

BEFORE THE  
OIL CONSERVATION COMMISSION  
Santa Fe, New Mexico  
April 19, 1961

EXAMINER HEARING

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IN THE MATTER OF: )

Application of Tenneco Corporation for ap- )  
proval of the Kemnitz-Wolfcamp Unit Agree- )  
ment and for a pressure maintenance project.)  
Applicant, in the above-styled cause, seeks )  
approval of the Kemnitz-Wolfcamp Unit Agree-) Case 2255  
ment, which unit embraces 4,520 acres of )  
State lands in Township 16 South, Ranges 33 )  
and 34 East, Lea County, New Mexico. Appli-)  
cant further seeks an order authorizing it )  
to institute a pressure maintenance project )  
in said Kemnitz-Wolfcamp Unit Area by the )  
injection of gas into 5 wells in said area, )  
and for special rules governing the opera- )  
tion of said project. )

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BEFORE: Mr. A. L. "Pete" Porter,  
Secretary-Director, Alternate Examiner

TRANSCRIPT OF HEARING

MR. MORRIS: "Application of Tenneco Corporation for  
approval of the Kemnitz-Wolfcamp Unit Agreement and for a pressure  
maintenance project.

MR. BRATTON: Howard Bratton appearing on behalf of the  
applicant Tenneco Corporation. Associated with me in presenta-  
tion of the case is Mr. William Armstrong, attorney from Texas.

MR. PORTER: Mr. William Armstrong?

MR. BRATTON: Yes, sir.

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MR. PORTER: And you are appearing for Tenneco?

MR. BRATTON: Tenneco.

MR. PORTER: I would like to ask at this time if there is going to be other appearances in this case.

MR. JONES: Yes, Mr. Porter, I'm Carl W. Jones, an attorney of Midland Texas. I think the Commission's files contain a letter from Mr. Charles C. Spann of the firm of Grantham, Spann and Sanchez of Albuquerque requesting that his appearance and my association in this case be noted. Is that in proper order?

MR. PORTER: Yes, we have that letter in the case file. On behalf of Phillips?

MR. JONES: Yes, sir, on behalf of Phillips.

MR. COUCH: You asked for appearances in this case, and The Ohio has some acreage in this pool. I think I'll have not any part to take in it at all, but I declare myself now in case I do.

MR. PORTER: Yes, sir. Mr. Bratton.

MR. BRATTON: We have one witness.

(Witness sworn.)

WAYNE NANCE

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

DIRECT EXAMINATION

BY MR. BRATTON:

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

A My name is Wayne Nance and employed by Tenneco Oil Company in Hobbs, New Mexico as assistant district petroleum engineer.

Q Will you state very briefly your educational and professional qualifications, Mr. Nance?

A I graduated from the University of Texas with a degree of Bachelor of Science in petroleum engineering, associated with Pan American Corporation for five and a half years as a production and reservoir engineer, been associated with Tenneco Oil Company for three and a half years, two and a half years being in Hobbs as district petroleum engineer.

Q Have you studied the Kemnitz-Wolfcamp Field and the matters under consideration in the application here today?

A Yes, I have for a considerable length of time, this field has been under study for approximately two years.

MR. BRATTON: Are the witness' qualifications acceptable?

MR. PORTER: Yes, sir.

Q (By Mr. Bratton) Mr. Nance, state briefly what are we asking for, what is Tenneco asking for in this application?

A We're requesting the approval of the Kemnitz-Wolfcamp unitization agreement and permission to conduct a pressure maintenance project by gas injection.

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Q We're asking for special rules in connection therewith?

A That's right.

(Tenneco's Exhibit No. 1  
marked for identification.)

Q Now, refer to your Exhibit No. 1, Mr. Nance, which is a structure map of the pool, and explain what it depicts.

A Exhibit No. 1 is a structure map contoured on what we call the Kemnitz line which occurs at approximately 10,600 feet and is a correlative marker throughout the field. It is also the top of the unitized interval in the unitization agreement. Shown on this exhibit is the unit outline, and the injection wells are circled and colored in red and also shown is the North and South area of the field. The North area is an area of low permeability and productivity and poor pressure communication. The South area is an area of good pressure communication, good permeability and is a high productivity area.

The injection wells are located along the structural high portion of the South area, or that part of the field that is in good pressure communication.

Q This is a gas pressure maintenance project that you are proposing, Mr. Nance?

A That is correct.

Q The unit outlined is outlined in red?

A That's correct.



Q The five proposed injection wells in which you propose to inject gas are structurally on the top of the South area, it grades from there down towards the South, is that correct?

A That is right.

Q Is there anything further you care to point out in connection with this map, Mr. Nance?

A Nothing at the moment.

(Tenneco's Exhibit No. 2  
marked for identification.)

Q Refer then to your Exhibit No. 2 which is the isopach map of the area.

A Exhibit No. 2 is an isopach map of the field and also shows the unit outline, the proposed gas injection wells and the North and South area of the field. As can be noted from this exhibit, the major part of the field is located in the South area and that we are injecting in the top part, we are recalling the structure map of the structure and will be initiating a pressure maintenance project by gas injection in the structural high areas.

Q You have depicted on there some cross sections of the area, is that correct?

A Yes. We have shown a trace of three cross sections, AA<sup>1</sup>, BB<sup>1</sup> and CC<sup>1</sup>.

Q Mr. Nance, one further thing before we go on, we're talking now about unitizing just the one zone in the pool, that



is correct?

A That is right. Production in the area is obtained from an upper Wolfcamp zone and also from the Pennsylvanian and Cisco zones. We are unitizing the lower Wolfcamp zone.

Q That is as set out in the unit agreement and defined in there?

A That's correct.

Q I believe that that is the definition of that zone, the Commission's definition of it, is that not correct, the zone that you are unitizing?

A I believe that it is.

Q That is the zone on top of which your contour map is made and which your isopach is made?

A That is correct.

Q Do you have anything further you care to point out in connection with your isopach?

A One other item of interest is that 84% of the 97% of the ultimate recovery of the field has been credited or estimated to come from the South area. That is the major producing area.

MR. NUTTER: What percent?

A 93% of the ultimate recovery will be from the South area.

Q (By Mr. Bratton) That is the area of good permeability and good performance. All right, refer then to your three cross sections, and I believe you can take them up in order. They are

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Nos. 3, 4 and 5, and explain what they show.

A Cross section AA<sup>1</sup> is a North-South cross section through the Western portion of the field and shows the top and the bottom of the unitized zone. The cross section also depicts the quality of pay as it grades from the North to the South area and also shows the continuity of the zones in the South area. The Seanan Unit No. 3 is a well that is in the North area, and the Kemnitz B No. 1 is in the South area which has excellent porosity development in the unitized zone.

Cross section BB<sup>1</sup> is a North-South cross section through the Eastern portion of the field and shows the same information as the other cross section. Examination of this cross section will indicate from the log the difference in pay quality of the North area wells.

Cross section CC<sup>1</sup> is an East-West cross section through the South area of the field with one North area well shown on it, the Humble BB No. 1. This cross section shows the good porosity development, the top and bottom of the unitized zones, and the good or the continuity of the zones throughout the fields.

Q Those three cross sections to which you have referred are respectively Exhibits Nos. 3, 4 and 5?

A That is correct.

(Tenneco's Exhibits Nos. 3, 4  
& 5 marked for identification.)



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Q Do you have anything further you care to point out in connection with your cross sections?

A No.

(Tenneco's Exhibit No. 6  
marked for identification.)

Q Your Exhibit No. 6 are the logs of the five injection wells?

A Yes.

Q Is that correct?

A Yes, that's right. On these logs shown in red is the top and bottom of the unitized zone and also shown is the current perforated intervals. These logs will show that the good porosity development in these wells which are good productivity wells and should be capable of taking the amount of gas that we show to inject.

Q Is there anything further you care to point out in connection with those logs, Mr. Nance?

A No.

Q So are the five logs of the five proposed injection wells?

A They are five logs, right.

MR. PORTER: These logs constitute your Exhibit No. 6?

MR. BRATTON: Yes, sir, all five collectively.





(Tenneco's Exhibit No. 7  
marked for identification.)

Q (By Mr. Bratton) We turn then to your Exhibit No. 7, Mr. Nance, which is your casing program in these five wells.

A Yes. Exhibit No. 7 is a tabulation of the casing and the cement used on each of the proposed injection wells.

Q There's actually nothing to point out in connection with that?

A No.

Q It's required by the rules.

(Tenneco's Exhibit No. 8  
marked for identification.)

Q Turn to your Exhibit No. 8 then, Mr. Nance, which is the data as to the pressure maintenance project.

A The producing formation is the lower Wolfcamp, the top of the porosity occurs at approximately 10,700 feet, or the major porosity zone. We propose to inject the produced casing head gas from the unit area and return 90%, or approximately 90% of the produced gas to the reservoir. It is anticipated that our initial injection volume will be 12,000,000 cubic feet per day with a possible maximum of 21,000,000 cubic feet per day. We estimate that during the life of the project we will probably inject 103,000,000,000 cubic feet. The source of the gas for injection will be the lease separators.



Q It is possible, is it, Mr. Nance, that you might have to acquire some additional source of gas at some time during the project?

A That is correct. We have considered the possibility of purchasing makeup gas if it becomes desirable to inject more than what we have proposed at this time.

Q At the moment you will reinject 90% of the produced casing head gas?

A That's right.

(Tenneco's Exhibit No. 9  
marked for identification.)

Q Turn then to what has been marked Exhibit No. 9, which is the Kemnitz Pool Engineering Report of April 1, 1960. I will not ask you to go through this in detail, but in summary, Mr. Nance, what is the conclusion of this report and your conclusion as to the recoveries which would be obtained from this pressure maintenance project?

A This engineering report dated April 1st, 1960 is the basis of the Engineering Committee's conclusion and recommendation that pressure maintenance by gas injection is the most efficient method of producing the Lower Wolfcamp reservoir. This report is approximately one year old and it is complete in itself, in that it contains the usual engineering data in a reservoir study of this type. The performance since April the 1st, 1960



has verified these calculations and the conclusions of the Engineering Committee. The primary recovery from the reservoir is estimated at approximately 42% and the recovery from the area under pressure maintenance operations by gas injection is estimated at 62%. Production or recovery will be increased about 20% by that pressure maintenance project. This is four and a half million barrels of additional oil. Any further delay in unitization will result in approximately 100,000 barrels of oil per month loss due to shrinkage of the crude and other factors.

Q Mr. Nance, one thing I believe that probably has changed in some magnitude from the Engineering Committee Report, and that is your estimate of the cost of the project.

A That is correct. Our estimate of the initial investment required at this time is approximately \$1,200,000, which is considerably more than was originally estimated in the report.

Q The conclusion of this report and your conclusion, I take it, Mr. Nance, is that this is the most effective way to obtain the greatest ultimate recovery from the pool?

A That is right.

Q This would be superior to a water flood or any other means of recovery?

A Yes, that's correct.

Q Is there anything else as far as the conclusions of the report that you wish to point to, Mr. Nance?



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A Nothing at this time.

(Tenneco's Exhibit No. 10  
marked for identification.)

Q Exhibit No. 10, Mr. Nance, is the proposed Kemnitz-Wolfcamp Unit Agreement, is that correct?

A Yes.

Q That reflects that all of the lands in this entire project are lands of the State of New Mexico?

A Yes, I believe it does.

Q And they are lands, state lands belonging to one beneficiary, is that correct?

A That's correct.

Q Have all of the operators in the proposed unit area agreed to the unit either verbally or commenced signing it?

A One hundred percent of the working interest ownership has either signed or verbally agreed to sign the unitization agreement.

Q Has the proposed unit agreement been approved by the office of the Land Commissioner as to the form of the agreement and as to the designation of the area?

A Yes, it has.

Q The unit agreement is self-explanatory, contains the participation formula and all of the mechanics of the unit agreement, is that correct?

A Yes.



Q Is there anything else you care to point out in connection with it?

A No.

Q Mr. Nance, what rules is Tenneco proposing in connection with this pressure maintenance project?

A We are requesting the authority to convert producing wells to injection, the initial number of injection wells would be five. We are requesting that a project allowable equal to the sum of the individual well allowables within the unit area and we are requesting full allowable credit to the producing wells to be converted to injection. We are also requesting top allowable credit for shut-in wells, observation wells, or the capacity of the wells to produce, whichever is less, with the limiting gas-oil ratio of 2,000 to 1 waived for the testing of the wells to determine their capacity to produce.

We are requesting transfer of allowable privileges limiting the amount of oil or allowable transferred to a well in the project area which directly or diagonally offsets a well outside the unit area to two times the top unit allowable for the pool.

We're requesting a net gas-oil ratio rule with no change in the limiting gas-oil ratio of 2,000 to 1. Such other rules as the Commission deems to be necessary.

Q Further, Mr. Nance, as I understand, Tenneco is agreeable to stipulate that there will be no allowables transferred



from the North area to the South area and that if the Commission desires to put that in the rule that can be entered as one of the special rules of the pool.

A We have no objections to that provision.

Q As I understand it, Mr. Nance, the rules that you are proposing are the same rules as adopted in the Horseshoe-Gallup pressure maintenance projects in Northwest New Mexico, is that correct?

A That's correct. These rules are similar to those that have been approved by the Commission for the Horseshoe-Gallup Pool with the exception we are not asking for the provision of water injection credit.

Q And they are as outlined in our application except in Paragraph B as to these wells shut-in for observation you want top allowable or capacity to produce whichever is less?

A That's correct.

Q Which is in accordance with the Horseshoe-Gallup Pools?

A Yes.

Q Mr. Nance, in your opinion will the approval of this pressure maintenance project and of the proposed unit agreement be in the interest of conservation, the promotion of the greatest ultimate recovery of oil in this area?

A Yes, it will.

Q Mr. Nance, in your opinion are the rules which you have



proposed necessary to protect the correlative rights of the operators inside and outside the pool?

A Yes, they are.

Q Outside the unit, in and outside the unit?

A Yes, they are.

Q Were Exhibits 1 through 9 prepared by you or under your supervision, Exhibit 9 being prepared by you in cooperation with the rest of the Kemnitz Engineering Committee?

A They were.

Q And Exhibit No. 10 is the proposed unit agreement?

A Yes.

Q Is there anything further which you care to state in connection with this application?

A No.

MR. BRATTON: We offer Tenneco's Exhibits 1 through 10 in evidence and we have nothing further at this point.

MR. PORTER: Is there any objection to the admission of the exhibits? They will be admitted to the record.

MR. ARMSTRONG: Mr. Porter, I might point out just for information, I think the unit agreement refers to Tennessee Gas Transmission Company, and through a series of corporate changes why Tenneco Corporation is a holding company that owns this property and it is run and managed by Tenneco Oil Company, it is all in the family. It is all one and the same property.

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MR. PORTER: Anyone have a question, please? Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Nance, how do you spell your name, N-a-n-c-e?

A That's correct.

Q What was the initial reservoir pressure in this pool, Mr. Nance?

A Approximately 3800 psi, 3788 psi.

Q 3788? A That's correct.

Q And at what datum is that pressure?

A Minus 6600.

Q What's the latest pressure that you have for the area?

A 1865 psi.

Q Is that the same datum? A The same datum.

Q Is that the pressure for the pool as a whole or the North area or South area?

A South area.

Q Has this pressure decline been such as to reach the bubble point of the reservoir?

A Yes, it has.

Q That's one of the factors then that's causing you to lose this 100,000 barrels per month if this thing is delayed, is that correct?

A That's correct.

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Q You stated that it would be due to shrinkage and what other factors?

A Well, due to the delay in initiating gas back into the reservoir. Viscosity decreases.

Q Is it your opinion, Mr. Nance, that the injection of gas on the line on which these wells will be located, which is just North of the line dividing the good area from the bad area, will affect the wells in the North area?

A No. Based on the engineering data available, I do not believe that the North area will be affected by gas injection into the Southern.

Q Essentially what you are doing, you have drawn a line of wells across the highest point in the good area?

A That's right.

Q Well, now, Mr. Nance, I noticed on these logs that three of these wells have perforations in more than one section. The Tennessee State Western A-1, for example, in Section 20, has two large perforated intervals. The State A No. 1 in Section 20 has approximately 25 feet, maybe, of perforations divided into three intervals, that's this one?

A Yes.

Q The first one I mentioned was this log here. The third well, the Sinclair State Lea 381 No. 2 has three, four small perforated intervals. Do offsetting wells to these wells have



perforations in more than one interval also?

A It varies in each well. Most of the wells were completed with a large number of perforations. A comparison of the intervals open in these upstructure wells with cross sections CC<sup>1</sup> would show that the zone thickens downdip through this section to where these are essentially one body of porosity.

Q In other words, these three wells into which you are injecting into more than one zone would be one zone when you got farther South?

A Yes, as far as we can tell they would be.

Q How about the wells that have injection intervals of only one perforated section, the other two injection wells? One is the Seanan Unit No. 4 which has one area of perforations and the other one is the Seanan Unit No. 5 which has one small area of perforations. Does it correspond with the main pay farther South?

A Yes, it does.

Q Which of the sets of perforations in the other three wells do these single intervals correspond to?

A Well, correlating your logs together you see that these zones, the zone that isn't perforated, the lower zone is perforated in the Western State A-1. You can go through each well in like manner. The State A would be, the lower interval being gone, you only have the one interval, the upper interval.



Q What I'm concerned with, Mr. Nance, is putting gas into a zone in a well in which there isn't a corresponding producing interval in another well that offsets it.

A Well, the offsetting wells will have, do have corresponding intervals open to production. In all probability we plan in the Seaman Unit No. 5, or will propose to the Engineering Committee, that the upper set be opened, which would be this set here, for injection, and that would put us in injection in the same zone.

Q So you do plan an additional injection zone in that area?

A We intend to discuss it in Engineering Committee and would consider the feasibility of opening additional zones in these wells. It may be that it would be feasible for a time to observe performance with the zones presently opened.

Q I see. Now, you stated that you had returned 90% of the gas that's produced to the ground, Mr. Nance?

A Approximately 90%.

Q Will the remaining ten percent be used for fuel?

A No. The remaining ten percent will be lost through remote absorption facilities which will be operated by Phillips and will be used some for fuel.

Q There will be a facility in the area then to strip the liquids from this gas prior to reinjection?



A That is correct.

Q That will be operated by Phillips Petroleum Company?

A By Phillips Petroleum Company.

Q Now, you stated that your initial rate of injection would be 12,000,000 cubic feet per day and you may have an ultimate of 21,000,000 cubic feet per day?

A Yes, sir.

Q The 12,000,000 one will be into these five wells, is that correct?

A Yes, sir.

Q Will the 12,000,000 be into these five wells or do you contemplate other wells?

A That would depend on the performance of the reservoir. At the present time I would say it would be in that line of wells, or those immediately South. It is all subject to the evaluation of additional engineering data.

Q I see. You expect an ultimate injection of gas to be 103,000,000,000 cubic feet?

A That's an estimate, yes, sir.

Q Well, now, in buying this makeup gas that you mentioned you might have to do, do you have sufficient gas to furnish this 12,000,000 feet that you are contemplating for the present?

A Yes. The unit area is now producing about eleven and a half million cubic feet per day. By the time that we get it



into operation it will be producing more. It could be slightly less than 12,000,000, depending upon the amount of shrinkage you have.

Q Now, you stated that in the South area with gas injection you expected to recover 62% of the oil that's in place, is that correct?

A Yes, sir.

Q What is the estimate of the amount of oil that is in place?

A Twenty-three and a half million barrels.

Q That's originally in place?

A Originally in place.

Q Then your recovery is what number of barrels?

A Ultimate recovery will be fourteen and a half million barrels under pressure maintenance.

Q Which is that 62%?

A Which is the 62%.

Q How about in the North area, have you gone into the amount of oil that's in place up there?

A We were unable to calculate the amount of oil in place in the North area as accurately as we were in the South area. We have estimated in the amount of acre feet in the North area to be about 15,000 acre feet.

Q Do you have any rough estimate of what the primary



recovery rate up there will be percentagewise?

A No, I don't.

Q Now, you stated that it would cost a million two hundred thousand dollars to put this gas injection project into operation?

A That's correct.

Q Are you including in that million two hundred thousand dollars any gas that you would be injecting or is this mechanical installation only?

A It's mechanical installation only. The compressor plant, the gathering and distribution systems, some of that would be controlled off tank batteries and flow lines and also gas lift equipment for a number of wells.

Q It doesn't include any loss of oil from the producing wells which will be converted to injection wells?

A No.

Q Do you have a written copy of the proposed rules which you are proposing here, or, essentially, are they the same as the Horseshoe-Gallup and you didn't prepare written?

A We did not prepare written. They are essentially the same as the Horseshoe-Gallup. Many of the provisions which we have asked for are included in the Horseshoe-Gallup.

Q You stated among one of the provisions that you were requesting was a net gas-oil ratio rule, is that a rule in which you would take credit for gas injected against high

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gas-oil ratio wells?

A That is correct. In accordance with the Horseshoe-Gallup rules which use a gas-oil ratio of two thousand.

Q The gas-oil ratio is two thousand in this pool at the present time?

A Yes.

Q And you suggest that that limit remain the same?

A Yes.

Q I don't know if I understood you completely or not on the limitation of amount of production which could come from a well which offsets a well outside, did you mean outside the project area or outside the unit or what?

A Outside the unit area.

Q A well in the North area would still be in the unit area though, would it not?

A Yes.

Q So the limit of two times top allowable would not apply to the wells in the North area which are inside the unit area?

A Well, those wells are all limited capacity wells at the present time. I believe there's only one well in the North area that is offset by a well outside of the project.

Q As you stated, you don't expect these wells in the North area to stay in any real response any way?

A No.

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Q So, in effect, what this limitation would boil down to would be a limitation of two times top allowable for the Forrest Well over here in Section 26, the Tennessee State AA Kemnitz B-4 and 5 in Section 25, and possibly the No. 4 Well in Section 30, is that correct?

A Well, a direct or a diagonal offset to a producing well. The Pure No. 3 up here also would be a diagonal offset. It might be a matter of interpretation, but I don't know if the Forrest would be a diagonal offset to a producing well or not.

Q I see.

MR. NUTTER: I believe that's all Mr. Nance, thank you.

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

REDIRECT EXAMINATION

BY MR. BRATTON:

Q Mr. Nance, as to the rules we are proposing, those Horseshoe-Gallup rules, are we not taking out the water credit which is in there because you don't have water involved here?

A Yes.

MR. PORTER: Is that the only deviation from those wells?

MR. BRATTON: Well, also I believe the Horseshoe is on a 40-acre and this is an 80-acre, but aside from that I think they are identical with what we have proposed here.





MR. NUTTER: All we have to do is eliminate Rule 8 of the Horseshoe rules then which applies to injection credit.

MR. PORTER: This last exception that you have just discussed concerning the allowable for the allowable wells outside the unit.

MR. NUTTER: I think that provision is in the Horseshoe-Gallup.

MR. BRATTON: I think it is in the Horseshoe-Gallup.

MR. PORTER: If no further questions of the witness, he may be excused.

(Witness excused.)

MR. PORTER: Mr. Jones, do you desire to present some testimony in the case?

MR. JONES: No, sir, we have no testimony to present.

MR. PORTER: Does anyone else have any testimony they would like to present in this case? Any statements or comments?

MR. JONES: Yes, I am Carl W. Jones representing Phillips Petroleum Company. Phillips owns the lease in the Kemnitz-Wolfcamp Pool covering the Southwest Quarter and the West Half of the Southwest Quarter of Section 25, Township 16 South, Range 33 East, owns the full working interest on that lease in which they are located, two Kemnitz-Wolfcamp wells. It also owns an undivided one-half interest in the lease covering the East Half of the Southeast Quarter of Section 25 on which there is



located one Kemnitz-Wolfcamp well.

I point out that, to that extent, the statement on Tenneco's Exhibit 1 relating to the East Half of the Southeast Quarter which indicates that Tenneco owns an undivided one-half working interest and Samedan owns an undivided one-half working interest is not correct. That one undivided half interest is owned by Phillips and an undivided one-half interest by Tenneco. Phillips has not been able to reach a satisfactory agreement in regard to joining the unit, and therefore will not at this time, at least, participate in the unit.

However, we have no objection to the granting of the application as proposed by Tenneco, provided, as I understand, it is agreeable to Tenneco, that the net gas-oil ratio limit be set and remain at 2,000 to 1.

We believe, in view of Tenneco's statement, that it has no objection to the incorporation of such a provision in the field rules and the testimony of Mr. Nance, that the gas injection will not affect the wells in the North area, that there should be a provision in the field rules as established for this project, that there should be no transfer of allowables from wells in the North area to wells in the South area.

However, we do believe that in view of the fact that there are numerous offsets to Phillips leases, and in order to protect the ~~correlative rights~~ of Phillips Petroleum Company, we do request

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that rather than eliminate to two times top allowable for transfer to direct or diagonal offsets, we would much prefer, and think that protection of correlative rights justifies the limit of one and one half times the top allowable for transfers to wells directly or diagonally offsetting leases and wells which are not included within the unit area. That's all I have.

MR. PORTER: Does anyone else have a comment to make concerning this case? Mr. Bratton.

MR. BRATTON: Mr. Porter, in view of the statement by Phillips, I would say first, we have no objection. I think I suggested that the rules incorporate a provision that there will be no allowables transferred from the North to the South area. In view of the suggestion that the allowables be limited to one and a half times on the offsets, I would like to recall Mr. Nance for very brief testimony with regard to that matter.

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

WAYNE NANCE

recalled as a witness, testified further as follows:

REDIRECT EXAMINATION

BY MR. BRATTON:

Q Mr. Nance, have you made calculations as to reservoir voidage and will you give the Commission the benefit of your calculations?

A Yes, I have. The reservoir voidage of one barrel of



oil, stock tank oil, at the present estimated bottom hole pressure of 1800 psi, and average producing GOR of 2500 cubic feet per barrel is 3.9 barrels of reservoir space per barrel of stock tank oil. Under the proposed pressure maintenance project, 90% of the produced gas, or approximately 90% would be returned to the reservoir. The voidage of one barrel of stock tank oil with 90% gas returned to the reservoir would be .83 reservoir barrels per barrel of stock tank oil. Therefore, a well inside, correction, a well outside of the unit area would be voiding 4.6 times as much reservoir space as a well inside the unit, assuming that they each produced one barrel of oil or a like amount of oil with the same GOR. We feel that in order to protect the correlative rights of the unit owners that the production of twice or two times the unit allowable for wells that offset producing wells outside of the unit area is necessary.

Q In further connection with that, Mr. Nance, do you have a map, which I'll ask be marked as Exhibit No. 11, and, I'm sorry, I believe we just have one copy of that, do we not?

A There are several copies.

Q All right.

(Tenneco's Exhibit No. 11  
marked for identification.)

Q Will you explain this map, Mr. Nance?

A Exhibit No. 11 is the same structure map as was marked



as Exhibit No. 1 and shows the same information. In addition, the blue area on Exhibit No. 11 is the area that is now above 3,000 to 1 gas-oil ratio, which indicates that gravity drainage and segregation is occurring within the reservoir. The red and green areas indicate the possible expanding of the secondary gas cap, which is being formed and which we hope to form on the gas injection.

You will see that the first row of wells will be the first to gas out and then the number of wells left within the unit area would be markedly reduced, since there are two, four, six, seven wells in the first row in the South area, excluding the State C-1, which is on the edge of the area.

MR. NUTTER: Is that the well way over in the Southwest Southwest of 24?

A No, that's plugged and abandoned. State C-1 is right here, (indicating).

MR. NUTTER: Oh, I see.

A We feel that in order to protect the correlative rights of the unit under this type of operation, that we need the privilege of producing twice the normal unit allowable from the pool from wells that directly or diagonally offset wells outside the project area.

Q (By Mr. Bratton) Based upon the voidage calculations that you have made and the operation of the project, the way it



will gravitate to the South, you feel that actually, Mr. Nance, the request of two times top unit allowable is very reasonable insofar as the unit operators are concerned?

A Yes, that's correct.

Q And actually that request of double top unit allowable is taken off of the Horseshoe-Gallup pressure maintenance rule?

A That is right.

Q Is there anything further which you care to state in this connection?

A No, nothing further.

Q You prepared Tenneco's Exhibit No. 11?

A That's correct.

MR. BRATTON: We would offer Tenneco's Exhibit No. 11.

MR. PORTER: Without objection, the exhibit will be admitted to the record. Anyone have a question of the witness? Mr. Nutter. .

RECROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Nance, as I understand it, your ratio of 4.6 times as much reservoir voidage occurs as a result of a well outside the unit area voiding the same amount of reservoir space as a well inside the unit area but not returning its gas to the reservoir, is that what you meant?

A That's correct. The well inside the unit would be



credited, or 90% of the produced gas would be returned, which would reduce the reservoir voidage.

Q On your map here your blue is the area that is presently producing with a ratio in excess of 3,000 to 1?

A That's correct.

Q What you are saying is that this area will be the area of a primary gas cap that you'll form?

A That's the --

Q The blue.

A -- the blue.

Q The red would be the secondary gas cap that you would form or the second stage?

A It appears that a gas cap is being formed even now and we would be injecting gas into this area of high gas saturation in order to continue and aid the formation of the gas cap to push oil downdip, which is represented by these additional stages of movement downdip.

Q What are those stages based on, just a time or percent of depletion or what, in which you drew those lines?

A Actually it is just a schematic representing the gas cap expansion. We did not attempt at this time to predict the date at which the gas cap would move to a certain structural level.

Q In other words, these lines separating the blue and the red and the green don't represent any particular time in the stage of operation of the project?

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A That's correct.

MR. NUTTER: Thank you.

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

(Witness excused.)

MR. PORTER: Does anyone else have anything to offer, any comment, any statement to make? Mr. Couch.

MR. COUCH: Terrell Couch on behalf of Ohio Oil Company. I would like to make this statement; as I understand Mr. Nance's testimony, it is not expected that the injection program will affect the North area as designated on Tennessee's Exhibit 1, and yet I understand that the proposal to restrict transfers of allowables is to apply with respect to wells in the South area as designated on that exhibit, along with testimony that the wells in the North area are not maximum capacity wells any way. If his testimony is right and the wells in the North area are not going to be affected, and I can observe from this exhibit that The Ohio's wells in Section 20 and Section 16 would be offset by wells within the unit, and in the North area, I think it would be appropriate for the rules to contain a safeguard that no allowable be transferred to those wells in that North area since it's not expected that they'll be affected by the program.

MR. PORTER: Mr. Bratton.

MR. BRATTON: If the Commission please, as far as

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we are concerned, the rules can state there will be no transfer of allowables from the North area to the South and from the South to the North.

MR. COUCH: I assumed there wouldn't be any objection to it.

MR. BRATTON: No, that's perfectly satisfactory to us.

MR. PORTER: Anything further? Mr. Morris has a communication.

MR. MORRIS: I have two letters, one from the Pure Oil Company signed by Mr. H. C. Wells, another from Skelly Oil Company signed by George Sellinger. Both concur in the application and urge the Commission's approval thereof.

MR. PORTER: If there is nothing further to be offered in the case, we will take it under advisement and have a short recess.

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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 at 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 26th day of April, 1961.

Sela Larnley  
Notary Public-Court Reporter

My commission expires:

June 19, 1963.

I do hereby certify that the foregoing is  
a complete record of the proceedings in  
the Examiner hearing of Case No. 2255,  
heard by me on May 5, 1961.  
A. H. Porter, Jr., Examiner  
New Mexico Oil Conservation Commission

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