BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE NO. 1668

TRANSCRIPT OF HEARING

MAY 14, 1959

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
3-6691 5-9546

I N D E X

BEFORE THE
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IN THE MATTER OF:

CASE 1668 Application of Phillips Petroleum Company for an order promulgating temporary special rules and regulations for the Ranger Lake-Pennsylvanian Pool in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order promulgating temporary special rules and regulations for the Ranger Lake-Pennsylvanian Pool and certain adjacent acreage in Lea County, New Mexico, to provide for 80-acre spacing units and well location requirements, and such other provisions as the Commission deems necessary.

BEFORE:

Mr. Murray Morgan
Gov. John Burroughs
Mr. A. L. Porter

TRANSCRIPTION OF PROCEEDINGS

Mr. Porter: Next case on the docket is 1668.

MR. PAYNE: Case 1668. Application of Phillips Petroleum Company for an order promulgating temporary special rules and regulations for the Ranger Lake-Pennsylvanian Pool in Lea County, New Mexico.

MR. SPANN: My name is Charles C. Spann of Grantham, Spann & Sanchez, 904 Simms Building, Albuquerque. I have associated with me Joseph Meroney, attorney, Midland, Texas, representing Phillips Petroleum Company's application.

MR. WHITE: I am Charles White of Gilbert, White & Gilbert, appearing on behalf of Mr. Gordon M. Cone, one of the operators of the Pool from Lovington, New Mexico.

MR. PORTER: Anyone else desire to make an appearance in Case 1668?

Mr. Spann, how many witnesses do you have in this case?

MR. SPANN: I have two.

(Witness sworn)

CARL F. LAWRENCE,

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

DIRECT EXAMINATION

BY MR. SPANN:

MR. SPANN: Our first witness will be Mr. Lawrence.

Q (By Mr. Spann) Would you state your name for the record, please?

A Carl F. Lawrence.

Q By whom are you employed, Mr. Lawrence?

A I am employed by the Phillips Petroleum Company at Midland, Texas, in the position of Division Development Geologist.

Q And how long have you been so employed?

A Six years.

Q Have you previously testified before this Commission, and have you had your qualifications accepted as a petroleum geologist?

A Yes, sir.

MR. SPANN: Are there any questions of Mr. Lawrence' qualifications, Mr. Porter?

MR. PORTER: No questions.

Q Mr. Lawrence, have you had occasion in your capacity as a geologist for Phillips Petroleum Company to study the Ranger Lake - Pennsylvanian Pool in Lea County, New Mexico?

A Yes, sir, I have.

Q And just what sort of a study did you make of it?

A I followed the field from its inception in the drilling of the discovery well, the Ranger Lake No. 1, and in studying the field, we have constructed a structure map and cross section.

Q Do you have a structure map available here?

A Yes, sir.

(Whereupon, Phillips' Exhibit No. 1 was marked for identification.)

Q Now, referring you to what has been marked as Phillips' Exhibit No. 1, I'll ask you if that is your structure map, Mr. Lawrence?

A Yes, sir, it is.

Q Will you just explain to the Commission what that shows?

A This is a structure map of the Ranger Lake Field constructed on top of the Ranger Lake pay zone. The contour map is made up on 25-foot contour intervals. The various wells indicated

on the structure plat are completed wells in the Ranger Lake pay zone. Starting in Section 24, the Gordon No. 2-24 State encountered the top of the pay at minus 6148. And Gordon No. 1-24 State, located in the NW of the SW encountered the top of the pay zone at 6165. The discovery well, Phillips West Ranger Unit No. 1, located in the SE of the SE of 23, encountered the top of the Ranger Lake at minus 6113. The West Ranger Unit No. 3 located in the NW of the SE, encountered the top at minus 6078. The West Ranger Unit No. 4, located in the SE of the NW, encountered the top of the pay at minus 6077. The West Ranger Unit No. 6, located in the SE of the SW, encountered the top at a minus 6,069. The West Ranger Unit No. 2, located in the NW of the NW of Section 25, encountered the top of the pay at minus 6133.

Now, using those datums we have constructed the field structure as we interpret it as an **anticlinal terracing** structure. We feel that oil entrapment occurred due to a combination of structure and stratagraphic conditions. The lighology of the Ranger Lake pay is a dolomitic limestone having some characteristics of a transgressive reef body.

Q Now, have there been any wells, to your knowledge, completed since you prepared this structure map?

A Yes, sir. The Phillips West Ranger Unit No. 6 has been completed; the potential in that well was 400 barrels of oil per day. This well came in at a structural datum that conformed with the structure map that was presented at the previous hearing.

Q Well now, you have the No. 6 on this map, do you not?

A Yes, sir. The No. 6 West Ranger Unit would be located in the SE of the SW of Section 23, 12 South, 34 East.

Q I am referring to any recent completions within the last few days. Do you know of any?

A There has been a recent drill stem test on the J. C. Barnes No. 1 Humble State Well located in the SE of the SE of Section 27, 12 South, 34 East. That well drill stem tested the Ranger Lake pay zone from 10,298 to 10,355; was opened 57 minutes; had gas to the surface in 42 minutes; oil to the surface in 55 minutes; flowed to the pit at a rate of 40 barrels per hour; reserves a full string of oil with no water. The initial 15 minute shut-in pressure was 3225, the flow pressures were 790, 2100, and the final shut-in pressure was 2700 pounds. The top of West Ranger pay was encountered at a minus datum of 6167, and that well which conforms with our structure map that we have here as well as the structure map that was presented at the previous hearing. We didn't have to move a contour line with the drilling of that well, it came in as we had predicted it.

Q Have the boundaries of this field been established?

A Only the eastern limits of the field we feel have been established by an oil-water contact of minus 6211. I will indicate this on Exhibit No. 1 by drawing a pencil line at the position of 6211 datum. The northern, western and southern limits as well as the southernlimits of the field have not yet been

established as currently there has been quite a bit of drilling activity in the area.

Tidewater is drilling their No. 1 Case State, located to the NE of the NE of Section 27. Tidewater has also staked locations in the NE/4 of Section 15, 12 South, 34 East. Independent operator, Tom Thagett has staked three locations in Section 28, 12 South, 34 East, indicating that other operators feel the same way we do, that the limits of the field in the northwest and southerly directions have not yet been established.

Q And you feel that there is the possibility of further development in that area?

A Definitely, yes, sir.

Q And within the next year, do you have any idea as to how many wells might be expected to be drilled?

A Within the period of say,6/1/59 to 6/1/60, I would say that at least ten wells will be drilled in the area on 80-acre spacing.

Q And the area is being developed on 80-acre pattern at this time?

A Yes, sir, it is.

Q Now, have you also prepared a cross section of the field, Mr. Lawrence?

A Yes, sir, I have.

MR. SPANN: I would like to have this marked as Phillips' Exhibit No. 2.

(Whereupon, Phillips' Exhibit No. 2 was marked for identification.)

Q Directing your attention to what has been marked as Phillips' Exhibit 2, would you describe that Exhibit and state to the Commission what it shows?

A Phillips' Exhibit No. 2 is a northwest southeast cross section extending in the South Phillips West Ranger No. 2, located in the NW of the NW of Section 25 to the West Ranger Unit No. 1, located in the SE of the SE of 23, to the No. 3 Well, located in the NW of the SE of Section 23, and terminating with Well No. 4 in the SE of the NW of Section 23. The cross section is labeled A A Prime, A being in the southeast portion, A Prime in the northwest portion. The cross section is made up of radio active logs run on the four just mentioned wells. The cross section indicates the top of the Cisco-Pennsylvanian age or datum on sealevel, which is a minus 5900, the top of the Ranger Lake pay zone, and our oil-water contact at minus 6211. This oil-water contact is shaded -- the area below 6211 is shaded a blue color; the area above indicating the oil columns is shaded a red color. The cross section also indicates the completion intervals of the four wells, the completion data, initial potentials, and the completion date. Now, this cross section, or on this cross section we've indicated what we feel is a gross upper porosity development. This is indicated by the cross-thaxed area shown in the upper portion of the cross section.

Q Now, would you discuss the quality of the various wells

with reference to that upper porosity development?

A Yes. We feel the quality of the wells is dependent on the upper porosity development that we have in the upper porosity zones, notably, our No. 1 and 2 Wells are principally of the same caliber, and the No. 2 Well we feel that we have 18 feet of net porosity development in the upper portions of pay zone. No. 1 Well, we have 10 feet of net porosity development in the upper portion. We feel those two wells are very comparable in both potential and producing capabilities. Well No. 3 is the best -- is the best well in the field notably, because it has 36 feet of net porosity development in this upper porosity zone. It is open to the well bore in that particular well.

Q Was the No. 1 Well perforated in that zone?

A No, sir, the No. 1 Well was not perforated in that upper zone. Well No. 2 was perforated in that upper zone.

Q Would that fact have any effect on the initial pressures of the wells, in your opinion?

A Well, sir, I feel that there is drainage from this upper zone in Well No. 1. Even though it is not perforated, I feel that the oil is draining downward and we are producing it from the existing perforations.

Q But it is vertical drainage?

A Yes, sir.

Q Go ahead.

A Well No. 4 is perhaps our poorest well. It has only

13 feet of net upper porosity development, and this section is opened to the well bore. So we feel that the caliber of the various wells is directly in proportion to the upper porosity development present in the wells.

Q Now, do you believe that these wells that you've completed are producing from a common source of supply and are within a common reservoir?

A Yes, sir, I do.

Q Now, I take it that -- let's see, Well No. 6 is not on that cross section?

A No, sir. Well No. 6, if projected on to the cross section, would fall into the position approximately here. I will indicate this on here.

Q Would you discuss the porosity development in these wells in relation to Well No. 6, the upper porosity?

A Well No. 6 did have the upper porosity development, and it is opened to the well bore in that particular well.

Q Now, how about the quality of Well No. 6 as compared with those?

A The quality of Well No. 6 is in the same order and magnitude of Well No. 3.

Q Now, based on your examination of the wells drilled and study of the field, do you believe there is communication between these wells, and what is your opinion about the area that one particular well can drain, Mr. Lawrence?

A Yes, sir. After studying this field in detail, examining samples, I feel that there is definitely communication between these wells and that one well will drain 80 acres.

QUESTIONS BY MR. MERONEY:

Q Mr. Lawrence, I believe it is true that the upper porosity development of which you spoke in the common reservoir appears in each well of the field that has been drilled?

A Yes, sir, that's what I base my opinion on that one well will drain 80 acres, the correlativeness of each identical zone throughout each well, as well as good porosity, permeability, and principally that is what I base my opinion on.

Q Mr. Lawrence, does that same upper porosity development also appear in the J. C. Barnes Well?

A From sample analysis, yes, sir, it did.

Q And would it have appeared in the Gordon Cone Well up here or --

Q We couldn't deflect any. The upper section, it apparently shaled out in the Gordon Cone Well No. 1-24 State, located in the NW of the SW of Section 24. That is primarily what we are basing our eastern limits of the field on.

Q And in this type of reservoir, in this acreage, would this particular type of porosity development be a common phenomena?

A Yes, sir.

Q (By Mr. Spann) I believe that's all with reference to that Exhibit, Mr. Lawrence. Now, in your -- I believe you can sit down here, if you care to. Were these maps or Exhibits 1 and 2 prepared under your supervision or by you?

A Yes, sir, they were.

MR. SPANN: I would like to, at this time, move the admission of -- into evidence of Exhibits 1 and 2.

MR. PORTER: Without objection, Phillips' Exhibits 1 and 2 will be admitted into the record.

(Whereupon, Phillips' Exhibits Nos. 1 and 2 were received in evidence.)

Q Nor, Mr. Lawrence, in your capacity as petroleum geologist for Phillips, have you had occasion to go into the economics of the Ranger Lake-Pennsylvanian Field and prepare estimates on the oil that might be recovered, the cost involved in developing this field, and possible resulting profits to the Company?

A Yes, sir, that is part of your responsibility before any well is drilled, to make an economic analysis, to see whether it will be a profitable venture to drill the well.

Q And have you done that in connection with the Ranger Lake-Pennsylvanian Field?

A Yes, sir, I have.

MR. SPANN: Now, I would like this marked as Exhibit No. 3, Phillips' Exhibit No. 3.

(Whereupon, Phillips' Exhibit No. 3 was marked for identification.)

Q Now, directing your attention to Phillips' Exhibit 3, I'll ask you to state what that is?

A Exhibit No. 3 is our economic analysis which we make on any well before we drill it to see whether it will be a profitable venture. The form that we use is identical with that form and figures which were used in justifying the drilling and development

of the wells existing in the Ranger Lake Field.

Q Does this Exhibit reflect your estimates on individual wells or the average of wells drilled in that Field?

A It represents an average. We cannot just take one well and say all the wells will be the same. We try to arrive at an average well -- an average recovery. We feel that is the best way to decide whether it will be a profitable venture to drill a well.

Q Well now, will you just go over Exhibit 3 and tell the Commission what it shows?

A Yes, sir. Exhibit No. 3 shows the economics for development based on 80-acre proration units recovering 210,000 barrels of oil per well, and for 40-acre units recovering 105,000 barrels of oil per well. Now, those economics are as follows: An 80-acre proration unit, the ultimate average primary recovery would be 210,000 barrels of oil per well. The initial investment for a 10,400 foot development well would be $200,000. Now, the net reserves, after we take our royalty out of it, or the royalty out of it, would be 183,750 barrels of oil. The value of that oil at $2.85 per barrel less overhead and taxes, would be $475,913. Subtract your eleven-year lease operating expenses and initial investment, which is $244,000. This leaves a profit before taxes of $231,913. Now, the well before payout in eighteen months at 163 barrels of oil per day, that would give the Company or individual drilling of the well an annual rate of return of 43 percent.

I might add at this time that our minimum, the point at which we decide to drill a well or not to drill a well, at this point is 22 percent. In other words, if a well will not make between 20 and 22 percent annual rate of return, we do not drill it, we find some other form or way to develop that property.

On a 40-acre proration unit development, the initial investment per well would be $200,000, the same as the previous investment. The gross reserves would be 105,000 barrels of oil. The net reserve would be 91,875 barrels of oil. The value of that net oil less the overhead and taxes would be $237,956. Less your investment and eleven-year lease operating expenses of $244,000, indicates a loss per well of $6,044. In order for 40-acre development to break even -- in order to break even on 40-acre development, the recovery per well would have to be 108,000 barrels of oil. That's to break even. Now, we realize that these are average figures; these are the economics that we have to look at before we go into an area to do exploration work or development, and we feel that a 40-acre development is typical of the rate of return and profit that -- or loss -- that would be obtained on development on 40 acres.

Q Mr. Lawrence, this is the identical calculation which was, in fact, made prior to the drilling of each well which Phillips Petroleum Company has drilled in the field, is that correct?

A That's right.

Q And these are the figures on which management actually decided whether a well will or will not be drilled, is that correct?

A That's correct.

MR. MERONEY: And you have used the same calculations in all cases which were used in each individual well, calculations prior to the drilling of each well, is that correct?

A That is correct, yes, sir.

MR. MERONEY: Thank you.

Q (By Mr. Spann) This actual Exhibit was prepared under your direction or supervision or by yourself, is that correct?

A It was prepared under my supervision.

MR. SPANN: I would like to move the admission into evidence of Exhibit No. 3.

MR. PORTER: Without objection, Exhibit 3 will be admitted.

(Whereupon, Phillips' Exhibit No. 3 was received in evidence.)

MR. SPANN: I believe that's all we have of Mr. Lawrence.

MR. PORTER: Does anyone have a question of Mr. Lawrence?

CROSS EXAMINATION

BY MR. WHITE:

Q Mr. Lawrence, I note this Exhibit 1, your structure map, was prepared May 7th, 1959, is that correct?

A That was the date that the first structure map was prepared at the previous hearing. I used the same base plat, May 7th,

yes, that would be -- that would be the date, yes, sir, that's right. I think perhaps the draftsman forgot to take the date off.

Q Now, you were present and testified at the last hearing in this case, I believe it was Case No. 1598?

A Yes, sir.

Q And you explained the structural map then, did you not?

A Yes, sir.

Q What differences are there, if any, between this structural map and your former Exhibit?

A Addition of Well No. 6, Ranger No. 6 as a completed producer. The location of the J. C. Barnes No. 1 Humble State, location of the Tidewater No. 1 Case State, both those aforementioned wells are located in Section 27.

Q Did you change any of the contour lines?

A Very little.

Q You say very little?

A Yes, sir.

Q Mr. Lawrence, which ones were changed?

A I believe we missed the top on the West Ranger Unit No. 6 by approximately 19 feet, and we moved that contour a small amount.

Q Now, this Exhibit shows a number of operators in the field other than Phillips. Approximately how many operators are there?

A Well, up until just here recently, operating the unit was Phillips-Texas and Pacific and Gordon Cone, they had been the only operators. Recent development has indicated that J. C. Barnes would be an operator, and in all probability Tidewater.

Q How about Humble?

A Humble does not have any producing wells in the field. Their acreage in Section 22, I believe, expired.

Q And the operator, Thagett, is he one?

A Quite possibly, yes. His locations are in Section 28. I think they would be classified as field exploratory wells. From what we know of the area, we feel they have an awful good chance to produce.

Q And none of these operators have joined in this application, have they?

A Well, there really is no producing operator other than Phillips, Texas and Pacific and Gordon Cone.

Q The answer to my question is no?

A At present, yes, sir.

MR. SPANN: I would like the record to show that Mr. White's question assumed the facts not in evidence. He referred to them as operators and not potentialled operators, as was testified to by Mr. Lawrence.

Q (By Mr. White) Has any potential operator joined in the application?

A Well, we have conversed with both Mr. Barnes and Tide-

water, and verbally they have expressed desires to me for 80-acre spacing.

Q The answer to my question is no?

A Which question?

Q The last question. Has any potential operator joined in your application?

A They have not joined actively. They have indicated that they would go on 80-acre spacing.

Q Now, referring to your structure map again, how -- will you explain how you predicted your contours beyond your control points?

A How we predicted our contours beyond our control points?

Q Yes, sir.

Q Do you have reference to any particular area, sir?

A No, I would just like to know.

Q Well, have we done that in any case?

Q Well, you have your contour lines here, and I am asking you how you predicted them from your control points, which would be from your producing wells?

A Well, I mean -- I don't quite understand your question, Mr. White. Do you have reference to any particular area where we did that?

Q Well, let's take over on the east flank.

A All right. In other words, your question is, how would

we know?

Q How did you establish your water-oil contact line?

A We established our water-oil contact from Phillips' West Ranger Unit Well No. 2, located in --

Q And the aerial extent?

A Let me get to the point here how we established it. We established our oil-water contact from West Ranger Unit Well No. 2, located in the NW to the NW of Section 5.In that particular well we made a production test from 10361 to 10371. After acidizing with five hundred gallons, we swabbed 50 gallons of salt water in 12 hours. We subsequently squeezed those perforations,plugged back,and completed higher in the pay zone.

Q Now, directing your attention to your structure map, would not the Cone Well No. 1 appear to be in a good structural position?

A As I stated before, this is a combination stratagraphic and structural trap. Gordon Cone Well No. 1, the upper portion of the pay zone, had shaled out. He did not have any lime section until he was below the gas, or the oil-water contact.

Q But based on your structural map, would that appear to be in a good structural position, the Cone Well No. 1?

A Structurally, it is approximately 20 feet lower than Well No. 2. It is for all practical purposes the lowest well in the field area. I would not say that was an advantageous structural position.

Q What was the last part of your answer, please?

A I would not say that that was an advantageous structural position.

Q Well now, let's refer to the Barnes Well. Now, that was two feet lower than the Cone Well, was it not?

A That is correct.

Q So that would be in a less desirable structural position, presumably, than from what you say, correct?

A Not necessarily, because in these type of structures, and as you go east, your pay zone, as indicated on the Gordon Well, tends to shale up. In going in a southwesterly direction, the J. C. Barnes Well had the porosity development in the upper portion.

Q But it is lower than the Cone Well, is that correct, Cone Well No. 1?

A Well, by sample analysis, I would say it was approximately flat.

Q And one is a dry hole and another one is a producer?

A Well, this well is not a producer yet. It indicated that it would produce.

Q Now, would you say that there is a permeability barrier as to the Cone Well No. 1?

A How do you mean, a permeability barrier? Are you saying then -- Repeat your question. I didn't quite understand it.

Q Is there a permeability barrier, in your opinion, in the NW/4 of the SW/4?

A Well, the --

MR. UTZ: Section 24.

MR. PORTER: Mr. White, do you have reference to Section 24?

MR. WHITE: Yes, sir, Section 24.

A Your question is, is there a permeability barrier surrounding the Gordon Cone Well No. 1?

Q (By Mr. White) Yes, sir.

A The pay zone had principally shaled out. That pay zone was drill stem tested from 10357 to 10397. The well -- the tool was opened one hour and five minutes, recovery was 1840 feet of water blanket plus 30 feet of drilling mud. On the next test, from 10346 to 10433, the tool was opened one hour. The recovery was 1840 feet of water blanket, plus 89 feet of salt water plus ten feet of drilling mud, with no shoe. I would say from that it indicated the pay zone had shaled up although there was some porosity in the lower limits which was below the water-oil contact.

Q Then would you say that there is evidence of permeability barriers in this pool?

A No, sir. In this local area, the difference between those two wells, the combination of a structurally low well, plus the fact that the upper member was shaled out, going to the east, I would say that was a condition limiting the field to the east, and namely, in Section 24.

Q Would you say that there are pinch outs in the

field?

A No, sir. We can correlate each identical section throughout all the wells that we have drilled to date.

Q Would you say that permeability --

A We can correlate the identical sections to Gordon Cone No. 1 with the exception that the upper member had shaled out, and due to the fact that it was structurally lower, the lower portion was below the water-oil contact, the porosity was there except that it was structurally low.

Q In regard to the Barnes Well, when did you examine the analysis of the Barnes Well?

A What do you mean analysis?

Q You stated on direct examination that you had examined the sample analysis of the Barnes Well No. 1.

A I personally did not, no, sir, but a geologist under my supervision had an opportunity to see the samples, and also see the operator's sample.

Q Then, your testimony is based upon what somebody else has told you?

A Based on what the geologist under my supervision reported to me.

Q Mr. Lawrence, in your opinion, is there any evidence of zoning of the net effect pay within the net gross sections?

A Will you repeat that, sir?

Q Is there any evidence of zoning of net effective pay

within the gross pay sections?

A No, sir. In each well drilled, we've correlated -- Just take, for instance, these three, four wells we have on the cross section. We can detect the same porosity development in each of the wells drilled.

Q In your opinion, is there any evidence that a competent barrier exists between the zones and that these barriers are of sufficient aerial extent to cause poor pressure communication between the zones?

A No, sir, there is no indication of zoning within the pay zone.

Q Is there any evidence that some of these zones are restricted in aerial extent within the gross pay section?

A Well, this field is, shall we say, in the early stage of development on the wells, and information that we have to date, they do not indicate that there is, shall we say, a limited aerial extent. On the information that we have so far, we have detected this upper zone in all of our wells, and we have no reason to believe that there is any impermeable barrier or anything that you mentioned.

Q Now, your statement in regard to my question only has reference to the upper zone, is that correct?

A I am speaking of the upper -- I am speaking of the Ranger Lake pay zone period. That would include everything in the Ranger Lake pay.

Q How about the lower zones?

A You mean the lower portion of pay zones?

Q Yes.

A Porosity development in the lower portion appears to be constant, it is in all wells. It is limited, however, by this oil-water contact.

Q In reference to your Exhibit No. 2, do your logs show a uniform permeability?

A The logs that we have used in the cross section indicate no porosity as yet. The oil industry has not devised a tool to measure permeability.

Q What is the variation of porosity?

A You mean by that, in percentage value?

Q Or in milladarcies?

A Porosity is in percentage.

Q Percent?

A Your question is variance in percent in the various wells?

Q Yes.

A I do not have each well tabulated. I do not have the data on each. At the time of completion, we analyzed each well. To the best of my recollection, I can give you an average porosity value, if that will help you. Would that be of value?

Q You don't have the actual figure as to each well?

A No, sir. I have average porosity values now.

Q Can you give us the maximum and minumum range from

which you worked out the average?

A Yes, sir, I can give you approximate values on that. The porosity will vary from 6 percent to as high as, say, 13 or 14 percent. We feel that an average porosity of 9 to 10 percent is valid.

Q Now, referring to your Exhibit 3, you state the net value of the oil as being $2.85?

A Yes, sir.

Q Is it not a fact that this oil is selling for $3.01 a barrel?

A I believe it is, yes, sir. Now, our $2.85, it's an average with our company, and most companies, the geological department justifies the drilling of the well, and we like to use an average value for that oil. It perhaps could be higher, but that was the value that we used in justifying the wells already in the field. I realize that the value of oil may fluctuate slightly.

Q Well then, your figure of $2.85 is a figure that your company picked out, and, in fact, they are collecting $3.01, is that correct?

A Yes, sir, I believe that's the going price now.

Q If you figured this out at $3.09, you probably would wipe out your loss?

A Approximately. You might wipe out that $6,000, yes, but if you are going to just break even on drilling a well, why drill a well? I mean --

Q Well, can you answer, why did you use $2.85 and present it to the Commission? Why didn't you advise them that the actual sale of this oil was $3.01, and that you are using that figure?

A I believe our engineering witness is going to get into that, sir. The $2.85 was the figure that we used because it was used in justifying previous wells.

Q Now, you state that the gross reserves as being 105,000 barrels of oil?

A Yes, sir.

Q What method did you use in your calculation?

A Volumetric calculation.

Q And can you give us the figures and how you arrived at that?

A I don't have the exact figures with me, no, sir. I believe our engineering witness will get into the volumetric calculation, part of it.

Q Can you give us the estimated or the actual cost of each of your six wells, and what your net pay is as to each, or ultimate recovery that you expect?

A Well,the ultimate recovery that we anticipate to get from each well is this 210,000 as total cost. Our engineering witness will have those.

Q Well now, by that you mean that all of your wells are exactly the same caliber?

A No, sir, some of the wells will produce more than 210. Some of them will produce a lot less.

Q This, again, is an average?

A Yes. We are talking about average. That's the only values we feel are valid because that's what you have to look at to develop the field.

Q Did you figure just the net average pay of the upper zone, or did you take all three zones into consideration?

A We are looking at one pay zone, Mr. White. We took the entire pay section.

Q You were present at the last hearing, were you not?

A Yes, sir.

Q And you were present when Mr. Bohan --

A W. R. Bohan.

Q -- testified before the Commission?

A Yes, sir.

Q You will recall that Mr. Nutter asked him this question: "Would it be economical to drill two wells on 80 acres in this pool?" And Mr. Bohan answered: "Yes, I think it would be?"

MR. SPANN: If the Commission please, I think in all fairness to this witness, it should be pointed out that that same witness was recalled the next morning, and --

MR. WHITE: Let me finish my question first.

Q (By Mr. White) Do you dispute Mr. Bohan's statement?

MR. SPANN: Well now, if the Commission please, I

again --

MR. WHITE: I am asking him for his opinion.

MR. SPANN: He has already disputed it, but I don't know whether Mr. Lawrence recalls that this witness was recalled the next day, and for the specific purpose of changing that testimony. I mean he went into why he made the statement initially, and that his opinion was now no and why it was. Now, I think that if Mr. White is going to propound that question to Mr. Lawrence, he ought to give Mr. Lawrence the benefit of the entire testimony on the point.

MR. WHITE: I am merely asking whether or not the witness agrees with that particular statement made by Mr. Bohan.

MR. PAYNE: Made on the first day of the testimony?

MR. WHITE: Yes, sir.

MR. SPANN: I would interject this. He has already disagreed with it by his Exhibits and testimony from Exhibit 3.

MR. PORTER: The record will show that, Mr. Spann. Let him answer this question as to whether he disagrees with that statement, then he can ask him if he disagrees with the second statement.

A Well, would you repeat your first statement there, Mr. White?

Q Mr. Nutter asked, "Would it be economical to drill two wells on 80 acres on this pool." Mr. Bohan's statement or answer was, "Yes, sir, I think that it would be." Now, I am asking

you whether or not you agree with Mr. Bohan's statement?

A I believe that Mr. Bohan did correct the statement.

Q I am asking you whether you agreed with him, not whether he corrected it?

A I do not agree with him.

MR. WHITE: Very well. That's all I have.

MR. SPANN: May I, for the record, ask one question on redirect examination here on this point.

MR. PORTER: Yes, sir.

REDIRECT EXAMINATION

BY MR. SPANN:

Q For the record, and referring to the transcript of the testimony of Mr. Bohan, I'll ask you if you recall Mr. Bohan being recalled the next morning to testify on one point?

A Yes, sir.

Q And do you remember that this question --

MR. WHITE: I would like to ask what the purpose of question is?

MR. SPANN: To give to the Commission, and for the record, the entire testimony of Mr. Bohan on this point, since you --

MR. WHITE: I didn't ask him whether he agreed with any other statement, I asked him whether he agreed with that particular statement made by Mr. Bohan. It is immaterial whether he corrected it or not, I do not care, that's immaterial to this case;

I merely asked the witness whether he agreed with him, and he said he didn't.

MR. PAYNE: Mr. Spann, would you like to incorporate the record of the previous case into this case?

MR. SPANN: No, sir, I just merely wanted to put into the record the complete testimony of Mr. Bohan on this point, since Mr. White has put a portion of it in the record.

MR. WHITE: I object --

MR. SPANN: No matter how he did it, he did it.

MR. WHITE: I object to any part of his testimony being incorporated in this case because he is not here subject to cross examination.

MR: SPANN: He opened it up, I didn't.

MR. PORTER: Mr. White, you asked the question as to whether or not he agreed with that particular statement, and he answered it.

MR. WHITE: Yes, sir.

MR. PORTER: Mr. Spann has asked permission to ask the same question concerning a later statement.

MR. WHITE: As I understand, he wants to incorporate part of the record, not whether or not this witness agrees with him.

MR. PORTER: No, I believe he said he does not wish to.

MR. SPANN: I want to find out if he agrees --

MR. WHITE: That is perfectly all right.

MR. PORTER: Mr. Spann, would you rephrase your question,

or state it again, please. I believe we have lost track of what it was.

Q (By Mr. Spann) Mr. Lawrence, I believe you testified that you were present the next morning on February the 20th, 1959, when Mr. Bohan was recalled for further testimony, is that correct?

A Yes, sir.

Q All right, do you remember these questions being asked and these answers being given?

"Question: Will you state your name, please?"

"Answer: W. R. Bohan."

"Question: You testified in Docket Number 1598?"

"Answer: Yes, sir, I did."

"Question: There was an item in your testimony you desire to correct, is that true?"

"Answer: Yes, sir, that is true."

"Question: I wish you would proceed, please."

"Answer: Thank you. Yesterday afternoon on testifying on the Ranger Lake Pennsylvanian Pool, on cross examination I was asked the question as to the reasons whether or not it would be feasible or possible for an oil company to drill on 40-acre spacing. In answer to that question, I made a quick mental calculation of the reserves, multiplying the estimated recovery factor by the original oil in place, but I used the original oil in place under the 80-acre tract, rather than a 40-acre tract, which of course doubles the reserves and would change the answer to my question from yes to no."

From yesterday to now, do you agree with the answer that Mr. Bohan gave when he was recalled for questioning, and which answer I just read to you?

A Yes, sir.

MR. SPANN: That's all.

MR. WHITE: I have nothing further.

QUESTIONS BY MR. PAYNE:

Q Mr. Lawrence, referring to your Exhibit Number 3 -- well, first let me ask you this: Do you feel that you will get as much ultimate recovery developing this pool on 80-acres as on 40, substantially the same amount of oil?

A Yes, sir.

Q Now, in your Exhibit 3, the first portion of that I believe is calculated on the basis of the present allowable, is that correct, this 163 barrels of oil per day?

A Yes, sir, I believe it is. It is an average 35-barrel per day unit.

Q And the payout on that basis is 18 months, is that right?

A Yes, sir, that's correct.

Q Now, do you consider an 18-months payout a reasonable period?

A Yes, sir.

Q Now, this unit is being developed on 80-acres now,

is it not?

A Yes, sir.

Q So that whether the Commission established 80-acre spacing or not, you would still be paying these wells out in 18 months, is that correct?

A On 40-acre units?

Q Yes, sir. Well, 80-acre development with a 40-acre allowable?

A Let's see, now, 80-acre development with 40-acre allowable --

Q Like it is now.

A -- if it were on 40-acres --

Q Under present circumstances, you are paying these wells out in 18 months, are you not?

A Yes, sir, that's correct.

Q So that if the Commission, if the Commission went to 80-acre spacing for this pool, you would pay them out in, oh, some 12 months, is that right?

A Oh, I don't think it would quite reduce it that much, but it would increase the payout time; now, this is assuming that the well will actually make that many barrels of oil every day for the full 18 months.

Q Well, now, in view of the fact that the unit area is being developed on 80-acre spacing, why do you feel that, economically speaking, Phillips Petroleum Company needs 80-acre allowables,

since they are paying the wells out in 18 months anyway?

A Well, if you have 80-acre spacing, of course it follows that you would have an 80-acre allowable. Our primary reason in attempting to secure 80-acre spacing is to eliminate the drilling of unnecessary wells.

MR. WHITE: May I ask a question at this point? Is this case concerned with 80-acre allowables? I believe the Notice and the Petition Application itself is limited to 80-acre spacing, and not allowables.

MR. PAYNE: Well, it is 80-acre proration units, Mr. White, and as Mr. Lawrence says, ordinarily it would follow, if you went to 80-acre proration units, you would get an 80-acre allowable. However, we have had applications in the past where they asked for 80-acre spacing with 40-acre allowable.

MR. WHITE: Is there anything in their Petition Application touching upon 80-acre allowables?

MR. SPANN: We contend that it follows from the establishment of 80-acre prorations.

MR. PAYNE: Mr. Lawrence, referring now to your application in this case, it is my understanding that you ask that 80-acre proration units or spacing be established in considerable additional acreage other than the presently defined limits of the Ranger Lake Pool, is that correct?

A I believe that was on our first application; as I remember the application that we now have, I do not believe it

encompasses that same area, as far as extending the pool limits, does it?

MR. PAYNE: Well, it was somewhat ambiguous, I thought, that's why I am trying to pin it down. Referring to Paragraph 4 of the application, it states as follows:

"It now appears from the information obtained from the drilling completion and production of the aforesaid wells, that the Pennsylvania formation will probably be productive of oil in at least the West Half of the West Half of Section 13, all of 14, 15, 22, 23, 26, and 27, West Half of the Northwest Quarter and the Southwest Quarter of the Southwest Quarter of 24, West Half of the West Half of 25, Township 12 South, Range 34 East, Lea County, New Mexico."

Now, are you asking in this application that this acreage, that 80-acre proration units be established in this acreage most of which is, well, I guess all of which is outside the presently defined limits of the Pool?

A Well, sir, I believe -- correct me on this if I am wrong, sir, but does not the Commission consider any well drilled within the confines of one mile of the Ranger Lake Field to be under the rules of that particular field?

Q (By Mr. Payne) Generally that is correct, sir.

A I think that's primarily what the application has in mind, sir.

Q Now, do you have any evidence that Section 14, 15, 22,

and 27, is productive of oil from the Ranger Lake Pool?

A Well, yes, sir. The South Half of Section 27 was pretty well proven productive on the drill stem test on the J. C. Barnes Humble State located in the Southeast Quarter of the Southeast Quarter of Section 27. As I stated before, the Tidewater is drilling their Number 1 Case State on the Northeast Quarter of the Northeast Quarter of 27; they are not at the point where they encountered the pay yet, but it is a company that believes it will be productive. They have also staked locations in Section 15, which somewhat substantiates the application that they feel it is productive, although the well is not in the pay zone, it is within the radius of one mile of the field.

Q Then you are not actually asking that the boundaries of the pool be extended?

A Other than that one mile, that is my understanding of the application, yes, sir.

Q Mr. Lawrence, how did you arrive at your Lease Expenses on your initial expense figure?

A Let's see, that's the lease, 7-year's lease, operating expenses and initial investment, total $244,000.00. Now, two hundred thousand of course is taken up by the drilling of that well; the $44,000.00 takes care of the installation, surface installation, pumps, the installation of a pump unit, and also the lease operating costs, average lease operating cost, the cost to your pumper and roughnecks, and various sundry items to initially

produce that well.

Q You didn't include that $200,000.00 twice?

A No, sir, the $200,000.00 is what you are paying to get the well drilled, and then we include, like I say, seven years lease operating expenses, and initial investment; the initial investment is $200,000.00, the $44,000 takes care of the unit, paying the pumper, roughnecks, mechanics, and perhaps a workover on the well during the life of the well.

Q Are you familiar with the unit agreement that deals with this acreage?

A I think I am fairly familiar, yes, sir.

Q Well, here is what I want to know, does it also provide that the procedure to be followed in the unit will also be followed within the confines of one mile therefrom?

A Well, the existing unit, West Ranger Unit, covers Section 25 and 26, and the Northwest Quarter of Section 25. Now, I am quite sure that the unit does not take into consideration what happens outside the unit.

Q In other words, that one mile facet would not apply to the unit agreement?

A No, sir. No, sir.

MR. PAYNE: That's all, thank you.

MR. PORTER: Mr. Lawrence, I believe you indicated wells drilling in the North Half of Section 26, that would be the Northwest Quarter of the Northeast Quarter of 26, and then there

is Tidwater 1-K; do you know the status of those wells at the present time?

A Yes, sir, our Phillips and Texas-Pacific Number 5 West Ranger, located in the Northwest Quarter of the Northeast Quarter of Section 26 is currently drilling below, approximately, I would say today that it should be around 4,000 feet, approximately; and the Tidewater well, notably the 1-K State, located in the Northeast of the Northeast of Section 27, I believe they have moved in a rotary on that well now, it should be drilling approximately, I will say, below 5,000 feet, I could be off on that one by a small amount.

MR. PORTER: How long does it take to drill a well in this area, ordinarily?

A Oh, drilled and completed, we allow approximately two months; two to two and a quarter months, approximately.

MR. PORTER: Thank you. Mr. Fischer.

QUESTIONS BY MR. FISCHER:

Q Mr. Lawrence, would you give us your definition of a Stratographic trap? I believe you said this was a stratographic and structural trap?

A Yes, sir, we feel that the Ranger Lake Field is a combination structural and stratographic trap. Now, the stratographic portion of that is dependent on your dolmite buildup; as we progress to the east, the pay zone is shaled out of the upper portion of it; the lower is still there, however, it is below the

water. This apparently is a band of porosity, notably, on shall we say a Northeast-Southwest direction wherein the dolmite is developed in a band, so to speak and to draw it diagramatically.

Q And in line with that, possibly, could you tell us which way, where the sea was, or where the beachline was in that case, please?

A Yes, sir. I will start off by saying that regionally this is in Lea-Chaves Basin Area, the Hightower Field is approximately, oh, I'll say eight miles to the East, and there is a big fault separating that Hightower from this area. Now, when the Pennsylvanian seas progressed in this area, there were Devonian highs scattered throughout this area, and Mississippian, and during the Pennsylvanian time when the seas came in, they progressed in and out. Now, that accounts for, we feel, the stratographic trapping of it; at some point the seas were, oh, stationary at some age covering a band of porosity within this Ranger Lake area, allowing dolmitization.

Q Mr. Lawrence, excuse me just one minute. You are indicating on the map that the sea was transgressing and regressing in a Northwest-Southeast way?

A Yes, sir, I feel that is apparent by the production we have, Pennsylvanian production in the four lakes, Pennsylvanian production in the Ranger Lakes, and the Pennsylvanian production in the Sprague area, all Cisco age.

Q As to your definition of a stratographic trap --

A A Stratigraphic Trap is a porosity body that is wedged out either by lack of deposits, either updip or downdip from the oil accumulation; it does not allow the oil to accumulate any higher, and forces entrapment of the oil.

Q Isn't permeability derived from porosity?

A Well, sir, you can have porosity but no permeability; if you have permeability, you have to have porosity.

Q Well, then, in answer to Mr. White's question, would it not be true then that there is a good possiblity, in your opinion, that there are permeability barriers, porosity barriers?

A No, sir; let's look at it this way. When we look at any electric log we are just looking at a very small portion of that pay zone; all through this well, here is 36 feet, and this well here is 13, a hundred feet up that may increase and for that reason, and in studying the field and the general area, I don't feel that there is a danger of permeability barrier between two wells; I think that fact is also borne out by our engineering and production data which will be put on at a later date.

Q Is it true that in a dolmite or limestone field, that permeability is really no indication?

A Indication of what, sir, indication of production?

Q Well, just because you -- say you have a 9% porosity, for instance --

A Average?

Q -- in a dolmite or limestone field, it could be that

it would most probably be that you would have to be from ranges of zero to probably a hundred percent porosity?

A Well, from sample analysis, and the one core that was taken in the field, the Ranger Lake pay zones exhibits both vuglar and some fractured porosity, so your statement that there is some, probably some vug in there where we have a hundred percent porosity, and there is some intercrested zones where it is perhaps quite a bit lower than that; but from the information we have, logs and core analysis, that is the best we could come up with, an average nine percent. Now, there are wells that are quite a bit higher.

Q Surely, and some lower ones?

A Yes, sir.

Q Well, then your range of porosity was 6 percent, to 12, to 14 --

A That is correct. I do not recall the exact porosity calculation at the completion of each well, but that's to the best of my recollection, yes.

Q Are there any formulas put out, or used, by the logging companies whereby you can determine from these electric logs permeability from porosity?

A You can estimate it; I think your best indication of permeability is perhaps your filter buildup as is shown on your microcaliper. That, of course, is just an indication, I do not believe it is a quantitative measurement of permeability.

MR. FISCHER: That's all.

MR. PORTER: Anyone else have a question?

MR. PAYNE: Mr. Lawrence, I just want to ask one more question. Are lease expenses the same on 40-acre development as on 80-acre development?

A Well, I would say that on 40-acre development, your lease operative cost would be increased, you would have more work for that pumper to do, you would have more workovers to perform, a lot more pumping units, so I would say it would be increased on 40-acres.

MR. PAYNE: I noticed you had them listed the same.

A Yes, sir, we used the 40-acre development analysis mainly by comparison, I mean for a comparison, to show that although we in our analysis show a loss, supposing we did break even, it still wouldn't be a profitable venture; supposing we made $10,000.00, it still wouldn't be a profitable venture. You could put that $200,000.00 in the bank at three percent, and you would make more money that way. We made that analysis mainly for comparison, sir.

MR. PAYNE: Thank you.

MR. PORTER: We will have a very short recess.

(Recess.)

MR. PORTER: The meeting will come to order, please. Mr. White, I believe you have a question?

RECROSS EXAMINATION

BY MR. WHITE:

Q Mr. Lawrence, do you have any actual costs for any one of your six wells?

A Our engineering witness does, sir, he has exact detailed costs.

Q You stated that there were wells being drilled, two wells in Section 28, and one in Section 15, is that correct?

A There have been locations, I believe, two or possibly three locations staked in Section 28; there has been one location staked in Section 15. We are drilling a well in Section 26; Tidewater is drilling a well in Section 27.

Q You don't know whether the actual drilling has been commenced in Section 28 or 15?

A The locations have just been announced the first part of this week, sir. I just imagine it does have a spudder or some type of equipment on the lease.

MR. WHITE: That's all I have.

MR. PORTER: Mr. Nutter.

QUESTIONS BY MR. NUTTER:

Q Mr. Lawrence, what is the status of the well up there in Section 9 indicated on your exhibit as, that was the Sunray-Midcontinent East Bagley Number 1, I believe it is now, and a one dead producer.

A That well, Mr. Nutter, was the Sunray-Midcontinent Number 1, East Bagley Unit, and it is currently -- no, sir, I believe it still is currently producing.

Q Is that well completed in the same interval of the Penn that these wells here in the Ranger Lake area are completed in?

A Yes, sir, approximately, it is in the Penn.

Q Do you know what the top of the Penn, the top of this equivalent pay is, and the thickness?

A Yes, sir, I have it right here. I stand corrected on that, Mr. Nutter. Looking at a newer plat here, that well is abandoned; the top of the Ranger Lake pay zone was encountered at a minus 6,061.

Q And it was completed in the same interval of pay that these wells in Ranger Lake unit are completed?

A Approximately, yes, sir.

Q Mr. Lawrence, I note in examination here in your cross section exhibit, that there is quite a bit of variation not only in the net feet of pay zones, but in the gross pay section. As a matter of fact, well Number 4 has 57 feet of gross pay sand, approximately, and 13 feet of net; when well Number 2 has 23 feet of gross sand and 18 feet of net, what is the principal reason for this large variation?

A Well, sir, well Number 4 is structurally a high well, consequently it has a larger oil column as indicated on the cross section. Now, the line, the line, Ranger Lake pay zone, the gross section encountered in that well was approximately a hundred and ten feet, covering the overall section. Now, the upper development

in that particular well is indicated by the log, it was approximately a half of what the upper development was in well Number 3. Now, you mentioned well Number 2, was it, sir?

Q Yes,sir.

A Well, Number 2 is structurally a low well, having approximately 75 feet of gross section. Now, the upper section, the upper development in the pay zone was very well developed having 18 feet of net development in the upper zone, upper portion.

Q Well, now, leaving out the lower section there, taking about what you have identified as the upper porosity in your exhibit, how do you account for the difference in the percentage of that gross upper development that has net pay sand in it, because as I pointed out before, in the Number 4 well you got 13 feet out of about 57 --

A Yes.

Q -- and in the Number 2 you got 18 feet out of about 23.

A Yes, sir. Now, your question is how do you account for that difference?

Q Yes, sir.

A Number 1, I feel -- one of the reasons for that is structure, I feel, I mean the fact that Number 4 well did have a larger section than the Number 2 well, as far as the net section, this is a combination, as I said, stratographic and structural trap; and right at the portion where the Number 4 well was drilled,

the upper porosity was just not as well developed as it was in the area of well Number 2. However, there is this factor to it, that although the log only shows 13 feet of net porosity development, perhaps a hundred feet from the well bore we may have had much more.

Q Now, you stated that you felt that the pay section in the Gordon M. Cone Number 1 well had been shaled out, that is correct?

A The upper portion, yes, sir.

Q Was any attempt made to complete that well in the lower section also?

A No, sir; as quoted from that drill stem test, they did test water, 89 feet of salt water.

Q Well, now, Mr. Cone went down to the South Half of that 80-acre tract and drilled a producing well?

A Yes, sir.

Q So there must be a variation in permeability and porosity from the location of the Number 1 and Number 2?

A There is always variance in structure, approximately 20 feet, 18 feet; I might add that the pay section also indicated that it was thin.

Q Well, according to your contour lines now, you got a substantial variation in structure in the Phillips acreage, comprising the West Half of the Northwest Quarter of Section 25, do you think there might be a possibility of a variation in permeability and porosity there?

A In Section 25?

Q Yes, sir.

A Your question then, let me see if I understand your question, Mr. Nutter. Is your question then, do I feel that there is the possibility that the East Half of the Northwest Quarter of Section 25 might not be productive, is that your question?

Q Yes, sir.

A In view of the control that we have, that is a possibility, that the East Half of that Northwest Quarter could not be productive, there is that possibility in light of Gordon Cone's well, as well as structure.

Q How about the Northwest Quarter of the Northwest Quarter of Section 25?

A I don't like -- I feel that, this is my opinion, that there is a drillable location in the Southwest Quarter of Section 25, in the Northwest of the Southwest, 25, right there.

Q How about the Southwest of the Northwest of 25? Perhaps I gave you the wrong location.

A The Southwest of --

Q Of the Northwest Quarter of Section 25?

A I see.

Q That would be directly south of where the Number 2 is located.

A Southwest of the Northwest of Section 25, I think, feel that is also a drillable location.

Q Isn't it located structurally in the same position that the Gordon Cone is located?

A Yes, but I feel that in view of the pay section encountered in the Number 2 well, as well as the pay section encountered in the J. C. Barnes Humble State Section 27, correlating those sections I feel that we would have the upper zone developed.

Q Well, now, let's refer to another 80-acre tract, the 80 acres being the E½ of the SE¼ of Section 23.

A The East Half of the Southeast --

Q Yes, sir, that's the 80-acre tract --

A The Number 1 well is located --

Q -- assuming that the tract would be dedicated North and South.

A Your question is, do I feel there is another drillable location there?

Q Yes, sir.

A In light of structure, I feel, and also the net pay section, gross pay section encountered in wells 1 and 3, we could anticipate a drillable location in the location you mentioned.

MR. MORGAN: Northeast of the Southeast?

A Northeast of the Southeast.

Q (By Mr. Nutter) I believe you stated that your engineering witness would have detailed cost of the drilling of these wells?

A You realize now, I base my opinion as to the drillable

locations as to my knowledge of the area and the construction of isopach studies that we have done in the area.

Q He will also have the calculations and the figures upon which you base the reserves of 105,000 barrels per 40-acre tract?

A He will have the figures upon which his department bases the reserves on; now, they are very much in line, yes, sir.

Q I believe you stated that the range of this, the porosity in this area, was 6 --

A I would say between 6 to 14.

Q -- with an average of 9?

A An average of 9 to 10.

Q Is that a weighted average, Mr. Lawrence?

A That's an average, arithmetic average of quantitative electric log analysis correlated to the one core that we have; we are limited in this respect that the upper member was not cored in the one well which did core, the regular pay zone, we started coring too low, so as to the exact porosity in that, I only have the quantitative log analysis.

Q That's the average of one well that was cored?

A No; no, that is the average of all the wells in the field.

Q And it is based on the core from the one well?

A No, sir, it is based somewhat on that, we took a core on that particular well into consideration, and then tried to

correct our quantitative analysis to that log, realizing that radioactive porosity will vary two or three percent sometimes; we try to correct to that by correlating to the core analysis.

Q You stated, Mr. Lawrence, that you were fairly familiar with the unit agreement for the Ranger Lake unit; do you know if that unit has any provision in it for the expansion of the unit area?

A No, sir, I am not that familiar with it; at one time I probably could have told you, but I have not had occasion to look over the unit agreement recently, and I couldn't say yes or no on that.

Q Do you know of any attempts having been made to expand the unit area?

A I believe one attempt was made by Mr. Cone to be included in the unit area.

Q Has Phillips Petroleum Company, or who is the other operator?

A Texas-Pacific.

Q Texas-Pacific, has either one of them made an attempt to expand the unit area to include additional acreage?

A No, sir, I don't believe any attempt has been made, to my knowledge.

MR. SPANN: May I interject, Mr. Nutter, we will be happy to furnish a copy of this unit agreement, if you care to have it.

MR. NUTTER: I think we probably have a copy of the Unit

Agreement, Mr. Spann. We don't happen to have one here.

MR. SPANN: If you don't have, and you need it, let us know.

MR. NUTTER: I am sure that we do, Mr. Spann. Thank you.

Q (By Mr. Nutter) Mr. Lawrence, what was the purpose of the Unit Agreement when the thing was formed? Was it not to drill a well to the Devonian formation --

A Yes, sir.

Q -- and that well was a dry hole?

A It was a dry hole in the Devonian.

Q And no other wells have been drilled to the Devonian?

A No, sir.

Q Normally, Mr. Lawrence, the Devonian structures that are encountered in Northeastern Lea County are smaller structures with steeply dipping plane --

A That's correct.

Q -- more than the Pennsylvanian?

A That's correct, the Pennsylvanian was a fill-in, a fill-in area that filled in over these highs.

Q Do you agree that more efficient operation of a pool is usually obtained by a unitized operation?

A Yes, sir, it is my opinion that by the pooling of resources, and the efficient method of one operator, he benefits by the opinion of another operator, I think that more efficient and better operations can be achieved, and the element of risk is

somewhat less in the drilling of an initial wildcat well.

Q And where this Unit Agreement was formed for the testing of the Devonian structure, which may have been a small structure with steeply dipping sides, and instead end up covering an area of a rather flat-Penn pool, it would seem that an expansion of the Unit Agreement would solve some of the difficulties here?

A Well, of course there are some very, very shallow Penn fields, and it was not until recent development in the area that it appeared that it was going to be a large field. We feel that of course unit operations taking other acreage into units is always a difficult problem to solve, at least we found it that way, and I don't know whether it would be any advantage taking any additional acreage or not.

Q Mr. Lawrence, you made one statement that in your opinion there is good communication in this pool, and that one well will drain 80 acres. Now, just what do you base that opinion on?

A I base that opinion on, it is a geological opinion, the first basis that I had is the correlativeness of the various beds, the sections in the Ranger Lake pay zone. The second basis that I have is sample analysis in the field indicating formations and lithology that lend itself to good communications, good communication between wells.

Q What do you actually know about the permeability in this reservoir, Mr. Lawrence?

A Permeability we have from the one core analysis,

and I believe the maximum measured permeability in that one core was 27 millidarcies; the upper section, however, was not cored, consequently we have no actual measured permeability in that upper section. From porosity, we feel that it may exceed that measured permeability of 27 millidarcies; we can estimate permeability to some extent from sample analysis, however, it is difficult, and it is just one geologist's opinion.

Q But you do feel that you have good permeability?

A Good permeability, yes, sir, in light of the fractures, the fractures that were indicated in that one core, as well as the vuglar porosity, and we feel that it would tend to lend itself towards good communication between wells.

Q You also stated, Mr. Lawrence, that you felt that wells that were drilled in this pool, some of them would recover more than the 105 barrels per 40-acre tract, and some considerably less?

A Yes, sir.

Q If permeability is good, why does this occur?

A Well, I think it would depend on the amount of net section that each well encounters; it depends to some extent upon the completion of the well. In other words, each well in the field will not recover a specified amount of oil. We also advocate structural position; some drilled in less advantageous position will recover less. So, in our analysis, we have tried to reach or arrive at an average recoverable.

Q Do you think that all, or actual reserves in place

under the various wells, will vary considerably, or is it rather uniform?

A Well, I feel it's -- I feel that the reserves are uniform, I mean, although wells may not recover that exact amount of oil because of their structural position and amount of net pay section encountered in the well.

Q Well, your Number 3 well has 33 feet of net, 36 feet of net sand; your Number 1 has 10 feet of net sand; you mean the reserves are the same in those two wells?

A Number 3 and Number 2?

Q Number 3 and Number 1, beg pardon.

A Number 3 well and Number 1 well --

Q 36 and 10. At the well bore this well showed 10 feet of net, and this well produced, had 36 feet of net.

A There again, I would say that the Number 3 well would in all probability recover a little more oil than the Number 1 well. However, the Number 1 well is the first well in the reservoir, and had an opportunity, chance to drain some of the oil that was in place under the Number 3; so I would say that well Number 3 actually may have a little more oil in place than Number 1, but the average, if averaged, all these things will come pretty close to what we had figured.

Q You say it would have a little more oil despite the fact that the Number 3 has 3 and 6/10ths --

A It would recover more oil, let's put it that way, yes,

in view of the structural position, as well as net pay section that appears in the well.

Q The Number 3 would recover more oil?

A Would ultimately recover more oil than the Number 1 well.

Q So some of these wells would have better opportunity of being out on 40-acres than would others?

A I think that's true in any field, yes sir. There again you are going to have some stickers in here to make up for that little extra that you will recover, and that's why we used an average figure.

Q Now, in your direct testimony, I think you stated where you may have only a small amount of net pay in a well, a hundred feet out that net pay may increase?

A That's always a possibility in any reservoir.

Q And it might decrease too?

A It might decrease, yes, sir.

MR. NUTTER: I believe that's all, thank you.

QUESTIONS BY MR. FISCHER:

Q Mr. Lawrence, the well in which you said you had your only core, did you get a chance to look at the drilling time on that well in that upper section?

A Through this upper portion?

Q Yes, sir.

A Yes, sir, there was, as I recall, a drilling break.

Q There was a drilling break in that upper section?

A Yes, sir.

Q What would it indicate to you?

A It would indicate a porous body, pay zone.

Q Would you venture an opinion as to, geologic opinion as to the amount of porosity in that upper section, as to the porosity in that lower--where you had the core, after having studied the core?

A You mean the value of the porosity?

Q Yes, sir.

A The well that was cored, I believe was well Number 2; yes, sir, that was well 2, yes, it is core well Number 2, cored the pay from 10313 to 28, 10328 to 73, 10373 to 94. The radioactive logs indicate the porosity in that upper portion that was not cored to be of a greater magnitude than that that was actually measured in the core analysis.

MR. PORTER: Anyone else have a question of the witness?

MR. PAYNE: One further question.

MR. PORTER: Mr. Payne.

QUESTIONS BY MR. PAYNE:

Q Mr. Lawrence, if I understand your application correctly, it is for 80-acre spacing, and the drilling of more than one well on the 80-acre dedicated acreage would be prohibited, is that correct, with the location in the center of the 80, with a

tolerance of 150 feet, I believe you propose?

A Is that it?

MR. SPANN: I believe that's what the application asked for, yes, sir.

Q (By Mr. Payne) You propose for it to be in the center of one of the two 40-acre tracts?

A That is correct.

Q But you would prohibit the drilling of the second well on the 80, is that right?

A Yes, sir, that would be my opinion.

MR. PAYNE: That is what the application asks, isn't it, Mr. Spann?

MR. SPANN: Well, of course I assume that if you wanted to drill an additional well, you would only have half an allowable if you wanted to do it under those circumstances, 40-acre allowable.

MR. PAYNE: In other words, you are asking for 80-acre proration units, rather 80-acre spacing --

MR. SPANN: We felt that followed from the application, yes, sir.

MR. PAYNE: Thank you.

MR. PORTER: Were you through with your questioning?

MR. PAYNE: Yes, sir.

MR. PORTER: Anyone else have a question?

MR. SPANN: If these gentlemen are through, I have a

couple of questions on redirect examination.

MR. UTZ: I have one question.

QUESTIONS BY MR. UTZ:

Q Mr. Lawrence, have you taken any micrologs on any of these wells?

A Yes, sir, I believe the first one or two wells had micrologs run on them; subsequent to that, we switched over the procedure of running gamma ray neutron log and combining it with a lateral log or microlateral log.

Q Would you make those logs available to us?

A Yes, sir, they will be available to you.

Q Will you please send us a copy of it?

A Of all the logs?

Q Yes, all the logs you have.

A Would you like me to send it to your office?

Q That will be fine.

REDIRECT EXAMINATION

BY MR. SPANN:

Q Mr. Lawrence, you testified that you felt there was a possibility that this field would be extended considerably as a result of further drilling; do you believe that temporary rules establishing 80-acre spacing in this area would encourage further development in the field?

A Yes, sir, I definitely do; I believe that permanent

rules would definitely enhance development and exploration in the area because operators would have a good chance of making a favorable recovery on their investment; temporary rules could possibly do the same thing.

Q Now, if these temporary rules are put into effect in this field as you have sought in your application for a period of one year, or until further order of the Commission, would there be additional evidence or information available at the end of that period which would perhaps confirm your conclusions you've made here?

A Yes, sir, there will be. We will have additional structural control; we will have additional reservoir control; from a geological standpoint we will have more wells into the pay zone wherein we will be able to correlate through the pay section.

Q But at least all the information available at this point indicates that one well will drain 80 acres, and this additional information, in your opinion, would merely confirm it?

A That's correct.

MR. SPANN: I believe that's all.

MR. PORTER: Anyone else have a question?

MR. WHITE: I have just one question, I want to clarify one thing.

RECROSS EXAMINATION

BY MR. WHITE:

Q Mr. Lawrence, in reference to your economics as to

the net pay, did you -- is this exhibit prepared as to the net pay applying only to that thaxed zone there where you have it thaxed?

A No, sir, it emcompasses the whole pay section.

MR. WHITE: That's all.

MR. PORTER: Anyone else have a question of the witness? He may be excused.

(Witness excused.)

MR. PORTER: Call the next witness, Mr. Spann.

MR. SPANN: Mr. B. W. Berthelot.

B. W. BERTHELOT

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

DIRECT EXAMINATION

BY MR. SPANN:

Q Would you state you name for the record, please?

A Byron W. Berthelot.

Q And by whom are you employed?

A Employed by Phillips Petroleum Company of Bartlesville, Oklahoma, but I am in Midland, Texas.

Q In what capacity?

A Division reservoir engineer.

Q Would you state briefly for the Commission, your educational background and your experience as a petroleum engineer?

A I am a graduate of the Agricultural and Mechanical

College of Texas, with a degree in Petroleum Engineering, and a degree in mechanical engineering, both issued in June 1948; entered the employ of Phillips Petroleum Company the same month and have been continuously employed since. The past nine years of that employment, have been doing reservoir work in a number of jobs of increasing responsibility and scope to my present position.

MR. SPANN: I would like to ask if Mr. Berthelot's qualifications as an engineer are acceptable?

MR. PORTER: The Commission will accept his qualifications.

Q (By Mr. Spann) Mr. Berthelot, have you had an occasion to study the Ranger Lake Penn Oil Pool, Lea County, New Mexico?

A I have.

Q And what sort of a study did you make of that pool?

A I made a sufficient study of that pool to determine the engineering aspects of the reservoir, and the capabilities of the wells, a general reservoir engineering study of the Ranger Lake Penn Field.

MR. SPANN: Would you mark this brochure, Mr. Reporter? The first page will be Exhibit 1, we have not -- or Exhibit 4, excuse me.

(Whereupon, Phillips' Exhibit No. 4 was marked for identification.)

Q (By Mr. Spann) Now, referring to Exhibit 4, will you explain that Exhibit to the Commission?

A That's a summary of the engineering features of the Ranger Lake Penn Field in Lea County, New Mexico. You want me to go into the specific --

Q Yes, sir, please.

A The normal features of such a summary include physical properties of the reservoir rock, and these have been analyzed; the approximate average porosity of 8.7 percent is taken from correlated neutron curves. Those neutron curves were adjusted to make them comparable with the core analysis data from the one core that has been taken in the field. The maximum measured permeability as recorded in that core analysis was 28 millidarcies; the permeability, the average permeability of the core analysis was 14 millidarcies. However, the over-all average would be considerably greater than that, I feel, as permeability shows a nominal relationship with porosity, and the porosity in the upper portions of the pay that we missed in the core were actually better, and we could anticipate a higher average permeability through the section. But the highest measured permeability was 28 millidarcies. Also in that core we have a measure of fluid saturation, the average connate water saturation being 25 percent of the porous space. I have also studied the structural features of the reservoir, they concur in all major aspects with those of the geological department of Phillips Petroleum Company that has been presented here. The original oil-water contact as defined by the production group by myself, is a minus 6210 feet subsea, taking into account two drill stem tests, the one in Phillips Petroleum and Texas-Pacific

well Number 2, and the second being in Gordon Cone well Number 1. That original oil-water contact has been well defined minus 6210, or minus 6211, I won't quibble about the foot.

The reservoir fluids as of right now, an undersaturated crude of 40 and 4/10th degrees API gravity; the estimated saturation pressure of the crude, 2250 pounds per square inch; and the initial formation volume factor of 1.409, that's reservoir barrel per stock tank barrel, that estimate estimated a saturation pressure would be 1.430 reservoir barrels per stock tank barrel. The solubility included solution gas, 754 cubic feet per barrel at initial conditions and at bubble point or at the saturation point.

The pressure and temperature of the reservoir, we will go into some detail on that in additional exhibits, specifically Number 6, 7, 8, and 9. The summary sheet here indicates an initial reservoir pressure of 3530, however, that was the first measurement; it is not the virgin reservoir pressure, but the first measurement of pressure, and was taken after the production of 7,500 barrels of oil from the Number 1 well, and indicates 3530 pounds at that particular point of reservoir depletion. Reservoir temperature 162 degrees, measured with a maximum recording thermometer in several instances of drill stem testing, and in bottom hole pressure measurements sometimes a maximum recording thermometer is included, and a hundred and sixty-two degrees is the formation temperature within reasonable engineering estimates. The pressure surveys that we will refer to in the future, were made with 48-hour shutin

periods, that's normally required pressure, and most of them were taken at that period of time. Productivity in the well varies from .793 to 1.553; that's the measure of barrels of production per day that can be expected per pound per square inch at the formation phase.

Statistically, we have accumulated production to 12-1-58, barrels of oil, 368,711; MCF of gas, 285,088, and no water.

On the next exhibit, why that has been extended to include production through the months of January and February 1959, but without the total; the approximate total being 450,000 barrels to date.

The number of producing wells is currently 6; as of the date this summary was made, there were 5. The state of depletion is in the early or development stage of depletion, and development to date has been staggered 80-acre development pattern.

To date the general reservor mechanics indicate production. The prime factor in the producing mechanism of the reservoir to date has been by fluid expansion from the pressure above the bubble point; down to the bubble point. The expansion of the fluid in the reservoir is the energy contributing in the oil to production. In the later life of the reservoir why it will undoubtedly be produced by solution gas drive, may or may not be aided by a partial water drive. To date there is no evidence of a water drive.

Q Now, would you have the next page marked as Exhibit 5, by the end of the brochure marked Exhibit 5, by the reporter.

(Whereupon, Phillips' Exhibit No. 5, was marked for identification.)

Q Referring to Exhibit 5, will you explain that to the Commission.

A Exhibit 5 is merely a recording of the oil production, gas production, monthly and accumulated through November of 1958, not accumulated beyond that date, and of the Gas-Oil Ratio as calculated from the oil production and the gas production by months through the Penn Field Ranger Lake, Lea County, New Mexico.

Q Now, referring to the next page of the brochure, I would like to have that marked Exhibit Number 6.

(Whereupon, Phillips' Exhibit No. 6, was marked for identification.)

Q Referring to Phillips' Exhibit 6, would you explain that to the Commission.

A Phillips' Exhibit 6 is a summary of the bottom hole pressure data that has been recorded to date in the Ranger Lake Penn Field of Lea County, New Mexico. It included six pressure determinations in Ranger Well Number 1, four pressure determinations in Ranger Number 2, four pressure determinations in Ranger 3 and 4, and a single pressure determination in Ranger Number 6. The important data on this page being the indicated initial pressure in well Number 1, 3530, taken some two months after completion of the well, and after its production of 7,500 barrels approximately from the reservoir.

The information on this exhibit is shown graphically on additional exhibits, and will be discussed further when we get to those.

Q How often do you take these tests, ordinarily?

A Ordinarily we take these tests semi-annually. There has been an increased frequency in this field as a result of hearings.

Q Well, now, if temporary rules for a period of one year are granted here, would you continue to take these tests so as to have the information available at the end of that period?

A We would certainly take the normal frequency of tests, based on 6-month intervals; there would be two additional pressure surveys within the field within a period of one year.

Q On each well, and of course on any additional wells that you might drill, is that correct?

A Yes, sir.

Q I would like the next page marked as Phillips' Exhibit Number 7.

(Whereupon, Phillips' Exhibit No. 7, was marked for identification.)

Q Referring to Exhibit 7, would you explain that to the Commission?

A Exhibit Number 7 is related to the Ranger Lease, the largest developed lease in the field to date; and it included the production from that lease and the cumulative production from the

lease taken from Phillips' lease operating statements, and it's available through the period of March 1959.

Q Now, referring to the next page, has that been marked Exhibit 8?

(Whereupon, Phillips' Exhibit No. 8, was marked for identification.)

A It has.

Q Referring to Exhibit 8, explain that to the Commission.

A Exhibit 8 is essentially the information contained in Exhibit Number 6, presented graphically. It shows the point of pressure measurement in the various wells with respect to time, and it shows a plot there of the bottom hole pressure versus the time of the pressure measurement.

(Whereupon Phillips' Exhibit No. 9, was marked for identification.)

Q Now, has your next exhibit been marked?

A It has. Actually, Exhibit Number 8 is an intermediate step in the preparation of the Exhibit Number 9. Exhibit Number 9 is a plot of the pressure production data versus cumulative lease production. In other words, Exhibit Number 8 shows the relationship with time, and from Exhibit Number 7 we have related those pressures to cumulative production; and then that's cross-plotted here on Exhibit Number 9, which shows the bottom hole pressure in those survey periods, and that pressure is indicated on this draft right here. We have cumulative lease production in barrels.

Now, this exhibit is perhaps the key exhibit of this brochure. It indicates the parallelism of the pressure decline history of four wells, Ranger Lease Number 1, 2, 3, 4, and one point there the initial pressure measurement on well number 6.

Also indicated here are the first two pressure measurements on Well Number 1, indicating that initial pressure of 3530, with a recovery of 7,500 barrels of oil; and a second pressure measurement of 2800-pounds after recovery of 70,000 barrels of oil. Now, the virgin reservoir pressure can be reasonably estimated from a back extrapolation of that portion of the decline, and doing that you'll notice a little red dash going back up there to the zero point on the abscissa that indicated pressure 3620 pounds being initially virgin reservoir pressure in the Ranger Lake, or in the Ranger Lake Penn Field.

Now, the subsequent wells drilled in that field all show the effects of pressure drop by reason of partial depletion. Wells Number 2, 4, and 6 come in varyingly from 600 or 800 pounds below virgin reservoir pressure, to as much as in the case of Well Number 6, some 1100 pounds below initial reservoir pressure. You'll notice that Well Number 3 had an initial pressure of approximately 3590 or 3595 pounds; 3597 is the accurate measure taken from Exhibit Number 6, and that pressure is a reduction of only 23 pounds from Well Number 1. That pressure is anomalous, it more normally would have been considered to come in somewhere in the same level of pressures, as well as Number 2, 4, and 6. And my opinion of the

reason why it did not is evidenced on this geologic cross section. Well Number 1 when completed, we took an initial test, was in the lower portion of the pay, got a top allowable well and shut her down there. We did not perforate the full interval of pay in the Ranger Number 1. Some drainage as evidenced by the 23 pounds took place from this entire segment by being produced through the limited perforations in well Number 1. Now, Well Number 2, we did open the full pay, however, this wellwas completed just 90 days prior to this one, and pressure had not reasonable time to be felt to any marked extent in Number 3. So at the completion of this well, when we opened up the full pay --

MR. PORTER: By "this well", would you identify it by number?

A I will, Ranger Number 3. We find a good pressure communication and relatively high pressure; now, that well you'll note on these curves remains above the other wells with the same depletion. Well Number 4, running parallel, remains slightly below, this is Well Number 4. And wells 1 and 2 run almost identical pressures; those pressure measurements being 48-hour shutin pressures are reasonably related to the quality of the wells, and that's been shown on these logs. It is also related somewhat to structure, but on true statistics these wells, true statistics and infinite shutin time, these wells might be expected to reach, all reach the same ultimate pressure.

The most recent completion in the fidd is our Number 6 well,

and I've indicated the pressure drop on that one; communication in the field is also established. Referring to Mr. Lawrence's testimony, and not indicated on the exhibit because it was not available at that time, but out here the recovery of approximately 460,000 or 465,000, you could mark a point at 3225 pounds, that was the initial shutin 15-minute pressure on this J. C. Barnes well. Now, the mechanics of taking that test, going in with drill pipe, setting a packer, and without any recovery from that well it is opened to a shutin chamber, and you get almost an immediate fluid fill of that joint of pipe in the test tool, and it records 3225 pounds, which shows pressure depletion from the initial virgin reservoir pressure of 3620, or approximately 400 pounds, although that well is a mile from the nearest producing well. That's J. C. Barnes here, and the nearest producing well would be Phillips-Texas-Pacific and Company's Number 6 Ranger Lease well.

I think that's the important information of this Exhibit Number 9.

(Whereupon, Phillip's Exhibits 10-A, 10-B, 10-C, and 10-D, were marked for identification.)

Q Now, referring to Exhibit Number 10 -- 10-A, is it?

A A group of four exhibits.

Q Yes, 10-A, B, C, and D; explain those, will you please?

A Those are duplicates of our operating report; actually, it is a list of the individual well tests, taken throughout the life of the field. The "A" exhibit, Exhibit 10-A refers to Ranger

Well Number 1; 10-B to Ranger Well Number 2; and "C" to Well Number 3; and "D" to Ranger Well Number 4. The important items on this are the fact that the oil, API oil gravity shows a maximum variation from 39 to 41, measured throughout the field, and it is essentially similar on each of the four exhibits, indicating that the oil in each of the four wells has been in intimate communication, or has been in communication for an infinite time. It also shows essentially the same gas-oil ratio, all of them essentially at the solution ratio, indicating the nature of the productive mechanism to date. By fluid expansion, if you had a solution gas drive reservoir, those gas-oil ratios might be expected to increase with time; these as yet have not.

However, we are pretty close to that estimated bubble point, and they can be expected to increase in the future, but as of right now, in each of the four wells you will notice that the gas-oil ratios were 1 or 2, anomalous measurements 357 Gas-Oil Ratios, and perhaps as high as 1279 on the Gas-Oil Ratio; most of them vary between seven and eight hundred, nine hundred cubic feet per barrel under producing conditions, and that's representative of the reservoir, and we feel that it is an under-saturated fluid producing by fluid expansion.

(Whereupon, Phillips' Exhibit No. 11 was marked for identification.)

Q Now, referring to Exhibit 11, would you explain that?

A Exhibit Number 11 is a reservoir engineering material

balance, limited material balance calculation, showing a determination of the drainage area of Phillips Ranger Number 1. That utilizes two points; November 21 bottom hole pressure of 2311, and cumulative production at that date of 137,000 barrels, and the original conditions actually here were taken as original, that first pressure measurement of 3530, which was after 7,500 barrels of oil had been produced.

The change in formation volume factor, the change in oil shrinkage is the only mechanism lending to this production, and from those variations in that formation volume factor, related to the pressure on this well, the pressure decline on this well, and the production from this well, we can calculate that there were 9,788,650 barrels of reservoir oil that contributed, that were influenced by the production from this well. Relating that to volumetric measurement of the reservoir to a volumetric calculation of 11,488 barrels per acre in space, we see that the area of influence of the Phillips' Ranger Number 1 was 852 acres.

Now, I don't mean by that that it will drain 852 acres; it will influence 852 acres; it will drain effectively an area of about 20 percent of that, actually, we are looking for a tenth of that when we are looking for a well to efficiently drain 80 acres, and it will. A well in this pool of the character of Ranger Number 1, it's just a little below average as a well, but it had the maximum benefit of all reservoir energy for a period of about nine months, and under those circumstances it would have influenced

852 acres, would have drained perhaps 200 acres, the average well in the field being expected to drain 80 acres efficiently and economically on the basis of this calculation.

(Whereupon, Phillips' Exhibit No. 12 was marked for identification.)

Q Now, referring to Exhibit 12, would you explain that?

A Exhibit 12 is essentially the same thing; it approaches the solution of the problem from a slightly different angle. We take the point of view that had Ranger Number 1 been draining only 80 acres why, what percent of oil in place would have been recovered, and we say that if 14 and 9/10ths percent of the oil in place would have been recovered, we could have expected a pressure drop on that basis almost to depletion. Actually, the pressure had not depleted that far, so the recovery to a pressure drop of 2311 indicates that 1 and 4/10ths percent of the oil under 80 acres should have been drained out. Actually, we indicate here that 14 and 9/10ths percent of the oil under 80-acres had been drained out. Once again, that's 10 to 1. In other words, we are influencing eight hundred acres, roughly speaking, 850 acres.

The conclusion of that Exhibit 12 then is obviously that a much larger area than 80-acres was contributing to the production of that well.

Q So I take it that you have, in addition to your pressure tests that have been made, these other calculations referred to in Exhibits 11 and 12, which go into your conclusion concerning

the area drained by one well, is that correct?

A That's right. Those considerations all entered into my conclusions, and confirmed my conclusions, yes, sir.

Q And your conclusion is that one well will drain more than 80 acres in this pool, is that correct?

A Yes, sir.

Q Now, were these exhibits 4 through 12 prepared by you or under your supervision?

A The preparation of these exhibits was for the most part by myself, or under my supervision. Some of these exhibits were prepared by Mr. W. R. Bohon who happens to be my boss, and --

Q And the exhibits prepared by him, have you checked them and verified the accuracy of the information contained on them?

A I have, and they are accurate.

Q I would like to ask that Exhibits 4 to 12 be admitted into evidence.

MR. PORTER: Is there objection to the admission of these exhibits? They will be admitted.

Q (By Mr. Spann) Now, assuming the special rules are imposed or adopted for 80-acre spacing for a period of one year in this area, do you believe that that will affect the future development of the field, do you have an opinion about that?

A I have an opinion, yes. I -- we make a separate analysis of the economics of drilling; my analysis of the economics is such that 40-acre drilling is not commercial, represents a loss some-

thing in excess of $6,000.00, and that a prudent operator could not be reasonably expected to invest his money in this area if he anticipated recovery from 40-acres; and I therefore feel that the adoption of 80-acre spacing, or of temporary 80-acre spacing, will accelerate the activity in this area.

As a further effect on a man psychologically, on that I am not a psychologist, as an engineer though if we put two wells on these 80-acres, and then we find out that we have been wrong, we can't undrill that second well, we can't cut it and sell it for post-holes, or anything. If we put one hole on that 80-acres, and then find out that we have been in error on any of the data or assumption, we can at a later date drill that second well, if it becomes necessary.

And the immediate picture, the solubility and shrinkage calculations based on all five wells that have produced here for a cumulative time period of approximately two and a half years, would indicate that this reservoir is going to be something in the neighborhood of 27 million barrels of oil in place; it is going to be a relatively large thing, it will take approximately 30 wells to develop, between 30 and 35 wells to develop this pool. Right now we are looking at six wells, for all intents and purposes we are looking at five wells that we have a good history on, we could be wrong, and to put 40-acre development in here now would remove many of our potential producers from the area, I feel certain.

Q Well, now, at the end of the year period, assuming

these special rules are adopted, would you have additional information available for the Commission to make a determination, and if so, just what kind of information would you have?

A I will refer, if I might, to Phillips' Exhibit Number 1 that was put into evidence by Mr. Lawrence,and -- these drilling wells and locations can add materially to our knowledge of this pool. The average feet of net pay that we are using has been estimated, the average so far, in a limited portion of the field, the net pay contributed 32 feet. It might be materially different if we consider the entire area involved, it might be either more or less. If it was more, it would make closer drilling economically more attractive. If it is less, it will make wider drilling economically more attractive. So we have the feet of pay there, that will influence the reserves on the average in this field; also, we will attempt to confirm a structural position, is it high enough; we will have more logs, is the quality of the pay essentially similar throughout this total volume of oil that is likely to be found in Lea County, New Mexico.

Now, I think there will be a material increase, mostly areawise with respect to the perimeters of this field.

Q You heard Mr. Lawrence's testimony on the characteristics of the recent J. C. Barnes well that was completed, did you not?

A I did.

Q Does that data confirm your conclusions as to the

characteristics of this field, and your conclusions that one well would drain economically 80 acres?

A In spite of my attorney's comments that I should answer "yes" or "no" whenever I could, that is perhaps the strongest bit of evidence. We have a material influence here, some 400 pounds here a mile away, and that indicates certainly that you can drain out to 2,000 feet, that you can drain as efficiently as current technology makes possible out to a distance of 1200, 1500, 1800 feet, which would include all of the acreage in any design, reasonable design of an 80-acre tract, yes.

Q Mr. Berthelot, you also heard Mr. Lawrence's testimony about his Phillips' Exhibit 3, and the conclusions as to the amount of oil that would be recovered in the average well in this field, I believe the exhibit shows 210,000 barrels. Would you just explain to the Commission what calculations went into arriving at that figure?

A Yes, sir, I will. That's typical of what our geological analysis does. They have a group of "rule of thumb" correlations. The figures in here on 210,000 barrels of oil are arrived at by a 75-barrel per acre foot estimate, that's a real good figure based on Penn formations, particularly the Cisco. I've worked with Penn formations in Kansas, Oklahoma, Texas, Colorado, in Alberta, all over; it is a good round number, 75-barrels per acre foot, and you are dependent upon that then, and they have used 35 feet as an average pay through this area, average net pay.

35 feet times 75 barrels per acre foot, times 80 acres, 210,000 barrels of oil. A more specific and a more rigorous determination has been used in these calculations of volumetric analysis by myself, related to the standard volumetric calculations from which the 75 is derived by a long number of separate instances; in this particular instance, using 32 feet of net pay which was the average that we have to date, I think all geologists are essentially optimists, and they stretch it every time they do it.

He uses 9 to 10 percent porosity; the actual porosity as related to these lots, 8 and 7/10ths percent, 32 feet of pay, water saturation of 25 percent, leaving oil saturation in this reservoir of 75 percent, comes out 11,488 barrels per acre; and on 40-acres, 82,000 barrels recovery, on 80-acres 164,000 barrels of oil recovery. I also use a field price of petroleum product, it varies between three dollars and ten and three dollars and eight cents. Instead of basing our calculation on a 7/8ths working interest, in the Production Department we use the actual working interest in the tract, it varies between these Ranger wells. We have an eighth of 7/8ths override relative to the South Half of Section 23; we have a sixteenth of 7/8ths override up to an 800 oil payment figure on the NW¼ of Section 23; and various other overrides and considerations.

The average picture though is reasonable, this is a good atmosphere. I think it is a little bit optimistic, but it is close enough for the work that they do in proposing of wells.

Q Do you think then the conclusions that appear on that exhibit are fair and reasonable, and although slightly optimistic, something that you could pretty well go by in evaluating this field?

A Yes, sir.

Q Now --

MR. PORTER: I believe we better recess at this point, Mr. Spann, until 1:30.

MR. SPANN: Thank you.

(Recess.)

AFTERNOON SESSION
1:30 P.M., May 14, 1959

MR. PORTER: The meeting will come to order, please. Mr. Spann, I believe you were still in the process of direct examination of Mr. Berthelot.

MR. SPANN: I just have one more question, I believe.

Q (By Mr. Spann) Mr. Berthelot, Mr. Lawrence mentioned that you would enlighten Mr. White further about this three-O-one value of oil, or two eighty-five value of oil that went into his calculations that appear on Exhibit 3; would you do that?

A I will. Geological analysis section uses average figures in the Production Department, while like I stated before, we use more realistic figures, the field sales, and they have varied between two ninety-eight and three-O-eight. Three-O-one is an approximated average price of the crude sold from this field. More realistic, it does not change my opinion of the economics of drilling in the field.

MR. SPANN: I believe that's all I have, Mr. Porter.

MR. PORTER: Any questions of the witness?

MR. WHITE: I have very few.

CROSS EXAMINATION

BY MR. WHITE:

Q Mr. Berthelot, is it not true that a solution gas drive is recognized as being the least efficient of reservoir drive mechanisms?

A Yes.

Q And there is no evidence that this is a water drive, is there?

A No, to date we have no such evidence; I don't really expect it.

Q Is it not possible that the results of the periodic bottom hole pressure surveys and the bottom hole pressure interference tests that have been taken, indicate only the communication within one particular zone?

A Possible, but not probable.

Q Well, it is possible?

A It is possible, yes, sir.

Q Is it not also true that the fact that the Number 1 Cone well was a dry hole, that this definitely would demonstrate that there is a rapid change of the pay characteristics within the pool above the water-oil contact?

A No, sir; it is a question of semantics. You say

within the field, and you say as you approach the edge of the field, geologically speaking they are the same combination structure, stratographic.

Q Well, now, structurally, as far as your structure map is concerned, that recent well that was just, is being brought in now, that's about the same, the Barnes well is about, structurally located about the same as your Cone Number 1, is it not? In fact it is two feet lower --

A From an engineering point, they are flat, the same. If structure were the only consideration, Cone would have had a well in his Number 1. The limits of the field being restricted by stratigraphy, this change in litology is the reason he did not get a well, because the only part of the reservoir that he had, the only part that they have down there in J. C. Barnes, I have not seen a log on it yet, don't know anything about the sample analysis. I will know when I see the log, but I expect they have porosity development in the upper body that yours did not have, or that Mr. Cone did not have.

Q I believe Mr. Lawrence testified that apparently many of the operators in this pool have verbally expressed their desire to continue on 80-acre spacing program in developing the field, is that correct?

A To the best of my knowledge, that is correct.

Q And is it not your intention to continue to develop that field on an 80-acre spacing program, rather than on 40?

A The best laid plans of mice and men -- we would intend to so develop, and if forced by offset obligation, we couldn't do anything but take a long, long look at it and perhaps pay compensatory royalty, perhaps take farmouts on acreage.

Q It probably has been said as to how much additional evidence or data will be available to the Commission at the end of the year, if a temporary order is granted; it would appear that there would be equally as much data available, whether the order was issued or not?

A With a possible exception that the security of a temporary order would possibly accelerate the activity in this area. Locations have been staked; there is one well right up here, this Tidewater-Pacific-Western well, they ran a stall on that well, speaking quite boldly, they ran a stall. It is a little bit cheaper if we don't go out there with a spurtting unit to make our surface holes; they wanted to see the other units on the field before they moved in the rotary rig on that well. I feel that the additional security that might be felt even through temporary orders, will accelerate development in this area, and that there will be more information available because of an order than there would be in the absence of such an order.

Q You are speaking of what you presume other operators might do, not what you yourself will do?

A That is correct.

MR. WHITE: I think that's all the questions we have.

EXAMINATION BY MR. PAYNE:

Q Mr. Berthelot, do you know what the allowable is for a 40-acre well on this pool at the present?

A I know the approximate allowable.

Q It is about 164, isn't it?

A About 160, 164; the wells have averaged, they are producing top allowable. You might miss it just a little bit because of tank room, or because of pumper snarls, or something or the other, they are running about 160 barrels a day.

Q And if the Commission went to 80-acre spacing, the allowable for the 80-acre unit would be somewhere in the neighborhood of 200 a day, is that right?

A Yes, sir, that's my understanding.

Q And then a 40-acre unit would then get an allowable of a hundred barrels, correct?

A Yes, sir.

Q So that Mr. Cone's well would lose some 64 barrels a day, approximately?

A Unless an exception were made.

Q Yes, that's what I was getting at, Mr. Berthelot. I was wondering if Phillips Petroleum Company would be willing to waive objection to a 164 barrel allowable from Mr. Cone's one well here, he has only 40-acres to dedicate to it. In other words, it would remain on the same allowable that it is on now.

A Let me answer you this way, Mr. Payne. There are twelve people that constitute management of Phillips Petroleum Company that could answer your question. My recommendation would be that we not oppose it. Now, I have made a call to Bartlesville, and checked with Mr. Bohon's boss, our chief reservoir engineer, on the subject. He states that he would recommend that we not oppose such an exception.

Q Thank you. Now, one further question here on this question of fill-in wells at a later date. If the additional data that you gain during the first year, in view of the data you gain, now you say it is always possible of course to come back and drill on the 40-acre locations, but wouldn't that only be true if subsequent information develops the fact that a well in the pool is draining 40-acres or less? Here is the point, at the end of a year's time, say you come back and your data then shows that one well only efficiently drains 60-acres, now, it would have been producing an 80-acre allowable so presumably it would have been taking some of the oil from under another 40-acre location?

A Or from under that incremental 20.

Q Yes. So at the end of a year's time it might no longer be feasible to drill the fill-in well in view of the fact it might only have 20 acres of reserves?

A It is my personal opinion, and I've arrived at that by a rather thorough study of that field, you can make a rather thorough study of a limited field, actually you have done the same

here on a part of a large field, a real thorough study in this part; I'm certain, just as certain as I can be, that we will effectively drain the 80-acres and that that possibility will not arise.

Q You think there is very little possibility that infill wells will be feasible in this pool because of the fact that the one well will efficiently drain the 80 acres?

A Yes, sir, that's the way I feel. As I've stated before, I think that the additional information will largely be a matter of extent; extensive, not intensive perimeters, but extensive merely areally, and wouldn't change any.

Q Of course if you were wrong, and one well here will only drain 60 acres, then at the end of that year there is a good possibility, is there not, that you will not feel it profitable to drill that second well on the 80?

A No, sir. Really if you get down to it, our Number 1 well has produced about 160,000 barrels of oil, and it is just now at the bubble point; if that oil is coming out of 60 acres, there will be enough oil under the other 20 acres to drill a well for it. In my opinion, that oil is coming out of a 60, 80 acres of land, but if your supposition is correct, that oil is coming out of the well, is only coming out of 60 acres, there will be enough in that next 40 or 20 to make a drilling well profitable.

MR. PAYNE: That's all.

MR. PORTER: Anyone else have a question of the witness? Mr. Nutter.

QUESTIONS BY MR. NUTTER:

Q Mr. Berthelot, I notice on your, I believe, Number 5 there, in late 1958 in November you had five wells producing in this area, and then in December and January you only had four wells, and went back to five wells in February, what caused that?

A That's a question of the reporting is the only thing; these last three months are taken from your New Mexico Oil Conservation Commission report, a semi-official document of the State, and they did not start recording production from the Cone well until February of '59. Our statistician in Bartlesville who accumulated this first group of data for the prior hearing, had already started to pick up production from that well in November.

Q So this is computed from your own company records through November?

A Through November, yes.

Q And then from O. C. C. reports --

A Beyond that date. Now, what I did on this was to check these against the State reports, and the prior information, with the exception of the month of November, is again identical with your O. C. C. report, your New Mexico Reporter Recorders, and the variation there I didn't think was sufficient to raise an issue on.

Q Well, I thought maybe you had that well shut in taking some tests on it, or something.

A We didn't change the production by such a practice.

Q Mr. Berthelot, do you think Mr. Cone's well will pay out?

A Yes, sir, I do.

Q Where is that oil coming from?

A Under my lease.

Q Well, now, you got him surrounded there pretty well, haven't you?

A Yes, sir, sure do. But I'm draining part of the acreage. You see, the cumulative effect of these three wells right in here (indicating), there is a mile of undeveloped acreage here that is feeding those three wells. His well will pay out; it is going to pay out at the expense of Phillips-Texas-Pacific, perhaps of Texas-Penns, of Humble, and J. C. Barnes.

Q Well, now, you are setting up a drilling pattern as evidenced here by your Number 5 well, to drill in the NW¼ of that quarter section, and also presumably in the SE¼. Now, won't a well located in unit "A", or the NE¼ NE¼ better protect you from drainage by Mr. Cone?

A In the initial phase of the reservoir, yes; when it reaches the point as it has almost now in that area, from the solution gas drive point, why it will very shortly be limited by ratio and the concentration of wells will increase the ratio and reduce the take from our lease if we include another well in there, that's my opinion. It's happened that way in a number of fields.

Q Do you have the actual production, the cumulative production for each of the six or seven wells that are in the pool at the present time?

A I do not. I can give you an approximation that is extremely close. They have all been top allowable wells, they have all produced their allowable from the date of their completion, and it has been taken ratably from the wells, I mean, the allowable assigned to a well has been produced from that well. We got a contract pumper out there, and those are his instructions, and it has been checked by our district personnel out of Hobbs, and that's the way it's been, and it won't plus or minus three percent.

Q Have any of the wells to date paid out?

A No, sir, they have not. Number 1 perhaps would have except that the cost of that Number 1 well was very nearly three hundred thousand. That was a wildcat, we took six drill stem tests, we had a couple of fishing jobs, we penetrated the Devonian, and at the time we had a plug-back job, and it is an unduly expensive well other than that it has produced sufficient oil to return the investment.

Q That's another thing I intended to ask you, Mr. Berthelot, what the actual drilling costs have been for the six wells that you have in there?

A Some of those are so recent that the machination of the corporation the size of Phillips doesn't give me the data on them. I got a sufficient number of costs here I am sure will be representative. The Number 1 shows authority for expenditure, that cost was $298,828.00, two-nine-eight-eight-two-eight. I can break that down into tangibles and intangibles.

Q Does that include going into the Devonian?

A Yes, that does, that included that; we got to pay for it some time. Number 2 well was $199,343.00.

MR. PORTER: Would you repeat that first one?

A First one?

MR. PORTER: No, the second one.

A One-nine-nine-three-four-three, the second one. Number 3, cost us one-seven-seven-nine-three-two. Number 4 cost us one-eight-six-eight-six-one. We have not closed the expense on Number 6 well yet, and Number 5 is still drilling. However, based upon the field estimates of those wells, Well Number 6 will cost us about $12,000.00 more than Well Number 4 did; Well Number 5 ought to be about an average well, it ought to cost us, the average on those three development wells has been $188,045.00, and I expect that we will drill Number 5 for that figure, one-eight-eight-0-four-five, that's initial cost of the well. We will produce for a time on solution gas drive flowing wells, and at approximately a recovery of 40 to 60 percent of the recoverable reserves, then we will install a pumping unit. It is pretty much a toss-up now whether we will put a 320 inch pound, or a 456 inch pound maximum; that unit will cost Phillips Petroleum Company $33,000.00 installed, and the smaller unit, a 320, will cost us twenty-six thousand, twenty-seven thousand dollars installed, in Lea County.

Q So the actual cost to drill these three development wells that you have completed costs on have been approximately

$12,000.00 less than the cost given on this?

A Than our estimated cost. Our estimates have ran from one hundred ninety-three thousand nine-nine five, to two hundred ten thousand five-one-five. The actual expenditures, so far we have been fortunate, like I say, the only well where we ran into trouble so far was on the Number 1 well, we had two fishing jobs. Now, it is going to happen again, it happens to everybody in the field, and you got to have your, a fee a little bit larger, you have to have your request for funds a little bit larger than you are going to spend, because you, if you don't the bosses are going to get all over you the first time you drop a cone in the hole.

Q Also, you are conservative in the estimate of reserves prior to the time that you submit it to management, aren't you?

A I would say that petroleum engineers tend to be conservative, yes.

Q So if this exhibit represents the tabulation that was submitted to management, it would be long on drilling costs and short on reserves?

A That's an awful free expression. That was not done by a petroleum engineer; those reserves, like I say, that two-ten was done by an earth scientist, a geologist, and they are, they look at things through rose-colored glasses. My personal estimate, we now submit them through production department control for funds, I would estimate 20 percent -- not 20 percent -- 12 percent less oil than that; and historically petroleum engineering estimates

have been conservative. You are right.

Q The average cost of a well, as a petroleum engineer, would be one hundred and eighty-eight thousand?

A I will say we are a little bit fortunate. I would say one hundred ninety to one hundred ninety-two, probably; by the time we get our acreage developed, our average cost of development wells will be one hundred ninety-two thousand. Now, we also got to split up that extra ninety-eight thousand, or one hundred thousand that we've got in this Number 1 well, see.

Q Well, now, Mr. Berthelot, I notice here on your Exhibit Number 9 where you show pressure versus cumulative lease production, that the Number 1 well had a rather sharp decline in pressure for the first increment of cumulative production there, and then the pressure decrease has levelled off subsequent to that, is that correct?

A Yes, sir.

Q Then it has a tendency to level more and more all the time, with the exception that you are taking between 3,000 and 4,000 pounds, I mean, barrels?

A Averaging those last five points, I would say that after that initial, you might call it spurt production, that I won't attempt to differentiate between the character of the slope on these things, the accuracy of our measurement. Those two were taken within a relatively short period of each other.

Q What is meant by "accuracy of measurement", since it has

been arranged like this from 2500 to 3500 pressure bottom?

A On the type we are using you can go 20-pounds real easy.

Q Could account for that 23-pound difference that you had between the Number 1 well?

A You could have 23 pounds, you could have 3 pounds, you could have 43 pounds. From an engineering point of view, you expect the 23 because it could be 20 pounds more, or 20 pounds less, or cumulatively speaking, 40 pounds.

Q Well, now, over here on Exhibit Number 11, where you calculated the number of barrels of oil in the reservoir that was being affected by the withdrawal of 137,000 barrels,you used a bottom hole pressure in November of 1958 of 2311. Now, this was a pressure that was the result of that sharp decline in the initial life of that well, isn't it?

A Yes, sir, that's from Well Number 1.

Q And the subsequent withdrawal also per barrel had been less, was it not --

A Subsequent withdrawals per barrel --

Q -- per pound drop?

A -- per pound drop has been less, which means you are influencing more as time goes on.

Q Now, in this formula, $\frac{N=dNB}{B-Bo}$, what is "B" there in that formula, Mr. Berthelot?

A "B" is the formation volume factor.

Q At that pressure?

A At that pressure.

Q Well, now, if you had withdrawn, or if you had taken another calculation at a time when you had withdrawn more barrels per pound of pressure decline than you did when you took this original calculation here, wouldn't you have a larger figure there in the enumerator of that number, the 137,000 would be larger, would it not, if you run this calculation on a later date?

A 137 would have been greater, yes.

Q What would the beta have been then?

A The same.

Q Wouldn't the pressure have been less --

A No, no.

Q -- if you tested it at a later time?

A Pressure would have been lower, right; beta would not have been materially different, however.

Q Beta is important, or the difference between --

A Beta subsea, or beta.

Q That is important --

A That is very, very critical, yes.

Q -- so what I am trying to get at here, Mr. Berthelot, if you ran this test or a calculation at a time when you had more barrels of oil recovered per pressure pound, than when you did, you would have a larger number in the enumerator, right?

A Yes.

Q But beta would be proportionately smaller because you would have less pounds per drop --

A No, beta is going up with time; beta is going up with time, you see your reservoir fluids are expanding.

Q Well, that's what I meant is the difference through --

A Would be greater also, but by a lesser amount than the number of barrels.

Q That's what I am driving at, so you have, in effect you would have a larger number in your enumerator, and a larger number in your denominator of that figure, but the proportionate increase in the denominator and enumerator would be out of kilter with each other, wouldn't they, wouldn't the enumerator go up faster than the denominator? That's what it amounts to.

A Let me look at some of the data.

Q Have you made this calculation for any other time?

A I have not.

Q For any other pressure?

A I have not. I have made similar calculations involving five wells, or four wells and the lease cumulative production from time zero to date.

Q Do you have that figure?

A Yes, all four wells here, that would come -- you are influencing 594 acres per well.

Q You have several wells?

A Four wells, and a composite pressure drop of 1500

pounds, and a shrinkage of 11 barrels per million per pound, and you are influencing 594 acres, and I have calculated it more than one way.

Q And you are influencing here 852?

A And that's reasonable because you see this was the first well, it had the greatest opportunity to influence; the composite of the four wells right at 600 acres, 594. Using that analogy, you are probably right in your assumption that if we used the one well, over the greater period of time you might have got a reduction in acreage to 750, or even down as low as 700, but still in the realm of 8 to 9 times the drainage area that we expect to efficiently drain with one well.

Q Well, now, in your next calculation there, you are using a net oil sand of 32 feet, what is that based on, Mr. Bethelot, is that what you assume to be the average for the whole pool?

A No; no, that's in your one well again, that's Ranger Number 1, 32 feet.

Q Well, your exhibit number 1 shows 10 feet for Number 1.

A No; no, that's 10 feet in the upper member.

Q Well, now, Mr. Lawrence in answer to my question said that the 10 feet represented the upper and the lower sand both.

A I believe that you are in error; I would have to ask Mr. Lawrence.

MR. LAWRENCE: I had in mind the 10 feet represented the net porosity in the upper porosity development; it did not represent the net porosity in the over-all Ranger Lake pay section.

Q Perhaps I misunderstood the answer, but I thought that when Mr. White asked you whether the feet of net pay represented the thaxed area as he called it, or the remainder of the pay itself that you stated that it represented the thaxed area only.

MR. LAWRENCE: No, sir, I had in mind the thaxed area represented the upper porosity development, and the figures designating the pay section there, restricted to that upper porosity development, they do not represent the net porosity in the over-all Ranger Lake pay section.

MR. NUTTER: In other words, you have 10 feet in the thaxed area --

MR. LAWRENCE: That's correct.

MR. NUTTER: -- for that Number 1 well?

MR. LAWRENCE: That's correct.

A There is an additional 22 feet in it, between the top of the pay and the water-oil contact, yes, sir.

Q (By Mr. Nutter) Well, now, how much pay do you have in the Number 2 well?

A I can look that up. I have that well credited with 28 feet.

Q How about 3 well?

A Number 3 well is better well, I have it credited with 47 feet.

Q How about the Number 4?

A It drops back down, sir; it's run here 32 and 2/10th

feet.

Q And how about the Number 6 well that has been completed?

A I have not made determination on Number 6 yet; we are still processing the records on it.

Q Have you had the figure available to you as to how much net pay they have in the Barnes well?

A No; no, we have not ever seen the log on it.

Q How about the Cone well? How many feet of net pay does he have?

A His well is slightly less than our Number 2; I really didn't go into his well with the degree of thought that I went into these other five.

Q Now, how about porosity, how much porosity have you had present?

A The porosity varies from well to well, but I did not make a separate tabulation by wells.

Q You used the Number 1 well as the criterion for establishing it?

A No, it was done collectively over the group of wells; the criterion was established in Number 2, where we had the core, and --

Q You defined the minimum porosity on your neutron log, and a shale porosity, and --

A The deflection is proportionate to porosity, but then that must be tied down to some physical measurement, and we tied

it to this core in the Nunber 2 well, and then I just added up feet.

Q Now, you had a core in the lower section only?

A That is correct.

Q Right?

A That is correct.

Q And is the lower section a better or worse section?

A It is a worse section, relatively speaking.

Q And what was this 8.7 percent, was that in the lower section?

A No, that's over-all.

Q That's the weighted average of porosity in the entire section there in the Number 2 well?

A In the whole field.

Q What is the actual porosity there in the lower section of the Number 2 well?

A The lower section of the Number 2. You have the core analysis on that, the average will run 6 and 7/10ths percent, and that's been raised by the addition of better porosity from gamma ray neutron logs correlated on that basis.

Q How about the connate water, is that from the one core?

A From the one core, 25 percent. As a normal thing, the increase of 2 percent porosity would not materially affect that connate water saturation; it might give you an oil saturation of 76 percent rather than 75 percent.

Q Have you made any calculation of the reserves under the individual wells, or have you taken this 32 feet and made that one reserve calculation?

A I made it on the basis of 32 feet; I've looked at it on the basis of 40 feet; I also looked at it on the basis of 16 percent recovery, and on the basis of 18 percent recovery. The trouble is they don't let me decide where we are going to drill, they -- somebody else decides that, and my calculations have principally been from, oh, shall we say, curiosity, and then it is necessary that I have a "feeling of our properties" if I am going to conduct my job properly.

Q Anywhere from 15 to 20 percent recovery is a reasonable recovery factor for a pool of this type?

A No, it wouldn't go 30 percent on solution gas drive; like Mr. White said, it is the least efficient method, some solution gas drive reservoir units get 30 percent, but they are not in the 10,000 foot depth bracket; when you get below 8,000 feet, when you get below 6,000 feet, you start reducing that maximum; you might get as much as 20 percent of the oil in place if you were lucky, at 10,000 feet from solution gas drive reservoir.

Q If we don't have a water drive in this pool, you consider 20 the maximum?

A If we do not have a water drive, and like I say, I don't anticipate a water drive, the water recoveries if you will notice have all been small, the water has been relatively immobile

on these two tests that recovered water. From my point of view, the water was just important in that it was water, that's why I reason that there will not be an active water drive in this Penn field.

Q There is a watertable there, but it is not moving?

A It is not moving, and that is borne out by these exhibits 10-A, B, C and D. We have not seen any water production as yet on any of our wells.

MR. NUTTER: That's all.

A It might help our case if we could have a little water drive; the water has a compressibility of about 3 parts per million, rather than 11 parts per million, and if the expansion of water was influencing this recovery, why we would be influencing four times as much acreage as the calculation shows, but I don't think that is the case.

MR. NUTTER: I believe that's all I have. Thank you.

QUESTIONS BY MR. PAYNE:

Q Mr. Berthelot, is the casing head gas produced from these wells being vented or flared?

A That's another question I wish you didn't ask. Yes, sir, it is, with the exception of a minor amount being used for lease use, and what we call nuisance contracts where we sell for development purposes.

Q So with increased allowance, there would be of course

more gas being flared?

A There would be more gas being flared.

Q Is there any possibility of getting a connection to take --

A The area is under investigation; this is not an isolated, not an isolated thing. Mr. Lawrence knows and talks about other development. Here we have an interest in one right about here, Humble's, we are watching very, very carefully; we got a well drilling over by Santiago, I forget the name of that prospect.

MR. LAWRENCE: It is the Spray Field.

A Spray Field, we got a well going on over there now, and we have several people itching to get their finger on this gas.

Q So it is certainly within the realm of probability that you will get connections for the gas?

A Yes; yes, very definitely, very definitely.

MR. NUTTER: When, Mr. Berthelot?

A That's another thing they don't let me decide; I would have had it yesterday.

MR. NUTTER: Do you know of any contracts that have been consummated, or any construction of any gathering system?

A I think, to the best of my knowledge, I am in contact with Walter Cox, our gas man in Amarillo, and they are actively working on it, and that's all he will tell me. That can mean a lot of different things, that can mean from 6 months to 18 months.

MR. NUTTER: Yes, sir, I know. Thank you.

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

Mr. Spann, does this conclude your testimony?

MR. SPANN: Just a moment, Mr. Porter. Mr. Nutter asked about the net pay in the Cone well. Mr. Lawrence has that information, if you care to have it.

MR. NUTTER: You have that available?

MR. SPANN: Do you want me to put him back on?

MR. PORTER: I think he can answer from where he is; he has already been sworn.

MR. LAWRENCE: The Gordon Cone Number 1 State-24, we felt had zero net pay. The Gordon Cone Number 2-24 in the SW of the SW of 24, we felt had 12 feet of net pay.

MR. NUTTER: Thank you.

MR. SPANN: That's all we have.

MR. PORTER: Mr. White, do you desire to proceed?

MR. WHITE: If the Commission please, in the event the Commission deems proper to issue an order as requested by the application, on behalf of Mr. Cone, I would like to submit that the Commission adopt a pool rule providing that any present well producing on a 40-acre unit to which 80-acres cannot be dedicated, that such well be given a normal 40-acre unit allowable.

MR. PAYNE: How many of such wells are there at present, Mr. White?

MR. WHITE: To my knowledge there is only one, the Cone

Number 2. That's about the only way we can protect the correlative rights.

MR. SPANN: In behalf of Phillips, we would not oppose that, insofar as it applies to Mr. Cone's well, the recommendation of Mr. White.

MR. WHITE: Thank you.

MR. PAYNE: I understood your witness, Mr. Spann, to say that he felt that he would not have any objection, at least personally, to a normal 40-acre allowable for this Cone well?

MR. SPANN: Isn't that what I concur, agree that we would not oppose Mr. White?--

MR. PAYNE: I see. Thank you.

MR. SPANN: -- concerning that, and I thought that's what I agreed to.

MR. PORTER: I misunderstood you too, Mr. Spann.

MR. WHITE: In other words, you concur in this proposal?

MR. SPANN: I would not oppose it.

MR. PORTER: Seems the lawyers are conservative too, sometimes.

MR. SPANN: If I may, I would like to as part of our case, just call the Commission's attention, if I may, to --

MR. PORTER: Mr. Spann, do you desire to make a closing statement at this time, or would you include this as part of this? I was first going to conclude the testimony, if anyone else

desires to present testimony, then you can go ahead and present your statement.

MR. WHITE: We have no testimony.

MR. PORTER: Mr. Spann.

MR. SPANN: I would merely like to call the Commission's attention to their order R-892 entered in Case Number 1102, in which you established permanent 80-acre spacing in the Dean Permo-Penn Pool; and your order R-895 in Case Number 1125 in which order you likewise established permanent 80-acre spacing in Elaine Penn Pool. My point being that there is precedent in the Penn for 80-acre spacing in Lea County. I want to include that as part of our case.

Now, so far as a final statement is concerned, Mr. Porter, we feel that the available information obtained from bottom hole pressure tests of the wells drilled to date in the pool, including the recently completed J. C. Barnes wells, establishes that effective communication exists in areas greater than 80-acres, and that one well will efficiently and economically drain 80-acres.

We also feel that from an economic standpoint, it apparently is not feasible to drill wells on 40-acres, and feel that if these temporary rules are imposed for a year's period, that we can come back and give you additional information which will confirm what we feel we have established today, which is that this pool should be developed on 80-acre spacing. Of course, if our -- if the additional information obtained in the next year indicates otherwise, then of

course we can always proceed to drill in fill-in wells and develop that area on 40-acres. However, contrarywise, if it is developed on 40-acres now, and this development confirms what we have said about it, the wells have been drilled at this extra expense, and there is no way of recovering the investment that has been made. And I understand that in these hearings, or 80-acre spacing hearings, one of the difficult problems you are always confronted with is where areas that have been developed on 40-acres should be converted to 80-acre spacing. In view of the testimony taken, and the information obtained, and we want to preclude our having to come in here sometime down the line with an area developed on 40, and ask for 80's, based on the information that has been developed, and we therefore urgently request that at least temporary 80-acre spacing be invoked or imposed in this area.

MR. PORTER: Any other statements or comments on the case? I will take the case under advisement.

Proceed with the next case on the docket.

MR. PAYNE: May it please the Commission, we did receive a communication here from Santiago Oil and Gas Company, who concurs in the application of Phillips Petroleum Company for 80-acre spacing in this pool.

MR. PORTER: Let the record show that the telegram is part of the record in this case.

(Whereupon taking of testimony in this case was concluded.)

C O P Y

WESTERN UNION TELEGRAM

MAIN OFFICE OCC
1959 MAY 12 PM 4:32

1949 MAY 12 (PM) 4 10

LA 216 DA 462

D MDA200 LONG PD=MIDLAND TEX 12 420PMC=

A. L. PORTER JR, SECRETARY AND DIRECTOR=

OIL CONSERVATION COMMISSION SANTA FE NMEX=

REGARDING THE HEARING ON 13 MAY 1959 OF THE COMMISSION FOR THE APPLICATION OF PHILLIPS PETROLEUM COMPANY FOR AN ORDER ESTABLISHING TEMPORARY 80 ACRE SPACING IN THE RANGER LAKE FIELD LEA COUNTY NEW MEXICO. SANTIAGO OIL AND GAS COMPANY IS FAMILIAR WITH THE FACTS INVOLVED IN THIS APPLICATION AND AS AN OPERATOR IN THE AREA WISHES TO RESPECTFULLY URGE THAT THE 80 ACRE SPACING PROGRAM BE ADOPED BY THE COMMISSION=

R. L. REDLINE JR PRESIDENT SANTIAGO OIL AND GAS CO-

=13 1959 80 80=

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/or under my personal supervision, 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 6th day of June, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

NOTARY PUBLIC.

My Commission Expires:

October 5, 1960.