BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
July 16, 1958

IN THE MATTER OF:
Case No. 1480

TRANSCRIPT OF HEARING

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BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
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In the matter of Southeastern New Mexico nomenclature case calling for an order for the creation of new pools and the extension and reclassification of existing pools in Lea, Eddy and Roosevelt Counties, New Mexico.	Case 1480

BEFORE:

Mr. Murray Morgan, Land Commissioner
Mr. A. L. Porter, Director

TRANSCRIPT OF HEARING

MR. PORTER: The meeting will come to order. We have previously announced the next case to be considered will be Case 1480. We would like to have all of the witnesses in this case to stand and be sworn at this time, and, since Humble Oil and Refining Company will present the testimony in connection with Paragraph J, we'll ask them to come on first.

MR. PAYNE: To consider the reclassification of the Four-Lakes-Devonian Pool, from an oil pool to a gas pool upon the application of Humble Oil & Refining Company.

MR. BRATTON: If the Commission pleases, in this portion of the nomenclature case, the Humble Oil and Refining Company

will present the evidence.

My name is Howard Bratton, of Hervey, Dow and Hinkle, Roswell, representing Humble Oil and Refining.

This paragraph of the nomenclature case concerns the proposed change of the Four Lakes-Devonian Pool, a reclassification from an oil pool to a gas pool. In this connection Humble Oil and Refining Company is not requesting -- there is not involved in the hearing any change in the horizontal limits of the pool, Humble is not asking for any variation from the state-wide rules, state-wide gas rules, and there is no question of prorationing involved; therefore, it is merely a reclassification question.

We will present one witness, Mr. Hackney, and I'll ask him to take the stand.

JAMES HACKNEY

a witness, having been first duly sworn, deposeth and saith:

DIRECT EXAMINATION

BY MR. BRATTON:

Q Will you state your name, address and occupation, please?

A My name is James Hackney, my address is Midland, Texas, employed by Humble Oil and Refining Company as a petroleum engineer.

Q Does your jurisdiction cover the Four Lakes-Devonian Pool, Mr. Hackney?

A I have made a study of the Four Lakes-Devonian Pool.

Q You are familiar with the Paragraph J of the nomenclature

here involving the reclassification of the Pool from an oil pool to a gas pool? A Yes, sir.

Q You have previously testified before this Commission as an expert petroleum engineer? A Yes, sir.

Q Your qualifications have been accepted.

MR. BRATTON: Are the witness's qualifications acceptable?

MR. MORGAN: The witness's qualifications are acceptable.

Q (By Mr. Bratton) Mr. Hackney, I hand you what has been marked Humble Exhibit Number One, and ask you if you will explain what that is and what it represents?

A Humble Exhibit One is a base map of the South Four Lakes unit area which shows the entire present horizontal limits of the Four Lakes-Devonian Pool. This map indicates the outline of the South Four Lakes unit and also the horizontal limits, present horizontal limits, of the Four Lakes-Devonian Pool, as well as the wells which are presently completed within the unit area. I might review briefly here, the South Four Lakes unit was formed and approved by the Commissioner of Public Lands, October 20, 1955, also by the Commission on the same date, under Order Number R-710. The unit area is situated in Lea County, New Mexico, and includes all of Section 35, west half of Section 36, Township 11 South, Range 34 East, all of Section 2, lots 3 and 4 and the south half of the northwast quarter of Section 1 in Township 12

South, Range 34 East. The unit area encompasses a total of 1760.46 acres, all State-owned land. The working interest ownership in the unit is: Humble, 63.6 percent approximately, Phillips Petroleum, 36.4 percent approximately, Humble being designated the unit operator.

Q Mr. Hackney, will you give us a brief statement of the development in the area?

A The first exploratory test in the unit area was the south Four Lakes unit Number One, a projected Devonian test which reached a total depth of approximately 12,200 feet, at which time pipe was stuck and fishing efforts unsuccessful. The well was completed in the Pennsylvania reservoir. The number Two South Four Lakes unit well was drilled next, completed on October the 8th, 1956, as a Devonian discovery well in the Four Lakes-Devonian Pool. Then the Number Three well was completed in November of 1956, as a second well in the Four Lakes-Devonian Pool; Number Four well in February of 1956, also in the Devonian; Number Five well was dry in the Devonian, actually penetrating the Devonian below the estimated water fluid contact, and was completed as a Pennsylvanian well.

Q What generally is the type of structure of the Devonian Pool here?

A The nature of the structure is, from the present drilling, is indicated to be a small high relief type structure, the Number Two well being approximately, topping the Devonian, approximately

250 feet higher than the Number Three or Four well and approximately 500 feet higher than the Number Five well which was below water fluid contact.

Q Does the yellow coloring on the Exhibit One represent the horizontal limits of the Four Lakes-Devonian Pool?

A Yes, the present horizontal limits were established by Order Number R-928, and Order Number R-1129. It includes the northwest quarter of Section One, the Northeast quarter of Section Two in Township 12 South, Range 34 East, and the southeast quarter of Section 34 in Township 11 South, Range 34 East.

Q Mr. Hackney, will you discuss briefly the nature of the fluid and the history of production in the Four Lakes-Devonian Pool?

A Upon completion of the original Devonian well, it was recognized immediately that this was an unusual fluid being produced, exhibiting high gas-oil ratio, the tank liquid being high gravity and exhibiting many of the characteristics that might be associated with a gas condensate type system. Several bottom hole samples were taken and extensive laboratory tests run to determine fluid properties, special equilibrium constants and for the basis of computer work to determine optimum production practices, as well as surface separation equipment.

Q Is the Pool producing now?

A No, sir, the Pool, the three wells included in the Four Lakes-Devonian Pool were shut in on February 1st of this year as a

gas conservation measure until a suitable method of disposition of gas products could be worked out.

Q Have you compared the fluid produced from this pool with other Devonian pools in the area?

A Yes, as indicated on the Humble Exhibit Two.

Q Would you explain Humble Exhibit Two, what it is and what it shows?

A Humble Exhibit Two is a comparison of oil gravity and gas-oil ratio data for Devonian pools in the general vicinity of the Four Lakes-Devonian Pool. The column, "Oil Gravities", listing oil gravities, this information came from the New Mexico Oil and Gas Engineering Committee and the Roswell Geographical Society. The gas-oil ration information came off of the May pro-ration schedule, except for the Four Lakes, which came off of the January schedule, the last month that the Four Lakes Pool was produced. The significance here of the gravity range shows that for these particular pools the gravity ranges from 40 to 60 degrees, API, the Four Lakes gravity being approximately 54, which is in the range of that and still is within a range that you could expect for a gas condensate. Gas-Oil Ratio column shows that a number of these Devonian Pools have extremely low gas-oil ratio some listed on the pro-ration schedule as too small to measure. Noted here that the Four Lakes ratio averaged slightly in excess of 5,000 to one as compared to the next highest ratio of approximately 1100 to one. The Four Lakes ratio being approximately five

times as high as the next highest ratio for any of the other pools in the vicinity which indicates that this Four Lakes fluid is unique from that standpoint.

Q Where did you get your information as to the gas-oil ratio?

A They came off the pro-ration schedule. I believe I mentioned that before.

Q Yes. Has your laboratory made an examination of the properties of the fluid produced from the Four Lakes-Devonian Pool?

A Yes, there have been extensive analyses run as indicated on Humble Exhibit Three. This is a summary of the reservoir fluid behavior as determined in the laboratory.

Q Would you explain what Humble Exhibit Three shows?

A The representation to the left on the exhibit, the left-hand side, indicates that .87 barrels of reservoir fluid, at the originally measured pressure of 5113 pounds per square inch and temperature of 200 degrees fahrenheit, when expanded to a pressure of 3270 pounds per square inch and the same degrees farhenheit which was found to represent a dew point or bubble point pressure, depending on whether it is a gas or fluid, that the .87 barrels would then occupy one barrel, and further that no change in phase would occur as the pressure was reduced to 3270 pounds. Any further reduction in pressure, there would exist two phases, the distinct gas and distinct liquid phase. Also noted here, when the material was expanded to 3270 the color change

occurred as indicated by the darker opaque color. It changed from a light yellow to the opaque color. The significance of that, we'll talk about later. When this one barrel of reservoir material at 3270 pounds per square inch and 200 degrees fahrenheit was expanded or was flashed to simulate surface conditions at atmospheric pressure at zero pounds and 74 degrees fahrenheit, from this one barrel of reservoir fluid only .184 barrels of liquid was obtained, which would correspond to a tank recovery of liquid. Out of this reservoir fluid, only 82 percent would be flashed off as gas. In other words, you could say that 82 percent of this barrel of reservoir fluid was gas and only 18 percent was liquid.

Q Do you have anything further with regard to Humble Exhibit Three?

A As noted below the listings of pressure and temperature for the original reservoir conditions, the viscosity, as measured in the laboratory, is mentioned, the viscosity was .118 centipoises; at the dew point or bubble pressure, it was .093, which is approaching the range of gas viscosities and which is lower than normally encountered in ordinary oil system.

Q Have you made a comparison of Devonian sub-surface samples from this and other pools?

A Yes, Humble had taken sub-surface samples from their Devonian Pools in southeastern New Mexico and west Texas, which had been analyzed in a similar manner in our laboratories, and

Humble Exhibit Four is a comparison of some of the properties that were exhibited by the different Devonian reservoir fluids in the State of New Mexico. We had a sample available from Caudill Pool, in addition to Four Lakes, and in Texas from the Block 9, Circle 2, Cordona Lake and Hutex fields. The first column is a comparison of measured fluid viscosity. They range from approximately .1 in centipoises in the case of Four Lakes up to almost one centipoise in the case of the Hutex field. The significance here is that the Four Lakes viscosity or the Four Lakes fluid is approximately two and a half times smaller than any of these other systems which are recognized oil systems, that it does have a very low viscosity.

The next three columns are properties that were observed from separation at atmospheric conditions, the liquid gravity expressed in degrees, API, gas-oil ratio and a shrinkage factor, which is a measure of what part of a reservoir barrel would correspond to a stock tank barrel to these separation conditions. The liquid gravities ranged from 31 to approximately 60 in the case of Caudill, with Four Lakes exhibiting a gravity, liquid gravity, of 49, under this separation condition, the significance here again being that this is a high gravity and still could be considered in the range of a condensate. Under the gas-oil ratio column, as noted again similar to Exhibit Number Two, all of these fluids exhibit low gas-oil ratios, with the Four Lakes fluid exhibiting a ratio of approximately 6300 to one, as compared

to the next highest ratio of approximately 1050 to one or 6 times the next highest ratio. Next you have shrinkage factor, which is a measure of how much liquid you can get to the tanks with. Here again is this .184 barrels that was shown on Exhibit Three in the case of Four Lakes as compared to the shrinkage factor for these other fluids examined, and the lowest of them being .65. In other words, for the other sample that exhibited the next most severe shrinkage factor, you were still getting into the tanks with approximately two-thirds of liquid per barrel of reservoir fluid, as compared to only about .184 barrels per barrel of reservoir fluid in the case of Four Lakes. This again would be to demonstrate the uniqueness of the Four Lakes-Devonian reservoir fluid and the fact it is different or not similar to recognized Devonian oil systems.

Q These samples that you had as shown on this exhibit were the only ones that you had available to you for this type of comparison?

A They were the only ones that we had.

Q They represent a wide variation in the types of Devonian pools?

A Yes, they do. However, of course, all the others except Four Lakes are recognized oil systems. There is one other point we might make here. Missibility experiments were run on the Four Lakes Reservoir fluid and these experiments indicated that this fluid could be displaced by dry gas in much the same fashion as a gas condensate would be displaced in a cycling operation by

dry gas whereas these other fluids could not.

Q Referring you, Mr. Hackney, to Humble's Exhibit Number Five which is on the board, will you explain what that exhibit is?

A Humble Exhibit Number Five is an illustration of a phase diagram for a hydrocarbon mixture, and the purpose of it being to show what is normally accepted as a technical classification of fluids as indicated on a phase diagram. On the left hand side is shown increases in pressure and on the horizontal from left to right is increases in temperature. The red area on the phase diagram indicates pressures and temperatures where this particular mixture would exist in one phase and would normally be considered a gas. The green area representing pressures and temperatures where this mixture would exist as a liquid, the white region here, or two phase region, would be, would represent pressures and temperatures where this particular mixture could not exist as one phase and there would be two separate phases, gas and liquid apparently, which, as indicated here, you could determine what percent liquid and what percent gas you had at any of those particular conditions. As noted on the legend, there is indicated a point where some of these liquid percent lines converge and the usual definition of this point, or nomenclature for this point, is the critical point and it is the point here or the condition of pressure and temperature where there is no difference in any of the properties of a gas or a liquid phase. In

other words, properties of a gas or liquid merge at this critical point and a line drawn, or a vertical line from this point up in the single phase region in passing from that constant pressure through here, you could note no change in phase, or actually you could not determine by physical means where you passed from a gas into a liquid zone. As indicated on the legend by the numbers one and two in the points here, number one would normally be considered an undersaturated liquid or oil, in that the pressure could be reduced at constant temperature without two phases occurring. Or put it another way, this material here could take more gas into solution and still be in one phase and it would be determined an undersaturated oil. Pressure was reduced down to the socalled bubble point pressure. That would be termed a saturated oil in that if the pressure were reduced any further, the two phases would occur and gas would be evolved from this liquid. In the case of point three, this would represent a gas in which for all conditions, if this represented the reservoir temperature over here, all conditions of pressure, this material would remain in one phase in the reservoir and it would always -- in other words, it would always be a gas in the reservoir and, as to whether it was a wet or dry gas would depend on the surface conditions. In other words, your surface separator conditions might be over here and you might drop out liquids, in which case it would be a wet gas, and if you did not, it would be a dry gas. There's another gas type classification which can occur, being a

retrograde gas condensate, in which case, as illustrated by points four and five, if the pressure is reduced at constant temperature below this dew point line, there will be two separate phases noted as pressure is further reduced and this, if the nomenclature is known as a retrograde condensation and that is a recognized type of gas reservoir. Again the significance of this critical point is a technical dividing line here as to what is a liquid and what is a gas, although actually you can't determine by physical means when you go back and forth between those.

Q You will refer back to this exhibit in relation to the Four Lakes Pool shortly?

A Yes, sir.

Q Referring to Humble's Exhibit Number Six, will you state what that is and what it shows?

A Humble Exhibit Six is an illustration here of some color changes that were observed in the reservoir fluid during laboratory investigations. This material was put in a visual type cell where you could actually observe what was happening in the cell and original reservoir conditions were approximated. In other words, the pressure of 5113 pounds was applied to the mixture in the cell and the material was held at a constant temperature of 200 degrees fahrenheit. At this condition all of this fluid existed as a single phase and exhibited a pale yellow color in the cell. As the pressure was reduced no change in phase or color was noted until the pressure had been reduced to 3330 pounds, still

at the 200 degree fahrenheit temperature, at which case a slight color change was noted. The material took on a slightly orange color, although still a single phase existed in the cell; as the pressure was then reduced to 3280 pounds, a bright orange color was noted and still a single phase. There was no separation noted to indicate that two phases existed. As the pressure was then reduced another 20 pounds to 3260 pounds, the fluid took on an opaque or had a black color, as you recall we referred to on Exhibit Two. With no further reduction in pressure, but with this material allowed to remain at this pressure and temperature after a time this black color faded to dark red and, upon fading to this deep red color, the two phases, two distinct phases were noted, approximately 65 percent liquid and 35 percent gas. On additional reduction in pressure to 3000 and 2000 pounds, this color faded, the bright color faded and it went back to a faint yellow color, and at 3000 pounds it was approximately half liquid and half gas, at 2000 approximately 30 percent liquid and 70 percent gas.

Q What's the significance of this color change in the fluid?

A The significance of this color change -- first I might state that it has been observed by several investigators, Dr. Donald L. Katz of the University of Michigan and Dr. Charles F. Weinang of the University of Kansas, among others, that as you approach this particular point for any particular hydrocarbon

mixture within a narrow boundary as you approach the critical point you may get very vivid color changes occurring. In other words, back over in this region there would be no color changes, you pass through the bubble point line and on down, and over in this region you would note no color change. As you approach the critical point, you may note color changes, and the closer that you approach this critical point the more vivid the colors are. This phenomona being known as critical opalescence and in the case of the Four Lakes-Devonian fluid as analyzed indicates that this Four Lakes fluid at reservoir conditions is very close to this critical point although you can't see from this which side of the critical it is. It is probably within a few degrees of temperature.

Q Actually the tests shown on Humble Exhibit Six were run at a temperature of 200 degrees fahrenheit. Have you shown on previous exhibits that you now believe the reservoir temperature is a little higher than that?

A No, we have not. We have indicated 200 all the way through up to this point. That was the original temperature measurement and when we had finished, it was so close to this critical point we went back and determined temperature again with accurately calibrated temperature gauges and determined that the average temperature was nearer the 204 degrees than the 200 degrees. In other words, if we had been here before, we tend to be over here.

Q So actually it would move you over into the gas phase?

A It would move toward the gas zone. The fact that we later did determine that the temperature was 204 rather than 200 at which these tests were run.

Q Do you have anything else with respect to Humble Exhibit Six?

A No, I believe not.

Q Have you found any other recognized gas condensate system substantially similar to this system in the Four Lakes Pool?

A Yes, we have. We made a search of the literature and the various other records that we had available to try to determine if there was any other system, known system, whose properties would approximate what we found here at Four Lakes-Devonian fluid. It was found that the Benedum Ellenburger field located in Upton County, Texas, exhibited many properties similar to the Four Lakes Pool. The Benedum Ellenburger field was discovered in 1949 and reclassified by the railroad commission in February of 1950, as a gas reservoir. The reservoir pressure original pressure at the Benedum Ellenburger field was 5005 pounds per square inch, as compared to 5124 pounds per square inch at Four Lakes, the dew point pressure at Benedum Ellenburger was 3500 pounds per square inch as compared to 3270 that we measured for Four Lakes, reservoir temperature 204 degrees fahrenheit at Four Lakes as compared to 195 degrees at the Benedum Ellenburger field. A complete phase diagram was run on a sample of this Benedum Ellenburger reservoir fluid by Dr. Weinang now at the

University of Kansas and Mr. Howard Braley, now with Magnolia Petroleum Company in Dallas, and reported in the AIME transactions. They determined from this complete phase diagram that they ran with this sample that the critical temperature of this Benedum Ellenburger reservoir fluid was 193 degrees fahrenheit, or approximately two degrees lower than the actual measured reservoir temperature, which in this case if this should represent 193 that the Benedum Ellenburger reservoir fluid probably existed in the reservoir at this point which was only, of course, two degrees from that technical dividing line between what would be a gas and what would be considered a liquid in the reservoir. We also had available for the Benedum Ellenburger field a hydrocarbon analysis as we had for the Four Lakes fluid which are compared at the bottom of Humble Exhibit Number Seven and as will be noted by inspection of these two analyses expressed in low percent, the reservoir fluids are very similar in composition all the way through. In fact, they are close enough that they could almost be two samples taken from the same pool or field. I think the significance of this is this, that the Four Lakes-Devonian fluid is very similar to this Benedum Ellenburger fluid and should behave in much the same manner and that this comparison, plus the color change we know in the Four Lakes we are probably right in this region. We can't say definitely whether we are on this side or this side. But in this particular case, if this particular fluid had occurred in a reservoir in south Louisiana or Texas gulf coast

where you had a higher temperature gradient that undoubtedly it would be shifted over far enough to the right that it definitely would have been even technically a gas condensate system.

Q Was that pool defined originally as an oil pool?

A Yes. It was produced as an oil pool and then a hearing was held on classification and field rules, at which time it was classified as a gas condensate system.

Q Do you have the gas-oil ratio of that pool?

A I have it available here by years. Actually it is averaged close to 6000 to one as determined by commission records.

Q It has a similar gas-oil ratio as well as physical properties?

A Yes, it's a low ratio.

Q Mr. Hackney, what are your plans for the future operations of the Four Lakes-Devonian Pool?

A Of course, one of our primary concerns is in the matter of gas conservation and we are presently, or will be soon, engaged in actual negotiations for a gas sales contract involving this gas production. We have completed a study of the Four Lakes-Devonian Pool which indicates that an active and strong water drive is present which should permit the pool to be efficiently produced without dropping our pressure below the 3270 which will represent a dew point pressure and could result in loss in the reservoir if the pressure was permitted to drop below that pressure. However, we plan in our gas sales contract to include a reservation

or clause in there that we can get the gas back for injection operation in the pool if it is needed either to prevent pressure from dropping below the dew point pressure, which in that case would be some type, as a cycling operation, or if future performance should indicate that we could possibly get higher recovery by that type of operation, we would probably want to get it back.

Q If this pool is classified as a gas pool, would you contemplate installing any special separation equipment?

A Yes, we would, as illustrated on Humble Exhibit Number Eight. Humble Exhibit Number Eight shows graphically the effect of separation practice on stock tank liquid recovery in the case of the Four Lakes-Devonian Pool. This one barrel of reservoir fluid at dew point pressure and reservoir temperature when separated at atmospheric pressure and 74 degrees, as indicated previously, you'd end up in the tank with .184 barrels of liquid for each barrel of reservoir fluid. So your present facilities are set up in the field with single stage low pressure separation. This middle stage here would indicate how we have been operating in the past with single stage separation at approximately 60 pounds per square inch gauge and 74 degrees fahrenheit and end up in the tank with .234 barrels of liquid. We found that by making a study of separation practice that by installing two stage separation to permit gas delivery at pipe line pressure and with a stabilizer to prevent losses of tank vapors, in other words

to get maximum recovery of this fluid that we could end up in the tank with approximately .29 barrels for each one barrel of reservoir fluid or 25 percent increase for each barrel of reservoir fluid withdrawn over what you would be able to get with the present equipment.

Q That is the type of equipment which you would contemplate installing if the pool is classified as a gas pool?

A Yes, sir.

Q Would it be economical to install that type of equipment-- Would it be economically practicable to install that type of equipment if the pool remains classified as an oil pool?

A I can't state definitely. I don't feel that it would, though, at the present time because as an oil pool you would be restricted to a certain tank allowable and actually by increasing the percent of a reservoir barrel you could put into the tank you'd actually be permitted to withdraw less reservoir fluid to get this increased recovery, and any payout that you could show on the investment to install this equipment would be derived way on down the line.

Q So that, as far as your present plans are concerned, if the pool is classified as a gas pool, you feel that you could contemplate an additional 25 percent recovery of liquid fluid from the pool?

A Yes, from each --

Q -- From the same barrel of fluid coming out of the pool?

A Yes.

Q Mr. Hackney, in summary, why do you feel that the Four Lakes-Devonian Pool should be classified as a gas pool?

A From a technical standpoint this Four Lakes fluid is very similar to a recognized gas condensate system. When I say that, I mean not only by the Railroad Commission but it has been recognized by technical societies as being a gas condensate system that being the Benedum Ellenburger field. From the laboratory tests indicating the color tests plus a similarity to the Benedum Ellenburger fluid, we know that this fluid exists in the reservoir at very near the critical temperature which is a technical dividing line between a liquid and a gas phase. The Four Lakes production is certainly unique in this area of Lea County due to the high producing gas fluid ratios. The viscosity of the fluid is very low approximating that of a gas system. The high shrinkage that is encountered even under optimum separation conditions still this barrel of reservoir fluid is approximately 71 percent gas; so you would say it was 71 percent a gas reservoir. The high gravity of the production is in the range normally encountered in gas condensates; as indicated previously this fluid is missible with dry gas. From that standpoint it is very similar to a gas condensate system.

Q From the practical standpoint, why should this pool be classifed as a gas pool?

A I feel that it can be efficiently and economically

operated as a gas pool and actually from a practical standpoint the Four Lakes-Devonian Pool is a gas reservoir, and in my judgment should be developed and produced as such. As we have indicated previously, it probably will not be economically attractive to install efficient separation equipment if the present classification is retained and actually development as an oil pool could result in excessive withdrawal rates from the reservoir because of this high shrinkage factor, and in other words, because of that you have to draw a large, draw out a large number of reservoir barrels to get into the tank with the same, with your tank production which would be just in excess of what the reservoir withdrawals are in other Devonian withdrawal pools.

Q Do you have anything further to offer in this case, Mr. Hackney?

A No, I believe not.

Q Were Humble Exhibits Number One through Eight prepared by you or under your supervision?

A Yes, they were.

MR. BRATTON: We would like to offer in evidence Humble Exhibits One through Eight.

MR. PORTER: Without objection Humble Exhibits One through Eight will be admitted.

(Whereupon Humble Exhibits One through Eight were admitted in evidence.)

MR. PORTER: At this time we will recess the hearing

until 1:00 p.m. At that time the witness will be available for cross-examination.

(Recess.)

MR. PORTER: The meeting will come to order, please. Are there any questions of Mr. Hackney regarding Case 1480?

CROSS-EXAMINATION

BY MR. NUTTER:

Q Mr. Hackney, in your opinion has the Four Lakes-Devonian Pool been completely drilled up as far as a possible gas pool spaced on 160 acres is concerned?

A Of course, as indicated previously, the Number Five well which would be to the west of the present development, that came in below the estimated water fluid contact, the Number Four and Number Three wells were both low structurally compared to the Number Two which would seem to limit, produce limits, to the north and to the east perhaps, and the only possibility now at the present appears possibly to the south. Each well that has been drilled there has kind of brought in what our exploration people thought as to what the productive limits might be. Before we do additional drilling perhaps to the south, we would make a detailed study to probably try and go in and shoot the area again to determine a favorable location.

Q When the Number One well was drilled into the Devonian then the hole lost in the Devonian formation, was it indicated to be productive?

A To my knowledge the Number One well never did top the Devonian.

Q Oh, I beg your pardon, I thought it did enter the Devonian.

A No, sir, they got stuck at, I believe, 12222 feet, which was probably a couple hundred feet short of the top of the Devonian.

Q There is evidence that there are locations in this area that would be productive of Devonian if they were drilled, how far, 40 acre locations?

A Yes.

Q Mr. Hackney, Exhibit Number Three with surface separator conditions indicates that there would be 18 hundredths of a barrel of liquid at surface separated conditions which was originally one barrel of liquid in the reservoir and that there would be 1150 cubic feet of gas. Now, would this give you a gas-oil ratio if you were to divide the 18 hundredths barrel into the --

A -- Yes, sir, that should give you 6270.

Q How about the GOR that was reported on Exhibit Number Two being 5026, wasn't this at the surface separator condition?

A Yes, sir, but as indicated on Exhibit Three, this was a case for separation at atmospheric pressure and in the case of Exhibit Two, separation pressures actually carried in the field at that time were around 50 pounds and that would reflect the difference.

Q I see. How about the variation in the liquid gravity?

Exhibit Number Four shows it as being 49.3; Exhibit Number Two you indicated the gravity at 54, what would be the difference there?

A That's again the difference in separation pressures. The gravity of the liquid is being sensitive to separation pressures.

Q So the amount of gas that has been removed from the liquid would affect the gravity?

A Yes, that is correct. In other words, you flash out more intermediate and light fractions at separation pressure than you would at higher pressure.

Q Will there be any difference in the value of the liquids produced by two stage separations as compared with the value of the liquids that are produced with single stage separations as you now have in the field?

A There could.

Q Would that affect the gravity materials, will it cause the value to be increased or decreased?

A It would probably cause it to be increased. I understand that most of the pipe line companies have put into effect a decrease in price and sometimes in the case of an established condensate, you may also take a price cut on a per barrel basis over what you get otherwise.

Q So you have calculated that you would get 25 percent more liquids with the two stage separation; your liquids would have a smaller value per barrel?

A Yes, I would anticipate it would be over ten cents a barrel less what you are talking about, maybe $3.08 a barrel at present.

Q How about the value of the gas, would that be changed whether the gas had gone through single stage separation or two stage separation?

A It would be changed, of course, in regard to the liquid products contained in the gas; the type of sale that at least had been contemplated, what a sale at high pressure and separation at low pressure could cause you, of course, to have to install compression facilities.

Q Have you made any analysis of the total value of the recoverable value, of the recoverable liquid hydrocarbon under single stage separation and two stage separation, considering the value of the liquids in the gas sold to the gas companies and also penalty on the high gravity of the liquids produced?

A Yes, we have. It indicates that in the case of where you could take your increase in recovery you get by installing efficient separation equipment on more or less current basis that there would be sufficient to pay out that equipment.

Q And you will make more money with the two stage separation?

A There would be more liquids put into tanks and sold, I mean from the pool. In other words, if the pool would be more efficiently produced that way.

Q This will not be off set by the decrease in the value of the gas? A No, sir.

Q You said that negotiations were presently under way for the

sale of the gas in this area, have you any idea of the volume of gas that would be taken from the wells?

A We contemplate a production range of from 3,000,000 up to perhaps as high as 5,000,000 a day from three -- from this pool, from all wells there.

Q That would be from 1,000,000 to slightly more than 1,000,000 for each well? A. Yes, sir.

Q What volume of liquid would be produced with that amount of gas?

A From approximately 800 barrels for the whole pool up to possibly as high as 1400. That would be at least as high as we would ever contemplate going at the present time.

Q What was the depth bracket that the wells presently fall in?

A 12 to 13 thousand.

Q What is the allowable for a well at 33 barrels normal unit allowable?

A I believe it is 223, as I recall, barrels.

Q So that three wells classified as oil wells would receive a total allowable of some 660 some odd barrels per day?

A Yes.

Q But by reclassification and taking 5,000,000 cubic feet per day you would produce as much as 1400 barrels from the three wells?

A Yes, conceivably, we would at least start out at that rate.

Q Is Humble entertaining any plans at the present time for drilling additional wells in the pool, in the Devonian?

A We are considering drilling at least one additional well.

Q Mr. Hackney, do you you know of any pools in the State of New Mexico which operate with a gas-oil ratio of 5 to 6 thousand cubic feel per barrel which are presently classified as gas wells?

A No, sir, I don't.

Q Or gas pools rather. Do you know, Mr. Hackney, of any oil pools which produce with an average gas-oil ratio of 5 to 6 thousand cubic feet per barrel?

A There may be oil pools that produce with that ratio. I know of no pool that's producing with a solution ratio in that range. If they are producing at that ratio, it's either a dissolved gas being for dry gas cap, gas produced with the oil.

Q Mr. Hackney, would you elaborate a little bit on the statement that you made that there was some danger, I believe you made this statement, correct me if I am wrong, did you made the statement that there was some danger to the ultimate recovery from this pool if the withdrawals were not at a predetermined rate?

A I had particular reference in that case to one factor of out running this natural water drive by excessive production rates which could permit reservoir pressure to drop below this dew point pressure and cause the formation of two phases in the reservoir which could leave liquid behind in the reservoir and thus reduce your ultimate liquid recovery. Another factor could

be that if you produced it at too high a rate you could cause premature coning or fingering of the advancing water.

Q This situation would be true whether the pool were classified as a gas pool or an oil pool, would it not?

A Yes.

Q Is there more likelihood that it would occur under either designation?

A There would be more likelihood that it would occur as an oil pool, I would think, if the pool were produced on a unit allowable basis unless the production was voluntarily curtailed below that.

Q How would this be true, Mr. Hackney, when you said you might produce 1400 barrels of liquid per day as a gas pool, but only 660 some odd barrels of liquid per day as an oil pool from the three wells?

A Of course, on present development there. I'm talking about if you went in and drilled it up on 40 acres.

Q Would Humble develop this unit on 40 acre spacing if the pool remained classified as an oil pool?

A We'd be, I think, very reluctant to because, one thing, if the pool were produced on unit allowable basis on 40 acre development, we feel that would result in excessive rates of withdrawal from the reservoir and it, of course, as a side issue there, it could probably cause the installation of this additional separation equipment to improve liquid recovery, it would probably

cause that to be uneconomical.

Q But the likelihood of excessive rates of withdrawal, considering now only the three wells that are completed in the pool at the present time, the likelihood of excessive withdrawals reducing the ultimate recovery from this pool there's more likelihood of this with the pool classified as a gas pool than as an oil pool?

A Well, that depends, of course, on how the operator would produce it, thinking on a gas pool type classification that it might be produced more on a unit basis. In other words, that you would produce the reservoir fluid from the wells where you could get the highest ultimate recovery as compared to producing it on an individual well basis.

Q This is a unit though?

A Yes.

Q With one operator of the entire unit?

A Yes.

Q Do you feel, Mr. Hackney, that one well in this pool will drain 160 acres regardless of whether the pool is classified as an oil pool or gas pool?

A I have no technical evidence that one well can drain 160; however, I have -- conversely, I have none that would indicate that it could not. The main factor that would indicate that it could drain 160 is the low viscosity of the fluid which approaches that of a gas, or actually is that of a gas at these

conditions. I mean it should drain 160 as feasibly as any other gas pool developed on 160. That is, of course, depending on different other factors that might be involved.

Q Does the viscosity of the liquid in this pool compare with the viscosity of liquids in the ordinary type of a gas pool at reservoir conditions?

A For their particular type pool, I believe that it does. Of course, when you get in the range of the critical, the methods for calculating viscosities more or less break down, since you are in this range where you can't distinguish between liquids and gases. Using a chart that I had available, I'll have to find my reference here, published in a pamphlet by Dr. Katz, at original reservoir conditions viscosity would have been, regarding the chart, .085 centerpoises as compared to the.113 that we measured. Of course, that's in the range of the .113. It's closer to that than --

Q -- .118, isn't it?

A Yes, .118. It's closer to that than it is any oil viscosity that we know of.

Q On your Exhibit Number Six where you had the black color description for the fluids, this is below the bubble point and yet it is still a single phase. How is that explained?

A Apparently, right when you drop below this critical pressure, of course, either the liquid breaks out of the gas or the gas breaks out of the liquid, it is in very small either droplets

or bubbles and it, of course, this occurred in dropping from 3280 to 3260, and that color change was noted after it sat there a while. You could notice two phases after they had time to separate out. Being near the critical there is very little difference in density between your gas and liquid phases since you are approaching the point at which you can't distinguish the two, and that would cause this difficult separation problem.

Q So it may actually be in two phases but without separation?

A Yes.

Q Now, these percents of liquid and gas that are given after it goes to two phase, are these in volumes or what?

A They are approximately in volumes. This particular cell, we aren't set up to measure accurately the percent liquid or gas. It was just more or less a guess they had. It was roughly 65 percent liquid and 35 percent gas on a volume.

Q By volume?

A Yes. Basis.

MR. NUTTER: I believe that's all.

MR. UTZ: I'd like to make a correction.

MR. NUTTER: Anyone else have a question? Mr. Utz.

CROSS-EXAMINATION

BY MR. UTZ:

Q Mr. Hackney, did you state this was a water drive reservoir?

A Yes, insofar as we have been able to determine from analyzing the past behavior.

Q You know of no gas cap?

A No, sir. It would be very unusual if a gas cap or two or an oil rim, however you want to put it, would be there, because the fact that this is existing in this range, it could be an equilibrium with another phase.

Q All of your reservoir fluid, you believe the gas in your reservoir is in solution?

A It's all in one phase, fluid phase.

Q In your opinion should reservoirs be classified as to the reservoir conditions or well conditions?

A Normally, I mean just in my judgment, I would think they ought to be classified on reservoir conditions. That is, if you are talking about as to whether they are gas or oil. Of course, I think you might take into consideration what the surface conditions are.

Q This is definitely a liquid in the reservoir, is it not?

A No, sir, I don't know, I can't say that it is. I think it's right in the dividing line between what would be considered a liquid and what would be considered a gas.

Q Did you take bottom hole samples? A Yes, sir.

Q What did the bottom hole samples indicate?

A What --

Q -- A liquid with gas in solution?

A Well, I mean either it's a liquid with gas in solution or a gas with liquids vaporized in it, depending on which side on a

technical basis which side of that critical point you are on.

Q The rate when it gets to the surface, you would have more gas?

A Well, considering when you take out a barrel of this material the largest percent of it is gas.

Q I believe you did state that it was a single phase in the reservoir?

A Yes, sir. As far as our laboratory has been able to determine, it is in one phase.

Q As it is produced, it becomes two phases?

A Yes, sir.

Q What was your GOR ratio in the bottom hole sample, GOR and reservoir conditions, would that be the same as the well head GOR?

A Yes, sir, it should be unless you have drawn down your reservoir pressure in the vicinity of your well bore in producing it, and cause some retrograde condensation to occur in the reservoir.

Q Did you take bottom hole samples from all three of these wells?

A No. It was taken from the Number Two and I believe a sample from the Number Three well. There were also surface samples taken and re-examined in the case of the Number Two well in addition to the regular bottom hole sample.

Q Did you at any time during this record state what the well

head GOR's for each individual well was?

A No. I believe, I don't believe I did. I stated here that for the most of January the average ratio was, on Exhibit Two, was 5026. They were all in that range.

Q They are all pretty close to 5000?

A Yes, they are all pretty close.

Q With reference to your Exhibit Number Two where you stated the GOR's on various other pools in this area, do you have any idea what the range of the GOR was on the other pools? Were there any as high as 5000 to one? Any wells in the pool as high as 5000 to one?

A On these particular pools?

Q Yes.

A I can't state definitely right now. I don't recall. I remember that some of them down in the south part of Lea County had some higher ratios. For instance, the Dollarhide which apparently is a solution gas drive and wasn't representative of these.

Q These are average GOR's that you have taken?

A Yes, arithmetic average.

Q Some would be higher, you don't know how much higher, and some would be lower?

A Yes, of course, in the case of these showing low ratios, as I recall, most of all of them had low ratios. There might have been some variation in them.

MR. UTZ: That's all I have.

CROSS-EXAMINATION

BY MR. COOLEY:

Q Mr. Hackney, returning for a moment to your remarks concerning Dr. Weinaung's paper that you pointed out on your Exhibit there on the board, I believe you had a constant pressure and a varying temperature, didn't you, in your discussion?

A I believe the reference I had to Dr. Weinaug was in the phase relationship diagram that he and Dr. Bradley actually determined on this Benedum Ellenbruger field.

Q Was that to determine the phase in the reservoir at reservoir temperature?

A They did that incidentally. Primarily what they found was another phenomenon that wasn't related particularly to this problem.

Q With reference to the particular pool at hand here, the temperature is always going to remain constant?

A Yes, that is right.

Q The varying factor will be the pressure?

A That's correct.

Q As you have shown on your Exhibit Six, as the pressure comes down you reach another critical point. There is no critical point with regard to pressure on that exhibit, is there?

A Well, the critical point, when you actually reach the critical point, I mean you don't reach it unless you happened to be right on this line and as you drop pressure at reservoir

temperature, you could hit the critical pressure in that case, but if you were over here, you, of course, wouldn't at reservoir conditions. Although you would hit a pressure according to that --

Q -- If the reservoir temperature put you in the green, if the temperature was high enough and the pressure was -- I mean, if the temperature was low enough and the temperature high enough, you would be in the green?

A Yes, sir.

Q As the pressure declined, you would get something that might reach the critical point to which you referred to as waste occur in the reservoir.

A Yes.

Q You would have a flashing?

A Yes, it could either occur in an oil system or gas system. In one case over here it would be retrograde.

Q Retrograde?

A And, of course, over here you would be operating under dissolved gas type mechanism where you produce your gas?

Q The gas would flash out and leave a substantial quantity of oil in the reservoir?

A Yes.

Q Have you determined what that pressure is, the critical pressure for this particular pool, can you produce -- well, answer that question first.

A It's in the range of 3270.

Q What is your present pressure?

A In the range of 5000. We're --

Q -- Do you feel that you can produce this regardless of whether it is oil or a gas reservoir in such a manner and preserve those pressures that the risk of waste could be minimized by a controlled type of production?

A Yes.

Q So as to prevent the pressures from falling below the critical point?

A Yes, I stated we did plan to watch the pressures very closely and not allow the pressure to drop below the 3270 or at such pressure which we would begin to lose liquids underground.

Q Now, being a water drive reservoir it would be possible, would it not, to produce the pool to depletion at a constant pressure if the withdrawals were exactly equal to the water encroachment?

A Yes, that is right.

Q You would keep above this critical pressure in that way?

A Yes.

Q You mentioned something about the reinjection of gas in the event you got in trouble. Would that mean that you had already got below the pressure and flashing occurred? Would you explain what you meant by that?

A I think the first thing, if there was indication that the withdrawal rates were, in use were going to cause this reservoir

pressure to drop below this 3270 that then the first thing that would happen would be that the production would be pinched back to try to permit the water drive to keep up and if it should appear that the water drive was so limited that you could have no substantial or significant production rates with the water drive, then you probably would want to consider putting gas in the ground.

Q Would this be an extremely dry type of gas?

A Yes, I would think in this case. It would depend on where the gas was being processed or not other than these processing facilities.

Q Would this be part of the gas that you were going to sell --

A -- Yes.

Q Or part of the gas that you had contracted to sell?

A Yes.

Q Do you know, or Mr. Bratton know, if this type of arrangement is possible or has ever been approved by the Federal Power Commission?

A To my knowledge it's in gas contracts. I don't know whether it's actually, that particular provision has been invoked. Our attorneys anticipate that there could be some delay in being able to get the gas back, say, if it had gone into inter-state commerce.

Q That's what I'm getting at, once it's committed to inter-

state commerce under your contract and you have a connection if that contract will not allow you to withdraw it, will they, without their permission?

A You will, as I understand it, have to get an abandonment of service certificate or permit. There could be some delay in getting that, at least under present procedures. I think they are not very prompt on considering those matters.

Q How long might that delay be, if you have any personal knowledge of it?

A Except what our people have estimated, it could be up to two years.

Q And in two years it would be well too late to do anything about it, couldn't it?

A It could, of course, that's a calculated risk that you have to take. In other words, we would produce the pool up to the date of shut-in flared the gas to get out of this problem that you are talking about so that we could have the gas available for injection immediately and then, of course, the pool was shut-in as of February First to conserve gas while these reservoir studies were made, and we attempted to determine what type of drive mechanism we might have and it appears now that we have a strong water drive and it would be safe to go ahead and contract this gas, and probably that this two year period would not hurt you in that case.

Q If this pool remains classified as an oil pool and gas is

consequently classified as casing head gas, would it be immediately available for reinjection or would there be the similar objection or delay of getting release from FPC?

A To my knowledge.

Q Is this problem present regardless of the classification of the pool?

A To my knowledge it is regardless of whether you have gas, well gas or casing head gas.

MR. BRATTON: Without personal knowledge, that is my understanding of the advice of the Humble Gas attorneys in Houston. That was the reason for the delay in disposing of the gas before, if you will recall a meeting was held with the Commission on this very problem approximately 6 or 8 months ago and that was the reason for the delay up to that point was that the Humble attorneys were afraid they would get into that same situation on a temporary type of contract and they did not want to do that until they had a chance to fully evaluate and study this reservoir and see just what it was. But, in short answer to your problem, I think that is present regardless of how the pool is classified.

Q (By Mr. Cooley) Could you submit something on the order of a more certain conclusion on this legal point, a very informal letter or anything like that as to whether it is, I mean on this delay, as to whether it is called casing head gas or dry gas?

MR. BRATTON: Will be glad to.

Q (By Mr. Cooley) Will you explain why it would not be economically feasible to install this two stage separation in the event the pool remains classified as an oil well?

A As an oil pool?

Q As an oil pool?

A Under an oil type allowable, assuming all your wells are capable of making the allowable, if you install more efficient separation equipment you are actually not permitted to produce any more liquids into the tank and also you are actually withdrawing fewer barrels of reservoir fluid than you would be permitted to withdraw under more inefficient separation practices. So any pay out that you could show for making this investment would not be on a current basis, you would have to get way on down the line to where you were near depletion before you actually would have any current income to apply on the pay out against this equipment.

Q Does this analysis fail to consider the presence of a gas-oil ratio penalty or limitation? Doesn't that assume an unlimited gas production?

A I think, I mean, if the pool classification were continued as oil, in my judgment it appears that there would be justification for asking for a higher penalty ratio than the 2000 to one, say, in the range of 6000 to one which would represent a solution ratio on an oil type fluid.

Q If you assume for the moment that no relief is granted in that respect, then it would be again to your advantage to install the two stage separation to decrease your gas-oil ratio?

A Oh, yes, I think that would be true. As I say, I would see no reason why the 2000 to one ratio would apply in that case, though.

MR. COOLEY: Thank you. That's all the questions I have.

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

CROSS-EXAMINATION

BY MR. FISHER:

Q Mr. Hackney, I just took it from your testimony, do you know what your critical point is?

A No, sir. I attempted to make clear at least in my judgment, I can't say whether this Four Lakes fluid is here, here or right on the line, but all indications we have is that it's very close to this technical dividing line between what is a gas and what is a --

Q -- Do you think you are on the single phase gas side of the line, is that right?

A I think that we're very near the line. I can't say which side of the line we are on. Actually, it would be very difficult to determine any significant change of property, say, from five degrees on one side to five degrees on the other side.

Q If you were on the red side of the line and you decreased your pressure at a constant temperature, then that line coming out of the critical point would be a dew line?

A Yes. This would represent a dew point line which comes into the critical point and then represents a bubble point line and, of course, at this critical point, your dew point and your bubble point becomes the same thing. You can't distinguish whether you have --

Q -- Your liquid then is what you might call, then it's kind of in a sublime state, is that right?

A You mean at this, in other words it is probably, I would call it a fluid in this zone rather than either a liquid or gas.

MR. FISHER: I have nothing further.

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

(Witness excused.)

MR. PORTER: Mr. Runyan, will you take the stand and proceed with Paragraph A through I?

MR. KELLAHIN: I would like to make a statement in connection with this phase of the case. Jason Kellahin of Kellahin and Fox, Santa Fe, representing Phillips Petroleum Company. As the testimony shows, Phillips owns in excess of 30 percent of the interest in this pool and Humble is the operator. Phillips sees the position that has been presented and urges the Commission to adopt the position presented by Humble Oil and Refining Company.

MR. PORTER: Does anyone else have anything further to say concerning Paragraph J of this case? Mr. Payne, will you proceed?

JOHN W. RUNYAN

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

DIRECT EXAMINATION

BY MR. PAYNE:

Q Would you state your name and position, please?

A John W. Runyan, Geologist for the Oil Conservation Commission.

Q In your capacity as geologist for the Oil Conservation Commission have you had an opportunity to make a study concerning the creation of new pools and the extension of existing pools in Lea, Eddy and Roosevelt Counties, New Mexico?

A Yes, sir, I have.

Q What is your recommendation concerning the creation of the new oil pool for Devonian production, designated as the Dickinson-Devonian Pool?

A Yes. I recommend that the new pool be created and called the Dickinson-Devonian and this is due to the discovery of Gulf Oil Corporation O. L. Cryer Number One well located in Unit N, Section 34, Township 10 South, Range 36 East, completed in the Devonian on the 5/5/1958 and top of perforation is 12315 feet.

Q What do you recommend as the vertical limits?

A The Devonian formation.

Q The horizontal limits?

A The horizontal limits will be the southwest quarter of Section 34.

Q What are your recommendations concerning the creation of a new oil pool for Queen production, designated as the East Millman-Queen Pool?

A I recommend a new pool be created, called the East Millman-Queen Pool, due to the discovery of the Miller Brother's Oil Company Western Development Number One well located in Unit J of Section 14, Township 19 South, Range 28 East, completed in the Queen, in April the 11th, 1958, and the depth to the casing shoe is 1760. It's an open hole completion.

Q What do you recommend as the vertical limits?

A The Queen formation.

Q Horizontal limits?

A The southeast quarter of Section 14.

Q What are your recommendations concerning the creation of a new oil pool for Bone Springs production, designated as the South Vacuum-Bone Springs Pool?

A I recommend that a new pool be created called the South Vacuum-Bone Springs Pool and this is due to the discovery of Sinclair Oil and Gas, State Lea 403, Well Number One, located in Unit D of Section 22, Township 18 South, Range 35 East, completed April the 23rd, 1958, top of the perforation, 8504 feet.

Q What do you recommend as the vertical and horizontal

limits?

A I recommend that the vertical limits be the Bone Springs formation and the horizontal the northwest quarter of Section 22.

Q What are your recommendations concerning changing the pool limits of the Artesia Pool to the Queen, Grayburg, and San Andres?

A I recommend that the vertical limits of the Artesia Pool be changed to include the Queen formation, which will then make it the Queen, Grayburg, and San Andres formation.

Q You are not recommending that the horizontal limits be changed? A No.

Q What are your recommendations concerning the extension of the Jalmat Pool?

A I recommend that this pool be extended as advertised due to four wells capable of producing from this pool.

Q What are your recommendations concerning the extension of the Justis Pool?

A I recommend that this pool be created as advertised due to one well recently completed and capable of producing from this pool.

Q What are your recommendations concerning the extension of the Justis-Fusselman Pool?

A I recommend that this pool be extended as advertised due to one well being capable of producing from the pool.

Q What are your recommendations concerning the extension

of the Milnesand-Pennsylvanian Pool?

A I recommend that this pool be extended as advertised due to two wells capable of producing from this pool and also an unadvertised portion being the northeast quarter of Section 14, Township 8 South, Range 34 East.

Q What are your recommendations concerning the extension of the Vandagriff-Keyes Gas Pool?

A I recommend that this pool be extended as advertised due to two wells capable of producing from this pool.

Q Mr. Runyan, have you prepared exhibits substantiating your recommendations?

A Yes, I have and I wish to submit Exhibits A through C and E through I to the Commission.

MR. PORTER: I move that the exhibits be received in evidence in Case 1480. Without objection the exhibits will be received.

(Whereupon Exhibits A through C and E through I were received in evidence.)

MR. PORTER: Anyone have a question of Mr. Runyan?

MR. NUTTER: I have.

MR. PORTER: Mr. Nutter.

CROSS-EXAMINATION

BY MR. NUTTER:

Q Would you explain the need for the extension of the vertical limits in the Artesia Pool to include the Grayburg

formation?

A Actually, this particular pool being discovered back in the late 1920's and there is found to be several wells which are open into the Queen formation which are completed as open hole and so, due to these wells, we wish to extend the vertical limits to include the Queen since they are opened into the Queen formation.

Q Are these old wells? A Yes.

Q So for many years the Queen formation has been one of the producing formations for this pool? A Yes, sir.

MR. NUTTER: Thank you.

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

(Witness excused.)

MR. PORTER: Does anyone have any further statements to make in this case? We'll take the case under advisement.

STATE OF NEW MEXICO)
) SS
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission, Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and Notarial seal this 18th day of August, 1958.

Ada Dearnley
Notary Public

My Commission Expires:
June 19, 1959