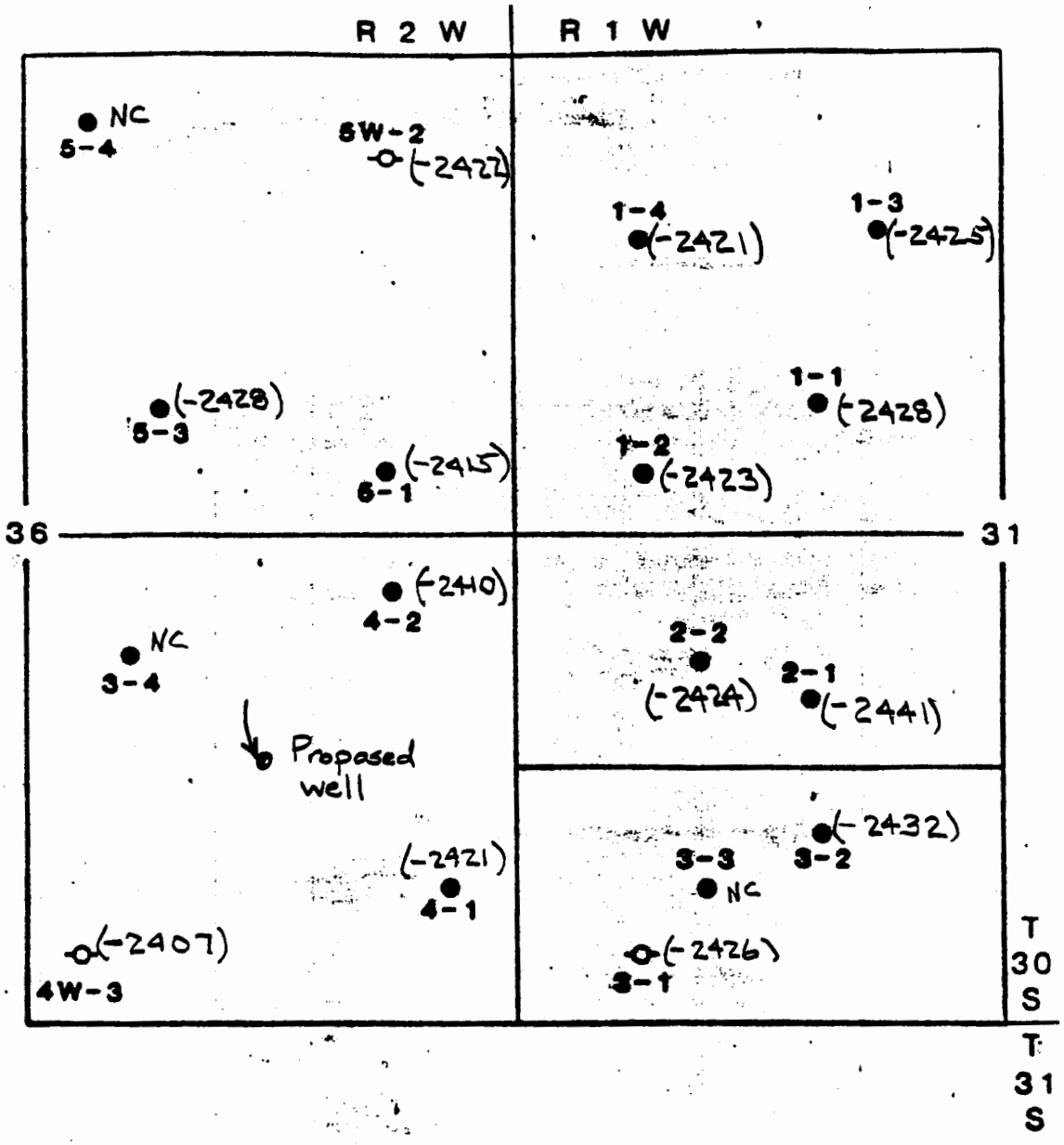
FIGURE 1



APPROX. 1" = 2000'

Subsea top of perforations, cummulative production and completion date

BATES UNIT - SUMNER COUNTY, KANSAS



APPROX. 1" = 2000'

Sub sea tops of Mississippi Lime

NC - top not called

BATES UNIT - SUMNER COUNTY, KANSAS

PHILLIPS PETROLEUM COMPANY

APPLICATION FOR SELF-CERTIFICATION AS A QUALIFIED TERTIARY RECOVERY PROJECT

BATES UNIT WATERFLOOD
POLYMER INJECTION PROJECT
LOCATED IN THE BATES FIELD
SUMNER COUNTY, KANSAS

JANUARY 31, 1984

EXHIBIT A

1) Phillips Petroleum Company's Bates Unit polymer injection project involves a tertiary recovery method that is expected to result in more than an insignificant increase in the ultimate recovery of crude oil. The project involves treating the injection wells in the Bates Unit with a polyacrylamide polymer slug crosslinked into a gel utilizing Phillips patented technology. The purpose of these treatments is to modify the injection profiles of the injection wells and divert the injected fluid into previously unswept regions of the reservoir. The application of the tertiary process is anticipated to result in the recovery of 35,200 additional barrels of crude oil.

2) Each of the two injection wells will first be cleaned out and acidized after which injection profile surveys will be run to determine the pre-project injection profiles. The injection wells will then receive a polyacrylamide polymer slug with appropriate gelling chemicals and reducing agents to form a gel in the formation. Samples of the injected chemical slug will be taken and stored at reservoir temperature to ensure a good quality gel is formed in the formation before water injection is resumed. When water injection is resumed and the injection rate has stabilized, injection profile surveys will again be run to determine the post-project injection profiles for comparison with the pre-project injection profile surveys. Each of the injection wells will be re-treated as necessary to maintain uniform sweep of the reservoir.

   The injection profile modification treatments are designed to increase the sweep efficiency of the waterflood. As of the end of 1982, approximately 10 million barrels of water had been injected into the Unit while only 2.6 million barrels of total fluid had been produced. The current water injection rate exceeds the total fluid production rate by a factor of 3.6 to one. The excess water injection is not influencing the producing wells closest to the injection wells as the oil and water production rates remain low and there is little fluid above the pumps. It is thought the injection water is channeling to the high porosity water zone of the Mississippi limestone formation and is bypassing the tighter oil zone. Consequently, waterflood sweep efficiency is very poor. The injection profile modification treatments will be designed to alleviate this problem by diverting the injection water to the oil zone. This will more efficiently flood the oil zone and increase the ultimate recovery of crude oil.

3) The area from which crude oil recovery is expected to be increased is shown in Attachment 1 and is the west half of Section 31, T-30S-R1W, and the east half of Section 36, T-30S, R-2W, in Sumner County, Kansas. The area contains two injection wells and 14 producing wells with a total Unit water injection rate of 2047 BWPD and a total fluid production rate of 562 BFPW.

4) The tertiary injectant was first injected into the reservoir during January 25 and 26, 1984.

5) Each of the two injection wells will receive a polyacrylamide polymer slug crosslinked utilizing Phillips patented technology at the start of the project. Well 4W3 will initially receive 6160 pounds of crosslinked polymer and well 5W2 will initially receive 2640 pounds of crosslinked polymer. The injection wells will be re-treated as necessary for injection profile modification control.

6) The project will continue to increase the recovery of oil during the entire life of the waterflood as the injection wells will be re-treated as necessary to maintain the desired injection profile.

7) The crude oil reserve estimate from the project area without the polymer treatments is 250,452 barrels of oil and with the polymer treatments is 285,652 barrels of oil.

8) Bates Unit Past Production History

Year	Oil Produced, STB	
1974	98,950	
1975	81,398	
1976	65,825	
1977	57,787	
1978	56,446	
1979	50,936	
1980	46,210	
1981	52,835	
1982	74,944	
1983	68,070	(through November, 1983)

The Unit was acquired by Phillips in August, 1973.

Bates Unit Estimate of Future Production *

Year	Oil Production, STB
1984	58,337
1985	47,002
1986	37,868
1987	30,511
1988	24,582
1989	19,808
1990	15,956
1991	12,856
1992	10,359
1993	8,347
1994	6,725
1995	5,418
1996	4,366
1997	3,517

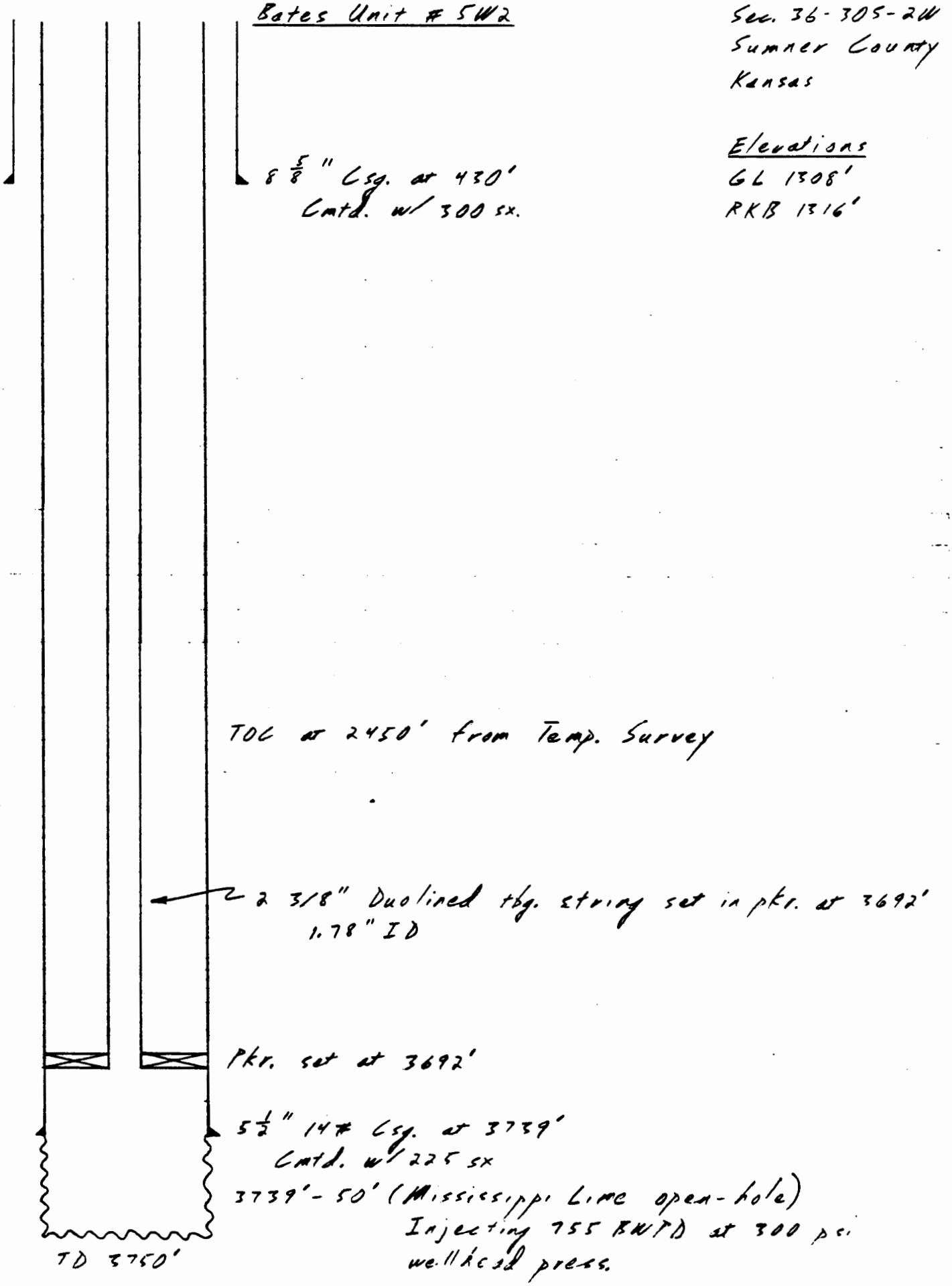
*Includes oil recovered due to application of tertiary recovery method.

9) There are 14 active producing wells and two active injection wells in the project area. No new wells will be drilled for the project.

10) No wells will be drilled for the project.

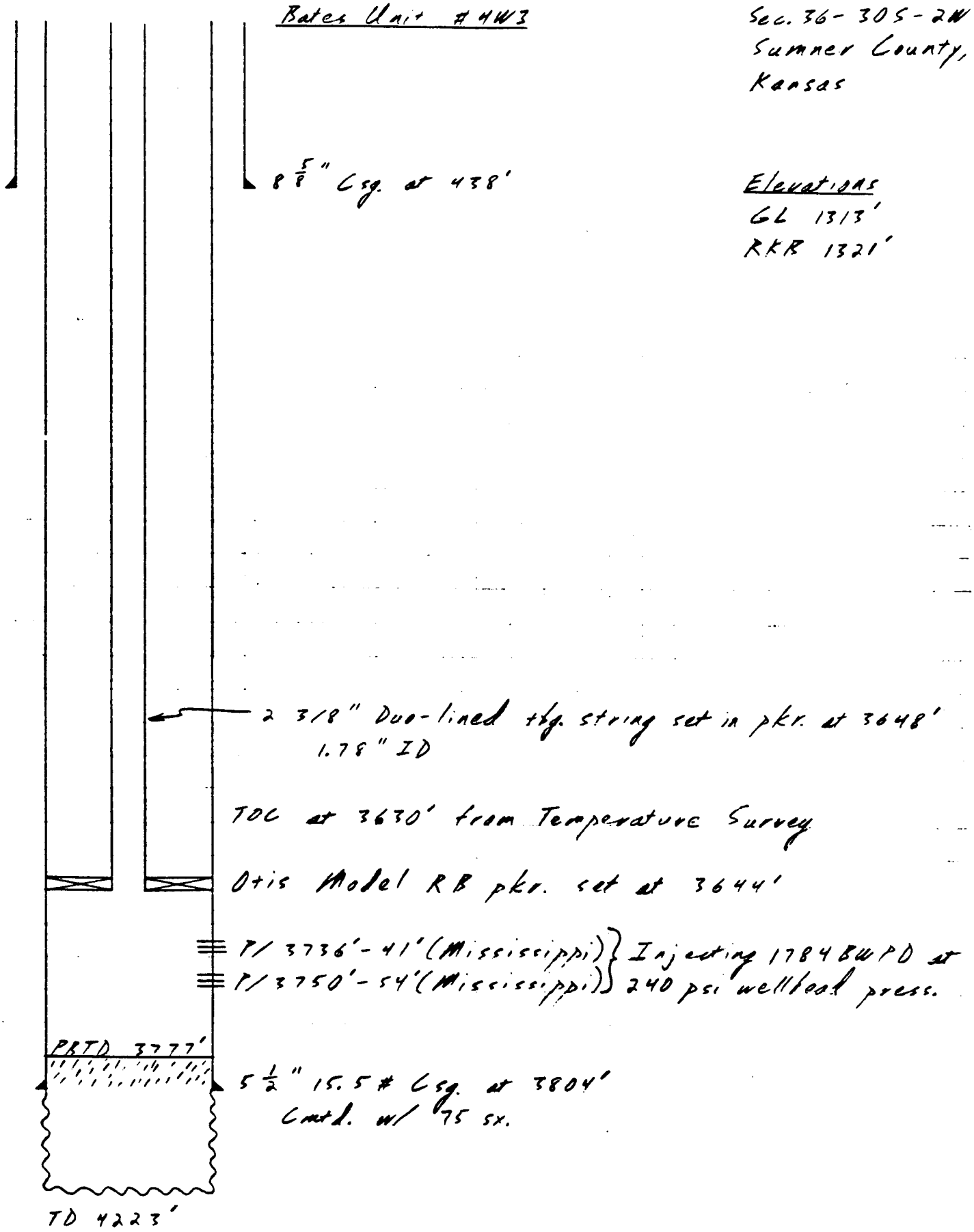
11) The projected future income is $6,326,000 (net to Phillips before Federal Income Tax) and the projected future expense is $2,530,000 (net to Phillips).

12) The employer identification number for Phillips Petroleum Company is 73-0400345.


Bates Unit # 5W2
Sec. 36-30S-2W
Sumner County
Kansas
Elevations
GL 1308'
RKB 1316'
8 5/8" Csg. at 430'
Cmtd. w/ 300 sx.
TOC at 2450' from Temp. Survey
2 3/8" Duolined tbg. string set in pkr. at 3692'
1.78" ID
Pkr. set at 3692'
5 1/2" 14# Csg. at 3739'
Cmtd. w/ 225 sx
3739'-50' (Mississippi Lime open-hole)
Injecting 755 BWPD at 300 psi
wellhead press.
TD 3750'

Bates Unit #4W3

Sec. 36-30S-2W
Sumner County,
Kansas



Elevations
GL 1313'
RKB 1321'

Great Bend, Kansas
May 17, 1983

Bates Unit
Sumner County, Kansas

R. A. Easterly
Oklahoma City Office

As requested in your letter dated May 4, 1983, the following are the latest well tests (05-03-83) for the fourteen producing wells on the Bates Unit:

Well # & Location	Pmpg Fluid Level (ft to fluid)	Pump Depth	BOPD	BWPD
1-1, W/2 SE NW, Sec. 31-30S-1W	3670'	3726'	1.5	18.4
1-2, S/2 SW NW, Sec. 31-30S-1W	3564'	3721'	21.8	3.8
1-3, S/2 NE NW, Sec. 31-30S-1W	3708'	3723'	13.7	2.7
1-4, S/2 NW NW, Sec. 31-30S-1W	3672'	3719'	17.5	3.2
2-1, SW NE SW, Sec. 31-30S-1W	3508'	3717'	.7	28.1
2-2, E/2 NW SW, Sec. 31-30S-1W	2536'	3716'	3.3	54
3-2, NW SE SW, Sec. 31-30S-1W	3018'	3715'	17.4	184.9
3-3, E/2 SW SW, Sec. 31-30S-1W	3672'	3719'	6.7	30.8
3-4, C NW SE, Sec. 36-30S-2W	3744'	3772'	18.5	4.4
4-1, E/2 SE SE, Sec. 36-30S-2W	3728'	3728'	16	2
4-2, N/2 NE SE, Sec. 36-30S-2W	3103'	3737'	15.8	3.5
5-1, S/2 SE NE, Sec. 36-30S-2W	3734'	3734'	37.8	1.3
5-3, C SW NE, Sec. 36-30S-2W	3734'	3734'	12.2	3.9
5-4, NW NW NE, Sec. 36-30S-2W	3720'	3747'	31.5	7.4

Also as requested in the same letter, is the following information about the two injection wells on the unit:

Well # & Location	Inj Rate	Wellhead Press	Tbg Setting Depth
4-W3, SW SW SE, Sec. 36-30S-2W	400	220	3714'
5-W2, C NE NE, Sec. 36-30S-2W	647	450	3711'

	Tbg O.D.	Tbg I.D.	Packer Depth
4-W3, SW SW SE, Sec. 36-30S-2W	2 3/8"	1.92"	Fiberglass tbg.
5-W2, C NE NE, Sec. 36-30S-2W	2 3/8"	1.78"	3711'

Attached is a plat giving well numbers and locations of producing and injection wells as recorded on well tests.

Please feel free to contact this office if we can be of further assistance in this matter.

C. D. Dohrer

KES/plp
Attachment

PHONE 316-792-2549

GORDON LAB, INC.

925 PATTON ROAD • P. O. BOX 605 • GREAT BEND, KANSAS 67530

WATER ANALYSIS

DATE December 14, 1973

TO Mr. Gene Stearns

Phillips Petroleum Company

Box 287 Great Bend, Kansas

Bates Unit-B Produced Water

	1.	2.	3.	
Specific Gravity	1.130			
Chlorides	105,400			Milligrams per liter
Calcium	12,000			Milligrams per liter
Magnesium	1,800			Milligrams per liter
Sulfates	692			Milligrams per liter
Bicarbonates	183			Milligrams per liter
Iron	18			Milligrams per liter
Hydrogen Sulfide	0			Milligrams per liter
Barium	0			Milligrams per liter
pH	5.5			
Sulfate Reducing Bacteria				

cc: Gene Hendricks
Joe Cronin

RESPECTFULLY SUBMITTED

LABORATORY ANALYST

Pivonka

BY T. J. Gordon

To convert to parts per million, divide by specific gravity.

WA FORM 1

PHONE 316-792-2549

GORDON LAB, INC.

925 PATTON ROAD • P. O. BOX 605 • GREAT BEND, KANSAS 67530

WATER ANALYSIS

DATE December 14, 1973

TO Mr. Gene Stearns

Phillips Petroleum Company

Box 287 Great Bend, Kansas

Hummon Oil Company Crawford #1

	1.	2.	3.	
Specific Gravity	1.132			
Chlorides	112,000			Milligrams per liter
Calcium	14,300			Milligrams per liter
Magnesium	904			Milligrams per liter
Sulfates	900			Milligrams per liter
Bicarbonates	195			Milligrams per liter
Iron	25			Milligrams per liter
Hydrogen Sulfide	0			Milligrams per liter
Barium	0			Milligrams per liter
pH	5.5			
Sulfate Reducing Bacteria				

cc: Gene Hendricks
Joe Cronin

RESPECTFULLY SUBMITTED

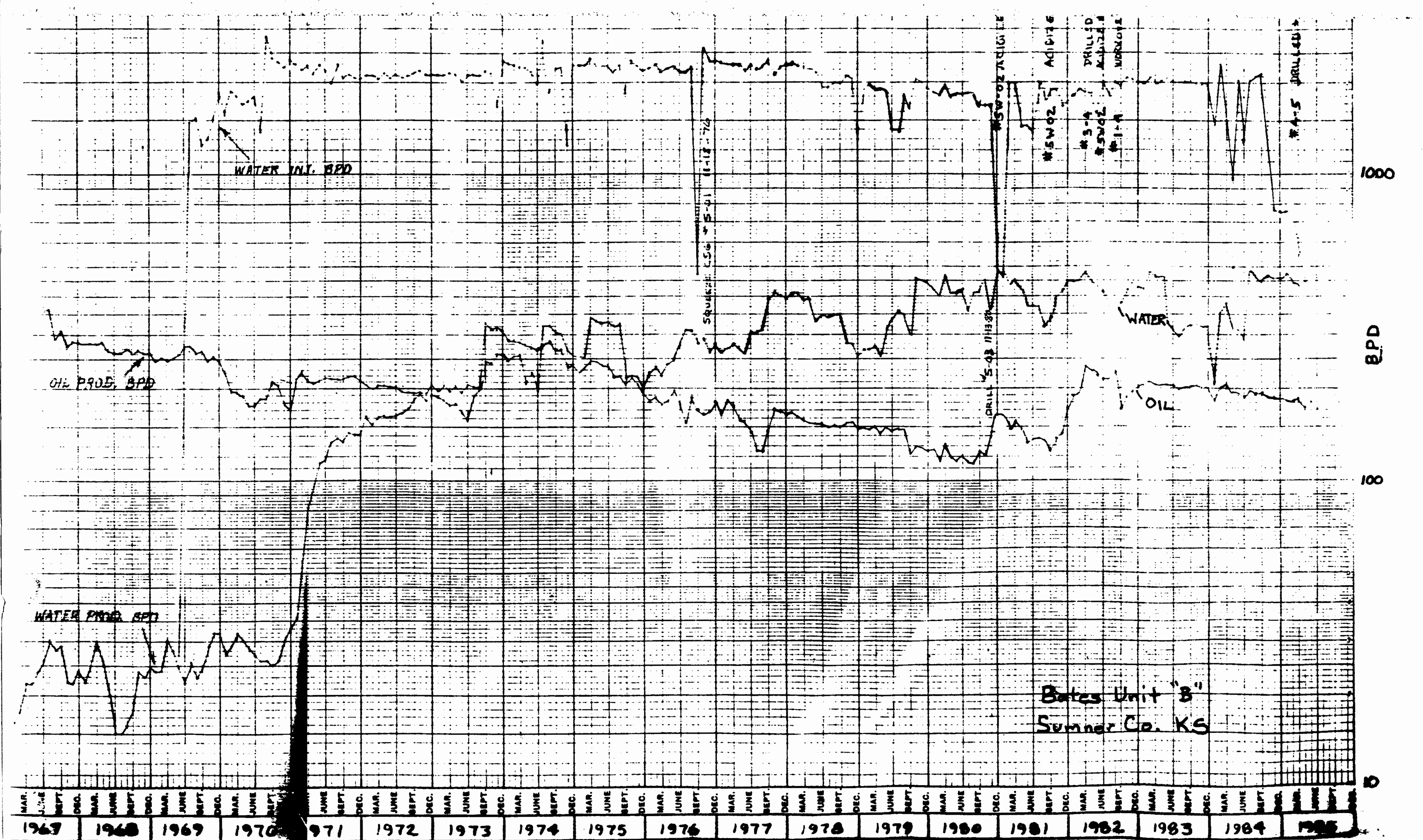
LABORATORY ANALYST

Pivonka

BY T. J. Gordon

To convert to parts per million, divide by specific gravity.

WA FORM 1


WATER INJ. BPD
OIL PROD. BPD
WATER PROD. BPD
SQUEEZE CSG #5-01 11-12-76
DRILL 5-03 11-13-80
#SW-02 ACIDIZE
#SW02 ACIDIZE
#3-4 DRILLED
#SW02 ACIDIZE
#1-4 WORKOVER
#4-5 DRILLED
WATER
OIL
BPD
1000
100
10
Bates Unit "B"
Sumner Co. KS
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
MAR.
JUNE
SEPT.
DEC.

BATES UNIT B No. 1-4

(form. Beardmore Drilling Bates A No. 4)

spud: 10-07-66
compl: 10-20-66

8 5/8" 28 lb/ft Cond. 2 csg @ 439'
w/350 sx cmt not circ, & 150 sax
cmt circ to surf by 1" tubing

ELEVATIONS:
RKB 1306'
DF 1303'
GL 1301'
BHF 1298'

TBG: @ 3716'
1 15' MA, SN,
120 jts 2-3/8" 8rd tbg
1 10' tbg sub
PUMP: RWT (S/N 6339)
Installed 8-16-91
2" x 1.25" x 12'
10' gas anchor
RODS: 1 3/4" x 2' rod sub
147 3/4" rods
3 rod subs (20' total)
1.25" x 16' PR
6' HF liner

Tbg last hydrotested 10-27-86

Csg lk @ 1101'-1255'
sqzd w/75 sx cmt (9/82)

Csg lk @ 1833'-64'
sqzd w/75 sx poznix (3/94)

►►FORMATION TOPS ◄◄
DRILLER or MUDLOGGER

ANHY	+/-400	(906)
B_ANHY	475	(831)
TOP	2020	(-714)
LKC	3066	(-1760)
MSSP CHT	3720	(-2414)
MSSP LM	3727	(-2421)

Csg lk @ 2866' sqzd w/40 sx cmt (9/82)
Csg lk @ 2867-98' sqzd w/75 sx poznix (3/94)

TOC @ 3000' (est)

ACID JOBS:
10/29/86 500g Xyl, 2000g DSFE w/0.5% Lo-Surf 259,
500g Diesel w/1% Hy-Flow, 20b KCl.
9 & 10 -> 21 & 23
8/24/92 250 gal dump.
14 & 9 -> 17.2 & 13

5 1/2" 15.5 lb/ft csg @ 3729'
w/75 sx cmt

Open Hole: MISSISSIPPI 3729'-41'

TD 3741'

OPERATOR PHILLIPS PETROLEUM COMPANY		
WELL NAME Bates Unit B		WELL NO. 1-4
FIELD Bates		
COUNTY Sumner		STATE Kansas
LOCATION C S/2 NW NW, 31-T30S-R1W		DATE 8/25/94

JV

BATES UNIT B No. 2-1

(form. Beardmore Drilling Bates No. 1)

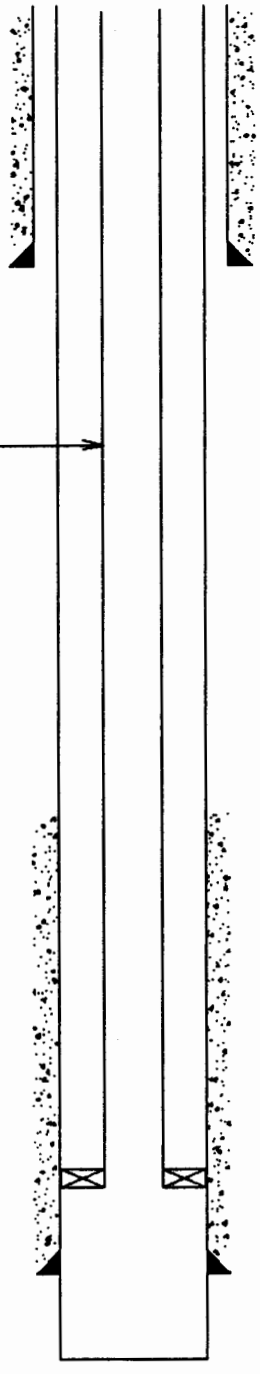
spud: 1-05-66
compl: 1-17-66

ELEVATIONS:
RKB 1295'
GL 1287'

KB = 8' above BHF

8 5/8" 24 ppf csg @ 424'
w/300 sx cmt not circ, & 200 sax
cmt circ to surf by 1" tubing

TBG: 2-7/8" Duolined



TOC @ 3000' (calc.)

Halliburton R-4 PKR @ 3685'

5 1/2" 15.5ppf used 8R csg @ 3737'
w/75 sx cmt

Open Hole: MISSISSIPPI 3737'-43'

TD 3743'

PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 2-1
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C SW NE SW, 31-T30S-R1W	DATE 8/11/94

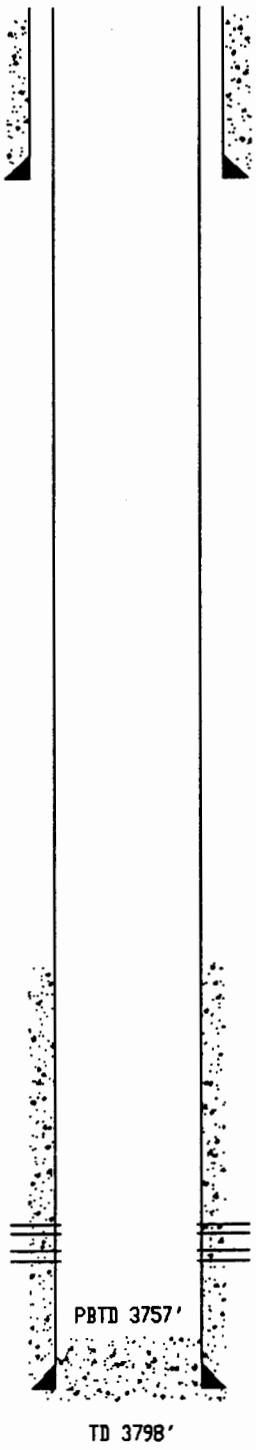
JV

BATES UNIT B No. 2-2

(form. Beardmore Drilling Bates No. 2)

spud: 3-11-66
compl: 3-24-66

ELEVATIONS:
RKB 1298'
GL 1291.5'



8 5/8" 24 ppf csg @ 433'
w/300 sx cmt circ to surf

NOTE:
May have recompletion potential in a lower, isolated zone in the Mississippi 3744-57', below a hard, impermeable dolomite streak (from core data).
Avg Poro 20%, avg Sw 45%, avg So 12%.

TOC @ 3150' (calc.)

Perfs: MISSISSIPPI (dolomite)

3720-23' 3 spf
3725-42' 4 spf

PBTD 3757'

5 1/2" 15.5 ppf csg @ 3797'
w/100 sx cmt

TD 3798'

PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 2-2
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C E/2 NW SW, Sec.31-T30S-R1W	DATE 8/26/94

JV

BATES UNIT B No. 3-2

(form. Beardmore Drlg Inman No. 2)

spud: 4-11-66
compl: 4-20-66

ELEVATIONS:
RKB 1291'
GL 1286'

8 5/8' 28ppf csg @ 425'
w/350 sx cmt. (Last 60 sx
to surf w/ 1' tbg)

TBG: 2-3/8' 8R EUE
Last hydrotested to 5000 psi 10/85.

Note:
No record of acid since original completion. Has pump wear probs. 2'x1.75'x12'x14'x17'. Pounded & pitted balls & cages on T.V.

TOC @ 3050' (calc.)

Baker AD-1 PKR @ 3700'

5 1/2' 15.5 ppf csg @ 3724'
w/100 sx cmt

Open Hole: MISSISSIPPI 3724-35'

TD 3735'

PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 3-2
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C NW SE SW, Sec.31-T30S-R1W	DATE 8/26/94

JV

BATES UNIT B No. 3-3

(form. Beardmore Drlg Inman No. 3)

spud: 12-06-66
compl: 12-14-66

8 5/8" 24 ppf csg @ 430'
w/300 sx cmt circ to surf

ELEVATIONS:
RKB 1296'
DF 1294'
GL 1291'
BH 1289.25'

TBG: 2-3/8" 8R EUE

TOC @ 3250' (calc.)

ACID JOBS:
9/86 250g Xyl, 2000g 15% DSFe HCl,
w/.75% Lo-Surf259, 500g Diesel
w/1% Hy-Flo, 60lb ls wtr.
5 bpm @ 300 psi.
1 & 23 -> 9 & 48

5 1/2" 15.5 ppf 8R csg @ 3727'
w/75 sx cmt

Open Hole: MISSISSIPPI 3727'-41'

TD 3741'

PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 3-3
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C E/2 SW NW, Sec.31-T30S-R1W	DATE 8/25/94

JV

BATES UNIT B No. 3-4

(NOTE: Well is in tract 4, not tract 3)

spud: 1-27-82
compl: 3-08-82

ELEVATIONS:
RKB 1326'
GL 1321'

8 5/8" 24ppf K-55 8R csg @ 565'
w/265 sx cmt w/2% gel &
1/4pps Flocele, circ to surf

Geologist recommended perfs:
3731-36' not open
3754-60' open
3770-74' not open

ACID:
7/86 500g Xyl, 1000g 15% DSFe HCl w/0.5%
Lo-Surf259, 500g diesel w/1% Hyflo,
15b 2% KCl, 2 bpm @ 200 psi.
14.5 & 13 -> 22 & 21
8/92 Dump 250g 15% Ne HCl, 30b ls wtr
5 & 12 -> 4.5 & 15

TOC sqz job
@ 1600' (calc.)

Sqz perfs @ 2280' (4 shots)
sqzd w/100 sx thixotropic cmt
to stop backside flow during
original completion.

TOC primary job
@ 2200' (calc.)

Perfs: MISSISSIPPI 3755-58' 2 spf

PBTD 3789'

5 1/2" 15.5ppf K-55 8R csg @ 3833'
w/225 sx 50-50 Poznix w/18% salt &
3/4% CFR-2

TD 3838'

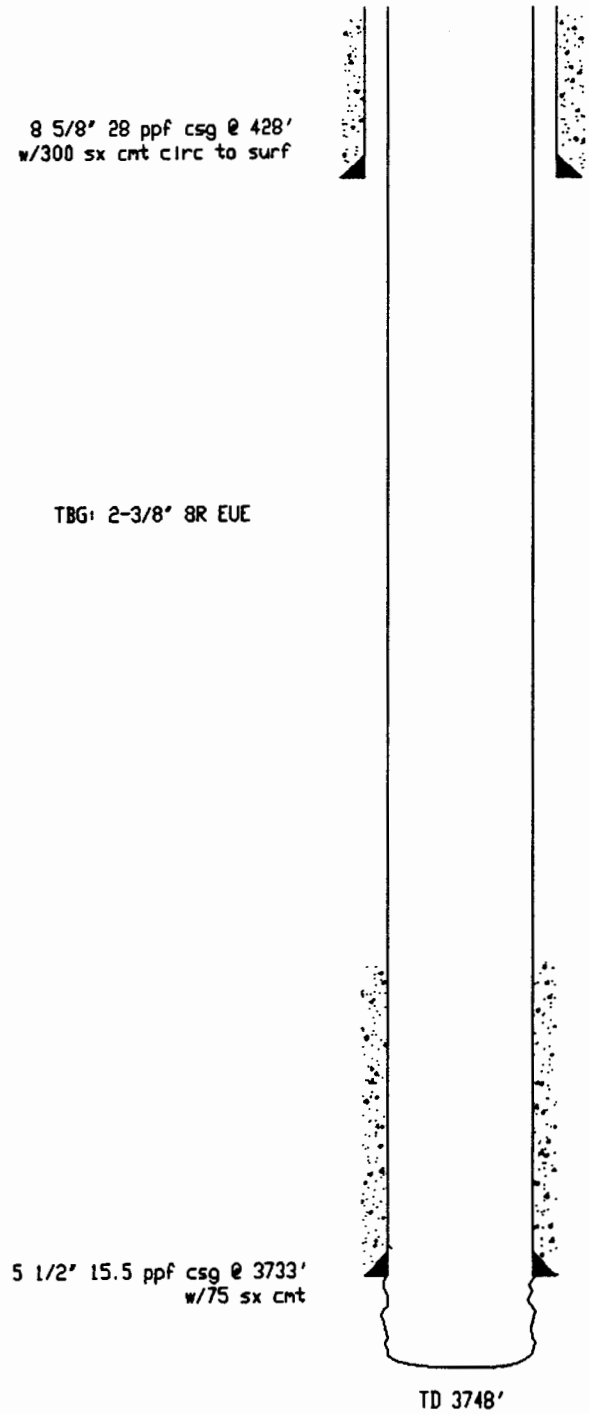
PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 3-4
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C NW SE, Sec.36-T30S-R2W	DATE 8/26/94

JV

BATES UNIT B No. 4-2

(form. Beardmore Drilling Haines No. 2)

spud: 9-21-66
compl: 9-30-66



8 5/8" 28 ppf csg @ 428'
w/300 sx cmt circ to surf

ELEVATIONS:
RKB 1313'
DF unknown
BH 1307'

TBG: 2-3/8" 8R EUE

ACID JOBS:
6/66 250g Xyl, 1500g 15% HCl,
w/0.75% LoSurf259, 500g
Diesel w/1% Hyflo, 72b ls wtr
14 & 13 -> 38 & 31
8/88 1500g DSFe 15% HCl, 500g
Diesel w/1% Hyflo, 74b ls wtr
4 bpm @ 0 psi.
17 & 13 -> 22 & 53
10/90 Acid Frac
5000g gelled acid
2000g reg acid, 3% KCl wtr
12 bpm @ 1450 psi
14.5 & 17 -> 15 & 61

TOC @ 3250' (calc.)

5 1/2" 15.5 ppf csg @ 3733'
w/75 sx cmt

Open Hole: MISSISSIPPI 3733'-48'

TD 3748'

PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 4-2
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C N/2 NE SE, 36-T30S-R2W	DATE 8/31/94

JV

BATES UNIT B No. 4-5

spud: 1-29-85
compl: 2-04-85

ELEVATIONS:
RKB 1329'
GL 1224'
DF 1327'

8 5/8" 24ppf K-55 8R ST&C csg @ 450'
w/440 sx cmt circ to surf

TBG: 2-7/8" 8R EUE

ACID JOBS:
9/86 Hydrotested tbg
1000g diesel w/freflo,
1000g 15% NE HCl w/clay stab,
55 balls, 2000g 15% NE gelled,
300# div mat'l. (50% Benzoic
flakes, 50% rock salt), 55 balls.
24b ls wtr. 4.2 bpm @ 750 psi.
3.5 & 54 -> 3 & 80
6 & 73 1 yr later
8/92 250g 15% NE HCl dump, 30b ls wtr
1 & 54 -> 2.2 & 52

TOC @ 2400' (calc.)

Csg tight spot @ 3723'
(csg scraper run)
rolled-out w/tapered mill

Perfs: MISSISSIPPI

3737-39' 4 spf
3742-45' 2 spf
3748-50' 4 spf
3762-66' 2 spf
3787-92' 2 spf

PBTD 3809'

5 1/2" 15.5ppf K-55 8R LT&C csg @ 3838'
w/200 sx 50-50 Poz w/18% salt & 1/4pps Flocele

TD 3840'

PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 4-5
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION SE/4, Sec.36-T30S-R2W (1320'FEL, 1245'FSL)	DATE 8/31/94

JV

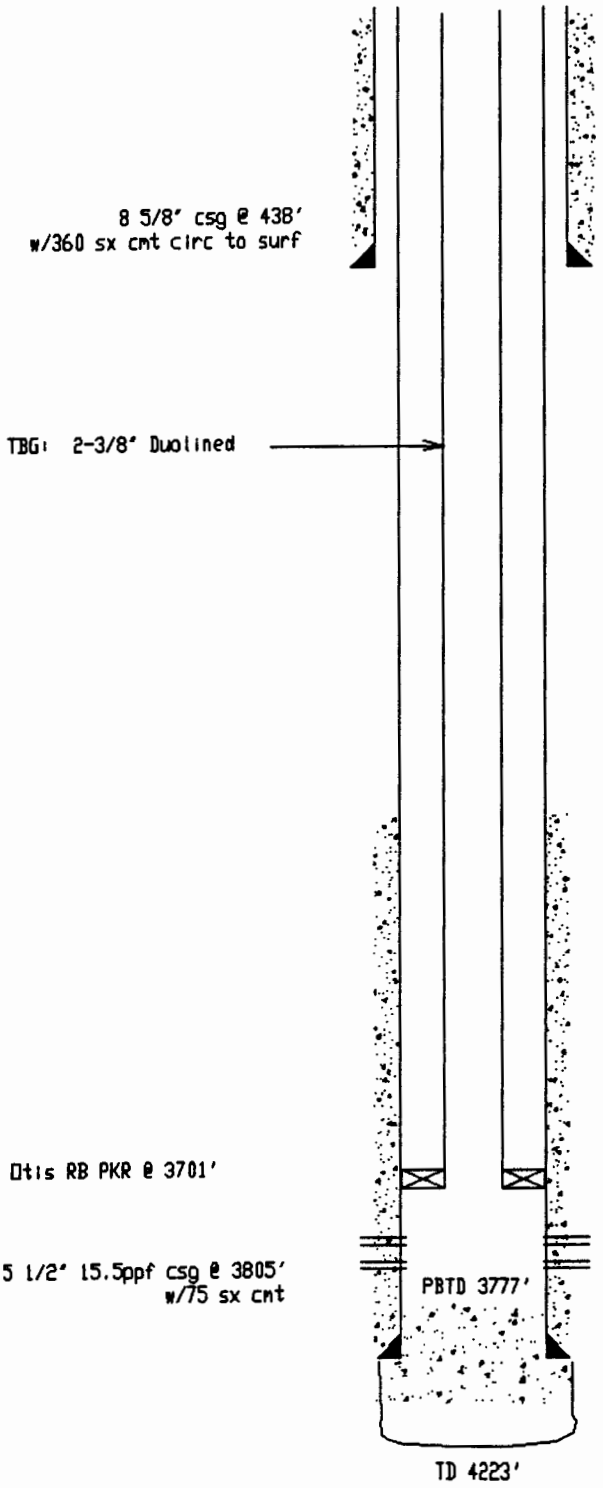
BATES UNIT B No. 4–W03

(form. Musgrove–Haines No. 1)

Original
spud: unknown
compl: n/a (dry hole)

Washdown
comm: 9-23-67
compl: 9-29-67

ELEVATIONS:
RKB 1318'
GL 1313'
DF 1315'



Polymer treatments:
Jan - Feb 1984
Mar - May 1985
Deemed unsuccessful.
Well down for 50 days in May & Jun 1984,
No noticable offset prod decline

PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 4-W03
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C SW SW SE, 36-T30S-R2W	DATE 8/11/94

JV

BATES UNIT B No. 5-1

(form. Beardmore Drilling Riner No. 1)

spud: 1-28-67
compl: 2-28-67

ELEVATIONS:
RKB 1308'
GL 1302.5'

8 5/8" 28 ppf csg @ 437'
w/330 sx cmt to surf w/1' tbg

TBG: 2-3/8" 8R EUE

STIMULATION JOBS:
7/86 Hydrotested tbg.
500g Xyl, 2000g 15% HCl,
w/0.25% LoSurf259, 500g
Diesel w/1% Hyflo, 14lb 2% KCl
2.7 bpm @ 550 psi
17 & 2 -> 57 & 15
11/87 250g Xyl, 2000g DSFe 15% HCl
w/0.5% LoSurf259, 500g Diesel
w/1% Hyflo, 69lb ls wtr
4 bpm @ 0 psi.
40 & 10 -> 36 & 18
6/89 Foam acid frac
500g diesel w/1% freflo. Wash
perfs w/PIP tool.
2000g DSFe 15% HCl @ 80Q foam,
displ w/20 mscf nitrogen.
10 bpm @ 2150 psi
33 & 10 -> 38 & 19

Csg Leak 3067'-80'
sqzd w/80 sx cmt (10/76)

TOC @ 3150' (calc.)

Perfs: MISSISSIPPI 3739-52'

PBTD 3771'

5 1/2" 15.5 ppf csg @ 3798'
w/100 sx cmt

TD 4185'

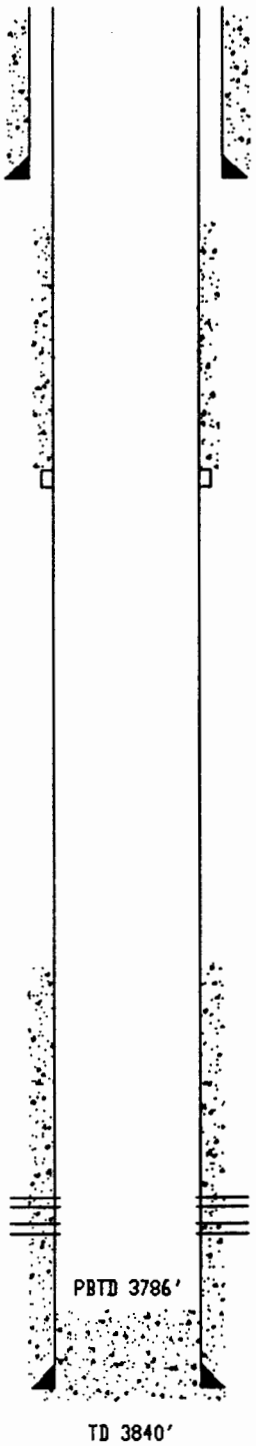
PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 5-1
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C S/2 SE NE, Sec.36-T30S-R2W	DATE 8/31/94

JV

BATES UNIT B No. 5-3

spud: 9-09-80
compl: 11-13-80

ELEVATIONS:
RKB 1315'
GL 1309'



8 5/8" 24 ppf csg @ 504'
w/340 sx cmt primary job +
1,000 sx cmt to surf w/1"

TOC unknown
(calc. to surf,
but no ret recd)

Stage Collar @ 1340'
w/375 sx cmt

NOTE:
May have recompletion potential lower,
in the Mississippi.

TOC @ 2300' (calc.)

Perfs: MISSISSIPPI

3734-36' 2 spf
3744-46' 2 spf

PBTD 3786'

5 1/2" 15.5 ppf csg @ 3837'
w/225 sx cmt w/18% salt

TD 3840'

PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 5-3
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C SW NE, Sec.36-T30S-R2W	DATE 8/31/94

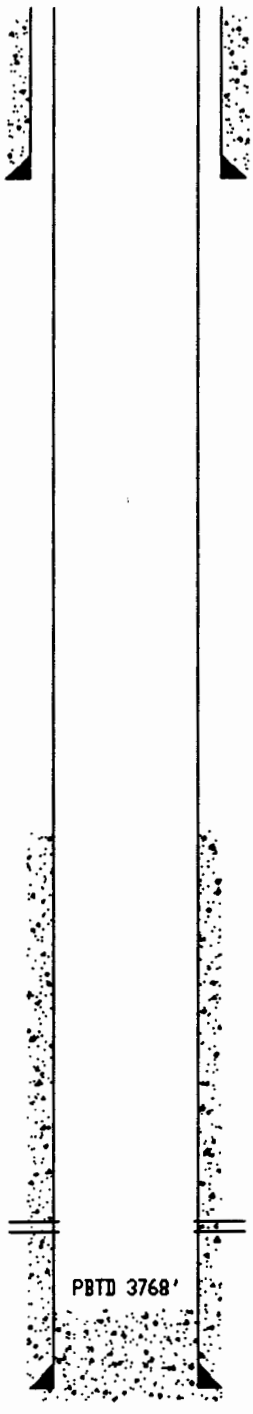
JV

BATES UNIT B No. 5-4

spud: 11-08-81
compl: 12-21-81

ELEVATIONS:
RKB 1324'
GL 1318'

8 5/8" 24 ppf csg @ 524'
w/350 sx cmt primary job +
175 sx cmt to surf w/1'



TOC @ 2300' (calc.)

Perfs: MISSISSIPPI 3756-62' 2 spf

PBTD 3768'

5 1/2" 15.5 ppf csg @ 3805'
w/225 sx cmt

TD 3810'

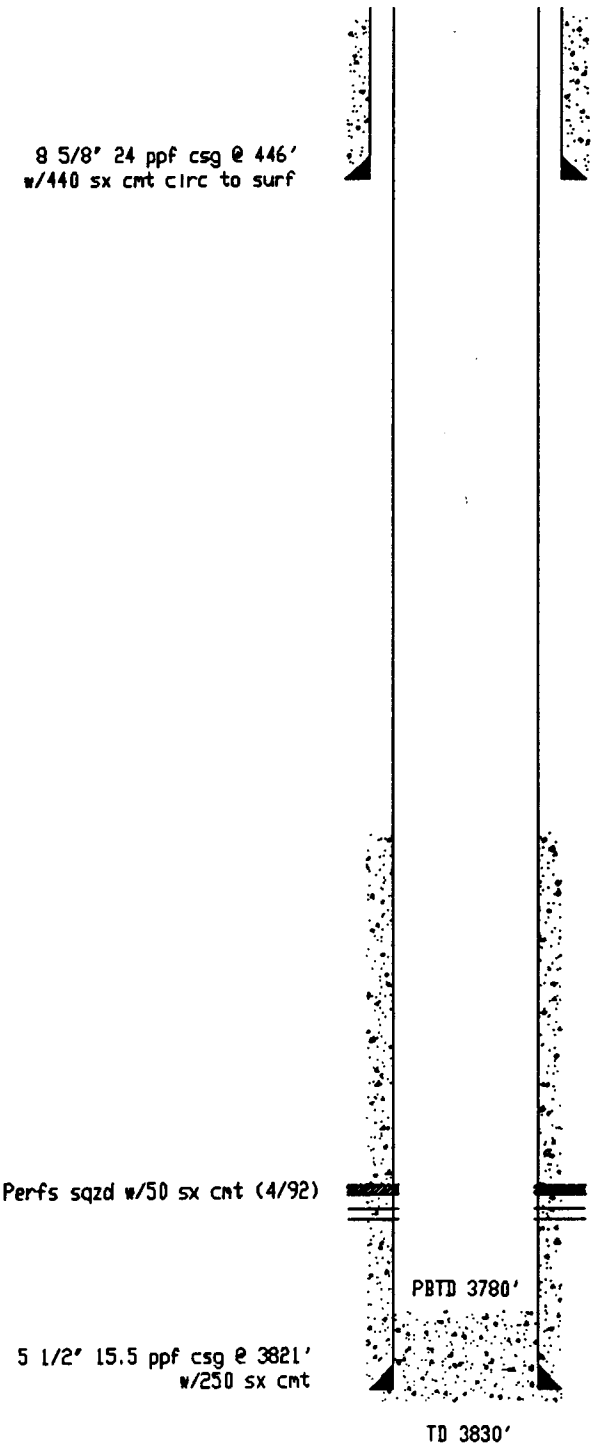
PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 5-4
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C NW NW NE, Sec.36-T30S-R2W	DATE 8/31/94

JV

BATES UNIT B No. 5-5

spud: 12-07-91
compl: 12-16-91

ELEVATIONS:
RKB 1307'
GL 1302'

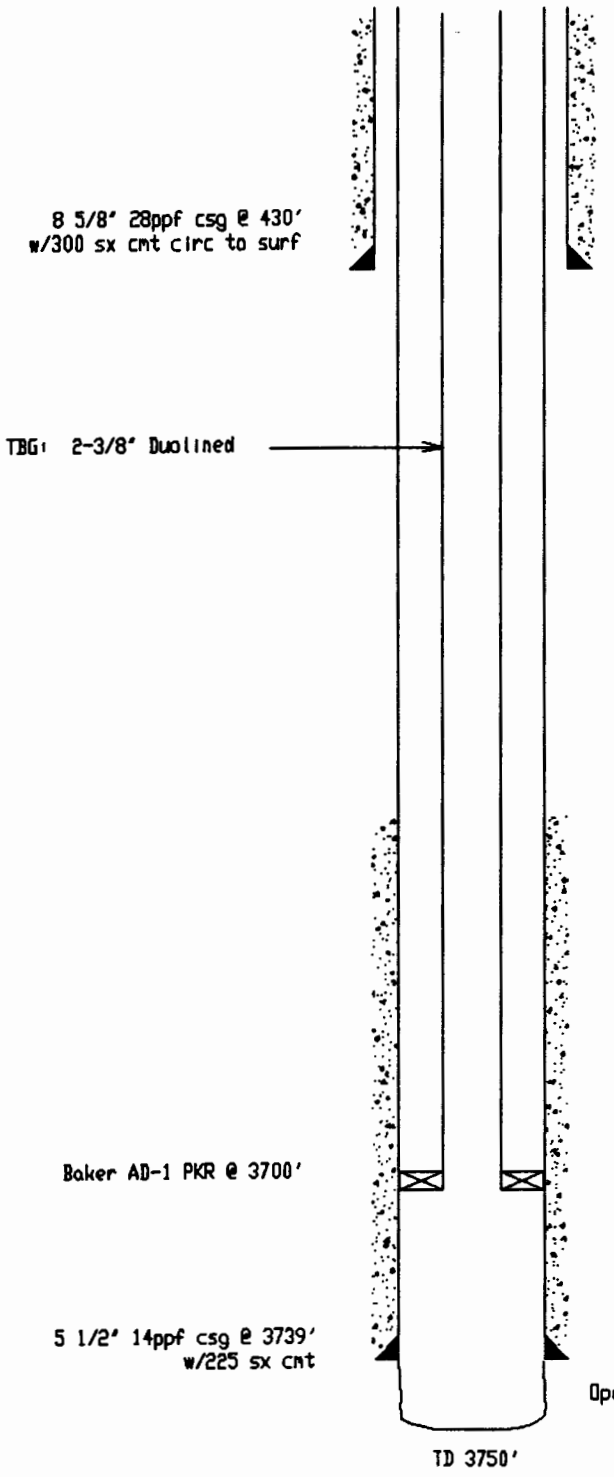


PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 5-5
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION NE SE NE, Sec.36-T30S-R2W (1650' FNL, 150'FEL)	DATE 8/31/94

JV

BATES UNIT B No. 5-W02

(form. Riner A No. 2)



spud: 6-22-67
compl: 7-14-67

ELEVATIONS:
RKB 1314'
GL 1309' (est.)

RKB = 10'3" above BHF

8 5/8" 28ppf csg @ 430'
w/300 sx cmt circ to surf

TBG: 2-3/8" Duolined

Polymer treatments:
Jan - Feb 1984
Mar - May 1985
Deemed unsuccessful.

TOC @ 2000' (calc.)

Baker AD-1 PKR @ 3700'

5 1/2" 14ppf csg @ 3739'
w/225 sx cmt

Open Hole: MISSISSIPPI 3739-50'

TD 3750'

PHILLIPS 66	OPERATOR PHILLIPS PETROLEUM COMPANY	
	WELL NAME Bates Unit B	WELL NO. 5-W02
	FIELD Bates	
	COUNTY Sumner	STATE Kansas
	LOCATION C NE NE, 36-T30S-R2W	DATE 8/11/94

JV