SED-241
Annual Report
SoCalGas Response to SED Data Request 17 (8)
I.19-06-016
ALJs: Hecht/Poirier
Date Served: March 25, 2021

file
AC0205

AGENDA FOR D.O.G. ANNUAL REVIEW
MEETING FOR ALISO CANYON
JUNE 13, 1989

ATTENDING

D. J. Anderson
S. P. Robinson
M. E. Melton
R. D. Phillips
P. J. Kinnear, Division of Oil and Gas

The topics to be covered in the meeting include geology, project performance, conservation, pollution prevention and operations.

DJA:hr
6/9/89

177443

SOUTHERN CALIFORNIA GAS COMPANY

ALISO CANYON FIELD

ANNUAL REVIEW MEETING

with the

DIVISION OF OIL AND GAS

TABLE OF CONTENTS

GEOLOGY

A 1978 geologic study of the Aliso Canyon field performed by the consulting firm Scientific Software Corporation indicated that gas had not migrated out of the defined boundaries (Frew fault on the west, Ward fault on the north and fluid contacts on south and east). The structure maps were revised in 1988 to incorporate 13 new wells that have been drilled over the past 10 years and to include new interpretations on faults along the northern boundary of the field. Isobaric maps drawn during recent shut-in periods indicate partial permeability barriers in the field with wells on the north west side (IW 70, F-2 and F-3), as well as IW 69 behaving differently than the rest of the field. It has been substantiated by Dr. Katz that gas is migrating to tighter zones in that area which has caused the shift in the P/Z curve. This low permeability area has been verified by pressure buildup tests.

Updated versions of structure maps and field cross-sections were used to determine vertical displacement along the Ward, Frew, and sub-Frew faults. All of these faults are reverse faults which bound the north and west flanks of the storage reservoir. Structure maps indicate the vertical displacement along the Ward fault is 300'-400' in the northwest section of the field. In the northeast section of the field, vertical displacement along the Ward fault is 1000'-1400'. North/south trending cross-sections through the west flank of the reservoir show the vertical displacements along the Frew and sub-Frew faults. The vertical displacement along the Frew fault ranges from 6000'-6500'. The vertical displacement along the sub-Frew fault is estimated at 300'-400'.

The conclusions of the 1978 Geological Study showed:

1. Reservoir Boundaries

South and East Sides:	Water aquifer
West Side:	Frew Fault
North Side:	Ward/Roosa Fault

2. SS-1-0 is an observation well which tests the communication between the storage zone and the Ward fault block. No gas shows were found in the Ward Fault block and subsequent pressure monitoring of the sub-Roosa fault block shows no communication with the storage zone.

3. The geologic structure is sound and competent to hold storage gas within the reservoir boundaries.

4. The northwest area represents 30% of initial gas cap volume, and 12% of the total reservoir pore volume.

5. The shifts to the right and left on the Hysteresis Curve has been due to:

    a. Gas moving into and out of tighter areas of the reservoir and then returning to the more permeable areas.

b. Some fault blocks, with restricted communication, being repressurized and depressurized.

c. Gas going into and out of the oil band.

6. Reasons for tilted water/oil contact along the south flank:

a. Sand-shale facies change, possible pinchout on the south and east flanks.
b. Step segments offset by older faults.

In 1987, while abandoning Porter 4, the MP shale was tested for possible migrated gas from well leaks. The interval produced no gas.

The following table summarizes some of the historical and geologic data for the gas storage reservoir.

TABLE 1. Aliso Canyon Statistical Data

Historical Information	
Year storage field was activated	1973
Discovery pressure	3602 psig
Reservoir Characteristics	
Name and geologic age of formation	Sesnon - Miocene Frew - Eocene
Formation structure	Faulted anticline
Formation thickness	150' to 400'
Depth range for wells (MD)	7100' to 9400'
Average Bottomhole pressure at 70 Bcf	3600 psig
Average Bottomhole temperature	180°F
Cushion gas	91 Bcf
Working gas	70 Bcf
Operations	
Gas Storage Wells	99
Observation Wells	11

DJA:hr
6/12/89

PROJECT PERFORMANCE

Injection Pressures

Figures 1, 2, and 3 show the variation of the average reservoir pressure with inventory for the 1986-1988 injection cycles. The stabilized reservoir pressure is always maintained at less than discovery pressure (3602 psig.)

Assuming a 0.7 psi/ft. fracture gradient for an 8000 ft. well, the wellbore pressure required to fracture the formation will be 5600 psig, which is 2000 psig greater than we ever encounter at Aliso Canyon.

Hysteresis Curve

Figure 4 is an updated graph of P/Z versus inventory (the data is also listed in Table 2). The shift in reservoir pressures from 1974 to date when plotted versus injected gas content is a combination of the repressurization of low pressure gas cap areas in the various fault blocks and of gas going into solution in crude oil some distance from the wellbore.

During the past four years the reservoir has not been filled to capacity. As a result the hysteresis curve has shifted to the left. This could be a result of gas coming out of solution, gas coming from tight regions of the reservoir, or gas returning from another fault block, such as the Ward fault or sub-Frew block on the north and west flanks. However, we have seen no evidence of pressure changes in observation wells penetrating the Ward fault block. We have no observation wells in the sub-Frew block. The volumetric weighting of reservoir blocks has been updated based upon observed pressure response in these blocks (see Figure 5). This revised reservoir weighting is used to calculate the current hysteresis curve, Figure 4.

Fluid Distributions

Figures 6 and 7 show structure maps for the S-4 and S-8 zone tops, respectively. Also shown are the original and best interpretation of current gas/oil and oil/water contacts. There is essentially no oil belt on the east flank which results in a gas/water contact along that flank. Very little changes in fluid contacts have been observed.

Reservoir Data Changes or Additions

No new wells have been drilled since the last DOG review. Most reservoir parameters are fairly well fixed from our major geologic study and log analysis. Subtle changes in gas saturation may have caused significant changes in the effective gas permeability and individual well deliverabilities. Each well is tested two to three times per year to determine its optimum sand free deliverability.

Oil Production

Table 3 presents annual oil production figures, starting from 1970 to date. From discovery the cumulative oil production through 1988 was 25,594,350 barrels. Figure 8 shows the annual oil production versus cumulative oil production.

Figure 9 is a graph of cumulative gas production versus cumulative oil production.

The performance of the reservoir since 1970 is shown on Figure 10. The plots of annual pressures decline through 1972. The semiannual plot from the start of storage operations illustrates the high and low range of inventory pressures. The estimated reserves for Aliso Canyon as of 12/31/88 is 884,000 Bbls. A 10% annual decline rate is used for Aliso Canyon oil production estimates.

Gas Analysis

Source gas for Aliso Canyon storage is still predominantly from the Permian Basin Mid-Continent area. As received, both the hydrocarbon distribution and helium content of this gas distinguish it from California gas. Table 4 represents a typical storage gas analysis.

Unusual Occurrences

There have been no unusual occurrences since the May 1988 DOG review.

DJA:hr
6/12/89

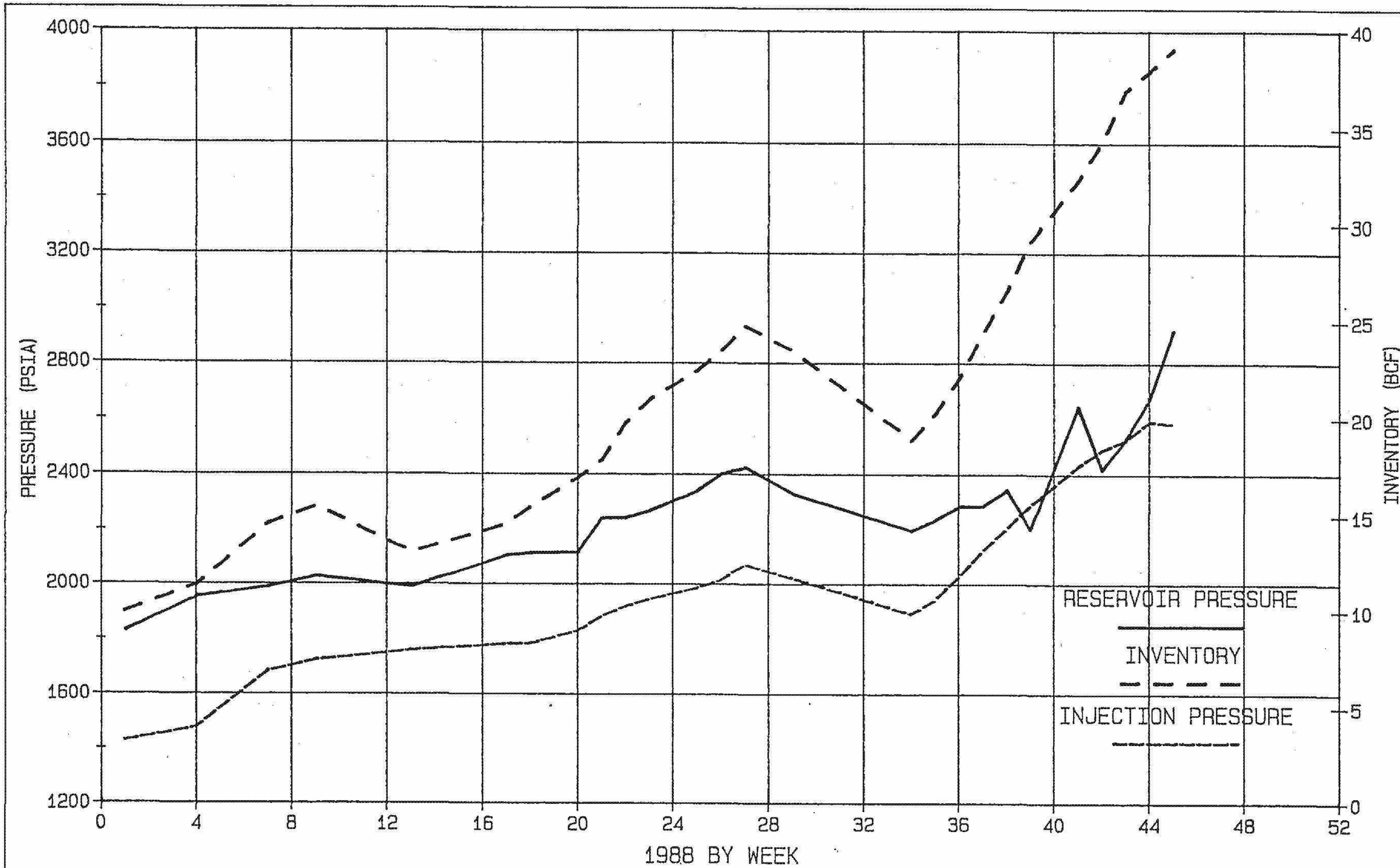


FIGURE 1. ALISO CANYON INVENTORY, RESERVOIR & INJECTION PRESSURES

hr: 5/2/89

Aliso_Canyon_DOGGR_0004947
AC_CPUC_SED_DR_17_0000691

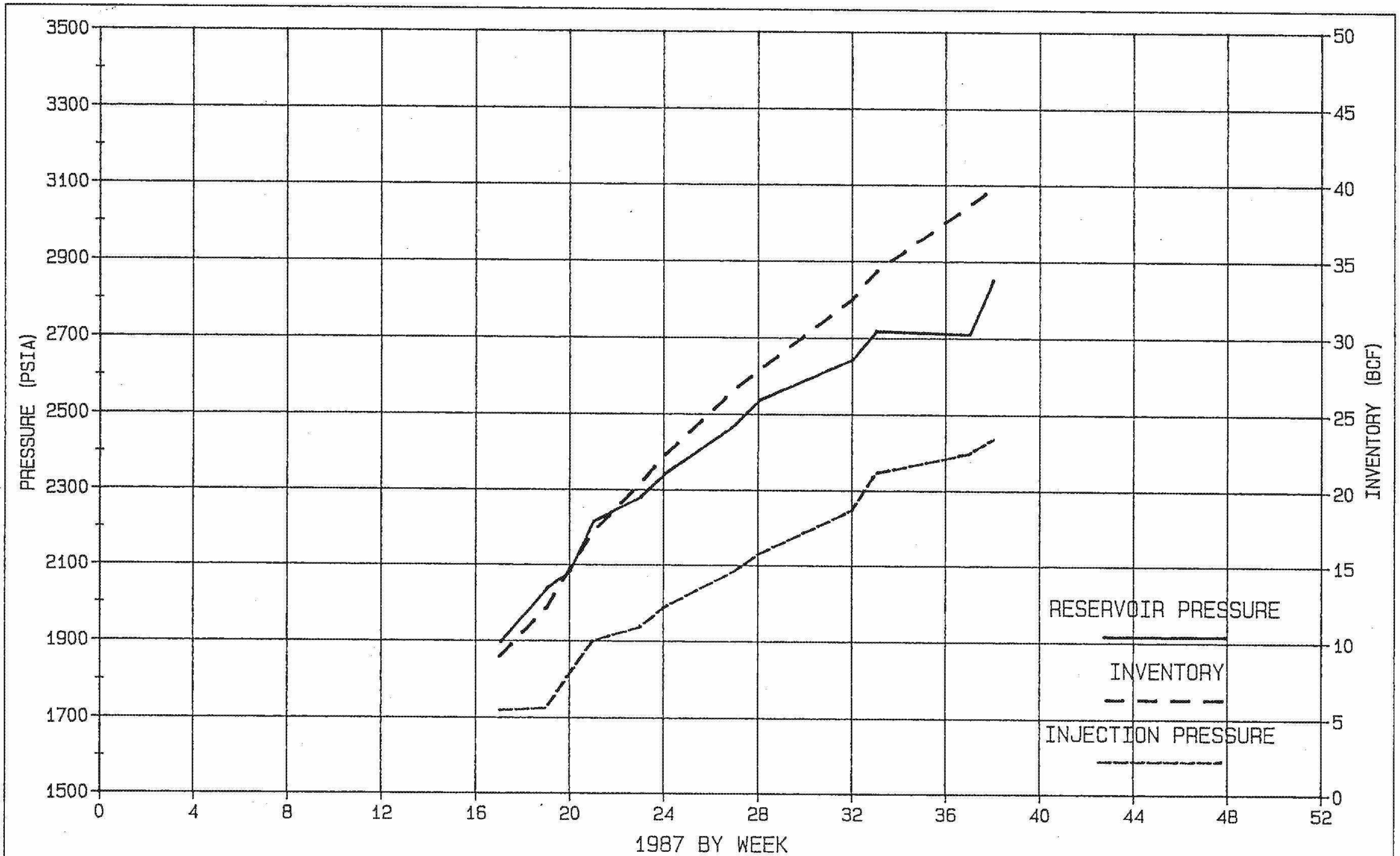


FIGURE 2. ALISO CANYON INVENTORY, RESERVOIR & INJECTION PRESSURES

hr: 5/2/89

Aliso_Canyon_DOGGR_0004948
AC_CPUC_SED_DR_17_0000692

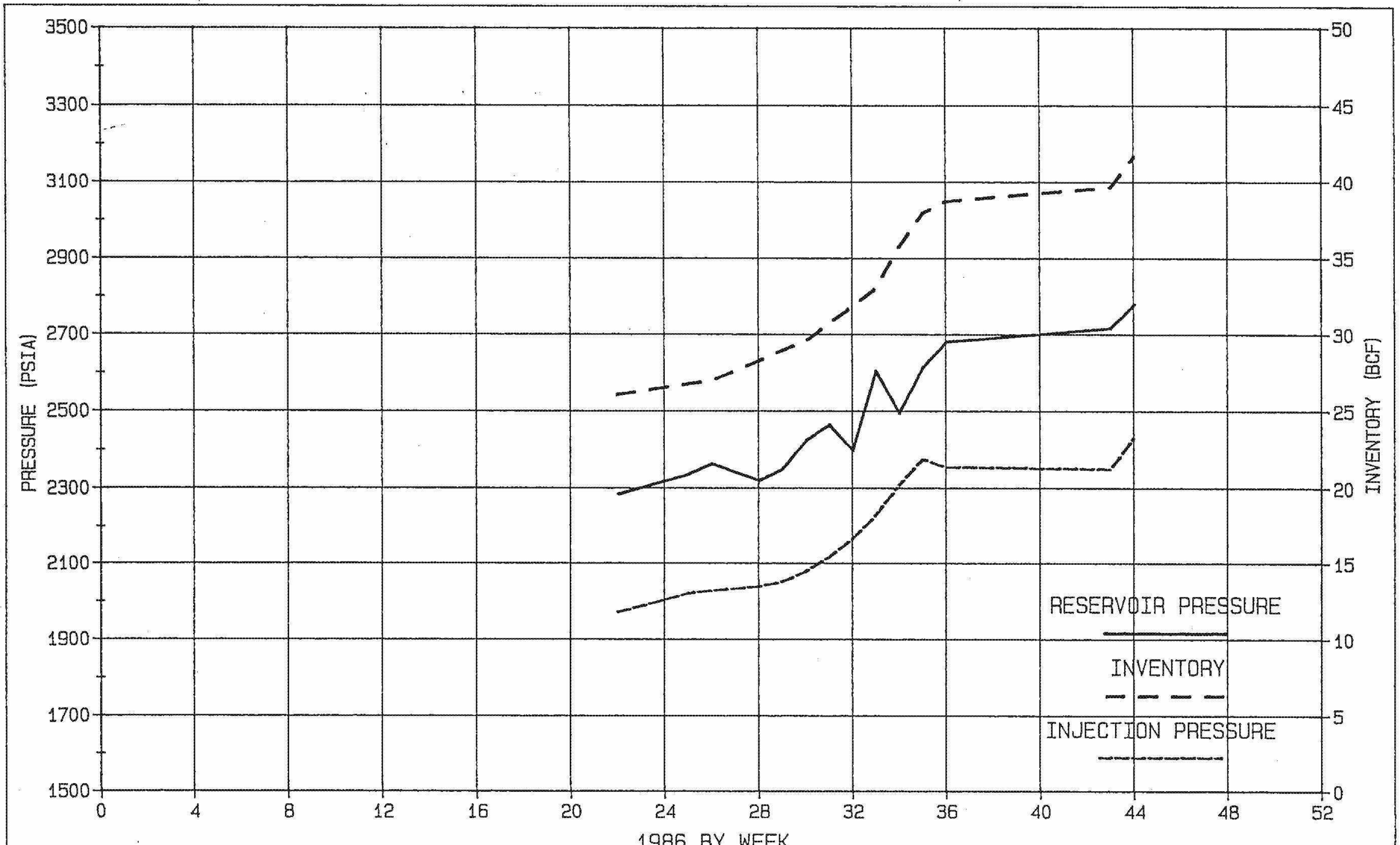


FIGURE 3. ALISO CANYON INVENTORY, RESERVOIR & INJECTION PRESSURES

hr: 5/2/89

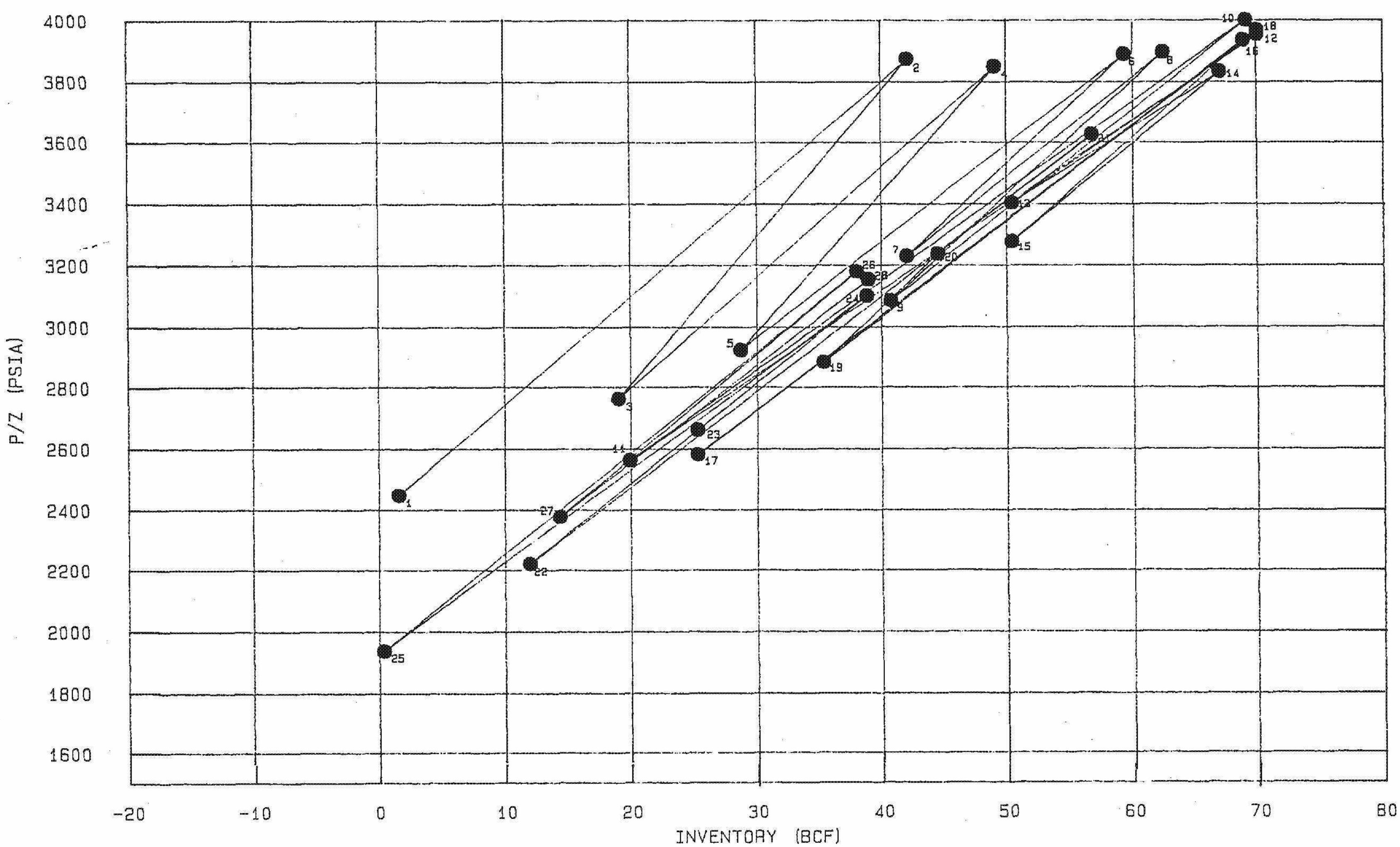


FIGURE 4. ALISO CANYON HYSTERESIS PLOT

:hr 6/6/89

TABLE 2
ALISO CANYON

POINT	DATE	AVERAGE RESERVOIR PRESSURE (PSIA)	P/Z (PSIA)	INVENTORY (BCF)
1	1/10/74	2127	2445	1.5
2	10/19/74	3404	3872	42.1
3	4/22/75	2391	2762	19.0
4	9/19/75	3380	3848	49.1
5	1/22/76	2526	2921	28.7
6	11/24/76	3420	3888	59.4
7	2/7/77	2793	3227	42.0
8	9/15/77	3427	3895	62.5
9	3/12/78	2665	3082	40.7
10	11/30/78	3536	4000	69.1
11	4/13/79	2222	2560	19.9
12	11/28/79	3486	3952	70.0
13	3/31/80	2949	3400	50.4
14	11/3/80	3364	3832	67.0
15	4/1/81	2835	3274	50.4
16	12/2/81	3468	3934	68.9
17	4/19/82	2238	2579	25.3
18	9/24/82	3502	3967	70.0
19	3/17/83	2492	2881	35.3
20	11/28/83	2801	3236	44.5
21	11/19/84	3160	3625	56.8
22	4/18/85	1942	2219	11.9
23	4/30/86	2306	2661	25.3
24	10/15/86	2680	3099	38.8
25	3/18/87	1710	1935	0.3
26	11/23/87	2749	3178	38.0
27	4/22/88	2070	2375	14.3
28	12/13/88	2727	3153	38.9

:hr
2/28/89

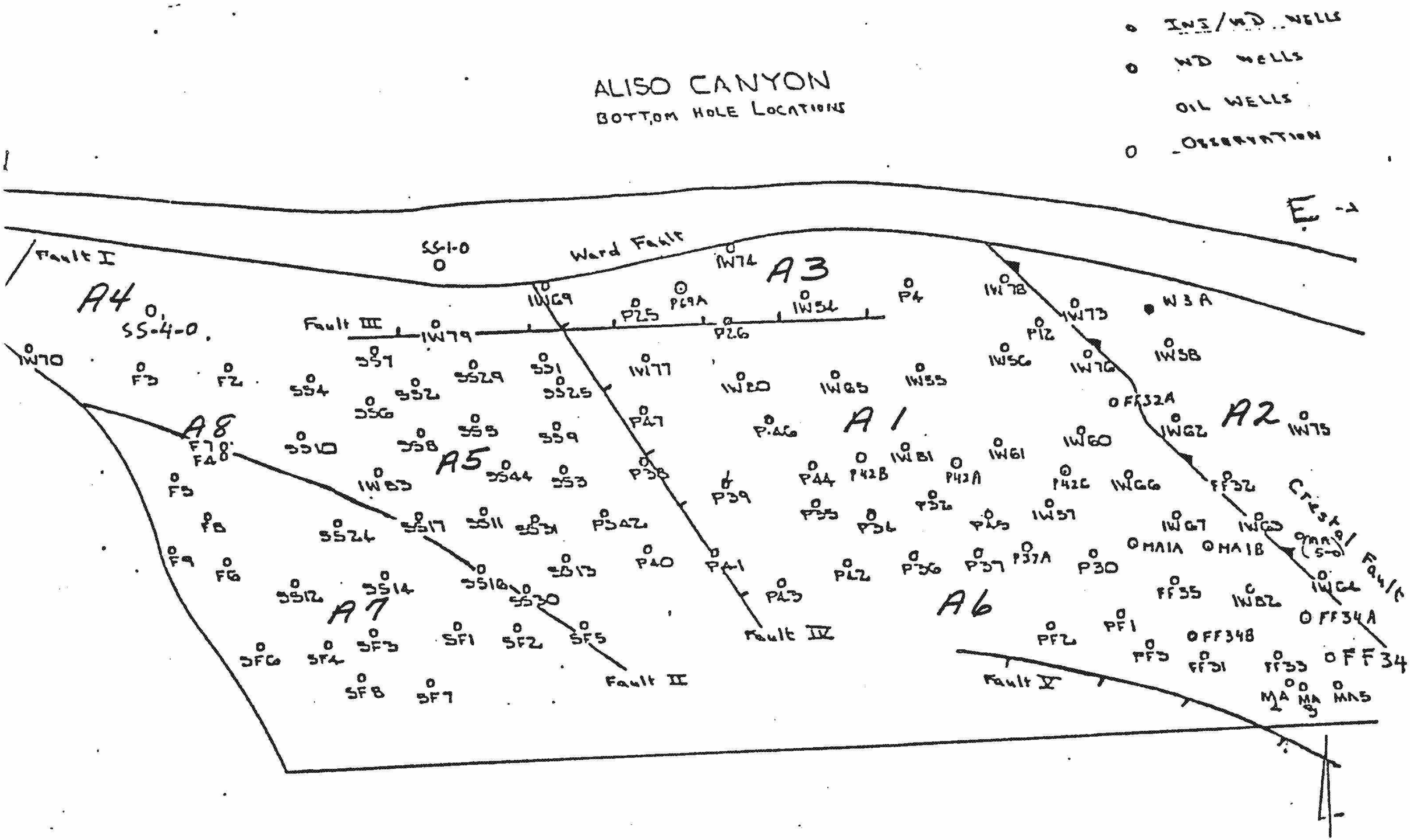


FIGURE 5. ALISO CANYON RESERVOIR BLOCKS

TABLE 3

ALISO CANYON OIL PRODUCTION

YEAR	OIL (Bbls/Yr)	CUMULATIVE OIL (Bbls)
1970	529,023	21,600,000
1971	496,016	22,096,016
1972	368,978	22,464,994
1973	203,709	22,668,703
1974	228,813	22,897,516
1975	298,639	23,196,155
1976	233,997	23,430,152
1977	288,107	23,718,259
1978	293,964	24,012,223
1979	164,505	24,176,728
1980	143,595	24,679,262
1981	175,414	24,495,737
1982	183,525	24,679,262
1983	91,502	24,770,764
1984	119,302	24,890,066
1985	171,307	25,061,373
1986	202,317	25,263,690
1987	178,828	25,442,518
1988	151,832	25,594,350

:hr
6/6/89

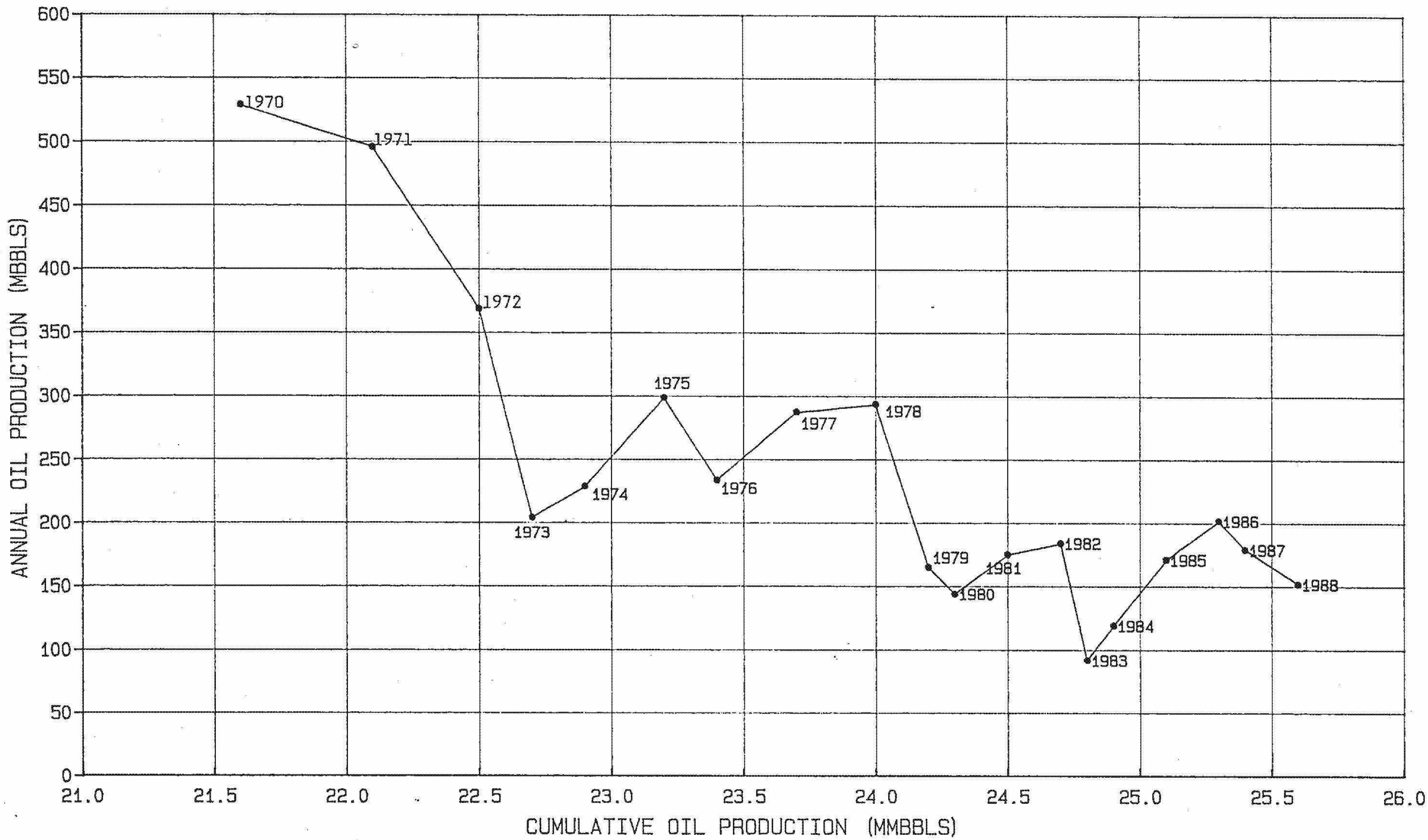


FIGURE 8. ANNUAL OIL VS CUMULATIVE OIL PRODUCTION

:hr 6/9/89

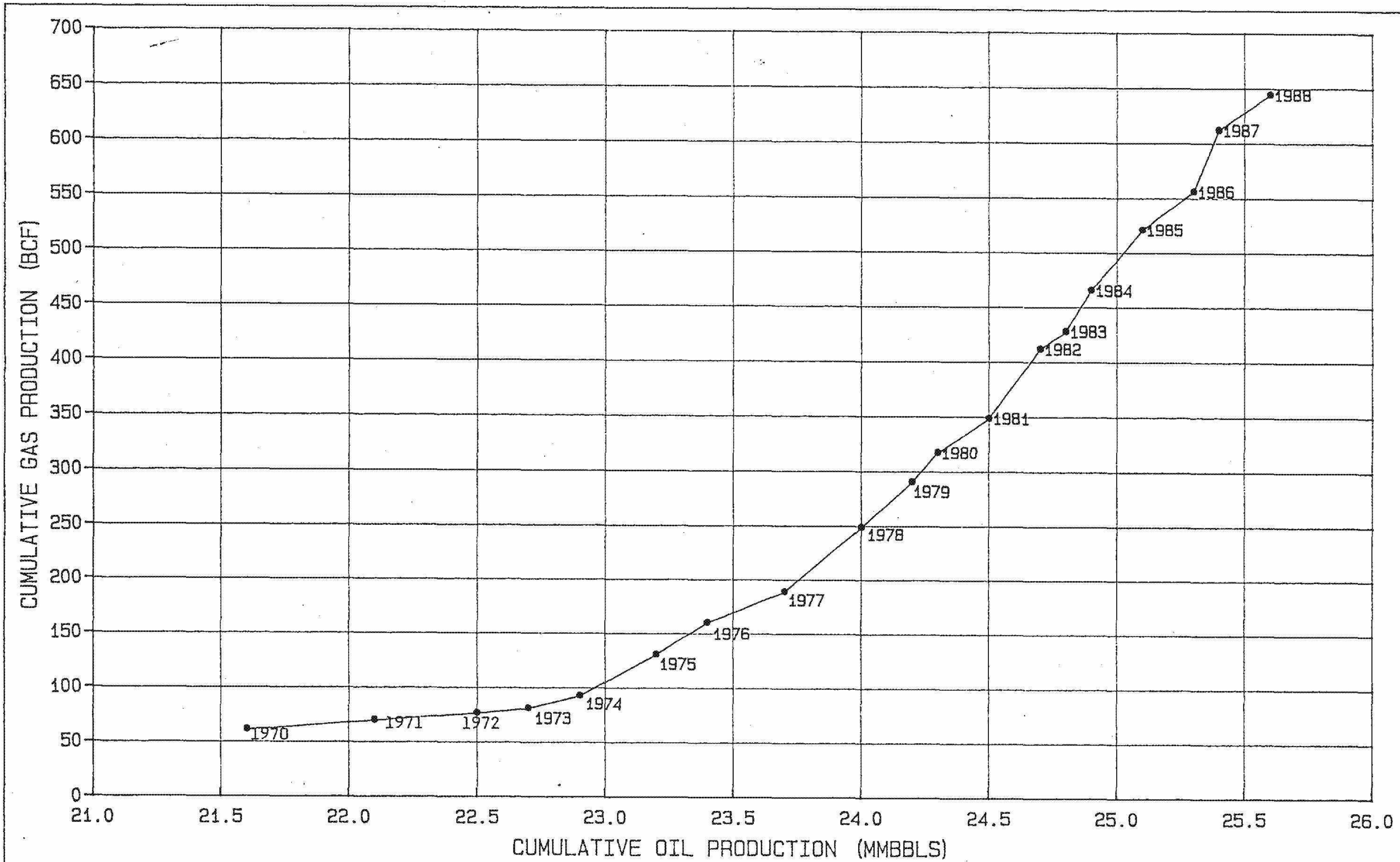


FIGURE 9. ANNUAL CUMULATIVE GAS VS CUMULATIVE OIL PRODUCTION

:hr 6/10/89

Aliso_Canyon_DOGGR_0004955
AC_CPUC_SED_DR_17_0000699

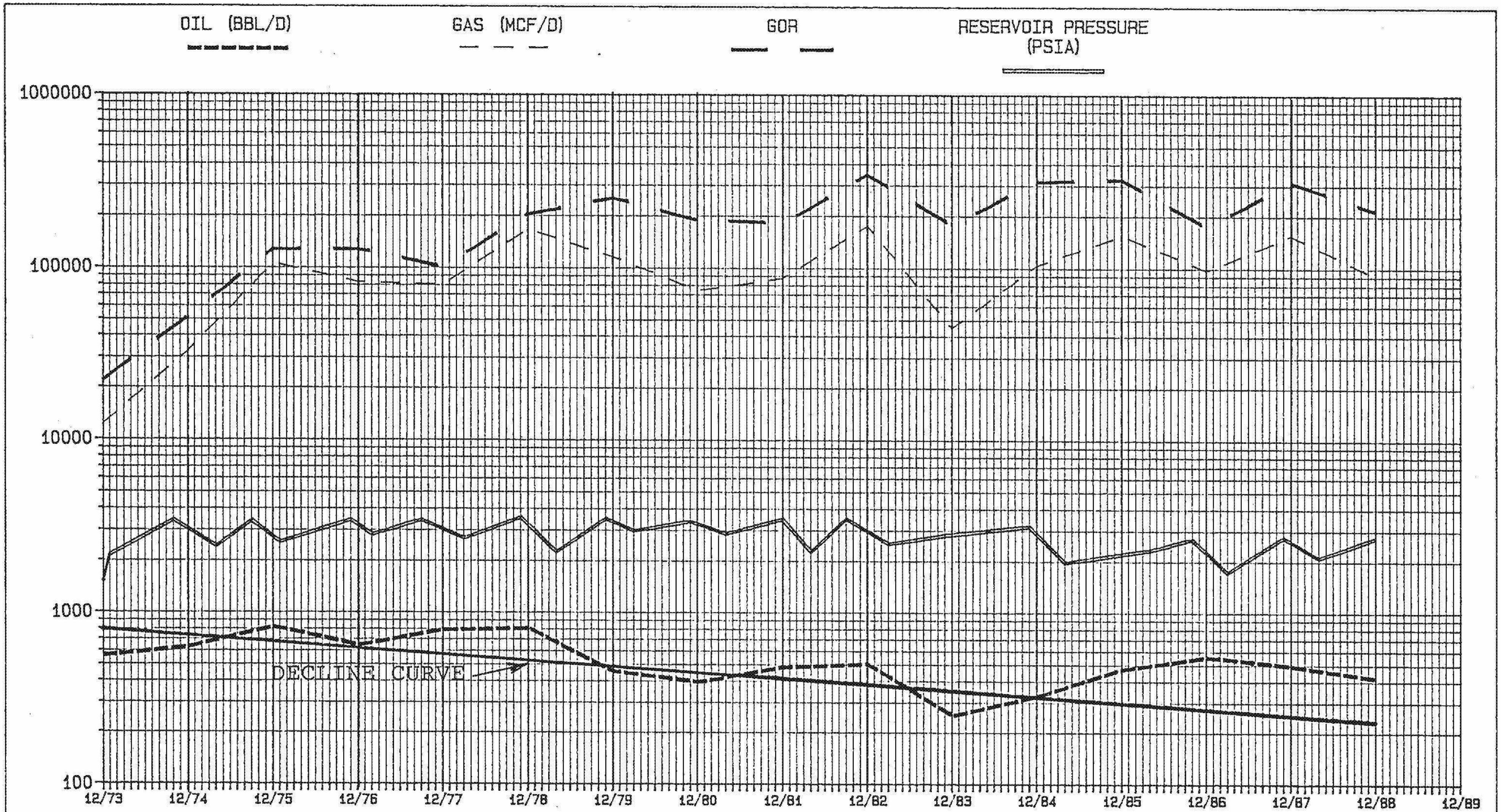


FIGURE 10. ALISO CANYON FIELD PRODUCTION

:hr 6/12/89

TABLE 4

GAS ANALYSIS

Typical Injection Gas for Aliso Canyon*

Component	Volume Percent
Nitrogen	1.16
CO2	1.12
Methane	92.65
Ethane	4.14
Propane	.71
I-Butane	.06
N-Butane	.08
I-Pentane	.02
N-Pentane	.02
C6 Plus	.04

* Sampled from Transmission system at Meter No. 3000-10 at Quigley, June 8, 1989.

Gas gravity 0.6020

CONSERVATION

Monitoring Programs

A monitoring program is developed as a means of ensuring the integrity of the gas storage operation of the reservoir. The variety of the programs include integrity logs on all storage zone and observation wells, pressure monitoring of selected observation wells around and above the storage zone, gas analysis monitoring of abandoned wells located in and around the storage project and the monitoring of production of nearby fields (Figures 14-21). As a whole, the monitoring programs provides a focused means of assuring a safe and efficient operation.

Table 5 lists the normal monitoring activities at this field. The well problems listed in Table 6 were discovered, analyzed, and remedied using routine operating procedures. Examples of field data that are effective monitoring tools are as follows:

Table 7	*A five week summary of annular pressures.*
Table 8	*Barhole reading for wellsite surface emission.*
Table 9	*Field helium counts.*
Figure 11a-d	*Plots of surface pressure for observation wells* *a. Del Aliso 1* *b. Porter 14* *c. Standard Sesnon 1-O* *d. Ward 3*
Figure 12	*A plot of annular pressure for a given well.*
Figure 13	*Example of a temperature survey of storage well through a water injector zone.*
Figure 14	*Noise log showing noise around bottomhole hardware.*
Figure 15	*Aliso Canyon Main Area Production Data* *a. Aliso* *b. Aliso West* *c. Porter-Del Aliso A36* *d. West Porter* *e. Faulted Sesnon*
Figure 16	*Aliso Canyon Gas Production Data (Main Area)*
Figure 17	*Del Valle (Main Area) Production Data*
Figure 18	*Newhall Production Data*
Figure 19	*Newhall-Potrero Production Data*
Figure 20	*Oat Mountain Production Data*
Figure 21	*Placerita Production Data*

TABLE 5
SUMMARY OF THE ALISO CANYON MONITORING PLAN

STORAGE ZONE WELLS

	ITEM	MINIMUM FREQUENCY OF DATA COLLECTION	PRIMARY RESPONSIBILITY	COMMENTS
1.	Flow tests	Annual	Resident Reservoir Engineer	All wells are flow tested for sand, production and back-pressure curves annually.
2.	Wellhead pressures (including surface casing and annular pressures)	Weekly	Station	Copies to Staff.
3.	Plot of surface casing annular pressures	Weekly	Resident Reservoir Engineer	To be reviewed twice yearly with Underground Storage Staff.
4.	Wellhead inspections	Monthly	Station	To be reported to Underground Storage Staff on daily activity report whenever leakage is found.
5.	Temperature surveys	Annual	Resident Reservoir Engineer	Copies to Staff.
6.	Noise logs	As needed	Resident Reservoir Engineer	Copies maintained in Division and Underground Storage files.
7.	Tracer surveys	As needed	Resident Reservoir Engineer Staff will normally assist	A detailed explanation of methods and results to be prepared by Resident for each well. Copy sent to Underground Storage Staff.
8.	Neutron logs	As needed	Underground Storage Staff	Copy to Division.
9.	Reservoir shut-ins	Annual	Senior Petroleum Engineer	Hysteresis curve and isobaric maps to be updated by Underground Storage Staff.
10.	Annular blowdown	As needed	Resident Reservoir Engineer	To recommend and implement annular blowdown tests and programs to determine corrective action needed, and to prevent fracture of primary cement at surface string shoe.
11.	Annular helium samples	Annual	Engineering Test Center	To monitor gas content in the annular.

Table 5, Page 2

SUMMARY OF THE ALISO CANYON MONITORING PLAN

NON-STORAGE ZONE WELLS

	ITEM	MINIMUM FREQUENCY OF DATA COLLECTION	PRIMARY RESPONSIBILITY	COMMENTS
1.	Wellhead pressures (including surface casing annular pressures)	Weekly	Station	Copies to Staff.
2.	Plot of surface casing annular pressures	Weekly	Resident Reservoir Engineer	To be reviewed with Underground Storage Staff twice yearly.
3.	Bottomhole pressure	Annual	Resident Reservoir Engineer	Copies to Staff.
4.	Temperature surveys	Annual	Resident Reservoir Engineer	Copies to Staff.
5.	Wellhead inspections	Monthly	Station	Copy of report to Resident Reservoir Engineer.
6.	Noise logs	As needed	Resident Reservoir Engineer	Copies maintained in Division and Underground Storage files.
7.	Tracer surveys	As needed	Resident Reservoir Engineer, Staff will normally assist	A detailed explanation of methods and results to be prepared by Resident and copy sent to Underground Storage Staff.
8.	Neutron logs	As needed	Underground Storage Staff	Copy to Division.

Table 5, Page 3

SUMMARY OF THE ALISO CANYON MONITORING PLAN

SURFACE OBSERVATIONS

	ITEM	MINIMUM FREQUENCY OF DATA COLLECTION	PRIMARY RESPONSIBILITY	COMMENTS
1.	Production from annular blowdowns	As needed	Station	Data to be plotted by Resident Reservoir Engineer.
2.	Inspection of well cellars	Monthly	Station	Copy of report to Resident Reservoir Engineer.
3.	Gas Scope survey of barholes	Annual	Station	Copy of report to Resident Reservoir Engineer.
4.	Flame Ionization survey of abandoned wellsites	Annual	Pipeline	Copy of report to Resident Reservoir Engineer.
5.	Flame Ionization survey of storage field pipelines	Annual	Pipeline	Copy of report to Resident Reservoir Engineer.
6.	Monitoring production from nearby fields	Annual	Underground Storage Staff	Data to be plotted by Staff with copies to Resident Reservoir Engineer.

TABLE 6

ALISO CANYON
Losses Detected and Corrective Measures Taken
May 1988 through May 1989

Well	Problem	Detected	Corrective Measures Taken
IW 77	Shoe Leak	8/24/87	Well not killed because rate of leakage is low.
SS 17	Shoe leak	11/8/85	Well not killed because rate of leakage is low.
SS 29	Shoe Leak	9/24/87	Well not killed because rate of leakage is low.
SS 30	Shoe Leak	1986	Well not killed because rate of leakage is low.

SPR:hr
6/6/89

TABLE 7: ALISO CANYON WEEKLY ANNULUS REPORT

WELL NAME	WEEK 1 9/21/88	WEEK 2 9/30/88	WEEK 3 10/12/88	WEEK 4 10/5/88	WEEK 5 10/20/88	(WEEK 4)-(WEEK 3)	(WEEK 5)-(WEEK 4)
SURFACE ANNULUS							
IW 54	0	0	0	0	0	0	0
IW 56	85	80	9	90	90	81	0
IW 57	0	0	0	0	0	0	0
IW 58	1	0	0	0	0	0	0
IW 61	70	60	70	60	60	-10	0
IW 62	45	45	50	35	50	-15	15
IW 63	20	20	10	20	20	10	0
IW 64	40	30	50	50	45	0	-5
IW 65	5	1	0	2	0	2	-2
IW 66	1	>5	<5	0	5	0	5
IW 67	4	>5	<5	<5	0	0	0
IW 69	0	0	0	0	0	0	0
IW 70	0	0	0	0	0	0	0
IW 73	30	30	40	20	30	-20	10
IW 74	0	0	0	0	0	0	0
IW 75	3	>5	<5	10	5	10	-5
IW 76	4	>5	<5	<5	5	0	5
IW 77	0	0	0	0	0	0	0
IW 78	0	0	0	0		0	0
IW 79	0	0	0	0	0	0	0
IW 80	0	0	0	0	0	0	0
IW 81	0	0	0	0	0	0	0
IW 82	0	0	0	0	0	0	0
IW 83	0	0	0	0	0	0	0
FF 31	0	0	0	0	0	0	0
FF 32	2	0	0	0	0	0	0
FF 32A	1	0	0	0	0	0	0
FF 33	0	0	0	0	0	0	0
FF 34A	1	0	0	0	0	0	0
FF 34B	1	0	0	<5	0	0	0
P 12	20	10	0	0	0	0	0
P 26	40	40	40	40	40	0	0
P 30	0	0	0	0	0	0	0
P 32	80	0	0	0	0	0	0
P 34	0	0	0	0	0	0	0
P 35	0	0	0	0	0	0	0
P 36	3	5	2	2	1	0	-1
P 37	0	0	0	0	0	0	0
P 37A	0	0	0	0	0	0	0
P 38	0	0	0	0	0	0	0
P 39	0	0	0	0	0	0	0
P 40	0	0	0	0	0	0	0
P 42A	0	0	0	0	0	0	0
P 42B	5	5	3	5	5	2	0
P 42C	0	0	0	0	0	0	0

TABLE 7: ALISO CANYON WEEKLY ANNULUS REPORT
Page 2

WELL NAME	WEEK 1 9/21/88	WEEK 2 9/30/88	WEEK 3 10/12/88	WEEK 4 10/5/88	WEEK 5 10/20/88	(WEEK 4)-(WEEK 3)	(WEEK 5)-(WEEK 4)
P 44	5	2	2	5	0	3	-5
P 45	0	0	0	0	0	0	0
P 46	0	0	0	0	0	0	0
P 47	0	0	0	0	0	0	0
P 50A	0	0	0	0	0	0	0
P 68A	10	3	2	2	2	0	0
P 69A	0	0	0	0	0	0	0
PS 42	0	0	0	0	0	0	0
F 2	0	0	0	0	0	0	0
F 3	20	0	0	<5	<10	0	0
F 4	0	0	0	0	0	0	0
F 5	0	0	0	0	0	0	0
F 7	0	0	0	0	0	0	0
SS 2	0	0	0	0	0	0	0
SS 3	0	0	0	0	0	0	0
SS 4	0	0	0	0	0	0	0
SS 5	0	0	0	0	0	0	0
SS 6	0	0	0	0	0	0	0
SS 7	0	0	0	0	0	0	0
SS 8	0	0	0	0	0	0	0
SS 9	0	0	0	0	0	0	0
SS 10	0	0	0	0	0	0	0
SS 11	0	0	0	0	0	0	0
SS 17	0	0	0	0	0	0	0
SS 24	0	0	0	<5	<10	0	0
SS 25	0	0	0	0	0	0	0
SS 29	0	0	0	0	0	0	0
SS 31	0	0	0	0	0	0	0
SS 44	0	0	0	0	0	0	0
W 3A	50	50	50	50	55	0	5
PF 1	0	0	0	0	0	0	0
PF 2	45	40	40	40	40	0	0
MA 1A	0	0	0	0	0	0	0
MA 1B	5	10	10	10	5	0	-5
MA 3	1	0	0	0	0	0	0
MA 4	1	0	0	0	0	0	0
MA 5A	1	0	0	<5	0	0	0
DA 1	0	0	0	0	0	0	0
FF 34	0	0	0	0	0	0	0
FF 35	18	15	18	18	19	0	1
IW 55	0	0	0	0	0	0	0
IW 60	2	2	3	2	10	-1	8
P 14	80	85	80	90	90	10	0
P 25	0	0	0	0	0	0	0
P 42	0	0	0	0	0	0	0
SS 1	0	0	0	0	0	0	0

TABLE 7: ALISO CANYON WEEKLY ANNULUS REPORT
Page 3

WELL NAME	WEEK 1 9/21/88	WEEK 2 9/30/88	WEEK 3 10/12/88	WEEK 4 10/5/88	WEEK 5 10/20/88	(WEEK 4)-(WEEK 3)	(WEEK 5)-(WEEK 4)
SS 1-0	0	0	0	0	0	0	0
SS 4-0	0	0	0	0	0	0	0
W 3	1	1	2	1	2	-1	1
F 6	1	0	0	0	0	0	0
F 8	0	0	0	0	0	0	0
F 9	0	0	0	0	0	0	0
SF 1	0	0	0	0	0	0	0
SF 2	0	0	0	0	0	0	0
SF 3	0	0	0	0	0	0	0
SF 4	0	0	0	0	0	0	0
SF 5	0	0	0	0	0	0	0
SF 6	65	65	60	65	70	5	5
SF 7	0	0	0	0	0	0	0
SF 8	0	0	0	0	0	0	0
SS 12	0	0	0	0	0	0	0
SS 13	0	0	0	0	0	0	0
SS 14	0	0	0	0	0	0	0
SS 16	0	0	0	0	0	0	0
SS 30	0	0	0	0	0	0	0
INNER ANNULUS							
IW 63	80	90	95	90	0	-5	-90
IW 65	0	0	0	0	0	0	0
FF 32	1	0	0	0	1	0	1
P 12	0	0	0	0	0	0	0
P 26	10	10	10	10	5	0	-5
P 30	0	0	0	0	0	0	0
P 32	0	0	0	0	2	0	2
P 45	0	0	0	0	0	0	0
P 69A	0	0	0	0	0	0	0
F 3	2	0	0	<5	0	0	0
F 4	0	0	9		<10	-9	0
SS 3	0	0	0	0	0	0	0
SS 4	0	0	0	0	0	0	0
SS 5	0	0	0	0	0	0	0
SS 6	0	0	0	0	0	0	0
MA 1B	4	5	5	20	4	15	-16
SS 1	0	0	0	0	0	0	0
SS 1-0	0	0	0	0	0	0	0
SS 4-0	0	0	0	0	0	0	0
SF 1	120	140	155	160	160	5	0
SS 12	100	90	70	80	60	10	-20
ANNULUS 3							
P 12	0	0	5	5	5	0	0

DUPLICATE SAMPLE

RUN DATE : 02/12/88
START DATE: 03/01/88 END DATE: 05/31/88

SOUTHERN CALIFORNIA GAS COMPANY
LEAKAGE SURVEY INSPECTION REPORT

ENTERED MAR 9 1988

REPORT NO. L44570-1

DIVISION : NORTH BASIN (26) ORG CODE: JBO TYPE: WELL INSPECT: INSTRUMENT CLASS LOC (CYCLE): ANNUAL (1)
SURVEY ID : DA-2 CRITICAL: YES LOCATION: DA-2 STRIP MAP:
COMMENTS : NON-COMPANY LENGTH: 0.00

ENDING DATE: 3/3/88 STARTING DATE: 3/3/88
SURVEYED BY: DL, MV REVIEW BY: [illegible]
REASON: ROUTINE METHOD: F.I.

BAR HOLE SUMMARY

NUMBER MADE: SURFACE:
REPAIRED: PERMIT NO:

	DATE WORKED	TIME STARTED STOPPED	LOCATION STARTED STOPPED	LEAK INDICATIONS FOUND	REMARKS
1	3-3-88	11:53	DA-2	0%	
2				0%	
3				0%	
4	3-3-88	11:54	DA-2	0%	
5					

	ADDTL WORK	ORDER ISSUED	DATE COMPLETED
1			
2			
3			
4			
5			

TABLE 8. BARHOLE READING FOR WELLSITE SURFACE EMISSION

RCB

Aliso_Canyon_DOGGR_0004966
AC_CPUC_SED_DR_17_0000710

TABLE 9. FIELD HELIUM COUNTS

TEST & DEVELOPMENT CENTER REPORT

Project No: C-41

Reported By: L. K. McCormack
Report Date: 3-7-89

Request: Test gas for helium content on Texaco, Chevron, and Gas Company wells at Aliso Canyon

Requested By: S.F. Robinson Mail Location: 9380 Request Date: 2-1-89

Division/Work Group: North Basin/UGS

First Quarter helium tests were completed using an in-truck Shimadzu Gas Chromatograph. A total of Eighty-Eight helium tests were made with no significant increases of helium noted since last tested in Fourth Quarter of 1988.

Please see attached report on helium results

Tested By: L. K. McCormack

Approved By: [signature] 3/8/89

cc:

TABLE 9 (cont.)

HELIUM ANALYSIS ON WELLS AT ALISO CANYON - PROJECT C-41

TESTED BY: L.K. McCormack 1st QUARTER 1989 YEAR

Well No.	Date Run	PPM Helium	Status	Well No.	Date Run	PPM Helium	Status
DA-2	2-28	20	Not Pumping	P-54	2-28	10	Pumping
DA-3	2-28	—	No Gas	P-57	3-3	2	Not Pumping
DA-4	2-28	4		P-58	3-3	—	No Gas
DA-5	2-28	10		P-60	2-28	<2	Pumping
DA-6	2-28	7		P-61	3-1	17	Pumping
DA-7	2-28	—	No Gas	P-63	3-1	15	Pumping
DA-8	3-1	2		P-65	3-1	12	Pumping
DA-9	2-28	4		P-66	2-28	12	Pumping
DA-10	2-28	12		P-68	3-3	—	No Gas
FF-1	3-1	10	Pumping	P-69	3-1	2	Pumping
FF-11	3-1	4	Pumping	P-70	2-28	7	Pumping
FF-30	3-1	—	No Gas	P-71	3-1	2	Pumping
FF-31 ANN	3-1	362		P-72	3-1	25	Not Pumping
FF-35 ANN	3-1	243		PS-20	2-28	15	No Rig
FF-38	3-1	2	Pumping	15-P	2-28	5	Not Pumping
MA-2	2-28	—	No Gas	ROOSA-1	2-28	<2	
ODAS-1(7)	2-28	5		SCCO-1	2-28	12	Pumping
OSLW-1	2-28	<2	Not Pumping	SS4-0Tbg	2-28	20	
O.T. 2	3-1	<2	No Rig	SS4-0Csg	2-28	30	
O.T. 3A	3-1	2	No Rig	SS-18	2-28	17	Not Pumping
P-1	3-1	6	Pumping	SS-19	2-28	4	No Rig
P-2	3-1	17	Pumping	SS-21	2-28	10	Pumping
P-3	3-1	10	Not Pumping	SS-22	2-28	—	No Gas
P-6	3-1	—	Vacuum	SS-23	2-28	<2	Pumping
P-10	3-1	17	Pumping	SS-26	2-28	<2	Not Pumping
P-11 ANN	3-1	74	No Rig	SS-27	2-28	12	Not Pumping
P-12A	3-1	2	No Rig	SS-28	2-28	12	Not Pumping
P-13	3-3	<2	Not Pumping	SS-32	2-28	5	Not Pumping
P-14	3-3	<2	No Rig	SS-33	2-28	5	Not Pumping
P-15	3-1	<2	No Rig	SS-34	2-28	25	Not Pumping
P-17	3-1	2	Not Pumping	SS-35	2-28	10	Not Pumping
P-18	3-1	20	Not Pumping	SS-39	2-28	12	No Rig
P-19	3-1	17	No Rig	SS-40	2-28	<2	Not Pumping
P-27	3-1	2	Pumping	SS-45	2-28	<2	Pumping
P-28	3-1	7	Not Pumping	SS-46	2-28	7	Not Pumping
P-33	3-3	57	No Rig	UnionT.F.	2-28	4	
P-52	3-3	10	Not Pumping	W-3 Tbg	3-1	17	
P-53	3-3	2	Not Pumping	W-3 Csg	3-1	10	
P-11 Casing	3-1	32	No Rig	IW56 ANN	3-3	320	
P-50A ANN	3-1	10		IW61 ANN	3-3	269	
FF33 ANN	2-28	340		IW62 ANN	2-28	149	
IW57 ANN	3-3	320		SS31 ANN	2-28	—	Vacuum
IW51 ANN	3-3	320		SS31 Barhole	2-28	94	18% Combustible
SS14 ANN	3-1	368		2nd Barhole	2-28	195	60% Combustible

SoCal Gas Reference

MSTRFORM/MF0030

Mid-Point Pressure = 1783 DA-1

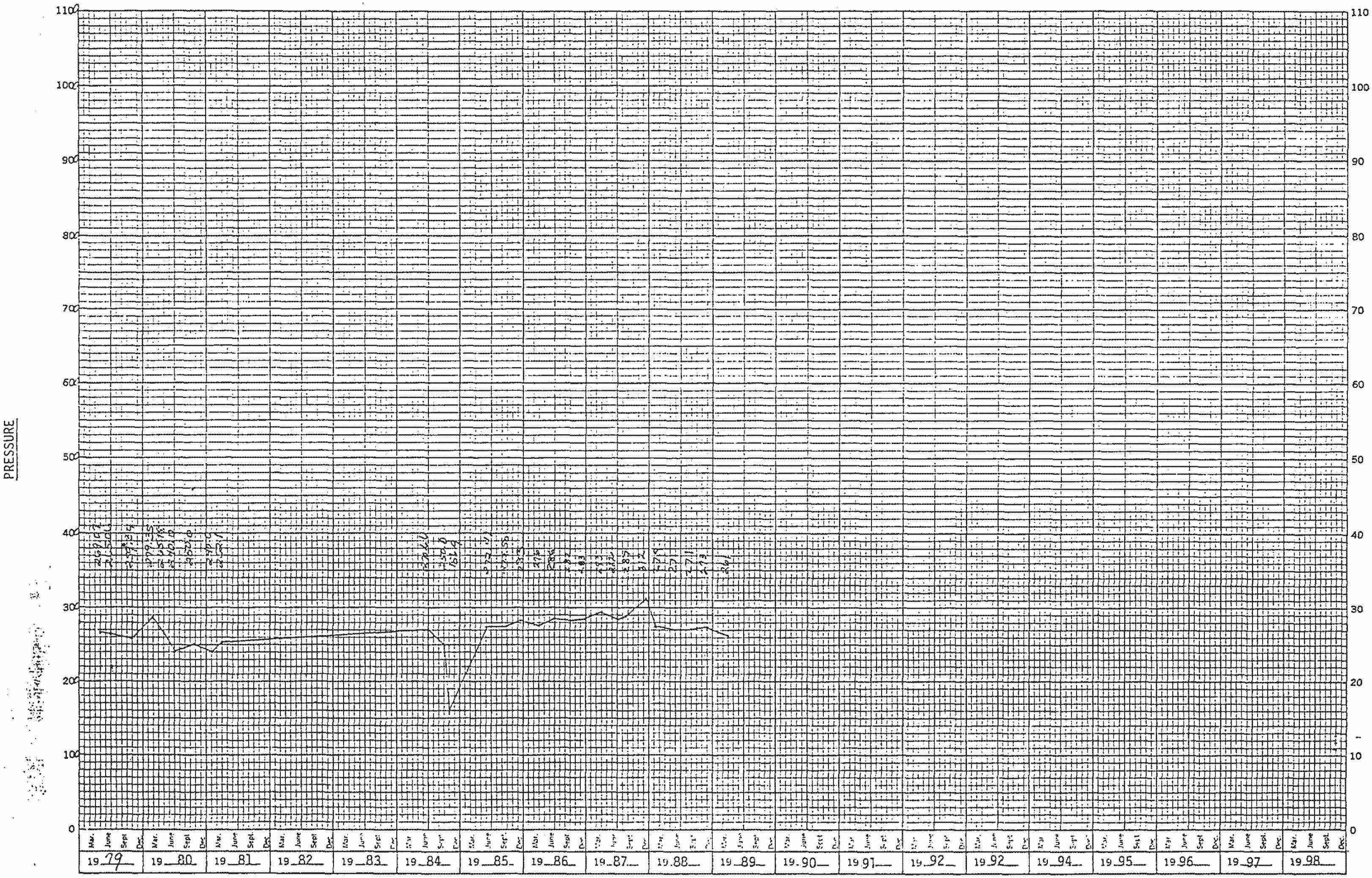


FIGURE 11a. DEL ALISO SURFACE PRESSURE

Aliso_Canyon_DOGGR_0004969
AC_CPUC_SED_DR_17_0000713

Mid-Point Pressure = 4690' P-14

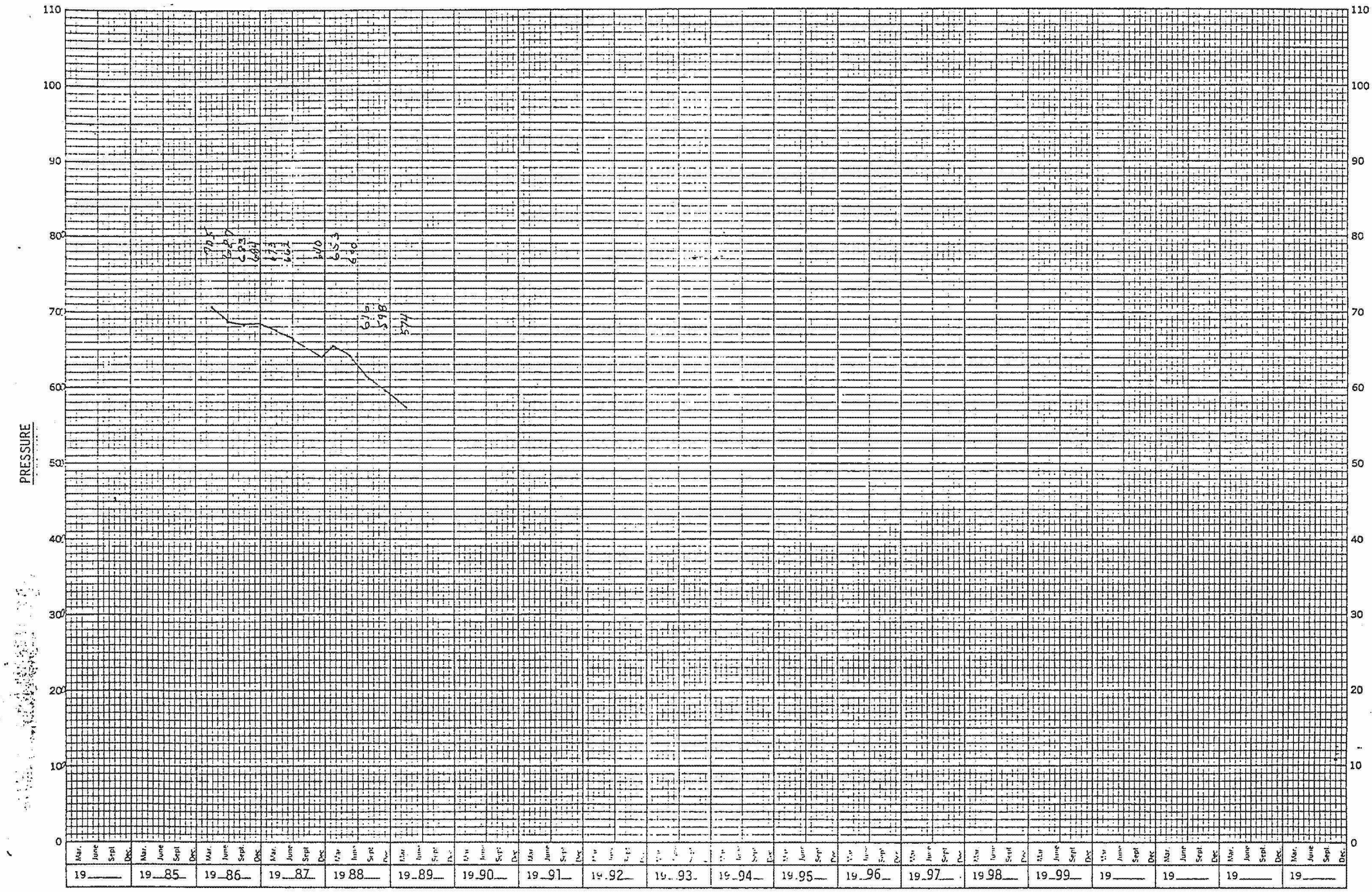


FIGURE 11b. PORTER 14 SURFACE PRESSURE

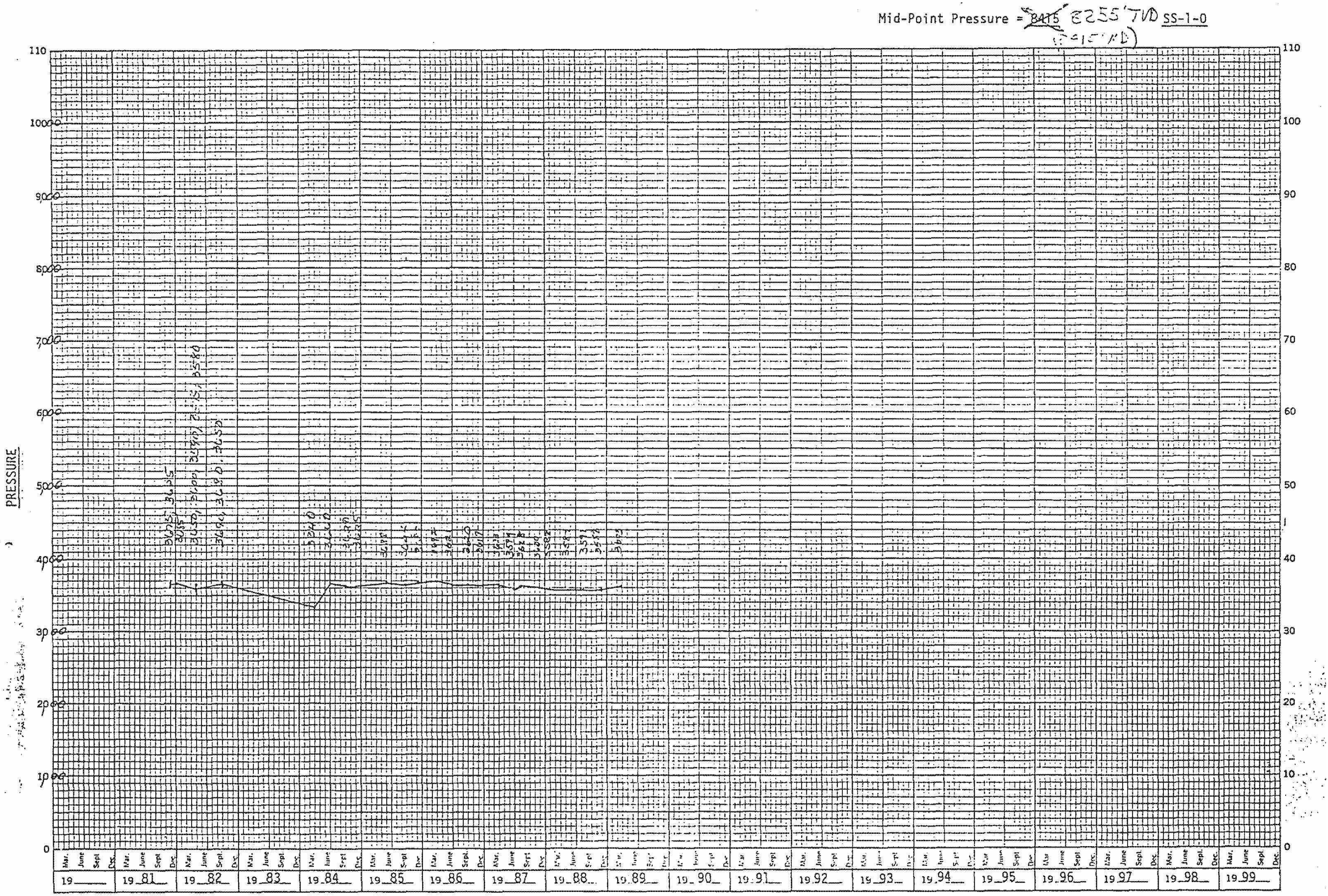


FIGURE 11c. STANDARD SESNON 1-O SURFACE PRESSURE

Aliso_Canyon_DOGGR_0004971
AC_CPUC_SED_DR_17_0000715

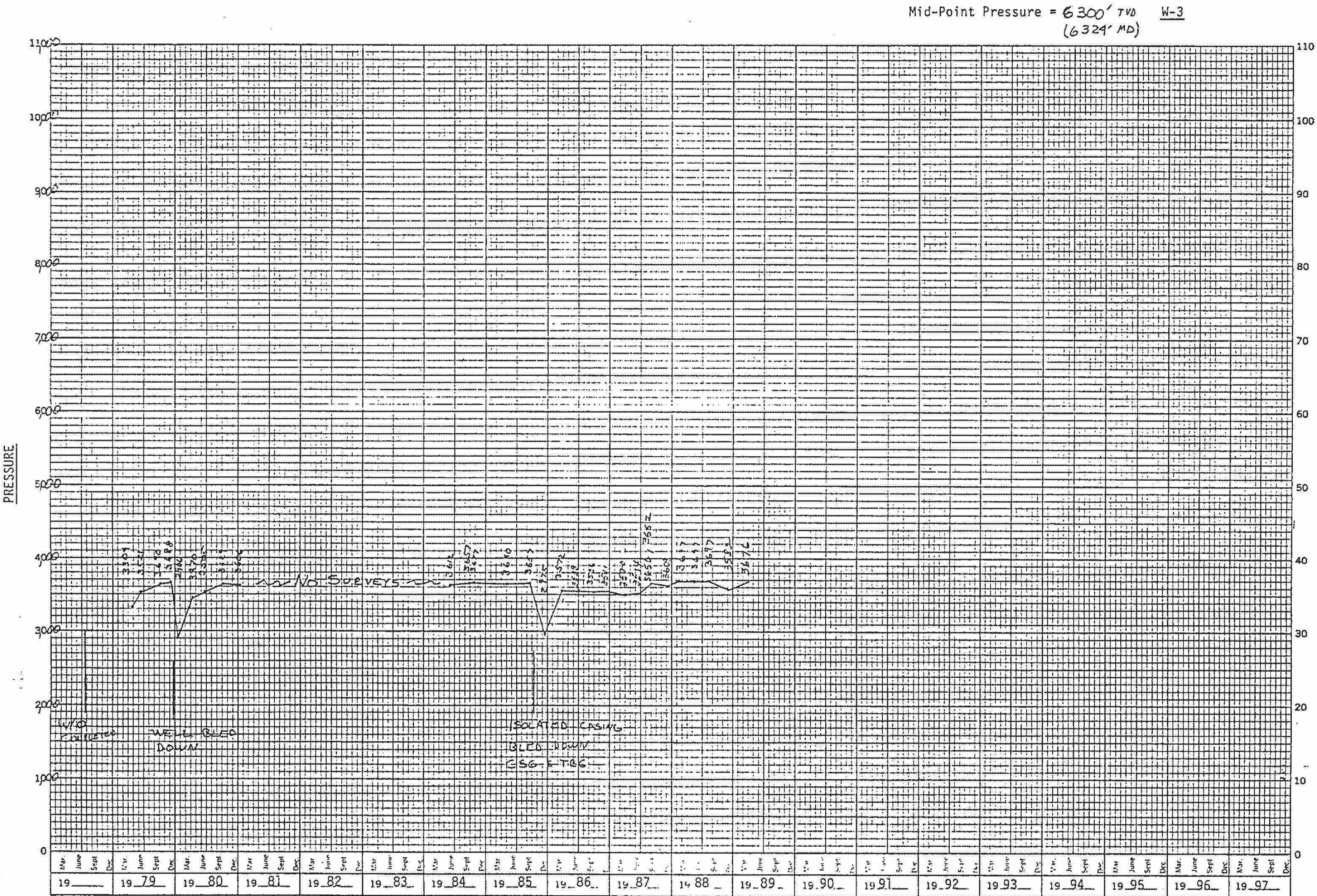


FIGURE 11d. WARD 3 SURFACE PRESSURE

ALL POINTS REPLOTTED TO 6300' TVD 5-4-86 JDM

→ MPP PLOT DEPTH CHANGED TO 6300' AFTER DUMMY INSTALLED IN G.L.M. TO ISOLATE TBG. & CSG. JDM 4-28-86

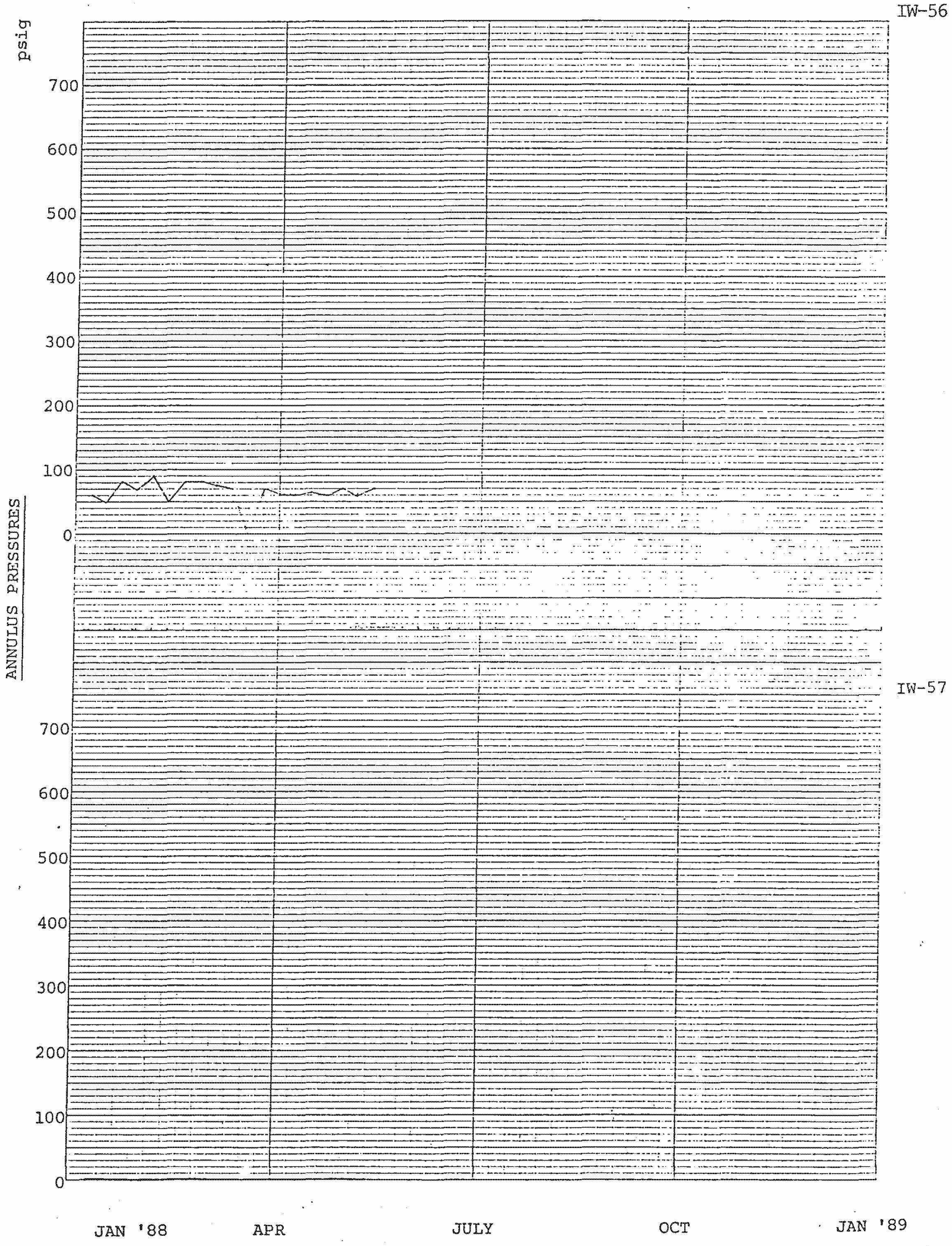


FIGURE 12. ANNULAR PRESSURE PLOT

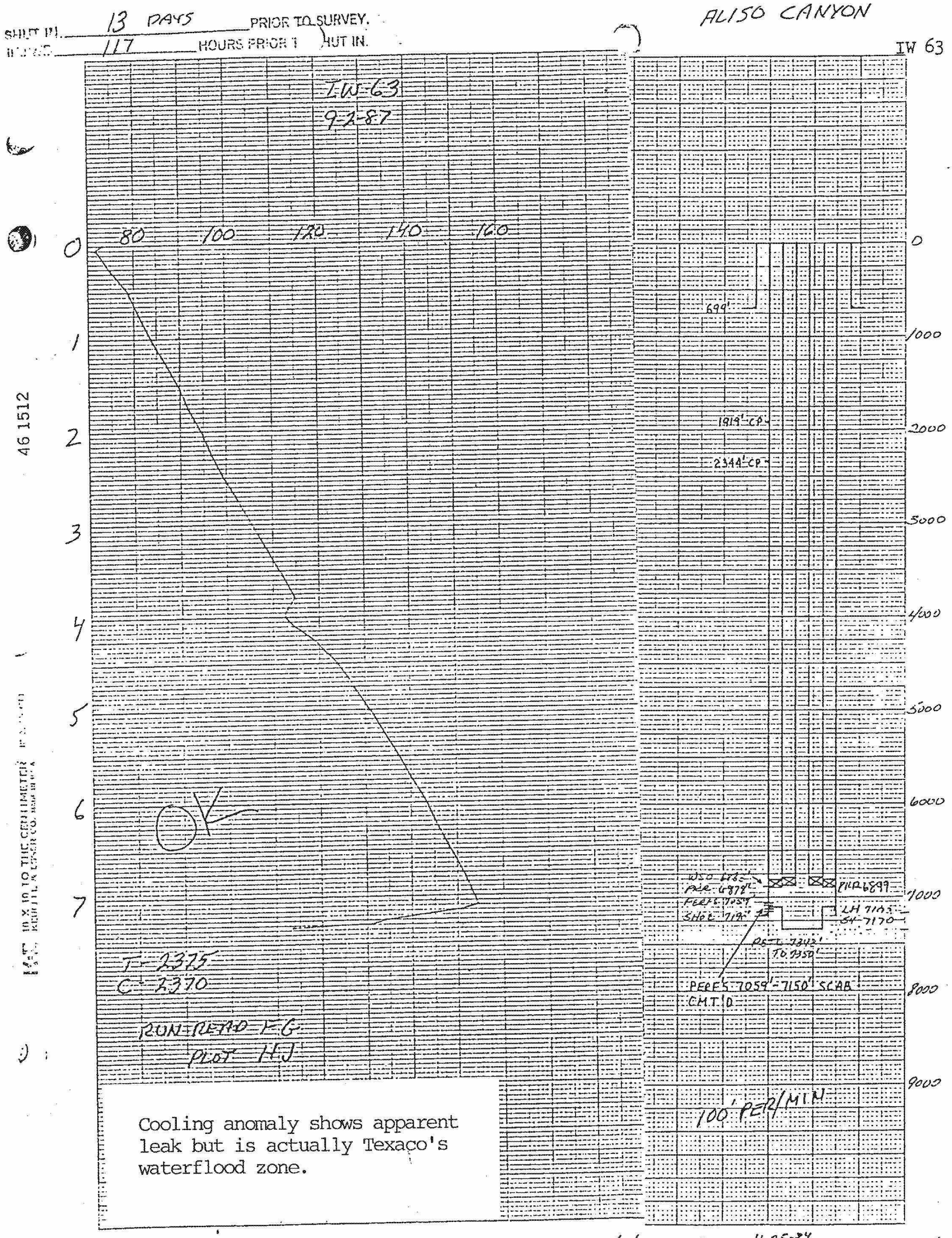


FIGURE 13. TEMPERATURE SURVEY

FIGURE 14

FLO-LOG INC.

TEMPERATURE AND NOISE LOG

SOUTHERN CALIFORNIA GAS CO.
MISSION ADRIAN 1-B
ALISO CANYON
LOS ANGELES STATE CA.
11-30-88

PURPOSE OF SURVEY
CHECK CASING SHOE AND WSO

TOP OF LOGGED INTERVAL 100

TYPE OF FLUID IN HOLE WATER & GAS

LOG RECORDED BY B. CLA.

FLUID LEVEL NONE OBSERVED

WITNESSED BY STEVE ROBINSON

CASING AND TUBING RECORD

Size	Weight	From	To
13-3/8	54#	ZERO	1014'
8-5/8"	40 & 36	ZERO	7347'
6-5/8"	24#	ZERO	7213'
5-1/2"	20#	7347'	7512'

WELL STATUS SHUT IN GAS STORAGE

Pressure	Producing	Injecting	Shut-in
TBG			2500 PSI
CSG			2500 PSI

TUBING 2-7/8" TO 7512'

PACKER(S) 7213 & 7183

MANDREL(S) 7084', 7115', 7150'

PERFORATIONS 7347' to 7512'

INJ RATE ZERO TYPE

OBS. RATE

METERED PRODUCTION RATES: Oil, Water, Gas; Gravity: °API

BOTTOM TEMPERATURE 169°

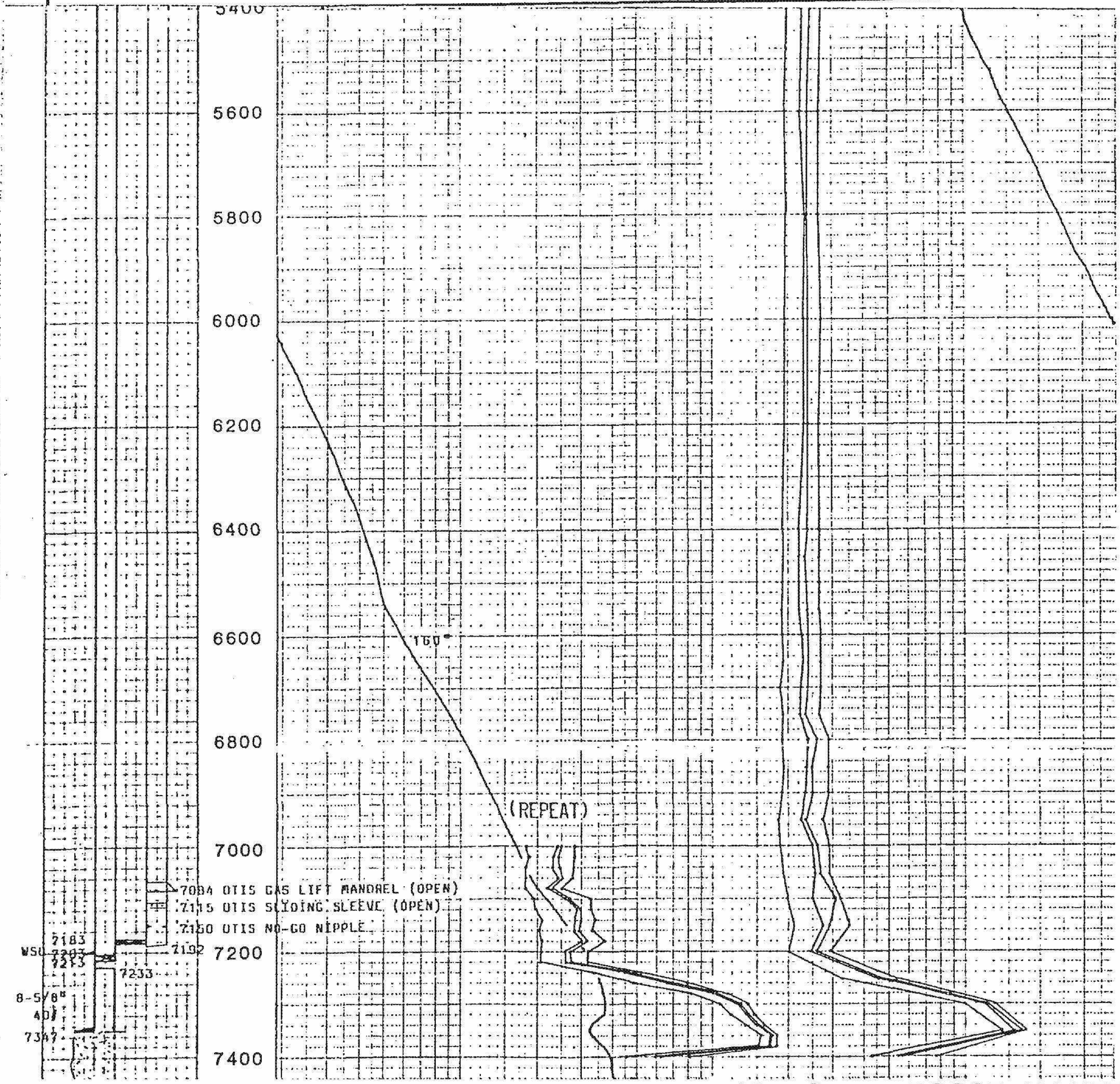
LOGGING UNIT 711 LINE SIZE 3/16" LINE LENGTH 19000'

TOOLS USED (3)5' BARS, COLLAR LOCATOR, TEMPERATURE, CAPACITANCE, NOISE

TOOL NUMBERS 4051

DIAMETER 1-3/8"

RESULTS AND REMARKS: NOISE LOG INDICATES GAS MIGRATION UP TO 7220'.
NO GAS APPEARS TO LEAK PAST THE WSO @ 7203'



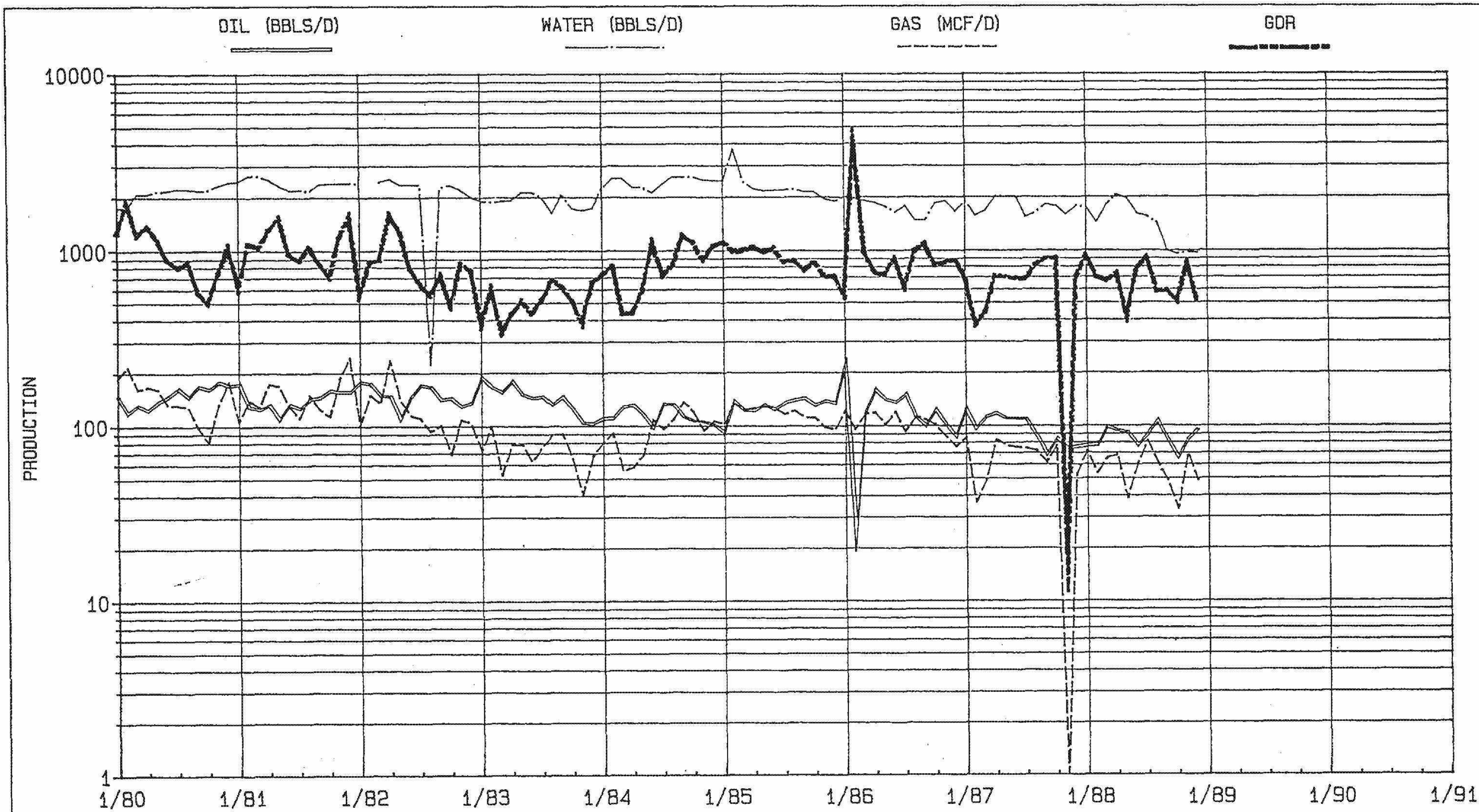


FIGURE 15a. PRODUCTION HISTORY: ALISO CANYON - ALISO ZONE

:hr 6/9/89

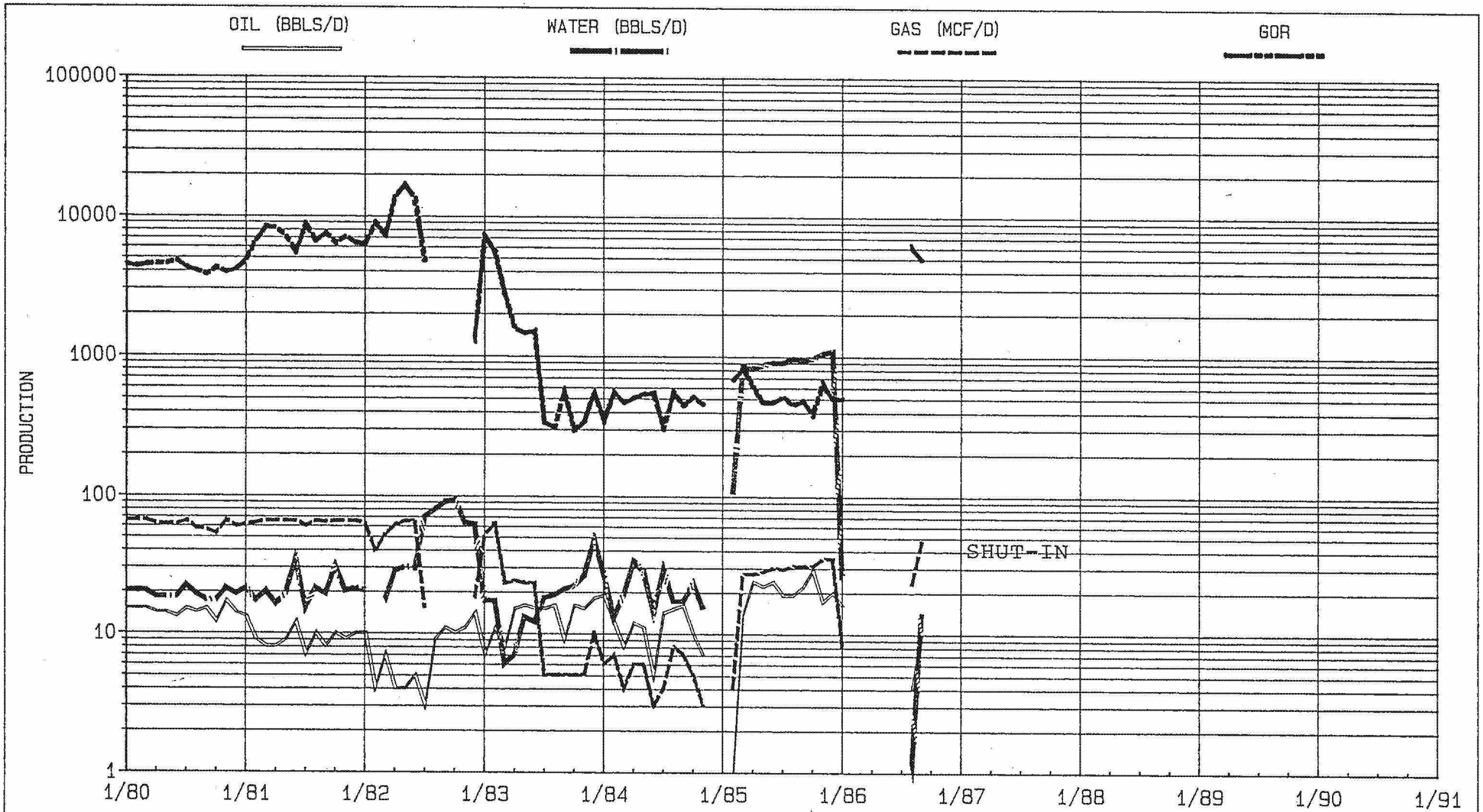


FIGURE 15b. PRODUCTION HISTORY: ALISO CANYON - ALISO WEST ZONE

:hr 6/7/89

Aliso_Canyon_DOGGR_0004977
AC_CPUC_SED_DR_17_0000721

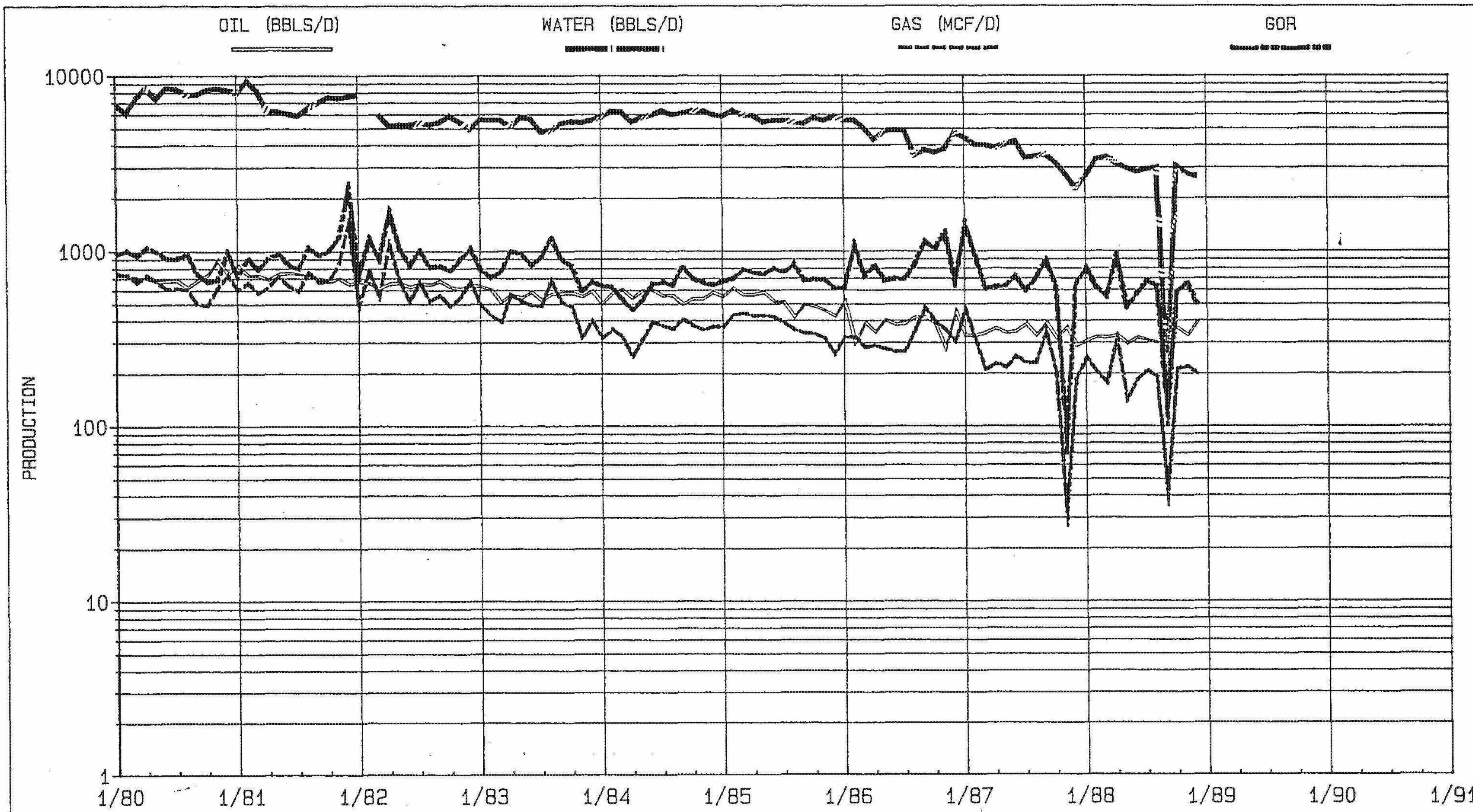


FIGURE 15c. PRODUCTION HISTORY: PORTER/DEL ALISO A-36 ZONES

:hr 6/7/89

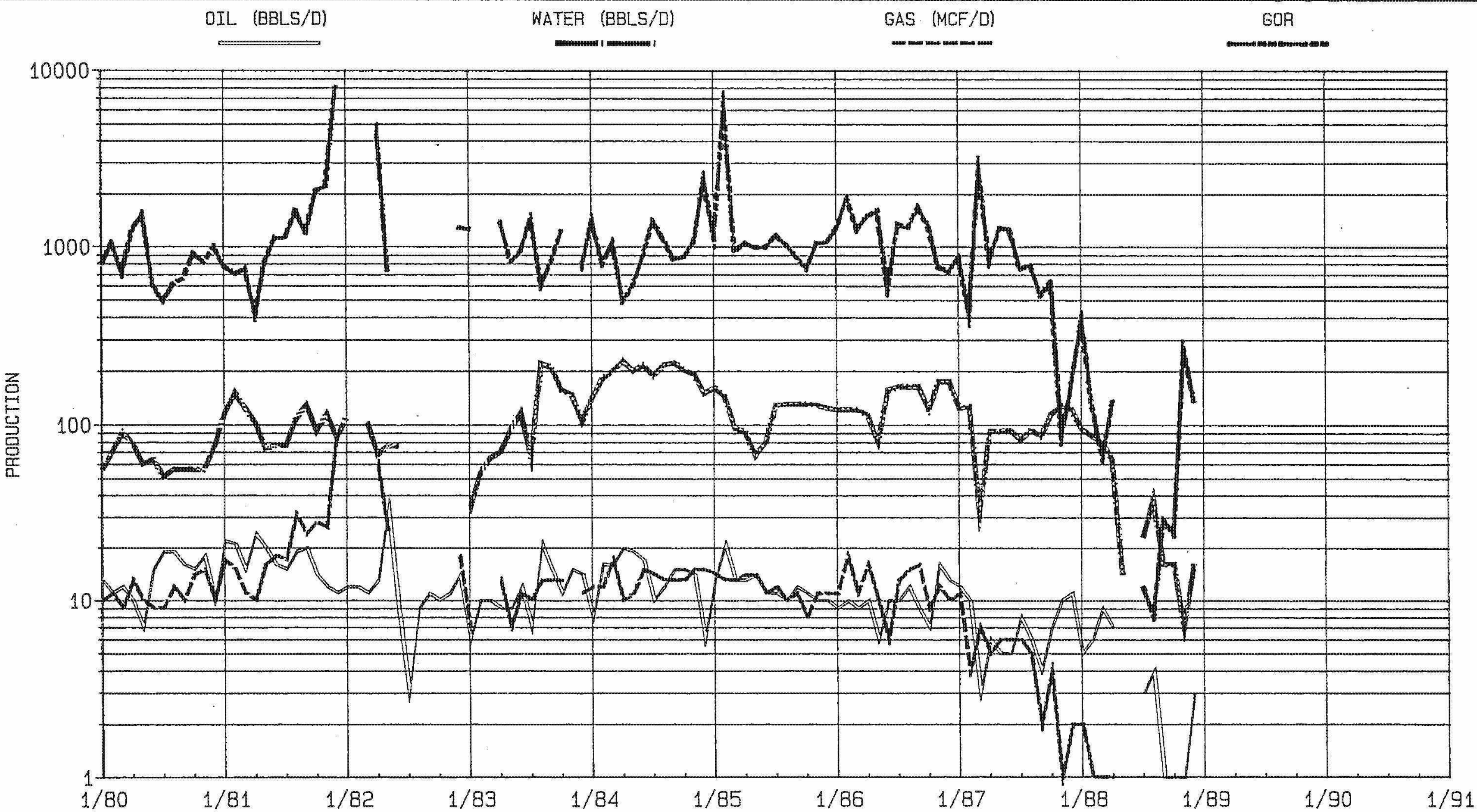


FIGURE 15d. PRODUCTION HISTORY: WEST PORTER ZONE

:hr 6/7/89

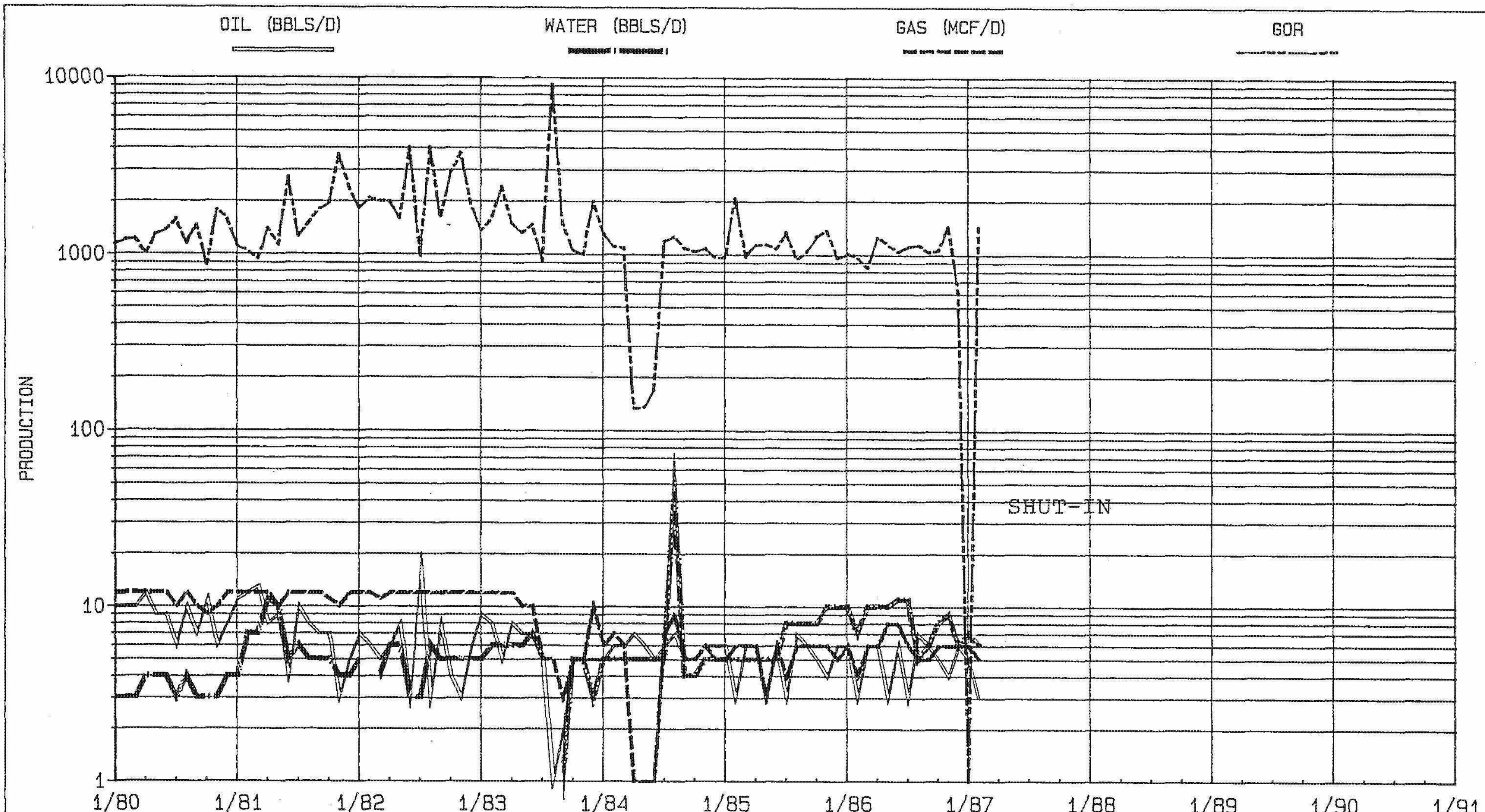


FIGURE 15e. PRODUCTION HISTORY: FAULTED SESNON ZONE

:hr 6/7/89

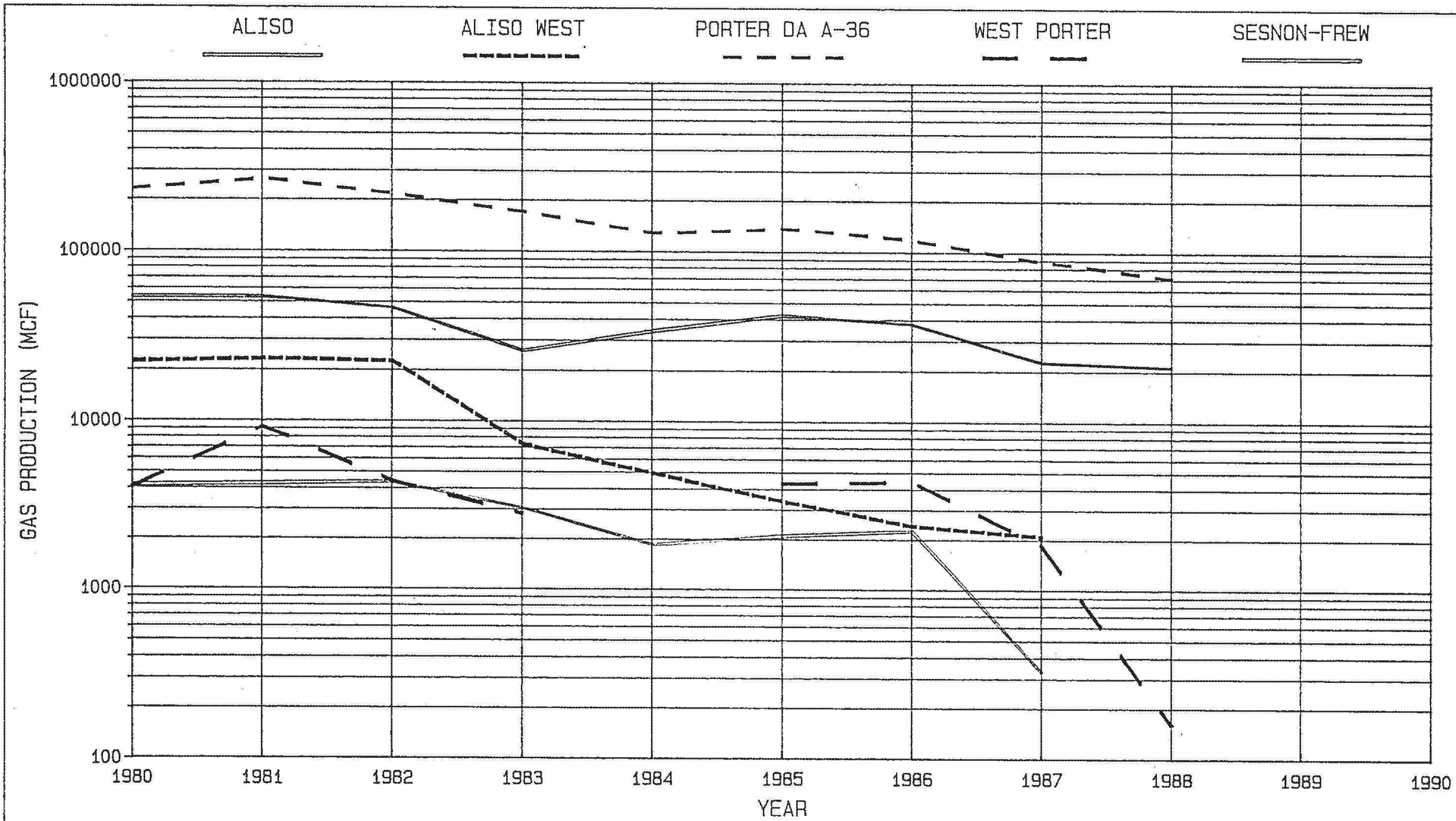


FIGURE 16. ALISO CANYON GAS PRODUCTION, MAIN AREA OVERLYING ZONES

:hr 6/7/89

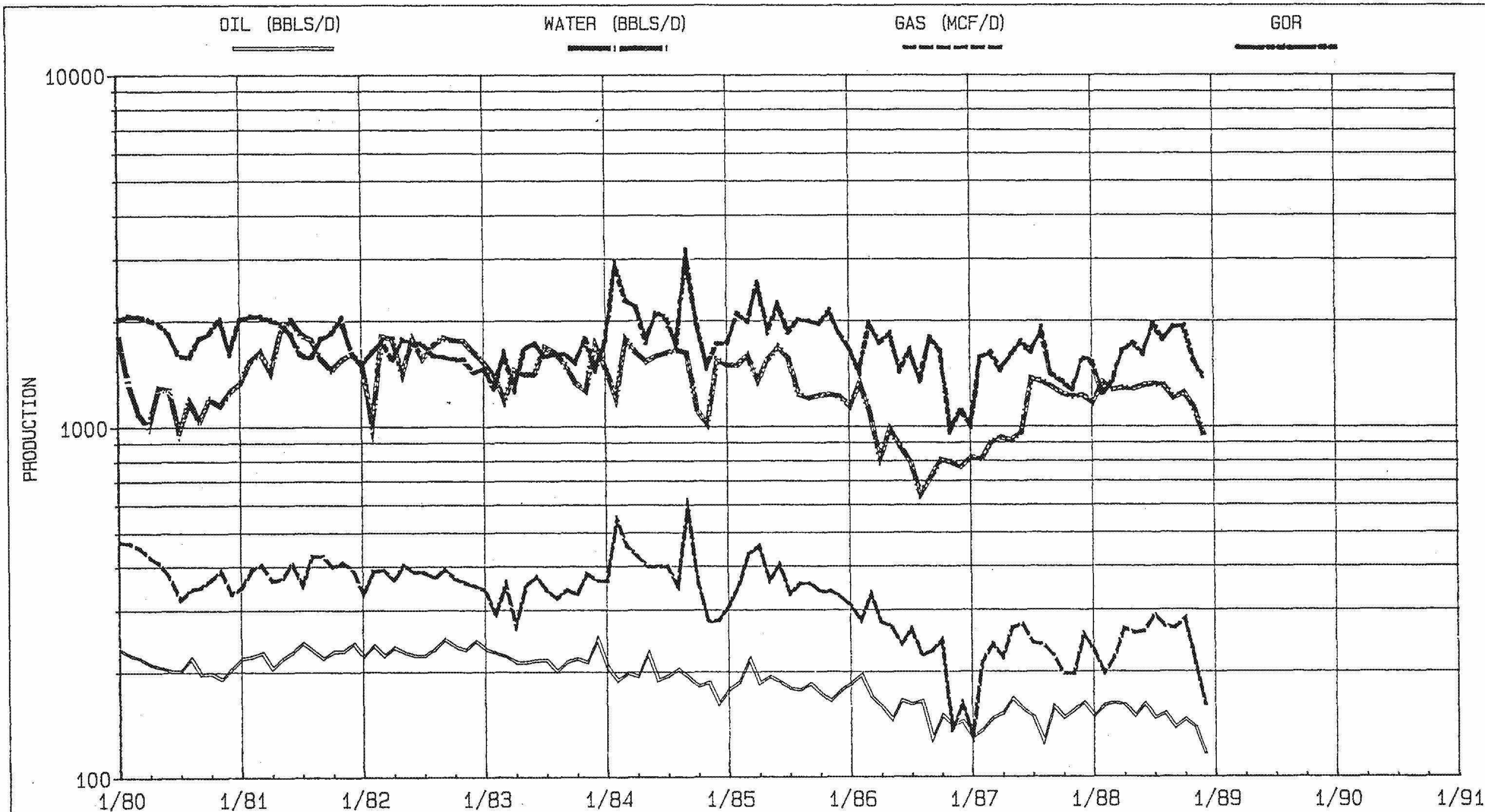


FIGURE 17. PRODUCTION HISTORY: DEL VALLE FIELD (MAIN AREA)

:hr 6/8/89

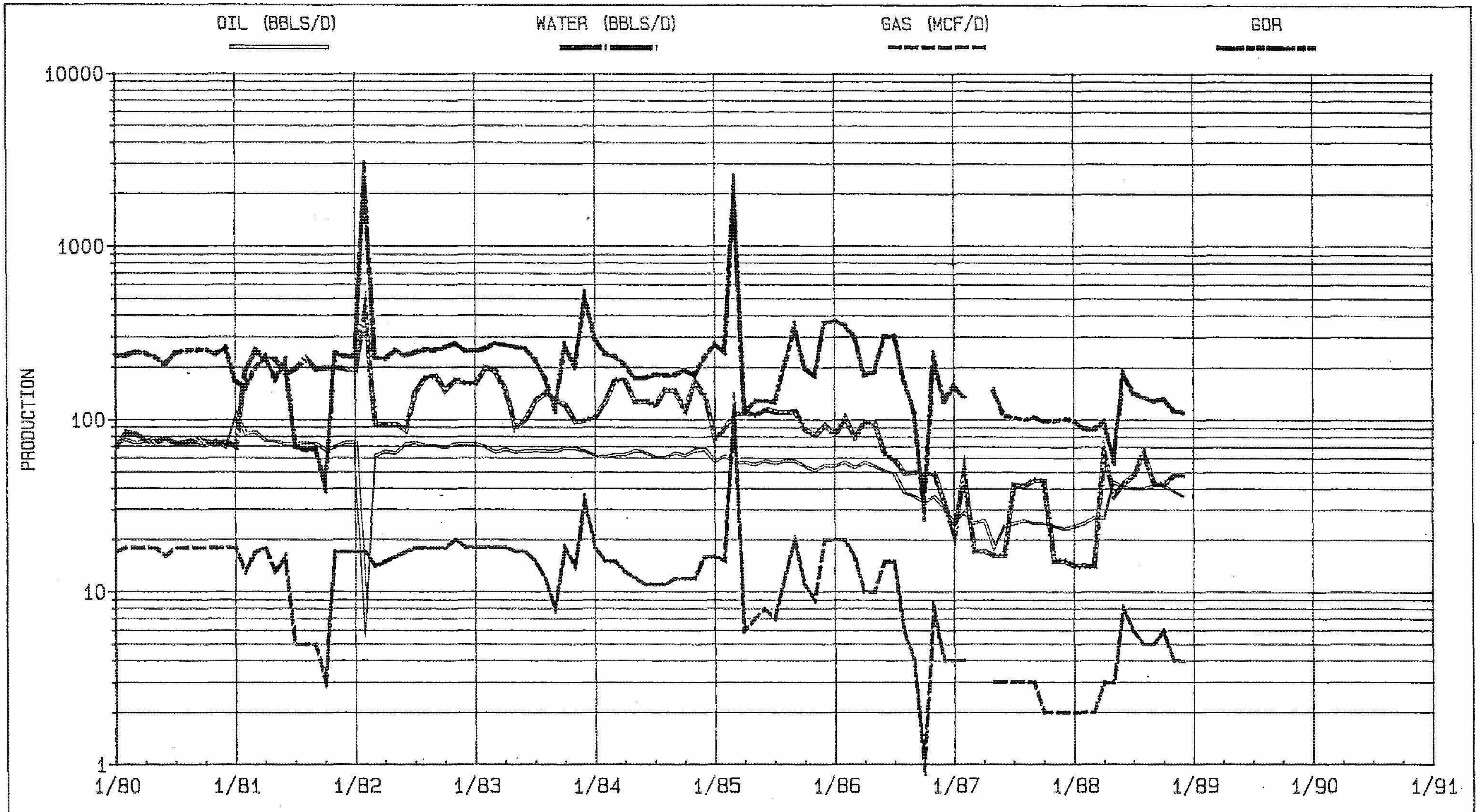


FIGURE 18. PRODUCTION HISTORY: NEWHALL FIELD

:hr 6/8/89

Aliso_Canyon_DOGGR_0004983
AC_CPUC_SED_DR_17_0000727

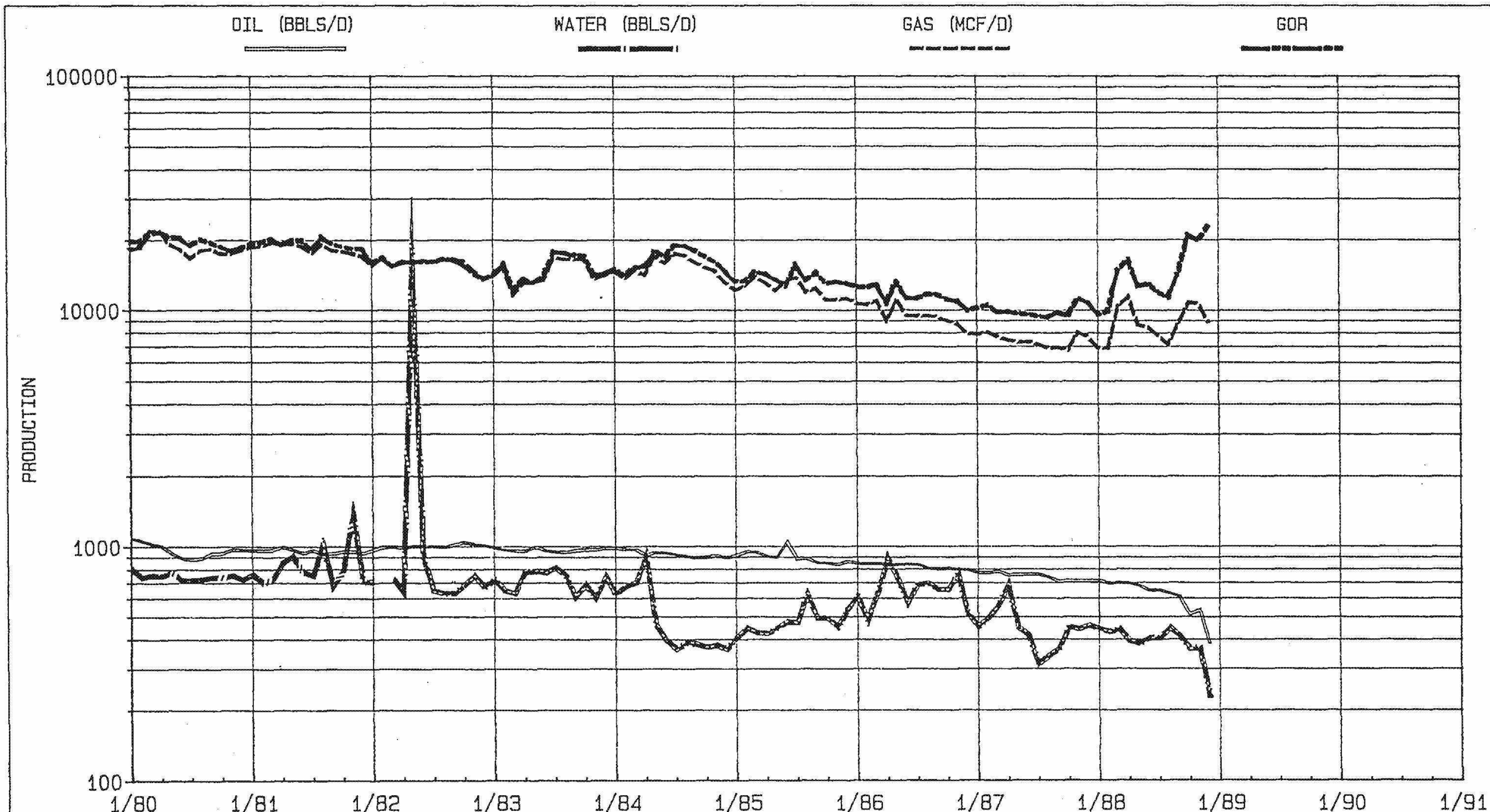


FIGURE 19. PRODUCTION HISTORY: NEWHALL-POTRERO FIELD

:hr 6/8/89

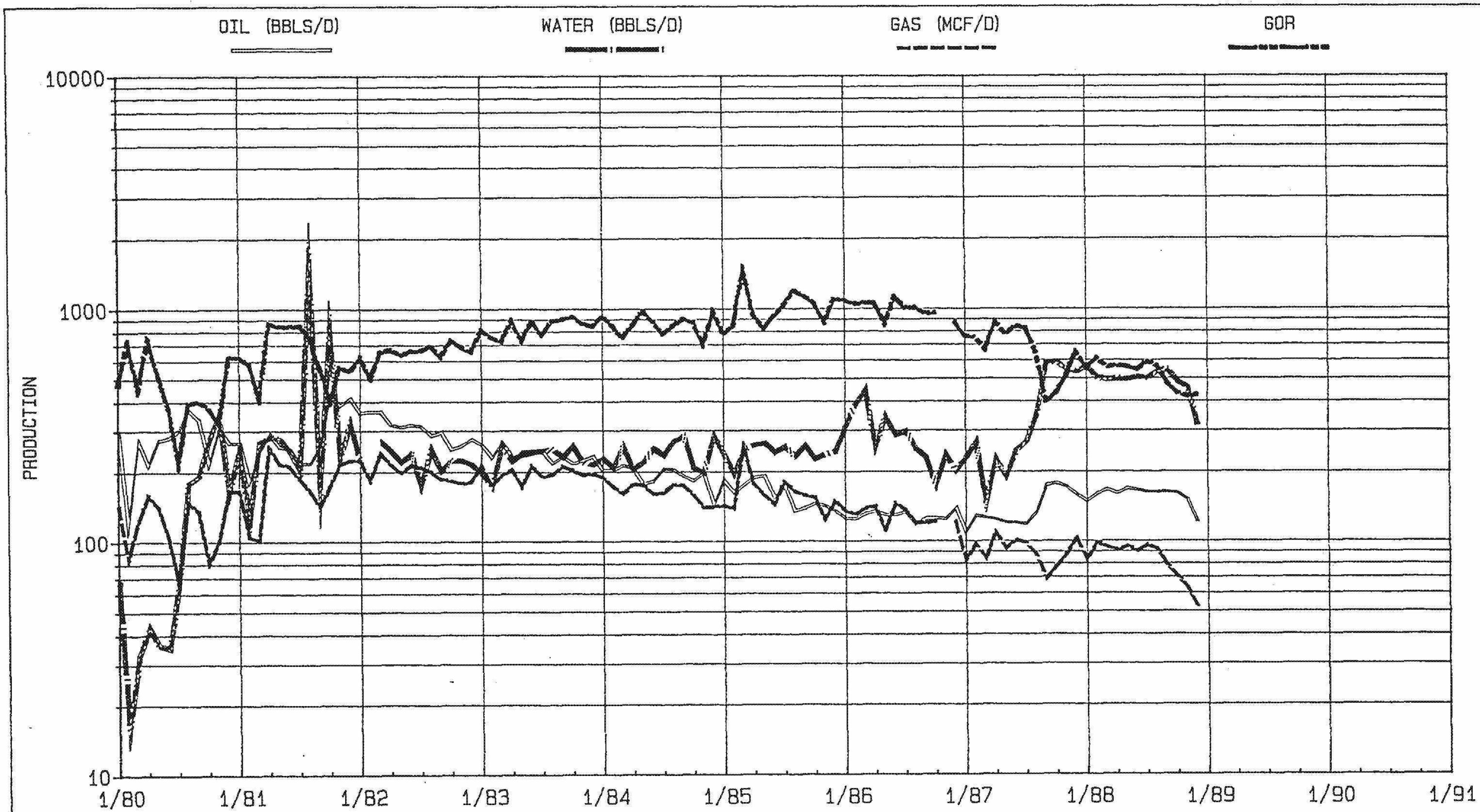


FIGURE 20. PRODUCTION HISTORY: OAT MOUNTAIN FIELD

:hr 6/8/89

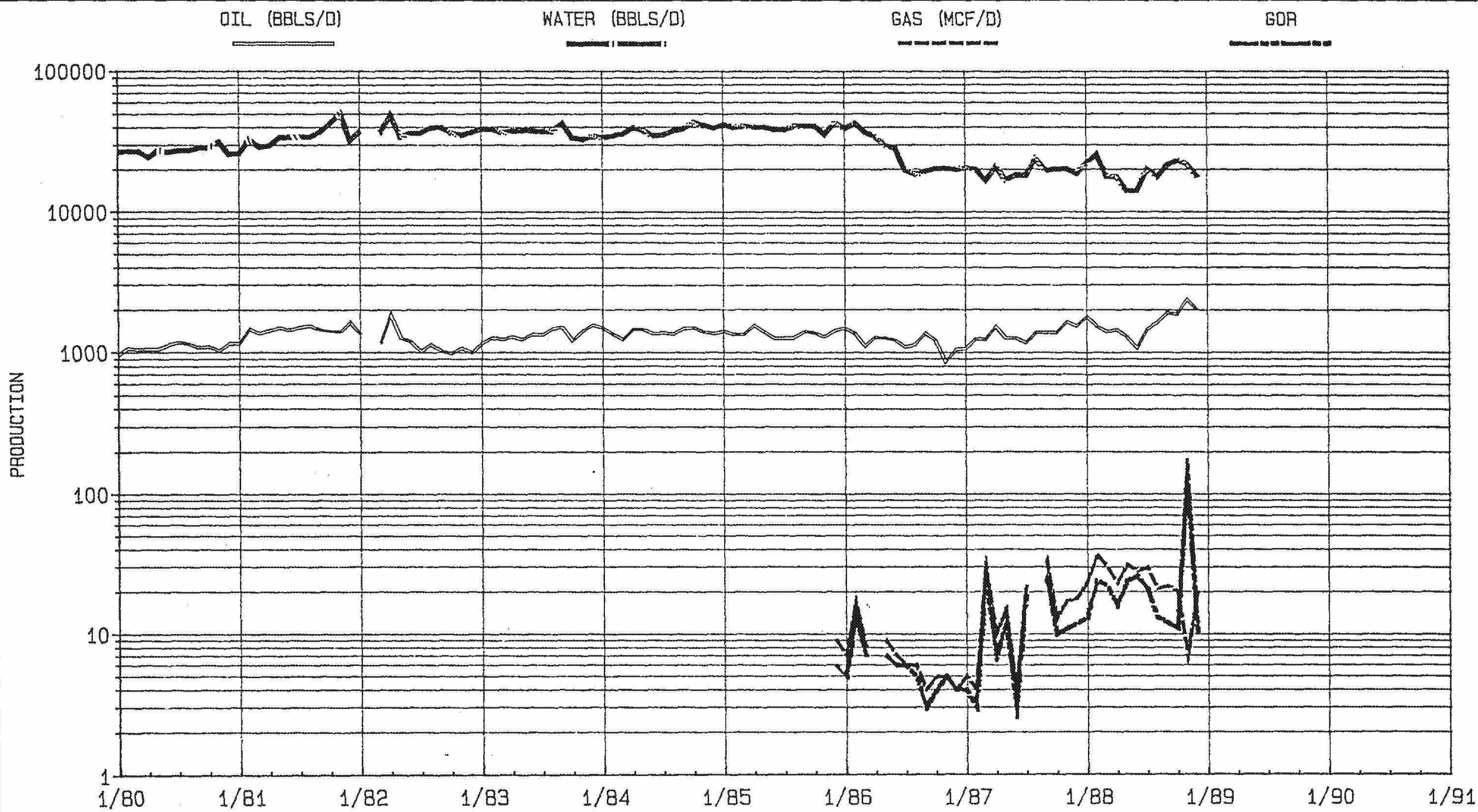


FIGURE 21. PRODUCTION HISTORY: PLACERITA FIELD

:hr 6/8/89

ENVIRONMENTAL PROTECTION

WELL SAFETY SYSTEMS

All wells at Aliso Canyon are equipped with surface safety systems that are designed to shut the well in to prevent loss of gas and oil in the event of damage to surface piping. The surface safety system consists of fail-close pneumatic operated gate valves that are closed by any of the following:

1. Low pressure pilot - shuts well in if a break in the piping causes pressure to drop below 300 psi.

2. High pressure pilot - shuts well in if pressure in withdrawal line exceeds 710 psi.

3. Sacrificial sand erosion probe - shuts well in if sand erosion wears hole in thin walled probe.

4. Fusible plug - shuts well in if a fire occurs in well cellar.

5. Remote shutdown station - allows well to be shut in manually from no closer than 150 feet away from wellhead.

All surface safety systems are tested twice a year.

Aliso Canyon does not have any critical wells that would require subsurface safety valves. However, three wells that are in high risk landslide areas are equipped with subsurface safety valves that are actuated by the same system as the surface safety valve. These valves are tested twice a year.

All workover and drilling rigs at Aliso Canyon are equipped with Class III or better blowout prevention equipment.

WATER DISPOSAL

Produced water is disposed of by Texaco. Texaco blends produced water from their wells in the Porter, Aliso and Del Aliso Zones with water from Southern California Gas Company wells in the Sesnon-Frew and re-injects it into the Porter and Aliso Zones.

SPILL PREVENTION

The Company has various written procedures that deal with spills of hazardous liquids. These procedures attempt to prevent such spills by requiring periodic inspections of wellheads, piping and tankage. The procedures also contain plans for dealing with spills if they occur. All tanks have secondary containment walls. All natural water courses within the field have catch basins that will trap any oil that would reach them if a field gathering line developed a leak. The oil could then be removed by vacuum truck.

OPERATIONS
May 1988 through May 1989

1. New wells drilled: None

2. Well workovers:

Well	Reason
F 4	Install protective string
P 32	Repair wellhead seals
P 37	Inspect casing; regravel pack; install protective string
P 46	Inspect casing
SS 8	Inspect casing
SS 9	Inspect casing
SS 30	Repair tubing

3. Well converted to observation:

None

4. Wells abandoned:

Well	Reason
None	

No unusual incidents or problems have occurred since the last D.O.G. review meeting.

SPR:hr
6/6/89