BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASES 1253 & 1254

TRANSCRIPT OF HEARING

NOVEMBER 13, 1958

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BEFORE THE
OIL CONSERVATION COMMISSION
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IN THE MATTER OF:	
CASES 1253 & 1254	In the matter of the hearing ordered to be held by Order No. R-1011 to permit the operators in the Kemnitz-Wolfcamp Pool in Lea County, New Mexico, to appear and show cause why the Special Rules and Regulations set forth in said order should be continued in effect beyond December 31, 1958.

BEFORE:

Mr. A. L. Porter, Examiner
Mr. Edwin L. Mechem
Mr. Murray Morgan

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

MR. PORTER: Take up next Cases 1253 and 1254.

MR. PAYNE: Case 1253 and Case 1254. In the matter of the hearing ordered to be held by Order No. R-1011 to permit the operators in the Kemnitz-Wolfcamp Pool in Lea County, New Mexico, to appear and show cause why the Special Rules and Regulations set forth in said order should be continued in effect beyond December 31, 1958.

MR. BRATTON: If the Commission please, Howard Bratton, Hervey, Dow & Hinkle, appearing on behalf of Tennessee Gas Transmission Company. I would like to introduce Mr. William Armstrong

of the legal department of the Tennessee Gas Company, who will be associated with me in this case. We would like to present evidence in this case for the purpose of supporting the continuance of the present Rules and Regulations in the Kemnitz-Wolfcamp Pool beyond December 31, 1958. We have two witnesses, and I ask that they be sworn at this time; Mr. Snell and Mr. Carnes.

(Witnesses sworn)

MR. McGOWAN: If the Commission please, I am G. H. McGowan. On behalf of Sinclair Oil & Gas Company, I would like to present an appearance. We are the original applicants in this case. We have no testimony. We will have a statement at the end.

MR. FEDERICI: Seth, Montgomery, Federici & Andrews, appearing on behalf of Shell Oil Company. I just want to make a statement on behalf of Shell. We have no witness. Does the Commission desire the statement now or later?

MR. PORTER: I believe we will wait until the testimony has been submitted.

Will there be any other appearances in the case?

GENE W. SNELL,

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

DIRECT EXAMINATION

BY MR. BRATTON:

Q Will you state your name, please?

A Gene W. Snell.

Q By whom are you employed, Mr. Snell?

A Tennessee Gas Transmission.

Q Where and in what capacity?

A Hobbs, New Mexico as an exploitation engineer.

Q Will you give a brief outline of your education and professional background, Mr. Snell?

A Yes, sir. I received a Bachelor of Science degree in geological engineering from the University of Houston in 1951. I worked three years in West Texas and Southeast New Mexico with Tennessee Gas.

Q In your capacity with Tennessee Gas, have you become familiar with the Kemnitz-Wolfcamp Pool?

A Yes, I have.

Q Are you familiar with the Special Rules and Regulations now in effect in that Pool?

A Yes, I am.

Q In your experience with Tennessee Gas, have you made a geological study of the Kemnitz-Wolfcamp Pool?

A Yes, I have.

MR. BRATTON: Are the witness' qualifications acceptable to testify in this case, Mr. Porter?

MR. PORTER: Yes, they are.

Q Mr. Snell, you say you have made a geological study of the Kemnitz-Wolfcamp Field?

A Yes.

Q And are the results of your study shown on Tennessee Gas Transmission Company's Exhibits 1 through 4?

A Yes, they are.

Q Will you refer to Exhibit No. 1 and explain what it is and what it shows?

A Exhibit No. 1 is a development map of the Kemnitz-Wolfcamp Field. Temporary field rule field designation is outlined in red. We have a symbol at the bottom of the exhibit designating the type of producer for each well in the Field. This map was drawn up to show the development of the Field since the hearing for the temporary Field Rules of the Kemnity-Wolfcamp Field. A generalized breakdown in the Field itself at the present, the producers and the type of wells, is as follows:

Tennessee Gas has 17 Lower Wolfcamp producers, 1 drilling well, 1 Cisco well; Shell Oil Company, 3 Lower Wolfcamp producers; Ohio Oil Company, 3 Lower Wolfcamp producers; Pure Oil, 1 Lower Wolfcamp producer, 1 Cisco; Forest Oil Company, 2 Lower Wolfcamp; Sinclair Oil & Gas, 6 Lower Wolfcamp, 1 dry hole Lower Wolfcamp; Humble Oil, 1 Lower Wolfcamp; Phillips, 1 Lower Wolfcamp, 1 dry hole. These totals for the Field are 34 Lower Wolfcamp, 1 drilling Lower Woldcamp, and 2 Cisco, and 2 Lower Wolfcamp dry holes.

Q Is there any further information reflected on Exhibit 1, Mr. Snell?

A No, there is not.

Q Have you prepared a structure contour map of the Field?

A Yes. Exhibit No. 2 is a structure contour map of the Lower Wolfcamp Field on what Tennessee calls the Kemnitz Lime. It is a 10,600' marker, log marker and lithology marker which we have used. This map is somewhat different than the structure map we presented in the original hearing in that this structure is some 350' lower structurally than that map. Our structure maps in the area have not sufficiently given us information in regards to further development drilling in that the trap itself is stratigraphic, and locally our structure does tell us a story, but generally, structure in that area is of no great help.

Q Is that for the reason that the structure does not reflect the occurrence of porosity in the pay?

A Yes, that's right.

Q This being a stratigraphic trap. Now, have you prepared Isopach maps of the Pool?

A Yes. Exhibit No. 3, which is the Isopach of the Gross Microlog porosity, Lower Wolfcamp Pay. And Exhibit No. 4, Isopach of Net Microlog porosity of the Lower Wolfcamp Pay. Again, the Field limits are designated in red. The dashed red line across the bottom of both porosity maps, Isopach map, is what we believe to be the oil-water contact of the Field. The difference in the two maps is that map, Exhibit No. 3, Gross, takes into consideration both our oil porosity and water porosity. Exhibit No. 4, which is Net oil porosity, cancels out all water which is effectively what

we are producing in the Field. These maps were constructed basically from the microlog with other information such as other logging devices, drill stem tests and production data gathered in the pay zone to delineate the amount of pay we had.

Q Now, speaking generally, what do those Isopach show with reference to the productive limits of the Lower Wolfcamp?

A Both Exhibit No. 3 and 4 indicate the Lower Wolfcamp pay pinchout to the north, to the east and to the west. The southern limits of the Field are yet undefined by development drilling, but we feel by the encountering of water in the Lower Wolfcamp pay that we have established about its southern limits of production.

Q Now, these maps were prepared from all available microlog data in the Field from all wells?

A Yes.

Q From any other data?

A Production data on each well through the pay zone, drill stem tests and that's about it.

Q Is there anything else you would like to tell the Commission with reference to these two Exhibits?

A No.

Q Is there anything further which you would like to testify to in this case?

A No.

Q Were Exhibits 1 through 4 prepared by you or under your direction?

A Yes, they were.

MR. BRATTON: We would like to offer Exhibits 1 through 4 in evidence.

MR. PORTER: Without objection, Tennessee Gas Company's Exhibits Nos. 1 through 4 will be admitted.

Anyone have a question of the witness?

CROSS EXAMINATION

BY MR. COOLEY:

Q Mr. Snell, can you draw any conclusions from the studies you have made which are portrayed by Exhibits 1 through 4 as the propriety or advisability of 80-acre spacing in this Pool?

A I think that will be covered in later testimony, sir.

Q Very good.

MR. COOLEY: No further questions.

QUESTIONS BY MR. NUTTER:

Q I wanted to ask the witness one question. Do you think that the presence of this water-oil contact would indicate that some of the acreage that is dedicated to the wells in the southernmost portion of the Field might not be productive of oil?

A Let me see if I understand you correctly. In the southern portion of the Field down here we feel that both structure and stratigraphy are going to be the main things to delineate the oil porosity. We think that the oil porosity will be too small further south of what we have designated the oil-water contact to make a commercial producer.

Q Do you think that a well that may be commercial, however, but is located north of the portion that you have drawn the water-oil contact, the well may be a commercial producer but have considerable acreage dedicated to it that is below the water-oil contact, might not be productive of oil, is that possible?

A Yes, it would be possible.

Q Are you familiar with the pool rules for the Kemnitz-Wolfcamp Pool?

A Yes, sir.

Q Are you aware that the rules require that either the E/2 or the W/2 of a governmental quarter section be dedicated to the well?

A Yes, sir.

Q Could you tell me, for example, what acreage is dedicated to Shell Oil Company's State "W D" No. 1, located in the NW/4 SW/4 of Section 29?

A That would be the east eighty.

Q That would be the east eighty of the SW/4?

A Yes, sir.

Q Do you think that the south forty there is productive of oil?

A Present indications point that it is not.

Q What acreage is dedicated to Tennessee Gas Transmission Company's State "B" No. 1 in the NE NW/4, Section 21?

A The east eighty, "B" 1.

Q Do you think the south forty there is productive of oil?

A Not in the Lower Wolfcamp pay.

Q What acreage is dedicated to, I believe it is a Pure State "E" Well No. 2 in the SW SE of 21?

A That Well is producing from the Cisco and is dry in the Lower Wolfcamp, and I assume under Cisco it would be the west eighty.

Q The No. 1 is in the Cisco or the No. 2 is in the Cisco?

A I am sorry. Did you say the No. 2?

Q No. 2.

A It would be the west eighty.

Q Do you think the north forty is productive of oil?

A Not in the Lower Wolfcamp.

Q Do you think it is advisable to have the elongated proration unit such as we have here in an area where the water-oil contact may change or appear as it does in this Pool and cause acreage which is not productive of oil to be dedicated to the wells? Do you think those wells are receiving more than their actual share of the Pool's allowable?

A No, I don't.

Q Would you elaborate a little further on that statement, please?

A If I understand you right, sir, in that -- as an example, our Tennessee Gas State "B" No. 1 in Section 21 --

Q Yes, sir.

A -- which has the west-east eighty dedicated to it would

be actually getting a higher allowable than the Ohio "S B" No. 1 located directly offset to the north in Section 16.

Q With respect to the amount of productive acreage that is dedicated to the well, do you believe it is getting more allowable?

A No, I do not.

Q Do you believe that Ohio's "S B" No. 1 has eighty productive acres dedicated to it?

A Yes, I believe it has it dedicated.

Q Well, does your well have eighty productive acres dedicated to it?

A Yes, sir, it does, eighty.

Q Productive acres?

A We hope productive acres, sir.

Q However, it is below your water-oil contact?

A Yes, sir. The area in the northeast part of the Field in the Lower Wolfcamp pay is pinching out quite drastically. In some respects it is structurally controlled, in other respects it is not. By that, you may get what we call the Kemnitz Lime and abandonment porosity. In others, you may get Kemnitz Lime and no porosity, so we know the northeast part of the Field is very erratic in development. The water-oil contact in this northeast part was drawn on information that we knew to exist, and we believe that it is encroaching in that area.

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

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

MR. BRATTON: I would like to ask a question or two.

REDIRECT EXAMINATION

BY MR. BRATTON:

Q Mr. Snell, do you know whether any or all of these wells as to which Mr. Nutter was inquiring, whether those wells are now top allowable wells? Do you happen to have that information?

A To the best of my knowledge, the Ohio "S B" No. 1, the Tennessee Gas "B" No. 1 are not top allowable wells.

MR. BRATTON: I believe that's all.

QUESTIONS BY MR. PORTER:

Q Do you have any information on the Shell well that was mentioned?

A The Shell "W D" No. 1?

Q Yes, sir.

A To the best of my knowledge, it is -- it was top allowable. At present, whether it is or not, I do not know.

MR. PORTER: Mr. Fischer.

QUESTIONS BY MR. FISCHER:

Q Mr. Snell, could you tell me the present status of -- I think it is Sinclair lease 692, State 692 lease, rather, No. 1 in the SE SW of Section 24?

A No. 1 692. Yes, it's dry and abandoned.

Q Is that the same condition that Phillips New Mexico State lease Well No. 2 in the SE/4 of the SE/4 of Section 25?

A Yes, it is dry and abandoned.

Q It is in the Kemnitz-Wolfcamp?

A Yes, they were both drilled to the Kemnitz Lower Wolfcamp pay and were dry.

Q Are there any indications of oil or production in the Cisco --

A The --

Q -- in those pools?

A The Phillips New Mex "A" No. 2, drilled to the Pennsylvanian at approximately 11,500, and encountered porosity, but it was not considered commercial to produce it.

Q What about that Sinclair State 692 No. 1 in the Cisco?

A To the best of my knowledge, it was also dry in the Cisco.

MR. FISCHER: Thank you.

MR. PORTER: Any further questions of the witness? The witness may be excused.

(Witness excused)

JAMES F. CARNES,

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

DIRECT EXAMINATION

BY MR. BRATTON:

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

A James F. Carnes. District engineer for Tennessee Gas in Hobbs, New Mexico.

Q Have you previously qualified before this Commission as an expert petroleum engineer?

A I have.

Q Are you familiar with the Kemnitz-Wolfcamp Pool?

A I am.

Q Are you familiar with the Special Rules and Regulations now in effect in that Pool?

A I am.

Q Have you made a study of the Pool in connection with those Rules and Regulations and this hearing?

A I have.

Q Will you refer, Mr. Carnes, to Tennessee Gas Transmission Company's Exhibits Nos. 5 and 6 and explain what those Exhibits are and what they show?

A Exhibits Nos. 5 and 6 posted here on the board, with the Commission's permission, will be shown together. Exhibit 5 is a plot of the monthly oil and gas producing rate and the fieldwide average bottom hole pressure versus time. Also tabulated across the upper part of the draft is the number of wells completed and producing at the end of each month. Primarily, it shows the rapid development of the Field since discovery in December of 1956 with, as Mr. Snell earlier pointed out, 34 wells producing at the present time. It also indicates that we are having no increase or appreciable

increase in gas-oil ratio at the present time. Current production shown on these is 150,000 barrels of oil per month, approximately 190,000 cubic feet of gas -- pardon me -- 190,000 MCF or gas-oil ratio of 1275. Exhibit No. 6 is a plot of the monthly oil and gas producing rate and fieldwide average, bottom hole pressure plotted against cumulative oil production. The bottom hole pressure as plotted, is a typical, almost a testbook example, of a solution gas drive reservoir. It is a primary reason for plotting these two drafts.

Q Is there any indication of a water drive in this Pool?

A None whatsoever.

Q What wells do you have shown on there?

A Well, I have all of the bottom hole pressures averaged that we have available in the Field, or approximately 100 pressure points have been averaged. The last point shown was taken November the 3rd, is the average of four wells which we felt were representative of the entire Field for bottom hole pressure. Those, if I may read them into the record, were our State "A A" Kemnitz "B" No. 5, thirty days of completion. It is on the extreme western edge of the Field. If you will refer to our Exhibit No. 1, with a bottom hole pressure of 2814 psi. Our Kemnitz "B" 3, an older producing well with bottom hole pressure of 2775; our State "A A" Kemnitz No. 1, the discovery well, which is offset on 40-acre spacing, with a bottom hole pressure of 2725 psi, and the State Western "A" No. 2, on the extreme eastern edge of the Field, the bottom hole pressure

of 2767 psi; the arithmetical average, 2770 psi. Those pressures are plotted on Exhibit 5, and they are shown on Exhibit 6 only by estimating the production for the month of October which we did not have available.

Q Mr. Carnes, I believe you said the last of your four wells was the State Western "A" No. 2. Is that correct, or is it "A" No. 3?

A It was "A" No. 2.

Q Do you have anything further which you wish to explain with regard to Exhibits 5 and 6?

A I believe that covers Exhibits 5 and 6.

Q Turning now to Exhibit No. 7, Mr. Carnes, will you explain Exhibit No. 7 and what it reflects?

A Exhibit No. 7 is a plot of all the bottom hole pressure tests, drill stem tests or initial completion pressures that we had in the Kemnitz Wolfcamp Field. The lower line, the solid line, is a plot of the average field pressures. The upper line is a plot of the drill stem test or initial completion pressures. We show that during the early life when we were at pressures above the saturation point, the average differential pressure between newly completed wells and those older producing wells in the Field was approximately 40 psi; that at the saturation point of 3217 psi, the differential between locations diverged slightly, and at the present time shows an average differential of approximately 80 psi. No distinction was made for this plot or for diagonal 80-acre

locations; 1860 feet from the nearest producer or 160-acre locations; 2640 feet from the nearest producing well. We feel that the 80-acre differential adequately indicates, or indicates adequate drainage on 80-acre spacing; that it was pointed out in our original hearing that the Townsend Wolfcamp Field, the average differential on 40-acre spacing was 138 psi, using ten completed wells, although five of those ten wells indicated differential pressure ranges from 200 to 400 psi.

Q Would you care to comment, particularly with reference to any wells which you have plotted on that curve, Mr. Carnes?

A If you will notice, in April of 1958, the Forest Oil Company State "A" No. 2, that well was 2640 feet from the nearest producer, indicated a differential of 80 psi above the Field average pressure. The Phillips New Mex "A" No. 1 was also a 160-acre location or 2640 feet from the nearest producing well, and indicated a differential pressure of only 130 psi higher than the Field average. The range of differential pressure had been from 30 to 130 psi greater than the Field.

Q Mr. Carnes, in your opinion, does Exhibit No. 7 indicate that there is excellent permeability in this Field?

A I think it shows extremely good permeability, that we are draining something considerably more than 80-acre spacing.

Q Do you believe that the evidence as reflected on Exhibit 7, is that the best type of evidence which could be obtained with regard to whether one well is draining 80-acres, or is there other

type of information which could be obtained which would be superior in quality?

A In our opinion, the bottom hole pressure curves are the best indication of field drainage.

Q And, in your opinion, Exhibit No. 7 conclusively proves to you that one well is efficiently draining 80 acres or more in the Pool?

A Yes. Very efficiently draining 80 or more.

Q Mr. Carnes, have you made any calculations on recovery from this Pool?

A We have made some preliminary calculations on the ultimate economic recovery from the Kemnitz Field. Our estimates indicate approximately 8,125,000 barrels of oil will be recovered from the reservoir.

Q Have you made any calculations as to how much, if any, additional oil could reasonably be anticipated to be recovered if the Pool were to be developed from now forward on 40-acre spacing?

A We have made again some preliminary studies there. Our statement shows that the Kemnitz-Wolfcamp Field will produce approximately 80 barrels of oil per acre foot; that on 40-acre spacing with the drainage that we have shown, there has been some 2,000,000 barrels of oil to date, or approximately 25 percent of the ultimate recovery, leaving only 60 barrels of oil per acre foot throughout the Field to be produced. Therefore, on 40-acre spacing, you would have to encounter immediately if the wells were completed today,

41 feet of net pay merely to return the investment. That would show that there are approximately eight locations that could be drilled on 40's. If those wells were drilled, our figures show that not more than 100,000 barrels of oil could be added to our ultimate recovery.

Q Now, what percentage of the total oil in place would that be?

A By our figures, that would be less than four-tenths of 1 percent of the oil in place.

Q Or what percent of the recoverable oil in place?

A Approximately 1 percent increase in ultimate recovery.

Q Do you have any information on the cost of drilling and completing a Wolfcamp Well?

A Our average cost for a Wolfcamp test only is $180,000 per well.

Q Therefore, if eight wells were drilled, that would be approximately an expenditure of $1,500,000 --

A Approximately.

Q -- for which an additional recovery could not be anticipated in excess of a hundred thousand barrels of oil.

A Approximately correct.

Q And for that expenditure. Some or most of those wells would no more than recover the cost of the well?

A By the time they could be completed, most would merely return the operator's investment.

Q Mr. Carnes, in your opinion, will one well in the Kemnitz Wolfcamp Pool efficiently and economically drain 80 acres?

A In my opinion, it will.

Q In your opinion, will the continuance of the present Special Rules and Regulations for the Kemnitz Wolfcamp Pool prevent waste and protect correlative rights?

A They will.

Q Is it your recommendation that the present Special Rules and Regulations be continued beyond December 31, 1958?

A It is my recommendation, recommendation of Tennessee Gas, that these temporary Rules be made permanent.

Q Do you have anything further which you would like to state in this case, Mr. Carnes?

A I believe we have covered our testimony.

Q Were Exhibits 5 through 7 prepared by you or under your supervision, Mr. Carnes?

A They were.

MR. BRATTON: I would like to offer in evidence Tennessee Gas Company's Exhibits 5 through 7 inclusive.

MR. PORTER: Is there objection to the admission of these Exhibits? Exhibits 5 through 7 will be admitted.

At this time the Commission will recess the hearing until one-thirty.

(Recess)

MR. PORTER: The hearing will come to order, please.

Mr. Bratton, have you concluded with your direct testimony of Mr. Carnes?

MR. BRATTON: Yes, sir.

MR. PORTER: Does anyone have a question of Mr. Carnes? Any questions of this witness? Mr. Nutter, do you have a question?

MR. NUTTER: Yes, sir, I do.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Carnes, your Exhibit 7 shows the differential between the dotted line and solid line. Now, the solid line represents the older bottom hole pressure for several of the older wells --

A Yes, sir, that's what we consider the field average bottom hole pressure.

Q -- and the dotted line is at bottom hole pressure of newer wells, and are they completed?

A Yes.

Q You have an eighty-pound differential for approximately the last seven months' period. How do you explain the lesser differential for the time previous to that?

A At the pressures above the saturation pressure, above 3217 psi, we were working primarily on fluid expansion, we were above the saturation pressure, at pressures below 3217. We are actually working now on a recovery mechanism on the solution gas drive.

Q Well now, in taking -- in deriving this solid line, you state that this is the average pressure for the Field, but I note in a lot of cases that you have only used two wells to obtain this average pressure.

A Where have we only used two wells, Mr. Nutter?

Q In July of 1957, for example, there is two-well average, I believe.

A Yes, July of 1957 there were only approximately eleven wells completed in the Field.

Q How many of those eleven wells could have been classified as older wells? Just the two?

A Only about five.

Q But you only used the bottom hole pressures?

A That's all the bottom hole pressures we had at that time. We used all of the bottom hole pressures we had available at that time.

Q Now, I believe you stated in obtaining this comparison of differential pressures, you in one case said that the differential was effective across 160-acre drilling pattern in the case of the Phillips Wells?

A Yes, sir.

Q And in other places it was an 80-acre pattern. Have you shown the differential in any case for a 40-acre pattern there?

A There are no 40-acres shown, no.

Q You have 40-acre locations in the Pool, however, do you

not?

A Yes, sir.

Q Were no bottom hole pressures available for those 40-acre wells?

A To my knowledge, if we had them, we did not separate them out as 40-acre locations.

Q Do you think that there would be any chance in the variation of pressure or the differential in pressure if you compared 40-acre locations and then compared 80-acre locations?

A My personal opinion is that there would be very very slight difference. I believe if we took the time, we could pick 40-acre offset bottom hole pressures from this curve, referring to our development map, that Shell "W C" No. 1 is a 40-acre pressure. If you will notice, in the latter part of April -- beg pardon -- I am looking at the working pressure point. The State "A" No. 1 is a 40-acre offset through in April --

Q Now, which is that, please?

A The Tennessee Gas Transmission Company's State "A" 1, shown in April of 1956 is offset on 40-acres. That point is approximately 30 psi above the Field average line that we have shown here.

Q Now, that's the --

A It is drill stem test pressure shown approximately April the 20th.

Q That's the Tennessee Gas State "A" No. 1?

A Yes, sir.

Q And what well is that pressure compared with?

A That is compared with the Field pressure of Shell's "W C" No. 1, a bottom hole pressure test taken early in May which our field line falls through.

Q What is the location of the Shell "W C" No. 1?

A The Shell "W C" No. 1 is 1320 feet south in the northwest of the northwest of Section 29. 1320 feet south of the State "A" No. 1.

Q Is --

A An interpretation of this map shows approximately 40 psi differential.

Q Are there any 40-acre locations comparisons later on, in late '57 or '58?

A No, there was no 40-acre development after the original Field Rule hearing some eighteen months ago.

Q Now, I believe, Mr. Carnes, that you stated that the original recoverable oil was approximately 80 barrels per acre-foot?

A Yes, sir.

Q And you have recovered approximately 23 percent now?

A Yes, sir.

Q How did you derive the 1 percent estimated increase in ultimate recovery by developing this Pool on 40-acre spacing versus 80-acre spacing?

A We compared our percentage recovery on our predicted percentage recovery on 80-acre development with percentage recovery

on the Townsend Field on 40-acre spacing.

Q This was in comparison, this Pool, with Townsend?

A Yes, sir.

Q At the original hearing of this case in May, 1957, considerable testimony was adduced that would indicate that the conditions in this Pool are very similar to the Townsend Wolfcamp. Has anything occurred in the intervening time to indicate that this would no longer be true?

A No, sir. We feel that the production characteristics are very similar to the Townsend Field excepting we have far better permeability.

Q This is very similar except the Pool conditions would be considered better --

A Yes, sir.

Q -- for development on a wider spacing pattern?

A Yes, sir.

Q You stated that you felt that wells that would be drilled now on a 40-acre pattern would just barely break even if they did that at all, is that true?

A I stated that there were eight locations which could be drilled on 40-acre spacing which would return the investment, if they were completed immediately.

Q Do you think that if these wells had been drilled on 40-acre locations a year ago that they would have had a better chance of paying out and making money?

A On a 40-acre spacing with the original average recovery of 80 barrels per acre-foot would require approximately 34 feet of net porosity to return the operator's investment. By referring to the lower net Isopach map, you could probably find one or two additional locations above the eight that we have estimated that would have broken even on 40-acre spacing.

Q And you stated that you now would have 41 net feet of pay?

A Due to the drainage of the formation.

Q So the time lag has made conditions less favorable for development on 40-acre spacing than it was?

A Yes, sir. As additional time, producing time goes on, conditions will be even less favorable to development on 40's.

MR. NUTTER: Thank you.

MR. PORTER: Any further questions of the witness? You may be excused.

(Witness excused)

MR. PORTER: Anyone else desire to present testimony at this time? Any statements?

MR. McGOWAN: If the Commission please, James McGowan for Sinclair. We own several wells in the Field, and we are co-applicant in the original hearing. Our people have made similar studies to those prepared here by the Tennessee Company. We see no point in reiterating by testimony. We reached essentially the same conclusions; that is, that the present Field Rules are at least the best Field Rules for this Field and should be made permanent.

MR. EFFINGER: If the Commission please, J. F. Effinger, Forest Oil Corporation. Our people also have made an examination of the Field, and we have two wells on the western edge there, and we reach essentially the same conclusions and recommend that these Rules be made permanent.

MR. FEDERICI: Bill Federici, of Seth, Montgomery, Andrews, & Federici, representing Shell Oil Company, I have a statement for the record. Shell Oil Company does not object to the continuance of the Special Field Rules of the Kemnitz Wolfcamp Field. We would like to reiterate our basic position with regard to the 80-acre spacing as expressed by the Commission here during April, 1957. First, rigid definition of the proration unit can lead to inequality and violate correlative rights; second, we feel as much freedom in well locations should be afforded under 80-acre spacing as exists under normal 40-acre development.

MR. PORTER: Anyone else have a statement?

MR. BRATTON: If the Commission please, in conclusion, I would like to say that I believe the evidence presented by the applicant here today and supported by the other operators in the Field is conclusive to show that one well will efficiently and economically drain 80 acres in the Kemnitz Wolfcamp Pool. For that reason, Tennessee Gas Transmittion Company requests that the Special Rules be continued in effect beyond December 31 of this year and be made the permanent Rules of the Pool. I am authorized by Humble Oil & Refining Company to state that they concur in the request of

Tennessee Gas Transmission Company, and advocate that the Special Rules be continued in effect as the permanent Rules of the Pool.

MR. PORTER: Nothing further in this case, we will take it under advisement.

C E R T I F I C A T E

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 19th day of November, 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph A. Trujillo
Notary Public

My Commission Expires:

October 5, 1960.

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
HOBBS, NEW MEXICO
MAY 16, 1957

CASE NO. 1253
and
CASE NO. 1254

TRANSCRIPT OF PROCEEDINGS

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE - SANTE FE
3-6691 2-2211

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
HOBBS, NEW MEXICO
MAY 16, 1957

IN THE MATTER OF:

CASE NO. 1253: Application of Sinclair Oil and Gas Company for the creation of a new oil pool to be known as the Seaman Wolfcamp Pool underlying portions of Township 16 South, Range 33 East, and Township 16 South, Range 34 East, Lea County, New Mexico, and for the establishment of 80-acre well spacing and proration units, and for the promulgation of special rules and regulations for said pool. Applicant, in the above-styled cause, seeks an order creating a new oil pool for production from the entire Wolfcamp formation underlying Sections 13, 24, and 25, Township 16 South, Range 33 East, and Sections 16, 17, 18, 19, 20, 21, 28, 29, and 30, Township 16 South, Range 34 East, Lea County, New Mexico, and for the establishment of 80-acre well spacing and proration units consisting of any contiguous 80-acres within a given quarter section with no designated quarter quarter section in which a well must be drilled, and for the promulgation of special rules and regulations for said pool.

CASE NO. 1254: Application of Tennessee Gas Transmission Company for the creation of a new oil pool to be known as Kemnitz Lower Wolfcamp Pool underlying portions of Township 16 South, Range 33 East, and Township 16 South, Range 34 East, Lea County, New Mexico, and for the establishment of temporary 80-acre well spacing and proration units, and for the promulgation of special rules and regulations for said pool. Applicant, in the above-styled cause, seeks an order creating a new oil pool for Lower Wolfcamp production in the Kemnitz Area embracing Sections 23, 24, 25, 26, 35, and 36, Township 16 South, Range 33 East, and Sections 16, 17, 18, 19, 20, 21, 28, 29, 30, 31, 32, and 33, Township 16, South, Range 34 East, Lea County, New Mexico, and for the establishment of temporary 80-acre well spacing and proration units consisting of the North and South halves of each quarter section with drilling locations limited to the Northeast quarter and Southwest quarter of each quarter section, and for the promulgation of special rules and regulations for said pool.

BEFORE:
Honorable E. L. Mechem
Mr. A. L. Porter
Mr. Murray Morgan

TRANSCRIPT OF PROCEEDINGS

MR. PORTER: The next case on the docket will be Case 1253.

MR. COOLEY: Application of Sinclair Oil and Gas Company for the creation of a new oil pool to be known as the Seaman Wolfcamp Pool underlying portions of Township 16 South, Range 33 East, and Township 16 South, Range 34 East, Lea County, New Mexico, and for the establishment of 80-acre well spacing and proration units, and for the promulgation of special rules and regulations for said pool.

MR. McGOWAN: James H. McGowan for Sinclair Oil Company. If the Commission please, I think it would be proper that this case be consolidated for the purpose of hearing in order with Case No. 1254. They involve the same general area, the same source of supply and obviously both cannot be granted as requested, and for that -- in view of that, I move that the two cases be consolidated for the purpose of hearing in order and I believe the applicant in Case 1254 will have no objection to that procedure.

MR. HINKLE: If the Commission please --

MR. PORTER: Mr. Hinkle.

MR. HINKLE: Clarence Hinkle of Hervey Dow and Hinkle, Roswell, representing the Tennessee Gas Transmission Company, we have no objection to the consolidation of Case 1253 with Case 1254 and that they be heard together.

MR. McGOWAN: At this time, since apparently we will not

be able to start with the evidence prior to the noon break, I believe it might be advisable to advise the Commission that there appears, examining the two applications -- there appears to be two points of difference, one is in the area covered by the application, which is of course, no problem, I mean all the area that is underlaid by it should be spaced and I think there will be no quarrel in the lateral area that is covered by the application. The two basic differences seem to be the vertical limits of the Wolfcamp as one source of supply and as to whether it will be a fixed spacing unit with fixed well location, or whether it will be a flexible spacing unit with the choice of wells in the center of the unit, and I believe that is really the only two differences in our application.

As far as matter of procedure, I would suggest that since Sinclair is first on the docket, if we may be allowed to put on our main case, which will be short, and then Tennessee following in support of their application which will amount in us opening the case and Tennessee following, giving us the right of rebuttal. Our rebuttal testimony, or in effect, opposition to theirs, would be limited to only the point of difference as they arose from the presentation of their case.

MR. HINKLE: We have no objection to that procedure.

MR. PORTER: Would you repeat generally the purposes for which you want these cases consolidated?

MR. McGOWAN: For the purpose of taking testimony and for the consideration by the Commission in the issuance of an order for

the pool.

MR. PORTER: That is satisfactory with Tennessee Gas?

MR. HINKLE: Yes, that is satisfactory. There may be some duplication of testimony, by reason of consolidation, and we wouldn't want the Commission to exclude any testimony we offer even though it may be a duplication of what Sinclair offers. It would be pretty hard to keep our testimony in such a manner that there wouldn't be absolutely any duplication. I think it can be facilitated by consolidation.

MR. PORTER: It is understood by both parties that one order would be written relative to the two applications.

MR. HINKLE: That's right.

MR. McGOWAN: That is right, they both obviously cannot be granted.

MR. COOLEY: Only one order denying a certain position to one and granting a certain position to the other.

MR. McGOWAN: Actually, the two applications can be consolidated for the two purposes, so long as there are different allegations for it and the person who made such application is free to offer supporting testimony for such allegations, and the other party is to offer opposition which would amount in his giving testimony to support his position. There will have to be a duplication to an extent of some testimony, but I believe the procedure we have agreed here is agreed on as near as possible.

MR. PORTER: Is there any objection to the consolidation of these two cases for the purposes stated by counsel? We will consolidate the two cases for hearing.

MR. McGOWAN: Do you have exhibits to introduce before the Commission? Actually, I don't think this case will take too much time. The points of differences are going to be narrow enough. In ten or fifteen minutes we will put our case in main and they probably will too. There will be cross examination, but it should not turn into a lengthy hearing, I think.

MR. PORTER: You can call your first witness. We might as well use this next fifteen minutes.

MR. COOLEY: Will the witnesses for Tennessee and Sinclair in Case 1253 and Case 1254 please come forward and be sworn.

MR. COOLEY: Do these five gentlemen represent the witnesses on both sides?

MR. HINKLE: Yes.

(Witness sworn.)

H. A. MERRILL

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

DIRECT EXAMINATION

BY MR. McGOWAN:

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

A H. A. Merrill, District geologist, Sinclair Company in

Roswell.

Q You have previously testified as an expert witness before this Commission have you not? A Yes, I have.

MR. McGOWAN: Does the Commission accept his qualifications?

MR. PORTER: They are acceptable.

Q Mr. Merrill, you, I believe, are in charge of the district for Sinclair in which the area involved is located, is that correct? A That is correct.

Q And you have made a study from the point of geology of the Wolfcamp common source of supply in the area covered by the Sinclair application? A Yes, I have.

Q Are the three exhibits that I have marked, Exhibits 1, 2 and 3, posted on the board behind you -- were they prepared by you or under your supervision? A Yes, sir.

Q Will you briefly describe what each exhibit is intended to show?

A Exhibit No. 1 is a structural plat of the Wolfcamp producing area contoured on the top of the Wolfcamp formation. This structural plat tends to show an anticlinal fold, or series of folds with the present limited control not allowing a complete definition either on the south end or actually through the center of it.

Q That is then a contour map based upon the best informa-

tion you have available today of the Wolfcamp formation underlying the area covered by the Sinclair application and adjoining area, is that correct? A That's correct.

Q All right. Now, Exhibit No. 2, please.

A Exhibit No. 2 is an electric log cross section extending from north to south through several of the producing wells in this Wolfcamp producing area.

Q And Exhibit No. 3?

A And Exhibit No. 3 is an electric log cross section extending from east to west through this same area.

Q Now those represent, do they not, repetitions of actual electric logs taken from the various wells indicated and reproduced on this map, a portion of them, and shown on this map?

A That's correct.

Q And the depth and all, from the top of surface, is that correct?

A The depths are from the surface elevation.

Q Now then, on the two cross sections, have you drawn a line in which, which represents, in your opinion, the formation of the top of the Wolfcamp source of supply found in these wells?

A Our uppermost horizontal line on each cross section indicates the top of the Wolfcamp formation.

Q And what is the approximate depth of that line, please, from the surface?

A Approximately ninety-six hundred feet.

Q Now, do you have a line on those two cross sections that represents, in your opinion, the bottom of the Wolfcamp formation?

A Our horizontal line, the third one from the top, indicates the base of the Wolfcamp formation and also the top of the Pennsylvania formation.

Q And approximately what depth below the surface is that line?

A That's approximately ten thousand seven hundred feet.

Q Ten thousand or eleven thousand?

A That would be ten thousand seven hundred feet.

Q Ten thousand, seven hundred. Then, is it your opinion that the Wolfcamp formation in this area lies between the vertical limits of approximately ninety-six hundred feet to ten thousand seven hundred feet below the surface? A That's correct.

Q And everything between those two depths, in your opinion, is Wolfcamp formation? A Right.

Q Now, you said the top line was the top and the third line down was the bottom of the Wolfcamp formation. Now, what is the middle line, what does it represent?

A The middle line represents the top of the lower Wolfcamp zone which has yielded the present production in this area.

Q That has been the basic or the main productive stringer in the Wolfcamp formation? A That's correct.

Q Now, are there other productive stringers in the Wolfcamp formation at different depths in these various wells?

A At the present time, there is no other production, but there has been four separate wells, which by drillstem test recovered free oil.

Q Is it small in quantity?

A Very minor amount of oil, at this time.

Q Does such zone, or finger of pay, appear to extend throughout the area, or is it more or less localized in one or two well locations?

A The limestone bodies may be present in the reservoirs, but the porosity has been insufficiently developed in the entire area to carry oil.

Q Now then, is it your opinion that this Wolfcamp formation, as you have defined it, underlies the area covered by the Sinclair application and probably the area covered by the Tennessee Gas Transmission application? A That's correct.

Q Are you, do you have any reason to think that there may be a major barrier anywhere in that area that would separate it into more than one reservoir horizontally?

A The present development has not indicated any excess barrier.

Q It would be your opinion, would it not, that it is all one common source of supply, or one reservoir, in this area?

A That's correct.

Q Now, what information do you have available which had convinced you that everything between those two lines is between the depths of ninety-six hundred feet and ten thousand seven hundred feet from the surface in this Wolfcamp formation?

A One of the earlier wells drilled in this area was the Sinclair Oil and Gas Company's No. 1 Seaman Unit. In this well we have a complete sample record, the electric log, and paleontological evidence supporting our application.

Q Then it is your opinion that it is one, that the entire area between ninety-six hundred feet and ten thousand seven hundred feet below the surface is one reservoir or one common source of supply containing one or more productive stringers that are in the form of lenses? A That is correct.

Q You are of the opinion, then, that the entire area is one common source of supply and should be so classified, is that correct? A That's correct.

Q And you are of the opinion that it underlies the entire area covered by the Sinclair application and probably the area covered by the Tennessee Gas Transmission application?

A That's correct.

Q Do you feel that that is the approximate outer limits of it today, as it is known today, or felt it exists today?

A Reasonably so.

Q Now, there are other pay zones in these same wells, or in this same area, that have been discovered below the Wolfcamp, is that correct? A That's correct.

Q But they are not part of the Wolfcamp formation?

A No.

Q It is your recommendation, then, I assume, that the Commission classify the Wolfcamp formation, found between the approximate depth of ninety-six hundred feet and ten thousand seven hundred feet from the surface, as one common source of supply, is that correct? A That is correct.

MR. McGOWAN: I believe that's all, Your Honor. You may cross examine.

MR. PORTER: Since we promised the school officials that we would recess promptly at 11:30, we will resume this case after the intermission, and you can proceed with your cross examination. The Commission will now recess until 1:30, and since these tables will be in use, it probably would be advisable to bring your brief cases and put them up here on the stage, unless you want to take them in your car.

(Recess)

MR. PORTER: The meeting will come to order, please. Mr. Merrill, will you take the stand, please, sir? I believe that counsel was through with direct examination. Do we have any questions of Mr. Merrill?

MR. HINKLE: We do, if the Commission please. Clarence Hinkle, representing Tennessee Transmission Oil Company.

CROSS EXAMINATION

BY MR. HINKLE:

Q Mr. Merrill, if you will refer to Exhibit No. 2, I believe that you testified that the top of the Wolfcamp was approximately ninety-six hundred feet, is that right?

A That's correct.

Q And that's indicated by the top solid line?

A Correct.

Q Now, the next line I believe you testified was the top of the pay zone in the lower Wolfcamp, is that correct?

A That's our interpretation, yes.

Q And approximately what interval is there between the ninety-six hundred top line and the next line?

A About nine hundred feet.

Q About nine hundred feet? A Yes.

Q I believe that you referred to that entire interval as being one reservoir, is that correct? A That is correct.

Q Did you mean that this is one producing reservoir or just geologically it is the same formation?

A Geologically the same formation.

Q You didn't intend to mean that all of that area was productive? A Not at all.

Q What is the nature of the formation between the ninety-six hundred interval and the top of the producing horizon?

A Our electric log shows that this is limited development, broken by considerable number of shale partings.

Q And it is an impervious formation, in most instances?

A Yes.

Q And I believe you testified that there are stringer of productions in that interval?

A There is at least one stringer carrying oil.

Q Is there any continuity of production between all of the wells as far as the upper Wolfcamp is concerned?

A Well, there have been four wells that encountered that show.

Q That have encountered show, but not, you would say, in commercial quantities?

A Possibly one of them.

Q The only common source of supply are known reservoirs in that area. Then is the producing area what you have between the second line and what is shown as the top of Pennsylvanian, is that right?

A At this time, yes, sir.

MR. HINKLE: That's all.

MR. PORTER: Anyone else have a question of Mr. Merrill? Mr. Mankin.

QUESTIONS BY MR. MANKIN:

Q Warren Mankin, with the Oil Commission. Mr. Merrill, it is noted from your structure map that you presented, I presume, as Exhibit 1 --

A Exhibit 1.

Q -- that the area which has been requested to be spaced is in the southeastern portion of that, particularly in Section 28, and portions of 21 and 29 which you seem to have no control over. I wonder what basis the spacing was requested for that particular area?

A Just enlarged from the present area, production to extend to areas underlain by the Wolfcamp which might possibly dissolve future production.

Q What was the basis for that expansion, was it seismic picture or what?

A I think our trends in general agree with our seismic information.

Q So you don't feel that the area to be spaced, which Sinclair requested, is too large, particularly in the southeastern portion, then?

A No, I don't.

Q You feel it is fairly realistic? A Yes.

Q I will ask you, in regard to Section 13, the Sinclair Seaman Unit No. 1, was the Wolfcamp productive, or found to be commercially productive in that particular well?

A We had a rather negative drillstem test there.

Q You wouldn't say that that either completely disproved or proved one way or the other whether that area was productive from Wolfcamp?

A I don't believe it would, until production tests have been taken, perforations and acidizing.

Q Sinclair has requested all of Section 13 to be space. Do you feel, until that is proven, do you feel that it is proper to space Section 13 for the Wolfcamp? A Yes, I do.

Q How much net pay section has been found in this area, do you have any figures?

A I don't have those figures.

MR. MANKIN: That's all.

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

MR. McGOWAN: Your Honor, I will refrain from redirect examination at this time with the understanding that following Tennessee's testimony I may recall this witness for rebuttal, if it is all right with the Commission.

MR. PORTER: That will be permissible. The witness may be excused. Call your next witness.

W. J. ROGERS

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

DIRECT EXAMINATION

BY MR. McGOWAN:

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

A W. J. Rogers, Sinclair Oil and Gas Company, Midland, Texas.

Q And you are the engineer in charge of the Division, are you not?

A Yes, sir.

Q And as such, the area covered by the Sinclair application comes under your jurisdiction, is that correct?

A Yes, sir.

Q Have you, on behalf of your company, made a study of the area under -- covered by Sinclair's application as to the Wolfcamp common source of supply and evaluated it from an engineer's standpoint?

A Yes, sir.

Q Did you prepare, or have prepared under your supervision, a small map of the area involved, with the area covered by the Sinclair application outlined in red, and the area covered by the Tennessee Gas application, outlined in green --

A Yes, sir.

Q -- which has been marked Exhibit 4, has it not?

A That's right.

Q Did you also prepare, or have prepared under your supervision, a sheet of economics we will call it, on the Wolfcamp common source of supply and which has been marked as Exhibit 5?

A Yes, sir.

Q And you have previously testified as an engineer and qualified as such before this Commission, have you not?

A Yes, sir.

MR. McGOWAN: I assume the Commission will accept his qualifications?

MR. PORTER: They will be accepted.

Q Now, referring briefly to Exhibit No. 5, will you advise the Commission briefly what that shows and the conclusions you reach from it?

A Briefly, it shows that if we drill wells on 40 acres, we would stand to lose 49,576 dollars per well. However, on the basis of our reserves, if we could drill wells on 80-acre units -- briefly, this unit shows that if we drill wells on 40-acre units, we stand to lose approximately $50,000 per well. However, if we drill them on 80-acre units, we stand to make a profit, based on our reserves, of $125,000 per well.

Q Now, Mr. Roger, in calculating this profit or loss, have you taken your figures from one particular well or from an average of all the wells, to attempt to strike a reservoir average?

A Wherever possible, we used the records available on the wells that had been completed or drilled at the time the study was completed.

Q Now, in reaching these conclusions, you obviously had to have various factors concerning the reservoirs, which you arrived

at, and had to have some means of arriving at them?

A Yes, sir.

Q I notice in Exhibit 5 you have used a porosity of 8.77 percent. I take it that, in your opinion, based upon the electric logs, that you had, and the other information of this pool, that is what you calculate to be the average porosity through this Wolfcamp formation, is that correct?

A Yes, sir. I would think, that if anything, the figure we have used here might be slightly too optimistic or too high. This figure was the weighted average obtained from interpretation of five radioactive logs and one limestone lateral curve on the six wells that had been completed and producing at the time.

Q Now, what effective pay have you used for an average through this reservoir, and where did you obtain it?

A We used an effective pay thickness of 31.5 feet, which was obtained from microlog analysis from the same six wells that had been completed.

Q And your formation factor is a 1.733, is that correct?

A Yes, sir, that formation volume factor was obtained from the bottom hole sample obtained on the Sinclair Seaman Unit Well No. 3.

Q And your water saturation, where did you get that figure?

A The connate water saturation of 20 percent by log interpretation. We had a fairly wide range. We did have available to

us, a core analysis on two wells, and using our best judgment in the choice, we arrived at the 20 percent figure as being a rather conservative figure, from the core analysis and the logs. In other words, we think that that figure could possibly be higher than 20 percent.

Q Nor, Mr. Rogers, what type of reservoir is this, generally speaking?

A Well, it's a limestone reservoir with voldular and fractured porosity. Actually, as to the type of recovery mechanism that we have, we really have insufficient information at the time to peg it down absolutely.

Q But you do have gasoline in solution at the present time as of --

A Yes, sir, the reservoir fluid analysis showed that the sample in reservoir fluid is slightly under saturated but that there are approximately 1396 cubic feet of gas in solution per barrel of oil.

Q You do not, I take it, then have any information today that would indicate the existence of a gas cap in this pool?

A No, sir.

Q I also take it you do not have any information available which would indicate an effective water drive?

A No, sir.

Q You have, then, based on present information, basically

a gasoline in solution type reservoir? A Yes, sir.

Q And from that you have estimated that the recovery will be 20 percent of oil in place?

A That is the figure we have used, yes, sir.

Q Now, applying that to the effective thickness, effective pay thickness and applying it to 40-acres and the 80 acres in the unit, at a price of $3.15 per barrel of oil, you could gross $249,000 plus on the 40 acres and on 80 acres $489,000 plus, is that correct? A Yes, sir.

Q Now, you have deducted from that the royalty, the direct tax, and the operating expense, the royalty and operating expenses. Now, in the operating expense, how did you estimate it for this pool?

A We used the figure of 8 to 10 years.

Q Now, you have used the cost of $226,000 as the cost of drilling a well, on what is that figure based?

A That's based on our experience in drilling wells in this area.

Q And based on your evaluation of this reservoir, and taking information you have available from these seven or eight wells that have been drilled, it's your opinion that on an investment of $226,000 for 40-acre spacing, that the operator would actually lose approximately $50,000, is that correct? A Yes, sir.

Q And then on the same investment on 80-acre spacing he

would make a profit of only $152,000, is that correct?

A That is correct.

Q Now, would that lead you to the conclusion that from the standpoint of economics, it is essential that this pool be spaced on 80 acres? A Yes, sir.

Q I take it that you recommend to this Commission that it be so spaced? A Yes, sir.

Q Now, have you calculated or obtained in any way an average permeability from this reservoir?

A We had two sources of information, for permeability, we have core analysis on two wells, and we did take some bottom hole pressure build-ups.

Q Approximately what, in your opinion, is the average permeability in this reservoir?

A The average permeability, as determined by the build-up curves ranged from .77 millidarcies up to 13 and a half millidarcies.

Q Well, now, do you have an opinion as to whether or not one well will effectively drain the recoverable hydrocarbons in place under 80 acres in this pool?

A Yes, sir, I think that one well would efficiently and economically drain 80 acres, at least.

Q And on what do you base that opinion, Mr. Rogers?

A On the permeability and the extremely low viscosity of the reservoir fluid. The reservoir fluid has a viscosity at satura-

tion pressure of only .18 centerpois.

Q Then, would it be fair to this extent, to this point, to summarize your opinion to be that from an economic standpoint, 80-acre spacing is necessary for the development of this pool and that one well will effeciently and effectively drain all recoverable hydrocarbons from under an 80-acre tract?

A Yes, sir.

Q That necessitates fixing an 80-acre spacing unit which you have recommended to the Commission. Do you have a recommendation as to how those units should be determined and where on the unit the well should be located?

A Yes, sir, we recommend that the 80-acre proration unit run in either direction, that is, either north-south, or east-west, so long as the 80-acre unit contains two contiguous 40-acre tracts with only one well located thereon, that all wells drilled into this formation should be located in the sand of either or the 40 acres within that 80-acre unit with a tolerance of 150 feet to avoid surface obstructions.

Q And in essence, Mr. Rogers, you are saying, are you not, that an operator should be allowed to choose any continuous or contiguous 80-acre tract within a section and determine that to be the 80-acre unit and drill one well in the center of either 40, with 150-feet tolerance for surface obstruction?

A Yes, sir, that's correct.

Q In the event there is more than one well that is presently

drilling, or drilled in this pool that would be further than that out of the center of the 40, would you recommend that this be granted as an exception to the well location and be the unit well on the 80 acres which this operator will assign to that well?

A Yes, I think they should be accepted in respect to the spacing or footage requirement.

Q Now, do you have a recommendation to the Commission concerning the allocation formula that should be used in this pool?

A We would suggest an allocation formula which is based 100 percent on acreage.

Q Now, you have recommended that -- we shall refer to it simply as variable on flexible spacing unit, with the well in the center thereof, is that unusual in this type of pool in New Mexico?

A No, I think I can think of at least one similar instance, the Den-Perma Pennsylvanian pool has the same flexibility.

Q Now, essentially, Mr. Rogers, what is your reason for recommending this type of spacing unit as opposed to say, fixing it now as an east-west 80-acre or north-east 80-acre and requiring the wells to be drilled in prescribed locations?

A I think flexibility is necessary in order that the operator can protect his correlative rights.

Q Now, Mr. Rogers, let's return just a moment to economics. In calculating your economics for this Wolfcamp reservoir, you used, I understand, exclusively the basic pay zone which has been

heretofore referred to, which for the purpose of identity, we will refer to it as the Townsend zone, did you not?

A Yes, sir.

Q Now, there is a possibility of other pay stringers up higher in the formation, existing in these wells, is that correct?

A Yes, sir, there is at least one additional little stringer higher up in the Wolfcamp formation which has, by drillstem test on three wells, indicated possible production, but they are relative thin marginal stringers.

Q Would it be correct to classify that as probably nothing but possible salvage production?

A That's the way we are looking at it, yes, sir.

Q In your opinion, would there be sufficient production in this upper zone, or more than one, if such should exist, to warrant the drilling of a separate well to produce it?

A No, sir.

Q Do you think it would ever be economically feasible to dually complete these wells in the two zones with large string tubing?

A No, sir, I don't think so.

Q In other words, in your opinion then, there is not sufficient recoverable oil in the upper stringer to pay for the cost of dually completing any of these wells?

A It does not appear, no, sir.

Q It is your opinion, then, that this Wolfcamp common sourde

of supply should all be called and spaced as one common source of supply? A Yes, sir.

Q Do you feel that the recommendations, recommendation you have made to the Commission will remove, as near as feasible, the necessity of drilling any wells that are not necessary to recover the hydrocarbons in place that can be recovered in this reservoir?

A I didn't --

Q Well, in other words, with the program that you have recommended, it will result in drilling the minimum amount of wells necessary to recover the recoverable hydrocarbons in place? Will it eliminate the necessity of unnecessary wells?

A On an economic basis, yes. I mean, we can get a profit and efficiently drain the reservoirs on an 80-acre unit. It is conceivable that you could do it even on a larger unit.

Q It would then prevent economic waste and physical waste?

A Yes, sir.

Q And I believe you previously testified that it would protect correlative rights? A Yes, sir.

Q Now, as to the area to be spaced, it is your recommendation that it, is it not, that area covered by the Sinclair application, be spaced as the, as overlying the Wolfcamp pool covered by our application? A Yes, sir.

Q Do you have any objection to the acreage, in addition to the Sinclair acreage covered by the Transmission application, to be included in the Wolfcamp spacing? A No objection.

Q Now, it's rather unimportant, but do you have a recommended name for this pool?

A We have suggested the name Seaman Wolfcamp for this pool.

Q Now, I believe you testified that the allowable should be based a hundred percent on acreage, did you not?

A Yes, sir, that's right.

Q Do you have any recommendation to the Commission as to what the allowable should be for such an 80-acre unit?

A We would suggest that the 80-acre top allowable would be the normal 40-acre allowable for that depth, plus one unit allowable. In other words, for example, the top allowable for May in this pool was 187 barrels. That is the normal unit allowable for that depth. Then, what we are suggesting, for the month of May, then you would add 40 to that 187, which would give you an 80-acre allowable for 227.

Q In other words, then in June, that would be the reduced allowable as fixed by the Commission this morning, plus 38 barrels?

A That is right.

Q At this time I move the admission of Exhibits 1 through 5.

MR. PORTER: Are there objections to the admission of these Exhibits? They will be admitted.

MR. McGOWAN: That is all I have at this time.

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

CROSS EXAMINATION

BY MR. HINKLE:

Q Mr. Rogers, in your direct examination, I believe you stated that you estimate that the primary recovery of oil in this area would be about 20 percent of the oil in place, is that right?

A That is the recovery factor that we are using, yes, sir.

Q Now, do you know whether or not that could be increased by some secondary recovery method such as pressure maintenance, whether it would be possible to do that?

A It may be possible, I don't think we can say at this time that it can be increased.

Q It is being done in other similar reservoirs, is it not?

A Possibly so, I don't know though, that, with the fractured nature of this reservoir, that we can compare it accurately with the other one.

Q You say fractured nature? A Yes, sir.

Q What do you mean by that?

A I mean that the -- by core analysis it indicates that considerable portions of pay sections are fractured. Vertical fractures.

Q You mean that the pay zone may not be entirely confined to just one strata or the lower Wolfcamp area then?

A No, sir, I am speaking only of the fracturing exhibited in the Townsend zone pay section itself.

Q But you don't think that the porosity and permeability is such that by injection of gas into the area that you would pour more oil out?

A I am saying that, with the information that we have available now, that we cannot accurately predict what gas injection or any other secondary recovery mechanism might produce.

Q But you did state it was a gas solution type of reservoir?

A Yes, sir. Well, I said -- actually, we don't know the type of mechanism we have yet, but we do have gas in solution. We do not have any evidence of water in the Townsend zone pay, and for that reason, we have assumed that we would have 20 percent recovery effeciency.

Q The gas solution type of reservoir is the type --

MR. McGOWAN: I would like to object to this line of questioning. I don't believe it is material to any part of this application. Possible secondary recovery or unit operation is a thing apart, and something that has to be considered under separate order and handled in an entirely different matter. The present application limits itself to primary recovery, and I don't believe it is material at all.

MR. HINKLE: It is material in this way, we are contending that there should be definite establishment of definite 80-acre tracts for well spacing and definite well locations, and I think that it all enters into this, that it will facilitate later on the secondary recovery program.

MR. PORTER: Mr. McGowan, your objection is overruled.

Q (By Mr. Hinkle) The gas solution type of reservoir is the type of reservoir which best lends itself to pressure maintenance, is that right?

A Not necessarily, but a lot of solution gas reservoirs do, under good conditions, yield substantial secondary oil.

Q Now, I believe that you recommended to the Commission that the operator be given the right to select the 80-acre in either direction? A Yes, sir.

Q And also the latitude in locating the well in either component 40 of the 80-acre unit? A Yes, sir.

Q Now, what advantages are there to giving the operator this latitude?

A The way I see it, we have a large area here which needs to be prorated; we need to have field rules. Now, we have production over several sections established now, and as I see it, with this large area, it's not likely that you will have given an 80-acre tract within this producing limits of the field that would be productive in one end and completely dry in the other. In other words, we don't have a situation here where you have a small sharply defined reservoir with very definite field limits. Here we have a broad structure that covers a lot of area, and a porosity and permeability variation. The erratic nature of the reservoir is such that an operator should be permitted to drill on either end of the 80, because to protect his correlative rights -- for example, if he

were, if a well is drilled offsetting his tract, and it is a good producer, then under the rigid spacing pattern he would be forced not to drill the direct offset where he would expect to encounter the same good pay section, but in a diagonal offset, where the porosity and permeability might not be as good. But there would not, in all likelihood be any question about the productivity or the fact that there would be recoverable oil under both ends of the 80-acre tract. Now, if the operator that is forced into drilling a diagonal offset in a section that might not be as good, he would come up with a limited capacity producer, probably, or he could. And then, under competitive operations, he would not be able to produce his well at the same rate as the offset operator. Now, that's the reason I think that the operator should have the flexibility of locating his well on either end of the 80, and that he should orient his 80 in either direction.

Q You say that one of the purposes is to protect correlative rights? A Yes, sir.

Q Now, let's take an arbitrary situation. Say you have a section of land, and it's owned by one operator, and all of those who own the surrounding or contiguous acreage elect to drill their wells offsetting that acreage on the 40 surrounding it --

A Yes, sir.

Q Now, what about the owner of that section,he couldn't possibly drill a well offsetting each one of those 40's at a joint,

could he -- A Yes, he could.

Q -- and still have 80 acres?

A Let's see. No, I misunderstood your question, he could not, but --

Q Well, now, would that protect correlative rights in that instance?

A So long as 80 acres is assigned to each well and they have the same top allowable, I think, yes.

Q Well now, wouldn't it be a fact that in the case that I mentioned, where the operator that owns the section drilled as many offsets as he could, that you would have wells that were draining considerably more, would have to drain considerably more than 80 acres?

A Well, no. You would have eight wells on 640 acres, that would be 80 acres per well.

Q I know, but the operator that owns the section would naturally locate his wells so as to offset as many wells of the surrounding operators as possible. If that is the case, there is bound to be drainage. You would have to have drainage of a larger area than 80 acres in order to have adequate recovery of that section.

A Well, one well would essentially drain from one end of the 80 to the other end.

Q But if that is the case, why not stop the development the way it is and not drill any more wells?

A Well, we think the time has come when some field rules should be adopted to prevent actual development on 40-acre patterns and units. After all, there has been some eight wells completed out there, and there are several rigs running now.

Q Giving the discretion to the operator to select the 80-acre unit and also the well location, isn't that, in effect, a 40-acre spacing with an 80-acre allowable?

A It's 80-acre proration units with what you might call 40-acre optional spacing. That is, you can have wells that are 1350 feet apart.

Q If you permitted that, it would necessarily mean that there is going to be an irregular pattern of spacing throughout the entire productive area, isn't that the case?

A It might be irregular in shape. I think, however, that the wells, though, will be drilled in the best parts.

Q Don't you think that it would result in the wells all being drilled, for instance, along a section line, and then skipping over an 80, and then drilling in another section line or another subdivision line?

A No, if you start drilling on the north end of your section, for example, then, if you extend your development south, chances are you would only drop down a half a mile to the north end of the 80, rather than a mile.

Q What is your object of wanting to include in this reser-

voir all of the stringers which may be encountered above the real producing horizon, which is what we call the lower Wolfcamp in this case?

A Well, as I mentioned before, we think that there is only a very slim stringer up the hole, which could be produced as a salvage stringer. Now, the main purpose of including the entire Wolfcamp section in the reservoir is to prevent an operator being forced into an uneconomically offset. That is, you might have the condition here where an operator drills a well and he encounters a good producer in the main pay section, which we call the Townsend zone, and the offset operator could possibly drill a well and not find sufficient porosity and permeability to produce in large amounts, so this operator might now have this little stringer up the hole present and he would, then, complete his well in that upper stringer.

Q From the standpoint of the Conservation Commission, would they be able to keep an accurate account of the oil that had been produced from the lower Wolfcamp reservoir if you permitted perforations into these other stringer zones above?

A Well, a report is filed each month showing the production from each well. It is true that if you did have more than one stringer open in the Wolfcamp and both stringers were producing, then that production would be reported as the well production and it would not be possible to split it down, split it up.

MR. HINKLE: I believe that's all.

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

QUESTIONS BY MR. COOLEY:

Q Mr. Rogers, in your direct testimony, you testified that you felt that existing wells in this area should be granted an exception in the event that they do not meet with the location set out in the order to be written as a result of this case?

A Yes, sir.

Q There also might be wells drilled on 40-acre tracts which is the present proration unit, of which owners could not dedicate an additional 40 acres to their existing well. In which case, you would have a 40-acre unit.

A I don't know of any such a condition, but if it is, if that is the case, then this existing well would, we will say, would have only 40 acres which could be assigned to it.

Q Yes, sir, is that --

A Is that what you are asking?

Q I am assuming that it is impossible to communitize it with other acreage which you recommend that it be excepted from this order, insofar as requiring 80-acre spacing in the pool. In other words, establish it as a nonstandard proration unit in this pool of 40 acres?

A Well, I don't know why it couldn't be accepted. Actually, I don't know of any well here that could not have 80 acres assigned

to it right now, or at least to governmental lots.

Q Assuming that there were such wells, what would you recommend the allowable to be for a 40-acre well in this pool?

A One half of the 80-acre allowable.

Q Mr. Rogers, would it be economically feasible to drill a separate well to the stringer, higher stringers --

A No, sir.

Q -- below the Townsend?

A No, sir, not in the Wolfcamp formation.

Q Would it be economically feasible to dually complete those stringers with any other zone?

A I don't think so, no, sir. They are too marginal. Actually, we had only relative minor indications of productive oil in the stringers above the Townsend.

Q Would this oil then be left in the ground if it is not economically feasible to dual complete or drill a separate well?

A No, sir, we expect to produce it as a salvage measure, probably when the Townsend pay is depleted.

MR. COOLEY: That's all. Thank you.

QUESTIONS BY MR. NUTTER:

Q Mr. Rogers, you mentioned with regard to your porosity of 8.77 percent that it was a weighted average from six wells. Precisely, what do you mean by weighted average?

A That was the weighted average of the porosity assigned

to each foot of pay, each foot of net pay.

Q Do you have a tabulation of the porosity for each of the six wells?

A I have my work sheets on it, yes, sir.

Q Rather than clutter up the record with those individual porosities at this time, could you furnish those for the Commission at a later date? A Yes, sir.

Q We would appreciate it if you would. You could also do the same thing for the effective pay thickness on the six individual wells.

A Yes, sir. Yes, sir.

Q Mr. Rogers, was the Sinclair Seaman Unit Well No. 3 the only well in which a bottom hole sample was taken for the determination of the formation volume factor?

A That is the only one which I have seen the results. I believe that some other company, I believe Tennessee has taken one, but I don't believe the results have been, there are not, they haven't been analyzed yet. In other words, they have not finished their work in the laboratory on the sample.

Q Do you think that one bottom hole sample from one well is indicative of the formation volume factor for the whole pool?

A I think in this case that it is very close, because of the amount of gas in solution reported by sample analysis. It is relatively close to 1400 cubic feet per barrel. The producing ratios are on the same order, and we have compared this fluid analy-

sis with one in the Townsend Wolfcamp pool, over to the northeast a few miles, and they are very similar in respect to the saturation pressure, the formation volume factor and the amount of gas in solution.

Q Are the producing GOR of all the wells fairly similar to each other?

A There has been some range in the ratios; I expect some of them are producing possibly a little more than 1400 cubic feet per barrel, some less, but I think a 1400 cubic feet per barrel is a good figure.

Q Are any of them producing considerably less than 1400?

A I believe there was one gas-oil ratio test reported on the Seaman, Sinclair Seaman Unit No. 3 that was somewhat less.

Q How about the Seaman Unit No. 2?

A We have figures here which show the producing ratios by wells by months. These figures indicate that the Tennessee Kemnitz A-1 reported a gas-oil ratio in December, for the month, 2349, in January 1599, February 1583, March 1601. You understand that is the monthly gas divided by the monthly oil.

Q We have just received this tabulation. It is a great help in that respect. A Thank you.

Q Mr. Rogers, your oil recovery of 20 percent, I think you stated that you had assumed that this would be the basic drive in this reservoir, would be gas in solution.

A We have assumed that. Actually, we have no proof that it is. It will take more producing history to peg it down.

Q Is an oil recovery of 20 percent fairly representative of the average recovery from such a reservoir?

A Yes, sir, I think it is.

Q Are other Wolfcamp pools in this area of the same type drive?

A We have looked pretty closely at the Townsend Wolfcamp pool and we think that that is a solution gas drive, and in many ways, the producing characteristics are similar.

Q How long will it be before you would know for such what type drive this reservoir is?

A Well, I hesitate to say, because it depends on the number of wells that are drilled and the producing rate.

Q Would a production history of one year --

A One to two years should shed a lot of light, there is no question.

Q Mr. Rogers, getting down to the economics of the Lower Wolfcamp Well in Section 5, you have shown that the gross value of recoverable stock tank oil on 80 acres is double that of a well on 40 acres. Now, you are familiar with the system of allocation that the Conservation Commission uses for 80-acre spacing, are you not?

Q The system of allocation that the Conservation Commission uses for 80-acre spacing? That is one normal unit allowable times the depth factor plus the normal unit allowable without the depth

factor?

A Yes, sir, that is what we suggested as the 80-acre allowable for this pool.

Q Well now, if the 80-acre well had that type of an allowable, would not the recovery of double the amount of oil that you will get on a 40-acre well be extended considerably longer than it would be on two 40-acre wells? In other words, you are not getting double the allowable?

A You are getting more than slightly double the allowable?

Q No, sir, you are getting slightly more than one allowable?

A Yes, sir.

Q Wouldn't that extend the pay out or the length of time it would take to get twice as much oil as you would get on a 40-acre well? A Yes, sir.

Q If the pay out were extended, the economic difference too, on a 40-acre well and an 80-acre well would not be quite as attractive, would it?

A We took into account economics, and in figuring the operating expense, we assumed that you might have an operating life of eight years for a 40-acre well, as compared to maybe ten years for an 80-acre well. Actually, if these, if this is in solution gas drive mechanism we would produce, that well would not produce at top allowable for any great length of time.

Q In the economics that you figured for these wells, have you given consideration to the value of the gas?

A No, sir, all the gas in the field, there is no connection for the gas in the field at this time. I suppose it's all being flared, with the exception of what is being used for drilling, or lease use.

MR. NUTTER: Thank you, that's all.

QUESTIONS BY MR. MANKIN:

Q Mr. Rogers, is there a present proposal for putting a gas line plant in the field which would make the economic picture more attractive?

A I believe the operators are considering the advisability of putting in a plant now, and, of course, if they do, and they get the plant in, why, that would improve the economics.

Q Is it not true that in portions in quite a lot of the field, that there is presently being produced from the wells in the neighborhood of ten million per month per well, ten million cubic feet?

A Yes, that looks like a reasonable figure.

Q That would then help the economic picture from either 40 or 80-acre spacing, if that were considered, would it not?

A Yes, sir, if we can get the plant in there and get the revenue from the gas, that would, certainly.

Q I note that there is at least one well in the field with a fairly sound structure producing water, which I believe is the Seaman Unit No. 2; how do you account for that?

A My records, through the month of May, don't show any water production for any of the wells in this pool.

Q I believe there is Form C-116 submitted for the month of February which indicated eight barrels of water, 47 barrels of oil, 27 point MCF's per day with the gas-oil ratio of 592. Do you think that is something that will continue?

A That was the month --

Q Test taken February 17th.

A Well, the well was completed about that time. It is possible that the well had a little drilling fluid in it.

Q You think that would be concerned with drilling fluid and is not something that you would expect after the well is cleaned up?

A Yes, sir.

Q You don't anticipate any water production for any period of time as yet? A No, sir.

Q Your reserves were based on the Lower Wolfcamp, was it not? I meant your economic picture? A Yes, sir.

Q If you added the small amount of stringers that you might find on the upper portion of the Wolfcamp above the Townsend, would that help the economic picture to any great extent?

A Not to any great extent. I feel that that additional oil would help, but not enough to make it profitable to drill on 40 acres.

Q Has Sinclair or Tennessee performed any kind of interference test, or any kind of test to indicate the rate of drainage of

these wells?

A No, sir, we have not taken any interference test, at least we have not.

Q So, there is no definite clue as to how much each well might drain?

A No, except by comparison with other fields, where we have more history and similar conditions in the reservoirs. On that basis, I think we can say that it will drain at least 80 acres.

Q You have compared this particular pool to the Townsend Wolfcamp in several cases. How much net pay section is there in the Townsend pool in comparison to this pool?

A They are probably, roughly equivalent.

Q Is it not true that in some cases, in addition to the Wolfcamp pay being open in those wells, there is also some Pennsylvanian pay open in those wells?

A We looked at the records, and sofar as we could tell, most all of the wells were completed in the Townsend pay. There may be some additional oil in there that I don't know about.

Q You feel that possibly the pool that joins it is separate and distinct, separate zones are open in the Pennsylvanian in those wells, whereas the Wolfcamp wells in the Townsend Wolfcamp are entirely separate?

A Well, it was my thinking that the Idsen and the Townsend pools may be producing from the same section and the development is

progressing to tying the two fields together.

Q You feel, then, that maybe the name is a misnomer in one of the pools? A Yes, sir.

Q You feel that possibly the production is entirely Wolfcamp rather than Pennsylvanian from those two areas?

A Yes, sir, that's my impression.

Q Are you in agreement with the exhibit which was put by Mr. Merrill which indicates that all of the production presently found is coming from the Lower Wolfcamp rather than any of it from the Pennsylvanian formation? A Yes, sir.

Q You don't feel --

A That is in the wells that are -- now there are wells in the area which are not completed in the Townsend, but I don't think that is what you mean.

Q I wasn't referring to the Seaman Unit No. 1 nor the Sombrero Unit No. 1.

A No. I think the production in the Townsend, from those wells is coming from the Wolfcamp, yes, sir.

Q Then, you are reasonably certain, then, that there is no Pennsylvanian production open in any of the wells presently completed in the field, except the Seaman Unit No. 1 or the Superior?

A Yes, sir.

MR. MANKIN: I believe that's all.

QUESTIONS BY MR. RUYAN:

Q Mr. Rogers, you have bottom hole pressure information in all of these zones, Townsend and --

A We have a few -- some eight bottom hole pressures that have been recovered in the Townsend pay. All we have in the upper stringers of the Wolfcamp are drillstem test pressures.

Q Is there enough pressure differentiation between the Townsend pay and the upper marginal pay zone that in case they were all opened and separated, that there would be a differentiation from Townsend due to maybe a greater pressure under your marginal well?

A Well, the drillstem test pressures, although quite variable within the Wolfcamp formation, although they are variable, I think that probably the original reservoir pressure was essentially the same in these various strings. However, of course, we were looking at the upper stringer as a salvage stringer, one that would be produced at a later date.

QUESTIONS BY MR. MANKIN:

Q In referring to this tabulation on the bottom hole pressures, I note that the Seaman Unit No. 3 on May the 7th only had a bottom hole pressure of 2479, whereas all the other wells are over 3,000 pounds, anywhere from 3133 to 3758. I wonder to what you account for that?

A To the thin pay sections and possibly small permeability. Now, that is the well which indicated -- had permeability.

Q The reason I asked that, I wondered if that is a mistake and if that should be the Seaman Unit No. 2 rather than Seaman Unit

No. 3?

A That is the Seaman Unit No. 3.

Q This tabulation, that has two different tabulations for the Seaman Unit No. 3, then?

A They are tabulated chronologically. In other words, we had two pressures on the Seaman Unit No. 3.

Q You mean that there would be a drop from 3133 pounds on March 22 to 2479 pounds on May 7th?

A Yes, sir. However, our build-up curves indicated that in neither case was the well fully built up, although it was shut-in 95 hours in one instance and 188 hours in the other instance.

Q You mean it would take 188 hours for a well to build up in this field?

A In that instance, yes, sir.

Q I might understand it on the Well No. 2, where you have a very thin pay section and a very poor well, but I just wondered about this No. 3, it being such a good well, it doesn't seem logical. You still feel that this is entirely possible, then?

A The two bottom hole pressure build-ups confirmed each other, and they did indicate that the well would, if left shut in long enough, go back to a pressure comparable to the other pressure that you see on this tabulation.

Q All wells in the field normally take considerably less than a hundred hours to build up; it would appear in this case, from

the tabulation -- I wondered why this was so much out of line?

A I don't think that it is especially. One thing that you might note, I mentioned that we had permeability from build-ups and core analysis both. Now, on the core analysis of our State 381 No. 1, which is a well that has not been completed yet, but it has been cored in the Townsend pay, that well is the direct north offset to the Tennessee's Kemnitz A-1. The permeability ranged from the usual 1 and 2 tenths of a millidarcy permeability up to a high of a thousand millidarcies in the fractured and voldular portions, so there is considerable variation in the porosity and permeability. It is an erratic nature, I believe in this field.

Q You have no bottom hole pressure on the Seaman No. 2?

A No, sir, that is a pumping well and we haven't --

Q You have taken no sonic or any other method --

A No, sir.

MR. MANKIN: I believe that's all.

MR. PORTER: Anyone else have a question of Mr. Rogers? Mr. Utz.

QUESTIONS BY MR. UTZ:

Q Mr. Rogers, you have bottom hole pressure of 3133 which was taken March 22. Was the pressure taken on 5/7/57 and 3/22/57 taken in the same zone? A Yes, sir.

Q Was there any production between those dates?

A Between March the 22nd and May the 7th. Yes, sir, I am sure there was.

Q What do you attribute the slow rate of build-up to?

A To the permeability and the fact that the pressure gradients have been extended further from the well bore by production.

Q Then it would be attributed more to low permeability than anything, would it not?

A In that instance, yes.

Q Would that indicate one well would drain 80 acres, then?

A Yes, in view of the extremely low viscosity that we have here, and in comparison with other fields that have, what I believe is a similar condition, I think that the well would drain 80 acres.

MR. UTZ: That is all.

MR. PORTER: Anyone else have a question?

QUESTIONS BY MR. KELLAHIN:

Q Jason Kellahin, representing Samedan Oil Corporation. Mr. Rogers, I believe you said that you considered the upper zone as a salvage proposition to be produced at a later date?

A Yes, sir.

Q Would you favor plugging of the lower zone before perforating the upper zone?

A Well, that depends on the particular conditions. Certainly, I would not favor opening the upper stringer, which may be a poor productive stringer, at the time that you have a good producer from the lower section.

Q Well, at what stage of depletion would you recommend perforating the upper zone?

A It may possibly never come up, that we would open them up simultaneously, but there is also the possibility that way down, the depletion -- towards the end of the depletion stage that if you have an extremely low productive well in the lower section, then you would plug it off and set a bridging plug between the two zones and open it.

Q From the point of view of the operator, you would plug in off the bottom before producing the upper?

A I think the operator should have the chance to examine each individual case and determine at the time the feasibility of opening both stringers up at the same time. I don't think that in the normal course of events that it would occur that way.

Q You would not recommend opening them both at the present time, would you? A No, sir.

Q In the event a secondary recovery program is instituted here, would you favor opening the upper zone before the secondary recovery program had been abandoned in the lower zone?

A Well, assuming that a secondary recovery program were put into effect in the lower zone, I think that certainly that project should be carried to depletion before the other one is opened up.

MR. KELLAHIN: Thank you, sir.

MR. PORTER: Anyone else have a question?

MR. McGOWAN: Let me make a couple of points at the moment.

REDIRECT EXAMINATION

BY MR. McGOWAN:

Q Mr. Rogers, you have in front of you what I have marked as Exhibit 6 which is entitled, "Proposed Seaman Wolfcamp Pool, Lea County, New Mexico, Production Data" shows the barrels of oil and MCF's of gas produced from various wells at various stages. Was that prepared by you or under your supervision?

A Yes, sir.

Q You also have in front of you what I have marked Exhibit No. 7, which is a chronological tabulation of bottom hole pressures of various wells. Is that -- was that prepared by you or under your supervision? A Yes, sir.

Q I would like to offer Exhibits 6 and 7.

MR. PORTER: Any objection to these Exhibits? They will be admitted.

Q One other thing, Mr. Rogers, refreshing your memory from the report, would you like to add anything to your testimony concerning the water from the Seaman Well No. 2 that is shown on the report, that was mentioned by Mr. Mankin?

A I believe this completion report, Form C-103, indicates that the well cleaned up and produced new oil with no water.

MR. McGOWAN: With that, sir, and with reserving the right of calling him for rebuttal, that is all.

MR. PORTER: Any further questions? The witness may be

excused.

(Witness excused.)

MR. McGOWAN: That is all the direct testimony we have, Your Honor.

MR. PORTER: Take a very short break.

(Short recess.)

MR. PORTER: The meeting will come to order, please. Mr. Hinkle, has your witness been sworn?

MR. HINKLE: Yes.

ROBERT L. BENTLEY

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

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name. A Robert L. Bentley.

Q By whom are you employed?

A I am employed by Tennessee Gas Transmission Company.

Q And in what capacity?

A Development geologist.

Q Are you a graduate geologist?

A Yes, I graduated from the University of Texas.

Q What year? A 1954.

Q Have you practiced your profession since that time?

A Yes, I have.

Q How many years of practical geological experience have

you had?

A I have had four and a half years total and two years with Tennessee.

Q Have you made a geological study of the area in which the Kemnitz, so-called Kemnitz area is located?

A Yes, sir, we have studied it. I believe we have made cross sections and contour maps and studied individual logs from all the wells and also we examined samples from all of our own wells and a few of the offset operators' wells.

Q Please refer to the Exhibit on the board, marked Exhibit No. 1 --

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

MR. PORTER: They are.

Q Refer to Exhibit No. 1, which is the first exhibit, and explain to the Commission what it is and what it shows.

A All right. This is the area under consideration in this hearing. We have outlined in red here, and I would like to state, for the benefit of some who might not know, this is in central Lea County, New Mexico, and it's located 15 miles south, approximately southwest of the town of Lovington on State Highway 83, and the area here outlined in red is the area that we will be discussing.

Q What are the closest producing, other producing pools or areas to the area outlined in red?

A We feel that the Townsend field, approximately five miles to the northwest here, and the Anderson Ranch Wolfcamp field, approximately seven miles to the west, and the Vacuum field approximately five miles to the south, Vacuum producing in the San Andres, are the closest producing areas.

Q Did the Tennessee Gas Transmission Company drill the discovery well in the Kemnitz area? A They did.

Q What was the location of that well?

A The location of that well is here in Section 30, Township 16 South, Range 34 east, 660 from the northeast corner of this section line.

Q What is the depth of the well?

A The total depth of the well -- it was drilled to 11,537 feet.

Q And when was it completed?

A December the 11th, 1956.

Q And from what formation is it producing?

A It is producing from what we call the Lower Wolfcamp zone.

Q At approximately what depth?

A 10,742 to 10,780 is the perforation depth.

Q What is the name of the lease that that well was located on?

A That's called the A A State Kemnitz A Lease.

Q How many wells have been completed in the area since the discovery well was completed?

A In the Lower Wolfcamp we saw that there had been seven wells completed and there are six now being drilled.

Q Refer now to the second plat, which is marked Exhibit No. 2, and explain to the Commission what that is and what it shows.

A All right. This is a structural contour map, and this map is very confusing since you have already seen an Exhibit presented by Sinclair, which does not look anything like this, but this is on a different horizon in the Wolfcamp, this is on a lower bed, and I will go into that in detail in a minute. I would like to call your attention to these structural numbers running through this section approximately in the north-south line here, which we think are favorable for the accumulation of oil and possibly what has caused accumulation of oil in this area.

Q What information was that Exhibit No. 2 based on?

A Well, this is from, strictly from correlation of electric logs from wells in the whole area. We fixed the top of this zone with what we call the Lower Wolfcamp marker. I would like to explain that in detail a little bit. On our Kemnitz A-1 well we picked a zone on the electric log at 10,687, which by paleontological work and evidence, there is a definite geologic change in age at that point, and also there is a lithologic chance there that can be correlated with logs from wells in the whole area, and since this zone is closer to the pay zone in question, we feel that a structure map contoured on the top of this will be of more benefit than at the top of the Wolfcamp which is about 900 feet above this.

Q What is the type of reservoir that you have in the Lower Wolfcamp formation?

A Well, so far, the indications are that it is strictly a statographic type because as far as we can determine, structure has very little to do with it. It appears to be based on a porosity development and this is quite similar to the condition that exists in the Townsend field and it appears that this reservoir is developing along the same lines.

Q Are all of the wells that have been drilled in that area producing from the Lower Wolfcamp formation?

A All the wells that are included in this red line here, inside this red line, are producing from the Lower Wolfcamp.

Q Are there any wells in the immediate vicinity producing from any other formation?

A Yes, there are some wells producing from the Pennsylvanian, I think. I think the Sinclair Seaman Well No. 1 located right here on the, in the corner, just above --

Q What section is that?

A That's in Section 3, I beg your pardon, Section 13, Township 16 South, Range 33 East. It will be in the southeast quarter of the southeast quarter.

Q Was that well drilled through the Lower Wolfcamp formation --

A Yes, sir.

Q -- and into the Pennsylvanian formation?

A Yes, sir, it is producing at a depth below the Wolfcamp in the Pennsylvanian.

Q Did it encounter a pay zone in the Lower Wolfcamp?

A From micrologs our interpretation from that well, from micrologs we found this pay present there.

Q Is that the reason that the jog is made in the red outline of the proposed area that you have?

A Yes, we feel that no limit of development will be determined in this field yet, except possibly in this northern area. This is the only well in the area in question that has penetrated this zone that we have given zero feet of pay to in the Lower Wolfcamp and that was based on microlog interpretation.

Q Have you made a study to determine the net thickness of pay in the wells which have so far been drilled in the area?

A Yes, sir, we have, and that is strictly our own interpretation on micrologs, and we have prepared a map here.

Q The one that you referred to is Exhibit No. 3?

A Yes, sir. This is Exhibit No. 3 here.

Q Explain to the Commission what it shows.

A As you will notice here, this is just a partially completed contour map, contoured on, I would like to, I would like to revert back to this map, this map was --

Q You are referring now to Exhibit No. 2?

A Back up a little bit here on this structural map, this is

20-foot contours. Now then, we come to this map and the contour interval here is five feet, and this shows thickness of total porosity, total effective porosity, it does not show actual net pay, but strictly the amount of total net porosity as determined from micrologs from each of these wells.

Q Some of the lines, I noticed, are solid lines and some are dotted lines. Is there any reason for that?

A Yes, sir, we feel that the solid lines, right in the center of the area here, contoured, have sufficient control to be contoured solidly, and the lines out here are strictly an interpretation on our part; possibly where the field might extend, or possibly further, but those are strictly interpretative lines.

Q And you are unable to complete the plat at this time down toward the southwest because of it?

A That's correct. No wells have been drilled there.

Q Now, refer to, turn the map over. Refer now to the plat which is identified as Exhibit No. 4, and explain to the Commission what it is and what it shows.

A All right. I think all of you have a copy of this in front of you, and I would like to call your attention that this starts in the northwest part of this area, and we have a plat over here designating the exact wells that are included in this cross section, and you will notice that they are projected onto a straight line, and the reason we did that is to show the general reasonable

dip to the southeast on the top of the Wolfcamp, and include the wells that are producing at the date that this cross section was prepared.

Q What general area does your small cross section map include?

A Well, it starts outside of the area in question, on the Humble AQ State No. 1.

Q And in what area is that located?

A That's to the northwest of the field and it extends down here, and all these wells are projected on here to show the relative structural position of these wells, and then we have the Skelly Sombrero Unit No. 1, and then we have the Sinclair Seaman No. 1, the Sinclair Seaman No. 2, the Ohio SA No. 1, the Sinclair Seaman No.3, and the Tennessee Gas B Kemnitz No. 1, and Tennessee Gas Kemnitz A No. 1. Now, we feel that this map will show quite a bit. It shows the points we have selected to be closer to the pay zone, and represents a true structural picture of the bed immediately above the pay zone in this area, and also it does not include this zone up here, which we feel it is not included in the reservoir in question. I would like to show also, that beginning here at the Sinclair Seaman Unit No. 1, from microlog investigation and examination, we found that zero feet of pay was present in this well, and the pay zone thickened as we went through the southeast on this cross section.

Q Has the Kemnitz area any geological relationship to the Townsend area?

A Yes, sir, it does. It is located regionally. They are both in the northwest sleeve, and the beds in that area dip generally southeast. That's the present permian beds that are generally southeast into the Delaware Basin, and the relative structural position of these two fields is quite similar.

MR. HINKLE: We would like to offer in evidence at this time Exhibits 1 through 4.

MR. PORTER: Are there any objections to the admission of these Exhibits?

MR. McGOWAN: Nothing, except they might be designated 1-A or 2-A so that they will be not confused.

MR. PORTER: Tennessee's Exhibits.

MR. HINKLE: I might ask, before you pass on that, did you prepare or were these prepared under your direction?

A Yes, sir, directly.

MR. PORTER: Without objection they will be admitted.

MR. HINKLE: That's all.

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

CROSS EXAMINATION

BY MR. McGOWAN:

Q I would like to ask one question. You stated, I believe, that this was a trap-type development and that the extent of the field really depends upon porosity development, is that not true?

A That is what we believe at this time, yes, sir.

Q Well, now, are you of the opinion that porosity development will be consistent in an area, or will be inconsistent, so that you might have good and poor porosity throughout the area, or will there be a good section and the rest of it poor porosity?

A From evidence that we have so far, and by correlation and study of logs, it appears that this pay is continuous, it is blanketed, and it is the same geologically and approximately the same depth and located structurally the same, and we feel that it is a continuous pay zone across the area, thinning somewhat to the northwest. At this time, we have that evidence, and we do not know the limits in any other direction.

Q I understand that, but now, in your opinion, will there be a variance of the porosity from well to well?

A The quality of the porosity?

Q Yes.

A Not an appreciable variance, possibly in the amount but not the quality.

Q Now, what is the basis of this middle line in your cross section marked in Exhibit 4, which as I understand, is where you are separating the Wolfcamp into two zones, one being the upper-lower and the other Lower Wolfcamp, am I correct?

A On our Kemnitz A-1 Well, let's see, right here, this well right here, we had the samples caught and they were examined by a

paleontology laboratory in Midland, and there was a definite lithologic break right here in age in the Wolfcamp, which is separated in places into two zones, the upper and lower Wolfcamp, and from this evidence that we have, this is approximately the top of the Lower Wolfcamp, and that's about all that could be determined from samples.

Q In other words, there is no permanent barrier running clear across the formation at that point of anything, is there?

A No permanent barrier horizontally at all. We didn't mean to contend --

Q How about vertically?

A Vertically, I would say you can correlate this point across the field, yes, sir.

Q Do you think it effectively separates those two zones completely throughout the area?

A I would say that as far as production, possibly you could have some productive beds immediately above this line in some parts of the area, but I do think that you could determine the difference in geologic age in one well from the other.

Q Approximately what depth from the surface do you place the top of the Wolfcamp formation itself?

A It's approximately 9600 and the bottom of the Wolfcamp approximately at --

MR. PORTER: At what?

Q This is a real high well here, and in our area in question, it is approximately 10,750.

Q Then your figures and, as I understand it, your analysis of the area in question, correspond pretty closely to that previously tested, except that you would separate them into two zones, the lower and upper Wolfcamp?

A Yes, sir, that's correct.

Q These two wells to the left are clear outside the area?

A They are completely outside the area, yes, sir. They are put on here to show the structural relationship.

Q And peaked this line in the middle then based upon what you found to be a difference in possible geological age?

A And lithology there is a lithologic break there also.

MR. McGOWAN: I believe that's all.

QUESTIONS BY MR. MANKIN:

Q Mr. Bentley, on your Exhibit No. 4, you refer to the Skelly Sombrero Unit you show there in the Idsen, or what you call the Lower Wolfcamp zone, the Packer failed in a test but there seemed to be some development there. I notice from your previous maps that you indicated there would be no effective porosity in this particular area. Is it possible that there might be some if you were able to determine tests?

A Oh, yes, sir. What I meant was that there was no continuous porosity. Probably, very possibly, there could be in this area, but what I meant to say by all that, was that in an intermediate

zone in between this well and the area in question, there appears to be no porosity. There might be another porosity development occurring up there.

Q In other words, what you are saying is that in the Seaman Unit No. 1 there appear to be no development, no effective porosity development, but that it might develop further to the northwest outside of this area in question?

A Yes, sir, that's correct.

Q Tennessee is here today seeking to separate the lower Pennsylvanian from the balance of the, I mean the lower Wolfcamp from the balance of the Wolfcamp. Do you feel that presently there has been enough information obtained from the upper Wolfcamp, or enough development, that any well could be drilled to that separate zone, the upper Wolfcamp?

A I don't, in my opinion, I don't know how many feet of pay it would take for a well to be economical. We do note that there is some porosity development, but I doubt very seriously if there would be enough to be economically --

Q Are you in agreement with what Sinclair has stated, that it is primarily a salvage proposition, as far as they know at this moment?

A Yes, I would be in agreement with that.

MR. HINKLE: In that connection, Mr. Mankin, Mr. Hunter, one of our witnesses, will cover that in detail.

A Yes, I am not familiar with the economica. Geology is about all that I am going to cover here.

Q From a geological standpoint, do you feel that there will be development in the Pennsylvanian in this area?

A Well, yes, sir, I do. Not in the area in question, particularly, but somewhere in the near vicinity.

Q Have any wells in the Kemnitz area found sufficient pay section in the Pennsylvanian to indicate, to warrant development?

A No, sir, not at this time, not in the Kemnitz area.

Q There has been --

A Indicators of pay, but probably not enough to drill a well, not enough to drill a well to that general area, along there.

MR. MANKIN: That's all.

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

(Witness excused.)

L. B. PLUMB

the witness, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name, please. A L. B. Plumb.

Q By whom are you employed, Mr. Plumb?

A Tennessee Gas Transmission Company.

Q In what capacity?

A Petroleum engineer in Midland, Texas.

Q What school are you a graduate from?

A I have a degree of engineering from the Pennsylvania State College in 1951.

Q What? A 1951.

Q Have you been practicing your profession since that time?

A Yes, sir. I have been in west Texas and eastern New Mexico for the past five years.

Q Have you made a study of the area in which the Kemnitz area is located? A Yes, I have.

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

MR. PORTER: Yes, sir.

Q Mr. Plumb, refer to the Exhibit which has been marked Exhibit No. 5 and explain to the Commission what it is.

A This is an ownership map of the area of northeastern Lea County. The area outlined in red is the area as described in our application. This map shows the ownership of each of the leases throughout here, in this area, and it shows the wells which have been drilled and completed in the area and shows the location of the wells which are presently drilling.

Q Also shows the depth of the well?

A Yes, the information included on the map shows the total depth of the well drilled, the horizon from which it is producing,

the depth from which the production is being made. It shows the date which the well was completed and the initial potential of the well, if the well was completed as a producer.

Q Does it show the ownership of the lease held by the Tennessee Transmission?

A Yes, it does in this area outlined in red. Tennessee Transmission has approximately a total of nine leases being 1720 acres.

Q How many wells has the Tennessee Gas Transmission Company drilled to date in the area?

A Three wells have been completed in this area by Tennessee Gas Transmission Company in Section 30, the Kemnitz A-1; one in Section 25, Range 33 East, the Kemnitz B-1; one in Section 20, Range 34 East, the State A-1, this well was completed recently and the data was not available in time to put it on this map.

Q Are all of those wells located in the northeast quarter and southwest quarter of each 160 acre legal subdivision?

A Yes, sir, they are.

Q From what formations are these wells producing?

A All of these wells produce from the Lower Wolfcamp formation.

Q Is that true of all the other wells which are drilled in the area?

A All of the wells drilled in the area outlined in red are

producing from the lower Wolfcamp.

Q What tests have been made in connection with the various wells which have been drilled in the area which you know of?

A There have been -- during the drilling of these wells, there were drillstem tests taken and since the completion of these wells there have been several bottom hole tests taken on each one.

Q Have you made a tabulation of the drillstem tests that have been made? A Yes, sir, I have.

Q Will you refer to Exhibit 6 and explain what it shows?

A Exhibit 6 shows the drillstem test taken by each operator on each well in the subject area. Each of these tests, each of these pages tabulates the test taken on each formation from the upper Wolfcamp, the lower Wolfcamp and the Cisco Pennsylvanian zone. These tests indicate the possible probable productivity of each zone.

Q Have you also made a tabulation of the completion data in connection with each well? A Yes, I have.

Q Refer to Exhibit No. 7 and state what it shows.

A This is a tabulation of all of the wells completed within the area outlined in red on the ownership map. This tabulation shows the operator, the lease and the well number, the completion date of the well, the producing formation, the producing interval, the total depth, the potential test of each well, the gas-oil ratio at the time of the potential test, the bottom hole pressure, whenever such tests were available, the oil gravity and the oil productivity of each well when such information was available.

Q Have you made a study of the physical characteristics of the reservoirs? A Yes, I have.

Q What are some of those characteristics?

A The reservoirs are indicated to be a statographic trap, limestone-type reservoirs, a limestone reservoir. One well was cored by Tennessee Gas Transmission, the State A-1, but the core recovery through the lower Wolfcamp pay zone was so poor that not a great deal would be determined from it.

Q Is there any indication of a water drive or --

A No, sir, there is no indication of free gas or free water in the lower Wolfcamp reservoirs at this time.

Q Have you made a study of the characteristic of the reservoirs fluids?

A We have taken a bottom hole sample on the Kemnitz No.B-1, the data is not fully assembled yet, but it appears from the preliminary data that the oil is a high gravity oil ranging from 37 to 40 degree oil, highly voluble oil with the formation factor of 1.78.

Q Are all of the wells of the Tennessee Gas Transmission Company that have so far been drilled capable of making the present allowable? A Yes, sir, they are.

Q In your opinion, would they be capable of producing the regular 80-acre allowable if allowed, with deep well factor?

A Yes, they would.

Q Were Exhibits 5, 6 and 7 prepared by you or under your direction?

A They were prepared under my direction.

MR. HINKLE: I would like to offer Exhibits 5,6 and 7 at this time.

MR. PORTER: Any objection to the admission of these Exhibits? They will be admitted.

MR. HINKLE: That's all.

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

MR. MANKIN: What was the gentleman's name?

A Plumb.

CROSS EXAMINATION

BY MR. MANKIN:

Q Mr. Plumb, you have indicated a formation volume factor of 1.78. What well was that taken on?

A The Kemnitz B No. 1.

Q That is just recent results?

A Yes, sir, that is preliminary data.

Q And that compares very closely with what Sinclair reported on their well?

A Very closely, yes, sir.

Q I believe 1.73?

A I believe that was it.

Q On your exhibit showing the completion data, you show the bottom hole pressure of several wells, which isn't quite as complete as Sinclair had, but I wonder if you can explain on the Sinclair Seaman No. 3, where you show a bottom hole pressure of 3133 and

which was taken on March 22, and 2479 taken on May 7th, a decrease of some 700, a little less than 700 pounds. Can you account for that rapid drop?

A No, sir, I can't explain that rapid drop in that one well. The information is somewhat dubious to me. It might have been a defective instrument or something like that, I don't know.

Q Do you feel that is an indication that there has been some pretty rapid drops throughout the pool or something in that particular well?

A I believe it is a peculiarity to that well alone. The casings of the bottom hole pressure, as taken, shows that there have been some drawdown from the initial bottom holes pressure in the Kemnitz A-1, and the second bottom hole pressure test shows approximately 66 pounds in that subject well. Then in subsequent wells completed since then, there have been, the bottom hole pressures have not been as high as the initial bottom hole pressure encountered in the Kemnitz A-1. The magnitude of the drawdown, however, has been in the range of 100 pounds.

Q One hundred pounds per -- A Square inch.

Q Per how much production?

A Well, it was on the, what I refer to was on the completion of the separate wells. For instance, the Shell Oil Company WC No.1, located in Section 29, 34 East showed initial bottom hole pressure on completion, I believe of some 120 pounds less than the initial bottom hole pressure of the Kemnitz A-1. Now, there has been no

production from that well to this time, it just shows that it came in with a lower initial bottom hole pressure.

Q You do have other bottom hole pressures that were not shown on this chart?

A Yes, sir, these bottom hole pressures were intended to be as near as possible to the time of the completion of the well.

Q In other words, you do have a pressure on the -- your Kemnitz A No. 1?

A Yes, we have run two bottom hole pressure buildup surveys on that well.

MR. MANKIN: I believe that's all.

MR. PORTER: Anyone else have a question?

QUESTIONS BY MR. NUTTER:

Q Mr. Plumb, have you made any analysis as to the economics of drilling a well on 40-acre or 80-acre spacing in this pool?

A I believe that will be covered in later testimony.

MR. HINKLE: We have another witness that will cover that.

MR. NUTTER: That's all.

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

(Witness excused.)

MR. PORTER: Mr. Hinkle, will you proceed with your next witness, please?

H. R. HUNTER

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

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name, please. A H. R. Hunter.

Q Where do you live, Mr. Hunter? A Houston, Texas.

Q And by whom are you employed? A Tennessee Gas.

Q In what capacity? A Petroleum engineer.

Q Are you a graduate petroleum engineer?

A Yes, sir.

Q From what school?

A The University of Texas.

Q In what year? A 1951.

Q Have you practiced your profession since that time?

A Yes, sir, I have. Four years in west Texas and southeastern New Mexico and the other two years in Houston.

Q Have you made a study of the area in which the Kemnitz and Townsend pools are situated?

A From a reservoir's performance and economic standpoint, yes.

Q Have there been sufficient wells drilled in the Kemnitz area up to this time to make a conclusive analysis of all the possible reservoir characteristics?

A No, not in the Kemnitz area. When we first tried to make an analysis on that particular area, we were faced with the lack of data and lack of well performance. Therefore, we thought that pos-

sibly another field in the area might offer us an opportunity to make a reservoir study by analogy.

Q Did you select any other field in the area for that purpose?

A Yes, after some investigation, we studied the Townsend Wolfcamp field, which is five miles east of the Kemnitz.

Q Are the characteristics of these two fields, in your opinion, similar?

A Very similar. If you will refer to our Exhibit No. 8, I believe, here we have a comparative cross section which extends through three wells in the Townsend field, and three wells in the Kemnitz area, and you will see that,that the SP curve here is very similar, that you can even pick out readily these breaks, which are fairly consistent throughout the cross section.

Q Explain to the Commission what wells were taken into consideration, and what area, in making the cross section.

A We started on the -- in the northern part of the Townsend Wolfcamp field with the Shell Oil Company State T A-1, went through the Humble Oil and Refining Company Townsend 5, and on through the Shell Oil Company State T A-1. On the small map here I don't know whether you can see it or not, but it shows these three wells and their relation structurally, on a straight northeast southwest line We continued on then through the Ohio State S A-1, which is located in Section 20 of the area in question, through the Tennessee Gas State AA Kemnitz A-1 and on through Sinclair Oil and Gas Company

State Seaman Unit No. 1.

Q Have you made a comparison of the physical characteristics of the two areas?

A Yes, from this analysis and from a microlog analysis, we were fairly well satisfied that the rock characteristics were similar. We went from that into other characteristics, and in our Exhibit 9 we have tabulated some of the characteristics of the reservoirs fluid.

Q What are the characteristics as shown by your Exhibit No. 9?

A We show the original bottom hole pressure in both reservoirs, which is very similar. We have several samples in the Townsend field which shows a saturation pressure ranging from 3,030 pounds to 3803 pounds. We have two samples now, one on the Sinclair Seaman 3 and one on our Kemnitz B-1 which shows a saturation pressure range in the Kemnitz area of 3,092 pounds to 2017 pounds. The solution gas-oil ratio in the Kemnitz area for those two samples has been 1396 and 1489 standard cubic feet per barrel in the Townsend field and the gas-oil ratio from the sample we had available ranged from approximately 1400 cubic feet per barrel to 1850 cubic feet per barrel, with the similar solution, gas-oil ratio you would expect, similar formation volume factors which is shown in the next line there. It is further shown that the oil gravity is similar and that the reservoir temperature is very similar.

Q What portion of the Townsend area did you use for evalu-

ation purposes?

A We had originally planned on using the entire Townsend field. We were primarily looking for an area that was moving on toward complete depletion, and we, in our investigation, we run across a pressure barrier, which, if I could have our Exhibit 1, our Lea County map back -- here is the Townsend Wolfcamp field, here is the Shell --

Q You are referring now to Exhibit No. 1?

A Exhibit No. 1, here is the Shell T A-1.

MR. PORTER: Would you indicate where "here" is there, -- for the record?

A In the Northeast Quarter of the Southeast Quarter, Section 4.

Q What Township?

A Township 16 South, Range, I presume, 35 East, which is shown on this cross section here running south off the Willshire well, which was drilled in the southeast southeast of that Section 4 and between the Humble Townsend 3 and 5 which were drilled in the North Half of the Northwest Quarter of Section 9 in that same Township and Range, and south of the Shell Oil Company ET A-1, drilled in the northeast northeast of Section 8. We found that a pressure barrier, or permeability barrier, existed, which effectively isolated the small area north of there from the rest of the Townsend field. This small area was further depleted than the rest of the Townsend field and provided an excellent place to base our analysis

on.

Q Now, Mr. Hunter, refer to the Exhibit which is marked Tennessee Gas and Transmission Company Exhibit 10 and explain to the Commission what it is.

A This -- first, in analyzing this small section of the Townsend Wolfcamp field, we first determine the net feet of pay in each well, and from that we got the net acre feet of pay, and from the production we knew the recovery per acre foot at any given time. This is a plot here -- First, this solid line here is the oil capacity of the area as a function of the cumulative oil recovery in barrels of oil per acre foot. The dotted line is gas recovery as a function again of oil recovery, and barrels of stock oil per acre foot, and the third line which is marked by the circle, is the pressure performance as a function of the accumulative oil recovery. You can see here that at the time we made this analysis, where our brown line ends here, that the area had already recovered 120 barrels per acre foot and was approximately 93 percent depleted.

Q Now, refer to Exhibit 11 and explain what it is.

A Exhibit 11 is essentially the same as Exhibit 10, except it is plotted against time on semilog paper for predicative reserve. You can extrapolate a straight line and you will see that the well capacity versus time on this semilog table gives a straight line, and by extrapolating this to the limits that the area can be produced, we can estimate how much oil remains to be produced on this

little segment. There has been approximately 1,350,000 barrels of oil produced a day and the remainder of the reserve there is estimated at only a hundred thousand barrels.

Q Have you made any study or comparison of the two areas as per acre foot recovery?

A In every comparison that we have made, there has been no reason to think that it will be significantly different in the Kemnitz area from the Townsend area.

Q Now, refer to Exhibit No. 12 and explain it to the Commission.

A Exhibit 12 is a plot of the initial pressure measured on a new well. These are initial pressures, the triangles and squares plotted against the field average pressure which existed at that time. We noticed, in our analysis of the Townsend field, that wells which were drilled late in the life of the field were coming in with bottom hole pressures that were more comparable to the field average pressure which existed at that time, than they were to the original reservoir pressure, which indicated to us that there has been some draining from the 40-acre unit on which they were drilled. To substantiate this, we made this plot here which shows that the individual well initial pressure, the first pressure measured on that well after it was completed, is comparable not to the original reservoir pressure, which would be the case had no draining occurred, but is comparable to the field average pressure which

shows that the proration unit on which the new well was drilled had been drilled by other wells in the reservoir.

Q Is there any indication that one well will drain 40 acres or more in the Kemnitz area?

A This is an indication that one well will drain in excess of 40 and will drain it over a ratio of 1340 feet. These wells in the north area of the Townsend are 1320 feet apart, and yet the pressure in these new wells is approximately the same as in the older offset.

Q Now, refer to Exhibit No. 13 and explain what it is.

A This is another plot that we undertook to substantiate the fact that 80-acre spacing would be sufficient to drain the Townsend Wolfcamp field.

If the older wells had drained the later drilled wells, then you would expect recovery, and barrels per acre foot would be considerably above the average on the first wells drilled and considerably below the average on the last wells drilled, and the recovery in barrels per acre foot for any given well would be a function, of the time that that well was drilled, or more probable the time that had elapsed since the first well was drilled until the well in question was drilled.

These circles on here are plots of per acre foot recovery for the pay section in any given well, plotted against the time that the given well was drilled. It shows here that the first recovery

well, the Wilshire Townsend 1, recovered 245 barrels per acre foot and there were two wells drilled in April, 1954 and one recovered 155 barrels an acre foot, and the other one recovered 100 barrels per acre foot. Development continued on until 1955 when the average recovery for wells drilled in '55 was only on the order of 35 barrels an acre foot. This further substantiates this graph and that drainage extends over a radius in excess of 1320 feet.

Q Did you make any attempt to arrive at a reserve estimate in the north Townsend area, had it been developed on an 80-acre basis?

A Yes, we did. First, for this comparison, we assumed that an 80-acre proration unit would consist of one 40-acre unit with a well located in its center, or a contiguous 40-acre tract which had no wells on it. By making this assumption, which is correct in nearly all 80-acre spacing pattern, then you can say, for example, that the initial pressure measured on a well, and which has just been drilled, would be the pressure that existed on the undrilled 40-acre tract of this 80-acre proration unit.

We made ten comparisons, which are shown on Exhibit 14, as to the pressure, the initial pressure on a new well, as compared to its oldest 40-acre offset. The average, over the ten comparisons, was that the new well has a pressure of only 138 pounds higher than the older well on the offsetting 40-acre tract. However, on 5 of the ten comparisons, the range was from 200 to 400 pounds. We therefore assumed that that was most typical, and for the purpose

of our comparison, assumed that in the 80-acre tract, consisting of two 40-acre proration units, the pressure on the undrilled 40-acre unit would be 300 pounds higher than that on the drilled 40-acre unit. To estimate, then, the reserves which would accrue under 80-acre development, we found here that depletion of the reservoir on the 40-acre spacing would occur at a pressure of 700 pounds. This would be the condition under 80-acre spacing for the 40-acre unit in which the well was located. To find out how much had been recovered from the offsetting 40 which did not have the well and which had a pressure of 300 pounds higher, it was only necessary to back up this pressure curve 300 pounds. In other words, the 80-acre unit would be abandoned then at the average pressure of the 80, or 850 pounds, rather than 700 for the 40-acre unit. Backing up to 850 pounds here on this, on Exhibit 10, you can extrapolate to show that recovery under 80-acre spacing would have been approximately 121½ barrels per acre foot.

MR. HINKLE: If the Commission please, we have five more Exhibits which we would like to take a few minutes to put up.

MR. PORTER: We will take a five minute break.

(Short recess.)

MR. PORTER: The meeting will come to order, please. At this time Mr. Don Walker of Gulf wants to make a brief statement in order to catch a plane. The counsel for the applicant have agreed, so Mr. Walker, would you make your statement.

MR. WALKER: If the Commission please, I appreciate being able to do this. Although Gulf Oil Corporation is not now an operator in the area under consideration, we do have like acreage, and would like to go on record as being in favor of 80 acres and any continuous 80 acres within the quarter section, with the provision to allow flexibility of well location, which will permit drilling on either end of the 80-acre unit, and vertical limits sufficiently drilled in the Wolfcamp formation. Thank you.

MR. PORTER: Mr. Hinkle, will you proceed with your witness?

Q Mr. Hunter, please refer to Exhibit 15 and explain to the Commission what it is.

A This Exhibit here was prepared from our Exhibit 10 and also from Exhibit 11 and merely represents the typical performance of a well in the Townsend Wolfcamp -- for that matter, in the Kamnitz area in 40-acre space. This, the well capacity is the solid line. Here again the well designates the decline and we have pressure over the declining period of well production here.

Q How were the points of decline determined?

A The points of decline were determined from this point back here on Exhibit 10. At the pressure at which the wells in this north area of the Townsend field exhibited a consistent decline was approximately 1900 pounds pressure, that is where this decline began. This was declined from the 40-acre depth factor allowable in the Townsend Wolfcamp.

Q Now, refer to Exhibit 16 and explain what it is.

A Exhibit 16 is the same as 15 with the exception it is for 80 acres. Here we ended our production when 121.5 barrels per acre foot had been recovered, with a pressure average over the 80-acre of 850 pounds. We determined our decline point generally, by assuming that the undrilled 40-acre of the 80-acre would have a 300 pound higher pressure than the drilled 40, and also we took into consideration the fact that more bottom hole pressure would be required to produce the additional 40 barrels a day allowable due to the 80-acre spacing. We established that point here, in this manner, to determine where our decline set in.

Q Do you have any indication as far as the Kemnitz area is concerned, whether one well will drain 80 acres or more?

A Yes, we do. Our discovery well, the Kemnitz A-1, was drilled in December and in the first part of December, I believe it was on December the 19th, we measured an initial pressure in that well of approximately 3780 pounds. In April we determined the pressure again, and the pressure had been drawn down to approximately 3670 pounds. Approximately a week later we measured the pressure, the initial pressure, after only a very small amount of production on our Kemnitz B-1 well, which was located one mile west of the A-1, and we found this pressure was essentially the same as the pressure which existed in the A-1 at that time, and that it was some hundred pounds lower than the initial pressure measured in our Kemnitz A-1.

Q Do you feel that that is pretty conclusive evidence that one well will drain as much or more than 80 acres?

A I think so. If draining were not occurring from under the Kemnitz B-1, then we would have expected an initial pressure similar to the Kemnitz A-1.

Q Have you made a study of the economic limits of development on a 40-acre basis with relation to the thickness of the pay?

A Yes, we have. We immediately set out to establish the lower limits of net pay for which it would be economical to drill -- drill on 40-acre spacing. This was approximately 20 feet.

Q Have you made the same study based on 80-acre development?

A Yes. For 80-acre development you can afford to drill pay thickness as small as 12 feet of net pay.

Q Now, refer to Exhibit 17 and explain to the Commission what that is.

A Exhibit 17, which has been passed out, is a tabulation by 80-acre east-west tracts of all the area in the Kemnitz region which we feel, that by drilling to date, has been virtually proven. We tabulated then the recovery which would occur in this area again by 80-acre tracts under both 40 and 80-acre development. You will see that wherever the average thickness of the pay is less than 20 feet, that there is no recovery given for 40-acre spacing. That is because a well drilled on 40-acre spacing with pay of this nature would not pay out, would not be economical to drill, and probably would not be drilled.

As a result of this study, you see that -- tabulated at the bottom of the page is the estimated recovery, both under 40-acre and 80-acre spacing for this area.

This area, by the way, is bounded roughly by the Ohio State SB, our Kemnitz A-1 and B-1 on the Sinclair Seaman Unit 2. You will see that recovery under 80-acre spacing for this area is some 700,000 barrels greater than it would be under 40-acre spacing, since more acres can be developed with 80-acre proration units. You will further see that this greater recovery was accomplished by the drilling of 18 less wells than would have been drilled on 40-acre spacing.

Q What are your conclusions and opinion as to whether the Kemnitz area should be developed on 40 or 80-acre basis?

A I think from this that I can safely say that I would recommend 80-acre spacing in that it will help to recover more oil with the drilling of fewer wells; it will give a greater life of the field with more constant gas production, which will require the building of a gas plant in this area

Q What is the recommendation to the Commission by the Tennessee Gas Transmission Company with respect to the spacing and well location?

A We are recommending now -- I think in our application we originally stated that we would like proration units consisting of the North Half and the South Half of each 160-acre tract. Due to

the locations that have been made since we filed our application, we are changing that now to be the East Half and the West Half of 160-acres, we are asking --

Q Why are you making that change?

A Based on locations which have been established, as I understand it, in the Southeast Quarter of the Northeast Quarter of Section 20, and the offset to the Ohio State SA well. If we proceeded with our original application, it would throw both of these wells on the same 80-acre proration unit.

Q And by having north and south, or the East Half and the West Half of each 160-acre legal subdivision, would there be more than one well on any 80-acre unit?

A No, there wouldn't.

Q Now, refer to Exhibit --

A Excuse me. We are also asking that the wells be, the well location be specified by the Conservation Board to be in the Northeast and Southwest Quarters of a Quarter Section.

Q Refer now to Exhibit 18 and explain to the Commission what it is.

A On Exhibit 18 we are assuming a mythical section in the Kemnitz area, and shows what possibly could happen if both proration units and well locations, or extreme flexibility, if you wish to refer to it that way, were granted. This section here is allowed only eight wells. It is under optional well location and optional proration units. It would be within the power of the operators off-

setting this section to locate their wells 1320 feet from the section line in all cases. The operator in this section would have only eight wells to drill in this section. He would attempt to meet as many of these offsets as he could, but you will notice that along each section line, north, east, south and west, there is one well outside the section which is not offset by wells located, by wells inside the section, located equal distance from the section line. In other words, this well is draining some oil from this section both here, here, here and here.

Q Mr. Hunter, I believe you said that the location could be 1320 feet?

A It would be 660 feet.

Q Now refer to -- would this same situation be true with respect to quarter sections and 80-acre legal subdivisions?

A Absolutely.

Q That is, that they could be surrounded?

A They could be surrounded and they could not be able to meet their offset equal distance from their offset lines.

Q Now, refer to the next, Exhibit 19, and explain what that is.

A This shows how development could possibly proceed around the same mythical circumstances if it were specified. In other words, it would be specified,either, the north, east or the west and north half of the quarter section. It is entirely within the

discretion of the operators outside the section to lay their wells 660 feet from the property line. This particular drainage here shows, for the north half and the south half of 60 acres, and to get the east half and the west half it would be necessary just to rotate this ninety degrees. You will see here that where we have four offsets, under the field rules we now have only two. However, these wells are not offset by wells in the section equal distance from the section line, and, therefore, both in this case and in this case, draining oil from under this section.

Q Now, refer to Exhibit 20 and explain what it is.

A This is how development would proceed under the Tennessee proposal, which would require that wells be drilled in the northeast and southwest quarters of a quarter section.

Here we still have our eastwest proration units. In other words, proration units consisting of the North Half and the South Half of a quarter section, but in an area that is yet to be developed. The direction of the proration unit makes no difference unless -- so long as the well locations are specified. You will see that here, going down this east line of this mythical section, you have a well which is not offset in equal distance. In other words, the midpoint between these two wells would be over here. However, in the next well to the south you would have a compensating situation, the third well would be similar to the first, the fourth well would be similar to the second, and you would have protection of correlative rights in this instance.

Q Do you have any opinion as to whether or not pressure maintenance would be feasible in this lower Wolfcamp Kemnitz area?

A We have not been able to make a study at this time, since we do not have the necessary core analysis information nor do we have complete results on our subsurface samples. However, in reserves of this type, there is no reason to think that pressure maintenance will not be adoptable to this reservoir.

Q Do you have any reason to expect that if a pressure maintenance program is inaugurated, that there will be an appreciable amount of additional oil recovery?

A Yes, I think that is understood. If the pressure maintenance program were adopted, it would be with that end in mind.

Q Has that been the experience in other comparable areas?

A I think so, yes.

Q Is the lower Wolfcamp reservoir in the Kemnitz area the only reservoir, in your opinion, of any consequence that is known from the present information?

A I would like to wait a minute on answering that and point out another argument for this type of development. You can see here that if pressure maintenance is put into effect, that the four wells surrounding any well which might be selected for injection would be equal distance from that well. Then, given a uniform pay section, you would expect that the injected fluid would reach these four wells at approximately the same time, which would give a good sweep effeciency. In this case, you can see that selection of any of

these wells along here as an injection well would result in three wells being located 1320 feet away, and the fourth well in the 5 spot being located 3960 feet away. These wells would flood out far in advance of the time that this well flooded out, and therefore, pressure maintenance would not proceed properly.

Q The location of wells in the northeast quarter and southwest quarter of each quarter section would then, in your opinion, facilitate the inauguration of pressure maintenance in this area?

A Yes.

Q And, would it result, if it were successful, in the recovery of a greater amount of oil -- A Yes.

Q -- by reason of having regular well location?

A That's right. In this case, the only thing that comes to my mind right now that you could do to get a reasonable conformance factor, would be to drill an additional well that was more -- that would be equal distance from the four producing wells.

Q In other words, where they have had pressure maintenance of this kind, is it uncommon to recover an additional 25 or 30 or 50 percent more oil? A No.

Q Now, what is your opinion with respect to the so-called stringers which have been discovered in some of the wells which have been drilled in the Kemnitz area above the lower Wolfcamp reservoirs?

A With pressure maintenance in mind, opening those reservoirs now would impose certain disadvantages. If you had two reser-

voirs opened together, such as the upper Wolfcamp and the lower Wolfcamp, it would be necessary to repair the upper Wolfcamp perforations before pressure maintenance would be pursued in the lower Wolfcamp. Furthermore, I don't think that enough is known in the upper Wolfcamp at this time to say whether or not opening those perforations would be detrimental to the main stringer in this area, which I think everybody agrees is in the lower Wolfcamp. At a later date, if data comes to light that proves that no detrimental effects occurred to any reservoir, to have oil commingle in the well bore, then it might be very well to include the two as one. At this time I don't think that we can say that.

Q Is there any other reason to treat them separately if they are separate and distinct reservoirs?

A Yes. I think that it is very possible that if they were opened together, there might occur migration of the oil in the well bore between the two reservoirs, and secondly, it would preclude the accurate gathering of both pressure and production data on either one of the separate reservoirs.

Q Would it not be better to consider the status of those zones at the end of a year, after more wells have been drilled, to determine the extent and character of any upper reservoirs that might exist?

A I think that's definitely true. By the end of the year we might have the data I spoke of, which will show that there will be

no detrimental effect to opening both reservoirs simultaneously. However, we cannot say that now.

Q If the Commission sees fit to grant 80-acre spacing in this case, what allowable would you recommend?

A I would recommend the 80-acre allowable with the depth factor. We have found no evidence of free gas or free water and, therefore, we feel that this reservoir is a solution gas reservoir, and producing rate will not affect the ultimate recovery at all. Furthermore, on 80-acre spacing we will be recovering almost twice as much oil per well as we would on 40 and, therefore, would need the extra allowable to keep the life of the wells within reason.

Q Do you have an opinion as to whether or not it is necessary to have a special field rule as far as limiting the gas-oil ratio is concerned?

A I don't think there is any necessity for exceeding the normal 2,000 to 1 ratio for the reason that from our work in the Townsend field, we could see that the operators were under no disadvantage in producing under that gas limit, and secondarily, to conserve the reservoir energy.

Q Do you have any recommendations to make to the Commission with respect to the inauguration of taking bottom hole pressures at regular intervals?

A Yes, we are asking only for a temporary order at this time; the order to extend for one year, and the primary purpose of this temporary order is to collect data by having semi-annual rather than

an annual bottom hole pressure. It would allow us to collect more data during this year period.

Q In your opinion, would it be in the interest of conservation and the prevention of waste to establish 80-acre spacing in this area and regular well location?

A I think so. We have shown in our Exhibit 17 that on 80-acre spacing, fewer wells will be required, and more oil will be recovered from the reservoir. The regular 80-acre pattern will certainly provide the most attractive pattern for pressure maintenance and also, as we show in our Exhibits 18, 19 and 20, will adequately protect all the correlative rights of mineral owners.

Q Do you have any recommendation to make to the Commission with respect to the naming of this area?

A We have proposed the name of the Kemnitz Wolfcamp field.

Q For what reason?

A The discovery well was drilled on the Kemnitz lease.

Q Now, were all of the Exhibits 8 through 20 inclusive, prepared by you or under your direction? A They were.

MR. HINKLE: We would like to offer in evidence Exhibits 8 through 20 inclusive.

MR. PORTER: Are there any objections to the admission of these exhibits into the record? They will be admitted.

MR. HINKLE: That's all of our case.

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

CROSS EXAMINATION

BY MR. MANKIN:

Q Mr. Hunter, right at the end you made a recommendation that it be called, this pool, be called Kemnitz Wolfcamp Pool. Is that what you desire, or Kemnitz Lower Wolfcamp Pool?

A Well, the Kemnitz Lower Wolfcamp Pool would be more probable.

Q You indicated that you desired to have this temporary order for one year. From what time?

A To date from the date the order is issued by the Board.

Q I noticed that Sinclair put in certain exhibits, and Tennessee put in certain exhibits as to ownership, and I wonder if you could clarify that particular aspect. On Tennessee's Exhibits 2 and 3 it is indicated that Tennessee now had half of 640-acre lease in Sections 36 and 25, 16 South 34 East as shown on Sinclair exhibits as being all Phillips, is that correct?

A Our exhibit is correct. Just within the past few days we have acquired an interest in that tract, since probably Sinclair does not have that information.

MR. MANKIN: That's all.

MR. PORTER: Does anyone else have a question?

QUESTIONS BY MR. NUTTER:

Q Mr. Hunter, referring to your Exhibit No. 13, I wonder if you could tell me how the recovery per acre foot was determined in the spot on the chart?

A This recovery per acre foot is a recovery per acre foot by wells. We determined the net pay from the log of the well, and we determined the reserves that can be produced from the well by the decline curves, very similar to our exhibits which would be our Exhibit 11, a producing rate versus time curves for each well in this north area of the Townsend.

Q In other words, each one of these points which you plotted here to develop this curve, each one of those points is a recovery which was extrapolated out of the known characters of these various individual wells? A That's right.

Q Now, I note that the wells to the left of the curve, the ones which were drilled in early 1952 have a higher barrels per acre foot recovery than the wells to the right --

A That is correct.

Q -- which were drilled later? A That is correct.

Q Is there a possibility that is the better location to drill sooner?

A I don't think so. The discovery well in, in this particular area, and I think the discovery well in the Townsend Wolfcamp field was Wilshire's Townsend No. 1 which was definitely not one of the better wells as far as pay section was concerned. The pay section showed up, we thought, rather well on the microlog, and I don't think that the better wells were drilled in all cases earlier in the life of the field.

Q A good part of the wells that were drilled later, however,

were edge wells, weren't they?

A Not necessarily, no. The Humble Townsend 5, for instance, could hardly be called an edge well in that it is offset in four directions, and the Wilshire Townsend 4, which is in the southeast, southwest, southwest of Section 4 was also offset in four directions. Those were both wells which were drilled late in the life of the field.

Q Of course, the wells that are on this Exhibit No. 13 aren't identified. I didn't know whether the location of --

A No, they weren't. We originally had them identified and it clouded our curve there so much having the well name spelled across by each little dot that we took them off so that it would show the trend better.

Q I wonder if you could furnish us with the names of the various wells which you used to determine this curve at a later time?

A At a later time, I don't think we have that stuff up here with us. We can furnish, I don't know whether we can furnish it today or not.

Q Well, that is satisfactory if you will mail it to us. I am interested in seeing where those wells are. Now, in Exhibits 15 and 16, the horizontal line, for instance, in Exhibit 16 is drawn at about 5700, what is that? Is that the allowable for a well?

A That is what we predicted as average allowable, that assumes a 40-acre, 40 barrels unit allowable in New Mexico and the 5.67 depth factor.

Q Now, how did you pick the point at which the oil production starts its decline?

A On the 40-acre, the Exhibit 15, we picked that point from the actual performance in the Townsend Wolfcamp field. Here is where the decline definitely set in on all of these wells, and it corresponded to a pressure of 1900 pounds at that time. At the time the pressure reached this 1900 pounds, we had recovered 76 barrels of oil per acre foot.

Q And these angular lines all have the same slope as the lines had on Exhibit 10, is that correct?

A This line, here, of course, you will see that the decline began actually at 70. When 77 barrels per acre foot had been recovered in all the cases, thereafter you would have varying amounts of oil on the decline depending on how much net pay you had assigned to that well. In other words, few had a thousand net acre feet of pay, then after the well went on decline you would recover 128 minus 77, which is 51 times a thousand or 51,000 barrels on decline. If you had only 500 acre feet of net pay, you would recover only half that much on decline.

Q I see. Now, referring to Exhibit No. 17, which is a tabulation, I notice that in every case that I can see, a well on 40-acres actually recovers more than a well on 80 acres?

A That is correct.

Q Why is that?

A If you will remember, we found on Townsend field assuming

an 80-acre tract to be composed of one 40-acre, with a well on it, and one 40-acre unit that did not have a well, that the undrilled 40 of it would have 300 pounds higher pressure. Therefore, when the pressure in the well was pulled down to our 700 pounds abandoned pressure at which point production would cease, the pressure on the undrilled 40 would be a thousand pounds. And therefore, the average pressure over that 80-acre unit would be 850 pounds. We found that for 40-acre development that recovery was approximately 128 barrels an acre foot and on the 80-acre development it was 121.5. However, you will see here on this Exhibit No. 17 that the 80-acre spacing allows drilling of several 80-acre tracts which has not been economically developed under 40-acre space where I have a zero here on 40-acre spacing the well would not pay out.

Q That acreage would not have enough reserves to warrant drilling a well? A That is correct.

Q Mr. Hunter, do you think that a period of one year in which to assimilate data on this pool would be sufficient time to determine whether a permanent 40 or 80 acre should be issued for this pool?

A I think it will. I think the main thing that is required over the next year is the accumulation of more, of possibly just one or two more subsurface samples. The further outlying of the field in question and the running of some interference tests on these 80-acre patterns after we have enough development on the 80-acre pattern, I think that interference tests can be run which will show

communication between wells on 80-acre spacing. At the rate development is proceeding out there, I think there will be enough development in a year to allow us to run those tests.

Q One more thing that I wanted to ask you is, I notice that on your comparison of the Townsend Wolfcamp and the Kemnitz area, that the Kemnitz area is slightly deeper than the Townsend, and yet the temperature is a little bit lower.

A Yes, it is. Actually, there is very little difference there. You will notice that the pressure is taken at a 100 foot lower datum and also slightly lower. I don't think that is out of the bounds of reason, I mean within normal variances, I think that probably you will find that much variation in your temperature, particularly as far as the lower pressure. I don't know whether that pressure has possibly, through some intercommunication along, between the Townsend Wolfcamp at Kemnitz have possibly a very small stringer or even through a small water table that the pressure might have been drawn down. There is no data to support that, but it has happened to my knowledge in several occasions where fields apparently not connected at all have been interconnected through very small connections and have drawn each other down, or down upon the same reservoir.

Q You feel that dispite these minor variations and the characteristics of the Townsend and Kemnitz area that there is enough similarity that the Townsend can produce criteria to judge the Kemnitz?

A Yes, I think the main thing in providing an anology is to have approximately the same permeability and porosity, and also in having the same type of drive, and in the same composition of the reservoir fluid, and every case that we have been able to make a comparison, all of those things have been in the same range. The permeabilities are very close, they cover quite a wide range in each instance, but they cover much the same range. The porosity seemed to be of the same order or magnitude and the reservoir fluids are certainly very similar for two separate reservoirs.

MR. NUTTER: That's all.

QUESTIONS BY MR. MANKIN:

Q I have three questions. First, Mr. Hunter, I noticed that your company asked that seven more sections be spaced than Sinclair. What was the basis for that increase of spacing some sections?

A As far as we have been able to determine, actually, the further south wells to date have been, have had the thickest pay sections, and for that reason we don't feel, particularly in Section 20 or Range 33 East, I think our Kemnitz B-1 has encountered the thickest pay section yet in the field, and we don't feel like, we feel like, rather, that the reservoir will extend on considerably past that section.

Q You feel that part of this extension to the south is based on seismic picture rather than any information that you know of from drilling?

A We had some seismic information in the area which influenced us to come extent. The main thing that influenced us was that the porosity appeared to be thickening to the south.

Q The second question I have is, do you feel that this particular Kemnitz area, or whatever you desire to call it, this particular area in question here today will have an increase in ratio similar to production history that the Townsend Pool has experienced?

A I think so, yes.

Q On that same basis, do you feel that gas-oil ratio taken over a year is sufficient? Would it not be better to have two a year as has been placed in the Townsend area?

A It probably would be better actually; from most of the work we did on Townsend, we found that gas-oil ratios did not rise appreciably in most cases until after the wells were declined and from then due to the decline in oil capacity, you remained normally below the -- your gas limits.

Q Then I take it from your last statement there that nothing particularly might be served during this next year or two, for two ratios a year, rather than one ratio test a year?

A Throughout the next year I don't think that there will be any advantage.

Q Do you experience any great increase during the next year of gas-oil ratio? A No, I do not.

MR. MANKIN: That is all.

MR. CAMPBELL: I am not quite clear on what the temporary recovery, is that all of the rules you are proposing?

A All the rules that we are proposing we are proposing for a temporary one year order.

MR. PORTER: Does anyone else have a question?

QUESTIONS BY MR. COOLEY:

Q Mr. Hunter, going through this plat very rapidly, I find at least five existing locations which would be unorthodox if the Commission should adopt your east half west half fixed proration units in drilling in the northeast and southeast quarter quarter section.

A They would, I believe, be unorthodox as far as the location of the well is concerned; but they would fit into the east and west half proration units.

Q I mean, I think, I only counted four, there might be that there is five, there is the Ohio, State SB in Section 16, which would be an unorthodox location; the Shell State WC in Section 29 would be unorthodox as would be the Shell State LEE 381, I mean the Sinclair State LEE 381 and the Sinclair Seaman Unit 2 in Section 19. I believe those are the only four that are unorthodox.

MR.NUTTER: There is a well on the southeast of the northeast of 20. All right, that would be the fifth one then. I don't have that one on this plat.

A If you will remember, that would be five wells which would fall off pattern, but would also, would still fall in the proper

proration unit, and we estimate in our Exhibit 17 that on 80-acre spacing there would be something like 32 wells drilled just in the proven area. This would probably, by the time the field is developed, work out to be something less than 10 percent of the wells in the field. These five that would be off pattern.

Q (By Mr. Cooley) You would recommend no adjustment for offsetting wells in the same quarter quarter section, or any offsetting well?

A You mean what would we want to do with these wells that are already drilled?

Q The ones that are drilled, of course, you have to authorize?

A That's right.

Q But there wouldn't be any corresponding change in wells to be drilled as a result of the unorthodox location, would there?

A No.

MR. COOLEY: I believe that's all.

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

QUESTIONS BY MR. NESTOR:

Q Mr. Hunter, I recall in your testimony you touched upon the subject of possibly secondary recovery in the area, and I believe that counsel asked you if such a project were feasible, and I believe your answer was, "I think so." I wonder if you could tell us why you think so?

A I don't believe, I don't believe that's exactly the question. He asked, he asked if we had any reason to think that it would

not be feasible, and we don't.

Q And, would you -- no, I don't believe so, because your answer was, "I think so," as I recall.

A Well, actually you do have some reason to think so and that is the fact that in any reservoir with the high range such as this, in other words, we have been, in both samples, we have had formation, volume factors of 1.47 plus; in any reservoir that you can arrest, or more or less maintain the oil nearest saturation in the reservoirs. You are going to recover appreciably more oil, and pressure maintenance will have some advantage anyway, whether it will be economic or not you can't tell until you make a detailed study.

Q My question then would be, do you have any experience with this sort of a project in a reservoir of this type that can carbonate rock of this approximate porosity, and permeability, and in solution ratio at approximately this depth?

A I have had no experience.

Q Then it is your idea? Is it really a theory based on theory or just a guess?

A I think what has been done unless I am mistaken, Atlantic is in about 31 fields in Andrew County, Texas, and is undertaking high pressure gas injections to maintain their oil, to approximately near saturation, possibly, and the preliminary results have been encountered.

Q Can you tell me whether their oil is the same as this oil?

A No, I couldn't.

Q Could you tell me whether the section involved is about the same thing in porosity and permeability?

A No, I don't know anything. As far as I know, they have not released a lot of data to their project. However, I do believe they are successful.

Q Do you believe that is on 80-acre spacing?

A Yes, I believe it is.

Q And do you know what depth that is?

A No, I don't remember the depth. You could get a good idea of the depth because I do remember that they are injecting gas at approximately 3400 pounds and are maintaining a reservoir pressure in excess of 3,000. Now, they are undoubtedly in the 10,000 foot.

MR. NESTOR: No further questions.

MR. PORTER: Does anyone else have any questions of Mr. Hunter? Mc. McGowan, do you have a question?

MR. McGOWAN: No.

MR. PORTER: No further questions. The witness may be excused.

(Witness excused.)

MR. HINKLE: That's all of our case.

MR. McGOWAN: In view of the time, and the apparent consistency on the opinions of the experts, we wish to submit no further testimony whatsoever. I would like to make a very brief closing

statement at the proper time.

MR. HINKLE: If the Commission please, I would like to move at this time that the application of the Tennessee Gas Transmission Company be amended to ask for, in setting up 80-acre proration units the establishment of units to consist of the east half and the west half of each, 160 acre legal subdivision in the producing area. And definite well locations consisting of the location in approximately the center of the northeast quarter and the southwest quarter of each 160 acre legal subdivision.

MR. PORTER: Without objection, the Commission will accept that amendment.

Mr. Hinkle, do you have any closing statement to make?

MR. HINKLE: If the Commission please, I think the evidence in this case, to sum it up briefly, shows that in the area which we would like to have called the Kemnitz area, there has been sufficient wells drilled to show that we have a reservoir that has considerable continuity over several miles, and it is going to be a reservoir of some consequence, which can be compared very favorably with the Townsend reservoir. The Commission and all the operators who had acreage in the Townsend area have had the experience in that area, and if we look back on it, I think if we had to do it over again, it would probably be better for all concerned had that area been developed on an 80-acre basis from the start.

In the end, probably, economically, the operator would have been far ahead and would now probably be in a position to inaugurate

a secondary recovery program which would have in the end recovered more oil than the method under which it has been operating. I think that we should profit by the experience which we have had in that area because as the test shows this is a similar reservoir. It is a reservoir which has all the ear marks of being the same, it is a stratographic trap type reservoir, it is a gas solution drive type of reservoir, it is a reservoir which will lend itself very readily, we think, to secondary recovery. We think that by having definite 80-acre well spacing units, definitely established with definite well location, there will be practically uniform well spacing throughout; and that if it is practical to inaugurate a secondary program it will be greatly facilitated and the recovery will be considerably more than it would be otherwise.

I think we ought also to take into consideration that this entire area is State land, and the State, of course, is interested not in getting the oil out today but over a period of time so that they will get the greatest test recovery, and we think that by developing this whole area on 80-acre with definite well spacing units and definite well location that economically we can recover as much as, or more oil by the drilling of approximately half as many wells; and that the State will be greatly benefited if we are able to inaugurate secondary recovery program in that the State stands to receive, anyway in my judgment, from 25 to 50 percent more royalty by that method than they would otherwise.

I think that time is of importance in this particular case. We have reached a point in the stage of development of this field wherein if something is not done immediately it may be too late to do anything, in that the lease owners will begin offsetting wells which have been drilled on a 40-acre basis, and it may not be practical later on to inaugurate the 80-acre spacing.

For that reason I would urge the Commission to seriously consider this case at the very earliest opportunity, and if an 80-acre proration order is to be entered that it be entered as quickly as possible, and that in the meantime that no well locations be approved until a determination can be made by this Commission as to whether or not they are going to go along with the applicant in this case on an 80-acre spacing basis.

MR. McGOWAN: I will tend to be as brief as possible and I see no point in lengthening the point in which we are in complete agreement. It seems that all the evidence and recommendations support an 80-acre unit, and certainly there is no disagreement on that point.

There are a few points of difference between the two applications in this case; one is whether it will be a temporary or permanent order. We see no advantage whatsoever in a temporary order, to issue a temporary order and then a year from now we have to go through this again. Whether it is needed or not, you go ahead and issue a permanent order, we need to go through this only, and if,

and when, to the extent it is needed, we feel the order should be permanent, and should be changed from time to time if it needs to be but not set up an order that demands continuous study.

The second point of difference is the area. As far as we are concerned, we are presently agreeable to the order of spacing the entire area covered by both applications. There is only one section covered by our application that is not covered by those. Theirs is not covered by ours. If the formation isn't there, nobody is hurt by spacing and if it is there, it should be. Now, the two main points of difference seem to be on the spacing pattern and the well location, and to term them location it is flexible against inflexible. The inflexible spacing pattern will eliminate the necessity in many instances of forcing unitization, maybe it can be unitized, maybe it can't. We don't know where this field is going. It will eliminate that problem. It will allow the operator to drill in the end of his unit which he thinks is the best and therefore recover the most oil rather than to have drilled in a particular spot, even though he knows in advance that it is going to be poor permeability or poor porosity and have a poor well, it might be uneconomical. It will add confusion in that many instances two leases will have to go together, where otherwise they will be 80 acres. We know that many jointly owned wells are not as similar, and easy to operate as solely owned wells are. To go along with that, you have then the flexible or inflexible drilling method that has been pointed

out by their exhibits, and they have gone through obvious possible exaggerations. The only trouble with the Exhibit 18 and 19, if you step on over to the next section, the man who is offsetting that section would be offset the same. So as a logical point I don't think it will do. The same thing will grow to an extent with a fixed pattern, but you have your offset. You don't, you have a well for every 80 acres in the field. Secondly, as we all know from experience, a fixed well pattern will result as soon as you start approaching the edge of the pillar or bad spot in it, and continued application for exceptions which will simply end up with a cluttered well pattern that will take up the time of the Commission and institute proration, and allowable problems because they will all come. This is the type of formation that lends itself to bad and good location on the same 80 acres. The permeability, the testimony shows that permeability varies quite a lot. Your information as you build up will be better known on that, if you will have to drill in a poor permeable part of an 80, you are not going to get the oil from it, but if you can drill in a good part of the permeable it will. It will result in good, to give the flexibility pattern that the operator needs and that we feel should be given in this area.

Now, the other point of controversy is the vertical limits. We see no reason to separate it into a lower and upper Wolfcamp. Everybody is in agreement that any production above what we refer

to as the Townsend zone is a sporatic lensed salvage deal. To separate them you would then add two separate common sources of supply, ultimately you will come into offset problems that this cannot be met, because this is not economical. Both of us agree on that. The only possible reason to separate them would be to keep from perforating both stringers at the same time and damaging one of them. I cannot conceive of a prudent operator who would spend 220 to 250 in drilling a well running the risk of veins of major pay by opening a salvage stringer up the hole. It does not seem possible to us to be feasible. Each well will have to be considered on its own merits, some of them might be commingled, some of them can't.

If the Commission feels that any safeguard is needed in that respect, we suggest that rather than separate them, that the Commission do the usual and establish the Wolfcamp common source of supply, but provide that both stringers will not be opened into the same well bore without the special order on the Commission. That to us is much more logical than establishing two separate sources of supply. We don't feel any protection is needed because, as you say, the owner who spends a quarter of a million dollars is not going to drill it for a few barrels of oil, up the hole. But if that is needed, we suggest that rather than the two common sources of supply. Being partially unfamiliar with New Mexico law and procedure, last night I attempted to read your statutes and I would like to read a very short paragraph. Paragraph B of 65-3-14 of the

New Mexico Statute. It simply says that the Commission may establish a proration unit for each pool, such being the area that can be effeciently and economically drained and developed by one well, and in so doing, in doing this, the Commission shall consider, shall consider the economic loss caused by the drilling of unnecessary wells. The protection of correlative rights, the prevention of waste, the avoidance of augmentation of risk arising from the drilling of excessive number of wells and the prevention of reduced recovery which might result from the drilling of too few wells, that obviously is the determination of the Commission; and we feel that the program of putting on 80-acre unit and allowing the flexibility of unit designation and oil location, which it has been recommended here by Sinclair, and calling the Wolfcamp a common source of supply with such safeguard as the Commission may feel is needed, which we don't feel is, will result in doing just exactly what the statute says shall be considered in issuing this type of order, and certainly will result in the recovery of a great amount of oil. But it will give the operator the freedom necessary to put his well on the spot that will produce the greatest amount of oil from 80 acres that can possibly be recovered.

One other point, in the event that they should be some day put under pressure maintenance unit, the well location obviously will be poor, but a fixed well pattern is not necessarily the best. It might and probably would work the best if a five spot pattern

is used, but if a perimeter pattern, or line drive injection is used, it wouldn't work at all. Further, you are going to have good and bad permeability throughout here. You will have varying porosity throughout, and the characteristics of the well whether it is a good producer or poor producer will determine much more whether it is a producing well or injection well than its geologic location. So we will urge the Commission to set out at the completion, supported by the testimony here, be adopted in your order and be a permanent order subject to such change as time may show it is necessary.

MR. HINKLE: If the Commission please, I would like to make one remark that I overlooked in making. That is, I forgot to mention that correlative rights will undoubtedly be better protected by a uniform well spacing pattern, than it can possibly be otherwise. I think that is clearly demonstrated by the evidence which has been introduced in this case. We have clearly showed a case where any units, 160, 320 or 640 can be completely surrounded by wells and the owner of that lease cannot properly meet the offsets, and consequently, those who have the surrounding acreages are going to get more than their fair share of the oil, and as Mr. McGowan has pointed out, the statute clearly provides that correlative rights is one of the factors to be considered in setting up a proration unit.

MR. PORTER: Does anyone else have a statement to make in this case?

MR. BOYCE: Your Honor, B. M. Boyce, representing Phillips Petroleum Company, Phillips does not have a completed well in the field now, but does own 560 acres within the possible limits of the proposed field. And Phillips supports Sinclair in requesting an order creating a new oil field for production from the entire Wolfcamp formation underlying certain acreage as set forth by Sinclair, and, furthermore, we support the establishment of 80-acres within a given quarter section, of no designated quarter quarter section in which a well must be drilled. We also favor the proposed minimum distance of 510 feet between wells and lease or subdivisions on it.

MR. PORTER: Mr. Motter.

MR. MOTTER: C. Motter, Cities Service. We concur with Sinclair and Tennessee Gas Transmission in the establishment of 80-acre spacing and proration unit for the 80 acres. We concur with Sinclair on the Sinclair unit, to consist of contiguous within the quarter section when there is no decision in which the quarter quarter section in which the well must be drilled.

MR. LORD: Y. A. Lord of Midland representing Shell Oil Company. The applicants in this case are not in agreement on a name, and in place of the names proposed by both of them, Shell proposes that it be called the Hume Permo-Penn Pool. We propose this name because the name Hume refers to a geological feature in the area and because it was used in the designation of the Hume Queen Pool, which

is in the same vicinity. As to the horizontal limits to be defined for the pool, we are of the opinion that an area that includes a reasonable perimeter around the well, which are presently completed would be sufficient. We recommend that the limits adopted do not exceed those that were proposed by Sinclair in their application.

In regard to the vertical limits for the pool available data seems to us to indicate that the major and probably the only commercial reservoir in this area is the lower Wolfcamp, the secondary reservoir occurring in the upper Wolfcamp and also in the Pennsylvanian.

Generally, Shell favors lengthy vertical limits for Permo-Pennsylvanian in sections that contain several pay zones and this without any limitation as to the number of such zones that may be opened into the same bore hole. However, in this present case where apparently in the lower Wolfcamp pay, there is a commercial reservoir that is capable of supporting development independently of any other pay zone. We recognize that it is possible, that damage to this reservoir might result if it were permissible to complete wells with both the lower Wolfcamp pay and one or more of the minor pays opened in the same bore holes. As a solution to what we consider to be the problem, Shell proposes that the vertical limits of the pool include the Permo-Pennsylvanian section extending from the correlative depths of 9650 feet to 11,500 feet as penetrated by the Tennessee Gas Transmission Company, State AA, Kemnitz A No. 1 well,

provided that any well which has been opened to production. That portion of the lower Wolfcamp occurring between the correlative depths of 10,500 feet and 10,900 feet as penetrated by the Tennessee Gas Transmission Company State AA Kemnitz A No. 1 well may not have any other pay zone opened to production. We suggest that the rules provide that this main lower Wolfcamp paying zone shall always be isolated from production by squeeze cementing or other means prior to the opening of any other zone for production. This proposal clearly would be in the interest of conservation, since it would permit the most economic exploration of the non-commercial zones; while at the same time protecting the main reservoir from any possible damage. If Shell's recommendation in this is followed, it will permit common storage of production from the minor and probably non-commercial zones with production from the lower Wolfcamp. The use of common storage facilities for all such Permo-Penn zone would be in the interest of conservation, in that it would increase ultimate recovery first, because it would lengthen the period of production, for production by lowering the operating cost, and second, because it would reduce shrinkage, due to the weathering of crude oil in the tanks, since with purchaser's tanks are required, runs to the pipeline would occur at more frequent intervals. Also, the use of such common storage tanks lends itself readily to automatic operation, which would permit further reduction in operating cost, thus excentuating the benefits just mentioned as well as permitting

a more efficient use of permeability. If on the other hand, Shell's recommendations as to the vertical limits are not followed, then we suggest that it would still be in the interest of conservation for the reasons stated before, to prescribe a rule specifically permitting the use of common storage facilities for all zones in the Permo-Penn Section, provided that adequate means for determining individual well production are available and are employed.

In regard to the matter of spacing, Shell concurs with the applicant in recommending the adoption of 80-acre proration unit. However, in the interest of providing complete equity for all operators in the pool, Shell recommends that the 80-acre proration units be permitted to run either north, south, east or west, provided only that each proration unit contain two contiguous 40-acre tracts; and Shell recommends further that well location be permitted upon either of the 40-acre tracts within an 80-acre unit at any location, not less than 320 feet from the boundaries of the 40-acre tract upon which the well is located.

It is Shell's opinion that today no data in the vicinity of this pool are available to suggest that regularity spacing on 80-acre development will provide a greater sweep efficiency in a reservoir of the type present in the subject pool. In our knowledge, there are no secondary recovery projects active in carbonate reservoirs of this type with similar crude properties, rock properties, depth of pay from surface located anywhere in the Permean Basin. Any discussion of spacing based on the likelihood of secondary re-

covery in the lower Wolfcamp reservoirs here under discussion must be considered highly speculative at this time. Finally, Shell proposes that the rule adopted by the Commission for the Permo-Pennsylvanian pay zones in the Hume area prescribe a limiting gas-oil ratio of 3500 cubic feet per barrel. Early production history in the V T data for the lower Wolfcamp pay zone indicate a higher than normal amount of dissolved gas in solution. Current producing gas-oil rations of 1400 to 1600 cubic feet per barrel are only moderately under the 2,000 cubic feet per barrel limit which is commonly applied to pools in this state. The 2,000 limiting ratio dates back to the early Grayburg-San Andres pool which has solution gas-oil ratio in the range of 400 to 600 cubic feet, and the application of the 2,000 limiting ratio. The pool having a solution gas-oil ratio two or three times as great cannot be supported by either engineering fact or common life. The application of the two thousand limitation gas-oil ratio tends to discriminate against the pool such as the one here under discussion, when compared with other pools in the state. By way of illustration we submit the case approved with a solution gas-oil ratio for 600 cubic feet per barrel where a free gas production of 300 percent in excess of solution gas is permitted before a ratio penalty is imposed as compared to a pool with a solution gas-oil ratio of 1600 cubic feet per barrel where a free gas of only 25 percent is permitted before the imposition of a ratio penalty.

The early adoption of the 3500 foot limiting ratio would facilitate the efficient design of the gasoline plant installations that are necessary to process the gas from the area by permitting a more realistic appraisal of future gas production schedules than could be made if the usual two thousand limiting ratio were adopted and then modified at some future date.

MR. PORTER: Mr. Cusock.

MR. CUSOCK: Mr. Chairman, Jack Cusock, from Roswell, New Mexico. I feel a little strange here, but I represent some individuals. Representing R. S. Anderson, W. D. Anderson, Lloyd Benedict, Earl Lind, C. C. Cate, Jerome West, Himner, H. L. Brown, all of whom own some fractional interest in the area under lengthy discussion. In order to make it short, we back the proposals of the Tennessee Gas Transmission Company.

MR. CLARK: C. H. Clark, Pure Oil Company. We are, in general, in favor of the suggestion made by Sinclair with some minor exceptions. We believe that the lower Wolfcamp should be kept separate in the well bore from the upper Wolfcamp. We have no objection to mingling production from the two zones if some adequate metering devices are included so that you can keep adequate record of the production from the two zones. We are very much in favor of the 80-acre proration units as proposed by Sinclair with the operator having the choice as to the direction in which it is to be run quarter quarter sections, and in which the well is located. There is a requirement, 150 foot right of way from the center of the

quarter quarter or the 330 feet from the lease lines. We have no choice. We believe that the two thousand GOR limit is satisfactory in this case and it leaves some five, six hundred pounds to recover normal operating difficulties. We are in agreement with Tennessee that there is very limited data presently available, and we feel that the order should be temporary.

MR. KELLAHIN: Jason Kellahin representing Samedan Oil Corporation. Samedan Oil Corporation has interest in the area involved in these two applications, and would favor an order for a period of one year for the development of the lower Wolfcamp formation. At the end of a year, the area should be more fully developed and the operator then would have the engineering and geological information on the basis on which the Commission can make the final determination as to the future development of the pool. Samedan feels that there can be no orderly development without a definite pattern of development, and for the protection of correlative rights, and the orderly development of pools favors alternate or staggered 80-acre well locations.

Due to the present state of development of this pool, the locations proposed in the northeast and the southwest of each quarter section appears to be the most practical method of development and would result in the fewest number of non-standard locations. Samedan favors the assignment of allowables on the basis of acreage as provided in all 505 of the Commission's rules and regulations. We take the position that on the basis of the evidence presented

here today, the lower Wolfcamp zone should be isolated for the protection of that zone, and for the purpose of development at the present. This appears to be the only commercial zone in the Wolfcamp with the possible exception of the upper Wolfcamp encountered in the Seaman No. 3 at a depth of approximately 10,142, 10,160 feet. It is probable, or at least possible, that secondary recovery or a pressure maintenance program will be required to achieve the greatest ultimate recovery from this lower Wolfcamp zone. If another zone is opened, such a program would be severely handicapped. Present indications are there is complete separation or at least no communication between the upper and the lower zones. Since this application is for a temporary order we strongly recommend that the lower zones be isolated at least until the additional information is available for the protection of the productive capacity of the lower zone. In view of the known conditions, it is our opinion that to have both the upper and lower zones opened would be detrimental both to primary and secondary recovery.

MR. PORTER: Any more statements?

MR. HAUSE: Wayne Hause, with Ohio Company. The Ohio Oil Company has two oil wells completed in the Townsend pay in this area, and is presently drilling a third well. Based on our interpretation of available information the Ohio is in favor of the Shell's proposed pool rules in this area as opposed to those presented by Sinclair and Tennessee. This includes 80-acre spacing extending the vertical limits to include the entire Wolfcamp at the Pennsylvanian-Cisco Pay

and permitting 330 foot location for the unit boundaries. We have no objection to the limiting gas-oil ratio of 350 foot per barrels in this case. We urge the Commission to avoid any overlap of vertical limits if more than one pool is created in this area.

MR. COLE: R. H. Cole, Tidewater Oil Company, Tulsa. I would like to read this statement. Tidewater Oil Company is owner of leasehold interests in the Wolfcamp area, under consideration today and operator for Hervey Oil Company in the same area, and also owns leasehold interest and concur with the Sinclair recommendations for 80-acre proration units and special field rules for the Wolfcamp area under consideration.

MR. PORTER: Anyone else have a statement?

MR. NUTTER: Principals seems to be agreed on a lot of things and disagreeing on two things. We have had two proposals from each on the name, for a name, and also from Shell, I propose that the Commission have the door open to calling this the West Townsend Pool, if there is too much disagreement.

MR. PORTER: Does anyone else have a statement in this case? Nothing further. The Commission will take the case under advisement.

C E R T I F I C A T E

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 10th day of June, 1957, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

J. A. Trujillo
NOTARY PUBLIC

My Commission Expires:

October 5, 1960