BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO
Santa Fe, New Mexico
March 25, 1958

IN THE MATTER OF: Case 1327

TRANSCRIPT OF PROCEEDINGS

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BEFORE: Honorable Edwin L. Mechem
Mr. A. L. Porter
Mr. Murray Morgan

TRANSCRIPT OF HEARING

Mr. PORTER: The meeting will come to order, please. This is a special hearing of the Commission for the purpose of a rehearing in Case 1327.

Mr. PAYNE: In the matter of the rehearing requested by Skelly Oil Company, et al., for reconsideration by the Commission of certain portions of Case 1327, Order No. R-1092-A - application of Texas Pacific Coal and Oil Company for an order immediately terminating gas prorationing in the Jalmat Gas Pool; or in the alternative, revising the Special Rules and Regulations for the Jalmet Gas Pool in Lea County, New Mexico.

Mr. MALONE: May it please the Commission, Ross Malone of Atwood and Malone at Roswell. I'm appearing in this rehearing for the parpose of presenting testimony on behalf of the following companies: Continemtal Oil Company, Atlantic Refining Company, Pan American Petroleum Corporation, Tidewater Oil Company, Cities Service Oil Company, Humble Oil and Refining Company, Shell Oil Company, Sinclair Oil Company, Amerada Petroleum Corporation, Texas Company, and the Standard Oil Company of Texas. All of these companies are united in opposing the inclusion of deliverability as a factor in the proration formula of the Jalmat Gas Pool. I'm authorised to say in addition that Skelly Oil Company, while at a member of the group which is presenting this testimony, is in agreement with the conclusions and recommedations which the group will make. I failed to include Samedan Oil Corporation, which is likewise a petitioner and a participant.

As the Commission will recall, it was at the suggestion of the Commission that these companies undertook to consolidate the presentation of testimony and the cross examination of witn3sses in an effort to expedite and facilitate this hearing in its earlier phases, and it is in pursuance of that suggestion of the Commission that they are united at this time for the purpose of presenting testimony. Each of the companies for whom I'm speaking in the regard has its own representatives here and will speak for itself at the conclusion of the hearing.

I want to point out, however, that the position of the respective companies in applying for the rehearing insofar as the issues that are raised in the rehearing and their position on them, is as stated in the respective petitions. I mention that for the reason that the petitions are not identical. All of the companies do not subscribe to each of the propositions which I will present, but some of the companies subscribe to all of the propositions, and the particular companies which do support them is apparent from the petitions that each company has filed for a rehearing in this case.

With the hope of expediting the hearing, I would like to very briefly stat the testimony which the Jalmat operators propose to present to the Commission. As the Commission will recall, in Order No. R-1092-A, Finding No. 5 of the Commission was as follows:

"That the Applicant, which was Texas Pacific Coal and Oil Company, has proved that there is a general correlation between the deliverabilities of the gas wells in the Jalmat Gas Pool and the gas in place under the tracts dedicated to said wells. And that the inclusion of a deliverability factor in the proration formula for the Jalmat Gas Pool would therefore result in a more equitable allocation of the gas production in said pool than under the present gas proration formula."

The testimony which will be presented with relation to that particular finding, and most of our testimony, will be directed to that, will be in an effort to show that apparently the Commission

concluded that there was a similarity or that the reserves which were testified to by Texas Pacific Coal and Oil Company as well reserves were the same as the recoverable gas in place under the taract which the statutes requires be considered in the protection of correlative rights, and the testimony will be directed to show that that conclusion, which as we view it could have been the only basis for the finding which the Commission made, in fact resulted from a misapprehension of the application of the testimony of Texas Pacific, and that it is not supported by sound engineering principles or by the testimony in the case.

We will further present testimony designed, we hope, to show that rather than a more equitable application resulting from the allocation resulting from the application of this formula, there will be set up a tremendous amount of drainage as between tracts, with the result that there will be irreparable injury to the correlative rights of a large number of the operations in this pool, injury which amounts to many, many dollars.

Finally, the testimony will be directed to show that as an inevitable result of the order as it has now been issued, economic waste and physical waste occurring undergound can be expected to result. We realize that in coming before the Commission on rehearing we are sort of arguing with the umpire about a decision, and that's not a very good place to be. Sometimes you get thrown out of the ball park when you do that. Nonetheless, in the best of

spirit and we hope of being helpful to the Commission in the decision, that is one of the most important questions the Commission has ever dealth with.

We have two witnesses, Mr. Robert Liebrock and Mr. Henry J. Gruy and we'll ask they be sworn at this time.

(Witnesses sworn.)

MR. MALONE: Mr. Leibrock, will you take the witness stand, please?

ROBERT M. LEIBROCK

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

DIRECT EXAMINATION

By MR. MALONE:

Q Will you state your name, please?

A Robert M. Leibrock.

Q You live in Midland, Texas, Mr. Leibrock?

A Yes, sir, that's correct.

Q You testified in this case at the time of the original hearing on behalf of the Jalmat Operators Group, did you not?

A Yes, sir, I did.

Q And I believe at that time you testified that you were a consulting petroleum engineer and had been engaged for some years in that business at Midland?

A Yes, sir, that is correct.

Q What was the name of your firm, Mr. Leibrock?

A Leibrock, Landreth and Campbell.

MR. MALONE: I assume that the witness' qualifications are acceptable to the Commission?

MR. PORTER: Yes, sir, they are.

Q Mr. Leibrock, you've heard the brief opening statement which I made, and you heard the testimony of Mr. Keller at the hearings

on December 9th and 10th relating to the so-called reserves as to which Mr. Keller found a correlation with deliverablility, did you not?

A Yes, sir, I did.

Q You have also read the order of the Commission in which there was found that there was a general correlation between the deliverabilities and recoverable gas in place under the tracts in the Jalmat Pool, have you not?

A Yes, sir, I have.

Q Have you prepared an exhibit which is designed to demonstrate the inapplicability of reserves computed by the so-called material balance equation to a determination of the recoverable gas in place under a particular tract?

A Yes, sir, I have.

Q Will you refer to the exhibit which for the record has been identified as Operator's Exhibit 1-R, the "R" designating rehearing?

(Operator's Exhibit No. 1-R marked for identifications.)

A Yes, sir, I will, By way of introduction of our Exhibit 1-R, I would like to remind the Commission that during the course of the testimony offered by Texas Pacific, they repeatedly referred to the use of the material balance method of estimating reserves. Now there's nothing peculiar about the material balance equation, either you have enough information to solve it or you don't. It's

nothing more or less than the name implies. You simply take the material produced from a well, in this particular instance gas, relate it to the pressure drop associated with that production, and the gas that's moving either to or away from the lease that you are attempting to conduct the material balance on, and that's the procedure that should be followed in conducting a material balance calculations.

Now in their approach to the analysis of individual leases and their reference to the material balance calculation, it's our position that they did not conduct a material balance calculation simply because they did not include all the material involved in the analysis of an individual lease. With that background, I would like to refer to our Exhibit No. 1-R.

As indicated at the top of this Exhibit No. 1-R, it is designed to show the limitations of the material balance equation or the inapplicability of the material balance equation as used by Texas Pacific as in other or individual leases within the reservoir, in the reservoir or individual lease.

Beginning on the left-hand side, we have Case 1, in which we have three tanks, Tank A,B, and C. All three are the same size, they all contain gas at an initial pressure of 1,000 pounds, and we haven't produced any gas out of any one of the three tanks. Now the only difference in the physical set-up of these three tanks is the size of the outlet. Briefly and roughly, the size of the outlet in Tank A is approximately twice the size of the

outlet in Tank B. The size of the outlet in Tank B is roughly twice the size of the outlet in Tank C. Now we open these valves simultaneously.

Q Mr. Leibrock, do I understand that there is the same quanitiy of gas in each of the tanks at the outset?

A The tanks are the same size and the gas is at the same pressure in each case, yes, sir. Now in the case of Tank A, we open up the valve along with the valves on Tank B and C, and we reduce the pressure down to 500 pounds in each tank, at which time we have produced a million cubic feet of gas. The results of this production is shown in graphical form on the right-hand side of each of the tanks. In other words, as the pressure drops from a thousand to five hundred pounds in each case, we produced one million cubic feet of gas, the only difference being that it takes longer, of course, to produce the gas out of Tank C than it does out of Tank A, because of the variation in the size of the outlet, because of the variation in the deliverability of the three tanks.

Q Now I want to be sure that I understand you concerning that exhibit, Mr. Leibrock. You say that you produced each one of those tanks down to 500 pound pressure, is that correct?

A Yes, sir, that is correct.

Q Because of the difference in the size of the exit from the tank, the time that is required to do that varies, as I understand it?

A Yes, sir, that is correct.

Q But you ultimately reach the same point with each tank; that is, each tank has produced the same amount of gas down to 500 pounds per square inch of pressure?

A Yes, sir, that is correct.

Q Will you proceed?

A You can see that in this particular case, if you plot the pressure- -

Q (Interrupting) Excuse me just a minute. You have referred to the fact that you have plotted a pressure decline curve over here for each of these tanks?

A Yes, sir, I have.

Q Is that the material balance equation that was used by Texas Pacific in the determination of the so-called reserves in the Jalmat Pool?

A Yes, sir, as I understand their procedure, that is.

Q All right.

A So in each case down to 500 pounds pressure we produced a million cubic feet of gas. The only difference being that it takes longer to produce the gas out of the tanks with a smaller opening, so that for each case where we solve graphically the material balance calculation as Texas Pacific did, we get an indication of two million cubic feet down to zero pressure, the amount of gas contained in each of these three tanks.

Now I would like to point out that if Case 1 were analogous

to the situation that exists in the Jalmat reservoir, then Texas Pacific would be perfectly justified in their approach to the problem, but Case 1 is not analagous to the situation that exists in the Jalmat reservoir, because in order for it to be analagous with each tank representing a lease within the reservoir, there would have to be an impermeable barrier within the reservoir itself coinciding with the fence lines or the lease lines on the surface. I don't think that situation exists, and if it doesn't exist then this situation Case 1 is not analagous to the conditions that exist in the Jalmat reservoir. So with that background, I would like to go on to Case 2.

Now in Case 2, we have an identical set up with one exception. We have the same three tanks containing gas at a thousand pounds before any one of the tanks has produced any gas. The one difference is that we have tied these three tanks together with a fairly large pie as indicated on this drawing. Now in sthis particular case we opened the three valves over here simultaneously, keeping in mind all the time that the three valves vary in size, Tank A approximately twice as big as Tank B, Tank B approximately twice as big as Tank C. We haven't changed anything, the only difference, we have tied the tanks together with this pie. We open the three valves simultaneously and produce a volume of gas, at which time we shut the valves on the tank, that would be similar to shutting in a field for bottomhole pressure survey. It happens at the time we shut the valves in, we have a

pressure of 500 pounds on our system. I would call your attention to the rather remarkable difference that exists in Case 2, as compared to 1. Here Tank A with the large valve and highest deliverability this time has produced down to 502.3 million feet of gas, whereas previously it produced only one million cubic feet of gas, the reason being simply that is has the highest deliverability. In other words, down to 500 pounds it has produced three tenths of a million cubic feet of gas more than it contained in the beginning.

Tank B, on the other hand, which has a smaller outlet, down to 500 pounds has produced six-tenths of a million cubic feet of gas with an indicated ultimate recovery of 1.2 million cubic feet of gas, or less than the tank contained initially.

Now Tank C on the other side, which has the smallest valve and the lowest deliverability, has produced only one-tenth of a million cubic feet down to 500 pounds, with an indicated ultimate recovery of only two-tenths of a million cubic feet, whereas it had an indicated recovery of two million cubic feet, or over ten times as much.

I would call your attention to the fact that the only reason for this condition existing is the variation in the size of the outlet of these three tanks. This recovery relationship that we have plotted opposite each tank is in no way related to the volume of gas initially contained in the tank. It reflects one thing and one thing only, the deliverability represented by the

size of the valve on each of these three tanks.

Q Now where did the additional gas that was produced out of Tank A, you said that Tank A in this situation has produced more gas than there was in the tank to begin with?

A Yes, Sir.

Q Where did that gas come from?

A It's apparent that the gas produced out of Tank A, that is, out of the outlet in Tank A, must of necessity been drained from Tank B and C.

Q It is also true that some of the gas that was produced throgh Tank B has come from under Tank C?

A Yes, sir, that is correct.

Q I mean out of Tank C?

A Yes, sir, that is correct.

Q Now, as between Case 1 and Case 2, which is applicable to the individual leases in the Jalmat Pool, which are owned by the individual operators who are producing them?

A I think it's apparent that the Case 2, the setup that we have depicted under Case 2 is analagous to the situation that exists in the Jalmat reservoir where gas is free to migrate across lease lines.

Q And that is true, even at the expense of repetition, because of the fact that there isn't any iron curtain between these leases, is that correct?

A Yes, sir, that is correct.

Q with the result that the gas which is shown by the extrapolation of a curve based on pressure and production in Tank A does not reflect the recoverable gas in place in tank A but reflects the drainage which occurs in addition, and the gas which comes through the outlet in Tank A from the other tanks?

A Yes, sir, that is correct. It not only does not reflect any, does not give any indication of the recoverable gas contained in Tank A initially, but there is absolutely no relationship between the gas that it will ultimately produce and the gas contained in Tank A.

Q Now, Mr. Liebrock, if you took these three extrapolations out here and assumed that each one of those represented the reserve of the tank which it is opposite, what would you conclude as to the reserves of Tank A, Tank B, and Tank C through the extrapolation of that pressure decline curve?

A Well, simply from extrapolation of the pressure production decline curve, you would conclude that the ultimate recovery down to zero pressure for Tank A would be about 4.6 million cubic feet, or over twice as much gas as it could possibly have contained initially.

Q Now, does that same thing occur when you applied the so-called material balance equation to a particular lease as Texas Pacific did in this hearing?

A Yes, sir, it does. When you attempt to apply the material balance calculation without inserting in the material balance

calculation all the factors that should be properly considered, then you can't help but get this.

Q The factor you are referring to is the gas which migrates into the lease itself because of the higher deliverability of that lease?

A That's right, in the case of Tank A the gas which migrates into the lease, in the case of Tank B and C, the gas which migrates away.

Q Now, Mr. Liebrock, you referred to the fact that the difference that we have in these three tanks is the difference in the size of the outlet and you mentioned the fact that that was comparable to the difference in the deliverability of three gas wells, is that correct?

A Yes, sir, that is correct.

Q Now is there any relationship whatever between the size of that outlet and the amount of recoverable gas in place in that tank?

A Absolutely no relationship between the size of the outlet and the recoverable gas in place in the tank, no, sir.

Q If you insert a deliverability factor in aprorationing formula in a gas field, do you not insert a factor which has no relationship whatever to the recoverable gas in place?

A Yes, Sir, that is correct.

Q And does not the New Mexico Statute say that as between owners in a particular pool, prorationing shall be on the basis of

the recoverable gas in place in the tract?

A Yes, sir, that is correct.

Q Is there anything further you would like to tell us about that exhibit?

A I think there's just one thing further; that is worth mentioning, and that is, if you apply the material balance equation to this entire system, as it should be applied, for example, if you take the total production from all three tanks, 2.3 million plus six tenths of a million plus one-tenth of a million, down to 500 pounds and apply the material balance calculation properly, then you will come up with an accurate indication of the total gas in place in the entire system, which would be analagous to an entire closed reservoir, and that is the proper way to apply the material balance calculation and is in fact the only way to apply the material balance calculation.

Q If I understand what you are saying, it is that that equation could be applied to the entire Jalmat Pool because there is no drainage back and forth across the exterior lines of that pool?

A That is correct.

Q But that it cannot be applied to an individual lease because effect must be given to the drainage, which cannot be done?

A That is correct. You are not making a material balance when you extrapolate this curve along the straight line as we have done here, and Texas Pacific has done along a number o leases in the Jalmat; you are assuming that that well will ultimately

recover that much gas if conditions in the future are identical to the conditions that were identical in the past, which puts a rather severe qualification on their material balance method of determining reserves or anything else.

Q Let me ask you if it would be a fair statement to say, first referring to finding No. 5 of the order in this case, which is that it has been demonstrated that a general correlation exists between the deliverabilities and recoverable gas in place, would that be the equivalent of saying on this exhibit that a general correlation exists between the size of the opening on the tank and the amount of gas in the tank?

A Yes, there very definitely is a correlation between the size of the opening and the gas that you would produce from the tank.

Q You misapprehend my question.

A I am sorry, there would be no relationship between the size of the opening and the recoverable gas in place.

Q And to say that there is a correlation between the deliverability in gas wells and the recoverable gas in place in the tract is equivalent of saying that there is a correlation between the size of the opening and the amount of gas that there is in one of those tanks?

A Yes, sir, that is correct.

Q Is there any correlation or relationship whatever in that regard?

A No, sir, there is not.

A The size of the opening could be doubled, trebled, or quadrupled and it wouldn't change the amount of gas in that tank?

A Yes, sir that is correct.

Q Have you made an attempt to apply the conclusion which is demonstrated by that exhibit to actual situations existing in the Jalmat Pool?

A Yes, sir, we have. I think it's fairly obvious that an exhibit of this type without supporting data from the field wouldn't be as useful as it would be if we could find field examples which depict this sort of thing, and that is the purpose of our second exhibit.

Q Will you refer then to Operator's Exhitit 2-R?

(Operator's Exhibit 2-R marked for identification)

Q What is disclosed on that Exhibit 2-R?

A Well, as indicated by the title on this exhibit, it's to demonstrate the fallacy of computing individual lease reserves by the material balance or by the graphical solution of the material balance equation as Texas Pacific applied it.

In other words, they have determined or contended that there is a general relationship between their reserves and deliverability, and if there is also a general correlation between recoverable gas and deliverability, then there must necessarily be some relationship, accoring to their testimony, between the reserves

and recoverable gas in place.

We have previously, from our first exhibit, demonstrated the fallacy of that line of reasoning, and here by actual field examples, we can demonstrate further the fallacy of that type of approach.

Q What three wells are involved in Operator's Exhibit 2-R?

A We have the Continental Oil Company Lynn B-26 No. 1, Continental Lynn B-26 No. 2, and their Lynn B-25 No. 2.

Q What is the relative position of those three wells in the Jalmat Gas Pool?

A They are adjacent tracts. Their acreage is contiguous between the three.

Q Will you proceed?

A Beginning over on the left-hand side, we have the pressure production data indicated for Continental Oil Company's Lynn B-26 No.1. I might add that I have a pressure point here initially which has not been colored in and which I will add from my records. This indicates that as of August 1950 this well had produced somewhere just under 7,000,000,000 cubic feet of gas, at which time you had a pressure drop of approximately 40 pounds.

Now, at that time, if you had drawn a line from the original pressure through the pressure points that you had at that time you would have had an indicated ultimate recovery of 118,000,000,000 cubic feet.

Q Will you take this red pencil and put your initial pressure

point on there, please? Was that pressure point just left off by the draftsman in drafting? A Yes, Sir.

Q It is shown on the smaller exhibits that have been distributed?

A No, sir, I don't believe it does.

Q Yes, it is.

A At any rate, at this particular time, utilizing the procedure employed by Texas Pacific, you would have estimated an ultimate recovery from this well of around 118,000,000,000 cubic feet, but at that time you had some additional development in the general area, with the result that the position of the pressure production decline curve was altered rather severely, as you can see from the red pressure points here, so extrapolating a line --

Q (Interrupting) You say that position was altered, but explain just what the dropping of that-- what causes that line to drop?

A Well, this is caused by additional withdrawals in the general area of the field. In other words, the production from the offsetting wells which were drilled about this time resulted in a departure from the previously established pressure curve. In other words, at this time this well was draining a trememdously large area because there weren't any other wells around, but with the drilling of additional wells it completely upset the drainage pattern of the B-26 No. 1, with the result that you got this rather

substantially different pressure production decline trend, and you can see that from this trend you would indicate an ultimate recovery of about fifteen and a half billion cubic feet, which is a rather substantial reduction from the estimate that you arrived at earlier. That is reflected by nothing more than the production from other wells in the area.

Q Now, Mr. Liebrock, if Texas Pacific had undertaken to determine the so-called reserves of this well in August, 1950, in the manner that they determined the reserves under the various tracts in the Jalmet Pool in this case what conclusion would they have come up by the extrapolation of that curve?

A They would have concluded that the ultimate recovery would have been in the neighborhood of 118,000,000,000 cubic feet.

Q Then if they had redone that same thing at a current date, what would be indicated as the reserves under that tract?

A 15.5 billion cubic feet.

Q That's about one-eight of what the original extrapolation indicated, isn't it? A Yes, sir, that is correct.

Q Had the recoverable gas in place under that tract changed other than as it might have been affected by the production from the well itself?

A No, sir, during the course of the history depicted here, the recoverable gas in place underlying the acreage assigned to the Lynn B-26 No. 1 had not changed except for a small acount of production.

Q The difference from 118,000,000,000 MCF to 15,000,000,000 MCF results entirely from a change in the producing pattern in the general area around the well, did it not?

A Yes, sir, that is correct.

Q And the reserves which were computed by the material balance equation, shown in this case by Texas Pacific, were all subject to that same effect on the basis of production in the pool over the period, were they not?

A Yes, sir, that is correct, except of course as we said previously, they did not make a material balance calculation to determine the recoverable gas in place under that tract. They did one thing and one thing only, nothing more, nothing less, they extrapolated pressure production history, which gives a figure that is in no way related to the recoverable gas in place, it couldn't possibly be.

Q Will you proceed to Continental Lynn B-26 No. 2 and state what extrapolation of the two curves on that well would indicate?

A Yes, the Continental Lynn B-26 No. 2 was drilled a little later. It was drilled at about the time recovery from this well had been around six to seven billion cubic feet. We have an indicated initial pressure here of around 1200 pounds with an established pressure production decline curve initially as shown by these points.

If we had extrapolated pressure production history as of August, 1951, we would have come up with an estimated 5.25 billion cubic feet down to 100 pounds, but at this particular time, due either to additional development or to higher withdrawals from this

well, or lesser withdrawals from the offset wells, the pressure production trend on this lease was established. This very short break in trend could have been caused by nothing else than the effect of offset production, which clearly demonstrates that you must of necessity have tremendous movement of gas across lease lines. That is the only way in the world you can upset a pressure production decline trend. So you see at this point from August, 1951 up to the present, you get an indicated ultimate recovery of almost twice as much as you would have estimated back here.

Q To be sure I understand you, if the basis of computing reserves used by the Applicant in this case had been used in a hearing before this Commission in August 1951, and the reserves of this well had been computed on that basis, it would have indicated approximately five and a quarter million MCF of ultimate production from that well, is that correct?

A Yes, sir, that is correct.

Q If they came back before this Commission this year dealing with exactly the same well and used exactly the same process for computation, they would have gotten twice the reserves that were originally indicated, is that correct?

A Yes, sir, that is correct.

Q And that indicates the fallacy, as I understand it, of the attempt to use this equation in determining the gas, recoverable gas in place under a particular tract in the Jalmat Pool?

A Yes, sir, that is correct. Nothing in my way of thinking

could demonstrate it any more conclusively, obviously both of these answers couldn't be right as to recoverable gas in place, and if either one happened to be close, it would be purely accidental.

Q Will you proceed to Continental Lynn B-25 No. 2?

A This is a plot of the pressure production distory on the Continental Lynn B-25 No. 2 which offsets the Lynn B-26 No. 2. Now, in this particular case we can draw a fairly good straight line through the pressure production history, but the main reason for plotting this particular data on the graph is to indicate that despite the fact that you can draw a straight line through these pressure points, that in itself is no indication that this well is simply draining the area which is assigned to the well. It may be draining more, it may be draining less, and here again, if it happens to be draining only the area assigned to the lease it would have to be accidental.

Q Now, tying this exhibit in to your tank exhibit which was Operator's 1-R, is there any way of determining from which one of these three connected tanks the gas that would be reflected by this curve was being produced? A No, Sir.

Q It could be coming from the tank at the top - the tank in the middle, or the tank at the bottom, couldn't it?

A Yes, that is correct. It's obvious from our plot on Lynn B-26 No. 1 for a long period of time it was draining an area much larger than the area assigned to the well.

Q Assuming on these three tanks that each one of them is owned

by a different operator, the result would be that tank A would be given credit for reserves which did not belong to that operator because they were not located under the tract assigned to the well, is that correct?

A Yes, sir, that is exactly correct.

Q Is there anything further in connection with that exhibit?

A No, sir, I believe not.

A Now, Mr. Liebrock, in the light of your testimony as to the total lack of relationship between the so-called reserves obtained by this method used by Texas Pacific and the recoverable gas in place under the tract which the New Mexico statute says that the operator is entitled to recover and his correlative rights must be based thereon, is there any relationship between the deliverability of the well and that recoverable gas in place?

A No, sir, I do not think that there is any relationship between the deliverability and the recoverable gas in place, From our first Exhibit 2-R we demonstrated by a hypothetical example why there shouldn't be, and by continuing the application on to the field examples in 2-R, we have demonstrated from field data why there should not.

Q Now, have you made an attempt to further test that situation by applying the proration formula which will result from the order issued by the Commission to wells that are located in the Jalmat Pool?

A Yes, sir, we have.

Q In an effort to see how that relationship would develop?

A Yes, sir, we have.

Q And have you in connection with doing that given consideration to the porosity and permeability conditions which are found to exist in that pool?

A Yes, sir, as we testified previously, we had access to core data on approximately five wells, and we have studied that data to determine the relative importance of permeability and porosity, and all the things we have been talking about here. In other words, permeability has been mentioned a lot, porosity has been mentioned a lot, and we have made a further investigation to determine just how these various parameters enter into the determination of recoverable gas in place, and how they enter into the determination of the ability of a well to produce.

Q Would it be a fair analysis to say that changes in the permeability are roughly the equivalent of the size of the opening you had in these tanks? A Roughly, Yes.

Q And that it has no relation to the amount of gas that there is in the tank?

A Yes, sir, no acceptable relationship between that and the recoverable gas you have in place in the tank.

Q Now, with reference to porosity, what part does it play in determining the recoverable gas in place? Is it a factor, and if so, is it an important factor?

A Yes, sir, if you take a unit or a given volume of reservoir rock, porosity is the most important single factor entering into the determination of recoverable gas in place.

Q Would it be a fair statement to say that the porosity is just the storage capacity of the rock?

A Yes, sir, I can't think of a better way to put it.

Q You said that is the greatest single factor in determining how much gas there is in place under a particular tract?

A Yes, sir.

Q All right, Will you proceed now to the exhibit which examines the relationship between those?

Q You are referring now to Operator's Exhibit 3-R?

A Yes, sir, that is correct.

As we just stated, for a given volume of reservoir rock porosity is the most important single factor that enters into the determination of the storage capacity. At the same time, permeability is the most important single factor in determining the ability of the rock to give up gas.

Q Is it also the most important single factor in deliverability?

A Yes, sir. Beginning over on the extreme left-hand side of this exhibit, we have here plotted the red points that are shown. These red points are average permeability values for each one percent increment of porosity change. This is data which is normal-

ly plotted on a semi-logarithmetic graph paper, but for clarification we have plotted it on a linear scale in both directions. You will see the relationship, the best average relationship we could draw between the points indicated here.

Now on the same graph we have super-imposed this 45 degree line here which is roughly the relationship that would be required in order for permeability to reflect storage capacity of the reservoir rock. Now to elaborate a little more on that, when you get an increase tenfold in porosity at the same time you get a tenfold increase in permeability.

Q That is, that is what you would have to get if permeability reflected the recoverable gas in place?

A Storage, yes, sir, that is correct. This is the relationship that you would have to have but which you do not. Here with a twenty percent increase in porosity, you would have to have a twenty-fold increase in porosity, you would have to have a twenty-fold increase in pereability, roughly, for permeability to reflect storage capacity of the rock. You do not have that relationship. You have this relationship that we have plotted here, which as you can see very readily differs extremely from the forty-five degree relationship that would be required, so we have shown here in bar graph form the significance of this type of analysis and what it means; for example, starting here where we have a permeability of one millidarcy, we have a porosity of twelve percent.

Where we have a permeability of four millidarcies we have a porosity of fifteen percent, reading directly off of the appropriate curve here. Where we have a permeability of twenty millidarcies right here where we have a porosity of nineteen percent. So you can see the porosity here over the range that we have investigated varies from twelve percent to nineteen percent.

Q That, Mr. Liebrock, is the storage capacity of the rock that you referred to earlier, is it not?

A Yes, sir.

Q That varies within what percentage?

A Porosity varies from twelve percent to nineteen percent.

Q That is the principal factor in the recoverable gas in place specified by the New Mexico Statute?

A Yes, sir, that is correct.

Q All right.

A so to sum up the results of this analysis, for a fifty-eight percent variation in porosity, from twelve percent to nineteen, taking the difference from twelve to nineteen and referring it to twelve, for fifty-eight percent variation in porosity, there is a corresponding two thousand percent variation in permeability. Now that reflects this and nothing more, that while you have a very slight variation or a minor variation in storage capacity, you have a tremendous variation in permeability. This is just from analysis of the rock itself, before it's been fracked. This

is a variation you have before you have done anything to the rock in the way of fracturing. Now let's take a look at it for a minute to see what would happen if we went in and fracked some of the wells. I don't think there's any question but that under a frack program in a field as large as Jalmat that you would tend, without a doubt, to expand, to result in a greater spread between the effective permeability that we have indicated here, so that instead of a two thousand percent in permeability you can easily wind up with a four thousand to six thousand percent variation.

Q Now, Mr. Liebrock, when you do that frack job, do you increase those green bars down there, which is the storage capacity of the rock?

A No, sir, and that's the next thing to discuss. In increasing the effective permeability of the system, you do not alter the storage capacity of the rock. In other words, we are not in a position to alter the storage, we can't put any more gas in the reservoir, but we can alter tremendously the ability of the wells in that reservoir to deliver gas. You have already got a tremendous spread, and with fracking it is going to be even more severe.

Q When you put deliverability in a gas proration formula, are you giving effect to this tremendous permeability range which has no relation to the porosity range, which is the storage capacity of the tract?

A Yes, sir. You very definitely are, and the calculations

that we have shown over here on the right indicate why, because as we said previously, for a given thickness or given volume of reservoir rock, permeability is the greatest single factor in determining the ability of a well to produce. For example, and this is nothing more than a sum up of what we have already said, but for a permeability of one millidarcy and for the thickness we have used here, you would have a productivity as against 500 of 127 MCF per day, whereas for a permeability of twenty millidarcies you would have a productivity of 2,540 MCF per day just by varying the permeability, an increase of two thousand percent, just as we have shown here. In the formula which is used for determining recoverable gas in place, permeability is not even a factor, admittedly it enters into some extent in determining the abandonment pressure of a well, but it is not an important factor and Texas Pacific apparently believed that because they extrapolated all their pressure production down, you have curves down to 100 pounds. This formula for calculating recoverable gas in place, the factor that is the greatest and most important single factor, namely, permeability, doesn't even enter into the determination of recoverable gas in place. When the two most fundamental factors, such as porosity and permeability, one entering into one formula and not in the other and vice versa, how could there possibly be any relationship between recoverable gas in place and the ability of a well to produce.

Q Mr. Liebrock, to look a little further at the effect of giving effect to this range in permeability by including deliverability in a gas proration formula, you've said there was a range of about two thousand percent in permeability in the Jalmat Pool, with a range of only fifty-eight percent in porosity, is that correct?

A Yes, sir, for the example that we have taken here, we have investigated the permeability range which would result if we had a range in porosity of twelve to nineteen percent, but you will recall previously from our study within our area of investigation we didn't find this much porosity variation, but we have this much permeability variation from the deliverability of the well.

Q Does a deliverability factor in a proration formula inevitably give a proportionately greater allowable to the well, so that the two thousand percent increase in permeability is reflected in the allowable, where only a fifty-eight percent difference exists in the storage capacity of the rock?

A Yes, sir.

Q And hence in the recoverable gas in place referred to by the Statute?

A Yes, sir, that is correct.

Q Is there anything further in connection with that exhibit, Mr. Liebrock?

A Yes, sir, there's one thing that I would like to add before leaving this particular exhibit. I would like to quote and read directly from an article which was just called to my attention last night. It appears in the March, 1958, issue of the Petroleum Engineer. The title of the paper is "Predicting Reservoir Performance from Core Analysis." This paper was written by Mr. Ben A. Elmdahl, who is head of Elmdahl Engineering Company in Houston, Texas, and formerly associated with Core Laboratories. He has had an opportunity to observe porosity and permeability relationships on a tremendous number of sandstone cores.

"For any given geologic formation with intergranular porosity and permeability, there is a direct relationship between these factors over a specific range of porosity. This relationship is such that at a certain lower limit of porosity, a formation becomes permeable and from this point both factors increase in a semi-log manner (a 3 percent increase in porosity usually affords a 10 fold increase in permeability)." I would like to repeat that. "A 3 percent increase in porosity usually affords a 10 fold increase in permeability."

Q May I interrupt to ask how that relates to the increase you found in this particular pool?

A Yes, sir. I'm calling your attention to the fact that we investigated the permeability variation for a porosity variation of twelve percent to nineteen percent so that we investigated a

seven percent range of porosity and for our seven percent range of porosity we observed a two thousand percent variation in permeability, which ties in very closely with what Mr. Elmdahl quotes in his paper. I might say that he's talking about dirty sands and when I say dirty sands I have reference to sands which have a relatively high concentration of shaly material. I think without a doubt from my discussions with engineers and geologists that the Jalmat sand reservoir comes under the classification of a dirty sand. He is talking about exactly the same type of sand lithologically that I'm talking about here.

I would like to continue this quote, I will have to read back. "This relationship is such, that at a certain lower limit of porosity a formation becomes permeable, and from this point both factors increase in a semi-log manner until an upper limit of porosity for the formation is reached. At this point permeability becomes independent of porosity and may continue to increase while the latter remain constant,"while permeability remains constant. That's exactly what you would suspent from--

Q (Interrupting) You misread that, I believe.

A While porosity remains constant.

MR. CAMPBELL: We would at least like to have it read properly.

MR. MALONE: Would the witness read it again, please?

A Yes, sir. I'm reading the last sentence where I misread.

"At this point permeability becomes independent of porosity and may continue to increase while the latter remains constant." That is, while porosity remains constant. That is exactly what you would anticipate from the graphical relationship that we have shown here. When you get up in the higher porosity ranges where the shaly content of the formation is less of a factor, then you can get tremendous increase in permeability with a minor variation in porosity, with a minor variation in storage capacity.

Q Does that mean, in effect, a tremendous increase in allowable where deliverability goes in the formula, when there is a very minor increase in recoverable gas in place?

A That is correct, with virtually no increase of recoverable gas in place, so I think that is significant from the standpoint of fracking, too, you would be working on the up end of the curve so when you materially increase the permeability of your formation you can do it over a tremendous range without increasing the storage capacity; so for all practical purposes permeability and porosity has no reasonable relationship as far as this field is concerned.

Q Would you just have a seat now for a moment, Mr. Liebrock? You testified on behalf of the operators in the original hearing in this case, or in the December hearing of the case, with reference to a study which you made on a portion of the Jalmat Gas Pool.

That study related to a determination of the recoverable

gas in place by a pore volume calculation or so-called volumetric calculation of the recoverable gas in place under the individual tracts; what was the area that was included in that study?

A It was an area of approximately 11,000 acres.

Q Approximately 11,000 acres?

A Yes, sir, that is correct.

Q In the Jalmat Pool?

A That is correct.

Q At that time you testified in substance that you felt that was an acceptable unit of the Pool on which to base a study such as you made, and that you had not made a study of the entire Pool or a pore volume calculation on the entire Pool because of the inadequate time that was available for that purpose. You recall your testimony in that regard?

A Yes, sir, I do.

Q You proposed to testify further with reference to some of the information that was disclosed in that 11,000 acre study, did you not?

A Yes, sir, I did.

Q Now, since the meeting or since the hearing in December, have you expanded the pore volume study to include the entire Pool?

A No, sir, we have not.

Q Have you made a further study of some aspects of the

entire Pool in determining whether or not you would be justified in expanding your study?

A Yes, sir, we have.

Q What did the further study which you made disclose in this regard?

A Well, at the time of the last hearing we fully intended to expand the study, our pore volume study to the entire field; however after we reviewed the additional information, we found that we had deliverability data on approximately fifty percent of the wells outside of our original 11,000 acre area, whereas we had deliverability data on eighty-seven percent of the wells within the 11,000 well area that we had previously studied.

Q Let me be sure I understand you. If you had expanded your study to include the rest of the Pool, you would have only had deliverability information on half of the wells in that additional area?

A That is correct, approximately half.

Q Would that have very materially reduced the value of the study for the purposes for which it was made, so far as the additional area in the Pool was concerned?

A Yes, in my opinion it would have materially. We could not have supported any conclusions or recommendations that we might have arrived at on the basis of expanded study to the same extent that we could support our conclusions on the small area where we

had adequate information. It boiled down to the case of having adequate information on a portion of the Pool and insufficient information on the remainder of the Pool.

Q Were there any other factors that entered into the decision not to expand this study to the entire Pool?

A Yes, sir, realizing that we did not have sufficient information on the area outside of the original area studied, and at the same time taking into consideration that it would require approximately a thousand man hour of work, we could not recommend to the operators that the study be expanded, because we could not give them any assurance that we could come up with anything that we could support to the extent that we could support it in the smaller area.

Q This resulted from the absence of adequate data on the wells outside the 11,000 acre area?

A Yes, sir, that is correct.

Q Now, have you prepared a net pay map and an isobar, a pressure map covering the 11,000 acre area which was the subject of your study, to which you testified in the December hearing?

A Yes, sir, I have.

Q Will you refer to that exhibit, please?

A Yes, sir.

Q You are referring now to Operator's Exhibit 4-R, is that correct?

A Yes, sir, that is correct. Referring first to the map on the left-hand side of the Exhibit 4-R, we have indicated a bottom-hole pressure map for the 11,000 acre area which we studied. The boundaries of the area are indicated in red on the map.

Q Your left or the Map's left are you taling about?

A On this side of the map.

Q What is shown there?

A This is the net pay map, I am sorry. Correction, on the left-hand side of the map we are referring to the left-hand side of the exhibit, we are referring to the net pay map. Now, the procedure followed in estimating net pay for this area has been previously discussed. However, I might mention briefly that we made use of the core data which we previously had reference to in previous hearings, and all of the available logs in this area relating them first to the cored intervals and then expanding the study to include the entire area, with the result that you see indicated here on this net pay map.

Now, on the right-hand side of this exhibit we have a bottom-hole pressure map of the same area, the area again being outlined in red. The pressures here have been corrected to bottom-hole conditions, and are based on measurements taken within three months before or after January 1st, 1957, which was the last complete, really complete pressure information that we had.

Now, you can see the results of our contouring of the pressure

data in this area.

Q Now, what generally does that pressure data indicate?

A Well, the pressure data indicates that within ghe area studied we have very little variation, relatively little variation compared to other places in the field. For example, a fair indication would be a variation of 100 pounds say from 900 to a thousand pounds.

Q Now, a small variation in pressure as between wells in an area of that kind indicates what, if anything, with reference to communication and the migration of gas back and forth between leases?

A Any time you see a pressure plateau of this type such as covers our area study, then you can immediately conclude that there is excellent communication throughout the reservoir, throughout that portion of the reservoir.

Q What do you mean by communication?

A I mean simply that gas is extremely free to move across lease lines depending on the withdrawal rate from individual wells, just as our first exhibit, our Case 1-R, the second case, our Exhibit 1-R, the second case where we showed that gas was free to migrate from tanks B and C to tank A. This is analogous gas, is free to migrate at will throughout this area.

Q It will indicate that you had a large pipe between the tanks shown on Exhibit 1-R? A Yes.

Q You have referred to the fact, Mr. Liebrock, that there is a relatively small variation between the pressures which you find in this area? A Yes, sir.

Q And that in some other acrea of the pool much larger differences exist? A That is correct.

Q For the purpose of the study which you are making to compare deliverabilities in wells to the net pay or to the recoverable gas in place, is it a more favorable or a less favorable condition to have uniformity in pressures such as exist here?

A It is a much better study where you have uniformities of pressure within a given area because it is in these areas that the migration will be greatest, it is in these areas where the migration of gas across lease lines will be maximum. It is in these areas where correlative rights is subject to damage.

Q (Interrupting) It is where they will be damaged as a result of the migration of the gas if an unfair proration formula is used? A Yes, sir.

Q Is there anything further in connection with the Operator's Exhibit 4-R?

A Yes, sir. I would like to elaborate a little more, I think it ties in with what you have just said, and it also ties in to statements by Texas Pacific earlier that this is an extremely poor area to study because there's very little variation in pressure and because there is only approximately a three-fold variation in

net pay.

I believe they said it was poor area because if you have little variation how can you evaluate differences. As a matter of fact, I can't think of a better area in the whole field to evaluate differences. We have better information here than any other place. It is only logical that the competent engineer will take the area where he can properly evaluate it.

I might point out that while we have only a three-fold in net pay and a small variation in pressure, we have a forty-three fold variation in deliverability, and not a great deal of variation in pressure and net pay thickness, then how can there be any correlation. For example, if we have very little variation in these factors, then we shouldn't have very much variation in deliverability, but we have a forty-three fold variation in deliverability, so as a practical matter and taking into consideration the availability of data and the procedure that any engineer could follow, I can't think of a better place to investigate the applicability of the proposed deliverability formula.

Q Now, have you made a study to determine what will actually happen as between wells if a deliverability formula is used on the wells in this area in relation to the recoverable gas in place which measures the correlative rights of the operators in that area?

A Yes, we have.

Q Will you refer to that study, please?

The exhibit to which you are now referring is entitled Exhibit Showing Absence of Relationship Between Recoverable Gas In Place And Deliverability Allowable, is that correct?

A Yes, sir, that is correct. In reviewing this area and the type of information available, it occurred to us that perhaps one of the clearest ways to depict the tremendous variation you have across lease lines would be to run cross sections at several points through the field.

First we have prepared cross section A,A 1 which runs from Tidewater King No. 1 on the north to the Amerada State LMT No. 2 on the south. On this exhibit we have shown the order of magnitude of variation in recoverable gas in place expressed in MCF per acre for the various wells that are included in this cross section.

Now, for the same wells we have shown the deliverability which would result from, we have shown the allowable which will result from the adoption of the deliverability formula. So the result is indicated here, we have approximately a 40% variation in recoverable gas in place between these wells shown on cross section A, A_1, but for the same wells we have approximately a 460% variation in the allowable under the deliverability formula.

Q Now, Mr. Liebrock, let me be sure I understand what you mean by that. Do you mean that considering those wells and comparing the wells as between each other that are shown on your cross section A, A_1, that there is a variation in the recoverable gas in

place of how much?

A Forty percent, approximately.

Q But that applying the allowable formula that would result from the Commission's Order R-1092-A, there would be a variation in allowable of how much? A Approximately 460%.

Q That's as between those individual wells that are shown on A, A_1? A Yes, sir, that is correct.

Q Now, when you get a roughly ten to one variation in allowable as between wells which have a substantially equal amount of gas under the tract, or recoverable gas in place, what is going to happen so far as drainage is concerned?

A Well, sir, there is only one thing that can happen, you must of necessity have tremendous drainage across lease lines.

Q That means that the well that gets the trememdously high allowable because of the injection and deliverability in the formula does not necessarily have any higher recoverable gas in place, is that correct?

A That is correct. It does not necessarily have any highte recoverable gas in place, but it will recover a much greater portion of the total gas in place in the area than it's entitled to.

Q Whose gas is the owner of that well going to be recovering?

A Well, from the various offset tracts.

Q It's going to be recovering somebody else's gas besides his own? A That is correct.

Q Does or does not that relate directly from the injection of a deliverability factor in the proration formula when there is no correlation between the deliverability and the recoverable gas in place? A Yes, sir.

Q All right, would you proceed with the description of that exhibit?

A I will continue on to cross section B,B_1 which is a west-east cross section extending from the Texas Pacific State A No. 1, 37 on the west to the Gackle King No. 1 on the east.

Q. That's an east-west cross section, isn't it?

A Yes, west-east.

Q Or west-east?

A Yes. Now, on this particular cross section we have approximately 110% variation in recoverable gas in place as we have shown here, whereas for the same wells we have approximately a 470% variation in allowable under the deliverability formula. So here again, you have the same pattern which will result in migration of gas across lease lines. It must of necessity result in migration across lease lines, it just simply can't help resulting in it.

Q Those individual bars each indicate an individual well which you have labeled on that exhibit, do they not?

A Yes, sir, that is correct.

Q And the green bar up above indicates the recoverable gas

in place under that tract? A That is correct.

Q The red bar down below indicates the allowable that the well will receive under the present Commission order?

A That is correct.

Q Now, if there was a general correlation between deliverability and recoverable gas in place, what would you find with reference to the relationship between the green bar on any well and the red bar?

A If there was a general relationship you would find that the length of these two bars would tend to coincide much closer.

Q And comparing the upper and lower bars, the green bars up above and the red bars down below, what would you find.?

A You would find the same order of magnitude of variation, instead of the tremendous variation you would have a variation much less than the order of magnitude indicated here.

Q Well, what, if anything, does it demonstrate in your opinion as to the existence or non-existence of any correlation between deliverability and recoverable gas in place which the statue says the operator is entitled to receive?

A Well, sir, in an area which lends itself better to the type of study that needs to be made than any other area of the field based on the availability of data, it proves conclusively that there is no general relationship between recoverable gas in place and the allowable which would result under the deliverability formula.

Q What if anything does it prove with reference to the drainage that is going to result from injection of that deliverability formula into the gas proration?

A Well, sir, when you study the results of these bar graph analysis in conjunction with the pressure history in this area and the net pay thickness in this area, you can conclude but one thing, no one could conclude anything else that there must of necessity be tremendous movement of gas across lease lines. You can't have variation of this order of magnitude without upsetting correlative rights tremendously.

Q Now, will you refer to your cross section C,C_1:

A Cross Section C, C_1 is patterned after the others and extends from the Gulf Janda 1 No. 2 on the north to the Continental Lynn B-26 No. 4 on the south. Here we have a variation in recoverable gas in place of approximately 85%, and for the same wells we have a variation in allowable under the deliverability formula of approximately 360%. So the pattern here is easily the same as the pattern on the other two cross sections.

Q These wells likewise are offsetting wells that are going to be draining each other if one well gets a greater allowable in relation to its recoverable gas in place than its adjoining well, is it not?

A Yes, that is correct.

Q Is there anything further that you would like to state in

connection with that exhibit?

A Well, there are two or three things that might be worth mentioning. We have called attention to a couple of wells here, first the Gackle King No. 1 which is the easternmost well in cross section B, B_1 which would have a monthly allowable of approximately twenty-one million under the existing formula, or under the acreage formula as compared to approximately one hundred three million under the deliverability formula.

Q You say the allowable of that well would increase from twenty-one million to a hundred three million?

A Approximately, yes, sir.

Q Under the new proration formula?

A Yes, sir. Approximately a five-fold increase.

Q And that is offsetting a well which is the Gulf Janda if that has a recoverable gas in place that compares how to that well?

A Well, they are practically identical, one I would say has a recoverable gas in place of approximately 32,000 as against 33,000 for the Gackle King No. 1.

Q So that with approximately equal recoverable amounts of recoverable gas in place, this Gackle well is going to get a five-fold increase in allowable as compared roughly, as compared to the Janda Well? A Yes, sir, roughly.

Q Those are adjoining wells, are they not?

A Yes, sir, they are.

Q What's going to happen to the gas under the Gulf Janda well when that allowable hits?

A Well, I think it's apparent, --

MR. CAMPBELL: Is Gulf a party to this rehearing?

MR. MALONE: I don't know whether they are or not. I'm not representing them.

MR. CAMPBELL: If Gulf is not a part, it seems to me it is immaterial.

MR. MALONE: If the Commission please, we are making study, we are presenting evidence of a study in the Jalmat Pool from information available in the Commission's files as to the wells. To suggest that we have to limit our study to the wells that belong to the people we represent is a new concept that so far as I know has never been injected in this Commission before, and I hope never will be. I might say we are referring to some Texas Pacific wells also, and I don't represent them either.

MR. PORTER: The Commission feels that it's immaterial as to the ownership of the wells in the area involved.

Q Will you proceed?

A That is the extent of my comment on this thing. I think it is apparent that a portion of the gas underlying the Gulf Janda H Lease will migrate to the Gackle King No. 1.

Q Is it your opinion as an engineer that that would occur?

A Yes, sir, it is.

MR. PORTER: Mr. Malone, let's take a ten munute recess.

(Recess.)

MR. PORTER: The hearing will come to order, Mr. Malone, would you proceed with your witness?

Q Mr. Liebrock, before we leave Operator's Exhibit 5-R, will you refer again to that exhibit and point out any wells indicated thereon which have extreme ranges in deliverability in relation to the recoverable gas in place as related to offset wells?

A Yes, sir, referring first to cross-section C-C', I think it's worth pointing out that the Continental Lynn "B" 26 No. 4 has a deliverability allowable of approximately sixty MCF per month per acre, which is the lowest allowable in the cross-section of the several wells included in the cross-section, whereas the same well has the highest calculated recoverable gas in place of approximately 41,000MCF per acre. By the same token, in cross-section A-A", the Amerada State LMT No. 2 has a deliverability allowable of approximately 65 MCF per month per acre, and it is the well with the lowest allowable in the several wells included in the cross-section, whereas it is the well with the highest indicated recoverable gas in place, approximately forty-six to forty-seven thousand MCF per acre.

Q I understand, then, that under the order of the Commission it would be permitted to produce less than any of those adjoining

wells, whereas it has the largest recoverable gas in place?

A Yes, that is correct.

Q As to the first well that you testified to, that it has the smallest allowable and the largest recoverable gas in place of any of the wells in that group?

A Yes, sir, that is correct.

Q Mr. Liebrock, did you prepare the bar graph comparing deliverability to recoverable gas in place on fifty-eight wells in the test area which was attached as an exhibit to the petition for rehearing of a number of the operators?

A Yes, sir, I did.

Q Do you have a larger scale version of that exhibit available?

A Yes, Sir, i fo.

Q Will you refer to that exhibit, please? What is the title of the exhibit to which you are now referring?

A The title of this exhibit, or the purpose of this exhibit is to show the absence of correlation between the deliverability and recoverable gas in place within this area which we studied. On this exhibit we have plotted deliverability in order of increasing deliverabilities. In other words, we have gone through, beginning with the well having the lowest deliverability, which is around 470 MCF per day, to the well having the highest deliverability, which is approximately 19.4 million cubic feet per day.

Q Is there a point up there just above --

A (Interrupting) There's a point and it is covered up but it is there.

Q That is the deliverability of the last well shown to the right on the bar graph?

A Yes, sir. You recall that we mentioned previously that within this area we had approximately a forty-three fold variation in deliverability.

Q To be sure that I understand what this exhibit reflects, what does the green bar indicate as to each well?

A The green dot?

Q The green dot, rather.

A The green dot indicates the deliverability for each well in the fifty-eight well area.

Q What does the red bar indicate?

A The red bar indicates the recoverable gas in place for the same well.

Q For the same well? A Yes, sir.

Q So that the relationship between the deliverability and the recoverable gas in place as to each well is shown by the green dot and the red bar respectively?

A Yes, sir.

Q Do you have available the information that you can identify each of the individual wells that is shown on here, if that should be of interest to anyone?

A Yes, sir, I do.

Q All right. Now what does that exhibit show with reference to the correlation, if any, between deliverability and recoverable gas in place in these wells?

A Well, it shows that there is no relationship, no correlation between recoverable gas in place and deliverability. For example, if there were any relationship, if there were any general relationship between recoverable gas in place and deliverability, the height of these red bars would coincide much more closely or approximate much more closely the deliverability increasing values as we have shown along here. As you can see, as we proceed from left to right, we don't get any indicated increase in height of the red bar which reflects recoverable gas in place. For example, here, the well which has the highest deliverability in the area has a reserve of approximately 30,000 MCF per acre. Well, there are any number of wells through here that have that much reserve or more with substantially less deliverability, so there is absolutely no correlation between recoverable gas in place and deliverability.

Q Now what is the range of deliverabilities that you found to exist in this group of wells?

A The deliverabilities in this area vary from 450 MCF per day to 19.4 million MCF per day, a forty-three fold variation, approximately.

Q A forty-three fold variation in deliverability?

A Yes, sir.

Q And if those deliverabilities are placed in the proration formula in accordance with the present order of the Commission, will effect be given to that forty-three fold variation without relation to the recoverable gas in place?

A Yes, sir, it will. For example, here, the second well in our cross section has a very low deliverability, has approximately 500 MCF per day deliverability, yet it had nearly 55 MMCF per acre recoverable gas in place. It will be penalized severely; whereas on the other end of the scale we have a deliverability of over nineteen million, this well has an indicated recoverable gas in place of somewhere around thirty, so it's obvious that it's recovery will be increased tremendously, even though it's recoverable gas in place is no greater than any number of other wells in the area.

Q Now, if a correlation did exist between deliverability and recoverable gas in place, what would you find with reference to a line drawn from the tops of each of those bars in relation to the line that's formed by those dots which go across showing deliverability?

A Well, sir, if a general relationship existed, you would find when you connected the top of the bar that they would increase gradually from left to right just as the green points representing

deliverability increase.

Q Does there seem to be any such increase there?

A No, sir, I can detect none.

Q Now, if that situation exists and the wells, some of the wells shown in here are offsetting wells or offset each other, what, if anything, will be the result of the proposed deliverability formula so far as migration is concerned?

A Well, sir, it's apparent, I believe, that it will tend to result in a substantial migration of gas across lease lines with the extent that correlative rights cannot possibly be protected. In some instances this migration will be very substantial.

Q Now, have you made a study in an effort to determine with respect to particular wells just how substantial that migration or how substantial that drainage or loss of reserves will be under the deliverability formula?

A Yes, sir, I have.

Q Will you refer to that study, please?

A Yes, sir.

Q You are referring now to an exhibit marked Operator's Exhibit R-7 and entitled Showing Leases Which Will Suffer Migration Loss Under Deliverability Formula, is that correct?

A Yes, sir, that is correct.

Q Will you tell us just what the study that you have made and the results that are shown on this Exhibit?

A Well, sir, you will recall from our previous exhibit showing the distribution of reservoir pressure throughout the area studied, that we had no tremendous variation in reservoir pressure, the order of magnitude being 100 pounds. The results of our analysis of this study indicates that there will be under the proposed deliverability formula ppreciable migration of gas across lease lines over and above what it would be under the acreage formula. The results of our study for the area are shown on this exhibit. Beginning here I might just read off the tracts involved. For example, here we have --

Q (Interrupting) Just a minute, let me clarify one thing. You have not listed on this exhibit all of the wells in this area that you are studying, have you?

A No, sir, we have listed only those wells and tracts which we calculate will suffer migration loss if the deliverability formula is adopted.

Q That is under the formula as now authorized by the Commission?

A Yes, sir.

Q You have listed the wells which are going to suffer drainage and tabulated the amount of drainage they'll suffer and the value of the gas? A That is correct.

Q All right, will you proceed?

A Just for example, you can see the order of magnitude of variation. We have a maximum migration loss for one lease here of

about 3.4 billion cubic feet ultimately. We have some leases which exhibit a very slight loss, for example down here the Texas Pacific Coal and Oil State A No. 30, a very slight loss. I might read down the line just a few. Texas Pacific State A-1 No. 22, Texas Pacific State A No. 21, State A-1 No. 31, State A-1 No. 33. The Continental Lynn B-26 No. 2 is a lease which will suffer a rather substantial migration loss, the Amerada State LM "T" No. 5.

Here is another well that will suffer a migration loss, the Olson E King which will have a loss of 2.875 cubic feet.

Q You say that that lease is going to suffer that loss. Do you mean that the operator and royalty owners will not receive that gas which they are entitled to receive under the present proration formula?

A Under the acreage formula, yes, sir.

Q Now, who will receive that gas if this deliverability formula goes into effect, who will produce it?

A Well, the gas will be produced by other tracts in the area which are presently shown in white.

Q You have colored some tracts in the area on the right-hand side of the exhibit, what do those colors indicate?

A Well, we have simply divided it into three groups and classifications, everything colored in green on the map will have an estimated loss of less than one billion ultimately. Tracts colored in brown will have a loss between one and two billion ul-

timately. Tracts colored in pink a loss of over two billion ultimately.

Q Now, when you say ultimately, what do you mean?

A I mean at the time of depletion of the area.

Q You mean between now and the time that the pool is completely depleted?

A Yes, sir.

Q Now, how did you go about computing the firgures that are whown on this exhibit?

A Well, as I stated previously, we have an area that lends itself particularly well to a study of this type. In fact, I think that this particular area lends itself better to this particular type of study than any other area of the field. Not only because we have sufficient information, but because of the minimum variation in pressure throughout here. As I stated previously, any time in a reservoir of this type where you see very little pressure variation, then you immediately conclude that you have rather substantial movement of gas laterally in the reservoir. With that as a background, and using that type of information, we have distributed the total recoverable gas in place in this area according to the acreage formula, that is we have broken down the total recoverable gas in place the way we think it would be, the way we calculate it would be under the acreage formula and the way we calculate it would be under the deliverability formula. From those two sets of figures we have determinted the values that we have indi-

cated here.

Q So that that loss in ultimate recovery is a loss, as compared with the present proration formula, that has been in effect for the last four years as compared to the proposed deliverability formula authorized by Order 1092-A?

A Yes, that is correct.

Q What do you find in that regard in terms of revenue loss which would be sustained by some of the individual leases that ate going to be drained under this formula?

A Well, we have made a very simple calculation by estimating that the gas price will be ten cents over the remaining life of the field.

Q Let me ask you whether you consider that to be a conservative estimate so far as gas price is concerned?

A I believe, sir, that it would be conservative.

Q Do you know prices in excess of that that are being paid in the Permian Basin?

A Yes, sir, I do, substantially in excess.

Q Prices range up to sixteen cents at least, do they not?

A Yes, sir, they do.

Q All right. In your computation, based on ten cents per MCF, shows what?

A It shows utilizing the total estimated loss of 53 billion cubic feet for the tracts that converted in terms of revenue would

be five million three hundred seventy-five thousand dollars for the tracts shown here.

Q Do I understand then that the effect of the change being made in the formula will be to distribute to different operators and royalty owners in this studied area, five million three hundred seventy-five thousand five hundred dollars, which they under the present formula are entitled to receive?

A Yes, sir, that is correct.

Q Percentagewise how much of a redistribution of wealth does that accomplish by this Order R-1092A?

A This represents a redistribution of approximately twenty percent of the estimated future recovery from the area studied.

Q So that the estimated future recovery in gas during the remainder of the life of this pool is how many dollars, approximately?

A Five point three million.

Q No, the estimated total.

A The total would be somewhere around twenty-five million.

Q This represents approximately what percentage of the entire Jalmat Pool?

A This area.

Q The studied area.

A The studied area represents, oh, some fifteen, twenty percent of the total field. I can check that figure.

Q If that same redistribution of wealth occurs over the entire pool, how much in dollars would be redistributed among the opera-

tors and taken away from persons entitled to receive it under the present formula if the proposed formula continued in effect?

MR. CAMPBELL: I'm going to object to that question. There is no testimony here that that same situation exists in other areas of the field. There is not even an indication that it does by this witness.

MR. MALONE: I agree to that, and if you wish to object to the mathematical calculation, we'll withdraw the question.

Q Is there anything further in this exhibit that you would like to point out, Mr. Liebrock?

A No, sir, I believe not.

Q All right. Would you return to the witness chair, please? On the previous hearing there was testimony, I believe, both by you and on cross examination by witnesses from Texas Pacific Coal and Oil Company as to the fact that in the event deliverability goes into this formula, a fract race in Jalmat will inevitably occur, and there was testimony as to the average cost of fracting wells. Have you made a study since that time in an effort to obtain a realistic figure as to the cost of fracting each well, the average cost of fracting wells in the Jalmat Pool?

A Yes, sir, I have.

Q What figure, in your opinion, is a fair average cost for the fract operation that would be required on each well?

A Well, sir, utilizing additional information, and further

reviewing the data available sinde the last hearing, I feel that a value of $10,000 will be a representative average figure.

Q How many wells, if you know, in the pool are not shown to have been fracted heretofore by the records of the Oil Conservation Commission?

MR. CAMPBELL: If the Commission please, at this point, for the record, I would like to offer an objection to any testimony relating to the economic aspects, economic wastes aspects of this hearing. I take the position I don't want to renew this very time it comes up in the event the Commission overrules me, that is why I'm making it now, that the only basis that this Commission has in the statutes to consider cost economic loss is in relation to well spacing and in preventing the drilling of unnecessary wells. Our statutues does not define waste as economic waste. I believe that costs that are involved to individual operators are not material to this hearing in any respect for that reason and I object to any of the testimony as to that phase of the hearing.

MR. PORTER: Mr. Campbell, the Commission has decided to overrule your objection.

MR. CAMPBELL: Will the record show that my objection goes to all testimony relating to economic loss or economic waste in connection with this hearing.

MR. PORTER: Let the record so show.

Q I believe that the question, Mr. Liebrock, was whether

or not you know the number of wells as shown by the Commission records in the Jalmat Pool which are not shown to have been fracked in their completion?

A Yes, sir, our review of the Commission records indicated that there are at least 283 wells which have not been fracked, at least where there is no record of them having been fracked.

Q Now, will you state whether or not in your opinion it will be necessary for the owners of wells which have not been fracked to do so in the event the deliverability formula is adopted?

A Yes, sir. I think it will be necessary for them to frack the wells to see what kind of an increase they can get, yes, sir.

Q What is the reason it would be necessary?

A In order to prevent the drainage of their gas across lease lines to wells which have higher deliverability and therefore higher allowables under the deliverability formula.

Q Now would you state briefly, Mr. Liebrock, how a frack job is accomplished on a well such as the Jalmat well?

A Well, there are various approaches that might be used. I would suspect that where the company conducting the frack job feels that the condition of the well is such that they can inject large volumes of sand and oil, that they will conduct large v9lumes, high injection rate frack treatments by going down the casing.

Q Is that the normal way of carrying out a frack job?

A Yes, sir.

Q Is it carried out under high pressures?

A Yes, sir, relatively high pressures.

Q Waht pressures on the casing occur in the course of such a frack job?

A Well, sir, I think it's reasonable to expect that the type of frack jobs performed in this field would result in wellhead injection pressures of around two to three thousand pounds.

Q Per square inch? A Yes, sir.

Q When was the first gas well in the Jalmat Pool drilled, if you know?

A I believe it was September of '29.

Q Are there in the Jalmat Pool a number, a large number of old wells that have had casing in them for a long time?

A Yes, sir, there are.

Q Taking that condition into account, will you state whether or not in your opinion the widespread fracking or attempts to frack wells in the Jalmat Pool would or would not result in underground waste?

A Yes, sir, I think there is a definite possibility that it would.

Q How would that occur, in your opinion?

A Well, sir, I think that in old Wells where the casing is old, the operator who decides to perform a high injection rate frack treatment runs the risk of rupturing his pipe and bursting

it, and possibility of water coming in from above, or if the pipe is all right, I think in the great number of the open holes, the operator runs the risk of fracking down into water, with the result he would have the invasion of the well bore with water, and to a certain extent, the surrounding formation.

Q Would you elaborate a little, please, on what you mean by fracking down into water?

A Well, sir, I thinkit's commonly accepted fact that the directions taken by the fractures resulting from imposing high pressure on the formation, take off in various directions. I think it has been positively established that some of these fractures extend in a vertical direction, and if they do extend in a vertical direction then there is a possibility of them fracking downward into water.

Q Would that result in physical waste?

A Yes, sir, in those instances where water come in from the bottom portion of the formation and invaded the reservoir surrounding the well bore, the recovery of gas from that area would be less than it would have otherwise.

Q Now, you have referred in your testimony to the range of increases that would result in the allowables of individual wells if this new formula goes into effect. Can you give us some examples of the increase in allowables in particular wells that would occur under the new formula?

A Yes, sir, I can cite a few. We could take the proration schedule and cite a great many, but I have selected here a few that might be of interest. Beginning first with the Cities Service Clausen "C" No. 1, under the acreage it would be an allowable of 41.2 million a month, whereas under the proposed deliverability formula it would have an allowable of slightly over two hundred million a month.

Q That's an increase from 41 million to 200 million a month?

A Yes, sir. The Clausen, the Cities Service Clausen "C" No. 3, an increase of 41 million to 172 million a month. The Continental Stevens B-18 No.1, an increase from 20.8 million to 82.5 million. The Gackle King No. 1 from 20.8 million to 108.6 million. Finally the Western Natural McDonald State No. 3 from 20.8 to 111.8 million. They're varying degress of variation throughout the field.

Q Now, have you made a study of the location of some of these wells as to which you have just testified with relation to water encroachment in this Pool?

A Yes, sir, I have.

Q Will you state whether or not in your opinion the increase of allowable in any of those wells will result in physical waste if the allowable provided by the new formula is applied?

A Yes, sir, we have given particular attention to the Cities Service Clausen wells on the west side of the field.

Q Why did you give particular attention to those wells?

A Because our analysis of the reservoir performance over there demonstrates conclusively in our opinion that you do have some influxion of water and that you have sufficient volume of water in contact with the gas over there to provide some of the energy which is contributing to the expulsion of gas.

Q How in your opinion then would physical waste occur in the event this increase in allowable is taken from those wells?

A Well, sir, in the instance of these two wells where the allowable would be increased from approximately three to five fold I think that it could very easily result in premature invasion of the formation by water.

Q In other words, it would be a condition which would be conducive to early fingering of the water into these wells?

A I have discussed this matter with the engineers who are particularly familiar with these wells and that is also their' opinion.

Q Now, you have heard testimony in this case, Mr. Liebrock, to the effect that the acreage formula which is now in existence or which is in existence till Order R-1092-A was issued, has been in existence since January 1st, 1954, or a period of some four years? A Yes, Sir.

Q Assuming that during that four-year period there have been sales of properties from time to time, loans made to operators

from time to time, and sales of royalty interests from time to time, will you state whether or not a change at this time in the proration formula would adversely affect the persons who entered into such transactions during that four-year period?

MR. CAMPBELL: If the Commission please, I would like the record to show that I object to that question upon the ground that it's immaterial inasmuch as no operator acquires a vested property right in allocation formula.

MR. PORTER: Mr. Campbell, the Commission will sustain your objection.

MR. MALONE: If it please the Commission, for the record I would like to make a tender of proof so that the proof which we propose to make by this witness would be in the record in the event of a review of the proceeding.

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

MR. MALONE: Come now the Jalmat Operators and make the following tender of proof upon the objection of Texas Pacific being sustained by the Commission. If permitted to do so, the operators would show by this witness that it is a common procedure to purchase properties and royalties, and for banks and financial institutions to make loans on the basis of the period of months required to pay out the purchase price of the property or the amount of the loan, as the case might be; that such transactions are concluded on the basis of the existing proration formula, and that a change

to the formula authorized in the Order 1092-A would adversely affect the parties who so entered into those transactions.

The operators would further show by this witness if permitted to do so that during that period operators have pooled their properties to form units under the acreage allocation formula, which units were advantageous to the parties under the acreage formula and would not be advantageous to the parties under the proposed formula, but that having contractually agreed to do so, they cannot now rescind the units which they made upon reliance on the Commission's prior order.

MR. PORTER: Mr. Malone, the Commission will deny the tender of proof.

Q Mr. Liebrock, based upon the study which you have made of the Jalmat Pool, will you state whether or not in your opinion there exists any correlation, general or otherwise, between the deliverabilities of wells in that pool and the recoverable gas in place under the tracts assignedto the well?

A No, sir. From my study there is no indication that such a correlation, general or otherwise, exists.

Q Will you state whether or not there exists in your opinion any correlation or constant relationship between reserves in the Jalmat Pool as computed by Texas Pacific Coal and Oil Company witnesses in this case and recoverable gas in place under the tracts assigned to the wells?

A No, sir, from my study there does not.

Q Will you state whether or not in your opinion there is any basis for assuming, or it can be assumed as a valid engineering concept, that a relationship exists between deliverabilities and recoverable gas in place if it be conceded that a relationship exists between deliverabilities and reserves computed by material balance calculation?

A No, sir, even, if I understand your question correctly, even if there is some indication of a correlation between deliverability and reserves computed by the material balance calculations as applied by Texas Pacific, even if there is some relationship of reserve there, there is no reason to believe that can be extended further to conclude that there would be a relationship between deliverability and recoverable gas in place.

Q Have you found anything to indicate such a relationship exists? A No, sir.

MR. MALONE: If it please the Commission, I think I'm through with this witness, if the Commission is thinking of adjouring for lunch, unless something else occurs during the noon hour while I check my notes.

MR. PORTER: The Commission is thinking of recessing for lunch. Suppose we take a recess until one-fifteen.

(Recess.)

AFTERNOON SESSION

MR. PORTER: The meeting will come to order, please. Mr. Malone.

MR. MALONE: If it please the Commission, as sometimes happens I thought of a couple more questions during the noon hour.

Q Mr. Leibrock, you testified this morning to an estimated $2,830,000 cost of the frack rates which you felt would result from injection of deliverability into the Jalmat gas proration formula. I did not ask you whether as a result of that expenditure the ultimate recovery of gas from the Jalmat Pool would be appreciable increased.

A No, sir, I do not think there will be an increase of any consequence.

Q Nos, I would like to refer you again to Operator's Exhibit 7-R, which shows the migration which you anticipate will occur if the change in formula contemplated by the present order is made. You testified that the drainage which is reflected by this loss in ultimate recovery and revenue loss was a loss as compared to the production that would be exprected under the present acreage formula, is that correct?

A Yes, that is correct.

Q Did you, in connection with making these computations, also compute the drainage loss that would occur under the acreage formula as compared to recoverable gas in place, or a perfect formula if

one could be devised?

A Yes, sir, we did.

Q What was the extent of drainage loss that occurs under the present acreage formula as compared to perfection?

A It is approximately 25 billion cubic feet.

Q In dollars that would amount to what?

A To approximately 2.5 million.

Q Then if I understand you, under the present formula the deviation from perfection or a perfect formula that occurs under acreage results in drainage of about two and a half million as compared to a drainage of $5,375,000 under the proposed deliverability formula --

A Yes, that is correct.

Q -- is that correct? Did you also compute the deviation of the deliverability formula from perfection? That is to say, the drainage that would occur in this area as compared to the recovery if a perfect formula could be devised?

A Yes, sir, we did.

Q Approximately what did that amount to?

A Approximately fifty billion cubic feet.

Q Approximately fifty billion cubic feet, so that the deviation from perfection of the deliverability formula is approximately the same as the deviation from the present acreage formula, is that correct?

A Yes, that is correct.

Q That is the change that will occur if the formula as proposed goes into effect?

A Yes, sir, that is correct.

MR. MALONE: That's all.

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

MR. CAMPBELL: Yes, sir.

MR. PORTER: Mr. Campbell.

CROSS EXAMINATION

By MR. CAMPBELL:

Q Mr. Liebrock, since the last hearing before this Commission on this matter, what data have you studied that you did not have available at that time?

A We have made a more comprehensive study of the data that we had available at that time.

Q Have you had any additional data that was acquired or available to you since that time that was not available to you at the time of the last hearing?

A Well, sir, I believe we had the core analysis that you had available and admittedly I had it at the time of the hearing, but I hadn't had chance to study it at the time.

Q Then your answer is that so far as new data is concerned available since the last hearing, you have had none, is that correct?

A I can't state definitely that I haven't had any new data at all. I would have to review my files, but that is substantially

correct.

Q What might you have had?

A Some additional deliverability data on a few wells that I didn't have at that time, but that is substantially correct, I don't have much additional information that I didn't have then.

Q Your study, your concentrated study of the Jalmat area at the time of the last hearing was confined to the fifty-eitht well area, was it not?

A Yes, sir, except I would like to clarify just a little. We referred to it as a fifty-eight well area, it is an area that contains approximately 11,000 acres and sixty-seven wells. Of the sixty-seven wells we had data on fifty-eight, this is, deliverability data.

Q I believe you testified that that contained fifteen to twenty percent of the total acreage within the Jalmat Gas Pool?

A I said this morning, I mentioned a figure like that, but I would have to check it to be sure.

Q But the area that you have been referring to here today which you have studied, the 11,000 acre, sixty-seven well area if you please, is the same area you studied prior to the time of the original hearing, is it?

A Yes, sir, that is correct.

Q Have you had any additional data available to you within that area since the time of the last hearing?

A No, sir, I don't believe so.

Q For the purpose of the evidence that you have offered here today relative to that area, you had the same data available and made the same types of calculations, or used the same assumptions for your calculations as you did at the prior hearing, is that correct?

A Well, sir, I don't know whether that's true or not. I don't know exactly what assumptions you have reference to.

A You will recall, Mr. Liebrock, at the last hearing, that I questioned you as best I could about the basis for some of your conclusions with reference to your determination of recoverable gas in place within this area?

A Yes, sir.

Q You testified at some length there with regard to the five cores that you had studied?

A Yes, sir.

Q With regard to, I believe, the thirty-eight logs that you had studied?

A Yes, sir.

Q With regard to the assumption that you made with reference to porosity and connate water, do you recall that testimony?

A Yes, sir, but I want to clarify one thing there. I don't quite agree with you on the use of the word "assumption". I don't believe I made any assumptions, in the sense that you are talking

about.

Q Well, it may not, what I was referring to was, I believe your testimony that using the data you had available, you then--"extrapolate" is probably not the word, but you used that as average within the area to the extent that you testified at the last hearing, it's in the record.

A Yes, sir, I think I can answer that question a little better. As you recall, we had some porosity data on the south side of the field and on the west side and to the north, and we also had one core analysis within the field and have those core data based on the criterian we used for estimating net pay, we did'nt come up with an appreciable variation in porosity so I think when you say assumption of porosity for the whole area, it implies that the quality of the data wasn't sufficient to justify using that value.

Q That is the point I want to make. I am not trying to change your testimony from the original hearing.

A Yes, sir.

Q What I want to ask you is this. Have you had any data available or have you made any different approaches insofar as the recoverable gas in place in this area is concerned, for the purpose of your testimony at this hearing, that you did not use at the last hearing?

A Are you questioning me simply from the calculation of the recoverable gas in place?

Q Yes.

A Yes, there hasn't been any change, we calculated it the same.

Q You had stated, Mr. Liebrock, the reason you did not extend your study outside of this 11,000 acre area since the last hearing is that data was not available and time was not available, is that correct?

A Well, principally data, sir

Q You testified that you had available deliverability data on only fifty percent of the wells outside of this 11,000 acre area?

A Approximately.

Q What effort did you make to obtain additional deliverability date beyond the fifty percent that you say was available?

A We had made what I consider to be a pretty exhaustive search of the files and records and the various sources at the time we made our first study, and I believe from my contacts with the various engineers that I worked with that they came up with all the deliverability data that was available. There may be data in the files of various companies that we did not have, but I thought that we made a resonable and determined effort to get it in the first place, and so I didn't feel there was, that any further effort on my part would be very fruitful from the standpoint of turning up a tremendously large volume of additional

information. I feel confident that is the case.

Q Did you investigate to determine whether the Oil Conservation Commission had in its files deliverability test data beyond the fifty percent to which you referred in your testimony? Did you check the files of the Commission?

A Not since the first time, no, sir.

Q Did you check the files of the Commission the first time?

A Yes, sir, in Hobbs.

Q Did you check the files of the Commission in Santa Fe?

A I would have to talk to a number of engineers that I worked with. I am not sure, I don't know whether we did or not.

Q How many actual deliverability, well deliverability tests did you have available to you within the 11,000 acre area by number?

A Fifty-eight.

Q Out of the sixty-seven?

A Yes, sir.

Q How many did you have available to you outside the 11,000 acre area?

A Well, sir, eliminating the marginal wells, somewhere around one hundred forty, fifty, something like that.

Q Do you believe if you had available to you deliverability test data on all or almost all of the wells within the 11,000 acre area, your study would have been more thorough?

A I'm sorry, I didn't quite get that.

Q Speaking now of the 11,000 acre area, if you had studied deliverability test data on more than the fifty-eight wells within the sixty-seven well area, would your study have been more complete?

A To the extent that sixty-seven is more complete than fifty-eight.

Q Would that same thing have been true if you had had more than fifty percent of the deliverability data on the wells outside of that area available to you, could you have made a study of that other area?

A I don't know whether we could have or not. Deliverability data was one of the things that entered into the decision, however, I might add also that I don't feel that the quality of reservoir data in general, outside of the fifty-eight well area and the surrounding area, is as good as it is in the area that we studied, so that is one factor, but that is not the whole question.

Q Now, Mr. Liebrock, is there any gas proration formula that will prevent migration between properties so long as there are not impermeable barriers between properties?

A As a practical matter, I don't think it would be possible to devise a formula which would completely eliminate migration, and acre foot formula perhaps would be close to realizing that objective.

Q So that the best allocation formula would be the one that more closely minimized or minimized to the greatest degree the

possible migration between properties, is that not correct?

A Yes, sir.

Q Have you made any effort to determine or analyze the drainage situation in this pool outside of the 11,000 acre area on the 100% acreage formula?

A No, sir. We haven't made any quantitative approach to the problem. Any engineer looking at the data would have some ideas qualitatively of what might be taking place.

Q Are you acquainted with the variations in pressure in this Jalmat Pool areawise? A Yes, sir.

Q Generally? A Yes, sir.

Q Are you acquainted with the fact that generally speaking the areas of lower pressure lie in the southern portion of the Jalmat Gas Pool? A Yes, sir.

Q Is it a correct engineering principle that migration of oil or gas is generally from the high pressure to the low pressure areas?

A Well, sir, that's a question that you can't give, it doesn't lend itself to the type of answer that you are looking for. In other words, it doesn't lend itself to a simple answer. I would be glad to answer the question taking the time that I feel would be required to answer it. I think it is a good question, but you can't just say yes or no to that question because there is a yes answer depending on certain conditions and no answer depending on

certain other conditions. I would be glad to take the blackboard and explain that.

Q No, I don't want you to do that. You say there is not an engineering principle, a general principle, that movement of oil or gas by way of migration is from high pressure to low pressure areas?

A Yes, sir, generally that's right, where you have a pressure differential and you are familiar with the reservoir conditions and you know that that pressure differential must of necessity reflect migration, that is true. But pressure differential quite frequently can reflect something else. It can reflect a combination of a great many things as to characteristics of these reservoirs. For example, an extremely sharp pressure gradient could indicate the presence of a permeability barrier. It could, due to precise pressure, indicate an impermeable barrier where no gas was moving across. There would be an apparent movement of gas, but actually it wouldn't be necessary.

Q Do you have any reason to believe that Jalmat contains any such impermeable barrier?

A I have good reason to believe that Jalmat has such a tremendous variation in permeability.

Q We are not talking about permeability. We are taling about pressure.

A Well, it's all related. You said barriers, didn't you, sir?

Q Yes.

A Well, permeability and barriers are associated normally where you have low permeabilities you have in effect the result of a barrier. In other words, you may have conditions in the Jalmat reservoir where gas is free to move to a limited extent but where the migration rate is extemely high. The point I'm trying to make is that pressure gradients are not indicative of volumes of migration movement. You see what I mean?

Q Of volumes, have I asked you about that? I asked if there was a relationship, that is where the migration in any reservoir is generally from the high pressure to the low pressure areas. As I understood your answered yes were these qualifications that there might be other factors affecting it?

A Yes, sir, and I didn't finish giving you all the qualifications.

Q You have also testified that there are considerable variations in pressures throughout the Jalmat Gas Pool?

A Yes, sir.

Q Does it not follow that a reduction in allowable in the low pressure areas might tend to minimize that migration?

A Well, sir, that's getting right back to just exactly what I was talking about, whether or not it would tend to minimize the migration depends upon the freedom of movement of gas from the high pressure area to the low pressure area, so--

Q (Interrupting) Aren't you talking about the degree or the

volume rather than the fact of movement, if there is movement, if this is one reservoir there is movement, is there not?

A Yes, sir. Yes, sir. But the volume of movement is important, if the volume of movement is small, then it is inconceivable that adoption of a different formula could have any significant effect on a distribution.

Q The only basis that you have for assuming either well, the area that you have studied, you have already conceded has a complete movement almost you have assumed 100% movement in some of your exhibits? A Yes, sir.

Q Have you not? A Yes, sir.

Q Mr. Liebrock, you stated in connection with your Exhibit 3-R, which was the approach to the relationships between porosity and--

A Yes, sir.

Q (Continuing) -- and permeability, that the greatest single factor in determination of gas in place is the porosity, is that your statement?

A Yes, sir. I said for a given interval of rock, yes, sir.

Q And previously and also at this hearing you have testified that pressure in this area you studied is relatively uniform?

A Yes, sir. That is correct.

Q Is the porosity in your opinion, or variation in porosity, the most important part of the variation in gas in place insofar as your study of the Jalmat Gas Pool is concerned?

A No, sir. In the area I studied?

Q Yes. A No, sir.

Q What is the most important factor?

A Well, sir, as we stated previously, we didn't observe appreciable variation in porosity in that area, so the only other factors that enter into the pore volume calculation is the pressure and the pay thickness.

Q What about the pressure and pay thickness, don't they have a bearing on the gas in place? A Yes, sir.

Q To what degree?

A We have a formula where we indicated the various factors that entered into the calculation.

Q Then your calculation on your Exhibit 3-R, and I may have misinterpreted your conclusion, I got the impression that you reached the conclusion that porosity and permeability were not closely related, and that therefore the gas in place in deliverability were not closely related. Had you taken into consideration pay thickness and pressures as additional factors in gas in place it might alter that conclusion, might it not?

A Well, sir, we have taken those things into consideration in our calculation of recoverable gas in place. We varied the net pay thickness to the extent we have indicated on our map. We varied the pressure to the extent indicated on the map, and I think that I properly evaluated all the factors that should be considered

in calculating recoverable gas.

Q Now, with regard to your testimony concerning the fracturing of these wells and the frack race that is going to result, in your opinion, if deliverability becomes a part of the allocation formula in this pool, I believe you testified in answer to a question by Mr. Malone after lunch that in your opinion these costs would be incurred without any appreciable or consequential increase in ultimate recovery. What do you mean by that?

A Well, sir, I mean simply that I don't feel that over the life of the field, the life of the reservoir, that the additional fracking work as it applies to the reservoir as a whole, will result in a substantial increase in the recovery of gas. In other words, I don't think that the productivities for the field as a whole will be increased enough to result in a substantially lower abandonment pressure. However, I did not assume in that statement that it wouldn't change the recovery appreciably from individual wells, the wells where you are able to materially improve the productivity by fracking, you perhaps would, it's just going to result in a redistribution of recoverable gas in place that we have testified to previously.

Q Well, you apparently believe there will be some increase in ultimate recovery as a result of any fracturing that may take place?

A Well, on an individual well basis I think that is where you will see the big increase.

Q I am asking you about the pool. Have you testified that there will be no increase in ultimate recovery, or not very much?

A I don't think there is, will be of any consequence.

Q What do you mean by consequence, will there be some?

A Yes, sir.

Q With regard to the individual wells that you have used in your exhibits, your horrible examples, did you consider in connection with those wells that the completion data on the wells in relation to each other?

A No, sir, we considered only the data that appears on the exhibit.

Q Did you consider in the Continental wells, for example, whether or not those wells had tubing?

A No, sir, we did not.

Q Whether or not any of the wells were open hole completions?

A No, sir, except that of course we were aware that these conditions existed.

Q The circumstances with regard to comparisons between wells would be affected to some extent by those factors, would they not?

A Yes, sir, it would perhaps be affected to some extent, but that would be a minor consideration compared to the fracking changes that might result, or the changes that might result in productivity from fracking.

MR. CAMPBELL: That's all.

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

MR. HOWELL: I have a few questions. Ben Howell, representing El Paso Natural Gas Company.

By MR. HOWELL:

Q Mr. Liebrock, the 11,000 acre area which you selected for your study is probably the best area in the entire Jalmat Gas Pool, is it not?

A You mean from the standpoint of deliverabilities or recoverable gas in place?

Q Well, let's take them one at a time, from the standpoint of recoverable gas in place, it is probably the best area, is it not?

A Well, of course, any answer that I might give would be highly qualified, because as I stated previously, we haven't had an opportunity to calculate; we don't have sufficient data to make a study of the reservoir.

Q Well, from the standpoint of deliverability and the actual production that is taking place today, the group of wells that you studied were among the best in the Jalmat Pool, are they not?

A Well, sir, I haven't compared them to the other wells in the field.

Q Are you unable to answer the question, or did you look at the wells that you studied in comparison with other wells in the

field as to their capacity to produce?

A Yes, I have a list of deliverabilities on all the wells where we were able to obtain deliverability, and I know that the highest deliverability well or one of the highest is in this area. Having found that we couldn't extend our gas in place study to the remainder of the field, then we didn't make the same comparison outside of the fifty-eitht well area, or the 11,000 acre area that we made here, so it is difficult for me to make a comparison or answer your question without having to qualify it, because I just haven't looked at it.

Q The pressures in this area are better than the pressures in the major portion outside your study, are they not?

A Yes, sir.

Q The best pressures in the field are in this area?

A Generally speaking, I believe that's true, yes, sir.

Q Do you have any information as to the relative dates of development between this area and other portions of the field?

A No, sir, but I know that I could get it.

Q Did you give any consideration to that in making your study?

A Yes, sir, you'll recall from our Exhibit 2-R we commented at length on the effect of early development on the performance of that well and the effect of migration to and from that well and we certainly considered it.

Q Did you consider the volumes which had been produced in

other portions of the field?

A In what respect did we consider?

Q In making your studies, did you give any consideration to the extent of completion in the other portions of the field?

A No, sir, only to the extent that you can make some qualitative conclusions simply from looking at the pressure, but I haven't related the pressures and recoveries in the field as a whole, no, sir.

Q Now then, referring to your Exhibit R-7 which is behind you, I note that you have colored certain leases or sections, let us say, tracts of land, to indicate that those sections will lose gas reserves in your opinion?

A Yes, sir.

Q To what point do you expect those reserves to go?

A Sir, would you rephrase the question?

Q No, perhaps you can tell me where the reserves are going from there?

A Oh, yes, sir. I think that they will be, from our study of this area I think it will result in a redistribution for the most part within the area.

Q Will the reserves from the flanks there under your estimate move to the center of the field?

A Well, sir, it is difficult for me to predict what will happen in the future because the pressure distribution will be

upset to some degree by the allocation formula that you use in the future, and the fact that you might have a thousand pounds pressure here and nine hundred here, it doesn't necessarily follow that the same pattern will hold for the future. I can't qualitatively predict, or even on the edge leases here qualitatively tell what might happen.

Q Do you assume that the loss of reserves will go from the lower pressure areas to the higher pressure areas?

A Generally, yes, sir, in a continuous reservoir.

Q And so you base your conclusion on the drainage going to the high pressure areas?

A No, sir.

Q I thought I just asked a question there, that question, and you stated that you did anticipate the movement of reserves from the low pressure areas in your plat there to the high pressure area?

A I am sorry, I misunderstood your question. Certainly I wouldn't anticipate that.

Q Where do you expect that to go?

A I think that the reserves, the recoverable gas in place that we have calculated for this area will be redistributed almost in direct proportion to the withdrawals that will result under the new allocation formula. I think the very fact that you have a minimum amount of pressure variation dictates that that will be the case.

Q Do you expect any of the reserves to migrate outside the area of your study?

A No, sir, I don't expect an appreciable volume, percentage-wise, I do not expect-- there of course will be some migration across our red boundary line, but the percent of migration that's taking place within this area as a whole will be much larger than any migration that's occurring across the lease line.

Q As a matter of fact, there will be migration regardless of that formula? Whatever formula may be used, the actual production will result in migration, will it not?

A To some degree.

Q Yes.

MR. HOWELL: That's all.

MR. PORTER: Does anyone else have a question of the witness? Mr. Utz.

By MR. UTZ:

Q Mr. Liebrock, I believe you stated earlier in answer to Mr. Malone's question, also Mr. Campbell's question, that you didn't feel there was enough deliverability information available to study the area outside this small area that you have studied?

A Yes, sir.

Q Are you familiar with our four-point method test that we run in Jalmat?

A Yes, sir.

Q Do you consider that deliverability information?

A Yes, sir, we utilized a great many of those in our study.

Q Do you know how many of those tests are in, how many wells have been tested by the four point method?

A As of right now?

Q Yes, sir.

A No, sir, I don't.

Q What percentage of wells reported would you think would be an ample amount of deliverability information to have studied the area outside of this area, small area?

A Well, sir, assuming for the moment that the quality of our other reservoir data is as good as we have in this area we have studied, then if we could get percentage-wise close to what we had in the 11,000 well area, then I think it would be sufficient.

Q What I'm asking you is not about the other reservoir area, but about the deliverability information which you said was one of the reasons for not studying the area?

A Yes, sir.

Q Would eighty-five percent of the wells being tested, would deliverability information be ample as far as deliverability is' concerned?

A Yes, sir, I think so, other things being equal.

A Would it surprise you to know that we have eighty-five percent of those wells tested?

A No, sir, at this moment it wouldn't.

Q At the time you made your last study, would it surprise you to know that you had probably over seventy-five percent of the wells tested and the information available?

A No, sir, I wasn't aware of that.

Q If you had know that, would that have made any difference in your decision not to study the area outside of your picked area?

A Well, sir, it certainly would have been a factor.

Q For your information, it appears that you didn't know at the time you made the first study that there was that much information available, and as of now there is eight-five percent of them available. Now your reserve studies kind of put me in a quandary. There are about four factors in the volumetric reserve calculation, is that right, that are reservoir factors that are important to the calculation?

A Yes, sir.

Q Could one of those be porosity?

A Yes.

Q Could one be connate water?

A Yes, sir.

Q Where did you get your connate water and porosity information to calculate the reserves that you show on your Exhibit 5-R, I believe it is?

A We use the average porosity figure that we indicated pre-

viously.

Q From the five cores that you indicated in the last hearing?

A Yes, sir.

Q Three of those cores were outside of this area, were they not?

A Yes, sir, I believe so.

Q Two of them inside the area?

A Maybe four out and one in.

Q You applied those average figures to each well that you calculated the reserves on, or each tract?

A Yes, sir, that is correct.

Q Those two factors, if you use the same porosity and the same connate water for each well, you couldn't hope to show much variance in reserves, could you, if you used the same factor on each tract?

A We indicated that we didn't have any reason to believe that the porosity would vary.

Q What reason did you have to believe that that porosity that you used was applicable to each tract that you calculated reserves on?

A In my study of sand reservoirs all over this country, it has been my experience that the porosity of sandstones don't vary to the extent they do in limestone, and that over tremendous areas you can have rather appreciable variation in permeability, but the porosity may not vary over two percent. When I found five

core analyses, I came up with the range of sixteen to seventeen percent porosity, roughly, I felt that with a great deal of confidence that I could use an average porosity figure. I feel in all sincerity and I know from my experience that I did not introduce appreciable error in these. I can cite field after field of sandstone fields from my own files to support my position on that matter. Now if my average porosity did not vary, and I have good reason to believe it doesn"t, then I don't believe that the use of an average interstitial or connate water value introduced appreciable error in the calculation. That is based on my experience, not only in this field but every sandstone field that I have ever analyzed.

Q Does porosity vary vertically throughout the section?

A Yes, it does.

Q Is is very consistent?

A No, it isn't very consistent.

Q Do you think there may be a chance of it varying quite a bit among the tracts you calculated the reserves on?

A The average, no, sir, I very defintely do not.

Q Two of the other most important factors in alculating reserves by your method is pressure and net pay, is that right?

A Yes, sir.

Q How did you arrive at the net pay on these various tracts?

A From the logs that we had available primarily radioactivity logs.

A And your pressures are determined by actual bottomhole pressures?

A Surface pressures corrected to bottom-hole conditions, yes, sir.

Q Pressures didn't vary a great deal in this area, did they?

A No, sir, as I indicated previously, the pressures varied approximately one hundred pounds, maybe a little more.

Q You think that a hundred pound variation in pressures is representative of the whole pool? A No, sir.

Q Do you know what the variation of pressures is throughout the Jalmat Pool?

A Yes, sir, roughly, yes, sir, I don't know the value of the lowest well or the value on the highest, but I have a pretty good knowledge of the order of magnitude of variation.

Q Would there be a pressure, in your opinion, as high as 1,060 pounds?

A Yes, I'm sure there would be.

Q Do you know of any pressures as low as 350 pounds?

A Yes, sir.

Q That is quite a bit more than 100 pounds, isn't it?

A Yes, sir, it is, but if you don't mind I would like to point out that that is not the test of deermining the applicability of a formula.

Q How does pressure affect reserves?

A Well, it enters into the pore volume calculation in direct proportion.

Q In other words, are you telling me that 333 pound pressure, everything else being consistent, would have the third of the reserves of a thousand pound pressure?

A Oh, roughly.

Q Is the pressure directly related?

A Yes, sir. That's what I just said.

Q That is quite a bit more in the variation of pressure than you get in your small area?

A Yes, sir, that is not the point.

Q All right. I would like to know the point.

A The point is simply this, that where you have, even though you have only one hundred pound variation in pressure, and even though you only have a 3.5 fold variation in porosity, or excuse me, in net pay thickness, you have a forty-three fold variation in deliverability. Now, you have this variation in an area of the field where it's pretty obvious from the pressure map that migration is going to be the most severe. Where would you attempt to determine the order of magnitude of migration in this field other than this area, even assuming for the moment that the quality of all our reservoir information was equal throughout the field, any engineer approaching this problem would immediately reconize from the pressure distribution that this is the area where migration is

going to be extremely severe and this is the area that you would center on. Areas where you have sharp pressure gradients are not indicative of tremendous volumes of gas movement, they are indicative of a tight reservoir rock.

That is my point, you can't find a better area in the field to investigate the applicability of this formula or any other formula than this area. The quality of your data is a lot better here, I might say all of it, your pressure data, I have a lot more confidence in the pressures that I read in this area than I do any other area in the field.

When you mentioned the pressure of 350 pounds, I don't know whether that is a good pressure or not. It may not be built up, it may be 450 pounds, but in this area I am confident that we have a lot better quality pressure data and everything else than we do in any other portion of the field. So if the deliverability formula doesn't meet the test here where we have got good data, how can it possibly meet it any other place. That's my whole point.

Q What you are actually saying is that you don't know too much about the rest of the field but you do know quite a bit about this area?

A Yes, sir, it's very obvious that we know a lot more about this area than any other portion of the field, but I would like to point out further that I think all of us know more about this area because we have more data that we can rely on in this area. I don't

think any of us know as much about the rest of the field as we do this area, if we make a general concerted effort to understand it any analyze it. I would like to add one other thing, if you don't mind.

Q Go ahead.

A In my study of oil fields and gas fields over the country where you have a tremendous aerial extent and where you have the pressure variations that you observe in this field, it isn't common practice to attempt a field-wide study. You generally study your reservoir by areas, you can learn a lot more about them and you can come up with conclusions and recommendations that are a lot better supported if you will study your reservoir by areas than if you attempt to lump the whole thing together and arrive at some broad conclusion based on overall performance. Nothing could be more misleading than to throw the whole reservoir in one study and attempt to arrive at some conclusion and recommendations.

Q How would you prorate the Pool?

A Sir?

Q Don't we prorate the pool on an entire pool basis?

A Yes, sir, and that't one of the difficulties.

Q Would you suggest breaking the pool down in smaller areas?

A For study I definitely would.

Q For proration, we are talking about proration formula.

A Well, I haven't gone into the field-wide study of proration,

but for study, to get some idea of what you might do, I would certainly bread the field down into areas, and I believe every reservoir engineer would break the field down into several areas to study, I feel confident that they would.

Q Would you have available the actual reservoir calculations for each of these tracts shown on Exhibit 5-R?

A Yes, sir, I believe we do. They were out at the noon hour, I believe they are back now.

Q Well, I don't mean to put them in now, but would you make those available to us? A Yes, sir.

Q I would like to go into Exhibit 1-R very briefly with you, you made a comparision, at least I understood that you did. Were you comparing a tank with so much pressure in it to Jalmat reservoir?

A No, sir, I'm comparing it in Case 2, I'm comparing it to a lease in the Jalmat reservoir. In Case 1, sir, I can't compare it to a lease because it is not analogous to the situation we have in the Jalmat reservoir.

Q That is the point I want to clarify in my mind.

A Yes.

Q There is no permeability barriers or anything in that tank, is there? A No, sir.

Q It is completely homogenous? A That's right.

Q You are not saying that Jalmat reservoir, is that homogenous then?

A No, sir, it is not a matter of homogenity, it is the matter of developing a case that is analogous to the reservoir.

Q Are you comparing a valve on a tank with the availability of gas to a well bore?

A I'm comparing it to the deliverability, yes, sir, of a well.

Q Well, would the availability of gas to the well bore affect the deliverability?

A The permeability of the reservoir, yes, sir, would affect the deliverability.

Q I mean if all the pay was open to the well bore as compared to half of the pay open to the well bore.

A Yes, sir, that would make a difference.

Q A difference in deliverability, wouldn't it?

A Yes, sir.

Q Let me ask this question, do you think that the vertical communication throughout Jalmat Pool is good?

A Well, sir, I don't know.

Q Would you suspect it to be shale lenses and so forth that would affect vertical deliverability?

A Yes, I suspect there would be.

Q Then in that case, if the well only had 50% of the net pay available to the well bore, the rest of the gas wouldn't be available for production, wouldn't be recoverable reserves?

A It wouldn't be available to that well, but it would be

available to the offset well if he had it open.

Q I thought, that is what we are trying to get away. I thought you wanted to let the individual tract produce its own reserves.

A That's what we do want to do.

Q Then the answer to your question is simply if a well has only fifty percent of the gas available to the well bore, that he wouldn't get it somebody else will?

A If the vertical communication, i didn't say that the vertical communication wasn't good. I said that I suspected that there were instances where there would be shale breaks that would prevent good vertical communication.

Q But you don't really know whether it's good or not?

A No, sir.

Q One more thing, I hate to bear on this point too long, we have already had two questions regarding it, but your statement that fracking a well will not increase ultimate gas recovery is a little confusing to me. I wonder if you would explain why you don't think that by having the well in good condition and having a little higher deliverability will not increase the ultimate recovery of gas from that well.

A I didn't say it wouldn't increase the ultimate recovery, but I don't think it will result in appreciable increase in ultimate recovery because you would have to increase the average

permeability of your entire reservoir rock rather substantially in order to get the abandonment pressure down to a lower value and to a sufficient lower value to substantially increase the ultimate recovery.

Q Are you familiar with the producing characteristics of a Jalmat well?

A Well, I know I'm familiar with the ability of the wells that deliver gas based on the deliverability data I have.

Q Do you know whether or not you have substantial liquid problems?

A In some wells, yes, sir, I know you do.

Q In a well that you have substantial liquid problems and have to lift liquids of either water or hydrocarbons, what causes thos liquids to come to the surface?

A The entrainment in the gas, if I understand your question.

Q Isn't it the velocity of gas in the flowing string?

A Yes, sir. That's a factor.

Q And when your velocity falls to a certain point, then the well fails to lift liquids, is that right?

A I can imagine conditions where that would exist. I don't know though that that is a problem, a big problem in the field as a whole. But for a hypothetical question, yes, sir.

Q Well, by fracking a well and maintaining a mere velocity and flowing string, wouldn't you say that you would lift more of those

liquids in a well at a lower pressure?

A Well, if we stay with your original problem now of a well that is making some liquids to begin with, some water, and we've having trouble getting it out because we don't have enough velocity as you say, and if this well is already making water, and I don't know where the source may be, but I would be concerned about fracking that well in the first place. I sort of suspect that if it might be bottom water and went in the fracked it, you would have so much water that regardless of the deliverability you would never lift anything. I suspect that you might junk the well.

Q In other words, you would be afraid of fracking into a water zone?

A I would be afraid of fracking into water in a number of wells in this pool.

Q Do you think that fracking will open up more gas to the well bore?

A No, sir.

Q You don't think fracking will penetrate the parts of the reservoir that would not be otherwise penetrated?

A Fracking alone, no, sir, I very definitely feel it would not. I am almost positive that it would not.

MR. UTZ: That's all I have.

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

MR. HOWELL: Can I ask one more question here.

MR. PORTER: Yes.

By MR. HOWELL:

Q Referring to your Exhibit R-5, Mr. Liebrock.

Q Is the length of your bars there placed accurately?

A Yes, sir, I think they are.

Q Well, excuse me a minute. Do you happen to have a slide rule, or is there a slide rule in the house? Would you measure this bar and tell me what the reserves are for this well?

A Well, approximately 28,000.

Q MCF. In other words, you measure this bar and tell me What the reserves are for this well?

A Approximately 29,000.

Q Well, inasmuch as it is the same well, how did you happen to assign a million feet per acre different reserves?

A You mean in the bar height here?

Q Yes.

A You mean this difference right here?

Q Yes.

A Well, sir, that is obviously a slight error, but I don't

Q It amounts to more than a million feet per acre.

A Yes, but percentage-wise it is not important, I think you will agree it is not.

Q I just wondered as to the reliability of your charts and the calculations made, and you have answered my question.

REDIRECT EXAMINATION

By MR. MALONE:

Q Would you say that your draftsman had ended this bar one row too soon?

A Yes, sir. I watched my draftsman put that tape on, and he was sure in a hurry at the time.

MR. MALONE: I would like to ask about two more questions, if there are no others.

MR. PORTER: Go ahead, Mr. Malone.

Q With reference to the deliverability data that was available at the time the study was made in preparation for the December 9th hearing, there seems to be some confusion about the amount of data that was available in Santa Fe, as compared to the amount of data that you had available to use?

A Yes, sir.

Q While it has not been so testified, Mr. Utz' question indicated that there might be available data on seventy-five percent of the wells outside of the test area?

A Yes, sir.

Q Now where did you check the Commission's files for this data?

A Well, I know that we checked the Commission files in Hobbs.

Q You had a working part of some ten or twelve engineers working on this for a period of two or three weeks, did you not?

A Yes, sir, that is correct.

Q You do know that all of the data that was available in the

Hobbs office of the Commission was utilized?

A Yes, sir.

Q And in addition were checks made of the files of all of the companies that were involved in this joint effort?

A Yes, sir, that definitely was my understanding.

Q So that in testifying that that was the extent of the deliverability data available to you, were you correct insofar as you then knew or now know?

A Yes, sir, I certainly was.

Q And if there was additional information available in Santa Fe, was that known to you at any time?

A No, sir, it wasn't.

Q Do you know what the practice as to the filing of this test data is with reference to whether it is available in Hobbs if available in Santa Fe?

A No, sir, except it was my understanding, and I didn't confirm it and I thought that any data that would be available anywhere would be in Hobbs.

Q The eight or ten engineers that were working with you work with the New Mexico Commission all the time?

A Yes, sir, a number of them do.

Q And you did have a detailed check made of every well file in the Hobbs office of the Oil Conservation Commission, did you not?

A Yes, sir.

Q Now, some implication existed in some of the questions with reference to the 11,000 acre test area which you studied and whether or not the conclusions which you reached there were necessarily applicable other places in the Pool. I would like to ask you whether or not the purpose of your study of this area was to see how the deliverability formula would compare as to the wells in this area?

A Yes, sir.

Q Would the condition that may exist in other parts of the area affect how this formula is going to relate to the wells in this area?

A No, sir, it would affect in no way.

Q For that reason, was or was not the basis of your study perfectly adequate for the purpose that it was being conducted?

A Yes, not only was it perfectly adequate, but in my opinion it lent itself better to determining the applicability of any formula than any other area of the field, or for that matter, the field as a whole.

Q Mr. Liebrock, if the proposed formula will not work in this area, based on the study that you have made, and will result in this area in a redistribution of some five million dollars in ultimate recovery between operators, is there any reason to believe it will work any better in any other part of the field?

A No, sir, I have no reason to believe it will work any

better in any other part of the field.

Q Does the fact that you did not study any other part of the field affect your conclusions as to what it will do in this part of the field?

A No, sir, not at all.

MR. MALONE: That's all.

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

MR. MALONE: I would like to offer the exhibits. I believe I failed to ask the witness if the exhibits were prepared by him or under your direction. A Yes, sir, they were.

MR. MALONE: We offer in evidence Exhibits 1-R through 7-R.

MR. PORTER: Is there objection to the admission of the exhibits? They will be admitted. The witness will be excused.

(Witness excused.)

HENRY J. GRUY

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

DIRECT EXAMINATION

By MR MALONE:

Q Will you state your name to the Commission?

A My name is Henry J. Gruy.

Q Where do you live, Mr. Gruy?

A I live in Dallas, Texas.

Q What is your profession?

A I'm consulting petroleum engineer.

Q What is the name of your firm?

A H. J. Gruy and Associates.

Q And is its offices located in Dallas?

A Yes, sir.

Q You have not testified before the New Mexico Commission on a prior occasion, have you? A I have not.

Q Where did you receive your professional education, Mr. Gruy?

A I was graduated from Texas A. and M. College in 1937 with a B.S. degree in petroleum engineering.

Q Have you received any graduate degrees from that institution since then?

A Yes, sir, I was later awarded the professional degree of petroleum engineering which is a degree that can't be obtained by going to school alone, it's based on professional activities in the business.

Q How does it relate as compared to a Master's degree or Doctor's degree?

A It's lower than a Doctor's degree, but higher than a Master's degree.

Q What was your first employment as a petroleum engineer after your graduation from Texas A. and M.?

A I went to work for Standard Oil Company of Texas in Ward

County, Texas as a field petroleum engineer.

Q For how long were you so employed?

A Until March of 1938.

Q By whom were you employed thereafter?

A By the Shell Oil Company as an exploitation engineer.

Q For how long did you continue in that position with Shell?

A I worked as an exploitation engineer with Shell in various districts and various capacities in Soth Louisiana, North Louisiana, Arkansas, Texas Gulf Coast area and East Texas until October of 1945.

Q Did you have occasion during that period to be dealing with gas reservoirs and gas reserves?

A Yes, sir, I certainly did. At the time that I left Shell I was district engineer in their East Texas District, and I was Shell's representative on the East Texas Field Engineering Committee and the Carthage Field Engineering Committee, and I was Chairman of the Engineering Committee for the Chapel Hill Paluxy Gas Cycling Unit, and I was member of the Geological Committee for the Chapel Hill Paluxy Gas Cycling Unit.

Q Was the Chapel Hill Paluxy Gas Cycling Unit a gas unit of considerable size?

A Yes, it was a gas unit, it had approximately one hundred billion cubic feet of reserves, it wasn't a large one.

Q You referred to the Carthage Field in Texas, is that a

large gas field?

A Yes, sir, that is a large gas field with about seven trillion cubic feet ultimate recoverable gas, it covers most of Penola County, Texas.

Q How many wells, if you know, in that pool?

A There are several hundred wells. I forget exactly how many wells there are now.

Q After you left Shell in 1945 with what company were you associated?

A I was employed by DeGolyer and MacNaughton, a consulting petroleum engineering firm out of Dallas, Texas.

Q How long did you continue with the De-Golyer and MacNaughton?

A I was with them for almost five years.

Q At the time that you left DeGolyer and MacNaughton, did you leave to establish your own consulting firm?

A I did.

Q What was your position with DeGolyer and Mac Naughton at the time you left them?

A During my entire time with them I was in responsible charge of the reports that were made on the East Texas-Louisiana, Arkansas and Mississippi area, and I did most of the gas reserves and deliverability studies that were done by the company during that period.

Q At the time that you left De Golyer and Mac Naughton, had

that firm been incorporated?

A Shortly before I left, yes, sir.

Q What was the title of the person who held your post after the incorporation?

A Person that took my place and many of the men that worked with me, and some of the men that worked under me, were all made Vice Presidents shortly after I left.

Q You have been active as a consulting petroleum engineer since 1950? A Yes, sir.

Q Will you give us the names of a few of the typical clients of your firm?

A Well, I worked for a large number of major companies, independent operators, several branches of the Federal Government; some of the companies for whom we have worked are Atlantic Oil and Refining Company, British American, Warren Petroleum Company, Tidewater Oil Company, Seaboard Oil Company, Socony-Mobil Oil Company, H. L. Hunt, Clint Murchison, Rockefeller Brothers.

Q I think that's enough. During the period of time that you have been active as a petroleum engineer, and particularly in the gas field, in what states or areas have you had experience in making reservoir studies?

A Well, I think I have made reservoir studies in all major producing areas of the United States, in several areas in Canada, British Columbia, Alberta and Saskatchewan and Alaska and in all

producing areas of Venezuela and some in Columbia.

Q Are you a member of any professional societies?

A Yes, sir, I am a member of the Association of Petroleum Engineers of the A.I.M.E. I am a member of the American Association of Petroleum Geologists.

Q What commissions have you had occasion to testify before as an expert?

A I have testified before the Texas Railroad Commission and the Louisiana Conservation Commission and the Oklahoma Conservation Commission and the Montana Conservation Commission and the Federal Power Commission.

Q Have you had occasion to write any articles in the general field of petroleum engineering?

A Yes, sir, I have authorized several papers that have been published.

Q Have you written any papers on the particular subject of the methods used in the estimation of gas reserves in reservoirs?

A Yes, sir. I wrote a paper entitled Critical Review of Methods Used in the Estimation of Natural Gas Reserves that was delivered in 1947 before the Mid-Continent Section of A.I.M.E. in Tulsa, and before the Pacific Coast Section of A.I.M.E. at Los Angeles that same year.

Q That paper has been published?

A Yes, sir, it was published in the Transaction of A.I.M.E.

1948

Q Is it still in distribution?

A We have had many requests for copies of that paper and we still get requests for copies of it. We had a request last month from Germany for copies of the paper.

Q Does that paper deal with the question which you understand to be involved in this case as to the basis on which the reserves should be computed?

A Well, it deals with method of estimating reserves, yes, sir.

MR. MALONE: Are the qualifications of the witness acceptable?

MR. PORTER: Yes, sir.

Q Tell us about when your first contact with this controversy was, Mr. Gruy.

A I learned of this controversy on Monday, March 10th when Mr. Liebrock called me.

Q Have you ever collaborated with Mr. Liebrock prior to this time or been jointly engaged in any undertaking with him?

A No, sir.

Q You do know his reputation as a consulting geologist in the field?

A Yes, sir, I have know him for many years.

Q In preparation for your testimony in this case have you reviewed the transcript of the testimony which has gone into the case up until this time.? A Yes, sir.

Q What further studies have you made?

A Well, our staff plotted all the pressure production history that was available on all the wells in this entire reservoir and we made projection of that to show that the gas that was going to be produced by those wells under continuation of the same situation.

Q Now, have you had occasion to deal with gas prorationing during the period of time that you have been in the engineering field?

A Yes, sir. Any time that we make a gas reserve and deliverability study we have to consider the proration formula in effect in order to see how the reserves in the reservoir are going to be distributed to the various tracts and what the future expected producing rates, what the future producing rates can be expected to be from the wells.

Q Based on your contact with the history of gas prorationing and its operation, will you briefly recount the part that potential or deliverability has had in proration formulas to your knowledge?

A Well, I believe any discussion of proration and proration formulas would have to start with oil proration, is where proration began and proration really has its beginning with the Yates Field and the East Texas Field when oil was in excess supply and some method was needed to reduce producing rates since wells had been producing at their maximum capacities, and the most obvious immediate way to curtail that production was a percent of capacity, and that

is a proration formula that was adopted for both Yates and East Texas, East Texas being allowed to produce only 3.2% of the wells hourly potential.

Q When you say percent of capacity, is that the same as percent of potential or percent of deliverability?

A Well, capacity potential and deliverability are all measures of a well's ability to produce. Now, when you say potential of a gas well, one usually thinks of the calculated absolute open-flow potential on the falacious assumption that you can get zero pounds at the bottom of the hole which adjusts to make a common measurement of all wells not restricted or affected by the different sizes of the casing or the size of the deliverability.

Deliverability is usually thought of as deliverability against some fixed back pressure or according to some formula such as a percent of the shut in pressure.

Q As the history of prorationing has developed, has the use of potential and deliverability increased or decreased in proration formulas to your knowledge?

MR. CAMPBELL: We're talking about oil and gas now?

MR. MALONE: Either.

A Well, as these proration formulas got tried out in the Courts over the land, and as people become proration officials and everybody becomes more cognizant of the necessity of protecting correlative rights, the use of potential factors in proration

formulas for both oil and gas has declined so that they're very rare in new proration formulas.

Q Is that same statement true of deliverability and in gas proration formulas?

A Yes, sir. Now the last in Texas, the last use I know of a potential factor in a proration formula, was in the Carthage Field where it was discontinued for several reasons, amoung them being the inability to make the tests in a comparable manner on all the wells so that everybody was satisfied with the deliverability test was one of the reasons that it was dropped out of the proration formula at Carthage.

Q Do you know of any recent gas proration formulas in new pools in which deliverability has been used as a factor anywhere in the Western Hemisphere? A I do not.

MR. CAMPBELL: What is the question?

REPORTER: Reading: Do you know of any recent gas proration formulas in new pools in which deliverability has been used as a factor anywhere in the Western Hemisphere?

Q I will qualify that by saying within the last two or three years.

A That's what I thought you meant, when you say new pools in the last year or so. I wouldn't classify the San Juan Basin as a new pool. I guess the definition of new might vary a little bit.

Q Are you familiar with the New Mexico statute defining correla-

tive rights? A I think so.

Q I would like to read that statute to you to be sure there is no misunderstanding as to what it provides. For purposes of the questions I will ask you, will you please bear in mind that the New Mexico State Section 65-3-29 H provides as follows:

"Correlative rights means the opportunity afforded so far as it is practicable to do so to the owner of each property in a pool to produce without waste his just and equitable share of the oil or gas or both in the pool, being an amount so far as can be practicably obtained without waste substanitally in the proportion that the quantity of recoverable oil or gas or both under such property bears to the total recoverable oil or gas or both in the pool, and for such purpose to use his just and equitable share of the reservoir energy".

Now, will you bare in mind that definition of correlative rights in the further questions which I will direct to you? I would like to ask you, Mr. Gruy, whether or not it is possible to determine the recoverable gas in a tract or underlying a tract assigned to a well by use of the so-called material balance equation as applied to the pressure decline of that well?

A No, sir.

Q Can you show us why that isn't possible?

A Well, I'm not a very good artist, but I can maybe draw a picture. Now, I'm intending this to be a kind of a rectangle

affair where this line would be comparable to the bottom of the pay and this surface here would be the top of the pay, and that this is just a segment cutout covering say a section of land, and that you have a well in each quarter section located here, here,here and there. We might assume then that these wells, although they have the same pay thickness and the same amount of gas in place under their unit, assuming that each one of them is a fence line that goes along there.

MR. PORTER: You mean along the quarter section lines?

A That this is a quarter section and this is a quarter section, that is a quarter section. And that each one of them would have the same amount of fence, doesn't go on down there. If we sould assume that this well has a deliverability of one, and this one two, this one three and this one four, and if we would then plot--If the man that has the slide rule wants to see if these are the same size, I am going to have to plead ignorance. If the production increases in that direction and pressure increases in that direction on the plot and that point there is the original pressure in that reservoir, we then start those four wells to producing according to their deliverability and the pressure is going to go down equally on all that, just like it has in Mr. Liebrock's 11,000 acre area, because there is good communication in there so that when the pressure reaches a certain point here, this well will have produced one--make some lines on here, they are crooked lines but

they are supposed to be straight. This one will have produced one down to this pressure, this one will have produced two, this ould produce three, and that one would have produced four, and it's obvious then that even though the lines are straight and we don't have the kind of thing that he showed when you can see where this drainage situation changed in Exhibit No.2-R, you can see where the drainage situation changed and where drainage happened in these two curves on the left.

Now on these (indicating), you can't see where the drainage has taken place, but if you extrapolate those down to zero pressure, you can see that your Well No. 4 is going to produce four times as much as Well No. 1, and the whole reservoir is depleted, so Well No. 4 had drained these other wells. So that by this method and this method alone you can't possibl tell what the recoverable gas in place is under a tract. You can tell how much it is going to recover under particular conditiosn, but as I understand the STatutes as he read it to me, the proration is upposed to be in proportion as to what was down there in place, and it does't say when, but I imagine they meant initially, so that this certainly wouldn't do it.

Now I think I might be able to explain that a little more clearly to you and cover the thing in a little broader manner in another way.

Well, I want to draw some wells. I'll put these little

things on the, that makes them gas wells. You can see I never was a draftsman. We'll assume that those are nine gas wells located out here in the Jalmat Field, and as I understand it, that they don't need to be in the center of the unit, so we'll say that this well's unit is there. Now the gas that is in place under that is what this man that owns this well is supposed to be entitled to produce in proportion, or to have a fair chance to recover. Now the, we'll put all these wells to producing at the same rate and we'll assume that the formation is uniform on there, and if they are producing at the same rate and the formation is uniform, this well will interfere with this well about half-way, and this well will interfere with this well about half-way between there, same here and same here (indicating), I can't measure half very close, and same here and same here and same here and same here, so as long as those wells are producing at the same rate this well's drainage area is right there (indicating), which is not equivalent to the area that's under the unit.

Now while that's going on, let's look at the pressures over here (indicating), you have production increase in that way, pressure increasing that way, as long as those wells are producing at that same rate the pressure will go as a straight line if it started initially, it will be initially on a straight line slope like that as long as the wells are producing at that rate, if you extrapolate that curve to abandonment pressure it will tell you

how much this well is going to produce or how much recoverable gas is in place under this area; not under the lease or the unit that's assigned to it, but under that area. Now then, assume that this well has a little bit higher deliverability than the other wells, and it increases its rate of production due to a change in the proration formula relative to the production of the other wells, we are going to keep them all the same. We are going to increase this one, as soon as we do that, the point of interference is going to be closer to that well, here closer to that well. How much closer, due to variations in the pay thickness and variation in the rate, if this one is greater it is going to move closer, since I haven't said how much greater. I don't have to measure, that's why I don't say. So the drainage area now is out here (indicating). As soon as that happens, that is reflected right up here in this little thing (indicating), so that this curve is flattened. Now at this time you estimate the reserve of this well and you assume this proration formula is going to stay in effect, after you estimate it is going to do that, you estimate it is going to produce a whole lot more gas eventually than it does now.

If you are going to prorate it on the basis of reserves, it will get alot more reserves, but we haven't changed the amount of gas under it originally, and they have never been consistent with what is reflected in that curve. Conversely, if you shut the well back to where it is producing slow, they will extend their

drainage area toward it and you will get a reduced thing there, when you do, this becomes steeper. If it cuts back to the same place of course it will be the same slope it was, but if it cuts back inside the first, I have to make the last one steeper than the first one, or I haven't made a true correlation.

We have plotted up every well in this field and all the pressure production data that has been filed with the Commission, and we can see where those things happened with the relative producing rates and the relative takes of the well where those have been changed. Now Mr. Liebrock has picked out a couple of them here that are good examples of them, but the point that I wanted to make is that the reserves of a well which can be determined by a pressure production plot has no relationship to the recoverable gas in place under a unit assigned to it.

Q Now, Mr. Gruy, I would like to ask you whether or not in your opinion as an engineer there is any correlation, either general or otherwise, between the deliverability of a well and the recoverable gas in place in the tract assigned to that well?

A In my opinion there is no correlation between the deliverability of a well and the reserves in place under the tract assigned to that well, or the gas in place under the tract assigned to that well. Of course, you have got the fact that if you have got some deliverability there must be some gas in place under the well, but it doesn't hold at the other end of the scale because you can have

no deliverability and still have a lot of gas in place under the tract, either through not locating your well at the right place or bad mechanical condition or tight spot or something of that sort.

Q Is there in your opinion any fixed or general correlation between the recoverable gas in place under the tract assigned to a well and the reserves which may be found by the extrapolation of a curve to be applicable to that well?

A The extrapolation of a curve like that, as I tried to demonstrate, reflects only the relative producing rate of that well with reference to its neighbors, and does not reflect the reserves in place. I don't want to say reserves, I want to say gas in place under it unit.

Q It is subject to being distorted by various conditions, is it not?

A That's right.

Q You have read the testimony in this case with reference to the extrapolation of the curves made by Texas and Pacific. Did you note anything in that condition that would have resulted in a distortion of the reserves as computed by them?

A Well, they computed their reserves in this manner, and assuming that the wells continued to produce in the same manner, I think the reserves are approximately correct.

Q But do they have any relation to the recoverable gas in place under the tract assigned to those wells?

A None whatsoever, and I don't think they said they did.

Q Have you read the Commission's order in this case?

A No, sir, I haven't read the Commission's order.

Q I would like to ask you, based upon your dealing with the gas proration formula, whether or not in your opinion stability in a gas proration formula, once it has been established, is desirable?

A I think it's highly desirable and I think stability in the oil and gas business, of course, maybe I'm prejudiced on this, but I would like to see stability in the oil and gas business. We know that proration brought stability to the oil and gas business to a greater extent than it had even been known before.

Q Are transactions and engineering reports based upon proration formulas as they exist at the time they are made?

A Yes, sir.

Q Is there a marked effect on the transactions in those reports if there is a change such as the one proposed here, from an acreage to a deliverability formula?

A Well, the proposed change here would certainly redistribute the ownership of the gas in the Jalmat Pool, and it would certainly affect any appraisals that were made, it would cause some that have been made in the past to be pretty far off.

Q Now, with reference to the testimony which you have heard in this case today by Mr. Liebrock and the exhibits which he has

presented, you have heard the question directed to him with reference to the validity of the 11,000 acre area as a basis for the volumetric calculation study which he made and the conclusions which he drew from examining the deliverabilities of wells in that area. Do you have any comment as to the correctness and reliability or unreliability of what Mr. Liebrock has done?

A I think Mr. Leibrock has made a sound study and as sound a study as can be made under the conditions. I could find nothing technically wrong with it. Of course, we would always like to have more data.

Q In your opinion, if a study of the wells in that area indicated the complete lack of correlation which was indicated by these exhibits between deliverability and recoverable gas in place, you think there is any reason to assume that the condition will be materially better in the Pool as a whole?

A Well, even if it is, it is bad enough in this area to say that such a formula is not justified.

Q Is that your conclusion?

A Yes, sir.

Q Do you have any further recommendations that you would like to make to the Commission in connection with the question here presented?

A I can't think of any that wouldn't be repetitious.

MR. MALONE: That's all.

MR. CAMPBELL: May I ask for a ten-minute recess?

MR. PORTER: You beat me to it. Ten minutes.

(Recess)

MR. PORTER: The hearing will come to order. Mr. Malone, I believe you have another question.

MR. MALONE: Thank you, Mr. Commissioner.

Q Mr. Gruy, you have heard the testimony with reference to a possible frack race that might result from the injection of deliverability into this proration formula, would you state whether or not in your opinion it is likely that that would occur?

A Oh, I think it definitely will occur.

Q Would you state whether or not in your opinion the fracking of all or a majority of the wells in this pool which have not been fracked would increase the ultimate recovery of gas from the Pool?

A Well, the fracking, if highly effective as I expect it to be, would increase the deliverability of most of the wells in the field and would enable the field to be operated so that at economic gas production rates to a lower pressure than would otherwise be possible initial wellhead pressures were in the order of 1200 pounds, and we are talking about abandonment of about 100 pounds which would leave about eight percent of the gas in the reservoir at abandonment.

Now, if by fracking you can lower that pressure to abandonment pressure to fifty pounds, well, you would recover about four percent additional gas in this reservoir if there weren't any other factors

involved. Now, there is some possibility that on the west where these wells are underlain by water, that wells will frack into water and waterlog some part of the reservoir, there's a possibility that if wells near the water contact are produced at too high rates, that they will hasten the coning and fingering of water into those wells so that there will be some gas trapped in these water logged areas and behind the water logged fronts so as to render it unrecoverable there might be enough of that to completely eliminate this four percent, or there might not, I couldn't say, but there would be something less I think than four percent increased recovery due to this fracking.

MR. MALONE: I won't ask you if that exhibit was prepared by you or under your direction. I want to offer Exhibit 8-R in evidence.

MR. PORTER: Is there objection to Exhibit 8-R. It will be admitted.

MR. MALONE: That's all.

MR. PORTER: Anyone have a question? Mr. Campbell.

CROSS EXAMINATION

By MR. CAMPBELL:

Q I want to say you are right about one thing, you are not much of an artist. A Thank you.

Q Mr. Gruy, did I understand your testimony correctly that you had available for your study the same data that Mr. Liebrock had

available?

A Well, I think we did, we got it all from him I believe.

Q You don't know whether you got all of it or not?

A I don't know whether we got all of it, no, I sent one of my men out to his office to get the data. I was tied up somewhere else, he came back with a lot of stuff, but I couldn't say it was everything.

Q You studied that data for a period of fifteen days, as I understood you, since March 10th, is that correct?

A Yes, Along with my staff we studied it during that period of time, yes, sir.

Q Your conclusions with reference to the operation of this formula or the present formula in the Jalmat Gas Pool are based upon that study?

A That's correct, and my previous experience in the gas business, I think that the results would be practically the same almost anywhere.

Q You have never studied this particular pool for reserve purposes, have you?

A I have made estimates of reserves in this pool in the past. I have never studied the whole field until this time.

Q Do you consider that you have studied the whole field in this case?

A We plotted the pressure production history of all the wells

in the field. We did not make a complete geologic study of the field. We did not make a complete geologic study of the field. We reviewed the holes that Mr. Liebrock had and reviewed his study of the 11,000 acre area, but I have not made what I would consider a comprehensive study of the entire field.

Q You stated that you had made a production history study of all the wells in the Jalmat Gas Pool, is that what you meant to say?

A All the wells in the Jalmat Gas Pool that have pressure production history reported in the records where we have plotted it up, some have one point and a large number of the operator' wells never had any pressures reported on them.

Q How many did you plot?

A I believe it was 307, I can check about that number.

Q What data did you use?

A We used the monthly production as reported to the Commission and the close wellhead pressures when thy were reported.

Q Did you use any deliverability data?

A We didn't use deliverability data in plotting the pressure of cumulative production curves, no, sir.

Q You stated in your testimony, Mr. Gruy, that to your knowledge there hadn't been any field's gas pools located recently, I think you said, in the Western Hemisphere with deliverability as a factor. Do you know how many of the prorated, what percentageof the prorated gas pools in the State of Texas are prorated on 100% acreage:

A No, sir, I don't

Q If I told you that that figure is less than 3% would it surprise you?

A Well, I wouldn't be surprised at any figure because I don't know how many are on straight acreage.

MR. CAMPBELL: That's all.

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

By MR. UTZ:

Q Mr. Gruy, do you think that all the wells in the Jalmat Gas Pool will produce gas down to the abandonment pressure of about 100 pounds without some remedial work?

A I imagine that some of those with the low deliverability will not produce at economic rates at 100 pounds. I think that possibly some of the high capacity wells will produce at economic rates at less than 100 pounds if compression or low pressure gathering lines are put in.

Q Then you are actually tying the ability of a well to produce to that abandonment pressure?

A In making precise estimates of reserves and projections for financing purposes and things, we don't use a blanket abandonment pressure in a field. We make not only a reserve estimate, but we calculate how much gas a well will produce each year in the future, and a high deliverability well we take to a lower pressure than we do the low deliverability well, because the high capacity well will

produce at an economic rate of gas, a rate of gas daily sufficient enough to pay its operating costs and taxes to a lower pressure than a low delivery well will. I haven't made enough of a study of this field to know what the variation in abandonment pressure would be, and since both parties in this suit had previously used 100 pounds abandonment pressure, why I used it too. I know that some of the wells will be abandoned at much higher and some of the will be produced at less than that.

Q In other words, you feel then that the better wells will produce down to a lower abandonment pressure?

A Yes, sir.

MR. UTZ: That's all.

MR. PORTER: Anyone else have a question?

MR. CAMPBELL: May I be permitted to ask a few more questions on the point I overlooked?

MR. PORTER: Yes, sir.

By MR. CAMPBELL:

Q Mr. Gruy, you answered my question with regard to the extent of your study that you had plotted production history on 307 wells in this pool. Do you have that data here?

A Yes, sir.

Q Would you produce it, please?

A I wish to correct my testimony. That is, the 379 instead of 307 that we plotted. Maybe some of the wells are not in Jalmet

but the schedule we had said they were in Jalmat, and we didn't Locate them all on there. This is it.

MR. CAMPBELL: We would like the opportunity to examine those records if it is agreeable.

MR. MALONE: Be glad for you to.

MR. CAMPBELL: That's all.

MR. PORTER: Mr. Malone.

REDIRECT EXAMINATION

By MR. MALONE:

Q Are you familiar with the total reserves that were testified to by Texas Pacific's witness on the basis of that extrapolation of pressure curves in the Jalmat Pool and how they relate to the totals which you obtained from the extrapolation of those pressure decline curves?

A We haven't added up our total, except with respect to the 11,000 acre area.

Q That's the 11,000 acre area that was studied by Mr. Liebrock?

A Yes, sir.

Q How did the figures which you obtained in that area compare to the figures which were testified to by Mr. Keller in that Area?

A I don't remember the exact numbers, but Mr. Keller's figures were about fifteen percent higher than Mr. Leibrock's gas in place at the same time, and my extrapolation showed about eleven percent less than Mr. Leibrock's gas in place at that time.

Q Or a difference of twenty-six percent between the conclusion indicated by you and that reached by Mr. Keller on the extrapolation of the same information?

A Yes, sir.

MR. CAMPBELL: I didn't understand his answer that way. It may be correct but I would like to have it clear. Didn't you say there was a fifteen percent difference between Mr. Leibrock's and Mr. Keller's?

A Yes, sir, Mr. Keller's being fifteen percent higher than Mr. Leibrock's mine being eleven percent lower than Mr. Leibrock's

MR. CAMPBELL: Thank you.

MR. MALONE: That's all.

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

(Witness Excused)

MR. PORTER: Is that all the witnesses you have at this time?

MR. MALONE: That concludes the witnesses for the Operators Group. Before our case is closed, I would like to make a motion to amend our petitition for rehearing in one respect. At the time the information on which those petitions was prepared, or at the time they were prepared, we did not have the transcripts before us; on a subsequent examination of the transcript we find that we referred to the case out of which Order No. R-520 grew as being the case in

which deliverability was considered by the Commission. We found that it actually occurred in the case which preceded the case out of which Order R-520 occurred. We ould like to make an appropriate amendment. It doesn't have to be done now. I would like to reserve the right to make that amendment and also to modify our knowledge that Texas Pacific supported deliverability in the case to allege that they participated in the case and that it was urged, and we found that we were wrong in our assumption that that company had supported it.

MR. CAMPBELL: We have no objection to that amendment, of course. I might point out that the record in Case No. 582 is a part of the record in Case 673, so it's actually all one case in any event, insofar as the record is concerned. We are going to request at some stage of the proceedings here that that record, or if the parties do not wish to have the entire record in, that we be permitted to put in the record part of the transcript of that case, in any event, but we have no objection to the proposed amendment and we would like to see you take that part out about us supporting deliverability originally.

MR. MALONE: That will be entirely agreeable with us. I would suggest that we just agree that either party can insert in this record whatever portion of the record from those combined cases they may desire and we won't have to take the Commission's time in reading it into the record.

MR. CAMPBELL: We'll have to put it in in some manner. We can argue it, use the pages for the reference and then argue it.

MR. MALONE: That is what I had in mind.

MR. CAMPBELL: That's fine.

MR. PORTER: Mr. Maone, you didn't want any action on this at this time? You wanted the right to move later?

MR. MALONE: That is correct. I understand Mr. Campbell is agreeable, so we can stipulate to that.

MR. PORTER: Does anyone else among the applicants in this hearing have testimony to present?

MR. DUTTON: If it please the Commission, Sun's representatives are in the unenviable position of having to put on a case following the president of the American Bar Association and Rockefeller brothers engineers. I have been unable to do anything about that, so at this time I would like to introduce our evidence.

We have one witness.

(Witness sworn.)

MR. DUTTON: If it please the Commission, I would like to make the following preliminary remarks prior to introducing Sun's testimony. It is Sun's position that field rules should fulfill two requirements: first, they should act to prevent waste; second, but of equal importance, they should provide each mineral interest owner an opportunity to recover the hydrocarbons beneath his property. A near ideal statement of Sun's position on this matter

is contained in paragraph A of Chapter 65, Article 3, Section 14, of the New Mexico Statutes, of which I now request the Commission to take administrative notice. The paragraph reads as follow:

"The rules, regulations or orders of the commission shall, so far as it is practicable to do so, afford to the owner of each property in a pool the opportunity to produce his just and equitable share of the oil or gas, or both, in the pool, being an amount, so far as can be practically determined, and so far as can be practicably obtained without waste, substantially in the proportion that the quantity of the recoverable oil or gas, or both, under such property bears to the total recoverable oil or gas or both in the pool, and for this purpose to use his just and equitable share of the reservoir energy."

It is significant that the equitable share which the Statute requires that each owner be afforded an opportunity to produce is defined to be in the proportion that the quantity of recoverable hydrocarbons under such property bears to the total in the pool. Such language would seem to preclude allocation upon a basis that ignores the volume of gas under the property assigned to the well.

Sun's case will be directed to a showing that the deliverability of the well has no relation to the volume of gas under the property assigned to such well.

WILTON C.STURDIVANT, JR.

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

DIRECT EXAMINATION

By MR. DUTTON:

Q Would you state your name, please?

A Wilton C. Sturdivant, Jr.

Q By whom are you employed?

A Sun oil Company.

Q In what location?

A Dallas, Texas.

Q Have you testified before the New Mexico Oil Conservation Commission before?

A No, I have not.

Q Would you give them a brief resume of your educational and professional background?

MR. CAMPBELL: We would be glad to agree he is qualified unless you prefer to have him do it.

MR. DUTTON: That's fine with us.

MR. CAMPBELL: We will accept his qualifications. He works for your company.

MR. DUTTON: If that is fine with the Commission, or would you prefer to hear his qualifications?

MR. PORTER: I think we should have a brief statement.

Q Would you proceed?

A I graduated from Texas A. and M. in 1939 with a degree of Bachelor of Engineering, Chemical Engineering. Shortly thereafter I was employed by Magnolia Petroleum Company as a junior engineer, and with the exception of four and a half years spent in the last war have worked in the petroleum industry. There is another exception; I did work for a railroad for one year. During the approximately fourteen years I worked in the petroleum industry, I have worked in the capacity of field engineer, area engineer, district engineer, and in the classification of senior petroleum engineer. During approximately two years of that time I had as a duty the computation of gas reserves for the Sun Oil Company. During approximately eight years of that time I have as an incident to my other duties, have computed and monitered reserves.

Q Mr. Sturdivant, are you a registered professional engineer?

A Yes, I am.

Q In what State? A Texas.

Q In what branch?

A Petroleum and Natural Gas Engineering.

Q Does the Jalmat Pool come under your general area of supervision as a senior petroleum engineer in the reservoir enginerring section?

A It does.

MR. PORTER: The Commission will accept his qualifications.

Q Mr. Sturdivant, you have indicated that you have been associated with the gas department of Sun Oil Company. In your duties in the gas department, were you involved in computing gas reserves?

A Yes, I was.

Q Did you compute these gas reserves on both a tract basis and a reservoir basis?

A Yes, I did.

Q How did you arrive at the recoverable gas in place under the various tracts?

A Recoverable gas in place under a tract is computed as the production of the acreage, the net feet under the tract, or if available the net acre feet as determined by isopac, the porosity, the connate water content of that porosity, and the formation volume factor of the gas within that porosity.

Q Did you ever use an extrapolation of a cumulative production versus pressure curve to determine recoverable gas in place?

A Yes, we have used that method.

Q Under what circumstances?

A Well, we use that method as a monitering or check system to see if the well is recovering the gas that's under the tract assigned to it.

Q Would you use this extrapolation to determine the gas in place under the tract assigned a given well?

A No, No.

Q Why not?

A It doesn't apply. The pressure production extrapolation is an indication of the gas in place in the area being drained by the well, which does not necessarily coincide with the gas in place under a tract assigned to a well.

Q Mr. Sturdivant, in your two years of computing as reserves, for Sun Oil Company, which I think we are using synonymously with recoverable gas in place, were you ever faced with calculating reserves in a field in which the data was sketchy or less than what you would prefer it to be?

A Frequently.

Q In this event would you resort to the use of an extrapolation of the cumulative production versus pressure in a particular well to determine the recoverable gas in place under the tract assigned to that well?

A No, I would not.

Q For what reason?

A The method just doesn't apply, as I said.

Q One other thing, Mr. Sturdivant. Are you familiar with who is substantially in control of Sun Oil Company?

A Yes, I am familiar with that.

Q Who is that?

A Mr. J. M. Pugh is chairman of the Board.

Q During the two years you were in the gas department and in the area under your supervision if Mr. Pugh wanted an estimate of what the reserves of gas were in that area, where did his request end up?

A Well, after going through several more important people, it ended up on my desk.

Q He used your estimates of reserves, is that correct?

A As far as I know, he used them.

Q Has Mr. Pugh much money?

A Far more than I have.

Q Perhaps, in your opinion, is he on the level with Mr. Rockefeller?

A Well, I'm not too familiar with that level.

MR. CAMPBELL: If this is going to be a contest of that kind, we give up, if the Commission please.

Q Mr. Sturdivant, what in your opinion should an allocation formula accomplish?

A An allocation formula should prevent waste and assure equity of correlative rights among property owners.

Q What do you mean by insure equity?

A To assure equity is to give each property owner the opportunity to recover that which is under his own property.

Q What goes into determining what is under his own property?

A The computation of what goes into determining the gas.

under a given property is the acreage of the property, the net feet of porous rock under the property, the average porosity within that net rock, the connate water content of that average porosity, and the formation volume factor of the gas within the porosity.

Q Does deliverability go into that calculation?

A No, it has no place in that calculation.

Q You mentioned formation volume factor. How do you define formation volume factor, or what do you mean by it?

A Formation volume factor, as I have been accustomed to use it, is the volume occupied by a standard cubic foot of gas at reservoir conditions.

Q What is it a function of primarily?

A Pressure, temperature and the specific gravity of the gas.

Q In the Jalmat Field, specifically, what is it primarily a function of?

A Well, it varies from place to place in the Jalmat Field primarily as does the pressure. The temperature and the specific gravity of the gas throughout the pool I believe can reasonably be thought of as being constant.

Q From a practical standpoint, would you say that other things being equal, the gas in place, or let"s state it this way, it is the gas in place under a given tract easily propertional to the pressure existing under that tract?

A Yes, that is approximately true.

Q Specifically referring to the Jalmat Field, in your opinion and for determining the proportional relationship between tracts, could pressure be substituted for the formation volume factor that you previously mentioned as entering into the volumetric calculation?

A Pressure could be substituted for this formation volume factor in computing the comparative amounts of gas under tracts which are side by side, presuming them to have equal acreage, porosity connate water and net thickness.

Q And comparative, is that in your opinion connate proportionately?

A Yes.

Q As used in the statutes?

A Proportionately as between tracts.

Q Thank you. Of the five factors that you mentioned as entering into the determination of recoverable gas in place under a tract, and for which you now indicated that from a proportional standpoint, you may substitute pressure for formation volume factor, which in your opinion, or could be made available and are capable of uniform interperetation in the Jalmat Field?

A Well, certainly acreage can be determined uniformly, bottom-hole pressure can likewise be determined uniformly, and possible acre feet or net thickness under each tract. I say possible because there would be a question of agreement of opinion among various people as to the net effective thickness under their own tracts.

Q Mr. Sturdivant, have you familiarized yourself with alloca-

tion as proposed in Order 1092-A?

A If that is the order number pertaining to this hearing, yes.

Q What does it involve?

A It involves acreage and deliverability.

Q Do you know how deliverability is proposed to be determined for the purposes of this order?

A Yes, the instructions on determining that deliverability are set out in a memorandum of the Commission, the number of which I don't remember at the moment.

Q Does the deliverability as so determined under this order for any given well have any relation to the gas in place under the tract assigned that well? A No, it does Not.

Q Why not?

A Well, this deliverability is a somewhat arbitrary function of the capacity of the well to produce. That capacity of the well to produce in turn is a function of the penetration of net pay, the amount of net pay exposed to the well bore, the permeability of the formation in the neighborhood of the well bore, the viscosity of the gas, and the pressure difference available to drive the gas into the well bore.

Q As proposed by this order, is there any arbitrariness in the manner in which the pressure differential that is suggested to be used in calculating this arbitrary?

A Yes, I believe it has been. Well, I know that it has been

fixed at the pressure difference between the shutin pressure or bottom-hole pressure and 80% of that number. The 80% is arbitrary but it is applied equally to all wells.

Q What volume of gas does deliverability affect, if any?

A Well, deliverability, the deliverability of a well determines the drainage area of a well together with the rate of production of nearby wells, deliverability is related to the volume of gas in the drainage area of a well.

Q Is this volume subject to change according to the manner in which the various wells are being produced?

A Yes, the drainage area of a well will vary as the well and its neighbors are varied in their relative production rates.

Q Mr. Sturdivant, have you studied Sun's wells within the Jalmat Field? A Yes.

Q Are there any variations in deliverability amoung our holdings? A Yes, there is.

Q What is the range of this variation?

A Well, sir, it is approximately two to one.

Q Mr. Sturdivant, to your knowledge--

A Correction.

Q Excuse Me.

A As I review my notes, here it is closer to five to one.

Q Mr. Sturdivant, to your knowledge has Sun Oil Company lost any allowable on the latest reschedule from any of these wells?

A No, it hasn't.

Q They have lost no allowable from the one having the deliverability of a fifth of the maximum well, is that correct?

A That is correct.

Q Has Sun had any problem in keeping their wells on scheduling and on allowables?

A Well, there seems to have been an administrative problem, in that we found it necessary to have almost monthly correspondence to insure that our wells are produced at rates which will secure our allowable.

Q But to date, or at least to the date of the last balancing period, there has been no problem in the well having the lowest deliverability making its allowable, is that correct?

A No, the wells have been able to keep up with their allowables.

Q Mr. Sturdivant, were you in the hearing room when the question relative to the effect of a pressure gradient existing across the field, particularly with reference to migration of fluids was brought out earlier today?

A Yes, I was here.

Q Mr. Sturdivant, in your opinion would an allocation formula based upon deliverability necessarily tend to eliminate that pressure differential? A No.

MR. DUTTON: That's all we have.

MR. PORTER: Does anyone have a question of the witness? Mr. Campbell.

CROSS EXAMINATION

By MR. CAMPBELL:

Q You stated, I believe, that after the summary of your attorney with reference to the proper consideration in an allocation formula, or he stated that any formula which ignores the amount of gas in place under a tract, I don't know if the word was "ignored" or "omits", or what it was, is not a proper allocation formula, is that your opinion?

A Well, it would be less desirable than other allocation formulas.

Q Do you think that a one hundred percent acreage formula gives any consideration to the recoverable gas in place under a tract?

A Yes, it does.

Q In what respect?

A The use of acreage is at least a partial attempt to relate allowables to the gas in place under a tract, whereas deliverability bears no relation to the gas under a tract.

Q Would a formula which gave consideration both to acreage and deliverability have a tendency to make that same sort of recognition?

A If both were included in a formula, the deliverability might offset the acreage or it might bring the total formula more nearly in line with what the gas in place under a tract would

deserve. It would, however, be a matter of coincidence.

Q Mr. Sturdivant, you stated in your experience in estimating the recoverable gas in place under a particular tract, that you used the volumetric method on a specific well. That method does not measure exactly the amount of gas in place under that tract, does it?

A Well, the method would measure it exactly if all the factors were exact.

Q Are the factors ever exact, as a practical matter?

A As a practical matter, it is never exact.

Q As a matter of fact, any time you depart form the size of the bore hole itself you are getting into the realm of uncertainty, are you not, in any type of calculation of reserves?

A We don't use the size of the bore hole in the calculation.

Q I am taling about the information you obtained as a result of the drilling of the hole.

A If I understand your question correctly, you are indicating that the core gathered from the bore hole is not necessarily a representative sample of the entire rock underneath a tract?

Q Yes.

A That, of course, is tru, because the sample is too small.

Q So that any measurement of recoverable gas in place is not an exact measurement?

A It cannot be --

Q (Interrupting) Unless you mine it and measure it in that manner?

A That is tru. To know it exactly you would have to dig it up, that is the tract, not the hole.

Q Mr. Sturdivant, I think you indicated that in the Jalmat Gas Pool, in addition to acreage which could be reasonably distributed in your opinion, and of course is on a straight acreage factor, that the pressure factor, that there was sufficient data that it might be spread on an equitable basis as a factor in determining the opportunity of a person to recover the recoverable gas in place under his tract, didn't you say that?

A Yes. Pressure can be determined fairly accurately, I should say reasonably accurately and with sufficient accuracy, though, that various parties can agree on it; further, it can be determined and redetermined as time goes on and adjustments made for the variation in pressure. Saying it another way, practically it can be handled.

Q Then if pressure were included, it would improve the formula in your opinion?

A It would.

Q Now you have stated following that that you see absolutely no relationship between recoverable gas in place and deliverability?

A I see no relationship between recoverable gas in place as determined by pressure production extrapolation, and that gas in

place under a given tract.

Q Well, now, isn't pressure a factor in a deliverability determination?

A Of sorts, sir, it is.

Q To the extent that it is of sorts, isn't there some relationship, regardless of how small or great you believe it is?

A There is a relationship.

Q It isn't exactly correct to say there is no relationship between the two?

A Between which two?

Q Between deliverability and recoverable gas in place, inasmuch as pressure is a factor in determination and you say pressure can be determined?

A I said pressure can be determined and in speaking of that pressure, I speak of the static pressure, that static pressure is as laid out in the rules of the Commission to be taken on a well that is shut out by a certain method in calculations made to a static pressure. The pressure involved in deliverability is not that static pressure, but the difference in the squares between that pressure and pressure equal to eighty percent of that pressure raised to a power, so you see we have two pressures involved. We're working on the difference in the squares.

Q You left me ther. I will have to talk to my engineers.

A Well, I might simplify my remarks to say this, that although

static pressure does enter into the calculation or estimation of reserves in place under a tract by the volumetric method, and under a drainage area by the pressure production method, or we have called it here the material balance method, the extent to which the static pressure is related to the nth power of the difference of the squares between the static and the other pressures is so far-fetched that I cannot describe it.

Q It's too late to pursue that any further. How many wells does Sun have in the Jalmat Gas Pool?

A Three.

Q Have you made any study of recoverable gas in place under your own wells?

A Yes, we have.

Q Is there a difference between the wells?

A A difference in the gas in place under the tracts assigned to the wells?

Q Yes, under your method of calculation.

A There is a difference in the amount of gas under each of these tracts.

Q Yes, that's what I asked you.

A Yes.

Q You think a hundred percent acreage formula gives recognition to that as between those wells?

A Partial recognition, yes.

MR. CAMPBELL: I think that is all.

MR. PORTER: Does anyone else have a question of the witness? Mr. Utz.

By MR. UTZ:

Q Mr. Sturdivant, I believe you stated that your range of deliverabilities on Sun Oil tracts was the ratio of one to five?

A Approximately, yes.

Q What is your reserve ratio?

A The reserve ratio is approximately one to four.

Q Deliverability ratio and reserve ratio is pretty close, then?

A Well, if you can say one to five and one to four are about the same, yes.

Q Is one to five, one to four closer than one to one, straight acreage? Straight acreage formula, you have a one to four ratio and the allowable for each tract would be the same, would it not?

A We have a one to two relationship under acreage. A one to four relationship between maximum and minimum gas in place under the tract, and a one to five ratio between maximum and minimum deliverability of the wells. So I make myself clear?

Q No, you didn't. I lost you on the one to two ration.

A One of our wells has eighty and the other two have one hundred sixty acres assigned.

Q I am taling about per acre, not tract reserves.

A I have been taling about tract reserves.

Q I should have asked you the question in a little different manner, perhaps. Is per acre reserves among your tracts one to four?

A The per acre reserves under the tract of the extreme ratio of one to three, approximately, that is between the highest per acre reserve and the lowest per acre reserve, with the other one in the middle, naturally.

Q On a straight acreage formula, you would receive the one to one ratio of allowable, would you not, instead of the one to three which your per acre reserves?

A On a per acre basis we would receive one to one.

Q Yes. So there's quite a difference between the one to one and comparing one to three than there is between the one to three and one to five, isn't there?

A That's right.

Q So with the straight acreage formula in your particlar company's case be further from allowing you to recover the proper reserves under your tracts than deliverability?

A Yes.

Q In calculating your reserves for your company, how do you arrive at the connate water and porosity for your individual tracts?

A You are speaking of these Jalmat Field wells?

Q Yes, sir, the reserves we are talking about here.

A The connate water figure I used was derived from a publication of the Roswell Geological Society and is, I suppose, to the best of their knowledge representative of the average in the field. This, of course, is a very limited evidence, but it was the only evidence or data that I had. The average porosity under each tract was given to me by our staff geologist in Roswell. I do know that he had available to determine that logs on each well and acore analysis on one of the three.

Q Micro-logs?

A I believe they are radioactive logs in two cases, and a micro-log in the third, if I remember correctly. I can't be sure.

Q Then you make reserves for your company on the basis, reserve estimates for your company on the basis of average water and sometimes average porosity figures?

A In this field, yes. In general, we make use of the best information that we have, and if we have sufficient information to use a different average porosity or connate water content under one tract as opposed to another, we do that. I might be able to answer your question by simply saying that we make what we think is the best use of all available data.

Q Has that method proved to be satisfactory as far as you are concerned?

A This is the only method available to compute gas in place under a tract.

Q As your average figures, then?

A Yes.

Q Have those figures proven to be accurate as far as your recoveries are concerned?

A The only way in which we can prove or disaprove the estimates of recoverable gas as calculated by the volumetric method is on al field-wide basis and in comparison with either the total field experience after it's all over with or on a material balance basis as applied to the entire pool.

Q Is it your opinion that the straight acreage formula in your particular case causes less drainage than the deliverability formula?

A Less drainage within the Jalmat Pool.

Q Less drainage from your tracts.

A Well, our tracts are separated and we would have to compare them with adjacent tracts owned by other folks to establish drainage from or to our tracts. We haven't the data to do that, and we haven't been able to do it.

MR. UTZ: That's all I have.

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

By MR. MALONE:

Q Did I understand you to say, Mr. Sturdivant, that you had experienced an administrative problem in making certain that your

wells produced the allowable allotted to them?

A I said, or should have said that my company has experienced that problem.

Q And who determines whether or not those wells do produce the allowable in that regard?

A Well, I can only quote things said to me, but I understand that the amount of gas taken from a well is under an allowable set by the Commission, but whether or not the gas allowable of a well is taken from the well during the month in which it is assigned is at least in part under the control of the pipe line company.

Q And your problem then has been with the pipe line company?

A Both with the pipe line company and with the Commission, I believe.

MR. MALONE: That's all.

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

MR. DUTTON: I have a few on redirect.

MR. HOWELL: I have one other question here.

MR. PORTER: Mr. Howell.

By MR. HOWELL:

Q Do you have any copies of the correspondence that you had with your administrative problem?

A No, sir, I don't.

Q Did you write that correspondence yourself?

A I did not.

MR. HOWELL: I move that the testimony be stricken as hearsay.

MR. PORTER: The Commission orders that the testimony concerning this correspondence and other administrative problem be stricken from the record.

Does anyone else have a question now? Mr. Dutton?

RE-DIRECT EXAMINATION

By MR. DUTTON:

Q Mr. Sturdivant, some of the questions directed by Mr. Campbell went to the accuracy of the information obtained from a well bore in determining the hydrocarbon in place within a field. To your knowledge, and within your experience, is that matter that is commonly done in the industry that the well information is what is relied upon to establish the data from which volumetric calculations are made?

A It is customarily done in the industry, and it is done of necessity.

Q Is there any other information generally available except that information obtained through the well bore?

A No.

Q In your opinion as an expert engineer, is it both logical and practical to use the information from the well bore in the manner in which it is being used?

A Well, it is not only practical, it is inescapable, it is all you can do.

Q Mr. Sturdivant, with respect to the recoverable gas in place being a function of either deliverability or the extrapolation of the cumulative production pressure curve, the question that was directed to you was in general. I would like to rephrase it and relate it to the recoverable gas in place under the tract assigned to the well and then ask you if either of the methods have any engineering reasoning behind them.

A The method of computing gas in place, which is what we are calling here the volumetric method, that is acres times thickness times porosity times minus one connate water times volume factor can be and is applicable to the computation of reserves in place under a given tract. The estimation of recoverable gas from a well which is gained by the extrapolation of the pressure production history of that well is applicable only as to an estimate of the amount of gas in place in the drainage area of that well. Since the drainage area of a well seldon coincides with the tract assigned to the well, the two methods can not calculate or estimate the same thing.

Q In your estimate as an engineer in the preservation of equity, should the gas in place under the tract assigned to a well be considered rather than the gas contained in the drainage area of the well? A Yes, it should.

MR. DUTTON: Thank you.

MR. PORTER: Any further questions? The witness may be excused.

(Witness excused.)

MR. PORTER: Does this conclude the testimony by the Applicants in this case?

MR. MALONE: It does so far as the Operators Group is concerned.

MR. PORTER: The commission will recess the hearing until nine O'clock tomorrow morning.

BEFORE THE

OIL CONSERVATION COMMISSION

Santa Fe, New Mexico

March 26, 1958

IN THE MATTER OF: Case No. 1327

(1)

TRANSCRIPT OF PROCEEDINGS

VOLUME II

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO

NEW MEXICO OIL CONSERVATION COMMISSION

MABRY HALL

SANTA FE, NEW MEXICO

REGISTER

HEARING DATE (SPECIAL HEARING) MARCH 25, 1958 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
Rose Mahone	Eddy Operators Group	Roswell, N. M.
E.T. Cothorn	Atlantic Refining Co	Midland Texas
V.M. Hilliard	" " "	Dallas, Texas
A.B. Tarco	The Ohio Oil Co	Tulsa Okla
Gary N Seliger	Kelly Oil Co	Tulsa Okla
P.L. Montgomery	OCC	Hobbs
J L Hankey	Humble Oil & Refining Co	Midland, Texas
W.D. Johnston	Continental Oil Co.	Hobbs, New Mex
R.L. Adams	" " "	Roswell, N.M.
[illegible] Kelly	Independent	Roswell NM
Harry D Riffel	Continental	Fort Worth
Layton G Webb	Sinclair	Midland, Tex
R.M. Anderson	Sinclair	Midland, Tex
W.P. Tarleton	Atlantic	Roswell
Howard Bailey	Continental Oil	Hobbs New Mex
W. Brown	Pan American Petr. Corp.	Roswell
Nancy Royal	N.M. Stenotype Reporting Service	S. F.

NEW MEXICO OIL CONSERVATION COMMISSION

MABRY HALL

SANTA FE, NEW MEXICO

REGISTER

HEARING DATE (SPECIAL HEARING) MARCH 25, 1958 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
Jason Kellahin	Kellahin & Fox	Santa Fe, N. M.
W O Keller	Keller & Peterson	Ff. Worth Tex
F. H. Callaway	" "	" "
H. N. Wade	The Texas Co.	— —
E W NESTOR	SHELL OIL CO	MIDLAND
W. V. TAYLOR	GULF OIL CORP.	ROSWELL
Paul S. Johnston	Cackle Oil Co.	Hobbs
J.W. Boulet, Jr.	E.P.N.G. Co	Jal
W.C. Stroud, Jr.	Sun Oil Co.	Fallon Texas
Granville Sutton	Sun Oil Co.	Dallas, Texas
Rex D. Fowler	Permian Basin Pl Co.	Omaha, Nebr.
Pat McCarthy	" " " "	" "
Lewis E. Hunter	Atl & Humble	Roswell N.M.
W. J. Brown	Permian Basin Pl Co	Hobbs, N. M.
J. O. Moore	Continental Oil Co	Roswell, N. M.
G. A. Dalton	U.S.G.S.	Hobbs, N. M.
H C Bratton	Humble & Humble	Hobbs, N.M.

NEW MEXICO OIL CONSERVATION COMMISSION

MABRY HALL

SANTA FE, NEW MEXICO

REGISTER

HEARING DATE (SPECIAL HEARING) MARCH 25, 1953 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
Alfred O Hall	Atlantic Refining Co	Portales, N.M.
R. E. Adams	—	—
S. J. Mbeta	—	Hobbs
H. D. Bushnell	Amerada	Tulsa
R. S. Christie	—	—
D. L. Leighton	Shell	Midland
John Quintana	Texas Pacific Coal & Oil	—
G. E. Bagwell		
[illegible]	El Paso Natural	El Paso
Ben F. Howell	"	"
F. Norman Woodruff		
J. J. Dunlavey	Shell Oil Co.	Hobbs
[illegible]	O.C.C.	Hobbs

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MORNING SESSION
March 26, 1958.

MR. PORTER: The meeting will come to order, please. I would like to announce at this time that Case 1394, the Gladiola case which was advertised to be heard this morning, will be heard at the conclusion of the Jalmat case.

At this time we will continue with Case 1327. I believe that yesterday we had concluded the testimony of the Applicants in the case. Mr. Campbell.

MR. CAMPBELL: If the Commission please, I would like to call Mr. Keller as a witness for the Texas Pacific Coal and Oil Company.

(Witness sworn.)

W. O. KELLER

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

DIRECT EXAMINATION

By MR. CAMPBELL:

Q Will you state your name, please?

A W. O. Keller.

Q Where do you reside, Mr. Keller?

A Fort Worth, Texas.

Q What's your profession?

A I'm a consulting petroleum engineer.

Q The name of your firm again, please?

A Keller and Peterson.

Q You testified in the original hearing in this case, did you not, on behalf of Texas Pacific Coal and Oil Company?

A Yes, sir.

Q Mr. Keller, since the original hearing in this case, have you had available to you additional data and information?

A Yes, sir.

Q Would you describe to the Commission the nature of the additional information you have had available since the last hearing?

A You will recall at the last hearing I had deliverability data on approximately 300 wells, reserve per acre estimates on approximately 260 wells, and on 226 wells I had both deliverability and reserves per acre estimates. Since that time I have been able to acquire additional deliverability data, and I have been able to prepare additional reserve per acre estimates. As a result, I now have available 322 wells in the Jalmat Field, which include 335 acre units, where I have both reserve per acre estimates and deliverability data; and consequently, pressure data.

Before, I had 226 wells with complete information in this regard, which represented about 63 percent of the wells in the area in the field. I now have complete data in this regard covering 322 wells, which represents 85 percent, approximately, of the wells, and about 85 percent of the assigned acreage in the Jalmat Field.

Q Where did you obtain the additional information, more recent information on deliverability tests for the additional wells that you have studied since the last hearing?

A Well, we obtained all of the deliverability data available as of Thursday, a week ago, in the files of the Commission in Santa Fe. A few days prior to that we had obtained all of the deliverability data available in the Hobbs office of the Commission, and also from the office of the El Paso Natural Gas Company in Jal.

Q As a result of this additional information that you have had available to you since the last hearing, have you been able to increase your knowledge of the Jalmat Gas Pool, do you feel?

A Yes, sir, I have. I've materially increased my coverage of the field, and as a consequence the data that I have on 322 wells is naturally more representative of the field as a whole, since it is 85 percent of the field, than would be 63 percent of the field.

Q Mr. Keller, you were present yesterday when the engineers for the operators testified in this case, and you recall that there was some doubt about the method that you have used in arriving at your estimates of recoverable gas in place in the Jalmat Gas Pool. I would like to ask you if there is any engineering method of determining the exact quantity of recoverable gas under a property.

A No, sir, there is not available to us any method of determining the exact quantity of recoverable gas in place underneath the individual tracts. Any determination of the true or actual recoverable gas in place underneath individual tracts and the consequent pattern of distribution must necessarily be obtained by estimation.

Q What is your professional opinion, Mr. Keller, as to the most practical method of determining the quantity of recoverable gas in place under a property in the Jalmat Gas Pool?

A Well, sir, as I think I previously testified, the best and most practical method of evaluating the distribution or estimating the distribution of the recoverable gas in place in the Jalmat Field is the method that I have employed to estimate the reserves per acre or the apparent recoverable gas in place. It is not only the best, but because of the data limitation, it is the only one available at this time.

Q The principal objection to your approach, Mr. Keller, has apparently been the effect of migration with regard to your estimates. Have you prepared an exhibit to illustrate the method that you have used in this regard?

A Yes, sir.

(Texas Pacific's Rehearing Exhibit No. 1 marked for identification.)

Q Mr. Keller, as I indicated in my previous question, it has become apparent that one of the objections to your approach in determining recoverable gas in place under the tracts has been the migrational effects. I refer you to what has been identified as Texas Pacific's Exhibit R-1 and ask you to state what it is and explain it to the Commission with regard to that particular phase of this problem.

A Yes, sir. I would first like to recall the method that I

employed to estimate the reserves per acre for the individual tracts, or the apparent recoverable gas in place per acre for the individual tract. You will recall I took the pressure production history for each of the wells, and I have done that now for additional wells that I didn't have data on at the last hearing, and I have plotted that pressure production history for the period 1951 to 1957. I have then extrapolated the pressure data to arrive at a reserve for the tract and divided by the acreage in the tract to get a reserve per acre, or apparent recoverable gas in place per acre.

You will also recall that I previously testified that the reserves per acre, or apparent recoverable gas in place arrived at in that manner included migrational effects, but that in spite of those migrational effects I felt that that reserve per acre was the best representation of the distribution of the recoverable gas in place per acre for the various tracts that could be had in the Jalmat Field.

Exhibit No. 1, I think, shows why that conclusion is adequately justified. Texas Pacific's R No. 1 Exhibit represents a hypothetical situation to show the relationship between the reserves per acre, or apparent recoverable gas in place, and the actual recoverable gas in place. Let's assume, as we have on Exhibit Texas Pacific's R No. 1 that we have a two-well field with Tract 1 and Tract 2 each containing 100 acres; and that the actual recoverable gas in place under Tract 1 is half the actual recoverable

gas in place under Tract 2. Assigning numbers to those proportions, let's assume that the recoverable gas in place under Tract 1 is 10 million per acre, and actual recoverable gas in place under Tract 2 is 20 million per acre. Now let's produce this two-well field under acreage allocation, that is, equal withdrawals between the two tracts and see what happens to the pressure behavior of the individual tracts and what the result would be of an extrapolation of pressure production data for the two tracts, would be as I have done in Jalmat in respect to how well the reserves per acre represent the distribution of the actual recoverable gas in place.

Let's first assume -- let me explain first that in the lower part of the Texas Pacific R No. 1 I have prepared two graphs, on the left-hand side a graph representing the behavior of Tract 1; and on the right-hand side the graph representing the behavior of Tract 2 in respect to the pressure on the vertical scale, in respect to cumulative production on the horizontal scale.

In order to clarify this matter, let's first assume that there is a barrier between these two tracts and there is no migration. Let's see what the pressure behavior of the two tracts would be and what the relationship between the reserves that you would calculate and the actual recoverable gas in place would be. I have represented the pressure behavior under that hypothetical assumption, it's not representative of the situation in the Jalmat Field, by the two dashed curves on the two graphs labeled "no migration". For example,

on Tract No. 1 without migration the pressure would decline from the assumed initial of 1,000 pounds in a straight line fashion to the abandonment pressure, and we would read off the graph a recoverable gas reserve of one billion, or ten million per acre, which would be identical to the actual recoverable gas in place.

Similarly with Tract 2, its pressure would decline in direct proportion to the recoverable gas in place, and that straight line pressure curve would intersect the abandonment pressure at twenty million per acre reserves, which would be identical to the actual recoverable gas in place.

Now in a field such as Jalmat, there's no barrier between the various tracts and there is opportunity for migration between the tracts. So now let us take that situation and analyze the resultant pressure behavior and the resultant reserves; I have calculated and compared it to the actual recoverable gas in place. If the two tracts are produced under 100 percent acreage allocation, they have equal acreage so they would have equal withdrawals. As a result, Plat No. 1 would be depleting its recoverable gas twice as fast as Tract No. 2, since it has half as much as Tract No. 2. As a result the pressure would tend to decline at a faster rate on Tract No. 1 than on Tract No. 2 and there would be created a pressure differential between the two, that is, at a given time in the depletion life of the two tracts the pressure under Tract No. 1 would be less than under Tract No. 2; a pressure gradient would exist, causing migration in the direction of Tract No. 1.

It would be the benefitor of migration; Tract No. 2 would be the loser by migration.

I have illustrated the typical pressure production history of the two tracts under that type of a situation. For example, on the left-hand graph representing Tract No. 1 I have shown points representing what you would probably get in the way of, the nature of the pressure measurements that you would get on Tract No. 1 by these points. Under my method, I would then take and evaluate that pressure decline trend with a straight line shown by the solid portion of that curve. I would then extrapolate that trend to the intersection with the abandonment pressure, and I would arrive at the reserves per acre.

Now let's just assume that the migrational effect which is going to be influenced by the difference in pressure and the thickness of the pay and the permeability and so forth amounts to two million per acre. In that case this extrapolation on Tract No. 1 which yields a reserve estimate of 12 million per acre, it would gain two million per acre as a result of migration. It would be somewhat different, some would be higher, for the lower recoverable gas in place per acre tract than the actual recoverable gas in place. The amount higher would represent the amount of migration. The migration gain would be two million per acre. Conversely, considering Tract No. 2, the performance history would be similar to the points I have shown on the right-hand graph. I would extrapolate that trend and arrive at an estimate of the reserves

per acre of 18 million per acre. The reserves per acre would differ from the actual recoverable gas by the amount of migration and for the higher recoverable gas per acre tract it would be a migration loss. Now, insofar as this field as a whole is concerned there is no migration, that is, the migration gains are equal to the migration loss, and they wash out, so to speak, so the sum of the reserves per acre for the field as a whole, for the two wells is equal to the actual gas in place per acre for the total field.

Q Now, at the conclusion of your testimony there you stated that the sum of the gas in place values would be the true value of the recoverable gas in place in the entire pool?

A Yes.

Q Have you checked this statement with any other data that you have had available in the Jalmat Gas Pool to confirm it?

A Yes, sir, I have done that, as a matter of interest. I have taken the average pressures for the entire field during the period '51 through '57 and plotted it versus the cumulative production of the entire field, and by that method estimated a reserve per acre or actual recoverable gas in place per acre as of 1/1/57 of approximately 21.2 million. I have then taken the results of the 322 pressure production extrapolations on the 322 wells and calculated the total reserves per acre from those estimates and arrived at a reserve per acre of 19.1 million; in other words, a difference of plus or minus five percent between the sum of the individual wells and the total field, the actual recoverable gas

in place in the total field. That is a check, anyway.

Q Mr. Keller, back again then to what you have satisfied yourself on with regard to this migrational effect. Does the migrational effect that you have conceded occurs in the Jalmat Gas Pool alter your opinion that this method of calculation you have used is a practical method of determining on a reasonable basis the recoverable gas in place under tracts within this Jalmat Gas Pool? Does the migrational effect alter that opinion?

A No, sir, and I would like to explain why it doesn't. First of all, let me review my knowledge of the statutory provisions in respect to the criteria for equity of the allocation formula. As I understand it, there are two statutory requirements, one of them simply says that the owners of each tract in the pool shall be given an opportunity to produce their fair share of the recoverable gas in place, that fair share being in proportion that the recoverable gas in place bears to the recoverable gas in place to the whole field; that is, within practical limits. The other provision simply says that insofar as practical drainage shall be prevented that's not offset by counter-drainage.

Now the engineering involved in reference to those statutory requirements in respect to testing the two allocation methods under consideration as to which one best fits the statutory requirements involves a comparison of the allowable distribution under the two methods with the recoverable gas in place distribution. Of course, I have made such comparisons for the two formulae, employing reserves

per acre or apparent recoverable gas in place, arrived at in the manner I have already discussed, in order to see which allocation formula best accomplished the intent of those statutory requirements. I have been criticized on the basis that that's not a valid way to test the two allocation formulas because I'm using reserves per acre, not recoverable gas in place per acre. Let's see what that means in respect to testing the two allocation formulas.

First of all, I think it's quite apparent that the closer an allocation formula distributes the allowables in respect to the recoverable gas in place, the greater the degree is that it accomplishes the statutory requirements. Now it's quite apparent from the hypothetical example presented on Texas Pacific's R No. 1 that in general the lower recoverable gas in place will tend to be over-evaluated by my reserve per acre estimate or apparent recoverable gas in place per acre method. The better, or higher recoverable gas in place per acre tract will tend to be under-evaluated in general by my reserve per acre approximation of recoverable gas in place. Now as a result the variation in the reserve per acre distribution as between the various tracts on the whole will be less than the actual recoverable gas in place variation. In other words, the reserves per acre estimates that I have used as approximation of recoverable gas in place will be more uniform, that is, the distribution will be more uniform; there will be less variation than the variation that actually

exists in respect to recoverable gas in place. Now it's quite apparent that 100 percent acreage would be the perfect formula if the distribution of the recoverable gas in place were uniform, because we would have coincidence of the reserves per acre, I mean the recoverable gas in place per acre and the acreage allocation. Both would be uniform. Therefore, if I am comparing, which I will as we will see later, a 100 percent acreage allocation with the reserves per acre distribution which is less severe or more uniform than the actual recoverable gas in place distribution, then in effect my comparisons will show that acreage allocation is better than it actually is; so it seems to me quite apparent that the use of the reserve per acre distribution as a test of whether or not 100 percent acreage allocation distributes allowables better or worse than 75-25 allocation in respect to the reserve per acre distribution if anything favors, shows that acreage is better than it actually is.

Now there is another feature here that I would like to clarify, and that is the point that has been raised here that there is no relationship between the reserves per acre as I have calculated them and the actual recoverable gas in place; and I would like to show that there is a relationship that makes valid or validates the employment of reserves per acre distribution to test or determine which allocation formula comes closest to meeting the statutory requirements. We have seen that the difference between reserves per acre or apparent recoverable gas in place and the actual

recoverable gas in place is a matter of the amount of migration, and that it certainly is obvious that in general the poorer tracts are going to be the gainers, the better tracts the losers; and that the total migration, the sum of the gains and the losses are going to be zero for the field. Let's see what that means with respect to the relationship between reserve per acre and recoverable gas in place per acre.

Let's just plot recoverable gas per acre on one side of the graph and reserves per acre on the other. If there were no migration, as I've attempted to illustrate by Exhibit Texas Pacific R No. 1, if there were no migration as between the various tracts, the reserves per acre and the recoverable gas per acre would be identical. If we plot the reserves per acre and recoverable gas in place per acre under such a situation, we would get a line like this, that is, forty-five degrees; if the recoverable gas in place per acre was one, the reserves per acre would be one, they would be the same and every point would fall right on that line. It would be a unique relationship between recoverable gas in place per acre and reserves per acre, arrived at by the method I employed. Now, of course, that's not the situation. The situation is, as I have tried to illustrate on Exhibit Texas Pacific R No. 1, if we actually could measure the recoverable gas per acre and arrive at approximations by the pressure production in terms of reserves per acre, we would get a scattering of points something like this. We would get (illustrating) -- where in general for the lower

recoverable gas per acre tract we would tend to over-evaluate in terms of reserves per acre, they will be a little higher than the recoverable gas; in general, for the higher recoverable gas in place per acre tract we tend to under-evaluate. As a result we would get a scattering of points trending in that manner. We drew a line through that trend, we would get that type relationship between recoverable gas in place and reserves per acre, whereby the spread or the difference here, the variation would be less in terms of reserves per acre than it would be in terms of recoverable gas in place per acre.

Q Mr. Keller, is it your conclusion that the method that you have used for determining reserves per acre is a proper method of calculating in the most practical manner the recoverable gas in place under the properties in the Jalmat Gas Pool?

A Yes, sir, I previously testified that that was so, and I do now testify that the reserves per acre distribution that I have used to test which of the two formulas falls more closely, carries out the statutory requirements, is a valid test and it is the best obtainable.

Q Now, the petitions for rehearing in this case, Mr. Keller, have denied that there is any correlation between recoverable gas in place and deliverability in this pool, and testimony, as you heard yesterday from their engineers, indicated that it was their opinion that there was no relationship between recoverable gas in place as you have calculated it and deliverabilities in this pool.

Have you, based upon the new information you had available, prepared additional exhibits in this regard?

A Yes, sir.

Q Would you please put those exhibits up?

(Texas Pacific's Exhibits R-2, R-3, R-4 marked for identification.)

Q Mr. Keller, you stated that you had, with the additional data you had available since the last hearing, had prepared information leading you to the conclusion that there is some correlation between the recoverable gas in place or reserves as you have calculated them, and deliverability. I refer you to what have been identified as Texas Pacific Exhibits R-2, R-3, and R-4, and ask you to explain them to the Commission.

A Yes, sir. These exhibits are similar to previous ones that I presented at the last hearing employing the data from 226 wells. These maps now have the data from 322 wells. For example, referring to Texas Pacific R No. 2, I have arranged the reserves per acre data or apparent recoverable gas in place per acre data in sequence of increasing values. I divided the various wells in quartiles, in fours, starting with the lowest quartile, the second, third, and fourth, and designating each quartile by color. The lowest reserve per acre quartile being colored in dark blue, the next highest light blue, the next highest light red, the highest quartile on the reserve per acre basis dark red. As a result, the half of the wells having the highest reserve per acre, the tracts

having the highest reserves per acre are colored in red, and the tracts having the lowest reserves per acre are colored in blue.

I have gone through a similar process for these same 322 wells in respect to deliverability, and designated the quartiles on a deliverability basis in a similar manner as I just described in respect to reserves per acre. I have also taken the pressure data from those deliverability tests and prepared Texas Pacific R No. 4 pressure map, using this same procedure.

Now, I think that it is quite apparent visually that there is a very great similarity in the pattern of distribution of the reserves per acre, the deliverability, and the pressure. That is, in general the areas of high reserves correspond in general with the areas of high deliverability, and also correspond with the areas of higher pressure. Conversely as to the areas of lower reserves per acre, deliverability and pressure. There's no doubt, I don't think, that there is a strict similarity between the patterns of distribution of reserves per acre, deliverability, and pressure. Now the significant thing about that in my opinion is that the determination of whether or not this similarity in patterns of distribution of these factors exists, and the evaluation of those patterns of distribution is absolutely necessary in order to properly determine the type of allocation formula that will best distribute allowables in proportion to recoverable gas in place, and will best tend to prevent drainage not compensated by compensating drainage. I don't see how anyone can avoid that fact. It's

essential to not only see if those relationships are there, but to evaluate them to see whether or not the allocation formula meets the statutory requirements. That, of course, has been the purpose of the work that I have done at the previous hearing and has been the purpose of the work that I have done in preparation for this hearing. It seems far-fetched to me that it would be possible to take the pressure and deliverability data on fifty-eight wells in this field, that's fifteen percent of the field, the logs on thirty-eight wells which is ten percent of the field, and core analyses on five wells, which is 1.3 percent of the field, and try to determine or find out whether or not there is a correlation in the distribution pattern between reserves and deliverability. It's quite apparent that such an analysis not only wouldn't tell you whether or not these patterns existed, it certainly couldn't evaluate them; and it's necessary in my opinion to do both to properly test the allocation formulas under consideration as to whether or not,which one conforms best to the statutory provisions.

Q Based upon all of your studies with regard to these relationships, have you satisfied yourself that the relationship does exist and you have been able to sufficiently evaluate it to reach the conclusion that the formula you proposed more nearly conforms to statutory requirements than 100 percent acreage?

A Yes, sir, I have.

Q You, I notice, have in this particular hearing compiled pressure data which was not offered at the original hearing. Do

you have any particular comments with regard to the pressure map, particularly in relation to the testimony here with reference to drainage?

A Well, I have included the pressure map because I think that an understanding and evaluation of the pressure distribution is important in order to test or determine the relative merits of one formula against the other in respect to the statutory provision that, insofar as practical, migration should be prevented.

Certainly, we all know that the direction of migration is going to be from high pressure to the low pressure areas. Now certainly, the magnitude of migration is not necessarily affected by the magnitude of the pressure difference, but the direction of migration is certainly reflected by the direction of the pressure difference. The migration where there is a gradient will always be from the high pressure to the low pressure areas.

Q Then based upon the 100 percent acreage formula, and referring to your pressure map, does it appear to you that under that formula, assuming uniform pressures, that there will be drainage between areas of this reservoir?

A Yes, sir, I think that the pressure distribution map readily demonstrates that there is drainage between various parts of the field, and that that drainage is going to be in the direction of the pressure gradients from the high to the low; and certainly, in order to minimize that migration it's necessary to minimize those pressure gradients. Of course, for example, the south end of the

field is generally lower in pressure than the north end -- in order to minimize drainage in that respect it is certainly quite obvious that the allowable in the south end ought to be less than in the north end, and conversely, the allowable in the high pressure areas ought to be higher than in the low pressure areas.

Q Now, Mr. Keller, using the information you now have available on the 322 wells in the Jalmat Gas Pool, have you made additional studies concerning this relationship to which you have referred between deliverability and reserve distribution of recoverable gas in place?

A Yes, sir.

Q Would you put up that next exhibit, please?

(Texas Pacific's Exhibit No. R-5 marked for identification.)

Q Mr. Keller, I refer you to what has been marked Texas Pacific's Rehearing Exhibit 5. Will you refer to that and explain it to the Commission?

A Yes, sir. I have merely taken the reserve per acre data for the 322 wells, averaged it in an increasing sequence fashion, and divided it into sixteen groups of approximately twenty wells per group. I have plotted those reserves per acre data in terms of relative values to the average reserve per acre by the red line shown on Exhibit Texas Pacific R-5. That is a reserve per acre distribution map averaged in increasing sequence. For each of the groups, then, of approximately twenty wells, I have calculated

the average deliverability for the same twenty wells and plotted that on the graph as shown and connected the points by a green line, again using relative values for the deliverability averages. I have also taken the acre factor per acre which is one in a relative value, and shown its value by a solid line on the graph. Now, it is quite apparent, I think, that what I have done is this, that in the two formulas, allocation formulas under consideration, there are just two factors involved in both of them; one of them is 100 percent acreage factor, the other one is a combination of 25 percent, the acre factor, and 75 percent, the deliverability times acreage factor. So I'm really comparing the distribution on the basis of averages for twenty well groups between the reserves per acre or apparent recoverable gas in place per acre with the two factors that enter into the formula, to see which one of them best fits the recoverable gas in place per acre distribution. It's quite apparent, I think, that the deliverability factor correlates very well with the reserve per acre distribution, and that the acreage factor doesn't correlate. In this connection, I would like to clarify one other point that I think is confusing in this hearing.

It's been said here that there is no relationship between deliverability and recoverable gas in place. Maybe we're involved in semantics, but if you were to say there is not a unique relationship between deliverability and recoverable gas in place, I think that would be a true statement, but there is a very definite

relationship. it's not unique, but it's there, between deliverability and recoverable gas in place, and the fact that there is a relationship is reflected by this statistical analysis represented by Texas Pacific R No. 5 Exhibit.

Let me explain, if I may, what the difference between the general relationship such as exists between deliverability and reserves per acre as shown on Exhibit Texas Pacific R No. 5 and what I have termed here a unique relationship. For example, I think we're all familiar with the fact that there is a relationship for the men in the United States between the height and weight. For example, when you go to weigh on a penny scale, you'll find a table there and it will show heights ranged in increasing sequence of height, and then it will show the average weight for men of that height and there will be a relationship between weight and height. If we were to plot that table, we'd get a relationship, say somewhat in that fashion (illustrating). Now that's the type of relationship that exists between deliverability and reserves per acre. For example, let's just take this -- we all know that shorter men are in general lighter in weight than heavier men. There's a relationship there that can't be denied, it has been proven statistically. It is a general relationship, it is not a unique relationship. I don't have that data, but just for example, let's take for men between five feet eight and five feet ten, and let's say that they weigh 150 pounds. Now, we can take men in this room that are between five feet eight and five feet ten and probably none of them

will weigh 150 pounds. That doesn't invalidate the fact that there is a relationship between height and weight. It just shows that it's not a unique relationship, it just shows that this type of relationship, I can't pick a man out that's between five eight and five ten and say, well, his weight is 150 pounds because it is just not that kind of relationship. Neither can I do this, neither can I take ten men that are between five feet eight and five feet ten and get their weights and I find that some of them hit up here and some of them are less than 155, and plot that on there and say,oh, this is all wrong, there's no relationship between height and weight because look at here, if there was, I've got men between the five feet eight and five feet ten and they don't weigh 150 pounds. Well, now, it's fallacious to argue that this height-weight relationship doesn't exist with the argument that here is some men that don't fall exactly on the curve. Certainly that proves that there is not a unique relationship between height and weight, but by no stretch of the imagination does it deny this relationship that we have between the height and weight, this general relationship.

Now the reason I bring this up is that that is actually what has been done here,in my opinion, in respect to this relationship between deliverability and recoverable gas in place. That's what the fifty-eight well area procedure has been, they have said; they have done exactly this, they have picked a range of height, they have picked a limited range in reserves per acre, I think it

was about three and a half to one, which would correspond by analogy with the five feet eight to the five feet ten height group, and they have said, "Well, look a-here, when we plot reserves against deliverability in that area, there's no relationship, just like there wouldn't be here; therefore, deliverability and recoverable gas in place aren't related." That's exactly analogous,to my way of thinking. Now if they had said there is not a unique relationship on the basis of the fifty-eight well study between deliverability and recoverable gas in place, they would have been 100 percent right, but you can't prove that a relationship of the nature that exists in the Jalmat Field between deliverability and recoverable gas in place doesn't exist by proving that it isn't a unique one.

Q Mr. Keller, in addition to plotting the deliverability as against the reserves distribution on your Exhibit R-5, did you make a similar calculation on the two methods of allocation under consideration in this hearing?

A Yes, sir. Exhibit Texas Pacific R-5 simply compares the factors that enter into the two allocation formulas with the reserves per acre or apparent recoverable gas in place distribution. Now I have prepared the next exhibit to show the effect of the relationship or the lack of relationship of these two factors with reserve per acre distribution in the two formulas under consideration.

(Texas Pacific's Exhibit No. R-6 marked for identification.)

Q Now, Mr. Keller, referring to what has been marked as Texas Pacific's Exhibit R-6, would you state what that indicates in connection with this statistical study you made?

A Yes, sir.

Q In the first place, does that cover the same twenty well groups?

A The same group of wells, the same sequence in decreasing reserves per acre. The only difference is this time --

MR. MALONE: (Interrupting) I wanted to inquire if it would be possible for us to have the listing of those twenty well groups so that we could be analyzing them preparatory to cross examination and not have to delay the progress of the case.

MR. CAMPBELL: Do you have those, Mr. Keller?

A Yes.

MR. CAMPBELL: Do you want him to wait until you have those?

MR. MALONE: We can go ahead.

Q Go ahead and explain Texas Pacific Exhibit R-6, please.

A Now, on Texas Pacific's R-6 Exhibit, I have plotted for each of the twenty well groups the average allowable in the 75-25 allocation formula, allowable per acre on a relative basis, and connected the points by a green line; similarly, I have shown the relative allowable per acre under 100 percent acreage allocation by a heavy blue line. This exhibit shows that the pattern of distribution as between those twenty well groups under the 75-25 allocation formula is much closer to the pattern of distribution

of the apparent recoverable gas in place per acre and the actual recoverable gas in place per acre than is the distribution of allowables under the 100 percent acreage formula.

Q Does that also indicate that the benefit of the doubt or the advantage goes to the wells with the lower reserves, the poorer wells?

A Yes, sir, you can see that in general the allowable under the 75-25 for the lower reserves per acre, lower recoverable gas in place per acre groups is less than it is under 100 percent acreage allocation and closer to the reserve distribution. Conversely, for the better twenty well groups the allowable under the 75-25 is higher than under 100 percent acreage as shown here. There's one other thing here I would like to point out. You will recall I have tried to explain how reserves per acre or apparent recoverable gas in place per acre were related to the actual recoverable gas in place per acre, if we could evaluate it. Now, the general relationship required, as I have tried to explain, between reserves per acre and recoverable gas would be something like this. If we could measure the recoverable gas in place per acre distribution, we in general would get a trend that would be more like that line.

Q The black line you have marked on Texas Pacific Exhibit R-6?

A Yes, sir. Actually what we would get would be, if we could have the actual values we would get points distributed along that black line, see, and this black line would represent the trend of

those points, and in general those points for the poorer wells on the actual recoverable gas would fall below the reserve per acre line, for the simple reason that, in general, the method employed to evaluating reserves per acre tends to over-evaluate the recoverable gas in place for the poorer ones, because it includes the migrational gain that they received generally and under-evaluate the better tracts; that is, the reserves per acre would be less than the actual recoverable gas in place, the difference being migration for the better tracts.

Q Mr. Keller, do your Exhibits R-5 and R-6 confirm your opinion as to the relationships to which you have testified in the original hearing and this hearing?

A Yes, sir. Actually, if you will recall during the first hearing, I believe it was in November, on Exhibit 7 I explained why there should be a general relationship between deliverability and recoverable gas in place. Now of course, basically, the reason there should be is because the same factors or some of the same factors that control recoverable gas in place also control deliverability. Now they control these factors that have an effect on both recoverable gas in place and deliverability, operate in a different fashion generally in controlling recoverable gas in place than they operate in controlling deliverabilities. Now all that says is that we shouldn't expect a unique relationship between reserves and recoverable gas in place, but that we should expect a general relationship between deliverability and recoverable gas

in place of the nature, as I tried to illustrate, between height and weight.

Q Now, Mr. Keller, have you prepared a similar analysis in this reservoir based upon the information you have available on an areal basis, apart from the well group distribution?

A Yes, sir, I have.

Q Would you put up these two, please?

(Texas Pacific's Exhibits No. R-7 & R-8 marked for identification.)

Q I'm going to ask you to refer to what have been identified as Texas Pacific's Exhibits R-7 and R-8, and briefly explain to the Commission what they reflect and how you have divided the field to make these analyses.

A Yes, sir. Going back for a moment to Exhibits Texas Pacific R-2 and 3, the reserve and deliverability maps, we can see from those maps a semi-quantitative or qualitative relationship between the distribution pattern of reserves per acre with deliverability. Texas Pacific R Exhibits No. 7 and 8 are simply graphs which show perhaps a little more clearly how the distribution pattern between reserves per acre and deliverability vary from one part of the field to the next. These two exhibits, No. 7 and 8, have been prepared by dividing the field up into eight strips running east and west of a half township from north and south. That is, we have taken all the deliverability and reserve data in the north half of Township 22, South Half of 22 and North Half of 23, the

South Half of 23, and so on down through Township 25. We have in effect divided the field in east-west strips a half a township or three miles from north to south.

Q Then have you on these Exhibits 7 and 8, have you plotted those on the same basis as you did in Exhibits 5 and 6 with regard to the twenty-well groups, or is this a different graph?

A No, sir, I have not. I have taken for each of the east-west strips the average reserves per acre for each strip; that is, for the wells out of the 322 that I had an average strip and I plotted the reserves per acre on Exhibit No. 7 and joined those points by a red line. I have also plotted the average deliverability for each of those strip areas and plotted those and connected them with a green line across the bottom of the graph, as the designation of the strips starting out in the south end with the South Half of Township 25, going north to the North Half of Township 22. I have also plotted the acre factor for each of the strips. Of course, that is in terms of relative values. Of course, it is constant, since the acre factor per acre is the same for each acre.

Q What have you done on Exhibit 8?

A Exhibit 8, I have done essentially, my area arrangement is exactly the same; in lieu of plotting the average acre factor and deliverability, I have plotted the average relative allowable per acre under the 75-25 allocation formula, and under the 100 percent acreage formula.

Q Did these two exhibits further confirm your opinion as to

the relationship between deliverability and reserves as you have calculated them, or apparent recoverable gas in place.

Yes, sir, they confirm the visual conclusion that you draw from Exhibits Texas Pacific R-6 and 3; that is, areally, that the pattern of distribution of the reserves per acre and the deliverability is similar. As you can see from Exhibit Texas Pacific No. 7, the reserves per acre graph and the deliverability both show a fairly consistent increase going from north to south, and that there is a pretty good correlation of the variation between deliverability and reserves per acre as we go from the south strip to the north strip. Of course, the acre factor doesn't correlate areally with the reserve per acre distribution.

Similarly referring to Exhibit Texas Pacific No. [illegible], which compares allowable distribution by areas under the two formulas with reserves per acre or apparent recoverable gas in place distribution, against the 75-25, as we would expect from Exhibit No. 7, the 75-25 formula allocates the allowables areally to these various strips more in relationship to the average reserves per acre of these various strips than does the 100 percent acreage allocation formula.

MR. CAMPBELL: May we take a five-minute break.

MR. PORTER: Let's make it ten minutes.

(Recess.)

(Texas Pacific's Rehearing Exhibits 9 through 13, inclusive, marked for identification.)

MR. PORTER: The hearing will come to order, please. Mr.

Campbell, would you proceed?

Q Mr. Keller, I'm going to ask you to refer to an exhibit which has been marked Texas Pacific Exhibit R-9, and ask you to state briefly what that is and what it shows.

A Yes, sir. I have taken the data on the 322 wells and arranged it in sequence of increasing pressure. I have then taken and divided the wells arranged in that sequence into eight groups of approximately 40 wells per group. For each of the 40-well groups, then, I have plotted in terms of relative values versus sequence the average pressure for each of the 40-well groups, and connected those points with a solid black line on Exhibit Texas Pacific R-9. I have also taken the average allowable in terms of relative values under both the 75-25 allocation formula and 100 percent acreage allocation formulas and plotted those average values per 40-well groups in terms of relative values in sequence. The 75-25 allowable distribution on the average for the 40 wells, I have connected with the green line. 100 percent acreage would be a straight horizontal black line, as shown on this exhibit.

Q Does that show that the formula which you propose more nearly approaches the allocation of gas on the basis of pressure distribution than does the 100 percent acreage allocation formula?

A Yes, it shows that the 75-25 allocation takes cognizance of the present distribution pattern in the field, and distributes the allowable more in the relationship to the pressure distribution, on the average, than does the 100 percent acreage formula which

ignores the pressure distribution.

Q Now, Mr. Keller, there has been some testimony offered in this rehearing with regard to situations of individual wells where the relationship, to which you have referred, in other words, extreme cases, have you made any analysis of the proposed formula as related to the 100 percent acreage formula, in connection with these exceptional cases that exist in the Jalmat Gas Pool?

A Yes, sir.

Q Were you necessarily referring to what has been identified as Exhibit R-10 -- explain to the Commission what the effect of the formula you propose on these exceptional situations as compared to the present 100 percent acreage formula?

A Yes, sir. I think we'll all agree that either formula, neither formula is perfect and there will be exceptions where the allowable assigned to various tracts will not be closely related to the recoverable gas in place. That's just, neither one of them are perfect. Now, there is, however, a feature to the 75-25 formula, the deliverability formula, which doesn't exist as to the acreage formula, and that's a feature that I am terming a self-correcting feature. That is, the deliverability formula has built into it a feature whereby if it distributes allowable not too closely related to the recoverable gas per acre or the reserves per acre, then it will tend to correct itself as time goes along. Now that self-correcting feature comes about due to the relationship between pressure and production, and the deliverability of a well and its

production or stage of depletion.

For example, let's assume that under the 75-25 formula, a well gets too much allowable relative to its recoverable gas in place. If that happens, the pressure will decline with production at a faster rate; deliverability also declines with production on a well, and it will disproportionately decline under the too high allowable. As a result, in the following year when its deliverability is measured, its deliverability will have decreased faster than it would have had the allowable been directly in proportion to the recoverable gas in place. As a result, because of this accelerated decrease in deliverability, it will receive less allowable relative to its reserves the next year, and the allowable will be closer in relationship to the recoverable gas per acre as time goes along.

Q Is there any similar self-correcting feature insofar as the 100 percent acreage formula is concerned?

A No, sir, there is not, and as a result, any error or any deviation between the acreage allowable, 100 percent, and its reserves for a tract will be perpetrated from now on.

Q Now, have you prepared some exhibits to illustrate this point?

A Yes, sir.

Q I am going to refer you -- or will you refer to the Texas Pacific Exhibits R-11, 12, and 13, and I will ask you to explain further to the Commission how this self-correcting feature in your

opinion will operate?

A Yes, sir, I have prepared these three exhibits to illustrate the tendency of the 75-25 formula to correct itself where the allowable tends to approach more in relationship to recoverable gas in place, as time goes on. Actually, all three of these exhibits are hypothetical cases under which there are, where deliverability is not in proportion to recoverable gas in place due to differences in deliverability relative to pay thickness and pressure; and where the error involved between the allowable and the recoverable gas in place is the same under both 100 percent acreage and the 75-25 formula, so that we can compare the two formulas in a situation where both of them are not in relation to recoverable gas in place to the same extent initially.

Referring now to Texas Pacific R No. 11, I have illustrated a situation where we have two wells, both at a thousand pounds, and two tracts of equal size, both at a thousand pounds pressure, but both having a deliverability of 2 million a year, Tract 1 or Well 1 having a thickness of 100 feet of pay, the other one being twice as great, or 200 feet of pay. Now, I've assigned the Well No. 1 a reserve of four and a half billion, No. 2 twice that much or nine billion. In such a case, the relative reserves of the two tracts or recoverable gas in place would be compared to the average, would be 667 for tract No. 1 and 1333 for Tract No. 2, or twice as great. Now, let us assume that initially we start out on 100 percent acreage basis, each well would get the same allowable

of 400 million a year under a hundred percent acreage, since they have the same deliverability they would also get 400 a year under the 75-25 formula. That is, their relative allowable compared to the average of the two would be one under both formulas. Now, on the lower part of Texas Pacific R No. 11, I have presented two graphs. The graph on the left is a plot of time in years along the horizontal scale versus deviation of allowable from the recoverable gas in place along the vertical scale. Now, this deviation of allowable is the difference in the relative allowable of the two wells, compared to their relative recoverable gas in place. If that difference is zero, then the allocation is in perfect agreement with the recoverable gas in place. Under this type of situation, referring to the left-hand graph on the bottom, under these circumstances Well No. 1 being the one with half as much recoverable gas as Well No. 2, under acreage would be in error deviated from the perfect formula on an acreage basis by .333. Also, the 75-25 would start out with the same error in the allocation. Now under the 100 percent acreage, that allowable error would be constant over the period involved, but as the deliverabilities are re-determined year by year, the pressure under Well No. 1 will decline faster than the average of the two; the deliverability will decline faster. Therefore, its relative allowable under the 75-25 formula will decrease as time goes along. The result, for example, on Well No. 1, would be that the 75-25 formula would tend to correct itself and tend to approach the proper relationship of allowable

with recoverable gas in place. It would start out with too much allowable, but its allowable would be decreased closer in proportion to its recoverable gas in place. Conversely, Well No. 2 under acreage, it would receive too little allowable and that would be perpetuated under the acreage formula from there on. However, under the deliverability formula, its pressure and deliverability would decline at a slower rate, since the formula which is equal for the two wells would be less in proportion to its recoverable gas in place, and as a result, the 75-25 formula, it would get an increase in allowable and the allowable would tend to correct itself and more nearly approach the proper relationship with reserves.

On the right-hand side of Exhibit Texes Pacific R No. 11, I have illustrated what would happen under such a situation in respect to the pressure difference between the two wells. They both started out at 1,000 pounds. They would have no pressure difference, but since under both formulas the allowable in relation to the recoverable gas in place for Well No. 1 is much higher, twice as high than Well No. 2, its pressure would decline at twice the rate. Therefore, there would be created a pressure differential in favor of the Well No. 1. Under 100 percent acreage, as shown by the lower right-hand graph on this exhibit, shown in red is the pressure difference that would occur, assuming no migration between the two; under the hundred percent acreage formula, as you see, the pressure difference would continually increase from nothing at the start to 400 pounds, under this example. But due to this

self-correcting feature in the 75-25 type formula, the pressure difference between the two wells would increase at a lesser rate than under the 100 percent formula, thus tending to diminish the pressure difference between the two and thereby tending to diminish the amount of migration that might occur under such a situation.

Q Mr. Keller, without going into detail on Exhibits 12 and 13, do those show essentially the same results with some variables in the situation, as between the two tracts?

A Yes, sir, those are just additional illustrations of this same principle. The only difference is that I have varied up the relationship between deliverability and recoverable gas in place by varying the pressure and keeping the thickness constant between the two wells in the Texas Pacific R No. 11, and varying both pressure and thickness in No. 12, so that we have varying situations where there is a disproportionate difference between the deliverability and recoverable gas. The same thing happens as to this correcting factor and the effect on the allowable distribution and pressure differences.

Q Mr. Keller, in the interest of saving time, I am going to ask you if you will hurriedly go through the exhibits, Operator's Exhibits 1-R through whatever the last exhibit is, and briefly make any comment that you may see fit to the Commission with regard to those exhibits, in relation to the testimony that you have presented here on behalf of Texas Pacific Coal and Oil Company.

A Yes, sir. On Operator's Exhibit 1-R, I would like to point out a very definite fallacy in it, and consequently a fallacy in the conclusion that was drawn.

MR. MALONE: Would you mind standing over here, Mr. Keller, some of the people say they can't see the exhibits.

A I will be in front of the Commission.

MR. PORTER: It's all right. Go ahead and stand on this side.

A The pertinent thing about Case 2 and Exhibit 1-R is the assumption that's made. You will note that the assumption is made that the production from the three Tanks, A, B, and C, is on the basis of the deliverability of the three tanks. They have illustrated the result in terms of pressure decline extrapolations, supposedly comparable to my pressure decline extrapolations that I arrived at reserves per acre with, but they are not comparable by any means, for the simple reason that this illustration assumes withdrawals in proportion to deliverability;in the period which I extrapolated my data, withdrawals were in proportion to acreage, just as I have illustrated on my Exhibit 1. So the conclusion that there is no relationship between the reserves per acre and the gas in place arrived at from this exhibit under those assumptions have no bearing in respect to the situation in the Jalmat Field, and the conclusion that there isn't any relationship between reserves per acre and recoverable gas in place arrived at in those circumstances doesn't apply to the Jalmat Field.

Q Is that same objection applicable to the free-hand drawing exhibit that Mr. Gruy put on that is on the board?

A Yes, it has in it the same fallacy. You recall that he assumed that the withdrawals in proportion to one, three, and four, which were the deliverabilities of the wells, and arrived at this pressure point. It has the same assumption as I just discussed in connection with Operator's, Texas Pacific R No. 1. It assumes withdrawals in proportion to deliverabilities. We haven't had that situation in the Jalmat Field during the period that we have used these pressure production declines at all. As I explained on my exhibit No. 1, there is a definite relationship between reserves and recoverable gas in place under the conditions of the analysis that I used.

Q Will you proceed with Exhibit 2-R?

A I would like to point out on Operator's Exhibit 2-R, for example, on the Lynn "B" No. 26 No. 1 well that they show that you would get two indicated reserves extrapolating these data. You get one answer if you use the data prior to August 5th, 1950, and another answer using the data after August 5th, 1950. Of course, I have used the data between 1951 and 1957, and I wouldn't do that. It is not comparable to what I have done at all. The same thing goes for Lynn"B" 26 No. 2. The date there is August, 1951 and thereafter, those aren't the periods involved in my analysis.

Q Go ahead with Exhibit 3-R, please.

A All I believe I need say about Exhibit 3-R is that nowhere

have I testified that permeability determines or governs the recoverable gas in place. Of course, it does govern or have an effect upon the deliverability, and I thought I explained in great detail in Exhibit 7 on another hearing that the relationship, how each of the factors had an effect on both permeability and recoverable gas in place. I would like to make a few comments about Operator's Exhibit No. 4-R, which shows a net pay map and a bottom-hole pressure map for the so-called fifty-eight well area. You will recall in the testimony in connection with this exhibit that the assumption was made that the cause of the rather uniform pressure distribution was very complete migration. Now, the truth of the matter is very complete migration might be one of the causes of rather uniform pressures in that area, but also it could also be due to the fact that you have a rather uniform pay thickness in that area; you have acreage allocation in the area and if you had uniform pay thickness and uniform allocation per acre, you would naturally get uniform pressures, so the truth of the matter is that that uniform pressure distribution could be caused by one or both of those situations, or a combination of the two. Yet, when we come to the so-called migration losses and gains calculated from this exhibit, the assumption is made, well, the only cause is complete migration. That's not necessarily true at all. In fact, I would expect that it's probably some migration and some uniform pay thicknesses causes that.

Q You are now referring to Exhibit 5-R?

A Yes, sir. I don't have any particular comment to make about Exhibit 5-R. I think it just illustrates that it has no purpose. It doesn't even illustrate that, even under the favorable circumstances, that acreage is perfect.

Q Have you taken into consideration that that type of situation would arise under the formula that you have proposed?

A No, I haven't, nor under the acreage formula either one. That's why I think the self-correcting feature to the deliverability formula should be brought out.

Q With regard to Exhibit 6-R, which I believe was attached to some of the applications for rehearing, do you have any comment on that?

A Yes, sir, I do. Let me preface by saying that you will recall that in this fifty-eight well area we had a variation in recoverable gas in place as calculated by the witness that presented this exhibit of about three and a half to one, as I recall, and I would like to also point out that in my analysis of 322 wells, that is, 85 percent of the wells rather than 15 percent, that there is a variation of about 70-fold instead of three and a half fold. To my mind this exhibit is analogous to the situation that I discussed previously in reference to this general relationship between weight and height. In essence, they have done the same thing on Operator's Exhibit 6-R that would occur if you took a dozen men that were between five eight and five ten and found out that they all didn't weigh the average of 150 pounds like the table

said they should, and then you conclude from that because they didn't fit that there wasn't any relationship between height and weight. They have done the identical same thing. They have picked an area here where there is a three and a half fold variation in recoverable gas in place, although the field has approximately 70-fold variation, have limited the amount of variation in the recoverable gas in place, plotted the deliverability versus that and found that there is no relationship; therefore there is no relationship in the field. Well, that procedure, to my mind, is fallacious, to say the least.

Q Now, referring to Operator's Exhibit 7-R.

A Yes, sir. Operator's Exhibit 7-R takes off from the pressure and net pay maps shown on a previous exhibit. Now, they have shown or there is shown on Operator's Exhibit 7-R a so-called calculated loss in ultimate recovery to various tracts, due to migration, increase in migration under the 75-25 formula relative to 100 percent acreage. The truth of the matter is that that is not by any stretch of the imagination an engineering estimate of the potential migrational loss. It is simply the result of the numbers that you arrive at when you make the assumption that if you distribute the allowables under 75-25, the pressures will continue to be uniform; that is, complete migration will take place, and that all of the migration will be confined within the fifty-eight well area. Well, now, that isn't the situation that exists at all. There's no barriers around this fifty-eight well area to limit the

migration between the tracts in here at all. Actually, I think as has also been previously pointed out in cross examination, the tracts that will lose, which are colored in on this exhibit, are generally around the periphery of the area, and they are lower pressures than the other tracts, and the migration is going to have to be out of the area. So because of these non-representative assumptions involved in the preparation of this exhibit, in my opinion, these calculated migrational losses have no real meaning with respect to the actual situation.

Q Now, Mr. Keller, you heard the testimony, I believe, of Mr. Gruy, with reference -- is that all of the exhibits?

A Yes.

Q -- with reference to the possibility that if deliverability is in the formula and if it results in a mad frac race in the Jalmat Gas Pool, that it could result in a recovery of four percent, up to four percent additional gas that would not be recovered in the absence of the working over of these wells. Based upon your calculation of the reserves in the Jalmat Gas Pool, what is the approximate amount or is the amount of four percent of those reserves?

A Well, sir, the four percent was applied to the ultimate reserves, and on the basis of my study, the ultimate reserves in the Jalmat Field are approximately two trillion cubic feet. Now, if you could increase that by four percent, that would be an increase in ultimate recovery for the field as a whole, as a result of, very effective result from fracs of approximately eighty billion

cubic feet, which at ten cents a thousand would be about eight million dollars worth of additional gas.

Q Now, Mr. Keller, some concluding questions based on your testimony here, considering the testimony that has been offered by the Applicants in this rehearing, in your opinion what allocation formula in the Jalmat Gas Pool will provide the most practical method of giving to each owner in the pool the opportunity to recover the gas under his property substantially in the proportion it bears to the recoverable gas in the entire pool?

A Well, sir, as a practical matter, the formula I have recommended of 75 percent credit to acreage times deliverability and 25 percent to acreage is the best one that I have been able to devise to fit those requirements.

Q In your opinion, would the formula you propose come closer to accomplishing this result than the 100 percent acreage formula?

A Yes, sir.

Q In your opinion, what allocation formula will minimize to the greatest extent under-compensated drainage in the Jalmat Gas Pool insofar as this can be done in a practical and practicable manner?

A I think that the 75-25 formula will definitely be an improvement in that respect over the 100 percent acreage.

MR. CAMPBELL: I would like to offer in evidence Texas Pacific Exhibits R-1 through R-13.

MR. PORTER: Without objection they will be admitted.

MR. CAMPBELL: I believe that's all.

MR. PORTER: At this time we'll recess the hearing until 1:00 o'clock.

(Recess.)

AFTERNOON SESSION
March 26, 1958

MR. PORTER: The meeting will come to order, please. Does anyone have any questions of Mr. Keller?

MR. MALONE: May it please the Commission.

MR. PORTER: Mr. Malone.

CROSS EXAMINATION

By MR. MALONE:

Q Mr. Keller, I want to be sure that I understand the procedure which you followed in arriving at the reserves which were the basis of your testimony. Am I correct in my understanding that you extrapolated a pressure production curve to an abandonment pressure of 100 pounds, and taking the figure which you obtained in that fashion, you divided it among the number of acres assigned to that well to arrive at the per acre value?

A Yes, sir.

Q That was the manner in which the computation was made?

A That's right. That pressure production data was during the period of '51 to '57.

Q When you say "to '57", do you mean up to '57 or including '57?

A Well, sir, it's up to the date of the pressure on the '57 survey on each well.

Q That would be up to approximately January 1st, 1957?

A Plus or minus.

Q Two or three months?

A Yes.

Q It is true that all of the figures which are the basis, the so-called reserve figures which are the basis of your testimony and the exhibits which you have presented are figures which you obtained through the use of that method?

A It's true that all my reserve per acre figures were arrived at in that manner, yes, sir.

Q Now, I would appreciate it if you could answer this question yes or no, just to clarify the question, and if you want to explain the answer, why, I'll be glad for you to. Are you telling this Commission that the figures which you arrived at in that manner are the recoverable gas in place under the tracts assigned to those wells?

A No, sir.

Q Are you telling --

A (Interrupting) Could I explain?

Q Yes, you may.

A I am telling the Commission that the distribution of the reserves per acre calculated in the manner that I have shown represents a trend in the variation of the actual recoverable gas

in place distribution throughout the field.

Q But not that they are the equivalent of the recoverable gas in place under the tracts?

A They are not the equivalent for the individual tracts, no, sir. I thought I had explained that. They do represent, in my opinion, the fact that there exists a variation between tracts in recoverable gas in place, and the variation represented by the reserves per acre is very similar to the variation that actually exists in respect to recoverable gas in place.

Q Now, may I ask you another yes or no question? Are you telling this Commission that the same relationship exists between deliverabilities and the reserves as you have computed them that would exist between deliverabilities of those wells and the recoverable gas in place under the tract on which the well is located?

A I am saying --

Q (Interrupting) Can you answer that yes or no?

A Would you repeat that? Can you read the question?

REPORTER (Reading) "Now, may I ask you another yes or no question? Are you telling this Commission that the same relationship exists between deliverabilities and the reserves as you have computed them that would exist between deliverabilities of those wells and the recoverable gas in place under the tract on which the well is located?"

A Yes, sir, so far as the field pattern is concerned.

Q Is that same answer true so far as individual tracts are

concerned?

A No, sir.

Q So you are not telling the Commission that the relationship between deliverability and the gas in place under individual tracts is the same as the relationship between deliverabilities and the reserves, as computed by you for that tract?

A Not for the individual tracts, just for the field distribution picture as a whole.

Q Thank you. Now, your study was based, the study to which you testified today was based on the extrapolation of curves on how many wells?

A 322.

Q And how many of those wells did you have complete --

A (Interrupting) Correction, if I may, there were extrapolations on approximately 280 wells. The other approximately 40 wells, the reserves per acre were arrived at by interpolation of a reserve per acre contour map, in a similar manner that Mr. Leibrock employed in assigning net pay to the 20 wells in his fifty-eight well study in which he didn't have logs.

Q You were in error then when you testified this morning that you had reserve and deliverability data on 85 percent of the tracts in the Pool and had extrapolated curves on that many tracts?

A I was in error if I testified I extrapolated curves on that many tracts. I did not intend to so testify. There were 40 that were interpolated reserve estimates, and I do have reserves per

acre estimates on 85 percent of the wells.

Q But as to some 40 wells, you made no computation and merely estimated or interpolated what the reserves would be?

A Yes, sir.

Q Now, with reference to the Exhibits 2, 3, and 4, which are on the forward bulkhead. You recall the so-called difference map which the operators presented at the last hearing analyzing the number of tracts as to which there was agreement and the number of tracts as to which there was difference as between your so-called reserve map and your deliverability map, do you recall that?

A Yes, sir.

Q Did you make an analysis of these two maps to see in what percentage of cases there was agreement and what percentage disagreement?

A Yes, sir.

Q Could you tell us the percentage in which there is complete agreement as disclosed by your surveys as between the reserve and the deliverability maps?

A Yes, sir. You will recall on the two previous maps there was a 50-50 agreement as to the quartile distribution between the reserves and the deliverability.

Q It was my recollection --

A (Interrupting) For the wells that we had data on.

Q Yes, but when the wells that you didn't have data on were added in, that there was only affirmative agreement shown in 30

percent of the cases?

A Of course, we can't include reasonably, I think, the wells that don't have both colors because we are talking about agreement between the two quartiles, and if you don't have complete data, you don't have a valid comparison, but the 50-50, there was 30 percent, as I recall, that agreed, and 30 percent that didn't agree, and 40 percent that you didn't have data on, both reserves and deliverability.

Now I would like to point out that if there were no correlation between reserves per acre and deliverability; that is, if there was just a random relationship, just a matter of chance, then that agreement of 50 percent agreed and 50 percent didn't would be 25 percent would agree and 75 percent would not agree, for the simple reason that for each quartile on reserve the deliverability, if there is random distribution, has one chance out of four of falling in the same quartile as the reserves; so the fact that you had twice as many agreements as you could expect if there were no relationship is just another way of showing that the truth of this situation,that the relationship exists.

Q My question was, what percentage of similarity did you find in comparison of these two?

A As I recall between the Texas Pacific R-2 and 3, that is the reserve and deliverability map, there was 40 percent of the 322 tracts, 41 I believe it was that agreed, and 59 that didn't agree. Of course, if there was no relation, it should have been

25 percent agreed and 75 percent disagreed, insofar as the same quartile distribution between reserves and deliverability. Here again, showing that had there been random distribution -- correction, here again showing --

Q (Interrupting) That wasn't my question at all, Mr. Keller. I believe we'll get along a little faster if you will confine yourself to my question. I'm glad for you to explain any answer but I didn't ask your opinion of what the agreement should have been. I merely asked the percentage that did exist, and you have answered that question.

A I was merely trying to clarify the significance of the percentage.

Q I don't want to shut you off, but I think we will get along better if we confine ourselves to the questions. Now, with reference to your Exhibit 11, R-11, and the exhibits related to it in which you referred to, I believe, a self-correcting mechanism that was built into the deliverability formula. That was the purpose of that exhibit, was it not?

A That was one of the purposes, yes, sir.

Q And it was intended to show that when this formula is in operation, this type of correction will occur?

A Yes, sir.

Q Well, now, is it or is it not essential to the analysis which you made of this exhibit that there be a barrier or a complete separation of Well No. 1 and Well No. 2, in order for these conditions

to occur?

A I have assumed no migration between the two, and whether or not there is migration will affect the degrees but not the basic principle which I was trying to illustrate.

Q Then the answer to my question as to whether or not a barrier or separation is necessary for the testimony which you gave to be applicable, the answer is yes, is that correct?

A I don't believe it can be answered with an unqualified yes. The answer is yes insofar as the hypothetical situation I have shown on Exhibit No. 11. It's not yes insofar as the principle which it illustrates.

Q Then is it also true that to the extent that migration does actually occur, your testimony with reference to these exhibits is proportionately reduced in its application?

A In degree, yes, sir.

Q If, as has been testified in this case, very complete communication exists in some of the areas, the conclusions which you drew from this and the related applicability would be wholly inapplicant, would they not?

A If there were complete migration between the two, the self-correcting factor would not operate, that is correct.

Q To the extent that migration does occur in this pool, that self-correcting mechanism will not operate?

A Yes, sir.

Q And you have testified that in your opinion there is wide-

spread migration in this pool, have you not?

A Widespread, but not complete.

Q Referring now to the exhibits which deal with your twenty-well groups, or which are predicated upon the twenty-well groups, I believe that those are the exhibits in the series of 7, 5, 6, 7, and those exhibits which are predicated upon a breakdown into twenty-well groups --

MR. CAMPBELL: (Interrupting) Just a minute, Mr. Malone. I think you are unintentionally in error there. 5 and 6 have to do with the twenty-well group, 7 and 8 have to do with the areal breakdown in half-townships.

MR. MALONE: Thank you very much, Mr. Campbell, I was in error.

Q Referring then to Exhibit 5, as I understand it, each of these points represents a twenty-well group, is that correct?

A Yes, sir.

Q And in determining the point at which you will place this point, you have averaged the reserves or the deliverability of those twenty wells to determine the point at which this will be placed on the log paper, is that correct?

A Yes, sir, it's an areally weighted average.

Q So that this point to which I am directing your attention indicates, and the color red is average reserve, is it not; that's the average reserve for twenty wells and not the reserve for any individual well?

A Yes, sir.

Q The twenty wells which make up that group are not physically located in immediate proximity to each other, necessarily, are they?

A No, sir.

Q In fact, the twenty wells which compose each of these groups are spotted over the entire Jalmat Gas Pool, are they not?

A Yes, sir.

Q The only thing that they have in common for purposes of this exhibit is the range of their reserve, which is averaged and shown on the exhibit?

A Yes, sir.

Q That is correct?

A Yes.

Q Have you made any effort to compare the range of reserves and the range of deliverabilities as between the individual wells which compose any of these twenty-well groups?

A No, sir, I have not, because that would be analogous to comparing the weights of men between five eight and five ten.

Q That's kind of a sorry subject with me, but go ahead.

A For the simple reason that would only test this relationship to see if it was a unique relationship, and I know it is not a unique relationship; it is a general relationship of the type that I tried to explain by analogy with the height-weight relationship.

Q Now drainage in a pool results in injury to correlative

rights, does it not, if it is not compensated by counter-drainage?

A It may, yes, sir.

Q Drainage occurs between individual wells and between the twenty-well groups spread over a pool, does it not?

A No, sir.

Q Would you care to explain your answer?

A If you would like for me to explain, yes. Drainage occurs over, across the distances over which the pressure gradient operates. It doesn't occur between wells, it occurs over the distances over which the pressure differences operate.

Q Do I understand you then to be testifying that drainage does not occur as between wells when disproportionate takes occur?

A Maybe I misunderstand what you mean by drainage, but when I say drainage, I mean the movement of oil underground as between properties takes place within the reservoir over the areas in which the pressure gradients operate.

Q Well, I believe if I was trying to define drainage, as I understand it, it would be that when one man produces the gas that the New Mexico Statutes says belongs to another man, would you accept that as a definition of drainage?

A Yes, sir.

Q When that kind of drainage occurs, it occurs from well to well and lease to lease, rather than as between your twenty-well groups, does it not?

A Well, sir, the drainage, the movement of gas from one

property onto another still takes place over the area which the pressure gradients in the reservoir exist.

Q There is no uniformity of pressure gradient as between the twenty wells in any of the groups shown on this exhibit, is there?

A I don't know. I haven't investigated that.

Q You haven't checked into that at all?

A I would suspect there is some relationship, but I haven't, I don't recall checking that.

Q You haven't, I believe you said, checked as between the wells that compose any of these groups to see how much of a range there may be as between them?

A No, sir.

Q There is no way of knowing, then, where a well which appears in this group, as to its reserve average, as to where it is going to appear in a group as to its deliverability average?

A Oh, yes. The same twenty wells that I show average reserve per acre for are the same twenty wells that the deliverability applies to.

Q But in their relative positions within the twenty-well groups, there is not necessarily any relationship?

A No, sir, just as in the people that are five foot eight to ten, there is no correlation between their weights. They may be, although they'll average out under my analogy to about 150 pounds, there is not a unique relationship on individual wells between deliverability and recoverable gas per acre.

Q Would you mind defining that term that you have been using, unique relationship?

A No, sir, I wouldn't. By unique relationship, I mean there is a definite mechanical relationship that holds true between two factors; for example, if all men between five foot eight and five foot ten weighed 150 pounds, then that would be a unique relationship. If I knew a man's height, I could tell you what his weight was.

Q As you use that term, is it synonymous with correlation?

A No, sir.

Q What is your definition of correlation, please?

A Well, sir, I think it's the same one that is in the dictionary, that there is a similarity between the two.

Q Without any relation to the extent of the similarity?

A Without any relation to the degree of similarity, yes.

Q I have just one or two other questions, Mr. Keller. You will agree, will you not, that a well with high deliverability which has been produced more than other wells in the area will normally extrapolate to a higher reserve than a well which has been shut in, or the production of which has been held back?

A Yes, sir.

Q For instance, the testimony, I believe, in this hearing was that there were a lot of wells that were connected to a pipe line other than El Paso Natural, which had not been taking the allowable of those wells over a period of time. The extrapolation

of the curve on those wells would indicate lower reserves for those wells than the extrapolation of a curve on a well of high deliverability which had been producing in excess of its allowable?

A The extrapolation, I think, would be influenced by that factor, if the period over which you were extrapolating covered the period of the data that you were using, yes, sir.

Q So that wells which were overproduced because of high deliverability or for any other reason during 1955 and 1956, would normally be shown in your computation of reserves to have a higher reserve than a well which had not been produced to that extent?

A Yes, sir.

Q Let's assume two wells with equal deliverability; one on a 320-acre unit, and one on a 160-acre unit. Let's assume that the production from those two wells is the same, and that you extrapolate a curve on each of the wells to determine its reserves as you have done in this case. You would come up with the same ultimate reserve for each well, would you not?

A No, sir.

Q You would not?

A No.

Q What would you come up with?

A I can't tell from your question.

Q What factors in addition would you like me to provide, and I will provide them.

A The recoverable gas in place underneath the two. That is

the one that is going to be critical in determining the reserve per acre that you are going to extrapolate.

Q I had reference to the extrapolation of a pressure production decline curve, which is what I understood you had done in this connection.

A Yes, sir.

Q If you had the production history on those two wells, if they had produced the same amount, and the pressure decline had been the same, the same indicated reserves would result, would they not?

A The same pressure?

Q Yes.

A Yes, sir.

Q So that we have got one well on 320 acres and one well on 160 acres, the same amount of production, the same pressure drawdown, and the same reserves are indicated. Now, when you distribute those reserves back to the tract on which that well is situated, you are going to get twice as much reserves per acre for the 160-acre tract as you do for the 320-acre tract, aren't you?

A Yes, sir.

Q On your map up there, you are going to show the 160 tract as having doubled the reserves that the 320-acre tract has, aren't you?

A Yes, sir, because under your assumption, the recoverable gas in place would be approximately twice as much under the 160-acre tract. Your assumption dictated that that would be necessary, if

that were not the case, then the pressures wouldn't decline per unit of production at the same amount. The only difference would be the amount of migration that took place between the tracts in the interim. The one with the lower recoverable gas in place per acre would benefit from migration to whatever extent it took place, and the other would lose.

Q I had reference to the reserves that you were going to end up showing on your reserve map as a result of the means of computing them that you have used. I think you did agree with me that on your map in that situation the 160-acre tract would show twice the reserves that the 320-acre tract would show?

A Yes, sir.

Q Your map was prepared on the basis of computation as to when that would be true?

A That would be the result of my computations under the assumption that you have given me, and of course, that necessarily implies that the recoverable gas in place would be in approximately the same relationship as my reserves per acre.

Q Now I have not --

A (Interrupting) The difference being whatever migration took place.

Q That, you understand, was not a part of the assumption in my question. That is a conclusion you are drawing.

A No, sir. That was inherent in the assumptions that you gave me.

Q And on that basis, you feel that there is no distortion in the reserve map that results from that computation?

A Well, to the contrary. I'm not sure what you mean by distortion of the reserve map.

Q I mean that showing twice the per acre reserve on the 160-acre tract that you show on the 320-acre tract is a distortion for my purposes.

A No, sir, it's not a distortion. It's a reflection of the approximate relationship of the recoverable gas in place between the two tracts.

Q Now, you have agreed with me, I believe, that the figure that you so compute is not the equivalent of recoverable gas in place?

A If there was no migration between the tracts, it would be exactly the recoverable gas in place between the tracts.

Q I believe we established early in the hearing that migration does exist between the tracts?

A You want me to assume migration in this example?

Q Yes.

A Then the difference in the reserves per acre and the actual recoverable gas in place that you get under your hypothesis would be dependent upon how much migration took place under those circumstances.

Q When you fixed -- pardon me, when you fix an allowable that includes a deliverability factor, because you show that that

deliverability factor is in proportion to the per acre value that you have assigned. On that basis, you are fixing an allowable that is not in proportion to the recoverable gas in place under the tracts, are you not?

A No, sir. You are fixing an allowable that comes as close as possible to be, under the circumstances is practical to be, in proportion to the recoverable gas in place. Your hypothesis and my answer, I think, proves that pretty well.

Q That is your conclusion?

A It's the only conclusion that can be drawn under the hypothesis you gave me, yes, sir.

MR. MALONE: That's all.

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

MR. DUTTON: Dutton, representing Sun Oil Company.

By MR. DUTTON:

Q Mr. Keller, the Jalmat Pool, is the recoverable gas in place under a tract assigned to a well proportional to the deliverability of that well?

A Directly proportional to?

Q Is it proportional to?

A No, sir, as I have repeatedly tried to explain, there is not a unique relationship or a proportionality between the deliverability and reserves in the Jalmat Field. There is only a general relationship such as the height-weight relationship.

Q Mr. Keller, in the Jalmat reservoir, is the recoverable gas in place under a tract assigned to a well proportionate to the deliverability of that well?

A My answer to that is no.

Q Thank you. Mr. Keller, is the volume indicated by your extrapolation of the cumulative production versus pressure curve of a given well that amount of recoverable gas under the tract assigned to such well?

A It may be or it may not be.

Q Under what conditions may it be?

A If there is no migration, net migration, it is the best measurement of the exact recoverable gas in place.

Q If there is no migration between tracts, is that correct?

A As to the particular tract you are referring to, if there is no migration in or out of that tract.

Q Now, for the moment let us define migration across a tract as the movement of gas across the boundary lines separating that tract from the adjacent tract, is that suitable? Do you understand for the purpose of this question what I refer to?

A Which boundary are you referring to?

Q Any boundaries.

A Any or all?

Q Any or all.

A You mean net movement then across all the boundaries?

Q All right, sir, if you prefer. Is the net migration across

those boundaries going to be affected by the location of the well on the tract assigned to it?

A Well, sir, it may be, there will be a lot of factors that determine that migration. The location of the well might under some circumstances be one of them.

Q You have implied that the volume indicated by your extrapolation might be proportional to the recoverable gas under the tract assigned to the well in question, if there is no migration on or off that tract?

A No, sir, I haven't implied it. I have stated it as a fact.

Q How many tracts within the Jalmat Pool would you estimate have suffered no migration?

A I don't know how many have.

Q First let me ask you this. Is migration, the movement of gas between tracts, as you are defining it, a function of the pressure gradient existing between the tracts?

A It is one of the factors that determine, the pressure gradient is one of the factors that influences the amount and direction of the migration, yes, sir.

Q Other than the fifty-eight well area which you have pointed out which has rather uniform pressure, is there in general pressure gradients established between the majority of the tracts in the Jalmat Field?

A There is pressure gradients established between the points where we measured pressure, yes, sir.

Q In the majority of the tracts in the Jalmat Field, is the volume indicated by your extrapolation of the cumulative production versus pressure curve of a given well that amount of recoverable gas under the tract assigned to such well, in the majority of the cases?

A Well, I don't -- it's not possible to evaluate the actual recoverable gas nor what the net migration has been from the pressure gradients, so I honestly can't answer that question.

Q You don't know the answer to the question, that in the majority of the cases is the volume indicated by your extrapolation of the cumulative production versus pressure curve of a given well that amount of recoverable gas under the tract assigned to such well? You cannot answer that question, is that correct?

A I don't know, no, sir.

Q You don't know?

A No, sir. Neither does anybody else.

Q In other words, you don't know that this is even the situation in the majority of the cases, and yet in all of these exhibits you are using that reserve in which, you don't know if it is even representative in a majority of the cases?

A Wait a minute. I didn't say I didn't know it was representative. I said I didn't know whether it was equally recoverable to the gas in place. I know it's representative. I know that the distribution of reserves per acre is representative of the recoverable gas in place distribution. That's what I tried to explain from

Exhibit No. 1 that I presented. I know that, yes, sir.

Q You know that that is in the majority of the cases, even though in the majority of the cases you do not know that the volume indicated by your extrapolation is that amount of recoverable gas under the tract, under the tract assigned to such well?

A Yes, sir, I know that the distribution of the reserves per acre --

Q (Interrupting) Excuse me.

A -- represents the distribution of the recoverable gas in place because they are related, and in a fashion that I tried to explain in Exhibit No. 1. They're related in the fashion that the recoverable gas in place for the lower or poorer tracts is somewhat less to varying degrees, as between tracts, than the reserves per acre and the recoverable -- the reserves, the recoverable gas in place, from the better tracts is somewhat higher than the reserves per acre; therefore, I know, and this all occurs because we're dealing with substantially acreage withdrawals, 100 percent acreage withdrawals over this period. I know, therefore, that the distribution of the actual recoverable gas in place is represented by the distribution of the reserves per acre.

Q Mr. Keller, I would be the first to defend your right to qualify the answer, but in the interest of time, I would be happy to stipulate that you could be brief each time.

The question involved is not the distribution of recoverable gas. The question involved is, does your method indicate the

recoverable gas under the tract assigned to the well? Your original answer, if I may review, was that in those cases in which migration is taking place; it was then established that you don't know, but that in the majority of the cases migration is taking place. Now, my question is, therefore, in the majority of the cases, is the volume indicated by your extrapolation that amount of recoverable gas under the tract assigned to such well, in the majority of cases?

A I don't know whether it is in the majority of cases, no, sir.

Q Thank you. But --

A (Interrupting) That is equal.

Q But your reserve map, let's first say that the reserve map is based on what you say, mcf per acre, in what you refer to as reserve per acres, is that correct?

A Yes, sir.

Q Now, what area did you divide this extrapolated volume by to get reserves per acre?

A By the acres assigned to each well.

Q Yes. And in the majority of the cases, you do not think that extrapolated value is the volume of recoverable gas under the given tract assigned to the well?

A No, sir, all I know is that it is equal to the recoverable gas in place, if there has been no net migration.

Q And you don't know the extent to which there has been net

migration?

A No, sir.

Q Thank you. One final question, if we can refer to your Exhibit R-1 which you mentioned just a minute ago. Mr. Keller, were you present yesterday when Mr. Leibrock testified that there was a 40-fold difference in the deliverabilities within the so-called fifty-eight well area?

A Yes, sir.

Q Do you have any reason, or do you deny the accuracy of that figure?

A I haven't checked it, but I think it's about right.

Q Referring now to your Exhibit No. R-1, let us assume that Tract 1 has a deliverability 40 times that of Tract 2. Under your recommended formula, what would be the approximate proportion of the allowable allocated between Tract 1 and Tract 2?

A What's the deliverability?

Q 40 times higher in Tract 2 than Tract 1, wouldn't it be approximately 30 by your formula?

A I would have to calculate this.

Q I see.

A Would you repeat the question? I forgot the question.

Q Yes, I would think you would. The deliverability of Tract 1 is 40 times that of Tract 2, you show the same acreage on Tract 1 and Tract 2. Now, with the 40-fold difference, what would be the relative allowable between Tract 1 and Tract 2?

A Let me check my calculations on it.

Q Sir, would it not be approximately in the order of three-quarters of the difference between the deliverabilities?

A I figure that the Tract 1 would have about three and a half times as Tract 2.

Q This is the formula that you recommend, 75 percent acreage times deliverability, plus 25 percent acreage, is that correct?

A Right. See, the most it could be would be four to one.

Q Well, your answer is three and a half times as much?

A I think that is correct, yes, sir.

Q And your actual recoverable gas in place is in what proportion, sir?

A It was two to one in favor of Tract 2.

Q Or one to two, as expressed between Tract 1 and Tract 2?

A Yes, sir.

Q On 100 percent acreage allocation, what would be the allowable for each one, expressed as a one -- would it be one to one?

A Yes, sir, it is one to one.

Q So in this case the deliverability could work to occur a worser distribution of the allowable, when measured in terms of the recoverable gas in place under each tract?

A Yes, sir, that's possible.

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

MR. PORTER: Mr. Howell, did you have a question?

By MR. HOWELL:

Q Mr. Keller, would you please refer to Texas Pacific Exhibits R-2, R-3, and R-4, and would you be kind enough to indicate on Exhibit R-2 the area covered by the fifty-eight well study made by the operators group?

A (Witness complies.)

Q It isn't necessary to block it out, just in general to indicate on that exhibit.

A Yes, sir. I tried to put it in with black on Texas Pacific Exhibit R-2, the so-called fifty-eight well area.

Q Mr. Keller, what is the relative reserve capacity of that area as shown by the colors there? Is it among the best or medium or the poorest?

A Oh, it covers, for the most part, the best part of the field.

Q That is approximately the best part of the field from a reserve standpoint?

A Yes, sir.

Q What about a deliverability standpoint, as shown by your R-3?

A Well, it's best for the field from deliverability, also.

Q What about the pressure standpoint?

A Well, in general, it's the highest pressure area, also.

Q Would you say it's a fair assumption that this particular fifty-eight well group does not represent the conditions which exist in the southern half of the field?

A I think that's quite obvious, that it doesn't.

MR. HOWELL: That's all.

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

By MR. UTZ:

Q Mr. Keller, I would like to clarify a little bit on your free-hand drawing you made there of recoverable gas and reserves per acre. I think it's on the bottom there. Now, your recoverable reserves per acre on your vertical axis --

A Yes, sir.

Q Did you have actual reserves on which to plot that, or is that an assumed mathematical fact?

A No, sir, this just shows the type of relationship that must necessarily exist between reserves per acre and recoverable gas per acre under a condition where the withdrawals are substantially on an acreage basis.

Q In other words, if the recoverable gas equalled your reserve, it would have to be a slope of one?

A Yes, sir. It is not a slope of one and has a slope oriented in this direction.

Q This is your other curve. That's your curve which you apparently sketched on there by your method of calculating reserves, is that correct?

A Yes, sir. Let me label these and maybe it will help us.

Q It is the second slope which I have reference to now.

A The one assuming no migration?

Q No, the one that you have dotted in there.

A Yes, sir.

Q Dashed in.

A Yes, sir.

Q Did you arrive at that slope or a reasonable facsimile of that slope from your actual reserve data that you contemplated by using your pressure decline method?

A No, sir, I didn't, because to do that I would have to have the reserve per acre which I have, but then I would have to have the corresponding actual true value of the recoverable gas in place underneath that tract, and of course, short of mining it, there is no way of determining that true value; but, see, the reason I know that this is representative of the slope is due to the fact that under 100 percent acreage allocation, the poorer tracts will be the gainers by migration. Therefore, I will evaluate more gas reserves per acre than the actual gas in place for the poorer tracts which will throw my points above the solid line, which assumes no migration. Conversely, in general the better tracts will be the losers by migration, so those points will be less than the recoverable gas in place that actually exists, so I know that I will get a slope, as illustrated by the dashed line, and the variation of these points will represent the degree of migration in my reserve measurements.

Of course, the thing about it is that the deviation, or

the difference between the various points and the actual recoverable gas in place will equal zero for the whole group, because for the whole field migration cancels out, so I do know that the sum total error from the points and the actual recoverable gas in place is zero, see. And it is because of that that we can use the reserve per acre distribution as a measurement of how well a formula abides by the statutory requirements in respect to distribution of recoverable gas in place.

Q Now, referring to your Exhibits 3 and 4, I believe it is, your colored exhibits up here --

A Yes.

Q -- What was the deliverability that you used under 3-R, is that the deliverabilities from the four-point test?

A Yes, sir. I have taken the data from the tests that I obtained from your office and other sources, and using the slope from those multiple point tests and the absolute open flow, I have calculated the deliverability against 80 percent of the shut-in pressure, employing the slopes for the individual wells shown on that deliverability data.

Q Now, referring to No. 4 --

A Yes.

Q -- Did you use the pressures of the four-point tests?

A Yes, sir.

Q Wellhead pressures?

A Yes, sir.

Q Are those wellhead pressures, you think, representative of bottom-hole pressures?

A Yes, sir, I think they are representative. It's not a matter of thinking, I know they are.

Q A little while ago, we were discussing migration and the extent of migration;if we had complete migration in the Jalmat Gas Pool, what would the pressure contours look like?

A Well, there would be no pressure contours. If we had complete migration, the pressure would be uniform and of course, the fact that they are not, there's such a widespread variation in pressure, is certainly indicative of the fact that the migration has been far from complete.

Q This is quite a pressure difference in the Jalmat Pool, which would indicate a pretty inefficient migration, is that right?

A Yes, sir, it would certainly indicate that it's far from complete, because, see, the pressure variation within the field or at least I can say within 85 percent of the field, because I have pressure data on 85 percent, varies from a minimum of 204 to a maximum of 1,050, which is a 5-fold variation, and that's pretty far removed from uniform pressures and certainly that's pretty far removed from complete migration.

Q The pressures in the pool are the same only in local areas, is that right?

A Yes, sir. There's a pattern to the distribution to where in one little area they tend to be less divergent in pressures than

the field as a whole.

Q Your studies as to the pressures in the Jalmat Pool, how effective do you think that migration is, how far, in other words?

A Mr. Utz, that, to quantitatively evaluate migration, contrary to what you might expect from the Operators Exhibit No. 7-R, is an extremely complex problem. It involves so many variables that actually it's almost impossible to evaluate it quantitatively without an extreme amount of work and a lot of data in respect to the permeability variations, especially,for example, and the pay thickness variation; so as a practical matter, the quantitative degree of migration can't be evaluated with the data at hand, or at least the data at hand I have in the Jalmat Field. So you have to rely on, let's say, experience and judgment, and I think the testimony I just gave in respect to pressure and its relationship with migration is about as close as I can come to it.

Q Mr. Keller, you as a consultant, I presume, do quite a bit of reserve work for various companies and individuals?

A Yes, sir.

Q What method do you use for all of your clients, does the method of calculating reserves vary, or do you use this method that you have used for all your clients?

A Well, sir, actually every reserve estimate is a little different problem, and you always have to tailor your method of estimation to the conditions that exist. Those conditions often limit the method that you have available. For example, if the

properties are new, you have no performance data, you are almost by necessity limited to the volumetric estimate; and in that case, that is what we would use. Now, if we had data available that we could use both methods, that is, both volumetric and performance extrapolation methods similar to the pressure production I have used here, normally we would use both as a check, but normally we place much more weight on the performance-type estimate because it integrates the results of all the variations in pay thickness and porosity and migration that might take place, that you can't evaluate mathematically from the volumetric type of calculation.

Q Then you would use the volume?

A Due to necessity.

Q If you were going to evaluate those properties, would you continue to use the volumetric method, or would you adjust your volumetric method by performance test?

A No, I would adjust them, that is the normal procedure, you have to start out early on a volumetric basis, and that is when your estimates are less reliable. As time goes along and you accumulate other data with respect to performance, you are able to improve the accuracy of your estimates by performance analysis.

Q Is that a commonly accepted practice, speaking of your clients, the work that you do?

A I think it's not only common procedures with us, but it's pretty well common procedures with most evaluators of reserves. In fact, there has been several articles written along those lines.

Q Referring to your Exhibits 5, 6, 7, and 8, where you referred to relative, your original scale is relative value, can you explain to me briefly how you arrived at those relative values?

A Yes, sir. For example, the relative reserve for a given tract per acre of a given tract is the reserve per acre divided by the weighted average reserve per acre for all of the 322 wells which is a constant. So for example, if the average reserve per acre is 21 for the 322 wells of a tract with a reserve per acre estimate of ten and a half, it would have a relative value of ten and a half over twenty-one, which would be five-tenths. Now, the relative values in respect to deliverability are arrived at in the same manner, in respect to pressure are arrived at in the same manner. Referring them to the average deliverability or average pressure, that puts the comparison on a common denominator conformed to one, so to speak.

MR. UTZ: That's all I have.

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

(Witness excused.)

MR. CAMPBELL: We have no more testimony. If the Commission please, I would like somewhere in the proceedings to offer in evidence some documentary evidence. There may be other witnesses here, and perhaps we can wait until the end, just before the argument, or would you prefer it now?

MR. MALONE: I think we might wait until the testimony is

(Texas Pacific's Exhibit No. R-14 marked for identification.)

MR. CAMPBELL: Let the record show that I did offer Exhibit Texas Pacific R-14 in evidence.

MR. PORTER: If there is no objection, it will be admitted.

(Witness sworn.)

F. NORMAN WOODRUFF

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

DIRECT EXAMINATION

By MR. HOWELL:

Q Will you state your name for the record?

A F. Norman Woodruff.

Q You are the same F. Norman Woodruff who testified in the original hearing?

A Yes, sir, I am.

Q Now, in the original hearing, El Paso Natural Gas Company introduced certain exhibits covering the nominations, allowables, and actual production in Lea County from, I believe it was the 1st of 1956 through October, 1957, is that correct?

A It was through September of 1957.

Q Through September of 1957?

A Yes, sir.

Q Have you now prepared a supplemental exhibit covering the nominations, allowables, and actual production by El Paso Natural Gas Company from the gas pools in Lea County, up to the latest date that such information is available?

A Yes, sir, I have,

MR. HOWELL: Will you mark that as El Paso's Exhibit R-1?

(El Paso's Exhibit No. R-1 marked for identification.)

Q Now, through what months do the nominations show on this Exhibit R-1?

A Nominations, through April of 1958.

Q And the allowables show through what months?

A March of '58.

Q The production shows through what months?

A February of '58.

Q Now, have you sub-totaled all of the columns ending with the month of February, so that comparison can be made?

A Yes, sir, I have.

Q What are those totals?

A Total nominations by El Paso Natural Gas Company for the five-month period, 93.7 billion cubic feet. Allowable for the same period, 58.8 billion; production for the same period, 59.0 billion cubic feet.

Q Will you continue with the other columns on the exhibit, explaining what each column reflects?

A Column 4 is purchased gas from Permian Basin Pipe Line Company for the same period, a total of 18.9 billion. The fifth column represents the sum of the third and fourth columns and shows for the five-month period a total El Paso demand supplied of 78 billion.

Q Now, approximately how much is that short from the nominations and the market which existed?

A Approximately 16 billion cubic feet of gas.

Q What do columns 6 and 7 reflect on this exhibit?

A Column 6 shows the cumulative overproduction to El Paso connections; Column 7 shows the cumulative underproduction to El Paso connections.

Q I note that the cumulative total of overproduction and the cumulative total of underproduction shows a steady rise, except for the month of December, 1957. Can you account for that drop during the month of December?

A At the end of December, 1957, the Commission balanced the Lea County prorated gas pools. As of that date, they made the cumulative production to that date equal to the cumulative allowable to that date.

Q Did that result in the cancellation of underproduction attributable to some wells and its redistribution to overproduced wells?

A Yes, sir, it did, which would result in lowering both underproduction and overproduction.

Q But I'll ask you what the experience reflects as to the two months of January and February in 1958, as to increase in both overproduction and underproduction?

A It shows that overproduction has increased during January and February, 1958, from the low at the end of December of approximately 7.1 billion. At the same time, underproduction has accumulated in the volume of approximately 3.7 billion.

Q Are there any other comments you care to make with reference to this El Paso Exhibit R-1?

A Yes, sir. I think it's significant to realize that during this period shown, we have experienced enforcement of the allocation formula adopted by the Commission. We have had a balancing date, the first one since proration started. We can see that there was some benefit from the balancing date that it reduced overproduction, reduced underproduction. We can also see that there has been interconnection of pipe lines, a substantial portion of El Paso's demand being supplied by Permian Basin Pipe Line Company. It shows even with the proration formula in effect and with interconnection of pipe lines, that the market demand for El Paso is not being supplied.

Q As a result of that situation, what happened to the total Lea County nominations made by El Paso for the month of April, 1958?

A They decreased from the month of March approximately three

billion cubic feet.

Q And where was that decrease nominated?

A Primarily in the San Juan Basin.

Q Do you have any further comments as to this exhibit?

A I believe not.

Q I will ask you if you have prepared an exhibit, which will be marked El Paso's Exhibit R-2?

A Yes, sir, I have.

(El Paso's Exhibit No. R-2 marked for identification.)

Q Will you please state just what this exhibit reflects in the way of figures and tabulations?

A This exhibit shows for the same period covered in Exhibit No. 1 El Paso's nominations, allowable, production, cumulative overproduction and cumulative underproduction for the Jalmat Pool.

Q Referring again to the sub-totals for the five months ending in February, 1958, will you please state what were the total nominations which El Paso made for production from the Jalmat Pool?

A Total nominations was 44.5 billion; total allowables, 32.8 billion; total production, 31.3 billion; cumulative overproduction was 6.3 billion; cumulative underproduction was 10.8 billion.

Q Now, how much of the market which existed did the Jalmat Pool fail to produce because of the effect of the allowable formula?

A Approximately 13 billion.

Q That is during a five-months period?

A That is correct.

Q Am I correct in my recollection that you have previously testified that in the Jalmat Pool El Paso Natural Gas Company is connected to approximately 85 percent of the units in the pool?

A Yes, sir, that is correct.

Q Do you have any further comments which you would care to make with reference to El Paso's Exhibit R-2?

A I believe not.

Q Mr. Woodruff, since January of 1958, what action has been taken by the New Mexico Oil Conservation Commission and the Texas Railroad Commission with reference to oil allowables?

A There has been a continual reduction in permitted oil production in each state.

Q Do you recall what the allowables were for each state during this two-months period?

A You mean for January and for March?

Q January, February and March.

A The Texas permitted days of production was 12 for January, 11 for February, 9 for March.

Q While you are on that subject, has it been announced for April?

A Yes, it is 8 days for April.

Q Do you recall the New Mexico oil allowables?

A I am not positive, I believe that they were 35 for the month of January and February, and 33 for the month of March.

Q The record, of course, of the Commission, will show if it

should be 34 instead of 35 for either of those months?

A That is correct.

Q At the original hearing, El Paso Natural Gas Company put on testimony showing the large proportion of its requirements which it supplied by residue gas, which is the gas produced in connection with the production of oil, in the States of Texas and New Mexico. What has been the effect during 1958 of the oil reduction, with reference to the supply of residue gas becoming available to El Paso Natural Gas Company?

A The supply of residue gas has declined month by month. I might go further to state that the months of January and February were at essentially the same rate that permitted oil production and the relating casinghead for those two months was almost identical, but for the month of March we have had a three-day cut, essentially a three-day cut from either January or February in Texas, and in New Mexico we have had a two-barrel cut.

Q Now, for example, do you have the comparable figures of residue gas which became available on the 17th day of January, 1958, and the 17th day of March, 1958; or can you tell the difference between the two?

A Yes, sir. The difference on those two days was 242 million cubic feet.

Q Which was the lesser, the March or January?

A The March. The 17th of March was less by 242 million.

MR. DUTTON: If it please the Commission --

A -- Than the 17th day of January.

MR. DUTTON: I'm sure that Mr. Howell has reasons for introducing this. I am going to object on the ground it appears to be wholly immaterial and somewhat time-consuming, too. I would like to make a formal objection and would appreciate hearing his side of the story.

MR. HOWELL: A good way to hear the side of the story is to withdraw the objection.

MR. DUTTON: My objection goes to the materiality of the information being introduced. If I am mistaken, I will be glad to hear it.

MR. HOWELL: If it please the Commission, the testimony continues along the same line as testimony introduced in the previous hearing, and admitted, which we expect to follow with additional testimony showing the inability of the Jalmat Pool to meet market demand under the present proration formula, the prejudice that is resulting to the Jalmat Pool from the imposition of this formula.

MR. MALONE: If it please the Commission, in the light of that statement by Mr. Howell as to the basis on which the testimony is being offered, we would join in the objection being made by Sun, for the reason that the two considerations which the Commission has authorized by the Statutes, on the basis of which they are authorized to allocate production, are waste and the protection of correlative rights. The consideration of whether or not the operations of the El Paso Natural Gas Company are expedited or complicated are not

considerations which may be made the basis of Commission action, as we understand the Statutes, and therefore are immaterial to the questions before the Commission in this case.

MR. HOWELL: I think Mr. Malone has utterly misinterpreted the statement. I did not state that we were offering any testimony to show that the El Paso Natural Gas Company was being benefited or harmed by this. I think that the Statutes, if I recall correctly, direct the Commission to attempt to adjust as between pools so as to prevent discrimination, and when the testimony shows that the effect of Commission action is to require discrimination and to force the transfer of a market which would be given to Lea County Pools to other pools, then it is certainly pertinent and within the jurisdiction of the Commission to hear that testimony and to adopt a rule which will tend to prevent the discrimination which is being caused, not by the action of a purchaser but by the operation of a formula that now exists.

MR. CAMPBELL: If the Commission please, I would like to concur in the statement that Mr. Howell just made about the materiality of this evidence. It was raised in the petition for rehearing with regard to one of the findings of the Commission. The Statutes of the State require the Commission, in Section 65-3-13 (d), "..shall so fix pool allowables as to prevent unreasonable discrimination between pools served by the same gas transportation facility by a purchaser purchasing in more than one pool." We take the position that if the allowable, the manner of fixing the allowable in the

Jalmat Gas Pool does in fact result in unreasonable discrimination by virtue of a deliverability factor, that it is indeed pertinent to this hearing, and as a matter of fact is a proper finding upon which the Commission could base an order. We don't think it's immaterial.

MR. PORTER: Mr, Dutton, the Commission has decided to overrule your objection.

Q (By Mr. Howell) Has the effect of reduced oil allowables in both States increased the market demand for gas from gas pools?

A Yes, sir, it has.

Q Now, does El Paso Natural Gas Company have adequate facilities to produce and market that gas from the Lea County Pools?

A During most periods, they do.

Q Do they have the present facilities to produce and market the deficiency in gas which is resulting from oil allowables?

A They do currently, towards the end of the month we may not have an adequate amount because of the severe drop-off that we anticipate will occur.

Q Are the reserves and the deliverabilities of the wells connected to El Paso's system sufficient to take up the lag that is resulting from oil cutbacks?

A Yes, sir, it is. They are.

Q What is the one thing which is causing a market which could be filled from Lea County wells to be transferred to other areas?

A The non-availability of allowables to the wells which must

produce the gas to meet the market demand.

Q Now, let me ask it this way, during this five-months period, what action have you taken in an effort to produce gas from underproduced wells in the Jalmat Pool?

A We have produced underproduced wells continually. The same thing has been true of all marginal wells.

Q Has the amount of underproduction during this period increased or decreased?

A It has increased.

Q Are there presently wells shut-in in the Jalmat Pool because of overproduction?

A Yes, sir, there are.

Q Are there additional wells which, if the market demand resulting from oil cutbacks would be made up out of the Jalmat Pool, that would be shut-in at the end of the next proration period?

A Yes, sir, there are.

Q In that connection, have you made a list of all of the wells connected to El Paso Natural Gas Company's system in Lea County?

A Yes, sir, I have a report that we prepare periodically listing those wells.

Q How often is that prepared?

A It is prepared three times a month.

Q What is the sequence upon which wells are shown on that report?

A First of all in a scheduling report, we list all marginal wells first; second, underproduced wells; third, balanced wells, that is, wells that have been balanced during the current proration period; and fourth, we list overproduced wells.

Q Now, does that report go to the field with instructions to keep the wells which are underproduced and marginal on to the fullest extent possible?

A Yes, sir, it does.

Q Has that been done during the five-months period?

A Not the entire five-months period.

Q When did the report begin?

A It began around the first of the year.

Q Was the same policy of keeping the marginal wells and underproduced wells turned on to the fullest extent in effect prior to that time?

A Yes, sir, it was.

Q Now, could you give the totals of the marginal wells or wells which are not prorated because they are gas wells in oil pools and hence subject to other regulations, the total of underproduced wells, balanced wells, and overproduced wells, as of the latest report?

A Are you asking for it for the Lea County area?

Q Yes, for the entire Lea County area.

A I'll have to do some figuring on one of the matters.

MR. MECHEM: Why don't we take a five-minute recess?

(Recess.)

MR. PORTER: The hearing will come to order, please. Mr. Howell, will you proceed with your questioning of the witness?

Q (By Mr. Howell) Will you please state for the record, Mr. Woodruff, the totalsof the various classifications of wells in Lea County connected to El Paso's system?

A Of the total 733 wells connected to our system, 50 wells are in a marginal category, 212 wells are in an underproduced condition that have not been balanced during the present proration period. We have 108 wells that have been balanced during the current proration period, both that had been over and that had been under. We had 271 wells that are in an overproduced unbalanced condition. There are 91 wells connected to our system in non-prorated pools.

Q Now, have you also computed from actual experience the producing capacity of each of these wells?

MR. MALONE: If the Commission please, we object to testimony in this regard as to wells located other than in the Jalmat Pool, inasmuch as the issues of this case are limited to that pool.

MR. HOWELL: If it please the Commission, we intend to step off, step from the general situation to the Jalmat Pool. We are able to make estimates as to the demand upon the entire Lea County area, and have made studies indicating at what point the wells which are needed will no longer become available,and will give a similar breakdown for the Jalmat Pool, but have been unable to compute the point on the Jalmat Pool because it's impossible to

tell the exact effect of allowables on that pool.

MR. PORTER: Mr. Malone, your objection is overruled.

A Yes, sir, we have done so.

Q Have you made studies to determine the maximum amount of gas that could be produced on a day from all of the wells that are marginal or underproduced or balanced up to a certain point?

A I have that in an approximate figure.

Q All right. Now what is the total production figure that you used as your basis?

A It would be approximately 850 million cubic feet per day.

Q Is that the total production from all of the wells connected to the entire system?

A In the Lea County area, no.

Q In the Lea County area?

A No.

Q It is not?

A No, sir.

Q You have made a computation based upon an estimated production of 400, approximately 430 million feet per day?

A That is correct.

Q What does 430 million cubic feet per day bear, a reasonable relationship to the anticipated demand for the immediate future?

A It bears a relationship to the desired demand in the immediate future from El Paso's connections; however, we do not consider that we can sustain that demand because of the overproduced condition

existing for our wells.

Q In order to produce the 430 million cubic feet per day which we would desire to produce, what wells would furnish all their production, every bit that could be produced?

A All of the marginal, all of the underproduced wells, all of the balanced wells, and about 50 percent of the overproduced unbalanced wells.

Q Now, have you listed the overproduced wells, with reference to the numbers of estimated days of production that they can be produced without having to be shut-in?

A Yes, sir, I have.

Q At what point does that 430 million figure take you, with reference to remaining days of production?

A It required the production of all wells connected to our system in prorated pools that had nine days or more of permitted production during the remaining 122 days from the 1st of February to meet the 430 million market demand, with the exception of a group of wells that were on for deliverability test. Let me explain what my figures reflect. We have estimated the demand for the six-month proration period. We have estimated our allowable for the six-month proration period. We have divided that allowable by our estimation of deliverable capacity of the well to determine the number of days of permitted production, both for the six-months period and as of the 1st of March, the remaining days of permitted production for the current proration period. I may have stated

that my figures, I may have previously stated that it was as of the 1st of February. This report reflects conditions as of the 1st of March and is for scheduling during the month of March. So the days of permitted production remaining during the current proration period that I have shown are the days remaining after having produced during January and February. I might go further to state that these allowables were based on production from our wells in the Lea County area of 446 million per day average over the six-month period. I don't expect now to be able to take that much gas out, because of the overproduced condition of the wells that would have to be produced if that volume were to be fulfilled; consequently, I think that the number of days calculated as permitted production during the current proration period are high, so rather than having, say, nine days permitted production left at the point that we were on our schedule when producing 430 million, we would actually be in a worse condition than is shown here.

Q What is the breakdown in the Jalmat Pool with reference, as of March 1st, to the marginal underproduced and overproduced wells?

A Of the total 342 wells, 42 are marginal, 147 are in an underproduced unbalanced condition, 91 are in a balanced condition, and 104 wells are in an overproduced unbalanced condition.

Q Now, have you made studies to attempt to determine the production which can be taken from the Jalmat Pool under the existing 100 percent acreage formula, before it becomes necessary

to incur underproduction on some wells and overproduction on other wells?

A Yes, sir, I have done so.

Q Will you please state the method that you used in making that study?

A I believe, Mr. Howell, that it can be explained best by referring to the exhibits that are now being handed out.

MR. HOWELL: All right, will you mark an exhibit as El Paso's Exhibit 3-R?

A And 4-R.

(El Paso's Exhibits Nos. 3-R and 4-R marked for identification.)

Q Please state what Exhibit 3-R consists of.

A 3-R shows in graphical form our determination of the optimum producing rate in Jalmat Pool with the present 100 percent acreage allocation formula for El Paso connections. Now, to explain how this graph was determined, we'll have to refer to Exhibit 4.

Q What is Exhibit 4?

A Exhibit 4 is the data sheet from which this graph, the data from which this graph was plotted. It is a data sheet containing the information from which this graph was plotted.

Q Now, is it correct then that Exhibit 4 covers the months of, beginning July, 1957, through January, 1958?

A It does.

Q And shows for each month the production from the Jalmat Pool and the average daily production from the Jalmat Pool for each of said months, and then carries forward in a cumulative statement the underproduction and the overproduction attributable to the Jalmat Pool?

A It does.

Q Have you taken that data and plotted it on Exhibit R-3?

A Yes, I have.

Q Please state just what that exhibit reflects.

A First let me refer to Exhibit No. 4, the month of August, 1957, we show a total production for the Jalmat Pool of three billion six, and an average daily rate of 116.5 million cubic feet. At the end of the month we had six billion underproduction. This underproduction was compared with the existing underproduction at the end of the month of July to get the difference, showing the next column, and 234,783 mcf or an average daily decrease in underproduction of 7.5.

The next column shows the end of the month overproduction, which compared with the end of the month for July showed a decrease in overproduction of 296,865 mcf, or 9,576,000 cubic feet each day. The data for other months were determined on the same basis.

Now on Exhibit No. 3 is plotted the daily increase or decrease of underproduction, and the daily increase or decrease of overproduction.

Q Let me ask you this. You've used a square to indicate the

overproduction, and a circle to indicate the underproduction?

A That is correct.

Q You have drawn a line across the center of the graph and am I correct in understanding that the rate at which underproduction is made up, or overproduction is made up, is shown above that line; that is the rate at which we are coming back in balance and that's the rate at which the underproduction and overproduction is growing, is shown on the scale below the line?

A That is correct.

Q Now then, the graph also shows from left to right certain figures that are shown at the bottom of the page. What do those figures mean?

A You are referring to the --

Q (Interrupting) Twenty, forty, sixty --

A That is the daily rate of production which would correspond with the graph.

Q So that in posting the month of August, that is posted at approximately 116, 118 million, it is with reference to the scale given at the bottom of the page, determines where that point will be posted?

A That is correct.

Q And the rate at which the wells were being brought back in balance shows above the line, and the rate at which they're going out of balance shows below the line?

A That's right, and the scale on the left-hand side, the

vertical shows the rate of make-up of over or underproduction, as the case may be.

Q Now, as the daily rate of production increased from October through November to January, what was the result?

A The result was an increase in overproduction and underproduction of the wells connected to El Paso's system.

Q Why did you omit charting December of 1957?

A No figures were determined for December, because of the distorting effect of the cancellation and redistribution of underage.

Q That was omitted because that was the one month in which cancellation had taken place and would not give any effect upon the daily rate of production that either increases or decreases the in-balance, is that correct?

A That is correct.

Q Then in drawing a line, what did you attempt to do there?

A We attempted to draw a median through the data shown. Actually, from one extreme to the other, we could have drawn a line from approximately 130 million to 166 million, but a rate of approximately 148 is that represented by the line drawn and estimated to be the optimum rate or balanced rate of production in the Jalmat Pool.

Q From that study, what rate do you conclude, what average daily production is the maximum that can be taken from the Jalmat Pool under the present rules, without wells incurring overproduction and underproduction?

A Without getting an unbalanced condition of over or under-production to our wells, the rate would be something in the vicinity of 150 million cubic feet.

Q Is the demand that we have for gas from the Jalmat Pool greater than that?

A Yes, sir, it is.

Q If that demand is met, what will the effect be, with reference to continued in-balance between overproduced and underproduced wells?

A The underproduction will continue to increase, and the overproduction will continue to increase.

Q Do you have any further comments you wish to make about that study?

A My recollection is that our desired market demand, average daily for the six-month current proration period, was in the vicinity of 260 million cubic feet.

Q From the Jalmat Pool?

A From the Jalmat Pool. Under the conditions exhibited on Exhibit R-1, to have produced that would result in the production of approximately 110 million cubic feet more than this optimum rate, and we calculate that the increase of overproduction would be increasing approximately 65 million cubic feet per day were that to occur.

Q If you increase that rate of overproduction at that rate of overproduction, what would happen to those overproduced wells?

A They would soon get to the place where you would have to curtail them to get them back in balance.

Q Well, if you didn't get them back in balance --

A The Commission would shut them in for failure to get them back in balance.

Q Do you have any further comments on that study?

A No, sir, I don't.

Q Now, did you make a study comparing the rate at which a pool can be produced under a deliverability formula and under a straight acreage formula, without going into an unbalanced condition?

A Yes, sir, I did.

Q Did you reflect that study on certain exhibits, or carry that study out?

A Yes, sir, I have.

(El Paso's Exhibit Nos. R-5 & R-6 marked for identification.)

Q Please state what El Paso's Exhibit No. R-5 reflects.

A Exhibit R-5 is a graphical presentation of a comparison of allowables and production calculated, using a 100 percent acreage formula and a 25 percent acreage plus 75 percent acreage times deliverability formula. The data from which the curves on Exhibit R-5 are plotted is shown on Exhibit R-6. We have utilized four separate rates for nine individual wells, all wells are connected to one gas transportation facility. The actual acreage

factors assigned to those wells were used, and our determination of producing ability was used, and the deliverability at 80 percent of shut-in pressure was calculated from the most recent back pressure test data available for the individual wells, with the exception of two, which were estimated. The rates are exhibited, total rates utilized are shown about mid-way down on Exhibit No. R-6 in the line that is headed "Total", as being 4.2 million for the first rate, 6 million for the second rate, and 9 million for the third rate.

Q Now, let me see if I understand you. You took nine wells and used for those nine wells the actual acreage factor given to wells, deliverability and producing ability by actual experience, and assumed then an allowable for those nine wells under Rate 1 of 4.2 million?

A That is correct.

Q Then you plotted that point on the graph?

A That is correct.

Q Then you assumed an allowable of 6 million?

A That is correct.

Q And plotted that point?

A Yes, sir.

Q Then you assumed an allowable of 9 million and plotted that point?

A That is correct.

Q And applying the deliverability formula and the 100 percent

acreage formula, what conclusions did you draw?

A The study reflected that with the deliverability type of formula, approximately 100 percent more gas could be delivered from the connections without increasing overproduction or underproduction, utilizing the deliverability formula instead of the straight acreage formula. Those figures are reflected by the point at which the curves cross the zero line across the center of the page. I should have pointed out one thing, Mr. Howell, about this, as regards Exhibit R-5 and the data on R-6, as well as the Exhibit R-3 and the data on R-4. To be able to know exactly what the condition in the pool was, we had to balance the pool at the end of each month. Now, the Commission balances the pool, but they do it two months subsequent to the month in which it occurs. They take the difference between production and allowable and adjust two months subsequent to that, but to know exactly what the status was at the end of each month, we made allowables equal to production for that month. The reason, on Exhibit R-6, that we only show underproduction, is that in a balanced pool with only one purchaser, underproduction would be equal to overproduction in the pool. I failed to point out that our data is for a balanced pool.

Q Are there any further comments?

A I believe not.

Q Now, do you have any further testimony or statements you would like to make, with reference to El Paso's experience in the

Jalmat Pool, or any studies that we have conducted in connection with it?

A I might mention, Mr. Howell, that while we were unable to conduct for the Jalmat Pool a study comparable to this nine-well area shown on Exhibit R-5, that I consider that the volumes of gas which we could take out of the Jalmat Pool, were we to have the formula applied that the Commission has adopted to go into effect July 1st will enable us to withdraw from the Jalmat Pool considerably larger volumes without incurring additional overproduction or underproduction than the existing straight acreage formula does. I can't estimate how much without making a complete study, but I would say it would be substantial. It could even be as great as this example showed of 100 percent. Certainly, the deliverability capacity of the wells in there is considerably in excess of the 300 million cubic feet a day rate which would result in doubling the optimum rate shown on Exhibit No. 3.

Q Now, let's refer for a minute to Texas Pacific's Exhibit No. R-7 which has been introduced in evidence, upon which Texas Pacific has plotted in the green line groups of wells, with the average deliverability of groups of wells under the green line, and has, I believe it is No. 8 I am looking for -- pardon me, on that has plotted the allowables, the average allowables shown on Exhibit No. R-8 as shown by the green line, and has plotted the average allowable under a straight acreage formula which is shown in a line that passes right straight across the exhibit.

Now, where the deliverability is such that the wells cannot make the difference between the deliverability which they have and that allowable, what must be eventually done with that allowable?

A That allowable must be produced by a well that is capable of producing it, or the market demand must be decreased accordingly.

Q If it is produced, then is not the ultimate result that the cancellation of the low deliverability allowables that cannot be made and the addition to the higher deliverability wells that can make it does include deliverability as a factor?

A Yes, sir, it does.

Q Now why doesn't that cure the market by doing it that way?

A Assuming that under this horizontal line represented or shown at the one position on this exhibit was the average allowable rate on straight acreage and the volume, or the area between that line and the green line represents underproduction which these wells were unable to produce, and at the end of the six-month proration period had cancelled, we would find that the volume represented by this area would be redistributed both to overproduced wells and to non-marginal underproduced wells. So that the cancelled underage is given only in proportion to the overproduced wells so that the wells that actually produced it do not get all of the underage cancelled, just a portion of it. Now, at the end of another six-month period, the same thing will occur again. There will be cancelled underage and redistribution, but still you will not be putting in the form of additional allowables to

overproduced wells an adequate allowable to compensate for the production that they had to have to make the market demand.

Q And is it or is it not a fact that that readjustment occurs somewhere between six and twelve months after the demand occurs, and the production has occurred?

A Yes, sir, that is correct. It occurs after you have already begun curtailing the overproduced well that had to produce the allowable to meet the market demand.

Q Do you have any further comments about that particular point you would like to make?

A I think it is apparent from that, that under the existing straight acreage allocation formula, that a market demand that has been experienced to date cannot be fulfilled out of the Jalmat Pool without incurring overproduction, which will result in the curtailment of production from wells and in turn decrease the ability to deliver adequate volumes to meet market demand in the future.

Q Does the effect of this formula result in choking off the ability of the Jalmat Pool to have its fair share of the market?

A I consider that it does.

Q Now, let's look at Operator's Exhibit -- referring to Operator's Exhibit No. 6-R, I will ask you if yesterday you obtained a list of the fifty-eight wells which are shown on that exhibit?

A Yes, sir, I did.

Q After obtaining that, did you make a rather hurried analysis

of some of the information regarding those wells which is available in the files of the Commission?

A Yes, sir, I did.

Q Perhaps you had better sit down and look at your notes. Referring, for the purpose of this question, to the well that is shown at the extreme right of the exhibit facing you as No. 1 and the next well as No. 2, No. 3, No. 4, and so on, in order to identify the particular wells shown on this exhibit; now, Well No. 2 is a well which shows high reserves and low deliverability. What do the records of the Commission show about that particular well on all points except its location? Later on I want to come back and taking another exhibit, we'll try to plot the location of the various wells.

A The Commission records reflect that that is a dually completed well producing oil from the Langley-Mattix through the tubing and gas from the Jalmat Pool through the annular space.

Q Do we have any information as to whether there is any tubing for gas production?

A No, sir. The Commission records reflect that there is no tubing for gas production.

Q Passing to Well No. 4, which also appears to have excessive reserves in comparison with its deliverability, what do the records show about that well?

A The records of the Commission also reflect that that well is a dual completion, producing oil through the tubing from the

Langley-Mattix, and gas from the Jalmat through the annular space.

Q Is this well connected to our system, the No. 4 Well?

A No, sir, that one is connected to Permian Basin Pipe Line system.

Q And No. 2 Well?

A It is also connected to Permian's system.

Q Now, referring next to Well No. 6, we might term this as the horrible example, what do the Commission records reflect with respect to the completion of that well?

A It reflects that that well was completed in 1949 and has no tubing in it.

Q Referring next to Well No. 7, what do the Commission's records reflect with reference to that well?

A It reflects that that well is a dual completion with the gas being produced through the annular space from the Jalmat Pool.

Q Referring now to Well No. 9, what do the Commission's records reflect with reference to that well?

A It reflects that that well was completed in 1949 with no tubing reported.

Q Did you make a notation of No. 10?

A Yes, sir, I did.

Q What do the Commission records reflect with reference to that well?

A They reflect that this well was originally an oil well that was plugged back and re-completed as a gas well in the Jalmat Gas

Pool by perforations above a bridge plug at 3300 feet.

Q Coming next to the one which appears out of line, have you looked at No. 12 -- wait a minute, I think I have counted wrong. No. 11 is the one I should have asked you about. No. 10 you have just testified to?

A Yes, sir.

Q Did you testify to No. 11?

A That, I believe, Mr. Howell, is No. 10.

Q You are correct. I not only can't see chairs, I can't see lines. Passing to No. 13, what do the Commission's records reflect with reference to that well?

A It reflects that that well was originally completed as an oil well in the Grayburg, was re-completed in 1952 as a gas well producing from the Jalmat Pool, and the Commission records do not reflect that there is tubing in the well.

Q Passing to No. 14, what do the Commission records reflect?

A It reflects that that well was completed in 1948 as a dual completion, producing gas from the Jalmat Pool in the annular space.

Q Now, taking this group of wells which may be termed as the horrible examples, do you find anything in the records of the completion of these wells which indicates a reason for a variation between reserves and deliverability?

A I find conditions in the records which may indicate that there are reasons to expect differences between deliverability and reserves.

Q What is the effect of liquids forming when gas is being produced through the annular space in a well?

A Well, when producing through the annular space?

Q Yes.

A In a well that is dually completed, or through a well that has no tubing, you find increasing difficulties in unloading the liquids which accumulate in the well bore. That accumulation of liquid in the well bore can in turn decrease the volume of gas producible from that well.

Q Did you make a hurried analysis of these fifty-eight wells with reference to determining the underproduced or overproduced status of all of them that were connected to our system?

A Yes, sir, I did.

Q First of all, how many of those fifty-eight wells are connected to El Paso's system?

A All except three, if I recall correctly. That would be fifty-five.

Q Now, of that, how many are underproduced, of the wells connected to El Paso's system?

A Of the wells connected to El Paso's system, seven are underproduced.

Q And of those seven, how many of them are included within this first ten that appear, starting at this edge of the graph?

A Six of the seven are in the first ten. The seventh well, I believe, is No. 16.

Q Now, how many of the remaining wells connected to El Paso's system are overproduced?

A All of the remaining wells will either be in an overproduced or balanced condition.

Q From that, what conclusion do you draw as to whether or not these wells are representative of the conditions that exist in the rest of the Jalmat Gas Pool?

A I would conclude that they are not representative, because we have almost a condition which would mean about 50 percent overproduced and 50 percent underproduced wells in the Jalmat Pool as a whole. These wells depicted in the fifty-eight well area are the best wells. This is the best area within the Jalmat Pool from a deliverability standpoint.

Q Passing now to Operator's Exhibit No. 7-R, I'll ask if you have determined the location of the wells which appeared down here at the right-hand side of Exhibit No. 6, where the variance between estimated reserves, as estimated by the operators, and deliverability was greatest?

A Yes, sir, I have done so.

Q Would you plot those, numbering the wells beginning with No. 1 as shown on this edge and just plot the numbers approximately on this exhibit?

A If there is no objection to my putting them on this exhibit.

MR. HOWELL: Do you have any objection to locating the wells on this exhibit?

MR. MALONE: The exhibit is in evidence. We have no objection to any legitimate use being made of it.

A (Witness complies.)

Q What is the difference in the symbols that you have used between the circles and the triangles?

A The circled wells are wells connected to El Paso's system. The wells with triangles are connected to Permian Basin Pipe Line Company's system. I have shown here only twelve out of the sixteen wells, starting from the left side of Exhibit No. 6.

MR. CAMPBELL: To keep the record straight, one of you is referring to that as the right side, and the other as the left side.

MR. HOWELL: Let's refer to it as the right side, as facing the exhibit's right side, as being the exhibit's right side.

A Actually, Mr. Howell, what I have shown is eleven out of the sixteen lowest deliverability wells as shown on Operator's Exhibit No. 6.

Q What do you conclude from that analysis?

A May I first --

Q Surely.

A -- put the other wells on?

Q Will you state what the last five circles you have put on the map mean?

A The last five circles are other wells in the sixteen lowest deliverability wells, all of which are connected to El Paso's

system as indicated by the circles.

Q Now, what do you conclude from platting those wells on the map of the ground as it exists?

A I conclude from plotting these wells, locating these wells, that the majority of the wells are located in one area of the field; that eleven of the sixteen wells are located in approximately two miles from the center of the area shown, nearer to a mile and a half.

Q Would it be possible that there might be some errors in estimates of recoverable gas reserves on a volumetric basis in that area?

A I think it would be entirely possible that that may have occurred, because of the fact that all of the wells essentially are located in one area, and include all of the wells or most of the wells in that area.

Q Do you have any further comments you would like to make as a result of your admittedly hurried analysis of these exhibits?

A Yes, sir. I would like to locate some more wells on this exhibit.

Q Will you do so?

A (Witness complies.) I would like to return to Operator's Exhibit No. 6. I have made a check to determine whether there was any particular significance to the wells which showed extremely low reserves as related to deliverability, within the last twenty wells on Operator's Exhibit No. 6. I will have to make a more

complete determination to be sure my numbering was correct. However, I have taken these wells that appear abnormal, the ones that fall below what you might expect to be the normal for this area, and made an investigation to find where they lie on this map. I'll be glad to furnish the names of the wells. I have shown on Operator's Exhibit No. 7 the location of the seven wells which showed to be anomalous in the higher deliverability range. Those wells are exhibited by the squares. To me it appears significant that all of these wells are located in a generally north-south direction on the east portion of this area. I have never made a thorough geologic study of the Jalmat Pool, but my recollection from testimony that has been given by geologists in previous pool delineation hearings is that the depositional conditions exist generally in a north-south direction with gradiations from west to the east.

The fact that these anomalous wells are located in the north-south direction would lead me to conclude that it is entirely possible that the estimates utilized in arriving at the reserve calculations for these wells may have been erroneous.

Q Mr. Woodruff, is it correct that there are now in Lea County seventy-four wells shut-in?

A Yes, sir, there are seventy-four wells, let me correct that. The Commission shut-in seventy-four wells connected to El Paso Natural Gas Company because of failure to balance overproduction accumulated to those wells by the January 1st balancing date, and they also shut-in two wells connected to El Paso's system which

are under contract to Permian which we have connected under our exchange agreement. Some of these seventy-six wells have been released because of having been brought in balance or have been permitted to produce a portion of a month because they can become in balance during the current month.

Q That represents approximately ten percent of all wells connected to the system in Lea County, does it not?

A That is correct.

Q How many wells have been shut-in in San Juan because of overproduction?

A As of February 1st balancing date, there were seven wells shut-in.

Q How many are connected, approximately how many are connected to our system in San Juan?

A My recollection is about 2500.

Q Is deliverability a part of the formula in the San Juan?

A Yes, sir, it is.

Q Is it substantially the same formula that has been recommended by Texas and Pacific?

A Yes, sir, it is.

Q Do you have any further statement that you would care to make?

A I think it is appropriate to say, Mr. Howell, that I attribute our ability to divert market demand to the San Juan Basin Area during the year of 1957 and 1958, as has been testified to

exist by me in this hearing, and the previous hearing, without resulting in severe overproduction or underproduction of the wells connected to our leases; I consider it is to be attributed to the type of proration formula utilized in the prorated gas pools of the San Juan Basin.

Q Would you recommend to the Commission the adoption of the formula as presented by Texas Pacific for the Jalmat Pool?

A Yes, sir. I would recommend that they do not change their existing order, which would result in application of the 75-25 formula on July 1st in the Jalmat Pool.

MR. HOWELL: That is all.

MR. PORTER: Have you offered your exhibits?

MR. HOWELL: I have not. We offer in evidence El Paso's Exhibits R-1 through R-6, inclusive.

MR. PORTER: Is there objection to the admission of these exhibits? They will be admitted. Does anyone have a question?

MR. MALONE: May it please the Commission.

MR. PORTER: Mr. Malone.

CROSS EXAMINATION

By MR. MALONE:

Q Mr. Woodruff, you have referred to the number of wells shut-in in San Juan as compared to the wells shut-in in Southeast New Mexico. Do you think the fact that there was no balancing period for four years in the Southeast, that the full effect of the January 1st balancing may have something to do with that?

A It probably did have something to do with it. I would say, though, that both areas had at least a year's period to become in balance, and prior to the balancing date, which I believe puts them on a comparable condition of being able to get in balance.

Q The fact is that there was an accumulation of overproduction over a four-year period, as far as Southeast New Mexico was concerned?

A Yes, sir.

Q For the first time, wells that had contributed to that overproduction were required to balance their takes?

A That's right.

Q That might have had something to do with the shutting in of wells in Southeast New Mexico?

A Yes, it may have. I would like to point out one thing, if I may, that during 1957 in Lea County, when we were attempting to get our wells in balance, we had our overproduced wells shut-in during the whole period, except when our extreme market demand required us to turn them on. The result of it was, as I previously testified to, a production of approximately 53 billion cubic feet, when the demand was actually 55 billion. Now during this same period, in the San Juan Basin, we diverted this demand up into the San Juan Basin; in other words, the San Juan Basin had the greater demand because of having to divert it from Lea County because of getting wells in balance. We took our swings in the San Juan Basin because Lea County was not available. So the conditions

under which the San Juan Basin was making up overproduction was much more severe than were the conditions in the Lea County Area where we reduced our takes so as to keep, or where we had to reduce takes because overproduced wells were shut-in to get in balance.

Q That was your answer to my question?

A Yes, sir. I'm sorry it took so long, but I thought it was important.

Q Now, with reference to your testimony that in your opinion the condition which you found on Operator's Exhibit 7 indicated that an error had been made in the computation of reserves, is it your testimony that you have made a study which as an engineer justifies you in testifying that in your opinion an error occurred?

A I did not realize that I had testified that an error had occurred. I said the fact that they are all in one area would lead me to conclude that an error may have occurred.

Q Is it your opinion that such an error did occur?

A There are other factors, as pointed out, regarding the same wells which also could have caused that.

Q Would it be surprising if a group of wells in the same area shared an unnormally low permeability?

A No, sir, it would be expected.

Q That was the condition which you found at the south end of that area on those wells,in the grouping of the wells?

A That they had a low permeability?

Q Yes.

A No, sir, I did not find that.

Q But if, as you have testified, that group of wells at the south end had a low deliverability, it could be accounted for by an area of low permeability as well as by an error having been made in the computation of recoverable gas in place, could it not?

A I would say that it could have. I would expect variations in the factors entering into the reserve calculation to have existed, also. I think it is very significant that we pointed out that there is a condition of completion practice in the area where the major portion of the wells are either dually completed with the gas being produced from the annulus, or else being produced through the casing without tubing, which might lead us also to conclude that they had a liquid condition existing which prevented the well's deliverability being what it would be if the well bore were in a clean state.

Q You are not testifying that in your opinion an error was made in the computation of the recoverable gas in place?

A No, I am just stating that it may have been made.

Q When did you first come to the conclusion that this proration system in Southeast New Mexico was no good?

A I would say probably in 1952 or '53.

Q And you have been having trouble with it ever since, have you?

A Yes, sir.

Q And have been making an effort to get it changed, have you?

A At the time of the original hearing, it was our recommendation that deliverability be included in the allocation formula.

Q You made a speech before the Interstate Oil Compact Commission entitled "Gas Prorationing in New Mexico", Santa Fe, New Mexico, on December 3, 1955, did you not?

A Yes, sir, I did.

Q I would like to read you an excerpt from that speech and see if you recall having made this statement: "The Pools of Southeast New Mexico vary in age with the initial well, and one of the Pools starting production in 1929, for example, this pool, the Jalmat Pool has within it areas varying from almost complete depletion to initial reservoir conditions. In prorating this pool, the regulatory body had many problems to face, such as the varying degree of depletion, the completion technique utilized in its development, the variety of gas transportation facilities taking gas from the pool, the occurrence of oil which is found within the designated limits of the gas pool, and the flaring of gas from the oil wells. Though there are problems still being solved, the rules and regulations for this pool established by the Commission have proved reasonable and workable, have stopped many wasteful practices, and are affording greater protection for correlative rights."

Was it your opinion in 1955 that the plan was working, or that it was no good, as you just testified?

A I believe as I just testified was correct.

Q So that you mis-stated your opinion in this paper, then?

A No, sir, I don't consider that I mis-stated anything in that paper.

Q Then it was not your opinion at that time that the rules and regulations established by the Commission had proved reasonable and workable?

A I did consider that certain of the rules, possibly I didn't go enough into detail in that, I was trying to be general. I believe I had one saving clause that you read right at the beginning of that, which indicated while there were still problems to be solved, I consider that one problem yet to be solved is making available to gas transportation facilities the market demand which must be fulfilled out of the Jalmat Pool.

Q You feel that one problem still being solved is the protection of the correlative rights of the operators in the pool, also?

A Yes, sir, I do. I do think that initiating proration in the Jalmat Pool, even on the straight acreage basis, was certainly a great stride in the right direction. It prevented, or did away with many wasteful practices.

Q In how many pools other than the six pools in Southeastern New Mexico and the pools -- well, in how many gas pools other than in New Mexico does El Paso buy gas?

A Other gas pools, other than Southeast New Mexico?

Q Other than the State of New Mexico.

A I'm not positive, but I would say somewhere between ten and twenty.

Q Where are those located, in the State of Texas?

A Some are located in the State of Texas, some in Colorado.

Q Is deliverability a factor in the proration of any of those pools?

A Yes, sir, it is a factor in the Hugoton Pool of Texas from which a portion of our gas comes.

Q That is a pool ofprorationing which started some thirty or forty years ago, isn't it?

A No.

Q Or twenty or thirty?

A No, it is a pool that started approximately ten years ago.

Q That is the only pool from which you buy gas that has a deliverability formula, outside of the State of New Mexico?

A I believe that to be correct.

Q Have you experienced in the pools outside the State of New Mexico,which do not have deliverability,the same problems that you have testified to in New Mexico?

A I would say not to any appreciable extent. Most of the pools in Texas that we get gas from are very small pools. The effect of variation in those pools is not too significant; too, there are pools in which the wells have considerable deliverability and no difficulty in meeting the market demand or in meeting the capacity of our facilities from the pools. Now, in the pools in

Colorado there is no prorationing, and under such circumstances you would anticipate no particular difficulties in meeting the market demand from those pools.

Q That is the ideal situation for a purchasing company to operate under, isn't it?

A No, sir, I wouldn't say that it's ideal.

Q You are hard to satisfy. Now, with reference to the wells in the Jalmat Pool, you testified, as I got it, that on March 1st there were 147 underproduced wells in the Jalmat Pool, is that correct?

A Yes, sir, underproduced wells which had not been balanced during the current proration period.

Q That doesn't include any marginal wells, does it? Those are underproduced non-marginal wells?

A That is correct.

Q You testified that your company needed the gas from those wells, did you not?

A Yes, sir.

Q And I take it, then, you have been unable to get the gas from them?

A That is correct.

Q Now, what is the reason for that, in your opinion?

A Inability of the wells to produce their allowables.

Q And if those wells are unable to produce the allowable which they have under the acreage formula at present, they will be

proportionately less able to produce the allowable under a formula which would give them a higher allowable, would they not?

A No, sir, I would say they could produce their allowables -- did you say deliverability formula?

Q I say under a formula which would give them a higher allowable.

A Yes, sir. Excuse me.

Q In other words, if they don't produce at the present allowable, they would have more trouble producing a higher allowable?

A Yes, that is correct.

Q So the injection of a deliverability factor into the formula, if it had the result of increasing the allowable of any of these wells, would offer no solution to your problem, would it?

A That is correct. It may be well to realize, though, Mr. Malone, that the lower deliverability wells would normally receive lower allowables, because of their low deliverability you would not expect them to get increased allowables. In fact, you would expect them to get allowables more in line with their actual ability to produce.

Q You did not testify that these 147 were low deliverability wells, they were merely underproduced. Have you studied the deliverable factor on those wells?

A Yes, sir, I have.

Q Are you prepared to testify as to the deliverability factor on those 147 wells?

A By deliverability factor, do you mean that which would be used in an allocation formula, or their actual producing ability at this time?

Q What would be used in the formula that would give a new allowable to those wells.

A No, sir, I have not calculated that.

Q What is the pressure that is normally maintained in the high-pressure line of El Paso Natural Gas Company's gathering system?

A Approximately 600 pounds.

Q Is that a uniform pressure throughout the Jalmat Pool, or does it vary?

A It varies.

Q What are the factors which cause it to vary?

A Location of the well or pipe line with regard to compression facilities, distance from plants, and compression facilities.

Q Would it also result from the production into that line at a given point of a high deliverability well?

A It could have some influence on that, yes, sir.

Q In other words, it is true, isn't it, that where a high deliverability well that is delivering a lot of gas under a lot of pressure into a line, will build up a higher pressure in that segment of the line where it enters?

A Actually, in most of our facilities, I would say no, in that they are adequately sized to prevent that; however, if we had

a peak demand period where we had a great increase, say, like from 400 million cubic feet a day to 500 million cubic feet a day, we would expect a greater line pressure to exist, because of the larger volumes of gas passing through the line.

Q If a well of lower deliverability was further from the outlet on this gathering system or the point at which the gathering system goes into the trunk line, and a high deliverability well is producing into it, would it or would it not be the case that a lower deliverability well which you might have left turned on twenty-four hours a day would be unable to produce against the pressure in that line that was built up from the higher deliverability well?

A Under normal circumstances, I would say no, if it was just a trunk line with the two wells on it, because normally our trunks are of adequate size to prevent that condition from existing. It would have to be an overall field or system condition which would back off the underproduced or low deliverability capacity well.

Q I understood you to say that this entire 147 wells that is underproduced had been left turned on twenty-four hours a day for the last three months and was still underproduced on March 1st, is that correct?

A I am sure that we may find some instance where we, to check every individual well, where it had not been on all of that time for some reason or other.

Q Is that generally true?

A Yes, that is generally true.

Q That is what you testified?

A Yes, sir.

Q How do you account for the fact that all 147 of those wells, although they were left on the line for three months, were still underproduced?

A How would I account for it? By stating that they are unable to produce their current allowables plus accumulated underproduction so as to get in balance. They lacked the deliverability capacity to get in balance.

Q Are you saying that some or all of them were marginal wells that should be reclassified?

A I would say some are. I think my statement probably was too strong, that some of these wells can get in balance and will get in balance, but a good portion of the wells will not get in balance because of inability to make their allowables.

Q How many pressure lines do you have now in the Jalmat Pool?

A You mean different systems?

Q How many systems of different pressure?

A We have what we refer to as our intermediate system, and then we have conditions where individual compressors are placed on wells or trunks, so as to draw down pressures, down say as low as 100 pounds.

Q Have you made any study to determine the relationship of this 147 wells to the intermediate system and those compressor

stations?

A No, I do not have that available.

Q Has the El Paso increased the four switchers that it has to handle the wells since the December hearing?

A No, sir.

Q I believe you testified that that was the number of switchers and the approximate number of wells for which they were responsible?

A That is correct. I did state that at any time we had four men available in the pool, but during periods of requirements to turn on large volumes of wells, we could call on other personnel, so as to rapidly turn on and turn off the wells to accomplish changes in rates to our pipe line system.

Q Do you think the fact that El Paso operates its New Mexico reserves as a standby to supplement its gas sources in Texas and hence requires large volumes of gas on short notice may have something to do with the additional problems you encounter in New Mexico and do not encounter in Texas?

A Yes, sir, I would think that has something to do with it. Now, we do also vary our takes in Texas, however, where it's possible to do so.

Q Have you made any effort through your Texas connections to obtain a more equitable distribution through the month of the gas that is available from those residue sources, in order to avoid the sudden calls on the New Mexico pool?

A Yes, we have done so.

Q Have you been able to make any such arrangements?

A Conditions in many plants are better than they were prior to our seeking aid in that respect. However, the fall-off at the end of the month is something which cannot be controlled in a permanent manner cause operators in both Texas and New Mexico attempt to make their allowables during the month it is assigned, because if they don't make it, it is going to be lost; so they don't try to wait until the last day to make it, they try to be sure of getting it;when they make it they have to shut it in; so it is inherent fact that residue will fall off from casinghead residue plant.

Q I would like to refer to your Exhibit R-6, please. That was nine wells that you reached the conclusion would be able to produce twice as much gas without overproducing, if there was a change to a proposed deliverability formula?

A Yes, sir.

Q Can you give us the identity of the nine wells, please?

A Yes, sir. It would probably suffice by saying that they are the wells in the Justis Gas Pool.

Q They are not in the Jalmat Pool at all?

A No, sir.

Q You didn't tell the Commission that when you introduced this exhibit.

A I didn't try to tell them anything. It was a difficult example.

Q I might be in error. I thought you implied they were in the pool that is being studied?

A No, sir.

MR. MALONE: I would like to move the Commission to strike Exhibit R-6 on the grounds it has to do with wells outside the Jalmat Gas Pool and has no materiality in the hearing before the Commission.

MR. HOWELL: If the Commission please, it was introduced as a study of theoretical effect and where the wells are located is immaterial. It merely took certain wells in order to have available data.

MR. PORTER: Mr. Malone, your objection is sustained. The Exhibit, El Paso's R-6, will be stricken, as well as the testimony in reference thereto.

MR. MALONE: Thank you.

MR. HOWELL: If the Commission please, I wish to call your attention to the fact that it was not offered as being Jalmat Pool. It was offered as an example of a study of a pool, a theoretical pool in which testimony has been introduced in this case on theoretical examples for the purpose of determining the characteristics and assigning various characteristics of wells, certain wells were selected. The allowable rate was an arbitrary rate which was suggested, and so stated. The entire testimony was offered as a nine-well pool; now how anyone could have mis-conceived that this referred to the Jalmat Pool, when it was offered as a nine-well

pool is beyond me, and we submit it is admissible as an example, and if the introduction is not clear, we would like an opportunity to re-introduce it with a definite statement that it is an example of a nine-well pool and the results that would occur.

MR. PORTER: Mr. Howell, the Commission's ruling will stand.

MR. MALONE: I have just a few more questions.

Q (By Mr. Malone) You have referred to the fact that in your April nominations, some 2,200,000 cubic feet of gas was transferred from Jalmat to Northwest New Mexico, Mr. Woodruff, is that correct?

A Would you please repeat the figures?

Q 2,200,000 was my recollection.

A Transferred from the Jalmat?

Q From the Jalmat.

A Elsewhere?

Q To Northwestern New Mexico.

A I believe that I testified that it was 13.2 billion cubic feet.

Q Out of the April allowable of the Jalmat Pool?

A Oh, excuse me. Out of the April allowable from the Jalmat Pool.

Q The nominations.

A I misunderstood your question. Our nominations for the month of April in the Jalmat Pool were less than the nominations for the month of March by approximately 2.1 billion cubic feet.

Q Now, you have referred to the fact that that much of the market demand for Jalmat gas was going to be filled from Northwestern New Mexico. I believe you also have testified that you purchased gas in a number of pools outside of New Mexico, in addition to the some twelve pools in New Mexico. Your gathering system is an integrated system, is it not, whereby gas from any source can be delivered into your transmission facility?

A I believe that's correct.

Q Under those circumstances, Mr. Woodruff, how do you determine what part of the market demand that you have for gas actually belongs to any particular pool in the State of New Mexico or elsewhere?

A Normally in determining our market demand for a pool, we consider our contractual obligation in that pool with regards to the total contractual obligation that we have for gas from all of the pools. We also give consideration to whether there are facilities which will enable us to take that volume of gas.

Q Then --

A Let me continue, please.

Q Pardon me.

A I would refer to facilities, and before, I should have. If our market demand is in excess of our contractual obligation, we normally allocate to the various pools in the relationship that their contractual obligation bears to the total contractual obligation. In other words, we try to give each pool its fair

share in relationship to its contractual obligation. If our demand should get excessive so there are inadequate facilities to handle gas from a particular pool, of course, we have to go elsewhere.

Q Do you mean the minimum take provisions in your contract, when you say contractual obligation?

A Yes, sir.

Q You determine market demand entirely on the basis of El Paso's minimum take obligations in its contracts and not with relation to any demand that may occur elsewhere?

A I didn't mean to give that impression.

Q Let me ask you if you didn't say this?

A May I just state what the actual facts are?

Q I will be glad for you to do that.

A We have a total demand from our customers. I explained in considerable detail at the last hearing, in determining what our demand would be from the pools, we take from our total market demand the volume of gas which will come from residue plants processing casinghead gas. That comes first, and the remaining volume of gas is gas which must be produced from gas pools; the volume of residue gas and the market demand of our customers are the controlling factors as to how much market demand there will be for gas from the wells connected to our system.

Q Didn't you say in answer to my previous question that you made the division on the basis of your contractual obligations in

the various pools, and then allocated as between those pools the balance of the demand on the basis that those contractual obligations bear to each other?

MR. HOWELL: I say that is purely argumentative. The record speaks for itself. The testimony was that the allocation as between pools was based upon that, and counsel is attempting to put words in the witness's mouth that he didn't say. The record is replete with a full description of the exact process the company uses. We submit it is repetitious and argumentative and immaterial.

MR. MALONE: It is just cross examination.

Q In making the determination as to your nominations or as to market demand for a particular pool, your company gives no consideration to the waste aspects of the production of that market demand by that pool, does it? You leave that to the Commission?

A At least, if it were apparent we would give consideration to it.

Q That is for the Commission to determine, primarily, is it not?

A I think first the operators and pipe line companies would become aware of it and attempt to prevent it. I'm not sure what you mean by waste. Do you mean wasteful production from an individual well? I think the operators and pipe line company would become aware of it well before the Commission would, and would attempt to remedy the situation without the Commission having to take action.

Q I have reference to the ability of the pool to produce the

allowable without waste.

A Certainly that is one of the obligations placed upon the Commission by the Statutes. I think, though, both the operators in a pool and the pipe line companies also would attempt to prevent a wasteful withdrawal of gas.

Q I believe you testified last week on the allowable hearing that this 2,200,000,000 cubic feet that you transferred from Jalmat to Northwestern New Mexico, that five percent of it would have been acquired from El Paso wells in Jalmat, and that thirty percent of it will be acquired from El Paso wells in Northwestern New Mexico, is that correct?

A Not exactly correct. In answer to questions, I estimated that our ownership of wells connected to our system in Lea County was approximately five percent, and I estimated that our ownership of wells connected to our system in the San Juan Basin was thirty percent. I would like to state right now, to answer any question that you or anyone else may have, that never in our determination of allocations of market demand to the various pools have we given consideration to the fact that El Paso owns one well in the pool.

Q You divorce yourself entirely from the financial aspects of the sale of this gas to yourself?

A That is correct.

MR. MALONE: That's all.

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

MR. DUTTON: If it please the Commission.

By MR. DUTTON:

Q Mr. Woodruff, I'm sure that El Paso is an interested party in this hearing, but from the nature of the evidence to date, I am not sure of your interest. Would you enlighten me on that before we commence?

A We are the purchaser of the major portion of the gas produced out of the Jalmat Pool in Lea County, as well as the owner of some of the wells in the Jalmat Pool.

Q I see. Thank you. Is it your recommendation as a purchaser that the formula involving deliverability as proposed by Texas Pacific be adopted in this pool?

A Yes.

Q Is it also your position as a producer?

A Yes.

Q Mr. Woodruff, in the Jalmat Pool, is the gas in place under a tract proportional to the deliverability of the well to which that tract is assigned?

A It may or may not be.

Q Under what conditions would it be?

A It would have to be determined by relating recoverable reserves with the actual deliverability from the wells.

Q How would you go about making such a relationship?

A It would be very difficult on the individual well to make such relationship, unless you knew all of the various factors entering into the determination of recoverable reserves.

Q Speaking as to the majority of the tracts in the field, would

it be so difficult that it could not be accomplished on the majority of the wells in the field?

A You mean on the pool as a whole, or on individual wells?

Q I'm talking about the tracts, since that is the situation. Can we determine?

A I don't think that it can be determined, except coincidentally on an individual well basis, because we do not know enough about the well, the reservoir, and the completion practice, to know what reserves are recoverable to the individual well. We know the acreage, we know the pressure, that's all that we know concerning the actual recoverable reserves of an individual well. If you are going to enter into, say a volumetric analysis, the net effective pay depends on how much of the reservoir is open to the well bore, porosity, and interstition, water content, of course, have to be estimated or determined. Excuse me for continuing, but determined of course from core analysis.

Q Now, limiting the coincidental aspects in the Jalmat Pool, is the gas in place under a tract proportional to the deliverability of the well to which that tract is assigned, eliminating coincidental aspects you have just mentioned.

A I think it is reasonably related, yes, sir.

Q The question is, is the gas in place under a tract proportional to the deliverability of the well to which that tract is assigned?

A And I had already answered that, as believing that we are

unable to determine positively whether it is or is not.

Q Eliminating the coincidental aspects, that was your actual testimony,was it not, that it would only be under the coincidental aspects?

A My reference to coincidence was being able to have the data available which would permit such a determination.

Q Well, do you choose to answer the question as to if the gas in place under a tract is proportional to the deliverability of the well to which the tract is assigned?

A My answer is, I think it is reasonably in proportion to it.

Q All right. Now, I wish you would consider the following example. In the event that you have the deliverability of the well on a given tract,doubled by virtue of remedial work on the well, is it your testimony to this Commission that that would double the recoverable gas in place under the tract assigned to that well?

A My testimony would be that it may or may not be.

Q And under what situations might it be?

A It might be if the increased deliverability was caused by additional entrances to the well bore, caused by the fracturing of the well, thereby increasing its recoverable reserves, in turn increasing the deliverability.

Q Let's look at it from this angle, then, that a deliverability is established for a well, under a later order of the Commission as an exception the acreage assigned to that well is

halved. Under these circumstances, would the gas in place under the tract assigned to the well remain as proportional to the deliverability?

A No, it would not.

Q Mr. Woodruff --

A (Interrupting) I might state that my first, my answer to the previous question was giving consideration to equalized tracts. In other words, my answer was premised on each well being on the same sized tract, as I assumed your question was premised.

Q I didn't base it on that, but if you want to consider different size tracts, does it change your answer to the last question?

A Your last test question, as I recall, concerned different sized tracts. It concerned cutting a tract to one-half.

Q No, sir, it concerns the basic problem as to if the information of deliverability as obtained in a well is proportional to the gas in place under the tract assigned to that well.

A My answer to that was no. That is why the allocation formula recommended which would utilize deliverability includes both acreage and deliverability. It is acres times deliverability, so that the well on the one-halved size tract would receive one-half the allowable, based on the acreage times deliverability factor, as a well on the full-sized tract.

Q Now, we have established the fact that the deliverability of the well is not necessarily proportional to the gas in place

under the tract. This is the focal point, I hate to keep rubbing it in, but this is the point which must be determined, and I cannot know if your qualification was away from your original answer. Let me bore you one more time with the fact; is the gas in place under a tract proportional to the deliverability of the well to which that tract is assigned?

MR. CAMPBELL: That question has been asked about six times. If it is going to be asked again, I wish you would use the language that is in the Statute. The Statute says that insofar as practicable, in substantial proportion. If we are going to harp on that point, let's use the language in the Statute.

MR. DUTTON: If the Commission please, I know Mr. Campbell is much better at this than I am, but is he to ascribe the manner in which I should ask the questions?

MR. PORTER: Can you get your desired information by using the language of the Statutes?

MR. DUTTON: Yes, sir, I think I can, but it will possibly add additional confusion. I'm trying to keep this on the simplest engineering basis possible.

MR. PORTER: Hasn't the question been answered?

MR. DUTTON: Well, it has been answered, but it has been qualified into obscurity, in my opinion. I know I'm not the one to decide that, but until I understand and Mr. Woodruff understands this basic principle, it is very difficult for me to go on with the case that we have outlined and feel is most important in

this matter.

MR. PORTER: Will you ask your question once more, please?

MR. DUTTON: Yes, sir, I would be happy to.

Q (By Mr. Dutton) In the Jalmat Pool, and neglecting coincidental aspects, is the gas in place under a tract proportional to the deliverability of the well to which that tract is assigned?

A I believe I'll attempt to answer it in a different manner this time. Utilization of deliverability in the allocation formula which the Commission has adopted for use in the Jalmat Pool beginning July 1st, 1958, will result in allocation of gas to the wells in the Jalmat Pool on the basis related in a general form. Let me not qualify it so much. Related to recoverable reserves.

Q That is your answer?

A Yes, sir.

Q Thank you.

MR. PORTER: Mr. Dutton, pardon me. I don't wish to hurry you here, but I would like to determine about how much longer your questioning will last, because our reporter is pretty tired at this point.

MR. DUTTON: The time that it will take me to ask the questions, approximately three-quarters of the questions can be answered yes or no. The other quarter would require a brief statement.

MR. PORTER: The hearing will recess until 9:00 o'clock

tomorrow morning. I will announce again that the Case 1394 will be heard at the conclusion of this case.

(Recess.)

MORNING SESSION
March 27, 1958

MR. PORTER: The hearing will come to order, please. I want to ask your cooperation this morning in keeping this hearing moving along as fast as we possibly can without overlooking any pertinent facts, and ask you to avoid repetition. We have previously announced another case that will take several hours, and we would like to wind this up by noon, if at all possible. Mr. Dutton, would you continue?

F. NORMAN WOODRUFF

the witness, having been previously duly sworn, resumed the stand and testified as follows:

CROSS EXAMINATION (Continued)

By MR. DUTTON:

Q As I understood your testimony yesterday, one of the principal reasons that you are in favor of the deliverability factor in the allocation formula of Jalmat is that it would allow the Jalmat Pool to produce its fair share of the market demand, is that correct?

A Yes, that's correct.

Q And thereby it would prevent discrimination against the Jalmat Pool, with reference to other gas pools, is that correct?

A I believe that's correct.

Q Would this prevent discrimination against the Jalmat Pool both from within and without New Mexico?

A I believe it would. I don't see distinction between the State lines in that regard.

Q As I understood your testimony with relationship to the wide swing in the daily production rate required from the Jalmat Pool, that it was at least in part occasioned by what the Texas operators were doing with respect to their casinghead gas, and that toward the end of each month this casinghead gas production that is available to you would drop off as the operators began to make their monthly allowable, is that correct?

A Yes, that's correct.

Q In your opinion, this does not represent discrimination against New Mexico production, is that correct?

A That is correct.

Q Thank you. Mr. Woodruff, could you tell us approximately what percent of the total New Mexico gas reserves are contained in Jalmat any time during or at the end of the year 1957?

A No, I do not have those figures in mind.

Q Mr. Woodruff, could you tell us what percent of the total New Mexico gas production was produced by the Jalmat Field in 1957?

A Percent of New Mexico production by Jalmat in '57?

Q Yes.

A I do not have the figure in mind.

Q Mr. Woodruff, does it seem a little inconsistent that you can state that the formula will result in discrimination against the Jalmat Pool without considering this information?

A No, sir, it doesn't.

Q I see. Does the pressure against which a gas well must flow govern the production from such well?

A Yes, it does.

Q And the lower the pressure against which it must flow, the higher the production that the well may make?

A Normally, that's correct.

Q In the Jalmat Pool, how many gathering systems does El Paso operate primarily with respect to pressure, if they can be so classified?

A I would say two complete gathering systems, and then other small systems have individual compressors that either handle one well or a group of wells on a trunk.

Q Where it handles a group of wells on the trunk in the individual system, are there compression facilities available with the individual system ties in with one of the higher pressure systems?

A Normally that would be the location of it, yes.

Q Approximately what pressures do your two complete systems operate at?

A Well, in approximate pounds, 600 pounds for the high pressure,

300 pounds for the intermediate.

Q Can you describe a general range for the individual systems? They're lower than 300, I presume.

A It would vary anywhere from 100 pounds to 400 pounds, something in that nature.

Q That much. First, with respect to the 42 marginal wells that you testified existed in the Jalmat Field, are any of these wells tied either to the intermediate or high pressure system?

A I do not have the figures as to where they are connected, but I would predict that the majority of them are connected either to the intermediate or the individual compressors systems.

Q But your testimony is not to the effect that they are all connected to the low pressure system?

A No, sir, that is correct.

Q With respect to these wells, would they be capable of producing more gas if they were connected to one of the lower pressure systems?

A You're asking me if the wells would produce more gas if producing against a lower pipe line pressure?

Q Yes.

A In most instances I would think they would.

Q With respect to the 147 underproduced wells in the Jalmat Field, are they all connected to individual systems?

A What do you mean by individual systems?

Q I'm sorry, I thought that was your testimony as to the

grouping of the third group. I'm speaking of the group that is neither high pressure or intermediate, the group that varies from one to four hundred pounds.

A You are asking me if all underproduced wells are connected to that system?

Q Yes.

A No, I'm sure we have underproduced wells connected to all of our various systems.

Q As I understand your testimony, the reason these wells are underproduced, the principal reason, I should say, is that they're called upon to make gas production on a daily basis that exceeds their ability to produce against the pressure to which they are flowing, to which they are being produced?

A Would you please read that question?

REPORTER (Reading): "As I understand your testimony, the reason these wells are underproduced, the principal reason, I should say, is that they're called upon to make gas production on a daily basis that exceeds their ability to produce against the pressure to which they are flowing, to which they are being produced?"

A I'm sorry, I don't believe I can answer that question. Would you mind rephrasing it for me?

Q Would these underproduced wells be less underproduced if they were produced against a lower pressure than what they are currently being produced against?

A I think some would, and some wouldn't. We do find a condition for many of the wells that results in inability to produce, not because of pipe line pressure, but where the wells' inability was solely due to the back pressure in the gathering facilities, I would expect its producing ability to increase with lower pipe line pressures.

Q With respect to the wells in the lower category, would the installation of an individual compressor at those wells tend to minimize or even eliminate their underproduction?

A We found that in many instances an individual compressor will not operate on an individual well, because for a compressor to operate requires a constant flow of gas. Many of these wells that have poor producing characteristics have that characteristic because of a liquid condition in the well bore. Their characteristic of production, then, is to load it up, unload and produce, load up and unload and produce again. A compressor cannot operate under those conditions, so for it to benefit, it would have to be a well that had no liquid producing characteristic.

Q Is the gas at Jalmat particularly rich in liquids?

A No, it isn't.

Q What percent of the underproduced wells would you roughly ascribe to the high liquid contents of the well, if you have any estimate on that?

A I have no specific knowledge on that.

Q Well, now, with respect to those wells that would be helped

by the setting of an individual compresser, would this not provide a remedy to your problem which would be, from a physical standpoint, the equal of adopting an allocation formula in the pool involving deliverability?

A I don't consider under the existing circumstances, if all of our wells were pulled down in pressure, say to 100 pounds, that we would still get the allowable assigned in a manner which would permit the fulfillment of anticipated market demands. Now, we are constantly analyzing the status of individual wells and working with the producers in an effort to assure that the well is capable of fulfilling our obligation under our contract to that producer as regards that well. There are some wells, certainly, which need pressures to be lowered. Some of them, I agree that we should lower pressures, and we are doing that. We have been involved in a certain case, which I understand that has just been granted as indicated in this morning's paper, additional compression facilities, that will go into operation in the Lea County Area. These facilities were found to be necessary, and authorization from the F.P.C. was requested more than a year ago. To build these, we had to wait for the authorization that we have just been advised of today, so we can't go out there immediately upon determining that a condition is apparent and remedy it.

Q Yes, sir. Well, we are all quite sympathetic with the problems with the F.P.C., but your evidence has been presented in this case as based upon the gathering facilities and pressure in

the Jalmat Pool as they exist today, do they not?

A Yes, I believe that is correct.

Q At least with respect to some of the wells and the number of which you don't at the present time know, as a result of your studies compression facilities properly installed could eliminate the underproducing characteristics of a number of the wells?

A That's entirely possible. I would say not a large portion of the wells, however.

Q What would be your opinion of establishing, then, a compression factor in an allocation formula, which would operate in the same manner to give recognition to the capacity of the well to produce according to the pressure against which it's producing?

A I think we have in essence done that very thing in the formula which the Commission has adopted to go into effect in the Jalmat Pool. This new formula that includes deliverability, because that formula determines deliverability at a pressure which is not related to pipe line pressures. It gives the well an allowable with relationship to that deliverability. We're going to try and get that deliverability out of the well that it's assigned to.

Q With respect to the acreage allocation formula which your testimony is that it should have been changed in the first place, and the present order be retained, that the reason for this is that it would allow the wells' capacity to more nearly -- or I should state it in the direction that it would allow the wells' allowable to be more nearly that of its capacity to produce?

A Is your question whether the new formula will permit wells to produce gas more nearly in relationship to the capacity of the well than it would under the straight acreage formula?

Q It would probably clarify it if you would answer that question first, yes, would it?

A Do you wish for me to answer it as I stated, or was your question different than that? If you'll rephrase your question, I believe I'll try to answer it. I have no desire to avoid it.

Q Yes, sir, sure. In your opinion, would the deliverability formula that has been recommended by Texas Pacific bring the allowable of each well more nearly into line with its capacity to produce?

A Yes, sir, I am sure that it will.

Q In your opinion would the installation of sufficient compression facilities more nearly bring the capacity of a well to produce in line with its allowable as established under the hundred percent acreage formula that was adopted in 1954?

A Yes, it would.

Q Then wherein does your choice lie, and which you have recommended to this Commission, the adoption of the deliverability formula rather than the installation of sufficient compression facilities?

A That's a difficult question to answer, if I understand it correctly. However, we consider that we have obligations under our contracts to maintain certain pressure conditions in our gathering

facilities as regards individual wells. We are constantly attempting to fulfill our obligations under the contract as it regards pressure. I think that is where our obligation lies.

Q Mr. Woodruff, are these contracts subject to the valid rules and regulations of this Commission?

A I understand that they are.

Q Are there any other reasons that lead you to recommend to this Commission the adoption of a deliverability formula rather than the installation of sufficient compression facilities to accomplish the same goal of producing capacities and allowables to be essentially in line?

A I will have to ask that be read back to me.

REPORTER (Reading) "Are there any other reasons that lead you to recommend to this Commission the adoption of a deliverability formula rather than the installation of sufficient compression facilities to accomplish the same goal of producing capacities and allowables to be essentially in line?"

A I'm sorry. I don't believe I could answer that question. Would you rephrase it for me? I don't believe it's answerable in the form that I understand it to exist.

Q You have made a recommendation to this Commission, recommending that the deliverability formula be the allocation formula in the Jalmat Field. One of the reasons you have given for this is that your contract commitments would be more nearly met if this were true. You have then stated that these contract commitments

are subject to the valid rules and regulations of this Commission. I now ask you, are there other reasons which lead you to recommend to this Commission the use of a deliverability factor, rather than the installation of sufficient compression facilities?

A I can think of no answer to your question. If you have a specific instance that you would like to query me on, I would be glad to answer you as well as I can on such an instance.

Q You have no other reasons for your recommendation, is that correct?

A I did not state that.

Q You did not, I agree. Do you have any other reasons for your recommendation?

A Would you -- I'm sorry, I don't want to prolong this, but I cannot answer this gentleman's question in the form that I understand it. If he wants to outline to me the reasons that he considers that I have based my recommendations on and ask me if there are any other reasons, I'll be glad to try to analyze and give it to you, but in the present form, I cannot do so.

MR. HOWELL: I suggest that counsel ask the witness what his reasons are for making the recommendation. That is a very simple way to get at it.

MR. PORTER: Mr. Dutton.

MR. DUTTON: If the Commission please, I recognize that there are counsel here who have much greater experience than I do in these matters. However, I also realize that it is essential to

the determination of this case that this Commission be provided with the true issues in the case, and to that line I must continue to try to find out the reasons as to why this witness thinks deliverability is superior to the establishment of additional compression facilities.

MR. HOWELL: The establishment of additional compression, if the Commission please, is not an issue in this case. The establishment of additional compression, as the Commission well knows, is largely in the hands of the Federal Power Commission. The construction of compression facilities, as the witness stated, in Lea County certain facilities have been authorized. The matter is not one that ever has been passed upon by this Commission, to my knowledge. I know of nothing in the Statute which authorizes the Commission to determine the matter of compression. The matter at which the individual operators, the pressures at which individual operators deliver their gas to a purchaser is one of contract. I object to an attempt to bring into this hearing an issue of comparing a matter that is not within the jurisdiction of the Commission, namely, compression, and the matter upon which the Commission has jurisdiction, the establishment of a proper formula for production of wells in the Jalmat Pool.

I object to the question.

MR. MALONE: May it please the Commission, I would like to point out that over our objection El Paso injected into this hearing the question of its ability or inability to get from the Jalmat

Pool the gas necessary to meet its market demand. The line of questioning that is being directed by Mr. Dutton to this witness deals exactly with that issue that was injected in the case over our objection by El Paso. They now wish to turn back around and get it out of the case because it might appear to be advantageous for them to do so. I suggest that the ground rules, once established, should hold, and the questioning should be permitted.

MR. PORTER: Mr. Newell, your objection is overruled. Mr. Woodruff, answer the question yes or no, if you can. If you can't answer it, say so. Mr. Dutton, in directing your questions please make them as simple, as uncomplicated as possible, so we can expedite the hearing and move on.

MR. DUTTON: Shall I re-ask this question?

MR. PORTER: Yes, sir.

Q Mr. Woodruff, you have given as one reason for your recommendation that the deliverability formula in the Jalmat Pool, that of fulfilling your contract requirements. What additional reasons do you have for your recommendation?

A I consider that the use of a deliverability formula will more nearly place the allowables to the individual wells in relationship to recoverable reserves than the existing straight acreage formula. I also consider that it will enable a market demand to be fulfilled out of the Jalmat Pool, where under existing circumstances it is not possible for that to be accomplished.

Q Do you base these opinions upon a study involving what

advantages could be obtained by making full use of compression facilities on every underproduced well?

A As I previously stated, we produce our underproduced wells consistently. I do not consider that there is insufficient compression facilities in the Jalmat Pool. With our additional facilities that we have requested, we'll still be in better shape. Now there are some individual wells where in accordance with our obligation to the individual operator owning that well, where we need and are putting in individual compression or remedial action, but the field as a whole, there is no condition of insufficient compressor capacity.

Q Do you base this opinion upon a complete study of the effects of installing compression facilities on each and every underproduced well?

MR. HOWELL: May it please the Commission, I know of no obligation to install compression facilities, unless it's the operator's obligation in many instances, and again I offer an objection to the testimony because the installation of compression is a matter of contract between the buyer and the seller. There's no obligation that has been shown on the part of any purchaser to install compression as to any particular individual well; if there is a contract to that effect, it's a matter that may be settled by the parties to the contract, and not before this Commission.

MR. DUTTON: If the Commission please, it is Sun's position in this matter that for an expert witness to make a recommendation

concerning an allocation formula and to base that recommendation upon the solution of a given problem he must have considered alternative remedies that would also satisfy the situation at hand.

MR. PORTER: Mr. Howell, your objection is overruled. The point you are trying to establish from this witness, Mr. Dutton, is to see whether or not in his opinion the same thing can be accomplished by the installation of compression as by a deliverability factor in the formula?

MR. DUTTON: Not quite. He has expressed his opinion that it cannot be. My question now goes to, upon what does he base this opinion. Is he basing it on a study that was complete enough to justify the conclusion as an expert witness?

MR. HOWELL: Are you attacking his qualifications as an expert?

MR. PORTER: Will you ask him his reasons, or have you asked him his reasons?

MR. DUTTON: I'm under the opinion that I have asked him his reasons, and in reply, when he gave me his reasons, I have asked him what one of the two reasons was based upon; was it based upon a study or not, or upon an opinion?

MR. HOWELL: I submit that he did not ask him that. He asked if he made a study of every individual well and the compression of every well. He did not ask the witness what he based his opinion on.

MR. PORTER: Is that the information that you require, Mr.

Q (By Mr. Dutton) Mr. Woodruff, the third reason, I understand, that you have recommended the deliverability formula is that it would more nearly distribute allowables in accord with the recoverable reserves in place, is that correct?

A That is correct.

Q I must again ask if this is based upon a study of the recoverable reserves in the Jalmat Pool?

A That is based on studies of factors involved in determination of recoverable reserves in the Jalmat Pool. We have made studies regarding relationship of net effective pay and isopaceous map with iso-deliverability. We have made studies of isobaric maps or lines of equal pressure as compared to deliverability, somewhat comparable to that which was shown by Mr. Keller in his exhibits. We found a general relationship between deliverability and each of these factors which enter into the reserve calculation. I have also been present and I have heard the testimony and seen the exhibits presented in this case. I generally concur with the conclusions reached that deliverability is reasonably related to recoverable reserves.

Q Then since Mr. Howell has brought the question up, I must ask you if you --

A (Interrupting) Please excuse me -- That the use of deliverability in the allocation formula as adopted by the Commission will result in allocation of allowables reasonably in relationship to recoverable reserves assigned to each tract.

Q Now, you have stated your opinion, and Mr. Howell has brought up the question of your qualifications. I am going to ask you if you have qualified yourself in this case as an expert reservoir engineer?

A I don't recall whether such qualifications were discussed in this case. I have qualified as an expert reservoir engineer in previous cases before this Commission.

MR. HOWELL: Does the Commission accept the witness's qualifications from the past? I do not recall whether he qualified as a reservoir engineer.

MR. DUTTON: In this particular case, he did not.

MR. PORTER: That's right, in this particular case. That's right.

MR. HOWELL: He has qualified before this Commission.

MR. PORTER: As I recall, he qualified them at the beginning of the recent hearing.

A In 1953 I qualified as a reservoir engineer, and my qualifications were accepted at that time.

MR. DUTTON: I would like the Commission to fully understand

that my questions don't go as to his qualifications as a reservoir engineer in general, but as a reservoir engineer basing his opinion upon a study made in the Jalmat Pool.

MR. PORTER: Anyone else have any questions? Mr. Nutter.

By MR. NUTTER:

Q Mr. Woodruff, referring to your El Paso Exhibit No. R-1, does Column No. 1 there, which is entitled "El Paso Natural Gas Company nominations", reflect the demand that El Paso has for gas in the Lea County area?

A Yes, sir, I consider that it does.

Q The nominations are the demand?

A Yes, sir.

Q Does Column No. 5 indicate the total supply of gas that has been available, including dry gas from the gas pools, casinghead gas, and purchased gas from other pipe lines?

A The Column 5 reflects only the gas available from gas wells connected to our system, plus the volumes of gas purchased from Permian Basin Pipe Line Company from the wells connected to their system in the Lea County area, and relate to Column 1, which is nominations for gas well gas from the gas pools in Lea County.

Q So this doesn't reflect your entire demand, there's an additional demand for casinghead gas that is not shown on this exhibit?

A Yes, sir, that is correct.

Q Is that demand for casinghead gas more, less, or approximately

equal to the demand for dry gas from the gas pools?

A Are you referring to New Mexico or the Permian Basin?

Q Yes, sir, New Mexico in particular.

A Our demand for dry gas in Lea County is in excess of our supply of residue gas from plants processing casinghead gas in Lea County. Is that what you --

Q (Interrupting) Yes, sir. Well, then, approximately what percentages or what ratio does the demand for casinghead gas compare with dry gas?

A I would say in Lea County that the casinghead gas supplies approximately 40 percent of our demand that is supplied out of Lea County.

Q Well, now, a comparison of column 5 and column 1 on this Exhibit R-1 indicates a deficiency in the amount of gas that is available to you to meet the demand for gas, is that correct?

A Yes, sir, that is correct.

Q Has there likewise been a deficiency of gas available to you to meet the needs for casinghead gas?

A Yes, sir, there have been decreased volumes of casinghead gas available to us because of restriction in permitted oil production.

Q How long has this situation existed, where the demand for dry gas has not been met by the dry gas that was available to you; by dry gas I mean gas pool gas.

A As I recall, from my testimony in the previous hearing on

this case, it began somewhere in 1955.

Q How long has there been a shortage of casinghead gas to meet the needs for casinghead gas?

A Actually there's no shortage of casinghead gas if we have dry gas well sources which can be turned on to compensate for the variations in casinghead gas supply. We do have available to our system adequate deliverability from gas well gas sources to compensate for the variations in casinghead gas supply, and we have adequate facilities to take those volumes.

Q Do you have adequate deliverabilities of casinghead gas to meet your need for that?

A Well, actually, casinghead gas production is related to the permitted oil production. I do not visualize what you refer to as deliverability from casinghead gas supplies.

Q I meant the supply of casinghead gas, is that adequate to meet your need?

A I consider that our total market demands could be supplied even under the severe restricted conditions of casinghead gas supply today, from the deliverability available to our facilities of gas pools.

Q Well, now, you still have a shortage of gas, whether it be casinghead gas or dry gas?

A That is correct.

Q Is every effort made to buy all the casinghead gas that you can economically gather?

A Yes, we do so. Our casinghead gas is taken first. We take all that is made available to us.

Q Mr. Woodruff, several months ago it was called to the attention of the Commission that El Paso Natural Gas low pressure and processing facilities for handling casinghead gas were loaded to capacity. When did these systems reach their capacity?

A I'm not thoroughly familiar with the facts concerning that, Mr. Nutter. I do believe that our facilities in Lea County have within the past year been fully loaded. It is my recollection that the authorization that we have just received from the F.P.C. also includes additional facilities for gathering and processing casinghead gas in plants operated by El Paso Natural Gas Company. The plants, of course, of others, of course we have no control over.

Q When did your -- you don't know when your gathering and processing facilities were loaded to their capacity with casinghead gas and you couldn't accept any more casinghead gas into them?

A Actually, Mr. Nutter, we are accepting additional casinghead gas, as I understand, even today, into our system if it can be economically connected to the system.

Q When were these proceedings before the F. P. C. for authority to expand your low pressure systems first applied for?

A If I am correct in my recollection, it would have been applied for a little more than a year ago. That is the time when the case was filed that has just been approved.

Q When were these proceedings first set for hearing by the F.P.C.?

A I believe it was in July of 1957.

Q Well, now, there were several postponements of the hearing, were there not?

A Yes, sir.

Q At whose request were those?

A By the Commission staff.

Q In other words, El Paso did not delay the proceedings?

A No, sir, we urged that they be expedited, in fact.

Q What actual construction is going to be involved in expanding the facilities? What is it going to take?

A You are referring to casinghead gas processing facilities?

Q The low pressure facilities that you have asked permission to expand.

A I am not positive, but I would assume it would require additional gasoline plant facilities and additional compression facilities.

Q Will the gathering lines have to be expanded, too?

A I doubt if there will be any substantial increase in gathering facilities, but rather an increase in the volume of gas which those facilities can handle by increased compression.

Q Does the F.P.C. control the expansion or construction of gas gathering facilities for casinghead gas?

A Not connecting lines to wells. It is my understanding,

though, that major pipe lines and, of course, plant facilities are under their jurisdiction.

Q One particular area I had in mind, El Paso has an eight-inch trunk line going through an oil field. Would it require F.P.C. approval to expand that to another size?

A I'm sorry. I don't know.

Q Does it take F.P.C. approval to expand a gasoline plant which is processing the casinghead gas?

A Yes, it does.

Q Mr. Woodruff, we have received estimates from various sources that upon approval of the program by F.P.C. it will take, well, my estimates are four to six months, eight to ten months, and ten to twelve months for the construction of these facilities. Do you have any idea how long it will take?

A No, sir, I don't.

Q Mr. Woodruff, one four well lease in Southern New Mexico several months ago was producing more than a million feet of casing-head gas per day. The casinghead gas from these wells is connected to the low pressure gathering system of El Paso. This operator has informed the Commission that El Paso's low pressure gathering system is so overloaded that El Paso can only purchase 30 percent of the gas produced on that lease, and that about 750,000 cubic feet of gas per day was available for flaring. Now, assuming that a non-marginal well in the Jalmat Pool had a daily allowable in February of approximately 800 mcf per day, this amount of gas that

was available for flaring on that one four well lease would be equal to about 95 percent of the allowable of that non-marginal well, would it help El Paso in supplying its market demand for natural gas in Lea County if they had an additional 95 percent of a well in the Jalmat Pool to put into their system?

A Do you mean Jalmat Pool, or are you referring to --

Q (Interrupting) If you had another 95 percent of one well in that pool, would that help you to supply the market demand?

A Certainly any additional gas we could receive into our system would aid in fulfilling our market demand. If you are referring to casinghead gas, we would have to have plant facilities to enable us to process that additional volume of gas; otherwise, we could not get any more into our system. Assuming that the plant was loaded to start off with.

Q If you could accept the gas and use it, would the 750,000 cubic feet of gas that is being flared, or was available for being flared, could that be utilized by El Paso?

A It could and would and should.

Q If it takes twelve months to complete one of these expansion programs, and it takes twelve months to get an F.P.C. approval for one, that means a total of twenty-four months from the time you need the gas or need the extra facilities until the time they can be completed, doesn't it?

A Yes, sir.

Q Is it impossible to foresee the conditions and do something

about it so that the gas can be utilized sooner than twenty-four months from the date you find the need for it?

A Certainly I think that you have to visualize as you go along the conditions that are going to be apparent, I'm sure that El Paso did that in making their application to the F.P.C.; they had to visualize what conditions would be apparent.

Q You don't think it would have been possible for El Paso to have foreseen the low pressure gathering and processing facilities being loaded to capacity soon enough so that they could have gotten approval for the project and completed the project in less than two years?

A Under the circumstances that have existed, and with your estimation of taking a year after approval to get it done, I would think that probably you are correct. Actually, to get approval from the F.P.C. of additional facilities, you pretty much have to show that you have got the gas that the facilities are going to be used for.

Q You mean until you are flaring the gas, you can't get approval from the F.P.C. to use it?

A I wouldn't say that is 100 percent correct, but you have to show them definitely that you are going to have the gas, both that the wells will be capable of producing it and that under existing rules of the regulatory body, the State regulatory body, that the gas can and will be produced to require these facilities.

MR. NUTTER: I believe that's all.

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

MR. MALONE: I have just one question that was raised by the most recent testimony.

By MR. MALONE:

Q Did I correctly understand, Mr. Woodruff, that the portion of the hundred and some million dollar approval from F.P.C. will go to provide additional facilities for dry gas in the Jalmat Pool?

A Yes.

Q Do you know how many horsepower of compression facilities in Southeast New Mexico is contemplated?

A I'm not positive. I would be glad to find out and let you know.

Q Do you know what part of the total will affect the Jalmat Pool?

A Total expenditure?

Q Yes.

A No, sir, I do not know. I do know that facilities for delivering gas out of the Permian Basin area that have been approved will increase our capacity approximately 100 million cubic feet per day.

Q It is your feeling that the situation as regards under-production in the Jalmat Pool will be improved, at least to some extent, by these expenditures?

A I believe that it will.

MR. MALONE: That's all.

MR. PORTER: Mr. Utz.

By MR. UTZ:

Q Mr. Woodruff, I believe you stated earlier in your testimony that you had a desired market demand from the Jalmat of 480 million a day, is that correct?

A It is my recollection that I said approximately 460 million.

Q 460 million. Mr. Woodruff --

A (Interrupting) Excuse me. Did you say Lea County or Jalmat?

Q My notes say Jalmat.

A I was incorrect if I stated that figure. My figure out of Jalmat is approximately 260 million.

Q Is your desired market demand from the Jalmat Pool 260 million?

A That is correct. That was the anticipated market demand, as I recall, for the first six-month period. Mr. Utz, excuse me, I am trying to recall the figure that I gave. As I recall, the 260 million figure represents the allowable which would be assigned to El Paso's wells, would represent the average daily allowable assigned to the wells connected to El Paso's system in the Jalmat Pool if our estimated market demands were fulfilled.

Q 260 million per day from your connections in the Jalmat Pool?

A Right.

Q Now, I think you answered this question for Mr. Dutton, but I was unable to be sure. Did you state that it was not possible

to lower your line pressures sufficiently in order for you to meet that market demand?

A I considered that it would be impossible to lower our line pressures sufficiently to meet that market demand without continuing to incur underproduction.

Q Why is that true?

A Because many of the wells that are incapable of producing their allowables have some condition inherent to the well which is not controlled by pipe line pressure. In other words, they load up with liquids, they have an inability to produce that isn't restricted because of pipe line pressure.

Q If you did lower your pipe line pressures, well, just say 200 pounds average over your field, would that increase each well's deliverability or ability to produce into your system in a direct proportion, or would the increased ability of a well to produce be different for various wells?

A Well, it would not be a direct proportional increase. It would vary from well to well. However, assuming that the well had no liquid condition apparent, the increase could be related to the pressure decrease. The increased deliverability could be related to the pressure decrease.

Q Why would it not be in direct proportion, can you answer that briefly?

A The deliverability of the well as affected by pressure is not on a direct relationship, in that pressure is involved in

deliverability in a squared form; that is the only reason that caused me to say that it was not in a direct fashion. If you have lower pipe line pressure, you are going to get greater deliverability in a well, so in that respect it would be direct.

Q Would the mechanical condition of the wells have anything to do with that phenomena?

A Yes, sir, it would.

Q Mr. Woodruff, you may not know the answer to this question, but if you can, I would like for you to answer it. Did the formula in existence in the Jalmat Gas Pool at the time that you applied to the F.P.C. for your increased facilities have any bearing on your application to the Federal Power Commission?

A I do not know.

Q Regardless of the outcome of this case, are you still going to install your compression facilities that have just been authorized?

A Yes, sir.

MR. UTZ: I think that's all I have.

MR. PORTER: Any further questions? Mr. Nutter.

By MR. NUTTER:

Q One more question, please, Mr. Woodruff. How often is it necessary to prorate the casinghead gas from wells to which El Paso's low pressure system is connected?

A I don't know that I can answer that in an exact fashion. The only time it would be necessary to restrict production, if production were restricted, is when production exceeds the capacity

of the plant to process the gas.

Q How many instances of this are in these pools down in southern New Mexico where you have the connection and you are taking only a part of the casinghead gas?

A I don't know.

MR. NUTTER: Thank you.

MR. CAMPBELL: I have one question.

MR. PORTER: Mr. Campbell.

By MR. CAMPBELL:

Q Mr. Woodruff, in your opinion, after the installations are completed that have been authorized with regard to compression facilities, will you still be required under the 100 percent acreage allocation formula to transfer some of your demand from the Jalmat Gas Pool to other pools?

MR. MALONE: If the Commission please, I object to the question for the reason that the witness has testified that he doesn't know what facilities are going to be installed, and would not be qualified to answer the question.

MR. PORTER: Objection overruled. Let the witness answer the question if he can.

A Under the demand conditions which exist today, with the straight acreage allocation formula, I do not consider that the facilities which I understand will be put in or added to the Lea County area for processing gas well gas will remedy the situation which I have described to exist. As a consequence, there will

continue to be gas diverted to other sources.

MR. MALONE: I'm forced to ask one more question.

By MR. MALONE:

Q What are the facilities that you believe will be constructed on the basis on which you answered this question?

A Additional compression facilities to our plants handling gas well gas.

Q And you have testified that you have no information as to the number of horsepower of such additional facilities?

A I'm not sure of what that figure would be.

Q You are answering the question on the basis of the extent of compression facilities unknown to you?

A I'm answering it on the basis of what I understand the additional compression facilities will accomplish when added to our existing plants processing gas.

MR. MALONE: That is all.

By MR. CAMPBELL:

Q In your opinion, based upon your knowledge of the operation of your system,both by way of physical operation and by way of the operation of the allocation of gas upon your system, do you believe that any facilities, if there is any way by the installation of any amount of additional compression facilities in the Jalmat Gas Pool, that will avoid the results that you have described that arise from the hundred percent acreage formula?

A I believe to a small degree we would continue to have the

condition that now exists even at pipe line pressures, say down as low as 100 pounds for all the wells connected to our system.

MR. PORTER: Any further questions? Mr. Bushnell.

MR. BUSHNELL: If the Commission please, H. D. Bushnell, atterney for the Amerada. I renew the motion of Mr. Dutton originally made to the effect that all of this testimony on behalf of El Paso be stricken from the record. It was my understanding that the purpose of this testimony was to show that the inclusion of a deliverability factor in an allocation formula in the Jalmat Pool will prevent undue discrimination. It is apparent and obvious from the witness's testimony, especially in answer to Mr. Dutton's cross examination questions, that this testimony being put in to support the proposition that the inclusion of a deliverability factor in an allocation formula in the Jalmat Pool as to those wells within the pool is necessary and will support the proposition that such allocation should be made on the basis of market demand. It is my position that this is not in conformity with the Statutes, Section 65-3-13 (c). For that reason, I move that it all be stricken from the record.

MR. PORTER: Mr. Bushnell, your motion is overruled. Any further questions of this witness? The witness may be excused.

(Witness excused.)

MR. HOWELL: That completes our testimony.

MR. PORTER: Mr. Malone, I believe you stated you had some rebuttal?

MR. MALONE: I have two witnesses whose testimony will not be lengthy.

MR. PORTER: We would like to take a very short recess.

(Recess.)

MR. PORTER: The meeting will come to order, please. Mr. Malone.

MR. MALONE: Our first witness will be Mr. Hackney. He has not been sworn.

(Witness sworn.)

DIRECT EXAMINATION

By MR. MALONE:

Q Will you state your name, please?

A James L. Hackney.

Q What is your present position with Humble Oil and Refining Company?

A I am a Senior Petroleum Engineer in the Western Division office in Midland, Texas.

Q You have not testified before this Commission before, have you?

A No, sir, I have not.

Q In an effort to expedite your qualifications, you are a graduate of Rice Institute at Houston, Texas, with the degrees of Bachelor of Science and Bachelor of Science in Chemical Engineering?

A Yes, sir.

Q You have been with the Humble Oil and Refining Company for how long?

A Over ten and a half years, since July 1st, 1947.

Q Have you spent a substantial portion of that time as a gas engineer?

A Yes, sir, approximately 75 percent of that time as a gas engineer.

MR. MALONE: Are his qualifications acceptable?

MR. PORTER: Yes, sir.

Q I invite your attention to Texas Pacific Coal and Oil Exhibit R-5 which appears on the wall. Were you in the room and did you hear the testimony concerning the twenty-well groups and the other groups of wells that composed this exhibit and the other five exhibits?

A Yes.

Q Did you thereafter have access to the information furnished by Texas Pacific Coal and Oil Company as to the individual wells which composed the twenty-well groups shown on this Exhibit R-5?

A Yes, sir, we did, in the form of computor sheets.

Q Did you have on those computer sheets the relative so-called reserves, the relative pressures, and the relative deliverabilities as computed by Texas Pacific Coal and Oil Company on the wells which were included in each of those twenty-well groups?

A Yes, sir.

Q Did you make a comparison of the wells within those groups

to determine the extent of relative variation as between the highest and the lowest well in each group, with reference to reserves, pressures, and deliverabilities?

A Yes, sir.

Q Did you prepare an exhibit showing the results of your study?

A Yes, sir, it is an exhibit appearing here on the board.

Q I invite your attention to the exhibit on the board which is designated Operator's R-9, and ask you to state if that is the exhibit that you prepared?

A Yes, sir.

Q What does that exhibit show vertically on the sides?

A Vertically, on the sides, indicated in percent is the percent variation within any of the well groups in the so-called relative reserves per acre, relative pressures, and relative deliverabilities, that is between the wells, say having the lowest relative reserve per acre and the well having the highest relative reserve per acre, referred to percentage increase of the higher one.

Q Let me be sure I understand you. You compared the well with the lowest deliverability with the well with the highest deliverability in each group, and plotted in a vertical bar the percentage of variation, is that correct?

A Yes, sir. In addition to deliverability, it was also, that computation was made for pressure and for the so-called relative reserves per acre.

Q Now, I notice the numbers 1 to 16 across the bottom of the exhibit below the bars. What do those numbers indicate?

A These numbers refer to well groupings as indicated on Texas and Pacific Exhibit R-5, starting with Group No. 1, being the approximate 20-well group having the lowest reserves per acre, and proceeding upward through Group 16, having the -- Group 16 being the approximate 20 wells having the highest indicated reserves per acre. These points represent an average relative reserve for the 20 wells within that group as the points on the green line which indicate the average deliverability for each of the 20 wells within the group.

Q That was the basis on which this exhibit was offered by Texas Pacific, was it?

A Yes, sir, as I understand it.

Q Will you show us what you found when you compared in each group the well with the lowest deliverability, the lowest reserves, and the lowest pressure, with the one with the highest? What percentage of variation did you find in Group No. 1?

A You are speaking with regard to all three?

Q To reserves first.

A With regard to reserves, we found that the well within that 20-well group having the higher reserves was approximately, these reserves were approximately 280 percent higher than the well with the lowest indicated reserves per acre.

Q Two hundred what percent?

between the lowest and the highest well in that Group No. 1?

A 280 percent, it was.

Q 280. What did the pressure variation indicate?

A The pressure variation within that, that was actually a 21-well group, was 226 percent variation between the well with the lowest relative pressure and the well with the highest relative pressure.

Q What in comparison did you find the variation in deliverability to be?

A As indicated by the red bar, the variation in deliverability between the well with the lowest relative deliverability and the highest was 3,300 percent within that Group 1.

Q That was a difference between, a variation of 248 percent in reserves and over 3,000 percent in deliverability, is that correct?

A Yes, sir, from 280 percent to over 3,000.

Q Let's move down these groups. The green color indicates the relative variation in reserves; the yellow, in pressure; and the red, in deliverability, does it not?

A Yes, sir, that is as indicated by the legend appearing at the top.

Q Let's move down these groups, we will ignore the pressure because we are primarily interested at this time in reserves as

computed by Texas Pacific and the variation in deliverability as they found it to exist in that, and show us the comparative variation in these groups.

A Proceeding from Group 1, in Group 2, which was a 20-well group, there was a 45 percent variation in indicated relative reserves per acre; in deliverability there was a 3,700 percent variation. In Group 3, the variation in reserves per acre, relative, was 24 percent, whereas the variation in deliverability was 4,300 percent.

Proceeding further, in Group 4, the percent variation for the relative reserves per acre was 27 percent, and the variation in deliverability, relative deliverability, was 16,300 percent, which actually was off the paper here.

Q In other words, the bar on Group 4 would have to extend three or four feet further up in the air to be relative to the variation in reserves that you found as shown on this exhibit?

A Yes, sir, approximately two to three feet.

Q Let's go back to the old simile about the man that had a given weight for a given height, and try to fit that man into that picture. Would would you find if you did that?

A Well, if I may make an analogy, assuming that Group 4 here represented men of my height range, say five six to five eight, and assuming that the man with the lightest weight within that group weighed 100 pounds, the heaviest men within that group would have to weigh 16,400 pounds.

Q All right, let's move along to Group No. 5.

A In Group 5 the variation found in so-called relative reserves per acre was 13 percent, whereas the range in relative deliverabilities was 9,200 percent.

Q Now, the comparisons which you have testified to with reference to these first five groups continue on through on this exhibit down through the groups numbered up to 16, do they not?

A Yes, sir.

Q The relative percentage is as shown visually and is in relation to the size of the green bar for the reserves and the red bar for the deliverabilities, is that correct?

A Yes, sir, insofar as we were able to measure; some of these lower ones here may not be exactly correct, being so short they were hard to indicate.

Q That is for Mr. Howell's benefit, I dare say. Is there any other explanation -- in an effort to save time, is there any other explanation that you would like to give the Commission with reference to any of these other groups as to what the exhibit shows?

A Mr. Howell, I believe the exhibit shows --

Q (Interrupting) My name is Malone.

A Excuse me. Mr. Malone, the exhibit shows that, for instance, taking any of these groups here, we find a relatively small variation in relative reserves per acre as computed by Texas and Pacific but we find extremely large variations in the relative deliverability within the same group.

Q What in your opinion does that indicate as to the effect of injecting that deliverability factor into a formula?

A It would indicate to me that within a group having relatively constant relative reserves per acre as calculated by Texas Pacific, that you would have a wide variation in allowable among the wells in that particular group.

Q You heard the testimony of Mr. Keller, did you not, that they had selected these twenty wells, they were spread around the pool at various places, but to the extent that they might be contiguous, would that indicate that drainage would occur if deliverability goes into the formula, in your opinion?

A In my opinion, it would, sir, on Texas and Pacific's reserve map and pressure map, in general, the higher -- and deliverability maps, in general as indicated by the colors, anyway, the higher reserve groupings coincide with the higher pressure groups and if the higher reserves groups, for instance, were offset tracts or wells, or in the adjacent area, which they would almost some of them would have to be within this grouping, with the wide variation in allowable between adjacent wells having the same indicated reserves per acre, you would of necessity have to have drainage between tracts.

Q Well, now, what in your opinion does this study disclosing these extremes of variation, what effect does it have in your opinion on the validity of any conclusion that might be drawn from Texas Pacific Exhibit R-5 and the related exhibits?

A As indicated on the exhibit, these points for the green line represent an average in relative deliverability within each of these groups, and if this were plotted on an individual well basis, any correlation that might appear on these groupings would almost be lost, due to the wide fluctuations in deliverability.

Q With that kind of fluctuations in deliverability, would you state whether or not in your opinion you are justified in averaging these extremes and indicating a particular point on an exhibit of this type, or let me ask you, do you think that when that is done, the result has any value?

A In my judgment, no, sir. I think that you would have gotten a different-looking curve had you taken these groups by increasing deliverability and plotted the average reserve per acre for the wells by increasing deliverability groups.

Q I believe you have also said that the picture would be vastly changed if individual wells rather than averages of 20 wells having this variation would have been used?

A Yes, sir.

MR. MALONE: That is all.

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

MR. CAMPBELL: Yes, I do.

MR. PORTER: Mr. Campbell.

CROSS EXAMINATION

By MR. CAMPBELL:

Q Has your study of the Jalmat Gas Pool been confined to this

study you made last night, or have you made an independent study of the pool on any other basis than the analysis of this one exhibit?

A No, sir, I worked with a groupof engineers prior to the last hearing, at which time Mr. Leibrock presented the operators' case.

Q To what extent did you work there, did you make the detailed study of the fifty-eight well area?

A No, sir, I was in on part of it, I didn't make the entire -- I'm familiar with the procedures that went into it. As to the actual computations, I did not make all of them.

Q Have you made any study of the fifty-eight well area with, on the entire Jalmat Pool, with respect to the hundred percent acreage formula upon the recoverable gas in place under the tract in the pool, any study of any nature?

A Not other than this fifty-eight well group, we didn't have any information on recoverable gas in place on the rest of the field.

Q So you are not in any position to state whether or not in allocating the gas throughout the entire pool, even assuming the analysis that you made is correct, whether there would be a more equitable allocation of gas under the formula now in effect, at least under the present order, than under the 100 percent acreage formula, would you?

A I believe, sir, if I may qualify that, that within, as

indicated on this exhibit, within well groupings of approximately the same reserves per acre as defined by Texas and Pacific, there is a large variation within, of deliverability within that same grouping, which would of necessity cause drainage between tracts.

Q You were present at the last hearing, were you?

A Yes, sir.

Q During the entire hearing? I mean were you here at the original hearing in this case?

A No, not at the original hearing. I was here at the last.

Q Were you here at the time that Texas Pacific Coal and Oil Company through Mr. Keller offered its Exhibit No. 10 in the original case, which showed the scattering of deliverabilities throughout the Jalmat Gas Pool?

A I was not here. I have seen the exhibit and studied it to some extent.

Q You have never heard Mr. Keller or any other witness for the Texas Pacific Coal and Oil Company deny there were wide variations within areas or groups within this pool, have you?

A No, not that I recall, sir.

Q From what you have heard, has their analysis been based on a general correlation that they contend exists throughout the entire Jalmat Gas Pool, based upon their studies, as between deliverability and recoverable gas in place? Isn't that the extent of their testimony, to your knowledge?

A No, sir, I believe it was between deliverability and reserves,

so-called, obtained by extrapolation of pressure curves for an individual well, and then dividing that indicated reserve for the well by the acreage assigned to that well by the Commission.

Q You heard Mr. Keller's testimony yesterday, did you not, in which he undertook at least to explain why he considered that that calculation of reserves per acre was related to recoverable gas in place under each tract? That testimony you heard, whether you agreed with it or not--

A I heard it, yes, sir.

Q -- is another question. Now, with regard to your analysis of this particular exhibit, you are aware, of course, that the 20 groups were selected upon the basis of increasing reserves, were you not?

A Yes, sir.

Q Then it is quite obvious that when you select that group as the ones with relatively increasing reserves, the percentage of variation is bound to be less than it is for a variable factor, is it not?

A If there's a reasonable relationship that can be predicted between deliverability and recoverable gas in place, it would not appear so.

Q Well, the graph that appears there as Texas Pacific Exhibit R-5 shows that there is some relationship, does it not? The degree of relationship is what you are arguing about, isn't it?

A It shows that if you average wells, that there may be some

indicated relationship in the method used.

Q Well, have you heard any testimony here that indicated anything else as far as position of Texas Pacific Coal and Oil Company is concerned?

A No, sir, I know that originally it was, these groups were broken down into four groups, and in this case they are broken down into 16, and at least in looking at it, it appears to me that the agreement is less in the 16 well, or the 16 groups, than it appeared in the 4.

Q Wouldn't that be inevitable under any analysis, until you got down to the individual well?

A It could if you had a factor that was not particularly, or was not related to what you were trying to compare it to, except as to coincidence.

Q There has also been testified here, and exhibits offered by Texas Pacific Coal and Oil, not only on a 20-well group analysis, but on an areal, both as to the entire pool on Exhibits 3 and 4, but to areal limits by half-townships, which indicated from their point of view a general correlation ? Have you analyzed those?

A No, sir, I haven't.

Q You have confined your study to this particular exhibit?

A I believe, or I feel certain that the conclusions or the variations showed would be the same.

MR. CAMPBELL: That's all.

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

Mr. Dutton.

MR. DUTTON: Dutton, for Sun Oil.

By MR. DUTTON:

Q Neglecting coincidences in the Jalmat Pool, is the recoverable gas in place under a tract assigned to a well proportional to the deliverability of that well?

A No, sir, not in my opinion.

MR. DUTTON: That's all.

MR. PORTER: Anyone else have a question? Mr. Malone, did you wish to offer this exhibit?

MR. MALONE: Yes, we will offer Exhibit 9-R.

MR. PORTER: Was this exhibit prepared by you or under your supervision?

A By me.

MR. PORTER: Without objection, the exhibit will be admitted. The witness may be excused.

(Witness excused.)

MR. MALONE: Mr. Gruy.

HENRY J. GRUY

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

DIRECT EXAMINATION

By MR. MALONE:

Q Mr. Gruy, you are the same Henry J. Gruy that appeared in this case earlier, and you were sworn in this case at that time,

were you not?

A Yes, sir.

Q Have you been present throughout the hearing and heard all the testimony that has been entered?

A I have been present. I think I heard it all, yes, sir.

Q You recall the reference that was made to the four percent figure used by you in connection with the possible increase in ultimate recovery from this pool which might result from the frac race which you testified would be inevitable if this deliverability formula goes into effect. You heard the conclusion by Texas Pacific's witness that possibly some 8 million dollars would result in gas value that would be recovered if that occurred. Now, is it your testimony that in your opinion four percent additional ultimate recovery will result from a frac race--

A No, sir.

Q -- that would not otherwise be recovered?

A No, sir.

Q What is your testimony in that regard?

A My testimony is that anything that you do to a well to increase its deliverability will necessarily allow it to be produced to a lower pressure at economic rates than would otherwise occur. Now then, should a deliverability formula be put in in this field, it is my opinion that a large number of frac jobs would be done immediately, that there would be a race to frac, that people would have to frac their wells in order to protect their reserves from

additional drainage, or attempt to protect them, and that wells would be fracked that would not otherwise be fracked or should be fracked, and that some of these wells will be wells that have old pipe in them or wells that will be fracked into water and that this will cause some loss of reserves. Now, I think that the wells that ought to be fracked and can reasonably be fracked to increase their ultimate recovery will be fracked under any proration formula that is in existence, but without the change to deliverability, there wouldn't be the mad scramble to frac and there wouldn't be the danger that wells that shouldn't otherwise be fracked, be fracked. There will be no net increase in reserves of this field as a result of a deliverability formula.

Q You testified yesterday, I believe, that you had extrapolated pressure production decline curves on some 374 wells, I believe, in the Jalmat Pool, is that correct?

A Not exactly. I testified that we had prepared a sheet and put all the pressure production on each well on the sheet, but not all of them were extrapolated.

Q What was the reason for that?

A Well, some of them we didn't have enough points, some of them we had the production but no pressures had been reported to the Commission or recorded in records so that we could find it. I don't have that many that were extrapolatable, but I had them recorded.

Q Insofar as the engineering reports were concerned, what company seemed to be most deficient in furnishing pressure data?

A El Paso Natural.

Q There was testimony, which you heard, by Mr. Keller, in which he said that in his opinion, I believe that this is what his statement was, that in his opinion his extrapolation of curves to determine per acre reserves was a perfectly satisfactory method with the exception of drainage, and that under an acreage formula there was no reason to assume there had been much drainage in this pool; therefore his system was satisfactory. Have you made any analysis to determine the validity of that conclusion?

A Yes, sir. I have looked at the decline curves which indicate that extensive and substantial drainage has occurred within the pool. Now, the method of analysis that I will present here to show that is by checking the initial pressure of the well, or if initial pressure was not measured, the projection of the trend, if it was extrapolatable, back to the point of zero production to see what the indicated I.P. would be.

MR. CAMPBELL: May I interpose there, this study that you are talking about is the one that you referred to in your testimony originally in this case. Is it the same data?

A It is the same data that we presented to you.

MR. CAMPBELL: I would like to clarify one point. You testified that there might be some of the wells that aren't in the Jalmat Gas Pool. Would you please clarify that, in order that we can determine if you can properly express an opinion on this data?

A We took all the wells listed in the schedules as having been in the Jalmat Pool and plotted the curve on them.

MR. PORTER: Are you referring to the proration schedules, to gas proration schedules?

MR. NETHERLAND: Mr. Clarence Netherland, who is an associate of Mr. Gruy. Yes, it was November proration schedule.

A We didn't take time to locate each one of these wells on the map to see where they were, but I feel sure that substantially all of them are in the pool, unless there is a lot of errors on the schedule, which I don't suspect that there are.

MR. PORTER: Thank you.

Q (By Mr. Malone) What did your study show in that regard?

A I have grouped the indicated I.P. of the wells in groups of 100 pound ranges. We found that two wells had an indicated I.P. between three and four hundred pounds, two wells between four and five hundred pounds, two wells between five and six hundred pounds, fifteen wells between six and seven hundred pounds, twenty-one wells between seven and eight hundred pounds, twenty wells between eight hundred and nine hundred pounds, forty wells between nine hundred and a thousand pounds, fifty-eight wells between a thousand and eleven hundred pounds, fifty-four wells between eleven hundred and twelve hundred pounds, twenty-five wells between twelve hundred and thirteen hundred pounds, eleven wells between thirteen and fourteen hundred pounds, six wells between fourteen hundred and fifteen hundred pounds, four wells

fifteen to sixteen, four wells sixteen to seventeen, and one well above seventeen. Now, the I.P. wellhead pressure in the pool is, probably should have been somewhere in the range of twelve to thirteen hundred pounds. Now the reason that these others extrapolate to a higher pressure must of necessity be that they started out at twelve hundred pounds at a flat slope and when the pressures were reported, that the drainage area had changed and the slope was down. Now, in addition to those that extrapolated back above the original pressure, showing a change in the drainage area and the effect that drainage must have been going across lease lines either before or after this change occurred, we had fifty-four additional wells which showed a sharp break in the slope of the curve. Now that all these wells that were completed with I.P. less than what the I.P. in the field with the area around them had sustained drainage before the wells were drilled, so that it must have been going to some of these other wells. Now all the wells that have a change in slope have changed their drainage area, and if they were draining across lease lines with the first slope, they might not be on the second slope, or they might still be, but the situation has certainly changed from before and after, and either before or after, if they weren't draining across lease lines before, there must be drainage going away from the lease after.

Q Is it proper to conclude from that then, that wherever that slope change occurs, drainage has occurred either at the one time or the other?

A Absolutely.

Q Now, does the wide variation in I.P. wellhead pressures in this pool indicate to you that widespread migration of gas had occurred and is occurring and will continue to occur if conditions permitting it are in effect?

A It shows that there is enough interconnection to allow migration to occur, and that it has occurred; if suitable relative producing rates are in force, it will continue to occur or it will be aggravated by changes in relative producing rates.

Q What effect does this condition which you have found have upon the validity of the extrapolation of a pressure decline curve to determine reserves, as was done by Texas Pacific Coal and Oil Company?

A It's perfectly all right to determine reserves, assuming that the conditions continue, but it certainly has no reflection upon the recoverable gas in place, or certainly has no relation to the recoverable gas in place under the unit assigned to that well.

Q Does it demonstrate that an attempt to determine recoverable gas in place through that method would be wholly fallacious?

A That is correct.

Q Now, with reference to the per acre reserves that were determined in the manner testified to by Mr. Keller, you testified I believe that you had extrapolated curves on all the wells that Mr. Keller had, or had attempted to do so, is that correct?

A Yes, sir.

Q What comment do you have with reference to the relationship which Mr. Keller found to exist between deliverabilities and reserves computed in that fashion?

A Well, I think in the field that's been produced as this one has, from the late 20's, I believe, up until seven or eight years ago at capacity, and more recently with an allowable based on acreage which had not been enforced up until the time that we got the pressure data that was used in these curves and was used by Mr. Keller; that there had continuously been a large number of overproduced wells which were the wells with the capacity to get overproduced, and a large number of underproduced wells that were the wells that had lesser capacity; that the indicated reserves are in relation to relative producing ratess, it is inescapable that you have to find a correlation between reserves determined in that manner and capacity to produce.

Now, Mr. Keller has turned it wrong side out. The reserve that he gets is a result, a direct result of the fact that the wells had a good capacity to produce and receive drainage. He has implied that the fact they had the reserves has resulted in the high deliverability, which is backward.

Q Which is what?

A Backward.

Q Then it would have been surprising if they had not come up with a correlation between reserves computed on that basis, and

deliverability, wouldn't it?

A Well, it certainly would, and there's nothing, his correlations exist with the reserves on the basis he's computing, but they are not valid with respect to the recoverable gas in place under the unit.

Q Now, have you made any study of the cumulative production of the wells in this pool which you feel might be of any assistance to the Commission?

A Yes, I have.

Q I invite your attention to Operator's Exhibit R-10 and ask you to state what that exhibit is.

MR. MALONE: This is work that was done last night to get this information up; we just want to check the date of the cumulative production figures that were used in preparing this plat.

Q This work was done under your direction, wasn't it, Mr. Gruy?

A That is correct.

Q It wasn't possible for you to do it all personally?

A No, I didn't do it, but I had it done to make this point.

Q All right, will you proceed?

A On this map of the Jalmat Pool, it is shown, the fifty-eight well area that Mr. Leibrock has outlined with black pencil here. A red figure has been placed by each well which is the cumulative production to 1/1/57 in MMCF millions of cubic feet for each of the wells. This has been extended beyond the fifty-

eight well area. Now, the reason this has been done is in reply to Mr. Keller's testimony in which he stated that it was no surprise to him that the pressures were uniformly distributed with only a hundred pound variation within the fifty-eight well area. He did not think that that had any relation or possibly did not have any relation to the fact there was good communication between wells in the area, but it could have been and probably was caused by the fact that the thickness was relatively equal, and under an acreage formula the takes would be relatively equal, so you would expect the pressures to be equal. I want to show that the takes havent been equal and the fact that the pressures are equal is a direct result of good communication.

If drainage hadn't occurred and uniform thickness in the area, the wells with a high production would have the low pressure and vice versa, but there is only a hundred pound variation in pressure and we have large variations in cumulative production. Here is a well right here that has produced 8,598 million cubic feet of gas. It is offset one location to the south by a well that has only produced 59 million cubic feet of gas. In this area, there is not but a hundred pounds of pressure variance. Additional examples of that kind occur all over this map. The well to the northeast of that well has produced 720 million cubic feet. Here is a well that has produced only 609 million cubic feet. Over here is a well that has produced 8,008 million cubic feet, offset by a well that has produced 550 million cubic feet,

so there is a very wide variation in the amount of production that has been taken from wells in this area, with the resulting very small pressure difference. Since the thickness is relatively uniform, there must be drainage to the units on the tracts that have the high production, since the amount of gas under them now is relatively equal per acre basis.

Q What would you expect to occur in the future if a formula which injects deliverability or includes deliverability, what would you expect in the future to occur as between wells?

A There will be drainage between wells, and the future reserves of the wells in here will be proportionate to their ability to produce and not proportionate to the reserves in place under the tracts.

Q Does that in your opinion fully support the conclusion drawn by Mr. Leibrock as to the redistribution of reserves in dollars that would occur from this allocation formula?

A It does.

Q Now did you make a study to determine relationships between alleged reserves and allowables under the new formula, assuming for the moment the correctness of Mr. Keller's computation?

A Yes, sir, we just made a study of the data that was given to us yesterday by the Texas Pacific engineers, which is the basic data that went into their curves.

Q I want to be sure of one thing. In using these figures prepared by Mr. Keller as to per acre reserves, you do not in any

way agree that they are a correct basis, do you?

A I do not in any way agree that the reserves have any relationship to recoverable gas in place under the acreage assigned to the well.

We have plotted on this map, which also shows the outline of the Jalmat Field and the outline of the 11,000 acre area, the relative reserves in green and the relative allowable per acre under the deliverability formula in red. They are shown as numbers, for instance, 2.01 being the relative reserves and 1.65 being the relative allowable.

Q These figures were taken from the Texas Pacific data that was furnished to you, is that correct?

A That is correct.

Q Now, the cross sections that you have studied were inside or outside of this fifty-eight well area?

A Well, we have spotted this data on the map to show how their reserves per acre and their allocation under the deliverability factor is distributed in the field. In order to show that more readily to the Commission and having to look at all these figures on this map, we have made cross sections across the field, not any of which are within the fifty-eight well area, to show that the same kind of condition that we have shown to exist in the fifty-eight well area also exists in other areas.

Q Will you go ahead? This work was completed at two or three o'clock this morning, and you didn't have time to prepare

copies for the Commission and the opposition, is that correct?

A That is correct.

Q Would you show us what is demonstrated by those exhibits?

A Well, start first with one that has been labeled Exhibit R-12, Operator's Exhibit R-12, cross section A-A', which runs from the Conoco wells Bl, No. 1 in Section 1, 25, 36, to Western Natural-Shell State 1-B in Section 2, 25, 37, that is a cross there (indicating). At the top we have the relative reserves of those wells in order from west to east shown as computed by Texas Pacific. Down below we have the relative allowable under the deliverability formula, also as computed by Texas Pacific. You can see that as between these three right here, which are the fourth, fifth, and sixth wells from the left, have very much higher allowables than their offset wells to the west or to the east, but they do not have higher reserves by Mr. Keller's extrapolation than the wells to the west or to the east, so that the imposition of this allowable will result in drainage to these wells from the wells on either side, which will have lower allowables.

Q Will you proceed to the next exhibit?

A The second one here is Section B-B', which goes from R. Olsen Cooper "G" No. 1 in Section 11, 24, 26, to Pan American Myers "B" 5 No. 5 in Section 9, 24, 37, and that's across right here, just south of the fifty-eight well area. Without taking enough time for explanation, it shows the same thing that Section A-A' showed; and Section C-C' up to the north goes from Cities Service

Clausen "B" No. 3 in Section 18, 22, 36, to the Western Natural McDonald State No. 1 in Section 14, 22, 36. This is the same as the others, and it shows a wide variation in allowable. It also shows a wide variation in reserves. You will note, however, that the two wells on the furthest to the west have about the same indicated reserves, but under this formula the westernmost well, Cities Service Clausen "B" No. 1 will have more than twice as much allowable as its offset well which has about the same reserve according to Mr. Keller's extrapolation.

Q Now, what in your opinion, Mr. Gruy, is the relative value in determining the effect of a proration formula upon individual wells and correlative rights?

A Well, correlative rights --

Q (Interrupting) Just a minute. As between a study such as you have made here of offsetting wells and a study such as presented by Texas Pacific in their Exhibit 5 which lumps together twenty wells?

A I think you have to get right down to what is happening across the lease lines in order to say what is going to happen to correlative rights.

Q Did this study of yours, even accepting the reserve figures of Texas Pacific, indicate what is going to happen to correlative rights?

A They are going to be damaged.

Q Will you state whether or not in your opinion correlative

rights would be better protected under the existing formula than under the formula proposed by Texas Pacific?

A In my opinion they would be, because there is not such a wide variation in the acreage as there is in the deliverability.

Q Now, you heard the testimony of Mr. Woodruff yesterday afternoon, in which he undertook to account for, or commented on the low deliverabilities in certain of the wells in the fifty-eight well area and attributed it to mechanical problems. Nonetheless, these are the deliverabilities as shown by official tests of the Commission, are they not?

A That is correct.

Q What comment do you have in connection with that situation?

A I have to say that that is one of the many reasons that in my opinion deliverability is not a good factor in a formula and bears no relation to reserves in the tract, because they can be varied so widely by the mechanical conditions of the well.

Q Is there anything further that you wish to include in your testimony, Mr. Gruy?

A No, sir.

MR. MALONE: That's all.

MR. PORTER: Any questions of the witness? Mr. Campbell.

CROSS EXAMINATION

By MR. CAMPBELL:

Yesterday you testified that you had first become acquainted with the question of an allocation formula in the Jalmat Gas Pool

on March 10th?

A That is correct.

Q Then apparently you spent some ten days, did you, working on this alone during that period of time?

A No, sir, I had my staff was all working on it, and we actually brought in some additional people to help compile the data.

Q You worked on it until the date that hearing started, from March 10th, fifteen days?

A Well, I worked on it up to right now.

Q Then you worked on it last night, apparently?

A Yes, sir.

Q You weren't here at the original hearing in this case?

A No.

Q Either of the hearings?

A No.

Q So you don't know the extent of the studies made by Mr. Keller in arriving at his conclusions?

A No, sir, I have reviewed his testimony. That is the extent of my knowledge.

Q You heard him testify yesterday as to the studies that he has completed since the last hearing on the basis of additional deliverability data and other data available to him since that time?

A Yes, sir.

Q You heard him testify that he had made a study of all the

wells in this pool upon which he had any data of that type, didn't you?

A Yes, sir.

Q In all fairness, Mr. Gruy, do you not believe that Mr. Keller has made a more extensive study of the Jalmat Gas Pool than you have?

A I think he has made a more extensive study than I have.

Q Do you have any reason, as an engineer, to believe his study and his conclusion is on any other basis than his honest opinion about them?

A No, sir, but I know why they are wrong and it is obvious.

Q There is an obvious difference of opinion between you, but your conclusions are based upon the extent of your study, and his conclusions are based upon the extent of his?

A Well, conclusions are based upon the extent of studies and the extent of experience.

Q And ability. Are you saying that you are better qualified, is that your point?

A No, sir, I certainly wouldn't say that.

Q You are aware, are you not, that acreage has been in effect in this pool as an allocation formula at least for the past three years?

A I am aware that it has been on the Statute books, I am not aware that it has ever had any effect on how much gas any well has produced until December of this year.

Q The acreage formula has been in effect in this pool, hasn't it?

A Yes, sir.

Q Do you have any basis for not believing that prior to that time, say three years prior to 1954, that the takes of this pool were not essentially upon an acreage basis?

A Yes, sir, because we had over 200 wells that were underproduced and over 200 wells that were overproduced, and the high deliverability wells, the wells in Mr. Keller's first high deliverability thing,were almost all overproduced. The wells in his low deliverability group were either marginal or underproduced.

Q I'm talking aboutthe period from 1951 to 1954, please.

A Well, I'm talking about the situation as it existed at the end of 1957 or at the end of 1956, and the beginning of 1957, at which time there was widespread over and underproduction in favor of the high deliverability wells.

Q Do you know anything about the method of takes from the pool for a three-year period from '51 to '54?

A Not except that we plotted all the production on the wells in the field by months and looked at the amount of over and underproduction for all the wells in the field by months.

Q In December, 1957?

A Up to December, 1957, yes, sir.

Q Are you aware of any of the contract provisions of the El Paso Natural Gas Company projects, with reference to their takes

in the absence of a proration formula?

A No, sir, I am not.

Q Do you believe there is any formula that can be established for the Jalmat Gas Pool which will eliminate the possibility of drainage across lease lines?

A No, sir, I do not.

Q Do you believe that the acreage formula, the 100 percent acreage formula, essentially ignores the difference in pay thickness and pressure differentials between wells?

A Yes, sir, it does.

Q Under a hundred percent acreage formula, then, inevitably there will be some movement or drainage across lease lines?

A Yes, sir.

Q And to that extent correlative rights will be abused under that formula?

A That is correct.

Q So that it becomes a matter of degree of abuse of correlative rights, in effect, since you cannot arrive at a perfect allocation formula?

A That is correct.

Q The difference of opinion, then, appears to be between you and Mr. Keller that in your opinion the 100 percent acreage formula minimizes that drainage to a greater extent that does the formula proposed by Mr. Keller?

A That is correct.

Q How can you arrive at that conclusion when you have made no comparative study out of the fifty-eight well area?

A Well, I certainly looked at the wide range of deliverabilities outside the fifty-eight well area as compared with everything else that we have on the wells. Now I don't know about the pay thickness outside the fifty-eight well area, it may vary and probably does vary more than it does within the fifty-eight well area.

Q But your statement as to the improvement or the advantage of the 100 percent acreage formula must be predicated upon the limited extent of your study in this pool, isn't that correct?

A That is correct.

MR. CAMPBELL: I believe that's all.

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

MR. HOWELL: Ben Howell.

By MR. HOWELL:

Q Mr. Gruy, in connection with the cumulative production from the fifty-eight well area, you are aware, are you not, that those wells were drilled at different times?

A Yes, sir.

Q And whenever wells are drilled at different times, the cumulative totals will vary from well to well, depending upon the length of production, will it not?

A Yes, sir, but if there is no movement of gas within the reservoir, the well with the most production will have the lowest

pressure.

Q In this particular reservoir at the time proration first began, it is your testimony, is it not, that there had already been migration?

A That's correct.

Q And are you or anyone else able to restore the migration which had previously taken place?

A No, sir, I'm glad I don't have that ability.

Q Aren't we all. Now, one other question, ordinarily the mechanical condition of a well is something that is within the control of the operator, is it not?

A To a certain extent, yes, sir.

MR. HOWELL: That's all.

MR. PORTER: Any further questions?

MR. MALONE: Were the exhibits to which you testified prepared by you or under your direction?

A They were prepared under my direction.

MR. MALONE: We offer in evidence the Operator's Exhibits 9-R through 14-R.

MR. PORTER: Let's go through the numbers again.

MR. MALONE: 9-R through 14-R inclusive.

MR. PORTER: Without objection these exhibits will be admitted. The witness may be excused.

(Witness excused.)

MR. PORTER: Any further testimony in this case?

MR. PORTER: We're going to recess the hearing until 1:00 o'clock. At that time we are going to allow each side twenty minutes for argument, and another twenty minutes for statements to any interested parties.

MR. FOWLER: I would like to have the record show that Permian Basin Pipe Line has appeared in opposition to the application for rehearing, and I believe we will be able to adopt the closing argument of Mr. Campbell and Mr. Howell.

MR. PORTER: The hearing will recess until 1:00 o'clock.

(Recess.)

AFTERNOON SESSION
March 27, 1958

MR. PORTER: The meeting will come to order, please. Mr. Howell of El Paso, and Mr. Dutton have requested a few minutes to make statements, since each of them made separate appearances in the case. The allotment will be twenty minutes for Mr. Malone and twenty minutes for Mr. Campbell and twenty minutes of statements from other interested parties. I think it might be well to ask you to stand, all of those who intend to make statements, to stand.

MR. MALONE: If the Commission please, are there going to be opportunities to file written statements?

MR. PORTER: Filing a written statement in support or opposition to the motions?

MR. CAMPBELL: I don't object to filing written statements as long as the statements are confined merely to statements of

position. I have had occasion to observe statements, or read here by people not under oath, by people who get into elements of proof or factual elements. If statements are filed, we should be able to raise objections to the statements.

MR. BRATTON: I would think any statements filed should be properly filed or served to the opposition and they would be given an opportunity to move to strike them. Would that satisfy your position?

MR. CAMPBELL: It would, coupled with an agreement they must be filed within a limited period of time.

MR. PORTER: The Commission will allow ten days for the filing of statements. Mr. Campbell.

(Whereupon, oral argument of counsel was heard by the Commission.)

MR. CAMPBELL: We have had marked and are offering into evidence four documents, Texas Pacific R-15 is a copy of Order R368-a in Case 582; Texas Pacific R-16 is a copy of a directive of the Commission dated March 15, 1954; Exhibit R-17 is a copy of Order R-520; and Exhibit No. R-18 are peges 1, 2, and 3, of a manual for back pressure states for, dated February 1, 1956. We offer these in evidence.

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

MR. DUTTON: I would like to state for the record that Sun is making an independent appearance in this case.

MR. PAYNE: The Commission has a telegram from the R. Olsen Company, which I would like to read into the record.

"New Mexico Oil and Gas Conservation Commission, Santa Fe, New Mexico. RE Jalmat Pool Deliverability Case, R. Olsen Oil Company wishes the following to be placed in the record at the rehearing of above case beginning Monday March 24th, quote: R. Olsen Oil Company agrees that deliverability should properly be a factor in the proration formula. It believes however that the formula in the present order is not equitable and urges the Commission to give greater weight to acreage in the formula for the Jalmat Pool. R. Olsen Oil Company also asks the Commission to without delay take whatever action proper, to place deliverability as a factor in the proration formula for the remaining prorated gas pools in southeastern Lea County, New Mexico." Signed, R. Olsen Oil Company, Phillip Randolph, vice president.

MR. PORTER: Anything else? We'll take the case under advisement.

* * * * * * * *

C E R T I F I C A T E

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

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

WITNESS my Hand and Seal this 18th day of April, 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Ada Dearnley
NOTARY PUBLIC

My commission expires:
June 19, 1959.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
December 9, 1957

IN THE MATTER OF: Case 1327

TRANSCRIPT OF PROCEEDINGS

VOLUME III

Pages 193 through 352

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NEW MEXICO OIL CONSERVATION COMMISSION

Mabry Hall

Santa Fe, NEW MEXICO

REGISTER

HEARING DATE Spec. Com. Mear. December 9, 1957 TIME: 9:00 a.m.

NAME:	REPRESENTING:	LOCATION:
Roy A Boze	Humble	Midland, Tex
R N Miller	Tidewater	Hobbs, N M
Rex C Colbaugh	Sinclair	Roswell, N M
[illegible]	[illegible]	[illegible]
[illegible]	Humble	Midland, Texas
Tommy Royal	[illegible]	[illegible]
[illegible]	Permian Basin	[illegible]
[illegible]	[illegible]	[illegible]
Wendell Cook	[illegible]	
John Thomas	" " "	"
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
R L Adams		[illegible]
G E Whitworth	El Paso Nat'l Gas	El Paso
[illegible]	[illegible]	[illegible]
[illegible]	Stanolind Oil & Gas	Houston
W. P. Tomlinson	Atlantic	Roswell
[illegible]	[illegible]	Ft Worth

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BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
December 9, 1957

IN THE MATTER OF:

Application of Texas Pacific Coal and Oil Company for an order immediately terminating gas prorationing in the Jalmat Gas Pool; or in the alternative, revising the Special Pool Rules for the Jalmat Gas Pool in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order immediately terminating gas prorationing in the Jalmat Gas Pool, or in the alternative, an order immediately cancelling all accumulated underproduction and redistributing such underproduction to overproduced wells in the Jalmat Gas Pool, and requiring gas purchasers to nominate a sufficient amount of gas from the pool to permit wells from which purchasers are able to take gas to have an allowable equal to their actual production, and upon this basis to thereafter balance the pool production at the end of each proration period, and establishing deliverability of gas wells as a factor in the proration formula for the pool, and establishing a maximum amount of gas which may be taken from any well in the pool during a specified period of time. Applicant further requests the Commission to issue such further order or orders as will bring the pool immediately into balance and maintain such balance without waste and without abuse of applicant's or others' correlative rights.

Case 1327
(Continued)

BEFORE:

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

TRANSCRIPT OF PROCEEDINGS

MR. PORTER: We will take up next Case 1327. This case was continued from the regular November hearing.

MR. MALONE: May it please the Commission, Ross Malone of Atwood Malone, Roswell.

As I am sure the Commission will recall, at the time of the continuance in this case, the continuance was granted on the request of a number of operators in the Jalmat Pool who stated in substance to the Commission that they felt that they could not accurately evaluate the exhibits which had been presented by the Applicant on Redirect Examination without an opportunity to study those exhibits; that if the Commission would grant a continuance the companies would, in lieu of Cross Examination on those exhibits, come forward with affirmative evidence as to the effect which they found that the proposed formula would have and as to an analysis of the exhibits.

The companies want to express their appreciation of the opportunity that the Commission afforded them to do that. Since the date of the last hearing, and in pursuance of the suggestion of the Commission that the companies consolidate their effort and undertake to use a single counsel and a single witness, if possible, or as few witnesses as possible, these companies have done that.

It is on behalf of those companies, all of whom join in supporting a continuance of the existing rules in Jalmat and oppose a change in the proration formula to include deliverability,

that this statement and the evidence which follows is presented.

Those companies and individual companies for whom this testimony is presented are all operators in the Jalmat Pool, and are as follows: Continental, Humble, Gulf, Tidewater, Shell, Atlantic, Standard of Texas, Sinclair, Cities Service, Pan American, Amerada, and John Kelly.

I might say that the work which has been done in preparation for this continued hearing was begun immediately upon the granting of the continuance and has continued without abatement, so to speak, since that date. Some seventeen hundred man hours have gone into the testimony and exhibits which the Commission will consider here this morning. Our testimony will be presented through a single witness, Mr. Robert Leibrock of Midland, a consulting engineer. I would like to have him sworn at this time.

(Witness sworn.)

ROBERT M. LEIBROCK

a witness, of lawful age, having been first duly sworn on oath, testified as follows:

DIRECT EXAMINATION

By MR. MALONE:

Q Will you state your name, please?

A Robert M. Leibrock.

Q Where do you live, Mr. Leibrock?

A Midland, Texas.

Q What is your profession?

A Consulting petroleum engineer.

Q Where did you receive your professional education?

A Well, sir, I was educated in the public schools of Arkansas. I attended Hendricks College in Conway, Arkansas, and graduated from the University of Texas with a Bachelor of Science degree in Petroleum Engineering in 1943.

Q Were you thereafter employed in the petroleum industry as an engineer?

A Yes, sir, I was. Immediately upon graduation, I was employed by Stanolind, now Pan American Petroleum Corporation.

Q For how long did you continue to be employed as an engineer by Pan American?

A Except for a two-year period of service in the Army, I was employed continuously from 1943 until 1955.

Q Will you state briefly the assignments which you had during that period of time and the responsibilities which you had?

A Immediately after graduation I served as a Junior Petroleum Engineer in the Pampa area office of Pan American. From there I went into the Army. Upon return from the Army, I served as a Research Engineer in the Tulsa Research Center, and from there I transferred to the Tulsa General Office as a Reservoir Engineer.

From the Tulsa General Office, I moved to Lubbock as District Reservoir Engineer in the Lubbock District Office.

Q May I inquire whether or not New Mexico, and the Jalmat Pool in particular, were included in the area for which you had

responsibility in that job?

A Yes, at that time New Mexico production was handled out of Pan American's Lubbock District Office.

Q You were the District Reservoir Engineer at that time?

A That is correct.

Q How long did you continue in that capacity?

A Approximately two years.

Q What was your next assignment?

A From Lubbock I moved to Fort Worth as Division Reservoir Engineer for Pan American.

Q What did that Division encompass?

A That Division included all of North and East Texas, all of West Texas and New Mexico.

Q So that the responsibility for the area which is the subject of this case was under your jurisdiction during all of that period?

A That is correct.

Q What was your next assignment with Pan American?

A After approximately two years in Fort Worth, I was transferred to Midland as District Engineer for Stanolind in the District Office there.

Q How many engineers were working under your direction or were you responsible for in that position?

A Well, at various times anywhere from thirty-seven to fifty-five engineers.

A Yes, I have.

Q What is the name of the firm with which you are connected?

A The name of the firm is Leibrock, Landreth and Campbell.

Q Their offices are at Midland, Texas?

A Yes, sir, they are.

Q Have you testified as an expert in the various courts in the State of Texas?

A Yes, sir.

Q Have you testified before Conservation Commissions in oil producing states?

A Yes, sir, I have.

Q What Commissions have you testified before?

A Before the Railroad Commission of Texas, New Mexico Conservation Commission.

Q Have you testified before the Colorado Commission?

A I have had occasion to participate in a hearing in Colorado.

MR. MALONE: Are the witness's qualifications satisfactory?

MR. PORTER: They are.

MR. MALONE: Thank you.

Q Mr. Leibrock, you were not present at the two previous hearings which occurred in this case here in Santa Fe, were you?

A No, sir, I was not.

Q Have you, in preparation for your testimony today, reviewed the entire transcript of all of the testimony that was presented at those two hearings?

A Yes, sir, I have.

Q Have you also reviewed the exhibits which were introduced by the applicant at that hearing?

A Yes, sir.

Q At those hearings?

A Yes, sir, we made a careful and thorough study of those exhibits, particularly the exhibits that were introduced during the course of the Redirect testimony, because simply on the surface it appeared at that time that a good relationship existed between deliverability and reserve.

Q Have you had the assistance of a staff of engineers and geologists working under your direction and in preparation of the exhibits for this case?

A Yes, sir, I have.

Q Was all of the work that was done to that end performed under your personal supervision and direction?

A Well, sir, as you stated previously, I believe in excess of 1,700 man hours have gone into the preparation of the exhibits and the reproduction of the exhibits.

Q And the studies on which the exhibits are based?

A And the studies on which the exhibits are based, yes, sir.

Q What was the purpose, Mr. Leibrock, of the study which you directed?

A Well, sir, you will recall that Texas and Pacific presented certain exhibits and testimony at the last hearing from which they developed certain conclusions and recommendations that deliverability should be a part of the allocation formula. I think the conclusions which they reached pretty well fix the scope and purpose of our investigation.

I think our purpose can probably be broken down into about two significant parts. The first part would be to determine the extent to which the proposed deliverability formula would give each operator the opportunity of recovering his fair share of the recoverable gas in place in the pool. The second purpose would be to determine which of the two formulas, the proposed delivera-

bility formula or the existing acreage formula, would come closer to protecting correlative rights as provided by the New Mexico statute.

Q You say in doing that you had occasion to analyze in detail the exhibits which had been presented by Texas Pacific?

A Yes, sir, that is correct.

Q Mr. Leibrock, I would like to read you the definition of correlative rights which is included in the New Mexico Statute for the purposes of the next question. "Correlative rights shall mean the opportunity afforded, so far as it is practicable to do so, to the owner of each property in a pool to produce without waste his just and equitable share of the oil or gas, or both, in the pool, being anamount, so far as can be practically determined, and so far as can be practicably obtained without waste, substantially in the proportion that the quantity of recoverable oil or gas, or both, under such property bears to the total recoverable oil or gas, or both, in the pool, and for such purpose to use his just and equitable share of the reservoir energy."

Is that definition of correlative rights one which in your experience is generally accepted in the engineering profession?

A Yes, that is right.

Q I would ask that, in the questions which follow relating to correlative rights, that you bear in mind that definition by the Legislature on the basis of which those rights are to be protected in New Mexico. Now what is an operator's fair share of the

rable gas, Mr. Leibrock?

An operator's fair share of the recoverable gas is that gas e in the reservoir immediately underlying the acreage assigned ell which can be recovered economically.

What is the right of that particular operator as regards ining operators if his rights are protected?

A Simply to recover that portion of the gas which underlies his tracts.

Q Then in analyzing a proration formula to determine its validity and its fairness, what is it necessary to do so far as the gas under his tract is concerned?

A Oh, it's necessary to make certain that the allocation formula, as near as practical permits him to recover that gas which actually underlies his tract, his fair share.

Q Is it a normal engineering computation to determine the gas which underlies the tract of a particular operator?

A Yes, sir, it is.

Q That's an operation that is done every day by reservoir engineers?

A Yes, that is correct.

Q What is that determination based upon?

A Based on a pore volume calculation of the gas that actually is contained in the reservoir which underlies the acreage assigned to that tract.

Q Now, in your experience as an engineer and in your knowledge

as an engineer, Mr. Leibrock, is there any other way than a study of the actual storage capacity under that tract by which you can determine a particular operator's interest in the gas in place?

A No, sir, there is one way and only one way to determine the volume of gas or the storage capacity which actually is contained in the reservoir underlying the acreage assigned to an operator's well.

Q Now, having made that determination, is it then possible to test a proration formula to determine its fairness and how it will operate as to an individual operator?

A Yes, sir, it is possible and in fact, I would say that it is the only way to properly test an allocation formula.

Q Now, from your analysis of the exhibits which were presented by the applicant and the testimony that was presented, was there any testimony presented based upon such a pore volume calculation of recoverable reserves?

A No, sir, there was not.

Q Did I understand you to say that that is the only standard recognized by the profession and by the New Mexico Statute for the determination of the rights of that individual?

A Yes, and from the standpoint of determination of the extent which his correlative rights are being protected, that is the only way.

Q What was the basis on which Mr. Keller, who testified for the applicant, determined what he referred to as the reserves under

the tracts shown on his exhibits?

A The reserves as defined by Texas Pacific were determined by extrapolation of pressure production decline curves.

Q Will you explain briefly what that is and what it reflects?

A It simply involves taking the pressure history on an individual well tract and plotting it against cumulative gas production and extrapolating that trend. That, to my way of thinking, is more a reflection of the manner in which a well has been produced and is not an indication of the recoverable gas in place underlying the tract in question.

Q Have you ever known of the acceptance of that method of determining gas in place, recoverable gas in place under a tract of an individual operator?

A That is a method which is commonly employed in analyzing the overall behavior of a single reservoir, and can be extremely misleading when applied to determine the gas in place under an individual tract, because it is burdened by the fact that past production history enters into the past production more than any other factor involved.

Q So that that method, if I understand you, reflects the history of the well rather than reflecting the amount of recoverable gas in place under the unit?

A Yes, sir, and that is particularly true in a reservoir where a substantial portion of the total gas production to date has been prior to the adoption of an allocation formula.

Q Now, have you for purposes of testifying as to the conclusions that were drawn by the applicant from this so-called reserve versus deliverability study, have you for purposes of the first part of your study accepted as correct the reserve figures which they have shown, in order to test the relationship to the deliverabilities which the applicant has shown?

A Yes, sir. For the purpose of conducting the initial phase of our study, we have assumed for the moment that their approach to the problem of estimating reserves is correct.

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

Q Now, I will invite your attention to the third plat, map, which has been added to the wall and which is identified as Operator's Exhibit 1, and ask you to state what that shows with relation to the two exhibits to the left or the right, depending on which way you are looking, which were introduced by Texas Pacific Coal and Oil Company at the last hearing.

A Yes, sir. In introducing our first exhibit, I would like to refer first to Texas Pacific Exhibits No. 8 and No. 9. You will recall that during the course of the Redirect testimony, Texas Pacific prepared and introduced a deliverability map and a reserve map. This is the reserve map on which they have indicated in various colors the order of magnitude of reserves; the dark red being the highest, the light red the next highest, the light blue the next, and the dark blue representing the lowest reserve. In

the same manner they have prepared a deliverability map in which they have indicated, using the same color scheme, decreasing ranges of deliverability. They have colored both of the maps in such a way to reflect the degree of similarity between the two. I think that is apparent to everyone. We have taken the same base map and prepared what we refer to as a different map. We call your attention to the fact that in the preparation of this map we did not have copies of the original map. We had to take copies which we took hurriedly at the close of the last hearing. We have indicated on this map in dark red areas that are in disagreement on these two maps. The areas indicated in pink on our map indicate tracts in which there was either incomplete information or no information. The area indicated in yellow on our map represents tracts in which these two maps are in agreement.

Q Now if I understand you then, Mr. Leibrock, you have shown in yellow on Operator's Exhibit No. 1 the areas where agreement exists between the so-called reserves as computed by Texas Pacific, and the ranges of deliverability, is that correct?

A Yes, sir, that is correct.

Q And only in areas shown on Operator's Exhibit 1 in yellow does exact agreement exist?

A Yes, that is correct. I would call your attention to one thing I have noticed at the base of the map; we have colored in dark red an area that should have been colored in pink. However, as I told you before, we were working from copies, and in my

opinion it is not significant.

The significant fact about this exhibit is that there are differences between these two maps. The only conclusion really to be drawn from this different map is that we should further investigate the various data and exhibits that were offered by Texas Pacific at the last hearing. This was merely a starting point and simply served to indicate that further investigation of their data and exhibits was justified.

Q Did you compute the number of acres shown in yellow in which agreement exists as between ranges of reserves and ranges of deliverabilities?

A Yes, sir. There are approximately 18,160 acres, or approximately twenty-nine percent of the dedicated acreage which are in agreement.

In dark red, areas not in agreement, there are approximately 18,640 acres or approximately thirty percent of the dedicated acreage; and in pink, the acreage you recall where they had incomplete data or no data, there are approximately 25,000 or forty-one percent of the dedicated acreage.

Q What percent of the acreage in the pool falls in the dark red and pink areas, the combined two?

A The combined dark red and pink areas, there are approximately 44,000 acres.

Q What is the percentage of the pool which falls in the two together?

A Or approximately seventy percent.

Q Do I correctly understand, then, that there is not agreement or agreement is not reflected by Texas Pacific exhibits on seventy percent of the pool as between deliverabilities and reserves?

A Yes, sir, that is correct.

Q Is there anything further in connection with this exhibit that you would like to state to the Commission?

A I believe that completes our comments on this exhibit.

Q You will recall, Mr. Leibrock, that in the testimony of Mr. Keller he made the statement that the better the deliverability the better the reserves?

A Yes, sir.

Q He had found a general correlation between reserves and deliverability?

A Yes, sir.

Q The analysis shown by Operator's Exhibit 1 would limit that relationship to approximately thirty percent of the pool, would it not?

A Yes, sir, that is correct.

Q And leave seventy percent of the pool in which that correlation is not shown to exist?

A That is correct.

Q You stated that finding this departure between reserves or so-called reserves as used by Texas Pacific and ranges of deliverability indicated the desirability of a further study of the data

presented by Texas Pacific. Did you make such a further study?

A Yes, sir, we did.

Q What was the next step which you took in making that study?

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

A I would refer at this time to our Operator's Exhibit No. 2. Before going directly to the exhibit, however, I would like to first introduce it by going back to Texas Pacific Exhibit No. 10, on which they plotted deliverability versus reserve. Now I would interrupt again at this point to state we do not agree with the procedure followed by Texas Pacific in estimating reserves. However, for the purpose of comparison, we are assuming for the moment that we are in agreement with their procedure.

You will recall that they concluded from this exhibit that there was a relationship, an acceptable relationship between deliverability and reserves, despite the fact they had a rather wide scattering of points. From this exhibit I would like to go to our Exhibit No. 2. On this exhibit --

Q (Interrupting) Wait just a minute until we get these exhibits distributed.

A All right.

Q Now, will you refer to Exhibit No. 2, which is entitled "Analysis of Apparent Correlation Between Deliverabilities and Reserves" and explain the exhibit?

A Well, to begin with, you will immediately recognize the

fact that we have shown here again the Applicants Exhibit No. 10, it is an exact reproduction upon which we have superimposed certain information.

Q That is the exhibit on the wall?

A Yes, sir, that is a reproduction of that exhibit. To begin with, we have taken this exhibit, on which there is contained approximately 220 wells; the applicant indicated 226, we were able to count 220, but that is not an important difference. On this exhibit we have divided it into four reserves groups, as indicated across the bottom here, 1, 2, 3, 4. Each of the reserves groups have fifty-five wells in them. Now that is approximately the breakdown of Texas Pacific.

Q Now, Mr. Leibrock, when you say that is approximately the breakdown of Texas Pacific, you are referring to Texas Pacific Exhibit 10, which is a bar graph in which the wells were broken down into reserve groups?

A Yes, sir. You recall they indicated they had approximately 226 wells, I believe, and they broke it down into reserve groups of fifty-seven, fifty-six, fifty-seven, and fifty-six. We could only count 220 wells on this plot, so we have an even number of wells in each of our reserve groups, fifty-five.

Now first I would call your attention to the color legend on this graph, and every instance where you see the color green, we will be talking about average deliverability in MMCF per day per well. Where you see the red, we will be talking about reserves.

These are reserves as defined by Texas Pacific, and these deliverabilities as defined by Texas Pacific.

We have broken the plot down to four reserve groups of approximately fifty-five wells each, and each set of bar graphs here covers each of our reserve groups. You will observe first that Group I, this group over here, has less than 11.5 million per acre; the Group 2 wells with reserves has the range of 11.5 to 20.9 million per acre; the Group 3 wells includes wells in the range of 21.0 to 34.5 million per acre; the Group 4, highest, in excess of 35.0 million per acre.

To further break this down and obtain some basis for properly analyzing this data, we have further broken the curve into four horizontal groups, four deliverability ranges. You recall they plotted deliverability versus their reserves.

Q May I interrupt, Mr. Leibrock, to ask if I correctly understand then that you took the four reserve groups which are shown on Texas Pacific Exhibit 10, and merely broke them down into four units or four ranges of deliverability, for the purpose of studying a smaller group of wells?

A Yes, sir, that is correct. The purpose of that study was to determine the extent to which their conclusions would hold up when subjected to this particular type of analysis. I might point out that this is no high-powered mathematical approach to this problem. It is a simple straightforward attempt to analyze the wide scattering of points they have on their exhibits. I want

to keep coming back to the fact that this is the basis for recommendations that Texas Pacific made. It behooves us to properly analyze it and take into consideration all the factors that are involved in determining the meaning and significance of it. So having broken it down into these four reserve groups and these four deliverability ranges, we were able to make a comparison of the range of deliverability within any one reserve group. So beginning first with Group 1, you will see here that we have four red bars, which represent the variations in reserves within Group 1. This is simply the variation in reserves in Group 1.

Q Those variations are proceeding up or down in ranges?

A These are proceeding up; in other words, this red bar represents the average reserves in this group in this range. The second bar represents the average reserves in deliverability range 2 and so on, in range 3 and 4.

Now you'll immediately observe that while you don't have a tremendous variation in reserves, you do have approximately a twelve-fold variation in deliverability in any one reserve group. Proceeding across to reserve group 2, you have a similar pattern in this group;as you would expect, the average reserve is a little higher. It's obvious from looking at this graph that would be the case. You can see here again we don't have a big variation in reserves, as indicated by the red bar, whereas here again we have a tremendous variation in deliverability.

In the same manner, we proceed across to Reserve Group 3;

we get the same pattern here again as you would expect simply from looking at their plot, the reserve average is higher as indicated by these bars here, but here again you have very little variation in reserves, but again a tremendous variation in deliverability.

The same pattern is observed in Reserve Group 4. This is the highest reserve group and you have the average for each of the deliverability ranges indicated here, but here again you have the tremendous variation in deliverability, so I think the obvious conclusion to be drawn from this exhibit is simply that within any one of their reserve groups there is no relationship between reserves and deliverability.

Q If there is no relationship between reserves and deliverability in a particular group, what would be the result of putting deliverability into a proration formula that was going to be applicable to that group?

A I think it is obvious that it will result in serious abuse of correlative rights. It couldn't possibly result in anything else.

Q You base that on the fact that, as you have testified, you get a twelve-fold range in deliverabilities as against wells that have substantially uniform reserves?

A Yes, sir, that is correct.

Q Is there anything further in connection with that exhibit which you would like to refer to?

A I believe that concludes the comment on that.

Q Did the study which you made in this exhibit, Mr. Leibrock,

of studying the relationship between reserves and deliverability, for instance?

A Yes, sir, I would say it is a conventional approach used by engineers and statisticians every day.

Q In your opinion as an engineer, is the result that is portrayed by that exhibit more authentic and reliable than the result indicated on Texas Pacific Exhibit 10?

A Yes, sir, it is, and for this reason. The data shown on Texas Pacific Exhibit 10 is drawn on an overall, a field-wide train and has little significance. I think in determining correlative rights there is only one analysis approach acceptable, and that is to break it down into small parts to determine what is actually happening across lease lines. That is where we are determining the extent to which correlative rights are being protected.

Q A study of the type shown by Operator's Exhibit 2 tends to

portray the effect as to lease lines and the possibility of drainage, is that correct?

A Yes, sir, that is correct.

Q You have concluded, I believe, that you find no relationship between reserves and deliverability when you make that study?

A Yes, sir, that is correct.

Q What did you next do then?

(Operator's Exhibit No. 3 marked for identification.)

A For the purpose of introducing our Operator's Exhibit 3, I would like briefly again to go back to Texas Pacific Exhibit No. 10. I don't wish to take up an undue amount of time in talking about this exhibit, but it's imperative that we properly analyze all the information on here because this exhibit is fundamental to everything, to every conclusion and every recommendation reached by Texas Pacific.

Now on this particular exhibit we have ranged in order of increasing deliverability each well which we find on this plot. Just to give you an indication of the manner in which it was prepared, we simply started at the bottom and worked our way upward in counting each well on here and determining its position with respect to deliverability. For example, this well here where only a half circle is shown represents the first well on this plot over here. We have simply moved upward, ranging in order of increasing deliverability the points which represent wells on this plot.

Q Now, Mr. Leibrock, do I understand that each one of the red bars on Operator's Exhibit 3 is one of the wells shown on Texas Pacific Exhibit 10 to which you just referred?

A Yes, that is correct. We should keep in mind that we are still working with information made available to us and to the Commission by Texas Pacific. Now as I indicated, we took each well of that graph and ranged it in order of increasing permeability on this plot.

Q Permeability or deliverability?

A I'm sorry, increasing deliverability. These are indicated by the green points on this curve here. After we had placed the green circles representing deliverability for each well on here, we came back and plotted the corresponding reserves. I think it's immediately apparent from this plot that there is no reasonable relationship between reserves and deliverability. For example, we can take any point here -- here's one right here where the deliverability on two wells is approximately the same but the reserves vary over approximately twenty-fold or so.

You can see at a glance the tremendous variation in reserves with no variation in deliverability, and you can come down, you can take countless examples on here where you find that situation to exist. It is immediately apparent just from a glance that you have a very irregular pattern of reserves with respect to deliverability, so the only reasonable conclusion that can be drawn is that there is no reasonable correlation between reserves and

deliverability, reserves as defined by Texas Pacific.

Q To be sure that we fully understand the basis on which Operator's Exhibit 3 was prepared, Mr. Leibrock, the red bar is the reserve of a particular well which is shown on Texas Pacific's Exhibit 9, is that correct?

A That is Texas Pacific Exhibit 10.

Q Exhibit 10?

A Yes, sir.

Q That is the reserve which Texas Pacific has given that particular well, based on the extrapolation of a curve, as you have testified?

A That is right. Each of the red bars represents the reserves assigned to the well by Texas Pacific, based on the extrapolation of pressure production decline.

Q The green point on that particular bar represents the deliverability of that particular well as Texas Pacific has indicated it on its Exhibit 10?

A Yes, sir, that is correct.

Q -- is that correct? The fact that you get a great range of reserves with no correlation whatever in the deliverability is the basis for your statement that there is no relationship on which deliverability could be put in a formula?

A Yes, sir, that is correct. I think this serves to emphasize even more than our preceding exhibit the tremendous inequities which would of necessity exist across lease lines. You need to take only

one glance at the exhibit to know that when you have this much variation in reserves with no variation in deliverability, you can't possibly reach but one conclusion; that is, you will have migration across lease lines and introduction of a deliverability factor in an allocation formula will not serve to protect correlative rights.

Q Is there anything further in connection with that exhibit?

A I believe that's all.

(Operator's Exhibit No. 4 marked for identification.)

MR. MALONE: If it please the Commission, I would like to make a brief statement in connection with the next three exhibits which will be presented. The Commission will recall -- first let me say that we are fully cognizant of the Commission ruling that the scope of this hearing is limited to the Jalmat Pool alone. We are certainly observing that ruling. The Commission will recall, however, that in Mr. Keller's testimony he referred to the fact that he had taken the same formula including deliverability which was used in all of the Northwestern New Mexico gas pools. You will recall the statement by Mr. Howell in this case that it was the absence of deliverability in this formula which had resulted in the over and under production in Jalmat.

We felt it would be entirely appropriate and helpful to the Commission, therefore, if we compared the over and under production situation that exists in Jalmat with other pools in which a

deliverability is included in the formula in order to test the conclusion that was reached by Mr. Keller and in Mr. Howell's statement; so that in presenting these exhibits which do refer to other pools, we are doing it on that basis and that basis alone.

Q Now, Mr. Leibrock, having concluded, as you stated, that the data presented by Texas Pacific when broken down showed absolutely no relationship between deliverability and reserves in the Jalmat Pool, to what did you then direct the study?

A Well, sir, I think it became apparent at that time that it would be worthwhile to make a study of the over and under production that existed in the Jalmat Field. This first bar graph, in other words, one-third of this exhibit is confined to an analysis of the distribution of over and under production in the Jalmat Field.

Now the bar on the right indicates the percent of wells in the field, in other words, the entire bar represents one hundred percent. The bars on the right represent percent of overproduction and percent of underproduction. Now I think the thing to observe immediately is that insofar as overproduction is concerned --

Q (Interrupting) May I interrupt you, Mr. Leibrock, to inquire whether this exhibit is limited to the non-marginal wells in the Pool?

A Yes, sir, it is.

Q How many wells, approximately, are the subject of that study?

A Approximately 239. I think the first thing to be observed

from this exhibit is simply this: that in the Jalmat Field, of these wells that are overproduced, 5.8 percent are contributing to nearly forty percent of the overproduction --

Q (Interrupting) Just a minute, Mr. Leibrock, is it five percent of the overproduced wells or five percent of all the wells in the Pool?

A 5.8 percent of all the wells in the pool are contributing to forty percent of the overproduction.

Q Thank you.

A Yes, sir. Whereas 6.8 percent of all the wells in the field are contributing to nearly fifty percent of the underproduction. Now further significant in this particular exhibit is that approximately forty-five percent of the total wells in the field are less than one month out of balance as indicated here, whereas approximately sixty-six percent of all the wells in the field are less than two months out of balance.

Now I think that this exhibit by itself is extremely revealing but I think as Mr. Malone previously pointed out, you can give more direction and purpose to an analysis of this particular type exhibit if we refer to the same type of analysis in other fields in which the deliverability is a factor in the allocation formula.

Q Now, Mr. Leibrock, in comparing a Southeastern Pool to a Northwestern New Mexico gas pool which has deliverability in its formula, are there any factors we need to bear in mind in the

A Well, the fact that we do have deliverability in the formula in those two pools.

Q And with respect to balancing periods?

A And the fact that all the San Juan fields we have had a balancing period, and in the case of Jalmat and Lea County, we have not yet had a balancing period.

Continuing on to the next bar graph, again an analysis of overproduction and underproduction of Fulcher-Kutz Pool, where we have twenty-five percent and seventy-five percent acreage times deliverability formula --

Q (Interrupting) May I interrupt you to ask you to explain in a little more detail how you computed the under and overproduction disclosed on the exhibit?

A It is indicated at the base of the exhibit that we calculated the number of months of overproduction simply by taking the over or underproduction and dividing it by the November current allowable.

Q All right. Then what are the two Northwestern New Mexico pools shown on the exhibit?

A As I indicated, first we analyzed the Fulcher-Kutz, and secondly the West Kutz-Pictured Cliffs Pool. I think it is immediately apparent that you have the same general pattern in the case of both of these fields that you have in Jalmat. For example, here again 5.1 percent of all the wells in the field are contributing

percent are contributing to around thirty percent of the underproduction. The same thing is true in the case of West Kutz-Pictured Cliffs, a very small percentage of the wells in each case is contributing to a sizeable percentage of total overproduction and underproduction.

Q Do I understand then from your statement and from this exhibit, Mr. Leibrock, that even though there has been a balancing period in the Northwestern New Mexico Pools, that the same condition of over and underproduction exists in these two pools that exists in Jalmat, even though deliverability is in their formula?

A Yes, sir, that is correct, even though deliverability is in the formula and even though they have had one balancing period.

Q Has any readjustment of the marginal wells occurred in Northwestern New Mexico which has not occurred in Southeastern New Mexico?

A Yes, sir, there has been some readjustment which I think will be apparent from the next exhibit.

Q Now, if you bear in mind the fact there has been a reclassification of marginal wells and that there has been a balancing period in Northwestern New Mexico, and there is deliverability in the formula, if deliverability was desirable would you expect to find a much better condition existing up there than you find in Jalmat?

A Yes, sir, I think it is perfectly reasonable to expect that

plus values above the zero line. We have two different shades of red here, but they are not real easy to distinguish. Underproduction, months under produced, minus values below the zero line. You would observe that in the case of Lea County we looked at Crosby Devonian,

Basin we looked at West Kutz-Pictured Cliffs, Fulcher Kutz-Pictured Cliffs, Aztec Pictured Cliffs, Blanco Mesa Verde, Ballard Pictured Cliffs, and South Blanco Pictured Cliffs.

Q Mr. Leibrock, I notice there are two figures at the bottom of the underproduced bar in the Northwestern New Mexico pool, and only one in the Southeastern. What is the reason for that?

A That relates back and ties in with your previous question a minute ago concerning the reclassification of some wells from non-marginal to marginal. The higher value represents the figure which would be obtained from the November proration schedule, which we were working from. We know that some wells have been reclassified and reflected on the December schedule and is a basis for a lower value. We are making every attempt to make a comparison analysis. For that reason we colored in only the lower values.

Q And dashed --

A And dashed in the figures that would have been obtained from the November proration schedule.

Q What situation did you find to exist in those pools?

A Well, as I indicated previously here, we have reflected the status of an average well in each of these fields in terms of months overproduced for those which are overproduced, and months underproduced for those which are underproduced.

Now in each case we have an average curve here. This is an arithmetic pool average for the Lea County Pools, and this is

an arithmetic average for San Juan Basin. I think it is apparent here that the San Juan Basin Pools, even with deliverability in their formula, from an overage and underage status reflect no more favorably than the average for the two,for the Lea County Pools.

Q In fact, the situation as regards over and under production is somewhat worse in the Northwestern New Mexico Pools than in the Southeastern New Mexico Pools which do not have deliverability?

A That is correct. That is indicated by the two figures here. You have an average well with 1.612 compared with 1.535 months overproduction in Lea County. The same situation is true with respect to underproduction.

Q At the expense of repetition, Mr. Laibrock, it must be borne in mind, must it not, that there has been a balancing period in Northwestern New Mexico --

A Yes, sir.

Q -- which you would expect to reduce the over and under production which was shown on the November allowables, is that correct?

A Yes, sir.

Q Or the November schedule?

A Yes, sir.

Q No such balancing has occurred in Southeastern New Mexico?

A Yes, sir, that is right.

Q In spite of the fact, if I understand your testimony, the over and under produced situation in the Northwestern New Mexico

Pools is somewhat worse than in the Southeastern New Mexico Pools?

A Yes, sir, to some degree it is.

Q Does that lend support to the statement that if deliverability were in the Jalmat formula the over and under produced situation we have would not exist?

A No, on the contrary, it would indicate that it would certainly not improve the condition, and if anything might tend to aggravate it.

Q Would you refer to the lower portion where the blue bars occur?

A This indicates the number of non marginal wells under and over produced. Here we have the percent of wells overproduced by fields. Here we have the percent of wells underproduced for each of the pools indicated above. Here you have simply 12.5 percent overproduction, 47.9 and so forth, right on down the line.

Here again we have two average bar graphs to show the average percent overproduction and the average percent underproduction for both Lea County and San Juan Basin.

Q Will you explain the relationship between the upper and lower portions of that exhibit?

A As indicated here, this is simply percent of non marginal wells that are over and under produced, and here, for example, in the case of -- let's take Eumont, we have 53.5 percent of the wells overproduced. That is simply all it means, contributing to this situation. Here we have 46.5 percent of the wells in

Eumont underproduced, and the same percentages of both overproduction and underproduction are indicated for each of these bars.

Q Does this portion of the exhibit lend further support to the conclusion which you stated with reference to the upper portion?

A Yes, sir, that is correct. It is apparent, of course, that this is the most important part of the exhibit; this simply tends to lend the further support to the conclusions reached as a result of this investigation.

Q You were referring to the red or upper portion as the most important part of this exhibit?

A Yes, that is correct.

MR. PORTER: We will take a short recess.

(Recess.)

MR. PORTER: The meeting will come to order, please. Mr. Malone.

Q Mr. Leibrock, before the recess you were testifying with reference to Operator's Exhibit 5 and the over and under produced situation which it showed with reference to the Lea County Pools where there is no deliverability in the formula, as compared to the Northwestern New Mexico Pools where deliverability is included. I believe your conclusion was that the situation in the Northwestern New Mexico Pools seemed to be as bad or worse as in Southeastern New Mexico, even though a balancing period had occurred?

A Yes, that is correct.

Q Is there anything further in connection with that exhibit

that you would like to state to the Commission?

A No, sir, I have nothing further to add in connection with this exhibit.

Q Now, having considered the over and under produced situation in these various Pools, to what did you then direct your study?

A Well, sir, the results of our next investigation are depicted by our Exhibit No. 6.

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

Q That exhibit is entitled "An Analysis of Over and Under Production by Well Groups in the Jalmat Pool"?

A Yes, sir, that is correct. This particular analysis is confined to the Jalmat Field.

Q Now, Mr. Leibrock, do I understand that that analysis is of the Jalmat Pool, and on what basis were they broken down?

A They were broken down into twenty well groups, twenty groups of wells, in order of decreasing deliverability.

Q Would the effect of that study then be to see whether there is any relationship between the deliverability of a well and its over or under produced status?

A Yes, sir, that was the purpose of this study.

Q On a Pool-wide basis?

A Yes, utilizing the 237 wells that we had to work with for this particular exhibit; that is, wells where we had good deliverability information.

Q This deliverability information to which you refer, is that the deliverability that was shown by Texas Pacific Exhibit 10, or were these deliverabilities that were actually computed by you and your staff?

A These were deliverabilities which we computed.

Q It encompasses how many wells, 237 in the Jalmat Pool?

A That is correct.

Q What does the exhibit show?

A Well, as I said previously, we have ranged it in order of decreasing deliverability. We have twenty groups of wells, each group had approximately twelve wells in it. We prepared this exhibit, realizing the problem confronting the Commission in making a decision as to the best type of allocation formula, and we felt like this particular type of analysis on these wells would be most revealing in indicating whether or not there was any relationship between deliverability and the over and under production problem.

This indicates simply, for example in Group 1, we have the highest deliverability group. This indicates that the average well in Group 1 is approximately sixty million feet overproduced, that the wells in that group that are overproduced, the average is sixty million cubic feet per well; the wells underproduced is approximately sixty-five million underproduced. You can read down from the zero reference line for any deliverability group, keeping in mind that each group has a correspondingly lower deliverability, and see there is no apparent relationship between over and under

production. You will note that in the case of Groups 19 and 20 we have an average under production which is more clearly or more apparent than in the case of the wells above. I might add these represent approximately ten percent of the total well study, and without a doubt properly should be classified as marginal wells. If we take off, then, the lower twenty percent, I think it is perfectly obvious there is no relationship between deliverability and the over and under production problem.

Q Do I understand correctly that that exhibit discloses that in this group of twelve wells that have the highest deliverability in the group both overproduction and underproduction exists, and that the averages are about the same?

A That is correct.

Q And as you proceed down that exhibit, you find first that both over and underproduction exists in each category of wells?

A That is correct, yes, sir.

Q So that regardless of what the deliverability may be, whether it's good or bad, both over and underproduction exists in that group of wells?

A Yes, sir, that is correct.

Q And you say that each of those bars represents about twelve wells?

A Yes, sir, that is correct.

Q Now, on the basis of that information, is there any reason to believe that the inclusion of deliverability in a proration

formula would tend to solve this problem of over or under production?

A No, sir, there is absolutely no basis for assuming it would solve over and under production problems.

Q Is that conclusion because of the fact there is no connection between deliverability of the wells and their over or under produced conditions when you study the field as a whole?

A Yes, sir, that is correct.

Q Is there anything further in that exhibit to which you would like to direct the attention of the Commission?

A No, sir.

Q Early in your testimony, Mr. Leibrock, when you referred to the statutory definition of correlative rights and the manner in which engineers determine the quantity of gas which the statute says an operator is entitled to produce, which is that quantity that underlies his tract of land, you referred to the fact that there was only one accepted engineering basis for determining the recoverable gas in place under a particular tract. What is that method?

A That is a method commonly referred to as a pore volume calculation.

Q Would you explain just what a pore volume calculation includes, or how it is done?

A Well, briefly, it consists of a small number of factors which properly should enter into a calculation of that type. If we have a sand formation such as the one we have out here in the

Jalmat Pool, and we can identify the top of the formation and the base of the formation and we can determine the percentage of the total section that is actually contributing to the amount of gas in place; that is, if we can actually calculate what percentage of the total is net pay and true pay, if we know the porosity and the net pay thickness and have knowledge of the characteristics of the gas contained in that formation, we can accurately calculate the volume of gas actually contained in the formation underlying that acreage that is assigned to each well.

Q Now, did you make such a calculation with reference to any of the wells in this Jalmat Pool?

A Yes, sir, we did. I would refer back to our exhibit. The area which we studied is bounded in blue on this map.

Q That is on Operator's Exhibit No. 1?

A Exhibit No. 1, yes, sir. It involves approximately fifty-eight wells on which we had complete information; that is, information where we had good deliverability data and good information on net pay thickness, porosity, and all of the other factors that should properly enter into a pore volume calculation of recoverable gas in place.

Q You have indicated that your study was limited to a portion of this field and was not made on the entire pool. What was the reason for that?

A Yes, sir, that is correct, and there are a number of reasons. The primary reason being that we didn't have time to make

a complete Field-wide study, so we were interested primarily in selecting a representative portion of the Field on which we knew we could make a good study; and for that reason we confined it to this area of the Field.

Q You said a representative portion on which you could make a good study. How did you arrive at this area as meeting those requirements?

A There are a number of reasons for that. If you will refer to Texas Pacific Exhibits 8 and 9, you will see that they had a good concentration of information in here. In other words, they were able to make a comparison in this same area, roughly, that we included in our study. When you move to the north or to the south, you will notice a great many windows in their maps, and therefore we concluded that in order to test the applicability of their proposed formula or any other formula, we should have an area where they had some information in order to determine how well our analysis would agree with their conclusion and recommendation.

Q Now, did or did not the area which you selected have included in it substantially all of the conditions that exist throughout the Pool?

A Yes, sir, that is correct. Now in order to make a pore volume study of any segment of a field, it is necessary to have a variation in all of the factors that enter into the formula. For example, in order to test the applicability of the proposed

deliverability formula or any formula, you need to select an area in which you have a variation in net pay, and within the area we studied we had a three-fold variation in net pay. We had a three hundred pound variation in pressure. So there are two factors which are extremely important in testing the applicability of any formula.

We selected this area where we had this much variation in order to see what the effect would be. You will note also that this is an area where, according to their exhibit, they in effect found the greatest degree of agreement from their two maps. So if there was ever an area where their formula should hold up, it should be in this area here.

Q Will you return now to the Operator's Exhibit 7--

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

Q -- which is entitled "Composite Log for Typical Well". You have testified that in making a pore volume calculation it's necessary to determine the thickness of the pay under the tract as to which you are making the determination. Now what was the method that you used for making that determination?

A Well, sir, it was common practice in making a pore volume study, or that is a study to determine the storage capacity of a reservoir or a portion of a reservoir underlying any given tract, it is common practice to utilize the logs which are available in the area to determine net pay. Before you can justify the use of

the logs in the area, you must establish the fact there is some relationship between what the log is indicating and true net pay. In other words, you must be certain that the log is getting you a realistic picture of the true net pay in the reservoir.

Q How do you determine whether or not it is giving you a true picture?

A Obviously it is necessary to have some core information. If you haven't cored any wells, it is extremely difficult. In this area of interest, we had five core analyses which were either in or immediately adjacent to the area we studied. Incidentally, these studies show very little variation in average porosity. With this information, it was possible to determine whether the logs were giving an accurate indication of net pay. This is a composite log for a typical well; in other words, all through the Yates section within the Jalmat Field, you obtained logs which have this characteristic and generally look roughly the same, although the amount of net pay varies. The purpose of this investigation, the results of which are depicted on this analysis, is to indicate the degree which logs are indicating true net pay.

Now on the right here we have porosity as actually measured from the core on this same well that was logged. The porosity is indicated by the red on this curve. That is the effective porosity. We have made a study of all the available core analyses in the Field, and we have concluded that pay having an excess of ten percent porosity is contributing the greater portion of the recover-

able gas in this Field. This blue curve on the right indicates permeability, and it indicates generally where you have porosity classified as pay, you have permeability which will permit the movement of gas through the reservoir. Now referring, or comparing the porosity curve as determined from actual analysis of the curve to the neutron curve on the log, you will see that the neutron curve is doing a remarkably good job of picking up the same pay sections as obtained from core analysis, so we can conclude therefore where we have radioactive logs, we can rely on them to give us a reasonable and reliable indication of the amount of net pay in each well in the area studied.

Q In your experience, is that a sound engineering conclusion?

A Yes, sir, it is.

Q And is it a test which is normally applied in making a calculation such as you have made?

A Yes, sir, it is. It is applied day in and day out through the industry by engineers and geologists.

Q How many radioactive logs did you have?

A We had approximately forty radioactivity logs which were used in delineating this area. Some of the logs were immediately adjacent to the area, but those logs were just as important as the ones within the area because it provided the degree of control we needed, not only internally, but along the periphery of the area studied.

Q Is it your conclusion from that exhibit that a net pay

study made on the basis of these radioactivity logs that were available to you would be a sound basis for determining net pay?

A Yes, sir, that is correct.

Q What did you then do with the logs which you had tested in this manner?

A Well, sir, having established the fact that the neutron log is giving a reliable indication of net pay, we went through log by log, utilizing all of the logs that were available and which were susceptible to analysis, and picked net pay for each of the tracts on the fifty-eight wells in our area on which we had complete information.

Q Did you have the assistance of qualified geologists in performing that particular function?

A Sir, I had the assistance of qualified geologists and engineers.

Q That work was done under your personal direction and supervision?

A Yes, sir, that is correct.

Q Did you then make a computation of the recoverable gas in place as defined by the New Mexico Statute on correlative rights for these fifty-five wells in the units which they represented?

A Yes, sir, that was the primary objective of this study. We made a tract by tract determination of the recoverable gas in place under each tract.

Q Now, having done that and having ascertained the actual recoverable gas in place, what did you do with that information?

A We used that information to compare it to the indicated recoveries or the apparent recoveries as derived by Texas Pacific in their extrapolation of pressure production decline.

Q When you said "recoveries", did you mean reserves?

A When I said recoveries, I mean reserves as defined by Texas Pacific, as distinguished between our definition which we refer to as recoverable gas in place.

Q And recoverable gas in place is what the New Mexico Statute refers to, isn't it?

A Yes, sir, that is correct.

Q All right.

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

Q Does Operator's Exhibit 8 show a typical study in that regard?

A Yes, sir, it does. I think it is apparent that the next step in our investigation, having made a pore volume study of the recoverable gas in place underlying each of the tracts in the area studied, that we would immediately compare the results we obtained; in other words, the results, the recoverable gas in place calculation should be compared to the reserves as defined by Texas Pacific. To best accomplish this and to bring to the attention of the Commission the type of comparison that was made,

we have prepared this exhibit which is entitled "Comparison of Recoverable Gas in Place", which is what we are talking about, and reserves here identified as the type of reserves Texas Pacific is talking about and which they obtained by extrapolation of pressure production data.

Now we have here three tracts within our fifty-eight well area up there. Each tract has one hundred sixty acres within it; indicated on this block here is the amount of net pay which we determined, utilizing the procedure previously discussed. We estimated eighty-five feet on this well, ninety foot on Tract 2, and ninety feet on Tract 3. You recall previously we indicated that was a factor that would enter into the pore volume calculation. Another factor is the pressure. On this well the weighted average bottom was a thousand psig; nine hundred seventy pounds and one thousand pounds. I might also at this time say that Tract 1 and Tract 3 are offsetting wells in this area. Tract 2 is located approximately two miles to the north of Tracts 1 and 3.

Now immediately below these three tracts we have indicated the results of our calculations of recoverable gas in place, utilizing reservoir data on each well. That indicates for Tract 1 4.18 billion cubic feet, and these are reserves after the first of 1957, 4.31 billion cubic feet and 4.34 billion cubic feet. That of course is what you would expect where you have essentially the same pay thickness and a minimum variation in pressure.

Now immediately below this we have indicated the procedure

followed by Texas Pacific in arriving at their reserves as they defined them. You will recall that they arrived at reserves by extrapolation of the pressure production decline data on each well. For example, here is the information on Tract No. 1, pressure plotted against production, the red circles represent each pressure point that has been measured since that well was completed. The same thing is indicated on each graph here, for Tracts 1, 2, and 3. Now in this particular tract, the indicated reserve by their method, this 4.7 billion cubic feet, which agrees very well with our pore volume calculation of gas in place.

Going over to Tract 2, by their methods you would get 5.74 billion, as compared to 4.31 cubic feet by our calculation procedure. On Tract 3, by extrapolation of their data, you would get 11.14 billion cubic feet or almost two and a half times as much as we calculate the reserves or the recoverable gas in place should be for that tract.

Q Now what abandonment pressure did you assume in extrapolating those curves?

A We used an abandonment pressure of one hundred pounds in each case. Going back, and I want to emphasize that in our opinion this is a very important exhibit and there are a number of points I want to bring out at this time. Going back here, I would call your attention to the fact that in the case of Tract 1, this well has not been producing as long, and approximately two-thirds of the production from this well has been made after adoption of the

acreage allocation formula. In other words, most of the production from this well has been produced under proration.

You will notice that you get good agreement between this extrapolation and ours which is what you would normally expect, whereas in the case of Tract 3, approximately two-thirds of the production from this well was made before you had any type of allocation formula in the Field in which the reserves were dependent more on the ability of the well to produce than anything else. When I say "reserves", I'm talking about Texas Pacific's definition of reserves, because their reserves are nothing more than a reflection of the manner in which the well was produced prior to adoption of a proration formula. For that reason, that well had an indicated recovery of approximately two and a half times as much as it would have been entitled to. The only reason that could occur was because of migration of gas across lease lines.

Q Now, Mr. Leibrock, taking that instance there of Tract No. 3 where the extrapolated reserve is indicated at two and a half times what the actual recoverable gas in place is computed to be, if deliverability was included in a proration formula applicable to that well, what would result?

A Well, that's indicated by the comparison at the base of our exhibit. You specifically ask about Tract 3. The present allowable for that well is 20,815 MCF per month. The allowable under the proposed deliverability formula would be approximately two and a half times as great as indicated here, 54 million cubic feet per

month.

Q That's in spite of the fact that the net pay thickness is the same, the pressure is the same as the other two wells that you have studied, or relatively the same, and the recoverable gas in place which the New Mexico Statute refers to is likewise substantially equal?

A Yes, sir, that is correct.

Q How does that allowable that would be arrived at with the deliverability formula compare to the allowable of the other two wells which should be permitted to produce the same amount of gas since they have a same recoverable gas in place?

A Well, sir, the comparison is indicated at the base here. As I said, here in the case of Tract 3, the deliverability would be approximately two and a half times as great; in the case of Tract 2, the deliverability formula would result in an allowable twice as great; and here in the case of Tract 1, the deliverability would be even higher than in the case of Tract 3. In other words, the deliverability formula here would give you fifty-seven million cubic feet per month, as compared to one hundred percent acreage figure of twenty million cubic feet per month.

You can conclude immediately from this comparison here there is no relationship between deliverability and recoverable gas in place.

Q I notice that at the bottom of this exhibit you have listed the allowable which those wells would have under the present acreage

formula as compared to the allowable which they would have under the proposed deliverability formula, and in each instance the allowable under deliverability is from two to two and a half times as great as the acreage allowable?

A Yes, sir.

Q Did you make any tests to determine which of those was within the range of the actual recoverable gas in place or how it should relate to it?

A Yes, sir, we did, and admittedly it was a rough study because, as I indicated previously, we did not have time to make a Field-wide study. However, we did make a rough check of the amount of gas initially retained in the reservoir, and the recoverable gas in place in the reservoir at the time of these tests. On one hundred percent acreage, the allowable would be within one hundred million cubic feet per month of the one hundred percent acreage formula. It would be in the range of approximately twenty to twenty-one million feet per month under each of these formulas.

Q I believe your tongue slipped on that statement. Let me go back just a minute. You said that the acreage formula would be within the range of the acreage formula, I believe.

A I meant the recoverable gas in place, assuming that we were allocating on the basis of one hundred percent recoverable gas in place, it would be close to the one hundred percent acreage formula.

Q The deliverability formula would be two and a half times

what the man was entitled to receive if you had a perfect proration formula?

A Yes, sir, that is correct.

Q You've referred to allocation on the basis of recoverable gas in place. That means a perfect formula, doesn't it?

A Yes, sir, that is correct. That would be the ideal situation, something that we are always striving for under the New Mexico Statute.

Q That would mean that after the Field was completely depleted on that formula, each man would have gotten just the recoverable gas that was under his tract of land, wouldn't it?

A Yes, sir, that is correct.

Q If I understood you, then, you said that the allowable that this tract 1 gets on an acreage basis is within one million cubic feet of being what the perfect allowable would be, whereas the deliverability allowable is thirty-seven million feet off?

A That is correct.

Q In your opinion if that deliverability formula was used in a situation of that kind, would or would not extensive drainage inevitably occur?

A Well, sir, I think that the conclusion is obvious that where you have that much variation between a perfect formula and a proposed deliverability formula that migration across lease lines would be tremendous.

Q When you say "migration across lease lines", you mean

A Yes, sir, I do.

Q You have referred to the allowable which these wells would get under the deliverability formula. How did you arrive at that allowable; how did you fix that allowable?

A I think it is apparent that in order to calculate the allowable that would exist under the proposed deliverability formula, it is necessary to go back to the very beginning, take all the wells on which you have accurate and reliable deliverability data; as I indicated previously, we have that information on approximately two hundred thirty-nine wells.

Q Did you construct a new proration schedule on those two hundred thirty-nine wells, based on this proposed deliverability formula?

A Yes, sir, we did.

Q Is that allowable which is indicated on this exhibit the allowable that that schedule indicated for these three wells?

A Yes, it is.

Q The acreage allowable, the allowable on the November schedule?

A That is correct.

Q Is there anything else in connection with that exhibit to which you would like to direct the attention of the Commission?

A Well, I believe I failed to call attention to the deliverabilities on the three wells, although we have been talking

[illegible] yet here are two wells which have a relatively close deliverability but which by the Texas Pacific procedure for determining reserves have a tremendous variation in reserves, in which case you can conclude that even on their approach to the thing there is no relationship between deliverability and reserves.

Q Would drainage occur if those were offset wells and the proposed formula was used?

A Yes, I think it is apparent that drainage would occur to a severe degree.

Q Is there any conclusion, Mr. Leibrock, that you draw from that exhibit as to the desirability or undesirability of the deliverability formula as compared to the acreage formula.

A I think it is obvious from the information presented on this exhibit that the one hundred percent acreage formula is a much more desirable method for allocating gas production than is the proposed deliverability formula, and that is further emphasized and on a wider scale on our next exhibit.

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

Q You are referring now to Operator's Exhibit No. 9, entitled "Average Deviation in Allowable from Recoverable Gas in Place"?

A Yes, sir, that is correct. I think it is apparent that

you wouldn't attempt to support any allocation formula on the strength of a three tract analysis. The purpose of the preceding exhibit was to call attention to some specific instances of inequities and migration of gas. The purpose of this exhibit reflects the results of our overall fifty-eight well study, and is designed to show the average deviation in allowable under the two formulas, the proposed deliverability formula and the existing one hundred percent acreage formula.

Q You say "deviation" from recoverable gas in place. Is that the deviation from this ideal formula we talked about?

A Yes, sir, it is. It is the deviation from the ideal formula. The ideal formula in this case would be one in which these spots fell along the zero line here. In other words, the ideal formula would be a straight line along the base of this graph in which you had no deviation from recoverable gas in place. It would be a perfect formula.

Now these two lines on this graph, first, the red line represents the results of our calculation to determine the extent to which the proposed deliverability formula would deviate from recoverable gas in place.

Q That is, deviate from perfection?

A That's right. This is deviation from perfection; that is a good term for it. It simply indicates that for all the fifty-eight wells, the average deviation would be 54.3 percent from recoverable gas in place.

Q If the deliverability formula were used?

A That is correct. By the same token, we have made a similar calculation to determine what the percent deviation would be for the same fifty-eight wells, assuming continuance of the existing one hundred percent acreage formula. That indicates a deviation of twenty-four percent from the ideal formula or from recoverable gas in place.

Q Now, you referred to this recoverable gas in place as being perfection. Has any regulatory body to your knowledge ever achieved that in working out a proration formula?

A No, sir, to my knowledge nobody has ever achieved perfection. It is something we constantly hold up before us as a very desirable objective, and we work for it. To my knowledge it would be impossible in any oil or gas field to achieve perfection.

Q It would be impossible to administrate if you figured it out?

A That is right. It is conceivable you can devise some complicated mathematical formula that would on paper give you one hundred percent allocation, but the administrative effect would be rigorous and impossible.

Q In your experience as an engineer, have you had occasion to know the deviation from perfection of the allocation formula used by various regulatory bodies in various pools?

A Well, certainly qualitatively.

Q In your opinion, based on that experience and as a qualified engineer, is the deviation shown for the acreage, shown for our

percent tolerance of twenty four percent, is that within an acceptable tolerance as generally regarded by the engineering profession?

A Yes, sir, it is definitely an accepted tolerance, and I might add when you take into consideration the many complexities confronting the Commission in attempting to realistically allocate gas in this Field, it is a very good comparison. You have a number of factors that complicate the problem in Jalmat. Taking all these things into consideration, I would say this is a very acceptable deviation.

Q What is the percentage relationship between the deviation of our present acreage formula and the deliverability formula?

A By comparing the summary bar graphs here, the deviation as indicated by the proposed deliverability formula is approximately one hundred twenty-five percent as great as we have calculated under the existing one hundred percent acreage formula.

Q You mean there would be one hundred twenty-five percent greater deviation from this perfect formula if we used deliverability, than if we continue our present formula?

A Yes, sir, that is correct.

Q What would result insofar as correlative rights are concerned if you take that additional deviation or incorporate that additional deviation in the formula?

A I think it is apparent that it would aggravate the situation. That is, it would tend to increase the volume and the rate of migration of gas across lease lines. I think there's another point

to be emphasized here. That is that by this study we have investigated the conditions that exist within an area, one single area of the Field. We haven't looked at an overall Field trend. We have developed conclusions as indicated here that are based on the conditions existing across lease lines within a given area, and to my way of thinking that is more important from the standpoint of correlative rights than any broad general trend based on an overall Field evaluation.

Q Is that because drainage is going to occur as between individual tracts and not as between pools?

A Yes, sir, that is correct.

Q You said that these deviations from perfection that are plotted on Operator's Exhibit 9 are based on this fifty-five well group -- fifty-eight wells on which you made a pore volume calculation of recoverable gas in place?

A Yes, sir, that is correct.

Q Is it your opinion that if you had had time to study the entire pool as you studied this selected area, you would get results which approximate the results you have gotten here?

A Yes, sir, it is.

Q Do you or do you not believe that the Commission would be justified in assuming that the relationship between the results of an acreage formula and the results of a deliverability formula would be typical of what would result in the whole pool?

A Yes, sir, I'd think it would.

Q I believe you said that each one of the spots or points on these curves is a particular well?

A Yes, sir, that is correct.

Q As to which you have computed the allowable under the proposed formula and compared it to the allowable under the present formula?

A Yes, sir, that is correct.

Q Can you by looking at that curve determine, for instance, what the deviation from perfection would be on thirty wells.

A Yes, sir.

Q Rather than the whole fifty-eight?

A Yes, sir. If we take thirty wells out of the fifty-eight as indicated here, under the existing acreage formula the deviation would be something less than ten percent.

Q On acreage?

A On acreage, that is on the same thirty wells, or -- correction, thirty wells under the deliverability formula, with the deviation would be something like twenty-five percent or two and a half times as great.

Q What if any conclusion do you draw from that study, Mr. Leibrock, as to the relative desirability of our present acreage formula as compared to the proposed deliverability formula in Jalmat?

A Well, sir, I think the conclusion to be drawn is apparent. We have indicated that neither of these formulas are perfect, but

[illegible] twenty-five percent spread between the deviation under the two formulas.

Q You think you can say that acreage is one hundred twenty-five percent better than deliverability?

A You might put it that way.

Q Now, having determined that this comparable, or that these results would occur in the event of a change of the proration formula, have you made a study to determine the effect upon the individual operators in the Jalmat Pool if this change was made?

A Yes, sir, we have.

Q Now, the Jalmat Pool has been producing for quite a long time, hasn't it?

A Yes, sir, that is correct.

Q Do you know whether it is substantially developed at the present time?

A I would say that it is substantially developed.

Q That development has occurred first under no proration and during proration under an acreage formula, hasn't it?

A Yes, sir, that is correct.

Q Leases and mineral interests and royalty interests have been bought on the basis of that acreage formula that has been applicable, have they not?

A Yes, sir, that is correct.

Q Could you say what percentage of depletion of this pool has occurred up to the present time?

A Yes, sir. We have made a rough calculation of that and we feel like a figure of forty percent depleted at the present time is realistic and reasonable.

Q You feel then that the field has been forty percent produced on the basis of the acreage formula that we have now, plus the condition that existed prior to any proration?

A Yes, sir, that is correct.

Q That if a change in the proration formula is made now, it would be made at a time when the field was forty percent depleted?

A That is correct.

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

Q Now will you refer to your exhibit showing the effect on individual operators in the pool of a change in the formula? Is that result portrayed by Operator's Exhibit 10, to which you are now directing your attention?

A Yes, sir, the results of this particular investigation are indicated by Operator's Exhibit 10, which shows the indicated change in monthly allowables which would result from adoption of the proposed deliverability formula. In other words, this is the change that would be immediately apparent after the adoption of the formula. Obviously we can't predict at this time how much

restimulation in the field would occur as a result of the adoption of the formula and the extent to which this would be subject to further redistribution of restimulation jobs had been performed on a large number of wells.

Q I want to be sure I understand what you mean. Is it that these changes which are shown by Exhibit 10 are the changes that would result next month if the formula was changed to deliverability and before any operators undertook to frac his well or do anything he could to jack up the deliverability?

A Yes, sir, that is correct, taking into consideration or remembering that our revised proration schedule under the proposed deliverability formula was based on two hundred thirty-nine wells and it's subject to that one qualification.

Q In other words, you used this same deliverability proration schedule that was based on two hundred thirty-nine wells that you had deliverability figures on?

A Yes, sir.

Q All right. What do the red bars indicate? Is that gain or loss in allowables?

A The red bars on this exhibit reflect loss in current allowable expressed in MCF per month. The scale here is from zero to one hundred fifty thousand. It is marked off in fifty thousand million feet segments.

Q What do the green bars indicate?

A The green bars, simply increase in current allowable.

Q They indicate increase in monthly allowable that that particular operator would receive if the change was made to deliverability formula?

A Yes, sir, that is correct.

Q I note that you have got Continental listed over there at the top of the column on losses. How have you treated the Federal Unit in which several companies are interested but which Continental operates?

A As if Continental owned all of it.

Q In other words, that loss is what all the operators in the Federal Unit would obtain, rather than just the Continental alone?

A Yes, that is correct.

Q What would be the effect on Continental and the other interested parties if the change was made?

A Well, this indicates simply that they would suffer a reduction in current allowable of a little in excess of one hundred fifty thousand MCF per month.

Q What would happen to Cities Service and Gulf?

A This indicates that Cities Service would obtain approximately or a little bit in excess of two hundred fifty thousand MCF per month, and Gulf would receive approximately the same amount of increase.

Q Cities Service and Gulf are two of the companies that are participating in this case and opposing the change, are they not?

A Yes, sir, that is correct.

Q Just for the purposes of getting this on a dollar and cents basis, would you assume that this gas is worth ten cents a thousand and tell us the approximate change in income that would result, let's say to Leonard Oil Company, if this new formula were adopted?

A Well, for example, Leonard Oil Company is indicated at this point with an indicated reduction in current allowable of approximately fifty thousand MCF per month.

Q How many dollars would that amount to at ten cents?

A That would be approximately $5,000.00 a month.

Q In other words, a change in the formula, unless there was money spent to frac or otherwise work over these wells, would result in approximately a $5,000.00 a month loss to that company?

A Yes, sir, that is correct.

Q What loss would occur to the R. Olsen Oil Company?

A R. Olsen Oil Company is indicated second in order on this side of those operators who would experience a reduction in current allowable, just under one hundred fifty thousand, which would represent a reduction in current income of approximately $15,000.00 per month.

Q A reduction in current income of $15,000.00 per month?

A Yes.

Q For one operator as a result of the change in this formula--

A That is correct.

Q -- is that correct?

A Yes, sir.

Q Let's go over and look at the gain side and see who would gain and what.

A Well, in the case of Cities Service, which along with Gulf stands to increase approximately two hundred fifty thousand per month, that would reduce to approximately twenty-five thousand dollars per month for both the Cities Service and Gulf.

Q How much would Texas Pacific Coal and Oil Company stand to gain per month if it was adopted?

A This analysis indicatds an increase of approximately fifty thousand current gas production MCF per month, which would mean an increase in current income of around five thousand dollars a month.

Q Around five thousand dollars a month to Texas Pacific?

A Yes, sir.

Q Have you listed on the exhibit all the operators in the Jalmat Pool and shown what the effect of the change would be on that?

A We have listed all the operators for whose properties we had good information. There are a number of operators or a few operators where we didn't have deliverability data, and for that reason we could not include them in our deliverability proration schedule.

Q But you listed all the operators that were in the two hundred thirty-eight wells, is that correct?

A Yes, sir, we have made a check, and according to the records in Hobbs, we find there are two hundred eighty-three wells for which there are no records and no indication of frac jobs or stimulation jobs having been performed.

Q In other words, insofar as you could find out from the Commission records, there were two hundred eighty-three wells that had not been stimulated or fracked?

A Yes, that is correct.

Q The figure of five to ten thousand dollars for a stimulation job has been mentioned in this hearing. Would you think that that would be a fair estimate of the cost of stimulating an individual Jalmat well?

A Yes, sir, I think it would.

Q In your opinion what would be necessary on the part of the owners of all the wells that have got a red bar opposite them on that exhibit, if there was a change in the formula, in order to preserve their present position?

A Well, sir, I think it's a logical conclusion that they would all attempt some type of stimulation job to improve the producing capacity of their wells.

Q Assuming seventy-five hundred dollar cost of that job, what would that amount to, approximately, for two hundred eighty-three wells?

A Well, sir, it would be approximately two million dollars.

Q Would the expenditure of that two million dollars on those

two hundred eighty-three wells increase to any appreciable extent the ultimate amount of gas that would be withdrawn from this pool?

A No, sir, in my opinion it would have no significant effect on the ultimate recovery from the field.

Q The only effect would be in perhaps postponing the abandonment date just a little bit, would it not?

A That perhaps would be the correct conclusion, yes, sir.

Q Do I correctly understand then that if the owners of all those two hundred eighty-three wells undertook a stimulation at that cost, there would be required of the operators in that pool an expenditure of some two million dollars, which would result in no increase in their ultimate recovery in the pool?

A Yes, sir, no significant increase.

Q In connection with the study that you have made, Mr. Leibrock, have you made an effort to determine the basis upon which the regulatory Commissions of some other States handle the proration of natural gas pools?

A Yes, sir, we initiated a study to include all of the States in the South and Southwest. However, we were unable to complete our entire investigation.

Q Did you get information on some of the gas producing States?

A Yes, sir, we did. We obtained information, and I think it's relatively complete, on the States of Mississippi, Louisiana, and Texas.

Q With reference to the State of Mississippi, what did you

find with reference to the use of acreage as the basis of allocation formulas?

A Well, in the State of Mississippi we found they have a Statute that provides for one hundred percent acreage. I believe, Mr. Malone, you have a copy of that.

Q With the approval of the Commission, I would like to read a brief excerpt of the Statute into the record. I don't know if the Commission takes judicial notice of the Statutes of other States or not. If there is no objection, I will read a brief excerpt from the Mississippi Statute to which the witness has referred.

Section 9 of Chapter 256 of the Laws of Mississippi of 1948, as amended, sub-section (d) reads as follows: "Except where otherwise provided, any allocation or apportionment of production shall be made on the basis of and in proportion to the surface acreage content of the drilling units prescribed for the producing horizons for the pool, so that each such prescribed unit shall have equal opportunity to produce the same daily allowable, and any special unit of less than the prescribed amount of surface acreage shall be allowed to produce only in the proportion that the surface acreage content of any such special unit bears to the surface acreage content of the regular prescribed unit; provided, however, that in the event any well in attempting to make its allowable should be operated in a way that would commit waste, as herein defined, or to the detriment of the field as a whole, the allowable for any such well shall be subject to adjustment."

MR. CAMPBELL: If the Commission please, I have no objection to this Mississippi Statute or a portion of it being in the record. I think, however, that it would be appropriate to have the record also show at this point the similar provision in the New Mexico Statute with reference to the allocation of gas allowed. I would like to ask permission of Commission counsel to read that portion of the New Mexico Statute for the record in the case.

MR. MALONE: We have no objection.

MR. CAMPBELL: It is in Section 65-3-13, New Mexico Statutes, 1953, Annotated. It is the portion of sub-paragraph (c) of that section. "Whenever, to prevent waste, the total allowable natural gas production from gas wells producing from any pool in this state is fixed by the commission in an amount less than that which the pool could produce if no restrictions were imposed, the commission shall allocate the allowable production among the gas wells in the pool delivering to a gas transportation facility upon a reasonable basis and recognizing correlative rights, and shall include in the proration schedule of such pool any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility which is reasonably capable of handling the type of gas produced by such well. In protecting correlative rights the commission may give equitable consideration to acreage, pressure, open flow, porosity, permeability, deliverability and quality of the gas and to such other

pertinent factors as may from time to time exist and insofar as is practicable shall prevent drainage between producing tracts in a pool which is not equalized by counter-drainage."

Q Now, resuming your check of the situation in the other States, Mr. Leibrock, you found, I assume that inasmuch as the Mississippi Statute prescribes acreage that that is the only basis used in the allocation of gas in Mississippi?

A Yes, sir, that is correct.

Q What did you find the situation to be in Louisiana?

A In the State of Louisiana they have a State-wide rule which provides for one hundred percent acreage unless an exception is granted.

Q Would you speak a little louder, please?

A Yes, I will repeat. In the State of Louisiana they have a State-wide rule which provides for one hundred percent acreage unless an exception is granted. Now we made a careful study of the fields in Louisiana and find there is only one field, the Old Monroe Gas Field, that has deliverability in the formula.

Q You say there is only one field that has deliverability in the formula. Do you know when that was written into that formula? Was the Monroe an early field or late field?

A I believe the Monroe Field is one of the oldest producing gas fields in the United States.

Q What did your study of the State of Texas disclose as regards whether deliverability is included in the formula for the

gas wells which are prorated?

A Well, of approximately four hundred twenty fields, we found twenty-one fields in which the factor of potential or deliverability entered into the formula.

Q That is twenty-one out of how many?

A Out of approximately four hundred twenty, or approximately five percent of the total fields involved.

Q Was there any appreciable pattern as to whether the fields which included deliverability were fields that were prorated beginning a long time ago, or were of recent origin?

A Well, generally fields which have potential or deliverability in the formula are fields where rules have been established some time ago. I don't know of any recent instances where a formula has been agreed upon where deliverability is a factor in the formula.

Q By "recent", you mean in the last year or two or three years?

A Three or four years, yes, sir.

Q Then to summarize the information which you obtained with reference to Mississippi, Louisiana, and Texas, is it correct to say that deliverability is not considered in any formulas in Mississippi, in only one of the very earliest formulas in Louisiana, and in only five percent of the prorated fields of Texas, most of which are early fields?

A That is correct.

Q Now, Mr. Leibrock, I would like to ask if you could briefly

have drawn from the study which you have made, and on the basis of which the exhibits presented have been prepared; just a brief summary and any recommendation which you feel is appropriate that you would like to make to the Commission.

A Well, sir, I believe that we can develop three important conclusions as a result of our study. The first one is that even if we accept the Texas Pacific definition of reserves and attempt to analyze the problem on the basis of relationship which they offered, that we find no reasonable relationship between reserves and deliverability. In fact, there is good reason to believe that if a formula with deliverability as a factor were adopted, that it would result in serious abuse of correlative rights.

Secondly, based on our study of the Lea County area and the San Juan Basin area, we find no relationship in deliverability in the over and under production problem. As indicated in the San Juan Basin where deliverability is a factor, they are apparently experiencing the same difficulty and to some extent perhaps to an even greater degree than in the Lea County area.

Third and finally, we feel that continuation of the existing one hundred percent acreage formula would result in substantially less deviation from recoverable gas in place than would be the result under the proposed deliverability formula.

You will recall from our ninth exhibit that we showed one hundred twenty-five percent less deviation from recoverable gas

Q With reference to the exhibits concerning which you have testified, Mr. Leibrock, were all of these exhibits prepared under your general direction and supervision?

A Yes, sir, they were. As I indicated previously, they were prepared under my direction and supervision.

Q Did you have available in Roswell where this work was done the two plats of Texas Pacific which are the Exhibits 8 and 9, I believe?

A 8 and 9. No, sir, as I indicated previously, we did not have copies of their exhibits.

Q You had to work from a take-off that was made up here in the Commission office and taken to Roswell, is that correct?

A Yes, sir, that is correct.

Q The actual preparation of these exhibits, the actual manual preparation was done by the Mann Engineering Company in Roswell, was it not?

A Yes, sir, that is correct.

Q On the basis of models which you gave to them to prepare?

A Yes, sir, that is correct.

Q When did you receive back from the Mann Engineering Company

Exhibit 1 which was the different map that was posted at the front of the room?

A Well, sir, we completed the preparation of the Exhibit 1, last of the several exhibits that were prepared; we did not receive a final copy of it until just a few minutes before we departed for Santa Fe.

Q Had you had an earlier opportunity to compare that exhibit to the Texas Pacific original exhibits, which are here?

A No, sir, we did not have an opportunity.

Q When you compared them this morning, did you find any discrepancies that had occurred in the preparation of your Exhibit 1?

A Yes, sir, we found that there were some errors in coloring.

Q Some errors in coloring?

A Yes, sir.

Q Did those errors affect the overall number of acres that agreed and disagreed as you testified to them?

A No, sir, they did not. The same percentages were found to exist after correcting the errors.

Q In other words, the percentages that you testified to were correct?

A Yes, sir, that is correct.

Q What if anything did you cause to be done during the noon hour to rectify that situation?

A Well, I would say we have a much more reliable check on

the percentage to which I previously testified.

Q Did you have an exhibit that is now by Exhibit 1 and is designated as Exhibit 1-A prepared correcting the coloring errors that had occurred?

A Yes, it corrected the coloring areas and that was the extent of the corrections. No other errors were indicated.

Q Are the two exhibits identical with the exception of the coloring errors that did occur?

A That is right.

Q Any instances in which there is not agreement between Operator's Exhibit 1 and Operator's Exhibit 1-A, Operator's Exhibit 1-A is correct?

A That is correct.

Q Did you check and recheck the preparation of this Exhibit 1-A during the noon hour to be certain it is correct this time?

A Yes, sir, we had a man taking information off and a man checking the man who was taking the information off. In turn we had another man plotting the information on the revised map and a man checking him.

MR. MALONE: We offer in evidence Operator's Exhibits 1 to 10 inclusive, including Operator's Exhibit 1-A.

MR. PORTER: Are there any objections to the admission of the exhibits? They will be admitted.

MR. MALONE: That's all we have from this witness, and this is our only witness.

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

MR. CAMPBELL: I have a few.

CROSS EXAMINATION

By MR. CAMPBELL:

Q Mr. Leibrock, would you like to have the record further corrected to reflect that you spent seventeen hundred one man hours?

A No, sir.

Q Mr. Leibrock, first just a few general questions about the opening portion of your testimony. As I gather it, you have disagreed with the basis used by Mr. Keller in his calculations of reserves throughout the Jalmat Gas Pool, is that correct?

A Yes, sir, that is correct.

Q You have stated that in your opinion there is only one way in which reserves can be determined under any circumstances, is that right?

A Well, sir, I believe I defined reserves as recoverable gas in place, and I would like to continue that definition. In other words, I believe that is the only way to calculate recoverable gas in place beneath a single tract.

Q Do you consider that the estimates of reserves as used by Mr. Keller in his testimony are not reasonable?

A Again I think they do not reflect the recoverable gas in place under each individual tract. I do not believe that they reflect reserves as we define them.

Q Do you think that they reflect the condition of variations of reserves between tracts within that pool to any degree?

A Yes, I do think they reflect variation. I think the reserves as offered by Texas Pacific reflect more than anything else the manner in which the well has been produced in the past. In other words, inherent in the method used by Texas Pacific is the overall, or the behavior of any single well in the past. In other words, I think that is a greater factor than enters into the method followed by Texas Pacific.

Q Do you consider that there is sufficient data available throughout this entire Jalmat Gas Pool upon which you can make reasonable estimates of reserves upon your basis of definition?

A Yes, sir, I do.

Q You haven't made that estimate in your testimony thus far, except as to fifty-eight wells, have you?

A That is correct, but we have looked at conditions and data that are available throughout the field to the extent necessary for me to conclude that we could make a Field-wide pore volume study to determine recoverable gas in place under each tract.

Q But you haven't made that study?

A No, we haven't made that study as yet, because as previously indicated reason, that we did not have sufficient time.

Q You, Mr. Leibrock, are acquainted with Mr. Keller, are you not?

A Yes, sir.

Q As a matter of fact, you were both employed by the same company at the same time and in generally the same capacity, were you not?

A Yes, sir, generally.

Q You feel that he is a reasonably competent engineer?

A Yes, sir, I know that he is.

Q Now, referring for a few moments to your Exhibit No. 1 and No. 1-A --

A Yes, sir.

Q I believe you stated a few moments ago that it had become necessary for you to make some changes in your exhibit due to the fact that you did not have available an exact copy of the exhibit as it had been offered here in Santa Fe?

A Yes, sir.

Q I believe you also stated that you had completed Exhibit 1 last in your work, is that correct?

A We completed the coloring of it last. We completed that exhibit first as far as taking a look at the distribution. We completed the coloring last; it was a difficult shaping and coloring problem. We told them to hold off until last on that. We previously had an answer to the distribution as to the percentage. The first step in our analysis procedure was to take a look at the difference that might exist between your two maps. It wasn't apparent from simply looking at your Exhibits 8 and 9 whether any appreciable difference existed or not. In fact, they appeared to be remarkably

similar. It wasn't until we made this comparison that we realized the extent; as I indicated previously the only purpose in making that was to determine whether there was justification in further pursuing an analysis of the data offered by Texas Pacific.

Q Would you say from your analysis of your Exhibit 1-A as you have now prepared it in relationship to Texas Pacific Exhibits 8 and 9 that there is no relationship existing between reserves and deliverability in the Jalmat Gas Pool?

A No, sir, I believe that I testified earlier that I feel that there is no reasonable relationship.

Q Do you believe that if Exhibits 8 and 9 in relation to your Exhibit 1-A had been prepared with only two colors that that relationship would be more apparent on your Exhibit 1-A?

A It's a little difficult for me, sir, to answer that question. I think I understand it, but it's a little difficult for me to visualize what the result would be. If you had only two colors on your exhibit, if I understand you right, you would have had your reserve map broken down into two reserve groups?

Q Yes.

A And your deliverability map into two groups?

Q You do believe that there is some relationship shown from the Exhibits 8 and 9 of Texas Pacific, do you not?

A To the extent that I can find some; we have indicated in yellow the areas of agreement, and certainly there are; your two maps are in agreement. It's just a matter of degree.

Q It's a matter of degree entirely as between your testimony and Mr. Keller's, except with relation to your definitions of reserves, isn't that correct?

A No, sir, that is not exactly what I said. It was a matter of degree as to how much similarity I found on our two maps, and that is the extent of my statement.

Q Now would you please turn those maps back to Exhibit No. 2. I would like to clear up a few questions to determine how you created your Exhibit No. 2 there. I understand, of course, that you took Mr. Keller's exhibit, which on its face reflected variations from the perfect formula that we have been talking about here, and broke them down further. Would you refer there to your first group and tell me, after you broke it down into that group, how did you decide how many wells you would put in each area of bar sections there?

A We followed the same procedure that we followed in breaking our reserve group down. We broke our deliverability portion down into groups of equal numbers of wells. In other words, there are fifty-five wells approximately in each of our four deliverability groups.

Q I understand that, but then when you get to the individual wells up above there, above the bars, number of wells, when you divided your fifty-five wells you got twenty-six in Category 1, seventeen in 2, ten in 3, and two in 4?

A Yes, sir.

Q How do you arrive at those numbers of those wells?

A That was inherent in the basic approach to the thing. You recall in your approach you broke it down into four groups of approximately fifty-six or fifty-seven wells each, and we tried to follow through on that same procedure.

Q But you didn't choose the same number of wells for each category. You got in the first group only two wells of high deliverability?

A Yes, sir, that is correct. We have indicated the number of wells here, but you'll notice as we move on over into the other reserve groups that the distribution with respect to any one deliverability range changes. When you get over here in Group 4 it is a reverse direction, and yet we observe the same basic trend in each one. Getting back to your question concerning the fact there are only two wells in our last deliverability group here, that conceivably would be a weakness in the analysis if it weren't for the fact you have an established trend, if it weren't for the fact that within any one reserve group you observe the same pattern, so one tends to support the other.

Q Now will you turn over to Exhibit No. 3, please. Now with regard to this particular exhibit, I understand that the dotted lines reflect the deliverability on each of those wells?

A Yes, sir.

Q And that the bars reflect the reserves on each of those wells?

A Yes, sir, taken directly from your plot, yes, sir.

Q What scale have you used on those two, the deliverability and reserves?

A Well, I think the scale is indicated on the right hand side for deliverability; they range from zero to twenty million.

Q What is it on the reserves?

A On the reserves we range from zero to seventy million per acre.

Q Well, now, isn't that in effect a difference of distance as to the two scales?

A Well, in setting up these scales we didn't give any particular attention to making any agreement between here and here, because that's not a factor in the thing. In fact, we could have plotted our increasing range of deliverabilities down below here, and in fact, if I were doing it over, I think I would. In other words, I don't believe there is any significance to that.

Q Does that over-accentuate the apparent discrepancy between deliverability and reserves, the method that you have used?

A No, sir, I don't believe that it does. We have got some deliverabilities that are clear up here, you see. We could have changed the deliverability scale and doubled it, which I would be perfectly happy to do right now because I don't think it would make, I can't see how it could possibly make any difference in the conclusions we have reached. In other words, we could change that scale and double it and make twenty up here, and this would cut

through about like this, but it wouldn't alter my conclusions at all.

Q Do you believe that there is some relationship shown even on the exhibit the way you have prepared it between deliverability and reserves, or not?

A Well, I'll try to answer your question this way. We have plotted deliverabilities in order of increasing deliverabilities and if I look at the thing as a whole, it's possible that I could find a few more high reserve wells down here than I find on this end of the thing, but my point is that I can see no reasonable relationship between reserves and deliverability. When I consider the matter that the reserves as by Texas Pacific were derived, it is inconceivable to me that you wouldn't get some sort of vague but general relationship.

Q What would be the effect of the exhibit if you imposed on there a straight line or acreage allowable factor? Do you think that would be in better relationship to those reserves as the line you show as deliverability?

A Yes, sir, you would have deviation from the average reserve line, admittedly;it would be a straight line. You would have deviation from the one hundred percent acreage line, just as we have shown in our exhibit. My opinion is that there is less deviation under the acreage formula than under the deliverability formula.

Q The relationship that you just referred to is a relationship

referring only to fifty-eight wells, is it not?

A Yes, sir, that is correct, but we have taken a close enough look at the field, and I believe I previously indicated, and if I didn't I would like to indicate now that we feel our analysis of the fifty-eight well area is indicative of what we could reasonably expect for the field as a whole, except we feel that the deliverability formula would not hold up as well on the field as a whole within the area studied, because in the area studied your apparent relationship held up better than in the portion of the field.

Q You chose the area of fifty-eight wells because it was an area in which you had more data?

A That was the secondary consideration. Our primary reason for choosing that area was because,in lieu of a field-wide study, is because we had insufficient time to make a field-wide study. We did select the area because we had good information. Even more important, I think, there is a greater concentration or wider area with less information missing than in other portions of the field.

Q We will get to that area in a moment.

A Yes.

Q Now will you turn to your Exhibit No. 4. Just to clear the record, Mr. Leibrock, I believe you stated several times that there has been a balancing program in the San Juan fields reflected on your Exhibit No. 4. Is it your testimony that that balancing has always taken place at the end of each six-months proration period?

A No, sir, I don't believe that is the case. It was my understanding there had been a balancing period.

Q Do you know whether there was a balancing period on June 30, 1957?

A No, sir, I don't know.

Q If there had not been a balancing --

MR. CAMPBELL: May I correct the record to indicate that balancing at July 31st, inasmuch as I understand that is the end of the balancing period in the San Juan Area.

Q If production had not in fact been balanced on July 31, 1957, in the San Juan Area, would that make a difference in the exhibit there?

A Would you --

Q If underproduction had not been canceled at that time and overproduction shut in?

A What was the date again?

Q July 31, 1957.

A I'm not in a position to answer that question, because this is simply a factual analysis of the data we had to work with as of November. It's taken from the November proration schedule. I think it accurately reflects the conditions as shown on the November proration schedule of this year. I don't believe that I can answer your question.

Q What months' production does the November proration schedule reflect?

A September, I believe.

Q So that if there had been no balancing at the end of July, that statement that you made as to differences between the two fields might be changed, might it not?

A I don't believe you can reach such a specific and definite conclusion on the basis of your assumption. I believe it is difficult, considering the tremendous number of factors and uncertainties that enter into analysis or into the production from these fields to make a conclusion of that type.

Q Mr. Leibrock, are you aware of the fact that during the first six months of 1957 and during a large portion of this last six months of 1957, that a number of wells in the Lea County Area and in the Jalmat Gas Pool in particular have been shut in or cut back by reason of imbalance?

A Yes, sir.

Q Were you present when Mr. Howell of El Paso Natural Gas Company made the statement here in this hearing that under those circumstances they found it necessary to go to the San Juan Basin to obtain gas?

A No, sir, I wasn't present.

Q If that were true, would that have a bearing upon the condition of the overproduction of wells in the San Juan Basin Area?

A Well, I don't believe that it would, if I understand your question properly. Our analysis here should reflect whether or not that is the case or not, and it seems to me that it does not

reflect that.

Q Now will you turn to your Exhibit No. 6, Mr. Leibrock. I'm sorry, I don't think I understood completely your explanation of how you set up that particular exhibit. Would you please briefly tell me what each of those bars represents?

A Well, to begin with, this bar, this upper bar indicates the overproduction, the average per well for the wells in Group 1.

Q How many wells are in each group?

A Approximately 12. I believe there are three groups where we had 11, and that was of necessity. We just couldn't break them all down.

Q Now, let's take the top bar there to further explain what you mean.

A Yes, sir.

Q How many wells would be included on the right hand side of that zero line?

A Well, that would vary. In the case of Group 1, as I recall, there were three wells on this side, and this is roughly, and perhaps nine over here.

Q Do you have the data on each of those?

A I'm not sure whether I have it or not, but I believe that I can answer the questions that you are getting ready to ask.

Q Do you detect a weakness or strength in your position?

A I'm sorry, sir.

Q I would like to have the data of the number of wells reflected

there if you have it available.

A I'll see if I can find it. I'm sorry, but I don't have that information, but I believe that I can try to elaborate a little on that. Let me put it this way. We started out and prepared an exhibit of this type, and we also prepared a supplement to it that broke it down on a well basis, and we had the two exhibits, one above the other, and there wasn't any conclusion to be reached from there that couldn't be reached from the other. In other words, we had a distribution of wells that indicated that there was no relationship on that basis either, so we concluded it didn't add anything to this exhibit to put it in.

Q I would rather reach my own conclusions about that if I may, if you have that information here available.

A We'll keep looking, but I'm sure we don't.

Q Certainly the number of wells appearing on one side or the other on this zero line would have a bearing on the relationship, or could have, could it not?

A Yes, sir. For example, we may be averaging six wells here and five here, or six on this side, or we might have an out of balance situation with nine here and two over here. We looked at it on that basis.

Q Your first testimony as to nine wells in the group of highest deliverabilities overproduced, and three underproduced, would indicate that, would it not?

A Yes, sir, it would.

Q So that this graph taken alone without that information could present a rather distorted picture, couldn't it?

A No, sir, I don't believe it can. We put it on a well basis and it would be weakened only to the extent that the number of wells that were available entered into the average; that is not necessarily a weakness.

Q I would appreciate it if you would get that information and furnish it to me later in your testimony. Now let's get your Exhibit No. 7, please. Now, Mr. Leibrock, it is my understanding that the basis for your testimony as to the third point which you made at the conclusion of your testimony, that an acreage basis contains less deviation than a deliverability basis, is predicated principally upon your study of the fifty-eight wells delineated in blue on Exhibit 1-A, is that correct?

A Yes, sir.

Q Now, would you tell me, if you have the information, what variations in reserves you found as between those fifty-eight wells, what degrees of variation?

A We found approximately a three-fold variation in reserves.

Q What variation have you determined throughout the entire field?

A Well, as I indicated previously, we did not study the entire field.

Q How many of the wells within the fifty-eight that you referred to -- on which wells did you have cores?

A We had cores on five wells.

Q Within the fifty-eight you are referring to?

A Oh, no, sir, within the area that we analyzed, we had two cored wells and we had three cored wells immediately adjacent to the area, and our study indicated that the rock characteristics were essentially the same in all five cored wells.

Q How many logs did you have on those fifty-eight wells?

A We had approximately forty.

Q Do you know exactly how many you had?

A Yes, sir.

Q We're referring to the fifty-eight wells now in the area.

A Yes, sir, thirty-eight.

Q Thirty-eight wells, and you had two cored within the area of the fifty-eight?

A Yes, sir.

Q Which wells were cored?

A The Gulf Janda I --

Q (Interrupting) When was that core obtained?

A -- the Gulf Janda I No. 1 and the Gulf Janda H No. 1.

Q When were those obtained, please?

A You mean when was the well cored?

Q Yes.

A I'm sorry, sir, I didn't get that.

Q Was it recent?

A I don't know when it was cored, other than established the

fact that I considered it to be representative, I didn't have much interest in when it was cored.

Q Perhaps someone here from Gulf can tell me?

MR. MALONE: I don't believe we can.

Q Do you have the core data on those two wells with you?

A No, sir.

Q Do you know how many feet were cored?

A I don't believe that I have that information. No, sir, I don't have it.

Q Do you have the average porosities?

A Yes, sir. Would you like for me to read them to you by well?

Q Yes, just the two you cored.

A We have five or six, five, rather.

Q Two within the fifty-eight area that you have been referring to are the ones I want.

A I would like to point out, too, that the other three are pertinent to the problem.

Q Only to the extent, as I understood you, that you believe they had the same general rock characteristics?

A No, sir, you misunderstood. They are probably just as important to analyzing the fifty-eight well area as the two wells in the area, because they are immediately adjacent to it.

Q Why aren't they in here?

A There are a number of good reasons. We indicated earlier

why we confined our study to the fifty-eight well area. To begin with, it was an area where we had a concentration of information, and where we felt like the study was valid, and further that other characteristics over on the flanks of the field over there that we don't feel are typical of the field as a whole.

Q That doesn't answer my question. It looks like if you have three more wells adjacent to the fifty-eight well area on which you have cores that those are the wells on which you have a sizeable amount of data. Why were they not included in the fifty-eight, the area you studied?

A For all practical purposes, the information from them was. This will answer the question, I believe. We made a study of the average core analysis on all the wells involved, the two within the area and the three without. We found that the porosity was about the same in all cases.

Q What was the maximum and what was the average?

A I have the averages. As I indicated, we eliminated everything with less than ten percent porosity. This is the average for net pay in excess of ten percent porosity. Ten percent in excess of net porosity.

Q Well, you have been using averages here?

A Yes.

Q As to these particular wells, a subject upon which you criticize Mr. Keller. Now, we would like to have the data upon which you arrived at those averages and determined the degrees of

A Well, I think it is safe to say from the core analysis that we looked at, assuming ten percent as a minimum, the pay will vary from ten percent up to thirty percent. I have observed that much variation in porosity. I haven't yet read the average values to you that you requested.

Q All right.

A For the two wells inside the area.

Q Yes.

A 16.75 percent, and 17.3 percent.

Q Which well was which, please?

A The first one I gave you was the Janda I No. 1; the second the Janda H No. 1.

Q What were they on the others outside the area?

A Would you like to have the names of the wells?

Q Yes.

A The Continental Fortney A-17 No. 1, 16.74 percent. The Pan American C. Meyers B No. 11, 16.35 percent; and the Cities Service Clawson B No. 13, 17.9 percent.

Q And you would testify that the variations would be from ten to thirty percent?

A Yes, I think you will find that order of magnitude variation in every core analysis.

Q Now with regard to your Exhibit No. 7, I believe you testified that you did not consider any porosity below ten percent?

A Yes, sir, that is correct.

Q Why is that?

A Because we feel that when the porosity drops below about ten percent, in general the permeability will definitely drop below a tenthof a millidarcy. From our experience we do not feel that these intervals here with low porosity will centribute significantly to the over-all gas production.

Q Actually your determination, then, takes into consideration to some extent deliverability, doesn't it?

A Oh, no, sir.

Q Well, permeability?

A It takes, that's the truth to some degree in any analysis of core data. You always look at the magnitude of porosity development and permeability development.

Q Do you have any data on the minimum permeability?

A Minimum?

Q Yes.

A Well --

Q On the wells cored.

A Zero, that's the minimum.

Q I thought you tied in some permeability figure with the porosity.

A No, sir.

Q With the ten percent porosity.

A In general, we found that intervals having less than ten

percent porosity did not have any permeability to speak of. We might have some with .02 millidarcy, but the water saturation in the extremely tight material would be so high it wouldn't be a factor anyway.

Q Now with regard to your determinations in this particular area, in how many of the cases of the fifty-eight wells did you determine that porosity by your gamma ray neutron log?

A Sir, we didn't make any attempt to calculate porosity from the gamma ray neutron curve.

Q How did you do it?

A We took the available wells on which we had core analyses, and as you will observe from the figures I gave you, we observed very little variation in porosity. I think it varied, say roughly sixteen percent to seventeen percent as a maximum, sixteen percent to eighteen percent; that being the case, taking into consideration that those wells were located within the area and on the edges of the area, we felt that was a good indication that there wasn't a tremendous variation in porosity.

Q So the net result of that is that on fifty-six of the fifty-eight wells, you assumed the porosity as being at a certain figure?

A Yes, sir, that is correct, as substantiated by our averages on five wells.

Q Did you follow the same procedure in the determination of connate water?

A No, sir. We had a relationship between capillary pressure data and interstitial water saturation which we used as a basis for estimating the amount of connate water in the reservoir.

Q You can do that, can you, without being able to determine the permeability or porosity on a particular well?

A We had a relationship, this reduced down to a relationship between permeability and interstitial water.

Q Where did you get the permeability?

A The permeability volumes were actually measured on the cores that were used to make the capillary pressure test.

Q Then transposed over to the other fifty-six wells, is that correct?

A We had enough information from this range to obtain what we consider to be a very reasonable interstitial water saturation volume.

Q Now would you turn to your Exhibit No. 8, please? Would you please identify the three wells that are referred to there?

A This well is the Texas Pacific A-1 No. 32; this is the Gulf Janda I No. 2; and the Gulf Janda G -- but let me be sure -- yes, G No. 1,Gulf Janda G No. 1.

Q Please give me those again.

A I'm sorry. Texas Pacific A-1 32, Gulf Janda I No. 2, Gulf Janda G No. 1.

Q What was the reason that you picked those particular wells?

A Well, for one thing we wanted in the case of Tract 1 and

Tract 3 to make a comparison between the indicated reserves as derived from your method in the case of two wells where we knew from our study that the pay characteristic was relatively constant. In other words, we wanted to make a study in which we didn't have a multitude of variables, in which we could hold some constant and investigate the effect on the others.

Q If you have a situation where you eliminate the variables, can't you inevitably come up with a conclusion that an acreage allowable would be reasonable?

A No, sir.

Q If you assume that the reserves are essentially the same and other factors remain essentially the same, that is bound to be true?

A That is not what we did in the final analysis.

Q What did you do in the final analysis?

A If you recall, we made the difference between your method of calculating reserve and our pore volume calculation in order to answer the question you have posed. We went to the entire fifty-eight well area. As I indicated previously, we did not take the position that on the strength of this analysis we supported the acreage formula, but rather on the strength of our entire fifty-eight well analysis.

Q But your fifty-eight well area, I believe you testified, was generally from the best area in the field, was it not?

A Well, sir, it's the area of high reserves generally,

although there is a substantial variation in reserves in that area also. I think whether we take our definition of reserves or yours, you will observe an appreciable variation.

Q You said your variations in reserves in the fifty-eight well area was approximately three to one?

A Approximately.

Q You had not made any study to determine the variation in other areas of the field?

A That is correct. We have not made a detailed study of any other area.

Q Do you know of any variations in the field beyond your fifty-eight well area?

A Well, I think that you can take any area of the field and that you will find variation in reserves, yes, sir.

Q But - -

A And you will find variations in recoverable gas in place or reserves, as you define them, either way.

Q You have made no reserve calculation other than the fifty-eight wells?

A That is correct.

Q Of any type?

A We have made, not of our type, we have made no estimates of recoverable gas in place. Now we have taken all of the pressure production data that we could obtain and plotted it on several other areas.

Q Could you give us the magnitude of these variations?

A What variations are those?

Q Just referred to.

A Those are the variations that we got from extrapolation of pressure production decline curves, and we have a whole sheet full of them and I would say we have at least a four-fold variation. That is the extrapolation of decline curves as used by Texas Pacific, not of recoverable gas in place.

Q That's all the reference I have to your exhibits. You can be seated, please, if you like.

A If you will pardon me, we have finally found the information that you requested on our other exhibit.

Q I'll go ahead and ask you some questions. Now you have stated, Mr. Leibrock, that in your opinion any workovers in connection with these wells in the Jalmat Gas Pool would have no significant effect upon the ultimate recovery of gas?

A Yes, sir.

Q Is that correct?

A Yes, sir.

Q Upon what do you base that conclusion?

A I base that conclusion on the fact that of all the factors that enter into the recoverable gas in place and the ultimate recovery from the field, the least important insofar as recoverable gas in place is concerned is permeability, and when you frac a well, all in effect you do is perhaps increase the permeability a

little bit.

Q A little bit, is that what you said?

A Well, it's difficult to predict how much you would change it.

Q Fracking is a fairly generally used practice, is it not?

A Well, I don't believe it is in this field.

Q Well, it hasn't been to date, has it?

A That is correct.

Q It is difficult to tell, is it not, what an effect may be of the fracking of the wells in this field?

A Yes, but that is not particularly important insofar as the abandonment pressure or ultimate recovery, because you can vary a permeability of a formation over a tremendous range and still not result in a large percentage increase, compared to ultimate recovery, comparable to all the gas available for recovery, compared to porosity and net pay thickness. The fracking is relatively unimportant in changing the ultimate recovery from the field.

Q Just one last question. You had occasion, did you not, when you were with Stanolind, now Pan American, to be acquainted with the gas proration system in the Hugoton Field in Kansas?

A Yes, sir.

Q I notice that you didn't mention Kansas as one of the places you had any information on. Is a deliverability factor used in the Hugoton Field?

A Yes, I believe it is.

Q Isn't that one of the largest gas fields in the country?

A Area-wise, but volume-wise it is not nearly as important as you would think.

Q It is certainly a field of some importance?

A Yes, that is only because of the tremendous area and the fact it covers parts of three States, but volume-wise it is a very small percentage of the total recoverable gas in place in the United States, let's put it that way.

Q It has a large number of wells?

A A tremendous number.

Q Isn't it essentially on one hundred percent deliverability?

A I can't answer that for sure. I know that deliverability is in the formula.

Q Mr. Leibrock, I'm unable to find from what you handed me the number of wells that you referred to.

A I'm sorry. It is on there.

Q How is it on there?

A I'm going to write the number of wells at the end of each bar to indicate it in the number of each group.

Q Where are you getting it off the paper?

A This was a re-evaluation of the same information on a different basis.

Q All right.

A We have indicated on here, if you would like for me to read them to you now.

Q You have shown it on there?

A Yes, sir.

Q That's all I need at the present time. Just one or two final questions here. Mr. Leibrock, you have testified that even in the fifty-eight well area on which you have made some study that there appears to be a variation about three to one in reserves in that particular area, is that correct?

A Yes, sir, in recoverable gas in place, yes, sir.

Q Now doesn't a proration formula based solely upon acreage assume that the reserves per acre are identical under each of the fifty-eight tracts?

A Yes, sir.

Q If the Commission, considering some of the factors referred to in the Statute I read a moment ago or any of the factors in addition to acreage, were able to devise a formula that would more closely relate the allocation to reserves, would you be in favor of such a formula?

A A workable formula?

Q Yes, sir.

A Yes, sir.

Q Are you in a position to state there is no formula that could be devised that would not more nearly relate the allocation to the variations in reserves, such as three to one that you have mentioned in this fifty-eight well area?

A Well, I'll put it this way. We have given a lot of thought

to that question during the course of our examination. It's our best judgment that it would be impossible to devise a workable formula that would come closer to permitting each operator to recover his fair share of the gas in place than the existing acreage formula.

Q You say it would be impossible?

A No, I say it would be difficult to find a workable formula, in our opinion, based on our study of the area and a rough look at the field as a whole.

Q In your study of the fifty-eight wells, in reaching that conclusion, did you actually consider other approaches than straight acreage and the formula proposed by the applicant?

A No, sir. As we indicated previously, despite the fact we have been working continuously, we had a limited amount of time. We felt like the most important points to be considered were the proposed deliverability formula and the existing formula, although we did take a rough look at the conditions that existed throughout the field in order to justify or to arrive at a basis for the statement that I just made, that I thought it would be difficult to find a better formula.

Q Well, you have recognized the variations and you have stated that a perfect allocation formula would allocate production entirely upon the basis of the correlative rights or the reserves as you define them, isn't that correct?

A Yes, sir.

Q Admitting that relationship, admitting the variations, are you saying that there is no formula that could be devised in this field that would come closer as a practical matter, that would come closer to accomplishing that than the straight acreage formula?

A Yes, I think as a practical matter there is no formula.

Q Have you studied any other formulas? Have you studied fifty percent acreage, fifty percent deliverability?

A No, sir, we haven't.

Q Have you studied any formula with regard to pressures?

A No, sir, we haven't, but we had a good reason for not studying a formula with regard to pressure, because we made a detailed study of the pressure distribution in the field and we feel if there were ever a field anywhere where the pressure data varies, it is in the Jalmat Field. That being the case, we don't think pressure a realistic factor in an allocation formula.

Q You don't think pressure should have a part in any allocation formula?

A In this field, we don't think that it would be an improvement in this formula, or we don't think it would be equal to the --

Q (Interrupting) Do you think that deliverability should have any place in the proration formula in the Jalmat Gas Pool?

A No, sir, I don't.

Q Isn't it true that it has a place there on the marginal wells, that they are produced on a deliverability basis?

A Yes, sir, that is correct.

MR. [illegible]: Anyone else have a question of Mr. Leibrock?

MR. HOWELL: Ben Howell, representing El Paso Natural Gas.

By MR. HOWELL:

Q Mr. Leibrock, referring to your Exhibit No. 2, in your Group 4 area, your first bar there in which you have high reserves and low deliverability includes four wells, I believe?

A Yes, sir, that is correct.

Q Which is actually less than ten percent of all of your group 4 wells?

A Yes, sir, I think that's right. I haven't calculated it.

Q I think you have fifty-five?

A Yes, sir.

Q It is certainly less than ten percent. Now the deliverability of those four wells, the average deliverability is shown at what figure?

A The average deliverability is shown at approximately four million.

Q On those four --

A (Interrupting) Just a minute, we will give it to you exactly. The average deliverability is --

Q (Interrupting) Shown as five hundred forty thousand cubic feet a day, isn't it?

A That is correct.

Q And that is, in effect, a marginal well right there, isn't

it?

A Well, it possibly is.

Q It is certainly close to being a marginal well?

A Well, I think if I understand your question, it would depend to some degree which system it is tied into.

Q The average production somewhere in the Jalmat Field is somewhere in the vicinity of about fifteen, twenty million a month per well, isn't it, per unit?

A That may be right.

Q So that the well that has a deliverability of only five hundred forty thousand is just crowding if it produced every minute of the time to make the allowable, would it not be?

A That possibly would be.

Q The operators of those wells, if they were prudent, would probably do something to clean out the well and get it into a better state of production, would they not?

A Well, they might.

Q Would you not anticipate that that low deliverability in those areas was due to some mechanical defect or trouble in the well itself?

A No, sir, I don't think there is any reason to reach that conclusion.

Q Did you make in this study, did you make any attempt to distinguish which wells were not open in all the producing formations?

A No, sir, we didn't attempt to make that study, because we felt it would be extremely difficult to come up with an analysis that would cover a sufficient number of wells.

Q But you do know there are a number of wells which are not open in all the producing formations, do you not?

A No, sir, I do not know that to be the case, no.

Q Referring again to the exhibit, your Exhibit 2, in your Group 1 wells there appear to be only two wells represented in that tall bar, is that not correct?

A Yes, sir.

Q So that out of that group of fifty-five wells, the two alone seem to be a great exception to the rule?

A Yes, sir, but that taken by itself has no significance. The significant thing about this group is that the two wells, the analysis of them, despite the fact that we are only looking at two wells, tend and do perpetuate a trend that we have observed on the other wells and they do that in the case of every group that we analyzed.

Q But you have forty-three wells in that Group 1 which are represented by your first two bars, with a reasonable relationship?

A No, sir, I wouldn't say that it's a reasonable relationship. I don't know what you mean by "reasonable relationship".

Q Mr. Leibrock, the variations that you have developed are by smaller groups and do not reflect the same acreages as are shown by the larger groups here?

A Yes, that's right. I am glad you asked the question, and if the Commission please, I would like to refer to these maps in order to better answer your question.

Q I think you have answered it, you said they did.

A I don't think I answered it properly, because there is a good reason why our evaluation differs.

Q I didn't ask you the reason for your evaluation. I asked you a question which I think you answered. If you want to expound on it later, I'm going to ask you to do it on your own time.

MR. MALONE: If the Commission please, I believe that the rules permit a witness to explain his answer, and I don't know whether Mr. Leibrock wants to, but I believe he is entitled to the courtesy of an opportunity if he does. I would like to move the Commission for that permission.

MR. PORTER: The witness may explain his answer if he so desires.

A I would certainly appreciate it, because I have a very good reason for expanding on it. In the first place, you recall in the analysis procedure followed by Texas Pacific, they broke their areas down into four reserve groups. For example, the solid red area here represents their high reserve group -- I believe this is the reserve map here -- the red area represents the high reserve group. The very procedure they followed makes it impossible to tell what is happening within any of these wells. In other words, their procedure technique is such that you can't from their

analysis or from any of their exhibits tell the extent to which migration is occurring across lease lines. That is the basis of our analysis, to break it down in the smaller groups to tell what is happening in any one area; that is the crux of the situation, where is gas occurring across lease lines, which we are not concerned with in the broad over-all picture.

We are concerned with what is happening in individual areas where correlative rights is of paramount importance. That is the point I wanted to make in connection with your question.

Q Thank you, Mr. Leibrock. However, in all proration it must be an approximation of the ideal or perfect formula, as you defined it, I believe?

A Yes, sir.

Q And there are inevitably going to be variations?

A Yes, sir.

Q And just as it's a practical impossibility to keep a well constantly in balance, there is always overproduction and underproduction in gas pools, is there not?

A Yes, sir, I believe that is a reasonable conclusion to reach from our analysis of all the pools included in our study.

Q Now referring to your Exhibit No. 5, the top section of your Exhibit No. 5 which contains the red bars shows the month's average overproduction, I believe, in different pools, with reference to the wells in those pools, is that correct?

A Yes, sir.

A No, sir, it is not.

Q For example, referring to the West Kutz-Pictured Cliffs Pool, which shows to be some 2.31 hundredths, month's average overproduced in the overproduced wells, the average monthly allowable for those wells is about how much?

A I don't have that figure here.

Q Well, wouldn't a figure of somewhere around two and a half million cubic feet per well per month be approximately that?

A Well, sir, I don't have any reason to quarrel with that figure.

Q With the Fulcher-Kutz, where you show something like 2.015 average overproduced months, would a figure of three million a month allowable per well be a reasonable figure?

A Well, again I don't have any reason not to agree with that.

Q Well, I think it's a fairly simple calculation to refer to the November schedule, and it was the November proration schedule from which you based that. I believe the November current allowable for all the wells, the pool total is five hundred forty-eight million four hundred eighty-three thousand cubic feet; and for the West Kutz, and the number of wells in the field is two hundred twenty, so that is in the vicinity of two and three-quarters to three million per well allowable?

A Yes, sir.

Q So that the overproduction in those fields per well is a

relatively small amount of gas, is it not?

A Yes, sir, if I understand your question right, and in an effort to give you a little better answer, is it concerning you that we have analyzed each field separately and that we have taken fields here in which the number of the wells varies appreciably between fields?

Q No, it isn't concerning me. I'm trying to get at the facts and the basis of the analysis you have made and look at an alternate basis of analysis.

A All right, sir.

Q Now, referring to the Jalmat Gas Field, what would the average well's allowable be?

A Oh, it looks like about 2.2.

Q 2.2 what? Isn't it about twenty-two?

A That's about right. That's right.

Q So that when we're talking about 1.933 overproduction in the Jalmat average for the overproduced wells, we are talking in a figure of forty million as compared with a figure of five or six million, in referring to the Fulcher Kutz-Pictured Cliffs and the West Kutz-Pictured Cliffs Field in the San Juan, that is correct, isn't it?

A Yes, sir.

Q Now, referring to your Exhibit No. 8, first let's get No. 6. Do you have available that you could furnish us -- I'm not going to ask you to do it now, I don't want to take the time

Q Thank you. We may want some questions after we have a look at that. Now going to No. 8, what is the difference in the three tracts as to time that the wells have been produced?

A I can't answer you specifically, without digging into it pretty deeply, but this well, of course, has been producing a lot longer than this well. The Tract 3 well has been producing substantially longer than Tract 1.

Q It has been producing substantially longer and still has a higher deliverability rate than Tract 2 well?

A Than Tract 2, yes, sir.

Q That is correct, then. Now, the relationship between the recoverable gas in place as calculated by you, and the comparison of the allowables, taking the seventy-five percent deliverability times acreage, is closer than the reserves as calculated, the relationships as calculated by the Texas Pacific calculation?

A Yes, sir.

Q That is correct, isn't it?

A Yes, sir.

Q The formula more nearly applies to recoverable gas as calculated by you?

A Yes, sir.

Q Now, in making these reserve calculations, did you make allowance for the production that has already taken place?

A Yes, sir. These reserve calculations, our calculations of the recoverable gas in place, taken into consideration the pressure in the formation at the time.

Q That is after the production of whatever has been produced from any tract?

A Yes, sir.

MR. HOWELL: I think that's all. I would like possibly to ask some other questions after we have a look at the list.

MR. MALONE: We'll be glad to furnish the list. It may be night before we can compile it. It includes a large number of wells.

MR. PORTER: We will take a short recess.

(Recess.)

MR. PORTER: The meeting will come to order. Mr. Grenier.

MR. GRENIER: A. S. Grenier for Southern Union Gas Company. I have a few questions I would like to ask you if I may, Mr. Leibrock.

A Yes, sir.

By MR. GRENIER:

Q Turning first to your Exhibit 1-A, I gather that you are not standing on Exhibit 1 now but 1-A represents your current thinking in that regard, is that right?

A As I explained earlier, as Mr. Malone explained, there is no difference in the conclusion. There wasn't a mistake except as to the color.

Q I want to find out which one you would prefer to talk about.

A I will talk about this one.

Q What was your standard to determine whether or not there was agreement? I gather that you colored something yellow only if there was agreement, is that correct?

A Yes, that is correct.

Q What was that standard, that they had to have been the same color on the two exhibits of Texas and Pacific?

A That is correct.

Q Now, within those blocks that Texas and Pacific was using, there could have been some rather substantial variation, is that correct?

A Yes, sir.

Q If they fell anywhere within that, you regarded them as being in agreement?

A Yes.

Q But if a well was in the light blue on one map and light red on the other, even though just marginally across the line, you nevertheless treated them as being fully out of agreement or in disagreement, is that correct?

A Yes, sir.

Q So that your 1-A doesn't give any indication of proportion

of disagreement or agreement --

A (Interrupting) If I --

Q -- it merely indicates whether or not they fell in the same one of these four blocks which happen to have been picked by Texas and Pacific, is that correct?

A Yes, sir, that is correct.

Q Now, referring to your Exhibit No. 2, I wasn't entirely clear as to the relationship of or the effect given to acreage in this study, and in several of the others which you later presented. Are all of your reserve figures reduced to one hundred sixty acre bases, or does, say, a six hundred forty acre tract have four times as much reserve attributed to it, or just what was done in that regard?

A Well, that will permit me to clarify this situation. As I indicated earlier, this analysis is confined to an attempt to interpret the data offered by Texas Pacific, and all of the information on this property was derived from their initial Exhibit No. 10 here. We had no way of identifying their wells. All we know is that they plotted approximately two hundred twenty points on here, each point representing a well. Since they didn't identify, they didn't give any more specific definition to this plot, I am forced to go along with their definition, and I can't elaborate on it any further.

Q You don't know whether these are reserves computed on a standard basis or on the actual basis?

from forty acres to six hundred forty acres?

A Yes, sir.

Q All other things being equal, if we can imagine such a situation here, the one would have then some six times the reserves in it than the other?

A I don't believe that is true under their method, because they didn't pay attention to reserves, I mean to wells, the acreage assigned to wells, as near as I can determine. They simply extrapolated the pressure production data on each well without regard to the acreage assigned to the well. That is my understanding of the exhibit.

Q The extent that there is that element of confusion present, it goes not only to their material but also the conclusions which you drew from it, is that correct?

A I don't believe that is correct, no, sir.

Q Did you attempt to correct back to a standard one hundred sixty acre basis?

A No, we didn't have any way to correct back, because they didn't identify their wells. However, the large majority, admittedly the majority of their wells were on forty acres and perhaps some on six hundred forty, but there are a great many more wells on one hundred sixty acres, I believe.

Q Turn, please, if you will, to Exhibit No. 3. As I understand this exhibit, what you did was simply to take the plots which had appeared on Texas Pacific exhibits and rearrange them on your Exhibit 3 in the order which was determined by the increasing size of the deliverabilities indicated, is that correct?

A Yes, sir, that is correct.

Q Now then, having put your plots on your Exhibit 3, you then drew a red line down from there to the base line at the foot of the graph, is that correct?

A Yes, sir.

Q Have you attempted to draw a trend line across the graph on the base of those plots?

A No, sir, because I don't see that there is any reasonable trend indicated.

Q Well, there's plainly a line that's going to go roughly across the sheet from one side to the other, isn't there?

A Yes, sir, and that gets right back to what I was talking about a minute ago. If we attempted to draw an average trend through here, we perhaps could do so, but in my opinion it would not be a reasonable relationship because within any well group, regardless of the size, you would have a fundamental breakdown in the approach to the problem. What I am saying is, and I am sorry I didn't make it clear earlier, you have such a tremendous variation, such a scattering of points, that any attempt to analyze it by conventional or by plotting an average curve seems to me to

be wholly unacceptable because it fails to point out those variations within any one group, which is the crux in correlative rights and avoiding migration along lease lines.

Q Have you made any attempt on their basis to determine the deviation of a well from the trend line which they have drawn?

A No, sir, I have not.

Q You have not attempted to match whatever the actual trend would be, arrived at by statistical methods?

A That is just my point. I believe the scattering is so wide that you are not justified in attempting to arrive at any statistical trend because it would not have much significance.

Q Here is the point I'm getting at. I don't gather from what you have said to date that you are prepared to state there is any closer correlation between your reserve plots and acreage than there is between the reserve plots and deliverability, you not having made studies to see how closely they correspond in either case or what the extent of deviation is from the trend line in either case. How can you express an opinion when you haven't made those necessarily basic studies?

A Well, we have made the only reasonable approach to the problem that we feel is right. What I'm trying to say is that we feel that it all goes back to our initial definition of reserves. As I said in the very beginning, we do not agree with the method of estimating reserves by Texas Pacific, and not agreeing with it, there is only one approach to the problem. That is from a recoverable

gas in place standpoint.

Q In any event, having started down the route, you didn't attempt to see when you were through with it if there was a closer correlation between reserves and acreage than there was between reserves and deliverability?

A You are missing my point entirely. There isn't any object in attempting to draw an average line through these points after you plot them and recognize this tremendous deviation in your plot, that takes precedence over everything else. That is the crux of the thing. That is establishing how much migration you have within a given area. As soon as you reach that conclusion, you are not justified in going beyond that point, because any attempt to draw an average line through this thing would be wholly without meaning. You have too much deviation within the plot itself.

Q Suppose that you had arranged these same wells on the basis of acreage in the tract. Would you have gotten any closer correlation between reserves and acreage, which you said, I believe, would be a perfectly straight line going across the sheet at one point in your testimony, than you find here now?

A If I understand you right, did we attempt to reverse this situation?

Q Yes, and I understood you to say now that you had not attempted to correlate reserves against acreage, using this same type of technique?

A No, because of their fundamental breakdown in the analysis

technique before we got to that point.

Q So you don't think there is any closer correlation between reserves and deliverability. You have not prepared any exhibit or made such studies that would enable us to tell whether there is any closer correlation between reserves and acreage?

A Yes, sir, we made that study utilizing the methods that we consider applicable to the problem. There is only one method, that is the pore volume calculation.

Q In calculating reserves, you didn't use this method?

A No, they are not reserves. They are merely apparent reserves. They are man-made reserves. They are based on the way you produced the wells over a period of years when you didn't have any proration.

Q You didn't even do the same thing, even using your reserve calculations?

A Yes, sir, that is the result of our Exhibit No. 9 in which we plot deviation from recoverable gas in place.

Q Turning to Exhibit No. 9, was that based on the entire field or just on your five wells?

A No, sir. As I indicated previously, it is based on our five wells.

Q You said there was a three-to-one variation, I believe, in reserves?

A Yes, sir, and that was offhand opinion. There is actually a greater variation then that. I checked it during the recess

period, and there would be at least a four to four and a half fold variation.

Q With that much variation, how does that tie in with the twenty-four percent deviation which you are indicating there as being present?

A If I understand your question, you are asking me how our twenty-four percent deviation relates to my statement there's approximately a four and a half fold variation in the reserves within the area?

Q Yes, sir.

A Yes, sir. Well, that is a very good question. Let me explain this plot a little closer. This represents the average deviation for the fifty-eight wells. I think it is perfectly obvious to everyone and you have already, it has already come up in your mind that in any area, regardless of the method you employ, you are going to get some wells that won't match any formula real well at all. They are going to string off and deviate appreciably from the average. The truth of the matter is we have that situation within this area; for example, well fifty-eight would probably deviate appreciably from the curve here, whereas on the same basis, though, under the proposed deliverability formula, we have some wells that deviate three hundred percent. My point is simply this, that this is a weighted average, the average deviation from all the fifty-eight wells is twenty-four percent.

Q Well, is that the deviation on what is over fifty-eight;

is that for the fifty-eighth well, or is that for all fifty-eight?

A No, sir, that is for the fifty-eighth well, the all fifty-eight average deviating only twenty-four percent.

Q If it is three hundred percent, why isn't there -- I'm lost.

A Well, sir, I'll explain it real quickly. I think I can answer your question and make it a little clearer, the basis for our plot. For example, we studied the fifty-eight wells and in our analysis we determined the extent to which each of the fifty-eight wells would deviate from the ideal formula, and this is the plot on which we have plotted here the fifty-eight wells against average deviation. Now the difference in the two plots is this, on this plot if we go to well number fifty-eight and read twenty-four percent, that's the average deviation for all fifty-eight wells, whereas on this particular plot we can go and read the average deviation for any one well. For example, here under one hundred percent acreage, the average deviation is one hundred twenty percent. In other words, the worst well in our group, and you would always expect this, you are going to have fringe areas, the worst well deviated one hundred twenty percent from --

Q (Interrupting) Let me see if this is correct. At .30, then, that would represent the average deviation of the thirty wells that came closest to your calculation of reserves?

A That's right.

Q Thank you. That has clarified --

A By way of comparison, the other thing I wanted to point out

under the proposed deliverability formula, the deviation for well number fifty-eight would be about three hundred thirty percent, so on that comparison, your fifty-eighth well, or our fifty-eighth well, the worst well in the field, you deviate under the proposed deliverability formula, you would deviate three times as much.

Q You have made it clear what you have done. I just couldn't understand what you had done. Turn now, if you will please, to your Exhibit No. 5.

Now turning first to the blue part, all of those bars appear to be exactly the same length, is that correct?

A Yes, sir, because it's one hundred percent. The total length represents one hundred percent.

Q So that all, that the graph really shows then is that you have accounted for one hundred percent of the wells in each pool?

A That's right. As I pointed out, the most significant thing is the upper bar. This just merely completes the picture as I see it.

Q Now then, as to the upper bar, you have counted all wells that were overproduced to any extent in taking the figures above the zero line there?

A Yes, sir.

Q And then figured out what the average months of overproduction is for those wells, is that correct?

A Yes, sir.

Q Now then, are you sufficiently familiar with the practical

operation of the proration formulas and calculations here to know how long it takes between the time when a pipeline nominates for gas from a field and when it finds out exactly what the allowable for each well was, based on the true production of the well and the field?

A No, sir, I don't know exactly.

Q Would about three months be approximately a correct figure for time lag there?

A I don't really know, but I don't have any reason to disagree with it.

Q Well, if a well is one or two months out of balance, it is fairly easy, is it not, in a year's time to get that well back into balance?

A Well, you would think that it would be.

Q In other words, if it's just a month or two out of balance and hasn't been out of balance before, and it's near the beginning of a proration period, you have through that period and the entire next six months balancing period to get it back into balance, is that not correct?

A Yes, sir, I believe that's right.

Q Now, notwithstanding the fact, then, that just ordinary variations from day to day in these wells do create a time lag, as I mentioned in a previous question, you have nevertheless counted in all those wells as part of your calculation there?

A Yes, sir, the basis for the analysis is the same throughout,

Q On both sides, so to say, southeast against northwest?

A Yes.

Q You have not attempted to determine how much of what you show there is represented either individually or on a comparative basis by wells, which actually are pretty close to being in balance?

A Oh, this exhibit, of course, doesn't reflect that. This, however, I think is a comparison analysis of all the factual data that were available to us.

Q You haven't attempted to make any such study for wells, only such wells as are seriously out of balance as opposed to all wells?

A No, sir, we haven't broken it down into that group. Excuse me. You're familiar with our number 4 in which we broke it down into three fields?

Q Yes.

A My answer to your question was that we hadn't done it on all the fields involved here, but you will recall that we broke down the three fields, Jalmat and the two San Juan Basin fields, as depicted on Exhibit No. 4.

Q And there, as I remember it, you, if we may go back to that one, approximately fifty percent of the wells in those pools were within one month of being even, is that correct?

A Yes, sir. In Jalmat approximately forty-five percent were within one month of being balanced. Over here you have a lower percentage; in Fulcher Kutz you have approximately thirty-eight

percent, thirty-nine percent, which are within one month of being balanced; and over here you have a slightly smaller percentage which are within one month.

Q Do you have any impression as to how the Northwestern and Southeastern areas would compare with each other as to the directness of relationship of reserves to acreage? Is there a closer correlation in the Southeast than in the Northwest?

A If I understand your question, if you don't mind if I rephrase it to be sure I understand it -- as I understand you, you are asking me if there is less variation in reserves in San Juan Basin than in the Southeast New Mexico area?

Q I don't care which way you take it.

A I'm just trying to understand it.

Q I'm just trying to see if you think there is a greater or lesser relationship between reserves and acreage in one pool than the other, or do you think they are about the same, I should say one area?

A Well, not having made a comprehensive study of the San Juan Basin or any of the fields in it, I don't really believe that I can answer that question.

Q Thank you. Turn, please, now to your Exhibit No. 6. I beg your pardon, excuse me, I do have a question on this one. Taking your uppermost bar, where I believe you show nine wells contribute to over production, and what --

A Three.

Q Three contributed to underproduction. How did you arrive at the average for the nine wells?

A Simply by taking the total overproduction and dividing by nine. This is an average per well. It is a straightforward arithmetic average.

Q Now then, if eight of those wells had been very close to the line, and one wild deviant in there, you would have got the same result as far as your bar is concerned as you would have if the situation had been that each of them was approximately right at the point now marking the end of the bar?

A Yes, sir, if that had been the case, but I believe our well distribution chart shows that you come up with essentially the same conclusion as we did from this one. It tends to give weight and validity to this.

Q But your exhibit does not show any median, it is merely an arithmetic average?

A That's right.

Q -- of all these that happened to be there?

A Yes, sir.

Q And again without regard to whether they are within the one or two month tolerance, which might be easily cured?

A Yes, sir.

Q Please refer to your Exhibit No. 8. Were all three of these tracts, Mr. Leibrock, within this fifty-eight well area?

A Yes, sir, they were.

Q How many of them were wells on which you had cores, if any?

A I don't believe we had cores -- we had cores on one of these wells, I believe.

Q Now, as to porosity, what control did you have as between these three wells? Did you base that on your logs of the three wells, or did you just assume that this approximately sixteen to seventeen percent porosity was going to be a standard competent across the board for that?

A No, sir. I think that our study of porosity variation, taking into consideration the five wells in which we had core analyses, demonstrated satisfactorily that porosity does not vary tremendously. That is the average porosity,for that reason I feel we were justified in using the same porosity.

Q In any event, you did use the same porosity for all three, based on your five cores?

A Yes.

Q How about the connate water content, did you do the same thing there?

A Yes, we did.

Q How about the permeability, did you assume that to be the same, so that the wells would be moving considerably similar amounts to the well bore?

A Well, sir, permeability didn't enter into our calculation.

Q It would have entered into the calculation down below?

A You mean as to the extent of the assumed abandonment pressure?

Q Yes.

A Yes, permeability, if it varied appreciably, would enter into the abandonment pressure to a small degree, but a very small degree in the case of these three tracts because they are all located such that I don't believe as a practical matter there will be any substantial variation in abandonment pressure. Therefore, the assumed abandonment pressure of one hundred pounds in each case is reasonable for three wells.

Q Are these five core analyses here at this time?

A No, sir, they are not.

Q I unfortunately am not going to be here tomorrow; I am therefore trying to conclude my cross examination today. I wonder if it would be possible to have them made available to Texas Pacific sometime tomorrow, if they could be sent up here by air mail overnight, so that they might have an opportunity to look at them?

A Well, I'm not in a position to say. That is an internal situation as regards the various companies involved. Based on past experience, it is sometimes difficult to get.

Q Now, let me ask you one other question about these reserves. Do these purport to be reserves today, or were they reserves as of the way the good Lord laid it down, or as it was when prorationing was put in?

A No, sir, and that point certainly needs to be clarified. The recoverable gas in place that we have calculated first is

approximately as of the first of 1957, at which time these pressure conditions existed. The reserves as derived by the Texas Pacific method are approximately at the same date. In other words, you will notice on each graph that we extrapolate down to one hundred pounds to some value beyond the figure we have used. We have simply indicated the production that is indicated by their curves beyond 1-1-57, so that in each case we are on a comparable basis.

Q Now, referring please to your Exhibit No. 10, I wasn't entirely clear as to just what you were trying to suggest to us in presenting this exhibit, Mr. Leibrock. Was the suggestion that merely because it would add to the revenues or subtract from the revenues of certain companies if we made any change in the present formula, that therefore any change even though for the better was nevertheless a bad thing?

A No, sir, this is simply an exhibit prepared to acquaint the Commission and everybody with the redistribution that would occur.

Q Are you familiar with what the redistribution was at the time when prorationing was first put in here, as contrasted with the way people had been producing and getting revenues in an unregulated state?

A No, sir.

Q What percent of the total sales of the field, taken at ten cents per MCF, would be represented by these total overages on one hand, or the underages on the other? Do you have anything

on that?

A No, sir, I haven't added them up.

MR. GRENIER: That concludes my questions. As I mentioned in the course of my cross examination, I unfortunately will not be able to be here tomorrow due to previous commitments. I would like to state, however, very briefly, that Southern Union Gas Company very strongly supports the application of Texas Pacific in this case, and believes that it is definitely to the best interest of all concerned; and that in attempting to justify the straight acreage formula as they have done in this instance, they have failed in any way to show that theirs truly comes any closer to actual reserves than does the deliverability formula, and is in itself admittedly pretty far away from a perfect formula. I think that the companies represented by Mr. Malone have failed to present their case and that Texas and Pacific is entitled to the relief which they have requested. Thank you.

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

By MR. COOLEY:

Q Mr. Leibrock, I have one question concerning one more exhibit. Would you please turn to Exhibit No. 9?

A Yes, sir.

Q I don't want to belabor this point, but it seems to me that Exhibit No. 9 is the culmination of all your efforts, that it purports to show that one method of prorationing is better than

Q I don't completely understand what you measured, or what you considered the perfect formula.

A All right. The perfect formula, I believe by our definition, which I believe is also consistent with the New Mexico Statute, is that recoverable gas in place, that is, if each operator could recover his proportionate part of the recoverable gas in place, and by proportionate part I mean that gas in place which actually underlies the acreage assigned to each of his units; any formula which would give you that recovery would be an ideal formula or a perfect one.

Q Then would that be restated as that the perfect allowable would be thus calculated, that a well would receive a fraction of the total pool allowable in the same proportion that the recoverable gas in place under the tract which is dedicated to that well bears to the total recoverable gas in place to the entire pool?

A Yes, sir, if I understand your question, that's right.

Q Then your perfect allowable would range, I believe you say there's four and a half, four to four and a half fold variation in gas in place?

A Yes, sir.

Q Then a range of allowables granted under your perfect formula would also range from one to four and a half, would they not?

A Yes, sir.

Q -- for the extreme ones?

A I believe that's correct, although I haven't calculated it. Yes, that is right on recoverable gas in place.

Q Then have you taken a calculation of the recoverable gas in place for each of the fifty-eight wells and determined what the total allowable for the pool would be, and taken a percentage on that basis to get the deviation for any given well?

A No, sir, the deviation, the whole study is confined to the fifty-eight well area. The proration schedule which we made up, assuming an adoption of the proposed deliverability formula, was made through the whole field, and we used those figures in these calculations to be consistent but, or I should say in order to be sure that the allowables that we calculated on the proposed deliverability formula were accurate as they relate to all the other wells in the field.

Q Well, obviously if one well receives more than its proportionate share of the allowable, then of necessity some well in the pool must be receiving less, is that the proper deduction?

A Yes, sir.

Q And under the perfect formula, you would have the uppermost extreme receiving an allowable of four and a half and the lowermost extreme receiving an allowable of one?

A Well, we have prepared the distribution study on that basis to see, we have some wells, if you broke it up between wells,

that is, if you took the fifty-eight wells and broke them down as between these wells which would deviate below and deviate above.

Q Yes, that is what I am getting at.

A We have made a study on that. Some would deviate in one direction and some would deviate in plus direction.

Q Some would receive less allowable than their fair share, some would receive more?

A That's right.

Q Under either formula?

A Under either formula.

Q You have taken into consideration how much a particular well varies; you have taken into consideration whether it should receive four and a half or a one allowable?

A Yes, sir. Let me put it this way. We have calculated gas in place for each of these tracts, and from the calculated gas in place we have then calculated for the two formulas the percent to which it would deviate and the results have been plotted here.

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

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

By MR. UTZ:

Q Mr. Leibrock, can you tell me what deliverability information you used for your studies in this field?

A Yes, sir. We availed ourselves of all the deliverability information that could be obtained. I think some of them were

obtained late in 1956 and others early in 1957. We did everything possible to get the latest information. We obtained the bulk of our information from the four-point back pressure test.

Q Referring to the graph behind you there --

A Yes, sir.

Q -- Did you make a plot in the same manner of relationship between the deliverabilities and your void space or volumetric reserves?

A No, sir, we did not.

Q Such a plot would be very interesting, would it not?

A No, sir, I don't believe that it would, because we, I think, have pretty well established the fact that deliverability is not a proper factor in the formula, I mean based on our analysis that -- you remember my conclusion that deliverability is not a proper factor in the formula because it weights too heavily on a great many things that have no bearing on the calculation of recoverable gas in place.

Q Do you have the information available that a person could make such a plot?

A Yes, sir, I believe so.

Q Do you have the reserves and deliverability on your fifty-eight wells?

A Yes, sir.

Q Would you make that available to me?

A Yes, sir.

MR. UTZ: I think that's all I have.

MR. PORTER: Anyone else have a question?

MR. CAMPBELL: Before this witness is excused, if the Commission please, I would like to make a couple of requests for data that has been mentioned here but has not been made available by this witness. I would like to obtain for examination the core analysis on each of the five wells upon which this fifty-eight well analysis was made and basic conclusions drawn, because that is the best evidence as to the conclusions of the witness. I would like to also request the data on the reserve calculations and deliverability estimates on the fifty-eight wells referred to in the witness's testimony.

MR. MALONE: I'm sorry, I didn't understand that request.

MR. CAMPBELL: The same data Mr. Utz requested, his own reserve calculations on the fifty-eight wells with relation to the deliverability data on those fifty-eight wells. I do not know what the status of that information is so far as that witness is concerned. We would like to have the information in the morning, at least, if we could, before we put on our rebuttal testimony.

A I don't see how we could get all the core data available, even if the operators released it.

MR. MALONE: To try to clarify that situation to the Commission, the cores are the individual properties of the companies they belong to. We would have to get their consent to release them now. I would assume that, since they were willing to make

them available for this study, they could be released, but the time required to get a release would not be adequate between now and tomorrow morning. The core information is in Roswell and Hobbs, as I understand it; that is where it would have to come from, and the companies who own it are going to have to clear the release of it internally, in order to release it. We are willing to make available any proper information, but the time limitation of tomorrow morning, I believe would be unrealistic.

MR. CAMPBELL: If the Commission please, it seems to me this is rather vital information to not be available to the Commission on some basis.

MR. MALONE: I didn't state it was not available. I stated it would take additional time to bring it. It is available and we are willing to make it available to the Commission.

MR. CAMPBELL: Is there any information available here with regard to the cores that this witness can give us, with regard to the amount cored and the amount of net pay discarded of analysis so we can determine the basis on which you started your assumption as to the fifty-eight wells?

A I thought I covered that.

MR. CAMPBELL: You never said how many feet had been cored in the cores.

A As I recall, of the cores that we had to work with, with the exception of one well, and I would have to check to be sure, we had a representative section and it isn't important.

MR. CAMPBELL: It is important to us. Let's leave it at that.

MR. MALONE: If the Commission please, with a little more checking we have found the information on the Gulf wells, or at least one of them is available here. They have to get clearance from their district office, which they could try to do by telephone tonight and try to have cleared by 10:00 o'clock in the morning. The information is here and could be released, but the men who have it do not have authority to release it which, as I am sure the Commission understands, is perfectly standard operating procedure with all companies. It looks as though we could have one available for tomorrow morning, and then, of course, there is one which was the subject of this exhibit.

MR. CAMPBELL: Subject of what exhibit?

MR. MALONE: The composite.

MR. CAMPBELL: Which two wells would those be, Mr. Malone?

MR. MALONE: Pan American -- Can I speak off the record?

MR. PORTER: Yes.

(Discussion off the record.)

MR. CAMPBELL: If this is agreeable, if the core analysis, the one that Gulf has, could be made available in the morning and the one that you used for your exhibit, I understand, is available, is that correct?

MR. MALONE: I think it can be made available, but there is going to have to be some telephoning done before it can be cleared.

MR. CAMPBELL: If the other three can be furnished to the Commission at a later date for study, and the Commission be advised at the time of the submission that they are or are not confidential except as to the Commission, we will withdraw our demand for their presentation at this time. Actually it occurs to me that there is some information that I have asked for here that is a part of the core analysis that certainly would not be confidential in anybody's book; that is the length of the cores and the amount of the net pay. It doesn't seem to me, that might be, but the length of the core, we ought to be able to get that from this witness.

MR. MALONE: That information is on the core analysis, which we do not have here available but that we are offering to get.

MR. CAMPBELL: He doesn't have notes on it here?

A No, sir, I read you all the information I have. I thought we gave a pretty good rundown on our composite log. I don't know how it can be much plainer.

MR. CAMPBELL: On your composite log?

A Yes, our core analysis.

MR. CAMPBELL: I'm talking about the individual logs.

MR. MALONE: This is an individual log.

(Discussion off the record.)

MR. CAMPBELL: That original statement I just made about an approach to this thing, we will go along on that basis. We definitely feel that this data is important to our rebuttal of this witness's testimony.

MR. MALONE: We will do our best to meet the request by tomorrow morning on the two and to make the other three available on a confidential basis to the Commission.

MR. PORTER: Mr. Cooley.

MR. COOLEY: This is not just in respect to this particular case, but a clarification of the Commission policy that may well be borne in mind in the future. Any time information, whether confidential or otherwise, is made the basis of testimony at a hearing before this Commission, that information will be furnished to this Commission and will be required to be furnished at any time, furnished voluntarily.

MR. PORTER: Then, Mr. Campbell, your last request is that they have the information from the two core analyses available in the morning and that the other three be furnished at a later date?

MR. CAMPBELL: To the Commission, we go along with the statement, request about those who furnish them -- no, I don't believe we will do that. If the first two are available, we think that all five ought to be available, but we won't insist that they be available tomorrow morning. They ought to be a part of the record.

MR. PORTER: Then, Mr. Malone, you have agreed to supply that information in the morning?

MR. MALONE: Yes, to the extent it is in my power to do it. I think we can get it done all right. If we don't, we'll sure have a satisfactory explanation, but we will have it.

MR. JOHNSTON: Mr. Porter.

MR. PORTER: Mr. Johnston.

MR. JOHNSTON: I would like to ask a question to the statement that Mr. Cooley made about evidence that would be furnished the Commission. Now does that mean that the evidence will be required to be furnished to the Commission and retained by the Commission as confidential information, or does that mean that you, do you mean that any information like that must be turned over to the other party, in this case, of course, Texas Pacific? I am not asking specifically about the information he asked for here, but to clarify your statement of policy.

MR. COOLEY: When information is used as a basis for testimony, as the underlying basis for factual testimony presented before this Commission, it will be required to be presented; if not presented voluntarily for the use in this hearing, in any given hearing, for the use of all parties involved in that hearing. The company cannot be expected to rebut testimony based on confidential information.

MR. JOHNSTON: That is the question I wanted to be cleared up. It would be required to be made public information before the Commission or in the hearing?

MR. COOLEY: They have their choice whether to bring forth the confidential information, to make it a basis of their testimony. Once they do so, they must reveal the basis of this testimony and this information, in order that the opponents and the Commission

may be afforded an opportunity to evaluate that information and thus the validity of the conclusions drawn therefrom.

GOVERNOR MECHEM: I think you have one clarification; that is, it should be available for examination. They don't have to come in and put it on the table. It should be available for examination.

MR. COOLEY: I thought that was what I said. The Governor requested that I clarify it further, that the information need not be introduced as an exhibit, but it must be available for the use of the Commission or to explain the conclusions drawn therefrom at the hearing. That applies to the adversary, as I said a moment ago. They can't be expected to rebut testimony based on confidential information.

MR. JOHNSTON: The statement that you made said it would be required any time we base --

MR. COOLEY: (Interrupting) It seems to me if it is made the basis of testimony it should be brought voluntarily. If it is withheld and if it is not brought forward, we will be forced to invoke our subpoena powers.

MR. JOHNSTON: Does that mean turning it over to the ones in opposition?

MR. COOLEY: This information, when there are inquiries directed concerning the information, as Mr. Campbell has directed at this hearing, just as an example, delving into what the bases for these conclusions are, these questions must be answered, I

mean how the details of the information, the underlying facts and the information --

MR. JOHNSTON: Then that simply means that the information must be made available to the Commission and also to the other party?

MR. COOLEY: Any other interested party in the case, insofar as is necessary to properly allow them to evaluate and rebut, if possible, the conclusions drawn therefrom.

MR. JOHNSTON: I understand that, but who is going to decide the insofar.

MR. COOLEY: The Commission.

MR. JOHNSTON: All right.

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

MR. CAMPBELL: Off the record.

(Discussion off the record.)

MR. PORTER: The witness may be excused, if there are no further questions.

(Witness excused.)

MR. PORTER: Mr. Malone, I believe you said this is all the witnesses you have?

MR. MALONE: This concludes the case on behalf of the companies for whom I was acting. I believe our exhibits have been admitted in evidence?

MR. PORTER: Yes, sir. Anyone else desire to present testimony at this time?

MR. NOWELL: El Paso Natural Gas Company has testimony to present.

MR. PORTER: You may proceed.

F. NORMAN WOODRUFF

a witness, of lawful age, having been first duly sworn on oath, testified as follows:

DIRECT EXAMINATION

By MR. NOWELL:

Q Will you state your name for the record, please?

A F. Norman Woodruff.

Q What is your position with El Paso Natural Gas Company?

A I am the company's manager of gas proration operations.

Q What experience have you had in connection with gas prorationing?

A I have handled the work for the company since the institution of prorationing in the various pools in New Mexico, since prorationing was instituted in those pools. Part of that time I was active in the prorationing of gas for the Railroad Commission of Texas.

Q How long were you employed in the gas proration department by the Railroad Commission of Texas?

A I headed the gas department of the Railroad Commission of Texas for about a year and a half.

Q Now, in connection with the making of gas nominations, what organization does El Paso Natural Gas Company have to determine the making of nominations in the pools in the State of New

Mexico?

A We have organized a proration department.

Q How many people do you have in that department?

A Thirty-seven people at this time.

Q Has that been organized since the institution of prorationing in this state?

A Yes, sir, it has.

Q Do you have any people in the field employed by other departments who work in connection with the prorationing of gas in New Mexico?

A Yes, sir, we do. Our dispatching sections in both the Lea County and San Juan areas try to operate the wells in such a manner as to comply with the proration rules.

Q Now, what are the sources of gas supply to that part of the El Paso Natural Gas Company's system that is connected to the Jalmat Gas Pool?

A The sources of our gas supply in the Jalmat Gas Pool comes from the various operators connected to our pipeline facilities and from wells of El Paso producing from the Yates, all except the lower one hundred feet of the Seven Rivers formation.

Q Well, the Jalmat delivers into what is known generally as our Southern System, does it not?

A That's right.

Q What are the sources of gas supply for the Southern System?

A Primarily the source of gas is residue gas from casinghead

gas processing plants in Texas and New Mexico, the balance of the total demand is made up from our dry gas or gas wells sources.

Q Do you know how many plants provide residue gas to the company?

A In the Permian Basin area, as of September, there were fifty-three plants in Texas and New Mexico, of which seven produced some gas well gas into the plants as well as casinghead gas.

Q Now, how many of those plants are operated by companies other than El Paso Natural Gas Company?

A My recollection is that all but six plants are operated by other producers.

Q Who determines as to those other plants not operated by the company the volumes of gas that will be taken and processed and made available?

A The gas, of course, is regulated by the operator of the gasoline plant. The gas available to the gasoline plant is dependent on the amount of oil permitted to be produced from the fields connected to the plant by the regulatory body governing that.

Q In making nominations for gas to be produced from New Mexico prorated pools, what steps do you take to estimate in advance the market demand expected in the future?

A Well, we first attempt to predict the demand of each of our customers. Some customers furnish data to us, other ones we must estimate ourselves. We have to try to predict temperature

breaks anywhere that might occur along our system, and where they occur. We are influenced also by shutdowns that may occur, the holidays, we must visualize the effect of holidays, strikes.

Q What effect do holidays have upon our market demand?

A Our demand for gas drops off considerably because of the shutting down of the plants during the holiday season.

Q I believe you have already testified that you do ask estimates from the various companies, the major customers?

A That is right. There are other matters which we must consider too. We are affected by the price of metals that are mined in the area in which we serve; plants shut down if they find it is not profitable to mine the metals. That is something that we must have information from the plant operators so as to know how much gas they will be using. We also serve considerable gas for irrigation purposes, and that is influenced by whether it is dry or wet.

All of those matters must go into the consideration of what our overall market demand for gas will be out of the Permian Basin area.

Q Now, in making nominations, do you each month determine to the best of your ability the best estimates of requirements of your customers for the month for which the nomination is made?

A We do.

Q Now, what determinations do you make in determining your supply?

A As stated, we have to try to visualize the action of the

regulatory board governing the oil production, such as the number of barrels permitted to be produced in New Mexico, the number of producing days in Texas. We again have the temperature change which affects the gas-oil ratio ofthe oil wells producing the residue gas. Severe temperature drops also cause freezing in the wellheads' meter runs, which vary the amount of gas available to our system. The plant residue varies also. I have some figures that I might show.

Q Will you give some typical figures of variances in the supplies of residue gas available from various plants?

A My figures will reflect our experience during the month of September, 1957, during the first three days, the peak three days, that's the three consecutive days that are peak, and the last three days of the month with the monthly average.

Q As I understand it now, you are taking three periods of three days each; the first period is the first three days in the month, the second period is the three consecutive days of peak production wherever they fell in the month, and the third are the last three days in the month?

A That's right.

Q And you are comparing that with the monthly average?

A That is correct. An example is the plant which in the first three days produced 26.4 million, during the peak three days 30.2 million, during the last three days 22 million; during the month an average of 27.3 million. We have a plant that during

the first three days produced 142.1 million, during the peak three days 199.2 million, during the last three days 156.8 million, an average during the month of 173.6 million.

Here is a small plant which produced during the first three days 12.9 million, peak three days 17.6 million, last three days 10.4 million; average for the month, 14.7 million.

I also have figures which reflect the variation for those same periods for all of the plants connected to our system. During September, for the first three days, we received one billion two hundred ninety six point three million cubic feet. During the peak three days, one billion five hundred ninety-seven point six million cubic feet. During the last three days, one billion three hundred forty-six million cubic feet. Average for the month, one billion four hundred thirty-one point four million cubic feet.

As an example of the variation represented by those total figures, it was three hundred one point four million variation between the first three days and the peak three days. Two hundred fifty-one point four million between the last three days and the peak three days. One hundred sixty-six point two million between the average for the month and the peak three days.

Q What effect does that have on the necessity of taking gas from gas wells in Lea County?

A For our market demand to be fulfilled for gas out of the Permian Basin area, we must have sources that we can turn on during

the variable periods that I have mentioned. Lea County is the prime source of that gas. We must go to our gas wells in Lea County to turn on gas during these periods.

Q In Lea County generally, what facilities are required in order to process gas, in order to make it gasoline, gas marketable through our pipeline?

A Treating for the sour content of the gas, dehydration, for extraneous liquids, and normal plant processing. We try to process all of our gas through plants so as to recover the liquid hydrocarbons that may be obtained in that manner. However, during our demand periods, we have experienced, particularly in the last couple of years, demands in excess of our plant facilities, which require that gas go down the pipeline after only treating and dehydration.

Q Now, do you then estimate the sources of supply that will be available to meet the market after the market estimate has been made?

A Yes, sir, we do that.

Q What do you estimate first?

A We estimate the residue gas available from the casinghead gas processing plants.

Q Is it the company's policy to take all the residue gas that is available, rather than to flare and waste that?

A That is our policy.

Q Then if the market demand is in excess of the available residue coming out of the Permian Basin, what is the next step

A The next step is to take the remaining demand and divide it among the various gas producing pools.

Q Are most of the gas producing pools to which we're connected in the Southern Division located in Lea County?

A Yes, sir. There are some pools of minor significance located elsewhere.

Q We have very few gas wells connected directly to the system in Texas?

A That is correct.

Q Now, in making these estimates, what do you do about guessing as to the number of producing days in Texas and the number of barrels of oil in New Mexico?

A We study past performance, try to second-guess the operators and what they will demand, and the Commission, what they will permit, and estimate the volume of gas which we anticipate will be available on those conditions. We often find that we are wrong. Our estimated demand for dry gas varies accordingly.

Q Is that the same system that you have used in making nominations since the beginning of prorationing?

A Yes, sir, that is correct.

Q Was there any change in the system of making nominations at the end of the year 1955?

A No, sir.

Q And what is your policy with reference to making the gas

available or producing the gas from the wells, the gas wells to which we are connected?

A We attempt to take the allowable of every well.

Q Is it always possible to do that?

A No, sir, it is not.

Q Now, have you compiled a schedule which shows the nominations which El Paso Natural Gas Company has made for the Lea County pools, the allowables which were granted and the amount of gas which has been produced?

A Yes, sir, I have. The exhibit reflects those of all for the Jalmat Pool and then for the total Lea County area.

MR. HOWELL: Will you mark that?

MR. ODOLEY: Will you make that El Paso's Exhibit No. 1, Mr. Howell?

MR. HOWELL: Yes, we will make that El Paso's Exhibit No. 1.

(El Paso's Exhibit No. 1 marked for identification.)

Q What period of time does this schedule cover?

A All of 1956 and the first nine months of 1957.

Q I'll ask you what the totals for 1956 in the nominations for Lea County dry gas were?

A Total nomination was one hundred thirteen billion, eight hundred seventy-four million, ten thousand cubic feet.

Q What allowable was received?

A One hundred seven billion, two hundred ninety-two million,

three hundred two thousand cubic feet.

Q And how much was produced?

A One hundred fifteen billion, seven million, eight hundred fifty-nine thousand cubic feet.

Q Now, for the Lea County area for the nine months of 1957, what have been the nominations?

A Ninety-four billion, six hundred thirty-nine million, four hundred seventy-seven thousand cubic feet.

Q What allowables have been granted?

A Sixty-nine billion, eight hundred seven million, nine hundred sixty-eight thousand cubic feet.

Q And the production during that same period has been what?

A Sixty-three billion, six hundred seventy million, six hundred three thousand cubic feet.

Q For the year and nine months, what is the excess of nominations over allowables, roughly, not an exact figure, but an approximate figure, the closest billion.

A Thirty-one billion.

Q What is the excess of nominations over production?

A Thirty billion.

Q Now, was the company desirous of obtaining that thirty-one billion cubic feet of gas from Lea County Pools?

A Yes, sir, we were.

Q Were we able to obtain it?

A We were not.

Q Did we have to go elsewhere to get gas to meet our market requirements?

A We did.

Q With reference to the Jalmat Pool, what were the nominations, the totals for the year 1956 in even billions?

A Fifty-nine billion.

Q And the allowable?

A Sixty-eight billion.

Q The production?

A Seventy-three billion.

Q The total for the one year and nine months is what?

A Nomination, one hundred five billion; allowable, one hundred ten billion; production, one hundred seven billion.

Q Now, I believe that the testimony in this case, the record shows that El Paso Natural Gas Company is connected to substantially eighty-five percent of the wells in the Jalmat Pool, is that correct?

A That is correct.

Q Now, what were the factors in 1956, in the first nine months of 1957, that caused our allowables to be approximately thirty billion cubic feet less than our nominations?

A Primarily the cause was the allocation of a portion of our market demand to other purchasers in the Lea County area.

Q If, for example, there were ten wells in a field or pool, and we nominated on the basis of one hundred for each well, and the other purchaser nominated on the basis of fifty, the resulting

A If that producer also had ten wells, yes, sir.

Q I'm assuming an equal number of wells. Now, when we have as large a percentage of a pool as existed in the Jalmat Pool, what is the effect of overproduction with reference to getting a return of the overproduction in a pool that's on the basis of fifty percent?

A For every MCF we overproduce in the Jalmat Pool wells connected to El Paso we receive back in the form of additional allowable in accordance with the procedure utilized by the Commission eighty-five percent, assuming that our interest in the pool was eighty-five percent; in the pool with fifty percent, we would get back fifty percent of the overproduction. Other operators who were underproducing their wells would get the other fifty percent of the allowable assigned to their wells.

Q What would be the effect as between the several pools in getting the pools out of balance?

A The pool with the fifty percent interest would become much greater underproduced than the pool with eighty-five percent interest, because you are essentially getting back in the form of additional allowables all gas overproduced.

Q Now, did the allocation in other pools have any result of causing you to go to Jalmat for gas when needed, rather than to some of the other pools?

A Yes, sir, it did.

Q Did it result in many wells in the Jalmat Pool becoming overproduced?

A Yes, sir, it did, dozens.

Q Have we been able in recent months to produce from the wells capable of producing in the amounts we would like to?

A No, sir, we have been unable to do so.

Q What attempt do you make, what effort do you make to keep wells in balance?

A We are continually analyzing the status of a well. If our market demand permits, we underproduce all overproduced wells so as to get them back in balance as promptly as possible. An underproduced well is produced constantly. Our policy is to never shut in an underproduced well.

Q Now, there was testimony, I believe, in Texas and Pacific Company's exhibits covering the months of February, first the month of February, 1956 --

A (Interrupting) Excuse me, Mr. Howell, before we leave this exhibit, may I dwell on it for a moment?

Q Surely.

A I think possibly I can explain more thoroughly just what happened in Lea County, going into some of these figures. First I would like to point out that in Lea County the production for the year of 1956 was fifteen billion, we nominated for Lea County fourteen billion, so actually we produced out of Lea County essentially what we had nominated for. Our allowables were only

one hundred seven billion, eight billion less than what we --

Q (Interrupting) I believe that you have made an error in reading the figures. Did you not leave off one hundred billion?

A The production was one hundred fifteen billion and the nominations one hundred fourteen billion. Our allowables were one hundred seven billion. As can be seen, there was eight billion cubic feet of demand which we were unable to produce from our wells within the allowables, that had to be overproduced. This condition was recognized as of July 1st, 1956. At that time, or right before that time the Commission had granted an exception to the application of the balancing provisions of the rules. We knew that we had the balance of 1956 and the year of 1957 to get our wells in balance. We knew we had a market demand to fulfill. We knew that we could fulfill a certain amount of it from our other sources, for instance, the San Juan just had so much capacity. Anything in excess of that that was market demand, we had to produce from our Lea County sources. We met our market demand; in doing it, we overproduced.

To result in the minimum amount of underproduction, we overproduced in the pools that would result in the least imbalance. That was the Jalmat Pool. Some wells in the pool could not produce their allowables. Other wells in the pool had to overproduce so as to meet that total market demand. That is why certain wells got extremely overproduced; it was because each well in the pool couldn't produce its share of our overall total demand. During

1958, after having had to overproduce our wells --

Q (Interrupting) Just a minute, did you say during 19 --

A In 1957, after several months which were still peak demand periods, we attempted to shut in all overproduced wells, and we continued to produce all underproduced wells. We have been successful in operating under those conditions to get the major portions of our wells in balance sometime in the intervening period. Unfortunately, during the time that these overproduced wells were shut in, the underproduced wells could not produce our market demand. Producing everything that we could produce without further overproducing wells, we could not meet the market demand, and that is reflected in these figures for 1957. Where we received an allowable of sixty-nine billion and we produced sixty-four billion, we would have produced from our wells, certainly, our total allowable of sixty-nine billion had they been capable of doing so, but the wells weren't even capable of producing the allowable that we got, let alone overproduce to make our nominations.

Of course these underproduced wells did have trouble in the form of underproduction, which they could have produced had they been capable of doing so.

Q Is that all you wanted in connection with this?

A Yes, sir.

Q Now, Texas and Pacific introduced some charts or exhibits showing production of individual wells during certain months in 1956. Referring to the month of February, 1956, I'll ask if

you have prepared a graph showing the original estimates of market demand, the actual market demand, and the estimates of residue gas that would be available, the actual residue gas that became available, and the production of wells from Lea County?

A Yes, sir, we have prepared such a graph.

MR. HOWELL: Will you mark it El Paso's Exhibit No. 2, please?

(El Paso's Exhibits Nos. 2, 3, 4, and 5 marked for identification.)

MR. PORTER: At this time we will recess the hearing until :00 o'clock tomorrow morning.

(Recess.)

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF THE STATE OF NEW
MEXICO FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 1327
Order No. R-1092-C

APPLICATION OF TEXAS PACIFIC COAL
& OIL COMPANY FOR AN ORDER IMMEDIATELY
TERMINATING GAS PRORATIONING IN THE
JALMAT GAS POOL; OR IN THE ALTERNATIVE
REVISING THE SPECIAL RULES AND REGULATIONS
FOR THE JALMAT GAS POOL IN LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on October 18, 1957, November 14, 1957, and again on December 9, 1957, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," and this cause came on for rehearing before the Commission, upon the petition of Skelly Oil Company et al., at 9 o'clock a.m. on March 25, 1958, at Santa Fe, New Mexico.

NOW, on this 25th day of April, 1958, the Commission, a quorum being present, having considered the application, the petitions for rehearing, and the testimony and evidence adduced at the original hearings and the subsequent rehearing, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That after considering all the evidence presented at the original hearings and the rehearing in this case, the Commission reaffirms its finding that Texas Pacific Coal and Oil Company has proved by a preponderance of the evidence that there is a general correlation between the deliverabilities of the gas wells in the Jalmat Gas Pool and the recoverable gas in place under the tracts dedicated to said wells, and that the inclusion of a deliverability factor in the proration formula for the Jalmat Gas Pool would, therefore, result in a more equitable allocation of the gas production in said pool than under the present gas proration formula.

(3) That the provisions of Order No. R-1092-A should remain in full force and effect.

IT IS THEREFORE ORDERED:

That the provisions of Order No. R-1092-A shall remain in full force and effect.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

MURRAY E. MORGAN, Member

A. L. PORTER, Jr., Member & Secretary

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BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF THE STATE OF NEW
MEXICO FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 1327
Order No. R-1092-B

APPLICATION OF TEXAS PACIFIC COAL
& OIL COMPANY FOR AN ORDER IMMEDIATELY
TERMINATING GAS PRORATIONING IN THE
JALMAT GAS POOL; OR IN THE ALTERNATIVE
REVISING THE SPECIAL RULES AND REGULATIONS
FOR THE JALMAT GAS POOL IN LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION FOR REHEARING

BY THE COMMISSION:

This cause came on for consideration for a rehearing in Case No. 1327, Order No. R-1092-A, dated January 29, 1958, upon the petition of Skelly Oil Company, Cities Service Oil Company, The Texas Company, Sun Oil Company, Humble Oil & Refining Company, The Atlantic Refining Company, Continental Oil Company, Samedan Oil Corporation, Shell Oil Company, Sinclair Oil & Gas Company, Amerada Petroleum Corporation, Standard Oil Company of Texas, Tidewater Oil Company, and Pan-American Petroleum Corporation.

NOW, on this 19th. day of February, 1958, the Commission, a quorum being present, having considered the petitions for rehearing,

HEREBY ORDERS:

That the above-styled cause be reopened and a rehearing be held at 9 o'clock a.m. on March 25, 1958, at Mabry Hall, State Capitol, Santa Fe, New Mexico.

IT IS FURTHER ORDERED:

That the testimony on rehearing shall be limited to new evidence on the issues raised in the petitions for rehearing.

IT IS FURTHER ORDERED:

That Order No. R-1092-A shall remain in full force and effect pending the issuance of any further order in this case.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Signed by: Edwin L. Mechem, Chairman; Murray E. Morgan, Member; A. L. Porter, Jr., Member & Secretary.
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BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF THE STATE OF NEW
MEXICO FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 1327
Order No. R-1092-A

APPLICATION OF TEXAS PACIFIC COAL &
OIL COMPANY FOR AN ORDER IMMEDIATELY
TERMINATING GAS PRORATIONING IN THE
JALMAT GAS POOL; OR IN THE ALTERNATIVE,
REVISING THE SPECIAL RULES AND REGULATIONS
FOR THE JALMAT GAS POOL IN LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on October 18, 1957, at 9 o'clock a.m. on November 14, 1957, and again at 9 o'clock a.m. on December 9, 1957, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 29th day of January, 1958, the Commission, a quorum being present, having considered the application, and the evidence adduced and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Texas Pacific Coal & Oil Company, seeks an order in the subject case for the immediate termination of gas prorationing in the Jalmat Gas Pool, Lea County, New Mexico, or in the alternative, an order for the immediate cancellation of all underproduction accumulated to wells in the Jalmat Gas Pool as of July 1, 1957, and further, to require the gas purchasers in said pool to nominate a sufficient amount of gas from the pool to permit the wells from which said purchasers are able to take gas to have an allowable equal to their actual production, and further for the establishment of a proration formula in the Jalmat Gas Pool whereby the allowables would be assigned 75 percent on the basis of deliverability times acreage and 25 per cent on the basis of acreage alone; and further, for the establishment of a maximum amount of gas which may be taken from any well in the Jalmat Gas Pool during a specified period of time.

(3) That it is necessary to continue the proration of gas production from the Jalmat Gas Pool in order to prevent waste and protect correlative rights.

(4) That all underage which accrued to wells in the Jalmat Gas Pool prior to July 1, 1957, and which was not produced prior to January 1, 1958, will be cancelled and redistributed as of that date in accordance with the Special Rules and Regulations for the Jalmat Gas Pool as set forth in Order No. R-520 as amended by Order No. R-967, and that the applicant has failed to prove the necessity for any additional relief in this regard.

(5) That the applicant has proved that there is a general correlation between the deliverabilities of the gas wells in the Jalmat Gas Pool and the gas in place under the tracts dedicated to said wells, and that the inclusion of a deliverability factor in the proration formula for the Jalmat Gas Pool would, therefore, result in a more equitable allocation of the gas production in said pool than under the present gas proration formula.

(6) That the inclusion of a deliverability factor in the proration formula for the Jalmat Gas Pool will result in the production of a greater percentage of the pool allowable, and that it will more nearly enable the various gas purchasers in the Jalmat Gas Pool to meet the market demand for gas from said pool.

(7) That the allowable gas production in the Jalmat Gas Pool should be allocated to the non-marginal wells in said pool in accordance with a proration formula based on seventy-five percent (75%) acreage times deliverability plus twenty-five percent (25%) acreage only.

(8) That the applicant has failed to prove the necessity for establishing a limitation on the amount of gas which may be taken from wells in the Jalmat Gas Pool in addition to the limitations presently imposed by the Special Rules and Regulations for the Jalmat Gas Pool.

(9) That the application of Texas Pacific Coal and Oil Company in the subject case should be denied in all respects except that the Special Rules and Regulations for the Jalmat Gas Pool should be amended to provide for a deliverability factor in the gas proration formula.

IT IS THEREFORE ORDERED:

(1) That the application of Texas Pacific Coal and Oil Company in Case No. 1327 be and the same is hereby denied in all respects except that portion of the application concerning the inclusion of a deliverability factor in the gas proration formula for the Jalmat Gas Pool.

(2) That all orders heretofore issued by the Commission creating non-standard gas proration units in the Jalmat Gas Pool, which orders provide in substance that the unit well be granted an allowable in the proportion that the acreage dedicated to the well bears to a standard gas proration unit in the Jalmat Gas Pool, be and the same are hereby amended,

effective July 1, 1958, to read as follows: That the unit be assigned an "Acreage Factor" for allowable purposes to be determined by dividing the acreage dedicated to the well by 160 acres.

(3) That Rule 5, and Rule 6, and Rule 12 of the Special Rules and Regulations for the Jalmat Gas Pool as set forth in Order No. R-520 and as amended by Order No. R-967, be and the same are hereby revised, effective July 1,1958, to read as follows:

SPECIAL RULES AND REGULATIONS FOR THE JALMAT GAS POOL

RULE 5. (a) (first paragraph) No change

(second paragraph) Revise to read as follows:

A non-standard gas proration unit shall be assigned an "Acreage Factor" for proration purposes to be determined by dividing the acreage in the non-standard gas proration unit by 160 acres. Any gas proration unit containing between 632 and 648 acres shall be considered to contain 640 acres for the purpose of computing allowables.

(third paragraph) No change

(b) No change.

RULE 6. (a) The Commission, after notice and hearing, shall consider the nominations of the gas purchasers from the Jalmat Gas Pool and other relevent data in fixing the allowable production for the pool.

(b) The monthly allowable allocation to the Jalmat Gas Pool shall be divided and allocated among the wells in the pool which are entitled to an allowable in the manner hereinafter set forth.

A marginal well shall be assigned an allowable equal to its maximum production during any month of the preceding gas proration period.

The pool allowable remaining after deducting the total allowable assigned to marginal wells shall be allocated among the non-marginal wells in the pool as follows:

(1) Twenty-five percent (25%) of the remaining pool allowable shall be allocated among the non-marginal wells in the pool in the proportion that each well's "Acreage Factor" bears to the total "Acreage Factor" for all non-marginal wells in the pool.

(2) Seventy-five percent (75%) of the remaining pool allowable shall be allocated among the non-marginal wells in the pool in the proportion that each well's "AD Factor" bears to the total "AD Factor" for all non-marginal wells in the pool.

A well's "Acreage Factor" shall be determined by dividing the acreage assigned to the well by 160 acres. The "Acreage Factor" shall be determined to the nearest one-hundredth of a unit.

A well's "AD Factor" shall be determined by multiplying the well's "Acreage Factor" by its "Calculated Deliverability" (expressed in MCF per day). The "AD Factor" shall be computed to the nearest whole unit. In those instances where there is more than one well on a proration unit the "Calculated Deliverability" for the unit shall be determined by averaging the "Calculated Deliverabilities" of all the wells on the unit.

(c) Annual deliverability tests shall be taken on all gas wells in the Jalmat Gas Pool in a manner and at such time as the Commission may prescribe. The results of such tests shall determine a well's "Calculated Deliverability." Deliverability tests taken during 1958 shall be used in calculating allowables for wells in the Jalmat Gas Pool until July 1, 1959. Subsequent annual deliverability tests shall be used for each twelve-month period thereafter.

(d) No well shall be assigned an allowable until an approved deliverability test has been filed with the Commission.

(e) The Secretary of the Commission shall have authority to exempt marginal wells from the requirement of taking an annual deliverability test in those instances where the deliverability of the well is of such low volume as to have no significance in the determination of the well's allowable.

(f) Retests and tests taken after recompletion or workover shall be taken in the same manner as provided in sub-paragraph (c) above, and any change in the well's "Calculated Deliverability" resulting therefrom shall become effective;

(1) On the date of reconnection after workover, such date to be determined from Form C-104 as filed by the operator; or

(2) A date 45 days prior to the date upon which a well's deliverability and shut-in pressure test is reported to the Commission on Form C-122-C; or

(3) A date 45 days prior to the receipt and approval of Form C-104 by the Commission's office (Box 2045, Hobbs, New Mexico);

(Form C-104 shall specify the exact nature of the workover or remedial work; if the nature of the work cannot be explained on Form C-104, in that event, Form C-103 shall also be filed in accordance with Rule 1106 of the Commission's Statewide Rules and Regulations. Form C-128 (Well Location and Acreage Dedication Plat) shall be submitted by the operator at any time there is a change in the acreage dedicated to said well);

RULE 12. Allowables to newly completed gas wells shall commence:

(a) On the date of connection to a gas transportation facility, such date to be determined from an affidavit furnished to the Commission (Box 2045, Hobbs, New Mexico) by the purchaser;

(b) the latest filing date of Form C-104, C-110 or C-128; or

(c) a date 45 days prior to the date upon which the well's deliverability and shut-in pressure test is reported to the Commission on Form C-122-C;

ichever date is later.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

MURRAY E. MORGAN, Member

A. L. PORTER, Jr., Member & Secretary

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BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION OF THE STATE OF NEW MEXICO FOR THE PURPOSE OF CONSIDERING:

CASE NO. 1327
Order No. R-1092

APPLICATION OF TEXAS PACIFIC COAL AND OIL COMPANY FOR AN ORDER IMMEDIATELY TERMINATING GAS PRORATIONING IN THE JALMAT GAS POOL; OR IN THE ALTERNATIVE REVISING THE SPECIAL POOL RULES FOR THE JALMAT GAS POOL IN LEA COUNTY, NEW MEXICO.

INTERIM ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on October 17, 1957, and again at 9 o'clock a.m. on November 14, 1957, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 27th., day of November, 1957, the Commission, a quorum being present, having considered the application, and the evidence thus far adduced and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That it was not possible for the Commission to hear Case No. 1327 to its conclusion at the last hearing of said case and that the case should be continued until 9 o'clock a.m. on December 9, 1957.

(3) That the applicant proposes that the Commission grant an interim exception to the Special Rules and Regulations for the Jalmat Gas Pool to the effect that if any well in the Jalmat Gas Pool had an overproduced status at the beginning of any month during the current gas proration period less than:

(a) the well's current allowable for said month, plus

(b) the well's share of the allowable redistributed as a result of the cancellation of underproduction on December 31, 1957,

then said well shall be considered to have been in balance during said month.

(4) That the proposed interim relief should be granted.

IT IS THEREFORE ORDERED:

(1) That Case No. 1327 be continued until 9 o'clock a.m. on December 9, 1957.

(2) That if any well in the Jalmat Gas Pool had an overproduced status, at the beginning of any month during the current gas proration period (July 1 - December 31, 1957), which was less than:

(a) the well's current allowable for said month, plus

(b) the well's share of the allowable redistributed as a result of the cancellation of underproduction on December 31, 1957,

then said well shall be considered to have been in balance during said month.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

MURRAY E. MORGAN, Member

A. L. PORTER, Jr., Member & Secretary

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BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION OF THE STATE OF NEW MEXICO FOR THE PURPOSE OF CONSIDERING:

CASE NO. 1164
Order No. R-967

APPLICATION OF THE OIL CONSERVATION COMMISSION OF NEW MEXICO UPON ITS OWN MOTION FOR AN ORDER REVISING THE SPECIAL RULES AND REGULATIONS FOR ALL PRORATED GAS POOLS IN THE STATE OF NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on October 17, 1956, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 23rd day of April 1957, the Commission, a quorum being present, having considered the application and the evidence adduced and being fully advised in the premises,

FINDS:

(1) That due notice of the time and place of hearing and the purpose thereof having been given as required by law, the Commission has jurisdiction of this case and the subject matter thereof.

(2) That, in order to promote a more efficient gas prorationing procedure in the State of New Mexico, the special pool rules for every prorated gas pool in the state should be clarified and revised in accordance with the recommendations of the special industry advisory committee appointed by the Commission to study the problem.

IT IS THEREFORE ORDERED:

(1) That Commission Order R-128-D dated October 13, 1955, amending the Special Rules and Regulations for the Blanco-Mesaverde Gas Pool as set forth in Commission Order R-110, dated November 9, 1951, be and the same is hereby amended as follows:

RULE 3 - R-128-D

In the event a gas purchasers' market shall have increased or decreased, he may file with the Commission prior to the 10th day of the month a "Supplemental Nomination," showing the amount of gas he actually in good faith desires to purchase during the ensuing proration month from the Blanco-Mesaverde Gas Pool. The Commission shall hold a public hearing between the 13th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month along with such other information as is necessary to show the allowable-production status of each well on the schedule. "Supplemental Nominations" shall be submitted on a Form C-121-A as prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the Blanco-Mesaverde Gas Pool delivering to a gas transportation facility, or lease gathering system, and shall include in the proration schedule any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well.

The total allowable to be allocated to the pool each month shall be equal to the sum of the preliminary or supplemental nominations (whichever is applicable), together with any adjustment which the Commission deems advisable. A monthly allowable shall be assigned to each well entitled to an allowable in the pool by allocating the pool allowable among all such wells in accordance with the procedure set out in Rule 4 provided, however, that the allowable assigned to any well shall not exceed the well's known producing ability. A well, the allowable of which is so limited, shall be classified as a marginal well and shall not be permitted to accumulate underproduction, and any underproduction accrued to a well prior to its classification as a marginal well shall be cancelled. Any well classified as a marginal well shall be removed from such classification in instances where the production of the well evidences that the classification is no longer applicable.

Effective August 1, 1956, and after the production data is available for the last month of each succeeding gas proration period, any well which had an underproduced status at the beginning of the preceding gas proration period and which did not produce its allowable during at least one month of such preceding gas proration period may be classified as a marginal well unless prior to the end of said preceding gas proration period, the operator or other interested party presents satisfactory evidence to the Commission showing that the well should not be so classified. However, a well which in any month of said proration period has demonstrated its ability to produce its allowable for said proration period shall not be classified as a marginal well.

The director may reclassify a marginal or non-marginal well at any time the wells production data, deliverability data, or other evidence as to the wells producing ability justify such re-classification.

A well which has been reworked or recompleted shall be classified as a non-marginal well as of the day of reconnection to a pipeline until such time as production data, deliverability data or other evidence as to the wells producing ability indicates that the well is improperly classified.

If during a proration month the acreage assigned to a well is increased the operator shall notify the Director in writing (Box 871, Santa Fe, New Mexico) of such increase. The increased allowable assigned the gas proration unit for the well shall be effective on the first day of the month following receipt of the notification by the Director. The Commission may assign minimum allowables in order to prevent the premature abandonment of wells.

If at the end of a proration period a marginal well has produced more than the total allowable for the period assigned a non-marginal well of like deliverability and acreage, the marginal well shall be reclassified as a non-marginal well and its allowable and net status adjusted accordingly.

All wells not classified as marginal wells shall be classified as non-marginal wells.

RULE 4 - R-128-D

The product obtained by multiplying each well's acreage factor by the calculated deliverability (expressed as MCF per day) for that well shall be known as the AD Factor for

that well. The acreage factor shall be determined to the nearest hundredth of a unit by dividing the acreage within the proration unit by 320. The "AD Factor" shall be computed to the nearest whole unit.

The allowable to be assigned to each marginal well shall be equal to the maximum production during any month of the preceding gas proration period.

The pool allowable remaining each month after deducting the total allowable assigned to marginal wells shall be allocated among the non-marginal wells entitled to an allowable in the following manner:

(1) Seventy-five percent (75%) of the pool allowable remaining to be allocated to non-marginal wells shall be allocated among such wells in the proportion that each well's AD Factor" bears to the total "AD Factor" for all non-marginal wells in the pool.

(2) Twenty-five percent (25%) of the pool allowable remaining to be allocated to non-marginal wells shall be allocated among such wells in the proportion that each well's acreage factor bears to the total acreage factor for all non-marginal wells in the pool.

RULE 5 - R-128-D

The calculated deliverability at the "deliverability pressure" shall be determined in accordance with the provisions of Order R-333-C & D.

The Secretary of the Commission shall have authority to allow exceptions to the annual deliverability test requirement for marginal wells in those instances where the deliverability of the well is of such volume as to have no significance in the determination of the well's allowable. Application for such exceptions may be submitted in writing by the operator of the well and, if granted, may be revoked by the Secretary of the Commission at any time by requesting the well to be scheduled and tested in accordance with Order R-333-C and D.

BALANCING OF PRODUCTION

RULE 5-A - R-128-D

The dates 7:00 a.m., February 1, and 7:00 a.m., August 1, shall be known as balancing dates and the periods of time between these dates shall be known as gas proration periods. The first proration period shall commence March 1, 1955 and shall continue for a period of 11 months and future proration periods shall commence on the dates outlined above.

RULE 6 - R-128-D

Underproduction: Any non-marginal well which has an underproduced status as of the end of a gas proration period shall be allowed to carry such underproduction forward into the next gas proration period and may produce such underproduction in addition to the allowable assigned during such succeeding period. Any allowable carried forward into a gas

proration period and remaining unproduced at the end of such gas proration period shall be cancelled.

Production during any one month of a gas proration period in excess of the allowable assigned to a well for such month shall be applied against the underproduction carried into such period in determining the amount of allowable if any, to be cancelled.

RULE 7 - R-128-D

Overproduction: Any well which has an overproduced status as of the end of a gas proration period, shall carry such overproduction forward into the next gas proration period, provided that such overproduction shall be made up during such succeeding period. Any well which has not made up the overproduction carried into a gas proration period by the end of such gas proration period shall be shut-in until such overproduction is made up. If, at any time, a well is overproduced an amount equaling six times its current monthly allowable it shall be shut-in during that month and each succeeding month until the well is overproduced less than 6 times its current monthly allowables.

Allowable assigned to a well during any one month of a gas proration period in excess of the production of the same month shall be applied against the overproduction carried into such period in determining the amount of overproduction, if any, which has not been made up.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut-in upon a showing at public hearing after due notice that complete shut-in of the well would result in material damage to the well.

Any allowable accrued to a well at the end of a proration period due to the cancellation of underage and redistribution thereof shall be applied against the overproduction carried into said proration period.

RULE 9 - (Second Paragraph) R-128-D

No well shall be assigned an allowable unless a deliverability test taken in conformance with Order R-333-C & D has been submitted, except in the case of a marginal well which has been exempt from testing in accordance with Rule 5 of this order.

(2) That the Special Rules and Regulations for the Fulcher Kutz-Pictured Cliffs, Aztec-Pictured Cliffs, and South Blanco-Pictured Cliffs Gas Pool as set forth in Commission Order-R-565-C, dated October 13, 1955, and the Special Rules and Regulations for the West Kutz-Pictured Cliffs Gas Pool as set forth in Commission Order R-566-D, dated October 13, 1955; and the Special Rules and Regulations for the Ballard Pictured Cliffs Pool as set forth in Commission Order R-846, dated July 18, 1956, be and the same are hereby amended as follows:

RULE 8 - R-565-C, R-566-D, and R-846

In the event a gas purchaser's market shall have increased or decreased, he may file with the Commission prior to the 10th day of the month a "Supplemental Nomination," showing the amount of gas be actually in good faith desires to purchase during the ensuing proration month from the Fulcher-Kutz, West Kutz, Aztec, South Blanco and Ballard Pictured Cliffs Gas Pool. The Commission shall hold a public hearing between the 13th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month along with such other information as is

necessary to show the allowable production status of each well on the schedule. "Supplemental Nominations" shall be submitted on a Form C-121-A as prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the Fulcher-Kutz, West Kutz, Aztec, South Blanco and Ballard Pictured Cliffs Gas Pool delivering to a gas transportation facility, or lease gathering system, and shall include in the proration schedule any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well.

The total allowable to be allocated to the pool each month shall be equal to the sum of the preliminary or supplemental nominations (whichever is applicable), together with any adjustment which the Commission deems advisable. A monthly allowable shall be assigned to each well entitled to an allowable in the pool by allocating the pool allowable among all such wells in accordance with the procedure set out in Rule 9 provided, however, that the allowable assigned to any well shall not exceed the well's known producing ability. A well, the allowable of which is so limited, shall be classified as a marginal well and shall not be permitted to accumulate underproduction, and any underproduction accrued to a well prior to its classification as a marginal well shall be cancelled. Any well classified as a marginal well shall be removed from such classification in instances where the production of the well evidences that the classification is no longer applicable.

Effective August 1, 1956, and after the production data is available for the last month of each succeeding gas proration period, any well which had an underproduced status at the beginning of the preceding gas proration period and which did not produce its allowable during at least one month of such preceding gas proration period may be classified as a marginal well unless prior to the end of said preceding gas proration period, the operator or other interested party presents satisfactory evidence to the Commission showing that the well should not be so classified. However, a well which in any month of said proration period has demonstrated its ability to produce its allowable for said proration period shall not be classified as a marginal well.

The director may reclassify a marginal or non-marginal well at any time the wells production data, deliverability data, or other evidence as to the wells producing ability justify such re-classification.

A well which has been reworked or recompleted shall be classified as a non-marginal well as of the day of reconnection to a pipeline until such time as production data, deliverability data or other evidence as to the wells producing ability indicates that the well is improperly classified.

If during a proration month the acreage assigned to a well is increased the operator shall notify the Director in writing (Box 871, Santa Fe, New Mexico) of such increase. The increased allowable assigned the gas proration unit for the well shall be effective on the first day of the month following receipt of the notification by the Director. The Commission may assign minimum allowables in order to prevent the premature abandonment of wells.

If at the end of a proration period a marginal well has produced more than the total allowable for the period assigned a non-marginal well of like deliverability and acreage, the marginal well shall be reclassified as a non-marginal well and its allowable and net status adjusted accordingly.

All wells not classified as marginal wells shall be classified as non-marginal wells.

RULE 9 - R-565-C, R-566-D and R-846

The product obtained by multiplying each well's acreage factor by the calculated deliverability (expressed as MCF per day) for that well shall be known as the AD Factor for that well. The acreage factor shall be determined to the nearest hundredth of a unit by dividing the acreage within the proration unit by 160. The "AD Factor" shall be computed to the nearest whole unit.

The allowable to be assigned to each marginal well shall be equal to the maximum production during any month of the preceding gas proration period.

The pool allowable remaining each month after deducting the total allowable assigned to marginal wells shall be allocated among the non-marginal wells entitled to an allowable in the following manner:

(1) Seventy-five percent (75%) of the pool allowable remaining to be allocated to non-marginal wells shall be allocated among such wells in the proportion that each well's "AD Factor" bears to the total "AD Factor" for all non-marginal wells in the pool.

(2) Twenty-five percent (25%) of the pool allowable remaining to be allocated to non-marginal wells shall be allocated among such wells in the proportion that each well's acreage factor bears to the total acreage factor for all non-marginal wells in the pool.

RULE 10 - 565-C, R-566-D & R-846

The calculated deliverability at the "deliverability pressure" shall be determined in accordance with the provisions of Order R-333-C & D.

The Secretary of the Commission shall have authority to allow exceptions to the annual deliverability test requirement for marginal wells in those instances where the deliverability of the well is of such volume as to have no significance in the determination of the well's allowable. Application for such exceptions may be submitted in writing by the operator of the well and, if granted, may be revoked by the Secretary of the Commission at any time by requesting the well to be scheduled and tested in accordance with Order R-333-C and D.

BALANCING OF PRODUCTION

RULE 10A - R-565-C, R-566-D & R-846

The dates 7:00 a.m., February 1, and 7:00 a.m., August 1, shall be known as balancing dates and the periods of time between these dates shall be known as gas proration periods. The first proration period shall commence October 1, 1956 and shall continue for a period of 10 months and future proration periods shall commence on the dates outlined above.

RULE 11 - R-565-C, R-566-D, & R-846

Underproduction: Any non-marginal well which has an underproduced status as of the end of a gas proration period shall be allowed to carry such underproduction forward into the next gas proration period and may produce such underproduction in addition to the allowable assigned during such succeeding period. Any allowable carried forward into a gas proration period and remaining unproduced at the end of such gas proration period shall be cancelled.

Production during any one month of a gas proration period in excess of the allowable assigned to a well for such month shall be applied against the underproduction carried into such period in determining the amount of allowable, if any, to be cancelled.

RULE 12 - R-565-C, R-566-D & R-846

Overproduction: Any well which has an overproduced status as of the end of a gas proration period shall carry such overproduction forward into the next gas proration period, provided that such overproduction shall be made up during such succeeding period. Any well which has not made up the overproduction carried into a gas proration period by the end of such gas proration period shall be shut-in until such overproduction is made up. If, at any time, a well is overproduced an amount equaling six times its current monthly allowable it shall be shut-in during that month and each succeeding month until the well is overproduced less than 6 times its current monthly allowable.

Allowable assigned to a well during any one month of a gas proration period in excess of the production of the same month shall be applied against the overproduction carried into such period in determining the amount of overproduction, if any, which has not been made up.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut-in upon a showing at public hearing after due notice that complete shut-in of the well would result in material damage to the well.

Any allowable accrued to a well at the end of a proration period due to the cancellation of underage and redistribution thereof shall be applied against the overproduction carried into said proration period.

RULE 14 - R-565-C, R-566-D, & R-846

No well shall be assigned an allowable unless a deliverability test taken in conformance with Order R-333-C & D has been submitted, except in the case of a marginal well which has been exempt from testing in accordance with Rule 10 of this order.

(3) That the Special Rules and Regulations for the Eumont and Jalmat Gas Pools as set forth in Order R-520, dated August 12, 1954, and the Special Rules and Regulations for the Tubb, Byers-Queen and Justis Gas Pools as set forth in Order R-586, dated April 11, 1955 be and the same are amended as follows:

RULE 6 - R-520 and R-586

(a) The Commission after notice and hearing, shall consider the nominations of gas purchasers from the Eumont, Jalmat, Tubb, Byers-Queen and Justis Gas Pools and other relevant data and shall fix the allowable production for the Eumont, Jalmat, Tubb, Byers-Queen and Justis Gas Pools.

(b) For the purposes of proration, each well shall be assigned an acreage factor determined by dividing the acreage assigned to the well by 160 acres.

The allowable to be assigned to each marginal well shall be equal to the maximum production during any month of the preceding gas proration period.

(c) The pool allowable remaining each month after deducting the total allowable assigned to marginal wells shall be allocated among the non-marginal wells entitled to an

allowable in the proportion that each well's acreage factor bears to the total of the acreage factors for all non-marginal wells in the Pool.

RULE 8 -R520 and R-586

In the event a gas purchaser's market shall have increased or decreased, he may file with the Commission prior to the 10th day of the month a "Supplemental Nomination," showing the amount of gas he actually in good faith desires to purchase during the ensuing proration month from the Eumont, Jalmat, Tubb, Byers-Queen and Justis Gas Pools. The Commission shall hold a public hearing between the 13th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month, and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month along with such other information as is necessary to show the allowable production status of each well on the schedule. "Supplemental Nominations" shall be submitted on a Form C-121-A as prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the Eumont, Jalmat, Tubb, Byers-Queen and Justis Gas Pools delivering to a gas transportation facilit,, or lease gathering system, and shall include in the proration schedule any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well.

The total allowable to be allocated to the pool each month shall be equal to the sum of the "preliminary or "Supplemental Nominations" (whichever is applicable), together with any adjustment which the Commission deems advisable. A monthly allowable shall be assigned to each well entitled to an allowable in the pool by allocating the pool allowable among all such wells in accordance with the procedure set out in Rule 6 provided, however, that the allowable assigned to any well shall not exceed the well's known producing ability. A well, the allowable of which is so limited, shall be classified as a marginal well and shall not be permitted to accumulate underproduction, and any underproduction accrued to a well prior to its classification as a marginal well shall be cancelled. Any well classified as a marginal well shall be removed from such classification in instances where the production of the well evidences that the classification is no longer applicable.

Effective January 1, 1958, and after the production data is available for the last month of each succeeding gas proration period, any well which had an underproduced status at the beginning of the preceding gas proration period and which did not produce its allowable during at least one month of such preceding gas proration period may be classified as a marginal well unless prior to the end of said preceding gas proration period, the operator or other interested party presents satisfactory evidence to the Commission showing that the well should not be so classified. However, a well which in any month of said proration period has demonstrated its ability to produce its allowable for said proration period shall not be classified as a marginal well.

The director may reclassify a marginal or non-marginal well at any time the wells production data, deliverability data, or other evidence as to the wells producing ability justify such reclassification.

A well which has been reworked or recompleted shall be classified as a non-marginal well as of the day of reconnection to a pipeline until such time as production data, deliverability data, or other evidence as to the wells producing ability indicates that the well is improperly classified.

If during a proration month the acreage assigned to a well is increased the operator shall notify the Director in writing (Box 2045, Hobbs, New Mexico) of such increase. The increased allowable assigned the gas proration unit for the well shall be effective on the first day of the month following receipt of the notification by the Director.

The Commission may assign minimum allowables in order to prevent the premature abandonment of wells.

If at the end of a proration period a marginal well has produced more than the total allowable for the period assigned a non-marginal unit of corresponding size, the marginal well shall be reclassified as a non-marginal well and its allowable and net status adjusted accordingly.

All wells not classified as marginal wells shall be classified as non-marginal wells.

BALANCING OF PRODUCTION

RULE 8-A - R-520 and R-586

The dates 7:00 a.m., January 1, and 7:00 a.m. July 1, shall be known as balancing dates and the periods of time bounded by these dates shall be known as gas proration periods.

RULE 9 - R-520 and R-586

Underproduction: Any non-marginal well which has an underproduced status as of the end of a gas proration period shall be allowed to carry such underproduction forward into the next gas proration period and may produce such underproduction in addition to the allowable assigned during such succeeding period. Any allowable carried forward into a gas proration period and remaining unproduced at the end of such gas proration period shall be cancelled.

Production during any one month of a gas proration period in excess of the allowable assigned to a well for such month shall be applied against the underproduction carried into such period in determining the amount of allowable, if any, to be cancelled.

RULE 10 - R-520 and R-586

Overproduction: Any well which has an overproduced status as of the end of a gas proration period shall carry such overproduction forward into the next gas proration period, provided that such overproduction shall be made up during such succeeding period. Any well which has not made up the overproduction carried into a gas proration period by the end of such proration period shall be shut-in until such overproduction is made up. If at any time, a well is overproduced an amount equaling six times its current monthly allowable it shall be shut-in during that month, and each succeeding month until the well is overproduced less than 6 times its current monthly allowable.

Allowable assigned to a well during any one month of a gas proration period in excess of the production for the same month shall be applied against the overproduction carried into such period in determining the amount of overproduction, if any, which has not been made up.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut-in upon a showing at public hearing after due notice that complete shut-in of the well would result in material damage to the well.

Any allowable accrued to a well at the end of a proration period due to the cancellation of underage and the redistribution thereof shall be applied against the overproduction carried into said proration period.

(4) That the Special Rules and Regulations for the Blinebry Gas Pool as set forth in Order R-610, dated April 11, 1955, as amended by Order R-610-A, dated May 27, 1955, Order R-610-B, dated June 13, 1955, Order R-610-C, dated January 9, 1956, and Order R-610-D, dated February 26, 1957, be and the same are amended as follows:

RULE 10 - R-610

(a) The Commission after notice and hearing, shall consider the nominations of gas purchasers from the Blinebry Gas Pool and other relevant data and shall fix the allowable production for the Blinebry Gas Pool.

(b) For purposes of proration, each well shall be assigned an acreage factor determined by dividing the acreage assigned to the well by 160 acres.

The allowable to be assigned to each marginal well shall be equal to the maximum production during any month of the preceding gas proration period.

(c) The pool allowable remaining each month after deducting the total allowable assigned to marginal wells shall be allocated among the non-marginal wells entitled to an allowable in the proportion that each well's acreage factor bears to the total of the acreage factors for all non-marginal wells in the pool.

RULE 12 - R-610

In the event a gas purchaser's market shall have increased or decreased, he may file with the Commission prior to the 10th day of the month a "Supplemental Nomination," showing the amount of gas he actually in good faith desires to purchase during the ensuing proration month from the Blinebry Gas Pool. The Commission shall hold a public hearing between the 13th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month, and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month along with such other information as is necessary to show the allowable-production status of each well on the schedule. "Supplemental Nominations" shall be submitted on a Form C-121-A as prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the Blinebry Gas Pool delivering to a gas transportation facility, or lease gathering system, and shall include in the proration schedule any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well.

The total allowable to be allocated to the pool each month shall be equal to the sum of the preliminary or supplemental nominations (whichever is applicable), together with any adjustment which the Commission deems advisable. A monthly allowable shall be assigned to each well entitled to an allowable in the pool by allocating the pool allowable among all such wells in accordance with the procedure set out in Rule 10 provided, however, that the allowable assigned to any well shall not exceed the well's known producing ability. A well, the allowable of which is so limited, shall be classified as a marginal well and shall not be permitted to accumulate underproduction, and any underproduction accrued to a well prior to its classification as a marginal well shall be cancelled. Any well classified as a marginal well shall be removed from such classification in instances where the production of

the well evidences that the classification is no longer applicable.

Effective January 1, 1958, and after the production data is available for the last month of each succeeding gas proration period, any well which had an underproduced status at the beginning of the preceding gas proration period and which did not produce its allowable during at least one month of such preceding gas proration period may be classified as a marginal well unless prior to the end of said preceding gas proration period, the operator or other interested party presents satisfactory evidence to the Commission showing that the well should not be so classified. However, a well which in any month of said proration period has demonstrated its ability to produce its allowable for said proration period shall not be classified as a marginal well.

The director may reclassify a marginal or non-marginal well at any time the wells production data, deliverability data, or other evidence as to the wells producing ability justify such reclassification.

A well which has been reworked or recompleted shall be classified as a non-marginal well as of the day of reconnection to a pipeline until such time as production data, deliverability data, or other evidence as to the wells producing ability indicates that the well is improperly classified.

If during a proration month the acreage assigned to a well is increased the operator shall notify the Director in writing (Box 2045, Hobbs, New Mexico) of such increase. The increased allowable assigned the gas proration unit for the well shall be effective on the first day of the month following receipt of the notification by the Director.

The Commission may assign minimum allowables in order to prevent the premature abandonment of wells.

If at the end of a proration period a marginal well has produced more than the total allowable for the period assigned a non-marginal unit of corresponding size, the marginal well shall be reclassified as a non-marginal well and its allowable and net status adjusted accordingly.

All wells not classified as marginal wells shall be classified as non-marginal wells.

BALANCING OF PRODUCTION
RULE 12-A - R-610

The dates 7:00 a.m., January 1, and 7:00 a.m., July 1, shall be known as balancing dates and the periods of time bounded by these dates shall be known as gas proration periods.

RULE 13 - R-610

Underproduction: Any non-marginal well which has an underproduced status as of the end of a gas proration period shall be allowed to carry underproduction forward into the next gas proration period and may produce such underproduction in addition to the allowable assigned during such succeeding period. Any allowable carried forward into a gas proration period and remaining unproduced at the end of such gas proration period shall be cancelled.

Production during any one month of a gas proration period in excess of the allowable assigned to a well for such month shall be applied against the underproduction carried into such period in determining the amount of allowable, if any, to be cancelled.

RULE 14 - R-610

Overproduction: Any well which has an overproduced status as of the end of a gas proration period shall carry such overproduction forward into the next gas proration period, provided that such overproduction shall be made up during such succeeding period. Any well which has not made up the overproduction carried into a gas proration period by the end of such gas proration period shall be shut-in until such overproduction is made up. If, at any time, a well is overproduced an amount equaling six times its current monthly allowable it shall be shut-in during that month, and each succeeding month until the well is overproduced less than 6 times its current monthly allowable.

Allowable assigned to a well during any one month of a gas proration period in excess of the production for the same month shall be applied against the overproduction carried into such period in determining the amount of overproduction, if any, which has not been made up.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shutin upon a showing at public hearing after due notice that complete shut-in of the well would result in material damage to the well.

Any allowable accrued to a well at the end of a proration period due to the cancellation of underage and the redistribution thereof shall be applied against the overproduction carried into said proration period.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

MURRAY E. MORGAN, Member

A. L. PORTER, JR., Member & Secretary

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BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE NO. 673
ORDER NO. R-520-A

THE APPLICATION OF THE OIL CONSERVATION
COMMISSION UPON ITS OWN MOTION FOR AN
ORDER AMENDING, REVISING OR ABROGATING
EXISTING RULES AND REGULATIONS OF THE
OIL CONSERVATION COMMISSION, AND/OR
PROMULGATING RULES AND REGULATIONS,
RELATING TO GAS POOL DELINEATION, GAS
PRORATION, AND OTHER RELATED MATTERS,
AFFECTING OR CONCERNING THE JALCO, LANGMAT,
EUMONT, AND ARROW GAS POOLS, LEA COUNTY,
NEW MEXICO.

NUNC PRO TUNC ORDER OF THE COMMISSION

BY THE COMMISSION:

It appearing to the Commission that Order No. R-520, dated August 12, 1954, and heretofore entered in the records of the Commission on August 16, 1954, does not correctly and accurately state the order of the Commission in certain particulars due to inadvertence and clerical error,

IT IS THEREFORE ORDERED:

1. That Order No. R-520, as the same appears in the records of the Commission, and the original of said Order, be amended in the following respects and particulars:

(a) At page 4, (10), paragraph 2, line 3 of the order entered in the Commission's records on August 16, 1954, and at page 4, line 4 of the original signed order, the word "duplicate" is ordered stricken and the word "quadruplicate" is substituted therefor.

(b) At pages 7, 14, and 19 in GAS PRORATION, RULE 5 (b), #5 of the order entered on August 16, 1954, and at pages 6, 12, and 16 of the original signed order, pertaining to the Jalmat, Eumont and Arrow Gas Pools, respectively, the words "quarter sections" are ordered stricken, and the word "section" is substituted therefor.

(c) At page 28 of the order entered August 16, 1954, and at page 23 of the original signed order, the following words, namely, "Horizontal Limits of the Arrow Gas Pool" are ordered inserted beneath the words "Exhibit "C"".

IT IS FURTHER ORDERED: That the corrections and changes set forth in this order be entered nunc pro tunc in the original order as of August 12, 1954, and in the records of the Commission as of August 16, 1954, the date of entry of said original order. DONE at Santa Fe, New Mexico, on this 31st day of August, 1954. s/ E. L. Mechem; E. S. Walker; W. B. Macey.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE NO. 673
ORDER NO. R-520

THE APPLICATION OF THE OIL CONSERVATION
COMMISSION UPON ITS OWN MOTION FOR AN
ORDER AMENDING, REVISING OR ABROGATING
EXISTING RULES AND REGULATIONS OF THE
OIL CONSERVATION COMMISSION, AND/OR
PROMULGATING RULES AND REGULATIONS,
RELATING TO GAS POOL DELINEATION, GAS
PRORATION, AND OTHER RELATED MATTERS,
AFFECTING OR CONCERNING THE JALCO,
LANGMAT, EUMONT, AND ARROW GAS POOLS,
LEA COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m., on March 17, 1954, April 15, 1954, May 10, 1954, and May 11, 1954, at Santa Fe, New Mexico, before the Oil Conservation Commission, hereinafter referred to as the "Commission".

NOW, on this 12th day of August, 1954, the Commission, a quorum being present, having considered the records and testimony adduced and being fully advised in the premises,

FINDS:

(1) That due notice of the time and place of hearing and the purpose thereof having been given as required by law, the Commission has jurisdiction of this case and the subject matter thereof.

(2) That under date of February 17, 1953, the Commission issued its Order No. R-264 creating the Jalco, Langmat, Arrow, and Eumont Gas Pools. That Order R-264 defined the vertical and horizontal limits of the Langmat, Jalco, Eumont and Arrow gas pools and that by subsequent orders the Commission extended the horizontal limits of the Jalco and Eumont Gas Pools and extended the vertical limits of the Eumont Gas Pool.

(3) That under date of September 28, 1953, the Commission issued its Orders Nos. R-368, R-369, R-370 and R-371 and under date of November 10, 1953, the Commission issued its Orders Nos. R-368-A, R-369-A, R-370-A and R-371-A, providing rules, definitions and procedures to be followed in prorating gas in the jalco, Langmat, Eumont and Arrow gas pools; and by subsequent orders issued after due notice and hearing, the Commission allocated production of gas in said pools commencing January 1, 1954.

(4) That the Eumont and Arrow Gas Pools are separate gas reservoirs and should be defined vertically and horizontally as set forth in this order; that the Jalco and Langmat Gas Pools are in fact one common gas reservoir, and said reservoir should be designated the "Jalmat Gas Pool" and delineated as set forth in this order.

(5) That the producing capacity of the gas wells in the Jalmat, Eumont and Arrow Gas Pools is greater than the market demand for gas from each of such pools.

(6) That for the prevention of waste it is necessary to allocate and prorate the gas production among the gas wells in the Jalmat, Eumont and Arrow Gas Pools in accordance with provisions of this order.

(7) That the protection and proper recognition of correlative rights as such rights are defined by Section 26 (h) Chapter 168, New Mexico Session Laws of 1949, require that the gas production from the Jalmat, Eumont and Arrow gas pools be prorated in accordance with the terms and provisions of this order.

(8) That the Rules and Regulations hereinafter set forth in this order are in all respects in the interests of conservation and provide for the allocation of the allowable production among the gas wells in the Jalmat, Eumont and Arrow gas pools upon a reasonable basis and give appropriate recognition to correlative rights.

(9) That one gas well in the Jalmat, Eumont and Arrow Gas Pools can efficiently drain 640 acres.

(10) That for the prevention of waste, a limiting gas-oil ratio of 10,000-to-1 should be assigned to the units in the following pools, namely: Cooper-Jal Oil Pool, Langlie-Mattix Oil Pool, South Eunice Oil Pool, Penrose-Skelly Oil Pool, Leonard Oil Pool, South Leonard Oil Pool, Hardy Oil Pool, Rhodes Oil Pool, Jalmat Gas Pool, Arrow Gas Pool and Eumont Gas Pool.

(11) To prevent waste, the vertical limits of the following oil pools namely: Eunice-Monument Oil Pool, Arrowhead Oil Pool, South Eunice Oil Pool, Langlie-Mattix Oil Pool, Cooper-Jal Oil Pool, Rhodes Oil Pool, Eaves Oil Pool, Hardy Oil Pool, Penrose-Skelly Oil Pool, Leonard Oil Pool, South Leonard Oil Pool, should be redefined as provided hereinafter in this order so that the vertical limits of the said oil pools will not conflict with the vertical limits of overlying gas pools.

(12) That the horizontal limits of the oil pools named in Finding No. 11 should be defined as hereinafter set forth in this order.

(13) That the Falby-Yates Oil Pool should be abolished.

(14) That in the interests of conservation, the special rules hereinafter set forth governing the production of oil from wells completed within the vertical and horizontal limits of the Jalmat, Eumont and Arrow gas pools should be adopted.

(15) That for the prevention of waste and the protection of correlative rights, the special rules contained in this order should be adopted to govern the production of oil from wells completed or recompleted in such a manner that the bore hole of the well is open in both the upper gas pools and the underlying oil pools.

(16) That for the prevention of waste a "no-flare" rule should be adopted to prohibit the flaring, venting, or wasting of casinghead gas or any other type of gas in any of the gas or oil pools referred to and affected by this order.

IT IS THEREFORE ORDERED:

(1) That the Jalmat Gas Pool be and the same hereby is created. The vertical limits of the Jalmat Gas Pool shall extend from the top of the Tansill formation to a point 100

feet above the base of the Seven Rivers formation, thereby including all of the Yates formation. The horizontal limits of the Jalmat Gas Pool shall be the area as described in Exhibit "A" attached hereto and made a part hereof.

(2) That the vertical limits of the Eumont Gas Pool, heretofore created, shall extend from the top of the Yates formation to the base of the Queen formation, thereby including all of the Yates, Seven Rivers and Queen formations. The horizontal limits of the Eumont Gas Pool shall be the area as described in Exhibit "B" attached hereto and made a part hereof.

(3) That the vertical limits of the Arrow Gas Pool, heretofore created, shall extend from the top of the Yates formation to the base of the Queen formation, thereby including all of the Yates, Seven Rivers and Queen formations. The horizontal limits of the Arrow Gas Pool shall be the area as described in Exhibit "C" attached hereto and made a part hereof.

(4) That the vertical limits of the Eunice-Monument Oil Pool, heretofore created, shall include all of the Grayburg and San Andres formations. The horizontal limits of the Eunice-Monument Oil Pool shall be the area as described in Exhibit "D" attached hereto and made a part hereof.

(5) That the vertical limits of the Arrowhead Oil Pool shall include all of the Grayburg formation.

(6) That the vertical limits of the following oil pools, heretofore created, defined and described shall extend from a point 100 feet above the base of the Seven Rivers formation to the base of the Queen formation.

Cooper-Jal Oil Pool
South Eunice Oil Pool
Langlie-Mattix Oil Pool

(7) That the horizontal limits of the Cooper-Jal Oil Pool shall be the area as described in Exhibit "E" attached hereto and made a part hereof.

(8) That the horizontal limits of the Langlie-Mattix Oil Pool shall be the area as described in Exhibit "F" attached hereto and made a part hereof.

(9) That the horizontal limits of the South Eunice Oil Pool shall be the area as described in Exhibit "G" attached hereto and made a part hereof.

(10) That no gas, either dry gas or casinghead gas, shall be flared or vented in the following pools unless specifically authorized by order of the Commission after notice and hearing:

Eunice-Monument Oil Pool
South Eunice Oil Pool
Hardy Oil Pool
Penrose-Skelly Oil Pool
Cooper-Jal Oil Pool
Arrowhead Oil Pool
Langlie-Mattix Oil Pool
Rhodes Oil Pool
Leonard Oil Pool
South Leonard Oil Pool

Eaves Oil Pool
Arrow Gas Pool
Eumont Gas Pool
Jalmat Gas Pool

This rule shall become effective November 1,1954. Any operator desiring to obtain exception from the provisions of this rule shall apply for hearing prior to September 15, 1954. All operators shall file Form C-110, in duplicate, designating thereon the disposition of all dry gas or casinghead gas from each well in each pool listed above. Within 15 days after completion of any oil or gas well within the boundaries of the above listed pools, the operator shall file Form C-110 designating the disposition of gas from the well.

Failure to comply with the provisions of this rule within the prescribed time limits will result in the suspension of any further allowable. Extraction plants procecessing any gas from any of the above designated pools shall comply with the "no-flare" provisior of this rule, provided however, that the restriction may be lifted when mechanical difficulties arise or when the gas flared is of no commercial value.

(11) That oil wells producing from the following named pools shall be allowed to produce a volume of gas each day not exceeding the daily normal unit oil allowable multiplied by 10,000; provided however, that such well shall not be allowed to produce oil in excess of the normal unit allowable as ordered by the Commission under the provisions of Rule 505; Cooper-Jal Oil Pool, Langlie-Mattix Oil Pool, South Eunice Oil Pool, Penrose-Skelly Oil Pool, Leonard Oil Pool, South Leonard Oil Pool, Hardy Oil Pool and Rhodes Oil Pool.

(12) That the Falby-Yates Oil Pool as heretofore created, defined and described shall be abolished and all oil wells presently producing from the Falby-Yates Oil Pool shall be governed by the applicable rules of the Jalmat Gas Pool.

(13) That that portion of the Rhodes Storage Area lying within the defined limits of the Jalmat Gas Pool shall be exempted from the applicable provisions of the Jalmat Gas Pool Rules. The Rhodes Storage Area shall include the following described area:

TOWNSHIP 26 South, RANGE 37 East, NMPM
Sec. 4: W/2 NW/4, SE/4 SE/4, W/2 SE/4, SW/4;
Sec. 5: All
Sec. 6: NE/4 NW/4, NE/4, SE/4 SE/4, N/2 SE/4
Sec. 7: NE/4 NE/4
Sec. 8: N/2, N/2 S/2, SE/4 SW/4, S/2 SE/4
Sec. 9: All
Sec. 10: W/2 NW/4, SE/4 NW/4, S/2
Secs. 15 & 16: All
Sec. 17: E/2 NW/4, E/2
Sec. 20: E/2
Secs. 21 & 22: All
Sec. 23: SW/4 NW/4, SW/4
Secs. 26, 27, & 28: All
Sec. 29: E/2 NE/4

That special pool rules applicable to the Jalmat Gas Pool be, and the same hereby are promulgated as follows:

SPECIAL RULES AND REGULATIONS FOR THE JALMAT GAS POOL

Well Spacing and Acreage Requirements for Drilling Tracts.

RULE 1. Any well drilled a distance of one mile or more outside the boundary of the Jalmat Gas Pool shall be classified as a wildcat well. Any well drilled less than one mile outside the boundary of the Jalmat Gas Pool shall be spaced, drilled, operated and prorated in accordance with the regulations in effect in the Jalmat Gas Pool.

RULE 2. Each well drilled or recompleted within the Jalmat Gas Pool on a standard proration unit after the effective date of this rule shall be drilled not closer than 1980 feet to any boundary line of the tract nor closer than 330 feet to a quarter-quarter section line or subdivision inner boundary line. Any well drilled to and producing from the Jalmat Gas Pool prior to the effective date of this order at a location conforming to the spacing requirements effective at the time said well was drilled shall be considered to be located in conformance with this rule.

RULE 3. The Secretary of the Commission shall have authority to grant exception to the requirements of Rule 2 without notice and hearing where application has been filed in due form and the necessity for the unorthodox location is based on topographical conditions or is occasioned by the recompletion of a well previously drilled to another horizon.

Applicants shall furnish all operators within a 1980-foot radius of the subject well a copy of the application to the Commission, and applicant shall include with his application a list of names and addresses of all operators within such radius, together with a stipulation that proper notice has been given said operators at the addresses given. The Secretary of the Commission shall wait at least 20 days before approving any such unorthodox location, and shall approve such unorthodox location only in the absence of objection of any offset operators. In the event an operator objects to the unorthodox location the Commission shall consider the matter only after proper notice and hearing.

RULE 4. The provisions of Statewide Rule 104, Paragraph (k), shall not apply to the Jalmat Gas Pool located in Lea County, New Mexico.

GAS PRORATION

RULE 5. (a) The acreage allocated to a gas well for proration purposes shall be known as the gas proration unit for that well. For the purpose of gas allocation in the Jalmat Gas Pool, a standard proration unit shall consist of between 632 and 648 contiguous surface acres substantially in the form of a square which shall be a legal subdivision (section) of the U. S. Public Land Surveys with a well located at least 1980 feet from the nearest property lines; provided, however, that a non-standard gas proration unit may be formed after notice and hearing by the Commission, or under the provision of Paragraph (b) of this Rule.

The allowable production from any non-standard gas proration unit as compared with the allowable production therefrom if such tract were a standard unit shall be in the ratio of the area of such non-standard proration unit expressed in acres to 640 acres. Any gas proration unit containing between 632 and 648 acres shall be considered to contain 640 acres for the purpose of computing allowables.

In establishing a non-standard gas proration unit the location of the well with respect to the two nearest boundary lines thereof shall govern the maximum amount of acreage that may be assigned to the well for the purposes of gas proration; provided, however, that any well drilled to and producing from the Jalmat Gas Pool, as defined herein, prior to the effective date of this order at a location conforming with the spacing requirements effective at the time said well was drilled shall be granted a tolerance not exceeding 330 feet with respect to the required distances from the boundary lines. The maximum acreage which shall be assigned with respect to the well's location shall be as follows:

Location	Maximum Acreage
660' - 660'	160 acres
660' - 1980'	320 acres

(b) The Secretary of the Commission shall have authority to grant an exception to Rule 5 (a) without Notice and Hearing where application has been filed in due form and where the following facts exist and the following provisions are complied with;

1. The non-standard gas proration unit consists of contiguous quarter-quarter sections and/or lots.

2. The non-standard gas proration unit lies wholly within a single governmental section.

3. The entire non-standard gas proration unit may reasonably be presumed to be productive of gas.

4. The length or width of the non-standard gas proration unit does not exceed 5280 feet.

5. The applicant presents written consent in the form of waivers from (a) all operators owning interests in the quarter sections in which any part of the non-standard gas proration unit is situated and which acreage is not included in said non-standard gas proration unit, and (b) all operators owning interests within 1500 feet of the well to which such gas proration unit is proposed to be allocated.

6. In lieu of paragraph 5 of this rule, the applicant may furnish proof of the fact that said offset operators were notified by registered mail of his intent to form such non-standard gas proration unit. The Secretary of the Commission may approve the application if, after a period of 30 days following the mailing of said notice, no operator has made objection to formation of such non-standard gas proration unit.

RULE 6. (a) The Commission after notice and hearing, shall consider the nominations of gas purchasers from the Jalmat Gas Pool and other relevant data and shall fix the allowable production of the Jalmat Gas Pool.

(b) The allowable assigned to any well capable of producing its normal gas allowable in the Jalmat Gas Pool shall be the same proportion of the total remaining allowable allocated to said pool after deducting allowables of marginal wells that the number of acres contained in the gas proration unit for that well bears to the acreage contained in all gas proration units assigned to non-marginal wells in the Jalmat Gas Pool.

RULE 7. At least 30 days prior to the beginning of each gas proration period the Commission shall hold a hearing after due notice has been given. The Commission shall cause to be submitted by each gas purchaser its "Preliminary Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration period, by months, from the Jalmat Gas Pool. The Commission shall consider the "Prelimin-

ary Nominations" of purchasers, actual production, and such other factors as may be deemed applicable in determining the amount of gas that may be produced without waste within the ensuing proration period. "Preliminary Nominations" shall be submitted on a form prescribed by the Commission.

RULE 8. In the event a gas purchaser's market shall have increased or decreased, he may file with the Commission prior to the 10th day of the month a "supplemental" nomination, showing the amount of gas he actually in good faith desires to purchase during the ensuing proration month from the Jalmat Gas Pool. The Commission shall hold a public hearing between the 15th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month, and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month.

Included in the monthly proration schedule shall be (a) a summary of the total pool allocation for that month showing nominations, and adjustments made for underage or overage applied from a previous month, (b) a tabulation of the net allowable, and production for the second preceding month together with a cumulative overage or underage computation, (c) a tabulation of the current and net allowables for the preceding month, (d) a tabulation of current monthly allowables for the ensuing proration month, and (e) a tabulation of the acreage assigned each well together with a tabulation of the acreage factor assigned each well. For the purpose of allocation a proration unit of 640 acres shall be assigned an acreage factor of 4.00; a proration unit of 160 acres a factor of 1.00, etc.

"Supplemental Nominations" shall be submitted on a form prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the Jalmat Gas Pool delivering to a gas transportation facility, or lease gathering system, and shall include in the proration schedule of the Jalmat Gas Pool any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well. The total allowable to be allocated to the pool each month shall be equal to the sum of the preliminary or supplemental nominations (whichever is applicable), together with any adjustment which the Commission deems advisable.

If during a proration month the acreage assigned a well is increased the operator shall notify the Proration Manager in writing (Box 2045, Hobbs, New Mexico) of such increase. The increased allowable assigned the gas proration unit for the well shall be effective on the first day of the month following receipt of the notification by the Proration Manager.

BALANCING OF PRODUCTION

RULE 9. Underproduction: The dates 7:00 a.m., January 1, and 7:00 a.m., July 1, shall be known as balancing dates and the periods of time bounded by these dates shall be known as gas proration periods. The amount of current gas allowable remaining unproduced at the end of each proration period shall be carried forward to and may be produced during the next succeeding proration period in addition to the normal gas allowable for such succeeding period; but whatever amount thereof is not made up within the first succeeding proration period shall be cancelled.

If it appears that such continued underproduction has resulted from inability of the well to produce its allowable, it may be classified as a marginal well and its allowable reduced to the well's ability to produce.

If at the end of a proration period a marginal well has produced more than the total allowable assigned a non-marginal unit of corresponding size, the marginal well shall be reclassified as a non-marginal well and its allowable adjusted accordingly.

If during a proration period a marginal well is reworked or recompleted in such a manner that its productive capacity is increased to the extent that it should be reclassified as a non-marginal well, the reclassification shall be effective on the first day of the proration month following the date of recompletion.

The Proration Manager may reclassify a well at any time if production data or deliverability tests reflect the need for such a reclassification.

RULE 10. Overproduction: A well which has produced a greater amount of gas than was allowed during a given proration period shall have its allowable for the first succeeding proration period reduced by the amount of such overproduction and such overproduction shall be made up within the first succeeding proration period. If, at the end of the first succeeding proration period, the well is still overproduced, and has not be in balance since the end of the preceding proration period, then it shall be shut in and its current monthly allowable charged against said overproduction until the well is in balance. If, at any time, a well is overproduced an amount equaling six times its current monthly allowable, it shall be shut in until it is in balance.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut in upon a showing at public hearing after due notice that complete shut in of the well would result in material damage to the well.

GRANTING OF ALLOWABLES

RULE 11. No gas well shall be given an allowable until Form C-104 and Form C-110 have been filed together with a plat showing acreage attributed to said well and the locations of all wells on the lease.

RULE 12. Allowables to newly completed gas wells shall commence on the date of connection to a gas transportation facility, as determined from an affidavit furnished to the Commission (Box 2045, Hobbs, New Mexico) by the purchaser, or the date of filing of Form C-104 and Form C-110 and the plat described above, whichever date is the later.

REPORTING OF PRODUCTION

RULE 13. The monthly gas production from each well shall be metered separately and the gas production therefrom shall be reported to the Commission on Form C-115 so as to reach the Commission on or before the 20th day of the month next succeeding the month in which the gas was produced. The operator shall show on such report what disposition has been made of the gas produced.

Each purchaser or taker of gas in the Jalmat Gas Pool shall submit a report to the Commission so as to reach the Commission on or before the 20th day of the month next succeeding the month in which the gas was purchased or taken.

Such report shall be filed on either Form C-111 or Form C-114 (whichever is applicable) with the wells being listed in approximately the same order as they are listed on the proration schedule.

Forms C-111 and C-114 referred to herein shall be submitted in duplicate, the original being sent to the Commission at Box 871, Santa Fe, New Mexico, the other copy being

sent to Box 2045, Hobbs, New Mexico.

Form C-115 shall be submitted in accordance with Rule 1114 of the Commission's Rules and Regulations.

The full production of gas from each well shall be charged against the well's allowable regardless of what disposition has been made of the gas; provided, however, that gas used on the lease for consumption in lease houses, treaters, compressors, combustion engines and other similar lease equipment shall not be charged against the well's allowable.

DEFINITIONS

RULE 14. A gas well shall mean a well producing with a gas-oil ratio in excess of 100,000 cubic feet of gas per barrel of oil.

RULE 15. A well producing from the Jalmat Gas Pool and not classified as a gas well as defined in Rule 14 shall be classified as an oil well.

RULE 16. The term "gas purchaser" as used in these rules, shall mean any "taker" of gas either at the wellhead or at any point on the lease where connection is made for gas transportation or utilization. It shall be the responsibility of said "taker" to submit a nomination.

RULE 17. No gas, either dry gas or casinghead gas, produced from the Jalmat Gas Pool shall be flared or vented unless specifically authorized by order of the Commission after notice and hearing.

RULE 18. Oil wells producing from the Jalmat Gas Pool shall be allowed to produce a volume of gas each day not exceeding the daily normal unit oil allowable multiplied by 10,000; provided, however, that such well shall not be allowed to produce oil in excess of the normal unit allowable as ordered by the Commission under the provisions of Rule 505.

PROVIDED FURTHER, After the effective date of this order no well shall be completed or recompleted in such a manner that the producing zone of the overlying gas pool and the producing zone of the underlying oil pool are both open in the same well bore unless specifically authorized by order of the Commission after notice and hearing. Dual completions may be effected in accordance with the provisions of Rule 112-A of the Commission's Rules and Regulations.

Any well presently completed in such a manner that the well bore is open to both the overlying gas pool and the underlying oil pool shall be assigned to either the gas pool or the oil pool by the Commission staff. Any operator of any well completed in such a manner shall submit to the Commission office at Hobbs, New Mexico, all pertinent well completion data on Form C-105, together with electric logs, sample logs, drill stem test records, etc. All data shall be submitted in duplicate on or before September 15, 1954. Failure of any operator to submit the required data will result in cancellation of Form C-110 and subsequent cancellation of allowables.

If the operator is not satisfied with the well's assignment he may apply for a hearing on the matter in accordance with Commission Rule 1203.

PROVIDED FURTHER, Gas-Oil Ratio Tests shall be taken in accordance with the provisions of Rule 301 of the Commission's Rules and Regulations.

Gas-Oil Ratio Tests shall be taken in all oil or gas pools in accordance with the attached schedule, (Exhibit H). This schedule supersedes the annual Gas-Oil Ratio test schedule previously issued only where applicable.

The operator of any oil or gas well who has submitted Form C-116 to the Commission during 1954 in compliance with the 1954 Annual Gas-Oil Ratio test schedule previously adopted is exempted from the requirement of taking another Gas-Oil Ratio test during 1954. If the test previously submitted is not complete the Proration Manager shall so advise the operator and the operator shall submit the required test in conformance with the Gas-Oil Ratio test schedule as outlined in Exhibit "H" attached hereto and made a part hereof.

PROVIDED FURTHER, That for gas allocation purposes and assignment of allowables the combination of the Jalco and Langmat gas pools to the Jalmat Gas Pool shall be effective September 1, 1954.

It is recognized that a great many wells will be reclassified and reassigned as a result of the provisions of this order and that the time involved in the reclassification may cause certain inequities; therefore, the Proration Manager is hereby directed to take such action as he deems advisable to prevent inequitable withdrawals.

PROVIDED FURTHER, That in filing Form C-101 "Notice of Intention to Drill or Re-complete" all operators shall strictly comply with the provisions of Rule 104, paragraph (e).

PROVIDED FURTHER, That failure to comply with the provisions of this order or the rules contained herein shall result in the cancellation of allowable assigned to the affected well. No further allowable shall be assigned to the affected well until all rules and regulations are complied with. The Proration Manager shall notify the operator of the well and the purchaser in writing of the date of allowable cancellation and the reason therefor.

PROVIDED FURTHER, That special pool rules applicable to the Eumont Gas Pool be, and the same hereby are promulgated as follows:

SPECIAL RULES AND REGULATIONS FOR THE EUMONT GAS POOL

Well Spacing and Acreage Requirements for Drilling Tracts.

RULE 1. Any well drilled a distance of one mile or more outside the boundary of the Eumont Gas Pool shall be classified as a wildcat well. Any well drilled less than one mile outside the boundary of the Eumont Gas Pool shall be spaced, drilled, operated and prorated in accordance with the regulations in effect in the Eumont Gas Pool.

RULE 2. Each well drilled or recompleted within the Eumont Gas Pool on a standard proration unit after the effective date of this rule shall be drilled not closer than 1980 feet to any boundary line of the tract nor closer than 330 feet to a quarter-quarter section line or subdivision inner boundary line. Any well drilled to and producing from the Eumont Gas Pool prior to the effective date of this order at a location conforming to the spacing requirements effective at the time said well was drilled shall be considered to be located in conformance with this rule.

RULE 3. The Secretary of the Commission shall have authority to grant exception to the requirements of Rule 2 without notice and hearing where application has been filed in due form and the necessity for the unorthodox location is based on topographical con-

ditions or is occasioned by the recompletion of a well previously drilled to another horizon.

Applicants shall furnish all operators within a 1980 foot radius of the subject well a copy of the application to the Commission, and applicant shall include with his application a list of names and addresses of all operators within such radius, together with a stipulation that proper notice has been given said operators at the addresses given. The Secretary of the Commission shall wait at least 20 days before approving any such unorthodox location, and shall approve such unorthodox location only in the absence of objection of any offset operators. In the event an operator objects to the unorthodox location the Commission shall consider the matter only after proper notice and hearing.

RULE 4. The provision of Statewide Rule 104, Paragraph (k), shall not apply to the Eumont Gas Pool located in Lea County, New Mexico.

GAS PRORATION

RULE 5. (a) The acreage allocated to a gas well for proration purposes shall be known as the gas proration unit for that well. For the purpose of gas allocation in the Eumont Gas Pool, a standard proration unit shall consist of between 632 and 648 contiguous surface acres substantially in the form of a square which shall be a legal subdivision (section) of the U. S. Public Land Surveys with a well located at least 1980 feet from the nearest property lines; provided, however, that a non-standard gas proration unit may be formed after notice and hearing by the Commission, or under the provisions of Paragraph (b) of this Rule.

The allowable production from any non-standard gas proration unit as compared with the allowable production therefrom if such tract were a standard unit shall be in the ratio of the area of such non-standard proration unit expressed in acres to 640 acres. Any gas proration unit containing between 632 and 648 acres shall be considered to contain 640 acres for the purpose of computing allowables.

In establishing a non-standard gas proration unit the location of the well with respect to the two nearest boundary lines thereof shall govern the maximum amount of acreage that may be assigned to the well for the purposes of gas proration; provided, however, that any well drilled to and producing from the Eumont Gas Pool, as defined herein, prior to the effective date of this order at a location conforming with the spacing requirements effective at the time said well was drilled shall be granted a tolerance not exceeding 330 feet with respect to the required distances from the boundary lines. The maximum acreage which shall be assigned with respect to the well's location shall be as follows:

Location	Maximum Acreage
660' - 660'	160 acres
660' - 1980'	320 acres

(b) The Secretary of the Commission shall have authority to grant an exception to Rule 5 (a) without Notice and Hearing where application has been filed in due form and where the following facts exist and the following provisions are complied with;

1. The non-standard gas proration unit consists of contiguous quarter-quarter sections and/or lots.

2. The non-standard gas proration unit lies wholly within a single governmental section.

3. The entire non-standard gas proration unit may reasonably be presumed to be productive of gas.

4. The length or width of the non-standard gas proration unit does not exceed 5280 feet.

5. The applicant presents written consent in the form of waivers from (a) all operators owning interests in the quarter sections in which any part of the non-standard gas proration unit is situated and which acreage is not included in said non-standard gas proration unit, and (b) all operators owning interests within 1500 feet of the well to which such gas proration unit is proposed to be allocated.

6. In lieu of paragraph 5 of this rule, the applicant may furnish proof of the fact that said offset operators were notified by registered mail of his intent to form such non-standard gas proration unit. The Secretary of the Commission may approve the application if, after a period of 30 days following the mailing of said notice, no operator has made objection to formation of such non-standard gas proration unit.

RULE 6. (a) The Commission after notice and hearing, shall consider the nominations of gas purchasers from the Eumont Gas Pool and other relevant data and shall fix the allowable production of the Eumont Gas Pool.

(b) The allowable assigned to any well capable of producing its normal gas allowable in the Eumont Gas Pool shall be the same proportion of the total remaining allowable allocated to said pool after deducting allowables of marginal wells that the number of acres contained in the gas proration unit for that well bears to the acreage contained in all gas proration units assigned to non-marginal wells in the Eumont Gas Pool.

RULE 7. At least 30 days prior to the beginning of each gas proration period the Commission shall hold a hearing after due notice has been given. The Commission shall cause to be submitted by each gas purchaser its "Preliminary Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration period, by months from the Eumont Gas Pool. The Commission shall consider the "Preliminary Nominations" of purchasers, actual production, and such other factors as may be deemed applicable in determining the amount of gas that may be produced without waste within the ensuing proration period. "Preliminary Nominations" shall be submitted on a form prescribed by the Commission.

RULE 8. In the event a gas purchaser's market shall have increased or decreased, he may file with the Commission prior to the 10th day of the month a "supplemental" nomination, showing the amount of gas he actually in good faith desires to purchase during the ensuing proration month from the Eumont Gas Pool. The Commission shall hold a public hearing between the 15th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month, and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month.

Included in the monthly proration schedule shall be (a) a summary of the total pool allocation for that month showing nominations, and adjustments made for underage or overage applied from a previous month (b) a tabulation of the net allowable, and production for the second preceding month together with a cumulative overage or underage computation, (c) a tabulation of the current and net allowables for the preceding month, (d) a tabulation of current monthly allowables for the ensuing proration month, and (e) a tabulation of the acreage assigned each well together with a tabulation of the acreage factor assigned each well. For the purpose of allocation a proration unit of 640 acres shall be assigned an acreage factor of 4.00; a proration unit of 160 acres a factor of 1.00, etc.

"Supplemental Nominations" shall be submitted on a form prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the Eumont Gas Pool delivering to a gas transportation facility, or lease gathering system, and shall include in the proration schedule of the Eumont Gas Pool any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well. The total allowable to be allocated to the pool each month shall be equal to the sum of the preliminary or supplemental nominations (whichever is applicable) together with any adjustment which the Commission deems advisable.

If during a proration month the acreage assigned a well is increased the operator shall notify the Proration Manager in writing (Box 2045, Hobbs, New Mexico) of such increase. The increased allowable assigned the gas proration unit for the well shall be effective on the first day of the month following receipt of the notification by the Proration Manager.

BALANCING OF PRODUCTION

RULE 9. Underproduction: The dates 7:00 a.m. , January 1, and 7:00 a.m., July 1, shall be known as balancing dates and the periods of time bounded by these dates shall be known as gas proration periods. The amount of current gas allowable remaining unproduced at the end of each proration period shall be carried forward to and may be produced during the next succeeding proration period in addition to the normal gas allowable for such succeeding period; but whatever amount thereof is not made up within the first succeeding proration period shall be cancelled.

If it appears that such continued underproduction has resulted from inability of the well to produce its allowable, it may be classified as a marginal well and its allowable reduced to the well's ability to produce.

If at the end of a proration period a marginal well has produced more than the total allowable assigned a non-marginal unit of corresponcing size, the marginal well shall be reclassified as a non-marginal well and its allowable adjusted accordingly.

If during a proration period a marginal well is reworked or recompleted in such a manner that its productive capacity is increased to the extent that is should be reclassified as a non-marginal well, the reclassification shall be effective on the first day of the proration month following the date of recompletion.

The Proration Manager may reclassify a well at any time if production data or deliverability tests reflect the need for such a reclassification.

RULE 10. Overproduction: A well which has produced a greater amount of gas than was allowed during a given proration period shall have its allowable for the first succeeding proration period reduced by the amount of such overproduction and such overproduction shall be made up within the first succeeding proration period. If, at the end of the first succeeding proration period, the well is still overproduced, and has not been in balance since the end of the preceding proration period, then it shall be shut in and its current monthly allowable charged against said overproduction until the well is in balance. If, at any time, a well is overproduced an amount equaling six times its current monthly allowable, it shall be shut in until it is in balance.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut in upon a showing at public hearing after

due notice that complete shut in of the well would result in material damage to the well.

GRANTING OF ALLOWABLES.

RULE 11. No gas well shall be given an allowable until Form C-104 and Form C-110 have been filed together with a plat showing acreage attributed to said well and the locations of all wells on the lease.

RULE 12. Allowables to newly completed gas wells shall commence on the date of connection to a gas transportation facility, as determined from an affidavit furnished to the Commission (Box 2045, Hobbs, New Mexico) by the purchaser, or the date of filing of Form C-104, and Form C-110 and the plat described above, whichever date is the later.

REPORTING OF PRODUCTION

RULE 13. The monthly gas production from each gas well shall be metered separately and the gas production therefrom shall be reported to the Commission on Form C-115 so as to reach the Commission on or before the 20th day of the month next succeeding the month in which the gas was produced. The operator shall show on such report what disposition has been made of the gas produced.

Each purchaser or taker of gas in the Eumont Gas Pool shall submit a report to the Commission so as to reach the Commission on or before the 20th day of the month next succeeding the month in which the gas was purchased or taken.

Such report shall be filed on either Form C-111 or Form C-114 (whichever is applicable) with the wells being listed in approximately the same order as they are listed on the proration schedule.

Forms C-111 and C-114 referred to herein shall be submitted in duplicate, the original being sent to the Commission at Box 871, Santa Fe, New Mexico, the other copy being sent to Box 2045, Hobbs, New Mexico.

Form C-115 shall be submitted in accordance with Rule 1114 of the Commission's Rules and Regulations.

The full production of gas from each well shall be charged against the well's allowable regardless of what disposition has been made of the gas; provided, however, that gas used on the lease for consumption in lease houses, treaters, compressors, combustion engines and other similar lease equipment shall not be charged against the well's allowable.

DEFINITIONS

RULE 14. A gas well shall mean a well producing with a gas-oil ratio in excess of 100,000 cubic feet of gas per barrel of oil.

RULE 15. A well producing from the Eumont Gas Pool and not classified as a gas well as defined in Rule 14 shall be classified as an oil well.

RULE 16. The term "gas purchaser" as used in these rules, shall mean any "taker" of gas either at the wellhead or at any point on the lease where connection is made for gas transportation or utilization. It shall be the responsibility of said "taker" to submit a nomination.

RULE 17. No gas, either dry gas or casinghead gas, produced from the Eumont Gas Pool shall be flared or vented unless specifically authorized by order of the Commission after notice and hearing.

RULE 18. Oil wells producing from the Eumont Gas Pool shall be allowed to produce a volume of gas each day not exceeding the daily normal unit oil allowable multiplied by 10,000; provided, however, that such well shall not be allowed to produce oil in excess of the normal unit allowable as ordered by the Commission under the provisions of Rule 505.

PROVIDED FURTHER, That special pool rules applicable to the Arrow Gas Pool be, and the same hereby are promulgated as follows:

SPECIAL RULES AND REGULATIONS FOR THE ARROW GAS POOL

Well Spacing and Acreage Requirements for Drilling Tracts.

RULE 1. Any well drilled a distance of one mile or more outside the boundary of the Arrow Gas Pool shall be classified as a wildcat well. Any well drilled less than one mile outside the boundary of the Arrow Gas Pool shall be spaced, drilled, operated and prorated in accordance with the regulations in effect in the Arrow Gas Pool.

RULE 2. Each well drilled or recompleted within the Arrow Gas Pool on a standard proration unit after the effective date of this rule shall be drilled not closer than 1980 feet to any boundary line of the tract nor closer than 330 feet to a quarter-quarter section line or subdivision inner boundary line. Any well drilled to and producing from the Arrow Gas Pool prior to the effective date of this order at a location conforming to the spacing requirements effective at the time said well was drilled shall be considered to be located in conformance with this rule.

RULE 3. The Secretary of the Commission shall have authority to grant exception to the requirements of Rule 2 without notice and hearing where application has been filed in due form and the necessity for the unorthodox location is based on topographical conditions or is occasioned by the recompletion of a well previously drilled to another horizon.

Applicants shall furnish all operators within a 1980 foot radius of the subject well a copy of the application to the Commission, and applicant shall include with his application a list of names and addresses of all operators within such radius, together with a stipulation that proper notice has been given said operators at the addresses given. The Secretary of the Commission shall wait at least 20 days before approving any such unorthodox location, and shall approve such unorthodox location only in the absence of objection of any offset operators. In the event an operator objects to the unorthodox location the Commission shall consider the matter only after proper notice and hearing.

RULE 4. The provisions of Statewide Rule 104, Paragraph (k), shall not apply to the Arrow Gas Pool located in Lea County, New Mexico.

GAS PRORATION

RULE 5. (a) The acreage allocated to a gas well for proration purposes shall be known as the gas proration unit for that well. For the purpose of gas allocation in the Arrow Gas Pool, a standard proration unit shall consist of between 632 and 648 contiguous surface acres substantially in the form of a square which shall be a legal subdivision (section) of the U. S. Public Land Surveys with a well located at least 1980 feet from the nearest property lines; provided, however, that a non-standard proration unit may be

formed after notice and hearing by the Commission, or under the provisions of Paragraph (b) of this Rule.

The allowable production from any non-standard gas proration unit as compared with the allowable production therefrom if such tract were a standard unit shall be in the ratio of the area of such non-standard proration unit expressed in acres to 640 acres. Any gas proration unit containing between 632 and 648 acres shall be considered to contain 640 acres for the purpose of computing allowables.

In establishing a non-standard gas proration unit the location of the well with respect to the two nearest boundary lines thereof shall govern the maximum amount of acreage that may be assigned to the well for the purposes of gas proration; provided, however, that any well drilled to and producing from the Arrow Gas Pool, as defined herein, prior to the effective date of this order at a location conforming with the spacing requirements effective at the time said well was drilled shall be granted a tolerance not exceeding 330 feet with respect to the required distances from the boundary lines. The maximum acreage which shall be assigned with respect to the well's location shall be as follows:

Location	Maximum Acreage
660' - 660'	160 acres
660' - 1980'	320 acres

(b) The Secretary of the Commission shall have authority to grant an exception to Rule 5 (a) without notice and hearing where application has been filed in due form and where the following facts exist and the following provisions are complied with;

1. The non-standard gas proration unit consists of contiguous quarter-quarter sections and/or lots.

2. The non-standard gas proration unit lies wholly within a single governmental section.

3. The entire non-standard gas proration unit may reasonably be presumed to be productive of gas.

4. The length or width of the non-standard gas proration unit does not exceed 5280 feet.

5. The applicant presents written consent in the form of waivers from (a) all operators owning interests in the quarter sections in which any part of the non-standard gas proration unit is situated and which acreage is not included in said non-standard gas proration unit, and (b) all operators owning interests within 1500 feet of the well to which such gas proration unit is proposed to be allocated.

6. In lieu of paragraph 5 of this rule, the applicant may furnish proof of the fact that said offset operators were notified by registered mail of his intent to form such non-standard gas proration unit. The Secretary of the Commission may approve the application if, after a period of 30 days following the mailing of said notice, no operator has made objection to formation of such non-standard gas proration unit.

RULE 6. (a) The Commission after notice and hearing, shall consider the nominations of gas purchasers from the Arrow Gas Pool and other relevant data and shall fix the allowable production of the Arrow Gas Pool.

(b) The allowable assigned to any well capable of producing its normal gas allowable in the Arrow Gas Pool shall be the same proportion of the total remaining allowable allocated to said pool after deducting allowables of marginal wells that the number of acres contained in the gas proration unit for that well bears to the acreage contained in all gas proration units assigned to non-marginal wells in the Arrow Gas Pool.

RULE 7. At least 30 days prior to the beginning of each gas proration period the Commission shall hold a hearing after due notice has been given. The Commission shall cause to be submitted by each gas purchaser its "Preliminary Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration period, by months from the Arrow Gas Pool. The Commission shall consider the "Preliminary Nominations" of purchasers, actual production, and such other factors as may be deemed applicable in determining the amount of gas that may be produced without waste within the ensuing proration period. "Preliminary Nominations" shall be submitted on a form prescribed by the Commission.

RULE 8. In the event a gas purchaser's market shall have increased or decreased, he may file with the Commission prior to the 10th day of the month a "supplemental" nomination, showing the amount of gas he actually in good faith desires to purchase during the ensuing proration month from the Arrow Gas Pool. The Commission shall hold a public hearing between the 15th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month, and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month.

Included in the monthly proration schedule shall be (a) a summary of the total pool allocation for that month showing nominations, and adjustments made for underage or overage applied from a previous month, (b) a tabulation of the net allowable, and production for the second preceding month together with a cumulative overage or underage computation, (c) a tabulation of the current and net allowables for the preceding month, (d) a tabulation of current monthly allowables for the ensuing proration month, and (e) a tabulation of the acreage assigned each well together with a tabulation of the acreage factor assigned each well. For the purpose of allocation a proration unit of 640 acres shall be assigned an acreage factor of 4.00; a proration unit of 160 acres a factor of 1.00, etc.

"Supplemental Nominations" shall be submitted on a form prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the Arrow Gas Pool delivering to a gas transportation facility, or lease gathering system, and shall include in the proration schedule of the Arrow Gas Pool any well which it finds it being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well. The total allowable to be allocated to the pool each month shall be equal to the sum of the preliminary or supplemental nominations (whichever is applicable) together with any adjustment which the Commission deems advisable.

If during a proration month the acreage assigned a well is increased the operator shall notify the Proration Manager in writing (Box 2045, Hobbs, New Mexico) of such increase. The increased allowable assigned the gas proration unit for the well shall be effective on the first day of the month following receipt of the notification by the Proration Manager.

BALANCING OF PRODUCTION

RULE 9. Underproduction: The dates 7:00 a.m., January 1, and 7:00 a.m., July 1, shall be known as balancing dates and the periods of time bounded by these dates shall be

known as gas proration periods. The amount of current gas allowable remaining unproduced at the end of each proration period shall be carried forward to and may be produced during the next succeeding proration period in addition to the normal gas allowable for such succeeding period; but whatever amount thereof is not made up within the first succeeding proration period shall be cancelled.

If it appears that such continued underproduction has resulted from inability if the well to produce its allowable, it may be classified as a marginal well and its allowable reduced to the well's ability to produce.

If at the end of a proration period a marginal well has produced more than the total allowable assigned a non-marginal unit of corresponding size, the marginal well shall be reclassified as a non-marginal well and its allowable adjusted accordingly.

If during a proration period a marginal well is reworked or recompleted in such a manner that its productive capacity is increased to the extent that it should be reclassified as a non-marginal well, the reclassification shall be effective on the first day of the proration month following the date of recompletion.

The Proration Manager may reclassify a well at any time if production data or deliverability tests reflect the need for such a reclassification.

RULE 10. Overproduction: A well which has produced a greater amount of gas than was allowed during a given proration period shall have its allowable for the first succeeding proration period reduced by the amount of such overproduction and such overproduction shall be made up within the first succeeding proration period. If, at the end of the first succeeding proration period, the well is still overproduced, and has not been in balance since the end of the preceding proration period, then it shall be shut in and its current monthly allowable charged against said overproduction until the well is in balance. If, at any time, a well is overproduced an amount equaling six times its current monthly allowable, it shall be shut in until it is in balance.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut in upon a showing at public hearing after due notice that complete shut in of the well would result in material damage to the well.

GRANTING OF ALLOWABLES.

RULE 11. No gas well shall be given an allowable until Form C-104 and Form C-110 have been filed together with a plat showing acreage attributed to said well and the locations of all wells on the lease.

RULE 12. Allowables to newly completed gas wells shall commence on the date of connection to a gas transportation facility, as determined from an affidavit furnished to the Commission (Box 2045, Hobbs, New Mexico) by the purchaser, or the date of filing of Form C-104, and Form C-110 and the plat described above, whichever date is the later.

REPORTING OF PRODUCTION

RULE 13. The monthly gas production from each gas well shall be metered separately and the gas production therefrom shall be reported to the Commission on Form C-115 so as to reach the Commission on or before the 20th day of the month next succeeding the month in which the gas was produced. The operator shall show on such report what disposition has been made of the gas produced.

Each purchaser or taker of gas in the Arrow Gas Pool shall submit a report to the Commission so as to reach the Commission on or before the 20th day of the month next succeeding the month in which the gas was purchased or taken.

Such report shall be filed on either Form C-111 or Form C-114 (whichever is applicable) with the wells being listed in approximately the same order as they are listed on the proration schedule.

Forms C-111 and C-114 referred to herein shall be submitted in duplicate, the original being sent to the Commission at Box 871, Santa Fe, New Mexico, the other copy being sent to Box 2045, Hobbs, New Mexico.

Form C-115 shall be submitted in accordance with Rule 1114 of the Commission's Rules and Regulations.

The full production of gas from each well shall be charged against the well's allowable regardless of what disposition has been made of the gas; provided, however, that gas used on the lease for consumption in lease houses, treaters, compressors, combustion engines and other similar lease equipment shall not be charged against the well's allowable.

DEFINITIONS

RULE 14. A gas well shall mean a well producing with a gas-oil ratio in excess of 100,000 cubic feet of gas per barrel of oil.

RULE 15. A well producing from the Arrow Gas Pool and not classified as a gas well as defined in Rule 14 shall be classified as an oil well.

RULE 16. The term "gas Purchaser" as used in these rules, shall mean any "taker" of gas either at the wellhead or at any point on the lease where connection is made for gas transportation or utilization. It shall be the responsibility of said "taker" to submit a nomination.

RULE 17. No gas, either dry gas or casinghead gas, produced from the Arrow Gas Pool shall be flared or vented unless specifically authorized by order of the Commission after notice and hearing.

RULE 18. Oil wells producing from the Arrow Gas Pool shall be allowed to produce a volume of gas each day not exceeding the daily normal unit oil allowable multiplied by 10,000; provided, however, that such well shall not be allowed to produce oil in excess of the normal unit allowable as ordered by the Commission under the provisions of Rule 505.

EXHIBIT "A"

Horizontal limits of the Jalmat Gas Pool

Township 21 South, Range 36 East

All of Section 31
SW/4 of Section 32
All of Secs. 33 and 34

Township 22 South, Range 35 East
E/2 Section 13

Exhibit "A" (Cont'd)

Township 22 South, Range 36 East
All of Secs. 3 through 10, inclusive.
W/2 Sec. 11
W/2 Section 14
All of Secs. 15 through 18, inclusive
NE/4 Sec. 19
All of Secs. 20 through 23, inclusive
W/2 Sec. 24
All of Secs. 25 through 29, inclusive
All of Secs. 32 through 36, inclusive

Township 22 South, Range 37 East
SW/4 Sec. 31

Township 23 South, Range 36 East
All of Secs. 1 through 4, inclusive
N/2 and SE/4 Sec. 5
E/2 Sec. 8
All Secs. 9 through 16, inclusive
NE/4 Sec. 17
All Secs. 21 through 27, inclusive
E/2 Sec. 28
E/2 Sec. 33
All Secs. 34, 35 and 36

Township 23 South, Range 37 East
All Secs. 6, 7, S/2 Sec. 8
All Secs. 17 through 21, inclusive
All Secs. 28 through 33, inclusive

Township 24 South, Range 36 East
All of Secs. 1, 2, and 3
E/2 Sec. 4
NE/4 Sec. 9
N/2, SE/4 Sec. 10
All of Secs. 11 through 14, inclusive
E/2 Sec. 15
All Secs. 22 through 26, inclusive
E/2 Sec. 27
E/2 Sec. 34
All Secs. 35 and 36

Township 24 South, Range 37 East
All of Secs. 5, 6, 7 and 8
W/2 Sec. 9
W/2 Sec. 16
All of Secs. 17 through 23, inclusive
All of Secs. 26 through 35, inclusive

Township 25 South, Range 36 East
All of Sec. 1
N/2 Sec. 2
All of Secs. 12, 13, 24 and 25
NE/4 Sec. 36

Township 25 South, Range 37 East
All Sec. 2 through 33, inclusive
W/2 Sec. 34

Exhibit "A" (Cont'd)

Township 26 South, Range 37 East
W/2 Sec. 3
All Secs. 4 through 9, inclusive
W/2 Sec. 10
All of Secs. 15 through 22, inclusive
All Secs. 27, 28 and 29
N/2, SE/4 Sec. 30
E/2 Sec. 31
All of Secs. 32, 33 and 34

EXHIBIT "B"

Horizontal limits of the Eumont Gas Pool

Township 19 South, Range 36 East
All of Secs. 12, 13, 14, 23, 24, 25, 26
E/2 Sec. 27
E/2 Sec. 34
All of Secs. 35 and 36

Township 19 South, Range 37 East
W/2 Sec. 4
E/2 Sec. 5
All of Secs. 7, 8, 17, 18, 19, 20
W/2 Sec. 9
W/2 Sec. 21
W/2 Sec. 27
All of Secs. 28, 29, 30, 31, 33 and 34

Township 20 South, Range 36 East
All of Secs. 1, 2
E/2 Sec. 3
E/2 Sec. 10
All of Secs. 11, 12, 13 and 14
NE/4 Sec. 15
N/2 and SE/4 Sec. 23
All of Secs. 24 and 25
E/2 Sec. 26
E/2 Sec. 35
All Sec. 36

Township 20 South, Range 37 East

W/2 Sec. 2
All of Secs. 3 through 10, inclusive
W/2 Sec. 11
All of Secs. 15 through 22, inclusive
S/2 Sec. 23
All of Secs. 26 through 35, inclusive
W/2 Sec. 36

Township 21 South, Range 35 East
All of Sec. 1
SE/4 Sec. 2

Exhibit "B" (Cont'd)

Township 21 South, Range 35 East (cont'd)
NE/4 Sec. 11
All of Sec. 12
All of Secs. 13 and 24

Township 21 South, Range 36 East
All of Secs. 1 through 21, inclusive
N/2 and SW/4 Sec. 22
W/2 Sec. 27
All of Secs. 28, 29 and 30
N/2 and SE/4 Sec. 32

Township 21 South, Range 37 East
All of Secs. 7 and 18

EXHIBIT "C"

Township 21 South, Range 36 East
SE/4 Sec. 24
All Sec. 25
E/2 Sec. 26
NE/4 and S/2 Sec. 35
All Sec. 36

Township 22 South, Range 36 East
All of Secs. 1 and 2
NE/4 Sec. 11
All of Sec. 12
N/2 and SE/4 Sec. 13

Township 22 South, Range 37 East
W/2 Sec. 7
All Sec. 18
N/2 Sec. 19

EXHIBIT "D"

Horizontal limits of the Eunice-Monument Oil Pool

Township 19 South, Range 36 East
E/2 Sec. 12
All of Sec. 13
All Secs. 23 through 27, inclusive
All Secs. 34, 35 and 36

Township 19 South, Range 37 East
SW/4 Sec. 3
S/2 Sec. 4
All of Secs. 7 and 8
W/2 Sec. 9
W/2 Sec. 16
All Secs. 17 through 21, inclusive
S/2 Sec. 27
All Secs. 28 through 34, inclusive

Exhibit "D" (Cont'd)

Township 20 South, Range 36 East
All Secs. 1, 2 and 3
All Secs. 10 through 14, inclusive
E/2 Sec. 15
All Secs. 23 through 26, inclusive
E/2 Sec. 27
All Secs. 35 and 36

Township 20 South, Range 37 East
All Secs. 3 through 10, inclusive
All Secs. 15 through 21, inclusive
W/2 Sec. 22
All Secs. 29 through 33, inclusive

Township 21 South, Range 35 East
All Secs. 1, 12, 13, 24
E/2 Sec. 25

Township 21 South, Range 36 East
SW/4 Sec. 1
All of Secs. 2 through 11, inclusive
W/2 Sec. 12
W/2 Sec. 13
All Sec. 14 through 22, inclusive
NW/4 Sec. 23
W/2 Sec. 27
All Secs. 28, 29 and 30
N/2 and SE/4 Sec. 32
All Sec. 33
W/2 Sec. 34

EXHIBIT "E"

Horizontal limits of the Cooper-Jal Oil Pool

Township 23 South, Range 36 East
All of Secs. 4, 5, 8, 9, 15, 16, 17, 20, 21, 22, 27, 28, 33 and 34

Township 24 South, Range 36 East
W/2 Sec. 2
All of Secs. 3 and 4
N/2 Sec. 9
All Sec. 10
W/2 Sec. 11
SW/4 Sec. 13
All Secs. 14 and 15
All Secs. 22, 23
NW/4 and W/2 SW/4 Sec. 24
W/2 Sec. 25
All Secs. 26, 27, 34 and 35
W/2 Sec. 36

Township 25 South, Range 36 East
All Secs. 1, 2, 3, 11, 12, 13, 14, 23, 24, 25, 26 and 36

Exhibit "E" (cont'd)

Township 25 South, Range 37 East
SW/4 Sec. 6
W/2 Sec. 7
W/2 Sec. 18
W/2 and W/2 E/2 Sec. 19
W/2 Sec. 30
All Sec. 31
SW/4 Sec. 32

EXHIBIT "F"

Horizontal limits of the Langlie-Mattix Oil Pool

Township 23 South, Range 36 East
All of Secs. 1, 2, 3, 10, 11, 12, 13, 14, 23, 24, 25, 26, 35 and 36

Township 23 South, Range 37 East
W/2 Sec. 6
All of Secs. 7, 18, 19
W/2 W/2 Sec. 26
All Sec. 27
S/2 Sec. 28
All Secs. 29 through 35, inclusive

Township 24 South, Range 36 East
All Sec. 1
E/2 Sec. 2
E/2 Sec. 11
All Sec. 12
N/2 and SE/4 Sec. 13
E/2 and E/2 SW/4 Sec. 24
E/2 Sec. 25
E/2 Sec. 36

Township 24 South, Range 37 East
All of Secs. 2 through 11, inclusive
All of Secs. 14 through 23, inclusive
SW/4 Sec. 25
All Secs. 26 through 35, inclusive
W/2 Sec. 36

Township 25 South, Range 37 East
All of Secs. 2 through 5, inclusive
N/2 and SE/4 Sec. 6
E/2 Sec. 7
All of Secs. 8 through 11, inclusive
W/2 Sec. 13
All Secs. 14 through 17, inclusive
E/2 Sec. 18
E/2 E/2 Sec. 19
All Secs. 20 through 23, inclusive
W/2 Sec. 24
All Sec. 25

Exhibit "F" (Cont'd)

Township 25 South, Range 37 East (Cont'd)
All Secs. 26 through 29, inclusive
E/2 Sec. 30
N/2, SE/4 Sec. 32
All Secs. 33, 34 and 35
W/2 Sec. 36

Township 26 South, Range 37 East
NW/4 Sec. 1
NE/4 Sec. 2

EXHIBIT "G"

Horizontal limits of the South Eunice Oil Pool

Township 21 South, Range 35 East
E/2 Sec. 36

Township 21 South, Range 36 East
All Sec. 31
SW/4 Sec. 32

Township 22 South, Range 35 East
E/2 Sec. 1

Township 22 South, Range 36 East
W/2 Sec. 3
All Secs. 4 through 10, inclusive
SW/4 Sec. 11
W/2 Sec. 14
All Secs. 15 through 23, inclusive
All Secs. 25 through 29, inclusive
E/2 Sec. 30
NE/4 Sec. 31
All Secs. 32 through 36, inclusive

EXHIBIT "H"
GAS-OIL RATIO TEST SCHEDULE

NAME OF POOL	GOR LIMIT	TEST PERIOD			DEADLINE FOR FILING FORM C-116
Oil Pools					
Arrowhead	3500	Nov.	Dec.		Jan. 15, 1955
Cooper-Jal	10000	Sept.			October 15, 1954
Eunice	6000	Oct.	Nov.	Dec.	January 15, 1955
Monument	3000	July	Aug.	Sept.	October 15, 1954
South Eunice	10000	Sept.	Oct.		November 15, 1954
Hardy	10000	Sept.	Oct.		November 15, 1954
Langlie-Mattix	10000	Sept.			October 15, 1954
Leonard	10000	Sept.			October 15, 1954
South Leonard	10000	Sept.			October 15, 1954
Penrose-Skelly	10000	Sept.	Oct.	Nov.	December 15, 1954
Rhodes	10000	Sept.	Oct.		November 15, 1954
GAS POOLS					
Arrow	10000	Oct.	Nov.		December 15, 1954
Eumont	10000	Oct.	Nov.	Dec.	January 15, 1955
Jalmat	10000	Sept.	Oct.	Nov.	December 15, 1954

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

W. B. MACEY, Member and Secretary

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BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE NO. 583
ORDER NO. R-369-A

THE APPLICATION OF THE OIL CONSERVATION
COMMISSION ON ITS OWN MOTION FOR ALL
OPERATORS AND INTERESTED PARTIES IN
THE LANGMAT GAS POOL TO SHOW CAUSE WHY
THE RULES AND REGULATIONS AS SET OUT IN
ORDER R-356, WITH ANY ESSENTIAL AMEND-
MENTS, SHOULD NOT BE PUT INTO EFFECT.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This case came on for hearing at 9 o'clock a.m., on October 27, 1953, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission".

NOW, on this 10th day of November, 1953, the Commission, a quorum being present, having considered the testimony adduced, the exhibits received, the statements of interested parties, the official records of this Commission and other pertinent data, and being fully advised in the premises.

FINDS:

(1) That due public notice having been given, the Commission has jurisdiction of this cause.

(2) That the Commission, for the purpose of preventing waste and drainage and for the protection of correlative rights, entered Order R-356, establishing certain general or "stand-by" rules and regulations relating to the proration of gas well gas proration units, well spacing, and other related matters in the gas pools of Eddy, Lea, Chaves and Roosevelt Counties, New Mexico, applicable in all cases only after special rules for each gas pool shall have been promulgated.

(3) That thereafter, after due notice and hearing, Order R-369 was duly entered by the Commission. Order R-369 adopted the general or "Stand-by" rules promulgated by Order R-356 as the Special Rules and Regulations of the Langmat Gas Pool, heretofore established. R-369 was entered pending a further order in the premises, said order to be entered only after all interested parties were afforded the opportunity to be heard in the matter.

(4) That as a result of such hearing and in consideration of the testimony adduced Special Pool rules should be promulgated for the Langmat Gas Pool, heretofore established, described and classified as a gas pool. That the Special pool rules should approximate the general rules and regulations promulgated by Order R-356 insofar as the same are applicable to the Langmat Gas Pool, and should conform, generally with the provisional special rules of Order R-369.

(5) That in order for the Commission to evaluate and delineate the actual productive limits of the Langmat Gas Pool all operators of oil and gas wells within the defined limits of the Langmat Gas Pool should supply certain Geological and Reservoir data to the Commission.

(6) That pending further study and orders, the allocation of gas in the Langmat Gas Pool should be calculated on the basis of 100 per cent acreage, based upon the standard 160 acre proration unit, which unit is limited to a regular quarter section subdivision of the U. S. Public Land Surveys and consisting of not less than 158 nor more than 162 acres, substantially in the form of a square, with provision for deviation therefrom particularly in cases of wells heretofore completed where the impracticability of unitization is apparent.

(7) That an adequate gas well testing procedure should be adopted as soon as possible so that operators, purchasers and the Commission can determine the fairness and feasibility of an allocation factor for the pool which employs the factors of deliverability, pressure, or any other factor relating to gas well productivity.

IT IS THEREFORE ORDERED:

That Special Pool Rules applicable to the Langmat Gas Pool, be and the same hereby are promulgated and are as follows:

SPECIAL RULES AND REGULATIONS FOR THE LANGMAT GAS POOL LEA COUNTY, NEW MEXICO

WELL SPACING AND ACREAGE REQUIREMENTS FOR DRILLING TRACTS.

Rule 1. Any well drilled a distance of one mile or more from the outer boundary of the Langmat Gas Pool shall be classified as a wildcat well. Any well drilled less than one mile from the outer boundary of the Langmat Gas Pool shall be spaced, drilled, operated and prorated in accordance with the Regulations in effect in the Langmat Gas Pool.

Rule 2. Each well drilled or recompleted within the Langmat Gas Pool shall be located on a tract consisting of not less than a quarter section of approximately 160 surface contiguous acres substantially in the form of a square which shall be a legal subdivision (quarter section) of the U. S. Public Land Surveys.

RULE 3. Each well drilled within the Langmat Gas Pool shall not be drilled closer than 660 feet to any outer boundary line of the tract nor closer than 330 feet to a quarter-quarter section or subdivision inner boundary nor closer than 1320 feet to a well drilling to or capable of producing from the same pool.

RULE 4. The Secretary of the Commission shall have authority to grant exception to the requirements of Rule 3 without Notice and Hearing where application has been filed in due form and the necessity for the unorthodox location is based on topographical conditions or is occasioned by the recompletion of a well previously drilled to another horizon.

Applicants shall furnish all operators within a 1320 foot radius of the subject well a copy of the application to the Commission, and applicant shall include with his application a written stipulation that all operators within such radius have been properly notified. The Secretary of the Commission shall wait at least 10 days before approving any such unorthodox location, and shall approve such unorthodox location only in the absence of objection of any offset operators. In the event an operator objects to the

unorthodox location the Commission shall consider the matter only after proper notice and hearing.

RULE 5. The provision of Statewide Rule 104 Paragraph (k), shall not apply to the Langmat Gas Pool located in Lea County, New Mexico.

GAS PRORATION

RULE 6. The Commission after notice and hearing, shall consider the nominations of gas purchasers from the Langmat Gas Pool and other relevant data and shall fix the allowable production of the Langmat Gas Pool, and shall allocate production among the gas wells in the Langmat Gas Pool upon a reasonable basis with due regard to correlative rights.

PRORATION UNITS

RULE 7. (a) For the purpose of gas allocation in the Langmat Gas Pool, a standard proration unit shall consist of between 158 and 162 contiguous surface acres substantially in the form of a square which shall be a legal subdivision (quarter section) of the U. S. Public Land Surveys; provided, however, that a gas proration unit other than a legal quarter section may be formed after notice and hearing by the Commission, or as outlined in Paragraph (b). Any allocation unit containing less than 158 acres or more than 162 acres shall be a non-standard unit and its allowable shall be decreased or increased to that proportion of the standard unit allowable that the number of acres contained therein bears to 160 acres. Any standard proration unit consisting of between 158 and 162 contiguous surface acres shall be considered as containing 160 acres for the purpose of gas allocation.

(b) The Secretary of the Commission shall have authority to grant an exception to Rule 7 (a) without Notice and Hearing where application has been filed in due form and where the following facts exist and the following provisions are complied with;

1. The non-standard unit consists of less acreage than a standard proration unit.

2. The acreage assigned to the non-standard unit lies wholly within a legal quarter section and contains a well capable of producing gas into a gas transportation facility on the date of this order.

3. The operator receives written consent in the form of waivers from all operators in the adjoining 160 acre proration units.

GAS ALLOCATION

RULE 8. At least 30 days prior to the beginning of each gas proration period the Commission shall hold a hearing after due notice has been given. The Commission shall cause to be submitted by each gas purchaser its "Preliminary Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration period, by months, from the Langmat Gas Pool. The Commission shall consider the "Preliminary Nominations" of purchasers, actual production, and such other factors as may be deemed applicable in determining the amount of gas that may be produced without waste within the ensuing proration period. "Preliminary Nominations" shall be submitted on a form prescribed by the Commission.

RULE 9. Each month, the Commission shall cause to be submitted by each gas purchaser its "Supplemental Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration month from the Langmat Gas Pool. The Commission shall hold a public hearing between the 15th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month, and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month. Included in the monthly proration schedule shall be a tabulation of allowable and production for the second preceding month together with an adjusted allowable computation for the second preceding month. Said adjusted allowable shall be computed by comparing the actual allowable assigned with the actual production. In the event the allowable assigned is greater than the actual production, the allowables assigned the top allowable units shall be reduced proportionately, and in the event the allowable assigned is less than the production then the allowables assigned the top allowable units shall be increased proportionately. "Supplemental Nominations" shall be submitted on a form prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the Langmat Gas Pool delivering to a gas transportation facility, or lease gathering system, and shall include in the proration schedule of the Langmat Gas Pool any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well. The total allowable to be allocated to the pool each month shall be equal to the sum of the supplemental nominations together with any adjustment which the Commission deems advisable. The allocation to a pool remaining after subtracting the capacities of marginal units shall be divided and allocated ratably among the non-marginal units in the proportion that the acreage contained in each unit bears to the total acreage allotted to such non-marginal units.

BALANCING OF PRODUCTION

RULE 10. Underproduction: The dates 7:00 A.M., January 1 and 7:00 A.M., July 1, shall be known as balancing dates and the periods of time bounded by these dates shall be known as gas proration periods. The amount of current gas allowable remaining unproduced at the end of each proration period shall be carried forward to be produced during the next succeeding proration period in addition to the normal gas allowable for such succeeding period; but whatever amount thereof is not made up within the first succeeding proration period shall be cancelled. If, at the end of the first succeeding proration period, a greater amount of allowable remains unproduced than was carried forward as underproduction, the amount carried forward to the second succeeding period shall be the total underproduction less the amount carried forward to the first succeeding period.

If it appears that such continued underproduction has resulted from inability of the well to produce its allowable, it may be classified as a marginal well and its allowable reduced to the well's ability to produce.

RULE 11. Overproduction: A well which has produced a greater amount of gas than was allowed during a given proration period shall have its allowable for the first succeeding proration period reduced by the amount of such overproduction and such overproduction shall be made up within the first succeeding proration period. If, at the end of the first succeeding proration period, the well is still overproduced, it shall be shut in and its current monthly allowable charged against said overproduction until the well is in balance. If, at any time, a well is overproduced an amount equaling six times its current monthly allowable, it shall be shut in until it is in balance.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut in upon a showing at public hearing after due notice that complete shut in of the well would result in material damage to the well.

GRANTING OF ALLOWABLES

RULE 12. No gas well shall be given an allowable until Form C-104 and Form C-110 have been filed together with a plat showing acreage attributed to said well and the locations of all wells on the lease.

RULE 13. Allowables to newly completed gas wells shall commence on the date of connection to a gas transportation facility, as determined from an affidavit furnished to the Commission (Box 2045, Hobbs, New Mexico) by the purchaser, or the date of filing of Form C-104 and Form C-110 and the plat described above, whichever date is the later.

REPORTING OF PRODUCTION

RULE 14. The monthly gas production from each gas well shall be metered separately and the gas production therefrom shall be submitted to the Commission on Form C-115 so as to reach the Commission on or before the twentieth day of the month next succeeding the month in which the gas was produced. The operator shall show on such report what disposition has been made of the gas produced. The full production of gas from each well shall be charged against the well's allowable regardless of what disposition has been made of the gas; provided, hpwever that gas used on the lease for consumption in lease houses, treaters, combustion engines and other similar lease equipment shall not be charged against the well's allowable.

DEFINITIONS

RULE 15. A gas well shall mean a well producing gas or natural gas from a common source of gas supply from a gas pool determined by the Commission.

RULE 16. The term "gas Purchaser" as used in these rules, shall mean any "taker" of gas either at the wellhead or at any point on the lease where connection is made for gas transportation or utilization. It shall be the responsibility of said "taker" to submit a nomination.

PROVIDED FURTHER that those wells located within the defined limits of the Langmat Gas Pool which produce oil and receive an oil allowable on the oil proration schedule shall be prorated as oil wells pending further study and that "preliminary" and "supplemental" nominations, as outlined in Rules 8 and 9 above, shall pertain only to gas wells which are not assigned an oil allowable.

PROVIDED FURTHER that all operators of oil or gas wells shall submit to the Hobbs office of the Commission (Box 2045) on or before January 1, 1954 a copy of either an electric log or sample log of each well (if available), whether oil or gas, that they operate within the defined limits of the Langmat Gas Pool. Attached to each log shall be a detailed report showing well elevation, total depth, plug back depth, depth of production string, interval of perforations and open hole and estimation of formation tops of Yates, Seven Rivers and Queen as indicated by the log. Any operator of any well hereafter completed or recompleted within the defined limits of the Langmat Gas Pool shall also submit to the Hobbs office of the Commission, the logs and information detailed above, within 30 days following such completion or recompletion.

In the event that the Commission deems it advisable to obtain additional information from wells producing outside the defined limits of the Langmat Gas Pool the Secretary of the Commission is hereby authorized to issue a directive to operators in order to obtain the desired information.

PROVIDED FURTHER that as soon as possible a testing procedure for all gas wells shall be adopted by the Commission. Said procedure shall contain adequate tests in order to determine the feasibility of employing any well potential, deliverability or pressure factors in allocating gas.

PROVIDED FURTHER that those operators who desire approval of the Commission of gas-oil dual completions under the provisions of Statewide Rule 112-A should also comply with the provisions of Rules 2, 3 and 4 of this order before approval will be granted.

PROVIDED FURTHER that in order to inaugurate gas prorationing and allocation in the Langmat Gas Pool on January 1, 1954 the Commission shall consider the nominations of purchasers for the proration period beginning January 1, 1954 at the regular hearing of the Commission on November 19, 1953 and shall require each purchaser of gas from the Langmat Gas Pool to submit with each "supplemental" nomination a list of the wells and their location from which gas is to be purchased commencing January 1, 1954. In this instance the list of wells shall pertain solely to those wells which are gas wells and are not on the oil proration schedule.

PROVIDED FURTHER that in the event an operator has a producing well on acreage which does not conform to the provisions of Rule 2 or Rule 7 and an exception to Rule 7 is to be requested of this Commission, the necessary information requested under Rule 12 should be complied with pending Commission action. In this instance the Proration Manager is directed to assign to the well only that acreage attributable to the well lying within the quarter section upon which the well is located. In the event the unorthodox unit is approved after notice and hearing and an increase in total acreage is permitted then the total allowable assigned the well shall be adjusted and made retroactive to the 1st day of the proration period or the 1st day the well produced into a gas transportation facility if the well was not productive prior to January 1, 1954.

PROVIDED FURTHER that copies of Form C-115, Monthly Production Report, submitted in compliance with Rule 14 shall be distributed by the operator as follows: Original to Oil Conservation Commission, Box 871, Santa Fe; two copies to Oil Conservation Commission, Box 2045, Hobbs, New Mexico.

IT IS FURTHER ORDERED that nothing in this Order, or Order No. R-369, heretofore issued by the Commission, shall be construed as re-classifying any well now prorated on the oil proration schedule as a gas well, and any such reclassification hereafter made shall only be made after due notice and hearing.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

S E A L

R. R. SPURRIER, Member & Secretary

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BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION OF THE STATE OF NEW MEXICO FOR THE PURPOSE OF CONSIDERING:

CASE NO. 583
Order No. R-369

THE APPLICATION OF THE OIL CONSERVATION COMMISSION ON ITS OWN MOTION FOR AN ORDER ESTABLISHING POOL RULES FOR THE LANGMAT GAS POOL, LEA COUNTY, NEW MEXICO, SAID RULES BEING CONCERNED WITH WELL SPACING, GAS PRORATION AND ALLOCATION, PRORATION UNITS, POOL DELINEATION AND OTHER RELATED MATTERS INSOFAR AS THEY PERTAIN TO THE GENERAL RULES FOR GAS PRORATION AS SET FORTH IN ORDER NO. R-356 IN CASE 521.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This case came on for hearing at 9 o'clock a.m. on September 17, 1953, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

Now, on this 28th day of September, 1953, the Commission, a quorum being present, having considered the statements of interested persons, and the official records of the office and other pertinent data, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given, the Commission has jurisdiction of this cause.

(2) That production records of gas wells producing within the Langmat Gas Pool as heretofore designated, classified and defined, indicate the necessity for proration of gas-well gas for the prevention of waste and the protection of correlative rights.

(3) That Order No. 356, heretofore issued by the Commission, and containing appropriate general rules relative to gas-well spacing, gas proration and gas allocation, appearing to be satisfactorily applicable to the Langmat Gas Pool, should be considered as the special rules and regulations for said pool pending further order of the Commission

IT IS THEREFORE ORDERED:

That the rules and regulations relating to gas-well spacing, gas proration and gas allocation, as set out in Order R-356, be, and the same hereby are made the

special rules and regulations of the Langmat Gas Pool pending further order of the Commission after notice and hearing.

IT IS FURTHER ORDERED:

That all parties interested in said Langmat Pool and the rules therefor be, and they and each of them are hereby ordered to show cause at 9 o'clock a.m. on October 27, 1953, at Santa Fe, New Mexico, why the rules and regulations referred to hereinabove, with any essential amendments, shall not be put into effect as of November 1, 1953.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

R. R. SPURRIER, Member & Secretary

S E A L

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION OF NEW MEXICO FOR THE PURPOSE OF CONSIDERING:

CASE NO. 582
Order No. R-368-B

THE APPLICATION OF THE OIL CONSERVATION COMMISSION ON ITS OWN MOTION FOR ALL OPERATORS AND INTERESTED PARTIES IN THE JALCO GAS POOL TO SHOW CAUSE WHY THE RULES AND REGULATIONS AS SET OUT IN ORDER NO. R-356, WITH ANY ESSENTIAL AMENDMENTS, SHOULD NOT BE PUT INTO EFFECT.

ORDER OF THE COMMISSION FOR RE-HEARING

This case came on for consideration upon petition of Texas Pacific Coal and Oil Company for re-hearing on Orders R-368 and R-368-A heretofore entered by the Commission.

NOW, on this 7th day of December, 1953, the Commission, a quorum being present, having fully considered said application for re-hearing.

IT IS HEREBY ORDERED:

That the above-entitled matter be reopened and a re-hearing in said cause be held January 21, 1954, at 9 o'clock a.m. on said day at Santa Fe, New Mexico, or at such time as the Commission may designate after due notice, at which time and place all interested parties may appear.

IT IS FURTHER ORDERED: That Orders R-368 and R-368-A (relating to the Jalco Gas Pool) shall remain in full force and effect until further order of the Commission.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Edwin L. Mechem, Chairman

E. S. Walker, Member

S E A L

R. R. Spurrier, Member and Secretary

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION FOR THE PURPOSE OF CONSIDERING:

CASE NO. 582
Order No. R-368-A

THE APPLICATION OF THE OIL CONSERVATION COMMISSION ON ITS OWN MOTION FOR ALL OPERATORS AND INTERESTED PARTIES IN THE JALCO GAS POOL TO SHOW CAUSE WHY THE RULES AND REGULATIONS AS SET OUT IN ORDER R-356, WITH ANY ESSENTIAL AMENDMENTS, SHOULD NOT BE PUT INTO EFFECT.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This case came on for hearing at 9 o'clock a.m., on October 26, 1953, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission".

NOW, on this 10TH day of November, 1953, the Commission, a quorum being present, having considered the testimony adduced, the exhibits received, the statements of interested parties, the official records of the Commission and other pertinent data, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given, the Commission has jurisdiction of this cause.

(2) That the Commission, for the purpose of preventing waste and drainage, and for the protection of correlative rights, entered Order R-356, establishing certain general or "stand-by" rules and regulations relating to the proration of gas well gas, proration units, well spacing, and other related matters in the gas pools of Eddy, Lea, Chaves and Roosevelt Counties, New Mexico, applicable in all cases only after special rules for each gas pool shall have been promulgated.

(3) That thereafter, after due notice and hearing, Order R-368 was duly entered by the Commission. Order R-368 adopted the general or "Stand-by" rules promulgated by Order R-356 as the Special Rules and Regulations of the Jalco Gas Pool, heretofore established. R-368 was entered pending a further order in the premises, said order to be entered only after all interested parties were afforded the opportunity to be heard in the matter.

(4) That as a result of such hearing and in consideration of the testimony addu.ed Special Pool rules should be promulgated for the Jalco Gas Pool, heretofore established, described and classified as a gas pool. That the Special pool rules should approximate the general rules and regulations promulgated by Order R-356 insofar as the same are applicable to the Jalco Pool, and should conform, generally with the provisional special rules of Order R-368.

(5) That in order for the Commission to evaluate and delineate the actual productive limits of the Jalco Gas Pool all operators of oil and gas wells within the defined limits of the Jalco Gas Pool should supply certain Geological and Reservoir data to the Commission.

(6) That pending further study and orders, the allocation of gas in the Jalco gas pool should be calculated on the basis of 100 per cent acreage, based upon the standard 160 acre proration unit, which unit is limited to a regular quarter section subdivision of the U. S. Public Land Surveys and consisting of not less than 158 nor more than 162 acres, substantially in the form of a square, with provision for deviation therefrom particularly in cases of wells heretofore completed where the impracticability of unitization is apparent.

(7) That an adequate gas well testing procedure should be adopted as soon as possible so that operators, purchasers and the Commission can determine the fairness and feasibility of an allocation factor for the pool which employs the factors of deliverability, pressure, or any other factor relating to gas well productivity.

(8) That the area within the exterior boundaries of the Jalco Gas Pool known and described as the "Rhodes Storage Area" should be exempt from the Special Rules and Regulations applicable to the Jalco Gas pool provided acceptable reports of operations in said storage area are regularly filed.

IT IS THEREFORE ORDERED:

That Special Pool Rules applicable to the Jalco Gas Pool, be and the same hereby are promulgated and are as follows:

SPECIAL RULES AND REGULATIONS
FOR THE JALCO GAS POOL
LEA COUNTY, NEW MEXICO

WELL SPACING AND ACREAGE REQUIREMENTS FOR DRILLING TRACTS.

RULE 1. Any well drilled a distance of one mile or more from the outer boundary of the Jalco Gas Pool shall be classified as a wildcat well. Any well drilled less than one mile from the outer boundary of the Jalco Gas Pool shall be spaced, drilled, operated and prorated in accordance with the Regulations in effect in the Jalco Gas Pool.

RULE 2. Each well drilled or recompleted within the Jalco Gas Pool shall be located on a tract consisting of not less than a quarter section of approximately 160 surface contiguous acres substantially in the form of a square which shall be a legal subdivision (quarter section) of the U. S. Public Land Surveys.

RULE 3. Each well drilled within the Jalco Gas Pool shall not be drilled closer than 660 feet to any outer boundary line of the tract nor closer than 330 feet to a quarter-quarter section or subdivision inner boundary nor closer than 1320 feet to a well drilling to or capable of producing from the same pool.

RULE 4. The Secretary of the Commission shall have authority to grant exception to the requirements of Rule 3 without Notice and Hearing where application has been filed in due form and the necessity for the unorthodox location is based on topographical conditions or is occasioned by the recompletion of a well previously drilled to another horizon.

Applicants shall furnish all operators within a 1320 foot radius of the subject well a copy of the application to the Commission, and applicant shall include with his application a written stipulation that all operators within such radius have been properly notified. The Secretary of the Commission shall wait at least 10 days before approving any such unorthodox location, and shall approve such unorthodox location only in the absence of objection of any offset operators. In the event an operator objects to the unorthodox location the Commission shall consider the matter only after proper notice and hearing.

RULE 5. The provision of Statewide Rule 104 Paragraph (k), shall not apply to the Jalco Gas Pool located in Lea County, New Mexico.

GAS PRORATION

RULE 6. The Commission after notice and hearing, shall consider the nominations of gas purchasers from the Jalco Gas Pool and other relevant data and shall fix the allowable production of the Jalco Gas Pool, and shall allocate production among the gas wells in the Jalco Gas Pool upon a reasonable basis with due regard to correlative rights.

PRORATION UNITS

RULE 7. (a) For the purpose of gas allocation in the Jalco Gas Pool, a standard proration unit shall consist of between 158 and 162 contiguous surface acres substantially in the form of a square which shall be a legal subdivision (quarter section) of the U. S. Public Land Surveys; provided, however, that a gas proration unit other than a legal quarter section may be formed after notice and hearing by the Commission, except as outlined in Paragraph (b). Any allocation unit containing less than 158 acres or more than 162 acres shall be a non-standard unit and its allowable shall be decreased or increased to that proportion of the standard unit allowable that the number of acres contained therein bears to 160 acres. Any standard proration unit consisting of between 158 and 162 contiguous surface acres shall be considered as containing 160 acres for the purpose of gas allocation.

(b) The Secretary of the Commission shall have authority to grant an exception to Rule 7 (a) without Notice and Hearing where application has been filed in due form and where the following facts exist and the following provisions are complied with;

1. The non-standard unit consists of less acreage than a standard proration unit.

2. The acreage assigned to the non-standard unit lies wholly within a legal quarter section and contains a well capable of producing gas into a gas transportation facility on the date of this order.

3. The operator receives written consent in the form of waivers from all operators in the adjoining 160 acre proration units.

GAS ALLOCATION

RULE 8 At least 30 days prior to the beginning of each gas proration period the Commission shall hold a hearing after due notice has been given. The Commission shall cause to be submitted by each gas purchaser its "Preliminary Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration period, by months, from the Jalco Gas Pool. The Commission shall consider the "Preliminary Nominations" of purchasers, actual production, and such other factors as may be deemed applicable in determining the amount of gas that may be produced without waste within the ensuing proration period. "Preliminary Nominations" shall be submitted on a form prescribed by the Commission.

RULE 9. Each month, the Commission shall cause to be submitted by each gas purchaser its "Supplemental Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration month from the Jalco Gas Pool. The Commission shall hold a public hearing between the 15th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month, and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month. Included in the monthly proration schedule shall be a tabulation of allowable and production for the second preceding month together with an adjusted allowable computation for the second preceding month. Said adjusted allowable shall be computed by comparing the actual allowable assigned with the actual production. In the event the allowable assigned is greater than the actual production, the allowables assigned the top allowable units shall be reduced proportionately, and in the event the allowable assigned is less than the production then the allowables assigned the top allowable units shall be increased proportionately. "Supplemental Nominations" shall be submitted on a form prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the Jalco Gas Pool delivering to a gas transportation facility, or lease gathering system, and shall include in the proration schedule of the Jalco Gas Pool any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well. The total allowable to be allocated to the pool each month shall be equal to the sum of the supplemental nominations together with any adjustment which the Commission deems advisable. The allocation to a pool remaining after subtracting the capacities of marginal units shall be divided and allocated ratably among the non-marginal units in the proportion that the acreage contained in each unit bears to the total acreage allotted tosuch non-marginal units.

BALANCING OF PRODUCTION

RULE 10. Underproduction: The dates 7:00 A.M., January 1 and 7:00 A.M., July 1, shall be known as balancing dates and the periods of time bounded by these dates shall be known as gas proration periods. The amount of current gas allowable remaining unproduced at the end of each proration period shall be carried forward to and may be produced during the next succeeding proration period in addition to the normal gas allowable for such succeeding period; but whatever amount thereof is not made up within the first succeeding proration period shall be cancelled. If, at the end of the first succeeding proration period, a greater amount of allowable remains unproduced than was carried forward as underproduction, the amount carried forward to the second succeeding period shall be the total underproduction less the amount carried forward to the first succeeding period.

If it appears that such continued underproduction has resulted from inability of the well to produce its allowable, it may be classified as a marginal well and its allowable reduced to the well's ability to produce.

RULE 11. Overproduction: A well which has produced a greater amount of gas than was allowed during a given proration period shall have its allowable for the first succeeding proration period reduced by the amount of such overproduction and such overproduction shall be made up within the first succeeding proration period. If, at the end of the first succeeding proration period, the well is still overproduced, it shall be shut in and its current monthly allowable charged against said overproduction until the well is in balance. If, at any time, a well is overproduced an amount equaling six times its current monthly allowable, it shall be shut in until it is in balance.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut in upon a showing at public hearing after due notice that complete shut in of the well would result in material damage to the well.

GRANTING OF ALLOWABLES

RULE 12. No gas well shall be given an allowable until Form C-104 and Form C-110 have been filed together with a plat showing acreage attributed to said well and the locations of all wells on the lease.

RULE 13. Allowables to newly completed gas wells shall commence on the date of connection to a gas transportation facility, as determined from an affidavit furnished to the Commission (Box 2045 Hobbs, New Mexico) by the purchaser, or the date of filing of Form C-104 and Form C-110 and the plat described above, whichever date is the later.

REPORTING OF PRODUCTION

RULE 14. The monthly gas production from each gas well shall be metered separately and the gas production therefrom shall be submitted to the Commission so as to reach the Commission on or before the twentieth day of the month next succeeding the month in which the gas was produced. The operator shall show on such report what disposition has been made of the gas produced. The full production of gas from

each well shall be charged against the well's allowable regardless of what disposition has been made of the gas; provided, however that gas used on the lease for consumption in lease houses, treaters, combustion engines and other similar lease equipment shall not be charged against the well's allowable.

DEFINITIONS

RULE 15. A gas well shall mean a well producing gas or natural gas from a common source of gas supply from a gas pool determined by the Commission

RULE 16. The term "gas purchaser" as used in these rules, shall mean any "taker" of gas either at the wellhead or at any point on the lease where connection is made for gas transportation or utilization. It shall be the responsibility of said "taker" to submit a nomination.

PROVIDED FURTHER that those wells located within the defined limits of the Jalco Gas Pool which produce oil and receive an oil allowable on the oil proration schedule shall be prorated as oil wells pending further study and that "preliminary" and "supplemental" nominations, as outlined in Rules 8 and 9 above, shall pertain only to gas wells which are not assigned an oil allowable.

PROVIDED FURTHER that all operators of oil or gas wells shall submit to the Hobbs office of the Commission (Box 2045) on or before January 1, 1954 a copy of either an electric log or sample log of each well (if available), whether oil or gas, that they operate within the defined limits of the Jalco Gas Pool. Attached to each log shall be a detailed report showing well elevation, total depth, plug back depth, depth of production string, interval of perforations and open hole and estimation of formation tops of Yates, Seven Rivers and Queen as indicated by the log. Any operator of any well hereafter completed or recompleted within the defined limits of the Jalco Pool shall also submit to the Hobbs office of the Commission, the logs and information detailed above within 30 days following such completion or recompletion.

In the event that the Commission deems it advisable to obtain additional information from wells producing outside the defined limits of the Jalco Gas Pool the Secretary of the Commission is hereby authorized to issue a directive to operators in order to obtain the desired information.

PROVIDED FURTHER that the provisions of these rules contained herein shall not apply to those wells involved in the Rhodes Storage Area. Provided, however, that operators in the Rhodes Storage Area shall submit semi-annual reports, corresponding with the Jalco Gas Pool proration period, said reports shall contain statistical information showing the amount of gas injected and withdrawan from storage during each period and the cumulative amount of gas injected and withdrawan at the end of the proration period.

PROVIDED FURTHER that as soon as possible a testing procedure for all gas wells shall be adopted by the Commission. Said procedure shall contain adequate tests in order to determine the feasibility of employing any well potential, deliverability or pressure factors in allocating gas.

PROVIDED FURTHER that those operators who desire approval of the Commission of gas-oil dual completions under the provisions of Statewide Rule 112-A should also comply with the provisions of Rules 2, 3 and 4 of this order before approval will be granted.

PROVIDED FURTHER that in order to inaugurate gas prorationing and allocation in the Jalco Gas Pool on January 1, 1954 the Commission shall consider the nominations of purchasers for the proration period beginning January 1, 1954 at the regular hearing of the Commission on November 19, 1953 and shall require each purchaser of gas from the Jalco Gas Pool to submit with each "supplemental" nomination a list of the wells and their location from which gas is to be purchased commencing January 1, 1954. In this instance the list of wells shall pertain solely to those wells which are gas wells and are not on the oil proration schedule.

PROVIDED FURTHER that in the event an operator has a producing well on acreage which does not conform to the provisions of Rule 2 or Rule 7 and an exception to Rule 7 is to be requested of this Commission, the necessary information requested under Rule 12 should be complied with pending Commission action. In this instance the Proration Manager is directed to assign to the well only that acreage attributable to the well lying within the quarter section upon which the well is located. In the event the unorthodox unit is approved after notice and hearing and an increase in total acreage is permitted then the total allowable assigned the well shall be adjusted and made retroactive to the 1st day of the proration period or the first day the well produced into a gas transportation facility if the well was not productive prior to January 1, 1954.

PROVIDED FURTHER that copies of Form C-115, Monthly Production Report, submitted in compliance with Rule 14 shall be distributed by the operator as follows: Original to Oil Conservation Commission, Box 871, Santa Fe; two copies to Oil Conservation Commission, Box 2045, Hobbs, New Mexico.

IT IS FURTHER ORDERED that nothing in this Order, or Order No. R-368, heretofore issued by the Commission, shall be construed as re-classifying any well now prorated on the oil proration schedule as a gas well, and any such reclassification hereafter made shall only be made after due notice and hearing.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Edwin L. Mechem, Chairman

E. S. Walker, Member

R. R. Spurrier, Member and Secretary

S E A L

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION OF THE STATE OF NEW MEXICO FOR THE PURPOSE OF CONSIDERING:

CASE NO. 582
ORDER NO. R-368

THE APPLICATION OF THE OIL CONSERVATION COMMISSION ON ITS OWN MOTION FOR AN ORDER ESTABLISHING POOL RULES FOR THE JALCO GAS POOL, LEA COUNTY, NEW MEXICO, SAID RULES BEING CONCERNED WITH WELL SPACING, GAS PRORATION AND ALLOCATION, PRORATION UNITS, POOL DELINEATION AND OTHER RELATED MATTERS INSOFAR AS THEY PERTAIN TO THE GENERAL RULES FOR GAS PRORATION AS SET FORTH IN ORDER NO. R-356 IN CASE 521.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This case came on for hearing at 9 o'clock a.m. on September 17, 1953, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 28th day of September, 1953, the Commission, a quorum being present, having considered the statements of interested persons, and the official records of the office and other pertinent data, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given, the Commission has jurisdiction of this cause.

(2) That production records of gas wells producing within the Jalco Gas Pool as heretofore designated, classified and defined, indicate the necessity for proration of gas-well gas for the prevention of waste and the protection of correlative rights.

(3) That Order No. 356, heretofore issued by the Commission, and containing appropriate general rules relative to gas-well spacing, gas proration and gas allocation, appearing to be satisfactorily applicable to the Jalco Gas Pool, should be considered as the special rules and regulations for said pool pending further order of the Commission.

IT IS THEREFORE ORDERED:

That the rules and regulations relating to gas-well spacing, gas proration and gas allocation, as set out in Order R-356, be, and the same hereby are made the special rules and regulations of the Jalco Gas Pool pending further order of the Commission after notice and hearing.

IT IS FURTHER ORDERED:

That all parties interested in said Jalmat Pool and the rules therefor be, and they and each of them are hereby ordered to show cause at 9 o'clock a.m., on October 26, 1953, at Santa Fe, New Mexico, why the rules and regulations referred to hereinabove, with any essential amendments, shall not be put into effect as of November 1, 1953.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

R. R. Spurrier, Member and Secretary

S E A L

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BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 521
Order No. R-356

THE APPLICATION OF THE OIL CONSERVATION
COMMISSION UPON ITS OWN MOTION FOR AN
ORDER ESTABLISHING MEANS AND METHODS
FOR THE PRORATION OF NATURAL GAS IN LEA,
EDDY, CHAVES AND ROOSEVELT COUNTIES,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m., on March 17, 1953, April 16, 1953, May 19, 1953, June 16, 1953, July 16, 1953, and August 20, 1953, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission".

NOW, on this 28th day of August, 1953, the Commission, a quorum being present, having considered the testimony adduced and the exhibits received in the hearings, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of the cause and the subject matter thereof.

(2) That for the prevention of waste and protection of correlative rights proper special Rules and Regulations relating to the proration of gas-well gas produced in the gas pools of Lea, Eddy, Chaves and Roosevelt Counties, New Mexico, should be promulgated.

IT IS THEREFORE ORDERED.

SECTION A. That the following rules pertaining to gas well spacing in defined gas pools and acreage requirements for drilling tracts within the defined limits of gas pools in Eddy, Lea, Chaves and Roosevelt Counties, be and the same hereby are adopted effective immediately.

I. WELL SPACING: ACREAGE REQUIREMENTS FOR DRILLING TRACTS.

RULE 1. The Secretary of the Commission shall have authority to grant an exception to the requirements of Statewide Rule 104, Sections (a), (b), (c) and (d),

without notice and hearing where application has been filed in due form, and,

(a) When the necessity for the unorthodox location is based on topographical conditions, or is occasioned by the recompletion of a well previously drilled to another horizon, and

(b) When either one of the following is applicable:

1. When the ownership of all oil and gas leases within a radius of 1320 feet of the proposed location is common with the ownership of the oil and gas leases under the proposed location.

2. When all owners of oil and gas leases within such radius consent in writing to the proposed location.

(The above provisions of Rule 1 supersede Rule 104 (f).)

RULE 2. The provisions of Statewide Rule 104 Paragraph (k), shall not apply to gas pools located in Lea, Eddy, Chaves and Roosevelt Counties, New Mexico.

SECTION B. That the following rules shall apply to defined gas pools in Eddy, Lea, Chaves and Roosevelt Counties only after hearings are held and an order issued on each individual pool. These rules shall be considered as "standby rules" and shall be used as a guide in establishing pool rules.

II. GAS PRORATION.

RULE 3. At such time as the Commission determines that allocation of gas production from gas wells producing from any pool in this four-county area is necessary to prevent waste or to protect correlative rights, the Commission, after notice and hearing, shall consider the nominations of gas purchasers from such gas pool and other relevant data, and shall fix the allowable production of such pool, and shall allocate production among the gas wells in such pool upon a reasonable basis with due regard to correlative rights. Unless special pool rules are adopted as provided in Rule 4 below, the general provisions of this rule shall apply to each gas pool allocated under this rule.

RULE 4. After notice and hearing, the Commission, in order to protect correlative rights, or prevent waste, or both, may promulgate special rules, regulations or orders pertaining to any gas pool.

(The above provisions of Rules 3 and 4 supersede Statewide Rule 502)

III. PRORATION UNITS.

RULE 5. For the purpose of gas allocation in the absence of special pool rules a standard proration unit shall consist of between 158 and 162 contiguous surface acres

substantially in the form of a square which shall be a legal subdivision (quarter section) of the U. S. Public Land Surveys; provided, however, that a gas proration unit other than a legal quarter section may be formed after notice and hearing by the Commission, or after the Commission has been furnished waivers from all offsetting operators, if all acreage is contiguous and does not contain more than four legal quarter-quarter sections and/or lots. Any allocation unit containing less than 158 acres or more than 162 acres shall be a non-standard unit and its allowable shall be decreased or increased to that proportion of the standard unit allowable that the number of acres contained therein bears to 160 acres. Any standard proration unit consisting of between 158 and 162 contiguous surface acres shall be considered as containing 160 acres for the purpose of gas allocation.

IV. GAS ALLOCATION.

RULE 6. At least 30 days prior to the beginning of each gas proration period the Commission shall hold a hearing after due notice has been given. The Commission shall cause to be submitted by each gas purchaser its "Preliminary Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration period, by months, from each gas pool from which it purchases gas. The Commission shall consider the "Preliminary Nominations" of purchasers, actual production, and such other factors as may be deemed applicable in determining the amount of gas that may be produced without waste within the ensuing proration period. "Preliminary Nominations" shall be submitted on a form prescribed by the Commission.

RULE 7. Each month, the Commission shall cause to be submitted by each gas purchaser its "Supplemental Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration month from each gas pool from which it purchases gas. The Commission shall hold a public hearing between the 15th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month, and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month. Included in the monthly proration schedule shall be a tabulation of allowable and production for the second preceding month together with an adjusted allowable computation for the second preceding month. Said adjusted allowable shall be computed by comparing the actual allowable assigned with the actual production. In the event the allowable assigned is greater than the actual production, the allowables assigned the top allowable units shall be reduced proportionately, and in the event the allowable assigned is less than the production then the allowables assigned the top allowable units shall be increased proportionately. "Supplemental Nominations" shall be submitted on a form prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the pool delivering to a gas transportation facility, or lease gathering system, and shall include in the proration schedule of such pool any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well.

The total allowable to be allocated to the pool each month shall be equal to the sum of the supplemental nominations together with any adjustment which the Commission deems advisable.

RULE 8. The allocation to a pool remaining after subtracting the capacities of marginal units shall be divided and allocated ratably among the non-marginal units in the proportion that the acreage contained in each unit bears to the total acreage allotted to such non-marginal units; provided that for this purpose standard units shall be as defined in Rule 5 above. More than one proration unit or fractional parts thereof may be assigned to a gas well and the allowables assigned said well may be increased proportionately, provided that:

a. No more than 640 acres shall be assigned to any one well.

b. All acreage in such units may reasonably be presumed to be productive of gas.

c. The multiple unit so formed shall not have an overall length or width exceeding 5,280 feet.

d. Where not more than two proration units are assigned to a well, the well shall not be located closer than 660 feet to the longest boundary of the pooled units nor less than 1320 feet from the shortest boundary of the pooled units. Where three or more units are pooled the well shall not be located closer than 1320 feet to the outer boundary of the pooled unit.

e. Exceptions to the provisions of this rule may be granted by the Commission after notice and hearing or after the Commission has been furnished waivers by all offsetting operators.

(The above provisions of Rules 6, 7 and 8 supersede Statewide Rule 602)

V. BALANCING OF PRODUCTION.

RULE 9. Underproduction: The dates 7:00 A.M. January 1 and 7:00 A.M. July 1 shall be known as balancing dates and the periods of time bounded by these dates shall be known as gas proration periods. The amount of current gas allowable remaining unproduced at the end of each proration period shall be carried forward to and may be produced during the next succeeding proration period in addition to the normal gas allowable for such succeeding period, but whatever amount thereof is not made up within the first succeeding proration period shall be cancelled. If, at the end of the first succeeding proration period, a greater amount of allowable remains unproduced than was carried forward as underproduction, the amount carried forward to the second succeeding period shall be the total underproduction less the amount carried forward to the first succeeding period.

If it appears that such continued underproduction has resulted from inability of the well to produce its allowable, it may be classified as a marginal well and its allowable reduced to the well's ability to produce.

RULE 10. Overproduction: A well which has produced a greater amount of gas than was allowed during a given proration period shall have its allowable for the first succeeding proration period reduced by the amount of such overproduction and such overproduction shall be made up within the first succeeding proration period. If, at the end of the first succeeding proration period, the well is still overproduced, it shall be shut in and its current monthly allowable charged against said over production until the well is in balance. If, at any time, a well is overproduced an amount equaling six times its current monthly allowable, it shall be shut in until it is in balance.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut in upon a showing at public hearing after due notice that complete shut in of the well would result in material damage to the well.

(The above provisions of Rules 9 and 10 supersede Statewide Rule 604)

VI. GRANTING OF ALLOWABLES.

RULE 11. No gas well shall be given an allowable until Form C-104 and Form C-110 have been filed together with a plat showing acreage attributed to said well and the locations of all wells on the lease.

RULE 12. Allowables to newly completed gas wells shall commence on the date of connection to a gas transportation facility or the date of filing of Form C-104 and Form C-110 and the plat described above, whichever date is the later.

VII. REPORTING OF PRODUCTION.

RULE 13. The monthly gas production from each gas well shall be metered separately and the gas production therefrom shall be submitted to the Commission so as to reach the Commission on or before the twentieth day of the month next succeeding the month in which the gas was produced. The operator shall show on such report what disposition has been made of the gas produced. The full production of gas from each well shall be charged against the well's allowable regardless of what disposition has been made of the gas; provided, however, that gas used on the lease for consumption in lease houses, treaters, combustion engines and other similar lease equipment shall not be charged against the well's allowable.

VIII. DEFINITIONS.

RULE 14. A gas well shall mean a well producing gas or natural gas from a common source of gas supply from a gas pool determined by the Commission.

(The above Rule supersedes Statewide Definition A-24)

RULE 15. The term "gas purchaser" as used in these rules, shall mean any "taker" of gas either at the wellhead or at any point on the lease where connection is made for gas transportation or utilization. It shall be the responsibility of said "taker" to submit a nomination.

DONE at Santa Fe, New Mexico on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

R. R. SPURRIER, Secretary

S E A L

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR THE
PURPOSE OF CONSIDERING:

CASE NO. 245
ORDER No. R-264

THE APPLICATION OF THE OIL CONSERVATION
COMMISSION UPON ITS OWN MOTION FOR AN
ORDER DESIGNATING, NAMING, DEFINING AND
EXTENDING THE GAS POOLS OF LEA, EDDY,
AND CHAVES COUNTIES, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 10 o'clock a.m. on December 22, 1950, March 20, 1951, April 24, 1951, May 23, 1951, and July 24, 1951, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission".

NOW, on the 17th., day of February, 1953, the Commission, a quorum being present, having considered the testimony adduced and the exhibits received at said hearings, and being fully advised in the premises,

FINDS:

(1) That due notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That under the authority of Rule 601 of Order No. 850, effective January 1, 1950, the Commission instituted proceedings upon its own motion to name, classify and define the limits of all known and producing gas pools in the Counties of Lea, Eddy and Chaves, New Mexico.

(3) That during the years 1950 and 1951, the Commission did cause exhaustive studies to be made of all then known southeastern New Mexico gas reserves, and at the several hearings in this cause took voluminous testimony of production engineers, geologists and other experts to the end that the producing gas pools in the area aforesaid should be named, defined and properly classified as such in the interests of conservation, prevention of waste, and the protection of correlative rights.

(4) That the following definitions and classifications of gas pools in Eddy, Lea and Chaves Counties, New Mexico will result in a more efficient administration of the conservation laws of the State of New Mexico.

(a) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Jalco Gas Pool, with the following description:

Township 21 South, Range 35 East, NMPM
E/2 Sec. 12; E/2 Sec. 13; E/2 Sec. 24.

Township 21 South, Range 36 East, NMPM
W/2 Sec. 7; W/2 Sec. 18; W/2 and SE/4 Sec. 19; SW/4 Sec. 20; All Secs. 29 thru 32, incl.

Township 22 South, Range 36 East, NMPM
All Secs. 5 thru 8 incl.; All Sec. 17; N/2 and SE/4 Sec. 18; NE/4 Sec. 19; All Sec. 20; NW/4 Sec. 28; All Sec. 29 and 32; SW/4 Sec. 33.

Township 23 South, Range 36 East, NMPM
All Sec. 4; N/2 and SE/4 Sec. 5; E/2 Sec. 8; All Sec. 9; All Sec. 16; NE/4 Sec. 17; All Sec. 21; W/2 Sec. 27; E/2 Sec. 28; E/2 Sec. 33; W/2 and SE/4 Sec. 34.

Township 24 South, Range 36 East, NMPM
All Sec. 3; E/2 Sec. 4; NE/4 Sec. 9; N/2 and SE/4 Sec. 10; W/2 Sec. 11; All Sec. 14; E/2 Sec. 15; All Secs. 22 and 23; S/2 Sec. 25; All Sec. 26; E/2 Sec. 27; E/2 Sec. 34; All Secs. 35 and 36.

Township 24 South, Range 37 East, NMPM
S/2 Sec. 31.

Township 25 South, Range 36 East, NMPM
All Sec. 1; N/2 Sec. 2; All Secs. 12, 13, 24 and 25; NE/4 Sec. 36.

Township 25 South, Range 37 East, NMPM
All Secs. 6 and 7; SW/4 Sec. 8; S/2 and NW/4 Sec. 16; All Secs. 17 thru 21 incl.; All Secs. 28 thru 33 incl.; W/2 Sec. 34.

Township 26 South, Range 37 East, NMPM
W/2 Sec. 3; All Secs. 4 thru 9 incl.; W/2 Sec. 10; All Secs. 18 and 19; W/2 Sec. 29; E/2 and NW/4 Sec. 30; NE/4 Sec. 31; NW/4 Sec. 32.

(b) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Langmat Gas Pool, with the following description:

Township 21 South, Range 36 East, NMPM
W/2 Sec. 28; All Secs. 33 and 34.

Township 22 South, Range 36 East, NMPM
All Secs. 3, 4, 9 and 10; SW/4 Sec. 11; W/2 Sec. 14; All Secs. 15 and 16; All Secs. 21, 22 and 23; All Secs. 25, 26, 27; S/2 and NE/4 Sec. 28; N/2 and SE/4 Sec. 33; All Secs. 34, 35 and 36.

Township 22 South, Range 37 East, NMPM
SW/4 Sec. 31

Township 23 South, Range 36 East, NMPM
All Secs. 1, 2 and 3; All Secs. 10 thru 15 incl.; All Secs. 22 thru 26 incl.; E/2 Sec. 27; NE/4 Sec. 34; All Secs. 35 and 36.

Township 23 South, Range 37 East, NMPM
All Secs. 6, 7, 18 and 19; W/2 Sec. 29; All Secs. 30 and 31; W/2 Sec. 32.

Township 24 South, Range 36 East, NMPM
All Secs. 1 and 2; E/2 Sec. 11; All Secs. 12, 13, 24; N/2 Sec. 25.

Township 24 South, Range 37 East, NMPM
All Secs. 5 thru 8 incl.; W/2 Sec. 9; W/2 Sec. 16; All Sec. 17 thru 21 incl.; All Secs. 28, 29 and 30; N/2 Sec. 31; All Secs. 32 and 33; SW/4 Sec. 34.

Township 25 South, Range 37 East, NMPM
W/2 Sec. 3; All Secs. 4 and 5; N/2 and SE/4 Sec. 8; All Sec. 9; W/2 and SE/4 Sec. 10; All Sec. 15; NE/4 Sec. 16; All Sec. 22; N/2 Sec. 27.

(c) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Eumont Gas Pool, with the following description:

Township 19 South, Range 36 East, NMPM
SE/4 Sec. 13; S/2 Sec. 23; S/2 and NE/4 Sec. 24; All Secs. 25 and 26; E/2 Sec. 27; E/2 Sec. 34; All Secs. 35 and 36.

Township 19 South, Range 37 East, NMPM
SE/4 Sec. 7; SW/4 Sec. 8; All Secs. 17 thru 20 incl.; W/2 Sec. 21; W/2 Sec. 27; All Secs. 28 thru 34 incl.

Township 20 South, Range 36 East, NMPM
All Secs. 1 and 2; E/2 Sec. 3; E/2 Sec. 10; All Secs. 11 thru 14; incl.; NE/4 Sec. 15; N/2 and SE/4 Sec. 23; All Sec. 24 and 25; E/2 Sec. 26; E/2 Sec. 35; All Sec. 36.

Township 20 South, Range 37 East, NMPM
All Secs. 3 thru 9 incl.; W/2 Sec. 10; W/2 Sec. 15; All Secs. 16 thru 20 incl.; W/2 and NE/4 Sec. 21; NW/4 Sec. 22; W/2 Sec. 29; All Secs. 30, 31 and 32; W/2 Sec. 33.

Township 21 South, Range 35 East, NMPM
SE/4 and Lots 1, 2, 7, 8, 9, 10, 15 and 16 of Sec. 1.

Township 21 South, Range 36 East, NMPM
SW/4 Sec. 1; S/2 and Lots 11, 12, 13 and 14 of Sec. 2; S/2 and Lots 3,4,5,6,9, 10, 11, 12,13, 14, 15 and 16 of Sec. 3; All Secs. 4,5 and 6; E/2 Sec. 7; All Secs. 8 thru 11, incl.; W/2 Sec. 12; NW/4 Sec. 13; N/2 and SW/4 Sec. 14; All Secs. 15, 16 and 17; E/2 Sec. 18; NE/4 Sec. 19; N/2 and SE/4 Sec. 20; All Sec. 21; W/2 and NE/4 Sec. 22; E/2 Sec. 28.

(d) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Arrow Gas Pool, with the following description:

Township 21 South, Range 36 East, NMPM
SE/4 Sec. 24; All Sec. 25; S/2 and NE/4 Sec. 35; All Sec. 36.

Township 22 South, Range 36 East, NMPM
All Secs. 1 and 2; NE/4 Sec. 11; All Sec. 12; N/2 and SE/4 Sec. 13.

Township 22 South, Range 37 East, NMPM
W/2 Sec. 7; All Sec. 18; N/2 Sec. 19.

(e) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Tubb Gas Pool, with the following description:

Township 21 South, Range 37 East, NMPM
SW/4 and Lots 3, 4, 5, 6, 11, 12, 13 and 14 of Sec. 2; All of Sec. 3; SE/4 and Lots 1, 2, 7, 8, 9, 10, 15, and 16 of Sec. 4; E/2 Sec. 8; All Secs. 9 and 10; W/2 Sec. 11; W/2 Sec. 14; All Secs. 15, 16 and 17; E/2 Sec. 19; All Secs. 20 thru 23; incl.; W/2 Sec. 25; All Secs. 26 thru 29 incl.; E/2 Sec. 30; E/2 Sec. 31; All Sec. 32 thru 36 incl.

Township 22 South, Range 37 East, NMPM
All Secs. 1 thru 5; incl.; E/2 Sec. 6; All Secs. 8 thru 16 incl.; E/2 Sec. 21; All Secs. 22, 23 and 24.

Township 22 South, Range 38 East, NMPM
W/2 Sec. 6; W/2 Sec. 7; W/2 Sec. 18; W/2 Sec.19.

(f) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Blinebry Gas Pool, with the following description:

Township 21 South, Range 37 East, NMPM
S/2 Sec. 10; S/2 Sec. 11; All Secs. 14, 15, 22, 23, 26, 27, 34, 35 and 36.

Township 22 South, Range 37 East, NMPM
All Secs. 1, 2, 3, 4, 10, 11, 12, 13, 14, 23, 24 and 25.

Township 22 South, Range 38 East, NMPM
W/2 Sec. 6; W/2 Sec. 7; W/2 Sec. 18; All Secs. 19, 30 and 31.

(g) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Amanda Gas Pool, with the following description:

Township 22 South, Range 37 East, NMPM
All Sec., 25.

(h) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Monument-McKee Gas Pool, with the following description:

Township 19 South, Range 36 East, NMPM
All of Sec. 36.

Township 19 South, Range 37 East, NMPM
All of Sec. 31.

Township 20 South, Range 36 East, NMPM
All of Sec. 1.

Township 20 South, Range 37 East, NMPM
All of Sec. 6.

(i) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Byers-Queen Gas Pool, with the following description:

Township 18 South, Range 38 East, NMPM
All of Secs. 29, 30, 31, and 32.

(j) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Maljamar-Queen Gas Pool, with the following description:

Township 17 South, Range 32 East, NMPM
SW/4 and W/2 SE/4 Sec. 15; All of Sec. 16;
NE/4 Sec. 21; NW/4 and W/2 NE/4 Sec. 22.

(k) That a new pool should be created, classified as a gas pool, with its boundaries defined, and named the Vandagriff-Keyes Gas Pool, with the following description:

Township 17 South, Range 28 East, NMPM
S/2 Sec. 3; S/2 and NW/4 Sec. 4; All of
Sec. 5; NE/4 Sec. 8; All of Sec. 9 and 10.

IT IS THEREFORE ORDERED:

That the application of the Oil Conservation Commission, be and the same hereby is approved, as follows:

I. (1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Jalco Gas Pool and described as follows:

Township 21 South, Range 35 East, NMPM
E/2 Sec. 12; E/2 Sec. 13; E/2 Sec. 24.

Township 21 South, Range 36 East, NMPM
W/2 Sec. 7; W/2 Sec. 18; W/2 and SE/4 Sec. 19; SW/4 Sec. 20; All Secs. 29 thru 32 incl.

Township 22 South, Range 36 East, NMPM
All Secs. 5 thru 8 incl.; All Sec. 17; N/2 and SE/4 Sec. 18; NE/4 Sec. 19; All Sec. 20; NW/4 Sec. 28; All Sec. 29 and 32; SW/4 Sec. 33.

Township 23 South, Range 36 East, NMPM
All Sec. 4; N/2 and SE/4 Sec. 5; E/2 Sec. 8; All Sec. 9; All Sec. 16; NE/4 Sec. 17; All Sec. 21; W/2 Sec. 27; E/2 Sec. 28; E/2 Sec. 33; W/2 and SE/4 Sec. 34.

Township 24 South, Range 36 East, NMPM
All Sec. 3; E/2 Sec. 4; NE/4 Sec. 9; N/2 and SE/4 Sec. 10; W/2 Sec. 11; All Sec. 14; E/2 Sec. 15; All Secs. 22 and 23; S/2 Sec. 25; All Sec. 26; E/2 Sec. 27; E/2 Sec. 34; All Secs. 35 and 36.

Township 24 South, Range 37 East, NMPM
S/2 Sec. 31.

Township 25 South, Range 36 East, NMPM
All Sec. 1; N/2 Sec. 2; All Secs, 12, 13, 24 and 25; NE/4 Sec. 36.

Township 25 South, Range 37 East, NMPM
All Secs. 6 and 7; SW/4 Sec. 8; S/2 and NW/4 Sec. 16; All Secs. 17 thru 21 incl.; All Secs. 28 thru 33 incl.; W/2 Sec. 34.

Township 26 South, Range 37 East, NMPM
W/2 Sec. 3; All Secs. 4 thru 9 incl.; W/2 Sec. 10; All Secs. 18 and 19; W/2 Sec. 29; E/2 and NW/4 Sec. 30; NE/4 Sec. 31; NW/4 Sec. 32.

(2) That the producing formation in the Jalco Gas Pool shall extend from the top of the Yates formation to a point 100 feet above the base of the Seven Rivers formation.

II. (1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Langmat Gas Pool and described as follows:

Township 21 South, Range 36 East, NMPM
W/2 Sec. 28; All Secs. 33 and 34.

Township 22 South, Range 36 East, NMPM
All Secs. 3, 4, 9 and 10; SW/4 Sec. 11; W/2 Sec. 14; All Secs. 15 and 16; All Secs. 21, 22 and 23; All Secs. 25, 26, 27; S/2 and NE/4 Sec. 28; N/2 and SE/4 Sec. 33; All Secs. 34, 35 and 36.

Township 22 South, Range 37 East, NMPM
SW/4 Sec. 31.

Township 23 South, Range 36 East, NMPM
All Secs. 1, 2 and 3; All Secs. 10 thru 15 incl.; All Secs. 22 thru 26 incl.; E/2 Sec. 27; NE/4 Sec. 34; All Secs. 35 and 36.

Township 23 South, Range 37 East, NMPM
All Secs. 6, 7, 18 and 19; W/2 Sec. 29; All Secs. 30 and 31; W/2 Sec. 32.

Township 24 South, Range 36 East, NMPM
All Secs. 1 and 2; E/2 Sec. 11; All Secs. 12, 13, 24; N/2 Sec. 25.

Township 24 South, Range 37 East, NMPM
All Secs. 5 thru 8 incl.; W/2 Sec. 9; W/2 Sec. 16; All Sec. 17 thru 21 incl.; All Secs. 28, 29 and 30; N/2 Sec. 31; All Secs. 32 and 33; SW/4 Sec. 34.

Township 25 South, Range 37 East, NMPM
W/2 Sec. 3; All Secs. 4 and 5; N/2 and SE/4 Sec. 8; All Sec. 9; W/2 and SE/4 Sec. 10; All Sec. 15; NE/4 Sec. 16; All Sec. 22; N/2 Sec. 27.

(2) That the producing formation in the Langmat Gas Pool shall extend from the top of the Yates formation to a point 100 feet above the base of the Seven Rivers formation.

III (1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Eumont Gas Pool and described as follows:

Township 19 South, Range ~~38~~ 36 East, NMPM
SE/4 Sec. 13; S/2 Sec. 23; S/2 and NE/4 Sec. 24; All Secs. 25 and 26; E/2 Sec. 27; E/2 Sec. 34; All Secs. 35 and 36.

Township 19 South, Range 37 East, NMPM
SE/4 Sec. 7; SW/4 Sec. 8; All Secs. 17 thru 20 incl.; W/2 Sec. 21; W/2 Sec. 27; All Secs. 28 thru 34 incl.

Township 20 South, Range 36 East, NMPM
All Secs. 1 and 2; E/2 Sec. 3; E/2 Sec. 10; All Secs. 11 thru 14 incl.; NE/4 Sec. 15; N/2 and SE/4 Sec. 23; All Sec. 24 and 25; E/2 Sec. 26; E/2 Sec. 35; All Sec. 36.

Township 20 South, Range 37 East, NMPM
All Secs. 3 thru 9 inc.; W/2 Sec. 10; W/2 Sec. 15; All Secs. 16 thru 20 incl.; W/2 and NE/4 Sec. 21; NW/4 Sec. 22; W/2 Sec. 29; All Secs. 30, 31 and 32; W/2 Sec. 33.

Township 21 South, Range 35 East, NMPM
SE/4 and Lots 1, 2, 7, 8, 9, 10, 15 and 16 of Sec. 1.

Township 21 South, Range 36 East, NMPM
SW/4 Sec. 1; S/2 and Lots 11, 12, 13 and 14 of Sec. 2; S/2 and Lots 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15 and 16 of Sec. 3; All Sec. 4, 5 and 6; E/2 Sec. 7; All Secs. 8 thru 11; incl. W/2 Sec. 12; NW/4 Sec. 13; N/2 and SW/4 Sec. 14; All Secs. 15, 16 and 17; E/2 Sec. 18; NE/4 Sec. 19; N/2 and SE/4 Sec. 20; All Sec. 21; W/2 and NE/4 Sec. 22; E/2 Sec. 28.

(2) That the producing formation in the Eumont Gas Pool shall extend from the top of the Yates formation to a point 200 feet below the top of the Queen formation thereby including all of the Seven Rivers formation.

IV. (1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Arrow Gas Pool and described as follows:

Township 21 South, Range 36 East, NMPM
SE/4 Sec. 24; All Sec. 25; S/2 and NE/4 Sec. 35; All Sec. 36.

Township 22 South, Range 36 East, NMPM
All Secs. 1 and 2; NE/4 Sec. 11; All Sec. 12; N/2 and SE/4 Sec. 13.

Township 22 South, Range 37 East, NMPM
W/2 Sec. 7; All Sec. 18; N/2 Sec. 19.

(2) That the producing formation in the Arrow Gas Pool shall extend from the top of the Yates formation to a point 200 feet below the top of the Queen formation, thereby including all of the Seven Rivers formation.

V. (1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Tubb Gas Pool and described as follows:

Township 21 South, Range 37 East, NMPM
SW/4 and Lots 3, 4, 5, 6, 11, 12, 13 and 14 of Sec. 2; All of Sec. 3; SE/4 and Lots 1, 2, 7, 8, 9, 10, 15 and 16 of Sec. 4; E/2 Sec. 8; All Secs. 9 and 10; W/2 Sec. 11; W/2 Sec. 14; All Secs. 15, 16 and 17; E/2 Sec. 19; All Secs. 20 thru 23; incl.; W/2 Sec. 25; All Secs. 26 thru 29 inc.; E/2 Sec. 30; E/2 Sec. 31; All Secs. 32 thru 36 incl.

Township 22 South, Range 37 East, NMPM
All Secs. 1 thru 5 incl.; E/2 Sec. 6; All Secs. 8 thru 16 incl.; E/2 Sec. 21; All Secs. 22, 23 and 24.

Township 22 South, Range 38 East, NMPM
W/2 Sec. 6; W/2 Sec. 7; W/2 Sec. 18; W/2 Sec. 19.

(2) That the producing formation in the Tubb Gas Pool shall extend from the top of the Tubb sand to a point 225 feet below the top of the Tubb sand.

VI. (1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Blinebry Gas Pool and described as follows:

Township 21 South, Range 37 East, NMPM
S/2 Sec. 10; S/2 Sec. 11; All Secs. 14, 15, 22, 23, 26, 27, 34, 35 and 36.

Township 22 South, Range 37 East, NMPM
All Secs. 1, 2, 3, 4, 10, 11, 12, 13, 14, 23, 24 and 25.

Township 22 South, Range 38 East, NMPM
W/2 Sec.6; W/2 Sec. 7; W/2 Sec. 18; All Secs. 19, 30 and 31.

(2) That the producing formation in the Blinebry gas pool shall be all of the Blinebry formation.

VII. (1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Amanda Gas Pool and described as follows:

Township 22 South, Range 37 East, NMPM
All Sec. 25.

(2) That the producing formation in the Amanda Gas Pool shall be known as the Amanda zone of lower Permian encountered at an approximate depth of 7050 feet.

VIII. (1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Monument-McKee Gas Pool and described as follows:

Township 19 South, Range 36 East, NMPM
All of Sec. 36.

Township 19 South, Range 37 East, NMPM
All of Sec. 31.

Township 20 South, Range 36 East, NMPM
All of Sec. 1.

Township 20 South, Range 37 East, NMPM
All of Sec. 6

(2) That the producing formation in the Monument-McKee Gas Pool shall be the McKee sand of the Simpson formation.

IX. (1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Byers-Queen Gas Pool and described as follows:

Township 18 South, Range 38 East, NMPM
All of Secs. 29, 30, 31 and 32.

(2) That the producing formation in the Byers-Queen Gas Pool shall be the Queen formation.

X.(1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Maljamar-Queen Gas Pool and described as follows:

Township 17 South, Range 32 East, NMPM
SW/4 and W/2 SE/4 Sec. 15; All of Sec. 16; NE/4 Sec. 21; NW/4 and W/2 NE/4 Sec. 22.

(2) That the producing formation in the Maljamar-Queen Gas Pool shall be the Queen formation.

XI. (1) That a new pool be, and the same hereby is created, designated for gas production, denominated the Vandagriff-Keyes Gas Pool and described as follows:

Township 17 South, Range 28 East, NMPM
S/2 Sec. 3; S/2 and NW/4 Sec. 4; All of Sec. 5; NE/4 Sec. 8; All of Sec. 9 and 10.

(2) That the producing formation in the Vandagriff-Keyes Gas Pool shall be the Queen formation encountered at an approximate depth of 1400 feet.

IT IS FURTHER ORDERED:

That due to the extensive development program being carried on by the oil and gas operators in the southeastern New Mexico, and the possible enlargement of existing pools or discovery of new pools, the Commission orders that further testimony in the matter be received at the regular monthly hearing of the Commission on April 16, 1953.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

R. R. SPURRIER, Secretary

SEAL