

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE NO. 1493

TRANSCRIPT OF HEARING

AUGUST 13, 1958

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OIL CONSERVATION COMMISSION
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IN THE MATTER OF: :
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CASE NO. 1493 Application of Magnolia Petroleum Com- :
pany for permission to institute a :
pilot water flood project and for ad- :
ministrative procedures for the subse- :
quent expansion of said water flood :
project and for the assignment of a :
special allowable to said project. Ap- :
plicant, in the above-styled cause, :
seeks an order authorizing it to insti- :
tute a pilot water flood project on its :
State Bridges Lease in the Vacuum Pool, :
which comprises all or portions of Sec- :
tions 3, 10, 11, 12, 13, 14, 15, 22, 23, :
24, 25, 26, and 27, Township 17 South, :
Range 34 East, Lea County, New Mexico. :
Applicant proposes to inject water into :
the Grayburg-San Andres formation of :
the Vacuum Pool through six wells lo- :
cated in said Section 14. Applicant :
further proposes that administrative :
procedure be established for (1) ex- :
panding said pilot water flood project :
within the limits of said State Bridges :
Lease without notice and hearing and :
(2) assigning a project or lease allow- :
able to the extent necessary for the :
proper operation of said project. :
----- :

BEFORE:

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

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

MR. PORTER: The hearing will come to order, please. At
this time we will take up Case 1493.

MR. PAYNE: Application of Magnolia Petroleum Company for permission to institute a pilot water flood project and for administrative procedures for the subsequent expansion of said water flood project and for the assignment of a special allowable to said project.

MR. SPERLING: C. T. Evans will be the witness.

(Witness sworn)

C. T. EVANS,

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

DIRECT EXAMINATION

BY MR. SPERLING:

Q Will you state your name and residence?

A C. T. Evans. I live at Hobbs, New Mexico.

Q By whom are you employed?

A Magnolia Petroleum Company.

Q In what capacity?

A Petroleum engineer.

Q Have you on previous occasions testified before the Commission?

A No, I have not, formally.

Q Would you state your qualifications: background, educationally and experiencewise?

A I received a B.S. and M.S. degree from Oklahoma A & M. I am a registered professional engineer in the State of New Mexico.

I worked two years for Magnolia in research and development laboratory, and five years in the field.

Q In the course of your experience, have you had occasion to be associated with water flood projects?

A I have. I worked with the Kermit water flood at Kermit, Texas as -- I designed and installed a water flood at Monahans and Magnolia Silsbee Field.

MR. SPERLING: May we consider the witness qualified as an expert?

MR. PORTER: Yes, sir.

Q (By Mr. Sperling) What is your present responsibility as district engineer? What area are you concerned with?

A We handle the State of New Mexico in its entirety.

Q Now, Exhibit A that was attached to the application that was filed, is I believe, reflected on the larger map which has been identified as Magnolia's Exhibit No. 1, which appears on the bulletin board. The smaller Exhibit which is being distributed to the Commission and the staff is actually the same but does not include as great a perimeter area, is that correct?

A That is true.

Q Now, will you state, please, Mr. Evans, what is proposed insofar as the mechanical aspects of this application are concerned, that is, where the proposed injection wells are and the general area of the lease in question?

A If I might, I would like to refer to the large map here.

We have mapped in yellow our leases. This is merely for identification in this general area. We have our proposed pilot injection wells marked in green with the big circle around the well. A little further, this is the Vacuum Field that we have presented here which is located approximately twenty-three miles west of Hobbs in Lea County. I believe right now I would like to talk just a little bit about the field proper here. In this field there are -- apparently is some sort of a pressure barrier or separation in the field, and I would like to divide that right now. I will be talking about the north portion and the southern portion as I refer to it. It is currently producing at top allowable predominantly in this area, and it is not considered in this case. I think that it is a separate field from this, but there is some separation mechanism there. In this end, the south end is the one that we will be referring to, is in the depleted state, and I will follow through on that.

Q Now, while we are at that point, would you sketch briefly the production history of the portion of the field that you are speaking about, that is, when the initial production was obtained and generally what the experience of the field has been?

A The field was discovered in 1929 by the Old Vacuum Oil Company. At that time the well was shut in for a period of years, and approximately 1939 to '44 the field underwent its major development, and at that time we had taken over -- Magnolia had taken over the lease of the Vacuum Company. The greatest producing rate was in 1944, and it has been on a decline since then.

Q What would you say the depletion stage of the field is at this time?

A I would call it so-called stripper stage in the southern edge, --

Q Would you --

A -- I mean north, excuse me.

Q North.

A Pardon me.

Q Would you explain your company's evaluation of the type of reservoir that you are dealing with in the area of the proposed project?

A This reservoir or the producing zone is the Grayburg-San Andres. It is composed of sand and dolomite. Actually, the porosities would be in the eleven percent range; permeability approximately one hundred millidarcys average in the zones that were considered for the pilot.

Q Now, would you -- what about the reservoir mechanism insofar as drive is concerned?

A We are certain in the northern end that we are undergoing a solution gas drive. There are no indications of water production. Our declines have been typical for solution gas and our ratios also as high as would be expected in that type of drive.

Q Would you refer to a table which has been identified as Magnolia's Exhibit 2, I believe, and state column by column what information is reflected on the data sheet?

A On this table we have summarized the offset injections --

I mean, producing wells as well as injection wells on our pilot flood. Column No. 1 indicates the well numbers affected, and these are the State Bridges Wells. I notice we do not have that indicated there. I believe I will put it on this Exhibit.

MR. PORTER: That's your first series of wells there, No. 2, 37, 56, and so forth?

A Yes, sir. The complete tabulation here refers to State Bridges Wells; they are all on a common lease.

MR. PORTER: That's indicated at the top of your Exhibit?

A That's true. That's true.

Q (By Mr. Sperling) Now, as you mentioned earlier, you propose the use of the first six wells that are listed on the table and as identified in green on the Exhibit as the injection wells?

A Yes, sir.

Q Would you state what their present productive capacity is, and the method of completion and what you expect to do should this project be approved?

A Well, I'll more or less start from the beginning on these wells. The normal completion practice at this time was set at approximately 700 feet of surface pipe, drilled from there with rotary tools to approximately 4400 feet, set a production string of either five and a half or seven inch pipe, cemented on the bottom with two or three hundred sacks. After this, either rotary tools or cable tools were used to drill out to total depth, which in this case here is normally through the first zone of porosity in the

San Andres. Completion was natural in some cases; most cases required shooting. The shot pattern consisted of three or four hundred quarts of nitroglycerin, and in some cases acid was used along with the completion, and most of the wells have been worked on from one to two times, normal cleanouts and acidizing. The average daily production for the six wells in question is approximately five barrels per well. It ranges from two to nine, actually.

Q I assume that, again, with reference to Exhibit 2, that the remainder of the wells listed on the data sheet represent the wells which you expect to be influenced by the water injection, is that correct?

A I'd say first, they are the direct offset wells.

Q I see.

A There is a possibility of more influence, but they will be probably influenced first.

MR. SPERLING: Are the members of the staff over there able to hear the witness?

MR. UTZ: Yes, sir.

Q What injection rate do you propose insofar as these six injection wells are concerned?

A We haven't set a definite injection rate. There are several things that are still in question. This is a pilot, and we are hoping to inject from two to four hundred barrels per well per day, depending on pressures, but we do not know at this time what we can achieve insofar as rates are concerned.

Q What is the source of the water to be injected?

A We have applied and received permission to use fresh water, shallow fresh water sand from the Ogallala formation overlying -- or actually underlying the State Bridges Lease on Sections 14 and 12.

Q In other words, supply wells will be drilled in Section 14 as a source of the injection water?

A That's true.

Q And the permits and the applications that you make reference to were made and received from the State Engineer's Office, is that correct?

A That is correct.

Q What do you anticipate by way of supply insofar as this fresh water source is concerned?

A You mean volume?

Q Volume, yes.

A Again, we are fairly limited. We have gone back -- we had wells in this area during development, that is, fresh water wells, and on tests and actually what was produced from them, they would have produced approximately four thousand barrels a day, which is more than we'll need, but I feel certain that we can probably get the water necessary from one fresh water well.

Q Well, do I understand that the water rights that you have available will supply a volume, or you are entitled to the use of a volume many times in excess of the anticipated requirements?

A That's true. We have 1200 acre-feet assigned in, I be-

lieve, Sections 11 and 14.

Q 11 and 14?

A Yes. That's Range 34 East, Township 17 South.

Q Will you explain the injection procedure that you expect to follow?

A Very simple. All we intend to do is pull our producing string, clean it up, steam it to see that we don't have anything to plug the formation, and clean out to the bottom. We have two possibilities, either reverse circulation or with normal clean-out tools, run a packer on a tubing string and test the casing tubing annulus at our anticipated casing pressures or above, come out with the packer and run the tubing opened to the bottom, and that is simply what we will do, convert them to injections, start injecting water.

Q Do you consider that you have sufficient test control insofar as these pressures are concerned for injection?

A Do you mean do we know what pressure we have?

Q Yes.

A No. What we'll have to do -- you are referring to testing the casing -- we'll have to set test pressures, which I think will be in the thousand to fifteen hundred pound range, and if the pressure exceeds that of the well, then we will have to go back and re-test, as far as the packer is concerned.

Q Do you have available, Mr. Evans, logs of any wells in the vicinity of the injection wells or of any of those injection

wells themselves?

A There are only two wells in that immediate area, radioactive logs.

Q These have been identified as Magnolia's Exhibits 3 and 4. Would you refer to those and explain the interval?

A On both of these logs, if you are familiar with radioactive, or this type of log, these were run in a cased hole, and casing was -- and the hole was shot, so interpretation was somewhat difficult. You can interpret them, and we do. What we have identified here is the top of the open hole section; merely we have a red line showing where the casing is set and total depth. This is considered as our zone of interest since we have open hole section and we are leaving it all open for our pilot flood. On these two logs, you can find in the range from thirty to forty net feet -- net productive feet on the basis of this log. I believe that's all I have on that.

Q Now, may I inquire, Mr. Evans, as to whether the reservoir characteristics which you find in connection with the pilot or proposed pilot project are similar in nature to those encountered throughout the area of the Bridges Lease and the Magnolia property that you have indicated in yellow on Exhibit 1?

A That's true, simply on performance, which is my basic reasoning in dividing the field, and it is a good divider, I think most people will admit, but on performance, the field is divided approximately on our lease line there. On our State Bridges Lease,

there is possibly two wells that are still producing at top allowable, but our lease line is essentially the dividing line on the two differences in reservoir characteristics.

Q You may have, but I don't recall -- have you identified the producing formation into which you propose to inject?

A The Grayburg-San Andres is the zone of intent.

Q Have you completed your explanation of what is reflected by the logs -- I mean, have you elicited as much information as indicated there, either by the logs themselves or by the red markings that you placed on there?

A I believe so. It merely shows the top -- well, it shows the bottom on the casing situation, the top and the bottom of interest and TD on the well; that was our main intent on the log.

Q What does your company anticipate insofar as primary production, the economics, the continuation of primary production in the area of the proposed project?

A We are presently considering a temporary abandonment status. I believe it is six wells in this area, six to ten, I'd say. Their production ranges from one barrel to two barrels. The ones we are considering, we feel that is the economic limit for these wells. We do have some one barrel wells in the immediate area.

Q Are any of these wells presently producing water?

A I'd say no.

Q Any appreciable amount?

A There are some traces of water in the lease, but predominately there is no water production with our wells.

Q Do you feel that the reservoir with which you are dealing has a good chance of favorable response to a water flood program?

A Well, we think it has a chance, a good chance, but we can't go much further than that. We are limited in the knowledge of dolomitic type floods. It is pretty hard to estimate what you will get. That is our main purpose for a fairly complete pilot. We would like to get as much information as we can and prove this thing as well as we can on the pilot. We actually do feel that it will flood, but we can't back it up with past data from this same type of reservoir.

Q Well, of course, you have concluded that if it is successful, that the ultimate recovery of oil in place will be greatly increased over that of primary methods?

A That is true. We anticipate that we will recover oil that would not be recovered by any other method or by primary methods.

Q And, therefore, lead to the prevention of waste?

A Yes, sir.

Q Now, the application which has been filed by your company, Mr. Evans, requests consideration by the Commission of the establishment of administrative procedure for extension or expansion of the proposed pilot project that you have already outlined for us. What, in fairly specific terms, do you have in mind insofar as the administrative procedure suggested is concerned?

A Well, first and foremost, it is our thought that by administrative procedures established at this hearing we can decrease the paper work for us and the Commission, and our thoughts were naturally, if the pilot is successful, expansion will be the next thing that will follow. That is what we are trying to prove, and that's where we will go. I would suggest or request of the Commission that if we could possibly have an administrative procedure set up here whereby we could expand in this general area on our lease, expand our water flood to such an extent as is demanded by the pilot by administrative procedures and regulated by them in that, we would go through the normal procedure of distributing our application to offset operators as well as the fifteen day normal waiting period for any of the other operators to protest if they please. I think by that we could simplify it as well as the same control, I think, would be present. A hearing can be called, or is called if anybody questions the procedures as such. That, basically, is my thinking on that.

Q I assume that what you are proposing leaves within the discretion of the Secretary-Director the necessity for a hearing in the event of an application for expansion, and if in his discretion and after due notice and so forth, permission for the expansion may be granted administratively, is that in substance your position?

A That's true.

Q Your company's application also makes reference, Mr. Evans, to a request of the Commission for the establishment of administra-

tive procedure for projected lease allowables without the necessity of additional formal hearings, in the event it should become necessary to produce any of the wells in the project as now proposed or as it may be hereafter expanded at a rate in excess of the top unit allowable. What do you propose insofar as the thinking on that is concerned?

A The thinking is the same insofar as the administrative procedure, but on that I think you would have to designate the wells that would be eligible for this. The possibility that I was thinking of would be an offset in a diagonal offset basis, and on these wells we could submit a request for the necessary allowable to produce our water flood oil to the Commission and have it administratively approved on that same basis. There would be offset and diagonal for all injection wells that we have.

Q I assume the same procedure that you suggested in connection with the expansion would also, that is, as to notice and that sort of thing, would also be a part of the procedure you are suggesting insofar as allowables are concerned, is that correct?

A That's true.

Q Is it your opinion, Mr. Evans, that the procedures which you are suggesting, particularly with reference to allowables, would provide adequate protection insofar as correlative rights are concerned?

A I certainly believe it would.

MR. SPERLING: I would like to offer at this time Exhibits

1 through 3.

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

QUESTIONS BY MR. PORTER:

Q Mr. Evans, in -- your earlier testimony indicated the major development in this pool took place during 1939 and 1944. Was that the approximate period in which these six injection wells were drilled?

A Let me check those. Up to 76 on our Bridges Lease, that is correct. We have some --

Q That would be all of your injection wells?

A That's true, all of our injection wells were drilled during that period.

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

CROSS EXAMINATION

BY MR. COOLEY:

Q First, Mr. Evans, I would like to make clear this one point. All of the yellow portions on your Exhibit -- or is it Exhibit 1 --

A Exhibit 1.

Q -- Exhibit 1 are not in the Bridges Lease, are they?

A No, there are three other leases.

Q Have you outlined the Bridges Lease on Exhibit 1 so it can readily be distinguished from the other areas colored in yellow?

A No, but I can do that.

Q It is only that Lease that is the subject of this hearing, is that right?

A That's true. Actually, I did color all of our acreage, but the "G" lease, "M" Lease and the "J," these three.

Q Would you outline the Bridges all the way around?

A There is more explanation. The three leases that do not belong are the "J," the "G," and the "M". So there are these three, and I have excluded them in my outline.

Q Isn't there also a "K" Lease in Section 31?

A We haven't included that as colored. We do have a "K" Lease. We have several other leases back in here.

Q I see it is colored on the plat that you handed out here. That's the reason --

A I see.

Q Then, there are several portions of the Bridges Lease, particularly in the E/2 of Section 3 and the NE/4 of Section 10, in Township 17 South, Range 34 East, certain other areas that are not contiguous with the rest of the lease, is that right?

A That's true.

Q Would it be feasible to try to flood these isolated portions of the lease in the general form of a block?

A No, not at this time in that we would have to negotiate cooperative agreements and so forth.

Q That was my next question. Is it proposed by your company that some type of lease line cooperative arrangement or full scale unitization agreement or something in that order would be adopted in the event that this whole northern area of the Vacuum Pool appears to be susceptible to water flooding?

A I am sure that would be the next step. Negotiations would have to be set up.

Q Do you know whether the trend might be toward cooperative agreements or unitization?

A I couldn't say. I would guess cooperative agreements, but that would be merely a guess. That would take negotiations. We have not negotiated with any of the other operators as yet.

Q Mr. Evans, is there any limitation either in time or amount on the fresh water supply for water flooding in this area?

A As I understand it, we have until June the 30th, 1960 to start the use of the fresh water, and we have four years --

Q From that date?

A -- to use it up. I think it is four years after we start using it.

MR. SPERLING: I believe that's correct.

A I believe that's correct. We do have the application with us.

Q Then, there is limitation in both time and amount on the fresh water source?

A Yes, sir. I think it can be appealed, but there is a definite limit on the forms that we have.

Q Is there any prospect of salt water supply source of sufficient quantities in this area?

A Not in the immediate area. The field proper in the southern end is producing approximately 600 barrels per day, total field,

and the gathering would hardly be worth the 600 barrels that you would get.

Q Is there any substantial quantity of salt water at a greater depth in this area? Discounting the possibility it might be uneconomical to develop, but are they present?

A I couldn't say for sure on that. We have investigated salt water, and we feel that it would be difficult to obtain. There is a good possibility that we could find a deeper source.

Q Do you have any figure in barrels of what you expect -- would expect of additional primary recovery from the Bridges Lease itself?

A As secondary results --

Q No, sir, primary.

A On additional primary. Well, I will have to do just a little bit --

Q Could you figure it in percentages then?

A Yes. I am trying to figure real rapidly. We are in 90 percent range depleted. That is on solely primary. We have that much of our primary recovery already.

Q Moving on, now, Mr. Evans, to your proposal for administrative approval for expansion of the pilot water flood projects, if the operator so desires, what, in your opinion as a petroleum engineer, is a sound basis for a recommendation of expansion of a pilot water flood project?

A You mean what reason should you have for expanding a pilot?

Q More particularly, my question goes to expansion at any given time. What I'm trying to get at is, what dictates that you expand the pilot or water flood project at a given time, rather than, say a year hence?

A Economics, primarily.

Q Aren't there also some waste considerations in getting your water flood out of balance as the term has heretofore been used in connection with water flood projects?

A That is a possibility.

Q What would be some of the indicia of water floods showing an imbalance?

A What would be the --

Q How would you know that a water flood was getting out of balance?

A Oh, normally, as we operate, we keep track of the volume that goes into each well and then from this we prorate it back to our producing wells the best that we can. That is one method you can tell. On our center wells we can tell if the push is, so-called, equal among the injection wells by this means.

Q May I interrupt at this point? What is the result of the trap?

A Well, you would trap oil.

Q You would trap oil?

A You certainly would.

Q If I haven't lost your line of thought, would you continue?

A You want me to tell you how we would trap the oil?

Q No, sir. Instead of considering it from the standpoint of the inside wells, what would be the indicia on the outside wells of an imbalance?

A Well, the thing you would probably get involved in would be a change of pattern to account for this imbalance that might be necessitated. There are several things that you could do, or shut your pilot down, which also you are taking the risk of losing oil there.

Q Would you say that a sound basis for expansion of a pilot water flood project would be that the proposed injection well, the one to which you are going to expand, injection has either itself been effected by the existing flood or that a well immediately offsetting this location has been effected by the water flood?

A Well, I'll have to say this. From our discussion, I would say no for this reason. You have an unbalance when you do that.

Q Unbalance has already occurred when this phenomenon exists?

A You have already effected one side of the well; you are going to start injecting to the others at a later date. You can't remake this imbalance by restriction of rates and so forth, but you have created an imbalance in that case.

Q I think, Mr. Evans, as a practical matter you can appreciate the interest of the Commission and other operators in the

State that these water flood projects not be developed at such a rapid pace that they preempt all primary production from the field. There must be something left of primary production, and thus we must arrive at some reasonable basis in which to allow the expansion of water flood projects. Do you think that a restriction of this type which we have just discussed would result in any appreciable amount of waste?

A I think that it could. It is something that you would have to recognize and work with, I will state that.

Q If you knew that that was going to be the criterion, could you not arrange your own plans in such a fashion that you could prevent any substantial amount of waste?

A You quite possibly could. There could be waste created by that, though, without proper supervision and control.

Q Mr. Evans, would a thirty-day delay -- after observing this type of effect either on the proposed injection well or direct offset -- would the thirty-day delay itself, as a general rule, cause any waste?

A Only to the extent that it would amplify -- I mean, increase the situation. You are progressing more toward unbalance with time, of course. We might talk just a little bit about timing in here, especially on our pilot flood. We are expecting approximately a year to elapse before we have much indication from our flood, six months to a year. That, of course, is an estimate, and, as I have said, we are not too familiar with this type of flood.

Q These floods can and very often do respond over night, as a practical matter, do they not?

A That's true.

Q Whereas you have no response for six, eight months, all of a sudden your production will jump one hundred percent in just a relatively short period of time, say a week or two weeks?

A They do.

Q That would not be an unusual situation, would it?

A No.

Q Mr. Evans, I would like to discuss with you for a few moments this allowable system that you have proposed. In your application you referred to a lease allowable, which the Commission has devised heretofore. I believe it was just the number of developed acre tracts on the lease times unit allowable which would obviously be greatly in excess of any present units in a particular flood, would it not?

A Yes, sir.

Q Now, in your direct testimony, you referred to what we commonly understand as a project allowable, that being a top unit allowable for each of the injection wells and for each developed 40-acre tract that either directly or diagonally offset the injection wells, is that correct?

A No. I intended to state -- you correctly identified the wells, but the limits that I set on them was a necessary amount above top allowable to produce them at their capacity during the

flood.

Q Then, rather than top allowable for these wells, you are requesting capacity allowables for these particular wells?

A For the effected wells in the pilot area.

Q And where any real effect or any discernable effect takes place, the only wells that could get capacity allowable would be the wells that are defined, those being directly or diagonally offsetting the injection wells?

A Yes.

Q It would be a practical matter for wells outside of this perimeter to be effected.--

A Yes.

Q -- by a fingering process or something like that?

A Yes. There is something I would like to bring out, or my thinking on it. This is administrative procedure that we are talking about, and should it be necessary for cases as you are talking about, then I think we would have the right to come back and request hearings on those. Is that not correct?

Q That is correct, and it is my understanding that anything outside of these wells would not be eligible for capacity allowables under the administrative approval.

A True.

Q Back to this water flood for just a second, Mr. Evans. If you've only got a four year prospect here, isn't there a very good chance that if this thing develops, it would take considerably more than four years and considerably more water than you have

presently available to adequately develop this pool on water flood project?

A The total Bridges?

Q Yes.

A We do not at this time have sufficient water to totally develop, or I doubt that we do, the whole field; that we would have to get.

Q Let me give you two hypothetical alternatives, tell me in which case you think it would be less likely to cause waste. In one case you start a water flood project, and in a depleted pool such as this area, and for, say, the reasons of shortage of water you have to stop for two or three years and then resume. And in the other case, you wait for three or four years before you start it, but when you do start you can proceed to depletion. Wouldn't it be a greater likelihood of waste if you had to interrupt this water flood project?

MR. SPERLING: Excuse me just a minute. I think we are making an erroneous assumption concerning the termination of the water rights after the expiration of four years. It is not my understanding if you have applied the water to beneficial use that it terminates at the expiration of four years. It is stated in the application filed with the State Engineer, that the time required to fully apply water to beneficial use is up to four years, to fully test water flood project. Now, that does not imply, as I understand it -- I am not an expert on water -- but, as I under-

stand it, that is the time required as stated in the application for the application of the water supply to the beneficial use which is contemplated in the application and is not a termination. Mr. Payne knows more about it than I do.

MR. PAYNE: I think that's correct. As long as you are applying it to beneficial use.

A We have a certain allocated amount.

MR. COOLEY: Possibly at the appropriate time, Mr. Irby can confirm whether the State Engineer so views it that way.

A Yes, sir.

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

MR. PORTER: Mr. Nutter.

QUESTIONS BY MR. NUTTER:

Q Mr. Evans, would you define the line, whether it is hypothetical or real, that runs across this pool and separates the marginal area from the nonmarginal area?

A I'm not prepared at this time to set out an exact line. It is not exact. I might have left a little doubt there. The way you can do it, and I do it, is simply on a producing or capacity basis, the ability of the wells to produce. There are two other things involved; workovers enter into it too. This area seems to also be very invulnerable to workovers. We haven't found anything that's real good in that area, and you can work down here. But it does proximate this area in here. I don't -- I could define it

more clearly, but I don't feel that it is necessary at this time.
You might --

Q Will you describe the line just roughly where it is so that we can --

A It is approximately on our lease line, Mr. Nutter. That is fairly representative of that line. We have, we think, twelve or possibly fifteen follow the other line.

Q It is a line that falls between Section 26 and 35?

A That's correct.

Q And possibly your Wells No. 12 and 15 in Section 26 are on the outside of the line?

A That is correct.

Q And then where does it go eastward from there, Mr. Evans?

A Approximately still on the east line. Our Bridges 13 is in the depleted area, definitely.

Q How about the Ohio Lease there?

A I would have to check that. I do have a proration schedule and we could.

Q Is the entire Bridges Lease on the north part of Section 25, on the north side of the line?

A Yes. I would say it is.

Q Would this Texas Company Lease be on the north or the south side of the line?

A That I don't know. I would have to check on that.

Q Mr. Evans, I note that the production during the month of

May varied on your Bridges Lease from a low of 21 barrels from one well to a high of 1,032 barrels. Where is this on this hypothetical line that relates to the marginal and nonmarginal portion of the field?

A It is something that I touched very briefly, and I'd better go back into it more carefully. Our Lease up to and including 76, State Bridges No. 76, was developed during a time -- Mr. Porter had asked me the question, on '39 to '44. We have recently -- beginning in about '54 or '55, pursued further development on the very northern end of our Lease, the wells from 76 on up.

Q You mean from wells that are numbered higher than 76 --

A Yes, sir.

Q -- are all newer wells?

A Yes, sir, they certainly are, and they are located in this general area up here. Some of these are depleted already. We do have three wells in this area that are top allowable at this time.

Q Now, you made a reference to the fact that you figured that 90 percent of the primary oil had been recovered from the Bridges Lease. Do you mean from the old wells on the Bridges Lease or from the Bridges Lease as a whole?

A Could I change that to Section 14? I was speaking primarily of the pilot flood area.

Q I see. Ten percent of the primary oil remains in Section 14?

A True.

Q Mr. Evans, do you anticipate that the water flooding of this area will result in production of more gas as well as oil?

A More gas?

Q Yes, sir.

A I think not.

Q Is the gas in this area marketed?

A Yes, sir.

Q To your knowledge, was -- this is a dolomited reservoir, is that not correct? A True.

Q To your knowledge, is there any fracturing in this dolomite?

A My description of the dolomite would be a vugular oleic dolomite, with some fracturing. It is not extensive in that it is --

Q You don't feel that the fracturing is going to be so extensive as to cause any impairment to the efficiency of the water flood?

A I do not. That is one thing we intend to learn from our pilot. Very definitely there are fractures in the dolomite.

Q Have you explored the possibility of obtaining brinish or salty water from Dew Lake or Santa Rosa formation in this area? A We have.

Q Is there any water in those formations?

A Apparently there is. From logs and determinations we are able to determine that. Right now we don't know how much there is. It looks, though, like water is present or that it is a water-

bearing section, so to speak.

Q As I understood you when you testified to this, Mr. Evans, you stated that your proposal for expansion of the water flood was for an administrative procedure for expansion -- I wrote this down as you said it, and I might not have put it all down -- in the general area of the pilot flood on your lease. Now, what did you mean --

A Well, I had in mind -- it is somewhat difficult in this area, but I think the general northern area could be handled by administrative procedure. True, we do have some wells that are still producing at top allowable, but they are not big wells. Their capacity is just somewhat in excess of top, and we feel, from our decline curves and so forth, that they will be depleted before too long.

Q Well now, your proposal for expansion of the pilot water flood, or administrative procedure for the pilot water flood is for the entire Bridges Lease, is it? A Yes.

Q Which wells do you anticipate you would propose would be converted to water injection wells on the Bridges Lease?

A That would depend on flood pattern, the final flood pattern as a development from the pilot.

Q It would not necessarily be a five spot extension of the pilot flood that you've proposed for these six wells?

A I'll say this, that will be the intent now. We set up the pilot on the five spot, two eighty acres, because that would be the final plan we would look at if there are no completions brought

out in the pilot flood.

Q Well then, barring unforeseen circumstances, every other well on diagonal lines across this plotted area would be an injection well, is that correct?

A I would say yes, that is quite possible.

Q How long do you think it will take to determine whether this pilot will be expanded or not?

A I'd say at least a year, and it could be further, depending.--If the data is doubtful, then I am sure we will carry it to full depletion, which would take longer.

Q Adding more wells to the --

A True. If the data apparently is conclusive and everything looks good, it is possible within a year. That would be my only thought on that.

Q Have you considered how rapidly the flood will be expanded in the event it is a complete success in the pilot area?

A No, only to the extent of -- we probably would try to install our final system at that time. On our first extension, I can't say for sure. It involves economics that we haven't fully gone into yet. There is a possibility we would put it in so-called pieces, depending on distribution system, how it lays, and so forth.

Q But there is also a possibility, is there not, that after evaluation of the pilot project and determination that it is successful, that you would install your entire water injection system

for the balance of the lease, put it all on at the same time?

A I would say that would be a possibility, that we would consider that.

Q Even if some of these top allowable wells are still top allowable?

A No. There would be another one of the considerations we I don't anticipate that we'd go into the primary area until it is more on the decline than it is now.

Q Now, to get back to what Mr. Cooley was discussing with you a moment ago and your reference to the producing wells, which would be eligible for the capacity allowable for the lease allowable, they would only be the wells that are offsetting the injection wells?

A Injection wells.

Q And would there be any limitation at all upon the allowable that the lease would receive?

A I don't understand for sure. We're so-called marginal or so forth in that area. You mean the total of the offset diagonal, that total allowable? There would be no top on that.

Q No, I am just trying to find out what kind of an allowable this would be.

MR. PORTER: You are just asking for unlimited allowables?

A Unlimited allowables on those specific wells, true. I could possibly set a maximum limit, if you are interested on that, on what the total well allowable would be through --

Q (By Mr. Nutter) That's what I was concerned with, Mr. Evans. I note the application is for administrative procedure for establishment of a project or lease allowable. I am just wondering what the application actually means.

A I recall one order that the Commission has entered, one order that enters my mind, that established a lease allowable for the number of wells that were on that particular lease. And there was another order that the Commission entered that established top unit allowable for each developed forty-acre tract within the area, and then allowed the producing wells in that project to produce that project allowable in any proportion.

A I think it should be depleted to -- speaking of the project or the affected wells or something of that order, we do have to have a base reference, and the thing that I was trying to find out would be a diagonal and offset basis.

Q For assignment of allowables, for wells that would be eligible for assignment of allowables?

A For wells that would be eligible for assignment of these allowables by administrative procedures.

Q And what do you propose for the administrative procedure for the expansion of the pilot project?

A Only that we submit our proposed expansion for administrative approval in this general area.

Q And the general area is the entire Bridges Lease or the area of the water flood?

A I'd say the entire -- well, the area of the water flood, which would be the entire Bridges Lease.

MR. PORTER: The only thing -- excuse this interruption -- the only thing that limits that area might be the fact that a number of the wells, say, on the south end were still producing somewhere near top allowable or above the stripper stage?

A Yes.

Q (By Mr. Nutter) Mr. Evans, are you aware of any Order that the Commission has entered to date authorizing the administrative procedure for expansion of pilot projects?

A One for sure.

Q Did that Order list the proposed injection wells that would be eligible for administrative authority?

A I believe that it did.

Q Are you prepared today to enumerate the proposed wells that you would convert to water injection at a later date?

A Quite possibly we could do that, Mr. Nutter, but it is my feeling on this that we are not depriving anybody of anything by not doing it. I don't think that we can do it ironclad. We are not that far along on our pilot. I feel that the Commission would have the same amount of control either way.

Q Barring unforeseen circumstances, you would have a five spot expansion of this pilot project that you have outlined here today?

A That's true.

Q So, barring these unforeseen circumstances, wouldn't you be in a position to say which wells will be converted later?

A That's true, but the question, is that necessary? I could. It still would require another hearing. Then, quite possibly, if we decided to change our pattern somewhat. There are several things that could cause you to do that. Mr. Cooley's questions brought that out, part of that. You could have an unbalance on your flood, where there is things that you might -- steps that you might have to take, such as maybe skipping a row or doing something else to try to get back in balance.

Q Do you have any idea as to the recovery that you are going to obtain from secondary recovery at this time? Do you have any estimates?

A I would give an estimate of forty to sixty percent primary.

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

MR. PORTER: Anyone else have a question?

MR. COOLEY: One additional question, please.

RECROSS EXAMINATION

BY MR. COOLEY:

Q Mr. Evans, if the allowable program as here proposed is granted, that being the direct and diagonal developed forty-acre tract, how many wells would be affected there by producing wells?

A Nineteen.

Q And how many undeveloped forty-acre tracts lie within that area?

A Let's see, four on our lease.

Q Do you anticipate any further development in those undeveloped forties?

A That would depend solely on the pilot. If the pilot is successful, I would say definitely yes.

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

QUESTIONS BY MR. UTZ:

Q Mr. Evans, I believe you stated a while ago in your testimony that you had recovered about ninety percent of primary from this Lease?

A That was strictly an estimate, Mr. Utz. I feel that that is close, yes.

Q What percent of the total oil in place is a hundred percent proper?

A In the thirteen percent range.

Q Thirteen percent. And I believe you stated to Mr. Nutter's question that you might recover an additional forty to sixty percent of the thirteen percent?

A Yes.

Q In regard to your allowable test and the various tests, did you ever set a limit to the allowable that you might need in this project?

A No, I did not. I could estimate one.

Q Would you do so?

A The basis I would use -- I think I indicated our injection rate would be some two to four hundred barrels per injection well

per day. You -- normally, there are several things involved. Your top allowable could go no higher than the water you are injecting or the top production that you take out of all wells affected by the flood, and normally it would be some amount less than that. On the two hundred basis, it would be twelve hundred barrels per day. Now, I am speaking of maximum. I don't think it will ever achieve that.

Q Do you think it will ever achieve eight hundred fifty barrels a day?

A It is possible. It would be hard to definitely set a top on that, but you can -- you can have an order of magnitude, so to speak, you can pretty well decide, all other things going right too. You may not even approach that if something goes wrong with your flood.

Q Eight hundred fifty barrels a day would no doubt take care of you for quite a while, wouldn't it?

A Quite possibly.

MR. UTZ: That's all the questions I have.

MR. PORTER: Mr. Morgan was interested in knowing about this well located on the east line of Section 14.

A That is the discovery well of 1929, and I expect it just got tired when they got out there with the rig. That would be my own explanation. It was just drilled there.

MR. PORTER: That is a discovery well?

A That is the discovery well for the pool.

QUESTIONS BY MR. FISCHER:

Q Mr. Evans, you said, I believe, the total or partial method of preparing your wells for injection -- Do you plan in setting a liner?

A No, we do not.

Q You are going to inject water like this particular well that we have the log on, which has 377 feet of open hole?

A It does.

Q You are just going to put it into open hole?

A We sure are. We do intend to run a survey of some type to see where the water is going. We will keep up with that for sure. That again is a pilot function. We want to determine that very definitely, where the majority is going.

Q I would like to ask again, what is the nature of this line or barrier that you spoke of in between the depleted part of this Vacuum Field and the part of the Vacuum Field that is still producing essentially top allowables, is it a permeability barrier of some sort?

A I haven't gone that thoroughly into it, but I would say it is. It is a combination of both, it is a pinchout, for one thing, in porosity. We do not have producible porosity in the northern section. It is available in the south. That could be one reason for the top allowable status in the south, that plus maybe some water drive, but it is a pinchout as well as probably permeability and porosity.

Q Don't you think that that barrier would cause the water to back up to a certain extent, if it slowed it down, the water front, if you got down to this section here with your flood?

A Yes.

Q Do you think that a great amount of water will go past that barrier?

A I doubt it, solely on performance. You can find this phenomenon occurring on offset basis. You can pretty well trace the outline by that method.

MR. FISCHER: Thank you.

MR. PORTER: Mr. Irby.

QUESTIONS BY MR. IRBY:

Q I would like to go back to the casing program, Mr. Evans. Not having one of these, I didn't keep up with it. Now, there is one of these injection wells, according to your testimony, that has some open hole there. Now, where is this open hole?

A Injection well?

Q Yes.

A Would you like that formationwise?

Q I want the formation and the depth below the surface.

A In the interval approximately 4,400 feet to 4,700 feet, it is the Grayburg-San Andres section that is opened.

Q Now, that is your injection zone? A Yes, sir.

Q And the open hole does not cover any formation other than your injection zone for the secondary oil recovery?

A No, sir.

Q And you have no other open hole in any of these injection wells?

A No, sir.

Q Now, you have six injection wells. Are they the first six listed on this Exhibit?

A They are.

Q Now, we'll take Well No. 2; sixteen inch casing set to sixty feet.

A That's correct.

Q Is the cement on that circulated?

A From our records, it is.

Q And from there down to 1,835 feet, you have ten and three-quarters casing?

A Yes.

Q Now, how far up the annulus did the cement come from the bottom of that casing?

A I couldn't say for certain. We did not run temperature surveys at that time nor any method of finding the cement top. I don't recall that cement was circulated, so it would be definitely hard to say where the cement is; the top of that casing string.

Q Now, on Well No. 37, you have 821 feet of ten and three-quarters, right?

A Yes, sir. You are asking me. Yes, sir, that's true.

Q What is the cementing on that?

A Two hundred and twenty sacks.

Q How far up the hole did it come from the bottom of the pipe?

A In that case, I would say it circulated -- I don't know. I think at that time was it not the policy to circulate surface

casing? Was that not a State requirement?

MR. PORTER: Yes, sir.

A It was circulated then. It is true.

Q Then, would you say that the surface string of casing has cement circulated to the surface in each of these six injection wells?

A Yes, sir, I would.

Q In most of these, the surface casing is set around eight hundred feet, excepting the No. 2 Well, a little below eight hundred. What formation is that in?

A I couldn't say for positive. It is through the Ogallala, I am sure, but I don't know exactly.

Q Is it through the Santa Rosa?

A I was trying to remember. We were trying to pin down some of the Santa Rosa sections. I believe it is. Now, I couldn't say that, I would have to check that.

Q Would you obtain that information and transmit it to me, please?

A I very definitely will.

Q And a copy to the Commission?

A Yes.

Q And I'll state at this time that the State Engineer may wish to enter an objection if this casing is situated above the base of the Santa Rosa. Now, --

A That's the base that you would like?

Q Yes.

A Okay.

Q Now, under six permits from the State Engineer's Office, Nos. L-3846, L-3846X, L-3846X-2, 3, 4 and 5, you have appropriated twelve hundred acre feet of water per annum. Do you anticipate that this water will take care of this pilot flood and your proposed expansion?

A That depends on the -- of course, the size of the proposed expansion, I'll say this, it could. You'll have to set a limit, a very definite limit. There is a possibility that it could be.

Q And if it isn't, where do you propose to get water?

A We've explored several considerations such as produced water from floods surrounding it, which is a great distance, twenty miles in most cases, and also the possibility of either deeper salt water zones in this area. We can't conclusively come up with a water source right now. We would find one, though.

Q If it is necessary for you to obtain other waters to complete this project, will they be commingled with this water, with the fresh water which you are using for this flood project?

A Quite possibly they would be.

Q And injected through the same wells as proposed here today?

A True. Again, I would like to bring out we do intend to test our casing in the wells to see that the water is going where we intend for it to go; we'll see that it does.

C Certainly, that is incumbent upon you because your permit

is for one purpose and one purpose only, and anything coming out of a casing --

A True.

Q -- is a waste which cannot be tolerated, and which the State Engineer is duly bound to eliminate even though it may stop your flood.

A Our intentions are equally as good. We will see that it goes to the proper spot.

MR. IRBY: That's all the questions I have of the witness. I would like to make a statement before the case is closed.

MR. PORTER: Anyone else have a question?

QUESTIONS BY MR. FISCHER:

Q Mr. Evans, on testing your casing to your proposed injection wells, if you found a casing leak and repaired it by cementing, would you still want to use that same well to inject again?

A We'll have two alternatives. I believe, Mr. Fischer, we might choose to pack that off, which I expect we would. Where we would find a leak, that, of course, would change our injection plans, and there would be economics and how we felt we could best control the water. I suspect we would go to a packer tubing arrangement.

MR. FISCHER: Thank you.

QUESTIONS BY MR. NUTTER:

Q Mr. Evans, I think I understood you correctly. Now, to test this casing, you are going to go in with tubing and packer pressure up the annulus?

A Yes.

Q Then, you are going to pull your tubing, remove the packer and go back?

A Open end.

Q What is the purpose of using the tubing if you are not going to use the packer?

A Backwash, primarily, is all.

Q There wouldn't be any protection against it from salt water or from water encountering the casing on the inside. However, will there, if you don't have a packer in the --

A No. It would be solely in some cases where you will have accumulation of bugs, so to speak, alga or iron oxide, various products, sand, and we have found in some cases it is very useful to circulate that back, rather than clean the well.

Q Have any tests been made to see if fresh water is compatible with natural waters in this formation?

A We have -- we sent them to our research laboratories.

Q And they are compatible?

A Yes.

MR. NUTTER: Thank you.

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

MR. SPERLING: May I ask him one more question?

MR. PORTER: Surely.

REDIRECT EXAMINATION

BY MR. SPERLING:

Q Mr. Evans, again with reference to the fresh water supply

source, do you have any information as to the recharge of the strata from which you will obtain your injection water? How is it recharged or what is the source, if you know?

A In my opinion, I would say surface accumulation would be the recharging part of it. Mr. Irby could probably state more on that, but I feel that that is the method of recharging.

MR. SPERLING: That's all we have at this time.

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

(Witness excused)

MR. PORTER: Does anyone have any further testimony to present in this case, any statements?

MR. CABANISS: I am R. C. Cabaniss with Shell Oil Company in Roswell. Shell operates twenty-three wells in the Vacuum Field and wishes to go on record as favoring Magnolia's proposal. We do, however, feel, in the best interest of protecting correlative rights, that due notice of hearing should be required for enlarging the project area.

MR. PORTER: Mr. Irby.

MR. IRBY: Since water is likely involved in any expansion -- I mean additional water will be involved in any expansion of this water flood, and in view of the State Engineer's responsibility concerning the waters of this State, the State Engineer strongly opposes any expansion which would not give him an opportunity to be heard. I realize that notices go out from oil companies to the various other persons, but the only application that

comes before this Commission which they are required to deliver a copy to the State Engineer is the application for salt water disposal. The only way we have of gaining knowledge of what they may be doing with respect to water flood projects is through the docket put out by this Commission, and we feel that a hearing should be held before any expansion is allowed, or at least that the State Engineer be given an opportunity to be heard.

MR. SPERLING: May the applicant stipulate with the Engineer's permission that the order, if granted, specify that notice of any expansion be given directly to the State Engineer's Office? It is the same prerogative as any other interested party would have insofar as requesting a hearing is concerned.

MR. IRBY: What is that prerogative?

MR. SPERLING: What we have suggested is that a fifteen-day period after notice be allowed within which a hearing could be requested.

MR. IRBY: By anyone who has objection?

MR. SPERLING: That's right. Anyone who is affected, and in effect, we are stipulating that the State Engineer's Office would be affected by any expansion, which certainly would place them in the category of interested party.

MR. IRBY: Insofar as the State Engineer is concerned, that is agreeable.

MR. PORTER: Mr. Steel.

MR. STEEL: Tom Steel, Midland, Texas, appearing on behalf

of the Ohio Oil Company.

The Ohio Oil Company has no objection to the operation of a Pilot Waterflood Project in the Vacuum Pool on Magnolia Petroleum Company's State Bridges lease. In fact, The Ohio urges the Commission to approve such a project. However, The Ohio requests that the operations be confined to a limited area to be specifically described in the order. The boundary of the pilot project area should be located a sufficient distance within the boundary of Magnolia's State Bridges lease to prevent the pilot operations from having any direct effect upon other leases in the area and transfer of allowables should be limited to such project area.

The Ohio prefers that another hearing be held to ascertain the effect and success of the proposed operations before any expansion of the project. If no such hearing is required by the order, The Ohio suggests that the order require that periodic detailed reports on the project be filed with the Commission for the information of all interested parties.

The Ohio considers that it would be premature at this time to establish administrative procedures for expansion of the project or for transfer of allowables between wells without the necessity of a hearing. However, if the Commission deems it appropriate to establish such administrative procedures for either or both of such purposes, The Ohio requests that a copy of each application for such administrative relief be furnished to each operator offsetting the State Bridges lease, that such application

specify in detail the relief sought, that no such application be granted until the expiration of thirty (30) days after copies of the application have been furnished to all offset operators, and that no such application be granted without hearing in the event of objection from any offset operator within the thirty (30) day period.

Subject to the limitations which I have mentioned, The Ohio strongly favors the approval of the pilot waterflood project proposed by Magnolia.

MR. SPERLING: May I make a closing statement, Mr. Porter?

MR. PORTER: Go ahead.

MR. SPERLING: In this application, Magnolia is not attempting to invade the prerogatives long established by the Commission. What we are seeking to do is to arrive at some workable procedure whereby the necessity for successive and repeated hearings will be eliminated, at the same time recognizing the responsibility of the Commission in its job. We feel that there is a possibility of arriving at a workable solution and are perfectly willing to leave it in the hands of the Commission on the basis of the presentation made and even in view of the concurring statements. We do feel, however, that the suggested period of thirty days is too long. That, we recognize is a matter of opinion. We feel that in the general terms, that the proposed expansion and allowable proposal has been made, that there is a possibility of a workable framework which can be devised by the Commission and its staff in

establishing a procedure that will work to the benefit of all concerned.

Thank you very much. That concludes our presentation.

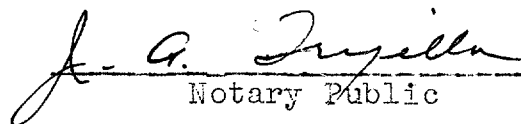
MR. PORTER: If there is nothing further to be presented in this case, we will take the case under advisement.

C E R T I F I C A T E

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, J. A. TRUJILLO, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in Stenotype and reduced to typewritten transcript by me and/or under my personal supervision, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal, this, the 25th day of August, 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.


Notary Public

My Commission Expires:

October 5, 1960.