

# INJECTION RATE vrs. INJECTION PRESSURE

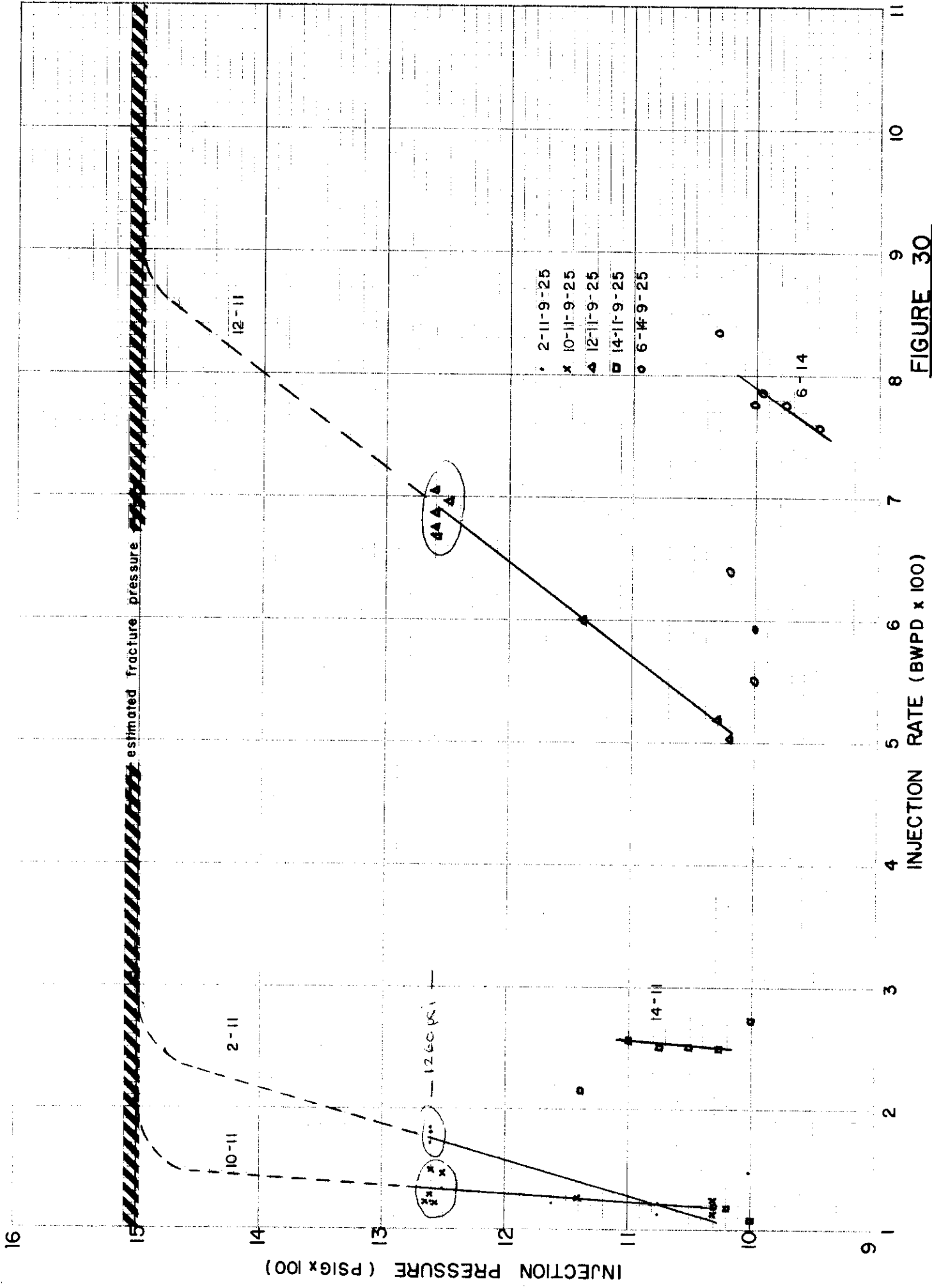


TABLE NO. 1

INJECTION RATE HISTORY

DATE	<u>2-11-9-25</u>		<u>10-11-9-25</u>		<u>12-11-9-25</u>		<u>14-11-9-25</u>		<u>6-14-9-25</u>		<u>FIELD PERFORMANCE</u>	
	RATE	PRESS.	RATE	PRESS.	RATE	PRESS.	RATE	PRESS.	RATE	PRESS.	RATE	MAXIMUM PRESSURE
	BWPD	PSIG	BWPD	PSIG	BWPD	PSIG	BWPD	PSIG	BWPD	PSIG	BWPD	PSIG
Nov. 1972	148	1000	100	1000	591	1000	75	1000	550	1000	1464	1000
Dec.	111	1075	123	1030	503	1020	192	1020	640	1020	1569	1075
Jan. 1973	121	1075	111	1030	518	1030	190	1030	834	1030	1774	1075
Feb.	121	1160	126	1140	600	1140	216	1140	784	980	1837	1160
March	134	1250	145	1250	695	1250	272	1000	752	850	1998	1250
April	127	1260	149	1260	674	1260	250	1025	757	950	2007	1260
May	182	1260	122	1260	669	1260	250	1050	775	900	1998	1260
June	181	1260	123	1260	688	1260	250	1075	775	975	2017	1260
July	172	1260	128	1260	704	1260	254	1100	777	1000	2035	1260
DESIGN RATE	330	1000	250	1000	1011	1000	244	1000	776	1000	2611	1000
DIFFERENCE	-158	+260	-122	+260	-307	+260	acceptable		acceptable		-576	+260

TABLE 4

## JOB TYPE - SANDWATER FRACTURING PROCESS

SAMEDAN 2-11

## WATER

INJECTION RATE - BBL/MIN	1.0
ASSUMED FRACTURE HEIGHT - FT	14.0
NET FORMATION THICKNESS - FT	14.0
ELASTIC MODULUS - PSI	0.40E+07
FORMATION PERMEABILITY - MD	43.40
FORMATION POROSITY	0.14
BHTP - PSI	1575.
RESERVOIR PRESSURE - PSI	978.
RESERVOIR FLUID VIS - CP	5.60

TYPE &amp; CONC NO 1 PROP

20-40 SAND

1.00 LB/GAL AVG

DESIGN NO	PROD INCREASE (T) (M-S)	TOTAL VOL GAL/1000	PAD VOL	PROPPED FRAC LN FT	PROPPED FRAC HT FT	VIS CPS	FRAC WIDTH IN	PROP 1ST SX	PROP 2ND SX
DESIGN NO. 1	DELETED, PAD VOLUME > 50% - WIDTH TOO SMALL FOR PROP								
DESIGN NO. 2	DELETED, PAD VOLUME > 50% - WIDTH TOO SMALL FOR PROP								
DESIGN NO. 3	DELETED, PAD VOLUME > 50% - WIDTH TOO SMALL FOR PROP								
DESIGN NO. 4	DELETED, PAD VOLUME > 50% - WIDTH TOO SMALL FOR PROP								
DESIGN NO. 5	DELETED, PAD VOLUME > 50% - WIDTH TOO SMALL FOR PROP								
DESIGN NO. 6	DELETED, PAD VOLUME > 50% - WIDTH TOO SMALL FOR PROP								
DESIGN NO. 7	DELETED, PAD VOLUME > 50% - WIDTH TOO SMALL FOR PROP								
DESIGN NO. 8	DELETED, PAD VOLUME > 50% - WIDTH TOO SMALL FOR PROP								
DESIGN NO. 9	DELETED, PAD VOLUME > 50% - WIDTH TOO SMALL FOR PROP								
DESIGN NO. 10	DELETED, PAD VOLUME > 50% - WIDTH TOO SMALL FOR PROP								

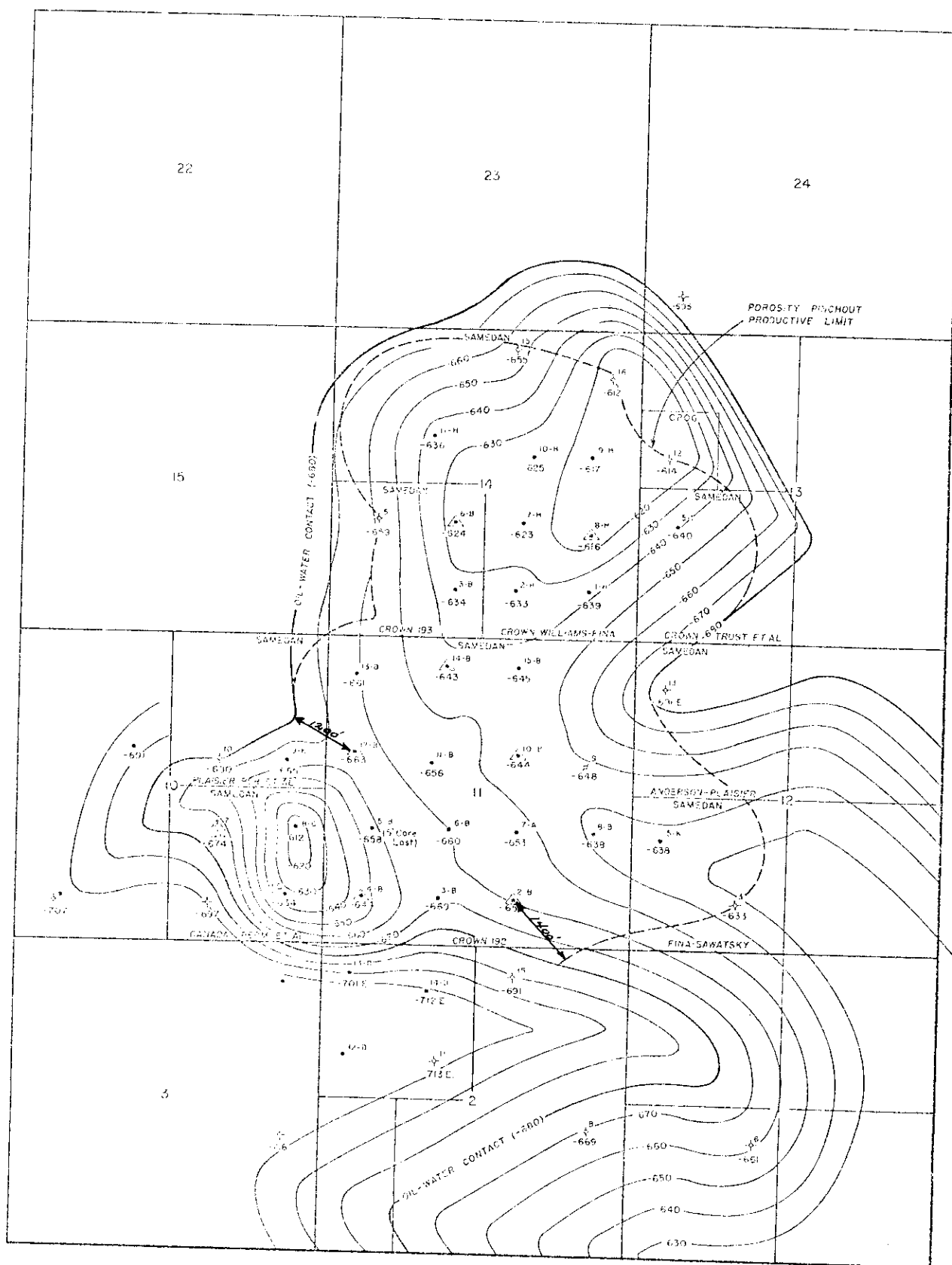
CREATED LENGTH	HEQ	RELATIVE CAP		HF/HI	C-EFF
		(T)	(M-S)		
0.	0.	0.	0.	0.	0.003434
0.	0.	0.	0.	0.	0.003434
0.	0.	0.	0.	0.	0.003434
1.	0.	0.	0.	0.	0.003434
1.	0.	0.	0.	0.	0.003434
2.	0.	0.	0.	0.	0.003434
2.	0.	0.	0.	0.	0.003434
3.	0.	0.	0.	0.	0.003434
4.	0.	0.	0.	0.	0.003434
6.	0.	0.	0.	0.	0.003434

100-443686-12

**JOB TYPE - SANDWATER FRACTURING PROCESS**

**WATER**

0.00 LB/GAL AVG



T  
9  
N

- PRODUCING WELL
- DRY HOLE
- △ SUSPENSION WELL
- ▲ PROPOSED INJECTION WELL

EAST ROUTLEDGE UNIT NO. 1  
MANITOBA PROVINCE, CANADA

0 1000 2000 3000  
Scale

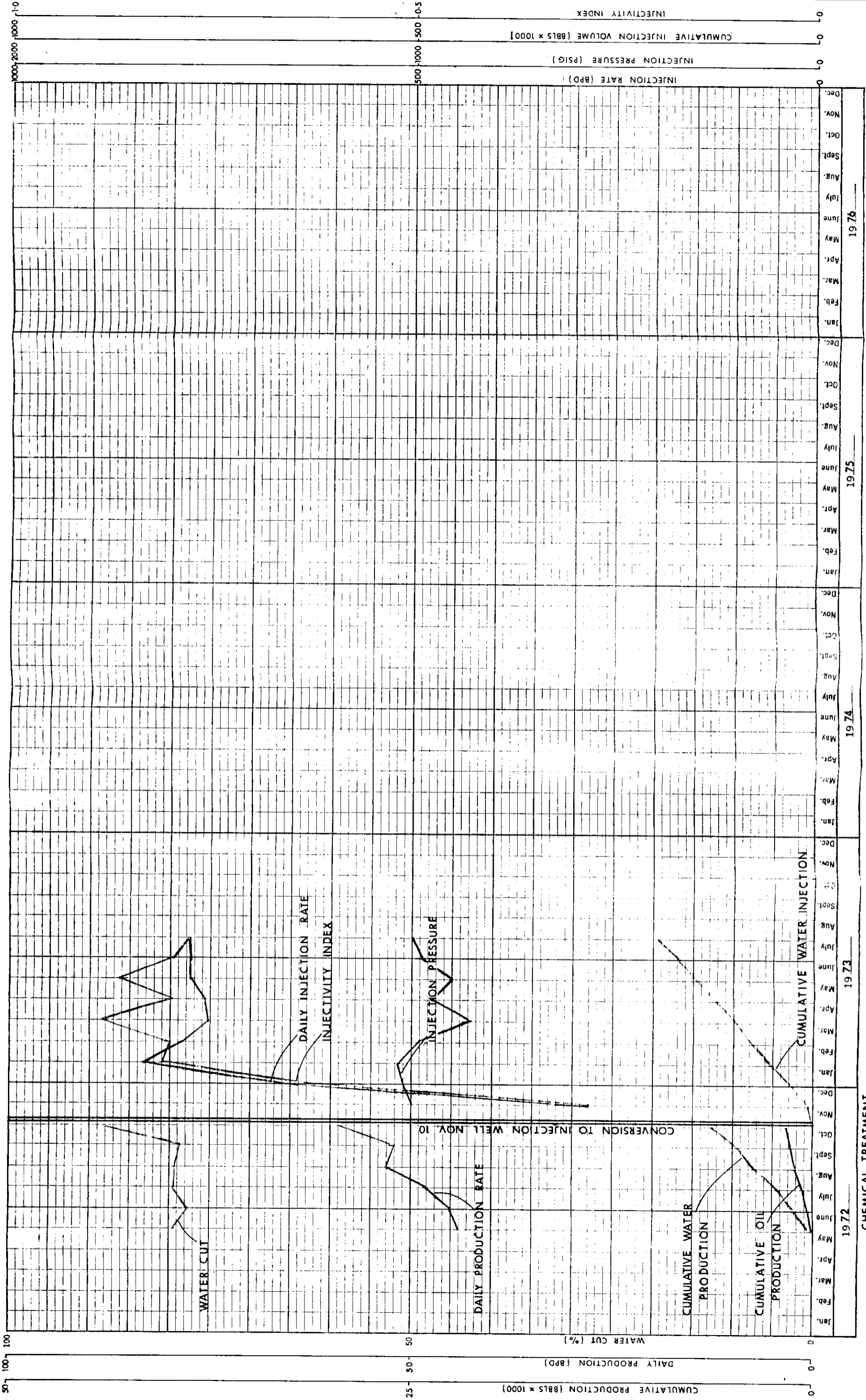
FIGURE 31

STRUCTURE MAP  
TOP OF CHERTY ZONE  
C.I.-10'

GEOLOGY BY G.M.C.

DATE 3/1/70

SAMEDAN ROUTLEDGE PROV. 6-14-9-25 WPM.



CHEMICAL TREATMENT

- JUNE 26/72
- 250 GAL. PARAN
- 165 GAL. VERSENE

FIGURE 29

SAMEDAN ROUTLEDGE PROV. 12-11-9-25WPM.

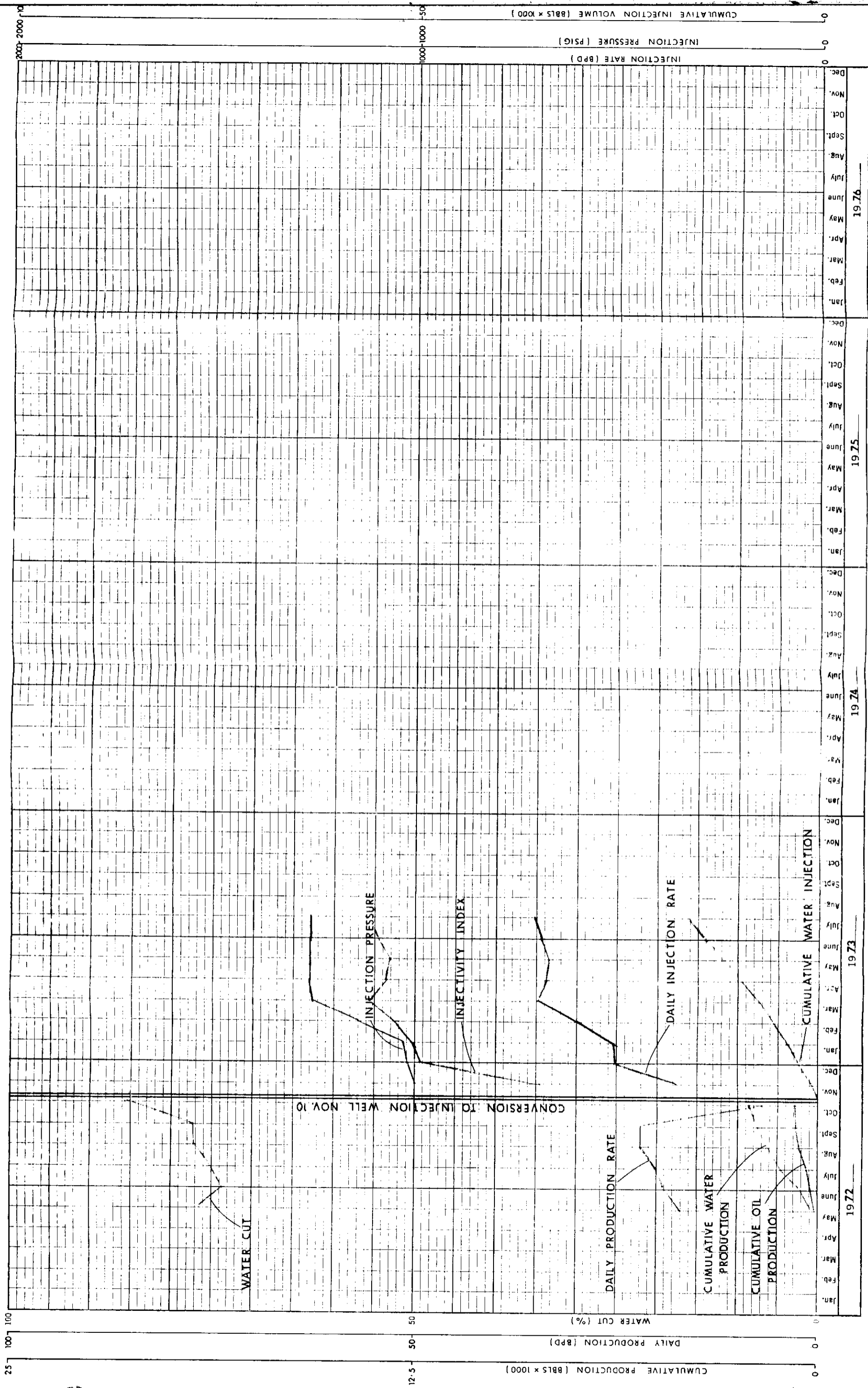


FIGURE 27

SAMEDAN ROUTLEDGE PROV. 14-11-9-25WPM.

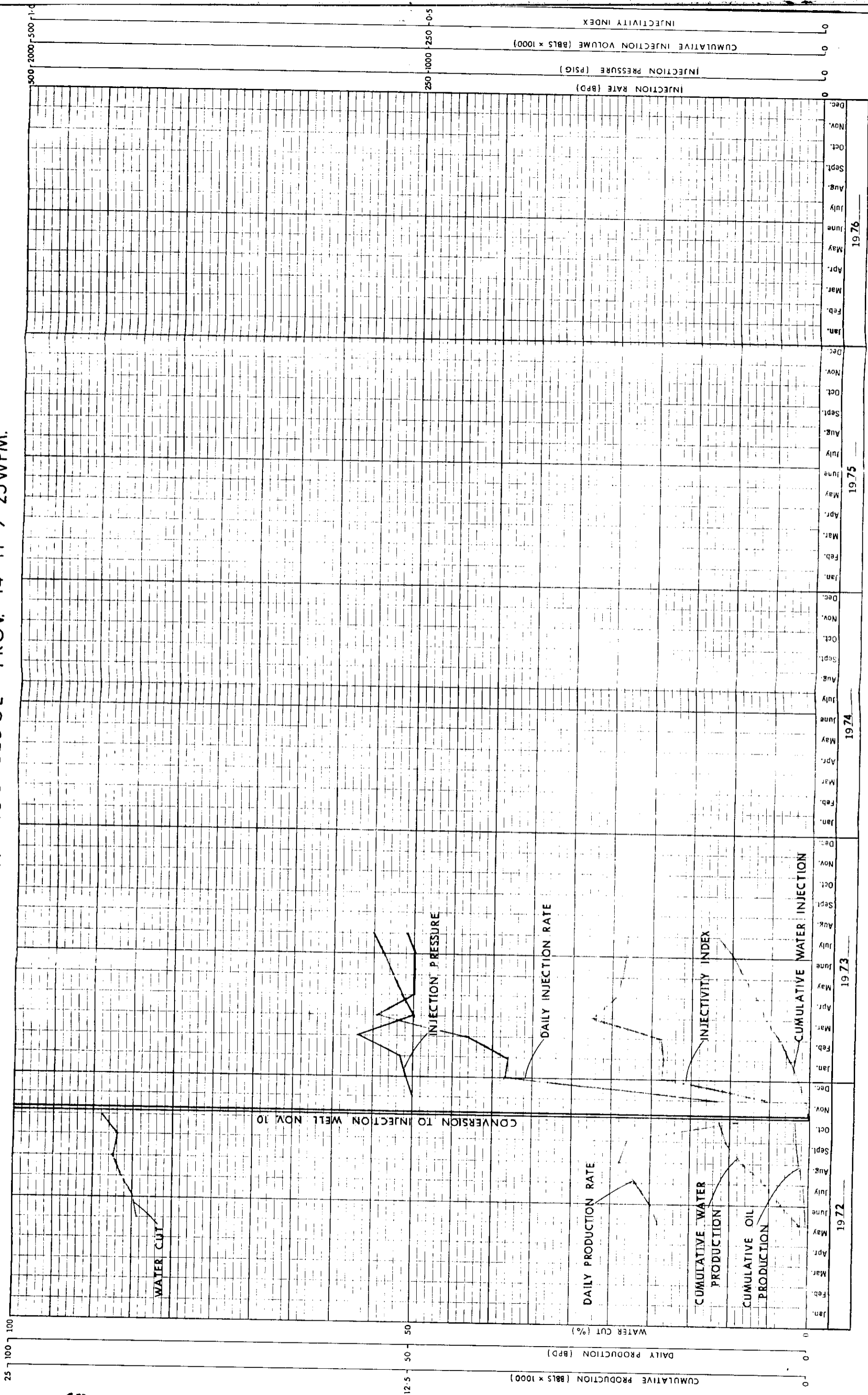


FIGURE 28

SAMEDAN ROUTLEDGE PROV. 2-11-9-25 WPM.

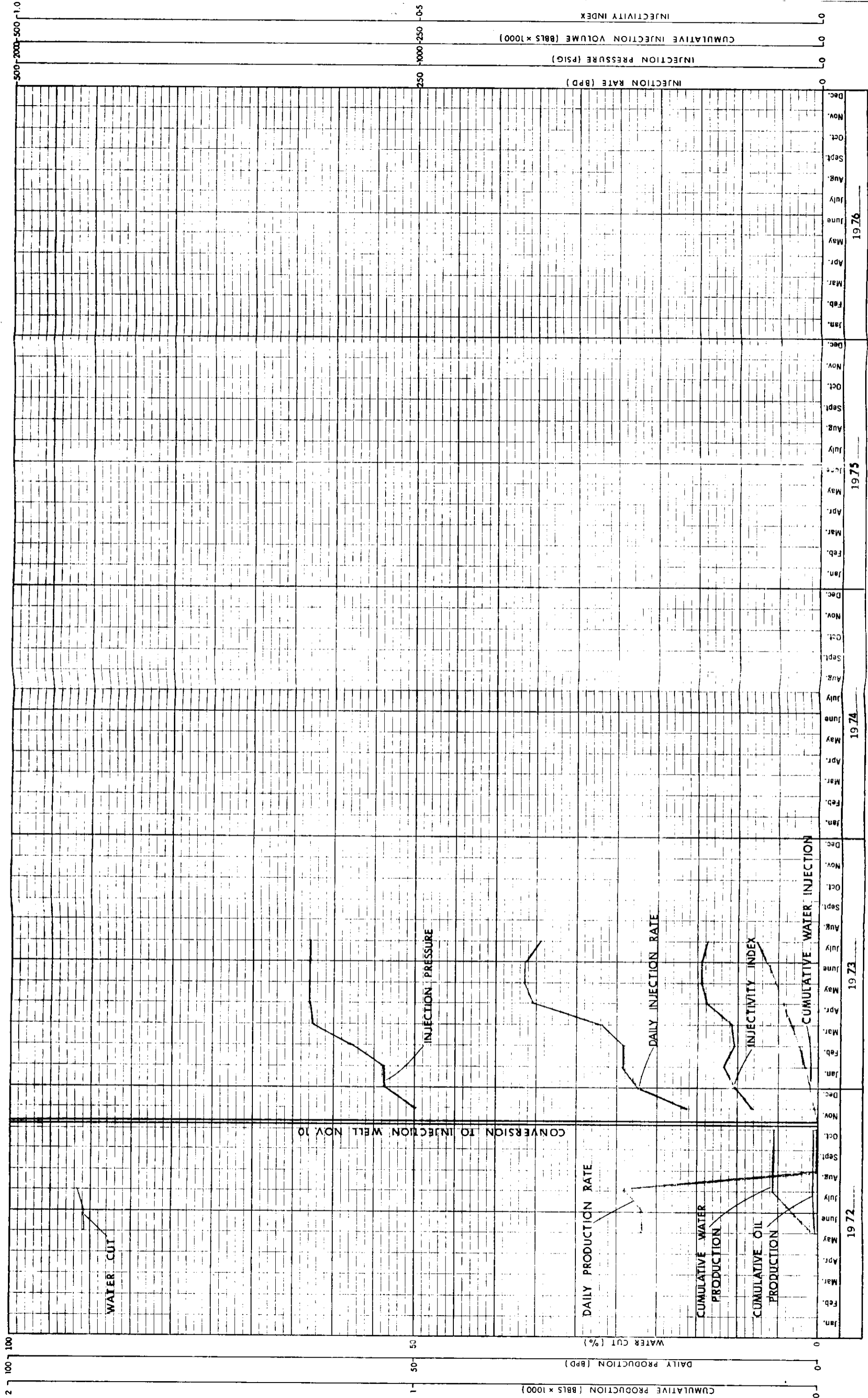


FIGURE 25

# SAMEDAN ROUTLEDGE PROV. 10-11-9-25WPM.

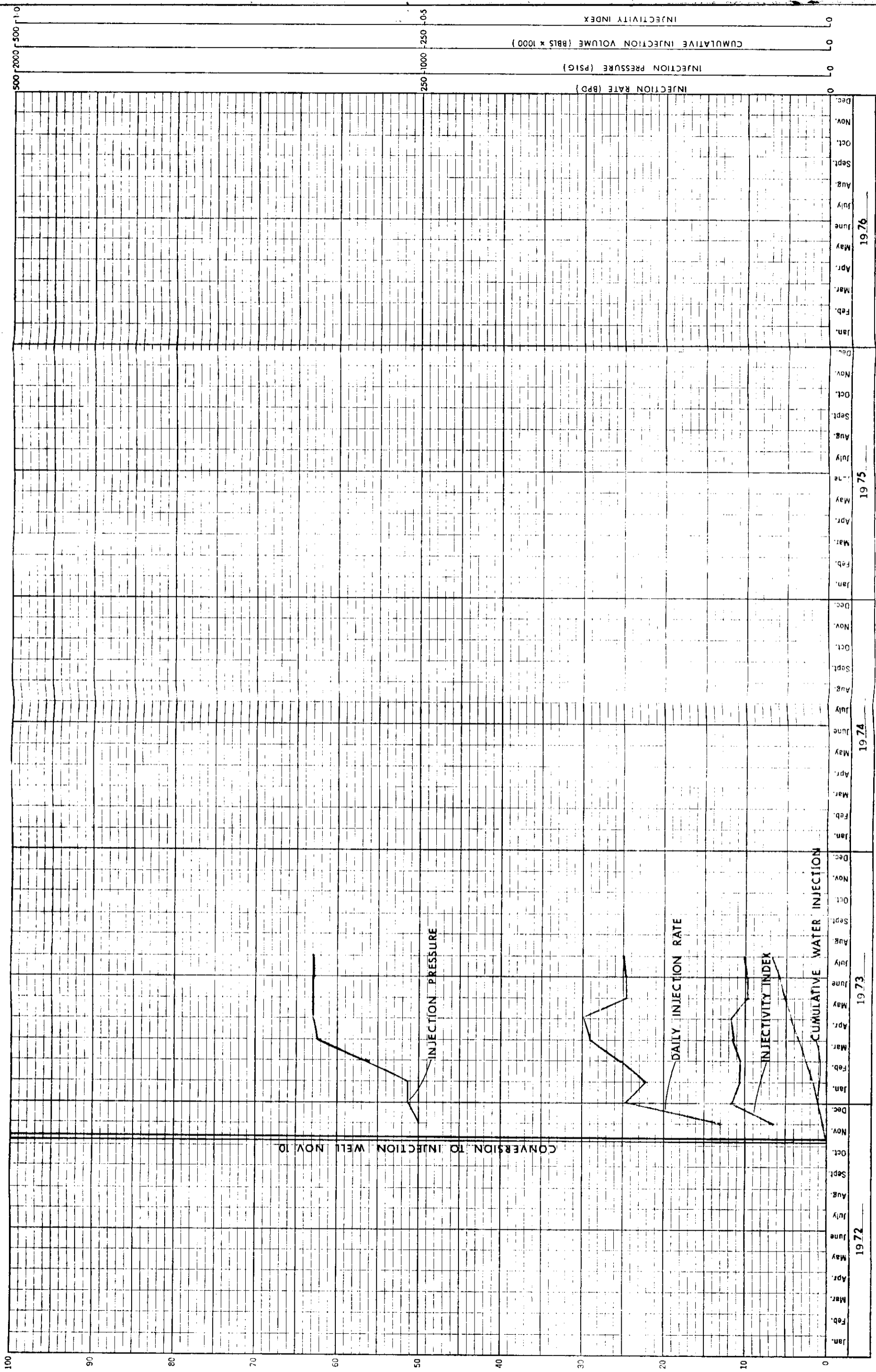


FIGURE 26

# EAST ROUTLEDGE UNIT #1 - PRODUCTION

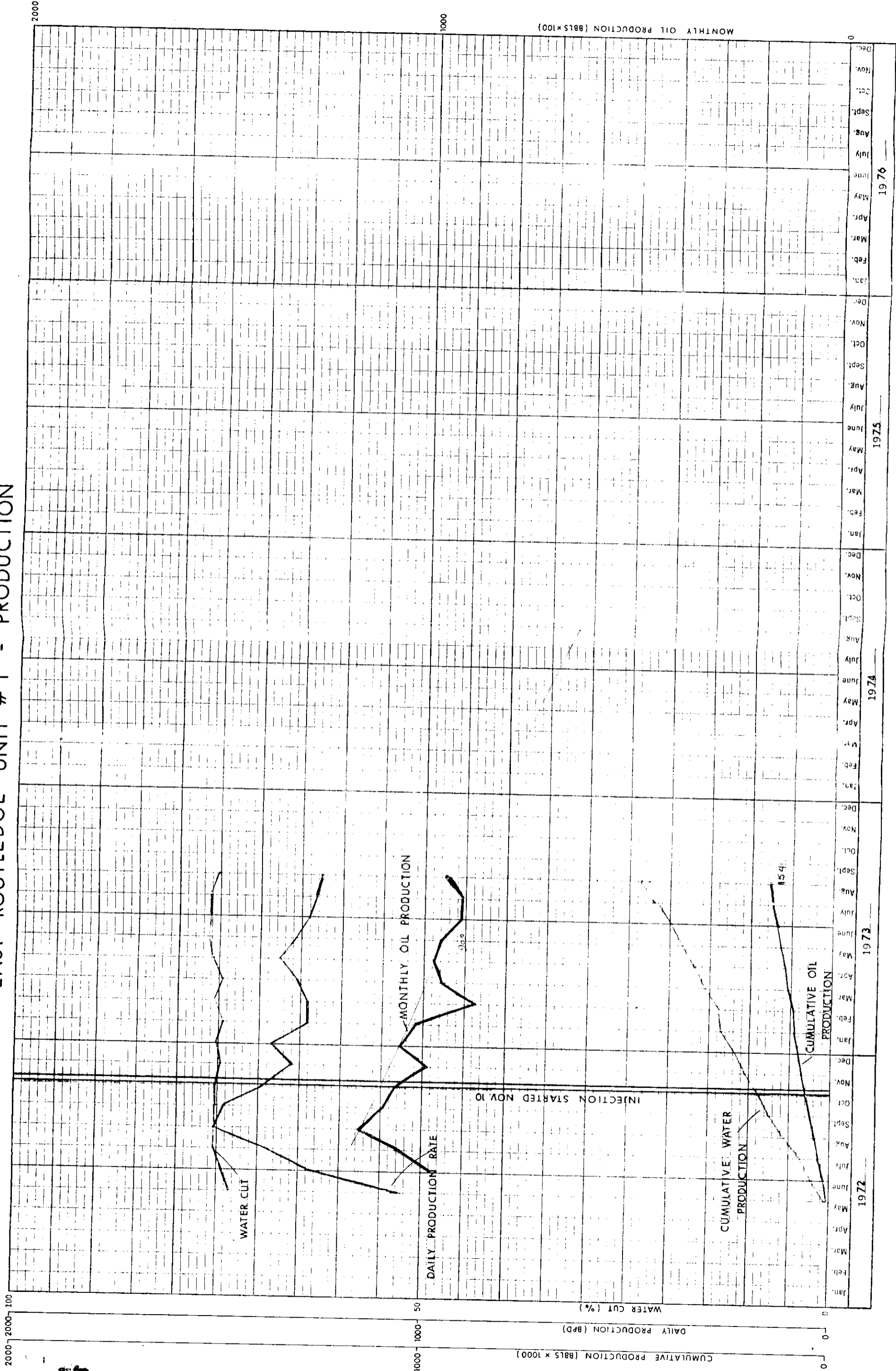


FIGURE 1

# EAST ROUTLEDGE UNIT #1 - INJECTION

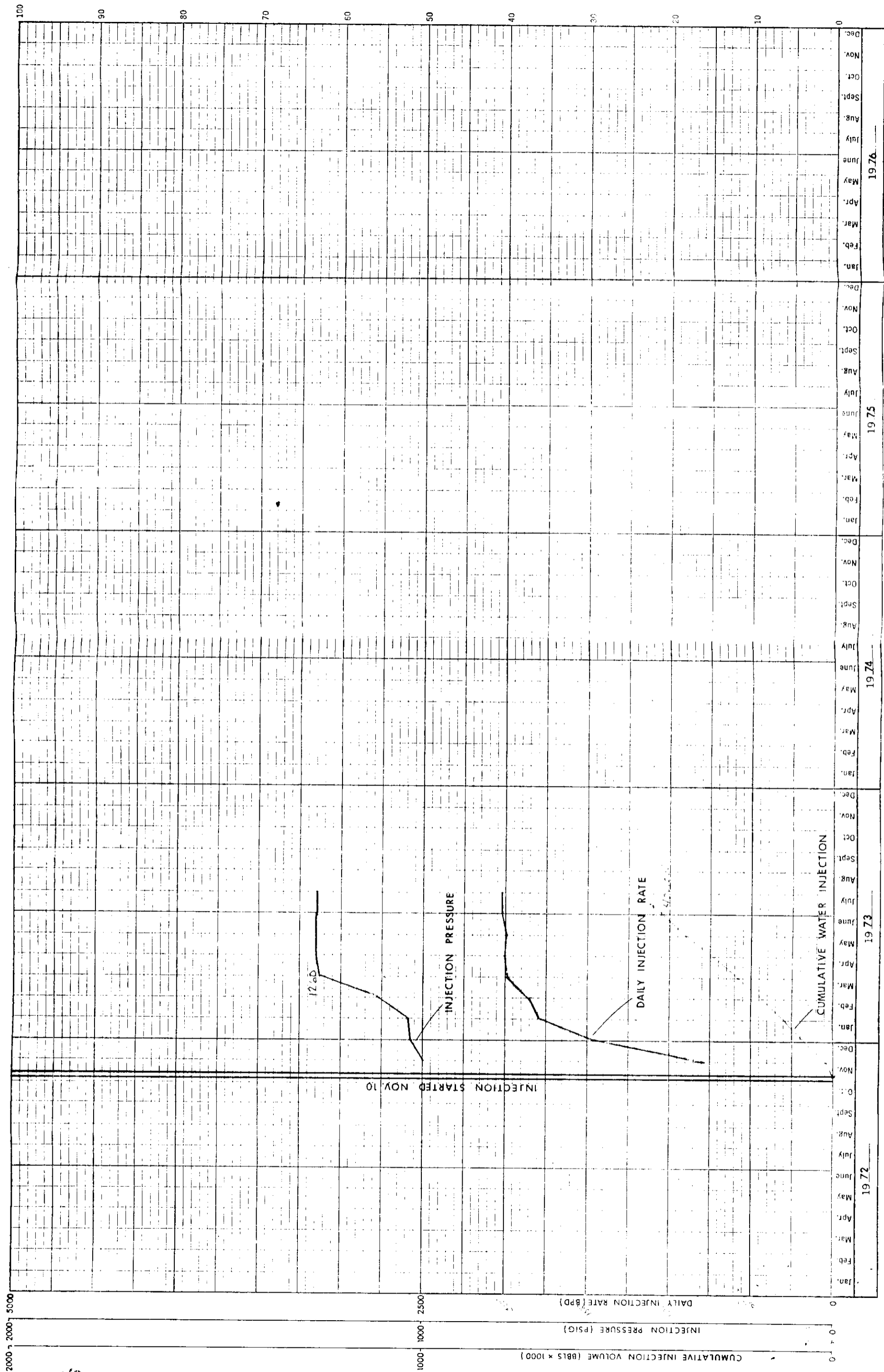
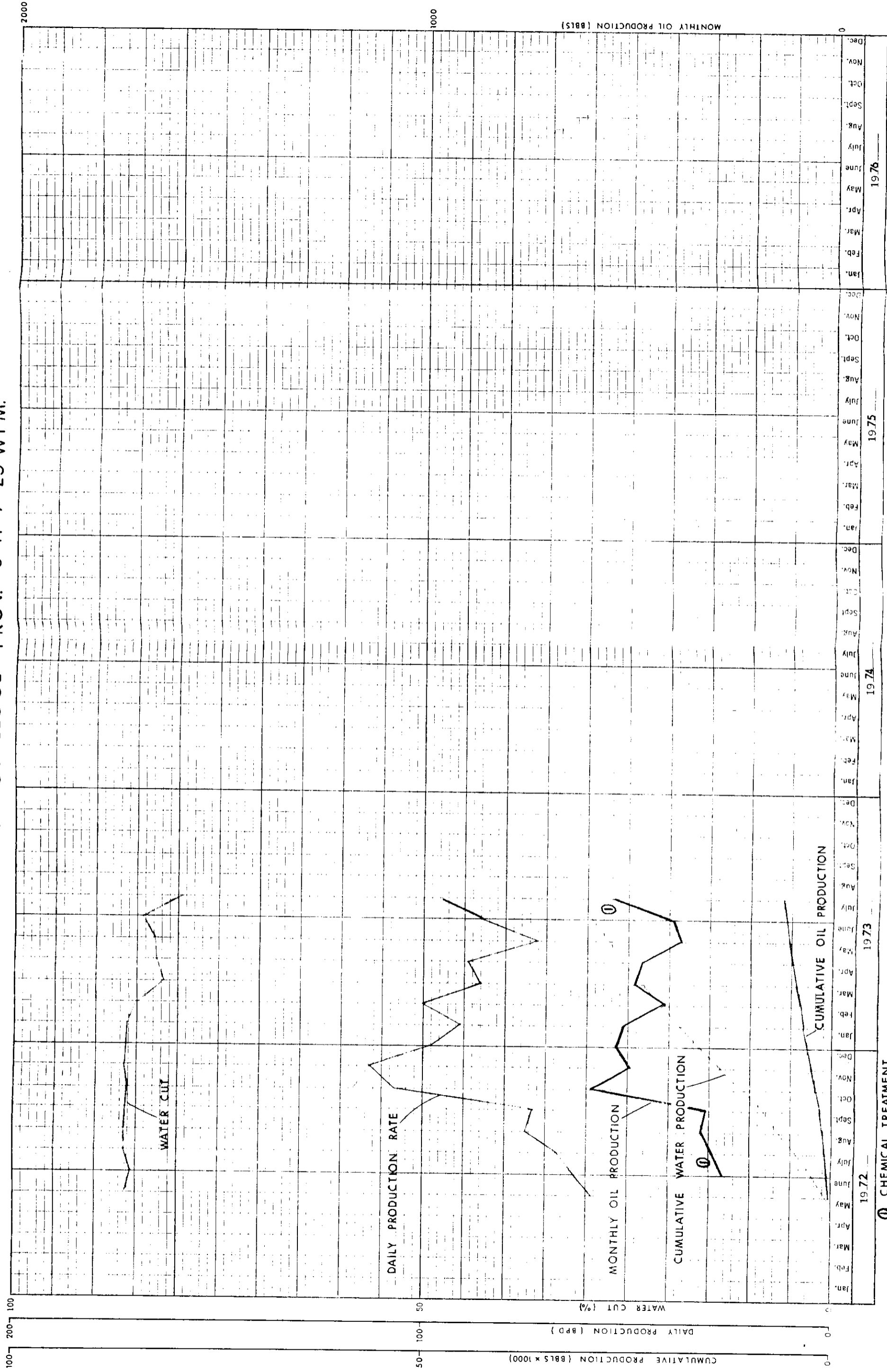


FIGURE 2

# SAMEDAN ROUTLEDGE PROV. 3-11-9-25 WPM.

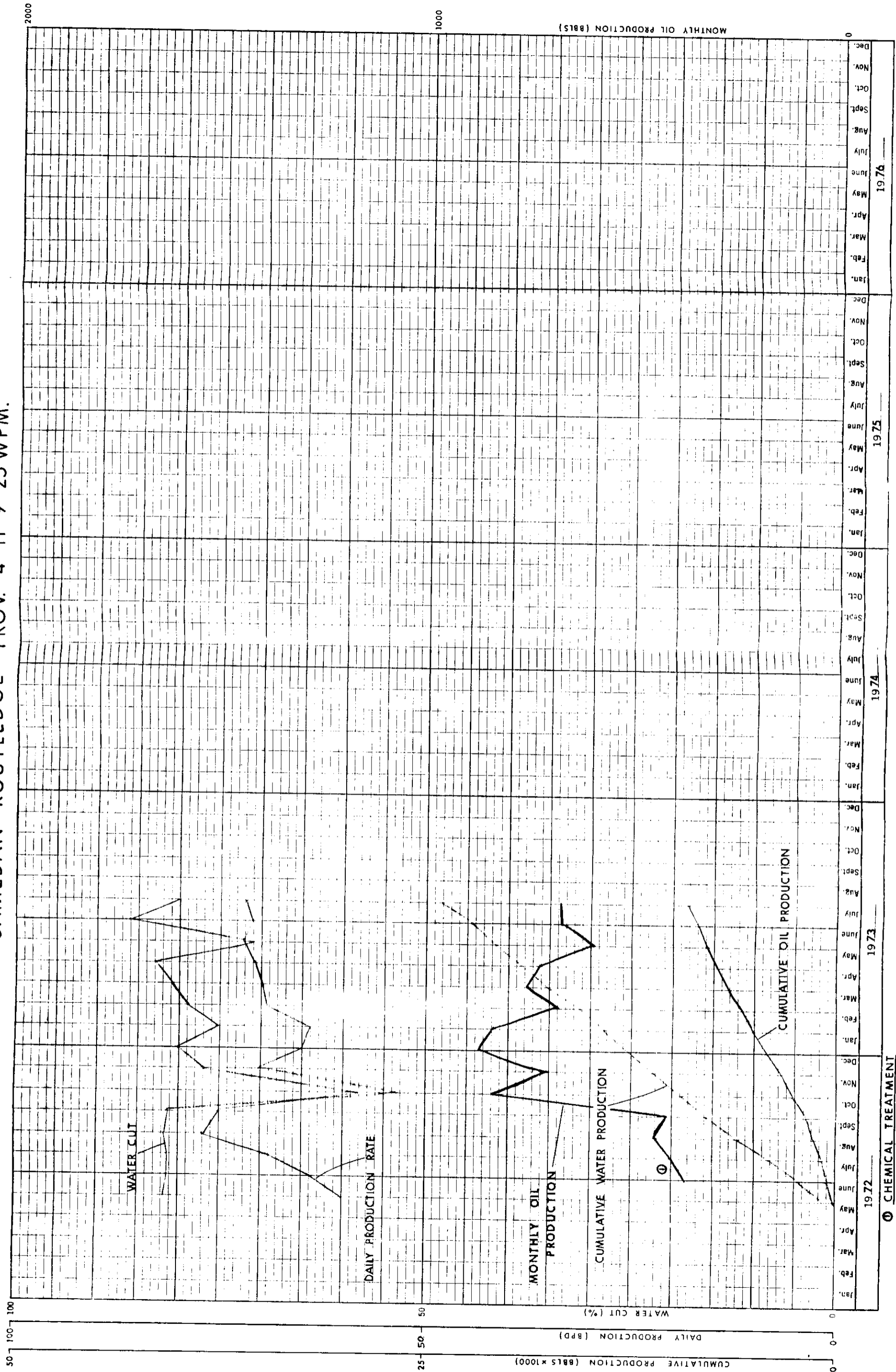


## ① CHEMICAL TREATMENT

- JULY 17/73
- JULY 20/72
- 250 GAL. PARAN
- 165 GAL. VERSENE
- 2 BBLs. T328

FIGURE 3

SAMEDAN ROUTLEDGE PROV. 4-11-9-25 WPM.



### ① CHEMICAL TREATMENT

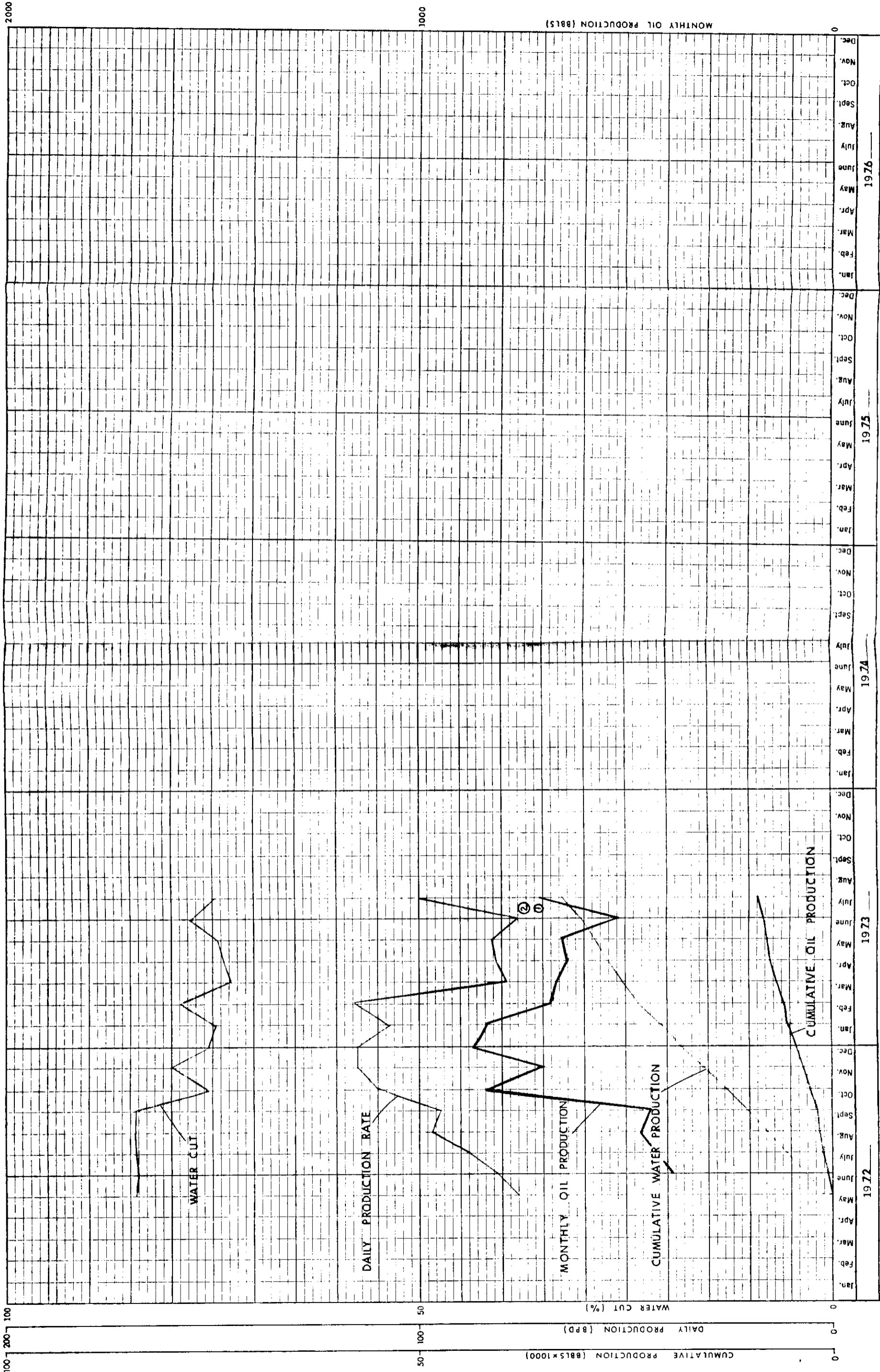
- JULY 20/72

- 250 GAL. PARAN

- 165 GAL. VERSENE

**FIGURE 4**

# SAMEDAN ROUTLEDGE PROV. 5-11-9-25 WPM.



① CHEMICAL TREATMENT

- JUNE 5/72  
- 250 GAL. PARAN  
- 165 GAL. VERSENE

② PUMP CHANGE

- JULY 6/73

FIGURE 5

SAMEDAN ROUTLEDGE PROV. 6-11-9-25WPM.

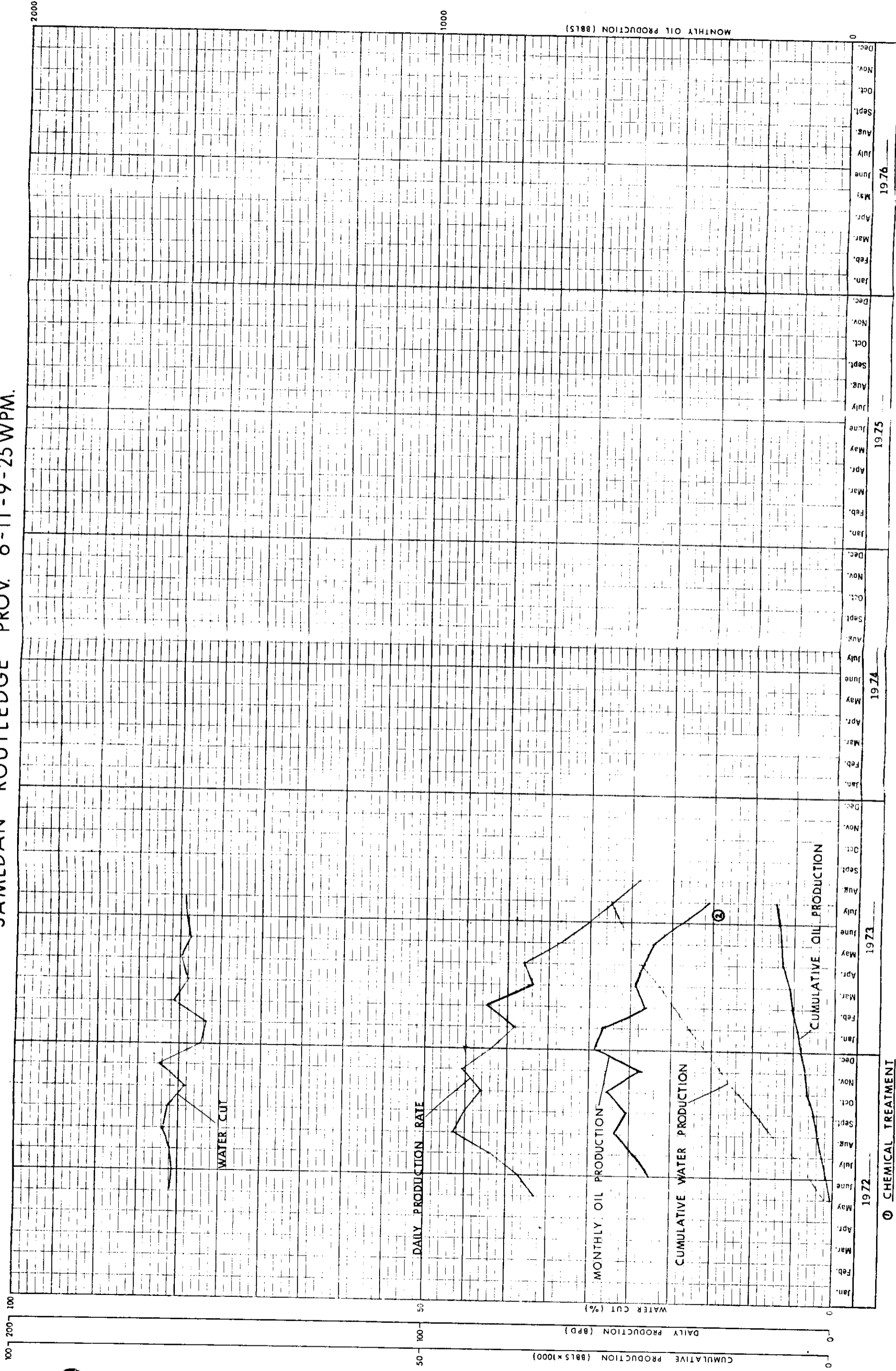
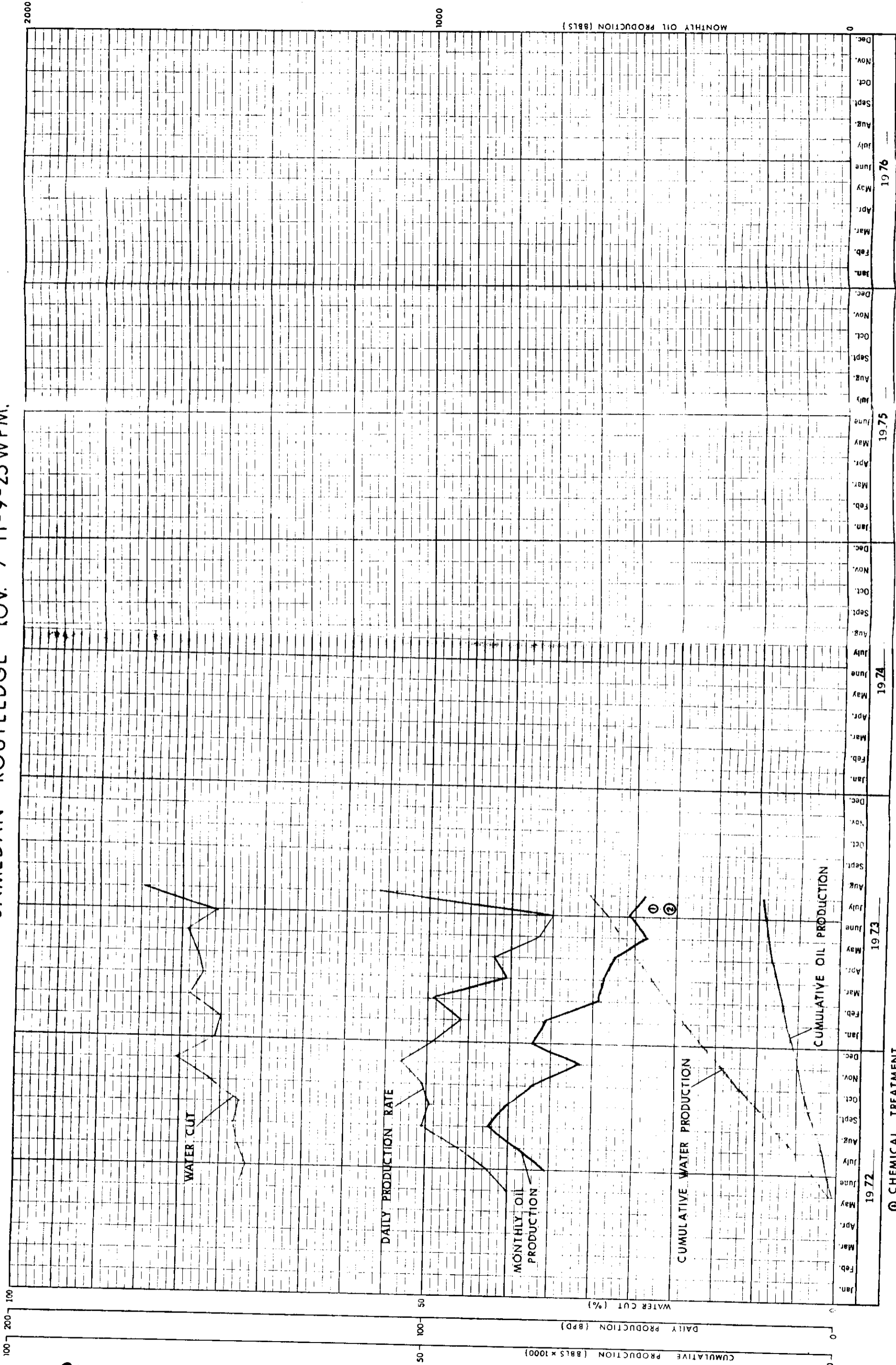


FIGURE 6



① CHEMICAL TREATMENT

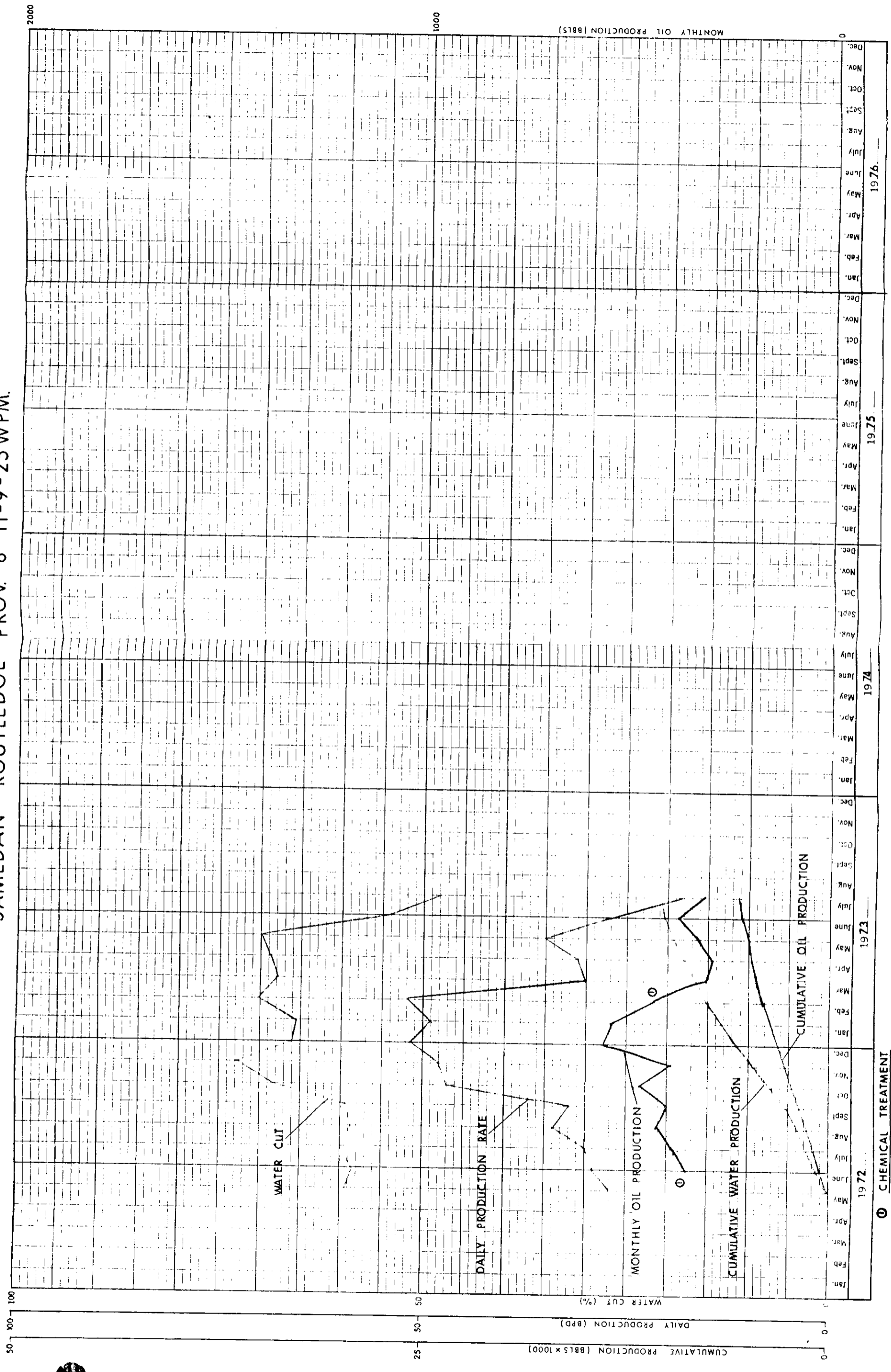
- JUNE 5/72  
- 250 GAL. PARAN  
- 165 GAL. VERSENE

- JULY 17/73  
- 2 BBLs. T328

③ PUMP CHANGE  
- JULY 7/73

FIGURE 7

SAMEDAN ROUTLEDGE PROV. 8-11-9-25 WPM.

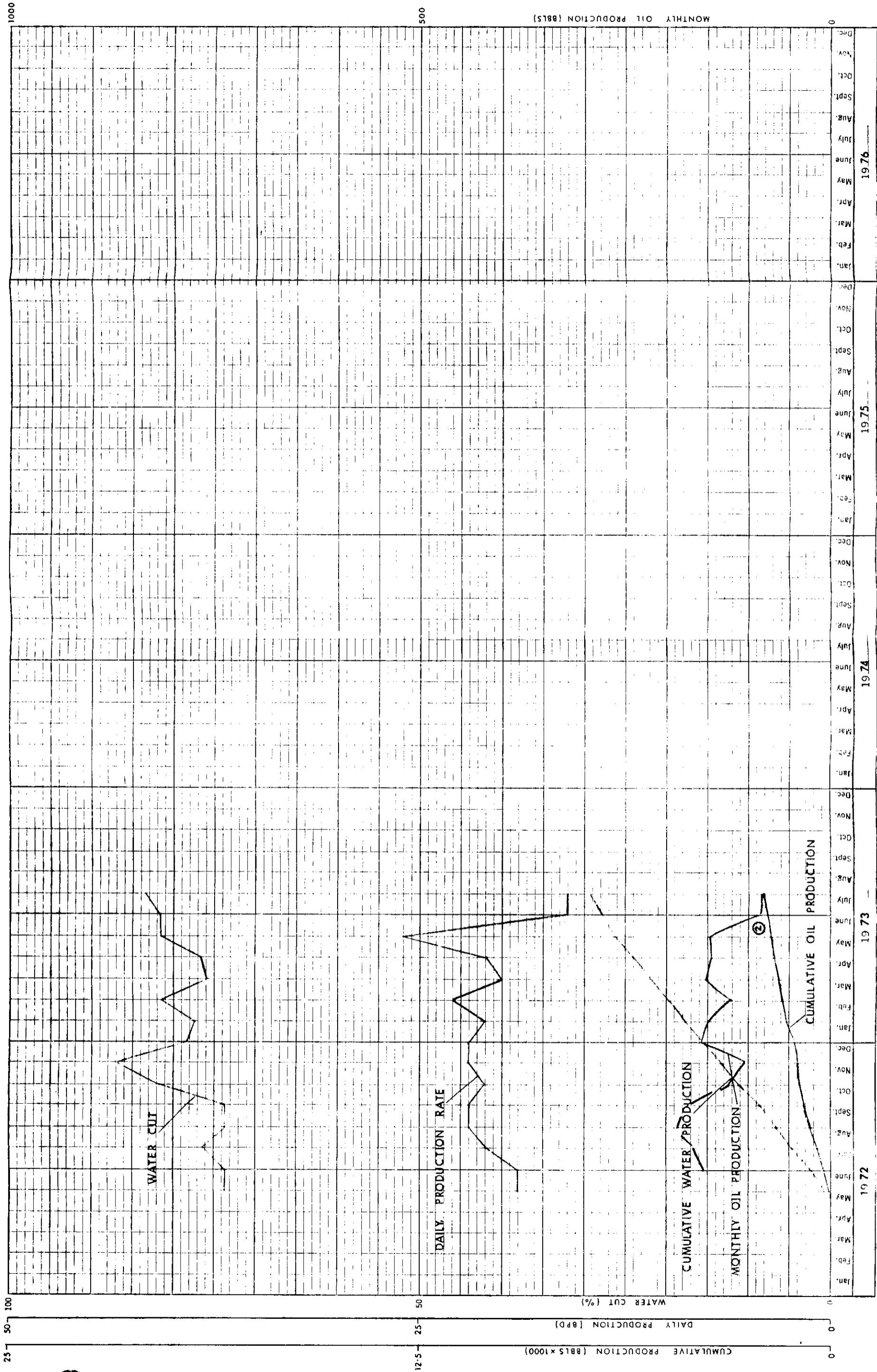


① CHEMICAL TREATMENT

- JUNE 6 / 72
- MARCH 23 / 73
- 250 GAL. PARAN
- 2 BBLs. T328
- 165 GAL. VERSENE

FIGURE 8

# SAMEDAN ROUTLEDGE PROV. 11-11-9-25WPM.

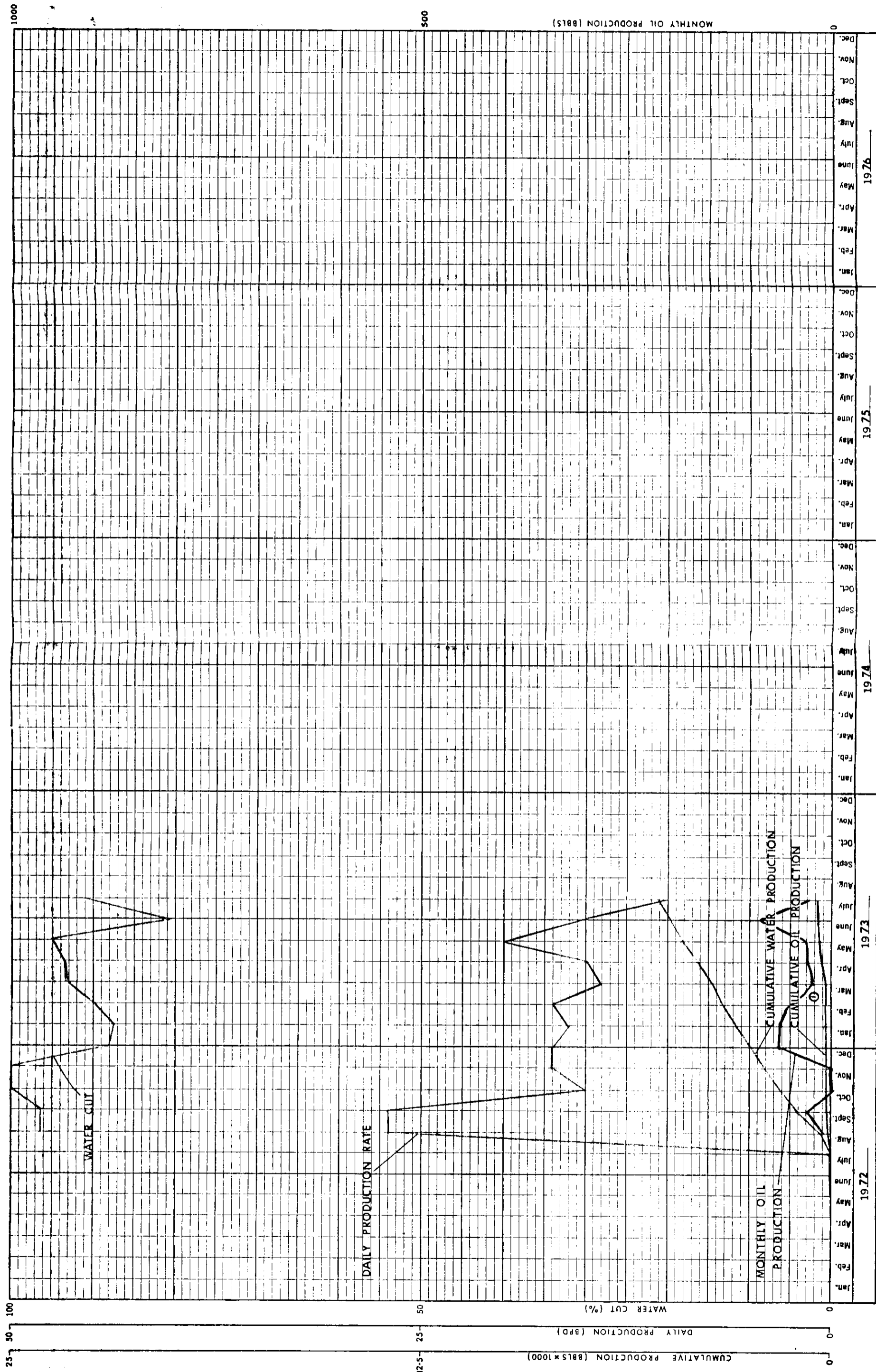


② PUMP CHANGE

- JUNE 28/73

FIGURE 9

# SAMEDAN ROUTLEDGE PROV. 13-11-9-25WPM.



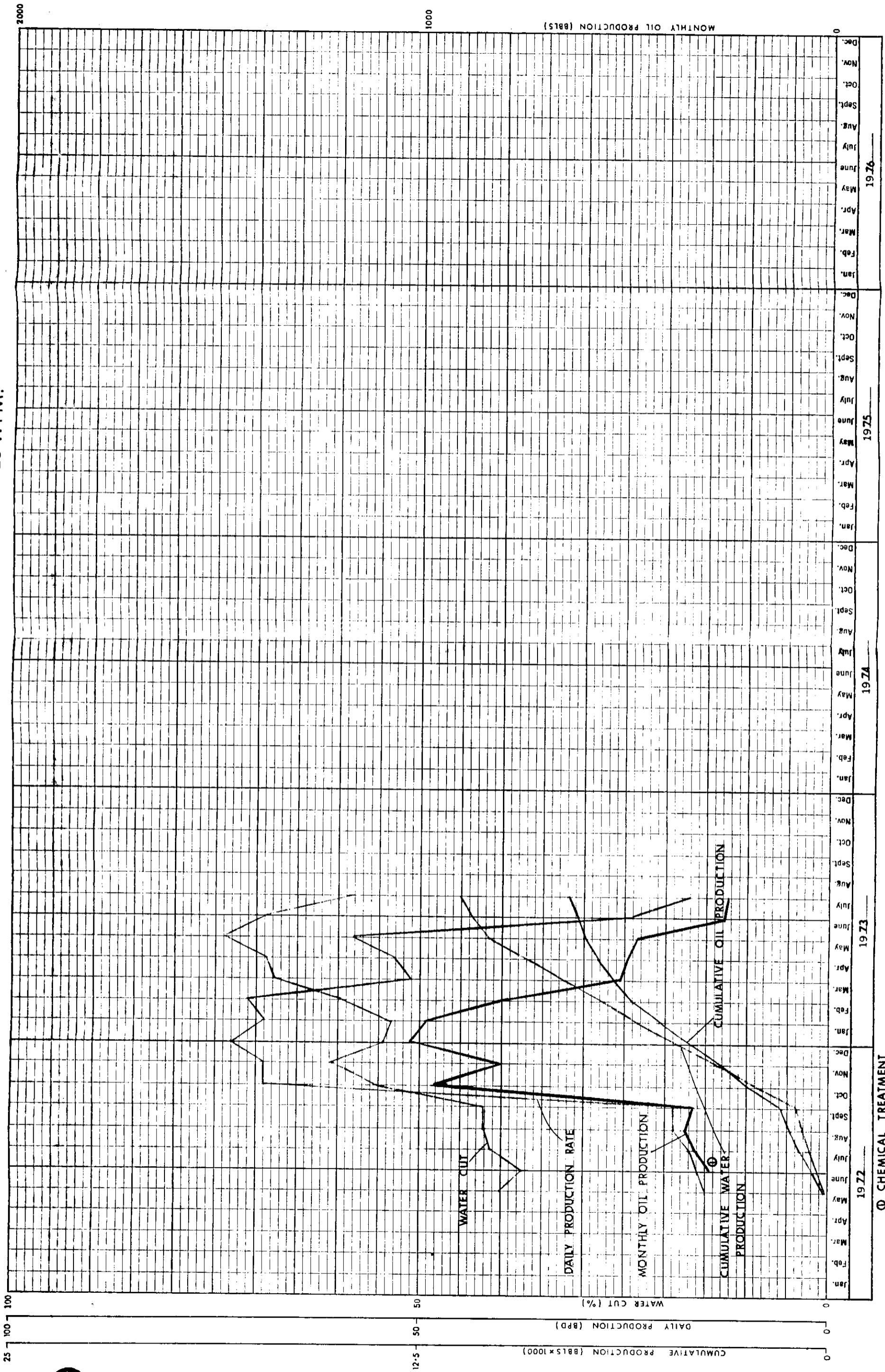
① CHEMICAL TREATMENT

-MARCH 22/73

-2 BBLs T328

FIGURE 10

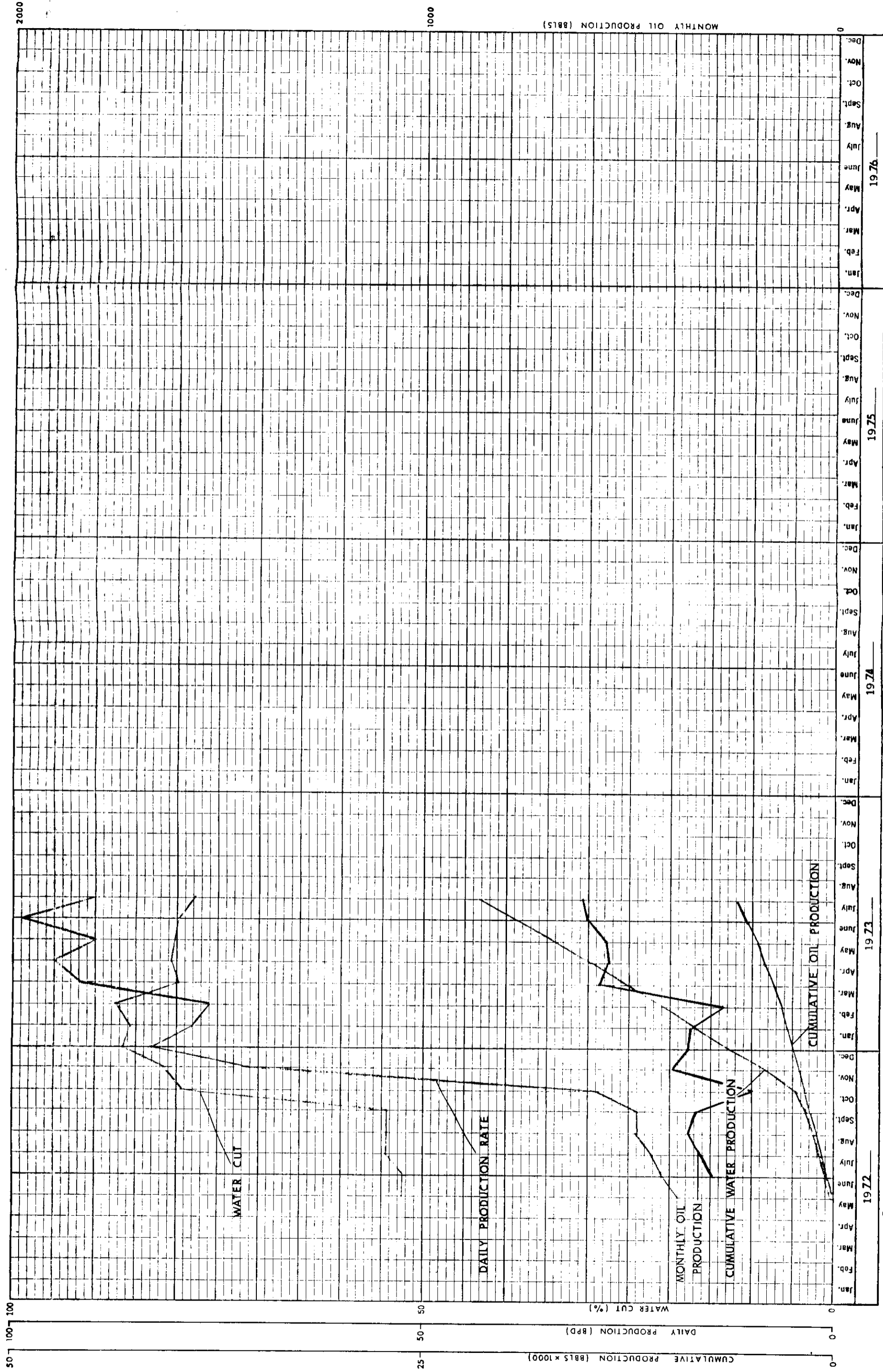
SAMEDAN ROUTLEDGE PROV. 15-11-9-25WPM.



⊕ CHEMICAL TREATMENT  
- JULY 20/72  
- 250 GAL. PARAN  
- 165 GAL. VERSENE

FIGURE 11

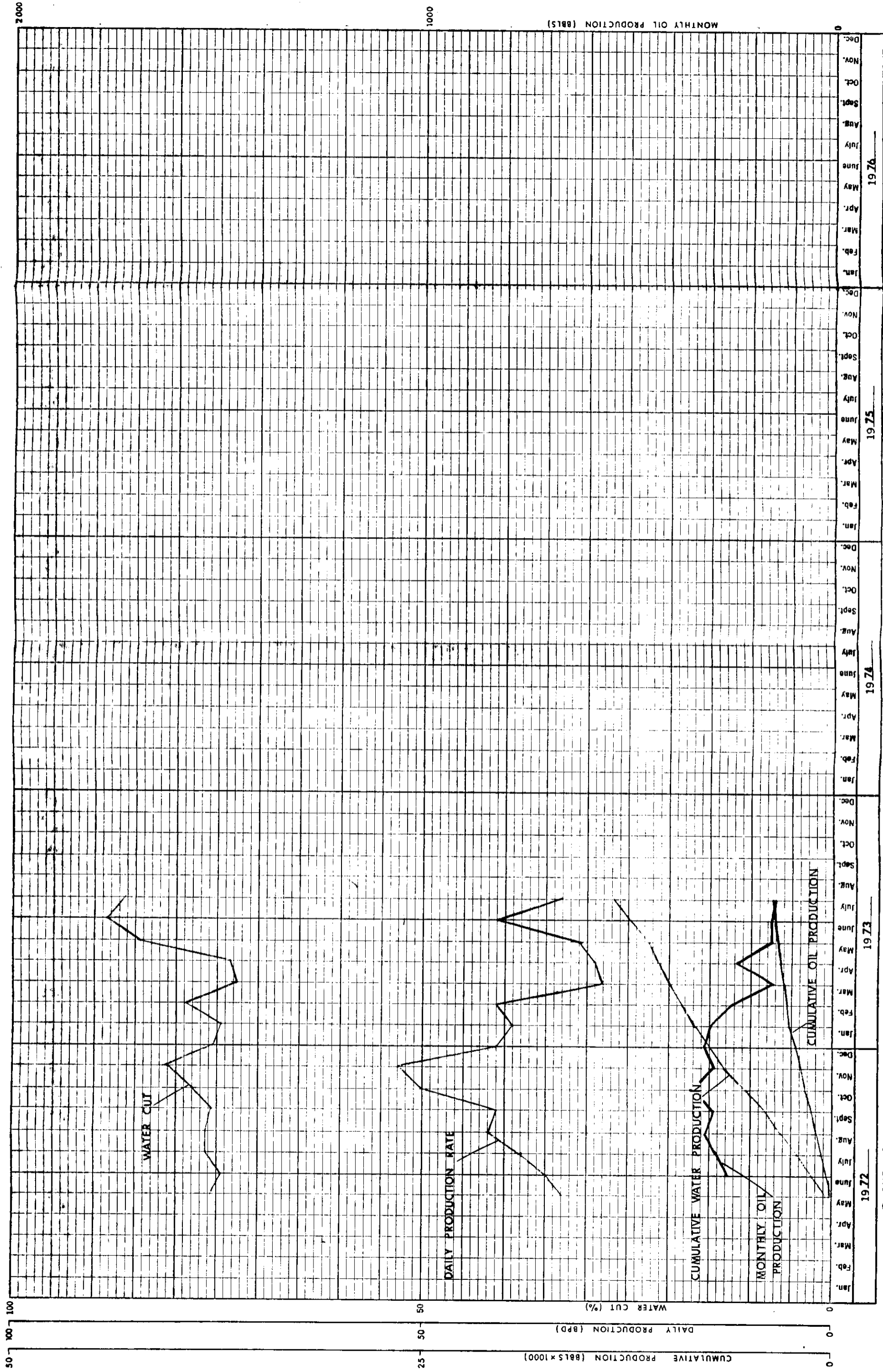
# SAMEDAN ROUTLEDGE PROV. 3-14-9-25WPM.



① CHEMICAL TREATMENT  
 - MAY 18/72  
 - 126 GAL. PARAN  
 - 165 GAL. VERSENE

FIGURE 12

# SAMEDAN ROUTLEDGE 5-12-9-25WPM.

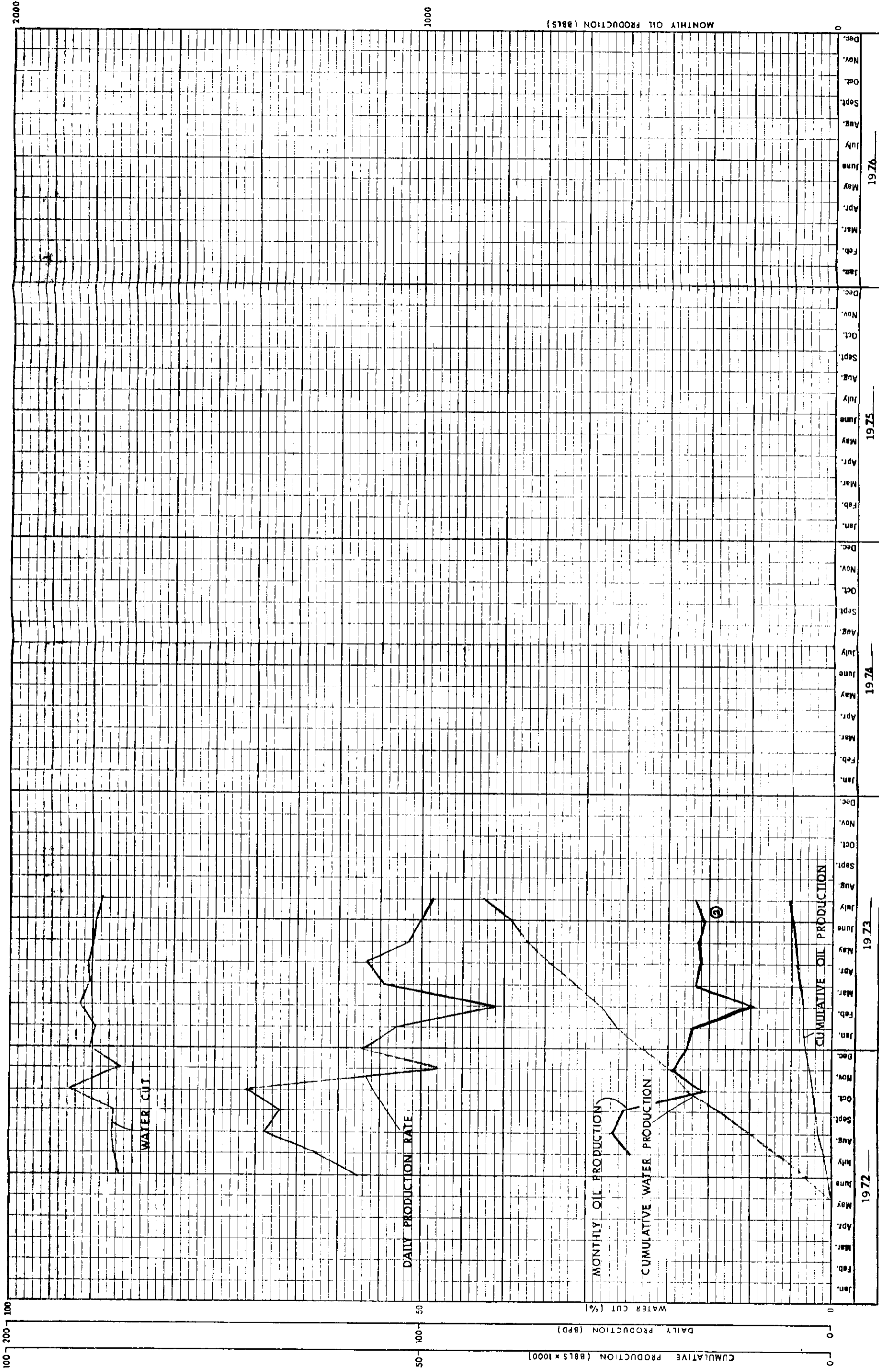


① CHEMICAL TREATMENT

- JUNE 21/72
- 250 GAL. PARAN
- 165 GAL. VERSENE

FIGURE 13

# SAMEDAN ROUTLEDGE 5-13-9-25WPM.



① CHEMICAL TREATMENT

- MAY 18/72
- 126 GAL. PARAN
- 165 GAL. VERSENE

② PUMP CHANGE

- JULY 7/73

FIGURE 14

# SAMEDAN ROUTLEDGE 1-10-9-25WPM.

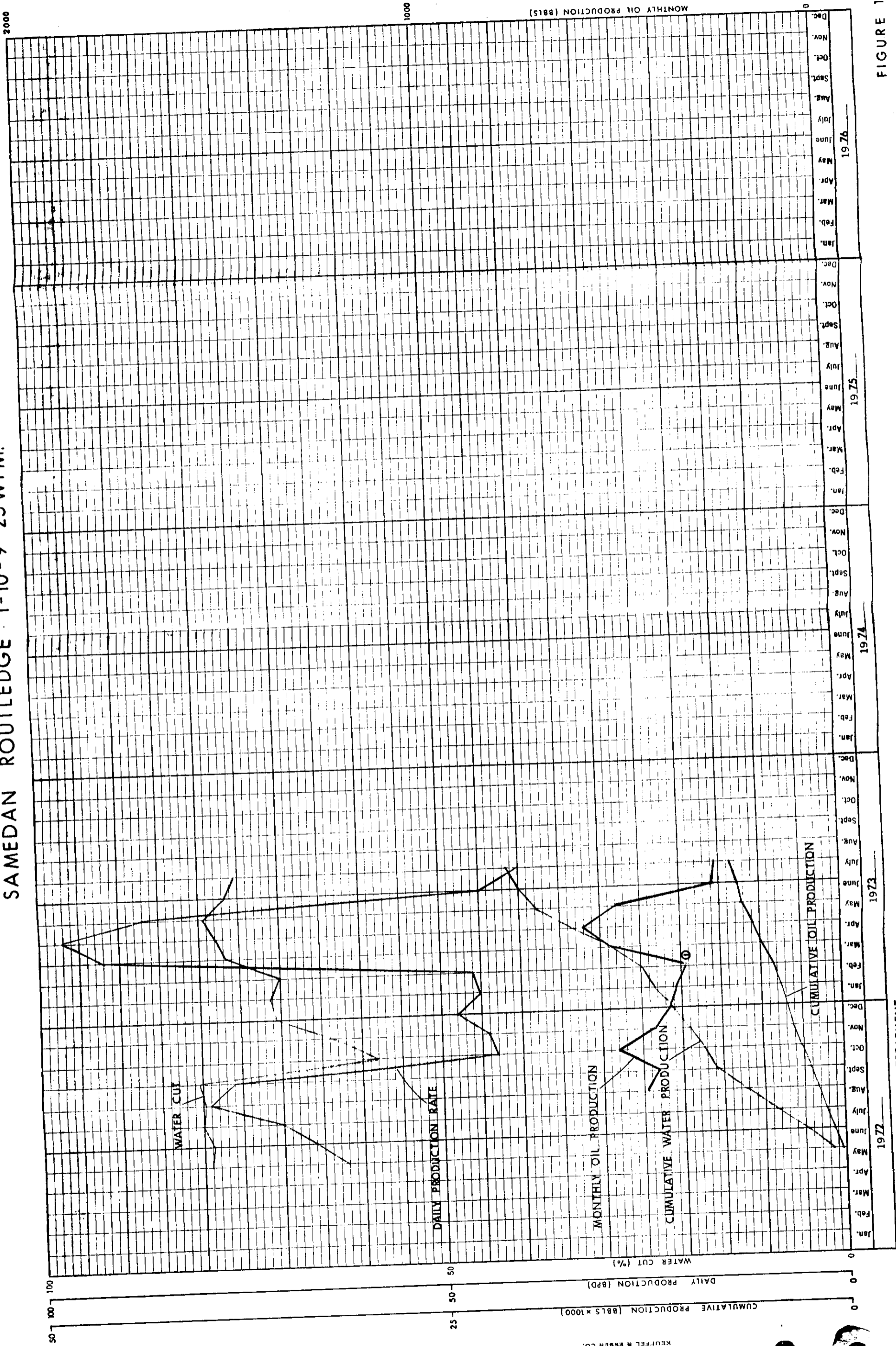
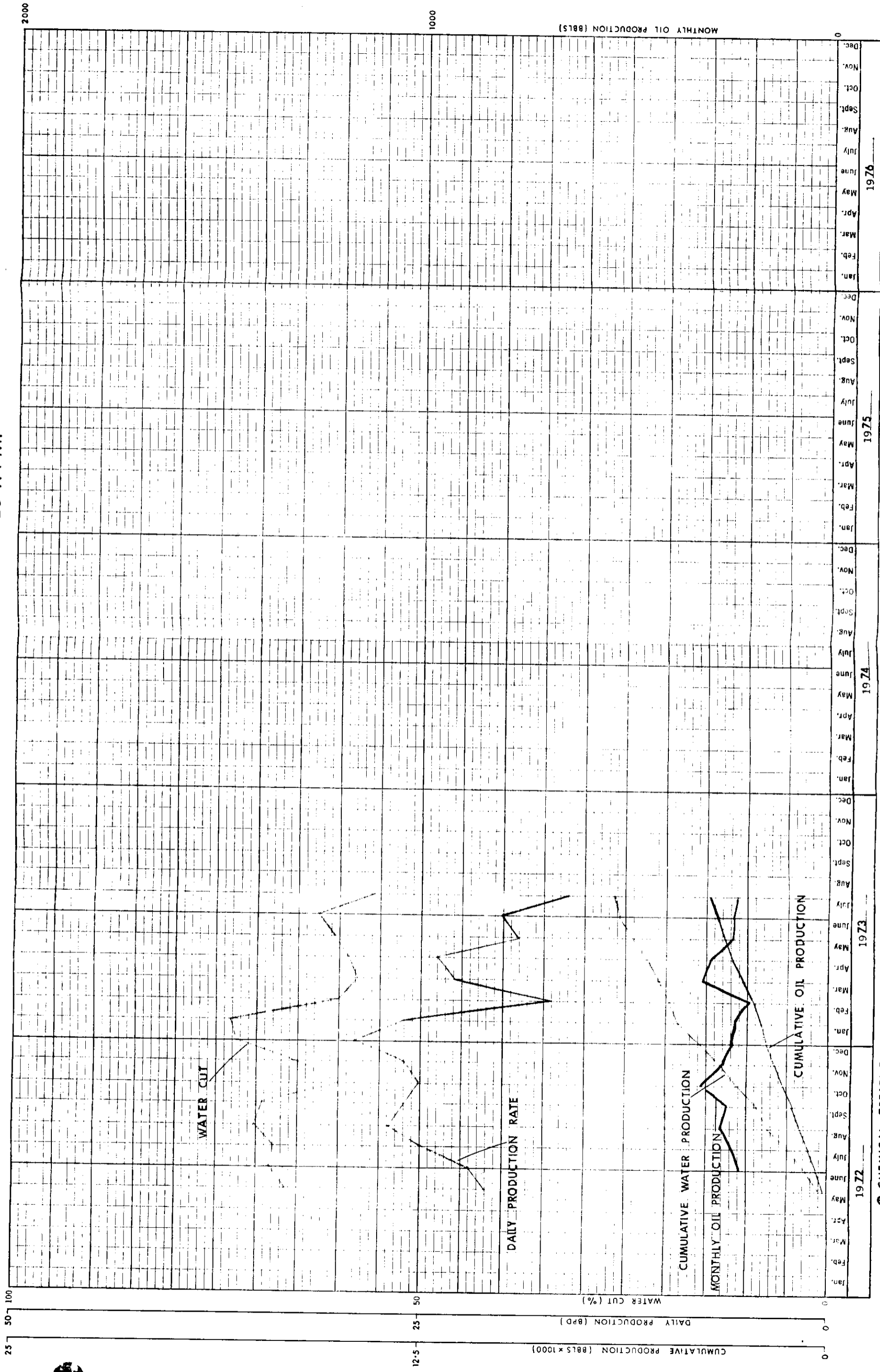


FIGURE 15

CHEMICAL TREATMENT  
 - MARCH 5/73  
 - 2.5 BBLs T328

# SAMEDAN ROUTLEDGE 8-10-9-25 WPM.



① CHEMICAL TREATMENT  
 - JUNE 6/72  
 - 250 GAL. PARAN  
 - 165 GAL. VERSENE

FIGURE 16

# SAMEDAN ROUTLEDGE 9-10-9-25WPM.

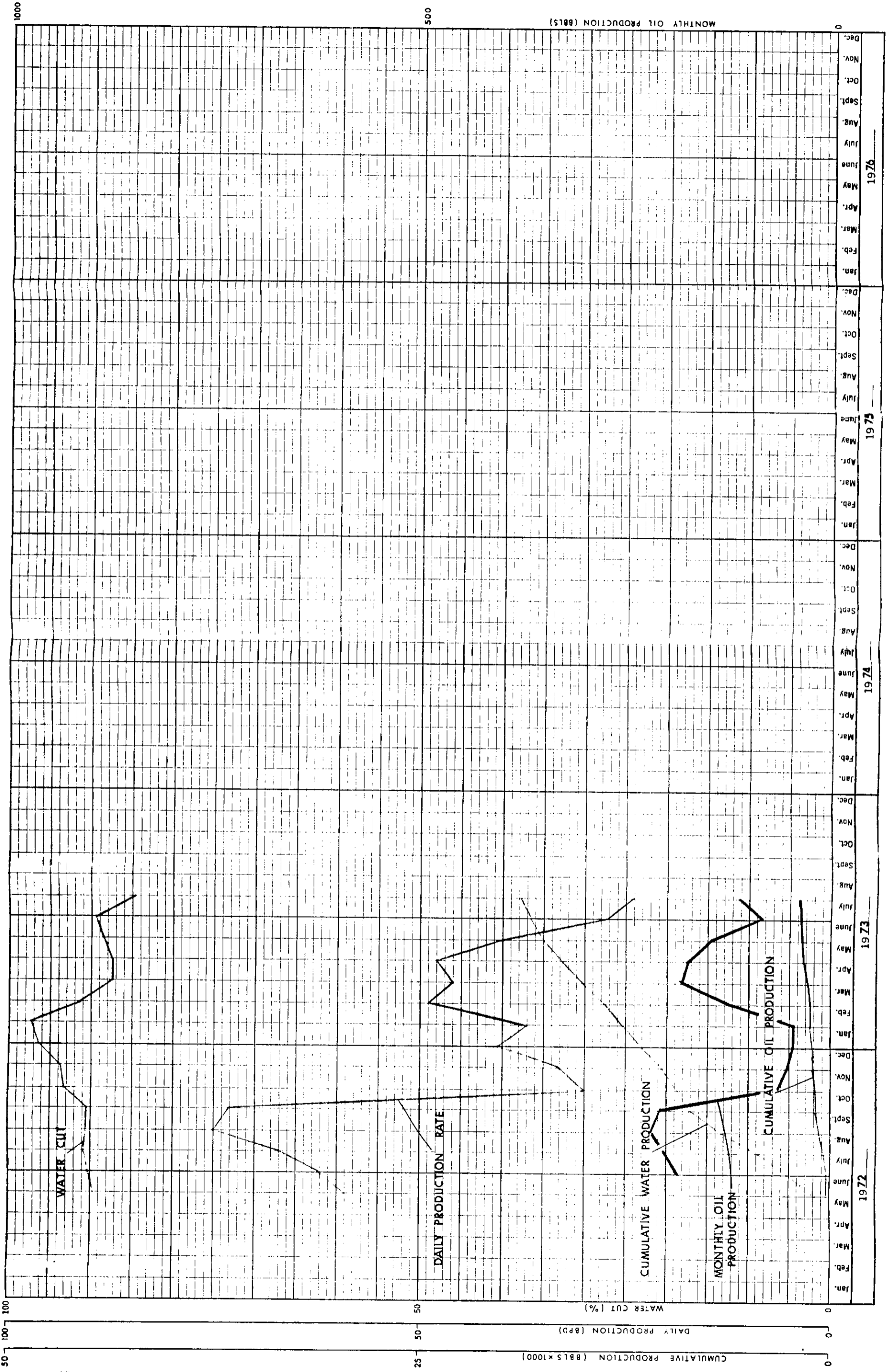
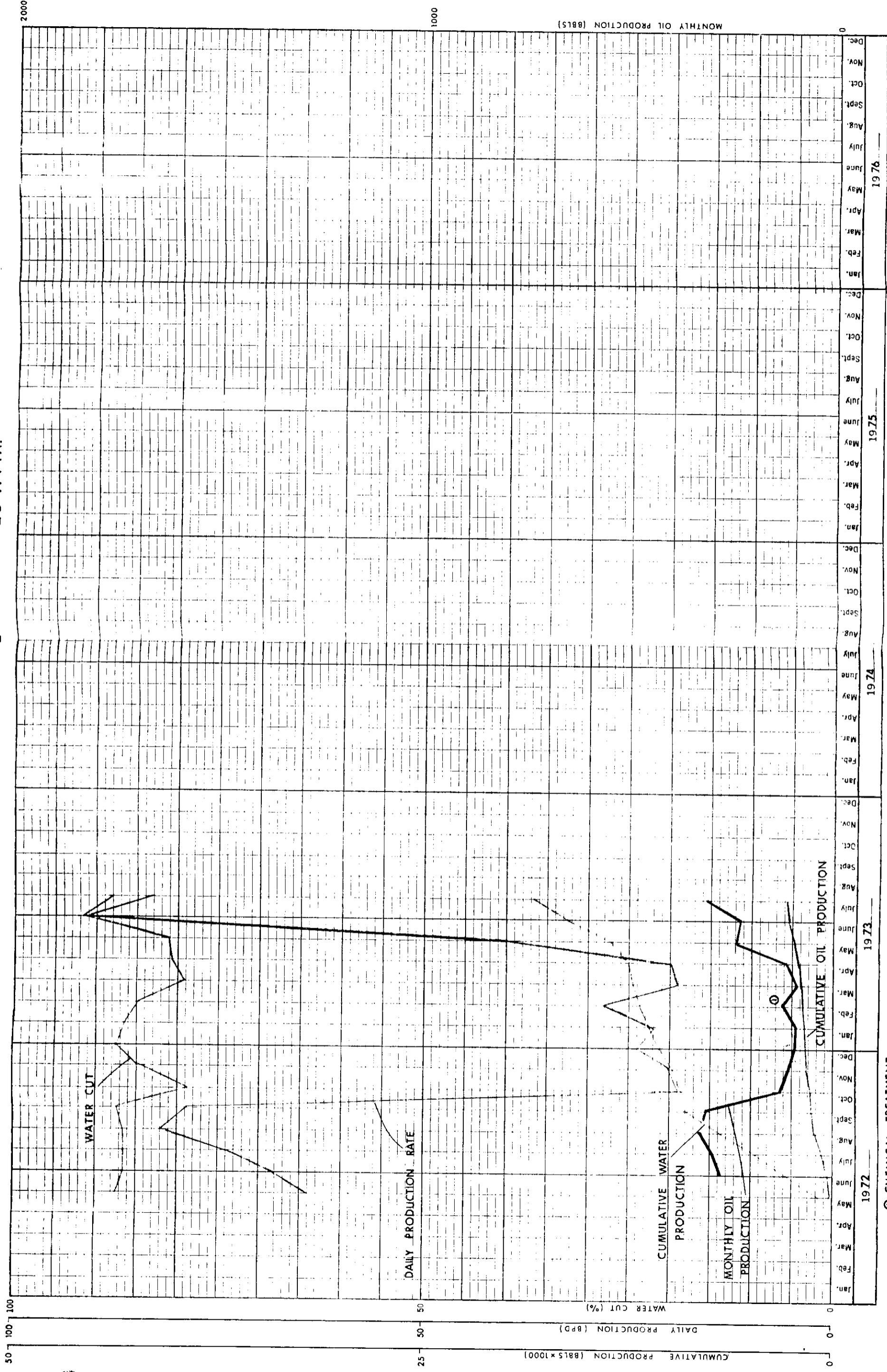


FIGURE 17

# SAMEDAN ROUTLEDGE 1-14-9-25WPM.



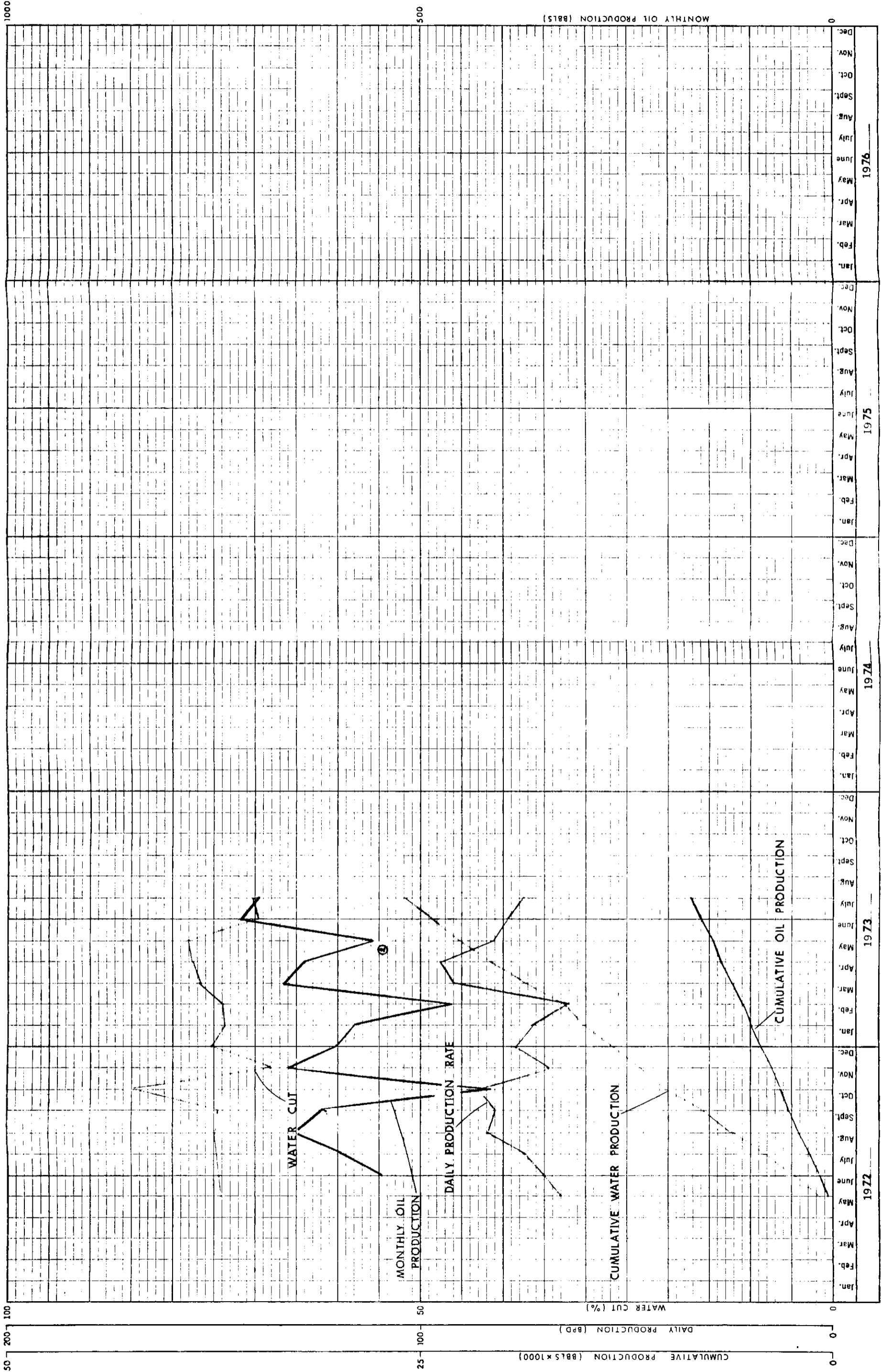
© CHEMICAL TREATMENT

- MARCH 23/73

- 2 BBLS T 328

FIGURE 18

SAMEDAN ROUTLEDGE 2-14-9-25WPM.



① CHEMICAL TREATMENT

-MAY 18/72  
-126 GAL. PARAN  
-165 GAL. VERSENE

② PUMP CHANGE

-MAY 23/73

FIGURE 19

SAMEDAN ROUTLEDGE 7-14-9-25 WPM.

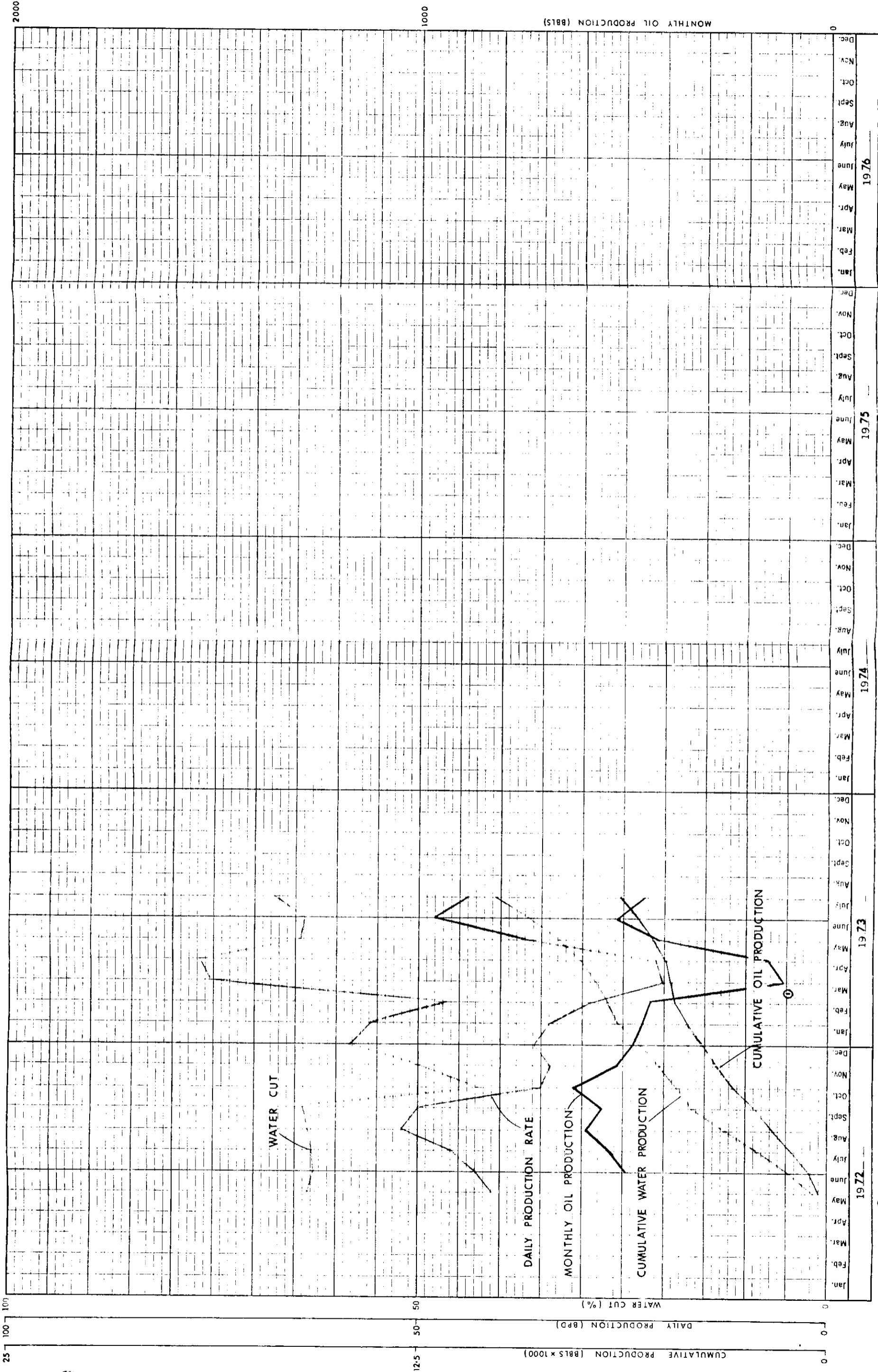
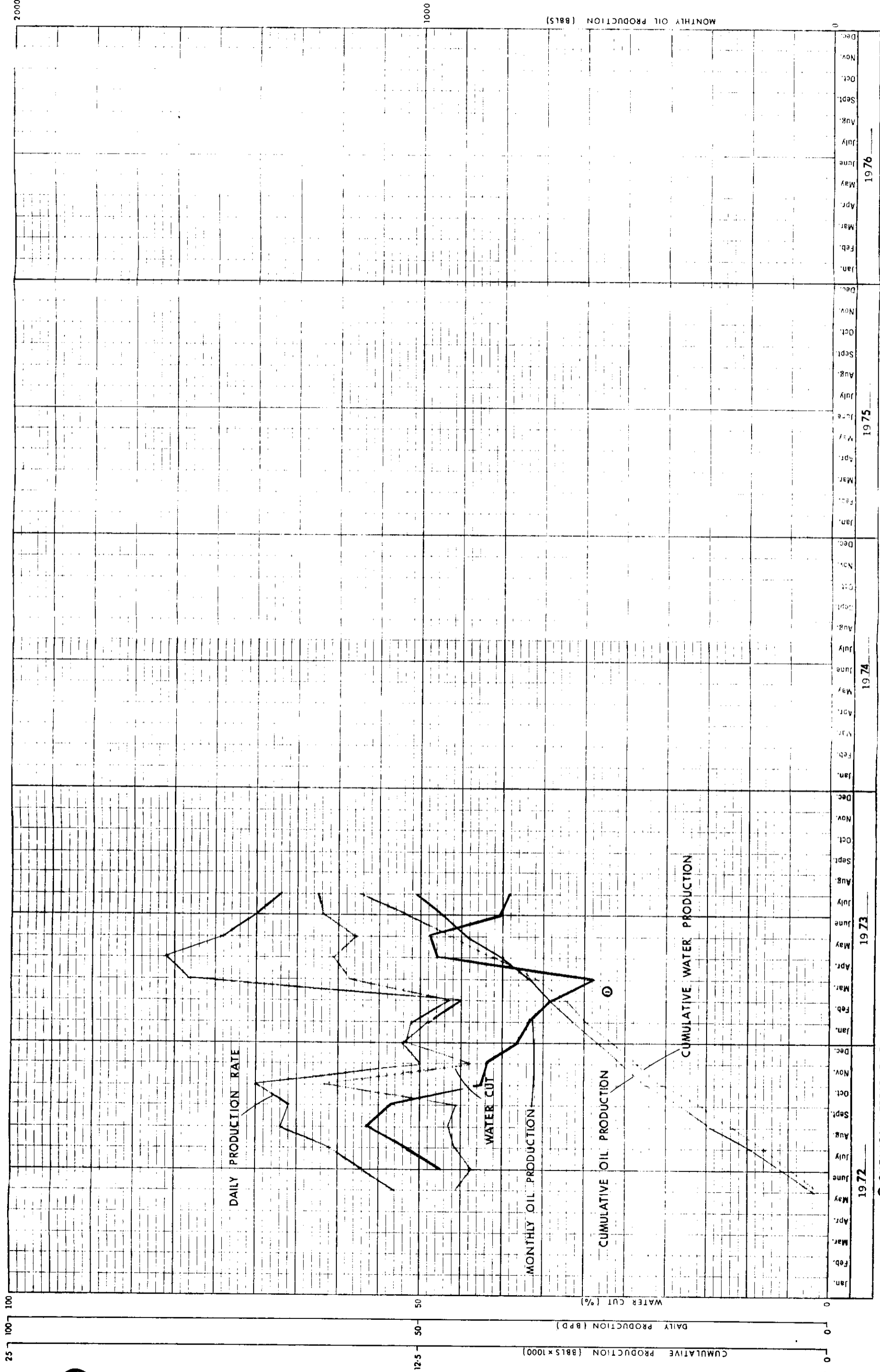


FIGURE 20

○ CHEMICAL TREATMENT  
-MARCH 23/73  
-2 BBLs T 328

SAMEDAN ROUTLEDGE 8-14-9-25 WPM.



Q CHEMICAL TREATMENT

- MARCH 5/73  
- 2 BBLs. T 328

FIGURE 21

SAMEDAN ROUTLEDGE 9-14-9-25 WPM.

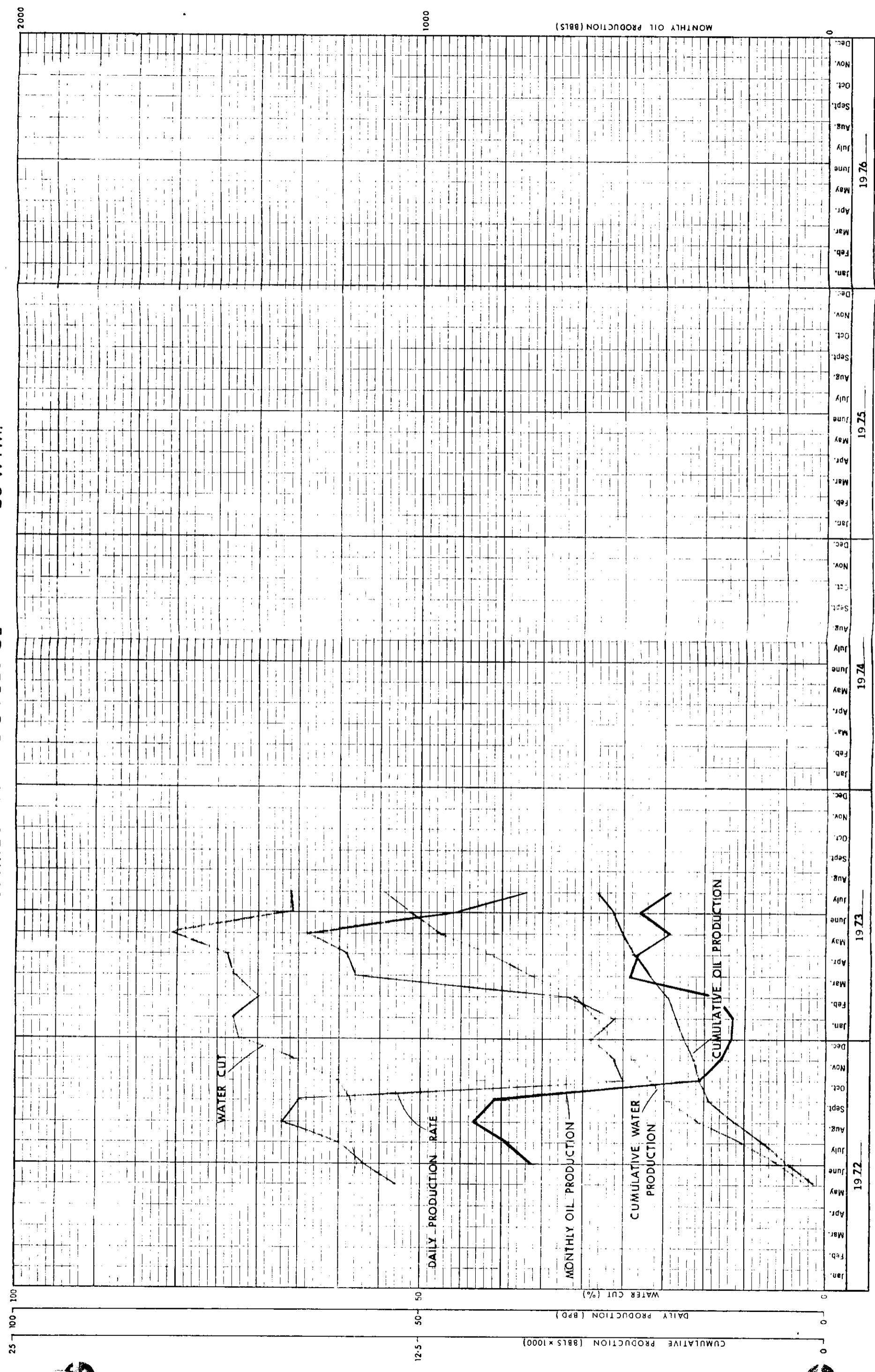
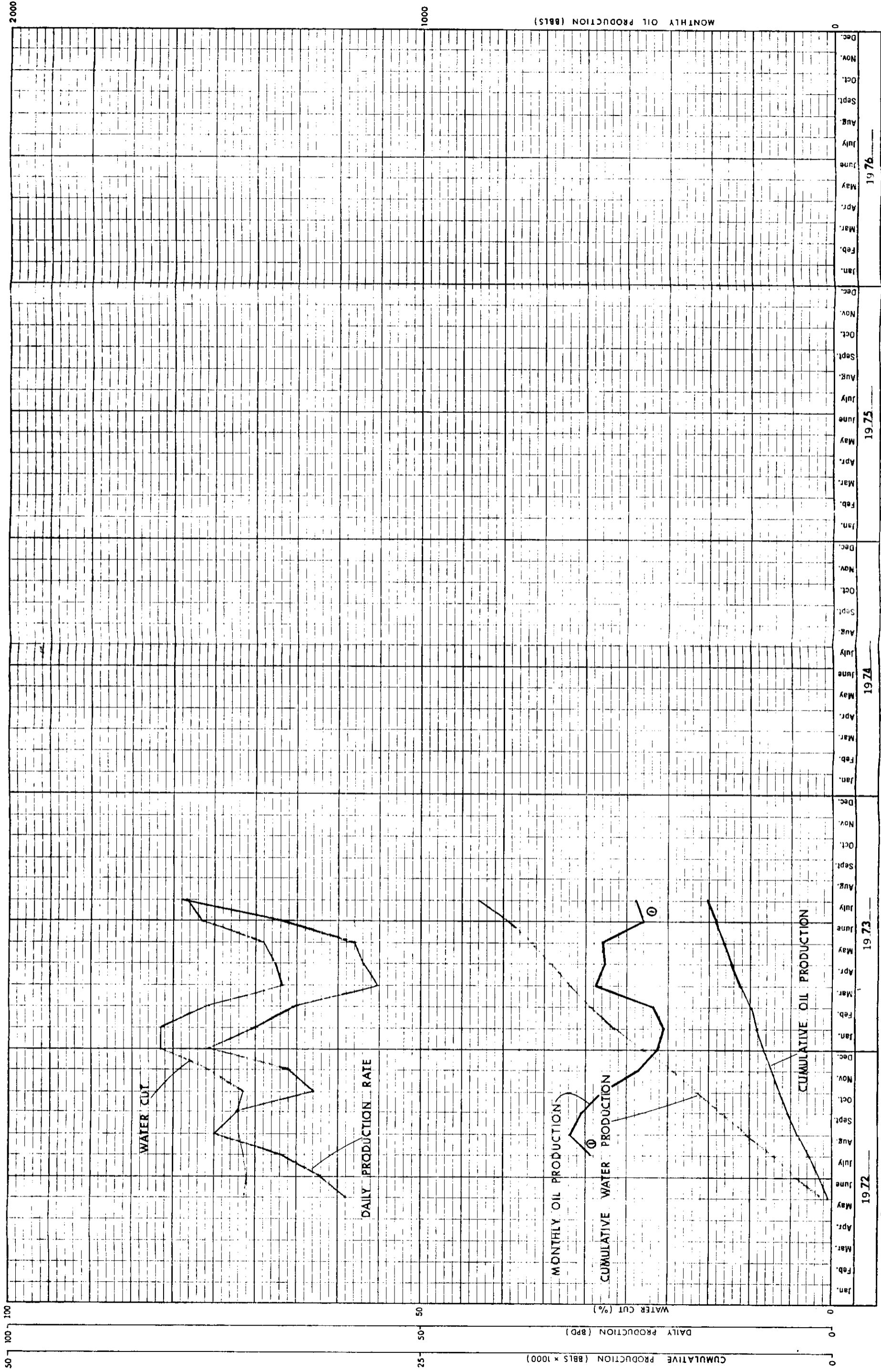


FIGURE 22



① CHEMICAL TREATMENT

- AUG. 23/72  
- 126 GAL. PARAN  
- 165 GAL. VERSENE