BEFORE THE

Oil Conservation Commission

SANTA FE, NEW MEXICO

August 15, 1956

IN THE MATTER OF:

CASE NO. 1125

TRANSCRIPT OF PROCEEDINGS

DEARNLEY-MEIER AND ASSOCIATES
COURT REPORTERS
605 SIMMS BUILDING
TELEPHONE 3-6691
ALBUQUERQUE, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
August 15, 1956

IN THE MATTER OF:

Application of Sunray Mid-Continent Oil Company for an order extending the Lane-Wolfcamp Pool and establishing the Lane-Pennsylvanian Pool in Lea County, New Mexico, and providing for uniform 80 acre spacing for said pools and providing further for a blanket authorization of oil-oil dual completions in said pools in accordance with Rule 112 (a) of the New Mexico Oil Conservation Commission Statewide Rules and Regulations. Applicant, in the above-styled cause, seeks an order extending the Lane-Wolfcamp Pool and establishing the Lane-Pennsylvanian Pool, Lea County, New Mexico, both to be delineated as follows:

Case 1125

TOWNSHIP 9 SOUTH, RANGE 33 EAST, NMPM	
Section 26:	SE/4
Section 25:	S/2
Section 35:	E/2
Section 36:	All
TOWNSHIP 9 SOUTH, RANGE 34 EAST, NMPM	
Section 30:	SW/4
Section 31:	W/2
TOWNSHIP 10 SOUTH, RANGE 33 EAST, NMPM	
Section 2:	E/2
Section 1:	All
Section 11:	NE/4
Section 12:	N/2
TOWNSHIP 10 SOUTH, RANGE 34 EAST, NMPM	
Section 6:	W/2
Section 7:	NW/4

Applicant also seeks the establishment of uniform 80 acre spacing in both of the above-described pools and suggests that each quarter section be divided into two north-south rectangles and that the approved well locations be in the area within a 150 foot radius of the center of the northwest and southeast 40 acre sub-divisions of each quarter section. Applicant further seeks blanket authorization, subject to objection by the Oil Conservation Commission or offset operators, for parallel tubing string oil-oil dual completions in the above-delineated pools.

BEFORE: Honorable John F. Simms, Jr.
Mr. E. S. (Johnny) Walker
Mr. A. L. Porter, Jr.

TRANSCRIPT OF HEARING

MR. PORTER: The meeting will come to order, please. The next case is No. 1125.

(Mr. Jack Gurley, Attorney for the Oil Conservation Commission read the title of the within case.)

(Exhibits 1 to 15 inclusive marked for identification by the reporter.)

MR. WHITE: If the Commission please, Charles White of Gilbert, White & Gilbert, Santa Fe, New Mexico, one of counsel for the applicant, Sunray Mid-Continent Oil Company. At this time I would like to introduce another attorney representing the applicant. This is his first appearance before the Commission and he will conduct the hearing and put on the evidence. It gives me pleasure to introduce Burns H. Errebo of Tulsa, Oklahoma.

MR. PORTER: Thank you Mr. White. Mr. Errebo, how many witnesses will you have?

MR. ERREBO: We have four witnesses.

MR. PORTER: We would like to swear them all at this time.

(The witnesses were sworn by Mr. Walker.)

MR. PORTER: You may proceed, Mr. Errebo.

MR. ERREBO: If the Commission please, I would like to call Mr. Clarence Symes.

C L A R E N C E S Y M E S

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

DIRECT EXAMINATION

By MR. ERREBO:

Q Mr. Symes, will you state your full name, occupation, and by whom you are employed?

A Clarence Symes, Jr,, District Geologist for Sunray Mid-Continent, Roswell District.

Q Have you read the applications of Sunray Mid-Continent in this matter?

A Yes

Q Are you familiar with the geology of the Lane-Wolfcamp and Lane- Pennsylvanian Pools?

A Yes, I have worked the geology in this area in the Permian Basin for the last 10 years.

Q Have you previously testified before this Commission?

A Yes, sir.

MR. ERREBO: Are his qualifications acceptable to the Commission?

MR. PORTER: They are.

Q Mr. Symes, where, geographically speaking, is the Lane field located?

A The Lane Field is in Lea County, New Mexico, approximately 19 miles north and west of Tatum, New Mexico.

Q Is this field located near any other oil field?

A This field is located about 9½ miles north and east of the Bagley Field which produces from the Devonian and Wolfcamp formations.

Q Do you have an area map showing the location of the Lane Field?

A Yes.

Q Is that the map there on the wall?

A Yes, the first map on the left.

Q Now the Commission has marked this as Exhibit 1. Was this map prepared by you or under your supervision?

A Yes.

Q Will you please state what this map shows.

A This map is located in the general area of the Lane Field and has outlined in red the area covered by the application. The producing wells are circled in red and are the wells which have penetrated the Wolfcamp and Devonian zones. The wells circled in green are drilling wells, or wells which have not been completed to date.

Q Will you identify the wells shown on that map by name and by location and by whether or not they are producing wells or drilling wells?

A As I have mentioned before, the wells shown in red are the producing wells at present in the Lane Field. This well, the Humble #1 State A is located in the center of the northeast quarter of the northeast quarter of Section 11. The Sunray State #1 F is located in the center of the southeast quarter of the northeast quarter of Section 1. The Sunray Mid-Continent State #1 F2 is located in the northeast quarter of the northwest quarter of Section 1, all in Township 10 South, Range 33 East. The other well shown to be producing is the Sunray No. 1-A, located in the center of the southeast quarter of the southwest quarter of

Section 36, Township 9 South, Range 39 East.

Q Will you describe the identity of and the location of the drilling wells shown in green?

A The wells shown in green are the leased State well in Section 2 which is located in the southeast quarter of the northeast quarter and two wells located in the southwest quarter of Section 1 which are the Mid-State wells, and the Sunray well located in the center of the northwest quarter of the southeast quarter of Section 36.

Q Now, Mr. Symes, how far and in what direction from the Lane Field is the nearest Wolfcamp or Pennsylvanian production?

A About 8½ miles south and west in the Mescalero Field.

Q Do you have structural maps drawn on the top of the Wolfcamp pay zone and the Pennsylvanian?

A Yes.

Q Will you indicate them on the map?

(The witness stepped to the maps which were on the wall.)

A The first map, the Wolfcamp Pay Zone, that's Exhibit 2. Exhibit 3 would be the Pennsylvanian.

Q All right. Do you have a cross-section showing the Wolfcamp and the Pennsylvanian?

A Yes

Q Would you just show that?

(Witness complied.)

Q The Commission has identified that as Exhibit 4?

A Yes, sir.

Q Were these two structural maps and the cross-sections prepared by you or under your supervision?

A Yes.

Q Is the information shown thereon correct?

A Yes to the best of my knowledge.

Q Now, Mr. Symes, referring to the two structural maps which have been identified as Exhibits 2 and 3, will you explain what is shown by each?

A Exhibit 2 is a structural map contoured on top of the Wolfcamp Pay Zone. This map is based on the completed wells in the area which are shown in red, and this completed well here (indicating). It is contoured on 20 foot intervals. As you can see by this map the control to the south is fairly good. The control to the north is weak due to lack of well control. However, we have incorporated some of the thinkings of the seismic maps in that area.

Q Is the seismic information which you have confirmed by the information you have to the south?

A Yes. Our structural top is located in this general area and shows a strong dip in this area. This is based on the lower Pennsylvanian formation.

Q Since this information is substantially confirmed by development to the south, you have reason to believe the map is reasonably correct as to the structure to the north, is that correct?

A Yes.

Q And also as to the east, is that correct?

A That's right.

Q Now then on the other map, Exhibit 3, is a structural map contoured on top of the Pennsylvanian. We are using contour intervals here of 20 feet and the structure is pretty much the same

as the Wolfcamp based on the same information. I should point out here that we have one well in this field that is producing from the Pennsylvanian zone and this is shown in red. I also should have pointed out in this map on top of the Wolfcamp pay zone that there are three presently producing wells shown in red from the Wolfcamp zones.

Q Mr. Symes, the elevation shown on those contours, are those sub-sea elevations?

A Yes, sir.

Q. Now with regard to your cross-section, how was that identified, if you will turn that over please, how was the cross-section prepared and what does it show?

A This cross-section--first, I would like to state here, this is a cross-section starting with the Humble well in Section 11 continuing to the north through the 1-F Well, the 2-F State Well, and the 1-I Well.

Q Is this a south-to-north cross-section then?

A Yes.

Q That is using all the available information that you have?

A All available information to date. This cross-section is based on gamma ray neutron logs and all information available on the field to date. In this cross-section we show the name of the well, the elevation, the drillstem tests, the perforations of the initial production. Also shown on the cross-section is the top of the Wolfcamp pay zone, the producing zone, as shown in red. Next is the top of the Wolfcamp water zone which was established by drillstem tests in these wells, shown as water, shown in green. The next line would be the top of the Pennsylvanian and then the

top of the Pennsylvanian pay zone as shown in blue on the cross-section. Here you will see that there has been water established between the two producing zones which indicates separate reservoirs.

Q Was water also found in any of the perforations or on any of Sunray's wells which were later squeezed off?

A Yes in the No. 1 State F Well which was the discovery well, the one right here, we had three sets of perforations in that well in which we produced water, squeezed those off, and perforated at the top of the Wolfcamp zone and completed a water-free well.

Q I notice in the Pennsylvanian zone which you have identified in blue on that Exhibit, that the blue zone is not shown to be continuous to the left, over to the Humble well. Why is that?

A Well, according to our information, this well was not tested in this Cisco zone. Therefore, we don't know whether it is oil-water, or what, so we actually block it off here to show there is no information and we don't know.

Q Does your log information, shown on there which you have examined, indicate the Pennsylvanian is present there?

A Yes. And from the looks of the log, I would say it is porous, or has porosity.

Q Now when the discovery well, which is the New Mexico State F No. 1, was first drilled, how did you distinguish between the Wolfcamp and the Pennsylvanian zones?

A We obtained fossil information from the paleontological laboratory at Midland, Texas which established the age of the Wolfcamp and Pennsylvanian zones which was the actual depth of the well or in the well, and from that information in correlating our

electric and gamma ray neutron logs, we can present a distinct break in all these wells which are correlative.

Q On the State F No. 1 Well, the discovery well, you, as geologist, could not definitely identify the Wolfcamp and Pennsylvanian zones as such from the kicks on the log or from sample information while they were being drilled?

A No.

Q Was the separation of these zones apparent to you without paleontology information?

A Yes, because water was established between them.

Q Once paleontological formation is established, is a geologist able to assemble the other information in the field?

A Yes normally, in this case yes.

Q And that is done by correlating the kicks?

A That is right.

Q Is use of a paleontologist generally necessary in this part of New Mexico to identify geologic formations in wildcat wells?

A In my opinion it is necessary in the Wolfcamp and Pennsylvanian zones.

Q Based on your study in your opinion, are the Wolfcamp and Pennsylvanian formations separate sources of supply with respect to each other and with respect to any other pool in the area?

A Yes since we do have a water zone between them, it indicates the reservoirs are separate. And since the producing wells in the general area are several miles from this field, and in the general area we have some dry holes, we definitely believe we are on a separate structure.

Q With regard to the depth of the Wolfcamp and the Pennsyl-

vanian, what are the approximate drilled depths at which they are found?

A The top of the Wolfcamp pay zone is approximately 9,650, depending on whether you are on structure/or/planes, and the top of the Pennsylvanian producing zone would be around 9,780 or 9,800.

Q Based on your study, in your opinion, are the Wolfcamp and Pennsylvanian formations probably producing through an area designated in the application and outlined in red on Applicant's Exhibit 1?

A Yes. It is my opinion with the information we have available at this time that we could reasonably expect production in the limits shown on our application.

MR. ERREBO: Thank you. If the commission please we would like to offer Exhibits 1 to 4 in evidence.

MR. PORTER: Without objection they will be admitted.

MR. ERREBO: Also, our next witness is a paleontologist and he will be available for any detailed questions.

MR. PORTER: Does anyone have any questions of Mr. Symes?

CROSS EXAMINATION

By MR. MANKIN:

Q Mr. Symes, I am Warren Mankin of the Oil Conservation Commission. It was indicated on your Exhibits 2 and 3 the producing wells at the present time are shown in red. Is that correct?

A The producing wells at the present time, if we could go back to Exhibit 1, yes they are shown in red. These in Exhibit 2 and 3 are distinguished between the Wolfcamp pay zones and the Cisco pay zone wells.

Q Mr. Symes, I call your attention to Sunray's State F2

which you designate as a Pennsylvanian completion. Is that correct?

A That is correct.

Q Is that well not presently carried in the Lane-Wolfcamp Pool?

A I believe--I am not sure of that.

Q In other words there is no Lane-Pennsylvanian Pool at the present time and in lieu of that for proration purposes it is carried in Lane-Wolfcamp Pool.

A Yes it is.

Q Would it be your recommendation that it be changed and put in the pool you requested by name, the Lane-Pennsylvanian, that is the State F 2 Well?

A Yes.

Q The area which you have delineated in both the Wolfcamp and the Pennsylvanian is a fairly large area involving about, between 5 and 6 sections in areal extent. Is that correct?

A Yes.

Q That's shown on Exhibit 1?

A Yes, shown on Exhibit 1.

Q At the present time the Lane-Wolfcamp Pool is only delineated by the west half of Section 1 and the northeast quarter of Section 11. Is that correct?

A And the south half of Section 36.

Q And the south half of Section 36 is presently delineated by the Commission?

A It is producing.

Q But it is not presently delineated by the Commission by nomenclature hearings, is it?

A I couldn't answer that. I am not familiar with that.

Q I believe that only the west half of Section 1 and the northeast quarter of Section 11 are presently delineated by Commission orders. Then you are suggesting a very large delineation of 5 or 6 sections as compared to three-quarters section by delineating the Wolfcamp and the Pennsylvanian. Is that right?

A Yes, sir.

Q As shown by your structural map you feel that would be productive?

A I feel with the information we have it is reasonable to assume that we could expect production in that area.

Q Even though some of the area you have suggested in Sections 7 and 12 and 11 are outside your closed contours on Exhibits 2 and 3?

A Section 7--

Q And 12 and 11.

A And 12 and 11--

Q A portion of that area is outside of your closed contours, is that correct?

A Correct.

Q Do you feel that possibly because the contours might be further expanded in that area, that area might not be productive?

A I believe oil would be encountered, whether economically, I don't know, because this well here is actually producing water and oil.

Q You mean the Humble Well?

A Yes sir.

Q And it is producing from the Wolfcamp?

A Yes sir.

Q How much separation have you found at the present time between the producing interval of the Wolfcamp and the Pennsylvanian, what is the interval between the two?

A I believe around 100 feet.

Q What have you found between the two intervals?

A We have found a water zone between the two intervals.

Q And you have completed one well in both the Pennsylvanian and the Cisco, which is the State I#1, is that correct?

A The State I#1 is the Wolfcamp producer and the State W#2F is the Pennsylvanian.

Q No, the State I#1, would it not encounter both zones, was it not completed in both zones with oil production from both?

A It is my understanding it was.

Q That is the only well completed in that manner?

A Yes, sir.

Q Some of them encountered both the Pennsylvanian and the Wolfcamp in the same camp, but they are only single completions, is that correct?

A Yes sir, that is correct.

Q I note from your Exhibit 1 that there are locations shown for the State I#3 and the State F#3. Have those locations been made and the wells started yet?

A The only well that is drilling in this particular area by Sunray is #2 State I, which is shown in green. These are locations.

Q Locations which have not been submitted to the Commission as yet?

A I am sure that is correct.

Q Do you have knowledge whether the two wells in Section 1 which is the Midstates-Phillips-Lincoln Unit 1 and 2, are presently drilling or are just locations?

A I am under the impression that these are drilling.

MR. ERREBO: I believe there may be a Midstates representative here to day.

MR. STALLINGS: Mr. Stallings, Midland, Texas, Midstates Phillips #1 Lincoln and #2 Lincoln are presently drilling.

MR. PORTER: Thank you, Mr. Stallings.

Q I have one other question, Mr. Symes: Have you been able to determine any information from the Aztec well that is drilling, has it penetrated Wolfcamp/or Pennsylvanian pay?

A I obtained or saw an electric log on that well last night and I haven't been able to go through it fully, but I understand both zones have been drilled through, the Wolfcamp and the Pennsylvanian, and tests have been made and right now I understand the pipe has been set and they are in the process of completing the well.

Q You don't know what zone they are attempting to complete?

A I believe one of their representatives is here.

Q But as yet you have no information as to the tops which would change your picture shown on Exhibits 2 and 3.

A I would say this, in quick calculations made on this well and 1-F, it looked like this well would encounter the Wolfcamp pay zone approximately 15 feet lower than the 1-F here and the Cisco zone would be approximately 20 feet lower. We show on our contours here that it would be approximately, maybe 25 feet lower, and it is actually 15, we missed it by 10 feet.

Q So it is a fairly close interpretation?

A Over here on the Pennsylvanian I believe it looks like about 20 feet lower and I show it here to be about maybe 40 feet, we missed that about 20 feet.

Q So that it is within the ballpark?

A Yes, and it looks like you would expect it to come out, a little flatter than what we show.

Q So it will be a higher structure than you show?

A Yes, sir.

Q Which would make it look even better, is that right?

A Yes, sir.

MR. MANKIN: I believe that is all I have.

MR CAMPBELL: Jack Campbell of Campbell and Russell, Roswell New Mexico. I would like to enter an appearance on behalf of F. J. Danglade, who owns a leasehold interest under the southwest quarter of Section 30, Township 9 South, Range 34 East and J. E. Simmons who owns a leasehold interest under the southwest quarter and the east half of the northwest quarter of Section 31, Township 9 South, Range 34 East, and Mrs. Valleye Hardin who owns a 3% overriding royalty interest under the Simmons lease, and J. C. Ainsworth who owns royalty under the southeast quarter of Section 26, the northeast quarter of Section 35, in Township 9 South, Range 34 East. I would like to ask Mr. Symes if he knows the answer to these questions. I don't know whether they have another witness on the spacing aspects or not or if he is acquainted with the application insofar as it regards spacing. Is he the proper witness to answer those questions?

MR. ERREBO: We have two other witnesses who will testify as to the spacing and the desirability and feasibility of what we

propose here today.

MR. CAMPBELL: Can this witness or you state what you are proposing insofar as the spacing aspects?

MR. ERREBO: Yes, sir, I can state what we are proposing. It is as shown in our application as filed and copies of which were furnished to Mr. Danglade and Mr. Simmons. Our application covers 80 acre spacing for each of the Wolfcamp and Pennsylvanian formations within the areas in red on Exhibit 1 and proposes that each governmental quarter section will be divided by running a north-south line through the center thereof and locating the well for each unit in the northwest and southeast 40 acres of each quarter section with the usual 150 foot tolerance.

MR. CAMPBELL: And you are at the same time requesting exceptions for the locations presently existing?

MR. ERREBO: We are requesting exceptions for those locations on which wells are presently drilled or have been drilling.

MR. CAMPBELL: Thank you.

MR. PORTER: Any further questions, Mr. Campbell?

MR. CAMPBELL: Yes.

CROSS EXAMINATION

By MR. CAMPBELL:

Q I note on Exhibit 1 an area which is delineated by diagonal lines. Will you state what that area is?

A I presume you are talking about the lines within Section 36 and the north half of Section 1?

Q Yes sir.

A This is an area in which a drilling unit was set up for the purpose of drilling the #1-F State in which Sunray Mid-Continent, along with Seaboard and Lion, share in the area in the cost of the drilling.

Q Was that for the original well or all the

Q In other words, the whole contour is based on wells drilled through that bed.

A The completed wells to date, yes sir.

Q And all the wells are either the three clustered there together a half-mile apart or the Humble--

A (Interrupting) it is based on all of them.

Q And those are all that you have information on?

A That is right.

Q What is the contour in the north half of your map of the two pools based on?

A Exhibit 3?

Q Exhibits 2 and 3.

A Exhibit 2 is based on top of the Wolfcamp pay zone in which I showed on the cross-section where we call our correlations and Exhibit 3 is based on the top of the Pennsylvanian.

Q How did you derive the contour in the north half of the pool?

A Up in this direction (Indicating)?

Q Yes, sir.

A I believe in this testimony I mentioned the fact that you would not have well control to the north but with this well control from the south and in the field plus the incorporating of our geophysical information in that area, we show this trend with the high in this particular direction, dipping on the northern direction.

Q In other words you do have a seismographic picture of this area.

A Yes, sir, but we haven't presented it at the hearing.

Q Do you plan to?

A We can, we can prepare one--pardon me, on the seismic picture, these maps show the wells are producing within the, we will say, within 1000 feet of the top of the Hueco or the Wolfcamp pay. The seismic picture is based on the basal Pennsylvanian marks, which are probably two or three thousand feet deeper and quite a bit thinner of course, but it has pretty much the same picture as this with a strong dip in this direction, your contour is high in this direction and dipping in the north again.

Q Your original well was based on the seismic picture?

A Yes sir, and was a Devonian well.

Q Has this Pennsylvanian encountered water pay?

A No sir, no water has been tested to date that I know of unless the well that is in process of completion now may have taken a drillstem test lower than we have here.

Q Where is the bottom of the Wolfcamp?

A The base of the Wolfcamp and the top of the Pennsylvanian occur--I don't have the exact depth here, but the estimated depth is at approximately, oh probably 9,770.

Q In other words, probably the lower level of this green portion on your cross-section is the bottom of the Wolfcamp?

A That's right.

MR. NUTTER: I believe that is all.

MR. PORTER: Does anyone else have any questions?

By MR. MANKIN: Mr. Symes, on your Exhibit 3 which shows the top of the Wolfcamp water zone, that is your oil-water contact essentially then?

A Not necessarily. I believe there is a small interval between this water here and the--well we show maybe it could be 20 feet

or so-- before you could get into the producing horizon of the Pennsylvanian.

Q Then there is an area of the Pennsylvanian that would not be particularly porous and would not be perforated and there would not be a direct contact between the oil and water?

A We had one drillstem test covering that area and it flowed off--in #2 State F--the logs would indicate very little permeability in this section.

Q Which section is that?

A Between the base of the water zone in the Wolfcamp and probably the top of the Pennsylvanian.

Q Which is the white area--

A Shown on the map.

Q --between the blue and green on Exhibit 3?

A That is correct.

Q I have one other question: The question was asked you in regard to this unit between the Seaboard and the Lion and Sunray. It involves two separate leases. Was permission obtained from the State of New Mexico for putting those two leases together?

A I am sure it was. I can't answer the question because I don't have the agreement in front of me.

Q Do you have knowledge of whether any witness here has that information?

A I believe I can get that from my files, I brought them with me, and I will be glad to show them to you.

Q Thank you. That's all.

MR. GURLEY: Mr. Symes, would it be possible for you to submit copies of the agreement to the Commission?

A Surely.

MR. ERREBO: One further question for the sake of the transcript: Mr. Symes, you have used terms Cisco and Pennsylvanian somewhat interchangably during your testimony. Do those terms refer actually to the same formation?

A They do in this case, yes.

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

CROSS EXAMINATION

By Mr. Nutter: Mr. Symes, I note here on your cross-section that you have a dotted line running from a point about 5 inches to the right of the Humble well over to the well. What does that represent there?

A This is the line I believe you have in question, here?

Q Yes, sir.

A A dipped line in the red portion of the Wolfcamp pay zone, since this well was completed with oil and water, apparently your water-oil contact is in here somewhere. We don't know, we were just showing the water in this particular pay zone is up in there somewhere and I don't know where it is.

Q Do you believe that any well might be drilled in this area as outlined on Exhibit 1 by the red line which might be off the structure and penetrating the water zone?

A Yes, from the information on the Humble well, wells that would be drilled below this particular rising would probably encounter water unless there is a tilted water table.

Q Do you indicate that the water table in the Wolfcamp is tilted?

A I don't know.

Q However, the top of the water is higher than the top in another cross-section?

A Well, on a sub-sea basis it would not be so.

Q This cross-section--

A (interrupting) You see, it's on a sub-sea of a "-5300". It was made on that basis.

MR. NUTTER: I believe that's all.

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

MR. ERREBO: With regard to the water which might be present within the areas under consideration in this application, is it not so, or let me state it this way: Is it your opinion Mr. Symes, that oil might reasonably be expected to be found in some quantity throughout the area even though around the edges there might not be enough to justify a commercial well?

A Yes, that is true in this case. This well actually is lower than the countours shown, but it actually is a producing well in the Wolfcamp zone.

MR. MANKIN: I have one final question; in speaking of the Cisco or Pennsylvanian, is it not true that Sunray found gas production in this area from the Pennsylvanian?

A Yes, sir.

MR. MANKIN: And that may be the subject of further development and a further hearing in the future, or at least there is an indication that it will be delineated in the gas production in the Strawn portion of the Pennsylvanian?

A Yes, sir.

MR. MANKIN: That's all.

MR. PORTER: Any further questions of Mr. Symes? If not,

he may be excused. The next witness is Mr. R. V. Hollingsworth.

R. V. HOLLINGSWORTH,

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

DIRECT EXAMINATION

By Mr. ERREBO:

Q Will you state your name and occupation.

A R. V. Hollingsworth, owner and operator of the Paleontological Laboratory at Midland, Texas.

Q Are you a paleontologist?

A Yes.

Q What is a paleontologist?

A A paleontologist is one who works with or studies fossils, the remains of plants and animals, for the purpose of determining a geological age of rocks which I encounter. The fossils are the ultimate basis, the definite criteria by which geological ages are extablished.

Q Have you previously testified before this Commission?

A No.

Q Will you describe your background and education and experience?

A I have a Bachelor of Science in Geology with major work in paleontology, a Master of Science in geology with major work in paleontology, two periods of post-graduate work and ten years experience as a stratigrapher and paleontologist with a major oil company, twelve years in the present connection. I have had about fourteen years experience in southeastern New Mexico and western Texas, geologically.

MR. PORTER: Are there any objections to this witness' qualifications? If not they are acceptable to the Commission.

Q Mr. Hollingsworth, have you made a study of the Sunray Mid-Continent Oil Company New Mexico State #F-1, which has been described as the discovery well in this field?

A Yes, we made an intensive paleontological study of the discovery well in this field.

Q As a result of your study of the State F-1, have you made a report?

A Yes, we made a paleontological report to our client, Sunray Mid-Continent Oil Company.

Q I hand you an Exhibit identified by the Commission as Exhibit 5. Is that your report?

A Yes, this is our report which we made to Sunray Mid-Continent Oil Company.

Q What does this report cover?

A This report covers the age of the formations ranging in age from Wolfcamp down to pre-Pennsylvanian formations. In other words, the Wolfcamp and Pennsylvanian and pre-Pennsylvanian formations.

Q What fossil information did you find pertaining to the Wolfcamp and Pennsylvanian in this well?

A Without detailing the names found in the zone indicated in Exhibit 4 with red, we found an abundance of Wolfcamp-age fossils in this zone, We also found Wolfcamp-age fossils in the zone indicated with green, which is the water zone. In the zone indicated in blue on the same exhibit, the Pennsylvanian pay zone, we found fossils of the Pennsylvanian age.

Q Now with regard to the range chart which is attached to and

made a part of Exhibit 5, does that chart show thereon, have you indicated on that chart, the fossils which are found solely in the Wolfcamp and identified the Wolfcamp as such, and are there shown thereon the fossils which are solely in the Pennsylvanian and indicated as such?

A With reference to the range chart in Exhibit 5, the scientific names of the fossils are given on the left-hand side arranged in alphabetical order. Because of particular interest in this specific instance, in the study of the Sunray Mid-Continent State F-1, we drop down to the "F's", the genus Schwagerina, which occurs only in the Wolfcamp and is not present in the Pennsylvanian. As a matter of fact, the definition of the Wolfcamp in geological time is the base of the range of the genus Schwagerina, that is the world-wide definition of the term Wolfcamp as far as age is concerned. In the "O's" there is the genus Oketaella, which occurs only in the Wolfcamp and we found it in this particular well. I don't know the correct pronunciation of the word either. The genus under D, Dunbarinella, in the Pennsylvanian; the genus Triticites was in the Pennsylvanian and in the Wolfcamp. These two names, as the others do, define groups and in order to delineate the Pennsylvanian from the Wolfcamp by use of these particular ones, one must get down to the type or kind, and in the State F-1 the kind, type or specie of Dunbarinella there was a Pennsylvanian age, was Triticites--those also were of Pennsylvanian age.

Q At this point, if the Commission please, we would like to offer in evidence Exhibit 5.

MR. WALKER: Without objection it will be received.

Q. Then Mr. Hollingsworth, will you state your conclusions

based on the results of this study?

A Based on the results of this study, it is our definite conclusion that the zones indicated hereon in red as the Wolfcamp age/pay zone and the zone indicated at the Pennsylvanian age pay zone are separate and distinct ages, one being Pennsylvanian in age, and the other Permean Wolfcamp in age. They are very separate and distinct zones.

MR. ERREBO: That is all we have.

MR. PORTER: Does anyone else have a question?

CROSS EXAMINATION

By MR. NUTTER:

Q Mr. Hollingsworth, these samples taken from this State well--

A Yes sir.

Q And the calculations for these--are correlated with the others in the electric log?

A That is correct.

Q I think you indicated that the Schwagerina was a good marker for the Wolfcamp?

A Yes.

Q Do you have a marker for the upper part of the Pennsylvanian?

A There is no one fossil commonly found which in itself is a good marker for the upper Pennsylvanian which would be indicated by the generic name, so that one would have to get into the specie or type of name in order to indicate those which are confined to the upper Pennsylvanian. The Dunbarinella on the range chart is known only in the upper Pennsylvanian and the lower Wolfcamp.

Q That Dunbarinella extends into the Wolfcamp?

A It does, but from practical experience its occurrence in the

Wolfcamp in the permean pool is very rare. Its occurance in the Pennsylvanian is fairly common.

Q In other words it is pretty easy to fix the bottom of the Wolfcamp and hard to pick the top of the Pennsylvanian?

A Yes sir.

Q Where did they get the "Thrifty" type of fossil in the Pennsylvanian?

A Thrifty is a group name for rock in central Texas of the uppermost Cisco age. It was named from the little Post Office in Thrifty, Texas, in western Brown County, and I think there is still a little store and Post Office there.

Q I can understand some of the goofey names but "Thrifty" I couldn't see.

By MR. MANKIN:

Q Just one question, was all your analysis based on samples, or were there some cores examined also.

A There were cores examined at a depth from 9,750 to 9,766 in the Pennsylvanian section and we felt the cores gave extremely good material upon which to make an analysis of the Pennsylvanian age for that portion of that well.

Q Most of it however was in the form of samples?

A Yes, sir.

MR. PORTER: Anyone else?

MR. MONTGOMERY: R, F. Montgomery of the Oil Conservation Commission. Due to the orageny going on in this area, what is the possibility that the fossils are transports, that is fossils laid down in this area?

A The rocks indicate no orageny and there is no evidence from

cuttings or corings that any transporting is involved in this particular field.

MR. PORTER: If there are no further questions, the witness may be excused. The next witness is Mr. W. N. Kellog.

W. N. KELLOG

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

DIRECT EXAMINATION

By MR. ERREBO:

Q Will you please state your name, occupation, and by whom you are employed?

A My name is Walter N. Kellog; I am a petroleum reservoir engineer employed by Sunray Mid-Continent Oil Company.

Q Have you ever testified before this Commission?

A No, sir.

Q Please state your background of education and experience.

A In 1948, petroleum engineer graduate of Oklahoma University. I have been employed by Sunray as a reservoir engineer for approximately 6½ years. Presently I am chief reservoir engineer. I am a registered professional engineer in the State of Oklahoma.

Q Have you ever testified before any other state regulatory bodies?

A Yes sir, the Oklahoma, Texas, Louisiana, and Arkansas.

Q Have you made a study of the Lane field involved in this application?

A Yes sir.

MR. PORTER: The Commission considers his qualifications acceptable.

Q Were you present during the testimony of Mr. Symes this morning?

A Yes sir.

Q Based on your studies of this field, do you agree with the testimony which he has given?

A Yes sir.

Q What study have you made or caused to be made of the Wolfcamp and Pennsylvanian reservoirs?

A The studies of the Lane field we have made consisted of individual well drainage calculations and material balance calculations and expected future performance of these two reservoirs under solution drive mechanisms.

Q Mr. Symes has previously testified that the Wolfcamp and Pennsylvanian constitute separate reservoirs by virtue of the water which was found between them. Do you have further evidence of the existence of water in this interval?

A Yes sir, based upon the calculations made from electrical and radio activity logs, the porous intervals in the Wolfcamp formation carry water saturation 20 to 30% higher than the pay section of the Wolfcamp. Also, in view of the core analysis in the porous intervals, it indicates a similar elevated water saturation of 20 to 30%. I interpret these data to further indicate that the two producing horizons are separated by porous intervals that are water producing.

Q Those are the ones you are testifying to now?

A Yes sir.

Q Do calculations of production from these logs show the presence of water as indicated on the drillstem testing to which Mr.

Symes testified?

A Yes sir.

Q And are the calculations from the electrical logs and radio activity logs usually reliable in distinguishing between water and oil-bearing formations?

A As far as I know.

Q These logs are commonly used to aid in distinguishing between oil and water-bearing formations?

A Yes, sir.

Q Do you have a tabulation of data representing the average reservoir characteristics of the Wolfcamp and Pennsylvanian formations which have been marked as Exhibit 6?

A Yes sir.

Q Was that prepared by you or under your supervision?

A Yes sir.

Q Will you please state and explain what is shown on this Exhibit?

A This exhibit is a tabulation of all the known factual data on the individual reservoirs and crude being produced. Probably the most important data shown on this exhibit pertains to the reservoir characteristics. The zones of production, being the Wolfcamp and the Pennsylvanian reservoirs, are quite different as evidenced by the differences in the porosity, permeability, and connate water and original stock tank oil in place.

Q What does this exhibit show as to the differences, what are the exact figures shown there.

A The Wolfcamp reservoir from core analysis has a porosity of 10.5% and the Pennsylvanian reservoir has a porosity of 4.9%; the

Wolfcamp permeability was 373 millidarcies, whereas the Pennsylvanian permeability was 8.7 millidarcies. The connate water calculations made from electric logs indicate the Wolfcamp to have a connate of 20%, whereas the Pennsylvanian has 30%. The original stock tank oil in place, barrels per acre-foot, based on these data, are indicated for the Wolfcamp to be 370 barrels per acre-foot, whereas the Pennsylvanian reservoir has 146 original stock tank barrels of oil per acre-foot.

Q Thank you Mr. Kellogg. Now will you please refer to the exhibit marked No. 7 and identify it?

A This exhibit, Exhibit 7, is a tabulation of the well tests that have been taken in the field.

Q Was this prepared by you or under your supervision?

A Yes sir.

Q Will you please explain what has been shown on that exhibit?

A This exhibit shows the number of completions by reservoirs and testing of the individual wells that has been made. The significant things indicated on this exhibit are the relatively high potentials, the high gas-oil ratio of the one well, Humble Oil & Refining New Mexico State AM #1, completed on the flank of the Wolfcamp structure, making appreciable volumes of water.

Q Will you please refer to Exhibit 8 and identify it?

A Exhibit 8 is a tabulation of the bottom hole pressure data obtained from the Wolfcamp and Pennsylvanian reservoirs in the Lane Field.

Q Was it prepared by you or under your supervision?

A Yes, sir.

Q Will you please explain what is shown by that exhibit?

A This tabulation indicates all of the bottom hole pressure data that has been compiled from the field. You will notice in the right-hand column of this exhibit that there are some bottom hole pressures dated and underlined. I would like to point out that these bottom hole pressures were obtained through the services of a different company than all the bottom hole pressures previously obtained. You will notice in particular that the New Mexico State F #1 Well under test date of August 8th, reported nearly original bottom hole pressures as did the New Mexico State I #1, surveyed July 11 to August 2nd.

Q What was that original bottom hole pressure and in what well was it found?

A The original bottom hole pressure we have found was 3,516 pounds per square inch gauge obtained September 21, 1955, in Sunray Mid-Continent's New Mexico State F Well #1. In the analysis of these later pressure surveys, I believe the differences, or the elevated bottom hole pressure in the New Mexico State F #1 is due to a mechanical difference existing in the bottom hole pressure bombs of the two companies. I cannot conceive how it could build up with continued production. This problem has been encountered in similar conditions in other fields. I believe the only thing to be concluded in the comparisons of these last bottom hole pressures with the previous bottom hole pressures is that the wells were completed in common reservoirs and are of the same or nearly the same bottom hole pressure, and the only thing in doubt at this date is just exactly what is the bottom hole pressure in the Wolfcamp and Pennsylvanian. There appears to be a difference in magnitude of something

over 1%. We intend to obtain additional information to verify the differentiation in the calibration. The measured pressure drop was 37 pounds per square inch, or approximately 1% in the Wolfcamp, whereas in the Pennsylvanian to July 1, 1956, the measured pressure drop was 149 pounds per square inch or approximately 4%. These pressure drops are recorded under State F Well #1 for the Wolfcamp reservoir and the New Mexican State F #2 in the Pennsylvanian reservoir.

Q Mr. Kellogg, you say that the original bottom hole pressure for each of the two reservoirs was nearly the same, or the same, and this Exhibit 8 shows that the Pennsylvanian has slightly the higher pressure.

A Yes, that is normal.

Q It can be expected?

A It is normally higher, yes sir.

Q Now, Mr. Kellogg, will you please refer to Applicant's Exhibit 9 and identify it?

A Exhibit No. 9 is a core graph indicating the core analysis results of the Sunray Mid-Continent Oil Company State of New Mexico F Well #2.

Q By whom has this core analysis been prepared?

A By Core Laboratories, Inc., Midland, Texas.

Q Will you please explain the results of this core analysis as shown in this exhibit?

A This is the reported whole core analysis--by that I mean the total core recovered during the operation was correlated rather than analyzing small plugs. The interval core analysis in this State Well #2 was from 9,620 to 9,805 feet. This analysis indicates

four separate porous wells.

Q How is that indicated on the Exhibit?

A These porous streaks are colored in compatibility with the cross-section. The top porous streak is colored in red and is found from 9,632 to 9,646. This is the horizon of the Wolfcamp interval. The next interval is colored in green from 9,683 to 9,694 feet. Also colored in green is the interval from 9,721 to 9,730 feet, approximately. The bottom porous reservoirs are from 9,771 feet to 9,798 feet, the productive pay interval of the Pennsylvanian. As previously mentioned, the uppermost porous interval and the bottom porous interval are the two productive sections. The center intervals are colored in green and are water bearing as established from drill-stem testing. And it is interesting to point out that they are separated by several feet of dense lime, the Wolfcamp interval was from 9,632 feet to 9,646 feet and has an average porosity of 10.5% and an average permeability of 373 milidarcies.

Q Is that a productive section?

A It is in the Pennsylvanian from 9,771 to 9,798 feet and the average porosity is 4.9% and average permeability 8.7 milidarcies.

Q Mr. Kellogg, I believe Mr. Campbell previously inquired as to the thickness of the pay zones. Would you state what is the average gross and net thickness of each of the pay zones?

A The gross interval of the Wolfcamp is approximately 15 feet of the porous section as shown by core analysis which indicates only a gross interval of 13 feet with a net pay being only 13 feet. The Pennsylvanian section gross interval is approximately 25 feet, is fairly consistent throughout the developed portion of the reser-

voir with a net feet of pay being 18 feet. In the State of New Mexico Well F #2,--we have interpreted--go ahead.

Q Do you have any further testimony in that regard?

A Not in regard to this Exhibit, no sir.

Q Let me ask you one additional question then: Is this core analysis fairly typical of the core analyses you have seen from other wells in this field?

A Yes sir.

Q Then in your opinion based upon your study of this well, other core analyses, the Pennsylvanian and Wolfcamp are separate reservoirs, is that correct?

A Yes, sir.

Q Will you please refer to Exhibit 10 and Exhibit 11 and identify them?

A Exhibits 10 and 11 are performance curves for the performance of the reservoirs of the Wolfcamp and the Pennsylvanian reservoirs for the pressures below the bubble point.

Q Does Exhibit 10, that is, the Wolfcamp Exhibit, and Exhibit No. 11 is the Pennsylvanian,--

A (interrupting) Excuse me--that is correct, yes sir.

Q Were these prepared by you or under your supervision?

A Yes, sir.

Q Will you please explain the meaning of them?

A On these exhibits are the plots of the bottom hole pressures and gas-oil ratio vs. cumulative oil recovery and per cent of recovery for an average well on 80-acre spacing. The bottom hole pressure is indicated on each by an orange line. The gas-oil is indicated on the exhibit by a green line and the estimated reservoir

backed pressure is 200 pounds as indicated across the bottom of the page in a red line. These curves were obtained by solution drive material balance calculations. For purposes of these calculations an 80 acre block was used of average pay thickness of 11.5 feet for the Wolfcamp and 15.5 feet for the Pennsylvanian reservoir. These curves were calculated by assuming a production volume and solving by trial and error the material balance equation for the bottom hole pressure and gas-oil ratios. These curves show the expected oil recovery for the Wolfcamp to be slightly in excess of 70,000 stock tank barrels of oil with a recovery percentage of 20.8% of the original stock tank oil in place. The calculated recovery for the Pennsylvanian is slightly in excess of 40,000 stock tank barrels of oil with 22.5% of the original stock tank oil in place. This shows as would be expected from an analysis, that the Pennsylvanian is the least productive of the two reservoirs and has a smaller reserve.

Q Mr. Kellogg, have you made a study of the economic drilling and developing of the Lane Field?

A Yes sir.

Q Will you please refer to Applicant's Exhibit 12 and identify it?

A Exhibit 12 is the tabulation of the economics of developing the Lane Field on several assumed spacing patterns, both single and dual completions.

Q Was this exhibit prepared by you or under your supervision?

A Yes sir.

Q Will you please explain the significance of the exhibit and what the exhibit shows?

A This is the tabulation of the economics of an average

single completion, assuming an average 40 and 80 acres development in the Wolfcamp and Pennsylvanian reservoirs, and also assuming dual completions between the two reservoirs and development on 40 and 80 acre spacing. For each of these conditions we have calculated the average net operating profit or loss to the operator of the well. This calculation and the results of the calculation are based on the previously introduced factual data as carried in the first two columns under the Wolfcamp and Pennsylvanian reservoirs, the prices used and the results of the calculations are indicated in the fourth line from the bottom of the page. These calculations show that if the Wolfcamp was developed by single completion on 40 acre spacing, probably the net operating loss would be $86,816 per well. If the Wolfcamp were developed on 80 acre spacing an average operating profit of $5,441 would be realized per well. With regard to the Pennsylvanian reservoir, also assuming a single completion, a net operating loss of $123,787 and $71,512 would be realized per well for 40 and 80 acre spacing respectively. Assuming however dual completions between the two reservoirs and development on 40 acre spacing, the average loss is reduced to $55,822 per well. The extreme right-hand column on Exhibit 12 shows that 80 acre development with dual completions will return an average net operating profit of $87,304 per well.

Q Mr. Kellogg, with regard to the net profit and loss to the operator for single completion development in the Pennsylvanian for 40 and 80 acres, I believe you stated that was a profit--that is a mistake isn't it?

A In the Pennsylvanian?

Q Yes, will you repeat that as it should be?

A Well, development by dual--

Q (interrupting) by single completion of the 40 and 80 acres in the Pennsylvanian.

A The 40 acre well by single completion on the Pennsylvanian should read $123,787 and $71,512 respectively for 40 and 80 acre spacing, loss per well.

Q That is what the Exhibit shows?

A Exhibit 12 does show that.

Q That is based on the economic study?

A Yes.

Q Did you consider the Pennsylvanian to be a marginal zone?

A Yes, sir.

Q Also based on the economic study, the only way an operator can afford to develop his property in this field is by drilling on 80 acre spacing and dually completing his wells. Is that correct?

A Yes, sir.

Q Have you made a study of this field to determine the amount of acreage being drained by the present wells?

A Yes, sir.

Q Please refer to Exhibits 13, 14 and 15 respectively and identify each of them.

A Exhibit 13 shows two equations which were used in calculating the area drained by a well where a reservoir is above the bubble point. Exhibit 14 shows the actual area being drained effectively by the New Mexico State F Well #1 completed in the Wolfcamp reservoir, and Exhibit 15 shows the actual area being effectively drained by the New Mexico State F Well #2 completed in the Pennsylvanian.

Q Was each of these exhibits prepared by you or under your supervision?

A Yes, sir.

Q Would you describe what your study of this drainage consists of, what it is based upon, and what the exhibits show in that regard?

A The study consisted of an analysis of the New Mexico State F #1 completed in the Wolfcamp reservoir and the New Mexico State F #2 well completed in the Pennsylvanian. Both of these wells have sufficient production and pressure data to permit such analysis. The basis of the study is the normal pressure behavior of an under-saturated crude or the study of a rewervoir, of the pressure and production performance of a reservoir before the bubble point. In order to construct these exhibits, the equation on Exhibit 13 was used--

Q (Interrupting) You mean in Exhibits 14 and 15?

A Yes, sir. In order to construct Exhibits 14 and 15, the equations on Exhibit 13 were used. The area of drainage for the normal expansion of this under-saturated crude was assumed to be increments of 40, 80, 160, 320,640 and the pressure performance with production was computed. Superimposed upon these calculated performances for incremental drainage is the actual pressure and cumulative production performance of the State F Well No. 1 in the Wolfcamp Horizon and on Exhibit 15 is the plot by use of a heavy line showing the performance of the New Mexico State F No. 2 in the Pennsylvanian reservoir.

Q Then, referring to Exhibit 14, this exhibit then shows the actual performance of the State F No. 1 which is completed in Wolfcamp, is that correct?

A Yes, sir.

Q And the solid lines on the exhibit show the State F No. 1 is actually drained in excess of 2,560 acres, is that correct?

A Yes, sir.

Q On Exhibit 15, the solid lines represents the performance of the State F No. 2 Well completed in the Pennsylvanian, is that correct?

A Yes, sir.

Q Does this line show the State F Well No. 2 is effectively draining 640 acres in the Pennsylvanian?

A Yes, sir.

Q How accurate are the performance curves?

A Based on laboratory and production data, and bottom hole pressure data, in my opinion these calculations are at least 95% correct.

Q At least 95%? A Yes, sir.

Q Does it therefore follow from this testimony that one well on 80 acres will recover as much oil as two wells on 80 acres?

A Yes, sir.

Q And will unnecessary wells be drilled if 40-acre spacing is adopted for a Wolfcamp and Pennsylvanian?

A Yes, sir.

Q How many?

A I reviewed the exhibits 2 and 3 and estimate the minimum of twenty-five unncessary wells would have to be drilled to develop these two wells on 40-acre spacing, assuming dual-completions. If single completions were permitted to be done, it would be something like twice that, or fifty unnecessary wells. Based on the estimate of twenty-five unncessary wells, it appears the cost of the operator would be approximately $5,000,000.

Q That is under dual-completion?

A Dual-completion, and twice that for single completion.

Q Or in the neighborhood of nine to ten million dollars, you figure?

A That is correct.

Q Is your estimate of the minimum number of unnecessary wells which would have to be drilled, that's a pretty conservative estimate, isn't it?

A It would be conservative by using the maps that we have as exhibits.

Q In other words, you wouldn't count the wells out toward the very edge of the structure?

A No, sir, I wouldn't go into that.

Q Then, is it your opinion that economic waste would occur if 40-acre spacing is adopted?

A Yes, sir.

Q Based upon your studies, is it your opinion that 80-acre spacing will constitute an area which will be economically and efficiently drained by one well?

A Yes, sir.

Q Is it your opinion that a 40-acre spacing pattern will unnecessarily increase the production costto all the operators in the area?

A That is correct.

Q What is the average capacity of the Wolfcamp formation as compared to the Pennsylvanian - - capacity to produce?

A The average capacity of the Wolfcamp reservoir from the core analysis indicates the Wolfcamp average capacity of 5,110 millidarcy feet. The Pennsylvanian reservoir appears to have an 87 milli-

darcy feet average. This means the Wolfcamp has approximately fifty-nine times the capacity produced as the Pennsylvanian reservoir.

Q If dual-completion is not permitted and if both zones are commingled, would you expect a pressure differential to exist between the two zones?

A Yes, sir. Under commingling with the Wolfcamp reservoir having a much higher capacity, the pressure would be expected to fall faster due to higher ability to produce and would reach an earlier stage of depletion sooner. The earlier stage would in turn subject the Pennsylvanian to greater and larger pressure differential and would cause gas to come out of solution inefficiently and there would not be an efficient displacement medium to the Pennsylvanian oil.

Q By that,you mean that this gas which comes out of place inefficiently would not be properly used to move the oil out of the formation?

A That is correct.

Q Therefore, at least a part of that oil would be left in the formation and not recovered in the primary depletion, is that right?

A Yes, sir.

Q If gas is inefficiently produced from the Pennsylvanian,does that mean oil would be left in the Pennsylvanian which would be otherwise recovered if those zones were separated by dual-completions?

A Yes, sir.

Q Therefore, is it your opinion that waste will be prevented if dual-completions are permitted?

A Yes, sir.

Q What effect will dual completions have on existing correlative rights?

A No effect whatsoever as they would be protected.

Q What effect will the commingling of these zones have on correlative rights?

A Under certain conditions commingling could cause correlative rights not to be protected.

Q Under what circumstances might correlative rights not be protected?

A As an example, we could assume that one operator on an adjacent lease, or on a lease, had only one horizon. The off-set operator possibly in an adjacent well could have two producing horizons with the wells both having the same allowable, the operator having only one horizon could deplete his reservoir faster and cause a bottom hole pressure sink to develop around the well.

Q It would deplete faster because he would have fewer reserves because of the one formation?

A Yes, sir, whereas the operator on an offset lease would have two horizons and no reserves and with the same allowable and the operator with the two reservoirs would be subjected to drainage due to the faster depletion of the offset operator's leases and the

pressure sink created by the offset operator.

Q Is it possible that Pennsylvanian oil under the well which had both zones present, and which was open to both zones, is it possible that Pennsylvanian oil could be produced through that zone, through the Wolfcamp formation and then produced by the adjoining operator who never had that oil under his lease?

A It would be an extra possibility, it is not likely. A more likely possibility would be that the Pennsylvanian oil in that instance would change the Wolfcamp oil and displace the Wolfcamp oil to an offset operator.

Q Have you made a study to determine whether or not pressure maintenance by water or gas injection into these reservoirs would be feasible?

A No, sir, but we are in process of collecting data on each of the individual reservoirs to make such a study and intend to keep these reservoirs under continuous observation.

Q Is it necessary that these reservoirs be kept separate if a study of pressure maintenance is to be made?

A Yes, sir, it is most important that they be kept separate for the purpose that additional data has to be gathered on each of these separate reservoirs.

Q Based on your general knowledge of pressure maintenance in other fields and on your knowledge of this field, do you think there is any possibility that these reservoirs might be susceptible to

pressure by maintenance after all the data is in?

A I think there is a good possibility, personally. We haven't evaluated the wells.

Q What spacing do you recommend for the Wolfcamp and Pennsylvanian formations?

A I recommend 80-acre spacing for both the Wolfcamp and Pennsylvanian reservoirs with two rectangular units to be formed by a line running north and south through the center of each quarter section with the permitted wells located in the center of the northwest and southeast 40 acres of each quarter section with a 150 foot tolerance towards the center of the unit.

Q Are there any wells drilled or drilling at the present time which are off pattern - - you can refer to the maps on the board if you wish.

A Yes, there are two wells in the Wolfcamp reservoir - - the Humble well, and the presently drilling Midstates Phillips well. The Humble well is located in the center of the $NE\frac{1}{4}$ $NE\frac{1}{4}$, Section 11, and the Midstates-Phillips in the center of the $NE\frac{1}{4}SW\frac{1}{4}$ of Section 1. In the Pennsylvanian reservoir there are two wells, one of which is off pattern. It is the Sunray-Midcontinent State of New Mexico F No. 2, - - it is colored in red, and again the same Midstates-Phillips well is located in the NE and SW quarters of Section 1.

Q Is it your opinion that the development of the Wolfcamp and Pennsylvanian on 80-acre spacing and the drilling of dual com-

pletion will prevent waste of oil and gas, prevent the drilling of unnecessary wells, recover the greatest amount of oil and gas, and protect correlative rights?

A Yes, sir.

MR. ERREBO: At this time, I would like to offer Exhibits 6 to 16 in evidence.

MR. PORTER: Without objection, they will be admitted.

MR. ERREBO: That concludes our testimony.

MR. PORTER: We will recess the hearing until 1:30 this afternoon.

(The hearing was recessed at 12 o'clock noon, and reconvened at 1:30 P. M. before Mr. Porter and Mr. Walker).

MR. PORTER: The meeting will come to order, please. Mr. Errebo, are you through with direct examination?

MR. ERREBO: Yes, sir.

Q Does anyone have any questions of Mr. Kellogg?

CROSS-EXAMINATION

BY MR. MANKIN:

Q Mr. Kellogg, is there an established p.t.d. analysis of the Wolfcamp oil, and of the Pennsylvanian oil in this field?

A No, sir. A bottom hole sample was obtained and the results indicated under the Wolfcamp on Exhibit 6 from the Sunray State of New Mexico AF Well No. 1 in the Wolfcamp horizon and the similarity

in the gravities of the crude in the original gas-oil ratio, we just used the characteristics for the Wolfcamp for the Pennsylvanian oil.

Q Then, actually you had no bottom hole pressure for the Pennsylvanian?

A Actually, no.

Q That was my question, since apparently the bubble point you assume was the same on both as shown by Exhibit 6, is that correct?

A Yes, sir.

Q And the same is true with the solutions of gas-oil ratios of 1,638?

A Yes, sir.

Q So there were several items where you had no bottom hole sample on the Pennsylvanian where you used some of the data from the Wolfcamp?

A That is correct.

Q Do you feel that it would be true, or do you feel maybe if you got a sample there might be somewhat of a difference?

A I believe it would be slightly different. I don't believe there would be an appreciable difference between the two oils.

Q On your Exhibit 9, you showed from the core graph the Wolfcamp shown in red and you showed at the bottom in blue the Pennsylvanian - - were those the two water zones in the Wolfcamp horizon?

A Yes, sir, in the Wolfcamp horizon.

Q I believe you made a recommendation, did you not, for 80-acre

spacing in both the Wolfcamp and Pennsylvanian pools?

A Yes, sir, that is correct.

Q And you recommended that the wells be drilled in the NW and SE¼'s of the excepted quarter section?

A Yes, sir, with the 150 foot tolerance.

Q Would you be agreeable to having some provision in the order for administrative approval where the Commission might grant that, where the tolerance might necessarily be more than 150 feet, if all the operators could be notified, rather than having another hearing?

A I would be agreeable to that.

Q Also, I believe you made a recommendation that the E½ and the W½ of each quarter section would be the 80-acre unit assigned to a well, is that correct?

A That is correct, yes, sir.

Q If you will note in Exhibits 1, 2,and 3, in the S½ of the area to be leased, there are several leases, particularly Phillips, British Empire, all in the N½ of Section 12, and units that would be either in the N½ or the S½ of the quarter section - - do you feel a hearing would be necessary for that operator to develop his properties so he wouldn't have to communitize?

A I would prefer that, Mr. Mankin, for the reason that it is better to have a uniform spacing and a uniform orientation of your developing units rather than leave it to the selection of the operator.

Q Could not the well be drilled in the NW and SE¼'s and still assign the north or south half of the section, and still have a proper pattern?

A That would be the way to do it.

Q But that would be your selection, if properly drilled - - it's not too important whether the north or south half - - do you think that would be satisfactory if the operator finds himself in that position, rather than having another hearing, by similarly notifying the other operators in the field, similar to the tolerances that I have mentioned?

A I think so, yes, sir.

Q Likewise there has been an area outlined on Exhibit 1 which was to be spaced, which would cover portions of about five of six sections?

A Yes, sir.

Q If the Commission saw fit/ to, because/of a structural interpretation, to cut the area down slightly to meet more fully the area actually covered, do you feel that would be proper, to be cut down slightly around the corners, to be more in line with the actual productive area that might be encompassed?

A I don't see - -

Q (Interrupting) I might point out that was similarly done in the Dean-Devonian-Pennsylvanian Pools - - I just wondered if you would be agreeable to something similar to that, if the Commission

saw fit?

A I personally,at this time,don't see anything wrong with that at all, Mr. Mankin.

Q Ordinarily the spacing of an area - - is not ordinarily the spacing and nomenclature set up on the basis of actual wells drilled?

A That is correct.

Q Then you would be agreeable to a slight reduction if it were deemed necessary?

A Yes.

Q And, at some future date it could be extended if the situation were changed?

A Yes, sir.

Q I believe you also recommended that wells currently drilled or completed that were off pattern should be given an exception?

A Yes, sir.

Q And I believe to relate those again, it was the Humble Well in the Wolfcamp, is that correct?

A Yes, sir, the well located in Section 11.

Q And you also mentioned Midstates Phillips Lane Unit No. 1 as a possible Wolfcamp exception. Was not that particular well designated to go to the Strawn which might be an exception to either the Pennsylvanian or the Wolfcamp?

A I am not familiar with the anticipated total depth, but it would be an exception if it was completed in either reservoir.

Q I believe you spoke of only one well as an exception, because No. 2 was on the pattern, is that correct?

A Yes, that would be the southernmost well of the Midstates, the No. 2.

Q Yes. I wanted to get straight again what you thought the gross net pay of the Wolfcamp and the Pennsylvanian is. Did I understand the gross pay of the Pennsylvanian is 15 feet and 13 feet of net pay, or is that based on one well?

A That is in this Exhibit 9, but the gross and net pay of the Wolfcamp appear to be very close. The gross section is fairly consistent and the net pay does vary, of course, between the various wells. The gross section which is fairly consistent for the Pennsylvanian reservoir is approximately 25 feet, but again the net pay tends to vary between the wells.

Q I believe you indicated there was about 18 feet net pay in the Pennsylvanian, and at least 25 feet gross, is that correct?

A Yes, sir.

Q Let me ask you, what the consistency is of the pay sections over the field as now known in regard to the Wolfcamp. Has it been rather consistent in the development over the field insofar as - - is there good development so far in all the wells drilled, except possibly the Humble Well?

A The net pays as we have picked them for all of the development for the Wolfcamp have been for the Humble AM Well No. 1. We

have picked 9 feet of net pay for the Wolfcamp; the Sunray-Midcontinent FW No. 1, we have picked 10 feet of net pay; the Sunray-Midcontinent F No. 2 in the Wolfcamp, we have picked 12 feet of net pay - -

Q (Interrupting) Before you go on, the 12 feet pay is behind the pipe at the present time?

A That is correct.

Q Go ahead.

A -- and in the New Mexico State I Well No. 1 completed in the Wolfcamp, we have picked 14 feet of net pay. These were net pays picked from the primary electric laterals, and the primary logs.

Q Would you indicate the net pay of the Pennsylvanian?

A Yes, sir, the net pay of the Pennsylvanian reservoir, we have an estimate of 11 feet of porous section for the Humble AM Well No. 1, located in Section 11, with Sunray-Midcontinent F No. 1, we have picked 15 feet of net pay, and in the Sunray-Midcontinent F No. 2, we have picked 18 feet of net pay, and Sunray-Midcontinent I No. 1 Well, we have picked 20 feet of net pay.

MR. MANKIN: Thank you.

MR. PORTER: Does anyone else have a question?

CROSS-EXAMINATION

BY MR. NUTTER:

Q I would like to ask a question or two. Mr. Kellogg, I

note on Exhibit 1, your plat of the area in general, that your State F No. 1 Well has 5½ inch casing, your No. 2 has 7 inch casing, and the State I No. 1 has 7 inch casing.

A I believe that is correct, yes, sir.

Q What provision did you make for dual completion with parallel strings of tubing in the State F No. 1 with 5 inch casing?

A I don't believe we would attempt to do a dual completion.

Q You don't think it could be dually completed?

A No, sir, not under the request that we have made to the Commission. If it were, it would have to be small tubing strings, and it seems unlikely that that request would ever be made.

Q On your Exhibit 6, you indicate that the porosity for the Wolfcamp is 10.5%, and for the Pennsylvanian 4.9%. How many wells are those porosities based upon?

A The porosity for the Wolfcamp was based on the core analysis shown as Exhibit 9, and the porosity for the Pennsylvanian reservoir is based upon the porosity indicated in Exhibit 9, and also a core analysis for the New Mexico State F Well No. 1.

Q Do you know what the individual porosities were on those two wells?

A Yes, sir. The porosity for the State of New Mexico F Well No. 2 in the Pennsylvanian reservoir was 4.6% for a section of 20.7 feet in length that was analyzed. That is net feet of length that was analyzed. And for 6.3 feet of permeability section in F No. 1,

we had a porosity of 6.1%.

Q I presume that your permeability is based on the same wells?

A It is based on the same two wells.

Q What is the permeability for the individual wells?

A The permeability for the New Mexico State F No. 2 is 4.33 millidarcies and for the short interval of F. No. 1, that was recovered and analyzed, it is 23.6 millidarcies.

MR. NUTTER: I believe that's all.

CROSS-EXAMINATION

BY MR. CAMPBELL:

Q Mr. Kellogg, the questions I would like to ask relate only to your proposed fixed spacing pattern, and not to the dual aspects of the case. When was the first well completed in either field, is that your No. 1 on December 12th, 1951?

A That is correct. It was in December, but as to the date -

Q (Interrupting) That is on your Exhibit 1. You don't show the completion date on the No. 2 Well. Could you give me that on the No. 2 Well in the NW¼ of Section 1?

A The completion date of the New Mexico State F Well No. 2 is carried on the well completion report of April 3, 1956.

Q Can you tell me why you didn't choose to locate that well in the NW¼ NW¼ of Section 1?

A I have no explanation for that. The location was staked

and we were drilling prior to any evaulation that was made of those reservoirs. That well, as I recall, the rig moved off the No. 1 Well to the No. 2, and the production and engineering department had not had time - -

Q (Interrupting) Do you think that you did not locate in the NW¼ of Section 1 because of the structural position?

A I am sure in the case of the Sunray Midcontinent, we had enough data to know, but as to why Midstates chose their location, I couldn't venture a guess.

Q The entire production history of the field has taken place since December 12, 1955?

A Yes, sir.

Q A period of some seven or eight months?

A That is correct.

Q The accumulated oil production from the Wolfcamp, 50,000 barrels, and the Pennsylvanian, 17,000 barrels, according to Exhibit 6?

A Yes, sir.

Q And you have taken, [illegible], as I understand only one core analysis in the Wolfcamp, is that correct?

A That is correct.

Q And do you believe that based upon that relatively short history and the fact that you have taken only one core for analysis purposes, and only produced 50,000 barrels in the Wolfcamp, and 17,000

in the Pennsylvanian that you have sufficient data on which to base your calculations and conclusions that you have made here today?

A Yes, sir, everything that I believe we have done has been accepted industry standards. Our solution drive calculations, we have analyzed the logs in comparison to the Wolfcamp to determine, in the matter of porosities,we find a fairly good agreement of the unilateral logs and porosity in the other two wells, and I believe the conclusions we have stated are logical and reasonable.

Q The original reservoir pressure you show as 3,930 pounds in the Wolfcamp, what is the present reservoir pressure?

A That question, I attempted to cover this morning in the statement that I am not exactly sure what it is, the resevoir pressure at this time.

Q I realize you have some differential, but what is your opinion as to the present reservoir pressure - - which of those figures do you feel is correct?

A There is about 1% differential between them, and I personally believe that the former pressures, those not underlined, are probably the ones that are going to be correct.

Q You consider that, considering the amount of production you have had, that the reduction of pressure is alarming at all?

A With the production we have had in the Wolfcamp reservoir, and not considering the New Mexico State I Well, the performance has been rather normal, that is we have to make one basic assumption,

that the Pennsylvanian oil has near the same bubble point as the Wolfcamp. And the only energy in the under saturated crude is the latent possibility of that oil, the associated connate water and rock, and it is unknown at this time.

Q With regard to that bubble point pressure at 3405, and the reservoir pressure in the Wolfcamp, that is 3405?

A Yes, sir.

Q Do you think you have enough drainage to make the calculations you have made with reference to the reservoirs and drainage area, and so forth?

A Yes, sir.

Q Have any interference tests been conducted?

A No, sir, not to my knowledge.

Q With regard to the permeability and porosity you indicate on your Exhibit 6, those are, of course, averages from the information you have available, is that correct?

A That is correct.

Q Could you give us from Exhibit 9 some indication of the range of permeability in the Wolfcamp reservoir?

A I believe on Exhibit 9, the lowest permeability I believe is 15 feet at 9636.6 to 9638.1, 15 millidarcies. The highest permeability indicated is at 9639 feet to 9641 feet, of 1,390 millidarcies.

Q Is that a considerable range of permeability or not?

A Yes, sir, it would be a considerable range.

Q With regard to the Pennsylvanian formation, it appears from your Exhibit 9 that the permeability in certain portions of that Pennsylvanian zone is very low, doesn't it?

A Yes, sir.

Q If that condition of low permeability in the Pennsylvanian and the wide range in the Wolfcamp is general throughout the reservoir, might it not have some effect on your conclusions as to the number of wells it might be necessary to drill to eventually drain this reservoir?

A Would you state that again?

Q With the wide range of permeability in the Pennsylvanian and the Wolfcamp, if it is as low or lower in other areas than appears to be on this particular analysis, would that not have some bearing upon the general conclusion as to the number of wells required to efficiently drain the reservoirs?

A It would have some bearing on it. As I pointed out, generally speaking, it has some permeability function and porosity, and even though we have two court houses, the porosity calculations on the full wells that have penetrated the reservoir to this time don't vary too widely with any individual reservoir.

Q With regard to your economic study of this reservoir, I note that you have used a figure for average net pay thickness that is

less than you gave us in your general testimony. How did you arrive at these thicknesses used in your economic study?

A That thickness for the economic study was arrived at in order to get a semi volumetric with the limited data we had just scaled the distance from the lowest net sand to the Humble well, and in both the Wolfcamp and Pennsylvanian reservoirs, and in both cases, the thickest net pay was in the Sunray Midcontinent I No.1 Well. We attempted to weigh it volumetrically.

Q With regard to your recovery factor of oil in place, how did you arrive at the figures 20.8 and 22.5?

A That was arrived at from the solution drive computations and material balance computation shown on exhibits 10 and 11. You will notice across the bottom of the page of Exhibits 10 and 11, where the red line intersects the horizontal line, the bottom hole pressure line, that was what we considered.

Q Would the rate of production have an effect on that?

A It could have if there was not any proration, or anything like that.

Q What rate of production do you propose to recommend in the event 80-acre spacing is approved?

A I believe in our discussion of that the more or less practical 80-acre spacing allowable.

Q The Statewide 80-acre allowable?

A Yes, sir.

Q It would be more or less one 40-acre unit in excess of the normal allowable, the wells are now producing, is that correct?

A Excuse me?

Q The present wells provide that you are given one allowable with one deep well factor and to that is added the one 40-acre, the deep well factor.

A I'm not familiar with that. I believe the norm would be one 40 for this depth, plus a fraction of - -

Q (Interrupting) Yes, you would have a one-third increase in the production.

A Yes, sir.

Q Based on your study of this reservoir and the possibility of the well's recovery factor, do you believe this field can be efficiently drained and efficiently produced at a rate in excess of the present rate of production?

A I don't believe the rate is that critical.

Q Do you believe again, do you have enough information in this reservoir to make that conclusion?

A Well, that has been the conclusion from my studies, yes, sir.

Q Just a few questions about the fixed pattern you are proposing. You understand, I assume, that if the arrangement outlined in red on Exhibit 1 is determined to be the pool for the purpose of this order and fixed pattern spacing is established as you recommend, that not only one of the wells drilled in that area but within a mile

of the boundaries of that area would be on a fixed pattern. Do you feel that is proper or fair to the other operators?

MR. SELINGER: If the Commission please, I hate to object but it is a general rule of the state, and whether operators are agreeable or not, it is the general rule. The rules require that all wells within a mile have to be in accordance with those rules.

MR. CAMPBELL: I know that. I'm asking what he thinks about the effect of this, if you have a fixed pattern and are within a mile of the area delineated there?

A I fail to see how that would materially affect an operator, particularly, I could see no effect outside of the boundary as that would probably have to be on some other structure if our geological structure is correct, and I don't believe any serious hardship would be caused to anyone.

Q As the field development stands now then, you will have two exceptions in the Wolfcamp,and two in the Pennsylvanian?

A That is correct.

Q That is at the outset? A Yes, sir.

Q Are you aware that there has been a permit to drill issued in the SW¼ of the SW¼ of Section 31, Township 9, Range 34 E?

A No, I'm not aware of that.

Q With regard to your general field picture, and referring you to the area in the NE corner of your contour in this Section 3 area,if your contour is correct, and perhaps modified by the Aztec

Well, as indicated this morning, it is apparent is it not, that the person owning a lease in the SW¼ of Section 30 is going to be hard pressed to comply with the fixed spacing pattern and still get a well, even though he might get a well in the SW¼.

A That would require the location to be in the NW of the S½ of the SW.

Q Your pattern would? A Yes.

Q I presume you would just require him to come in and ask for an exception?

A Yes, sir.

MR. CAMPBELL: No further questions.

CROSS-EXAMINATION

BY MR. MANKIN:

Q Mr. Cambell asked you a question in regard to the location in the SW¼ of the SW¼ of Section 31. If there has been a well started there, and drilling as of this date, would it be additional exception over what you have already listed?

A Yes, sir. I was not aware of it, I believe that is the general way.

Q If it was actually drilling on this date?

A Yes, sir.

MR. CAMPBELL: If the Commission please, no order has been issued in this case and if no order has been issued, I presume

the state rules are applicable.

MR. ERREBO: I have a question of Mr. Campbell -- Mr. Campbell, I believe you asked the witness if he was aware that a permit had been issued on the Sunray acreage - - who has issued it?

MR. CAMPBELL: The U.S.G.S., it's a Federal lease.

MR. ERREBO: Has permission been asked of the Oil Conservation Commission?

MR. CAMPBELL: Well, the Oil Conservation Commission normally is not asked about those things. They get a copy of it. It is on Federal Government acreage and they pretty well call the shots. It is 330 feet from the west line and 660 from the south. I assume they have commenced drilling.

MR. PORTER: But you say the location has been approved?

MR. CAMPBELL: Yes, sir.

CROSS EXAMINATION

By MR. NUTTER:

Q Mr. Kellogg, due to the wide difference in the permeability of these two zones in the Wolfcamp and the Pennsylvanian, in the event the Commission should not be convinced that 80 acre spacing is appropriate for both, would it be helpful if you got 80 acres for one and 40 for the other?

A I would have to do a little figuring on that, if you please, sir. Right off hand I would venture a guess that it wouldn't help very much, I just don't believe it would help a great deal. I believe -- well, we could look at this economically -- No, sir, it wouldn't help. We would be applying $5,000.00 profit against $71,000.00 loss.

Q And you wouldn't get any relief, then?

A No, sir.

MR. NUTTER: That's all.

CROSS EXAMINATION

By MR. MANKIN:

Q I might ask, Mr. Errebo, will the other witnesses discuss the dual completion facilities?

MR. ERREBO: Yes, sir.

Q I have just one question: Have you found in the development of the Pennsylvanian over the area that has been developed, that the Wolfcamp is pretty good in development, too, in other words, is it too erratic from a porosity and permeability and producing standpoint?

A It is quite good from the standpoint of permeability. We

have only one courthouse for porosity, but it is quite uniform.

Q Would you say the same thing for the Pennsylvanian, that it is quite uniform?

A The porosity is not quite as uniform as I recall, but, I believe, generally stating, it is as nearly uniform as the porosity in the Wolfcamp.

Q So in this particular area you have a little different problem than in an area not too far from this, which is the Dean-Devonian-Pennsylvanian, and the Wolfcamp, which it was suggested they be thrown together, and it was very erratic?

A Yes, sir.

Q But in this case you have a pretty good development in essentially the same well from both zones?

A The individual reservoirs appear to be uniform between themselves. The comparasion between the two, they are erratic as between them.

Q So the development is pretty good between them as you know it now?

A Yes, sir.

Q One other question, on the Exhibits No. "10" and No. "11", which are your performance curves on the Wolfcamp and Pennsylvanian, did you develop this performance curve from material balance or did you have, -- or was this likewise developed from samples by analysis?

A This was a material balance calculation in which the production rate was assumed. Incorporated in the calculation was the available bottom hole sample analysis.

Q You had a bottom hole sample on the Wolfcamp?

A Yes.

Q But you have none on the Pennsylvanian. Was the Wolfcamp used as a guide -- I mean the Pennsylvanian, was it made up from the Wolfcamp?

A The bottom hole data was corrected in regard to pressure and used as is for the Wolfcamp with the minor change in the formation volume factor due to a slight increase.

Q But no actual sample was available?

A That is correct.

CROSS EXAMINATION

By MR. GURLEY:

Q Concerning the spacing pattern about which you testified this morning, you recommend 150 foot tolerance for topographical conditions on your well?

A Yes, sir, I believe it was part of my recommendation, it would be more than satisfactory.

CROSS EXAMINATION

By MR. SELINGER:

MR. SELINGER: G. W. Selinger of Skelly Oil Company, Tulsa, Oklahoma.

Q Mr. Kellogg, at the present time every well can be assigned 80 acres, is that correct?

A Yes, sir.

Q In other words, the density of every area is one well to every 80 acres?

A That is correct.

Q Calling your attention to the W/2 of Section 1 wherein each of those government quarter sections has two wells either drilled or drilling, did you note that on your maps?

A Yes, sir.

Q Hasn't the point been reached now in development where it is necessary for not only the Commission but the operators to know and determine what the density is because you cannot have any additional development on the west half of one on the basis of 80 acres, or if you drill an additional well in the west half, you have broken the density of your 40 acres?

A That is correct.

Q So regardless of whether you have complete data, the development program has reached the stage that it is necessary to know what the development program is right now for drilling purposes?

A Yes, the decision has to be reached.

Q And as I understood your testimony, the red outline on Exhibit "1" which is the area sought to be spaced, followed the contouring of Exhibits "2" and "3", is that right?

A To the best of my knowledge the structural maps were used as a basis for arriving at this area to be spaced.

Q And you stated it was your intention to have the same spacing and the same density covering the Wolfcamp and Pennsylvanian whether they fall within the red line of One or fall without the red line of the other -- your intention is to cover the entire reservoir, is that correct?

A That is correct.

Q Should you contact the red line then, you would have a

spacing program for part of a reservoir and a spacing program of the same reservoir on a different basis?

A Yes, sir.

Q Except for the fact that the general rules now state that regardless of where your red line is all operations within a mile of production are to follow the pattern established by that designated field?

A Yes, sir.

Q Wouldn't that general rule apply to both sides of Sections 25 and 36, Township 9 South, Range 33 East; and on both sides of Sections 1 and 12, Township 10 South, Range 33 East, where it lies within the red line?

A Yes, sir.

MR. SELINGER: I believe that is all.

MR. PORTER: Does anyone else have a question?

CROSS EXAMINATION

By MR. MANKIN:

Q I believe there was some questioning going on at the present time regarding whether or not this area should be contacted. I ask you, would you look again and superimpose the red line on Exhibits "2" and "3" off Exhibit "1" -- I think you will find the NW/4 of Section 7 is within the delineated area but outside of the area -- in other words the structural contour interpretation, is that correct on both Exhibits "2" and "3"?

A That is correct, although there is no attempt to establish oil-water contact on these maps as we haven't sufficient data to establish it and I believe that is the reasoning that was followed

in the area of the NW/4 of Section 7.

Q And that would be likewise true for the other sections such as the SE/4 of Section 26?

A Yes.

Q And a portion of the SW/4 of Section 30?

A Yes, sir.

Q And also essentially the entire N/2 of Section 12?

A Yes, sir

Q So this question as to whether or not the area should be contacted, I think since you are basing it on a structural interpretation, it would appear to be more realistic to possibly contact this rather than taking in the scenery, as well, do you agree to that?

A I can see nothing wrong with that as long as we remain cognizant of the fact that the actual extent of the reservoir has not been interpreted.

Q One other question -- it was brought up that in Section 1 in the W/2 there was a complete line of four wells in the E/2 of the W/2?

A That is true.

Q And also it was intimated that there would be no development in the W/2 of the W/2 but is it not true that some of those wells can not be or will not be dually completed and therefore there will have to be development in the W/2 of the W/2 as alternate wells?

A I believe in the case of the State of New Mexico F Well No. 2, that does have small casing, 5 inch casing, and it might possibly

require a well be drilled to take care of a portion of that unit if dual completion were permitted.

MR. MANKIN: That's all.

MR. PORTER: Does anyone else have a question of Mr. Kellogg, if not Mr. Kellogg will be excused.

MR. D. E. HALL

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

DIRECT EXAMINATION

By MR. ERREBO:

Q Will you state your name, occupation, and by whom you are employed?

A D. E. Hall, Petroleum Engineer, employed by Sunray Mid-Continent Oil Company.

Q Mr. Hall, what is your educational and experience background?

A I am a graduate of the University of Oklahoma with a Bachelor of Science in Petroleum Engineering, I have approximately seven years experience in the Permian Basin and three years in the Gulf Coast as Petroleum Engineer.

Q Are you familiar with the drilling, completion, and operational work in the Lane Field?

A Yes, I have actively supervised and participated in drilling and completion of all the Sunray Mid-Continent Wells.

Q Have you previously testified before this Commission?

A Yes.

MR. PORTER: The witness' qualifications are acceptable to the Commission.

Q Have you made a study of the feasibility of dual completion of the Wolfcamp and Pennsylvanian in this field?

A Yes.

Q Based upon your study, do you believe that dual completion of the Wolfcamp and Pennsylvanian is feasible?

A Yes, sir.

Q What conditions must be met to make a dual completion feasible?

A Well, the first condition, there must be effective separation between the zones. The second, reservoir fluids from each zone must be independently produced and measured. Third, each zone much be separately tested, including taking such tests as gas-oil ratios, bottom hole pressures, indices, and other such tests. Of course, each zone must be produced to the same state of depletion as twin wells, and each completed in a different zone.

Q Do you believe that these conditions will be met if the Commission sees fit to permit dual completions in this field?

A Yes, I do.

Q In regard to the separation of the two zones, is equipment available which will permit effective separation of these zones and at the same time allow them to be separately measured and stored and produced?

A Yes, and we intend to install such equipment.

Q Will the Wolfcamp and Pennsylvanian be in communication between the casing and the bore hole?

A No, they will be separated by cement.

Q How do you propose to dually complete wells in this field?

A We intend to install two strings of tubing with a packer between the two zones and produce one zone through each string of tubing.

Q What differential pressure exists between the Wolfcamp and the Pennsylvanian?

A The initial pressure differential was 25 pounds per square inch. Certainly we wouldn't expect it to ever exceed 2,000 pounds per square inch.

Q What pressure differential will the packer which you propose to install, stand?

A In excess of 10,000 pounds per square inch.

Q Will you refer to Exhibit "16", and I ask you to identify it?

A This is a schematic drawing showing the proposed oil-oil dual completion of the Wolfcamp and Pensylvanian 's formations with both zones flowing.

Q Was the Exhibit prepared by you or under your supervision?

A Yes.

Q Will you continue on with your explanation of that diagram, please?

A The separation of the two zones is accomplished by setting a Baker retainer, production retainer between the formations, and the installation of two strings of tubing, the long string of tubing is set in the packer through which the Pennsylvanian is produced. The short string of tubing is hung through the packer through which the well fluid from the Wolfcamp is produced. The blue indicates the fluid flowing from the Pennsylvanian and the red indicates the

fluid flowing from the Wolfcamp.

Q Isn't it possible at some stage in the depletion of this field that it might be necessary to concurrently pump one zone and flow the other?

A Yes.

Q Will you please refer to Exhibit "17" --and was this Exhibit prepared by you under/or your direction?

A Yes, sir.

Q Will you please explain it or identify it?

A This is a schematic drawing, showing the proposed oil-oil dual completion with the Wolfcamp flowing and the Pennsylvanian pumping. The drawing shows a pump which has been run in a long string of tubing and is pumping from the Pennsylvanian. The Wolfcamp is flowing through the short string.

Q Mechanically speaking, could you expect a similar or the same performance by pumping the Wolfcamp and flowing the Pennsylanian?

A Yes.

Q Is it possible that sometime in the life of this field, it might be necessary to concurrently pump both zones?

A Yes, sir.

Q Will you then refer to Exhibit "18" and identify it?

A This is a schematic diagram showing the proposed oil-oil dual completion with both zones being pumped. The drawing is the same as in Exhibit "17" with the addition of a pump in the short string of tubing. We propose to pump each zone with individual pumping units.

Q Was this Exhibit prepared by you or under your supervision?

A Yes.

Q Have you calculated the anticipated pumping capacity for zones located at the depth encountered in the Lane field?

A Yes, at this depth we can produce in excess of 280 barrels of fluid per day.

Q What is the estimate based upon?

A That is from each zone, that estimate is based upon pumping a dead load of water with 80 per cent pump efficiency.

Q Do you know what the current allowable is for wells in this area?

A The August allowable is currently 148 barrels per day.

Q And I believe you were here when it was testified earlier in this hearing that the 80 acre allowable would be expected to be in the neighborhood of 180 barrels per day?

A Yes, the pump capacity should be able to pump at least 100 barrels in excess of the 80 acres allowable, approximately 100 barrels in excess of the 80 acre allowable.

Q Under the three sets of conditions you have described, both zones flowing, one zone flowing and one pumping, and both zones pumping, could each zone be tested separately in each instance?

A Yes, since they are producing through individual strings of tubing, and have individual well head control, have individual flow lines, and will produce in individual lines.

Q In your opinion can they be produced to the same state of depletion as twin single completions in separate zones?

A Yes.

Q Do you expect any corrosion problems due to hydrogen sulphide causing corrosion?

A No, the analysis of gas and oil have shown no hydrogen sulphide to be present and we would not expect that corrosion would be a problem.

MR. ERREBO: We offer Exhibits 16, 17 and 18 in evidence.

MR. PORTER: Without objection they will be admitted.

MR. ERREBO: That concludes our testimony.

MR. MANKIN: Mr. Errebo, do you have copies of those Exhibits?

MR. ERREBO: Yes, sir, we do.

CROSS EXAMINATION

By MR. MANKIN:

Q Mr. Hall, you indicated the possibility of the Pennsylvanian going on a pump fairly soon, or did you make that statement?

A No, I just indicated it might be necessary to pump the Pennsylvanian.

Q What do you think in regard to the Pennsylvanian, will it go in the pump before the Wolfcamp will?

A Well, I don't know, I would say the bottom hole pressure is increasing more rapidly than the Wolfcamp, but I do not know what is going to happen so far as the flowing characteristics.

Q What are the fluid levels in the Pennsylvanian, are they fairly high at the present time, are most of them flowing or what is the situation?

A The one well being produced from the Pennsylvanian that we have is flowing. It's tubing pressure, I believe, is approximately 700 pounds, that figure is not exact.

Q That well you mentioned, the State Sunray Mid-Continent F No. 2, is that the one?

A That is correct.

Q The State I No. 1 is being produced at the present time, is it not?

A From the Wolfcamp.

Q So that the only one is being produced at the present from the Pennsylvanian although it is carried as a Wolfcamp?

A That is right.

Q Did you make any recommendation as to the casing programs or cementing programs that would be instituted in these wells in this area?

A We have made recommendations to our company on using 7 inch casing. The cementing program that we are following would not necessarily, I don't believe, we would necessarily want to require other companies to follow it, but we are attempting to get a good cement job between the two zones and we are planning to squeeze cement between the two zones. We would do that in either case whether it was a single or dual completion, to squeeze off the water.

Q Would you be agreeable to cementing to at least 500 feet above the top of the Wolfcamp in dual completions?

A I am sure we would want to cement at least 500 feet above the Wolfcamp.

Q Would you be agreeable if such order was granted administratively, if all operators in the field were first notified, prior to actual administrative approval of dual completions?

A You mean we would notify them?

MR. MANKIN: Yes, while you are requesting actual permission, you are requesting blanket permission here, are you not?

A Yes.

Q But rather than requesting a blanket request, would you be willing that all operators be notified in both fields as distinguished from the area you are requesting?

A We know of no reason why not.

Q For example, t he other field that we have granted -- the Dean-Devonian-Pennsylvanian?

A Yes, sir.

Q Likewise would you be agreeable to setting pipe on the bottom of all the zones which have been penetrated to production, including the Strawn-Pennsylvanian and Wolfcamp -- including to 500 feet above the top of the Wolfcamp and to determine the top of the cement by a temperature survey which would b e submitted to the Commission?

A In my opinion, we would hesitate to require the other companies to squeeze cement providing they thought they would have good cement jobs without squeezing, but we would certainly want to set pipe through any productive zones, and would be agreeable to run a temperature survey to locate the top of the cement.

Q I didn't mean that you would tell the other operators what to do but would you be agreeable that the rule specifies that?

A Yes, sir.

Q And probably a 20 day waiting period prior to approval of administrative orders, providing they meet these specifications?

A Yes.

Q Rather than a 10 day period because some of the companies are large companies and it would necessitate more paper work?

A Yes.

CROSS EXAMINATION

By MR. NUTTER:

Q Mr. Hall, how would you determine whether you had communication across the packer if the thing started leaking?

A With a packer leakage test where the pressure recording device was installed on both sets of -- well, on the well heads of both zones -- with a sufficient draw down in pressure from one zone it would show that there is no communication to the other zone if the other zone would not draw down.

Q You are talking there about determining communication with a packer leakage test, what I am talking about is how would you know without running a test, in order to decide to run the test, in other words, what clues would you have with the flow characteristics of the reservoirs which would indicate communication?

A Any indication such as a change in tubing pressures or in rate of flow.

Q Is there enough pressure difference between these two reservoirs for the communication to show up in flowing tubing pressures?

A Yes, there is approximately 700 pounds in the Pennsylvanian tubing pressure now and I believe about 1300 on the Wolfcamp that is within 150 pounds either way on the Wolfcamp. Since we have two wells producing from the Wolfcamp, they vary some, but there is a

pressure differential right now in the tubing pressure of around 500 pounds.

Q Is there enough difference in the G.O.R.'s to be effective?

A There is very little difference in the G.O.R.'s that I know of.

MR. NUTTER: I believe that is all.

RECROSS EXAMINATION

By MR. MANKIN:

Q Do you have -- what is the gravity of the Pennsylvanian oil and the Wolfcamp oil, is there any considerable difference between the two?

A No, I am not positive of just what the gravity is. I believe it is slightly over -- I was going to say over 49 -- here it shows the Wolfcamp gravity being 48 per cent a.p.i. and the Pennsylvanian 49 percent a.p.i., but they are very similiar.

Q And that would likewise not be an indication that there was any considerable difference. Was there any characteristic of the producing gas -- that it was one sour and one sweet or were they essentially the same?

A They are both sweet.gas. I don't have the exact constitutents of the gas here, but I am sure they are close together. I have seen the analysis run on them.

MR. PORTER: Does anyone else have a question?

CROSS EXAMINATION

By MR. CAMPBELL:

Q Are you selling gas from these wells?

A No, there is no gas connection there, -- I take that back

-- we are selling gas to some of the rigs in the field, they are using our gas.

Q That has been calculated in your economic study?

A No, and I am not sure what price, or if we are charging for it, but they are using gas from there.

MR. ERREBO: Mr, Campbell, the sale of gas was included in the economic study but not the incidental sales as he is testifying to.

MR. PORTER: Does anyone else have a question? If not, Mr. Hall may be excused.

MR. ERREBO: That concludes our case.

MR. GURLEY: If the Commission please, I have two statements, I have a telegram and a letter which I would like to read. First, I would like to ask if anybody from Gulf is here?

(No response from the audience.)

I will read the telegram received by the Commission, it was sent August 14, 1956, addressed to the New Mexico Oil Conservation Commission, State Capitol Building, Santa Fe, New Mexico, and it states: " Re Case 1125 Sunray Mid-Continent Oil Company's application concerning delineation 80 acre units well spacing and dual completion. Gulf is agreeable to request contained in Sunray Mid-Continent's application with the exception of proposed well spacing within 80 acre units. Gulf Oil Corporation favors sufficient flexibility in the well location requirement to permit an operator to drill on either end of an 80 acre unit." That is signed by H. N. Bayer, Gulf Oil Corporation. Next, is a statement which was asked to be read into the record by H. N. Wade, of the Texas

Company: "The Texas Company believes that the testimony presented by Sunray Mid-Continent indicates that dual completions between the Wolfcamp and Pennsylvanian formations, and development of these formations on 80 acre spacing, are justified in the Lane Field. Therefore, The Texas Company concurs with Sunray Mid-Continent in requesting dual completion privileges and 80 acre development in this field."

And, I have another letter from the Seaboard Oil Company which I would like to read into the record. It is dated August 10, 1956, and directed to the New Mexico Oil Conservation Commission. "Gentlemen: Seaboard Oil Company is a working interest owner in the leases operated by Sunray Mid-Continent Oil Company in the Lane Field, which may be described as all of Section 36 with the exception of the E/2 of the NW/4, Township 9 South, Range 33 East, and the N/2 of Section 1, Township 10 South, Range 33 East, Lea County, New Mexico. Seaboard Oil Company concurs with Sunray Mid-Continent Oil Company's application to develop the Wolfcamp formation on 80 acre spacing, to develop the Cisco formation on 80 acre spacing, and to dually complete the wells by means of twin strings of tubing. Seaboard Oil Company believes this to be the most feasible method to develop these two reservoirs and strongly urges the Commission to establish such rules as will be applicable to grant Sunray Mid-Continent's applications at the hearing on August 15, 1956." and it is signed by Seaboard Oil Company by Ebb White, Manager of the Production Department. I would like to have these introduced into the record for what they are worth.

MR. PORTER: Are there any other statements to be made?

MR. STALLINGS: Mr. Stallings of Mid-States Oil Corporation, Midland, Texas. Mid-States Oil concurs with the recommendations and requests set forth by Sunray Mid-Continent and respectfully requests an exception to the spacing rule by the drilling of the Mid-States Phillips No. 1, Lane Unit, located in the NE/4 of SW/4 of Section 1, Township 10 South, Range 33 East, in Lea County.

MR. PORTER: Thank you, Mr. Stallings. Anyone else?

MR. HARBEN: N. J. Harben of Sinclair Oil and Gas Company, Fort Worth, Texas: I am representing Sinclair Oil and Gas Company and while Sinclair does not own any producing well in the area sought to be spaced, it does own oil and gas leases embracing acreage within and adjoining the area. Sinclair concurs in the testimony offered by Sunray in support of its application and recommends that the application be granted.

MR. PORTER: Does anyone else have any statements?

MR. WOOD: A. W. Wood, of Midland, Texas. Manzano owns a one sixth interest in Sunray Mid-Continent's operations in the area under discussion in this hearing. According to studies made by our engineers, we believe that the problem in the spacing in the Pennsylvanian and Permian zones in this area should be 160 acres, that is from the standpoint of efficient drainage and economics. Sunray Mid-Continent is the operator of our interest and we think they are a prudent operator so Manzano states concurrence in their application for 80 acre spacing in the Wolfcamp and Pennsylvanian and all oil-oil completions in each reservoir, and urges the Commission to establish rules and regulations that will be applicable to grant the Sunray application in this hearing.

MR. LUCCHI: Harold J. Lucchi representing Cities Service Oil Company, Hobbs, New Mexico. I have a letter addressed the Oil Conservation Commission stating the position of Cities Service Oil in this case: "Gentlemen: We are in receipt of copies of the applications filed in the above captioned matter, and Docket No. 27-56 setting it for hearing on August 15, 1956. Cities Service Oil Company has a leasehold interest within the proposed delineated area for the Lane-Wolfcamp and Lane-Pensylvanian Pools.

It is our opinion, based on the data available to us and our experience with similiar type production in other areas, that a development program of one well to 80 acres will adequately and efficiently drain these respective pools. However, in the interests of greatest ultimate recovery we do not subscribe to a frozen development pattern. Experience has proven that more oil can ultimately be produced when more latitude is permitted in the selection of drilling sites so that structural features can be taken advantage of to a greater extent. In this connection we recommend that 80-acre drilling and spacing units be established by dividing quarter sections into either North and South or East and West halves, at the option of the operator, and that the location of the permitted well for each unit be restricted only to a distance not nearer than 330 feet to the unit boundary line. The incorporation of such a rule would also tend to expedite development, and eliminate unnecessary spacing exception hearings.

The policy of this company with respect to the dual completion of wells is the same throughout its entire area of operations. We believe that in almost all fields comprising more than one oil

producing reservoir, oil-oil dual completions are feasible and practical. In our judgment this is true in the instant case. As one of the companies who have pioneered dual completion practices, we have had occasion to field test many types of equipment required for these installations. As a result of this experience, and our observations of other operations, we know that wells can be dually equipped and efficiently produced with no commingling of fluids either with the use of one or two tubing strings. This is true regardless of whether the wells are flowing or produced by articifial lift.

It is our recommendation that a field wide dual completion rule be adopted for the Lane-Wolfcamp and Lane-Pennsylvanian Pools but that the type of such installation be left discretionary with the operator as long as it is in conformity with good engineering principles and practices that have been generally accepted and approved by the industry and other state regulatory agencies. We do not believe that the regimentation of dual completions can be justified as a sound conservation policy." And the letter is signed by J. A. Cleverley, Vice President of the Company.

MR. SELINGER: T. W. Selinger, of Skelly Oil Company, Tulsa. I first wish to concur in Sunray Midcontinent's application as requested herein. I want to elaborate a little bit about the 80-acre spacing, density program. You will recall from the exhibits that the cost was in the neighborhood of a hundred and seventy and some odd thousand dollars. Most regulatory bodies in other states have come to the realization that wide spacing is a necessity and we hope that this body comes to that realization, also. Because of the deeper drilling, the necessity for the wide spacing, aside from the economics, is the difficulty in finding oil. Those two factors alone, on their face, just like proration has been a factor, are good for the industry, generally. The industry has reached the point - - it is quibbling to say put five inch casing in the hole and therefore the operator can go on another part of the 80 acres and drill to the other formation, but you know as far as that is concerned, the operator is faced with whether he should drill on that 80 acres to that formation, or on another 80. Particularly on the west side, the problem is what it should be. If you wait until the outline is determined, or the geological and engineering factors are evaluated, you will never have spacing. Spacing is to prevent unnecessary wells. If every 40 acres is drilled, you have nothing but 40 acres. Obviously, if you have to wait to evaluate all of those, the operators will not know what sort of program to develop. Therefore, it is almost incumbent to have a development program

from the inception, and it would be to the best interests of the industry, generally, immediately upon the drilling of the first well, that this Commission establish temporary spacing as wide as possible and set the matter a year hence in which additional development is had and you have had time to evaluate it. Then, if the spacing is too wide, you have the right and privilege to come back and do further drilling. We have a declining field now, and I think now is the time for the Lane field to start such a program.

MR. PORTER: Anyone else?

MR. CAMPBELL: I would like to first say the people for whom I have entered an appearance have no objection to the dual completion features of this application; as a matter of fact, they are all for them. We do object to the fixed pattern of 80-acre spacing at this time. It is quite obvious from the contour, if it turns out to be correct, that Danglade and Simmons are both on the east edge of the field with acreage which may be partially productive or not productive at all. They don't feel they should be compelled to come before the Commission on an exception where an exception will become the rule and ask for authority to drill on their property. If this well that Simmons has is a good well and will pay on 40 acres, he would like to drill another. If he doesn't think it will pay out, I am sure he won't drill it and I am confident that Sunray won't drill any that they know in advance won't pay out, and I don't know of anything compelling them to do so, particularly within that area, and if the other operators agree to eighty acres, I can't

see what prevents their drilling on 80 or 160, or 2500, or whatever they want to do. As far as we are concerned, we want a chance to locate our wells where we think there is a good chance of getting production and we are not called upon to establish a dry hole as in the case of 80-acre spacing in New Mexico.

MR. PORTER: Does anyone else have anything? If not, the case will be taken under advisement. We will now take a little recess.

* * * *** * * *

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, DOROTHY B. MYERS, a Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the Oil Conservation Commission for the State of New Mexico, was reported by me in shorthand and reduced to typewritten transcript by me, or under my personal supervision, and that the same is a true and correct transcript to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal, this, the 11th day of September, 1956, in the City of Santa Fe, County of Santa Fe, State of New Mexico.

Dorothy B. Myers
Notary Public

My Commission Expires: 8-3-60