



CHEVRON STANDARD LIMITED

MEDICAL ARTS BUILDING, 329A - 6TH AVENUE S.W., CALGARY, ALBERTA.

March 7, 1966

acknowledged

Daly Waterflood Progress Report
December 31, 1965

Manitoba Department of Mines and Natural Resources
Room 911
Norquay Building
401 York Avenue
Winnipeg 1, Manitoba

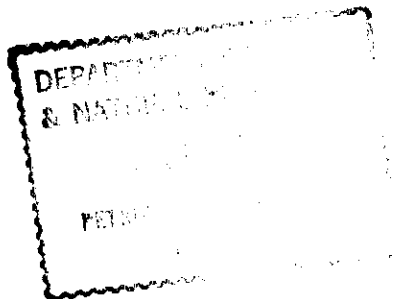
Gentlemen:

Enclosed herewith please find two (2) copies of the "Daly Waterflood Progress Report, December 31, 1965".

Yours very truly,

J. G. TROWELL
Division Superintendent
Producing Department
Calgary Division

SNB/ew
Encl.



Mar 9



PROVINCE OF MANITOBA

Whitehall 6-7162

F. S. GAMEY
RESERVOIR GEOLOGIST

**DEPARTMENT OF MINES AND NATURAL RESOURCES
MINES BRANCH**

PETROLEUM ENGINEERING DIVISION
911 NORQUAY BUILDING,
401 YORK AVENUE, WINNIPEG 1

F.S. Gamey
Reservoir Geologist

August 19th, 1965

Chevron Standard Limited,
Medical Arts Building,
329A - 6th Avenue, S.W.,
CALGARY, Alberta.

Attention: J.G. Trowell

Dear Sir:

Re: Daly Waterflood.

This acknowledges, with thanks, receipt of the following items covering the above named well:

(2) Daly Waterflood Progress Report,
June 30th, 1965.

Yours very truly,

F. S. Gamey,
Reservoir Geologist.

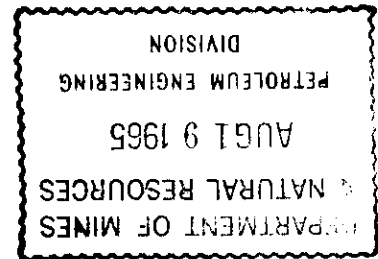
FSG/ js

Adm. Calgary



CHEVRON STANDARD LIMITED

MEDICAL ARTS BUILDING, 329A - 6TH AVENUE S.W., CALGARY, ALBERTA.



August 17, 1965

Department of Mines and Natural Resources
Mines Branch
Petroleum Engineering Division
911 Norquay Building
401 York Avenue
Winnipeg 1, Manitoba

Attention: Mr. F. S. Gamey
Reservoir Geologist

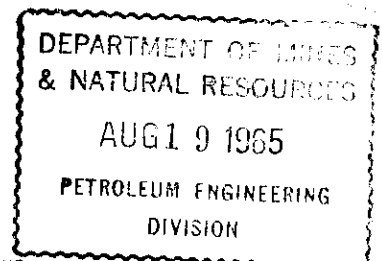
Dear Sir:

Enclosed please find two copies of the Daly Waterflood Progress Report, June 30, 1965.

Yours very truly,

for J. G. TROWELL
Division Superintendent
Producing Department
Calgary Division

PP/cb
Encl.



August 9, 1963

The California Standard Company,
Box 100,
VIRDEN, Manitoba.

Attention: Mr. C. F. Kirkvold,
District Superintendent

Dear Sir:

At your convenience, would appreciate 2 copies of Figure II which were omitted from our copies of the Daly Water Flood Progress Report, June 30, 1963.

Yours very truly,



M. J. Gobert,
Senior Petroleum Engineer.

MJG/h

August 6, 1963.

The California Standard Company,
Box 100,
Virden, Manitoba.

Attention: Mr. C. F. Kirkvold,
District Superintendent

Dear Sir:

This acknowledges, with thanks, receipt of two copies
of the Daly Water Flood Progress Report, June 30, 1963.

Yours very truly,



M. J. Gobert,
Senior Petroleum Engineer.

MJG/h

THE CALIFORNIA STANDARD COMPANY

DISTRICT OFFICE
VIRIDEN, MAN.


July 26, 1963.

Department of Mines & Natural Resources,
Mines Branch,
Petroleum Engineering Division,
Box 42,
Legislative Building,
WINNIPEG 1, Manitoba.

Dear Sir:

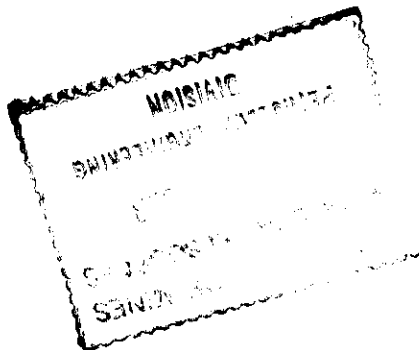
Please find attached two copies of the Daly Water Flood
Progress Report, June 30, 1963.

Yours very truly,
The California Standard Company,

for 
C. F. KIRKVOLD,
District Superintendent.

PP/ck

Attach.





THE CALIFORNIA STANDARD COMPANY

7TH AVENUE & RAGLAN STREET • VIRDEN, MANITOBA

MAILING ADDRESS: P.O. BOX 100

April 26, 1963.

File: 351.1.

Mr. F.S. Gamey,
Reservoir Geologist,
Department of Mines & Natural Resources,
Legislative Building,
WINNIPEG 1, Manitoba.

Dear Sir:

Re: Initiation of Daly Waterflood

Daly 10-1A-10-28 was the first well placed on continuous injection. This well was put on injection on July 14, 1953. Therefore the date on which the Daly Waterflood started would be July 14, 1953.

In April of 1953 Daly 10-1A-10-28 was put on an injectivity test using a Dowell pump truck but this can not be considered as going on continuous injection. The purpose of this test was to determine how much water the injection wells would take and which part of the Grinnell Zone would take the water.

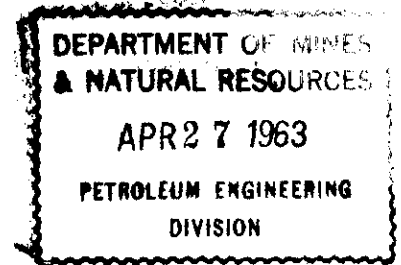
Yours very truly,

J. G. Trowell

J. G. TROWELL,
District Production Superintendent.

RAP/jp

*We have gone to look down that
May this date of initiation
J.G.*



April 26, 1963.

P.I.T.S. Unitization Subcommittee,
Bentall Building,
444 - 7th Avenue S.W.,
Calgary, Alta.

Attention: Mr. C. J. Christensen

Re: Your file: FWJ-340-932
Daly Water Flooding Unit - Manitoba

Dear Sir:

Our records indicate that the pertinent data concerning the Daly Water Flood commences with the "Pilot Flood" listing the following injection wells and "on injection" dates:

<u>Injection Well</u>	<u>Date on Injection</u>
2 - 12	July 11/53
* 10 - 1A	July 14/53
14 - 1	July 17/53
16 - 1	July 20/53

* Permission was granted in April, 1953, for California Standard to rework 10-1A and carry out injectivity tests. This may account for the company date of 5-15-53.

However, the progress reports start with injection well #2-12 on July 11, 1953, (7-11-53) and we consider this to be the effective date of operations.

Yours very truly,


F. S. Gamey,
RESERVOIR GEOLOGIST.

FSG/h

PAN AMERICAN PETROLEUM CORPORATION

BENTALL BUILDING
444 - 7TH AVENUE S.W.
CALGARY, ALBERTA, CANADA.

C.J. CHRISTENSEN,
DIVISION PRODUCTION SUPERINTENDENT.

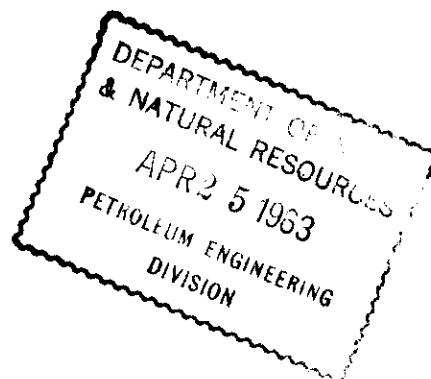
April 24, 1963.

File: FWJ-340-932

Re: Statistical Summary
of Canadian
Producing Units

Province of Manitoba,
Department of Mines and Natural Resources,
Mines Branch,
911 Norquay Building,
401 York Avenue,
WINNIPEG, Manitoba.

Attention: Mr. F. S. Gamey,
Reservoir Geologist.



Gentlemen:

This has reference to your letter of December 5, 1962, which forwarded a list of Units operating in Manitoba as of December 5, 1962.

The P.I.T.S. Unitization Subcommittee in preparing statistics on Western Canadian Producing Units and in comparing dates supplied by the Unit Operator and that supplied by your Department noted the following difference:

	<u>Effective Date</u>	
	<u>Company</u>	<u>Government</u>
Daly Water Flooding Unit	5-15-53	7- -53 ✓ (7-11-53)

We would appreciate any comments you may have on these differences and are attaching for your file a summary of the statistics which were compiled.

Yours very truly,

C. J. Christensen
TC

C. J. Christensen, Chairman,
P.I.T.S. Unitization Subcommittee.

Attach.

LIST OF WESTERN CANADIAN PRODUCING UNITS

April 10, 1963

<u>Effective Date</u>	<u>Unit Name</u>	<u>Unit Operator</u>
<u>ALBERTA</u>		
6-13-45	Jumping Pound Unit	Shell Oil Company of Canada, Limited
5- 1-53 (1)	Golden Spike South D-3	Imperial Oil Limited
1- 1-55	Westeros D-3 Unit	The British American Oil Company Limited
12-21-55 (2)	Acheson North D-2	The California Standard Company
12- 1-56	Pincher Creek Madison Limestone Unit	The British American Oil Company Limited
3- 1-57	Stettler D-2 Unit	The British American Oil Company Limited
7-17-57 (3)	Okotoks Unit	Devon-Palmer Oils Ltd.
9- 1-57	Joffre Viking Sand Unit	The California Standard Company
9- 1-57	Joffre Viking Sand Unit	Great Plains Development Company of Canada, Ltd.
9- 1-57	Joffre Viking Sand Unit No. 1	Imperial Oil Limited
10- 1-57	Wizard Lake D-3 Unit	Texaco Exploration Company
2- 1-58	Pouce Coupe Cadotte Gas Unit No. 1	Pacific Petroleums Ltd.
2- 1-58 (4)	Sturgeon Lake Unit	Amerada Petroleum Corporation
3- 1-58 (5)	Provost Viking Gas Unit	Provo Gas Producers Limited
11- 7-58 (6)	Oyen Viking Sand Gas Unit	Hudson's Bay Oil and Gas Company Limited
11- 8-58 (7)	Cessford Gas Unit No. 1	Hudson's Bay Oil and Gas Company Limited
6- 1-59 (8)	Turner Valley Unit No. 3	Western Decalta Petroleum Limited
6- 1-59	Bentley Viking Sand Unit	The California Standard Company
7-18-59	Okotoks Unit (South)	Christie, Mitchell & Mitchell Co.
8- 1-59 (9)	Bindloss Unit No. 1	Canadian Export Gas & Oil Ltd.
8- 1-59	Campbell-Namao	Canadian Delhi Oil Ltd.
9- 1-59	North Pembina Cardium Unit No. 1	Socony Mobil Oil of Canada, Ltd.
11- 1-59 (10)	Medicine Hat-Roseglen Gas Unit	Canadian Delhi Oil Ltd.
11- 1-59 (11)	Pembina Cardium Unit No. 5	Texaco Canada Limited
12- 1-59	Nevis Unit No. 1	The California Standard Company
12- 1-59	Pembina Cardium Unit No. 2	Shell Oil Company of Canada, Limited
1- 1-60	Carstairs Elkton Unit	Home Oil Company Limited
1- 1-60	Pembina Cardium Unit No. 3	Western Decalta Petroleum Limited
1- 1-60	Pembina Cardium Unit No. 4	Pan American Petroleum Corporation
2-29-60 (12)	Alexander Indian Reserve Basal Quartz Gas Field	Mid-Western Industrial Gas Ltd.
7- 1-60	Pembina Cardium Unit No. 13	Whitehall Canadian Oils Ltd.
7- 1-60	Turner Valley Unit No. 4	Western Decalta Petroleum Limited
7- 1-60	Turner Valley Unit No. 5	Royalite Oil Company, Limited
7- 1-60	Turner Valley Unit No. 6 (TVU 6)	Home Oil Company Limited
8- 1-60	Pembina Cardium Unit No. 20	Western Decalta Petroleum Limited

<u>Effective Date</u>	<u>Unit Name</u>	<u>Unit Operator</u>
<u>ALBERTA (continued)</u>		
10- 1-60	Leduc Woodbend D-2	Imperial Oil Limited
10- 1-60	Leduc Woodbend D-3	Imperial Oil Limited
11- 1-60 (13)	Innisfail Leduc Reef Unit	Canadian Oil Companies, Limited
11- 1-60	Morleyville Unit	Shell Oil Company of Canada, Limited
12- 1-60	Harmattan-Elkton Unit No. 1	Canadian Superior Oil Ltd.
12- 1-60 (14)	Pembina Cardium Unit No. 31	Western Decalta Petroleum Limited
12- 1-60	Westerose South (Dick Lake) Leduc Unit	The British American Oil Company Limited
1- 1-61 (15)	Pembina Cardium Unit No. 6	Pacific Petroleums Ltd.
1- 1-61	Three Hills Pekisko Unit No. 1	Pan American Petroleum Corporation
2- 1-61	Homeglen Rimbey Leduc Unit No. 1	The California Standard Company
4- 1-61	Clive North Basal Quartz Gas Unit	Imperial Oil Limited
5- 1-61	Pembina Cardium Unit No. 7	Dome Petroleum Limited
7- 1-61 (16)	Provost Viking Gas Unit No. 2	Tenneco Oil Company
8- 1-61	Pembina Cardium Unit No. 14	Whitehall Canadian Oils Ltd.
9- 1-61	Namoo Blaimore "A" Unit	Tidal Petroleum Corporation Ltd.
10- 1-61 (17)	Drumheller Nisku Unit No. 1	Great Plains Development Company of Canada, Ltd.
10- 1-61	Sarcee Unit	Shell Oil Company of Canada, Limited
11- 1-61	Chauvin Main Mannville Unit	Devon-Palmer Oils Ltd.
12- 1-61	Calgary Crossfield Unit No. 1	Jefferson Lake Petrochemicals of Canada Ltd.
12- 1-61	Calgary Elkton Unit No. 1	Jefferson Lake Petrochemicals of Canada Ltd.
12- 1-61 (18)	Wainwright Unit No. 1	Fulton Engineering Ltd.
12-27-61	Crossfield Turner Valley Unit No. 1	Shell Oil Company of Canada, Limited
1- 1-62	Fort Saskatchewan Viking	Mid-Western Industrial Gas Ltd.
1- 1-62	Pembina Cardium Unit No. 8	Mitchell & Associates for Luscar Coals Limited
3-24-62	Windfall D-3 Unit	Canadian Fina Oil Limited
4- 1-62	Acheson Lower Cretaceous Unit No. 1	The California Standard Company
4- 1-62	Pembina Cardium Unit No. 9 (Blue Rapids Area)	Pan American Petroleum Corporation
4- 1-62	Wood River Basal Quartz Unit No. 1	Canadian Export Gas & Oil Ltd.
5- 1-62	Leduc Woodbend D-2 B Pool	Western Decalta Petroleum Limited
8- 1-62	Pembina Cardium Unit No. 10 (Berrymoor Cardium Unit)	Imperial Oil Limited
8- 1-62	Turner Valley Unit No. 7 (Gas Cap)	Royalite Oil Company, Limited
8- 1-62	Willesden Green Cardium Unit I	Amerada Petroleum Corporation
9- 1-62	Harmattan East Unit No. 1	Shell Oil Company of Canada, Limited
10- 1-62	Pembina Cardium Unit No. 11	Texaco Exploration Company
10- 1-62	South Swan Hills Unit	Pan American Petroleum Corporation
10- 1-62	Wainwright Unit No. 2	Canadian Husky Oil Ltd.
11- 1-62	Judy Creek Beaverhill Lake Unit	Imperial Oil Limited
11- 1-62	Pembina Cardium Unit No. 12 (Lindale Area)	Northern Natural Gas Producing Company
11- 1-62	Wainwright Unit No. 6	James A. Lewis Engineering Co. Ltd.
12- 1-62	Gilby Viking Unit No. 1	The California Standard Company

<u>Effective Date</u>	<u>Unit Name</u>	<u>Unit Operator</u>
<u>SASKATCHEWAN</u>		
3- 1-54	Brock Viking Sand Unit	Canadian Husky Oil Ltd.
7- 1-55	Coleville-Smiley Viking Sand Gas Unit	Imperial Oil Limited
9- 1-55	Dollard	Tidewater Canadian Oil Ltd.
5- 1-56	Instow Unit	Tidewater Canadian Oil Ltd.
8- 1-57	Hoosier Viking Sand Gas Unit	United Canso Oil & Gas Ltd.
10- 1-57	Eastend Unit	Tidewater Canadian Oil Ltd.
10- 1-57 (19)	Rapdan Unit	Tidewater Canadian Oil Ltd.
12- 1-57	Alida Unit	Socony Mobil Oil of Canada, Ltd.
12- 1-57	Success Unit	Socony Mobil Oil of Canada, Ltd.
6- 1-58	Bone Creek Unit	Canadian Delhi Oil Ltd.
7- 1-58	Fosterton Main Unit	Socony Mobil Oil of Canada, Ltd.
7- 1-58	Fosterton Northwest Unit	Socony Mobil Oil of Canada, Ltd.
10- 1-58	Gull Lake North Shaunavon Pool Unit	Socony Mobil Oil of Canada, Ltd.
5- 1-59	Hatton Unit	Saskatchewan Power Corporation
10- 1-59	Cantuar Unit	James A. Lewis Engineering Co. Ltd.
7- 1-60	Success Alpha Unit	Socony Mobil Oil of Canada, Ltd.
10- 1-60	Nottingham North Alida Beds Unit	Socony Mobil Oil of Canada, Ltd.
1- 1-61	West Carnduff Unit	Imperial Oil Limited
7- 1-61 (20)	Steelman Unit No. IA	Imperial Oil Limited
7- 1-61	Steelman Unit No. II	Imperial Oil Limited
7- 1-61	Steelman Unit No. III	The British American Oil Company Limited
7- 1-61	Steelman Unit No. IV	The British American Oil Company Limited
7- 1-61	Steelman Unit No. V	Sun Oil Company
7- 1-61	Steelman Unit No. VI	The British American Oil Company Limited
5- 1-62	The East Carnduff Unit	Royalite Oil Company, Limited
6- 1-62	Steelman Unit No. VII	Sun Oil Company
8- 1-62 (21)	Alameda East Unit	Whitehall Canadian Oils Ltd.
8- 1-62	The Midale Unit	Shell Oil Company of Canada, Limited
9- 1-62	Success Main Unit	Socony Mobil Oil of Canada, Ltd.
12- 1-62	Alameda Central Unit	The British American Oil Company Limited
12- 1-62	Aberfeldy Unit	Canadian Husky Oil Ltd.
<u>MANITOBA</u>		
5-15-53 (22)	Daly Water Flooding Unit	The California Standard Company
8- 1-62	North Virden-Scallion Unit No. 1	The California Standard Company

DATE DISCREPANCIES

<u>Unit</u>	<u>Company</u>	<u>Effective Date</u>	
		<u>Company</u>	<u>Government</u>
(1) Golden Spike South D-3	Imperial Oil Limited	5- 1-53	3- 1-53
(2) Acheson North D-2	The California Standard Company	12-21-55	4- 1-56
(3) Okotoks Unit	Devon-Palmer Oils Ltd.	7-17-57	7-16-57
(4) Sturgeon Lake Unit	Amerada Petroleum Corporation	4- 1-58	2- 1-58
(5) Provost Viking Sand Gas Unit	Provo Gas Producers Limited	8- -57	3- 1-58
(6) Oyen Viking Sand Gas Unit	Hudson's Bay Oil and Gas Company Limited	10- 1-58	11- 7-58
(7) Cessford Gas Unit No. 1	Hudson's Bay Oil and Gas Company Limited	11- 8-58	11- 1-61
(8) Turner Valley Unit No. 3	Western Decalta Petroleum Limited	1- 1-59	6- 1-59
(9) Bindloss Unit No. 1	Canadian Export Gas & Oil Ltd.	8- 1-59	5- 1-60
(10) Medicine Hat-Roseglen Gas Unit	Canadian Delhi Oil Ltd.	11- 1-59	10-29-59
(11) Pembina Cardium Unit No. 5	Texaco Canada Limited	11- -59	3- 1-60
(12) Alexander Indian Reserve Basal Quartz Gas Field	Mid-Western Industrial Gas Ltd.	2-29-60	3- 1-60
(13) Innisfail Leduc Reef Unit	Canadian Oil Companies, Limited	11- 1-60	11- 3-60
(14) Pembina Cardium Unit No. 31	Western Decalta Petroleum Limited	11- 1-60	12- 1-60
(15) Pembina Cardium Unit No. 6	Pacific Petroleums Ltd.	7- 1-60	1- 1-61
(16) Provost Viking Gas Unit No. 2	Tenneco Oil Company	7- 1-61	6- 1-60
(17) Drumheller Nisku Unit No. 1	Great Plains Development Company of Canada, Ltd.	10- 1-61	11- 1-61
(18) Wainwright Unit No. 1	Fulton Engineering Ltd.	1- 1-62	12- 1-61
(19) Rapdan Unit	Tidewater Canadian Oil Ltd.	10- 1-57	11- 1-62
(20) Steelman Unit No. 1A	Imperial Oil Limited	7- 1-61	7- 1-58
(21) Alameda East	Whitehall Canadian Oils Ltd.	8- 1-62	7- 1-62
(22) Daly Water Flooding Unit	The California Standard Company	5-15-53	7- -53

OPERATORS OF WESTERN CANADIAN PRODUCING UNITS

April 10, 1963

Amerada Petroleum Corporation

ALBERTA

Sturgeon Lake Unit
Willesden Green Cardium Unit I

The British American Oil Company Limited

ALBERTA

Pincher Creek Madison Limestone Unit
Stettler D-2 Unit
Westerose D-3 Unit
Westerose South (Dick Lake) Leduc Unit

SASKATCHEWAN

Alameda Central Unit
Steelman Unit No. III
Steelman Unit No. IV
Steelman Unit No. VI

The California Standard Company

ALBERTA

Acheson Lower Cretaceous Unit No. 1
Acheson North D-2 Unit
Bentley Viking Sand Unit
Gilby Viking Unit No. 1
Homeglen Rimbey Leduc Unit No. 1
Joffre Viking Sand Unit
Nevis Unit No. 1

MANITOBA

Daly Water Flooding Unit
North Virden-Scallion Unit No. 1

Canadian Delhi Oil Ltd.

ALBERTA

Campbell-Namao
Medicine Hat - Roseglen Gas Unit

SASKATCHEWAN

Bone Creek Unit

Canadian Export Gas & Oil Ltd.

ALBERTA

Bindloss Unit No. 1
Wood River Basal Quartz Unit No. 1

Canadian Fina Oil Limited

ALBERTA

Windfall D-3 Unit

Canadian Husky Oil Ltd.

ALBERTA

Wainwright Unit No. 2

SASKATCHEWAN

Aberfeldy Unit
Brock Viking Sand Gas Unit

Canadian Oil Companies, Limited	<u>ALBERTA</u> Innisfail Leduc Reef Unit
Canadian Superior Oil Ltd.	<u>ALBERTA</u> Harmattan-Elkton Unit No. 1
Christie, Mitchell & Mitchell Co.	<u>ALBERTA</u> Okotoks Unit (South)
Devon-Palmer Oils Ltd.	<u>ALBERTA</u> Chauvin Main Mannville Unit Okotoks Unit
Dome Petroleum Limited	<u>ALBERTA</u> Pembina Cardium Unit No. 7
Fulton Engineering Ltd.	<u>ALBERTA</u> Wainwright Unit No. 1
Great Plains Development Company of Canada, Ltd.	<u>ALBERTA</u> Drumheller Nisku Unit No. 1 Joffre Viking Sand Unit
Home Oil Company Limited	<u>ALBERTA</u> Carstairs Elkton Unit Turner Valley Unit No. 6 (TVU 6)
Hudson's Bay Oil and Gas Company Limited	<u>ALBERTA</u> Cessford Gas Unit No. 1 Oyen Viking Sand Gas Unit
Imperial Oil Limited	<u>ALBERTA</u> Pembina Cardium Unit No. 10 (Berrymoor Cardium Unit) Clive North Basal Quartz Gas Unit Golden Spike South D-3 Joffre Viking Sand Unit No. 1 Judy Creek Beaverhill Lake Unit Leduc Woodbend D-2 Leduc Woodbend D-3 <u>SASKATCHEWAN</u> West Carnduff Unit Coleville-Smiley Viking Sand Gas Unit Steelman Unit No. IA Steelman Unit No. II

Jefferson Lake Petrochemicals of
Canada Ltd.

ALBERTA
Calgary Crossfield Unit No. 1
Calgary Elkton Unit No. 1

James A. Lewis Engineering Co. Ltd.

ALBERTA
Wainwright Unit No. 6

SASKATCHEWAN
Cantuar Unit

Mid-Western Industrial Gas Ltd.

ALBERTA
Alexander Indian Reserve Basal Quartz
Gas Field
Fort Saskatchewan Viking

Mitchell & Associates Ltd. for Luscar
Coals Limited

ALBERTA
Pembina Cardium Unit No. 8

Northern Natural Gas Producing Company

ALBERTA
Pembina Cardium Unit No. 12 (Lindale Area)

Pacific Petroleum Ltd.

ALBERTA
Pembina Cardium Unit No. 6
Pouce Coupe Cadotte Gas Unit No. 1

Pan American Petroleum Corporation

ALBERTA
Pembina Cardium Unit No. 4
Pembina Cardium Unit No. 9 (Blue Rapids Area)
South Swan Hills Unit
Three Hills Pekisko Unit No. 1

Provo Gas Producers Limited

ALBERTA
Provost Viking Sand Gas Unit

Royalite Oil Company, Limited

ALBERTA
Turner Valley Unit No. 5
Turner Valley Unit No. 7 (Gas Cap)

SASKATCHEWAN
The East Carnduff Unit

Saskatchewan Power Corporation

SASKATCHEWAN
Hatton Unit

Shell Oil Company of Canada, Limited

ALBERTA

Crossfield Turner Valley Unit No. 1
Harmattan East Unit No. 1
Jumping Pound Unit
Morleyville Unit
Pembina Cardium Unit No. 2
Sarcee Unit

SASKATCHEWAN

The Midale Unit

Socony Mobil Oil of Canada, Ltd.

ALBERTA

North Pembina Cardium Unit No. 1

SASKATCHEWAN

Alida Unit
Fosterton Main Unit
Fosterton Northwest Unit
Gull Lake North Shaunavon Pool Unit
Nottingham North Alida Beds Unit
Success Alpha Unit
Success Main Unit
Success Unit

Sun Oil Company

SASKATCHEWAN

Steelman Unit No. V
Steelman Unit No. VII

Tenneco Oil Company

ALBERTA

Provost Viking Gas Unit No. 2

Texaco Canada Limited

ALBERTA

Pembina Cardium Unit No. 5

Texaco Exploration Company

ALBERTA

Pembina Cardium Unit No. 11
Wizard Lake D-3 Unit

Tidal Petroleum Corporation Ltd.

ALBERTA

Namoo Blairmore "A" Unit

Tidewater Canadian Oil Ltd.

SASKATCHEWAN

Dollard
Eastend Unit
Instow Unit
Rapdan Unit

United Canso Oil & Gas Ltd.

SASKATCHEWAN

Hoosier Viking Sand Gas Unit

Western Decalta Petroleum Limited

ALBERTA

Leduc Woodbend D-2 B Pool

Pembina Cardium Unit No. 3

Pembina Cardium Unit No. 20

Pembina Cardium Unit No. 31

Turner Valley Unit No. 3

Turner Valley Unit No. 4

Whitehall Canadian Oils Ltd.

ALBERTA

Pembina Cardium Unit No. 13

Pembina Cardium Unit No. 14

SASKATCHEWAN

Alameda East Unit

LIST OF WESTERN CANADIAN PRODUCING UNITS

April 10, 1963

<u>Unit Name</u>	<u>Effective Date</u>	<u>Unit Operator</u>
<u>ALBERTA</u>		
Acheson Lower Cretaceous Unit No. 1	4- 1-62	The California Standard Company
Acheson North D-2	12-21-55	The California Standard Company
Alexander Indian Reserve Basal Quartz Gas Field	2-29-60	Mid-Western Industrial Gas Ltd.
Bentley Viking Sand Unit	6- 1-59	The California Standard Company
Bindloss Unit No. 1	8- 1-59	Canadian Export Gas & Oil Ltd.
Calgary Crossfield Unit No. 1	12- 1-61	Jefferson Lake Petrochemicals of Canada Ltd.
Calgary Elkton Unit No. 1	12- 1-61	Jefferson Lake Petrochemicals of Canada Ltd.
Campbell-Namoo	8- 1-59	Canadian Delhi Oil Ltd.
Carstairs Elkton Unit	1- 1-60	Home Oil Company Limited
Cessford Gas Unit No. 1	11- 8-58	Hudson's Bay Oil and Gas Company Limited
Chauvin Main Mannville Unit	11- 1-61	Devon-Palmer Oils Ltd.
Clive North Basal Quartz Gas Unit	4- 1-61	Imperial Oil Limited
Crossfield Turner Valley Unit No. 1	12-27-61	Shell Oil Company of Canada, Limited
Drumheller Nisku Unit No. 1	10- 1-61	Great Plains Development Company of Canada, Ltd.
Fort Saskatchewan Viking	1- 1-62	Mid-Western Industrial Gas Ltd.
Gilby Viking Unit No. 1	12- 1-62	The California Standard Company
Golden Spike South D-3	5- 1-53	Imperial Oil Limited
Harmattan East Unit No. 1	9- 1-62	Shell Oil Company of Canada, Limited
Harmattan-Elkton Unit No. 1	12- 1-60	Canadian Superior Oil Ltd.
Homeglen Rimbey Leduc Unit No. 1	2- 1-61	The California Standard Company
Innisfail Leduc Reef Unit	11- 1-60	Canadian Oil Companies, Limited
Joffre Viking Sand Unit	9- 1-57	The California Standard Company
Joffre Viking Sand Unit	9- 1-57	Great Plains Development Company of Canada, Ltd.
Joffre Viking Sand Unit No. 1	9- 1-57	Imperial Oil Limited
Judy Creek Beaverhill Lake Unit	11- 1-62	Imperial Oil Limited
Jumping Pound Unit	6-13-45	Shell Oil Company of Canada, Limited

<u>Unit</u>	<u>Effective Date</u>	<u>Unit Operator</u>
<u>ALBERTA (continued)</u>		
Leduc Woodbend D-2	10 -1-60	Imperial Oil Limited
Leduc Woodbend D-3	10- 1-60	Imperial Oil Limited
Medicine Hat-Roseglen Gas Unit	11- 1-59	Canadian Delhi Oil Ltd.
Morleyville Unit	11- 1-60	Shell Oil Company of Canada, Limited
Namao Blairmore "A" Unit	9- 1-61	Tidal Petroleum Corporation Ltd.
Nevis Unit No. 1	12- 1-59	The California Standard Company
Okotoks Unit	7-17-57	Devon-Palmer Oils Ltd.
Oyen Viking Sand Gas Unit	11- 7-58	Hudson's Bay Oil and Gas Company Limited
North Pembina Cardium Unit No. 1	9- 1-59	Socony Mobil Oil of Canada, Ltd.
Pembina Cardium Unit No. 2	12- 1-59	Shell Oil Company of Canada, Limited
Pembina Cardium Unit No. 3	1- 1-60	Western Decalta Petroleum Limited
Pembina Cardium Unit No. 4	1- 1-60	Pan American Petroleum Corporation
Pembina Cardium Unit No. 5	11- 1-59	Texaco Canada Limited
Pembina Cardium Unit No. 6	1- 1-61	Pacific Petroleums Ltd.
Pembina Cardium Unit No. 7	5- 1-61	Dome Petroleum Limited
Pembina Cardium Unit No. 8	1- 1-62	Mitchell & Associates for Luscar Coals Limited
Pembina Cardium Unit No. 9 (Blue Rapids Area)	4- 1-62	Pan American Petroleum Corporation
Pembina Cardium Unit No. 10 (Berry Moor Cardium Unit)	8- 1-62	Imperial Oil Limited
Pembina Cardium Unit No. 11	10- 1-62	Texaco Exploration Company
Pembina Cardium Unit No. 12 (Lindale Area)	11- 1-62	Northern Natural Gas Producing Company
Pembina Cardium Unit No. 13	7- 1-60	Whitehall Canadian Oils Ltd.
Pembina Cardium Unit No. 14	8- 1-61	Whitehall Canadian Oils Ltd.
Pembina Cardium Unit No. 20	8- 1-60	Western Decalta Petroleum Limited
Pembina Cardium Unit No. 31	12- 1-60	Western Decalta Petroleum Limited
Pincher Creek Madison Limestone Unit	12- 1-56	The British American Oil Company Limited
Pouce Coupe Cadotte Gas Unit No. 1	2- 1-58	Pacific Petroleums Ltd.
Provost Viking Gas Unit	3- 1-58	Provo Gas Producers Limited
Provost Viking Gas Unit No. 2	7- 1-61	Tenneco Oil Company
Sarcee Unit	10- 1-61	Shell Oil Company of Canada, Limited
South Swan Hills Unit	10- 1-62	Pan American Petroleum Corporation
Stettler D-2 Unit	3- 1-57	The British American Oil Company Limited
Sturgeon Lake Unit	2- 1-58	Amerada Petroleum Corporation
Three Hills Pekisko Unit No. 1	1- 1-61	Pan American Petroleum Corporation
Turner Valley Unit No. 3	6- 1-59	Western Decalta Petroleum Limited
Turner Valley Unit No. 4	7- 1-60	Western Decalta Petroleum Limited
Turner Valley Unit No. 5	7- 1-60	Royalite Oil Company, Limited
Turner Valley Unit No. 6 (TVU 6)	7- 1-60	Home Oil Company Limited
Turner Valley Unit No. 7 (Gas Cap)	8- 1-62	Royalite Oil Company, Limited

<u>Unit Name</u>	<u>Effective Date</u>	<u>Unit Operator</u>
<u>ALBERTA (continued)</u>		
Wainwright Unit No. 1	12- 1-61	Fulton Engineering Ltd.
Wainwright Unit No. 2	10- 1-62	Canadian Husky Oil Ltd.
Wainwright Unit No. 6	11- 1-62	James A. Lewis Engineering Co. Ltd.
Westerose D-3 Unit	1- 1-55	The British American Oil Company Limited
Westerose South (Dick Lake)		
Leduc Unit	12- 1-60	The British American Oil Company Limited
Willesden Green Cardium Unit No. 1	8- 1-62	Amerada Petroleum Corporation
Windfall D-3 Unit	3-24-62	Canadian Fina Oil Limited
Wizard Lake D-3 Unit	10- 1-57	Texaco Exploration Company
Wood River Basal Quartz Unit No. 1	4- 1-62	Canadian Export Gas & Oil Ltd.
<u>SASKATCHEWAN</u>		
Aberfeldy Unit	12- 1-62	Canadian Husky Oil Ltd.
Alameda Central Unit	12- 1-62	The British American Oil Company Limited
Alameda East Unit	8- 1-62	Whitehall Canadian Oils Ltd.
Alida Unit	12- 1-57	Socony Mobil Oil of Canada, Ltd.
Bone Creek Unit	6- 1-58	Canadian Delhi Oil Ltd.
Brock Viking Sand Unit	3- 1-54	Canadian Husky Oil Ltd.
Cantuar Unit	10- 1-59	James A. Lewis Engineering Co. Ltd.
The East Carnduff Unit	5- 1-62	Royalite Oil Company, Limited
West Carnduff Unit	1- 1-61	Imperial Oil Limited
Coleville-Smiley Viking Sand Gas Unit	7- 1-55	Imperial Oil Limited
Dollard	9- 1-55	Tidewater Canadian Oil Ltd.
Eastend Unit	10- 1-57	Tidewater Canadian Oil Ltd.
Fosterton Main Unit	7- 1-58	Socony Mobil Oil of Canada, Ltd.
Fosterton Northwest Unit	7- 1-58	Socony Mobil Oil of Canada, Ltd.
Gull Lake North Shaunavon Pool Unit	10- 1-58	Socony Mobil Oil of Canada, Ltd.
Hatton Unit	5- 1-59	Saskatchewan Power Corporation
Hoosier Viking Sand Gas Unit	8- 1-57	United Canso Oil & Gas Ltd.
Instow Unit	5- 1-56	Tidewater Canadian Oil Ltd.
The Midale Unit	8- 1-62	Shell Oil Company of Canada, Limited

<u>Unit Name</u>	<u>Effective Date</u>	<u>Unit Operator</u>
<u>SASKATCHEWAN</u> (continued)		
Nottingham North Alida Beds Unit	10- 1-60	Socony Mobil Oil of Canada, Ltd.
Rapdan Unit	10- 1-57	Tidewater Canadian Oil Ltd.
Steelman Unit No. IA	7- 1-61	Imperial Oil Limited
Steelman Unit No. II	7- 1-61	Imperial Oil Limited
Steelman Unit No. III	7- 1-61	The British American Oil Company Limited
Steelman Unit No. IV	7- 1-61	The British American Oil Company Limited
Steelman Unit No. V	7- 1-61	Sun Oil Company
Steelman Unit No. VI	7- 1-61	The British American Oil Company Limited
Steelman Unit No. VII	6- 1-62	Sun Oil Company
Success Alpha Unit	7- 1-60	Socony Mobil Oil of Canada, Ltd.
Success Main Unit	9- 1-62	Socony Mobil Oil of Canada, Ltd.
Success Unit	12- 1-57	Socony Mobil Oil of Canada, Ltd.

MANITOBA

Daly Water Flooding Unit	5-15-53	The California Standard Company
North Virden-Scallion Unit No. 1	8- 1-62	The California Standard Company

INTER-DEPARTMENTAL
MEMORANDUM



PROVINCE OF MANITOBA

FROM J. S. Richards

TO Mr. A. G. Wirtham,
Departmental Accountant.

ATTENTION _____

SUBJECT Water Flooding Programme - Daly Field

DATE February 22, 1960.

Further to our recent discussion I am attaching hereto copies of the following letters received from The California Standard Company:

1 - Letter received from Mr. C. H. Young, "re Water Flooding Programme -- Daly Field". You will note that this letter advised that, pursuant to the Water Flooding Unit Agreement, production from certain producing wells will be allocated in the manner set forth on November 1, 1959. It is suggested that this proposed allocation should be reviewed to determine if it is in accordance with the agreement on file in this office. I would be pleased to review this matter with you at your earliest convenience.

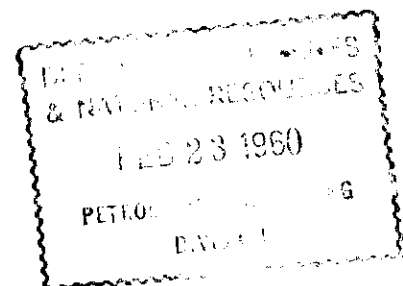
2 - Copy of a letter addressed to Mr. M. J. Gobert, advising of a change of method in the data reporting from the Daly Field. It is requested that the new method of reporting be reviewed in order to determine if it is sufficient for the calculation and acceptance of our Oil Royalties.

3 - Copy of a letter from Mr. J. G. Trowall suggesting a change of the "Mode of Measurement" in respect to production from the Daly 15-2-10-28 well. It is our intention to approve the application contained in this letter but we would appreciate any comments you care to make.


J. S. Richards.

JSR:glp

c.c. to: Senior Petroleum Engineer.



COPY

September 10, 1959.

Mr. R. H. Tallin,
Assistant Legislative Counsel,
Rm. 225, Legislative Building,
Winnipeg 1.

Dear Mr. Tallin:

In accordance with our verbal understanding, I am enclosing, herewith, copies of "Water Flooding Unitisation Agreements", Documents No. 52,924 and No. 12,674, in respect to a water flooding project in the Daly Field.

Document No. 12,674 was executed by the Minister of this Department, on behalf of the Crown, in 1956.

Document No. 52,924, submitted by The California Standard Company, covers a proposed expansion of the flood project, and the company states it has been "duly executed by all persons owning interests in the mineral rights within the proposed spacing units". However, you will note that the Crown is not a party to this agreement; the company presumably takes the attitude that the Crown is committed to the expansion by being a party to the previous agreement. There are, however, two new injection wells, Calstan Daly 10-12-10-28 and Calstan Daly 16-2-10-28, which are outside the boundaries of the pooled area established by the previous agreements. In addition, a Crown producing well, within the previously pooled area, is being converted to an injection well. We have checked these two documents against each other, and the wording of both is identical except where circumstances make this impossible.

September 10, 1959.

2--Mr. R. H. Tallin,
Assistant Legislative Counsel.

This Branch has no objection to the proposed program, but we would like a legal opinion as to whether the Crown should be a signatory to the new agreement, and the limit of the extent of the Crown's commitment by the previous agreement.

In addition to these two documents, which might be termed main agreements, there were several "side agreements" in respect to the earlier agreement (Document No. 12,674) affecting the division of production of wells which will become part of the new agreement. No reference is made to these side agreements in the new agreement (Document No. 52,924); the company apparently takes the position that they automatically lapse. This point should also be checked.

You will note that Section 14 of both agreements is subject to the approval of the Minister of Mines and Natural Resources, pursuant to the provisions of Section 196 of the Regulation under The Mines Act. However, Sections Three and Six give the company authority to unitise new leases, and to set up additional flooding units in the pooled area.

Mr. Gobert and I will both be absent from the office for the period of September 14 to 25, except probably for September 18. I will also be absent for the week of September 25 to October 2. However, we would appreciate receiving your opinion as soon as possible and, also, have an opportunity of discussing this matter with you.

Yours very truly,


S. S. Richards,
Director of Mines.

JSR:db

Encs. 2.

c. c. to: Mr. J. G. Cowan, Q.C.,
Deputy Minister;

> Mr. M. J. Gobert,
Senior Petroleum Engineer.

INTER-DEPARTMENTAL
MEMORANDUM



PROVINCE OF MANITOBA

FROM Director of Mines

TO Mr. J. G. Cowan, Q.C.,
Deputy Minister.

ATTENTION _____

SUBJECT Daly Water Flood -
Document No. 52,837 -
The California Standard Company.

DATE March 3, 1959.

Enclosed herewith, eight copies of the above-mentioned document, together with Mr. R. R. McDaniel's comments in respect to it, supplied at our request.

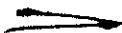
This document provides that the Crown will allocate 1/8 of the production from the Calstan Daly Prov. 13-6-10-27 well to the injection well, Calstan Daly 16-1-10-28, on Mr. W. R. Williams property. You will note Mr. McDaniel is of the opinion that, while the Prov. 13-6 well will probably gain from water injected into the well on L.S. 16-1-10-28 and as the Crown's obligation is only a moral one, it would be "prudent to wait until" the effects of the water flooding have been established.

This matter was first drawn to our attention by the company in November, 1956, at which time we pointed out that the Prov. 13-6 well was outside the pooled area, and invited any comments which the company cared to make. No reply was received to our request, and the above document was recently forwarded for approval.

If it is decided to approve the agreement, I would assume that the authorization of the Lieutenant-Governor-in-Council should be obtained in accordance with the provision of Section 65(1) of "The Mines Act". Kindly advise if a Recommendation-to-Council should be prepared, or if the company should be advised in accordance with Mr. McDaniel's recommendation.


J. S. Richards.

JSR:lan

 c.c. Senior Petroleum Engineer.

McDANIEL CONSULTANTS LTD.

Oil and Gas Reservoir Evaluations

R. R. McDANIEL, P. ENG.
TELEPHONE AMHERST 9-1683

231 EIGHTH AVENUE WEST
CALGARY ALBERTA

February 17, 1959

Director of Mines,
Mines Branch,
Department of Mines and Natural Resources,
Room 21 - 469 Broadway Avenue,
Winnipeg 1, Manitoba.

Attention Mr. J.S. Richards

Dear Sir,

In regard to the allotting of production from the
Canstar Daly Prov. No. 13-6 to the offsetting water injection
well in 16-1-10-28W1 we would have the following comments.

In view of the fact that the No. 13-6 well was
drilled after the injection plan was put into effect we
feel there is only a moral obligation to relinquish a
share of the production.


Although the effects of water injection on the
well in No. 13-6 will be difficult to analyse it is evident
that if water flooding is found beneficial in this area of
the field then this well will probably gain from injection
into the No. 16-1 well.

In view of the fact that the effects of water
flooding cannot as yet be established it might be pru-
dent to wait until such effects become evident before
any sharing of the production is considered. It should
be pointed out that the flood could fail in that either
water breakthrough might occur or that no effective
pressure maintenance will result.

...the reliability of the results that it would be
...the results are obtained and the
...the results are obtained and the results are considered

Sincerely yours,

MICHAEL CONSULTANTS LTD.


per R. R. McFarlane, P. Eng.

M.J. Gobert

J. S. Richards

Daly Water Flood Unit #3

January 11, 1957.

For the month of November, 1956, The California Standard Company reported production for the Flood Unit shown above, made up of the following wells -

Calstan Daly 2-14	Water injection
Calstan Daly Prov. 14-11	" "
Calstan Daly Prov. 3-14	Oil production

A handwritten signature in dark ink, appearing to be 'J. S. Richards', is located below the table of production data.

HI 111

AUGUST 28

1.45PM DST

RE CALSTAN SALT WATER LINE 2-1--15-1

I HAVE A LETTER FROM JACK TROWELL DATED -AUGUST 27 IN WHICH HE STATES
THAT CERTAIN PLANS FOR THE ABOVE SALT WATER LINE AND IT'S TIE IN WITH
THE PLANT AT 15-1 HAVE BEEN FORWARDED UNDER SEPARATE COVER. WE HAVE
NOT RECEIVED THESE TO DATE AND WOULD APPRECIATE YOUR CALLING HIM AND
ASKING IF THEY WERE MAILED OR NOT.

END

BT

RE YOUR ABOVE MESSAGE #3 TROWELL I NOW CHECKING WITH HIS STAFF
TO SEE IF IT WAS MAILED....

RE UR ABOVE TEL #3..... TROWELL ADVISES THAT THE PLANS WERE MAILED
A SEPARATE TIME ON AUG 24... TO BOX ROAD LEGISLATIVE BLDGS....
IS IF YOU WOULD RECORD THEM IN A BOX OR TWO HE COULD SEND
COPIES OF SAID PLANS...

DEPARTMENT OF MINES AND NATURAL RESOURCES, WINNIPEG, CANADA

COPY

April 23, 1956.

Mr. H. A. Now,
The California Standard Company,
153 - 3th Street,
Winnipeg, Manitoba.

Dear Mr. Now:

Re: Daly Water Flood Unit #3

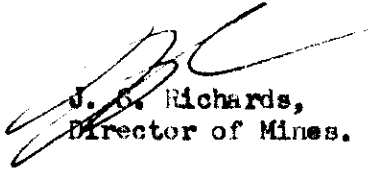
As you are aware, we have deferred answering your letter of March 15th, relative to the above water flood unit, until we had an opportunity of reviewing the problem as a whole. We believe that the agreement, as drawn, is equitable, provided that it is made clear that it terminates as of the date that Daly 4-12 is converted to a water injection well. When this conversion is completed, the Crown should have credited to Daly 4-12 one-eighth of the production from Daly 13-1, if the above agreement is to remain in force.

I would also draw to your attention that this Department has not received any completed agreements in respect to the most recent expansion of the Water Flooding Project.

As you are aware, six copies of the side agreement, in respect to Daly Prov. 3-14, were completed by the Crown several months ago, but we have not received a copy completed by the other interested parties. No copy of the main agreement has been received, nor have side agreements, in respect to Daly Prov. 1-12, Daly 11-12, and Daly 13-12, been forwarded. We are particularly interested in Mr. Haskett's attitude in respect to the last two wells. Would you kindly advise immediately what progress has been made with these agreements.

The copy of the agreement in respect to Flood Unit #3 is returned herewith.

Yours very truly,

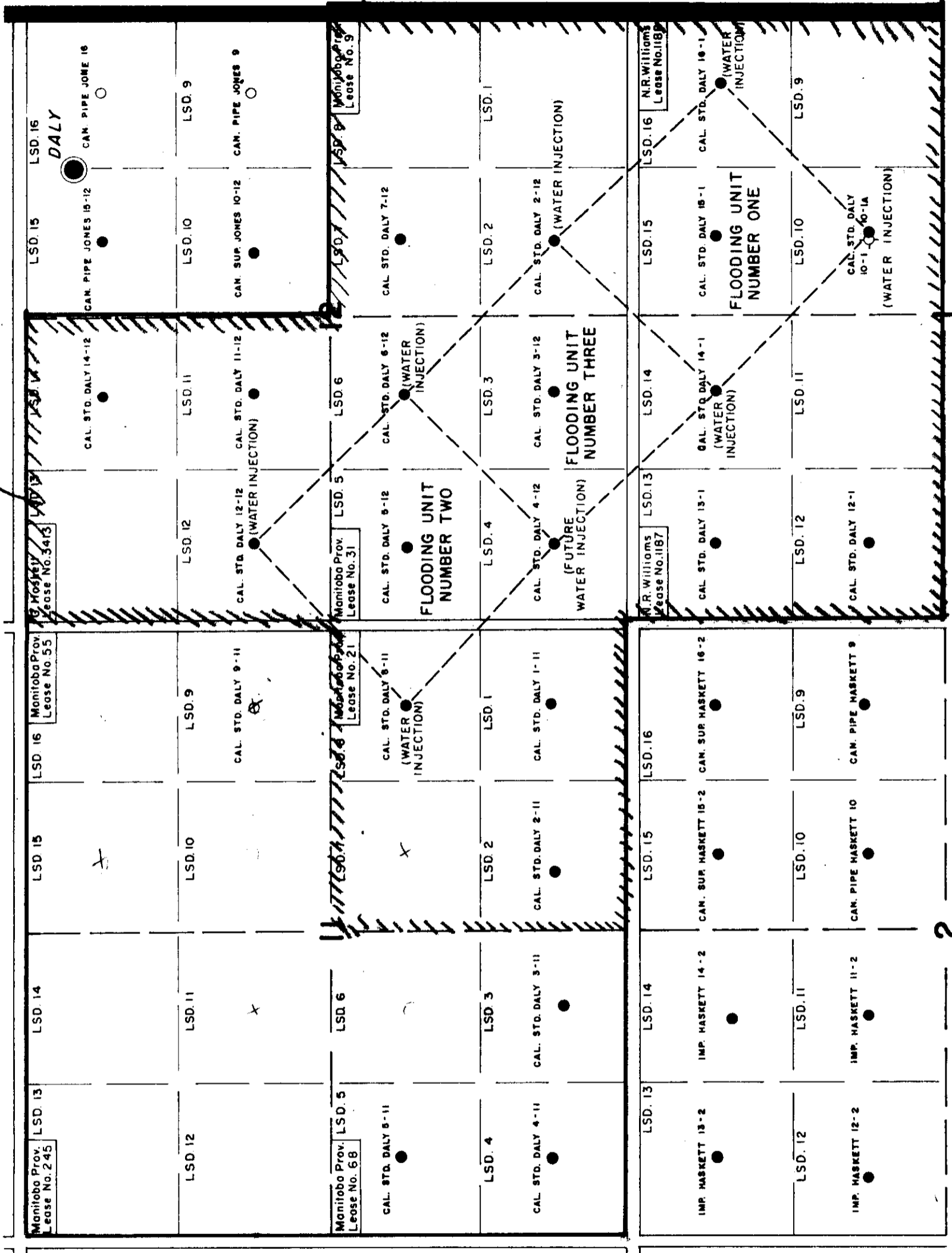

J. G. Richards,
Director of Mines.

J:alk
Registered

c.c. to: Mr. C. D. Mims,
Vice-President, Producing,
The California Standard Company,
Calgary, Alberta.

Mr. M. J. Gobert,
Senior Petroleum Engineer.

TP. 10



THE PARTIES HAVE AGREED THAT FLOODING UNIT NUMBER THREE
IS COMPRISED AS FOLLOWS:

LEASE NO. 1187 N.R. WILLIAMS	10 ACRES
MANITOBA PROV. LEASE NO. 31	60 ACRES
MANITOBA PROV. LEASE NO. 9	10 ACRES
TOTAL	80 ACRES

November 14, 1955.

Mr. C. D. Mims,
Vice-President, Producing,
The California Standard Company,
Medical Arts Building,
Calgary, Alberta.

Dear Mr. Mims:

The following comments are offered in reply to your letter of November 7th, relative to the terms of the "Water Flooding Unitization Agreement".

We realize that Section Fourteen of the agreement stipulates that all Operators are subject to all laws, regulations, etc. of the Province of Manitoba, but felt that the several phrases giving the company the right to further expand the flood programme could be interpreted to mean that the Minister of Mines and Natural Resources was, in advance, giving the consent necessary under Section 196 of the Regulations for any such expansion. We feel that the agreement should make clear to all subscribers that this is not intended.

As you state, the internal offset may not be a factor if all wells are drilled prior to the extension of the flooding units. However, we feel that, should the company elect to complete only a part of the proposed programme, it should not be relieved of its internal offset obligation. We also believe that the company should not be relieved of its drill-out obligation.

We were not aware that the suggested method of sharing royalty was a "standard practice of the Conservation Boards across the three Prairie Provinces" and would appreciate being advised where this practice has been followed.

You will recall that the initiative in creating Flood Unit #3 was taken by you on May 2, 1955, because "we feel that in fairness to Mr. N. R. Williams and his assigns, we should inquire from you as to whether you would be willing to have us form Flooding Unit No. 3".

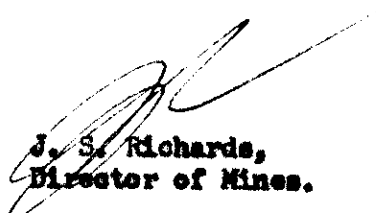
As previously stated, we feel that the acceptance will immediately create problems identical to that which necessitated the creation of Flood Unit No. 3. However, should you believe that our proposal leads to

2--Mr. C. D. Mims, November 14, 1955.

similar inequities we will be pleased to discuss the matter at anytime which is mutually convenient.

We realize the difficulty in going back to the royalty holders who have signed the original agreement. However, if the water flooding is successful, as it appears to be, it will not be long before other operators are involved and, consequently, we feel that now is the time to determine if our suggestions have any merit.

Yours very truly,



J. S. Richards,
Director of Mines.

JSR:lk

c.c. to: Mr. J. G. Cowan, Q.C.,
Deputy Minister.

> c.c. to: Mr. M. J. Gobert,
Senior Petroleum Engineer.

LEGEND

- LOCATION
- OIL WELL
- WATER INJECTION WELL
- PROPOSED WATER INJECTION WELL

PILOT WATER FLOOD AREA

WATER FLOOD EXPANSION NO. 2

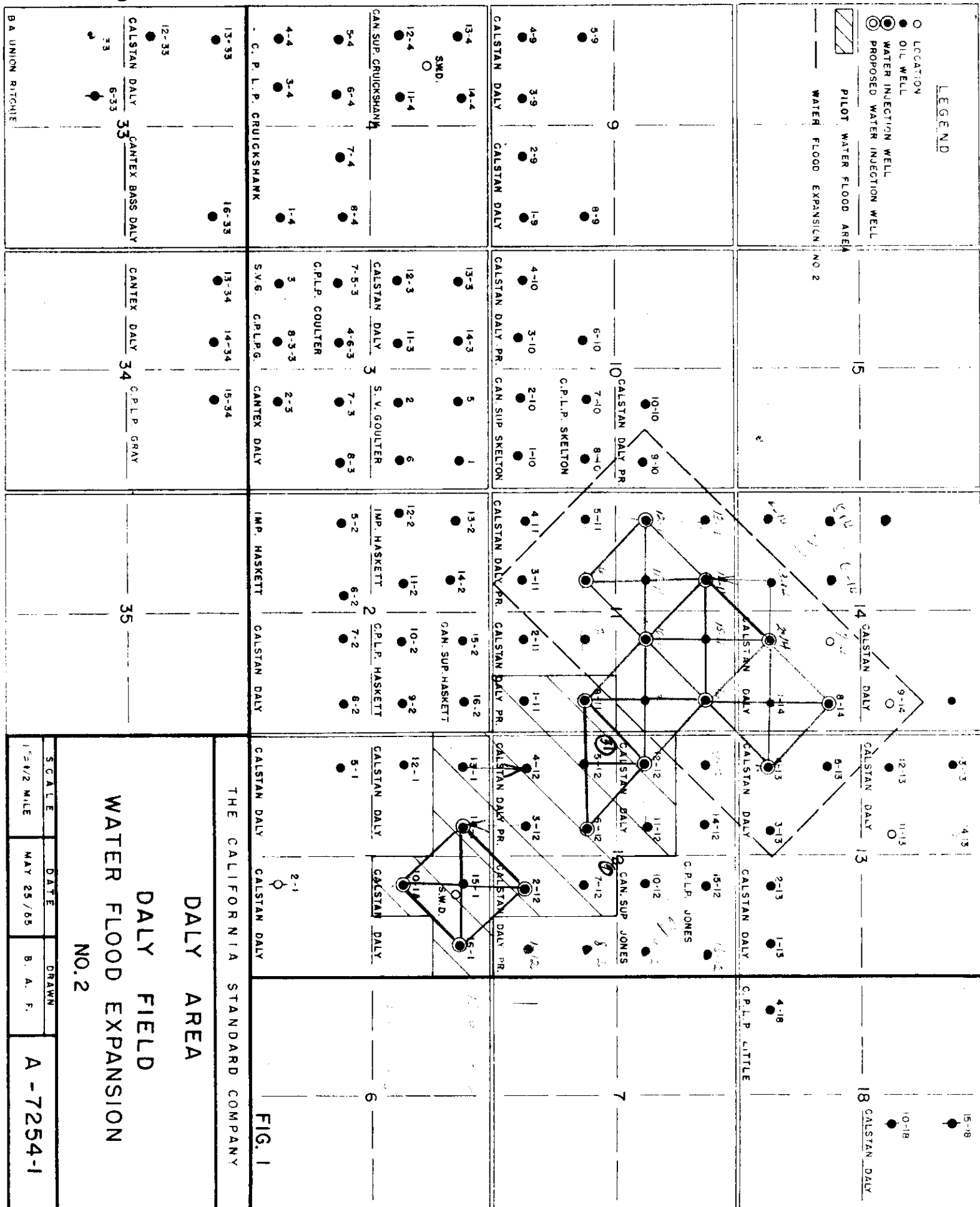
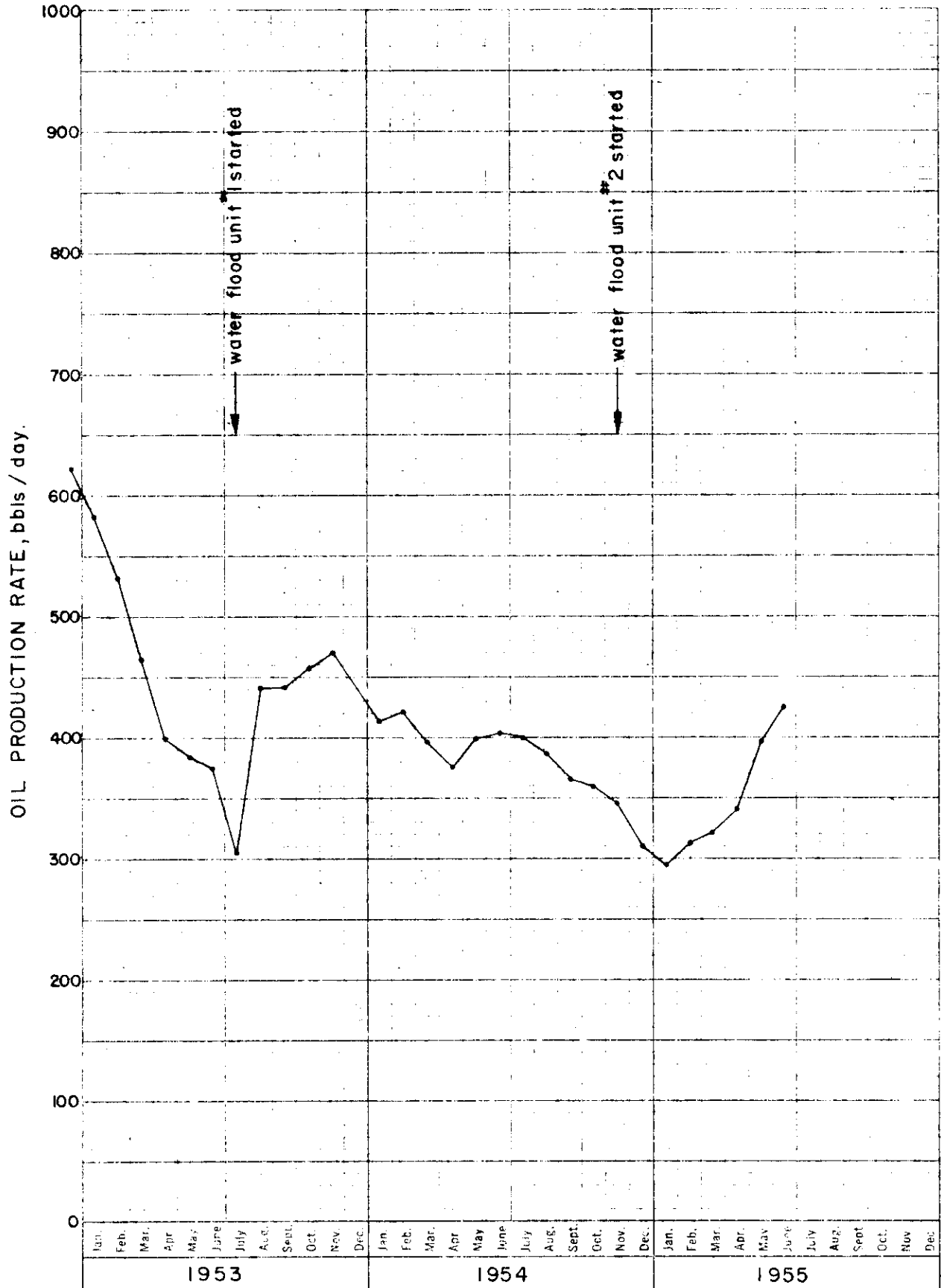


FIG. 1

DALY FIELD

FIG. 2

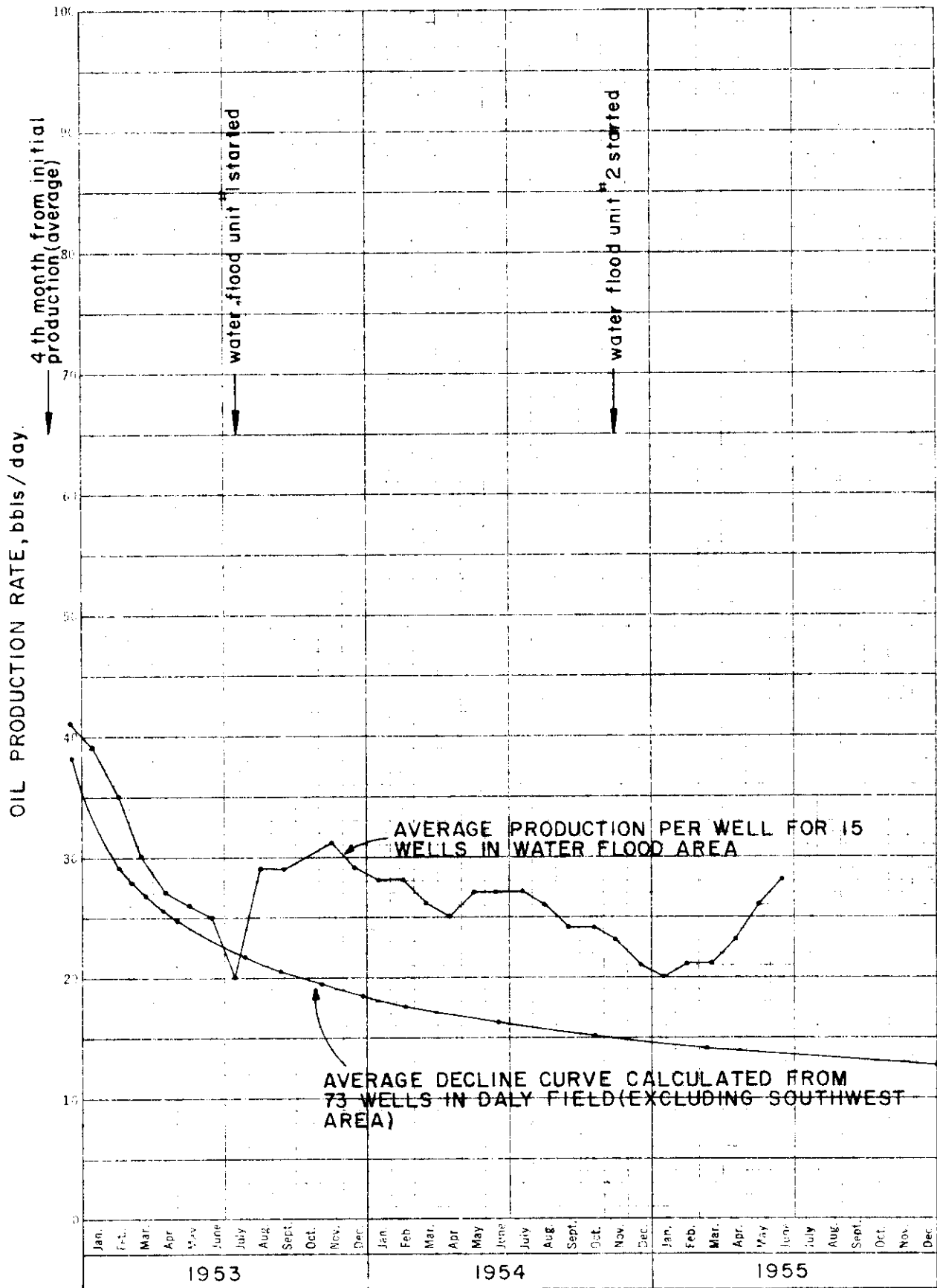
TOTAL PRODUCTION RATE OF 15 WELLS IN PILOT WATER FLOOD AREA
(10-1A, 13-1, 14-1, 15-1, 16-1, 1-11, 8-11, 2-12, 3-12, 4-12, 5-12, 6-12, 7-12, 11-12, 12-12,)



DALY FIELD

FIG.3

COMPARISON OF FIELD AVERAGE DECLINE CURVE WITH
AVERAGE PRODUCTION CURVE FOR PILOT WATER FLOOD AREA



Director of Mines

Mr. J. G. Cowan, Q.C.,
Deputy Minister.

Water Flooding Unitization Agreement

September 20, 1955.

Enclosed herewith, four copies of proposed Water Flooding Unitization Agreement submitted by The California Standard Company in respect to a proposed expansion of the project.

In our opinion, certain phrases contained in the agreement would give the company the right to further expand the flood programme without further approval being received from this Department. We would recommend that these objectionable phrases be eliminated, or be qualified by clauses requiring the approval of the Department. They are as follows:

1. Page 4 - The definition of water injection well includes any well "in or near the pooled area". It is suggested that the words "or near" be deleted.
2. Page 4 - The last paragraph of Section 1 gives the company the right to add "new or additional lease or interest therein necessary to form additional flooding units ----", merely by filing such additions with this Department.
3. Page 5 - Section 3, paragraphs (1) and (2) repeat the right of the operator to add additional leases which will become part of the agreement.
4. Page 7 - Section 6, permits operator "in its sole discretion ---- to set up additional flooding units --- and to add such parts of additional leases to the pooled area --- as may be necessary to form such additional flooding units."
5. Page 10 - Section 12, grants operator permission to conclude agreements with other companies to expand the flooding programme.

The company may claim that Section 14 on page eleven gives us all the assurance we require in respect to the above point. On the other hand, it would appear that if the Minister signs this agreement, he has approved in advance any expansion of the scheme the company may desire.

In addition to the above points, it would appear that the provision that the company be relieved of all obligation to drill internal offsets goes too far. We can appreciate that the company might require additional time to make up its mind in respect to the drilling of an injection or producing well, but it is felt that there should not be a complete release from offset obligations.

2--Mr. J. G. Cowan, Q.C., September 20, 1955.

It should also be pointed out that names of the wells as listed in Section 4 do not agree with the official name of these wells.

The sharing of royalty, as suggested by the unitization agreement, is for each producing well to contribute $1/8$ of its production to each of the surrounding injection wells, and retain $1/2$ of the production. It is to be noted that Flooding Units No. 2 and No. 3 are incomplete because Calstan Daly 4-12, which is common to both units, has not yet been converted to an injection well. You will recall that it was necessary to create Flooding Unit No. 3 in order to correct an inequity to Mr. M. R. Williams who holds the adjoining acreage. It is our opinion that the acceptance of the company's proposal will immediately create situations identical to that before Flood Unit No. 3 was created. In order to eliminate these inequities, it is suggested that additional Flood Units be created to include all wells adjacent to injection wells. Each such adjacent well would contribute $1/8$ of its production to the offsetting injection well or wells.

Attention is particularly drawn to the wells on 13-12-10-28 and 7-11-10-28, which will have the benefit of injection wells on three sides, but will contribute nothing to these wells if the company's proposal is accepted. There are several other cases where wells are receiving the benefit of at least two injection wells.

Charts are enclosed setting out the present royalty division and the additional units suggested by the company and the Mines Branch.


J. S. Richards.

JSR:lk
Encls.

c.c. to: Mr. M. J. Gobert,
Senior Petroleum Engineer.

August 24th, 1955.

The California Standard Company,
Virden, Manitoba.

Attention: Mr. J. G. Trowell,
District Production Superintendent.

Dear Sir:

In reply to your telephone conversation today, permission is granted to use salt water in the Daly flood units.

This permission is of temporary nature and will be confirmed or denied as soon as I am able to get a quorum of the Board together.

Thank you for enquiring into this matter before proceeding.

Yours very truly,


R. J. Kinsley,
Reservoir Engineer.

RJK/es

July 19, 1955.

RE: THE CALIFORNIA STANDARD COMPANY
WATER FLOOD EXPANSION NO. 2,
DALY FIELD

The Oil and Natural Gas Conservation Board,
Mines Branch, Province of Manitoba,
Winnipeg, Manitoba.

Gentlemen:

Proposal

The California Standard Company's pilot water flood in the Daly Field has been in operation two years. Results are encouraging. It is requested that approval be given to the proposed Water Flood Expansion No. 2 for the Daly Field (see Figure 1, attached).

The plan involves:

- a) Drilling 6 new injection wells: California Standard Daly Province 6-11, 10-11, 12-11, 14-11 and 16-11 in LSD's 6, 10, 12, 14, 16 respectively, of Section 11, Township 10, Range 26, W.P.M.; and California Standard Daly 2-14 in LSD 2 of Section 14, Township 10, Range 28, W.P.M.
- b) Converting to water injection wells: California Standard Daly 4-13 (4-13-10-28-WPM) and California Standard Daly 8-14 (8-14-10-28-WPM.)
- c) Drilling new producing wells and forming the appropriate units for proration of royalty interests to the injection wells and producing wells.
- d) Extending the water injection lines from California Standard Daly Province 8-11 to serve new wells 6-11, 10-11, 12-11 and 14-11, and from California Standard Daly 12-12 to serve new wells 16-11, 4-13, 2-14 and 8-14.
- e) Enlarging the injection plant at California Standard Daly 15-1 to handle approximately 3,000 bbls/day of water.

It must be remembered that the proposed flood area is largely undeveloped and thus an exploration problem. There are indications that part of the Mississippian limestone section becomes dolomitized, tight and non-oil saturated, to the north. Development drilling will be cautious and slight modifications in the proposed five-spots may be necessary if a tight section is developed.

Results of Pilot Flood

1. Water Injection History

	<u>Injection Well</u>	<u>Date on Injection</u>	<u>Initial Injection Rate</u> bbls/day	<u>Current Injection Rate</u> bbls/day	<u>Cumulative Inj. at June 30/55 - bbls.</u>
*	C.S.Daly 10-1A	July 14, 1953	400	30	55,142
	C.S.Daly 14-1	July 17, 1953	600	120	177,542
	C.S.Daly Prov. 2-12	July 11, 1953	350	160	208,132
	C.S.Daly 16-1	July 20, 1953	650	60	89,879
	C.S.Daly Prov. 8-11	Nov. 27, 1954	350	200	53,975
	C.S.Daly Prov. 6-12	Dec. 6, 1954	400	240	52,008
	C.S.Daly 12-12	Dec. 6, 1954	750	140	44,391
				<u>950</u>	<u>681,069</u>

* C.S. - California Standard

2. Water Flood Oil Production

Since the first moderate expansion of the pilot flood took place (conversion to water injection of 8-11, 6-12 and 12-12), some significant effects have occurred. Daly 3-12 has increased to 173 bbls/day from a previous high of 115 bbls/day and from a rate before flooding of 60 bbls/day. Daly 5-12, the other central producing well, has increased to 45 bbls/day from a rate of 27 bbls/day before Water Flood Unit No. 2 was formed. Some effect has also been felt at Daly 1-11, 7-12 and 11-12 from the additional injection wells. The original five-spot central producing well, Daly 15-1, is up to 44 bbls/day from 7 bbls/day at start of injection. Water breakthrough has not occurred in any producing wells to date.

Current status of the 15 wells in the pilot flood area (see Figure 1) is as follows:

<u>Well No.</u>	<u>Cumulative Production to June 30, 1955</u> bbls.	<u>Current Production Rate (June, 1955)</u> bbls/day
C.S. Daly 10-1A	3,416	*
C.S. Daly 13-1	21,469	19
C.S. Daly 14-1	10,897	*
C.S. Daly 15-1	32,662	44
C.S. Daly 16-1	0	*
C.S. Daly Prov. 1-11	34,487	47
C.S. Daly Prov. 8-11	17,737	*
C.S. Daly Prov. 2-12	21,148	*
C.S. Daly Prov. 3-12	101,241	173
C.S. Daly Prov. 4-12	68,128	62
C.S. Daly Prov. 5-12	37,555	45
C.S. Daly Prov. 6-12	11,197	*
C.S. Daly Prov. 7-12	27,766	14
C.S. Daly 11-12	21,092	21
C.S. Daly 12-12	8,441	*
Totals	417,236	425

* Water Injection Wells

Figure 2 shows a plot of the total production rate of the 15 wells in the pilot water flood area since December, 1952. The rapid decline in the production rate was arrested by the inception of Water Flood Unit No. 1 in July of 1953. Figure 3 compares the average production rate over the 15 wells to an average decline curve, which was calculated from 73 wells representing floodable acreage in the Daly Field. Wells in the south west portion of the field, which are affected by a natural water drive, were excluded from the calculations for the average decline curve.

Discussion

The maximum efficient rate of production should be considered the amount the well will produce. Fluid withdrawal from the reservoir in the flood area will not likely exceed the fluid injection. Considering the area affected by the water flood (the 15 wells listed under 2. Water Flood Oil Production), the total oil production is 425 bbls/day and the total water injection is 950 bbls/day. Using the analogy of a water drive reservoir, the fluid replacement efficiency at reservoir conditions (applying formation volume factor for oil and water compressibility) is 210%. This means not only is the original reservoir pressure being maintained, but in fact the pressure is being increased. In the 80 acre five-spot unit centred by 3-12, it is estimated that 250 bbls/day of water is being injected and 173 bbls/day of oil is being withdrawn for a fluid replacement efficiency of 130%. This considers that most of the water injected into 14-1 and 2-12 flows toward 3-12 due to the higher permeability zone, as indicated by a Carter Analyzer Study conducted for us by California Research Corporation.

The 425 bbls/day production credited to the existing flood pattern of 15 injection and producing wells indicates an average of 28 bbls/day per well which is certainly far from an excessive rate.

The pilot flood to date has indicated sufficiently satisfactory results to provide a basis for a further water flooding extension. Our present injection plant, located at Daly 15-1, can be readily enlarged to handle about 3,000 bbls. of water per day. Salt water production, especially in the south-west part of the field, is becoming a problem and its use in water flooding would solve disposal while providing a supplementary water supply.

Conclusions

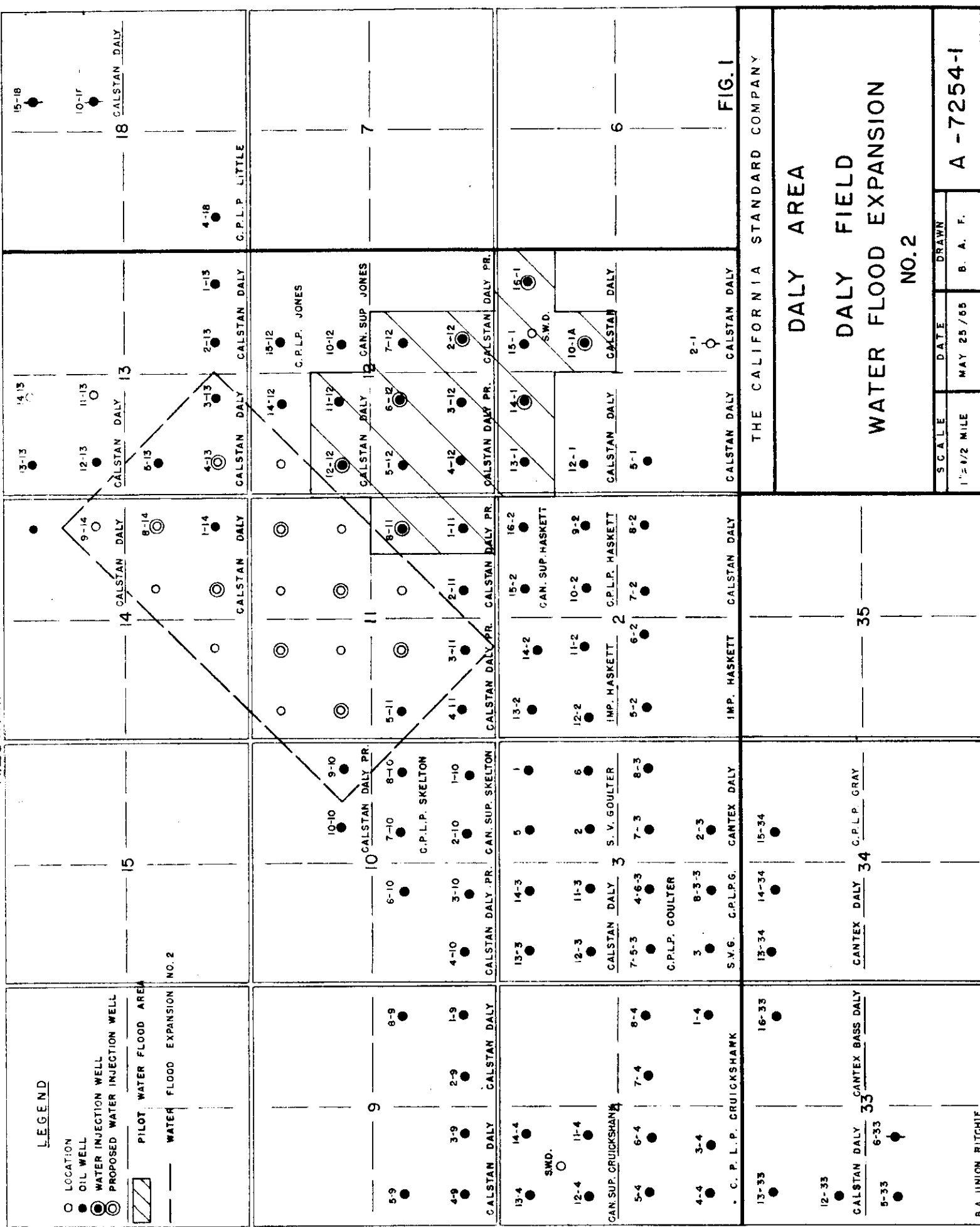
1. Primary production of wells in the major portion of the Daly Field, excluding the south-west area, decline rapidly.
2. It is estimated that water flooding, without a primary production phase, will give double the recovery that is currently expected for Daly wells by primary means.

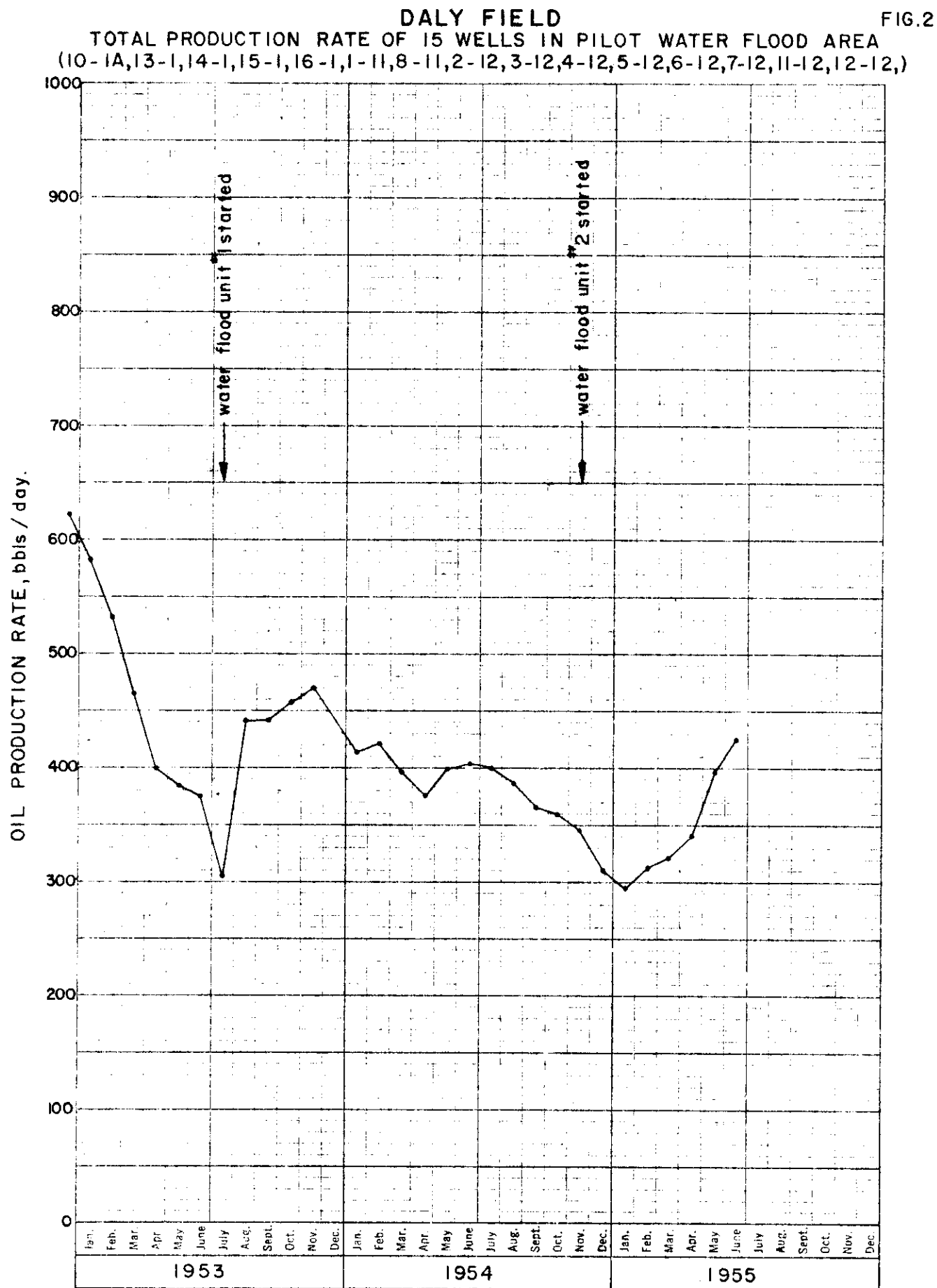
3. Capacity of the present injection plant at Daly 15-1 can be doubled by increasing the electric motor on the injection pump from 50 H.P. to 100 H.P., adding another filter and changing the manifolding as required.
4. The salt water disposal problem is taken care of by using produced salt water for flooding. Laboratory tests indicate that produced salt water can be satisfactorily inhibited to prevent corrosion and permit its use.

Respectfully submitted,

THE CALIFORNIA STANDARD COMPANY

R. R. Dutka

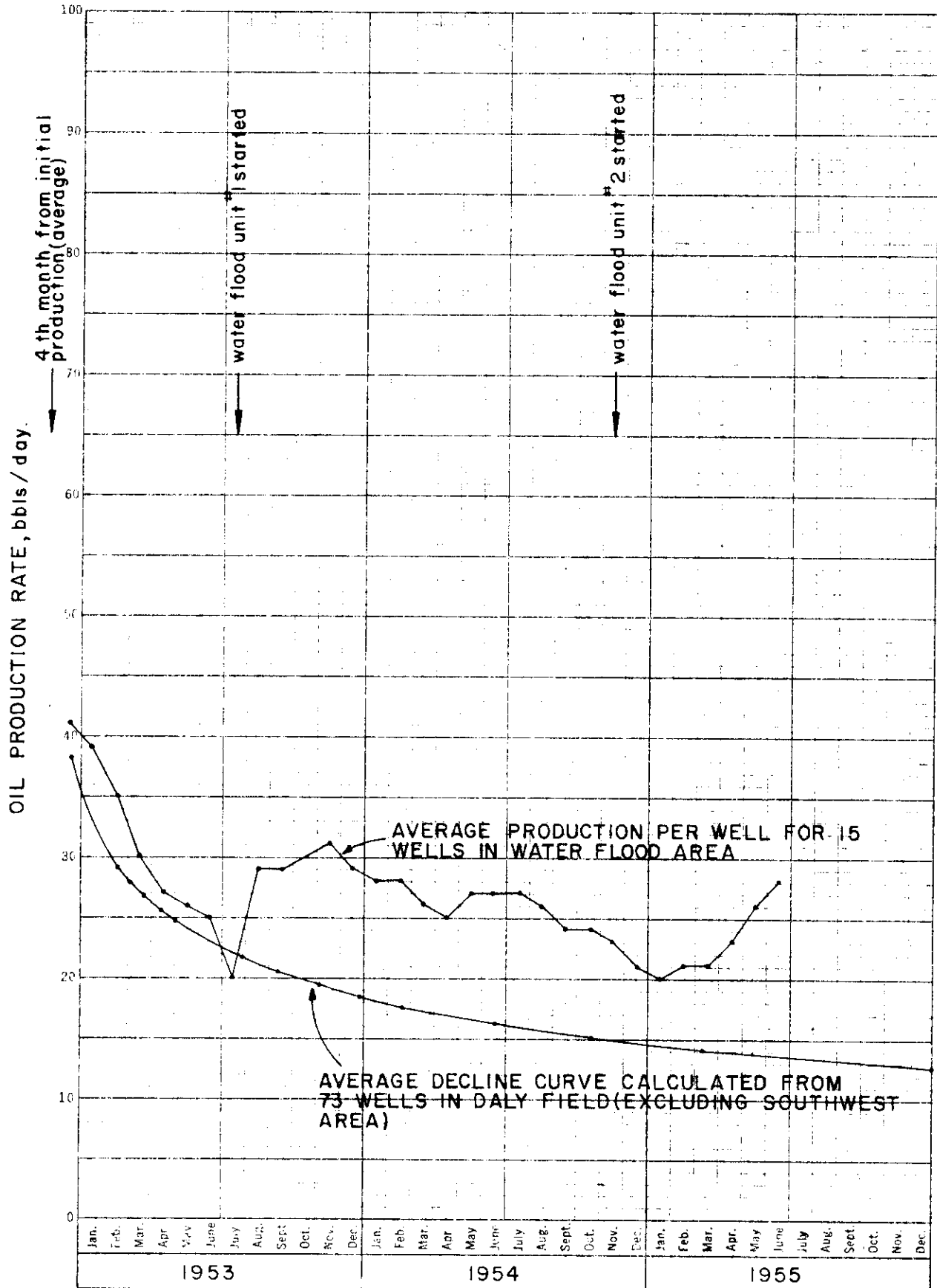




DALY FIELD

FIG. 3

COMPARISON OF FIELD AVERAGE DECLINE CURVE WITH
AVERAGE PRODUCTION CURVE FOR PILOT WATER FLOOD AREA



Director of Mines

Mr. J. G. Cowan, Q.C.,
Deputy Minister.

Proposed Flooding Unit No. 3.

June 30, 1955.

In reply to your memorandum of June 27th, relative to the above mentioned subject, I have to advise that it was not our intention to reopen the matter of royalty divisions, which form part of the agreements in respect to Flooding Units No. 1 and No. 2, but that the matter of royalty division should be reviewed before any new agreements were concluded, in respect to any expansion of the present flooding area.


J. S. Richards.

JSR:lk

> c.c. to: Mr. M. J. Gobert,
Senior Petroleum Engineer.

Director of Mines.

Mr. J. G. Cowan, Q.C.,
Deputy Minister.

The California Standard Company,
Flooding Unit No. 3.

June 8th, 1955.

This will acknowledge receipt of your reply, dated May 6th to Mr. C. D. Mims' letter of May 2nd, relative to the above subject.

Our reply has been deferred until Mr. Kinsley had an opportunity to prepare an estimate of the recovery which would have been obtained from the Daly 3-12 well, had the flooding not been carried out. Mr. Kinsley's estimate and comments are quoted in full.

"The California Standard Company has suggested that Flood Unit #3, which is now a physical fact, be formed for accounting purposes. In the interest of equity, the unit should be formed and the agreement backdated to December 1, 1954.

"From the inception of Flood Units #1, in August, 1953, and #2, in December, 1954, to the end of May, 1955, the Calstan Daly/#3-12 well has benefitted by an estimated increase in production of 48,000 bbls. (Table 1). Since Flood Unit #2 was formed the Crown has received, from the 3-12 well, nearly \$6,000 of Royalty payment of which approximately \$730 would have gone to Mr. Williams, the lessor of the California Standard Williams lease #1187 had Flood Unit No. 3 been in December 1, 1954. (Table 11 enclosed).

"Decline curves constructed show that the #3-12 well would have produced about 23,000 bbls., under normal methods, between July 1, 1953 and May 31, 1955, while the actual production was 70,832 bbls. Between July 1, 1953 and December 1, 1954, the comparable figures are about 19,000 bbls. and actual 51,588. Thus about 32,000 bbls. of increased production was caused by Flood Unit #1 and Units 1 & 2 combined to increase production by about 15,000 bbls.

"Under the present system of Flood Units, wells offsetting injection wells outside the Flood pattern may benefit from the flood but contribute nothing to the cost. As was noted previously (memo to J. S. Richards, Mar. 29/55), a new approach to Flood Unit allocation of oil production should be made. Since the present units, 1 & 2, have been agreed to, the 4-12 well conversion approved in principal, the Flood Unit #3 a physical fact, there is probably no legal grounds for change but if any future Flood Units are created, consideration should be given to an alteration in allocation of production from wells offsetting injection wells."

2-- Mr. J. G. Cowan, Q.C., June 8th, 1955.

The other members of the Conservation Board and I are in agreement with Mr. Kinsley's comments which may be summarized as follows:

- (1) In equity, Mr. Williams should be paid his royalty from December 1, 1954, as if Flooding Unit No. 3 had been formed at that time. Mr. Mims suggested date of May 1st does not appear logical because, if any redress is proper, it should date at least from the commencement of the process creating the reason for the redress which is Flooding Unit No. 2.
- (2) That the whole matter of royalty division, and the possible inconclusion of wells adjacent to flooding wells but outside the flooding units, as presently constituted, should be reconsidered before the approval of any expansion of the flooding programme.


J. S. Richards,

JSR/lk

c.c. to: Mr. M. J. Gobert,
Senior Petroleum Engineer.

TABLE II

Value of Royalty paid by Leaseholder
and distribution of Royalty if Unit #3
formed with Unit #2

<u>Month-Year</u>	<u>Wells Production</u>	<u>Royalty \$ (A)</u>	<u>1/8 Share to Williams</u>	<u>1/8 Share to Prov. Lease #9</u>	<u>$\frac{3}{8}$ Share to Prov. Lease #31</u>
Dec./54	2856	957	120	120	717
Jan./55	2602	831	104	104	624
Feb./55	2773	849	106	106	637
Mar./55	3292	963	120	120	720
Apr./55	3434	1004	125	125	754
May /55	<u>4287</u>	<u>1254</u>	<u>157</u>	<u>157</u>	<u>940</u>
Totals	19,244	5,858	732	732	4,394

(A) - approximate

*Pilot Flood
Collection*

June 7th, 1955.


Mr. J. F. Ross,
Chief Engineer,
The California Standard Company,
Medical Arts Building,
Calgary, Alberta.

Dear Mr. Ross:

Many thanks for your report on the Daly Pilot Water Flood. The results to date are quite encouraging, and we are looking forward to the results of your engineering study being conducted to determine if application should be made for an extension to the present flooded units.

Have you prepared any estimates of the recovery and life expectancy of the wells presently affected by the water injection? The fact that the Daly Province 3-12 well has a rapidly increasing rate of production makes us feel that consideration should be given to placing M.P.R.'s on water flood wells. Consequently, we would appreciate receiving your estimate of the maximum efficient rates of production for the present flood unit wells.

Yours very truly,


J. S. Richards,
Director of Mines.

JSR/lk

c.c. to: Mr. M. J. Gobert,
Senior Petroleum Engineer.

INTER-DEPARTMENTAL
MEMORANDUM

PROVINCE OF MANITOBA

FROM Mr. J.G. Cowan
Deputy MinisterTO Mr. J.S. Richards

ATTENTION _____

SUBJECT California Standard Company
Re Daly Water Flood AgreementDATE October 28th, 1954.

I am returning herewith a letter dated October 25th addressed to the Board, and also the accompanying statement.

In discussion with Mr. How yesterday it was agreed that so far as Section 11 is concerned the agreement would include only the S.E. $\frac{1}{4}$.

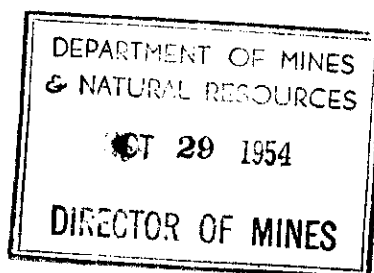
Mr. How further stated that after communicating with Calgary they advised him that there was no intention of making Cal. Stan. Daly 1-11 a water injection well. I note that the August production from this well was 1320 barrels. It would appear difficult for us to justify authorizing the conversion of such a well to a water injection well.

The Minister has had an opportunity of perusing the agreement and subject to the deletion of the three quarters in section 11 it is satisfactory to him.

I have suggested to Mr. How that the other interested parties should execute the agreement before it is submitted to us for the Minister's signature.

J.G. Cowan

A.



LEGEND

- LOCATION
- O.L. WELL
- ⊙ WATER INJECTION WELL
- ⊙ PROPOSED WATER INJECTION WELL
- ▨ PILOT WATER FLOOD AREA
- WATER FLOOD EXPANSION

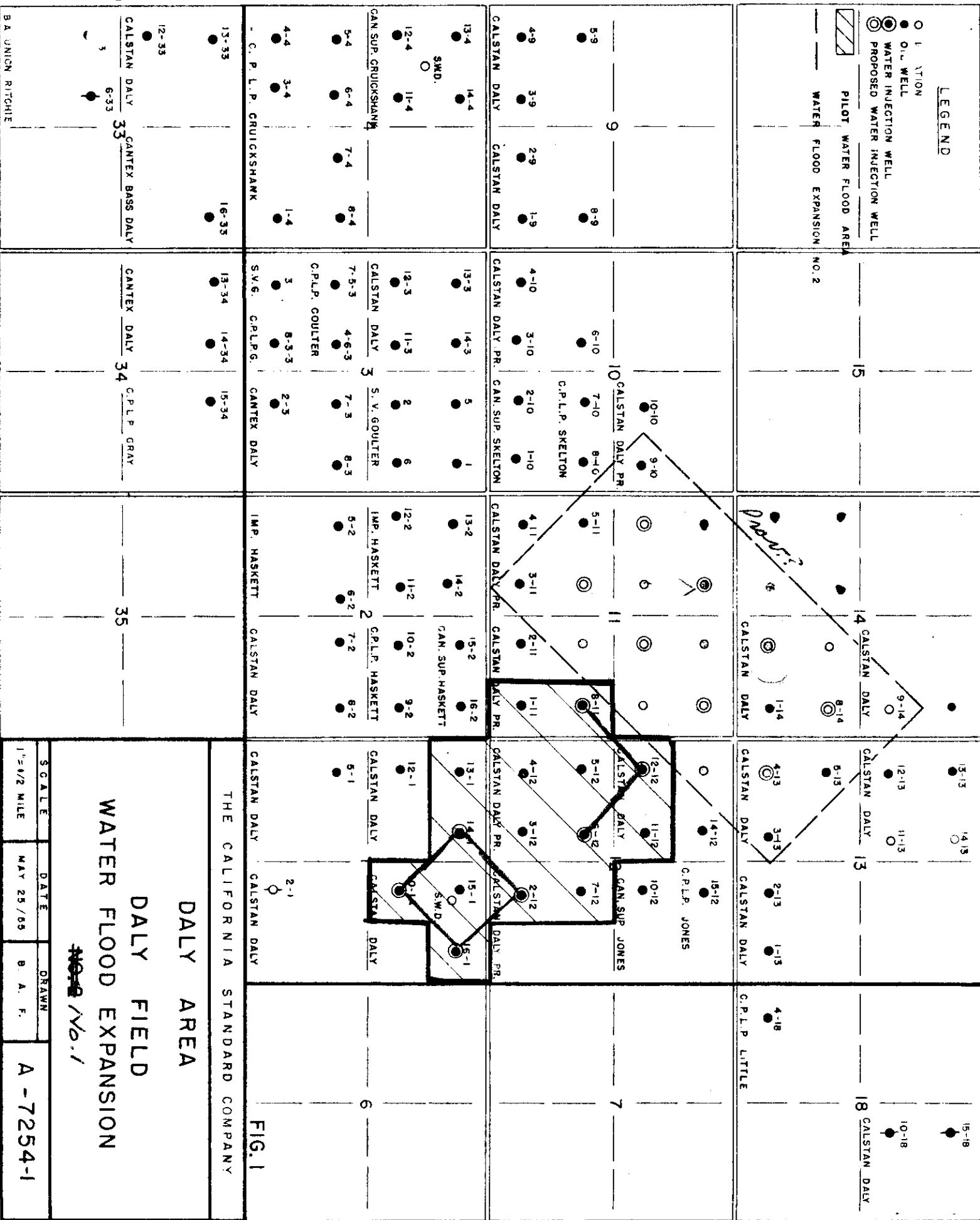


FIG. 1

THE CALIFORNIA STANDARD COMPANY

DAILY AREA

DAILY FIELD

WATER FLOOD EXPANSION

NO. 1

SCALE DATE DRAWN

1"=1/2 MILE

MAY 25 / 65

B. A. F.

A-7254-1

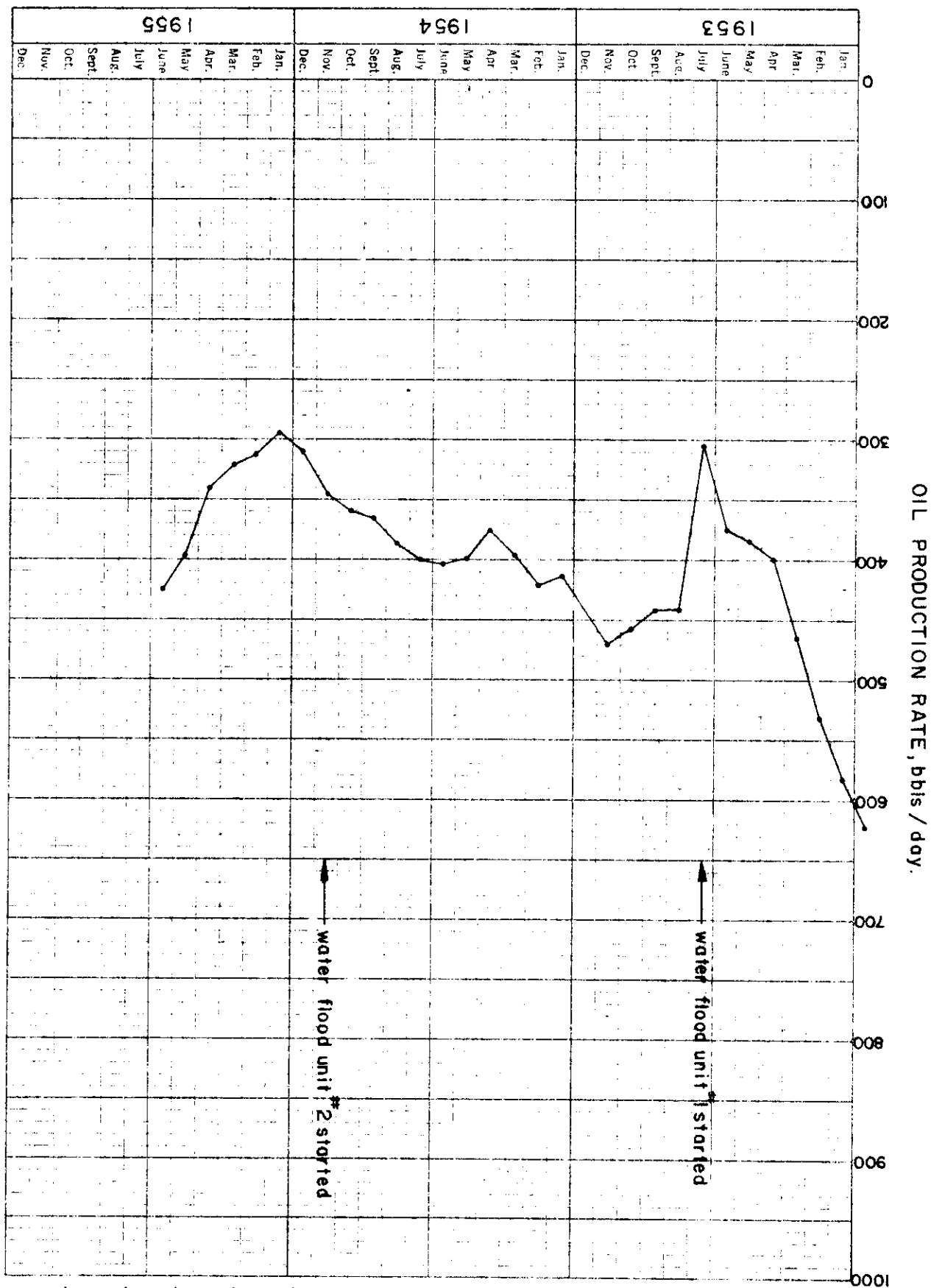


FIG. 2
DAILY FIELD
TOTAL PRODUCTION RATE OF 15 WELLS IN PILOT WATER FLOOD AREA
(10-1A, 13-1, 14-1, 15-1, 16-1, 11-1, 11-8, 11-2, 12-3, 12-4, 12-5, 12-6, 12-7, 12-11, 12-12, 12-12)

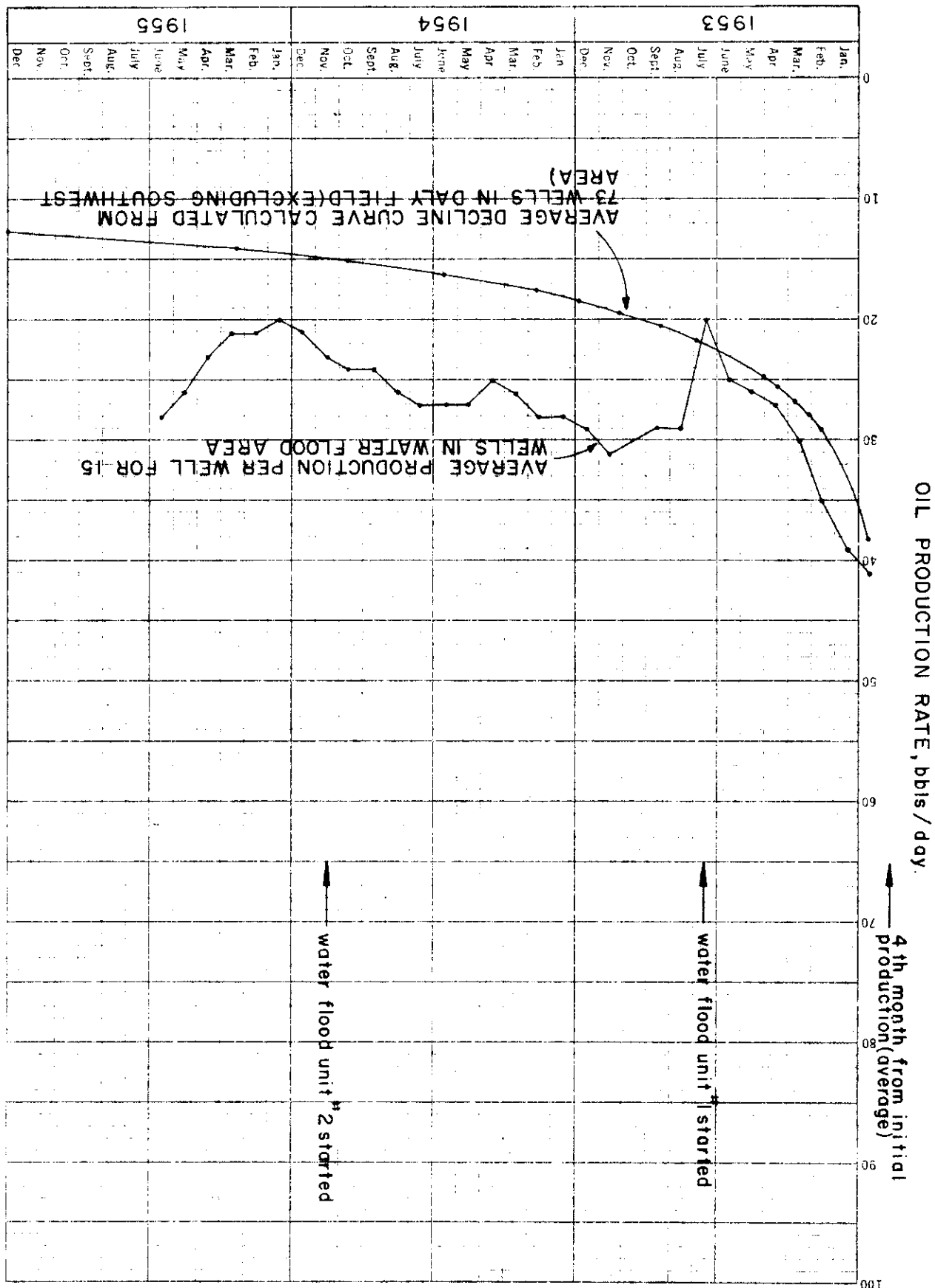


FIG. 3

October 25, 1954.

PROPOSAL FOR EXPANSION - DALY PILOT WATER FLOOD

The pilot water flood has been in operation over fifteen months. This report presents the results to date; the significance of these results; the conclusions which must be drawn and a proposal to expand the pilot water flood.

Results to Date

1. Daily production at 15-1 has increased from 7 barrels per day to 38 barrels per day.
2. Daly 3-12 has increased from 62 barrels per day to 120 barrels per day.
3. Daly 4-12 production increased from 75 barrels per day to 90 barrels per day and is currently 75 barrels per day.
4. Smaller production increases have been noted at 13-1, 5-12, and 6-12 (see rate cumulative curves attached).
5. Although not conclusively established, we believe the effect of the flood is starting to be felt at 12-1, 1-11 and 7-12. The low compressibility of the oil and connate water accounts for the repressuring of a rather extensive area. Assuming 50' of pay it only takes approximately 8000 barrels of water to raise the formation pressure in 40 acres from 1000 pounds to 2100 pounds.
6. The total daily water injection has declined from 2000 barrels per day to 730 barrels per day.
7. Recent attempts to increase injectivity by fracturing 16-1 and 10-1A have yielded very little increase.
8. A Carter Analyzer study made by C.R.C. indicates that:
 - (a) 15-1 will increase gradually during the next year to approximately 50 to 70 barrels per day.
 - (b) that approximately a total of 70 barrels per day of water is converging on 15-1 from the 4 injection wells.
9. No water breakthrough has been noted in any of the producing wells adjacent to the pilot flood.

Discussion

Since the injected water is not following radial behavior as in homogeneous sands it is necessary to revise our predictions of the behavior of the 80 acre 5 spot. The initial assumptions were that $1/4$ of the total water injected i.e. $1/4$ of 2000 barrels per day was moving in the direction of 15-1. Instead of this only $1/10$ of the total water injected is approaching 15-1 or about 70 barrels per day. This means that the time required to determine recovery efficiency in the 80 acre 5 spot to breakthrough, is greatly extended.

In addition it is estimated that a large portion of the injected water (approximately 500 barrels per day) is moving into the higher permeability area 3-12, 4-12, etc. The significance of this is illustrated in the attached map B-6752-1 which shows the theoretical flood fronts. This suggests that water breakthrough can be expected at 3-12 within the next year. This type of water drive is similar to a staggered line drive in which water breakthrough is followed by a rapid increase in W.O.R.'s and oil production consequently declines rapidly.

Conclusions

- (a) In order to confirm recovery efficiency in the 80 acre 5 spot to breakthrough (by the most conservative prediction, Stiles method) approximately 2 1/2 years additional time will be required. Cumulative production 15-1 at September 30, 1954, barrels.
- (b) The nonradial behavior of the injected water suggests that the flooding pattern should be altered to take advantage of the heterogeneity of the producing formation.
- (c) It is highly probable that Daily 3-12 production will drop rapidly should water breakthrough occur as a result of the unbalanced pattern currently influencing 3-12.
- (d) The production rate of the 3-12, 4-12, 1-11 and 5-12 can be increased substantially by addition of water drive from the west.

Recommendations

It is recommended that the Daly Pilot Flood be expanded to include the following injection wells:

6-12
12-12
8-11

This limited expansion is proposed in order to:

- (1) contain the flood front advance in a westerly direction to prevent 3-12 going to water prematurely.
- (2) increase production in the better permeability area.

Predicted Results of Pilot Water Flood Expansion

Following fill-up and pressurization the average injection rates are estimated as follows:-

		<u>Effective in Better Perm. Area</u>
14-1	210	175
8-11	200	165
2-12	210	160
6-12	150	115
12-12	<u>50</u>	<u>15</u>
	820 b/d	630 b/d

Based on these injection rates the future production is estimated as follows:

<u>Well</u>	<u>Current Daily Production</u>	<u>Est. Future Flood Production</u>	<u>Net Gain b/d</u>
13-1	24	24	-
1-11	51	65	14
3-12	115	303	188
4-12	72	112	40
5-12	<u>34</u>	<u>126</u>	<u>92</u>
	296	630	334
8-11	14	-	
6-12	18	-	
12-12	<u>8</u>	<u>-</u>	
	40		lost prod'n 40
			294
12-1	11	20	9
2-11	6	10	4
7-12	14	25	11
11-12	<u>18</u>	<u>25</u>	<u>7</u>
	49	80	31
TOTALS	<u>385 b/d</u>	<u>710 b/d</u>	<u>325 b/d</u>

The production rates were estimated by a material balance consideration and must be modified for time lag. From the 3-12 decline curve it was assumed that the net gain would be 50% complete in 6 months, 75% complete in 1 year, and 100% complete in 1½ years.

Since water breakthrough is anticipated at 3-12 in one year's time it was further assumed that 4-12 would be converted to injection in one year's time. This would mean a loss in production at that time of approximately 110 b/d. However, with 4-12 on injection the 110 b/d loss would be made up by increases in 1-11, 5-12, 13-1 and 3-12.

The production increase by expanding the flood is estimated as follows:

<u>Year</u>	<u>Net Increase in Production</u>
1	140 b/d
2	200 b/d
3	325 b/d

Daly Road 1954 file

THE CALIFORNIA STANDARD COMPANY

C. D. MIMS
VICE-PRESIDENT
PRODUCING

CALGARY, ALBERTA

January 29, 1954

→
Mr. J. S. Richards, Chairman,
The Oil and Natural Gas Conservation Board,
Province of Manitoba,
WINNIPEG, Manitoba.

Dear Mr. Richards:

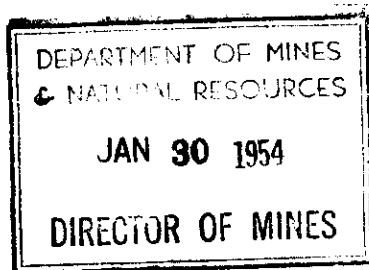
I wish to acknowledge receipt of your letter of January 28, 1954, and inform you that I have requested our Engineering Division to submit the report on the Daly water injection project as you have requested at the earliest practical date.

Yours very truly,

C. D. Mims

C. D. MIMS

CDM:DMc



THE CALIFORNIA STANDARD COMPANY

C. D. MIMS
VICE-PRESIDENT
PRODUCING

CALGARY, ALBERTA

February 10th, 1954.

Mr. J. S. Richards,
Chairman,
The Oil and Natural Gas Conservation Board,
Department of Mines and Natural Resources,
Mines Branch,
Winnipeg, Manitoba.

Dear Mr. Richards:

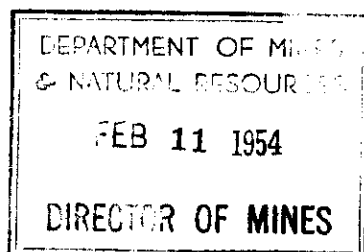
Further to our letter of January 29th, 1954, we enclose herewith two copies of the report on the Daly Pilot Water Flood Project as requested in your letter of January 28th, 1954.

If there is any further information you require regarding the above please advise.

Yours very truly,


C. D. MIMS

Encl.



INTERIM REPORT
PILOT WATER FLOOD PROJECT
DALY FIELD, MANITOBA

HISTORY

Construction of the Pilot plant started during the last week in May, 1953, and was ready for operation around the first week in July. The total cost of the Pilot Flood project, including the drilling of injection well 16-1, is approximately \$165,000.

Injection water was obtained from a surface slough in the South East quarter of Section 1, and was pumped through a 3" pipeline using a centrifugal pump at the slough. A wooden pier extends out into the water to permit cleaning of the suction screen. At the plant raw water enters a 1000 barrel settling tank which is baffled in order to permit preliminary sedimentation. Calcium hypochlorite is injected prior to the tank to eliminate bacteria, and a residual chlorine of 0.2 p.p.m. is maintained. Currently Calgon is being added to the water to prevent carbonate plugging of the hypochlorite solution tubes. From the settling tank the water is pumped through three anthracite filters with the object of maintaining the turbidity less than 5 p.p.m. The water is then metered prior to storing in a 1000 barrel surge tank, from which the high pressure National F-90 pump takes suction. On the discharge side of the pump, the water passes through a manifold located at the plant, and is carried to the wells through 2" seamless steel lines. Wellhead equipment consists of a check valve, strainer, and a 4" master valve.

The Pilot Flood was put into operation after completion of the 4th injection well in the 80 acre five spot. The four injection wells are Daly 2-12, Daly 14-1, Daly 10-1A, and Daly 16-1. The central producing well is Daly 15-1. Water injection was started into Daly 2-12 on July 11th, Daly 10-1A and Daly 14-1 on July 17th, and finally Daly 16-1 on July 20th. The original plant injection rate was approximately 2000 barrels per day, decreasing to a current rate, seven months later, of approximately 800 barrels per day (see Fig. 1). Individual well injection rates are shown graphically in figures 2, 3, 4, 5. The plant pressure was increased from 950 psi. to 1080 psi. This is considered a maximum pressure in order to remain below the over-burden pressure.

The Pilot Water Flood has indicated some results to date as is illustrated by production curves for Daly 15-1 and the offset wells (see Figures 6, 7, 8, 9, 10, 11). Daly 15-1 has risen from an original 11 barrels per day at the start of the Flood to a current 34 barrels per day, an increase of 300%. Daly 3-12 production has gone up from 65 barrels per day to a current 110 barrels per day, for an increase of 70%. This is undoubtedly a result of better permeability in the vicinity of Daly 3-12, and indicates some directional preference, but should not be viewed with undue alarm.

To February 4th, 1954, a total of 242,929 barrels have been injected into the four injection wells.

OPERATION

Continued operation during the cold weather was made possible by an adequate winterization program, which included the installation of a steam generator,

insulating the water plant and wellheads, as well as burying the injection lines six feet deep.

The operating costs for the three months, October, November, December, 1953, averaged \$5,800 per month. Since we were unable to obtain water from the slough in the South East quarter of Section 1 after January 7th, we have now resorted to trucking water from the Dam at the Springvale school. This will probably increase operating costs by approximately 50%.

During the fall of 1953, a shallow water well drilling program was undertaken. Fourteen wells were drilled at an expenditure of \$12,500, but proved unsuccessful. Since that time the Jurassic sand at Daly 2-1 was opened and attempts made to evaluate it from the standpoint of water productivity. Considerable difficulties have been encountered due to the unconsolidated nature of the sand. Owing to the fineness of the Jurassic sand (some sand passes 325 mesh screen) special completion technique has been made necessary. Completion was attempted during December, but due to the mechanical difficulties and the cold weather, has been temporarily suspended. It is anticipated that work shall be resumed following moderation of the weather.

STATUS OF PILOT FLOOD PROJECT

It is too early to draw any definite conclusions concerning the success of the Pilot Flood project. We anticipate a continued increase in the production of Daly 15-1 during 1954. Barring any unforeseen delays, the success of the Pilot Flood project may be ascertained during the current year, although Pilot Floods in the past in other areas have taken longer than 18 months to evaluate.

DAILY WATER FLOOD PLANT NO. 1

Total Plant Injection Rate, bbl/day

Plant Pressure, psig

July

August

September

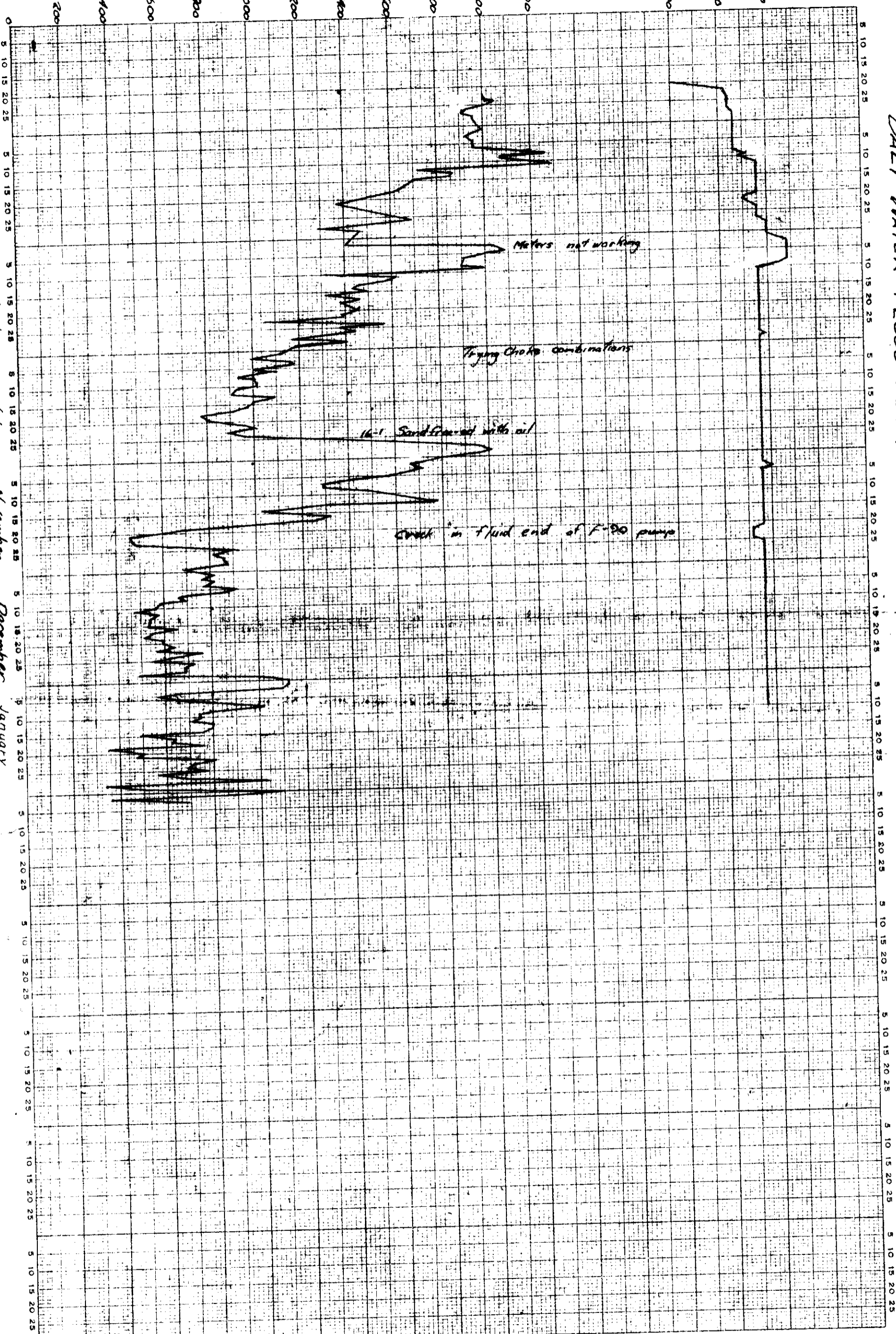
October

November

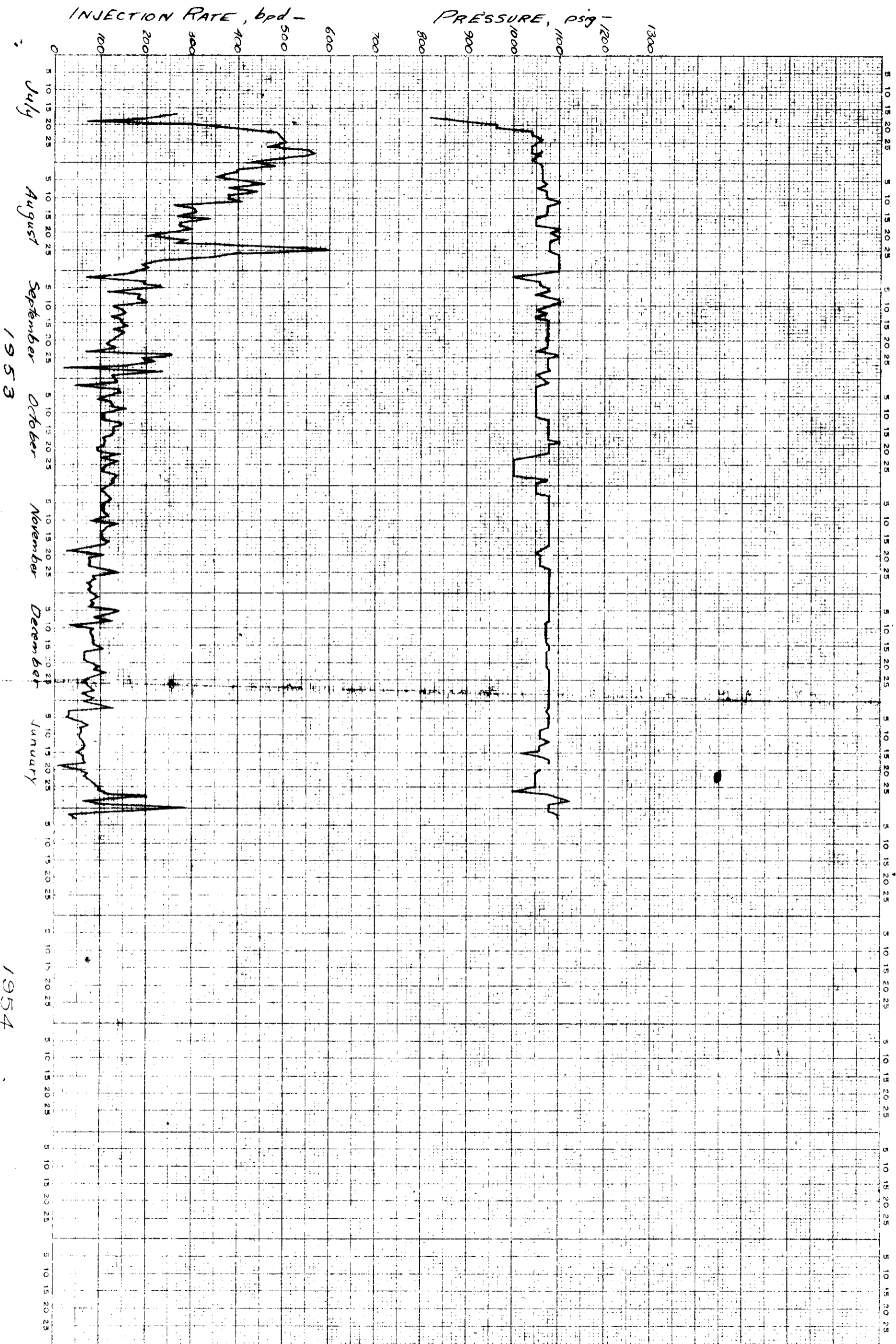
December

January

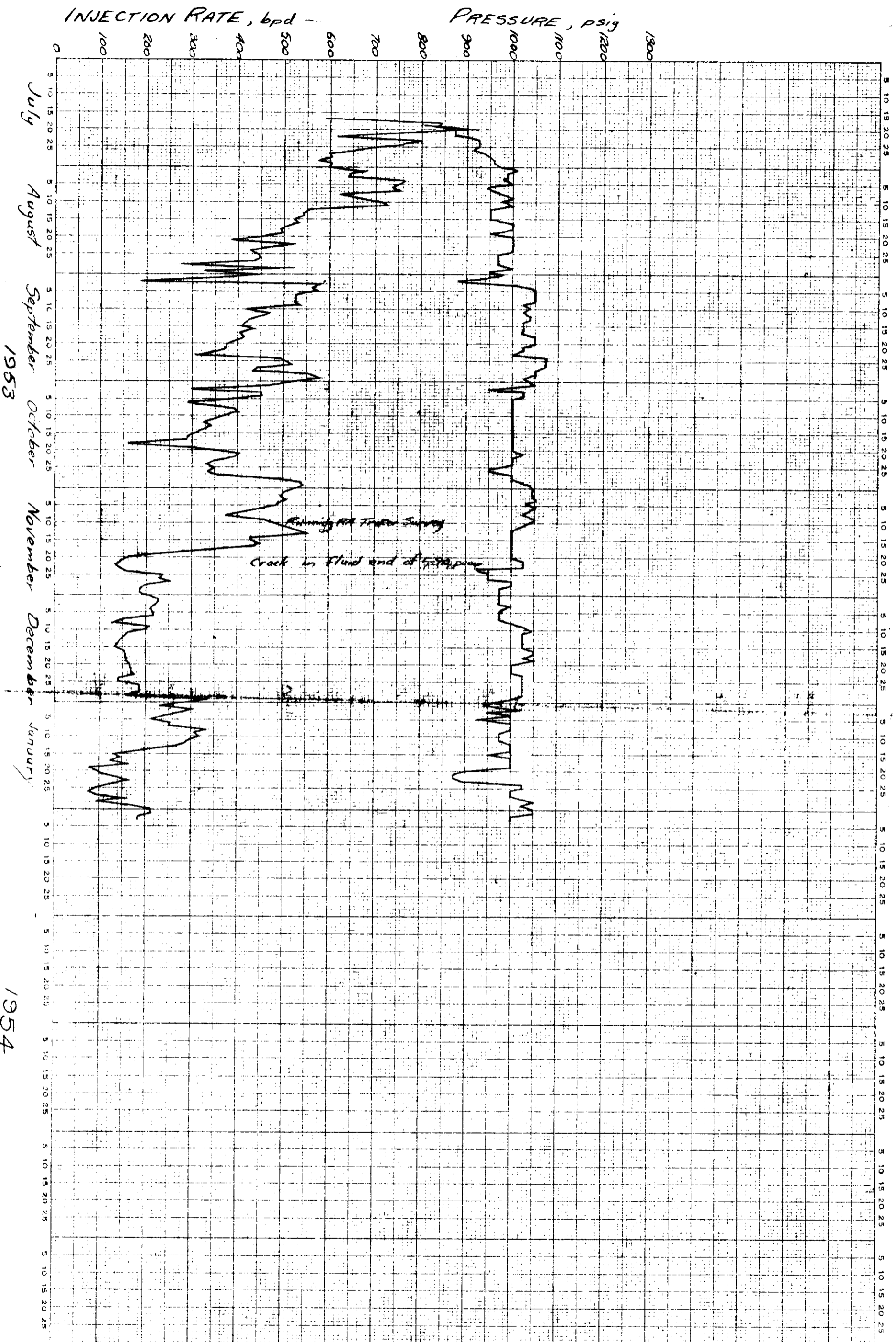
1954



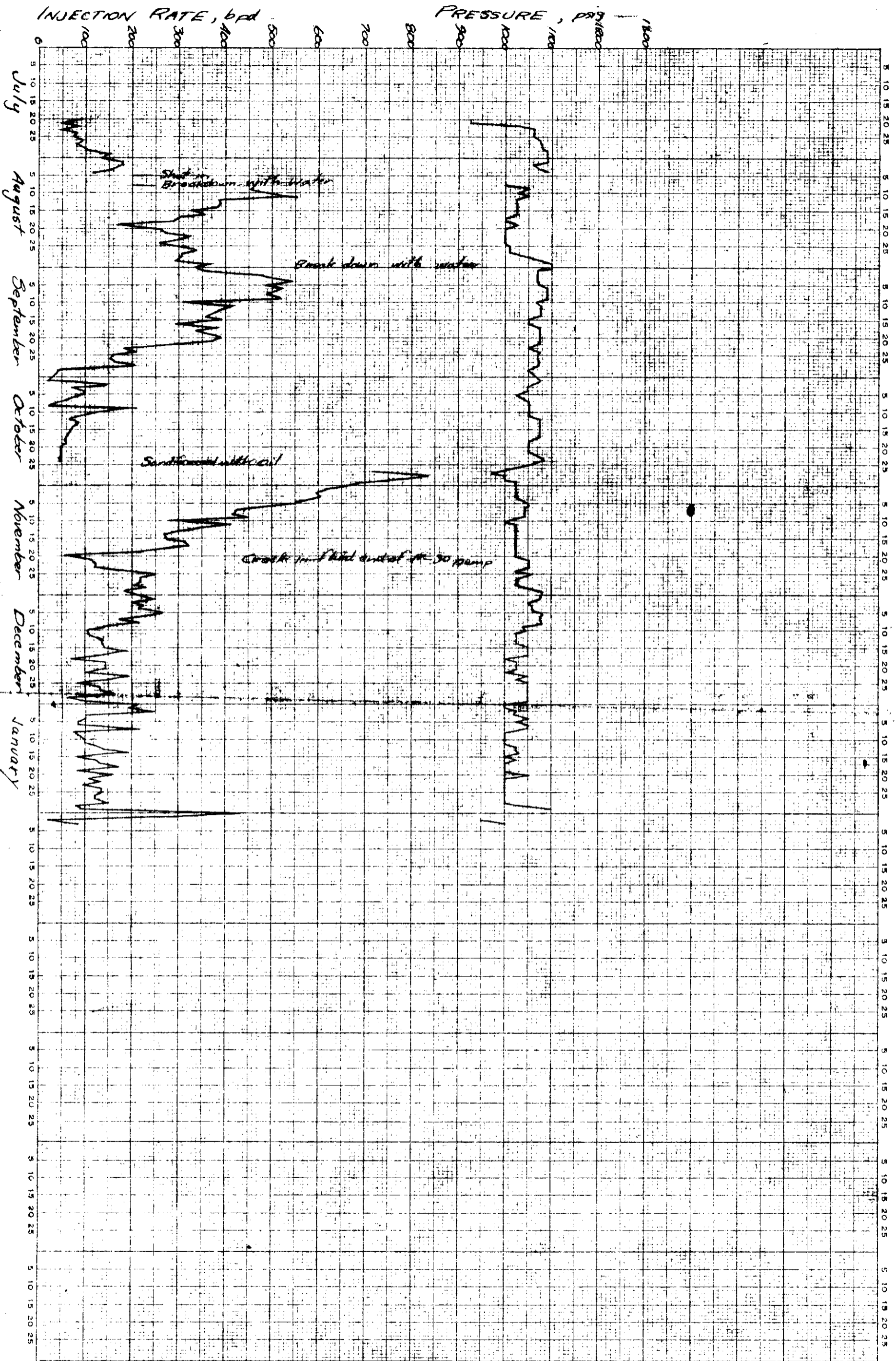
WATER INJECTION
DAILY 10-14



WATER INJECTION
DAILY 14-1



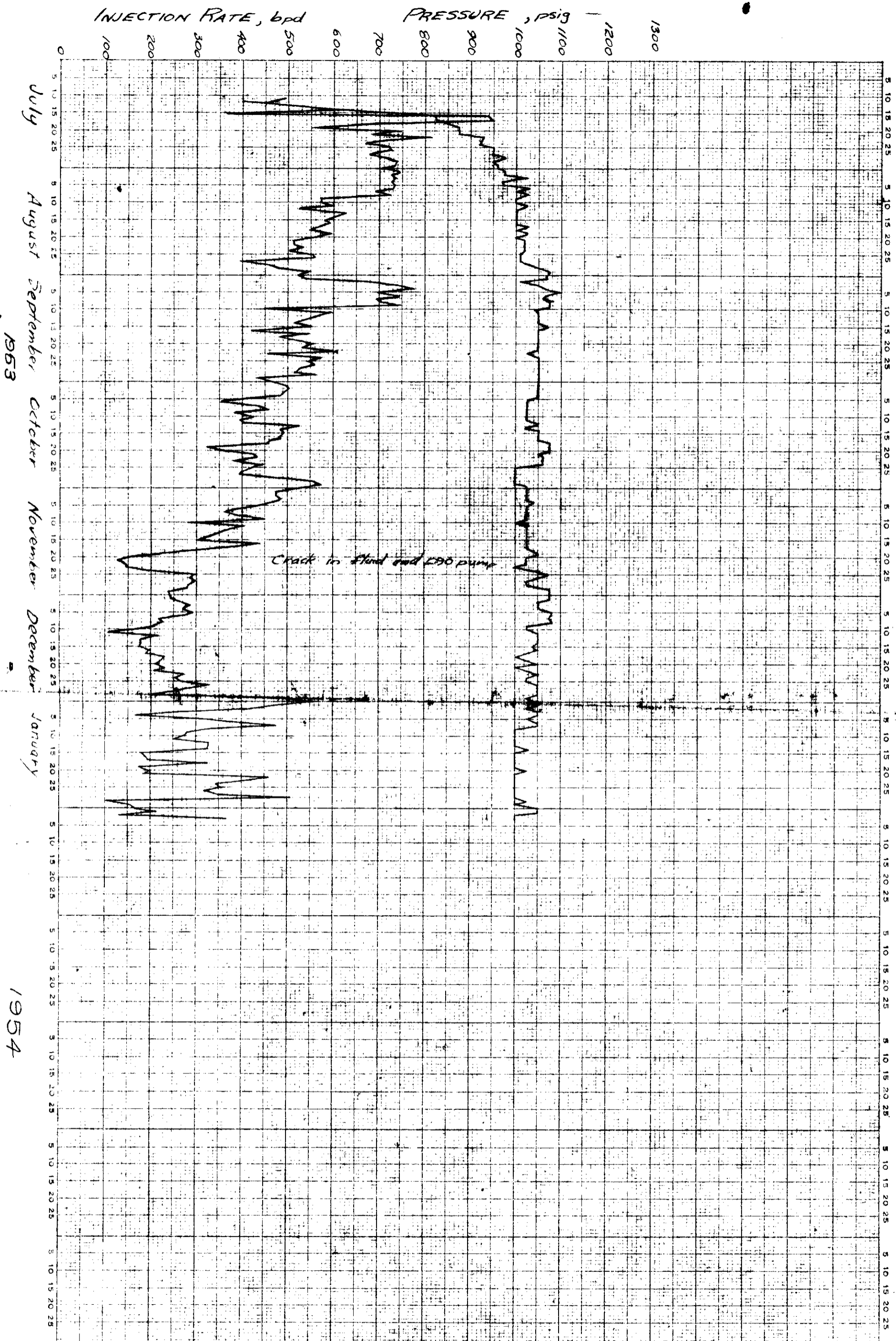
WATER INJECTION DAY 16-1



Divisions vertically.
MADE IN U.S.A.

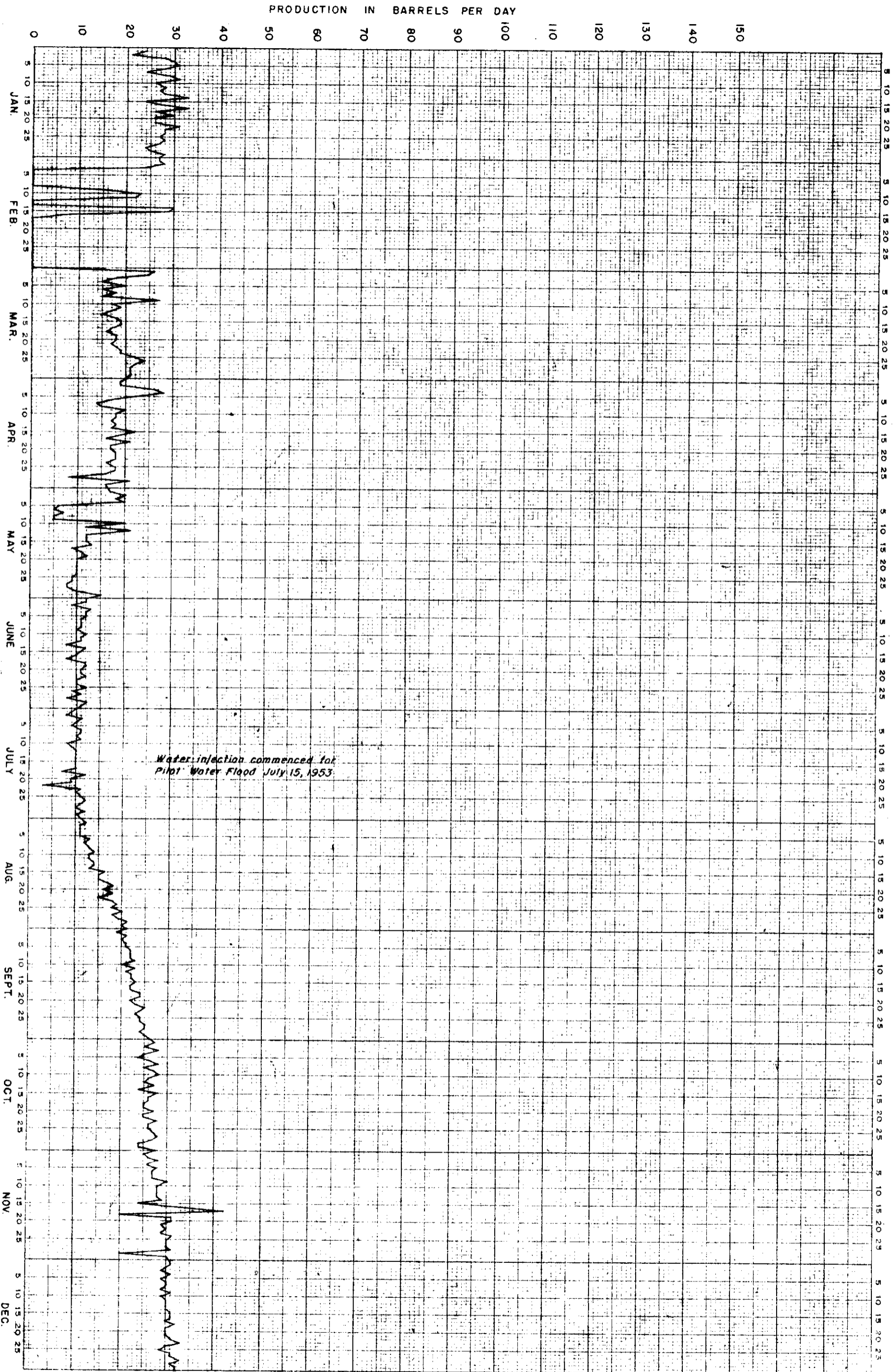
1954

WATER INJECTION DAY 2-12



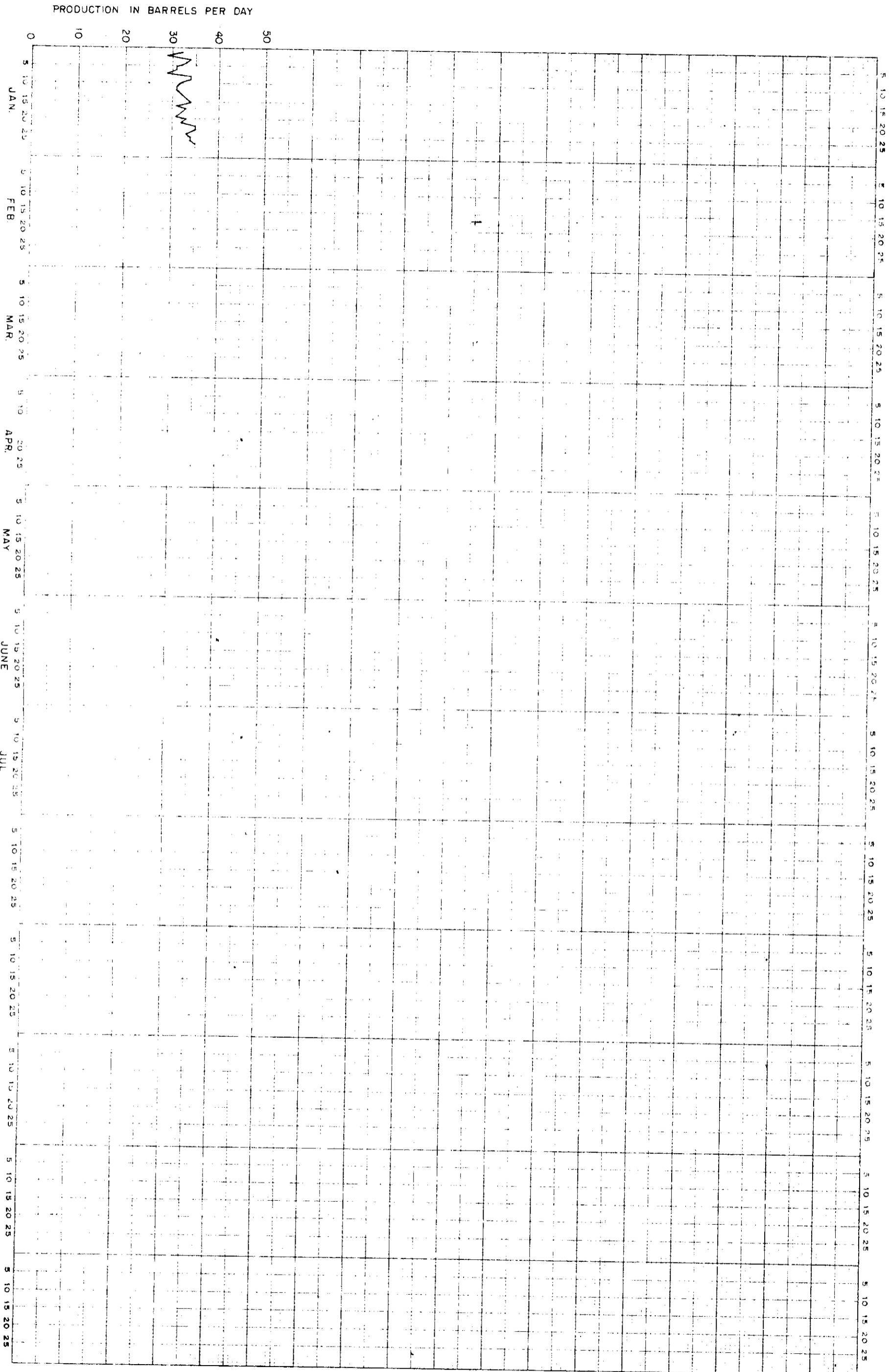
PRODUCTION DECLINE
DAILY 15-1

PAGE 2.



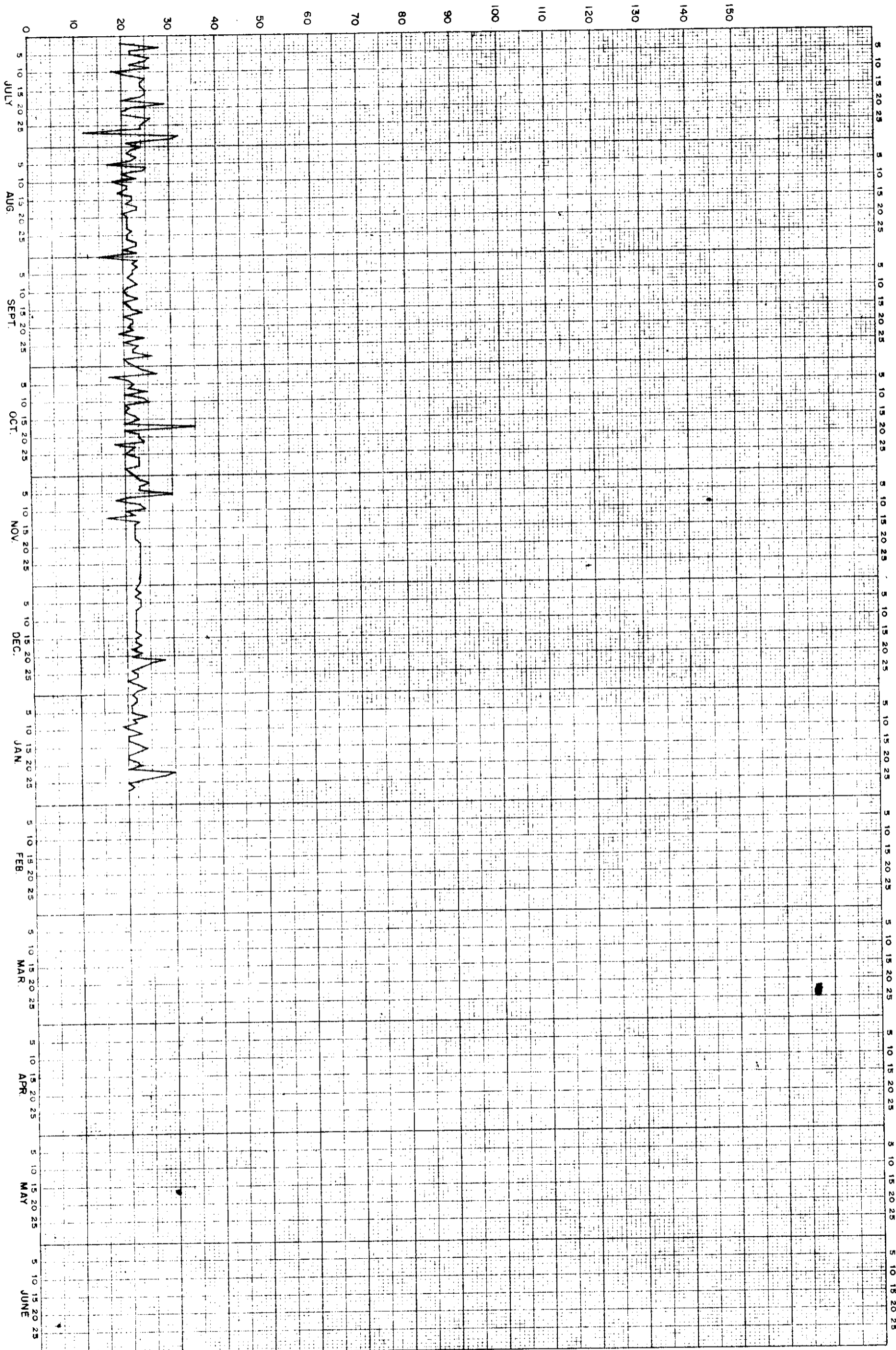
1953

PRODUCTION DECLINE CURVE
DALY 15-1



PRODUCTION IN BARRELS PER DAY

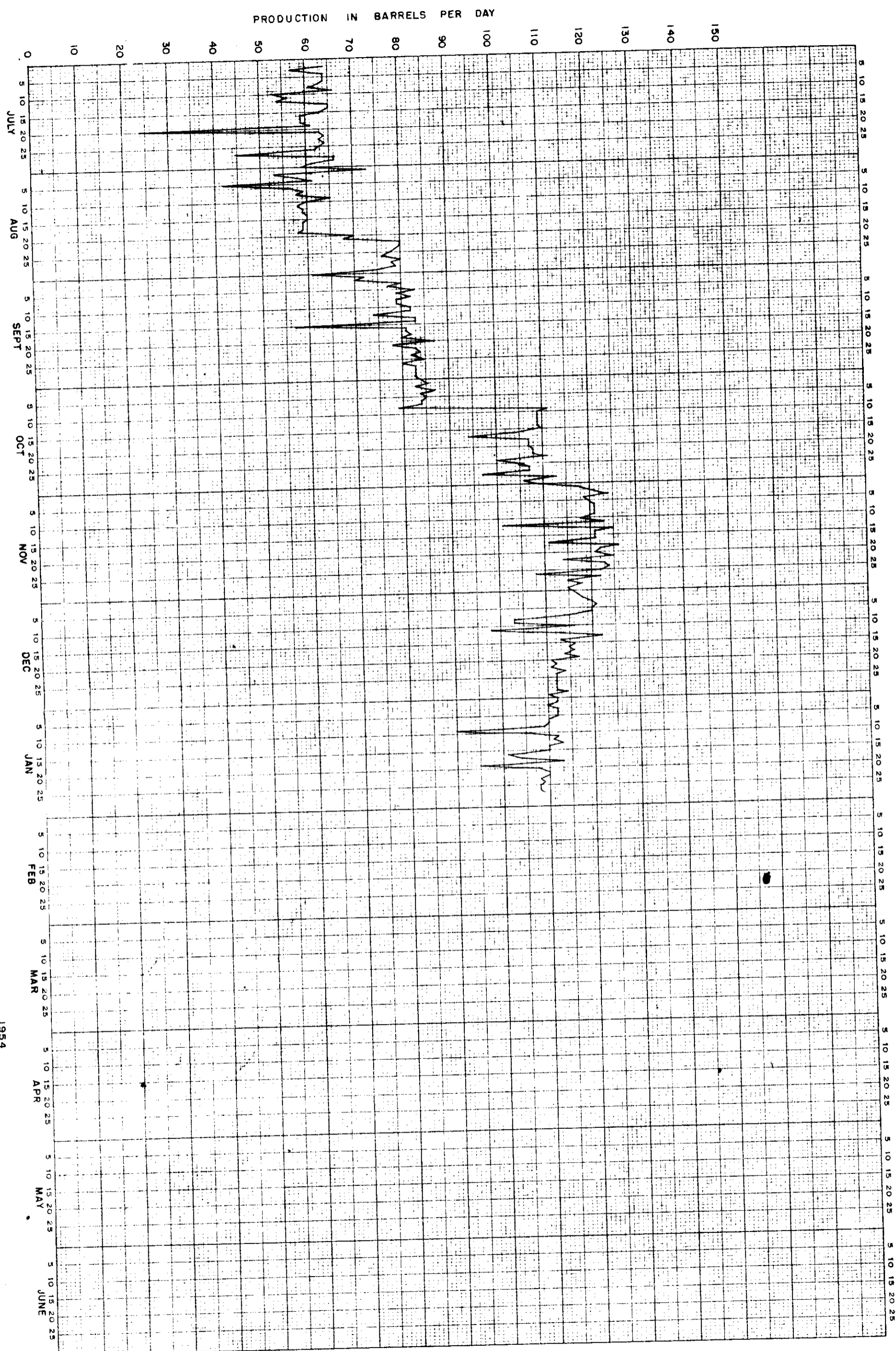
PRODUCTION DECLINE CURVE
DALY 13-1



1953

1954

PRODUCTION DECLINE CURVE
DALY 3-12

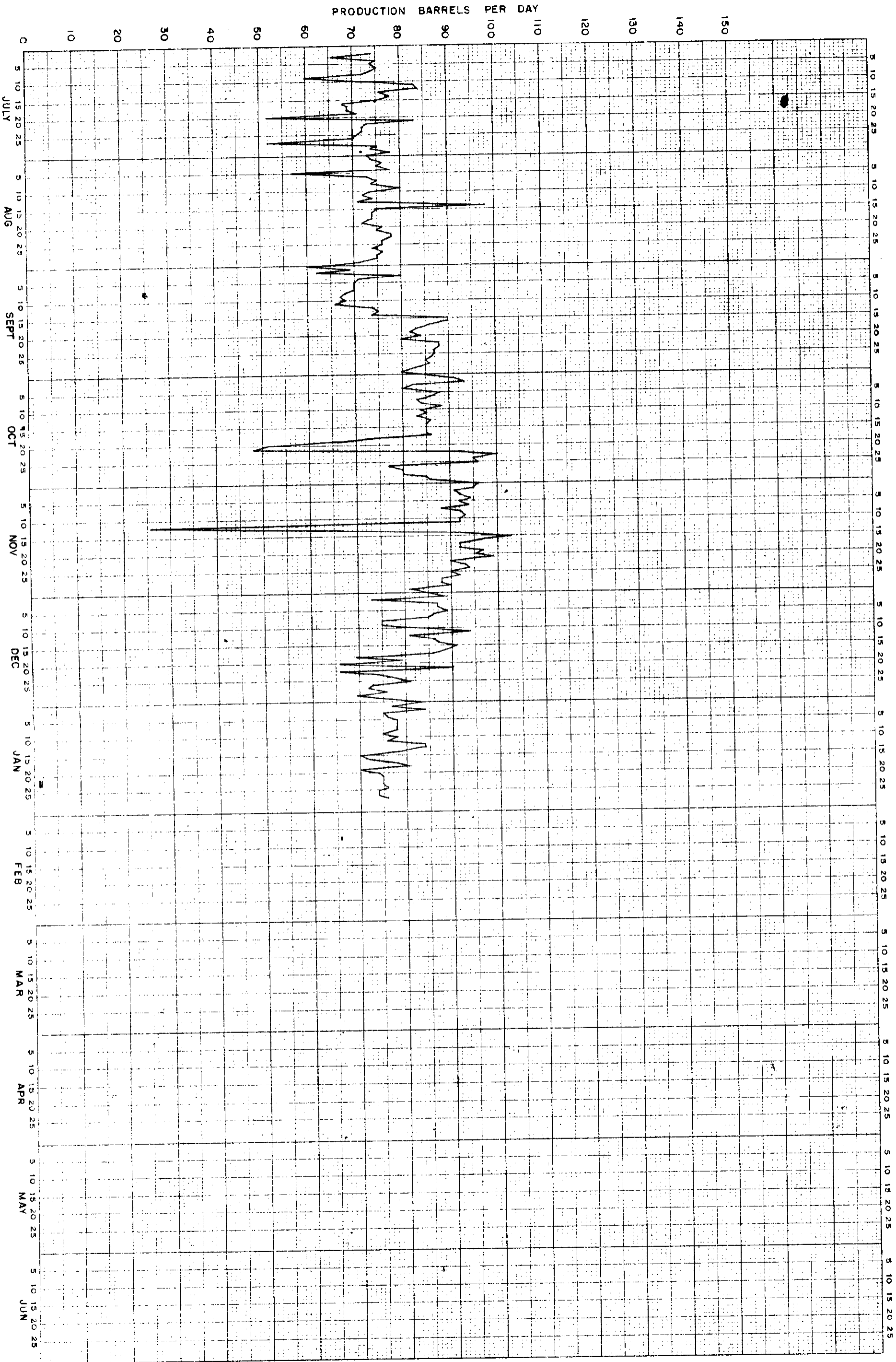


1953

1954

PRODUCTION DECLINE CURVE
DALY 4-12

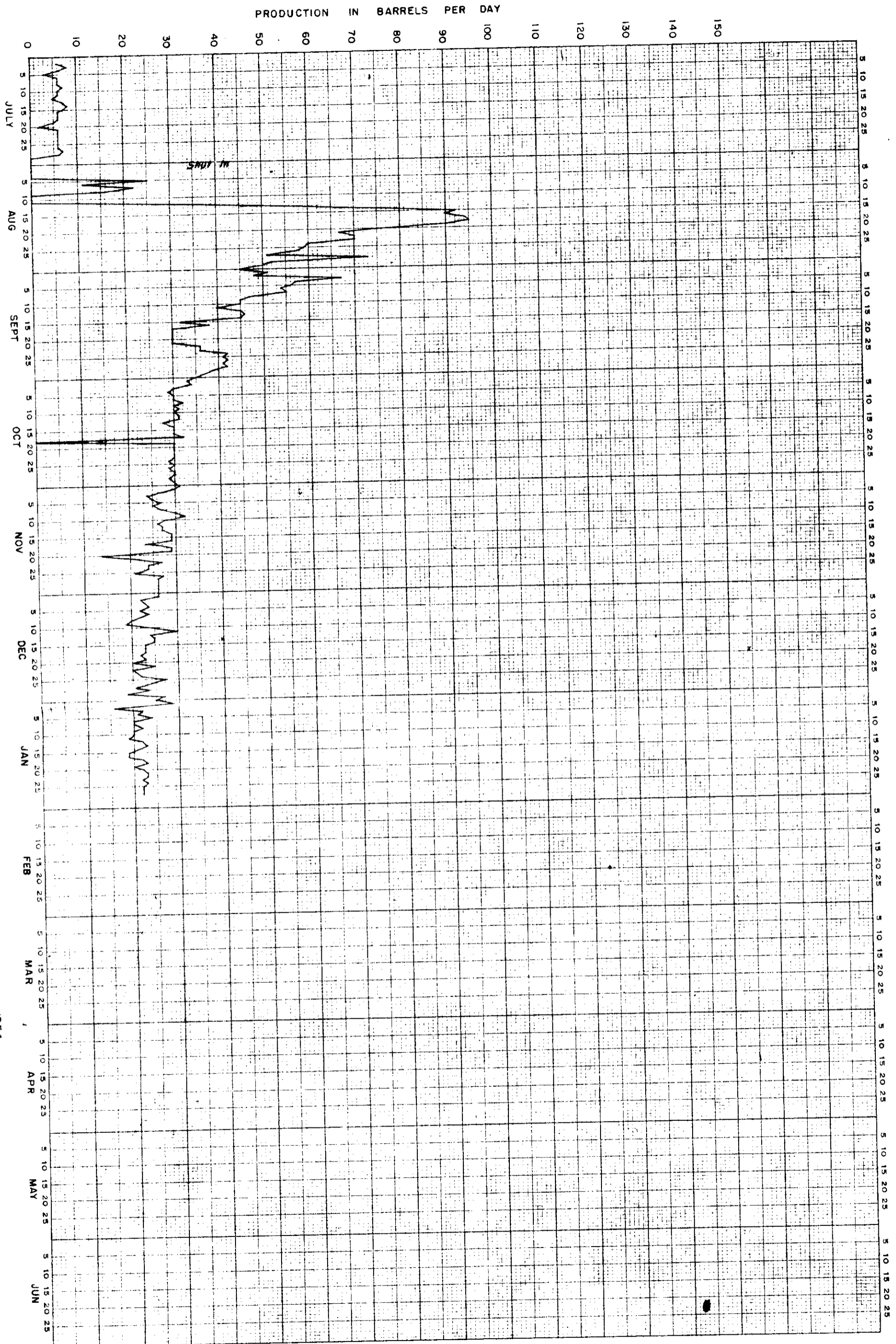
PRODUCTION BARRELS PER DAY



1953

1954

PRODUCTION DECLINE CURVE
Daly 6-12

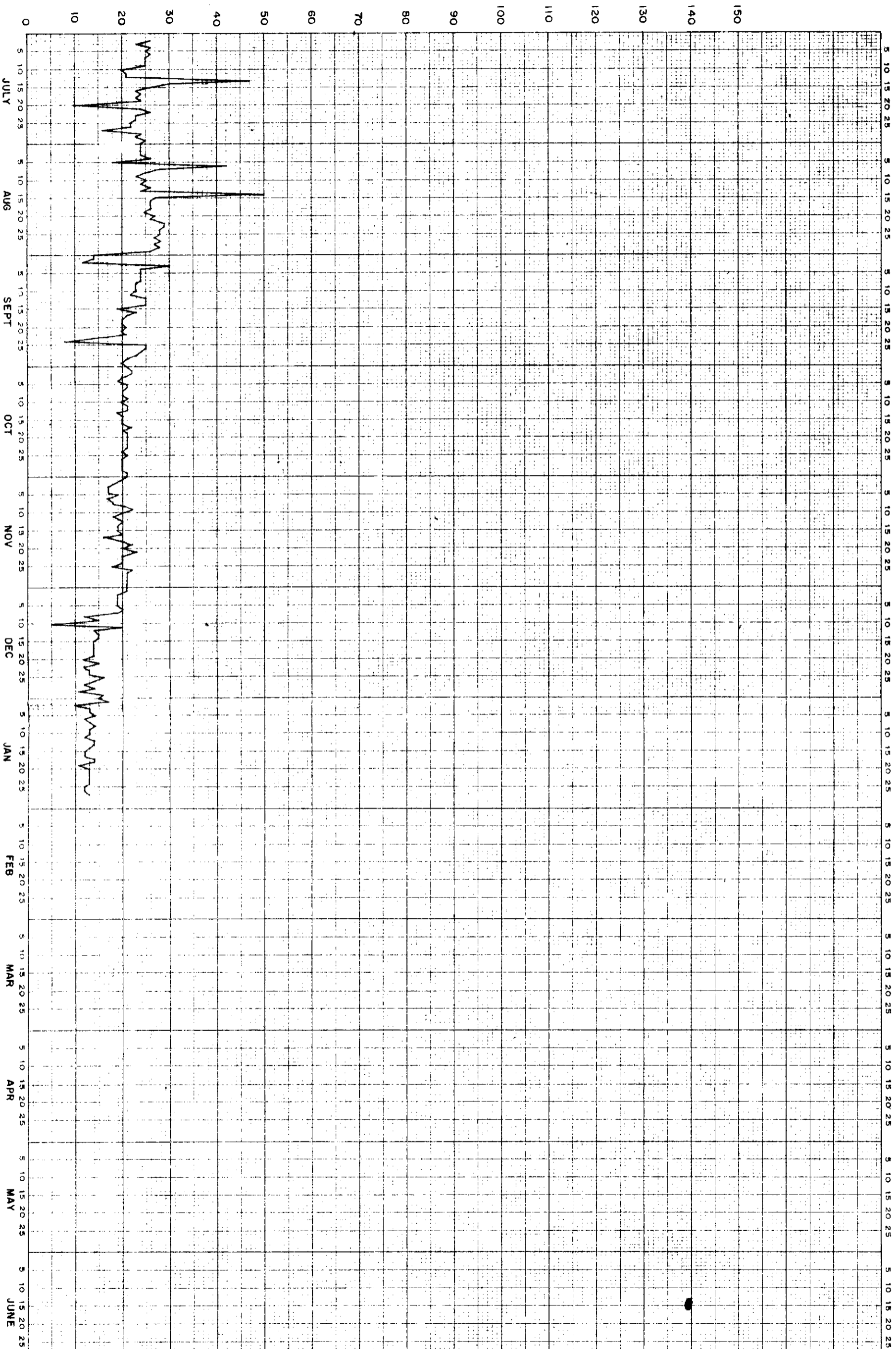


1953

1954

PRODUCTION DECLINE CURVE
DALY 7-12

PRODUCTION IN BARRELS PER DAY



1953

1954