BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE 1735

TRANSCRIPT OF HEARING

AUGUST 13, 1959

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BEFORE THE
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IN THE MATTER OF:

CASE 1735 Application of The Ohio Oil Company for an order promulgating special rules and regulations for the Bluitt-Pennsylvanian Pool in Roosevelt County, New Mexico. Applicant, in the above-styled cause, seeks an order promulgating special rules and regulations governing the drilling, spacing and production of wells in the Bluitt-Pennsylvanian Pool in Roosevelt County, New Mexico, including the establishment of 80-acre spacing for wells in said pool. Applicant further seeks an exception from the proposed spacing requirements for a well to be drilled in the NE/4 of Section 20, Township 8 South, Range 37 East.

BEFORE:

A. L. Porter
Murray Morgan

T R A N S C R I P T O F P R O C E E D I N G S

MR. PORTER: Consider next Case 1735.

MR. PAYNE: Case 1735. Application of The Ohio Oil Company for an order promulgating special rules and regulations for the Bluitt-Pennsylvanian Pool in Roosevelt County, New Mexico.

MR. NEWMAN: If the Commission please, Kirk Newman of Atwood and Malone, Roswell, New Mexico, representing the applicant. I have associated in the case Mr. Terrell Couch of Houston, Texas, a member of the Texas Bar.

MR.PORTER: The hearing will now be recessed until two-thirty at which time we will continue with Case 1735.

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MR. PORTER: Back to Case 1735. The record will show that Mr. Kirk Newman made an appearance for Mr. Terrell Couch in this case. Mr. Couch, would you proceed with your case?

MR. COUCH: Gentlemen of the Commission, my name is Terrell Couch appearing for the Ohio Oil Company. We are convinced that 80-acre and proration units in the Bluitt-Pennsylvanian Pool will prevent waste and protect correlative rights in compliance with the Statutes of the State of New Mexico. Although the best conservation practices dictate that the spacing pattern and proration unit size should be fixed early in the life of the pool, it is, of course, often difficult and sometimes impossible to obtain the necessary data because of offset demands or the natural desire of a producer to drill closer to a well that has already been brought in. It is too late to obtain complete and effective development of the entire pool. This is the dilemma of operators, of the Commission, and of its staff, and I believe that we've found a solution to that dilemma in this case. I believe that the evidence which we present will convince the Commission that under the standards fixed by your New Mexico Statutes, 80-acre spacing and 80-acre allowable should be applied at this time in the Bluitt-Pennsylvanian Pool. The Statutes, of course, do not establish spacing or proration units at 40 acres or at any

other size, but on the contrary, the Statutes recognize that each pool is to have separate consideration measured by the Statutes and guises that are contained in this Statute. The 40-acre drilling unit which is provided for in the statewide rule is in effect an initial or an interim step taken by this Commission in advance of any data on a newly discovered pool. Our question, then, is not really whether the 40-acre unit should be changed in this pool, it is more simply starting from scratch, and considering all available data, what is the most reasonable and fair proration unit for this particular field when the statutory standards are applied. The statewide rules in providing allowable factors for 80-acre units clearly recognize that under appropriate circumstances, 80-acre units will be established by this Commission. The Statute requires that the Commission shall, so far as it is practicable, afford the owner of each property the opportunity to produce his proportionate part of the recoverable oil and gas in a pool, so far as that amount can be practicably, reasonably, feasibly determined and obtained without waste. This opportunity to produce that fair share of the oil or gas must not be illusionary, it must be a fair and realistic opportunity when evaluated in the light of economic and practical facts of the oil and gas business. In affording such an opportunity, the Commission is authorized to establish a proration unit for each pool, which unit is to be "the area that can be efficiently and economically drained and developed by one well." What is that area in the

Bluitt-Pennsylvanian Pool? In reaching the ultimate conclusion, the Commission is specifically enjoined by Statute to consider five points:

(1) The economic loss caused by the drilling of unnecessary wells;

(2) The protection of correlative rights, including those of royalty owners;

(3) The prevention of waste;

(4) The avoidance of augmentation of risks arising from the drilling of unnecessary wells or excessive number of wells, "The Statute;" and

(5) The prevention of reduced recovery which might result from the drilling of too few wells.

Now, we believe that the Commission can most effectively consider these five points and reach the ultimate conclusion required by the Statute by looking at the pool as a whole, as near as that can be determined at this stage. In fact, it seems to be the method, the exact method which was -- of analysis -- which was contemplated by the Statute. Accordingly, we have prepared our case from that general viewpoint. We will present our evidence in such order as to cover the five statutory points that I have mentioned so as to arrive at this ultimate conclusion of what area can be efficiently and economically drained and developed by one well in the Bluitt-Pennsylvanian Pool.

I appreciate the indulgence of the Commission in permitting

me to make this preliminary statement as to what we all regard as fundamentals in a case of this kind, but it helps me to get my prospectus to review the statutory principles from time to time and particularly when we are about to embark here upon a presentation of evidence that will deal with these very fundamentals that I have mentioned.

We will have two witnesses. The first will be Mr. Roy Young from Houston, Texas.

(Witnesses sworn)

ROY M. YOUNG,

called as a witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. COUCH:

Q Will you please state your name, by whom you are employed and in what capacity?

A My name is Roy M. Young. I am employed by the Ohio Oil Company in the capacity of a reservoir engineer.

Q Have you previously testified before this Commission, Mr. Young?

A No, sir, I have not.

Q Will you briefly state your qualifications, both of education and experience?

A I attended the University of Houston and received my Bachelor of Science degree in petroleum engineering in 1950. The

following year I attended A & M College of Texas, and did graduate work, which eventually led to my Master of Science degree in petroleum engineering in 1955. I have been employed by The Ohio Oil Company as a reservoir engineer for the past eight years. In my duties as a reservoir engineer with The Ohio Oil Company, I have made an engineering study of all the available data from the Bluitt-Pennsylvanian Pool. I have directed my study toward determining the most efficient and effective well spacing and allowable factors that should be applied to this field.

MR. COUCH: Are the qualifications of the witness acceptable?

MR. PORTER: They are.

Q Mr. Young, in connection with this case, you prepared or had prepared under your direct supervision a number of Exhibits. The first of those is identified as Exhibit 1, and is a map of the Bluitt-Pennsylvanian Pool area, is it not?

A That is correct.

(Thereupon, Applicant's Exhibit 1 was marked for identification.)

Q All right. Mr. Young, will you describe briefly this Exhibit 1 which is a map of the Bluitt-Pennsylvanian Pool located in Township 8 South, Range 37 East, Roosevelt County, referring to the data that is shown on that Exhibit, please, sir?

A Exhibit 1, as you've stated, is a map of the Bluitt-Pennsylvanian Pool located in Roosevelt County, New Mexico. All

wells that are currently completed in the Bluitt-Pennsylvanian Pool are completed in Section 20. They are shown by large red dots upon Exhibit 1. There is one well presently being completed in Section 21 that is identified by an open red circle on Exhibit 1.

Q All right, sir. Is The Ohio Oil Company operator of all these four existing wells and the well that is in the process of being completed?

A Yes, sir, they are.

Q State briefly the interests owned by The Ohio Oil Company in this area and as shown on the map.

A The Ohio Oil Company is the owner -- has a three-fourths working interest in all of Section 20 in the S/2 of Section 17. The Intex Oil Company is the owner of the other one-fourth interest. The Ohio Oil Company also owns the hundred percent working interest in all of Section 21, which includes the present drilling well. The Ohio also owns the hundred percent working interest in the SW/4 of Section 18, the NW/4 of Section 19, and the E/2 of Section 32. In addition to these interests, The Ohio owns one-fourth interest in the E/2 of Section 29.

Q Mr. Young, is that the W/2 of Section 32 and W/2 of Section 29 --

A That is correct.

Q -- instead of the E/2 of those two Sections?

A Yes, sir.

Q And is the acreage in which Ohio owns interest that you have recounted here, is that shown in any way on this map?

A Yes, sir, it is all shown in a blue shaded area.

Q Part of that blue shaded area is in the yellow area and is covered up?

A That's correct. That's Sections 20 and 21 and the NW/4 of Section 29.

Q All right, sir. Will you please state briefly the discovery date of Bluitt-Pennsylvanian Pool and the brief information concerning the wells that are presently completed there?

A The Bluitt-Pennsylvanian Pool was discovered on January the 11th, 1959 with the completion of the Federal McGrail No. 1 located in the SE of the NW/4 of Section 20. That was a Devonian test which was dry in the Devonian and plugged back to the Pennsylvanian.

Q In other words, that well was drilled clear to the Devonian --

A Yes, sir.

Q -- and had no indication of production below this depth?

A No, sir.

Q All right, --

A The initial potential of the discovery well was 719 barrels of oil per day on a 20/64 inch choke. Now, the check well drilled on the field was the Federal McGrail No. 2 which is

located in the NE of the NW/4 of Section 20, subsequent to the completion of Well No. 2. The remaining three wells have been drilled on alternate 40 acres to set up an 80-acre pattern.

Q That's on altered quarter-quarter sections?

A That is correct.

Q What about these four producing wells we have at the present time, are they top allowable wells?

A Yes, sir, they are all top allowable wells and are capable of producing an 80-acre allowable.

Q Is that by applying the depth factor stated in the statewide hearing?

A That is correct.

Q Will you briefly state for us the productive formations from which this pool produces and describe it to us?

A The production from the Bluitt-Pennsylvanian Pool is obtained from the Bough "C" formation found in an average depth of 9500 feet. The Bough "C" formation is a limestone with intercrystalline and vuggy porosity. The net pay averages from 9 to 24 feet in a gross section of approximately 26 feet in this area.

Q All right, sir. What about the normal completion practice involved in wells that you -- we have used in this area?

A All of the wells in this field have been completed by setting pipe through the formation and selectively perforating the net pay.

Q Well, sir, in the Federal Silver "A" No 1, was it com-

pleted naturally, or was it treated?

A The Federal Silver "A" No. 1, which is located in the NW/4 of the SE/4 of Section 20, was completed naturally. All the other wells have been treated with various amounts of acids.

Q All right, sir. Now, back specifically to Exhibit 1, this map, describe the contour intervals shown on the map and explain that to us. please, sir.

A Exhibit 1 is contoured on top of the Bough "C" formation with 25 foot contour intervals.

Q What does the yellow color on the map represent?

A The yellow area on this map is an area which, in my opinion, based on the data available at that time, is the area which is reasonably expected to be productive.

Q Have the productive limits of this field actually been defined this early in its life?

A No, sir, no gas, oil or water contacts have been found.

Q And the productive units themselves have not been specifically figured?

A No, sir.

Q What about the horizontal limits of this field as defined by the Commission at the present time?

A At the present time the horizontal limits of Bluitt Pool include only Section 20.

Q The entire section --

A Yes, sir.

Q -- is the field so far as the official designation is concerned?

A That is correct.

Q Now, what does our present information indicate to us as to the nature of the reservoir itself?

A At the present time the available data indicates that the Bluitt-Pennsylvanian Pool is a stratographic trap with erratic porosity and permeability.

Q All right, sir. Now, there is some other data on Exhibit 1, opposite the wells that you have shown on there. Will you identify that information for us?

A Shown to the left of each well is the completion date of that well and beneath each well is a subsea top of the Bough "C" formation.

Q What is that figure in parenthesis that follows the subsea depth at which the formation was encountered?

A The figure in parenthesis following the subsea top of the formation within each well is the amount of pay which, in my opinion, was encountered in each well.

Q You are speaking there of the net pay that you selected in that well, are you not?

A That is correct.

Q How have you gone about selecting the amount of net pay which you have indicated -- shown on this map for each of those four wells?

A I have selected the net pay by the examination of microlateralogs in conjunction with the core analyses that have been obtained from two wells.

Q What about the other wells? Were they cored, Mr.Young?

A No, sir. The two wells cored were the Federal Silver "A" No. 1 and the Federal McGrail No. 3. The other two wells were not cored; neither was the Federal Silver "B" No. 1 in Section 21 cored.

Q All right, sir. Now, Exhibit No. 1, you testified, was prepared under your supervision and direction, the data that is shown on there, the result of your personal investigation, and inspection of the logs of those wells, and the core analyses reports?

A Yes, sir, it was.

(Thereupon, Applicant's Exhibit No. 2 was marked for identification.)

Q I wish you would now look at the document labeled Ohio's Exhibit No. 2 in this case and identify it, state whether it was prepared under your supervision and direction?

A Exhibit No. 2 was prepared under my supervision and is a comparison of the microlateralogs of the four presently completed wells in the Bluitt Pool.

Q Mr. Young, this does not purport to be a cross section, does it?

A No, sir, it does not.

Q What is the purpose of this Exhibit, comparing these microlateralogs please, sir?

A The purpose of this Exhibit is to demonstrate the amount of the net pay in each well and to verify the accuracy and reasonableness of my selection of that net pay.

Q All right, sir. Then, will you describe the sequence in which the wells are placed on that Exhibit and just continue with an explanation of what the various data are that are shown on there?

A Exhibit No. 2, as I have said, is a comparison of the microlateralogs of all the wells, four wells completed in the Bluitt Pool. They were aligned and placed on this Exhibit in the order in which they were drilled. They were aligned on a sub-sea depth of minus 5350. Above the log of each well is pertinent data related to each well.

Q Identifying the well by its name, elevation and location, is that right?

A That is correct.

Q All right, sir. Is the top of the Bough "C" formation, not the net pay but the formation itself shown on each of these logs?

A Yes, sir, it is by a solid heavy line.

Q What about the perforated interval, is that shown on each log?

A Yes, sir, the perforated interval in the Bough "C"

formation is shown for each well.

Q What about those two wells that were cored, is that information indicated on there?

A Yes, sir, the interval that was cored is shown on the Federal Silver "A" No. 1 and the Federal McGrail No. 3, which are the last two logs on Exhibit No. 2.

Q That is on the right side of Exhibit No. 2?

A Yes, sir.

Q Now, there is some red coloring on that Exhibit, Mr. Young. Tell us what that is, please, sir.

Q The red coloring on Exhibit No. 2 within the Bough "C" formation on each log is the amount and location of net pay which I have selected for each one of these wells.

Q All right, sir. How many feet of net pay did you pick in Federal McGrail No. 1? That's the first well on the left side of Exhibit No. 2 and the discovery well in the field?

A I selected 24 feet of net pay for the Federal McGrail No. 1.

Q That is shown in red on the Exhibit?

A That is correct.

Q How about the next well, the Federal McGrail No. 2, the second well drilled?

A I selected 12 feet of net pay for Federal McGrail No. 2.

Q And the third one that is shown, the Federal Silver

"A" No. 1?

A I selected 12 feet of net pay for the Federal Silver "A" No. 1. Now, this was verified by core analysis of that well. We have complete core analysis of the Federal Silver "A" No. 1. The core analysis indicates that the Federal Silver "A" No. 1 lacks 11.2 feet of net pay, and substantiates my picture of net pay from the microlateralog.

Q All right, sir. Now, Federal McGrail No. 3, core was cut in that well also, you've testified. Will you describe that core briefly for us?

A Unfortunately, the coring point in the Federal McGrail No. 3 was missed and only the bottom six feet of formation of the Bough "C" formation was cored.

Q The core itself was how long?

A Forty-three feet.

Q Thank you, sir. When you compared this core analysis with the microlateralog, how many feet of net pay did you assign to that well?

A I assigned a total of net -- 9 feet of net pay to the Federal McGrail No. 3. The bottom six feet of formation showed to be pay from nine core analyses, and in addition to that six feet, I added an additional three feet as selected from the microlateral.

Q That was up above the core point?

A That is correct.

Q All right, sir. Have you averaged the net pay that you found in these wells and selected --

A Yes, sir. The average net pay is 14 feet.

Q All right, sir. What is the average thickness of the Bough "C" formation as shown on those logs?

A In these four wells the average gross thickness of the Bough "C" is 26 feet.

Q Now, Mr. Young, you have testified about a fifth well which is in the process of being completed. Has a log been run on that well since this Exhibit 2 was prepared?

A Yes, sir, it has.

Q Do you have a copy of that log with you?

A Yes, sir, I do.

MR. COUCH: If it hasn't been marked, will you mark it Exhibit 2-A, please sir?

(Thereupon, Applicant's Exhibit No. 2-A was marked for identification.)

MR. COUCH: If it please the Commission, we have only one copy of this Exhibit that we can introduce. We have one additional copy for our use. Would you like for me to pass it to the staff?

MR. PORTER: Yes, sir, please.

Q Mr. Young, have you examined that log that is identified as Exhibit 2-A of The Ohio --

A Yes, sir, I have.

Q And how much net pay did you find in this Bough "C" formation as shown by that log on this fifth well?

A Eleven feet.

Q Eleven feet. Have you taken that net pay into consideration in computing your net pay and reaveraged the net pay for the Bluitt field in this Bough "C" formation?

A Yes, sir. Actually, the arithmetic average of the first four wells was actually 14.25 feet. Now, --

Q On that 14.25, you used 14?

A Yes, sir.

Q That being the nearest --

A Yes, sir, the average net pay. Now, if we include this well with eleven feet of net pay, the average net pay now is only 13.75. But in this computation we will still use 14 feet as the average net pay for the Bough "C" formation.

Q Still within a quarter of a foot?

A Yes, sir.

Q All right, sir. Now, do you have before -- you have a copy of Exhibit No. 3 --

A Yes, sir, I do.

Q -- before you. What is Exhibit 3, Mr. Young?

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

A Exhibit No. 3 is a completion coregraphs of the two wells that were cored in the Bluitt-Pennsylvanian Pool.

Q That Exhibit actually meant, Mr. Young, to just furnish some scientific data to the Commission staff so that they can see the basis of your work fundamentally and principally is that the reason for it?

A That is correct.

Q All right, sir, and this shows, then, the core, completion coregraph on each of those wells. What about the average porosity in this Bluitt Pennsylvanian Pool?

A The weighted average porosity of these two core analyses is 5.93 percent.

Q What about the permeability, Mr. Young?

A Weighted average permeability is 508 milladarcies.

Q Can you give us the range of permeability as shown by these completion coregraphs?

A The range of permeability varied from .6 to 6,620 milladarcies.

Q All right, sir. What can you tell us about the cumulative oil production from this Bluitt Pennsylvanian Pool, Mr. Young?

A Well, the Bluitt Pennsylvanian Pool, the cumulative oil production to 7/1/59 has been 43,916 barrels.

Q And the cumulative gas production?

A 62,181 MCF.

MR. PORTER: Excuse me just a minute, what date was that?

A 7/1/59.

MR. PORTER: Thank you.

Q Have any pressures been taken of the wells in this field, Mr. Young?

A Yes, sir, there have been some pressures.

Q Will you state briefly some relatively important highlights about that?

A The first pressure measured in the field was taken in the discovery well, the Federal McGrail No. 1, on February the 4th, 1959. That pressure, as measured, was 3,027 pounds at minus 5450.

Q What is the most recent bottom hole pressure that has been taken?

A The most recent bottom hole pressure taken was in the Federal McGrail No. 3 which was the first pressure in that well, and was measured on July the 21st, 1959, and was found to be 2,977 pounds at minus 5450.

Q All right, sir. That was about a 50 pound pressure drop between the date of the taking of that first pressure in February of '59 and the taking of the most recent pressure on July 21, 1959, was it not?

A That is correct.

Q Will you comment on the significance or insignificance of that information, please, sir?

A Well, although it is not conclusive, it indicates there

has been drainage on this 80-acre pattern for a distance of 1,867 feet between wells.

Q In other words, those two wells are over 1,867 feet apart, is that correct?

A Yes, sir.

Q There has been a 50-pound pressure drop in about --

A Five-month period.

Q Five-month period?

A Yes, sir.

Q What other statistics do you have with reference to the reservoir conditions, please, sir?

A The bottom hole temperature of the Bluitt Pennsylvanian is 155 degrees Fahrenheit. The gravity of the produced crude is 47 degrees API. The solution gas-oil ratio by differential liberation is 1517 cubic feet per barrel.

Q Now, from where did you obtain that last figure?

A That last figure was obtained from a reservoir fluid sample taken from the Federal McGrail No. 1.

Q All right, sir. Did the fluid study show that the reservoir oil was saturated at original reservoir pressure?

A It did.

Q All right, sir. Bluitt Pennsylvanian was discovered only eight months ago, according to your testimony, Mr. Young, --

A That is correct.

Q -- is the data from this pool necessarily limited?

A It certainly is.

Q Well, in your opinion, if this data is properly considered and evaluated -- when properly considered and evaluated, the data that you have, does it support the conclusion that a well can economically and efficiently drain in excess of 80 acres in this field?

A I believe it does.

Q In studying this case and in attempting to present the matter to the Commission as clear as you could, did you come up with some idea of how you might show whether this data or your conclusions are correct or not about this pool?

A Yes, sir, I did. Since the data is limited and the reservoir is in its early stages of development, it seems to me that the most logical way of evaluating and checking the data that is available for the Bluitt would be to study and evaluate another pool which has produced to depletion in this same formation.

Q Well, now, have you made such a study of a pool like that?

A Yes, sir.

Q And what is that pool, Mr. Young?

A It is the Bough Pool located nine miles southwest of the Bluitt Pool.

Q Is that Pool substantially depleted?

A Yes, sir, it is, and it is very similar to the Bluitt.

They both produce from the Bough "C" formation at approximately the same depth.

Q All right, sir. Have you prepared or had prepared under your supervision, a map of this Bough Pennsylvanian Pool?

A Yes, sir, I have.

Q And that's labeled Exhibit No. 4?

A Yes, sir.

(Thereupon, Applicant's Exhibit No. 4 was marked for identification.)

Q Will you give us, please, briefly, Mr. Young, a history of this Bough Pennsylvanian Pool?

A The Bough Pennsylvanian Pool was discovered in 1949. There were 21 producing wells drilled, but as of June the 1st, 1959 only four remained on production. I have identified on Exhibit No. 4 the four producing wells as solid red dots, and all of the shut-in and abandoned wells as solid blue dots.

Q You have a good many blue spots up there, don't you, Mr. Young?

A Yes, seventeen of them.

Q How about the heavy dashed line on the Exhibit No. 4, what does that show, please?

A The heavy dashed line on Exhibit No. 4 is the horizontal pool limits as defined at the present time by the New Mexico Oil Conservation Commission.

Q And how many acres are included within -- in those

field limits, please, sir?

A There is 4,440 acres included within the horizontal limits.

Q And now looking back over this field after it has produced to this point, have you made your personal selection of what you consider the area to have been productive in that field?

A Yes, sir, I have.

Q And how is that shown on Exhibit No. 4?

A That is shown in the yellow color on Exhibit No. 4.

Q How many acres are included in that yellow colored area, Mr. Young?

A 2,720 acres.

Q All right, sir. Now, Exhibit No. 4 has contour lines on it. Describe those, please, sir.

A Exhibit No. 4 is contoured on the Bough "C" formation with 25-foot contour intervals. This is the same formation and contour interval as was used to depict the Bluitt Pool in Exhibit No. 1.

Q All right, sir. And the yellow area shows your selection of productive areas such as the yellow area shows your selection of productive areain the Bluitt, is that correct?

A That is correct.

Q Now, there is also data shown around the wells on this pool somewhat similar to what you have shown on the Exhibit No.1. Describe the data that are shown around the wells on Exhibit No.

4, please, sir.

A Above each well on Exhibit No. 4 in large numerals is cumulative oil production for each well to June 1, 1959. Shown to the left of each well is the well's completion date, and to the right of it, the shut-in wells, is the shut-in date.

Q Have you personally checked the allowable schedules to see whether any of those wells has produced since the shut-in dates as shown on this map?

A Yes, sir, I have.

Q And there has been no production from any of them reported?

A No, sir.

Q All right, sir. You mentioned there were four of these twenty-one wells which are still in production. Will you identify them and state briefly their productive capacities as you have them?

A The Betenbough "A" No. 3 in Section 12 remains on production, and for the month of May its average production was 10 barrels of oil per day. The Hobbs-Leonard No. 1 in Section 14 is still producing, and its production averaged 125 barrels of oil per day in May. The Capps-Federal 6 in Section 13 averaged 129 barrels of oil per day, and the Capps-Federal No. 3 in Section 24, averaged 129 barrels of oil per day during May.

Q All right, sir. Now, have you shown below each of those wells, as you did in the Bluitt map, the top of Bough "C"

formation and paragraphs following that with net pay selections that you have made?

A Yes, sir, I did.

Q Now, there is one well in there -- two wells in there that do not show a top or a net pay. Was that because you didn't have the log on either of those two wells?

A I did not have log or core analysis of either of those two wells. Those wells would be identified as the Betenbough "C" No. 1 in Section 11, and the Betenbough "A" No. 3 in Section 12.

Q Mr. Young, actually The Ohio Oil Company has no acreage at all in this Bough field, do we?

A That is correct.

Q How did you go about picking your net pay for the wells in this Bough field as you have shown it here on this map?

A I picked net pay from micrologs or from core analysis, where it was available.

Q Is that the same procedure that you followed in determining net pay in the Bluitt-Pennsylvanian Pool?

A Yes, sir, it is.

Q And you personally made all of the selections and examined all the logs and the core analyses where available?

A Yes, sir, I did.

Q Have you made any computations considering this 7,220 productive acres that you have selected and the twenty-one wells drilled as to the density to which your selected average has been

drilled?

A Yes, sir. Based upon the 2,720 productive acres and the twenty-one wells being drilled in the pool, the density, therefore, was 130 acres per well.

Q All right, sir. What about cumulative production for that field to June 1, 1959?

A The cumulative oil production from the Bough Pool has been 4,320,867 barrels.

Q What is the average recovery per well?

A 205,756 barrels.

Q Has the per well recovery varied, gone up substantially in that average and location?

A That was the average, yes, sir. Actually, the actual per well recovery has varied up to 438,000 in the Sharp Federal-Yeckel Well No. 1 in Section 13.

Q What is your computation as to the average cumulative recovery per acre in this productive area you've selected?

A 1,589 barrels per acre.

Q That is up to June 1, 1959?

A That is correct.

Q That is an actual production calculation on the average?

A That is correct.

Q What do these actual production figures indicate to you, Mr. Young?

A The actual production figures indicate to me that the wells in the Bough "C" have drained in excess of 80 acres. And when taken in connection with data which I will present in connection, which will be presented later, these figures will conclusively show that such drainage has occurred.

Q All right, sir. Now, prepared under your supervision and direction, was Exhibit 5, is that correct, sir?

A That is correct.

(Thereupon, Applicant's Exhibit No. 5 was marked for identification.)

Q What is this Exhibit, Mr. Young?

A Exhibit No. 5 is a production history graph of the Bough Pool in Lea County, New Mexico.

Q All right, sir. Will you state briefly what this graph presents, just as briefly as you can, please, sir?

A This graph presents a history of the reservoir pressure, the number of producing wells, and the monthly and cumulative oil and water production for the pool.

Q All right, sir. Your pressure history is available only through '55, that is where that curve stops there, is that correct?

A That is correct.

Q During the period of '53, '54, and '55, did the pressure stabilize?

A Yes, sir, it stabilized at approximately 3,000 pounds.

Q Now, what about water production from the pool as indicated by that graph?

A Since the beginning of 1953 water production has been a prominent part in the production of the wells in this pool.

Q What about the wells that have been shut-in, those seventeen that have been shut-in? Do you know why they were shut-in?

A All seventeen wells that have been shut-in in the Bough Pool have been shut-in because of excess water production.

Q All right, sir. Cumulative oil produced from the pool is shown to be how much?

A Approximately 4.3 million.

Q All right, sir.

A To 6/1/59.

Q All right, sir. Now, is there anything of significance as to the percentage of that oil that was produced through the year 1955?

A Yes, sir, this is a significant point. Through 1955 approximately 75 percent or 5.4 million barrels of the oil had been produced with the pressure drop of only approximately 500 pounds. This, in my opinion, indicates and shows conclusively that the Bough field had a strong water drive.

Q When you say this, you are talking about all the data considered on the Bough Pool, is that correct?

A That is correct.

Q Mr. Young, is it your opinion that it is reasonable to assume that the Bluitt also has a water drive?

A Yes, sir, I would think it was reasonable to assume it. It is too early to tell exactly what type of drive the Bluitt will have.

Q But similarities between the two pools, do they indicate to you that the probabilities are that the Bluitt will have a water drive?

A Yes, sir, they do.

(Thereupon, Applicant's Exhibit No. 6 was marked for identification.)

Q All right, sir. Have you had prepared under your supervision Exhibit No. 6?

A Yes, sir, I have.

Q All right, sir. Will you please look at that and state what it is?

A Exhibit No. 6 is a comparison of the basic data for the Bough Pennsylvanian and Bluitt Pennsylvanian Pools.

Q All right, sir. Showing the discovery of each pool the --

A Yes, sir, I have stated those previously.

Q Okay. Now, the next item on that Exhibit 6 is the weighted average permeability from those two pools. State what those weighted average permeabilities are for each of the two pools and the source of your information, please.

A The weighted average permeability for the Bough Pool

was 30 milladarcy. That was taken from the core analysis of nine wells. The average weighted permeability in the Bluitt Pool taken from the core analysis of two wells is 508 milladarcies.

Q That is substantially greater, isn't it?

A Yes, it is.

Q How about the range of permeability in the two pools?

A The range of permeability in the Bough Pool was from one-tenth to 522 milladarcies, and in the Bluitt Pool the range was from .6 to 6,620 milladarcies.

Q And the source of that information, of course, is the same as your weighted average permeabilities, the source of the information?

A Yes, sir.

Q How about the weighted average porosity, the next figure shown on each column of those two pools?

A The weighted average was 6.54 percent. The weighted average in the Bluitt is 5.93 percent.

Q And the source of that is -- in the Bluitt it is from two core analyses?

A That is correct.

Q And in the Bough it is from how many wells?

A Ten wells.

Q Core analysis in ten wells?

A Yes, sir.

Q How about the average net pay in the two fields?

A The average net pay in the Bough is 15 feet, and in the Bluitt 14 feet.

Q How about connate water saturation?

A Connate water saturation, we had to estimate for the Bough Pool and estimated at 25 percent. In the Bluitt Pool, the log analyses indicate the connate water to be 15 percent.

Q And how about your formation volume factor?

A The formation volume factor in the Bough is estimated to be 1.75, and in the Bluitt 1.762.

Q And then the recovery factor that you have assumed for each of the two fields, for each of the two pools, Mr. Young?

A In the volumetric calculation for recoverable reserves, I have used 50 percent recovery factor. I think this is reasonable and is supported by the data that was presented in Exhibit 5, which showed that the Bough had a water drive.

Q All right, sir. What if the Bluitt Pool doesn't develop a water drive and the recovery factor is less than 50 percent?

A If the Bluitt Pool does not develop a water drive, the recovery factor will be substantially less than the 50 percent which I have used, and the net effect there would be that the recoverable, actual recoverable reserves will be even less than I will present here today.

Q All right, sir. Now, at the bottom of this Exhibit 6, below these basic data that we've talked about, you show the

volumetric recoverable oil in barrels, per acre in the Bough and in the Bluitt. What are those figures, please, sir?

A Those are the calculated volumetric recoverable reserves per acre, using the data as presented above in Exhibit No. 6.

Q In arriving at these factors in the Bluitt Pool, did you use the same methods and techniques which you used in arriving at the factors in the Bough Pool?

A Yes, sir.

Q I mean calculated?

A Yes, sir.

Q What is the comparison of your volumetric calculation in the Bough Pool as compared with the actual cumulative recoveries from the Bough Pool that you previously testified about?

A The calculated volumetric recoverable oil per acre in the Bough Pool is 1,631 barrels. This figure supports and is in agreement with the cumulative oil production of 1,089 barrels per acre as was computed from the actual production from the Bough Pool and discussed in connection with Exhibit No. 4.

Q Now, did those two figures coming out fairly close make you feel like you did a fairly good job of calculating those volumetric recoverable reserves in the Bough?

A Yes, sir.

Q When you spoke about the actual recoverable figures a while ago, 1,589 acres, you said you would present testimony

that would show that the acreage in the Bough would drain an average of 80 acres. Is this the testimony you were talking about?

A Yes, sir, it is.

Q Well, now, since those volumetric calculations there in the Bough were relatively close to the actual production figures per acre, what does that lead you to believe with respect to your volumetric calculations on the Bluitt Field? Do you think that's going to be relatively close to what the actual recoverable oil is or not?

A Yes, sir, I do. The volumetric recoverable oil, as I have calculated for the Bluitt is 1,994; for the Bluitt. This value was, of course, calculated using the data -- basic data as presented in Exhibit 6.

Q What does that indicate to you about whether a well in the Bluitt will efficiently and economically drain or efficiently drain in excess of 80 acres?

A I believe these data conclusively show that the average well in the Bough is capable of efficiently draining greater than 80 acres.

Q You said in the Bough it is capable of doing that. You mean the Bough "C" formation?

A The Bough "C" formation.

Q It did it in the Bough Field?

A Yes, sir.

Q And you think the similarity in the two pools indicates pretty strongly that it will also do it in the Bluitt?

A Yes, sir, I do.

Q All right, sir. We have been talking about Page 1 of Exhibit 6 so far. State very briefly what Pages 2, 3, 4 and 5 are for.

A Page 2 of Exhibit 6 is the actual volumetric calculation for the recoverable oil reserves per acre for both Pools. Page 3 is a summary of the core analysis and the weighted average porosity and permeability for the two Pools. Page 4 is supporting data and actual calculation for arriving at the weighted average permeability. and porosity.

Q That Page 4 was gotten off the core analysis report, right?

A Yes, sir.

Q Except for your calculation, I mean, of course?

A Yes, sir. Well, actually, the tabulation there on Page 4 is an average weighted porosity and permability for each of the individual wells as listed on Page 4.

Q I see.

A It was not copied directly off of the core analysis report.

Q These were averages which you computed from the core analysis?

A That is correct.

Q All right, sir. Now Page 5.

A Page 5 is a tabulation of the net pay that I have selected for each well in both Pools. Also it is a determination of the average net pay for the two Pools.

Q Now, you've got some asterisks along there beside off of those net pay figures, and one other type symbol, I see, appears twice. Will you state what those are please, sir?

A The asterisk beside the net pay for each well is wells in which core analysis were available, and the net pay, therefore, was picked from the core analysis. The core analysis, or the asterisk with a capital "I" by the side of it means that the core analysis was available but incomplete. Therefore, I have actually given those two wells a slightly more net pay than the core analysis showed because the core analysis wasn't complete. The additional net pay was selected, of course, from the micro -- or microlateralogs.

Q Mr. Young, considering all of your previous testimony, do you consider that that shows that competent reservoir engineering calculations, using those factors presented in Exhibit 6, being reasonable and accurate with those things, that you can reasonably and accurately predict the actual ultimate recovery from the Bluitt from the area that you are talking about here?

A Yes, sir, I do.

Q All right, sir. Have you made those calculations and presented them in Exhibit 7, which was prepared under your super-

vision and direction?

A Yes, sir, I have.

(Thereupon, Applicant's Exhibit No. 7 was marked for identification.)

Q All right, sir. Exhibit 7 not only presents your calculated recoveries from the Bluitt Pool, but also the present actual recoveries from the Bough Pool, and compares those two sets of figures?

A Yes, sir, it does.

Q Using again the two yellow areas that are marked on Exhibits 1 and 4, shown on Exhibits 1 and 4, we have -- the total acreage in the Bough is how much?

A 2,720 acres.

Q And the number of producing wells?

A Twenty-one.

Q Was this pool developed, the Bough Pool, developed under 40-acre spacing?

A Yes, sir, it was.

Q And what appears to you from that, although the Bough Field rules require 40-acre spacing, the pool actually, was the pool actually developed to a density of 40 acres?

A Not actual. Density was 130 acres per well.

Q All right, sir. Now, the Bluitt area that you expect to be productive on the basis of your present data is 2080 acres shown on this Exhibit?

A On Exhibit 1.

Q And that's the top figure on the right side of Exhibit 7?

A Yes, sir.

Q How many wells would be required to develop that 2,080 acres to a density of one well per 80 acres?

A Twenty-six wells.

Q Twenty-six wells to develop on 80 acres?

A Right.

Q All right, sir. Now, let's look back at the actual recovery from the Bough. You've previously given the figure 4,320,867 barrels to June 1 of '59, is that right, --

A That is correct.

Q -- with average recovery per well of 205,756 barrels?

A That's correct.

Q And your actual cumulative recovery in the Bough to June 1, 1,589 barrels?

A That's correct.

Q Your calculated recovery in the Bluitt is how much?

A Is 1,554 barrels per acre. Therefore, the average expected recovery per 80-acre well on the 2,080 acres is 124,320.

Q That's the figure shown on Exhibit 7?

A Yes, sir.

Q And have you also then calculated the expected ultimate oil reserves in the 2,080 acres that you have designated in the

Bluitt?

A Yes, sir. That amounts to 3,232,320 barrels.

Q Now, Mr. Young, we will go down to the economics. Have you made some computations for comparative economics for complete development of this Bluitt Pool on 40-acre spacing as compared to 80-acre spacing?

A Yes, sir, I have.

Q Is that designated on Exhibit 8?

A Yes, sir, it is.

(Thereupon, Applicant's Exhibit No. 8 was marked for identification.)

Q Was that prepared under your supervision and direction?

A Yes, sir.

Q Does it contain your personal calculations?

A Yes, sir, it does.

Q Mr. Young, in considering the economics of the development of an oil field, you consider it more realistic to consider economics for the entire pool rather than only for one unit?

A I certainly do. Certainly in pools of this nature where a well would drain large areas, the first wells completed will have higher ultimate recoveries and show greater return to the operator. Therefore, the economics which an operator considers in development of an oil pool must be based on the overall pool and then extended to an average well cost and profit. This is the method of calculation that I have carried through on Exhibit 8.

Q All right, sir. Again you start with the area which you expect to be productive, based on your present data, 2,080 acres, right?

A Yes, it is a yellow colored area on Exhibit 1.

Q How many wells would have to be drilled in that area to develop it to a density of 40 acres?

A Fifty-two wells.

Q And following on down Exhibit No. 8, there are twenty-six wells required, you previously testified, to develop that area to 80-acre density?

A Yes, sir.

Q Have you investigated actual costs of The Ohio in drilling, completing, and equipping a well for production in the Bluitt Pool?

A Yes, sir.

Q And have you stated in round figures an amount per well which you think is reasonable?

A Yes, sir. That's 190,000 per well.

Q Some of our actual well costs have been in excess of that?

A Yes, sir. The 190,000 would be a good estimate as to the average well cost.

Q You are speaking now of complete development of the Pool --

A Yes, sir.

Q -- after you settle off problems and can drill some of the wells with less trouble?

A Yes, sir.

Q All right, sir. At 190,000 per well, how much would it cost to develop this 2,080 acres to a density of 40 acres, that is, fifty-two wells?

A $9,880,000.

Q All right, sir. And for 80 acres with twenty-six wells, half that amount, or how much?

A $4,940,000.

Q Your calculation, your volumetric calculations of ultimate oil reserves are shown on this Exhibit, you previously testified, and showed how you arrived at them, and they are how much, please, sir?

A The ultimate oil reserve is 3,232,320 barrels.

Q And what about gas that you would expect to produce with that oil? Have you stated it also?

A The gas reserves at a 1500 cubic feet per barrel ratio would be 4,848,480 MCF.

Q That ratio is a ratio that you have selected as being reasonable over the entire life of the pool, Mr. Young?

A Yes, sir.

Q It is approximately your solution gas-oil ratio, is it not?

A Yes, sir.

Q Have you made computation of the working interest,

net operating income for each gross barrel of oil produced, including income from gas which is produced with the oil? You lump gas and oil together and figure out how much you would expect per gross barrel?

A Yes, sir, that I have, and is shown on the center portion of Exhibit No. 8. The net operating income per gross barrel is $2.26 per barrel.

Q All right, sir. Now, that's the amount after paying, as you have indicated on this Exhibit, severance and advalorum taxes, royalty tax, lifting costs, take that out, this $2.26 is the amount the operator should have left, on the average, to put in his pocket, is that right?

A Yes, sir, that's seven-eighths working interest net.

Q That doesn't take into account the fact that Ohio has a bunch of overriding royalties, does it?

A No.

Q It doesn't take into account the capital cost that would be required to install pumps on these wells later in the life of the field?

A No, sir.

Q All right, sir. In taking your volumetric calculation of your total expected reserves and multiplying that dollar figure per barrel, do you show on this Exhibit the working interest, seven-eighths working interest total net operating income to be expected from your 2,080 acres?

A Yes, sir, I do, and that amounts to $7,305,043.

Q And when you apply that against the cost of the fifty-two wells needed to develop this area to a 40-acre density, what is the result, Mr. Young?

A The net economic loss on 40-acre density would be $2,574,957, or a net economic loss per well of $49,518.

Q All right, sir. Now, have you made computation on what the results would be there as to net profit or loss on development to an 80-acre density of this same area you are talking about?

A On an 80-acre density, the total net profit would be $2,365,043, or a net profit per well of $90,963. I would like to point out at this time that the anticipated profit of $190,000 investment is not good in an industry with as much risk as the petroleum industry. This amounts to less than a fifty cents per dollar invested profit.

Q All right, sir. And that's anticipated profit?

A Yes, sir.

Q That's not in the pocket yet, is it?

A No, sir.

Q Is it your opinion, Mr. Young, that the development of this Bluitt Pennsylvanian Pool on 80-acre spacing will cause measurable decrease in the recovery as a result of drilling too few wells?

A It is my opinion that there will be no measurable in-

crease.in recovery by drilling two wells on each 80-acre tract instead of one well. There is --

Q And when -- go ahead.

A There may be some who disagree with this conclusion. Therefore, I have shown calculations at the bottom of Exhibit No. 8 which show the necessary increase in recovery to pay for a second well on any 80-acre tract.

Q All right, sir. The cost of those twenty-six additional wells, to move from 80-acre spacing to 40-acres spacing, would be $4,940,000, wouldn't it?

A That is correct.

Q How much total additional recovery would you have to have to repay the cost of those twenty-six additional wells at $2.26 a barrel?

A That would be 2,185,841 barrels. The increase recovery needed from each 80-acre tract to repay the cost of the second well would be $84,000 -- 84,000 barrels. Even if the extra well drilled on any 80-acre tract would produce some additional oil, it seems certain that the extra well on any 80-acre tract would not increase the recovery from that 80-acre tract by 84,000 barrels.

Q You just don't believe your volumetric calculations can be off that much, do you, Mr. Young?

A No, sir, I don't.

Q Now, looking at 80-acre spacing from another standpoint in this pool, Mr. Young, do you think that 80-acre spacing will cause a more uniform development of this pool over a wider area than would 40-acre spacing?

A Yes, sir, I do.

Q Do you think -- what effect do you think that would have on the depletion of the reservoir as a whole?

A It would be a more uniform depletion and a more efficient depletion, in my opinion.

Q Would that conceivably result in an increased recovery if you had the wells drilled on out over a wider area? Could it conceivably increase the recovery or not?

A Yes, sir, I believe it could.

Q If 40-acre spacing were required in this Bluitt Pool, what would be your opinion as to the pattern of development of the Bluitt?

A In the event 40-acre spacing was required, the development of the Bluitt Pool would probably be similar to that of the Bough Pool, that is to say, that the development will be clusters of wells grouped along lease lines and not uniformly spaced throughout the productive area. Certainly, the development pattern in the Bough Pool is not the intended result of the conservation orders of this Commission.

Q You do get a picture of that development pattern as it occurs, the 40-acre pattern, on Exhibit 4, don't you, Mr. Young?

A Yes, sir.

Q Looking at Exhibit 4 -- this is one of our older exhibits -- you show two dry holes right up in the area there around some other producing wells on Exhibit 4?

A Yes, sir, I do.

Q Is that indicative to you of the erratic character of the permeability and porosity in this Bough "C" formation?

A Yes, sir. The Bough "C" formation seems to lose its permeability and porosity at any given 40-acre tract.

Q As to certain located points?

A Yes, sir. As a matter of fact, on Exhibit 4 these dry holes are actually surrounded by producers which average approximately 200,000 barrels per well.

Q Now, does that indicate to you -- let's go one step farther, Mr. Young. On Exhibit 1, one of our wells was push-tight, wasn't it?

A Yes, sir, the Federal McGrail No. 2 is tight.

Q Does that indicate to you, this erratic condition of the reservoir, that the more wells you drill the greater the odds or the greater the risk is augmented by, in developing this field?

A Yes, sir.

Q You have a greater chance of hitting these tight spots if you can poke holes all over it, don't you?

A Yes, sir.

Q Now, is there a possibility that, or if there should be a possibility of secondary recovery operations in this Bluitt Pool, as it produces on down the line and past its primary production, what would be your idea as to whether 40 or 80-acre spacing would leave that pool in condition for possibly secondary recovery operations?

A Well, it is common knowledge that wells uniformly spaced will lend themselves better and more efficiently to any type of secondary recovery operation. Now, if 40-acre spacing was adopted for this field, and if the resulting pattern of development would be similar to the Bough Pool, the irregular pattern would not lend itself to secondary recovery. It is my opinion that 80-acre spacing will more uniformly space your wells, and it is quite conceivable that 80-acre spacing would prevent waste whereas 40-acre might cause waste.

Q Now, the controlling factor whether you could afford to undertake secondary recovery operations might actually be whether your pattern was sitting there so that you could use it or whether it wasn't?

A That is correct.

Q Mr. Young, considering all of the testimony that you have presented and the Exhibits which you have presented, do you have some recommendations to make to the Commission at this time concerning pool rules in this field?

A Yes, sir. Based upon all the data available, I strongly

recommend to this Commission that pool rules be established for the Bluitt Pennsylvanian Pool requiring 80-acre proration units and 80-acre spacing pattern, each proration unit to consist of any two contiguous governmental quarter-quarter sections, with the well located in the approximate center of either quarter-quarter section in the unit, but with no well hereafter commenced to be located nearer than 1860 feet to any other well previously completed in or drilling to the Bluitt Pennsylvanian reservoir except as otherwise provided.

Q All right, sir. Do you have some further recommendations as to exceptions to the tolerance distance as to your well locations?

A Yes, sir. Due to the present development in the N/2 of Section 20, I recommend that the pool rules permit without notice of hearing a tolerance of 150 feet in the location of any well, and that the rules authorize the drilling of one additional well in the NE/4 of Section 20, at a location 1320 feet from one existing well, but otherwise in compliance with the rules requested; and that the rules provide that no other exception to spacing and proration unit requirements shall be authorized without notice and hearing, and then only to prevent waste and protect correlative rights.

Q Well, Mr. Young, one specific exception that you recommended pertains to the N/2 of the NE/4 of Section 20?

A That is correct.

Q That is authority to drill an additional well in that acreage I have just described on 80 acres. If it proves economically feasible to do so, is that exception, in your opinion, necessary to protect correlative rights?

A Yes, sir, it is.

Q In other words, under the field rules that you propose there could not be a well located in that N/2 of the NE/4 unless it is as an exception, is that right?

A That's correct.

Q That results from the fact that the second well in the field was drilled where it was --

A Yes, sir.

Q -- before we began our actual development on alternate 80-acre spacing?

A Yes, sir. Yes, sir.

Q The tolerance of 150 feet from the center of the quarter-quarter section, which you recommend, would be applicable to all future wells, would it not?

A Yes, sir.

Q What is your recommendation as to the fixing of allowables in this field, Mr. Young?

A As to all allowables for the Bluitt-Pennsylvanian Pool, I recommend that the oil allowable for all wells in the field be fixed by applying the 80-acre proportional factor as provided for in statewide rule 505, with the allowable for any non-standard

proration unit which may be approved, to be increased or decreased in the proportion that the number of surface acres included in such unit bears to 80 acres.

Q These recommendations as to proration unit spacing, location of wells and allowables are the same as set out in The Ohio application in that case, are they not, Mr. Young?

A Yes, sir, that is correct.

MR. COUCH: Mr. Commissioner, this concludes the direct testimony of this witness.

MR. PORTER: Do you want to offer your Exhibits?

MR. COUCH: Exhibits 1 through 8, including 2-A, we offer in evidence.

MR. PORTER: Without objection, Exhibits 1 through 8 will be admitted.

Take a ten-minute recess, and the witness will resume his seat for cross examination.

(Short recess)

MR. PORTER: The meeting will come to order, please. Does anyone have any questions of Mr. Young? Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Young, referring to Exhibit 1, what do you base the area that you have colored in yellow on?

A Mr. Nutter, as my testimony will show, we do not know as yet what the productive limits of this pool are. This is just

an area that we have selected at what we might call for calculation purposes in presenting our economics as the productive area of this pool. It was upon the 2,080 acres that we prepared our economics. Now, looking at the contours, I think we could say that this 2,080 acres is reasonably productive. I'm not saying it is productive. It is just an area blocked out to present our economics.

Q Well, now, I think you stated this is probably a stratographic trap?

A Yes, sir, it is.

Q And you stated that the oil was saturated with gas?

A Yes, sir, it is saturated at original conditions.

Q Do you expect there will be a gas cap as you move up the structure?

A There could be. There is no data to substantiate it or refute it at this time.

Q And you expect as you come on down the structure that you probably will encounter a water-oil contact which you haven't encountered as yet?

A Well, that certainly is reasonable.

Q But just generally you base this yellow area upon a contour interval of roughly from minus 5375 to maybe minus 5525, is that right?

A We could have easily taken two sections -- I think this is three and a quarter sections -- we could have easily taken

two sections to present our economica. I'm not saying that the bottom three-quarters of the section in my yellow colored area there is productive; it certainly is reasonably productive, I believe.

Q I see. Well, now, on your Exhibit No. 2, Mr. Young, you've shown the net pay in each well colored in red, --

A Yes, sir.

Q -- and that was correlated from the net pay as picked off the cores on the two wells that were cored, or what is the basis for determining whether pay is net pay or not in this instance?

A The microlateralog kicks to the right indicating porosity. Now, we cannot tell permeability, of course, from any porosity log. The log will actually only tell you porosity, and, therefore, I think I have reasonably included everything that we could call porosity from the log as net pay. I believe I have been reasonable in getting the maximum net pay that we could justify it.

Q Now, in your Federal Silver No. 1, I think -- didn't you have 12 feet of net pay from the microlateralog?

A In the Federal Silver "A" No. 1?

Q Yes, sir.

A Yes, sir, we had complete core analysis on the complete Bough "C" formation, and the core analysis showed 11.2 feet of net pay.

Q What did you base your net pay on the core analysis, what made net pay there?

A Anything greater than .6 milladarcy. If you will look and refer to the third Page of Exhibit No. 3 -- are you asking about the Federal Silver "A?"

Q Yes.

A It is the second Page of the first core analysis, and in that case we considered net pay anything greater than 1 milladarcy, or stated another way, anything that showed less than one-tenth milladarcy we did not consider as pay.

Q I see.

A I think that's the generally accepted method in the industry.

Q And so regardless of porosity, if you didn't have that permeability, you didn't include it?

A That's correct.

Q I see.

A All cores that had greater than 1 milladarcy, regardless of its porosity, was considered net pay, and there again I believe we have included everything that could be included.

Q Do you think there is any chance of getting any oil out of that section that is not considered net pay?

A No, I do not.

Q On account of that permeability?

A Yes, sir, that figure with less than one-tenth. Now, the

Core Laboratory, I believe, will show in their relative -- in their permeability measurements anything that they can't get one-tenth milladarcy out of they just show it as one-tenth. In other words, they would show a solid, "a solid rock," if I may use the expression, as less than one-tenth milladarcy.

Q Did any of the cores have any evidence of any fracturing?

A Yes, sir, there is some evidence of fracturing.

Q Was this area where you had your permeability of 6620 an area where there was fracturing, or was that limited permeability, but just an extremely permeability streak?

A If you will refer to the completion coregraph on Federal Silver "A" No. 1, the interval from 9507.7 to 9.4 is the foot with 6620 millidarcys. In the far column before you get to the plotted graph is a sample characteristic as determined by Core Laboratory. That particular foot shows a "FV" which is fractured and vuglar.

Q So unless you had these fractures continuous throughout the entire Bough "C" pay there, you probably wouldn't have a net weighted permeability of 580 millidarcys, as you have indicated on your Exhibit, would you?

A Mr. Nutter, let me answer that in this way. I believe my testimony will show that I said that the average weighted permeability as established by these two cored wells was 508. I don't think any of us can actually say that that is really

representative of the entire formation. It may be, I don't know.

Q However, the permeability wouldn't actually enter into any of your calculations on your recoverable reserves or anything like that?

A No, sir, it sure doesn't.

Q Did you have any other pressures except the two pressures that you mentioned in your direct testimony?

A Yes, sir, I did. As the testimony will show, the initial pressure measured in the Federal McGrail No. 1 was 3,027 pounds. All these pressures are at minus 5450 feet that were measured on February the 4th.

MR. UTZ: 5450?

A 5450, correct. The Federal McGrail No. 2, as we mentioned, is a tight well. The pressure measured on May the 2nd on that well was only 152, which indicates again the erratic characteristic of the porosity and permeability in the formation. Now, on May the 20th, the pressure in the Federal Silver "A" 1, which was the initial pressure in that well, was 3,004 pounds. On the same day, or the next day the Federal McGrail pressure, Federal McGrail No. 1 was remeasured and its pressure was 3,010. So we see there that from February 4th to May 20th and 21st, the pressure had declined approximately 20 pounds in those two wells. Now, on July the 21st, the initial pressure was run in the Federal McGrail No. 3, and it was found to be 2977. This was where we got the 50 pound decrease in pressure from the

initial pressure as run on February the 4th. And I believe the testimony will show that I testified that these data are not conclusive that it has been drained, but it does substantiate and indicate that drainage is occurring over large areas.

Q Well, now, let me get these pressures straight. Your first well completed in the pool was the McGrail No. 1, correct?

A Correct.

Q And the first pressure that you indicate here is on February the 4th of '59?

A Yes, sir. That was the first pressure.

Q Now, had any production come out of that well at that time?

A Yes, sir. Approximately three weeks' production had been taken from the No. 1.

Q Did you have an initial virgin pressure on that?

A No, sir, we did not.

Q And then the next pressure that you have mentioned were three pressures that were taken in May, I believe?

A Yes, sir.

Q The Silver No. 1 on May the 1st, --

A Silver "A" 1 is May 20th.

Q May the 20th. Was that the one at 3,004?

A Yes, sir.

Q Is that an initial pressure on that?

A That is an initial pressure on that well.

Q And the McGrail 1 had another pressure taken on it on May the 20th also?

A May 21st.

Q May 21st at 3,010?

A Yes, sir.

Q How do you account for the fact that the Silver pressure, which is an initial pressure, is lower than the McGrail pressure, which is a well that has been producing for quite some time in May?

A My answer to that, Mr. Nutter, would be that that is just within the accuracy of your measuring devices. It is only six pounds difference. I wouldn't put too much faith in the absolute value of the two.

Q What range of accuracy do you think you can depend on with these bombs?

A They should be within a range of half of one percent, I believe, which would be about 15 pounds at this pressure. Now, I'm not an expert on pressure recording devices.

Q And, now, this McGrail No. 2 Well, --

A Yes, sir.

Q -- when was that pressure of 1852 recorded on that well?

A May the 2nd.

Q Was that an initial pressure on it?

A It was the first pressure run on it.

Q That well was completed, actually, in March?

A Yes, sir.

Q How do you account for this low pressure in it?

A I would say that this particular area that the No. 2 is drilled in is just tight low permeability. That is, I believe, shown and borne out to be typical of the Bough "C" formation. In Exhibit No. 4 the Bough Pool substantially in the center of the field had two dry holes. Now, the Bough "C" formation is present in both of those wells, but there is no porosity or permeability in either of them. So, therefore, you had a dry hole right in the center of production. This well here is surrounded by wells that produced an average of 200,000 barrels per well. It is a localized condition.

Q Well, now, this McGrail No. 2, do you think that had an initial pressure somewhere in the range of the initial pressure of these other wells?

A Yes, sir, I do. Now, I might say this, that this pressure of 1852 was after a shut-in of 94 hours, and the well was still building up. If the data was extrapolated on out, the pressure, I believe, would be around 2300 pounds.

Q Well, it would appear, then, that some parts of these pools are probably much more permeable than other parts?

A Yes, sir.

Q And some parts, maybe a well could drain larger radius than another part?

A Yes, sir.

Q Mr. Young, we have two pressures there on the No. 1 well?

A Yes, sir.

Q Your early pressure in February of 30.7, and a later pressure in May of 3,010, I guess. How much production had been taken from that well at that time?

A I would have to estimate that, Mr. Nutter, and say it is about 16,000 barrels.

Q Now, on your Exhibit No. 4 you have shown the estimated productive limits of the Bough Pool, and colored what you feel is the productive area in yellow?

A Yes, sir.

Q What do you base that yellow area on?

A This yellow area on Exhibit No. 4 is what I have estimated as the productive limits of this pool. Now, this is not something that you can take and just pick from this map. You have to consider these volumetric calculations as to how much oil can be recovered per acre. Then in comparing that with the cumulative production from the Bough Pool, you must of necessity have drained on the order of 2720 acres, as I have shown in the Exhibit No. 4. Here again I do not say this is the exact productive limit of that pool. Taking all the data that is available and interpreting it, these wells in the Bough Pool must have drained on the order of the area that I have shown. Now, the

exact area, I don't believe anybody could say.

Q Well, now, if there hadn't been a well drilled in the NE of the NE of 13, you probably -- that was a dry hole -- you probably would have colored that in yellow, wouldn't you?

A No, sir, I wouldn't.

Q If there hadn't been a well --

A Yes, I beg your pardon, yes.

Q -- you probably would have colored that 40 in where that dry hole No. 3 is located?

A Yes, sir, I probably would have.

Q Do you think there is probably -- possibly some areas in here where you might get dry holes if you drill them?

A Yes, sir, but at the same time there is probably other areas on this map that could be colored in yellow or be productive that I have not shown. This is merely to demonstrate and explain where all the oil that was produced from the Bough Pool came from.

Q Well, now, you stated that these two holes, these two dry holes were evidence of the fact that the more holes you punched, the more likelihood it would be that you would get dry holes. Do you think the more holes you punch, the more likely it would be that you find productive acreage in here?

A It is my opinion that all of these wells are draining wide areas. You might find some more productive areas or that were productive, but at the same time I think these wells have

drained the area.

QUESTIONS BY MR. PAYNE:

Q Mr. Young, I believe you testified that if this pool remains on 40-acre spacing you are liable to have non -- a non-uniform pattern, is that correct?

A Yes, sir, I believe if we are forced to drill on 40-acre spacing, we'll end up with something similar to what the Bough Pool is.

Q Now, that is because it will not be entirely drilled up on 40's, is that right?

A That is correct.

Q Don't you assume in your Exhibit and in calculating your economics that it will be drilled up entirely and determined what the loss will be per well?

A Yes, sir, I have done that.

Q Do you think that is justified in view of the fact that it won't be drilled up?

A Well, I have no --

MR. COUCH: Excuse me just a minute, Mr. Commissioner, if I may, the assumption that the well -- that the pool would be drilled up on 40 acres for the purpose of economics, is an assumption which is granted upon the proposition that under the statute the area fixed on this pool would be the area that a well would efficiently and economically drain. That being the case, if that is the area that a well will drain, and the area fixed

by the Commission, then it should follow that the wells would be drilled. The economics indicate that that is not the correct unit for a field of this character. But that's the reason for the assumption.

Q (By Mr. Payne) I want to ask you this, Mr. Young, --

MR. MORGAN: Are you objecting to the question or are you testifying, Mr. Couch?

MR. COUCH: Mr. Morgan, I was attempting to show the reason for the assumption, it being a matter of, pertaining to law and not within the professional training of this witness.

Q (By Mr. Payne) This is Federal acreage, isn't it?

A A good portion of it is Federal acreage.

Q So there would be no offset requirement for you drilling a well, if you establish it would be uneconomical to drill it?

A Not all of it is Federal acreage. The western portion, well, the E/2 of Section 19, NE/4 of Section 19 is not Federal acreage as shown by my reasonably expected productive limit.

Q Now, you have testified, I believe, that the permeability varies a great deal on this pool?

A Yes, sir, I think that's evidenced from the core analysis.

Q And that you are less likely to hit one of these bad spots if you drill on 80 rather than 40, is that your testimony too?

A I believe the testimony showed that if you drilled on

40, the more wells you drilled, the more likelihood you would hit these tight areas, but at the same time it is my opinion that were you to hit a good area, it will drain a large area and actually produce the oil around these tight areas.

Q In other words, if you hit a bad spot, that well would not drain 80, but some other well would, is that --

A Yes, sir.

Q So you are relying on drainage and counter-drainage both?

A Yes, sir.

Q Have you run any interference tests in this pool, Mr. Young?

A No, sir.

Q Why not?

A The PI's of all these wells, with the exception of the one tight well, are extremely high. The PI of the Federal McGrail No. 1 is around 30. The PI of the Federal McGrail No. 3 is 5. And if we were to run PI tests, they would certainly be, in my opinion, inconclusive because with a PI of something like 30, if you produced 500 barrels a day, your drawdown would be insignificant in that well and certainly would not affect the other wells.

Q Mr. Young, have you had any experience in water floods -- with water floods?

A No, sir.

Q Just as a matter of curiosity, how did that cow pasture get in that Bough Pool on the nomenclature?

A Well, that I don't know.

MR. COUCH: I don't believe I understand the question.

Q The productive limits are the yellow, and the Commission has designated it in the cross-hatched portion, and if you are correct, then about half of that pool is dry acreage?

A Well, I personally believe a lot of it is dry.

Q Do you think it was a poor job of nomenclature?

A Of course, this field was discovered in a nomenclature setup back in the early 50's.

Q Was that by an industry committee?

A That I couldn't say.

MR. PORTER: Mr. Payne, I think I have a personal explanation for that. At the time this pool was discovered, the nomenclature was handled by an industry committee which had been appointed by the Director of the Commission. I used to sit with that committee in a capacity as advisor on newly completed wells, and it was the policy of the nomenclature committee if a well were found at a corner of a section, they set up a section of four section. If it was near the middle of the section, they set up one section pool. I believe you'll find that there has been an erratic departure from that since the Commission has handled that. Also, the name of the pool was derived from the name Betenbough. The nomenclature committee shortened the name

of the pool, used the last word, Bough.

QUESTIONS BY MR. NUTTER:

Q Mr. Young, in making your volumetric calculations of reserves in the Bluitt Pool, you've used an average porosity of 5.93?

A Yes, sir.

Q Was that obtained from the cores of the two wells that you had cores on?

A Yes, sir, it was.

Q So you have one core of the pay section and another core that took in a portion of the bottom hole pay section?

A Yes, sir.

Q Now, have you tried to determine what the average porosity is of all the wells in the pool by the microlateralogs that you have there?

A We have done some of that work. The average would come out about the same. It may have varied one percent if we throw in the log calculations.

Q I see. One percent higher or lower, or what?

A Well, I don't know which way it would be going, Mr. Nutter. I just haven't tried to throw it in. I would think that the core analysis porosity, if it is available, I would prefer using it rather than log calculations.

Q Even though you had one complete core available and that's all?

A And almost two complete cores through. We had six feet out of possibly nine in the second well.

Q You didn't have any cores up there in that area where the pool is tight, did you?

A You are referring now to the Federal McGrail No. 2?

Q Yes, sir.

A No, there is no core there.

Q This 50 percent recovery factor that you have used, what is that based upon?

A Well, now, that is based upon the Bough Pool having a good water drive in volumetric calculations. With the water drive, I think 50 percent is a good recovery factor to be using in volumetric calculations.

Q Well, now, if you use a recovery factor of 50 percent, and make the volumetric calculations of the reserves, and your recovery factor is high, then maybe that Bough Pool would cover more than 2720 acres that it covers?

A Yes, sir, it would.

Q If your recovery factor is low, maybe it doesn't cover quite as much acreage as you expect?

A That is correct, it could be. All these calculations are made on a 50 percent recovery factor. Now, if the recovery factor is lower in the Bough Pool, you would have to have more acres to explain where all this oil came from, or was produced. Now, if it is higher, I don't believe you could go in the formation.

of this low porosity and permeability. I don't believe you could go much higher than a 50 percent, granted you could maybe go 60 percent on your volumetric calculations, but still your drainage on the average well would still be in excess of 80 acres.

Q Well, now, your calculations are based on recovery factor of 50 percent, and your Bluitt calculations are based on recovery factor of 50 percent, yet the permeability, one is 30 and the permeability in the other is 508. Do you think you will have the same recovery factor regardless of the permeability?

A That's difficult to say. In other words, you are trying to relate permeability to the -- directly to the recovery factor.

Q Yes, sir, particularly when we are comparing wells on 40-acre spacing versus 80-acre spacing. Do you think that permeability would affect the distance that a well could drain?

A Yes, sir, I believe it would.

Q Don't you think if you had a low permeability, you might not have as high a recovery factor as you would if you had a higher permeability.

A There would probably be some decrease in the recovery factor in the low permeability.

Q So maybe these recovery factors that were assumed may not necessarily be the same for the two pools.

A No, sir, I wouldn't say identically for the two pools and probably wouldn't be.

Q Have you seen a pool that had a recovery factor of less than 50 percent?

A Offhand, I can't name any, Mr. Nutter.

Q You have seen them with more?

A Yes, sir, with more, but they are considerably different characteristics than we have here. They are extremely high permeability and high porosity.

Q I see.

QUESTIONS BY MR. PAYNE:

Q Mr. Young, how deep are these wells?

A 9500 feet on the average.

Q How much did your discovery well cost you to drill?

A Mr. Payne, the discovery well was drilled as a dry test to the Devonian. Now, the actual cost of the Bough "C" I cannot say.

Q Do you have the figures on any of these other wells?

A Yes, sir.

Q $190,000 seems to be a little high?

A Oh, well, I only have estimated figures, Mr. Payne. The estimated figure, leaving out the Federal McGrail No. 1, actual estimated figures for the other four wells comes to $206,000.

Q Mr. Young, do you think a pool ought to be spaced on the basis of the poorest wells in the pool, the best wells in the pool, or the average?

A I think it would have to be on the average. That was one of the reasons that in this economics we presented it on a poolwide basis and then averaged it out on a per well basis.

QUESTIONS BY MR. NUTTER:

Q Now, if you took it on a poolwide basis, you used the same recovery factors and the same number of barrels of oil from each well and then multiplied that by the twenty-six or fifty-two wells, didn't you?

A Yes, sir. In my opinion, there would be very little, if any, measurable difference if this field is developed on 40 or 80-acre spacing.

Q What I maintain, you said you thought the pool should be spaced on the average well. Do you think that's what we have here now, these cores that we have, and this data that we have to calculate the expected reserves, do you think those are average wells?

A Well, at this stage of development, we will have to assume that they are average, Mr. Nutter.

Q We already know that one is not quite as good as the average, so we must expect that we will have better wells to make this average, is that right?

A Well, I think one or two of the wells now will be as best as you can get. Anything with a PI of 30, I think,would be an extremely good well.

Q At least it is average?

A Yes. Let's say that the existing wells combined would probably present you with an average well.

QUESTIONS BY MR. PAYNE:

Q Mr. Young, are you in your application asking for 80-acre spacing as opposed to 80-acre proration units? In other words, do you have any objection to having two wells drilled on an 80 with one 80-acre allowable between them?

A Would you repeat the question, Mr. Payne?

Q Are you asking for 80-acre spacing requiring not more than one well be drilled on an 80?

A Well, I believe that's correct, but at the same time I believe the Commission would have a right to grant two wells on an 80 and give each one of them half an 80-acre allowable.

Q I wanted to make clear whether you are asking for 80-acre spacing as opposed to 80-acre units.

MR. COUCH: Both.

Q The two are incompatible. I believe you testified earlier in regard to non-standard units. Now, the non-standard units that you visualize are those simply where you get to the edge of the pool and you only have 40 acres to dedicate to the well or the non-standard units that you are talking about are in the 40 acres?

A Any 40 acres on the pool.

Q So you are actually asking for 80-acre proration units. Then, you have no objection to a man drilling two wells on an 80?

A And giving each one of them half an 80-acre allowable?

Q Right.

A I would have no objection to that.

QUESTIONS BY MR. NUTTER:

Q What allowable do you propose for the wells if the Commission should authorize 80-acre spacing?

A Repeat the question.

Q What allowable do you propose for the wells if the Commission should authorize 80-acre spacing?

A The allowable for 80 acres with the depth factor applied.

Q The same allowable that the rule books --

A Yes, sir.

Q -- set up for?

A The statewide Rule 505 for 80-acre proportional factor.

Q Do you want these pool rules to be permanent, or are you seeking temporary rules here, or just what?

A We are seeking permanent rules, Mr. Nutter.

Q Do you think that there is a possibility that after development has gone on here for a period of time, that you may be -- the Commission could be in a better position to enter a permanent order one way or the other?

A Well, in the --

MR. COUCH: If it please the Commission, a question such as this, I think, would go more directly to the legal aspect

of this thing. Certainly, the Commission has legal right, at any time in developing the pool, to call a hearing on its own motion, take the testimony that is available, and revise the original order of the pool, if the circumstances warrant it. The more information we have, the better, more complete answers we may be able to give to these things. But as to the legal right of the Commission to change them down the line, why, this witness, I think, would not be qualified to answer it, but I say you can do it, and I think Mr. Payne will agree.

QUESTIONS BY MR. PAYNE:

Q Mr. Young, are you contemplating taking any interference tests in this pool even though they might be inconclusive?

A We don't have any present plans to take them, Mr. Payne.

Q So that any additional data on this pool will have to come from further development rather than tests?

A Yes, sir.

QUESTIONS BY MR. PORTER:

Q Mr. Young, in connection with, I believe, Exhibit No. 4, the number of wells which have been abandoned, I believe you said those wells had been abandoned because of excess water production?

A Yes, sir.

Q Do you think that is premature water encroachment?

A No, sir, I do not.

Q You don't think that the rate of withdrawal had anything to do with the time in which the wells were abandoned?

A No, sir, I do not. Let me refer you now, Mr. Porter, to the row of wells in the N/2 of the N/2 of 14. If you will look at the abandoned or shut-in dates of those wells, they are shut-in progressively as you go up structure, which is a normal expectation of wells with a water drive. The outer well was shut-in, that's the Gulf John Allen No. 1, was shut-in in July of '55. The Magnolia Betenbough, July, '56, Magnolia "B" 1 Betenbough, August of '57, the Sharp Yeckel No. 1 in March of '58. That is the highest well on the structure. Those wells were shut-in as you progressively -- as the water progressed right up the structure, which would indicate to me the normal encroachment of water in a water drive reservoir.

Q What presently is being done with the gas produced in this field?

A I believe it is being flared, but I understand we are getting a gas contract.

Q You anticipate a market at some time in the early future?

A Yes, sir.

MR. PORTER: That's all the questions I have.

QUESTIONS BY MR. NUTTER:

Q Well, now, Mr. Young, you said that this was, the abandonment of these wells in the Bough Pool was the natural

result of the water marching up the structure. Now, these three wells in the southwestern portion of the pools are some of the lowest wells in the structure?

A Yes, sir.

Q Hasn't water marched in there yet?

A The wells in the south end of pools, if you will notice, were drilled in '56 and '57. That is approximately six to seven years after these big producers in the center portion of the field were producing. Now, the concentration of these large wells, or the early wells in the center of this field probably, in my opinion, pulled in the water from different directions and resulted in an irregular water encroachment pattern. Therefore, the area in the south, some of it you'll notice, are flooding out the wells that are higher than the ones that are still producing, which are lower wells.

Q You'd still claim this is edge water and not bottom water coming up?

A I'm almost positive it is edge water. You have to remember that the Bough formation's maximum gross net is 35 feet, the water has to move up.

Q What is below that Bough "C?"

A A shale. The Bough "C" is bounded on top and bottom by shale. The only way water could possibly move up would be parallel to the bedding plane. Now, the wells on the western edge produced oil. So, therefore, the gas, the oil water con-

tact must of necessity be out further than those wells. Now, if you can visualize a bed only 30 feet thick, that's the gross thickness of the Bough "C." The water had to move up at least 150 feet up structure before it could flood out the top wells.

Q The dates on the right of the wells are the dates of abandonment?

A The day they were shut-in, Mr. Nutter. Lots of times we can't tell when a well was actually abandoned, but we know when it stopped producing due to the production reports. So the date on the right is the shut-in date.

Q So the water evidently was moving in rather erratically in some places, wasn't it?

A Yes, sir.

MR. PORTER: Mr. Montgomery.

MR. MONTGOMERY: My question was answered.

QUESTIONS BY MR. UTZ:

Q Mr. Young, I believe you, in your recommended rules, recommended contiguous 40-acre tracts to be dedicated to the wells?

A Yes, sir.

Q Was that any two 40-acre tracts within any legal section?

A I believe the testimony will show that it was any two contiguous governmental quarter-quarter sections.

Q In other words, you would suggest, then, that you form

a standard unit across the section line?

MR. COUCH: This goes, again, to the matter of company policy and legal application of rules. If this Commission will remember, we were here with a motion for rehearing in the Dean-Permo Pennsylvanian, and it was contested very strenuously that the section line should not be used as a cutoff point for units such as this. And for that reason, maintaining still the same thought we had then, we had not thought to cut them off.

MR. UTZ: I take it, then, that you form units across section lines?

MR. COUCH: Thatis right, if it is the way the acreage develops, yes, sir.

Q In regard to the location of the wells, did you recommend which quarter-quarter section the wells should be drilled in?

A I said -- recommended they could be located in either quarter-quarter section, in either quarter-quarter section with tolerance allowance of 150 feet.

Q From the center?

A From the center, yes.

Q Then, you could have two wells on the same end of 160?

A No, sir. There was one other provision that I recommended, and that be -- that that would be 1860 feet between any two wells.

Q That would be the diagonal between two wells on opposite corners?

A Yes, sir.

MR. UTZ: That's all I have.

MR. PORTER: Anyone else have a question of Mr. Young? Mr. Payne.

QUESTIONS BY MR. PAYNE:

Q Mr. Young, on your Exhibit 4, I notice that these two dry holes that were drilled, you show 40-acres, therefore, as being unproductive.

A Yes, sir.

Q Is that because of 40-acre spacing? If you had 80-acre spacing, would you show that 80 acres would have been dry?

A We have no way of knowing how many acres are actually dry.

Q Maybe it could be 131 since that is what productive wells drain.

A I couldn't refute the 131 if you said that is what it was.

MR. PORTER: Anyone else have a question?

REDIRECT EXAMINATION

BY MR. COUCH:

Q Mr. Young, if you did take 131 for those dry holes, you have to reach out there and get some areas that actually produced, wouldn't you?

A Yes, sir, I would.

Q These tight spots that we have found, tight spots that

we found, as far as we now can determine at this time, are they located tight spots?

A I would think so.

Q We have nothing to indicate that they extend over any given area or any weighed area, do we?

A No.

Q And the core analysis that you have on our two wells and the ones you looked at on the Bough, they indicate rather wide ranges of permeability, do they not?

A Yes, sir, they do.

Q Again indicating the erratic condition of the reservoir?

A Yes, sir.

Q Now, there have been some questions directed toward your assumption of a 50 percent recovery factor on each of these two pools. Mr. Young, if you are incorrect and if there is no water drive in the Bluitt and if the recovery factor is 20 percent or 30 percent, would that make it more or less attractive to develop this Bluitt area on 40 acres?

A Definitely less attractive.

Q All things considered, Mr. Young, would you consider that in the Bluitt Field area, based upon what you know now, that the drilling of that area up to a density of 40 acres per well, would cause the drilling of unnecessary wells?

A Yes, sir, I believe it would.

Q Mr. Young, this data which you have presented on the Bluitt is necessarily limited by the early life of the field, is that not right?

A Yes, sir.

Q If the wider spacing which you have recommended is adopted, would it be your opinion that the aerial limits of the Bluitt would be more quickly defined, more rapidly known than if development proceeds under 40-acre spacing?

A Yes, sir, certainly would.

Q Of course, you would have to step out 1850 feet from every well when you got ready to drill it, wouldn't you?

A Yes, sir.

Q And if that uniform and wide pattern spacing is applied on the Bluitt, would it be your opinion that that would be a more complete development of the reservoir?

A Yes, sir.

Q In your opinion, would it be wise to wait and let this field develop on 40 acres and try to apply 80 later on?

A No, sir.

MR. COUCH: We have no further questions.

MR. PORTER: Does anyone else have a question? The witness may be excused.

(Witness excused)

MR. PORTER: I believe you offered your Exhibits at the end of your first direct.

MR. COUCH: Yes, sir.

We have one other witness.

MR. PORTER: Off the record.

(Discussion off the record)

J. D. WHEELER,

called as a witness, having been first duly sworn, testified as follows:

MR. COUCH: Mr. Payne, did you ask a question? The witness has been sworn.

MR. PAYNE: Yes, sir, he has.

DIRECT EXAMINATION

BY MR. COUCH:

Q Will you please state your name and position with The Ohio Oil Company?

A J. D. Wheeler, division manager for the Houston producing division of The Ohio Oil Company.

Q And that division covers the greater part of Texas and New Mexico -- most of New Mexico, is that right?

A That is correct.

Q Mr. Wheeler, do you have a statement that you wish to make in connection with this case?

A Yes, sir.

Q Will you please do so?

A I have nothing to add to the technical testimony that

has been given, but I would like to give the Commission just a few thoughts along the line of this problem as it affects oil industry management. For the past couple of years the industry has been having a pretty tough time with allowables being cut, operating costs going up, development costs going up, and we keep getting letters from our home office to see if we can't cut the costs, and we try to do it by cutting down on the cost of the well. That is probably one reason that we only cored two wells in this field. I told them that we couldn't spend the money. And the same way with logs, we tried to cut down the number of logs we take, and we so advised the production superintendent, and he was asked to run five and a half inch instead of seven inch as he preferred to run, and after we get through with all that, perhaps, why, we save 5 percent of the total cost of the wells.

Now, 5 percent is a nice savings, but the ironical thing about it is that maybe we should have saved 100 percent of the cost of that well because maybe that development was an unnecessary well. And by an unnecessary well, I mean a well that would not materially increase the ultimate recovery from the reservoir in which it was drilled.

As an expert engineer, I would be the last to advocate 80-acre spacing for all fields because I recognize that certain fields that have thick pays with a large volume of oil in place, per acre, and perhaps they have low permeabilities, and certainly they warrant and justify a closer spacing than does a field with

a thin pay, low per acre oil recoveries possible, but with the virtue of a high permeability. And certainly, the Bluitt Pennsylvanian Field is an excellent example of this latter type of reservoir.

Now, we know that we in this country are having a lot of difficulty in trying to compete with foreign oil. One of the main reasons we can't, that is, from a standpoint of cost, one of the main reasons we can't is because in these foreign countries they have extremely wide spacing. Perhaps a mile or two miles is a normal offset, and from those wells they are producing thousands of barrels a day. Well, I recognize that we in this country can't ever do anything like that because we have to protect correlative rights. But I think we ought to make an attempt to approach that, and the best way to do it isn't by trying to save a little money on drilling a well, but by eliminating as many unnecessary wells as we possibly can.

One other sidelight that is very important to me, and I believe it will be of interest to the Commission, is the manner in which a company budget operates. Using our own company as an example, the financial department will tell all the operating departments how much money there is in the till to be spent for capital investment in the subsequent year. The production department, for instance, will take their allocated money and allocate it again among the various producing divisions of which ours is one. We, in the meantime, have prepared the budget, and

we have a group of wildcat wells on there that we wish to test, geological structures, and spots that we are pretty proud of, and we start out the year with a budget with maybe half a dozen wildcat wells in there, but invariably, by the end of the year we don't get them all drilled because we have had to spend the money somewhere else, and if, by way of example, next year we had to drill five unnecessary development wells at a total cost of a million dollars, why, as far as our budget is concerned, that would mean that we would have to forego the drilling of a million dollars worth of wildcat wells, wells that we are just jumping up and down wanting to drill. And to summarize this and also generalize it, what I am in favor of is wider spacing for developing wells and closer spacing for wildcats.

Now, I would like to say just a word with specific reference to the field we have under consideration today. It has been indicated that probably the field wouldn't be drilled up to a 40-acre density even if a 40-acre rule were in effect. And I think I can say definitely that it wouldn't be because my technical people have convinced me that we can maybe make a couple million dollars in that field if we drill it on 80-acre spacing, but if we drill it on 40, we would lose our shirt. I sort of like my job, and I don't want to lose it by losing money in a field where we could make some, so I think we all have a little Casper milky toast in it. In referring to our first Exhibit, that Well No. 2 was drilled 1320 feet from the discovery well

because some people thought that to jump out to 1860 was taking too big a chance. Well, fortunately, perhaps we thought we had a dry hole for about a week, but by some pretty substantial treatments we did get a second rate well. And upon the completion of that well, why, we sat down again and said, "Well, let's get out there and drill that thing on a regular 80-acre pattern. Instead of just one well to 80 acres, let's have a pattern established."

And so, in my opinion, what we are asking the Commission to do today is to set an 80-acre pattern so that we'll be forced to drill our wells further apart, and we can't drill them in clusters, the way it has been done -- the way it has been done at Allison, and I think it will not only help the oil industry economically, but I think the Commission will be further in conservation by having a set of rules that requires the operators not to drill its wells in groups. I believe that's all I have to say.

CROSS EXAMINATION

BY MR. MORGAN:

Q Mr. Wheeler, you stated at the outset of your remarks that you don't call for 80-acre spacing in all pools, by any means.

A That's correct.

Q Did you have any misgivings at all about your company making application -- this particular application?

A No, sir.

Q You were in accord with it from the very start?

A Absolutely. I was pushing.

MR. PORTER: Anyone else have a question of Mr.Wheeler? The witness may be excused.

(Witness excused)

MR. COUCH: May I be permitted to make a final statement if there are no others to be made here?

MR. PORTER: Any other statements to be made in this case?

MR. COUCH: It is not going to last long. I trust that all of you will agree with me that Mr. Wheeler's manager's eye-view presents prospectives here that should be of substantial assistance to us all in evaluating and applying the testimony and the evidence that has been presented in this hearing.

We've presented here our Exhibits 1 through 8. Lawyers have a little trouble in trying to follow the rules of evidence, and I have tried to see to it that that which is presented at a hearing such as this is competent evidence. And when you get a good well and you get a core from it, everybody wants to see it. I tried to justify myself in being able to place through the hand of those interested persons in our company a core that we took from our Federal Silver "A" No. 1. I think we had to trace this thing all the way up to the home office and get it back. I personally have not been able to understand what a millidarcy is, and six thousand sounds more like a whole lot than one, but for

the benefit of some of you folks that don't know or even attempt to know -- this is admissible evidence in this case -- and if the Commission prefers this to be off the record, we can go off the record. I've got here Exhibit 8. You can push smoke through those 6,600 millidarcys; through that core. Maybe some of you that are used to this altitude can blow a little harder than I can, and can get more smoke through it than I did.

Intex Oil Company is an owner of a substantial amount of acreage that is involved here. They own a fourth interest, and I am authorized to state for the record that they concur in our application. The United States Geological Survey has considered our proposal, and if you will examine our Exhibits -- Exhibit 1, that shows the Bluitt Field in that area -- you'll see that virtually all of it or at least a very substantial part is Federal government acreage. I have been authorized to state that U.S.G.S. does not object to our proposal. In support of our limited actual information on this new pool, the scientific knowledge and techniques fairly and reasonably apply, and have made it possible for us to practically determine, I submit in the language of the statute, what the productive history of this pool will be and what area a well will efficiently and economically drain. These practical determinations with respect to the Bluitt Pool have been verified to you by result of analysis by the same individual and by the same type of calculations on extremely similar but substantially depleted pools, and also by comparing the practical

determinations on this Bough Pool with the actual productive history of that pool.

It would be wonderful if we could wait until we know much more about this pool and then fix a spacing pattern, but then it would be too late and then we would be faced with some situation like we had in the Bough. We believe that these competent engineering determinations have convinced this Commission that in this pool that an area which one well will efficiently and economically drain is in excess of 80 acres. We believe that the Commission, in support of this conclusion, will consider those five points in the Statute that we mentioned to start out with, and in reviewing this record, you'll see that each of those five points is discussed and pointed out and the answer supplied; all answers in favor of the 80-acre spacing, and in the final analysis, I submit to you gentlemen, that it is clear unless 80 acres is set up as a proper spacing with an 80-acre proration unit and allowable in this pool, The Ohio and the other owners will be effectively and actually deprived of that realistic opportunity that is afforded by the Statute here, to produce their proportionate parts of the recoverable oil and gas in the Bluitt Pennsylvanian Pool.

MR. PORTER: Anyone have anything further to offer in this case?

MR. PAYNE: Off the record.

(Discussion off the record)

MR. PORTER: We will take the case under advisement

and recess the hearing.

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STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, J. A. Trujillo, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in Stenotype and reduced to typewritten transcript by me, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this, the 28th day of August, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph A. Trujillo
NOTARY PUBLIC

My Commission Expires:

October 5, 1960