CORE LABORATORIES, INC.
Reservoir Fluid Analysis

File ARFL-860042
Well ~~Lettie~~ No. 1
CODDY

NMOCD CASE #8946

BUSCH EXHIBIT #1

OCD EXHIBITS
JUNE 13, 1988

P.V.T.

DIFFERENTIAL VAPORIZATION AT 170°F.

Pressure, PSIG	Solution Gas/Oil Ratio(1)	Relative Oil Volume(2)	Relative Total Volume(3)	Oil Density, Gm/Cc	Deviation Factor, Z	Gas Formation Volume Factor(4)	Incremental Gas Gravity
1482	588	1.380	1.380	0.6991			
1300	537	1.358	1.465	0.7045	0.852	0.01179	0.711
1100	480	1.333	1.605	0.7113	0.865	0.01412	0.721
900	423	1.307	1.824	0.7160	0.878	0.01747	0.731
700	365	1.281	2.184	0.7252	0.896	0.02281	0.757
500	305	1.253	2.881	0.7327	0.914	0.03231	0.794
300	241	1.222	4.576	0.7411	0.939	0.05426	0.888
153	184	1.192	8.692	0.7489	0.962	0.10424	1.032
90	142	1.166	14.566	0.7558	0.973	0.16868	1.231
0	0	1.055		0.7769			1.921
	at 60°F. =	1.000					

Gravity of Residual Oil = 40.9°API @ 60°F.

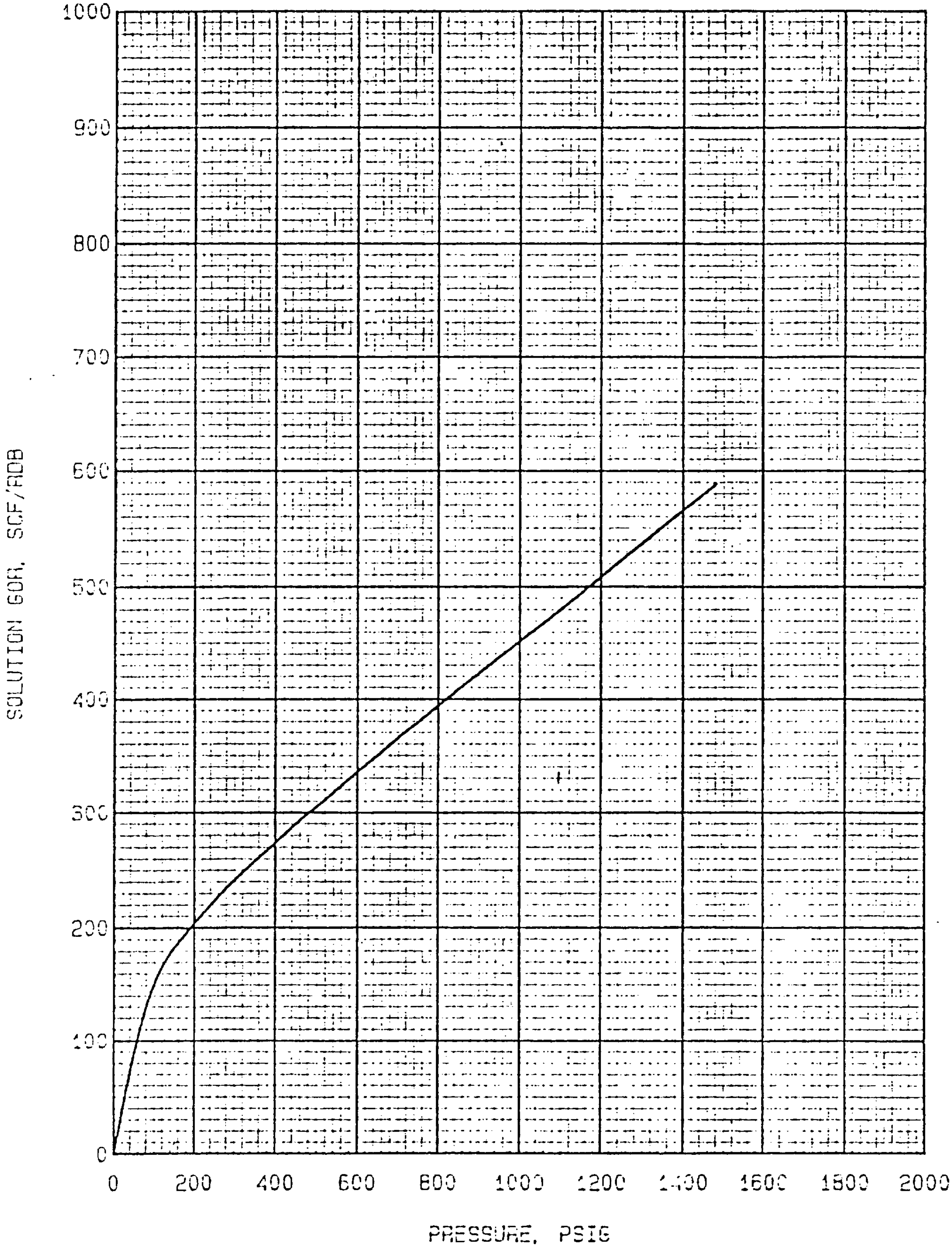
(1) Cubic feet of gas at 15.025 psia and 60°F. per barrel of residual oil at 60°F.

(2) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60°F.

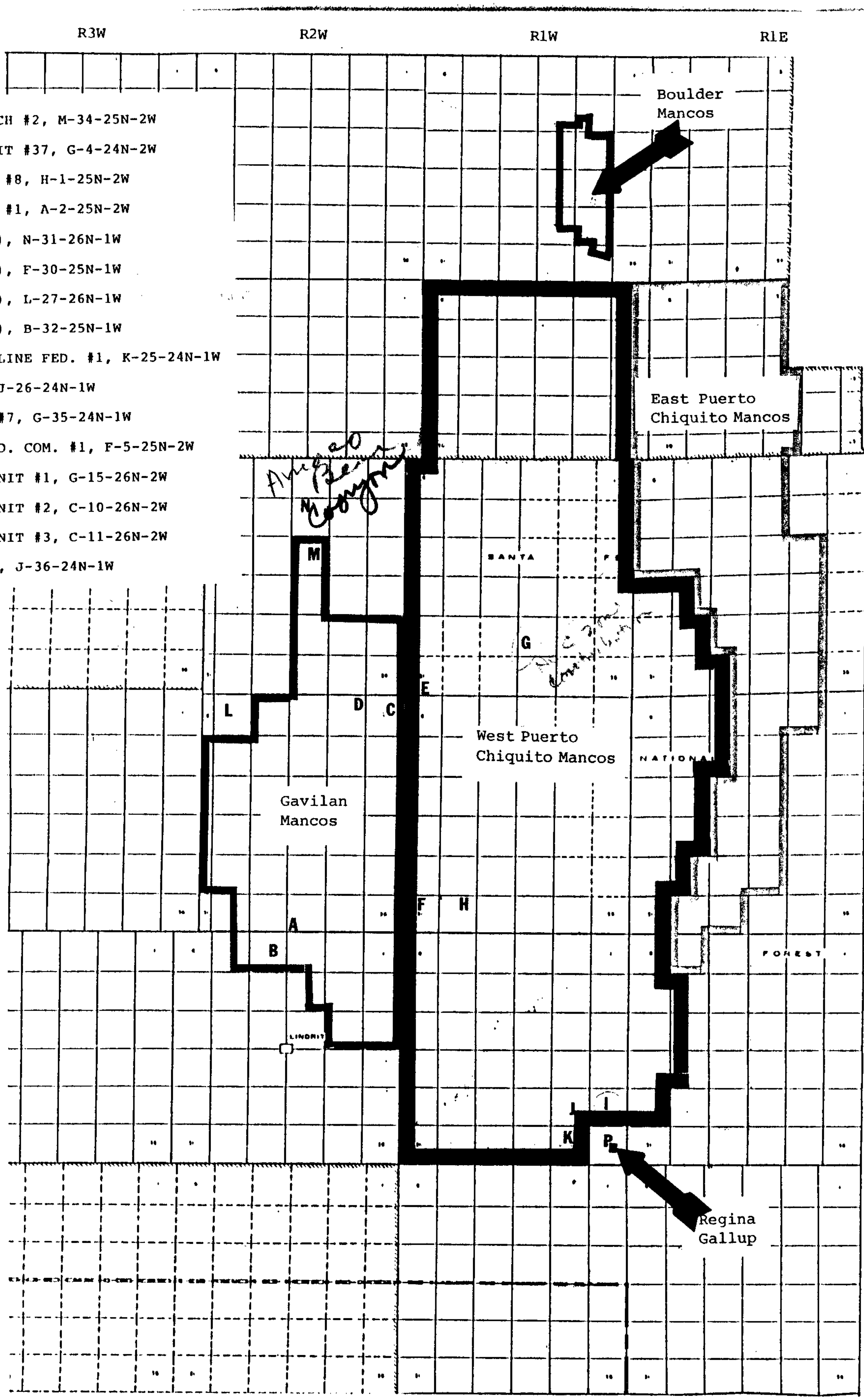
(3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60°F.

(4) Cubic feet of gas at indicated pressure and temperature per cubic foot at 15.025 psia and 60°F.

SOLUTION GAS/OIL RATIO DURING DIFFERENTIAL VAPORIZATION



A: SUN
HOMESTEAD RANCH #2, M-34-25N-2W
B: MOBIL
LINDRITH B UNIT #37, G-4-24N-2W
C: MALLON
HOWARD FED. 1 #8, H-1-25N-2W
D: MALLON
FISHER FED. 2 #1, A-2-25N-2W
E: B-M-G
COU #31 (N-31), N-31-26N-1W
F: B-M-G
COU #30 (F-30), F-30-25N-1W
G: B-M-G
COU #13 (L-27), L-27-26N-1W
H: B-M-G
COU #25 (B-32), B-32-25N-1W
I: AMOCO
SCHMITZ ANTICLINE FED. #1, K-25-24N-1W
J: AMOCO
STATE CC #1, J-26-24N-1W
K: NASSAU
WISHING WELL #7, G-35-24N-1W
L: AMOCO
HILL TRUST FED. COM. #1, F-5-25N-2W
M: AMOCO
BEAR CANYON UNIT #1, G-15-26N-2W
N: AMOCO
BEAR CANYON UNIT #2, C-10-26N-2W
O: AMOCO
BEAR CANYON UNIT #3, C-11-26N-2W
P: SUEX
MOBIL FED. #1, J-36-24N-1W



NMOCC CASE #8946
BUSCH EXHIBIT #2

NMOCC CASE #8946
BUSCH EXHIBIT #3

Welex
CASED HOLE

COMBINATION PRODUCTION LOG

COMP J.P. MC HUGH
WELL HOMESTEAD RANCH NO. 2
FIELD GAVILAN/MANCOS/DAKOTA
COUNTY RIO ARRIBA ST. N.MEX.

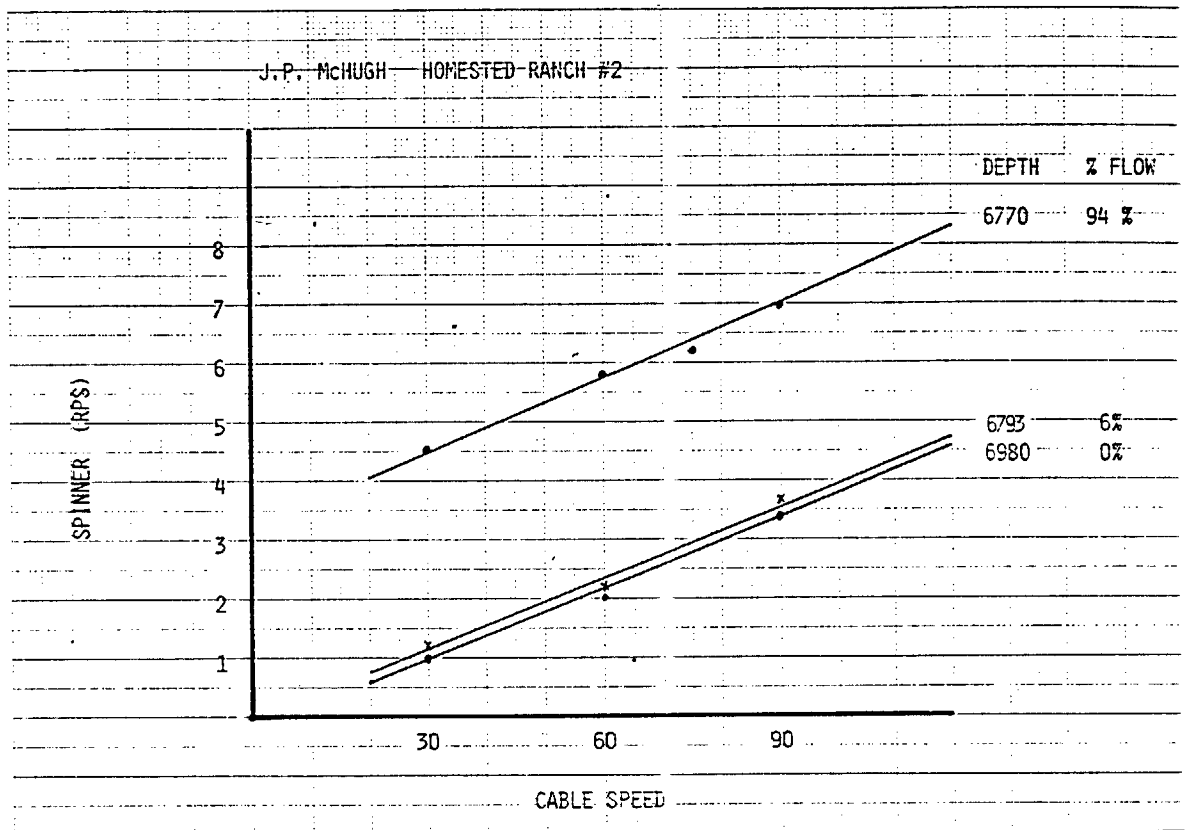
COMPANY	J.P. MC HUGH
WELL	HOMESTEAD RANCH NO. 2
FIELD	GAVILAN/MANCOS/DAKOTA
COUNTY	RIO ARRIBA STATE N.MEX.
API NO.	
LOCATION	990 FSL-1850 FWL
OTHER SERVICES	NONE
SEC. 34	TWP. 25N RGE. 2W

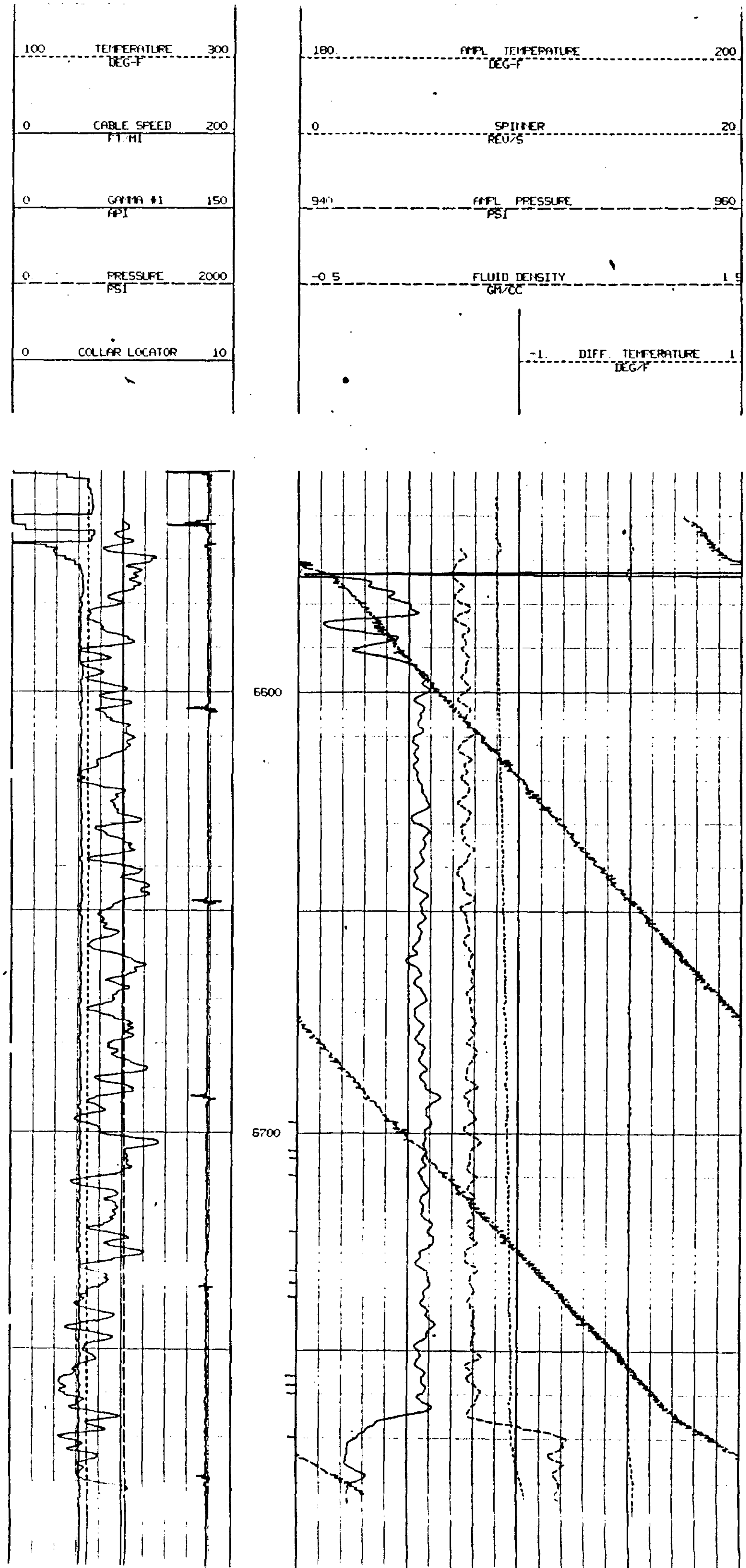
PERMANENT DATUM	GROUND LEVEL ELEV 7210	ELEV.: K.B. 7222
LOG MEASURED FROM	KELLY BUSHING 12 FT. ABOVE PERM. DATUM	D.F. 7221
DRILLING MEASURED FROM	KELLY BUSHING	G.L. 7210

DATE	3/13/87			
RUN NO.	ONE THRU SEVEN			
DEPTH-DRILLER	N-A			
DEPTH-WELEX	7100			
BTM. LOG INTER.	7050			
TOP LOG INTER.	6300			
TYPE FLUID IN HOLE	OIL/GAS			
SALINITY PPM NACL	N-A			
DENSITY	N-A			
LEVEL	FULL			
MAX REC TEMP	171			
OPERATING RIG TIME	4 HRS			
EQUIPMENT: LOCATION	2887 :FARM.	:	:	:
RECORDED BY	ATWOOD/LILLY			
WITNESSED BY	MR. J.HAZEN			
TIME MAX DPTH REACH	10:00A.M.			

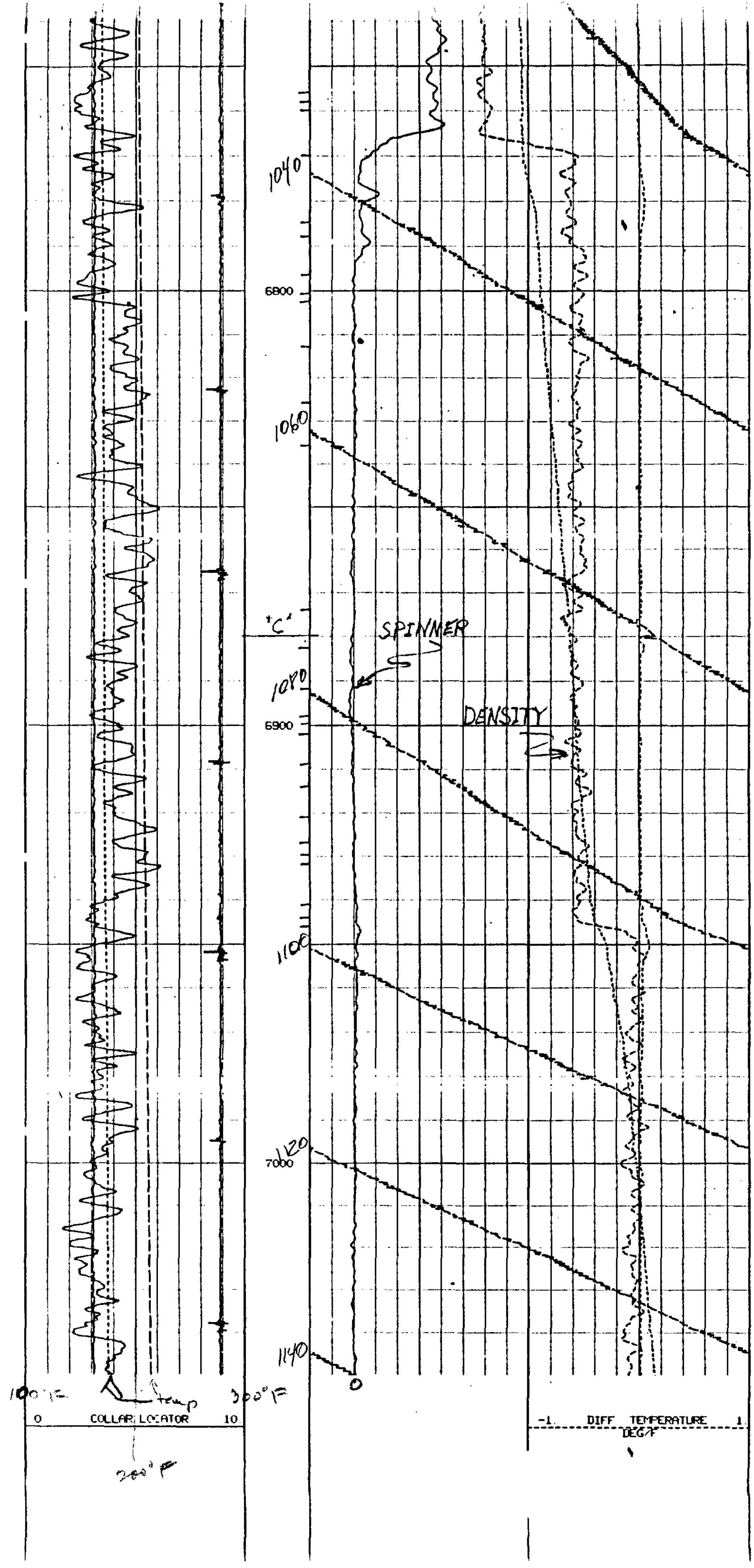
BOREHOLE RECORD				CASING AND TUBING RECORD			
RUN NO	BIT	FROM	TO	SIZE	WGT.	FROM	TO
				5.5	17.0	SURF	7896
				2.875		SURF	6437

K+E 10 X 10 TO 1 INCH KEUFFEL & ESSER CO. 46 1327





100 TEMPERATURE 300
DEG-F
0 CABLE SPEED 200
FT/MI
0 GAMMA #1 150
API
0 PRESSURE 2000
PSI
0 COLLAR LOCATOR 10
180 AMPL TEMPERATURE 200
DEG-F
0 SPINNER 20
REV/S
940 AMPL PRESSURE 960
PSI
-0.5 FLUID DENSITY
GM/CC
-1. DIFF. TEMPERATURE 1
DEG/F
6600
6700


1040
6800
1060
'C'
SPINNER
1080
6900
DENSITY
1100
1120
7000
1140
0
100°F
temp
300°F
0 COLLAR LOCATOR 10
-1 DIFF TEMPERATURE 1
DEG/F
200°F

NMOCC CASE #8946
BUSCH EXHIBIT #4

B on 2

WELEX CASED HOLE

COMBINATION PRODUCTION LOG

COMP MOBIL PRODUCING TEXAS OIL
WELL LINDRITH B-37
FIELD GAVILAN MANCOS
COUNTY RIO ARRIBA ST. N. M.

COMPANY	MOBIL PRODUCING TEXAS AND NEW MEXICO INC
WELL	LINDRITH B-37
FIELD	GAVILAN MANCOS
COUNTY	RIO ARRIBA STATE N. M.
API NO.	
LOCATION	1850 FNL / 1850 FEL
OTHER SERVICES	
SEC.	4 TWP 24N RGE 2W
PERMANENT DATUM	G.L. ELEV. 7120.0
LOG MEASURED FROM	K.B. 14.0 FT. ABOVE PERM. DATUM
ELEV.:	K.B. 7134.0 D.F. 7133.0 G.L. 7120.0
DRILLING MEASURED FROM	K.B.
DATE	03/20/87
RUN NO	ONE
DEPTH-DRILLER	6958 PBTD
DEPTH-WELEX	6860.0
BTM. LOG INTER.	6859.0
TOP LOG INTER.	6490.0
TYPE FLUID IN HOLE	WATER, GAS, OIL
SALINITY PPM NACL	N/A
DENSITY	N/A
LEVEL	FULL
MAX REC TEMP	171 DEGREES
OPERATING RIG TIME	NONE
EQUIPMENT: LOCATION	2887 GILLETTE
RECORDED BY	LILLY
WITNESSED BY	Mr. Hamner
TIMEMAX DPTH REACH	12:30 PM

BOREHOLE RECORD

RUN	BIT	FROM	TO
NO.			

CASING AND TUBING RECORD

SIZE	WGT.	FROM	TO
5.5	15.5	0	6831.0
4.0	10.6	6244.0	6966.0
2 3/8		0	6150.0

FOLD HERE

SERVICE TICKET NO.: 018922-2 API SERIAL NO.: PCM VERSION: VPLX4 11/25/86

EQUIPMENT DATA

GAMMA			NEUTRON			TEMPERATURE		
RUN NO.	ONE		RUN NO.			RUN NO.	ONE	
SERIAL NO.	100697		SERIAL NO.			SERIAL NO.	100697	
MODEL NO.	PROD LOG		MODEL NO.			MODEL NO.	PROD LOG	
DIAMETER	1 11/16		DIAMETER			DIAMETER	1 11/16	
DETECTOR MODEL NO.	N/A		LOG TYPE					
TYPE	G.M.		SOURCE TYPE					
LENGTH	18 IN.		SERIAL NO.					
DISTANCE TO SOURCE	N/A		STRENGTH					

LOGGING DATA

GENERAL					GAMMA			TEMPERATURE			NEUTRON			
RUN	DEPTHS		SPEED	TOOL		SCALE			SCALE			SCALE		
NO.	FROM	TO	FT./MIN.	POSITION	TC/FL	L	R	TC/FL	L	R	TC/FL	L	R	MATRIX
1	6477.0	6879.0	30	CENT	2	0	150	2	100	300				
2	6450.0	6840.0	60	CENT	2	0	150	2	100	300				
3	6450.0	6795.0	90	CENT	2	0	150	2	100	300				
4	6823.0	6494.0	30	CENT	2	0	150	2	100	300				
5	6827.0	6491.0	60	CENT	2	0	150	2	100	300				
6	6820.0	6490.0	90	CENT	2	0	150	2	100	300				

REMARKS:

'A' - 6624 - 6684
'B' - 6684 - 6804
'C' - 6804 - 6879

Mobil Producing Texas and NM
Lindrith B-37

Induction Log Interpretation

Purpose: Identify hydrocarbons entering the wellbore and quantify the percentage of total production coming from each set of perforations.

Reported Production: 288 BO/D
833 MCF/D
0 BW/D

Method: Use the combination production logging tool at 30, 60, and 90 FPM up and down. The Fluid Density and Pressure readings will be more accurate on Pass 4 logged 30 FPM up. The temperature will be most sensitive on Pass 1 logged 30 FPM down. The well was flowing at 500 PSI tubing pressure on all passes. All sensors were recorded simultaneously. The well had been producing 24 hrs. before these logs were run. Previously it was shut-in for 5 days.

Interpretation: TD was found to be 6878'. A rising water column was found near TD. On Run 1 the oil-water contact was at 6860' and on Run 6 the contact was found at 6818' three hours later. There are perfs open below TD that could be producing this water. The well was reported as making no water, so this water column may reach equilibrium below significant production.

For Spinner Interpretation the water column was considered near static. Flow percentages are calculated above the water column. The three down passes were used to calculate flow contribution from each zone. The two pass techniques were also used and the two were averaged for the final results.

The Fluid Density Measurement was used in calculating the percentages of oil and gas in the wellbore fluid. Fluid Density of oil and gas used in the computations were .74 g/cc and .065 g/cc, respectively.

From 6761' to the oil-water contact there appears to be a stagnant or a slow moving oil column. The Fluid Density indicates no gas is in the oil. The Spinner computations indicate 8% of the total production is coming from the perfs at 6828'-36'. This could be from the water column rising, pushing the oil up.

There is a fluid entry at 6764' making 2.25% of the total production. The wellbore fluids above these perfs is 95% oil and 5% gas.

The perfs from 6745'-48' do not appear to be open.

The perfs from 6729'-34' are making 3% of the total production from 6734'. The wellbore fluid is now 91% oil and 9% gas.

There is a fluid entry at 6724' making 16% of the total production. The wellbore fluid is now 62% oil and 38% gas.

The perfs from 6715'-21' is making 27% of the total production from 6713'. The wellbore fluid is now 21% oil and 79% gas.

The perfs at 6706' and 6702' do not appear to be open.

The perf at 6696' is making 6.75% of the total production from 6698'. Wellbore fluid is now 81% gas and 19% oil. This is probably a gas entry.

There is a fluid entry at 6690' contributing 17.5% of the total production. Wellbore fluid is now 73% gas and 27% oil.

The perf at 6684' is contributing 19.5% of the total production . Wellbore fluid contains 73% gas and 27% oil .

The perfs from 6676'-79' and 6664'-71' do not appear to be open.

The log was correlated to a Schlumberger CNL log.

Mobil Producing Texas and NM
Lindrith B-37

	REPORTED PERFORATIONS	ENTRY	% OF TOTAL PRODUCTION ZONE DOWN	ZONE ΔRPS	CUMULATIVE DOWN	CUMULATIVE ΔRPS	ZONE AVERAGE	CUMULATIVE AVERAGE	FLUID DENSITY 30 FPM UP	% GAS	% OIL	% WATER
'A'	6664-71'		0	0	101	100	0	100	.245	73	27	0
	6676-79'		0	0	100.5	100	0	100	.245	73	27	0
	6684'	6684'	20	19	100.5	100	19.5	100	.245	73	27	0
'B'		6690'	18	17	80.5	81	17.5	80.5	.245	73	27	0
	6696'	6698'	6.5	7	62.5	64	6.75	63	.19	81	19	0
	6702'		0	0	56	57	0	56.25	.205	79	21	0
	6706'		0	0	56	57	0	56.25	.205	79	21	0
	6715-21'	6713'	27	47	56	57	27	56.25	.205	79	21	0
		6724'	16	*	29	*	16	29.25	.48	38	62	0
	6729-34'	6734'	3	*	13	*	3	13.25	.68	9	91	0
	6745-48'		0	0	0	.10	0	10.25	.705	5	95	0
		6764'	3.5	1	10.5	10	2.25	10.25	.705	5	95	0
'C'	6806-20'		0	0	7	9	0	8	.74	0	100	0
	6828-36'	6824'	7	9	7	9	8	8	.74	0	100	0
	6847-50'		0	0	0	0	0	0	.98	0	0	100

* Interval contribution indeterminate from 2 pass technique
Fluid entry at 6713', 24' and 34' Total 47% using 2 Pass Technique and 46% using down runs. The down values were used.

134.0
133.0
120.0

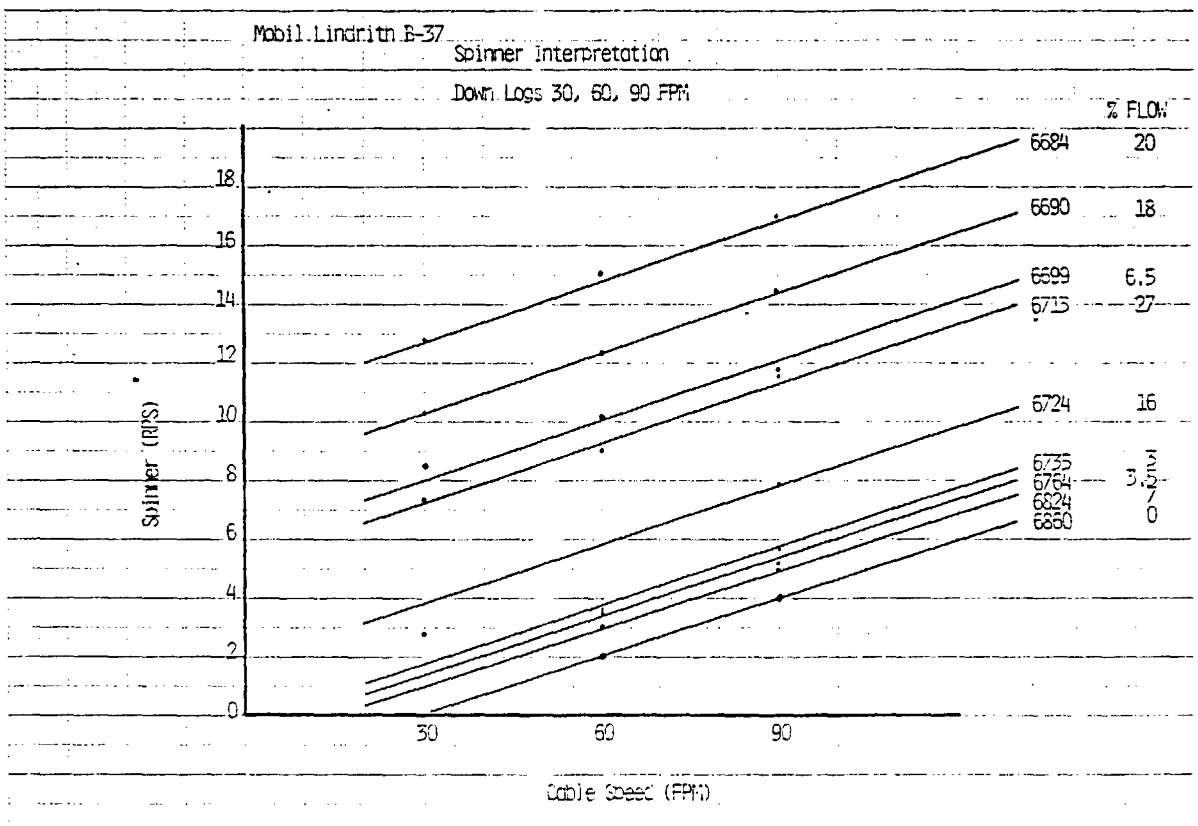
RECORD
TO
6831.0
6966.0
6150.0

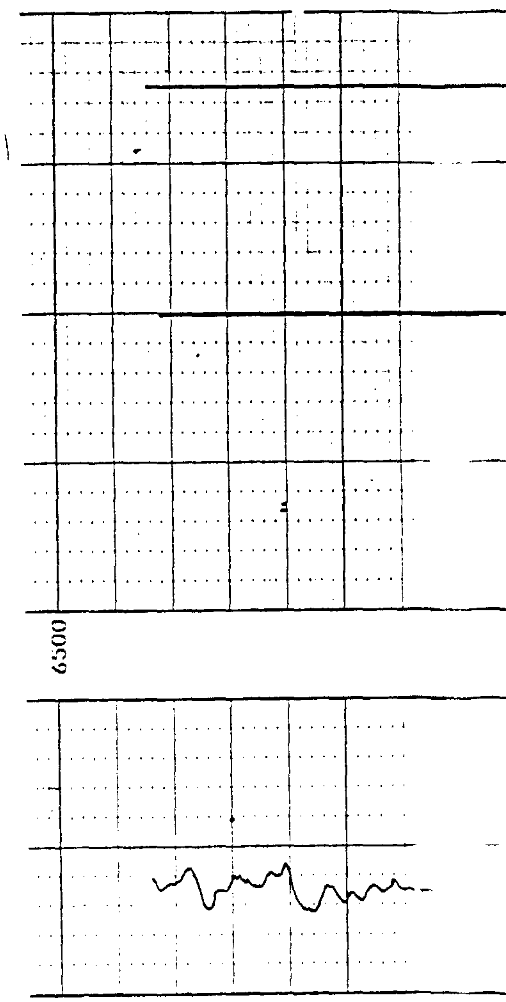
Spinner (RPS)

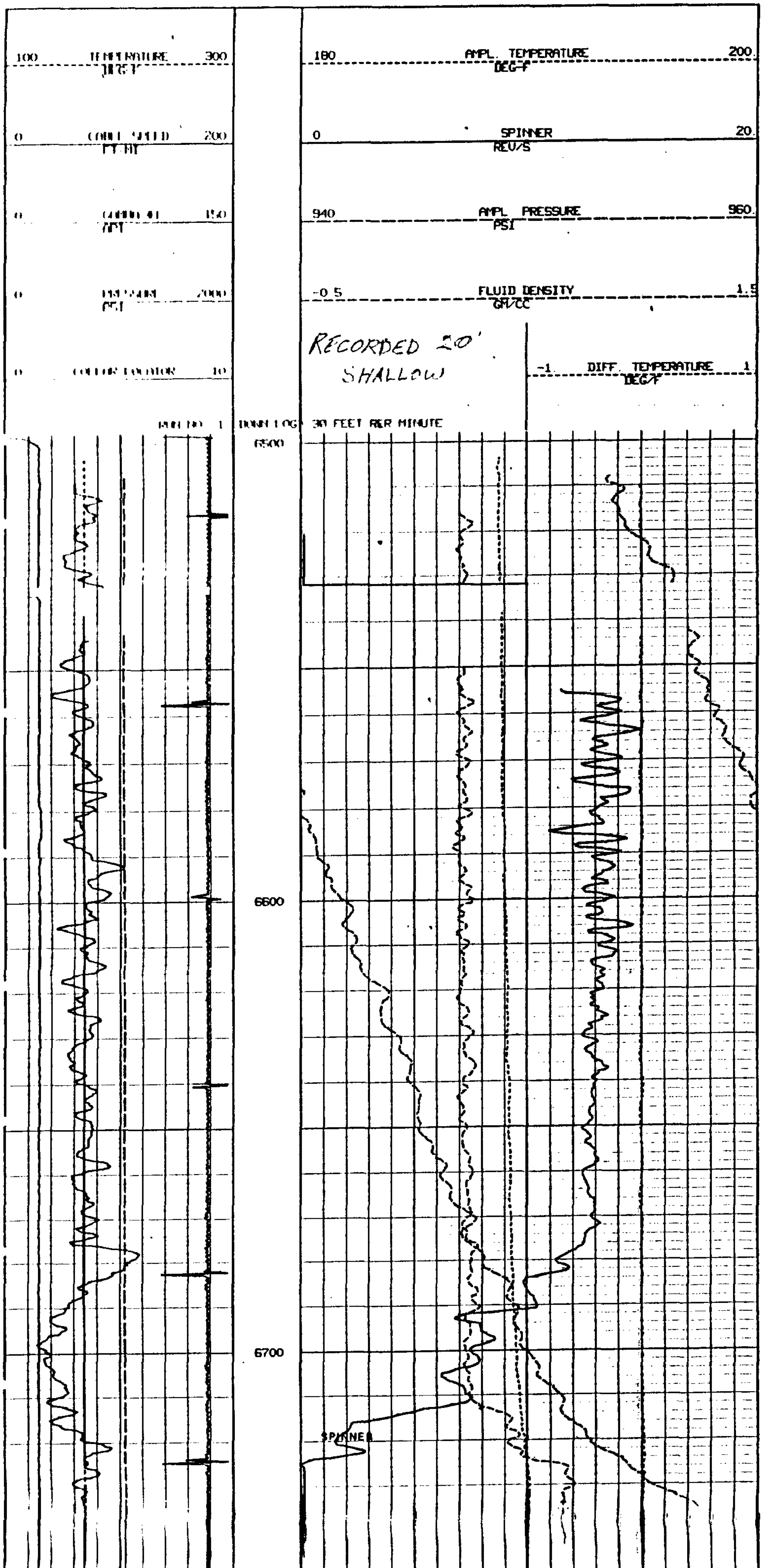
% WATER

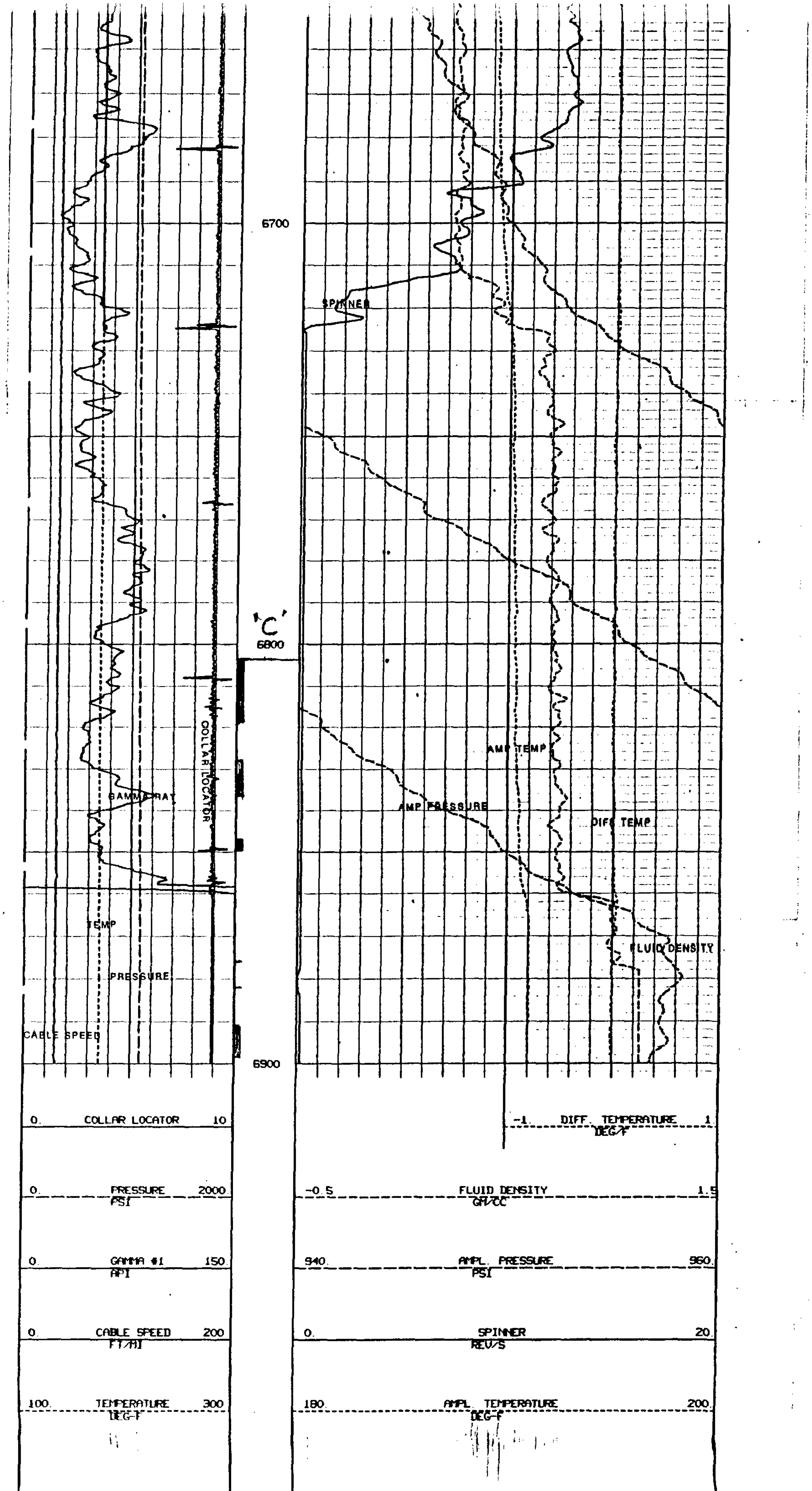
0
0
0
0
0
0
0
0
0
0
0
0
0
0
100

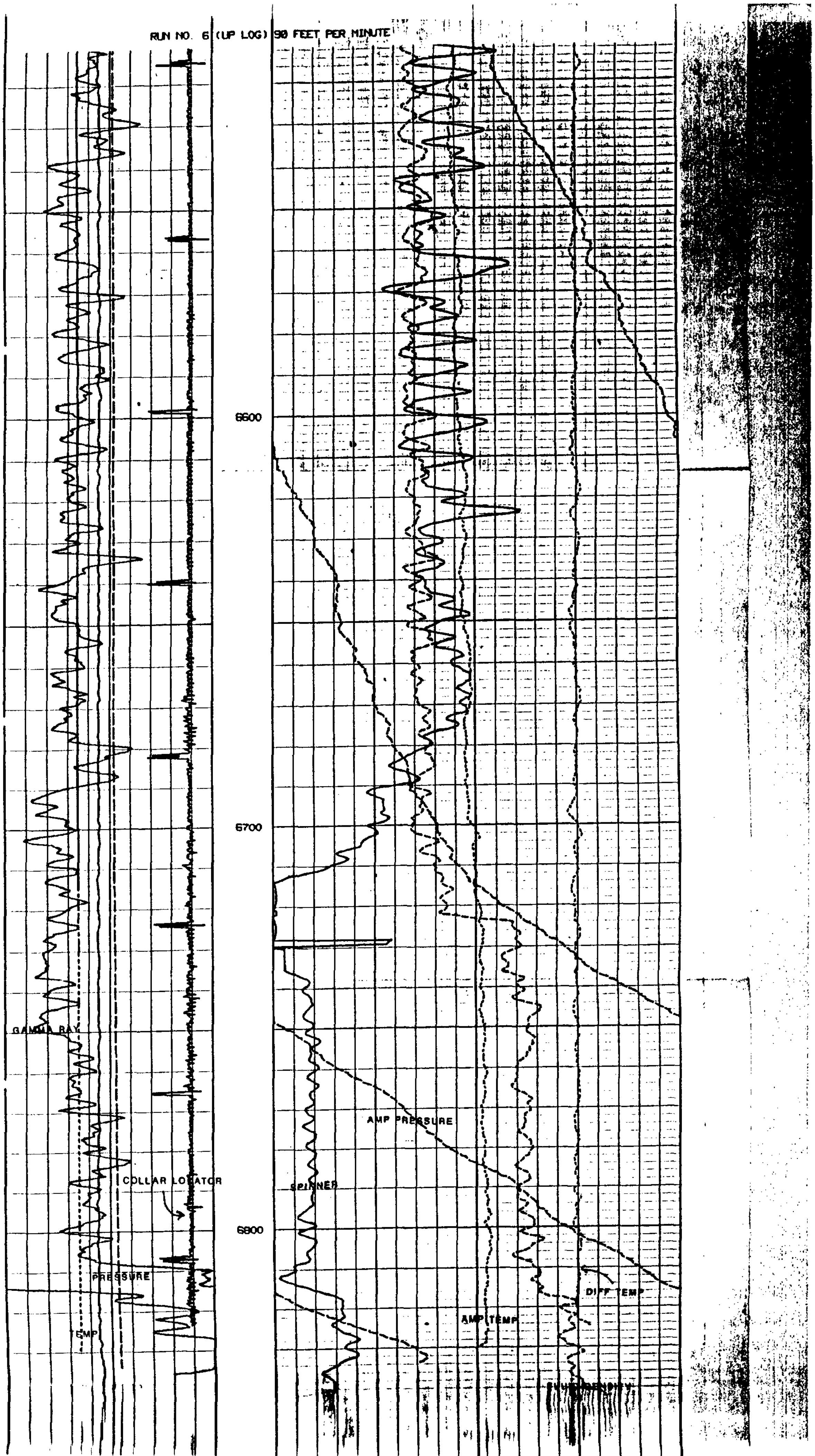
lues were used.






100 TEMPERATURE 300
0 200
0 150
0 2000
0 10
180 AMPL. TEMPERATURE 200.
DEG-F
0 SPINNER 20.
REV/S
940 AMPL. PRESSURE 960.
PSI
-0.5 FLUID DENSITY 1.5
GM/CC
RECORDED 20' SHALLOW
-1. DIFF. TEMPERATURE 1.
DEG/F
RUN NO. 1
DOWN LOG
30 FEET PER MINUTE
6500
6600
6700
SPINNER


6700
SPINNER
'C'
6800
COLLAR LOCATOR
AMP TEMP
GAMMA RAY
AMP PRESSURE
DIFF TEMP
TEMP
FLUID DENSITY
PRESSURE
CABLE SPEED
6900
0. COLLAR LOCATOR 10
-1. DIFF. TEMPERATURE 1
DEG/F
0. PRESSURE 2000
PSI
-0.5 FLUID DENSITY 1.5
GM/CC
0. GAMMA #1 150.
API
940. AMPL. PRESSURE 960.
PSI
0. CABLE SPEED 200
FT/MI
0. SPINNER 20.
REV/S
100. TEMPERATURE 300
DEG-F
180. AMPL. TEMPERATURE 200.
DEG-F


RUN NO. 6 (UP LOG) 90 FEET PER MINUTE
6600
6700
6800
GAMMA RAY
COLLAR LOCATOR
PRESSURE
TEMP
SPINNER
AMP PRESSURE
AMP TEMP
DIFF TEMP

Form 3160-4
(November 1983)
(formerly 9-330)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SUBMIT IN DUPLICATE*
(See other instructions on reverse side)

Form approved.
Budget Bureau No. 1004-0137
Expires August 31, 1985

WELL COMPLETION OR RECOMPLETION REPORT AND LOG*

1a. TYPE OF WELL: OIL WELL [X] GAS WELL [ ] DRY [ ] Other

b. TYPE OF COMPLETION: NEW WELL [X] WORK OVER [ ] DEEP-EN [ ] PLUG BACK [ ] DIFF. RESVR. [ ] Other

RECEIVED
FEB 10 1986
BUREAU OF LAND MANAGEMENT
FARMINGTON RESOURCE AREA

2. NAME OF OPERATOR: Mobil Producing TX & NM Inc.

3. ADDRESS OF OPERATOR: 9 Greenway Plaza - Suite 2700 - Houston, TX 77046

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements)*
At surface: 1850 FNL & FEL
At top prod. interval reported below
At total depth: Same

5. LEASE DESIGNATION AND SERIAL NO.: SF-078907

6. IF INDIAN, ALLOTTEE OR TRIBE NAME

7. UNIT AGREEMENT NAME: Lindrith "B" Unit

8. FARM OR LEASE NAME

9. WELL NO.: 37

10. FIELD AND POOL, OR WILDCAT: West Lindrith-Gallup/Dakota

11. SEC., T., R., M., OR BLOCK AND SURVEY OR AREA: Sec. 4, T-24N, R-~~0~~2W

14. PERMIT NO. | DATE ISSUED: 8-15-85

12. COUNTY OR PARISH: Rio Arriba | 13. STATE: NM

15. DATE SPUDDED	16. DATE T.D. REACHED	17. DATE COMPL. (Ready to prod.)	18. ELEVATIONS (DF, RKB, RT, GR, ETC.)*	19. ELEV. CASINGHEAD
10-8-85	11-5-85	1-23-86	KB-7134	7120

20. TOTAL DEPTH, MD & TVD	21. PLUG, BACK T.D., MD & TVD	22. IF MULTIPLE COMPL., HOW MANY*	23. INTERVALS DRILLED BY →	ROTARY TOOLS	CABLE TOOLS
7100	6958			X	

24. PRODUCING INTERVAL(S), OF THIS COMPLETION—TOP, BOTTOM, NAME (MD AND TVD)*: 6664-6746, 6804-6897 Gallup

25. WAS DIRECTIONAL SURVEY MADE: No

26. TYPE ELECTRIC AND OTHER LOGS RUN: Dual Ind/SFL, BHC Sonic, CN, CH-CN

27. WAS WELL CORED: No

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT, LB./FT.	DEPTH SET (MD)	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
9-5/8	36#	409	12-1/4	400x Cl B (468 cf)	circ 75x
5-1/2	15.5#	6831	8-3/4	405x 1-1 TALC + 2000x	
				TWT Lite (4126 cf)	TOC 2330

29. LINER RECORD

SIZE	TOP (MD)	BOTTOM (MD)	SACKS CEMENT*	SCREEN (MD)

30. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD)
2-3/8	6150	6150

31. PERFORATION RECORD (Interval, size and number)
Perf Gallup w/1&2 JSPF @ 6804-18, 6826-33, 6844-47, 6876, 82, 6891-97 (34 holes)
Perf Gallup w/1&2 JSPF @ 6664=71, 6675-78, 6684, 96, 6701, 6706-15, 6720, 6728-33, 6744-46 (39 holes)

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL (MD)	AMOUNT AND KIND OF MATERIAL USED
6804-6897	Bkdn w/6800 gal 2% KCL Filter + 68 RNCBS. SWF w/84272 gal 40# GWX07 gel + 117,500# 20/40 Ottawa sand.

33.* PRODUCTION (SEE REVERSE)

DATE FIRST PRODUCTION	PRODUCTION METHOD (Flowing, gas lift, pumping—size and type of pump)	WELL STATUS (Producing or shut-in)
1-23-86	flowing	shut-in

DATE OF TEST	HOURS TESTED	CHOKE SIZE	PROD'N. FOR TEST PERIOD →	OIL—BBL.	GAS—MCF.	WATER—BBL.	GAS-OIL RATIO
1-29-86	24	16/64		240	320	8	1333

FLOW. TUBING PRESS.	CASING PRESSURE	CALCULATED 24-HOUR RATE →	OIL—BBL.	GAS—MCF.	WATER—BBL.	OIL GRAVITY-API (CORR.)
460	pkr					43.0 @ 60°

34. DISPOSITION OF GAS (Sold, used for fuel, vented, etc.): Sold - pending gas connection

TEST WITNESSED BY: K. D. Jones

35. LIST OF ATTACHMENTS: logs

ACCEPTED FOR RECORD
FEB 14 1986
FARMINGTON RESOURCE AREA

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records

SIGNED Nancy Lewis TITLE Authorized Agent DATE 2-5-86

*(See Instructions and Spaces for Additional Data on Reverse Side)

e m 2

Welex

CASED HOLE

COMBINATION PRODUCTION LOGS

COMP MALLON OIL COMPANY
WELL HOWARD NO 1-8
FIELD BASIN DAKOTA-UNDESIGNATE
COUNTY RIO ARRIBA ST N MEX

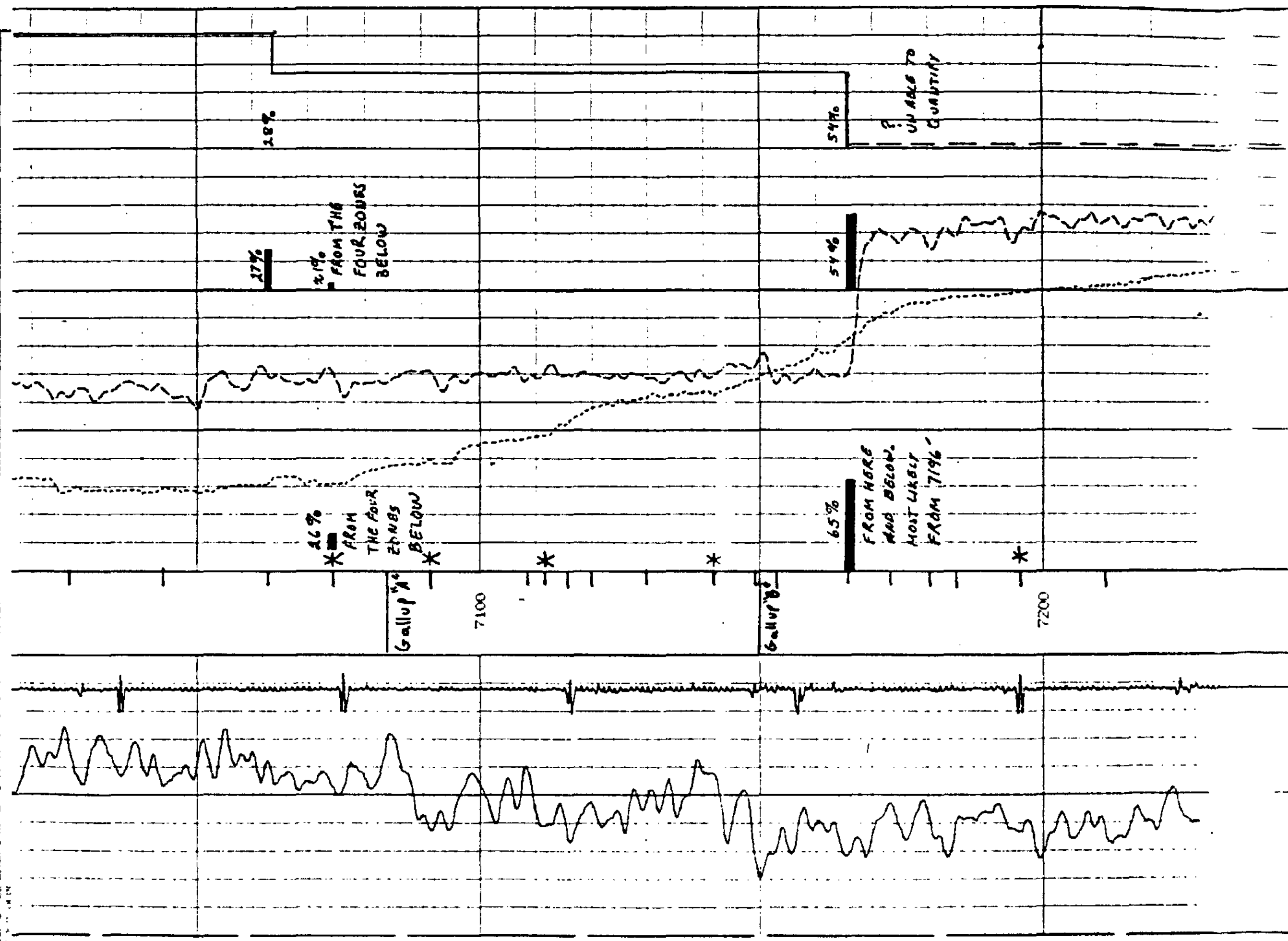
COMPANY	MALLON OIL COMPANY		
WELL	HOWARD NO.1-8		
FIELD	BASIN DAKOTA-UNDESIGNATED GALLUP		
COUNTY	RIO ARRIBA	STATE N MEX	
API NO. LOCATION	1650 FNL / 870 FEL		OTHER SERVICES NONE
SEC 1	TWP 25N	RGE 2W	

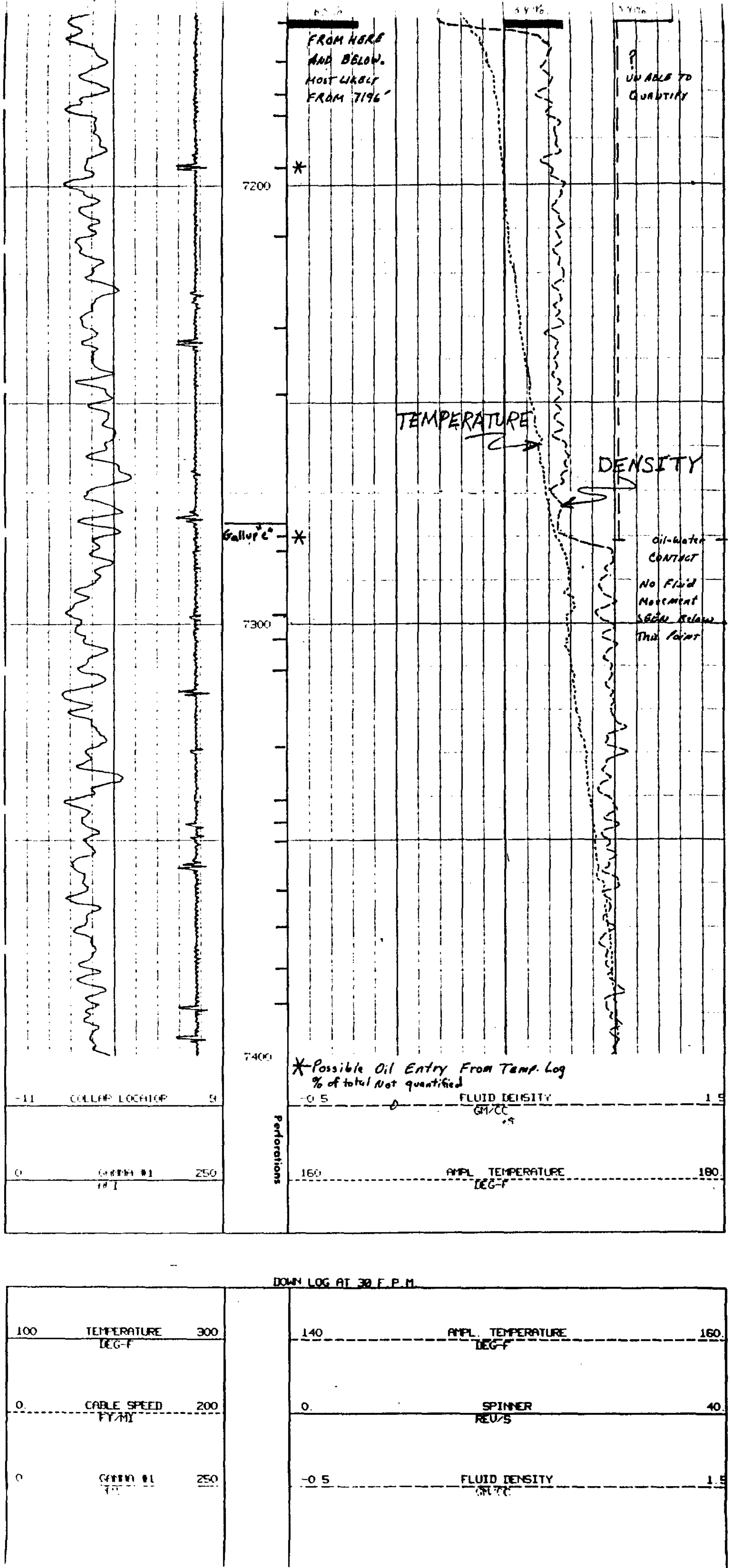
PERMANENT DATUM	GROUND LEVEL	ELEV 7511	ELEV K B 7523
LOG MEASURED FROM	KELLY BUSHING	12 FT ABOVE PERM DATUM	D F 7522
DRILLING MEASURED FROM	KELLY BUSHING		G L 7511

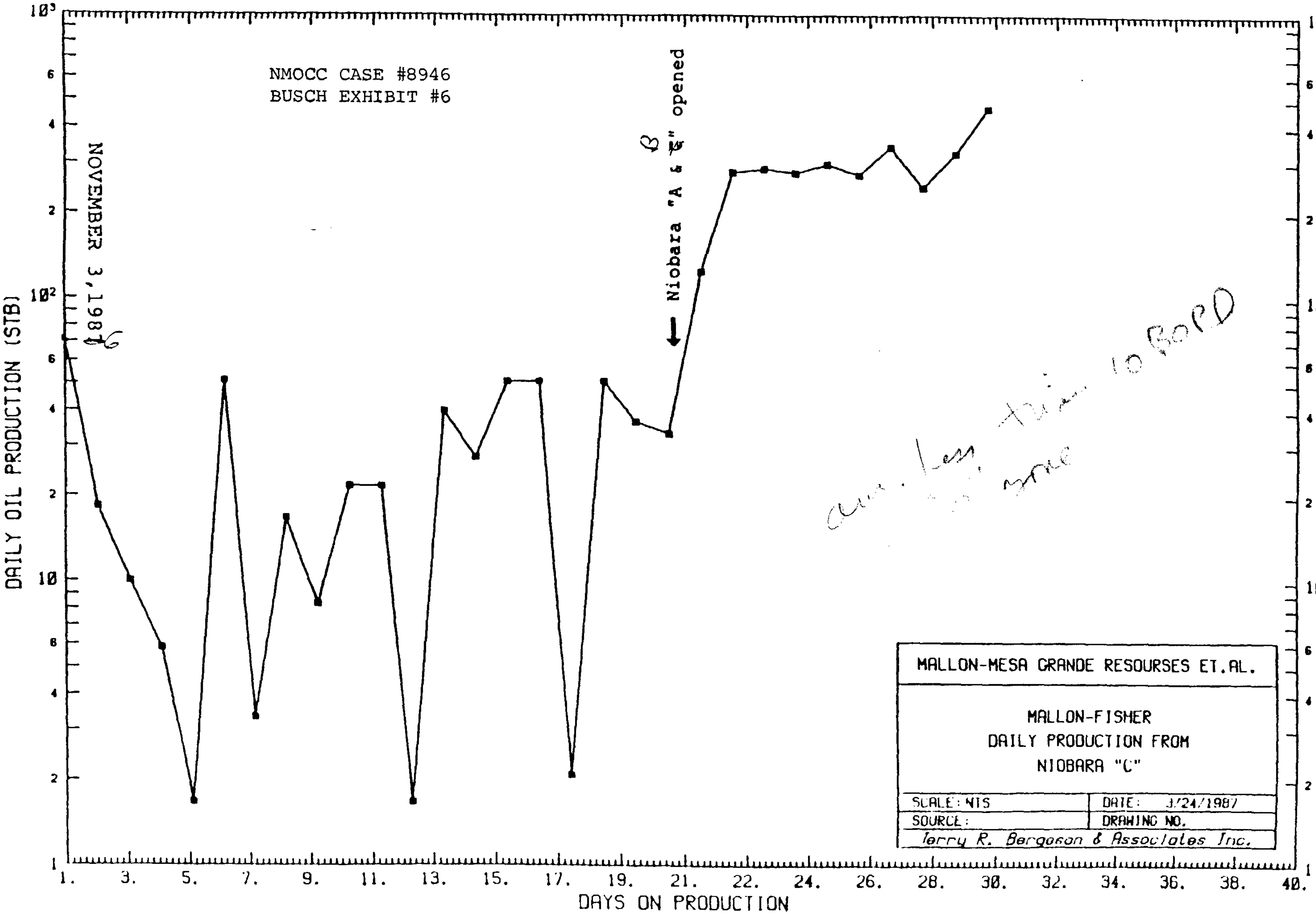
DATE	03-01-88	
RUN NO	ONE	
DEPTH-DRILLER	8220	
DEPTH-WELEX	7930	
BTM LOG INTER	7930	
TOP LOG INTER	6850	
TYPE FLUID IN HOLE	OIL/GAS/WATER	
SALINITY PPM NACL	NA	
DENSITY	NA	
LEVEL	NA	
MAX REC TEMP	187 7	
OPERATING RIG TIME	4 HRS	
EQUIPMENT LOCATION	4548 FRMNGTON	
RECORDED BY	ATWOOD/MULLEN	
WITNESSED BY	F MC CORD	J WATCH
TIME@MAX DPTH REACH	9.45 A M	

RUN NO	BOREHOLE RECORD BIT	FROM	TO	CASING AND TUBING RECORD SIZE	WGT	FROM	TO
ONE	16 00	0	270	13 375	48 0	SURF	270
ONE	8 75	270	6266	5 500	17 0	SURF	6222
				2 875		SURF	5657

RECEIVED
MAY 17 1988
OIL CON. DIV.
DIST. 3




FROM HERE AND BELOW. MOST LIKELY FROM 7196'
? UNABLE TO QUANTIFY
7200
TEMPERATURE
DENSITY
Gallup "C"
Oil-Water CONTACT
No Fluid Movement Seen Below This Point
7300
7400
* Possible Oil Entry From Temp. Log
% of total Not quantified
-11 COLLAR LOCATOR 9
-0.5 FLUID DENSITY 1.5
GM/CC
Perforations
0 GAMMA #1 250
160 AMPL TEMPERATURE 180
DEG-F
DOWN LOG AT 30 F.P.M.
100 TEMPERATURE 300
DEG-F
140 AMPL. TEMPERATURE 160
DEG-F
0. CABLE SPEED 200
FT/MI
0. SPINNER 40.
REV/S
0 GAMMA #1 250
-0.5 FLUID DENSITY 1.5


NMOCC CASE #8946
BUSCH EXHIBIT #6
NOVEMBER 3,1986
Niobara "A & B" opened
DAILY OIL PRODUCTION (STB)
DAYS ON PRODUCTION
MALLON-MESA GRANDE RESOURSES ET.AL.
MALLON-FISHER
DAILY PRODUCTION FROM
NIOBARA "C"
SCALE: NTS
DATE: 3/24/1987
SOURCE:
DRAWING NO.
Terry R. Bergeson & Associates Inc.

NMOCC CASE #8946
BUSCH EXHIBIT #7

E-2

Welex
CASED HOLE

Combination Production Log

COMP. BENSON MOTIN GREER DRIL
WELL CANADA OJITOS UNIT NO.3
FIELD GALLUP
COUNTY RIO ARRIBA ST. N.M.

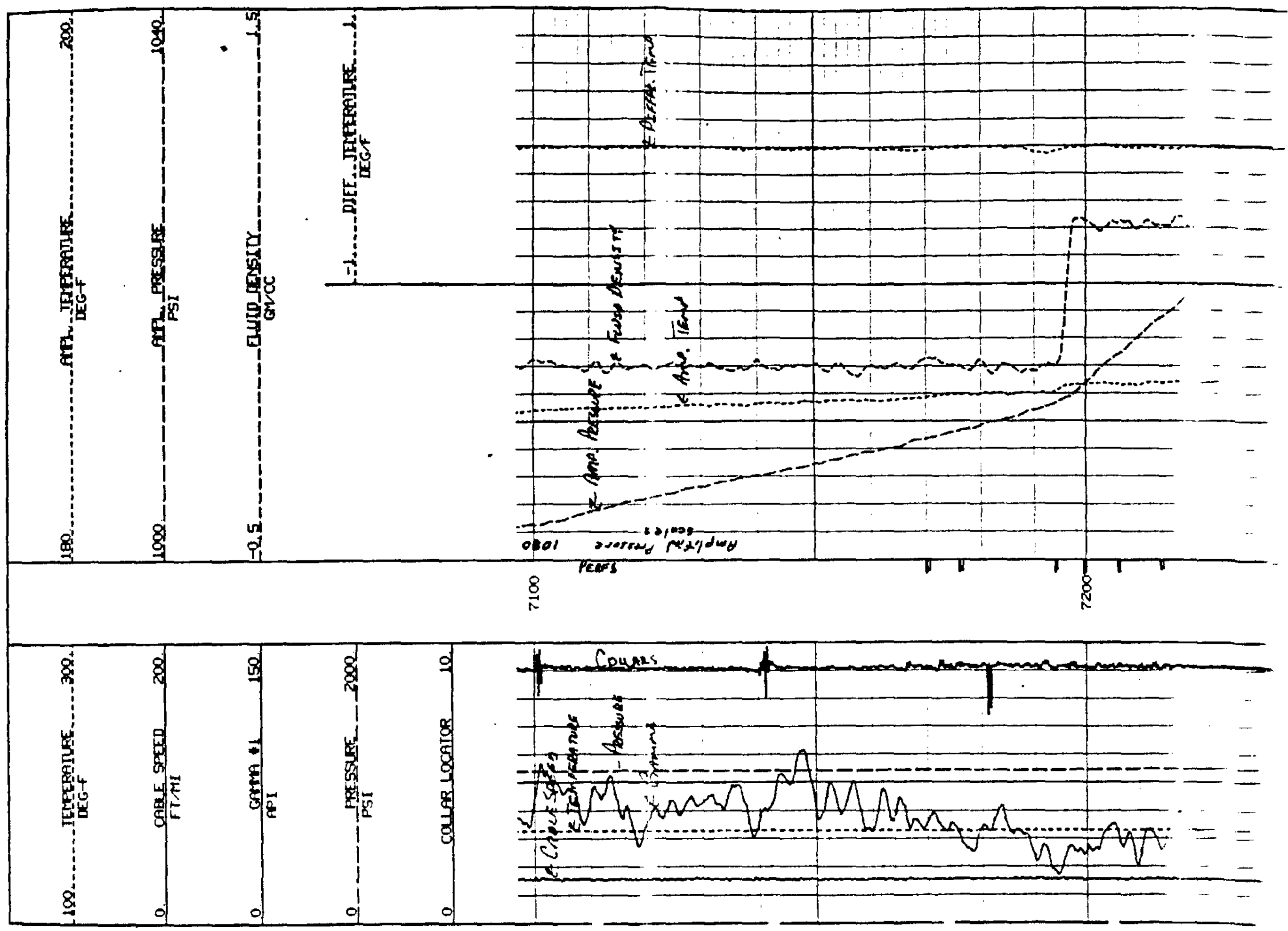
COMPANY BENSON MOTIN GREER DRILLING CORP.
WELL CANADA OJITOS UNIT NO.31 N-31
FIELD GALLUP
COUNTY RIO ARRIBA STATE N.M.
API NO.
LOCATION 900 FSL AND 1650 FWL 14
OTHER SERVICES FLUID TRAVEL
SEC. 31 TWP. ~~25N~~ 26 RGE. 01W

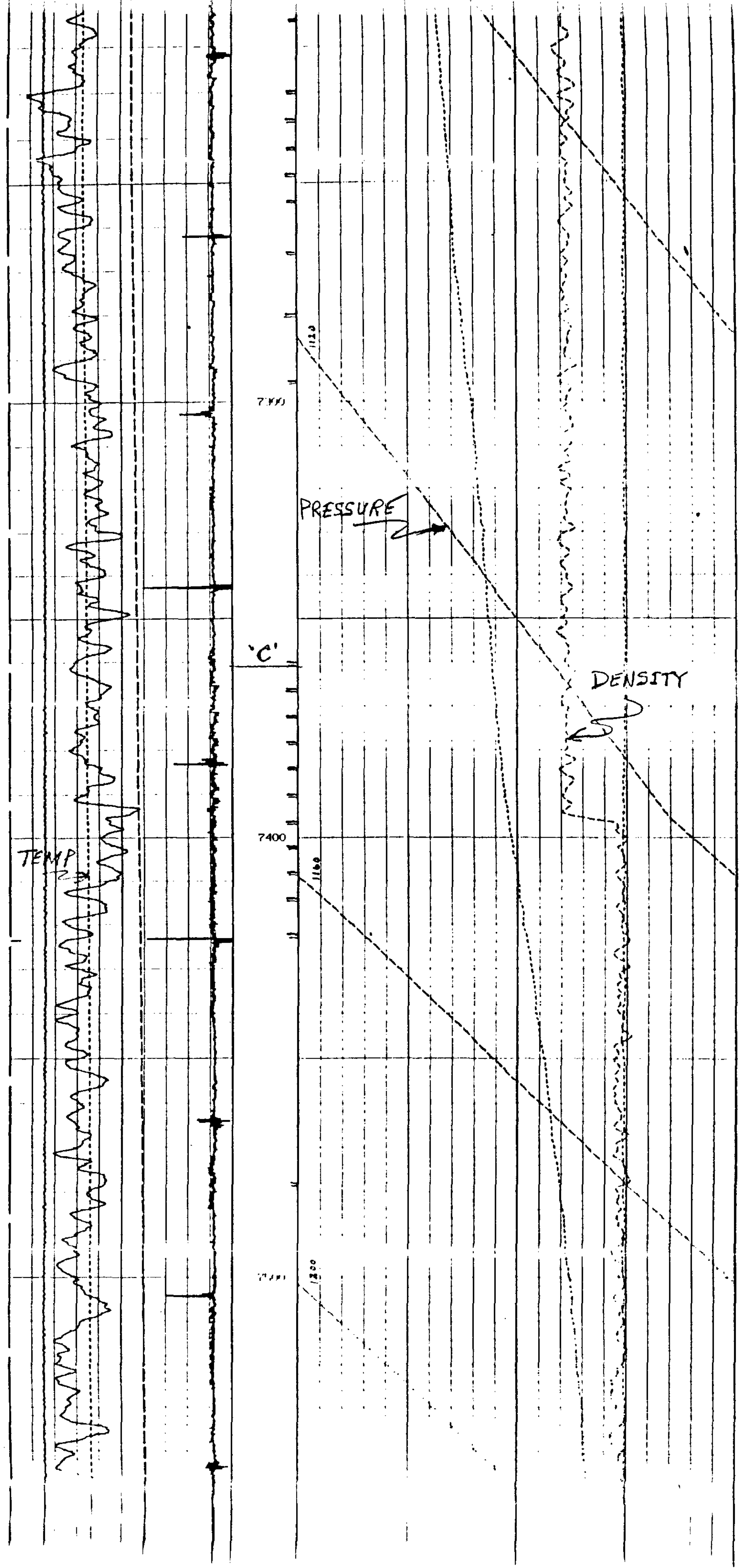
PERMANENT DATUM	GROUND LEVEL	ELEV. 7569	ELEV.: K.B. 7581
LOG MEASURED FROM	KELLY BUSHING	12 FT. ABOVE PERM. DATUM	D.F. 7580
DRILLING MEASURED FROM	KELLY BUSHING		G.L. 7569

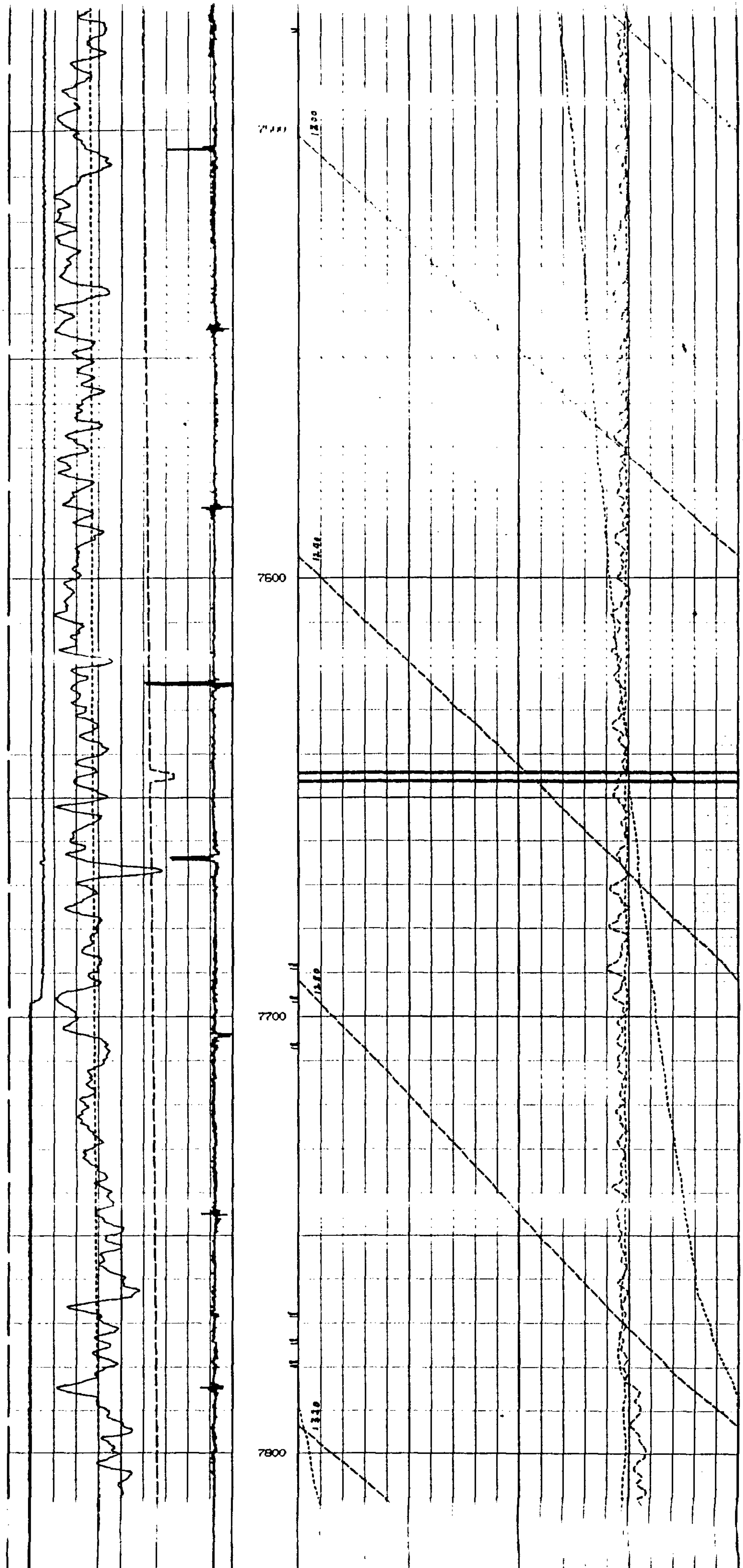
DATE	03/08/87		
RUN NO.	ONE		
DEPTH-DRILLER	7900		
DEPTH-WELEX	7820		
BTM. LOG INTER.	7844		
TOP LOG INTER.	6880		
TYPE FLUID IN HOLE	OIL, GAS		
SALINITY PPM NACL	N/A		
DENSITY	N/A		
LEVEL	N/A		
MAX REC TEMP	180		
OPERATING RIG TIME	2.5 HRS		
EQUIPMENT: LOCATION	2887 : GILLETTE		
RECORDED BY	MCCARTER, MULLEN	KESLER, MCCONNELL	
WITNESSED BY	MR. CHAMBERS		
TIME@MAX DPTH REACH	1600		

RECEIVED
MAR 24 1987
OIL CON. DIV.
DIST. 3

RUN NO.	BOREHOLE RECORD BIT	FROM	TO	CASING AND TUBING RECORD SIZE	WGT.	FROM	TO
ONE	---	SURF	500	9.625	---	SURF	500
TWO	7.875	500	7900	5.5	23	SURF	7891
				2.875	6.5	SURF	6949




7300
PRESSURE
'C'
DENSITY
7400
TEMP


7600
7700
7800

Fm 2

Welex

CASED HOLE

COMBINATION PRODUCTION LOG

NMOCC CASE #8946
BUSCH EXHIBIT #8

WELL CANADA OJITOS UNIT NO 3
FIELD GALLUP
COUNTY RIO ARRIBA ST. N.M.

COMPANY	BENSON MOTIN GREER DRILLING CORP.
WELL	CANADA OJITOS UNIT NO.30 F-30
FIELD	GALLUP
COUNTY	RIO ARRIBA STATE N M
API NO.	
LOCATION	SE/NW 1755 FNL AND 2418 FWL

6

OTHER SERVICES: FLUID TRAVEL

SEC. 30 TWP. 25N RGE. 01W

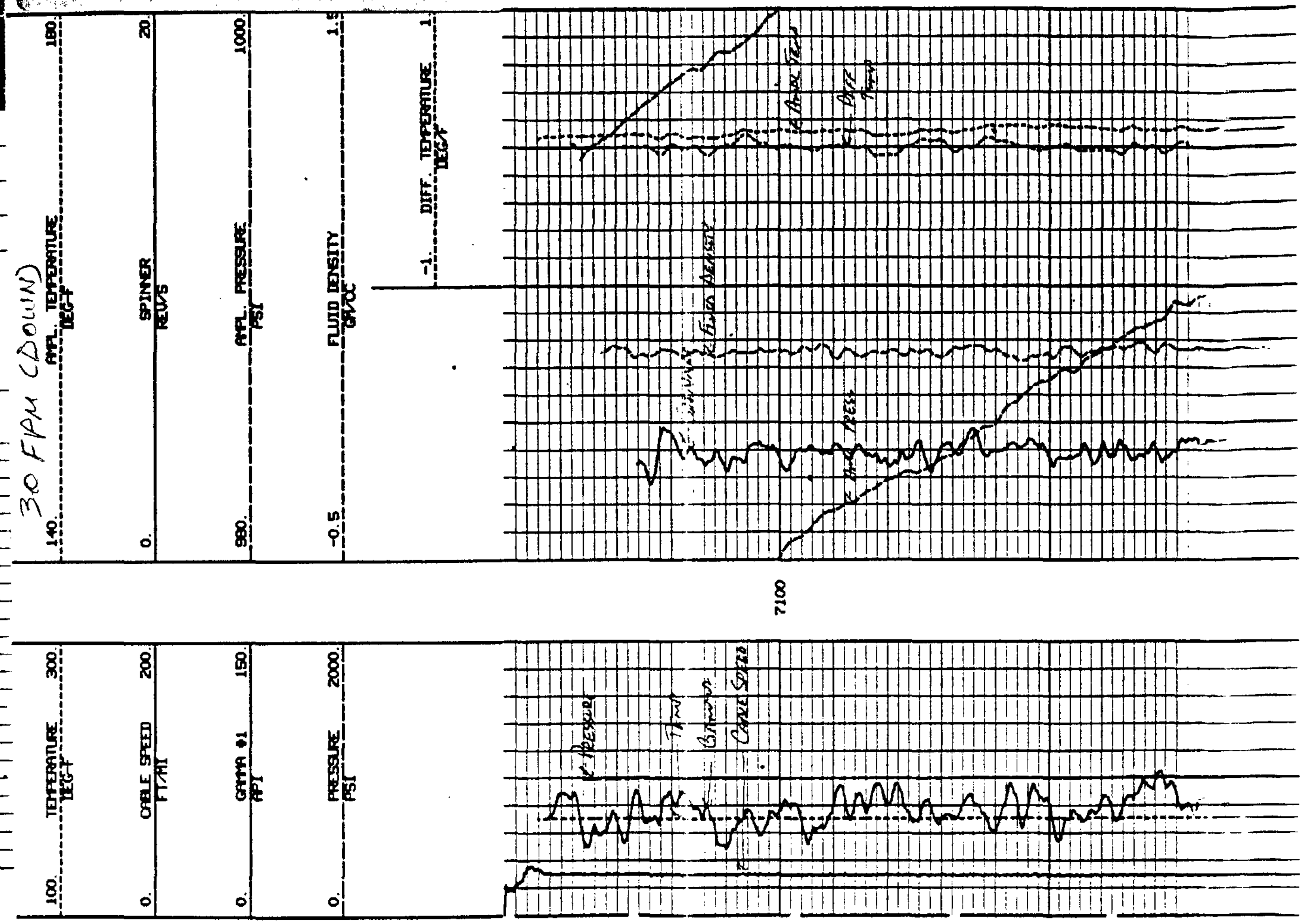
PERMANENT DATUM	GROUND LEVEL ELEV. 7671	ELEV.: K.B. 7683
LOG MEASURED FROM	KELLY BUSHING 12 FT. ABOVE PERM. DATUM	D.F. 7682
DRILLING MEASURED FROM	KELLY BUSHING	G.L. 7671

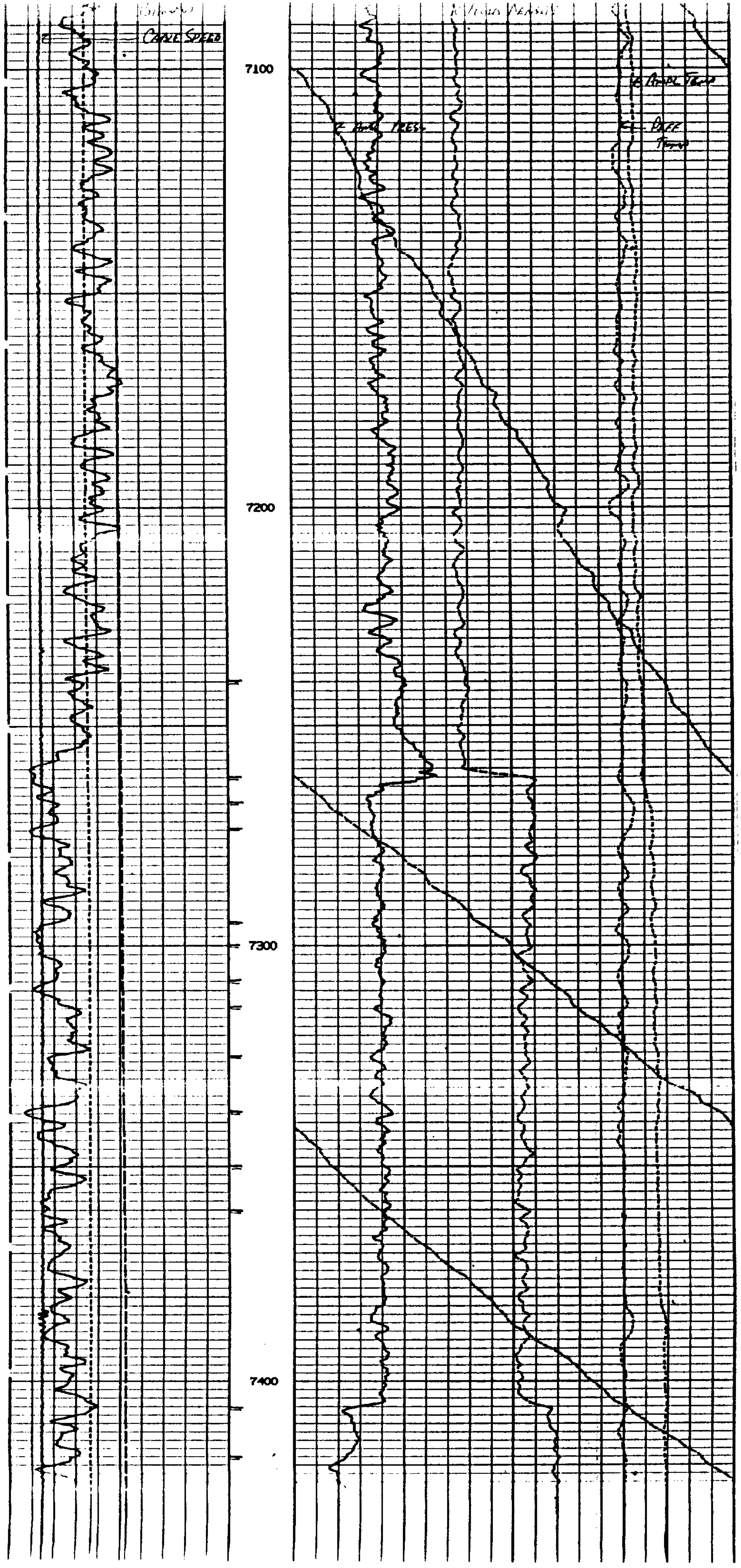
DATE	03/05/87
RUN NO.	ONE
DEPTH-DRILLER	7959
DEPTH-WELEX	7954
BTM. LOG INTER.	7924
TOP LOG INTER.	6870
TYPE FLUID IN HOLE	OIL, GAS
SALINITY PPM NACL	N/A
DENSITY	N/A
LEVEL	N/A
MAX. REC TEMP	180
OPERATING RIG TIME	2.5 HRS
EQUIPMENT: LOCATION	2887 :GILLETTE
RECORDED BY	MCCARTER,KESLER YARBRO,MCCONNELL
WITNESSED BY	MR. CHAMBERS
TEMMAX DPTH REACH	1530

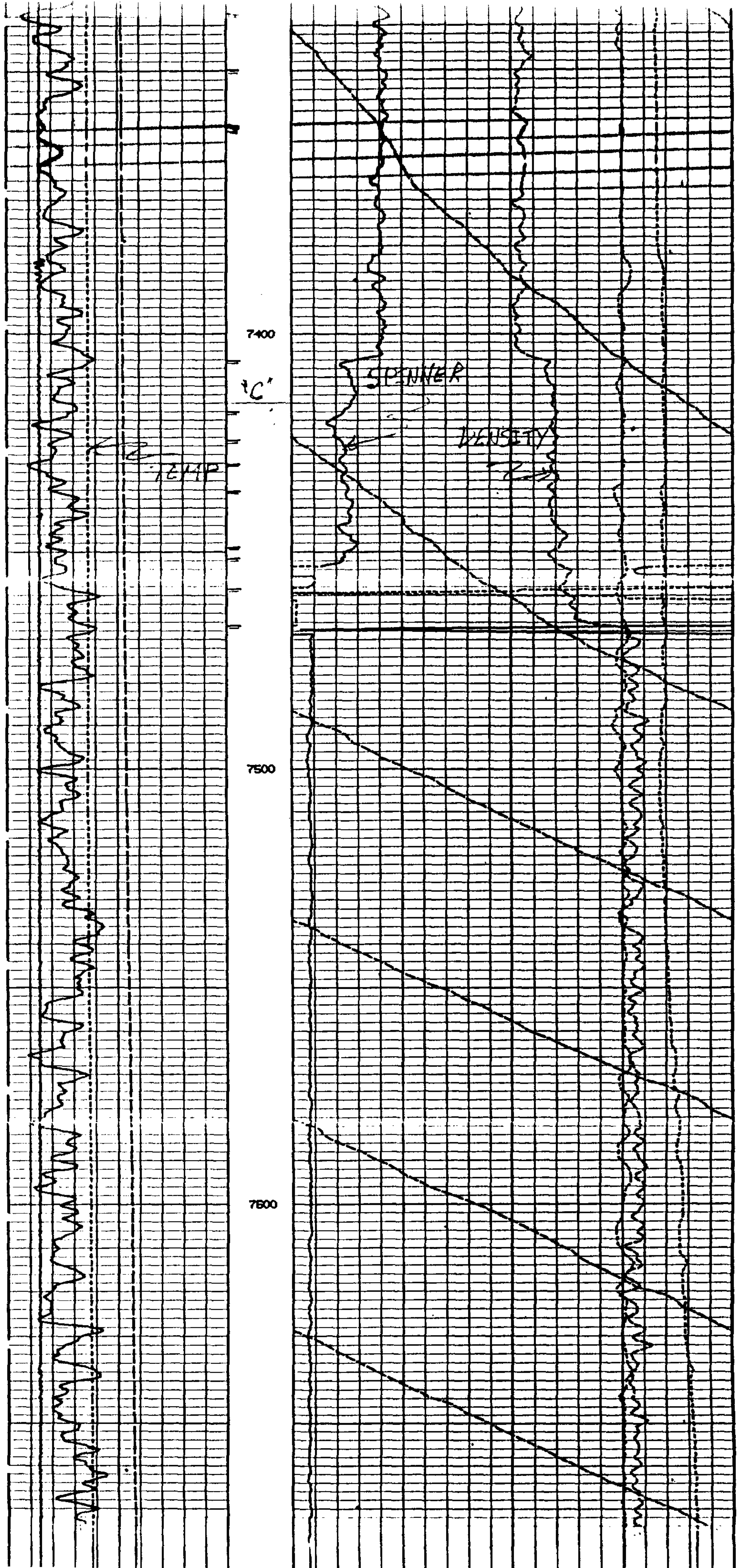
RECEIVED
MAR 24 1987
OIL CON. DIV.
DIST. 3

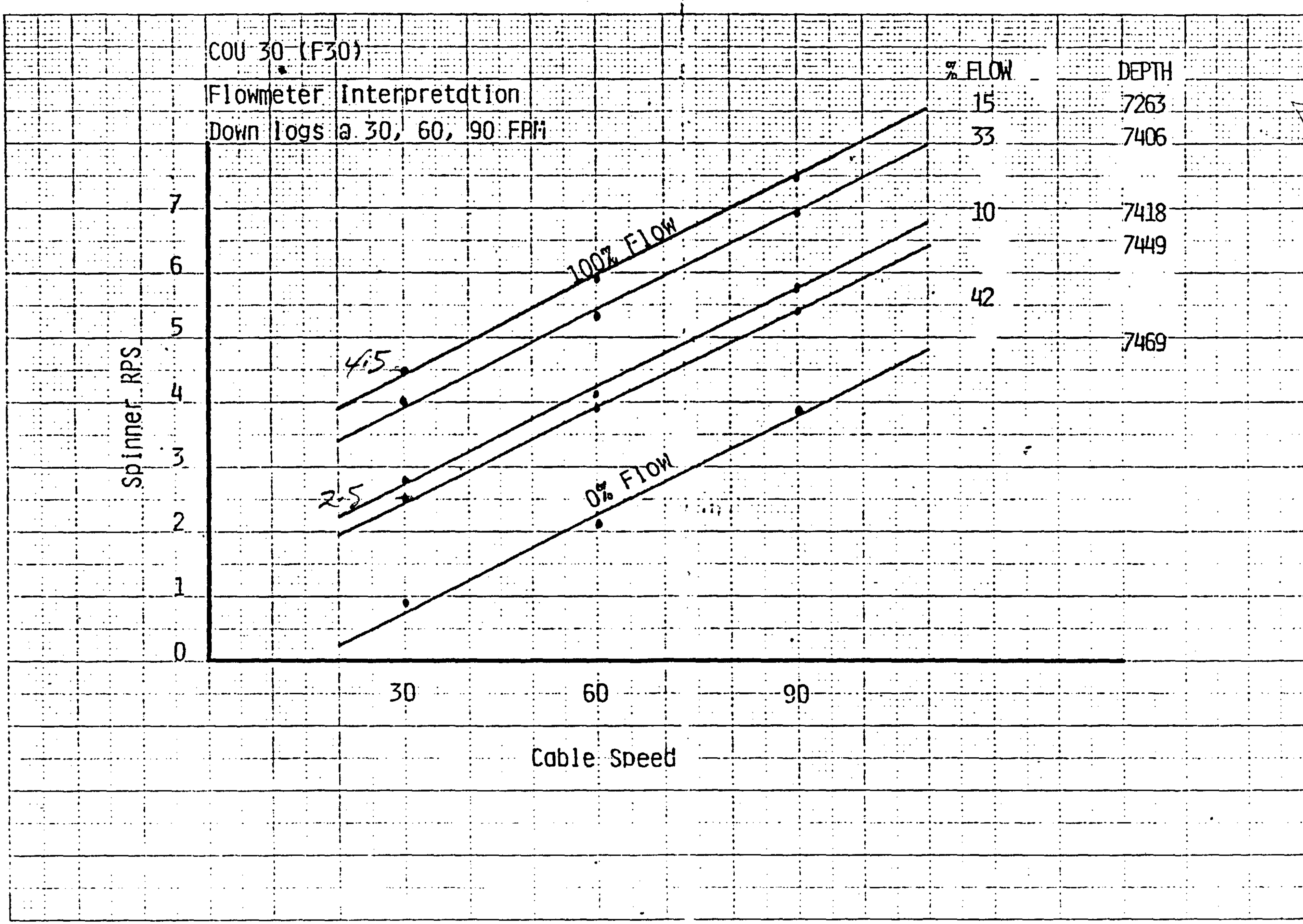
RUN NO	BIT	BOREHOLE RECORD FROM	TO	CASING AND TUBING RECORD SIZE	WGT.	FROM	TO
	---	SURF	535	9.625	---	SURF	535
	7.875	535	8050	5.5	23	SURF	8050
				2.875	6.5	SURF	6957

30 FPM (DOWN)




CABLE SPEED
7100
7200
7300
7400


7400
"C"
SPINNER
DENSITY
TEMP
7500
7600



COU 30 (F30)
Flowmeter Interpretation
Down logs a 30, 60, 90 FPM
% FLOW
DEPTH
15
7263
33
7406
10
7418
7449
42
7469
4.5
2.5
100% Flow
0% Flow
Spinner RPS
0
1
2
3
4
5
6
7
30
60
90
Cable Speed

$\frac{2}{4.5} = .44$

NMOCC CASE #8946
BUSCH EXHIBIT #9

Ex 9
6 m 2

Dresser Atlas

DRESSER

PRODUCTION LOGGING SERVICES

FILE NO.	COMPANY BENSON-MONTIN-GREER DRILLING CORPORATION
	WELL CANADA OJITOS UNIT NO. 13 (L-27)
API NO.	FIELD CANADA OJITOS UNIT
	COUNTY RIO ARRIBA STATE NEW MEXICO
FIELD PRINT	LOCATION: 1415' FSL & 740' FWL 12 SEC 27 TWP 26N RGE 1W

OTHER SERVICES: PCM: GR HP FDN FMTR TEMP

PERMANENT DATUM GROUND LEVEL ELEV. 7451'
LOGGING MEASURED FROM K.B. 14 FT. ABOVE P.D.
DRILLING MEASURED FROM K.B.

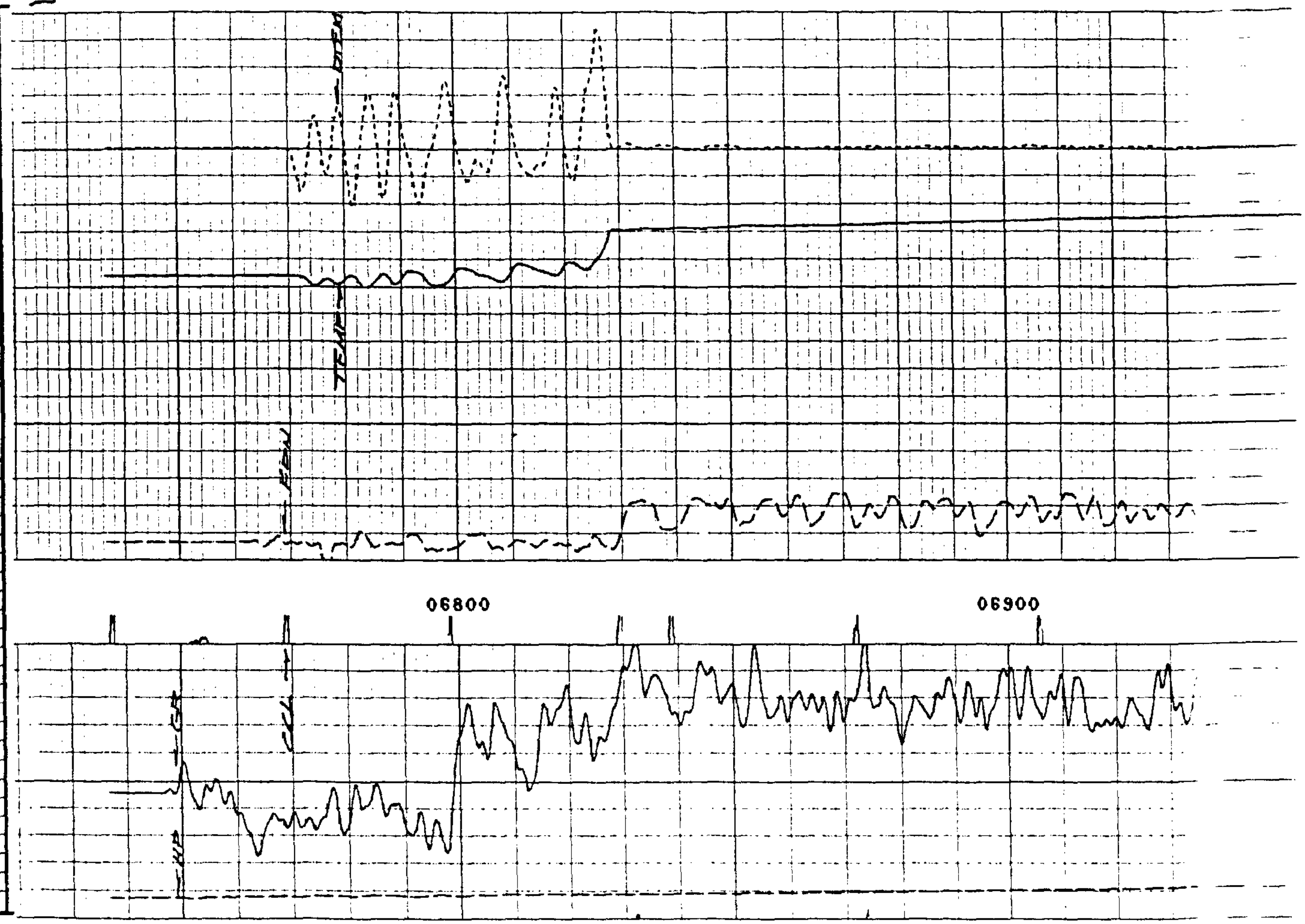
ELEVATIONS: KB 7465' DF 7464' GL 7451'

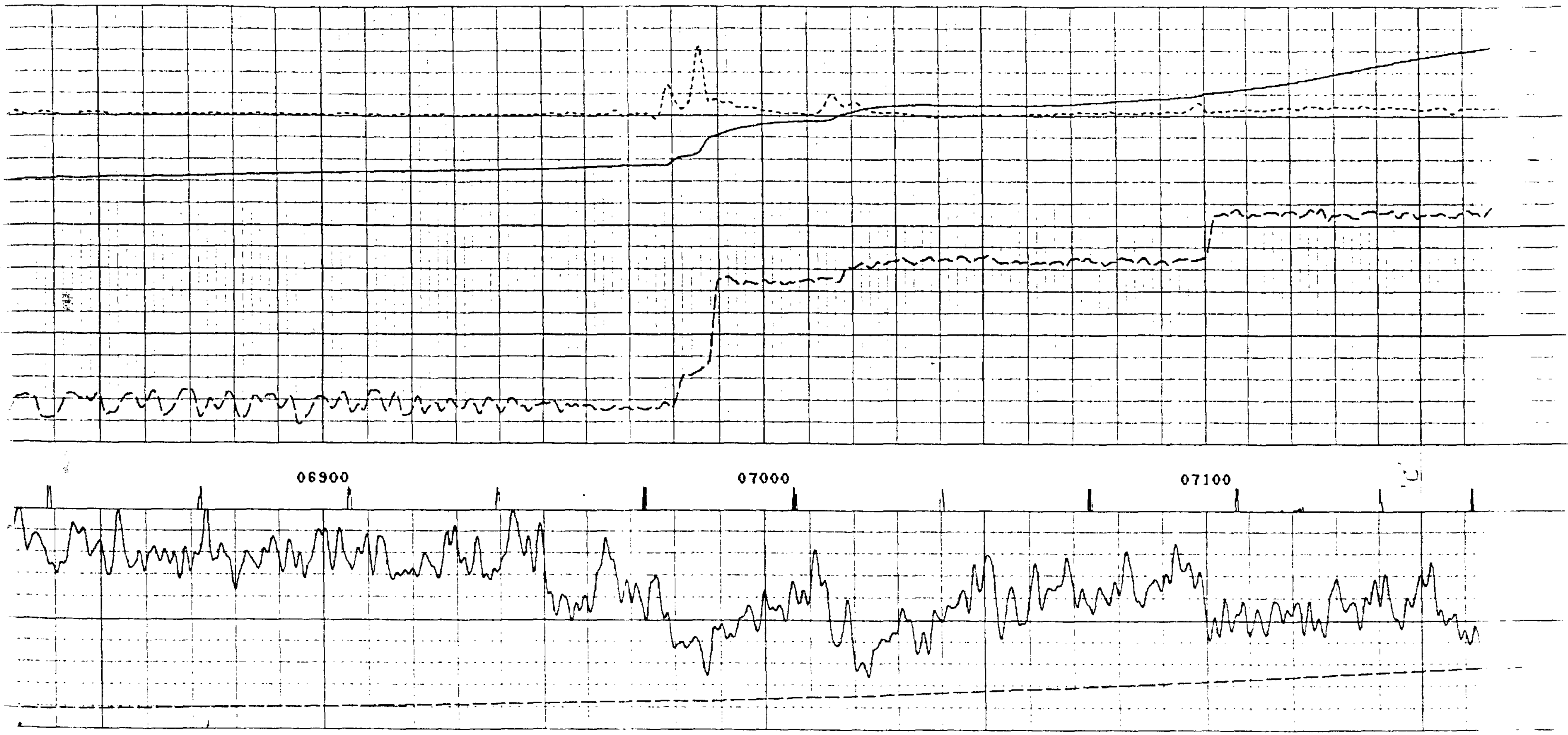
DATE	11 AUG 1987	
RUN	1	
SERVICE ORDER	147033	
DEPTH-DRILLER	7210'	
DEPTH-LOGGER	7199'	
BOTTOM LOGGED INTERVAL	7199'	
TOP LOGGED INTERVAL	6600'	
TYPE FLUID IN HOLE	GAS/OIL/WATER	
SALINITY PPM CL.	20000	
DENSITY LB/GAL.	SEE LOG	
LEVEL	FLOWING	
MAX. REC. TEMP. DEG. F	166	
OPR. RIG TIME	MAST	
EQUIP. NO. / LOC.	HP-6385 HOBBS NM	
RECORDED BY	CHRISFIELD/STANLEY	
WITNESSED BY	MR. MILLER	

BOREHOLE RECORD

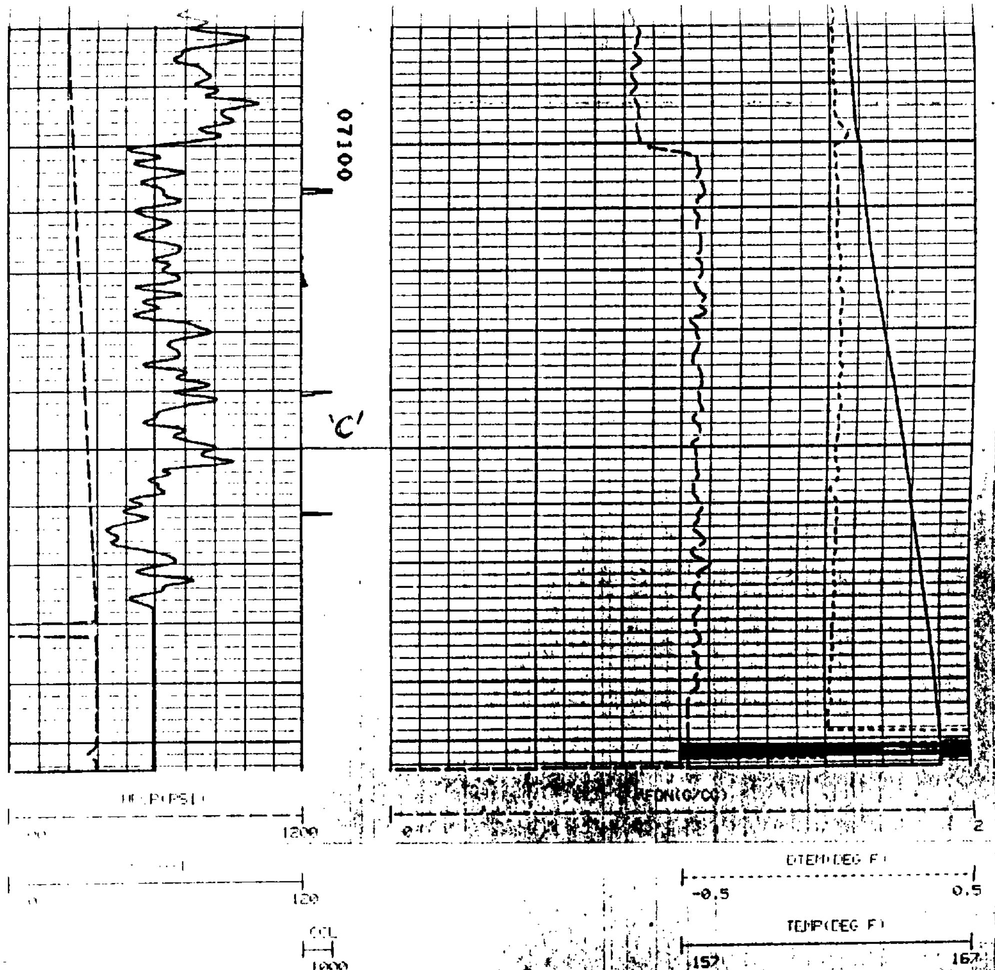
NO.	BIT	FROM	TO

RECEIVED
AUG 24 1987
OIL CON. DIV.
DIST. 3





06900
07000
07100

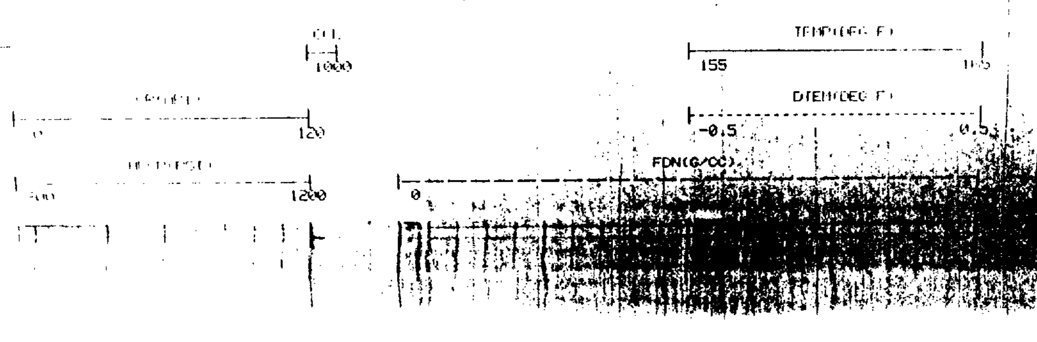


CURVE DELAYS

CURVE	DELAY	UNITS
CCL	[illegible]	FT.IN
GR	[illegible]	FT.IN
[illegible]	0	FT.IN
[illegible]	0	FT.IN
[illegible]	0	FT.IN
[illegible]	0	FT.IN
[illegible]	[illegible]	FT.IN
[illegible]	[illegible]	FT.IN
[illegible]	[illegible]	FT.IN
[illegible]	0	FT.IN
[illegible]	0	FT.IN
[illegible]	6.0	FT.IN
[illegible]	6.0	FT.IN
FDN	[illegible]	FT.IN

[illegible]: [illegible]-GREEP
[illegible]: [illegible] NO. 13 (L-27)
[illegible]: [illegible] FILE: 1 DATE: 08/12/87 TIME: 08:41:32
[illegible]: [illegible] D008 VER 2
DOWN

RUN: 1
TRIP: [illegible]
MODE: RECORD
7" DEEP



NOTE REGARDING ATLAS WELL SERVICE TERMINOLOGY OF PRODUCTION LOG

On the facing page, the column headings are abbreviated:

DEP	FMTR	FDN	TEMP	HPCP
Depth	Flow Meter	Fluid Density	Temperature	Hewlett Packard Continuous Pressure

Depth of Instruments

In bold handwritten figures are depths of the instruments at each setting (from 10 to 20 readings taken at each depth and averaged).

DEP: Depth: This is depth signal sent to computer. To get more than one reading at a set depth, the computer is told it is at a new depth.

FMTR: Flow Meter: Readings are in revolutions per second.

FDN: Density of flow stream in gmc/cc.

TEMP: Temperature in degrees F.

HPCP: Hewlett Packard continuous pressure: pressure in psia.

BENSON-MONTIN-GREER
C.O.U. NO. 13 (L-27)

0.0000000
0000000$00

SERVICE TABLE ***P 433E***   FILE LABEL # 6

TAPE LEVEL SPACING : 0.25   TAPE STARTING DEPTH :   7050.00
PRINT LEVEL SPACING : 0.00   TAPE ENDING DEPTH : 99999.00

** UNITS OF MEASURE **

DEPTH	FT
ACOUSTIC	US/FT
CALIPER	IN
TENSION	LBS
TEMPERATURE	F
PRESSURE	PSI
VOLUME	FT3

*** END OF LIST ***

r000

DEP	FMTR	FDN	TEMP	HPCP
7175.00	0.00	1.02	165.35	902.93
7180.00	0.00	1.03	165.34	903.09
7190.00	0.00	1.05	165.32	903.24
7200.00	0.00	1.02	165.32	903.26
7210.00	0.00	1.02	165.32	903.47
7220.00	0.00	0.99	165.32	903.36
7230.00	0.00	1.01	165.33	903.42
7240.00	0.00	1.01	165.34	903.38
7250.00	-0.35	1.00	165.35	903.31
7255.00	0.00	0.99	165.33	902.64
** INTERVAL AVERAGES				
0.00	-0.01	1.02	165.33	903.30

FMTR 7170'
FDN 7165'

DEP	FMTR	FDN	TEMP	HPCP
7330.00	0.00	1.04	164.23	892.19
7340.00	0.00	1.04	164.23	892.41
7350.00	0.00	0.99	164.23	892.37
7360.00	0.00	1.05	164.24	892.11
7370.00	0.00	1.01	164.24	892.14
** INTERVAL AVERAGES				
0.00	0.00	1.02	164.24	892.26

FMTR 7140'
FDN 7135'

DEP	FMTR	FDN	TEMP	HPCP
7085.00	0.00	0.77	162.38	870.21
7090.00	0.00	0.78	162.37	870.34
7100.00	0.00	0.79	162.36	870.28
7110.00	0.00	0.77	162.35	870.45
7120.00	0.00	0.79	162.33	870.32
7130.00	0.00	0.79	162.34	870.39
7135.00	0.00	0.77	162.34	870.41
** INTERVAL AVERAGES				
0.00	0.00	0.78	162.35	870.35

FMTR 7080'
FDN 7075'

I 5 N

NMOCC CASE #8946
BUSCH EXHIBIT #10

Dresser Atlas
DRESSER

PRODUCTION LOGGING SERVICES

FILE NO.	
API NO.	
FIELD PRINT	

COMPANY BENSON-MONTIN-GREER DRILLING CORPORATION
WELL CANADA OJITOS UNIT NO. 25 (B-32)
FIELD PUERTO CHIQUITO WEST MANCOS
COUNTY RIO ARRIBA STATE NEW MEXICO

LOCATION: (2)
231' FNL & 2218' FEL
SEC 32 TWP 25N RGE 1W

OTHER SERVICES
PCM:
GR HP
FDN FMTR
TEMP

PERMANENT DATUM GROUND LEVEL ELEV. 7599'
LOGGING MEASURED FROM K.B. 12 FT. ABOVE P.D.
DRILLING MEASURED FROM K.B.

ELEVATIONS
KB 7611'
DF 7610'
GL 7599'

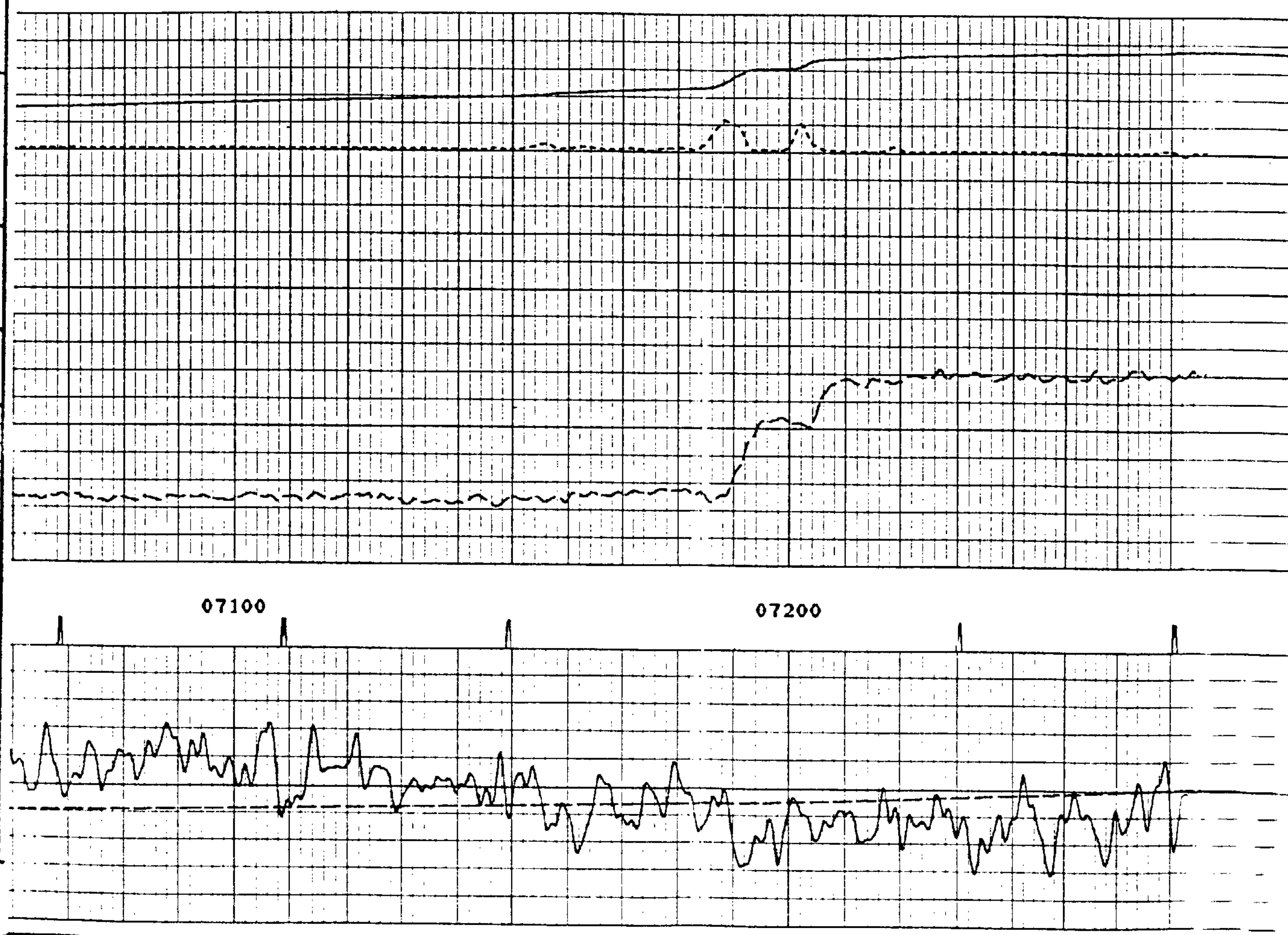
DATE	11 AUG 1987	
RUN	1	
SERVICE ORDER	147032	
DEPTH-DRILLER	7485'	
DEPTH-LOGGER	7440'	
BOTTOM LOGGED INTERVAL	7440'	
TOP LOGGED INTERVAL	6700'	
TYPE FLUID IN HOLE	GAS/OIL	
SALINITY PPM CL.	20000	
DENSITY LB/GAL.	SEE LOG	
LEVEL	FLOWING	
MAX. REC. TEMP. DEG. F	170	
RIG TIME	MAST	
EQUIP. NO. / LOC.	HP-6385	HOBBS NM
RECORDED BY	CHRISFIELD/STANLEY	
WITNESSED BY	MR. MILLER	

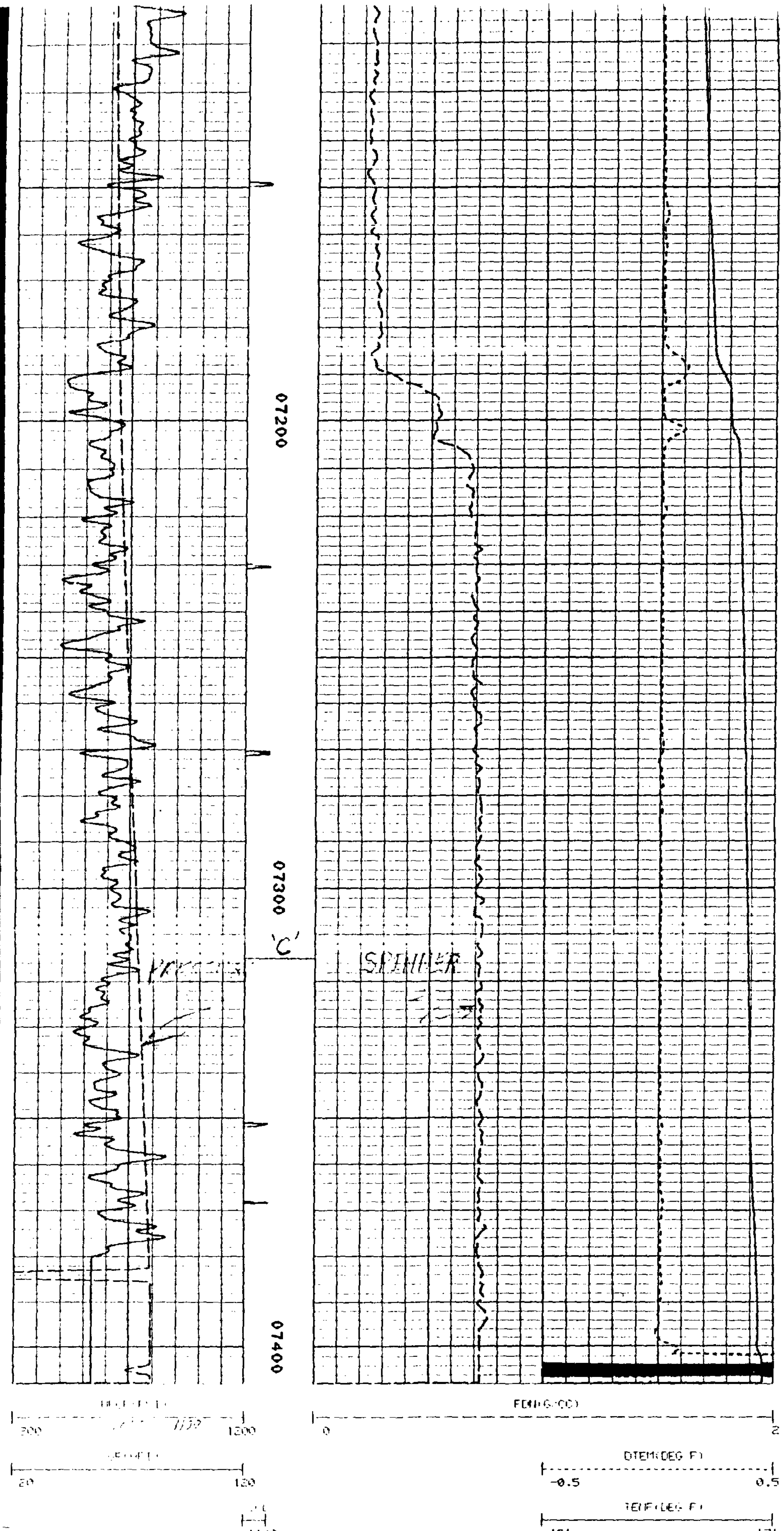
BOREHOLE RECORD

RUN	BIT	FROM	TO

Field Print

RECEIVED
AUG 17 1987
OIL CON. DIV
DIST. 3




07200
07300
07400
'C'
SPINNER
300
1200
20
120
1100
0
2
DTEMP(DEG F)
-0.5
0.5
161
171

NOTE REGARDING ATLAS WELL SERVICE TERMINOLOGY OF PRODUCTION LOG

On the facing page, the column headings are abbreviated:

DEP	FMTR	FDN	TEMP	HPCP
Depth	Flow Meter	Fluid Density	Temperature	Hewlett Packard Continuous Pressure

Depth of Instruments

In bold handwritten figures are depths of the instruments at each setting (from 10 to 20 readings taken at each depth and averaged).

DEP: Depth: This is depth signal sent to computer. To get more than one reading at a set depth, the computer is told it is at a new depth.

FMTR: Flow Meter: Readings are in revolutions per second.

FDN: Density of flow stream in gmc/cc.

TEMP: Temperature in degrees F.

HPCP: Hewlett Packard continuous pressure: pressure in psia.

BENSON-MONTIN-GREER
C.O.U. NO. 25 (E-32)

SERVICE TABLE ***A 433B***   FILE LABEL # 6

TAPE LEVEL SPACING : 0.25   TAPE STARTING DEPTH : 7400.00
PRINT LEVEL SPACING : 0.00   TAPE ENDING DEPTH : 99999.00

** UNITS OF MEASURE **

DEPTH	FT
ACOUSTIC	US/FT
CALIPER	IN
TENSION	LBS
TEMPERATURE	F
PRESSURE	PSI
VOLUME	FT3

*** END OF LIST ***

DEP	FMTR	FDN	TEMP	HPRS
7405.00	7.62	0.72	170.67	1037.62
7410.00	7.55	0.73	170.67	1037.57
7420.00	7.35	0.72	170.67	1037.62
7430.00	7.07	0.73	170.66	1037.70
7440.00	7.15	0.72	170.67	1037.75
7450.00	7.22	0.75	170.67	1037.70
7460.00	7.56	0.73	170.67	1037.70
7470.00	7.77	0.71	170.67	1037.65
7480.00	7.34	0.70	170.66	1037.57
7490.00	7.64	0.73	170.66	1037.54
7500.00	7.35	0.70	170.66	1037.48
7510.00	7.64	0.73	170.67	1037.46
7520.00	7.92	0.72	170.67	1037.43
7530.00	7.66	0.71	170.67	1037.41
7540.00	7.51	0.73	170.67	1037.31
[illegible]	[illegible]	0.75	[illegible]	[illegible]

** INTERVAL AVERAGES --

0.00	7.58	0.72	170.67	1037.58

FMTR 7405'
FDN 7400'

7360.00	15.15	0.73	170.15	1023.11
7370.00	16.07	0.71	170.14	1023.07
7380.00	16.10	0.71	170.13	1023.04
7390.00	15.93	0.72	170.13	1023.00
7400.00	15.24	0.73	170.13	1022.96
7410.00	16.10	0.73	170.12	1022.86
7420.00	16.11	0.71	170.12	1022.82
7430.00	16.00	0.72	170.12	1022.83
7440.00	15.91	0.74	170.12	[illegible]
7450.00	15.35	0.73	170.12	1022.36
7460.00	15.86	0.73	170.12	1022.75

** INTERVAL AVERAGES --

0.00	16.01	0.73	170.13	1022.93

FMTR 7360'
FDN 7355'

DEP	FMTR	FDN	TEMP	HPCP
7540.00	16.65	0.68	169.92	1008.49
7550.00	17.19	0.67	169.92	1008.47
7560.00	17.34	0.68	169.92	1008.43
7570.00	17.17	0.68	169.91	1008.45
7580.00	17.09	0.73	169.91	1008.48
7590.00	16.36	0.71	169.90	1008.42
7600.00	16.34	0.70	169.90	1008.38
7610.00	16.65	0.72	169.90	1008.41
7620.00	16.54	0.73	169.90	1008.39
7630.00	16.50	0.71	169.89	1008.36
** INTERVAL AVERAGES				
0.00	16.98	0.71	169.91	1008.42

FMTR 7315'
FDN 7310'

DEP	FMTR	FDN	TEMP	HPCP
7667.00	15.40	0.67	169.83	1001.06
7670.00	15.51	0.67	169.83	1001.06
7680.00	15.33	0.69	169.82	1001.05
7690.00	15.62	0.70	169.81	1001.07
7700.00	15.36	0.70	169.81	1001.08
7710.00	15.73	0.68	169.80	1001.04
7720.00	15.23	0.68	169.80	1001.03
7730.00	15.39	0.68	169.79	1000.96
7740.00	15.87	0.63	169.79	1000.92
7750.00	15.93	0.66	169.79	1000.88
7757.00	16.17	0.67	169.79	1000.86
** INTERVAL AVERAGES				
0.00	15.31	0.68	169.80	1001.00

FMTR 7290'
FDN 7285'

DEP	FMTR	FDN	TEMP	HPCP
7805.00	16.53	0.66	169.69	990.55
7810.00	16.79	0.66	169.69	990.49
7820.00	16.79	0.63	169.68	990.44
7830.00	16.77	0.65	169.67	990.42
7840.00	17.04	0.67	169.67	990.34
7850.00	16.57	0.66	169.67	990.29
7860.00	16.34	0.68	169.66	990.27
7870.00	16.62	0.71	169.66	990.26
7880.00	16.78	0.67	169.66	990.24
7890.00	16.73	0.67	169.66	990.28
7900.00	16.83	0.67	169.66	990.28
7905.00	16.74	0.70	169.65	990.25
** INTERVAL AVERAGES				
0.00	16.68	0.67	169.67	990.33

FMTR 7255'
FDN 7250'

DEP	FMTR	FDN	TEMP	HPCP
7945.00	16.04	0.68	169.58	984.47
7950.00	16.14	0.65	169.58	984.47
7960.00	16.25	0.67	169.57	984.47
7970.00	16.47	0.64	169.57	984.47
7980.00	16.46	0.66	169.56	984.47
7990.00	16.34	0.69	169.56	984.45
8000.00	16.57	0.69	169.56	984.41
8010.00	16.39	0.69	169.56	984.42
8020.00	16.37	0.65	169.56	984.39
8030.00	16.69	0.65	169.56	984.35
8040.00	16.33	0.67	169.55	984.32
8045.00	16.49	0.69	169.56	984.25
** INTERVAL AVERAGES				
0.00	16.42	0.67	169.56	984.43

FMTR 7235'
FDN 7230'

Western Atlas International
A Litton/Dresser Company

Western Geophysical
Atlas Wireline Services
Core Laboratories
LRS
Aero Service
Downhole Seismic Service
J S Nolen & Associates

2-4-88

Atlas Wireline Services

Benson-Montin-Greer, Canada Ojitos Unit Well B-32
(intervals numbered from top downward)

Surface Rates

648 BOPD
894.24 MSCFD
39 API
0.7 gas gravity
960 psi downhole
166 ^{o}F downhole

Downhole Rates

805 BOPD
1920 BGPD
56.7 basket RPS** in total flow
56.7/2725 = .0208 RPS/BPD

Interval one (7150-7170)

240 BGPD (13% of total free gas)
*RPS = 5

Interval two (7190-7210)

1682 BGPD (87% of total free gas)
*RPS = 35

Interval three (7362-7382)

409 BOPD (53% of total oil)
*RPS = 8.5

Interval four (7436-7456)

361 BOPD (47% of total oil)
*RPS = 7.5

---

* Indicates differential RPS across interval.

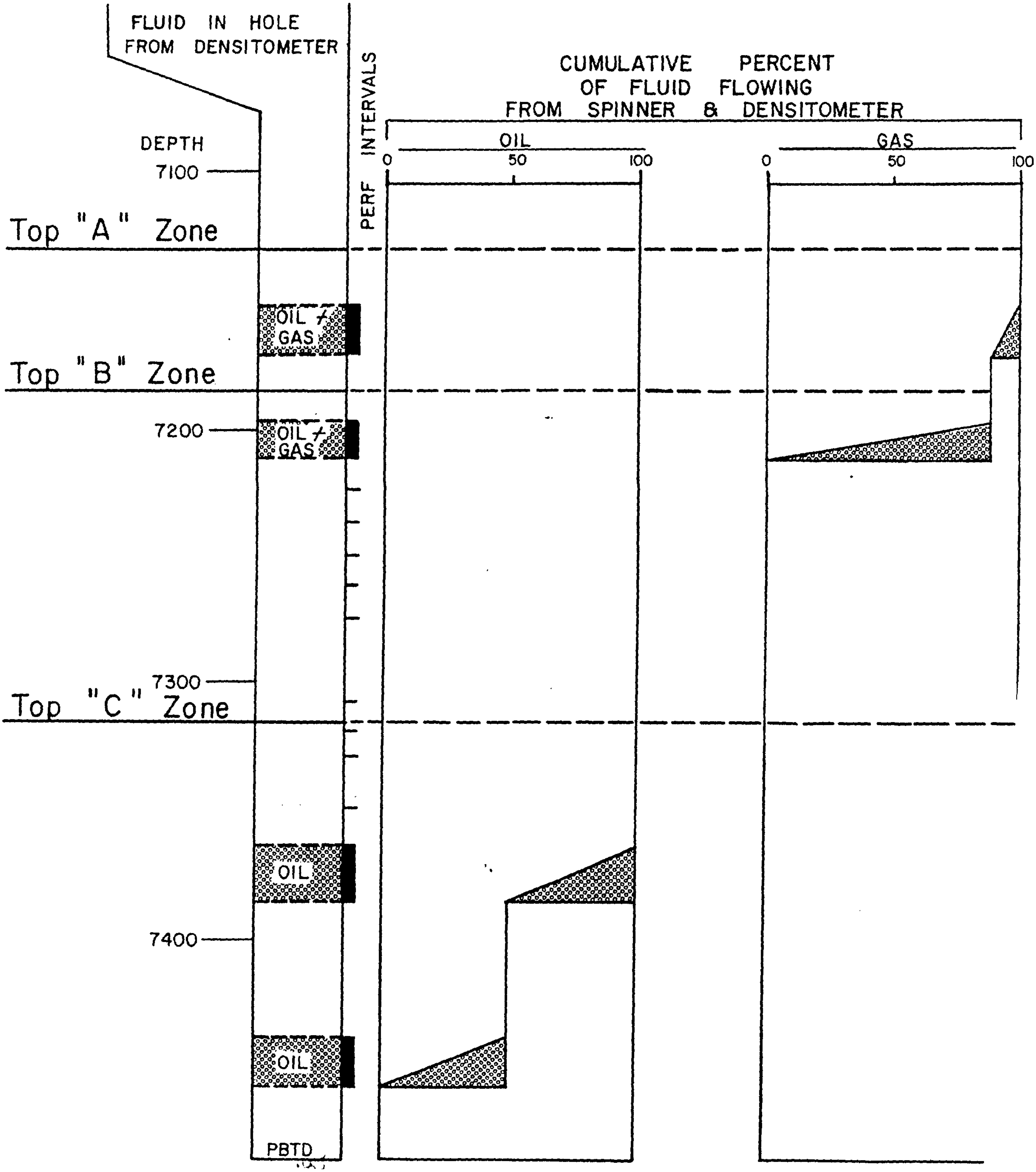
** Stationary data are presented at bottom of log, with recording depths shown handwritten at right. Each line of data corresponds to a single stationary recording; the column headed "DEP" does not indicate recording depth. Average of Fluid Density data recorded stationary is more representative than data recorded with tool moving, which comprise the Fluid Density curve shown by the composite presentation.

Volumetric flow rates apply to downhole conditions and are not adjusted to surface.

Downhole rates determined from formation volume factors based on COU L-11 fluid sample analysis, as furnished by Benson-Montin-Greer.

SUMMARY OF
PRODUCTION LOG
8-10-87

COU B-32
Sec. 32-T25N-R1W



STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

Form C-105
Revised 10-1-78

NMOCC CASE #8946
BUSCH EXHIBIT #11

OIL CONSERVATION DIVISION

P. O. BOX 2088
SANTA FE, NEW MEXICO 87501

WELL COMPLETION OR RECOMPLETION REPORT AND LOG

RECEIVED
JUL 26 1985
OIL CON. DIV.
DIST. 3

DISTRIBUTION
SANTA FE
FILE
U.S.G.S.
LAND OFFICE
OPERATOR

5a. Indicate Type of Lease: State [ ] Fee [X]

5. State Oil & Gas Lease No.

1a. TYPE OF WELL: OIL WELL [X] GAS WELL [ ] DRY [ ] OTHER

b. TYPE OF COMPLETION: NEW WELL [X] WORK OVER [ ] DEEPEN [ ] PLUG BACK [ ] DIFF. RESVR. [ ] OTHER

7. Unit Agreement Name

8. Farm or Lease Name: Amoco Federal Schmitz Anticline

2. Name of Operator: Amoco Production Co.

9. Well No.: 1

3. Address of Operator: 501 Airport Drive, Farmington, N M 87401

10. Field and Pool, or Wildcat: W. Puerto Chiquito Mancos

4. Location of Well: UNIT LETTER K LOCATED 1650 FEET FROM THE South LINE AND 1980 FEET FROM THE West LINE OF SEC. 25 TWP. 24N RGE. 1W NMPM

12. County: Rio Arriba

15. Date Spudded	16. Date T.D. Reached	17. Date Compl. (Ready to Prod.)	18. Elevations (DF, RKB, RT, GR, etc.)	19. Elev. Cashinghead
4-20-84	5-14-84	7-24-84	7274' KB	7262' GR

20. Total Depth	21. Plug Back T.D.	22. If Multiple Compl., How Many	23. Intervals Drilled By	Rotary Tools	Cable Tools
7744'	7700'	Two	→	0-TD	

24. Producing Interval(s), of this completion — Top, Bottom, Name: 6420'-6510' Gallup

25. Was Directional Survey Made: Yes

26. Type Electric and Other Logs Run: DIL-SP-GR; Lithodensity-GR; Dipmeter; Lss-Volan; EPT

27. Was Well Cored: No

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT LB./FT.	DEPTH SET	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
8-5/8"	24#,K55	332'	12-1/4"	318 cf Class H Neat	
5-1/2"	15.5#,K55	7743'	7-7/8"	955 cf Class B Neat, 1247 cf Class B Neat	

29. LINER RECORD

SIZE	TOP	BOTTOM	SACKS CEMENT	SCREEN

30. TUBING RECORD

SIZE	DEPTH SET	PACKER SET
2-7/8"	6509'	

31. Perforation Record (Interval, size and number)
5790'-5830', 5890'-5920', 5990'-6030', 6120'-6200', 6250'-6380', 6420'-6510', 1 jspf, .33", 205 holes.

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL	AMOUNT AND KIND MATERIAL USED
6250'-6510'	102,000 gal 30# gel and 99,600 # 20-40 Sand
5790'-6200'	141,000 gal 30# gel and 111,200 # 30-40 Sand (Over)

33. PRODUCTION

Date First Production	Production Method (Flowing, gas lift, pumping — Size and type pump)	Well Status (Prod. or Shut-in)
7-24-84	Pumping 2' x 1-1/2" x 20' pump	Shut-in

Date of Test	Hours Tested	Choke Size	Prod'n. For Test Period	Oil — Bbl.	Gas — MCF	Water — Bbl.	Gas—Oil Ratio
7-25-84	3 hrs	open	→	5.4	3	4.4	558

Flow Tubing Press.	Casing Pressure	Calculated 24-Hour Rate	Oil — Bbl.	Gas — MCF	Water — Bbl.	Oil Gravity — API (Corr.)
0 psig	145 psig	→	43	24	35	

34. Disposition of Gas (Sold, used for fuel, vented, etc.): vented and lease use

Test Witnessed By: Hollis Vaughn

35. List of Attachments: None

36. I hereby certify that the information shown on both sides of this form is true and complete to the best of my knowledge and belief.

SIGNED B D Shaw TITLE Adm. Supervisor DATE 7-25-85

Note → 32. 5790'-6380' squeezed with 767 cf Class B, 2% CaCl, .8% D-60

INSTRUCTIONS

This form is to be filed with the appropriate District Office of the Division not later than 20 days after the completion of any newly-drilled or deepened well. It shall be accompanied by one copy of all electrical and radio-activity logs run on the well and a summary of all special tests conducted, including drill stem tests. All depths reported shall be measured depths. In the case of directionally drilled wells, true vertical depths shall also be reported. For multiple completions, Items 30 through 34 shall be reported for each zone. The form is to be filed in quintuplicate except on state land, where six copies are required. See Rule 1105.

INDICATE FORMATION TOPS IN CONFORMANCE WITH GEOGRAPHICAL SECTION OF STATE

Southeastern New Mexico		Northwestern New Mexico	
T. Anhy	T. Canyon	T. Ojo Alamo 1910	T. Penn. "B"
T. Salt	T. Strawn	T. Kirtland-Fruitland 2200	T. Penn. "C"
B. Salt	T. Atoka	T. Pictured Cliffs 2360	T. Penn. "D"
T. Yates	T. Miss	T. Cliff House 4550	T. Leadville
T. 7 Rivers	T. Devonian	T. Menefee 4760	T. Madison

DUAL INDUCTION - SFL

CSU

4

COMPANY:	AMOCO PRODUCTION COMPANY
WELL:	AMOCO FED. SCHMITZ ANTICLINE #1
FIELD:	BASIN DAKOTA W. PUERTO CHIQUITO MANCOS
COUNTY:	RIO ARRIBA
STATE:	NEW MEXICO
LOCATION:	1980 FWL 1650 FSL
SEC: K	25 TWP: 24 N RGE: 1 W

PERMANENT DATUM: G. L.
ELEV. OF PERM. DATUM: 7262.0 F
LOG MEASURED FROM: K. B.
12.0 F ABOVE PERM. DATUM
DRLG. MEASURED FROM: K. B.

ELEVATIONS-
KB: 7274.0 F
DF: 7273.0 F
GL: 7262.0 F

DATE: 13 MAY 84
RUN NO: 1

DEPTH-DRILLER: 7743.0 F
DEPTH-LOGGER: 7744.0 F
BTM. LOG INTERVAL: 7733.0 F
TOP LOG INTERVAL:

CASING-DRILLER: 336 F
CASING-LOGGER: 333 F
CASING: 8.625
…ZE: 7.875

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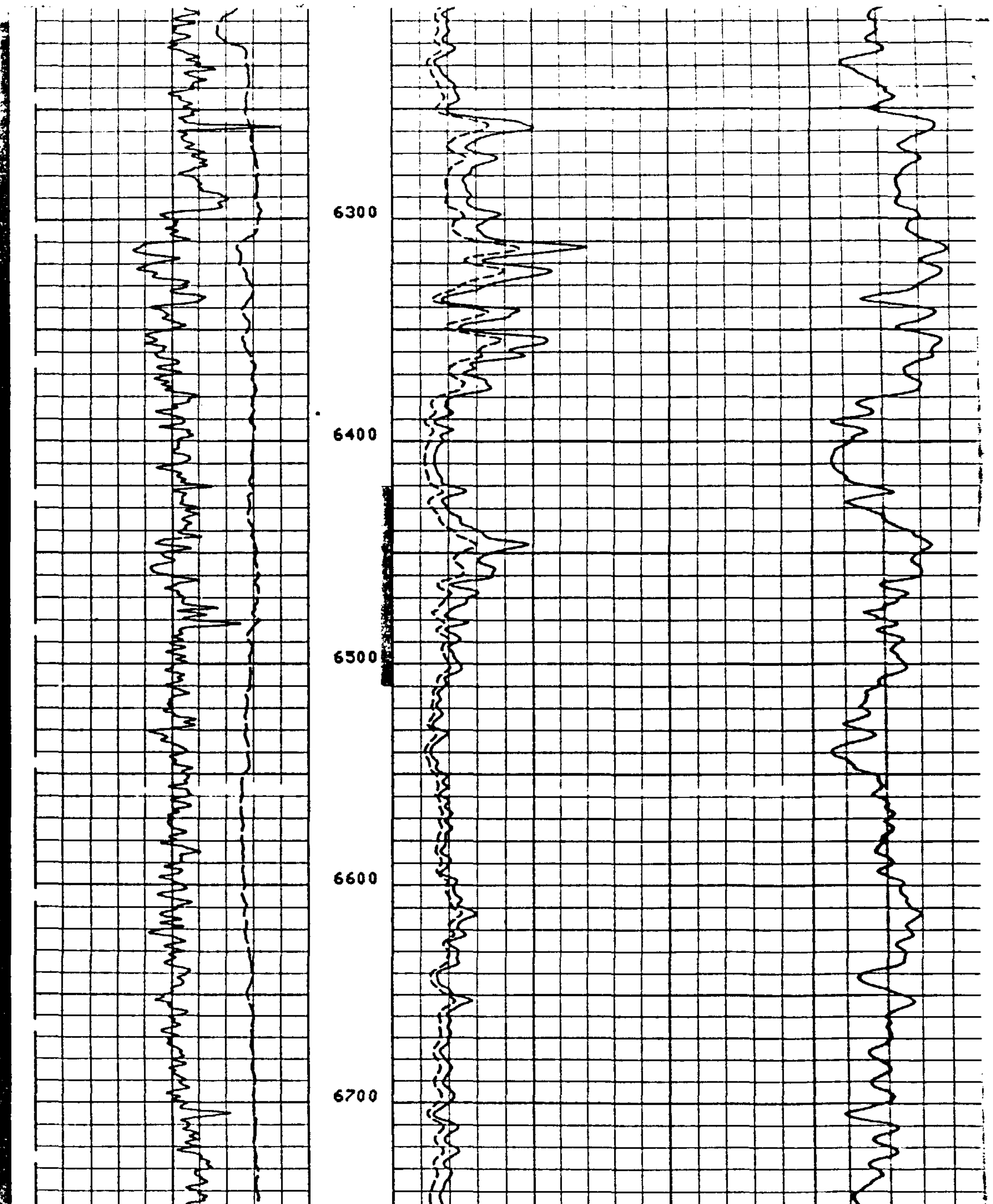
JUN 05 1984
OIL CON. DIV.
DIST. 3



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Form C-105
Revised 11-1-16

NEW MEXICO OIL CONSERVATION COMMISSION
WELL COMPLETION OR RECOMPLETION REPORT AND LOG

CONFIDENTIAL

RECEIVED
FEB 04 1988
OIL CON. DIV
DIST. 3

5a. Indicate Type of Lease: State [X] Fee [ ]
5. State Oil & Gas Lease No. LG-2385

1a. TYPE OF WELL: OIL WELL [X] GAS WELL [ ] DRY [ ] OTHER ____

b. TYPE OF COMPLETION: NEW WELL [X] WORK OVER [ ] DEEPEN [ ] PLUG BACK [ ] DIFF. RESVR. [ ] OTHER ____

7. Unit Agreement Name:

8. Farm or Lease Name: State CC

2. Name of Operator: Amoco Production Company

9. Well No.: 1

3. Address of Operator: 2325 East 30th Street Farmington, NM 87401

10. Field and Pool, or Wildcat: W Puerto Chiquito Mancos

4. Location of Well

UNIT LETTER J LOCATED 1650 FEET FROM THE South LINE AND 2100 FEET FROM THE East LINE OF SEC. 26 TWP. 24N RGE. 1W NMPM

12. County: Rio Arribo

15. Date Spudded	16. Date T.D. Reached	17. Date Compl. (Ready to Prod.)	18. Elevations (DF, RKB, RT, GR, etc.)	19. Elev. Cashinghead
11-4-87	11-14-87	1-5-88	7292' GR	7305'

20. Total Depth	21. Plug Back T.D.	22. If Multiple Compl., How Many	23. Intervals Drilled By →	Rotary Tools	Cable Tools
6860'	6795'	Single		0-TD	

24. Producing Interval(s), of this completion — Top, Bottom, Name: 6662' - 6736' Mancos

25. Was Directional Survey Made: Yes

26. Type Electric and Other Logs Run: CNL-FDC, DIL-SFL-GR

27. Was Well Cored: No

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT LB./FT.	DEPTH SET	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
9-5/8"	36 # K55	317'	12-1/4"	260 cf Class B Ideal	
5-1/2"	15.5 # K55	6859'	7-7/8"	665 cf Class B 50:50 poz,	
				1192 cf Class B 65:35 poz,	
				118 cf Class B Ideal	

29. LINER RECORD

SIZE	TOP	BOTTOM	SACKS CEMENT	SCREEN

30. TUBING RECORD

SIZE	DEPTH SET	PACKER SET
2-7/8"	6752'	

31. Perforation Record (Interval, size and number): 6662'-6676', 6676'-6696', 6696'-6716', 6716'-6736', 2 jspf, .45" in diameter, for a total of 148 holes

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL	AMOUNT AND KIND MATERIAL USED
6662'-6736'	85,000 gals 30# gel surf. per 1000 gals 2% KCL, 87,500 # 20-40 mesh brady sand

33. PRODUCTION

Date First Production	Production Method (Flowing, gas lift, pumping — Size and type pump)	Well Status (Prod. or Shut-in)
1-5-88	Pumping - 2×2×20 RHBCT-TS	Producing

Date of Test	Hours Tested	Choke Size	Prod'n. For Test Period →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Gas—Oil Ratio
1-30-88	24 hrs.			325	0	27	0

Flow Tubing Press.	Casing Pressure	Calculated 24-Hour Rate →	Oil — Bbl.	Gas — MCF	Water — Bbl.	Oil Gravity — API (Corr.)
90 psig	90 psig		325	0	27	41.2

34. Disposition of Gas (Sold, used for fuel, vented, etc.): Vented or used for fuel

Test Witnessed By: Albert Salazar

35. List of Attachments

36. I hereby certify that the information shown on both sides of this form is true and complete to the best of my knowledge and belief.

SIGNED BD Shaw TITLE Adm Supervisor DATE 2-4-88

NMOCC CASE #8946
BUSCH EXHIBIT #12

CONFIDENTIAL

FINAL PRINT
Schlumberger

DUAL INDUCTION - SFL
WITH LINEAR CORRELATION LOG

COUNTY	RIO ARRIBA
FIELD	W. PUERTO CHIQUITO MANCOS
LOCATION	1650' FSL & 2100' FEL
WELL	STATE CC #1
COMPANY	AMOCO PRODUCTION COMPANY

COMPANY AMOCO PRODUCTION COMPANY

WELL STATE CC #1

FIELD W. PUERTO CHIQUITO MANCOS

COUNTY RIO ARRIBA STATE NEW MEXICO

LOCATION 1650' FSL & 2100' FEL 10

Other Services: FDC/CNT, BHTV, DL

API SERIAL NO.	SECT.	TWP.	RANGE
	26	24N	1W

Permanent Datum	GL	Elev.	7292.0 F	Elev.: K.B. 7304.0 F
Log Measured From	KB	12.0 F	above Perm. Datum	D.F. 7303.0 F
Drilling Measured From	KB			G.L. 7292.0 F

Date	14-NOV-87		
Run No.	ONE		
Depth Driller	6861.0 F		
Depth Logger (Schl.)	6861.0 F		
Btm. Log Interval	6855.0 F		
Top Log Interval	316.0 F		
Casing-Driller	8.625 @ 316.0 F	@	
Casing-Logger	316.0 F		
Bit Size	7.875		
Type Fluid in Hole	L.S.N.D.		
Dens. / Visc.	8.80 LB/G	57.0 S	
pH / Fld. Loss	8.5	6.4 C3	
Source of Sample	TANK		
Rm @ Meas. Temp.	5.420 OHMM @ 65.0 DEGF		@
Rmf @ Meas. Temp.	4.670 OHMM @ 68.0 DEGF		@
Rmc @ Meas. Temp.	8.130 OHMM @ 65.0 DEGF		@
Source: Rmf / Rmc	MEAS	CALC	
Rm @ BHT	2.256 OHMM @ 166. DEGF		@
Time: Circulation Ended	20:00 11/13		
Time: Logger on Bottom	2:45 11/14		
Max. Rec. Temp.	166. DEGF		
Equip. / Location	8174	FARMINGTON	
Recorded By	GARBER/SITTON		
Witnessed By	D. DELVENTHAL		

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OIL CON. DIV.
DIST. 3

The well name, location and borehole reference data were furnished by the customer.

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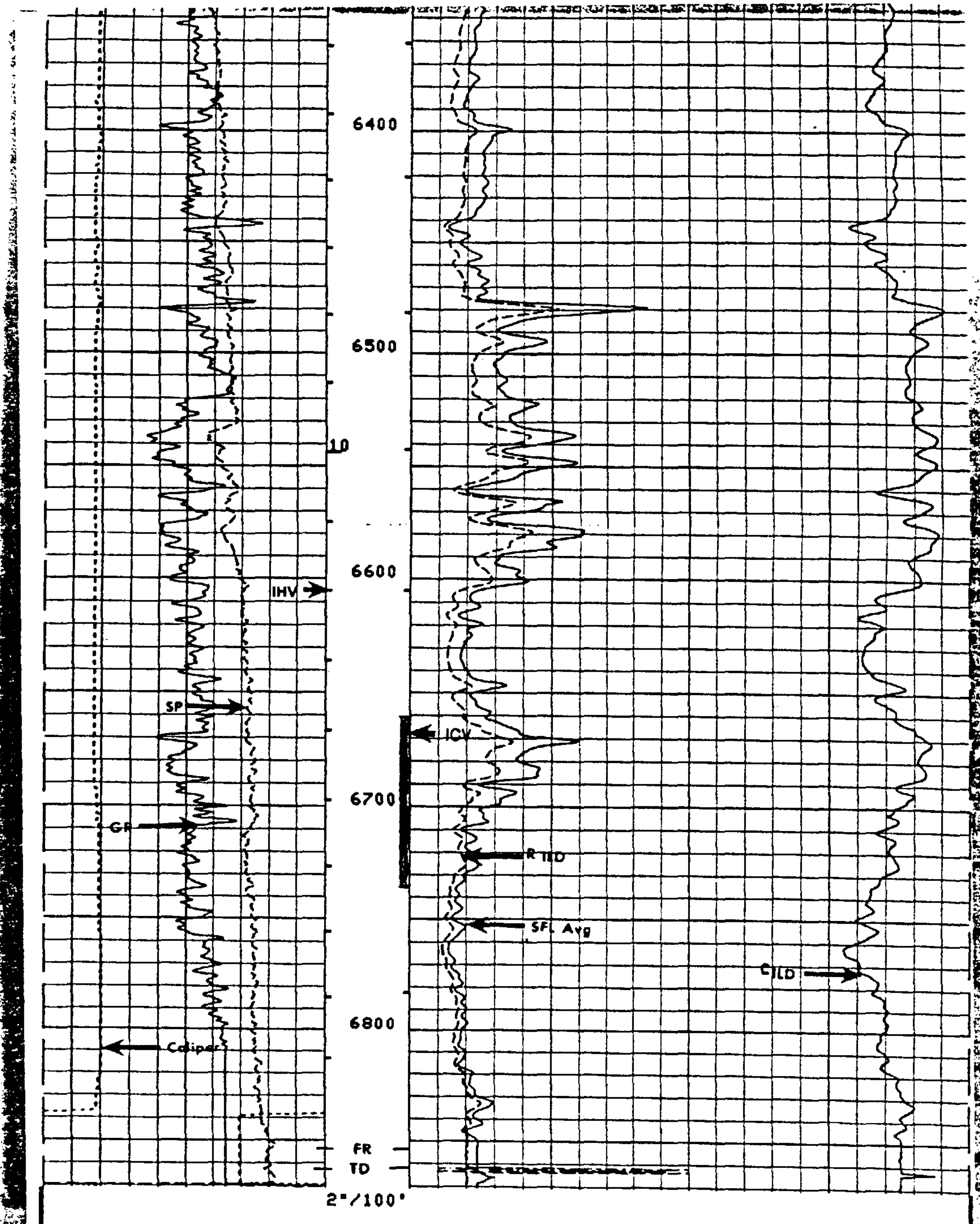

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION
P. O. BOX 2088
SANTA FE, NEW MEXICO 87501

Form C-116
Revised 10-1-78

GAS-OIL RATIO TESTS

Operator: Amoco Production
Pool: Puerto Chiquito, west
County: Rio Arriba
Address: 2325 east 30th Street Farmington, NM 87401
TYPE OF TEST - (X): Scheduled [ ] Completion [X] Special [ ]

LEASE NAME	WELL NO.	LOCATION U	LOCATION S	LOCATION T	LOCATION R	DATE OF TEST	STATUS	CHOKE SIZE	TBG. PRESS	DAILY ALLOW-ABLE	LENGTH OF TEST HOURS	PROD. DURING TEST WATER BBLS.	PROD. DURING TEST GRAV. OIL	PROD. DURING TEST OIL BBLS.	PROD. DURING TEST GAS M.C.F.	GAS - OIL RATIO CU.FT./BBL
State Com CC	1	J	26	N24	W01	6/6/88	P				24	0		626	100	160

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OIL CON. DIV.
DIST. 3

No well will be assigned an allowable greater than the amount of oil produced on the official test.

During gas-oil ratio test, each well shall be produced at a rate not exceeding the top unit allowable for the pool in which well is located by more than 25 percent. Operator is encouraged to take advantage of this 25 percent tolerance in order that well can be assigned increased allowables when authorized by the Division.

Gas volumes must be reported in MCF measured at a pressure base of 15.025 psia and a temperature of 60° F. Specific gravity base will be 0.60.

Report casing pressure in lieu of tubing pressure for any well producing through casing.

Mail original and one copy of this report to the district office of the New Mexico Oil Conservation Division in accordance with Rule 301 and appropriate pool rules.

I hereby certify that the above information is true and complete to the best of my knowledge and belief.

C B Douglas
(Signature)
Sr. Staff [illegible]
(Title)
6-7-88
(Date)

5 NMOCD 1 DE 1 Mobil 1 File

Form C-105
Revised 10-1-78

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

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OIL CONSERVATION DIVISION
P. O. BOX 2088
SANTA FE, NEW MEXICO 87501

WELL COMPLETION OR RECOMPLETION REPORT AND LOG

RECEIVED
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OIL CON. DIV.
DIST. 3

5a. Indicate Type of Lease: State ☐ Fee [XX]

5. State Oil & Gas Lease No.

1a. TYPE OF WELL: OIL WELL [XX] GAS WELL ☐ DRY ☐ OTHER

b. TYPE OF COMPLETION: NEW WELL [XX] WORK OVER ☐ DEEPEN ☐ PLUG BACK ☐ DIFF. RESVR. ☐ OTHER

7. Unit Agreement Name

8. Farm or Lease Name: Wishing Well 35

CONFIDENTIAL

2. Name of Operator: NASSAU RESOURCES, INC.

9. Well No.: #7

3. Address of Operator: P O Box 809 Farmington, N.M. 87499

10. Field and Pool, or Wildcat: West Puerto Chiquito Mancos

4. Location of Well

UNIT LETTER G LOCATED 2210 FEET FROM THE North LINE AND 2310 FEET FROM THE East LINE OF SEC. 35 TWP. 24North RGE. 1West NMPM

12. County: Rio Arriba

15. Date Spudded	16. Date T.D. Reached	17. Date Compl. (Ready to Prod.)	18. Elevations (DF, RKB, RT, GR, etc.)	19. Elev. Casinghead
12-20-87	1-8-88	3-5-88	7255'GL 7267'KB	7255'GL

20. Total Depth	21. Plug Back T.D.	22. If Multiple Compl., How Many	23. Intervals Drilled By	Rotary Tools	Cable Tools
7850'	7780'		→	TD	--

24. Producing Interval(s), of this completion — Top, Bottom, Name: 6344-6597' Mancos

25. Was Directional Survey Made: Yes

26. Type Electric and Other Logs Run: Oriented Micro Resistivity, CN-FD, GR (temperature log) Continuous Dipmeter

27. Was Well Cored: No

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT LB./FT.	DEPTH SET	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
9-5/8"	36#	304'KB	12-1/4"	180 sx of class "B" w/2%	---
				CaCL (212 cu.ft.)	
5-1/2"	17# & 15.5	7819'	7-7/8"	Total of 2821 cu.ft.	----
				in 3 stages. See attached.	

29. LINER RECORD

SIZE	TOP	BOTTOM	SACKS CEMENT	SCREEN
N/A				

30. TUBING RECORD

SIZE	DEPTH SET	PACKER SET
2-7/8"	6613'KB	----

31. Perforation Record (Interval, size and number)

6344, 48, 53, 60, 67, 69, 73, 80, 86, 90
6400, 23, 28, 38, 40, 43, 48, 50, 53, 55, 67,
80, 85, 89, 94, 99
6505, 70, 74, 75, 81, 84, 89, 94, 97
Total of 35 holes.

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL	AMOUNT AND KIND MATERIAL USED
6344-6597'	1500 gal. 15% HCL Acid
	200,000 # of 20/40 sand
	3904 bbls. SLK water

33. PRODUCTION

Date First Production	Production Method (Flowing, gas lift, pumping — Size and type pump)	Well Status (Prod. or Shut-in)
2-22-88*	Flowing	SI

Date of Test	Hours Tested	Choke Size	Prod'n. For Test Period	Oil — Bbl.	Gas — MCF	Water — Bbl.	Gas—Oil Ratio
3-5-88	24	27/64"	→	402	359	20 (frac)	893

Flow Tubing Press.	Casing Pressure	Calculated 24-Hour Rate	Oil — Bbl.	Gas — MCF	Water — Bbl.	Oil Gravity — API (Corr.)
300 psi	810 psi	→	402 BOPD	359 MCFD	20 (frac wtr)	41.6°

34. Disposition of Gas (Sold, used for fuel, vented, etc.): Vented during test; to be sold

Test Witnessed By: Brasuel

35. List of Attachments: Cement detail.

36. I hereby certify that the information shown on both sides of this form is true and complete to the best of my knowledge and belief.

SIGNED [signature] James S. Hazen TITLE Field Supt. DATE 3/8/88

NMOCC CASE #8946
BUSCH EXHIBIT #13

Schlumberger

DUAL INDUCTION - SFL

WITH LINEAR CORRELATION LOG

COUNTY	RIO ARRIBA
FIELD	W.PUERTO CHIQUITO MAN-DAK
LOCATION	2310' FEL & 2210' FNL
WELL	WISHING WELL 35 #7
COMPANY	NASSUA RESOURCES, INCORPORA

COMPANY NASSUA RESOURCES, INCORPORATED

WELL WISHING WELL 35 #7

FIELD W.PUERTO CHIQUITO MAN-DAK.

COUNTY RIO ARRIBA STATE NEW MEXICO

LOCATION 2310' FEL & 2210' FNL

7

Other Services: FDC/CNT NDT

API SERIAL NO.	SECT.	TWP.	RANGE
UNAVAIL.	35	24 N	1 W

Permanent Datum GL Elev. 7255.0 F

Log Measured From KB 12.0 F above Perm. Datum

Drilling Measured From KB

Elev.: K.B. 7267.0 F D.F. G.L. 7255.0 F

Date	08-JAN-88			
Run No.	ONE			
Depth Driller	7850.0 F			
Depth Logger (Schl.)	7804.0 F			
Btm. Log Interval	7798.0 F			
Top Log Interval	250.0 F			
Casing-Driller	9.625 IN @ 304.0 F	@	@	@
Casing-Logger	303.0 F			
Bit Size	12.25 IN	7.875 IN		
Type Fluid in Hole	GEL CHEM			
Dens. / Visc.	9.10 LB/G	65.0 S		
pH / Fld. Loss	9.0	6.0 C3		
Source of Sample	MUD TANK			
Rm @ Meas. Temp.	4.260 OHMM @ 55.0 DEGF		@	
Rmf @ Meas. Temp.	3.690 OHMM @ 55.0 DEGF		@	
Rmc @ Meas. Temp.	7.180 OHMM @ 55.0 DEGF		@	
Source: Rmf / Rmc	MEASURED	CALCULATED		
Rm @ BHT	1.682 OHMM @ 150. DEGF		@	
Time: Circulation Ended	11:00 1/8			
Time: Logger on Bottom	6:00 1/9		JAN 12 1988	
Max. Rec. Temp.	150. DEGF			
Equip. / Location	8191	FARMINGTON4314		
Recorded By	AYRES			
Witnessed By	BRASUEL			

The well name, location and borehole reference data were furnished by the customer

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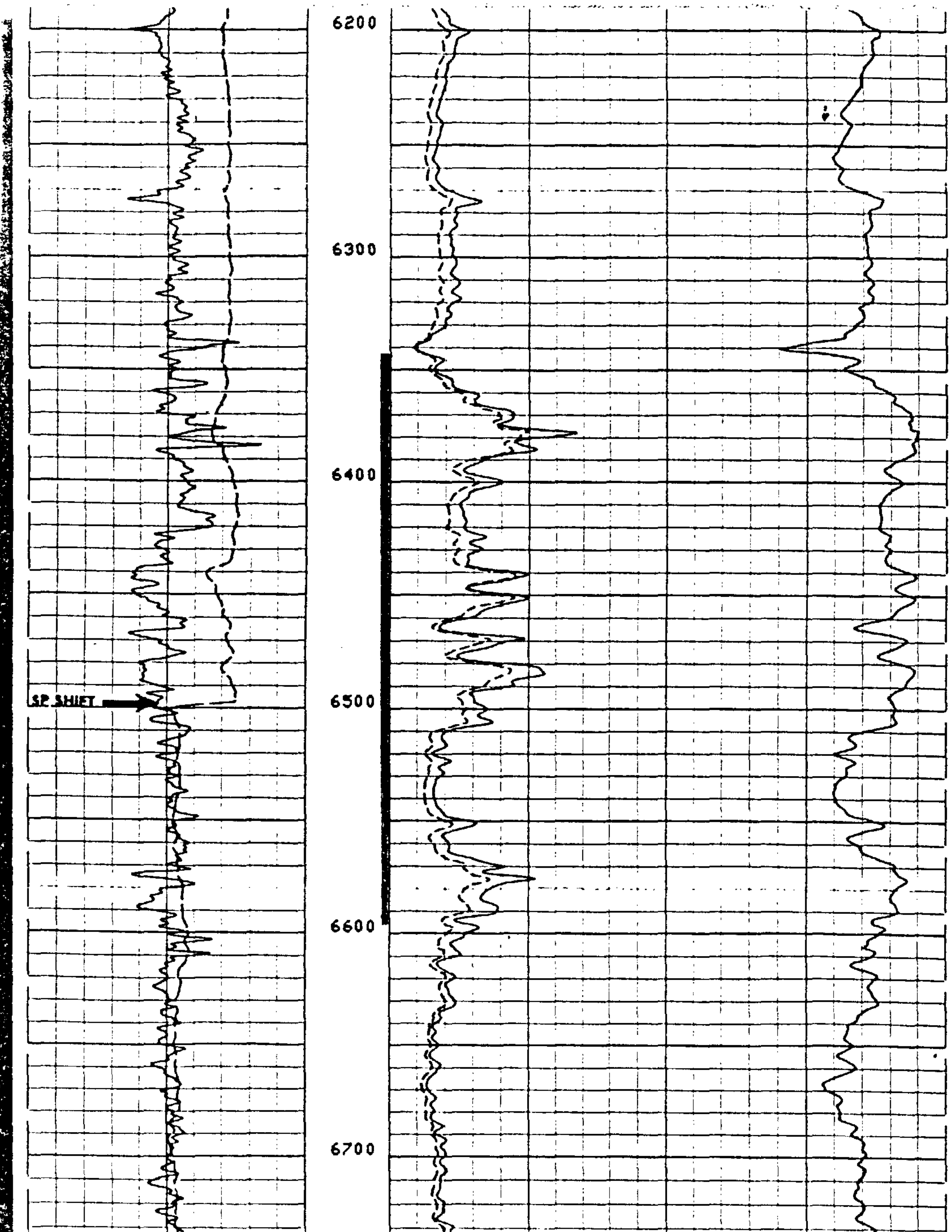


Form 3160-4
(November 1983)
(formerly 9-330)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SUBMIT IN DUPLICATE*
(See other instructions on reverse side)

Form approved.
Budget Bureau No. 1004-0137
Expires August 31, 1985

RECEIVED
BLM MAIL ROOM
88 MAR 16 AM 11:12
FARMINGTON RESOURCE AREA
FARMINGTON, NEW MEXICO

WELL COMPLETION OR RECOMPLETION REPORT AND LOG*

1a. TYPE OF WELL: OIL WELL [X] GAS WELL [ ] DRY [ ] Other

b. TYPE OF COMPLETION: NEW WELL [X] WORK OVER [ ] DEEPEN [ ] PLUG BACK [ ] DIFF. RESVR. [ ] Other

2. NAME OF OPERATOR: Amoco Production Company

3. ADDRESS OF OPERATOR: 2325 East 30th Street, Farmington, NM 87401

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements)*

CONFIDENTIAL

At surface 1660' FNL x 1680' FWL

At top prod. interval reported below Same

At total depth Same

5. LEASE DESIGNATION AND SERIAL NO.: NM-04073-A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7. UNIT AGREEMENT NAME:

8. FARM OR LEASE NAME: Hill Trust Federal Com

9. WELL NO.: 1

10. FIELD AND POOL, OR WILDCAT: Gavilan Grnhrn Graneros DK Ex and Gavilan Mancos Ext

11. SEC., T., R., M., OR BLOCK AND SURVEY OR AREA: SE/NW Sec 5 T25N R2W

14. PERMIT NO.: | DATE ISSUED:

12. COUNTY OR PARISH: Rio Arriba | 13. STATE: NM

15. DATE SPUDDED	16. DATE T.D. REACHED	17. DATE COMPL. (Ready to prod.)	18. ELEVATIONS (DF, RKB, RT, GR, ETC.)*	19. ELEV. CASINGHEAD
10-27-87	11-11-87	12-9-87	KB 7382'	Gr 7369'

20. TOTAL DEPTH, MD & TVD	21. PLUG, BACK T.D., MD & TVD	22. IF MULTIPLE COMPL., HOW MANY*	23. INTERVALS DRILLED BY	ROTARY TOOLS	CABLE TOOLS
8400'	8352'	One	→	0-Td	

24. PRODUCING INTERVAL(S), OF THIS COMPLETION—TOP, BOTTOM, NAME (MD AND TVD)*: 7368'-7508' Gavilan Mancos Ext

25. WAS DIRECTIONAL SURVEY MADE: Yes

26. TYPE ELECTRIC AND OTHER LOGS RUN: DIL, FDC, CNL, BHTV, GR, CAL, SP

27. WAS WELL CORED: No

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT, LB./FT.	DEPTH SET (MD)	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
9-5/8"	36# K55	319'	12-1/4"	189 cf Class B	
5-1/2"	15.5# 17#	8399'	7-7/8"	1149 cf Class B	
	K55 N80			1277 cf Class B	
				118 cf Class B	

29. LINER RECORD

SIZE	TOP (MD)	BOTTOM (MD)	SACKS CEMENT*	SCREEN (MD)

30. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD)
2-7/8"	7559'	

31. PERFORATION RECORD (Interval, size and number)

7468' - 7488', 7488' - 7508', 7368' - 7468', 2 jspf, .50" dia, 280 holes

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL (MD)	AMOUNT AND KIND OF MATERIAL USED
7368' - 7508'	105924 gal 30# xlink gel
	114000# 20-40 mesh brady sand

33.* PRODUCTION

DATE FIRST PRODUCTION	PRODUCTION METHOD (Flowing, gas lift, pumping—size and type of pump)	WELL STATUS (Producing or shut-in)
12-09-87	Pump RWBC 2x2x20	Shut-in

DATE OF TEST	HOURS TESTED	CHOKE SIZE	PROD'N. FOR TEST PERIOD	OIL—BBL.	GAS—MCF.	WATER—BBL.	GAS-OIL RATIO
1-9-88	24		→	22	35	5	1590

FLOW. TUBING PRESS.	CASING PRESSURE	CALCULATED 24-HOUR RATE	OIL—BBL.	GAS—MCF.	WATER—BBL.	OIL GRAVITY-API (CORR.)
55	75	→	22	35	5	

34. DISPOSITION OF GAS (Sold, used for fuel, vented, etc.): To be sold

TEST WITNESSED BY: Ron Sansoni

RECEIVED
MAR 3 1988
OIL CON. DIV.
DIST. 3

CONFIDENTIAL

35. LIST OF ATTACHMENTS: None

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records

SIGNED [signature] TITLE Adm. Supervisor DATE

ACCEPTED FOR RECORD
MAR 17 1988
FARMINGTON RESOURCE AREA
BY [initials]

*(See Instructions and Spaces for Additional Data on Reverse Side)

NMOCC

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

NMOCC CASE #8946
BUSCH EXHIBIT #14

FINAL PRINT

Schlumberger

DUAL INDUCTION - SFL
WITH LINEAR CORRELATION LOG

COUNTY	RIO ARRIBA
FIELD	W. LINDRITH GALLUP DAKOTA
LOCATION	SE NW
WELL	HILL TRUST FEDERAL COM #1
COMPANY	AMOCO PRODUCTION

COMPANY AMOCO PRODUCTION

WELL HILL TRUST FEDERAL COM #1

FIELD W. LINDRITH GALLUP DAKOTA

COUNTY RIO ARRIBA STATE NEW MEXICO

LOCATION: SE NW, 1660 FNL & 1680 FWL

Other Services: DIL, FDC-CNL, BHTV

API SERIAL NO.	SECT.	TWP.	RANGE
	5	25N	2W

Permanent Datum	GL	Elev. 7369.0 F		Elev.: K.B. 7382.0 F
Log Measured From	KB	13.0 F above Perm. Datum		D.F. 7381.0 F
Drilling Measured From	KB			G.L. 7369.0 F

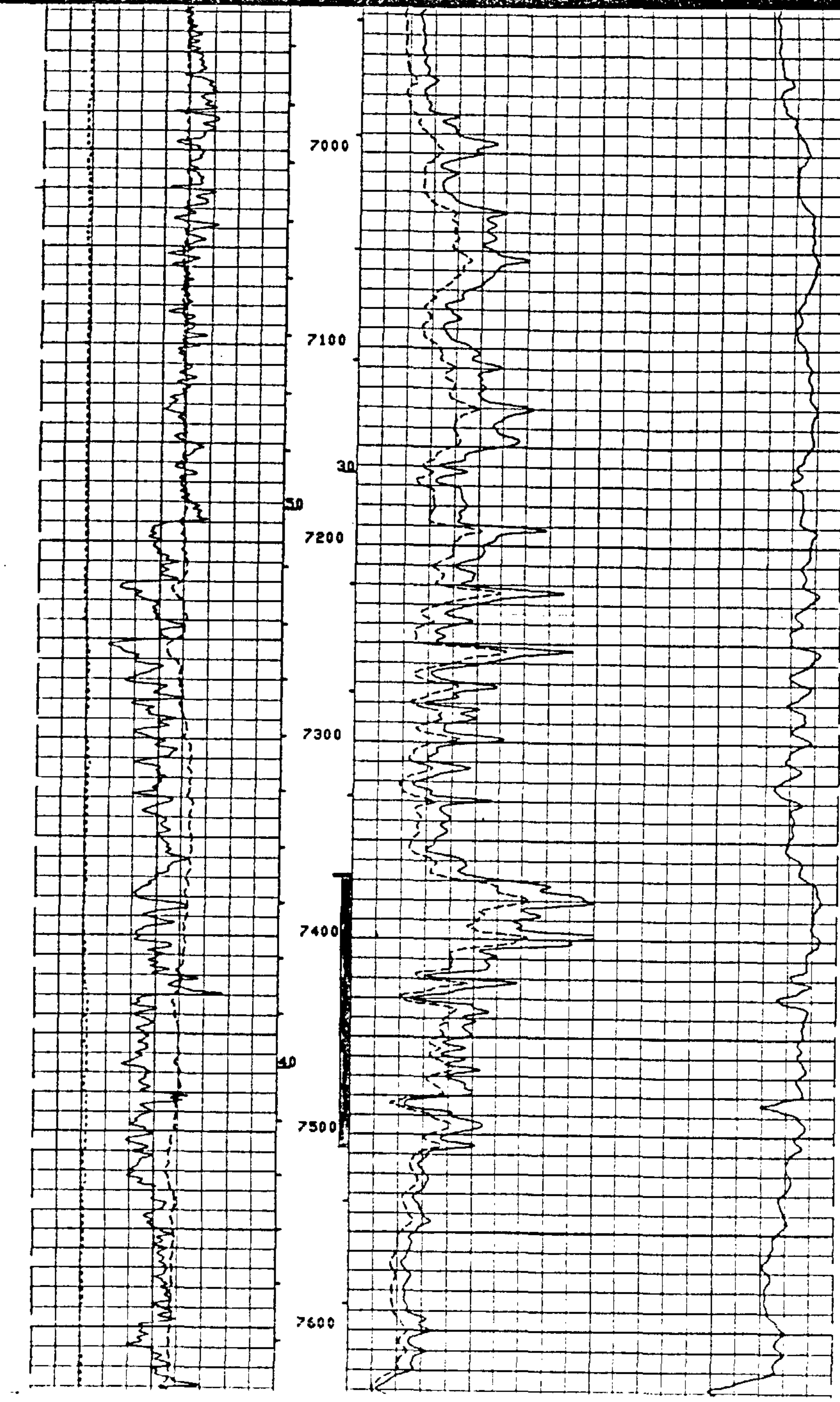
CONFIDENTIAL

Date	NOV. 10, 1987			
Run No.	ONE			
Depth Driller	8401.0 F			
Depth Logger (Schl.)	8404.0 F			
Btm. Log Interval	8398.0 F			
Top Log Interval	320.0 F			
Casing-Driller	9 5/8 @ 320.0 F	@	@	@
Casing-Logger	320.0 F			
Bit Size	7 7/8 IN			
Type Fluid in Hole	POLYGEL			
Dens. / Visc.	9.00 LB/G	72.0 S		
pH / Fld. Loss	9.0	6.0 C3		
Source of Sample	FLOWLINE			
Rm @ Meas. Temp.	4.320 OHMM @ 59.0 DEGF		@	
Rmf @ Meas. Temp.	3.690 OHMM @ 59.0 DEGF		@	
Rmc @ Meas. Temp.	4.860 OHMM @ 59.0 DEGF		@	
Source: Rmf / Rmc	MEASURED	CALCULATED		
Rm @ BHT	1.639 OHMM @ 167. DEGF		@	
TEMP Circulation Ended	11-10 @ 0900			
TEMP Logger on Bottom	10-11 @ 1500			
Max. Rec. Temp.	167 DEGF			
Equip. / Location	8174	FARMINGTON		
Recorded By	SITTON			
Witnessed By	THOMAS			

RECEIVED
FEB 05 1988
OIL CON. DIV.
DIST. 3

The well name, location and borehole reference data were furnished by the customer

FOLD HERE



Amoco Production Co.
Hill Trust Federal #1
5-25N-2W

February

date	bopd	mcf	gor
	C" zone only		
3	15	20	1333
4	13	20	1538
5	12	20	1667
6	7	20	2857
7	6	20	3333
8	10	20	2000
28	20	20	1000
total	83	140	1687

March

date	bopd	mcf	gor
	A&B only		
2	47	20	426
3	68	25	368
4	70	20	286
5	70	20	286
6	90	21	233
7	97	130	1340
8	85	130	1529
9	104	106	1019
10	85	106	1247
	A,B,&C		
21	60	78	1300
22	90	78	867
23	107	56	523
24	123	56	455
25	172	85	494
26	231	115	498
27	184	117	636
28	221	115	520
29	176	115	653
30	163	58	356
31	211	113	536
total	2454	1564	637

April

date	bopd	mcf	gor
1	193	113	585
2	273	113	414
3	199	113	568
4	199	113	568
5	185	113	611
6	185	111	600
7	203	111	547
8	216	123	569
9	173	123	711
10	83	56	675
11	187	96	513
12	228	117	513
13	134	30	224
14	155	30	194
15	216	90	417
16	80	31	388
17	234	110	470
18	100	121	1210
19	226	121	535
20	198	123	621
21	195	123	631
22	280	123	439
23	197	123	624
24	204	123	603
25	253	117	462
26	181	117	646
27	227	70	308
28	175	72	411
29	218	71	326
30	221	72	326
total	5818	2969	510

May

date	bopd	mcf	gor
1	208	79	380
2	213	72	338
3	194	64	330
4	0	0	
5	0	0	
6	134	43	321
7	212	70	330
8	277	91	329
9	246	77	313
10	129	70	543
11	272	70	257
12	75	70	933
13	227	104	458
14	230	104	452
15	227	104	458
16	159	76	478
17	223	80	359
18	285	80	281
19	170	21	124
20	204	111	544
21	205	108	527
22	198	108	545
23	215	108	502
24	178	74	416
25	0	0	
26	261	98	375
27	323	117	362
28	150	117	780
total	5215	2116	406

Form C-105
Revised 11-1-16

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LAND OFFICE		
OPERATOR		

NEW MEXICO OIL CONSERVATION COMMISSION

WELL COMPLETION OR RECOMPLETION REPORT AND LOG

RECEIVED
NOV 16 1987
OIL CON. DIV.
DIST. 3

5a. Indicate Type of Lease: State [ ] Fee [X]

5. State Oil & Gas Lease No.

7. Unit Agreement Name: Bear Canyon Unit

8. Farm or Lease Name

9. Well No.: 1

10. Field and Pool, or Wildcat: Gavilan - Mancos Ext.

1a. TYPE OF WELL: OIL WELL [X] GAS WELL [ ] DRY [ ] OTHER

b. TYPE OF COMPLETION: NEW WELL [X] WORK OVER [ ] DEEPEN [ ] PLUG BACK [ ] DIFF. RESVR. [ ] OTHER

2. Name of Operator: Amoco Production Company

CONFIDENTIAL

3. Address of Operator: 2325 E. 30th Farmington, NM 87401

4. Location of Well: UNIT LETTER G LOCATED 1680 FEET FROM THE North LINE AND 1780 FEET FROM THE East LINE OF SEC. 15 TWP. 26N RGE. 2W NMPM

12. County: Rio Arriba

15. Date Spudded	16. Date T.D. Reached	17. Date Compl. (Ready to Prod.)	18. Elevations (DF, RKB, RT, GR, etc.)	19. Elev. Cashinghead
05-23-87	06-25-87	07-30-87	KB 7418'	GR 7395'

20. Total Depth	21. Plug Back T.D.	22. If Multiple Compl., How Many	23. Intervals Drilled By	Rotary Tools	Cable Tools
8316'	8256'	One	→	0-Td	

24. Producing Interval(s), of this completion — Top, Bottom, Name: 7346' - 7442' Gavilan Mancos Ext.

25. Was Directional Survey Made: Yes

26. Type Electric and Other Logs Run: BHC, CAL, GR; ZDL, CN, CAL, GR; CALOG/ORIEN; CDL, SL, CAL, GR

27. Was Well Cored: No

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT LB./FT.	DEPTH SET	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
9-5/8"	36# J55	361'	12-1/4"	295 cf Class B Ideal	
5-1/2"	17# & 15.5#	8316'	7-7/8"	1408 cf Class B Ideal	
	N-80 & J55				

29. LINER RECORD

SIZE	TOP	BOTTOM	SACKS CEMENT	SCREEN

30. TUBING RECORD

SIZE	DEPTH SET	PACKER SET
2-7/8"	7478'	

31. Perforation Record (Interval, size and number): 7346' - 7442' 2 jspf .51" dia. 192 holes

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL	AMOUNT AND KIND MATERIAL USED
7346' - 7442'	162988 gal 30# xlink gel
	143600# 20-40 mesh brady sand

33. PRODUCTION

Date First Production	Production Method (Flowing, gas lift, pumping — Size and type pump)	Well Status (Prod. or Shut-in)
07-30-87	Pumping 2" x 2" x 28' RWBC	Shut-in

Date of Test	Hours Tested	Choke Size	Prod'n. For Test Period	Oil — Bbl.	Gas — MCF	Water — Bbl.	Gas—Oil Ratio
08-23-87	24	Plate .5"	→	167	77	2	461

Flow Tubing Press.	Casing Pressure	Calculated 24-Hour Rate	Oil — Bbl.	Gas — MCF	Water — Bbl.	Oil Gravity — API (Corr.)
70	80	→	167	77	2	

34. Disposition of Gas (Sold, used for fuel, vented, etc.): To be sold

Test Witnessed By: M. McClelland

CONFIDENTIAL

35. List of Attachments: None

36. I hereby certify that the information shown on both sides of this form is true and complete to the best of my knowledge and belief.

SIGNED B. D. Shaw TITLE Adm. Supervisor DATE November 16, 1987

NMOCC CASE #8946
BUSCH EXHIBIT #15

CONFIDENTIAL

Dresser Atlas

DRESSER

DUAL INDUCTION FOCUSED LOG
GAMMA RAY

FILE NO.

API NO.
30-039-

TIGHT HOLE!

COMPANY AMOCO PRODUCTION COMPANY
WELL BEAR CANYON UNIT NO. 1
FIELD GAVILAN MANCOS
COUNTY RIO ARRIBA STATE NEW MEXICO

LOCATION:
1680' FNL & 1780' FEL

SEC 15 TWP 26-N RGE 2-W

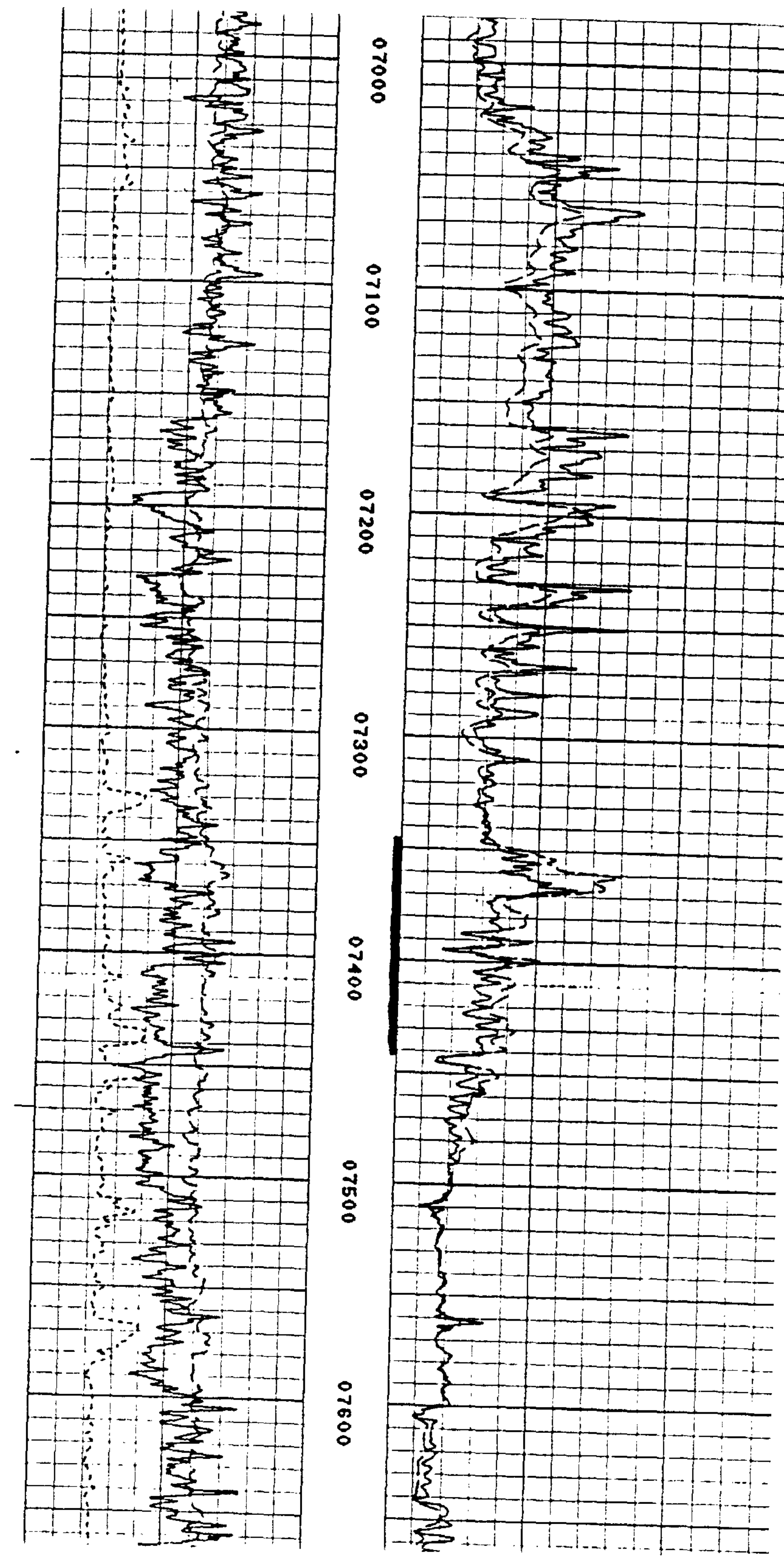
OTHER SERVICES
BHC/AL-CAL-GR
ZDL-CN-CAL-GR
CALOG/ORIEN.
CDL-SL-CAL-GR

PERMANENT DATUM GROUND LEVEL ELEV. 7395'
LOGGING MEASURED FROM KB 13.0' FT. ABOVE P.D.
DRILLING MEASURED FROM KELLY BUSHING

ELEVATIONS
KB 7408'
DF 7407'
GL 7395'

DATE	JUNE 23, 1987			
RUN	1			
SERVICE ORDER	121638			
DEPTH-DRILLER	8315'			
DEPTH-LOGGER	8304'			
BOTTOM LOGGED INTERVAL	8302'			
TOP LOGGED INTERVAL	280'			
CASING - DRILLER	9 5/8"	@ 360'		@
CASING - LOGGER	362'			
BIT SIZE	7 7/8"			
TYPE FLUID IN HOLE	LSND/LCM			
DENSITY / VISCOSITY	8.7	73		
PH / FLUID LOSS	8.5	6.6		
SOURCE OF SAMPLE	FLOW LINE			
RM AT MEAS. TEMP.	1.35	@ 70		@
RMF AT MEAS. TEMP.	1.04	@ 70		@
RMC AT MEAS. TEMP.	1.72	@ 70		@
SOURCE OF RMF / RMC	MEASURED	MEASURED		
RM AT BHT	0.56	@ 168		@
TIME SINCE CIRCULATION	8 HOURS			
MAX. REC. TEMP. DEG. F	168			
EQUIP. NO. / LOC.	HL-6383	ODESSA, TX.		
... BY	PICKERING & REYNOLDS			
... BY	S. RUSHWORTH & T. GRAY			

RECEIVED
AUG 12 1987
OIL CON. DIV.
DIST. 3



Amoco Production Co.
Bear Canyon Unit #1
15-26N-2W

January

date	bopd	mcf	gor
6	327	20	61
7	154	20	130
8	382	20	52
9	121	20	165
10	303	20	66
11	316	20	63
12	326	20	61
13	365	20	55
14	316	327	1035
15	338	310	917
16	354	20	56
17	474	109	230
18	364	20	55
19	354	20	56
20	355	20	56
21	324	20	62
22	358	20	56
23	316	20	63
24	309	20	65
25	334	20	60
26	267	20	75
27	46	20	435
28	273	47	172
29	374	90	241
30	370	90	243
31	353	201	569
total	8173	1554	190

February

date	bopd	mcf	gor
1	360	252	700
2	274	221	807
3	311	45	145
4	320	80	250
5	333	20	60
6	330	60	182
7	284	20	70
8	314	20	64
9	197	20	102
10	303	20	66
11	262	20	76
12	302	20	66
13	368	20	54
14	308	20	65
15	366	20	55
16	334	20	60
17	272	20	74
18	373	20	54
19	317	20	63
20	310	20	65
21	0	0	
22	0	0	
23	0	0	
24	0	0	
25	320	20	63
26	127	20	157
27	33	20	606
28	271	20	74
29	308	20	65
total	7297	1058	145

March

date	bopd	mcf	gor
1	369	40	108
2	365	40	110
3	305	40	131
4	307	40	130
5	336	40	119
6	342	40	117
7	287	40	139
8	330	40	121
9	321	40	125
10	365	40	110
11	347	40	115
12	346	40	116
13	343	40	117
14	304	40	132
15	300	40	133
16	350	40	114
17	309	40	129
18	350	40	114
19	327	40	122
20	373	40	107
21	336	40	119
22	309	40	129
23	338	40	118
24	321	40	125
25	343	40	117
26	305	40	131
27	309	40	129
28	401	40	100
29	99	40	404
30	365	40	110
31	359	40	111
total	10161	1240	122

April

date	bopd	mcf	gor
1	355	40	113
2	330	40	121
3	309	40	129
4	327	40	122
total	1321	160	121

May

date	bopd	mcf	gor
12	334	40	120
13	334	40	120
14	429	40	93
15	401	40	100
16	247	40	162
17	196	36	184
18	440	30	68
19	252	35	139
20	330	36	109
21	402	36	90
22	414	36	87
23	401	41	102
24	0	0	ERR
25	213	36	169
26	372	61	164
27	427	95	222
28	412	75	182
29	296	45	152
30	384	73	190
31	772	49	63
total	7056	884	125

Form 3160-4
(November 1983)
(formerly 9-330)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SUBMIT IN DUPLICATE*

Form approved.
Budget Bureau No. 1004-0137
Expires August 31, 1985

RECEIVED
BLM MAIL ROOM
88 MAR 24 AM 11:23
FARMINGTON RESOURCE AREA
FARMINGTON, NEW MEXICO

WELL COMPLETION OR RECOMPLETION REPORT AND LOG*

5. LEASE DESIGNATION AND SERIAL NO.: NM-13809

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

1a. TYPE OF WELL: OIL WELL [X] GAS WELL [ ] DRY [ ] Other

b. TYPE OF COMPLETION: NEW WELL [X] WORK OVER [ ] DEEP-EN [ ] PLUG BACK [ ] DIFF. RESVR. [ ] Other

7. UNIT AGREEMENT NAME: Bear Canyon Unit

8. FARM OR LEASE NAME:

2. NAME OF OPERATOR: Amoco Production Company

9. WELL NO.: 2

3. ADDRESS OF OPERATOR: 2325 E. 30th, Farmington, NM 87401

10. FIELD AND POOL, OR WILDCAT: Wildcat Dakota and Gavilan Mancos Ext.

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements)*

At surface 880 FNL x 2280 FWL

At top prod. interval reported below Same

At total depth Same

RECEIVED
MAR 30
OIL CON.

11. SEC., T., R., M., OR BLOCK AND SURVEY OR AREA: NE/NW Sec 10 T26N R2W

14. PERMIT NO.: | DATE ISSUED:

12. COUNTY OR PARISH: Rio Arriba | 13. STATE: NM

15. DATE SPUDDED	16. DATE T.D. REACHED	17. DATE COMPL. (Ready to prod.)	18. ELEVATIONS (DF, RKB, RT, GR, ETC.)*	19. ELEV. CASINGHEAD
11/20/87	01/03/88	02/03/88	KB 7208'	GR 7195'

20. TOTAL DEPTH, MD & TVD	21. PLUG, BACK T.D., MD & TVD	22. IF MULTIPLE COMPL., HOW MANY*	23. INTERVALS DRILLED BY	ROTARY TOOLS	CABLE TOOLS
7510'	7461'		→	0-TD	

24. PRODUCING INTERVAL(S), OF THIS COMPLETION—TOP, BOTTOM, NAME (MD AND TVD)*: 7194'-7338' Gallup

25. WAS DIRECTIONAL SURVEY MADE: Yes

26. TYPE ELECTRIC AND OTHER LOGS RUN: DIL-GR-SP, BHTV

27. WAS WELL CORED: No

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT, LB./FT.	DEPTH SET (MD)	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
9-5/8"	36# K55	305'	12-1/4"	236 cf Class B	
5-1/2"	17# K55	7510'	7-7/8"	825 cf Class B	
				1200 cf Class B	

29. LINER RECORD

SIZE	TOP (MD)	BOTTOM (MD)	SACKS CEMENT*	SCREEN (MD)

30. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD)
2-7/8"	7381'	

31. PERFORATION RECORD (Interval, size and number): 7194'-7338', 2jspf, .5" dia, 288 holes

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL (MD)	AMOUNT AND KIND OF MATERIAL USED
7194'-7338'	96360 gal 30# xlink gel
	110000# 20-40 mesh brady sand

33.* PRODUCTION

DATE FIRST PRODUCTION	PRODUCTION METHOD (Flowing, gas lift, pumping—size and type of pump)	WELL STATUS (Producing or shut-in)
2/3/88	Pumping 2-1/2" x 2" x 30' RHBC	Shut-in

DATE OF TEST	HOURS TESTED	CHOKE SIZE	PROD'N. FOR TEST PERIOD	OIL—BBL.	GAS—MCF.	WATER—BBL.	GAS-OIL RATIO
2/15/88	24		→	288	60	7	208

FLOW. TUBING PRESS.	CASING PRESSURE	CALCULATED 24-HOUR RATE	OIL—BBL.	GAS—MCF.	WATER—BBL.	OIL GRAVITY-API (CORR.)
100	100	→	288	60	7	

34. DISPOSITION OF GAS (Sold, used for fuel, vented, etc.): To be Sold

TEST WITNESSED BY: Floyd Thomas

ACCEPTED FOR RECORD

35. LIST OF ATTACHMENTS: None

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records

MAR 25 1988

SIGNED BJ Shaw TITLE Admin. Supervisor DATE March 21, 1988

FARMINGTON RESOURCE AREA
BY

*(See Instructions and Spaces for Additional Data on Reverse Side)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

NMOCD

NMOCC CASE #8946
BUSCH EXHIBIT #16

Final Print
Schlumberger

DUAL INDUCTION - SFL

COUNTY RIO ARRIBA
FIELD GAVILAN MANCOS EXTENSION
LOCATION 860' FNL & 2280' FWL
WELL BEAR CANYON UNIT #2
COMPANY AMOCO PRODUCTION COMPANY

COMPANY	AMOCO PRODUCTION COMPANY
WELL	BEAR CANYON UNIT #2
FIELD	GAVILAN MANCOS EXTENSION
COUNTY	RIO ARRIBA STATE NEW MEXICO

LOCATION: 860' FNL & 2280' FWL
NE/NW

Other Services: DL, BHTV

API SERIAL NO.	SECT.	TWP.	RANGE
	10	26N	2W

Permanent Datum GL Elev. 7196.0 F
Log Measured From KB 14.0 F above Perm. Datum
Drilling Measured From KB

Elev.: K.B. 7208.0 F, D.F. 7208.0 F, G.L. 7196.0 F

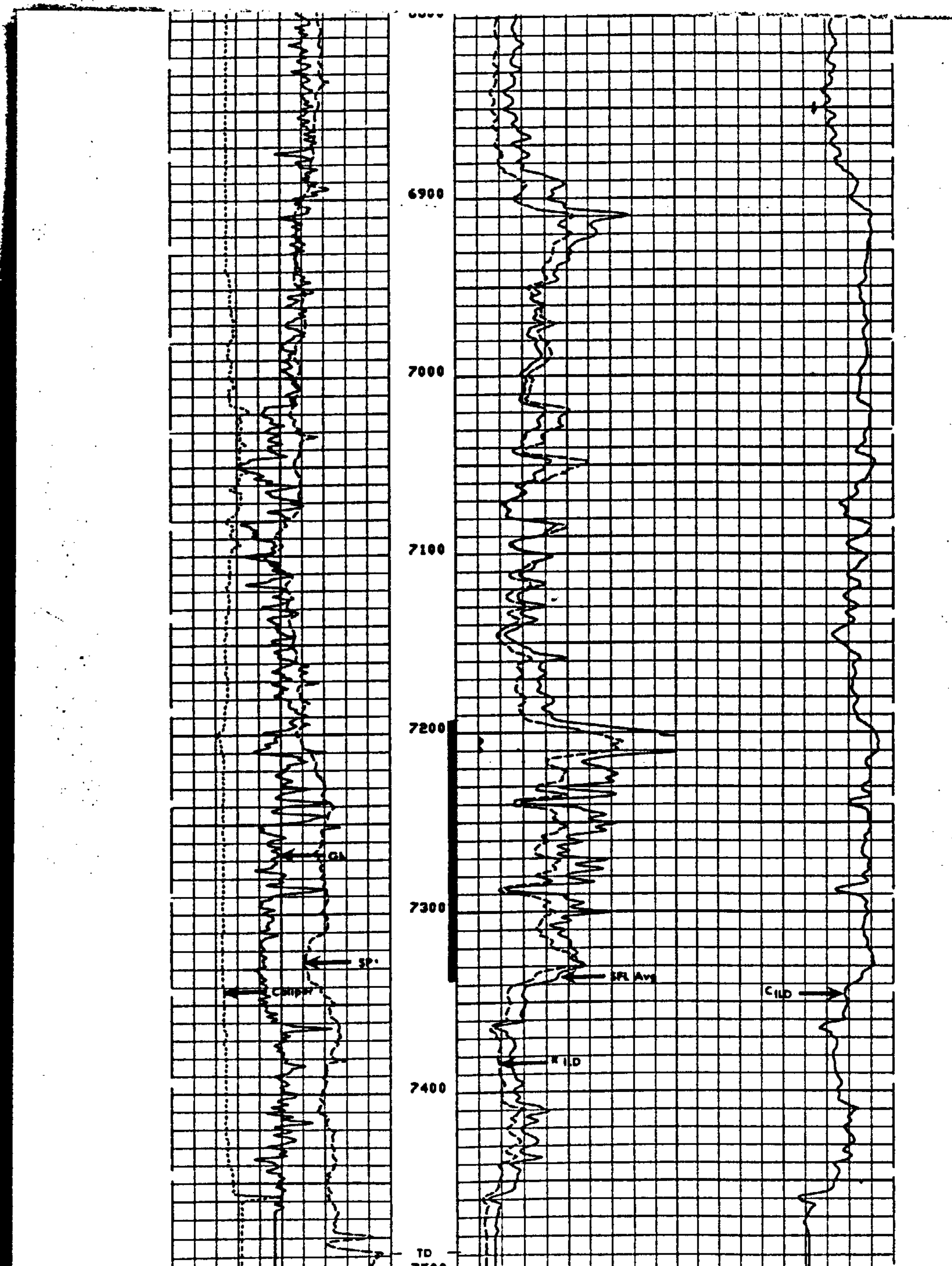
Date	30-DEC-87			
Run No.	1			
Depth Driller	7500.0 F			
Depth Logger (Schl.)	7489.0 F			
Btm. Log Interval	7481.0 F			
Top Log Interval	304.0 F			
Casing-Driller	9.625 @ 305.0 F	●	●	●
Casing-Logger	304.0 F			
Bit Size	7.875			
Type Fluid in Hole	GEL CHEM/LCM			
Dens. / Visc.	8.90 LB/G	67.0 S		
pH / Fld. Loss	8.5	6.0 C3		
Source of Sample	FLOW LINE			
Rm @ Meas. Temp.	2.120 OHMM @ 67.0 DEGF			
Rmf @ Meas. Temp.	1.710 OHMM @ 67.0 DEGF			
Rmc @ Meas. Temp.	3.180 OHMM @ 67.0 DEGF		@	
Source: Rmf / Rmc	MEAS	CALC		
Rm @ BHT	1.008 OHMM @ 148. DEGF		@	
Time: Circulation Ended	14:30 12/30/87			
Time: Logger on Bottom	2:30 1/1/88			
Max. Rec. Temp.	148. DEGF			
Equip. / Location	8181	FARMINGTON		
Recorded By	M BUEIDE			
Witnessed By	D. DAVENTHAL			

Confidential

RECEIVED
FEB 1 6 1988
OIL CON. DIV.
DIST. 3

The well name, location and borehole reference data were furnished by the customer.

FOLD HERE



Amoco Production Co.
Bear Canyon Unit #2
10-26N-2W

February

date	bopd	mcf	gor
8	288	0	0
16	292	54	185
17	372	60	161
18	92	69	750
19	182	79	434
20	256	76	297
21	70	32	457
22	12	11	917
23	376	54	144
24	309	63	204
25	275	129	469
26	246	104	423
27	267	67	251
28	176	70	398
29	208	70	337
total	3421	938	274

March

date	bopd	mcf	gor
1	352	70	199
2	294	70	238
3	258	78	302
4	330	83	252
5	365	83	227
6	280	78	279
7	278	73	263
8	318	78	245
9	174	32	184
10	366	81	221
11	265	32	121
12	331	32	97
13	38	32	842
14	111	73	658
15	388	0	0
16	406	38	94
17	378	44	116
18	157	44	280
19	467	44	94
20	332	44	133
21	390	44	113
22	337	44	131
23	359	93	259
24	304	56	184
25	400	38	95
26	367	82	223
27	327	82	251
28	291	82	282
29	295	82	278
30	319	82	257
31	383	82	214
total	9660	1876	194

April

date	bopd	mcf	gor
1	454	0	0
2	424	26	61
3	427	82	192
4	315	82	260
5	411	82	200
6	339	82	242
7	431	82	190
8	311	74	238
total	3112	510	164

Form approved.
Budget Bureau No. 1004-0137
Expires August 31, 1985

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SUBMIT IN DUPLICATE*
(See other instructions on reverse side)

RECEIVED
BLM MAIL ROOM
88 MAY -2 AM 11:03
FARMINGTON RESOURCE AREA
FARMINGTON, NEW MEXICO

WELL COMPLETION OR RECOMPLETION REPORT AND LOG*

1a. TYPE OF WELL: OIL WELL [X] GAS WELL [ ] DRY [ ] Other

b. TYPE OF COMPLETION: NEW WELL [X] WORK OVER [ ] DEEP-EN [ ] PLUG BACK [ ] DIFF. RESVR. [ ] Other

2. NAME OF OPERATOR: Amoco Production Co.

3. ADDRESS OF OPERATOR: 2325 East 30th Farmington NM 87401

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements)*
At surface 1820' FSL x 970' FWL
At top prod. interval reported below Same
At total depth Same

5. LEASE DESIGNATION AND SERIAL NO.: NM-66506
6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
7. UNIT AGREEMENT NAME: Bear Canyon Unit
8. FARM OR LEASE NAME:
9. WELL NO.: 3
10. FIELD AND POOL, OR WILDCAT: Wildcat Dakota and Gavilan Mancos Ext.
11. SEC., T., R., M., OR BLOCK AND SURVEY OR AREA: NW/SW Sec 11 T26N R2W
12. COUNTY OR PARISH: Rio Arriba
13. STATE: NM

14. PERMIT NO.: | DATE ISSUED:

15. DATE SPUDDED: 1-5-88
16. DATE T.D. REACHED: 2-10-88
17. DATE COMPL. (Ready to prod.): 4-21-88
18. ELEVATIONS (DF, RKB, RT, GR, ETC.)*: Kb 7366'
19. ELEV. CASINGHEAD: Gr 7353'
20. TOTAL DEPTH, MD & TVD: 8411'
21. PLUG, BACK T.D., MD & TVD: 7610'
22. IF MULTIPLE COMPL., HOW MANY*: —
23. INTERVALS DRILLED BY: → ROTARY TOOLS: 0-Td CABLE TOOLS:

24. PRODUCING INTERVAL(S), OF THIS COMPLETION—TOP, BOTTOM, NAME (MD AND TVD)*
7326' - 7470' Gallup

CONFIDENTIAL

25. WAS DIRECTIONAL SURVEY MADE: Yes

26. TYPE ELECTRIC AND OTHER LOGS RUN: DIL-FDC-CNL-BHTV-GR-SP-CAL

27. WAS WELL CORED: No

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT, LB./FT.	DEPTH SET (MD)	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
9-5/8"	36# K55	308'	12-1/4"	236 cf Class B	
7"	23# N80	6898'	8-3/4"	616 cf Class B	
				118 cf Class B	
				1617 cf Class B 118 cf Class B	

29. LINER RECORD

SIZE	TOP (MD)	BOTTOM (MD)	SACKS CEMENT*	SCREEN (MD)
4-1/2"	6564'	8401'	570 cf	

30. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD)
2-7/8"	7310'	
BP	7610'	

31. PERFORATION RECORD (Interval, size and number)
8170'-8222', 4 jspf, .50" dia, 208 holes, 7326'-7470', 2 jspf, .50" dia, 288 holes

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL (MD)	AMOUNT AND KIND OF MATERIAL USED
8170'-8222'	60,000 gal 30# xlink gel
	85000# 20-40 mesh brady sn
8100'	CIBP 2 sx cement
6464'-6475'	130 sx Class B cement (over)

33.* PRODUCTION

DATE FIRST PRODUCTION: 04-21-88
PRODUCTION METHOD (Flowing, gas lift, pumping—size and type of pump): Pumping
WELL STATUS (Producing or shut-in): Shut-in

DATE OF TEST	HOURS TESTED	CHOKE SIZE	PROD'N FOR TEST PERIOD	OIL—BBL.	GAS—MCF.	WATER—BBL.	GAS-OIL RATIO
4-26-88	24		→	50	TSTM	86	—

FLOW. TUBING PRESS.	CASING PRESSURE	CALCULATED 24-HOUR RATE	OIL—BBL.	GAS—MCF.	WATER—BBL.	OIL GRAVITY-API (CORR.)
—	75	→	50		86	

34. DISPOSITION OF GAS (Sold, used for fuel, vented, etc.): To be Sold
TEST WITNESSED BY: Ron Sanson

RECEIVED
MAY 31 1988
OIL CON. DIV.
DIST. 3

ACCEPTED FOR RECORD
MAY 25 1988
FARMINGTON RESOURCE AREA
BY

35. LIST OF ATTACHMENTS: None

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records

SIGNED B D Shaw TITLE Admin. Supervisor DATE April 29, 1988

*(See Instructions and Spaces for Additional Data on Reverse Side)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

NMOCD

NMOCC CASE #8946
BUSCH EXHIBIT #17

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION
P. O. BOX 2088
SANTA FE, NEW MEXICO 87501

Form C-116
Revised 10-1-78

GAS-OIL RATIO TESTS

Operator: Amoco Production Company
Pool: Gavilan Mancos Ext.
County: Rio Arriba
Address: 2325 East 30th Street Farmington , NM 87401

TYPE OF TEST - (X): Scheduled [ ] Completion [X] Special [ ]

LEASE NAME	WELL NO.	LOCATION U	LOCATION S	LOCATION T	LOCATION R	DATE OF TEST	STATUS	CHOKE SIZE	TBG. PRESS	DAILY ALLOW-ABLE	LENGTH OF TEST HOURS	PROD. DURING TEST WATER BBLS.	GRAV. OIL	OIL BBLS.	GAS M.C.F.	GAS - OIL RATIO CU.FT./BBL
Bear Canyon	3	L	11	26N	2W	05-23-88	P				24			346	100	289

RECEIVED
MAY 25 1988
OIL CON. DIV
DIST. 3

No well will be assigned an allowable greater than the amount of oil produced on the official test.

During gas-oil ratio test, each well shall be produced at a rate not exceeding the top unit allowable for the pool in which well is located by more than 25 percent. Operator is encouraged to take advantage of this 25 percent tolerance in order that well can be assigned increased allowables when authorized by the Division.

Gas volumes must be reported in MCF measured at a pressure base of 15.025 psia and a temperature of 60° F. Specific gravity base will be 0.60.

Report casing pressure in lieu of tubing pressure for any well producing through casing.

Mail original and one copy of this report to the district office of the New Mexico Oil Conservation Division in accordance with Rule 301 and appropriate pool rules.

I hereby certify that the above informati[on] is true and complete to the best of my kno[w]ledge and belief.

B D Shaw
(Signature)

Admin. Supervisor
(Title)

5-23-88

FINAL PRINT

Schlumberger

DUAL INDUCTION/SFL - GR

CSU

COMPANY:	AMOCO PRODUCTION COMPANY		
WELL:	BEAR CANYON UNIT #3		
FIELD:	GAVILAN MANCOS		
COUNTY:	RIO ARRIBA		
STATE:	NEW MEXICO		
LOCATION:	NE SW		
SEC: 11	TWP: 26 N	RGE: 2 W	

PERMANENT DATUM: GL
ELEV. OF PERM. DATUM: 7350.0 F
LOG MEASURED FROM: KB
13.0 F ABOVE PERM. DATUM
DRLG. MEASURED FROM: KB

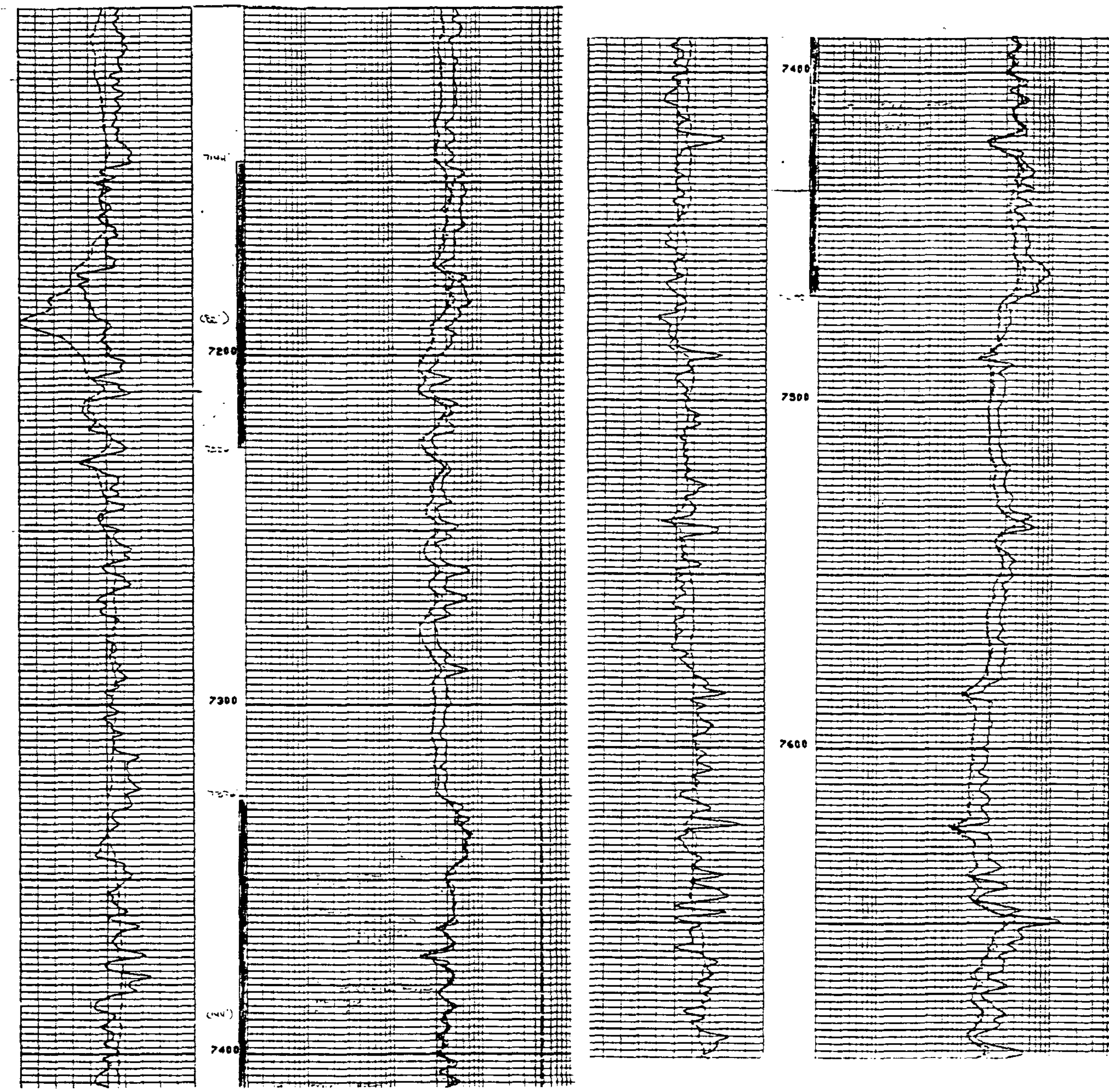
ELEVATIONS-
KB: 7363.0 F
DF: 7362.0 F
GL: 7350.0 F

DATE: 9 FEB 88
RUN NO: 1

TIGHT HOLE

DEPTH-DRILLER: 8408.0 F
DEPTH-LOGGER: 8369.0 F
BTM. LOG INTERVAL: 8363.0 F
TOP LOG INTERVAL: 6880.0 F

CASING-DRILLER: 6898.0 F
CASING-LOGGER: 6880.0 F
CASING: 7"
WEIGHT: 23.0000 LB/F
BIT SIZE: 6 1/4
DEPTH:



Form 9-330
(Rev. 5-63)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN DUPLICATE* (See other instructions on reverse side)

Form approved. Budget Bureau No. 42-R355.5.

5. LEASE DESIGNATION AND SERIAL NO. NM - 28699

6. IF INDIAN, ALLOTTEE OR TRIBE NAME

WELL COMPLETION OR RECOMPLETION REPORT AND LOG*

1a. TYPE OF WELL: OIL WELL [X] GAS WELL [ ] DRY [ ] Other

b. TYPE OF COMPLETION: NEW WELL [ ] WORK OVER [X] DEEP-EN [ ] PLUG BACK [ ] DIFF. RESVR. [ ] Other

7. UNIT AGREEMENT NAME

8. FARM OR LEASE NAME Mobil Federal

9. WELL NO. #1

2. NAME OF OPERATOR
Southern Union Exploration Company

3. ADDRESS OF OPERATOR
Suite 1800 First International Bldg, Dallas, Texas 75270

10. FIELD AND POOL, OR WILDCAT Wildcat Gallup

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements)*
At surface 1980' FSL & 1980' FEL
At top prod. interval reported below Same
At total depth Same

11. SEC., T., R., M., OR BLOCK AND SURVEY OR AREA Sec 36, T24N, R1W

14. PERMIT NO. | DATE ISSUED

12. COUNTY OR PARISH Rio Arriba | 13. STATE New Mexico

15. DATE SPUDDED	16. DATE T.D. REACHED	17. DATE COMPL. (Ready to prod.)	18. ELEVATIONS (DF, RKB, RT, GR, ETC.)*	19. ELEV. CASINGHEAD
11-13-64	12-2-64	6-12-79	GL 7200'	7200'

20. TOTAL DEPTH, MD & TVD	21. PLUG, BACK T.D., MD & TVD	22. IF MULTIPLE COMPL., HOW MANY*	23. INTERVALS DRILLED BY	ROTARY TOOLS	CABLE TOOLS
4664	4174		→	0-4664	

24. PRODUCING INTERVAL(S), OF THIS COMPLETION—TOP, BOTTOM, NAME (MD AND TVD)*
3845 - 4123 Gallup

25. WAS DIRECTIONAL SURVEY MADE No

26. TYPE ELECTRIC AND OTHER LOGS RUN
Induction - Gamma Ray (originally)

27. WAS WELL CORED No

28. CASING RECORD (Report all strings set in well)

CASING SIZE	WEIGHT, LB./FT.	DEPTH SET (MD)	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
10 3/4"	32.75	100'	13 3/4"	100 SX	none
7"	20-23	2530'			

29. LINER RECORD

SIZE	TOP (MD)	BOTTOM (MD)	SACKS CEMENT*	SCREEN (MD)
4 1/2"	3347	4174		

30. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD)
1¼ & 2 3/8"	3960.84	4½ x 7"

31. PERFORATION RECORD (Interval, size and number)
3845'-3873', 3929'-3957', 3981'-4004', 4104', 4121', 4123', (31 js)

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL (MD)	AMOUNT AND KIND OF MATERIAL USED
3845-4123	1025 Bbls oil, 25,000# sand

33.* PRODUCTION

DATE FIRST PRODUCTION	PRODUCTION METHOD (Flowing, gas lift, pumping—size and type of pump)	WELL STATUS (Producing or shut-in)
6-12-79	Flowing	Producing

DATE OF TEST	HOURS TESTED	CHOKE SIZE	PROD'N. FOR TEST PERIOD	OIL—BBL.	GAS—MCF.	WATER—BBL.	GAS-OIL RATIO
6-15-79	24	11/64	→	6	108	0	18,000 to 1

FLOW. TUBING PRESS.	CASING PRESSURE	CALCULATED 24-HOUR RATE	OIL—BBL.	GAS—MCF.	WATER—BBL.	OIL GRAVITY-API (CORR.)
120	309	→	6	108	0	51^0

34. DISPOSITION OF GAS (Sold, used for fuel, vented, etc.)
Vented

TEST WITNESSED BY Ron Coffee

35. LIST OF ATTACHMENTS
Variable choke, separator, orifice tester

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records

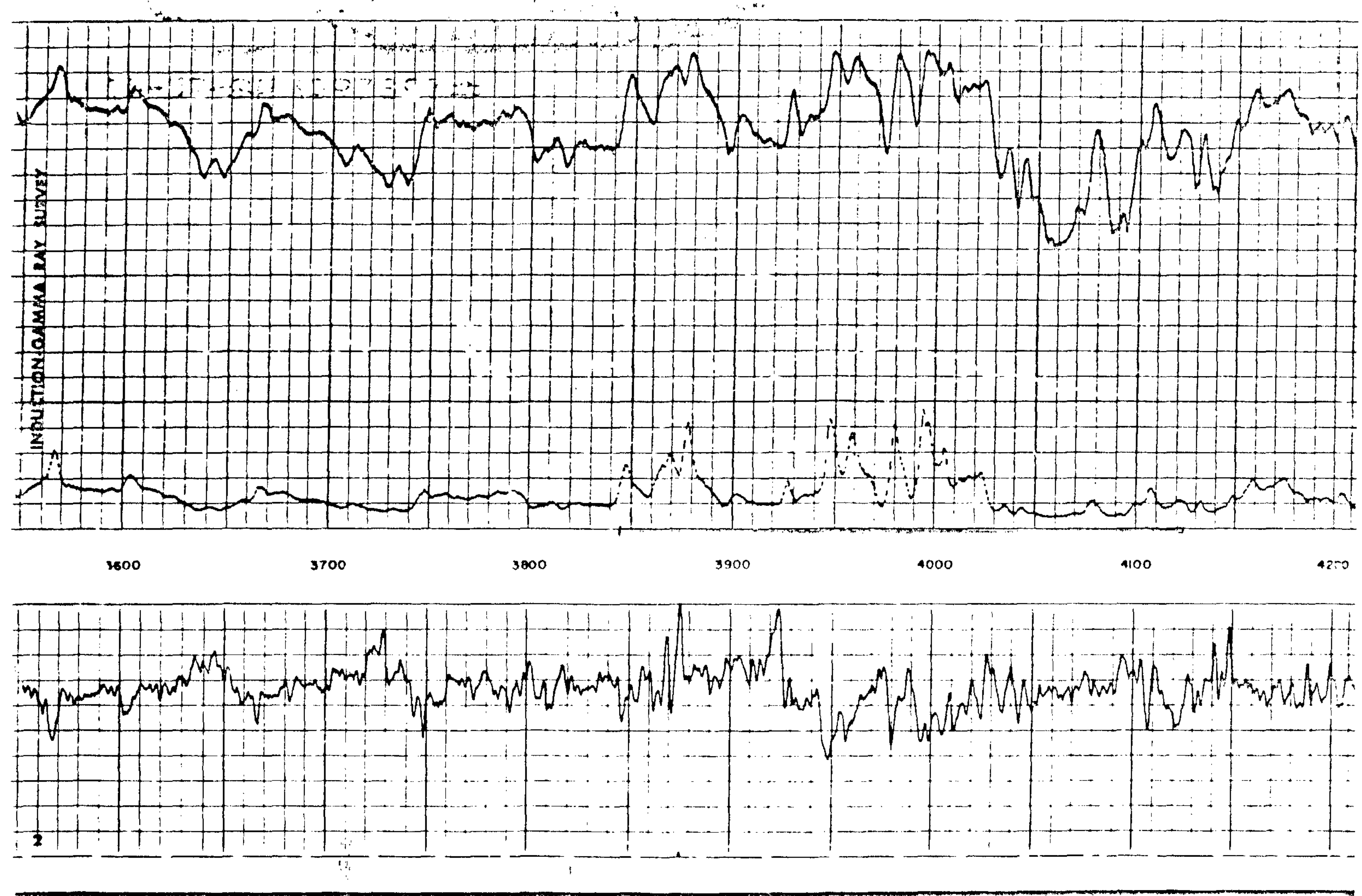
SIGNED Ronald Hesert TITLE Drlg & Production Engineer DATE 10/9/79

RECEIVED OCT 16 1979 OIL CON. COM. DIST. 3

*(See Instructions and Spaces for Additional Data on Reverse Side)

State

NMOCC CASE #8946
BUSCH EXHIBIT #18


INDUCTION-GAMMA RAY SURVEY
3600
3700
3800
3900
4000
4100
2

NEW MEXICO PETROLEUM RECOVERY RESEARCH CENTER

Exhibits in Case Nos. 7980, 8946, 8950, and 9111
Before the Oil Conservation Commission of the
New Mexico Department of Energy and Minerals.

June 13, 1988

A Review of the Gavilan-West Puerto Chiquito Mancos Reservoir
Performance During the Period of
July, 1987 - February, 1988.

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A REVIEW OF THE GAVILAN - WEST PUERTO CHIQUITO MANCOS RESERVOIR PERFORMANCE DURING THE PERIOD OF JULY, 1987 - FEBRUARY, 1988.

Background

The New Mexico Oil Conservation Division (OCD) requested that operators of the two subject pools, Gavilan and West Puerto Chiquito, conduct pressure buildup tests[1] on key wells. The purpose of the tests was to create data of sufficient quality to determine static pressures and reservoir characteristics. The Commission also ordered a variation in well-producing rates via the allowables ruling to test rate sensitivity.[2] The variation in producing rates suggests that the reservoir may be rate-sensitive, as shown by the fact that lower gas-oil ratios (GOR) were observed during periods of high production rates.

Included in the pressure study were wells Wildfire #1, High Adventure #1, Loddy #1, and Boyt & Lola #1, operated by Sun E&P; Bearcat #1 by Mesa Grande Resources; Howard Federal #43-15 by Reading and Bates; Hill Federal #2Y (later switched to Hill Federal #1) by Meridian; Johnson Federal 12#5 by Mallon; Lindrith B-37 by Mobil; and Canada Ojita Unit (C.O.U.) wells E-6, B-32, A-20, and K-13, operated by Benson-Montin-Greer. In addition to the data from these thirteen wells being studied by the Commission, operators generously provided information from other wells which is incorporated in this review.

The two subject pools both produce from the Mancos Shale at a depth of about 6,200 to 7,800 feet. Production is from the "A", "B", and "C" zones in what is described as a tight naturally-fractured reservoir consisting of shaley siltstone and low-porosity, fine-grained sand. Production from the Gavilan Pool is by primary means only, while the West Puerto Chiquito Pool has produced primary and secondary oil via a gas injection program during the past twenty years.

The 25-well Boulder Mancos pool is located in T28N R1W. This pool has been produced by primary means only since 1961 and is close to depletion as seen in Figure 1. Pressure buildup tests were conducted on this pool by Standard of Texas during 1963, and the resulting transmissability, kh/μ, was reported to be 97 D-ft/cp for three wells.[3] The pool encompasses about 4000 acres and will produce 1,830,000 cumulative barrels of oil, assuming 3 BOPD is the economic limit. In comparison, C.O.U. well E-10 alone has produced over 2,200,000 barrels of oil--evidence that gas injection is a successful secondary recovery process.

Static Pressures

Static pressures were measured on 6/30/87, 11/19/87, and 2/23/88 in the wells listed above with all other pool wells shutin. Pressures which were obtained with a downhole bomb are illustrated in Figures 2-4.

The method of arriving at the +370-ft pressure used in the figures is outlined in Matthews and Russell's monograph entitled "Pressure Buildup and Flow Tests in Wells."[4] Briefly, bomb pressure was corrected to the top of the "B" zone based on the tubing gradient. The pressure was then adjusted to a +370-ft datum based on the reservoir gradient. The reservoir gradient was determined from the volume-weighted, average fluid density from the Loddy #1 PVT data. The volume parameters used were the gas- and oil-producing rates prior to the test, corrected to reservoir conditions. The work sheets are included in Appendix 1.

Examination of the pressure data illustrates the presence of a pressure gradient from east to west across the pools--the exception being the undeveloped north and east sides of Gavilan. Pressure gradients of this nature are not uncommon in secondary recovery projects. For example, the isobaric lines shown in Figure 5 are taken from a CO_2 flood located in the Texas Panhandle.[5] The well density is 80 acres in this tight, heterogeneous carbonate reservoir, the capacity is about 1 D-ft, and the production response shown in Figure 6 clearly demonstrates that this Texas reservoir is contiguous, even with a 300-psi pressure drop across the 80 acres (~ 200 psi/1000 ft).

Other examples of the pressure gradients seen in secondary recovery projects include the 21 psi/1000 ft gradient measured at the 13 D-ft capacity Schuler Field edge-gas-injection project[6] (Figure 7) and the 75 psi/1000 ft gradient observed at the Judy Creek Waterflood[7] which is in the 5-10 D-ft capacity range (Figure 8). These examples are similar to the 25 psi/1000 ft pressure gradients in C.O.U. as seen in Figure 9.

Figure 9 also illustrates the directional dependency of the pressure gradients resulting from gas injection in West Puerto Chiquito. Notice that the pressure drop per 1000 ft is about a factor of 10 larger in the east-west direction than in the north-south direction.

Pressure Buildup Tests

Transmissibility, kh/μ, was calculated from the transient buildup data whenever the data permitted. Since the GOR's were above those of solution gas, the analytical method used to find reservoir parameters included converting gas and oil flow rates to one reservoir flow rate. Formation volume factors and fluid viscosities were arrived at by volume averaging the Loddy #1 PVT data in a manner similar to that used to find reservoir fluid density.

The technique used to analyze most of the transient data consisted of using Agarwal[8] time, $T \times dt/T + dt$, as the time parameter to eliminate short, producing-time effects, and plotting the pressure difference vs. time on logarithmic paper along with the first derivative[9] of the pressure difference curve in order to find the proper semi-log straight line. Most of the buildups had storage and skin effects, which were identified by a unit slope on the logarithmic plots. The middle-time (MTR) straight line began at about 50 times the end of the unit slope line. The first derivative plot confirms the unit-slope-line rule. In an effort to maintain consistency with the Gavilan analyses, the pseudo-steady state (MTR) straight line was used in all analyses. The single exception was the November data from the B-37 well which fit a dual-porosity model very nicely and was so analyzed. Work sheets are included in Appendix 2.

Table I summarizes the analyses of the pressure buildup data. The transmissibilities are mapped in Figure 10.

As mentioned earlier, the 11/19/87 buildup data from the B-37 well was of sufficient quality, and free of boundary effects, that the dual-porosity analytic model described by Raghaven[10] in 1983 could be applied, producing the following results:

Fracture capacity, $k_f h_f$	=	1,477 md-ft
Matrix capacity, $k_m h_m$	=	9.16 md-ft
Transfer coefficient, λ'	=	1.27×10^{-7}
Fracture storativity, $\phi_f C_f h_f$	=	1.106×10^{-5}
Dimensionless matrix storativity, ω'	=	27 (about 4% of total porosity is in the fracture system)

During a recent review of the B-37 well data with Mobil, it was suggested that the proper reservoir thickness was the top 50 feet of the "B" zone, which is the producing interval. This zone was cored in the B-38 well, and found to have an arithmetic average porosity of 0.019 and permeability of 0.39 md.

Using a thickness of 50 ft and a matrix porosity of 1.9%, instead of the 233 ft and 0.1% used in the above calculations, produces the following results:

Fracture capacity, $k_f h_f$	=	1,477 md-ft
Matrix capacity, $k_m h_m$	=	30 md-ft
Transfer coefficient, λ'	=	5.12×10^{-7}
Fracture storativity, $\phi_f C_f h_f$	=	4.46×10^{-5}
Dimensionless matrix storativity, ω'	=	27

The matrix capacity agrees well with the 20 md-ft from the core analysis. These results support Mobil's observation that the reservoir is a dual-porosity system.

Interference Tests

Benson-Montin-Greer recorded bottomhole pressures at various observation wells while stimulating seven Canada Ojitos Unit wells. The pressure pulse generated by the hydraulic fracture treatment was recorded as a deviation from the pressure trend as seen on the curves included in Appendix 3. During conversations with M.M. Kamal, R. Raghavan, and W.E. Brigham, it became evident that the superposition method should be used to evaluate the frac pulse results rather than the analytical methods applied in the preliminary study. The superposition method is described in many of the textbooks used as references.[11,15,16,18] Briefly, the method involved obtaining the pressure difference, Δp, resulting from the frac jobs and the prior pressure trend. The observed pressure difference was then matched to the theoretical pressure difference resulting from the application of superposition. The permeability, k, and the porosity, ϕ, values were varied in the superposition calculations until the theoretical Δp matched the observed Δp as illustrated in the appendix.

The problem of reconciling the pressure buildup kh/μ with the interference test kh/μ is qualitatively answered with the information shown in Figure 11, reproduced from Ref. 11, p 133. The figure indicates that kh resulting from an interference test in a naturally fractured reservoir will always be greater than that resulting from a buildup unless t_D is larger than $1x10^6$. Since the dimensionless time results, t_D, calculated from the buildup results tabulated in Table I are all less than $1\ x10^1$ for one-mile well spacing, it is evident that the pulse test results in Table II reflect the transmissibility and storage capacity of the fracture system rather than the total system properties obtained from a single well test.([illegible])

Accepting that the pressure buildup tests provide a reliable estimate of total kh/μ, the contribution to production resulting from the pressure drop existing on November 19, 1987, between B-32 and C-34 wells can be estimated utilizing

$$q = \frac{1.127\ kA\Delta p}{\mu L}$$

q

k Perm

μ = viscosity

L = distance b/

Substituting the B-32 buildup results, a one-mile distance between wells B-32 and B-29, and a 460-psi pressure drop between wells B-32 and C-34 result in a 5500 RB/D rate. The combined rate of wells B-32 and B-29 was 9700 RB/D at the time of the buildup. It is apparent that about 50% of the production from the two wells was being replaced by drainage from the gas injection area.

Frac pulse response was identified by examining the pressure vs. time curves illustrated in Appendix 3. Due to the wide well spacing, the fracture transmissibility must be much greater than the transmissibility calculated from the buildup tests. It appears that fracture transmissibility must be on the order of 5-10 times greater than buildup transmissibility if a readily defined frac response is to be seen at the observation well. The absence of a frac pulse response at an observation well does not necessarily mean the wells are not connected, but it could indicate that the fracture transmissibility is approaching the buildup transmissibility.

Frac response at eight wells was identified and analyzed. The calculated values of transmissibilities and storativity feet are presented in Table II. The transmissibilities also are illustrated in Figure 12.

Rate Sensitivity

During the 6/30/87 to 2/23/88 test period, a GOR vs. BOPD trend developed which indicated increased recovery efficiency at high production rates. A total of 87 wells were monitored. The GOR's were based on monthly averages except where producing time was less than three months; then daily rates were utilized. The data were sorted according to the producing rate so that correlations between rate and GOR could be studied; therefore, once the data was sorted it was not necessarily in chronological order.

Logarithmic plots of rate vs. GOR were made for the 87 wells. A total of 46 wells had a goodness of fit to a logarithmic straight line of 85% or better. The remaining 41 wells exhibited too much variation in their rate vs. GOR plots to be statistically meaningful. Three of the data plots of the statistically significant wells are in chronological order. These plots suggest performance typical of the solution-gas producing mechanism, not of rate sensitivity. Only one well had a positive slope, indicating poor recovery efficiency at high rates; the remaining wells indicate increased recovery efficiency at high rates. The wells with their correlation coefficients are tabulated in Table III. All wells are included in Appendix 4.

Explanations for the more efficient rate sensitivity vary. Three possibilities are:

1. Counter-current gas flow with the formation of a secondary gas cap displacing oil downward.

2. Formation of a large pressure difference between the fractures and the matrix enhancing the transfer of oil to the fracture system.

3. Formation of an unusually large number of gas bubbles in oils subject to rapid pressure decline which in turn reduces the oil saturation.

The concept of the formation of gas bubbles with resulting reduced oil saturation was proposed 25 years ago by Amoco in a paper titled "The Role of Bubble Formation in Oil Recovery by Solution Gas Drives in Limestones,"[12] which followed a paper by Kennedy and Olsen[13] on the same subject. Since then, little has been done to advance the concept.

Increasing the pressure difference between the fractures and the matrix was suggested by Elkins[14] as a means of improving recovery efficiency in the Spraberry Trend. If this was applied in the field, the results were not well documented in the literature. The concept does have merit in the Mancos where the surface area available for flow from the very tight matrix is extensive due to the fracture system. Flow from the matrix could continue for a number of years following the depletion of fracture storativity.

Normally, rate-sensitivity is associated with a displacement process and is readily described with the fractional flow equation:[15,16,17]

$$f_g = \frac{1 - \dfrac{4.9 \times 10^{-4}\, k\, k_{ro}\, A\, (\Delta\rho) \sin\Theta}{q_t\ \mu_o}}{1 + \dfrac{kro}{krg}\ \dfrac{\mu g}{\mu o}}$$

Dake, Eq. 10.21

With the formation of a secondary gas cap, oil is displaced downward and the sin(-90°) becomes minus, which allows the fraction of gas flowing, f_g, to decrease as the total rate, q_t, increases.

The equation shown above was applied to well B-37 utilizing the parameters derived from the November pressure buildup test, 320 acres drainage, relative permeability ratios from Slider's textbook[18] (curve #16 on page 456 which is for large fractures connected together), and Loddy #1 PVT data. Figures 13-16 depict the theoretical match to the actual data obtained, utilizing only the fractional flow equation. The trend of the theoretical curve is similar to the production trend in the B-37, E-6, and Johnson-Federal 12#5 wells; however, the Bearcat #1 does not follow suit.

The match of the theoretical to the actual shown in Figure 17 for the B-37 well was obtained by reducing the permeability-area product in the fractional flow equation from 8.75 x 10^7 md-ft^2 to 8.75 x 10^5 md-ft^2, suggesting that the secondary gas cap is not continuous throughout the 320-acre drainage area.

The permeability calculated from the well B-37 buildup test was used to match the producing f_g trend in the critical rate, q_{crt}, equation[15] shown below.

$$q_{crt} = \frac{4.9 \times 10^{-4}\, k k_{rg}\, A\, \Delta\gamma \sin\Theta}{\mu_g\ (M-1)}$$

This equation results in a 50 STB/D critical flow rate.

Counter to the production data supporting the improvement in the recovery efficiency, is recovery efficiency as a function of pressure drop. During the period of high-production rates, the recovery efficiency averaged 98 barrels/psi for the nine wells illustrated in Figure 18. However, during the low-production-rate period, illustrated in Figure 19, the recovery efficiency increased to 543 barrels/psi. Results are tabulated in Table IV.

This dichotomy can be explained by pressure support external to the individual well-drainage areas. Also notice that the Bearcat #1 and Howard-Federal #43-15 demonstrate little variation in recovery efficiency as a function of pressure drop since they do not have external pressure support. However, wells E-6, A-20, and B-32 show improvement during the period of low production rates when gas injection was able to support withdrawals. Notice that pressure increased 4 psi at the Hill Federal #1 during the period of restricted rates. The well produced 537 BO and 29,123 Mcf of gas during this time. Well E-10's static pressure increased 12 psi while the well produced 2,558 BO and 29,100 mcf of gas during the restricted rate period.

Conclusions

The Gavilan-West Puerto Chiquito Mancos Pools appear to be a common reservoir. It is probable that reservoir transmissibility is sufficient to allow fluid migration across pool boundaries.

Approximately 50% of the wells studied exhibited the more efficient rate-sensitive characteristics, with the GOR declining during the period of high oil production rates. The rate-sensitive producing mechanism is not clearly understood.

The anisotropic nature of the reservoir should be defined in order to investigate a secondary recovery process in Gavilan. Production rates in a secondary mode would be dependent on balancing injection and production rates.

References

1. State of New Mexico Energy and Minerals Department, Oil Conservation Division, Oil Conservation Commission Order No. R-6469-D.

2. State of New Mexico Energy and Minerals Department, Oil Conservation Division, Oil Conservation Commission Order No. R-7407-E.

3. State of New Mexico Oil Conservation Commission, Case No. 2857, July 10, 1963.

4. Matthews, C.S. and Russell, D.G.: Pressure Buildup and Flow Tests in Wells, Monograph Service, SPE, Richardson, TX (1967) 1, 117-118.

5. Flanders, W.A., Stanberry W.A., and Martinez, M.: "Review of CO_2 Performance of the Hansford Marmaton Unit," paper SPE/DOE 17327 presented at the 1988 SPE/DOE Sixth Symposium on Enhanced Oil Recovery, Tulsa, OK, April 17-20.

6. Muscat, Morris: Physical Principles of Oil Production, International Human Resources Development Corp., Boston (1981) 472-476.

7. Jardine, D., Andrews, D.P., Wishart, J.W., and Young, J.W.: "Distribution and Continuity of Carbonate Reservoirs," JPT (July 1977) 873-884.

8. Agarwal, R.C.: "A New Method to Account for Producing-Time Effects When Drawdown Type Curves are Used to Analyze Pressure Buildup and Other Test Data," paper SPE 9289 presented at the 1979 SPE-AIME Annual Technical Conference and Exhibition, Las Vegas, September 21-24.

9. Bourdet, D., Ayoub, J.A., and Pirard, Y.M.: "Use of Pressure Derivative in Well Test Interpretation," paper SPE 12777 presented at the 1984 SPE California Regional Meeting, Long Beach, April 11-13.

10. Serra, K., Reynolds, A.C., and Raghavan, R.: "New Pressure Transient Analysis Methods for Naturally Fractured Reservoirs," JPT (December 1983) 2271-84.

11. Earlougher, R.C., Jr.: Advances in Well Test Analysis, Monograph Series, SPE, Richardson, TX (1977) 5, No. 18, 45-57.

12. Stewart, C.R., Hunt, E.B., Jr., Geffen, T.K., and Berry, V.J., Jr.: "The Role of Bubble Formation in Oil Recovery Gas Drives in Limestone," Trans., AIME (1954) 201, 294-301.

13. Kennedy, H.T. and Olson, C.R.: "Reservoir Performance and Well Spacing, Spraberry Trend Area Field of West Texas," Trans., AIME 198, 177-196.

14. Elkins, L.F.: "Reservoir Performance and Well Spacing, Spraberry Trend Area Field of West Texas," Trans., AIME 198, 177-196.

15. Dake, L.P.: Fundamentals of Reservoir Engineering, Elsevier Scientific Publishing Co., New York (1978) 359, 376.

16. Craft, B.C. and Hawkins, M.F.: Applied Petroleum Reservoir Engineering, Prentice Hall, Inc., Englewood Cliffs, NJ (1959) 368.

17. Smith, R.S.: Mechanics of Secondary Oil Recovery, Reinhold Publishing Corp., NY (1966) 292.

18. Slider, H.C.: Practical Petroleum Reservoir Engineering Methods, Petroleum Publishing Co., Tulsa, 456.

TABLES

Table I

Transient Test Results[11]

Well	Test Date	$\frac{kh}{\mu}$ md-ft/cp	$k_o h$ md-ft	$k_g h$ md-ft
E-6	11/19/87	18,320	1,290	232
B-32	11/19/87	21,700	4,925	196
Fisher Federal #2-1	2/23/88	5,710	154	76
Johnson Federal 12#5	11/19/88	3,110	88	44
Hill Federal 2Y	6/30/87	1,240	126	15
Hill Federal #1	11/19/87	7,020	12.3	98
Bearcat #1	6/30/87	2,500	133	32
Lindrith B-37	11/19/87	19,020	1,242	235
Howard Federal 43-15	11/19/87	3,690	14.2	50.5
High Adventure #1	11/19/87	11,150	992	134
Loddy #1	11/19/87	2,085	113	27

Table II

Frac Pulse Test Results

Well Signal	Well Observation	Frac Date	Transmissibility kh/μ, $\frac{D\text{-}ft}{cp}$	Storativity Feet $\frac{\phi\mu h}{psi} \times 10^{-5}$
Tap-4	E-6	2-13-86	180	9.8
N-31	E-6	4-1-86	54	4.9
F-7	E-6	11-25-87	310	6.5
F-7	J-6	1-25-87	400	0.5
F-30	B-32	9-4-86	62	5.5
F-30	Hill Fed 2Y	9-4-86	44	0.9
A-20	B-32	2-4-87	82	0.052
A-20	B-29	2-4-87	122	3.2

TABLE III

Gavilan Dome
Rate Sensitivity Correlation Coefficients

Operator	Well Name	c.c.	Slope	
AMOCO	SCC	1.00	NEG	
M.G.	PRO#2	1.00	NEG	
B.M.G.	L-11	1.00	NEG	
B.M.G.	J-6	1.00	NEG	
MALLON	JF 12#5	1.00	NEG	
MERIDIAN	HF 3	1.00	NEG	
MERIDIAN	HF #1	0.99	NEG	
SUN	JA A2	0.99	NEG	
SUN	NS 2	0.98	NEG	
M.G.	BC#1	0.98	NEG	
M.G.	RL#3	0.98	NEG	
MOBIL	B 37	0.98	NEG	
SUN	FS A2	0.97	NEG	
MALLON	RF 2#16	0.97	NEG	
MERIDIAN	HF 2Y	0.97	NEG	
MALLON	HF 1#11	0.97	NEG	
MERRION	KRY 1	0.96	NEG	
M.G.	HC #1	0.96	NEG	
MERIDIAN	HAF 2	0.96	NEG	
SUN	DRDO 1	0.96	NEG	
B.M.G.	E-10	0.96	NEG	-- CHRONOLOGICAL
SUN	HR 1	0.95	NEG	
SUN	NS 1	0.95	NEG	
MOBIL	B 73	0.95	NEG	
SUN	ET 1	0.93	NEG	
SUN	LOD 1	0.93	NEG	
M.G.	GH#1	0.92	NEG	-- CHRONOLOGICAL
M.G.	MAR#1	0.92	NEG	
B.M.G.	N-31	0.92	NEG	
MERIDIAN	HAF 3	0.92	NEG	
M.G.	INV#1	0.91	NEG	
SUN	FT E1	0.91	NEG	
MALLON	FF 2#1	0.90	NEG	
M.G.	GAV #3	0.90	NEG	
B.M.G.	A-20	0.90	POS	
MALLON	PF 13#6	0.89	NEG	
B.M.G.	E-6	0.89	NEG	
SUN	BL 2	0.89	NEG	
SUN	FT 1	0.88	NEG	
MOBIL	B 34	0.88	NEG	
SUN	ML 2	0.87	NEG	
B.M.G.	F-19	0.87	NEG	
SUN	NS 3	0.86	NEG	
MOBIL	B 38	0.86	NEG	-- CHRONOLOGICAL
MOBIL	B 74	0.86	NEG	
MALLON	DF 3#15	0.85	NEG	

Of the sample with c.c. > .85

Negative Slopes	
amount	percentage
45	97.83%

Positive Slopes	
amount	percentage
1	2.17%

85% Correlation Coefficient Cut Off Point

TABLE III

Gavilan Dome
Rate Sensitivity Correlation Coefficients

Operator	Well Name	c.c.	Slope
B.M.G.	C-34	0.84	POS
SUN	LL 1	0.80	NEG
SUN	GG 1	0.80	NEG
R&B	IN 34-16	0.79	NEG
B.M.G.	O-9	0.76	NEG
B.M.G.	B-29	0.76	POS
R&B	HF 43-15	0.76	NEG
DUGAN	LIND 1	0.75	NEG
M.G.	RL#2	0.73	NEG
SUN	HA 2	0.71	NEG
B.M.G.	L-3	0.68	NEG
B.M.G.	F-30	0.66	NEG
SUN	JA B3	0.66	NEG
SUN	NH 1	0.65	NEG
SUN	WW 1	0.62	NEG
B.M.G.	F-18	0.58	NEG
M.G.	BRO#1	0.54	NEG
SUN	HA 1	0.52	NEG
B.M.G.	D-17	0.52	NEG
MOBIL	B 72	0.49	NEG
SUN	FS B3	0.48	NEG
SUN	FS 1	0.46	NEG
SUN	BB 1	0.44	NEG
B.M.G.	L-27	0.43	NEG
B.M.G.	O-33	0.43	NEG
B.M.G.	B-32	0.36	POS
AMOCO	SGC 1	0.35	NEG
M.G.	GAV #1	0.32	POS
AMOCO	BCU 1	0.31	NEG
MALLON	HF 1#8	0.31	NEG
SUN	JA 1	0.29	NEG
B.M.G.	K-8	0.20	NEG
B.M.G.	F-7	0.18	POS
B.M.G.	N-22	0.17	POS
B.M.G.	A-16	0.16	NEG
MERRION	OCG 1	0.15	POS
B.M.G.	G-5	0.13	POS
SUN	ML 1	0.08	POS
HIXON	DIV 3	0.06	NEG
B.M.G.	G-32	0.05	NEG
HIXON	TAP 4	0.01	POS

TABLE IV

Gavilan Dome, Recovery Efficiency
Barrel per PSI Pressure Drop

6/30-11/19

Operator	Well Name	dP psi	Cum Oil bbl	Cum/dP bbl/psi
B.M.G.	E-6	-208	41118	-198
B.M.G.	A-20	-217	2443	-11
B.M.G.	B-32	-237	83828	-354
M.G.	Bearcat #1	-271	2929	-11
Mobil	Lind B 37	-270	26385	-98
R & B	HF 43-15	-261	1020	-4
Sun	High Adventure #1	-291	24002	-82
Sun	Loddy #1	-230	7296	-32
			Average	98 bbl/psi

11/19-2/23

Operator	Well Name	dP psi	Cum Oil bbl	Cum/dP bbl/psi
B.M.G.	E-6	-16	4424	-277
B.M.G.	A-20	-19	2400	-126
B.M.G.	E-10	12	2317	193*
B.M.G.	B-32	-13	42177	-3244
Merridian	Hill Federal #1	4	453	113*
M.G.	Bearcat #1	-33	531	-16
Mobil	Lind B 37	-36	13011	-361
R & B	HF 43-15	-37	393	-11
Sun	High Adventure #1	-54	14052	-260
Sun	Loddy #1	-53	3318	-63
			Average	543 bbl/psi

* Not Included in Average
Since Pressure Increased

FIGURES

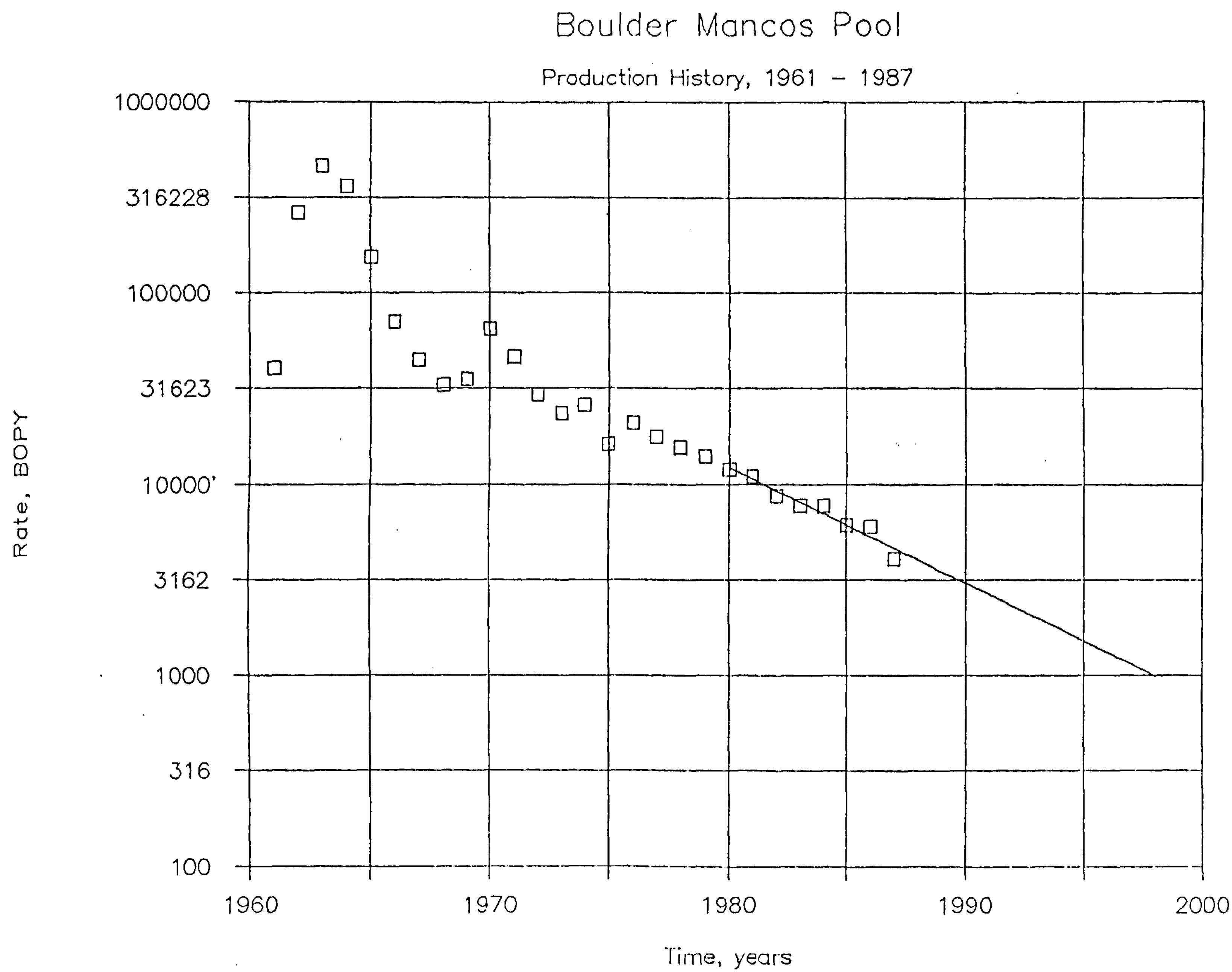

Boulder Mancos Pool
Production History, 1961 - 1987
Rate, BOPY
1000000
316228
100000
31623
10000'
3162
1000
316
100
1960
1970
1980
1990
2000
Time, years

Figure 1

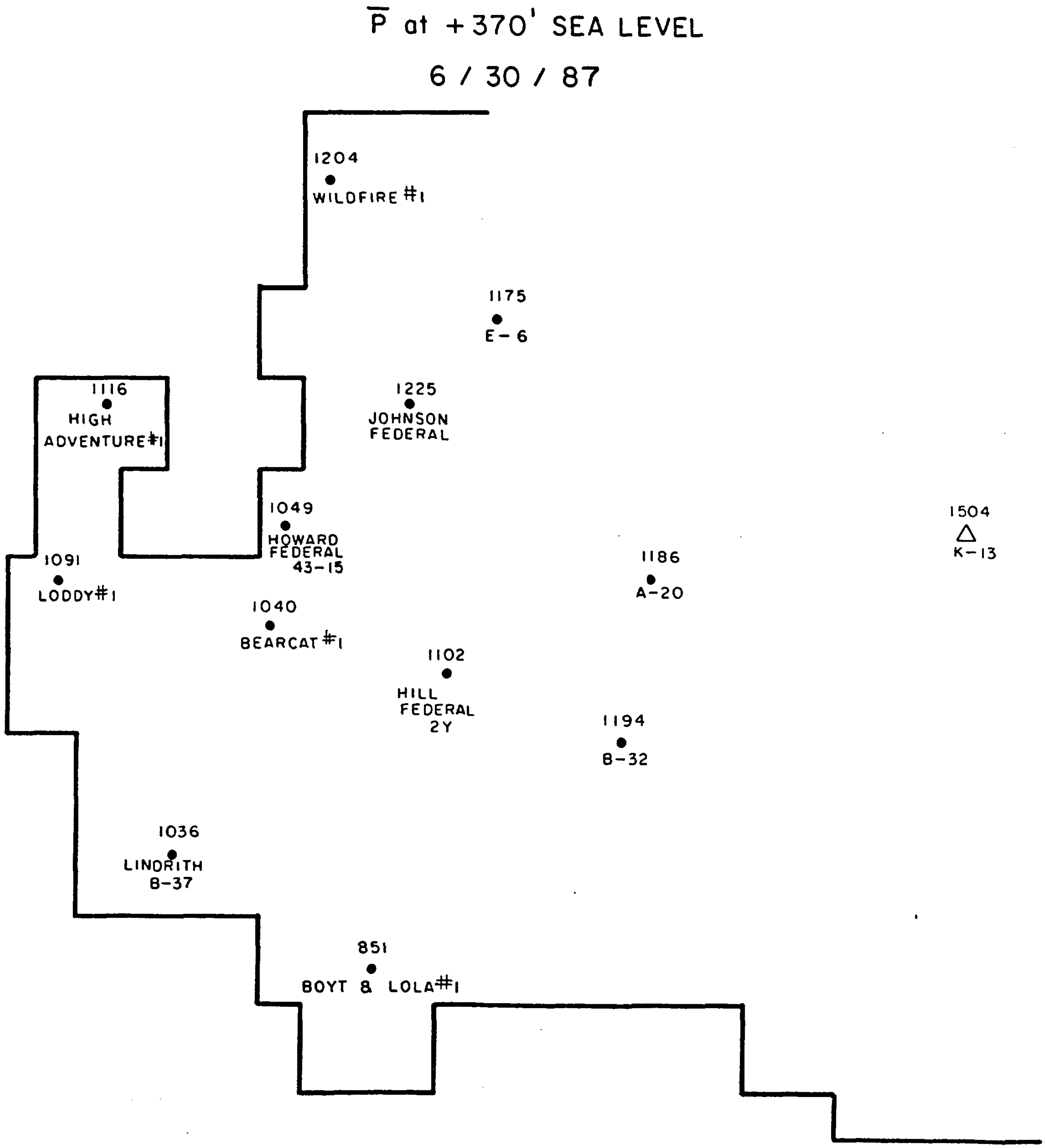
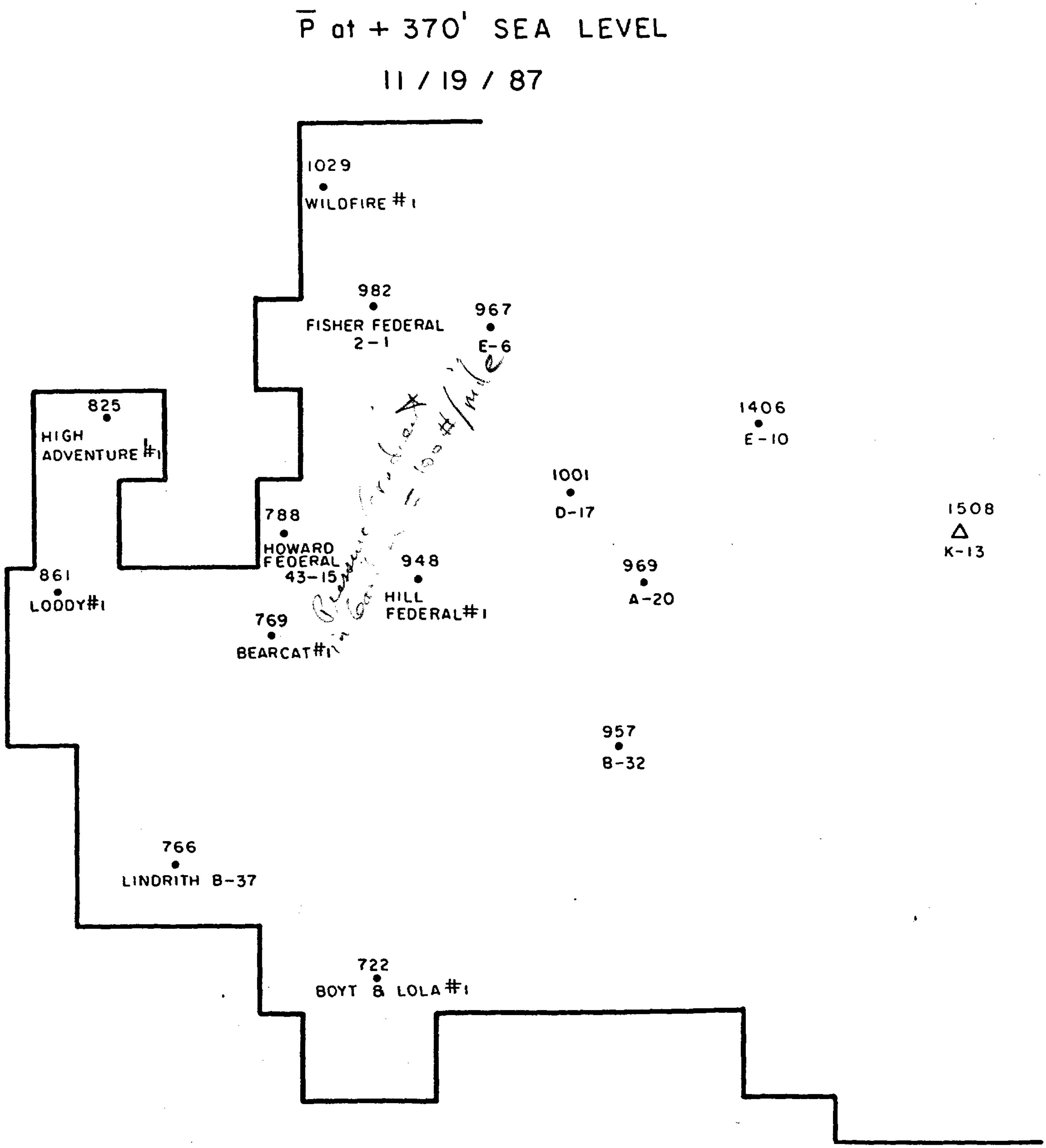

$\overline{P}$ at +370' SEA LEVEL
6 / 30 / 87
1204
WILDFIRE #1
1175
E-6
1116
HIGH
ADVENTURE #1
1225
JOHNSON
FEDERAL
1049
HOWARD
FEDERAL
43-15
1504
K-13
1091
LODDY #1
1186
A-20
1040
BEARCAT #1
1102
HILL
FEDERAL
2Y
1194
B-32
1036
LINDRITH
B-37
851
BOYT & LOLA #1

Figure 2



P̄ at + 370' SEA LEVEL
11 / 19 / 87
1029
WILDFIRE #1
982
FISHER FEDERAL
2-1
967
E-6
825
HIGH
ADVENTURE #1
1406
E-10
1001
D-17
1508
K-13
788
HOWARD
FEDERAL
43-15
948
HILL
FEDERAL #1
969
A-20
861
LODDY #1
769
BEARCAT #1
957
B-32
766
LINDRITH B-37
722
BOYT & LOLA #1

Figure 3

$\overline{P}$ at +370' SEA LEVEL 2/23/88

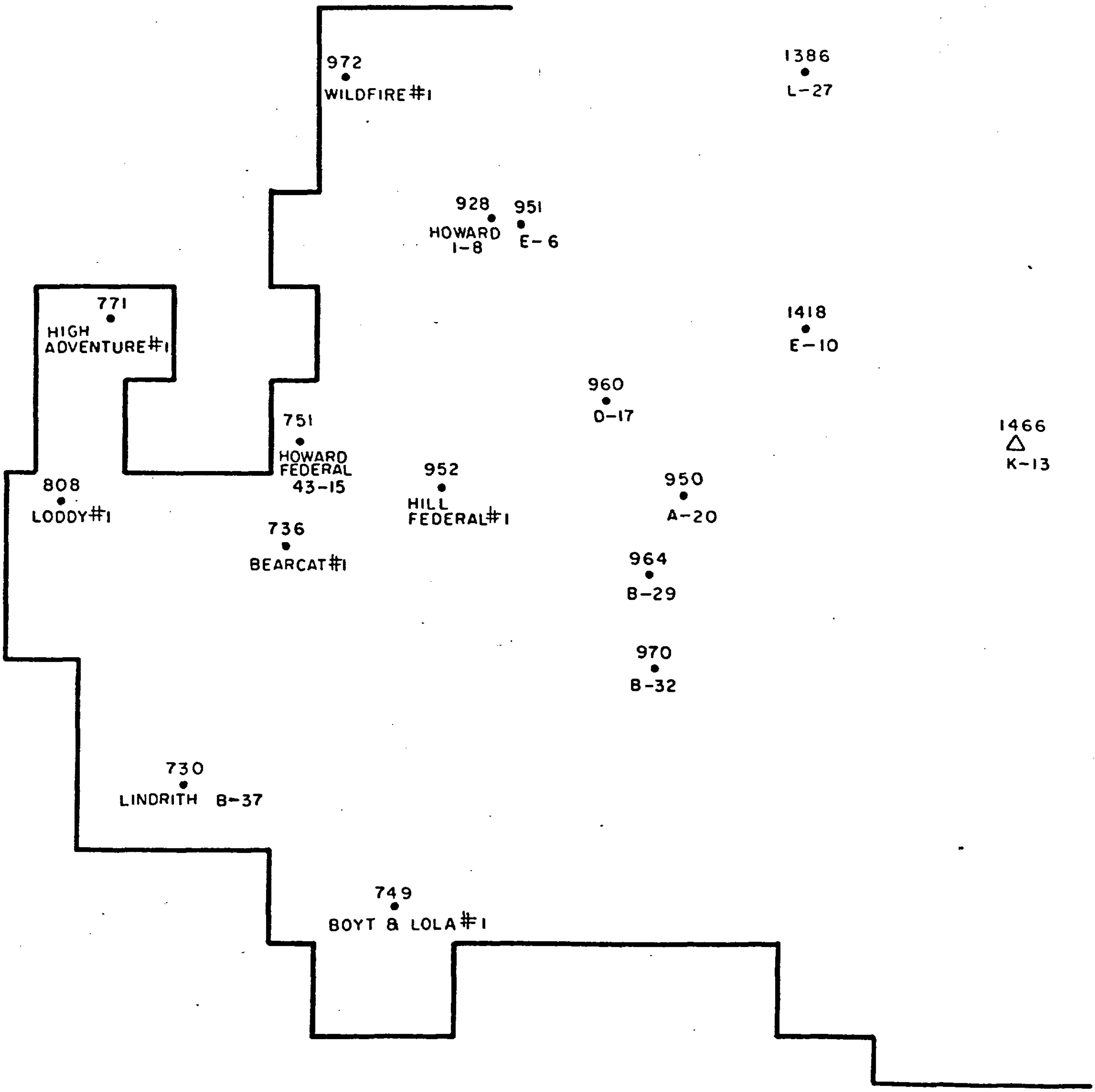


Figure 4

CO_2 FLOOD ISOBARS

SPE / DOE 17327

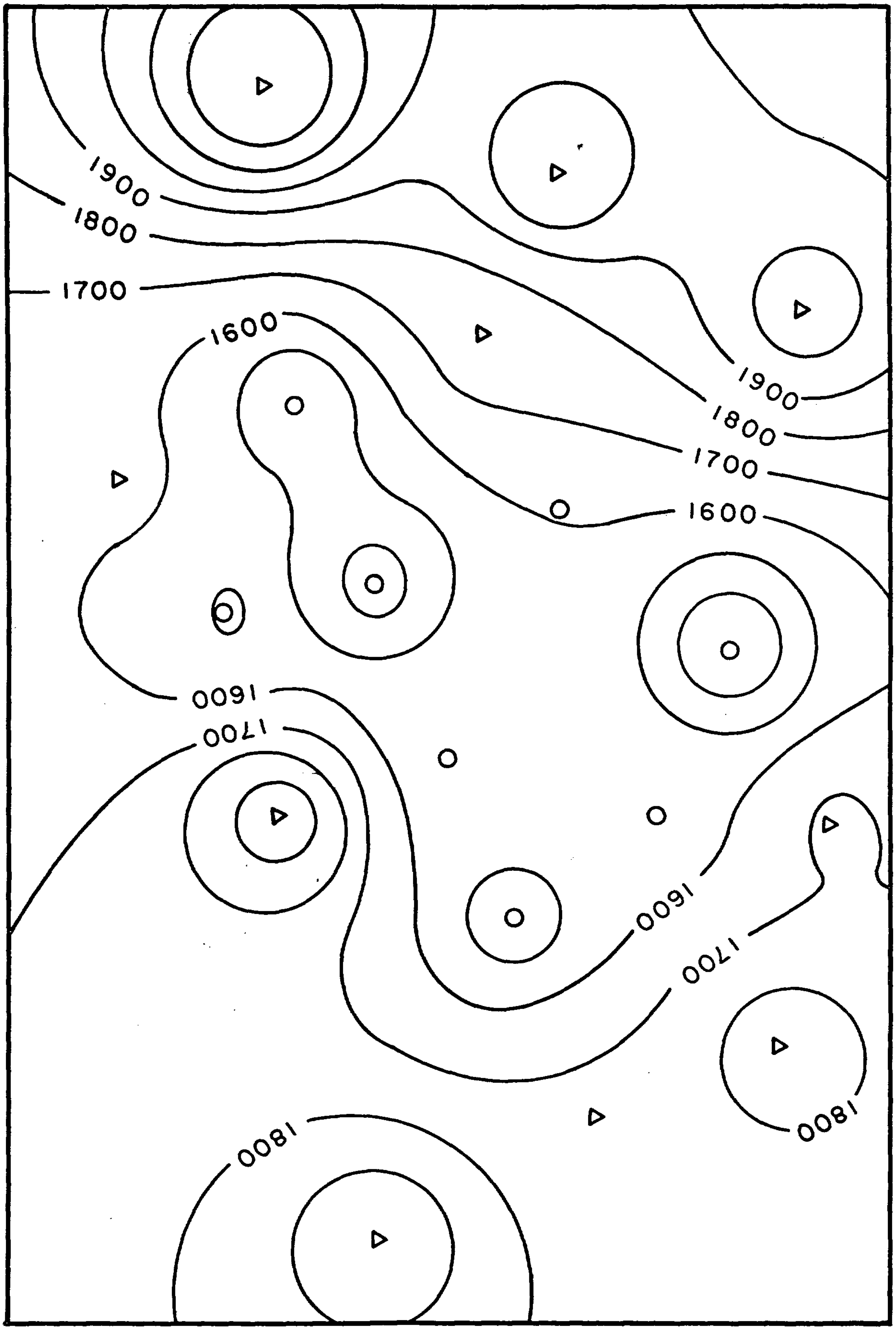


Figure 5

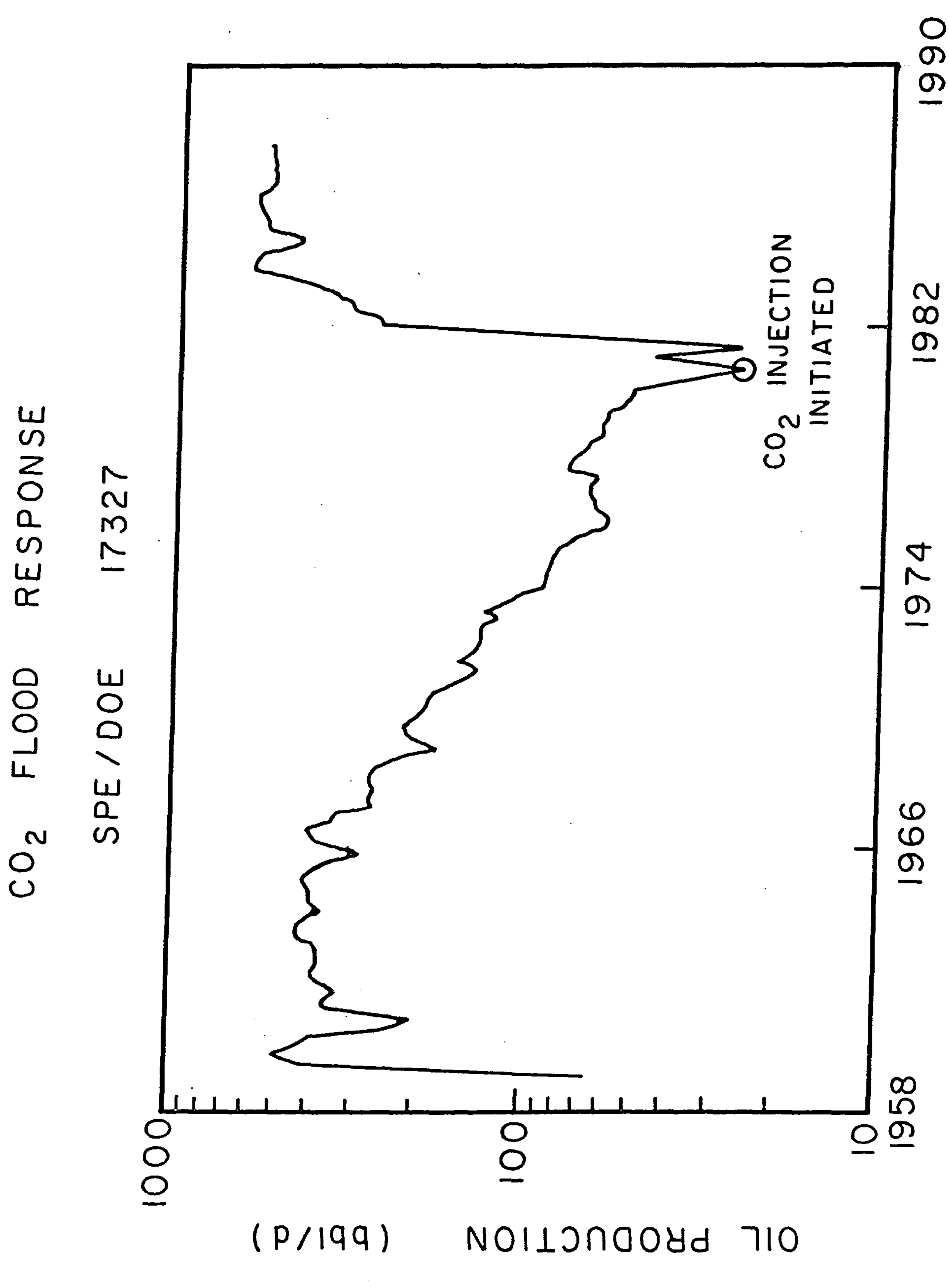

CO2 FLOOD RESPONSE
SPE/DOE 17327
CO2 INJECTION INITIATED
OIL PRODUCTION (bbl/d)
1000
100
10
1958
1966
1974
1982
1990

Figure 6

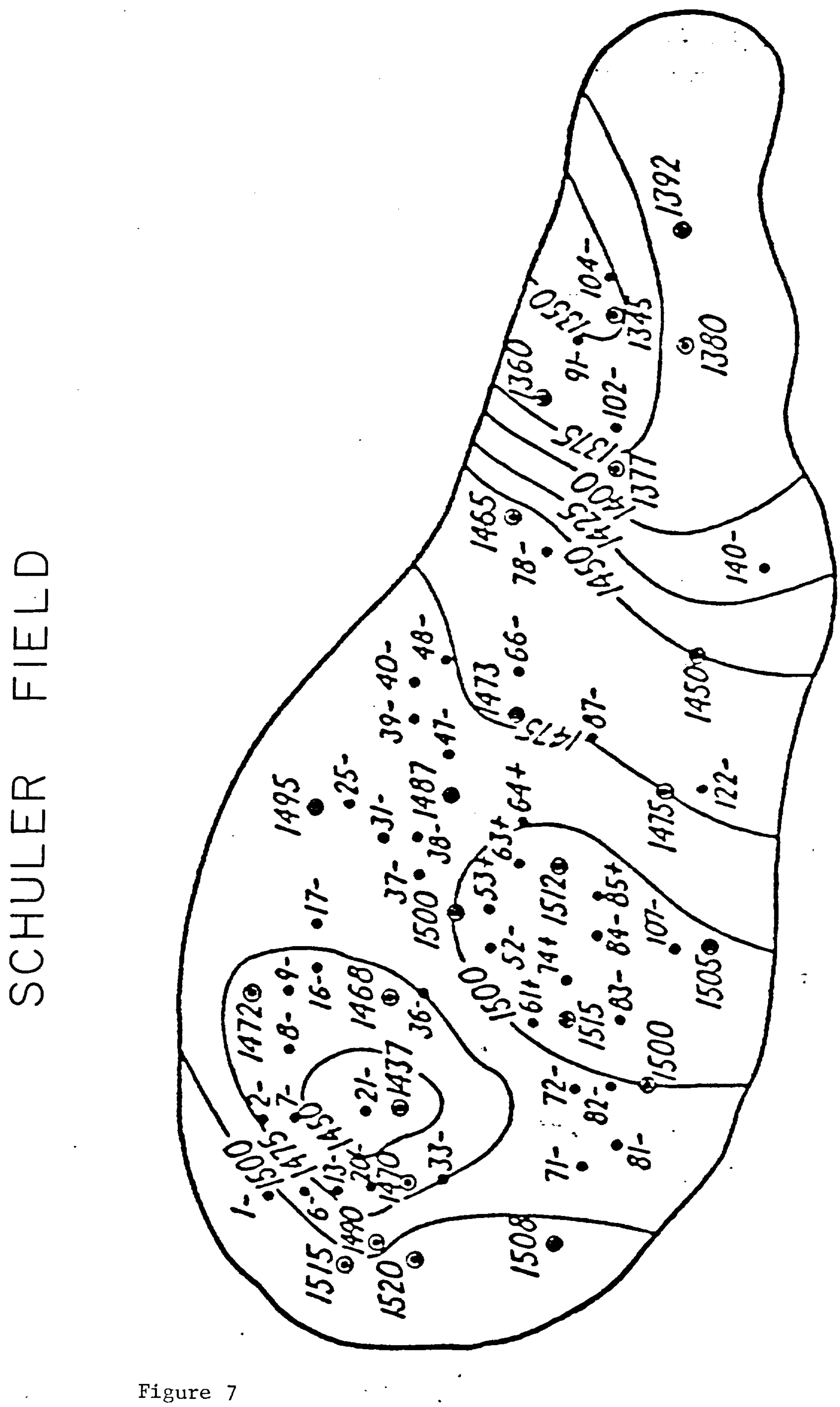


Figure 7

JUDY CREEK

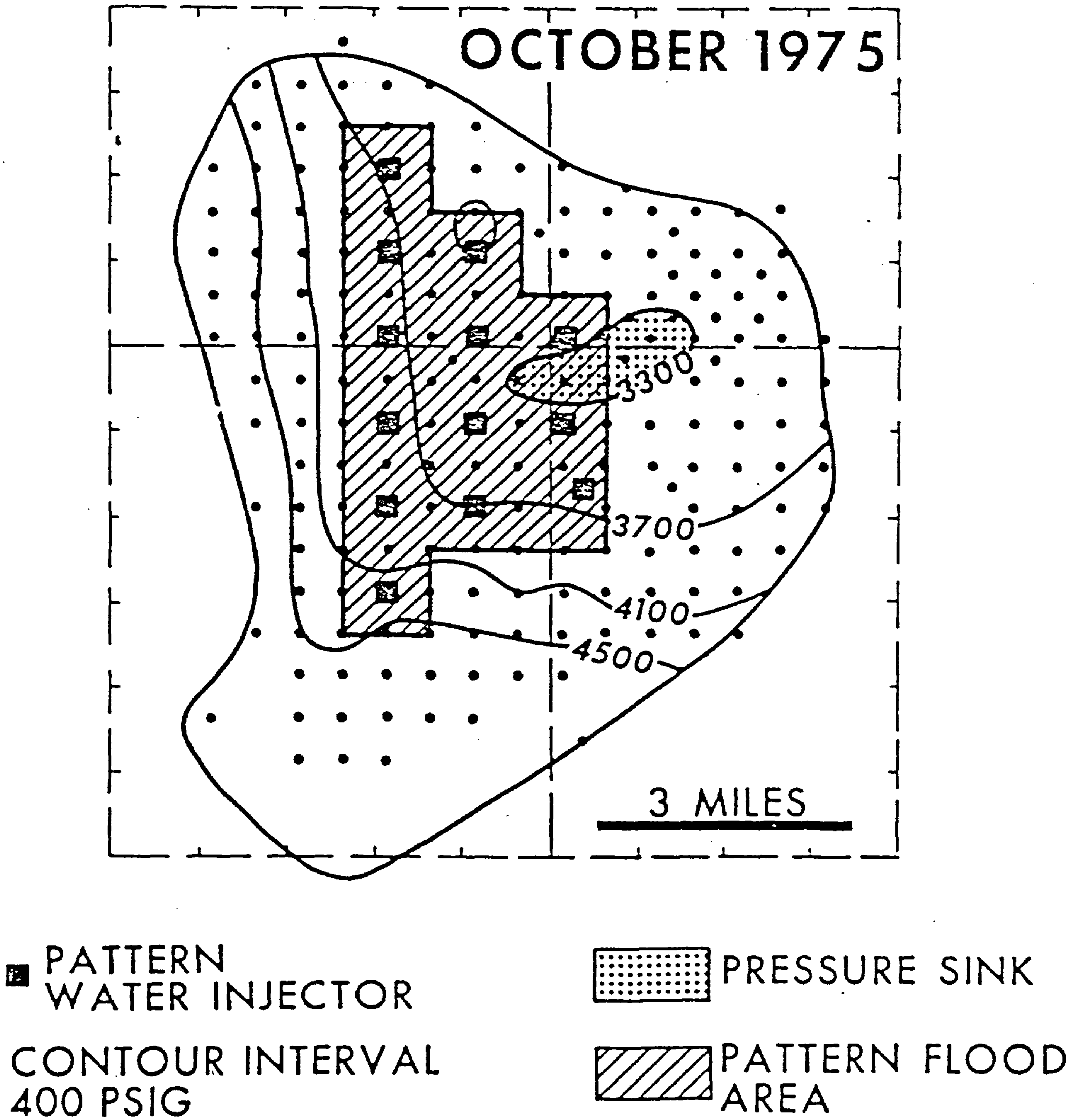


Figure 8

PRESSURE GRADIENTS, psi/1000 2/23

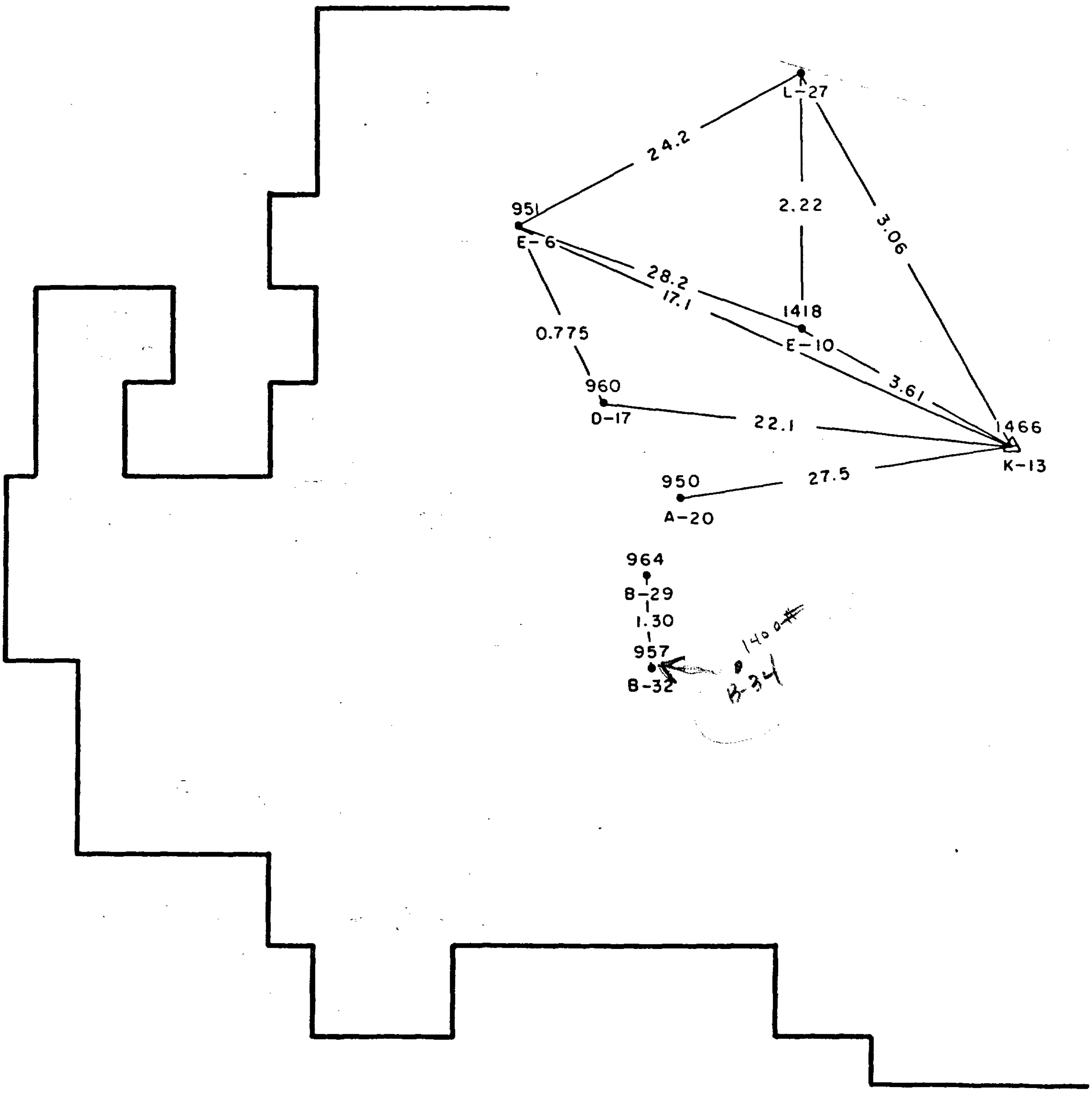


Figure 9

TRANSMISSIBILITY $\frac{Kh}{\mu}$, $\frac{D \cdot ft}{cp}$ FROM BUILDUPS

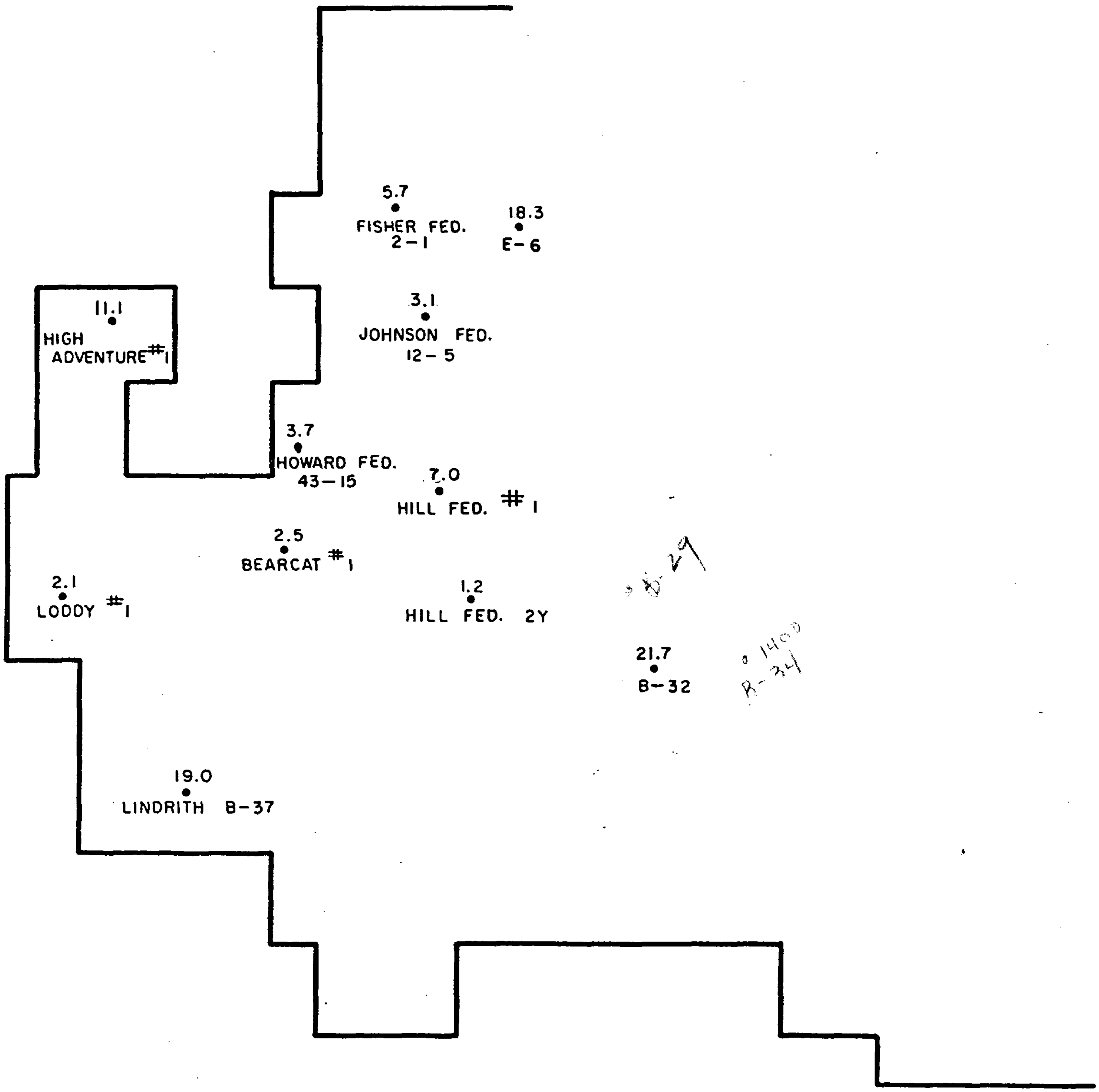
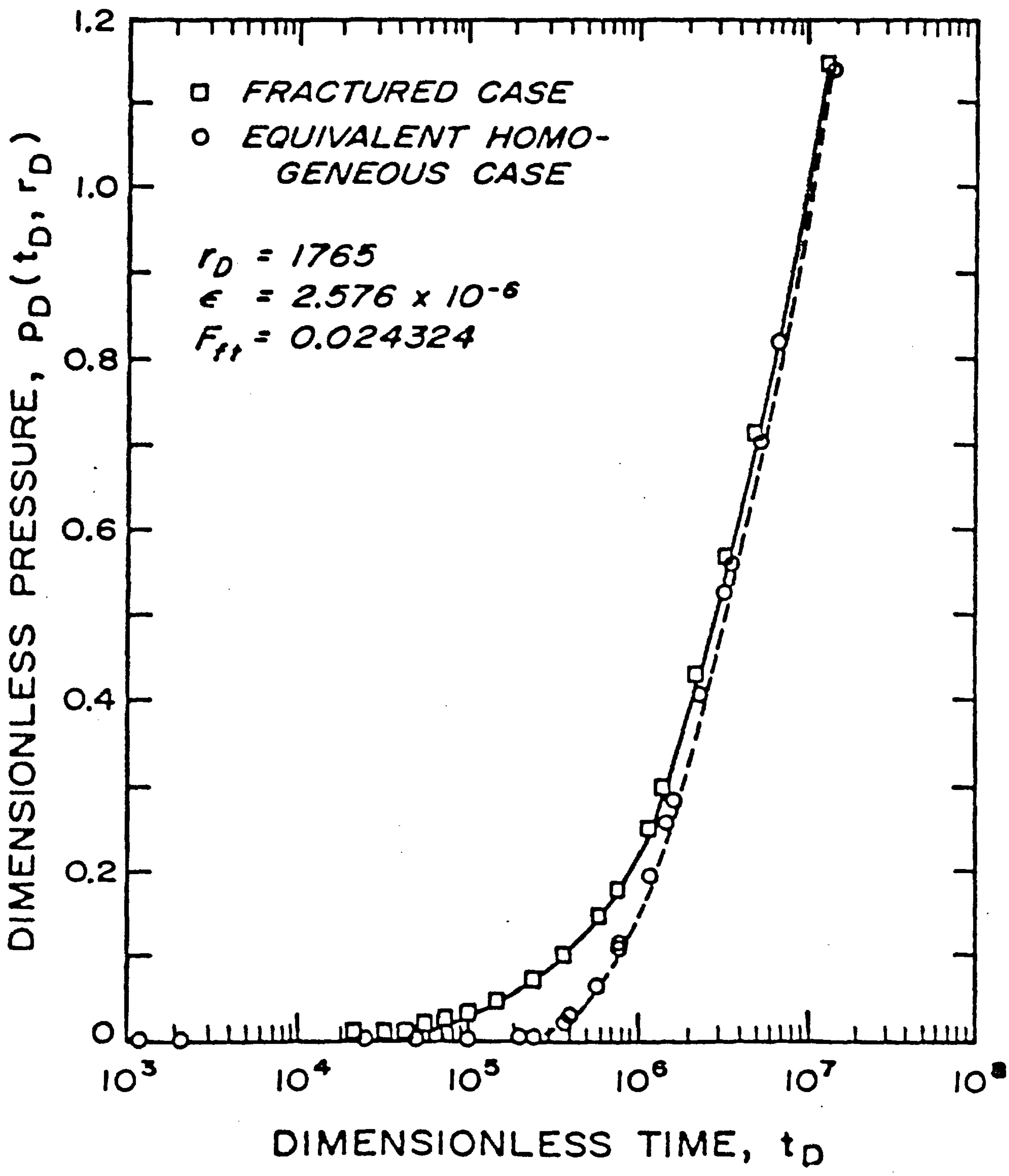


Figure 10



FRACTURED CASE
EQUIVALENT HOMOGENEOUS CASE
r_D = 1765
ϵ = 2.576 x 10^{-6}
F_{ft} = 0.024324
DIMENSIONLESS PRESSURE, $p_D(t_D, r_D)$
DIMENSIONLESS TIME, t_D

Figure 11

FRAC PULSE RESULTS

TRANSMISSIBILITY $\frac{Kh}{\mu}$, $\frac{D\text{-}ft}{cp}$

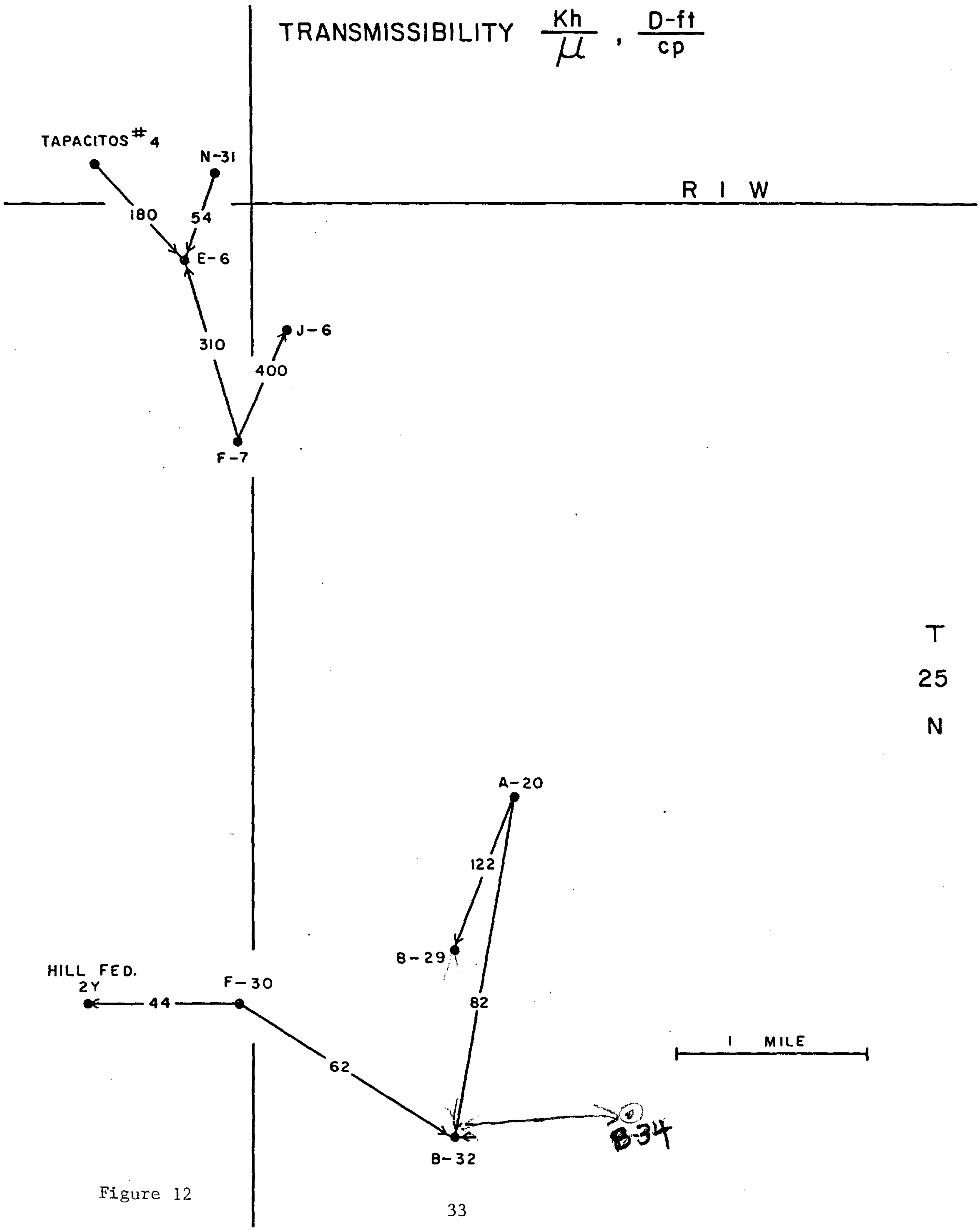


Figure 12

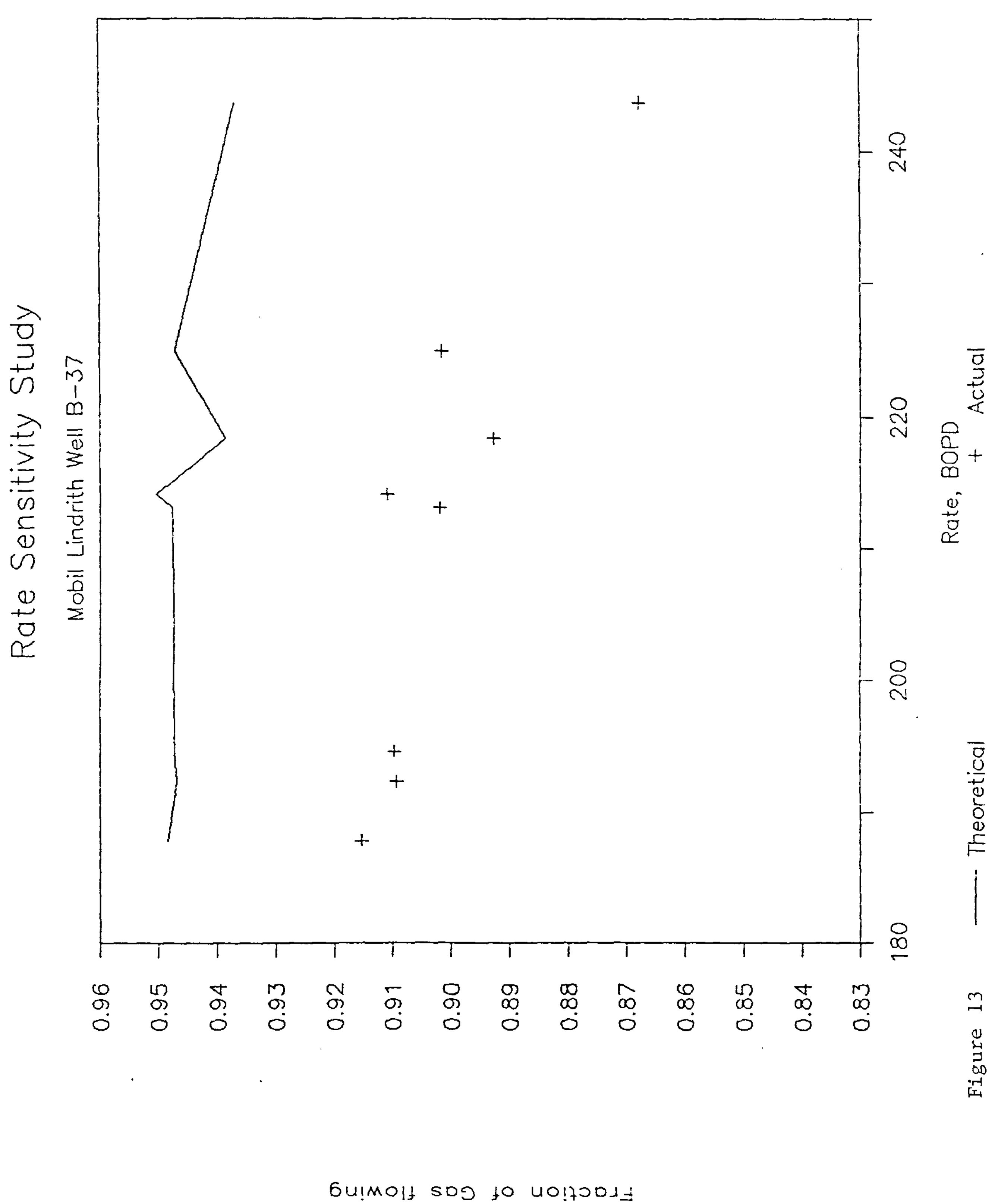

Rate Sensitivity Study
Mobil Lindrith Well B-37
0.96
0.95
0.94
0.93
0.92
0.91
0.90
0.89
0.88
0.87
0.86
0.85
0.84
0.83
180
200
220
240
Rate, BOPD
Fraction of Gas flowing
Theoretical
+ Actual

Figure 13

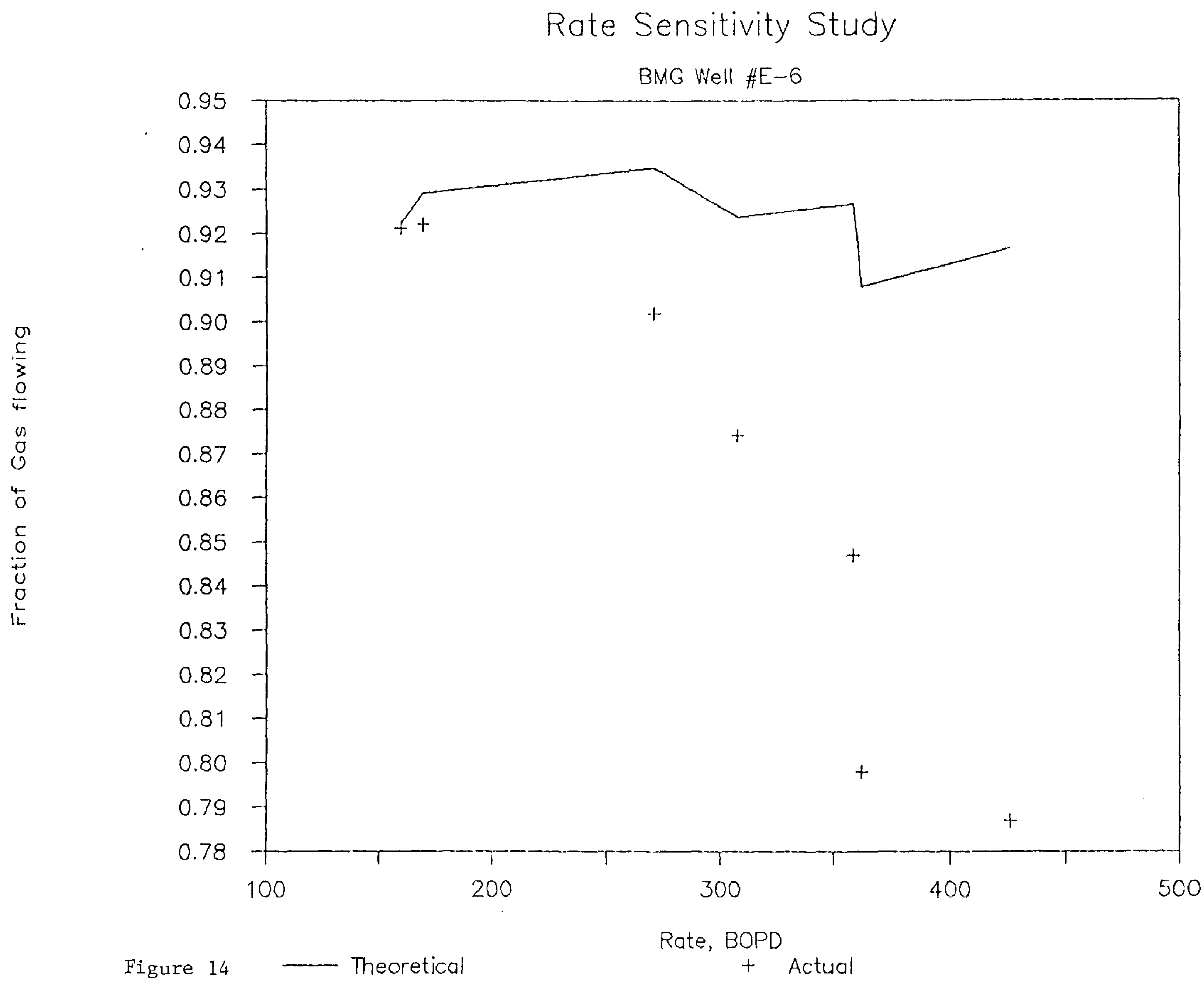

Rate Sensitivity Study
BMG Well #E-6
Fraction of Gas flowing
0.95
0.94
0.93
0.92
0.91
0.90
0.89
0.88
0.87
0.86
0.85
0.84
0.83
0.82
0.81
0.80
0.79
0.78
100
200
300
400
500
Rate, BOPD
Theoretical
+ Actual

Figure 14

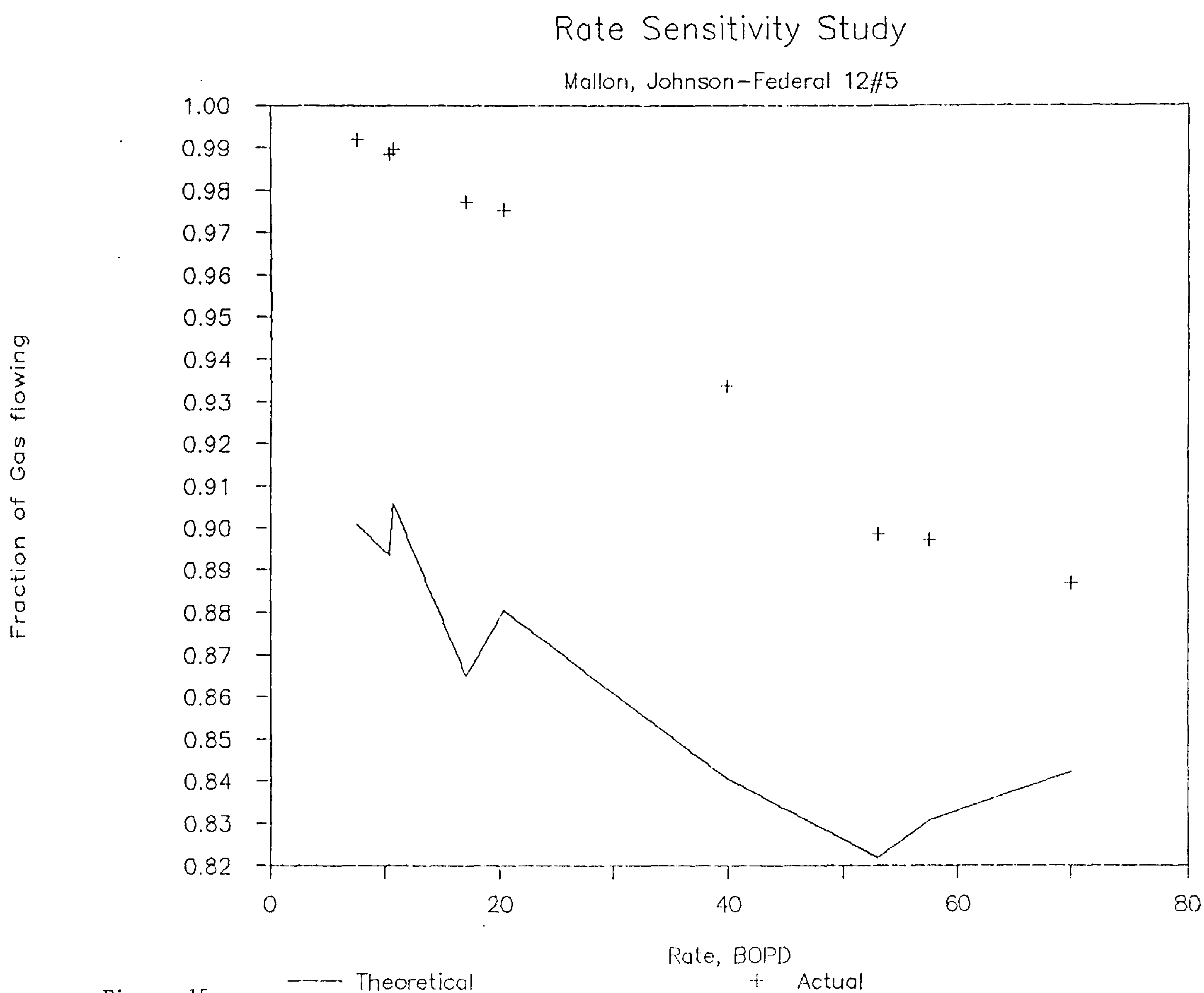

Rate Sensitivity Study
Mallon, Johnson-Federal 12#5
Fraction of Gas flowing
1.00
0.99
0.98
0.97
0.96
0.95
0.94
0.93
0.92
0.91
0.90
0.89
0.88
0.87
0.86
0.85
0.84
0.83
0.82
0
20
40
60
80
Rate, BOPD
Theoretical
+ Actual

Figure 15

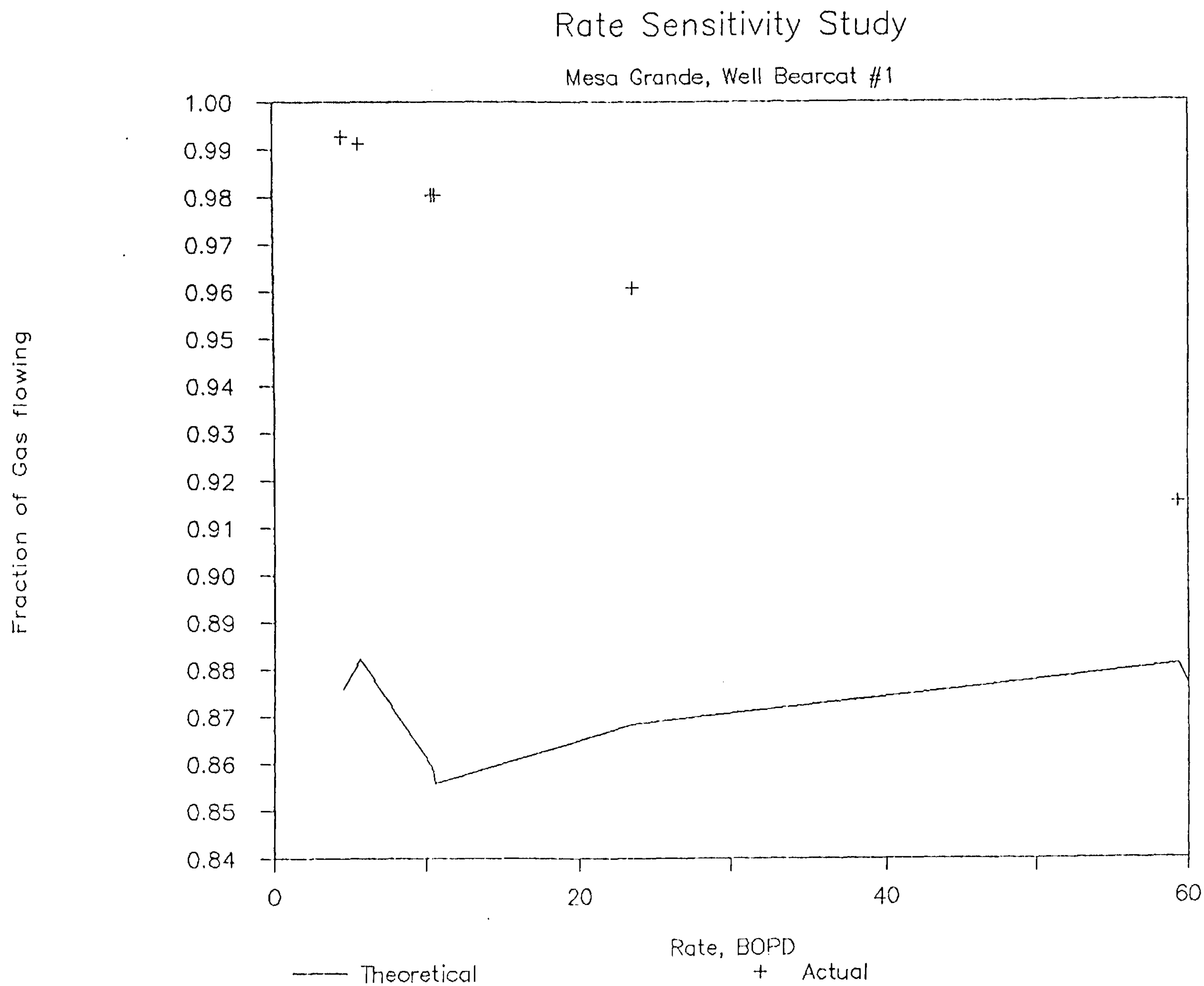

Rate Sensitivity Study
Mesa Grande, Well Bearcat #1
Fraction of Gas flowing
1.00
0.99
0.98
0.97
0.96
0.95
0.94
0.93
0.92
0.91
0.90
0.89
0.88
0.87
0.86
0.85
0.84
0
20
40
60
Rate, BOPD
Theoretical
+ Actual

Figure 16

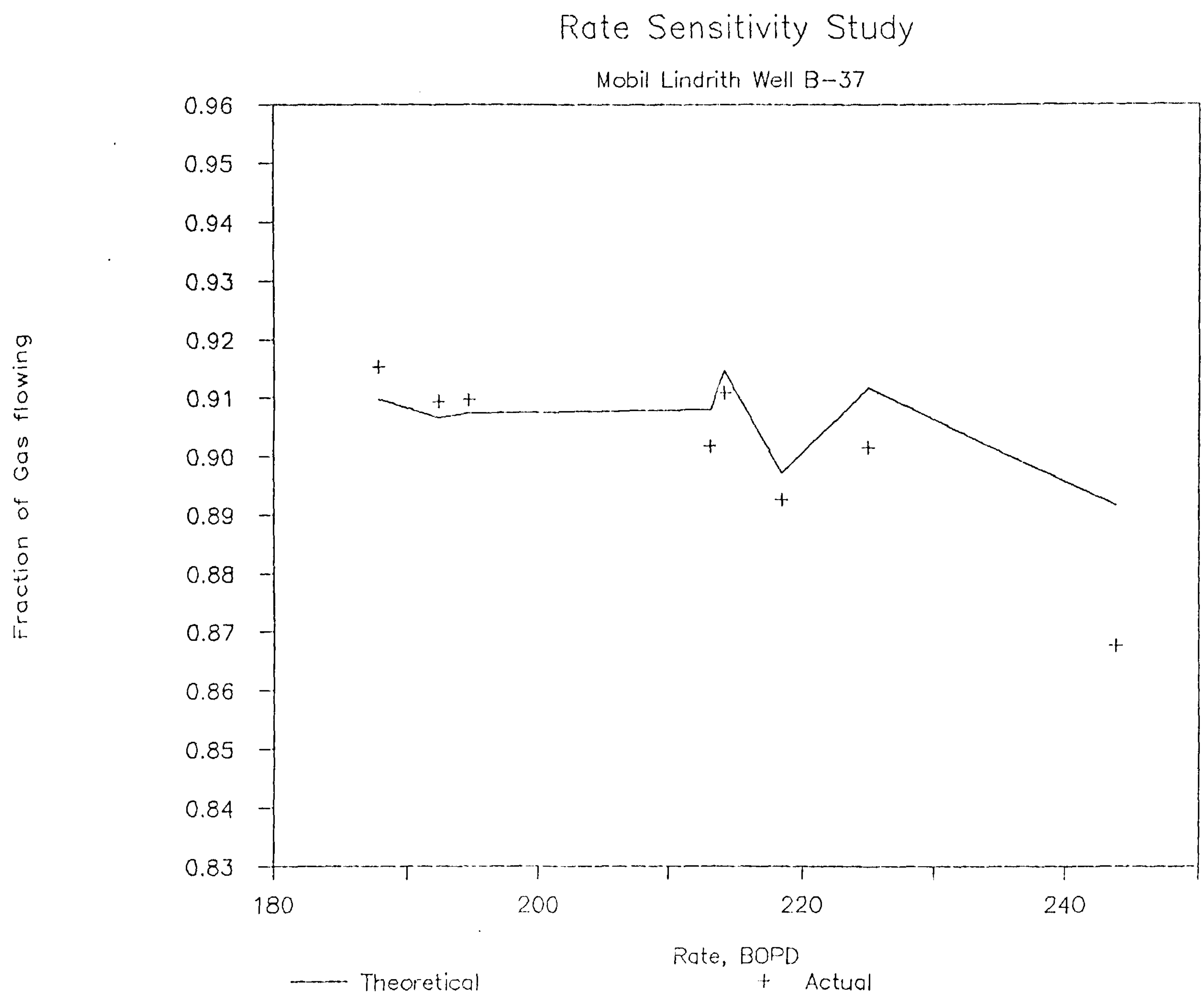

Rate Sensitivity Study
Mobil Lindrith Well B-37
Fraction of Gas flowing
0.96
0.95
0.94
0.93
0.92
0.91
0.90
0.89
0.88
0.87
0.86
0.85
0.84
0.83
180
200
220
240
Rate, BOPD
Theoretical
Actual

Figure 17

BARRELS OF OIL PRODUCED
PER PSI PRESSURE DROP
6 / 30 / 87 to 11 / 19 / 87

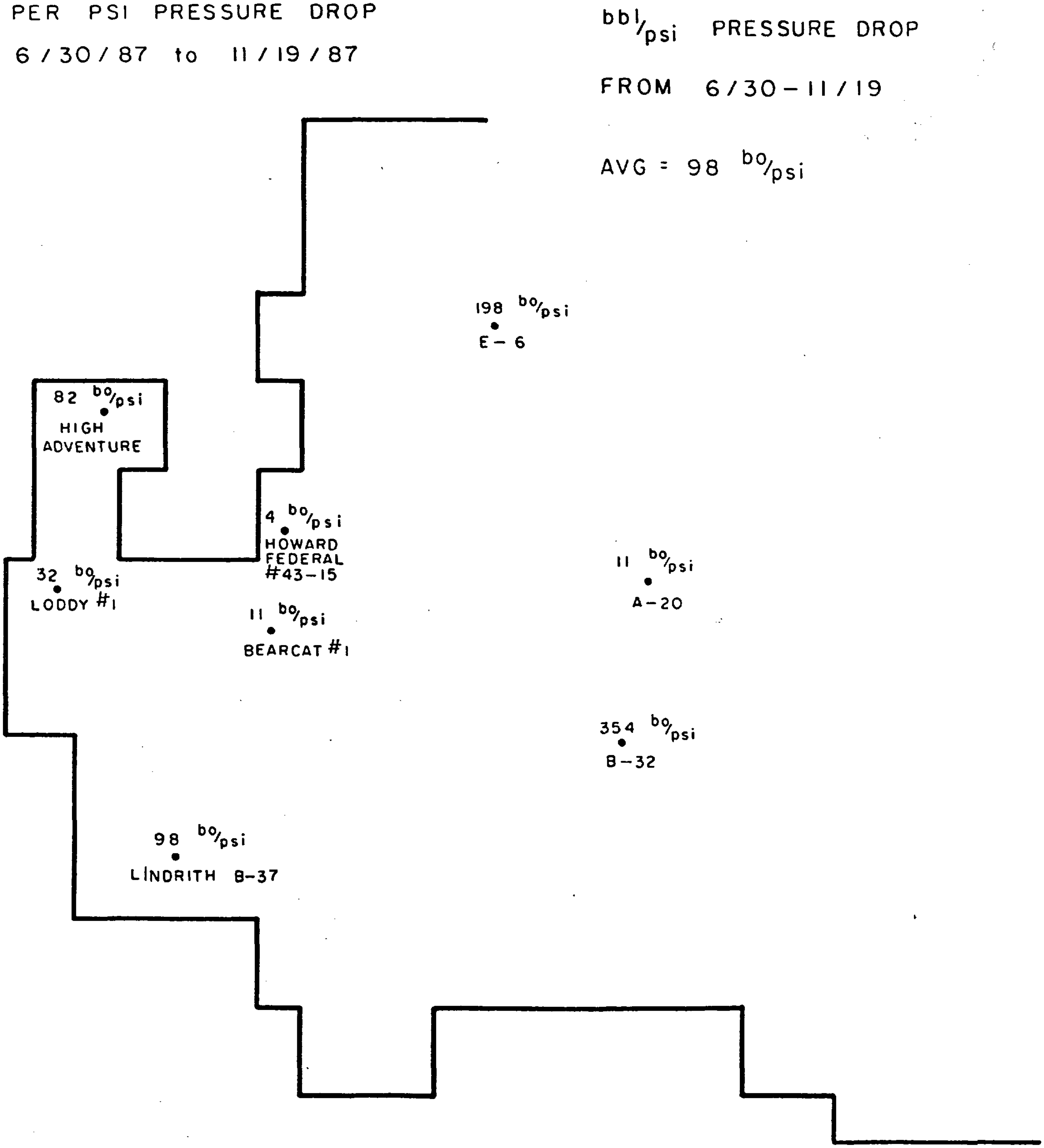


Figure 18

BARRELS OF OIL PRODUCED
PER PSI PRESSURE DROP
11 / 19 / 87 to 2 / 23 / 88

bbl/psi PRESSURE DROP
FROM 11 / 19 — 2 / 23

AVE = 543 bo/psi

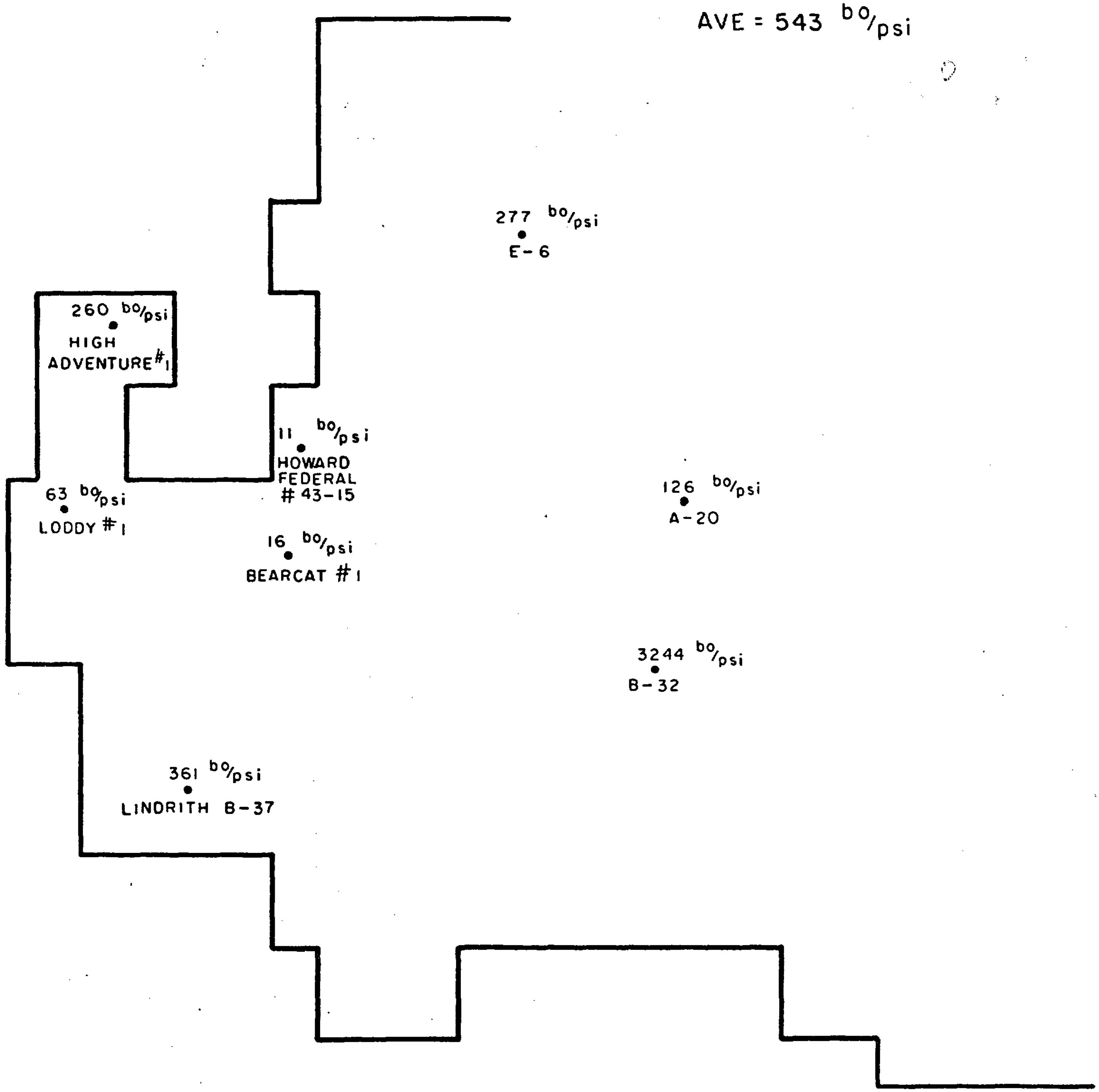


Figure 19

APPENDIX 1

Static Pressure Worksheets

	KB		Subsea
Operator	BMG		
Well	E-6		
Elevation	7505		
Top of B Zone	7148		+357
Test Date		6/30/87	
Bomb Depth	7277		+228
Bomb Pressure, psig		1214.2	
Fluid Level	7137		+368
Wellbore Gradient			
Oil, psi/ft	(0.3)(228-357)		-38.7
Gas, psi/ft			
Pressure at Top of B Zone		1175.5	
Top of B Zone to +370 ft	13		
Production			
BO/D		321	
Mcf/D		1471	
Volume Weighted Reservoir Density, psi/ft		0.06350	
dP to +370 ft		.83	
Pressure at +370 ft datum		1174.7	

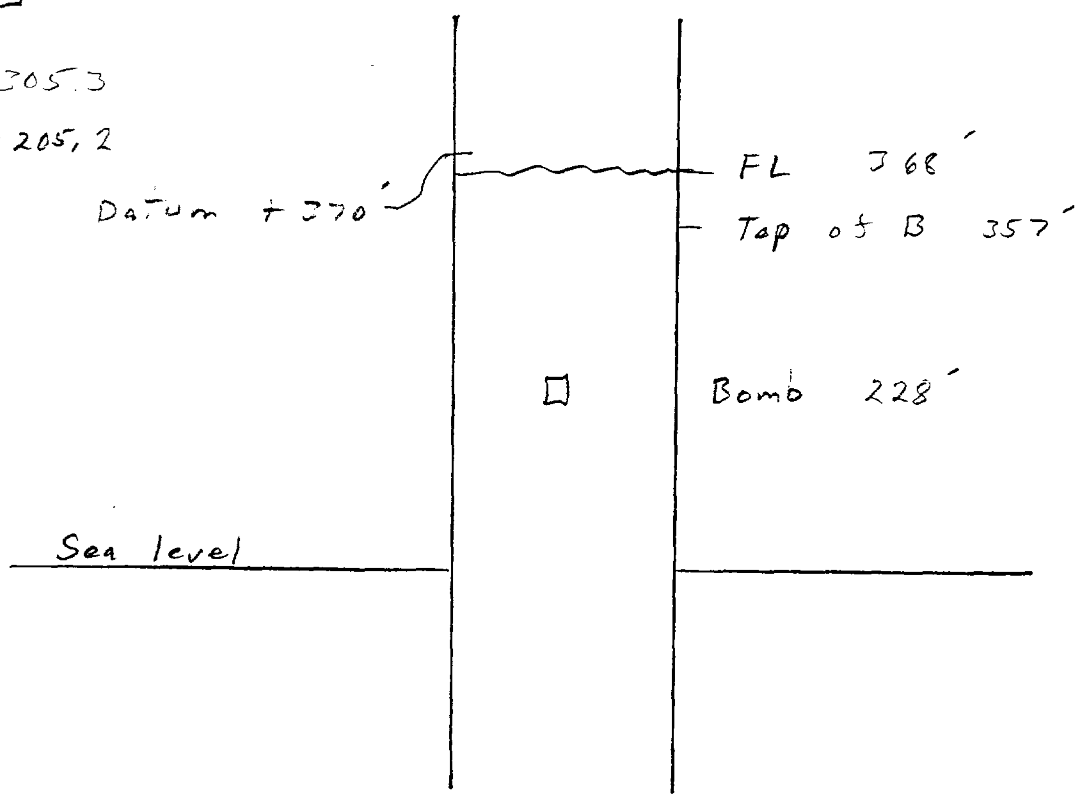
$(321)(1.342) = 430.8$

$\left[1471 - \frac{(321)(501)}{1000}\right] 2.328 = 3050.1$

$(.7088)(430.8) = 305.3$

$(.067265)(3050.1) = 205.2$

$(.433)(.1466)$



	KB		Subsea
Operator	BMG		
Well	E-6		
Elevation	7505		
Top of B Zone	7148		+357
Test Date		11/19/87	
Bomb Depth	7332		+168
Bomb Pressure, psig		1014.9	
Fluid Level	7132		+323
Wellbore Gradient			
Oil, psi/ft	0.3(168-323)		-46.5
Gas, psi/ft	0.03(323-357)		- 1.0
Pressure at Top of B Zone		967.4	
Top of B Zone to +370 ft	13		
Production			
BO/D		291	
Mcf/D		1250	
Volume Weighted Reservoir Density, psi/ft		0.05437	
dP to +370 ft		0.7	
Pressure at +370 ft datum		966.7	

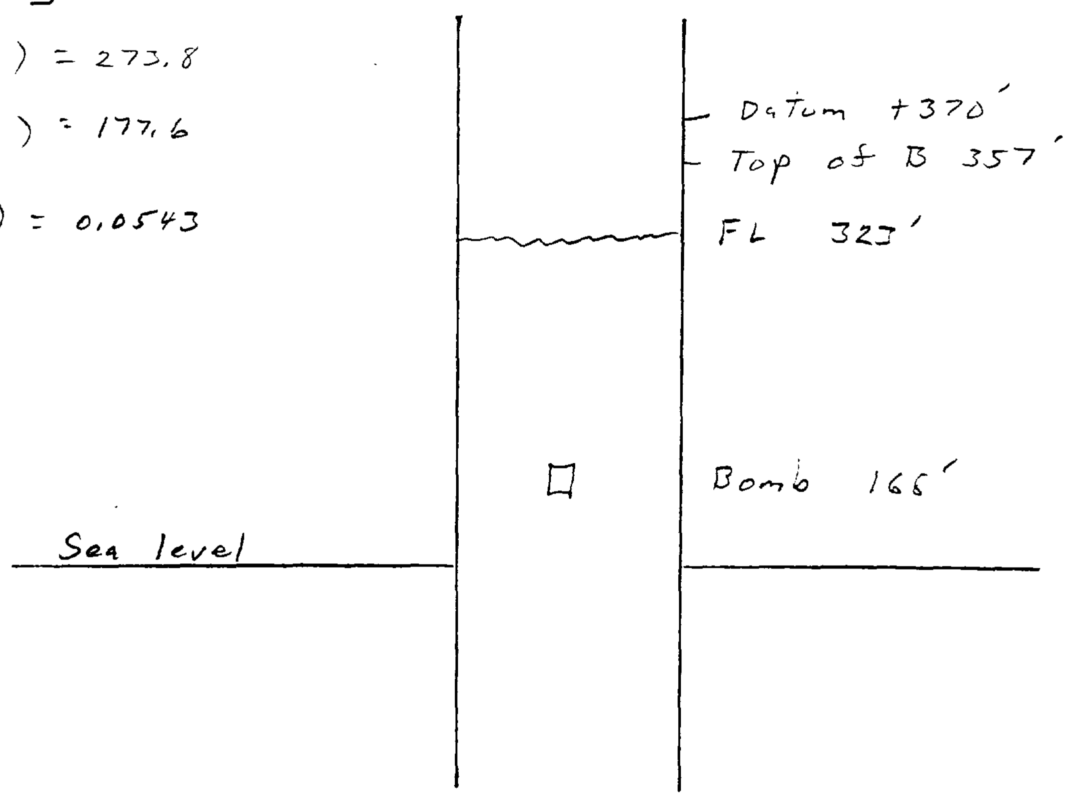
$(291)\ (1.317) = 383.2$

$\left[1250 - \frac{291(443)}{1000}\right] 2.865 = 3211.9$

$(.7143)(383.2) = 273.8$

$(.055291)(3211.9) = 177.6$

$(.433)(.1256) = 0.0543$



	KB		Subsea
Operator	BMG		
Well	E-6		
Elevation	7505		
Top of B Zone	7148		+357
Test Date		2/23/88	
Bomb Depth	7277		+228
Bomb Pressure, psig		955.2	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(228-357)		-3.9
Pressure at Top of B Zone		951.3	
Top of B Zone to +370 ft	13		
Production			
BO/D		160	
Mcf/D		840	
Volume Weighted Reservoir Density, psi/ft		0.04788	
dP to +370 ft		0.6	
Pressure at +370 ft datum		950.7	

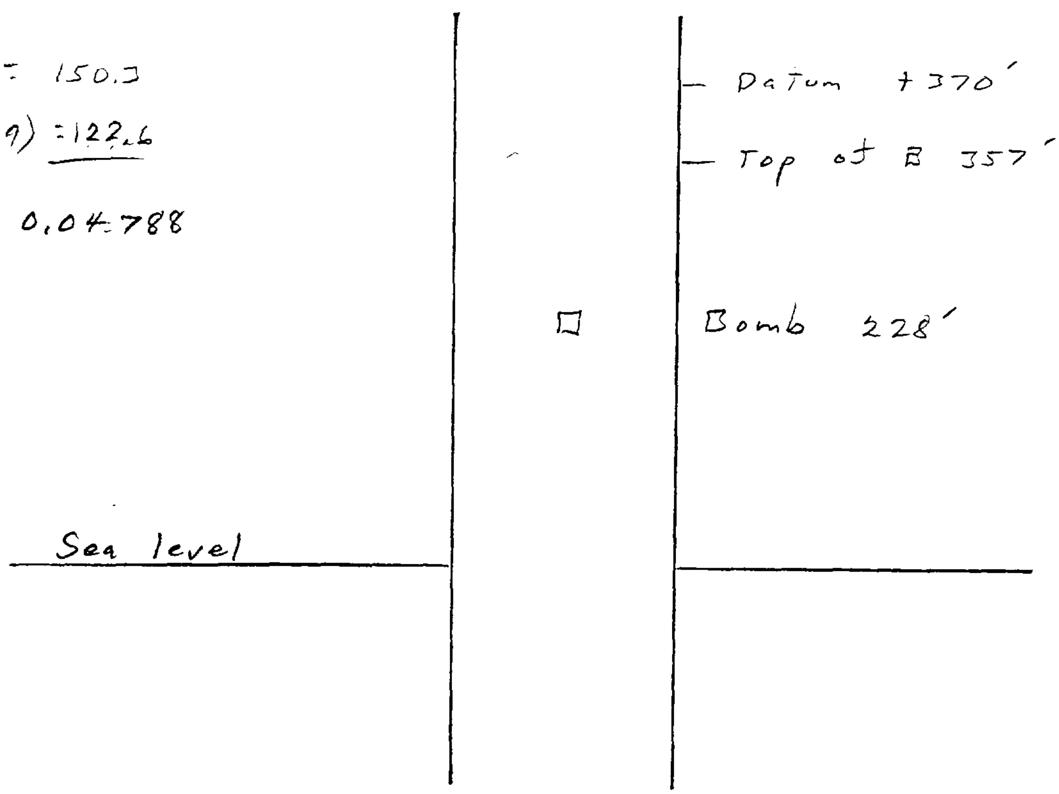
$(160)\ (1.314) = 210.24$

$\left[840 - \frac{(160)(437)}{1000}\right] 2.932 = 2257.9$

$(.7148)(210.2) = 150.3$

$(.054314)(2257.9) = 122.6$

$(.433)(.1166) = 0.04788$



	KB		Subsea
Operator	EMG		
Well	E-10		
Elevation	7341		
Top of B Zone	6820		+521
Test Date		11/19/97	
Bomb Depth	7012		+329
Bomb Pressure, psig		1403	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(329-521)		-5.8
Pressure at Top of B Zone		1397.2	
Top of B Zone to +370 ft	151'		
Production			
BO/D		234	
Mcf/D		1760	
Volume Weighted Reservoir Density, psi/ft		0.0580	
dP to +370 ft		8.8	
Pressure at +370 ft datum		1406.0	

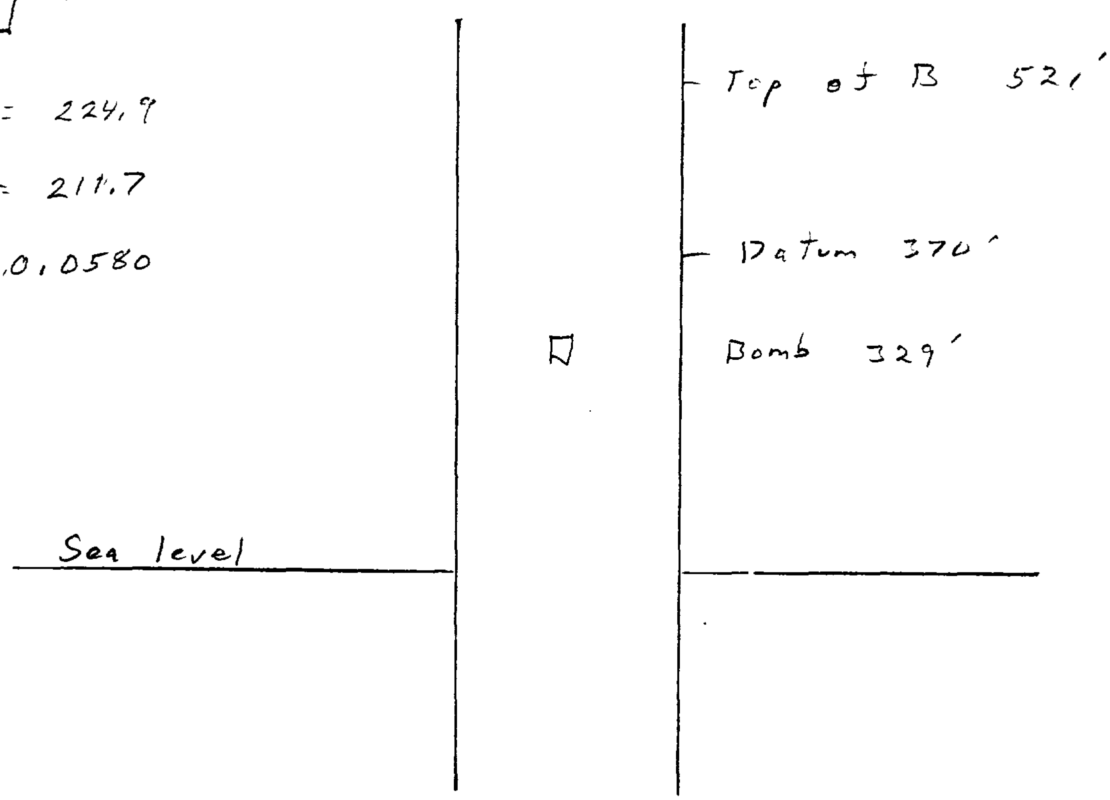
$(234)(1.370) = 320.6$

$$\left[1760 - \frac{234(565)}{1000}\right] 2.081 = 3387.4$$

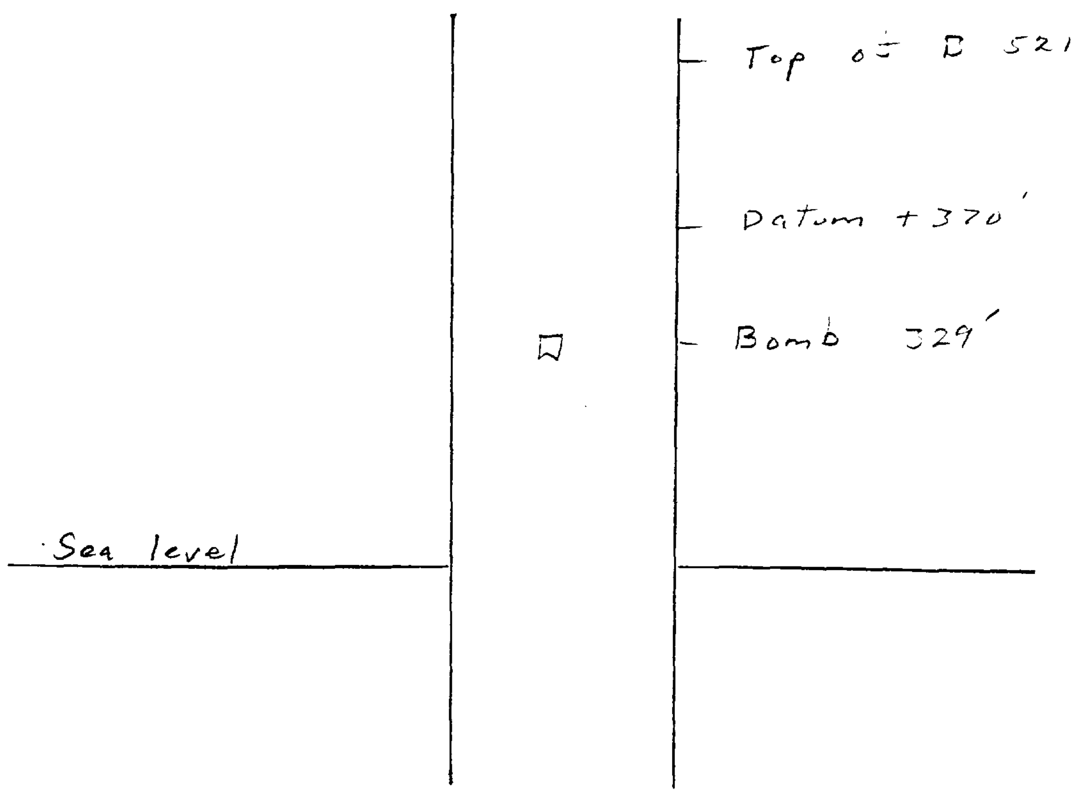
$(.7015)(320.6) = 224.9$

$(.080205)(557.4) = 211.7$

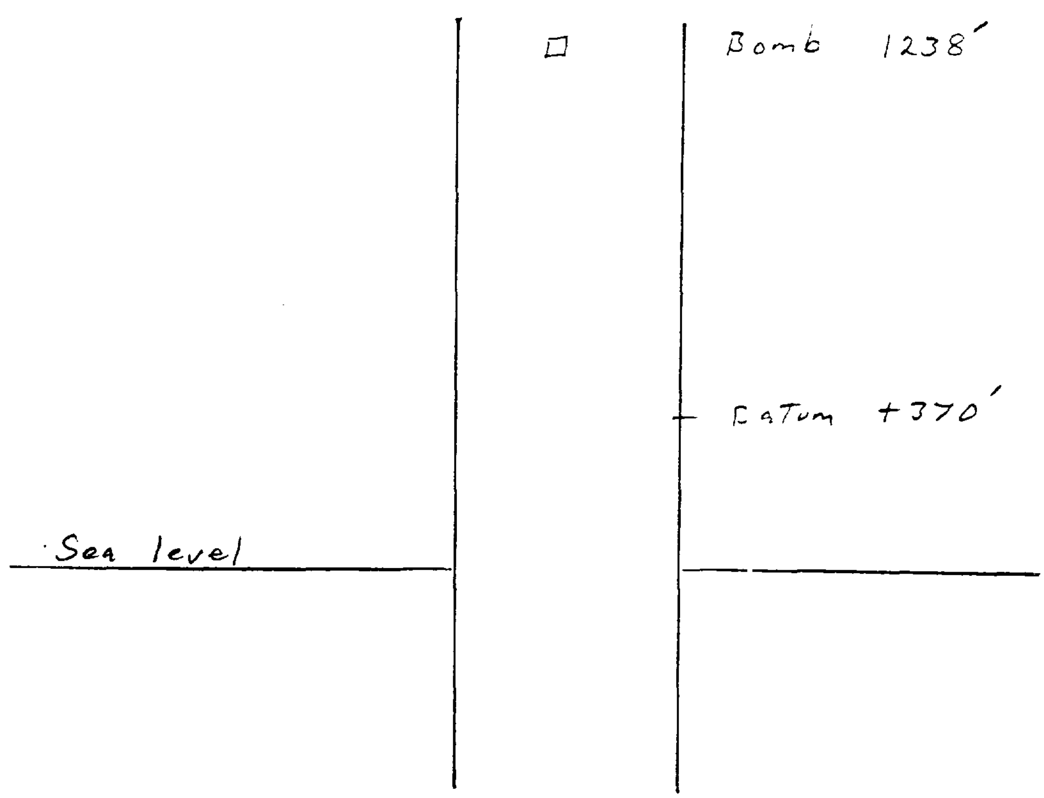
$(.433)(.1339) = 0.0580$



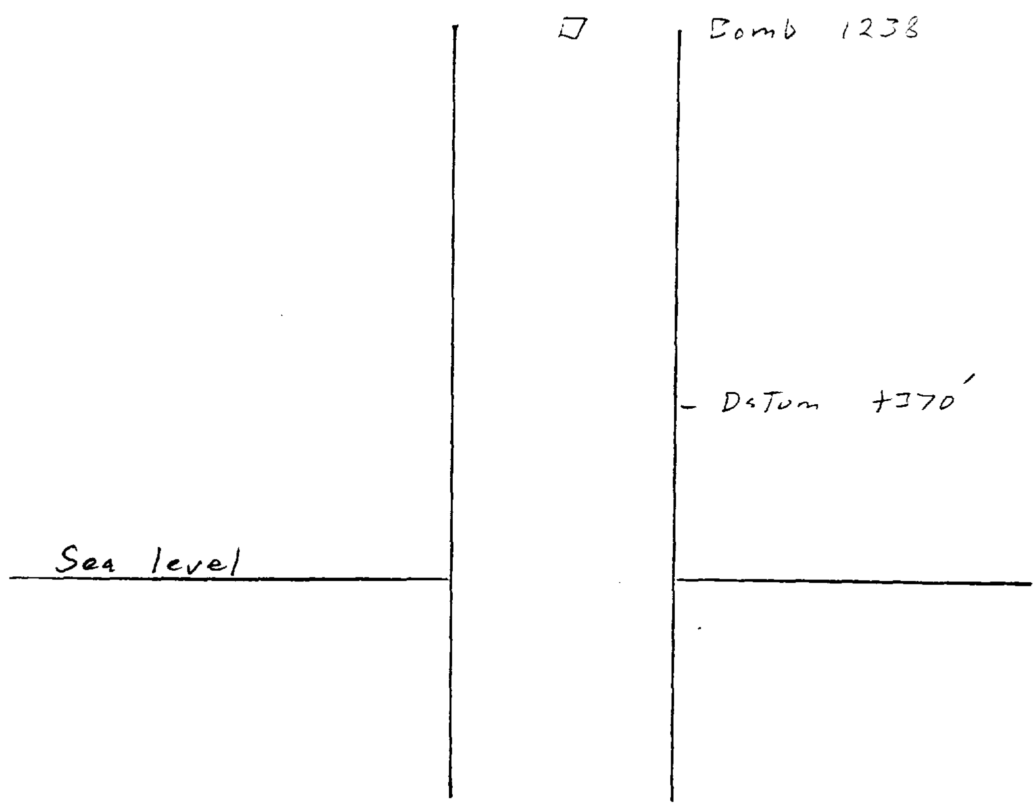
Operator	BMG		
Well	E-10		
	KB		Subsea
Elevation	7341		
Top of B Zone	6820		+521
Test Date		2/23/88	
Bomb Depth	7012		+329
Bomb Pressure, psig		1415	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(329-521)		-5.8
Pressure at Top of B Zone		1409.2	
Top of B Zone to +370 ft	151		
Production			
BO/D		23	
Mcf/D		1600	
Volume Weighted Reservoir Density, psi/ft		.058	
dP to +370 ft		8.8	
Pressure at +370 ft datum		1418.0	



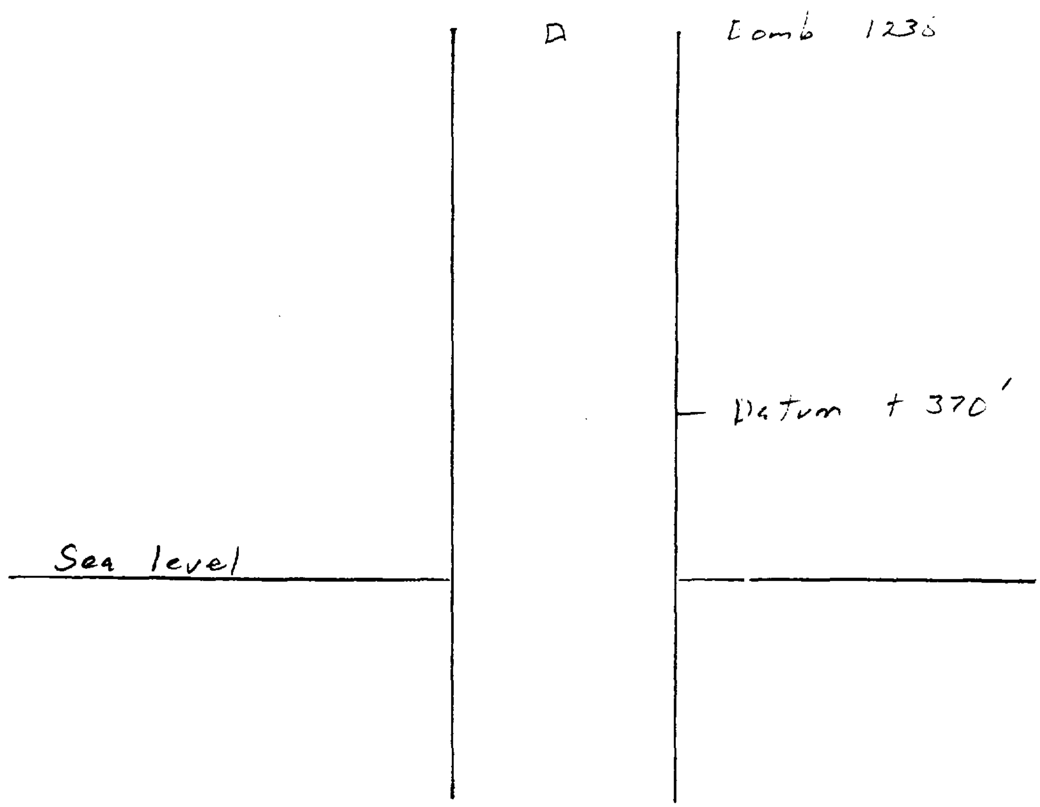
	KB		Subsea
Operator	BMG		
Well	4-13		
Elevation	7100		
Top of B Zone			
Test Date		6/30/87	
Bomb Depth	5862		+1238
Bomb Pressure, psig		1477.8	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(0.03)(1238-370)		26.04
Pressure at Top of B Zone			
Top of B Zone to +370 ft			
Production			
BO/D			
Mcf/D			
Volume Weighted Reservoir Density, psi/ft			
dP to +370 ft			
Pressure at +370 ft datum		1503.8	



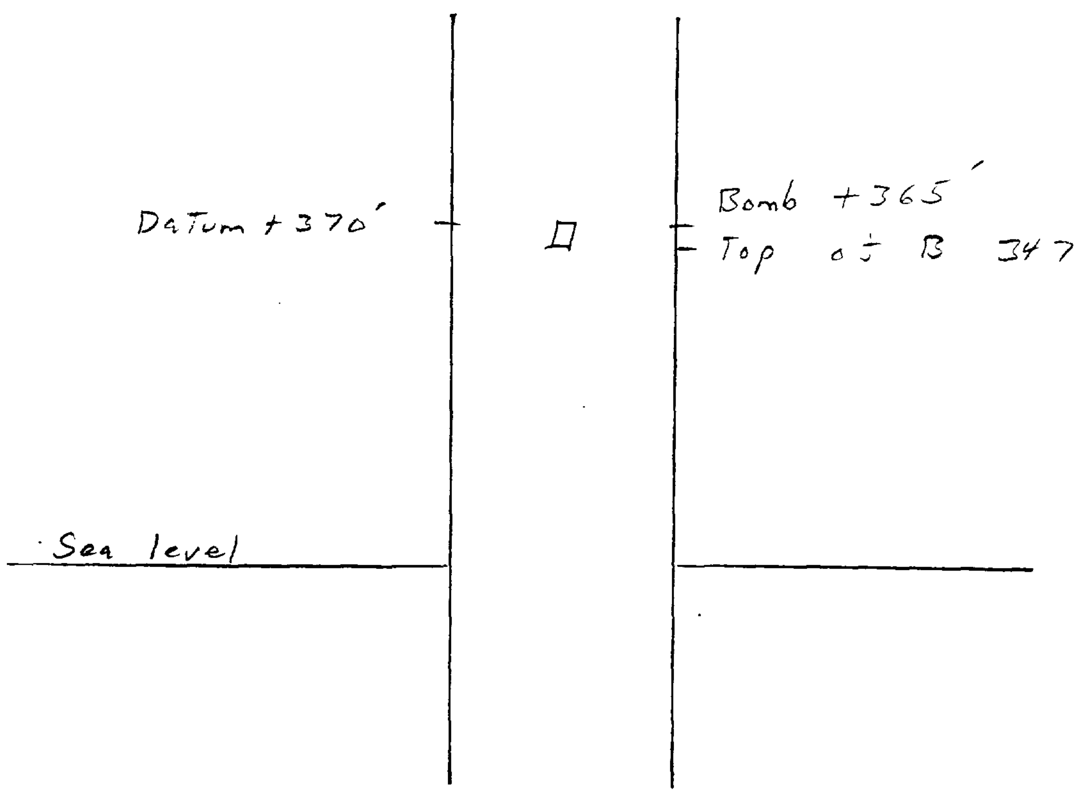
	KB		Subsea
Operator	BMG		
Well	K-13		
Elevation	7100		
Top of B Zone			
Test Date		11/19/87	
Bomb Depth	5862		+ 1238
Bomb Pressure, psig		1482	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(1238-370)		26.04
Pressure at Top of B Zone			
Top of B Zone to +370 ft			
Production			
BO/D			
Mcf/D			
Volume Weighted Reservoir Density, psi/ft			
dP to +370 ft			
Pressure at +370 ft datum		1508	



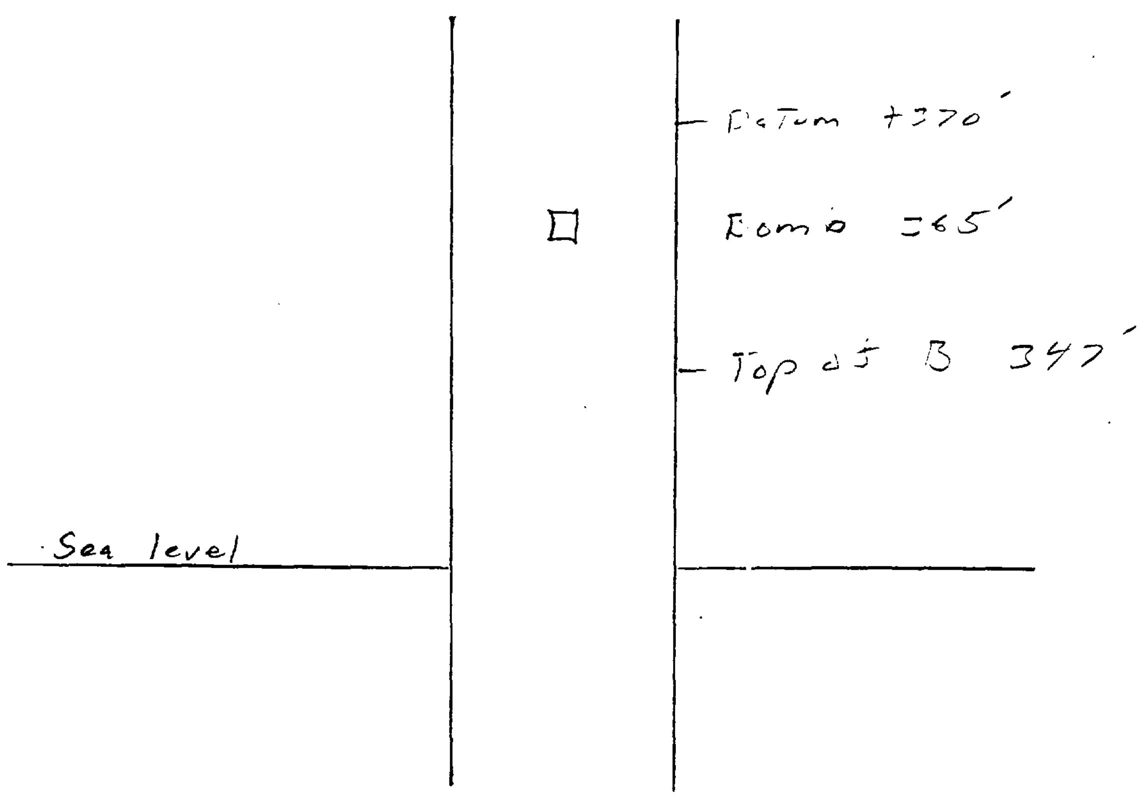
	KB		Subsea
Operator	EMG		
Well	1-13		
Elevation	7100		
Top of B Zone			
Test Date		2/23/88	
Bomb Depth	5862		+1238
Bomb Pressure, psig		1440	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(1238-370)		26
Pressure at Top of B Zone			
Top of B Zone to +370 ft			
Production			
BO/D			
Mcf/D			
Volume Weighted Reservoir Density, psi/ft			
dP to +370 ft			
Pressure at +370 ft datum		1466	



	KB		Subsea
Operator	BMG		
Well	D-17		
Elevation	7477		
Top of B Zone	7130		+347
Test Date		11/19/87	
Bomb Depth	7112		+365
Bomb Pressure, psig		1001	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(365-347)		.5
Pressure at Top of B Zone		1001.5	
Top of B Zone to +370 ft	23		
Production			
BO/D			
Mcf/D			
Volume Weighted Reservoir Density, psi/ft		.035	
dP to +370 ft		0.8	
Pressure at +370 ft datum		1000.7	



	KB		Subsea
Operator	BMG		
Well	7-17		
Elevation	7477		
Top of B Zone	7130		+347
Test Date		2/23/88	
Bomb Depth	7112		+365
Bomb Pressure, psig		960	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(365-347)		0.5
Pressure at Top of B Zone		960.5	
Top of B Zone to +370 ft	23		
Production			
BO/D			
Mcf/D			
Volume Weighted Reservoir Density, psi/ft		.035	
dP to +370 ft		0.8	
Pressure at +370 ft datum		959.7	



	KB		Subsea
Operator	BMG		
Well	A-20		
Elevation	7444		
Top of B Zone	7038		+406
Test Date		11/19/87	
Bomb Depth	7166		+278
Bomb Pressure, psig		971.1	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(0.03)(278-406)		-3.8
Pressure at Top of B Zone		967.3	
Top of B Zone to +370 ft	36		
Production			
BO/D		37	
Mcf/D		220	
Volume Weighted Reservoir Density, psi/ft		0.0458	
dP to +370 ft		1.6	
Pressure at +370 ft datum		968.9	

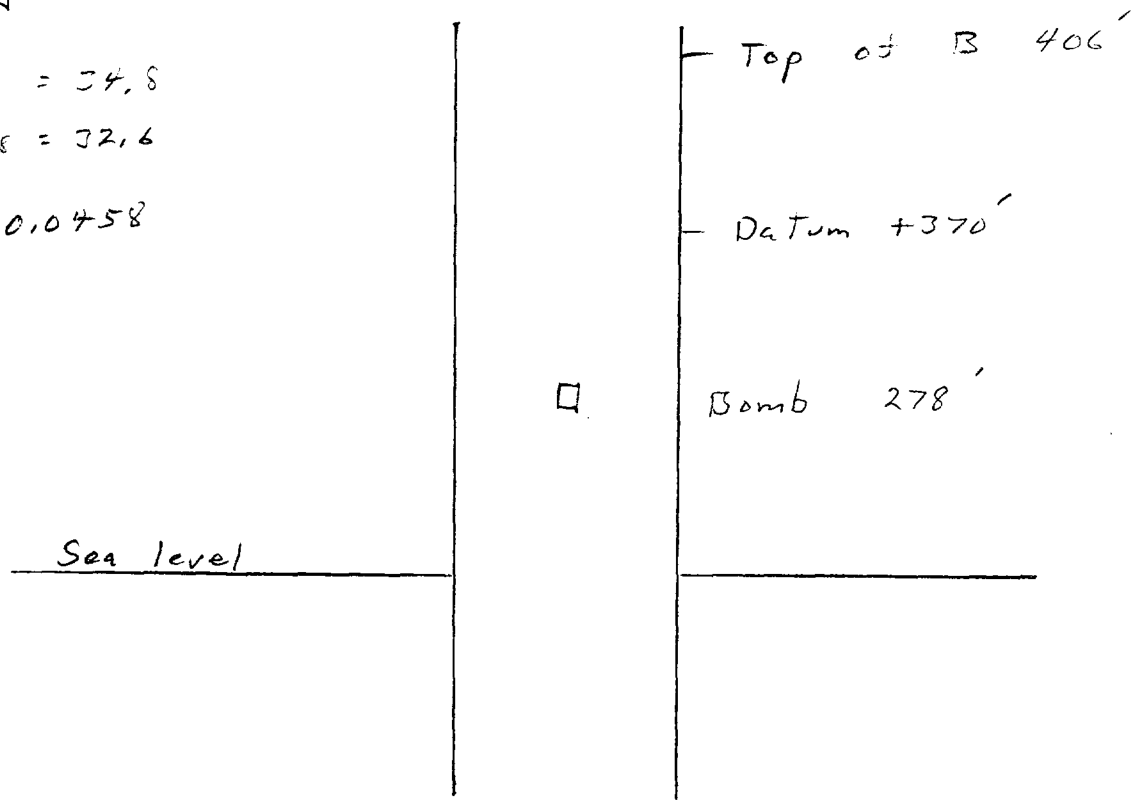
$(37)(1.316) = 48.7$

$\left[220 - \frac{(37)(441)}{1000}\right] 2.891 = 588.8$

$(.7144)\ 48.7 = 34.8$

$(.055291)\ 588.8 = 32.6$

$(.433)\ .1057 = 0.0458$



Operator	3MG	
Well	A-20	
	KB	Subsea
Elevation	7444	
Top of B Zone	7038	+406
Test Date	6/30/87	
Bomb Depth	7166	+278
Bomb Pressure, psig	1224.6	
Fluid Level	6992	+454
Wellbore Gradient		
Oil, psi/ft	(0.3)(278-406)	−38.4
Gas, psi/ft		
Pressure at Top of B Zone	1186.2	
Top of B Zone to +370 ft	36	
Production		
BO/D	37	
Mcf/D	220	
Volume Weighted Reservoir Density, psi/ft	0.05628	
dP to +370 ft	2.0	
Pressure at +370 ft datum	1186.0	

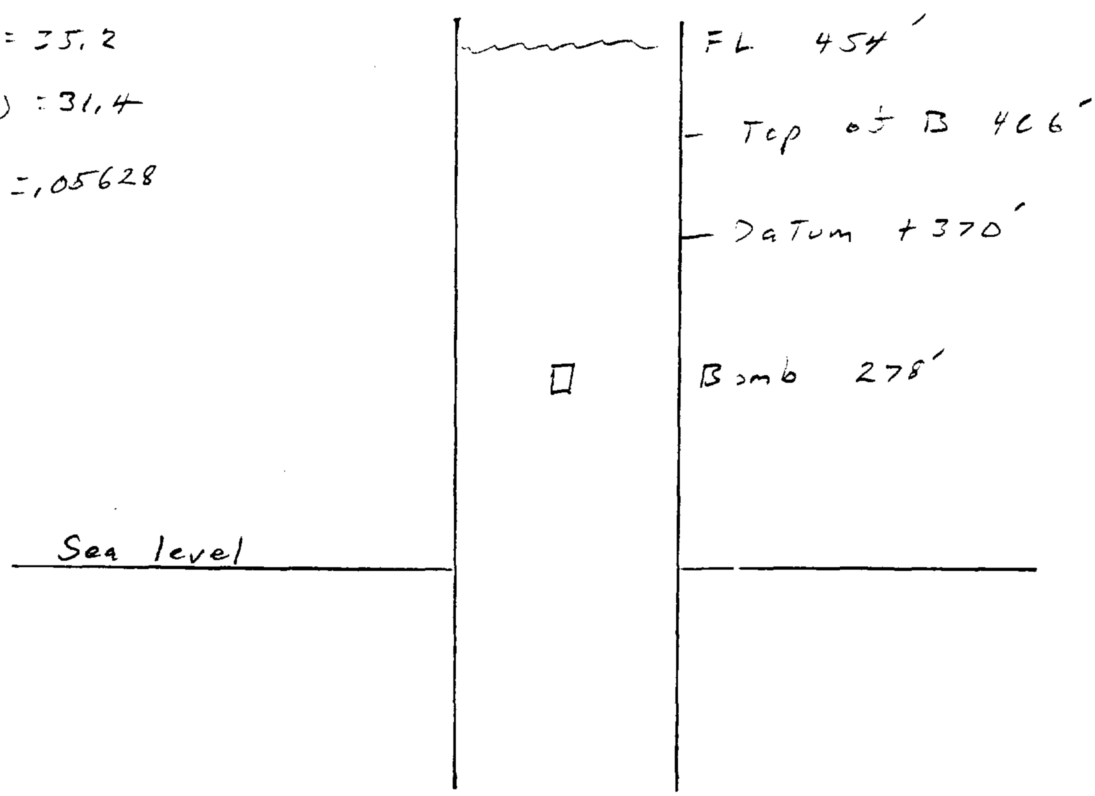
$(37)\ (1.344) = 49.7$

$\left[220 - \frac{(37)(505)}{1000}\right] 2.3 = 463$

$(.7074)(49.4) = 35.2$

$(0.067899)(463) = 31.4$

$(.433)(.1300) = .05628$



	KB		Subsea
Operator	BMG		
Well	A-20		
Elevation	7444		
Top of B Zone	7038		+406
Test Date		2/25/88	
Bomb Depth	7166		+278
Bomb Pressure, psig		952.4	
Fluid Level	None		
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(278-406)		-3.8
Pressure at Top of B Zone		948.6	
Top of B Zone to +370 ft	36		
Production			
BO/D		45	
Mcf/D		360	
Volume Weighted Reservoir Density, psi/ft		.0395	
dP to +370 ft		1.4	
Pressure at +370 ft datum		950.0	

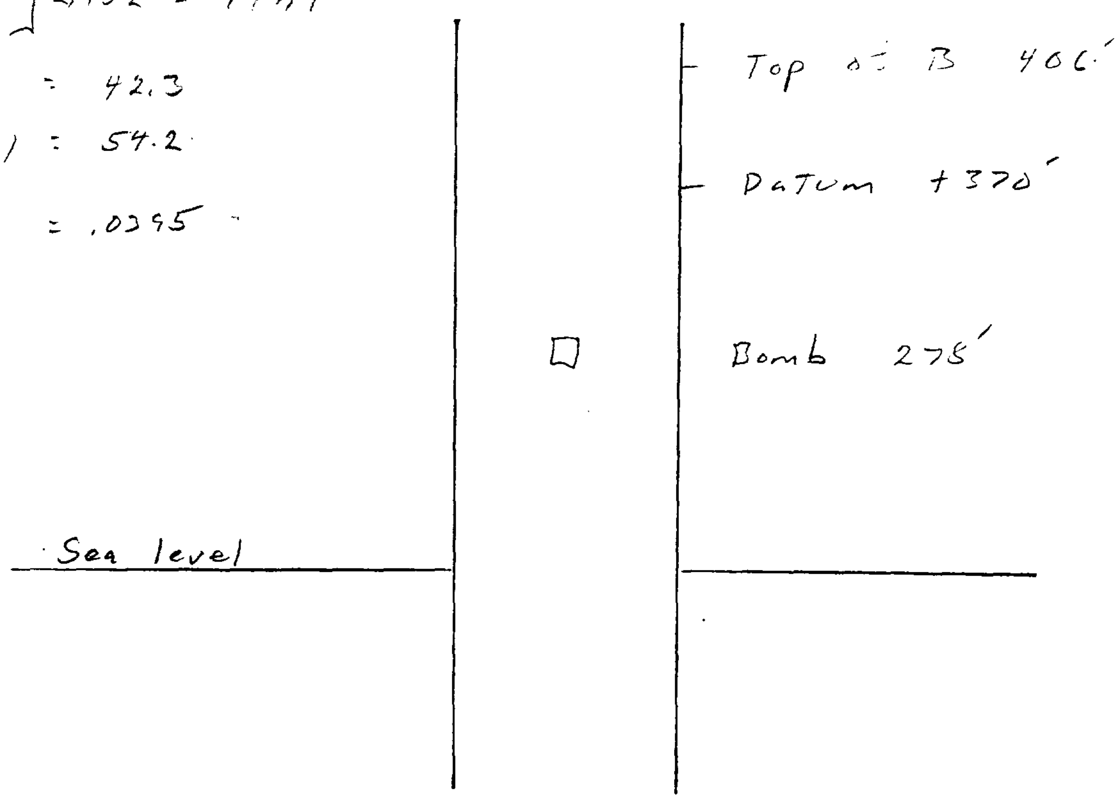
$(45)(1.314) = 59.1$

$\left[360 - \frac{(45)(437)}{1000}\right] 2.932 = 997.9$

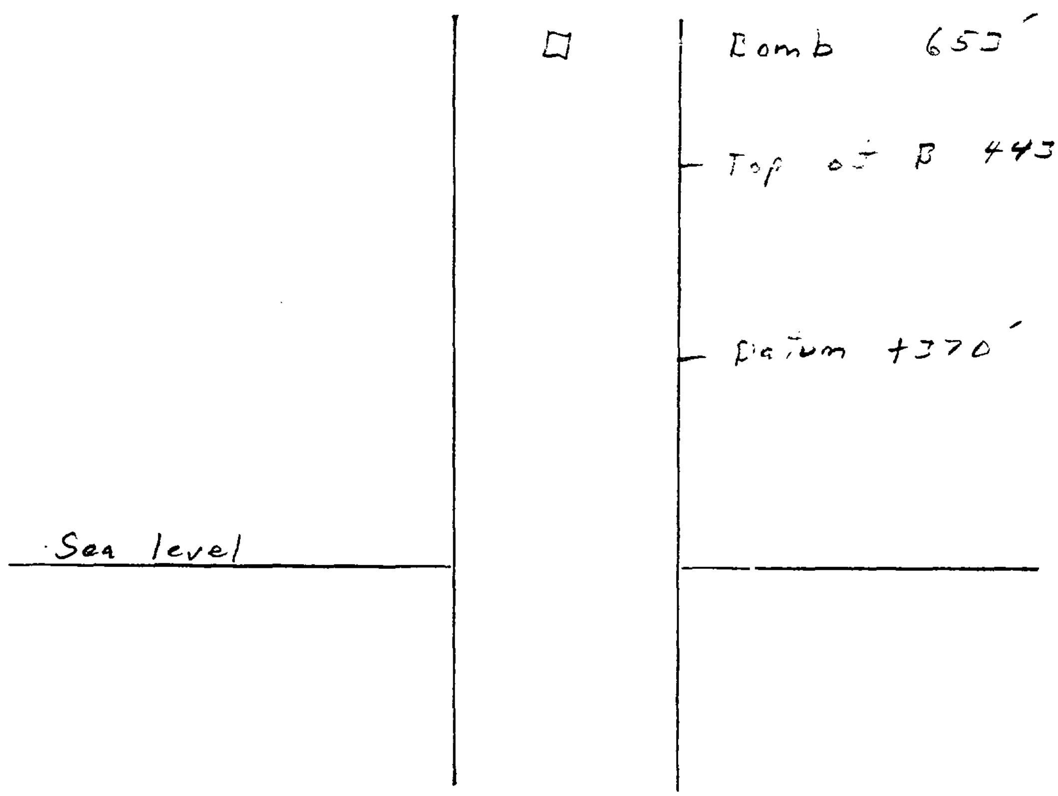
$(.7148)(59.1) = 42.3$

$(.054314)(997.9) = 54.2$

$(.433)(.09130) = .0395$



Operator	BMG		
Well	L-27		
	KB		Subsea
Elevation	7475		
Top of B Zone	7032		+443
Test Date		2/26/88	
Bomb Depth	6822		+653
Bomb Pressure, psig		1377	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(653-443)		6.3
Pressure at Top of B Zone		1383.3	
Top of B Zone to +370 ft	73		
Production			
BO/D			
Mcf/D			
Volume Weighted Reservoir Density, psi/ft		.035	
dP to +370 ft		2.6	
Pressure at +370 ft datum		1385.9	



Operator	BMG		
Well	B-29		
	KB		Subsea
Elevation	7508		
Top of B Zone	7085		+423
Test Date		2/23/88	
Bomb Depth	7212		+296
Bomb Pressure, psig		962	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(03)(296-423)		- 3.8
Pressure at Top of B Zone		958.2	
Top of B Zone to +370 ft	53		
Production			
BO/D		1136	
Mcf/D		1590	
Volume Weighted Reservoir Density, psi/ft		0.1117	
dP to +370 ft		5.9	
Pressure at +370 ft datum		964.1	

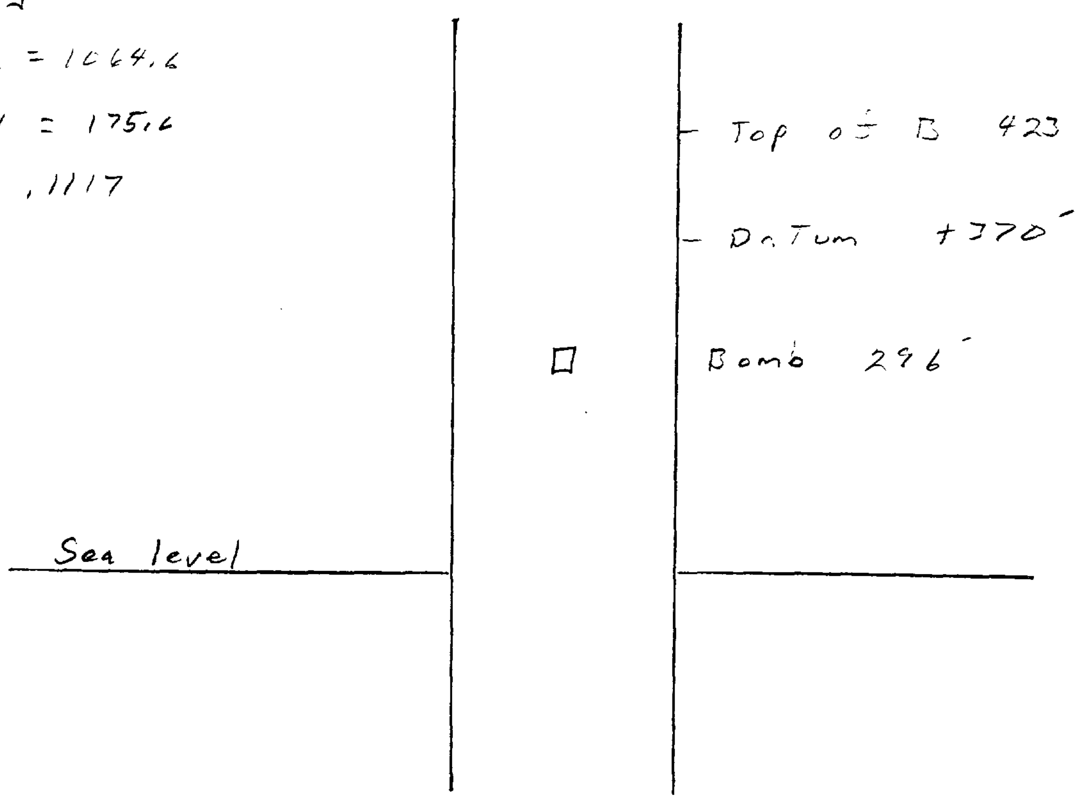
(1136) 1.316 = 1488.2

$\left[1590 - \frac{(1136)(420)}{1000}\right] 3.015 = 3321.1$

(.7154) 1488.2 = 1064.6

(.052877) 3321.1 = 175.6

(.433)(.2579) = .1117



	KB		Subsea
Operator	BMG		
Well	B-32		
Elevation	7611		
Top of B Zone	7190		+421
Test Date		6/30/87	
Bomb Depth	7316		+295
Bomb Pressure, psig		1203.4	
Fluid Level	7262		+349
Wellbore Gradient			
Oil, psi/ft	(.3)(295-349)		-16.2
Gas, psi/ft	(.03)(349-421)		-2.2
Pressure at Top of B Zone		1185	
Top of B Zone to +370 ft	51		
Production			
BO/D		520	
Mcf/D		470	
Volume Weighted Reservoir Density, psi/ft		0.1832	
dP to +370 ft		+ 9.3	
Pressure at +370 ft datum		1194.3	

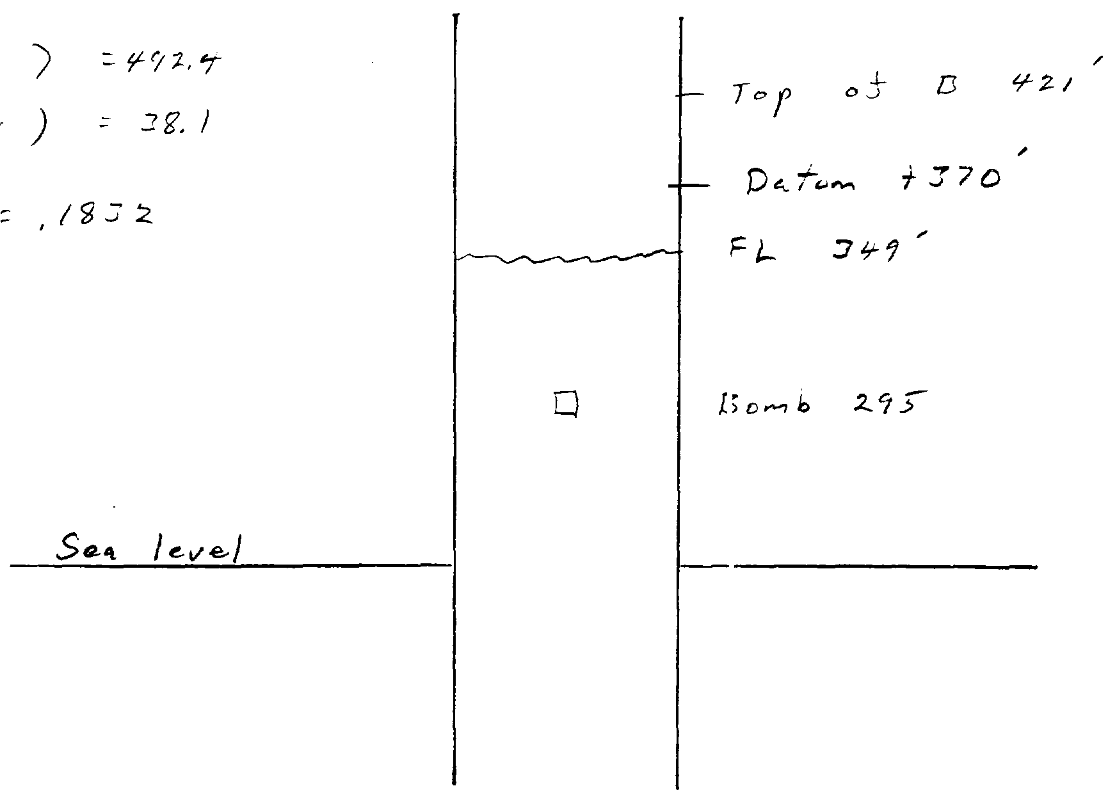
$(520)\ (1.331) = 692.1$

$\left[470 - \frac{(520)(476)}{1000}\right] 2.524 = 561.5$

$(.7115)\ (692.1) = 492.4$

$(.067841)\ (561.5) = 38.1$

$(.433)(0.4232) = .1832$



	KB		Subsea
Operator	BMG		
Well	B-32		
Elevation	7611		
Top of B Zone	7190		+421
Test Date		11/19/87	
Bomb Depth	7302		+309
Bomb Pressure, psig		970.5	
Fluid Level	None		
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(309-421)		-3.4
Pressure at Top of B Zone		967.1	
Top of B Zone to +370 ft	51		
Production			
BO/D		766	
Mcf/D		920	
Volume Weighted Reservoir Density, psi/ft		.05684	
dP to +370 ft		2.9	
Pressure at +370 ft datum		970.0	

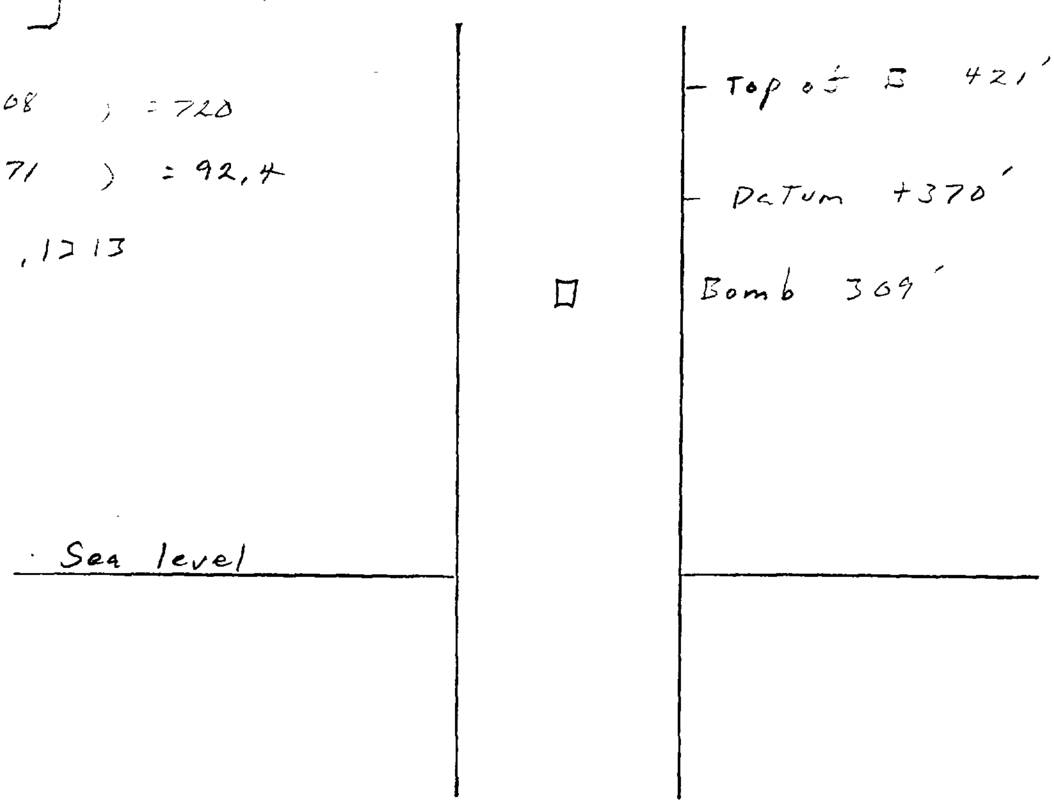
$(766)\quad(1.316) = 1008.1$

$\left[920 - \frac{(766)(442)}{1000}\right]2.875 = 1671.6$

$(0.7143)(1008) = 720$

$(0.055291)(1671) = 92.4$

$(.433)(.3032) = .1313$



Operator	DMG	
Well	B-32	
	KB	Subsea
Elevation	761	
Top of B Zone	7190	+ 421
Test Date	2/23/88	
Bomb Depth	7302	+309
Bomb Pressure, psig	953.8	
Fluid Level		
Wellbore Gradient		
Oil, psi/ft		
Gas, psi/ft	.03(309-421)	-3.4
Pressure at Top of B Zone	950.4	
Top of B Zone to +370 ft	51	
Production		
BO/D	754	
Mcf/D	770	
Volume Weighted Reservoir Density, psi/ft	0.1238	
dP to +370 ft	+ 6.3	
Pressure at +370 ft datum	956.7	

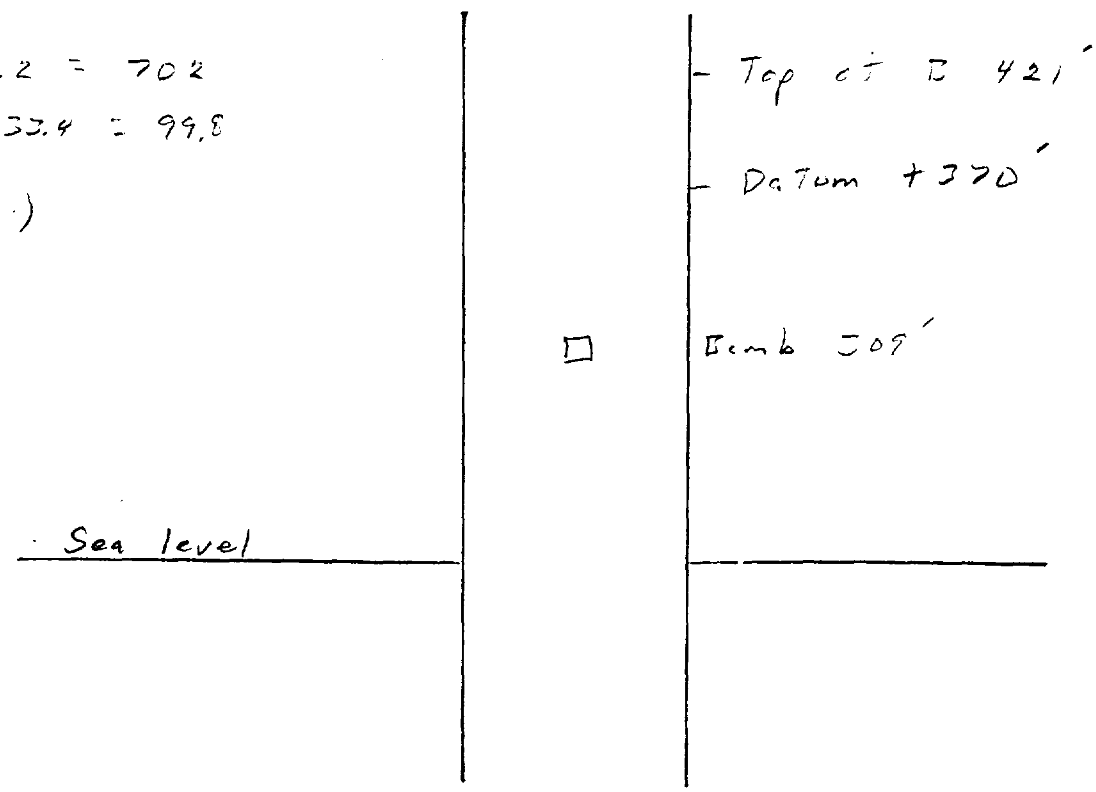
(754) 1.288 = 971.2

$\left[770 - \frac{754(380)}{1000}\right] 3.792 = 1833.4$

(.7229) 971.2 = 702

(.054314) 1833.4 = 99.8

(.433)(0.2858)



	KB		Subsea
Operator	Mallon		
Well	Johnson Federal 12-5		
Elevation	7430		
Top of B Zone	7029		+401
Test Date		6/30/87	
Bomb Depth	7611		-181
Bomb Pressure, psig		1427	
Fluid Level	5205		+2225
Wellbore Gradient			
Oil, psi/ft	(0.355)(-181-401)		-206.6
Gas, psi/ft			
Pressure at Top of B Zone		1220.4	
Top of B Zone to +370 ft	94		
Production			
BO/D		30	
Mcf/D		382	
Volume Weighted Reservoir Density, psi/ft		0.04324	
dP to +370 ft		4.1	
Pressure at +370 ft datum		1224.5	

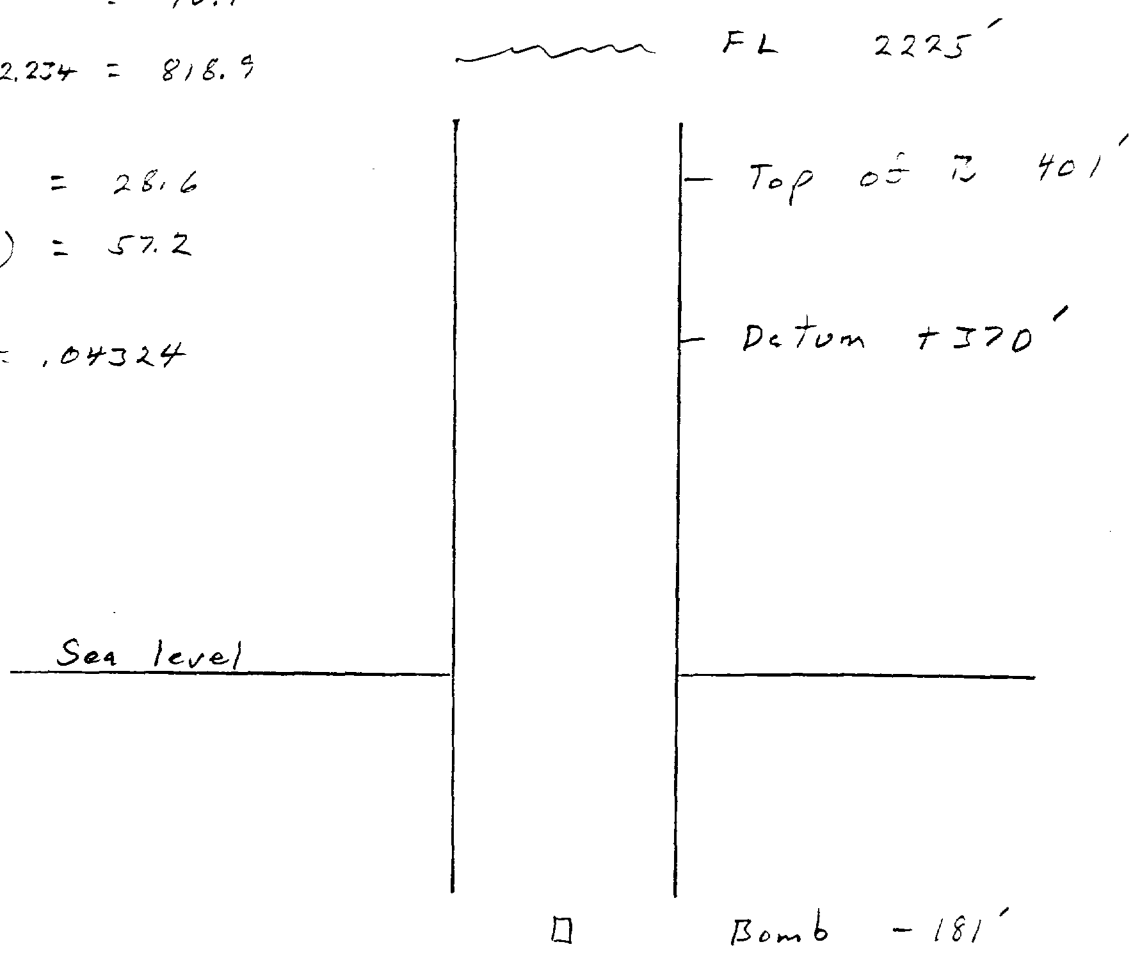
$(30)(1.348) = 40.4$

$\left[382 - \frac{(30)(515)}{1000}\right] 2.234 = 818.9$

$(.7072)(40.4) = 28.6$

$(.069860)(818.9) = 57.2$

$(.433)(.09986) = .04324$



	KB		Subsea
Operator	Mallon		
Well	Fisher Federal 2-1		
Elevation	7654		
Top of B Zone	7307		+347
Test Date		11/19/87	
Bomb Depth	7875		-221
Bomb Pressure, psig		1177	
Fluid Level	7297		+357
Wellbore Gradient			
Oil, psi/ft	(0.34)(-221-347)		-193.1
Gas, psi/ft			
Pressure at Top of B Zone		983.8	
Top of B Zone to +370 ft	23		
Production			
BO/D		228	
Mcf/D		575	
Volume Weighted Reservoir Density, psi/ft		0.08429	
dP to +370 ft		1.9	
Pressure at +370 ft datum		981.9	

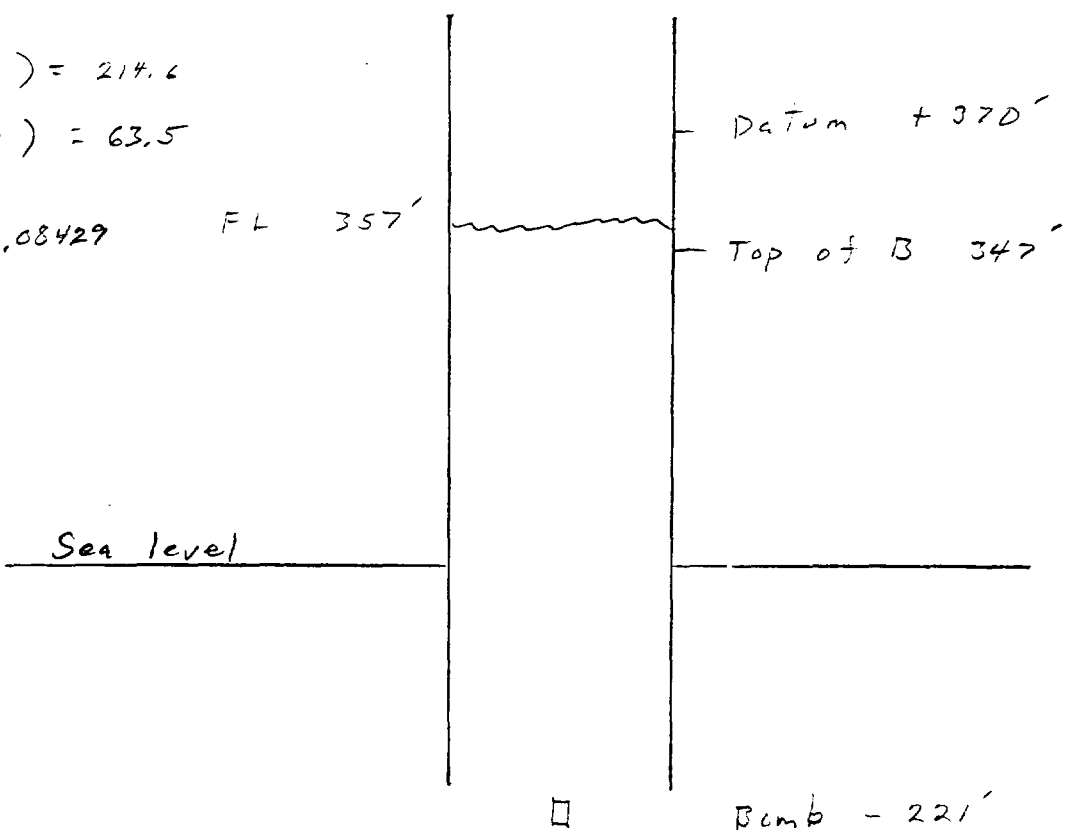
$(228)\ (1.3185) = 300.6$

$\left[575 - \frac{(228)(448)}{1000}\right] 2.808 = 1127.8$

$(.7140)(300.6) = 214.6$

$(.05627)(1127.8) = 63.5$

$(.433)(.19467) = .08429$



	KB		Subsea
Operator	Mallon		
Well	Howard 1-8		
Elevation	7522		
Top of B Zone	7150		+372
Test Date		2/23/88	
Bomb Depth	7300		+222
Bomb Pressure, psig		980	
Fluid Level	4523		+2999
Wellbore Gradient			
Oil, psi/ft	.345 (222-372)		-51.8
Gas, psi/ft			
Pressure at Top of B Zone		928	
Top of B Zone to +370 ft	2		
Production			
BO/D		120	
Mcf/D		1021	
Volume Weighted Reservoir Density, psi/ft		.03754	
dP to +370 ft		0.1	
Pressure at +370 ft datum		928.1	

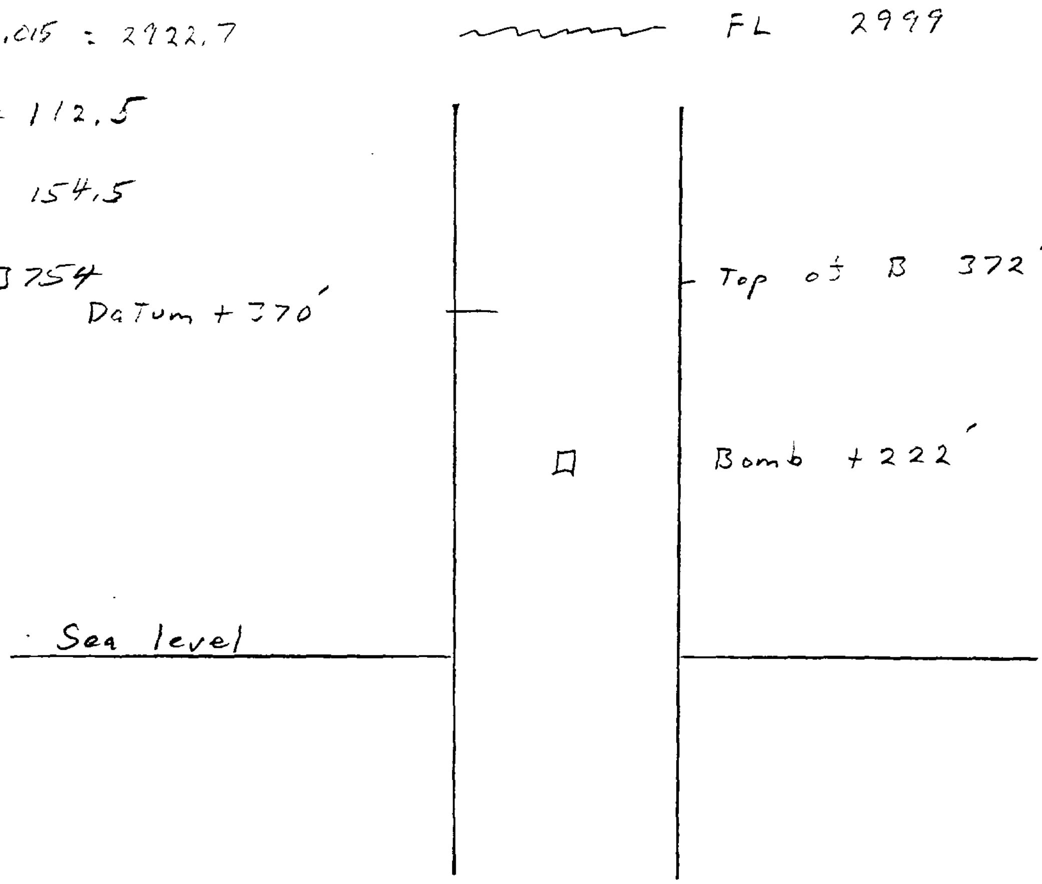
$(120)(1.310) = 157.2$

$\left[1021 - \frac{(120)(430)}{1000}\right] 3.015 = 2922.7$

$(.7154)(157.2) = 112.5$

$(.052877)(2922.7) = 154.5$

$(.433)(.08671) = .03754$



	KB		Subsea
Operator	Mesa Grande		
Well	Bearcat #1		
Elevation	7249		
Top of B Zone	6777		+472
Test Date		6/30/87	
Bomb Depth	6800		+449
Bomb Pressure, psig		1036	
Fluid Level			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(449-472)		-.66
Pressure at Top of B Zone		1035.4	
Top of B Zone to +370 ft	102'		
Production			
BO/D		52	
Mcf/D		347	
Volume Weighted Reservoir Density, psi/ft		0.04657	
dP to +370 ft		4.8	
Pressure at +370 ft datum		1040.2	

$(52)(1.325) = 68.9$

$\left[347 - \frac{(52)(463)}{1000}\right] 2.67 = 862.2$

$(.7129)(68.9) = 49.1$

$(.05920)(862.2) = 51.0$

$(.433)(.1076) = .04657$

Top of B 472'

Bomb 449'

Datum +370'

Sea level

By analogy to Hill Fed 24 (237') Lockdy #1 (205') and High Adventure #1 (230') the FL of Bearcat #1 will be +200' to +250' therefore the gradient is gas only

Operator	Mesa Grande	
Well	Bearcat #1	
	KB	Subsea
Elevation	7249	
Top of B Zone	6777	+472
Test Date	11/19/87	
Bomb Depth	6770	+479
Bomb Pressure, psig	765	
Fluid Level	below +370'	
Wellbore Gradient		
Oil, psi/ft		
Gas, psi/ft	(.03)(479-472)	.15
Pressure at Top of B Zone	765.15	
Top of B Zone to +370 ft	102	
Production		
BO/D	10.6	
Mcf/D	192	
Volume Weighted Reservoir Density, psi/ft	.035	
dP to +370 ft	3.6	
Pressure at +370 ft datum	768.7	

$(10.6)(1.289) = 13.7$

$\left[192 - \frac{(10.6)(385)}{1000}\right]3.7 = 695.3$

$(.722)(13.7) = 9.9$

$(.04414)(695.3) = 30.6$

$(.433)(.05725) = .0248$

use 0.035 psi/ft (wet gas)

Bomb 479'

Top of B 472'

Datum +370'

Sea level

Operator	Mesa Grande	
Well	Bearcat #1	
	KB	Subsea
Elevation	7249	
Top of B Zone	6777	+472
Test Date	2/23/88	
Bomb Depth	6770	+479
Bomb Pressure, psig	722	
Fluid Level	below +370'	
Wellbore Gradient		
Oil, psi/ft		
Gas, psi/ft	(.03)(479-472)	.15
Pressure at Top of B Zone	722.15	
Top of B Zone to +370 ft	102	
Production		
BO/D	5.7	
Mcf/D	213	
Volume Weighted Reservoir Density, psi/ft	0.035	
dP to +370 ft	3.6	
Pressure at +370 ft datum	735.7	

$(5.7)(1.285) = 7.3$

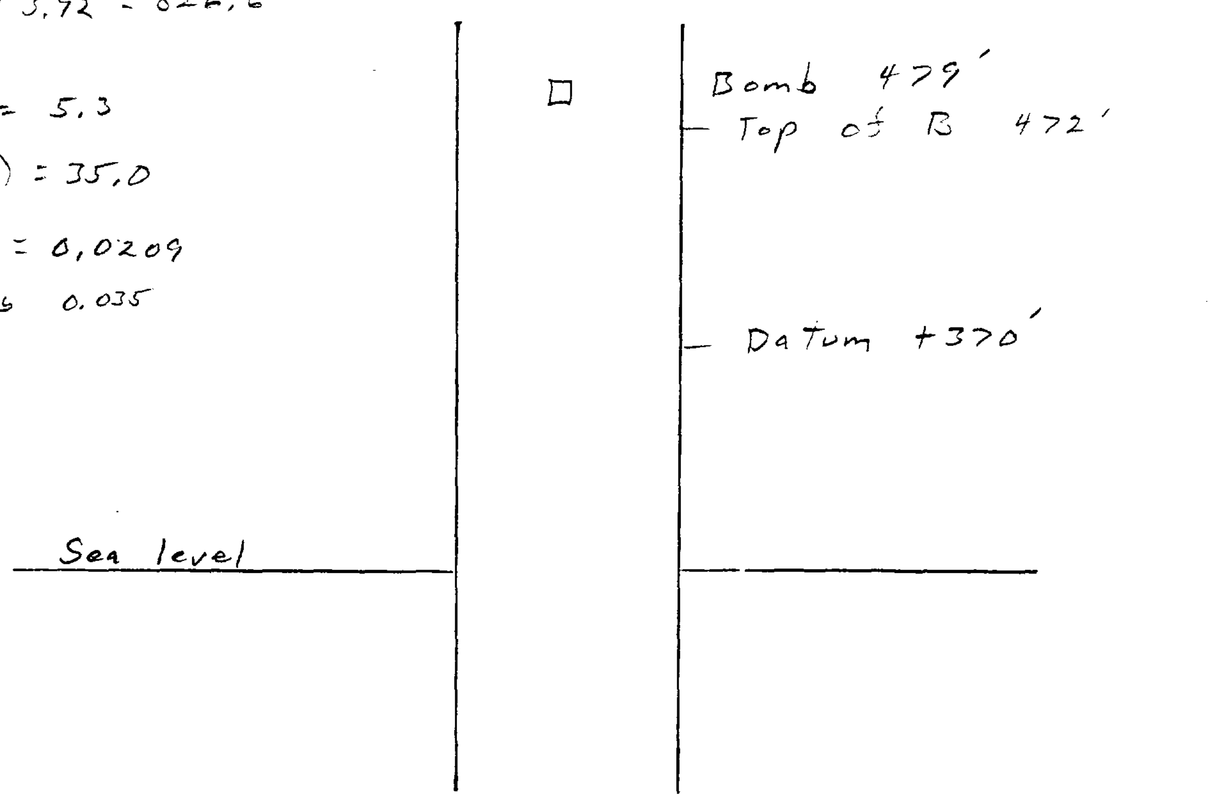
$\left[213 - \frac{5.7(373)}{1000}\right] 3.92 = 826.6$

$(.7239)(7.3) = 5.3$

$(.04239)(826.6) = 35.0$

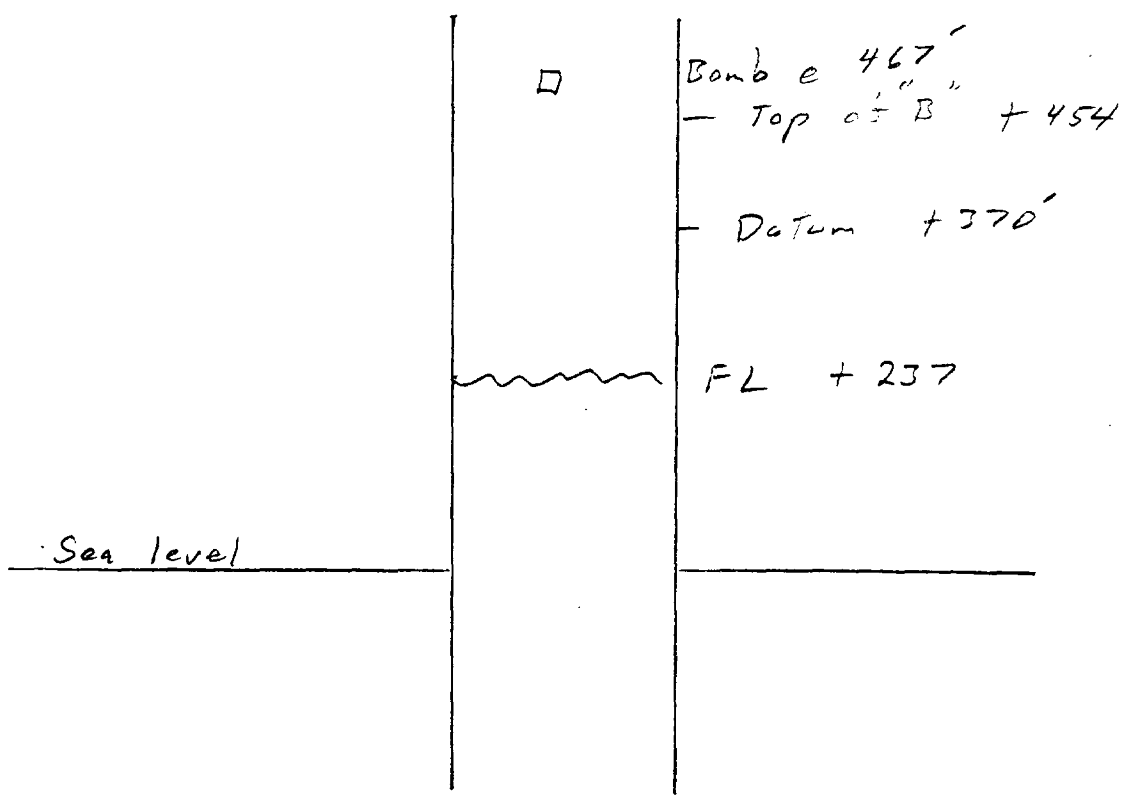
$(.433)(.04837) = 0.0209$

use wet gas 0.035

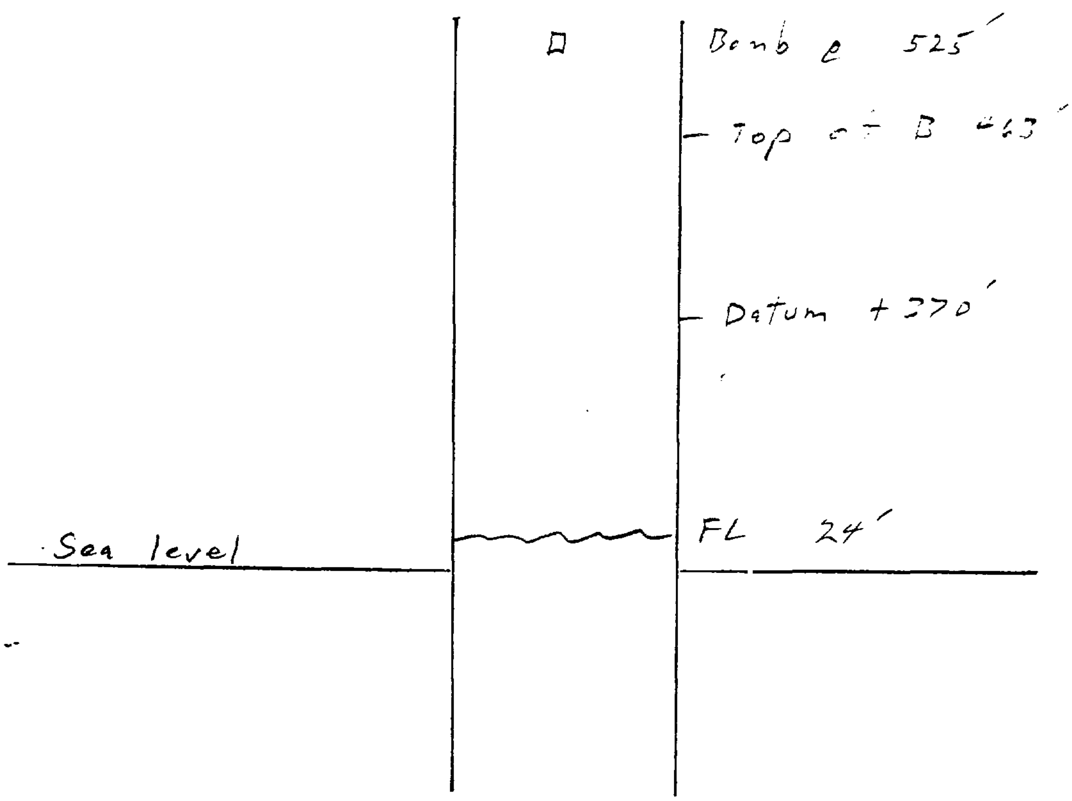


5/28/88

	KB		Subsea
Operator	Merridian		
Well	Hill Federal 2Y		
Elevation	7467		
Top of B Zone	7013		+454
Test Date		6/30/87	
Bomb Depth	7000		+467
Bomb Pressure, psig		1109	
Fluid Level	7230		+237
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(13)		0.4
Pressure at Top of B Zone		1109.4	
Top of B Zone to +370 ft	84		
Production			
BO/D		100	
Mcf/D		240	
Volume Weighted Reservoir Density, psi/ft		0.08803	
dP to +370 ft		7.4	
Pressure at +370 ft datum		1116.8	

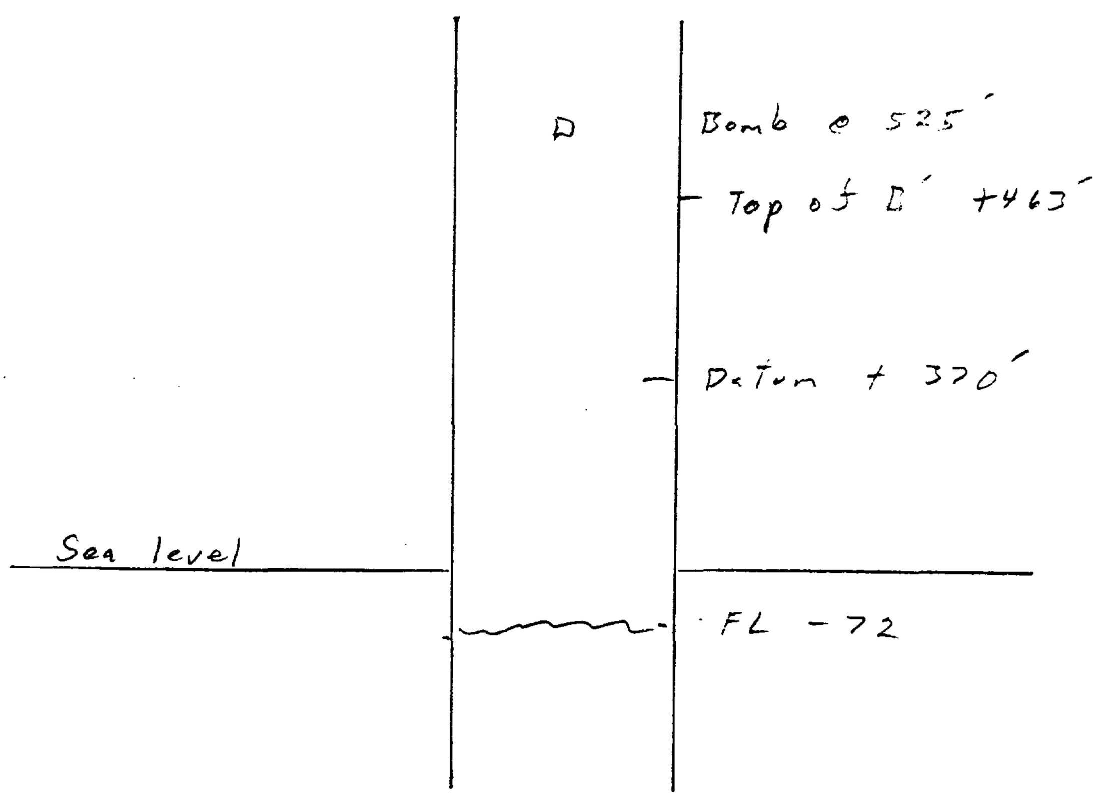


Operator	Meridian		
Well	Hill Federal #1		
	KB		Subsea
Elevation	7480		
Top of B Zone	7017		+463
Test Date		11/19/87	
Bomb Depth	6955		+525
Bomb Pressure, psig		936	
Fluid Level	7456		+24
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.03)(525-463)		+1.86
Pressure at Top of B Zone		937.9	
Top of B Zone to +370 ft	93'		
Production			
BO/D		27	
Mcf/D		850	
Volume Weighted Reservoir Density, psi/ft		0.035	
dP to +370 ft		3.3	
Pressure at +370 ft datum		941.2	



5/28/88

	KB		Subsea
Operator	Meridian		
Well	Hill Federal 21		
Elevation	7480		
Top of B Zone	7017		+463
Test Date		2/23/88	
Bomb Depth	6955		+525
Bomb Pressure, psig		940	
Fluid Level	7552		-72
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft	(.02)(525-463)		1.24
Pressure at Top of B Zone		941.9	
Top of B Zone to +370 ft	93'		
Production			
BO/D		11	
Mcf/D		962	
Volume Weighted Reservoir Density, psi/ft		0.035	
dP to +370 ft		3.3	
Pressure at +370 ft datum		945.2	



5/3/88

	KB		Subsea
Operator	Mobil		
Well	Lindrith B-37		
Elevation	7134		
Top of B Zone	6683		+451
Test Date		6/30/87	
Bomb Depth	6814		+334
Bomb Pressure, psig		1059	
Fluid Level			+419
~~Distance to Top of B Zone~~			
Wellbore Gradient			
Oil, psi/ft		0.3 (419-334)	
Gas, psi/ft		0.03 (451-419)	
Pressure at Top of B Zone		1059-26 = 1032	
Top of B Zone to +370 ft		81	
Production			
BO/D		54	
Mcf/D		435	
Volume Weighted Reservoir Density, psi/ft		0.04270	
dP to +370 ft		3.5	
Pressure at +370 ft datum		1035.5	

$(54)(1.323) = 71.4$

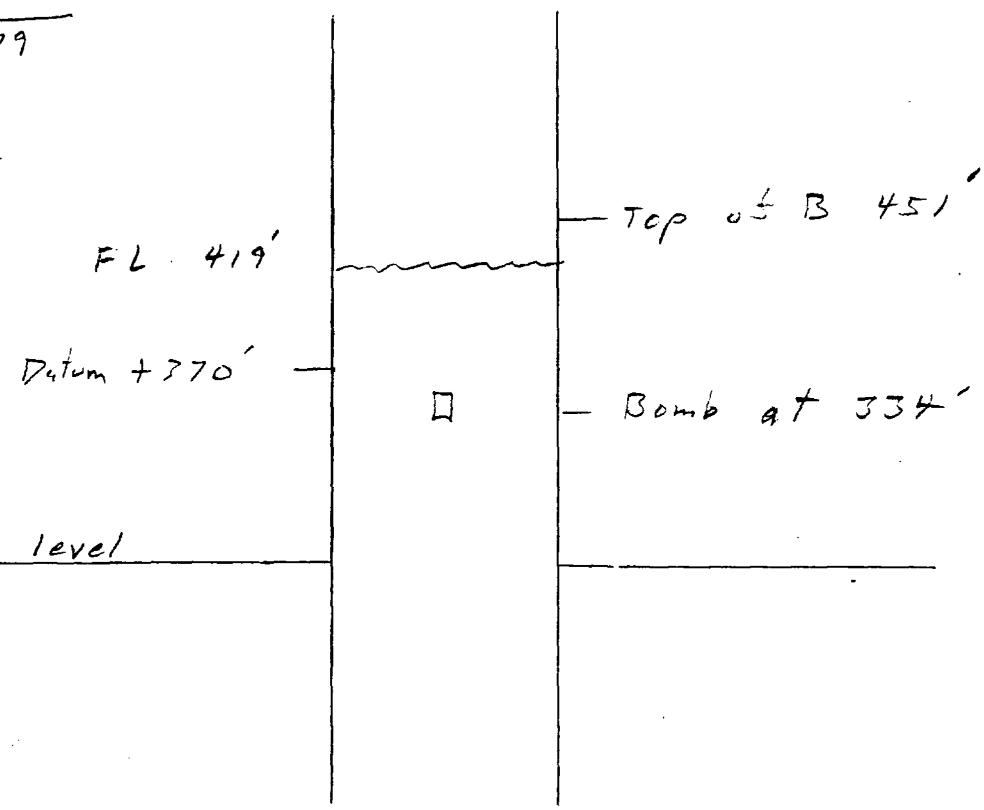
$\left[435 - \frac{(54)(459)}{1000}\right] 2.7 = 1107.6$

1179

$(71.4)(.7131) = 50.9$

$(1107.6)(.05903) = 65.4$

$.433(.0986) = .04270$



Operator	Mobil		
Well	Lindrith B-37		
	KB		Subsea
Elevation	7134		
Top of B Zone	6683		+451
Test Date		11/19/87	
Bomb Depth	6814		+334
Bomb Pressure, psig		797	
Fluid Level			+522
~~Distance to Top of B Zone~~			
Wellbore Gradient			
Oil, psi/ft		0.3 (451-334)	
Gas, psi/ft		0.03	
Pressure at Top of B Zone		762	
Top of B Zone to +370 ft		81	
Production			
BO/D		214	
Mcf/D		889	
Volume Weighted Reservoir Density, psi/ft		0.04422	
dP to +370 ft		3.6	
Pressure at +370 ft datum		765.6	

$(214)(1.291) = 276.3$

$\left[889 - \frac{(214)(257)}{1000}\right] 3.656 = 2947.4$

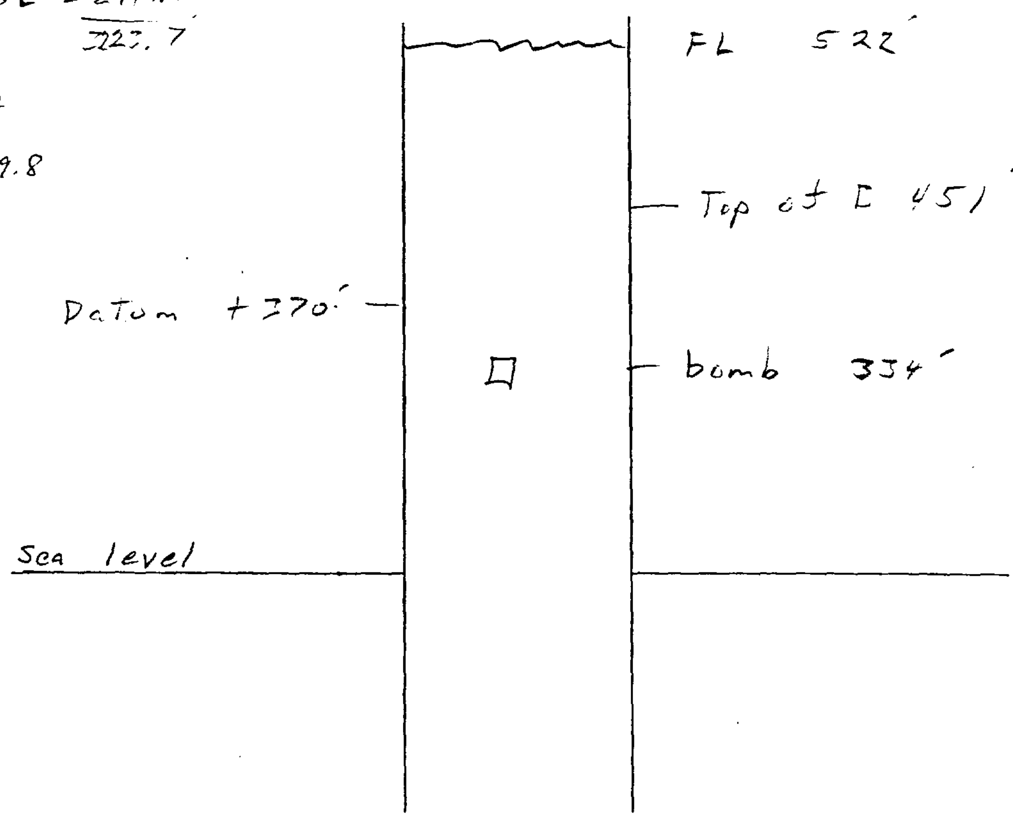
3223.7

$(276.3)(.72218) = 199.4$

$(2947.4)(.04404) = 129.8$

$\rho_{Avg} = (.10212)(.433)$

$= .04422$



	KB	Subsea
Operator	Mobil	
Well	Lindrith B-37	
Elevation	7134	
Top of B Zone	6683	+451
Test Date	2/23/88	
Bomb Depth	6894	+240
Bomb Pressure, psig	774	
Fluid Level	6744	+390
~~Distance to Top of B Zone~~		
Wellbore Gradient		
Oil, psi/ft	.3 (390-240) = 45	
Gas, psi/ft	.03 (451-390) = 1.8	
Pressure at Top of B Zone	774-47 = 727	
Top of B Zone to +370 ft	81	
Production		
BO/D	188	
Mcf/D	816	
Volume Weighted Reservoir Density, psi/ft	0.04070	
dP to +370 ft	3.3	
Pressure at +370 ft datum	730.3	

(188)(1.284) = 241.4

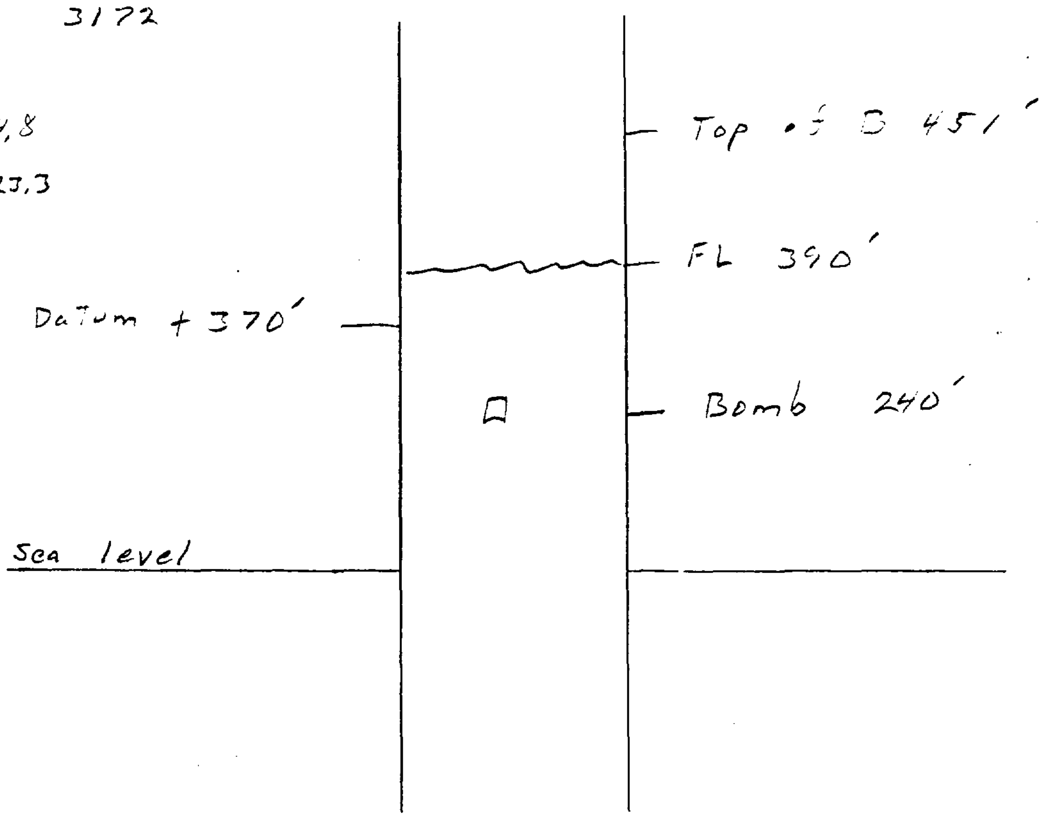
$\left[816 - \frac{(188)(372)}{1000}\right] 3.928 = 2930.5$

3172

(.7241)(241.4) = 174.8

(.04209)(2930.5) = 123.3

ρ_{AV} = .09399 (.433)



	KB		Subsea
Operator	Reading & Bates		
Well	Howard Federal 43-15		
	KB		Subsea
Elevation	7269		
Top of B Zone	6799		+ 470
Test Date		6/30/87	
Bomb Depth	6802		+467
Bomb Pressure, psig		1045	
Fluid Level	None		
~~Distance to Top of B Zone~~			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft		.03	
Pressure at Top of B Zone		1045 − (.03)(2) = 1045	
Top of B Zone to +370 ft		100'	
Production			
BO/D		4.3	
Mcf/D		239	
Volume Weighted Reservoir Density, psi/ft		0.035	
dP to +370 ft		3.5	
Pressure at +370 ft datum		1048.5	

$(4.3)(1.327) = 5.7$

$\left[239 - \frac{(4.3)(446)}{1000}\right] 2.632 = 623.8$

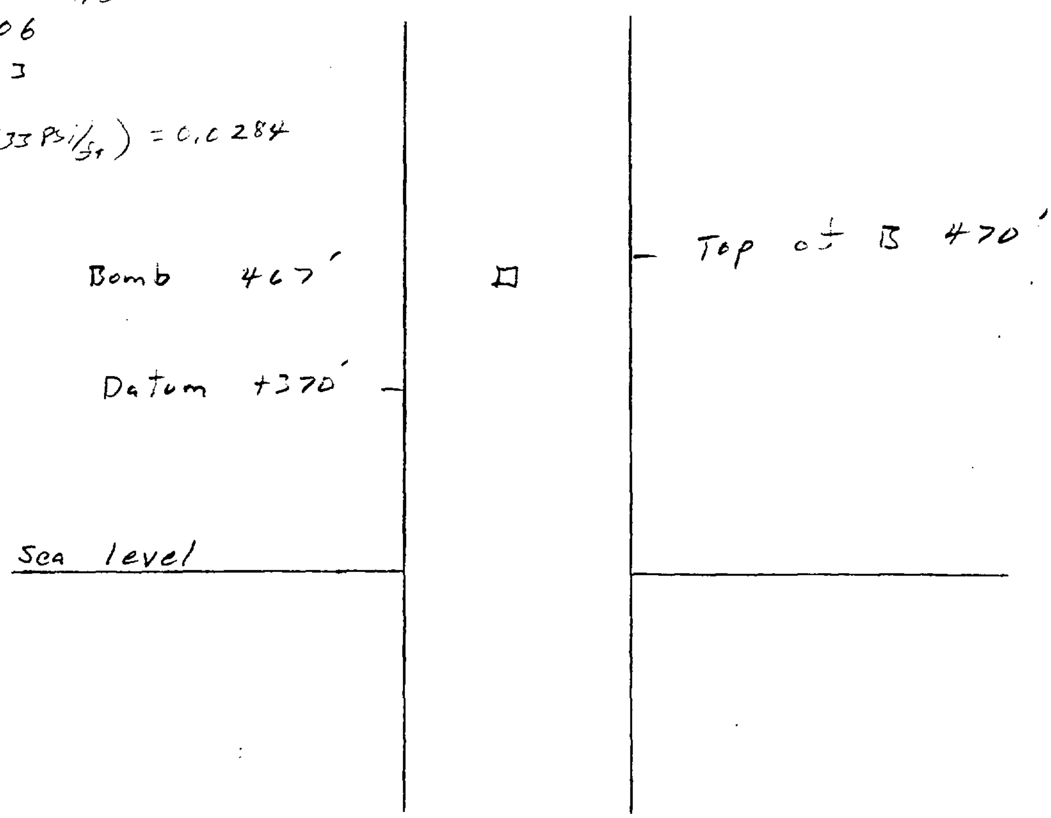
629.5

$(.7125)(5.7) = 4.06$

$(.05978)(623.8) = 37.3$

$\rho_A = (.0657\ gm/cc)(0.433\ psi/ft) = 0.0284$

use 0.035 (wet gas)



Operator	Reading + Bates		
Well	Howarth Federal #3-15		
	KB		Subsea
Elevation	7269		
Top of B Zone	6799		+470
Test Date		11/19/87	
Bomb Depth	6512		+757
Bomb Pressure, psig		776	
Fluid Level			
~~Distance to Top of B Zone~~			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft		0.03 (757-470) =	
Pressure at Top of B Zone		776 + 8.6 = 784.6	
Top of B Zone to +370 ft		100	
Production			
BO/D		9.2	
Mcf/D		637	
Volume Weighted Reservoir Density, psi/ft		0.035	
dP to +370 ft		3.5	
Pressure at +370 ft datum		788.1	

(9.2) (1.292) = 11.8

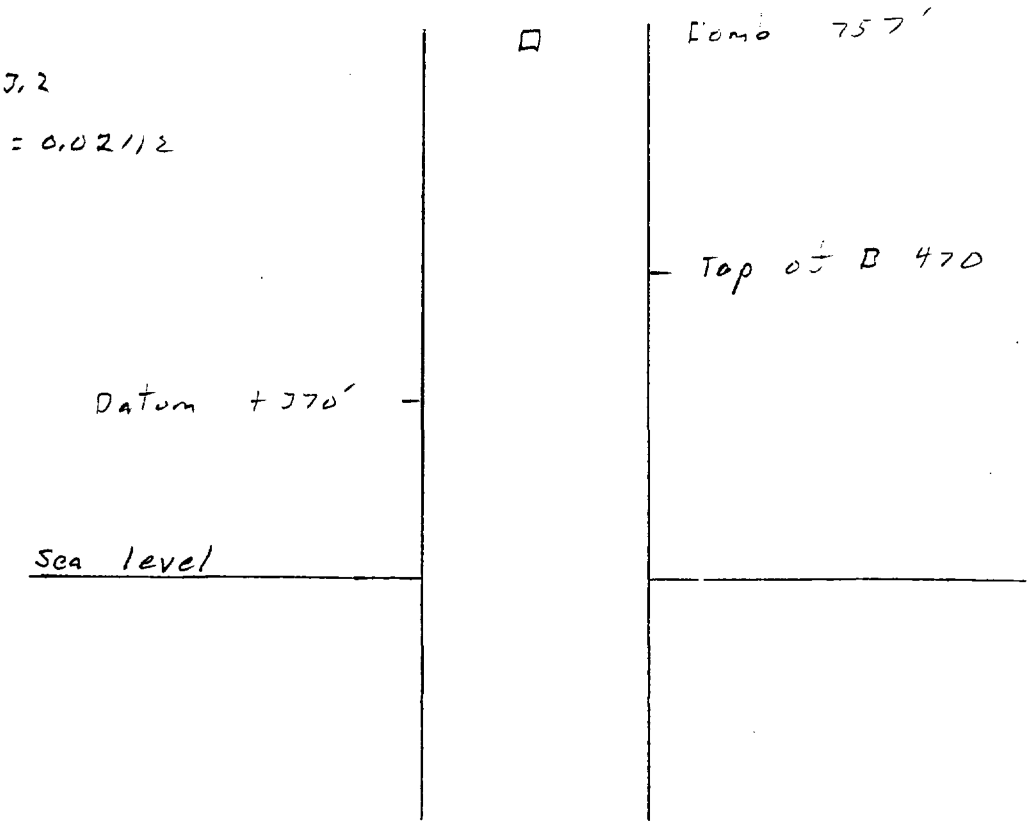
$$\left[637 - \frac{(9.2)(390)}{1000}\right] 3.6 = 2280$$

(.7210)(11.8 = .8.57

(.04526)(2280) = 103.2

(.433)(0.04877) = 0.02112

use 0.035



	KB		Subsea
Operator	Reading + Bates		
Well	Howard Federal 43-15		
Elevation	7269		
Top of B Zone	6799		+470
Test Date		2/23/88	
Bomb Depth	6512		+757
Bomb Pressure, psig		739	
Fluid Level	None		
~~Distance to Top of B Zone~~			
Wellbore Gradient			
Oil, psi/ft			
Gas, psi/ft		.03 (470-757)	
Pressure at Top of B Zone		739+8.6 = 747.6	
Top of B Zone to +370 ft		100	
Production			
BO/D		3.6	
Mcf/D		240	
Volume Weighted Reservoir Density, psi/ft		0.035	
dP to +370 ft		3.5	
Pressure at +370 ft datum		751.1	

(3.6) (1.268) = 4.63

$\left[240 - \frac{(3.6)(380)}{1000}\right] 3.792 = 904.9$

909.5

(.7229)(4.63) = 3.35

(.0~~43344~~)(904.9) = 39.2

$\rho_A = (.04681)(.433) = 0.02027$

use wet gas 0.035

Bomb 757

Top of B 470'

Datum +370'

Sea level

	KB		Subsea
Operator	Sun		
Well	Boyt & Lola #1		
Elevation	7351		
Top of B Zone	6848		+ 503
Test Date		6/30/87	
Bomb Depth	7000		+ 351
Bomb Pressure, psig		853	
Fluid Level			+ 363
~~Distance to Top of B Zone~~			
Wellbore Gradient			
Oil, psi/ft		0.3	
Gas, psi/ft		0.03	
Pressure at Top of B Zone		845	
Top of B Zone to +370 ft 133′			
Production			
BO/D		1.8	
Mcf/D		9.7	
Volume Weighted Reservoir Density, psi/ft		.04210	
dP to +370 ft		5.6	
Pressure at +370 ft datum		850.6	

$(.3)(363-351) = 3.6$
$(.03)(503-363) = 4.2$ } 7.8

853
$-\ 8$
845

$(1.8)(1.301) = 2.3$

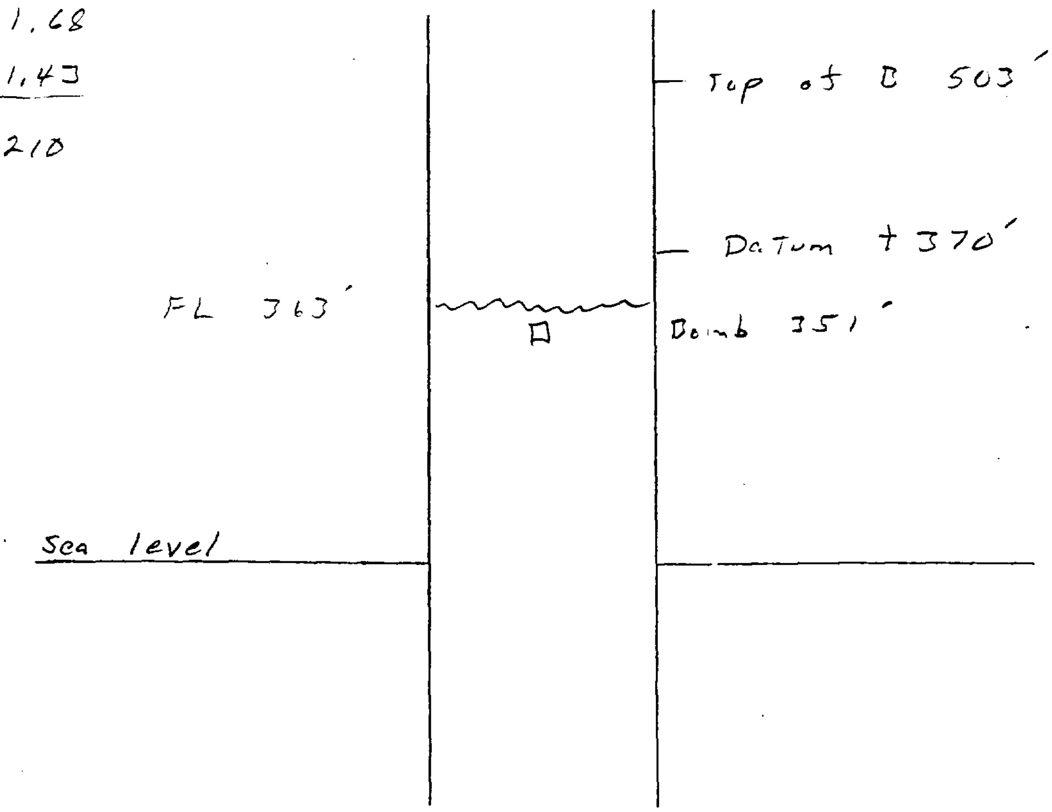
$\left[9.7 - \frac{(1.8)\,409}{1000}\right] 3.309 = 29.6$

32.03

$(.7183)(2.3) = 1.68$

$(.04848)(29.6) = 1.43$

$(.433)(.0973) = .04210$



	KB		Subsea
Operator	Sun		
Well	Bout + Lola #1		
Elevation	7351		
Top of B Zone	6848		+503
Test Date		11/19/87	
Bomb Depth	7060		+351
Bomb Pressure, psig		762	
Fluid Level			+571
Distance to Top of B Zone			
Wellbore Gradient			
Oil, psi/ft		.3(503-351) = 45.6	
Gas, psi/ft			
Pressure at Top of B Zone	762-46	716.4	
Top of B Zone to +370 ft	133'		
Production			
BO/D		1.8	
Mcf/D		9.7	
Volume Weighted Reservoir Density, psi/ft		0.04241	
dP to +370 ft		5.6	
Pressure at +370 ft datum		722.0	

$(1.8)(1.315) = 2.4$

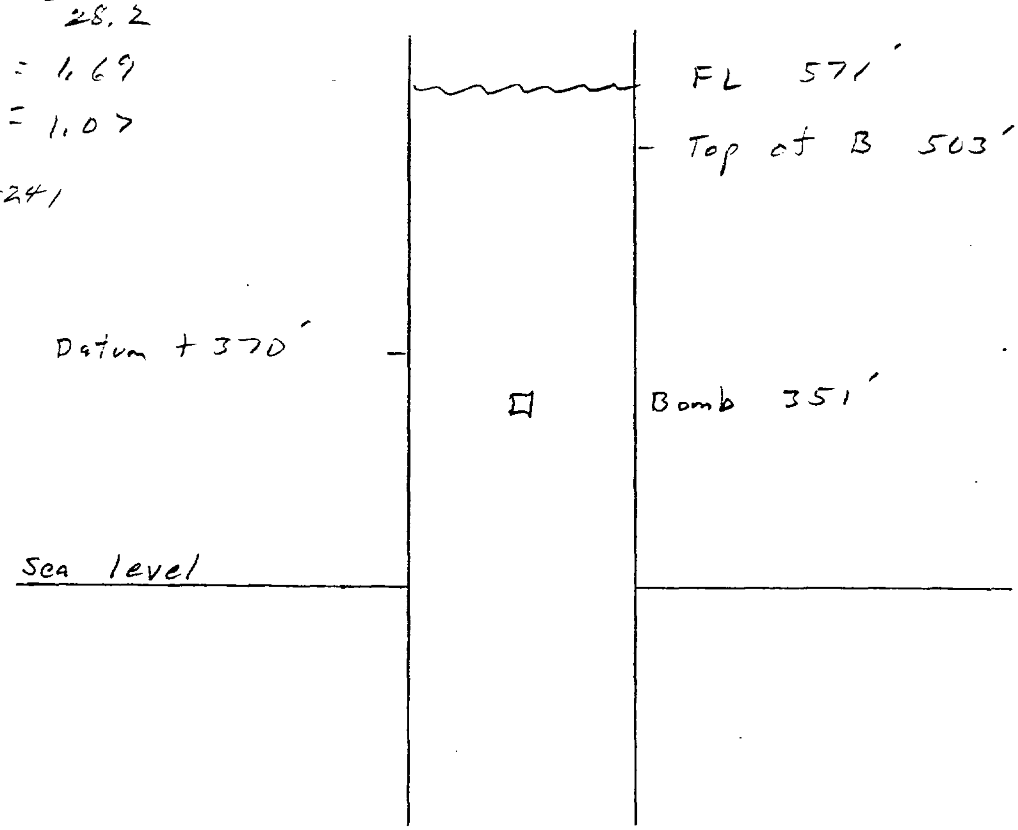
$\left[9.7 - \frac{(1.8)(440)}{1000}\right] 29 = 25.8$

28.2

$(.7146)(2.4) = 1.69$

$(.04155)(25.8) = 1.07$

$(.433)(.09794) = .04241$



	KB		Subsea
Operator	Sun		
Well	Boyt + Lola #1		
Elevation	7351		
Top of B Zone	6848		+503
Test Date		2/22/88	
Bomb Depth	7000		+351
Bomb Pressure, psig		790	
Fluid Level			+561
~~Distance to Top of B Zone~~			
Wellbore Gradient			
Oil, psi/ft		(0.3)(503−351) = 45.6	
Gas, psi/ft			
Pressure at Top of B Zone	790 − 45.6	= 744.4	
Top of B Zone to +370 ft	133'		
Production			
BO/D		1.8	
Mcf/D		9.7	
Volume Weighted Reservoir Density, psi/ft		.03727	
dP to +370 ft		5.0	
Pressure at +370 ft datum		749.4	

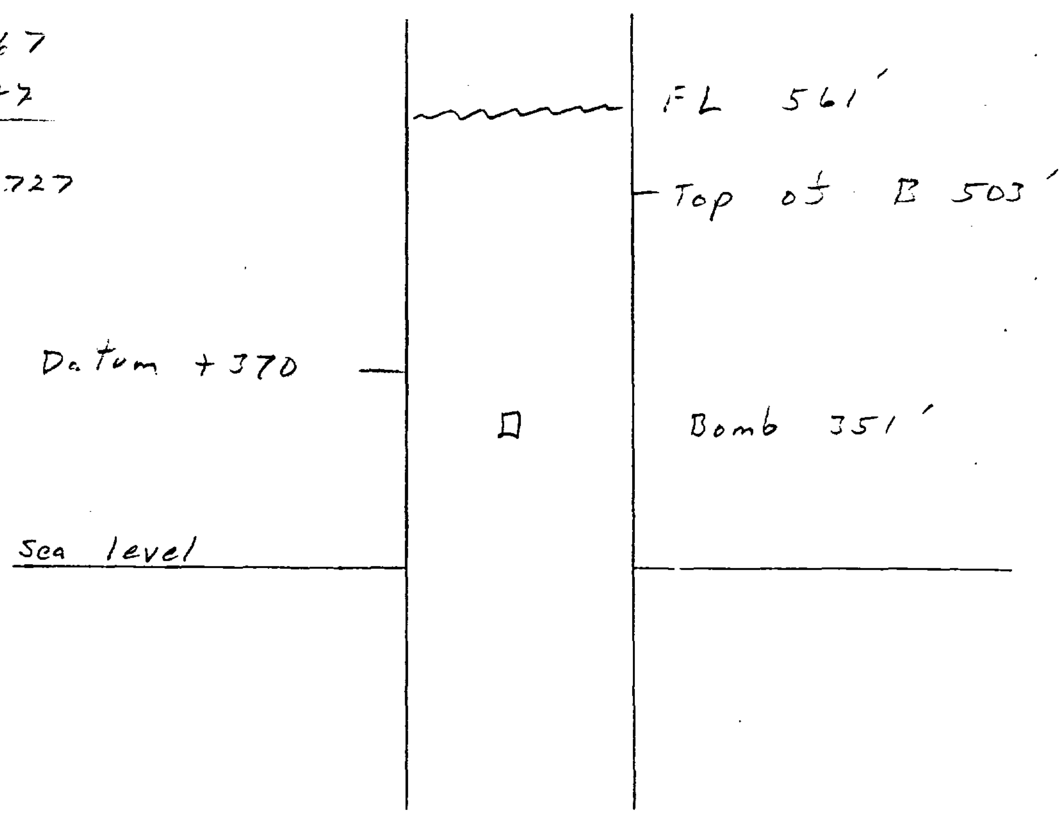
$(1.8)(1.288) = 2.3$

$\left[9.7 - \frac{(1.8)(380)}{1000}\right] 3.792 = 34.2$

$(.7229)(2.3) = 1.67$

$(.04302)(34.2) = 1.47$

$(.433)(.08606) = .03727$



Operator	Sun		
Well	High Adventure #1		
	KB		Subsea
Elevation	7332		
Top of B Zone	7150		+ 182
Test Date		6/30/87	
Bomb Depth	7310		+ 22
Bomb Pressure, psig		1164	
Fluid Level	7102		+ 230
Wellbore Gradient			
Oil, psi/ft	0.3 (182-22)		48
Gas, psi/ft			
Pressure at Top of B Zone	1164-48	= 1116	
Top of B Zone to +370 ft	188'		
Production			GOR
BO/D		225	2684
Mcf/D		604	
Volume Weighted Reservoir Density, psi/ft		.07474	
dP to +370 ft		14.1	
Pressure at +370 ft datum		1101.9	

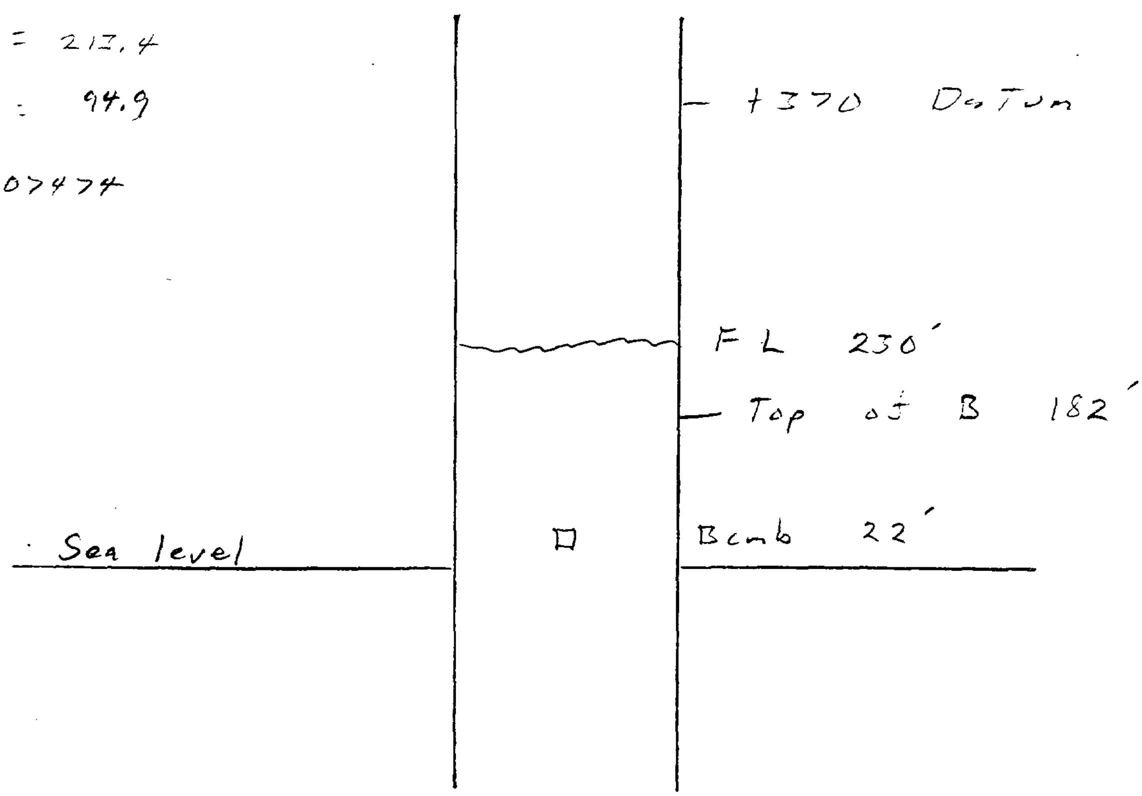
$(225)(1.334) = 300.2$

$\left[604 - \frac{(225)(482)}{1000}\right] 2.46 = \frac{1485.8}{1786}$

$(.7110)(300.2) = 213.4$

$(.063860)(1485.8) = 94.9$

$(.433)(.1726) = 0.07474$



	KB	Subsea
Operator	Sun	
Well	High Adventure #1	
Elevation	7332	
Top of B Zone	7150	+182
Test Date	11/19/87	
Bomb Depth	7400	−68
Bomb Pressure, psig	911	
Fluid Level		+210'
Wellbore Gradient		
Oil, psi/ft	(.3)(−68−182)	−75
Gas, psi/ft		
Pressure at Top of B Zone	836	
Top of B Zone to +370 ft	188	
Production		
BO/D	228	
Mcf/D	659	
Volume Weighted Reservoir Density, psi/ft	0.05798	
dP to +370 ft	10.9	
Pressure at +370 ft datum	825.1	

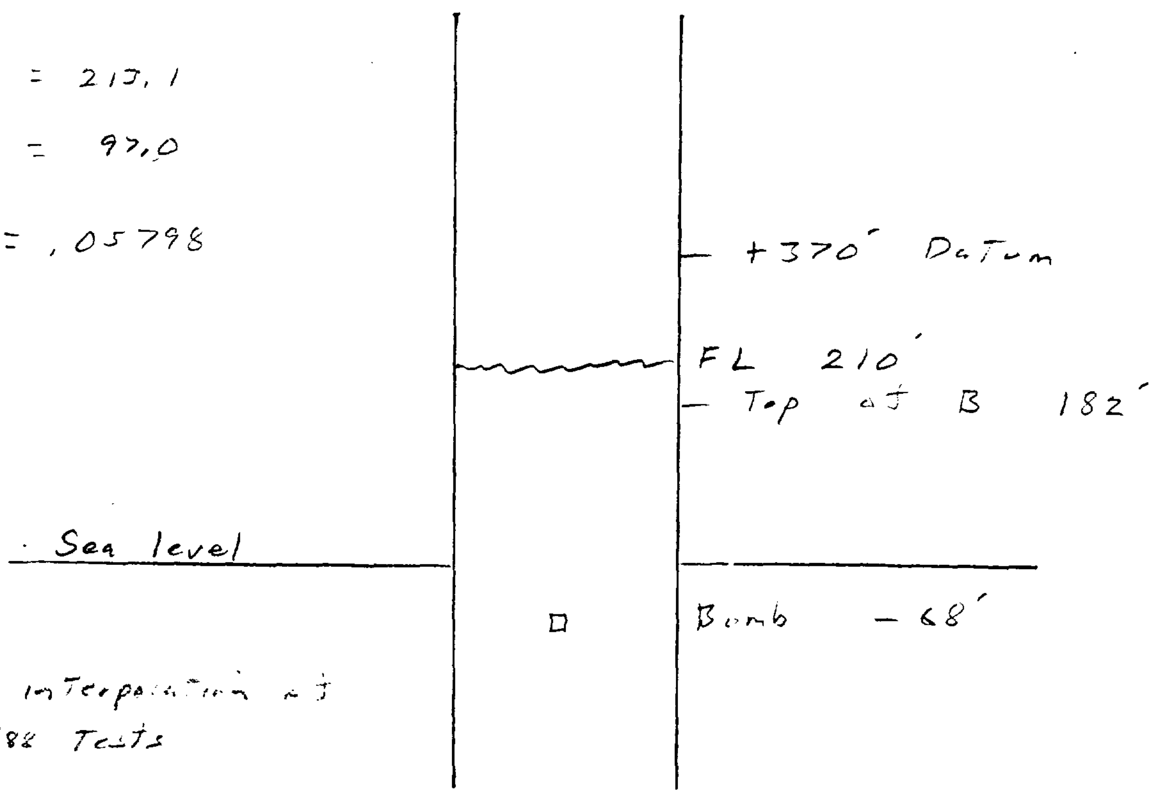
$$(228)(1.30) = 296.4$$

$$\left[659 - \frac{228(405)}{1000}\right] 3.385 = 2019.6$$

$$(.719)(296.4) = 213.1$$

$$(.04805)(2019.6) = 97.0$$

$$(.433)(.1339) = .05798$$



Fluid level by interpolation of 6/30/87 & 11/19/88 Tests

$$\frac{1116-785}{911-785} = \frac{230-197}{FL_{11/19}-197}$$

$$FL = 210'$$

	KB		Subsea
Operator	Sun		
Well	High Adventure #1		
Elevation	7332		
Top of B Zone	7150		+182
Test Date		2/23/88	
Bomb Depth	7400		-68
Bomb Pressure, psig		860	
Fluid Level	7135		+197
Wellbore Gradient			
Oil, psi/ft	(.3)(-68-182)		-75
Gas, psi/ft			
Pressure at Top of B Zone		785	
Top of B Zone to +370 ft	188'		
Production			
BO/D		269	GOR
Mcf/D		584	2171
Volume Weighted Reservoir Density, psi/ft		0.07269	
dP to +370 ft		13.7	
Pressure at +370 ft datum		771.3	

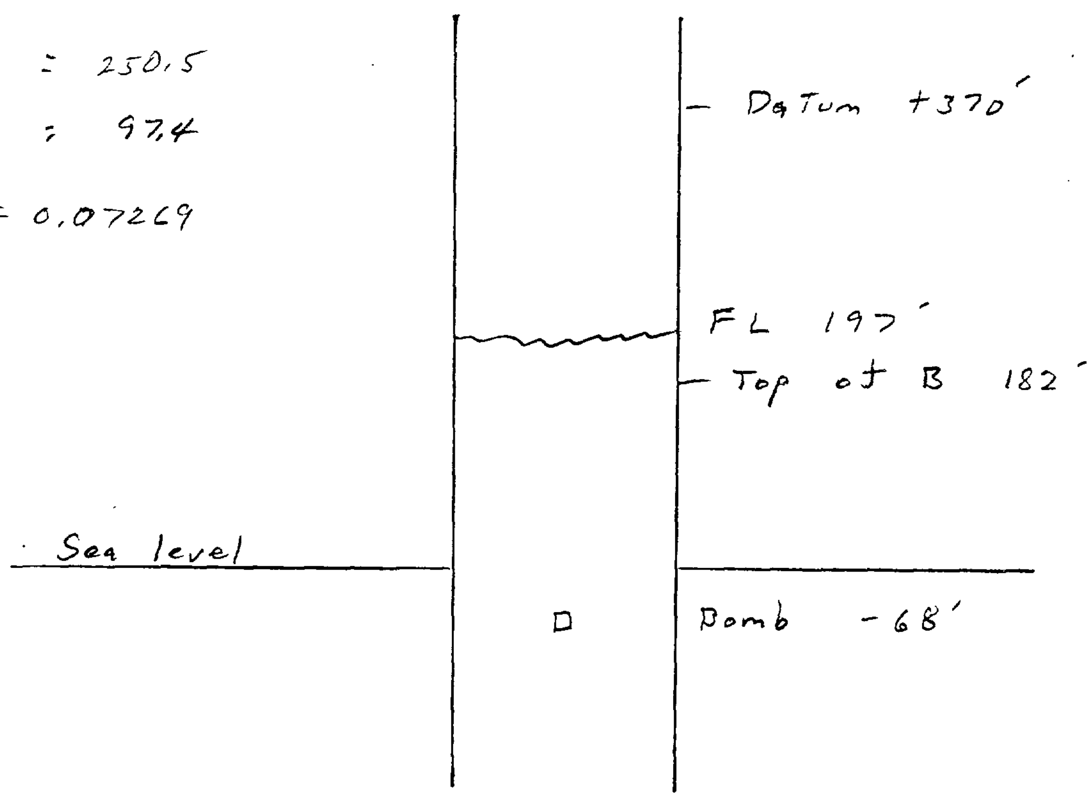
$(269)(1.292) = 347.5$

$\left[584 - \frac{269(390)}{1000}\right] 3.6 = 1724.7$

$(.7210)(347.5) = 250.5$

$(.05647)(1724.7) = 97.4$

$(.433)(.16789) = 0.07269$



	KB		Subsea
Operator	Sun		
Well	Laddy #1		
Elevation	7167		
Top of B Zone	6927		+ 240
Test Date		6/30/87	
Bomb Depth	7100		+ 67
Bomb Pressure, psig		1140	
Fluid Level	6962		+ 205
Wellbore Gradient			
Oil, psi/ft	(.3)(205-67)		41.4
Gas, psi/ft	(.03)(240-205)		1.1
Pressure at Top of B Zone		1097.5	
Top of B Zone to +370 ft	130'		
Production			
BO/D		61	
Mcf/D		433	
Volume Weighted Reservoir Density, psi/ft		.04819	
dP to +370 ft		6.3	
Pressure at +370 ft datum		1091.2	

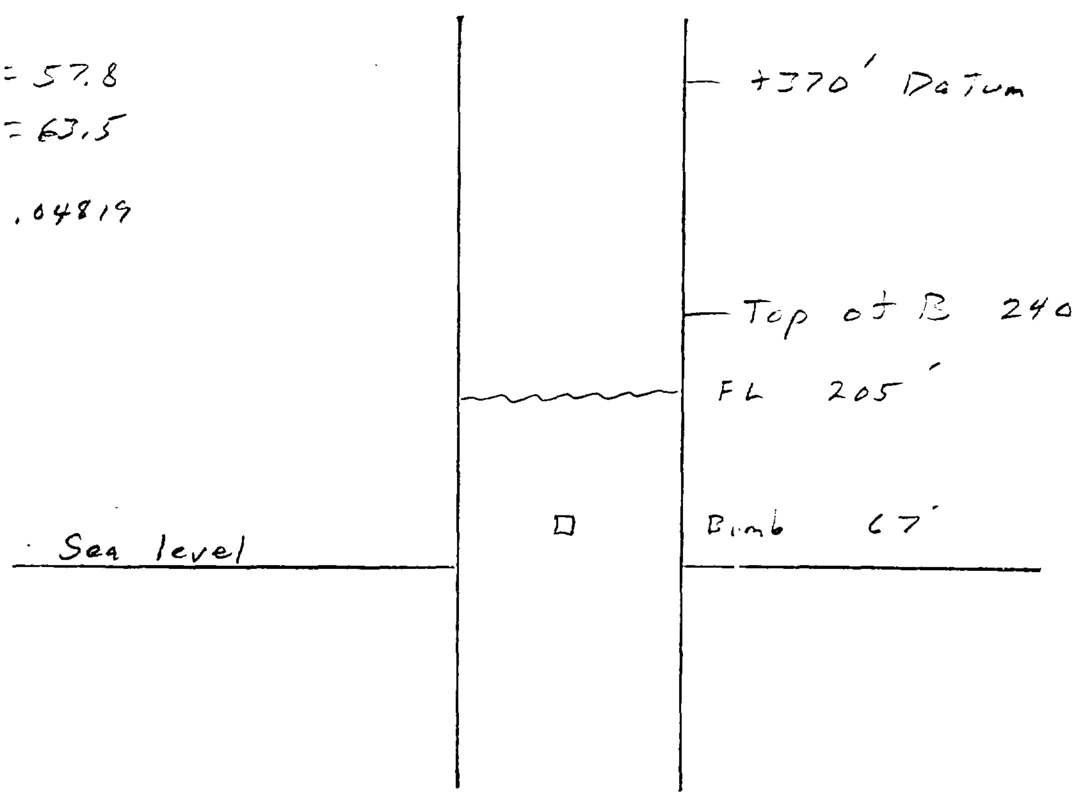
(61) (1.333) = 81.3

$$\left[433 - \frac{(61)(480)}{1000}\right] 2.497 = 1008.1$$

(.7113) (81.3) = 57.8

(.062944) (1008.1) = 63.5

(.433) (.1113) = .04819



	KB		Subsea
Operator	Sun		
Well	Loddy #1		
Elevation	7167		
Top of B Zone	6927		+240
Test Date		11/19/87	
Bomb Depth	7100		+67
Bomb Pressure, psig		902	
Fluid Level			+182
Wellbore Gradient			
Oil, psi/ft	(.3)(182-67)		34.5
Gas, psi/ft	(.03)(240-182)		1.7
Pressure at Top of B Zone		866.8	
Top of B Zone to +370 ft	130		
Production			
BO/D		58	
Mcf/D		338	
Volume Weighted Reservoir Density, psi/ft		0.4187	
dP to +370 ft		5.4	
Pressure at +370 ft datum		861.4	

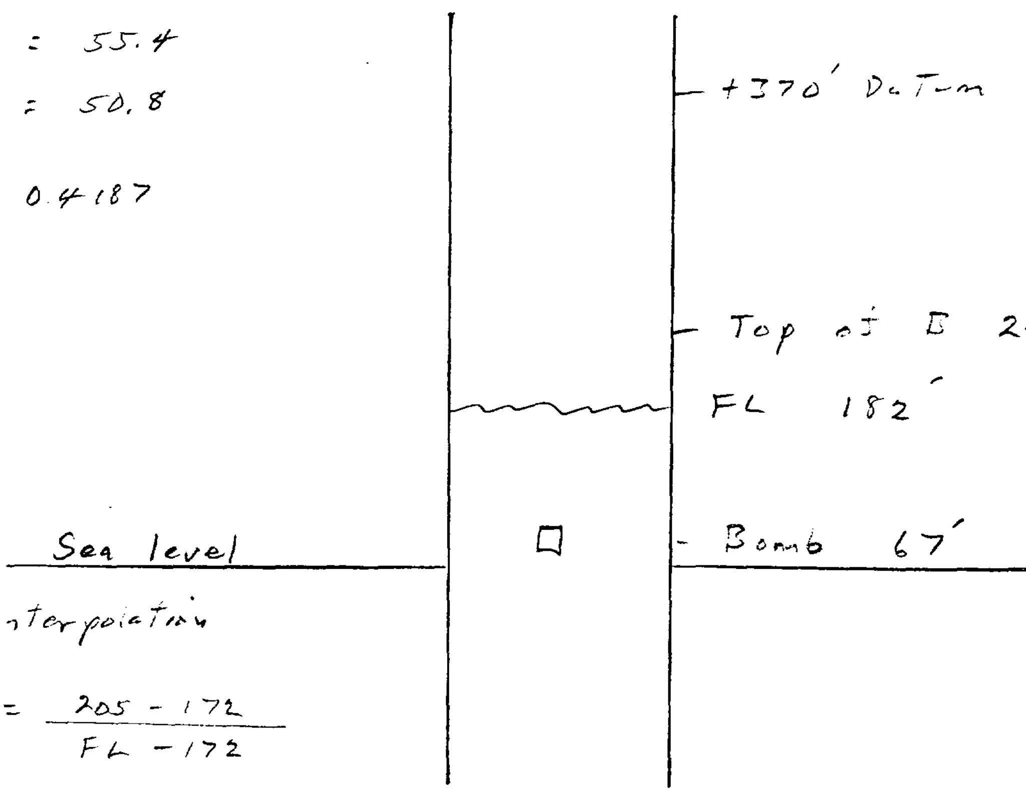
$(58)(1.303) = 77.1$

$\left[338 - \frac{(58)(412)}{1000}\right] 3.25 = 1020.8$

$(.7178)(77.1) = 55.4$

$(.049729)(1020.8) = 50.8$

$(.433)(.09670) = 0.4187$



Fluid level by interpolation

$$\frac{1097.5 - 812.5}{902 - 812.5} = \frac{205 - 172}{FL - 172}$$

$FL = 182$

	KB	Subsea
Operator	Sun	
Well	Loddy #1	
Elevation	7167	
Top of B Zone	6927	+240
Test Date	2/25/88	
Bomb Depth	7100	+67
Bomb Pressure, psig	546	
Fluid Level		+172
Wellbore Gradient		
Oil, psi/ft	(.3)(172-67)	31.5
Gas, psi/ft	(.03)(240-172)	2.04
Pressure at Top of B Zone	812.5	
Top of B Zone to +370 ft	130	
Production		
BO/D	52	
Mcf/D	369	
Volume Weighted Reservoir Density, psi/ft	.03569	
dP to +370 ft	4.6	
Pressure at +370 ft datum	867.8	

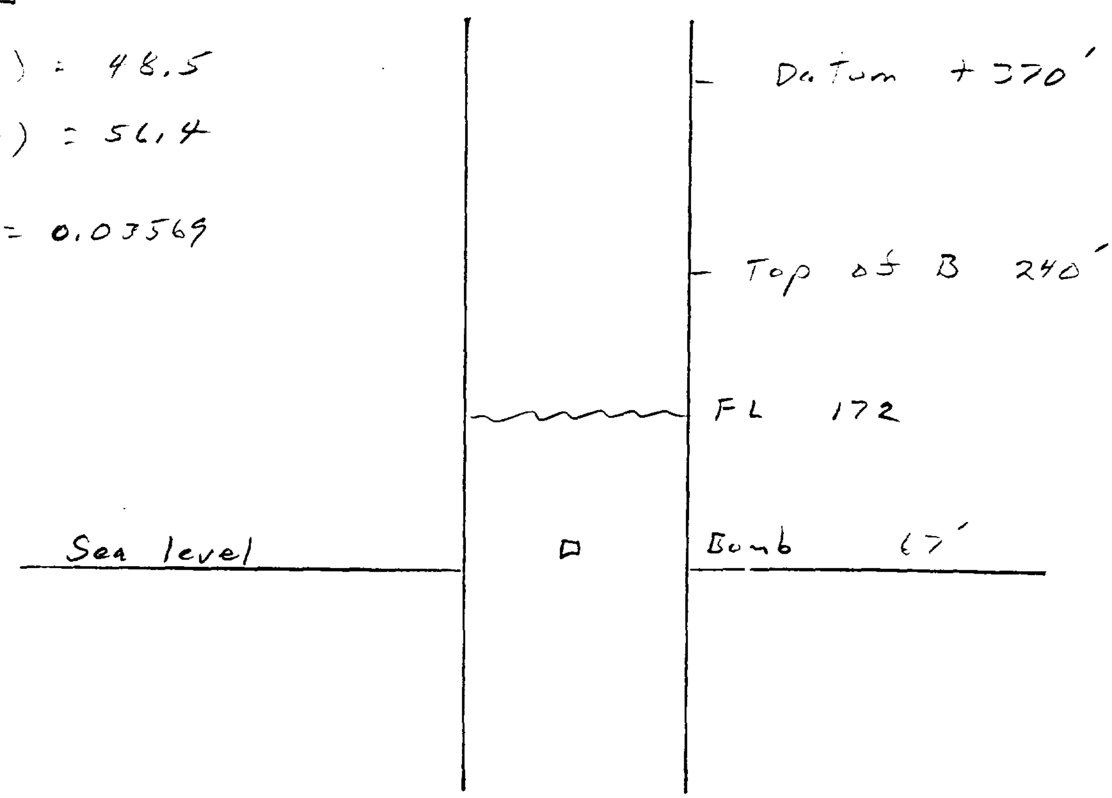
$(52)(1.295) = 67.3$

$\left[369 - \frac{(52)(399)}{1000}\right] 3.46 = 1205.0$

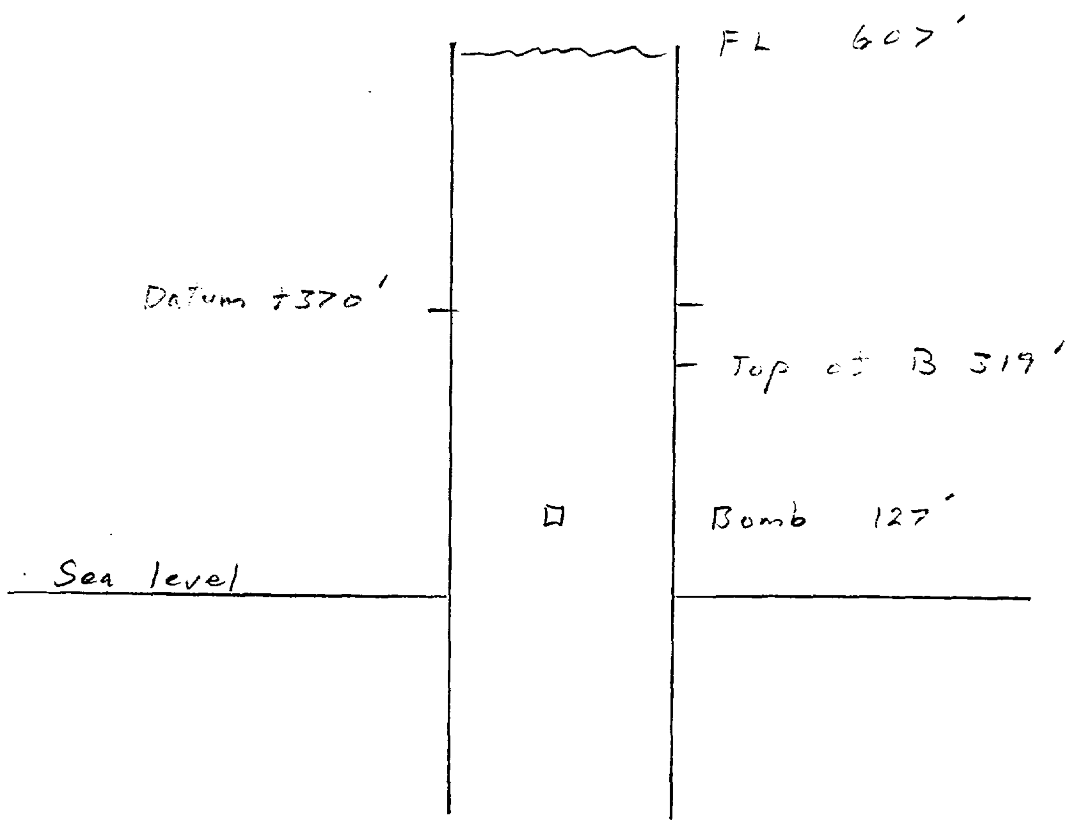
$(.7200)(67.3) = 48.5$

$(.04679)(1205) = 56.4$

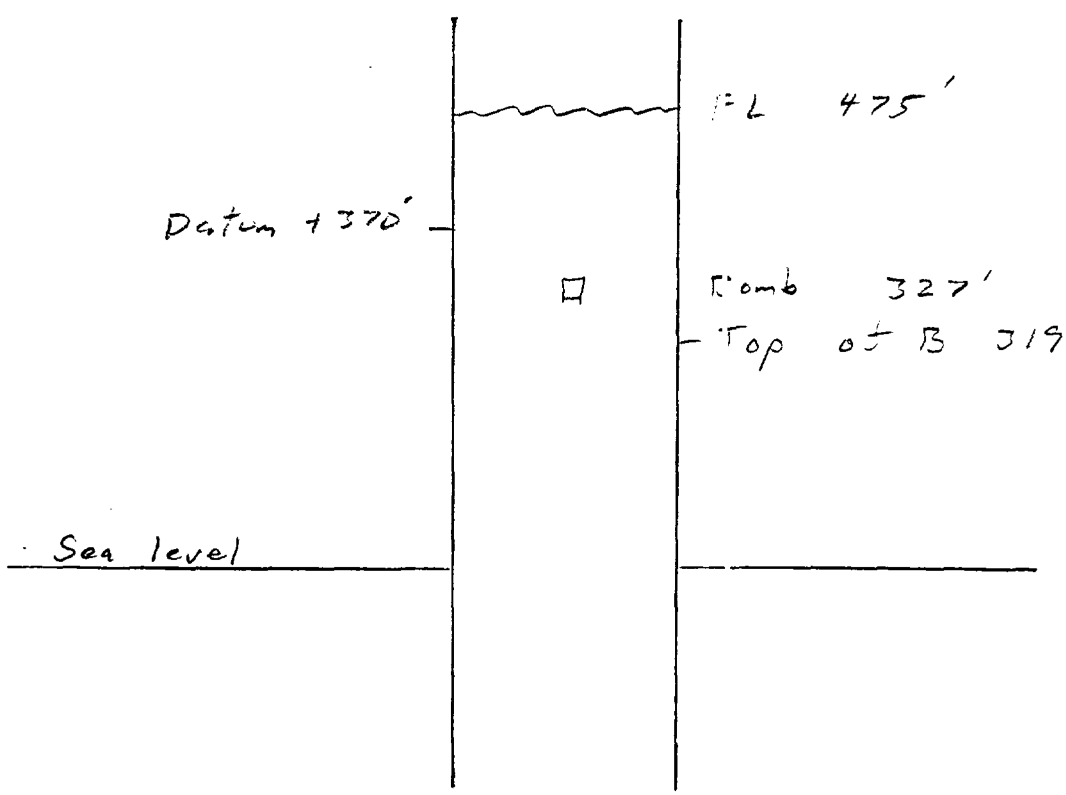
$(.433)(0.08243) = 0.03569$



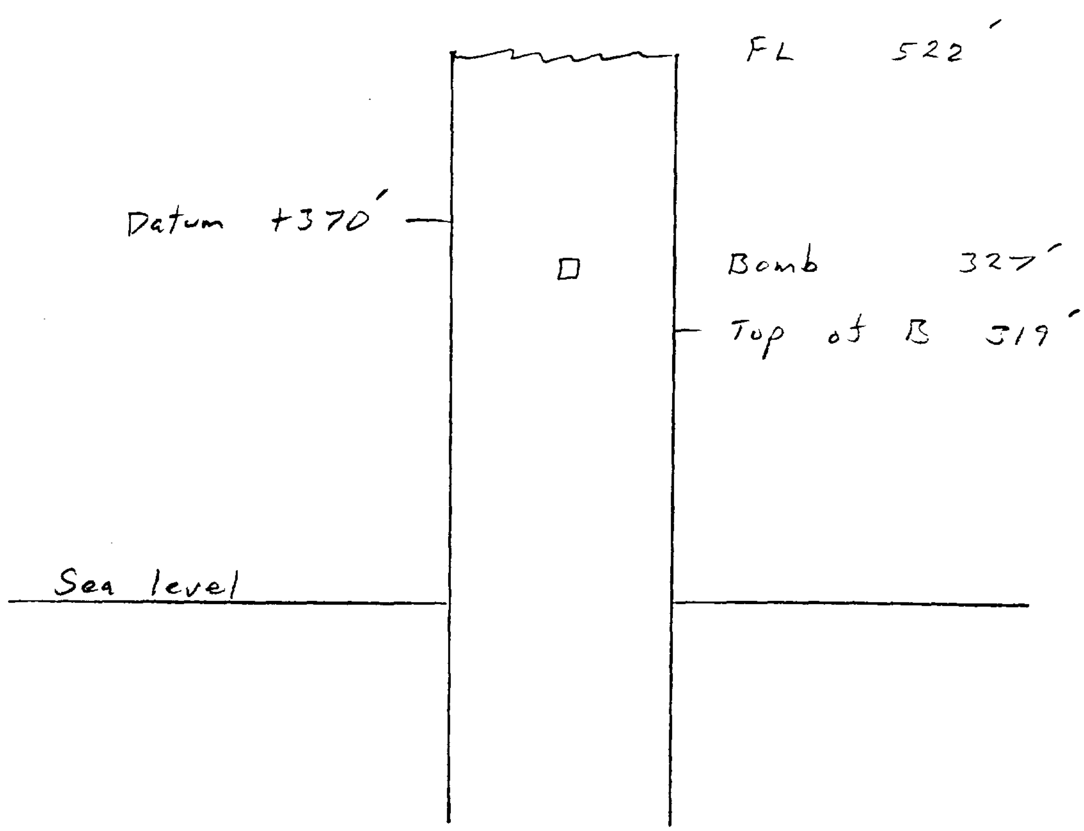
	KB		Subsea
Operator	Sun		
Well	Wildfire #1		
Elevation	7727		
Top of B Zone	7408		+ 319
Test Date		6/30/87	
Bomb Depth	7600		+ 127
Bomb Pressure, psig		1263	
Fluid Level	7120		+ 607
Wellbore Gradient			
Oil, psi/ft	(.3(319-127))		57.6
Gas, psi/ft			
Pressure at Top of B Zone		1205.4	
Top of B Zone to +370 ft	51		
Production			
BO/D		Not Produced	
Mcf/D			
Volume Weighted Reservoir Density, psi/ft		.035	
dP to +370 ft		1.8	
Pressure at +370 ft datum		1203.6	



	KB		Subsea
Operator	Sun		
Well	Wildfire #1		
Elevation	7727		
Top of B Zone	7408		+319
Test Date		11/19/87	
Bomb Depth	7400		+327
Bomb Pressure, psig		1028	
Fluid Level	7252		+475
Wellbore Gradient			
Oil, psi/ft	(.3)(327-319)		2.4
Gas, psi/ft			
Pressure at Top of B Zone		1030.4	
Top of B Zone to +370 ft	51		
Production			
BO/D		Not Produced	
Mcf/D			
Volume Weighted Reservoir Density, psi/ft		0.035	
dP to +370 ft		1.8	
Pressure at +370 ft datum		1028.6	



Operator	Son		
Well	Wildfire #1		
	KB		Subsea
Elevation	7727		
Top of B Zone	7408		+319
Test Date		2/23/88	
Bomb Depth	7400		+327
Bomb Pressure, psig		972	
Fluid Level	7205		+522
Wellbore Gradient			
Oil, psi/ft	.3(327-319)		2.4
Gas, psi/ft			
Pressure at Top of B Zone		974	
Top of B Zone to +370 ft	51		
Production			
BO/D		Not Produced	
Mcf/D			
Volume Weighted Reservoir Density, psi/ft		0,035	
dP to +370 ft		1,8	
Pressure at +370 ft datum		972,2	

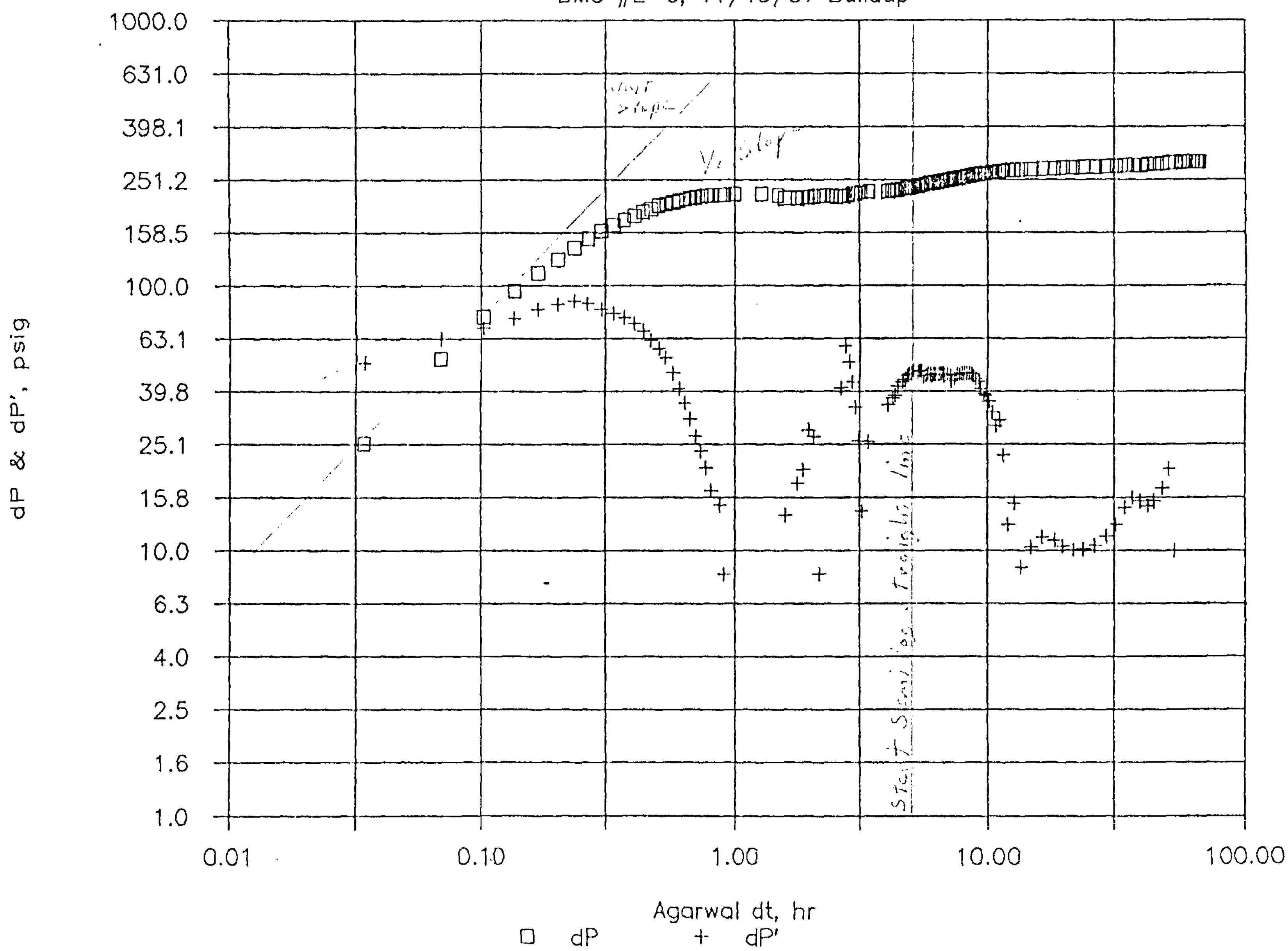


APPENDIX 2

Pressure Buildup Worksheets

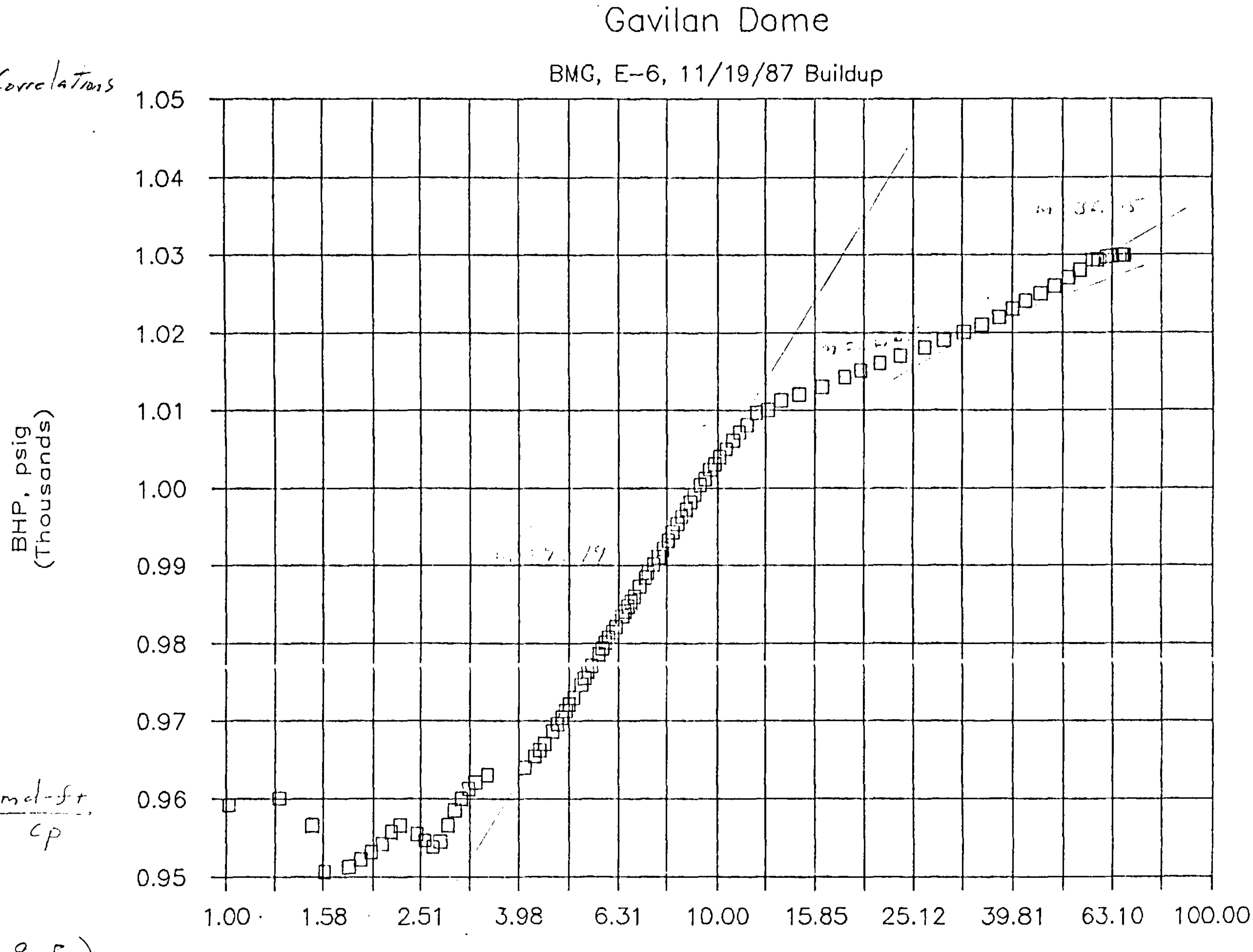
Gavilan Dome

BMG #E-6, 11/19/87 Buildup



Gavilan Dome, 11/19/87 Buildup
BMG, E-6, q_o = 281 B/D GOR = 4500

Initial work
From Standings Correlations
GOR = 4000
$B = 11.0$
$q_o = 281$
$m = 36.05$



$\frac{kh}{\mu} = \frac{162.6\, q\, B}{m}$

$\frac{kh}{\mu} = 13,942 \frac{md\text{-}ft}{cp}$

Using q_t concept

$q_{Rt} = q_o B_o + \left(q_g - \frac{q_o R_s}{1000}\right) B_g + q_w B_w$

$\frac{kh}{\mu} = 14,156$

From Lasater PVT
$B_g = 2.778$ RB/Mcf
$R_s = 452$

$B_o = 1.242$
$q_g = 4000 \times 281$

$B_g = 5.04 \times 10^{-3} \frac{TZ}{P}$
$q_{Rt} = 3139$ RB

11/19/87 Buildups 4/14/88

①

Initial Work

E-6 $q_o = 281$ B/D GOR = 4296 $q_g = 1207$ Mcf/D

Boundry Dominated Flow. Therefore use Flow Regime 1 (doesn't work 4/24)

for analyses $m = 99.19$ Max pressure = 1030 psig

Transform gas flow rate to RB

$$\left(q_g - \frac{q_o R_s}{1000}\right) B_g$$

where q_g, Mscf/D
R_s; scf/bbl
B_g, RB/Mscf

$$\left[1207 - \frac{(281)(466)}{1000}\right] 2.632 = 2832 \text{ RB/D}$$

Total flow rate = (281)(1.327) + 2832
= 3205 RB/Day

Flow Regime #1

$$\lambda h_t = \frac{(162.6)\, q_{Rt}}{m} = 5254 \frac{\text{md}\cdot\text{ft}}{\text{cp}} \quad (m = 99.19 \text{ psi/cycle})$$

if $m = 36.05$ last slope

$$\lambda h_t = 14{,}456 \frac{\text{md}\cdot\text{ft}}{\text{cp}} = \left(14{,}456 \frac{\text{md}\cdot\text{ft}}{\text{cp}}\right)(.0831 \text{ cp}) = 1200 \text{ md}\cdot\text{ft}$$

Average viscosity
$$(1.327)(281 \text{ BO/D})(.605) = 255.6 \frac{\text{RB}\cdot\text{cp}}{\text{D}}$$
$$+ (2832 \text{ RBG/D})(.0143) = 40.5 \frac{\text{RB}\cdot\text{cp}}{\text{D}}$$

3204 RB/D — $266.1 \frac{\text{RB}\cdot\text{cp}}{\text{D}}$

$$\frac{266.1 \frac{\text{RB}\cdot\text{cp}}{\text{D}}}{3204 \frac{\text{RB}}{\text{D}}} = 0.0831 \text{ cp}$$

Average Rate, STB/D
(1,076)(2.632) = 2832 STB/D
+ 281 (1.327) = 373 STB/D
3205 STB/D

Average FVF $\frac{3205}{1357 \text{ STB/D}} = 2.361$

4/14/88

②

doesn't work with $m = 99.19\ psi/cy$

$$Kh_{absolute} = \left(5254\ \frac{md \cdot ft}{cp}\right)(.0831\ cp) = \cancel{1200}\ 437\ md \cdot ft$$

$$K_o h = \frac{(162.6)(281)(1.327)(.605)}{36.05} = 1018\ md \cdot ft$$

$$K_g h = \frac{(162.6)(2832)(\quad)(0.0143)}{36.05} = 783\ md \cdot ft$$

BMG E-6 11/19/87 Buildup Last effort 4/15/88

③

10 hr → 55 hr Agarwal Time (Averaged slope)

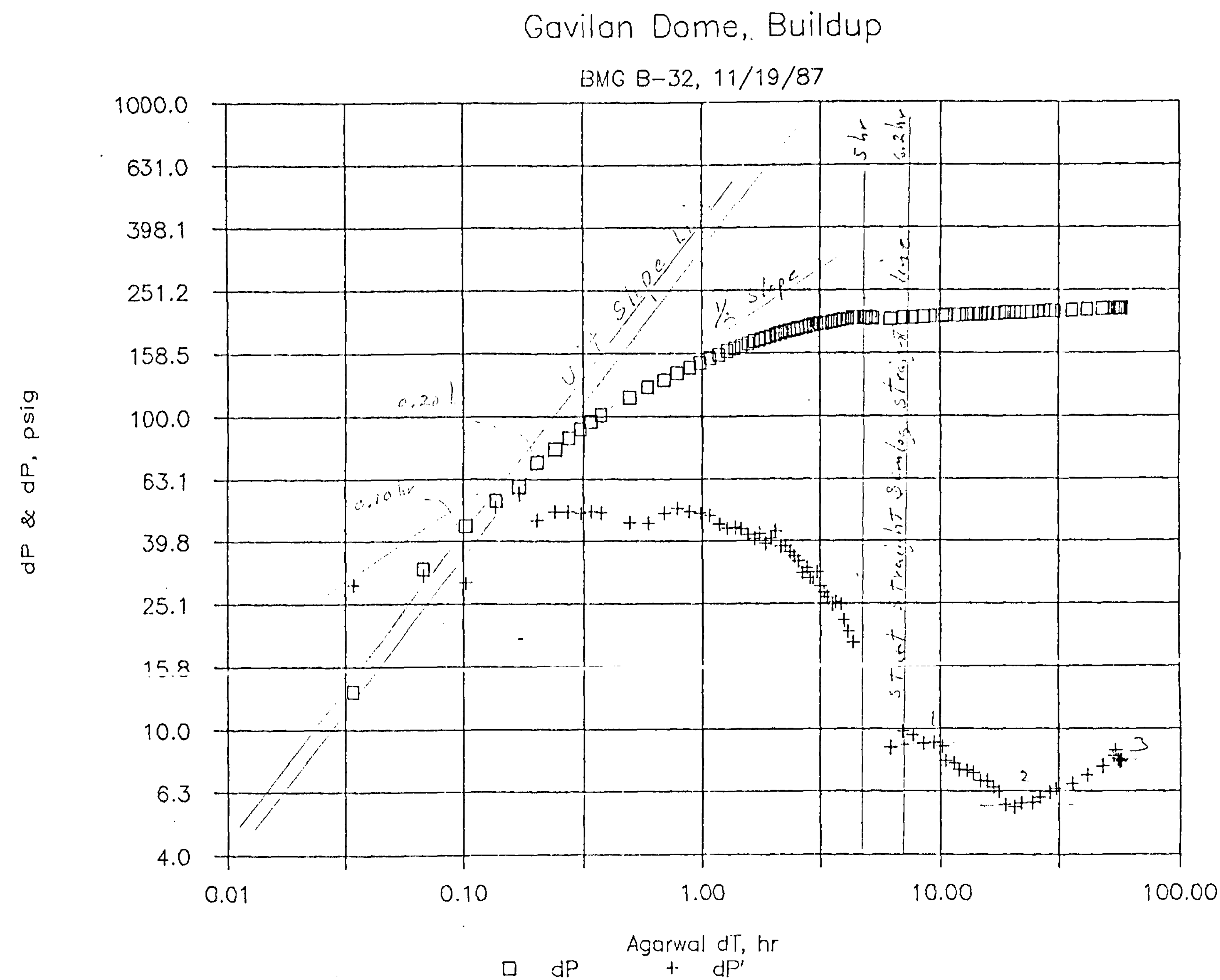
CC = 99.5%, Intercept = 977.9 psig slope = <u>28.44</u>

$$\frac{Kh}{\mu}_{absolute} = \frac{162.6\, q_{bRt}}{m} = \frac{(162.6)(3205)}{28.44} = 18324\ \frac{md \cdot ft}{cp}$$

$$Kh_{absolute} = \left(18324\ \frac{md \cdot ft}{cp}\right)(0.0831\ cp) = 1523\ md \cdot ft$$

$$K_o h = \frac{(162.6)(281)(1.327)(.605)}{28.44} = 1290\ md \cdot ft$$

$$K_g h = \frac{(162.6)(2532)(0.0143)}{28.44} = 232\ md \cdot ft$$


Gavilan Dome, Buildup
BMG B-32, 11/19/87
1000.0
631.0
398.1
251.2
158.5
100.0
63.1
39.8
25.1
15.8
10.0
6.3
4.0
0.01
0.10
1.00
10.00
100.00
dP & dP, psig
Agarwal dT, hr
□ dP
+ dP'
unit slope line
½ slope
0.20 hr
0.10 hr
5 hr
6.2 hr
start straight semilog straight line
1
2
3

4/13/88

From Loddy #1

PVT data @ 1000psig

GOR = 1200

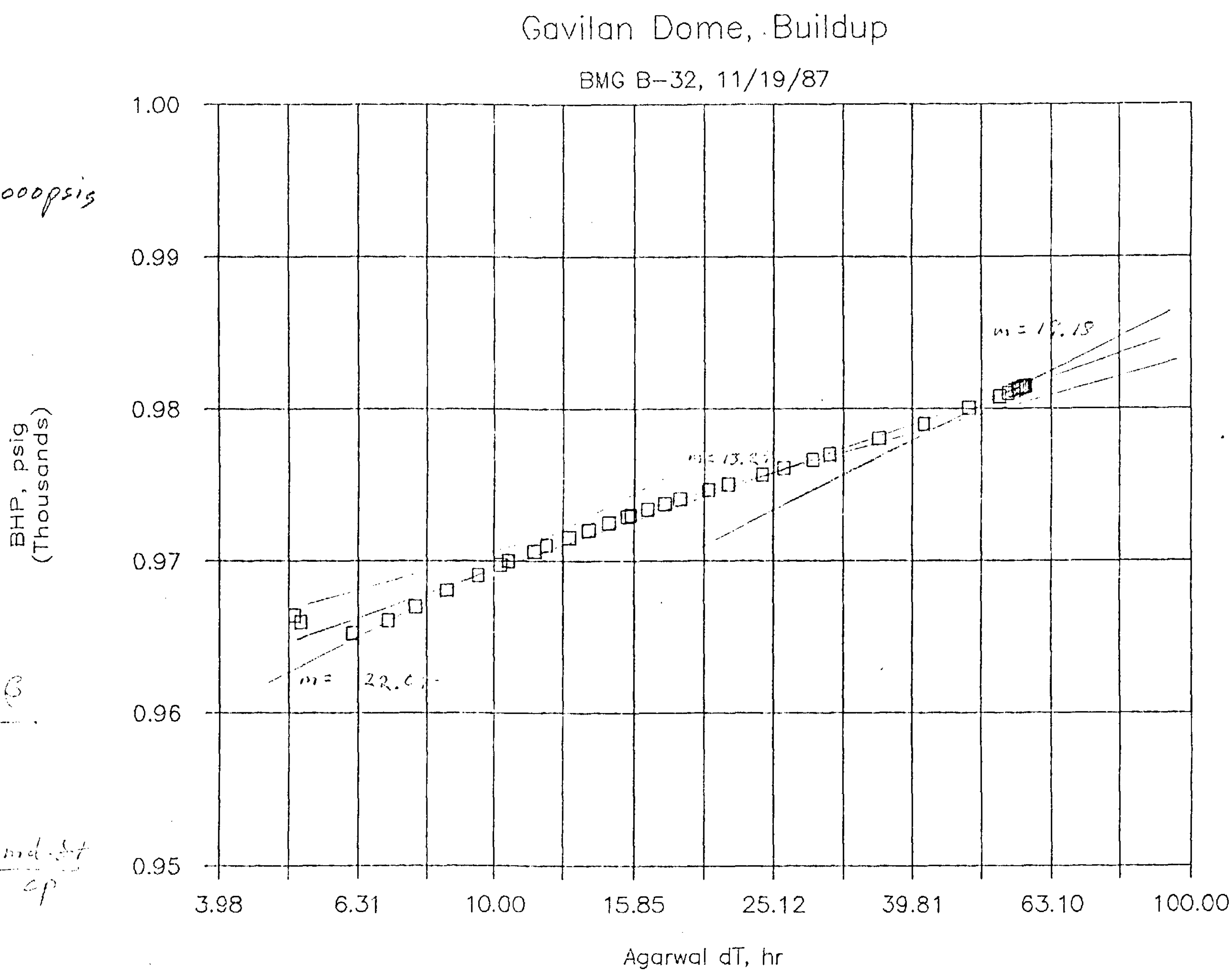
$\beta = 1.242$

$q = 719$ BOPD

$m = 19.18$

$$\frac{kh}{\mu} = \frac{162.6\, q\, \beta}{m}$$

$$\frac{kh}{\mu} = 7570 \ \frac{\text{md}\cdot\text{ft}}{\text{cp}}$$



BMG B-32 7/2?/82

11/19/82 Buildup

$q_o = 719$ BCPD GOR = 1.242

$q_g = 893$ Mcf/D Max pressure 955 psi

$B_o = 1.314$ $B_g = 2.932$ $\mu_o = 0.635$ $\mu_g = 0.01403$ $R_S = 437$

$\rho_o = .7148$ $\rho_g = .000891$

q_o, RB $= (719)(1.314) = 944.8$ RB/D

577 bbl/D equivalent

q_g, RB $= \left[893 - \frac{(719)(437)}{1000}\right] 2.932 = 1697$ RB/D

$q_t = q_o + q_g = 2642$ RB/D

Volume average viscosity + density

$(944.8)(0.635) = 599.9$

$(1697)(0.01403) = 23.8$

623.8

$\mu_{Average} = 0.2361$ cp

$(944.8)(0.7148) = 675.3$

$(1697)(.000891) = 1.5$

676.9

$\rho_{Average} = 0.2562$ gm/cc

$\frac{0.2562}{1} = \frac{X}{0.433 \text{ psi/ft}}$

Reservoir gradient, $X = 0.1109$ Psi/ft

$\frac{K_t h}{\mu} = \frac{(162.6)(2642 \text{ RB/D})}{19.8} = 21,696 \frac{\text{md.ft}}{\text{cp}}$, $\therefore Kh = 5123$ md.ft

$K = 34.2$ md h ≈ 150'

$K_o h = \frac{(162.6)(944.8)(.635)}{19.8} = 4927$ md.ft

$K_g h = \frac{(162.6)(1697)(0.01403)}{19.8} = 196$ md.ft

Mallon

Fisher Federal 2-1

11/19/87 Buildup $m = 64.0$ $q_o = 39.8$ $q_g = 347.47$

$\bar{P}$ 978 $B_o = 1.317$ $B_g = 2.55$ $\mu_o = 0.628$ $\mu_g = 0.01409$ $R_s = 444$

$q_{o,RB} = (39.8)(1.317) = 52.4166$

$q_{g,RB} = \left[347.47 - \frac{(39.8)(444)}{1000}\right] 2.55 = 939.9$

$q_{t,RB} = 992.3$ RB/D

$(52.4)(.628) =$

$(939.9)(.01409) =$

46.15

$\mu_{Average} = 0.0465$ cp

$\lambda_t h = \frac{(162.6)(992.3)}{m} = 2338 \frac{md \cdot ft}{cp}$

$Kh = 109$ md

2/23/88 Buildup $m = 87$ $q_o = 98$ $q_g = 1013$

$\bar{P} \sim 925$ $B_o = 1.310$ $B_g = 3.015$ $\mu_o = 0.643$ μ_g 0.01396 $R_s = 420$

$q_o = (1.310)(98) = 128.4$ RB/D

$q_g = \left[1013 - \frac{(98)(420)}{1000}\right] 3.015 = 2927.1$ "

3055

$q_t = 3055$ RB/D

$(128.4)(.643) = 82.56$

$(2927.1)(0.01396) = 40.86$

123.42

$\mu_{Average} = 0.0404$

$\lambda_t h = \frac{(162.6)(3055)}{87}$

$\lambda_t h = 5710 \frac{md \cdot ft}{cp}$

$Kh = 231$ md·ft

$K_o h = \frac{(128.4)(.643)(162.6)}{87} = 154$

$K_g h = \frac{(2927.1)(.01396)(162.6)}{87} = 76.4$

Meridian
Hill Federal 2-4

6/30/87 Buildup

$m = 108.4 \quad q_o = 107.2 \quad q_g = 327.0 \quad \bar{P} = 1111$

$B_o = 1.334 \quad B_g = 2.477 \quad \mu_o = .588 \quad \mu_g = 0.01442 \quad R_s = 482$

$q_o = (107.2)(1.334) = 143.0$

$q_g = \left[\left(327 - \frac{(107.2)(482)}{1000}\right]2.477\right. = 682$

$\overline{825 \text{ RB/D}}$

$(143)(.588) = 84$

$(682)(0.01442) = \underline{9.8}$

93.92

$\lambda_t h = \frac{(162.6)(825)}{108.4} = 1237.5 \frac{md\text{-}ft}{cp}$

$\bar{k} h = 141 md$

$\mu_{Average} = 0.1138$

$k_o h = \frac{(162.6)(143)(.588)}{108.4} = 126$

$k_g h = \frac{(162.6)(682)(.01442)}{108.4} = 15$

Meridian

Hill Federal #1

11/19/57 Buildup

$m = 168.9 \quad q_{bo} = 24 \quad q_g = (820)(3) \quad \bar{P} = 943$

$B_o = 1.312 \quad B_g = 2.965 \quad \mu_g = 0.01401 \quad \mu_o = .637 \quad R_s = 435$

$$q_o = (24)(1.312) = 31.5$$

$$q_g = \left[(820)(3) - \frac{(24)(435)}{1000}\right]2.965 = 7262.9$$

$$q_t = \qquad 7294 \text{ RB}$$

$(31.5)(0.637) = 20.06$

$(7262.9)(.01401) = 101.75$

121.81

Average μ = 0.01670

$$\lambda_t h = \frac{(162.6)(7294)}{168.9} = 7022 \frac{\text{md.ft}}{\text{cp}}$$

$$\bar{K} h = 1173 \text{ md.ft}$$

$$K_o h = \frac{(162.6)(20.06)(.637)}{168.9} \quad 12.3$$

$$K_g h = \frac{(162.6)\,7262.9\,(.01401)}{168.9} = 98.0$$

Bear Cat #1 4/26/8?

6/30/87 Buildup

$q_o = 47.11$ BO/D

$q_g = 268.95$ Mcf/D

$h = 95'$ (perforated)

Max BHP 1352 psig

$P_{1hr} = 950.2$ psig

$m = 46.36$ psig/cycle

$B_o = 1.327$

$B_g = 2.632$

$\mu_o = .605$

$\mu_g = .01428$

$R_s = 466$

q_o, RB $= (47.11)(1.327) = 62.5$ RB/D

q_g, RB $= \left[268.95 - \frac{(47.11)(466)}{1000}\right] 2.632 = 650.1$ RB/D

$q_t = q_o + q_g = 712.6$ RB/D

Volume average viscosity

$$\begin{aligned}(62.5)(0.605) &= 37.8\\ (650.1)(0.01428) &= \underline{9.28}\\ & 47.1\end{aligned} \qquad \frac{47.1}{712.6} = 0.06610 \text{ cp}$$

$$\lambda_t h = \frac{162.6\, q_t}{m} = \frac{(162.6)(712.6)}{46.36} = 2499 \frac{\text{md}\cdot\text{ft}}{\text{cp}}$$

$$K_o h = \frac{162.6\, q_o B_o \mu_o}{m} = \frac{(162.6)(62.5)(.605)}{46.36} = 132.6 \text{ md}\cdot\text{ft}$$

$$K_g h = \frac{162.6\, q_g (RB) \mu_g}{m} = \frac{(162.6)(650.1)(0.01428)}{46.36} = 32.6 \text{ md}\cdot\text{ft}$$

$$Kh_{Absolute} = \left(2499 \frac{\text{md}\cdot\text{ft}}{\text{cp}}\right)(0.0661 \text{ cp}) = 165.2 \text{ md}\cdot\text{ft}$$

$K_{absolute} = 1.8$ md

end of storage
at .033 hr

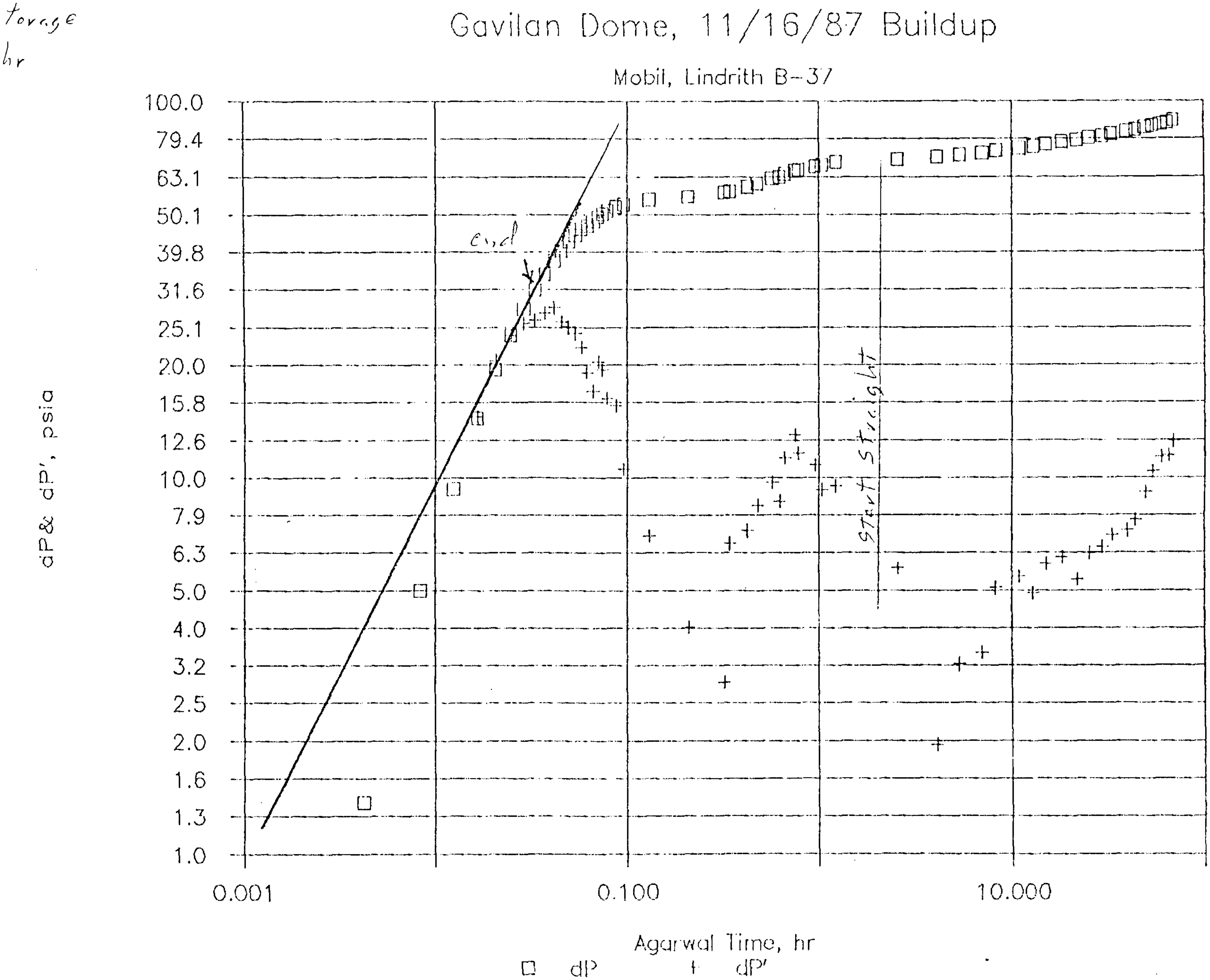


Fig 1

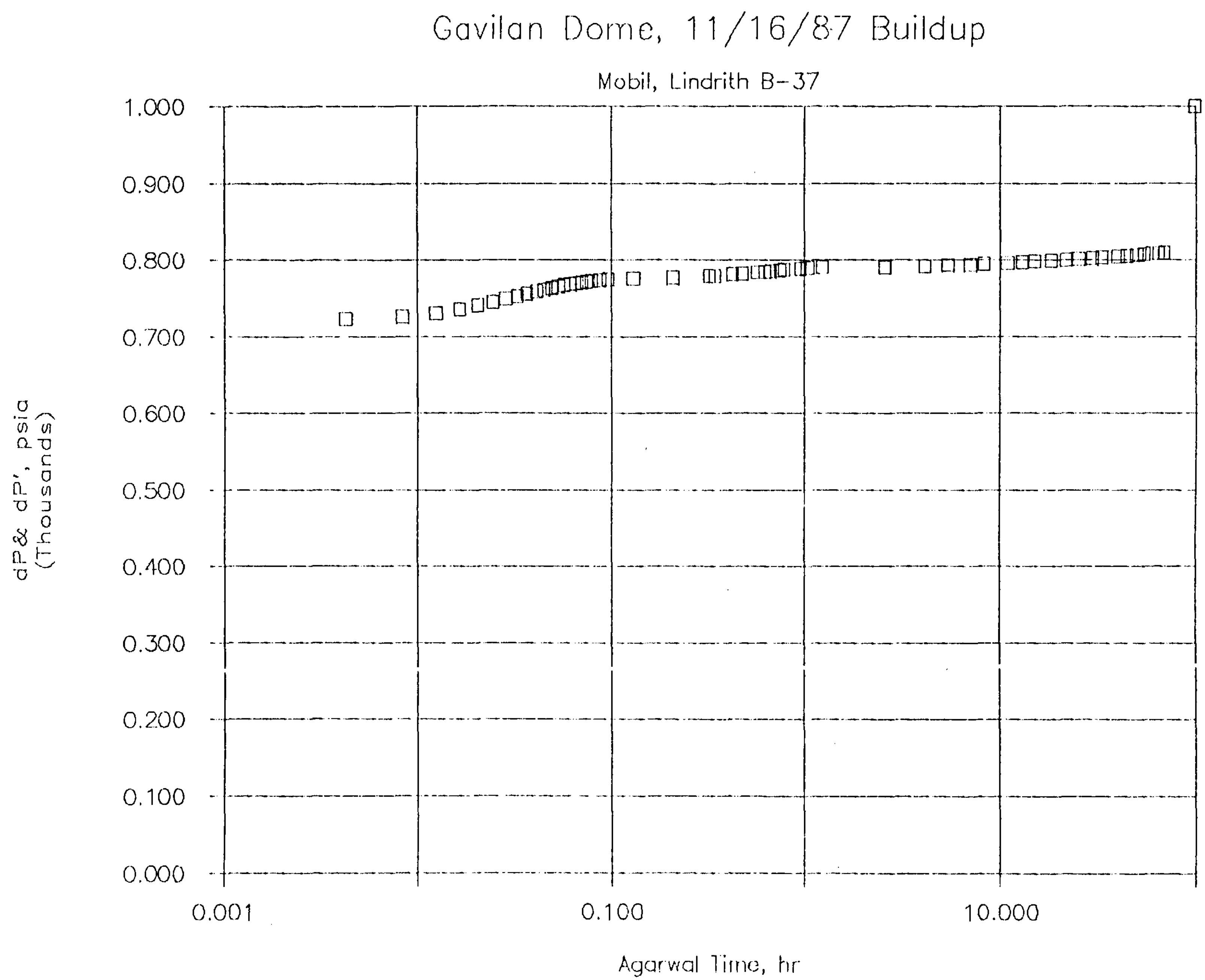

Gavilan Dome, 11/16/87 Buildup
Mobil, Lindrith B-37
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
dP& dP', psia
(Thousands)
0.001
0.100
10.000
Agarwal Time, hr

Fig. 2

Gavilan Dome, 11/16/87 Buildup

Mobil, Lindrith B-37

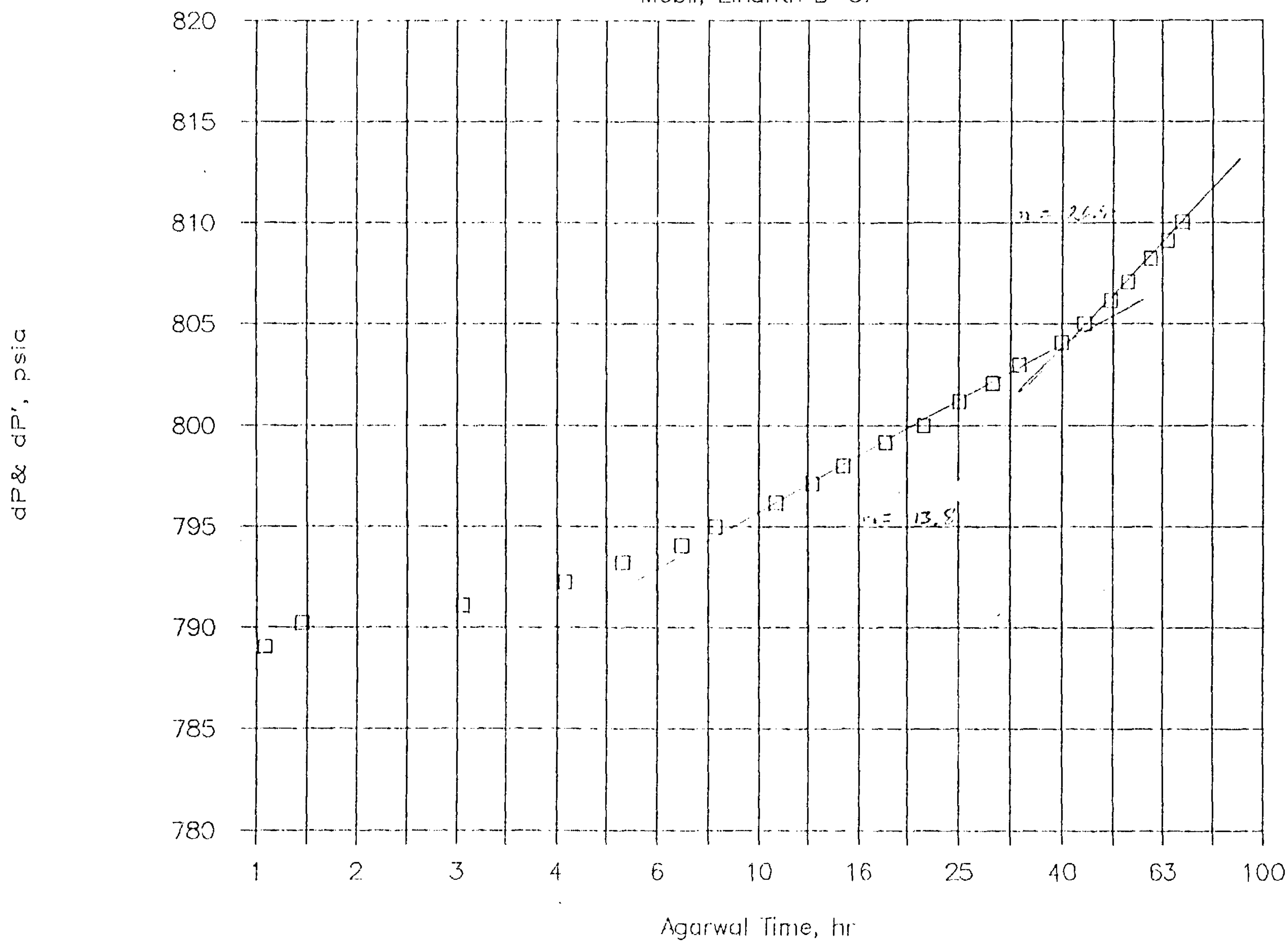


Fig 3

Mobil Lindrith "B" Unit ①

Well # 37 4/24/88

11/16/87 Buildup

Max Pressure 810 psig Loddy PVT Data

Rates 221.2 BOPD, 889.1 Mcf/D GOR = 3907 scf/bbl

m = 26.4 psig/cycle h = 233 ft

Flow Rates, Reservoir bbl

gas $\left[889.1 - \frac{221.2(400)}{1000}\right] 3.5 = 2802$ RB/D

oil $(221.2)(1.295) = \underline{286}$ RB/D

$q_t = 3088$ RB/D

$$\lambda h_t = \frac{(162.6)(3088)}{26.4} = 19{,}022 \ \frac{md \cdot ft}{cp}$$

Average viscosity

$(2802)(.0136) = 38.11$

$(286)(.705) = \underline{201.63}$

239.7

$$\frac{239.7 \ RB \cdot cp}{3088 \ RB} = 0.0776 \ cp$$

$$\left(\frac{Kh}{\mu}\right)_{absolute} = 19{,}022 \ \frac{md \cdot ft}{cp} \quad \text{or} \quad 1477 \ md \cdot ft \ (6.3 \ md)$$

$$K_o h = \frac{(162.6)(286)(.705)}{26.4} = 1242 \ md \cdot ft \ (5.3 \ md$$

$$K_g h = \frac{(162.6)(2802)(0.0136)}{26.4} = 235 \ md \cdot ft \ (1.0 \ md$$

2

4/24/88

SKin estimate

C1 C2

$$S = 1.151\left[\frac{761.4-721.2}{26.4} - \log\frac{6.3}{(.001)(1.265\times10^{-3})(.0776)(.229^2)} + 3.23\right]$$

$$S = -5$$

Then from type curve for wells with storage + skin

at $S = -5$ $P_D = \dfrac{(1477)(87)}{(141.2)(3088)(.0776)} = 3.80$ $\dfrac{\Delta P Kh}{141.2\, qB\mu} = 1$

at $\Delta P = 87$ psig $\Delta t = 59.523$

From Type curve at $P_D = 3.8$ & $S = -5$ $t_D = 1.9\times10^{7}$

$$\phi = \frac{(2.637\times10^{-4})(6.3)(59.523)}{(1.9\times10^{7})(0.0776)(1.265\times10^{-3})(.229^2)}$$ $t_D = \dfrac{2.637\times10^{-4}\, Kt}{\phi \mu C_t r_w^2}$

$$\phi = 10.11\times10^{-2}$$

$$\phi h = 0.236$$

$$K_m = \frac{(532.3)(1.011\times10^{-3})(1.265\times10^{-3})(233^2)(0.0776)}{41.6}$$

$$K_m = 0.069 \text{ md}$$

$$\lambda' = 12\left(\frac{.069}{6.3}\right)\left(\frac{0.229^2}{233^2}\right) = 1.27\times10^{-7}$$

$$\phi_f c_f h_f = 8.33\times10^{-4}\left[\frac{(1477)(1.011\times10^{-3})(1.265\times10^{-3})(233)(1.27\times10^{-7})(12.833)}{(0.0776)(.229^2)}\right]^{1/2}$$

$$\phi_f c_f h_f = 1.106\times10^{-5}$$ $$\phi_f = \frac{1.106\times10^{-5}}{(1.265\times10^{-3})(233)} = 3.75\times10^{-5}$$

③
4/24/88

$$\omega' = \frac{\phi_m}{\phi_f} = \frac{1.011 \times 10^{-3}}{3.75 \times 10^{-5}} = 27$$

or ~ 3.7% of total porosity is in fractures

Meoi B-37 11/16/87 Buildup 5/3/88

Dual Porosity Effect with 50' h (6685-6735) ①

"B" Zone only producing zone

Mike Stallworth 6/2/88

$\phi = 0.019$, $K = 0.29$ md } Mat

$\phi h = 0.95$

slope = 26.4 psi/cy

① $\lambda h_t = \dfrac{(162.6)(3088)}{26.4} = 19{,}022 \; \dfrac{md \cdot ft}{cp}$

weighted average viscosity 0.0776 cp

$Kh_t = 1477$ md·ft

$h = 50'$

$K = 29.5$ md

$K_o h = \dfrac{(162.6)(286)(.705)}{26.4} = 1242$ md·ft

$K_g h = \dfrac{(162.6)(2802)(.0136)}{26.4} = 235$ md·ft

② Skin estimate with ϕ from Lindrith B-38 Top 50' of "B"

$$S = 1.151\left[\frac{761.4-721.2}{26.4} - \log\frac{29.5}{(.019)(1.265\times10^{-3})(.0776)(.229^2)} + 3.23\right]$$

$S = -4.2$

③ Composit ϕh from Ramey type curve with storage + skin

at 59.5 hr $\Delta P = 87$ psig

at $P_D = 3.8$ on Ramey Curve

$t_D = 9\times10^6$

$$P_D = \frac{(19022)(87)}{(141.2)(3088)} = 3.8$$

$$\phi = \frac{(2.637\times10^{-4})(29.5)(59.5)}{(9.0\times10^6)(.0776)(1.265\times10^{-3})(.229^2)}$$

$\phi = 0.00999$ or 0.01 fair agreement with B-38 core

④ $K_m = \dfrac{(532.3)(.019)(1.265\times10^{-3})(50^2)(0.0776)}{41.6}$

$K_m = 0.05966 = 0.06$ md (B-38 core is 0.04 md)

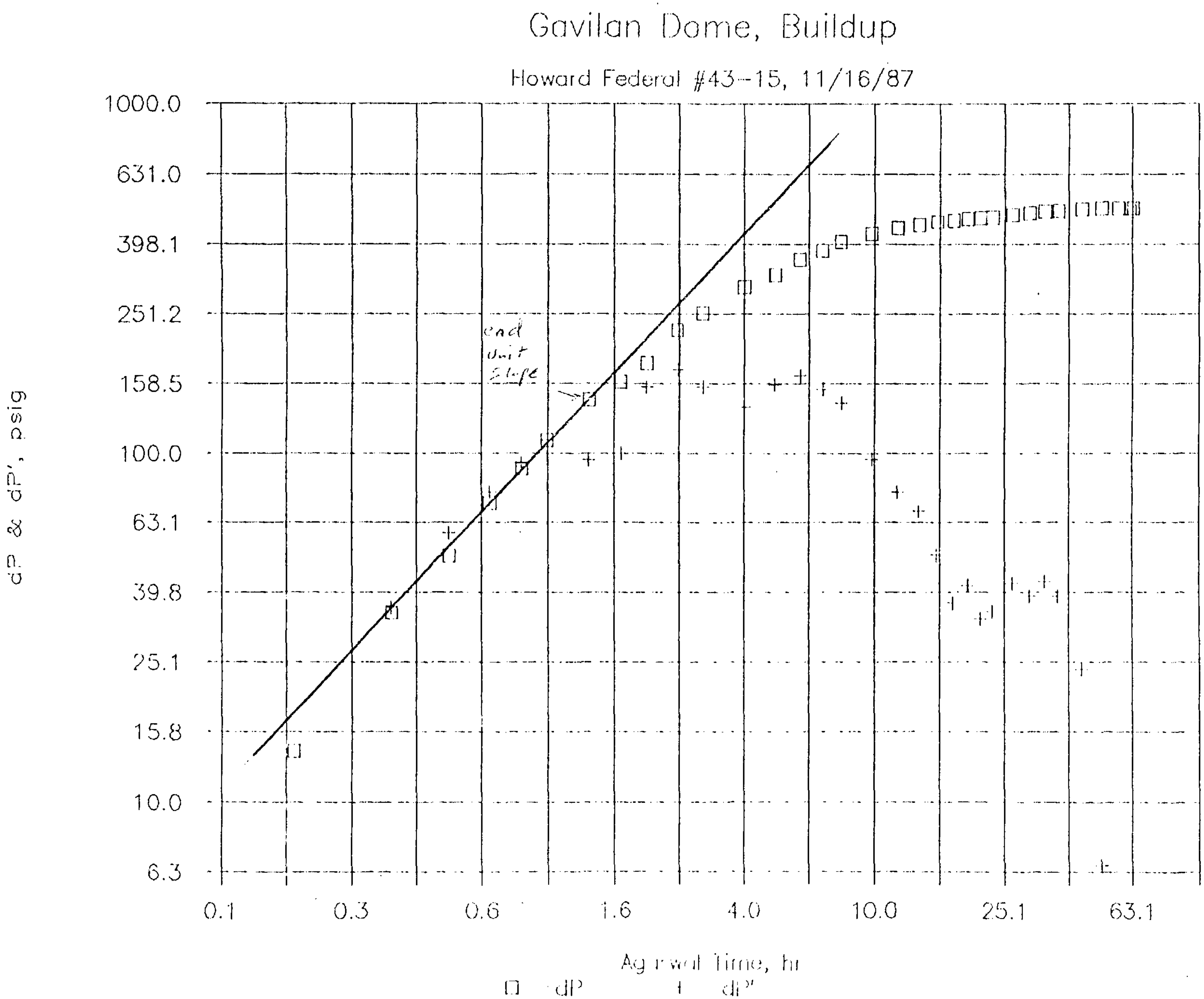
⑤ $\lambda' = 12\left(\dfrac{.06}{29.5}\right)\left(\dfrac{.229^2}{50^2}\right) = 5.12\times10^{-7}$

⑥ $\phi_f c_f h_f = 8.33\times10^{-4}\left[\dfrac{(1477)(.019)(1.265\times10^{-3})(50)(5.12\times10^{-7})(12,833)}{(0.0776)(.229^2)}\right]^{1/2}$

$\phi_f c_f h_f = 4.46\times10^{-5}$

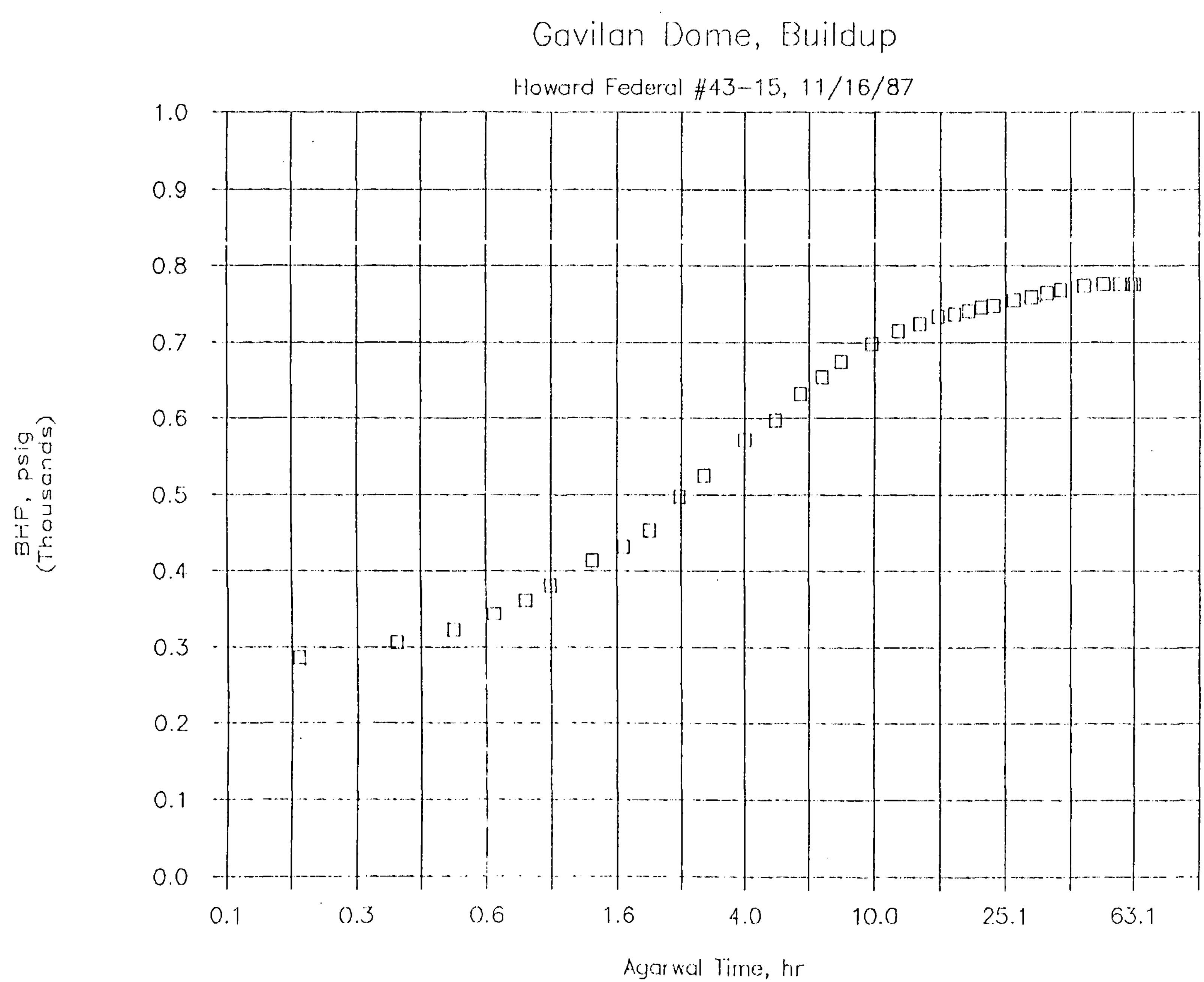
$\phi_f = \dfrac{4.46\times10^{-5}}{(1.265\times10^{-3})(50)} = 7.05\times10^{-4}$

⑦ $\omega' = \dfrac{\phi_m}{\phi_f} = \dfrac{0.019}{7.05\times10^{-4}} = 26.9$



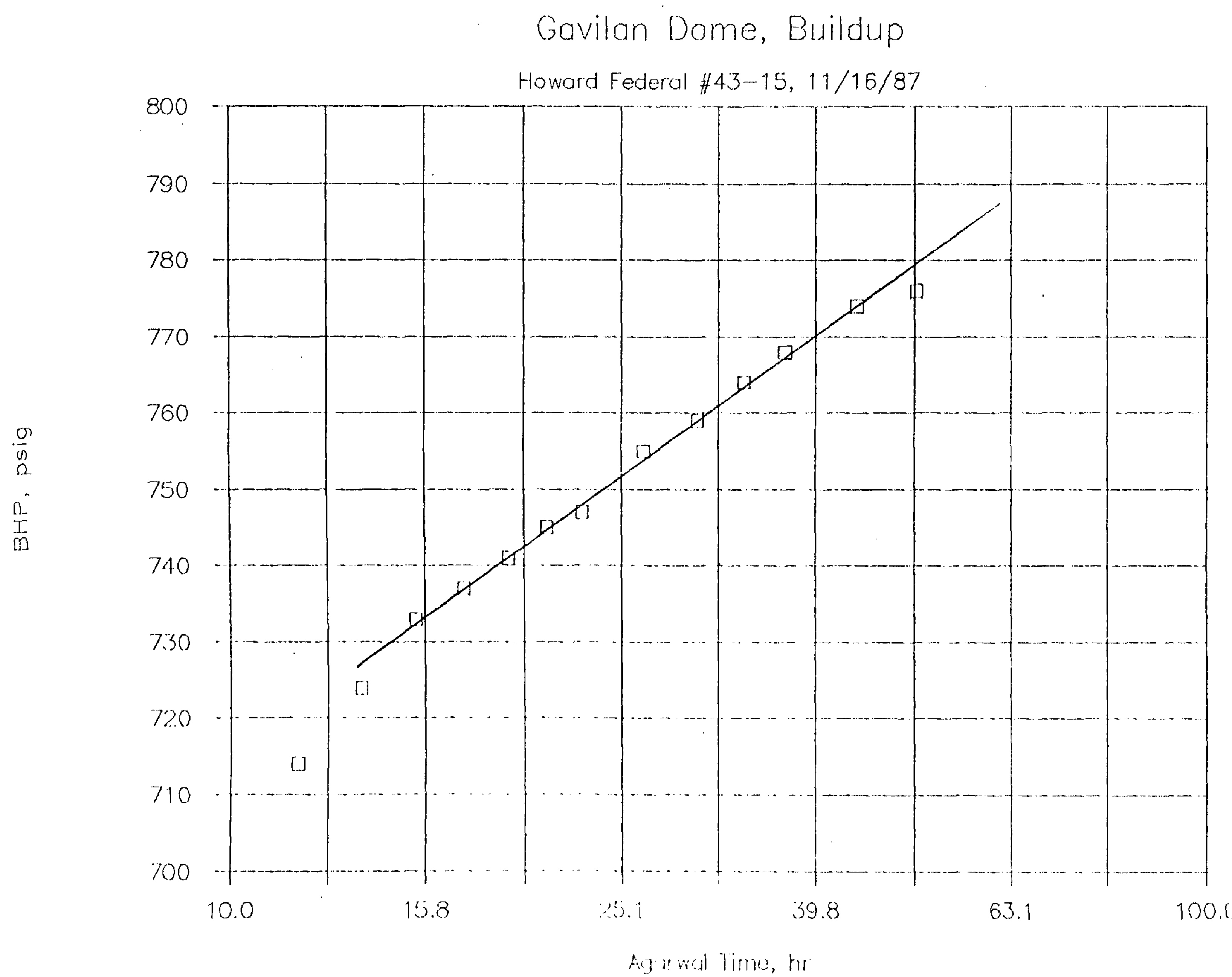
Gavilan Dome, Buildup
Howard Federal #43-15, 11/16/87
dP & dP', psig
1000.0
631.0
398.1
251.2
158.5
100.0
63.1
39.8
25.1
15.8
10.0
6.3
0.1
0.3
0.6
1.6
4.0
10.0
25.1
63.1
end unit slope
Agarwal Time, hr
□ dP + dP'

Fig. 1



Gavilan Dome, Buildup
Howard Federal #43-15, 11/16/87
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
BHP, psig
(Thousands)
0.1
0.3
0.6
1.6
4.0
10.0
25.1
63.1
Agarwal Time, hr

Fig 2



Gavilan Dome, Buildup
Howard Federal #43-15, 11/16/87
BHP, psig
800
790
780
770
760
750
740
730
720
710
700
10.0
15.8
25.1
39.8
63.1
100.0
Agarwal Time, hr

Fig 3

Reading

Howard Federal #43-15

11/19 Buildup

$q_o = 9.19$ BOPD $\quad q_{gs} = 626.63$ Mcf/D $\quad \bar{P} = 852 \quad m = 92.77$

$B_o = 1.301 \quad B_g = 3.309 \quad R_s = 409 \quad \mu_o = .680 \quad \mu_g = 0.01375$

$$q_o = (9.19)(1.301) = 11.9$$

$$q_g = \left[636.63 - \frac{(9.19)(409)}{1000}\right] 3.309 = 2094.2$$

$$q_t = \qquad\qquad 2106 \text{ RB/D}$$

$$(11.9)(.680) = 8.13$$

$$(2094.2)(0.01375) = 28.79$$

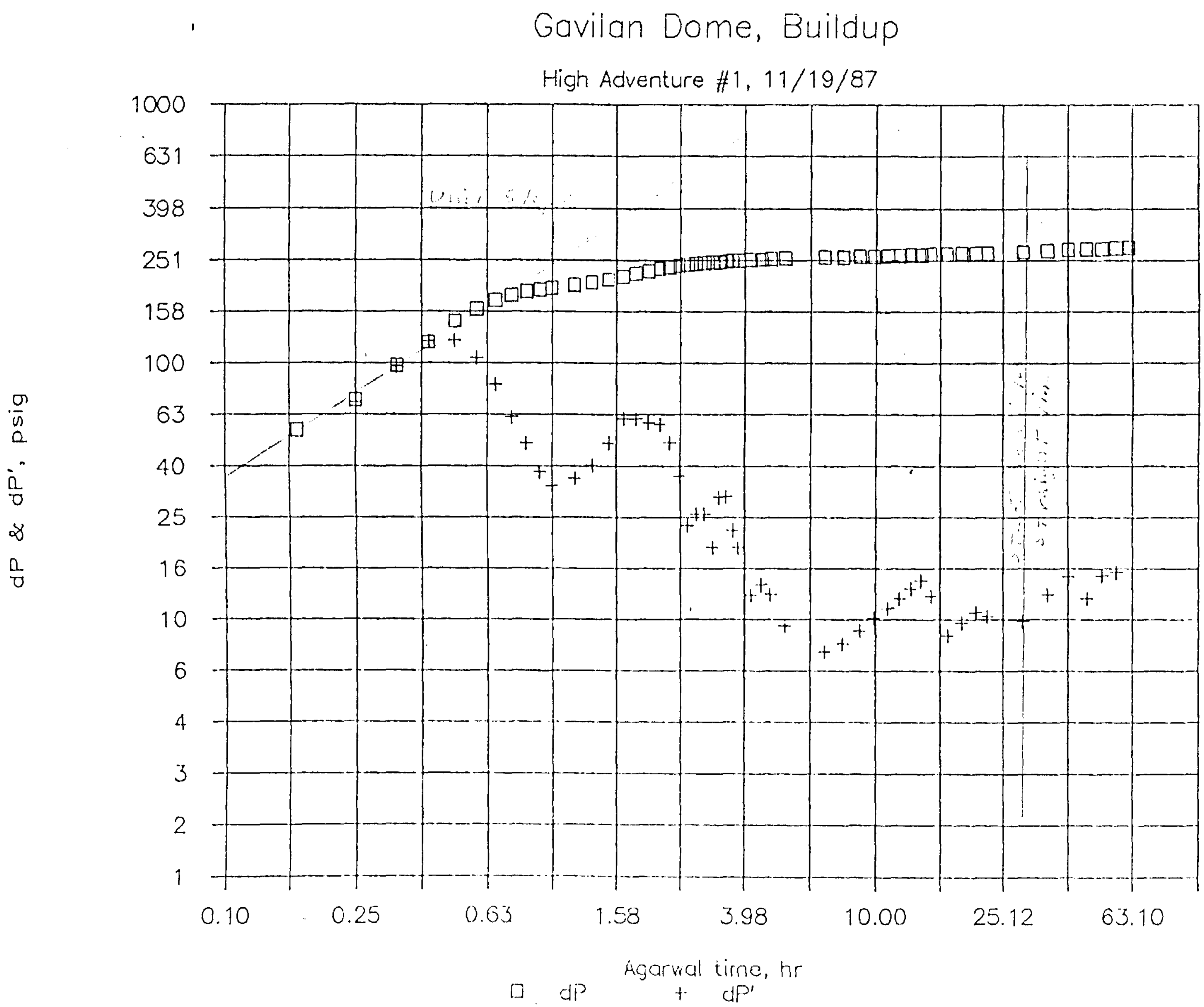
$$\mu_{average} = 0.01755 \text{ cp}$$

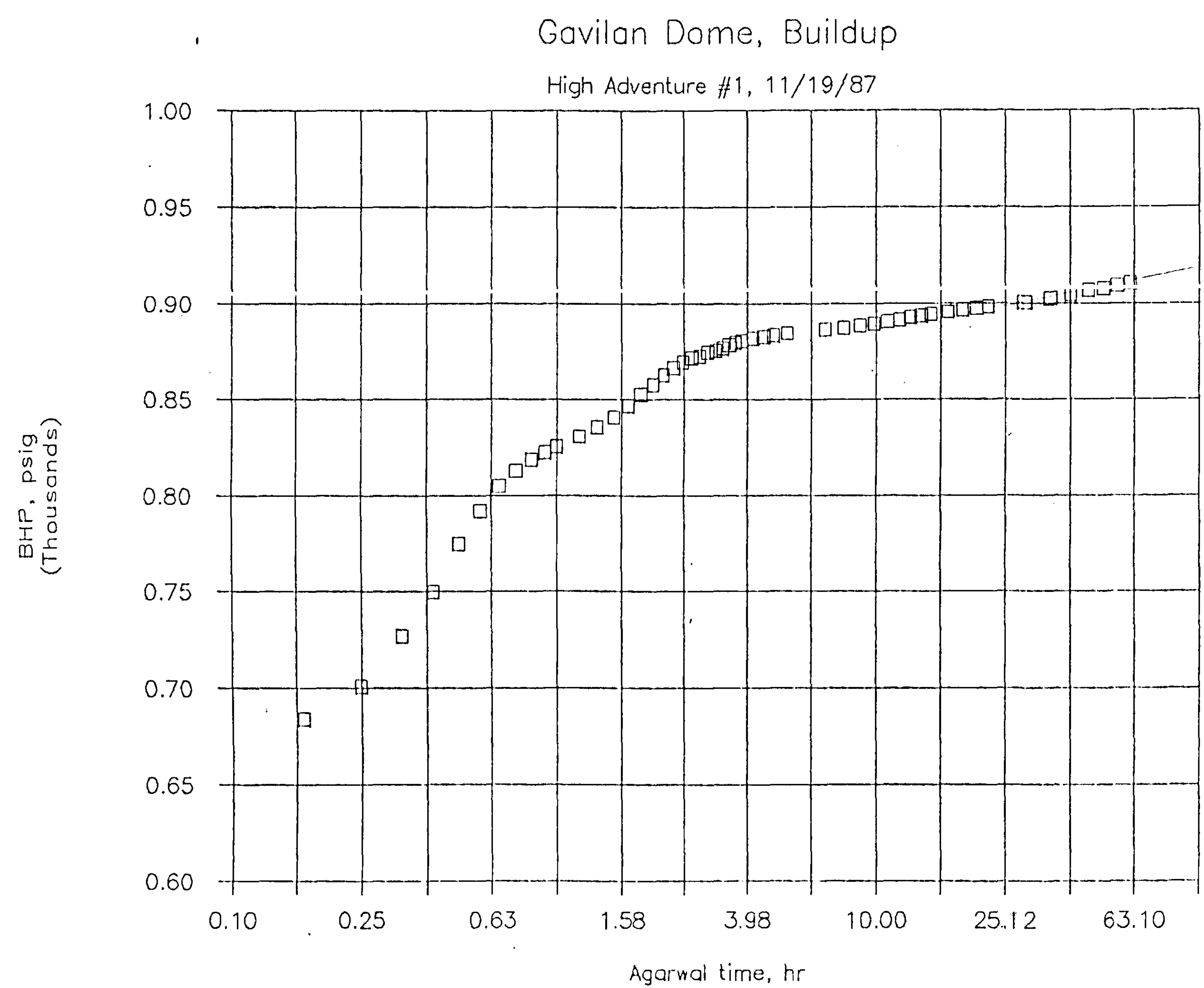
$$\lambda_t h = \frac{(162.6)(2106)}{92.77} = 3691 \frac{\text{md}\cdot\text{ft}}{\text{cp}}$$

$$\bar{k} h = 64.7 \text{ md}\cdot\text{ft}$$

$$k_o h = \frac{(162.6)(11.9)(.68)}{92.77} = 14.2$$

$$k_g h = \frac{(162.6)(2094.2)(.01375)}{92.77} = 50.5$$


Gavilan Dome, Buildup
High Adventure #1, 11/19/87
1000
631
398
251
158
100
63
40
25
16
10
6
4
3
2
1
dP & dP', psig
0.10
0.25
0.63
1.58
3.98
10.00
25.12
63.10
Agarwal time, hr
dP
dP'


Gavilan Dome, Buildup
High Adventure #1, 11/19/87
BHP, psig
(Thousands)
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.10
0.25
0.63
1.58
3.98
10.00
25.12
63.10
Agarwal time, hr

Gavilan Dome Buildup Analysis
Sun High Adventure #1, Start Test 11:23 AM, 11/16/87
Flow Time,T = 840 hours   q = 233 B/D

k_g = 123.0
q_o = 233
T = 840 h

@ 910 Psig
B_o = 1.308 B_g = 3.065 R_s = 426 μ_o = .647 μ_g = .01392

dt hr	BHP psig	dP psig	T*dt/T+dtAgarwal' Agarwal	WMS Tech
0.00				
0.17	683.8	54.9	0.167	
0.25	700.8	71.9	0.250	70.4
0.33	726.8	97.9	0.333	97.3
0.42	749.7	120.8	0.416	121.4
0.50	774.7	145.8	0.500	122.4
0.58	791.6	162.7	0.583	104.8
0.67	805.0	176.1	0.666	82.9
0.75	813.0	184.1	0.749	62.0
0.83	818.9	190.0	0.832	49.0
0.92	822.9	194.0	0.916	38.0
1.00	825.9	197.0	0.999	33.5
1.17	830.9	202.0	1.168	35.7
1.33	835.9	207.0	1.328	40.3
1.50	840.9	212.0	1.497	49.1
1.67	846.9	218.0	1.667	61.0
1.83	852.8	223.9	1.826	60.8
2.00	857.8	228.9	1.995	58.9
2.17	862.8	233.9	2.164	58.0
2.33	866.8	237.9	2.327	49.2
2.50	869.8	240.9	2.493	48.7

hr	psig	psig	Agarwal	WMS Tech
36.00	902.7	273.8	34.521	12.6
42.00	904.7	275.8	40.000	14.7
48.00	906.7	277.8	45.405	12.1
54.00	907.7	278.8	50.738	14.9
60.00	909.7	280.8	56.000	15.5
66.00	910.7	281.8	61.192	

Reservoir bbl

$(233)(1.308) = 304.8$ RB

$\left[723 - \frac{(233)(426)}{1000}\right] 3.065$

$= 1911.8$ RBG

$q_t = 2217$ RB/D

$(304.8)(0.647) =$

$(1911.8)(.01392) =$

$\mu_{Average} = 0.1010$ cp

6 points

CL : 99.7 %

P_{1hr} = 852.9 psig

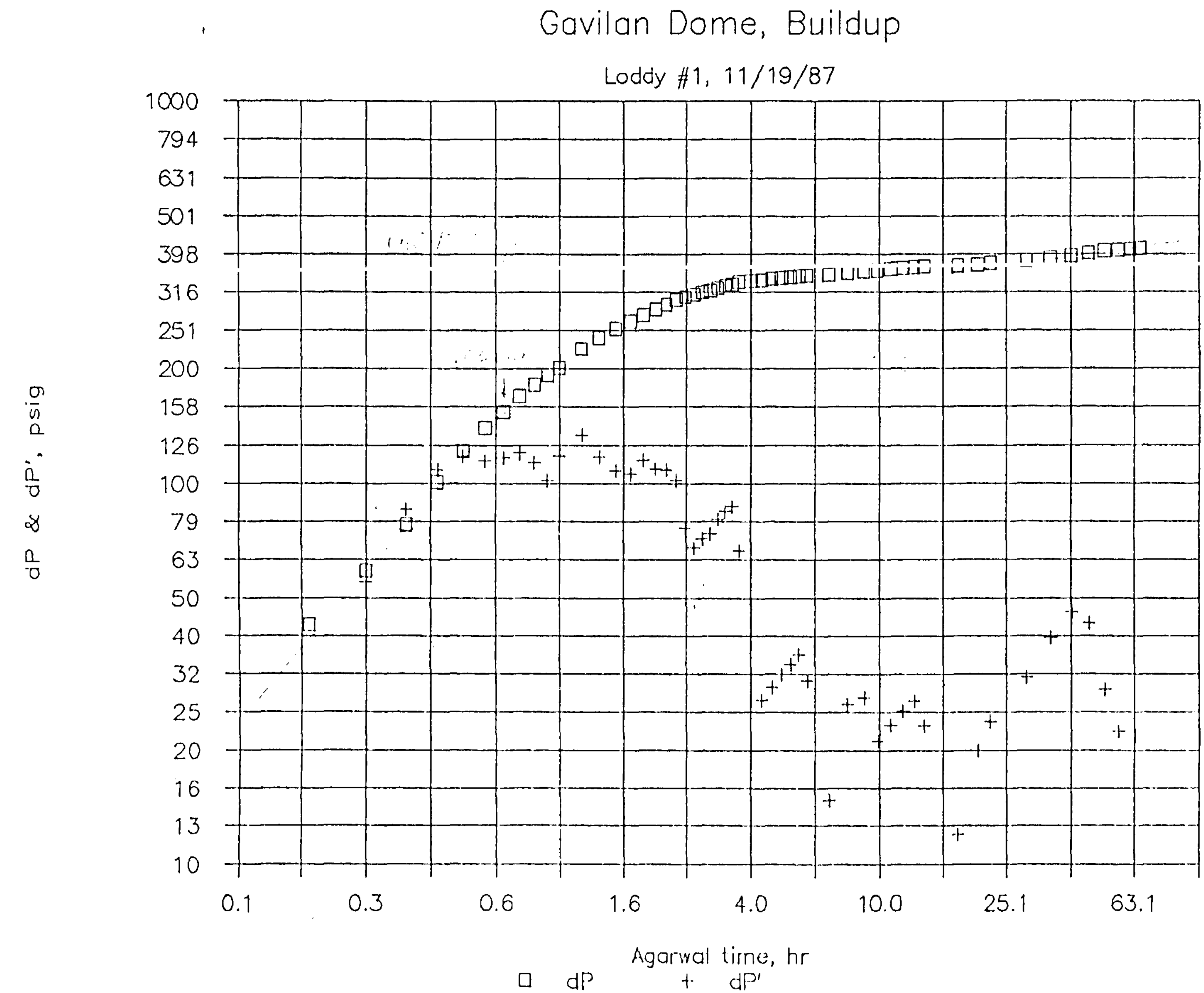
slope = 32.34 psi/cycle

$$\lambda_t h = \frac{(162.6)(2217)}{32.34} = 11,146 \ \frac{md \cdot ft}{cp}$$

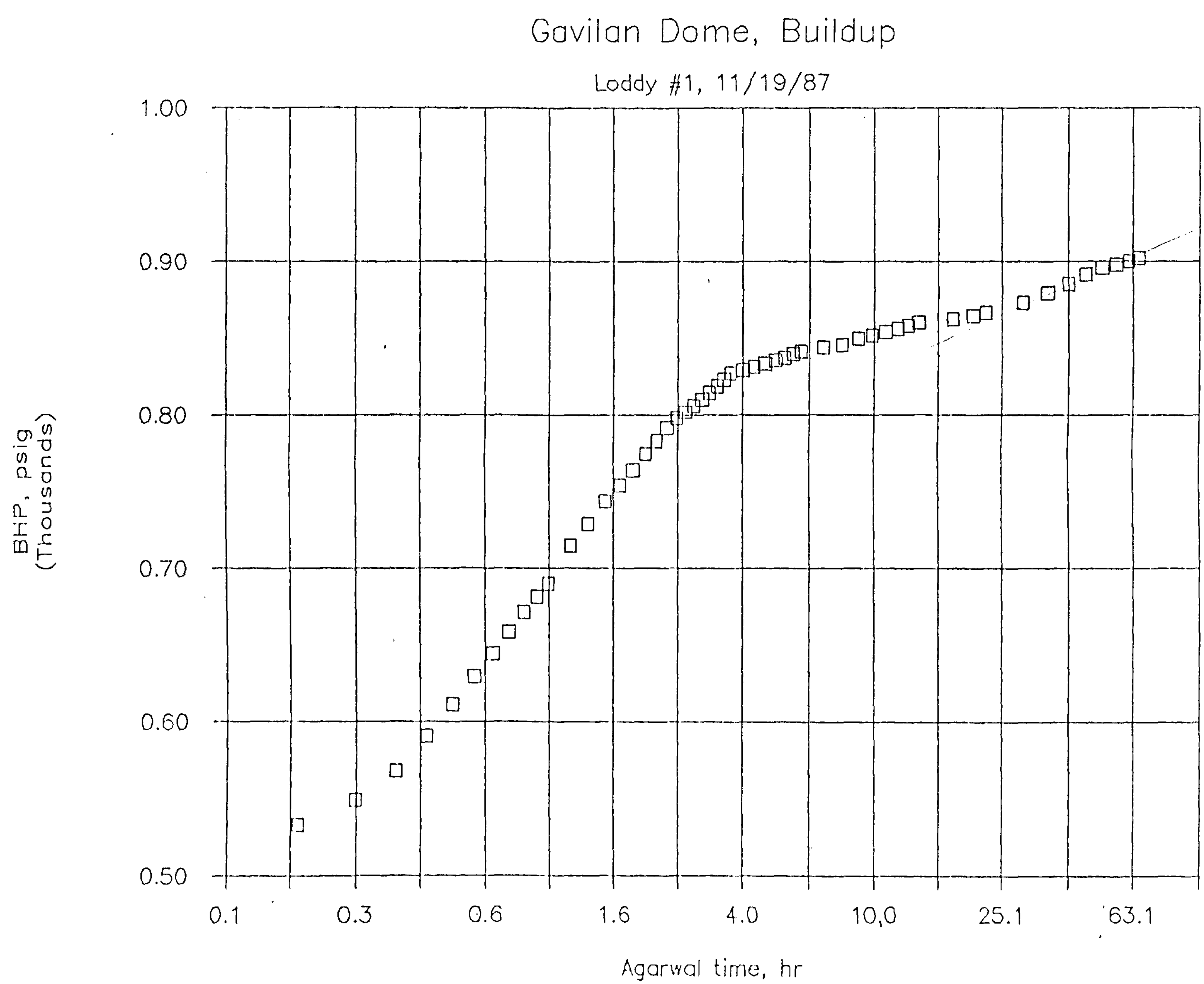
$$\bar{K} h = 1126 \ md \cdot ft$$

$$K_o h = \frac{(162.6)(304.8)(.647)}{32.34} = 991.5$$

$$K_g h = \frac{(162.6)(1911.8)\,.01392}{32.34} = 133.8$$



Gavilan Dome, Buildup
Loddy #1, 11/19/87
dP & dP', psig
1000
794
631
501
398
316
251
200
158
126
100
79
63
50
40
32
25
20
16
13
10
0.1
0.3
0.6
1.6
4.0
10.0
25.1
63.1
Agarwal time, hr
□ dP
+ dP'


Gavilan Dome, Buildup
Loddy #1, 11/19/87
BHP, psig
(Thousands)
1.00
0.90
0.80
0.70
0.60
0.50
0.1
0.3
0.6
1.6
4.0
10,0
25.1
63.1
Agarwal time, hr

$q_g = 338.54$ MCF/D

Gavilan Dome Buildup Analysis 19
Sun Loddy#1, Start Test 10:06 AM, 11/~~16~~19/87
Flow Time,T = ~~816~~ 840 hours q = ~~69~~ 67 B/D

$q = 67$ BO/D

$T = 840$ hr

$B_o = 1.307$ $B_g = 3.098$ $R_s = 423$ $\mu_o = 0.650$ $\mu_g = 0.01390$

dt hr	BHP psig	dP psig	T*dt/T+dtAgarwal' Agarwal	WMS Tech
0.00	490.0			
0.17	532.6	42.6	0.167	
0.25	549.2	59.2	0.250	55.1
0.33	567.9	77.9	0.333	85.7
0.42	590.7	100.7	0.416	108.3
0.50	611.4	121.4	0.500	117.7
0.58	630.1	140.0	0.583	114.4
0.67	644.6	154.6	0.666	116.5
0.75	659.1	169.1	0.749	120.6
0.83	671.5	181.5	0.832	113.3
0.92	681.9	191.9	0.916	101.8
1.00	690.2	200.2	0.999	117.9
1.17	715.0	225.0	1.168	133.7
1.33	729.5	239.5	1.328	117.2
1.50	744.0	254.0	1.497	108.1
1.67	754.4	264.4	1.667	105.8
1.83	764.8	274.8	1.826	115.3
2.00	775.1	285.1	1.995	109.1
2.17	783.4	293.4	2.164	108.7
2.33	791.7	301.7	2.326	102.2
2.50	797.9	307.9	2.492	76.4
hr	psig	psig	Agarwal	WMS Tech
36.00	879.2	389.2	34.479	39.4
42.00	885.4	395.4	39.944	46.2
48.00	891.7	401.7	45.333	43.1
54.00	895.8	405.8	50.648	28.9
60.00	897.9	407.9	55.890	22.4
66.00	900.0	410.0	61.061	27.7
71.00	902.1	412.1	65.317	

Cartesian plot
cc = 100%
Intercept
$P_{\Delta t=0} = 490$ psig

$(67)(1.307) = 87.57$ RB/D

$\left[338.54 - \frac{(67)(423)}{1000}\right] 3.098 = 961.0$ RB/D

$q_t = 1049$ RB/D

$(87.57)(.650)$

$(961)(.01390)$

$\mu_{average} = 0.0670$ cp

7 points
cc 98.4%
$P_{1hr} = 754.7$ psig
slope = 81.82 psi/cycle

$$\lambda_t h = \frac{(162.6)(1049)}{81.82} = 2085 \frac{\text{md.ft}}{\text{cp}}$$

$$\bar{k}h = 140 \text{ md.ft}$$

$$k_o h = \frac{(162.6)(87.57)(.650)}{81.82} = 113.1$$

$$k_g h = \frac{(162.6)(961)(.01390)}{81.82} = 26.5$$

APPENDIX 3

Interference Test Analyses

Displacement Calculations

6/5/01
1

From Craft & Hawkins P276

11/19/87 B-32
Buildup

$w = 1$ mile

$$q = \frac{1.127\, K A \Delta P}{\mu L} \qquad \frac{KA}{\mu} = \frac{Kh}{\mu} \times w$$

$$q = \frac{1.127 \frac{Kh}{\mu} w \Delta P}{L} = \frac{1.127\,(21.696)(5280)(1400-960)}{10{,}411}$$

$q = 5{,}456$ RB/D

	Oil Rate RB/D	BOPD	Mcf/D
B-32	2642.0	719	893
B-29	7041.5	1040	2390
	9684 RB/D		

B-29

$$RB_o = (1040)(1.314) = 1367$$

$$RB_g = \left[2390 - \frac{(1040)(437)}{1000}\right] 2.932 = 5675$$

7041.5 RB/D

B.M.G.
Interference Test TAP 4 - E-6
2/13/86 TAP 4 Frac   Q = 100,800 bfpd r = 3448 ft
GOR = 348 scf/bbl, BHP = 1691 psig

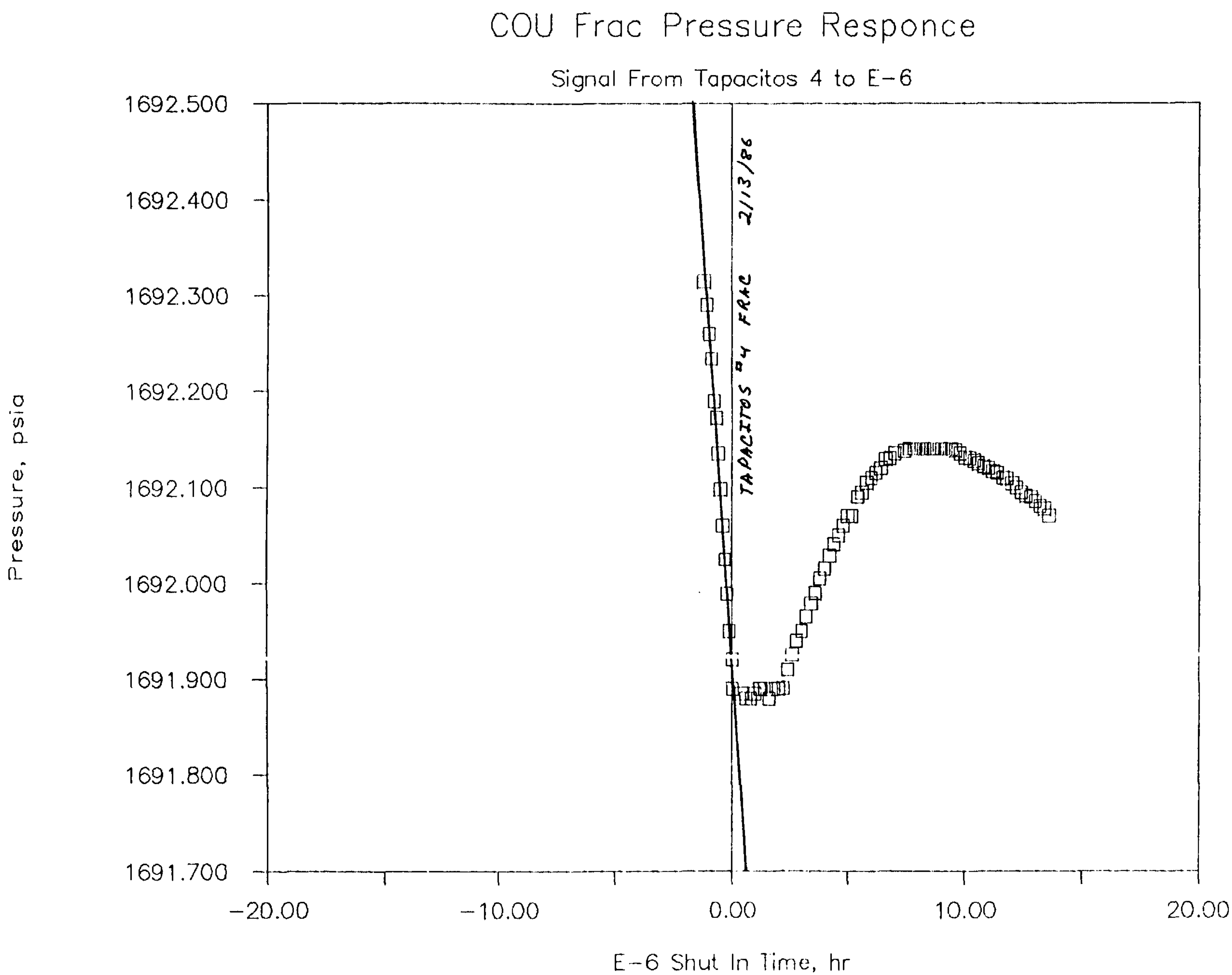
Pressures and times taken from graph, BMG exhibit #3.

time (hr)	pressure
0.02	1691.890
0.40	1691.885
0.60	1691.880
0.80	1691.880
1.00	1691.885
1.20	1691.890
1.40	1691.890
1.60	1691.880
1.80	1691.890
2.00	1691.890
2.20	1691.891
2.40	1691.910
2.60	1691.925
2.80	1691.940
3.00	1691.950
3.20	1691.965
3.40	1691.979
3.60	1691.990
3.80	1692.005
4.00	1692.015
4.20	1692.029
4.40	1692.040
4.60	1692.050
4.80	1692.060
5.00	1692.070
5.20	1692.070
5.40	1692.090
5.60	1692.095
5.80	1692.105
6.00	1692.110
6.20	1692.115
6.40	1692.120
6.60	1692.129
6.80	1692.130
7.00	1692.135
7.40	1692.138
7.60	1692.140
7.80	1692.140
8.00	1692.140
8.20	1692.140
8.40	1692.140
8.60	1692.140
8.80	1692.140
9.00	1692.140
9.20	1692.140
9.40	1692.140
9.60	1692.139

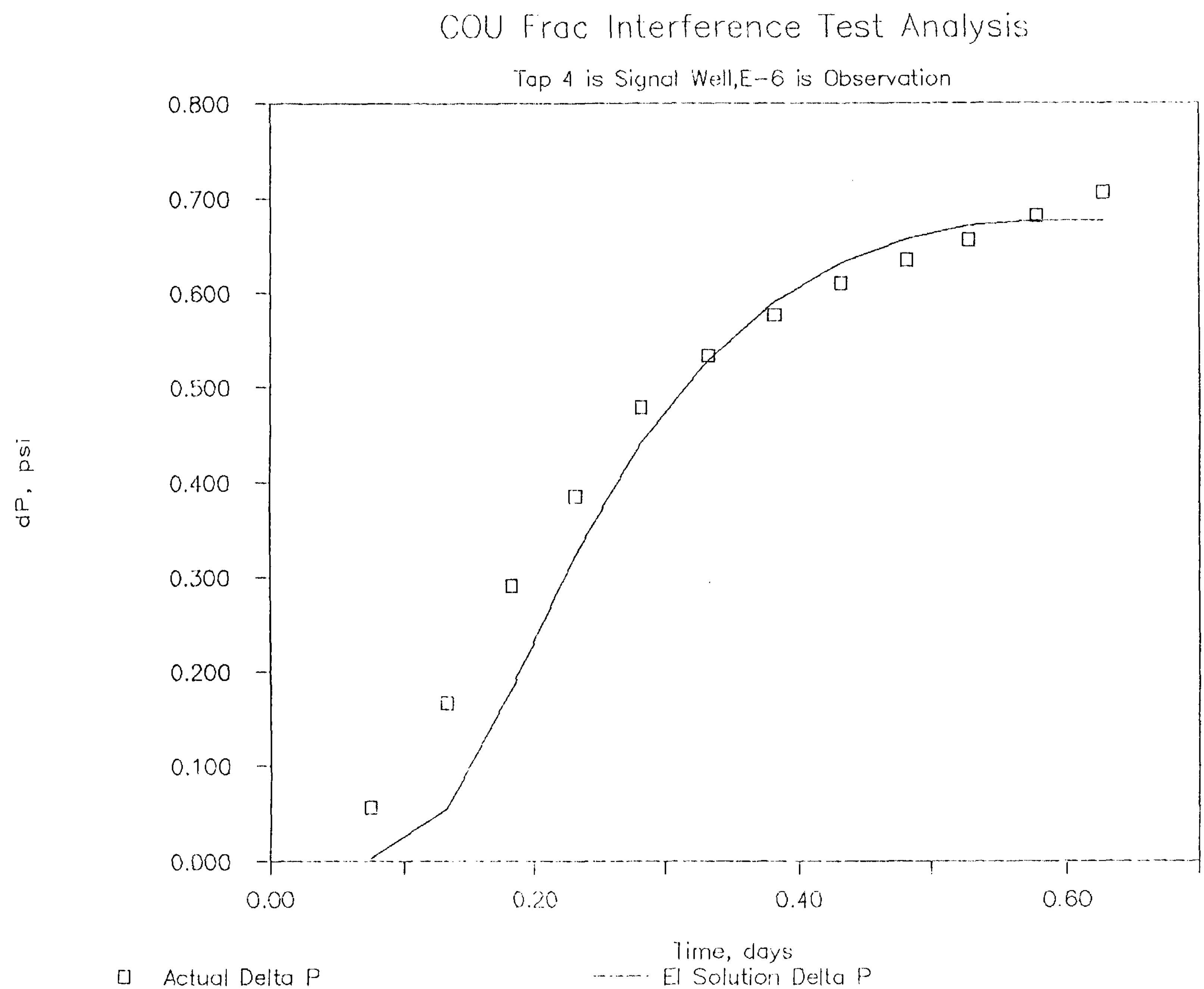
B.M.G.
Interference Test TAP 4 - E-6
2/13/86 TAP 4 Frac Q = 100,800 bfpd r = 3448 ft
GOR = 348 scf/bbl, BHP = 1691 psig

Pressures and times taken from graph, BMG exhibit #3.

time (hr)	pressure
9.80	1692.135
10.00	1692.131
10.20	1692.130
10.40	1692.128
10.60	1692.125
10.80	1692.122
11.00	1692.120
11.20	1692.117
11.40	1692.115
11.60	1692.110
11.80	1692.109
12.00	1692.104
12.20	1692.100
12.40	1692.095
12.60	1692.091
12.80	1692.090
13.00	1692.085
13.20	1692.080
13.40	1692.078
13.60	1692.070
0.00	1691.920
-0.10	1691.950
-0.20	1691.989
-0.30	1692.025
-0.40	1692.060
-0.50	1692.098
-0.60	1692.135
-0.70	1692.173
-0.80	1692.190
-0.90	1692.234
-1.00	1692.260
-1.10	1692.290
-1.20	1692.315



COU Frac Pressure Responce
Signal From Tapacitos 4 to E-6
1692.500
1692.400
1692.300
1692.200
1692.100
1692.000
1691.900
1691.800
1691.700
Pressure, psia
-20.00
-10.00
0.00
10.00
20.00
E-6 Shut In Time, hr
TAPACITOS #4 FRAC 2/13/86

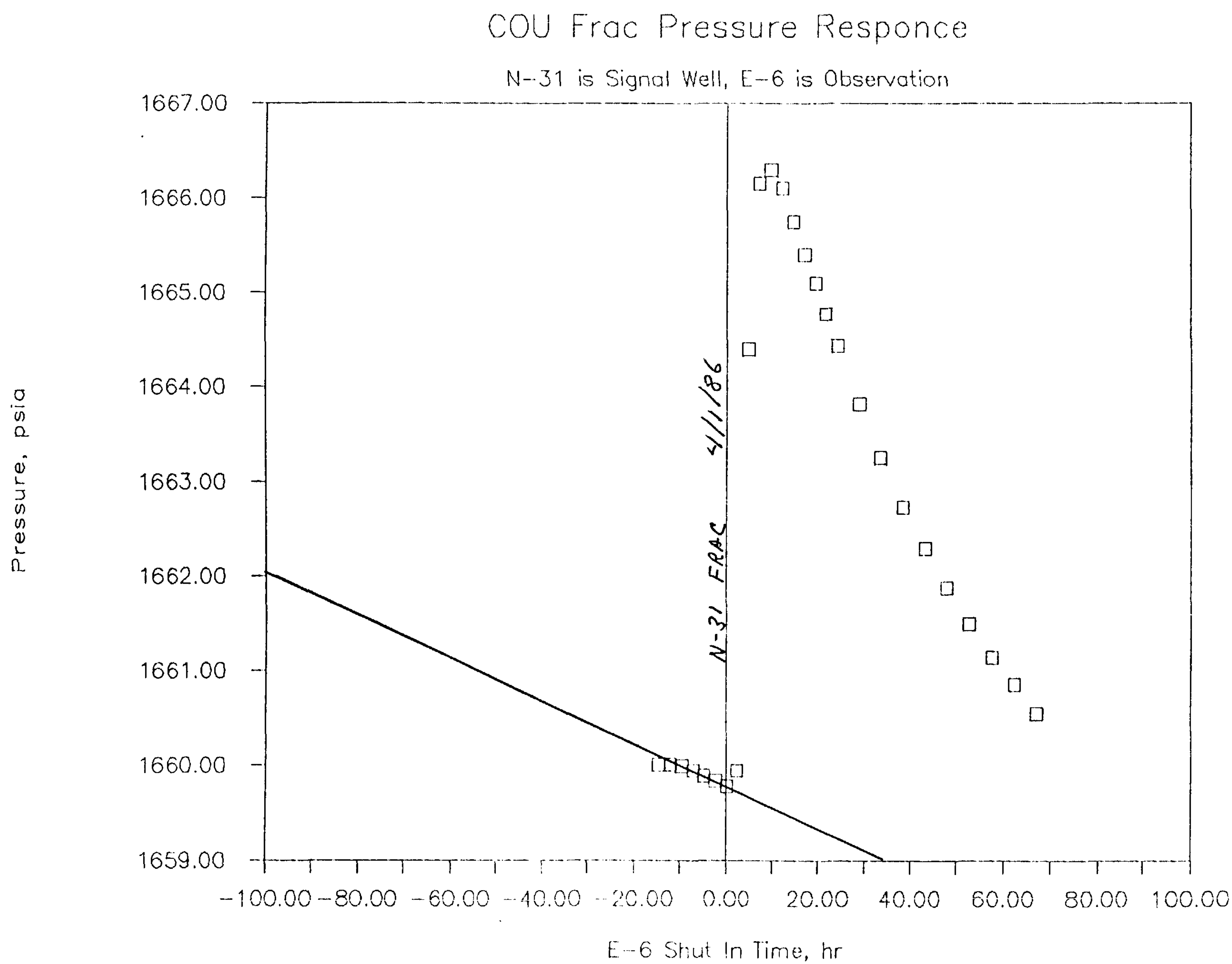

COU Frac Interference Test Analysis
Tap 4 is Signal Well,E-6 is Observation
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
dP, psi
0.00
0.20
0.40
0.60
Time, days
Actual Delta P
EI Solution Delta P

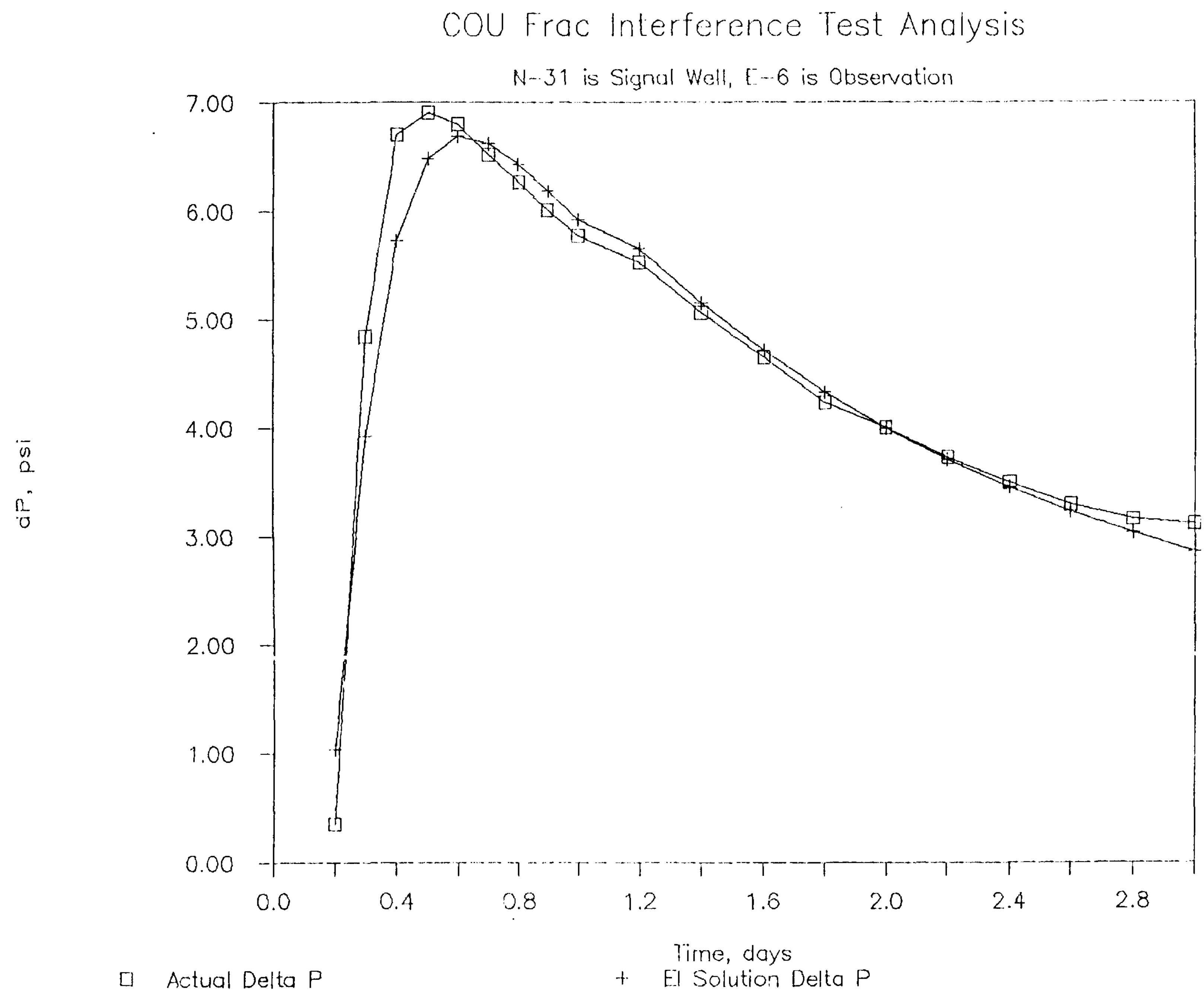
COU Frac Interference Analysis
N-31 Signal Well E-6 Response Well
April 1, 1986 Test Date

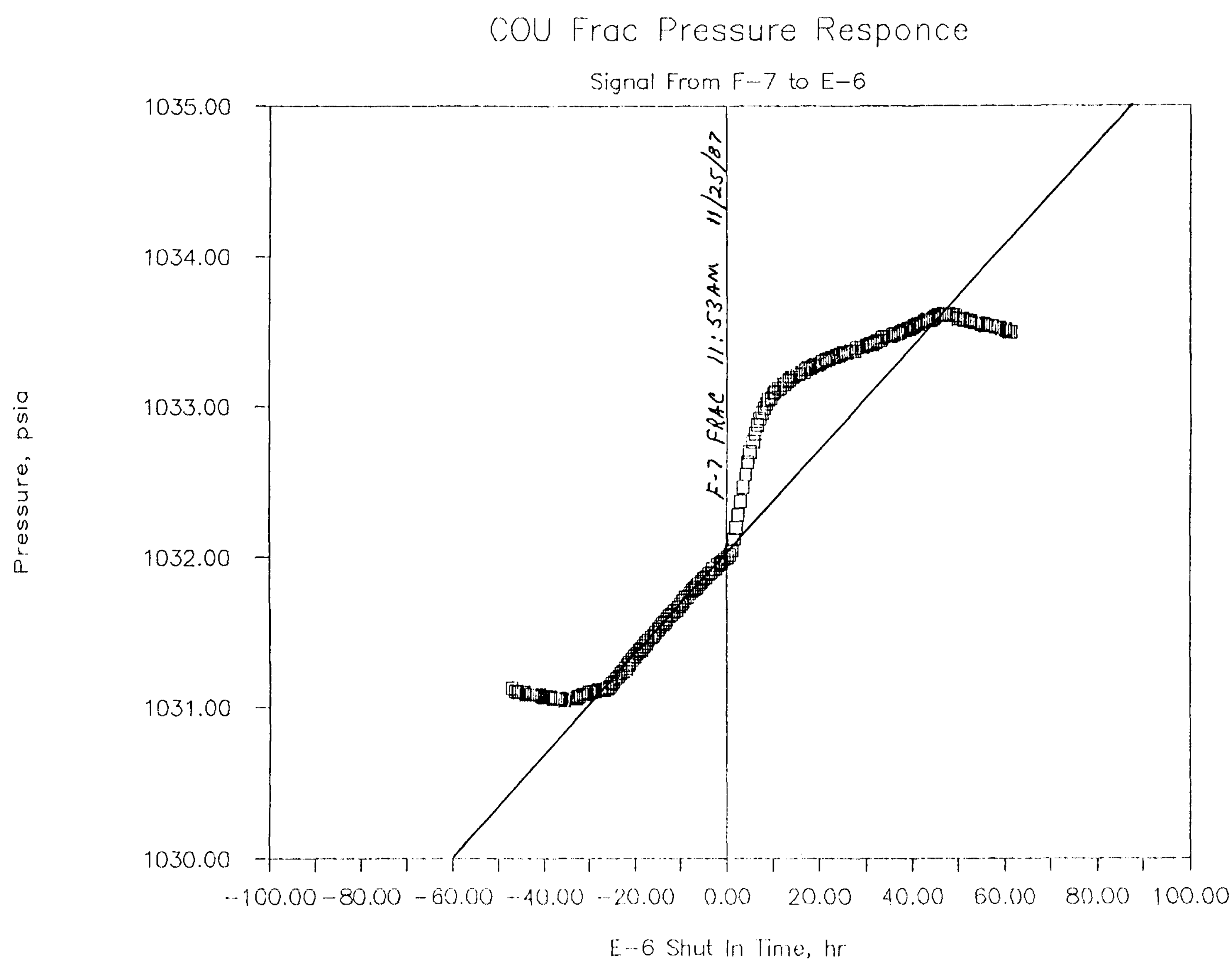
Injection Rate 111 BPM = 159,840 BPD
Injection Period 0.0468 Day = 1.12 Hr

From Pressure Response Curve BMG Exhibit #3

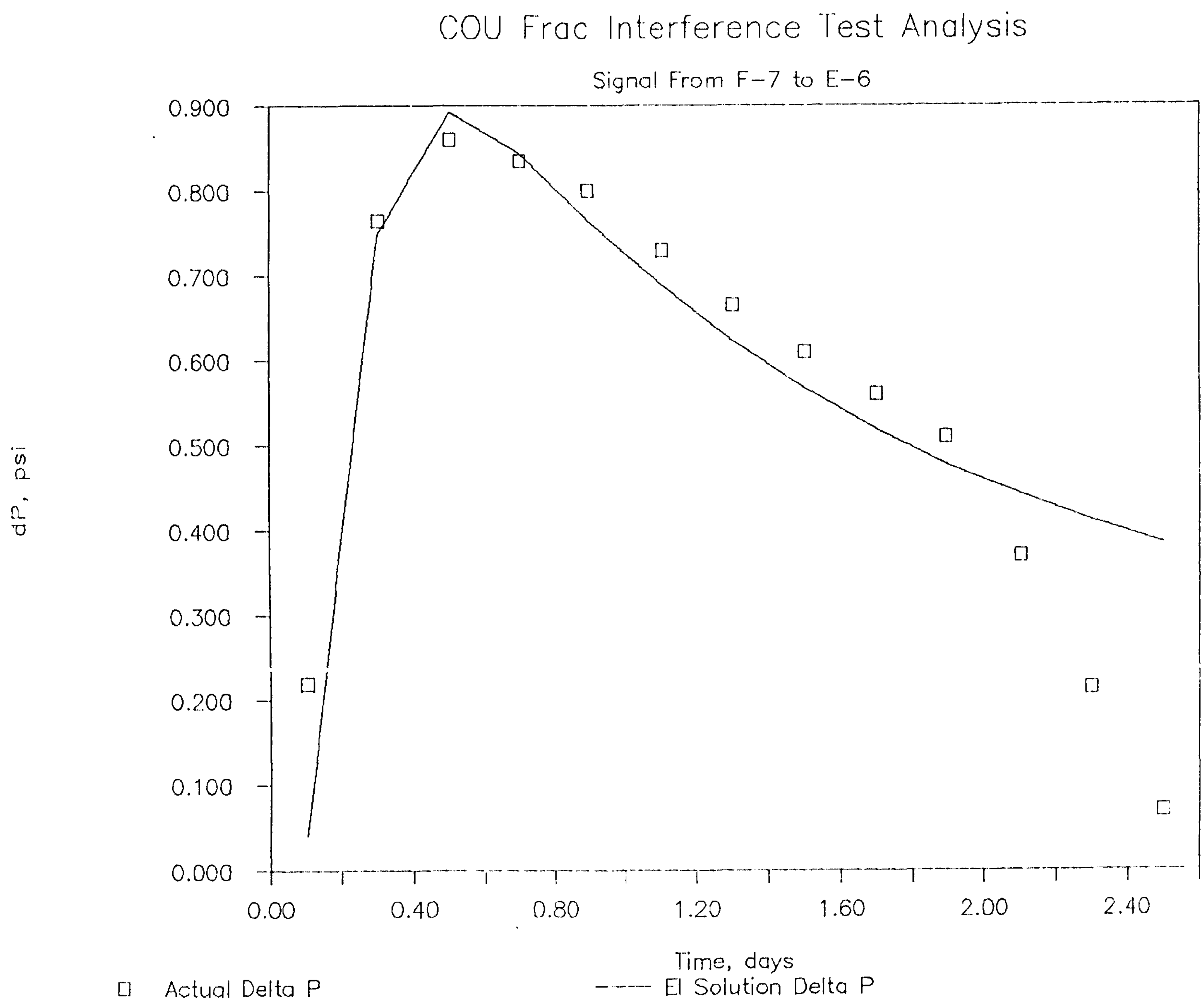
Time Hr	Actual Pressure Psi
2.4	1659.95
4.8	1664.40
7.2	1666.15
9.6	1666.30
12.0	1666.10
14.4	1665.75
16.8	1665.40
19.2	1665.10
21.6	1664.77
24.0	1664.44
28.8	1663.82
33.6	1663.25
38.4	1662.73
43.2	1662.30
48.0	1661.88
52.8	1661.50
57.6	1661.15
62.4	1660.86
67.2	1660.55
0.0	1659.78
-2.4	1659.84
-4.8	1659.89
-7.2	1659.95
-9.6	1660.00
-12.0	1660.01
-14.4	1660.01


COU Frac Pressure Responce
N-31 is Signal Well, E-6 is Observation
Pressure, psia
1667.00
1666.00
1665.00
1664.00
1663.00
1662.00
1661.00
1660.00
1659.00
-100.00
-80.00
-60.00
-40.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
E-6 Shut In Time, hr
N-31 FRAC 4/1/86

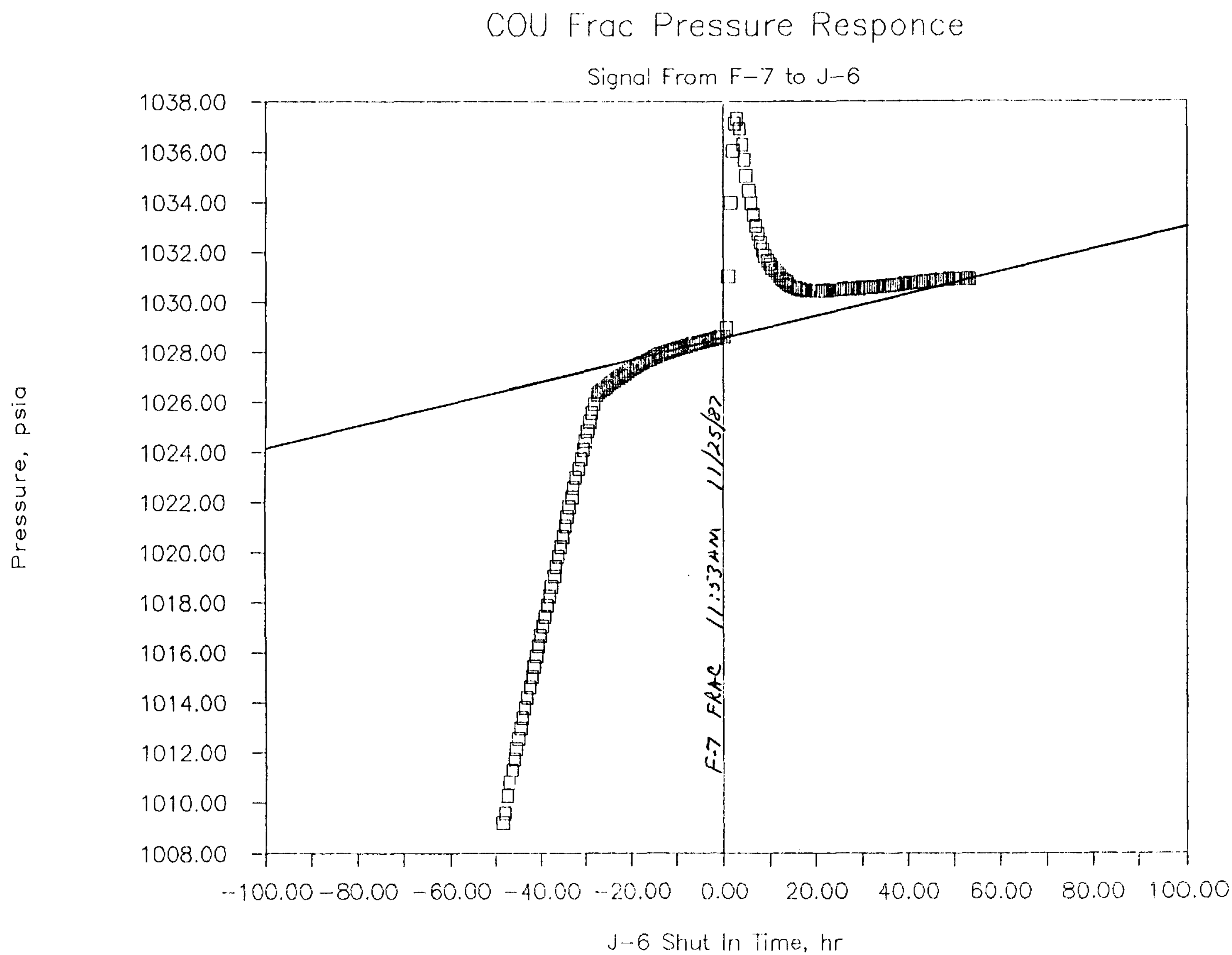

COU Frac Interference Test Analysis
N-31 is Signal Well, E-6 is Observation
dP, psi
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.0
0.4
0.8
1.2
1.6
2.0
2.4
2.8
Time, days
Actual Delta P
El Solution Delta P

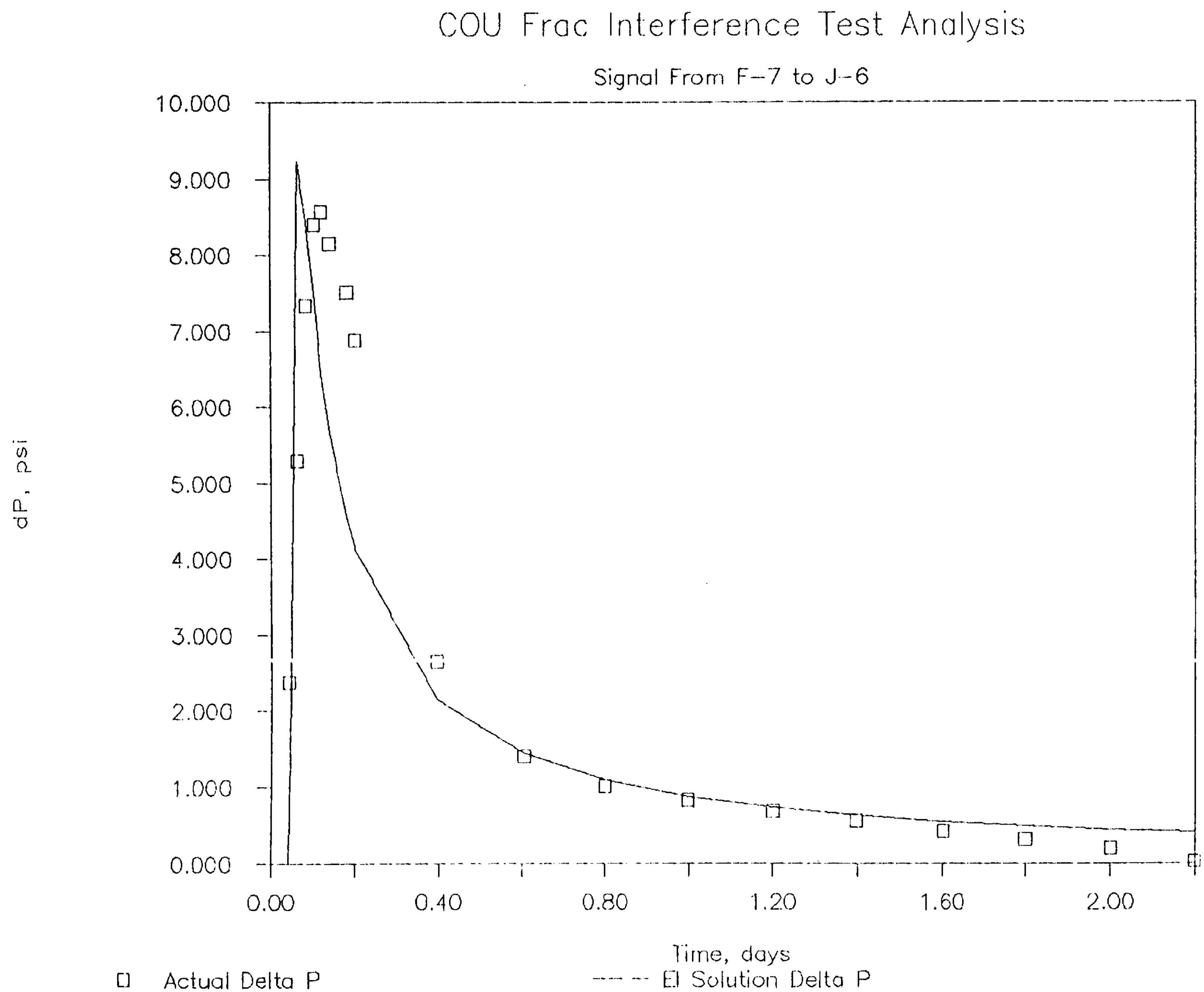


COU Frac Pressure Responce
Signal From F-7 to E-6
1035.00
1034.00
1033.00
1032.00
1031.00
1030.00
Pressure, psia
-100.00 -80.00 -60.00 -40.00 -20.00 0.00 20.00 40.00 60.00 80.00 100.00
E-6 Shut In Time, hr
F-7 FRAC 11:53AM 11/25/87



COU Frac Interference Test Analysis
Signal From F-7 to E-6
dP, psi
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.00
0.40
0.80
1.20
1.60
2.00
2.40
Time, days
Actual Delta P
EI Solution Delta P


COU Frac Pressure Responce
Signal From F-7 to J-6
1038.00
1036.00
1034.00
1032.00
1030.00
1028.00
1026.00
1024.00
1022.00
1020.00
1018.00
1016.00
1014.00
1012.00
1010.00
1008.00
Pressure, psia
-100.00 -80.00 -60.00 -40.00 -20.00 0.00 20.00 40.00 60.00 80.00 100.00
J-6 Shut In Time, hr
F-7 FRAC 11:53AM 11/25/87



COU Frac Interference Test Analysis
Signal From F–7 to J–6
dP, psi
10.000
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
0.00
0.40
0.80
1.20
1.60
2.00
Time, days
Actual Delta P
EI Solution Delta P

Pressure Responce Of A-20 Frac Observed At B-32

Pressures and times taken from BMG exhibit March 30, 1987.

time hr	pressure psia
-64.80	1274.08
-62.40	1274.18
-60.00	1274.28
-57.60	1274.38
-55.20	1274.48
-52.80	1274.58
-50.40	1274.68
-48.00	1274.78
-45.60	1274.88
-43.20	1274.98
-40.80	1275.08
-38.40	1275.18
-36.00	1275.28
-33.60	1275.38
-31.20	1275.48
-28.80	1275.58
-26.40	1275.68
-24.00	1275.78
-21.60	1275.88
-19.20	1275.98
-16.80	1276.08
-14.40	1276.18
-12.00	1276.28
-9.60	1276.38
-7.20	1276.48
-4.80	1276.58
-2.40	1276.68
0.00	1276.73
2.40	1276.85
4.80	1277.35
7.20	1278.05
9.60	1278.52
12.00	1278.9
14.40	1279.11
16.80	1279.41
19.20	1279.6
21.60	1279.79
24.00	1279.95
26.40	1280.05
28.80	1280.15
31.20	1280.25
33.60	1280.35
36.00	1280.45
38.40	1280.54
40.80	1280.6
43.20	1280.67
45.60	1280.72
48.00	1280.78
50.40	1280.82

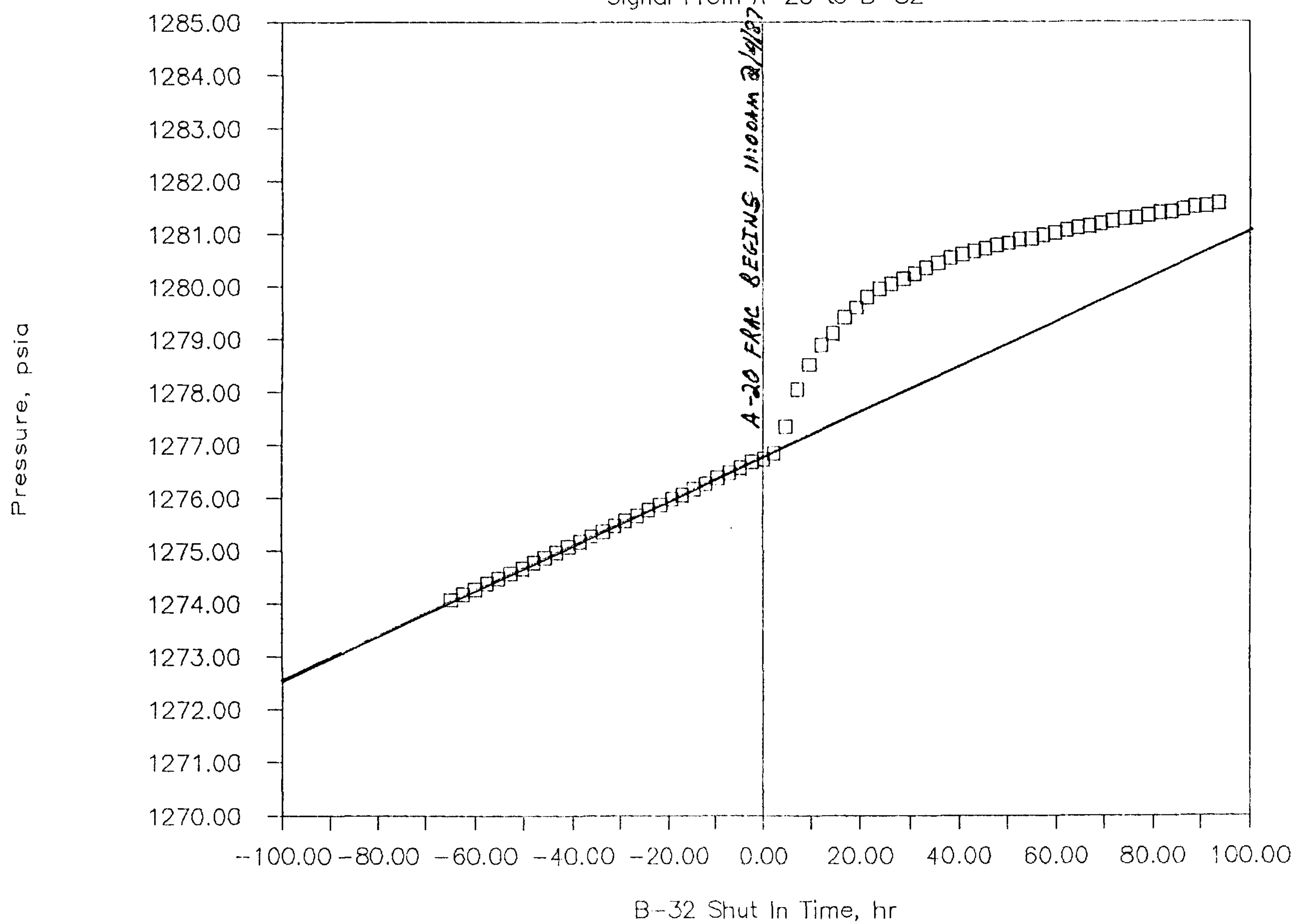
Pressure Responce Of A-20 Frac Observed At B-32

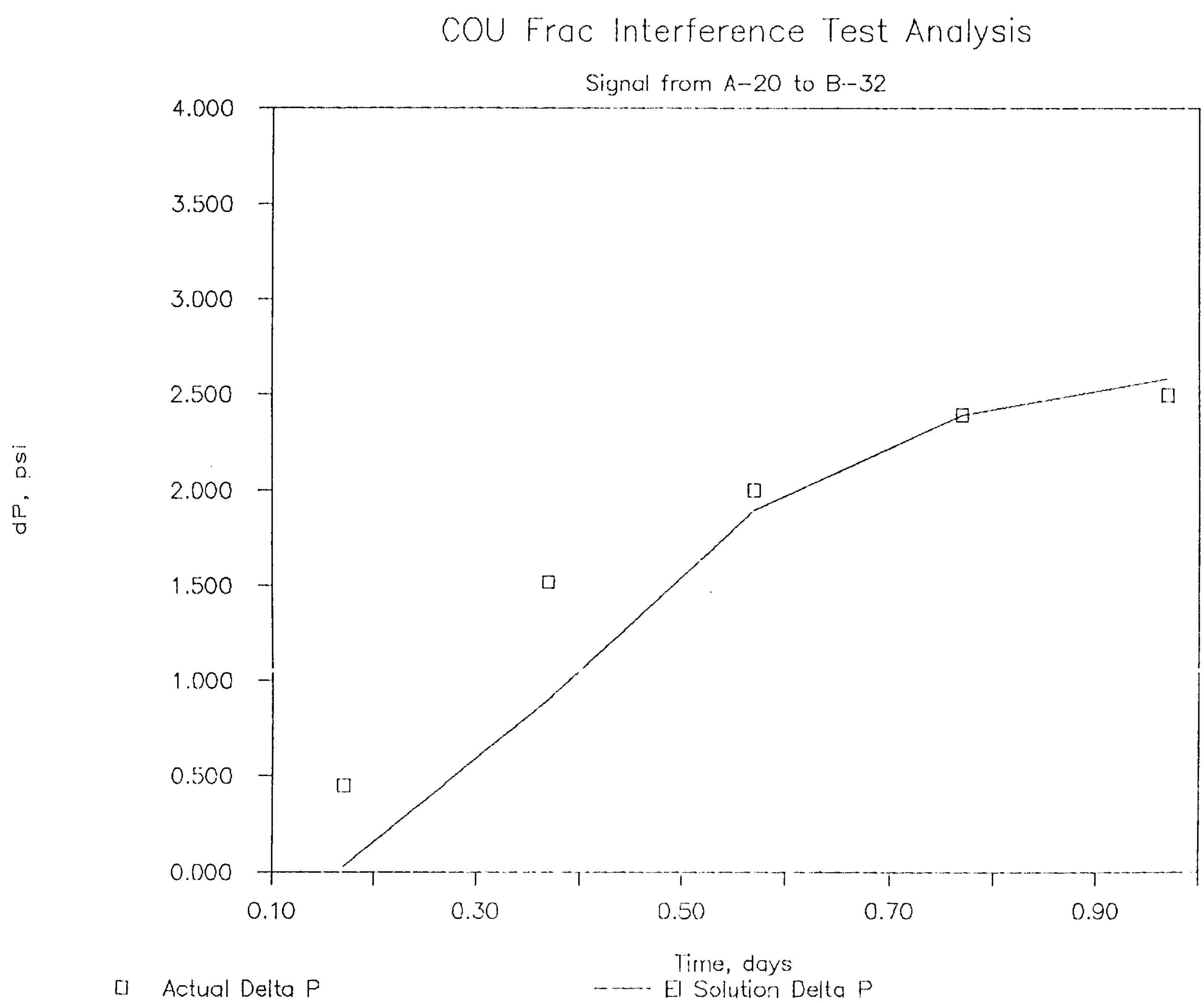
Pressures and times taken from BMG exhibit March 30, 1987.

time hr	pressure psia
52.80	1280.89
55.20	1280.91
57.60	1280.97
60.00	1281.01
62.40	1281.07
64.80	1281.11
67.20	1281.14
69.60	1281.2
72.00	1281.24
74.40	1281.28
76.80	1281.3
79.20	1281.35
81.60	1281.39
84.00	1281.42
86.40	1281.47
88.80	1281.5
91.20	1281.52
93.60	1281.58

COU Frac Pressure Responce

Signal From A-20 to B-32




COU Frac Interference Test Analysis
Signal from A-20 to B-32
dP, psi
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
0.10
0.30
0.50
0.70
0.90
Time, days
Actual Delta P
EI Solution Delta P

Frac Interference Test Anal
Signal from A-20 to B-29

time hrs	Pressure psi	dt hr
4.5	1219.35	-44.5
5	1221.7	-44
5.5	1223.4	-43.5
6	1224.44	-43
6.5	1224.92	-42.5
7	1225.01	-42
7.5	1225	-41.5
8	1224.99	-41
8.5	1224.99	-40.5
9	1224.99	-40
9.5	1224.99	-39.5
10	1224.99	-39
10.5	1224.99	-38.5
11	1225.01	-38
11.5	1225.03	-37.5
12	1225.03	-37
12.5	1225.03	-36.5
13	1225.04	-36
13.5	1225.06	-35.5
14	1225.07	-35
14.5	1225.08	-34.5
15	1225.1	-34
15.5	1225.11	-33.5
16	1225.13	-33
16.5	1225.14	-32.5
17	1225.15	-32
17.5	1225.16	-31.5
18	1225.17	-31
18.5	1225.2	-30.5
19	1225.22	-30
19.5	1225.23	-29.5
20	1225.27	-29
20.5	1225.28	-28.5
21	1225.29	-28
21.5	1225.32	-27.5
22	1225.34	-27
22.5	1225.37	-26.5
23	1225.38	-26
23.5	1225.42	-25.5
24	1225.44	-25
24.5	1225.46	-24.5
25	1225.46	-24
25.5	1225.51	-23.5
26	1225.51	-23
26.5	1225.5	-22.5
27	1225.53	-22
27.5	1225.54	-21.5
28	1225.57	-21
28.5	1225.6	-20.5

Frac Interference Test Anal
Signal from A-20 to B-29

time hrs	Pressure psi	dt hr
29	1225.61	-20
29.5	1225.63	-19.5
30	1225.64	-19
30.5	1225.67	-18.5
31	1225.68	-18
31.5	1225.69	-17.5
32	1225.71	-17
32.5	1225.73	-16.5
33	1225.76	-16
33.5	1225.77	-15.5
34	1225.8	-15
34.5	1225.8	-14.5
35	1225.82	-14
35.5	1225.85	-13.5
36	1225.85	-13
36.5	1225.88	-12.5
37	1225.9	-12
37.5	1225.91	-11.5
38	1225.92	-11
38.5	1225.96	-10.5
39	1225.98	-10
39.5	1225.99	-9.5
40	1226.01	-9
40.5	1226.02	-8.5
41	1226.03	-8
41.5	1226.04	-7.5
42	1226.07	-7
42.5	1226.09	-6.5
43	1226.1	-6
43.5	1226.12	-5.5
44	1226.14	-5
44.5	1226.14	-4.5
45	1226.17	-4
45.5	1226.18	-3.5
46	1226.21	-3
46.5	1226.23	-2.5
47	1226.26	-2
47.5	1226.27	-1.5
48	1226.29	-1
48.5	1226.3	-0.5
49	1226.31	0
49.5	1226.36	0.5
50	1226.53	1
50.5	1226.74	1.5
51	1227.06	2
51.5	1227.43	2.5
52	1227.88	3
52.5	1228.28	3.5
53	1228.65	4

Frac Interference Test Anal
Signal from A-20 to B-29

time hrs	Pressure psi	dt hr
53.5	1228.89	4.5
54	1228.99	5
54.5	1229.1	5.5
55	1229.21	6
55.5	1229.3	6.5
56	1229.44	7
56.5	1229.55	7.5
57	1229.65	8
57.5	1229.73	8.5
58	1229.8	9
58.5	1229.88	9.5
59	1229.93	10
59.5	1229.97	10.5
60	1230.01	11
60.5	1230.04	11.5
61	1230.07	12
61.5	1230.08	12.5
62	1230.1	13
62.5	1230.09	13.5
63	1230.06	14
63.5	1230.07	14.5
64	1230.06	15
64.5	1230.06	15.5
65	1230.06	16
65.5	1230.06	16.5
66	1230.06	17
66.5	1230.08	17.5
67	1230.09	18
67.5	1230.09	18.5
68	1230.09	19
68.5	1230.11	19.5
69	1230.1	20
69.5	1230.11	20.5
70	1230.12	21
70.5	1230.14	21.5
71	1230.14	22
71.5	1230.14	22.5
72	1230.14	23
72.5	1230.14	23.5
73	1230.14	24
73.5	1230.14	24.5
74	1230.14	25
74.5	1230.13	25.5
75	1230.12	26
75.5	1230.12	26.5
76	1230.13	27
76.5	1230.12	27.5
77	1230.12	28
77.5	1230.12	28.5

Frac Interference Test Anal
Signal from A-20 to B-29

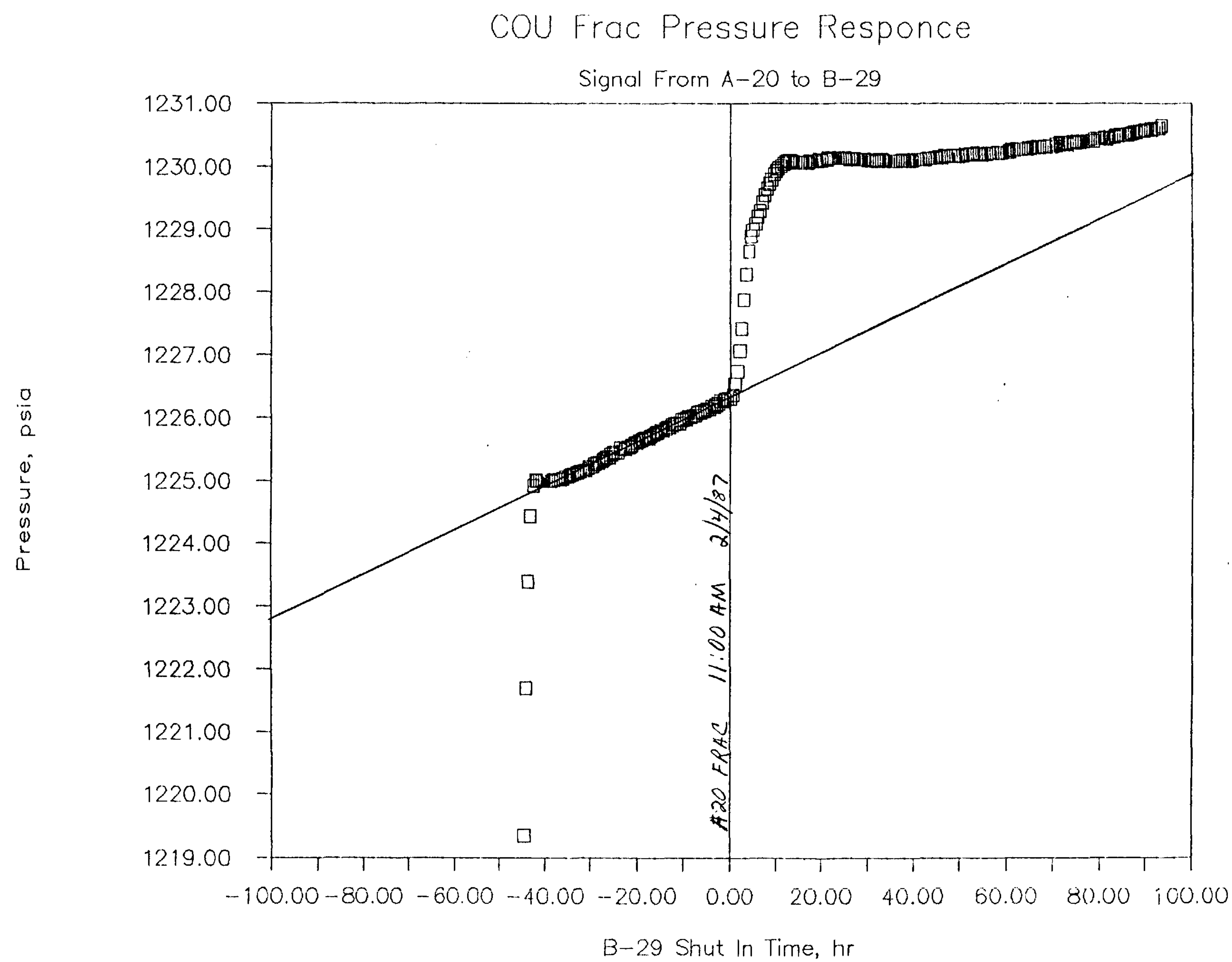
time hrs	Pressure psi	dt hr
78	1230.11	29
78.5	1230.11	29.5
79	1230.1	30
79.5	1230.11	30.5
80	1230.1	31
80.5	1230.11	31.5
81	1230.09	32
81.5	1230.09	32.5
82	1230.11	33
82.5	1230.1	33.5
83	1230.08	34
83.5	1230.09	34.5
84	1230.08	35
84.5	1230.08	35.5
85	1230.08	36
85.5	1230.09	36.5
86	1230.09	37
86.5	1230.1	37.5
87	1230.09	38
87.5	1230.1	38.5
88	1230.09	39
88.5	1230.1	39.5
89	1230.11	40
89.5	1230.11	40.5
90	1230.12	41
90.5	1230.11	41.5
91	1230.11	42
91.5	1230.12	42.5
92	1230.13	43
92.5	1230.13	43.5
93	1230.13	44
93.5	1230.14	44.5
94	1230.14	45
94.5	1230.15	45.5
95	1230.15	46
95.5	1230.17	46.5
96	1230.16	47
96.5	1230.17	47.5
97	1230.17	48
97.5	1230.18	48.5
98	1230.16	49
98.5	1230.16	49.5
99	1230.18	50
99.5	1230.18	50.5
100	1230.19	51
100.5	1230.19	51.5
101	1230.2	52
101.5	1230.2	52.5
102	1230.19	53

Frac Interference Test Anal
Signal from A-20 to B-29

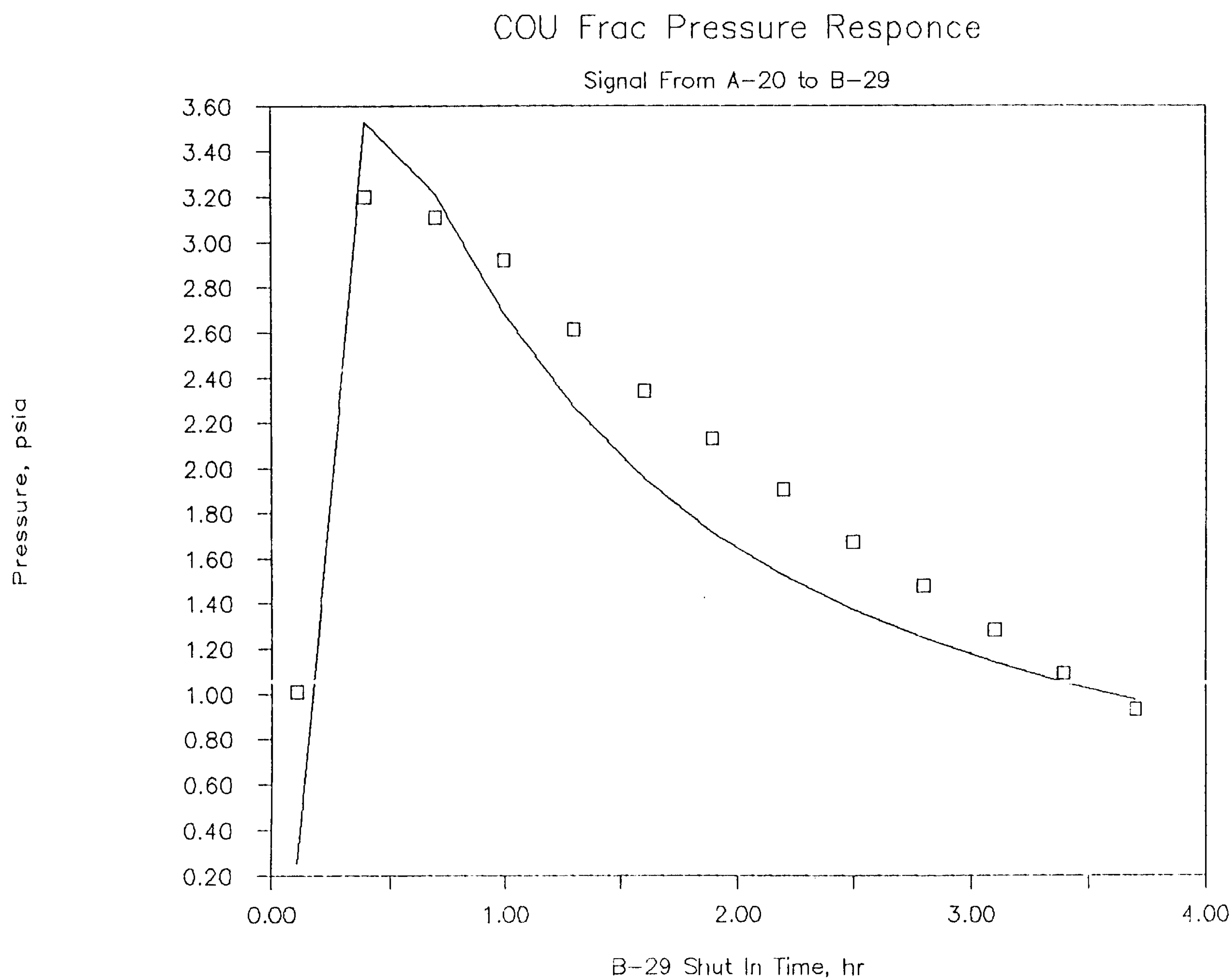
time hrs	Pressure psi	dt hr
102.5	1230.21	53.5
103	1230.2	54
103.5	1230.19	54.5
104	1230.21	55
104.5	1230.2	55.5
105	1230.21	56
105.5	1230.22	56.5
106	1230.22	57
106.5	1230.22	57.5
107	1230.23	58
107.5	1230.22	58.5
108	1230.23	59
108.5	1230.23	59.5
109	1230.23	60
109.5	1230.25	60.5
110	1230.26	61
110.5	1230.26	61.5
111	1230.28	62
111.5	1230.27	62.5
112	1230.27	63
112.5	1230.28	63.5
113	1230.28	64
113.5	1230.29	64.5
114	1230.29	65
114.5	1230.3	65.5
115	1230.3	66
115.5	1230.31	66.5
116	1230.3	67
116.5	1230.31	67.5
117	1230.32	68
117.5	1230.32	68.5
118	1230.33	69
118.5	1230.32	69.5
119	1230.33	70
119.5	1230.35	70.5
120	1230.35	71
120.5	1230.37	71.5
121	1230.36	72
121.5	1230.36	72.5
122	1230.35	73
122.5	1230.38	73.5
123	1230.39	74
123.5	1230.38	74.5
124	1230.4	75
124.5	1230.39	75.5
125	1230.4	76
125.5	1230.41	76.5
126	1230.41	77
126.5	1230.41	77.5

Frac Interference Test Anal
Signal from A-20 to B-29

time hrs	Pressure psi	dt hr
127	1230.41	78
127.5	1230.41	78.5
128	1230.44	79
128.5	1230.44	79.5
129	1230.44	80
129.5	1230.45	80.5
130	1230.46	81
130.5	1230.45	81.5
131	1230.47	82
131.5	1230.47	82.5
132	1230.47	83
132.5	1230.49	83.5
133	1230.49	84
133.5	1230.5	84.5
134	1230.5	85
134.5	1230.51	85.5
135	1230.51	86
135.5	1230.52	86.5
136	1230.53	87
136.5	1230.54	87.5
137	1230.55	88
137.5	1230.56	88.5
138	1230.56	89
138.5	1230.57	89.5
139	1230.58	90
139.5	1230.58	90.5
140	1230.59	91
140.5	1230.58	91.5
141	1230.61	92
141.5	1230.6	92.5
142	1230.61	93
142.5	1230.64	93.5



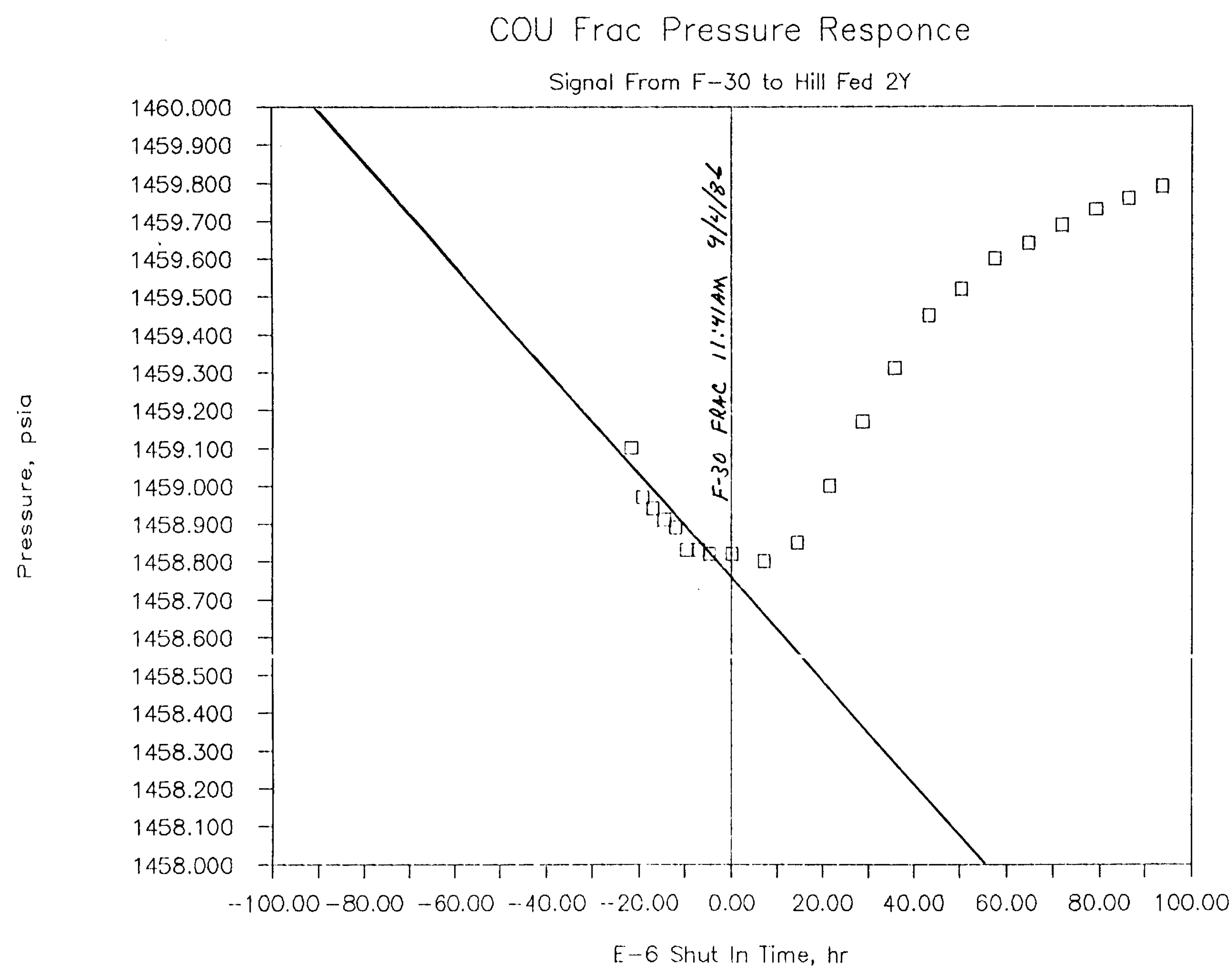
COU Frac Pressure Responce
Signal From A-20 to B-29
1231.00
1230.00
1229.00
1228.00
1227.00
1226.00
1225.00
1224.00
1223.00
1222.00
1221.00
1220.00
1219.00
Pressure, psia
-100.00 -80.00 -60.00 -40.00 -20.00 0.00 20.00 40.00 60.00 80.00 100.00
B-29 Shut In Time, hr
#20 FRAC 11:00 AM 2/4/87

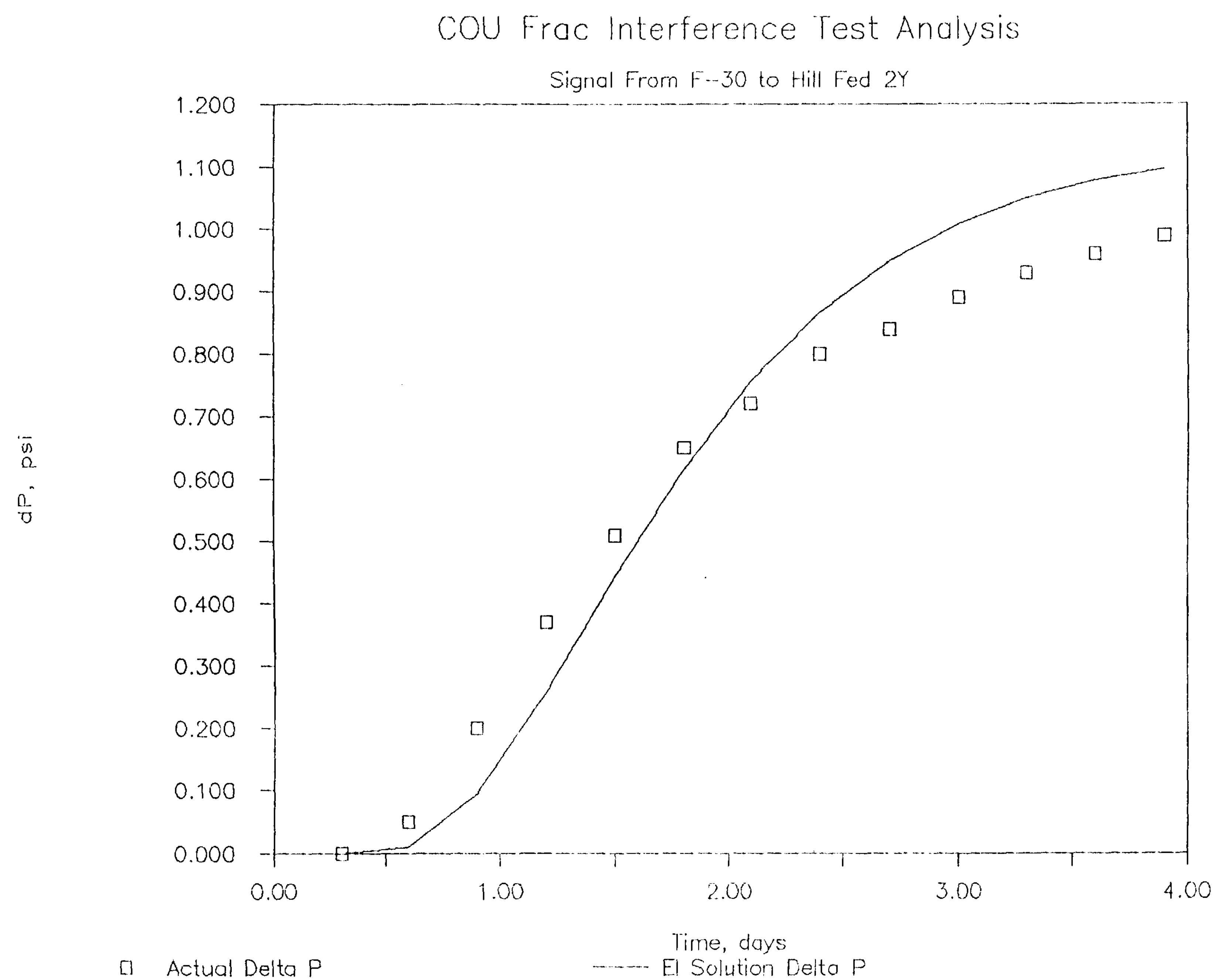

COU Frac Pressure Responce
Signal From A-20 to B-29
Pressure, psia
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1.00
2.00
3.00
4.00
B-29 Shut In Time, hr

Frac Interference Test Analysis
Signal - F-30 to Hill Fed 2Y

Pressures and times taken from BMG exhibit March 30, 1987

time hr	Pressure psi
7.20	1458.800
14.40	1458.850
21.60	1459.000
28.80	1459.170
36.00	1459.310
43.20	1459.450
50.40	1459.520
57.60	1459.600
64.80	1459.640
72.00	1459.690
79.20	1459.730
86.40	1459.760
93.60	1459.790
0.00	1458.820
-4.80	1458.820
-7.20	1458.830
-9.60	1458.830
-12.00	1458.890
-14.40	1458.910
-16.80	1458.940
-19.20	1458.970
-21.60	1459.100

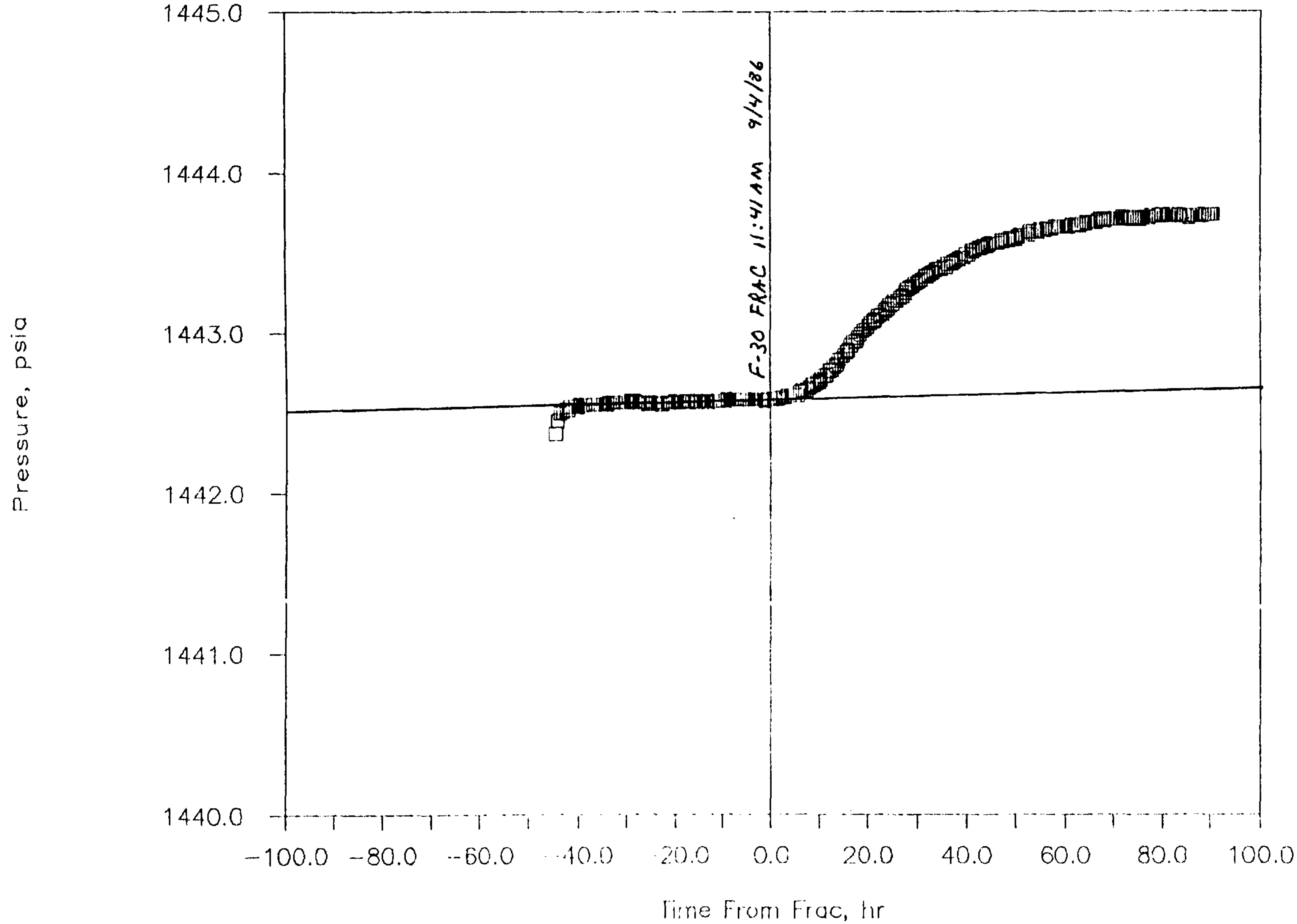

COU Frac Pressure Responce
Signal From F-30 to Hill Fed 2Y
Pressure, psia
1460.000
1459.900
1459.800
1459.700
1459.600
1459.500
1459.400
1459.300
1459.200
1459.100
1459.000
1458.900
1458.800
1458.700
1458.600
1458.500
1458.400
1458.300
1458.200
1458.100
1458.000
-100.00 -80.00 -60.00 -40.00 -20.00 0.00 20.00 40.00 60.00 80.00 100.00
E-6 Shut In Time, hr
F-30 FRAC 11:41AM 9/4/86



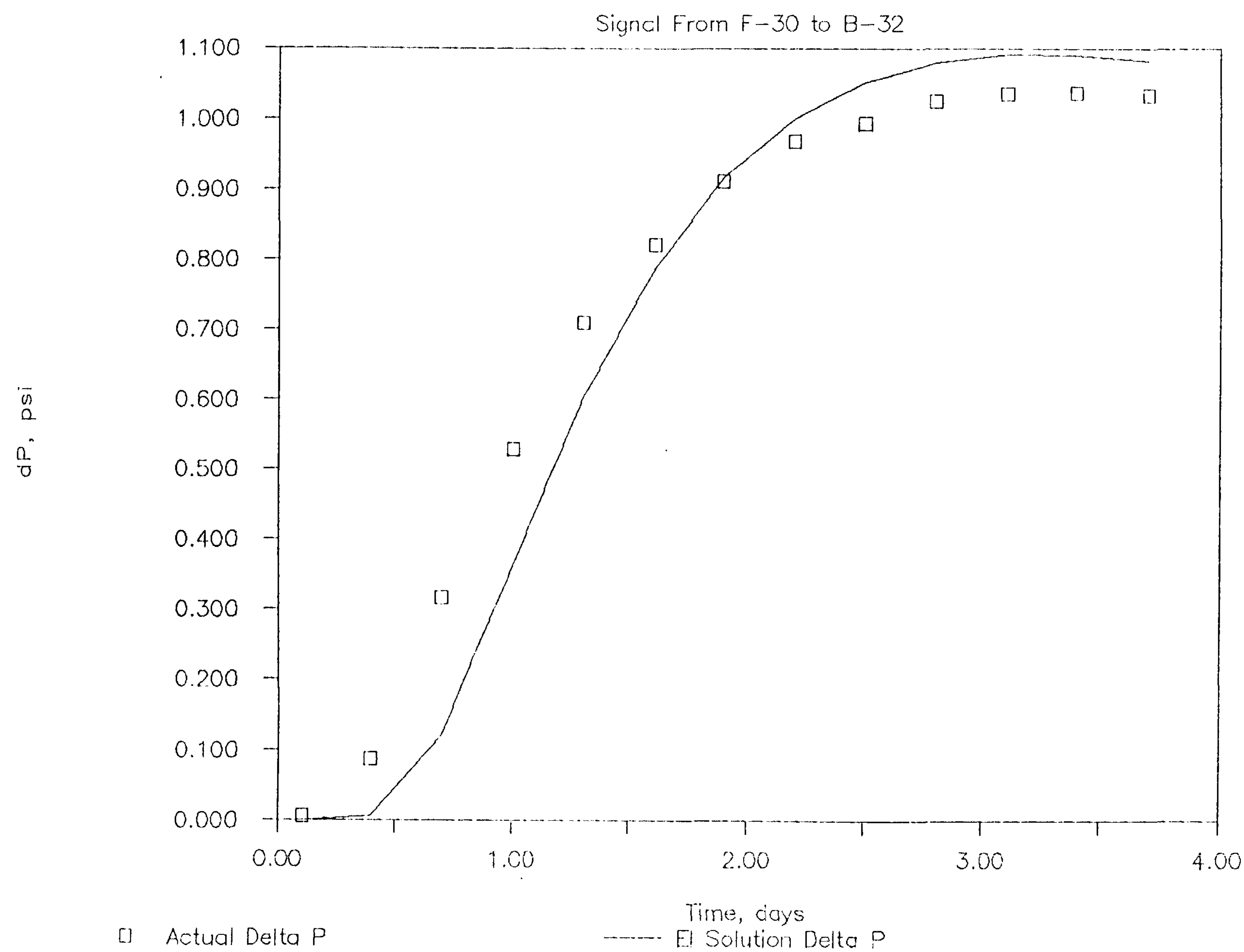
COU Frac Interference Test Analysis
Signal From F--30 to Hill Fed 2Y
1.200
1.100
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
dP, psi
0.00
1.00
2.00
3.00
4.00
Time, days
Actual Delta P
EI Solution Delta P

COU Frac Pressure Responce

Signal From F-30 to B-32

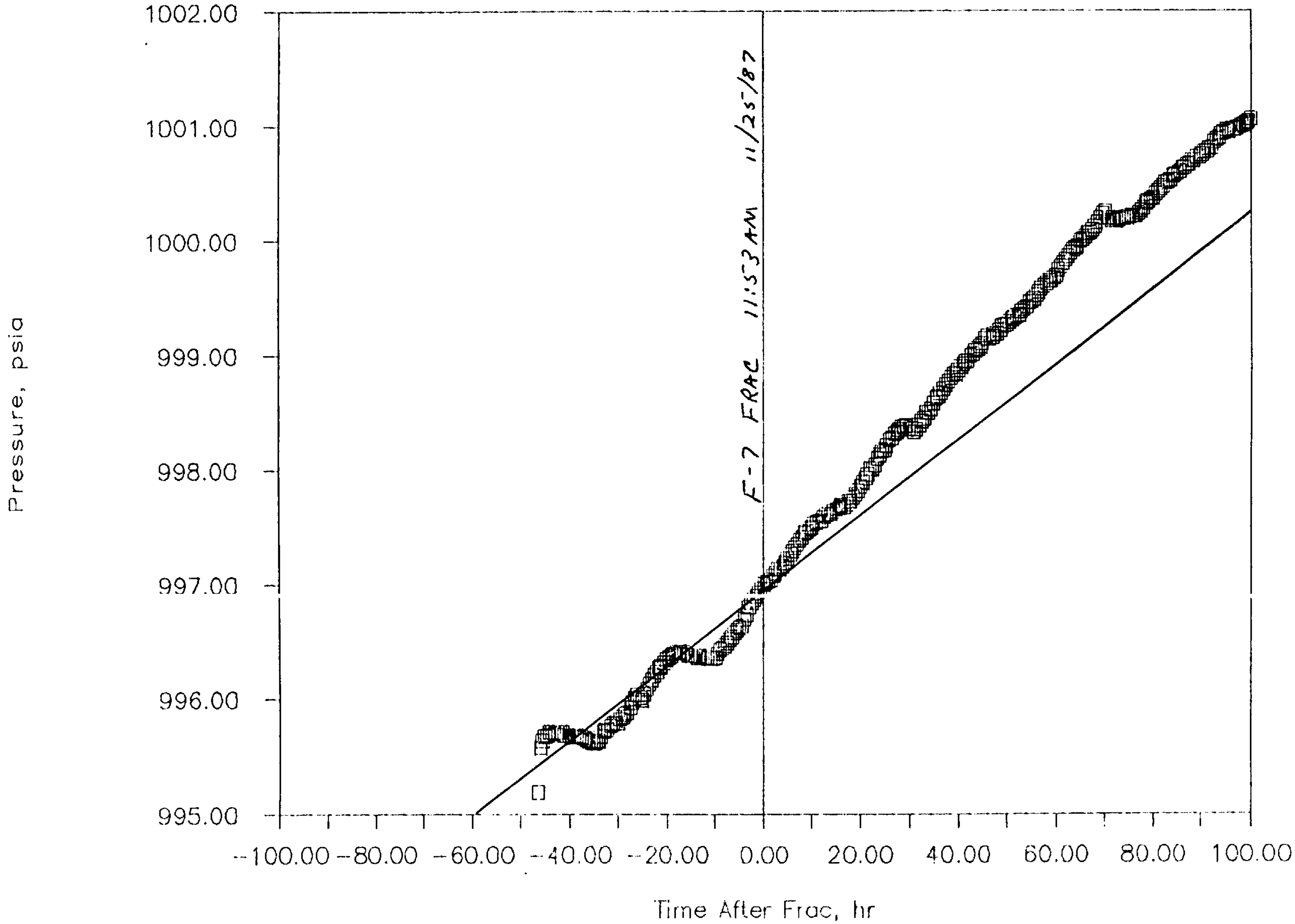


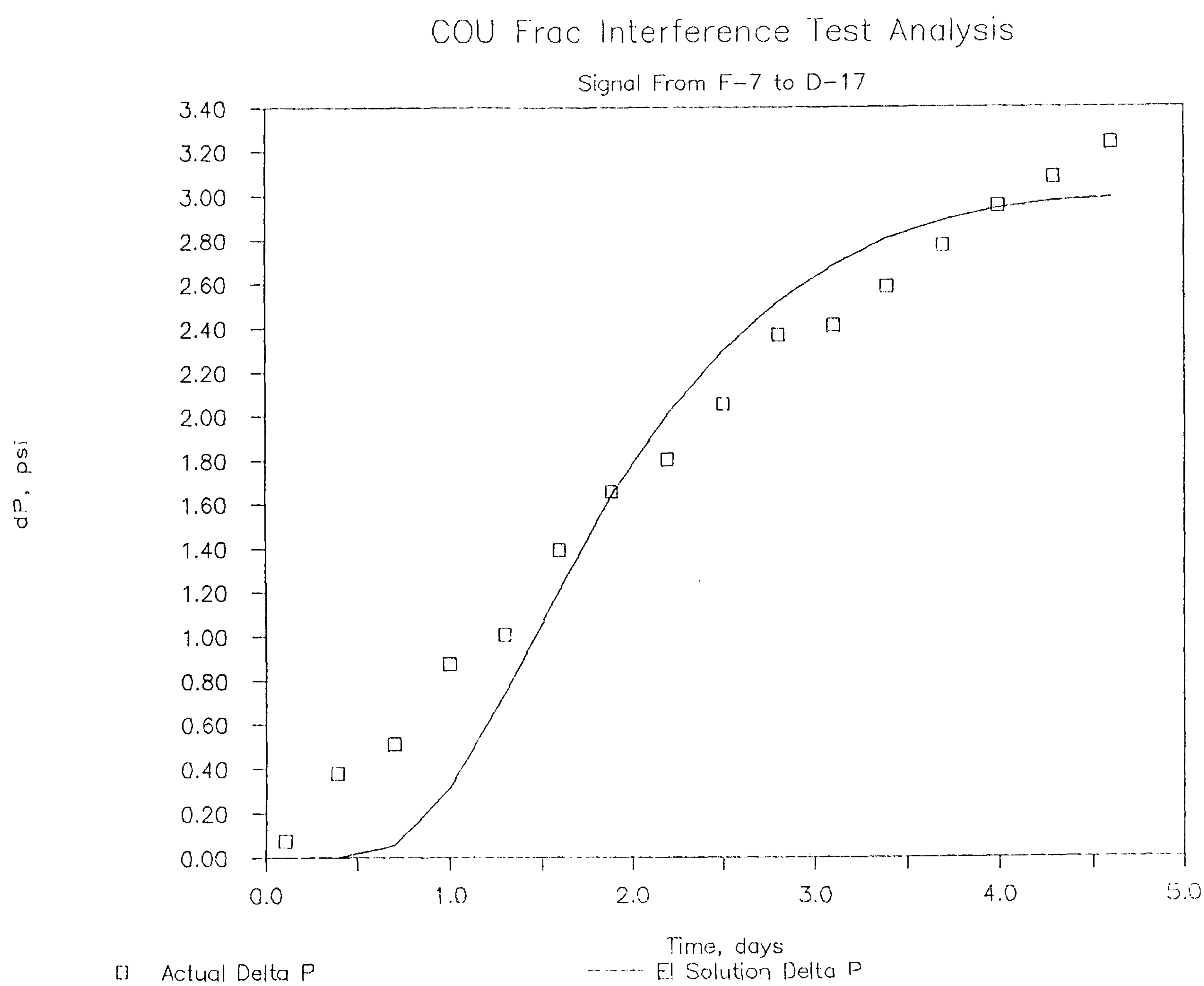
COU Frac Interference Test Analysis



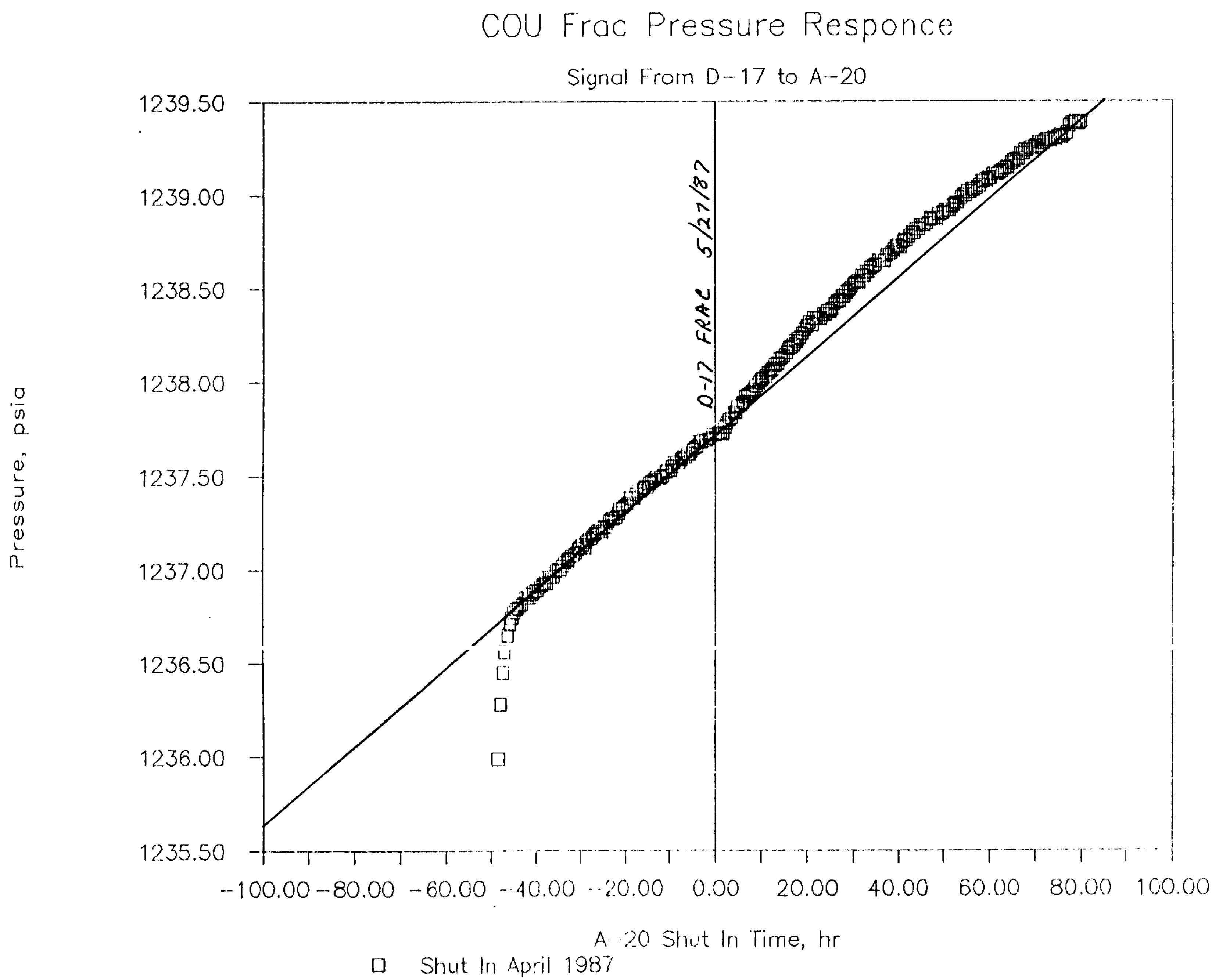
B.M.G. Interference Test

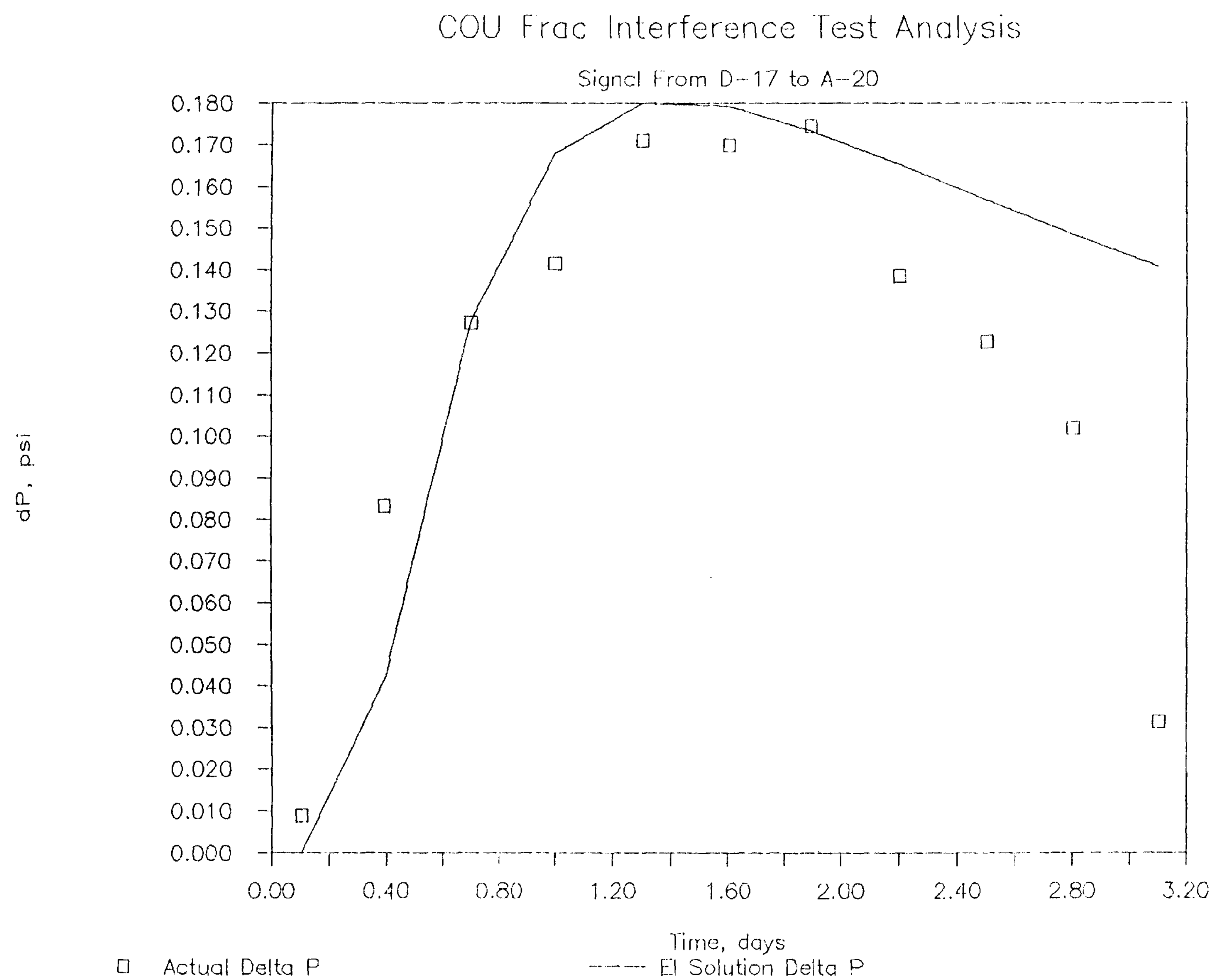
Signal From F-7 to D-17

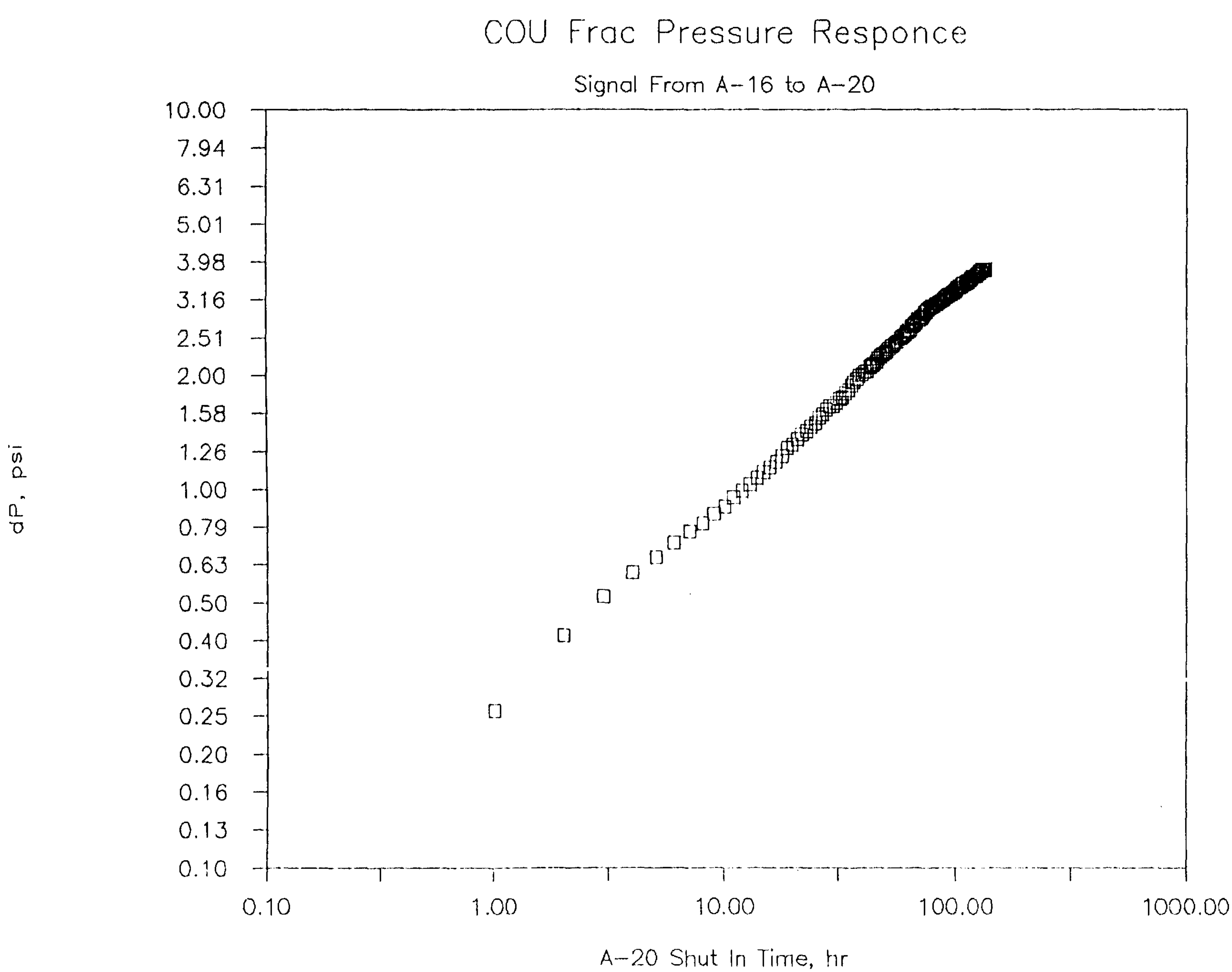




COU Frac Interference Test Analysis
Signal From F-7 to D-17
dP, psi
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.0
1.0
2.0
3.0
4.0
5.0
Time, days
Actual Delta P
El Solution Delta P

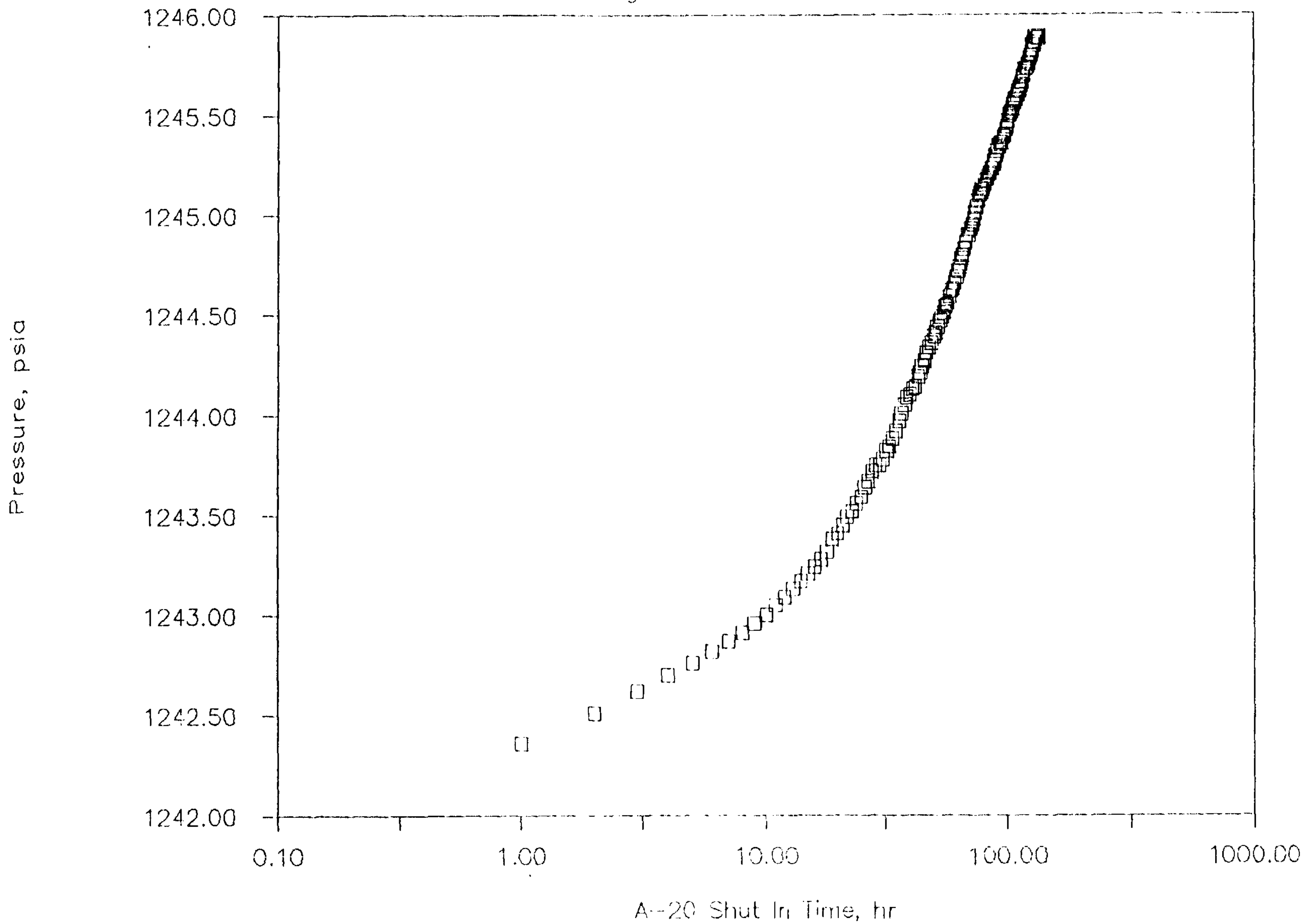

COU Frac Pressure Responce
Signal From D-17 to A-20
Pressure, psia
1239.50
1239.00
1238.50
1238.00
1237.50
1237.00
1236.50
1236.00
1235.50
-100.00
-80.00
-60.00
-40.00
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
A-20 Shut In Time, hr
D-17 FRAC 5/27/87
Shut In April 1987


COU Frac Interference Test Analysis
Signal From D-17 to A-20
dP, psi
0.180
0.170
0.160
0.150
0.140
0.130
0.120
0.110
0.100
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
0.00
0.40
0.80
1.20
1.60
2.00
2.40
2.80
3.20
Time, days
Actual Delta P
El Solution Delta P


COU Frac Pressure Responce
Signal From A-16 to A-20
10.00
7.94
6.31
5.01
3.98
3.16
2.51
2.00
1.58
1.26
1.00
0.79
0.63
0.50
0.40
0.32
0.25
0.20
0.16
0.13
0.10
dP, psi
0.10
1.00
10.00
100.00
1000.00
A-20 Shut In Time, hr

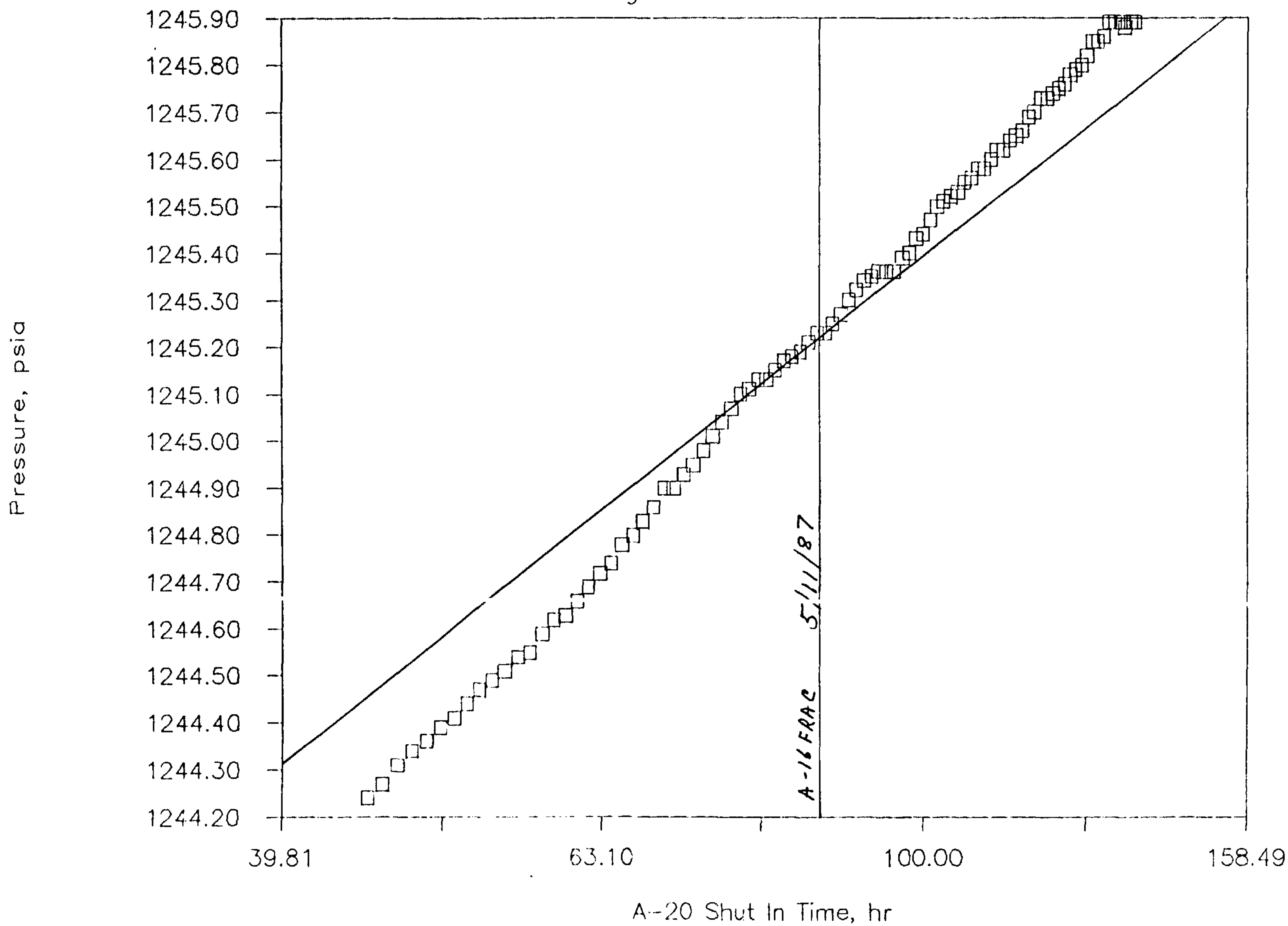
COU Frac Pressure Responce

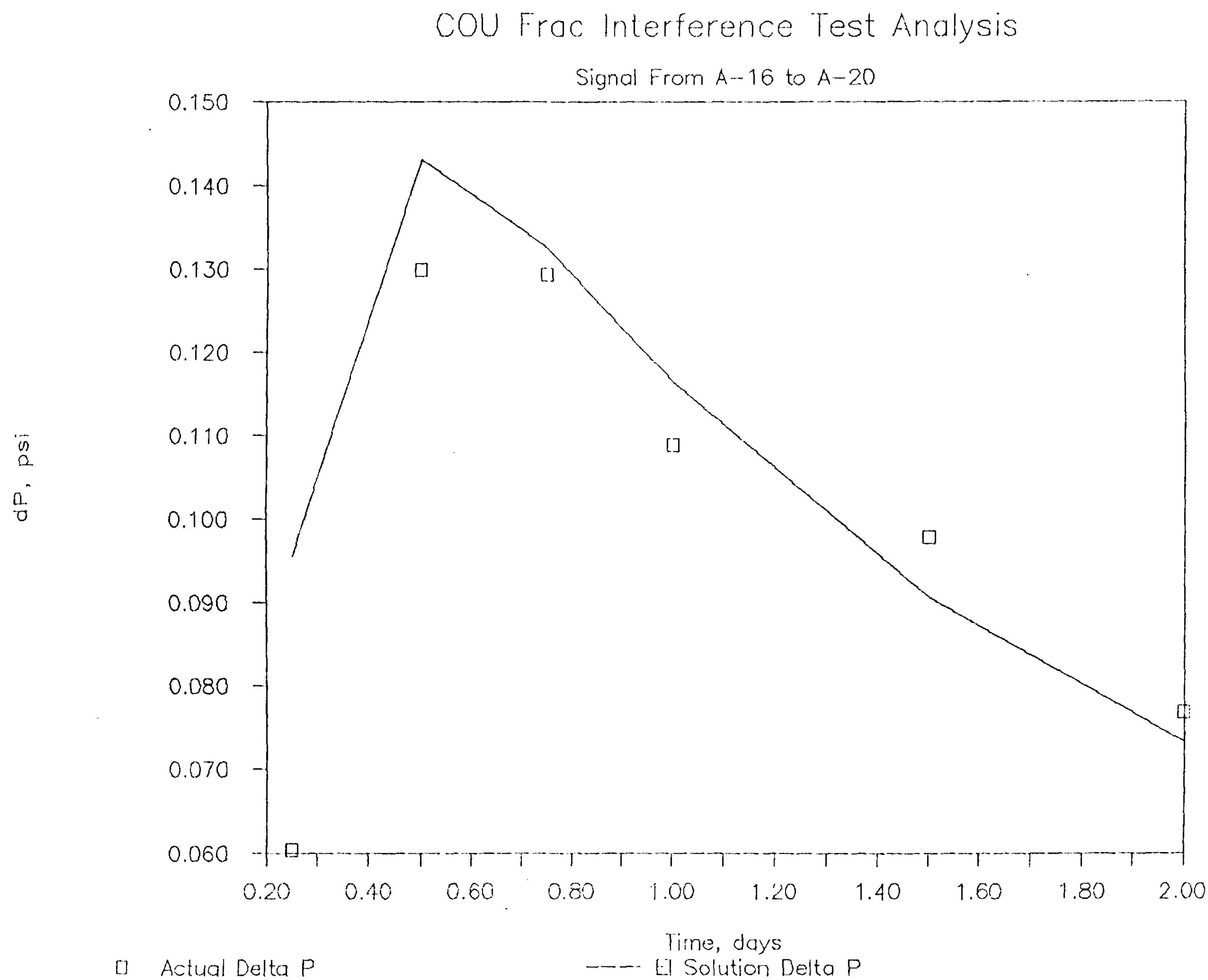
Signal From A-16 to A-20

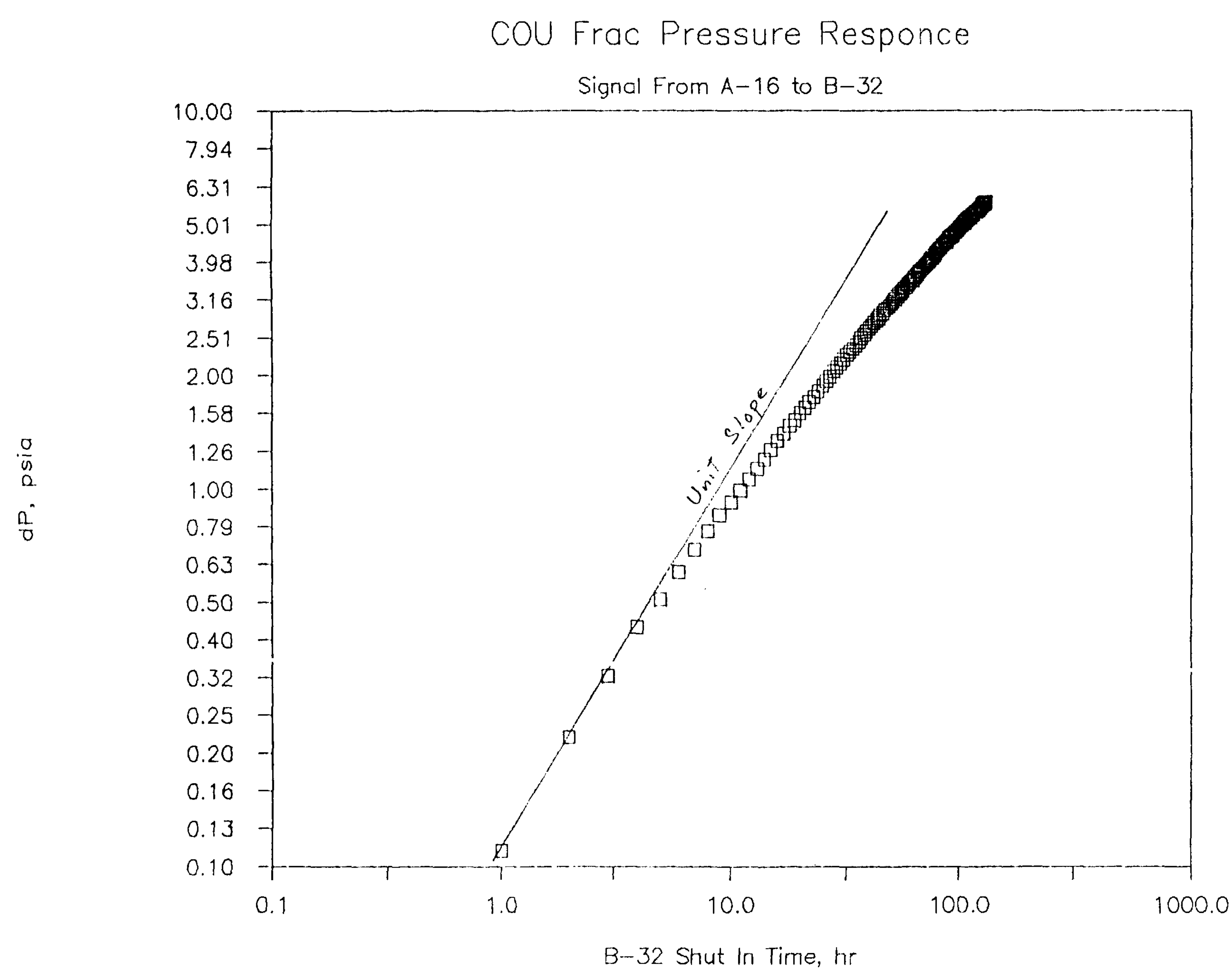


COU Frac Pressure Responce

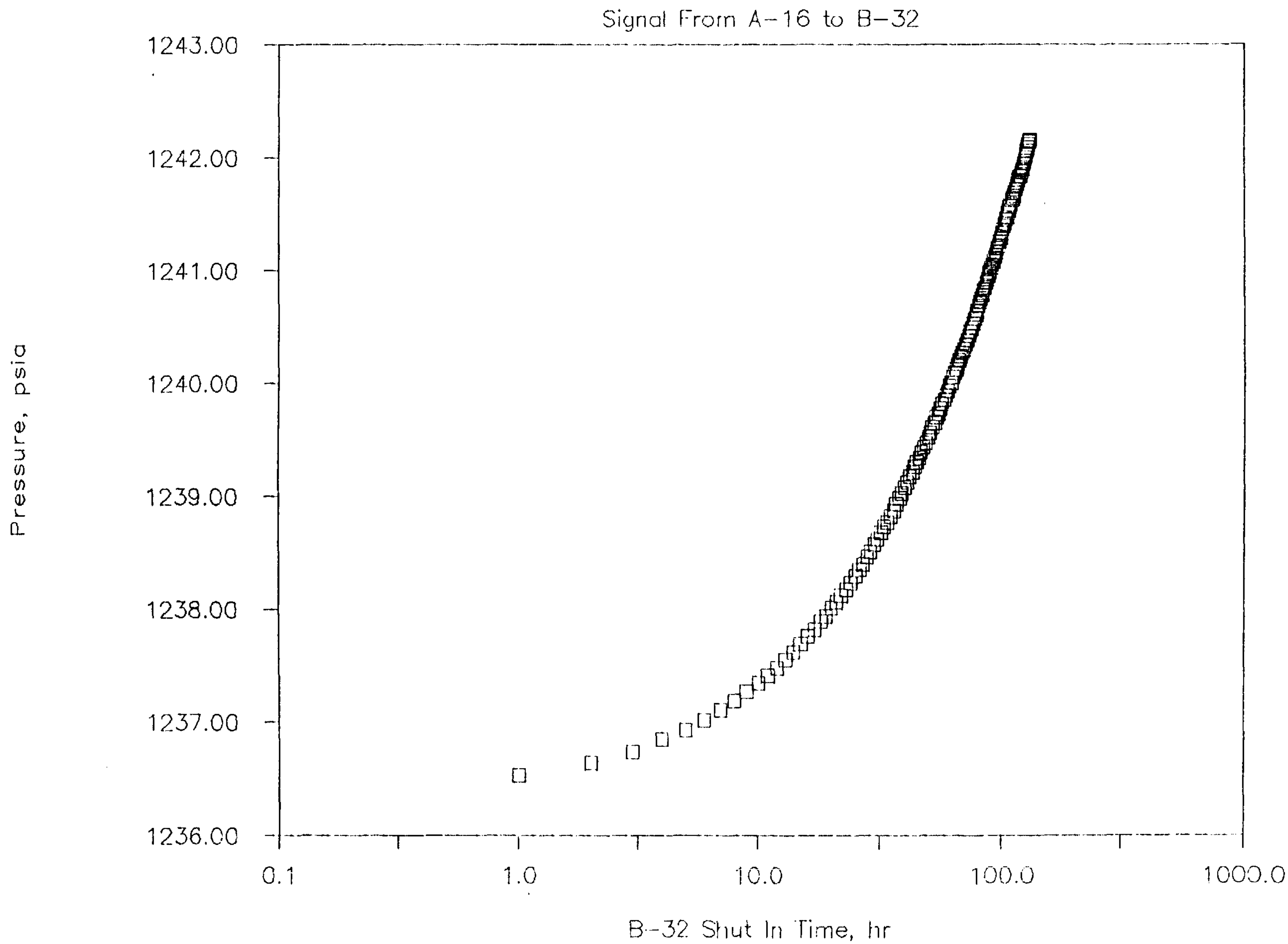
Signal From A-16 to A-20




COU Frac Interference Test Analysis
Signal From A-16 to A-20
dP, psi
0.150
0.140
0.130
0.120
0.110
0.100
0.090
0.080
0.070
0.060
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
Time, days
Actual Delta P
El Solution Delta P

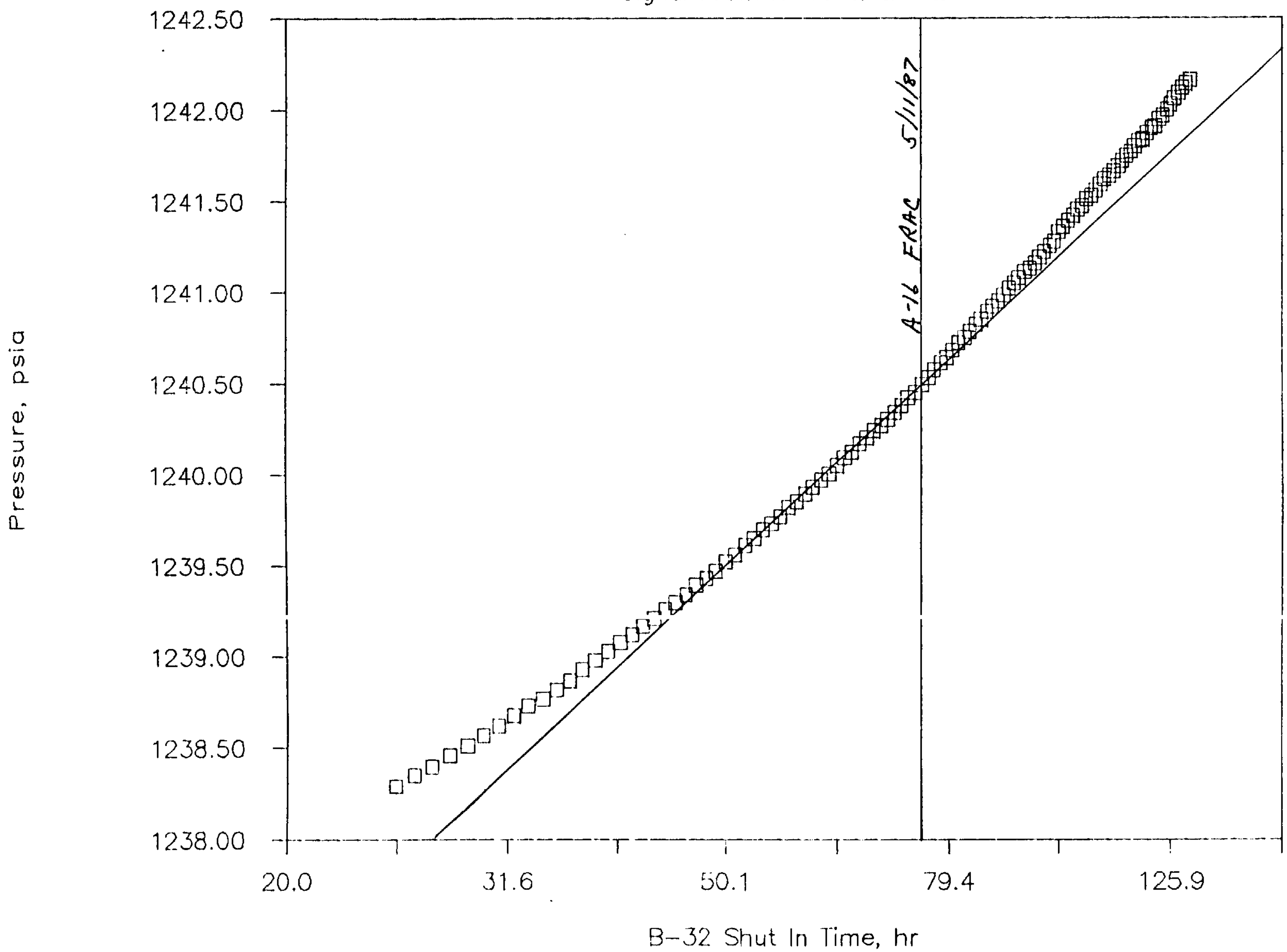

COU Frac Pressure Responce
Signal From A-16 to B-32
dP, psia
10.00
7.94
6.31
5.01
3.98
3.16
2.51
2.00
1.58
1.26
1.00
0.79
0.63
0.50
0.40
0.32
0.25
0.20
0.16
0.13
0.10
0.1
1.0
10.0
100.0
1000.0
B-32 Shut In Time, hr
Unit Slope

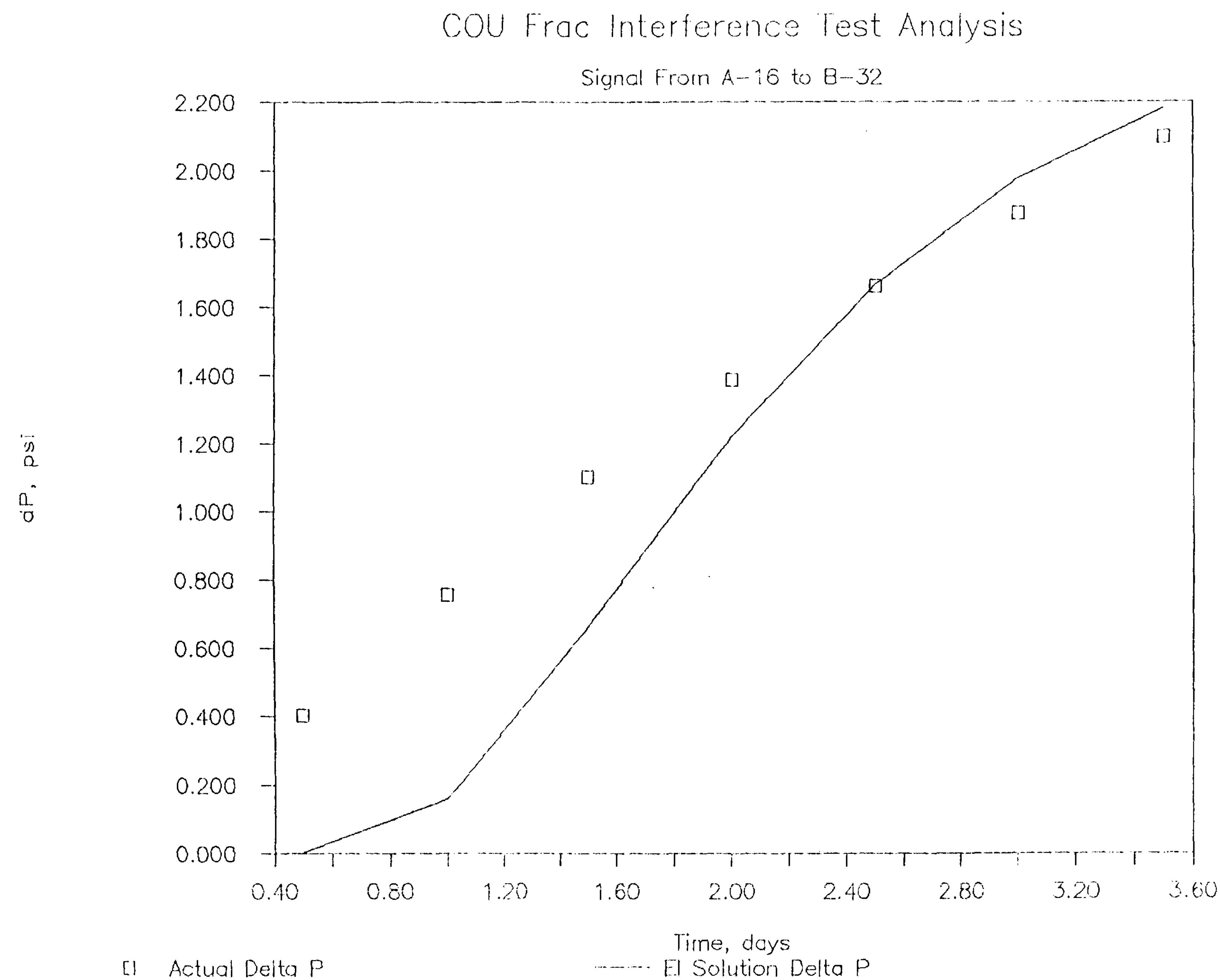
COU Frac Pressure Responce

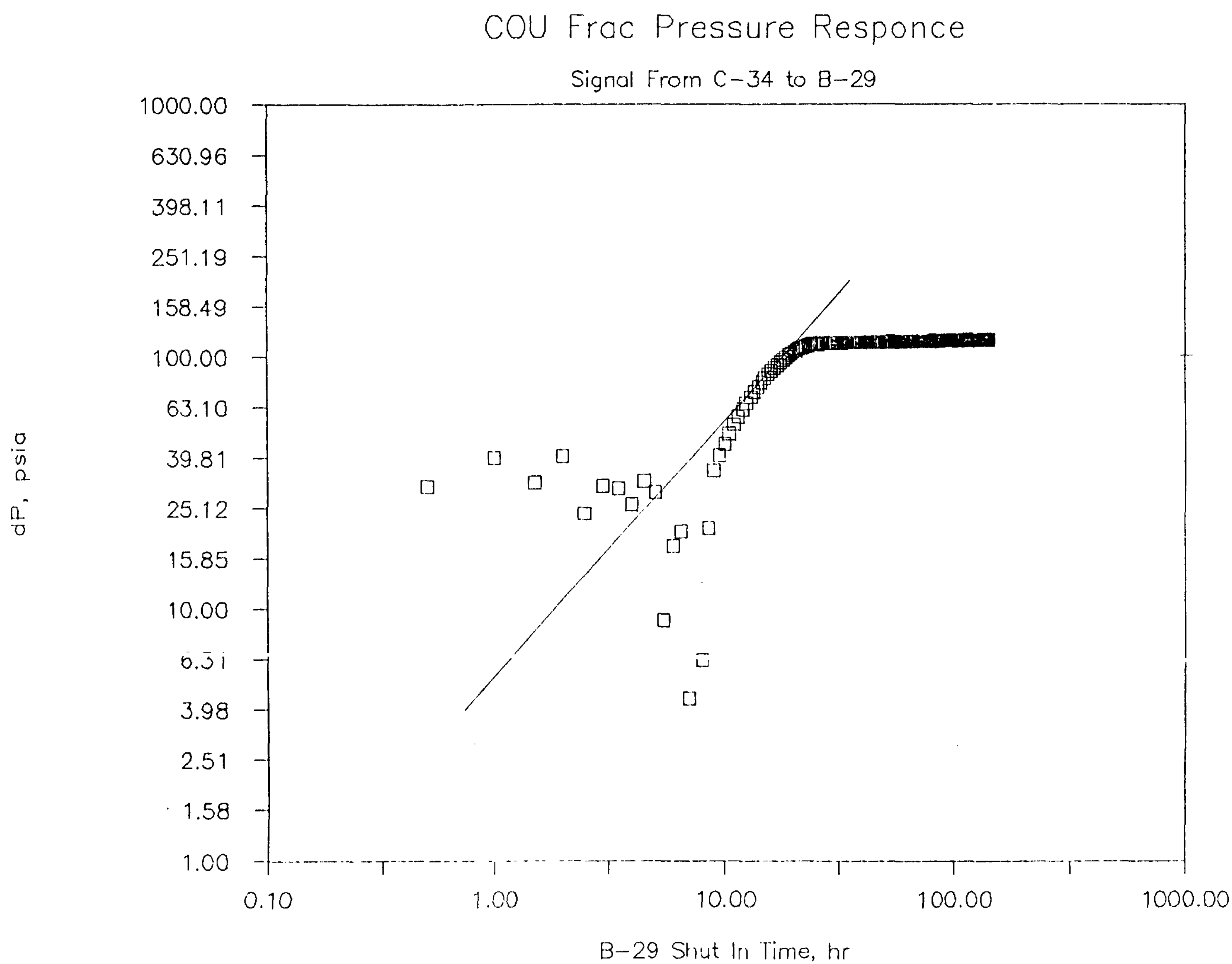


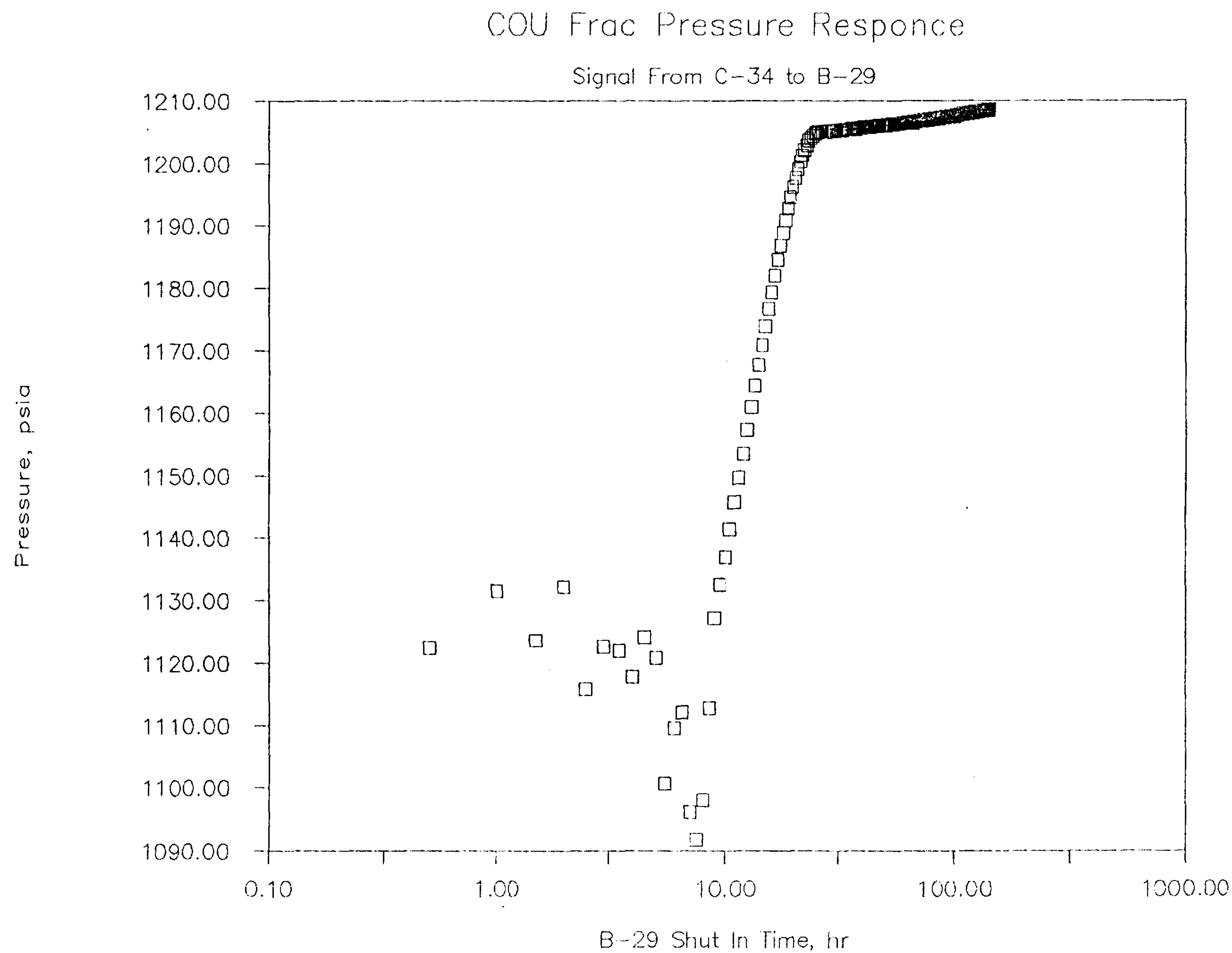
COU Frac Pressure Responce

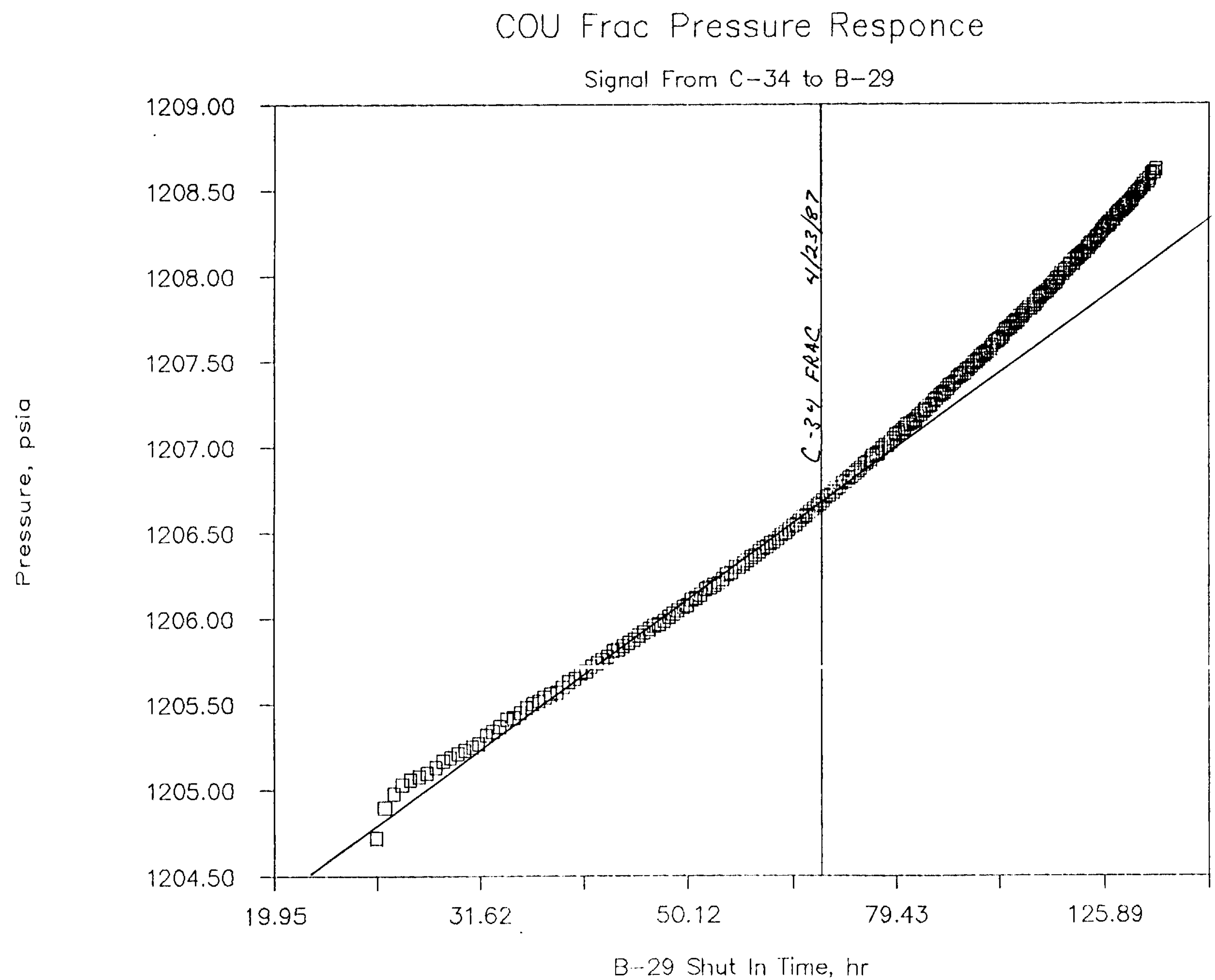
Signal From A-16 to B-32



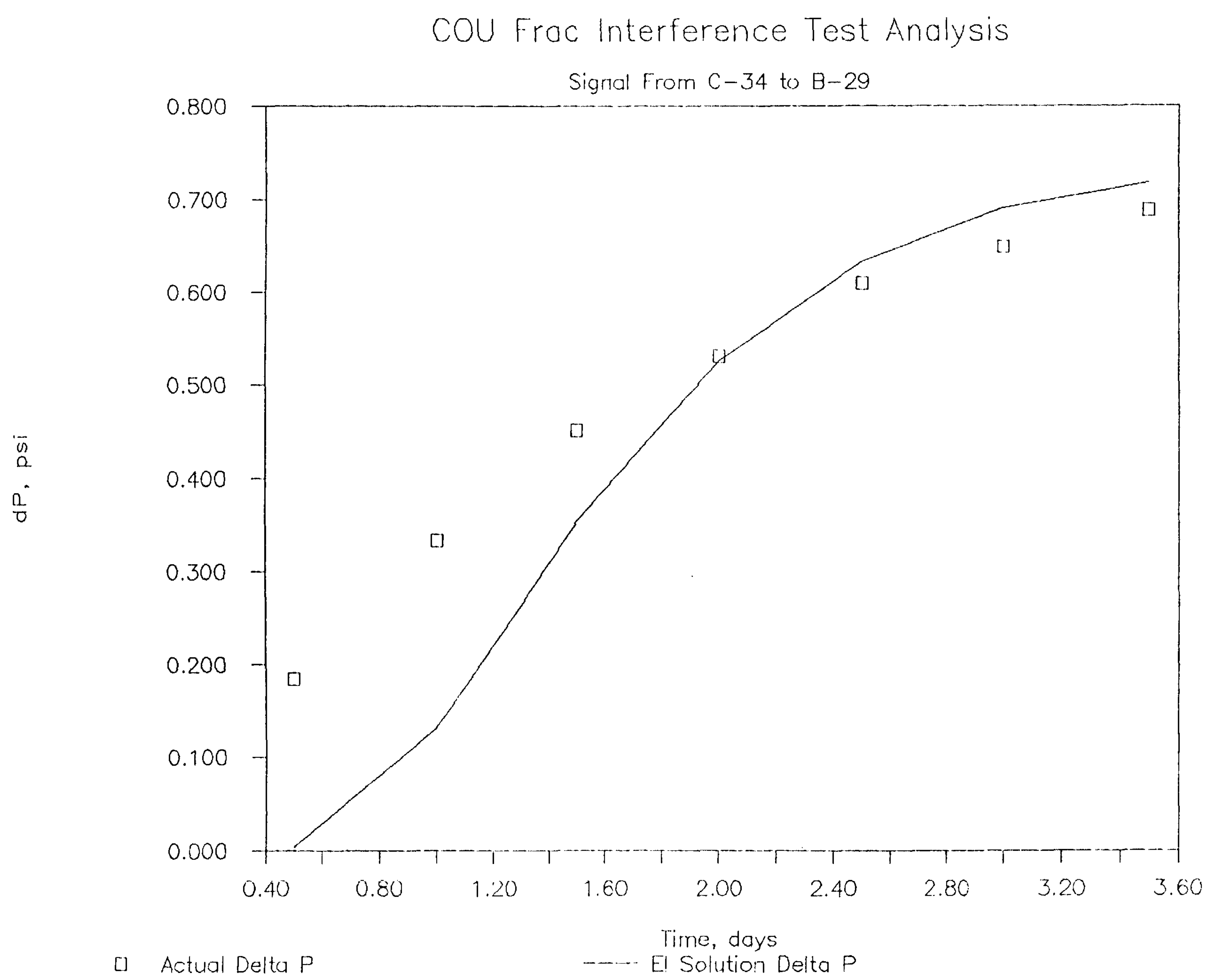

COU Frac Interference Test Analysis
Signal From A-16 to B-32
dP, psi
2.200
2.000
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
0.40
0.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
Time, days
Actual Delta P
El Solution Delta P


COU Frac Pressure Responce
Signal From C-34 to B-29
dP, psia
1000.00
630.96
398.11
251.19
158.49
100.00
63.10
39.81
25.12
15.85
10.00
6.31
3.98
2.51
1.58
1.00
0.10
1.00
10.00
100.00
1000.00
B-29 Shut In Time, hr


COU Frac Pressure Responce
Signal From C-34 to B-29
Pressure, psia
1210.00
1200.00
1190.00
1180.00
1170.00
1160.00
1150.00
1140.00
1130.00
1120.00
1110.00
1100.00
1090.00
0.10
1.00
10.00
100.00
1000.00
B-29 Shut In Time, hr

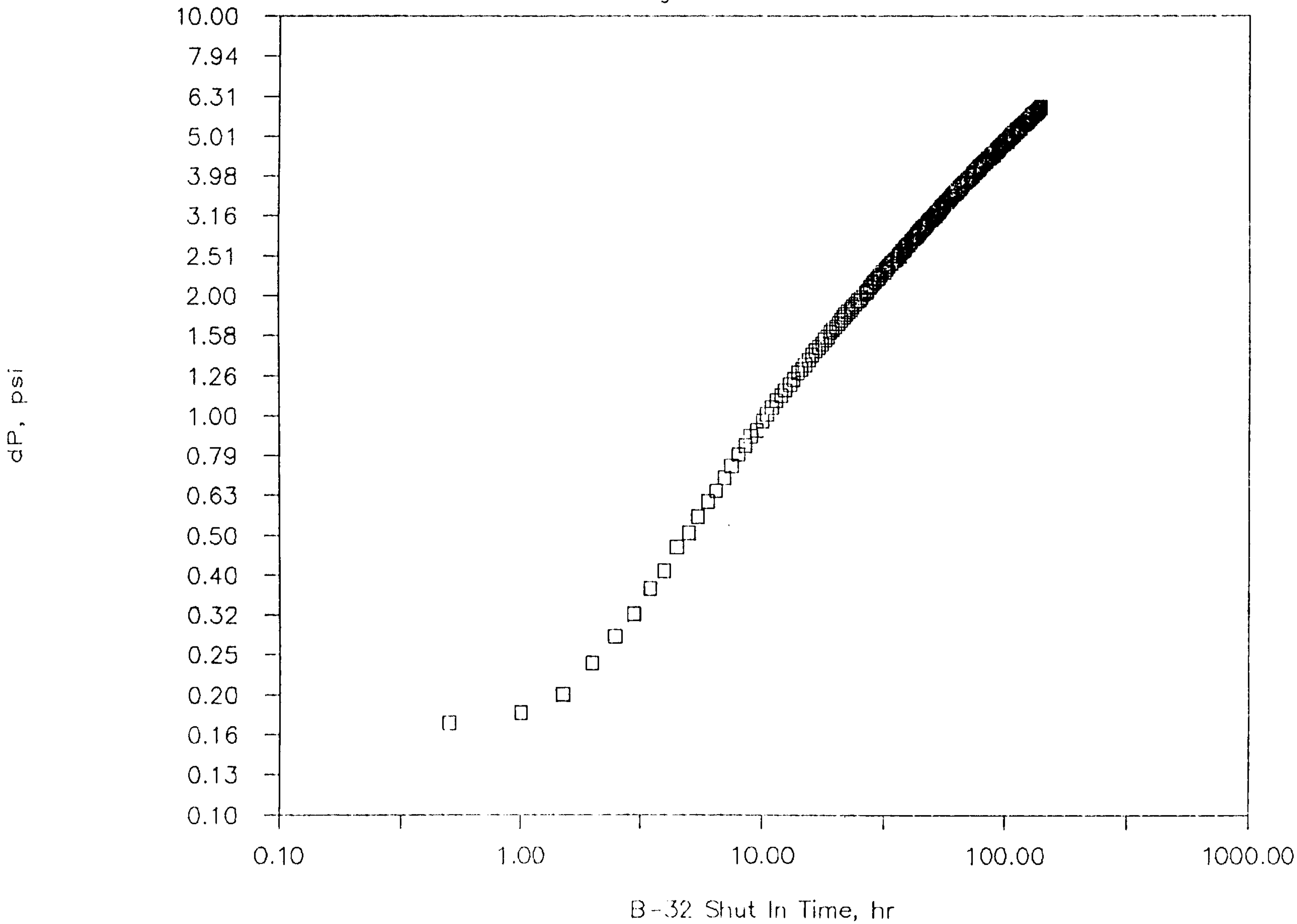


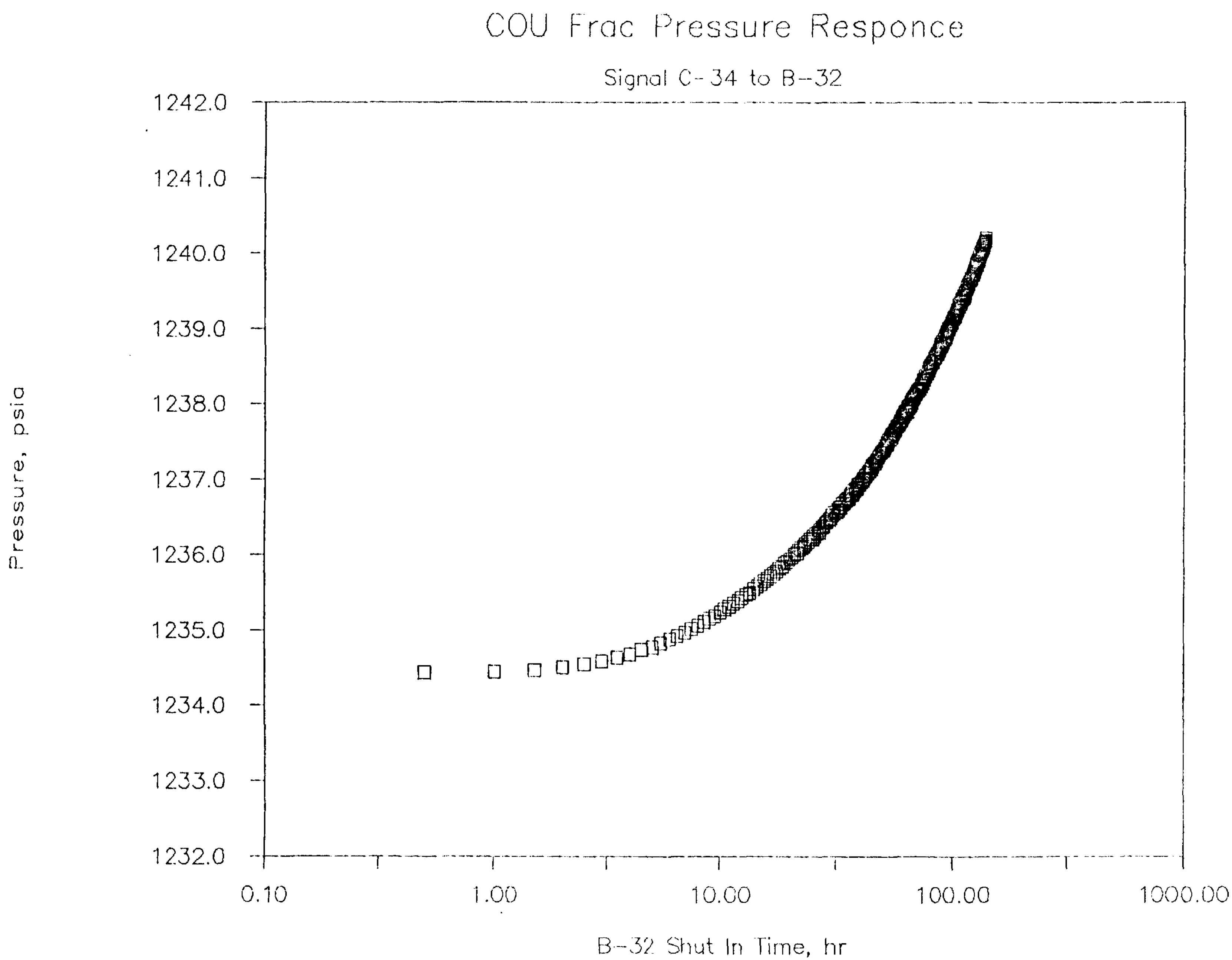
COU Frac Pressure Responce
Signal From C-34 to B-29
C-34 FRAC 4/23/87
1209.00
1208.50
1208.00
1207.50
1207.00
1206.50
1206.00
1205.50
1205.00
1204.50
Pressure, psia
19.95
31.62
50.12
79.43
125.89
B-29 Shut In Time, hr

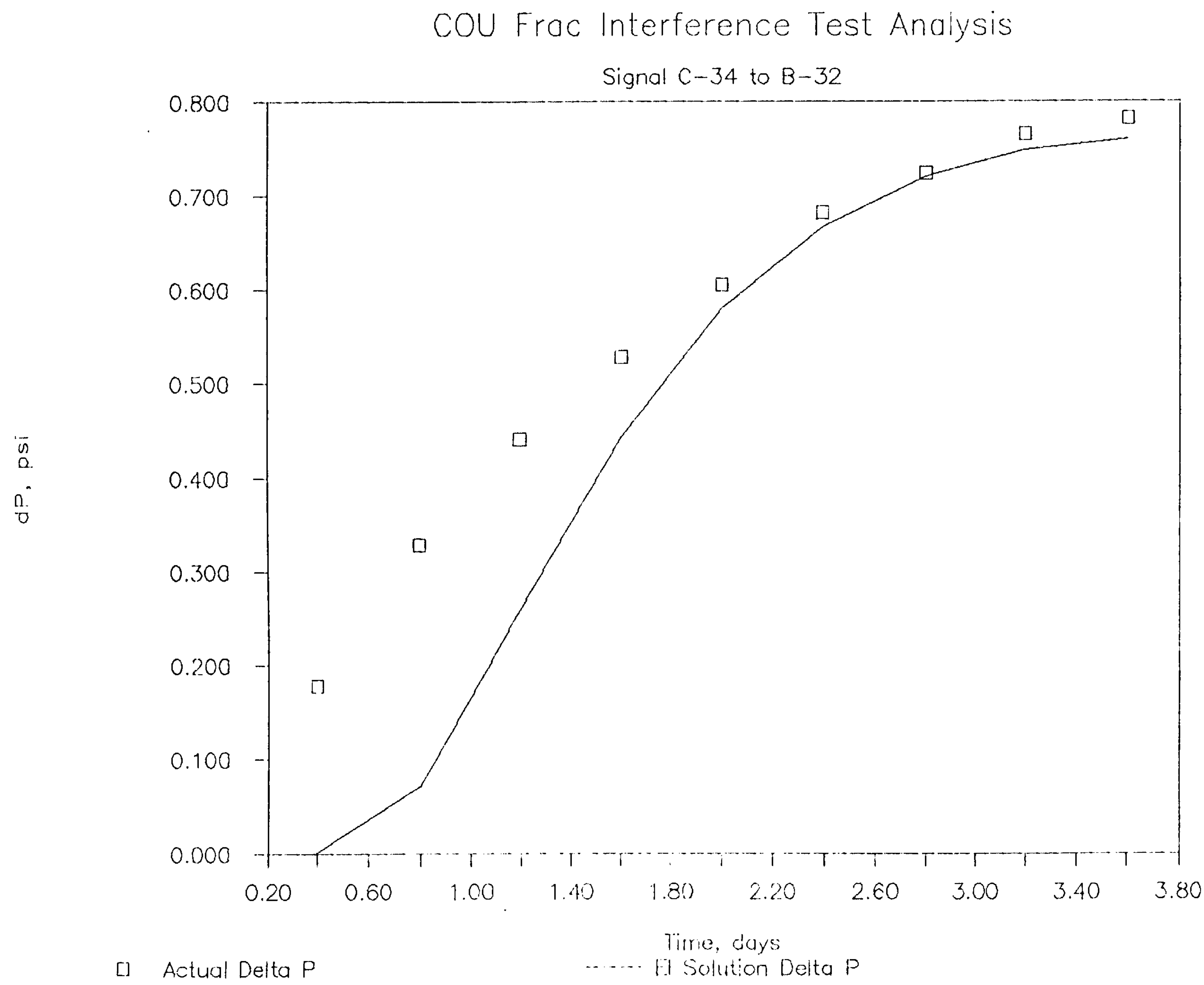

COU Frac Interference Test Analysis
Signal From C-34 to B-29
dP, psi
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.40
0.80
1.20
1.60
2.00
2.40
2.80
3.20
3.60
Time, days
Actual Delta P
El Solution Delta P

COU Frac Pressure Responce

Signal C-34 to B-32




COU Frac Pressure Responce
Signal C-34 to B-32
1242.0
1241.0
1240.0
1239.0
1238.0
1237.0
1236.0
1235.0
1234.0
1233.0
1232.0
Pressure, psia
0.10
1.00
10.00
100.00
1000.00
B-32 Shut In Time, hr



COU Frac Interference Test Analysis
Signal C-34 to B-32
dP, psi
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
0.20
0.60
1.00
1.40
1.80
2.20
2.60
3.00
3.40
3.80
Time, days
Actual Delta P
FI Solution Delta P

APPENDIX 4

Rate Sensitivity

$$q_{crit} = \frac{(4.9\times10^{-4})(kk'_{rg})(A)(\Delta\gamma)(\sin\theta)}{(\mu_g)(M-1)} = RB/D$$

Page 376 Data

$$kk'_{rg} = \frac{235}{235 ft} = 1.0 md$$

$B_o = 1.293$

$A = 139400$

$\Delta\gamma = (0.7206 - 0.0136)$

$\mu_g = 0.01359$

$\mu_o = 0.710$

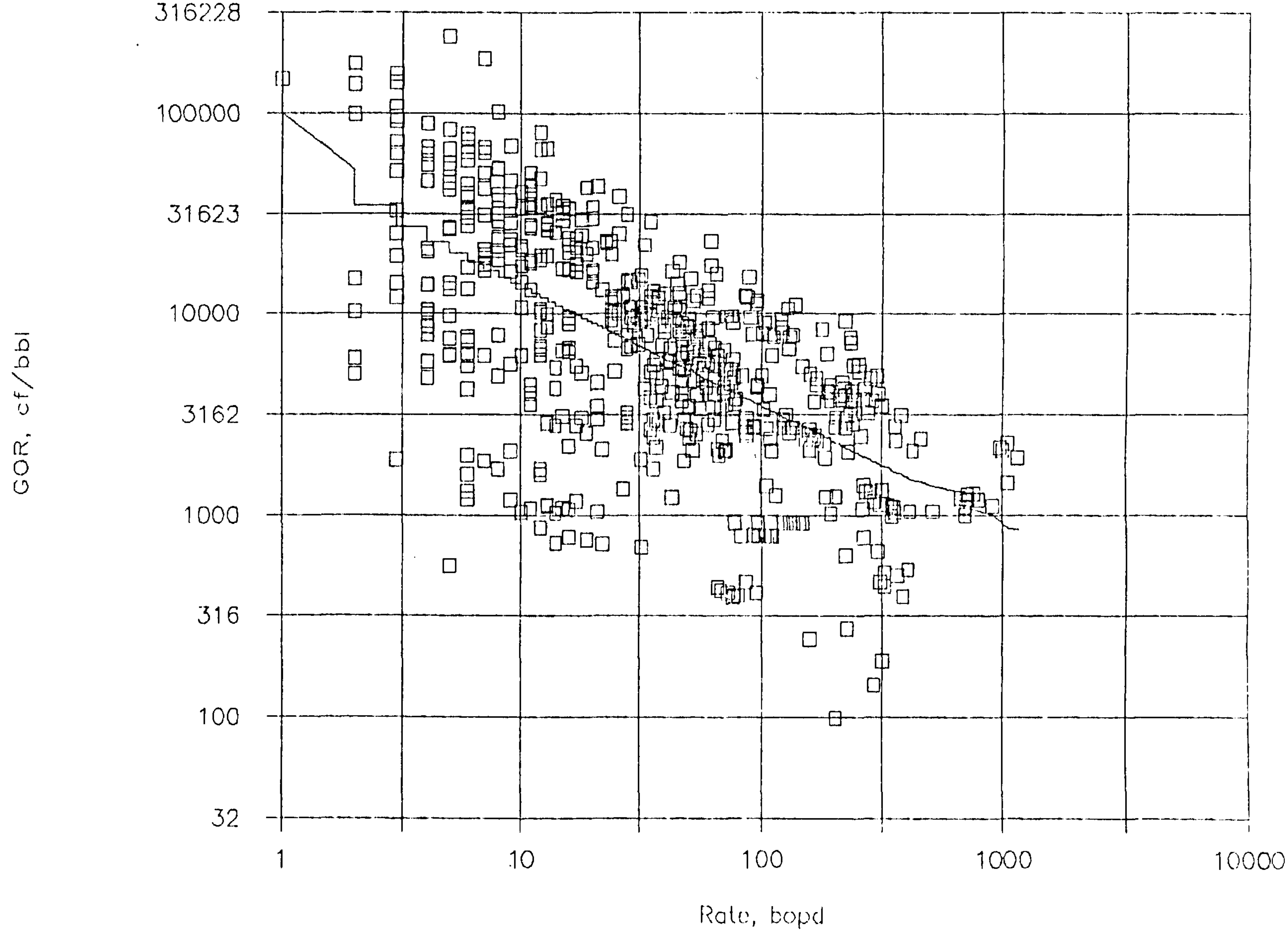
$$M = \frac{k_{rg}}{k_{ro}}\frac{\mu_o}{\mu_g} \quad @\ 800\ psi \quad \frac{(0.85)(0.710)}{0.01359} = 44.4$$

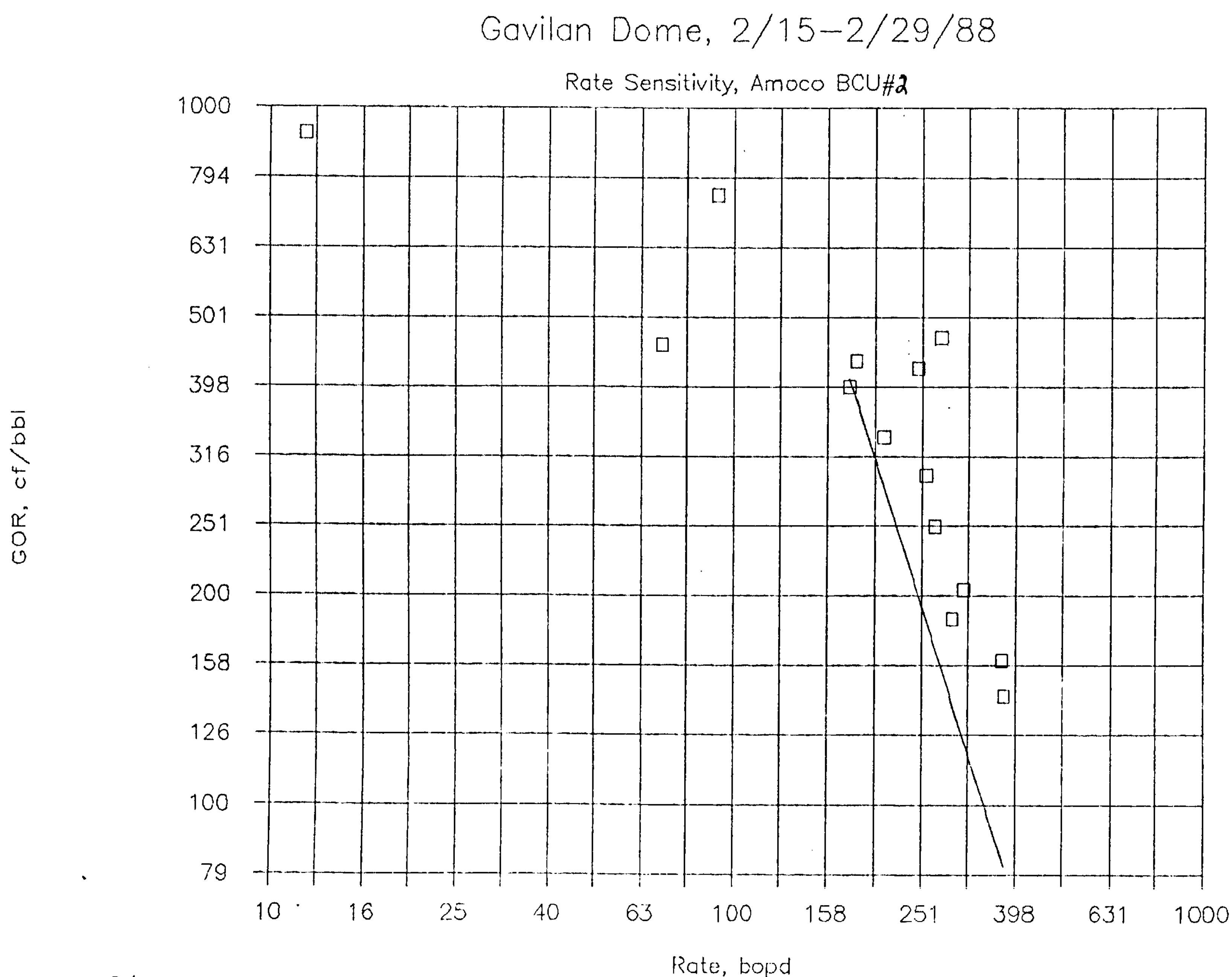
$$q_{crit} = \frac{(4.9\times10^{-4})(1\ md)(139400)(0.7206-0.0136)(-1)}{(0.01359)(44.4-1)(1.293)}$$

$q_{crit} = 63.3\ RB/D$ or $50\ STB/D$

GAVILAN--W. PUERTO CHIQUITO

Rate Sensitivity, All Wells

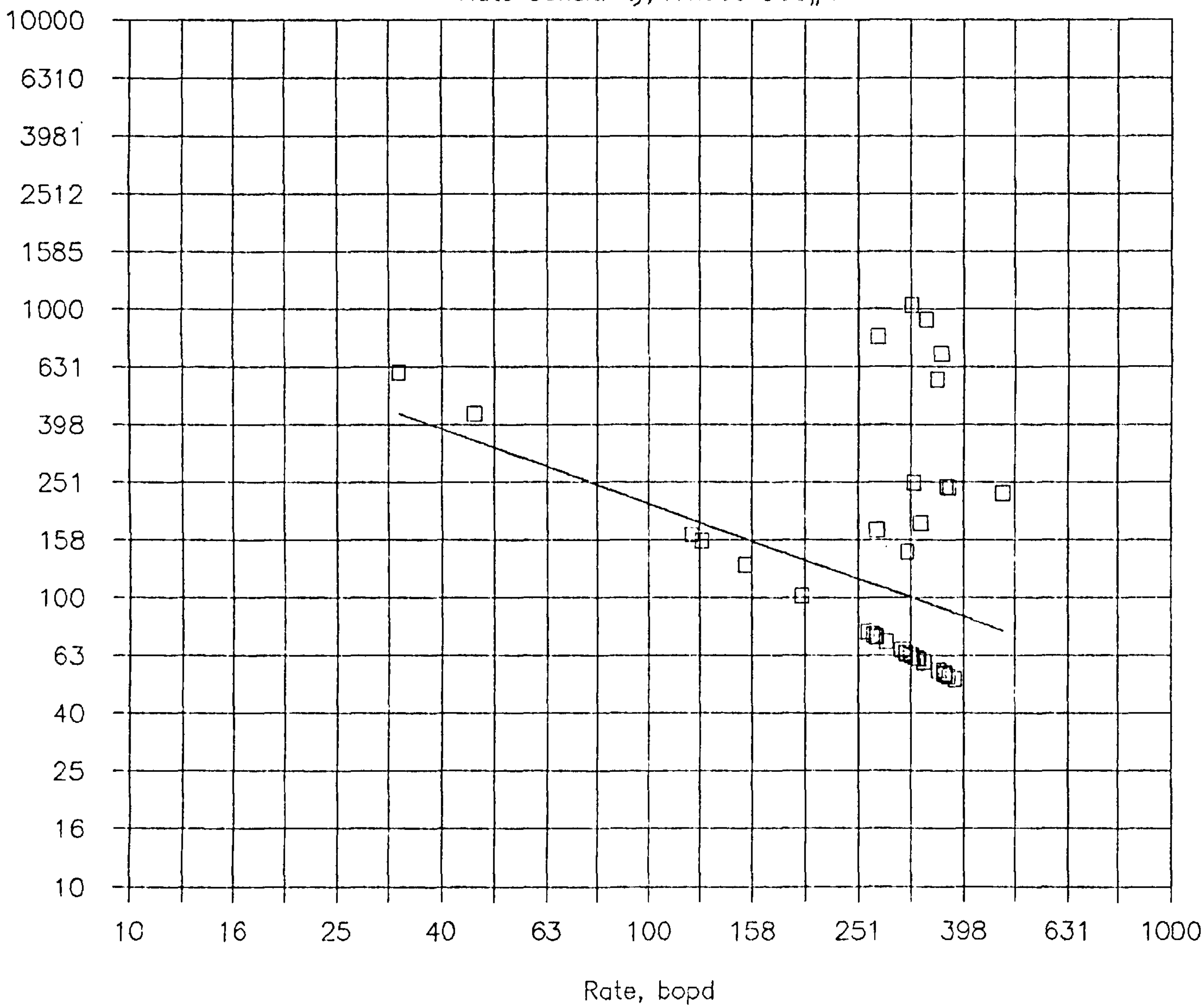



Gavilan Dome, 2/15–2/29/88
Rate Sensitivity, Amoco BCU#2
GOR, cf/bbl
1000
794
631
501
398
316
251
200
158
126
100
79
10
16
25
40
63
100
158
251
398
631
1000
Rate, bopd

C.C. = 0.31

Gavilan Dome, 1/6–2/29/88

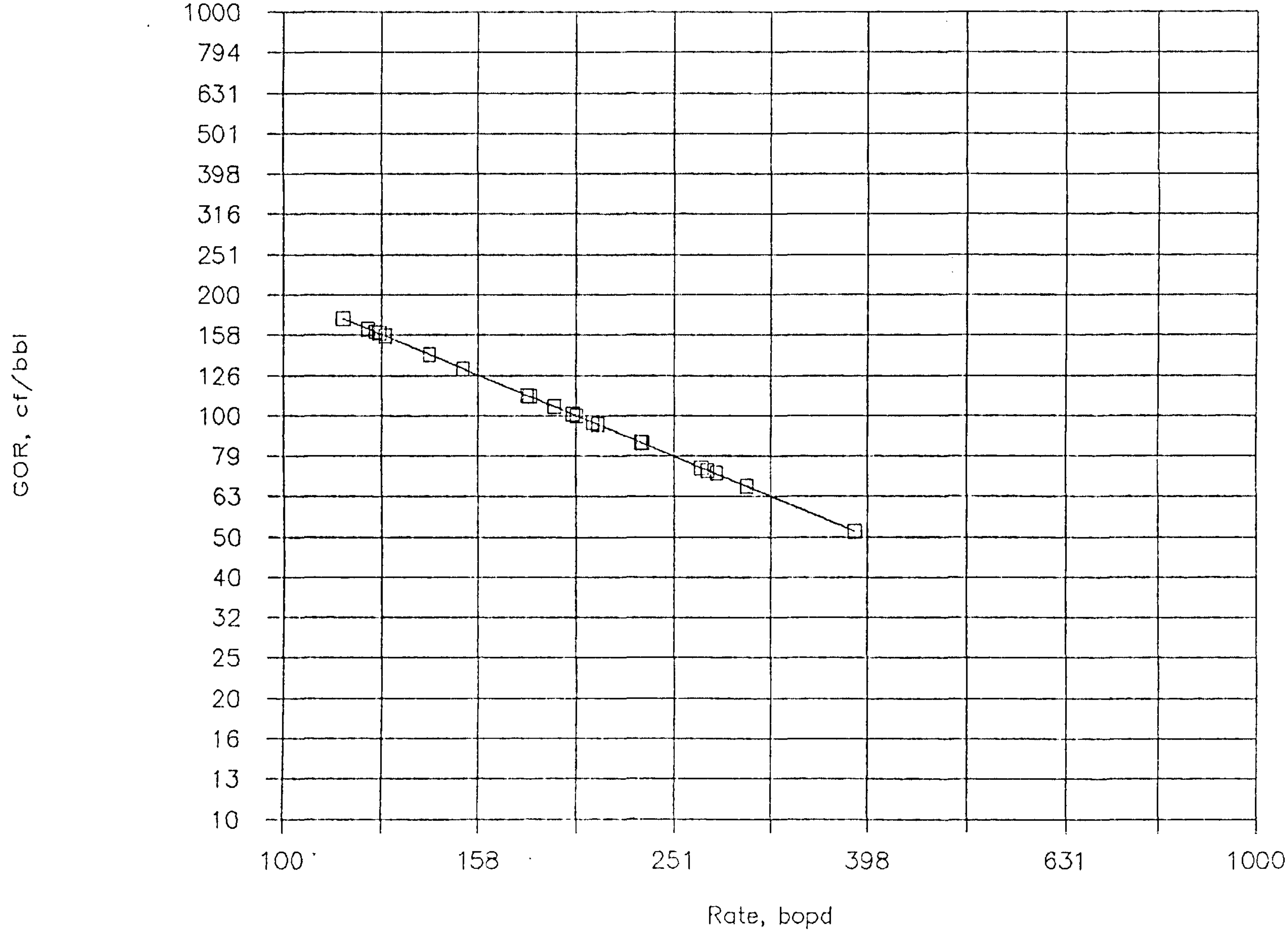
Rate Sensitivity, Amoco SGC#1



C.C. = 0.35

Gavilan Dome, 2/1–2/29/88

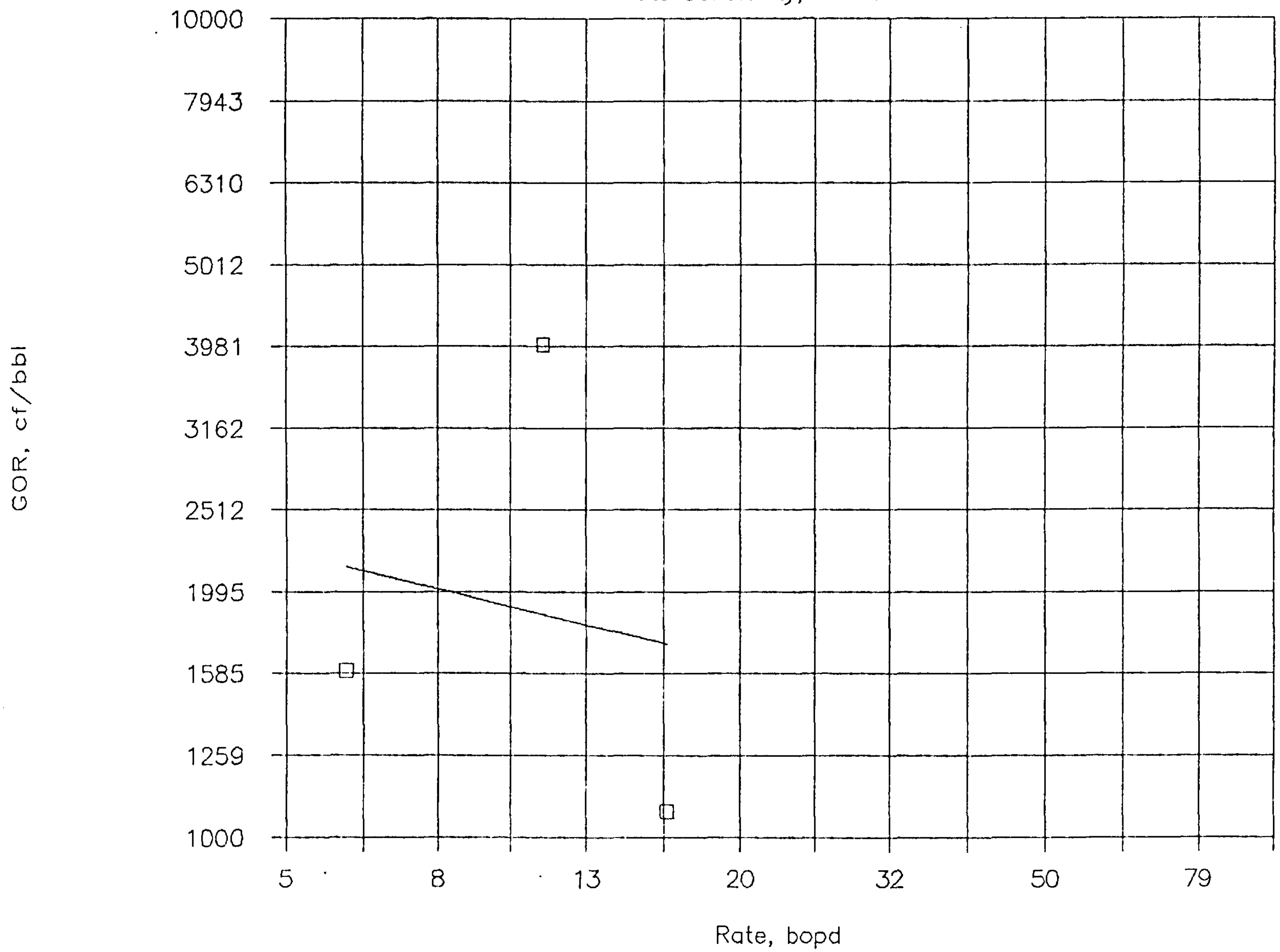
Rate Sensitivity, Amoco SCC



C.C. = 1.00

W. Puerto Chiquito, July–Sept. 87

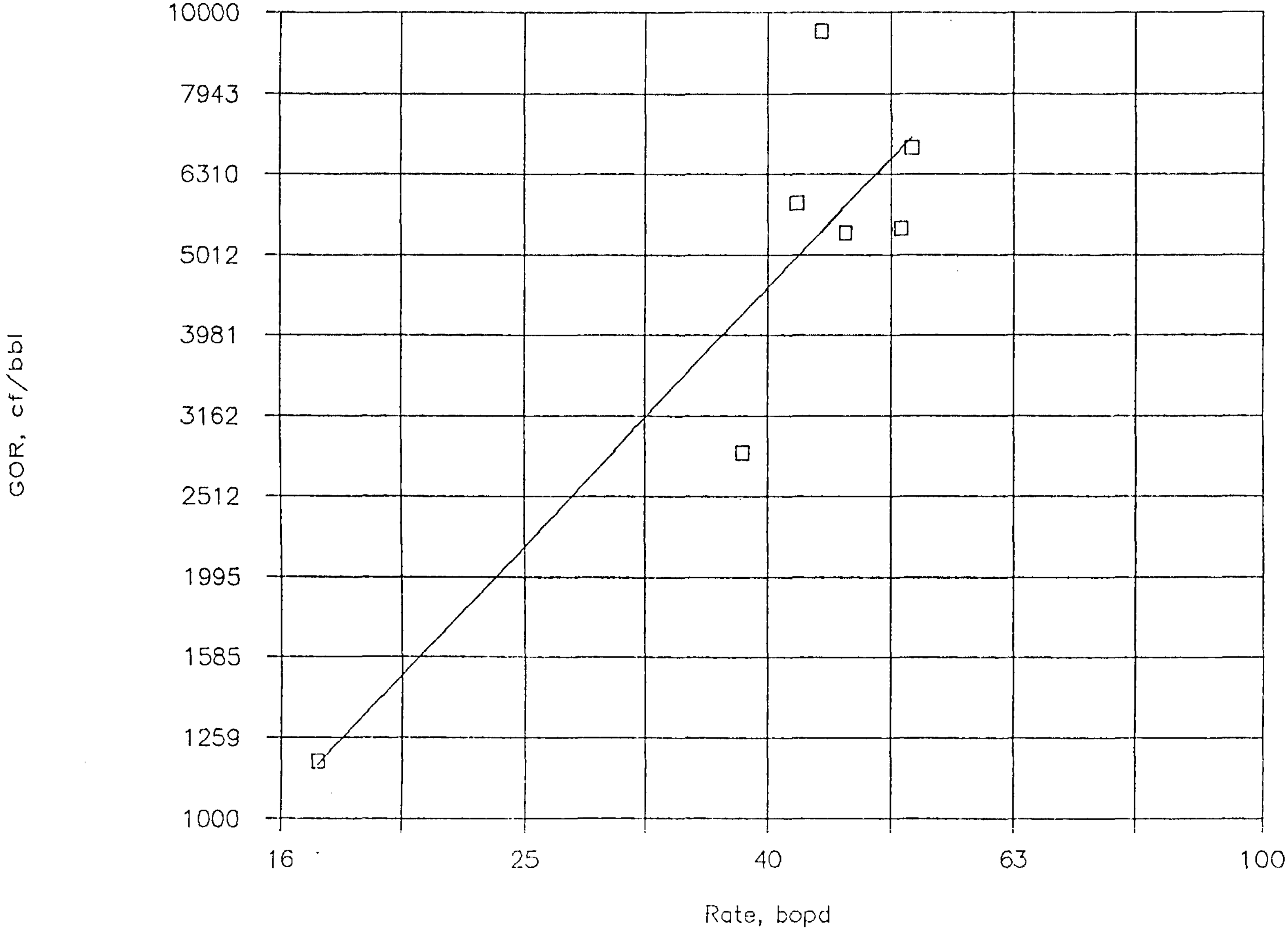
Rate Sensitivity, BMG A–16



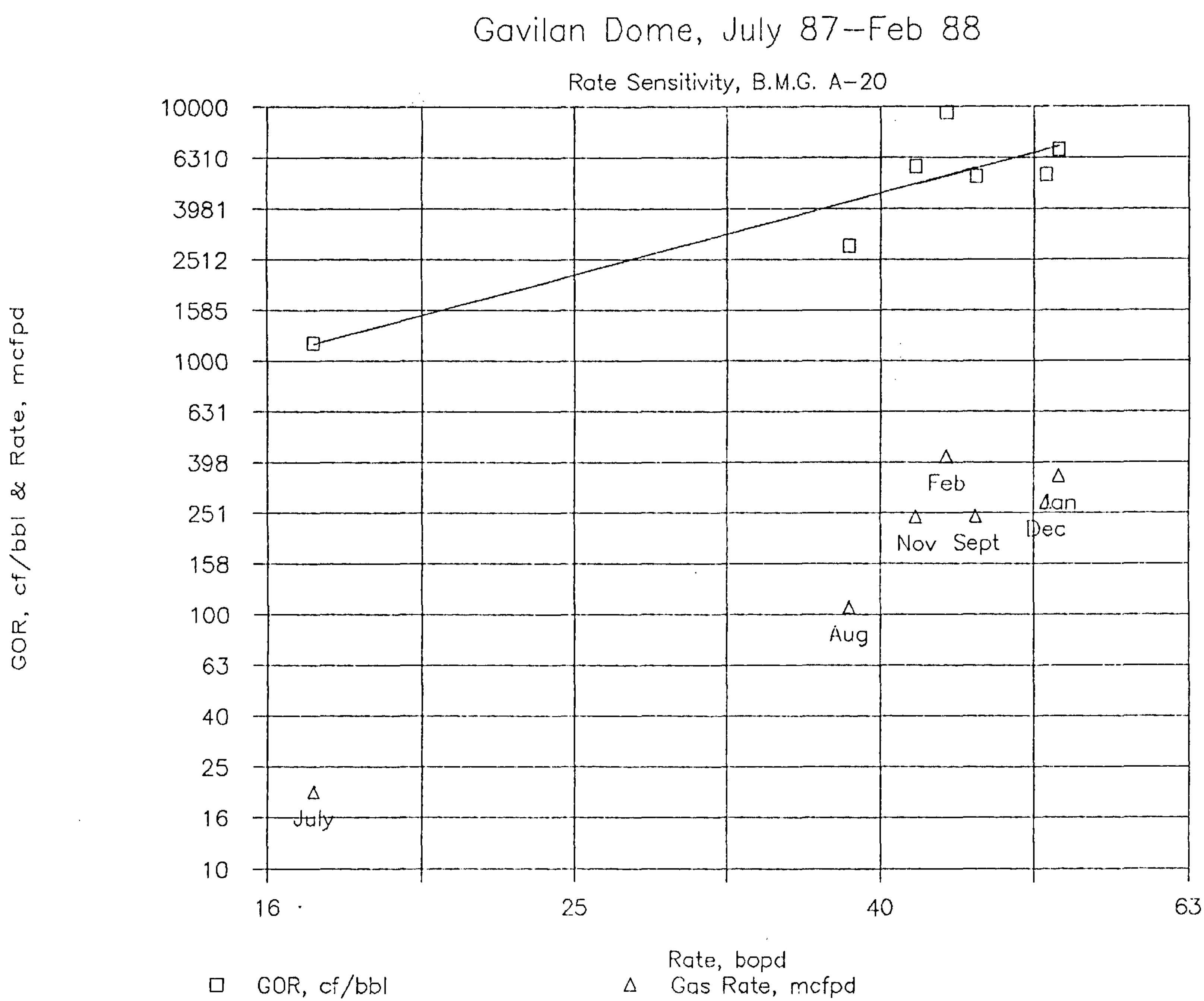
C.C. = 0.16

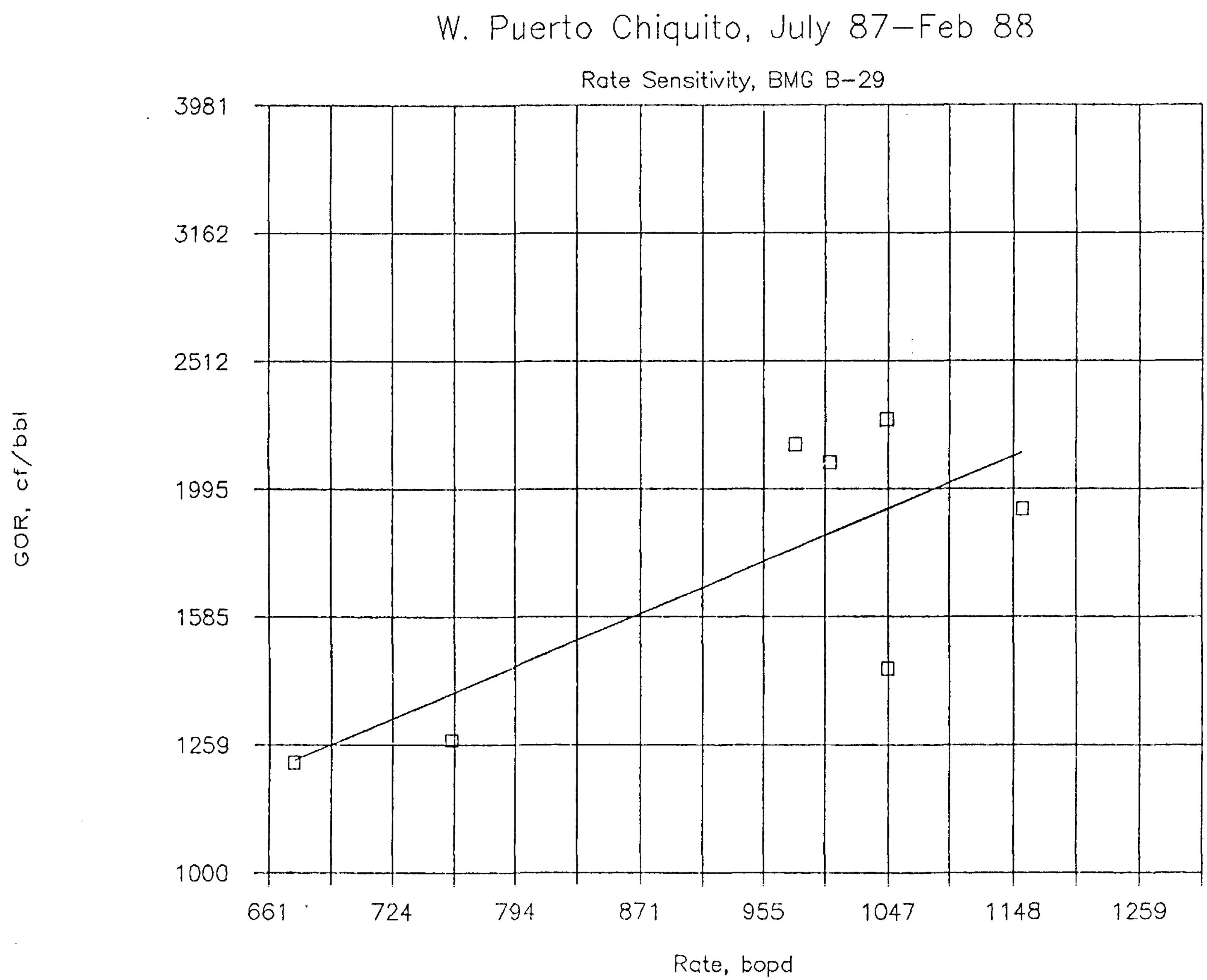
W. Puerto Chiquito, July 87–Feb 88

Rate Sensitivity, BMG A–20



C. C. =0.90


Gavilan Dome, July 87--Feb 88
Rate Sensitivity, B.M.G. A-20
10000
6310
3981
2512
1585
1000
631
398
251
158
100
63
40
25
16
10
GOR, cf/bbl & Rate, mcfpd
Feb
Jan
Dec
Nov
Sept
Aug
July
16
25
40
63
Rate, bopd
GOR, cf/bbl
Gas Rate, mcfpd

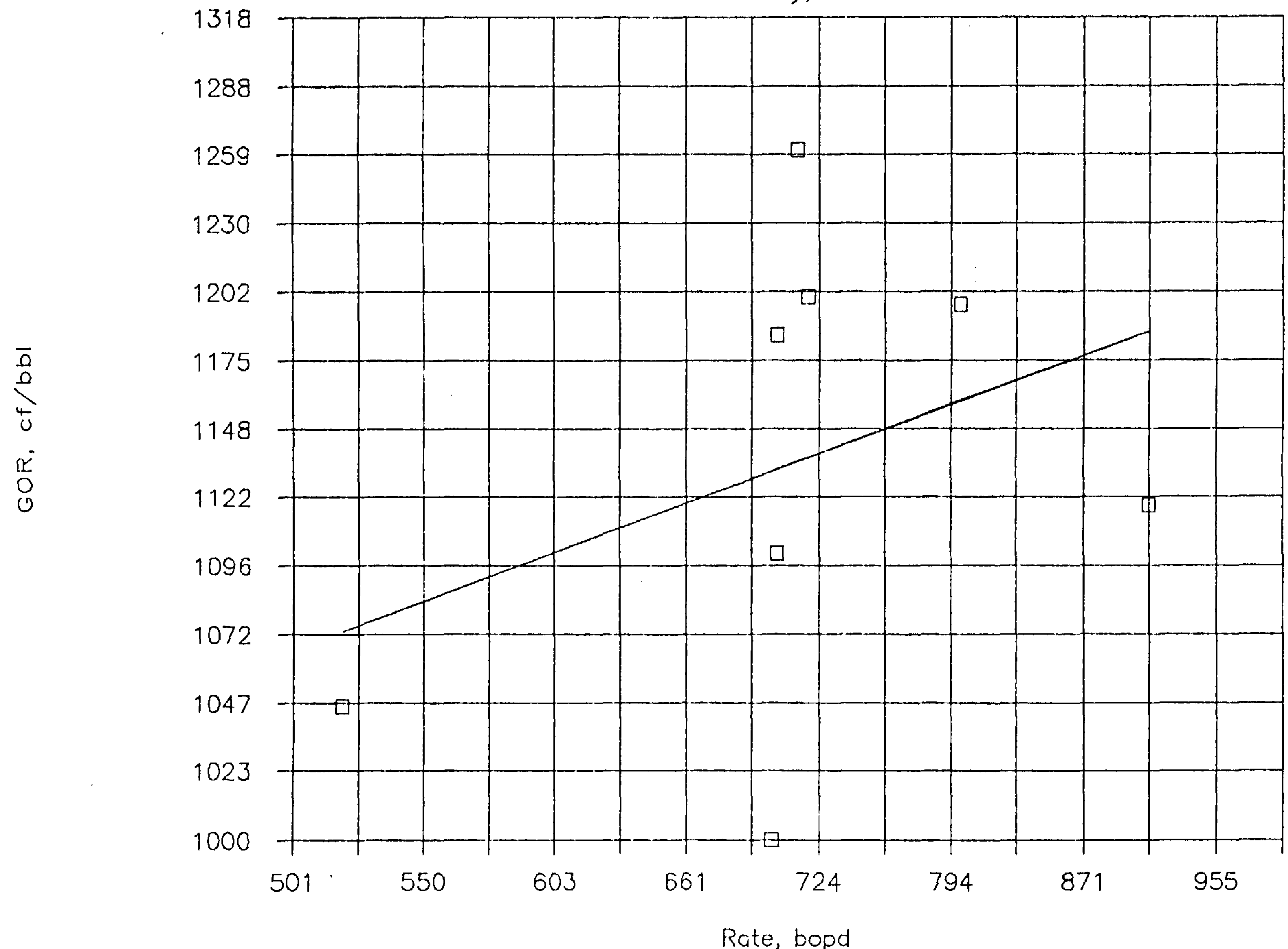


W. Puerto Chiquito, July 87–Feb 88
Rate Sensitivity, BMG B–29
3981
3162
2512
1995
1585
1259
1000
GOR, cf/bbl
661
724
794
871
955
1047
1148
1259
Rate, bopd

C. C. = 0. 76

W. Puerto Chiquito, July 87–Feb 88

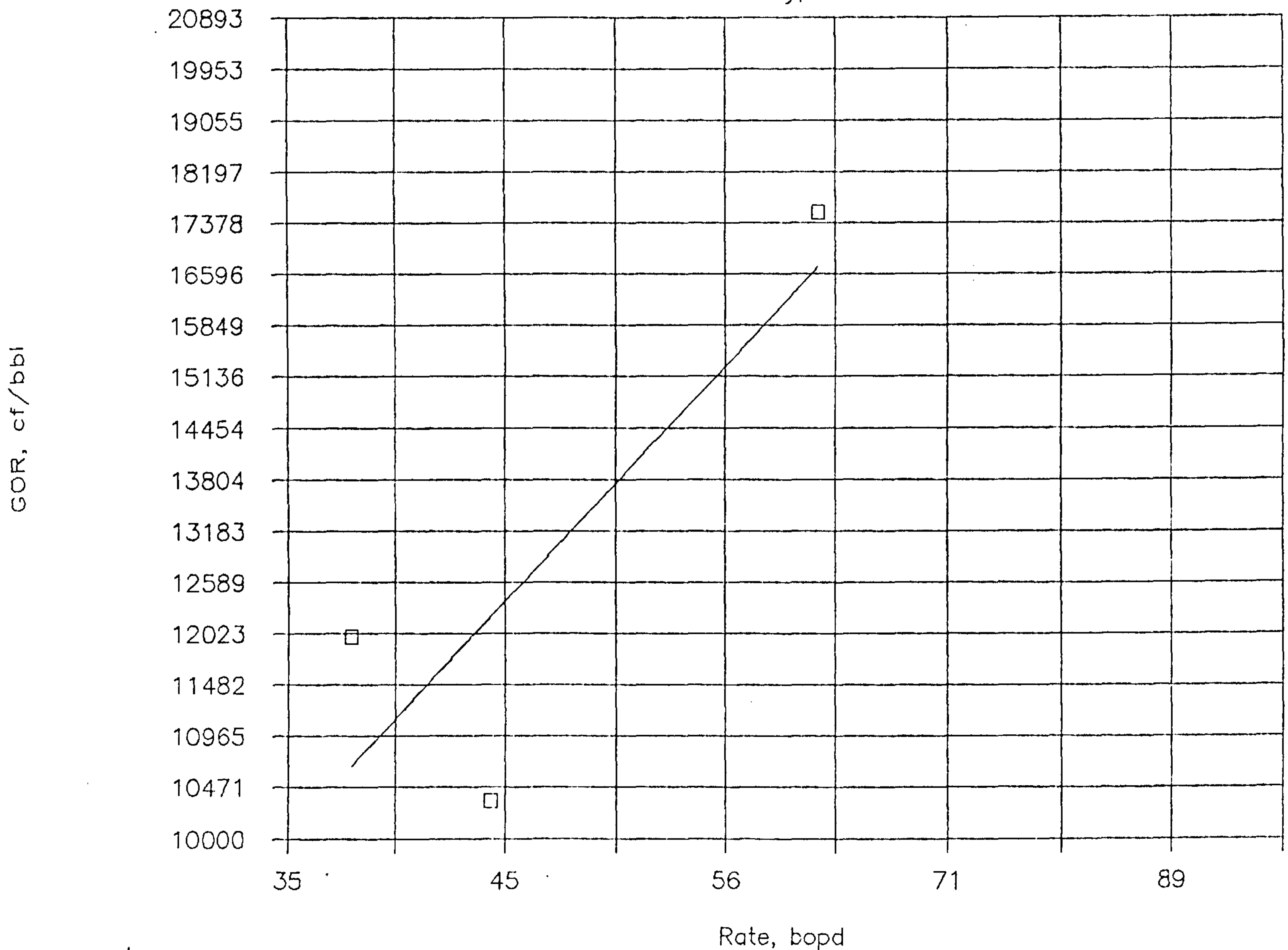
Rate Sensitivity, BMG B-32



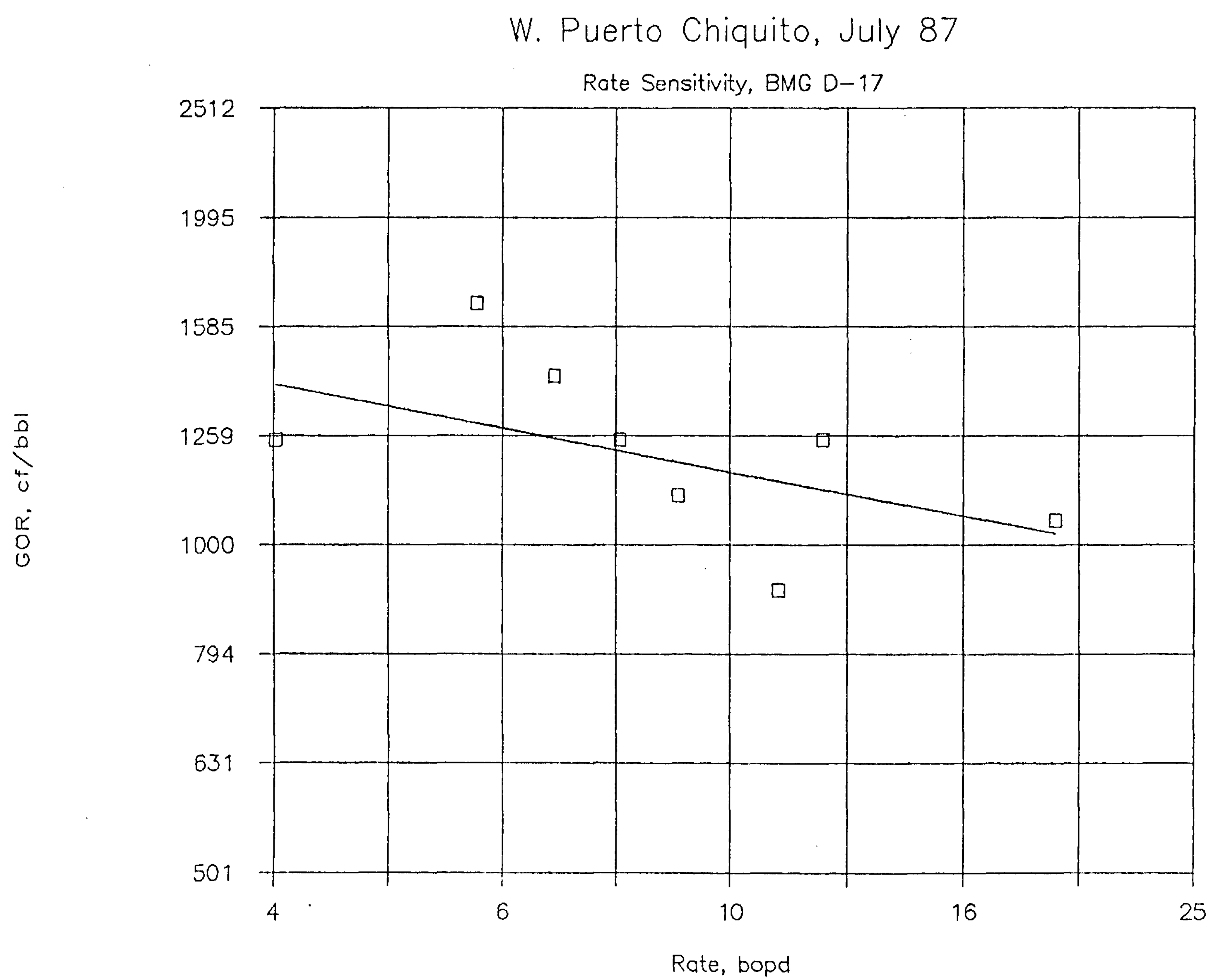
C.C. = 0.36

W. Puerto Chiquito, Dec 87—Feb 88

Rate Sensitivity, BMG C—34

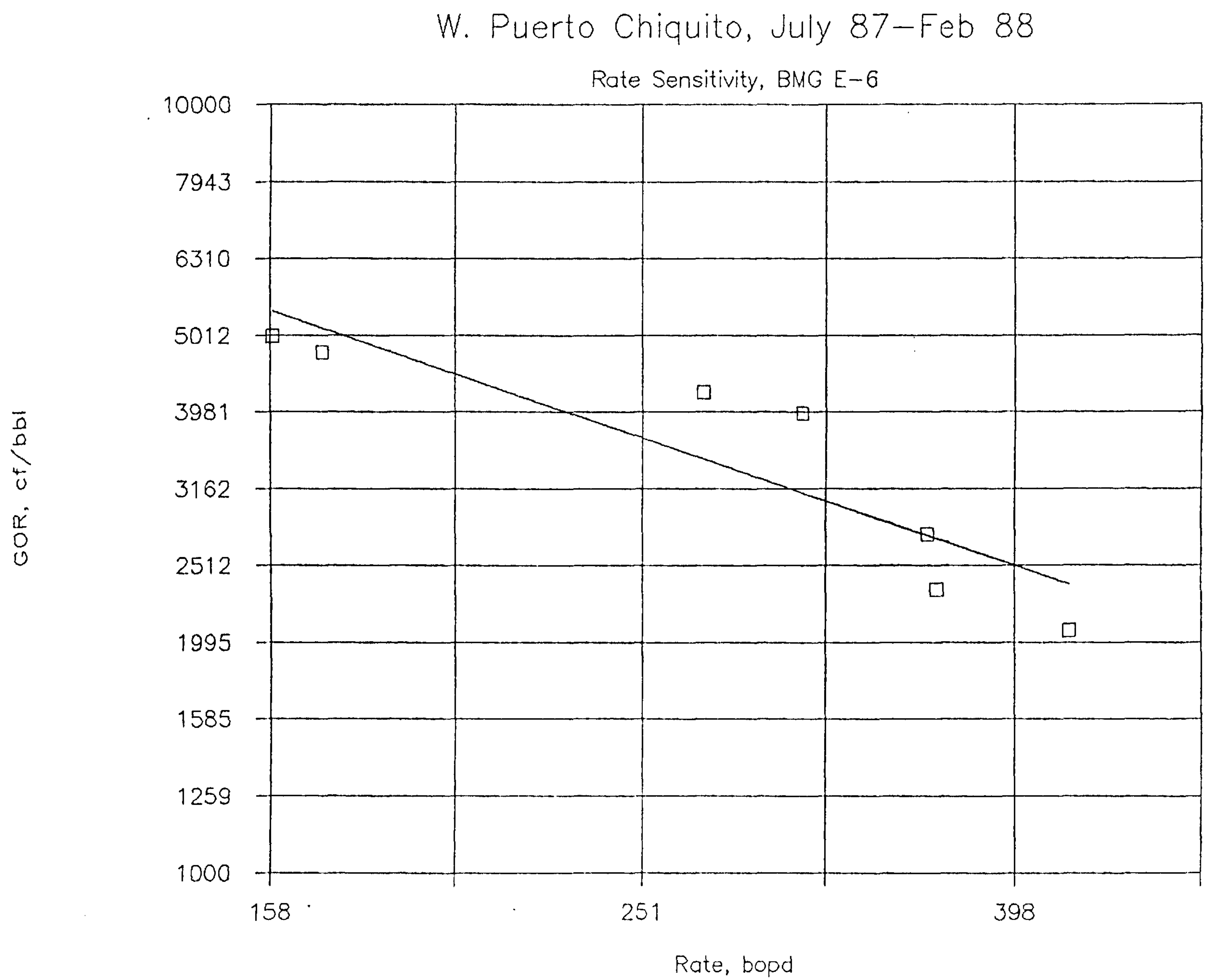


C.C. = 0.84



W. Puerto Chiquito, July 87
Rate Sensitivity, BMG D-17
GOR, cf/bbl
2512
1995
1585
1259
1000
794
631
501
4
6
10
16
25
Rate, bopd

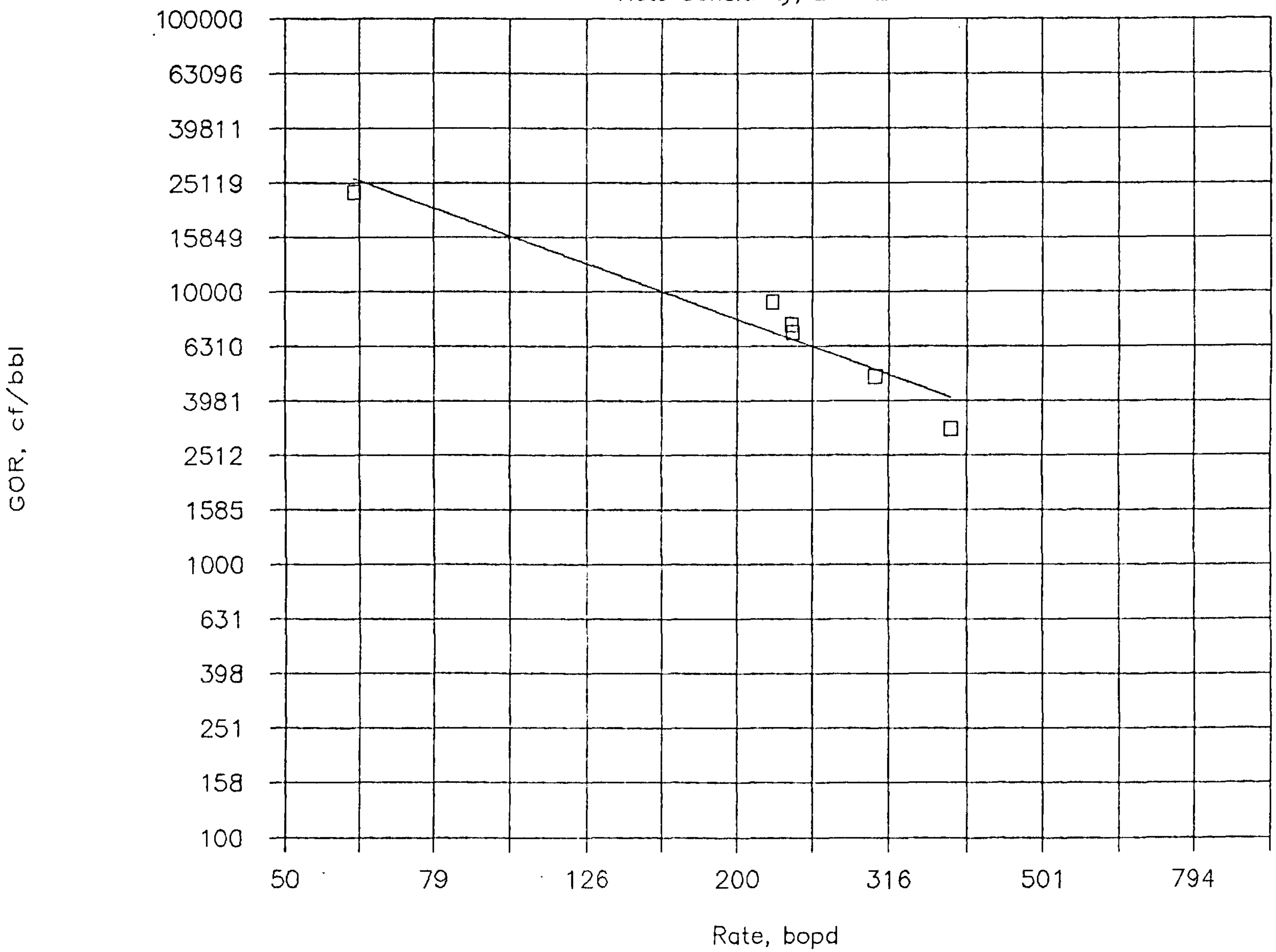
C.C. = 0.52


W. Puerto Chiquito, July 87—Feb 88
Rate Sensitivity, BMG E-6
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
GOR, cf/bbl
158
251
398
Rate, bopd

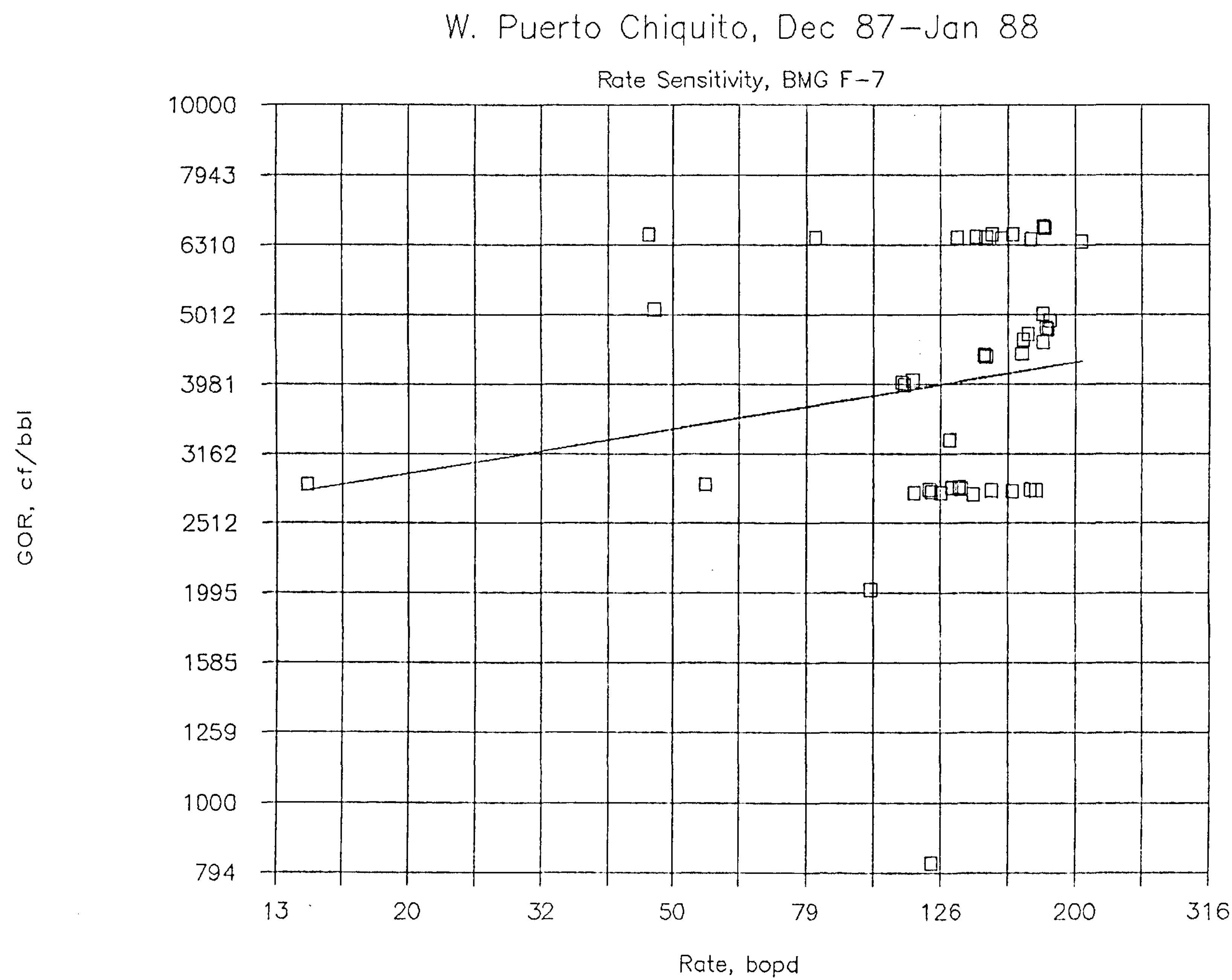
C. C. = 0.89

W. Puerto Chiquito, July 87–Feb 88

Rate Sensitivity, BMG E–10

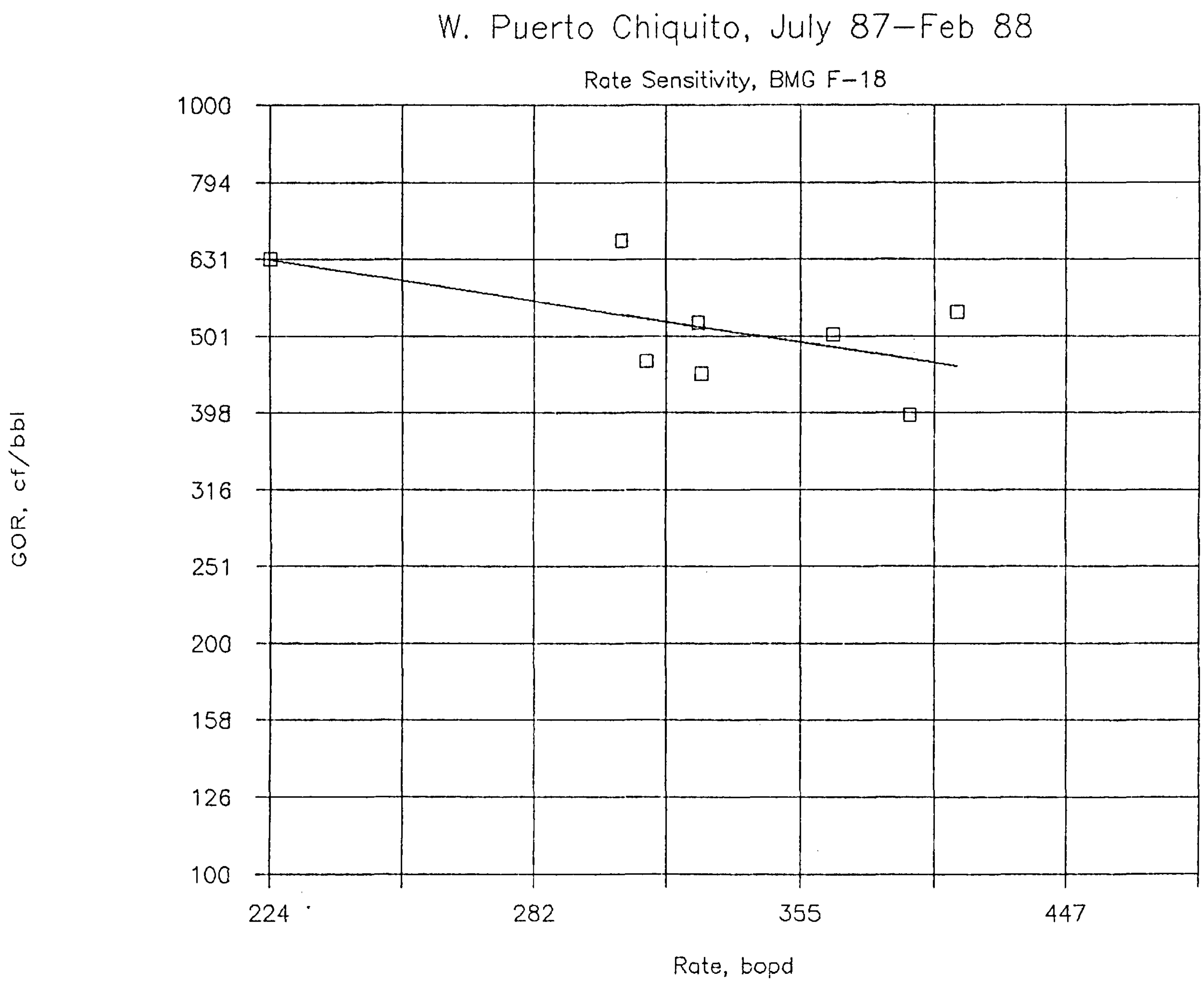


C. C. = 0.96



W. Puerto Chiquito, Dec 87–Jan 88
Rate Sensitivity, BMG F-7
GOR, cf/bbl
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
794
13
20
32
50
79
126
200
316
Rate, bopd

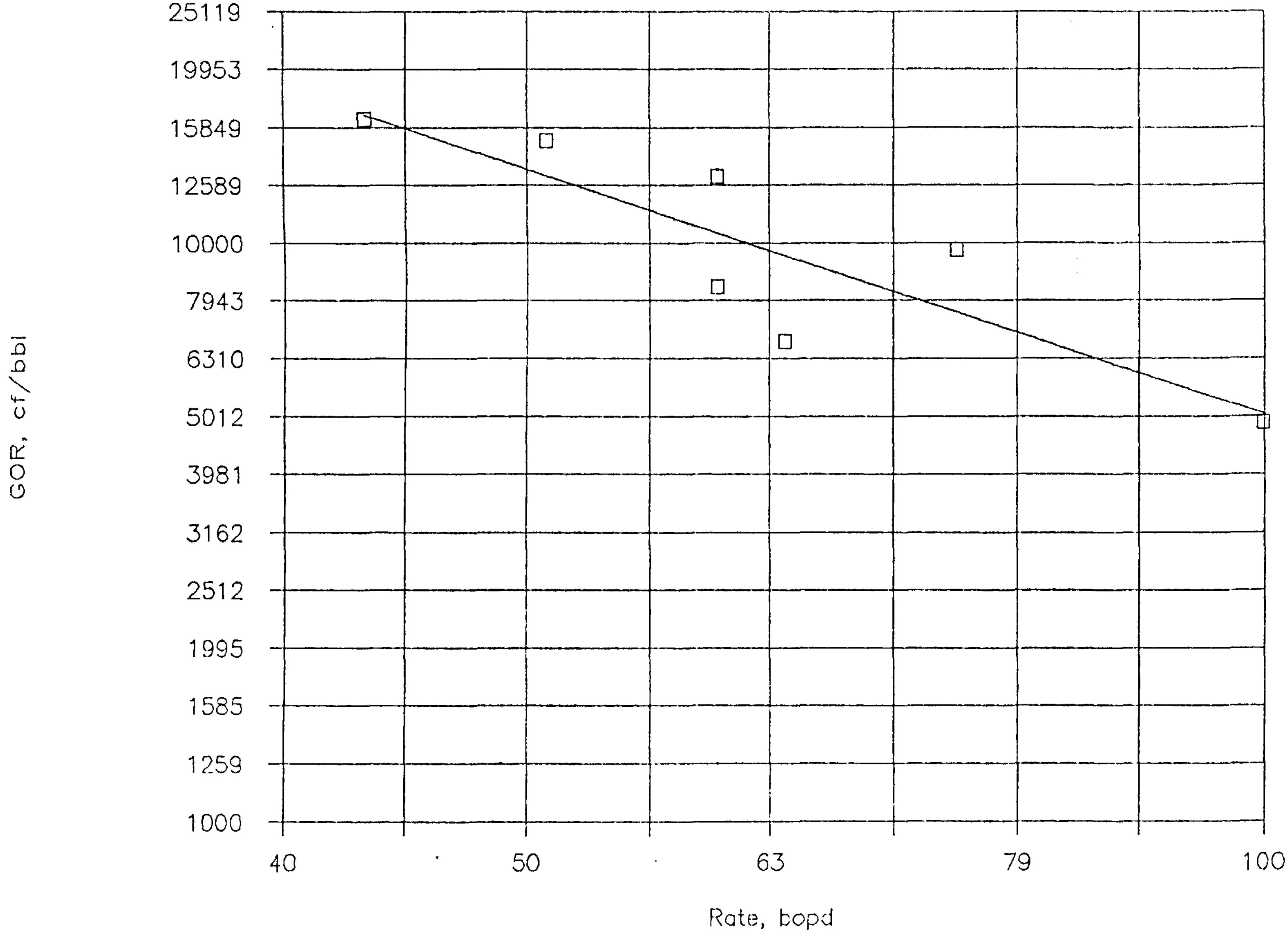
C. C. = 0.18


W. Puerto Chiquito, July 87—Feb 88
Rate Sensitivity, BMG F-18
GOR, cf/bbl
1000
794
631
501
398
316
251
200
158
126
100
224
282
355
447
Rate, bopd

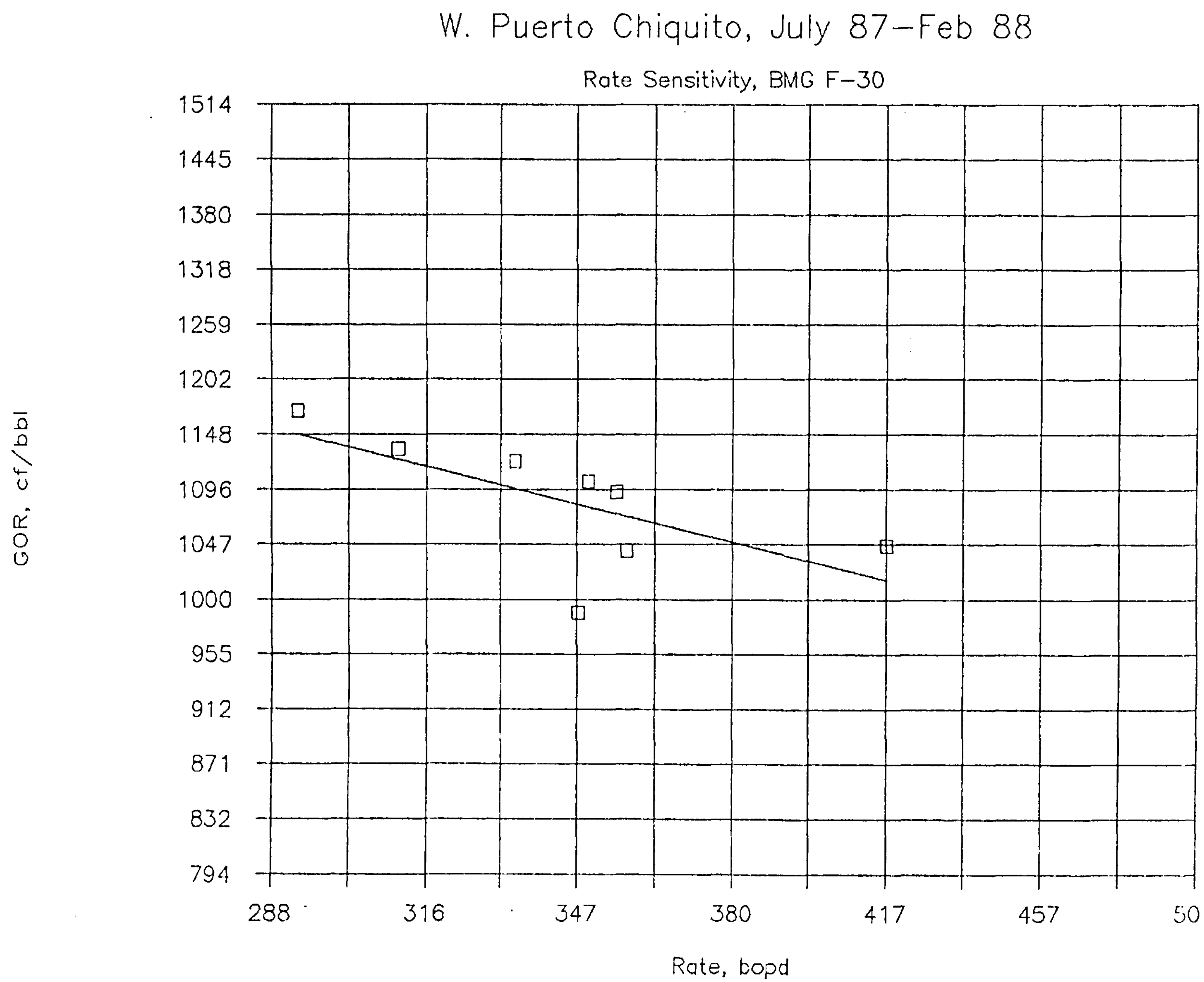
C.C. = 0.58

W. Puerto Chiquito, July 87–Feb 88

Rate Sensitivity, BMG F-19



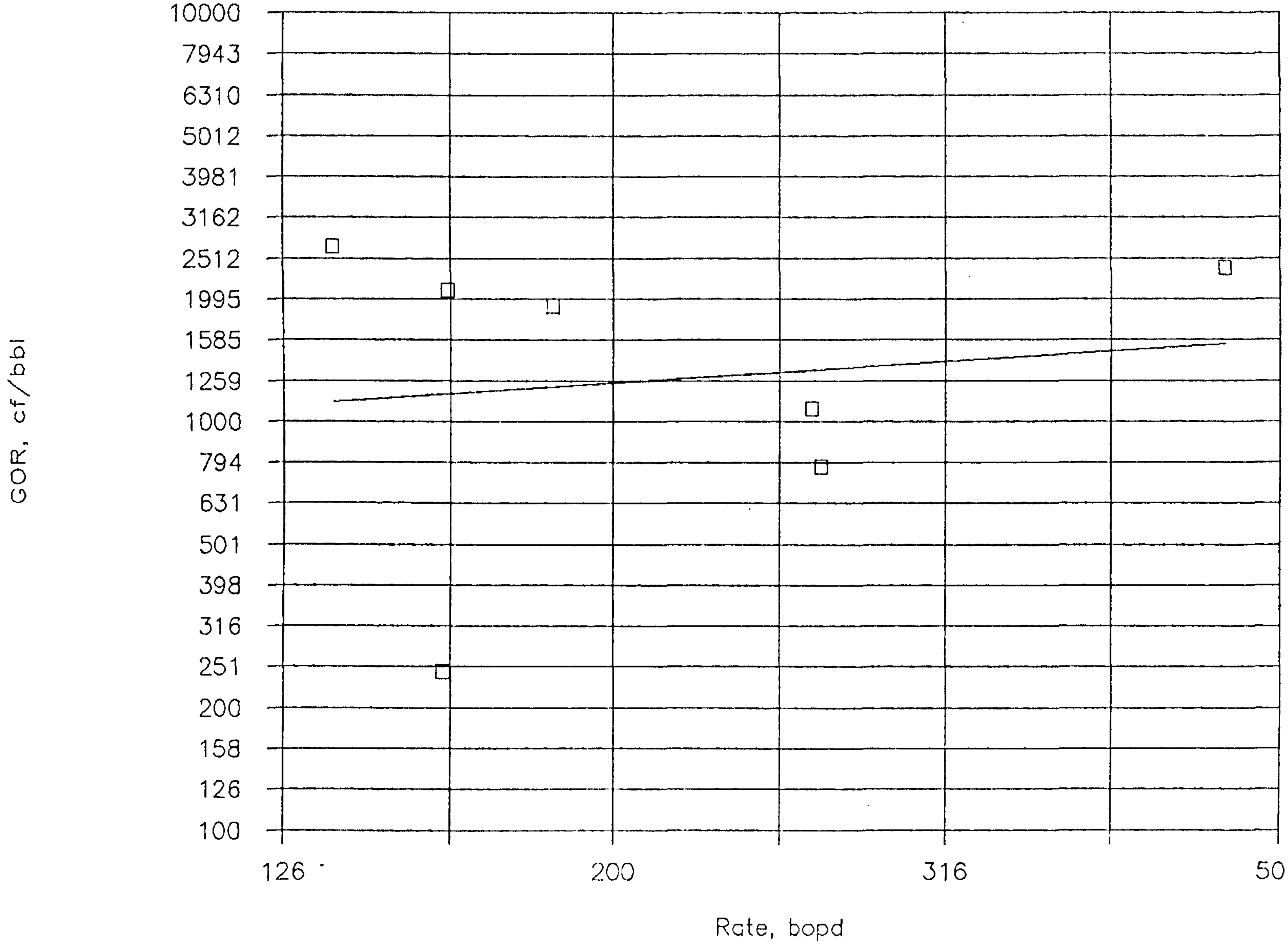
C. C. = 0.87


W. Puerto Chiquito, July 87—Feb 88
Rate Sensitivity, BMG F-30
GOR, cf/bbl
1514
1445
1380
1318
1259
1202
1148
1096
1047
1000
955
912
871
832
794
288
316
347
380
417
457
501
Rate, bopd

C.C. = 0.66

W. Puerto Chiquito, July 87–Feb 88

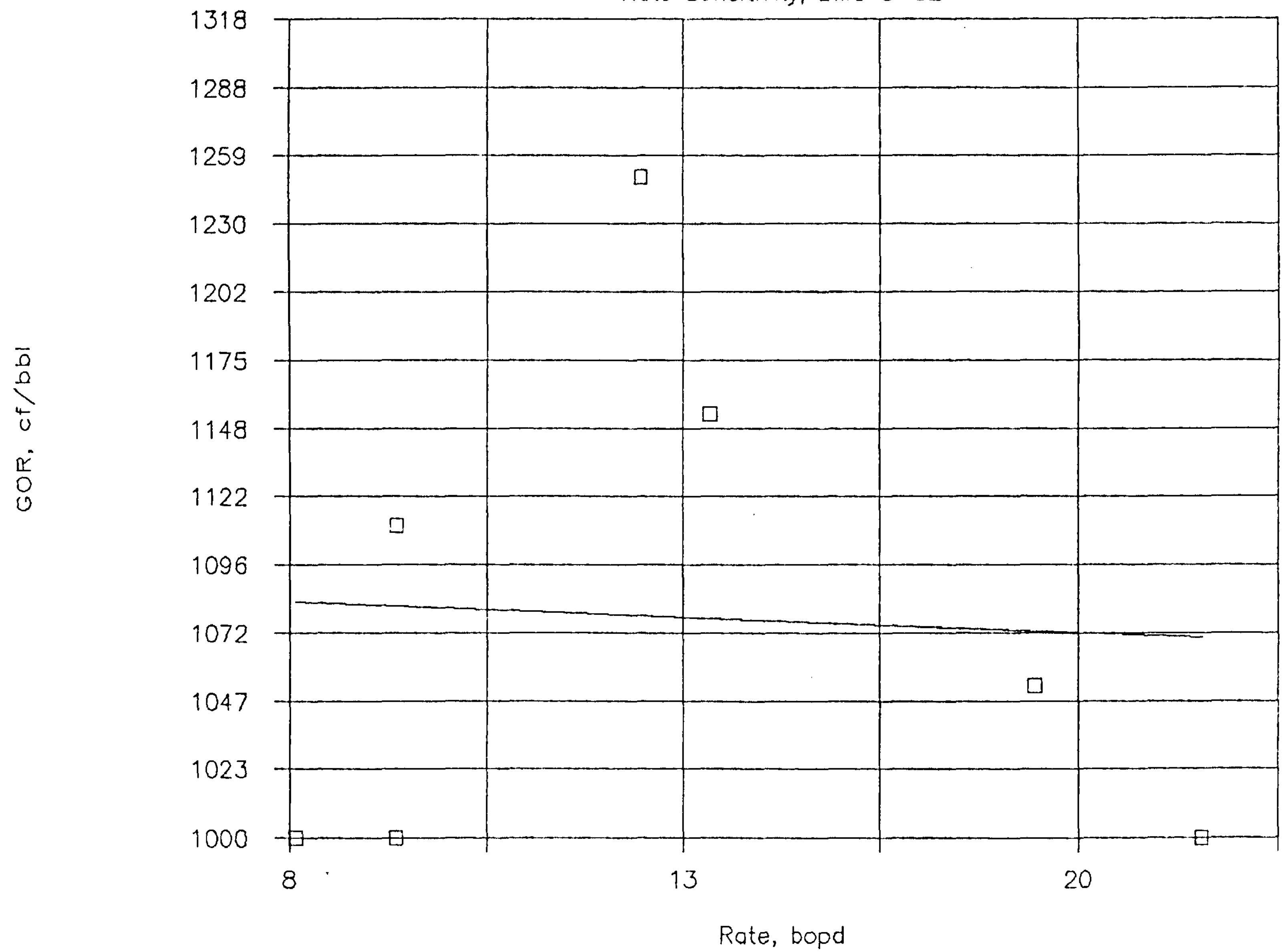
Rate Sensitivity, BMG G-5



C.C. = 0.13

W. Puerto Chiquito, July 87–Sept 87

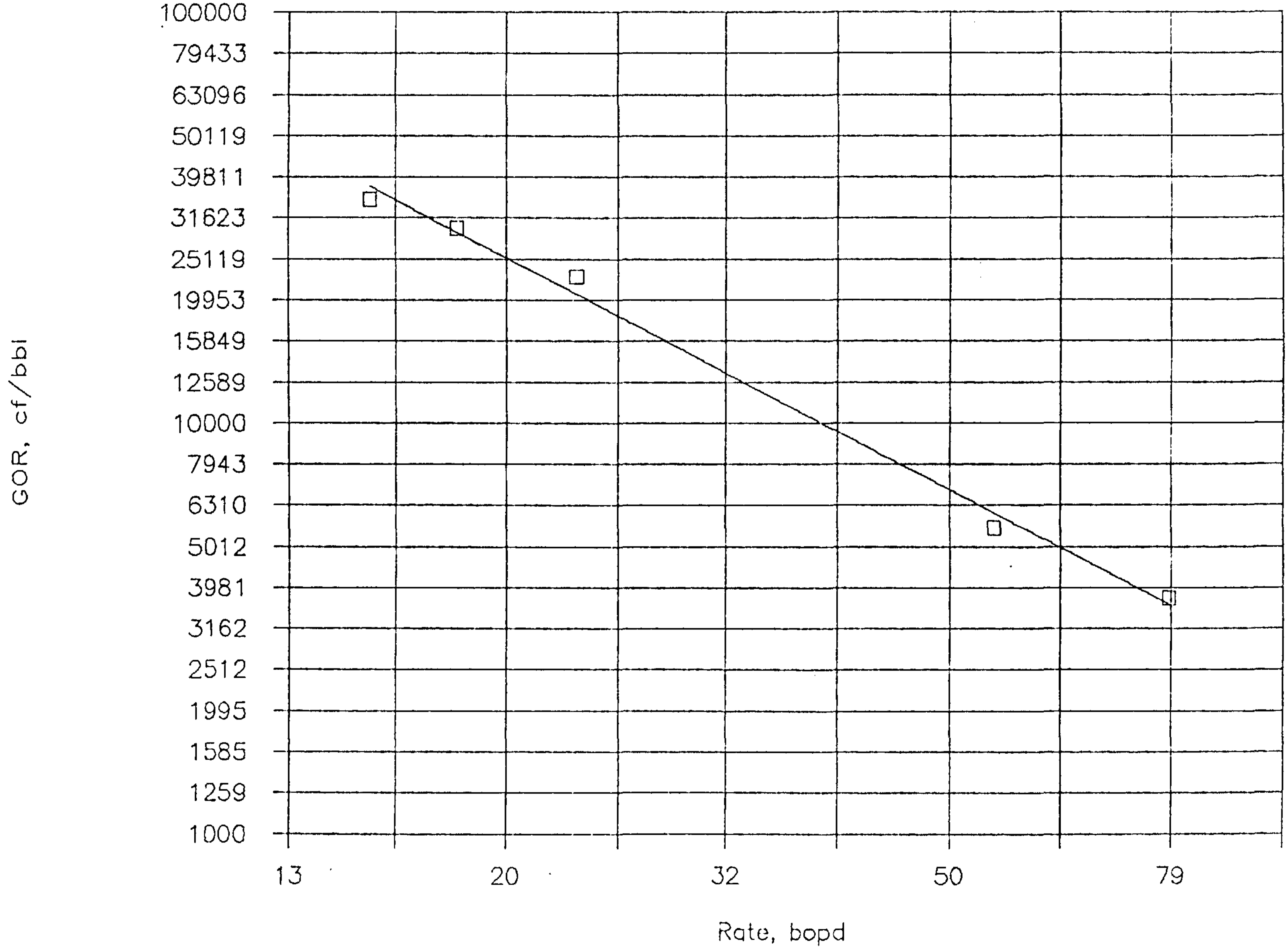
Rate Sensitivity, BMG G-32



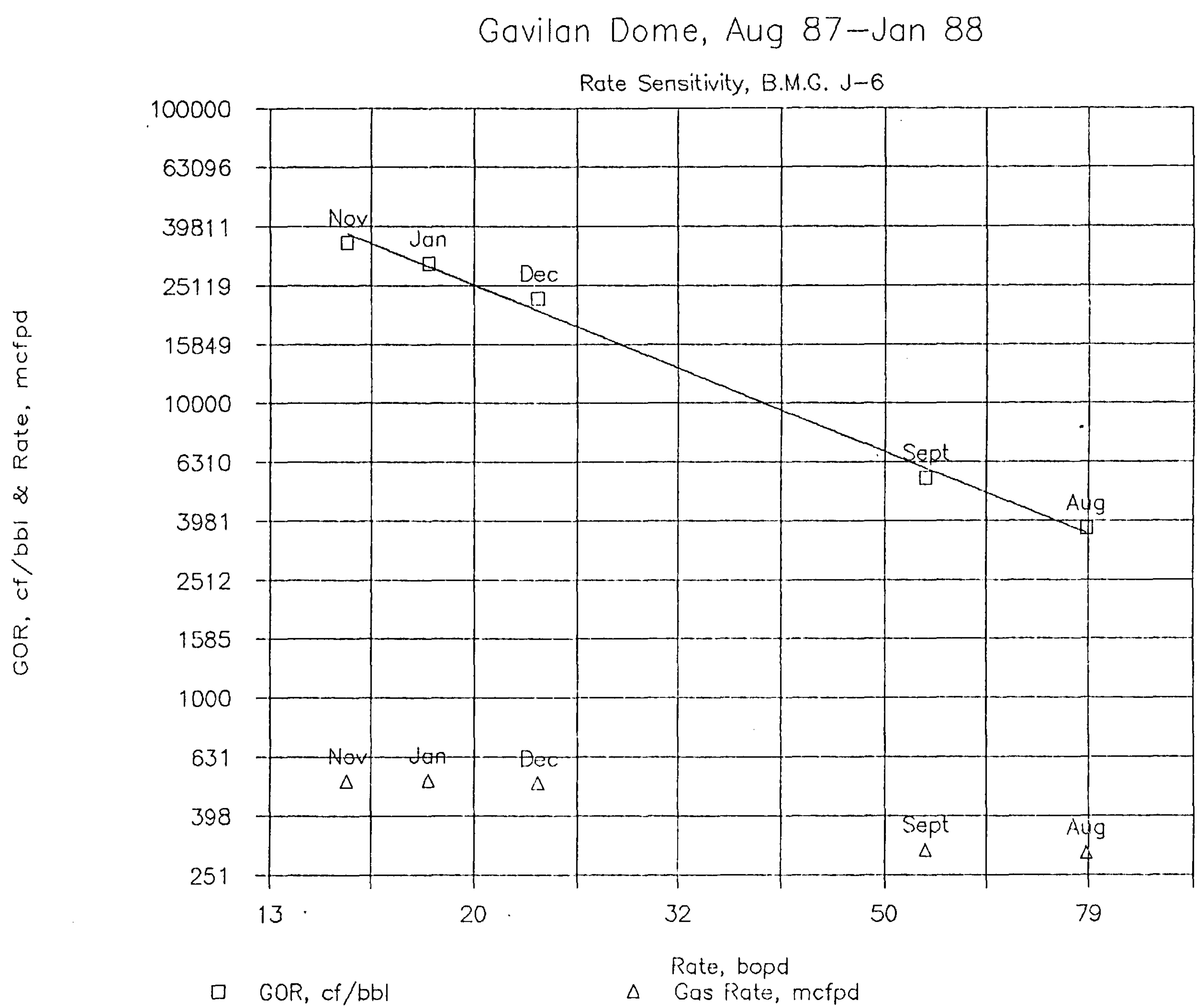
C. C. = 0.05

W. Puerto Chiquito, Aug 87—Jan 88

Rate Sensitivity, BMG J—6



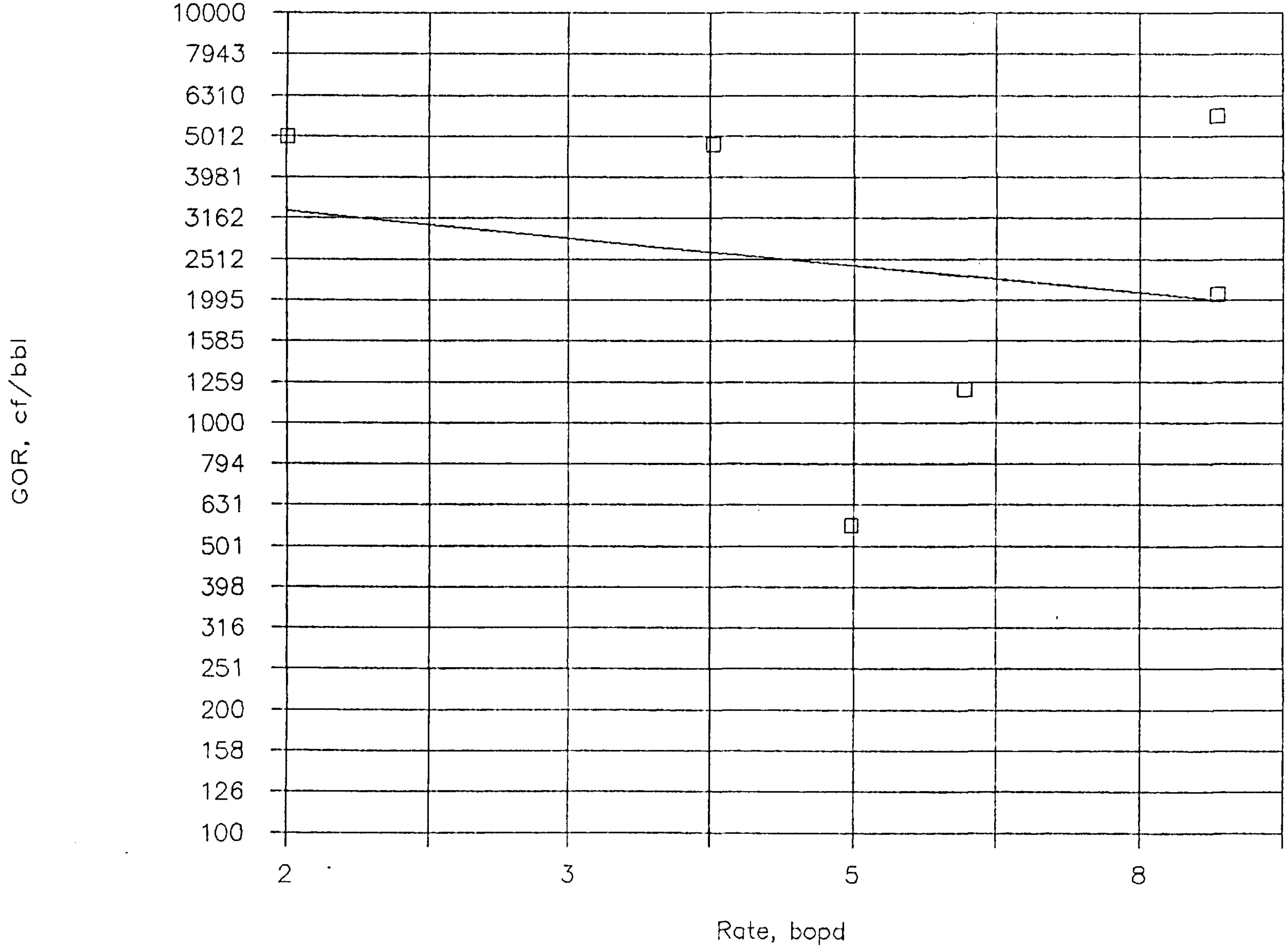
C.C. = 1.00



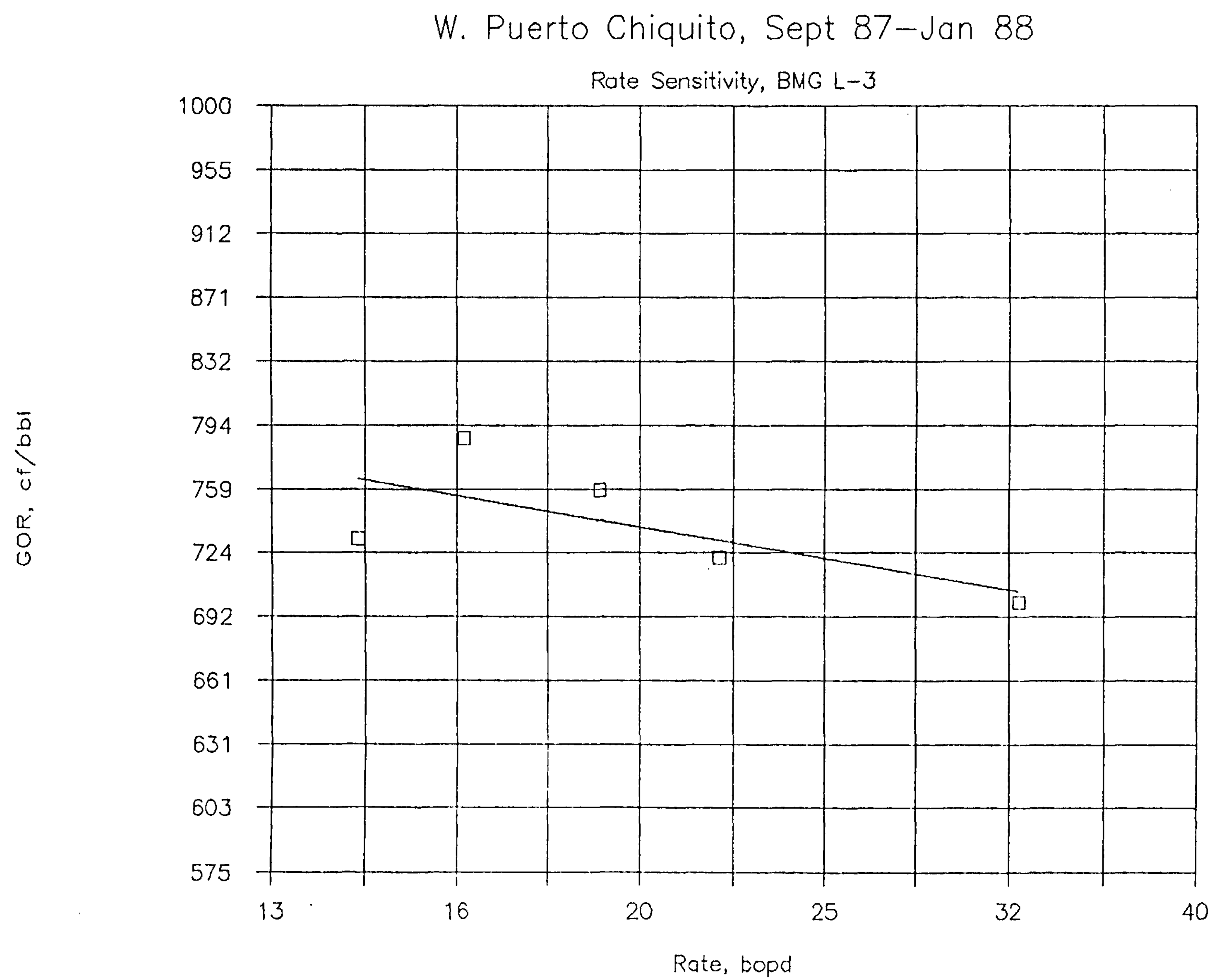
Gavilan Dome, Aug 87—Jan 88
Rate Sensitivity, B.M.G. J-6
GOR, cf/bbl & Rate, mcfpd
100000
63096
39811
25119
15849
10000
6310
3981
2512
1585
1000
631
398
251
13
20
32
50
79
Nov
Jan
Dec
Sept
Aug
Rate, bopd
GOR, cf/bbl
Gas Rate, mcfpd

W. Puerto Chiquito, July 87–Feb 88

Rate Sensitivity, BMG K–8

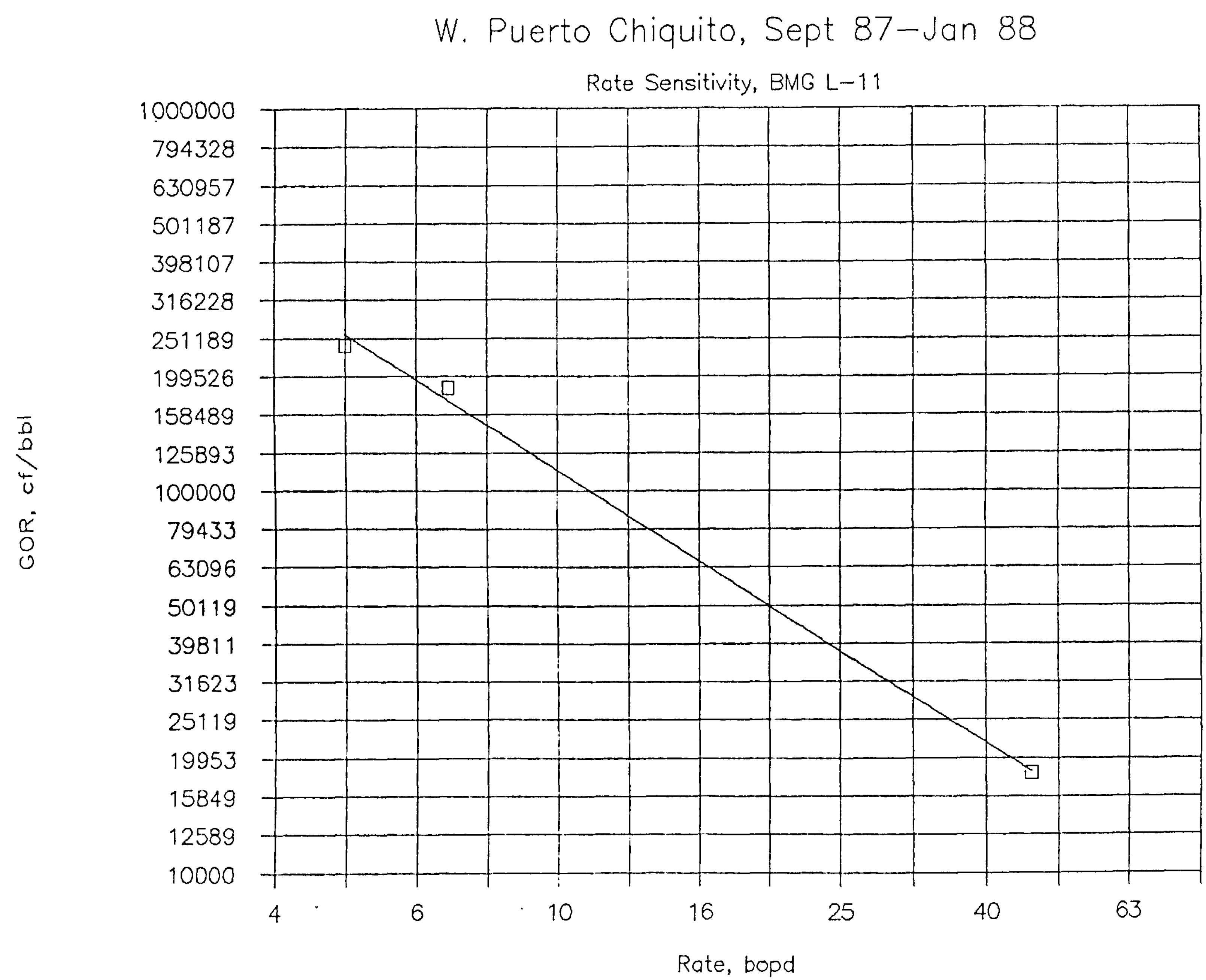


C.C. = 0.20



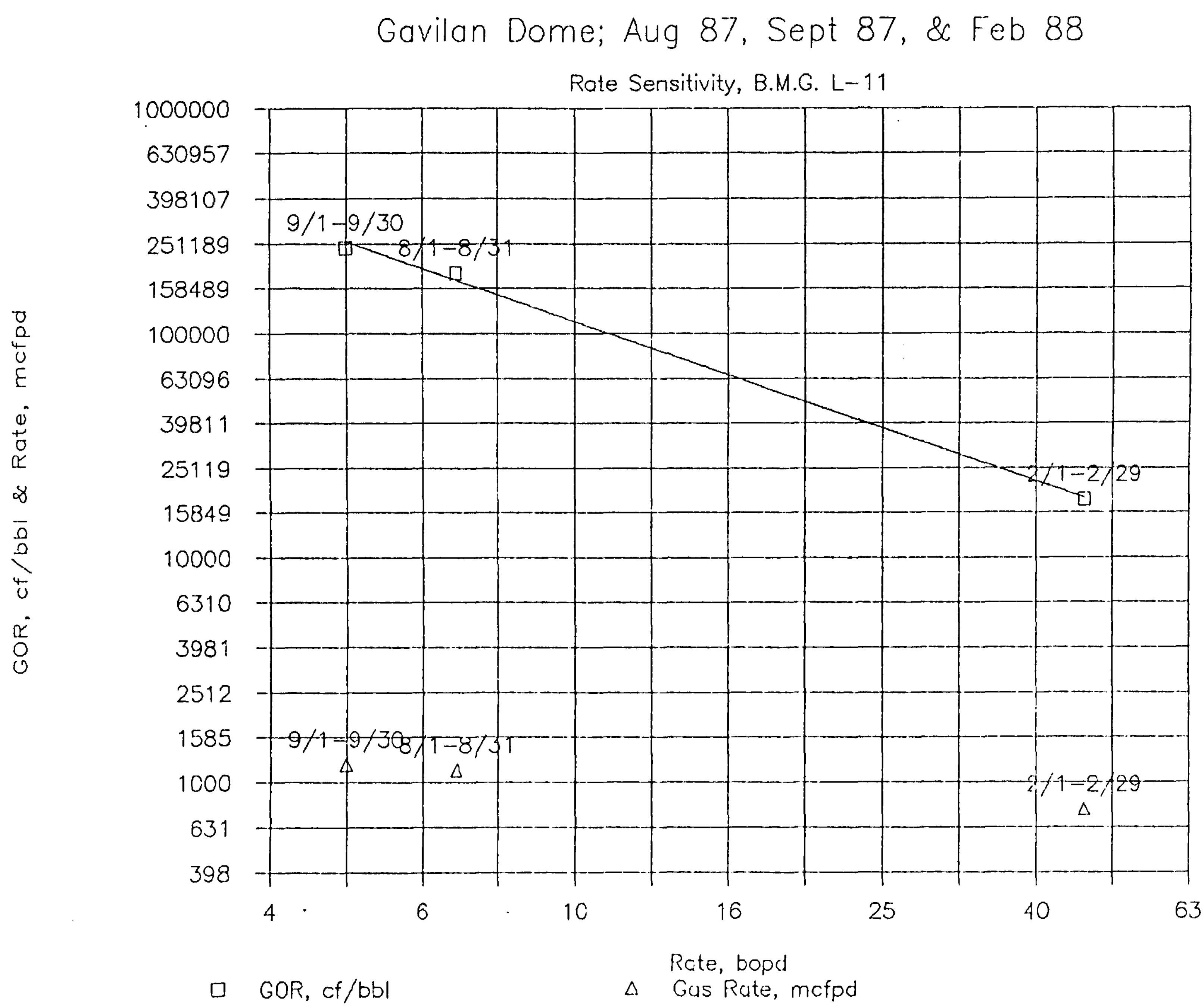
W. Puerto Chiquito, Sept 87–Jan 88
Rate Sensitivity, BMG L-3
GOR, cf/bbl
1000
955
912
871
832
794
759
724
692
661
631
603
575
13
16
20
25
32
40
Rate, bopd

C.C. = 0.68



W. Puerto Chiquito, Sept 87–Jan 88
Rate Sensitivity, BMG L–11
GOR, cf/bbl
1000000
794328
630957
501187
398107
316228
251189
199526
158489
125893
100000
79433
63096
50119
39811
31623
25119
19953
15849
12589
10000
4
6
10
16
25
40
63
Rate, bopd

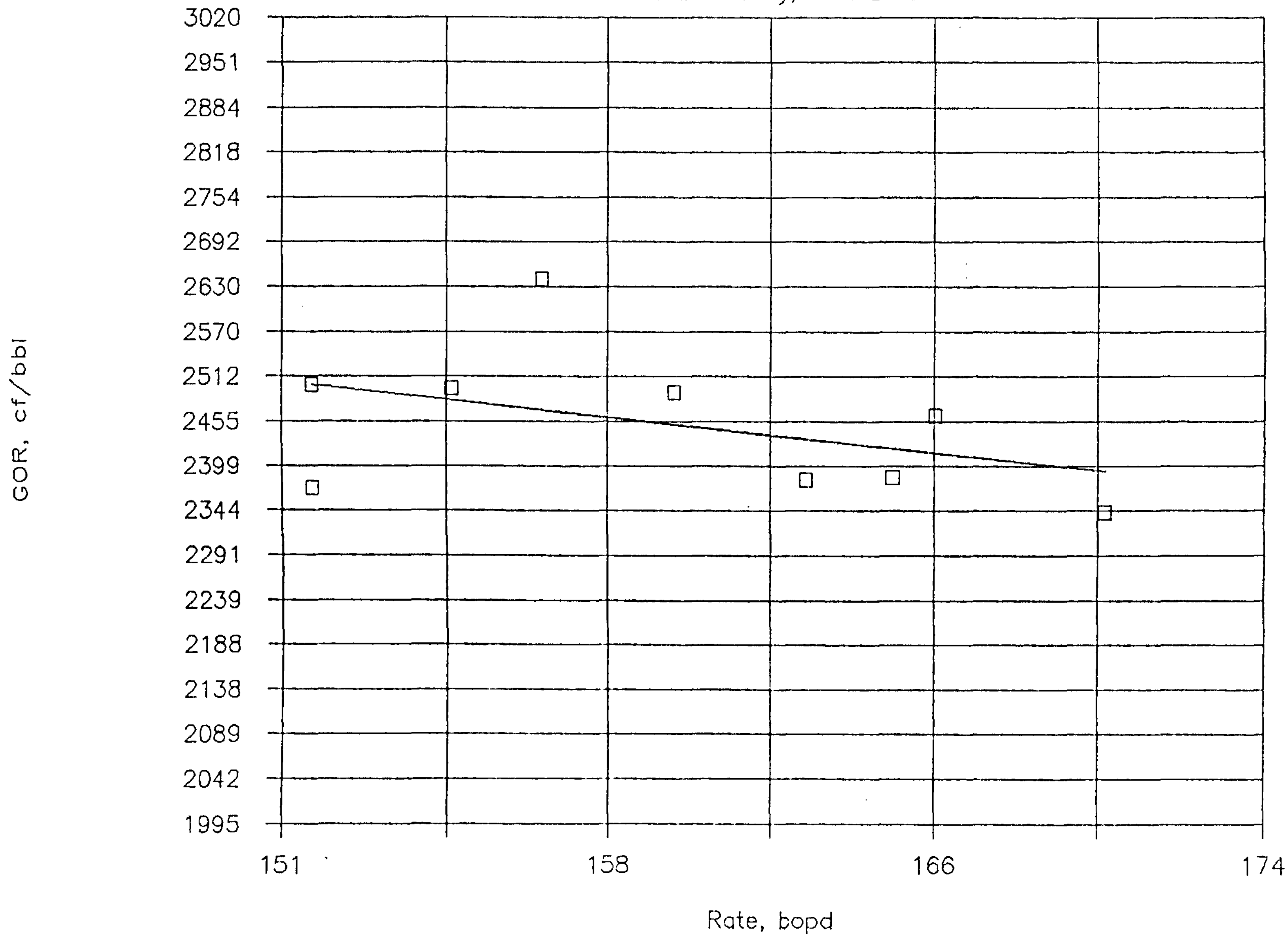
C.C. = 1.00



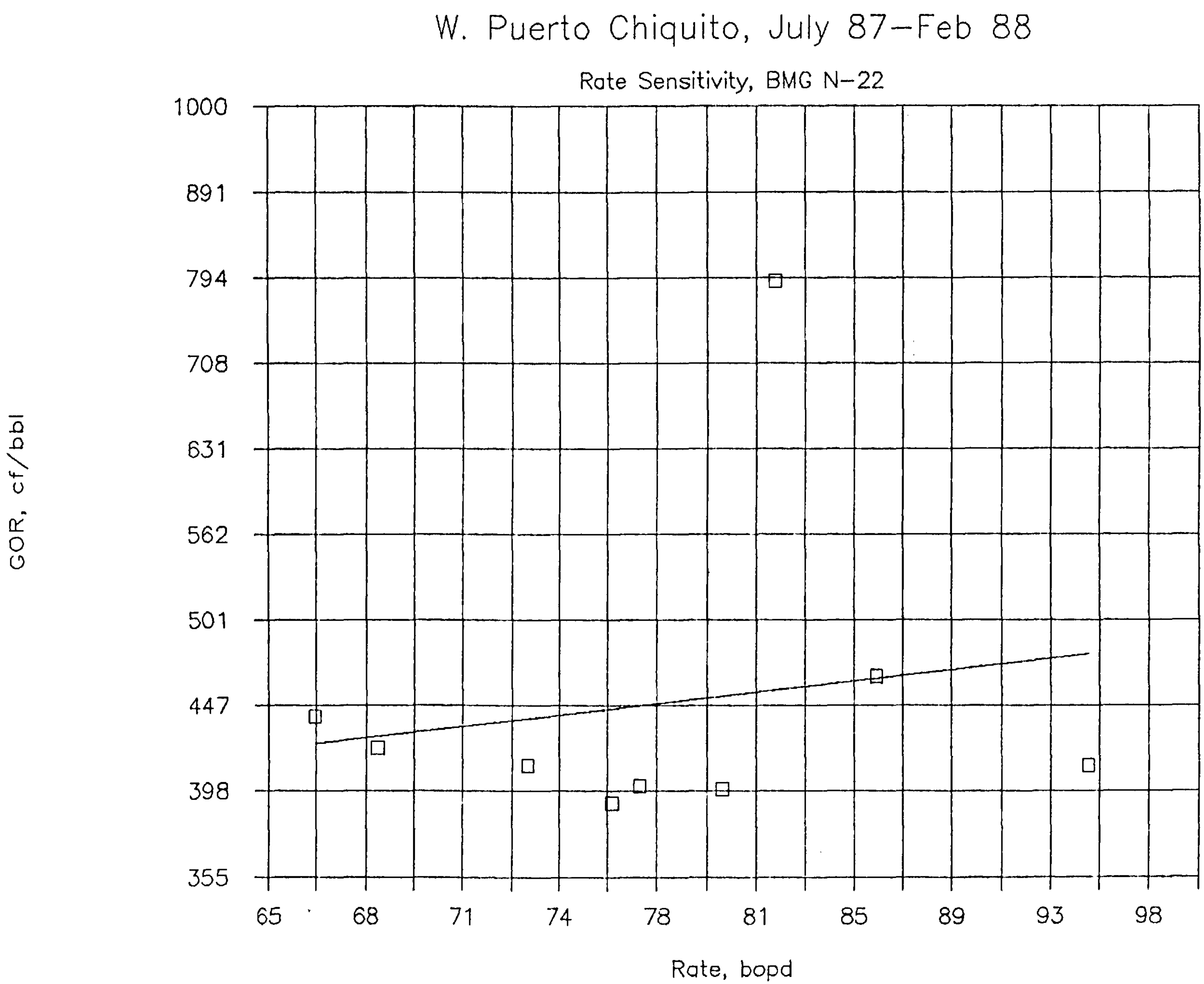
Gavilan Dome; Aug 87, Sept 87, & Feb 88
Rate Sensitivity, B.M.G. L-11
GOR, cf/bbl & Rate, mcfpd
1000000
630957
398107
251189
158489
100000
63096
39811
25119
15849
10000
6310
3981
2512
1585
1000
631
398
9/1-9/30
8/1-8/31
2/1-2/29
4
6
10
16
25
40
63
Rate, bopd
GOR, cf/bbl
Gas Rate, mcfpd

W. Puerto Chiquito, July 87–Feb 88

Rate Sensitivity, BMG L-27



C.C. = 0.43

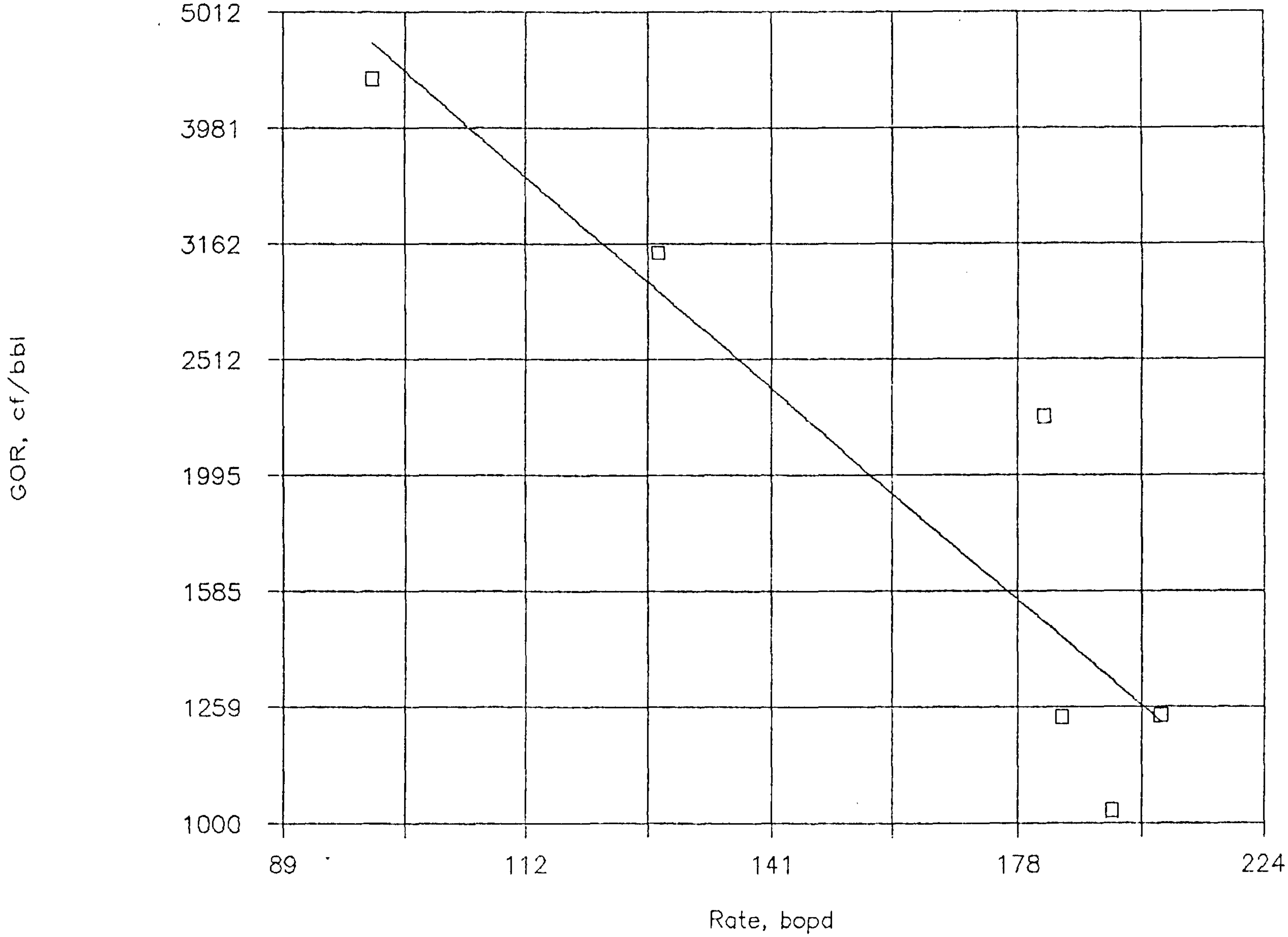


W. Puerto Chiquito, July 87–Feb 88
Rate Sensitivity, BMG N–22
GOR, cf/bbl
1000
891
794
708
631
562
501
447
398
355
65
68
71
74
78
81
85
89
93
98
Rate, bopd

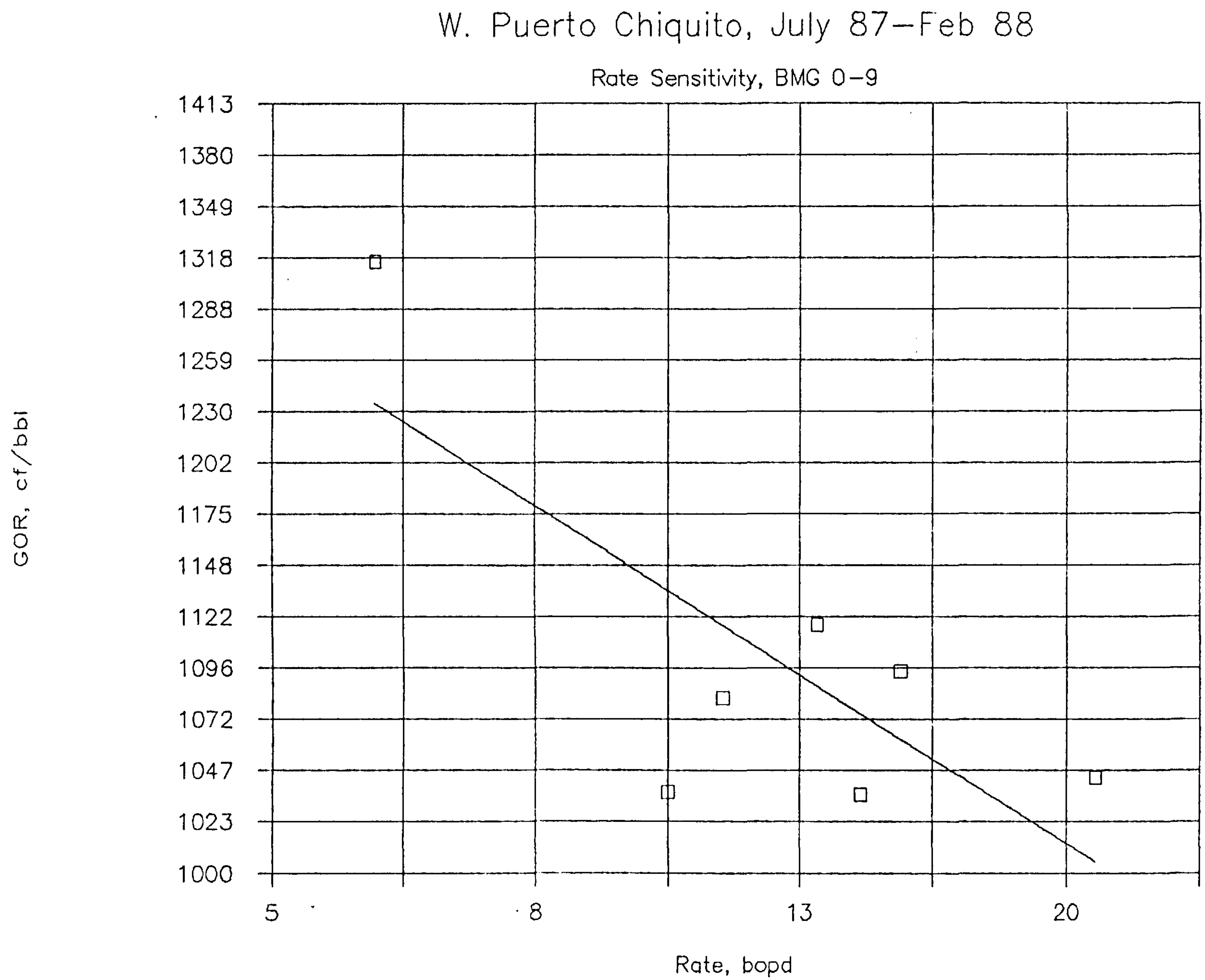
C.C. = 0.17

W. Puerto Chiquito, July 87–Dec 87

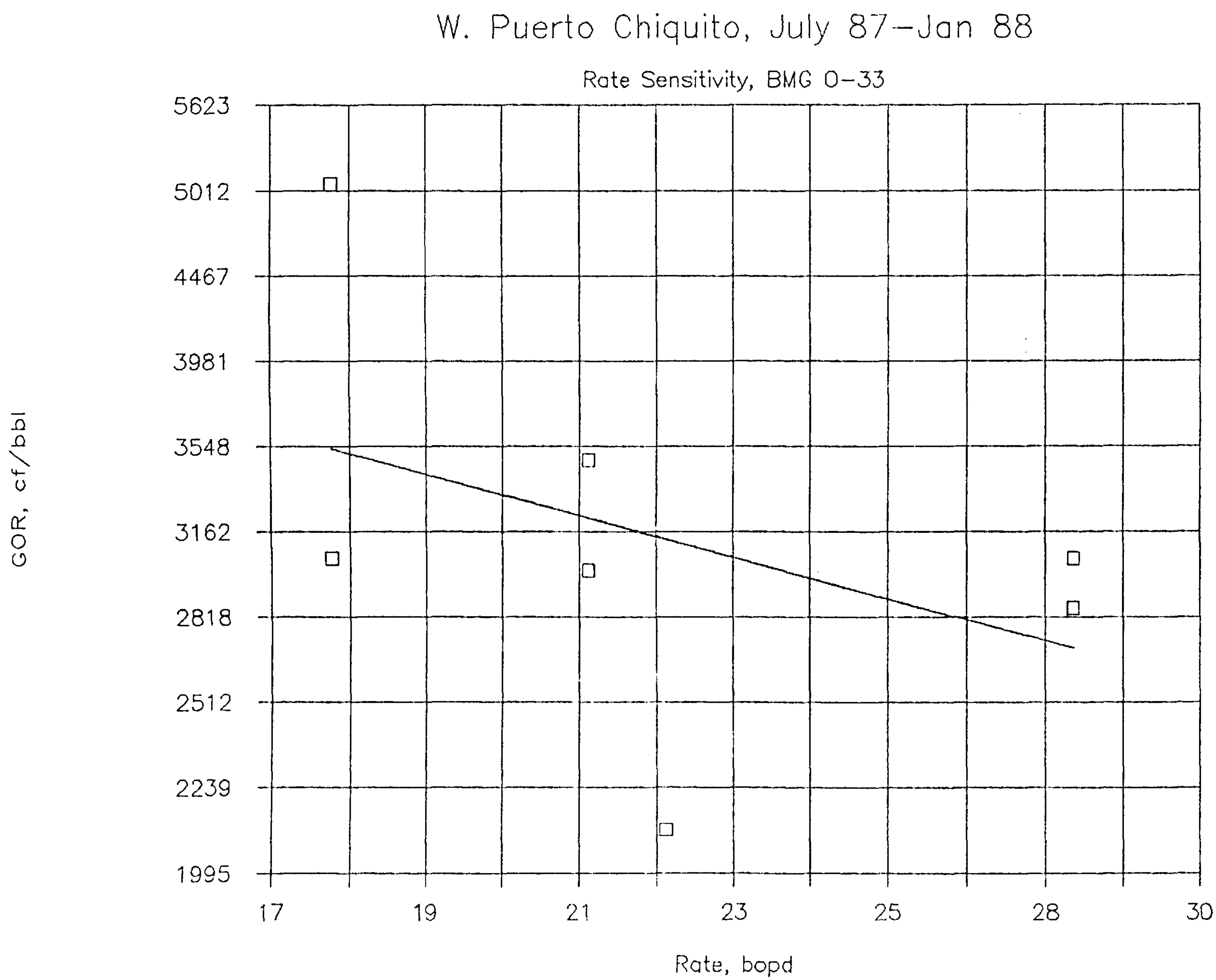
Rate Sensitivity, BMG N–31



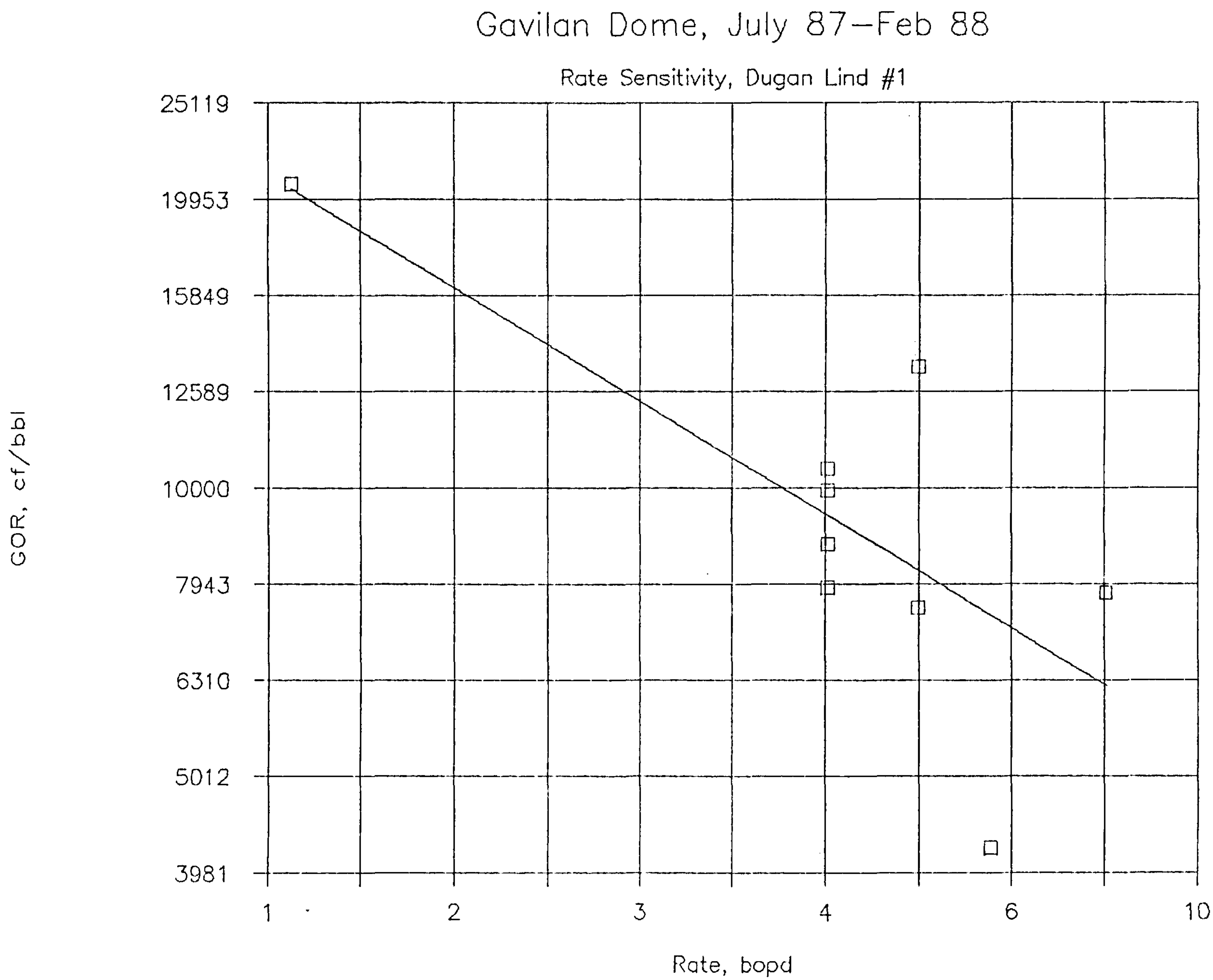
C.C. = 0.92


W. Puerto Chiquito, July 87—Feb 88
Rate Sensitivity, BMG 0-9
GOR, cf/bbl
1413
1380
1349
1318
1288
1259
1230
1202
1175
1148
1122
1096
1072
1047
1023
1000
5
8
13
20
Rate, bopd

C.C. = 0.76


W. Puerto Chiquito, July 87–Jan 88
Rate Sensitivity, BMG O–33
GOR, cf/bbl
5623
5012
4467
3981
3548
3162
2818
2512
2239
1995
17
19
21
23
25
28
30
Rate, bopd

C.C. = 0.43

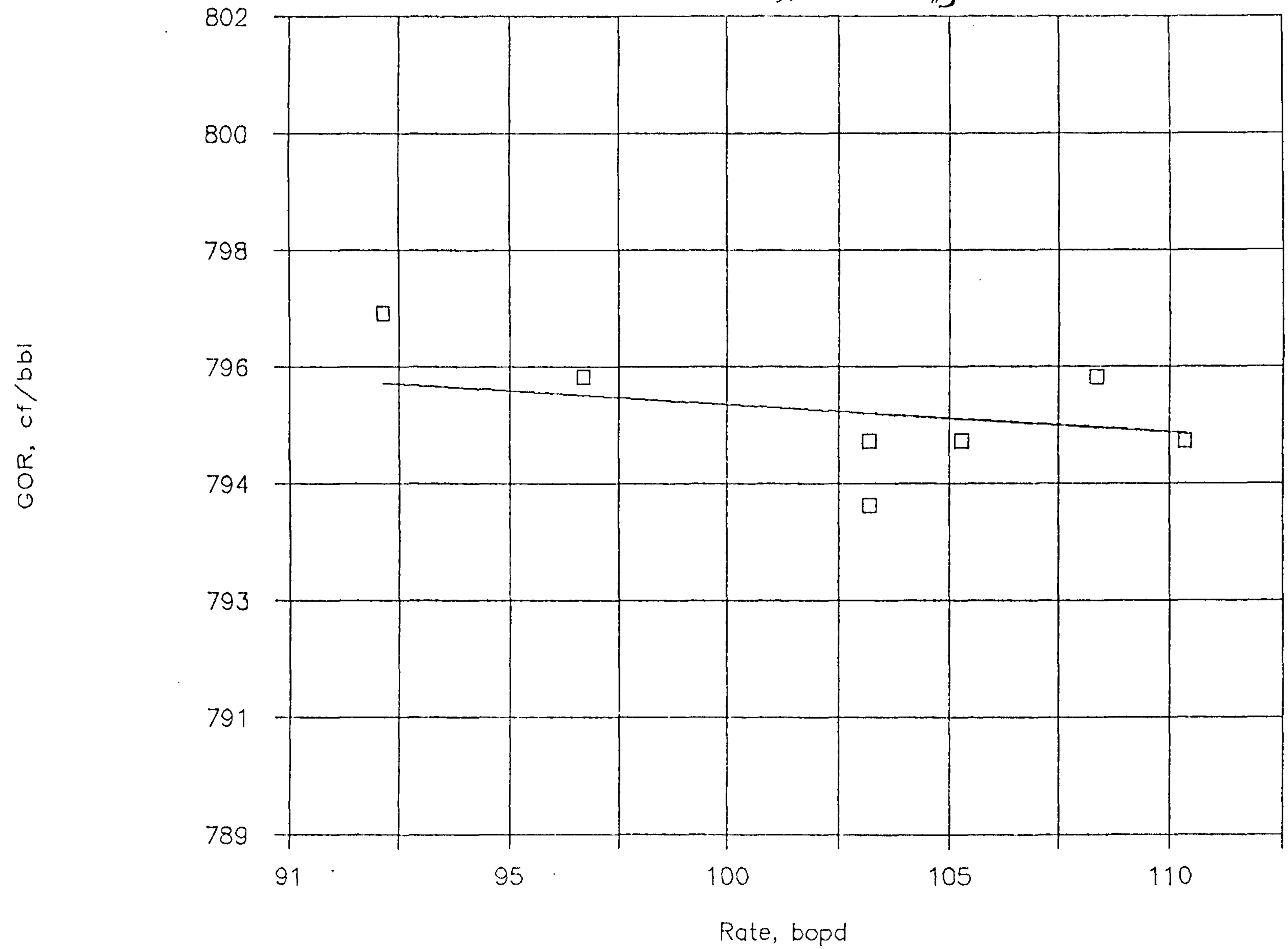


Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Dugan Lind #1
25119
19953
15849
12589
10000
7943
6310
5012
3981
GOR, cf/bbl
1
2
3
4
6
10
Rate, bopd

C. C. = 0.75

Gavilan Dome, July 87—Feb 88

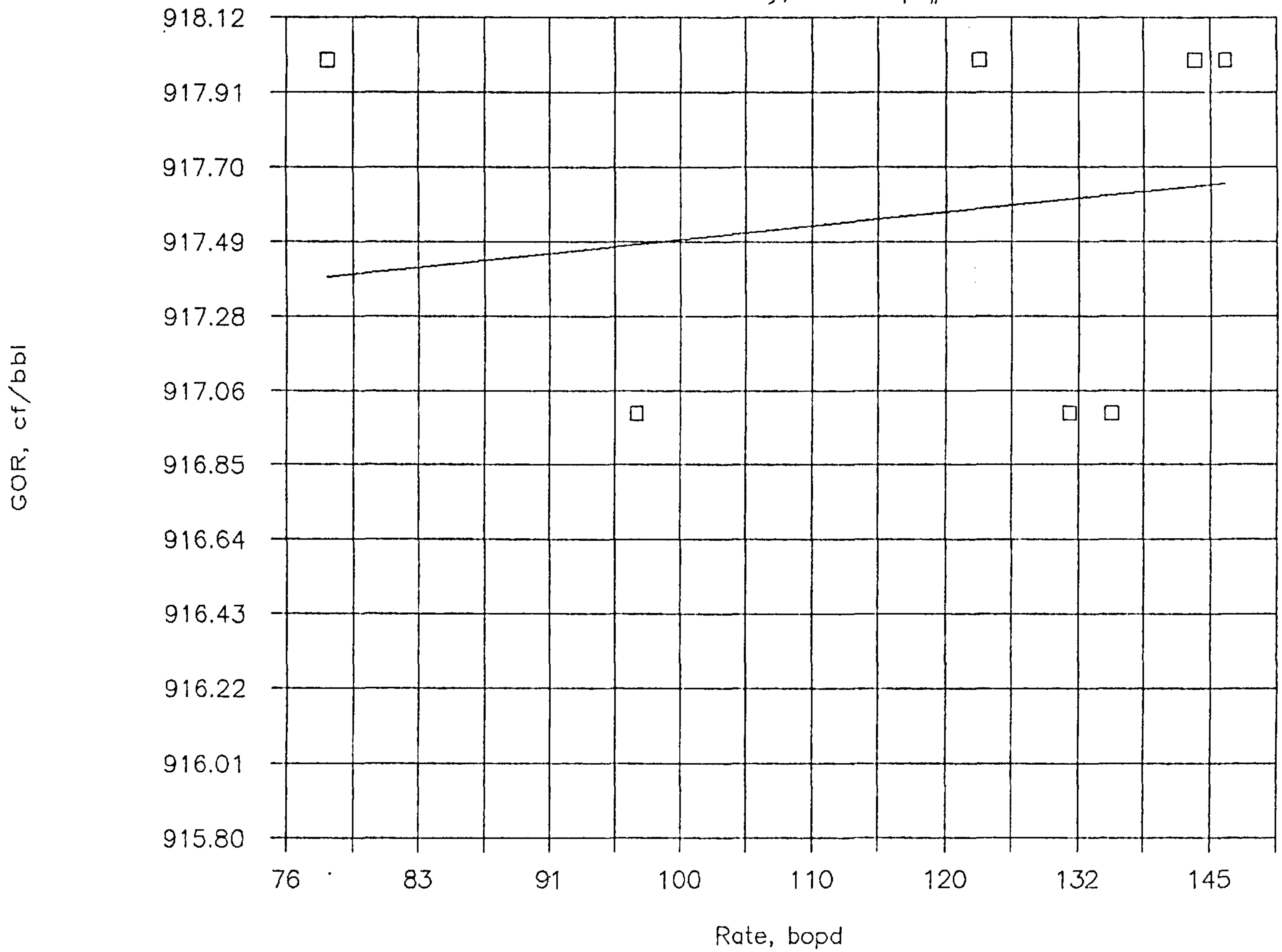
Rate Sensitivity, Hixon Div #3



C.C. = 0.06

Gavilan Dome, July 87—Feb 88

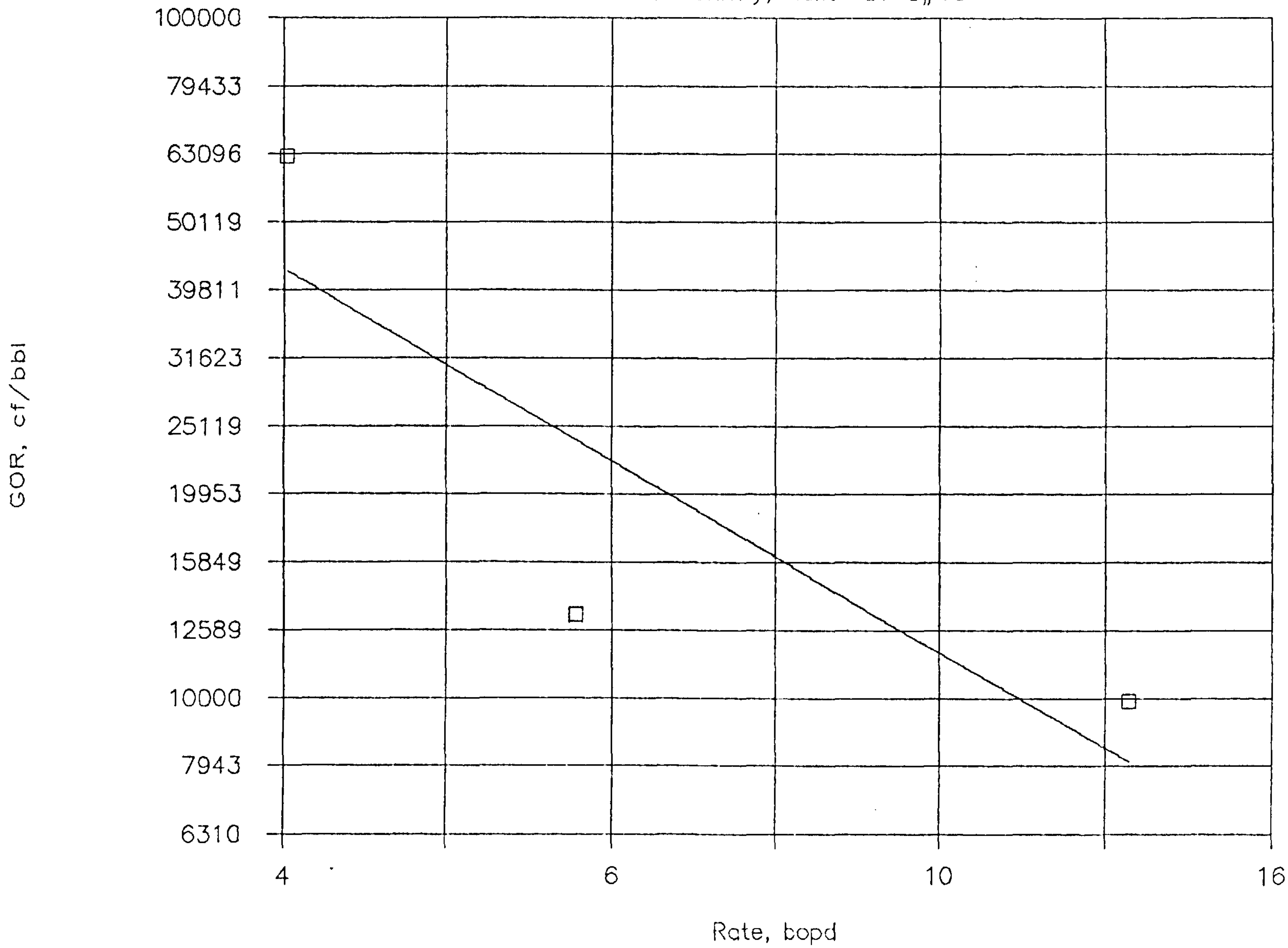
Rate Sensitivity, Hixon Tap #4



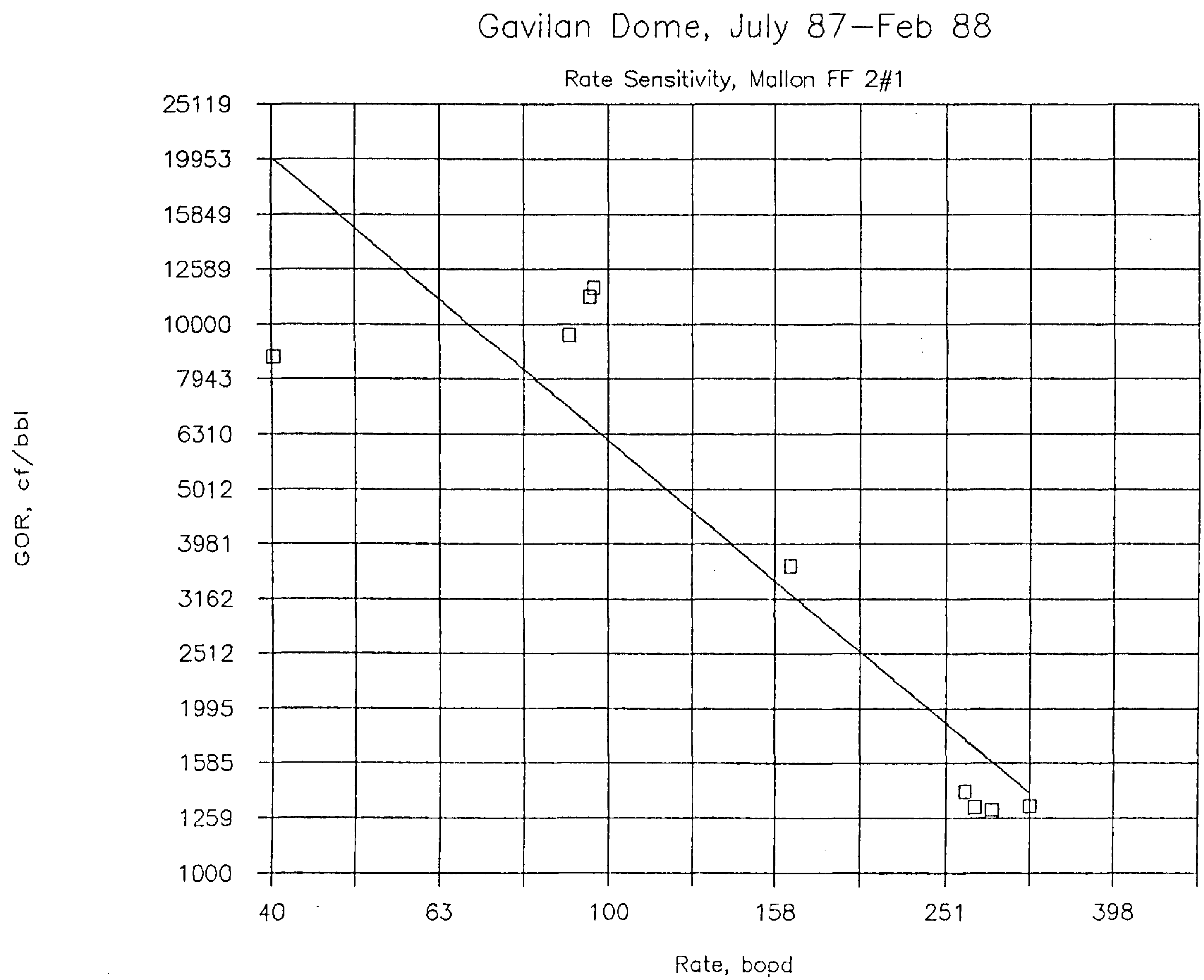
C.C. = 0.01

Gavilan Dome, Dec 87—Feb 88

Rate Sensitivity, Mallon DF 3#15

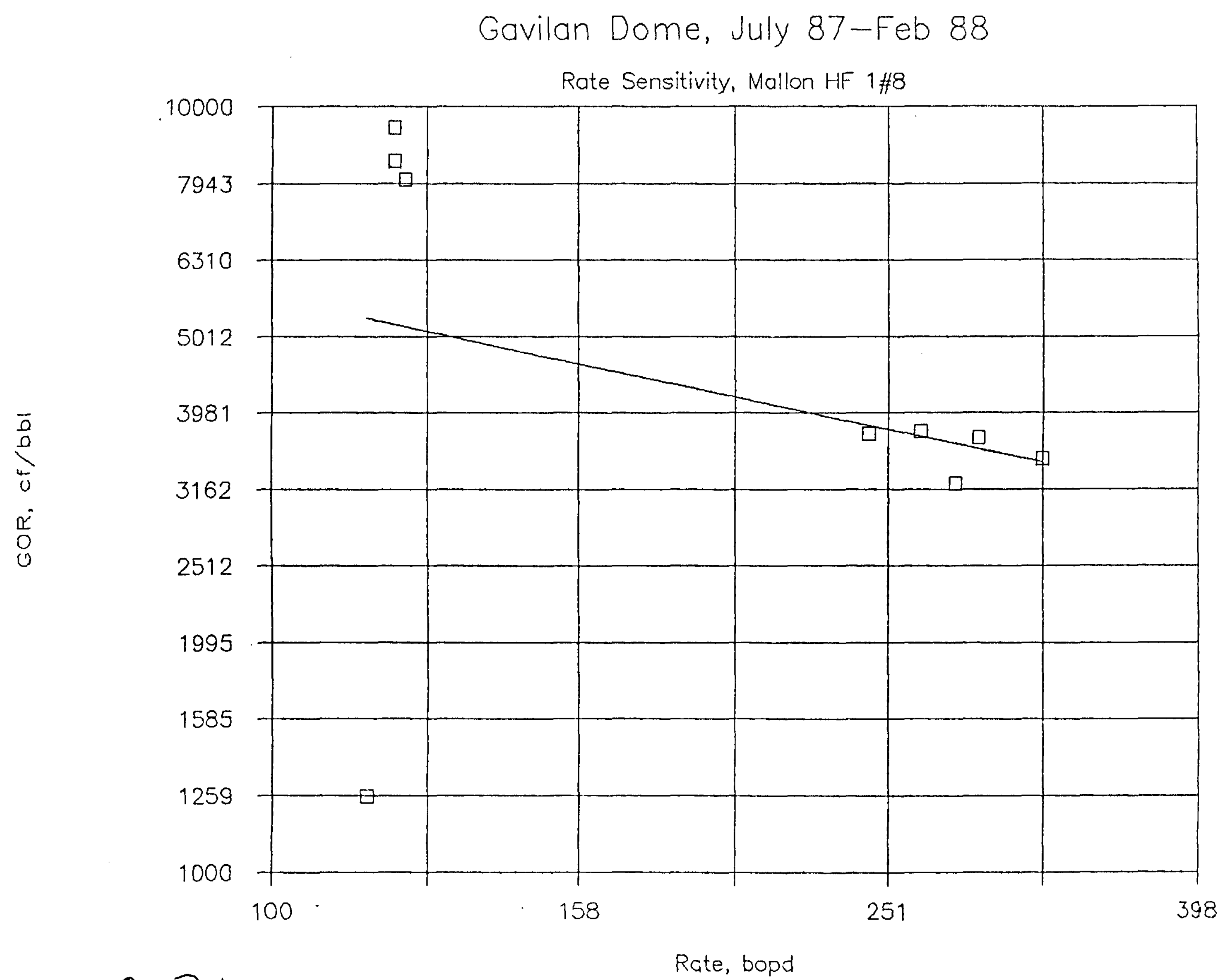


C.C.=0.85

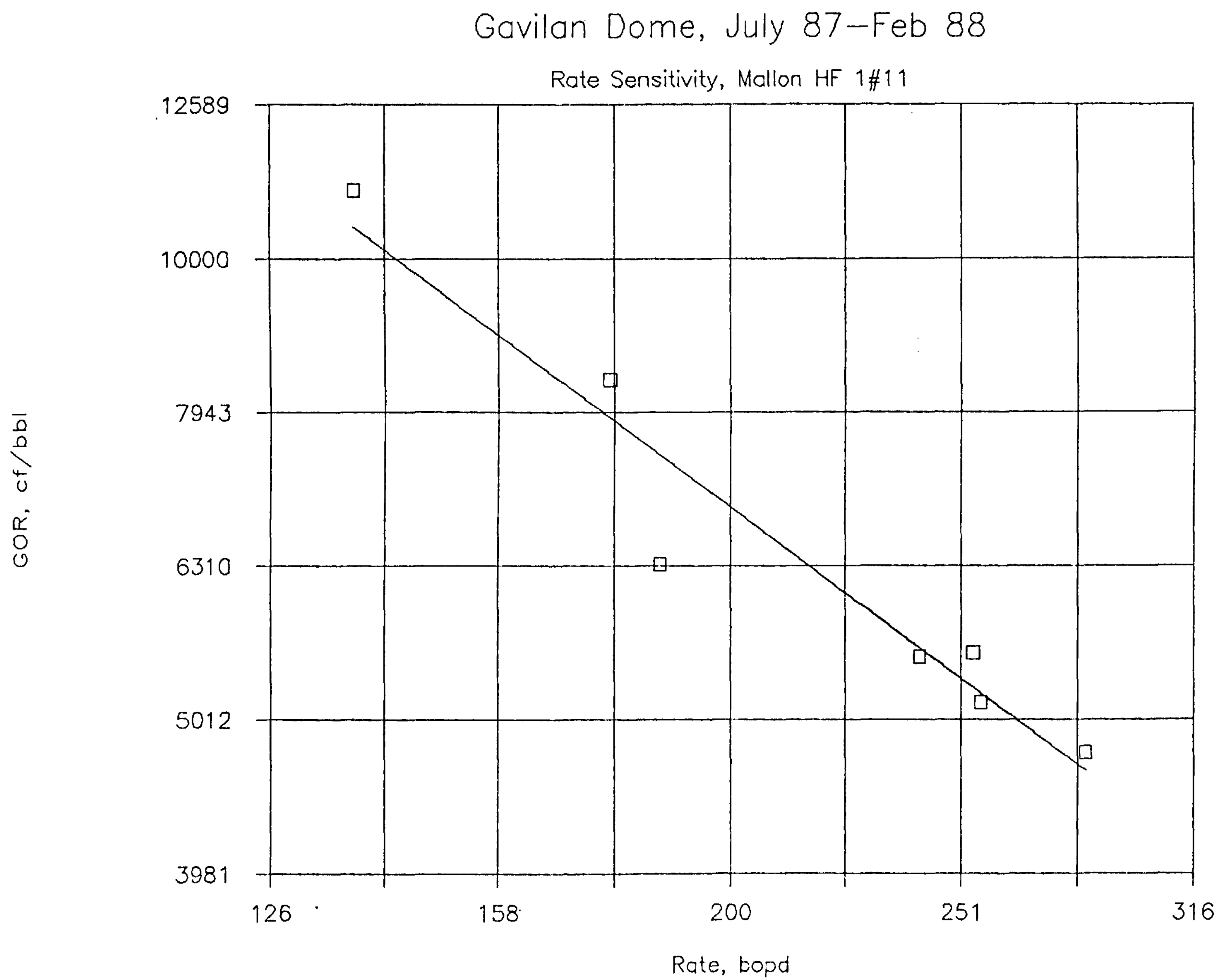


Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Mallon FF 2#1
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
GOR, cf/bbl
40
63
100
158
251
398
Rate, bopd

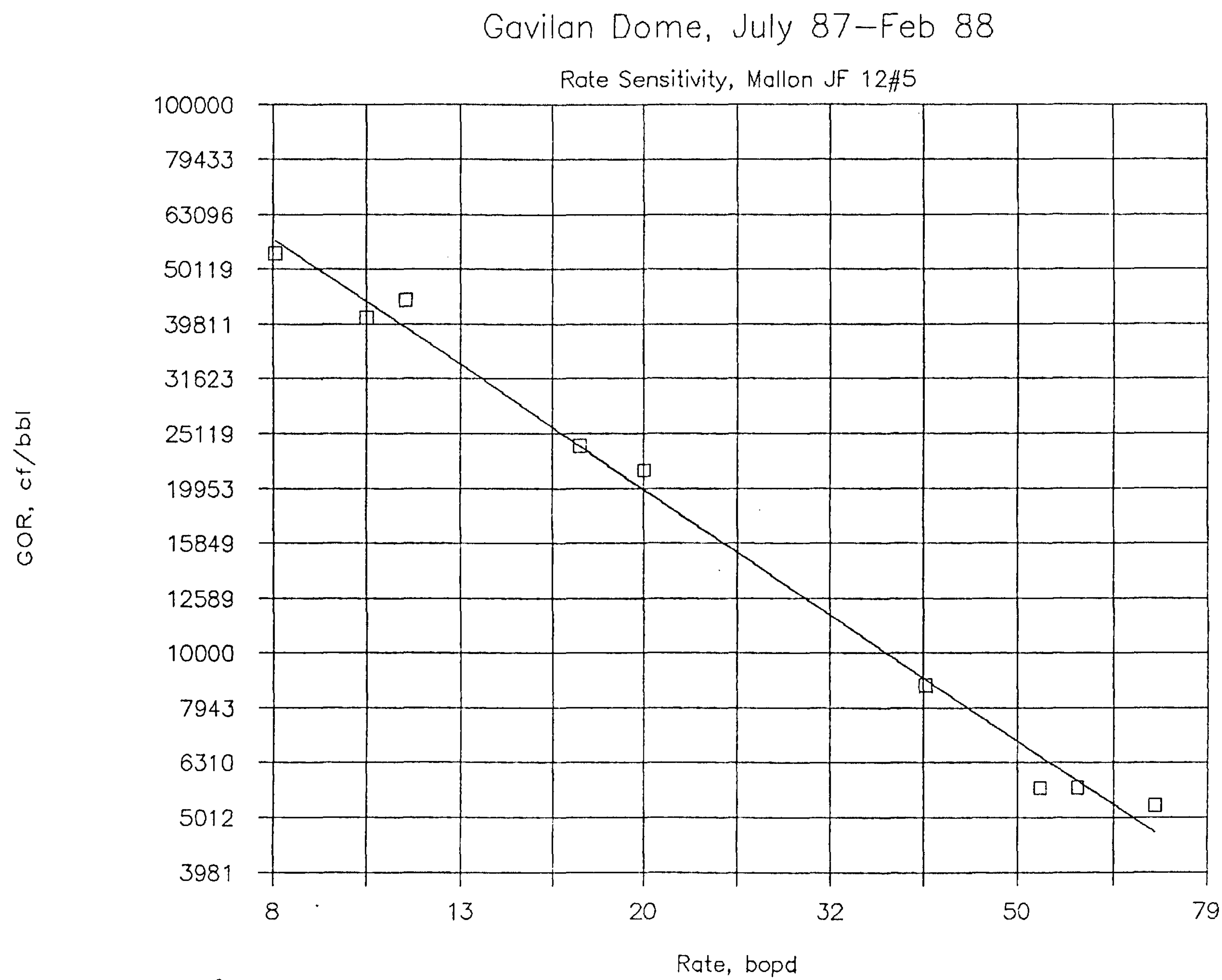
C.C. = 0.90


Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Mallon HF 1#8
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
GOR, cf/bbl
100
158
251
398
Rate, bopd

C. C. = 0.31

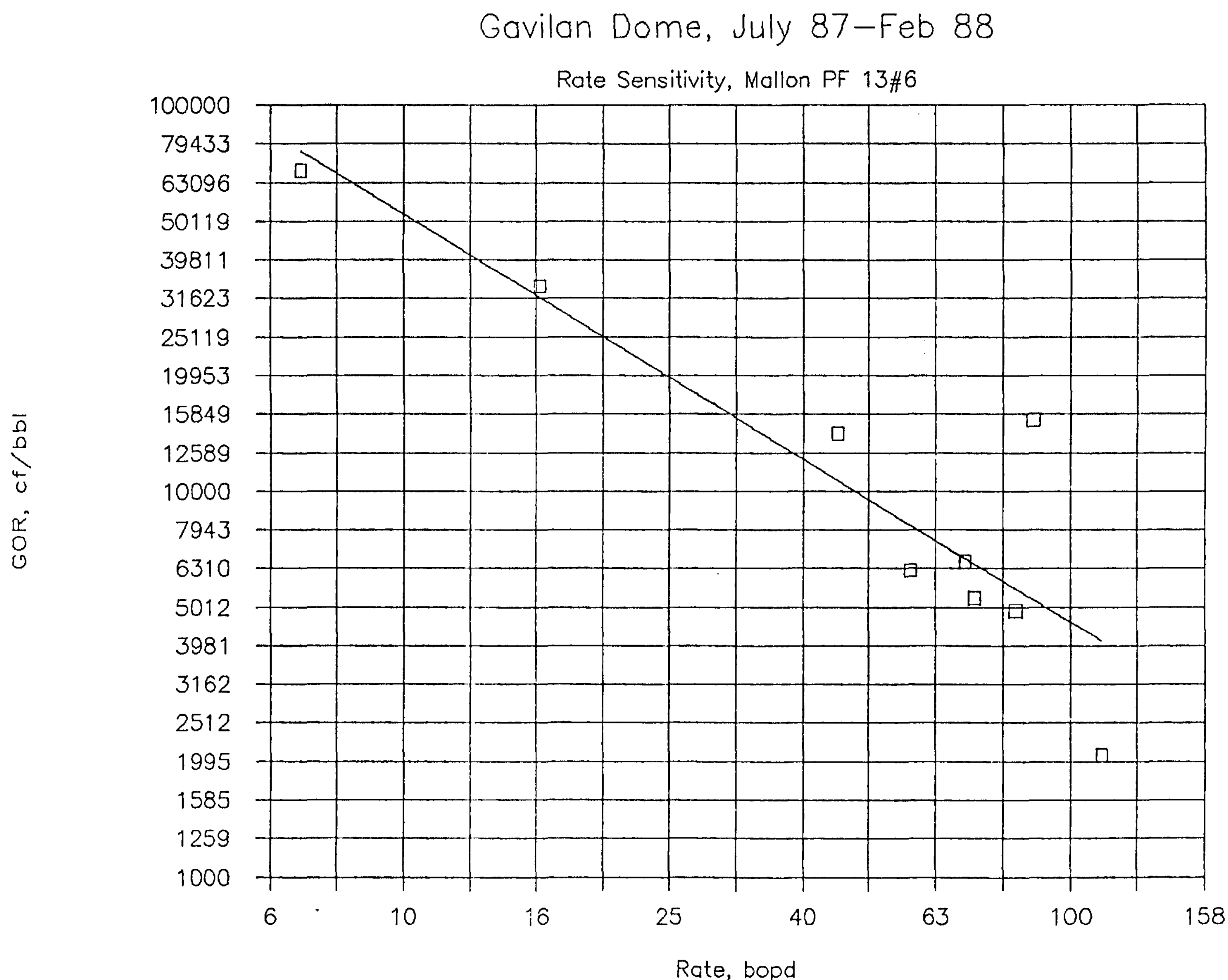

Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Mallon HF 1#11
12589
10000
7943
6310
5012
3981
GOR, cf/bbl
126
158
200
251
316
Rate, bopd

C.C. = 0.97



Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Mallon JF 12#5
GOR, cf/bbl
100000
79433
63096
50119
39811
31623
25119
19953
15849
12589
10000
7943
6310
5012
3981
8
13
20
32
50
79
Rate, bopd

C.C. = 1.00

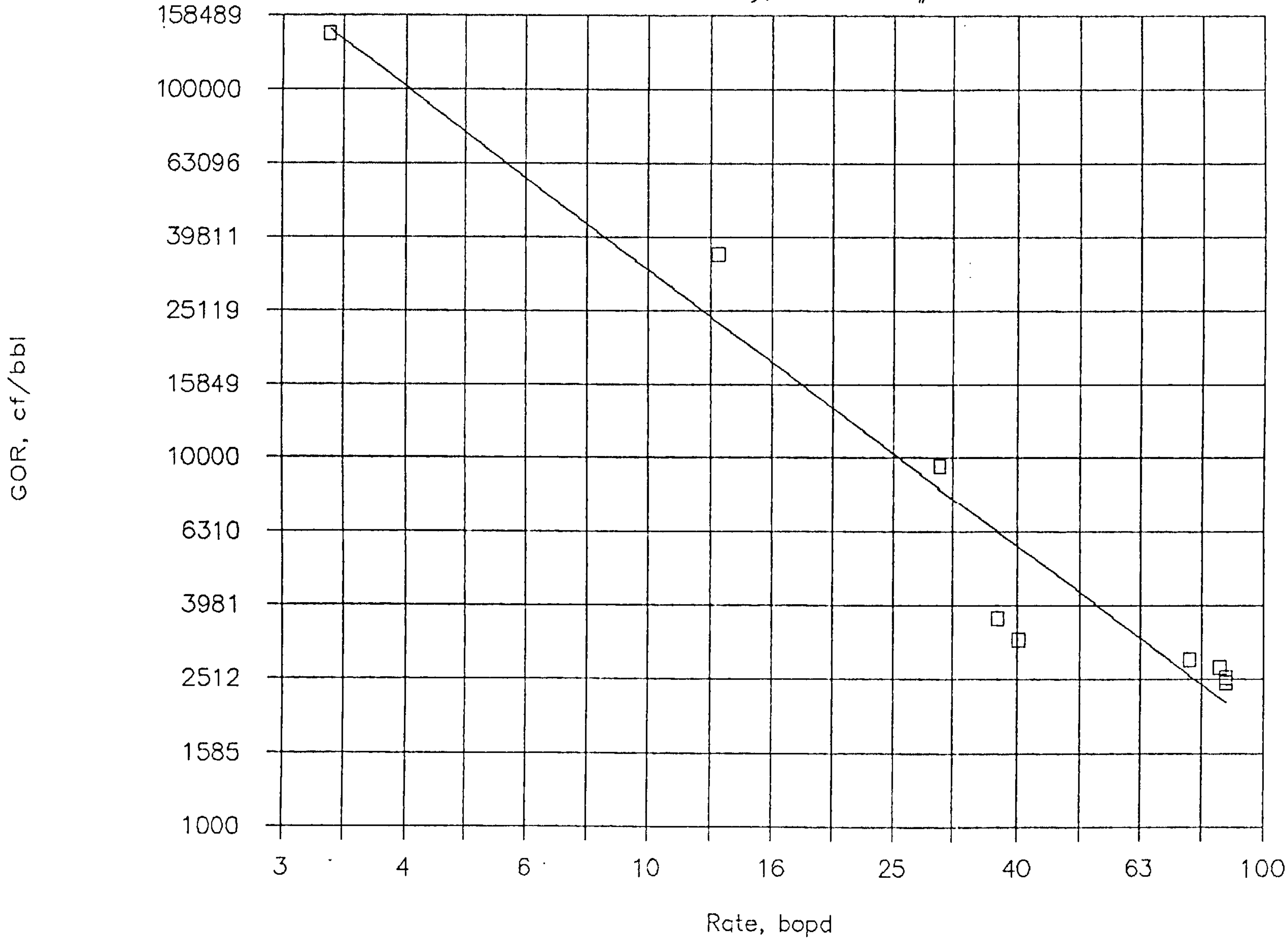


Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Mallon PF 13#6
GOR, cf/bbl
100000
79433
63096
50119
39811
31623
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
6
10
16
25
40
63
100
158
Rate, bopd

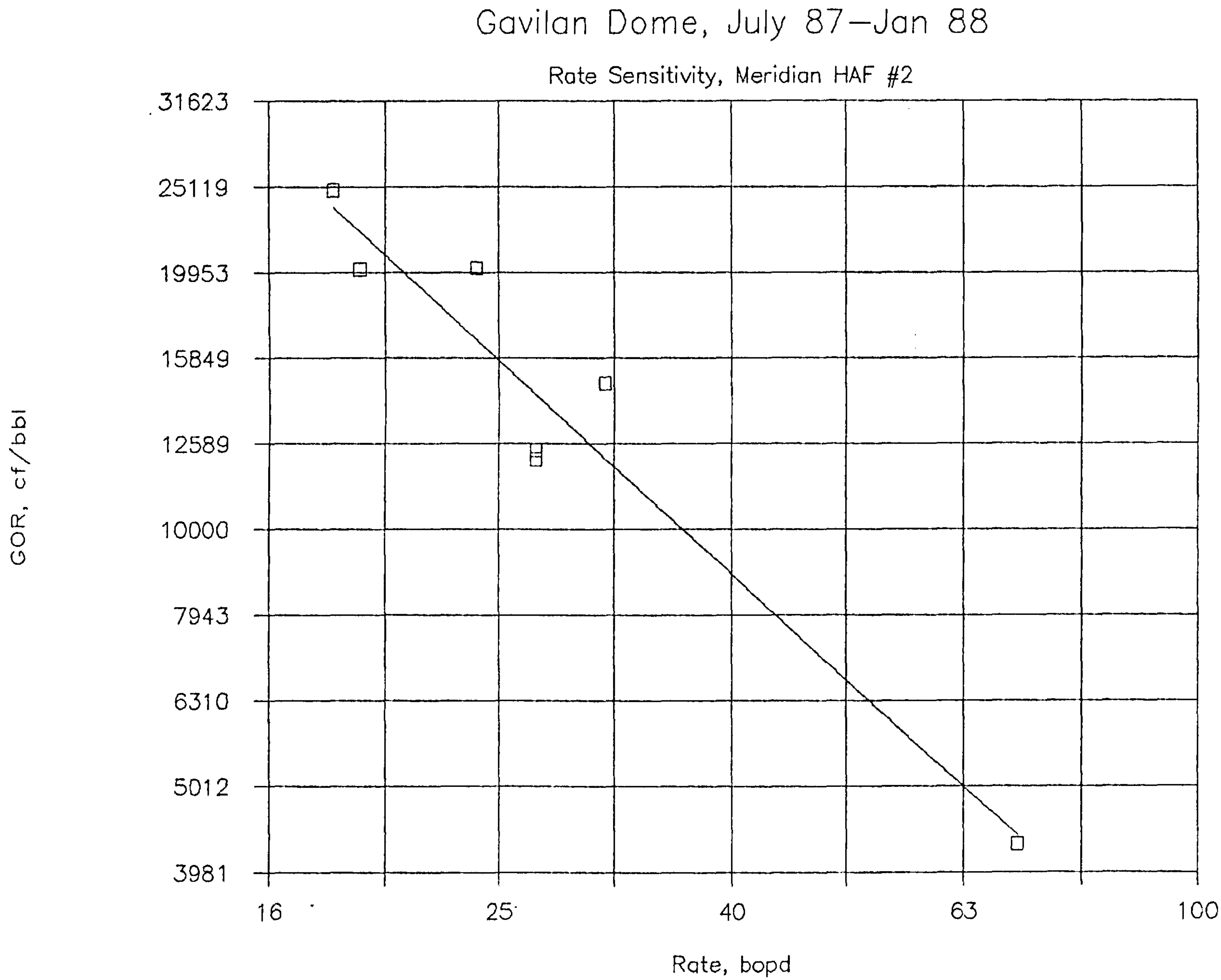
C. C. = 0.89

Gavilan Dome, July 87—Feb 88

Rate Sensitivity, Mallon Rf 2#16

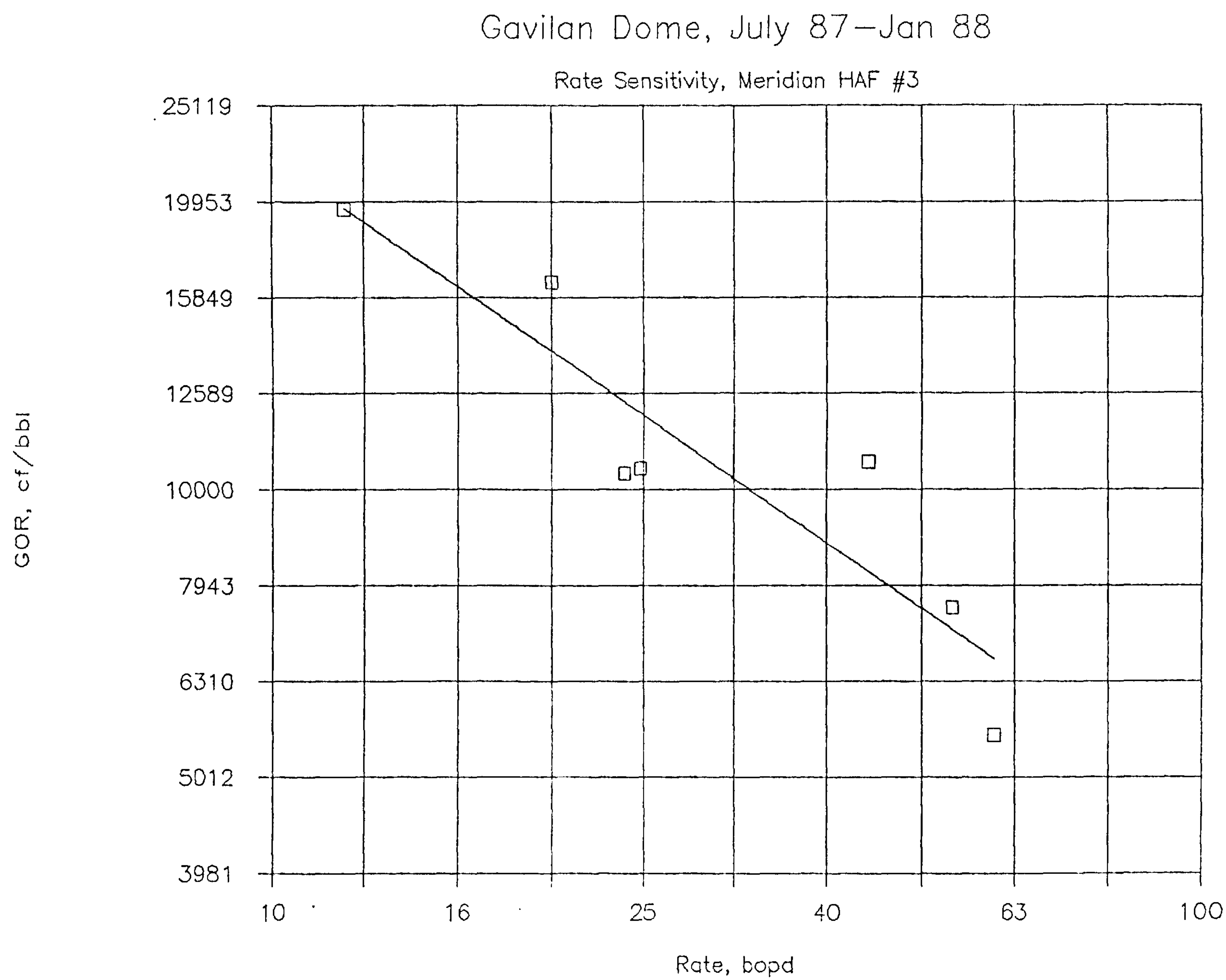


C.C. = 0.97



Gavilan Dome, July 87–Jan 88
Rate Sensitivity, Meridian HAF #2
GOR, cf/bbl
31623
25119
19953
15849
12589
10000
7943
6310
5012
3981
16
25
40
63
100
Rate, bopd

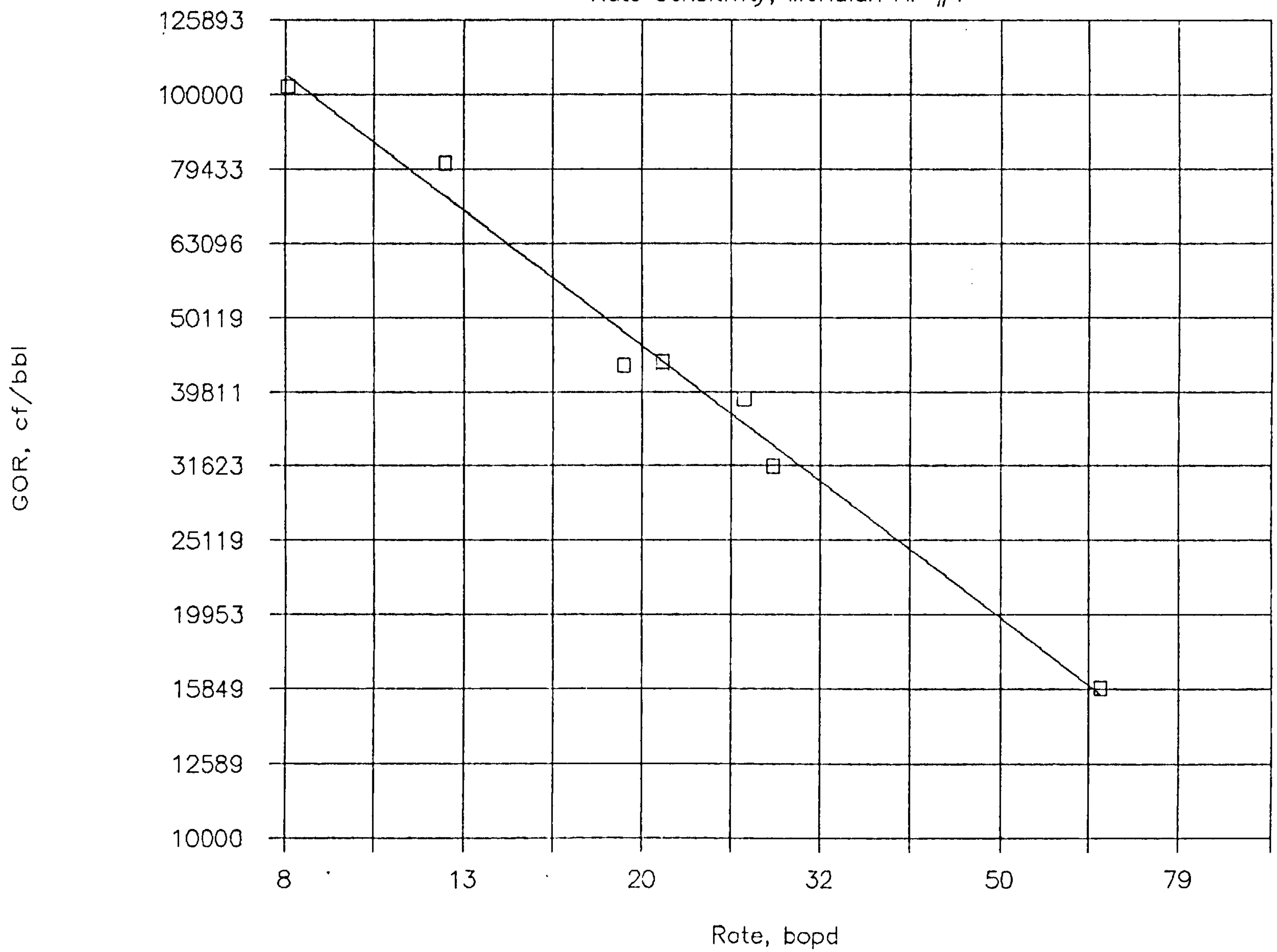
C. C. = 0.96


Gavilan Dome, July 87—Jan 88
Rate Sensitivity, Meridian HAF #3
25119
19953
15849
12589
10000
7943
6310
5012
3981
GOR, cf/bbl
10
16
25
40
63
100
Rate, bopd

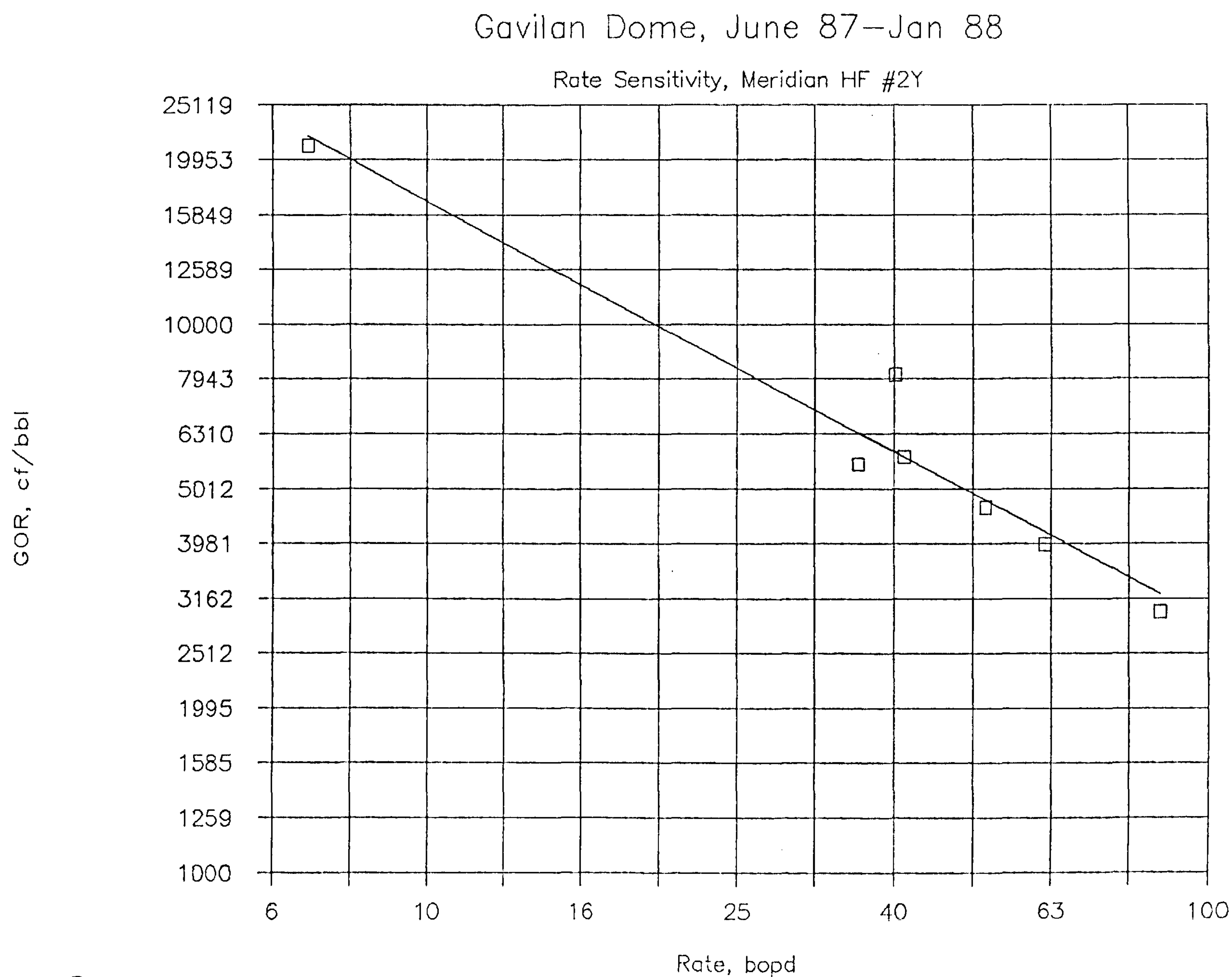
C. C. = 0.92

Gavilan Dome, July 87—Jan 88

Rate Sensitivity, Meridian HF #1



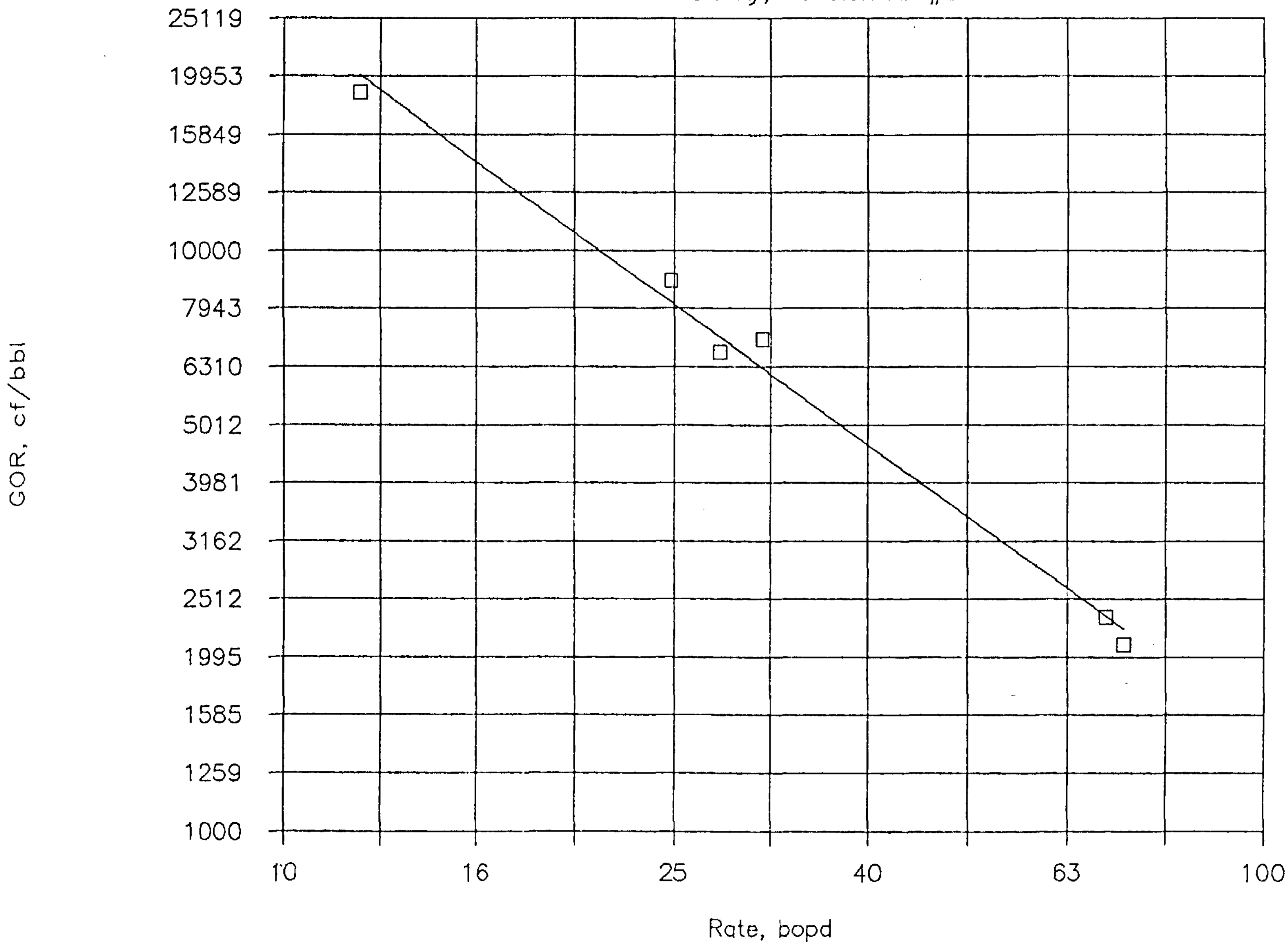
C.C. = 0.99


Gavilan Dome, June 87–Jan 88
Rate Sensitivity, Meridian HF #2Y
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
GOR, cf/bbl
6
10
16
25
40
63
100
Rate, bopd

C.C. = 0.97

Gavilan Dome, July 87—Jan 88

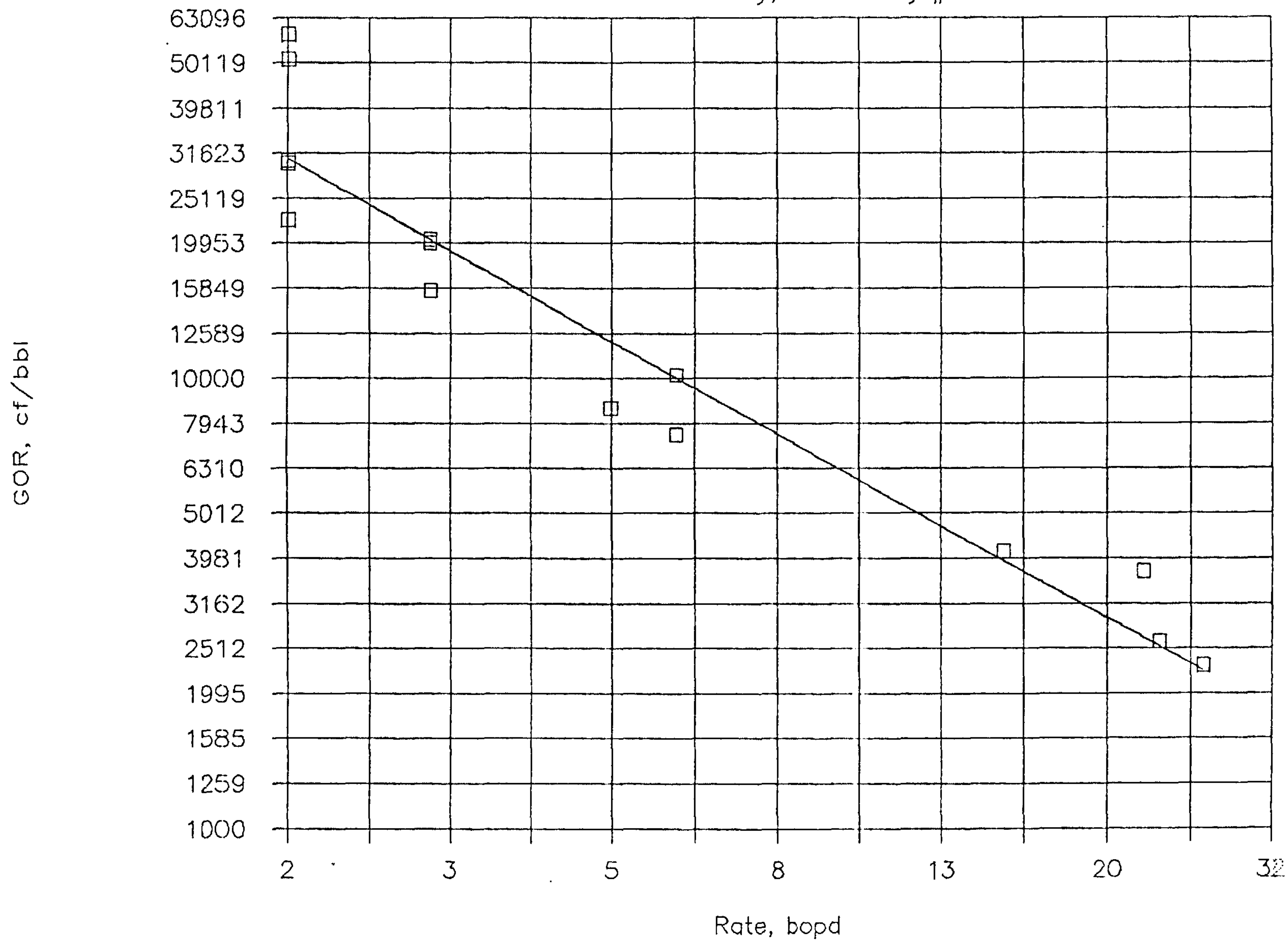
Rate Sensitivity, Meridian HF #3



C. C. = 1.00

Gavilan Dome, 1/1–2/15/88

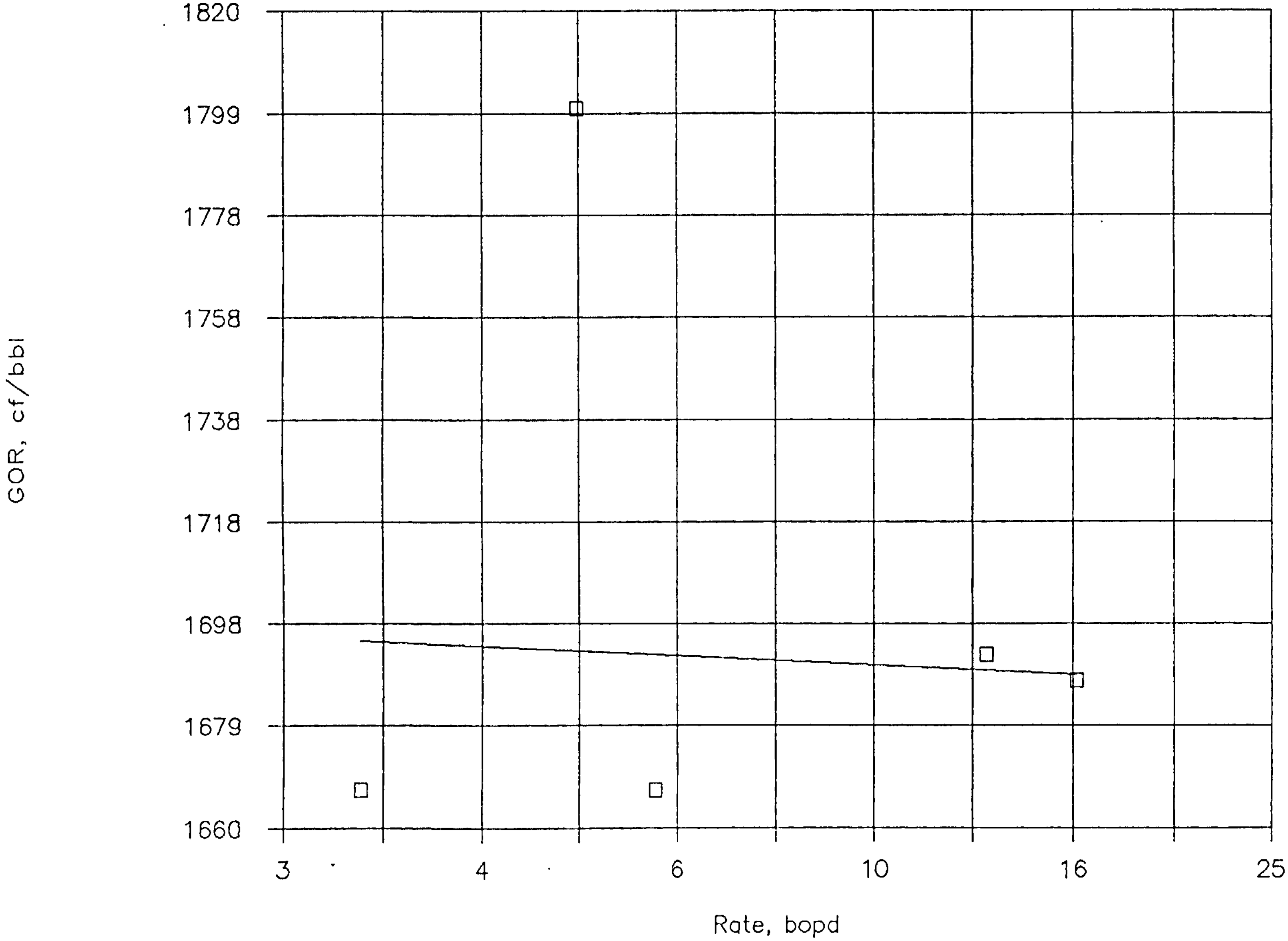
Rate Sensitivity, Merrion Kry #1



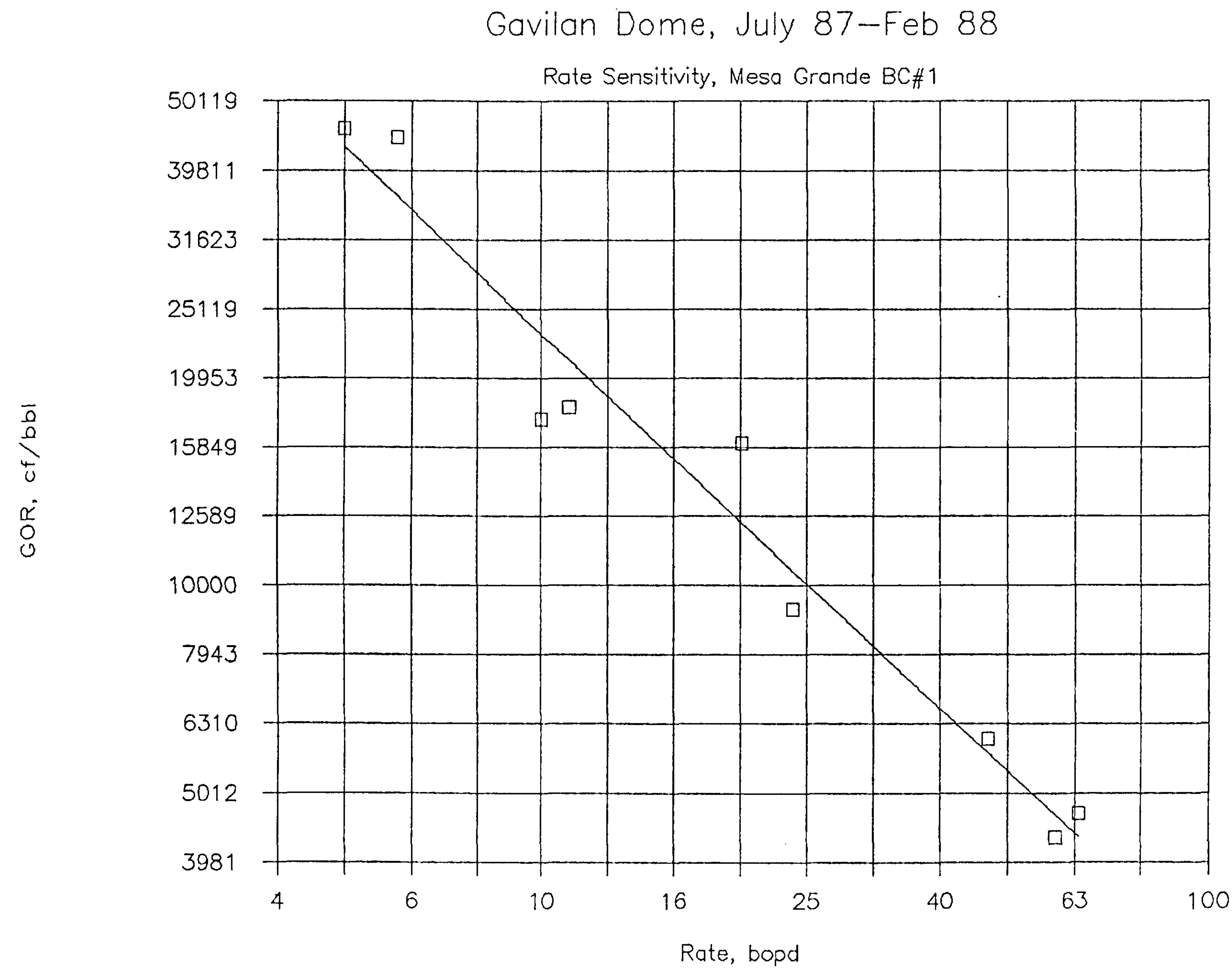
C.C. = 0.96

Gavilan Dome, July 87

Rate Sensitivity, Merrion OCG #1

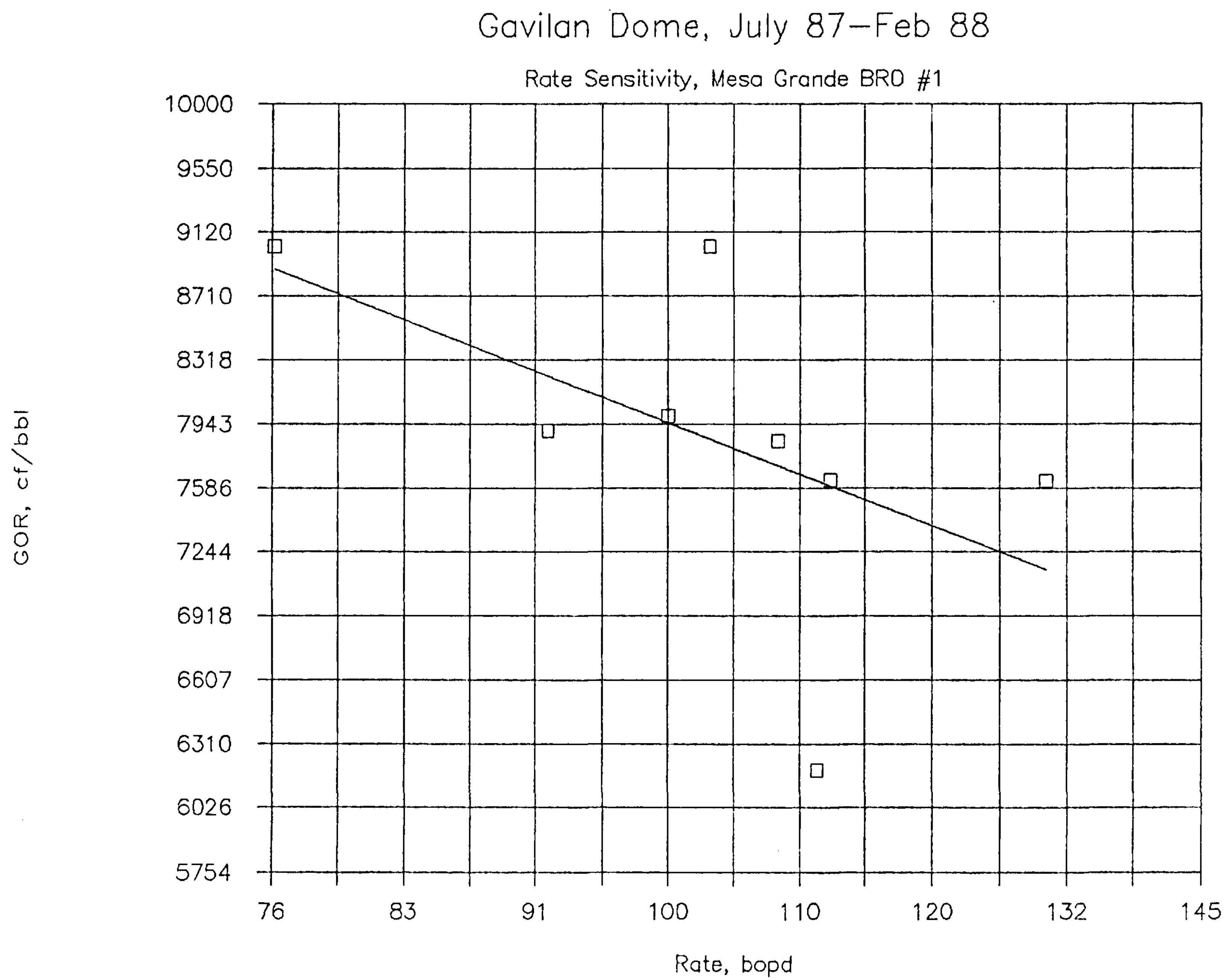


C. C. = 0.15



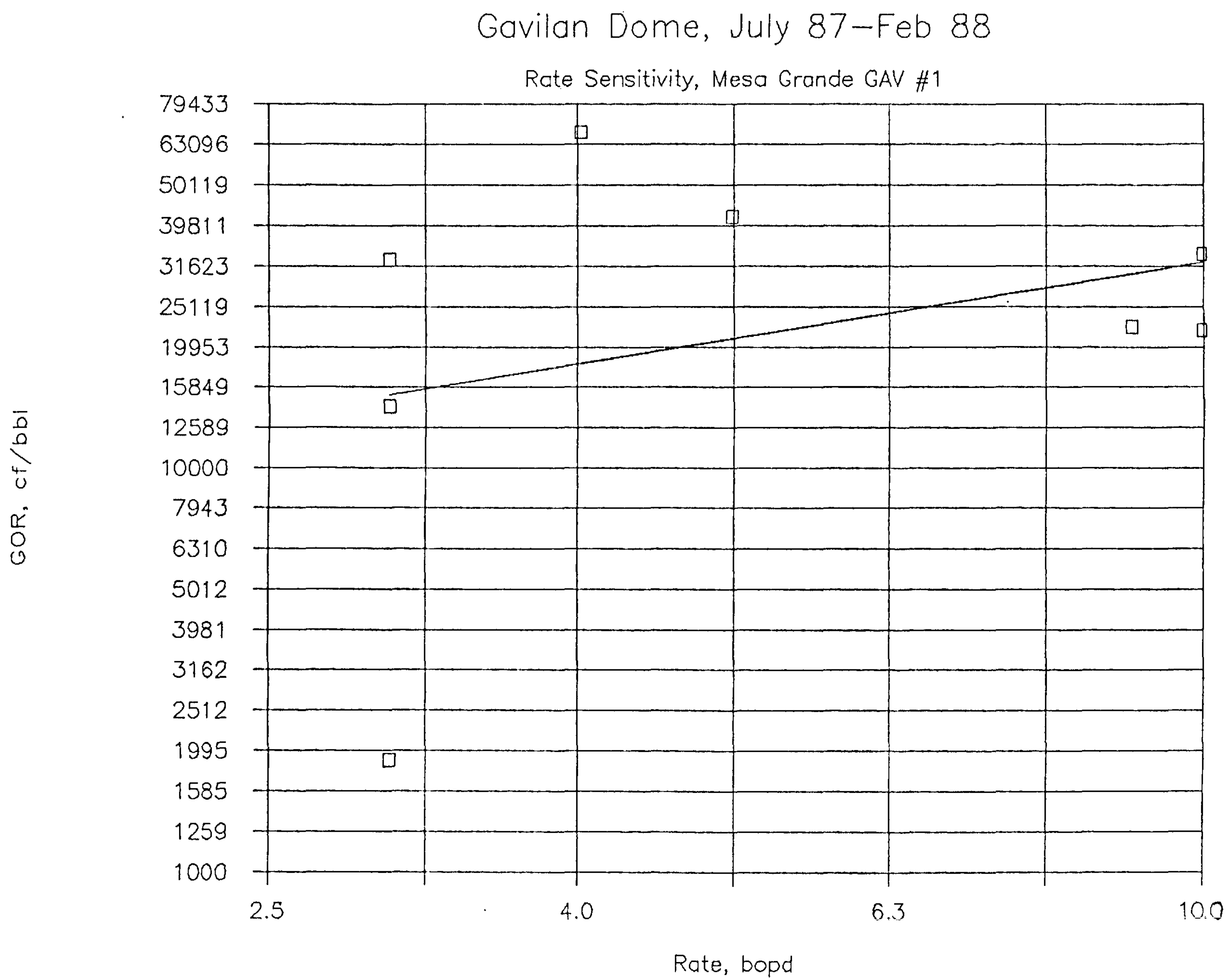
Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Mesa Grande BC#1
GOR, cf/bbl
50119
39811
31623
25119
19953
15849
12589
10000
7943
6310
5012
3981
4
6
10
16
25
40
63
100
Rate, bopd

C. C. = 0.98



Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Mesa Grande BRO #1
10000
9550
9120
8710
8318
7943
7586
7244
6918
6607
6310
6026
5754
GOR, cf/bbl
76
83
91
100
110
120
132
145
Rate, bopd

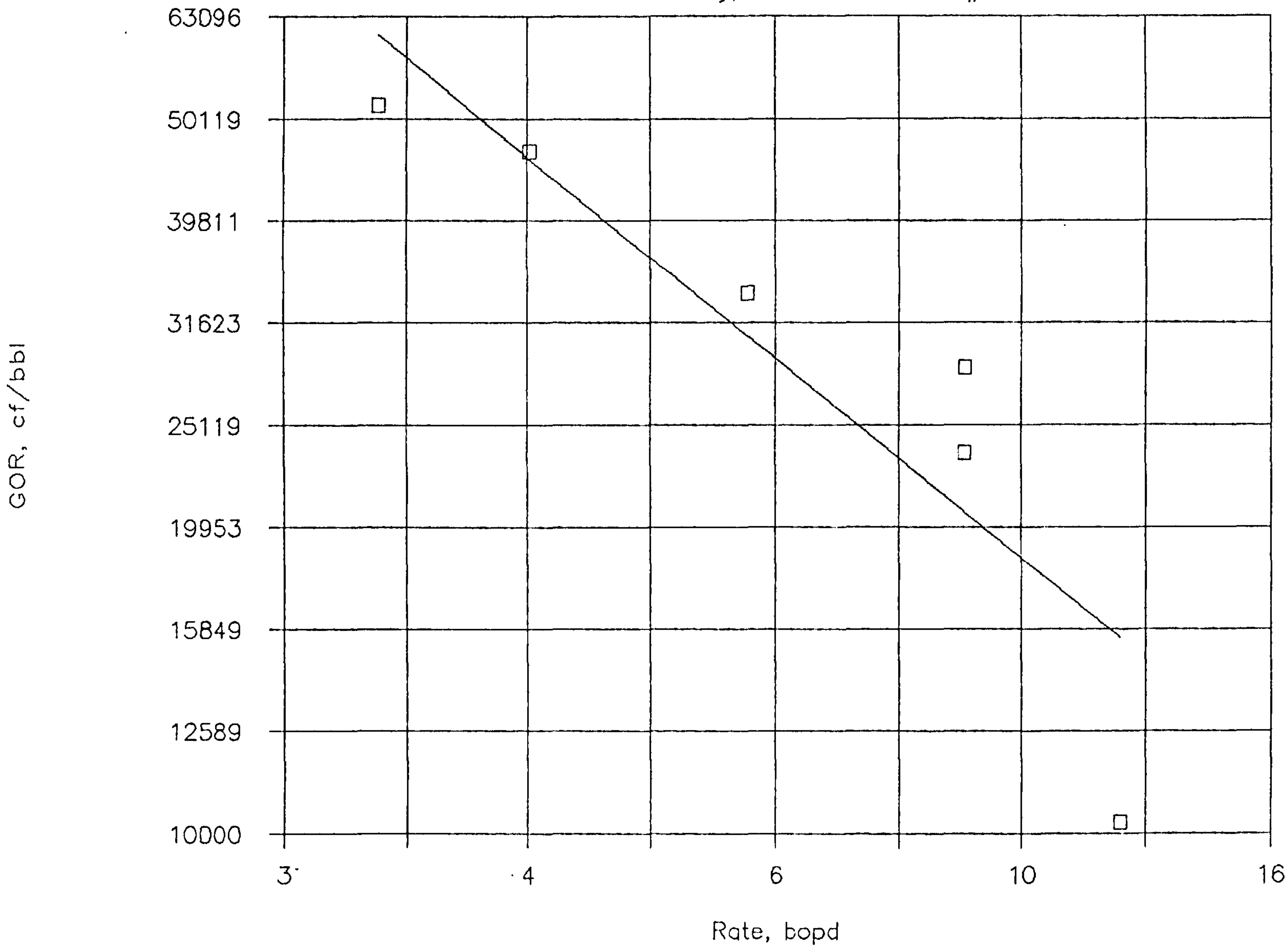
C.C. = 0.54


Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Mesa Grande GAV #1
GOR, cf/bbl
79433
63096
50119
39811
31623
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
2.5
4.0
6.3
10.0
Rate, bopd

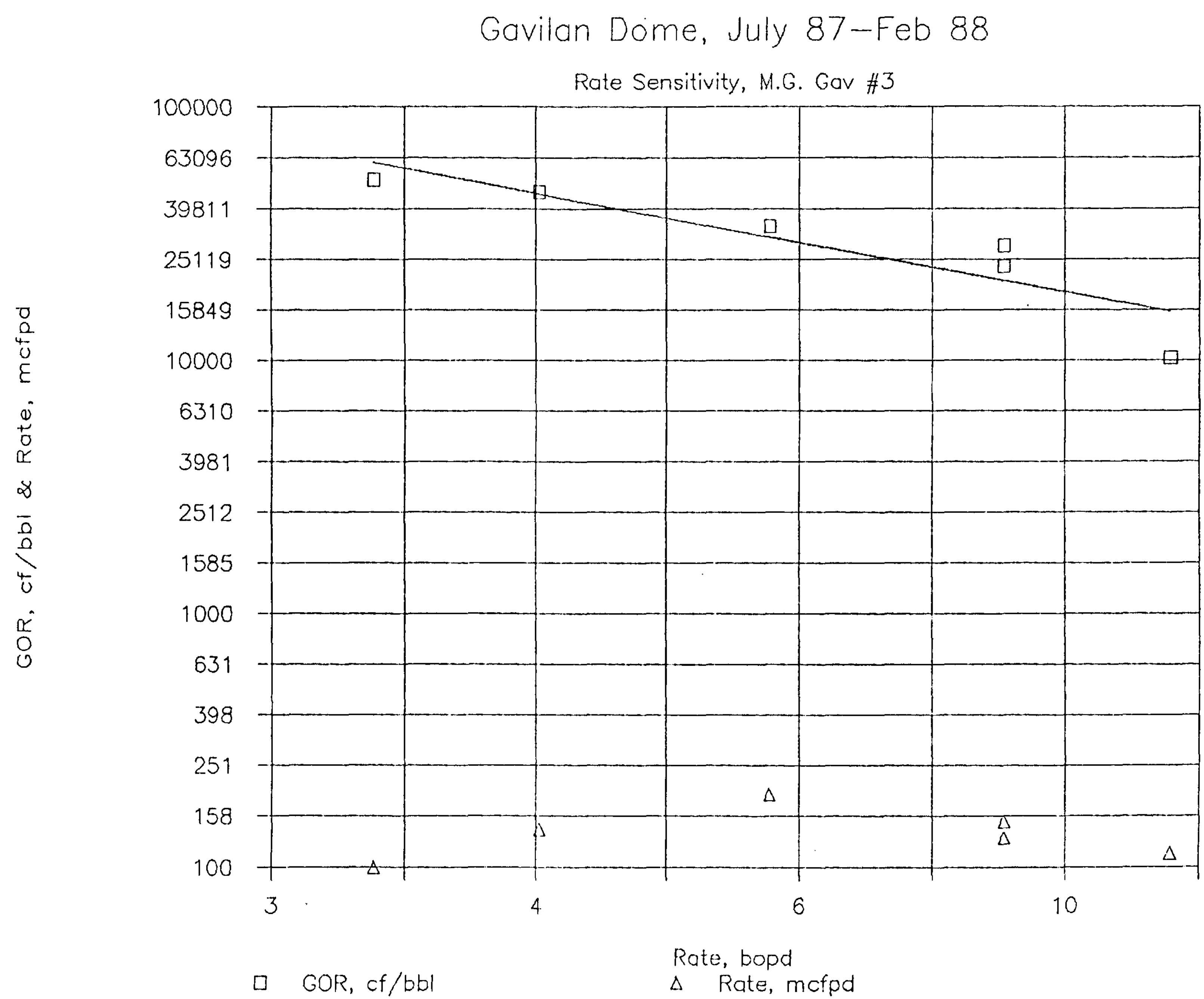
C.C. = 0.32

Gavilan Dome, July 87–Feb 88

Rate Sensitivity, Mesa Grande GAV #3

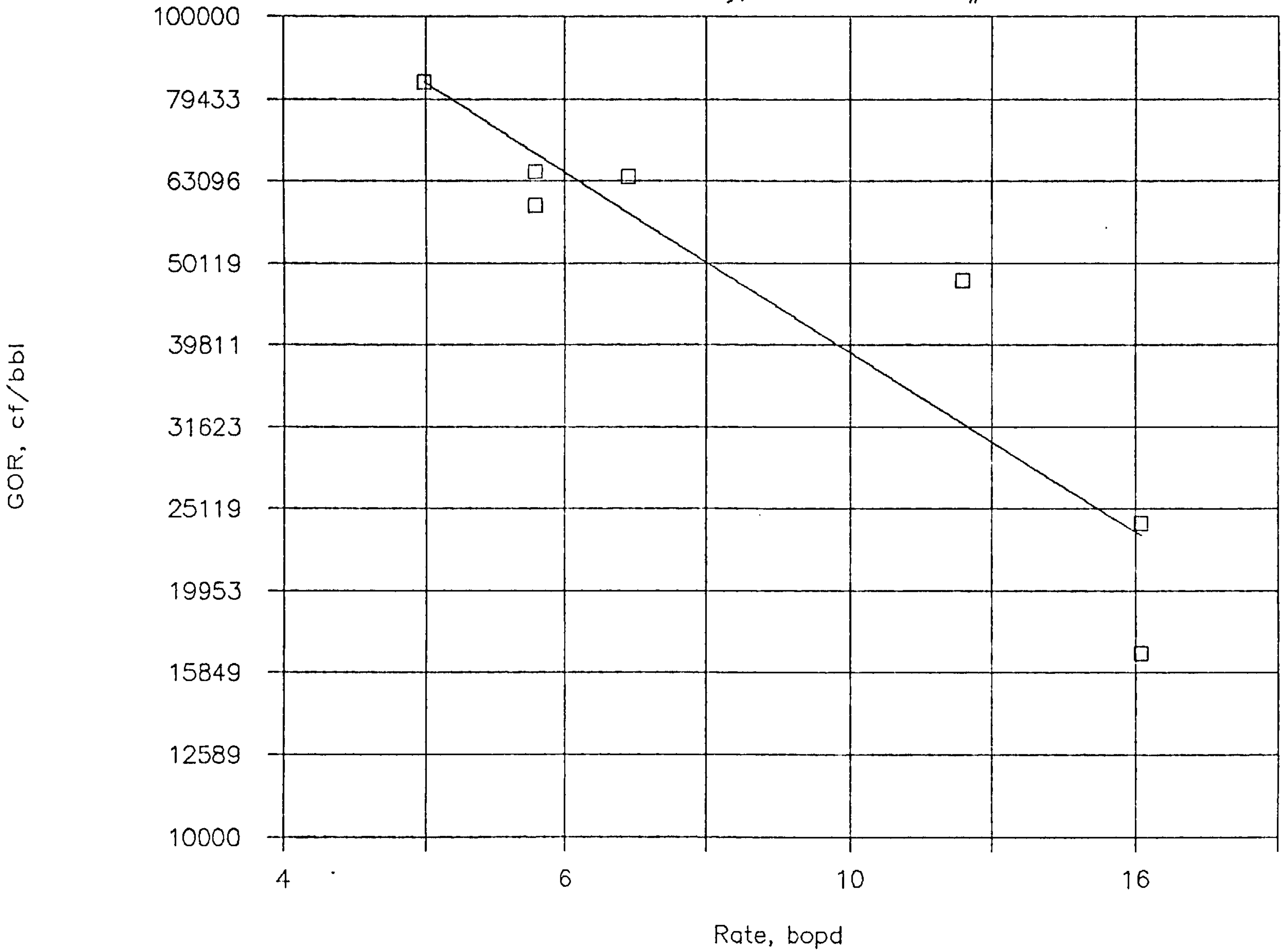


C.C. = 0.90


Gavilan Dome, July 87–Feb 88
Rate Sensitivity, M.G. Gav #3
100000
63096
39811
25119
15849
10000
6310
3981
2512
1585
1000
631
398
251
158
100
GOR, cf/bbl & Rate, mcfpd
3
4
6
10
Rate, bopd
GOR, cf/bbl
Rate, mcfpd

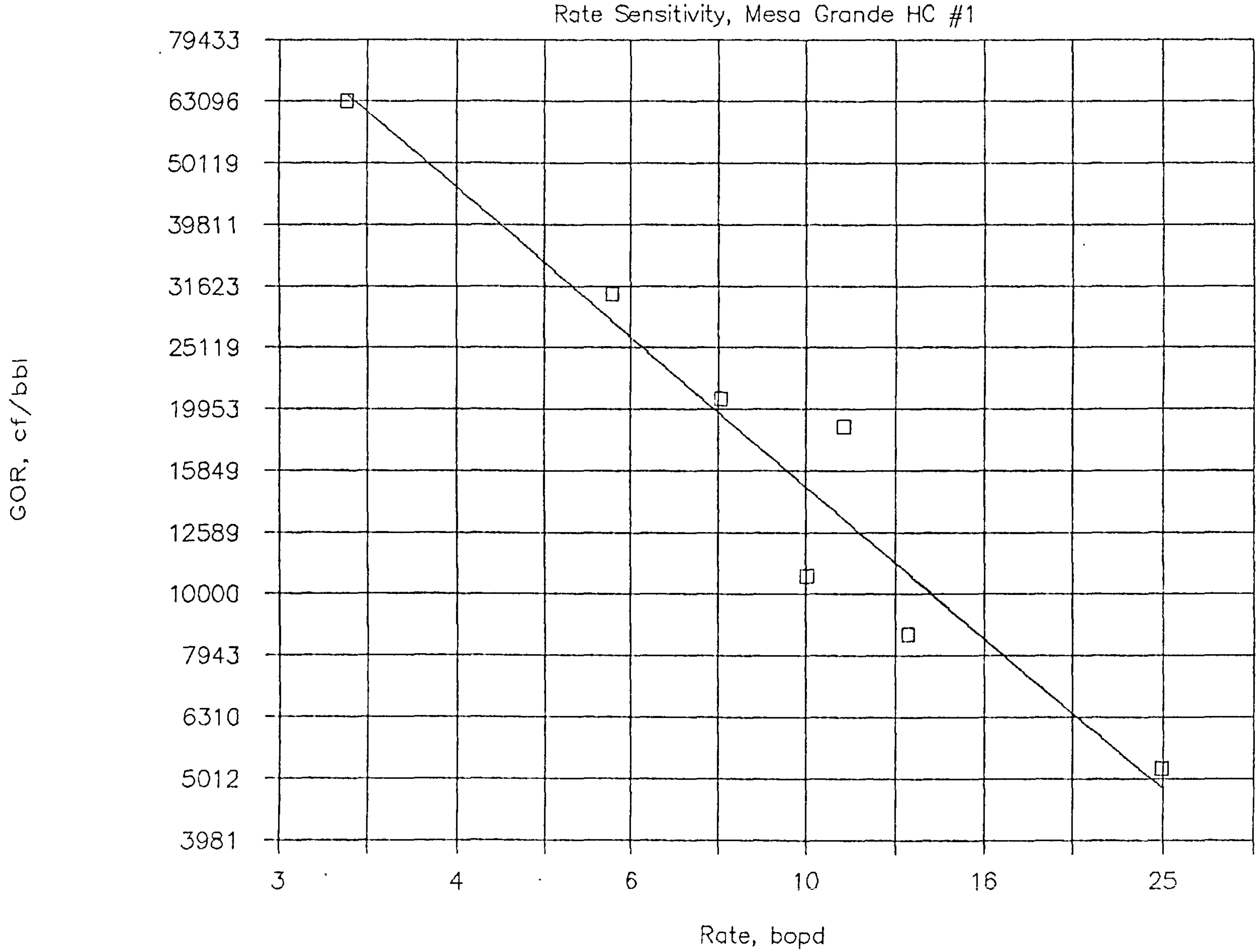
Gavilan Dome, July 87—Feb 88

Rate Sensitivity, Mesa Grande GH #1

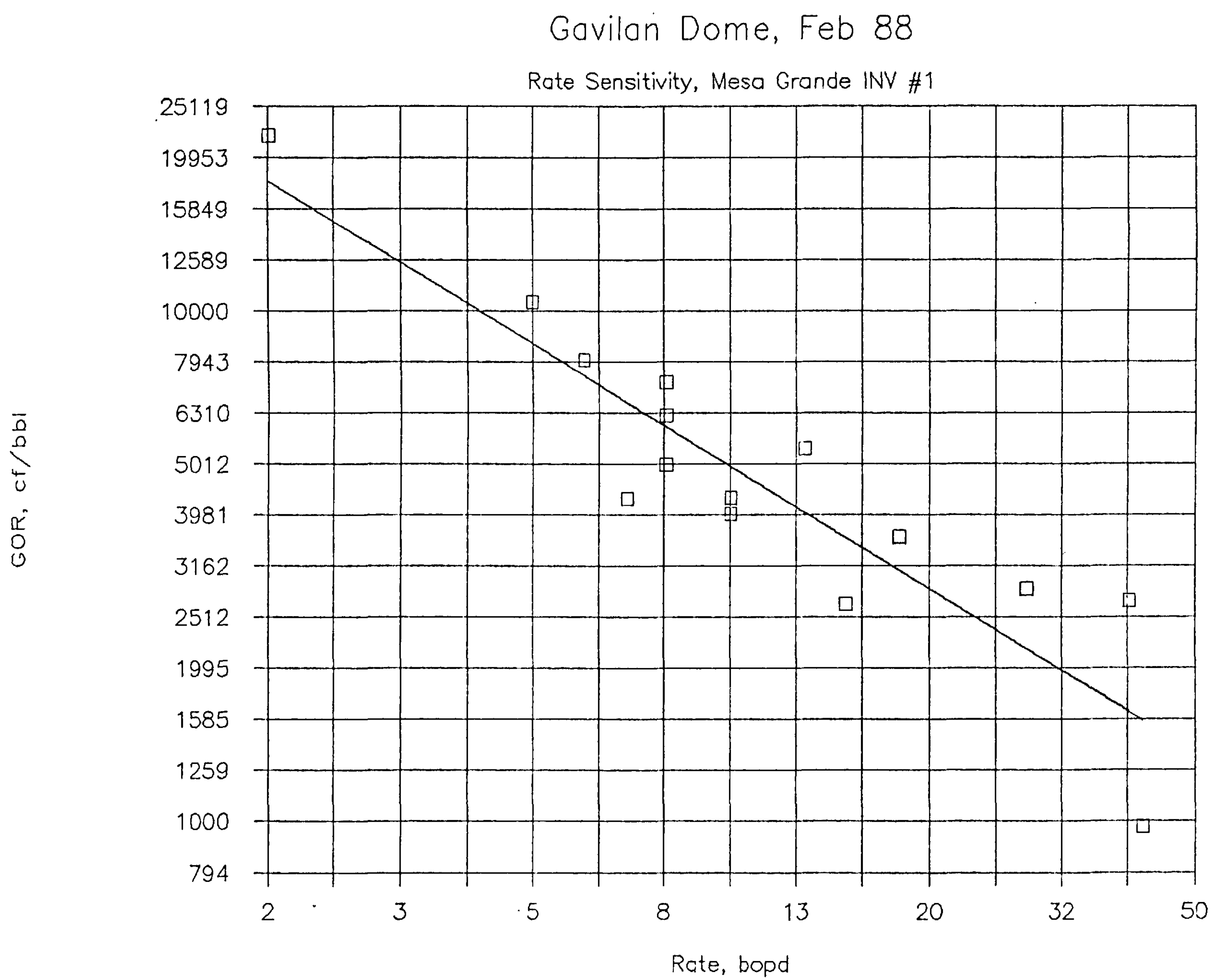


C.C. = 0.92

Gavilan Dome, Aug 87–Feb 88

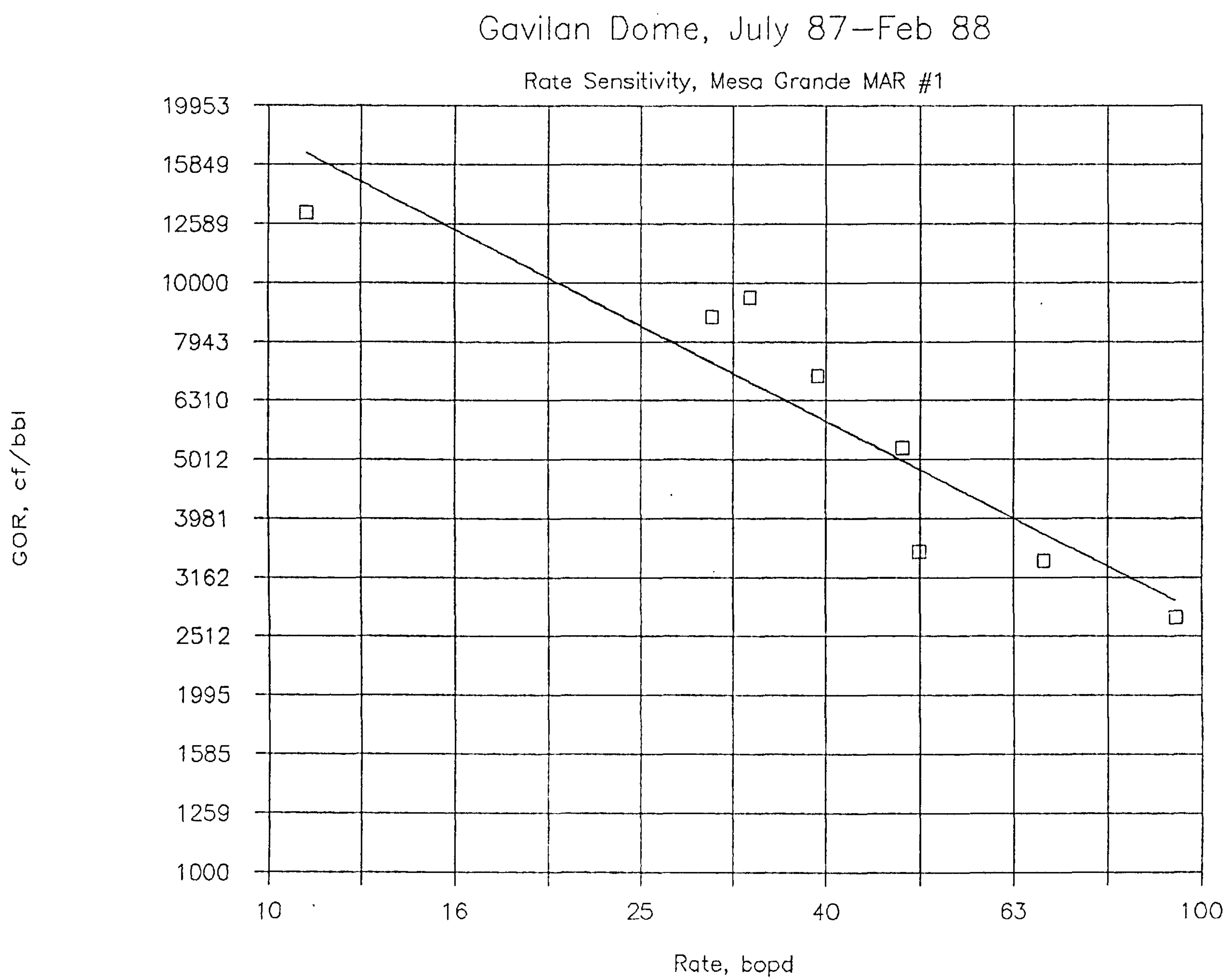


C. C. = 0.96



Gavilan Dome, Feb 88
Rate Sensitivity, Mesa Grande INV #1
GOR, cf/bbl
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
794
2
3
5
8
13
20
32
50
Rate, bopd

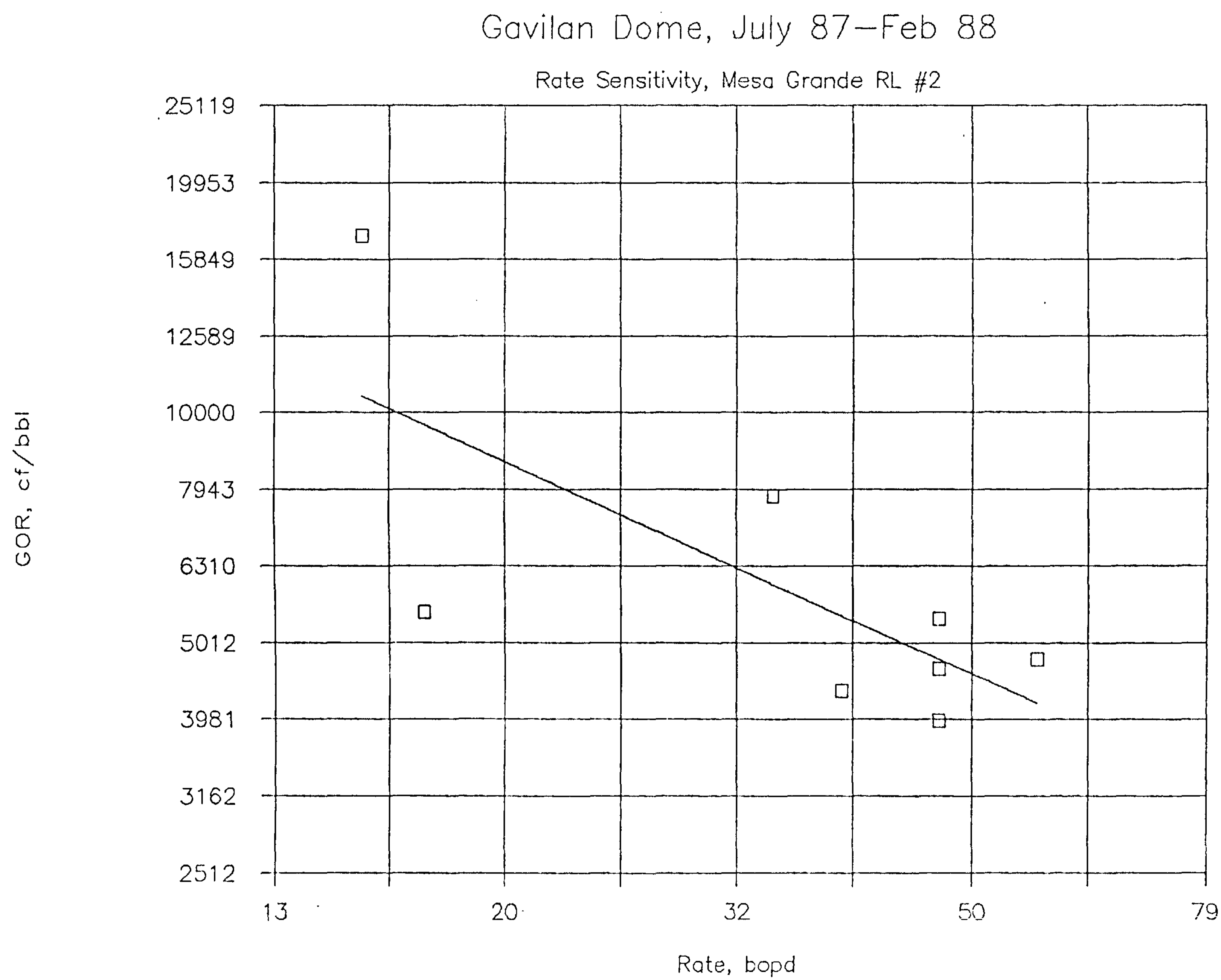
C.C. = 0.91


Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Mesa Grande MAR #1
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
GOR, cf/bbl
10
16
25
40
63
100
Rate, bopd

C. C. = 0.92

Gavilan Dome, Feb 88
Rate Sensitivity, Mesa Grande PRO #2
GOR, cf/bbl
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
4
6
10
16
25
40
Rate, bopd

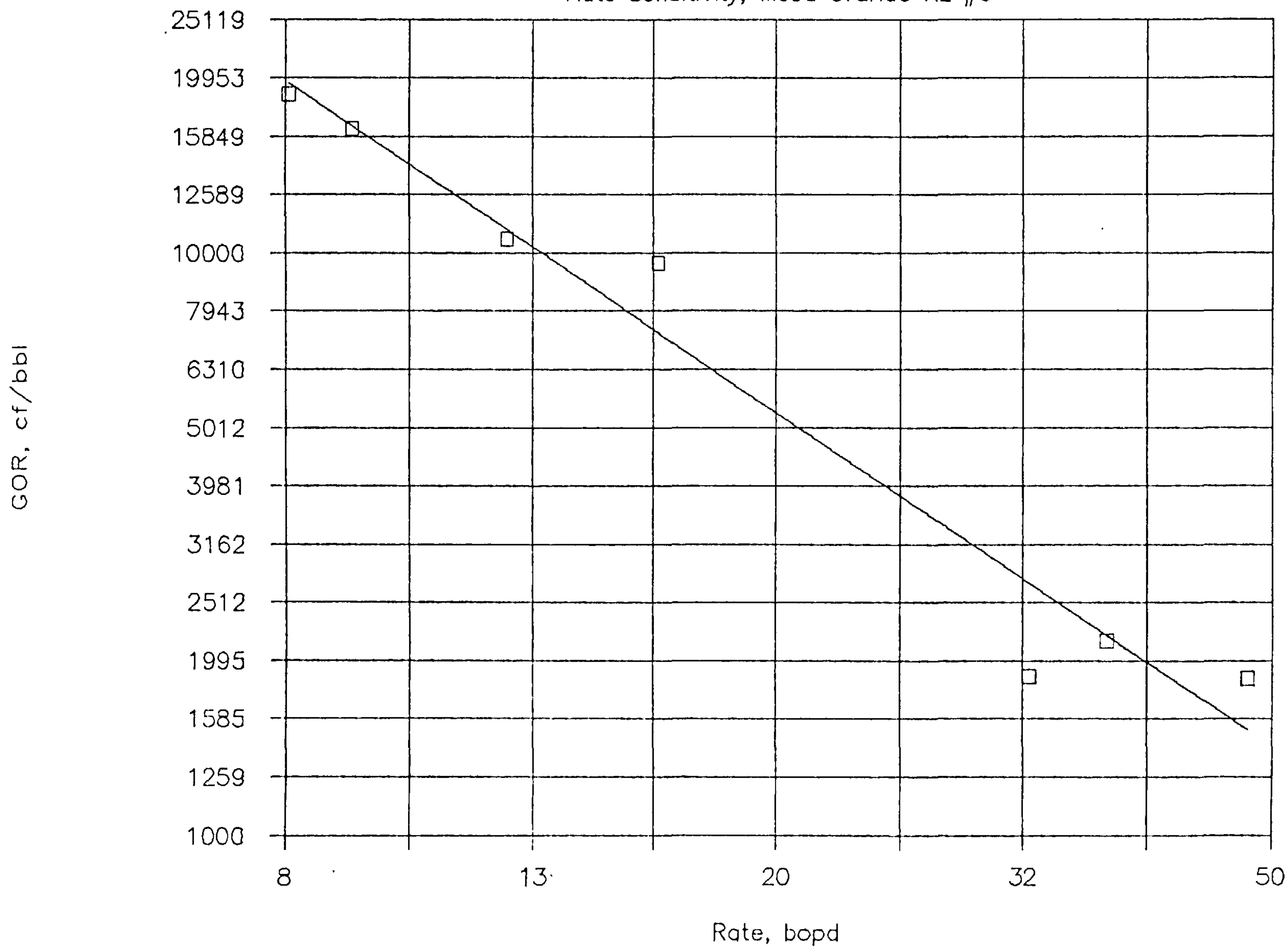
C.C. = 1.00


Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Mesa Grande RL #2
GOR, cf/bbl
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
13
20
32
50
79
Rate, bopd

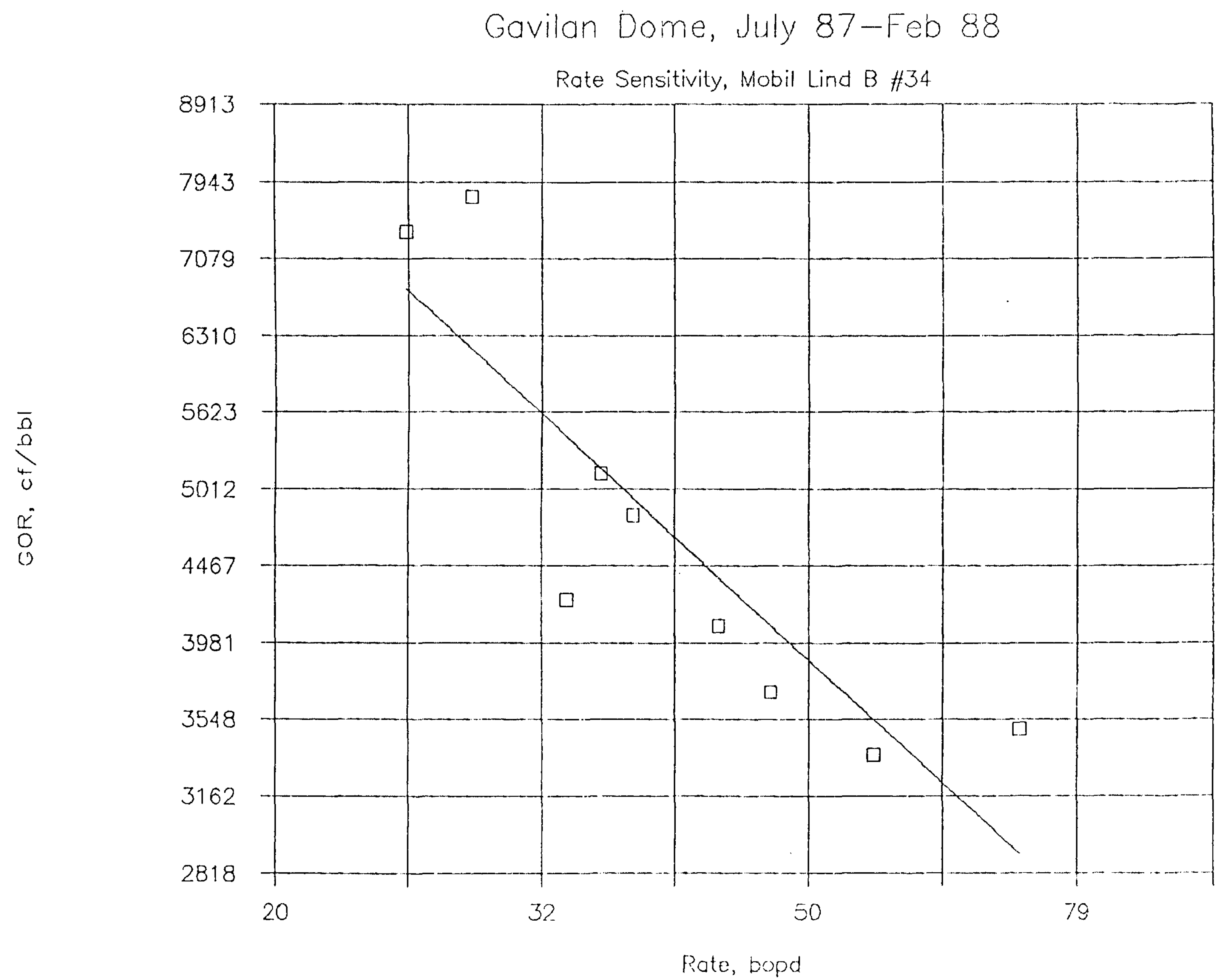
C.C. = 0.73

Gavilan Dome, July 87–Feb 88

Rate Sensitivity, Mesa Grande RL #3



C.C.= 0.98

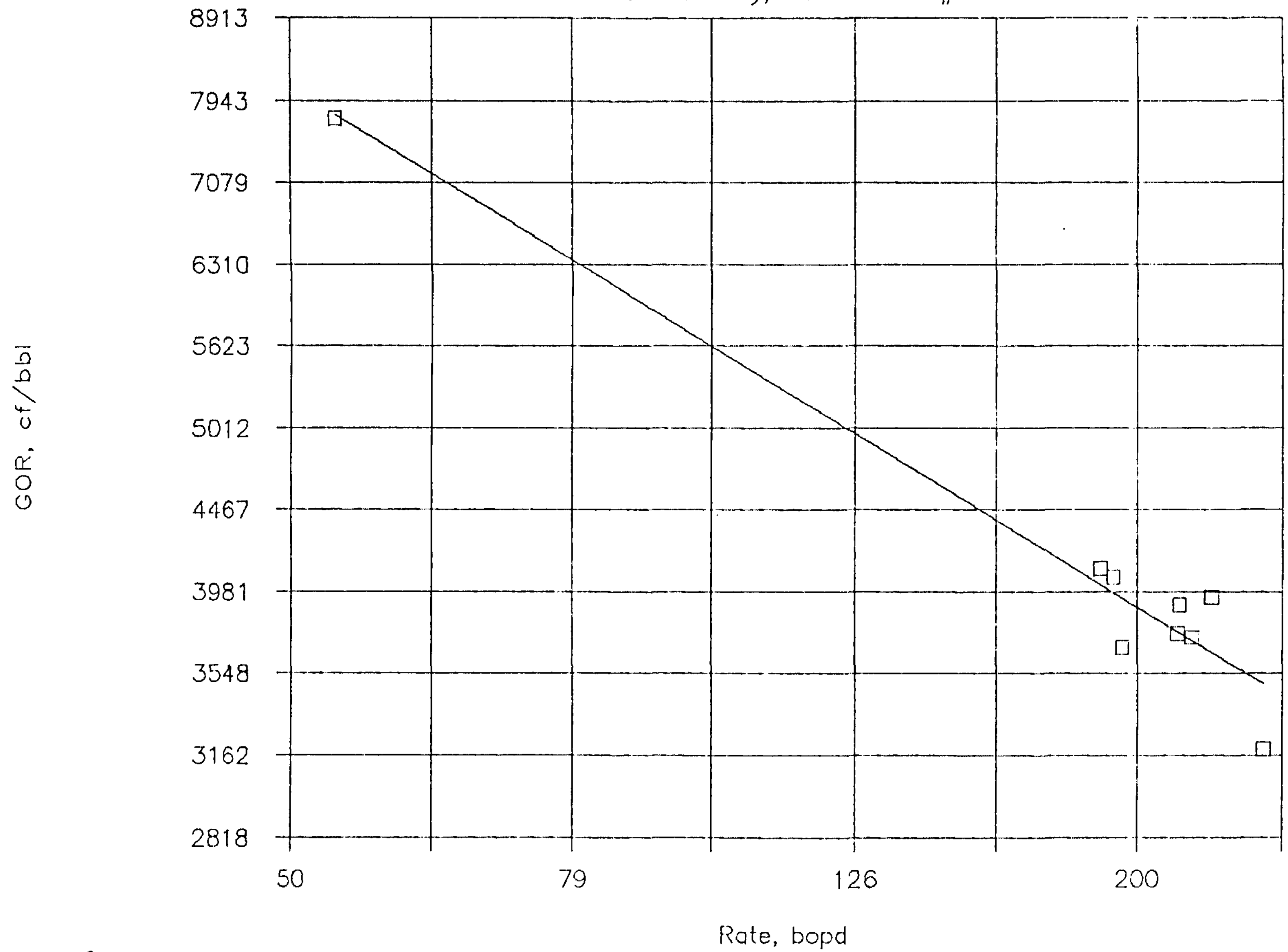


Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Mobil Lind B #34
8913
7943
7079
6310
5623
5012
4467
3981
3548
3162
2818
GOR, cf/bbl
20
32
50
79
Rate, bopd

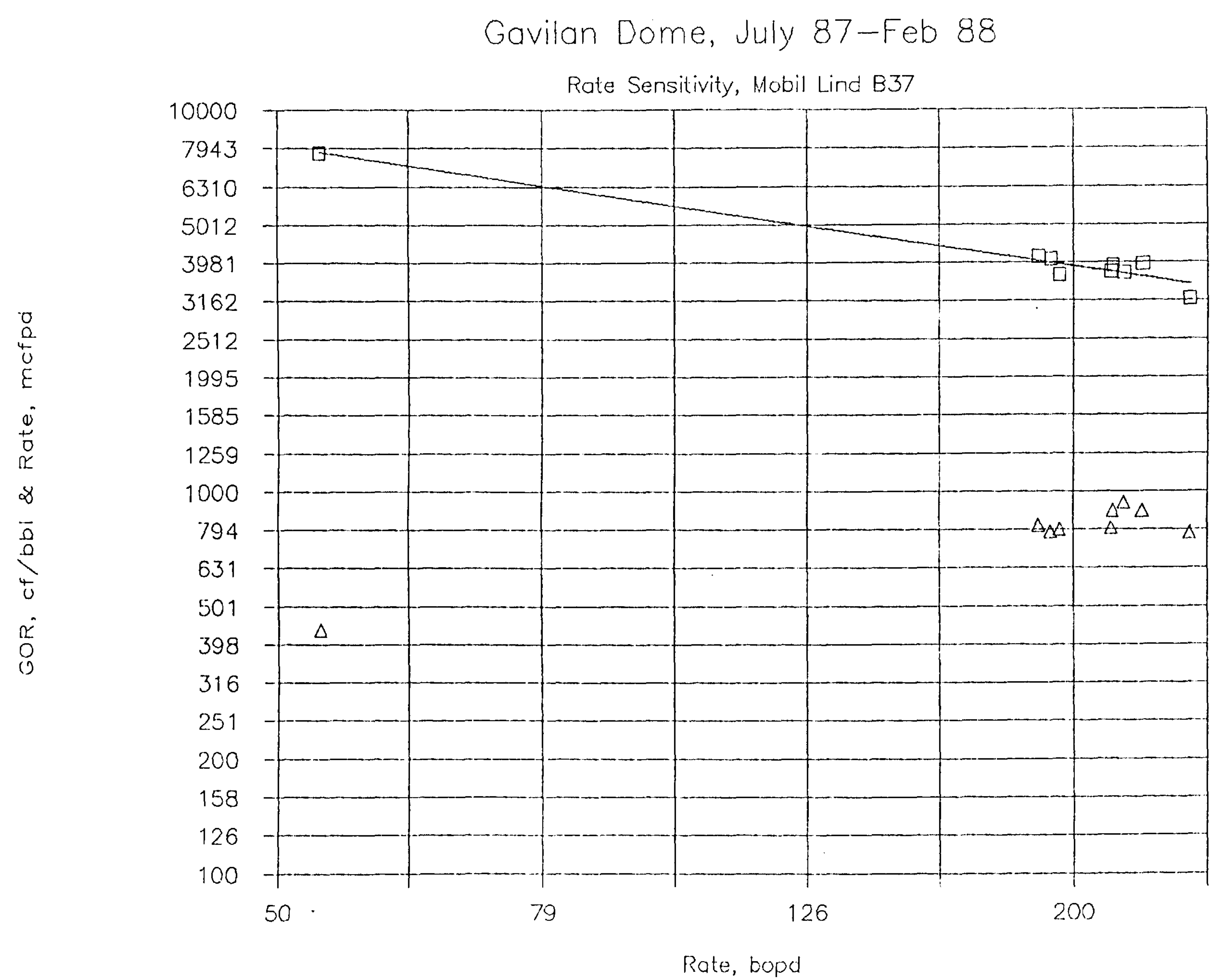
C.C. = 0.88

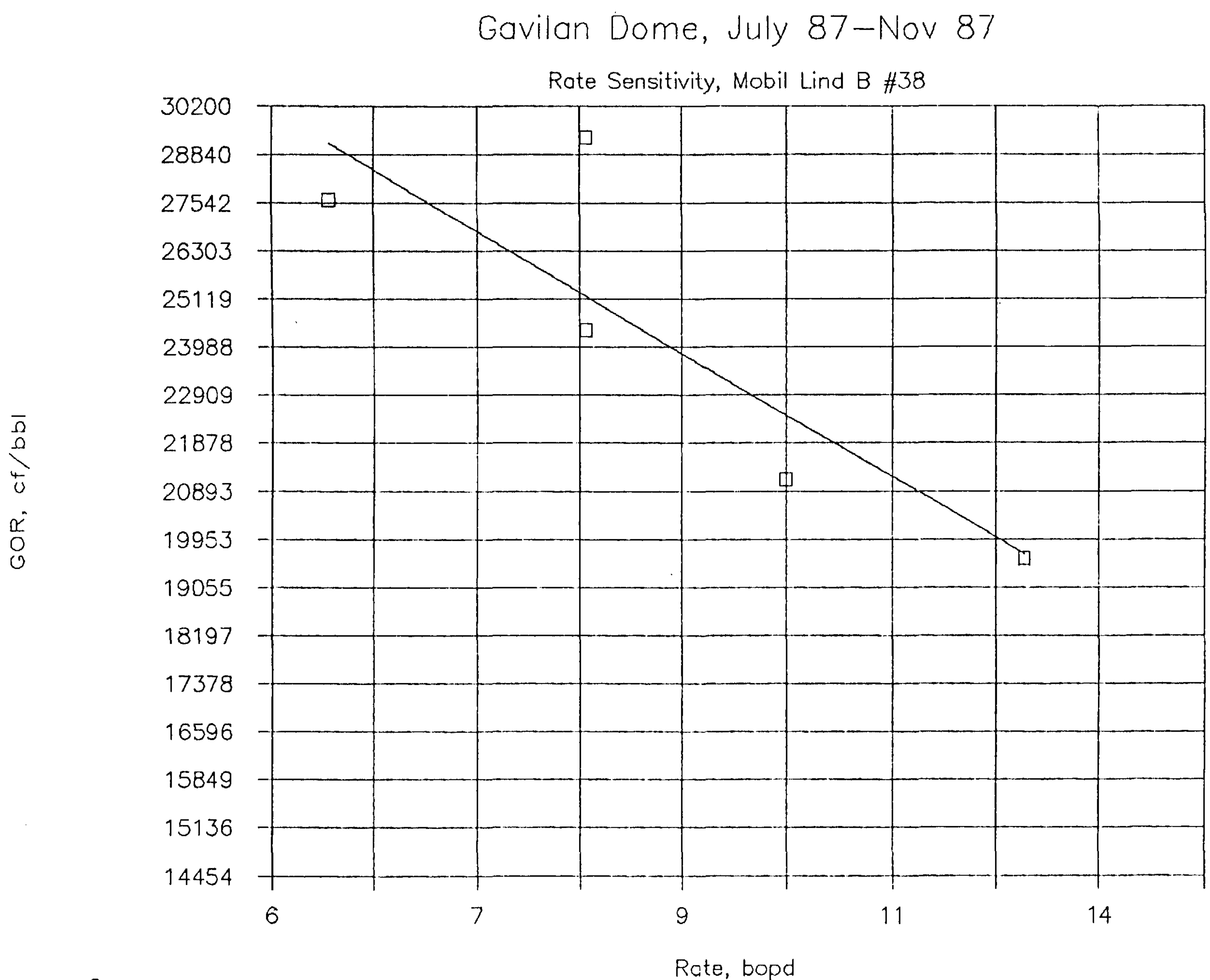
Gavilan Dome, July 87—Feb 88

Rate Sensitivity, Mobil Lind B #37



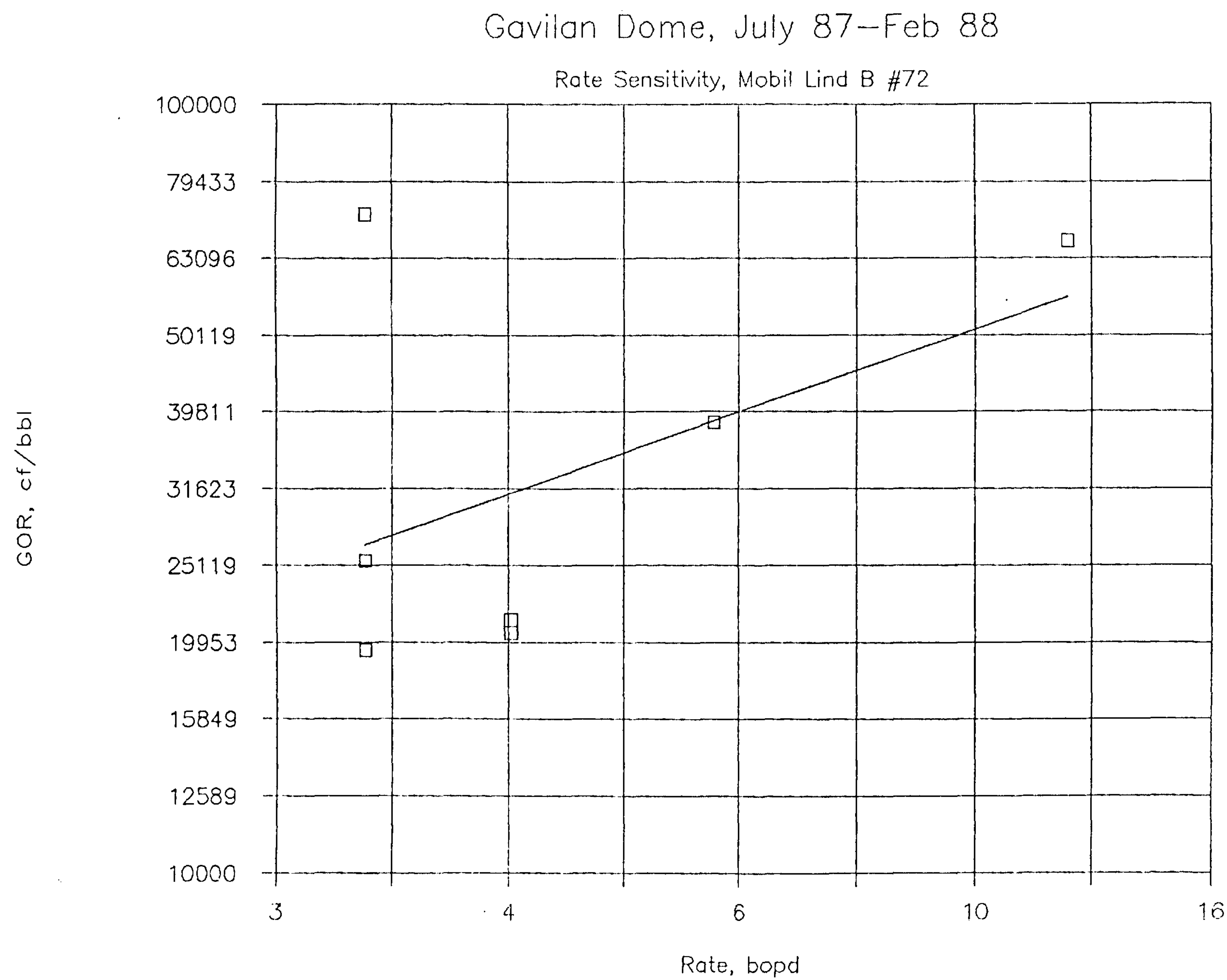
C.C. = 0.98


Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Mobil Lind B37
GOR, cf/bbl & Rate, mcfpd
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
794
631
501
398
316
251
200
158
126
100
50
79
126
200
Rate, bopd

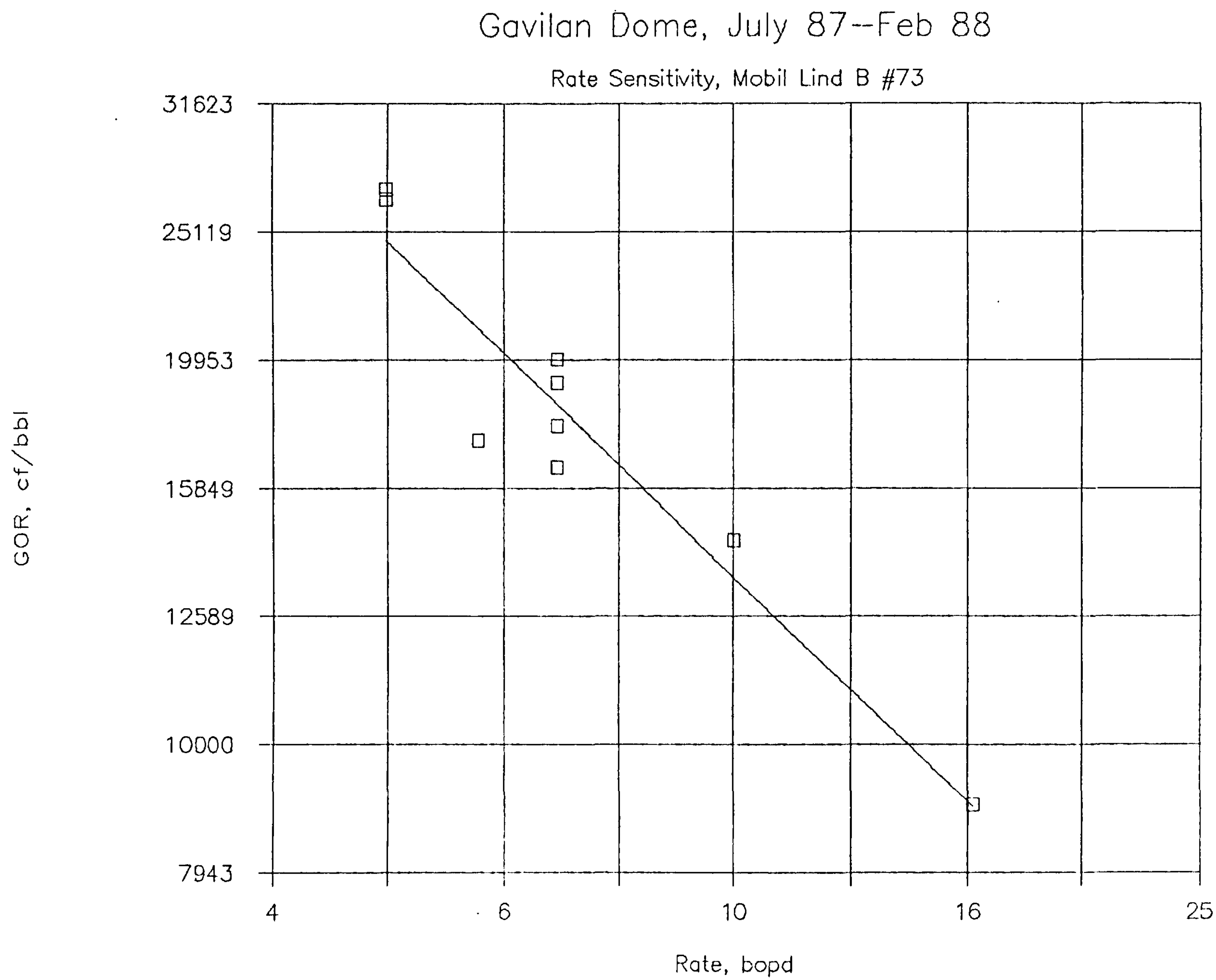


Gavilan Dome, July 87–Nov 87
Rate Sensitivity, Mobil Lind B #38
30200
28840
27542
26303
25119
23988
22909
21878
20893
19953
19055
18197
17378
16596
15849
15136
14454
GOR, cf/bbl
6
7
9
11
14
Rate, bopd

C.C. = 0.86

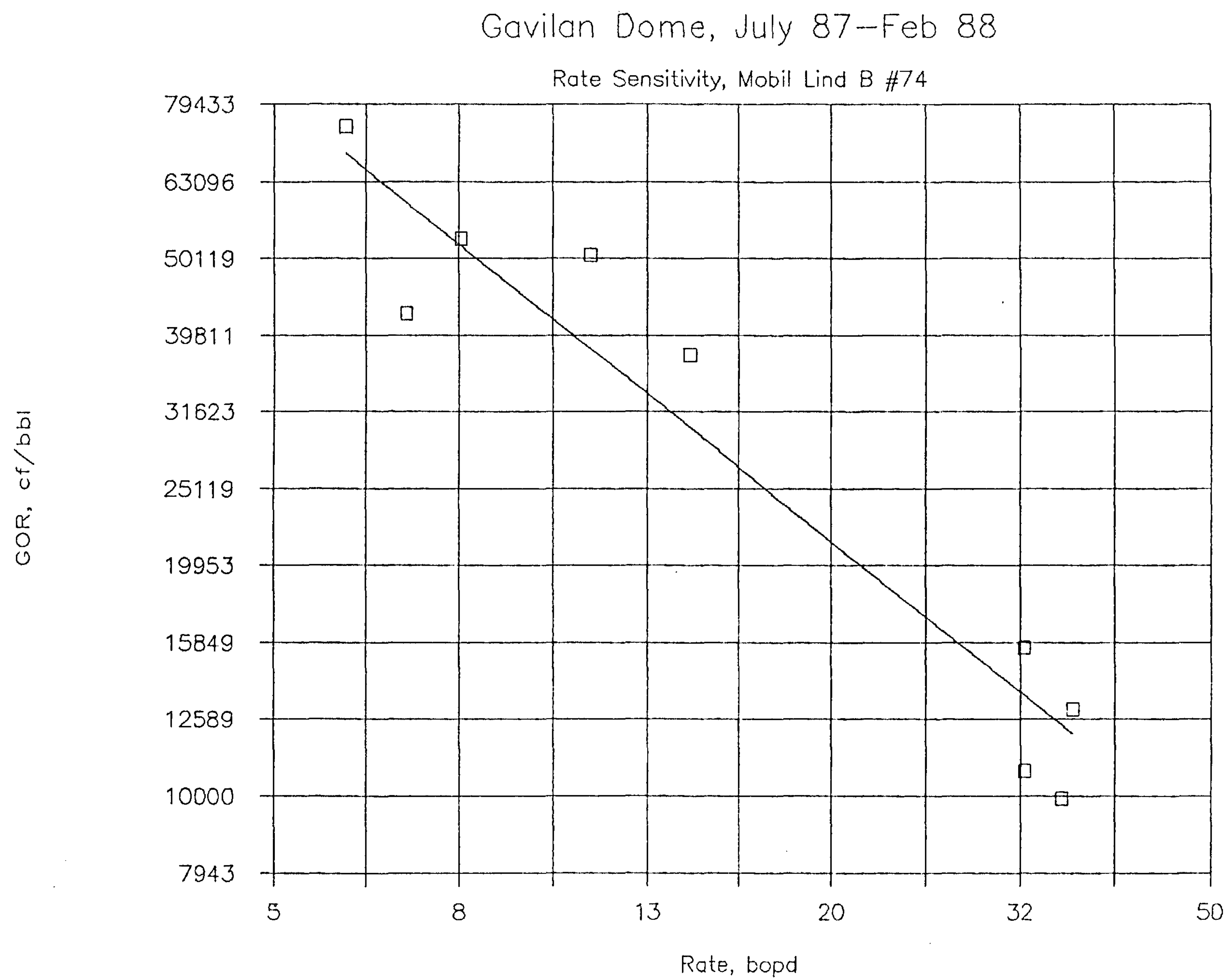

Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Mobil Lind B #72
100000
79433
63096
50119
39811
31623
25119
19953
15849
12589
10000
GOR, cf/bbl
3
4
6
10
16
Rate, bopd

C.C.=0.49

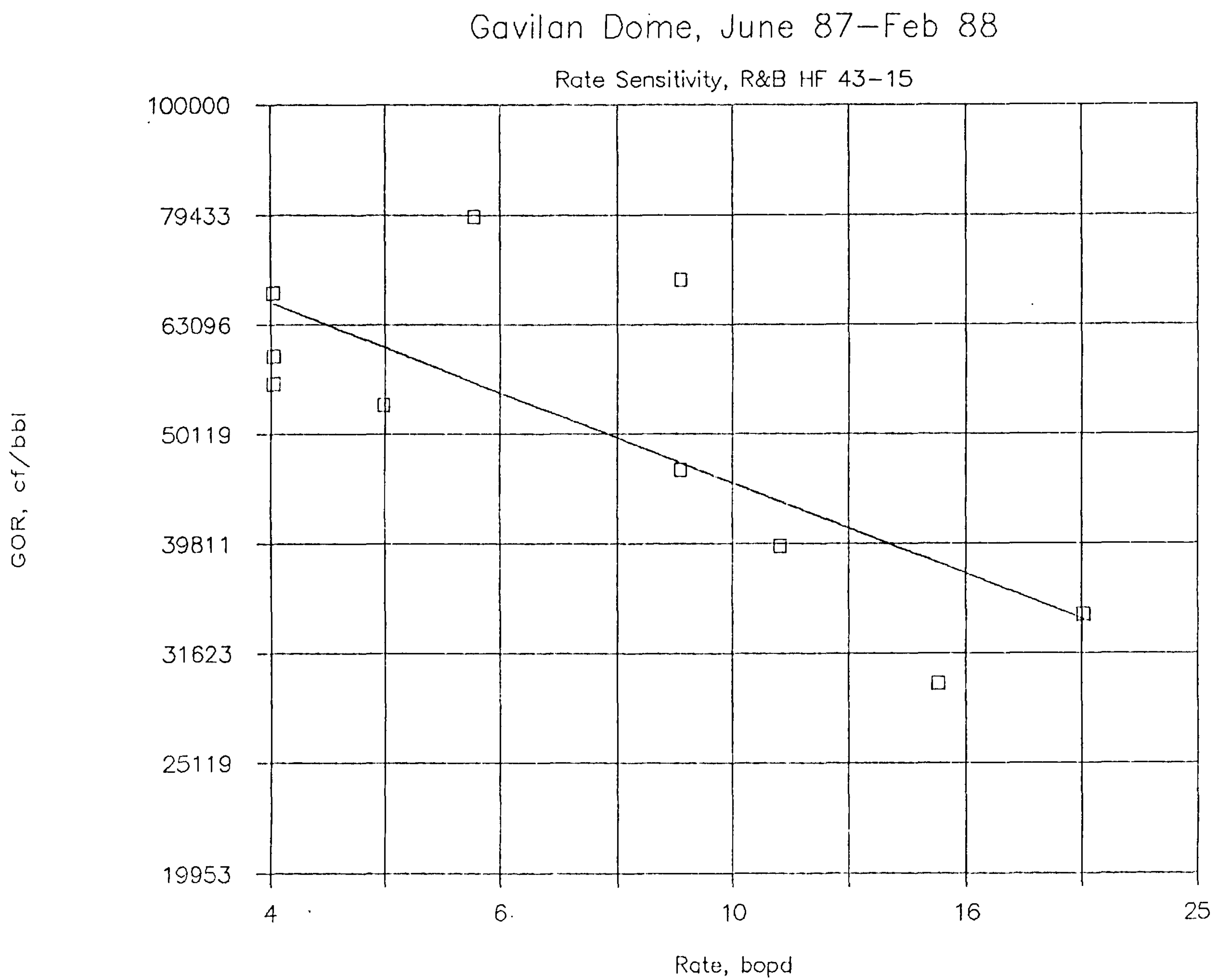


Gavilan Dome, July 87--Feb 88
Rate Sensitivity, Mobil Lind B #73
31623
25119
19953
15849
12589
10000
7943
GOR, cf/bbl
4
6
10
16
25
Rate, bopd

C.C. = 0.95


Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Mobil Lind B #74
GOR, cf/bbl
79433
63096
50119
39811
31623
25119
19953
15849
12589
10000
7943
5
8
13
20
32
50
Rate, bopd

C. C. = 0.86

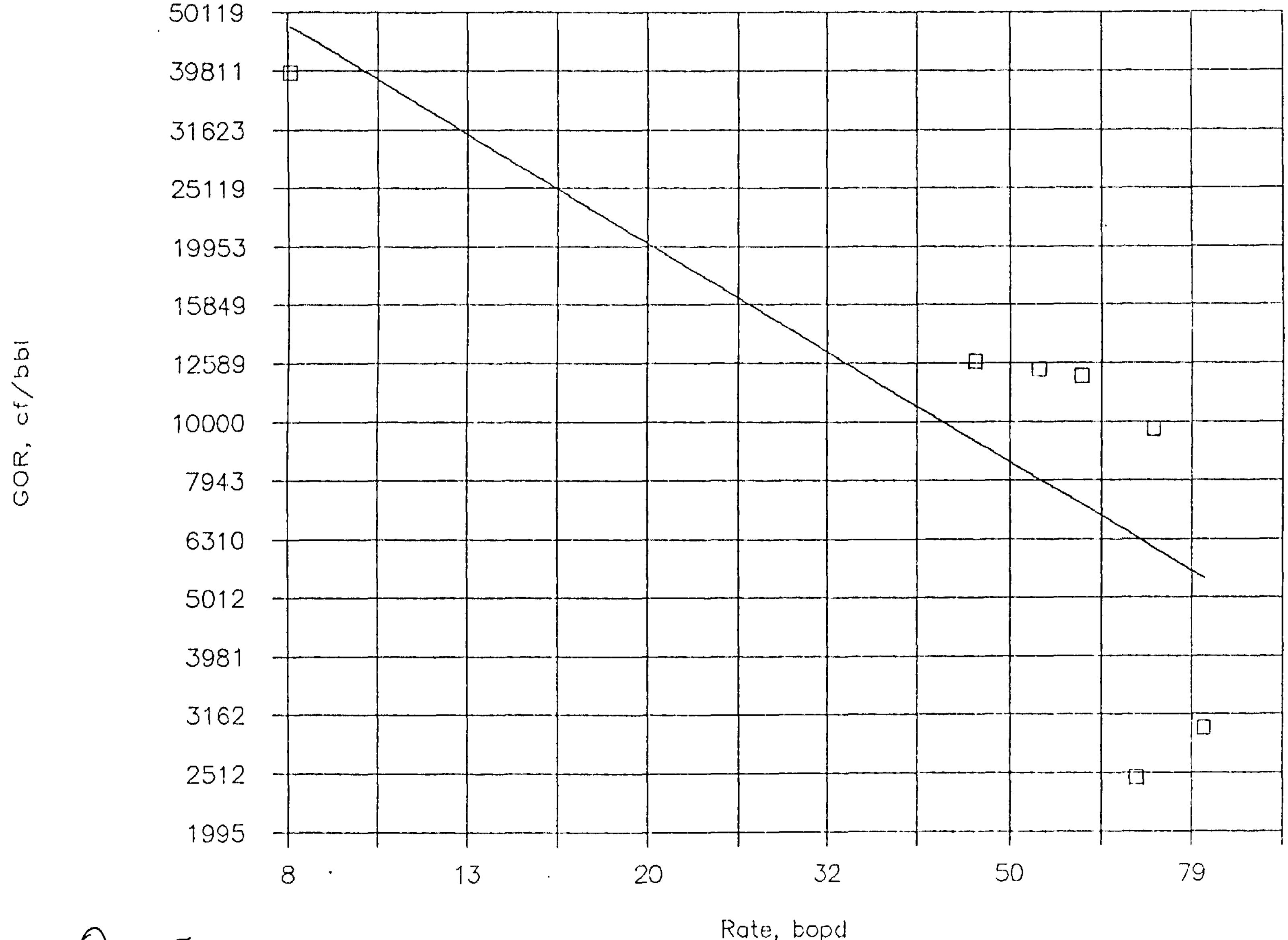


Gavilan Dome, June 87—Feb 88
Rate Sensitivity, R&B HF 43-15
100000
79433
63096
50119
39811
31623
25119
19953
GOR, cf/bbl
4
6
10
16
25
Rate, bopd

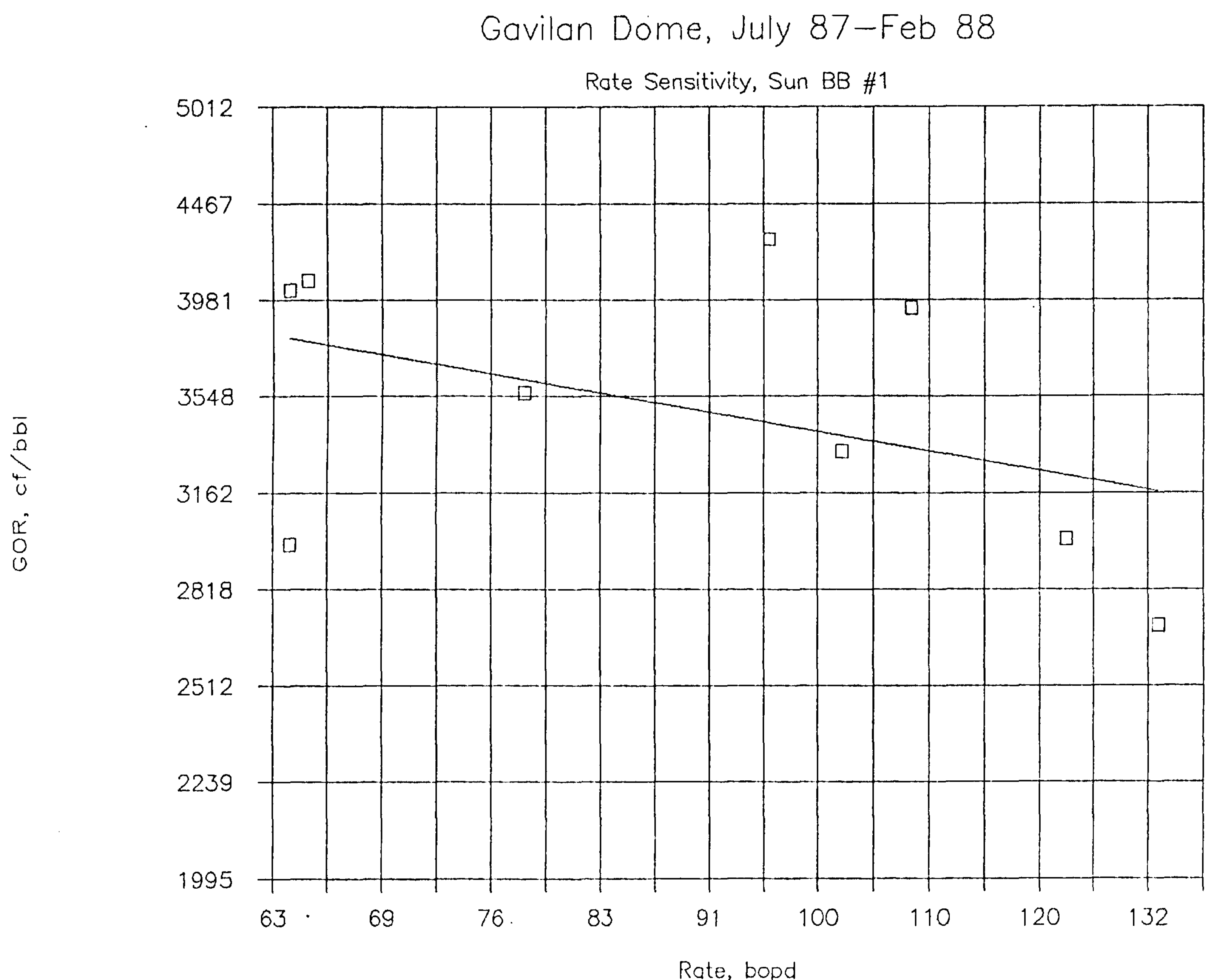
C.C. = 0.76

Gavilan Dome, Sept 87–Feb 88

Rate Sensitivity, R&B Ing 34-16

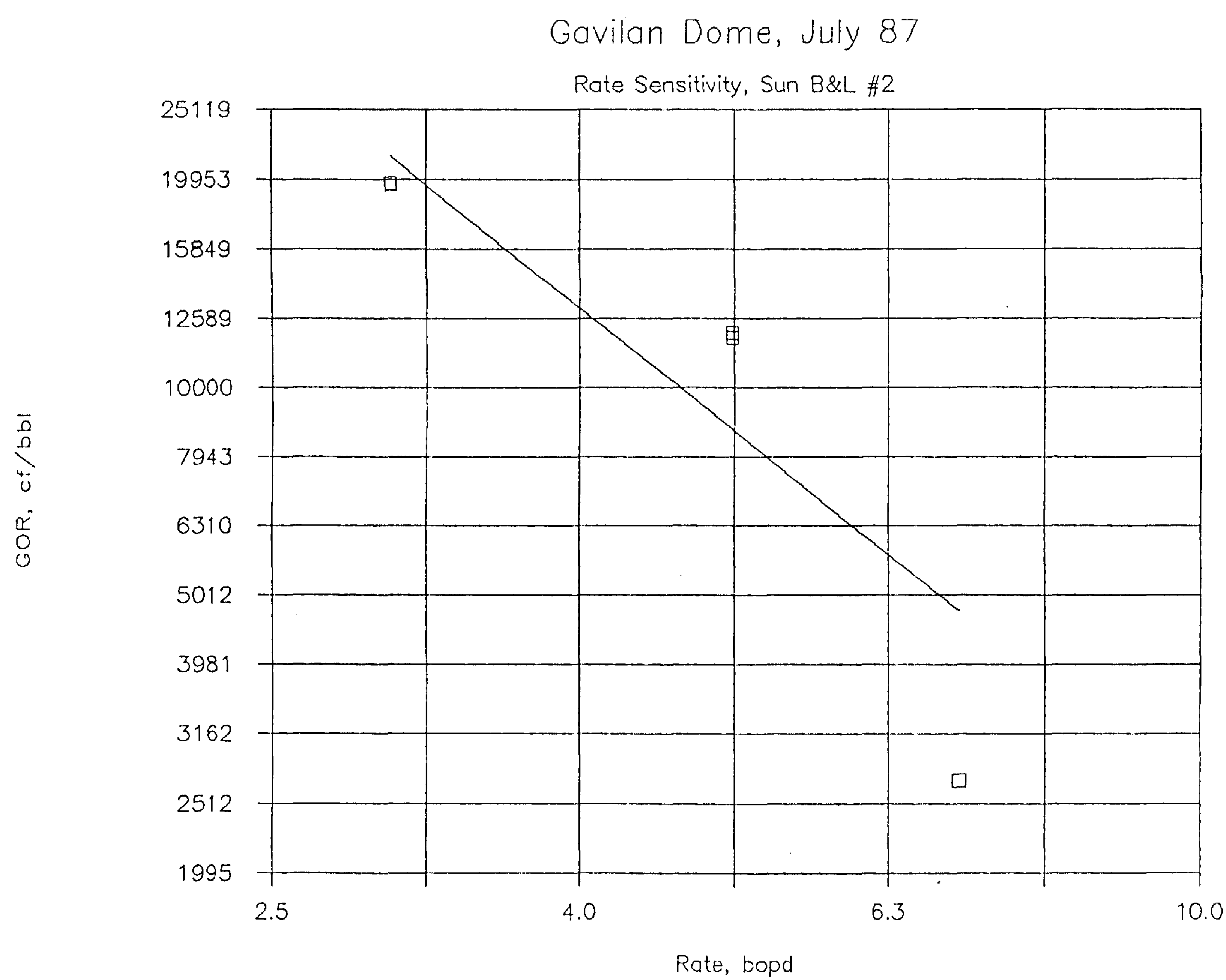


C.C. = 0.79



Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Sun BB #1
5012
4467
3981
3548
3162
2818
2512
2239
1995
GOR, cf/bbl
63
69
76
83
91
100
110
120
132
Rate, bopd

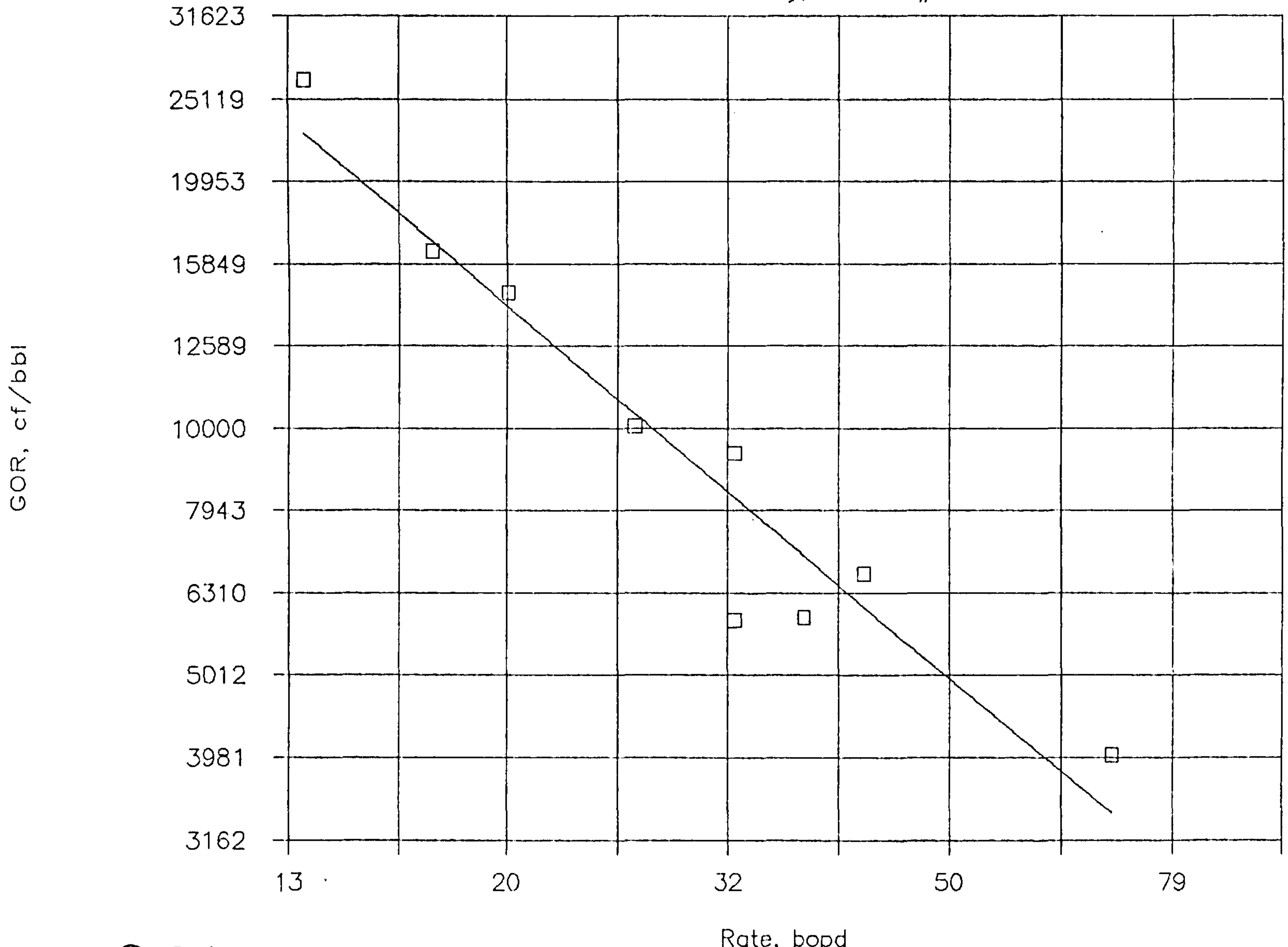
C.C. = 0.44


Gavilan Dome, July 87
Rate Sensitivity, Sun B&L #2
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
GOR, cf/bbl
2.5
4.0
6.3
10.0
Rate, bopd

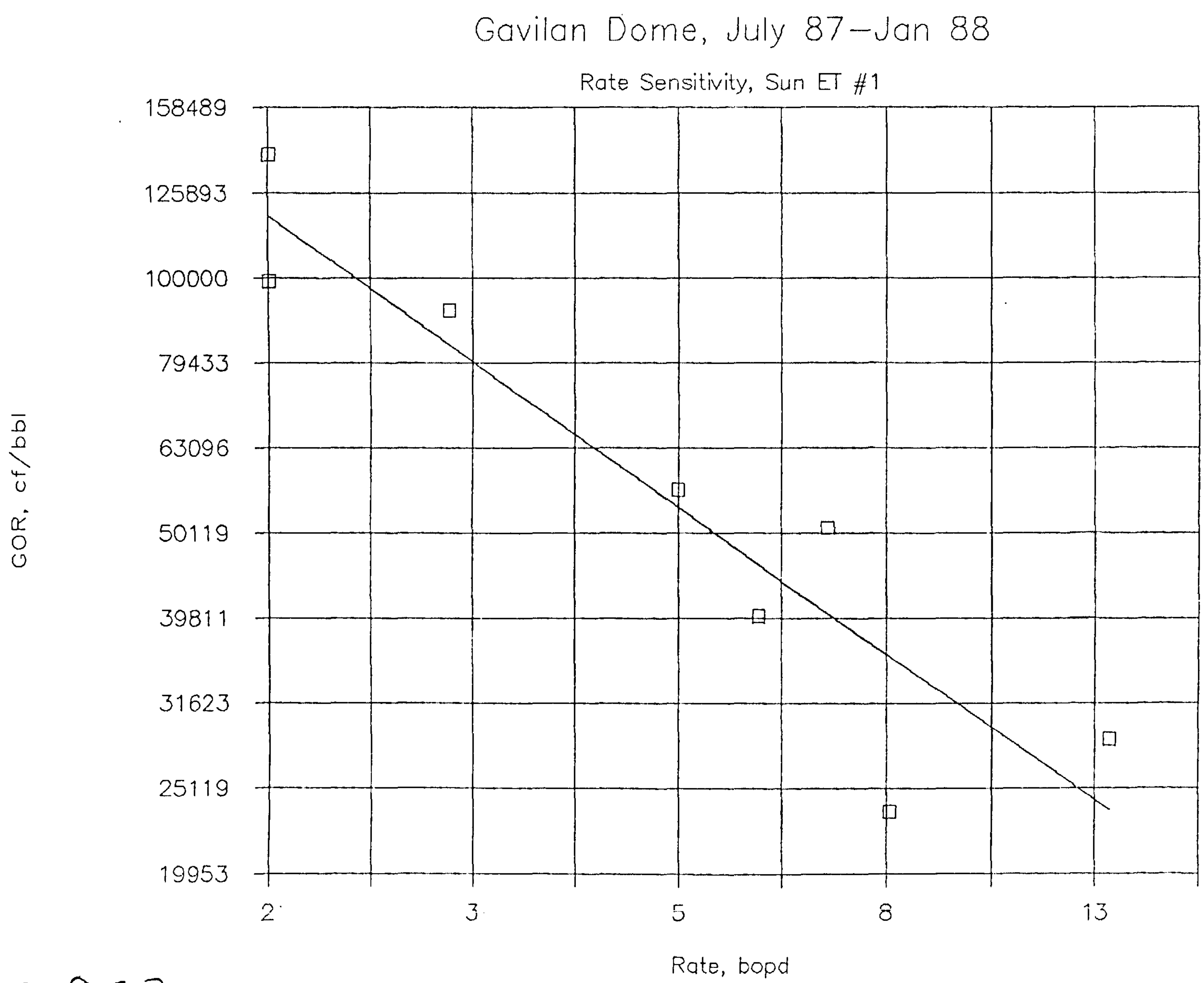
C. C. = 0.89

Gavilan Dome, July 87—Feb 88

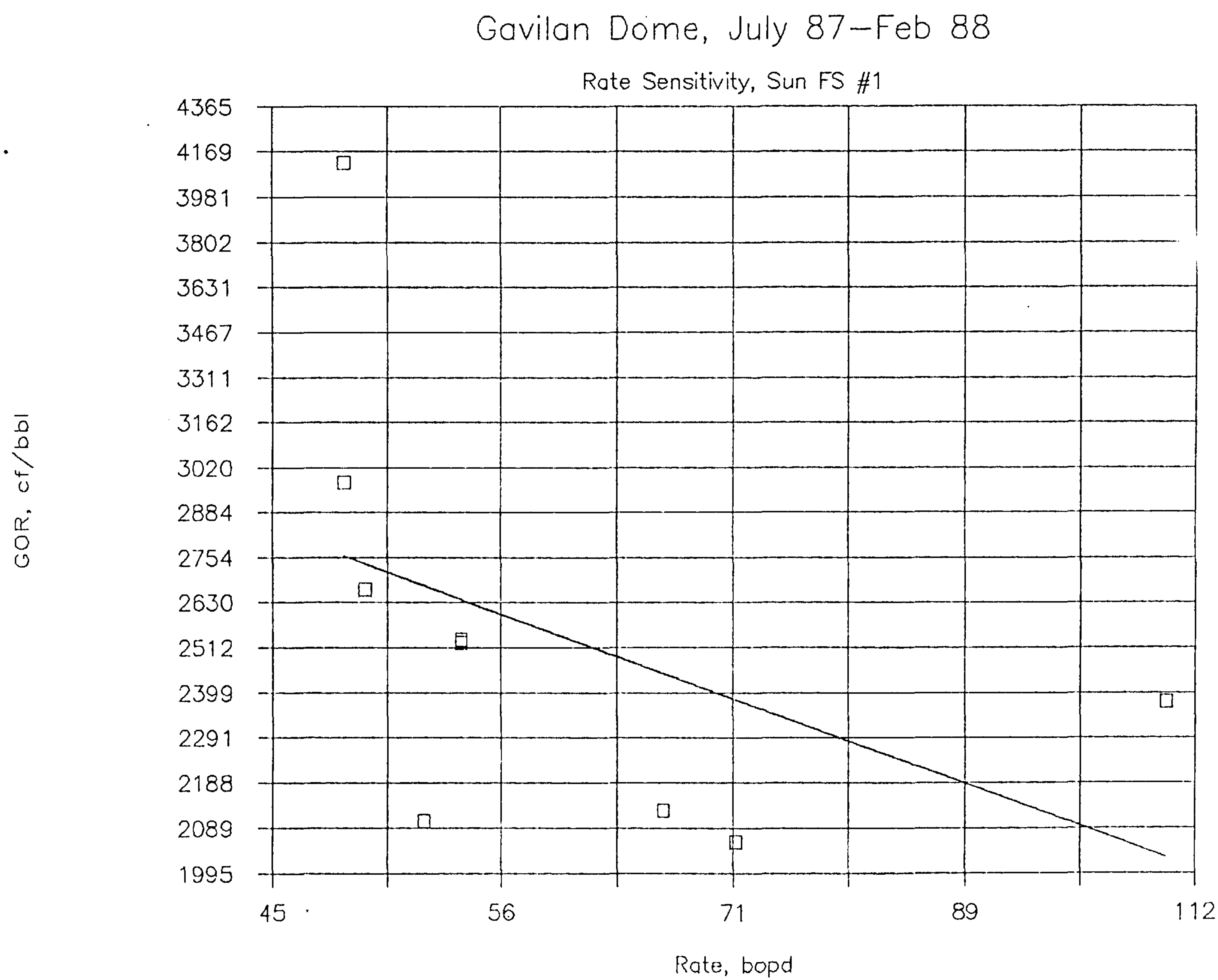
Rate Sensitivity, Sun-~~BB~~ DROO #1



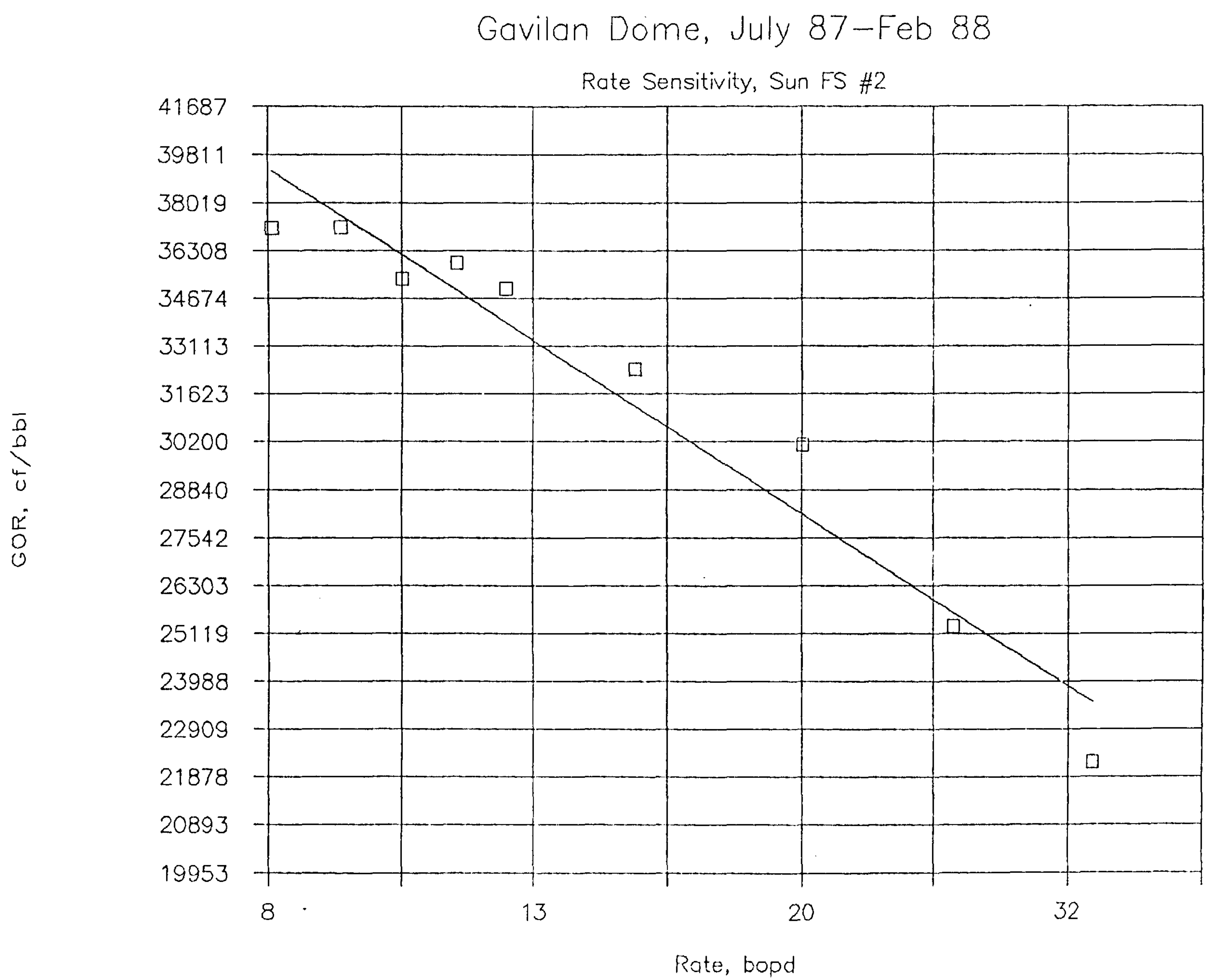
C.C. = 0.96


Gavilan Dome, July 87–Jan 88
Rate Sensitivity, Sun ET #1
GOR, cf/bbl
158489
125893
100000
79433
63096
50119
39811
31623
25119
19953
2
3
5
8
13
Rate, bopd

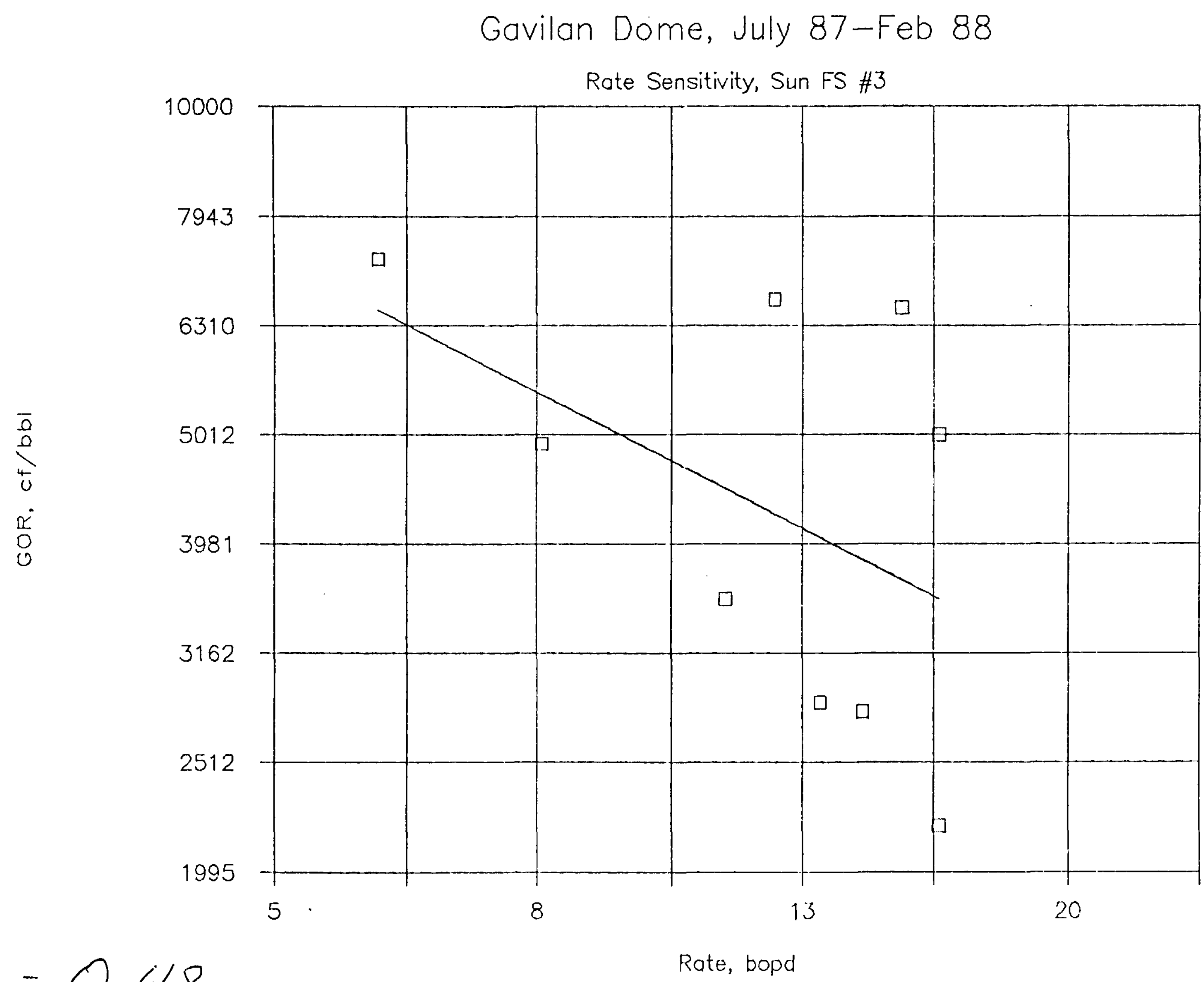
C.C. = 0.93


Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Sun FS #1
GOR, cf/bbl
4365
4169
3981
3802
3631
3467
3311
3162
3020
2884
2754
2630
2512
2399
2291
2188
2089
1995
45
56
71
89
112
Rate, bopd

C.C. = 0.46

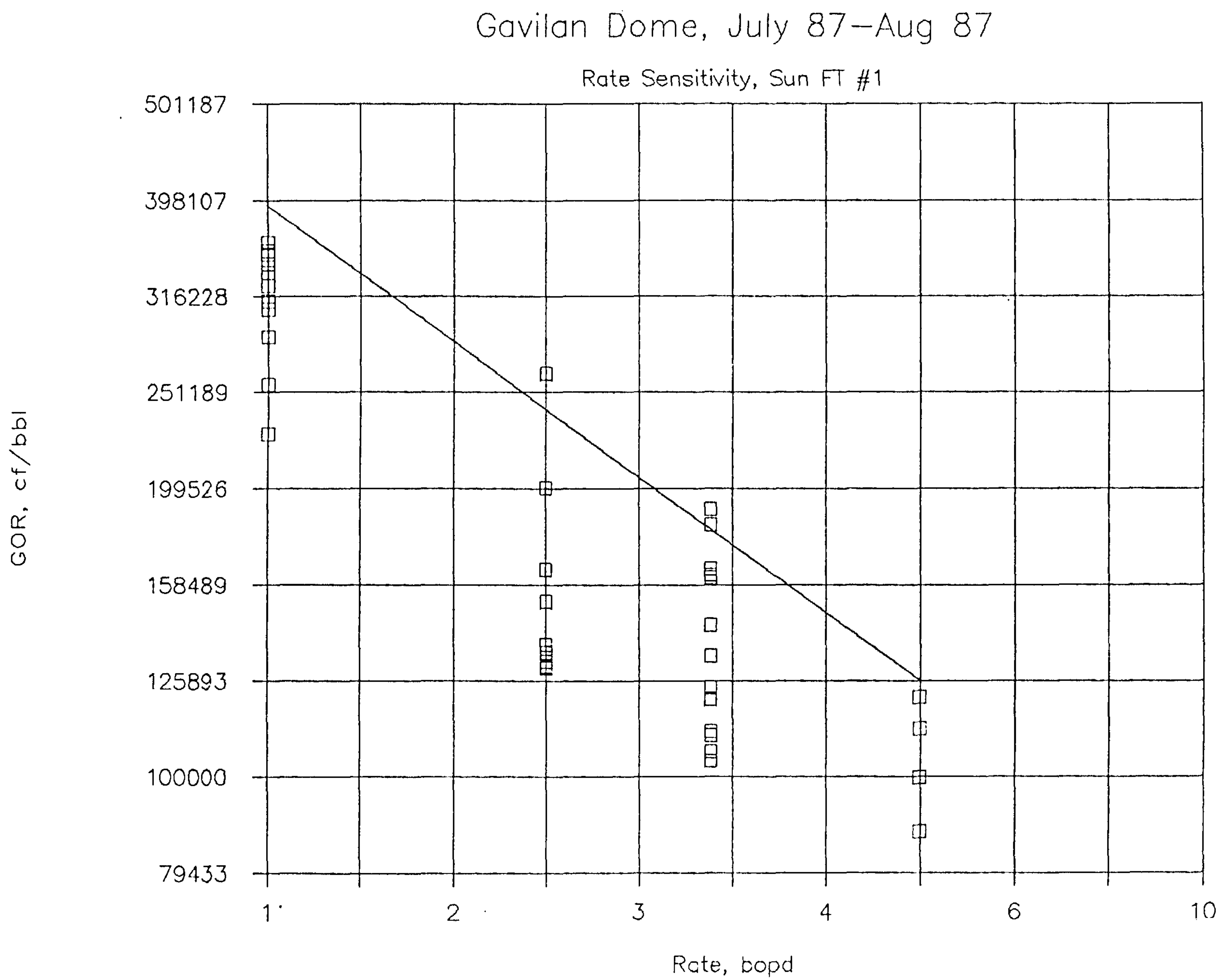

Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Sun FS #2
41687
39811
38019
36308
34674
33113
31623
30200
28840
27542
26303
25119
23988
22909
21878
20893
19953
GOR, cf/bbl
8
13
20
32
Rate, bopd

C.C. = 0.97



Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Sun FS #3
GOR, cf/bbl
10000
7943
6310
5012
3981
3162
2512
1995
5
8
13
20
Rate, bopd

C.C. = 0.48

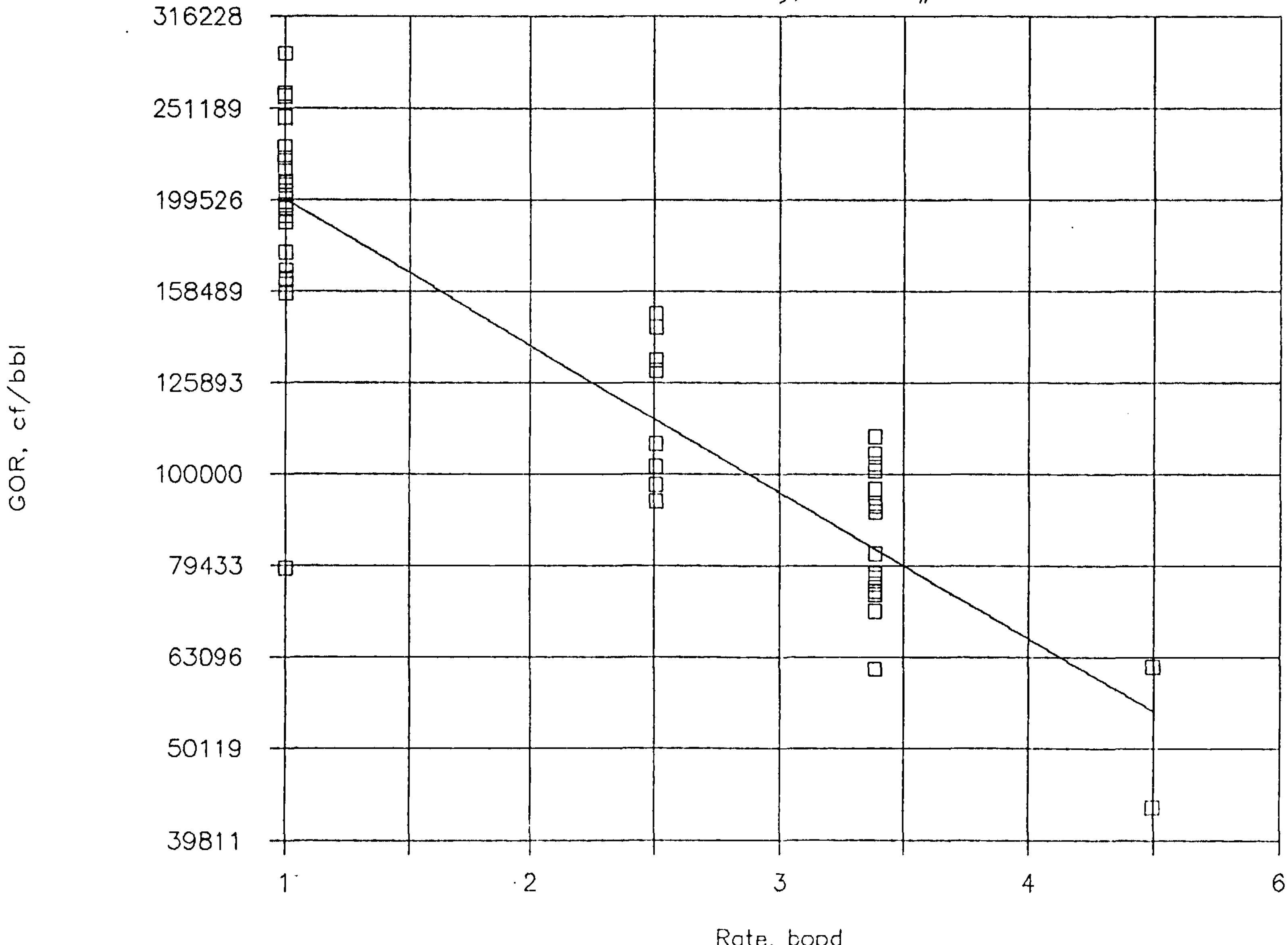


Gavilan Dome, July 87–Aug 87
Rate Sensitivity, Sun FT #1
501187
398107
316228
251189
199526
158489
125893
100000
79433
GOR, cf/bbl
1
2
3
4
6
10
Rate, bopd

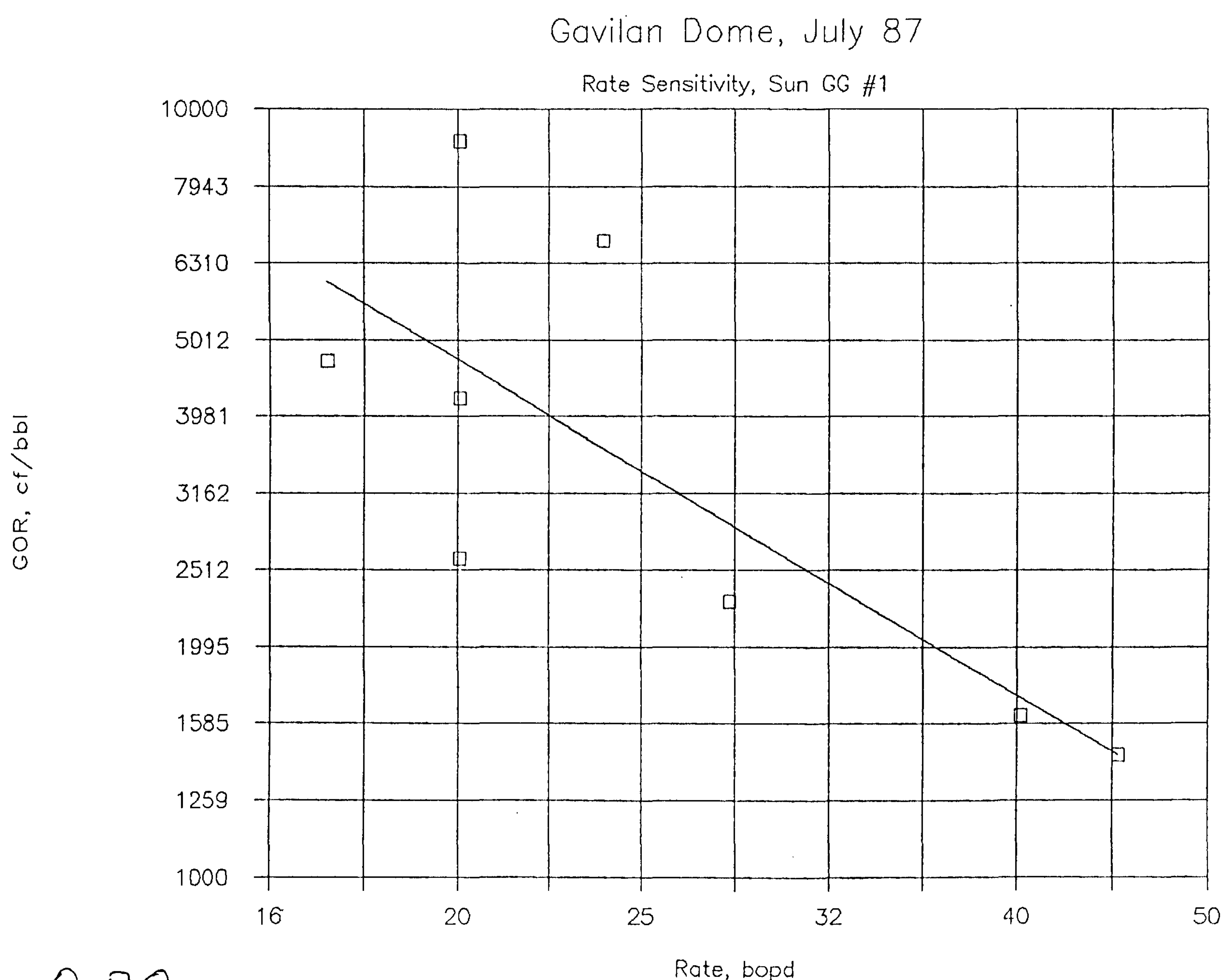
C. C. = 0.88

Gavilan Dome, July 87–Aug 87

Rate Sensitivity, Sun FT E#1



C.C. = 0.91

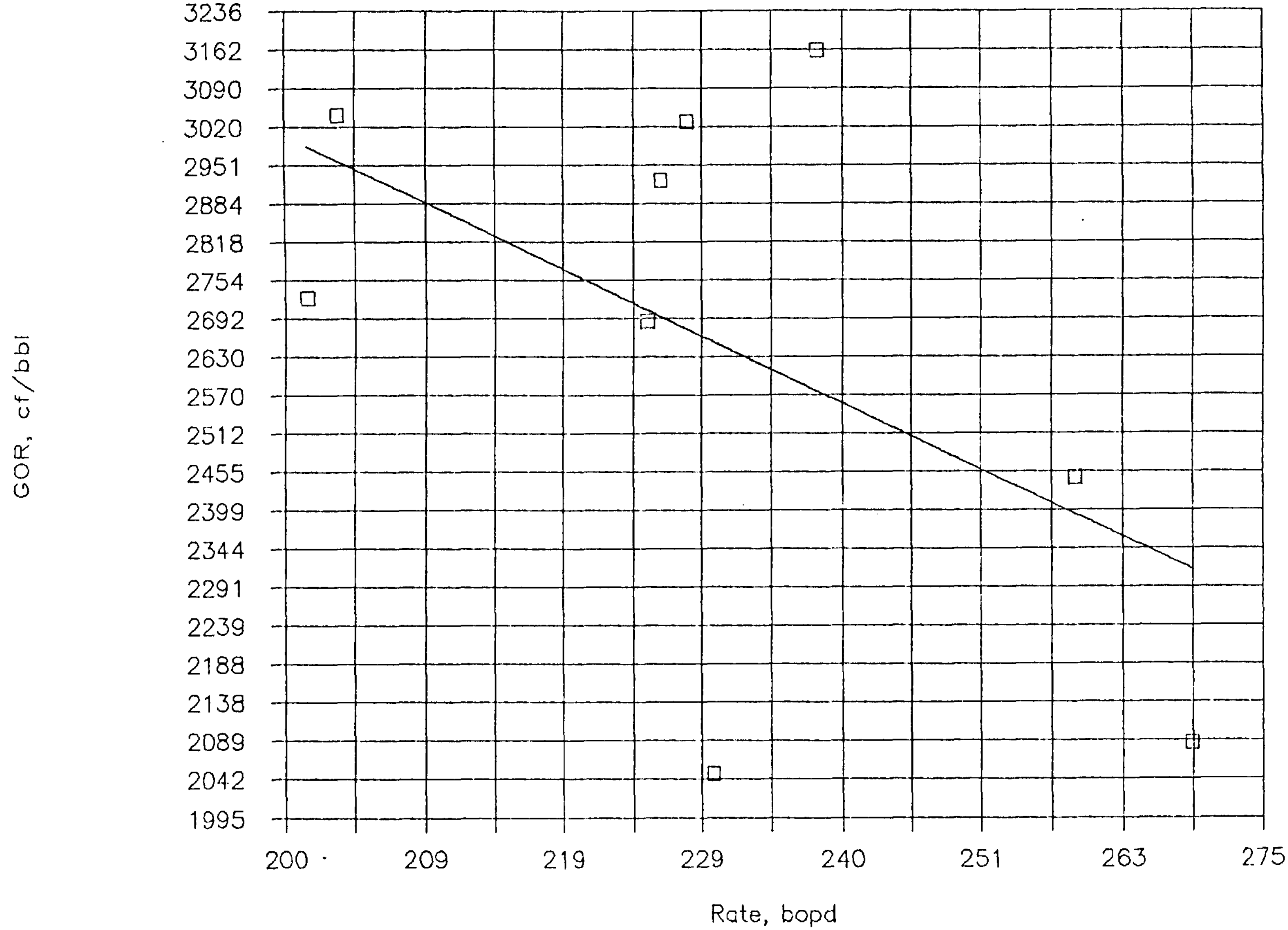


Gavilan Dome, July 87
Rate Sensitivity, Sun GG #1
GOR, cf/bbl
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
16
20
25
32
40
50
Rate, bopd

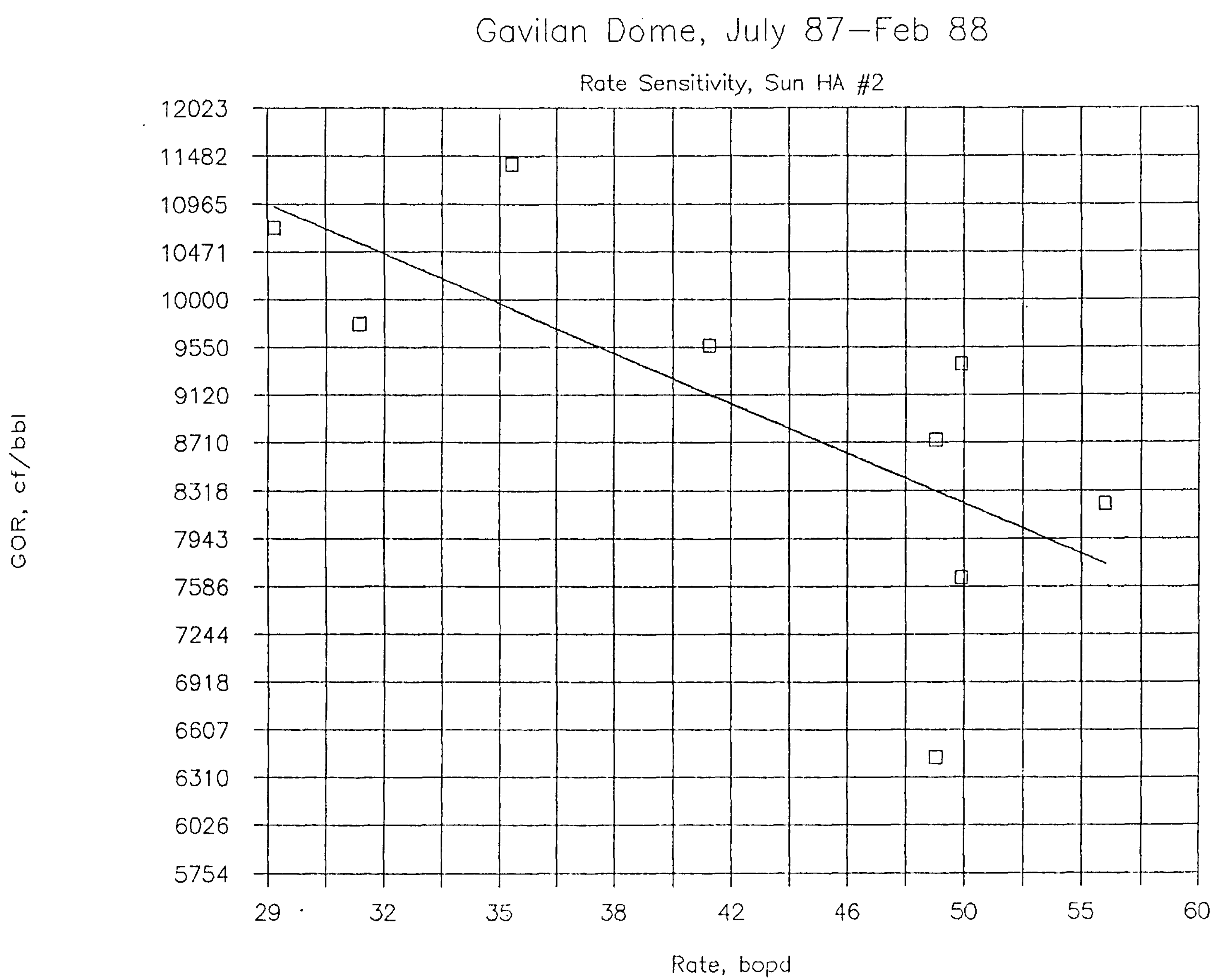
C.C. = 0.80

Gavilan Dome, July 87—Feb 88

Rate Sensitivity, Sun HA #1



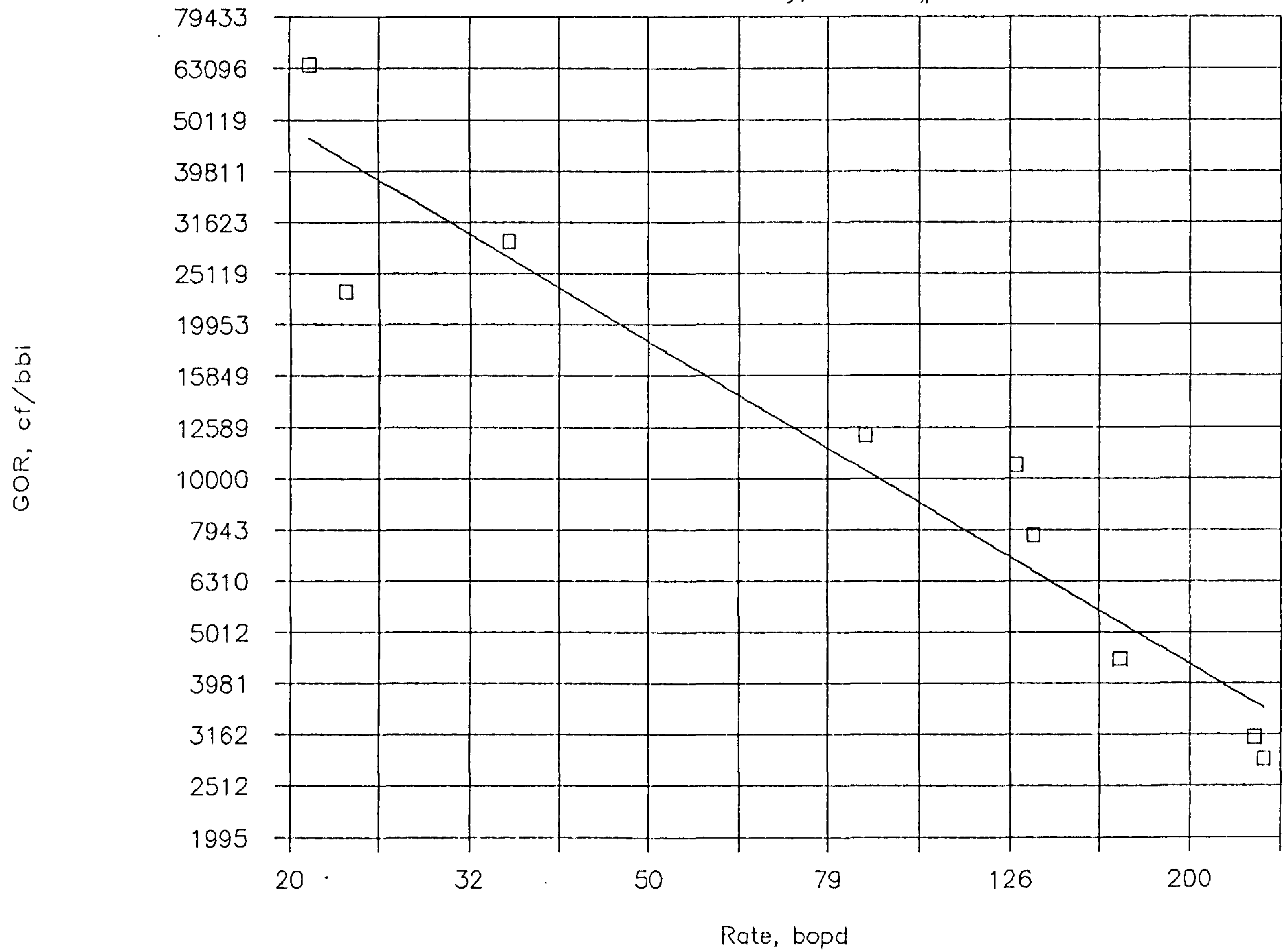
C.C. = 0.52


Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Sun HA #2
GOR, cf/bbl
12023
11482
10965
10471
10000
9550
9120
8710
8318
7943
7586
7244
6918
6607
6310
6026
5754
29
32
35
38
42
46
50
55
60
Rate, bopd

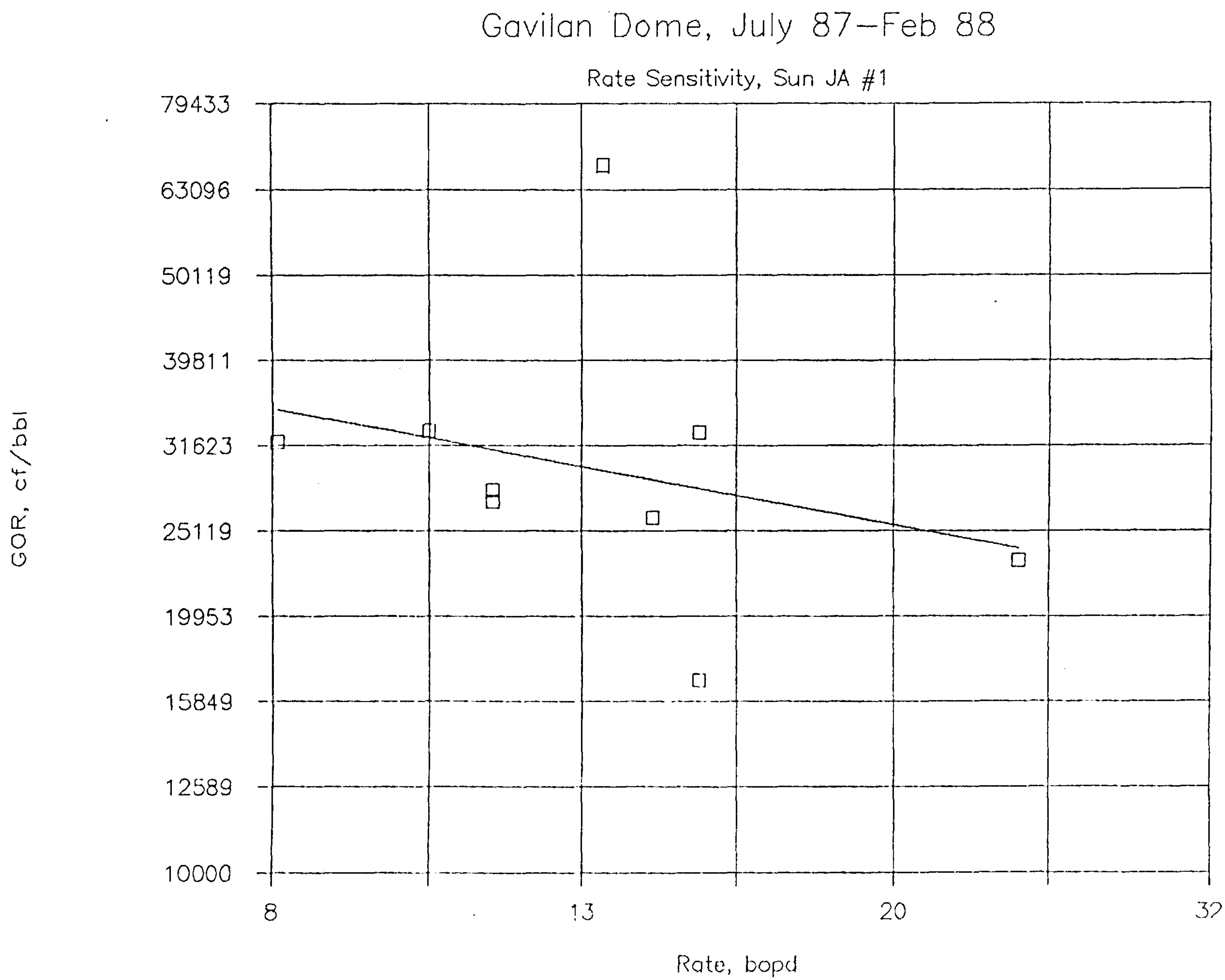
C.C. = 0.71

Gavilan Dome, July 87–Feb 88

Rate Sensitivity, Sun HR #1

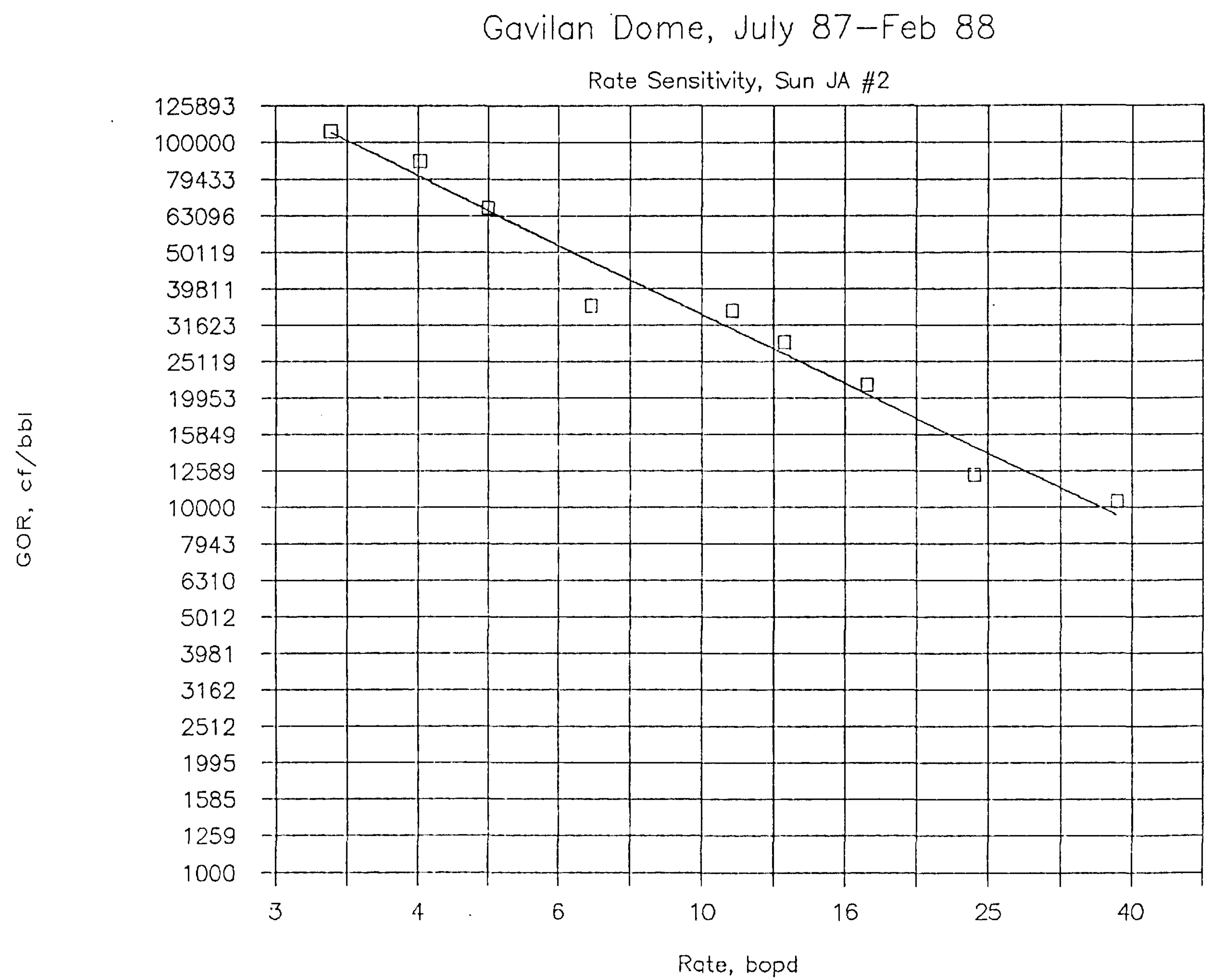


C. C. = 0.95



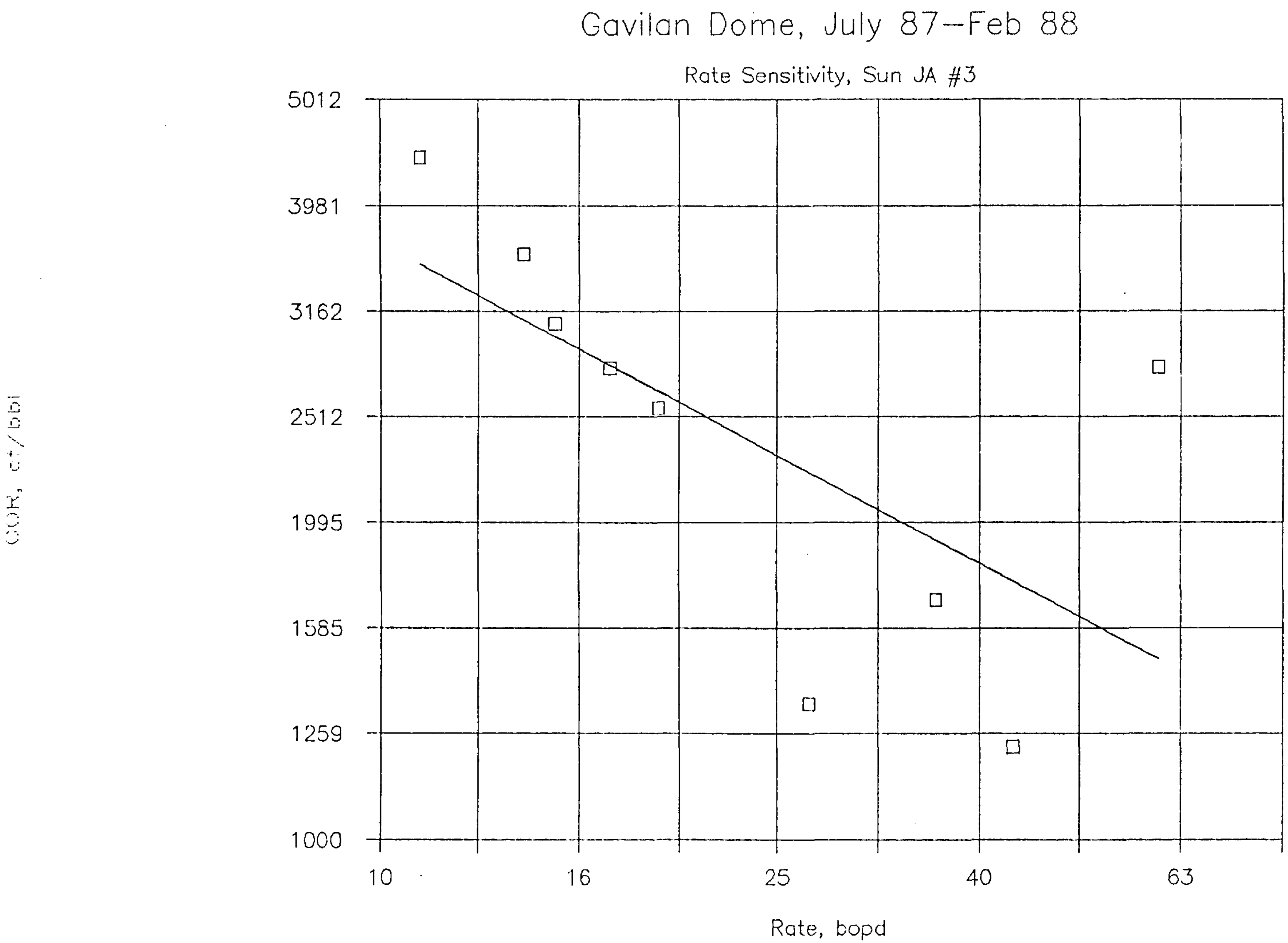
Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Sun JA #1
79433
63096
50119
39811
31623
25119
19953
15849
12589
10000
GOR, cf/bbl
8
13
20
32
Rate, bopd

C. C. = 0.29

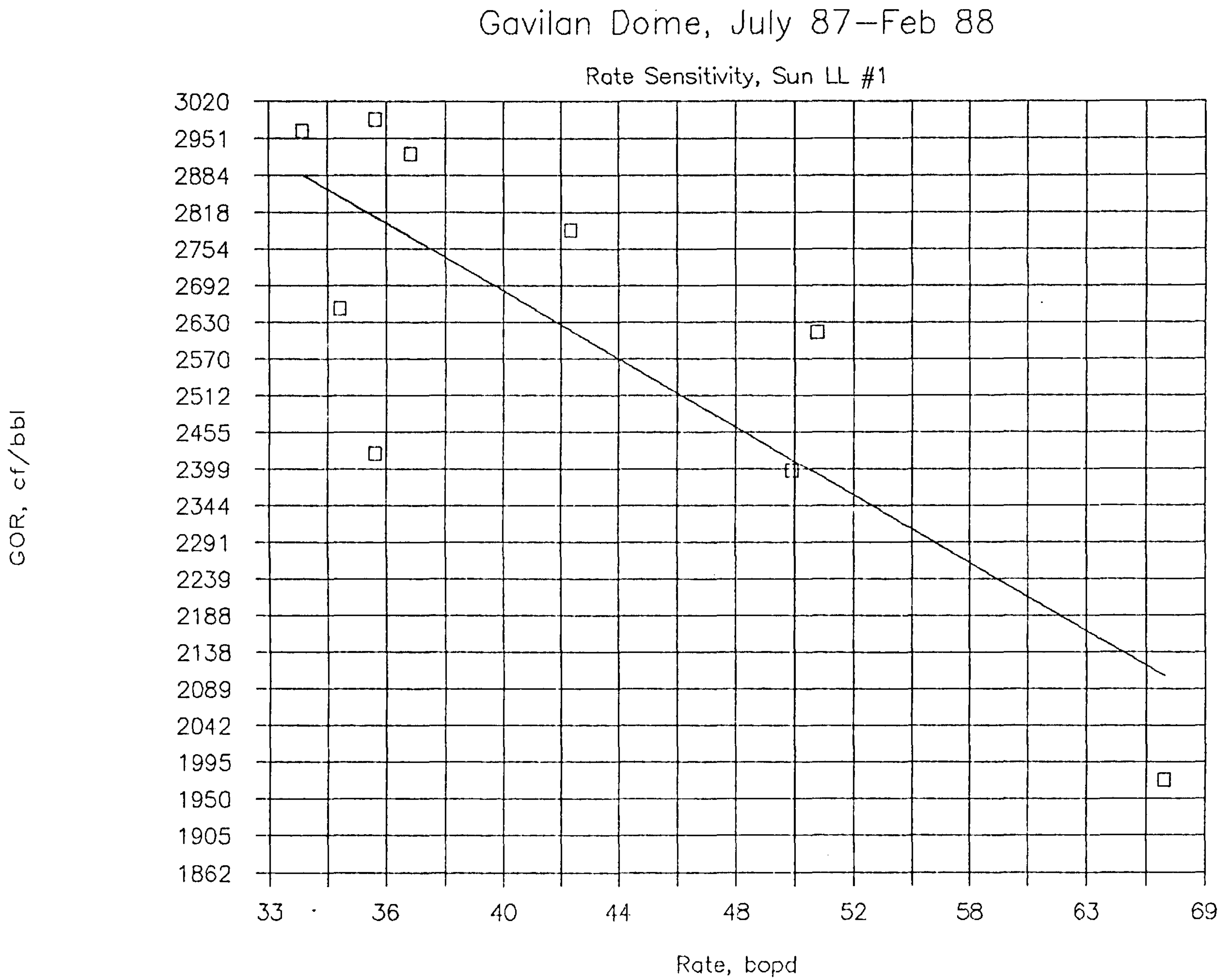


Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Sun JA #2
125893
100000
79433
63096
50119
39811
31623
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
GOR, cf/bbl
3
4
6
10
16
25
40
Rate, bopd

C.C. = 0.99

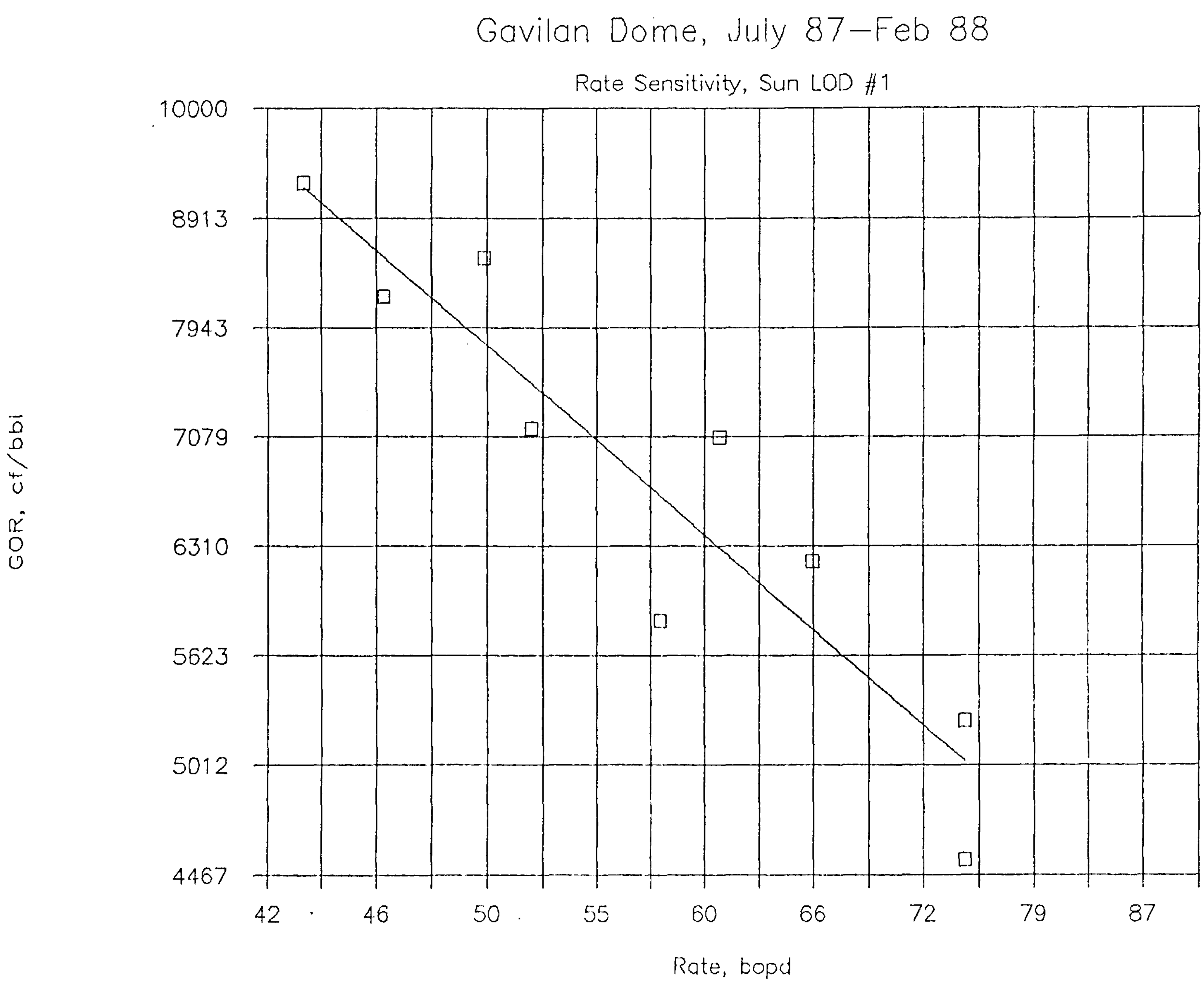

Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Sun JA #3
5012
3981
3162
2512
1995
1585
1259
1000
10
16
25
40
63
Rate, bopd

C. C. = 0.66

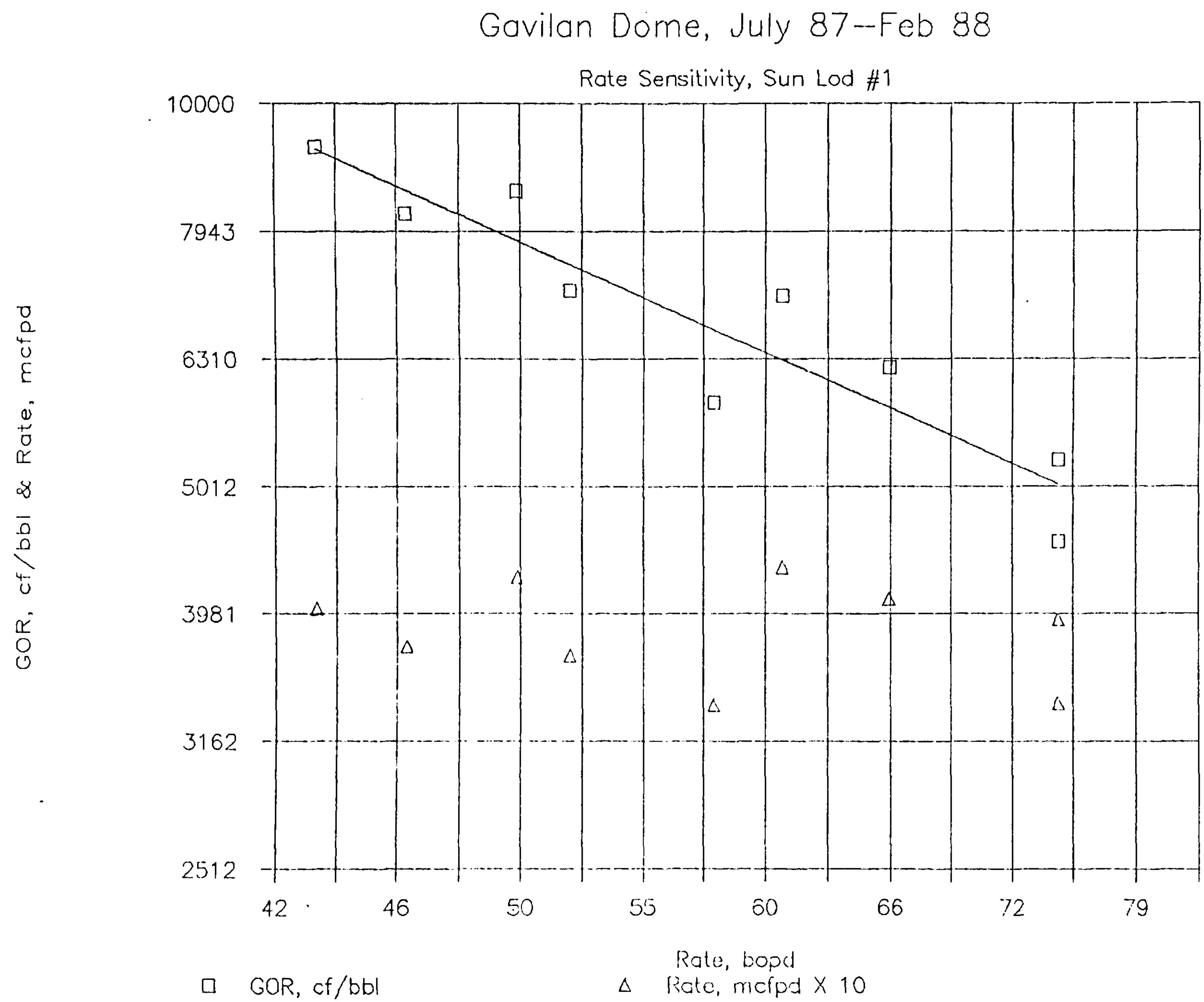


Gavilan Dome, July 87—Feb 88
Rate Sensitivity, Sun LL #1
GOR, cf/bbl
3020
2951
2884
2818
2754
2692
2630
2570
2512
2455
2399
2344
2291
2239
2188
2138
2089
2042
1995
1950
1905
1862
33
36
40
44
48
52
58
63
69
Rate, bopd

C. C. = 0.80


Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Sun LOD #1
10000
8913
7943
7079
6310
5623
5012
4467
GOR, cf/bbl
42
46
50
55
60
66
72
79
87
Rate, bopd

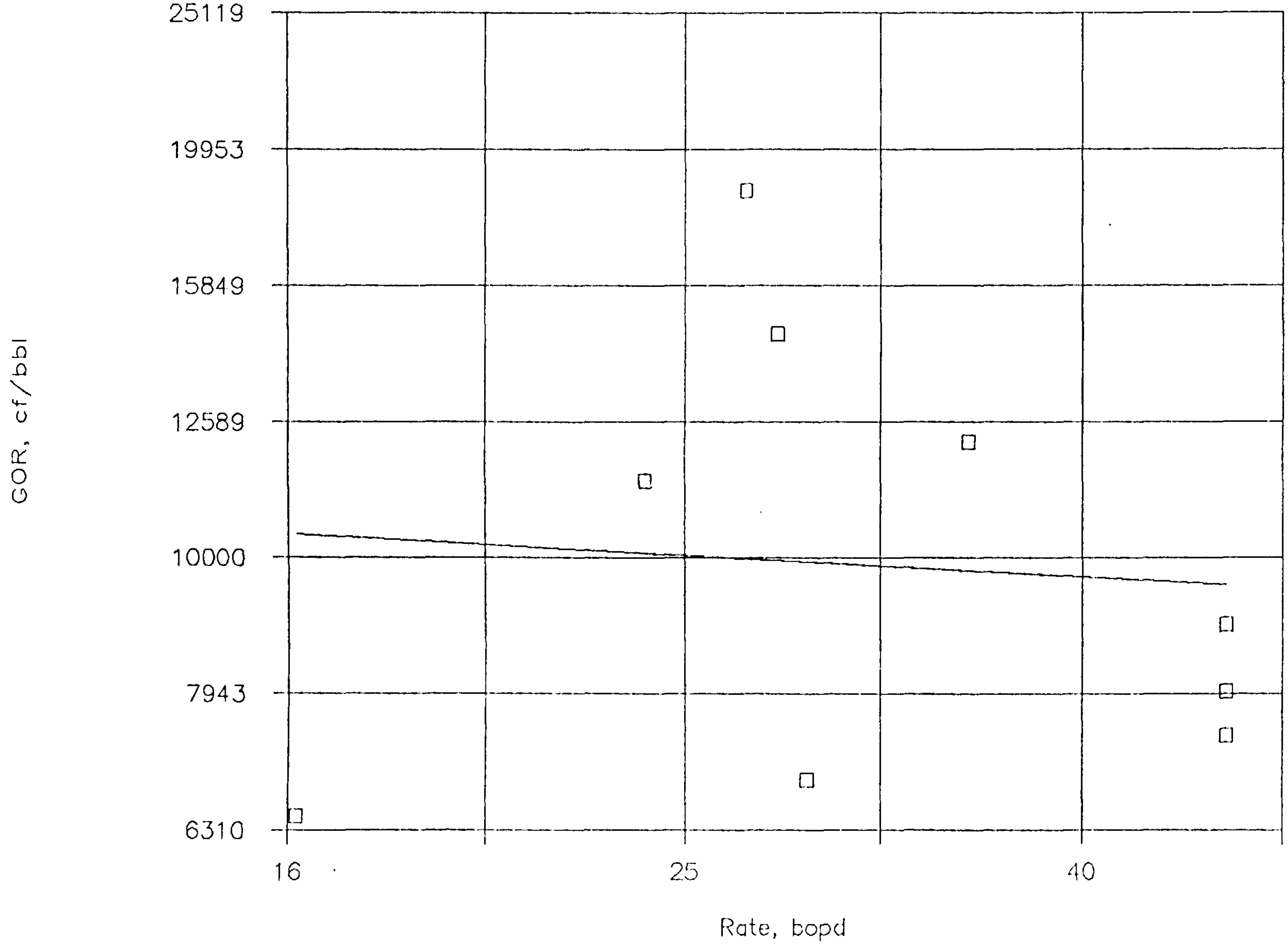
C.C. = 0.93



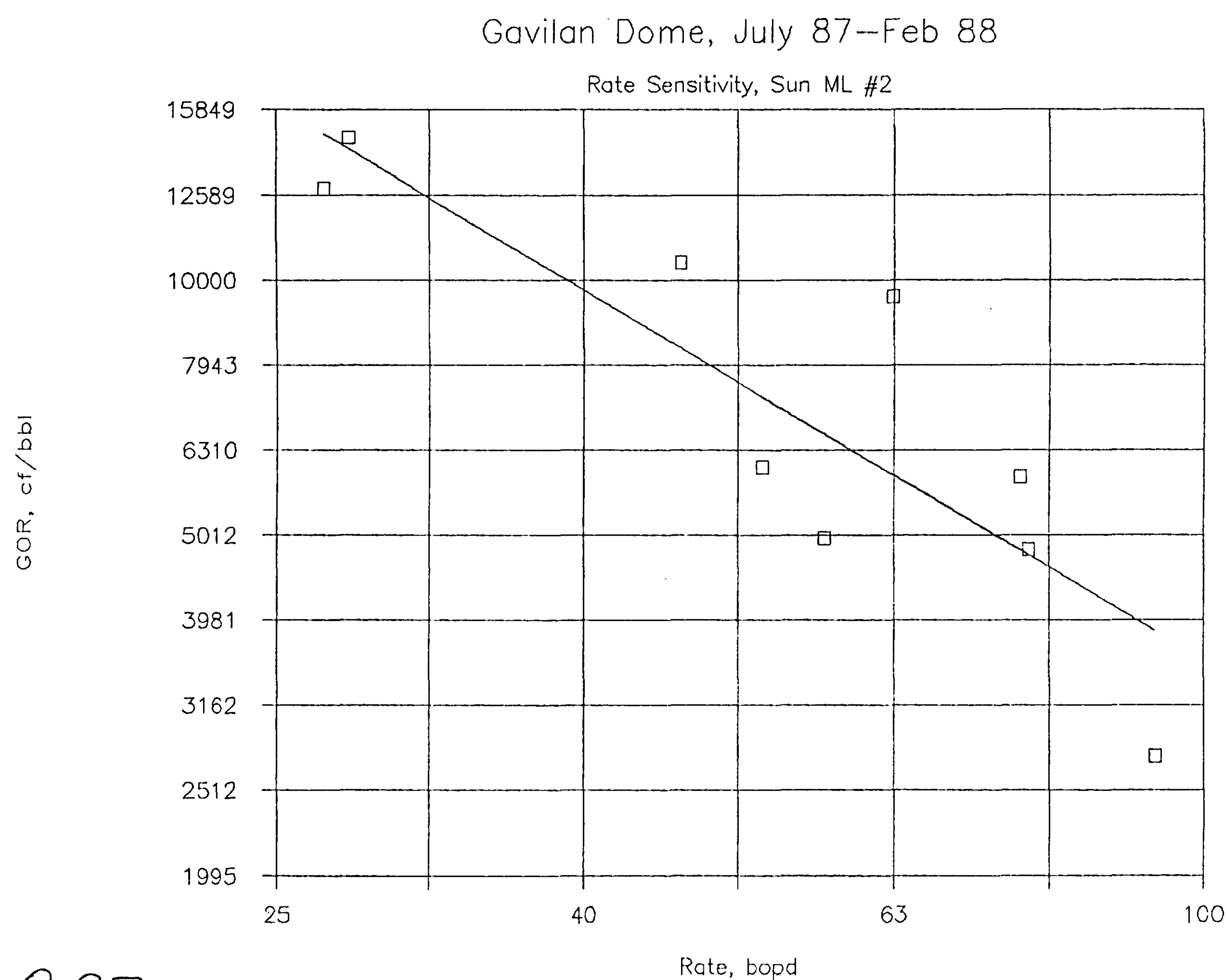
Gavilan Dome, July 87--Feb 88
Rate Sensitivity, Sun Lod #1
GOR, cf/bbl & Rate, mcfpd
10000
7943
6310
5012
3981
3162
2512
42
46
50
55
60
66
72
79
Rate, bopd
GOR, cf/bbl
Rate, mcfpd X 10

Gavilan Dome, July 87—Feb 88

Rate Sensitivity, Sun ML #1

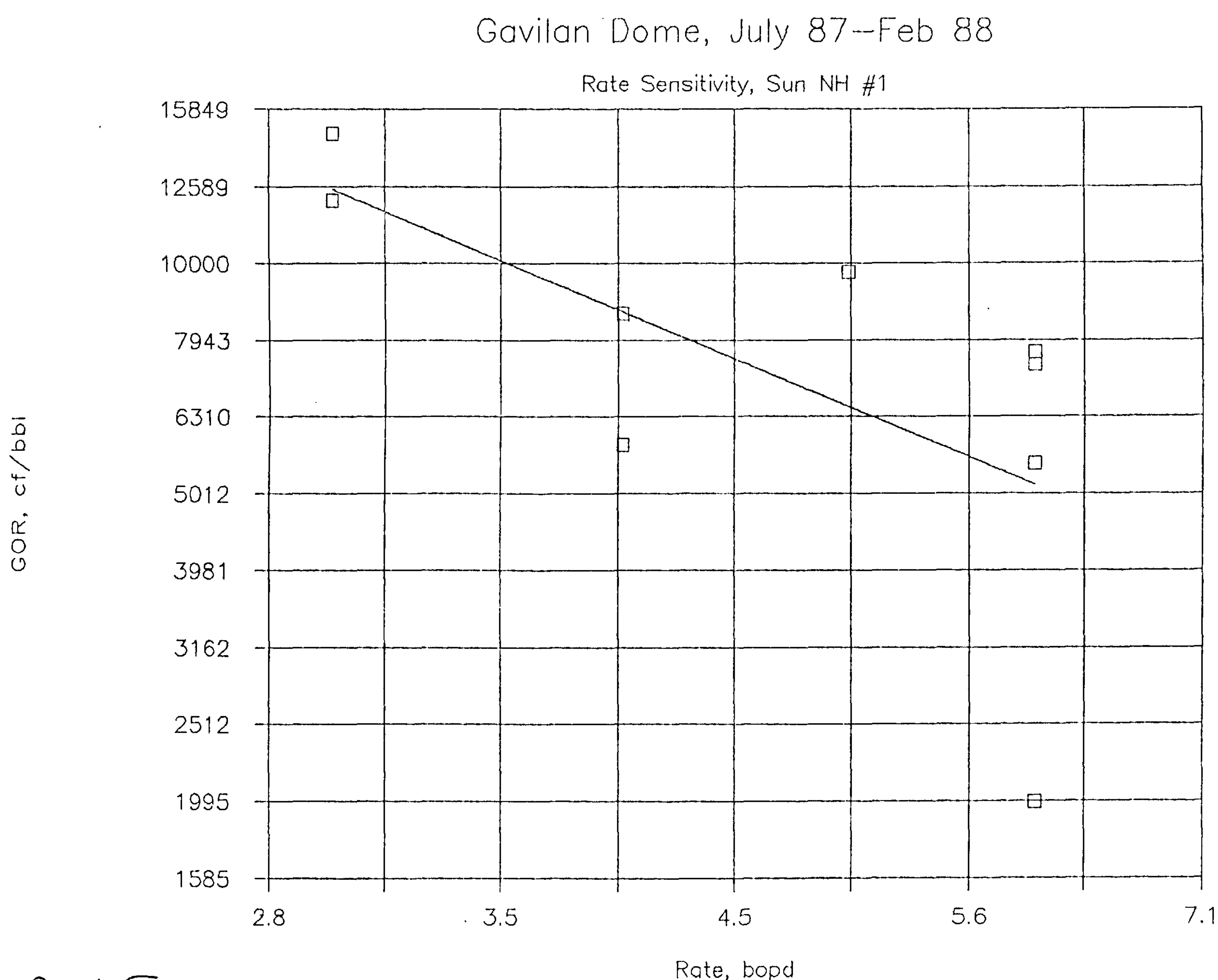


C.C. = 0.08

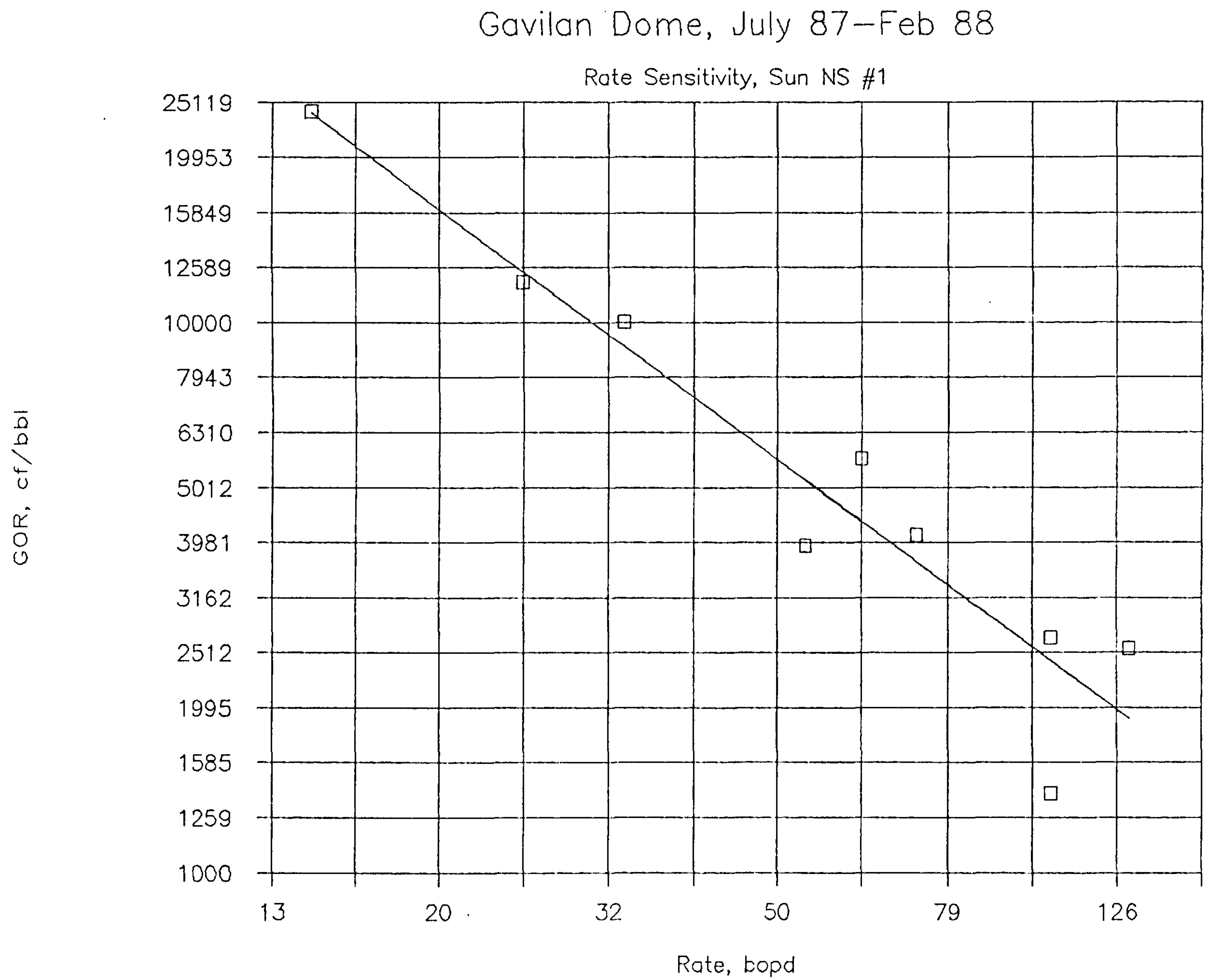


Gavilan Dome, July 87--Feb 88
Rate Sensitivity, Sun ML #2
GOR, cf/bbl
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
25
40
63
100
Rate, bopd

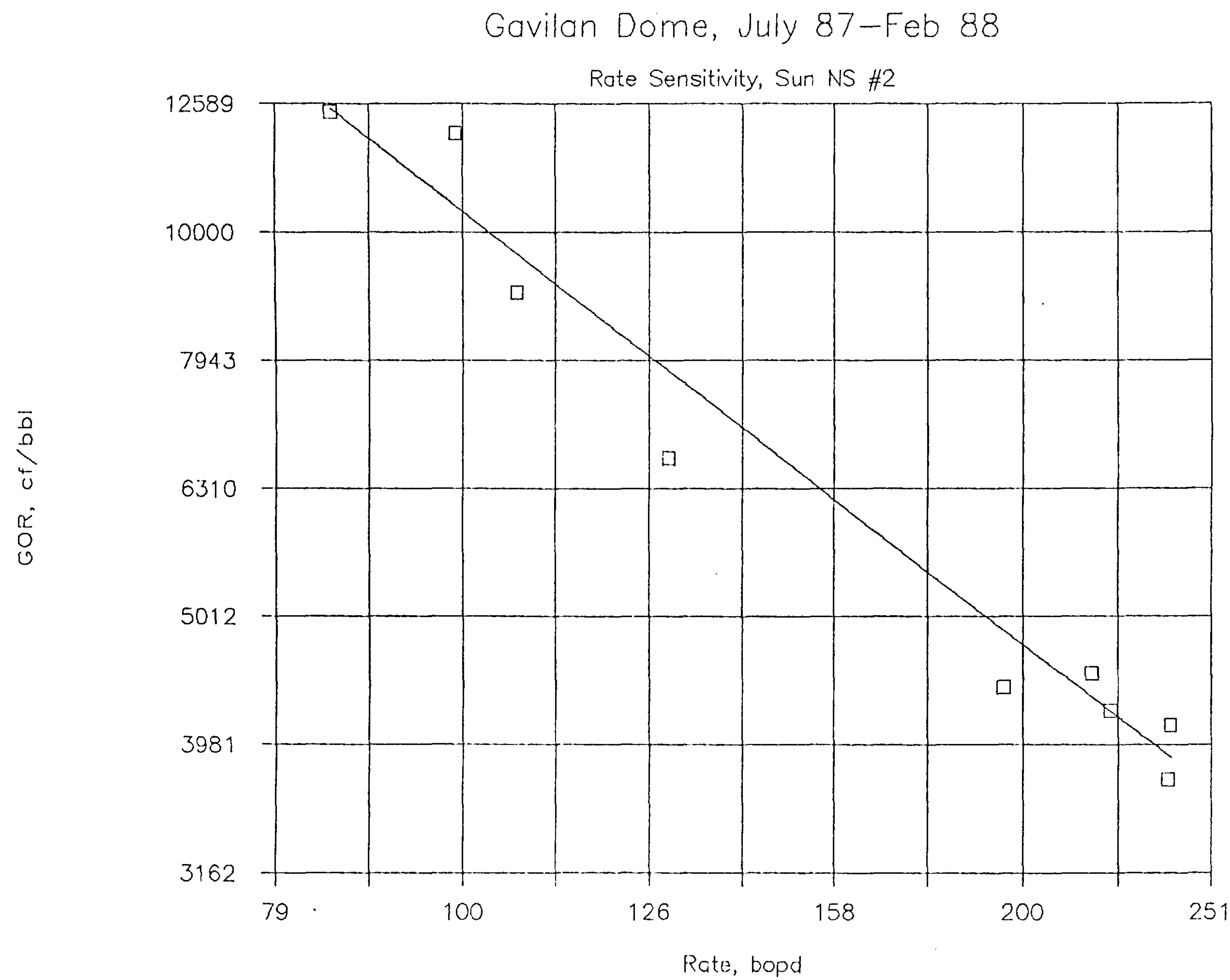
C. C. = 0.87


Gavilan Dome, July 87--Feb 88
Rate Sensitivity, Sun NH #1
GOR, cf/bbl
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
2.8
3.5
4.5
5.6
7.1
Rate, bopd

C. C. = 0.65


Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Sun NS #1
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
1000
GOR, cf/bbl
13
20
32
50
79
126
Rate, bopd

C.C. = 0.95

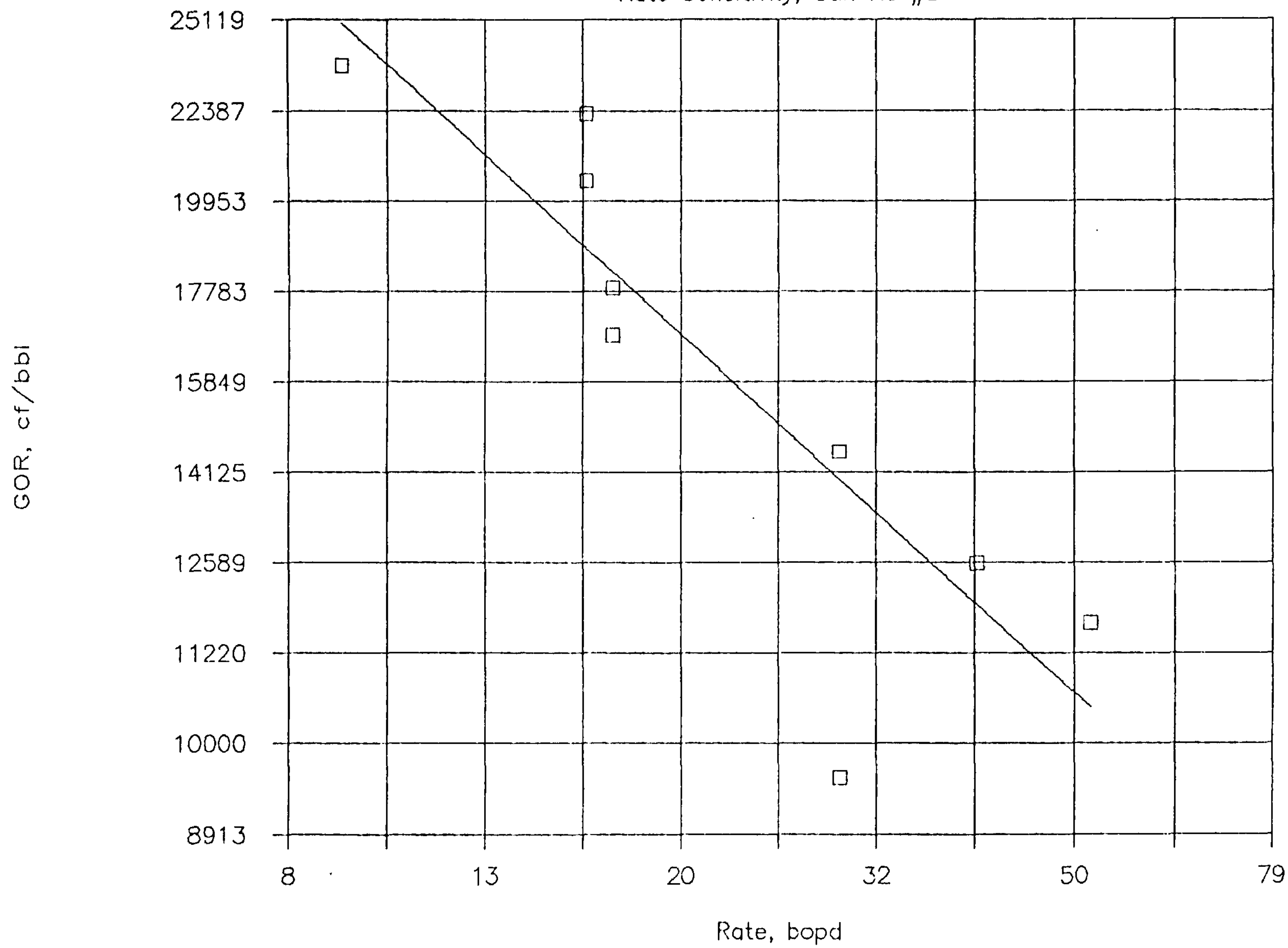


Gavilan Dome, July 87–Feb 88
Rate Sensitivity, Sun NS #2
GOR, cf/bbl
12589
10000
7943
6310
5012
3981
3162
79
100
126
158
200
251
Rate, bopd

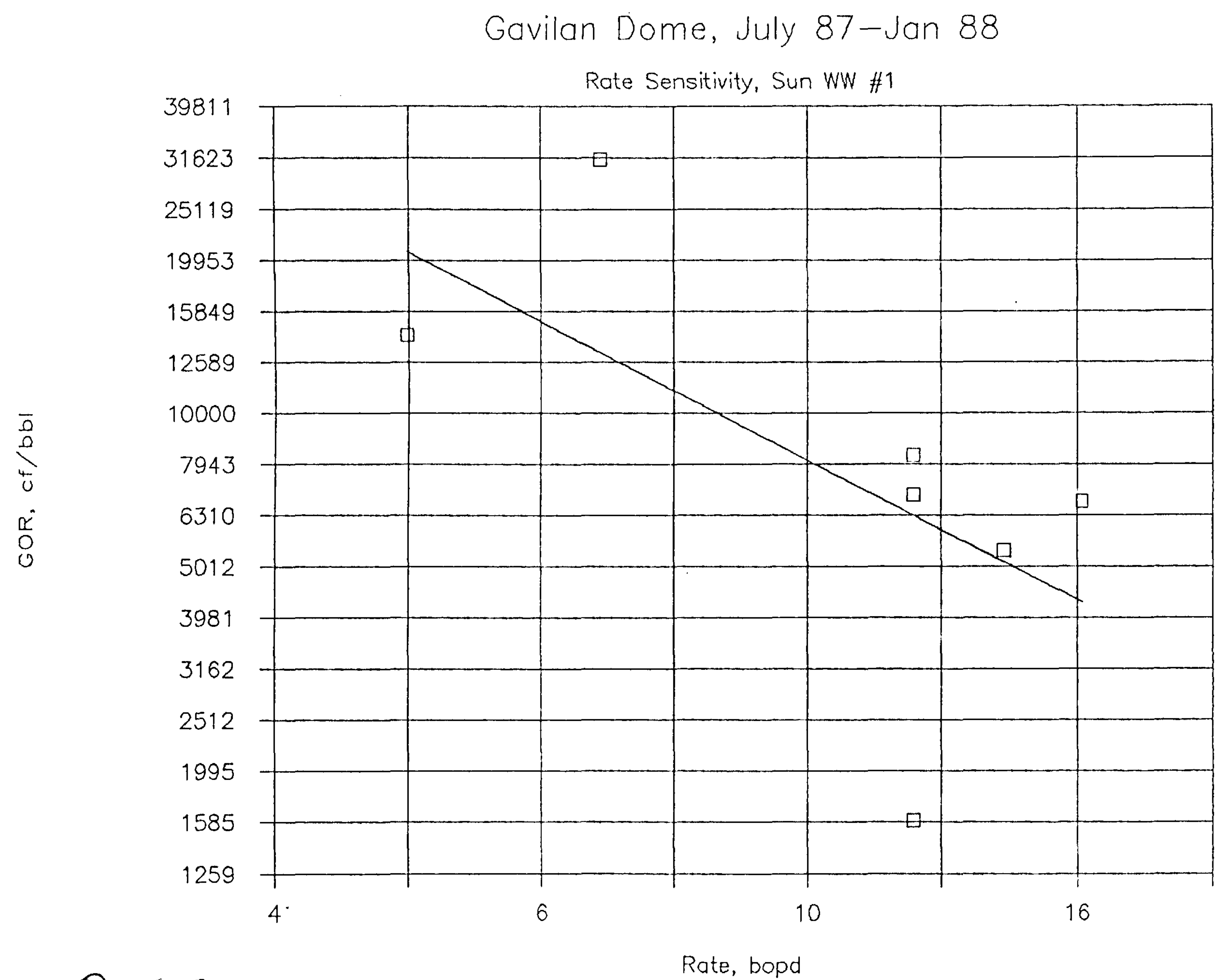
C. C. = 0.98

Gavilan Dome, July 87—Feb 88

Rate Sensitivity, Sun NS #3



C. C. = 0.86


Gavilan Dome, July 87—Jan 88
Rate Sensitivity, Sun WW #1
GOR, cf/bbl
39811
31623
25119
19953
15849
12589
10000
7943
6310
5012
3981
3162
2512
1995
1585
1259
4
6
10
16
Rate, bopd

C.C. = 0.62

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
AMOCO	BCU#1	1/1-1/31	190	314	8173	1554	60
AMOCO	BCU#1	2/1-2/29	145	292	7297	1058	42
				606			
AMOCO	BCU#2	2/1-2/29	274	228	3421	938	67
AMOCO	HTF#1	2/1-2/29	1687	12	83	140	20
AMOCO	OCFB#1	2/1-2/29	13250	22	44	583	292
AMOCO	SGC#1	1/1-1/31	8971	30	273	2449	245
AMOCO	SGC#1	2/1-2/29	3856	35	810	3123	142
				65			
AMOCO	SCC#1	2/1-2/29	99	201	4432	440	20
BMG	A-16	7/1-7/31	1075	16	214	230	18
BMG	A-16	8/1-8/31	1600	6	25	40	10
BMG	A-16	9/1-9/30	4009	11	212	850	45
				33			
BMG	A-20	7/1-7/31	1176	17	187	220	20
BMG	A-20	8/1-8/31	2843	38	568	1615	107
BMG	A-20	9/1-9/30	5331	46	1103	5880	245
BMG	A-20	11/1-11/14	5812	42	585	3400	243
BMG	A-20	12/1-12/31	5405	51	666	3600	277
BMG	A-20	1/1-1/31	6802	52	1601	10890	351
BMG	A-20	2/1-2/29	9474	44	133	1260	420
				290			
BMG	B-29	7/1-7/31	1219	673	18176	22160	821
BMG	B-29	8/1-8/31	1269	757	21187	26887	960
BMG	B-29	9/1-9/30	1922	1156	32372	62230	2223
BMG	B-29	10/1-10/31	2092	1003	15041	31460	2097
BMG	B-29	11/1-11/16	2262	1046	16738	37860	2366
BMG	B-29	11/30-12/31	2161	977	17578	37990	2111
BMG	B-29	2/1-2/29	1444	1047	8379	12100	1513
				6659			
BMG	B-32	7/1-7/31	1046	519	12984	13575	543
BMG	B-32	8/1-8/31	1261	714	19993	25210	900
BMG	B-32	9/1-9/30	1119	911	27344	30600	1020
BMG	B-32	10/1-10/31	1197	800	11998	14360	957
BMG	B-32	11/1-11/16	1200	719	11509	13810	863
BMG	B-32	11/30-12/31	1185	704	11964	14180	834
BMG	B-32	1/1-1/31	1000	701	13319	1300	700

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
BMG	B-32	2/1-2/29	1101	704	16894	18605	775
				5772			
BMG	C-34	12/1-12/31	10345	44	348	3600	450
BMG	C-34	1/1-1/31	11990	38	191	2290	458
BMG	C-34	2/1-2/29	17551	62	494	8670	1084
				144			
BMG	D-17	7/1-7/31	1195	9	135	160	1067
BMG	E-6	7/1-7/31	3966	307	7687	30490	1220
BMG	E-6	8/1-8/31	2339	362	11228	26260	847
BMG	E-6	9/1-9/30	2068	426	12765	26404	880
BMG	E-6	10/1-10/31	2757	358	5375	14820	988
BMG	E-6	11/1-11/16	4223	271	4063	17160	1144
BMG	E-6	12/1-12/31	4998	159	2391	11950	797
BMG	E-6	1/1-1/31	4752	169	2033	9660	805
				2052			
BMG	E-10	7/1-7/31	3124	380	11012	34400	1186
BMG	E-10	8/1-8/31	4896	303	9384	45940	1482
BMG	E-10	9/1-9/30	7124	236	6127	43760	1750
BMG	E-10	11/1-11/16	7589	235	3754	28490	1781
BMG	E-10	1/1-1/31	9199	222	1761	16200	1800
BMG	E-10	2/1-2/29	23201	62	556	12900	1433
				1438			
BMG	F-7	12/1-12/31	2689	124	2224	5980	332
BMG	F-7	1/1-1/31	5457	147	3832	20910	804
				271			
BMG	F-18	7/1-7/31	631	224	3362	2120	141
BMG	F-18	8/1-8/31	448	326	10096	4520	146
BMG	F-18	9/1-9/30	538	406	9751	5250	219
BMG	F-18	10/1-10/31	395	390	5846	2310	154
BMG	F-18	11/1-11/16	504	365	5469	2755	184
BMG	F-18	12/1-12/31	522	325	9753	5095	170
BMG	F-18	1/1-1/31	465	311	9643	4480	145
BMG	F-18	2/1-2/29	667	304	6982	4655	202
				2651			
BMG	F-19	7/1-7/31	6754	64	1869	12624	435
BMG	F-19	8/1-8/31	9719	75	2314	22490	725
BMG	F-19	9/1-9/30	13050	60	1436	18740	781
BMG	F-19	11/1-11/14	15035	51	712	10705	765
BMG	F-19	12/1-12/31	16392	43	693	11360	757
BMG	F-19	1/1-1/31	4899	100	398	1950	488
BMG	F-19	2/1-2/29	8417	60	120	1010	505
				453			

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
BMG	F-30	7/1-7/31	1042	357	10009	10430	373
BMG	F-30	8/1-8/31	989	347	9703	9600	343
BMG	F-30	9/1-9/30	1046	417	12506	13080	436
BMG	F-30	10/1-10/31	1094	355	5331	5830	389
BMG	F-30	11/1-11/16	1123	334	5337	5992	375
BMG	F-30	11/30-12/31	1134	311	9963	11295	353
BMG	F-30	1/1-1/31	1171	293	8491	9940	343
BMG	F-30	2/1-2/29	1104	349	8366	9240	385
				2763			
BMG	G-5	9/1-9/30	774	266	1330	1030	206
BMG	G-5	10/1-10/31	1073	263	3952	4240	283
BMG	G-5	11/1-11/16	1912	183	2924	5590	349
BMG	G-5	11/21-11/30	2093	158	473	990	330
BMG	G-5	12/1-12/31	2688	135	2697	7250	363
BMG	G-5	1/1-1/31	244	157	4860	11880	383
BMG	G-5	2/1-2/29	2374	465	3252	7720	351
				1627			
BMG	G-32	7/1-7/31	1132	13	53	60	15
BMG	G-32	9/1-9/30	870	12	46	40	10
				25			
BMG	J-6	8/1-8/31	3764	79	1905	7170	299
BMG	J-6	9/1-9/30	5556	55	1530	8500	304
BMG	J-6	11/1-11/10	35101	15	149	5230	523
BMG	J-6	12/1-12/31	22735	23	340	7730	515
BMG	J-6	1/1-1/31	29858	18	211	6300	525
				190			
BMG	J-8	9/1-9/30	1852	7	27	50	13
BMG	K-8	7/1-7/31	562	5	146	82	3
BMG	K-8	8/1-8/31	1207	6	29	35	7
BMG	K-8	9/1-9/30	2065	9	46	95	19
BMG	K-8	12/1-12/31	5618	9	89	500	50
BMG	K-8	1/1-1/31	4789	4	95	455	20
BMG	K-8	2/1-2/29	5000	2	41	205	10
				35			
BMG	L-3	9/1-9/30	722	22	486	351	16
BMG	L-3	10/1-10/31	732	14	205	150	10
BMG	L-3	11/1-11/16	758	19	211	160	16
BMG	L-3	12/1-12/31	699	32	256	179	22
BMG	L-3	1/1-1/31	787	16	305	240	13
				103			
BMG	L-11	8/1-8/31	186207	7	116	21600	1137

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
BMG	L-11	9/1-9/30	240000	5	15	3600	1200
BMG	L-11	2/1-2/29	18206	46	418	7610	761
				58			
BMG	L-27	7/1-7/31	2462	166	3980	9800	408
BMG	L-27	8/1-8/31	2641	157	4863	12845	414
BMG	L-27	9/1-9/30	2386	165	4949	11810	394
BMG	L-27	10/1-10/31	2382	163	2439	5810	387
BMG	L-27	11/1-11/16	2497	155	2479	6190	387
BMG	L-27	11/21-11/30	2491	160	1443	3595	399
BMG	L-27	12/1-12/31	2343	170	3064	7180	399
BMG	L-27	1/1-1/31	2372	152	4697	11140	359
BMG	L-27	2/1-2/29	2501	152	3351	8380	381
				1440			
BMG	N-22	7/1-7/31	791	82	2365	1870	64
BMG	N-22	8/1-8/31	465	86	1634	760	40
BMG	N-22	9/1-9/30	401	77	2317	930	31
BMG	N-22	10/1-10/31	412	73	1093	450	30
BMG	N-22	11/1-11/16	392	76	1213	475	30
BMG	N-22	11/21-11/30	412	95	947	390	39
BMG	N-22	12/1-12/31	422	68	2108	890	33
BMG	N-22	1/1-1/31	440	66	1911	840	29
BMG	N-22	2/1-2/29	399	80	1753	700	32
				703			
BMG	N-31	7/1-7/31	2240	182	5291	11850	409
BMG	N-31	8/1-8/31	1238	203	6303	7800	252
BMG	N-31	9/1-9/30	1025	194	5833	5980	199
BMG	N-31	10/1-10/31	1234	185	2771	3420	228
BMG	N-31	11/1-11/16	3106	127	2035	6320	395
BMG	N-31	12/1-12/31	4393	97	1457	6400	427
				988			
BMG	O-9	7/1-7/31	1082	11	319	345	12
BMG	O-9	8/1-8/31	1316	6	19	25	8
BMG	O-9	9/1-9/30	1044	21	297	310	22
BMG	O-9	11/21-11/30	1095	15	137	150	17
BMG	O-9	12/1-12/31	1118	13	331	370	16
BMG	O-9	1/1-1/31	1037	10	270	280	10
BMG	O-9	2/1-2/29	1036	14	304	315	15
				90			
BMG	O-33	7/1-7/31	3484	21	574	2000	74
BMG	O-33	8/1-8/31	5056	18	89	450	90
BMG	O-33	9/1-9/30	3052	28	729	2225	85
BMG	O-33	10/1-10/31	3003	21	313	940	63
BMG	O-33	11/1-11/14	2115	22	260	550	46
BMG	O-33	12/1-12/31	2853	28	333	950	95
BMG	O-33	1/1-1/31	3051	18	372	1135	54

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
				156			
DUGAN	LIND #1	7/1-7/31	7766	8	128	994	34
DUGAN	LIND #1	8/1-8/31	7504	5	121	908	36
DUGAN	LIND #1	9/1-9/30	7884	4	95	749	31
DUGAN	LIND #1	10/1-10/31	8733	4	116	1013	33
DUGAN	LIND #1	11/1-11/16	10465	4	22	225	28
DUGAN	LIND #1	11/21-11/30	9935	4	15	152	30
DUGAN	LIND #1	12/1-12/31	13367	5	60	802	29
DUGAN	LIND #1	1/1-1/31	4227	6	22	93	23
				40			
HIXON	DIV #3	7/1-7/31	794	103	2480	1969	82
HIXON	DIV #3	8/1-8/31	795	105	3147	2501	83
HIXON	DIV #3	10/1-10/31	795	110	1759	1399	87
HIXON	DIV #3	11/1-11/15	796	108	1619	1289	86
HIXON	DIV #3	12/1-12/31	795	103	3083	2452	82
HIXON	DIV #3	1/1-1/31	796	97	3019	2404	78
HIXON	DIV #3	2/2-2/29	797	93	2322	1851	74
				719			
HIXON	TAP #2	7/1-7/31	6239	12	355	2215	73
HIXON	TAP #2	8/1-8/31	6209	10	325	2018	65
HIXON	TAP #2	10/1-10/31	6202	6	99	614	38
HIXON	TAP #2	11/1-11/15	6208	7	77	478	43
HIXON	TAP #2	12/1-12/31	6220	5	127	790	32
HIXON	TAP #2	1/1-1/31	6196	5	56	347	32
HIXON	TAP #2	2/1-2/29	6220	6	41	255	36
				51			
HIXON	TAP #4	7/1-7/31	918	143	4133	3795	131
HIXON	TAP #4	8/1-8/31	918	146	4235	3889	134
HIXON	TAP #4	10/1-10/31	917	135	2154	1976	124
HIXON	TAP #4	11/1-11/15	917	131	1970	1807	120
HIXON	TAP #4	12/1-12/31	918	123	3824	3510	113
HIXON	TAP #4	1/1-1/31	917	97	2140	1962	89
HIXON	TAP #4	2/1-2/29	918	78	1944	1784	71
				853			
MALLON	DF 3#15	12/1-12/31	62591	4	44	2754	230
MALLON	DF 3#15	1/1-1/31	9908	13	141	1397	64
MALLON	DF 3#15	2/1-2/29	13295	6	95	1263	66
				23			
MALLON	FF 2#1	7/1-7/31	1326	316	9789	12979	419
MALLON	FF 2#1	8/1-8/31	1407	265	8211	11556	373
MALLON	FF 2#1	9/1-9/30	1306	285	6844	8936	372
MALLON	FF 2#1	10/1-10/31	1321	272	8426	11134	359
MALLON	FF 2#1	11/1-11/15	8730	40	597	5212	347
MALLON	FF 2#1	11/20-11/30	3636	165	1814	6596	600

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
MALLON	FF 2#1	12/1-12/31	9591	90	1077	10329	861
MALLON	FF 2#1	1/1-1/31	11649	96	479	5580	1116
MALLON	FF 2#1	2/1-2/29	11232	95	1048	11771	1070
				1624			
MALLON	HF 1#8	7/1-7/31	3212	278	8609	27649	892
MALLON	HF 1#8	8/1-8/31	3691	288	8919	32922	1062
MALLON	HF 1#8	9/1-9/30	3472	316	9471	32886	1096
MALLON	HF 1#8	10/1-10/31	3771	264	8186	30871	996
MALLON	HF 1#8	11/1-11/15	3736	244	3657	13664	911
MALLON	HF 1#8	11/21-11/30	8022	122	856	6867	981
MALLON	HF 1#8	12/1-12/31	1255	115	805	1010	144
MALLON	HF 1#8	1/1-1/31	9388	120	720	6759	1127
MALLON	HF 1#8	2/1-2/29	8498	120	841	7147	1021
				1867			
MALLON	HF 1#11	7/1-7/31	6328	186	5578	35298	1217
MALLON	HF 1#11	8/1-8/31	5147	256	5368	27628	1316
MALLON	HF 1#11	9/1-9/30	4770	284	6241	29769	1294
MALLON	HF 1#11	10/1-10/31	5503	241	7472	41119	1326
MALLON	HF 1#11	11/1-11/30	5545	254	3803	21087	1406
MALLON	HF 1#11	12/1-12/31	8339	177	1415	11800	1311
MALLON	HF 1#11	2/1-2/29	11085	137	684	7582	1516
				1535			
MALLON	JF 12#5	7/1-7/31	23870	17	322	7686	452
MALLON	JF 12#5	8/1-8/31	5281	70	1260	6654	370
MALLON	JF 12#5	9/1-9/30	5689	58	1725	9813	327
MALLON	JF 12#5	10/1-10/31	5682	53	1644	9341	301
MALLON	JF 12#5	11/1-11/15	8730	40	597	5212	347
MALLON	JF 12#5	11/20-11/30	21547	20	223	4805	437
MALLON	JF 12#5	12/1-12/31	40893	10	270	11041	425
MALLON	JF 12#5	1/1-1/31	44067	11	75	3305	472
MALLON	JF 12#5	2/1-2/29	53509	8	114	6100	407
				287			
MALLON	PF 13#6	7/1-7/31	5311	72	2235	11869	383
MALLON	PF 13#6	8/1-8/31	4897	83	2558	12526	404
MALLON	PF 13#6	9/1-9/30	2071	111	3331	6899	230
MALLON	PF 13#6	10/1-10/31	15351	88	2725	41831	1349
MALLON	PF 13#6	11/1-11/15	6241	58	872	5442	363
MALLON	PF 13#6	11/20-11/30	6573	70	769	5055	460
MALLON	PF 13#6	12/1-12/31	14096	45	178	2509	627
MALLON	PF 13#6	1/1-1/31	34024	16	252	8574	536
MALLON	PF 13#6	2/1-2/29	67677	7	96	6497	406
				550			
MALLON	RF 2#16	7/1-7/31	2849	76	2366	6741	217
MALLON	RF 2#16	8/1-8/31	2468	87	2708	6683	216
MALLON	RF 2#16	9/1-9/30	2541	87	2604	6617	221

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
MALLON	RF 2#16	10/1-10/31	2718	85	2550	6931	224
MALLON	RF 2#16	11/1-11/15	3686	37	370	1364	136
MALLON	RF 2#16	11/20-11/30	3227	40	441	1423	129
MALLON	RF 2#16	12/1-12/31	9538	30	751	7163	276
MALLON	RF 2#16	1/1-1/31	35631	13	295	10511	350
MALLON	RF 2#16	2/1-2/29	141905	3	21	2980	373
				458			
MERIDIAN	HAF #2	7/1-7/31	20207	24	386	7800	488
MERIDIAN	HAF #2	8/1-8/31	14827	31	689	10216	464
MERIDIAN	HAF #2	9/1-9/30	4296	70	1049	4506	300
MERIDIAN	HAF #2	11/1-11/16	12074	27	27	326	326
MERIDIAN	HAF #2	11/21-11/30	12384	27	190	2353	336
MERIDIAN	HAF #2	12/1-12/31	20154	19	325	6550	364
MERIDIAN	HAF #2	1/1-1/31	24918	18	306	7625	477
				216			
MERIDIAN	HAF #3	7/1-7/31	10685	44	696	7437	465
MERIDIAN	HAF #3	8/1-8/31	7537	54	1089	8208	410
MERIDIAN	HAF #3	9/1-9/30	5551	60	907	5035	336
MERIDIAN	HAF #3	11/1-11/16	10520	25	25	263	263
MERIDIAN	HAF #3	11/21-11/30	10401	24	167	1737	248
MERIDIAN	HAF #3	12/1-12/31	19618	12	280	5493	211
MERIDIAN	HAF #3	1/1-1/31	16465	20	159	2618	154
				239			
MERIDIAN	HF #1	7/1-7/31	15915	65	1037	16504	1032
MERIDIAN	HF #1	8/1-8/31	38913	26	515	20040	1002
MERIDIAN	HF #1	9/1-9/30	43723	21	314	13729	915
MERIDIAN	HF #1	11/1-11/16	102500	8	8	820	820
MERIDIAN	HF #1	11/21-11/30	31623	28	167	5281	880
MERIDIAN	HF #1	12/1-12/31	43236	19	191	8258	751
MERIDIAN	HF #1	1/1-1/31	81011	12	95	7696	962
				179			
MERIDIAN	HF #2Y	6/1-6/30	2997	87	1819	5452	260
MERIDIAN	HF #2Y	8/1-8/31	3978	62	934	3715	219
MERIDIAN	HF #2Y	9/1-9/30	4626	52	773	3576	238
MERIDIAN	HF #2Y	11/1-11/16	21143	7	7	148	148
MERIDIAN	HF #2Y	11/21-11/30	8100	40	140	1296	216
MERIDIAN	HF #2Y	12/1-12/31	5733	41	857	4913	234
MERIDIAN	HF #2Y	1/1-1/31	5554	36	1082	6009	207
				325			
MERIDIAN	HF #3	7/1-7/31	2342	69	1105	2588	162
MERIDIAN	HF #3	8/1-8/31	2101	72	1516	3185	152
MERIDIAN	HF #3	11/1-11/16	6679	28	28	187	187
MERIDIAN	HF #3	11/21-11/30	7027	31	183	1286	214
MERIDIAN	HF #3	12/1-12/31	8861	25	624	5529	213
MERIDIAN	HF #3	1/1-1/31	18724	12	199	3726	143

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
				237			
MERRION	KRY #1	1/1-1/31	19631	13	65	1276	51
MERRION	OCG #1	7/1-7/31	1691	8	55	93	13

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
MESA GR.	BC #1	6/1-6/30	6010	47	895	5379	269
MESA GR.	BC #1	7/1-7/31	4681	64	966	4522	301
MESA GR.	BC #1	8/1-8/31	4323	59	1543	6670	267
MESA GR.	BC #1	10/1-10/31	16050	20	20	321	321
MESA GR.	BC #1	11/1-11/17	9263	24	400	3705	218
MESA GR.	BC #1	11/21-11/30	18094	11	85	1538	192
MESA GR.	BC #1	12/1-12/31	17406	10	251	4369	182
MESA GR.	BC #1	1/1-1/31	45768	5	99	4531	206
MESA GR.	BC #1	2/1-2/29	44417	6	96	4264	213
MESA GR.	BRO #1	7/1-7/31	9027	76	1135	10246	683
MESA GR.	BRO #1	8/1-8/31	9027	103	2783	25123	930
MESA GR.	BRO #1	10/1-10/31	7627	130	3912	29837	962
MESA GR.	BRO #1	11/1-11/16	7848	108	1725	13538	846
MESA GR.	BRO #1	11/21-11/30	7990	100	800	6392	799
MESA GR.	BRO #1	12/1-12/31	7631	112	2234	17047	852
MESA GR.	BRO #1	1/1-1/31	6194	111	1886	11681	687
MESA GR.	BRO #1	2/1-2/29	7907	92	1661	13133	773
MESA GR.	GAV #1	7/1-7/31	21926	10	149	3267	218
MESA GR.	GAV #1	8/1-8/31	22408	9	238	5333	190
MESA GR.	GAV #1	10/1-10/31	32875	3	104	3419	110
MESA GR.	GAV #1	11/1-11/17	14220	3	41	583	34
MESA GR.	GAV #1	11/21-11/30	42027	5	37	1555	194
MESA GR.	GAV #1	12/1-12/31	1889	3	36	68	6
MESA GR.	GAV #1	1/1-1/31	33977	10	130	4417	316
MESA GR.	GAV #1	2/1-2/29	67716	4	81	5485	219
MESA GR.	GAV #3	7/1-7/31	28595	9	79	2259	151
MESA GR.	GAV #3	8/1-8/31	10247	12	299	3064	113
MESA GR.	GAV #3	10/1-10/31	33843	6	178	6024	194
MESA GR.	GAV #3	12/1-12/31	23618	9	55	1299	130
MESA GR.	GAV #3	1/1-1/31	51710	3	31	1603	100
MESA GR.	GAV #3	2/1-2/29	46578	4	45	2096	140
MESA GR.	GH #1	7/1-7/31	16749	16	239	4003	267
MESA GR.	GH #1	8/1-8/31	24102	16	372	8966	345
MESA GR.	GH #1	10/1-10/31	47667	12	12	572	572
MESA GR.	GH #1	11/1-11/17	64780	6	109	7061	392
MESA GR.	GH #1	11/21-11/30	58909	6	44	2592	324
MESA GR.	GH #1	12/1-12/31	63796	7	152	9697	359
MESA GR.	GH #1	1/1-1/31	83186	5	118	9816	393
MESA GR.	HC #1	8/1-8/31	8604	13	371	3192	110
MESA GR.	HC #1	10/1-10/31	5200	25	25	130	130

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
MESA GR.	HC #1	11/1-11/16	10727	10	161	1727	108
MESA GR.	HC #1	11/22-11/30	63267	3	15	949	136
MESA GR.	HC #1	12/1-12/31	18663	11	89	1661	151
MESA GR.	HC #1	1/1-1/31	20767	8	129	2679	128
MESA GR.	HC #1	2/1-2/29	30725	6	109	3349	146
MESA GR.	INV #1	2/1-2/29	4259	14	228	971	54
MESA GR.	MAR #1	7/1-7/31	2709	94	1416	3836	256
MESA GR.	MAR #1	8/1-8/31	3376	68	1489	5027	229
MESA GR.	MAR #1	10/1-10/31	5237	48	1394	7301	243
MESA GR.	MAR #1	11/1-11/17	6948	39	620	4308	253
MESA GR.	MAR #1	11/21-11/30	8774	30	212	1860	233
MESA GR.	MAR #1	12/1-12/31	13194	11	263	3470	129
MESA GR.	MAR #1	1/1-1/31	3494	50	451	1576	197
MESA GR.	MAR #1	2/1-2/29	9449	33	750	7087	308
MESA GR.	PRO #1	2/1-2/29	4594	21	512	2352	98
MESA GR.	RL #2	7/1-7/31	4771	57	855	4079	272
MESA GR.	RL #2	8/1-8/31	5389	47	1260	6790	251
MESA GR.	RL #2	10/1-10/31	3967	47	1456	5776	186
MESA GR.	RL #2	11/1-11/17	4336	39	664	2879	169
MESA GR.	RL #2	11/21-11/31	5500	17	120	660	83
MESA GR.	RL #2	12/1-12/31	4629	47	1088	5036	187
MESA GR.	RL #2	1/1-1/31	7791	34	506	3942	141
MESA GR.	RL #2	2/1-2/29	17015	15	336	5717	249
MESA GR.	RL #3	7/1-7/31	2156	37	556	1199	80
MESA GR.	RL #3	8/1-8/31	1860	48	1250	2325	83
MESA GR.	RL #3	10/1-10/31	1875	32	933	1749	56
MESA GR.	RL #3	11/1-11/17	9625	16	32	308	62
MESA GR.	RL #3	12/1-12/31	10554	12	177	1868	75
MESA GR.	RL #3	1/1-1/31	16365	9	192	3142	101
MESA GR.	RL #3	2/1-2/29	18720	8	175	3276	131
MOBIL	LIN B#34	7/1-7/31	3501	72	2229	7804	252
MOBIL	LIN B#34	8/1-8/31	3365	56	1733	5832	216
MOBIL	LIN B#34	9/1-9/30	3697	47	1396	5161	172
MOBIL	LIN B#34	10/1-10/31	4817	37	955	4600	170
MOBIL	LIN B#34	11/1-11/16	4246	33	532	2259	141
MOBIL	LIN B#34	11/20-11/30	4083	43	384	1568	174
MOBIL	LIN B#34	12/1-12/31	5126	35	987	5059	181
MOBIL	LIN B#34	1/1-1/31	7368	25	560	4126	179
MOBIL	LIN B#34	2/1-2/29	7766	28	691	5366	215

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
MOBIL	LIN B#37	7/1-7/31	7750	54	1683	13044	435
MOBIL	LIN B#37	8/1-8/31	3733	218	6772	25283	936
MOBIL	LIN B#37	9/1-9/30	3192	244	7314	23349	778
MOBIL	LIN B#37	10/1-10/31	3953	225	6975	27573	889
MOBIL	LIN B#37	11/1-11/17	3907	214	3641	14225	889
MOBIL	LIN B#37	11/20-11/30	3682	195	1947	7168	796
MOBIL	LIN B#37	12/1-12/31	3757	213	3837	14417	801
MOBIL	LIN B#37	1/1-1/31	4063	192	3657	14858	782
MOBIL	LIN B#37	2/1-2/29	4112	188	3570	14679	816
MOBIL	LIN B#38	7/1-7/31	19598	13	415	8133	262
MOBIL	LIN B#38	8/1-8/31	21127	10	300	6338	235
MOBIL	LIN B#38	9/1-9/30	29320	8	219	6421	199
MOBIL	LIN B#38	10/1-10/31	24403	8	238	5808	187
MOBIL	LIN B#38	11/1-11/16	27625	6	96	2652	166
MOBIL	LIN B#72	7/1-7/31	20565	4	108	2221	74
MOBIL	LIN B#72	8/1-8/31	21349	4	86	1836	68
MOBIL	LIN B#72	9/1-9/30	25473	3	74	1885	63
MOBIL	LIN B#72	11/20-11/30	38523	6	44	1695	188
MOBIL	LIN B#72	12/1-12/31	66383	12	81	5377	199
MOBIL	LIN B#72	1/1-1/31	71987	3	79	5676	183
MOBIL	LIN B#72	2/1-2/29	19500	3	58	1131	45
MOBIL	LIN B#73	7/1-7/31	19977	7	173	3456	115
MOBIL	LIN B#73	8/1-8/31	17279	6	165	2851	106
MOBIL	LIN B#73	9/1-9/30	16449	7	187	3076	103
MOBIL	LIN B#73	10/1-10/31	17724	7	192	3403	110
MOBIL	LIN B#73	11/1-11/16	26657	5	67	1786	112
MOBIL	LIN B#73	11/20-11/30	19154	7	52	996	111
MOBIL	LIN B#73	12/1-12/31	8970	16	302	2709	113
MOBIL	LIN B#73	1/1-1/31	14429	10	219	3160	117
MOBIL	LIN B#73	2/1-2/29	27143	5	98	2660	111
MOBIL	LIN B#74	7/1-7/31	53190	8	210	11170	30
MOBIL	LIN B#74	8/1-8/31	15613	32	727	11351	437
MOBIL	LIN B#74	9/1-9/30	12994	36	980	12734	424
MOBIL	LIN B#74	10/1-10/31	9931	35	1008	10010	323
MOBIL	LIN B#74	11/1-11/16	10793	32	482	5202	325
MOBIL	LIN B#74	11/20-11/30	37495	14	109	4087	454
MOBIL	LIN B#74	12/1-12/31	50631	11	141	7139	376
MOBIL	LIN B#74	1/1-1/31	74360	6	100	7436	372
MOBIL	LIN B#74	2/1-2/29	42538	7	119	5062	281

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
R&B	HF 43-15	6/1-6/30	55728	4	103	5740	239
R&B	HF 43-15	7/1-7/31	29693	15	378	11224	416
R&B	HF 43-15	8/1-8/31	39632	11	353	13990	466
R&B	HF 43-15	9/1-9/30	46545	9	44	2048	410
R&B	HF 43-15	10/1-10/31	34337	20	98	3365	673
R&B	HF 43-15	11/1-11/16	69293	9	147	10186	637
R&B	HF 43-15	11/21-11/30	79180	6	61	4830	483
R&B	HF 43-15	12/1-12/31	53333	5	117	6240	240
R&B	IN 34-16	9/1-9/30	39613	8	31	1228	205
R&B	IN 34-16	10/1-10/31	12698	46	1160	14730	526
R&B	IN 34-16	11/1-11/16	12312	54	858	10564	660
R&B	IN 34-16	11/20-11/30	11991	60	663	7950	723
R&B	IN 34-16	12/1-12/31	9708	72	1231	11950	703
SUN	BB#1	7/1-7/31	2701	133	3585	9684	372
SUN	BB#1	8/1-8/31	2995	123	3309	9909	367
SUN	BB#1	9/1-9/30	3322	102	1635	5431	362
SUN	BB#1	10/1-10/31	3944	108	2054	8100	426
SUN	BB#1	11/1-11/16	4282	96	1533	6564	410
SUN	BB#1	11/22-11/30	2973	64	451	1341	192
SUN	BB#1	12/1-12/31	3563	78	2026	7219	267
SUN	BB#1	1/1-1/31	4030	64	1538	6198	258
SUN	B&L#1	7/1-7/31	10250	2	48	492	21
SUN	B&L#1	8/1-8/31	6020	2	50	301	10
SUN	B&L#1	9/1-9/30	14909	2	11	164	15
SUN	B&L#2	7/1-7/31	13971	4	34	475	53
SUN	DRDO#1	7/1-7/31	4010	70	2106	8445	282
SUN	DRDO#1	8/1-8/31	6664	42	1038	6917	266
SUN	DRDO#1	9/1-9/30	9324	32	550	5128	302
SUN	DRDO#1	10/1-10/31	14614	20	383	5597	295
SUN	DRDO#1	11/1-11/16	16424	17	264	4336	271
SUN	DRDO#1	11/21-11/30	26475	13	101	2674	334
SUN	DRDO#1	12/1-12/31	10084	26	713	7190	257
SUN	DRDO#1	1/1-1/31	5901	37	1135	6698	216
SUN	E.T.	7/1-7/31	28740	13	404	11611	387
SUN	E.T.	8/1-8/31	50890	7	172	8753	324
SUN	E.T.	9/1-9/30	56356	5	87	4903	288
SUN	E.T.	10/1-10/31	91667	3	48	440	232
SUN	E.T.	11/1-11/16	99280	2	25	2482	155

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
SUN	E.T.	11/21-11/30	40089	6	45	1804	226
SUN	E.T.	12/1-12/31	23621	8	214	5055	181
SUN	E.T.	1/1-1/31	139615	2	13	1815	113
SUN	FS#1	7/1-7/31	2533	54	1404	3556	142
SUN	FS#1	8/1-8/31	2060	71	1918	3952	146
SUN	FS#1	9/1-9/30	2128	66	1120	2383	140
SUN	FS#1	10/1-10/31	2525	54	1027	2593	136
SUN	FS#1	11/1-11/16	2667	49	787	2099	131
SUN	FS#1	11/21-11/30	2378	109	368	875	109
SUN	FS#1	12/1-12/31	2105	52	1405	2957	106
SUN	FS#1	1/1-1/31	2976	48	1446	4303	143
SUN	FSA#2	7/1-7/31	22195	33	990	21973	732
SUN	FSA#2	8/1-8/31	25292	26	678	17148	660
SUN	FSA#2	9/1-9/30	30122	20	345	10392	611
SUN	FSA#2	10/1-10/31	32395	15	294	9524	501
SUN	FSA#2	11/1-11/16	35884	11	138	4952	354
SUN	FSA#2	11/21-11/30	37120	8	50	1856	309
SUN	FSA#2	12/1-12/31	35008	12	244	8542	427
SUN	FSA#2	1/1-1/31	37137	9	95	3528	358
SUN	FSB#3	7/1-7/31	6550	15	447	2928	98
SUN	FSB#3	8/1-8/31	2800	14	370	1036	38
SUN	FSB#3	9/1-9/30	2197	16	254	558	35
SUN	FSB#3	10/1-10/31	2851	13	255	727	38
SUN	FSB#3	11/1-11/16	3548	11	177	628	39
SUN	FSB#3	11/21-11/30	6663	12	83	553	69
SUN	FSB#3	12/1-12/31	4919	8	222	1092	39
SUN	FSB#3	1/1-1/31	7263	6	137	995	38
SUN	FTS#1	7/1-7/31	156636	3	22	3446	431
SUN	FTS#1	8/1-8/31	177222	2	45	7975	332
SUN	FTS#1-E	7/1-7/31	96712	3	73	7060	243
SUN	FTS#1-E	8/1-8/31	147825	1	40	5913	211
SUN	GG#1	7/1-7/31	3224	28	254	819	91
SUN	HA#1	7/1-7/31	2688	225	6290	16905	604
SUN	HA#1	8/1-8/31	2924	226	6098	17831	660
SUN	HA#1	9/1-9/30	3042	203	3451	10499	618
SUN	HA#1	10/1-10/31	3160	238	4522	14288	752

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
SUN	HA#1	11/1-11/16	3029	228	3641	11029	689
SUN	HA#1	11/21-11/30	2446	259	1812	4433	633
SUN	HA#1	12/1-12/31	2725	201	3422	9324	548
SUN	HA#1	1/1-1/31	2049	230	3450	7068	471
SUN	HA#2	7/1-7/31	6435	49	1455	9363	312
SUN	HA#2	8/1-8/31	9774	31	810	7917	293
SUN	HA#2	9/1-9/30	10726	29	485	5202	306
SUN	HA#2	10/1-10/31	8211	56	1057	8679	457
SUN	HA#2	11/1-11/16	8733	49	776	6777	424
SUN	HA#2	11/21-11/30	9566	41	327	3128	391
SUN	HA#2	12/1-12/31	9398	50	906	8515	473
SUN	HA#2	1/1-1/31	11391	35	741	8441	384
SUN	HR#1	7/1-7/31	2837	241	7231	20516	684
SUN	HR#1	8/1-8/31	3130	235	6347	19865	736
SUN	HR#1	9/1-9/30	10617	128	1914	20321	1195
SUN	HR#1	10/1-10/31	7768	134	2538	19714	1038
SUN	HR#1	11/1-11/16	4455	167	2671	11899	744
SUN	HR#1	11/21-11/30	12157	87	611	7428	929
SUN	HR#1	12/1-12/31	29058	35	242	7032	1005
SUN	HR#1	1/1-1/31	23162	23	68	1575	525
SUN	JA#1	7/1-7/31	26019	14	420	10928	364
SUN	JA#1	8/1-8/31	28062	11	305	8559	317
SUN	JA#1	9/1-9/30	27180	11	178	4838	285
SUN	JA#1	10/1-10/31	16785	15	293	4918	259
SUN	JA#1	11/1-11/16	67333	13	39	2626	219
SUN	JA#1	11/21-11/30	23240	24	96	2231	279
SUN	JA#1	12/1-12/31	32738	15	160	5238	249
SUN	JA#1	1/1-1/31	31906	8	212	6764	251
SUN	JAA#2	7/1-7/31	10379	38	1125	11676	389
SUN	JAA#2	8/1-8/31	12279	24	655	8043	298
SUN	JAA#2	9/1-9/30	28395	13	215	6105	359
SUN	JAA#2	10/1-10/31	34693	11	212	7355	409
SUN	JAA#2	11/1-11/16	66521	5	73	4856	208
SUN	JAA#2	11/1-11/21	21660	17	103	2231	279
SUN	JAA#2	12/1-12/31	88865	4	74	6576	329
SUN	JAA#2	1/1-1/31	107549	3	51	5485	274
SUN	JAB#3	7/1-7/31	1224	43	1283	1570	52
SUN	JAB#3	8/1-8/31	1688	36	961	1622	60
SUN	JAB#3	9/1-9/30	1344	27	453	609	36
SUN	JAB#3	10/1-10/31	2560	19	368	942	50

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
SUN	JAB#3	11/1-11/16	2795	17	268	749	47
SUN	JAB#3	11/21-11/30	3075	15	120	369	46
SUN	JAB#3	12/1-12/31	2801	60	423	1185	44
SUN	JAB#3	1/1-1/31	4416	11	334	1475	49
SUN	LL#1	7/1-7/31	1973	67	1939	3826	125
SUN	LL#1	8/1-8/31	2615	51	1374	3593	133
SUN	LL#1	9/1-9/30	2397	50	844	2023	119
SUN	LL#1	10/1-10/31	2787	42	752	2096	116
SUN	LL#1	11/1-11/16	2986	36	574	1714	107
SUN	LL#1	11/21-11/30	2922	37	294	859	107
SUN	LL#1	12/1-12/31	2653	35	992	2632	94
SUN	LL#1	1/1-1/31	2422	36	1071	2594	84
SUN	LOD #1	7/1-7/31	7072	61	1898	13422	433
SUN	LOD #1	8/1-8/31	6212	66	1776	11033	409
SUN	LOD #1	9/1-9/30	5255	75	1276	6705	394
SUN	LOD #1	10/1-10/31	4538	75	1420	6444	339
SUN	LOD #1	11/1-11/16	5837	58	926	5405	338
SUN	LOD #1	11/21-11/30	8548	50	398	3402	425
SUN	LOD #1	12/1-12/31	8206	46	1051	8625	375
SUN	LOD #1	1/1-1/31	9252	43	1043	9650	402
SUN	ML#1	7/1-7/31	11402	24	711	8107	270
SUN	ML#1	8/1-8/31	6861	29	793	5441	202
SUN	ML#1	9/1-9/30	6460	16	63	407	136
SUN	ML#1	10/1-10/31	7402	47	894	6617	389
SUN	ML#1	11/1-11/16	7984	47	745	5948	372
SUN	ML#1	11/21-11/30	8942	47	378	3380	423
SUN	ML#1	12/1-12/31	12175	35	629	7658	450
SUN	ML#1	1/1-1/31	14617	28	847	12381	442
SUN	MLA#2	7/1-7/31	9571	63	1877	17965	599
SUN	MLA#2	8/1-8/31	2756	93	2512	6924	256
SUN	MLA#2	9/1-9/30	4973	57	910	4525	266
SUN	MLA#2	10/1-10/31	6030	52	989	5964	314
SUN	MLA#2	11/1-11/16	4815	77	1239	5966	373
SUN	MLA#2	11/21-11/30	5869	76	611	3586	448
SUN	MLA#2	12/1-12/31	10493	46	836	8772	487
SUN	MLA#2	1/1-1/31	14692	28	770	11313	435
SUN	NS#1	7/1-7/31	4105	73	2181	8952	309
SUN	NS#1	8/1-8/31	2679	105	2831	7584	281
SUN	NS#1	9/1-9/30	1395	105	210	293	147
SUN	NS#1	10/1-10/31	2556	130	518	1324	331

GAVILAN DOME DATA BASE
RATE vs. GOR SENSITIVITY

OPERATOR	WELL	DATE	AVERAGE GOR	AVERAGE BOPD	CUM OIL	CUM GAS	AVERAGE MCFPD
SUN	NS#1	11/1-11/16	3932	54	862	3389	242
SUN	NS#1	11/21-11/30	5661	63	502	2842	355
SUN	NS#1	12/1-12/31	10044	33	749	7523	289
SUN	NS#1	1/1-1/31	11837	25	711	8416	301
SUN	NSA#2	7/1-7/31	4229	222	6646	28108	937
SUN	NSA#2	8/1-8/31	3739	238	6421	24005	889
SUN	NSA#2	9/1-9/30	4125	239	4066	16774	988
SUN	NSA#2	10/1-10/31	4526	217	4127	18678	983
SUN	NSA#2	11/1-11/16	4414	195	3113	13742	859
SUN	NSA#2	11/21-11/30	6669	129	900	6002	857
SUN	NSA#2	12/1-12/31	8984	107	859	7717	965
SUN	NSA#2	1/1-1/31	12412	85	677	8403	1050
SUN	NSB#3	7/1-7/31	11665	52	1360	15865	610
SUN	NSB#3	8/1-8/31	12580	40	1087	13675	506
SUN	NSB#3	9/1-9/30	14502	29	458	6642	391
SUN	NSB#3	10/1-10/31	9581	29	520	4982	293
SUN	NSB#3	11/1-11/16	17857	17	237	4232	282
SUN	NSB#3	11/21-11/30	20477	16	109	2232	319
SUN	NSB#3	12/1-12/31	22308	16	276	6157	342
SUN	NSB#3	1/1-1/31	23718	9	163	3866	276
SUN	NH#1	7/1-7/31	5802	4	121	702	24
SUN	NH#1	8/1-8/31	1989	6	176	350	11
SUN	NH#1	9/1-9/30	5484	6	95	521	31
SUN	NH#1	10/1-10/31	8600	4	85	731	38
SUN	NH#1	11/1-11/16	12059	3	51	615	38
SUN	NH#1	11/21-11/30	9750	5	32	312	39
SUN	NH#1	12/1-12/31	7653	6	121	926	39
SUN	NH#1	1/1-1/31	7371	6	159	1172	39
SUN	WW#1	7/1-7/31	6731	16	468	3150	105
SUN	WW#1	8/1-8/31	6923	12	311	2153	80
SUN	WW#1	9/1-9/30	5406	14	219	1184	70
SUN	WW#1	10/1-10/31	8290	12	207	1716	90
SUN	WW#1	11/1-11/16	1599	12	187	299	37
SUN	WW#1	11/21-11/30	14256	5	39	556	70
SUN	WW#1	12/1-12/31	31385	7	13	408	17