BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
August 30, 1961

IN THE MATTER OF:

CASE NO. 2370

TRANSCRIPT OF HEARING

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OIL CONSERVATION COMMISSION
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EXAMINER HEARING

IN THE MATTER OF:

Application of Newmont Oil Company for special rules governing its Square Lake Pool Waterflood Project, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks the establishment of special rules governing its Square Lake Pool Waterflood Project in Eddy County, New Mexico, to include provisions for the immediate conversion to water injection of certain wells in said project and the conversion of additional wells to water injection at later stages in the life of said waterflood project.

Case 2370

BEFORE:
Elvis A. Utz, Examiner

TRANSCRIPT OF HEARING

MR. UTZ: Case 2370.

MR. MORRIS: Application of Newmont Oil Company for special rules governing its Square Lake Pool Waterflood Project.

MR. CAMPBELL: I am Jack N. Campbell of Campbell & Russell, appearing on behalf of the applicant.

MR. UTZ: Are there other appearances in this case? You may proceed.

MR. CAMPBELL: I have one witness: Mr. Darden, to be sworn.

(Witness sworn.)

FRANK DARDEN,

called as a witness herein, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CAMPBELL:

Q State your name, please.

A Frank Darden.

Q Where do you work, and by whom are you employed, and in what capacity?

A I work in Fort Worth, Texas, for Newmont Oil Company as manager of operations.

Q Do you have a professional background?

A Yes, sir.

Q What is your profession?

A I am a Petroleum Engineer by experience and education.

Q Have you previously testified before this Commission in that capacity?

A I have.

Q In your work with Newmont Oil Company, are you acquainted with the Square Lake Pool Waterflood Project?

A Yes.

Q To what extent have you been acquainted with that?

A Well, I have supervised the handling and development of that project since our company acquired the property from Ambassador Oil Corporation.

Q I refer you, Mr. Darden, to an Exhibit which has been identified as Newmont's Exhibit No. 1, and which has been placed on the wall, there, and ask you if you will step up there, please.

A (Indicating.)

Q Referring to that Exhibit, will you point out to the Examiner what it depicts insofar as this Project is concerned, insofar as your application, here, is concerned.

A Well, we have shown on this map the presently developed, presently developed by waterflooding area outlined in orange, with the current injection wells in solid, circled solidly in red with solid red lines between wells. We have shown the three stages of development which we are applying for. The first state in green, the second in brown, and the third stage in brown, with the proposed pattern for extension of that project in dotted red lines.

Q Over what period of time do you propose to make these stage developments on the project, Mr. Darden?

A We would like to commence development of stage 1 October the 1st of '61, stage 2, July the 1st of '63, and stage 3, April the 1st of '63.

Q What peculiar problems does this particular waterflood project embrace with regard to the configurations of the project area and the ownership of the properties within the area, Mr. Darden?

A Well, as you can see, the field of the project which we are developing is nearer towards the east and south, and Newmont is operating all of the properties colored, here. However, some of these properties are being operated by contract, and Newmont does not own any of the oil that has been used from those properties.

We did that to assure the most efficient development of the property for use and for the offset operators. As you can note from the Exhibit, this property, the oil from this property is owned by Southern Petroleum Corporation, and the oil from these checkerboarded properties, labeled Kennedy, are owned by Kennedy Oil Company. So while we are operating the entire project, we are not receiving the oil from the total area colored in here, and under the present expansion rule where we are not permitted to put new injection wells on until we have had a response and offset producers, we are put at a severe disadvantage in this project because of the limited number of producers that can effect our development.

For example, in the presently developed area, we will have to wait until we get response in these two wells before we can put these three wells on. Then, from our history, it looks like it takes between 9 and 14 months to get response, based on our pilot performance, which we will show you in detail. So then, between 9 and 12 months later, those two wells should respond. Then, we can put two more wells on. And then, approximately a year later this well will respond. Then, we can put those two wells on. And then a little later, maybe this one will respond, and we can put that one on a little later. These two wells will respond, and then we can put these three wells on. And then a year later, this well will respond, and we can put these two wells on. Then a year later, this well will respond, and then we can

put this one and that one on. And a little later than that, this one will respond and we can put this one on, and we will have finished development. But, it is because of the configuration of this particular project that it is so-limited in the, in a normal project with your pilots in the middle, and you can expand periphery, you can get your project developed much faster, but this just happens to be a field where it is impossible to do so.

Q What is the approximate length of time it would take you to develop this property, to your developing --

A It would take us into 1966. I have the date over there. It is April of '65, I believe it is. We estimate it would take 32 months longer to reach full development on this basis on the present basis that it would if we are permitted to develop it in three stages.

Q Now, in addition to the problems arising out of the configuration of the area and the diverse ownership of oil within the area, what can you tell the Examiner with regard to the potential of this particular waterflood project as related to some of the other project in which you may be engaged, or which have been developed in the State of New Mexico? I am speaking now from the point of view of potential reserves, recoverable secondary reserves, the economic factors that might be involved in connection with the length of time required to develop this project.

A Well, we would definitely not class this project as a a Class A project in terms of reserves or response or final return.

And one of the best indexes of that is the amount of oil that was recovered by primary. This property was recovered approximately 1500 barrels per acre by primary. We are flooding tight sand. We have found that we have had very little reservoir, very few cores to use when we took the project, and we found that by boosting our injection pressure to 1,950 pounds and using water and various other devices, we are able to get a little less than 300 barrels per well per day in the ground, in the injection wells, which is a measure of the low permeability of the oil sand. We also have three Sands there, and the permeability is not, at least we do not believe it to be consistent in every member, so we have got a permeability variation problem there, which indicates that we will have some permeable zones flooding out faster than others, and therefore we will have water production earlier in this field than we would in a field where we are flooding one solid chunk of sand, where you will have a more uniform fillup. So all of those things combine to make this project a much tighter economic prospect than some other floods which we are developing and operating.

Q Do you consider that the items which you have mentioned in connection with the configuration or ownership of the oil and reservoir conditions are such that it does create in this particular project area, problems that may not usually be encountered in other waterflood projects?

A Yes, I do; and as I showed you there, it is primarily because of configuration and the varied ownership within the

individual area.

Q Will you return to the chair, here, now, Mr. Darden.

A (Indicating.)

Q In connection with your work on the waterflood project, have you had occasion to make a study of the performance of the wells thus far in the pilot area of the project?

A I have.

Q I refer you to what has been identified as Exhibit No. 2, and ask you to state what that is, please.

A This is a composite plot of the individual well performance of all of the wells in the original pilot area that were affected by two injection wells. We would say that they are affected by a two-way drive.

Q Would you step up to Exhibit No. 1, there, and point out, and identify by location the wells that are involved in what you call the two-way drive.

A Now, I would like for you to realize the original pilot area consisted of these six wells.

Q You will have to make some sort of identification.

A Yes. The original pilot area consisted of Vickers No. 2 in the northeast of the northeast of Section 30, and Vickers No. 3 in the southwest of the northeast of Section 30. Fidel No. 2 in the northeast of the southeast of Section 30. Druning Unit No. 1 in the southwest of the northwest of Section 29. Texas Trading A No. 4 in the northeast of the southwest of 29. Texas

Trade A No. 1 in the southwest of the southwest of Section 29; all in Township 16 South, 31 East. Now, on this Exhibit of the performance of the two-way drive, each of them has a different type of line depicting the production in barrels per month of oil since the 1st of 1960. Actually, we commenced injection with pressure water, and we date our actual operation of this project from the middle of December of '59. That was when we got a suitable water supply completed.

Vickers No. 4, which is one of the wells on this Exhibit, is located in the northwest of the northeast of Section 30, and that well is plotted on this curve as a solid line, which has reached a peak of approximately 1,770 barrels per month. The Druning Unit No. 2, which is in the southwest of the northwest of Section 29, is plotted in a dashed line, and that well has reached a peak of 1,760 barrels per month. Fidel No. 1, which is in the southeast of the southeast of Section 30, is plotting the dotted line, and that well has reached a peak of 1,110 barrels per month. Texaco Trading A No. 2, which is in the southeast of the southwest of Section 29, and is depicted by a line of dots and dashes, has reached a peak of 2700 barrels per month. As you can note, some of these wells have already started declining, but we think that is a temporary thing, and we hope that it is, in any event, and that they will continue on up.

And then, we have drawn a solid dash line through these individual well curves, these being the four wells in the

pilot area have had sufficient performance to be representative of what our pilot will do, to determine an average performance for a two-way drive, and that is shown by the solid dark line.

Q Now, have you made this same sort of analysis with regard to those wells in the pilot area that have been subject to a four-way drive?

A Yes.

Q Well, I refer you to what has been identified as Newmont Exhibit No. 3, and ask you to point out to the Examiner --

A The two wells in the pilot area that are surrounded by four injection wells are the Vickers No. 1 in the southeast of the northeast of Section 30, and the Texas Trading A No. 3, in the northwest of the southwest of Section 29. The production from these two wells is also plotted on this Exhibit, and you can see that the Vickers No. 1 has passed a peak production of approximately 1800 barrels per month, to date, and the Texas Trading A No. 3 had a peak production of 3,270 barrels per month.

Q Then, you find that the response of the wells subject to the four-way drive has been substantially greater than that well subject to the two-way drive; is that correct?

A Yes, we do.

Q And in this particular configuration of the project area, under the present Rule, if applied, would you find that there would be larger number of wells than normal which would be subject to drive from a two-way drive, at least, over a year's period of

time?

A Yes. I think that in showing you the rate of development, that was pretty clearly seen, that most of the slush production from this project would be on a two-way drive, simply by necessity since we would have to get response from a two-way drive before we do put the next row of injection wells on.

Q Have there been any wells in this project area or in the pilot area which have peaked out under, and which are now producing water?

A Yes, one.

Q Which one is that?

A That is the Vickers No. 7.

Q Where is it located?

A It is located in the center of the northeast quarter of Section 30. It is above the pattern producer.

Q I refer you to what has been identified as Newmont's Exhibit No. 4, and ask you to state what this is, please.

A This is a production history of oil and water of the Vickers No. 7. As you can see, this well hit a peak production of almost 4,100 barrels per month, and then dropped sharply. Two months after it hit its peak, we had our first water production, and the water production has climbed rapidly. Now, this is our only well so far that has had sufficient history for us to determine the rate of decline that we can expect in this project, and also it gives us some indication of the way our water production

will perform in the project.

Q Does it indicate or substantiate the statement you made earlier in your testimony that this project will not be one that will be a prolific producer in relation to some of the other projects that have been undertaken in the State?

A Yes, it does, because it, this particular well, reached a high peak which necessitated buying larger pumping equipment, and then we still have to have that large pumping equipment to handle all the water it will make, but as you can see, our oil production rate has dropped sharply in a period of six months, there. And, as you will note on this curve, there was a very sharp break two months after we hit our peak. Now, we are hoping that will not be typical, but we don't know. We feel that we had some sand face plugging in the well which caused that abrupt drop, and we were forced to use a fracture treatment to restore fluid production from that well; and of course, that is another extent of things. It seems to be characteristic of this flood, because we have had to frac several of the injection wells in order to keep them taking water.

Q Now, based upon your study of the producing history of these wells, as indicated in Exhibits 2, 3, and 4, have you reached any conclusion as to the ultimate recovery of oil by secondary methods from this project area under the provisions of the present Rule, and under the proposal that you make here, with regard to the three-stage development of the area? Can you remember my

question, or was that too long?

A I think --

Q I asked if you had reached any conclusion with regard to the comparative recovery.

A Well, we definitely have concluded that we will recover more oil by having our producing wells surrounded by injectors, rather than by two-way drive. If you will look at your Exhibits of the production history of these individual wells on both the two- and the four-way drive, you will note that on the two-way drive response came in oh, 8, 9, to 10 months normally on these two-way wells, whereas on the center producers, we didn't get response until a year, or as much as fourteen months on one of them, I believe.

Now, to us, that indicates that we are getting a much more uniform fillup of the sand volume inside that five-spot than we do on a two-way drive. On a two-way drive, your water is going to take the path of least resistance, and therefore, it is going to be dissipated without filling up that void space, and without driving oil, so you will get an immediate response out of a higher permeability part of the sand, which will come a little sooner than you would get in a closed five-spot. But then, water will come right behind it, so that you will ultimately, certainly, recover less oil unless you have the producers backed up.

Q Now, I refer you to what has been identified as Newmont's Exhibit No. 5, and ask you please to state what that is.

A This is our best estimate of how this project's total oil production would occur if we were permitted to develop it in the three additional stages which we have proposed. We have marked the original developed area, which is marked on Exhibit 1 in orange. Its projected production curve is also marked in orange, as you will note. The first-stage development, marked in green, will not peak until after the original developed area has already started its decline. And the same thing will be true of Page No. 2, which will not reach its peak until we have the original area and stage 1 have commenced to decline. And then, Page 3, which, of course, will be a smaller stage, will not reach its peak until stage 2 has already commenced its decline. Then, we have combined the production for the various stages to give the solid curve, which is shown as the total production from the project. And, we anticipate by this method of development that this project will peak in the fourth quarter of 1961 at approximate monthly production rate of 68,700 barrels, which is an average daily rate of 2,287 barrels. There will be a total of 28 producing wells in the project at that time, and that will be an average production per producing well of 18.7 barrels per day.

Q And how would that average per producing well production compare with a situation if you drilled it under the present provisions of Rule 701?

A Well, by the present methods of expansion, we would peak at around 40,000 barrels per month, and that would hold that peak

considerably longer than will this higher peak. However, it would take us 32 months of additional time in which to recover the oil, and we do not believe that we would recover as much ultimate oil from this project as we will by this proposed development plan. Incidentally, this 32 months of additional operation will amount to, in the neighborhood of $340,000 of additional operating costs, which on a project of this economic situation is not going to help us continue as long as we might otherwise. In other words, this additional operating cost may make us abandon it a little earlier than we would otherwise, simply because we are having to produce so much water to get the amount of oil that is still left there.

Q Based upon your calculations of the production from this particular project, and from the peak production during the year 1964, is it your opinion that this project will have any substantial effect or impact upon the amount of oil available to meet the market demand in New Mexico?

A We do not think so.

Q It will not be substantially different between that and what would occur under the Rule as it now exists; is that correct, over a period of years?

A That is right.

Q Do you believe that if you are permitted to develop this project on the basis of the three stages you propose, that you will more nearly protect the correlative rights of the owners of the oil within the project area?

A I do.

Q Do you believe that by proceeding with the three stages, you will be able to ultimately recover a greater amount of oil than you would otherwise be able to recover under the present Rule?

A I do.

MR. CAMPBELL: I would like to offer Newmont's Exhibits Nos. 1 through 5 in evidence.

MR. UTZ: Without objection, Exhibits 1 through 5 will be entered into the record.

(Whereupon, Newmont's Exhibits 1 through 5 received in evidence.)

MR. CAMPBELL: That is all the questions I have, Mr. Examiner.

Q (By Mr. Utz) Mr. Darden, your Exhibit No. 5, does that not predict that these peaks, by the areas you suggest here, are nearer 12 months apart, rather than the 9 months that you suggest?

A Yes. Actually, as you can see from Exhibit No. 2, the four-way drive, I believe that Exhibit No. 2, No. 3.

MR. CAMPBELL: 3.

THE WITNESS: With surrounded producers, it takes a little longer for the response.

Q (By Mr. Utz) Well, referring to your Exhibit No. 3, you began receiving its response in about October, 1960?

A Yes, sir.

Q And it would indicate that the well may not have peaked

in, what is it? -- May or June of '61?

A That is June, yes. It has. It dropped off in July, so we don't know whether it has peaked or not.

Q Which would be a minimum of 9 months to peak, and possibly a little longer?

A Yes, sir. Well actually, in this particular case, perhaps I misunderstood your question, but that was 8 months to peak on that particular well, and 9 months to peak on the Vickers No. 1, if that is peak. Now, we don't know whether it is or not.

Q Yes, sir.

A When I said 12 months, I was speaking more of fillup. I was thinking of fillup when you asked me the question. That 12 months is closer to the time for actual response.

Q Yes, sir. Now, on your Exhibit No. 2, how many of those wells do you show on that that have actually started declining?

A Well, two of them. Well, let's see -- No, only one has actually started declining, and we are not sure. We hope that is not going to be all that well makes, but we don't know.

Q That would be your --

A Texas Trading A 2.

Q So, the other wells started increasing production at around August, 1960, and all except the one still hadn't peaked in July of '61; is that correct?

A That is correct.

Q Which is about 10 months, which would indicate that after

response the wells would probably not have peaked a minimum of 10 months?

A This is only on the two-way drive.

Q Yes, sir. Well, to level out the production of this entire area, does it not seem that 9 months is maybe a little bit short to space the area?

A Well of course, we feel that this is a reasonable development plan because our peak production, as we expect it, will be less than it would be if this were a prorated waterflood, because as I understand it, the allowable for prorated waterflood is 42 barrels per well per day, which would, with injection wells, which would give you an average of 42 barrels a day for an average injection well, and we don't expect to reach that point by this development plan.

Q What was the average that you gave?

A 81.7, 82 barrels a day.

Q I believe it was your proposal to put the green area on October '61?

A Yes, sir.

MR. UTZ: This coming October.

Are there other questions of the witness? If there are none, the witness may be excused. Are there other statements in this case?

MR. BRATTON: Howard Bratton on behalf of the Humble Oil & Refining Company. I would just like to make one general statement

to the effect that the provisions of Rule 701, of course, were carefully worked out and considered after extensive hearings. I believe that the Commission should, and I know that it will take care that the provisions of that Rule are not emasculated by indirection, either as to allowables or as to expansions, and that in considering any application for an exception to the Rule in either direction, that the Commission must carefully consider not only that exception requested, but the precedent which it is establishing, or which might be considered to be established.

MR. UTZ: Thank you. Are there other statements? The case will be taken under advisement. The Hearing is adjourned.

(Whereupon, the hearing of Case No. 2370, was concluded.)

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, Michael P. Hall, Court Reporter, in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in machine shorthand and reduced to typewritten transcript under my personal supervision, and that the same is a true and correct record to the best of my knowledge, skill and ability.

NOTARY PUBLIC

My commission expires:

June 20, 1965

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2520, heard by me on Dec. 20, 1961.

, Examiner
New Mexico Oil Conservation Commission