BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

State of New Mexico to:

All named parties in the following case,
and notice to the public:

CASE NO. 126

In the matter of the petition of Southern Union Production Company for an order fixing the spacing of wells in the Kutz Canon and Fulcher Basin gas fields of San Juan County (as they may be extended) on the basis of one well to a drilling unit of approximately 160 acres with suitable provisions for any related matters including special approval of unorthodox well locations where necessary.

BY MR. WILLIS LEA, Attorney for Southern Union Production Company.

If the Commission please, for the Petitioner we have Willis Lea of Dallas and Manuel Sanchez of Santa Fe.

This is a petition of the Southern Union Production Company for an order of the Commission to fix a spacing program in Kutz Canon and Fulcher Basin. We have referred to them as two fields and it may be two fields, however, more recent drilling has developed the fact that the fields are contiguous. I believe our evidence will indicate, for practical purposes at least, the fields are one.

This problem of spacing has been handled rather satisfactorily heretofore because of several well known facts. During the war the P. A. W. had a spacing program of 160 acres, and this Commission conformed to it. Prior to that the activity in the area did not seem to require any particular spacing. Shortly after the war the 160 acre rule of this Commission applicable to that area was rescinded, with the result that the general spacing rule which I believe is 40 acres, with wells to be drilled 330 feet from lease boundary lines, has prevailed. This is an economic problem. We all know in a given reservoir there is only so much gas and only so much can be commercially extracted. This field is 20 years old, the first well was drilled in 1929; it has developed sometimes gradually and sometimes rapidly. The facts the Southern Union Production Company has accumulated over the years as one of the oldest operators are available to us. The Company has made its own study of spacing and what is the proper spacing in that area. This is no oil area unless you want to call the oil turned up in the so-called Farmington series.

It may be one or more of the wells might commercially produce oil from the Farmington. In fact, I know of no well that is producing oil in this immediate area. We have a gas problem. We recently employed Mr. Earl Nichols of Dallas to test our figures and reach his own conclusions; for the benefit of the Commission and others interested as to what is a proper spacing unit for that field. His conclusions go not only to the area which a well will drain, but also go to the question of the economics of drilling on the 160 acres as opposed to some smaller spacing units. I don't think we have a pro-ration problem; it is not our view to do that. We have peculiarly a spacing problem.The wells in that area that have been drilled today have been connected with a pipe line. The gas comes to Santa Fe and Albuquerque. If there are any exceptions I don't believe I know of them, and if there are the wells must be recently completed and pipe line connection in the process of being made. As we all know, gas is maintained and necessarily so from other areas; some of it comes from Barker Dome.

(After being duly sworn Mr. Earl Nichols and Mr. Van Thompson testified as follows)

MR. LEA:

Mr. Nichols, state your name for the record.

MR. NICHOLS:

Earl Nichols.

Q. You live in Dallas, Texas?

A. That is right.

Q. What is your profession?

A. Petroleum Engineer.

Q. You are actively engaged in that profession at the present time?

That is right, consultant.

Q. For how long?

A. As consultant or petroleum engineer?

Q. Petroleum engineer?

A. Since the first of 1938 - about 10 years.

Q. What has been the nature of your experience since 1938?

A. I spent about three years with Carter Oil Company in Oklahoma, during that time they put me through the training program - gasoline plant work, research work in chemical laboratory, field engineering, office and inventory courses - a little bit of everything they felt a Petroleum Engineer should have. After I left Carter I worked for Phillips in their research department for a short while; then with Core Laboratories, Inc., in Dallas. I worked for them about 6½ years as manager of the reservoir fluid analysis department.

Q. You have had experience in the study of reservoir conditions?

A. Primarily that has been the biggest majority of my work.

Q. Included the study of reserves and porosity?

A. That is right.

Q. What is your educational background?

A. I received my degree from Texas Christian University, major in physics and math, a small amount of graduate work in physics from the Washington University in St. Louis.

Q. Have you been employed by Southern Union Production Company to make a study of statistics and conditions applicable to Kutz Canon-Fulcher Basin?

A. That is right.

Q. Is this the first time you have been employed by Southern Union Production Company?

A. That is right.

Q. Were the Company's data made available to you in so far as they apply to these fields?

A. Yes, they gave me all their data.

Q. Did you find those data complete or not for your purpose in making the required study?

A. Yes.

Q. How many wells located in these areas?

A. Approximately 77.

Q. Do you know when the first well was drilled?

A. I don't have that information.

MR. VAN THOMPSON:

The first well was completed in 1927 or 1928.

Q. What would you say to have been the initial field pressure in that area?

MR. NICHOLS:

In the order of 585 pounds, might be some variation one way or the other.

Q. 585 pounds Virgin Rock Pressure?

A. Yes, sir.

Q. From your study of the present conditions of that area what do you find to be the arithmetical average of pressures presently prevailing in wells completed in that area?

A. A lot of the work was based upon the last pressure survey of April 1947. The arithmetic average pressure at that time was 385 pounds.

Q. As opposed to 585 pounds originally?

A. That is right.

Q. Would you state whether or not the pressure is likely to have declined under 385 pounds since the last test in April of 1947?

A. I think it is reasonable to assume that it would have - yes.

Q. In connection with these pressures, have you prepared a chart showing graphically the initial field pressure of approximately 585 pounds as compared with the average prevailing pressures in this field by years and also showing the initial well-head pressures of certain wells more recently completed in that area?

A. I have.

Q. Is this the study you refer to? (Presented charts)

A. Yes, it is.

Q. Will you please state what that means for the benefit of the record?

A. This particular compilation of data is divided into two areas, Kutz Canon and Fulcher Basin. In the Kutz Canon field the average arithmetic pressure in the wells producing at any given time has been plotted versus the time in years, that is the lower broken line near the middle or bottom of the page. The upper dotted line is a flat line showing approximately the initial pressure of the field. Between these two lines some of the wells have been drilled later in the life of the field. Some of them have been drilled during the last year, and the pressure in those wells is spotted in the proper position. The pressure on those wells does not lie near the 585 pound but between the 585 pound line and the average field pressure. A line has been drawn through these new wells representing an average of their pressures.

Q. Is it approximately one-half way between?

A. Yes. Not any individual well, but groups of wells by average, and it lies approximately one-half way between. There is a definite indication that in those areas where these wells have been drilled there had been pressure decline from the initial pressure, indicating you had pressure reduction out there previous to those wells having been drilled. The same would apply to Fulcher Basin.

Q. What is the conclusion or conclusions to be drawn from this type of study?

A. You have undoubtedly had, if the initial field pressure over the area is 585 pounds, and if you have drilled in adjacent areas since that time it is pretty conclusive you have had pressure decline in those areas. If you had pressure decline you have had removal of gas out of there.

Q. What does it mean with respect to the quantity of gas ultimately to be recovered from one of the wells more recently drilled?

A. The quantity of gas existing in a given unit of the reservoir is proportional to pressure existing on that gas. Whatever your pressure might be the quantity of gas you will recover is proportionate to the pressure of the gas existing. You would expect less gas from these wells drilled in lower pressure areas.

Q. If you drill a well with initial rock pressure of 400 pounds you could compute the quantity of gas which might be ultimately recovered from that well as opposed to the quantity expected to be recovered from a well having approximately the 585 pound virgin field pressure?

A. You could.

Q. In any event, to the extent that your initial rock pressure in any well is below the initial field pressure of 585 pounds, the quantity of gas to be recovered is reduced?

A. That is right.

Q. Would it be a fair question to ask you if you could approximate by a fraction of the total reserves recoverable from a given spacing unit that will not be recovered because of the lower pressure from the recently drilled wells?

A. If the average pressure is 385 pounds and the initial 585 pounds you would have a ratio of 400 to 600 pounds absolute, and would have approximately 1/3 of your gas having already been produced.

Q. That is 1/3 of the gas that originally underlay a drilling unit that has been taken out by drilling not on that unit but on adjacent units?

A. That is right.

Q. Have you prepared, Mr. Nichols, what I will refer to as pressure contour map, showing in general terms at least, the prevailing well-head pressures in this field?

A. That is right.

Q. If the Commission please, may we have identified as Petitioner's Exhibits 1 and 2 the schedules concerning which Mr. Nichols has just testified to?

COMMISSIONER MILES:

You may.

Q. We will offer them in evidence at a later time.

May we have similarly identified as Petitioner's Exhibit No. 3 the map I will refer to as a pressure contour map, dated January 7, 1948?

COMMISSIONER MILES:

You may.

Q. Mr. Nichols, I hand you this map identified as Petitioner's Exhibit No. 3, and aks you to explain the method of its preparation and give the conclusions to be drawn from it.

A. On this particular map, I took the pressures existing in April of 1947 and spotted them in their proper geographical location, adjacent to the well location. Then drawing lines of equal pressures in their proper place between these pressure points, we get what we call a pressure contour map showing the overall pressure picture of the area. The outer line is the 575 pound contour. These are in 25 pound intervals so the innermost contour is the 375 pound contour. The innermost further down on the map is the 350 pound contour. There are two "sinks", and it is rather apparent those lie roughly in the center of the two old fields, with the intervening area having remained undrilled for sometime, It is normal you would expect in the older areas to have larger pressure declines. You will notice also in the new intervening area between the two sinks. That sink is quite likely due to the influence of production from the two older areas. Another sink is forming in the upper northwest area; that is due to the total withdrawals from that area being proportionately large due to the small well spacing units.

Q. Is it not a fact that the area on the northwest is a newer developed area?

A. I believe that is right.

Q. Do you have the dates on which those wells were drilled?

A. Yes, sir. Waggoner #1, June 1946. Waggoner #2, September 1947. Copp #1 September 1946. Copp #3, October 1947. Wyper #2 January 1947

Q. All fairly recent drilling?

A. That is right.

Q. What can you say with respect to the pressure in that area surrounding those wells?

A. You have pressures existing all the way from 475 pounds to 500 pounds, which is 100 pounds or so lower than the initial field pressure. It looks like the pressure decline there is rather rapid in that particular area.

Q. Are those wells more or less densely spaced than the wells further to the south?

A. I think by observation they are more closely spaced.

Q. Any comparison between the pressure declines in these more densely spaced wells in comparison with the wells to the south which appear to be drilled on the 160 acre unit?

MR. THOMPSON:

That last record is in April 1947, and the majority of them have completed since that time.

MR. NICHOLS:

Your question could be tied back to withdrawals in any area regardless of the wells. Your total withdrawals on an area basis would give you an indication.

Q. Referring to this well in the extreme southeast portion of the field, the Feasel #1, what is its original rock pressure?

A. 565 pounds. Some 20 pounds lower than the initial of the field.

Q. Is it very close to any other well drilled in the area?

A. No it isn't.

Q. In other words, the Feasel well was drilled some distance from the other wells and you found initial pressure within 20 pounds of the original virgin rock pressure?

A. That is right.

Q. Will you compare that to some wells more recently drilled?

A. The wells in the center section, drilled a year or so ago, some of the Mangum wells, had pressures in April existing between the 425 pound and 450 pounds contour.

Q. Those were initial pressures?

A. Those were pressures existing in April 1947.
The Mangum #1 was completed in February 1947, and the initial pressure was 492 pounds, No. 2 was completed in June 1947 at 454 pounds, No. 3 was completed in July 1947 at 440 pounds.

Q. How do you account for the fact that those wells had lower initial pressure than the Feasel No. 1 well?

A. The drainage from these two adjacent areas seemingly had a great effect on this pressure.

Q. That is because production from adjacent wells previously drilled had so reduced the pressure in that vicinity that in the main portion of the field you find lower initial pressures?

A. That is right.

Q. Anything else in particular to be said about this map?

A. I don't believe so.

Q. Mr. Nichols, state whether or not the Company caused to be made an interference test at your suggestion on six or seven wells drilled in this area with a spacing unit of 160 acres for each well?

A. They did.

Q. Will you state in general terms how the interference test was conducted and what assumptions were necessary and what was found as a result of the interference test?

A. I believe my letter to Mr. Thompson dated February 5, 1948 will explain that.

(Letter as follows)

"EARL A NICHOLS
Consulting Petroleum Engineer
2000 Kidwell Street
Dallas, Texas
T3-4422

February 5, 1948

Mr. Van Thompson
Southern Union Gas Co.
Burt Building
Dallas, Texas

Dear Mr. Thompson:

"I have received the charts giving the results of the recommended field tests. These tests were performed on the Kutz Canyon - Fulcher Basin Field in order to attempt to establish a positive, mechanical answer as to whether pressure interference exists across 160 acre tracts in the above mentioned field. It was our belief that should such pressure interference exist between wells now drilled on approximately 160 acre spacing, one could accordingly feel that drainage across 160 acres tracts existed.

"Seven wells whose approximate spacing are 160 acres per well were chosen. They were the SUP Walker #1, SUP Walker #2, SUP Mc Grath #1, SUP Mc Grath #2, SUP McGrath #3, SUP Kattler #1, and the SUP Hudson #2 wells. These wells were shut in at noon January 9, 1948 and remained shut in until 8:30 A.M. January 12, 1948. At this time all of the wells except the Walker # 1 were put on production against a line pressure of 261 to 270 P.S.I. ga. At 9:00 A.M. on January 13th, the surrounding wells were taken off of the line and blown to the air, the Walker #1 still remaining shut in. A recording pressure chart on the well head of the Walker # 1 well during this test reveals the attached tabulated and graphical results.

"It is to be noticed that due to the normal cycle of atmospheric temperature change during a 24 hour period, the temperature effect on the recording instrument shows a distinctive 24 hour cycle change on the recorded pressures. To help clarify this effect, the pressures were plotted versus time of day and this graph is included. It will be noticed that, irregardless of these temperature effects, the overall curve of pressures for the second day lie considerably above the curve of the pressures for the first day of the shut in period. This is explained, of course, as being the normal build up of pressure due to the well being shut in. Likewise, the curves of pressure for the 3rd and 4th days lie respectively higher each day, showing this same build up. The surrounding wells were put on production, on the morning of the 4th day, but their effect on Walker # 1 is not significantly felt until the 5th day. It will be

noticed that the curve of pressures for the 5th day falls back below those of the 4th day, very definitely indicating pressure interference had reached the Walker # 1 from the outlying wells.

"In order to try to evaluate the magnitude of this pressure drop, an arithmetic average of the pressures the last 21 hours of the tests give a value of 401, 8 P.S.I. gauge. An arithmetic average of the pressures during the same hours of the preceding day gave 403.6 P.S.I. gauge. This is a 1.8 pound drop. This may not seem like a large drop, but after consideraing all of the reservoir factors involved, this is felt to be as large a pressure drop as one might expect.

"It is my feeling that these tests have conclusively shown pressure interference between wells now drilled on a 160 acre pattern. It is further my feeling that since pressure draw down can be experienced between such wells, drainage of reservoir material across 160 acre tracts exists under such conditions.

"If there are any points discussed on which you would like further comment, please contact me.

Very truly yours,

/s/ Earl A. Nichols

Earl A. Nichols

EAN/ly"

The Chart accompanying Mr. Nichols' letter was marked for identification as Petitioner's Exhibit #4.

MR. LEA:

Lets try to identify where these wells are located.

MR. THOMPSON:

Sections 2 and 3, Township 29; Section 34, Township 30, each in Range 12 W.

Q. Identify for us on this map the test well - Walker No. 1, outlining the spacing unit of Walker #1.

A. NE/4 Section 3, 29 N, 12 W.

Q. Will you identify for us the surrounding units on which the other six wells are located?

A. Walker #2, McGrath #3, McGrath #1, Kattler #1, Hudson #2, Southern Union Production McGrath #2.

Q. Your test well is located right in the middle of these other units?

A. That is right.

Q. Your pressures were taken on the Walker No. 1 Well?

A. MR. NICHOLS:

Yes, sir, those adjacent wells had been shut in. The pressures throughout that whole period of time were measured on the Walker Well.

Q. That is, I believe, without exception 160 acre spacing units with the well located in approximate center of the spacing unit? The fourth day is the red line?

A. That is right. The fifth day fell below the fourth day and in certain periods below the third day. The pressure during the last hour was below the third and fourth day pressures.

Q. Yet during this entire time the Walker No. 1 was shut in, the outlying wells were being produced during the last how many hours of the test?

A. Approximately 25 hours of the test.

Q. From the time the outlying wells were open to the air, how long did it take the pressure decline to be noted in the centrally located test well?

A. The remaining wells were put on the line at 8:30 a.m., January 12th at 9:00 o'clock a.m., January 13th twenty five hours later, they were taken off and put on the air, and there was approximately 24 hours remaining in this test.

Q. You regard the result of this interference test as being significant?

A. I do.

Q. Does it not indicate that not only did the outlying wells pull down their own pressures on 160 acre units - but that the outlying production also pulled down the pressure on the centrally located test well?

A. That is right.

Q. Is not each of those wells located on a regular 160 acre tract?

A. That is right.

Q. It is not noteworthy that instead of continuing to build up the test well pressure not only ceased to build up but in fact declined?

A. That is right. I think it might be expected that the well would have continued to build up for some time longer, how long I don't want to say. Might be a day or a week.

MR. SPURRIER:

How much did it drop back?

A. About 2 pounds. That is the arithmetical average in the last 21 hours.

MR. LEA:

Looking at this chart I find at the beginning of the first day a pressure of approximately 381 pounds on Walker #1.

A. It varies by the hour, it started at 381 pounds.

Q. At the same hour of the second day the well had built up to 398 pounds.

A. That is right.

Q. Approximately 17 pounds build up.

That is right.

Q. The same hour the next day it had built up to approximately 403 pounds.

A. Right.

Q. At the same hour the fourth day the build up was approximately 407 pounds.

A. Right.

Q. At the same hour the fifth day I find a very noticeable pressure interference had been commenced.

A. That is right. It was at that hour of the fifth day that the interference began to show up. There was undoubtedly some effect after the fifth day.

Q. From the data available, has it been possible for you to compute the total gross number of cubic feet of gas which should be expected to be in the reservoir under 160 acres of land?

A. Yes, it has been. There are certain assumptions one frequently has to use. An attempt was made to calculate the actual reservoir gas in place from the available reservoir data.

We had one set of core analysis data on the Cozzens #2 well. This is certainly a minimum amount of core analysis.

Sample Number	Permeability Millidarcys	Porosity Per Cent
1	98	18.3
2	92	16.7
3	74	23.3
4	90	18.6
5	102	14.3
6	10	9.8
7	51	12.3
8	83	9.6
9	59	17.5
10	5.5	8.1
11	18	20.5
12	16	19.3
13	8.6	19.5
14	10	18.3
15	18	17.7
16	11	16.3
17	18	19.1
18	15	10.3
19	44	15.5
20	17	18.5
21	50	19.2
22	95	12.3
23	118	13.1
24	340	11.1
25	423	19.5
26	160	16.2
27	6.5	6.1
28	15	18.5

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reservoir initially.

That is the total gas in place. Below a certain pressure this field cannot be operated economically. We set it at 150 pounds. The net gas that can be taken from the reservoir between 585 pounds and 150 pounds is 1,361,000,000, or about 72% of the initial gas in place.

MR. CASWELL SILVER - Florence Company:

Would you consider all of those permeabilities as being within the effective pay?

MR. NICHOLS:

There was no consideration made as to the permeability in determining the effective pay. I presume you are referring to the thickness data. It was taken from the various drilling logs available and one or two electric logs were taken into consideration.

The amount of gas - net gas you might expect to recover between 585 pounds and 150 pounds, multiplied by 5¢ per thousand cu.ft. and allowing for State taxes, royalty and production tax brings the net down to about 84¢ which would give gross income irregardless of time of about $56,000 per 160 acre block. That does not give any consideration to operating expense or the present worth of a dollar. A lot of these dollars are going to be obtained a number of years hence. This is simply the gross income minus royalty and tax. The cost of drilling wells would be roughly $16,000 per well varying from person to person. That would allow a ratio of dollars returned on your investment of about 3½ to 1.

If you will take 160 acres at the present pressure average of the field of 385 pounds. The ultimate total income to be recovered over the years would be $30,000 after deducting royalty and taxes, but without giving any effect to operating expenses or other factors.

MR. SILVER:

That is assuming initial well-head pressure of 385 pounds would give you a ratio of about 1.9?

A. Yes - it would give you a ratio of about 1.9 to 1. If we look at it as a 40 acre drilling unit and calculate the ultimate returns you might expect in the order of $14,000 with the initial pressure of 585 pounds. If the well cost you $16,000 you would be in the red to begin with. If your well was drilled in an area with 385 pound pressure your total revenue would be in the order of $7,500 and your well would still cost $16,000.

MR. LEA:

Mr. Nichols, would you care to express an opinion from the studies made and data reviewed - whether or not one well drilled on 160 acres at approximately the center could be reasonably expected to drain in this field more or less than 160 acres or exactly 160 acres.

A. I feel the material we have looked at here has shown that the drainage from one well is adequate for a 160 acre block. You will be able to drain a 160 acre block with one well.

Q. Are there any instances where the gas produced from one of the older wells in the field exceeds ~~the field exceeds~~ the calculated quantity of gas initially in place under 160 acres.

A. There are several wells whose total production to date has already either exceeded or been very close to the 1,878,000,000 cu. ft. of gas in 160 acres. The Browning and Stewart No. 4 well has produced over 2 billion cubic feet; that well still has 305 pounds of pressure and will undoubtedly produce still more gas.

MR. ENGLISH:

Who owns that well?

MR. THOMPSON:

We do now - Southern Union recently bought it from Browning and Stewart.

MR. NICHOLS:

Angels Peak, the 9-B and 10-B - between the two of them there has been 2,600,000,000 cubic feet of gas in 160 acres, and one-half of this is 1,300,000,000 each, which is approaching the 1,878,000,000. Summit #1 has produced 1½ billion and the Summit #2 has produced 1-1/10 billion. The Cornell wells 3 and 4 have together produced nearly 1½ billion, one half of which for each well is 7/10 billion with 373 pounds pressure remaining.

MR. ENGLISH:

Where you are drawing more gas off one well, would that make a difference in your pressure? Your pressure would be lower than where you did not have to draw as much gas?

A. Yes, especially if you did not have any gas from other areas to help re-build your pressure. Those pressure sinks had been influenced from some adjacent areas. This is indicated by the pressure build-up. There have been times when some areas have been shut in and have had a considerable build up, indicating you have had pressure build-up from these outlying areas.

MR. LEA:

In making assumptions necessary to compute the total reserves of gas under the 160 acre tract you have taken such data as was available?

A. That is right.

Q. Where assumptions had to be made were you on the long side or on the low side in making your estimate.

A. I feel in all these estimates we have been optimistic in making the necessary assumptions for computing reserves.

(EXAMINATION OF MR. VAN THOMPSON)

MR. LEA:

Your name is Van Thompson and you live in Dallas?

MR. THOMPSON:

Yes, sir.

Q. You are employed by the Southern Union Gas Company and the Southern Union Production Company?

A. That is right.

Q. How long have you worked for Southern Union?

A. Since 1930.

Q. What is your present capacity?

A. I am Chief Engineer of the Company in charge of production for all properties.

Q. Are you familiar with the gas situation in Kutz Canon and Fulcher Basin?

A. I have been personally familiar with it since 1932.

Q. Is it, at the present time, under your personal supervision?

A. Yes, sir.

Q. Are you familiar with the statistics and data in the way of gas production, open flow capacity, pressures, etc.?

A. That is right - our Company has accumulated this information by years since the beginning . We had a practice instituted of shutting all wells in for a week and took pressures during that time every year.

Q. Was that the data made available to Mr. Nichols in the course of his study?

A. Yes, sir.

Q. You have heard Mr. Nichols testify, are his findings made in connection with the study of this field - have they confirmed or altered your own conclusions?

A. Yes, it has convinced me that on a lot of the wells we have drilled in the middle of the field on closer spacings we will never get our money back out of them - it isn't economical.

Q. Did your figures on the total reserves of gas on 160 acres correspond with the figures Mr. Nichols has given us?

A. I would say, if anything, they would probably be a little less.

Q. Your figures would be less than his?

A. Yes, sir.

Q. What experience have you had in connection with unitization or more simple form of commutization of separately owned tracts?

A. Well, during the last 1½ years we have unitized about seven different tracts into 160 acre drilling units. These have included fee land and federal land, so far they have not included any state land.

Q. Have you used the so-called short form of commutization agreement in these?

A. Yes, sir.

Q. Has your experience been satisfactory or unsatisfactory?

A. So far it has worked very well, it hasn't taken long to get them approved.

Q. Have you commutized federal land with fee land?

A. Yes, sir.

Q. How about commutized with federal and federal?

A. I think we are working on one at the present time but it isn't completed.

Q. In general, your experience has been good and delay has not been too bad?

A. Right.

MR. LEA:

If the Commission please, we would like now to offer in evidence Exhibits which have been identified as Petitioner's exhibits 1 to 4 respectively.

COMMISSIONER MILES:

Exhibits received.

MR. LEA:

Mr. Foster Morrell wrote a letter regarding this proceeding in his letter suggested he would have no objection to the use of it in this proceeding. It may be well known that Mr. Morrell, and I presume his predecessors, have participated to some extent in the 160 acre spacing condition which generally prevails at the present time.

He writes under date of February 10, 1948 - -

"UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

P. O. Box 997
Roswell, New Mexico
February 10, 1948

Mr. Willis L. Lea, Jr.
Southern Union Production Company
Burt Building
Dallas, Texas

Dear Mr. Lea:

"Reference is made to your letter of January 26, enclosing for our information a copy of Southern Union Production Company's petition forwarded to the New Mexico Oil Conservation Commission requesting an order, after notice and hearing fixing spacing requirements for wells hereafter drilled in the Kutz Canyon-Fulcher Basin gas fields, San Juan County, New Mexico. You requested our opinion concerning the proper spacing of wells in these fields.

"The essential facts presented in your petition are substantiated by the records of this office, and, accordingly, this office concurs in your request for the establishment of a well spacing plan with a minimum of one well to 160 acres to promote orderly development without waste in the Kutz Canyon and Fulcher Basin gas fields.

"As most of the lands in these fields are public lands of the United States, it is the desire of this office to encourage uniform and economic development and greatest ultimate recovery of gas from these fields. This can be accomplished only so long as areasonable profit can be secured from capital invested. Federal leases have been developed generally on a well spacing pattern of one well to 160 acres, except where necessary to protect properties from closer spacing by offset operators.

"Only where the market demand and marketing facilities are unlimited for continued expansion with the completion of additional outlets or producing gas wells can necessary profit be obtained to continue development. These conditions are not present in the fields under consideration. Hence the drilling of unnecessary wells does not proportionately increase the ultimate volume of gas available for sale but instead tends to reduce the margin of profit of all wells in the fields and to discourage proper development of the fields.

"Future development at a well density consistent with the majority of past development is essential to prevent injury to neighboring leases or properties and to protect equities involved.

"There is no objection to your use of this letter in connection with your petition to the New Mexico Oil Conservation Commission. As this office is very interested in the subject, I expect to be present at the hearing in Santa Fe on February 17.

Very truly yours,

/s/ Foster Morrell

FOSTER MORRELL
Supervisor, Oil and Gas Operations"

MR. LEA:

I would like to have this in evidence as Petitioner's Exhibit No. 5. I believe that is all we have at the present time.

(Exhibit No. 5 admitted).

DUDLEY CORNELL:

I would like to ask Mr. Nichols is it a fact that the conclusions which you have drawn from your work here would support an application for pro-ration of gas in this field on a 160 acre basis just as fully as it does on 160 acre spacing?

A. My conclusion is that there is adequate drainage by one well on a 160 acre block.

Q. The petition here would really prevent the wells being drilled on 40 acres - have you given any thought to the wells on 40 acre spacing?

A. My purpose was to determine if adequate drainage can be obtained by one well, on a 160 acre block.

Q. If 160 acre spacing in this field is used, do you have any suggestions in handling the present wells on 40 acre spacing?

A. I have not given the problem any consideration. I think you will find some precedent set up, however.

MR. LEA:

We have always visualized this matter as a spacing matter. For that reason I am sure Mr. Nichols has not approached it on pro-ration.

MR. CORNELL:

I cannot see how the two problems can be separated, I was wondering if you would ignore the situation.

MR. LEA:

I would make a statement - Here is the way we see it, this field is 20 years old or more. It has been growing and developing by fits and starts ever since, but it is an old field with a rather loose spacing regulation which has prevailed during most of the time. It is only natural there have grown up several inequities where the spacing of units is too close to larger adjoining units. I have your situation in mind among others. Pro-ration may have to come to the Kutz Canon-Fulcher Basin field on a proper pro-ration proposal. I can say now my Company will have no objection to pro-ration but we will be very much interested because of the additional burden cast upon us by pro-ration, and I think the Commission will be very much interested because of the additional burden of administering pro-ration.

MR. CORNELL:

You have referred to my own situation, makes it personal - I would like to ask Mr. Thompson one or two questions.

You have an 80 acre lease on which you have two wells known as the Cornell-SUG 3 and 4?

MR. THOMPSON:

That is right, yes, sir.

MR. CORNELL:

And that 80 is entirely surrounded by acreage I am interested in.

MR. THOMPSON:

I am not sure it is surrounded on the south.

MR. CORNELL:

Yes, sir. How far do you think those two wells are draining?

MR. THOMPSON:

They are draining considerably more than 80 acres.

(CONTINUED ON PAGE 17)

Q. In this study you say it is draining across [illegible] 160 acres, would you say this draining would go ½ mile from the well

A. No, I wouldn't say it is draining that far. That would be a half section in each direction.

Q. Presupposing 160 acre spacing, the drainage would go across the next 40 acres?

A. Yes, sir.

Q. A well located such as that would at least drain the 40 acres adjoining it?

A. That is correct.

Q. With an 80 acre lease - 2 - 40 acres on east, west, north and south, 2 - 40's plus the 80 you have, your two wells would be effective draining 640 acres?

A. In the petition we are asking for 160 acres minimum spacing and the purpose is to prevent what is happening right there.

Q. I am simply making a little argument for this pro-ration; wouldn't it be true those two wells would be draining effective 640 acres.

A. Possibly so. We are contending one well would drain 160.

Q. If your spacing rule is put into effect without pro-ration those two wells will continue to drain 640 acres.

Mr. Lee:

I don't believe the witness is in agreement with you that the two wells were draining 640 acres. It is conceded that one well will drain 160 acres.

Mr. Hill:

You make a presumption that Mr. Nichols has proved that. I don't believe the Commission has yet admitted that.

Mr. Lee:

My statement was I did not think the evidence submitted would substantiate the idea, or that the witness agreed, that the two wells would drain the 640 acres.

Mr. Hill:

No one has admitted that a well would drain the 160.

Mr. Lee:

We are willing to grant to Mr. Cornell the two wells referred to do drain more than the 80 acres on which they are located.

Mr. Hill:

You are willing to admit that the Commission has not agreed?

Mr. Lee:

Mr. Silver, I can't make any statement binding on this Commission.

MR. CORNELL:

I agree with the witnesses from the standpoint of the economics of drilling these wells on the 40 acres, but ths spacing rule without a follow-up with a pro-ration order, I think is just doing one-half the job, and creates additional inequalities. I would like to suggest what we need for this field is a pro-ration order, ratable taking and common purchaser act. I would like to suggest to this Commission that some leader appoint a committee to present such legislation for the next legislature, that it be carefully prepared and operators have a chance to voice their suggestions and at this next legislature all the operators combined with their influence, to the end we do obtain a common purchaser and ratable taking law for gas. I think there has been changeon some operators in this subject. I think it ties into this application here.
I would like to ask another question - Mr. Nichols, with reference to your interference test of the seven wells, isn't it a fact that the original pressures on those wells differ and that their open flow potentials are different.

MR. NICHOLS:

That is right, I am sure it is.

Q. Very considerable difference isn't there?

A. I can check them and see.

Q. I would like to develop more fully in the economics in those wells, the amount of gas withdrawn and their open flow potentials.

A. In the interference test all the measurements were made on one well, the Walker No. 1. Irregardless of the open flow potentials and the pressures on the surrounding wells the pressures on this well built up to the fifth day and then dropped back. The only difference which the open flow potentials of the surrounding wells might make would be in the quantity of gas produced from them during the test, which in turn might influence only the magnitude of the pressure drop during that time.

MR. THOMPSON:

Hudson #2 well had an open flow in January 1948 of 560 MCF, McGrath #1 of 416 MCF, McGrath #2 140 MCF, McGrath #3, 396 MCF - Walker No. 1 584 MCF

Q. I did not have in mind proving anything particularly, but thought that information should be in the record.

MR. SILVER:

How are these wells gauged?

MR. NICHOLS:

The Walker No. 1 well had a recording instrument on the well head.

Q. What kind of recording instrument, dead weight?

MR. THOMPSON:

Bristol Spring Gauge - recording gauge.

Q. Mr. Nichols, you are familiar with spring gauges. To your knowledge isn't it true spring gauges have variation of five to 10 pounds. In use of spring guages they have to be tested against larger tested gauges?

A. That is true in any type of gauge.

Q. In Sections 11 and 14, township 29 N, range 10 W, wasn't there considerable variation in rock pressure when the wells were brought in?

A. I think that is brought out in the exhibit showing initial field pressures and pressures of wells drilled later in the life of the field.

Q. Isn't it true that the pressure measured on a well is in part functional of the length of time in which that well is allowed to remain idle?

A. Your build-up time certainly affects the pressure measurements.

Q. Isn't it also true that the permeability changes and that the lower the permeability the longer the pressure build-up required to reach stabilization?

A. I am not aware the permeability changes in a given field.

Q. I have the permeability as given me here. (Quoting certain figures noted from evidence).

A. The permeabilities you are reading there are indivudual measurements on individual feet - one sample for each foot. That is normal in any kind of reservoir. Permeability of a given foot is constant and does not change during life of the well.

Q. Isn't it true the permeability in this well, which is the only well in the field that has core analysis, is not a good test of the permeability?

A. In what manner?

Q. In that one well, if the variation of permeability is so great from foot to foot vertically, then conceivably the permeability from foot to foot horizontally is just as great.

A. Getting back to your point, it is true that the amount of our core analysis data is on the low side. I pointed out early in my discussion that we had in that instance a minimum of data, and that we had to assume certain things - for example the deviation factor.

Q. I have no objections to your deviation value.

A. Along that same line of thought we have a minimum of permeability data but we used what we had, which is the best we can do.

Q. The point I was attempting to bring out was the very serious effect permeability would have on your concept of drainage across 160 acres - I wanted to point the manner in which they affect that.

A. I think we can approach it from this angle; the permeability is a measure of the rate at which a well can produce, but not a measure of the total amount it will produce. Permeability times feet will be an index of the open flow. Potentials on every well in the field are not exactly the same.

Q. That is exactly right.

MR. THOMPSON:

Would you mind stating what you think minimum spacing should be?

MR. SILVER:

We have a field of our own on which we own considerable part or majority of acreage in the San Juan Basin that has almost exactly similar reservoir conditions. Any decision the Commission might make with respect to your field will certainly have a bearing on a field almost exactly like it geologically. We have no opinion as to what the well spacing should be in this field, we are only interested in finding out what the most economic spacing would be.

Therefore, we are vitally interested in this case. That will determine what the economic spacing is in our field. Therefore, I want to bring out some of the inadequate data presented by Mr. Nichols. The fact that an additional test should be made which may aid the Commission to determine the type of drainage on 160 acre spacing they would want, but by 160 acre spacing the data presented today, I do not think is adequate. By meeting with Mr. Nichols I believe we could find out.

MR. NICHOLS:

Back to about the last point I made in regard to total production from certain blocks - that is based on porosity. It does not tie back into permeability or productivity.

MR. SILVER:

As I stated before, I thought you were over generous in the amount of gas in place.

A. That fact tied with the actual production from some of these wells is pretty hard to overlook.

MR. SILVER:

Let's go into the problem of reservoir development - each well is a sink and each field is in itself a larger sink within a known gas area. I think there are men in this audience who know there have been wells drilled outside this field which have encountered gas and that gas has been non-commercial. It is entirely conceivable this is the only commercial gas production in the area. If you have a sink here what is the optimum number of wells draining this basin.

A. That is an economic problem. I think the productivity of the wells is related directly to permeability. I think the fact that there has been greater production from these wells on the 160 acre block than the total original gas in place proves very definitely drainage across those areas.

MR. SILVER:

I do not believe this whole heartedly myself, but as a point of reasonable doubt, Mr. Thompson, you have drilled many wells in the area, the United States Geological Survey in its professional paper No. 134, by Mr. J. B. Reeside, Jr., gives the thickness of the Picture Cliff sand zone in this zone between 75 and 225 gross feet.

MR. THOMPSON:

The gross and effective thickness are two different things.

MR. SILVER:

Q. We have cored as much as 25 feet of such sand and found the core bleeding gas all the way.

MR. THOMPSON:

This appears in wells of that type as well as wells of thicknesses of 10 and 12 feet.

MR. SILVER:

Q. You get some influx of drainage of gas upward from the lower permeability zones?

A. Is it in the lower part?

MR. SILVER:

Q. Usually it is in the lower part but you get streaks of higher permeability with lower permeability.

MR. CORNELL:

Mr. Nichols, you stated in your opinion 72% of the gas underlying 160 acres would be withdrawn under 160 acre spacing - how much do you think under 40 acre spacing?

MR. NICHOLS:

I said it was, if we want to assume the abandonment pressure of 150#, it would be 72%.

Q. What would be the recovery from 40 acre block as compared to 160 acres?

A. You would have ¼ as much gas.

Q. How much gas is going to be missed in the sand - approximately 28% of the gas?

A. It would be the same percentage if your pressure was brought to the same pressure regardless of size of the unit.

MR. SILVER:

You could withdraw more gas on 40 acre spacing than 160 acres.

A. That is an economical problem. I don't know why you could.

Q. This isn't economics, I am just helping Mr. Cornell get his point.

A. You could take it to absolute zero pressure but you would be there an awful long time.

MR. ENGLISH:

Finishing the wells - the Picture Cliff wells have all got coal and water just above the pay zone. I wonder if it would make any difference in the finishing of the well - if it would make any difference in your pressures. We drilled a well and got ½ more gas - we cemented off some of that gas, I wondered if that would make any difference in your pressure?

A. If you cemented the casing above that water it would make some difference.

Q. Some of these wells you are getting your figures off of - if they are wells of bad completion jobs and have some water in the well bore.

MR. THOMPSON:

We have siphon lines in every one, even then we get pressure that will be 10 to 20 pounds low.

MR. NICHOLS:

If your well bore goes into the main part of Picture Cliff sand your build-up on that well is determined by the permeability - your pressure would be all right.

COMMISSIONER MILES:

One question was asked I did not get the answer on - someone asked if it would be more complete recovery of gas with a well on 40 acres than 160 acres.

MR. NICHOLS:

If your pressure over the whole block, whether it be 40 or 160 acres, is drawn down to 150# your gas recovery percentage would be the same-recovery of gas from a 40 acre block would be ¼ of the gas recovered from a 160 acre block.

MR. LEA:

Let me get this question clear - take a 40 acre unit as opposed to a 160 acre unit. If during the commercially productive life of this field you had one well on 160 acres as opposed to one on 40 acres, in the center of each unit, and no drainage between the units, would you be able to get from a 40 acre tract more than 25% of what you would get out of a 160 acre tract - during the productive life of the entire field. For your ultimate productivity of gas during the productive life of the field would recovery be substantially greater in the case of four wells equally spaced on 160 acres than with one well in the center, or

is it just a question of time?

MR. NICHOLS:

If your pressure is stabilized, if you draw down that whole area to 150# the same in any geographical area, if your complete 40 acre block is drawn down to exactly 150#, you would get ¼ of what is recoverable on the 160 acre block drawn down to exactly 150#. Those things are true because equal withdrawals in a given unit will be as your pressure is drawn down; just the same in a large area as a small. You will get the gas out one way or the other. It is this question of drainage from 160 acres being adequate and I believe it is.

MR. LEA:

Given a reasonable period of time, which might be measured by the economic life of the field, would your pressure equalization of 160 acres with one well be substantially all the way across that 160 acres?

A. If your permeability from one area to another is substantially the same, whether foot by foot does not matter - the permeability times the feet is uniform geographically, the answer is yes.

MR. LEA:

Would you be able to state from the study of this field and from the data available that there exists, generally speaking, that type of permeability - are you satisfied there is drainage across 160 acre tracts by virtue of permeability of the areas?

A. I believe about the first thing we introduced was that those wells drilled later in the life of the field had initial pressures considerably lower than the field initial of 585#. Those were taken where they might happen to hit and have indicated that generally speaking you have sufficient permeability for drainage over large areas.

MR. ALBERT GREER:

In your first exhibit you have shown these wells - the new wells come in with pressure between the old field pressure and the initial field pressure. In other words, you found a pressure differential which here approximates 100#. You made the statement that the wells would probably have to be abandoned at 150# pressure which I assume to be the seven day shut-in pressure you have recorded.

MR. NICHOLS:

I do not believe I stated that they had to be abandoned at 150#. This 150# arbitrarily has been set as possible abandonment pressure.

MR. GREER:

There would still be a pressure differential between the old wells and new wells.

MR. NICHOLS:

These wells vary from well to well. Even drilled at a given time there is as much as 70# difference from well to well. It would depend on where you drilled your well.

MR. GREER:

Too, isn't the differential increasing as the pressure in the old field declines.

MR. NICHOLS:

Magnitude, yes. It is not declining by percentages.

MR. GREER:

At 150# for the field we may expect a differential of 150 or 200#.

MR. THOMPSON:

I don't think there will be any new wells at that point.

MR. GREER:

I was assuming there would be - doesn't that 200# represent additional recoverable gas if the wells had been drilled on closer spacing?

MR. THOMPSON:

If you found a position to drill where that was true - but that would be uneconomical, don't you think?

MR. GREER:

I think that ought to be decided by the Commission. Approximately 3/4 of the gas originally in the place would still be there.

MR. THOMPSON:

This well - a theoretical well - what is the actual pressure - 150 plus 200# - - -

MR. GREER:

Would there be a greater recovery of gas with denser spacing - there will be more, just how much you are just about to figure out.

MR. NICHOLS:

If your pressure is 365# and initial 600# you would have approximately 61% of your pressure remaining or approximately 1,100,000,000 cu. ft. of gas. At 150# we have a little over 500,000,000 remaining, which would amount to a difference of 500 or 600 million that could be obtained between 365# and 150#.

MR. GREER:

Which represents a very large volume of gas when you consider a large field.

MR. NICHOLS:

On a 160 acre block at 5¢ a thousand, it would be about $30,000 derived.

MR. GREER:

If the operator could reduce the cost from 14 or 15 thousand dollars to 10 thousand dollars he would have a ratio of 3 to 1 and could do it economically.

MR. NICHOLS:

If your drilling cost could be reduced that great, those conditions would hold true.

MR. GREER:

That is one thing possibly an operator could do.

MR. NICHOLS:

It doesn't prove that closer spacings would recover more gas - if your pressure reduction is such that you have equalization of pressure of 150# over the entire area you will recover the same amount of gas regardless of well density.

MR. GREER:

The information you present here does not substantiate that fact. The wells open with most bottom hole pressure and the well you were testing had a draw down, very small draw down compared to very many of the oil and gas fields in the state.
We have a great draw down but spacings are not changed. The operators believed they would recover more oil or gas due to the fact that they get greater production. Draw down of approximately 400# in adjoining wells that caused draw-down of 2# in the adjoining wells was very small.

MR. NICHOLS:

But is an indication of differential.

MR. GREER:

You will have that anywhere in the United States. The question is one of how much will it draw down and how much will it affect it.

MR. THOMPSON:

I think these wells shown in the outlying area - show that.

MR. GREER:

What percentage?

MR. THOMPSON:

It is 150# compared with 600#. You are assuming pressure of some theoretical amount in the outlying area.

MR. GREER:

You do not have evidence to support that and we don't know it will do it.

MR. THOMPSON:

You have got drainage across there.

MR. GREER:

Drainage, but how much drainage and at the end of the time how much gas is left in the reservoir that you could have produced?
Spacing on 160 acres it would be adjoining wells on your spacings. We can take wells in most of the fields of New Mexico and West Texas and you will find the same type of pressure interference between wells on adjoining units. That factor alone is not sufficient evidence, it is a minor important consideration. The well spacing itself - it is going to result to the unrecoverable gas and cost of drilling the wells. There is a question it will be a considerable amount of gas left.

MR. THOMPSON:

I don't follow you. If you drilled a well on 160 acres - we are going to abandon that particular well at 150#, you could not possibly have 360# pressure inside the unit.

MR. GREER:

We are not talking about new wells - two or three miles in some cases, in most cases they are off to the sides - the average.

MR. THOMPSON:

In some cases they are 160 acres from the old wells.

MR. GREER:

When you have that you have no differential at all.

MR. THOMPSON:

All these wells had not been produced at all when this was taken. That was a dead section, no production being taken out there at all.

MR. GREER:

Let's take a close one - 416#, that is a difference of 60# on a 160 acre unit.

MR. THOMPSON:

This well wasn't being produced at the time. It had just been drilled. When you connect it with the pipe line it will immediately start declining. You would have an area of 1/4 or 1/2 mile - everywhere else where you had a well connected with the pipeline it will be coming down in pressure.

MR. GREER:

So would the well drilled five miles away, but how far would it deplete the area? Mr. Morrell said something about inadequate market for all the wells and the drilling of additional wells would further decrease the take from any individual well. It was his opinion 160 acre spacing would tend to alleviate that situation. It appears to me 160 acres would tend to aggravate rather than alleviate. There are a great many wells now drilled that lie on the inside of any particular block but the company drilled the well, which is greater than 1320 feet from the edge of the lease. This well then does not force the offset on the adjoining lease. If the 160 acre spacing is taken up a great many more offsets will be forced and required than is now existing in the field on 40 acre spacing ruling. If we take this information presented today as correct, a man would have the right and privilege to say to the land owners - I do not believe I can economically drill this well on 40 acres - it is possible he can unitize with someone or he would have a reasonable excuse for not drilling a well himself. 160 acres, he would not have the excuse or reason for not drilling the well and you would have additional wells drilled not forced or required. I think for the 160 acre spacing you require some 30 or 40 offsets in the field.

MR. LEA:

You assume that if the requested order is entered, any 160 acre unit which abuts a 160 acre unit you have got to have a well drilled on it?

MR. GREER:

I presume that to be so, if the Commission passes this ruling. It is now a 40 acre ruling and I believe it would be the same for 160.

MR. LEA:

Q. If you are predicting what the government is going to do that is one thing, but if you are asserting the necessity for such offsetting I would be inclined

to disagree with you.

A. The government thinks this is the logical thing to do. It will depend on how your lease is written up. I believe they are federal leases in the Kutz Canon area - - -

MR. ENGLISH:

The majority of them.

MR. GRIER:

I believe this should be taken into consideration.

MR. THOMPSON:

Nichols and I checked the amount of gas withdrawals from the two fields for last year. The average take from the whole field was 17% of its open flow.

MR. GRIER:

You feel any wells in those fields would be granted an allowable to what it has been in the past, regardless of the production and spacing.

MR. THOMPSON:

I did not follow you at all.

MR. GRIER:

I believe if you will show the government acreage in these fields you will find approximately 15 or 20 additional locations which will be forced if the 160 acre ruling is upheld.

MR. THOMPSON:

Why on 160 if it is not being forced on 40?

MR. GRIER:

Some of the wells now drilled are more than 1320 feet from the edge of the lease.

MR. THOMPSON:

I believe that is a problem of the United States Geological Survey.

MR. SPURRIER:

Al do you mean to say that the distance of 1320 feet is the offset distance. If I am drilling a well closer than 1320 feet to your acreage then you will be forced to drill an offset. - By whose rules and regulations?

MR. GRIER:

Mr. Morrell will you contradict or add to that?

MR. MORRELL:

I would like to make my statement all at one time.

MR. SPURRIER:

Is it reasonable to believe that the price of gas in this area will remain at 5¢ per thousand and if so how long. I am not being

facetious in the least - Mr. Nichols' figures were necessarily predicted on 5¢ a thousand but also the prices were assumed.

MR. GRAHAM:

Additional recoverable gas left in the ground more from it and possibly additional wells. Just how much gas would be left is the question.

COMMISSIONER MILES:

The point I am interested in is as to the recovery. It may become more valuable - but the recovery is what I am interested in.

MANUEL SANCHEZ:

Wouldn't your regulations have to be changed then? It is a matter to be considered at the time. When the time comes if you can recover it below 150# economically, isn't that the time to come in and pass regulations?

COMMISSIONER MILES:

If it could be recovered now that would be the time to consider it.

MR. SANCHEZ:

Has there ever been any basic figure fixed upon which recovery at the present time could not be had economically?

MR. NICHOLS:

I think that varies both with your drilling cost and operating expense in any given areas; I think it would be considerably misleading for me to try to give a point such as that.

MR. GRAHAM:

It is conceivable all gas could be recovered on 160 acre basis - it is better for the operators to get together and decide among themselves as to what they prefer. Certainly an operator is not going to drill a well closer than he feels he can recover gas economically in and at the same time he would like to be able to drill on smaller area if he feels he can.

MR. LEA:

Mr. Commissioner, I would like to make a statement. Mr. Spurrier asked the question regarding the price of gas. We don't know what is going to happen to the price of gas in San Juan County or any other location. We only know the price of gas in this general area has increased within the last 18 months from 3½¢ to 5¢. The concensus of opinion among producers is that the price of gas will increase. We all know the value of gas in a given area depends on many factors, not the least of which is the amount of gas available in that area. I don't know whether 150# or 100# or some other figure is the abandonment pressure for this field, but it strikes me that the operating costs of the producers or of the gathering company is a real and positive barrier, not only on the value of the gas but on the abandonment pressure for the field. Unless I am badly informed, I believe Southern Union Production Company in its operations in this Kutz Canon - Fulcher Basin area is required to visit every well on a daily or twice daily basis for the purpose of checking the well as to its operating condition. Having operated up in that field for a long time it has been our view, as evidenced by our own operations, we have operated on a basis of one well to 160 acres - we believe one well will reasonably and economically drain 160 acres. Anyone is entitled to his views, and ours should not necessarily prevail; however, we have gone to some effort to either confirm or modify our own conclusions and while it is probable that in any given period you can get more gas out by putting four wells on 160 acres; it is also true and cannot be denied that you do have drainage, counter drainage, cross drainage and drainage

from wide areas. If the present spacing rule prevails - I have heard some comments that made me wonder whether someone would really like to see 240 or 320 acre spacing, but so long as the present 40 acre ruling prevails in these fields some 20 years old - where pressures have declined without exception because of adjoining wells - we contend there is ample drainage across 160 acres. 1/3 of the gas has already been taken out. To leave the spacing like it is will permit or perhaps encourage the drilling of wells on a 40 acre basis, and is actually going to reduce the value of gas produced from that field because of additional operating cost, ultimately, to the man interested in getting value from that gas. My people are convinced we should have had 160 acres in the field all the time. To a large extent we have, in fact, operated on the basis of 160 acres; it is the smallest area that we think is a proper spacing unit. It isn't really feasible to try to unitize any smaller, but if you did you would almost be compelled to go to 40 acres. There might be some gas in remote areas that will never be recovered but we cannot see the economics of it. We can see it is liable to permit and encourage the operators to drill to their own self-destruction. I think we are all interested in getting the most gas for the least money. We want all the gas we can produce consistently with reasonable investment. It will naturally take longer to get that 71% of the total reserves out of one well on 160 acres than it will take with one well on each 40 acres; as pressures get lower and lower it is naturally going to produce less.

With the Southern Union Compressor Station serving this area - it is now some 2000 HP - and the gathering lines and with 160 acre spacing prevailing we aren't concerned about our ability to get the gas out of there. There is a definite danger to anybody owning and operating in that field under a spacing rule that will permit the drilling of wells on 40 acre units. We have just had an example of it - we have some wells located on like units, under the rule of the Commission and don't criticize it. Under your rules, however, it was proposed recently to drill a well up in the nock of three 160 acre units 330 feet from each of them. Such well would require a 3 way offset and that kind of thing isn't even 40 acre spacing. We would be forced to pay compensatory royalty or drill three wells to offset - I am sure my figures are right and the distance between those wells is only 660 feet. If that is not 10 acre spacing I am badly mistaken. It is this very situation that brought this matter before this Commission. The well was re-located before it was commenced and put in the center of a 160 acre unit. We sincerely have brought this thing to the Commission because we felt that something had to be done. We are drilling in an old area where 1/3 of the gas is already gone. As to the old wells on small units, the wells were drilled properly and lawfully at the time. They are there and if we had it all to do over again we wouldn't drill them in some cases. Whether that is true with some other people I don't know, but there the wells are and we cannot do anything about it. We do know that one well will drain more than 160 acres of land if given a reasonable opportunity in point of time. We suggest 160 acres because that is the generally established spacing.

COMMISSIONER MILES:

Anybody else like to ask any questions?

(No response)

Let me get one point straight - as an overall picture, I was talking about the matter we were discussing at that particular time pertaining to whether or not you could produce more gas from 4 wells on 40 acres each than 1 well on 160 acres.

MR. LEA:

I would concede it is manifest that in the same period of time you can extract more gas on 160 acre tracts by drilling 4 wells than one well. It is the limiting factor of the open flow. I think everyone realizes that they can produce more gas per day with 4 wells than one. Our problem is to find an optimum spacing unit being the reasonably adequate and economical unit for the field. We certainly cannot produce more gas ultimately from 4 wells than from one located on a 160 acre unit.

JUDGE SETH:

On behalf of the Stanolind Oil Company I am instructed to advise the Commission they have no objection, but believe the spacing should be larger than the 160 acres in these pools of gas.

DUDLEY CORNELL:

Mr. A. Greer has been informal chairman of independent operators, and he asked me to ask that a copy of these exhibits be made available - and that the independent operators be allowed a rebuttal at the next meeting of the Commission.

MR. LEA:

I don't know what that means exactly, but it strikes me a little singular. We went to the extreme of mailing to each person a copy of our petition with the suggestion that we exchange information with a view to ending our business properly at this hearing. I do not comprehend exactly why it should be necessary under those conditions - adequate notice has been given and we had no request from anyone for information. We did not hear from Mr. Cornell. We are not denying the opportunity to anyone to be heard in this matter, but I believe the opportunity has been given.

MR. SILVER:

I would like to make a statement for my employer. As I said before, we have no particular desire about well spacing other than the most economical. We have a peculiar problem in San Juan Basin of having a like permeability of sand structure, productive areas which are not too well understood to the present day. We do not particularly have any preference in this field, we have a small amount of acreage on which we probably will never drill. We would like to see, if possible, additional data on this field as time goes on. So far as the 160 acre spacing is concerned, it is entirely feasible that a greater or lesser spacing might be desirable. That should be determined from the economic facts. We would like to see the data given here today given to us in some form.

COMMISSIONER MILES:

Mr. Lea, you do not feel you can operate on less than 160 acres from an economical standpoint?

MR. LEA:

We sincerely think it would be a mistake to do it. Mr. Nichols' figures assume $16,000.00 cost and a 5% rate on present day conditions. If you could find a spot where a well drilled could produce 585# and you drill on 40 acres, the only thing other than 160 acres that is feasible, you would recover only 37% of your investment disregarding operating cost and disregarding the fact that it would take you years to do it in. If you drill a well with 400# of pressure you would recover - assuming you had this kind of condition, exactly one-half your original investment.

MR. ENGLISH:

You fellows have been talking on pressure all day and have never mentioned the millions of feet you could get.

MANUEL SANCHEZ:

Mr. Nichols gave it in the record.

MR. ENGLISH:

I would like to know about millions of feet of gas.

MR. THOMPSON:

The testimony has developed the net recoverable gas on 160 acres as 1,300,000,000 feet. If you drill on 40 acres and everybody else does, your recoverable gas would be 1/4 of that. The area of the present field covers approximately 22,600 acres; if we drilled it on a basis of one well to 40 acres, it would require 439 more

wells at $16,000.00 a well - would be almost $8,000,000.00 you would have to spend. It would be impossible to ever recover the original investment.

MR. LEA:

My statement was made on the same assumption, a 400# well could never produce the same quantity of gas as a 585# well.

MR. ENGLISH:

You fellows have anything against ratable taking?

MR. LEA:

No. But about a year ago there was a bill appeared - about a year ago - and it was the most immature I have seen. If we are going to have one, let's have a good one.

COMMISSIONER MILES:

That was the only bill presented, you had the same opportunity of anybody else to present one. The meeting was called for the purpose of discussing it and that should not be taken as an example.

MR. LEA:

I did not mean to suggest that at all, but the fact does remain that a bill was presented and we thought it a bad one and had to oppose it. Pro-ration may come to this field, perhaps it should. There are people in the field today that would be hurt by this. Our only question about pro-ration would be the additional burden on the operators and the Commission.

COMMISSIONER MILES:

This is a matter to come before the Legislature and not this Commission.

MR. GRUER:

I would like to request that the Commission consider the offsets that will be required if a 160 acre spacing ruling is upheld or in deciding on spacing ruling that they be taken into consideration; and the reason for that being considered I would refer to Mr. Foster Morrell's letter in which he remarks about the market, and the increased number of wells causing the production from each well to be so small as to make it uneconomical to drill additional wells. Also the rule 4 - 40 acres to a unit, and establishing a great number of bad spaced wells throughout the field. I doubt that the average spacing in the field exceeds 120 acres. I do not believe the retaining of the 40 acre spacing unit will see additional wells in the old field unless it does become economically feasible.

FOSTER MORRELL:

I would like to clarify the points that have been raised.

First, in order to show the interest that the Federal Government has in the Kutz Canyon - Fulcher Basin areas, I have prepared some acreage figures. A conservative estimate taking in more than 1/2 mile from present existing wells - arrived at a figure of approximately 22,680 acres that could be considered as proven production. From the south end of Section 32 up to Section 19, 30 N, 12 W - of that acreage the federal is 16,200 or 71%, fee land 6400 acres or 29%. According to our maps there are 80 acres of state land we could not get percentage mark on. On that proven acreage there have been 77 wells completed; 45 on government lands and 32 on fee lands. The development, 58% of the wells, against 42% for fee lands as compared to 71% of the acreage, broken down to fields - Fulcher Basin total is 12,400 - 52% lands government, 48% fee and no state.

In the Fulcher Basin fields, 40% of the wells on U. S. land, in number 21 on U.S. land, 31 on fee land - a total of 52. Kutz Canon is a total of 10,280 acres, of the federal interest represents 96%, of the fee 4%. Twenty-five wells have been completed, 24 of those 25 wells are on our federal land, with the control we have under the lease act and federal leases in Kutz Canon, we have 96% of the acreage developed by 96% of the wells. Going back somewhat into history of the development, I think the whole picture is somewhat complicated by the variance of opinions of individuals versus companies which we always have with us, but our position is one that equity should be provided regardless of whether the operator is a major company or an individual or small company. The facts with respect to development are indicated in a very short statement I reported recently to Washington, that during the past six years wells increased from 8 as of December 31, 1941 in Fulcher Basin only to 15 as of December 31, 1944 and 51 as of December 31, 1947. A ratio of 8 to 51 or over six times increase. The field withdrawals during that period is represented by the figures of 1 billion cu. ft. for 1942, 1.9 billion in 1945, and 2.6 billion in 1947. That is a ratio of one to 2.6. We have a number of outlying producing wells but the number of wells increased 6 times and the market increased by only 2.6 on all wells in the same period. The withdrawal per unit decreased.

MR. ENGLISH:

Have they been taking all that gas?

A. They have a market for all the gas.

MR. ENGLISH:

If you are furnishing gas from Barker you wouldn't be taking as much gas from Fulcher Basin?

MR. MORRELL:

Barker comes into the pipeline south of Kutz Canyon and does not affect the deliveries in the Kutz Canyon - Fulcher Basin area.

Any market from any field will depend on deliverability of the gas from that field, and deliverability depends on the open flow capacity. You can't get away from pressure at the rate to which the wells can get it up.

MR. ENGLISH:

At one time they had the same pressure in each field. You are not going to try and tell me there isn't any more gas than before. How do you know this field won't reach out and take in a large area?

MR. MORRELL:

This is just a matter of record of past production. The point we are making is that you have greater increased wells than you have in the market, which means you will have to divvy up your market.

MR. ENGLISH:

From what I hear there is a pretty good size market.

MR. GRUER:

Isn't it natural for the pressure of gas wells to decline in any gas field? They could have taken more gas from time to time by lowering their pressure.

MR. MORRELL:

I don't know about lowered pressure in order to get more gas. It is a matter of record in all gas publications that for protection of reservoirs gas should not exceed 25% of the flow. Over the years you will find that limit is maintained.

MR. GRUER:

The question of whether it should be maintained at 25% of the open flow and

whether you hurt the reservoir by taking more is certainly an open question.

MR. MORRELL:

It has been debated for the last 30 years and there has been very little proof otherwise. You are getting to the matter of rate at which a reservoir will re-charge itself. If you pull it out too fast when it comes you are going to have to sit there and wait for it.

MR. GREER:

I do not believe you could find evidence to substantiate that.

MR. SILVER:

This field and your data given - more gas by harder draws and I believe it will be substantiated.

MR. THOMPSON:

I said the average annual take was 17% of its open flow, I don't know of a field in the country that is being given a better pull than that.

MR. MORRELL:

In the earlier days of development, there were certain spacing exceptions made before it was determined that a 160 acre spacing was the most economical and best for the reservoir - at that time by agreement with both Southern Union Gas and Dudley Cornell in connection with the development of the Fulcher Basin field, the only one active at that time - we set up 160 acre units. P.A.W. had the 640 acre limitation and at the request of Cornell and Southern Union Gas, several 160 acre exceptions were made.

MR. CORNELL:

Southern Union Gas refused to join with me in my application at that time.

MR. MORRELL:

The fact was that we had 160 acre spacing and the Oil Conservation Commission adopted an order for that field - Order 551 effective in June 1943.

On application from private land operators and after a hearing of the Commission, the Commission cancelled the order. The Interstate Compact Commission made a recommendation that well spacing adopted during the war should be continued wherever feasible to protect equities. A great additional development - this increase from 15 to 31 over a three year period has been to a considerable extent caused by the recent development on private lands along the Animas River. I think they are entitled to all the gas underneath their ground and should be given considerations, but I don't think that acreage should set up spacing for the entire field. What the Commission could do and should do has been pointed out in the testimony. The only other thing I could see at this time would be by legislation for pro-ration, as Mr. Cornell proposed. As I understand the petition of the Southern Union Gas it is for development from now on and will not adversely affect any existing wells up to this time. In answer to some of the questions that have been raised, Mr. Greer has given me some ideas. Maybe we can get more wells drilled ourselves.

MR. ENGLISH:

That is what we are afraid of.

MR. MORRELL:

The question of offsets is a matter of your lease terms, lease terms on private lands are more strict than on federal land. If the operator does not do what the owner thinks he should, he can take it into court and you have to drill an offset. The public lands leases allow considerable discretion - that discretion is in favor of the operator. Compensatory royalty is called for in lieu of actual

drilling. We made this as to each location and wherever a possible location might be we take into consideration all known facts. If we think there is drainage we will call on you to show cause why you shouldn't drill. You have a chance to show us and if the information is adequate that is all there is to it. Our office at Roswell has leaned over backwards on the spacing matter in Fulcher Basin, primarily because of the small type of production obtained. To let this thing come to a head where it can get to a point of development - I have in mind a tract surrounded by four wells, immediately adjoining that 120 on which we have asked Byrd-Frost to drill one well, but if the Commission does not see fit to protect the equity of operators who have already drilled and allows unnecessary wells to be drilled on 40 acre tracts - - -

MR. ENGLISH:

What well is that?

MR. MORRELL:

That is the Byrd-Frost Hudson.

MR. ENGLISH:

You don't consider that a gas well?

MR. MORRELL:

That is a gas well of the type being completed in that field.

If the Commission does not see fit to set up a minimum spacing for that, more than 40 acres and up to 160, it may become necessary for us to essentially draw a fence around private operations by requiring offsets where we have a block of acreage on 160 acre spacing. We don't want to do that, that is false economy. The testimony presented has shown this is more a matter of economics than anything else. I would like to take exception to Mr. Greer's statements as to the gas left in the ground. There will not be any more gas in the 160 than the 40. I would also like to correct a statement made by Mr. Silver - you said you had an identical field.

MR. SILVER:

I meant the geological boundaries - type of formation, age, conditions of accumulation, everything but the pressure.

MR. MORRELL:

Would you name that for the record - the name of the field?

MR. SILVER:

Blanco field - two producing zones, Mesa Verde formation and Point Lookout sandstone. 4400 feet and approximately 5051 feet.

MR. MORRELL:

Pressure is about what?

MR. SILVER:

The pressure is around 1300#, the only difference, the accumulation is currents of gas the limits of the field and their field is not limited by geological conditions so much as by economical factors of production and development. We feel we have a field limited the same way by economic factors of production and development. The geological factors closely approximate those in Fulcher Basin - Kutz Canon.

MR. MORRELL:

I understood you were talking of an entire different reservoir. You made the statement what was done in the Fulcher Basin and Kutz Canon would apply directly to your field.

MR. SILVER:

I meant what action the Commission might take on low permeability reservoir, it is economically a marginal reservoir, has to be produced as such. We feel also our reservoir might be marginal reservoir and will have to be produced as such. The action of the Commission in this case will have some bearing on our field.

MR. MORRELL:

Did you have in mind a spacing of 160 acres or more.

MR. SILVER:

Our pressure is greater. We could not conceivably see less than 320 acre spacing.

MR. MORRELL:

As I recall, the south of your present wells at San Juan, the river crosses your structures on which there is considerable land. The same question could arise in the Blanco area as in Fulcher Basin.

It may be a good idea to make an application to the Oil Conservation Commission before it gets out of hand.

MR. SILVER:

We feel we cannot discuss it with the Oil Conservation Commission without a geological survey.

MR. LEA:

Yours is a new field?

MR. SILVER:

No, it is fully as old as Fulcher Basin.

MR. MORRELL:

I would like to mention for the information of the Commission - I think Governor Miles mentioned something about 5¢ gas - I think the operators in Fulcher Basin - Kutz Canon should feel very fortunate that they are receiving 5¢ mcf because there is no other gas produced in the State of New Mexico that is getting 5¢ per mcf. The standard price in Lea County - the best you can get on normal sale is 3½¢ mcf.

I do say, as stated in this letter, the 160 acre spacing is a necessary thing to protect all parties who have drilled wells - to protect them from losing the money they have invested - the questions that have been asked indicates a lack of knowledge of what may happen in the future on the part of some individual operators who may be making investments and end up in the red. If we have operators losing money it is going to discourage development. We want to keep operators on a profitable basis.

MR. ENGLISH:

If we get 160 acre spacing and if we want to drill a well in Farmington.

MR. MORRELL:

Wouldn't have any effect.

COMMISSIONER MILES:

Anyone have a question or statement to make?

MR. L. L. STALLINGS:

I would like to present these petitions from farmers in San Juan County, and would like for them to appear on the record.

COMMISSIONER MILES:

They will be considered by the Commission and included in the record.

MR. LUA:

While all these statements have been made without the benefit of the testimony I have some other statements for the record.

One from the Western Natural Gas Company expressing approval of the plan, and one from J. J. Hudson. There seems to be several spots of concern about exceptions; I guess we have taken it for granted that exceptions would be provided by the Commission. There will be and there are situations in which if the operator can find it economically feasible to drill he should be permitted to do so, on petition to this Commission describing what he expects to do and be given full consideration whatever spacing unit should be adopted. That applies not only in the well developed field but in the flanking areas where open flows and permeability are a little out of the trend. The citizens from Farmington seem concerned over the statement in the petition that the Commission's order should govern the field or area as it might be extended. The only purpose of that is to make unnecessary new orders of the Commission on account of extensions. The Commission's order should include the immediate surrounding area of the field as it is extended; otherwise, it could only be controlled by repeated orders of the Commission. I did not suppose anyone had the idea this field would include other developed areas. The Commission's order should have a provision to include this field and exclude other producing areas. So far as other areas are concerned it strikes us there is not sufficient information to this Commission or to the operator to know what is needed. There is no reason to prevent this Commission from entering, on petition, whatever additional orders might be necessary.

MR. MORRELL:

Of the wells drilled 71% of the total and 96% in Kutz Canon and 54%, I believe, in Fulcher Basin are on Federal land. I would like to add we have had in the past several applications and one current for relief an account of high operating costs, for relief from rentals on public land leases from $1.00 an acre to 25¢ an acre. In granting those the Department has recognized the low return. We have one by Mr. Carroll and Mr. Carroll has developed his own lease on 160 acre spacing and still needs reduction on the rental.

This increased number of wells and the annual rate of withdrawals at 2.6 billion for 1947 and estimated for 1948 approximately the same. Fifty one gas wells in Fulcher Basin $15,000 or $16,000 per well for cost of drilling. You can add your taxes, you would have in the neighborhood of $1,000 to $1,500 net per year, in the neighborhood of $100 per month. That is the situation if you get into excess wells it will continue to decrease. Instead of $100 to $150 per month you get $75 to $100 per month.

MR. GORDON:

Byrd-Frost encourages spacing not less than 160 acres to the well, but we are concerned with this offset proposition and also feel when the boundaries of the field is reached there should be some latitude given on the location of wells less than 1/2 mile if possible, and should be a little latitude there.

MR. SILVER:

The geological limitation of the field we have been discussing will be more by economics than by geology.

MR. MORRELL:

I will say as much.

MR. ENGLISH:

According to the United States Geological Survey there is no structure there.

MR. MITCHELL:

I am afraid we would have to differ, anything is a structure.

MR. GAHAN:

What area did the proposed order apply to?

MR. THOMPSON:

Approximate area is described in the application.

COMMISSIONER MILES:

Anybody else any question to ask or any statement to make?

The Commission is going to take this case under advisement and anyone who wants to file a written statement to the Commission, we will be glad to have you do so.

ILLEGIBLE