CASE 3499: Application of PAN AM. for pressure interference tests, Chaves County, New Mexico.

CASE NO.
3490

Application,
Transcripts,
Small Exhibits
ETC.

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

March 23, 1967

Pan American Petroleum Corporation
Post Office Box 68
Hobbs, New Mexico

Attention: Mr. V. E. Staley

Re: Pressure Interference Tests
Cato-San Andres Pool
Chaves County, New Mexico

Gentlemen:

Reference is made to Mr. D. L. Ray's telegram of March 20, 1967, requesting that Pan American be granted authority to leave its Baskett "D" Well No. 1 shut-in as a pressure observation well through June 30, 1967, and to produce its allowable and the 6,238 barrels of underproduction which had accrued to the Baskett "D" Lease as of March 1, 1967, as well as the current allowable, from the other four wells on the lease.

This letter confirms the verbal approval given the above-described procedure in the March 20 telephone conversation between Pan American's Mr. V. E. Staley and Mr. D. S. Nutter of this office. This approval is given pursuant to the provisions of Order No. R-3165 which originally authorized the pressure interference tests.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/ir
cc: Oil Conservation Commission - Hobbs, New Mexico
Union Texas Petroleum Corporation - Midland, Texas
MWJ Producing Company - Midland, Texas
Max Coll - Roswell, New Mexico
Case File 3499

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

1201 (4-60)

W. P. MARSHALL, PRESIDENT

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

LA085 NSA367

NS FWB202 PD=FAX FORT WORTH TEX 20 124P CST=
:A L PORTER, JR NEW MEXICO OIL CONSERVATION COMMISSION
STATE LAND OFFICE BLDG COLLEGE AVE SANTA FE NMEX=

RE NMOCC ORDER R-3165 DATED DECEMBER 16 1966 AUTHORIZING PAN AMERICAN TO CONDUCT A PRESSURE INTERFERENCE TEST IN THE CATO-SAN ANDRES POOL, CHAVEZ COUNTY, AS REQUESTED AT NMOCC HEARING ON NOVEMBER 30 1966, CASE NO 3499. ALSO OUR TWX OF JANUARY 27, 1967, AND YOUR TWX OF JANUARY 27 1967 AUTHORIZING EXTENSION OF INTERFERENCE TEST PERIOD AND OVERPRODUCTION OF BASKETT "D" NO 1 FOR

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

1201 (4-60)

W. P. MARSHALL, PRESIDENT

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

AN ADDITIONAL 30 DAY PERIOD. AS PREVIOUSLY ADVISED, DRAWDOWN PHASE OF TEXT ON BASKETT "D" NO 1 WAS INITIATED ON JANUARY 13, 1967. THIS PHASE WAS TERMINATED ON FEBRUARY 23 1967 WITH A PRODUCTION DURING THE PERIOD FROM "D" NO 1 OF APPROXIMATELY 7600 BARRELS. WITH ALLOWABLE TRANSFER PROVISIONS, IN SPITE OF OVERPRODUCTION OF BASKETT "D" NO 1, THE ENTIRE BASKET "D" LEASE WAS UNDERPRODUCED 6238 BO AS OF 3/1/67. AS A RESULT OF PRODUCTION FROM BASKETT "D" NO 1, PLUS THREE DAYS OF PRODUCTION OF BASKETT "D" NO 5, DEFINITE INTERFERENCE WAS OBSERVED IN THREE WELLS WITH A MAXIMUM PRESSURE DROP

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

INTERFERENCE TEST RESULTS.=PLEASE ADVISE YOUR DECISION BY COLLECT WIRE TO MR V E STALEY, JR, PAN AMERICAN , HOBBS, NEWNMEXICO. COPIES ARE BEING SENT TO ALL OPERATORS IN THE FIELD AND YOUR MR JOE RAMEY=

D L RAY PAN AMERICAN PETROLEUM CORP=:

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

OF ABOUT 10 PSI WITH PROBABLE INTERFERENCE BEING OBSERVED AT A FOURTH WELL. AS A FURTHER CROSS CHECK ON INTERFERENCE TEST RESULTS NOW BEING ANALYZED, IT IS RESPECTFULLY REQUESTED THAT UNDER DECRETAL PROVISIONS GRANTED TO LEAVE BASKETT "D" NO 1 SHUT IN AS A PRESSURE OBSERVATION WELL FOR A PERIOD THROUGH JUNE 31 1967, (1), (2), (3), ANDN(4) OF R-3165 THAT AUTHORITY BE WITH MARCH THROUGH JUNE BASKETT "D" NO 1 ALLOWABLE AND CURRENT LEASE UNDERPRODUCTION TRANSFERRED TO THE OTHER FOUR WELLS ON THE LEASE PURPOSE WOULD BE TO OBSERVE SEMI-STEADY STATE PRESSURE DECLINE AND FURTHER CONFIRM

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

LA042 NSB083

1967 JAN 27 AM 11 26

NS FWC008 PD=FAX FORT WORTH TEX 27 1016A CST=
A L PORTER JR, NEW MEXICO OIL CONSERVATION COMM=
STATE LAND OFFICE BLDG COLLEGE AVE SANTAFE NMEX=

RE NMOCC ORDER R-3165 DATED DECEMBER 16, 1966, AUTHORIZING PAN AMERICAN TO CONDUCT A PRESSURE INTERFERENCE TEST IN THE CATO-SAN ANDREW POOL, CHAVES COUNTY, NEW MEXICO AS REQUESTED AT NMOCC HEARING ON NOVEMBER 30, 1966, (CASE NO. 3499. PAN AMERICAN COMMENCED TEST ON JANUARY 1, 1967 BY SHUTTING IN ALL WELLS IN TEST AREA FOR BOTTOMHOLE PRESSURE BUILDUP TESTS. THE DRAWDOWN STAGE OF THE TEST WAS COMMENCED ON JANUARY 13,

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

DOMESTIC SERVICE
Check the class of service desired; otherwise this message will be sent as a fast telegram
TELEGRAM
DAY LETTER
NIGHT LETTER

$
S
E

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1206 (4-55)

INTERNATIONAL SERVICE
Check the class of service desired; otherwise the message will be sent at the full rate
FULL RATE
LETTER TELEGRAM
SHORE-SHIP

NO. WDS.-CL. OF SVC.	PD. OR COLL.	CASH NO.	CHARGE TO THE ACCOUNT OF	TIME FILED
	COLLECT			2:30 P.M.

Send the following message, subject to the terms on back hereof, which are hereby agreed to

JANUARY 27, 1967

Case 3499

V. E. STALEY, JR.
PAN AMERICAN PETROLEUM CORP.
HOBBS, NEW MEXICO

PURSUANT TO REQUEST FROM D. L. RAY FORT WORTH OPERATORS IN CATO SAN ANDRES POOL HEREBY AUTHORIZED TO ACCRUE UNDERPRODUCTION ON WELLS SHUT IN FOR INTERFERENCE TESTS FOR ADDITIONAL 30 DAYS IF NECESSARY. BASKETT "D" NO. 1 ALSO PERMITTED TO OVERPRODUCE FOR ADDITIONAL 30 DAYS IF NECESSARY. PRESENTLY AUTHORIZED 90-DAY PERIOD FOR MAKING UP UNDERPRODUCTION ALSO EXTENDED ON BASIS OF 3 ADDITIONAL DAYS FOR EACH ADDITIONAL DAY SHUT IN AFTER JANUARY 31. OTHER OPERATORS PARTICIPATING IN TESTS NOT BEING NOTIFIED BY COMMISSION OF THIS ACTION. WE DEEM IT YOUR RESPONSIBILITY, AS APPLICANT, TO SO NOTIFY THEM.

A. L. PORTER, JR.
SECRETARY-DIRECTOR
NEW MEXICO OIL CONSERVATION COMMISSION

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

1201 (4-60)

W. P. MARSHALL, PRESIDENT

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

TO EXTEND THE AUTHORIZED PERIOD FOR OVERPRODUCING THE BASKET "D" WELL NO. 1 UNTIL MARCH 1, 1967. PRESENTLY AUTHORIZED 30-DAY PERIOD FOR ACCRUING UNDERPRODUCTION TERMINATES JANUARY 30, 1967. ALSO, WE REQUEST AUTHORITY TO EXTEND FOR AN ADDITIONAL 60 DAYS THE PRESENTLY AUTHORIZED 90-DAY PERIOD TO PRODUCE ACCRUED UNDERPRODUCTION, SINCE WE ANTICIPATE DIFFICULTY IN MAKING UP UNDERPRODUCTION IF 30 DAY EXTENSION TO TEST PERIOD IS APPROVED. PLEASE ADVISE YOUR DECISION BY COLLECT WIRE TO V. E. STALEY, JR., PAN AMERICAN, HOBOS, NEW MEXICO. UNION TEXAS PETROLEUM AGREES WITH THESE REQUESTS=

D L RAY==

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

1201 (4-60)

W. P. MARSHALL, PRESIDENT

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

1967 WHEN PAN AMERICAN'S BASKET "D" WELL NO. 1 WAS RESTORED TO PRODUCTION AT CAPACITY RATES. TEST RESULTS OBTAINED TO DATE INDICATE DEFINITE FRECTURE ORIENTATION, WITH 4 PSI DRAWDOWN OBSERVED IN ONE WELL. PAN AMERICAN DESIRES TO CONTINUE TEST BEYOND MAXIMUM 30-DAY PERIOD AUTHORIZED IN ORDER R-3165 SO AS TO ACHIEVE AT LEAST 10 PSI DRAWDOWN IN AT LEAST ONE OBSERVATION WELL AS REQUESTED AT HEARING. THEREFORE, PAN AMERICAN RESPECTFULLY REQUESTS THE SECRETARY-DIRECTORS PERMISSION TO ACCRUE UNDER PRODUCTION FROM THE SHUT-IN WELLS FOR AN ADDITIONAL 30-DAY PERIOD, ENDING MARCH 1, 1967, AND

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

1201 (4-60)

W. P. MARSHALL, PRESIDENT

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

LA149 NSB306

NS MDA114 PD=MIDLAND TEX 20 333P CST=

1967 FEB 20 PM 3 04

NEW MEXICO OIL CONSERVATI ON COMMISSION=

SANTA FE NMEX=

ATTN MR DAN NUTTER: RE INTERFERENCE TEST CATO SAN ANDRES POOL ORDER #R-3165. THIS IS TO ADVISE THAT UNION TEXAS PETROLEUM DOES NOT OPPOSE THE PAN AMERICAN REQUEST TO PLACE THE PAN AMERICAN BASKETT D-5 WELL ON PRODUCTION UNDER MAXIMUM CAPACITY CONDITIONS=

HOWARD PERDUE UNION TEXAS PETR=

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

DOMESTIC SERVICE
Check the class of service desired; otherwise this message will be sent as a fast telegram

TELEGRAM	X
DAY LETTER	
NIGHT LETTER	

$ S E

WESTERN UNION
TELEGRAM

1206 (4-55)

W. P. MARSHALL, PRESIDENT

INTERNATIONAL SERVICE
Check the class of service desired; otherwise the message will be sent at the full rate

FULL RATE	
LETTER TELEGRAM	
SHORE-SHIP	

NO. WDS.-CL. OF SVC.	PD. OR COLL.	CASH NO.	CHARGE TO THE ACCOUNT OF	TIME FILED
	COLLECT			4 P.M.

Send the following message, subject to the terms on back hereof, which are hereby agreed to

FEBRUARY 20, 1967

PAN AMERICAN PETROLEUM CORPORATION
HOBBS, NEW MEXICO
ATTENTION: V. E. STALEY

PAN AMERICAN HEREBY AUTHORIZED TO PUT BASKETT "D" WELL NO. 5 BACK ON PRODUCTION AT CAPACITY FOR REMAINDER OF CATO-SAN ANDRES INTERFERENCE TESTS, PROVIDED SUCH PRODUCTION SHALL BE CHARGED AGAINST UNDERPRODUCTION ACCUMULATED BY SAID WELL DURING SHUT-IN PERIOD, OR, IF IN EXCESS THEREOF, AGAINST FUTURE ALLOWABLES ASSIGNED AFTER CESSATION OF TESTS OR AFTER MARCH 1, WHICHEVER COMES FIRST.

A. L. PORTER, Jr.
SECRETARY-DIRECTOR
NEW MEXICO OIL CONSERVATION COMMISSION

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

February 16, 1967

MWJ Producing Company
413 First National Bank Building
Midland, Texas 79701

Re: Interference Tests,
Cato-San Andres Pool,
Chaves County, New Mexico

Gentlemen:

Reference is made to your letter of February 13, 1967, requesting approval to participate in the pressure interference tests recently authorized for the Cato-San Andres Pool by Commission Order No. 3165.

MWJ Producing Company is hereby authorized to participate in the interference tests by shutting in its Cato-State No. 2 Well Unit N, Section 2, Chaves County, New Mexico, and said well shall be permitted to accrue underproduction in accordance with Ordering Paragraph (6) of Order No. R-3165 for a period not to exceed 30 days.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/og
cc: Oil Conservation Commission - Hobbs
Pan American Petroleum Corp., - Hobbs
Mr. Max Coll, Roswell
Union Texas Petroleum Division

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

February 16, 1967

Pan American Petroleum Corporation
P. O. Box 68
Hobbs, New Mexico

Re: Interference Tests,
Cato-San Andres Pool
Chaves County, New Mexico

Gentlemen:

Reference is made to your letter of February 16, 1967, requesting approval to participate in the pressure interference tests recently authorized for the Cato-San Andres Pool by Commission Order No. 3165.

Pan American Petroleum Corporation is hereby authorized to participate in the interference tests by shutting in its Abko Federal No. 3 Well, located in Unit A, Section 10, Township 8 South, Range 30 East, and said well shall be permitted to accrue underproduction in accordance with Ordering Paragraph (6) of Order No. R-3165 for a period not to exceed 30 days.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/og
cc: Oil Conservation Commission - Hobbs
Mr. Max Coll - Box 1818, Roswell, New Mexico
MWJ Producing Company - Midland, Texas
Union Texas Petroleum Corp. - 1300 Wilco Building, Midland

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 3499
Order No. R-3165

APPLICATION OF PAN AMERICAN PETROLEUM
CORPORATION FOR PRESSURE INTERFERENCE
TESTS, CHAVES COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on November 30, 1966, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 16th day of December, 1966, the Commission, a quorum being present, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Pan American Petroleum Corporation, seeks authority for the operators in the Cato-San Andres Pool, Chaves County, New Mexico, to conduct a pressure interference test in said pool by shutting in a number of wells in said pool and by producing the Pan American Baskett "D" Well No. 1, located in Unit G, Section 11, Township 8 South, Range 30 East, NMPM, Chaves County, New Mexico, at capacity.

(3) That the applicant also seeks authority to transfer the allowable from other wells on said Baskett "D" Lease to said Well No. 1, to temporarily overproduce said lease, and to make up the overproduction at the conclusion of the test period by curtailment of wells on said lease.

(4) That the applicant further seeks authority for any operator in said Cato-San Andres Pool to accumulate underproduction

on any lease where wells will be shut-in, for production upon conclusion of the interference tests.

(5) That the applicant seeks permission to take interference tests in order to gather reservoir data in the Cato-San Andres Pool.

(6) That applicant's request should be granted in order to gain additional reservoir information.

IT IS THEREFORE ORDERED:

(1) That the applicant, Pan American Petroleum Corporation, is hereby authorized to conduct a pressure interference test in the Cato-San Andres Pool, Chaves County, New Mexico, by producing its Baskett "D" Well No. 1, located in Unit G of Section 11, Township 8 South, Range 30 East, NMPM, at capacity, and by shutting in the following wells:

TOWNSHIP 8 SOUTH, RANGE 30 EAST, NMPM

Pan American	ABKO Federal "B"	No. 1, Unit M, Section 1
Pan American	Thelma Crosby "B"	No. 1, Unit I, Section 3
Pan American	Queen	No. 1, Unit C, Section 10
Pan American	Queen	No. 2, Unit E, Section 10
Pan American	ABKO Federal	No. 1, Unit H, Section 10
Pan American	ABKO Federal	No. 2, Unit G, Section 10
Pan American	Baskett "C"	No. 1, Unit O, Section 10
Pan American	Baskett	No. 1, Unit L, Section 11
Pan American	Baskett "B"	No. 1, Unit F, Section 11
Pan American	Baskett "D"	No. 2, Unit A, Section 11
Pan American	Baskett "D"	No. 3, Unit O, Section 11
Pan American	Baskett "D"	No. 4, Unit I, Section 11
Pan American	C. S. Wosley	No. 1, Unit C, Section 14
Pan American	Baskett "E"	No. 1, Unit A, Section 15

(2) That Union Texas Petroleum Corporation is hereby authorized to shut in the following wells:

TOWNSHIP 8 SOUTH, RANGE 30 EAST, NMPM

Union Texas	J. E. Cato	No. 1, Unit I, Section 10
Union Texas	Baskett	No. 1, Unit K, Section 10
Union Texas	Baskett	No. 2, Unit E, Section 11

(3) That the applicant, Pan American Petroleum Corporation, is hereby authorized to transfer the allowable from its Baskett "D"

Wells Nos. 2, 3, and 4, located in Units A, O, and I, respectively, of Section 11, Township 8 South, Range 30 East, NMPM, Chaves County, New Mexico, to its Baskett "D" Well No. 1, located in Unit G of said Section 11 and to produce said well at capacity until a 10-psi pressure drop has appeared in at least one observation well, provided however, if said capacity production should cause said Baskett "D" Lease to be overproduced, all wells on said lease shall be curtailed upon conclusion of the test period and said overproduction made up within 90 days following conclusion of the test; and provided further, that in no case shall the applicant overproduce its Baskett "D" Well No. 1 more than 30 days without obtaining permission from the Secretary-Director of the Commission after notifying the offset operators.

(4) That the Secretary-Director of the Commission is hereby authorized to approve the shutting in of additional wells owned by Pan American Petroleum Corporation or Union Texas Petroleum Corporation or by any other operator in the Cato-San Andres Pool, provided the operator of the well proposed to be shut in requests such approval and notifies all other operators in the pool of his intent.

(5) That the operator of any well shut in pursuant to the provisions of Order (1), (2), or (4) above is hereby authorized to accumulate underproduction during the period said well is shut in, provided however, that said underproduction shall be produced only by the well incurring the underproduction and provided further, that said underproduction shall be produced within 90 days after placing the well back on production.

(6) That prior to shutting any well in for pressure interference tests, the operator thereof shall conduct a 24-hour test of said well and shall file the results of said test on Form C-116 with the Hobbs District Office of the Commission. In no event will the daily amount of underproduction accruing to the well during the shut-in period exceed the ability of the well to produce, as shown by the test, or top unit allowable for the Cato-San Andres Pool, whichever is less.

(7) That the provisions of Rule 502, Sections I, II, III, and IV, are hereby suspended for wells in the Cato-San Andres Pool which are shut in for pressure interference tests pursuant to the provisions of this order.

(8) That no well shall be permitted to accrue underproduction for more than 30 days without specific authority from the Secretary-Director of the Commission.

(9) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JACK M. CAMPBELL, Chairman

GUYTON B. HAYS, Member

A. L. PORTER, Jr., Member & Secretary

esr/

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

January 13, 1967

Pan American Petroleum Corporation
Post Office Box 68
Hobbs, New Mexico

Attention: Mr. V. E. Staley

Re: Interference Tests
Cato-San Andres Pool
Chaves County, New Mexico

Gentlemen:

Reference is made to your letters of December 30, 1966, and January 10, 1967, requesting authority to include certain wells in your forthcoming pressure interference tests in the Cato-San Andres Pool, Chaves County, New Mexico.

Pursuant to Section (4) of Order No. R-3165, Pan American is hereby authorized to include in the tests the following wells in Township 8 South, Range 30 East, NMPM:

Baskett Well No. 2:	Unit M	Section 11
Baskett "C" Well No. 2:	Unit J	Section 12
Baskett "D" Well No. 5:	Unit J	Section 11
Crosby "D" Well No. 1:	Unit C	Section 18
Crosby "E" Well No. 1:	Unit M	Section 12
Wasley Well No. 2:	Unit E	Section 14
Wasley Well No. 3:	Unit F	Section 14
Wasley Well No. 4:	Unit D	Section 14
Wasley Well No. 5:	Unit G	Section 14

In accordance with Section (6) of Order No. R-3165, the above wells will be permitted to accrue underproduction for a period not to exceed 30 days,

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

-2-
Pan American Petroleum Corporation
Post Office Box 68
Hobbs, New Mexico
Attention: Mr. V. E. Staley

January 13, 1957

provided, however, that the allowable for the Baskett "D" Well No. 5 may be transferred to your Baskett "D" Well No. 1 for production therefrom during the test period.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/ir

cc: Oil Conservation Commission
Hobbs, New Mexico

Union Texas Petroleum Corporation - Midland, Texas
MWJ Producing Company - Midland, Texas
Max Coll - Roswell, New Mexico
Case File 3499

FORM 470 2-57

PAN AMERICAN PETROLEUM CORPORATION

Post Office Box 68
Hobbs, New Mexico

January 10, 1967

File: VES-8-986.510.1

Subject: Additional Wells
Interference Test
Cato San Andres Pool

Mr. A. L. Porter, Jr.
Secretary-Director
New Mexico Oil Conservation Commission
Post Office Box 2088
Santa Fe, New Mexico

Dear Sir:

Order R-3165 provides for conducting an interference test in the Cato San Andres Pool of Chaves County, New Mexico. In compliance with Paragraph (4) of this order, Pan American Petroleum Corporation respectfully requests approval to include the following wells in the test program:

Crosby "E" No. 1	-	Unit M, Section 10, T-8-S, R-30-E
Wasley No. 4	-	Unit D, Section 14, T-8-S, R-30-E
Wasley No. 5	-	Unit G, Section 14, T-8-S, R-30-E

Yours very truly,

V. E. Staley
Area Superintendent

cc: New Mexico Oil Conservation Commission
P. O. Box 1980 - Hobbs, New Mexico
Max Coll
MWJ Producing Company
Union Texas Petroleum

FORM 470 2-57

PAN AMERICAN PETROLEUM CORPORATION

Post Office Box 68
Hobbs, New Mexico

December 30, 1966

File: VES-432-986.510.1

Subject: Additional Wells
Interference Test
Cato San Andres Pool

Mr. A. L. Porter, Jr.
Secretary-Director
New Mexico Oil Conservation Commission
Post Office Box 2088
Santa Fe, New Mexico

Dear Sir:

Order R-3165 provides for conducting an interference test in the Cato San Andres Pool of Chaves County, New Mexico. In compliance with Paragraph (4) of this order, Pan American Petroleum Corporation respectfully requests approval to include the following wells in the test program:

Baskett No. 2	SW/4 SW/4 Section 11
Baskett "C" No. 2	NW/4 SE/4 Section 10
Baskett "D" No. 5	NW/4 SE/4 Section 11
Crosby "D" No. 1	NE/4 NW/4 Section 16
Wasley No. 2	SW/4 NW/4 Section 14
Wasley No. 3	NE/4 NE/4 Section 14

Yours very truly,

V. E. Staley
Area Superintendent

cc: New Mexico Oil Conservation Commission
P. O. Box 1980 - Hobbs, New Mexico
Union of Texas Petroleum
Max Coll
MWJ Producing Company

GOVERNOR
DAVID F. CARGO
CHAIRMAN

State of New Mexico

Oil Conservation Commission

Case No. 3799

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

P. O. BOX 2088
SANTA FE

February 9, 1967

Union Texas Petroleum Division
1300 Wilco Building
Midland, Texas

Re: Interference Tests,
Cato-San Andres Pool,
Chaves County, New Mexico

Gentlemen:

Reference is made to your letter of February 6, 1967, requesting approval to participate in the pressure interference tests recently authorized for the Cato-San Andres Pool by Commission Order No. R-3165.

Union Texas Petroleum Division is hereby authorized to participate in the interference tests by shutting in its Winkler Federal #1, Unit H, Section 9, Township 8 South, Range 30 East, Chaves County, New Mexico, and said well shall be permitted to accrue underproduction in accordance with Ordering Paragraph (6) of Order No. R-3165 for a period not to exceed 30 days.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/og
cc: Oil Conservation Commission - Hobbs
Pan American Petroleum Corp. - Hobbs
Mr. Max Coll, Roswell
MWJ Production Co., Midland, Texas

GOVERNOR
DAVID F. CARGO
CHAIRMAN

State of New Mexico
Oil Conservation Commission

Case No. 3499

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

P. O. BOX 2088
SANTA FE

February 9, 1967

Pan American Petroleum Corporation
P. O. Box 68
Hobbs, New Mexico

Re: Interference Tests
Cato-San Andres Pool,
Chaves County, New Mexico

Gentlemen:

Reference is made to your letter of February 7, 1967, requesting approval to participate in the pressure interference tests recently authorized for the Cato-San Andres Pool by Commission Order No. R-3165.

Pan American Petroleum Company is hereby authorized to participate in the interference tests by shutting in its Cato "B" Federal No. 1, Unit L, Section 14, Township 8 South, Range 30 East, and its Cato "C" Federal No. 1, Unit J, Section 14, Township 8 South, Range 30 East, Chaves County, and said wells shall be permitted to accrue underproduction in accordance with Ordering Paragraph (6) of Order No. R-3165 for a period not to exceed 30 days.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/og
cc: Oil Conservation Commission - Hobbs
Union Texas Petroleum Corporation - Midland, Texas
Mr. Max Coll, Roswell, New Mexico
MWJ Producing Company - Midland, Texas

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

January 27, 1967

Union Texas Petroleum Corporation
1300 Wilco Building
Midland, Texas 79704

Attention: Mr. W. F. Jones, Jr.

Re: Interference Tests
Cato-San Andres Pool
Chaves County, New Mexico

Gentlemen:

Reference is made to your letter of January 16, 1967, requesting authority to include certain wells in the pressure interference tests recently authorized for the Cato-San Andres Pool by Commission Order No. R-3165.

Union Texas Petroleum Corporation is hereby authorized to participate in the interference tests by shutting in the following Cato-San Andres wells:

CHAVES COUNTY, NEW MEXICO
TOWNSHIP 8 SOUTH, RANGE 30 EAST, NMPM

Baskett Well No. 3	Unit D	Section 11
Baskett Well No. 4	Unit N	Section 11
Cato Well No. 2	Unit P	Section 10
Cato Well No. 3	Unit G	Section 10
Cato Well No. 4	Unit B	Section 15

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

January 27, 1967

Union Texas Petroleum Corporation
1300 Wilco Building
Midland, Texas 79704

CHAVES COUNTY, NEW MEXICO
TOWNSHIP 8 SOUTH, RANGE 30 EAST, NMPM (Cont.)

Crosby Well No. 1	Unit K	Section 10
Crosby Well No. 2	Unit N	Section 10
Crosby Well No. 3	Unit D	Section 15
Crosby Well No. 4	Unit E	Section 15

The above wells shall be permitted to accrue underproduction in accordance with Ordering Paragraph (6) of Order No. R-3165 for a period not to exceed 30 days.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/esr

cc: Oil Conservation Commission - Hobbs, New Mexico
Pan American Petroleum Corporation - Hobbs, New Mexico
Mr. Max Coll - Roswell, New Mexico
MWJ Producing Company - Midland, Texas

Allied Chemical Corporation

UNION TEXAS PETROLEUM DIVISION

1300 WILCO BUILDING • MIDLAND, TEXAS 79701 • AREA CODE 915, 682-0515

January 16, 1967

Mr. A. L. Porter, Jr.
Secretary-Director
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Re: Cato (San Andres)
Interference Tests
Order R-3165

Dear Sir:

Pursuant to paragraph (4) of Order No. R-3165, of the Oil Conservation Commission of the State of New Mexico, the following named wells are requested to be included in the testing of the subject field by being shut-in during the test period.

T 8 S R 30 E

The wells are:	Baskett #3	Unit D	Section 11
	Baskett #4	Unit N	Section 11
	Cato #2	Unit P	Section 10
	Cato #3	Unit G	Section 10
	Cato #4	Unit B	Section 15
	Crosby #1	Unit K	Section 10
	Crosby #2	Unit N	Section 10
	Crosby #3	Unit D	Section 15
	Crosby #4	Unit E	Section 15

Yours very truly,

UNION TEXAS PETROLEUM CORPORATION

W. F. Jones, Jr.
Petroleum Engineer

WFJ:ms
cc - Pan American Petroleum Corp. - Hobbs
MWJ Producing Company - Midland
Max Coll
Oil Conservation Commission - Hobbs (C-116's attached per paragraph 6 of the subject order)

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

December 29, 1966

MMJ Producing Company
413 First National Bank Building
Midland, Texas 79701

Attention: Mr. R. Ken Williams

Re: Interference Tests
Cato-San Andres Pool
Chaves County, New Mexico

Gentlemen:

Reference is made to your letter of December 28, 1966, requesting approval to participate in the pressure interference tests recently authorized for the Cato-San Andres Pool by Commission Order No. R-3165.

MMJ Producing Company is hereby authorized to participate in the interference tests by shutting in its Cato State Well No. 1, located in Unit M, Section 2, Township 8 South, Range 30 East, Chaves County, and said well shall be permitted to accrue underproduction in accordance with Ordering Paragraph (6) of Order No. R-3165 for a period not to exceed 30 days.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/esr

cc: Oil Conservation Commission - Hobbs, New Mexico
Union Texas Petroleum Corporation, Midland, Texas
Pan American Petroleum Corporation, Hobbs, New Mexico
Mr. Max Coll, Roswell, New Mexico

MWJ PRODUCING COMPANY

★ PETROLEUM PRODUCERS ★

413 FIRST NATIONAL BANK BUILDING
MIDLAND, TEXAS 79701
TELEPHONE (915) MU 2-5216

File Case 3499

December 28, 1966

Mr. A. L. Porter, Jr.
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Re: Interference Tests
Cato--San Andres Field
Chaves County, New Mexico
Case 3499
Order R-3165

Dear Mr. Porter:

In accordance with Ordering Paragraph (4) of the captioned Order, this is our notice of intention to participate in the interference tests planned for the Cato-San Andres Field and our request for approval by the Commission for our participation, subject to the privileges and limitations imposed by said Order.

Our participation will require the shutting in, for the test period, of our Cato-State Lease, Well No. 1, Location M, Section 2-T8S-R30E, Chaves County. This is our only well in the field.

The test of our well required by Paragraph (6) is being filed this date with the Hobbs Oil Conservation Commission office, and other operators in the field are being sent copies of this letter as notice of our request to participate in the test program.

Very truly yours,

R. Ken Williams

RKW:pag
cc: Pan American Petroleum Corporation, Hobbs, New Mexico
Union Texas Petroleum Corporation, Midland, Texas
Mr. Max Coll, Roswell, New Mexico
Oil Conservation Commission, Hobbs, New Mexico

BEFORE THE NEW MEXICO
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
November 30, 1966

EXAMINER HEARING

In the matter of:	CASE NUMBER 3499
Application of Pan American Petroleum Corporation for pressure interference tests, Chaves County, New Mexico.	

BEFORE:

DANIEL S. NUTTER, Examiner

TRANSCRIPT OF HEARING

MR. HATCH: Case 3499, application of Pan American Petroleum Corporation for pressure interference tests, Chaves County, New Mexico.

MR. BUELL: For Pan American Petroleum Corporation, Guy Buell. We have one witness, Mr. Harpke.

MR. NUTTER: The record will show a written appearance on your behalf by Atwood and Malone.

MR. BUELL: It's nice to be legal.

(Witness sworn.)

MR. BUELL: Mr. Examiner, if I may, I would like to make a very brief opening statement. Of course, as the Examiner know, the Cato-San Andres oil pool is a very recent discovery. Its exact discovery date was June 19th, 1966. Development has been extremely rapid in this pool and again, as the Examiner may recall, on October the 19th at the time of our application for temporary pool rules, at that time we had eleven wells completed as producers. Now only a little over a month later than that, we have nineteen wells completed as producers. Also, there are several wells in various stages of drilling and completion in the field other than these nineteen.

One thing, Mr. Examiner, that all of our reservoir engineers have difficulty in doing early in the life of an oil pool such as this is to come up with completely accurate

estimates of oil in place. They have trouble making predictions with regard to whether or not this newly discovered pool will be good or not good as the secondary recovery prospect. Well, now, our data gathering program which we are going to propose here today is designed to give our reservoir engineers the data they need to make these beneficial studies and predictions for the operators and, of course, I think it will be a benefit to this Commission.

Our program is not designed specifically as an interference test, although it is based on pressure interference and pressure communication, but it should show us many more beneficial reservoir data than just the drainage area of the well. Now, at the time this program was conceived and planned, there were only two operators in this pool, Union Texas and Pan American. Now, these two operators actively participated together in the planning and designing of this program. Now, subsequent to that time we had two other operators either with a completed well or one very near to completion. One is Max Coll II. His well is in the southeast portion of the pool.

The W.M.J. Producing Company is currently completing a well in Section 2 which is in the north central portion of the pool. We have kept these two subsequent operators completely apprised of our program and our effort and both of them have

indicated that if it is at all possible, they, too, would like to participate in this data gathering program. I think at the current time, Max Coll may not be able to participate due to the producing characteristics of his well. Of course, W.M.J. is not sure yet just what kind of well they have, but I am sure, knowing that company as I do, they, if they can participate, they will. But I would like to impress on the Examiner that the program we are going to recommend today is more than just a common or conventional interference test program.

So with that background out of the way, I would like to call our witness, Mr. Harpke.

CARL F. HARPE, called as a witness on behalf of the applicant, having first been duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. BUELL:

Q Mr. Harpke, would you state your complete name, by whom you are employed, in what capacity and in what location, please?

A Carl F. Harpke. I am employed by Pan American Petroleum Corporation in Fort Worth, Texas.

MR. NUTTER: How do you spell your last name?

THE WITNESS: Harpke, H-a-r-p-k-e, and I am employed

as a petroleum engineer.

Q Mr. Harpke, you have testified at previous Commission hearings and your qualifications as a petroleum engineer are a matter of public record?

A Yes, sir.

MR. BUELL: Are his qualifications acceptable?

MR. NUTTER: They are.

(Whereupon, applicant's Exhibit 1 was marked for identification.)

Q (By Mr. Buell) First, Mr. Harpke, I'm going to ask you to look at what has been identified as Pan American's Exhibit Number 1. What is that Exhibit?

A Exhibit Number 1 is a base map of the Cato-San Andres pool area. This map shows the currently producing wells and the drilling or wells which are being completed by conventional well symbols. Also, on this map I have shown, by means of appropriate color symbols, those wells which we will propose to include in our data gathering program.

Q All right. Let me ask you this, Mr. Harpke: Throughout your testimony, you will be talking about the test area. What will you mean when you say and use the words "test area"?

A By "test area" I would mean an area encompassing those wells which are color coded on Exhibit Number 1.

Q Mr. Harpke, have you prepared a summary of the proposed data gathering program and reduced it to exhibit form?

A Yes, sir, I have.

MR. BUELL: We will have that identified, Mr. Examiner, as Pan American's Exhibit Number 2.

(Whereupon, Applicant Pan American's Exhibit Number 2 was marked for identification.)

Q Now, before we get into our data gathering program, Mr. Harpke, let me ask you this: How would you describe or define the normal or conventional interference tests?

A Well, I would define the conventional interference test as the shutting in of one or maybe two wells in a reservoir and determining the pressure effects in this one or two wells caused by the production of the other wells in the reservoir. In other words, we would shut in a minimum number of wells, determine the pressure drawdown effects caused by producing a maximum number of wells.

Q All right, sir. Now, how would you contrast that conventional interference test with the data gathering program that the operators propose to execute here in Cato?

A The data gathering program that we are proposing for the Cato Pool is almost the invert of the conventional interference test. Here we are going to produce one well and

shut in virtually all of the other wells in the reservoir.

Q All right. Now, in addition to drainage data of pure interference data, what other results, beneficial results will we obtain or do we hope to obtain from the execution of this program?

A We hope to obtain data which will enable us to more accurately determine the hydrocarbon poor volume of the reservoir also the hydrocarbon poor volume distribution in the reservoir. We hope to get some idea of fracture orientation. We know that the reservoir is highly fractured,also, we hope to be able to analyze the secondary recovery possibilities of the reservoir.

Q All right, sir. Now, going back to Exhibit Number 1 for just a moment. I believe I see, according to your legend on your exhibit, that we have three categories of wells that will actively participate in this data gathering program. Would you briefly identify for the Examiner and the record, these three categories?

A Well, commencing with the uppermost color code in the legend, the red dot represents the control producing well. This would be Pan American's Basket D Well Number 1 located in the Northeast quarter of Section 11. The second color code which is a yellow dot with a blue ring around it are five key shut-in pressure observation wells which we will use in the

program and the yellow dots represent twelve additional wells which will be shut in.

Q All right, sir. Now, I notice, I believe, two wells shown by conventional symbols on this exhibit to be completed wells yet not designated with any special color. What two wells are those?

A These two wells would be first the Pan American Thelma Crosby Number 1 located to the southwest of the main pool in Section 17, and the Max Coll Fee Number 1 located in Section 13 to the southeast of the pool.

Q All right, sir. Are these two wells a sufficient distance away from your test area such that any production that could accrue of those wells during the test period should not adversely affect the data gathering program?

A Yes, sir. We believe they are.

Q All right, sir. Look on up in Section 1 of the Southwest quarter of the Southwest quarter of that section. I notice you have a well colored there with a yellow dot that is not shown to be a completed producing well. By the conventional symbol, what is the status of that well?

A This well, this is our Pan American Abko Federal B Number 1. We are still attempting to complete the well in the same San Andres zone with which the, which is correlative with the rest of the field. We aren't having much success; I

rather think we are not going to make a commercial well of this.

Q Are we still working on the well, trying to complete it?

A Yes, we are.

Q What is your opinion as to its possibility of becoming a commercial well based on the test data which you have analyzed?

A On the data I have seen to date, I think it's a very slim chance of becoming a commercial well.

Q Then why do you have it colored by a yellow dot?

A Well, regardless of whether it's a producing well or not, we would like to include this well in the program to attempt to determine whether it is in communication with the main portion of the reservoir. This may lead to its future use possibly as an injection well, at such time as we start a secondary recovery program.

Q Well, it's your recommendation that regardless of the outcome of that well, you would like to have it participate in the program?

A Yes, sir.

Q All right, sir. Now, let's go back to our data gathering program itself. What is the first thing, Mr. Harpke, that we will do, assuming, of course, that the Commission

approves our program?

A Well, the first thing we would do, would be to obtain productivity indexes from all of the flowing wells in the test area.

Q Excuse me, Mr. Harpke. What does a productivity indexing take?

A Well, the productivity index of a well by definition is the capacility of that well to produce per unit pressure drop. This is expressed in terms of barrels of oil per day per psi.

Q Is that valuable information for a reservoir engineer and in evaluating a reservoir?

A Yes, sir, this gives us some idea of formation capacity. However, in this particular test program, we hope to be able to correlate the productivity indexes with the oil in place distribution, hydrocarbon and poor volume distribution.

Q So you will use these date with every data that will be gathered as a result of the program?

A Yes, sir.

Q All right, sir. After you have run these psi tests, what will the next step be that the operator will take?

A The next step would be to shut in all of the wells that I have shown here in the test area. After shutting in

these wells we would obtain bottom hole pressure buld-up curves from five wells which I have designated as the key shut-in pressure observation wells. These are the wells that are shown by the yellow symbol with the blue ring around them. These pressure build-up curves will be obtained over a minimum of a seventy-two hour period or at least until we reach inner-static pressure conditions. We will obtain this with a conventional bottom hole pressure bomb.

Q All right, sir. Now, after you obtain your pressure build-up on these five key shut-in wells, what will the next step be that the operators will take?

A After we have gotten these initial bottom hole pressure build-up curves from the five key shut-in wells, we will then run Sperry-Sun bottom hole pressure recording instruments in these wells. Actually, we will run two of these ultrasensitive recording instruments in each well.

Q All right, sir. Now, the pressure build-up curves are going to be taken with a conventional bomb but for the duration of the test we are going to run this Sperry-Sun recording instrument. Would you elaborate on it just a little bit?

A The Sperry-Sun instrument is a very highly refined pressure recording instrument, highly accurate. It's accurate within five one thousandths of one per cent which means in a

case of the pressure, pressure range we expect to encounter in these wells we should be able to record pressure differences to within approximately one tenth of one psi by means of these instruments.

Q Let me ask you this, Mr. Harpke: Since this Sperry-Sun instrument is so sensitive and accurate at low ranges of pressure change, is it also more expensive than the conventional Amarado or Humble bomb?

A Yes, sir, very much more expensive.

Q What would you anticipate the expense would be to the operators for running these Sperry-Sun recording instruments in these key wells?

A Based on a twenty-day rental period and the running of dual bombs in each well, we estimate it would cost the operator approximately $2500 per well. This would, in the case of the five wells here, it would be approximately $12,500 just to run these bombs.

Q That's for a twenty-day period?

A Yes, sir.

Q And, of course, if the test goes longer than that, that it will be more expensive?

A Yes, sir.

Q All right, sir. Now, what is the next step now in this data gathering program?

A After we have run the Sperry-Sun bombs in the key shut-in pressure observation wells, we would then commence flowing the control producing well, our Basket D Well Number 1. This well would be produced at capacity and the oil, water and gas production from the well would be measured as would the oil, water and gas production from any of the other wells which might continue to produce during a test. This would be the Max Coll well and our Crosby well that I previously mentioned.

Q Or any other wells that might subsequently be completed and not participate in the program by being shut in?

A Yes, sir.

Q All right, sir. How long will you produce the Basket D Number 1 at its capacity with the other participating wells shut in?

A We will produce the control producing well for ten days, at which time we will pull the Sperry-Sun instruments from the five key shut-in observation wells and we will monitor the pressure here. If we see a ten psi pressure drop in any one of the five wells, we will then conclude the test program. We feel that approximately a ten psi pressure drop will be sufficient to determine what we hope to get from the test.

Q All right, sir. Assume that at the end of ten days you do not have a pressure drawdown of the magnitude of ten

pounds. What would you do, then?

A We would then rerun the boms and remonitor the pressure after another ten-day interval.

Q All right, sir. Now, based on your knowledge of the reservoir and the extreme sensitivity and accuracy of the Sperry-Sun instruments, would it be your opinion that this data gathering program could be completed, say within at least thirty days?

A Yes, sir. If the reservoir possesses the fractured conditions or properties that we think it does, I think we should be able to continue -- to complete the test prior to the thirty-day period.

Q Now, Mr. Harpke, let me ask you this: Of course, I am more accustomed to the results we get from our conventional bottom hole pressure bombs. Do you feel that working with an instrument that will be accurate within the range of a pressure drawdown such as this Sperry instrument, do you think that observing a pressure drawdown of approximately ten pounds will be sufficient for you engineers to achieve the results from this data gathering program that we would like to?

A Our studies and a field test which our company has run indicates that with approximately a ten psi draw, we would be able to get what information desired from this.

(Whereupon, Applicant's Exhibit No. 3 was marked for identification.)

Q (By Mr. Buell) In that connection, Mr. Harpke, let me direct your attention to what has been identified as Pan American's Exhibit Number 3. What is that exhibit?

A Exhibit Number 3 is a paper that was prepared by Pan American's Research Department and Producing Department personnel. This paper is entitled, "Determination of Poor Volume in a Naturally Fractured Reservoir." This paper was presented at the fall meeting of the Society of Petroleum Engineers in Denver, in October of 1965. The paper describes the analytical method that was developed by our Research Department and it also describes a field test that was conducted in the Southwest Lacey Field in Kingfisher County, Oklahoma. The Southwest Lacey Field produces from a highly fractured reservoir the Mississippian solid formation.

Q Let me ask you this, Mr. Harpke, do you feel that this paper, our Exhibit 3, is more or less self-explanatory or do you feel that we need to burden the record by going into the technical detail and procedures which are contained in this paper?

A I believe that the paper very clearly presents the theoretical derivations of the method. It also adequately defines the results of the test program that was run and the data that was obtained from that test program.

Q The field test that is contained in this paper, our

Exhibit 3, was it at a reservoir somewhat similar to Cato in that it was known to be fractured?

A Yes, sir.

Q All right, sir. What are your recommendations to the Commission today with regard to the proposed data gathering program which the operators in this pool would like to conduct?

A I would recommend, first, that the Commission approve the program; secondly, that they permit us to produce control producing well Basket D Number 1 at capacity. Also, that we be given authority to transfer the allowables from the other three Basket D lease wells, which will be key shut-in wells to the Basket D Number 1. In the event that the total allowable is transferred to the control producing well is not sufficient to account for all the production from the well at capacity, I would then recommend that the Commission give us the authority to overproduce the well above that allowable and to make up the over-allowable after the test period is terminated.

Q All right, sir. Let me ask you this: At this point, based on the normal unit allowable and the one that the Commission has already set for December, is it your opinion that the allowable of the Basket D 1 and the transferred allowable will be sufficient to produce the D 1 at capacity without overproducing it?

A Based on the present or the normal unit allowable

set for December of fifty-two barrels, yes, I think that would be sufficient.

Q But you make this request for overproduction in the event the Commission should change the normal unit allowable before our test is concluded.

A Yes, sir.

Q All right, sir, do you have any other recommendations to make?

A Yes, sir. I would recommend that the Commission approve the shutting in of the other wells other than the Basket D lease wells. I would recommend that they approve the shutting in of these other wells that we would include in the test program and grant the authority to make up the under-production from these wells after the test is terminated.

Q All right, sir. In that connection, let me ask you this: Are the wells that the operators presently propose to shut in those wells designated by the yellow color on Exhibit 1 all those wells named on Pan American's Exhibit Number 2, the summary of the data gathering program?

A Yes, sir.

Q All right, sir. Do you have any other provisions you would recommend that the Commission include in an order approving this program?

A Yes, sir. In view of the rapid development program

that is being undertaken in Cato, I would recommend that the Commission provide for the administrative approval of other wells that are presently completing or may be completed to permit these wells to be shut in with the allowable to be made of after the test is completed.

Q And since we don't know at this time what wells those might be, we need an administrative procedure such that the Commission can approve them as they are completed and the operators elect to participate?

A That is correct.

Q Mr. Harpke, based on your knowledge of this program, can you visualize in any way which the correlative rights of any of the owners of interest in this pool could be harmed by the approval of this program?

A No, sir, I cannot.

Q Can you see any conservation benefits that could accrue not only to the operators but to the Commission as well, by approval of the conducting of this program?

A I believe that the data gathering program that we are proposing here will make available to both the operators and to the Commission a considerable amount of reservoir information that is not normally available in a reservoir in this early stage of depletion. I think this will serve the conservation ultimately.

Q Do you have anything else that you would care to add at this time, Mr. Harpke?

A No, sir, I do not.

Q Let me ask you this: Were Exhibits 1 and 2 prepared either by you or under your supervision?

A Yes, sir.

Q And, of course, probably the only thing you had to do with Exhibit 3 was reproduce it, is that correct?

A Yes, sir, that is correct.

Q Since you were not one of the authors?

A I also read it.

MR. BUELL: That concludes our direct, Mr. Examiner, and I would like to formally offer Pan American's Exhibits 1, 2, 3 inclusive.

MR. NUTTER: Pan American's Exhibits 1 through 3 will be admitted in evidence.

(Whereupon, Exhibits 1 through 3 were admitted in evidence.)

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Harpke, it has been the standard procedure of the Commission in authorizing interference tests that the amount of allowable that a well accumulates while it's shut in is based on a test that is taken prior to shutting in, the well in, and normally that's the final twenty-four hours of

a seventy-two hour flow rate at a constant rate of production. Would this type of a test and this type of a determination of a well's productivity during shut-in be suitable to you?

A I think it would be, yes.

Q Likewise oftentimes there is a maximum as to the rate of production when a well is making up the underproducting that is accumulated to that well during its shut-in time and this is very frequently limited to two times the normal daily allowable?

A I think that would be satisfactory, yes, sir.

Q Now, it's not your intent that the allowable which would accrue during shut-in would be transferred off of any leases at any time?

A No, sir. It would be made up by that well.

Q On that lease by that well?

A Yes, sir.

Q Now, the five key shut-in wells will be shut in and measured with Sperry-Sun instruments for ten days or until you have got a ten-pound drop. How about all these other little yellow wells on here? Will they be shut in for the full ten days, also?

A They will be shut in and we have several flowing wells out in this area that we would also measure the pressure change in, but this would be done with the conventional bottom hole

pressure bomb. This would be simply an interference or conventional interference type --

Q You won't be producing any well in the pool except your Basket D Numoer 1, will you?

A Just the Basket D Number 1 and at this time these other two wells that I have mentioned.

Q That was the Max Coll well and the Thelma Crosby well over in seventeen?

A Yes, sir. Way over here, yes, sir.

Q As far as you know, everything else would be shut in?

A Yes, sir.

Q Certainly all the Pan American wells would be shut in?

A Yes, sir.

MR. BUELL: All of our completed wells --

A All of the wells we have presently completed, yes, sir.

MR. BUELL: We may complete a well in the interperiod that would have such a low ability to produce that we would not want to shut that well in.

MR. NUTTER: I see. But you would be measuring bottom hole pressures, flowing pressures on those wells that would not be shut in?

A No, the only other pressures that would be measured

would be in shut-in wells which are presently flowing that we could run the bomb down in without having to pull the wells.

MR. BUELL: Really, what we are saying is in addition to the key shut-in wells with the Sperry-Sun at the conclusion of the test, we will probably also take pressures on other shut-in wells by conventional bomb or sonic log.

MR. NUTTER: And it is your intent, is it not, that this administrative authority that you have proposed for additional wells would also extend to other operators, not only to Pan American?

MR. BUELL: Yes, sir.

MR. NUTTER: Does anyone have any further questions of Mr. Harpke? He may be excused.

(Witness excused.)

MR. NUTTER: Anything further, Mr. Buell?

MR. BUELL: No, Mr. Examiner, that's all Pan American has at this time.

MR. NUTTER: Does anyone have anything they wish to offer in Case 3499?

MR. PERDUE: Yes, sir. Mr. Examiner, I am Howard Perdue. I am with Union Texas Petroleum. We collaborated with Pan American engineers in the planning of this project and we would like to support their request. I would like to point out on Pan American Exhibit Number 1, that since this exhibit was

prepared, Union Texas has completed two wells and is in the process of completing about three others which we would like to point out in regard to the request for administrative approval on other wells to be included.

MR. NUTTER: Which are the two that have been completed, Mr. Perdue?

MR. PERDUE: If you will refer to the exhibit, they have shown a well up in Section 3 in the Southwest quarter of the Southeast quarter they have shown a location there that we call the Union Texas Crosby 3 No 1. That well has been completed.

MR. PORTER: What is the potential, do you know?

MR. PERDUE: It was potentialled for, I believe sixty-four barrels pumping. The other completion is down in the, in Section 10. It would be the Northeast quarter of the Southwest quarter also shown as a location on this exhibit. That well was completed for a flowing potential of approximately 120 barrels.

MR. BUELL: A hundred and what, Howard?

MR. PERDUE: A hundred and twenty.

MR. NUTTER: Off the record.

(Whereupon, an off the record discussion was held.)

MR. PERDUE: At any rate, we would like to support

the request and as I say, we have been involved in the planning and are wholeheartedly in agreement.

MR. NUTTER: Thank you, Mr. Perdue. Does anyone else have anything to offer in this case?

We got a letter in our files from Union Texas. We got a letter that I had in my hand just before the hearing but I can't place my hand on it right now, from M.W.J.

MR. HARPKE: We have a copy of that, Mr. Examiner.

MR. NUTTER: And they support the Pan American application and request that it be extended to the other operators as well as Pan American.

MR. BUELL: Off the record.

(Whereupon, an off the record discussion was held.)

MR. NUTTER: Does anyone have anything further to offer in this Case 3499? We will take the case under advisement.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, JERRY POTTS, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached transcript of hearing was reported by me in stenotype and that the same was reduced to typewritten transcript under my personal supervision and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

NOTARY PUBLIC

My Commission Expires:

July 10, 1970

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 3499, heard by me on 11/20, 1966.

Examiner
New Mexico Oil Conservation Commission

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

P. O. BOX 2088
SANTA FE

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

December 16, 1966

Mr. Guy Buell
Pan American Petroleum Corporation
Oil and Gas Building
Post Office Box 1410
Fort Worth, Texas 76101

Re: Case No. 3499
Order No. R-3165
Applicant:

Pan American Petroleum Corp.

Dear Sir:

Enclosed herewith are two copies of the above-referenced Commission order recently entered in the subject case.

Very truly yours,

A. L. Porter, Jr.

A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC x
Aztec OCC _____
OTHER Mr. Frank Irby - Mr. Howard Perdue

FORM 446 R-66

PAN AMERICAN PETROLEUM CORPORATION

OIL AND GAS BUILDING P. O. BOX 1410
FORT WORTH, TEXAS—76101

D. L. RAY
DIVISION ENGINEER

November 4, 1966

File: GHF-407-986.510.1

Subject: Application for Approval of Data Gathering Program, Cato-San Andres Oil Pool, Chaves County, New Mexico

Mr. A. L. Porter, Jr.
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Porter:

Case No. 3477, the application of Pan American Petroleum Corporation for temporary Pool rules for the Cato-San Andres Oil Pool, was heard by the Commission October 19, 1966. At that hearing Pan American advised the Commission that the proposed rules did not include the normal one providing for administrative approval of interference tests because Pan American engineers were designing a data gathering program, field wide in scope, that would require the cooperation of the other operator in the field, Union Texas.

We are pleased to advise the Commission that the engineering phase of this program has been completed. This program has been discussed in detail with Union Texas and they are in complete agreement and have offered their full cooperation. Max Coll, II now operates one well in this pool. This program has been discussed thoroughly with Mr. Coll, and he and his partners are giving it their serious consideration.

In addition to gathering interference data, this program is also designed to determine PI, pressure buildup and other valuable reservoir information. Briefly summarized the program contemplates shutting in several of the Pool's producing wells while producing the one control well at capacity. Extremely sensitive and very expensive pressure measuring instruments will be used in this program. By using this very sophisticated equipment we believe the program can be completed in only one month.

The control or producing well that has been selected is Pan American's Baskett 'D' No. 1. By transferring the allowable from all wells on the Baskett 'D' lease to the No. 1 well, temporary overproduction can be held to a minimum. However, some overproduction is likely so Commission authority is needed to clear the expected overproduction until it can be made up by underproducing the Baskett 'D' lease.

DOCKET MAILED

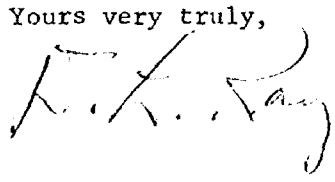
Date 11-18-66

Authority will also be needed to accumulate underproduction on the leases where wells will be shut in with the understanding that such underproduction may be made up by future orderly overproduction.

It is respectfully requested that Pan American and Union Texas be granted administrative approval to conduct this interference test with the authority to overproduce the control well and to make up underproduction from the shut in wells as requested above.

In the event administrative approval cannot be granted, please consider this letter as a request from Pan American for a hearing on the earliest possible docket to permit operators to conduct a data gathering program in the Cato-San Andres Oil Pool.

Yours very truly,



GHF:df

CC - Mr. Howard Perdue
Union Texas Petroleum Division
Allied Chemical Corporation
1300 Wilco Building
Midland, Texas

Mr. Max Coll II
Box 1818
Roswell, New Mexico

MWJ PRODUCING COMPANY

★ PETROLEUM PRODUCERS ★

413 FIRST NATIONAL BANK BUILDING
MIDLAND, TEXAS 79701
TELEPHONE (915) MU 2-5216

November 22, 1966

File

Mr. A. L. Porter, Jr.
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Re: Case 3499
Application of Pan American
Petroleum Corporation for
Pressure Interference Test
Cato San Andres Pool
Pan Am: JWA 2023-501.75

Dear Mr. Porter:

We are in receipt of a copy of Pan American's application for approval by the Commission of a proposed data gathering program involving temporary shut-in of certain wells in the field and their request for makeup of lost allowable during the program.

We have just recently completed our No. 1 Cato State located in the SW/4 SW/4 Section 2, T-8-S, R-30-E, in the Cato Field and are in the process of placing it on production to determine its productive performance.

This is to advise the Commission that we have no objection to Pan American's proposed data gathering program nor to the Commission's granting the makeup of allowable production lost during any shut-in period.

We have not yet made a decision as towhether or not we will participate in Pan American's program since we are not yet sure of the producing characteristics of our well. We will advise Pan American prior to the start of their program, if approved by the Commission, whether or not we wish to participate. In order to allow complete flexibility to the program and to our participation, we request that any order forthcoming permitting the makeup of lost allowable oil be extended to all participants in the test program, including us, in the event we elect to participate. We will of course advise the Commission along with Pan American of our decision as to participation.

Very truly yours,

R. Ken Williams

RKW:pag
cc: Pan American Petroleum Corporation,

Allied Chemical Corporation

UNION TEXAS PETROLEUM DIVISION

1300 WILCO BUILDING • MIDLAND, TEXAS 79701 • AREA CODE 915, 682-0515

November 7, 1966

Mr. A. L. Porter, Jr.
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Re: Application for Approval of
Data Gathering Program,
Cato-San Andres Oil Pool,
Chaves County, New Mexico

Dear Mr. Porter:

Please refer to Mr. D. L. Ray's letter to you dated November 4, 1966 regarding the captioned subject.

This is to advise that Union Texas Petroleum participated with Pan American in planning the data gathering program and supports their request for approval to conduct the tests and make up the underproduction and overproduction that will result.

Yours very truly,

UNION TEXAS PETROLEUM

Howard Perdue

Howard Perdue
District Petroleum Engineer

HP:ms

cc - Mr. D. L. Ray
Pan American Petroleum Corporation

DOCKET MAILED

Date 11-18-66

(Case 3497 continued)

36 East, Eumont Gas Pool, Lea County, New Mexico, to be dedicated to its Wallace State Well No. 3 located at an unorthodox location 3,300 feet from the South line and 1980 feet from the West line of said Section 3. Applicant further seeks the assignment to said proration unit of the accumulated underproduction presently carried by its Wallace State Well No. 2 located in Unit L of said Section 3, said well currently being dedicated to a 160-acre non-standard gas proration unit comprising Lots 5, 6, 11, and 12 of said Section 3, and also the assignment to said unit of the accumulated underproduction presently carried by the aforesaid Wallace State Well No. 3, said well currently being dedicated to an 80-acre non-standard proration unit comprising Lots 13 and 14 of said Section 3.

CASE 3498: Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a pressure maintenance project in the Piñon Gallup Oil Pool by the injection of water into the Gallup formation through five wells located in Section 19, Township 28 North, Range 11 West and Sections 14, 15, and 24, Township 28 North, Range 12 West, San Juan County, New Mexico. Applicant further seeks the promulgation of special rules for the operation of said project.

CASE 3499: Application of Pan American Petroleum Corporation for pressure interference tests, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks authority to conduct a pressure interference test in the Cato-San Andres Pool, Chaves County, New Mexico, by shutting in a number of its wells in said pool and producing its Baskett "D" Well No. 1 located in Unit G, Section 11, Township 8 South, Range 30 East, Chaves County, New Mexico. Applicant also seeks authority to transfer the allowable from other wells on said Baskett "D" lease to Well No. 1, to temporarily overproduce said lease, and to make-up the overproduction at the conclusion of the test period by curtailment of wells on said lease. Applicant further seeks authority to accumulate underproduction on any lease where wells will be shut-in, for production upon conclusion of the interference tests.

Docket No. 30-66

DOCKET: EXAMINER HEARING - WEDNESDAY - NOVEMBER 30, 1966

9 A.M. - OIL CONSERVATION COMMISSION CONFERENCE ROOM,
STATE LAND OFFICE BUILDING - SANTA FE, NEW MEXICO

The following cases will be heard before Daniel S. Nutter, Examiner, or Elvis A. Utz, Alternate Examiner:

CASE 3492: Application of Midwest Oil Corporation for special pool rules, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the promulgation of special pool rules for the Cinta Roja-Morrow Gas Pool, Lea County, New Mexico, including a provision for 640-acre proration units.

CASE 3493: Application of H. N. Sweeney for a unit agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of its Hale Unit Area comprising 1920 acres, more or less, of Federal, State and Fee lands in Township 20 South, Range 30 East, Eddy County, New Mexico.

CASE 3494: Application of Texaco Inc. for a non-standard gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of its Cotton Draw Unit Well No. 64 at an unorthodox gas well location 660 feet from the North line and 1652 feet from the West line of Section 18, Township 25 South, Range 32 East, in an undesignated Devonian gas pool, Lea County, New Mexico.

CASE 3495: Application of Burleson & Huff for a non-standard proration unit and a non-standard location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the approval of a 50.30-acre non-standard oil proration unit comprising all of Lot 3, Section 2, Township 16 South, Range 32 East, North Anderson Ranch-Wolfcamp Pool, Lea County, New Mexico, to be dedicated to a well to be drilled at a non-standard location for said pool 990 feet from the North line and 330 feet from the East line of said Lot 3.

CASE 3496: Application of Newmont Oil Company for a waterflood expansion, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks authority to expand its West Square Lake Waterflood Project, Square Lake Pool, by the conversion to water injection of its Continental State Well No. 1, located 1980 feet from the North line and 1980 feet from the West line of Section 36, Township 16 South, Range 31 East, Eddy County, New Mexico.

CASE 3497: Application of Me-Tex Supply Company for a non-standard gas proration unit and a non-standard gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the approval of a non-standard gas proration unit comprising Lots 5, 6, 11, 12, 13, and 14 of Section 3, Township 21 South, Range

ATWOOD & MALONE
LAWYERS

JEFF D. ATWOOD (1883-1960)
ROSS L. MALONE
CHARLES F. MALONE
RUSSELL D. MANN
PAUL A. COOTER
BOB F. TURNER
ROBERT A. JOHNSON
JOHN W. BASSETT, JR.

P. O. DRAWER 700
TELEPHONE 505 622-6221
SECURITY NATIONAL BANK BUILDING
ROSWELL, NEW MEXICO
88201

November 21, 1966

Mr. A. L. Porter, Jr.
Secretary-Director
Oil Conservation Commission
Post Office Box 2088
Santa Fe, New Mexico

'66 NOV 22 AM 8 :

RE: Case Number 3499 on the November 30, 1966 Docket

Dear Mr. Porter:

We enclose herewith our Entry of Appearance on behalf of Pan American Petroleum Corporation. The actual presentation for Pan American Petroleum Corporation will be made by Guy T. Buell, Esquire, of the Texas Bar.

Very truly yours,

ATWOOD & MALONE

Paul A. Cooter

PAC:sah

Encl.

cc: J. K. Smith, Esquire
Guy T. Buell, Esquire

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF PAN AMERICAN PETROLEUM CORPORATION FOR AUTHORITY TO CONDUCT PRESSURE INTERFERENCE TESTS IN THE CATO-SAN ANDRES POOL, CHAVES COUNTY, NEW MEXICO.	))))))	No. 3499

ENTRY OF APPEARANCE

The undersigned, Atwood & Malone of Roswell, New Mexico, a firm of attorneys whose members are duly licensed to practice law in the State of New Mexico, hereby enters its appearance in this cause as New Mexico counsel for Pan American Petroleum Corporation.

DATED at Roswell, New Mexico, this 21st day of November, 1966.

ATWOOD & MALONE

By _____

Attorneys for Pan American
Petroleum Corporation
Post Office Drawer 700
Roswell, New Mexico

PROPOSED DATA GATHERING PROGRAM
CATO-SAN ANDRES POOL
CHAVES COUNTY, NEW MEXICO

I. Definition and Designation of Test Area Wells

1. Control Producing Well - Pan American's Baskett 'D' Well No. 1

2. Key Shut-in Pressure Observation Wells:

Pan American's Baskett 'D' Well No. 2
Pan American's Baskett 'D' Well No. 3
Pan American's Baskett 'D' Well No. 4
Pan American's Baskett 'B' No. 1
Union Texas Petroleum's Baskett No. 1

3. Other wells to be shutin during test.

Pan American's Abco Federal No. 1
Pan American's Abco Federal No. 2
Pan American's Abco Federal 'B' No. 1
Pan American's Baskett No. 1
Pan American's Baskett 'C' No. 1
Pan American's Baskett 'E' No. 1
Pan American's Thelma Crosby 'B' No. 1
Pan American's Queen No. 1
Pan American's Queen No. 2
Pan American's C. S. Wasley No. 1
Union Texas Petroleum Corporation's Baskett No. 2
Union Texas Petroleum Corporation's J. E. Cato No. 1

II. Interference Test Procedure

1. Obtain productivity indices for each flowing well in test area prior to shutting well in. Test area will include the control producing well, key shut-in pressure observation wells, direct and diagonal offsets to key shut-in pressure observation wells, and other selected wells as specified above.

2. Shut-in all wells in test area.

3. Obtain bottomhole pressure build-up curves from key shut-in pressure observation wells with conventional bottomhole pressure bombs. The duration of the bottomhole pressure build-up period will be at least 72 hours or until near-static pressures are attained.

4. Run Sperry-Sun ultra-sensitive bottomhole pressure recording instruments in key shut-in pressure observation wells.

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Pan Am's EXHIBIT NO. 2
CASE NO. 3499

5. Flow control producing well at capacity and measure oil, water and gas production during test period. Oil, water, and gas production from any other wells producing during the test period will also be measured.

6. Pull Sperry-Sun instruments from key shut-in pressure observation wells after ten days. If a 10-psi pressure drop has not been observed in at least one observation well, then re-run the Sperry-Sun instruments and again monitor pressure after another 10-day period. The test will be concluded at such time as a 10-psi pressure drop has occurred in at least one key shut-in pressure observation well.

7. In addition to the pressures obtained from the key shut-in wells with the Sperry-Sun instrument, pressures will be obtained from one or more of the other shut-in wells through the use of conventional bottomhole pressure bombs at the beginning and at the conclusion of the program.

SOCIETY OF PETROLEUM ENGINEERS OF AIME
6300 North Central Expressway
Dallas, Texas 75206

PAPER
NUMBER SPE 1185

THIS IS A PREPRINT --- SUBJECT TO CORRECTION

DETERMINATION OF PORE VOLUME IN A NATURALLY FRACTURED RESERVOIR

By

Earl E. Morris, Junior Member AIME, and G. W. [illegible], Member AIME
Pan American Petroleum Corp., Oklahoma City, Okla.

ABSTRACT

Conventional methods for estimating original oil in place are not suitable for reservoirs where the oil is contained primarily in a natural fracture system. A method has been developed based on theoretical considerations which uses empirically derived values for needed coefficients. These values can be obtained from pressure interference and productivity well test data.

The Mississippian-Solid formation has been diagnosed as a "pore space in fractures" type formation. The S. W. Lacey Field, Kingfisher County, Oklahoma, was the site of a special well test program designed to estimate hydrocarbon pore volume in a typical Mississippian-Solid reservoir.

After a 45-day shut-in period, one well was put on controlled production and continuous bottom hole pressures were registered for 51 days at three of the five nearby shut-in offset wells.

Pressure communication was established with one of the observation wells located 5000 feet from the producer. A pressure drop was not recorded at either of the other two wells. Where interference data were obtained, it was used to provide numerical values for solving the theoretically derived equations. A calculated oil in place of 6515 Res. Bbls/acre was obtained as representative of the formation in the vicinity of the observation test well. This information together with the original productivity index of this well was used to calibrate, for this field, a theoretical relationship between fracture volume and fracture flow capacity. From this relationship, the original oil in place for other parts of the field may be estimated.

In application, the fracture storage capacity is derived from the well's initial productivity index. Where measured productivity data were not available, a method was used which obtained productivity index values from an empirical correlation which related these values to reported original producing rates. The method used is expected to provide acceptable results because most wells in the S. W. Lacey Field were initially potentialed using about the same backpressure.

The paper does not include a study of the expected oil recovery performance from this unusual reservoir. The method of estimating areal distribution of original oil in

place has application in selecting drilling locations and for unitization purposes. It is usable only in fields where the oil is located predominantly in a fracture system. In such reservoir rock systems, it is logical to expect that a relationship exists between the fluid flow ability and associated pore volume.

INTRODUCTION

The Mississippian-Solid formation, underlying extensive portions of northwest Oklahoma, is proving itself to be a most unusual reservoir. This paper presents a theoretically developed method for calculating oil in place from special well test data. This method was applied to the S. W. Lacey Field, Kingfisher County, Oklahoma, which is a typical reservoir in the Mississippian-Solid. In addition to well pressure interference data being used to calculate the hydrocarbon pore volume in a test area, a method is presented for using the well data together with productivity index information to calculate the oil in place in other areas of the field. This study does not include a prediction of oil recovery.

The Mississippian-Solid formation in S. W. Lacey Field is a massive, dense, cherty, silicious limestone having a thickness of approximately 500 feet. Matrix porosities as determined from log and core analyses ranged from nil to a maximum of 12 percent, with the average being less than 3 percent. The associated matrix permeability was generally less than 1 md. The formation is characterized by an extensively developed natural fracture system.

For determination of hydrocarbon pore volume (i.e., reservoir pore volume less connate water saturation) early in the life of a field, the conventional approach utilizes porosity, water saturation, feet of pay, and productive acres. However, in the case of the Mississippian-Solid formation, the applicable factors proved difficult, if not impossible, to determine from logs and cores.

Results of log and core analyses, together with normal recovery factors, suggested that the average well (160-acre) in this field should recover about 250,000 barrels of oil by solution gas drive. Field performance to date indicates that this recovery value will be reached by only a few of the better wells. Also, core analyses indicated that few wells should have a producing capacity greater than 40 to 50 barrels/day, prior to stimulation. Actually, the natural productivity varied from 20 to 1300 barrels/day. These contradictions between predicted and actual performance pointed to natural fractures as being the flow channels.

This conclusion led in turn to the concept that the effective hydrocarbon pore volume is directly associated with natural fractures and only indirectly related to the formation's matrix porosity; that, in other words, the natural fracture system acts as storage porosity for most of the hydrocarbons in place.

Evidence offered in support of the fracture storage concept includes: (1) high initial well producing capacities as compared to the capacity values obtained from core analyses; (2) absence of staining, fluorescence, and/or oil shows in samples or cores except along recognized fracture surfaces; (3) analyses on large cores which indicate maximum matrix porosities of 12 percent, but averaging generally less than 3 percent, and matrix permeability values less than 1 md; and (4) variations in average well core values do not reflect observed differences in well performance. For example, two wells with a near equal permeability-thickness product have differed in productivity index by up to a factor of near 200.

In the face of these conflicting sets of data, it was concluded that a different approach was required to determine the hydrocarbon pore volume in this reservoir where native fractures not only are of primary importance in controlling the flow of fluids, but are conceived to be serving as the principal space for fluid storage.

Accordingly, a special well test program was designed for the purpose of evaluating the fracture storage concept so that means would be available to select development drilling locations and provide a factor which could be used in unitization arrangements.

SPECIAL WELL TESTS

General

Figure 1 shows the wells included in the special well test area and their proximity to the rest of the S. W. Lacey Field development. The test program consisted of two separate phases. The first phase was concerned with attaining static equilibrium within the individual test wells located in the test area. The second phase was designed to obtain producing rate and pressure drawdown data from which an analytical determination of hydrocarbon pore volume might be made. Following

is a brief discussion of the static and drawdown phases of the special well test program which covered 96 days. It was recognized from the beginning that the test conditions were not ideal since producing wells did exist near the test area. However, the producing rates of these wells were low, the nearest ones making less than 40 barrels/day. This production was considered to be of little significance to the test results.

Static Phase of Special Well Tests

All six wells in the test area as shown on Figure 1 were shut in for 45 days. Static pressure surveys were conducted at regularly scheduled intervals. A typical example of a buildup history obtained during this period is exhibited by observation well No. 2 and is shown on Figure 2.

Drawdown Phase of Special Well Tests

This phase was initiated by running bottom hole pressure bombs into the three wells to be used for observation and opening the producer. The remaining two wells were left shut in. The pressure bombs had a continuous recording accuracy rating of ±.005 percent (.25 psig on a 5000 psig element) along with a variable chart speed from 36 hours to 28 days.

The magnitude of the expected pressure drops could not be predetermined as a function of producing time; therefore, the test was designed to continue for such a period of time as required to establish communication, and attain a 10 psig pressure drop, in at least one of the three observation wells.

This value of 10 psig pressure drop was an arbitrary limit assigned to yield sufficient data for analysis. If communication were obtained in each of three observation wells, the variations in pore volume around each of these wells could have been determined.

Initial communication as illustrated on Figure 3 was established with observation well No. 2 in only a few days (approximately 100 hours) after the test began and during the 51-day flow period, a maximum pressure drop of 38 psig was recorded. This response indicates that maximum permeability or fracture development within the test area is oriented in a northeast-to-southwest direction.

The other two observation wells continued to build up throughout the duration of the drawdown phase. This continued buildup shows a lack of the same degree of communication between the producing and observation wells. It is speculated that if the tests had been continued over a longer period of time, communication would have been established between the producing well and the other two observation wells. To support this, it is pointed out that the special well test area had a static reservoir pressure between 3200 and 3300 psia prior to any production. This value is below the original S. W. Lacey reservoir pressure of 3500 psia at a datum of -6900 feet. This pressure reduction must have occurred as a result of production from the field to the north and west of the special well test area. Figure 3 represents the results of the pressure history in each of the three observation wells as recorded during the drawdown phase.

During the 51-day flow period, the producing well flowed 5400 barrels of oil and 22,069 MCF of gas. Figure 4 shows the complete well behavior with regard to oil producing rate, bottom hole flowing pressure, and producing gas-oil ratio throughout the test period.

The performance data obtained for the producing well along with the pressure drawdown in observation well No. 2 provides a basis for calculating oil in place which should be representative of the area around observation well No. 2. Because there are variations in the fracture development between this observation well and the producing well, as indicated by the difference in the productivity index of each well, it is not possible to state unequivocally the degree to which the formation character around each well affects the measured data. However, since the pressure measurements were made at the observation well, it can be expected that the formation characteristics around that well had the greater affect on the measured data.

TECHNIQUE UTILIZED TO EVALUATE INTERFERENCE DATA AND RESULTS

Throughout the entire test period, the pressures in observation wells No. 1 and No. 3 continued to increase. The performance of these observation wells suggests that a temporary barrier to flow or a zone of low permeability existed between the producing well and these observation wells.

A mathematical model was prepared which assumed two barriers to flow as shown on Figure 1 and in the Appendix. It is felt that flow of fluids perpendicular to a line between the producing well and observation well No. 2 is restricted as compared with

flow parallel to a line between the two wells.

The generalized interference equation (Equation 1 in the Appendix) defines a relationship between pressure and time in an observation well. This same equation contains two constants, C_1 and C_2, which are defined by Equations 3 and 4 in the Appendix; also, Equation 1 includes producing rate values. These are values of the producing rates (includes both oil and gas production) from the producing well expressed as daily reservoir barrels of production. The constants C_1 and C_2 include reservoir properties, the values for which are unknown (i.e., pay thickness, porosity, permeability, etc.). The calculation procedure used to determine values for C_1 and C_2 was as follows: (1) a value of C_2 was estimated; (2) values for C_1 as a function of the time were calculated (to yield the correct results, C_1 should be constant with time); (3) a statistical criterion was then determined which is the ratio of the standard deviation to the mean value of C_1; and (4) Steps (1) through (3) were repeated until a minimum value of the criterion as computed in Step (3) was obtained. To insure that a minimum was obtained, values of C_2 were used on both sides of the particular value which produced a minimum criterion.

It was found that only a fairly narrow range of assumed C_2 values would yield the desired linear relationship with C_1. A C_2 value of around 300 appears to give the best results. Figure 5 presents the results of the trial and error solution for the values of the constants C_1 and C_2. The calculation procedure used to determine Kh/μ (md-ft/cp) and the $h\phi$ product is shown by Equations 3 through 9 in the Appendix. The computed values believed to be representative of the area around observation well No. 2 were Kh/μ equals 4950 md-ft/cp and an $h\phi$ product equal to .840. The reservoir hydrocarbon pore volume calculated to be around observation well No. 2 was 6515 Res. Bbls/acre. This assumes no water saturation in the fractures.

ANALYSIS OF THE RESULTS OF SPECIAL WELL TESTS

The results of these special well tests to determine hydrocarbon pore volume and the capacity of the natural fracture system are thought to be representative of the area around observation well No. 2. This is supported by two observations: (1) The value of Kh/μ from the test data was 4950 md-ft/cp. This value is much larger than the comparable value of 250 md-ft/cp as obtained from pressure buildup data measured on the producing well (see Figure 6); therefore, the test data must have been predominantly affected by reservoir properties other than those representative of the area around the producing well. (2) The pressure measurements were made at observation well No. 2; therefore, it is logical that reservoir properties near this well would greatly affect the data.

DEVELOPMENT OF TECHNIQUE FOR DISTRIBUTION OF HYDROCARBON PORE VOLUME ON A LEASE AND/OR FIELD-WIDE BASIS

A well in a low productivity index area of this reservoir remains a poor producer regardless of the type and nature of the stimulation attempted; whereas, a fair to good well in terms of productivity index responds rather rapidly once the wellbore is connected to the natural fracture system. During the drilling and development of this field, individual well treatments ranged from 1500 gallons of breakdown acid to 630,000 gallons of fracturing fluid. The question of treating the whole section where perforations ranged over a 300-foot interval versus selectively treating only a few feet of the section was explored at length. Finally, it was concluded that where the natural fracture development is extensive and, consequently, there exists a greater productivity index and hydrocarbon pore volume, it is only necessary to use the minimal treatment required to establish communication with the natural fracture system.

A method was developed for estimating the areal distribution of original oil in place. For application, the information needed is the productivity index of wells, and a numerical value for a coefficient derived from a well test. The theory and mathematical development are described in the Appendix, and include Equations 10 through 19. Basis for the theory is that in a fracture system, the fluid flow capability and the fluid storage space are both related directly to the width of the fractures.

Productivity indexes are not directly proportional to pore volumes in a natural fracture system because a slight increase in fracture width will have a greater affect on productivity index than on storage capacity. However, as shown by Equations 10 through 18 in the Appendix, an equation can be developed which relates fracture pore volume and productivity index.

A relationship was established between the productivity index of observation well No. 2 where the drawdown occurred and the hydrocarbon pore volume it represented. This relationship indicated that a productivity index of .1058 Res. Bbls/day/psi drawdown was representative of approximately 6515

Res. Bbls/acre. The constant C_8 in Equation 18 can be evaluated as equal to 13,850 using the special well test results.

The above discussed method for calculating hydrocarbon pore volume on a lease basis requires productivity index data early in the life of each well. These data are often not available until production has been sufficient to cause a reduction in the productivity index. Therefore, an additional method was needed to determine the oil in place on a lease basis where productivity index data are not available. An empirical correlation was developed between initial productivity indexes and initial well potentials. In making such a correlation, it was assumed that the pressure drawdown at each well was about the same during the well potential test. It was observed that reported backpressures for the wells throughout this field were generally about the same during potential tests. One additional correlation was developed relating hydrocarbon pore volume and initial well potentials. This was developed by cross-plotting data obtained from the empirically derived productivity index versus initial well potential correlation and the productivity index versus hydrocarbon pore volume relationship developed for the test area. The resulting relationship was assumed to be representative of the entire field and is presented by Figure 7.

SUMMARY

The developments described in this paper apply specifically to reservoirs where the oil is largely contained in natural fractures, as opposed to normal matrix porosity.

(1) Data collected during an interference test were used to compute the hydrocarbon pore volume in the vicinity of an observation well.

(2) The relationship between hydrocarbon pore volume and productivity index as presented was used to estimate hydrocarbon pore volume on a lease basis.

(3) In the absence of productivity index data, a relationship between hydrocarbon pore volume and initial potential has been developed which is based on an empirical correlation between productivity index data and reported initial well potentials. This relationship was used to distribute hydrocarbon pore volume on an areal basis.

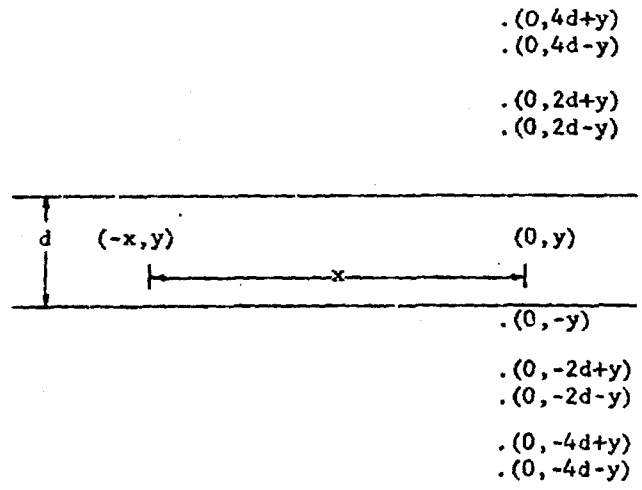
NOMENCLATURE

- μo = Oil Viscosity, cp
- K_o = Oil Permeability, md.
- h = Pay Thickness, ft.
- ϕ = Formation Porosity, fraction
- c = Fluid and Rock Compressibility, psi^{-1}
- x = Distance Between Observation Well and Producing Well
- d = Distance Between Assumed Barriers
- $d = d/x$ = Ratio of the distance between barriers and the distance between observation and production wells
- $y = y/x$ = Ratio of the distance between the production well and one barrier to the distance between observation and production wells
- t = Total Test Time, hrs.
- ΔPn = Pressure Drop in Observation Well at Any Time, t, psig
- q = Sum of oil and gas producing rates based on reservoir pore volume voidage, Res. Bbls/day
- W = Fracture Width
- C_3 = Fracture Clearance
- C_4 = Fracture Extension
- n = Number of Fractures Converted to Wellbore
- C_5 = $C_3\ C_4$
- C_6 = Constant Used in Approximating Fracture Permeability
- C_7 = $C_3\ C_6 n$

APPENDIX

Development of Hydrocarbon Pore Volume From Interference Data

A mathematical model for the wells and barriers shown on Figure 1 was developed using the method of images. The conceptual model is shown below:



Where:
The observation well is located at (-x,y).
The one producing well is located at (0,y).
The image producing wells are located at (0-y); (0,+2di+y) where i = 1 to i = ∞ .

Using the method of images and the super position principle, the computed pressure drop at the observation well, after n discrete time intervals, is as follows:

$$\Delta P_n = C_1 \left[q_1 \Psi \left(C_w, \bar{y}, \bar{d}, t_n \right) + \sum_{j=2}^{n} (q_j - q_{j-1}) \Psi \left(C_2, \bar{y}, \bar{d}, t_n - t_{j-1} \right) \right] \quad \ldots (1)$$

$$\Psi (C_w, \bar{y}, \bar{d}, t) = -\left[E_i \left(-\frac{C_2}{t} \right) + E_i \left(-\frac{C_2 (1+4\bar{y}^2)}{t} \right) + 2 \sum_{i=1}^{\infty} E_i \left(-\frac{C_2 (1+4 i^2 \bar{d}^2)}{t} \right) + \sum_{i=1}^{\infty} E_i \left(-\frac{C_2 (1+4 (\bar{d}_i + \bar{y})^2)}{t} \right) + \sum_{i=1}^{\infty} E_i \left(-\frac{C_2 (1+4 (\bar{d}_i - \bar{y})^2)}{t} \right) \right] \quad \ldots (2)$$

In the above equations, the constants C_1 and C_2 are defined as follows:

$$C_1 = \frac{70.6 \mu}{Kh} \quad \ldots (3)$$

$$C_2 = \frac{948 \phi \mu c x^2}{K} \quad \ldots (4)$$

from Eq. 3 $$\frac{K}{\mu} = \frac{70.6}{hC_1} \quad \ldots (5)$$

from Eq. 4 $$\frac{K}{\mu} = \frac{948 \phi c x^2}{C_2} \quad \ldots (6)$$

The right-hand side of Eq. 5 equals the right-hand side of Eq. 6:

$$\frac{70.6}{hC_1} = \frac{948 \phi c x^2}{C_2} \quad \ldots (7)$$

and solving for $h \phi$ from Eq. 7 gives:

$$h \phi = \left(\frac{.07447}{c x^2} \right) \left(\frac{C_2}{C_1} \right) \quad \ldots (8)$$

Using calculated values of C_1 and C_2 obtained from special well test results; porosity-feet can be calculated as follows:

$$h \phi = \left[\frac{(.07447)}{(74.5 \times 10^{-6})(5000)^2} \right] \left[\frac{(300)}{(.01429)} \right] = .840$$

Pore volume per acre may be determined by:

Pore Volume = (7758) ($h\phi$) ..... (9)

Pore Volume = (7758) (.840)

= 6515 Res. Bbls./Acre

Development of Basis for Hydrocarbon Pore Volume Distribution

Total fracture cross sectional area =

$C_3 Wn$ ..... (10)

Fracture Pore Volume, V_p, =

$(C_3 Wn)\ C_4 = C_5 Wn$ ..... (11)

Using Darcy's Law a relationship can be developed relating Productivity Index, permeability and fracture width, for a fracture system, as follows:

$$PI = \frac{Q}{\Delta P} = \frac{KA}{\mu L} \quad \ldots (12)$$

From Eq. 10 a substitution can be made in Eq. 12 for the total fracture cross sectional area in terms of fracture width.

$$PI = \frac{1}{\mu L} K (C_3 Wn) \quad \ldots (13)$$

The permeability of a fracture has been approximated as a constant times the fracture width squared and making this substitution into Eq. 13 yields:

$$PI = \frac{1}{\mu L} (C_6 W^2) (C_3 Wn) \quad \ldots (14)$$

Eq. 14 can be simplified to give Eq. 15.

$$PI = C_7 W^3 \quad \ldots (15)$$

From Eq. 11 $$W = \frac{V_p}{nC_5} \quad \ldots (16)$$

From Eq. 15 $$W = \sqrt[3]{PI} \,/\, \sqrt[3]{C_7} \quad \ldots (17)$$

$$V_p = \left(\frac{nC_5}{\sqrt[3]{C^7}}\right)\sqrt[3]{PI} = C_8 \sqrt[3]{PI} \quad \ldots\ldots(18)$$

Using the results of the Special Well Tests the constant C8, in Eq. 18 can be evaluated as:

$$C_8 = \frac{V_p}{\sqrt[3]{PI}} = \frac{6515}{\sqrt[3]{.106}} = 13{,}850$$

Therefore, a general equation for pore volume distribution can be given as:

$$V_p = 13{,}850 \sqrt[3]{PI} \text{ Res. Bbls./Acre} \ldots(19)$$

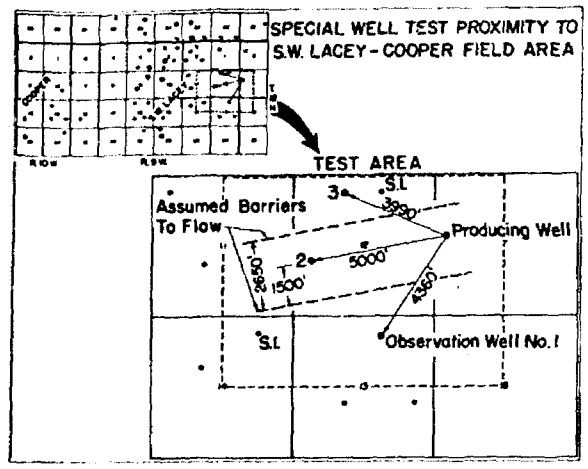


Fig. 1 - Special Well Test Proximity to S. W. Lacey - Cooper Field Area

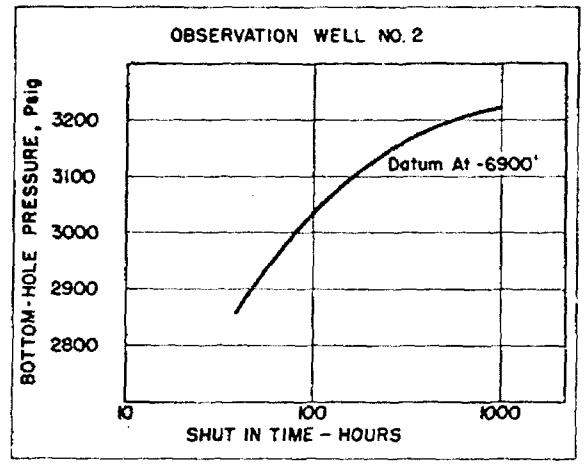


Fig. 2 - Pressure Buildup History for Observation Well No. 2

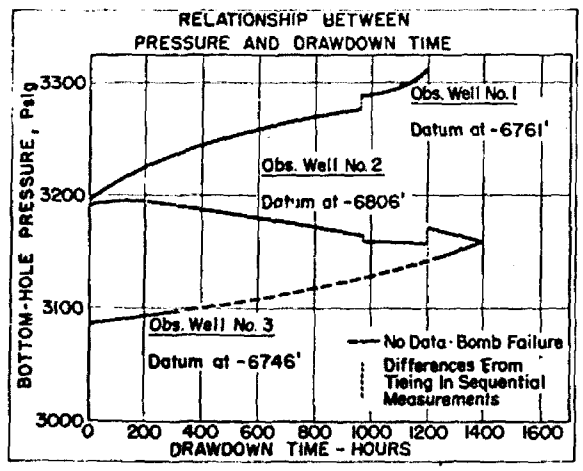


Fig. 3 - Relationship Between Pressure and Drawdown Time in Observation Wells

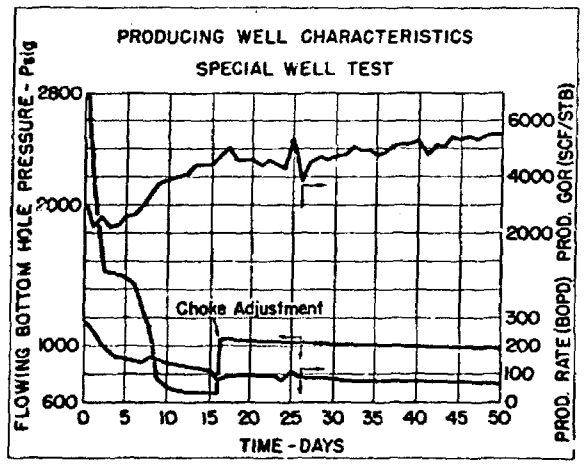


Fig. 4 - Production Well Characteristics, Special Well Test

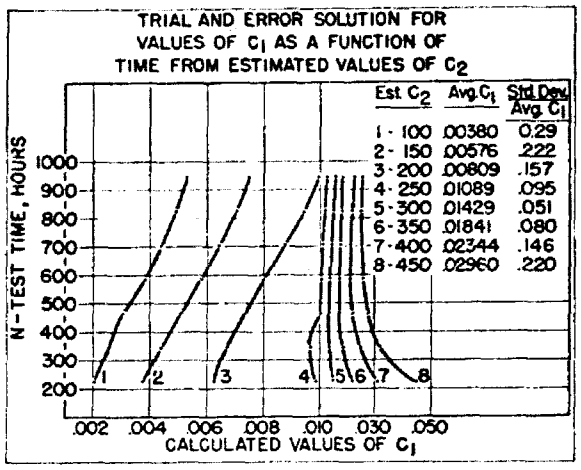


Fig. 5 - Trial and Error Solution for Values of C_1 as a Function of Time from Estimated Values of C_2

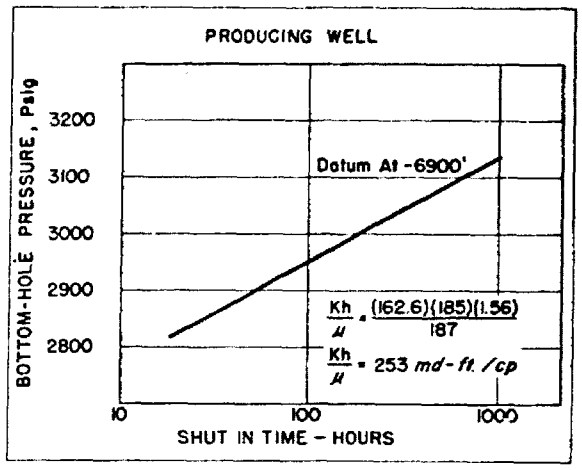


Fig. 6 - Pressure Buildup History for Producing Well.

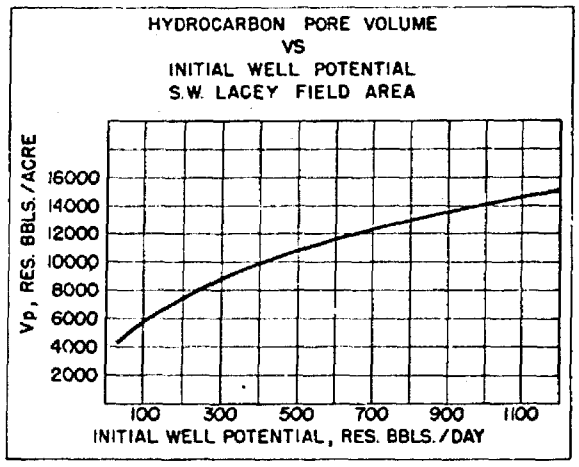


Fig. 7 - Hydrocarbon Pore Volume vs Initial Well Potential, S. W. Lacey Field Area