1069
1665

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

COPY

Jnne 1, 1959

Mr. Clarence Hinkle
Hervey, Dow & Hinkle
Box 547
Roswell, New Mexico

Dear Mr. Hinkle:

On behalf of your client, Atlantic Refining Company, we enclose two copies of Order R-1389-A issued May 28, 1959, by the Oil Conservation Commission in Case No. 1637.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ir

Enclosures

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

COPY

May 7, 1959

Mr. Clarence Hinkle
Hervey, Dow & Hinkle
Box 547
Roswell, New Mexico

Dear Mr. Hinkle:

On behalf of your client, Atlantic Refining Company, we enclose two copies of Order No. R-1389 issued May 7, 1959, by the Oil Conservation Commission in Case No. 1637, which was heard on April 15, 1959 at Hobbs, New Mexico.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ir/

Enclosures

Mobil

Magnolia Petroleum Company

A Socony Mobil Company

Producing Division

P. O. BOX 900 • DALLAS 21, TEXAS

A. E. CHESTER
VICE PRESIDENT AND MANAGER
M. C. BRADLEY
ASSISTANT MANAGER
D. V. CARTER
CHIEF PETROLEUM ENGINEER
C. H. HUDSON
ASSISTANT CHIEF PETROLEUM ENGINEER

April 10, 1959

File: H-220

Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Attention: Mr. Jim Rhotenberry

Subject: Combination of Fields and Adoption of Rules for the Allison and North Allison (Pennsylvanian) Fields, Lea and Roosevelt Counties, New Mexico

Gentlemen:

Magnolia Petroleum Company has reviewed the provisions of Atlantic's application to the Oil Conservation Commission (Case No. 1637), and supports the Atlantic Refining Company in its proposals, which we understand briefly consist of the following:

1. Combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian into one field to be known as the Allison Pennsylvanian Field.

2. The adoption of 80-acre proration units with a well to be located in either quarter-quarter section within 100' of the center of said quarter-quarter section.

3. A per-well allowable in accordance with the statewide 80-acre proportional factor for a depth range of 9000 to 10,000' as provided for in statewide Rule 505.

4. Any completed or drilling well as of the effective date of the Commission Order shall be granted exception to the proposed rules as pertains to location of wells.

Yours very truly,

MAGNOLIA PETROLEUM COMPANY

D. V. Carter
cs

D. V. Carter

OJF:BW

R E Howard

SUN OIL COMPANY

SOUTHWEST DIVISION

S. M. GLADNEY
MANAGER

T. F. HILL
ASSISTANT MANAGER

RIO GRANDE NATIONAL BUILDING
DALLAS 2, TEXAS

A. S. RHEA
SUPT. OPERATING DEPT.

March 31, 1959

Atlantic Refining Company
Box 1610
Midland, Texas

In Re: Allison and North Allison Pools

Gentlemen:

Sun Oil Company has reviewed the field rules application which has been filed with the New Mexico Oil Conservation Commission by the Atlantic Refining Company for the Allison and North Allison pools. Sun Oil Company is in accord with the plan for 80 acre spacing proration units and allocation as outlined in your application with the Commission.

Yours very truly,

SUN OIL COMPANY

By
A. R. Ballou

ARB:mi

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Re: NMOCC Case No. 1637:
80-Acre Proration Units
For Allison and North
Allison Pools

Gentlemen:

We have examined the attached plat, Exhibit A, "Development Plan For The Allison Pool Area." Development of our property will be in accordance with this plan except where subsequent information shows that such will cause waste or be uneconomical. We understand that this is to be presented at the forthcoming rehearing for 80-acre proration units in the Allison and North Allison Pools, provided that all operators in those pools are agreeable to the plan.

Yours very truly,

Cactus Drilling Co
COMPANY

By: George Baker

Date: 7-7-59

ALLISON AND NORTH ALLISON POOL OPERATORS
ADDRESSEE LIST

Ada Oil Company (2)
P. O. Box 844
Houston, Texas
Attn: Mr. W. G. Harvey

Cactus Drilling Co.
P. O. Box 1826
Hobbs, New Mexico
Attn: Mr. George Baker

Cosden Petroleum Corporation
P. O. Box 1311
Big Springs, Texas
Attn: Mr. H. T. Bratcher

Gulf Oil Corporation
P. O. Box 1290
Fort Worth, Texas
Attn: Mr. H. P. Reardon

Gulf Oil Corporation
P. O. Box 669
Roswell, New Mexico
Attn: Mr. O. K. Gilbreth, Jr.

Magnolia Petroleum Co. (3)
P. O. Box 2406
Hobbs, New Mexico
Attn: Mr. G. S. Young, Jr.

Ohio Oil Co.
P. O. Box 552
Midland, Texas
Attn: Mr. Coe S. Mills

Skelly Oil Company (2)
P. O. Box 38
Hobbs, New Mexico
Attn: Mr. J. N. Dunlavey

Sun Oil Co.
P. O. Box 1861
Midland, Texas
Attn: Mr. D. C. Brown

Trice Prod. Co.
P. O. Box 167
Midland, Texas

ATTENDANCE LIST
JUNE 25, 1959, MEETING

NAME	COMPANY	LOCATION
W. P. Tomlinson	Atlantic	Roswell
J. R. Rhotenberry	Atlantic	Midland
C. E. Mace	Gulf	Roswell
G. A. Naert	Ohio	Midland
Tom Steele	Ohio	Midland
I. B. Stitt	Magnolia	Midland

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Re: NMOCC Case No. 1637:
80-Acre Proration Units
For Allison and North
Allison Pools

Gentlemen:

We have examined the attached plat, Exhibit A, "Development Plan For The Allison Pool Area." Development of our property will be in accordance with this plan except where subsequent information shows that such will cause waste or be uneconomical. We understand that this is to be presented at the forthcoming rehearing for 80-acre proration units in the Allison and North Allison Pools, provided that all operators in those pools are agreeable to the plan.

Yours very truly,

Skelly Oil Co.
COMPANY

By: [illegible]

Date: [illegible]

RECEIVED
JUL 13 1959
MIDLAND OPERATIONS

ALLISON AND NORTH ALLISON POOL OPERATORS
ADDRESSEE LIST

Ada Oil Company (2)
P. O. Box 844
Houston, Texas
Attn: Mr. W. G. Harvey

Cactus Drilling Co.
P. O. Box 1326
Hobbs, New Mexico
Attn: Mr. George Baker

Cosden Petroleum Corporation
P. O. Box 1311
Big Springs, Texas
Attn: Mr. H. T. Bratcher

Gulf Oil Corporation
P. O. Box 1290
Fort Worth, Texas
Attn: Mr. H. P. Reardon

Gulf Oil Corporation
P. O. Box 669
Roswell, New Mexico
Attn: Mr. O. K. Gilbreth, Jr.

Magnolia Petroleum Co. (3)
P. O. Box 2406
Hobbs, New Mexico
Attn: Mr. G. S. Young, Jr.

Ohio Oil Co.
P. O. Box 552
Midland, Texas
Attn: Mr. Coe S. Mills

Skelly Oil Company (2)
P. O. Box 38
Hobbs, New Mexico
Attn: Mr. J. N. Dunlavey

Sun Oil Co.
P. O. Box 1861
Midland, Texas
Attn: Mr. D. C. Brown

Trice Prod. Co.
P. O. Box 167
Midland, Texas

ATTENDANCE LIST
JUNE 25, 1959, MEETING

NAME	COMPANY	LOCATION
W. P. Tomlinson	Atlantic	Roswell
J. R. Rhotenberry	Atlantic	Midland
C. E. Mace	Gulf	Roswell
G. A. Naert	Ohio	Midland
Tom Steele	Ohio	Midland
I. B. Stith	Magnolia	Midland

GULF

PETROLEUM AND ITS PRODUCTS

ROSWELL DISTRICT
W. A. SHELLSHEAR
District Manager
E. S. GREAR
District Exploration Manager
M. I. TAYLOR
District Production Manager
G. A. PRICE
District Services Manager

GULF OIL CORPORATION

P. O. DRAWER 669 — ROSWELL, NEW MEXICO

FORT WORTH
PRODUCTION DIVISION

July 7, 1959

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Attention: Mr. P. E. Fletcher
Regional Operations Manager

Gentlemen:

As requested by your letter of June 29, 1959, concerning proposed 80-acre proration units for the Allison and North Allison Pool, attached is a copy of your letter ballot properly executed by Gulf Oil Corporation.

Yours very truly,

WAShellshear

W. A. SHELLSHEAR

Attachment

RECEIVED
JUL 13 1959
MIDLAND OPERATIONS

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Re: NMOCC Case No. 1637:
80-Acre Proration Units
For Allison and North
Allison Pools

Gentlemen:

We have examined the attached plat, Exhibit A, "Development Plan For The Allison Pool Area." Development of our property will be in accordance with this plan except where subsequent information shows that such will cause waste or be uneconomical. We understand that this is to be presented at the forthcoming rehearing for 80-acre proration units in the Allison and North Allison Pools, provided that all operators in those pools are agreeable to the plan.

Yours very truly,

GULF OIL CORPORATION
COMPANY

By: W A Shellshear

Date: JUL 8 1959

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Re: NMOCC Case No. 1637:
80-Acre Proration Units
For Allison and North
Allison Pools

Gentlemen:

We have examined the attached plat, Exhibit A, "Development Plan For The Allison Pool Area." Development of our property will be in accordance with this plan except where subsequent information shows that such will cause waste or be uneconomical. We understand that this is to be presented at the forthcoming rehearing for 80-acre proration units in the Allison and North Allison Pools, provided that all operators in those pools are agreeable to the plan.

Yours very truly,

The Ohio Oil Co.
COMPANY

By: E. L. Smith
for Coe S. Mills

Date: 7-10-59

RECEIVED
JUL 13 1959
MIDLAND OPERATIONS

ALLISON AND NORTH ALLISON POOL OPERATORS
ADDRESSEE LIST

Ada Oil Company (2)
P. O. Box 844
Houston, Texas
Attn: Mr. W. G. Harvey

Cactus Drilling Co.
P. O. Box 1826
Hobbs, New Mexico
Attn: Mr. George Baker

Cosden Petroleum Corporation
P. O. Box 1311
Big Springs, Texas
Attn: Mr. H. T. Bratcher

Gulf Oil Corporation
P. O. Box 1290
Fort Worth, Texas
Attn: Mr. H. P. Reardon

Gulf Oil Corporation
P. O. Box 669
Roswell, New Mexico
Attn: Mr. O. K. Gilbreth, Jr.

Magnolia Petroleum Co. (3)
P. O. Box 2406
Hobbs, New Mexico
Attn: Mr. G. S. Young, Jr.

Ohio Oil Co.
P. O. Box 552
Midland, Texas
Attn: Mr. Coe S. Mills

Skelly Oil Company (2)
P. O. Box 38
Hobbs, New Mexico
Attn: Mr. J. N. Dunlavey

Sun Oil Co.
P. O. Box 1861
Midland, Texas
Attn: Mr. D. C. Brown

Trice Prod. Co.
P. O. Box 167
Midland, Texas

ATTENDANCE LIST
JUNE 25, 1959, MEETING

NAME	COMPANY	LOCATION
W. P. Tomlinson	Atlantic	Roswell
J. R. Rhotenberry	Atlantic	Midland
C. E. Mace	Gulf	Roswell
G. A. Naert	Ohio	Midland
Tom Steele	Ohio	Midland
I. B. Stitt	Magnolia	Midland

K. S. ADAMS, JR.
PRESIDENT

ADA OIL COMPANY
HOUSTON 1, TEXAS

6910 FANNIN, P. O. BOX 844
JACKSON 6-1911

JULY 8, 1959

MR. P. E. FLETCHER
THE ATLANTIC REFINING CO.
P. O. BOX 1610
MIDLAND, TEXAS

DEAR MR. FLETCHER:

RE: NMOCC CASE NO. 1637
80-ACRE PRORATION UNITS
FOR ALLISON AND NORTH
ALLISON POOLS, LEA AND
ROOSEVELT COUNTIES,
NEW MEXICO

WE ARE RETURNING A SIGNED COPY OF THE LETTER AND ATTACHED PLAT TRANSMITTED FOR OUR EXAMINATION ON JUNE 29, 1959, TO SIGNIFY OUR AGREEMENT WITH THE ARRANGEMENT OF PRORATION UNITS AS SHOWN ON THE PLAT MARKED "EXHIBIT A".

VERY TRULY YOURS,

ADA OIL COMPANY

Miriam Harrison

MIRIAM HARRISON
SECRETARY TO WM. G. HARVEY

MH:s

ENCLOSURE

RECEIVED
JUL 13 1959
MIDLAND OPERATIONS

THE ATLANTIC REFINING COMPANY
Incorporated - 1870
Petroleum Products

Domestic Producing Department
West Texas-New Mexico Region

Post Office Box 1610
Midland, Texas

June 29, 1959

ALLISON AND NORTH ALLISON POOL OPERATORS
(ADDRESSEE LIST ATTACHED)

Re: June 25, 1959, Meeting
Midland, Texas

Gentlemen:

Representatives of Allison and North Allison Pool operators met at 10:00 A.M., CST, on June 25, 1959, in Atlantic's Conference Room, Midland, Texas. An attendance list is attached. The purpose of the meeting was to discuss a development plan for the Allison and North Allison Pools which would be presented to the NMOCC at the forthcoming rehearing for 80-acre spacing. Those present agreed on arrangement of proration units as shown in our letter to you of June 10, 1959, with modifications as shown in the NE/4 SE/4 of Section 10 and S/2 of Section 11, T-9S, R-36E. Operators of those tracts were not present but had previously indicated a preference for rearrangement of their proration units.

We have attached two copies of a letter by which you may signify agreement with the arrangement of proration units as shown on the plats attached, Exhibit A. We would appreciate execution of one of the letters and the return of it and one of the plats to us. The other letter and plat are for your files.

Yours very truly,

THE ATLANTIC REFINING COMPANY

P. E. Fletcher

P. E. Fletcher,
Regional Operations Manager

Enclosures - 6

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Re: NMOCC Case No. 1637:
80-Acre Proration Units
For Allison and North
Allison Pools

Gentlemen:

We have examined the attached plat, Exhibit A, "Development Plan For The Allison Pool Area." Development of our property will be in accordance with this plan except where subsequent information shows that such will cause waste or be uneconomical. We understand that this is to be presented at the forthcoming rehearing for 80-acre proration units in the Allison and North Allison Pools, provided that all operators in those pools are agreeable to the plan.

Yours very truly,

COMPANY

By:

Date: [illegible]

ALLISON AND NORTH ALLISON POOL OPERATORS
ADDRESSING LIST

Ada Oil Company (2)
P. O. Box 844
Houston, Texas
Attn: Mr. W. G. Harvey

Cactus Drilling Co.
P. O. Box 1826
Hobbs, New Mexico
Attn: Mr. George Baker

Cosden Petroleum Corporation
P. O. Box 1311
Big Springs, Texas
Attn: Mr. H. T. Kratcher

Gulf Oil Corporation
P. O. Box 1290
Fort Worth, Texas
Attn: Mr. H. P. Reardon

Gulf Oil Corporation
P. O. Box 669
Roswell, New Mexico
Attn: Mr. O. K. Gilbreth, Jr.

Magnolia Petroleum Co. (3)
P. O. Box 2406
Hobbs, New Mexico
Attn: Mr. G. S. Young, Jr.

Ohio Oil Co.
P. O. Box 552
Midland, Texas
Attn: Mr. Coe S. Mills

Skelly Oil Company (2)
P. O. Box 38
Hobbs, New Mexico
Attn: Mr. J. N. Dunlavey

Sun Oil Co.
P. O. Box 1861
Midland, Texas
Attn: Mr. D. C. Brown

Trice Prod. Co.
P. O. Box 167
Midland, Texas

ATTENDANCE LIST
JUNE 25, 1959, MEETING

NAME	COMPANY	LOCATION
W. P. Tomlinson	Atlantic	Roswell
J. R. Rhotenberry	Atlantic	Midland
C. E. Mace	Gulf	Roswell
G. A. Naert	Ohio	Midland
Tom Steele	Ohio	Midland
I. B. Stitt	Magnolia	Midland

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Gentlemen:

We have reviewed the field rules application filed with the NMOCC by The Atlantic Refining Company for the Allison and North Allison Pools. Our company is in accord with your plan for 80-acre spacing, proration units, and allocation as outlined in the application.

Yours very truly,

Cactus Drilling Company
Company

Representative
Vice-President

4-1-59

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Gentlemen:

We have reviewed the field rules application filed with the NMOCC by The Atlantic Refining Company for the Allison and North Allison Pools. Our company is in accord with your plan for 80-acre spacing, proration units, and allocation as outlined in the application.

Yours very truly,

The Ohio Oil Co.
Company

Representative

RECEIVED
APR 3 1959
MIDLAND OPERATIONS

RE Howard

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Gentlemen:

We have reviewed the field rules application filed with the NMOCC by The Atlantic Refining Company for the Allison and North Allison Pools. Our company is in accord with your plan for 80-acre spacing, proration units, and allocation as outlined in the application.

Yours very truly,

Ada Oil Company
Company

Floyd E Suder, Jr
Representative

4-3-59

The Atlantic Refining Company
P. O. Box 1610
Midland, Texas

Gentlemen:

We have reviewed the field rules application filed with the NMOCC by The Atlantic Refining Company for the Allison and North Allison Pools. Our company is in accord with your plan for 80-acre spacing, proration units, and allocation as outlined in the application.

Yours very truly,

COSDEN PETROLEUM CORPORATION
Company

L. M. Thompson
Representative
Manager, Producing Division

RECEIVED
APR 1 1959
MIDLAND OPERATIONS

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			

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

5-28-59

HOWARD BRATTON
HERVEY, DOW & HINKLE
ROSWELL, NEW MEXICO

REHEARING GRANTED IN ALLISON CASE. REHEARING GRANTED IN SOUTH-VACUUM CASE ONLY ON ISSUE OF TRANSFER OF ALLOWABLE. BOTH REHEARINGS SET FOR JULY 15.

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

DISCUSSION OF RECOVERY CALCULATIONS

Atlantic has made the attached calculations to show that spacing of wells in an oil reservoir does not materially affect the ultimate recovery from that reservoir so long as the permeability and porosity are continuous. The final results of these calculations is a plot of recovery factor versus well spacing and is included as an exhibit. It can be seen from the exhibit that after well spacing exceeds 10 acres, the change in recovery factor is negligible.

The approach to this problem was first to determine oil-in-place at bubble point and to predict future performance of the reservoir as a function of pressure. Then by estimating the minimum bottom hole working pressure for each well, the producing rate was calculated as a function of the shut-in reservoir pressure. With these two plots versus pressure, it was possible to determine the residual oil saturation in the reservoir when the producing rate reached the economic limit of 5 BOPD per well under various spacing patterns. The residual oil saturations were used to calculate the recovery factor as a percent of original oil-in-place (not bubble point oil) as plotted in the exhibit versus well spacing. A detailed explanation of the purpose of each of the attached calculation sheets is as follows:

Page 1. Since the gas liberation process in the reservoir is of a differential type, it is necessary to convert stock tank oil production and separator gas production to a differential basis. Page 1 of the calculation sheets has been designed for this purpose. In our calculation which is over the pressure range of 3150 psi to 2734 psi, the stock tank production of oil was 1,475,000 barrels and the separator gas production was 1894 MMSCF. In terms of differential production these figures are equivalent to 1,454,000 residual differential barrels of oil and 1875 MMSCF.

Page 2. The differential production figures arrived at in Page 1 are used in calculations shown on Page 2 to determine the oil-in-place in the reservoir at the bubble point pressure. The oil-in-place at the bubble point is calculated to be 21,840,000 barrels.

Page 3. Page 3 is a calculation of future reservoir performance versus pressure. For purposes of this calculation the oil saturation at bubble point was estimated to be 75% of total pore space; i. e, 25% water saturation and no free gas. Relative permeability ratio data was not available for the Allison Pennsylvanian reservoir so an average of six West Texas dolomite reservoir relative permeability curves was used. This is a trial-and-error calculation wherein an oil saturation at the end of each pressure increment is assumed and other factors calculated to agree with the assumed oil saturation to facilitate the calculation of an oil saturation at the end of the pressure increment. This process is repeated until the calculated oil saturation agrees with the assumed oil saturation for the end of each pressure increment. Successive pressure increments are used from the bubble point pressure to a point at or below abandonment reservoir conditions and oil saturations calculated at the end of each pressure increment. A plot of these oil saturations versus mean reservoir pressure is shown as Curve 1 on Page 9 of the attachments. This form is also used to determine the oil production in terms of residual differential barrels for each pressure increment assumed.

Page 4. Page 4 is a calculation sheet for converting the residual differential barrels calculated production from Page 3 to stock tank barrels. It is also used for converting differential gas production from Page 3 to separator gas production. Curve 4 on Page 9 is a plot of stock tank production versus reservoir pressure as calculated on Page 4.

Page 5. Under flowing conditions the fluid saturations in the reservoir will vary from a minimum value at the well bore to a maximum value at the extreme radius of drainage of a proration unit. The reservoir pressure will also be a minimum at the well bore and maximum at the extreme radius of drainage. Since this is true, it is necessary to solve the radial-flow equation for oil influx in the well bore in its differential form as the permeability is a function of pressure and viscosity and volume factors are a function of pressure. The calculation on Page 5 is for the evaluation of the integral which appears in the following equation:

$$q_o = \frac{7.08 k_i h}{1000 \ln(0.607 \frac{r_e}{r_w})} \int_{P_{wf}}^{P_e} \frac{k_{ro}}{\mu_o B_{of}} dP$$

Since it is impossible to write an equation defining relative oil permeability, oil viscosity, and oil formation volume factors as functions of pressure, it is necessary to evaluate the integral in the above equation for average conditions in small successive pressure increments from the pressure at the extreme radius of drainage to the well bore working pressure. A plot of the values of this integral as a function of mean reservoir pressure is shown as Curve 3 on Page 9. Relative oil permeability data used in evaluating this integral is shown on Page 10. A value for K_i, productivity index permeability, was calculated from a productivity index test taken on Atlantic's Federal ~~Gulf~~ No. 1 Well. This calculation is shown on Page 7.

Page 6. It will be noted from the above radial flow equation that for a given radius of drainage the oil influx rate into the well bore will be directly proportional to the value of this integral. It will further be noted that the radius of drainage does not affect the value of this integral, therefore, it is possible to solve the above equation for the required value of the integral to sustain a given production rate for a given radius of drainage. In the Allison and North Allison Pools, we estimate the abandonment producing rate of each well will be 5 BOPD. Substituting this value into the above equation, values of the integral to maintain a producing rate of 5 BOPD are calculated on Page 6. Then referring to Curve 3 on Page 9 and Curve 1 on Page 9, the residual oil saturations existing in the reservoir and abandonment conditions for various radii of drainage are determined. These residual oil saturations are tabulated on Page 6. By use of Curve 4 on Page 9 the stock tank oil production from bubble point to abandonment conditions for different radii of drainage is determined. These values of stock tank oil production are also tabulated on Page 6. Adding to these stock tank production figures the amount of oil that was produced from the reservoir between the original reservoir pressure and bubble point pressure, a recovery factor as a percent of original oil-in-place is calculated as shown on Page 6. These calculated values of recovery factors are shown as a smooth curve versus well spacing in the exhibit.

Page 8. Page 8 is a sample calculation of the value of the above mentioned integral assuming $q_o = 5$ BOPD and $R_e = 745$ feet.

Case 1637

LAW OFFICES
HERVEY, DOW & HINKLE
HINKLE BUILDING
ROSWELL, NEW MEXICO

J. M. HERVEY 1874-1953
HIRAM M. DOW
CLARENCE E. HINKLE
W. E. BONDURANT, JR.
GEORGE H. HUNKER, JR.
HOWARD C. BRATTON
S. B. CHRISTY IV
LEWIS C. COX, JR.
PAUL W. EATON, JR.
ROBERT C. BLEDSOE

TELEPHONE MAIN 2-6510
POST OFFICE BOX 547

March 24, 1959

Mr. A. L. Porter, Jr., Secretary-Director
New Mexico Oil Conservation Commission
Mabry Hall, State Capitol
Santa Fe, New Mexico

Re: Allison and North Allison Pools,
Roosevelt and Lea Counties,
80-acre spacing

Dear Mr. Porter:

We have heretofore filed with the Oil Conservation Commission application of The Atlantic Refining Company for an order combining the Allison and North Allison Pools and for the establishment of special field rules, including 80-acre spacing.

We desire to amend the application by making a slight change in the wording of paragraph 3 on page 2 and enclose original and two copies of page 2 to be substituted for these pages in the application which we have heretofore filed with you.

The change simply deletes the words, "more than," in the last line of paragraph 3.

Yours sincerely,

HERVEY, DOW & HINKLE

By

CEH/bp
Encl.

cc: Mr. A. B. Tanco
Mr. F. W. Turner
Mr. P. E. Fletcher
Mr. V. E. Stepp
Mr. V. M. Hollrah
Mr. Phil Tomlinson

Docket Mailed
4-3-59
BP

4-58)

MPCO
PETR. ENGR. DEPT.
X-6743

FU DIAMETERCORE ANALYSIS REPC

IBM PROJECT NO. (0093 DIVISION WEST TEXAS DISTRICT LEA (070)
PARISH ☐
COUNTYXX LEA STATE NEW MEXICO (095)
FIELD ALLISON PENNSYLVANIAN (01200) ZONE PENNSYLVANIAN (00)
LEASE CHILDERS FEDERAL (0326) WELL NO. 1 (001)
FORMATION PENNSYLVANIAN (0964) ELEVATION GL (4046) CORING TOOL DIAMOND (1)
CORING FLUID SALT GEL (4) DATE CORED 5-54 (54)DATE ANALYZED 4-59 (59) BY JLE(99)

COMPLETE HEADING CODE 10093070095012000003260010964404614545999

SAMPLE NUMBER	DEPTH, FEET	LITHOLOGY	LITH. CODE	PERMEABILITY, md.			EFFECTIVE POROSITY (PERCENT)	SATURATION (% PORE SPACE)	
				HORIZONTAL		VERTICAL		RESIDUAL OIL	TOTAL WATER
				MAX.	90° MAX.				
001	09683-84	LS	15	0000.J	0.J	0000.J	00.1	00.P	00.P
002	09683-84	"	15	0000.J	0.J	0000.J	00.1	00.P	00.P
003	09684-85	"	15	0000.J	0.J	0000.J	00.1	00.P	00.P
004	09685-86	FR LS	17	0000.1	0.1	0000.J	00.8	00.P	00.P
005	09685-86	" "	17	0000.J	0.J	0000.J	00.3	00.P	00.P
006	09686-87	LS	15	0000.J	0.J	0000.J	00.3	00.P	00.P
007	09686-87	"	15	0000.J	0.J	0000.J	00.3	00.P	00.P
008	09689-90	FR VUG LS	17	0001.1	0.1	0000.3	01.9	00.P	00.P
009	09690-91	VUG LS	16	0000.2	0.2	0000.J	01.6	00.P	00.P
010	09690-91	" "	16	0000.5	0.4	0000.1	02.0	00.P	00.P
011	09691-92	FR VUG LS	17	0000.1	0.1	0000.J	01.7	00.P	00.P
012	09691-92	" " "	17	0000.2	0.1	0000.1	02.4	00.P	00.P
013	09692-93	FR LS	17	0000.5	0.1	0000.J	00.4	00.P	00.P
014	09693-94	" "	17	0000.J	0.J	0000.J	00.3	00.P	00.P
015	09693-94	" "	17	0000.J	0.J	0000.J	00.2	00.P	00.P
016	09694-95	" "	17	0000.1	0.1	0000.J	00.2	00.P	00.P
017	09694-95	LS	15	0000.J	0.J	0000.J	00.2	00.P	00.P
018	09695-96	FR LS	17	0000.1	0.1	0000.J	00.2	00.P	00.P
019	09696-97	LS	15	0000.J	0.J	0000.J	00.1	00.P	00.P
020	09696-97	"	15	0000.J	0.J	0000.J	00.2	00.P	00.P
021	09697-98	"	15	0000.J	0.J	0000.J	00.1	00.P	00.P
022	09698-99	FR LS	17	0000.1	0.J	0000.J	00.1	00.P	00.P
023	09698-99	LS	15	0000.J	0.J	0000.J	00.2	00.P	00.P
024	09699-9700	FR LS	17	0000.4	0.3	0000.J	00.2	00.P	00.P
025	09699-9700	LS	15	0000.J	0.J	0000.J	00.1	00.P	00.P
026	09700-01	"	15	0000.J	0.J	0000.J	00.1	00.P	00.P
027	09701-02	"	15	0000.J	0.J	0000.J	00.3	00.P	00.P
028	09701-02	FR LS	17	0000.4	0.3	0000.J	01.0	00.P	00.P
029	09702-03	VUG LS	16	0000.7	0.5	0000.2	01.2	00.P	00.P
030	09703-04	" "	16	0001.7	1.4	0000.4	02.2	00.P	00.P
031	09704-05	LS	15	0000.J	0.J	0000.J	00.3	00.P	00.P
032	09705-06	FR LS	17	0000.1	0.J	0000.J	00.1	00.P	00.P

(J) PERMEABILITY < 0.1 md.	SD – SANDSTONE	SDY – SANDY	FR – FRACTURED
(K) INSUFFICIENT SAMPLE	LS – LIMESTONE	LY – LIMEY	VUG – VUGULAR
(L) TOO FRIABLE	DOL – DOLOMITE	DLC – DOLOMITIC	OLI – OOLITIC
(M) MUD CONTAMINATED	SH – SHALE	SHY – SHALY	V – VERY
(N) COMPLETELY ALTERED BY MUD	CONG – CONGLOMERATE	IGR – INTERGRANULAR	SL – SLIGHTLY

Remarks:

Date Submitted: APRIL 13, 1959

Signed: (CONTINUED)

(4-58)

MPCO
PETR. ENGR. DEPT.
X-6743

FULL IAMETER CORE ANALYSIS REPO

IBM PROJECT NO. (0093) DIVISION WEST TEXAS DISTRICT LEA (070)
PARISH
COUNTY XX LEA STATE NEW MEXICO (095)
FIELD ALLISON PENNSYLVANIAN (01200) ZONE PENNSYLVANIAN (00)
LEASE CHILDERS FEDERAL (0326) WELL NO. 1 (001)
FORMATION PENNSYLVANIAN (0964) ELEVATION GL (4046) CORING TOOL DIAMOND (1)
CORING FLUID SALT GEL (4) DATE CORED 5-54 (54) DATE ANALYZED 4-59 (59) BY JLE 99

COMPLETE HEADING CODE 1009307009501200000326001096440461454599

SAMPLE NUMBER	DEPTH, FEET	LITHOLOGY	LITH. CODE	PERMEABILITY, md.			EFFECTIVE POROSITY (PERCENT)	SATURATION (% PORE SPACE)	
				HORIZONTAL		VERTICAL		RESIDUAL OIL	TOTAL WATER
				MAX.	90° MAX.				
033	09705-06	FR LS	17	0000.J	0.J	0000.J	00.3	00.P	00.P
034	09706-07	" "	17	0000.1	0.J	0000.J	00.2	00.P	00.P
035	09707-08	" "	17	0000.J	0.J	0000.J	00.1	00.P	00.P

(J) PERMEABILITY < 0.1 md.
(K) INSUFFICIENT SAMPLE
(L) TOO FRIABLE
(M) MUD CONTAMINATED
(N) COMPLETELY ALTERED BY MUD

SD – SANDSTONE
LS – LIMESTONE
DOL – DOLOMITE
SH – SHALE
CONG – CONGLOMERATE

SDY – SANDY
LY – LIMEY
DLC – DOLOMITIC
SHY – SHALY
IGR – INTERGRANULAR

FR – FRACTURED
VUG – VUGULAR
OLI – OOLITIC
V – VERY
SL – SLIGHTLY

Remarks: (P) - FOR CODING PURPOSES ONLY

Date Submitted: APRIL 13, 1959

Signed:

LARGE FORMAT EXHIBIT HAS BEEN REMOVED AND IS LOCATED IN THE NEXT FILE

LARGE FORMAT
EXHIBIT HAS
BEEN REMOVED
AND IS LOCATED
IN THE NEXT FILE

FORM M.B.-IIa

CONVERSION FROM SURFACE PRODUCTION TO DIFFERENTIAL – RESERVOIR BASIS OIL RESERVOIRS BELOW BUBBLE POINT PRESSURE

PAGE 1
INITIALS K
DATE 2/13/59

RESERVOIR: Allison + No. Allison

REMARKS:

Primed Values (0') are Values on Preceding Line

$$\frac{\Delta G_d}{\Delta N_p} = \left[R_{sp} + (R_s)_{sp} + \left(\frac{B_{of}}{B_{od}} R_{sd} - R_{sf}\right)_m\right]$$

$$\Delta N_d = \left(\frac{B_{of}}{B_{od}}\right)_m \Delta N_p$$

$$N_{d2} = N_{d1} - \Delta N_d$$

N_{f2} is not equal to $N_{f1} - \Delta N_p$ except above the bubble point pressure or for non-varying B_{of}/B_{od} ratio.

Conversion Between Flash and Differentral Oil In-place

COL. NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
QUANTITY	p_1	p_2	p_m	N_p Oil	G_{sp} Gas	W_p Water	$\frac{B_{of}}{B_{od}} R_{sd} - R_{sf}$	$(R_s)_{sp}$	R_{sp}	ΔG_{sp}	ΔN_p	ΔN_d	$\left(\frac{B_{of}}{B_{od}}\right)_m$	$\frac{\Delta G_d}{\Delta N_p}$	ΔG_d	ΔW_p	B_w	$B_w \Delta W_p$	Cumulative Reservoir Production $B_w \Delta W_p$	ΔN_d	ΔG_d	N_{f2}	N_{d2}	$\left(\frac{B_{of}}{B_{od}}\right)_2$
Source		(Bubble Point Pressure on 1st Line	$\frac{① + ②}{2}$	Cumulative Production From Initial Production To p_2			at p_m		$\frac{⑩}{⑪}$	⑤ - ⑤'	④ - ④'	⑪ ⑬	at p_m	⑦ + ⑧ + ⑨	⑪ ⑭	⑥ - ⑥'	at p_m	⑯ ⑰	Cumulative From Bubble Point Pressure To P_2 Cum. of ⑱	Cum. of ⑫	Cum. of ⑮	Known ㉓/㉔	㉒ ㉔ Known	at p_2
UNITS Date at p_2	PSIG	PSIG	PSIG	MSTB	MMSCF	MSTB	MSCF/STB	MSCF/STB	MSCF/STB	MMSCF	MSTB	MRDB	RDB/STB	MSCF/STB	MMSCF	MSTB	RVB/STB	MRVB	MRVB	MRDB	MMSCF	MSTB	MRDB	RDB/STB.
		Pb=3150																	0	0	0			
Total-Allison + No. Allison 1/59	3150	2734	2942	1,475	1894	—	-43	.030	1.284	1894	1475	1454	.9855	1.271	1875	—	—	—	0	1454	1875			.9856

Use moderate size for pressure intervals ($p_1 = p_2$ of previous interval): maximum size depends on variations of PVT functions with pressure

III - A - 4.4 (11)

FORM
M. B. - IIb

MATERIAL BALANCE CALCULATION OF WATER INFLUX OR OIL IN-PLACE
OIL RESERVOIRS BELOW BUBBLE POINT PRESSURE

PAGE 2
INITIALS *ll*
DATE 3/13/59
+ 6-29-59

RESERVOIR: Allison + No Allison

REMARKS: for Oil in Place @ bubble Point

To avoid confusion cross out source lines not being used

If p_1 is always bubble point pressure then primed values are values at bubble point.

If p_1 is p_2 of previous interval then primed values are values on preceding line.

E x p a n s i o n + Influx = V o i d a g e

$$N_{d1}\left[B_{g2}(R_{sd1}-R_{sd2})+\frac{G_{F1}}{N_{d1}}(B_{g2}-B_{g1})-(B_{od1}-B_{od2})\right]+\Delta W_e=\Delta N_d B_{od2}+B_w\Delta W_p+B_{g2}(\Delta G_d-\Delta N_d R_{sd2})$$

Evolved Gas Free Gas Oil Water Oil Water Free Gas

$$N_{d2}=N_{d1}-\Delta N_d$$

Free Gas Evolved Free Gas Produced

$$G_{F2}=G_{F1}+N_{d1}(R_{sd1}-R_{sd2})-(\Delta G_d-\Delta N_d R'_{sd2})$$

COL. NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
QUANTITY	p_1	p_2	$B_w \Delta W_p$	Oil & Water Voidage	B_{od2}	$\Delta N_d B_{od2}$	ΔN_d	R_{sd2}	$\Delta N_d R_{sd2}$	ΔG_d	Free Gas Production MMSCF	MRVB	B_{g2}	$B_{g2}(R_{sd1}-R_{sd2})$	$R_{sd1}-R_{sd2}$	$B_{od1}-B_{od2}$	$\frac{G_{F1}}{N_{d1}}$	$B_{g2}-B_{g1}$	$\frac{G_{F1}}{N_{d1}}(B_{g2}-B_{g1})$	Total Voidage	Water Influx ΔW_e	Total Expansion	Expansion / N_{d1}	N_{d1}	Evolved Gas	G_{F1}	G_{F2}
Source For ΔW_e / For N_{d1}		Bubble point pressure on first line	See form M.B.-II a	③ + ⑥	at p_2	⑤ ⑦	See form M.B. II a	at p_2	⑦ ⑧	See form M.B. II a	⑩ - ⑨	⑪ ⑬	at p_2	⑬ ⑮	⑧′ - ⑧	⑤′ - ⑤	㉖ / ㉔ Known	⑬ - ⑬′	⑰ ⑱	④ + ⑫	⑳ - ㉒ Known	㉓ ㉔ ⑳ - ㉑	⑭ + ⑲ - ⑯	㉔′ - ⑦ ㉒ / ㉓	⑮ ㉔	㉗′ ⑰ ㉔	㉕ + ㉖ - ⑪
UNITS → Date at p_2 ↓	PSIG	PSIG	MRVB	MRVB	RVB/RDB	MRVB	MRDB	MSCF/RDB	MMSCF	MMSCF	MMSCF	MRVB	RVB/MSCF	RVB/RDB	MSCF/RDB	RVB/RDB	MSCF/RDB	RVB/MSCF	RVB/RDB	MRVB	MRVB	MRVB	RVB/RDB	MRDB	MMSCF	MMSCF	MMSCF
		Pb=3150			1.860			1520					.8064														
	3150.	2734	0	2513	1.728	2513	1454	1.250	1818	1875	57	52.67	.9242	.2495	.270	.132	0	.1178	0	2566	0	2566	.1175.	21,840	5,897	0	5840

Note: Accuracy of this calculation is not dependent on size of pressure interval

FORM S.G.D-I

SOLUTION GAS DRIVE MATERIAL BALANCE
CALCULATION OF "DIFFERENTIAL" PRODUCTION VERSUS RESERVOIR PRESSURE

PAGE 3
INITIALS VC
DATE 6-59

RESERVOIR: Allison & North Allison

REMARKS: $V_p = \frac{21,800 \times 1.86}{.75} = 54,064$ MRVB

Fill in line 1 for pressure and known conditions at start of calculation
Primed values are values for the last line of preceding trial and error interval (where ㉖ checks ⑬)
Primed values for first trial and error pressure interval are values on line 1.
S_{ob} = Oil saturation at bubble point pressure.

Gas-Oil Ratio Equation (columns 13–16): $R_{d2} = \left(\frac{k_g}{k_o}\right)_2 \left(\frac{\mu_o}{\mu_g}\gamma B_{od}\right)_2 + R_{sd2}$

Material Balance Relation Between Gas-Oil Ratio And Saturation Change (columns 17–26): $R_{dm} = \frac{R_{d1}+R_{d2}}{2}$ $\Delta S_o = \frac{(S_{ob}-S_{o1})(\gamma_1-\gamma_2)+S_{o1}\left[\frac{R_{dm}}{B_{od2}}\left(\frac{B_{od1}-B_{od2}}{B_{od1}}\right)+\frac{R_{sd1}}{B_{od1}}-\frac{R_{sd2}}{B_{od2}}\right]}{\frac{R_{dm}}{B_{od2}}+\gamma_2-\frac{R_{sd2}}{B_{od2}}}$ $S_{o2} = S_{o1} - \Delta S_o$

Differential PVT Basis "Production" (columns 27–31): $\Delta N_d = \frac{V_p}{B_{od2}}\left[\Delta S_o - S_{o1}\left(\frac{B_{od1}-B_{od2}}{B_{od1}}\right)\right]$ $\Delta G_d = R_{dm}\Delta N_d$

COL. NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
QUANTITY	p_1	p_2	γ_2	$\gamma_1-\gamma_2$	$S_{ob}-S_{o1}$		R_{sd2}	$\frac{R_{sd2}}{B_{od2}}$	B_{od2}	$B_{od1}-B_{od2}$	$\frac{B_{od1}-B_{od2}}{B_{od1}}$	$\left(\frac{\mu_o}{\mu_g}\gamma B_{od}\right)_2$	S_{o2}	$\left(\frac{k_g}{k_o}\right)_2$	$(R_d-R_{sd})_2$	R_{d2}	R_{dm}	$\frac{R_{dm}}{B_{od2}}$			S_{o1}				ΔS_o	S_{o2}			$\frac{\Delta N_d}{V_p}$	ΔN_d	ΔG_d
Source: First Trial / Subsequent Trials	②′		at p_2	③′-③	(0.75) - ㉑	④⑤	at p_2	⑦ / ⑨	at p_2	⑨′-⑨	⑩ / ⑨′	at p_2	Assumed ㉖ of Prior Trial	at ⑬	⑫⑭	⑦+⑮	(⑯′+⑯) / 2	⑰ / ⑨	⑪⑱	[⑧′-⑧] + ⑲	㉖′	⑳㉑	⑥+㉒	③+⑱ - ⑧	㉓ / ㉔	㉑-㉕	⑪㉑	㉕-㉗	㉘ / ⑨	(54064)㉙ V_p in MRVB	⑰㉚
UNITS →	PSIG	PSIG	MSCF/RVB	MSCF/RVB	—	MSCF/RVB	MSCF/RDB	MSCF/RVB	RVB/RDB	RVB/RDB	—	MSCF/RDB	Fraction	—	MSCF/RDB	MSCF/RDB	MSCF/RDB	MSCF/RVB	MSCF/RVB	MSCF/RVB	Fraction	MSCF/RVB	MSCF/RVB	MSCF/RVB	—	Fraction	—	—	RDB/RVB	MRDB	MMSCF
Line 1 →		3150	1.250				1.523	.8188	1.86			—	.75	0	0	1.523										.75					
	3150	3000	1.19	0.06	0	0	1.425	.7873	1.81	.05	.02688	18.73	.70	0	0	1.425	1.474	.8144	.02189	.0535	.75	.0401	.0401	1.217	.033	.717					
													.717	.0014	.0262	1.451	1.438	.7945	02135	.0529	.75	.0397	.0397	1.198	.033	.717	.0201	.0129	.00713	385.4	568.1
								.0502																							
	3000	2800	1.11	.08	.038	.00264	1.290	.7371	1.75	.06	.0331	18.44	.677	.0117	.2157	1.506	1.478	.8446	.02796	.0782	.717	.0561	.0587	1.2175	.0482	.669					
													.669	.0132	.2434	1.533	1.520	.8686	.02875	.0789	.717	.0566	.0592	1.240	.0477	.669	.0237	.0240	.0137	740.7	1125.9
								.0545																							
	2800	2500	.992	.118	.081	.009558	1.140	.6826	1.67	.08	.0457	19.87	.61	.042	.8345	1.975	1.754	1.050	.0480	.1025	.669	.06857	.07813	1.359	.05749	.6115	.0306	.0269	.01611	871.0	1527.7
								.1060																							
	2500	2000	.785	.207	.139	.0288	.900	.5766	1.561	.109	.0653	20.84	.53	.183	3.814	4.714	3.345	$\overset{2}{1.115}$	.0728	.1788	.611	.1092	.1380	1.323	.1043	.507					
													.507	.30	6.252	7.152	4.563	2.923	.1909	.2969	.611	.1814	.2102	3.131	.06713	.544					
													.544	.143	2.980	3.880	2.927	1.875	.1224	.2284	.611	.1395	.1683	2.083	.0808	.530					
													.530	.183	3.814	4.714	3.345	2.142	.1399	.2459	.611	.1503	.1791	2.350	.0762	.535	.0399	.0363	.0232	1254.3	4195.6
								.0848																							
	2000	1500	.570	.215	.215	.0462	.720	.4918	1.464	.097	.0621	19.19	.47	.54	10.363	11.083	7.898	5.395	.3350	.4198	.535	.2246	.2708	5.473	.0495	.486					
													.486	.41	7.868	8.588	6.651	4.543	.2821	.3669	.535	.1963	.2425	4.621	.0525	.483					
													.483	.43	8.252	8.972	6.843	4.674	.2902	.3750	.535	.2006	.2468	4.752	.0519	.483	.0332	.0187	.01277	690.4	4724.4
								.1144																							
	1500	1000	.370	.200	.267	.0534	.520	.3774	1.378	.086	.0587	15.05	.450	.760	11.438	11.958	10.465	7.594	.4457	.5601	.483	.2705	.3239	7.587	.0427	.440					
													.440	.91	13.700	14.220	11.596	8.415	.4940	.6084	.483	.2939	.3473	8.408	.0413	.442	.0284	.0129	.00936	506.4	5872.2
								.0906																							
	1000	500	.175	.195	.308	.0601	.370	.2868	1.290	.088	.06386	9.143	.400	1.85	16.914	17.284	15.752	12.186	.7782	.8688	.442	.4709	.5310	12.074	.0440	.398	.0282	.0158	.0122	659.6	1039.0
								.2172																							
	500	50	.025	.150	.352	.0528	.080	.0696	1.150	.140	.1085	1.59	.325	7.2	11.44	12.24	14.762	12.836	1.393	1.610	.398	.6408	.6936	12.791	.0542	.344					
													.344	5.0	7.950	8.030	12.657	11.006	1.194	1.411	.398	.5616	.6144	10.961	.0561	.342	.0432	.0129	.0112	605.5	766.4
																														5713.3	

Plot S_{o2} versus B_{od2} as calculations proceed. Extrapolate to new B_{od2} to get first trial value of S_{o2} assumed column ⑬. For first interval below bubble point let $k_g/k_o = 0$ and use [illegible] values of [illegible] until S_{o2} calculated corresponds with critical gas saturation.

FORM
S.G.D. - II

CONVERSION OF "DIFFERENTIAL" RESERVOIR PRODUCTION TO SURFACE PRODUCTION, NEGLECTING SURFACE LIQUID CONDENSATION FROM RESERVOIR FREE GAS PRODUCTION (USUALLY NEGLIGIBLE)

PAGE 4
INITIALS VC
DATE 7-1-59

RESERVOIR:

REMARKS:

$$\Delta N_p = \Delta N_d \div \left(\frac{B_{of}}{B_{od}}\right)_m \qquad \Delta G_{sp} = \Delta G_d - \Delta N_p \left[(R_s)_{sp} + \left(\frac{B_{of}}{B_{od}}\right) R_{sd} - (R_{sf})\right]_m$$

COL. NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
QUANTITY	P_1	P_2	P_m	$(R_s)_{sp}$	$\frac{B_{of}}{B_{od}} R_{sd} - R_{sf}$		$\Delta G_d - \Delta G_{sp}$	ΔG_{sp}	ΔG_d	ΔN_d	$\left(\frac{B_{of}}{B_{od}}\right)_m$	ΔN_p	Oil Rate From Reservoir	Δt	Δt	Cumulative Values To p_2			$\frac{\Delta G_{sp}}{\Delta N_p}$
																t	N_p	G_{sp}	
Source	②'		(① + ②) / 2	at p_m	at p_m	④ + ⑤	⑥ ⑫	⑨ − ⑦	From Solution Gas Drive Calculations Form S.G.D.-I		at p_m	⑩ / ⑪	Other Calculations	⑫ / ⑬	⑭ / (0.365)				⑧ / ⑫
UNITS →	PSIG	PSIG	PSIG	MSCF / STB	MSCF / STB	MSCF / STB	MMSCF	MMSCF	MMSCF	MRDB	RDB / STB	MSTB	STB/D	M Days	Years	Years	MSTB	MMSCF	MSCF / STB
	3150	3000	3075	.030	-.0375	-.0075	-2.932	565.2	568.1	385.4	.9859	390.9					390.9	565.2	
	3000	2800	2900	.030	-.042	-.012	-9.009	1116.9	1125.9	740.7	.9865	750.8					1141.7	1682.1	
	2800	2500	2650	.030	-.039	-.009	-7.951	1519.7	1527.7	871.0	.9859	883.5					1975.2	3201.8	
	2500	2000	2250	.030	-.0195	+.010	+12.748	4208.3	4195.6	1254.3	.9839	1274.8					3250.0	7410.1	
	2000	1500	1750	.030	+.001	+.031	+21.867	4702.5	4724.4	690.4	.9788	705.4					3955.4	12112.6	
	1500	1000	1250	.030	+.0285	+.059	+30.768	5903.0	5872.2	506.4	.9711	521.5					4476.9	18015.6	
	1000	500	750	.030	+.0255	+.055	+37.691	1076.7	1039.0	659.6	.9625	685.3					5162.2	19092.3	
	500	50	275	.030	+.0032	+.033	21.104	787.5	766.4	605.5	.9469	639.5					5801.7	19879.8	
								19879.8	19819.3										

FORM S.G.D.-III

III-B-1.12(5)

CALCULATIONS OF $\int_p^{p_e} \frac{k_{ro}}{\mu_o B_{of}} dp$ FOR USE IN OIL PRODUCTION RATE EQUATION: $q_o = \frac{7.08 k_j h}{1000 \ln\left(0.607 \frac{r_e}{r_w}\right)} \int_{p_{wf}}^{p_e} \frac{k_{ro}}{\mu_o B_{of}} dp$

PAGE 5

INITIALS VC

DATE 6-57

RESERVOIR: Allison & North Allison

REMARKS: Kro from Denton Co. Depth 9353-54 - Dickinson A-2

Above Bubble Point: Omit columns ② thru ⑥ and let $k_{ro} = 1.0$
Gas Saturations Less Than Critical Gas: Omit ② thru ⑤ and use S_o versus p as defined by calculations on Form S.G.D.-I

Gas-Oil Ratio Equation

$$\frac{k_g}{k_o} = \frac{R_d - R_{sd}}{\frac{\mu_o}{\mu_g} \gamma B_{od}}$$

Primed values are values on previous line

COL. NO.	1	2	3	4	5	6	7	8	9	10	11	12	13
QUANTITY	p	R_{sd}	$R_d - R_{sd}$	$\frac{\mu_o}{\mu_g}\gamma B_{od}$	$\frac{k_g}{k_o}$	S_o	k_{ro}	$\mu_o B_{of}$	$\frac{k_{ro}}{\mu_o B_{of}}$	$\left(\frac{k_{ro}}{\mu_o B_{of}}\right)_{avg}$	Δp		$\int_p^{p_e} \frac{k_{ro}}{\mu_o B_{of}} dp$
Source	Drawdown Pressures Descending Order	at ①	R_d at p_e minus ②	at ①	$\frac{③}{④}$	at ⑤	at ⑥	at ①	$\frac{⑦}{⑧}$	$\frac{⑨' + ⑨}{2}$	①′-①	⑩⑪	Cumulative of ⑫
UNITS	PSIG	MSCF/RDB	MSCF/RDB	MSCF/RDB	—	—	—	(cp)(RVB/STB)	STB/(cp)(RVB)	STB/(cp)(RVB)	PSI	(STB)(PSI)/(cp)(RVB)	(STB)(PSI)/(cp)(RVB)
			R_d = 14.0 mscf/RDB										
Pe	200	.200	13.800	4.575	3.016	37.2	.020	.6479	.0308				
	150	.165	13.835	3.413	4.053	35.7	.018	.7112	.0253	.0281	50	1.405	1.405
	100	.130	13.870	2.819	4.920	34.6	.017	.847	.0201	.0227	50	1.135	2.540
	50	.080	13.920	1.581	8.804	31.3	.010	.996	.0100	.0150	50	.750	3.290
	25	.060	13.940	.957	14.566	28.5	.003	1.092	.0028	.0064	25	.160	3.450
			R_d = 13.4 mscf/RDB										
Pe	150	.165	13.235	3.413	3.878	35.8	.018	.7112	.0253				
	100	.130	13.270	2.819	4.707	34.8	.017	.847	.0201	.0227	50	1.135	1.135
	50	.080	13.320	1.581	8.425	31.6	.010	.996	.01004	.0151	50	.755	1.890
	25	.060	13.340	.957	13.939	28.8	.003	1.092	.00275	.0064	25	.160	2.050
				R_d = 11.6 mscf/RDB									
Pe	100	.130	11.470	2.819	4.068	35.6	.018	.847	.0213				
	50	.080	11.520	1.581	7.286	32.4	.011	.996	.0110	0162	50	.810	.810
	25	.060	11.540	.957	12.038	29.6	.008	1.092	.0073	.0092	25	.230	1.040
				R_d = 8.03 mscf/RDB									
Pe	50	.080	7.950	1.581	5.028								
	25	.060	7.970	.957	8.328								

	1	2	3	4	5	6	7	8	9	10	11	12	13
	p	R_{sd}	$R_d - R_{sd}$	$\frac{\mu_o}{\mu_g}\gamma B_{od}$	$\frac{k_g}{k_o}$	S_o	k_{ro}	$\mu_o B_{of}$	$\frac{k_{ro}}{\mu_o B_{of}}$	$\left(\frac{k_{ro}}{\mu_o B_{of}}\right)_{avg}$	Δp		$\int_p^{p_e} \frac{k_{ro}}{\mu_o B_{of}} dp$
	Drawdown Pressure Descending Order	at ①	R_d at p_e Minus ②	at ①	$\frac{③}{④}$	at ⑤	at ⑥	at ①	$\frac{⑦}{⑧}$	$\frac{⑨' + ⑨}{2}$	①′-①	⑩⑪	Cumulative of ⑫
	PSIG	MSCF/RDB	MSCF/RDB	MSCF/RDB	—	—	—	(cp)(RVB/STB)	STB/(cp)(RVB)	STB/(cp)(RVB)	PSI	(STB)(PSI)/(cp)(RVB)	(STB)(PSI)/(cp)(RVB)
			R_d = 14.85 mscf/RDB										
Pe	250	.220	14.63	5.335	2.742	37.8	.025	.6318	.0396				
	200	.200	14.65	4.575	3.202	36.9	.021	.6479	.0324	.0360	50	1.80	1.80
	150	.165	14.69	3.413	4.304	35.3	.019	.7112	.0267	.0296	50	1.48	3.28
	100	.130	14.72	2.819	5.222	34.3	.016	.847	.0189	.0228	50	1.14	4.42
	50	.080	14.77	1.581	9.342	31.1	.010	.996	.0100	.0145	50	.72	5.14
	25	.060	14.79	.957	15.450	28.4	.004	1.092	.0037	.0069	25	.17	5.31
				R_d = 15.50 mscf/RDB									
Pe	300	.250	15.25	6.377	2.407	38.5	.029	.6023	.0481				
	250	.220	15.28	5.335	2.864	37.6	.026	.6318	.0411	.0446	50	2.23	2.23
	200	.200	15.30	4.575	3.344	36.7	.021	.6479	.0324	.0368	50	1.84	4.07
	150	.165	15.33	3.413	4.492	35.0	.018	.7112	.0253	.0289	50	1.44	5.51
	100	.130	15.37	2.819	5.452	34.0	.016	.847	.0189	.0221	50	1.10	6.61
	50	.080	15.42	1.581	9.753	30.8	.010	.996	.0100	.0145	50	.72	7.33
	25	.060	15.44	.957	16.133	28.0	.003	1.092	.0027	.0064	25	.16	7.49
				R_d = 16.60									
Pe	400	.295	16.30	8.185	1.991	39.6	.031	.5873	.0528				
	300	.250	16.35	6.377	2.563	38.2	.027	.6023	.0448	.0488	100	4.88	4.88
	250	.220	16.38	5.335	3.070	37.2	.023	.6318	.0364	.0406	50	2.03	6.91
	200	.200	16.40	4.575	3.585	36.3	.021	.6479	.0324	.0344	50	1.72	8.63
	150	.165	16.43	3.413	4.813	34.7	.018	.7112	.0253	.0289	50	1.45	10.08
	100	.130	16.47	2.819	5.842	33.6	.014	.847	.0165	.0209	50	1.05	11.13
	50	.080	16.52	1.581	10.449	30.3	.009	.996	.009	.0087	50	.43	11.56
	25	.060	16.54	.957	17.28	27.7	.003	1.092	.0033	.006	25	.3	11.86

When working from measured

$R_d = \left[R_{sp} + (R_s)_{sp} + \left(\frac{B_{of}}{B_{od}} R_{sd} - R_{sf}\right)\right] \div \left[\frac{B_{of}}{B_{od}}\right]$

Page 6

Calculation of Recovery Factors for Various Well Spacing — 7-59 VC

(Assuming Areas To be Circular)

Size Unit (Acres)	Size Unit Sq. Ft.	Area ÷ π	r_e (ft.)	r_e/r_w	$.607\ r_e/r_w$	$\ln(.607\ r_e/r_w)$	$\int_{P_{wf}}^{P_e} \frac{k_{ro}}{\mu_o B_o} dp =$ $.9185 \ln(.607\ r_e/r_w)$	S_{RO}	ΔN MMSTB	Rec. Factor % B.P. Oil	Rec. Factor % OOIP
5	217,800	69,328	263	1052	638.6	6.45	5.92	.372	5.46	25.00	26.15
10	435,600	138,656	373	1493	906.2	6.81	6.25	.373	5.44	24.91	26.06
15	653,400	207,984	455	1820	1104.7	7.02	6.45	.373	5.44	24.91	✓
20	871,200	277,312	526	2105	1277.7	7.15	6.57	.373	5.44	24.91	✓
30	1,306,800	415,967	644	2670	1620.7	7.39	6.79	.374	5.43	24.86	26.01
40	1,742,400	554,623	745	2980	1808.9	7.51	6.90	.3745	5.43	24.86	✓
80	3,484,800	1,109,247	1053	4220	2561.5	8.04	7.38	.375	5.41	24.77	25.92
160	6,969,600	2,218,493	1490	5960	3617.7	8.20	7.53	.3755	5.41	24.77	✓
1	43,560	13,865	118	473	287.1	5.50	5.05	.370	5.47	25.05	26.19
.5	21,780	6,961	83	332	201.5	5.30	4.87	.369	5.48	25.09	26.24
.25	10,890	3466	56	224	136.0	4.91	4.51	.368	5.49	25.14	26.29
.1	4,356	1386	37.2	148.8	90.3	4.51	4.14	.366	5.52	25.27	26.42

5,443.4

$$\int_{P_{wf}}^{P_e} \frac{k_{ro}}{\mu_o B_o} dp = \frac{q_o\ 1000 \ln(.607\ r_e/r_w)}{7.08 k_j h} = \frac{5 \times 1000 \times \ln(.607\ r_e/r_w)}{7.08 \times 86 \times 8.94'} = .9185 \ln(.607\ r_e/r_w)$$

* $r_w = .25'$

$h = 8.94'$

45086

Rec. Factor if Total Res. drawn down to 25 psi = 27.77% of OOIP

Allison & No. Allison Penn.

$$K_j = \frac{1000\, q_o\, \mu_o\, B_{of}\, \ln(.607\, r_e/r_w)}{7.08\, h\, (P_e - P_{wf})}$$

For 40ac. Spacing $= \dfrac{1000 \times 153.05 \times .19 \times 1.82 \ln\left(.607 \frac{745}{.25}\right)}{7.08 \times 10 \underbrace{(3059 - 2990)}_{\text{Taken from P.I. on Fed. Yates \#1}}}$

3059
2990
0.69

$= 80$ md.

For 80ac. Spacing
$r_e = 1053'$

$= 86$ md.

Use 86 md. as K_j for formation

Under 80 acre Spacing, required value of $\int_{P_{wf}}^{P_o} \frac{k_{ro}}{\mu_o B_{of}}\, dp$ in order for $q_o = 5$ BOPD is:

$$\int_{P_{wf}}^{P_o} \frac{k_{ro}}{\mu_o B_{of}}\, dp = \frac{q_o\, 1000 \ln(.607\, r_e/r_w)}{7.08\, K_j\, h}$$

$$= \frac{5 \times 1000 \overset{7.85}{\ln\left(.607 \frac{1053}{.25}\right)}}{7.08 \times 86 \times 10}$$

$= 6.5$

Under 40 acre spacing, required value of integral for $q_o = 5$ BOPD is:

$$\int_{P_{wf}}^{P_e} \frac{K_{ro}}{\mu_o B_{of}} dp = \frac{\overset{5}{q_o}\, 1000 \ln\left(.607 \frac{745}{.25}\right)}{7.08 \times 86 \times 10}$$

$$= 6.16$$

S_{RO} for 80 ac. spacing = .3730

S_{RO} for 40 ac. Spacing .3725

For 80 acre Tract - 1 well

$3196^{2}96$

$P_m = 282$ $N_R = \frac{7758 \times .0515 \times .3730 \times 10 \times 80}{1.243} = 95,914$ RDB

For 80 acre tract - 2 wells

$P_m = 275$ $N_R = \frac{7758 \times .0515 \times .3725 \times 10 \times 80}{1.242}$ 95,860 RDB

Lost Oil = 54 RDB

ECONOMICS OF DRILLING ONE WELL PER 40 ACRES IN ALLISON AND NORTH ALLISON POOLS

REVENUE

Oil

(70,000) (1.0 - .125) ($2.95) =	$180,688
Less Severance Taxes At $0.1369/BO.	8,385
Gross Oil Revenue Less Severance Taxes.	172,303

Gas

(70,000) (1.0 - .125) (1.517) ($0.08)	7,433
Less Severance Taxes At 0.0264 Of Value	196
Gross Gas Revenue Less Severance Taxes.	7,237
Total Gross Revenue Less Severance Taxes.	179,540

COST

Drilling.	175,000
Pumping Equipment	30,000
Flow Lines.	1,600
Total Cost.	206,600
Loss - 40 Acre Well	27,060

CONDITIONS

Oil In Place Per 40 Acres	70,000 barrels
Gas-Oil, Ratio.	1517 cubic feet per barrel
Oil Price	$2.95 per barrel
Casinghead Gas Price.	$0.08 per MCF

Recovery factor has been used as 1.0. In practice, recovery factor will range between 0.2 and 0.5. Oil and gas recovery and revenue will be reduced proportionately. Operating expenses, which were neglected, will increase total costs.

FREE DEPOSITION AND HEARING ROOMS • AIR CONDITIONED • IN DOWNTOWN ALBUQUERQUE

DEARNLEY-MEIER REPORTING SERVICE, Inc.

605 SIMMS BUILDING
ALBUQUERQUE, NEW MEXICO
P. O. BOX 1092 PHONE CH 3-6691

ADA DEARNLEY, PRESIDENT
MARIANNA MEIER, SEC.-TREAS.
FIELD MANAGER
JERRY MARTINEZ
OFFICE MANAGER
STELLA MONTOYA
REPORTERS STAFF
J. A. TRUJILLO
PAUL R. DENNY
J. CALVIN BEVELL
SOVEIDA GONZALES

Specializing In:
DEPOSITIONS
HEARINGS
STATEMENTS
EXPERT TESTIMONY
DAILY COPY
CONVENTIONS

May 8, 1959

Ida Rodriquez
Oil Conservation Commission
P. O. Box 878
Santa Fe, New Mexico

Dear Mrs. Rodriquez:

Please send us a copy of the transcript in Case # 1637.

Thank you.

Very truly yours,

DEARNLEY-MEIER REPORTING SERVICE, INC.

BY M. Ortiz.

Sent transcript # 1637
5-11-59

Our Experience Assures Superior Service

Case 1637

NEW MEXICO OIL CONSERVATION COMMISSION

SANTA FE, NEW MEXICO

APPLICATION OF THE ATLANTIC REFINING COMPANY FOR AN ORDER COMBINING THE ALLISON AND NORTH ALLISON POOLS, LEA AND ROOSEVELT COUNTIES, AND DETERMINING THE LIMITS THEREOF AND ESTABLISHING 80-ACRE WELL SPACING AND PRORATION UNITS AND PROMULGATING SPECIAL RULES AND REGULATIONS THEREFOR

To the New Mexico Oil Conservation Commission
Santa Fe, New Mexico

Comes The Atlantic Refining Company and hereby makes application to the New Mexico Oil Conservation Commission for an order combining the Allison and North Allison Pools, located in Lea and Roosevelt Counties, New Mexico, and determining the limits thereof and redesignating the same as the "Allison Pool" and establishing 80-acre well spacing and proration units within said pool as redefined and promulgating special rules and regulations therefor and in support of said application respectfully shows:

1. That there is attached hereto, made a part hereof and for purposes of identification marked Exhibit "A," a plat showing the location of all wells which have been drilled in the Allison and North Allison Pools, as heretofore defined by the New Mexico Oil Conservation Commission, together with the ownership of the lands upon which said wells are located and the owners of the oil and gas leases embracing the same.

That applicant is the owner of the leasehold interests and wells indicated on said plat.

2. That all of the wells within the Allison and North Allison Pools, as shown on Exhibit "A" attached hereto, are producing from a common reservoir, all of said wells being completed in the Bough "C" zone of the Pennsylvanian formation at a depth of approximately 9700 feet.