BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO
Santa Fe, New Mexico

December 18, 1957

TRANSCRIPT OF HEARING

Case 1353

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE - SANTE FE
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BEFORE THE
OIL CONSERVATION COMMISSION
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IN THE MATTER OF:	
The hearing upon the motion of the Oil Conservation Commission to permit all operators in San Juan, Rio Arriba, Sandoval, and McKinley Counties, New Mexico, to appear and show cause why any well or wells in that area should be granted an exception to prorationing.	Case 1353

BEFORE:

Mr. A. L. Porter
Mr. Murray Morgan

TRANSCRIPT OF HEARING

MR. PORTER: The hearing will come to order, please. The Commission will consider next Case 1353.

MR. COOLEY: Case 1353. In the matter of the hearing upon the motion of the Oil Conservation Commission to permit all operators in San Juan, Rio Arriba, Sandoval, and McKinely Counties, New Mexico, to appear and show cause why any well or wells in that area should be granted an exception to prorationing.

I might add that is oil prorationing.

MR. PORTER: Anyone wish to make an appearance in this case? Mr. Errebo.

MR. ERREBO: If it please the Commission, Burns Errebo,

representing Sunray Mid-Continent Oil Company. We would like to present evidence this morning in support of our request that the four producing wells in the pilot LPG producing area in the Bisti Field be excepted from the Northwest prorationing.

MR. COOLEY: How many witnesses will you have?

MR. ERREBO: We will have one witness.

MR. PORTER: Will you have your witness come forward and be sworn.

(Witness sworn.)

R. E. BROOKS

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

DIRECT EXAMINATION

By MR. ERREBO:

Q Your name is R. E. Brooks? A Yes, sir.

Q You are employed by the Sunray Mid-Continent Oil Company?

A Yes, sir.

Q Where are you located, Mr. Brooks?

A Tulsa, Oklahoma.

Q You are employed in what capacity?

A I'm Senior Reservoir Engineer.

Q I believe you previously qualified as an expert witness before this Commission in previous hearings, is that correct?

A Yes, sir.

Q Mr. Brooks, you are familiar with this project, are you not, inasmuch as Sunray is the operator of the injection well?

A Yes, sir.

Q And you are also a member of the Engineering Committee which has been formed by the six operators contributing to the cost of this LPG injection project, are you not?

A Yes, sir, I'm Chairman of the committee in behalf of Sunray. The others are British American, Phillips, Amerada, El Paso and Shell.

Q As Chairman of the Engineering Committee, are you making a continuous study of the operation of this project as prescribed by this committee?

A Yes, sir. We're conducting field tests of a new method which we hope the ultimate recovery will surpass all other secondary recovery methods. We're keeping it under very close observation. The Engineering Committee prescribed the method and I believe they have been carried out satisfactorily. (Marked Sunray's Exhibit No. 1, for identification.)

Q Mr. Brooks, will you please refer to the plat which has been identified as Exhibit 1, and state briefly what it shows?

A The Exhibit 1 is a plat of the pilot area. We have shown Section 31, Township 26 North, Range 12 West, Section 6, Township 25 North, Range 12 West, Section 1, Township 25 North, Range 13 West, Section 36, Township 26 North, Range 13 West.

We have shown the pilot area surrounded by a heavy dashed line.

The four producing wells in the pilot area are the Sunray Mid-Continent Federal C No. 1 which is located in the northwest, northwest corner of Section 6. The British American Mayre No. 1, located in the northeast, northeast corner of Section 1. The Phillips Hospah No. 1, located in the southeast, southeast corner of Section 36, the Sunray Mid-Continent Federal C No. 2 is located in Section 31.

Q That plot shows, does it not, those wells are located in the center of each of those 40 acre tracts?

A Yes, sir.

Q Mr. Brooks, will you tell us now briefly what has been done on the pilot project since its approval by the Commission on August 7 of this year?

A We have since that time conducted tests to determine the reservoir conditions. LPG injection was started on August 21 and completed on September 19. At that time we had injected 31,015 barrels of LPG. A bottomhole pressure survey was conducted on September 26 and gas injection was started on September 29, the volume up to this time injected is approximately 41,000,000 cubic feet. Two other bottomhole pressure surveys were conducted on November 6 and December 4.

Q Then based on your studies of this project and the work that you have done on it and the data which you have received on it, is it your opinion that up to this point that this project has been a

success?

A Yes, sir. I feel that it has been a success and I believe that the other members of the committee would also agree, the bottomhole pressures, the gas-oil ratios, the specific gravities of the gas are all performing as we had predicted.

Q Then is it your opinion that the present rates of production from the various wells in the pilot area which are the four wells, are about right and should not be disturbed?

A Yes, sir.

Q Now, if these wells were cut back down where all of the recoverable oil would be lost --

A This is a new method of oil recovery, and I don't believe that I could give a definite answer to that question.

Q In other words -- excuse me, go ahead.

A It seems to me that we should be able to determine the success of the pilot so we can put it on a fieldwide base before we reach the bubble point, and free gas saturation could be created.

Q Is it your opinion that the full benefits of this experimental program will probably not be realized, if the allowables are reduced to the unit allowable for the northwest area and varied from month to month? A Yes, sir.

Q At what rates have the operators been endeavoring to produce these wells up to the present time, taking into consideration

the fact that the Commission issued on December 6 of this year an emergency order permitting the production of these wells in excess of the December allowable?

A We have been endeavoring to maintain the production on the pilot wells as prescribed by the Engineering Committee as follows: The Sunray Mid-Continent Federal C No. 1, 169 barrels, the Sunray Mid-Continent Federal C No. 2, 129 barrels, the Phillips Hospah A No. 1, 144 barrels, and the British American Marye No. 1, 158 barrels.

Q Those rates were determined by agreement of the Engineering Committee, were they not? A Yes, sir.

Q Do you think they are fair and equitable and necessary to maintain the proper balance and obtain the proper information from this experimental project? A Yes, sir.

Q Is it your opinion that results should be obtained from this project as quickly as possible if waste is to be prevented?

A Yes, it is. The potential benefits from this LPG flood,, if we can put it on a fieldwide basis, would be a hundred percent increase in the primary production, and certainly any delay would be wasteful.

Q Has the necessity of obtaining quick results from this experimental project always been recognized by the operators?

A Yes, sir.

Q Was this project designed for the specific purpose of obtaining quick results? A Yes, it was.

Q Now, was the British American Mayre No. 1 located in Section 1, the first well drilled in the Bisti Field after the discovery well?

A I believe it was. Yes, sir.

Q That is located in the northwest, northeast of Section 1?

A That's correct.

Q Then this being a fairly new area and being relatively a wildcat well, were the other three wells surrounding and offsetting that well drilled in fairly rapid succession as you would normally do under the circumstances? A Yes, sir.

Q Then the necessity for quick results was one of the main reasons why this particular area was chosen for the institution of this pilot project, is that correct?

A Yes, it was, and also we wanted to give the other operators a chance to share in this experiment and the close spacing, why we could get the earliest possible results.

Q You have stated as production continues, reservoir pressure can be expected to drop. If this occurs, gas saturation will increase, will it not?

A The gas saturation will increase after it falls below the bubble point and equilibrium gas saturation will be reached shortly after the bottomhole pressures fall below the bubble point.

Q Would you say that reservoir pressure and gas saturation have any adverse affect on a performance of an LP flood?

A Would you repeat the question?

Q Does reservoir pressure and gas saturation have an adverse effect on the performance of an LPG flood?

A Yes, it does. Missibility in the LPG floods can only be achieved with pressures above 1200 pounds or approximately 1200 pounds, and free gas saturation would reflect the degree of missibility. Only with complete missibility can we achieve the highest ultimate recovery.

Q Do you know of any actual example of an experimental LP flood in another field using the same process where difficulty has been encountered and at least a part of the disability has attributed to the delay in the injection of LPG?

A Yes, sir, I can cite an example from the December 2, 1957 issue of the Oil and Gas Journal. From this I would like to quote what the engineers have said. Incidently, this was on the Millikan Reef Field, Coke County, Texas. The LPG slug pilot was tried and they had exceptionally early breakthrough.

It says, "Engineers feel a contributing factor was the relatively high gas saturation any place in the project. The pilot likely would have performed better if it had been possible to start it several years back when gas saturations were lower." End of quote.

We realize the hazards of the LPG when we started this, and have taken all practical steps possible to complete the project in a minimum time. Incidently, from this I should also like to

read the last paragraph: "But the project may serve notice that operating a missible drive of the LPG slug type will be no snap. That it likely will require extreme care in choice of reservoir and unusual precise design and control of operations."

Q Then is it your opinion that the earlier in the life of the field the LPG flooding is commenced, the more successful the flood will be and the ultimate recovery will be higher?

A Yes, sir.

Q Also is it your opinion that there is grave danger that gas saturation will increase to such a point that the success of an LPG program will steadily decrease and as a result waste will occur as a result of the restriction of the pilot area?

A Yes, sir.

Q That being the case, Mr. Brooks, would you recommend that this Commission permit each operator to file with the Commission each month, or prior to the first of each month, an allowable request for that particular month, that particular following month, setting out the allowable which should be produced per day from each of the four wells in the pilot area?

A Yes, sir, I believe that would give us good flexibility.

Q You think that this flexibility of operation is necessary if you are to keep this project in balance and obtain the maximum results from it?

A Yes, sir.

Q Is it your opinion then that these proposed rates of

production which you cited earlier in your testimony are necessary and reasonable, and are necessary to the successful completion of this project? A Yes, sir.

Q Do you know whether the proposed rate of production from these wells is causing, or will cause, any drainage from offset leases or cause any other adverse effect?

A No, sir.

Q Was Exhibit No. 1 there, Mr. Brooks, which you offered, prepared by you or under your supervision?

A Yes, it was.

MR. ERREBO: We would like to offer that exhibit at this time.

MR. PORTER: Without objection the exhibit will be admitted. Does anyone have a question?

MR. DUTTON: Granville Dutton, Sun Oil Company.

CROSS EXAMINATION

By MR. DUTTON:

Q Mr. Brooks, I believe it is your testimony that this is primarily necessary in order to permit a rapid evaluation of this particular pilot, is that correct?

A Yes, sir.

Q It is not your testimony then that this is a rate sensitive project in which it would decrease the rates, it might decrease the ultimate recoveries?

A I didn't testify as to that, no, sir. However, I don't know that we can definitely state whether it's rate sensitive or not.

Q You don't have an opinion on that at this time?

A My opinion is that there has been several contradictory statements in the literature lately and I am not ready to state my opinion at this time.

Q I see. Then to state it the other way, you are not representing to the Commission that this is a rate sensitive project?

A No, sir.

MR. DUTTON: Thank you.

MR. PORTER: Anyone else have a question? Mr. Nutter.

By MR. NUTTER:

Q Mr. Brooks, you gave those producing rates that the Engineering Committee has established for the four wells in the pilot area. Are those the maximum rates that these wells can produce at this time?

A No, sir.

Q They are optimum rates somewhat less than the maximum?

A Yes, they are.

Q Your entire testimony, I gather, especially in response to Mr. Dutton's question there, is that the need for producing these wells at high rates at this time is to obtain a quick evaluation of the pilot flood?

A Yes, Mr. Nutter.

Q Or pilot project?

A That's correct. The quicker we can get the results the sooner we can put it into field application.

Q Do you think that in the event that the pilot flood should be expanded that quick evaluation would be necessary there too?

A No, at this time I can't see any reason why it should be, we should be able to get reasonable results out of the pilot as you see it on this plat.

Q If the production from the wells should be curtailed to less than the optimum rates that you have indicated have been chosen, what changes would be necessary to be made in your program as a whole?

A Well, one change would be that we would have to get another compressor, which is mechanical problems of course. Another thing that we would have to look for, it will make the calculations in evaluating the pilot more difficult.

Q Would you inject less gas or more gas if you curtailed the production?

A We would have to inject less gas, it is on a volumetric withdrawal basis.

Q Referring to that article on the Sun Flood, down in Texas, didn't one of those engineers also state that maybe the problem that they hadn't injected enough LPG to start with?

A That was the other reason. But we don't have that problem, we put twice too much in.

Q They also expressed the sentiment that there is possibly no answer that could be determined to be any answer for the breakthrough in their flood, did they not? They couldn't put their finger on it?

A That is true enough. They are still trying to evaluate it, I'm sure. At the same time they haven't completely given up. They are going to try again, I guess, by putting more LPG in and trying to abate the problem of taking care of the high gas saturation. But they will not get the recovery that they would have gotten if they had started sooner with this gas saturation.

MR. NUTTER: I believe that's all.

MR. PORTER: Mr. Cooley.

By MR. COOLEY:

Q I believe it is your position then that the necessity for exempting these four wells from prorationing is that we might have this information at an earlier date, thereby saving or recovering a greater amount of oil from the entire pool if the program proves successful? A That's correct.

Q But due to this gas saturation problem, if it comes a year or two years late it might lose any overall recovery?

A That's correct.

Q Now, would you please explain in some greater detail the method by which you propose to establish the daily unit allowable for each of these wells?

A The unit allowable will be determined by the Engineering Committee, which means that the six operators will have a meeting and decide upon the rates that they should be produced from time to time.

Q To reiterate at this point, that is optimum rate rather than a maximum rate? A That is correct.

Q Proceed.

A I don't believe that the rates would ever be too much greater, if any, than rates which I quoted. There could be some time down the line when we have gas breakthrough in one well and the other three wells need to catch up with that well that we could have a slightly higher rate.

Q Then once this Engineering Committee has determined what the optimum rate is for each of the four wells, the operator of each well will then nominate that amount of oil per day to the Commission to be produced from that well?

A Yes, sir.

MR. COOLEY: I believe that's all the questions I have of the witness. However, I would like to direct one question to Mr. Errebo. You are appearing in this case on behalf of British American and Phillips in addition to Sunray Oil Company?

MR. ERREBO: I am actually authorized only to appear in behalf of the Sunray as the operator of the injection wells. These other companies are here and will concur in this request.

MR. COOLEY: Thank you.

MR. PORTER: Mr. Nutter.

By MR. NUTTER:

Q Mr. Brooks, in this area you said that the British American Marye No. 1 was the original well drilled in this area?

A Yes, sir.

Q What was the original bottomhole pressure on it?

A On the Mayre No. 1, I don't know whether I have that with me. I could give it to you.

Q Do you have the bottomhole pressure -- you mentioned that you are taking periodic bottomhole pressure tests. You are taking these on all four of the wells in the pilot area?

A That's correct.

Q What were the bottomhole pressures on those when you commenced the injection of LPG?

A I can give you some of them. Bottomhole pressure, 8 and 16, 1957 on the Federal C No. 1 was 1179 pounds.

Q 1179?

A Yes, sir. On the Federal C No. 2 it was 1204.

Q What date was that?

A The same date. 8-16-'57, the Phillips Hospah A No. 1 was 1272 pounds. I don't see the British American. These are at a datum of 1345 incidently.

Q Do you have your most recent bottomhole pressure test, I think

you said that was on December 4?

A I sure don't. I don't have it with me.

Q Could you furnish those pressures?

A Yes, sir.

Q To us. Have you figured out how long it will take to evaluate this LPG system if the optimum rates are permitted?

A I would say that we should have the pilot well evaluated within a year.

Q Those four pilot wells? A Yes, sir.

Q Have you also calculated how many barrels of oil per acre foot would be required to be removed from the Bisti sand in order for this saturation of gas to reach a point where an LPG project might not be worthwhile? In other words, what the danger point is in terms of production per acre foot.

A I don't have the answer to that question. However, I have calculated it. I don't have it with me and I don't remember it. Not on an acre foot base, but on a percentage of the original oil in place. It will be slightly below the 1200 some pound bubble point pressure. I would estimate in the order of 1100 pounds.

Q You don't have any idea how much oil that would take to remove to get down to that pressure though?

A I don't recall.

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

MR. ERREBO: I have one more question I would like to ask.

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

RE-DIRECT EXAMINATION

By MR. ERREBO:

Q Mr. Brooks, with regard to this rate sensitivity of this flood, I think perhaps it was at one time your opinion at the start of this flood, and several months back when you had not obtained data from other floods and from this flood, that this process would not be rate sensitive, is that correct? A That's correct.

Q But since that time and almost six months have elapsed, have you obtained other information which I believe you called conflicting information to the contrary?

A Well, there are some articles out, that is that there is a relationship to rate. However I haven't made any opinion.

Q At least it is enough to, now, to make you modify that thinking somewhat? A That's correct.

Q Although you never thought that very strongly in the first place? A That's correct.

Q I believe you stated that this flood was running very well now?

A I think that it is, yes, sir.

Q It's operating just as well as you could expect it to operate? A Yes, sir.

Q Then if you disturb these producing rates under which this flood is operating so well, then from what you have said there

might be danger that waste would occur, is that correct?

A Yes, sir, and it might complicate our calculations to the point that we wouldn't be able to evaluate it.

MR. ERREBO: Thank you.

MR. PORTER: Anyone else have a question of Mr. Brooks?

By MR. COOLEY: RE-CROSS EXAMINATION

Q Mr. Brooks, in your computations concerning the percentage of oil which would have to be produced from the field as a whole to reach the danger point as something below 1200 pounds pressure, I believe you said? A Yes.

Q Did you make a determination that this pilot would have to be evaluated, and if successful, instituted on more or less of a fieldwide basis within one year to prevent, if you are to beat that deadline?

A We had considered that, yes, sir.

Q What was the result of your study in that regard, Mr. Brooks?

A Of course, we can't say definitely how long it's going to take because it is an experimental project and we don't know exactly what the recoveries willbe. We have been producing successfully at near the rates which I have described, and our result was that it would take approximately a year's time.

Q It would take a year's time to evaluate the project?

A Yes.

Q My question is will the pool still have sufficient pressure

as a whole, do you feel, after that year has elapsed, to allow the proper operation of this project if it be successful?

A I believe that we can pull the pressures back up if they are not too far below the bubble point.

Q Did you make any calculations as to what the pool pressures would be after a year's production?

A Due to the fact that I didn't know how fast the field would produce or how much the withdrawals would be, I haven't made that calculation.

Q This would depend largely on the allowables authorized by this Commission for that pool, would it not?

A That is right.

Q And the pressures would be directly proportionate to the amount of oil withdrawn during this one-year period?

A Yes, sir. I can't recall whether I submitted to the Commission material balance calculations of the Bisti Field or not. I believe I did.

MR. COOLEY: That's all the questions.

MR. PORTER: Anyone else have a question of the witness? Mr. Brooks may be excused.

(Witness excused.)

Is this the only witness you have, Mr. Errebo?

MR. ERREBO: Yes, sir.

MR. PORTER: Anyone else ready to present testimony?

MR. COOLEY: Mr. Porter, please, at this time I would like to have the concurrence of the other operators in this particular test project.

MR. PORTER: Are representatives of the other operators participating in this project present?

MR. KELLAHIN: Jason Kellahin, representing Phillips Petroleum Company. Phillips joins in the application for an emergency order in this case and supports Sunray Mid-Continent's application as presented, and request that it be approved.

MR. SULLIVAN: R. W. Sullivan on behalf of the British American Oil Producing Company. British American concurs in the recommendation made by Sunray Mid-Continent and request its approval.

MR. PORTER: Are there other representatives?

MR. COOLEY: I believe that's all.

MR. PORTER: I believe that's all. Is anyone else ready to present testimony in this case at this time? Any other operator? Mr. Kellahin.

MR. KELLAHIN: Yes, sir.

MR. COOLEY: Howmany witnesses will you have, Mr. Kellahin?

MR. KELLAHIN: Jason Kellahin, representing Lowry Oil Company. We will have one witness, Mr. Art Holland.

MR. COOLEY: Would you stand and be sworn?

(Witness sworn.)

MR.KELLAHIN: If the Commission please, before we go into

our testimony, I would like to make a brief statement by way of explanation of our situation in this case. In connection with the presentation of the case, you will note that some of the exhibits are marked in the name of Caulkins Oil Company. The Commission records in the past have shown the operator to be the Lowry Oil Company, and in some instances they appear under the name of Lowry, et. al., operating account. By way of explanation of that, the Lowry, et. al. is the owner of the leases in the pool. The Lowry has been the operator in the past as a management company that has now been transferred over to Caulkins Company, and it is my understanding that the Forms 1104's have been filed with the Commission asking the transfer of the wells to the Caulkins Oil Company.

However, in connection with this case, it is referred to as Lowry, although some of the exhibits appear as Caulkins.

Just to briefly review the history of the situation in the Tocito Pool which we were not able to bring out in connection with the allowable hearing, when the Commission first considered prorating oil production in the Northwest part of New Mexico, I would like to call the Commission's attention to several orders which were heretofore entered. The first one being the order approving 80 acre spacing in the South Blanco-Tocito Pool which was entered in Case No. 537, Order No. R-326, dated May 26, 1953.

In connection with that order there was a provision which said that in the event, something to the effect that in the event

of prorationing, these wells would be assigned the 80 acre proportional factor under the rules and regulations of the Commission in effect at the time.

Now, later in July of 1953, application was made to this Commission for approval of a pilot pressure maintenance program in Case No. 555, and this program was approved in Order No. R-349. In that order there is a direction that the operator, in the event of prorationing, submit to this Commission a plan of prorationing for the transfer of allowables and to take care of any emergency situations which might arise in the pool as a result of the pressure maintenance water injection program.

In December of 1953 the Commission called a case to consider oil prorationing for the San Juan Basin. That was Case No. 607 and in connection with that case and in compliance with the instructions contained in Order No. R-349, we appeared and presented a program, a proposal as to the handling of allowables in this pool, and also requested that the Commission make under its supervision, gas-oil ratio tests of all the wells in the pool. As the Commission is aware, no order was ever entered in connection with Case 607 unless it has been, recently been dismissed.

The next cases were concerned with the expansion of the pressure maintenance program. The first order entered being Order R-532, dated October 4, 1954, and later Order R-664, dated July 14, 1955. In both of these orders there is a provision that in the event of

prorationing, suitable provision would be made for transfer of allowables.

Now, in view of those orders, we feel that this is the time to present this. We had no opportunity to do so at the time that prorationing was first considered in this particular area under the present circumstances. Under its Order A-97, the proration order for December of this year, the Commission set up a definite allowable of 28 barrels per well. We immediately made application for an emergency order and we would like to explain to the Commission the reasons for that application.

The first was in our opinion the proration order was wholly unworkable in the South Blanco-Tocito Pool; in adopting the order there was no consideration given to the limiting gas-oil ratios, and there was no consideration given to water injection, no credit considered in connection with the limiting gas-oil ratio which would have resulted in a violation by this operator of the pool rules if it had complied with the provisions of Order A-97.

It would have been necessary to shut down some wells which were producing water, and in addition it set a flat allowable with no consideration of acreage or depth factors, and no schedule was issued by the Commission as is the case in Southeastern New Mexico. With this situation, it left considerable doubt in the operator's mind as to just what the allowable available on a per well basis would be in the South Blanco-Tocito Pool, and because of the water

injection program it left the operator in the position of not knowing just what could be done. So we filed an application for an exception on an emergency basis until this case could be heard.

A. F. HOLLAND

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

DIRECT EXAMINATION

By MR. KELLAHIN:

Q Would you state your name, please?

A A. F. Holland.

Q By whom are you employed?

A I am employed by Caulkins Oil Company.

Q Mr. Holland, you heard my statement in explanation of the names of Lowry, et. al. operating account, Lowry Oil Company and Caulkins Oil Company. Did the information I gave the Commission substantially cover that situation?

A I think so. The property formerly was operated by a management concern, Lowry Oil Company. Caulkins Oil Company is now assuming those management relations, forms have been filed, and within a short period of time all of the paperwork should be cleared so that there will be no discrepancy in forms being filed and present management.

Q Now, what is your position with the Caulkins Oil Company, Mr. Holland?

A I'm an engineer in charge of the Production Department.

Q In connection with your duties as engineer in charge of the Production Department, are you familiar with the South Blanco-Tocito Pool?

A Yes, I am.

Q Have you prepared a plat showing that area?

A Yes, sir, I have.

(Marked Caulkin's Exhibit No. 1, for identification.)

Q Referring to what has been marked as Exhibit No. 1, will you state what that shows, Mr. Holland?

A Exhibit No. 1 is a plat of the South Blanco-Tocito area showing all of the wells in the pool, and showing the results of the most recent bottomhole pressure survey which was taken approximately October 1 of this year. It also shows the wells that are presently being used for water injection purposes.

Q How many wells are being used for water injection?

A In the operation of the pressure maintenance program, a total of three wells to date have been used. An additional well is currently being added and should be an injection well probably by the end of the month.

Q Is that the well designated as the 157?

A That is correct.

Q Are the bottomhole pressure results shown in figures above each well?

A Yes, that's right. Nearly every well in the pool was

surveyed and the results are shown above the well.

Q How many producing wells are there?

A At the present time there are fourteen producing wells in the field, three are operated by other operators.

Q Leaving 11 operated by Caulkins Oil Company?

A That is correct.

Q Now, have you made any study of the performance figures for this pool?

A Yes, sir, I have. I would like to introduce Exhibit No. 2, showing the results achieved by the pressure maintenance program.

(Marked Caulkin's Exhibit No. 2, for identification.)

Q Referring to Exhibit No. 2, what period of time does that cover?

A Exhibit No. 2 covers the operations from inception of production through October the 31st, 1957.

Q What does that exhibit reflect in connection with this case, Mr. Holland?

A It sets out a number of items that are pertinent to ultimate oil recoveries and good production practice. The first item I would like to point out is that in the six-year producing history of the field, and these are Lowry operations only, they do not include the other three wells in the field, there has been essentially no change in producing gas-oil ratio. Before water injection,

the producing gas-oil ratio was 1669 cubic feet per barrel. The period after water injection commenced the producing gas-oil ratio has been 1683 to 1 for a field of this type, which has a gas cap expansion and depletion type drive that in my opinion is a good production record.

Q Has there been any change in the oil produced per pound per square inch drop in pressure?

A Prior to the commencement of water injection, approximately 3,152 barrels of oil were produced per pound drop in bottomhole pressure. Since commencement of water injection operations, that has been nearly tripled, the oil recovery per pound drop has been 9,460 barrels.

Q Does that exhibit show the cumulative water injection and water production in the pool?

A It does, the cumulative water injected through October 31 was 3,250,661 barrels. The water produced, 479,077 barrels. Leaving a net amount of water injected, 2,771,584 barrels.

In terms of the amount of gas that would have been necessary to have been injected in the reservoir to equal this net water volume, the figure would be 1,940,109 MCF.

Q What has been the average oil production on a per day basis over the life of this field?

A I would like to elaborate a little bit more.

Q I'm sorry.

A In considering the amount of water that has been injected, applying it as a credit against the gas production of the field, the net gas production amounts to 448,318 MCF. The net equivalent gas-oil ratio since commencement of water injection for the Lowry operation has been 316 cubic feet per barrel.

Q What is done with the gas which is produced, Mr. Holland?

A Essentially all of the gas that is produced is being sold.

Q In other words, as a matter of practice, you are not venting gas over there in that pool?

A Lowry Oil Company installed a compressor plant at considerable expense, and is now compressing the gas and selling it.

Q What has been the average production rate on that pool?

A Approximately 950 barrels per day, 920 barrels per day before water, and since injection, 950 barrels round figures.

Q Have you made a study of the water percentage?

(Marked Caulkin's Exhibit No. 3, for identification.)

Q Referring to what has been marked as Exhibit No. 3, will you state what that shows?

A Exhibit No. 3 shows a water percentage produced by wells for the Lowry operations in the South Blanco-Tocito Pool. It shows that the water is not confined to a small area, that a number of the wells in the field are producing water, that many of the problems encountered in a normal water flooding project are being

encountered in this field, that it is necessary when the wells commence producing water to essentially producing the wells to capacity.

Q Does the sand vary in this formation, Tocito formation?

A It does. There are areas of tight sands, and areas of highly permeable sands. It's not a perfect homogenous reservoir.

Q Does that create a need for the flexibility in your operations in order to maintain control of your pressure maintenance program?

A I think it does. The performance, the manner in which the water injection is prosecuted, is determined by the field performance of the individual wells.

Q Has Lowry Oil Company spent a large sum of money in developing this program?

A I have some financial statistics that I would like to introduce as Exhibit No. 4, showing the expenditures that we can directly allocate to the water injection program.

(Marked Caulkin's Exhibit No. 4, for identification.)

Q Referring to Exhibit No. 4, Mr. Holland, I believe you stated that reflects expenditure on the water flood program. How did you arrive at those figures?

A Those are, those figures were taken directly from charges, invoices, time tickets and it conforms with the general accounting

procedure used in the oil industry.

Q Does it include expenditures which are not directly attributable to the water flood project?

A Not all of them. It's been necessary to recondition some of the wells, in the prosecution of this project there was a scaling problem in the wells. It necessitated setting liners in many of the wells and treating the wells with sand fracture treatments in order to maintain production. A lot of those expense items are not reflected in this statement.

Q Could that money have been used for the development of other wells to which an allowable would be assigned under the present proration system?

A That is correct. The expenditures of nearly $700,000 would have drilled an additional six or seven wells.

Q Do you have that many locations available?

A We do have, yes, sir.

Q You made a study of the operating expenses of the water flood project?

A We have an analysis prepared for our own company which I would like to present as Exhibit No. 5, showing the additional expenses incurred which are directly related to the water injection program.

(Marked Caulkin's Exhibit No. 3, for identification.)

Q Now, in allocating those expenses, how did you make that computation, Mr. Holland?

A In the same manner that the expenditures were made, time tickets, invoices, an accounting procedure was in operation that delineated charges directly attributable to the program.

Q How did you make an allocation to supervision?

A Generally our method of allocation of supervision is on the basis of direct labor charges.

Q That would apply to any other items that appear on the list which could be general expenditures? A That is correct.

Q Now, have you made a study of well performance on any of the wells involved in this program?

A Yes, sir, we keep detailed records on all of the wells that we operate in the pool. I would like to present the production curve on Well No. T-129 which reflects some of the operating conditions that are encountered in a project of this type.

(Marked Caulkin's Exhibit No. 6, for identification.)

Q What is Exhibit No. 6, would you please explain just what appears on Exhibit No. 6?

A Exhibit No. 6 is a production curve showing the amounts of daily oil, daily water, gas-oil ratio, and water percentage for the well. I think the significant thing on the performance of this well is that it shows the delay in anything you do in the

field, any change in operation that you make regarding your water injection program is reflected several months later. It tends to point out that in an operation of this type, to operate efficiently and analyze results, that the operation needs to be stable both as regards water injection rates and oil production rates.

Q Mr. Holland, referring to Exhibit No. 6, would you explain to the Commission just what occurred and how the results are shown on the exhibit?

A In the operation of the water injection program, we found that in some areas there was bypassing of oil. This particular well in May of 1956, we discontinued injecting water into our well T-85. During that time the well was producing approximately 90% water. The well continued to produce water at approximately that percentage until the month of October of the same year. So it shows that an operation commenced to detect any change in producing conditions required an excess of four months.

Q Now, does that indicate that there should be a stable allowable for this pool for any period of time?

A I think it certainly does.

Q What period of time would be a minimum in your estimation?

A I think to efficiently operate the field, using good reservoir management, that stable production rates of at least six months are necessary.

Q In the absence of stable conditions, what would be the result?

A I think the efficiency of your reservoir management would decrease, resulting in less ultimate oil recovery, the problems encountered in trying to analyze your operation would be very difficult, and all of those factors would mean less oil recovery from the pool.

Q Now, does the operation of this program require any trained personnel?

A Any project of this type requires good supervision, there's lots of engineering data to be maintained and compiled, and it does require better than average supervision.

Q How many men approximately are employed up there on this project?

A There are six.

Q Mr. Holland, if there is a variation in production such as might be contemplated on the basis of the testimony you heard in the allowable hearing this morning from 28 barrels last month down to approximately 9 or 10 barrels, would that make any difference in regard to your personnel situation?

A It presents, yes, it does, it presents a difficult personnel situation along, well, with the other production problems, and a project of this type I believe needs some stability, good stability.

Q On the base of your experience with this project, have you arrived at an efficient rate of production?

A I think Exhibit No. 2 detailed that approximately 950 barrels a day is an efficient rate.

Q That is the figure which you recommended as the efficient rate of production from the Lowry operation in the Tocito Pool?

A I believe that that is a good efficient rate and good reservoir management can be maintained at that rate.

Q Now, there are, as you have indicated, offset operators to the water flood project, is that correct?

A There are three wells operated by Texas National Petroleum Company.

Q What would you propose should be done in regard to those wells?

A In regard to those wells it would be our recommendation that they be prorated along the normal statewide proration plan with production limited and governed by gas-oil ratios.

Q As provided by the orders of the Commission, the gas-oil ratio in the South Blanco-Tocito Pool is 2,000 to 1, is it not?

A That has been established by the field rules.

Q Would you recommend the same thing be done with the wells operated by Lowry immediately offsetting the Texas National wells?

A I think that the wells offsetting the Texas National wells should be prorated in the same manner that the Texas National wells are. They should be governed, oil production should be governed by gas-oil ratio, and the method of proration should be the same.

Q That would apply then to your wells designated as the 123 and the 125?

A Yes, those wells offset the Texas National property.

Q Have you had any gas-oil ratio tests made, Mr. Holland?

A Recently there was a joint test conducted in the pool which I would like to introduce as Exhibit No. 7.

(Marked Caulkins Exhibit No. 7, for identification.)

MR. PORTER: Mr. Kellahin, I note by my watch it is almost twelve o'clock.

MR. KELLAHIN: We have another five to ten minutes of testimony at least.

MR. PORTER: I think we might as well recess at this time until one-thirty. I would like to announce before you leave that the normal unit allowable for Southeastern New Mexico would be 37 barrels, for the Northwest it will be calculated by the staff on the basis of the figures in the record.

We will recess until one-thirty.

(Recess.)

AFTERNOON SESSION

December 18, 1957

MR. PORTER: The meeting will come to order, please. We will continue with Case 1353. Mr. Holland, will you return to the stand, please.

DIRECT EXAMINATION (Continued)

By MR. KELLAHIN:

Q Mr. Holland, at the time of the noon recess, we had just referred to Exhibit No. 7, showing gas-oil ratio tests. Have you anything to comment on that exhibit?

A The only comment I wish to make is that it's a gas-oil ratio test of the wells, of the South Blanco-Tocito Pool, that was performed by an outside consultant engineer. It was a cooperative effort, and the tests should be reliable and should be accurate.

Q Does that testimony cover all of the wells in the pool including the Texas National wells?

A It covers two of their three wells. The other well is a marginal producer, and from our information does not have an excessive gas-oil ratio. That well is there Rincon No. 20. It misses one of the Lowry wells, T-182, which is a pumping well, producing water, and we'll be glad to submit a ratio to the Commission on that well.

Q Now, Mr. Holland, have you made any calculations on the unit allowable based upon the allowable granted by the Commission last month?

A Yes, sir, I have. Based on the discovery well of the pool, the 6,000 to 7,000 foot depth factor would apply, the discovery well had the casing shoe set at 6615 feet.

Q Have you prepared an exhibit on that?

A I have, Exhibit No. 8.

(Marked Caulkin's Exhibit No. 8, for identification.)

Q Referring to Exhibit No. 8, does that take into consideration the depth factor and the acreage?

A Considering the depth factor and the acreage, the allowable based on the unit allowable of 28 barrels per day, would be 78 barrels per day for wells of the South Blanco-Tocito Pool.

Q Does that show the pool average allowable? I mean the total pool allowable.

A Not on Exhibit 8. That's on the next exhibit.

Q Have you prepared an exhibit showing that?

A Exhibit No. 9 is a proposed proration plan for the South Blanco-Tocito Pool, based on a top unit allowable of 78 barrels per day.

(Marked Caulkin's Exhibit No. 9, for identification.)

A Also providing for gas-oil ratio limitations for the Texas National Petroleum Company wells and the Lowry Oil Company wells offsetting such Texas National wells. The plan also provides that wells associated with the water injection project will be exempt from gas-oil ratio limitation and that credit will be allowed for wells converted to injection service, and wells that have been abandoned because of water encroachment.

Based on that, such a plan provides that the total pool

allowable will be 1,500 barrels per month, and is parallel to the emergency order that we requested earlier in the month from the Commission.

Q Do you consider that a reasonable allowable for the operations under your pressure maintenance program?

A Our past production history record of the pool has been at the rate of 950 barrels per day, and I believe the exhibit shows that it has been an efficient operation.

Q The allowable as you have calculated would be slightly in excess of the 950?

A For the pool, yes. For our operations, roughly 950.

Q Are you equipped to take care of the gas which would be produced if such an allowable were granted to this pool?

A We have sold essentially all of the gas produced from the Lowry Oil Company wells except for very rare peak periods in the past production history from the field.

Q In computing your allowable figures on Exhibit No. 9, have you taken into consideration the transfer of allowables from injection wells?

A That provides for the transfer of allowable from the three wells now being used for water injection and transferring such allowable to a combined well plan allowable.

Q Is it your recommendation that that transfer be made and the allowable be allocated to the pressure maintenance program

to be produced from such well or wells as efficient operations indicate?

A I believe that is good proration procedure, yes, sir.

Q Now, in calculating the transfer of these allowables from the injection wells, on what basis do you propose to do that?

A On the three wells converted to injection service on the basis of their production prior to conversion.

Q Those are the figures then which appear on Exhibit 9?

A Yes, sir.

Q Now, in your testimony you referred to asking for credit for the gas equivalent of the water injected, is that practice common in a pressure maintenance or water flood program of this type?

A We have participated in at least one project not in this state, where such credit was given, and I know of several other instances and it has become a prevalent proration practice.

Q In what project did you participate?

A This was in the Diamond N project in Scurry County, Texas.

Q How was that handled in that pool?

A Much in the same manner that we have presented that water injected was converted to a gas equivalent and deducted from their produced gas resulting in a net gas-oil ratio.

Q Would such a procedure result in waste in your opinion?

A I think such a procedure would do just the contrary, promote conservation.

Q Do you have any recommendation in regard to any further gas-oil ratio tests?

A Just that tests be conducted as provided by the field rules semi-annually. I would like to point out that this field using the combined oil production plan is not producing in excess of the 2,000 to 1 gas-oil ratio limit. It is below that.

Q Do you have some wells that are?

A Some wells are.

Q At the outset, Mr. Holland, I failed to ask you if you had previously testified before this Commission as an expert engineer and had your qualifications accepted.

A Yes, I have.

MR. KELLAHIN: At this late date, I ask if the witness's qualifications are acceptable?

MR. PORTER: They are.

Q Were Exhibits 1 through 9 with the exception of Exhibit No. 7, being the gas-oil ratio tests, prepared under your direction and supervision?

A Yes, sir, they were.

Q Have you examined the Exhibit No. 7 to determine its correctness, and in your opinion is it a correct representation of the gas-oil ratios?

A These were actual tests measured under field producing conditions.

Q Were they made under the direction and supervision of anyone in your employ?

A Not directly, no, sir.

Q It was an independent calculation?

A It was an independent.

MR. KELLAHIN: At this time we offer Exhibits 1 through 9 inclusive.

MR. PORTER: Any objections to the admission of the Applicant's Exhibits 1 through 9? They will be admitted.

MR. KELLAHIN: That concludes our case.

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

MR. SELINGER: May I ask the witness one question?

CROSS EXAMINATION

By MR. SELINGER:

Q Apparently your program has been successful on the basis of 80 acres as developed by the operators in the field and on the order as established by the Commission?

A Yes, sir, we believe it is.

MR. PORTER: Mr. Nutter.

By MR. NUTTER:

Q Mr. Holland, first of all I would like to find out what you find this pool to be, a water flood pool or pressure maintenance project, or just what?

A We haven't entirely maintained reservoir pressure. In our

orders we have designated it as such. It's not in the usual sense, it is not exactly like what you would call a water flood. We are letting the pressure decline a little over the life of the field, as you will see.

Q How many wells are currently injecting water?

A Currently we are injecting water in one well.

Q That would be the 134?

A The 134, and planning to add the second well, the 157.

Q Do you anticipate that any more water will be injected in 185 and 187?

A I think so, as the field warrants. At this point I think so.

Q Do you think that the injection of water into say the 185, the 187 and the 134 over a period of time the last several years, has had any pressure on the wells far removed such as the 137 and the 157 over in the west corner of Section 8?

A I'll answer your question this way, that to obtain an average reservoir pressure, all the wells are weighted in and I think you can see that in the past four years we have lost 150 pounds of reservoir pressure.

Q Well, to obtain this average reservoir pressure that you have on one of these exhibits, did you include the pressures on the water injection wells?

A No. No. Those are just on the oil producing wells.

Q I note you have pressures on the 85 and 83 marked on the

exhibit. Were they included in the average?

A They were not averaged in.

Q In essense, what did this amount to that you have spoken of on your Exhibit No. 2 on the second page where you are talking about the daily average production since inception has been 920 barrels, the daily average production from October '53 to October of '57 has been 955, then I think you stated that a rate of about 950 barrels would be the ideal rate that you desired to produce the thing. In essense, what does this amount to, an MER for the production of oil from this pool or what?

A I think so.

Q You know of any pools in the State of New Mexico that operate on an MER?

A Well, as I understand the proration in the State of New Mexico, it is not established on that base.

Q Now, in this exhibit entitled Proposed Oil Allowable Plan for the South Blanco-Tocito, I don't know the number of it. You have listed some thirteen wells here with excess opposite ten of them and numbers opposite the other three. Now, all of these wells that are marked with an excess are top allowable wells under the proration scheme that you have developed here?

A Those wells at the initiation of this project were top allowable wells, yes, sir.

Q Are all of them capable of production at this date?

A At top allowable now?

Q Yes. A No, sir, they are not.

Q Are all of them capable of producing any oil?

A All except one well which is T-D 157 which is, the water front has moved beyond that well.

Q How about the 177?

A The 177 is capable of top allowable oil production.

Q You didn't produce that well in October though, did you?

A No, sir, we didn't. The ratio on it is higher than we want to produce right now.

Q The gas-oil ratio?

A Yes, sir. We have governed the operation of the field to produce our oil so that we could have minimum gas-oil ratios with the reservation that wells that were producing water we have produced some of those wells with fairly high ratios.

Q Is this the 177 GOR such that the well would be penalized for GOR? A Oh, yes.

Q How about in your T127, what is the status of that well?

A It is producing.

Q It produced 42 barrels in the month of October, is that about the most that it can make?

A No. It's capable, it will produce in excess of 150 barrels a day.

Q You just had it shut in then most of the time?

A That's right.

Q How much could 177 produce with the GOR penalty applied to the well?

A How much will it produce?

Q Could it legally produce with GOR limitation?

A The ratio on the well is about 11,000.

Q It is? A Yes.

Q That is sufficient. How about your Well No. T-207? Can it produce? A Will it produce?

Q Yes, sir.

A It is currently producing, well, about 175 barrels a day.

Q That is another one that didn't produce in October. That's the reason I was wondering about it. I think one of your exhibits has the potentials of these wells.

A They're a matter of Commission record. I don't think they are here.

Q Well, this one here that shows the gas-oil ratio tests in 1957.

A I don't think you can consider that a potential test in all cases.

Q Is this the actual amount of oil that was produced and the number of hours that the wells were on test, or is this the daily rate of production expanding those hours of production to a twenty-four hour basis?

A They are supposed to be the actual oil production.

Q So this 123 that shows oil production of 50 barrels in six hours made 50 barrels in six hours. That is not the daily rate of production? A That's right.

Q Based on a six hour test? A That's right.

Q Did I understand you, Mr. Holland, that in the allocation of the total allowable, that you would transfer the allowable of these wells based upon their ability to produce at the time they were converted to injection wells?

A I said that in the case of the three wells we picked out, they were all producers, they were basically transferred in their original state, if you follow me. It's production as they were under primary depletion. Now, on this well T-157 at the time we quit producing it it was 95% water. It was no longer a top allowable well.

Q But you would transfer the original allowable that the well had?

A Based on this reasoning, that a project of this kind necessarily wells, the water encroachment as it advances across the field will pass beyond wells that will become water productive. Under such a situation, if an operator is penalized for using a secondary recovery measure, it's an unjust penalty. We'd have been better, I mean we lost the allowable from the well by injecting water.

Q One more question, Mr. Holland. Do you think that the

allocation of 950 barrels, or 1,005 barrels or whatever the figure is to these 14 wells in this pool, will have any adverse effect on the allowables for the other wells in the San Juan Basin?

A Well, I don't know exactly what you mean.

Q Well, do you think that they're getting a disproportionately high share of the market demand for oil from the San Juan Basin?

A From the testimony at the hearing and the rumors that we have been able to hear, this present severe oil curtailment is supposedly a temporary thing, maybe a month or several month's duration. A project of this kind, I believe to have fluctuating allowable changes, is a great detriment to the operation of the project.

I say that isn't definite, the thing is just not as flexibile as wells under their primary state of depletion.

Q Well, now, you say this is a temporary thing for a matter of a few months. Do you think that any actual physical harm will be done to this reservoir or to this project if it were curtailed on a temporary base for a matter of just a few months, just a month or two months?

A I primarily think that these allowables should be granted to the project in view of all of the factors, the additional expenditures, the gain in ultimate recovery, I think the projects of this type should be encouraged by the Commission.

Q I mean will any actual physical harm result to the reservoir

itself.

A I think a severe reduction, yes, sir.

Q That couldn't be recouped? A I think so.

MR. PORTER: Anyone else have a question? Mr. Mankin.

MR. MANKIN: Warren Mankin with Aztec Oil and Gas Company.

By MR. MANKIN:

Q Mr. Holland, is this a stratographic type accumulation in the reservoir? A Yes, it is.

Q Is the producing mechanism solution gas?

A Well, it's water injection now.

Q As it originally was laid down, wasn't the producing mechanism solution gas? A No.

Q In this reservoir the permeabilities, they were very erratic in the conditions that you found them, is that right?

A There were varying permeabilities in the field, yes, sir.

Q Have you not had numerous breakthroughs of water into producing wells?

A We have had troubles. We have had some bypassing of oil in the reservoir. Our most efficient operation is in the eastern portion of the field. Our calculations indicate that oil is being recovered efficiently.

Q Hasn't there been at times in this project when you had great breakthroughs, that you actually almost ceased operations of injected water?

A Well, we have discontinued water injection in two wells if that is what you mean.

Q In other words, there has been quite a cutdown of water injection in this project?

A In rate, yes, sir, there has.

Q That was caused by some of these very rapid increases in water production that occasioned these breakthroughs, was it not?

A Would you --

Q (Interrupting) In other words, as you had these great rates, the water broke through and almost went to 100% water in the production wells, is that correct?

A You mean on high producing rates?

Q Yes.

A I think that was one of the factors, yes, sir.

Q Is it your experience that in this type of reservoir that water injection is normally considered a success rather than gas injection?

A Well, all the engineering factors that we have indicate that gas injection in this reservoir would not materially increase ultimate oil recovery.

Q But it has never been tried, is that correct?

A In this reservoir?

Q Yes.

A No, it has not been tried.

Q Of the 11 wells in which you have asked for large allowables, some of these could not make these 90 to 100 barrels a day, is that correct? A You mean now?

Q Now.

A Some of them would have high gas-oil ratios in making it.

Q I meant if they took their proportionate decrease in production based on the high gas-oil ratios, is there some wells that could not make their allowables? A Why sure.

Q And therefore you would have to take as much as maybe a couple of hundred barrels a day out of some individual wells?

A That's why we are asking for credit for our injected water. But fieldwide over the life of the project, our producing gas-oil ratio has been 1680 cubic feet per barrel.

Q The pressure has been somewhat sustained, has it not, in this reservoir?

A Well, I think the figures prove that.

Q Yes.

A Our pressure drop per barrel of oil produced is triple of that before water injection.

Q But as far as increasing your reserves, they have not been proportionate to the amount of water injected as to the amount of oil produced, is that correct? In other words, reservoir volumewise.

A I don't know what you are saying.

Q In other words, are you getting fillup such that you are

actually getting some effects due to water injection, or is it just maintaining pressure?

A We think that our ultimate oil recovery will be greatly increased.

Q That's what I was trying to determine. You do feel that it has been greatly increased? A We do.

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

MR. COOLEY: Yes, sir.

MR. PORTER: Mr. Cooley.

By MR. COOLEY:

Q Mr. Holland, under the present pool rules for the South Blanco-Tocito Pool as outlined on your exhibits, Exhibit 9, --

A Yes, sir.

Q (Continuing) -- would provide you a desired number of barrels, roughly 1,005 barrels per pool and 954 barrels for the nine Lowry wells, is that correct, that 954 barrels would be allocated to nine producing wells? A That is correct.

Q This would be accomplished through the operation of the present program?

A Some 842 barrels to the nine wells. Some 954 to the eleven wells.

Q This, I believe you stated, is the desirable level?

A We think our past production history sustains that.

Q How do you feel this is sustained, by your production history?

A Well, in that No. 1 we have had a pressure drop of only 150 pounds in the past four years of production. No. 2, we have had a net produced gas-oil ratio of 316 cubic feet per barrel.

Q Is there anything in these figures or this history that would tend to prove that this would not have been the case had the production been reduced say to 500 barrels per day or 400 barrels per day or any other figure?

A Well, I think earlier in the life of the field we were experiencing rapid increases in gas-oil ratios. There was nothing we could do. To us that meant, No. 1, that our gas injection program was not feasible, No. 2, that we needed some water injection into the reservoir to maintain high pressures and high fluid saturation in the reservoir to better use our available gas energy.

Q Mr. Holland, I don't mean to imply that your program has not been quite successful. I think it has been, but what I'm asking is there anything in the history of this program that indicates that a different rate of production would not have been equally as successful?

A Of course excessive production rates under this type of reservoir will reduce ultimate recoveries. But I see no way under primary means to recover the oil that we believe we will recover under this program.

Q I don't understand that last statement.

A No matter how we produce the field.

Q I still don't understand your last statement.

A What I am saying is under primary depletion, irregardless of your production rates, I don't believe you would achieve the ultimate recovery well under this water injection program, so the answer to your question is no.

Q Is there anything in the history of this pool since the water injection was commenced, I'm speaking of the history of the water injection project, not the entire pool, is there anything in the history of this project that indicates to you as an expert witness on this matter that the production rates could not be reduced without causing waste?

A I think so. As we pointed out in our Exhibit No. 6, that your reservoir mechanics are not instantaneous, they're delayed, to have varying allowable rates, varying producing rates, it would be difficult to analyze your operations and have an efficient program.

Q You have testified, and I will accept for the moment that this fact that you require a constant rate of production --

A Yes.

Q -- but what is present in this material presented here, or any other material that you have available to you, to indicate that this constant rate could not be 500 barrels per day or 300 barrels per day?

A Well, we have some wells that shouldn't be curtailed at all,

in our opinion, those wells producing water.

Q Will you explain to me why? That's what I am trying to get at.

A Just I think for the same reasons that the same problems that a water flood has. As oil is pushed to the well bore with water, that the chances of recovering that oil are better by taking it at that point than having additional migration through the reservoir where there could be water blocking.

Q Do you feel that the conditions in a pressure maintenance program where water injection is commenced early in the life of the field while pressures are still high are comparable to the conditions which you have in the ordinary water flood situation where the water injection is commenced after the pressures are near abandonment level?

A I think each project ought to be analyzed on its own merits. This particular project, I believe, we have many of the problems that are encountered with a normal water flood.

Q You feel that you are actually getting a water drive here with this injected water? A Yes, sir.

Q Just as you would in a water flood project?

A Yes, sir.

Q What difference, if any, occurs as a result of the difference in pressures between the situation that you have in this pool and the ordinary lower pressures in the standard water flood situation?

A Well, here as I see it, we have two elements, two sources of energy, one, our injected water, the other the formation and gas cap gas. We are using a combination of those two. As I understand the normal water flood, the energy source is the injected water.

Q You state that if your allowables fluctuate with the normal fluctuations of market demand for the area are assigned the normal unit allowables with the 80 acre proportional factor, and the depth factors, that this will, I believe you said, cause an inability on your part to evaluate the success of your program, but I don't think you state it would cause any waste?

A And also to govern our water injection incident to our oil production. I believe it would make a very difficult problem both in the producing mechanics of the reservoir and an analysis and understanding of the program.

Q Can you state at this time that you feel that more oil will be ultimately recovered from this pool if the constant allowable of 854 barrels per day is assigned to these nine wells than would be recovered if say a 500 barrel constant allowable were assigned to these wells?

A Well, economically if a field with the expenditures incurred and the program employed, has an allowable condition over the life of the project such as you mentioned, I think there would be economic waste.

Q Will you define the term economic waste, how you are using that term?

A Well, as I've used it here, I would construe it that the program of the Commission would be such so that projects of this type would not be encouraged.

MR. NUTTER: Would not be what?

A Would not be encouraged.

Q It is your position that high allowables be granted projects such as this to encourage them and prevent physical waste?

A It is not our position that these are high allowables. A 28 barrel a day unit allowable is not a high allowable.

Q But it becomes high when the normal unit allowable is ten, doesn't it?

A Well, there are other factors, depth, and 80 acres.

Q Well, calculated out at ten times your 277, you would get 27.7 barrels per day, is that correct?

A I'll take your figures.

Q As compared --

A (Interrupting) What I'm saying is this, that under the Conservation Commission allocation formula A-97, we were entitled to a unit allowable of 78 barrels for the month of December. If that is drastically reduced, if that type of proration is applied to projects of this kind, great percentages of curtailment, I think it would make a very difficult program for you to understand and

for us to understand.

Q How do you mean that, Mr. Holland?

A Well, just that you can't instantaneously time your water injection to your oil production. As we have seen on one of our exhibits, a program or a change that we made was reflected four months later.

Q You can curtail a production from this unit or from any well in this unit at any time, can you not? I mean you are doing so, they are not producing at capacity?

A In general we haven't curtailed our water producing wells.

Q Now, how many water producing wells are there?

A I would like to point out that in the consideration of allowables our expenditure of in excess of $600,000, we could have spent that money for drilling additional oil wells. In addition to that we have had increased operating costs. In addition to that we've had to purchase pumping equipment. I think all of those factors should be considered by the Commission in setting allowables for projects of this type, and that's why we're here today.

Q And you feel that the additional expense incurred in instituting such projects should be a consideration in the allowable?

A One of the factors. I think if it isn't, that proration-wise there's no encouragement for operators to pursue something like this.

Q Did your company enter upon this project and the expenditure of these sums, you might say, in reliance on a given allowable figure?

A Well, we knew that we didn't have that.

MR. PORTER: Mr. Holland, I believe Mr. Cooley asked you a question and never did get an answer to how many wells are producing water. I notice on this Exhibit 7 that you show that four wells produced water on these gas-oil ratio tests, is that an accurate record?

A We have five wells producing water.

Q You have four wells producing water?

MR. PORTER: Five.

A Five.

Q Is Well T-207 one of those wells?

A T-207 is one of those wells.

Q Is that the highest water producer you have?

A No, sir, 182 is the highest producer.

Q How much water is T-207 producing?

A T-207 I believe about 10% water.

Q Pardon. A About 10% water.

Q Is that your highest oil producer?

A Is that our highest?

Q Yes.

A We have taken varying rates, as I have related before,

depending on both water production and current gas-oil ratio.

Q I believe you stated it has been your policy not to shut in water-producing wells? A I said in general.

Q Would you tell me why T-207 was shut in during the month of October?

A That well had a fairly high gas-oil ratio and was shut in for that reason.

Q Do you feel shutting in of a well which has some water production might cause the bypassing of some oil?

A I think so. We were limited by our market there. We had to make a choice among wells.

Q If this application for exception is denied that you will also have to make a choice on where to make your cuts in production to stay within the allowable on those nine wells which are --

A (Interrupting) We will have to abide by the rules of the Commission.

Q What I am getting at, would you attempt to make most of the cuts from wells which are not producing water or would you cut straight across the board or how would you propose to accomplish that?

A I think we would cut on the wells not producing water.

MR. COOLEY: That's all, thank you.

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

RE-DIRECT EXAMINATION

By MR. KELLAHIN:

Q Mr. Holland, in response to a question by Mr. Cooley, in regard to the possibility of producing this field at say a rate of 500 barrels as opposed to the 950 barrels requested, I believe you said it possibly could be done. Could you economically operate that project on a curtailed allowable over a period of time as you have indicated is necessary in reference to your Exhibit No. 6?

A Over a period of time we can adjust our rates, we believe that. But the 500 barrel rate for a project of this kind is too low in my opinion.

Q And if the allowable from month to month varied say between 500 and 1,000 barrels as occurred last month, during the month of December, and it apparently will occur in January, would you be able to make that adjustment?

A If we have to we'll live with it, but it makes it a difficult operational problem and is not in the best interest of conservation in my opinion.

Q By that do you mean in your opinion it could result in waste?

A I think so.

MR. KELLAHIN: That's all I have.

MR. PORTER: Anyone else have a questionof Mr. Holland? The witness may be excused.

(Witness excused.)

MR. KELLAHIN: If the Commission please, that is all

we have to present at this time.

MR. PORTER: Anyone else have testimony to present in Case 1353?

MR. MONTGOMERY: A. K. Montgomery. We do, Your Honor. Texas Calgary Oil Company.

MR. PORTER: That is the Calgary?

MR. MONTGOMERY: That is the Texas Calgary in the Hospah Field.

MR. PORTER: How many witnesses do you have?

MR. BUELL: My name is Guy Buell with Pan American Oil Corporation. I have a short statement that I would like to make in reference to the Hogback Field.

MR. PORTER: All right.

MR. BUELL: As soon as the pattern for the proration in the Northwest area became apparent, Pan American began collecting data to show that the Hogback [illegible] pool should not be prorated. To provide additional time to collect the data, we applied for and were granted a temporary order temporarily exempting the pool for proration. Due to the time element involved due to adverse winter weather and other factors, we were not able to obtain the data believed necessary to conclusively show that the pool should be permanently exempt as a result of this, and also to collect data at a lower producing rate, the producing rate in the field has been cut back. This should make up the underproduction which occurred

during the period of time that the emergency order was in effect.

At this time we would like to express our appreciation to the Commission for the emergency order, and also state that we would continue to collect data and in the event that we feel that we can conclusively show that the field should be exempt, we will then request a hearing.

MR. PORTER: Thank you, Mr. Buell.

Texas Calgary, would you proceed, please? Did you identify yourself?

MR. MONTGOMERY: No, sir, I was going to introduce myself. My name is A. K. Montgomery. I'm a member of the law firm of Seth and Montgomery and Federici and Andrews here in Santa Fe.

I, at this time, would like to state to the Commission that I'm not prepared on this hearing at all. That the representatives of the company who are here and who are going to testify didn't realize how the hearings are conducted and they didn't contact me until during the noon hour. I, over a cup of coffee, discussed the matter with them very briefly. I'll ask the Commission to sort of bear with me in my stumbling around, if I do in my presentation of their case. Also I have ascertained they did not bring sufficient copies of the one exhibit which they will offer. I attempted to make verifax copies of it rather hurriedly, but the figures are so small that they are hardly legible and I'll furnish those legible copies in sufficient numbers to the Commission if desired,

immediately.

I would like to introduce at this time the first witness, Mr. Autry who will testify first and then Mr. Ray McGlothlin, the President of the company, will testify.

MR. PORTER: Will you have both witnesses to stand, please?

(Witnesses sworn.)

MARK AUTRY

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

DIRECT EXAMINATION

By MR. MONTGOMERY:

Q Will you please state your name and residence and occupation?

A Mark P. Autry, geologist for Texas Calgary Company in Abilene, Texas.

Q What is your profession, you say, a geologist?

A Yes.

Q Will you tell the Commission where you received your training, what experience you had, in other words, your qualifications?

A I have a B. S. degree in geology at S.M.U. I worked for various independents for six years, and have been in my present position with the Texas Calgary Company for two years.

Q Have you held any position or connection with any state

oil conservation commissions or similar body in your experience?

A Yes.

Q As a geologist?

A Yes, Montana Oil Conservation Commission.

Q What was your position with Montana Oil Conservation Commission?

A District Superintendent.

Q For how long did you hold that position?

A Two and a half years.

Q What does your work consist of with the Texas Calgary Company?

A Mostly evaluation of properties.

Q With respect to oil and gas?

A Oil and gas, yes, sir.

Q Now, in the course of your employment there, have you had occasion to study maps, charts, the official records of the company with respect to its Hospah Pool?

A Yes, I have.

Q From that have you prepared a statement that you would like to make to this Commission in that connection?

A Yes, sir.

Q You prepared that yourself, personally, from your personal examination of the records?

A Yes.

Q You go ahead and make your statement to the Commission.

A The Texas Calgary Company respectfully requests exemption

from the field. Our reasons for requesting exemption are curtailment of production and consequent regular shutdown periods would create reservoir waste in the form of unrecoverable oil due to oil saturated zones being drowned --

MR. PORTER: (Interrupting) Would you speak a little louder? I believe the people toward the back of the room are having difficulty.

A All right. Number two, the Hospah Field is stripper production. The Hospah Field was discovered in August 1927, it's therefore about thirty years old and from that date to the present time forty-three producable wells have been drilled, forty-one of which are still producing. Production is from the Hospah sand at 1700 feet.

The field has produced a total of 3,754,000 barrels through October 31, 1957. The structure of the Hospah Field is a faulted anticline, and well spacing is generally on ten acres, with deviations from regular ten acre spacing as a result of structural location and faulting. The Texas Calgary Company owns and operates all the productive leases in the Hospah Field, Production for the month of October was 10,960 barrels. Forty-one wells, that is arithmetic average of 8.62 barrels of oil per well per day.

The total field averages, 53 barrels of oil per day for October. An active water drive producing mechanism is the displacing energy in the field. Total water production is 70% of total fluid. The

entire producing acreage is a low pressure area, and at this late life in the productive history, flow channels have been firmly established. Mechanical breakdowns have affected well performance adversely by increased water production in the past.

We believe that curtailment of production will cause shut-downs as much as fifteen days per month on some wells. These shut-down periods will result in the creation of back pressure at the sand interface, thus diverting the water influx into new, less permeable channels, bypassing oil saturated areas and creating back water blocks.

The above conditions will isolate all saturated areas and preclude their drainage. Back pressure in the well bore in the form of oil and water will also cause water to filter into oil saturated sections of the entire Hospah zone at the sand interface, thus creating water blocks in the immediate drainage area of the bore hole.

The end result of the above conditions will be the ultimate loss of recoverable oil and, therefore, reservoir waste. The Hospah sand aquivier is sufficiently large to maintain a relatively constant water influx into the producing area. At the present producing stage, the mechanical producing process is identical to secondary water injection project at a water breakthrough stage.

There are fifteen producable units in the Hospah Field. Six of these units consist of a total of twenty-five wells, are capable

of exceeding the Commission's unit allowable of 868 barrels per month. The total field allowable for December would be 13,020 barrels. The Hospah Field, however, will only produce about 10,960 barrels per month. It is our contention, therefore, that the Hospah Field is stripper production and should be allowed to produce at its capacity.

Correlative rights have been and are fully protected under past and present productive methods. We feel that a shutdown period during one month will adversely affect recoverable oil, and we therefore ask the Commission for relief in the form of an emergency order to allow the Hospah Field to produce without proration.

That's all I have.

MR. MONTGOMERY: I don't believe I have anything further to ask this witness. I might state that Mr. McGlothlin, who is the practical owner of the field of all the wells, is going to testify from practical operational experience to which this witness cannot testify as shown by his statement that he has been with the company only two years. If there are any technical questions that would be asked of a geologist, I'll pass the witness for that purpose.

MR. PORTER: Anyone have a question of Mr. Autry? Mr. Autry, did you state that the Texas Calgary owned and operates all of the wells in the Hospah? A Yes, sir.

MR. PORTER: Mr. Nutter.

CROSS EXAMINATION

By MR. NUTTER:

Q Mr. Autry, did you say that the average daily production from these wells was 8.62 barrels per day?

A Yes, sir, that is an arithemtic average.

Q What is the range in production on the various wells?

A I don't have that information, but I believe the highest well will produce around 22 barrels of oil per day. I have someone here that can testify to that.

Q Well, assuming that a well can produce 22 barrels a day, did you hear the testimony this morning, the allowable hearing, that some of these big wells are going to be curtailed to the range of 9 or 10 barrels a day? A Yes, sir.

Q Do you think that reservoir damage is going to result to those wells if they're curtailed?

A I don't know anything about it.

Q But reservoir damage will result to these wells if they are curtailed? A Yes, sir.

Q Why?

A I believe that the wells will just be drowned out. They'll be water blocked, isolate zones, if you shut them down the water influx will continue to migrate into your producing area due to the low pressure. If they are shut down for any period of time it will find new channels and isolate saturated areas that may never be

produced.

Q What is this, a natural water drive?

A Yes, sir.

Q Is this true of all natural water drives that they should be produced without restriction?

A Generally I would say that most water drive would channel where you have a variable permeability zone. I don't believe that most fields have a bank of oil pushed by a bank of water. You would have to approach ideal conditions to have that situation.

Q So in any water drive field you might have channeling of water? A Yes, sir, I believe.

Q Is the tendency towards channeling of water increased by the restriction on those wells?

A I believe once the flow channels have been established, that all wells are producing water here that that water influx will continue and that it will seek to find new channels and isolate certain areas. Yes, sir.

Q Do all of these forty-one wells produce water?

A Yes, sir, to some extent.

Q What is the highest percentage that any well produces water?

A 97%.

Q What is the lowest percentage of water produced in any well?

A Around 2%.

MR. NUTTER: Thank you.

MR. COOLEY: May I ask one question, please?

MR. PORTER: Mr. Cooley.

By MR. COOLEY:

Q Mr. Autry, have you ever had any actual experience with curtailment of water drive pools similar to that in the Hospah, that ha caused what in your estimation resulted in bypassing of oil or waste?

A Well, the Hospah Field itself, not from my own personal knowledge, having been there, but from my Production Superintendent and Mr. McGlothlin has stated that upon shutdown periods why production of water increases in most of the wells after a period of shutdown.

Q Are these periods of increased production, or is this increased water production permanent or is it just a temporary thing which ordinarily resolves itself back --

A (Interrupting) I don't know if it is permanent or not. I think Mr. McGlothlin could answer that question right now.

Q If you can't answer it, Mr. Autry, why we'll ask it of the other witness.

A All right, sir.

Q You have had no personal experience of your own that would bear out this fact?

A Not on-the-ground personal experience, no, sir.

MR. COOLEY: Thank you.

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

(Witness excused.)

I believe you said you had one exhibit.

RAY McGLOTHLIN

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

DIRECT EXAMINATION

By MR. MONTGOMERY:

Q Will you please state your name and residence and occupation?

A Name is Ray McGlothlin. Residence is Abilene, Texas.

Q What do you do, Mr. McGlothlin, what is your connection with the application here?

A I'm President of the Calgary Company

Q Are you familiar with the operation and production from the Hospah Field? A Yes.

Q How long have you been connected with that field or pool, Mr. McGlothlin? A Since 1939.

Q What was your connection at that time with the field?

A Well, in 1939 the field, I was President of that company at that time which was Petroleum Products Company which has now been merged into Texas Calgary Company.

Q Did you ever live near the field?

A Yes, I lived there for several years.

Q You built the refinery, I believe, originally at Prewitt?

A That is correct.

Q You operated it for a number of years?

A That is correct.

Q The oil on which the refinery operated was produced largely from the Hospah Field? A It was, yes.

Q Have you, yourself, personally taken an active part in the operation, that is the drilling, the equipping and production of the wells in the field? A Yes, I have.

Q Just how closely have you worked in that connection with the field?

A Well, I've worked very close with it. I have been right there almost with the wells at the time of the oil completions. There was six wells on the field at the time that I came into the picture, and I drilled some total of about forty wells drilled out of which there was forty-two producers, that is a total of forty-two including the six that were already producing.

Q How many are in production at the present time?

A Forty-two.

Q Have any of them been shut in?

A Yes. We shut in in the early stages when the water encroachment first started when one of the, particularly one of the wells got up to about 85% water, we had an idea by closing that well off that we would maintain our reservoir pressure better by

doing so.

We shut that well in for about thirty days to see if the other wells would respond to the increased production by not taking hundred to hundred fifty barrels of water a day that we were taking out. We found there was no change in it, so we went back and put the well back on, we found out it was dead and we didn't have our oil. We never did get it back. It happened to us on two occasions.

Q How long did you try to recover the wells in those instances?

A We worked with the well sixty days or more.

Q Never got oil production out of them?

A Never got oil production out of them again.

Q Describe the pool, that is its location, the area embraced and how the wells are patterned and who set out the original pattern which you have followed in the drilling of those wells.

A Well, a firm by the name of Boice and Sniser, Engineers, out of Houston, Texas were the engineers that set out the pattern for the development of the Hospah Field. The Hospah Field is located approximately thirty miles north and east of Prewitt, New Mexico, and in this pattern they started their original pattern from the wells that were already there at the time we took over the field.

Of course, worked around those wells for developing their well pattern, and they were layed out for what those engineers thought

would be the most efficient spacing for the recovery of the maximum amount of oil. There were some places, of course, where the permeability varied very considerably, and some spots they have more wells than they do others, but generally it is on a ten acre spacing, at least it is attempted to be that way. Our water encroachment has been followed very carefully from the inception of the field when it first started, and we have noticed a number of occasions when we would have mechanical trouble on a well after water had reached it.

We, for some reason, had to shut that well down that when we did get it back on we never did get the production that we had out of that well before. It was always down in production, our water production was always up.

Q For how long intervals would the well be down?

A Possibly forty-eight hours would affect them.

Q You mean that a forty-eight hour shutdown results in permanent damage to that well insofar as recovery of oil is concerned?

A Permanent damage to that well, yes, sir.

Q Go ahead.

A That has happened a number of times, and as I said, we have never been able to get that back into position again where it was before. We keep those wells going twenty-four hours a day very religiously because of that point. We just don't want those wells to shut down because they will flood out if we shut them down.

Q Have you had a geological map made and prepared for your companies during the time that you have operated the field?

A Yes, I have.

Q Do you have that map there before you?

A Yes, I have.

Q Is your testimony largely based on the map of your company?

A Yes, it is.

Q Who prepared that?

A This was prepared by Meyer Achtschin of Dallas, Texas.

Q Did they do that from an actual geologic exploration upon the ground? A Yes, they did.

Q Have they been close to the operation and production of this field? A Yes, they have.

Q When was it prepared?

A This one was 1953.

Q I am going to put the date on it, 1953. Have there been any more wells drilled since 1953?

A Yes, there has been a few wells drilled. Our drilling program was completed in -- no, I beg your pardon, no, there has not been. I'm sorry, **strike that.**

Q When was the last well drilled?

A The last well was 1945 or approximately that date.

Q Do you feel it is economically unsound to make any further exploration drilling of wells in that area?

A Yes, we feel that we have the field completely defined and have it sufficiently drilled up to where it will properly drain the area.

Q What is your information with respect to any possible connection between the oil in this field and any oil in any other field in New Mexico?

A Well, this is obviously a structure within itself and has no connection with the other structures in New Mexico.

Q Who is the buyer of the production there?

A El Paso Natural.

Q They take the entire output?

A They take the entire output.

Q Where is it transported to and where is it refined?

A It goes by pipeline to the refinery at Prewitt.

Q In the pipeline which you constructed?

A Yes.

Q Do you feel that it will result in waste and there being unrecovered oil left in the ground if you are required to shut in or curtail the production on any or all of your wells in the field, Mr. McGlothlin?

A I certainly do. I think it would definitely create a waste.

Q Over how many sections of land are these forty-one wells or forty-two wells of yours located?

A In two sections.

Q You heard the testimony of Mr. Autry that the average production over all the wells is 8.62 barrels per day, is that substantially correct? A That is correct, yes.

Q In general, which way does the water drive come from, or which direction?

A We have two separate water drives in the field being separated by a fault cutting down through the middle of the field. We had one water drive that comes from the southwest and moves to the northeast, and then we have another water drive on the opposite side of the fault that is moving from the northeast to the southwest direction.

Q Is it true or correct generally over the field that any of your wells and all of your wells in which you have made shutdowns for even short intervals, that it is very difficult, if not impossible, to ever get them back up to the going production?

A That is correct, yes.

Q Do you have anything further you want to say to the Commission with respect to this field and your operation?

A I don't know, I think we have covered pretty well all of it. The Commission may have some questions.

Q How long have you been engaged in the oil and gas industry?

A About thirty years.

Q Do you operate anywhere other than New Mexico?

A Yes, sir, we operate in Texas, Montana, Arkansas and Oklahoma.

MR. MONTGOMERY: You may question the witness.

MR. PORTER: Does that conclude your questions?

(Marked Texas Calgary's Exhibit No. 1, for identification.)

MR. MONTGOMERY: While we're waiting, I might introduce or offer in evidence the map from which the witness based and used in his testimony. Texas Calgary'Company's Exhibit No. 1.

MR. PORTER: Since you didn't have sufficient copies to pass out to the various members of the staff, would you state again for the record what that exhibit is?

MR. MONTGOMERY: This is a structure map on the Hospah Field in McKinley County, New Mexico, compiled by Meyer and Achtschin of Dallas, Texas, and it shows the location of the various wells. It shows the contours, it shows the units as defined by the Conservation Commission and various other data which is set out on it.

I would be glad to immediately, today or tomorrow, make additional copies if I might withdraw it from the Commission for a very brief interval if the Commission desires additional copies and tell me the number they want.

MR. PORTER: Any objection to the admission of this exhibit? It will be admitted. Mr. Cooley, do you have any questions?

MR. COOLEY: Yes.

CROSS EXAMINATION

By MR. COOLEY:

Q Mr. McGlothlin, I believe you stated that you entered the picture in the Hospah Pool in 1939?

A I beg your pardon.

Q You came into the area of the Hospah Pool and became actively engaged there in 1939? A Yes, sir.

Q Can you tell me what, if any, were the spacing provisions for that area prescribed by the New Mexico Oil Conservation Commission?

A I think it was ten acre spacings, if I remember correctly.

Q How do you mean that, Mr. McGlothlin? Do you mean that it was permissible to drill four wells on a 40 acre tract?

A Yes, sir.

Q Well, that condition has existed and still exists in the State of New Mexico, Mr. McGlothlin. However, the standard proration unit is 40 acres. A Yes, sir.

Q Under our present rules it is permissible in most pools.

A Yes.

Q To drill four wells at precise locations on a 40 acre tract. However, in the event of proration of that pool, the rule has always been that the 40 acre tract is prorated as a unit whether it be one well on it or four or two or three.

A That's what I understand.

Q It was with this understanding that Texas Calgary or its predecessor chose to develop the Hospah Pool on four wells to the 40 acres in some instances?

A Well, there was no thought given at this time. The thought was given to the most efficient method of exhausting the oil, not from the standpoint of proration or anything, it was the maximum recovery that we could receive and recover from the field. In the engineer's opinion it would take that many wells to properly deplete that field.

Q I see. Now, I believe that you stated that you had two distinct and separate water drives in this pool?

A Yes, sir.

Q Does this fault run northwest, southeast?

A Yes. As is shown there on the map, it's as near correct as the geologist could put it I guess. It runs northeast, southwest.

Q Northeast, southwest? A Yes.

Q I believe you stated that north of the fault the drive was generally from the northeast to the southwest?

A That is correct.

Q And south of the fault the drive was from the southwest to the northeast? A Yes.

Q From that I assume that this is an edge water drive rather

than a bottom water drive? A That is correct.

Q Has it been your experience that the wells, I mean on the outer periphery of the pool, have gone to higher water or water production first? A Yes.

Q And that your lower water productions are near the fault?

A That is correct, more near the apex of the structure and to the east side. On the south side of the fault would be to the east side of the structure, and then when you get to the other side of the fault then it would be the west side of the structure that your water movement is the other way.

Q Yes.

A That was followed, I stated that from the way that the water encroachment started, and as we have followed it upstructure, as it came into the field.

Q These are in general referred to as water drive. Does the edge water actually move the oil along with it or does it replace the oil?

A No, this water, I am positive in this particular case, moves the oil.

Q Moves the oil ahead of it? A That is correct.

Q Then if a well that is such as that to which you referred in your testimony, I believe the instance you mentioned was producing 85% water? A Yes.

Q Was shut down for thirty days? A Yes, sir.

Q When reopened was producing 100% water and was never able to recover it? A Yes, sir.

Q I believe you also stated that the Texas Calgary owns the entire pool? A That is correct.

Q Would it be a fair analysis of what took place then, that during this thirty-day period the water-oil front had passed by this particular well?

A No, sir, I don't think that is a fair analysis.

Q What would be the analysis?

A I think you have fingering of the water. You have varying permeabilities in that sand. Some run as high as three or four hundred millidarcies. Some run possibly as low as fifty millidarcies, and those ones that water has passed through that higher permeability sand and gets out ahead and hits that well, then you shut that well off and then this other water settles down through that sand or you get some vertical. You have a certain amount of vertical permeability, the water from the high permeability zone will drop down or raise up as the case may be, and block off this oil from behind, and being a low pressure area, when you start producing it again you get your relief through your high permeability zone and your low permeability zone never comes in again, you have just lost that.

Q You said the oil was behind the water. How would that occur?

A When we speak of being behind it, I say it was behind it,

we would refer to that in the beginning. Now, once it started producing, you have created fingers through that production zone and there are zones through that Hospah Field that I'm sure are depleted, completely depleted within this sand section. We have about fifty feet of sand and there's a considerable amount of that zone in my opinion is already completed and that's where the oil, the wells are getting their water. It's getting it through those zones which have been completed and, but while you are completing those zones you still have your energy back behind that is still pushing some against these other lower permeable zones, which if given time and keeping this water pumped off at the front end of the drive or at the bore hole, you will finally recover the oil out of those lower permeable zones.

Q You don't feel that it is possible that what oil was left therein by this well bore was moved on ahead of the water?

A No, it think it was trapped behind it. It may be moved on later to another zone, but at that particular well it was trapped behind it. You just flooded out around that bore hole and your pressure in your reservoir is so low that once you start to produce it you relieve your reservoir pressure at the bore hole through the more permeable zones and you do not have enough pressure through the low permeability zones to push that oil out with that water block ahead of it. So it never comes into the bore hole.

Q In this situation, however, if the oil were, I believe you

stated that this water drive did have the effect of pushing some oil ahead of it?

A I don't think there's any question but what it was pushing some ahead, but once it's exhausted, then it is the unit that is pushing it ahead and also the other oil, then water pushing the next block or the next zone. Say you had two zones there, one, well just use for instance a ten foot zone and another ten foot zone and the lower ten foot zone was more permeable, your water would break through there or your upper, in this particular case, it is the upper ten foot zone that is the most permeable.

The very top ten foot is very permeable, then the bottom thirty feet of that zone gets tighter and tighter, yet it's got lots of oil in it but we know that we have a water flood that has come through those wells over the top and we feel that if we stopped producing that oil out of there and quit taking that water out, that that water is going to settle down and block that oil off and then once it gets it blocked off, when you start producing it again all you are going to do is relieve your pressure through this more permeable zone, and you will never get that pressure against the other.

Q If, however, any oil was moved from one tract to another from one 40 acre or one 10 acre tract to another, it would be just moved from one Texas Calgary on the next tract to another Texas Calgary on the other tract? A That's right.

Q There is no question of correlative rights involved?

A No, there is not.

Q Mr. McGlothlin, have you had an opportunity to study other water drive pools in the State of New Mexico?

A Not in the State of New Mexico, no, sir.

Q In the State of Texas or the other states in which you operate?

A We are operating one up in Montana. Water drive, my results up there has been identical to what I have just stated here. We had a shutdown on a well, when we got it back on we didn't have our production, we never did get it back.

Q Aren't these characteristics which you have just described pretty much typical of all water drive pools?

A That is correct, yes, sir.

Q Are you aware that we have many other water drive pools in this state?

A I'm sure that you have. As a matter of fact, to my knowledge they are all water drive as far as I know. But you also have a different stage of depletion, in the early stage of depletion you wouldn't be affected this way because your water has not had time to finger in and get out over the top of their oil zones. In their particular case your water has moved out over your oil zone. If it were in the early stages of the field you have an entirely different situation.

Q As they develop, they develop rather uniformly, all these water drive pools to which you have referred?

A What do you mean uniformly?

Q They develop somewhat identically, we'll say?

A Yes.

Q At any given stage of depletion?

A At that particular stage of depletion, yes. Provided that your water drive is from the edge water and not from a bottom hole water. Assuming it is bottom hole water, of course, you have a different type of depletion. If it is edge water you have another type of depletion.

If you have very uniform permeability in your sands, you have one type of depletion. If you have an irregular permeability in your sands you have still another type of depletion to deal with in your field.

Q Also the irregular permeability factors are rather common throughout the State of New Mexico, are they not?

A Yes, as far as I know they are.

Q And we have other water drive pools in various stages of depletion throughout the State, are you aware of any of these pools which have been exempt from proration?

A No, to my knowledge this is the first attempt on exempting to proration.

Q Is it your feeling that all water drives in this state,

when they reach the stage of depletion which the Hospah has reached, should be exempt from proration?

A Yes, sir, it certainly is.

MR. COOLEY: Thank you.

A I'll state once more as far as I know I don't know of any man in the oil business that would argue about that point that they should be exempt.

MR. COOLEY: I'm sure that everyone would like to have their operations exempt from proration.

A I am sure they would.

MR. COOLEY: That's all.

MR. PORTER: Anyone else have a question of Mr. McGlothlin?

RE-DIRECT EXAMINATION

By MR. MONTGOMERY:

Q Why do you feel that such pools should be exempt, Mr. McGlothlin?

A Well, I think that it is waste if it is not exempt. You lose oil. You will not recover the oil that is in the reservoir that would be recovered if it were permitted to go ahead and produce at its regular rate; in this particular case we are not talking about much oil anyway. It's very low, and most fields when they get down to that stage, you are not talking about much oil.

Q Do you operate your pumps on these wells twenty-four hours a day, thirty days a month? A Yes, sir.

Q Around the clock? A Around the clock.

Q The suggestion was brought up here a moment ago that the oil, if one well was shut in on a ten acre tract, that that oil by force of the water would migrate to another ten acre block in your field in your opinion, is that correct?

A I don't think it's necessarily correct that it would migrate to another. I think it would be dangerous to assume it would.

Q Why don't you think it would migrate that distance?

A Well, that particular zone in the other area might have already been depleted and it would be blocked off by water and couldn't reach there. I think it would be just dead right in that area once it is blocked there.

Your water channels or movement is set up there and they are going to be rather constant, and once you block one of these oil zones off, that has not been depleted, I think you have just lost it. I don't think you will ever get one-fifth of the oil out of it that you would normally have got.

Q Do you consider all your wells to be stripper type wells?

A Yes, I do.

MR. MONTGOMERY: That's all.

MR. PORTER: Mr. Cooley.

RE-CROSS EXAMINATION

By MR. COOLEY:

Q What is your production from the Hospah Pool at the

present time?

A Approximately 10,000 barrels a month.

Q Ten thousand barrels a month? A Yes.

Q And is your request in this case that they be permitted to produce at capacity, is this capacity production?

A That is capacity, yes, sir. They are all producing water, we will have to keep the water pumped off in order to keep them alive.

Q Your request is for a complete exemption and capacity production?

A Yes, that is correct.

Q Is there any reason or any conceivable way that we could expect this figure to increase?

A No, it will decrease.

Q Certainly decrease throughout the years?

A Yes, it has been decreasing. It is definitely on a decline.

Q I believe you stated that it is not economically feasible to drill any wells in this area?

A No, the field is drilled up, has been since 1945.

MR. PORTER: Mr. Nutter.

By MR. NUTTER:

Q Mr. McGlothlin, do you consider your Wilson State No. 35 well to be a stripper? It produced 27 barrels of oil per day in October.

A Well, that well is getting awful close. It's beginning to make just a little bit of water now, so in our experience in the past that even though they are making a small amount of water, once you shut them down and bring them back on your water increases immediately and your oil decreases. I think the whole thing is a stripper deal there.

Q You have been talking all the time about shutting wells down. Isn't it possible to curtail the production a little bit without shutting them down?

A Well, again you are right on the same situation. You either got to keep that water off of there, or you either keep it off or you don't, because when a well starts making water, once the water breaks through I would be afraid to let the reservoir pressure build up on the zone where it has been depleted, where the water has broken through.

We know the water is through on that, if we let the pressure build up the least bit there is nothing to keep it from moving downward and blocking off the water from below, the oil from below.

Q Will there be movement of water and fingering of water into these wells if the whole pool were shut down for a period of time?

A Well, I don't think that the fingering of the water into the wells, I think what would happen in that case your water would settle down in the lower zone and just block off the whole thing.

Q The water would continue to move even though the whole field were shut in?

A Your water would settle down in the lower zone. It would come into the bore hole of your well and back up into your other zone, you would then have your high pressure zone in your water area.

MR. NUTTER: That's all. Thank you.

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

(Witness excused.)

MR. MONTGOMERY: Thank you very much.

MR. PORTER: Anyone else have any testimony to present in Case 1353, any statements to make?

MR. HINKLE: Clarence Hinkle, representing Humble Oil and Refining Company. The Humble has no particular interest in any of these exceptions that have been requested, or in any of the acreage that might be involved. We do want to go on record, however, as urging the Commission to consider very carefully any exception which is made to prorationing, particularly with reference to pressure maintenance projects, because it follows and very obvious if too many exceptions are made, particularly in the San Juan area, that there is going to be very little primary oil to prorate.

MR. PORTER: Anyone else have a comment or statement in this case? We will take the case under advisement and take a short

recess.

(Recess.)

C E R T I F I C A T E

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 19th day of January, 1958.

Ada Dearnley
Notary Public-Court Reporter

My commission expires:

June 19, 1959.