BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE NO. 882
Order No. R-333-B
(Supersedes R-333-A)

THE APPLICATION OF THE OIL CONSERVATION COMMISSION UPON ITS OWN MOTION FOR AN ORDER REVISING, AMENDING OR DELETING CERTAIN PORTIONS OF ORDER R-333-A PERTAINING TO GAS WELL TESTING PROCEDURE APPLICABLE TO GAS WELLS COMPLETED IN SAN JUAN, RIO ARRIBA AND McKINLEY COUNTIES, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause having come on for hearing at 9 o'clock a.m. on April 20, 1955, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission".

NOW, on this 9th day of May, 1955, the Commission, a quorum being present, having considered the records and testimony adduced and being fully advised in the premises,

FINDS:

(1) That due notice of the time and place of hearing and the purpose thereof having been given as required by law, the Commission has jurisdiction of this case and the subject matter thereof.

(2) That there is need for a number of additions to and revisions of Order R-333-A, heretofore entered by the Commission, said order outlining a gas testing procedure for gas wells completed in San Juan, McKinley and Rio Arriba Counties, New Mexico.

(3) That the following rules and regulations should be adopted, and that said rules and regulations are in the interests of conservation.

IT IS THEREFORE ORDERED:

That the following Special Rules and Regulations governing gas well testing in the San Juan Basin (Counties of San Juan, Rio Arriba and McKinley, New Mexico,) superseding the rules and regulations contained in Order No. R-333-A, be and the same hereby are promulgated and adopted as an exception to the general statewide rules and regulations of this Commission relating to gas well testing procedures, (Rules 401 et seq.):

Entered May 12, 1955
wbm

GAS WELL TESTING RULES AND PROCEDURES FOR SAN JUAN BASIN AREA

SECTION A. TYPE OF GAS WELL TESTS REQUIRED:

(1) THE INITIAL POTENTIAL TESTS: An "open flow" test and a "shut-in pressure" test shall be made immediately upon completion of each gas well.

(2) ANNUAL DELIVERABILITY AND SHUT-IN PRESSURE TESTS:

Annual deliverability and shut-in pressure tests of all producing gas wells are required to be made during the period from April 1 through October 31 of each year. The results of these annual tests shall be filed with the Commission on Form C-122-A within the month next after completion of such tests.

All wells connected to a pipeline system between November 1 and December 31, of any calendar year shall be tested during the following annual testing period. All wells connected to a pipeline system between January 1 and April 1 of any calendar year shall be tested during the testing period of that calendar year.

(3) SCHEDULE OF TESTS:

On or before February 15 of each year, the pipeline companies receiving gas from wells to be tested shall, in cooperation with respective operators, submit a testing schedule for the annual deliverability and shut-in pressure tests for all wells connected to their respective pipeline systems as of February 1 of the year for which the schedule is applicable; such test schedules shall be filed promptly with the Commission for approval, and if approved, the Commission shall furnish each operator, as identified by lists of names and addresses furnished by the respective pipeline companies, with a copy of such schedule as approved by the Commission, or a part thereof pertinent to such operator's wells, on or before March 15, of each year.

Such schedules shall be filed with the Commission for each Gas Pool as designated by the New Mexico Oil Conservation Commission listing under the heading of each pool the operator, lease, well number and location of each well. Should the pipeline company elect to file schedules by areas then the above listed information shall be listed under the heading of each area.

All wells connected to a pipeline system during the period of February 1 to October 31, both inclusive, of any year shall be scheduled for testing during the testing period for that particular year. Then and in that event the pipeline in cooperation with the operator shall notify the Commission in writing at least (5) five days before the commencement of the conditioning period for any tests.

In event changes for substantial reasons are necessary in the annual test schedule, the Commission shall be notified fifteen (15) days before tests are scheduled to commence.

(4) WHO MAY WITNESS TESTS: Any Initial Potential Test or Annual Deliverability and shut-in pressure test may be witnessed by any or all of the following: an agent of the Commission, an offset operator, a representative of the pipeline company taking gas from an offset operator, or a representative of a pipeline company taking gas from the well under test.

Deliverability tests required hereinabove in Paragraph 2 of this section shall determine the calculated deliverability of each gas well, which shall be reported to the Commission by converting actual deliverability against existing line pressures to the calculated deliverability at a pressure equal to fifty (50) percent of the shut-in pressure of each well in the manner hereinafter specified below. Such calculated deliverability so determined, and hereinafter so referred to, shall not be considered as the actual deliverability of any well into a gas transportation facility, but shall be used by the Commission as an index to determine the well's ability to produce at assumed wellhead working pressures, as compared to other wells in the pool under like conditions.

SECTION B. PROCEDURES FOR TESTS:

The several known gas producing formations of the San Juan Basin represent a variety of testing situations, and each is treated separately.

I. MESAVERDE FORMATION:

(1) INITIAL POTENTIAL TEST: The initial potential test in the Mesaverde formation shall be made after a minimum shut-in time of seven (7) days. The shut-in pressure will be measured by the use of a dead-weight gauge. The open flow shall be determined by a pitot tube measurement after unrestricted flowing of the gas to the air for a period of three (3) hours; the flow nipple shall be at least eight (8) diameters long. The pitot tube shall be constructed of one-eighth (1/8) inch pipe (nominal diameter). Standard tables (Reid's) will be provided by the Commission, on request.

This test shall be reported on regular Commission Form C-122-B.

The following data is required to be reported immediately to the Commission:

(a) The open flow in MCF per day, calculated by the use of Reid's Tables.

(b) The shut-in wellhead casing and tubing pressure, psig.

(c) The actual length of time well is shut-in before test.

(2) THE ANNUAL DELIVERABILITY AND SHUT-IN PRESSURE TESTS:

(a) 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 from an average of seven (7) consecutive producing days, following a minimum conditioning period of fourteen (14) consecutive days production. The first seven (7) days of said conditioning period shall have not more than one (1) interruption, which interruption shall be no longer than 36 hours continuous duration. The eighth to fourteenth days, inclusive, of said conditioning period shall have no interruptions whatsoever.

All such production during the fourteen (14) day conditioning period plus the seven (7) day deliverability test period shall be at working wellhead 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 potential shut-in pressure of such well shall be used.

The static wellhead working pressure (P_w) of any well under test shall be determined to be the calculated seven (7) day average tubing pressure if the well is flowing through the casing; or the calculated seven (7) day average 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 procedure 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, a copy of which is attached hereto and made a part hereof.

To obtain the shut-in pressure of a well under test the well shall be shut-in immediately after the seven (7) day 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 string through which the well flowed during the conditioning and seven (7) day flow period.

All wellhead pressures as well as the flowing meter pressure tests which are to be taken during the seven (7) day deliverability test period, as required hereinabove, shall be taken with a dead-weight gauge. The dead-weight readings taken shall be recorded on the flow chart in psia. The time and point on chart flowing pressure curve at which these readings are taken shall be indicated with an arrow.

Orifice meter charts shall be changed, and so arranged as to reflect upon a single chart the flow data of gas from each well for the full seven day deliverability test period. Corrections shall be made for pressure base, measured flowing temperature, specific gravity and supercompressibility (superexpansibility), 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 near-by wells, the specific gravity of which has been actually determined by measurement.

The seven (7) day average flowing meter pressure shall be calculated by taking the average of all consecutive 2-hour flowing meter pressure readings as recorded on the seven (7) day flow period chart (test chart #3). The pressure so calculated shall be used in calculating the wellhead working pressure, determining supercompressibility factors and calculating flow volumes.

The seven (7) day flow period volume shall be calculated from the integrated reading as determined from the flow period orifice meter chart. (Chart #3) The volume so calculated shall be divided by the number of flowing

days on the chart to determine the average daily flow period rate of flow. The flow chart shall have legibly recorded a minimum of seven (7) days and a maximum of eight (8) flowing days to be acceptable for test purposes. The volume used in this calculation shall be corrected to New Mexico Oil Conservation Commission standard conditions.

The average flowing meter pressure for the seven (7) or eight (8) flow period and the corrected integrated volume shall be determined by the purchasing company that integrates the flow charts and furnished to the operator or testing agency when such operator or testing agency requests such information.

The daily average integrated flow period rate of flow shall be corrected for meter error by the multiplication of 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 as determined from the flow period chart (Test Chart #3) integrator readings shall be calculated by applying the Basic Orifice meter formula $Q = C' \quad h_w \; p_f$.

where:

Q = Metered volume of flow MCFD @ 15.025, 60°F. and .60 specific gravity.

C' = The 24 hour basic orifice meter flow factor as taken from New Mexico Oil Conservation Commission release "4G-12-BPT-State" and corrected for flowing temperature, gravity and supercompressibility.

h_w = Daily average differential meter pressure from flow period chart.

p_f = Daily average flowing meter pressure from flow period chart.

The basic orifice meter flow factors, flowing temperature factor and specific gravity factor shall be determined from New Mexico Oil Conservation Commission release No. "4 G-12-BPT-State", The four tables in said release are based on "Gas Measurement Committee Report No. 2" (Revised 1948) of the American Gas Association, New York 17, New York. A copy of said New Mexico Oil Conservation Commission release is attached hereto and made a part hereof.

The daily flow period average corrected flowing meter pressure, psig, shall be used to determine the supercompressibility factor. Correction shall be made for supercompressibility (deviation from Boyle's law) for flowing meter pressures in excess of 100 psig by the use of Simplified Supercompressibility Tables, compiled from C. N. G. A. Bulletins TS-402 and TS-461, published by John P. Squier Company, Dallas, Texas. These tables have been reproduced by specific permission from John P. Squire

Company a copy of which is attached hereto and made a part hereof.

When supercompressibility (superexpansibility) correction is made for a gas containing either nitrogen, carbon dioxide or hydrogen sulfide in excess of 2 per cent, the pseudocritical pressure and temperature properties of such gas shall be corrected by the use of Table V of the above mentioned TS-402 for pressure 100-500 psig and TS-461 for pressures in excess of 500 psig.

The use of tables for calculating rates of flow from integrator readings, which do not specifically conform to New Mexico Oil Conservation Commission release "4 G-12-BPT-State", may be approved for determining the daily flow period rates of flow upon a showing that such tables are appropriate and necessary.

Deliverability pressure, as used herein for Mesaverde production, is a defined pressure applied to each well and used in the process of comparing the abilities of wells in this formation to produce against a back pressure equal to fifty (50) per cent, of the seven (7) day shut-in pressure of the respective individual wells.

The "deliverability" of gas at the "deliverability pressure" of any well under test shall be calculated from the test data derived from the tests hereinabove required by use of the back-pressure formula:

$$Q = C \left(P_c^2 - P_w^2 \right)^n$$

Using point seventy-five (.75) for the exponent "n" by the following formula:

$$D = Q \left(\frac{P_c^2 - P_d^2}{P_c^2 - P_w^2} \right)^n$$

WHERE:

D = Deliverability at the deliverability pressure, (P_d) MCF/da. (at Standard Condition of 15.025 psia and 60°F).

Q = Daily flow rate in MCF/da. at wellhead pressure (P_w)

P_c = Shut-in casing (or tubing) wellhead pressure, psia.

P_d = Deliverability pressure; half of the individual well 7-day shut-in pressure, P_c, psia.

P_w = Average wellhead working pressure, as determined from 7-day flow period, psia and calculated from New Mexico Oil Conservation Commission Pressure Loss Due to Friction Tables. (casing pressure if flowing through the tubing, or tubing pressure if flowing through the casing).

n = Average pool slope of back pressure curve (0.75) for Mesaverde wells).

Any test hereinabove provided for, except initial potential test, will be considered unacceptable if the average flow rate for the final 7 day deliverability test is 25 per cent in excess of any consecutive 7-day average of the preceding two weeks. A "deliverability test" not meeting this requirement shall be retested.

The annual deliverability and shut-in pressure tests as required hereinabove shall be reported upon Commission Form C-122-A and filed with the Commission as provided hereinabove. Form C-122-A shall be signed by the operator or agent designated by the operator.

All charts relative to annual deliverability tests shall be identified by the words "Test Chart No. 1" (2, 3, 4, etc.), and any or all charts or photostats thereof shall be made available to the Commission upon its request.

II. PICTURED CLIFFS FORMATION:

(1) INITIAL POTENTIAL TEST: Same as prescribed for Mesaverde formation; see Section B, subsection I, Mesaverde formation hereinabove. Paragraph 1.

(2) ANNUAL DELIVERABILITY AND SHUT-IN PRESSURE TESTS:

In all respects the deliverability and shut-in pressure tests of wells in the Pictured Cliffs formation shall be made in conformity with the procedures set out in Section B, Subsection I, part 2, sub-parts (a) (b) (c) (d) (e) of the Mesaverde formation procedures, except that in paragraph (a) thereof, the back pressure formula, the exponent "n" shall have the value of point eighty-five (.85) and the deliverability pressure (P_d) shall be one half (1/2) of the individual wellhead shut-in pressure = P_c, psia.

III. FRUITLAND FORMATION:

(1) All initial potential, annual deliverability and shut-in pressure tests of gas wells producing from the Fruitland formation shall be identical in all respects to those requirements and procedures hereinabove set out and required for the Pictured Cliffs formation (Section B, Subsection II, parts 1 and 2).

IV. THE DAKOTA FORMATION: All tests of Dakota wells shall be in conformity with requirements and procedures provided hereinabove for the Mesaverde formation, except as follows:

(1) BARKER DOME - DAKOTA: (Storage Area)

(a) INITIAL POTENTIAL TEST: An average "pool slope", based upon bottom-hole conditions, shall be established by the Commission after consideration of data to be provided by the operators; these data shall

be based upon tests taken in conformity with the conventional back pressure method, indicated in Commission Rule 401. This "slope" shall be applied to each well in the Barker-Dome-Dakota Area, arbitrarily, as if such slope were the actual performance back pressure slope of each such well, in the following manner:

This back pressure slope so established shall be plotted through a point predetermined by one stabilized flow rate at a working well head pressure not in excess of seventy-five (75) per cent of the seven (7) day shut-in pressure of such well.

The flowing volumes (Q) shall be corrected for pressure base, measured flowing temperature, specific gravity and supercompressibility, by the use of methods of calculation and tables hereinabove referred to and approved in Section B, Subsection (2), paragraph (a) Mesaverde procedures.

A seven (7) day shut-in pressure test shall be made for each well in the Barker Dome-Dakota Area, provided however, that where the shut-in period exceeds seven days such fact shall be reported to the Commission.

The values of the seven (7) day shut-in pressure (P_c) and the working well head pressure (P_w) shall be corrected to bottom hole conditions.

A schedule of tests shall be prepared by the transporter and approved by the Commission, and reports of such tests shall be signed by the operator or his designated agent and duly filed with the Commission, on Form C-122, the regular statewide form.

(b) ANNUAL POTENTIAL TEST: This test shall be made of all wells producing from the Barker Dome-Dakota storage area by obtaining seven (7) day shut-in pressures of all Dakota wells, converting the same to bottom hole pressures (P_f) computing the squares of such bottom hole pressures, (P_f^2) and applying the same to the original average "pool slope" to obtain an adjusted open flow. If so desired as an alternate method an adjusted open flow may be computed from the following equation:

$$O_{f_2} = O_{f_1} \left(\frac{P_{f_2}^2}{P_{f_1}^2} \right)^n$$

WHERE:

O_{f_2} = Adjusted absolute open flow.

O_{f_1} = Original absolute open flow.

P_{f_2} = New bottom hole shut-in (psia.)

P_{f_1} = Old bottom hole shut-in (psia).

n = Slope of back pressure curve.

Tests of all wells in the Barker Dome-Dakota storage area shall be made during the period of April 1 through October 31 of each year and reports made to the Commission within the next succeeding month after test is made.

V. PENNSYLVANIAN FORMATION:

All tests of wells producing from the Pennsylvanian formation of the San Juan Basin Area shall be as follows:

(1) INITIAL POTENTIAL TEST: Immediately after completion of each new well an absolute open flow shall be determined by the conventional back-pressure method indicated by Rule 401 of the Commission's Rules and Regulations.

Seven day shut-in pressures will be used in all cases, and, if for any reason the shut-in period exceeds seven days, then, the actual shut-in time shall be reported.

(2) ANNUAL POTENTIAL TEST: This test shall be made of all wells producing from the Pennsylvanian formation of the San Juan Basin area, and such tests shall conform in all respects with the procedure set out next above under initial potential test or in the alternative, by obtaining a seven day shut-in pressure of each well and converting the same to bottom hole pressure (P_f). The square of the bottom hole pressure (P_f^2) will be computed and applied to the original back pressure curve and an adjusted absolute open flow will be obtained.

If shut-in pressure time is in excess of seven (7) days, then the actual shut-in time shall be reported.

There is no objection to the use of an adjusted absolute open flow calculated from the equation as set out hereinabove under Dakota formation, Section B, Subsection IV, paragraph 1 - subparagraph b.

All tests hereunder shall be made during the period from April 1 through October 31 of each year, and reported to the Commission upon regular Form C-122 during the month succeeding the month in which the tests are made.

IT IS FURTHER ORDERED:

(1) That Form C-122-A entitled "Gas Well Test Data Sheet, San Juan Basin", a copy of which is attached hereto and made a part hereof, be, and the same hereby is approved in open form subject to minor modifications as experience may indicate and the same shall be used only for the area heretofore indicated, excepting therefrom only the Barker Dome-Dakota storage area, and the Pennsylvanian formation, all within the said San Juan Basin.

(2) That this order shall modify Rule 1121 of the Rules and Regulations of the Commission only to the extent of requiring reports upon Form C-122, a copy of which is attached hereto and made a part hereof.

(3) Form C-122-B, a copy of which is attached hereto and made a part hereof, be and the same is hereby adopted.

(4) All forms heretofore mentioned, are hereby adopted for use in the San Juan Basin area, with exceptions noted.

(5) All testing agencies whether individuals, companies, pipeline companies or operators shall maintain a log of all tests accomplished by them. This log shall show the operator, lease, well number, section unit letter, section, township, range and pool as defined by New Mexico Oil Conservation Commission, for each well tested. The log shall further show the date the flow period pressures (psia.) and shut-in pressures are measured and the values thereof. A copy of this log shall be made available to the Commission or a Commission representative at any time during any testing season. A copy of this log shall be filed with supervisor of District III, Box 697, Aztec, New Mexico, by the 10th of December following each testing season. A log form setting out the data required shall be furnished by the New Mexico Oil Conservation Commission to all testers, a copy of this form is attached hereto and made a part hereof.

IT IS FURTHER ORDERED:

That other formations in the San Juan Basin Area which may in the future be found to be productive will be provided with testing programs on the basis of formation characteristics.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JOHN F. SIMMS, Chairman

E. S. WALKER, Member

W. B. MACEY, Member and Secretary

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