Lottie York #1 Discovery Well

EXHIBIT #7: PROPOSED SOUTHWEST HUMBLE CITY FORMATION UPPER STRAWN FORMATION POOL: GOR DATA:

The Bonneville Fuels Corporation has also requested that a special limiting GOR of 8,000 SCF/STBO be assigned to the proposed Southwest Humble City Upper Strawn Fm. Pool by the New Mexico Oil Conservation Division.

A Core Lab Differential Liberation Analysis was undertaken in November 1995, based on computer simulation of the results of a Core Lab 1982 Flash Liberation Analysis of a fluid sample from the Lottie York #1 well, taken in December 1982. The proposed Pool was discovered by the Lottie York #1 well in 1982 and the following reservoir fluid and pressure parameters have been determined.

The reservoir at discovery was an undersaturated oil reservoir:

Initial Reservoir Pressure:	3,715 PSIG.
Bubble Point Pressure:	2,987 PSIG.
Initial Gas Complement:	1,190 SCF/STBO @ 60 PSIG & 60 deg. F.

The average reservoir pressure is estimated to have declined below the bubble point pressure in June of 1983. Two volumetric calculations of OOIP based approximately on an unrefined version of Exhibit #2 brackets the OOIP value at between 9.08 and 10.57 MMSTBO. Material balance calculations prior to the Bubble Point Pressure seem to indicate an initial reservoir volume 9.6 MMSTBO (with a corresponding complement of 11.42 BCFG).

Production and well test data available to the Bonneville Fuels Corporation indicated that as of March 18, 1996:

1. 1,579,728 STBO (1.58 MMSTBO) has been produced.
2. Approx. 2.76 BCFG (incl. estimated 80 SCF/STBO loss at surface oil holding facilities) has been produced.
3. Approx. 115,200 STBW has been produced.
4. The average reservoir pressure since 1/1/82 has declined to approximately 1,200 PSIG (see Exhibit #5).
5. The dissolved gas complement @ 1200 PSIG is estimated to be 626 SCF per barrel (STBO) of remaining oil in place.

Simple computations indicate that the following data are true as of March 18, 1996:

1. Produced Gas Originally Dissolved In Oil:
   1.58 MMSTBO * 1,190 SCFG/STBO = 1.88 BCFG.
2. Remaining OIP: 9.60 - 1.58 = 8.02 MMSTBO.
3. Dissolved Gas Remaining In Reservoir:
   8.02 MMSTBO * 626 SCF/STBO = 5.02 BCFG.
3. Gas Liberated (Free Gas) From Oil Remaining In Reservoir:
   (1,190 - 626) SCF/STBO * 8.02 MMSTBO = 4.53 BCFG.
4. Free Gas Produced To Date:
   2.76 BCFG- 1.88 BCFG = 0.88 BCFG.
5. Free Gas Remaining In Reservoir:
   4.53 BCFG- 0.88 BCFG = 3.65 BCFG.

Clearly, until this time, the location of wells has allowed free gas to accumulate in the reservoir and this gas expansion has acted to improve the recovery of oil. With the implementation of a 3-D seismic survey and the accurate definition of the areal extent of the reservoir Bonneville Fuels Corporation has recently drilled 2 new wells in this reservoir, the Lottie York #3 and the Norris #4, in order to protect correlative rights and properly develop the reservoir for optimum drainage under 'Depletion Drive' pressure decline (the primary production mechanism).

In the drilling of the Lottie York #3 an induced gas cap was discovered in the top section of the Upper Strawn Fm. Effort was expended to understand the log character of 'gas cap' reservoir segments - a combination of high density porosity/neutron porosity log separation (4 to 6%+) along with a large separation of the MSFL and Deep Induction curves seems to be indicative of 'gas cap' development. Using this analysis technique BFC avoided perforating potential 'gas cap' intervals in both the Lottie York #3 and Norris #4 wells.

EXHIBIT #7: PROPOSED SOUTHWEST HUMBLE CITY FORMATION UPPER STRAWN FORMATION POOL: GOR DATA: CONTINUED:

Attached to this Exhibit are a spread sheet and three graphs. The spread sheet (Spread-Sheet #1) computes the GOR between 1/1/95 and 3/18/96 for the three (3) wells BFC had in the Southwest Humble City Pool prior to 3/15/96. Graph I presents the GOR behavior of the Lottie York #1, Lottie York #2, and Lottie York #3 wells since January 1, 1995. Graph II presents the Instantaneous Producing GOR (as well as the Projected Average Reservoir Pressure and the Cumulative Producing GOR, Rp) for the Southwest Humble City Upper Strawn Fm. field since 1/15/82. Graph III presents the GOR behavior of the Norris #4 well since its recent completion.

Inspection of Graph I indicates that:

1. The Lottie York #1 well has an average GOR of approximately 4,200 SCF/STBO. In the last 12 months this has been significantly exceeded as the wells BHP became too low to lift oil effectively with a plunger lift. As soon as the well was placed on a beam pump the GOR returned to approx. 3,500 SCF/STBO.
2. The Lottie York #2 GOR is steadily increasing due to the effects of increased drawdown caused by improvement of the Lottie York #1 well and completion of the Lottie York #3 well. When the Lottie York #1 well was crippled the Lottie York #2 well GOR decreased. The Lottie York #2 well has an average GOR, at this time, of approx. 3,000 SCF/STBO.
3. The Lottie York #3 GOR has steadily increased through its 9 month life to approx. 4,200 SCF/STBO (this will be shown more graphically in Exhibit #8). The high GOR prior to the Shut-In test on 3/18/95 was due to a downhole pump failure.

Inspection of Graph II indicates that:

1. Field Instantaneous Producing GOR indicates a steady GOR increase through the life of the field. The GOR for the last year has averaged approx. 4,000 SCF/STBO.
2. The shape of the Cumulative Producing GOR Curve indicates that 'Free Gas' in the wellbore vicinities became mobile in November 1984 and that the 'Free Gas' became generally mobile in the reservoir in August 1988.

Inspection of Graph III indicates that:

1. The GOR at the Norris #4 well (a new producer) is steadily increasing and is currently at approx. 2,000 SCF/STBO. Some months must pass before the true characteristic GOR of this well is evident. The initial well test indicates this well principally produces from fracture porosity and its behavior may be at substantial variance with the other wells in this reservoir, all of which produce primarily from vugular porosity.

EXHIBIT #7: ENGINEERING CONCLUSIONS:

1. An induced 'Gas Cap' was discovered during the drilling of the Lottie York #3 well. The log character of principally gas saturated reservoir ('Gas Cap') has been recognized.

2. The original GOR of the reservoir in the undersaturated state was 1,190 SCF/STBO. The Instantaneous Producing GOR of the reservoir has risen steadily through its life to a current value of approx. 4,000 SCF/STBO. Approx. 3.65 BCFG exists as an independent phase in the reservoir. 'Gas Cap' expansion, 'Free Gas' expansion, and gravitational segregation energy has been used by the Bonneville Fuels Corporation to optimize oil recovery from this reservoir under the primary production (Depletion Drive) mechanism.

3. Optimum recovery from this reservoir by the Depletion Drive mechanism will be approximately 25% of OOIP, 2.4 MMSTBO per Craft & Hawkins (Chapter 3). Under this mechanism the remaining primary oil (0.82 MMSTBO) will be produced with approx. all of the remaining GIP (approx. 8.66 BCFG). The GOR inherent in the expected remaining producible reserves (10,560 SCF/STBO) makes the requested special GOR of 8,000 SCF/STBO appropriate.

EXHIBIT #7: ENGINEERING CONCLUSIONS: CONTINUED:

4. Additional wells were drilled to optimize recovery and protect correlative rights in this reservoir as soon as Bonneville Fuels Corporation confirmed the validity of its seismic interpretation. Both new wells have been selectively perforated to optimize oil recovery at the base of their Upper Strawn Fm. sections. While the additional drawdown of the reservoir due to the new wells may accelerate GOR increase vs. time the selective perforation of wells and the prospective abandonment of perforations when they 'Gas-Out' should allow Bonneville Fuels Corporation to optimize oil recovery in this reservoir by the Depletion Drive mechanism.

5. In proposing the 'Special GOR' of 8,000 SCF/STBO Bonneville Fuels Corporation is seeking a GOR that will allow optimum reservoir recovery if the reservoir is produced to depletion by the 'Depletion Drive' mechanism. Setting the 'Special GOR' at a realistic value below the remaining estimated recovery GOR will give the Bonneville Fuels Corporation an incentive to take further steps to optimize recovery from this reservoir, as reservoir performance and economics dictate recovery technique. The standard state rule of 2,000 SCF/STBO is just too low for this reservoir at its current condition (only the new Norris #4 well is producing near the 'limiting' GOR of 2,000 SCF/STBO). The use of the standard 2,000 SCF/STBO 'limiting' GOR will only cause premature abandonment of oil reserves and waste if it is not raised. This will be further demonstrated in Exhibit #8.

A copy of the Core Lab Flash Liberation Fluid Analysis (1982), the Core Lab Differential Liberation Fluid Analysis Simulation (1995), the two original volumetric reservoir estimates, the material balance calculations of reservoir volume, and of each individual well test analysis is available to the N.M.O.C.D. and, if desired by the Examiner or the N.M.O.C.D., will be presented to the Examiner and entered into the record and made a part of the testimony if that is so desired.

ALL OF THE AFORESAID EXHIBIT #7 IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND IS PRESENTED UNDER MY SEAL.

R. A. Schwering 4/30/96

Robert A. Schwering, P.E.
Operations Manager: New Mexico
Bonneville Fuels Corporation

Colorado P.E. No. 28108
Petroleum Engineer

Spread-Sheet #1: GOR Performance: 1995-1996

Date	LY#1:OIL	LY#1:GAS	LY#1:GOR	LY#2:OIL	LY#2:GAS	LY#2:GOR	LY#3:OIL	LY#3:GAS	LY#3:GOR	SWHC:OIL	SWHC:GAS	SWHC:GOR
1/95	2749	10552	3838.5	2179	4192	1923.8				4928	14744	2991.9
2/95	3275	10435	3186.3	1720	4095	2380.8				4995	14530	2908.9
3/95	3526	12002	3403.9	1951	4714	2416.2				5477	16716	3052.0
4/95	3115	12091	3881.5	1708	4743	2776.9				4823	16834	3490.4
5/95	3625	12737	3513.7	2040	5004	2452.9				5665	17741	3131.7
6/95	3000	11681	3893.7	1655	4581	2768.0				4655	16262	3493.4
7/95	2954	11770	3984.4	1595	4614	2892.8				4549	16384	3601.7
8/95	2665	11666	4377.5	1601	4582	2862.0	7447	21881	2938.2	11713	38129	3255.3
9/95	1810	9523	5261.3	1329	3953	2974.4	7958	31891	4007.4	11097	45367	4088.2
10/95	1365	7614	5578.0	992	2997	3021.2	6859	28075	4093.2	9216	38686	4197.7
11/95	1141	6461	5662.6	1237	4526	3658.9	7140	33537	4697.1	9518	44524	4677.9
12/95	447	4898	10957.5	1139	1982	1740.1	4280	21016	4910.3	5866	27896	4755.5
1/96	1420	6515	4588.0	1245	2589	2079.5	9663	37352	3865.5	12328	46456	3768.3
2/96	3615	12632	3494.3	1204	4896	4066.4	8176	35929	4394.4	12995	53457	4113.7
3/1-18/96	2408	8195	3403.2	729	2169	2975.3	4023	20632	5128.5	7160	30996	4329.1
Totals: 8/95-3/18/96:	14,871	67,504		4,476	27,694		55,546	230,313		79,893	325,511	

Spread-Sheet #1

Southwest Humble City

Southwest Humble City GOR History GRAPH II

GRAPH II

Field Data

Southwest Humble City

Average Reservoir Pressure : PSIA

47 1240

$P_i = 3715$ PSIG

$P_{RES} = P_b = 2981$ PSIG : 6/83

$P_{RES} = 1200$ PSIG : 3/96

R_{si}

R_p

P

Free Gas Mobile Near Well Bore

Free Gas Mobile In Reservoir Repair Lottie York #2 Well

Possible 1st Gas Cap Effect : 6/1/91

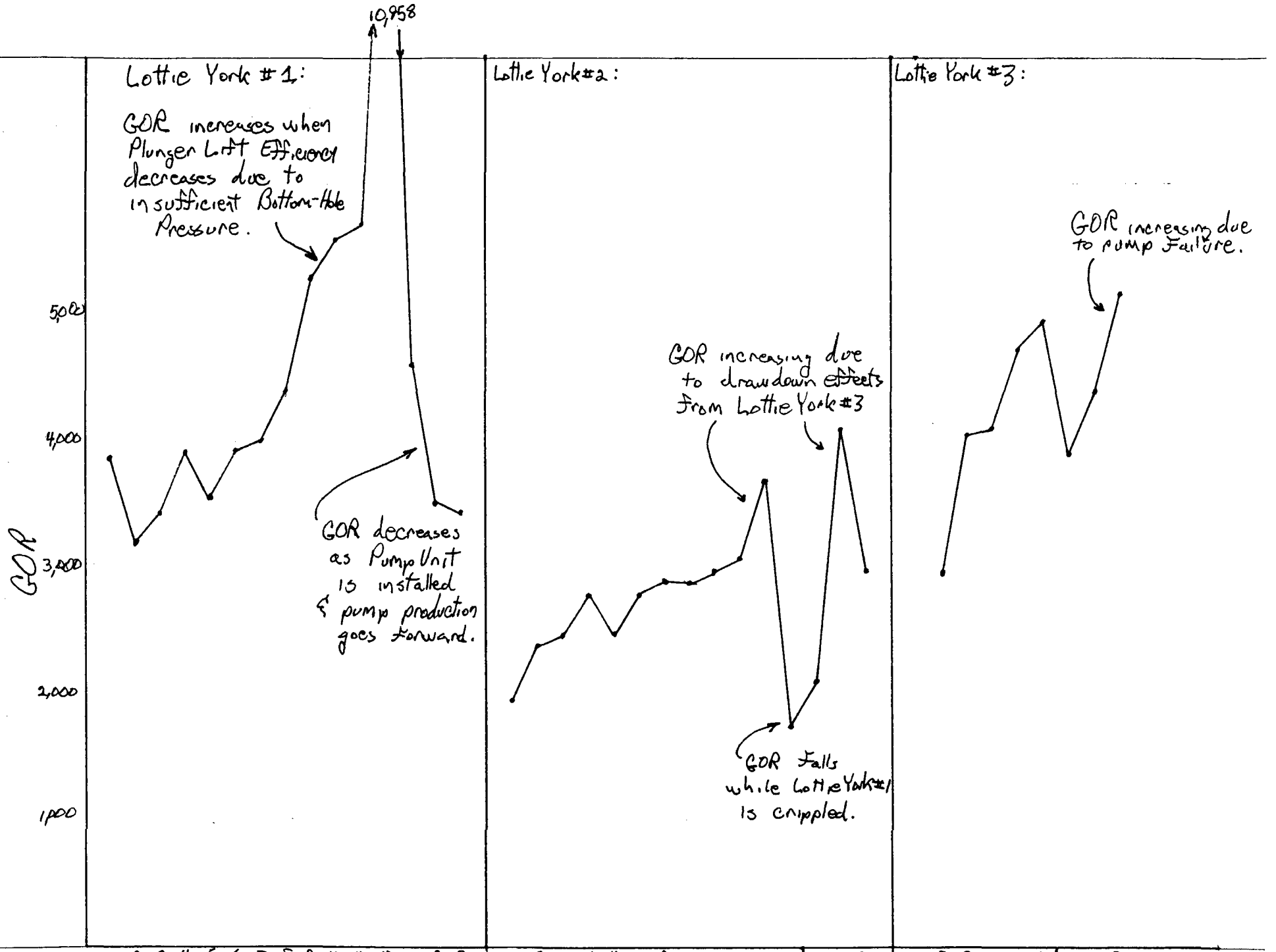
4000 3000 2000 1000

8000 7000 6000 5000 50 4000

1/80 1/82 1/84 1/85 1/86 1/87 1/88 1/89 1/90 1/91 1/92 1/93 1/94 1/95 1/96 1/97 1/98 1/99 1/00 1/01 1/02 1/03 1/04 1/05

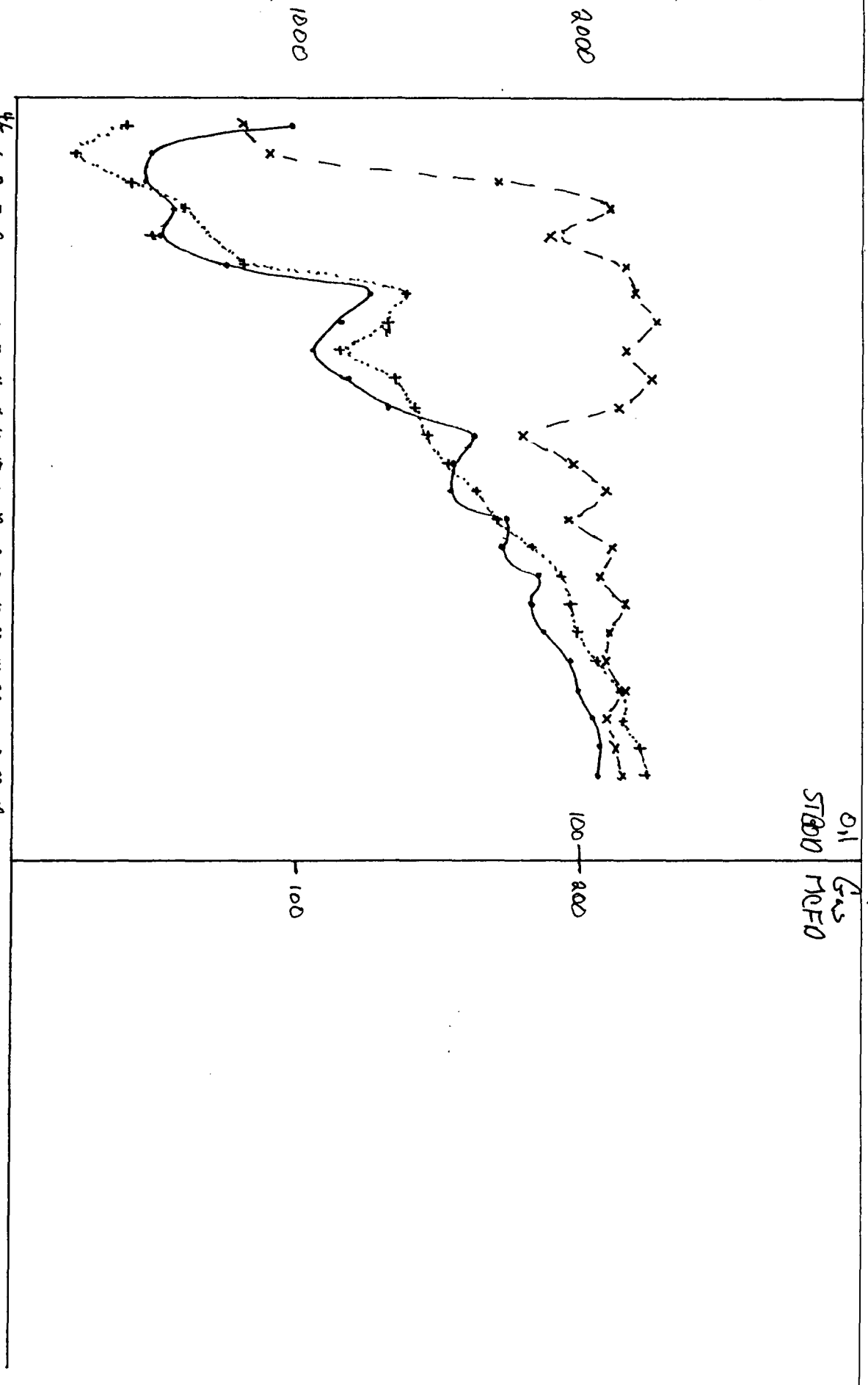
20 X 20 TO THE INCH • 10 X 15 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
K&E

Southwest Humble City | GOR Performance @ 3 Wells | GRAPH I



Southwest Trumbo City | GOR Behavior NORRIS #4 | GRAPH III

GOR: Previous 24 Hours: SCF/STBO



BEFORE THE
OIL CONSERVATION DIVISION
Santa Fe, New Mexico

Case No. 11493 Exhibit No. 7

Submitted by: Bonneville Fuels Corporation

Hearing Date: May 2, 1996