

PLAIN OFFICE COPY

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ATTORNEYS AND COUNSELORS AT LAW
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FARMINGTON, NEW MEXICO

1963 JAN 14 AM 8:29

GEO. L. VERITY
JOEL B. BURR, JR.
WM. J. COOLEY

NORMAN S. THAYER
RAY B. JONES

January 10, 1963

TELEPHONE 325-1702

Oil Conservation Commission
Post Office Box 871
Santa Fe, New Mexico

Gentlemen:

You are hereby requested to dismiss the application of J. Gregory Merrion for rehearing in Case No. 2049, which has been set down on your docket on January 16, 1963.

Very truly yours,

VERITY, BURR & COOLEY

By

William J. Cooley

WJC/dh

cc: Oil Conservation Commission
Aztec, New Mexico

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION]
OF THE OIL CONSERVATION COMMISSION]
ON ITS OWN MOTION TO RECONSIDER THE]
SPECIAL RULES AND REGULATIONS FOR]
THE DEVILS FORK-GALLUP POOL, RIO]
ARRIBA COUNTY, NEW MEXICO.]

No. ³⁰⁰~~2409~~

ENTRY OF APPEARANCE

The undersigned, Atwood & Malone of Roswell, New Mexico, a firm of attorneys all of whose members are duly licensed to practice law in the State of New Mexico, hereby enters its appearance as local counsel with Guy Buell, of the Texas Bar, appearing for Pan American Petroleum Corporation in said cause.

DATED at Roswell, New Mexico this 12th day of April, 1962.

ATWOOD & MALONE

By *Harold K. Malone*
Post Office Drawer 700
Roswell, New Mexico

SUPPLEMENTARY REPORT OF KEMNITZ POOL ENGINEERING COMMITTEE

CONCLUSIONS

1. The Kemnitz Wolfcamp reservoir is behaving as a solution gas drive reservoir.
2. A study of stratification indicated that there were no correlative zones of high permeability continuous through the reservoir.
3. A model study will not aid in determining reservoir conformance to water injection.
4. An analysis of the past performance and pressure history of the individual wells indicates that there is an area of good pressure communication and an area of poor pressure communication in the reservoir. The pressure maintenance calculations were made for the area of good pressure communication only.
5. The area of poor pressure communication will probably not respond favorably to pressure maintenance.
6. Based on available data, this study indicates that pressure maintenance by gas injection will yield a greater profit than primary and waterflood operations.
7. Continued study of the reservoir should be made, particularly to determine the feasibility of supplementing gas injection with water injection.

RECOMMENDATIONS

1. It is recommended that the Kemnitz Wolfcamp Pool be unitized to protect correlative rights and achieve efficiency and economy of operation.
2. It is recommended that pressure maintenance by gas injection in the South Area be initiated as soon as possible.
3. It is recommended that the study of this reservoir be continued, particularly with regard to the supplementing of gas injection with water injection.

3111

Orig. Transcript

Ex. 6

10,641 } 0.1
10,835 }

870 - Rec. S. W.
0-5

Ch. 2A Production Unit
for # 3 is contained
as well as production
from some portion
of Kemnitz zone as
No. 1 well is producing.



1046



52

PAN AMERICAN PETROLEUM CORPORATION

P. O. Box 480, Farmington, New Mexico
September 16, 1960

File: E-620-986.510.1

Subject: Crude Oil Analysis Data
To Be Used In Equivalent
Volumetric Withdrawal Formula
For Devils Fork-Gallup Pool
Rio Arriba County, New Mexico

Mr. A. L. Porter, Jr.
New Mexico Oil Conservation Commission
Santa Fe, New Mexico

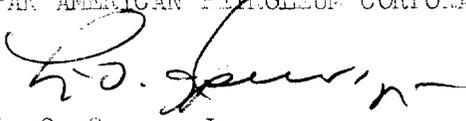
Dear Sir:

Attached please find a tabulation of the reservoir volume factor data and solution gas-oil ratio data as a function of pressure which were obtained from the bottom hole sample analysis from Pan American's John S. Dashko "B" No. 1, Devils Fork-Gallup Pool, Rio Arriba County, New Mexico. These data are being furnished for use in the equivalent volumetric withdrawal formula which was recommended by the Devils Fork-Gallup Pool Operators for adoption by the Commission in Case 2049. Also attached for your information is a copy of the graphical presentation of the solution gas-oil ratio data and reservoir volume factor data which were compiled from the Dashko "B" No. 1 bottom hole sample in Pan American's Research Laboratory.

Also attached is a graph showing the gas deviation factor as a function of bottom hole pressure. This graph was computed from the basic data obtained from a gas sample on El Paso's Canyon Largo Unit No. 89 well using the method outlined in the publication "Natural Gasoline and the Volatile Hydrocarbons". This method relates the deviation factor as a function of the reduced pressure and temperature of the gas as computed from the molecular analysis of the gas together with the reservoir temperature and pressure.

Very truly yours,

PAN AMERICAN PETROLEUM CORPORATION


L. O. Speer, Jr.
Area Superintendent

CME:en

Attachments

Bottom Hole Sample Data

Field: Devils Fork Gallup

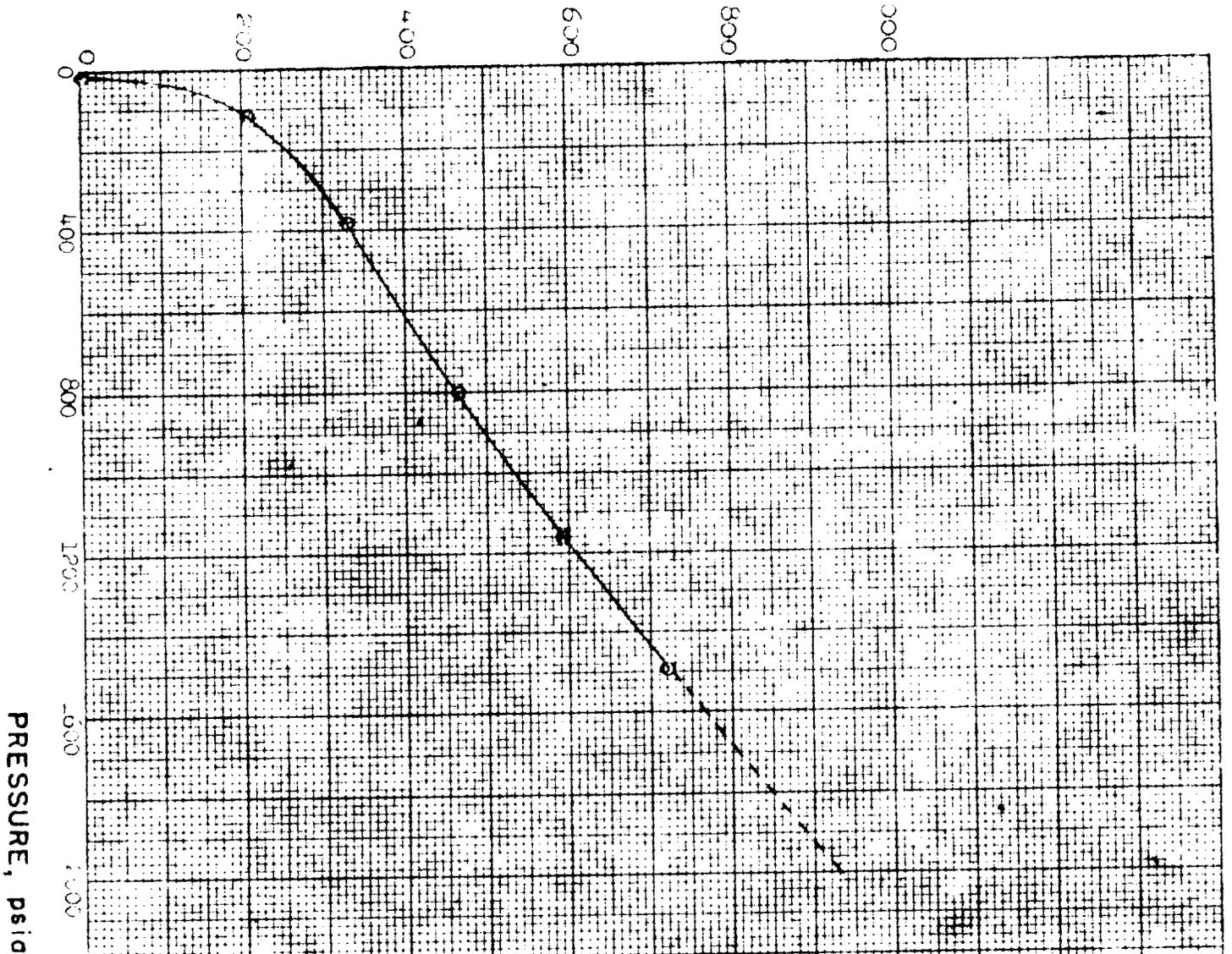
Well: John S. Dashko "B" No. 1

Date Sampled: 8-14-60

Sample Depth Pressure: 1616 psia; Temp: 150°F

<u>Pressure (psia)</u>	<u>Reservoir Volume Factor</u>	<u>Solution GOR ft³/Bbl.</u>
2000-	1.434	935
1900-	1.424	890
1800-	1.414	850
1700-	1.404	805
1600-	1.393	765
1500-	1.382	725
1400-	1.371	685
1300-	1.360	647
1200-	1.347	610
1100-	1.335	570
1000-	1.322	535
900-	1.309	498
800-	1.295	463
700-	1.280	429
600-	1.262	396
500-	1.245	365
400-	1.227	335
300-	1.208	300
200-	1.190	255
100-	1.160	195
12	1.045	0

STD. CU. FT. OF GAS IN SOLUTION PER BBL. OF RESIDUAL OIL



GAS SOLUBILITY

FIELD Inville Fork Group
WELL John S. Doshier 51 500-1
SAMPLE NO. 51-105 **DATE SAMPLED** 1-1-61
SAMP. DEPTH PRESS. 400 psia **TEST TEMP.** 150 °F
DATUM PL. PRESS. 1600 psia
ORIG. RESERVOIR PRESS. 2000 psia
GAS AND RESIDUAL OIL AT 60°F

RELATIVE VOLUME OF OIL REFERRED TO RESIDUAL OIL

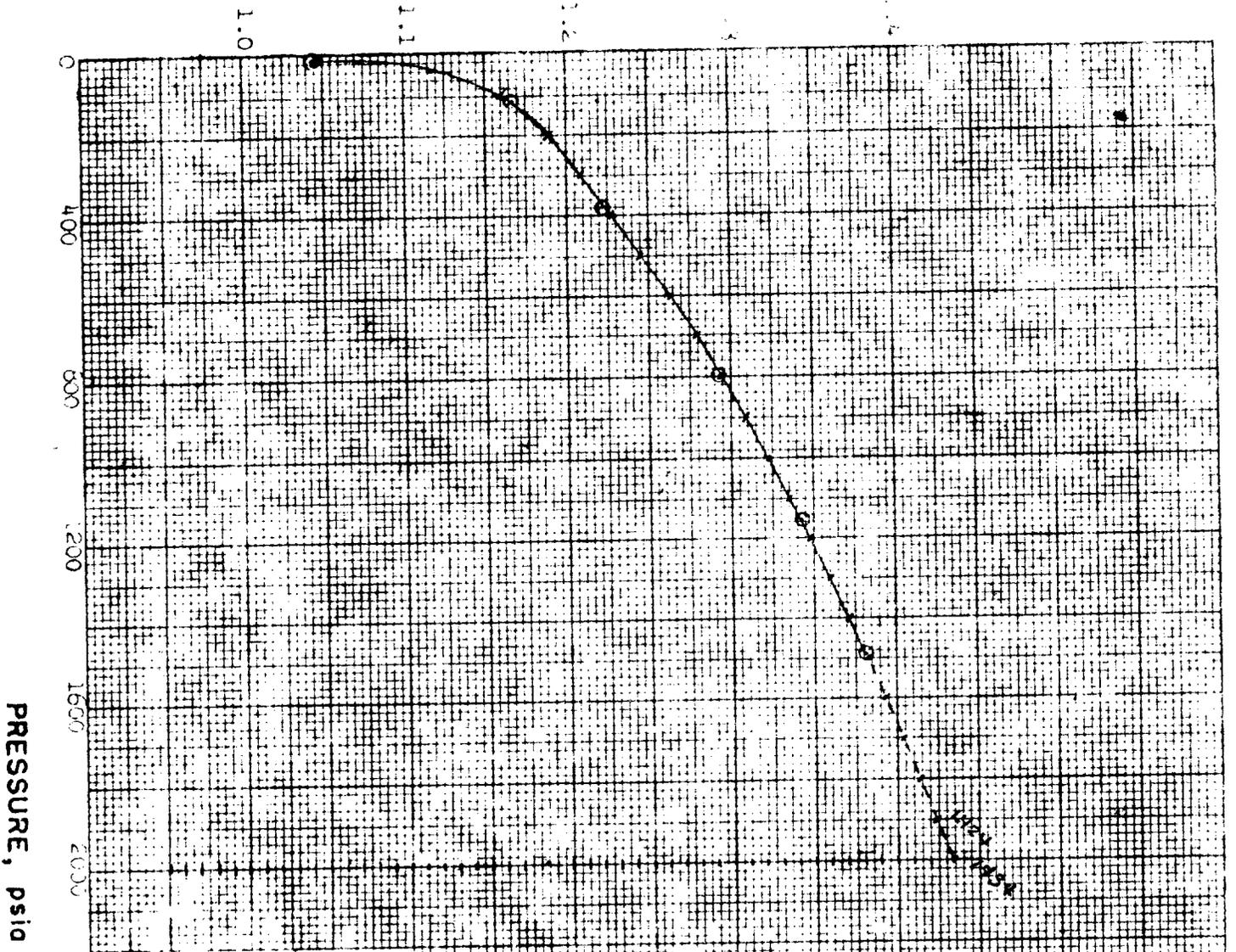
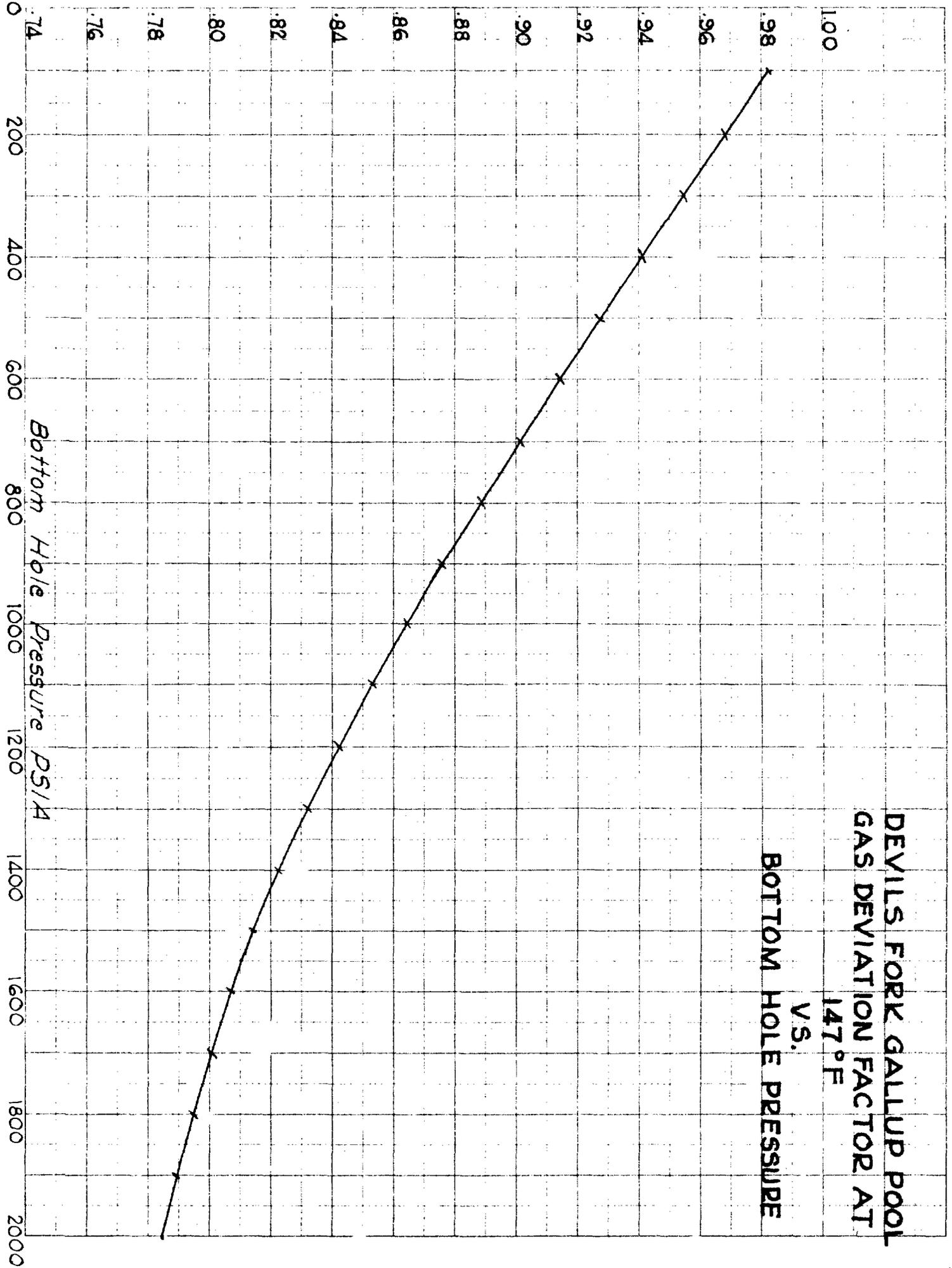


FIG. 1 RELATIVE OIL VOLUME

FIELD Levitt Fork Gallatin
WELL John S. Bachro 'B' No. 1
SAMPLE NO. 833 **DATE SAMPLED** 8-14-60
SAMP DEPTH PRESS. 1615 **psia** **TEST TEMP.** 150°F
DATUM **psia** 1615 **psia**
CRIG. RESERVOIR PRESS. **psia**
GAS AND RESIDUAL OIL AT 60°F

Z, Gas Deviation Factor



DEVILS FORK GALLUP POOL
GAS DEVIATION FACTOR AT
147°F

V.S.
BOTTOM HOLE PRESSURE

Bottom Hole Pressure PSIA

COLE 2009
EPN 11/11 EX 1

PROPOSED SPECIAL RULES AND REGULATIONS IN THE
DEVILS FORK GALLUP GAS POOL

(The term "General Rules" used herein refers to the General Rules and Regulations for Prorated Gas Pools of Northwest New Mexico contained in Order No. R-1670.)

A. WELL LOCATION AND ACREAGE REQUIREMENTS

Rule 1:

Pertains to pool wells and wildcat wells--General Rules applicable.

Special Rule 2:

Each well drilled or recompleted within the Devils Fork Gallup Gas Pool on a standard proration unit, after the effective date of this Rule, shall be drilled not closer than 660' to any boundary line of the tract, nor closer than 330' to a quarter-quarter section line or subdivision inner boundary line. Any well drilled to and producing from the Devils Fork Gallup Gas Pool prior to the effective date of this Order, at a location conforming to the spacing requirements in effect at the time said well was drilled, shall be considered to be located in conformance with this Rule.

Rule 3:

Pertains to exceptions to the spacing provisions--General Rules applicable.

Rule 4:

Pertains to the exception of these rules to Statewide Rule 104, paragraph (k)--General Rules applicable.

Special Rule 5 (A):

The acreage allocated to a gas or oil well for proration purposes shall be known as the gas or oil proration unit for that well. Each well completed or recompleted in the Devils Fork Gallup Gas Pool on a standard proration unit as a gas well shall be located on a proration unit on approximately 320 acres comprising any two contiguous quarter sections of a single governmental section being a legal subdivision of the U. S. Public Land Surveys, and each well completed or recompleted in the Devils Fork Gallup Gas Pool on a standard proration unit as an oil well shall be located on a proration unit of approximately 80 acres comprising any two contiguous quarter-quarter sections of a single governmental section being a legal subdivision of the U. S. Public Land Surveys. Any gas proration unit containing between 316 and 324 acres shall be considered to contain the number of acres in a standard unit for the purposes of computing allowables.

Rule 5 (B):

Provides for administrative approval for non-standard proration units--
General Rules applicable.

B. NOMINATIONS AND PRORATION SCHEDULE

Rule 6 (A):

Provides for preliminary nominations--General Rules applicable.

Rule 6 (B):

Defines the term "gas purchasers"--General Rules applicable.

Rule 7 (A):

Provides for supplemental nominations--General Rules applicable.

Rule 7 (B):

Provides that wells shall be listed on a proration schedule--General
Rules applicable.

C. ALLOCATION AND GRANTING OF ALLOWABLES

Rule 8 (A):

Provides that total gas allowable of the pool shall be equal to the preliminary
or supplemental nominations with any adjustments which the Commission
deems advisable--General Rules applicable.

Rule 8 (B) 1:

Provides no gas well to be given an allowable until certain forms have
been filed--General Rules applicable.

Rule 8 (B) 2:

Provides that deliverability test must be taken--General Rules applicable.

Special Rule 8 (B) 3:

No oil well shall be given an allowable until Form C-104 and Form C-110 have been filed, together with a plat (Form C-128) showing acreage attributed to said well and the location of all wells on the lease.

Special Rule 8 (B) 4:

The allowable for an oil well shall be determined in accordance with the provisions of Statewide Rule 505.

Rule 8 (C):

Provides when allowables to newly completed gas well shall commence--
General Rules applicable.

Special Rule 8 (D):

Allowables to wells whose classification has changed from oil to gas, based on the results of a gas-oil ratio test, will commence on the effective date of the new gas-oil ratio as provided in Special Rule 28; provided that:

- 1) A deliverability test is taken in conformance with the provisions of Order R-333-C and D, as amended by Order R-333-E and is submitted to the Commission within 45 days of the effective date of reclassification. In no event will a gas allowable be granted for a date more than 45 days prior to the date the well's initial deliverability and shut-in pressure test is reported to the Commission on Form C-122-A, in conformance with the provisions of Orders ~~R-333-C and D, as amended by Order R-333-E;~~ *10 C. 122-A*
- 2) A plat, Form C-128, showing the acreage attributed to said gas well and the location of all wells on the lease, and a new Form C-104 and Form C-110 has been filed.

Special Rule 8 (E):

Allowables to wells whose classification has changed from gas to oil based on the results of a gas-oil ratio test, will commence on the effective date of the the new gas-oil ratio as provided in Special Rule 28, provided that a plat, Form C-128, showing the acreage attributed to said oil well and the location of all wells on the lease and a new Form C-104 and C-110 has been filed.

Rule 9 (A):

Provides method for calculating "AD factor"--General Rules applicable.

Rule 9 (B):

Provides for allowable which shall be assigned to marginal wells--General Rules applicable.

Rule 9 (C) 1 and 2:

Provides for specific method of calculating allowables--General Rules applicable.

Rule 9 (D):

Provides that deliverability tests become effective on February 1st of the year following the year in which test is taken--General Rules applicable.

Special Rule 9 (E):

Oil wells in the Devils Fork Gallup Gas Pool on an 80 acre standard proration unit shall be permitted to produce a gas limit determined by multiplying the following factors:

(The normal unit allowable for Northwestern New Mexico) X (The proportional factor of 2.33) X (The limiting gas-oil ratio for the Devils Fork Gallup Gas Pool)

Rule 10 (A):

Provides for procedures in case acreage assigned to a well is increased--General Rules applicable.

Rule 10 (B):

Provides for effective date of a new allowable due to change in deliverability after retest or after recompletion or workover--General Rules applicable.

Rule 10 (C):

Provides that deliverability be determined in accordance with the provisions of Order R-333-C and D, as amended by R-333-E, and provides for exceptions to annual deliverability test requirements--General Rules applicable.

Proposed Special Rules and Regulations in the
Devils Fork Gallup Gas Pool

Page 5.

Special Rule 10 (C):

Gas wells in the Devils Fork Gallup Gas Pool shall have deliverability tests taken in conformance with the procedure outlined in Section B (procedure pertaining to the Mesa Verde Formation) of Order R-333-C and D, as amended by Order R-333-E.

Rule 11:

Provides that the Commission may assign minimum allowables in order to prevent premature abandonment--General Rules applicable.

Rule 12:

Provides that all production shall be charged against the well's allowable--General Rules applicable.

D. BALANCING OF PRODUCTION

Rule 13:

Provides for balancing dates and proration periods--General Rules applicable.

Rule 14 (A):

Provides that underproduction accrued in one proration period may be carried forward into the next proration period before cancellation--General Rules applicable.

Rule 14 (B):

Provides for method of making up underproduction--General Rules applicable.

Special Rule 14 (C):

The status of the gas area, as defined in the following formula, of the Devils Fork Gallup Gas Pool shall be determined as of February 1st and August 1st each year in the following manner:

- 1) The volumetric equivalent of gas for the gas area, based on the total production from the oil area, shall be calculated from the formula below:

Proposed Special Rules and Regulations in the
Devils Fork Gallup Gas Pool

Page 6.

$$V = \frac{A \times Q}{a} \times C \quad \text{where } C = r_1 - r_2 + \left(\frac{0.3199 P_r B}{Z} \right)$$

A = The gas area which is the total acreage dedicated to gas wells (acres).

a = The oil area which is the total acreage dedicated to oil wells (acres).

Note: The acreage to be added for any oil or gas well which receives its first allowable during a six month balancing period, for that period only, shall be calculated by the following formula:

$$\Delta a \text{ or } \Delta A = a \left(\frac{d}{D} \right) \text{ or } A \left(\frac{d}{D} \right)$$

where Δa or ΔA = acreage to be added to oil or gas area respectively.

a or A = Acreage dedicated to the well.

d = Days well received allowable during proration period.

D = Total days during proration period.

Q = Total oil production from oil area (bbls. /6 months).

r_1 = Average produced GOR for the oil area determined by dividing the total gas production of the oil area by the total oil production of the oil area for the previous six months proration period (cu. ft. /bbl.).

r_2 = Solution GOR determined from the characteristic performance curve for the oil at P_r (cu. ft. /bbl.).

P_r = Average reservoir pressure based on the pressures obtained on the most recent bottom hole pressure survey as provided in Special Rule 29.

B = The oil reservoir volume factor determined from the characteristic performance curve for the oil at P_r .

Z = Deviation factor for gas at P_r and 147° F for average gravity of produced gas from gas wells.

V = The volumetric equivalent of gas for the gas area, cubic feet for the six months rounded off to the nearest MCF.

Proposed Special Rules and Regulations in the
Devils Fork Gallup Gas Pool

Page 7.

$$0.3199 = \text{constant} = \frac{520 \times 5.61}{15.025 \times 607} \quad (607 = 147^\circ \text{ F} + 460^\circ \text{ R})$$

where 147° = the initial bottom hole temperature, assumed to remain constant.

- 2) The volumetric equivalent of gas for the gas area determined in 1) above shall be compared with the actual production from the gas area.
 - a) If the actual production from the gas area exceeds such volumetric equivalent plus any permitted production remaining as determined in b) below, then the nominations by gas purchasers during the succeeding six month period shall be adjusted by the Commission so that the volumetric withdrawals from the gas area shall be restricted for the purpose of balancing the cumulative equivalent volumetric withdrawals from each area.
 - b) If the actual production from the gas area is less than the volumetric equivalent for the gas area, then no adjustments will be made but the difference between the volumes will be carried forward as permitted production of gas from the gas area in subsequent balancing periods.

Rule 15 (A):

Provides that overproduction accrued in one proration period may be carried forward into the next proration period--General Rules applicable.

Rule 15 (B):

Provides that any time a well is six times overproduced its current allowable it shall be shut-in until it is underproduced less than six times its current allowable--General Rules applicable.

Rule 15 (C):

Provides for method of making up overproduction--General Rules applicable.

Rule 15 (D):

Provides that overproduction may be made up at a lesser rate than complete shut-in--General Rules applicable.

Rule 15 (E):

Provides that allowable assigned to a well through cancellation and redistribution shall be applied against overproduction--General Rules applicable.

E. CLASSIFICATION OF WELLS

Rule 16 (A):

Provides for classification of marginal well--General Rules applicable.

Rule 16 (B):

Provides that Secretary-Director may reclassify wells--General Rules applicable.

Rule 17:

Provides that a marginal well is not permitted to accumulate underproduction--General Rules applicable.

Rule 18:

Provides for method of reclassification of a marginal well to a non-marginal well--General Rules applicable.

Rule 19:

Provides that a reworked or recompleted well shall be classified as non-marginal upon reconnection--General Rules applicable.

Rule 20:

Provides that all wells not classified as marginal wells shall be classified as non-marginal wells--General Rules applicable.

F. REPORTING OF PRODUCTION

Rules 21 (A) (B) (C) and (D):

Provides that gas production shall be metered separately and reported to the Commission in accordance with appropriate Statewide Rules--General Rules applicable.

G. GENERAL

Rule 22:

No flare provision--General Rules applicable.

Proposed Special Rules and Regulations in the
Devils Fork Gallup Gas Pool

Page 9.

Rule 23:

Provides that failure to comply with Order will result in cancellation of allowable--General Rules applicable.

Rule 24:

Provides that all transporters shall file connection notices--General Rules applicable.

H. MISCELLANEOUS SPECIAL POOL RULES

Special Rule 25:

The vertical limits of the Devils Fork Gallup Gas Pool shall be the Gallup Formation.

Special Rule 26:

A gas well in the Devils Fork Gallup Gas Pool shall be any well producing with a gas liquid ratio of 30,000 cu. ft. of gas per barrel of liquid hydrocarbons or more; or, any well which produces liquid hydrocarbons with a gravity of 60° API or greater.

Special Rule 27:

An oil well in the Devils Fork Gallup Gas Pool shall be a well producing with a gas liquid ratio of less than 30,000 cu. ft. of gas per barrel of liquid hydrocarbons, and the liquid hydrocarbons have a gravity of less than 60° API.

Special Rule 28:

Gas-oil ratio tests shall be taken on all wells in the Devils Fork Gallup Gas Pool and on all wells producing from the Gallup Formation within one mile of the boundaries of the Devils Fork Gallup Gas Pool and not within another designated pool during the first fifteen days of the months of January, April, July, and October of each year. Tests shall be 24-hour tests, being the final 24 hours of a 72-hour period during which the well shall be produced at a constant rate of production to be determined by the operator, but in no event shall the rate be less than that necessary to produce the gas limit if the well is capable of producing the gas limit. Results of such tests shall be filed on Commission Form C-116 within ten days after the close of each test period and shall become effective on the first of the month following the test period. At least 72 hours prior

to commencement of any such gas-oil ratio tests, each operator shall file with the Aztec office of the Commission a Test Schedule for its wells, specifying the time each of its wells is to be tested. Copies of the Test Schedule shall also be furnished to all offset operators. The Secretary-Director may extend the 15-day testing period if future development indicates that 15 days does not allow sufficient time for operators to adequately test all of their wells.

Special Rule 29:

The average reservoir pressure shall be determined during the months of April and October each year after each well has been shut-in for a minimum of 3 days and calculated to a common datum, which shall be the subsea depth of the gas-oil contact. The pressures on individual wells shall be determined in the following manner:

- 1) Subsurface pressure tests shall be taken on all flowing oil wells (pumping wells exempted) in accordance with the procedure outlined in Statewide Rule 302, except with respect to shut-in time and datum as provided above.
- 2) Wellhead shut-in pressure shall be obtained on all gas wells and calculated to bottom hole conditions at the subsea datum of the gas-oil contact in accordance with the standard procedure as outlined in the "Manual for Back Pressure Tests for Natural Gas Wells in the State of New Mexico."
- 3) Information obtained on these tests shall be reported on Form C-124 in compliance with the provisions of Statewide Rules 302 and 1123, and the Commission shall use the arithmetic average of the pressures so reported for the pressure, P_r , in the calculations as provided in Special Rule 14 (C).

Special Rule 30:

No acreage shall be simultaneously dedicated to an oil well and to a gas well in the Devils Fork Gallup Gas Pool

Special Rule 31:

In order to prevent waste, the gas-oil ratio limitation for the Devils Fork Gallup Gas Pool shall be 2,000 cu. ft. of gas per barrel of oil produced.

PROPOSED SPECIAL RULES AND REGULATIONS IN THE
DEVILS FORK GALLUP GAS POOL

(The term "General Rules" used herein refers to the General Rules and Regulations for Prorated Gas Pools of Northwest New Mexico contained in Order No. R-1670.)

A. WELL LOCATION AND ACREAGE REQUIREMENTS

Rule 1:

Pertains to pool wells and wildcat wells--General Rules applicable.

Special Rule 2:

Each well drilled or recompleted within the Devils Fork Gallup Gas Pool on a standard proration unit, after the effective date of this Rule, shall be drilled not closer than 660' to any boundary line of the tract, nor closer than 330' to a quarter-quarter section line or subdivision inner boundary line. Any well drilled to and producing from the Devils Fork Gallup Gas Pool prior to the effective date of this Order, at a location conforming to the spacing requirements in effect at the time said well was drilled, shall be considered to be located in conformance with this Rule.

Rule 3:

Pertains to exceptions to the spacing provisions--General Rules applicable.

Rule 4:

Pertains to the exception of these rules to Statewide Rule 104, paragraph (k)--General Rules applicable.

Special Rule 5 (A):

The acreage allocated to a gas or oil well for proration purposes shall be known as the gas or oil proration unit for that well. Each well completed or recompleted in the Devils Fork Gallup Gas Pool on a standard proration unit as a gas well shall be located on a proration unit on approximately 320 acres comprising any two contiguous quarter sections of a single governmental section being a legal subdivision of the U. S. Public Land Surveys, and each well completed or recompleted in the Devils Fork Gallup Gas Pool on a standard proration unit as an oil well shall be located on a proration unit of approximately 80 acres comprising any two contiguous quarter-quarter sections of a single governmental section being a legal subdivision of the U. S. Public Land Surveys. Any gas proration unit containing between 316 and 324 acres shall be considered to contain the number of acres in a standard unit for the purposes of computing allowables.

Rule 5 (B):

Provides for administrative approval for non-standard proration units--
General Rules applicable.

B. NOMINATIONS AND PRORATION SCHEDULE

Rule 6 (A):

Provides for preliminary nominations--General Rules applicable.

Rule 6 (B):

Defines the term "gas purchasers"--General Rules applicable.

Rule 7 (A):

Provides for supplemental nominations--General Rules applicable.

Rule 7 (B):

Provides that wells shall be listed on a proration schedule--General
Rules applicable.

C. ALLOCATION AND GRANTING OF ALLOWABLES

Rule 8 (A):

Provides that total gas allowable of the pool shall be equal to the preliminary
or supplemental nominations with any adjustments which the Commission
deems advisable--General Rules applicable.

Rule 8 (B) 1:

Provides no gas well to be given an allowable until certain forms have
been filed--General Rules applicable.

Rule 8 (B) 2:

Provides that deliverability test must be taken--General Rules applicable.

Special Rule 8 (B) 3:

No oil well shall be given an allowable until Form C-104 and Form C-110 have been filed, together with a plat (Form C-128) showing acreage attributed to said well and the location of all wells on the lease.

Special Rule 8 (B) 4:

✓ The allowable for an oil well shall be determined in accordance with the provisions of Statewide Rule 505.

Rule 8 (C):

Provides when allowables to newly completed gas well shall commence--
General Rules applicable.

Special Rule 8 (D):

Allowables to wells whose classification has changed from oil to gas, based on the results of a gas-oil ratio test, will commence on the effective date of the new gas-oil ratio as provided in Special Rule 28; provided that:

- 1) A deliverability test is taken in conformance with the provisions of Order R-333-C and D, as amended by Order R-333-E and is submitted to the Commission within 45 days of the effective date of reclassification. (In no event will a gas allowable be granted for a date more than 45 days prior to the date the well's initial deliverability and shut-in pressure test is reported to the Commission on Form C-122-A, in conformance with the provisions of Orders R-333-C and D, as amended by Order R-333-E;
- 2) A plat, Form C-128, showing the acreage attributed to said gas well and the location of all wells on the lease, and a new Form C-104 and Form C-110 has been filed.

Special Rule 8 (E):

Allowables to wells whose classification has changed from gas to oil based on the results of a gas-oil ratio test, will commence on the effective date of the the new gas-oil ratio as provided in Special Rule 28, provided that a plat, Form C-128, showing the acreage attributed to said oil well and the location of all wells on the lease and a new Form C-104 and C-110 has been filed.

Rule 9 (A):

Provides method for calculating "AD factor"--General Rules applicable.

Rule 9 (B):

Provides for allowable which shall be assigned to marginal wells--General Rules applicable.

Rule 9 (C) 1 and 2:

Provides for specific method of calculating allowables--General Rules applicable.

Rule 9 (D):

Provides that deliverability tests become effective on February 1st of the year following the year in which test is taken--General Rules applicable.

Special Rule 9 (E):

Oil wells in the Devils Fork Gallup Gas Pool on an 80 acre standard proration unit shall be permitted to produce a gas limit determined by multiplying the following factors:

(The normal unit allowable for Northwestern New Mexico) X (The proportional factor of 2.33) X (The limiting gas-oil ratio for the Devils Fork Gallup Gas Pool)

Rule 10 (A):

Provides for procedures in case acreage assigned to a well is increased--General Rules applicable.

Rule 10 (B):

Provides for effective date of a new allowable due to change in deliverability after retest or after recompletion or workover--General Rules applicable.

Rule 10 (C):

Provides that deliverability be determined in accordance with the provisions of Order R-333-C and D, as amended by R-333-E, and provides for exceptions to annual deliverability test requirements--General Rules applicable.

Special Rule 10 (C):

Gas wells in the Devils Fork Gallup Gas Pool shall have deliverability tests taken in conformance with the procedure outlined in Section B (procedure pertaining to the Mesa Verde Formation) of Order R-333-C and D, as amended by Order R-333-E.

Rule 11:

Provides that the Commission may assign minimum allowables in order to prevent premature abandonment--General Rules applicable.

Rule 12:

Provides that all production shall be charged against the well's allowable--General Rules applicable.

D. BALANCING OF PRODUCTION

Rule 13:

Provides for balancing dates and proration periods--General Rules applicable.

Rule 14 (A):

Provides that underproduction accrued in one proration period may be carried forward into the next proration period before cancellation--General Rules applicable.

Rule 14 (B):

Provides for method of making up underproduction--General Rules applicable.

Special Rule 14 (C):

The status of the gas area, as defined in the following formula, of the Devils Fork Gallup Gas Pool shall be determined as of February 1st and August 1st each year in the following manner:

- 1) The volumetric equivalent of gas for the gas area, based on the total production from the oil area, shall be calculated from the formula below:

$$V = \frac{A \times Q}{a} \times C \quad \text{where } C = r_1 - r_2 + \left(\frac{0.3199 P_r B}{Z} \right)$$

A = The gas area which is the total acreage dedicated to gas wells (acres).

a = The oil area which is the total acreage dedicated to oil wells (acres).

Note: The acreage to be added for any oil or gas well which receives its first allowable during a six month balancing period, for that period only, shall be calculated by the following formula:

$$\Delta a \text{ or } \Delta A = a \left(\frac{d}{D} \right) \text{ or } A \left(\frac{d}{D} \right)$$

where Δa or ΔA = acreage to be added to oil or gas area respectively.

a or A = Acreage dedicated to the well.

d = Days well received allowable during proration period.

D = Total days during proration period.

Q = Total oil production from oil area (bbls. /6 months).

r_1 = Average produced GOR for the oil area determined by dividing the total gas production of the oil area by the total oil production of the oil area for the previous six months proration period (cu. ft. /bbl.).

r_2 = Solution GOR determined from the characteristic performance curve for the oil at P_r (cu. ft. /bbl.).

P_r = Average reservoir pressure based on the pressures obtained on the most recent bottom hole pressure survey as provided in Special Rule 29.

B = The oil reservoir volume factor determined from the characteristic performance curve for the oil at P_r .

Z = Deviation factor for gas at P_r and 147° F for average gravity of produced gas from gas wells.

V = The volumetric equivalent of gas for the gas area, cubic feet for the six months rounded off to the nearest MCF.

Handwritten notes:
 This
 should be
 calculated
 by
 this
 formula

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Proposed Special Rules and Regulations in the
Devils Fork Gallup Gas Pool

Page 7.

$$0.3199 = \text{constant} = \frac{520 \times 5.61}{15.025 \times 607} \quad (607 = 147^\circ \text{ F} + 460^\circ \text{ R})$$

where 147° = the initial bottom hole temperature, assumed to remain constant.

- 2) The volumetric equivalent of gas for the gas area determined in 1) above shall be compared with the actual production from the gas area.

and purchases

a) If the actual production from the gas area exceeds such volumetric equivalent plus any permitted production remaining as determined in b) below, then the nominations *by gas purchasers* during the succeeding six month period shall be adjusted by the Commission so that the volumetric withdrawals from the gas area shall be restricted for the purpose of balancing the cumulative equivalent volumetric withdrawals from each area.

b) If the actual production from the gas area is less than the volumetric equivalent for the gas area, then no adjustments will be made but the difference between the volumes will be carried forward as permitted production of gas from the gas area in subsequent balancing periods.

Rule 15 (A):

Provides that overproduction accrued in one proration period may be carried forward into the next proration period--General Rules applicable.

Rule 15 (B):

Provides that any time a well is six times overproduced its current allowable it shall be shut-in until it is underproduced less than six times its current allowable--General Rules applicable.

Rule 15 (C):

Provides for method of making up overproduction--General Rules applicable.

Rule 15 (D):

Provides that overproduction may be made up at a lesser rate than complete shut-in--General Rules applicable.

Rule 15 (E):

Provides that allowable assigned to a well through cancellation and redistribution shall be applied against overproduction--General Rules applicable.

E. CLASSIFICATION OF WELLS

Rule 16 (A):

Provides for classification of marginal well--General Rules applicable.

Rule 16 (B):

Provides that Secretary-Director may reclassify wells--General Rules applicable.

Rule 17:

Provides that a marginal well is not permitted to accumulate underproduction--General Rules applicable.

Rule 18:

Provides for method of reclassification of a marginal well to a non-marginal well--General Rules applicable.

Rule 19:

Provides that a reworked or recompleted well shall be classified as non-marginal upon reconnection--General Rules applicable.

Rule 20:

Provides that all wells not classified as marginal wells shall be classified as non-marginal wells--General Rules applicable.

F. REPORTING OF PRODUCTION

Rules 21 (A) (B) (C) and (D):

Provides that gas production shall be metered separately and reported to the Commission in accordance with appropriate Statewide Rules--General Rules applicable.

G. GENERAL

Rule 22:

No flare provision--General Rules applicable.

Rule 23:

Provides that failure to comply with Order will result in cancellation of allowable--General Rules applicable.

Rule 24:

Provides that all transporters shall file connection notices--General Rules applicable.

H. MISCELLANEOUS SPECIAL POOL RULES

Special Rule 25:

✓ The vertical limits of the Devils Fork Gallup Gas Pool shall be the Gallup Formation.

Special Rule 26:

A gas well in the Devils Fork Gallup Gas Pool shall be any well producing with a gas liquid ratio of 30,000 cu. ft. of gas per barrel of liquid hydrocarbons or more; or, any well which produces liquid hydrocarbons with a gravity of 60° API or greater.

Special Rule 27:

An oil well in the Devils Fork Gallup Gas Pool shall be a well producing with a gas liquid ratio of less than 30,000 cu. ft. of gas per barrel of liquid hydrocarbons, and the liquid hydrocarbons have a gravity of less than 60° API.

Special Rule 28:

Gas-oil ratio tests shall be taken on all wells in the Devils Fork Gallup Gas Pool and on all wells producing from the Gallup Formation within one mile of the boundaries of the Devils Fork Gallup Gas Pool and not within another designated pool during the first fifteen days of the months of January, April, July, and October of each year. Tests shall be 24-hour tests, being the final 24 hours of a 72-hour period during which the well shall be produced at a constant rate of production to be determined by the operator, but in no event shall the rate be less than that necessary to produce the gas limit if the well is capable of producing the gas limit. Results of such tests shall be filed on Commission Form C-116 within ten days after the close of each test period and shall become effective on the first of the month following the test period. At least 72 hours prior

to commencement of any such gas-oil ratio tests, each operator shall file with the Aztec office of the Commission a Test Schedule for its wells, specifying the time each of its wells is to be tested. Copies of the Test Schedule shall also be furnished to all offset operators. The Secretary-Director may extend the 15-day testing period if future development indicates that 15 days does not allow sufficient time for operators to adequately test all of their wells.

Special Rule 29:

The average reservoir pressure shall be determined during the months of April and October each year after each well has been shut-in for a minimum of 3 days and calculated to a common datum, which shall be the subsea depth of the gas-oil contact. The pressures on individual wells shall be determined in the following manner:

- 1) Subsurface pressure tests shall be taken on all flowing oil wells (pumping wells exempted) in accordance with the procedure outlined in Statewide Rule 302, except with respect to shut-in time and datum as provided above.
- 2) Wellhead shut-in pressure shall be obtained on all gas wells and calculated to bottom hole conditions at the subsea datum of the gas-oil contact in accordance with the standard procedure as outlined in the "Manual for Back Pressure Tests for Natural Gas Wells in the State of New Mexico."
- 3) Information obtained on these tests shall be reported on Form C-124 in compliance with the provisions of Statewide Rules 302 and 1123, and the Commission shall use the arithmetic average of the pressures so reported for the pressure, P_r , in the calculations as provided in Special Rule 14 (C).

Special Rule 30:

- ✓ No acreage shall be simultaneously dedicated to an oil well and to a gas well in the Devils Fork Gallup Gas Pool

Special Rule 31:

In order to prevent waste, the gas-oil ratio limitation for the Devils Fork Gallup Gas Pool shall be 2,000 cu. ft. of gas per barrel of oil produced.

✓

VERITY, BURR & COOLEY
ATTORNEYS AND COUNSELORS AT LAW
SUITE 152 PETROLEUM CENTER BUILDING
FARMINGTON, NEW MEXICO

GEO. L. VERITY
JOEL B. BURR, JR.
WM. J. COOLEY

October 29, 1962

TELEPHONE 325-1702

NORMAN S. THAYER
RAY B. JONES

Mr. A. L. Porter
Oil Conservation Commission
Post Office Box 871
Santa Fe, New Mexico

Re: Special Rules and Regulations for the
Devils Fork-Gallup Pool -- R-1670-B-1

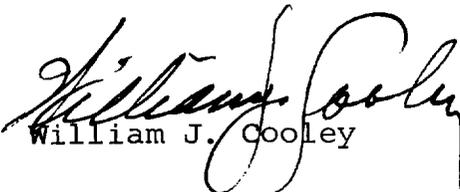
Dear Mr. Porter:

Forwarded herewith is the application of J. Gregory Merrion for rehearing in the referenced case.

Although recent hearings in this case have consumed a great deal of the Commission's time, I feel that the importance and urgency of the matters that would be brought to light at a rehearing justify and warrant a rehearing in this case.

Very truly yours,

VERITY, BURR & COOLEY

BY 
William J. Cooley

WJC/dh
Enclosures

cc: Mr. J. Gregory Merrion

DOCKET MAILED

Date 1-3-63



REDFERN & HERD, INC.

WILCO BUILDING
MIDLAND, TEXAS

POST OFFICE BOX 1747
TELEPHONE MUTUAL 4-5591

September 11, 1962

IN REPLY REFER TO
FILE:

Re: Case 2049
Devils Fork-Gallup
Rio Arriba County, N.M.

New Mexico Oil Conservation Commission
Morgan Hall
State Land Office Building
Santa Fe, New Mexico

Gentlemen:

We regret that other business does not permit personal representation at the above hearing. We do not feel that we could add anything to the record at this time.

We wish to recommend that the present field rules be continued on a temporary basis. We support the recommendation that all gas produced be metered.

Very truly yours,

REDFERN & HERD, INC.


John J. Redfern, Jr.

JJR: BJB

Case 2019
EPAG Ex 1

PROPOSED SPECIAL RULES AND REGULATIONS IN THE
DEVILS FORK GALLUP GAS POOL

(The term "General Rules" used herein refers to the General Rules and Regulations for Prorated Gas Pools of Northwest New Mexico contained in Order No. R-1670.)

A. WELL LOCATION AND ACREAGE REQUIREMENTS

Rule 1:

Pertains to pool wells and wildcat wells--General Rules applicable.

Special Rule 2: ✓

Each well drilled or recompleted within the Devils Fork Gallup Gas Pool on a standard proration unit, after the effective date of this Rule, shall be drilled not closer than 660' to any boundary line of the tract, nor closer than 330' to a quarter-quarter section line or subdivision inner boundary line. Any well drilled to and producing from the Devils Fork Gallup Gas Pool prior to the effective date of this Order, at a location conforming to the spacing requirements in effect at the time said well was drilled, shall be considered to be located in conformance with this Rule.

Rule 3:

Pertains to exceptions to the spacing provisions--General Rules applicable.

Rule 4:

Pertains to the exception of these rules to Statewide Rule 104, paragraph (k)--General Rules applicable.

Special Rule 5 (A):

The acreage allocated to a gas or oil well for proration purposes shall be known as the gas or oil proration unit for that well. Each well completed or recompleted in the Devils Fork Gallup Gas Pool on a standard proration unit as a gas well shall be located on a proration unit on approximately 320 acres comprising any two contiguous quarter sections of a single governmental section being a legal subdivision of the U. S. Public Land Surveys, and each well completed or recompleted in the Devils Fork Gallup Gas Pool on a standard proration unit as an oil well shall be located on a proration unit of approximately 80 acres comprising any two contiguous quarter-quarter sections of a single governmental section being a legal subdivision of the U. S. Public Land Surveys. Any gas proration unit containing between 316 and 324 acres shall be considered to contain the number of acres in a standard unit for the purposes of computing allowables.

Rule 5 (B):

Provides for administrative approval for non-standard proration units--
General Rules applicable.

B. NOMINATIONS AND PRORATION SCHEDULE

Rule 6 (A):

Provides for preliminary nominations--General Rules applicable.

Rule 6 (B):

Defines the term "gas purchasers"--General Rules applicable.

Rule 7 (A):

Provides for supplemental nominations--General Rules applicable.

Rule 7 (B):

Provides that wells shall be listed on a proration schedule--General
Rules applicable.

C. ALLOCATION AND GRANTING OF ALLOWABLES

Rule 8 (A):

Provides that total gas allowable of the pool shall be equal to the preliminary
or supplemental nominations with any adjustments which the Commission
deems advisable--General Rules applicable.

Rule 8 (B) 1:

Provides no gas well to be given an allowable until certain forms have
been filed--General Rules applicable.

Rule 8 (B) 2:

Provides that deliverability test must be taken--General Rules applicable.

Proposed Special Rules and Regulations in the
Devils Fork Gallup Gas Pool

Page 3.

Special Rule 8 (B) 3:

No oil well shall be given an allowable until Form C-104 and Form C-110 have been filed, together with a plat (Form C-128) showing acreage attributed to said well and the location of all wells on the lease.

Special Rule 8 (B) 4:

The allowable for an oil well shall be determined in accordance with the provisions of Statewide Rule 505.

Rule 8 (C):

Provides when allowables to newly completed gas well shall commence--
General Rules applicable.

Special Rule 8 (D):

Allowables to wells whose classification has changed from oil to gas, based on the results of a gas-oil ratio test, will commence on the effective date of the new gas-oil ratio as provided in Special Rule 28; provided that:

- Rule 100
- 1) A deliverability test is taken in conformance with the provisions of ~~Order R-333-C and D~~, as amended by Order R-333-E and is submitted to the Commission within 45 days of the effective date of reclassification. In no event will a gas allowable be granted for a date more than 45 days prior to the date the well's initial deliverability and shut-in pressure test is reported to the Commission on Form C-122-A, in conformance with the provisions of Orders R-333-C and D, as amended by Order R-333-E;
 - 2) A plat, Form C-128, showing the acreage attributed to said gas well and the location of all wells on the lease, and a new Form C-104 and Form C-110 has been filed.

Special Rule 8 (E):

Allowables to wells whose classification has changed from gas to oil based on the results of a gas-oil ratio test, will commence on the effective date of the the new gas-oil ratio as provided in Special Rule 28, provided that a plat, Form C-128, showing the acreage attributed to said oil well and the location of all wells on the lease and a new Form C-104 and C-110 has been filed.

Rule 9 (A):

Provides method for calculating "AD factor"--General Rules applicable.

Rule 9 (B):

Provides for allowable which shall be assigned to marginal wells--General Rules applicable.

Rule 9 (C) 1 and 2:

Provides for specific method of calculating allowables--General Rules applicable.

Rule 9 (D):

Provides that deliverability tests become effective on February 1st of the year following the year in which test is taken--General Rules applicable.

Special Rule 9 (E):

Oil wells in the Devils Fork Gallup Gas Pool on an 80 acre standard proration unit shall be permitted to produce a gas limit determined by multiplying the following factors:

(The normal unit allowable for Northwestern New Mexico) X (The proportional factor of 2.33) X (The limiting gas-oil ratio for the Devils Fork Gallup Gas Pool)

Rule 10 (A):

Provides for procedures in case acreage assigned to a well is increased--General Rules applicable.

Rule 10 (B):

Provides for effective date of a new allowable due to change in deliverability after retest or after recompletion or workover--General Rules applicable.

Rule 10 (C):

Provides that deliverability be determined in accordance with the provisions of Order R-333-C and D, as amended by R-333-E, and provides for exceptions to annual deliverability test requirements--General Rules applicable.

Proposed Special Rules and Regulations in the
Devils Fork Gallup Gas Pool

Page 5.

Special Rule 10 (C):

Gas wells in the Devils Fork Gallup Gas Pool shall have deliverability tests taken in conformance with the procedure outlined in Section B (procedure pertaining to the Mesa Verde Formation) of Order R-333-C and D, as amended by Order R-333-E.

Rule 11:

Provides that the Commission may assign minimum allowables in order to prevent premature abandonment--General Rules applicable.

Rule 12:

Provides that all production shall be charged against the well's allowable--General Rules applicable.

D. BALANCING OF PRODUCTION

Rule 13:

Provides for balancing dates and proration periods--General Rules applicable.

Rule 14 (A):

Provides that underproduction accrued in one proration period may be carried forward into the next proration period before cancellation--General Rules applicable.

Rule 14 (B):

Provides for method of making up underproduction--General Rules applicable.

Special Rule 14 (C):

The status of the gas area, as defined in the following formula, of the Devils Fork Gallup Gas Pool shall be determined as of February 1st and August 1st each year in the following manner:

- 1) The volumetric equivalent of gas for the gas area, based on the total production from the oil area, shall be calculated from the formula below:

Proposed Special Rules and Regulations in the
Devils Fork Gallup Gas Pool

Page 6.

$$V = \frac{A \times Q}{a} \times C \quad \text{where } C = r_1 - r_2 + \left(\frac{0.3199 P_r B}{Z} \right)$$

A = The gas area which is the total acreage dedicated to gas wells (acres).

a = The oil area which is the total acreage dedicated to oil wells (acres).

Note: The acreage to be added for any oil or gas well which receives its first allowable during a six month balancing period, for that period only, shall be calculated by the following formula:

$$\Delta a \text{ or } \Delta A = a \left(\frac{d}{D} \right) \text{ or } A \left(\frac{d}{D} \right)$$

where Δa or ΔA = acreage to be added to oil or gas area respectively.

a or A = Acreage dedicated to the well.

d = Days well received allowable during proration period.

D = Total days during proration period.

Q = Total oil production from oil area (bbls. /6 months).

r_1 = Average produced GOR for the oil area determined by dividing the total gas production of the oil area by the total oil production of the oil area for the previous six months proration period (cu. ft. /bbl.).

r_2 = Solution GOR determined from the characteristic performance curve for the oil at P_r (cu. ft. /bbl.).

P_r = Average reservoir pressure based on the pressures obtained on the most recent bottom hole pressure survey as provided in Special Rule 29.

B = The oil reservoir volume factor determined from the characteristic performance curve for the oil at P_r .

Z = Deviation factor for gas at P_r and 147° F for average gravity of produced gas from gas wells.

V = The volumetric equivalent of gas for the gas area, cubic feet for the six months rounded off to the nearest MCF.

Proposed Special Rules and Regulations in the
Devils Fork Gallup Gas Pool

Page 7.

$$0.3199 = \text{constant} = \frac{520 \times 5.61}{15.025 \times 607} \quad (607 = 147^\circ \text{ F} + 460^\circ \text{ R})$$

where 147° = the initial bottom hole temperature, assumed to remain constant.

- 2) The volumetric equivalent of gas for the gas area determined in 1) above shall be compared with the actual production from the gas area.
 - a) If the actual production from the gas area exceeds such volumetric equivalent plus any permitted production remaining as determined in b) below, then the nominations by gas purchasers during the succeeding six month period shall be adjusted by the Commission so that the volumetric withdrawals from the gas area shall be restricted for the purpose of balancing the cumulative equivalent volumetric withdrawals from each area.
 - b) If the actual production from the gas area is less than the volumetric equivalent for the gas area, then no adjustments will be made but the difference between the volumes will be carried forward as permitted production of gas from the gas area in subsequent balancing periods.

Rule 15 (A):

Provides that overproduction accrued in one proration period may be carried forward into the next proration period--General Rules applicable.

Rule 15 (B):

Provides that any time a well is six times overproduced its current allowable it shall be shut-in until it is underproduced less than six times its current allowable--General Rules applicable.

Rule 15 (C):

Provides for method of making up overproduction--General Rules applicable.

Rule 15 (D):

Provides that overproduction may be made up at a lesser rate than complete shut-in--General Rules applicable.

Rule 15 (E):

Provides that allowable assigned to a well through cancellation and redistribution shall be applied against overproduction--General Rules applicable.

E. CLASSIFICATION OF WELLS

Rule 16 (A):

Provides for classification of marginal well--General Rules applicable.

Rule 16 (B):

Provides that Secretary-Director may reclassify wells--General Rules applicable.

Rule 17:

Provides that a marginal well is not permitted to accumulate underproduction--General Rules applicable.

Rule 18:

Provides for method of reclassification of a marginal well to a non-marginal well--General Rules applicable.

Rule 19:

Provides that a reworked or recompleted well shall be classified as non-marginal upon reconnection--General Rules applicable.

Rule 20:

Provides that all wells not classified as marginal wells shall be classified as non-marginal wells--General Rules applicable.

F. REPORTING OF PRODUCTION

Rules 21 (A) (B) (C) and (D):

Provides that gas production shall be metered separately and reported to the Commission in accordance with appropriate Statewide Rules--General Rules applicable.

G. GENERAL

Rule 22:

No flare provision--General Rules applicable.

Proposed Special Rules and Regulations in the
Devils Fork Gallup Gas Pool

Page 9.

Rule 23:

Provides that failure to comply with Order will result in cancellation of allowable--General Rules applicable.

Rule 24:

Provides that all transporters shall file connection notices--General Rules applicable.

H. MISCELLANEOUS SPECIAL POOL RULES

Special Rule 25:

The vertical limits of the Devils Fork Gallup Gas Pool shall be the Gallup Formation.

Special Rule 26:

A gas well in the Devils Fork Gallup Gas Pool shall be any well producing with a gas liquid ratio of 30,000 cu. ft. of gas per barrel of liquid hydrocarbons or more; or, any well which produces liquid hydrocarbons with a gravity of 60° API or greater.

Special Rule 27:

An oil well in the Devils Fork Gallup Gas Pool shall be a well producing with a gas liquid ratio of less than 30,000 cu. ft. of gas per barrel of liquid hydrocarbons, and the liquid hydrocarbons have a gravity of less than 60° API.

Special Rule 28:

Gas-oil ratio tests shall be taken on all wells in the Devils Fork Gallup Gas Pool and on all wells producing from the Gallup Formation within one mile of the boundaries of the Devils Fork Gallup Gas Pool and not within another designated pool during the first fifteen days of the months of January, April, July, and October of each year. Tests shall be 24-hour tests, being the final 24 hours of a 72-hour period during which the well shall be produced at a constant rate of production to be determined by the operator, but in no event shall the rate be less than that necessary to produce the gas limit if the well is capable of producing the gas limit. Results of such tests shall be filed on Commission Form C-116 within ten days after the close of each test period and shall become effective on the first of the month following the test period. At least 72 hours prior

to commencement of any such gas-oil ratio tests, each operator shall file with the Aztec office of the Commission a Test Schedule for its wells, specifying the time each of its wells is to be tested. Copies of the Test Schedule shall also be furnished to all offset operators. The Secretary-Director may extend the 15-day testing period if future development indicates that 15 days does not allow sufficient time for operators to adequately test all of their wells.

Special Rule 29:

The average reservoir pressure shall be determined during the months of April and October each year after each well has been shut-in for a minimum of 3 days and calculated to a common datum, which shall be the subsea depth of the gas-oil contact. The pressures on individual wells shall be determined in the following manner:

- 1) Subsurface pressure tests shall be taken on all flowing oil wells (pumping wells exempted) in accordance with the procedure outlined in Statewide Rule 302, except with respect to shut-in time and datum as provided above.
- 2) Wellhead shut-in pressure shall be obtained on all gas wells and calculated to bottom hole conditions at the subsea datum of the gas-oil contact in accordance with the standard procedure as outlined in the "Manual for Back Pressure Tests for Natural Gas Wells in the State of New Mexico."
- 3) Information obtained on these tests shall be reported on Form C-124 in compliance with the provisions of Statewide Rules 302 and 1123, and the Commission shall use the arithmetic average of the pressures so reported for the pressure, P_r , in the calculations as provided in Special Rule 14 (C).

Special Rule 30:

No acreage shall be simultaneously dedicated to an oil well and to a gas well in the Devils Fork Gallup Gas Pool

Special Rule 31:

In order to prevent waste, the gas-oil ratio limitation for the Devils Fork Gallup Gas Pool shall be 2,000 cu. ft. of gas per barrel of oil produced.

Special Rule 10 (C):

Gas wells in the Devils Fork Gallup Gas Pool shall have deliverability tests taken in conformance with the following procedure:

(A) INITIAL DELIVERABILITY AND SHUT-IN PRESSURE TEST.

1. Within (45) forty-five days after a newly completed well is connected to a gas transportation facility the operator shall accomplish a deliverability and shut-in pressure test in conformance with the following paragraph (B).

(B) THE ANNUAL DELIVERABILITY AND SHUT-IN PRESSURE TESTS.

These tests shall be taken by unrestrictedly producing the well into the pipeline through either the casing or tubing, but not both. The daily flowing rate shall be determined for a one (1) day test flow period, following a minimum conditioning period of three (3) consecutive days production. There shall be no interruption of production during the four (4) days of conditioning and test. All such production during the three (3) day conditioning period plus the one (1) day deliverability test period shall be at static wellhead working pressures not in excess of seventy-five (75) per cent of the previous annual seven (7) day shut-in pressure of such well if such previous annual shut-in pressure information is available; otherwise, the seven (7) day initial shut-in pressure of such well shall be used.

In the event that existing line pressure does not permit a drawdown as specified above, with the well producing unrestrictedly into the pipeline, the operator shall request an exception to this requirement on the Form C-122-A. The request shall state the reasons for the necessity for the exception.

The static wellhead working pressure (P_w) of any well under test shall be the calculated static tubing pressure if the well is flowing through the casing; or the calculated static casing pressure if the well is flowing through the tubing. The static wellhead working pressure (P_w) shall be calculated by applying the tables and procedures as set out in New Mexico Oil Conservation Commission manual entitled "Method of Calculating Pressure Loss Due to Friction in Gas Well Flow Strings". This manual is more specifically known as release 4-G-9-FLT-NW.

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To obtain the shut-in pressure of a well under test the well shall be shut-in immediately after the deliverability test for the full period of seven (7) consecutive days. Such shut-in pressure shall be measured within the next succeeding twenty-four (24) hours following the seven (7) day shut-in period aforesaid. The seven (7) day shut-in pressure shall be measured on the tubing through which the well flowed during the conditioning and test flow periods.

All wellhead pressures as well as the flowing meter pressure shall be taken at the end of the deliverability test period with a dead-weight gauge. The dead-weight readings taken shall be recorded on the flow chart in psia.

The flowing meter chart shall be changed, and so arranged as to reflect upon a single chart the flow data for the gas from each well for the full three (3) day conditioning and one (1) day deliverability test period. Corrections shall be made for pressure base, measured flowing temperature, specific gravity and supercompressibility (superexpandibility), provided however, that if the specific gravity of gas from any well under test is not available, then and in that event an estimated specific gravity may be assumed therefor, based upon that of gas from nearby wells, the specific gravity of which has been actually determined by measurement.

The one (1) day test flow period volume shall be calculated from the readings at the end of the test period as determined from the last record orifice meter chart. The volume used in this calculation shall be corrected to New Mexico Oil Conservation Commission standard conditions.

The daily average rate of flow shall be corrected for meter error by the multiplication by a correction factor determined by dividing the square root of the chart flowing meter pressure psia into the square root of the dead-weight flowing meter pressure psia.

The daily volume of flow shall be calculated by applying the Basic Orifice meter formula.

$$Q = C \sqrt{h_w P_f}$$

Where:

Q = Metered volume of flow MCFD @ 15,025. °C° and 1.0 specific gravity.

ILLEGIBLE

ILLEGIBLE

CALCULATIONS TO DETERMINE EQUIVALENT VOLUMETRIC WITHDRAWALS

WDE 2044
EPNG
EX 2

$$V = \frac{A \times Q}{a} \times C$$

$$\text{where } C = r_1 - r_2 + \frac{(T_b)}{(T_r)} \frac{(P_r)}{(P_b)} \frac{(B)}{(Z)} 5.61$$

1 Barrel
Stock Tank
Oil 5.61 ft.³

$$\times \frac{(B)}{1.43} =$$

8.02
ft.³

This 8.02 ft.³ of reservoir space exists at 2,015 psia and 147° F and must be corrected to 15,025 psia and 60° F, and for deviation from Perfect Gas.

8.02
ft.³

$$\times \frac{(T_b)}{(T_r)} =$$

6.87
ft.³

Temperature

$$\times \frac{(P_r)}{(P_b)} =$$

$$\times \frac{2015}{15,025} =$$

Pressure

921.33
ft.³

921.33
ft.³

$$\times \frac{(1)}{(Z)} =$$

$$\times \frac{1}{0.8058} =$$

Deviation from
Perfect Gas

1143.37
ft.³

- (1) This is the volume of gas which will occupy the same reservoir space as one barrel of stock tank oil and its solution gas.
- (2) The volume determined in (1) is added to the volume of free gas (r₁ - r₂) to obtain the total volume voided by the actual production of one barrel of oil.
- (3) In order to determine the total volume voided by the oil area, the volume determined in (2) is then multiplied by Q--the total oil production from the oil area during the six month period.
- (4) Next, the total space voided by the oil area is reduced to a per-acre basis by dividing the volume determined in (3) by a--the total acreage dedicated to oil wells.
- (5) The volumetric equivalent of gas for the gas area is determined by multiplying the volume determined in (4) by A--the total acreage dedicated to gas wells.

Recommended Formula: $V = \frac{A \times Q}{a} \times C$ where $C = r_1 - r_2 + \frac{(0.3199 P_r B)}{(Z)}$

$$0.3199 = \text{constant} = \frac{T_b \times 5.61}{T_r \times P_b} = \frac{560 \times 5.61}{607 \times 15,025}$$

(607 = 147° F + 460 R

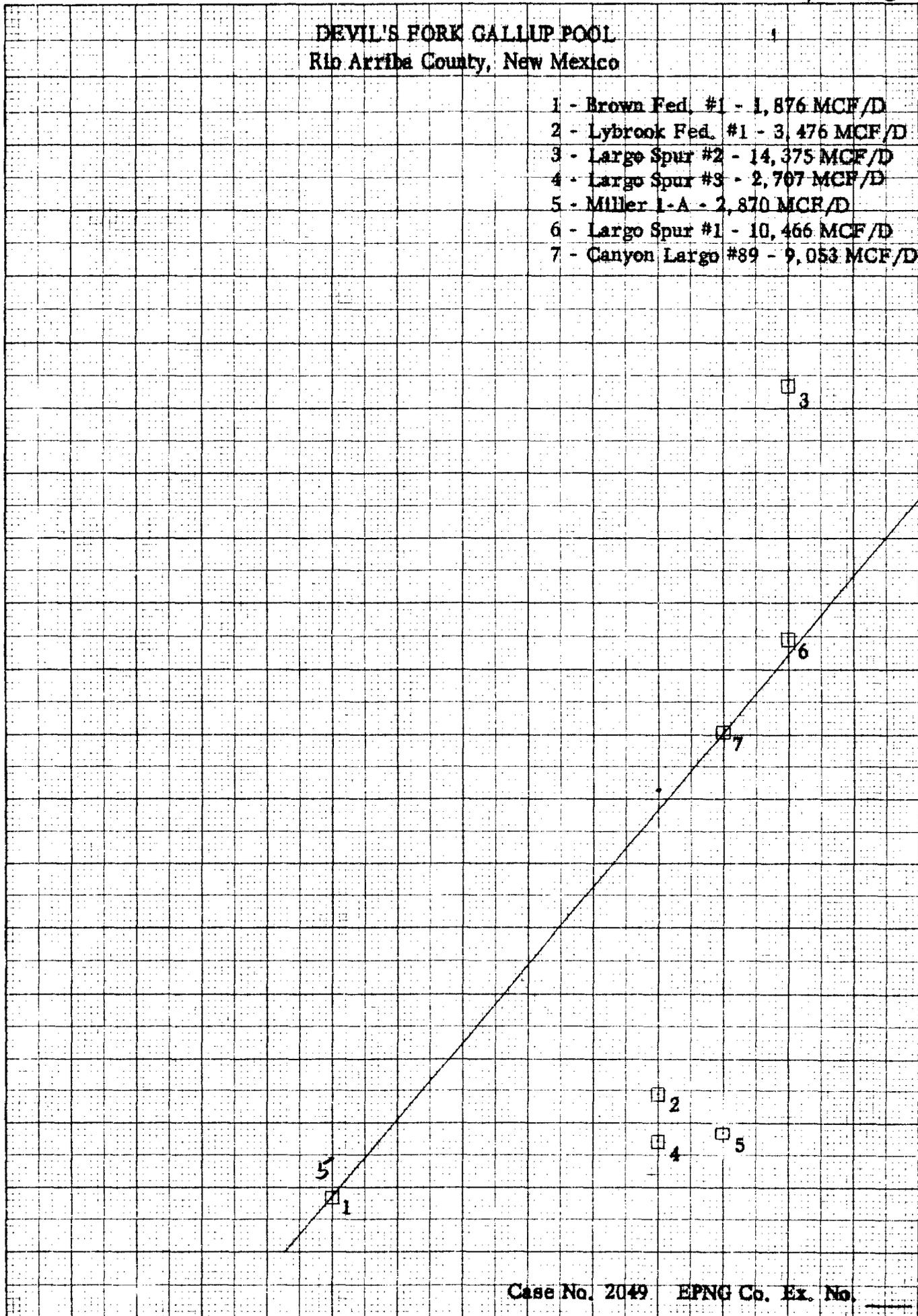
where 147° F = the initial bottom hole temperature, assumed to remain constant)

DEVIL'S FORK GALLUP POOL
Rio Arriba County, New Mexico

- 1 - Brown Fed. #1 - 1,876 MCF/D
- 2 - Lybrook Fed. #1 - 3,476 MCF/D
- 3 - Largo Spur #2 - 14,375 MCF/D
- 4 - Largo Spur #3 - 2,767 MCF/D
- 5 - Miller 1-A - 2,870 MCF/D
- 6 - Largo Spur #1 - 10,466 MCF/D
- 7 - Canyon Largo #89 - 9,053 MCF/D

INITIAL POTENTIAL L--M²CF/D

14
12
10
8
6
4
2



Case No. 2049 EPNG Co. Ex. No. _____

2 4 6 8 10 12 14

NET EFFECTIVE PAY--FT.

GAS-OIL RATIO INFORMATION

<u>Date Of Test</u>	<u>Test Hours</u>	<u>Oil (Bbls)</u>	<u>Gas (Mcf)</u>	<u>GOR</u>
Byrd 1-23				
Section 23, T-24N, R-7W				
12-8-60	3	2.3	267	116,087
4-23-61	24	55	349	6,345
7-5-61	24	23	210	9,130
10-3-61	24	23	350	15,217
1-12-62	24	23	303	13,174
4-25-62	24	22	159	7,227
7-23-62	24	28	325	11,607
Byrd 5-23				
Section 23, T-24N, R-7W				
9-17-61	24	150	203	1,353
10-5-61	24	30	198	6,600
1-12-62	24	19	242	12,737
4-25-62	24	17	371	21,823
7-23-62	24	13	320	24,615
Love 2-23				
Section 23, T-24N, R-7W				
4-17-61	4	224	98	439
7-5-61	24	161	165	1,025
10-3-61	24	90	328	3,720
1-12-62	24	72	236	3,278
4-12-62	24	39	133	3,376
7-18-62	24	36	156	4,321
Kenney 3-23				
Section 23, T-24N, R-7W				
7-20-61	10	193	71	368
10-4-61	24	65	267	4,108
1-13-62	24	63	263	4,175
4-13-62	24	32	375	11,792
7-18-62	24	24	356	15,149

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

EXHIBIT No. _____
CASE _____

<u>Date Of Test</u>	<u>Test Hours</u>	<u>Oil (Bbls)</u>	<u>Gas (Mcf)</u>	<u>GOR</u>
Blakely 6-23				
Section 23, T-24N, R-7W				
11-12-61	24	85	130	1,529
1-15-62	24	53	200	3,774
4-15-62	24	40.1	148	3,691
Lybrook 2-22				
Section 22, T-24N, R-7W				
12-24-60	24	85	275.4	1,486
1-1-61	24	187	296	1,583
7-5-61	24	169	302	1,787
10-3-61	24	120	281	2,342
1-12-62	24	90	357	3,967
4-25-62	24	130	386	2,969
7-23-62	24	92	295	3,207
Lybrook 6-22				
Section 22, T-24N, R-7W				
5-29-61	13	195	67	344
7-7-61	24	47	51	1,085
10-5-61	24	50	439	8,980
1-14-62	24	40.5	268	6,617
4-25-62	24	35	156	4,457
7-25-62	24	21	130	6,190

OF FASB REPORT AND COMPLEY CAMPUS, LANGE G. 17 986
 AND PRODUCTION FIG 123

DATE	ALLOCABLE	PRODUCTION	SALES
Nov. 1960	11,014	71,143	(61,129)
Dec.	11,382	53,022	(142,369)
Jan. 1961	11,382	55,725	(180,712)
Feb.	19,296	0,005	(173,421)
Mar.	21,364	0	(152,057)
Apr.	20,675	0	(131,382)
May	21,364	0	(110,018)
June	20,675	0	(89,343)
July	21,364	0	(57,979)
Aug.	24,826	0	(43,151)
Sept.	14,386	6,855	(35,620)
Oct.	14,865	14,272	(33,027)
Nov.	14,386	0	(20,641)
Dec.	14,865	0	(5,776)
Jan. 1962	14,865	0	9,089
Feb.	9,836	0	18,895
Mar.	19,107	0	38,002
Apr.	14,343	0	52,345
May	13,195	18,064	<u>47,476</u>
			(1,037,818)

2041

TABLE A. MEMBERS 1-B. UNITED STATES OF AMERICA

DATE	ALLOTTMENT	PROVISIONAL	BALANCE
Nov. 1960	11,314	33,448	(48,414)
Dec.	11,382	30,799	(73,831)
Jan. 1961	11,382	10,338	(72,787)
Feb.	15,296	38,600	(92,091)
Mar.	21,364	17,801	(86,528)
Apr.	20,675	0	(67,853)
May	21,364	0	(40,489)
June	20,675	0	(25,814)
July	21,364	0	(4,450)
Aug.	24,828	0	20,378
Sept.	14,386	0	34,764
Oct.	14,865	16,763	32,866
Nov.	14,386	21,555	35,697
Dec.	14,865	49,994	(9,432)
Jan. 1962	15,865	40,795	(41,352)
Feb.	9,806	39,420	(70,970)
Mar.	19,167	33,819	(85,616)
Apr.	14,343	16,107	(81,452)
May	13,195	0	(68,257)
			<u>(783,719)</u>

Handwritten notes:
 7
 20-1

EPNG, CLU # 106 GAS PRODUCTION FIGURES

Date	Allowable	Production	Status
November, 1960	0	0	0
December	0	0	0
January, 1961	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0
May	0	0	0
June	0	0	0
July	0	0	0
August	0	0	0
September	0	0	0
October	0	0	0
November	0	0	0
December	0	0	0
January, 1962	5,332	3,331	2,001
February	9,806	29,690	(17,883)
March	19,107	33,032	(31,808)
April	14,343	38,312	(55,777)
May	13,195	0	<u>(42,582)</u>
			(146,049)

7 pages
2049

BCO. INC., ZAMORA # 1 GAS PRODUCTION FIGURES

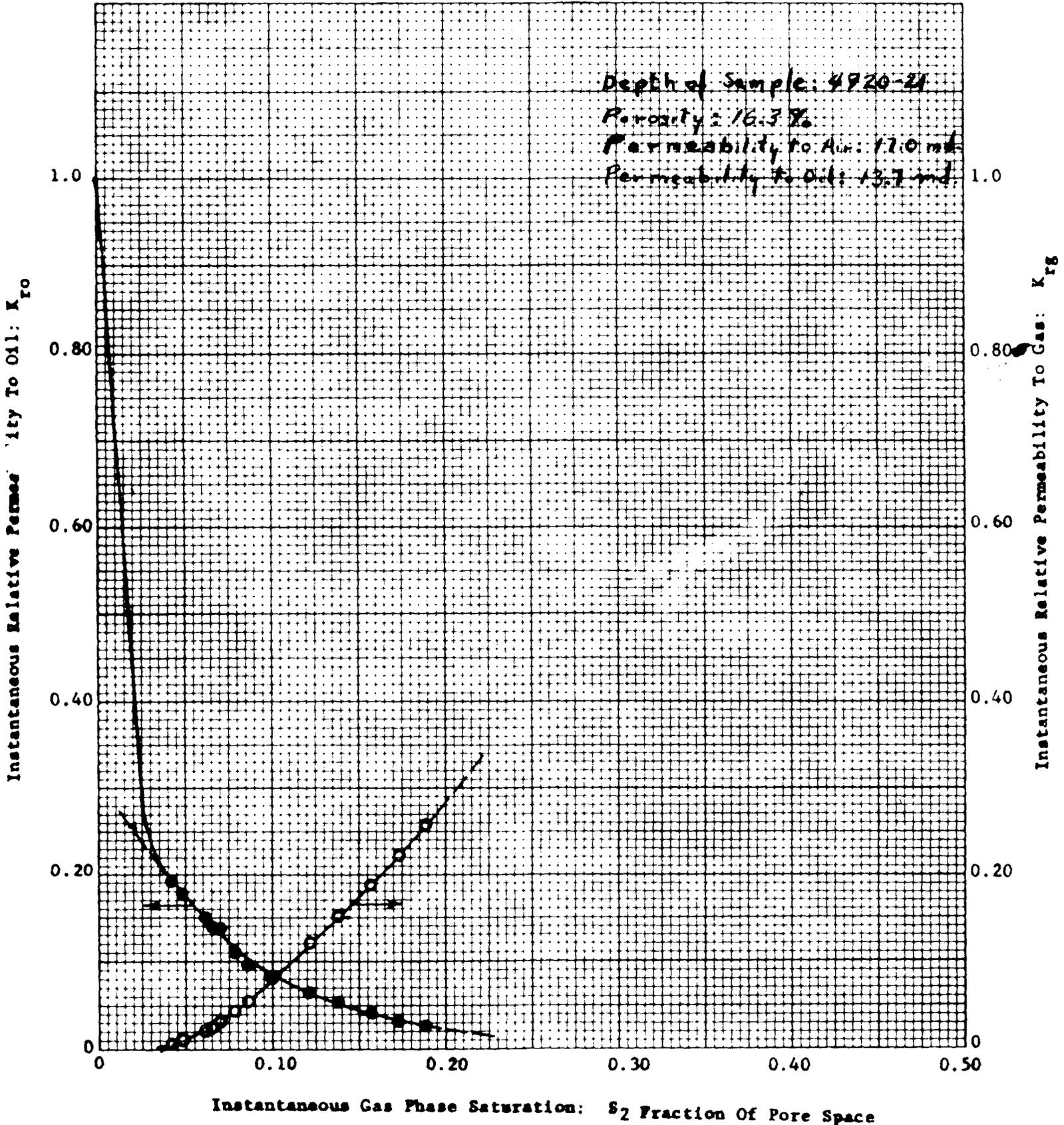
Date	Allowable	Production	Status
November, 1960	0	0	0
December	0	0	0
January, 1961	0	0	0
February	0	0	0
March	5,513	0	5,513
April	20,675	5,990	20,198
May	21,364	66,892	(25,330)
June	20,675	69,194	(73,849)
July	21,364	0	(52,485)
August	24,828	0	(27,657)
September	14,386	0	(13,271)
October	14,865	0	1,594
November	14,386	0	15,980
December	14,865	60,031	(29,186)
January, 1962	14,865	42,018	(56,339)
February	9,806	78,592	(125,125)
March	19,107	54,389	(160,407)
April	14,343	68,676	(215,740)
May	13,195	78,647	<u>(281,192)</u>
			(1,017,296)

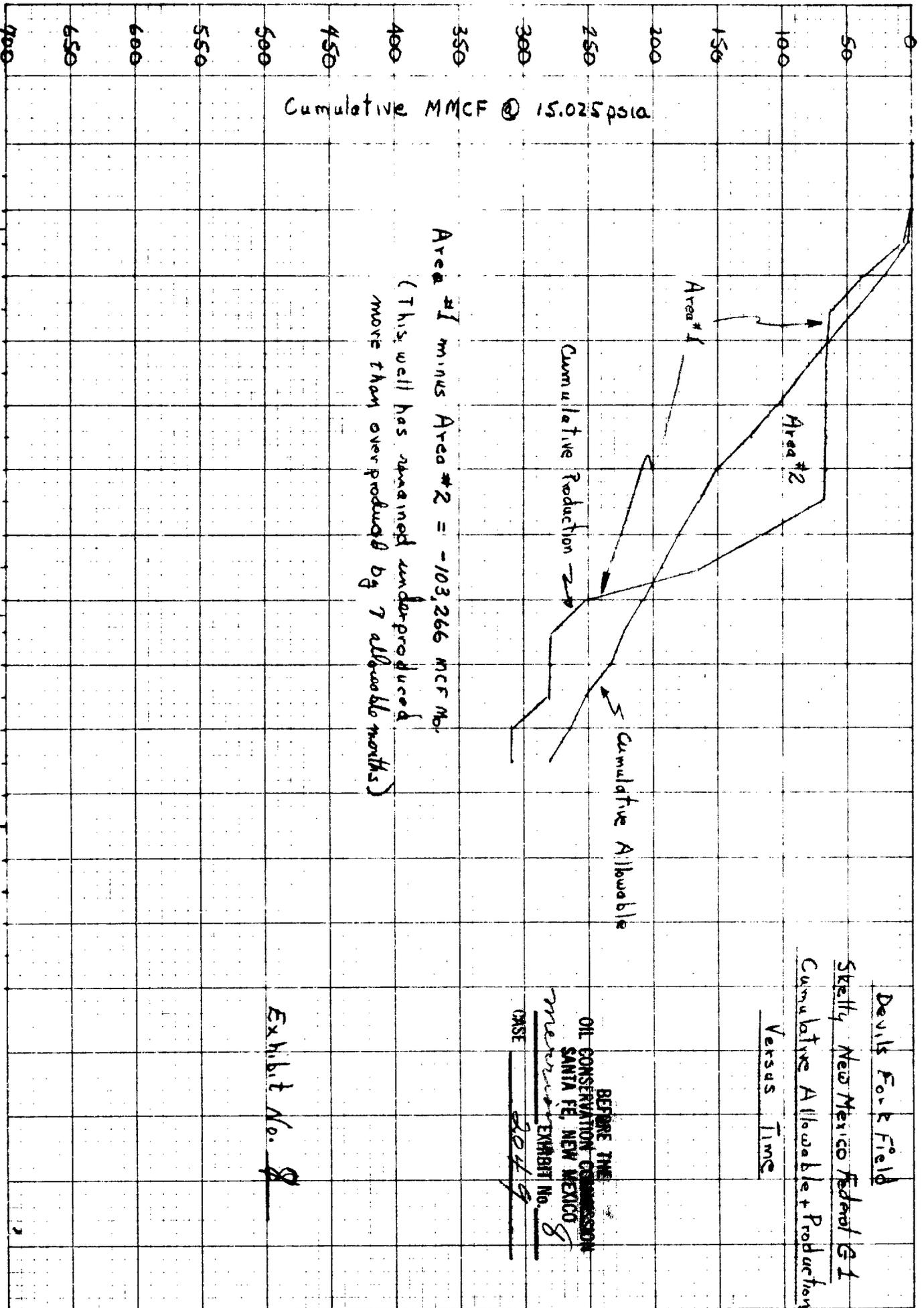
Ex 7 page 9
2049

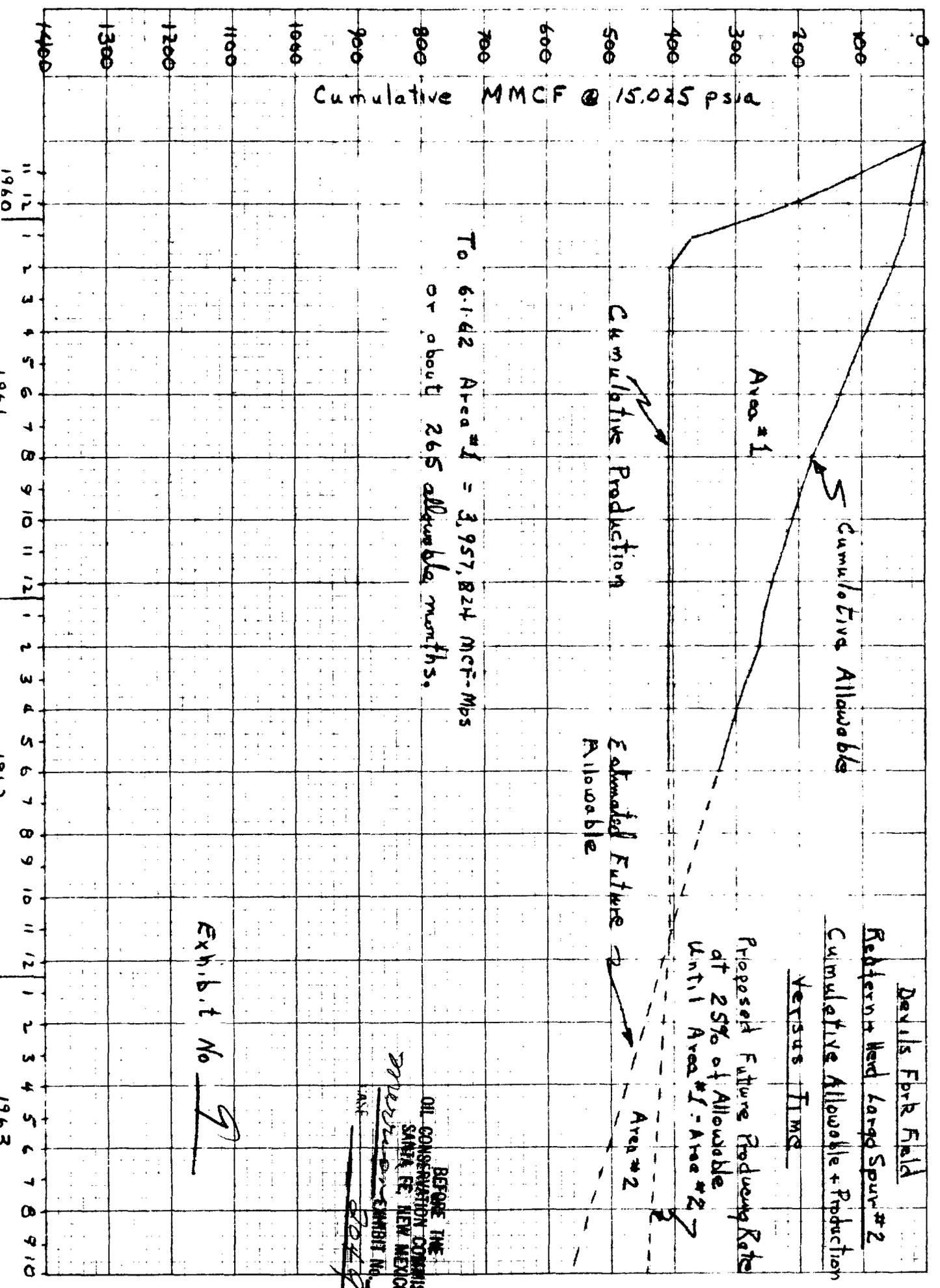
INSTANTANEOUS RELATIVE PERMEABILITY TO GAS AND OIL VS. CORRESPONDING GAS PHASE SATURATION

Sample No. 2 The British-American
 Company Oil Producing Company Well Marye "B" No. 4
 Reservoir Gallup Sand Field Bisti Depth 4920-21

Depth of Sample: 4920-21
 Porosity: 16.3%
 Permeability to Air: 17.0 md
 Permeability to Oil: 13.7 md







BEFORE THE
 OIL CONSERVATION COMMISSION
 SANTA FE, NEW MEXICO

Shirley J. ...
 EXHIBIT No. 9

1960 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10

ECONOMIC EVALUATION
AVERAGE GAS WELL - DEVILS FORK GAS FIELD

ASSUMPTION: Spacing - 320 acre/ well
 Recoverable Reserve - 5,300 MCF/acre = 1,696 MM/Location
 Liquids - 8 bbls/ MM @ \$2.00/bbl
 Well Cost - \$80,000.00
 Conditions - 15.025 psi @ 60° F

Year	Annual Prod. MMcf	Gas & Liquid Value (14.6¢/Mcf)	Less Royalty & Taxes (23.14%)	Operating Expense	Net to Operator	Discounted Present Worth @ 6%
<u>IF INITIAL PRODUCTION RATE IS 800 MCF/D</u>						
1	292	\$42,632	\$9,865	\$1,800	\$30,967	\$30,078
2	292	42,632	9,865	1,800	30,967	28,375
3	292	42,632	9,865	1,800	30,967	26,769
4	292	42,632	9,865	1,800	30,967	25,254
5	223	32,558	7,534	1,800	23,224	17,867
6	182	26,572	6,149	1,800	18,623	13,517
7	<u>127</u>	18,542	4,291	1,800	12,451	<u>8,525</u>
	1,696					\$150,385
						Fair Market Value @ 2/3 of Present Worth \$100,257
<u>IF INITIAL PRODUCTION RATE IS 1,000 MCF/D</u>						
1	365	\$53,290	\$12,331	\$1,800	\$39,159	\$ 38,035
2	365	53,290	12,331	1,800	39,159	35,882
3	365	53,290	12,331	1,800	39,159	33,851
4	292	42,632	9,865	1,800	30,967	25,254
5	182	26,572	6,149	1,800	18,623	14,328
6	<u>127</u>	18,542	4,291	1,800	12,451	<u>9,037</u>
	1,696					\$156,387
						Fair Market Value @ 2/3 of Present Worth \$104,258

BEFORE THE COMMISSION
 OIL CONSERVATION BOARD
 SANTA FE, N.M.
 Ledfem, Herd EXHIBIT 1
 2049

ECONOMIC EVALUATION
AVERAGE GAS WELL - DEVILS FORK GAS FIELD

ASSUMPTIONS: Spacing - 160 acre/well
Recoverable Reserve - 5,300 MCF/acre = 848 MMCF PERLOC
Liquids - 8 bbls/million @ \$2.00/bbl
Well Cost - \$80,000.00
Conditions - 15.025 psi & 60° F

Year	Annual Prod. MMcf	Gas & Liquid Value (14.6¢/Mcf)	Less Royalty & Taxes (23.14%)	Operating Expense	Net to Operator	Discounted Present Worth @ 6%
<u>IF INITIAL PRODUCTION RATE IS 400 MCF/D</u>						
1	146	\$21,316	\$4,932	\$1,800	\$14,584	\$14,165
2	146	21,316	4,932	1,800	14,584	13,363
3	146	21,316	4,932	1,800	14,584	12,606
4	146	21,316	4,932	1,800	14,584	11,893
5	146	21,316	4,932	1,800	14,584	11,219
6	<u>118</u>	17,228	3,987	1,800	11,441	<u>8,304</u>
	848					\$71,550

Fair Market @ 2/3 of Present Worth

\$47,700

IF INITIAL PRODUCTION RATE IS 500 MCF/D

1	182	\$26,572	\$6,149	\$1,800	\$18,623	\$18,088
2	182	26,572	6,149	1,800	18,623	17,064
3	182	26,572	6,149	1,800	18,623	16,098
4	182	26,572	6,149	1,800	18,623	15,187
5	<u>120</u>	17,520	4,054	1,800	11,666	<u>8,975</u>
	848					\$75,412

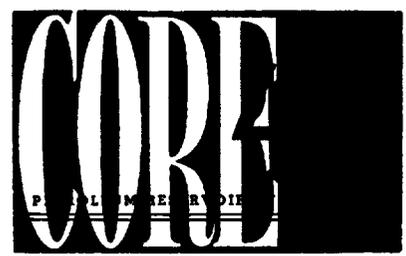
Fair Market @ 2/3 of Present Worth

\$50,275

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO.
Redfern's Herd EXHIBIT No. 2
CASE 2049

5-27-11
Case No. 2011-11

**CORE ANALYSIS REPORT
FOR
SKELLY OIL COMPANY
NEW MEXICO FEDERAL G-1 WELL
DEVILS FORK FIELD
RIO ARRIBA COUNTY, NEW MEXICO
LOCATION: SEC. 18 - T24N - R6W**



Distribution of Final Reports

6 Copies	Skelly Oil Company Box 4115, Station A Albuquerque, New Mexico Attention: Mr. Bill Kendall
2 Copies	Skelly Oil Company Box 426 Farmington, New Mexico Attention: Mr. P. E. Cospers
1 Copy	Skelly Oil Company Box 426 Farmington, New Mexico Attention: Mr. Julian Clausen
2 Copies	Mr. E. B. Germany P. O. Box 12266 Dallas 25, Texas
2 Copies	Mr. Leo Manning 2321 Candelaria Road, Northwest Albuquerque, New Mexico

Calculation of Recoverable Reserves in Marye Sand Only

El Paso #89 Canyon Largo
Section 17, T-24N, R-6W
Rio Arriba County, New Mexico

August 17, 1960

Acres in well site	320
Net sand thickness	19 feet
Porosity of sand	10.0 %
Oil saturation of sand	14.7 %
Water saturation of sand	32.3 %
Calculated bottom hole pressure	2015 psig
Reservoir temperature	118 °F
Compressibility factor	.779
Gas per acre-foot originally in place	367 Mcf
Gas per acre-foot remaining at 250 psia abandonment pressure	37 Mcf
Recoverable gas per acre-foot	330 Mcf
Recoverable gas per acre	6,270 Mcf
Oil content	10 Bbls. / MMcf
Pipeline gas recoverable per acre	6,188 Mcf
Recoverable pipeline gas from 320 acre drillsite	1,980,160 Mcf
Recoverable oil from 320 acre drillsite	19,802 Bbls.

$$43,560 \times .100 \times .530 \times \frac{2015 \div 12}{14.73} \times \frac{520}{460 \div 118} \times \frac{1}{.779} = 367,045 \text{ cu. ft. or } 367 \text{ Mcf/acre-foot originally in place}$$

$$43,560 \times .100 \times .530 \times \frac{250}{14.73} \times \frac{520}{460 \div 118} \times \frac{1}{.962} = 36,658 \text{ cu. ft. or } 37 \text{ Mcf/acre-foot remaining at abandonment}$$

Ex No 5-B

Calculation of Recoverable Reserves in Marye Sand Only
 Redfern-Herd #1 Largo Spur
 Section 18, T-24N, R-6W
 Rio Arriba County, New Mexico

August 17, 1960

Acres in well site	320
Net sand thickness	23 feet
Porosity of sand	11.0 %
Oil saturation of sand	21.4 %
Water saturation of sand	28.4 %
Calculated bottom hole pressure	2015 psig
Reservoir temperature	118 °F
Compressibility factor	.779
Gas per acre-foot originally in place	382 Mcf
Gas per acre-foot remaining at 250 psia abandonment pressure	38 Mcf
Recoverable gas per acre-foot	344 Mcf
Recoverable gas per acre	7,912 Mcf
Oil content	10 Bbls. / MMcf
Pipeline gas recoverable per acre	7,809 Mcf
Recoverable pipeline gas from 320 acre drillsite	2,498,880 Mcf
Recoverable oil from 320 acre drillsite	24,989 Bbls.

$$43,560 \times .110 \times .502 \times \frac{2015 \div 12}{14.73} \times \frac{520}{460 \div 118} \times \frac{1}{.779} = 382,418 \text{ cu. ft. or } 382 \text{ Mcf/acre-foot originally in place}$$

$$43,560 \times .110 \times .502 \times \frac{250}{14.73} \times \frac{520}{460 \div 118} \times \frac{1}{.962} = 38,193 \text{ cu. ft. or } 38 \text{ Mcf/acre-foot remaining at abandonment}$$

Calculation of Recoverable Reserves in Marye Sand Only
 Val R. Reese & Assoc., Inc. #1-19 Lybrook
 Section 19, T-24N, R-6W
 Rio Arriba County, New Mexico

Calculation of Recoverable Reserves in Marye Sand Only
 Val R. Reese & Assoc., Inc. #1-19 Lybrook
 Section 19, T-24N, R-6W
 Rio Arriba County, New Mexico

August 17, 1960

Acres in well site	320
Net sand thickness	29 feet
Porosity of sand	10.3 %
Oil saturation of sand	22.5 %
Water saturation of sand	35.5 %
Calculated bottom hole pressure	2015 psig
Reservoir temperature	118 °F
Compressibility factor	.779
Gas per acre-foot originally in place	300 Mcf
Gas per acre-foot remaining at 250 psia abandonment pressure	30 Mcf
Recoverable gas per acre-foot	270 Mcf
Recoverable gas per acre	7,830 Mcf
Oil content	10 Bbls. / MMcf
Pipeline gas recoverable per acre	7,728 Mcf
Recoverable pipeline gas from 320 acre drillsite	2,472,960 Mcf
Recoverable oil from 320 acre drillsite	24,730 Bbls.

$$43,560 \times .103 \times .420 \times \frac{2015 \div 12}{14.73} \times \frac{520}{460 \div 118} \times \frac{1}{.779} = 299,592 \text{ cu. ft. or 300 Mcf/acre-foot originally in place}$$

$$43,560 \times .103 \times .420 \times \frac{250}{14.73} \times \frac{520}{460 \div 118} \times \frac{1}{.962} = 29,921 \text{ cu. ft. or 30 Mcf/acre-foot remaining at abandonment}$$

Calculation of Recoverable Reserves in Marye Sand Only
 Redfern-Herd #2 Largo Spur
 Section 13, T-24N, R-7W
 Rio Arriba County, New Mexico

August 17, 1960

Acres in well site	320
Net sand thickness	20 feet
Porosity of sand	11.0 %
Oil saturation of sand	21.4 %
Water saturation of sand	28.4 %
Calculated bottom hole pressure	2015 psig
Reservoir temperature	118 °F
Compressibility factor	.779
Gas per acre-foot originally in place	382 Mcf
Gas per acre-foot remaining at 250 psia abandonment pressure	38 Mcf
Recoverable gas per acre-foot	344 Mcf
Recoverable gas per acre	6,880 Mcf
Oil content	10 Bbls. / MMcf
Pipeline gas recoverable per acre	6,791 Mcf
Recoverable pipeline gas from 320 acre drillsite	2,173,120 Mcf
Recoverable oil from 320 acre drillsite	21,731 Bbls.

$$43,560 \times .110 \times .502 \times \frac{2015 \div 12}{14.73} \times \frac{520}{460 \div 118} \times \frac{1}{.779} = 382,418 \text{ cu. ft. or } 382 \text{ Mcf/acre-foot originally in place}$$

$$43,560 \times .110 \times .502 \times \frac{250}{14.73} \times \frac{520}{460 \div 118} \times \frac{1}{.962} = 38,193 \text{ cu. ft. or } 38 \text{ Mcf/acre-foot remaining at abandonment}$$

Calculation of Recoverable Reserves in Marye Sand Only
 Killarney Oil Company #1-24 Killarney
 Section 24, T-24N, R-7W
 Rio Arriba County, New Mexico

August 17, 1960

Acres in well site	320
Net sand thickness	37 feet
Porosity of sand	10.6 %
Oil saturation of sand	30.3 %
Water saturation of sand	38.7 %
Calculated bottom hole pressure	2015 psig
Reservoir temperature	118 °F
Compressibility factor	.779
Gas per acre-foot originally in place	228 Mcf
Gas per acre-foot remaining at 250 psia abandonment pressure	23 Mcf
Recoverable gas per acre-foot	205 Mcf
Recoverable gas per acre	7,585 Mcf
Oil content	10 Bbls. / MMcf
Pipeline gas recoverable per acre	7,486 Mcf
Recoverable pipeline gas from 320 acre drillsite	2,395,520 Mcf
Recoverable oil from 320 acre drillsite	23,955 Bbls.

$$43,560 \times .106 \times .310 \times \frac{2015}{14.73} \times \frac{520}{460} \times \frac{1}{118} \times .779 = 227,567 \text{ cu. ft. or } 228 \text{ Mcf/acre-foot originally in place}$$

$$43,560 \times .106 \times .310 \times \frac{250}{14.73} \times \frac{520}{460} \times \frac{1}{118} \times .962 = 22,728 \text{ cu. ft. or } 23 \text{ Mcf/acre-foot remaining at abandonment}$$

Reese #3.

GAS-OIL RATIO INFORMATION

<u>Date Of Test</u>	<u>Test Hours</u>	<u>Oil (Bbls)</u>	<u>Gas (Mcf)</u>	<u>GOR</u>
Byrd 1-23				
Section 23, T-24N, R-7W				
12-8-60	3	2.3	267	116,087
4-23-61	24	55	349	6,345
7-5-61	24	23	210	9,130
10-3-61	24	23	350	15,217
1-12-62	24	23	303	13,174
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7-23-62	24	28	325	11,607
Byrd 5-23				
Section 23, T-24N, R-7W				
9-17-61	24	150	203	1,353
10-5-61	24	30	198	6,600
1-12-62	24	19	242	12,737
4-25-62	24	17	371	21,823
7-23-62	24	13	320	24,615
Love 2-23				
Section 23, T-24N, R-7W				
4-17-61	4	224	98	439
7-5-61	24	161	165	1,025
10-3-61	24	90	328	3,720
1-12-62	24	72	236	3,278
4-12-62	24	39	133	3,376
7-18-62	24	36	156	4,321
Kenney 3-23				
Section 23, T-24N, R-7W				
7-20-61	10	193	71	368
10-4-61	24	65	267	4,108
1-13-62	24	63	263	4,175
4-13-62	24	32	375	11,792
7-18-62	24	24	356	15,149

<u>Date Of Test</u>	<u>Test Hours</u>	<u>Oil (Bbls)</u>	<u>Gas (Mcf)</u>	<u>GOR</u>
Blakely 6-23				
Section 23, T-24N, R-7W				
11-12-61	24	85	130	1,529
1-15-62	24	53	200	3,774
4-15-62	24	40.1	148	3,691
Lybrook 2-22				
Section 22, T-24N, R-7W				
12-24-60	24	85	275.4	1,486
1-1-61	24	187	296	1,583
7-5-61	24	169	302	1,787
10-3-61	24	120	281	2,342
1-12-62	24	90	357	3,967
4-25-62	24	130	386	2,969
7-23-62	24	92	295	3,207
Lybrook 6-22				
Section 22, T-24N, R-7W				
5-29-61	13	195	67	344
7-7-61	24	47	51	1,085
10-5-61	24	50	439	8,980
1-14-62	24	40.5	268	6,617
4-25-62	24	35	156	4,457
7-25-62	24	21	130	6,190

EL PASO NATURAL GAS COMPANY
CANYON LARGO #89

Case 20149
Recse Ex. No. 3

C—Crack
F—Fracture
H—Horizontal
O—Open

LEGEND
NF—No Fracture
IS—Insufficient Sample

S—Slight
St—Stain
V—Vertical
Vu—Vugs

SAMPLE NO.	LEGEND	DEPTH, FEET	EFFECTIVE POROSITY, PORESPACE	PERMEABILITY MILLIDARCIES		SATURATIONS		CONNATE WATER	SOLUBILITY	
				HORIZONTAL	VERTICAL	%, PORE SPACE RESIDUAL OIL	%, PORE SPACE TOTAL WATER		MUD ACID	10 % ACID
32	NF	5485-86	11.5	8.75		5.9	30.1			
33	NF	5486-87	9.1	5.13		10.3	30.5			
34	NF	5487-88	6.7	0.04		22.6	27.1			
35	NF	5488-89	4.4	0.10		17.3	37.9			
36	NF	5489-90	10.2	0.83		26.4	29.1			
37	NF	5490-91	7.5	0.17		12.6	34.8	58.6		
38	NF	5491-92	12.7	40		22.3	25.6			
39	NF	5492-93	13.2	25		9.4	37.9	34.2		
40	NF	5493-94	5.8	0.22		17.4	46.2	65.4		
41	VF	5494-95	11.2	7.17		14.3	28.5			
42	NF	5495-96	10.5	5.51		8.2	25.2			
43	NF	5496-97	14.5	43		9.7	34.2			
44	NF	5497-98	14.9	74		15.9	28.3			
45	NF	5498-99	12.5	19		12.6	29.7			
46	NF	5499-5500	9.9	1.84		11.0	33.8			
47	NF	5500-01	8.9	0.08		12.7	34.5			
48	NF	5501-02	6.3	0.05		21.8	52.5			

17 FEET OF NET PRODUCTIVE SAND

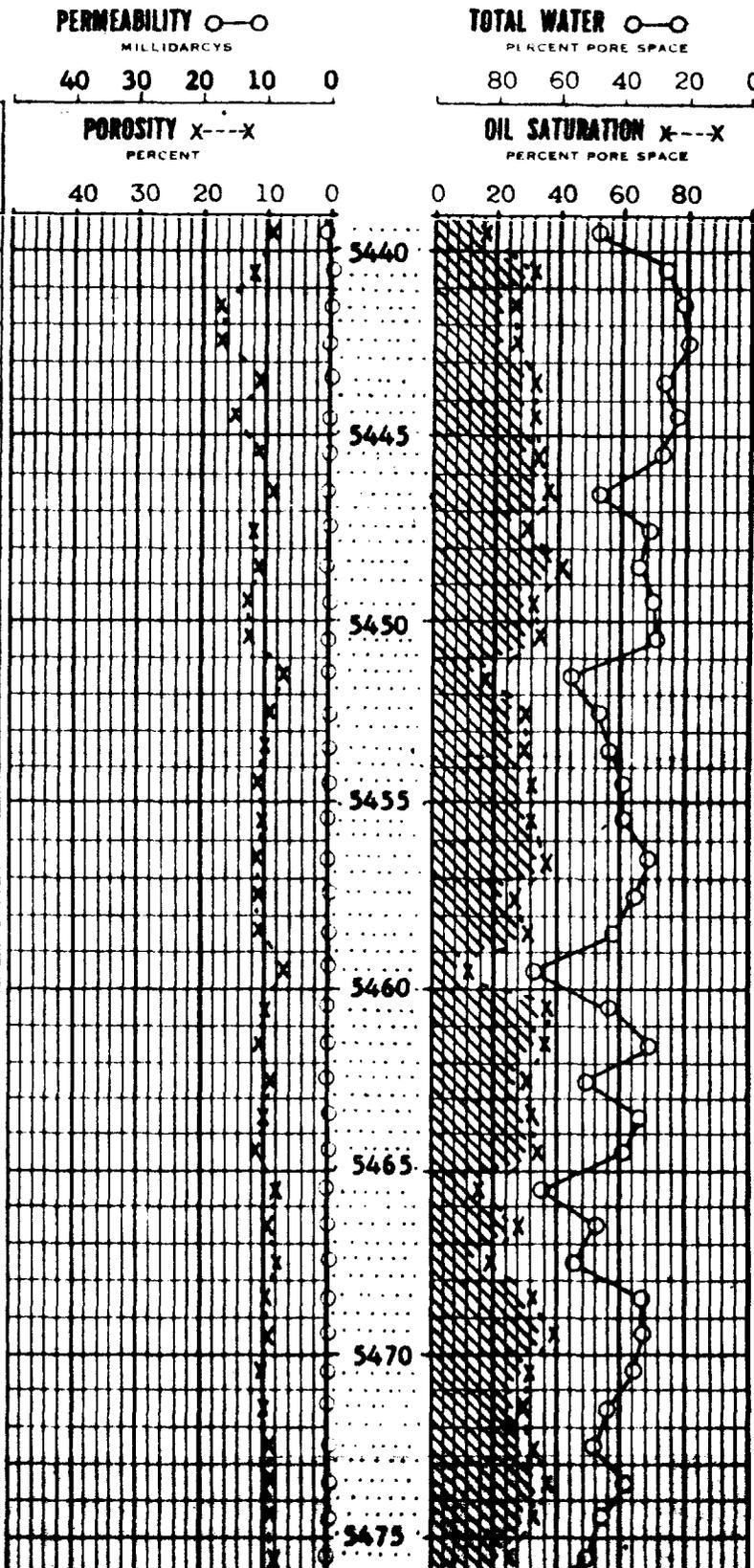
AVERAGES : PERM. 13.5 MD.
POROSITY 10.0%
OIL SATURATION 14.7 %
WATER SATURATION 32.3%

COMPANY VAL REESE & ASSOCIATES, INC. DATE ON 8/21/58 FILE NO. RP-3-821 FC & P
 WELL FEDERAL NO. 1-24 DATE OFF 8/25/58 ENGRS. WJC
 FIELD ESCRITO EXTENSION FORMATION GALLUP ELEV. 6652' GL
 COUNTY RIO ARriba STATE NEW MEX. DRLG. FLD. OIL EMULSION CORES DIAMOND
 LOCATION 1980' PXL, 1980' PXL, SEC24-T24N-R7W REMARKS SAMPLED BY CLI ENGINEER AND REPRESENTATIVE OF CLIENT

COMPLETION COREGRAPH

TABULAR DATA and INTERPRETATION

SAMPLE NUMBER	DEPTH FEET	PERM MD.	POROSITY %	RESIDUAL SATURATION % PORE SPACE		PROD
				OIL	TOTAL WATER	
				1	5439-40	
2	40-41	0.26	12.5	32.8	26.5	
3	41-42	0.38	17.0	26.5	20.6	
4	42-43	0.43	16.7	25.8	19.8	
5	43-44	0.33	11.0	32.7	27.3	
6	44-45	0.28	8.7	33.3	23.1	
7	45-46	0.43	11.0	33.6	28.2	
8	46-47	0.29	8.7	35.7	47.1	
9	47-48	0.27	12.2	30.3	31.1	
10	48-49	0.57	11.4	41.3	34.3	
11	49-50	0.52	13.1	32.8	29.8	
12	50-51	0.18	13.4	33.6	29.1	
13	51-52	0.42	7.1	16.9	55.0	
14	52-53	0.17	9.5	30.5	47.3	
15	53-54	0.15	10.1	29.7	43.6	
16	54-55	0.16	11.4	33.3	38.7	
17	55-56	0.19	10.4	31.7	39.5	
18	56-57	0.17	11.4	35.9	30.7	
19	57-58	0.15	11.0	28.2	35.5	
20	58-59	0.22	10.7	30.9	42.1	
21	59-60	0.10	7.3	12.4	67.2	
22	60-61	0.13	10.2	37.3	43.2	
23	61-62	0.13	11.3	36.3	31.0	
24	62-63	0.11	9.5	30.6	51.5	
25	63-64	0.15	10.3	32.0	34.0	
26	64-65	0.17	11.3	33.6	39.0	
27	65-66	0.13	8.5	16.5	66.7	
28	66-67	0.12	9.0	28.9	47.8	
29	67-68	0.11	8.3	19.3	54.2	
30	68-69	0.11	10.0	33.0	33.0	
31	69-70	0.12	9.5	38.9	32.6	
32	70-71	0.19	10.4	31.8	35.6	
33	71-72	0.14	19.7	29.9	44.3	
34	72-73	0.22	9.2	32.6	47.8	
35	73-74	0.11	9.1	37.4	39.5	
36	74-75	0.09	8.6	32.6	46.5	
37	75-76	0.08	8.3	25.9	50.6	



37 FEET OF NET PRODUCTIVE SAND
 AVERAGES: PERM. .23 MD; POROSITY 10.6%;
 OIL SATURATION 30.3%; WATER SATURATION 38.7%

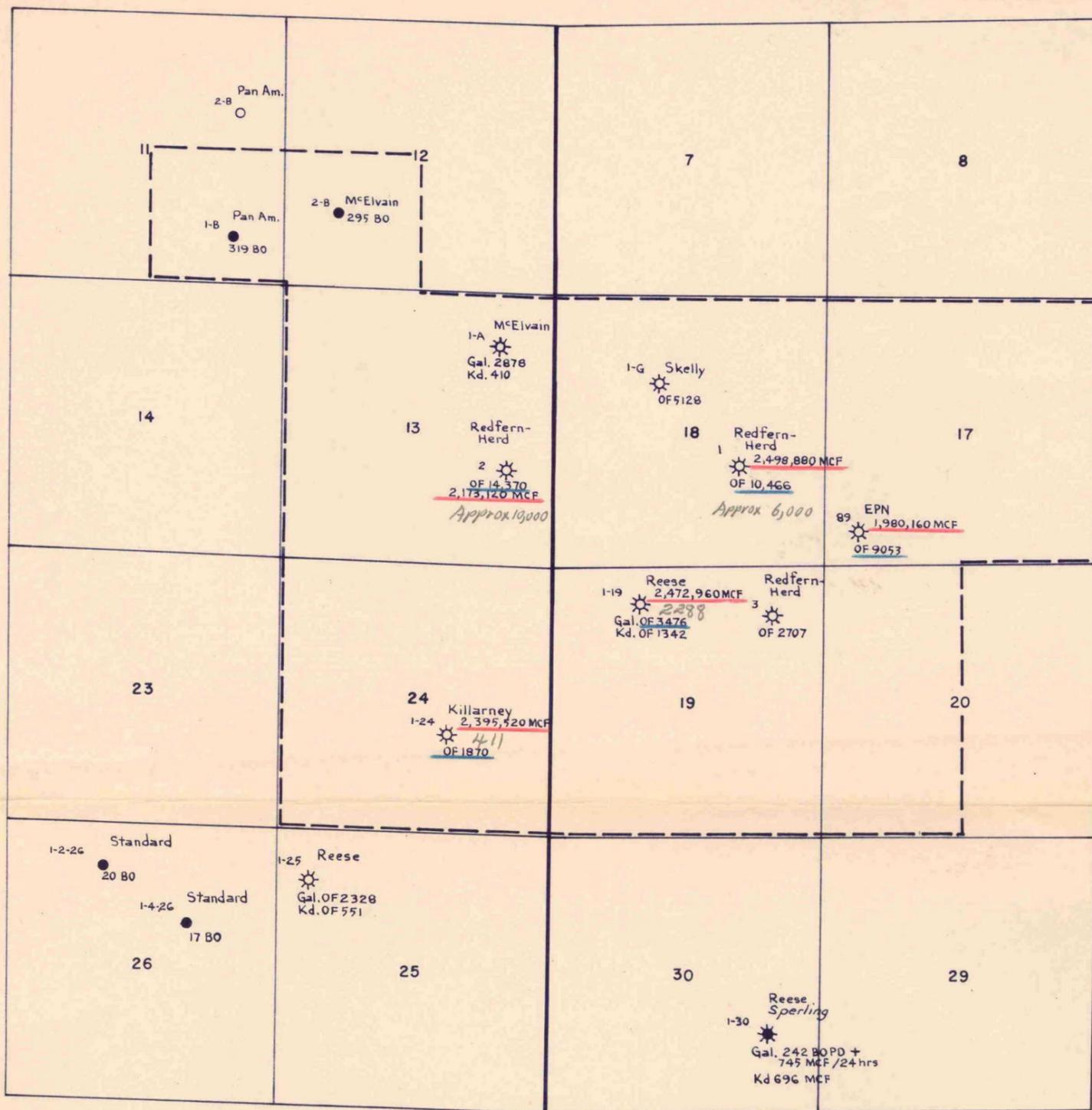
Case 2049
 Reese Ex. No. 4

Case 2049

Reese Ex. No. 1

R 7 W

R 6 W



T 24 N

DEVILS FORK — GALLUP POOL
 RIO ARRIBA CO., NEW MEXICO

AUGUST 1960

— PRESENT LIMITS OF DEVILS FORK — GALLUP POOL

VAL R. REESE AND ASSOCIATES INC.

2,395,520 MCF GAS UNDERLYING 320 AC. WELL SITE

411 MCFPD WELL DELIVERABILITY



CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

COMPANY SKELLY OIL COMPANY DATE ON 7/12/60 FILE NO. RP-3-1228
 WELL NEW MEXICO FEDERAL G - 1 DATE OFF 7/12/60 ENGRS. ENGLISH
 FIELD DEVILS FORK FORMATION GALLUP ELEV. 6646' DF
 COUNTY RIO ARRIBA STATE N. MEXICO DRLG. FLD. OIL EMULSION CORES DIAMOND
 LOCATION SEC18 T24N R6W REMARKS SAMPLED BY CLIENT

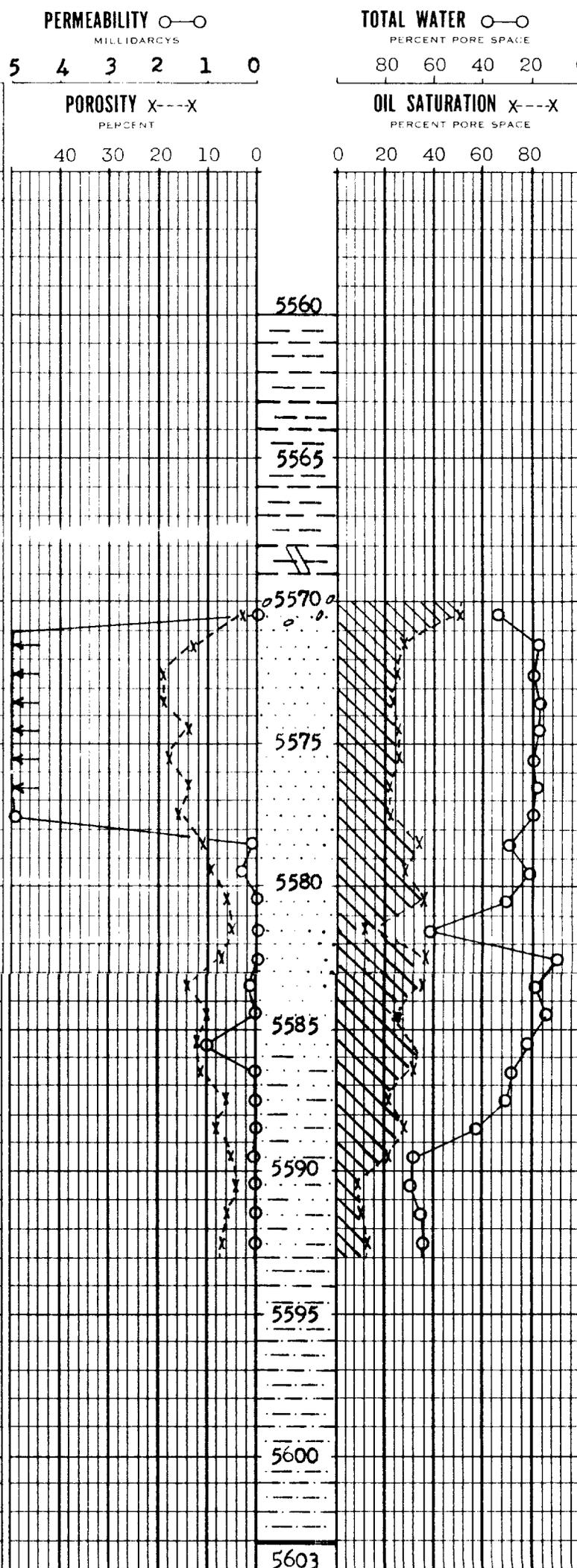


These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. all errors and omissions excepted, but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

TABULAR DATA and INTERPRETATION

SAMPLE NUMBER	DEPTH FEET	PERM. MIL.	POROSITY %	RESIDUAL SATURATION % PORE SPACE	
				OIL	TOTAL WATER
1	5570-71	0.01	2.9	51.8	34.5
2	71-72	8.0	13.1	28.2	19.1
3	72-73	37	19.4	25.7	20.1
4	73-74	181	19.5	23.6	17.9
5	74-75	48	13.9	25.9	18.7
6	75-76	49	18.7	25.6	20.3
7	76-77	11	14.6	22.6	19.2
8	77-78	4.9	16.0	23.1	20.6
9	78-79	0.08	11.3	34.5	29.2
10	79-80	0.32	9.4	29.8	21.3
11	80-81	0.01	6.2	35.5	30.6
12	81-82	0.02	5.5	12.7	61.8
13	82-83	0.05	7.4	37.9	11.8
14	83-84	0.13	14.6	35.6	19.2
15	84-85	0.06	10.1	26.7	15.9
16	85-86	1.0	12.2	34.5	22.1
17	86-87	0.06	11.1	32.5	28.8
18	87-88	0.02	6.3	22.2	31.8
19	88-89	0.04	8.5	29.4	42.3
20	89-90	0.02	5.4	22.2	68.5
21	90-91	<0.01	4.6	10.9	69.6
22	91-92	0.03	6.1	11.5	65.6
23	5592-93	0.01	6.7	13.4	64.2

COMPLETION COREGRAPH



CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

July 25, 1960

REPLY TO
724 PATTERSON BLDG
DENVER, COLORADO

Skelly Oil Company
Box 4115, Station A
Albuquerque, New Mexico

Attention: Mr. Bill Kendall

Subject: Core Analysis
New Mexico Federal G-1 Well
Devils Fork Field
Rio Arriba County, New Mexico
Location: Sec. 18-T24N-R6W

Gentlemen:

Gallup formation analyzed from 5571 to 5580 feet exhibits residual fluid saturations which indicate the interval to be capable of producing oil. The total observed natural productive capacity of 342 millidarcy-feet is considered adequate for satisfactory rates of flow.

Formation analyzed from 5583 to 5587 feet is interpreted to be oil productive. The low productive capacity indicates a formation treatment will be necessary in order to obtain satisfactory rates of production.

Recoverable oil estimates have been prepared to be used as a guide in the evaluation of the formation. These theoretical maximum estimates have been calculated using the observed core analysis data in conjunction with estimated original reservoir fluid characteristics considered applicable and are subject to the conditions outlined in the body of and in the footnotes to the summary page.

The intervals, 5570 to 5571, 5580 to 5583 and 5587 to 5593 feet, are essentially nonproductive due to low permeability and porosity.

We sincerely appreciate the opportunity to be of service to you.

Very truly yours,

Core Laboratories, Inc.

J. D. Harris
(R)

J. D. Harris,
District Manager

JDH:LW:sp

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

Page 1 of 1 File RP-3-1228

Well New Mexico Federal G-1

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Gallup 5571.0-5580.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL	9.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	20.7
FEET OF CORE INCLUDED IN AVERAGES	9.0	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(c) 19
AVERAGE PERMEABILITY: MILLIDARCYB	38	OIL GRAVITY: °API	(e) 39
PRODUCTIVE CAPACITY: MILLIDARCY-FEET	342	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	(e) 380
AVERAGE POROSITY: PER CENT	15.1	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	(e) 1.26
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	26.6	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	753

Calculated maximum solution gas drive recovery is 221 barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is 441 barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (Please refer to footnotes for further discussion of recovery estimates.)

FORMATION NAME AND DEPTH INTERVAL: Gallup 5583.0-5587.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL	4.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	21.5
FEET OF CORE INCLUDED IN AVERAGES	4.0	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(c) 21
AVERAGE PERMEABILITY: MILLIDARCYB	0.31	OIL GRAVITY: °API	(e) 39
PRODUCTIVE CAPACITY: MILLIDARCY-FEET	1.2	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	(e) 380
AVERAGE POROSITY: PER CENT	12.0	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	(e) 1.26
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	32.3	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	584

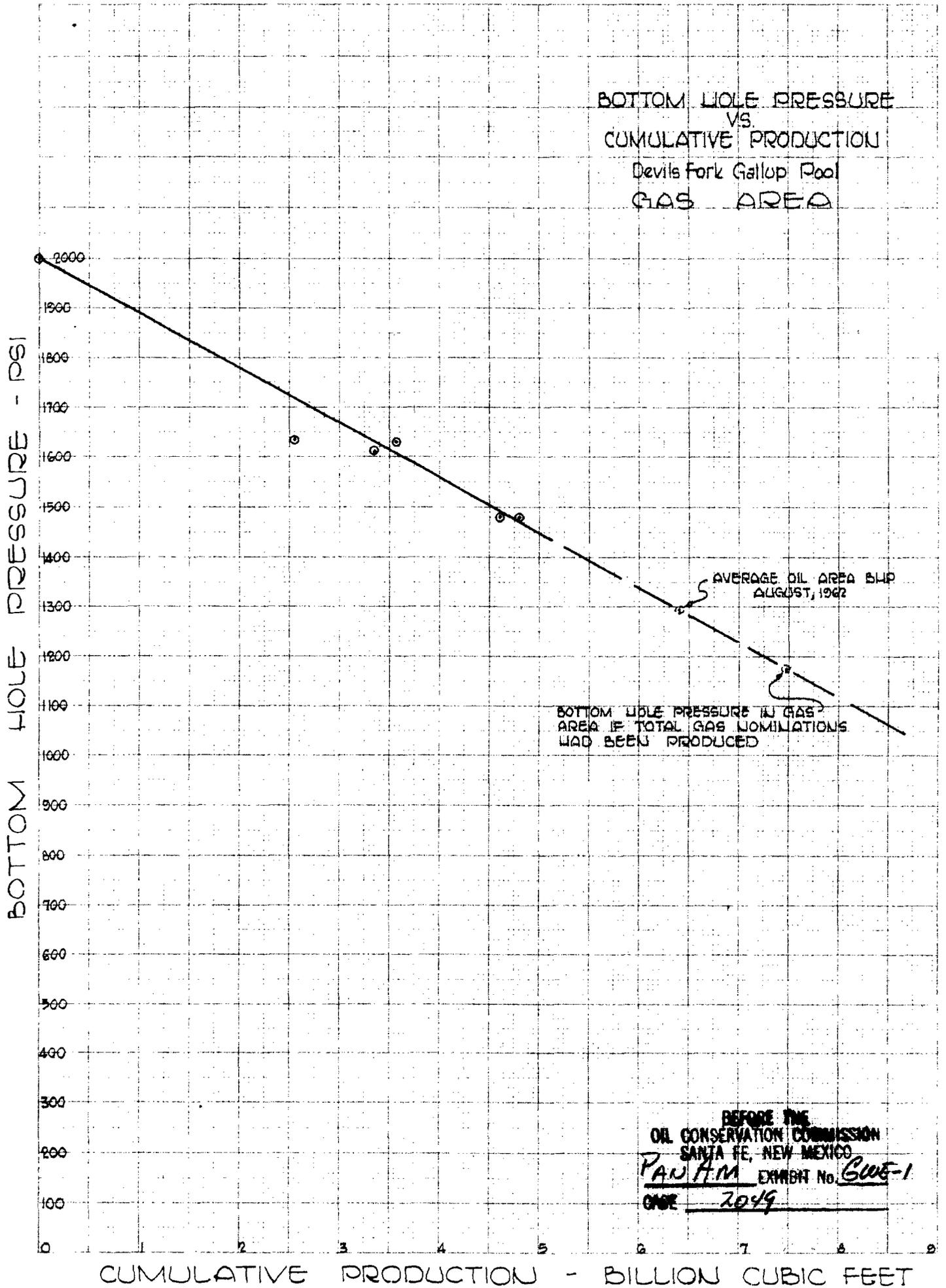
Calculated maximum solution gas drive recovery is 172 barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is 283 barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (Please refer to footnotes for further discussion of recovery estimates.)

(c) Calculated (e) Estimated (m) Measured (*) Refer to attached letter.

These recovery estimates represent theoretical maximum values for solution gas and water drive. They assume that production is started at original reservoir pressure; i.e., no account is taken of production to date or of prior drainage to other areas. The effects of factors tending to reduce actual ultimate recovery, such as economic limits on oil production rates, gas-oil ratios, or water-oil ratios, have not been taken into account. Neither have factors been considered which may result in actual recovery intermediate between solution gas and complete water drive recoveries, such as gas cap expansion, gravity drainage, or partial water drive. Detailed predictions of ultimate oil recovery to specific abandonment conditions may be made in an engineering study in which consideration is given to overall reservoir characteristics and economic factors.

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc., and its officers and employees assume no responsibility and make no warranty or representation as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

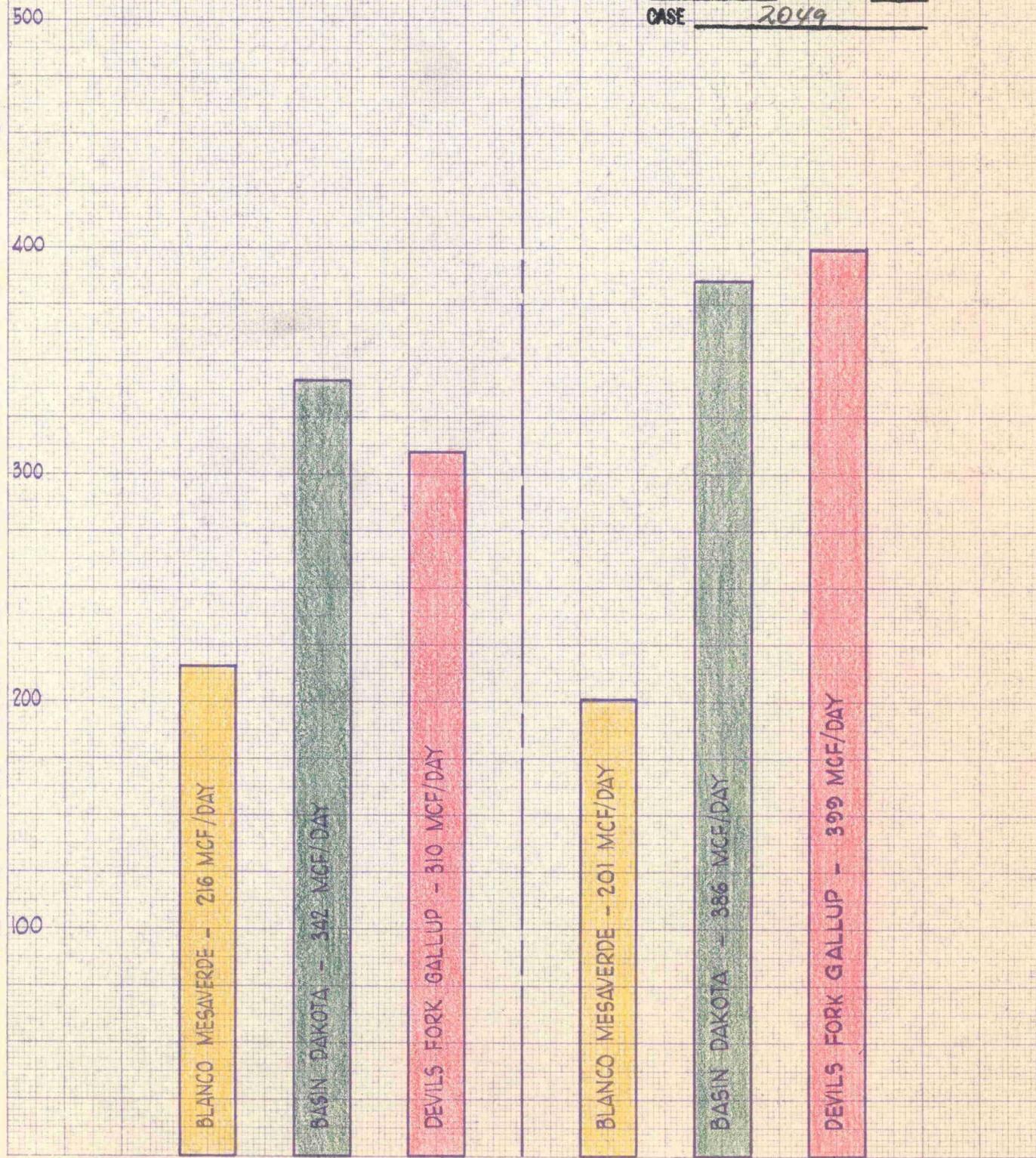
LARGE FORMAT
EXHIBIT HAS
BEEN REMOVED
AND IS LOCATED
IN THE NEXT FILE



COMPARISON OF DEVILS FORK GALLUP ALLOWABLES WITH BLANCO MESAVERDE AND BASIN DAKOTA ALLOWABLES

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
Pan Am EXHIBIT No. GWE-2
CASE 2049

AVERAGE GAS ALLOWABLE PER WELL PER DAY - MCF



FEBRUARY THROUGH DECEMBER
1961

JANUARY THROUGH AUGUST
1962

D E V I L S F O R K F I E L D

RIO ARriba COUNTY, N.M.

Bottom Hole Pressure
Buildup
Calculations

W. J. ...
CP # 2A.

DEVILS FORK FIELD
 Bottom Hole Pressure Survey
 7-30-62 to 8-6-62

<u>Well</u>	<u>Highest Measured Pressure</u>	<u>Extrapolated Pressure</u>	<u>Pressure by Horner's Method</u>	<u>Estimated Reservoir Pressure</u>
Canyon Largo #89	1482	1600	N.A.	1541
Canyon Largo #106	1516	N.A.	N.A.	1512
Canyon Largo #118	1865	1933	N.A.	1933
NCRA*State #1	1848	1941	N.A.	1941
Edna #1	1127	1930	1748	1748
Edna #2	1709	1930	1843	1843
Edna #3	1398	1843	1622	1622
Miller A-1	1371	1575	N.A.	1473
Miller B-2	1114	1532	1324	1324
Miller B-4	1258	1838	1609	1609
Dashko B-1	1269	1486	1356	1356
Dashko B-2	931	1509	1286	1286
Largo Spur 1	1505	1616	1530	1530
Largo Spur 2	1505	N.A.	N.A.	1505
Largo Spur 3	1493	1674	N.A.	1542
Largo Spur 1-A	1383	1761	1582	1582
Zamorra 1	1499	N.A.	N.A.	1499
Byrd 1-23	932	1330	1071	1071
Byrd 5-23	728	955	765	765
Killarney 1	1454	N.A.	N.A.	----
Lybrook 1-19	1522	N.A.	N.A.	1522
New Mexico Fed.G-1	1436	1563	N.A.	1500

Geo Inc. Eyed 1-A

BHP Buildup

7-30-62 to 8-6-62

Cum. Prod. = 10,762 bbl/s

Avg. Stabilized Prod. Rate = 22 B/D

Pseudo Prod. Time $\bar{T} = \frac{10762}{22} = 489.2 \text{ da.}$

Start in date 7-30-62

Date	Δt	$\Delta t / \bar{T} + \Delta t$	Pressure
8-1-62	2	0.00407	
8-3-62	4	0.00811	
8-6-62	7	0.01417	

Horne Calculation of Average Pressure

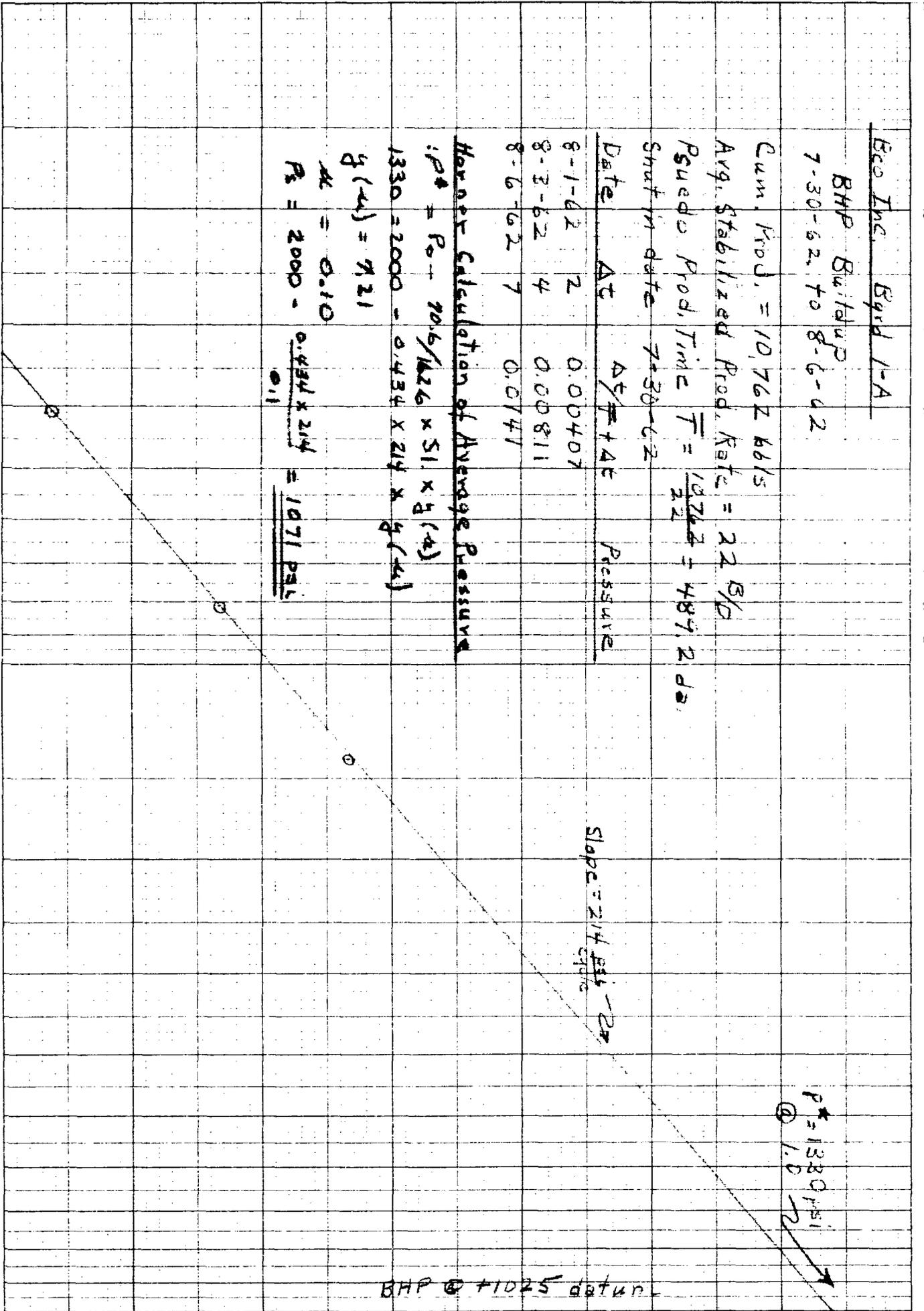
$i P^* = P_0 - \frac{70.6}{k h} \times 51 \times q(u)$

$1330 = 2000 - \frac{0.434}{k h} \times 214 \times q(u)$

$q(u) = 7.21$

$k h = 0.10$

$P_0 = 2000 - \frac{0.434 \times 214}{0.1} = 1071 \text{ PSI}$



Slope = 214 PSI-cp

$P^* = 1330 \text{ PSI}$
 @ 1.0 day

BHP @ #1025 datum

.001 Dimensionless Time $\frac{\Delta t}{\bar{T} + \Delta t}$.01 0.1

REDFERN + WERD LARG SPIRE #8

BHP R/O/DHP

7-28-62 to 8-6-62

CUMULATIVE PRODUCTION = 376,156 MCF

AVG. STABILIZED PROD. RATE = 1613 MCF/D

PERIOD PRODUCING TIME T = 371 da

START IN 7-28-62

DATE	AT	ΔT/AT	PRESSURE
8-1-62	4	0.0107	1455
8-6-62	9	0.0237	1433*

$p^* = 1674 \text{ psi}$
 Slope = $\frac{11 \text{ psi}}{\text{cycle}}$

HORNER CALCULATION OF ORIGINAL PRESSURE

$p^* = P_0 - 70 \frac{q}{162.6} \times 58 \times f(u)$

$1674 = 2000 - 0.234 \times 1111 \times f(u)$

$f(u) = 6.74$

$u = 0.105$

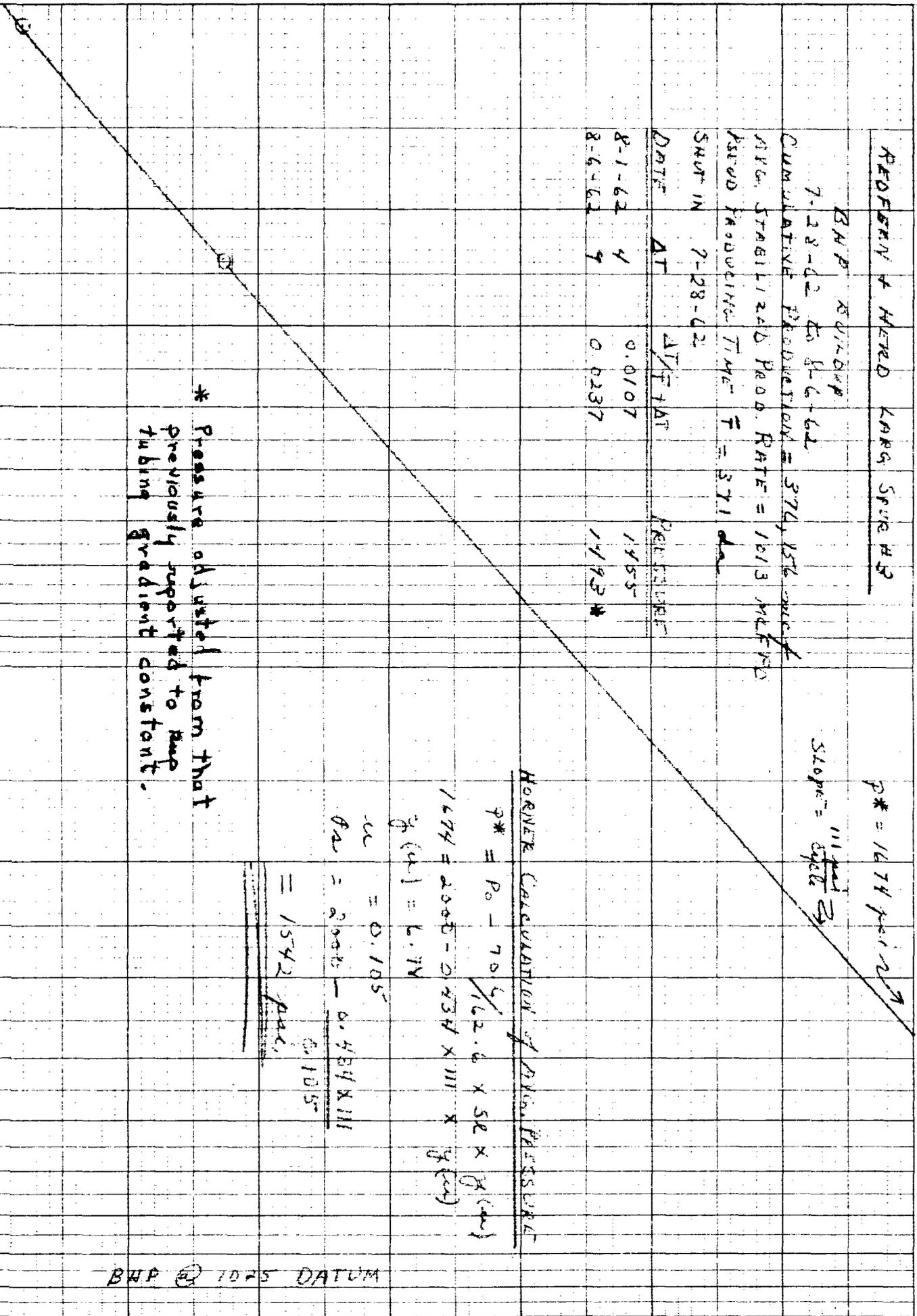
$\phi_{2L} = 2000 - \frac{0.448 \times 1111}{0.105}$

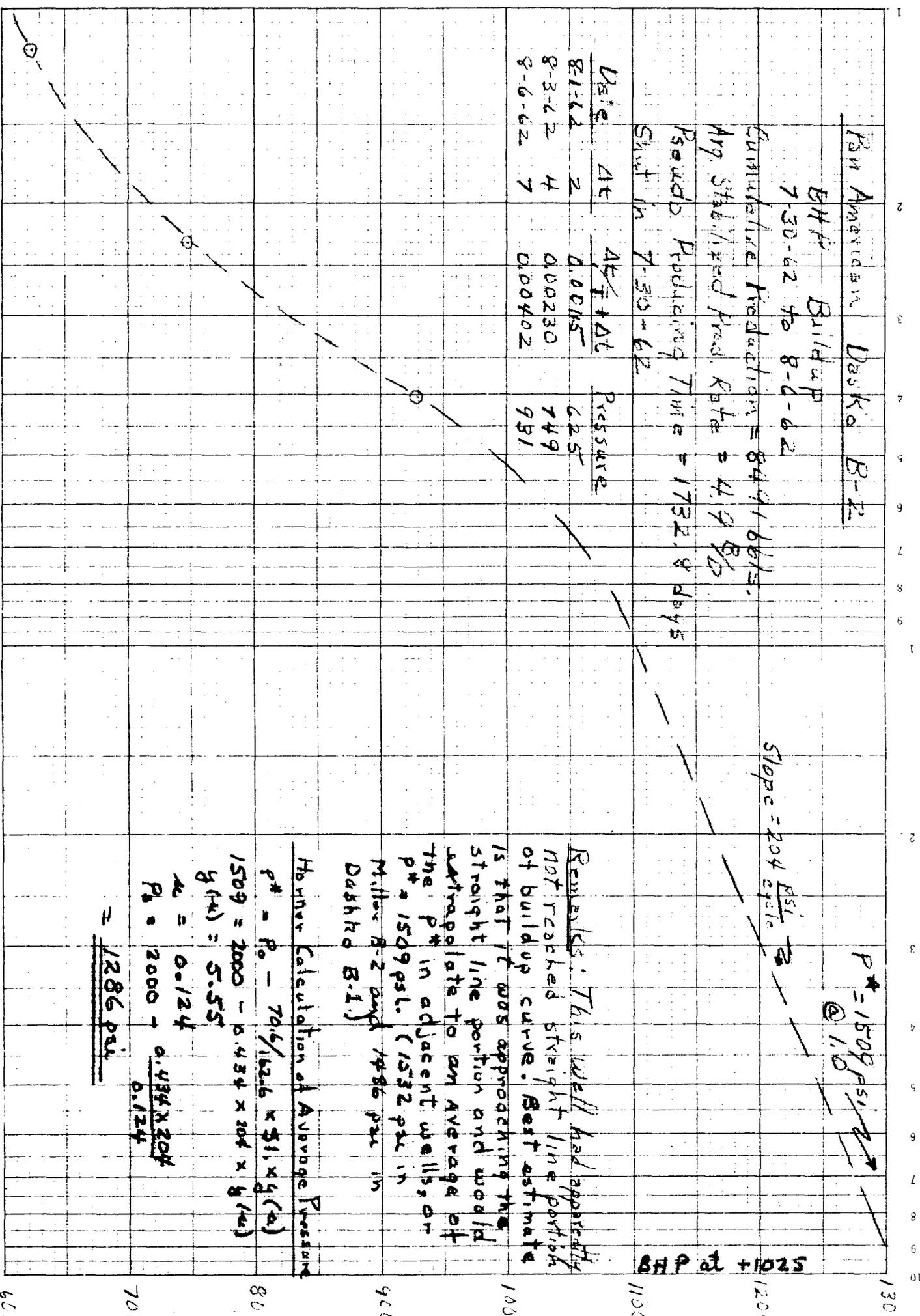
$= 1542 \text{ psi}$

* Pressure adjusted from that previously reported to keep tubing gradient constant.

BHP @ 1025 DATUM

0.01 DIMENSIONLESS TIME - $\frac{\Delta T}{T + \Delta T}$ 0.1 1.0





0.001 Dimensionless Time 0.01 Δt / T + Δt 0.1

EL PASO NAT. OIL & GAS COMPANY, DENVER LEGAL DEPT # 89

7-18-62 BHP GOLDEN 86-62

CUMULATIVE PRODUCTION = 468.534 MCF

AVG. STABILIZED PROD. RATE = 2450 MCF/D

ASUDO PRODUCTION TIME = 191 days

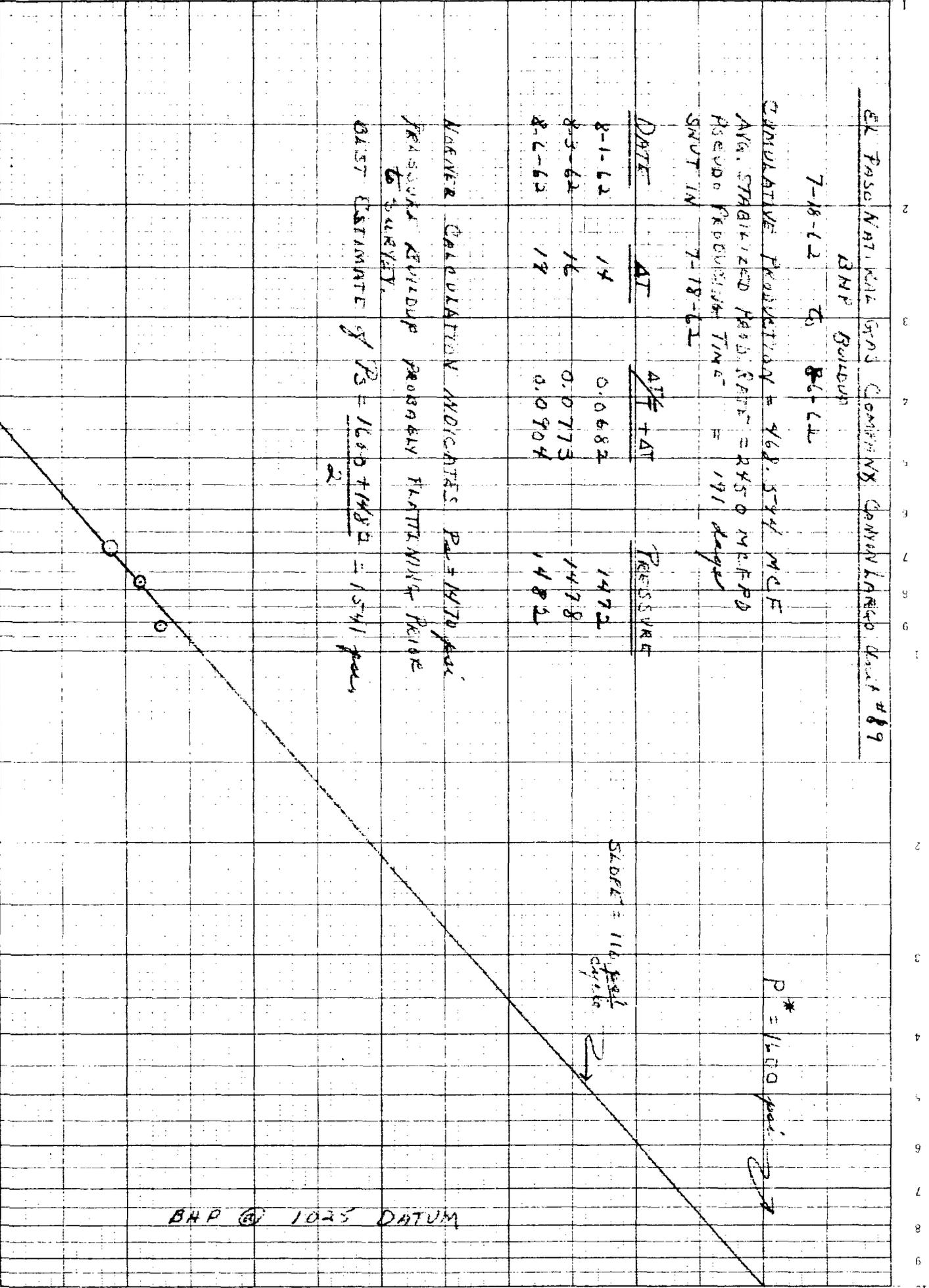
SHUT IN 7-18-62

DATE	ΔT	$\frac{\Delta T}{T + \Delta T}$	PRESSURE
8-1-62	14	0.0682	1472
8-3-62	16	0.0773	1478
8-6-62	19	0.0904	1482

WAGNER CALCULATION INDICATES $P_w = 1470$ psi

FRASER REIDUP PROBABLY FLATLINE WITH REIDUP

TO SURVEY, BEST ESTIMATE of $P_s = \frac{1660 + 1482}{2} = 1541$ psi



0.01 DIMENSIONLESS TIME = $\frac{\Delta T}{T + \Delta T}$ 0.1 1.0

WELL F. WYLLIE & MILNER A-1

BHP @ BUILDUP
 7-16-62 to 8-6-62
 CUMULATIVE PRODUCTION = 592,607 MCF
 AVG. STABILIZED PRODUCTION RATE = 1864 MCF/DAY
 PSEUDO PRODUCING TIME = 210.6 DAYS
 SHUT IN 7-16-62

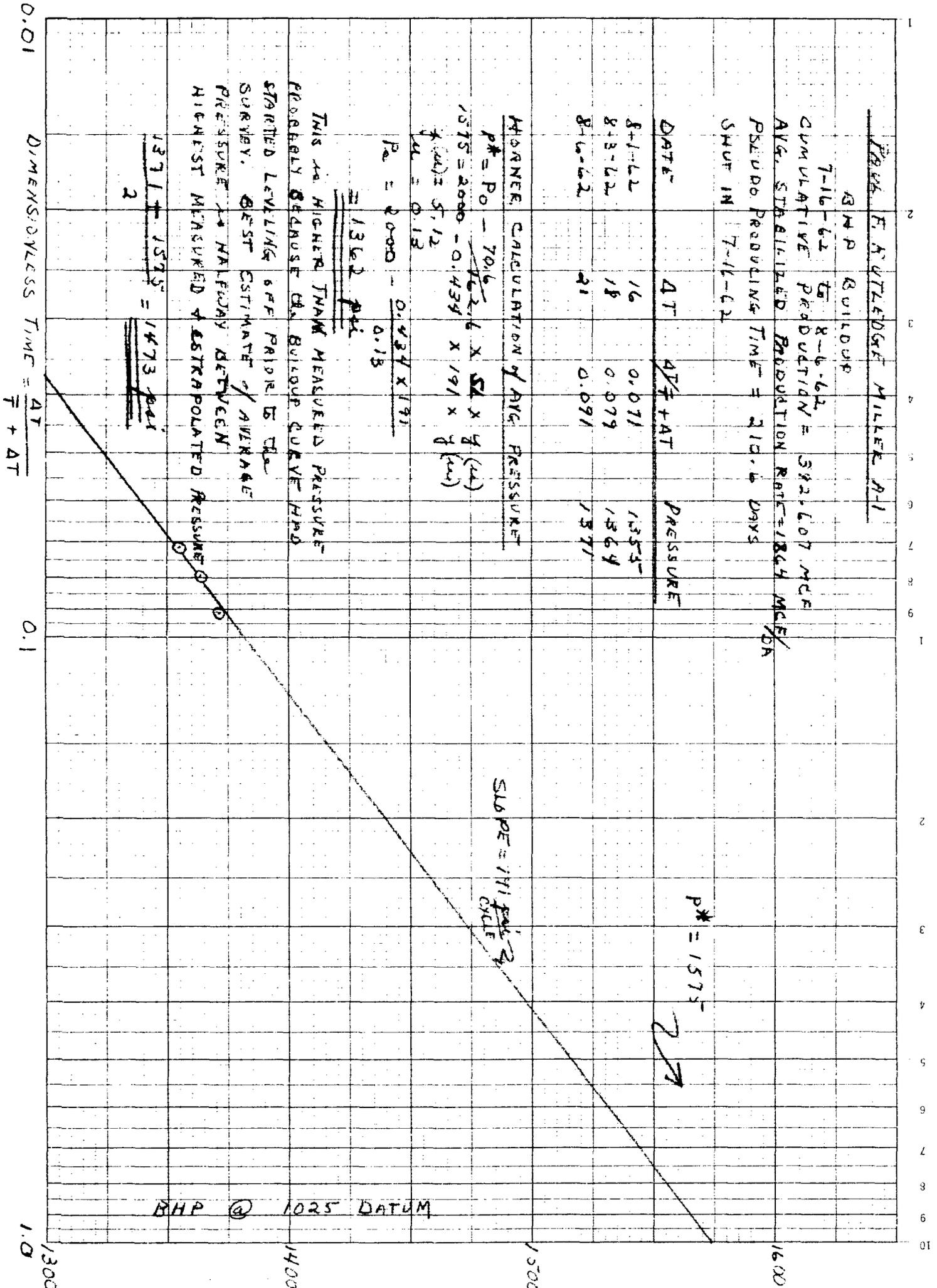
DATE	ΔT	$\frac{\Delta T}{T + \Delta T}$	PRESSURE
8-1-62	16	0.071	1355
8-3-62	18	0.079	1364
8-6-62	21	0.091	1371

HORNER CALCULATION OF AVG. PRESSURE

$P^* = P_0 - 70.6 \frac{Q \mu c}{k h} \times S \times \frac{y}{y_0}$
 $1575 = 2000 - 0.434 \times 191 \times \frac{y}{y_0}$
 $\frac{y}{y_0} = 0.13$
 $P_0 = 2000 - 0.434 \times 191$
 $= 1362 \text{ psi}$

THIS AS HIGHER THAN MEASURED PRESSURE
 PROBABLY BECAUSE THE BUILDUP CURVE HAD
 STARTED LEVELLING OFF PRIOR TO THE
 SURVEY. BEST ESTIMATE OF AVERAGE
 PRESSURE IS NAILED IN BETWEEN
 HIGHEST MEASURED & EXTRAPOLATED PRESSURE

$\frac{1371 - 1575}{2} = 1473 \text{ psi}$



J. STEPHEN MERRIN & ASSOCIATES, MCRAE-STATE #1

BHP GUIDEP

9-2-62 to 9-5-62
 CUMULATIVE PRODUCTION = 343 BBLs

AVG. STABILIZED PROD. RATE = 188 $\frac{bbl}{d}$

AVG. PRODUCING TIME = 1.82 DAYS = 43.8 $\frac{hr}{d}$

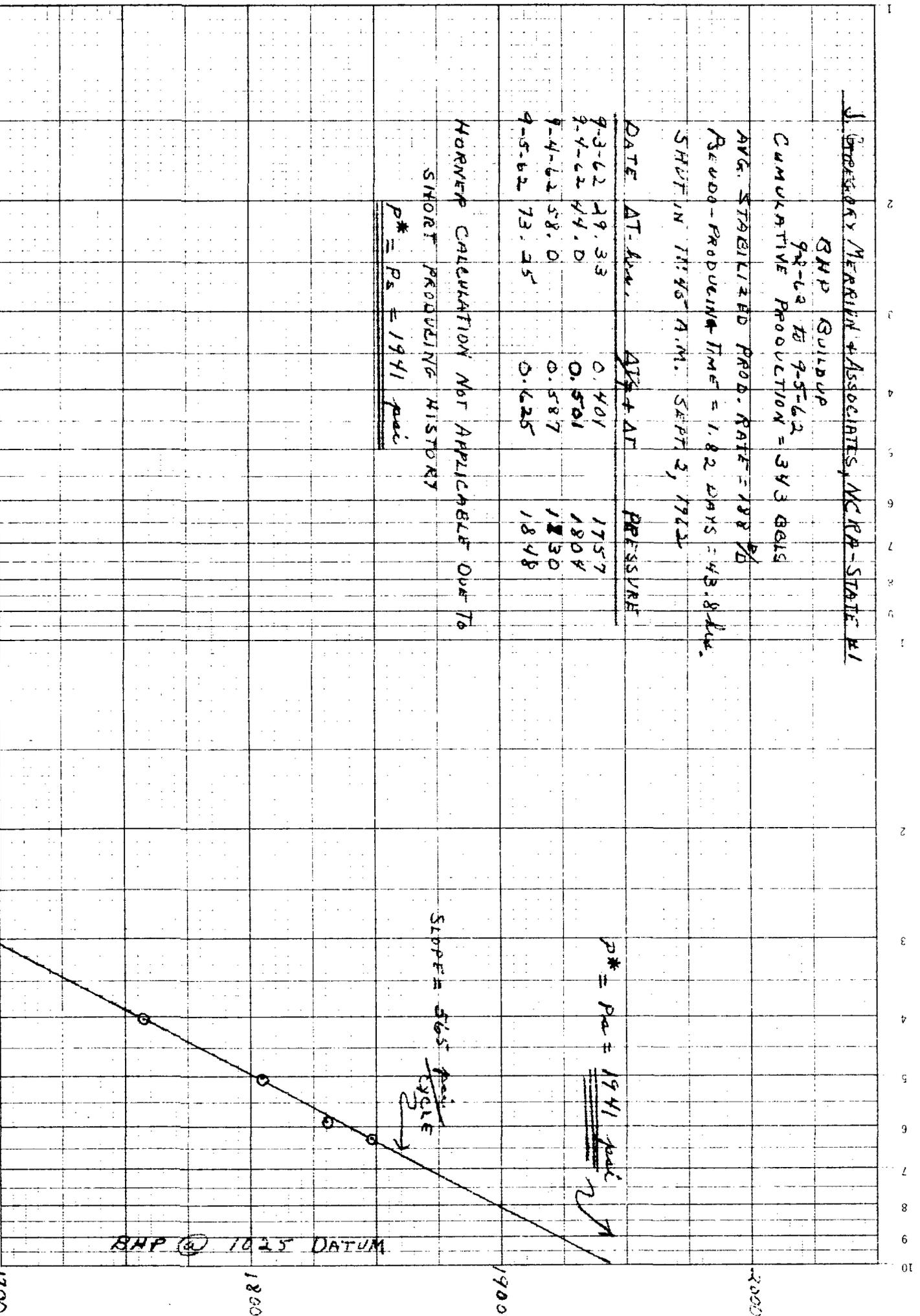
SHIFT IN 11:45 A.M. SEPT 3, 1962

DATE	AT. Hrs.	AT. + AT	PRESSURE
9-3-62	29.33	0.401	1757
9-4-62	44.0	0.501	1804
9-4-62	58.0	0.587	1830
9-5-62	73.25	0.625	1848

HORNER CALCULATION NOT APPLICABLE DUE TO

SHORT PRODUCING HISTORY

$P^* = P_s = 1941 \text{ psia}$



0.01 DIMENSIONLESS TIME = $\frac{AT}{T + AT}$ 0.1 1.0

RAW AMERICAN DASHNOB-1

BHP BUILDUP

7-30-62 to 8-6-62

CUMULATIVE PROD. = 47.933 BBLs

AVG. STABILIZED PROD. RATE = 36.1 B/D

PSEUDO PRODUCING TIME = 1307.8 DAYS

SHUT IN 7-30-62

DATE	ΔT	ΔT / (T + ΔT)	PRESSURE
8-1-62	2	0.0015	1217
8-6-62	7	0.0052	1269

MORNER CALCULATION OF AVG. PRESSURE

$$P^* = P_0 - \frac{70.8}{162.6} \times S \times \mu \times q_w$$

$$1486 = 2000 - 0.434 \times 95 \times \frac{1}{2} \times q_w$$

$$q_w (\mu) = 12.4$$

$$\mu = 0.064$$

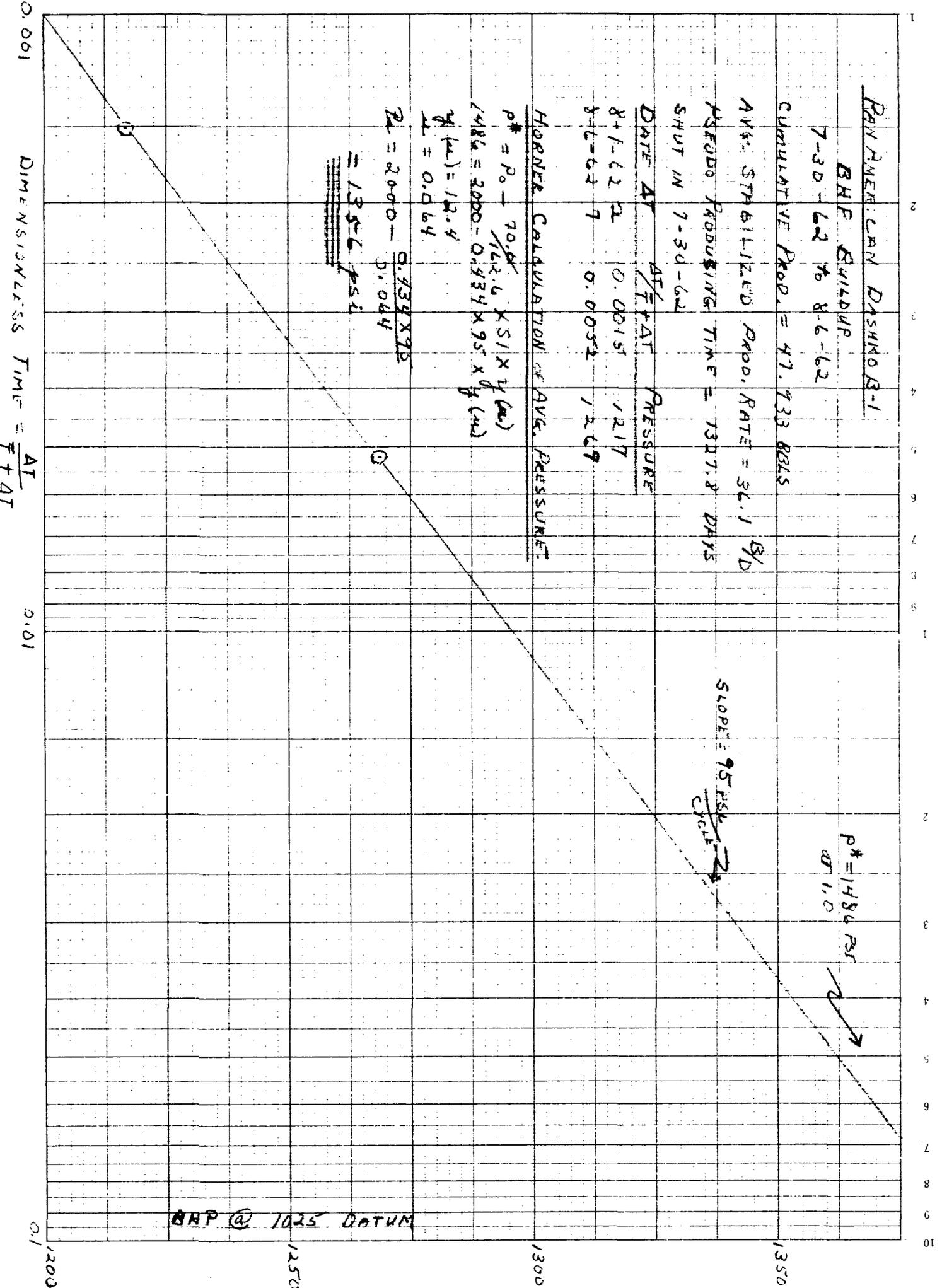
$$P_a = 2000 - \frac{0.434 \times 95}{0.064}$$

$$= 1356 \text{ PSI}$$

$$P^* = 1484 \text{ PSI}$$

at 1.0

SLLOPE = 95 PSI / CYCLE



BHP @ 1025 DATUM

Rawl E. Kuffedge Mill #1 B-4

BHP Buildup
 7-30-62 to 8-6-62

Cumulative Production = 6,158 bbls.

Avg. Prod. Rate = 11 B/D

Pressure Productivity Time = 5,578 days

Shut in 7-30-62

Date	AT	$\frac{\Delta P}{T} + AT$	Pressure
8-1-62	1.88	0.00335	1101
8-3-62	3.88	0.00688	1197
8-6-62	6.88	0.01214	1258

Horner Calculation of S Avg Pressure

$$P^* = P_0 - 70.6/162.6 \times St. \times y(u)$$

$$1838 = 2000 - 0.434 \times 297 \times y(u)$$

$$y(u) = 1.255$$

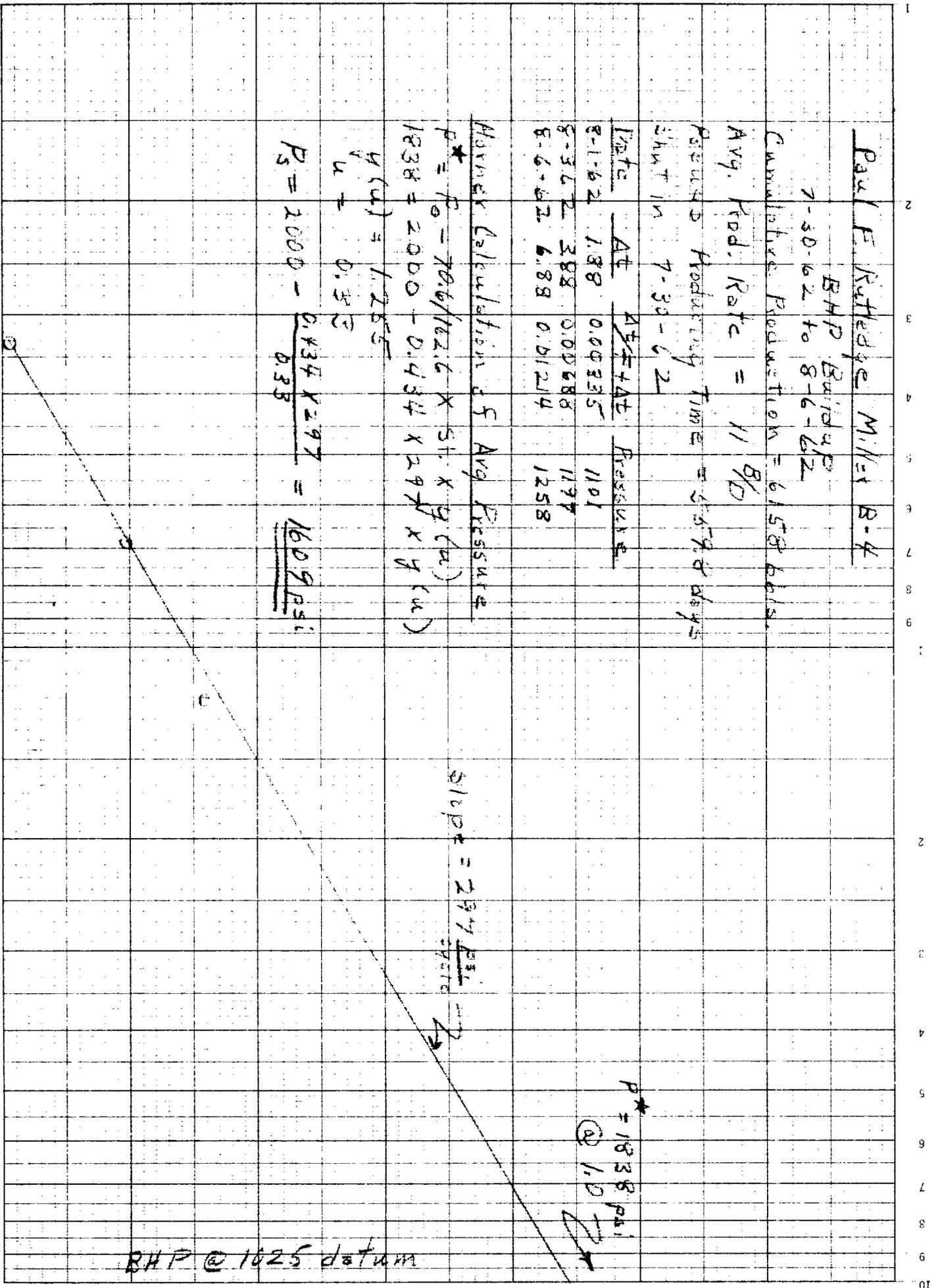
$$u = 0.33$$

$$P_s = 2000 - \frac{0.434 \times 297}{0.33} = 1609 \text{ psi}$$

$$\text{Slope} = 297 \frac{\text{psi}}{\text{cycle}}$$

$P^* = 1838 \text{ psi}$
 @ 1.0 cycle

BHP @ 1625 datum



0.001 Dimensionless Time = $\frac{AT}{T + AT}$ 0.01 0.1

Return # Hard Layer Spurt 1-A

BHP Buildups 7-28-62 to 8-6-62

Cumulative Production = 2553 bbls.

Avg. Stabilized Prod. Rate = 2.8 $\frac{bbl}{day}$

pseudo Flow Time $T = 733.2$ days

Start on 7-28-62

DATE	Δt	$\frac{\Delta t}{t + \Delta t}$	Pressure
8-1-62	4	0.00542	1315
8-6-62	9	0.0121	1383

Hemler's Calculation of Avg. Pressure

$$P^* = P_0 - 70.6 \sqrt{z} \times S.L. \times y(u)$$

$$1761 = 2000 - 0.434 \times 19.4 \times y(u)$$

$$y(u) = 2.90$$

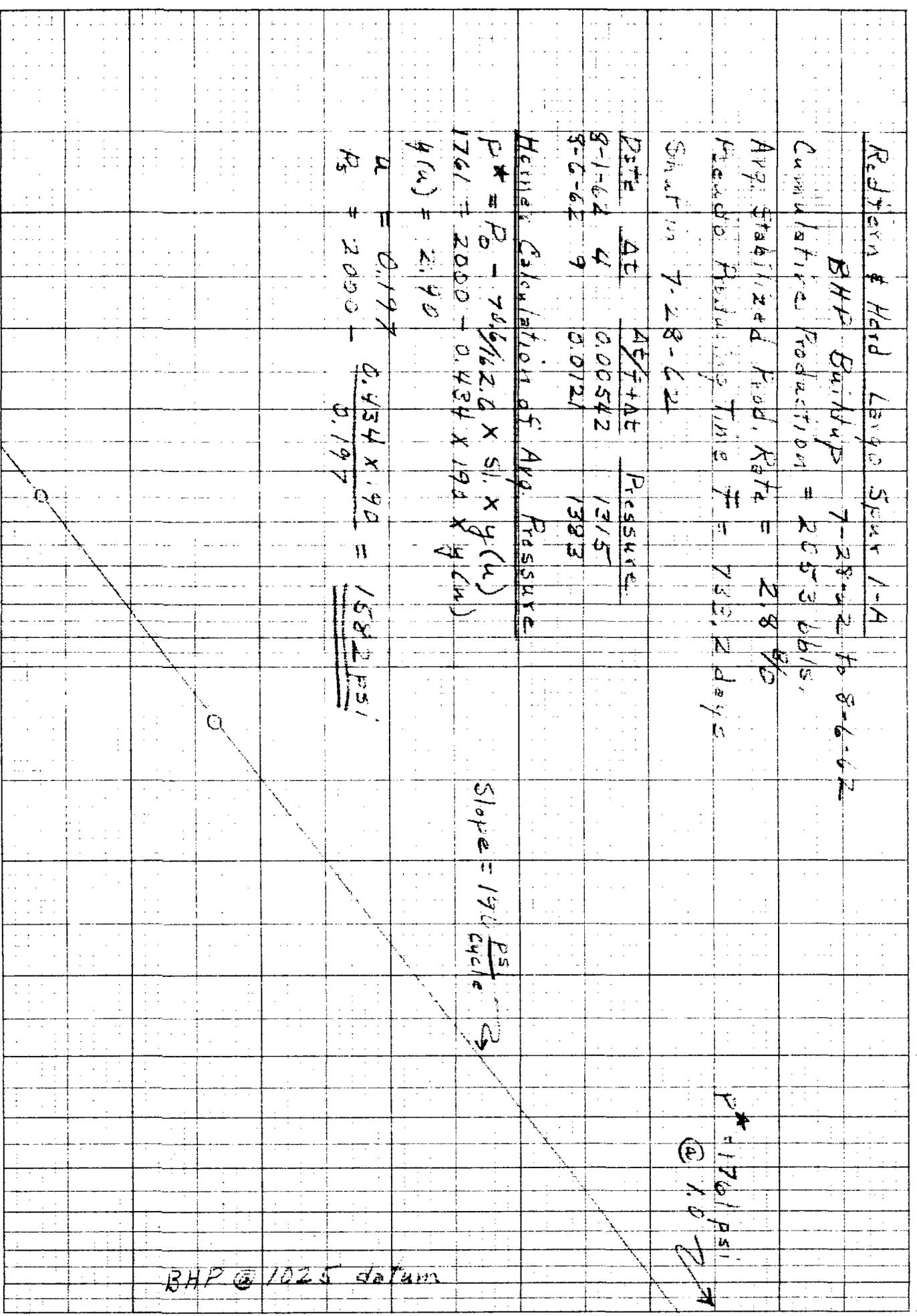
$$u = 0.197$$

$$R_s = 2000 - \frac{0.434 \times 19.4}{0.197} = \underline{\underline{1582 \text{ PSI}}}$$

Slope = 194 $\frac{PSI}{cycle}$

$P^* = 1761 \text{ PSI}$
 @ 1.0 $\frac{bbl}{day}$

BHP @ 1025 datum



0.001 Dimensionless Time = $\frac{\Delta t}{t + \Delta t}$ 0.01

J. Gregory Wicks and Assoc. Edna #3

BHP Buildup

7-30-62 to 8-6-62
 Cumulative Production = 8844 bbls

Avg. Stabilized Prod. Rate = 36 b/d

Buildup Producing Time $F = 245.7$ days

Shut in 7-30-62

DATE	ΔT	$\frac{\Delta F}{\Delta T}$	Pressure
8-1-62	2	0.00807	1243
8-3-62	4	0.01602	1356*
8-6-62	7	0.0277	1598*

Horne's Calculation of Avg. Pressure

$$P^* = P_0 - 76.6/162.6 \times 51 \times y(u)$$

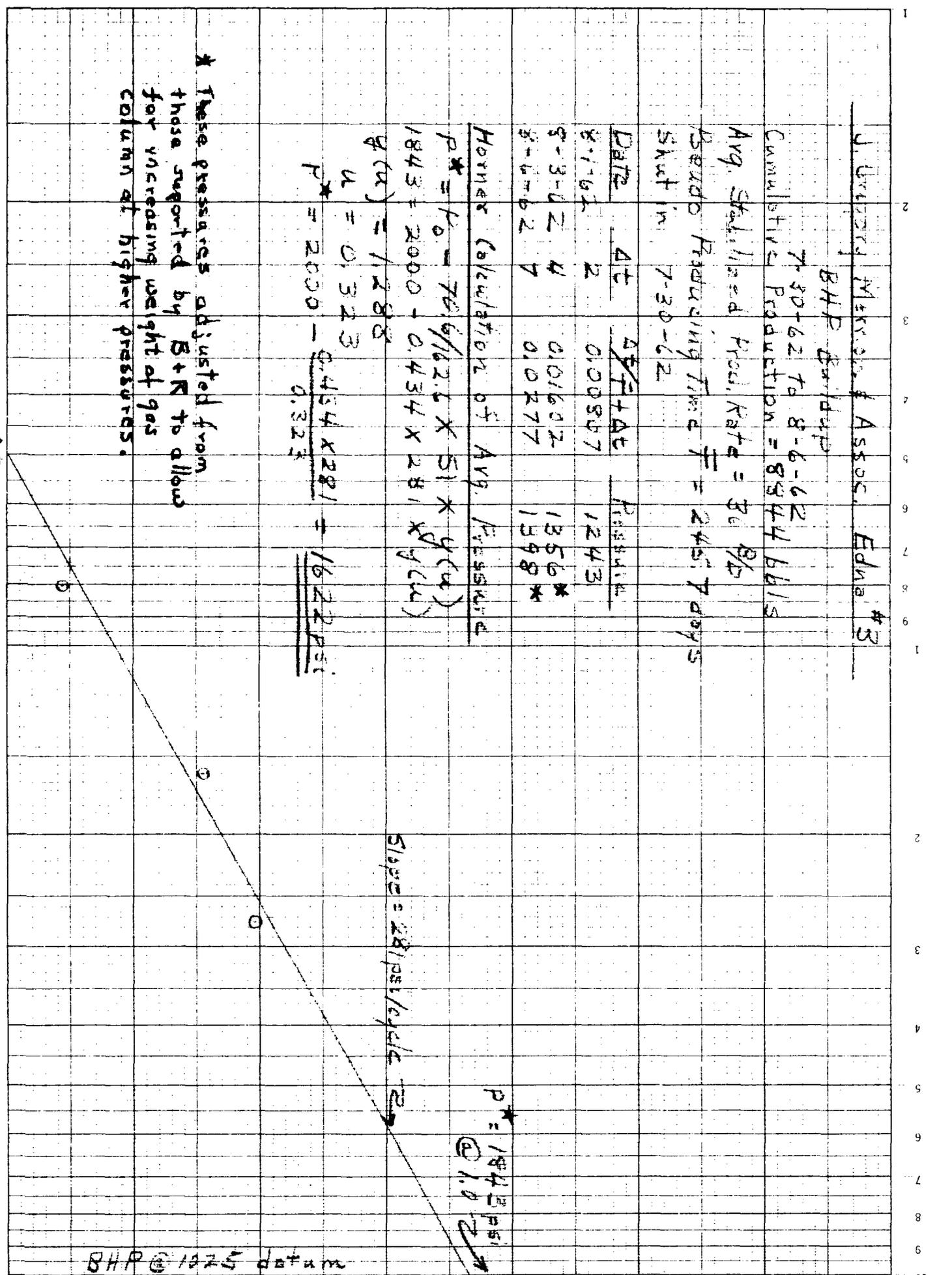
$$1843 = 2000 - 0.434 \times 281 \times y(u)$$

$$y(u) = 1.288$$

$$u = 0.323$$

$$P^* = 2000 - \frac{0.434 \times 281}{0.323} = \underline{\underline{1622 \text{ PSI}}}$$

* These pressures adjusted from those reported by B+R to allow for increasing weight of gas column at higher pressures.



0.01 Pressure vs. Time = $\frac{\Delta T}{F + \Delta T}$ 0.1

V. Gregory MERRION & ASSOC. Edna #1

BHP BUILDUP

7-30-62 to 8-6-62

Cumulative Production = 42,216 bbls

Avg. Stabilized Prod. Rate = 55 B/D

Pseudo Producing Time $T = \frac{42,216}{55} = 767.6$ da.

Shut in 7-30-62

Date	AE	$\frac{\Delta P}{F+AT}$	Pressure
8-1-62	2	0.0026	926
8-3-62	4	0.0052	1045
8-6-62	7	0.00904	1127

Horner Calculation of Avg. Pressure

$P^* = P_0 = 70.6/162.6 \times 51.1 \times y(u)$

$1930 = 2000 - 0.434 \times 387 \times y(u)$

$y(u) = 0.417$

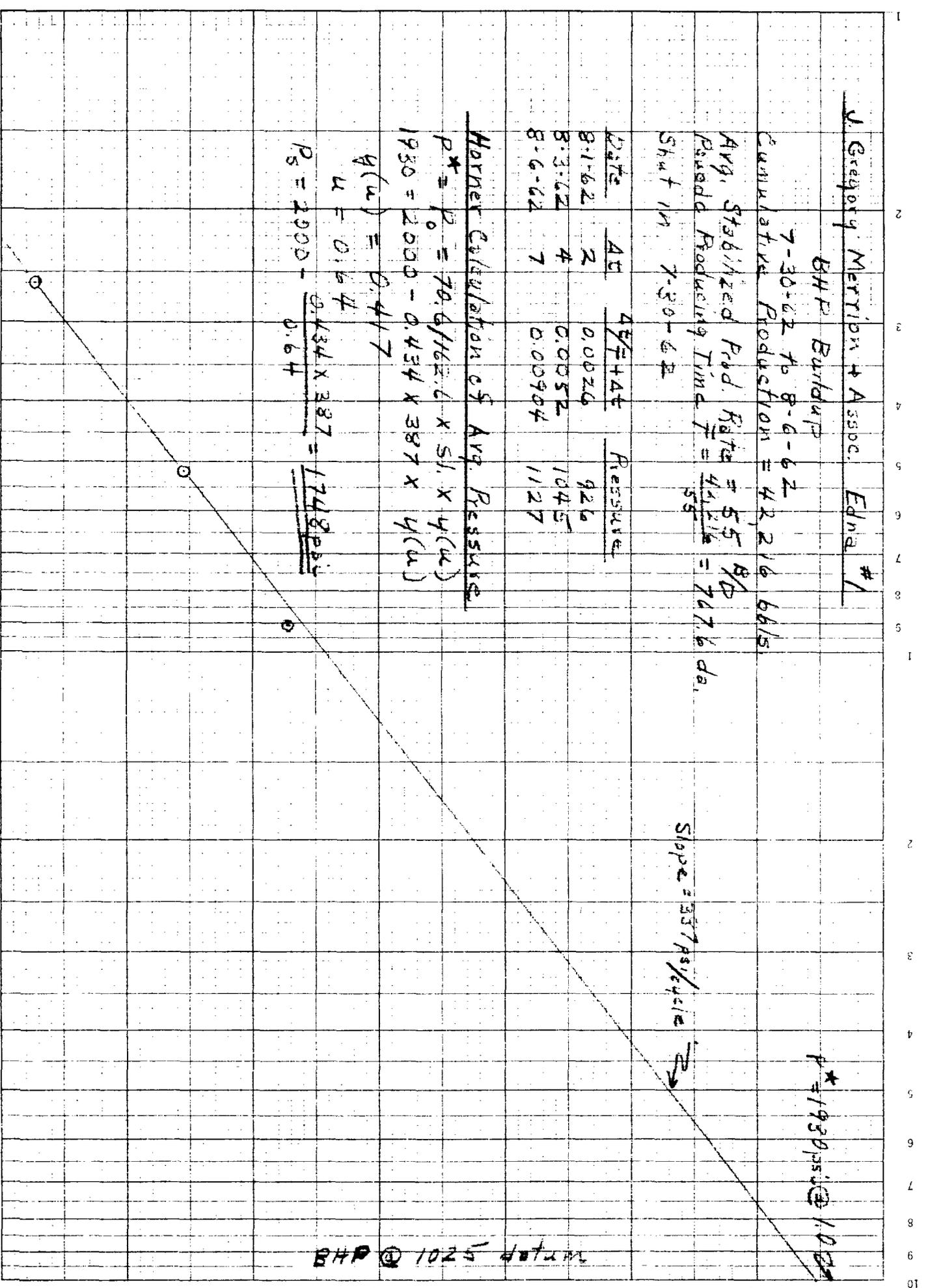
$u = 0.64$

$P_5 = 2000 - \frac{0.434 \times 387}{0.64} = \underline{1748 \text{ psi}}$

Slope = 337 psi/cycle

$P^* = 1930 \text{ psi} @ 1000$

BHP @ 1025 datum



0.001

Dimensions Time = $\frac{At}{F+At}$

0.01

0.1

900 1000 1100 1200 1300 1400 1500 1600

J Gregory Meyerton & Assoc Edine #2

BHP Edine #2

7-30-62 to 8-6-62

Cumulative Production = 31,708 bbl/s

Avg. Stabilized Prod. Rate = 65 bbl/s/day

Asado Fracturing Time $T = \frac{31708}{65} = 487.8$ days

Station 7-30-62

Date	AT	$\Delta P/\Delta t$	Pressure
8-6-62	7	0.014	1709

Horner Calculation of Avg. Pressure

$$P^* = P_0 - 70.6/162.6 \times 51 \times y(u)$$

$$1930 = 2000 - 0.434 \times 119 \times y(u)$$

$$y(u) = 1.36$$

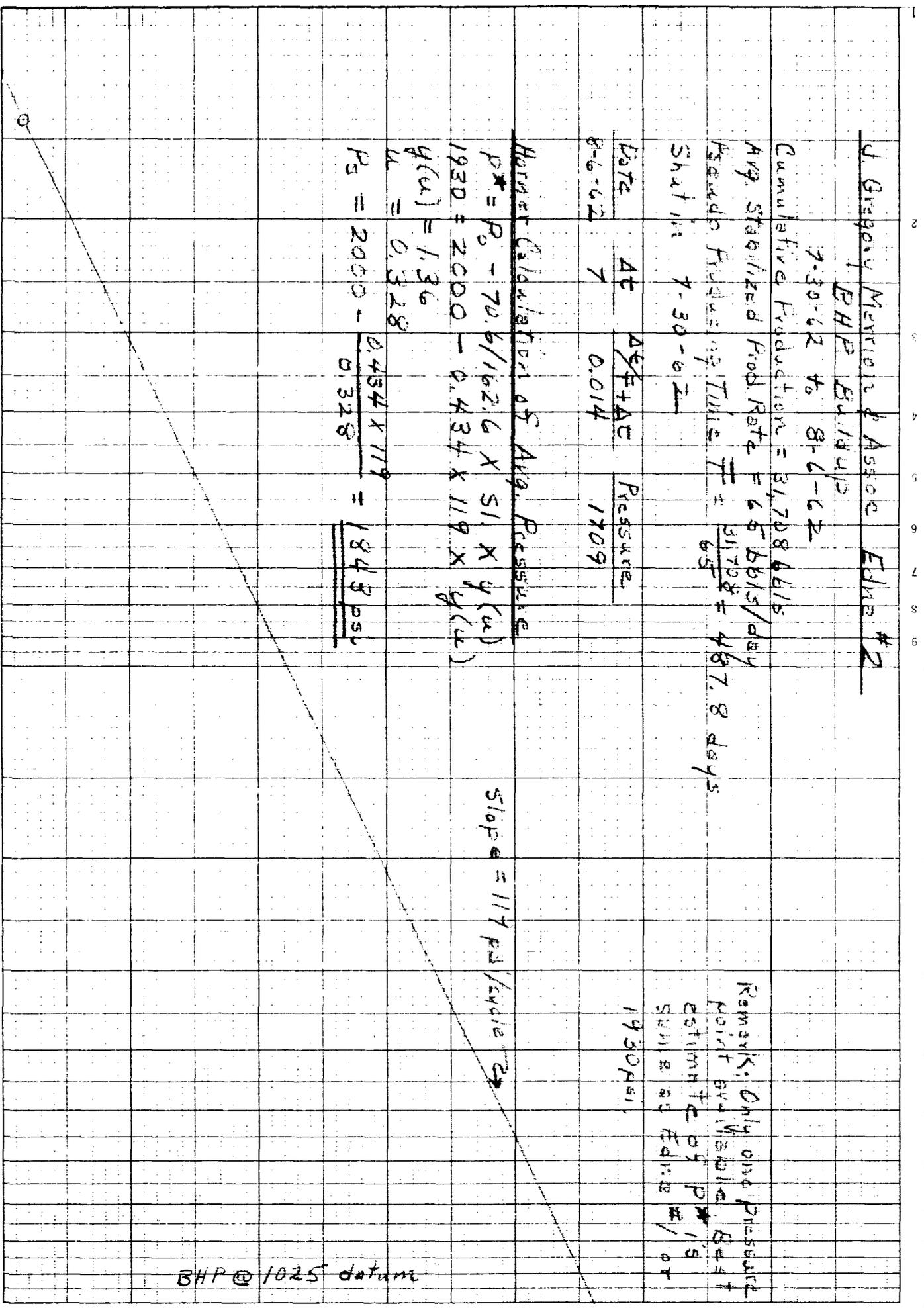
$$u = 0.328$$

$$P_3 = 2000 - \frac{0.434 \times 119}{0.328} = \underline{\underline{1843 \text{ psi}}}$$

Slope = 119 psi/cycle

Remark: Only one pressure point available. Best estimate of P^* is shown as Edine #1 or 1930 psi.

BHP @ 1025 datum



0.01

Dimensionless Time = $\frac{AT}{k+AT}$

0.1

1.0

175

180

190

200

B&B Ind. Field S-A

BHP Buildup

7-30-62 to 8-6-62

Cum. Prod = 3384 bbl/s.

Stabilized Prod Rate 9 b/d
 Prior to shut in =

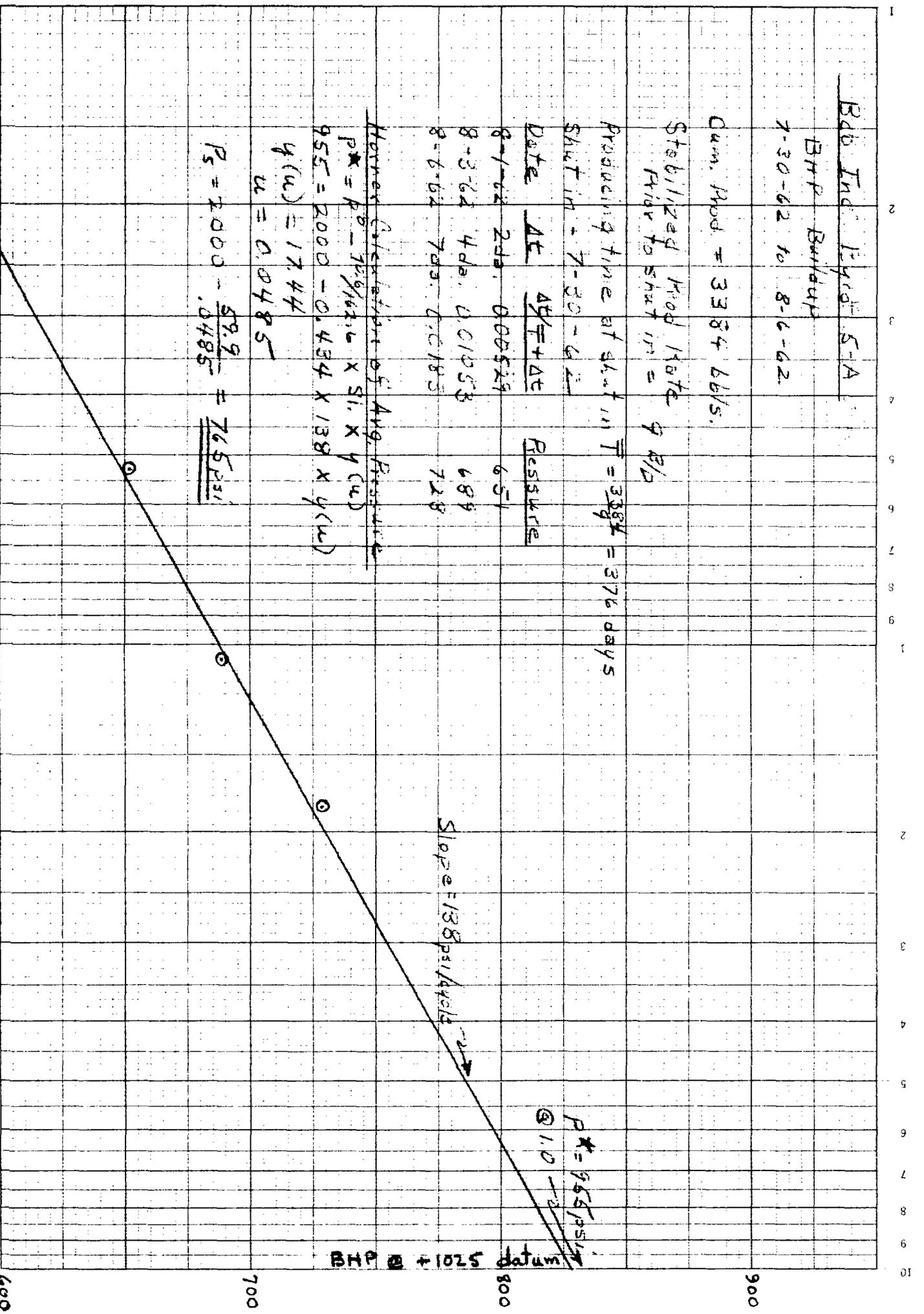
Producing time of shut in $\bar{T} = 358 \text{ days} = 376 \text{ days}$

Shut in - 7-30-62

Date	At	$\Delta t / \bar{T} + \Delta t$	Pressure
8-1-62	2da.	0.00529	651
8-3-62	4da.	0.01058	689
8-6-62	7da.	0.0185	728

Horne's Calculation of Avg. Pressure
 $P^* = P_s - 7.07 \times 10^{-4} \times S.I. \times y(u)$
 $955 = 2000 - 0.434 \times 138 \times y(u)$
 $y(u) = 17.44$
 $u = 0.0485$

$P_s = 2000 - \frac{59.9}{.0485} = 765 \text{ PSI}$



0.001

0.01

0.1

Dimensionless Time

$\Delta t / \bar{T} + \Delta t$

600

700

800

900

psi

E/180 Well Gas Co. Canyon Largo Unit #118

BHP Barrels
 7-29-62 to 8-6-62

Cumulative Production = 609 bbls

Avg. Stabilized Prod. Rate = 130 bpd

Pseudo Producing Time $T = 4.65$ days

Shut in 7-29-62

Date At ~~45~~ 440 Pressure

8-1-62	3	0.391	1812
8-3-62	5	0.517	1835
8-6-62	8	0.631	1865

Mooren Calculations - Not Applicable

Due to short producing history, well

was producing with such a small

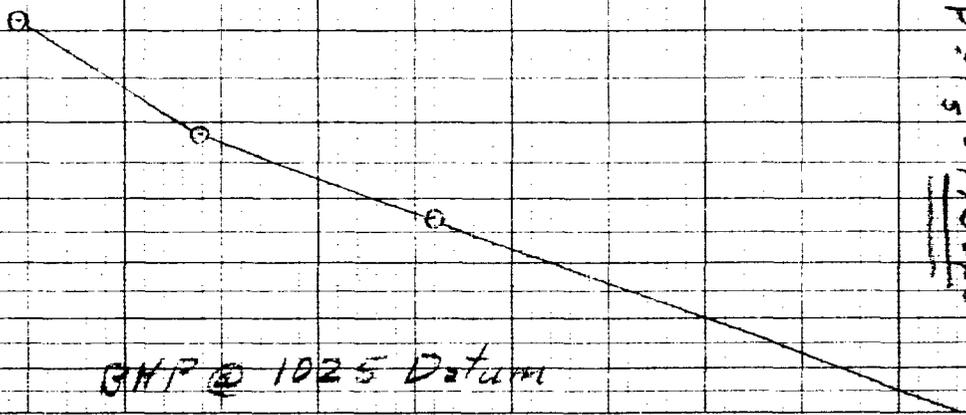
drainage radius that reservoir can

be considered infinite and

$P^* = P_s = 1935$ psi

$P^* = 1935$ psi

GHP @ 1025 Datum



0.01

Dimensionless Time - $\frac{AT}{r^2 + AT}$

0.1

1.0

180

190

195

200

10

Redfern A Herd Largo Spur #1

BHP Buildups
 7-12-62 to 8-6-62

Cumulative Production = 1,020,735 MCF

Avg. Stabilized Prod. Rate = 818 MCF/PD

Residual Production Time $T = 1250$ days

Shut In 7-12-62

Date	Δt	$\Delta P/P$	Pressure
8-1-62	20	0.0157	1499
8-3-62	22	0.0173	1499
8-6-62	25	0.0196	1505

Slope = $66 \frac{\text{psi}}{\text{cycle}}$

$F^* = 1616 \text{ psi}$

BHP @ 1925 Datum

Horizon Calculation of Avg. Pressure

$$P^* = P_0 - \frac{70.6}{162.6} \times S.I. \times y(u)$$

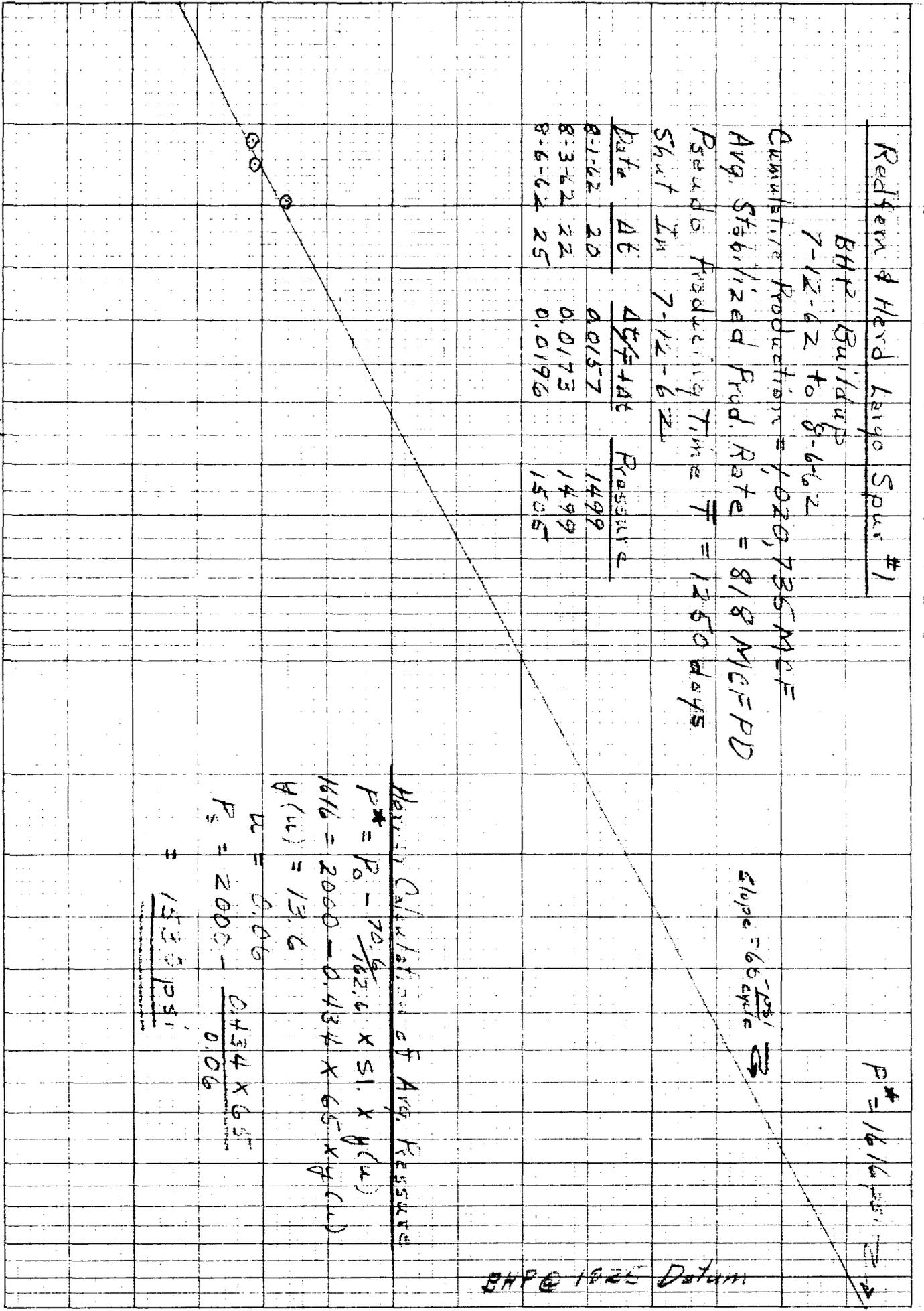
$$1616 = 2000 - 0.434 \times 65 \times y(u)$$

$$y(u) = 13.6$$

$$u = 0.06$$

$$F_s = 2000 - \frac{0.434 \times 65}{0.06}$$

$$= 1530 \text{ psi}$$



C.C.I Dimensionless Time = $\frac{qt}{F \Delta P}$

0.1

1.0 1450

Paul F Kutledge Miller B-2

BHP Bu 141/15

7-30-62 to 8-6-62

Cumulative Production = 16,477 bbl/s

Avg Stabilized Prod. Rate = 17.5 b/d

Residual Resolving Time = 941.5 days

Start in 7-30-62

Date	Δt	$\Delta t / \Delta t$	Pressure
8-1-62	1.92	0.00335	1012
8-3-62	3.83	0.00405	1070
8-6-62	6.88	0.00725	1114

Horner Calculator at Avg. Pressure

$$P^* = P_0 - \frac{70.8}{1626} \times 51 \times y(u)$$

$$1532 = 2000 - 0.434 \times 193 \times y(u)$$

$$y(u) = 5.58$$

$$u = 0.124$$

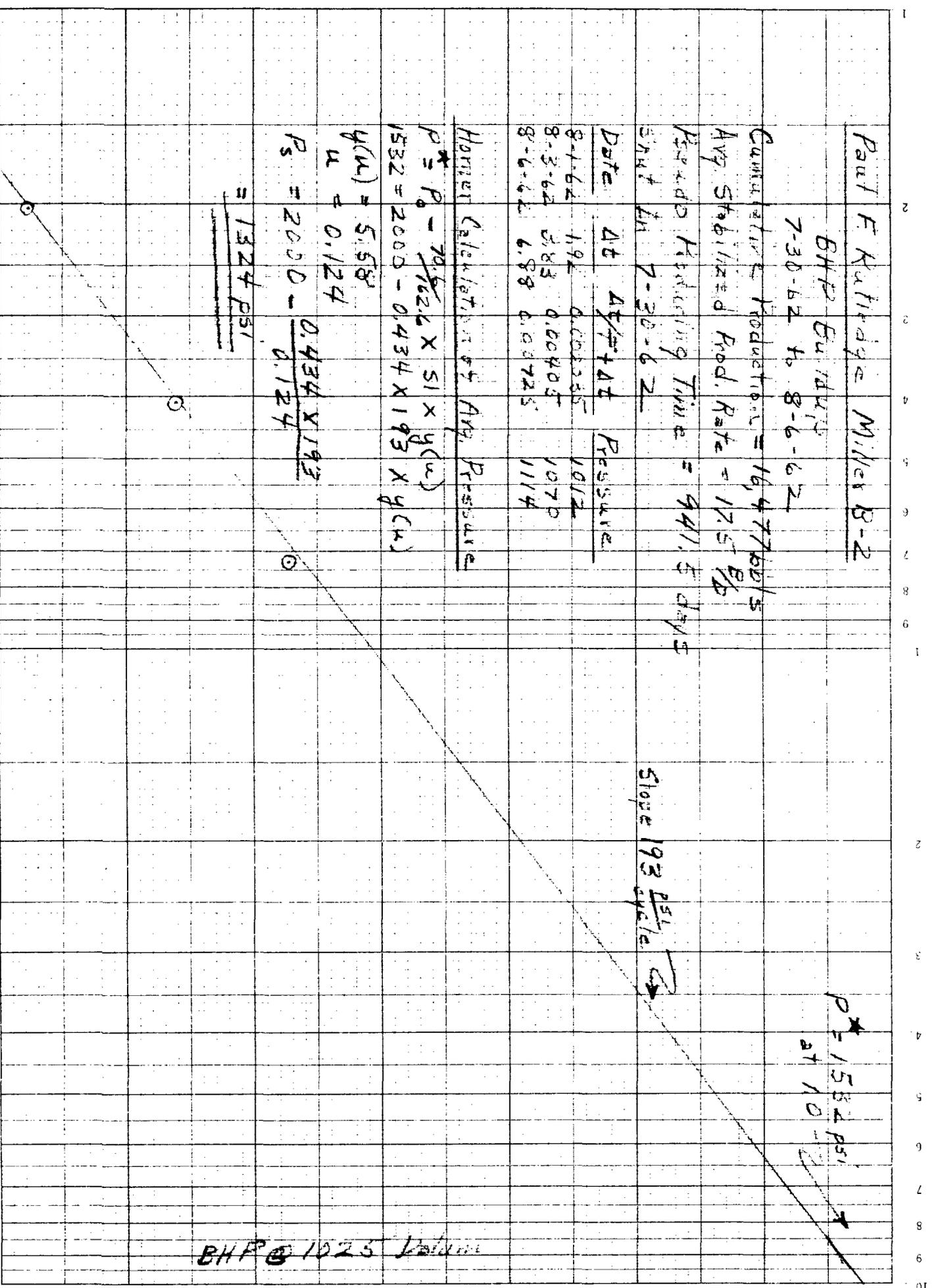
$$P_s = 2000 - \frac{0.434 \times 193}{0.124}$$

$$= 1324 \text{ PSI}$$

Slope 193 $\frac{\text{PSI}}{\text{cycle}}$

$P^* = 1532 \text{ PSI}$
at 10 - 2

BHP @ 1025 Volume



0.001 Dimensionless Time $\frac{\Delta t}{\Delta t}$ 0.01 0.1 1 2 3 4 5 6 7 8 9 10

Skillig Oil Co. New Mexico Federal G-1

BHP Build up
 7-23-62 to 8-6-62

Cumulative Production = 345,046 MCF

Avg. Stabilized Producing Rate = 1157 MCF/D

Periods Producing Time = 303.5 days

Skull no 7-23-62

Slope = 92 PSI/cycle

Date	Δt	Δt/T+At	Pressure
8-1-62	9	0.031	1422
8-6-62	14	0.044	1436

Horner Calculation indicates P_s = 1444 psi

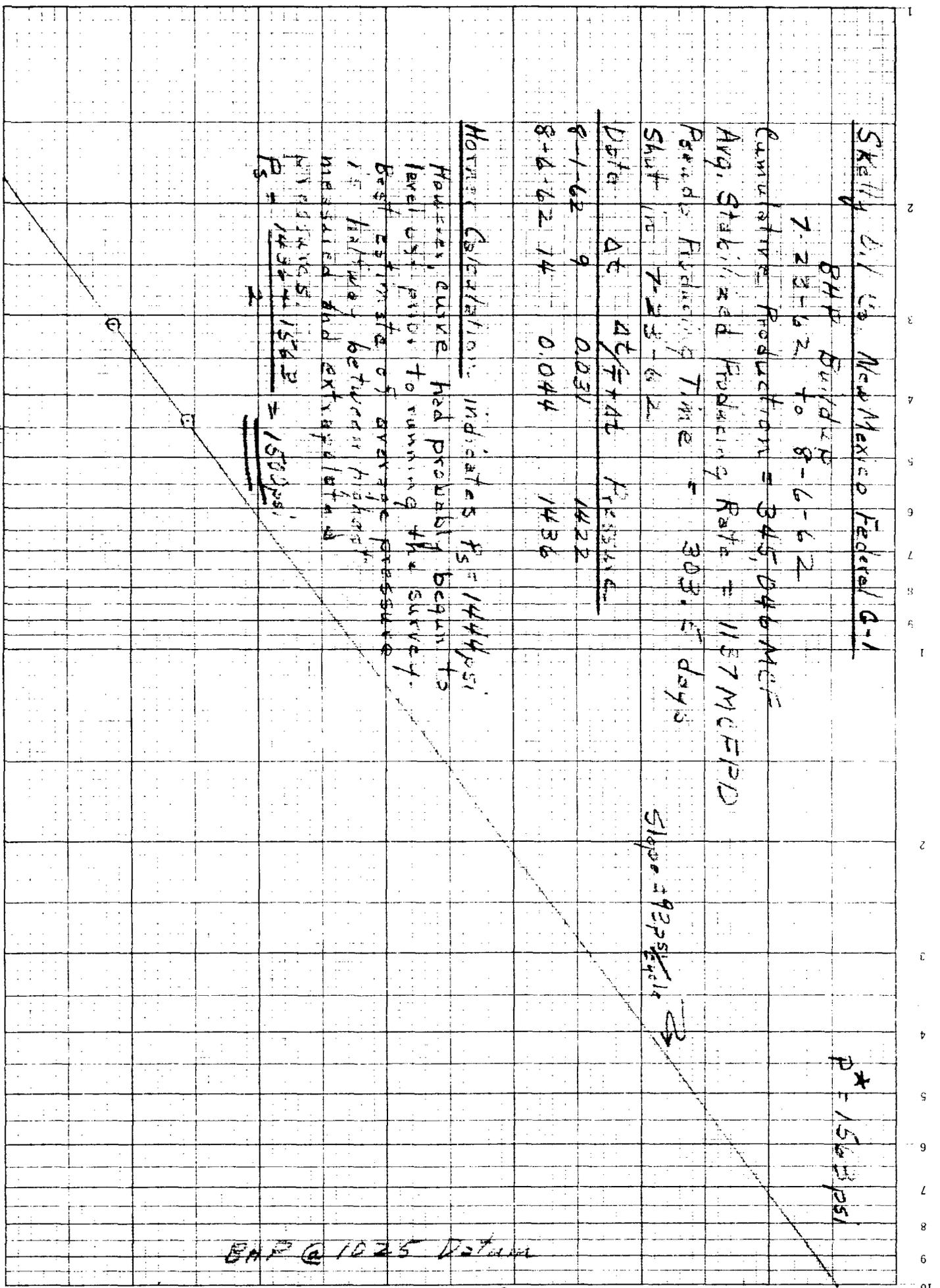
However, curve had probably begun to level off + tends to running the survey.

Best estimate of average pressure is halfway between highest measured and extrapolated

$$P_s = \frac{1436 + 1542}{2} = 1500 \text{ psi}$$

P* = 1563 PSI

BHP @ 1025 Data



0.01 Dimensionless Time = $\frac{\Delta t}{P + \Delta t}$ 0.1 140 145 150

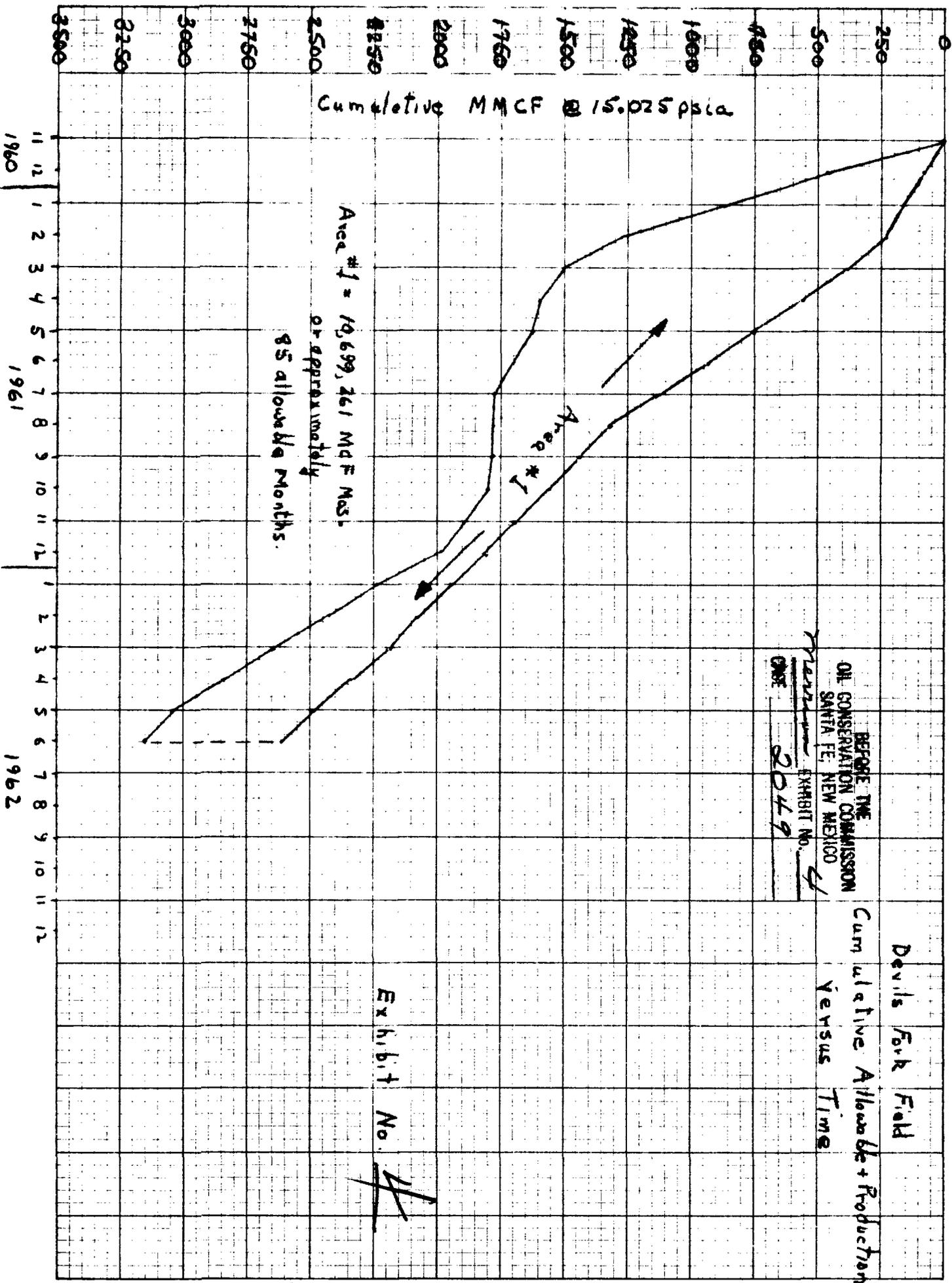
DEVILS FORK FIELD TOTAL GAS PRODUCTION FIGURES

DATE	ALLOWABLE	PRODUCTION	STATUS
Nov. 1960	77,098	469,519	(392,421)
Dec.	79,674	407,230	(719,977)
Jan. 1961	81,877	395,711	(1,033,811)
Feb.	154,368	241,496	(1,120,939)
Mar.	176,425	85,481	(1,029,995)
Apr.	186,075	26,269	(870,189)
May	192,276	79,557	(757,470)
June	186,075	77,447	(648,842)
July	192,276	4,431	(460,997)
Aug.	121,845	3,073	(342,225)
Sept.	123,709	15,685	(234,201)
Oct.	129,753	91,369	(195,817)
Nov.	123,699	94,114	(166,232)
Dec.	127,607	269,647	(308,272)
Jan. 1962	130,031	172,114	(350,355)
Feb.	98,354	232,380	(484,381)
Mar.	179,710	179,748	(484,419)
Apr.	138,464	210,382	(556,337)
May	121,296	107,340	(542,381)
	<u>2,620,612</u>	<u>3,162,993</u>	<u>(10,699,261)</u>

6708

EXHIBIT NO. *normal*

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
BEFORE THE



BEFORE THE
 OIL CONSERVATION COMMISSION
 SANTA FE, NEW MEXICO

EXHIBIT NO. 4

DATE 2049

Devils Fork Field
 Cumulative Allowable + Production
 Versus Time

Exhibit No. 4

SKELLY NEW MEXICO FEDERAL 1-G GAS PRODUCTION FIGURES

DATE	ALLOWABLE	PRODUCTION	STATUS
Nov. 1960	0	0	0
Dec.	0	0	0
Jan. 1961	2,203	3,995	(1,792)
Feb.	19,296	35,640)18,136)
Mar.	21,364	23,121	(19,893)
Apr.	20,675	3,410	(2,628)
May	21,364	2,399	16,337
June	20,675	0	37,012
July	21,364	0	58,376
Aug.	24,828	0	83,204
Sept.	14,386	209	97,381
Oct.	14,865	47,946	64,300
Nov.	14,386	50,265	28,421
Dec.	14,865	84,918	(41,632)
Jan. 1962	14,865	28,833	(55,600)
Feb.	9,806	0	(45,794)
Mar.	19,107	0	(26,687)
Apr.	14,343	29,055	(41,399)
May	13,195	0	(28,204)
			<u>103,266</u>

BEFORE THE
 OIL CONSERVATION COMMISSION
 SANTA FE, NEW MEXICO
 EXHIBIT No. 7 page 1
 CASE 2049

KEDFERK AND HERD #3 GAS PRODUCTION FIGURES

DATE	ALLOWABLE	PRODUCTION	STATUS
Nov. 1960	11,014	62,274	(51,260)
Dec.	11,382	21,196	(61,074)
Jan. 1961	11,382	29,770	(79,462)
Feb.	19,296	47,896	(108,062)
Mar.	21,364	20,908	(107,606)
Apr.	20,675	0	(86,931)
May	21,364	0	(65,567)
June	20,675	0	(44,892)
July	21,364	0	(23,528)
Aug.	24,828	0	1,300
Sept.	14,386	0	15,686
Oct.	14,865	0	30,551
Nov.	14,386	0	44,937
Dec.	14,865	26,911	32,891
Jan. 1962	14,865	2,047	45,709
Feb.	9,806	0	55,515
Mar.	19,107	5,475	69,147
Apr.	14,343	33,052	50,438
May	13,195	8,088	<u>55,545</u>
			(226,663)

Jan 21
3049

VAIL RESSE & ASSOCIATES 1-19 LEHIGH GAS PRODUCTION FIGURES

DATE	ALLOWABLE	PRODUCTION	STATUS
Nov. 1960	11,014	69,907	(58,893)
Dec.	11,382	32,693	(80,204)
Jan. 1961	11,382	24,067	(92,889)
Feb.	19,296	45,408	(119,001)
Mar.	21,364	13,024	(110,661)
Apr.	20,675	9,261	(99,247)
May	21,364	0	(77,883)
June	20,675	0	(57,208)
July	21,364	0	(35,844)
Aug.	24,828	0	(11,016)
Sept.	14,386	0	3,370
Oct.	14,865	0	18,235
Nov.	14,386	10,211	22,410
Dec.	14,865	39,106	(1,831)
Jan. 1962	14,865	42,779	(29,745)
Feb.	9,806	74,578	(94,517)
Mar.	19,107	45,286	(120,696)
Apr.	14,343	20,563	(126,916)
May	13,195	0	(113,721)
			<u>(1,186,257)</u>

Ex 7 page 3

2049

Redfern and Herd #2 Largo Spur Gas Production Figures

DATE	ALLOWABLE	PRODUCTION	STATUS
Nov. 1960	11,014	103,807	(92,793)
Dec.	11,382	112,850	(194,261)
Jan. 1961	11,382	154,242	(337,121)
Feb.	19,296	32,407	(350,232)
Mar.	21,364	0	(328,868)
Apr.	20,675	0	(308,193)
May	21,364	0	(286,829)
June	20,675	0	(266,154)
July	21,364	0	(244,790)
Aug.	24,828	0	(219,962)
Sept.	14,386	0	(205,576)
Oct.	14,865	0	(190,711)
Nov.	14,386	0	(176,325)
Dec.	14,865	0	(161,460)
Jan. 1962	14,865	0	(146,595)
Feb.	9,806	0	(136,789)
Mar.	19,107	0	(117,682)
Apr.	14,343	0	(103,339)
May	13,195	0	(90,144)
			<u>(3,957,824)</u>

7 page 4
2049

REDFORD #1 LEAD #1 LARGE SPUR GAS PRODUCTION FIGURES

DATE	ALLOWABLE	PRODUCTION	STATUS
Nov. 1960	11,014	92,446	(81,432)
Dec.	11,382	101,575	(171,625)
Jan. 1961	11,382	108,947	(269,190)
Feb.	19,296	26,081	(275,975)
Mar.	21,364	0	(254,611)
Apr.	20,675	0	(233,936)
May	21,364	0	(212,572)
June	20,675	0	(191,897)
July	21,364	0	(170,533)
Aug.	24,828	148	(145,353)
Sept.	14,386	0	(131,467)
Oct.	14,865	1,555	(118,157)
Nov.	14,386	3,472	(107,243)
Dec.	14,865	0	(92,378)
Jan. 1962	14,865	0	(77,513)
Feb.	9,806	0	(67,707)
Mar.	19,107	0	(48,600)
Apr.	14,343	240	(34,497)
May	13,195	0	(21,302)
			(2,706,488)

7 page 5
2049

OIL CONSERVATION COMMISSION

P. O. BOX 871

SANTA FE, NEW MEXICO

November 9, 1962

**Mr. William J. Cooley
Verity, Burr & Cooley
Suite 152 Petroleum Center Building
Farmington, New Mexico**

**Re: Case No. 2049
Order No. R-1670-B-2
J. Gregory Merrion**

Gentlemen:

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

Very truly yours,

**A. L. PORTER, Jr.,
Secretary-Director**

ALE/JMD/og

**cc: Oil Conservation Commission - Aztec
Oil Conservation Commission - Hobbs**

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DATA FOR ECONOMIC ANALYSIS
DEVILS FORK GALLUP POOL
RIO ARRIIBA CO., N. M.

Oil Reserves:

Porosity = 10% (Core data - Canyon Largo Unit No. 89).
Thickness = 10' (Est. average for Pan Am acreage).
Connate Water = 30% (Core data - Canyon Largo Unit No. 89).
Reservoir Volume Factor = 1.3 (Est. from correlation charts).
Recovery Factor = 15% (Analogy with Bisti).
Area = 40 acres.

Oil Reserves = 25,000 bbls./40 acres.

Gas Reserves:

Est. Solution GOR = 600 cu. ft./bbl. (based on correlation charts.).
Solution Gas in Place = 100,000 MCF.
Recovery Factor = 85% (Est.)

Gas Reserves = 85,000 MCF.

Compressor investment to handle 4 wells \$22,000
Operating costs for compressor \$219/mo.
Life 3 years
Total compressor investment and operating costs (4 wells) \$29,900
Average investment and operating costs per well \$7,750
Compressor fuel 28 MCFPD

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
Pan Am EXHIBIT No. 4
CASE 2049

ECONOMICS OF 40-ACRE OIL DEVELOPMENT
DEVILS FORK GALLUP POOL
RIO ARRIBA CO., N. M.

Well Costs		\$67,000
Lease Equipment, average per well		3,500
Artificial Lift		10,000
Operating Costs		5,400
Compressor investment and operating costs, average per well		<u>7,750</u>
Total investment and operating costs		\$93,650
Oil reserves per 40 acres		25,000 Bbls.
After Royalty of 12½%		22,000 Bbls.
Posted price of oil		\$2.75/Bbl.
Less Hauling		.30/Bbl.
Net price		\$2.45/Bbl.
Income from oil to working interest	\$54,000	
Gas reserves per 40 acres		85,000 MCF
Less compressor fuel		<u>7,660 MCF</u>
Saleable gas		77,340 MCF
After royalty of 12½%		67,600 MCF
Income from gas at 13¢/MCF	<u>\$ 8,800</u>	
Gross income from gas and oil	\$62,800	
Less production taxes at 8%	<u>5,020</u>	
	\$57,780	
Less investment and operating costs	<u>93,650</u>	
Net <u>loss</u> per well	\$35,870	

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
PAN AM EXHIBIT No. 3
CASE 2049

Assuming a normal unit allowable of 45 barrels per day, the following table shows the top unit allowables and increases of allowable for each depth interval.

Depth Interval	Depth Factor	Top Unit Allowable Bbl.	Allowable Increase Above 0 - 5000' Interval Bbl.	Allowable Increase Above Pre- ceding 1000' Bracket Bbl.
5,000 - 5,000'	1.00	45	0	0
5,000 - 6,000'	1.33	60	15	15
6,000 - 7,000'	1.77	90	35	20
7,000 - 8,000'	2.33	105	60	25
8,000 - 9,000'	3.00	135	90	30
9,000 - 10,000'	3.77	170	125	35
10,000 - 11,000'	4.66	210	165	40
11,000 - 12,000'	5.66	255	210	45
12,000 - 13,000'	6.77	305	260	50
13,000 - 14,000'	8.00	360	315	55
14,000 - 15,000'	9.33	420	375	60
15,000 - 16,000'	10.78	485	440	65
16,000 - 17,000'	12.33	555	510	70
17,000 - 18,000'	14.00	630	585	75

ILLEGIBLE

$$\text{Depth factor} = 45 + 15n + 5 \frac{45}{45} [(n-1) + (n-2) + \dots + (n-n)]$$

45

Bailed down, this becomes:

$$D.F. = 1 + \frac{n^2 + 5n}{18}$$

where n = the number of 1000' increments below 5000' to the lower limit of the depth bracket.

$$DF = 1 + \frac{n^2 + 5n}{18}$$

0-5000	$n=0$	$DF = 1 + \frac{0^2 + 5 \cdot 0}{18} = 1 + \frac{0}{18} = 1.00$
5-6000	$n=1$	$1 + \frac{1^2 + 5 \cdot 1}{18} = 1 + \frac{1+5}{18} = 1 + \frac{6}{18} = 1.33$
6-7000	$n=2$	$1 + \frac{2^2 + 5 \cdot 2}{18} = 1 + \frac{4+10}{18} = 1 + \frac{14}{18} = 1.78$
7-8000	$n=3$	$1 + \frac{3^2 + 5 \cdot 3}{18} = 1 + \frac{9+15}{18} = 1 + \frac{24}{18} = 2.33$
8-9000	$n=4$	$1 + \frac{4^2 + 5 \cdot 4}{18} = 1 + \frac{16+20}{18} = 1 + \frac{36}{18} = 3.00$
9-10000	$n=5$	$1 + \frac{5^2 + 5 \cdot 5}{18} = 1 + \frac{25+25}{18} = 1 + \frac{50}{18} = 3.78$
10-11000	$n=6$	$1 + \frac{6^2 + 5 \cdot 6}{18} = 1 + \frac{36+30}{18} = 1 + \frac{66}{18} = 4.67$
11-12000	$n=7$	$1 + \frac{7^2 + 5 \cdot 7}{18} = 1 + \frac{49+35}{18} = 1 + \frac{84}{18} = 5.67$
12-13000	$n=8$	$1 + \frac{8^2 + 5 \cdot 8}{18} = 1 + \frac{64+40}{18} = 1 + \frac{104}{18} = 6.78$
13-14000	$n=9$	$1 + \frac{9^2 + 5 \cdot 9}{18} = 1 + \frac{81+45}{18} = 1 + \frac{126}{18} = 8.00$
14-15000	$n=10$	$1 + \frac{10^2 + 5 \cdot 10}{18} = 1 + \frac{100+50}{18} = 1 + \frac{150}{18} = 9.33$
15-16000	$n=11$	$1 + \frac{11^2 + 5 \cdot 11}{18} = 1 + \frac{121+55}{18} = 1 + \frac{176}{18} = 10.78$
16-17000	$n=12$	$1 + \frac{12^2 + 5 \cdot 12}{18} = 1 + \frac{144+60}{18} = 1 + \frac{204}{18} = 12.33$
17-18000	$n=13$	$1 + \frac{13^2 + 5 \cdot 13}{18} = 1 + \frac{169+65}{18} = 1 + \frac{234}{18} = 14.00$