BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
November 16, 1960

IN THE MATTER OF: (De Novo) APPLICATION OF VAL R. REESE & ASSOCIATES, PAN AMERICAN PETROLEUM CORPORATION, EL PASO NATURAL GAS COMPANY AND REDFERN AND HERD FOR A HEARING DE NOVO IN CASE 2089 which was an application for special rules and regulations governing the drilling, spacing and production of oil and gas wells in the Escrito-Gallup Oil Pool, Rio Arriba County, New Mexico.	CASE NO. 2089

BEFORE:

Hon. John W. Burroughs
Mr. A. L. Porter, Examiner
Mr. Murray Morgan, Commissioner

TRANSCRIPT OF PROCEEDINGS

MR. PORTER: Next Case, Number 2089.

MR. MORRIS: Case 2089, Application of Val R. Reese & Associates, Pan American Petroleum Corporation, El Paso Natural Gas Company and Redfern and Herd for a hearing de novo in Case 2089.

MR. PORTER: Before we get into the testimony in this case, I would like to ask for appearances.

MR. ERREBO: Burns H. Errebo, appearing for Val Reese & Associates.

MR. HOWELL: Ben Howell, El Paso, representing El Paso Natural Gas Company, And an appearance has also been entered for El Paso Electric-Gas Company by Messers. Seth, Montgomery, Andrews and Federici of Santa Fe, New Mexico. And in this connection, if it please the Commission, I would like to state that Mr. John J. Redfern has been advised that a written appearance was mailed on his behalf by Mr. Howard Brighton of Hervey, Dow and Hinkle in Roswell; and I would like the opportunity to examine Mr. -- conduct the direct interrogation of Mr. Redfern's witness.

MR. PORTER: Mr. Payne, have you received this communication from Mr. Brighton?

MR. PAYNE: No, sir, but I feel that inasmuch as it is a joint application, that Mr. Howell, by way of the entry of an appearance of Mr. Seth, resident counsel, could interrogate witnesses from any of the companies who filed this joint application.

MR. PORTER: The Commission will abide by counsel's desire.

MR. BUELL: For Pan American Corporation, Atwood and Malone of Roswell, and I am Guy Buell.

MR. PORTER: Are there any other attorneys?

MR. PAYNE: Mr. Commissioner, the staff may desire to present testimony, depending upon the thrust of the attack on the outstanding Commission order.

MR. PORTER: Mr. Errebo, I recognize you.

MR. ERREBO: May it please the Commission, maybe the

Commission is aware Val R.Reese & Associates were applicants originally and one of the applicants having joined the other three parties at this time,I would like to make an initial statement concerning the presentation of testimony, and perhaps bring the Commission up to date with regard to this point; and I am sure the Commission is familiar with it, but I think it might be advisable, if you care to receive it.

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

MR. ERREBO: At the original hearing on September 21, Val R. Reese and Associates proposed rules for the Escrito-Gallup Oil Pool, which consisted primarily of classification of the Escrito as an associated gas-oil reservoir; and also proposed 80-acre spacing for oil, and 320-acre spacing for gas, and also related other rules. Since the pool limits at that time had been previously defined by order of this Commission after Notice of Hearing, our testimony at that hearing related primarily to the spacing and classification of the pool as defined.

The order which was issued, denied the application in its entirety, and in doing so, the Commission created the limits of the Escrito Pool, particularly to the East, to the extent that for gas wells, which will be probably discussed rather thoroughly this afternoon later, were made subject to the Devils Fork-Gallup -- to the Devil Fork-Gallup rules.

Val Reese's testimony today, as one of the applicants, will be again directed primarily to the rules applicable to the Escrito

Pool, classification of it as an associated reservoir. We understand that certainly the other applicants have considerable testimony relating to the separation of the Escrito and the Devils Fork area, and the delineation of them. We suggest, therefore, that in the interest of an orderly presentation of the evidence, that these other parties present their evidence first, and then put on the testimony relating to the pools thus defined. I understand that these other parties are ready at this time to put on that evidence, if the Commission is ready to proceed on that basis.

MR. PORTER: Mr. Howell.

MR. HOWELL: May it please the Commission, I also would like to make a brief statement before actually introducing our testimony, both as to El Paso Natural Gas Company, and as to Redfern and Herd. This case involves the Escrito Pool, that's correct, but also indirectly involves the Ingport-Campbell Pool.

Now, the Commission had before it two cases recently involving the Devils Fork-Gallup Pool. The first was the designation of the pool, and that was followed then by a hearing and an order promulgating rules within the pool. El Paso Natural Gas Company, and Redfern and Herd are not operating in the Escrito Pool; for that reason, neither party, I believe, did not enter an appearance in hearings relating to the Escrito Pool. However, when the order arrived,it was determined that a portion of the Escrito Pool had been detached from the Escrito Pool, and the effect of the order was to make four wells which lie in that area subject to the rules of the Devils

Fork Pool, we felt we were adversely affected for the reason that by our testimony, we expect to prove that the wells in question do not lie within the same common reservoir as the Devils Fork-Gallup Pool, and that inclusion of these wells in the rules and proration of the Devils Fork-Gallup Pool will disrupt the equitable volumetric equivalent withdrawal formula which the Commission has established.

I think that is a brief statement of our position, and we would like, in the interest of orderly presentation of testimony, to put on first Mr. Redfern's testimony -- I think Pan American would then present a witness, and followed by El Paso, and then by Mr. Reese, in that order.

MR. PORTER: Do you have an opening statement, Mr. Buell?

MR. BUELL: No.

MR. PORTER: Shall we proceed?

MR. HOWELL: Call Mr. Thornton.

MR. PORTER: We will swear the witness, and then have a break, Mr. Howell.

(Witness sworn.)

MR. PORTER: We will have a short recess.

(Recess -- Ending at 3:05 P.M.)

MR. PORTER: The hearing will come to order. Mr. Howell.

MR. HOWELL: Mr. Thornton, will you please take the stand?

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J A C K D. T H O R N T O N, a witness, called by the Applicants,

Redfern and Herd, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. HOWELL:

Q Will you state for the record, your name?

A Jack D. Thornton.

Q And by whom you are employed, and in what capacity?

A I am employed by Redfern and Herd, Incorporated, as a geologist.

MR. HOWELL: Mr. Thornton has testified in previous hearings, and his qualifications as an expert witness are a matter of record. Are they satisfactory to the Commission?

MR. PORTER: Yes, sir, they are.

Q (By Mr. Howell) Mr. Thornton, have you had occasion to make a study of the area in the vicinity of the Devils Fork-Gallup Pool, and the Escrito-Gallup Pool, in San Juan County, New Mexico?

A Yes, I have. I might correct that, it is Rio Arriba.

Q Yes.

A Yes, I have.

Q Just tell the Commission, in general, what your study consisted of, and then go ahead, if you will, and show any exhibits that you prepared as a result of that study.

A All right. The study, of course, was primarily to carry on profitable exploration in the San Juan Basin. That study, and that study of course led into detail work in the Gallup formation

in the Devils Fork Pool and the Escrito Pools, and that study, detailed study with what additional wells have been drilled since the hearing last February and March, has answered now for -- has answered a lot of questions for exploration that were not answered in those early stages of the two pools.

Q Could I interrupt you there? How many wells have been drilled since you testified on that original hearing?

A In the vicinity, or near it, on the East side of the Escrito near the Devils Fork, there has been approximately five wells drilled; and then I think there has been five or six on to the northwest which did not, did not directly influence the Devils Fork study. And as Mr. Howell pointed out in his opening statement, we are operators in the Devils Fork Pool, and we are directly affected as a result of the last Examiner's hearing; and with the following exhibits that I have, we wish to point out the separate reservoirs present in the area and try to show, or show what wells are related to which wells, or which wells are related to each other, say it that way, plus the outline, possibly, of the pools; and with the following exhibits, I wish to point out that separation which you can -- it is based on profitable exploration methods, sedimentatiin principles, and other data from the drilling of the wells.

Now, I have passed out a set of four exhibits which are before you. Exhibit Number 1 is a structure contour map on top of the Gallup formation. This map is primarily to show the area

of this discussion, which is the eastern limits of the Escrito, and the western edge of the Devils Fork in the vicinity of the red lines which are the lines of the following cross-sections; and it also shows the structural relationship of each well to nearby wells. The contour interval there indicated is 50 feet, with the general dip to the northeast.

Q The squares shown on that Exhibit 1, are sections, and the larger squares are the township markers, is that correct?

A Yes. Map scale 1 to 3,000. The small squares with numbers in them are sections; the larger squares composed of 36 sections are townships. The Rio Arriba County line, of course, separates Range 8 and Range 7. The following cross-sections will also -- I mean, the result of this last Examiner's hearing has brought on some of the questions to be brought out in this hearing, in that the Standard of Texas wells here, which are now shut in, we want to show their relationship to Devils Fork, we want to show their relationship to the well in Section 25, and their relationship to the well in Section 30, which I have a cross-section of.

Q Before we leave that, there is one thing that I might ask you to point out. Would you point out the four wells that you have reference to that --three of which, I believe, were deleted from the Escrito in the hearing, and one other which lies within a mile of the Devils Fork, but which has been prorated with Escrito prior to that time?

A Those wells are the two wells in Section 26, the one

well in Section 25, and the one well in Section 30, Township 24, Range 6 West; that is the four wells.

Q Thank you.

A Now, when I go to Exhibit Number 2, we wish to show with this that the wells hereon strikes to the southeast with Escrito; they are separated geologically, they are separated stratographically, and lithologically from the Devils Fork sandbar. This exhibit that I am using of bottles of oil on top, which is the same exhibit as your Exhibit Number 2 without the oil. The scale of this, of the logs on this cross-section have been blown up to one inch -- I mean, ten inches equals a hundred feet, for clarity. It has come to this, there appears to be a series of sandbars, or a series of sand lenses in the area, and to define those, to keep them straight, to know which one you are drilling for, which one is the primary producer, what to expect, it became obvious we were going to have to blow these logs up a little bit to follow them; so for clarity, the log is blown up to ten inches equals a hundred feet.

Now, I want to point out geologically first, the facie change moving from northeast, the Redfern and Herd Number 1 Largo-Spur; moving southwest through the Val Reese Lybrook 119, into the Kilarny well further southeast, in the Reese 125-Mason, and then into the Standard Oil Company Federal 4-26.

Q May I interrupt you long enough there to have you identify which of the wells there are within the Devils Fork-Gallup Pool?

A These three wells on the right, Redfern and Herd Number 1 Largo-Spur, Number 119 Val Reese Lybrook, the Kilarny Number 114, those three wells are now in the limits of the Devils Fork-Gallup Pool.

Q And the two wells at the left of Exhibit Number 2, are two of the wells which were excluded from the Escrito Pool?

A That's correct. The two wells on the left, which are the Val R. ReeseMason-125, the Standard Oil Number 1 Federal 4-26, those two were excluded from the Escrito Pool.

Before I talk about the oil, I would like to point out the significance geologically, the significant basic change of the existing and producing sand. To the northeast, which is illustrated by the Redfern-Herd's Number 1 Largo-Spur, the Gallup sand lens is well developed, and has been named here the "Devils Fork Sand Lens". As you move further to the left, you can see there are three sand lenses; we could number them "1", "2" and "3", but here I have called the top one "Devils Fork", the middle one "Middle Sand", and the bottom one "Bottom Sand". If we move northeast from the area, there the sand is well developed, clean, prolific. If you move southwest updip, the sand lens starts thinning, then starts changing to shale; and as you move into the area, or the vicinity of the Standard of Texas well, or the Val Reese well, it has acquired a tremendous amount of shale, and does not appear to be the primary producer. Another sand, which is labelled the "Bottom Sand" up here, is the one developed in the

ReeseMason well, develops into a clean sand, and perforated, and it seems to be the primary producer.

The "Bottom Sand" is not developed, is not present in the Devils Fork area of this cross-section, so with this shale barrier occurring in the Devils Fork sand lens, possibly prohibiting commercial production and the development of a lower sand which appears to be clean enough to support production, it appears to be the primary producer in the Escrito area, plus lower sand which is strange or foreign, or missing in another well, found near 5500-feet in the Standard Oil well and the Mason well. It also is perforated in those two wells, and it is possibly a producer, so -- and I wish to also point out the type of liquid hydrocarbons being produced.

In the Redfern and Herd well, the condensate is getting clear, it is frack oil, practically all the frack oil is getting clear, the gravity is 69 degrees. In the Val R. Reese and Kilarny the fluid is practically identical; I took refinery gravity measurements there, and it is three degrees less than the Redfern, which makes it a 66 degree gravity. But, as you can see, the liquid hydrocarbons in those two wells is very similar, and will possibly clean up a little more. I understand if it is fracked with water, they should not contain any frack oil, but they are relatively light, you can see through them, extremely high gravity.

As you move into the vicinity of the Standard of Texas 4-26, and the Reese Masonwell, within a half a mile, I wish to point out

the gravity, difference in the gravity and quality of the oil within a half a mile. The gravity drops to 42 and 41 degrees, it is a thicker oil and has no resemblance to the condensate being produced in the Devils Fork-Gallup Pool, which also confirms, or supports the shaling out, or the facies change of the Devils Fork sandbar as a producer, and points up the high possibility of the lower sandbars being the primary producer in the Escrito area.

Q Before you leave that, let me ask you this question, Mr. Thornton. Has that middle and lower sandbar there to the northwest in the Escrito area, do those two sandbars have good development in that area?

A As you leave the vicinity of the Standard wells and move northwest?

Q Yes.

A As you do that, the middle sand lens and the lower sand lens, bottom one, they develop better, they clean up and become cleaner sands further to the northwest, which illustrates also that the Escrito is producing from those; the Devils Fork sand lens remains shaley, I wish to point that out on the next exhibit.

Q Is there anything further you wish to point out on that exhibit?

A Just the transition. Now, we have pointed out that the Standard of Texas well and the Mason well are not similar to the Devils Fork producers; but we wish to show what they are similar to, what they seem to be related to production-wise, so I would

like to go to Exhibit Number 3.

Exhibit Number 3 is the same type of cross-section, showing facies change and caliber of the sand lenses, and it is also the same scale as the previous cross section, ten inches equals a hundred feet. Previously, there was some question as to why the Standard of Texas well, and the Masonwell were -- Well, the Mason well was actually completed as a gas well -- the question was why was the Standard of Texas well primarily a gas well from its origin. When you work in detail with the sand lenses, it appears to be this: The middle and bottom sand lens appear to be better developed in the Standard well and Masonwell, and also better developed in the Sperling well, which was originally completed as an oil well for a little over 200 barrels of oil.

The map shows that the Standard well and Masonwell have the same sand lens developed and it is structurally updipped, and is possibly the gas cap to the Sperling well; they are structurally updipped, they have the same sand lens better developed, which is the bottom sand lens, and possibly this area here (indicating) is the gas cap to the Sperling well. Also, it is possible they could be the gas cap for production in this area (indicating), they are structurally higher, the sand lens. As Mr. Howell asked me about, the middle sand lens and especially the bottom sand lens develop better to the northwest, and appear to be primary producers in the Escrito area; so possibly the Standard of Texas well could be partially a gas cap from these wells in the Escrito wells, gas cap

for the Sperling well.

Also, supporting the fact that the production in those three wells is coming from a common zone, is the type of oil produced by each. The oil is 42 gravity, it varies sometimes on re-runs to 40 gravity, but it is negligible; same type, also supporting the, supporting the idea that the production is coming from a common reservoir. Also, the assumption might be made that the gas could be coming from one zone, the oil from another, and even though it is an assumption, if I might go back to Exhibit Number 2 -- The Kilarny-Brown well is perforated from top to bottom, it did not affect its liquid hydrocarbons, so it is assumed there the primary production is coming from one lens. The heavier gravity producers, one or two of those are perforated from top to bottom, and the Mason well, even though it is perforated from top to bottom, its oil is identical to the Standard well which is only perforated in the bottom portion. So, the assumption the gas to be coming from one, and the oil from another, does not support the evidence found by this detailed study.

Q Before you leave that, just one minute there. Are all of your cross-sections there hung on a common datum point?

A Yes, I forgot to point that out originally. They are, these cross-sections do not show structure, the cross-sections are hung on a good consistent marker, and placed side by side on this flat datum line.

Q Do you have a check on that in a lower marker that is

also below the sand lenses?

A Yes, below the producing interval, they are getting close to the synosity there is a little sand developing that produces a marker that is just slightly above, well, about 5490, the Standard well, and follow it across and it also is flat. So, with a flat marker at the bottom, a flat marker at the top, the sand lenses then begin to fall in place. Now, we can go to, summarizing those two cross-sections, it becomes evident that one sand lens is not a primary producer over the entire Devils Fork-Escrito area, but it is a series of sand lenses with different ones being primary producers in different pools.

Now, that brings us to the fact -- I will bring this to the point -- where does the effective permeability, or effective sand development die out moving westward from the Devils Fork? That brings us to Exhibit Number 4, which is a cross-section of two new wells drilled and logged last week. On the left, the Val R. Reese Number 21-Byrd, Redfern and Herd Union Largo Number 1-Spur, you can see there moving from right to left, the sand is well developed in the Largo-Spur Number 1, it is getting thin but it is still effective in the Redfern-Herd Number 1-A Largo-Spur, and becomes quite shaley in a direct offset half a mile due south in the Val R. Reese-Byrd well. So the change found in these two wells offsetting each other, shows that the Devils Fork changes rapidly in its effectiveness and helps point out a closer distinction between the producing zones in the Escrito and the producing zone

in the Devils Fork, and that just about summarizes the cross-sections.

But I did want to point out that this is labelled Number 3 on the Exhibit Number 1, the little cross-section Number 3. The wells were drilled last week, and I am happy to report we treated an hour yesterday morning and it kicked off this morning, and it is flowing, it is flowing gas and frack oil and sand; it is cleaning up real well from a 6-foot interval, we perforated six feet, we shot the Devils Fork sandbar six feet, six foot interval, and that is what is producing in the Redfern and Herd Well Number 1-A. So, with that, let me go back to Exhibit Number 1, which was the map, and I would like to point those wells out in the area of the cross-section. That cross-section goes from --

Q You are speaking of Exhibit Number 4, this last cross-section?

A Yes, there will be Exhibit Number 4. I want to point out on Exhibit Number 1 -- the cross-section includes, extends a mile west, half a mile south, and as you can see, the abrupt change in the producing sand from the Devils Fork to the Byrd well. That closeness of distinction helps clarify the effectiveness of the Devils Fork zone as being the producer in the Escrito.

So, summing up, we think that the Standard of Texas well, the Mason well, and the Sperling well, with the evidence shown, the type of hydrocarbons being produced, we think that they should not be put in the Devils Fork Pool. We think they should be put in the

Escrito Pool.

Q In your opinion, Mr. Thornton, is there an impermeable barrier between the wells in the Devils Fork Pool, and these four wells lying to the south?

A Yes, for practical purposes, it becomes impermeable, the Devils Fork sandbar becomes impermeable, a lower sandbar develops which is foreign to the Devils Fork -- it is foreign to the Escrito and not the Devils Fork. The Devils Fork sandbar, as you said, it becomes impermeable to sustained production.

Q I assume that these four wells that we are talking about here, the three which were deleted from the Escrito Pool and the Sperling well, are producing from a different reservoir than the wells in the Devils Fork?

A Different reservoir, yes.

Q Do you care to comment on pressures as between wells, or will another witness do that?

A I could say it, but another witness has that in mind. It is also criteria to separate the pools, in addition to the geological evidence we have, pressure difference is another criteria. So, summing up, it becomes apparent that to find commercial production, or profitable production outside of the Devils Fork Pool, you have to depend on another sand lens; and then it becomes apparent that the commercial effectiveness of the Devils Fork sand lens begins to die out in a westward direction somewhere along a line of this nature (indicating).

Q For the record, you have placed a line, which runs across Exhibit Number 1, which shows the southwestern limits, in your opinion, of commercial production from the Devils Fork, is that right?

A Yes.

Q And will you just identify that line by marking it --

A I will mark a zero on it, and put "Western extent of Devils Fork effective permeability".

Q Now, to summarize one other point, Mr. Thornton, is it your opinion that the four wells that we have discussed today, are producing from the same common source of supply, as those wells that are in the Escrito-Gallup Pool at the present time?

A Yes, the middle and bottom sand lens develops better in that area, and they are producing from a common reservoir.

Q Are there any other comments, or statements, you wish to make on either the exhibits or the results of your studies?

A I will probably think of some I wish I had said, but right now that concludes my statement.

MR. PORTER: Maybe the cross-examiner can help him.

Q (By Mr. Howell) The letters which you placed on Exhibit 1 is an approximation and an estimate of the area?

A Yes, it is an approximation; close, but an approximation.

Q Now, the exhibits 1 to 4 were prepared by you, or under your supervision, were they not?

A Yes, they were.

Q And do they correctly reflect the matters which you have testified to?

A Yes.

MR. HOWELL: We offer Exhibits 1 through 4 in evidence.

MR. PORTER: Without objection, the exhibits will be admitted.

MR. HOWELL: I believe that's all from this witness.

MR. PORTER: Mr. Payne, do you have a question?

MR. PAYNE: Yes, sir.

CROSS-EXAMINATION

BY MR. PAYNE:

Q Mr. Thornton, I take it the crux of your testimony is the Devils Fork sand and the Escrito sand are separate in the area of these four wells?

A Yes, they are separate vertically; they are vertically separated by something, is that what you mean?

Q Yes, in an area of some sort?

A Yes, usually a shale layer.

Q Now, Mr. Thornton, did you hear Mr. Woodruff's testimony in the Devils Fork exploration case?

A I must not; I don't recall it, Mr. Payne.

Q Well, to summarize it briefly, it was that the volumetric formula would work all right in Devils Fork, even if there were one, two, three, or four sands, if the wells were perforated in all of them, because by perforating in all of them as a single

completion, you thereby make one common source of supply. Do you agree with that conclusion?

A You mean by man-made connection, you mean perforating all of the intervals?

Q Yes, sir.

A No, because we have run -- I don't really know what he was referring to, but I will say this, it will help me -- We have run pressure tests on some of those weaker sands, and pressures are zero, so even though they, some of the other sands up and down the Gallup section were perforated, I don't think they would contribute a thing. I have looked at samples, I have looked at samples in detail under a microscope with equipment you can get, and lights, U. V. lights that not only pick up hydrocarbons, but they are longways U.V. lights, and looked into some of those sands, and practically -- some of them are quartzitic or shaley, and some of them, even though they were perforated and put into a well bore, opened into a well bore, I don't think they would contribute a thing;in addition to those drillstem tests,we run pressure,tests we have taken for the pressure, and I doubt if they would contribute a thing. Actually, they might steal something from you.

Q So in your opinion, these four wells are completed in two separate pools?

A The four wells are completed in a separate pool from Devils Fork?

Q Well, they are each completed in two separate pools, are they not, if your assumption is correct, if there is a separation, since they are perforated in both areas?

A The Redfern and Herd well, and the Lybrook and Kilarny wells, are in separate reservoirs from those two, is that what you mean?

Q Are those wells producing from two reservoirs?

A These wells, are they producing from two reservoirs?

Q Yes, sir.

A I would say no, because the one on the right is perforated in only one zone, its production is practically like the two producing from multiple zones; so I would say that they are not, or production is not coming from two different zones.

Q Well, the wells I am referring to, Mr. Thornton, are the wells which were deleted from the Escrito in the last case, are those wells completed in two separate common sources of supply -- They are perforated in what is known as the Devils Fork sand and the Escrito sand, are they not?

A I don't think the Devils Fork can be called a sand there, so I don't call the Devils Fork a sand there.

Q Why not, how do you define that shale section?

A It is not sand.

Q Your kick on the log shows it is sand?

A The kick on the log suggests there is a little bit of silt there, slight change from the pure shale above; and the log

also showed that it is not of quality that you can bank on as sustaining production. That is what that log shows, it shows that the sandbar develops, that -- those logs show that sandbar starts as a silty shale, and develops into a nice clean sandbar moving to the northeast. That is what the logs, used together, show.

Q To your knowledge, have any tests been made on these wells by the use of packers, or otherwise, to determine where the gas production is coming from?

A Only in this one, while it was being drilled.

Q It hasn't been done on the three wells which were deleted from the Escrito in the last order?

A No, they do not produce enough to be significant for the operator to take care of them.

Q Well, the wells produce enough, don't they --

A They are shut in now.

Q -- or they would be abandoned?

A No, they are holding several hundred acres of leases on that. It averaged one barrel a day in August, gas, G.O.R. 68,000 to 1; it must have been 68,000 cubic feet of gas that day.

Q Which well is that?

A The Standard; so the operator, as the result of that last hearing, the operator is very happy to shut those wells in and hold the leases.

Q Is that a holding of the 125 well--what does the 125 well --

A The 125 well has never been hooked up, due to these

hearings back and forth.

Q What is the potential?

A The potential on the Mason, it was potentialed for 1723 MCF per day.

Q Do you consider that a commercially productive well?

A From that, I don't know; the well has never been hooked up, it will depend on the deliverability. I imagine it will make a deliverable well. The well was quite different than this, the well was treated right, it was drilled with one thing in mind, it was not a wildcat. This well, old as it is, it did not seem to be treated too well, in that they have about 55 feet of perforations open continuously, and they just treated it, it did not make much, and they walked off and have not really messed with it since.

Q So the question really is, where the gas that these wells are making comes from?

A Yes, which I hope I pointed out, could be coming from the better developed sand lens down in the bottom below, stratographically below the Devils Fork zone. I hope I pointed out in the exhibit there which I went through, that it is possibly coming from a better developed sand, which is lower in the section than that Devils Fork.

Q That is where the oil is coming from, isn't it?

A It possibly is contributing this oil, also could; and the fact the oil is so much different, great deal different than

anything over here (indicating), that it is undoubtedly a different sandbar than that. I might add for information, this well has about a 40 degree pour point; in cold weather, the well begins to jell, it is highly loaded with paraffin, it is altogether different than these.

Q Have any of these three wells been cored?

A I don't have that prepared on my testimony, but I don't think so.

Q Now, you say that you get into an impermeable area here insofar as what you call the Devils Fork sand is concerned; how do you know there is notfracturing?

A If there was fracturing, there should be a number of liquid hydrocarbons -- I mean, the liquid hydrocarbons would differ, but even though there is fracturing up and down this zone, it does not change much because the Devils Fork sand lens has changed to a practically all shale, and --

Q That is your interpretation of the log?

A -- and does not appear to be capable of sustaining production; so even though it is fractured, I think it would contribute little in that area when you view the fact there is better sand down here (indicating) perforated, that is probably contributing to both of the productions from these two wells.

Q Now, Mr. Thornton, would you review briefly for me what those samples, liquid samples actually show?

A The liquid samples show the great difference in gravity,

color of it, from the wells; that is what they show, primarily.

Q From the two separate sands?

A Yes, two separate sands. These wells do not -- these two wells are not producing from this sand over here (indicating), is that what you mean?

Q Well, that is your conclusion, based upon the log?

A Yes; for effective consideration, I have followed this, and you might say we have not done too bad, I have followed this, and we have not looked too much for this type stuff -- I mean, production records, you can see the reason there, but this is my conclusion -- follow those sands in detail and keep, you know, try to keep straight as to what you are after, what you might get, where to expect it; and that is my conclusion, yes.

Q Mr. Thornton, are you aware of the Gallup Pool in the northwest, the vertical limits other than these -- Well, even these, where the vertical limits are other than the Gallup formation?

A No, I am not acquainted with one whose vertical limits go above the Gallup, I am sure not.

Q And they include all of the Gallup, do they not, all the Gallup pools include all the Gallup formation?

A I don't know, Mr. Payne.

Q Are you generally familiar with the Horshoe-Ogallala Pool?

A Vaguely, not intimately, but roughly; vaguely familiar with it.

Q You are aware that there are what has commonly been depicted as sand "A" and sand "B"?

A Yes; yes.

Q You are also aware, however, that it is treated as one common source of supply?

A No, I have not gone into it that far, I sure have not. We have not had any reason to look.

Q Do you have any general information relative to the Bisti Pool?

A Not too much detail, no.

Q You are aware there are four or five different structures in that pool, are there not?

A Yes, but they are presently under all the wells, you might say.

Q It is treated as one common source of supply, is it not?

A I think so, yes. You have a different situation, if you had three or four of these developed equally under all the wells, you have a different situation. Here, we have two types of production, we have oil undipped from gas, we have two pools here definitely, I think; we have a gas condensate pool, and we have an oil pool. The oil pool appears to be primarily producing from sand lenses other than this sand lens.

Q The oil, yes, sir, I think everybody agrees with that. Now --

A The gas, as I said, it would be an assumption to say the

gas is coming from somewhere else when -- it could, it could be coming from somewhere else, but I think it would be most likely to be coming from one of these which is better developed than this shaley zone up here (indicating). That is what I want to point out.

Q Well, Mr. Thornton, assume with me a moment, that the gas is coming from the Devils Fork sand; in that case, these wells would be completed, in your opinion, in two separate common sources of supply?

A I don't contend that the Devils Fork sand is developed well enough to sustain production in this area.

Q Well, you certainly can't prove otherwise, can you? You have no core, you have put no packer in these wells to determine if the gas is coming from there, so I think it is only reasonable that you assume, for purposes of my next question, that it is coming from there.

A All right. Here's what I do have though, I have these electrologs which are the standard of the industry; if you can't believe them, you can't believe anything.

Q Your log shows a kick -- you say it is shaley?

A Yes, I say it is shaley, and it has more of the characteristics of shale than sand.

Q All right, but it does have some sand; so let's assume there is some gas production coming from that zone.

A Okay.

Q These wells are completed in one common source of supply, under your assumption of the impermeable barrier, is that right?

A Well, even though they are perforated up here in a weakly, weak kick on the electrolog, it is just hard for me to say, or it is hard for me to assume that the gas would be coming up here, you know, from a different zone. I strongly contend that the gas and the oil is coming from the better developed zones down to the bottom.

Q Mr. Thornton, we intend to put on evidence showing they are producing from this zone. Therefore, I am not asking you to assume facts that will not be in the record, so just assume with me they are from that zone; then, under your theory, these wells are completed in two separate pools, are they not?

A Yes, if you assume that, these wells are completed in two separate pools --

Q Yes.

A -- if you assume that.

Q Do you believe they should be squeezed off, or be required to be dually completed, if the evidence does establish that the gas is coming from the Devils Fork sand?

A Well, now, we are making assumptions based on assumptions.

Q No, I am asking you your recommendations, assuming it is proved the gas does come from there? We certainly intend to put on testimony to that effect.

A The wells might possibly be here, the Standard well might

possibly be plugged completely; I mean, they have intimated such. I don't think they will, but as long as they can hold their lease, they want to hold their lease, but that is a problem with this pool; we have limited production from the top of the Gallup, which is 200 feet above the main facie, 200 feet above to, I think, a hundred feet below, that is one of the problems, from top to bottom.

Q That is what I am trying to get at, how this can best be resolved. Insofar as your company is concerned, do you feel this entire area should be treated as one pool --

A The Devils Fork and the Escrito?

Q -- inasmuch as both of them supposedly take in the entire Gallup formation?

A Definitely not, based upon what we have uncovered, data we have uncovered, we do not think they should be treated as one pool, it would be an injustice to the prolific producers, or the profitable producers. It would not be an injustice, it might not be an injustice to the oil producers.

Q How would it be an injustice to anybody, if it were prorated under the same formula?

A It would be an injustice because it is just two different types of production, oil on the one hand and pure gas on the other.

Q Well, sir, if you had the same rules in both, same pool rules, and you just call it one pool, or call it two pools, same rules in both, how can that --

A If you can come up with an equitable rule for, you know, that could cover both of them, that would be fair to both the gas and the oil, that would be a task well done; but right now, as it stands, we have two types of production, and we have the gas pool defined, and we have an oil pool defined, and we think to be fair and equal to both producers, producers of both pools, we think we should keep them separate and try to work out a fair remedy for the oil producers. And one reason for this hearing, we think we have a fair, or we have a starting point for rules in the Devils Fork, and we want to give it a try anyway and see how it works.

Q Well, sir, are you recommending then, generally speaking, that in areas of northwest New Mexico, where the Gallup formation has two or more benches that are separated, one oil, one gas, that they be considered as separate common sources of supply, and an operator can complete his well in only one unless he gets dual completion, or triple completion authority?

A No, I would not propose that in this type, in this type area, because these sand lenses are thin; sometimes you need two for a well, sometimes two, sometimes three maybe. I would not propose anything like that, because it would lead to more confusion probably, and you might have to have a judge to say you are in this sand, or you are in this sand -- you would probably have to have a judge, and the sands are not that cleancut, or that clear-cut.

Q Isn't that with regard now --

A Let me finish. What I mean is, they do not run up to a section line and stop right there at the section line, see. I would not propose that; I really have not gone into it, but I would hate to propose it.

Q Isn't that what you are proposing?

A No, I am just outlining geologically the difference between the Devils Fork and the Escrito; and I am outlining the separation lithologically, stratographically, production-wise, and engineering-wise later, and contending that the Devils Fork sand, even though you can follow a trace of the zone in that shaley section, I am contending that it is not of a sufficient caliber to sustain production in the Escrito area. In other words, the Devils Fork sand becomes ineffective as a producer, it turns practically to shale. No, I am not proposing to limit any division. Now, that is done in a lot of areas in different states, it certainly is.

Q That is what I am trying to find out, whether you think that the Gallup formation --

A That may be the answer, I don't know.

Q Treated as a separate common source of supply, depending upon which bench it is?

A You can divide the Gallup into lower and upper, geologically, and that may be the answer; but I have never gone into it to limit you, you are in the upper, or the lower, if you are in an oil well you are over here. You know, it is a combination of

structure, production, and sand development, it is a combination of several things.

Q If you do separate them like that, aren't you putting an undue financial burden on the operator, where he would be allowed to perforate only from one, unless he got dual completion?

A No, I am not proposing -- I said that may be the answer.

Q But I say, you would let him have a single completion --

A What?

Q -- and complete in separate benches?

A Yes; yes, just the way it is now. I think it would cause too much confusion otherwise.

Q In your opinion, that man-made communication, I will call it, you would not say would have the result of making them one common source of supply?

A Oh, no. If something is not capable, or not the caliber to produce.

Q Well, I agree with you there.

A I don't think it would make a well, perforated or not, producing from that zone.

Q For purposes you might question, I am assuming some gas at least is produced from that Devils Fork sand; if that be true, you would still let the operator singly complete in both pay sections?

A Oh, yes; yes.

Q Due to economics, mainly?

A Yes, due to economics, and a number of factors. I mean, your work, the routine that your staff has, they would have a tremendous battle on their hands; but you are right, being completed from top to bottom, it has added to this problem probably, but it would sure cause confusion.

Q Mr. Thornton, the line you drew there as to the limits of commercial productiveness, what did you use to guide you in the determination where that line should be drawn?

A Why I called it "Extent of effective commercial production from the Devils Fork"? I used geology, economics, a number of things; geology, the economics, engineering pressures, and data, just a number of factors. I hope the line is close; I hope it is back to the southwest a little more, but as I said, it is an approximation. Somewhere in that area, the effectiveness as a good producer, the Devils Fork sandbar turns to more of a shaley facie and that is what that line is; it is somewhere in that area it appears to be becoming non-effective as a producer. Which in drilling for wells, you have this well, one in the middle, and this one; you would not want to get too far away from this well (indicating), at the rate of downgrading, the rate of decrease of this sand, you would not want to get too far further west to drill one. I mean, theoretically, you could hit nothing, you could hit shale from top to bottom. So that line was drawn on the effectiveness of profitable production from that zone, and I think it is somewhere close, because it is not going to be far from this well,

because when you get down in here, you have got two lower sands developed. The two lower sands in the Escrito, see, are not even developed over here (indicating), and those wells are within a half a mile of each other. It is practically all a shale facie. The two sands I was showing you down here (indicating), they do not, they are not developed up in here, so with those gone, plus this one going up, you would not want to get too far west of that well to drill for your, for a producer.

Q Mr. Thornton, would it be any great task to determine where the gas, say, from the Val Reese well, or the 125 well, the Mason-125 well, would it be any great task to determine whether that gas was coming from the upper sand? Couldn't you simply run a packer down there to separate the upper forks from those in the other sand?

A I understand there are instruments available, but not being in the engineering end of it, I don't know how big the task would be, Mr. Payne, but there are instruments that people are trying to promote now on the market, that we can tell where this is coming from, like water, or we can tell where gas is coming from; but not being in the engineering profession, I don't know how big the task would be.

MR. PAYNE: I see. Thank you.

QUESTIONS BY MR. NUTTER:

Q Mr. Thornton, where did you get those samples you have got on that board?

Q Right out of the top of the well tank, the tank battery; dipped them out myself.

Q Those were taken from the tank?

A Yes.

Q All right. Now, in the case of the, in the case of the Standard well there, how near full was the tank?

A About half.

Q And what size of tank was it?

A I believe it was 250.

Q And how much oil did you say that well is making a day?

A Well, from the Commission reports, the 4-26 in August made 27 barrels in August; made 57 barrels in July, and 60 barrels in June. June it averaged 2 barrels a day; July averaged 2 barrels a day; and August averaged 1 barrel; and then they shut it in.

Q Now, if it is a 250 barrel tank, it would have about 125 barrels in it, would it not?

A Yes.

Q And if it is producing at the rate of 30 to 40 to 50 barrels a month, it has several months' production in that tank?

A Yes; it has been doing that. I think last February, and -- well, production averaged about three barrels a day for a year.

Q Now, if that were producing some high gravity liquids with gasses from upper perforations, most of those high gravity liquids would have had a chance to evaporate off, would they not?

A No, I don't think so, because they have a separator there, and that oil is still identical to the sample we caught coming through the separator back in February on it.

Q That is what I was wondering, if these are true samples, if they represent the oil that comes out of the well, or out of the separator, or oil that set in the tank on an average for three months?

A Yes, we have checked those, and this oil is the same as we caught coming out of the wellhead in, back in February, in fact.

Q What is the gravity on the Standard of Texas Number 4-26 on the left side of Exhibit Number 2?

A The refinery, or from your report, it was 41 degrees.

Q The gravity as it comes out of the separator?

A And corrected -- Yes, 41 degrees out of there. And, let's see, and 39 in February, and now it --

Q If it was 39 in February, when was it 41?

A Your August reports.

Q Well, now, August is a warmer month than February, is it not?

A Yes.

Q And the weather would have had an opportunity to have caused the high gravity?

A No, it would have been the reverse; it should have been higher in February when it contained -- it's higher, see, the

colder --

Q This was taken from the separator?

A -- when something is colder, it will hold more gas; the warmer, the less it will hold; so theoretically, this should have been much lower, the one I have now should have been much lower than the one in February.

Q How do you account for that difference?

A Primarily the difference there is the way the refinery is checked. They just run a quick check in a tank load, where I specifically tested these and corrected it right down to the pinpoint correction, you know, altitude, temperature, and everything; and even then there is only two degrees difference, and mine was methodically done. And the refinery check, the way I have seen them do it, it was not as methodically done.

Q Are you talking about refinery, or gauger in the field?

A Refinery, buyer.

Q And the gauger, who comes around and takes it on, he takes the gravity?

A No, the operator. The refiner, the only association he has is sends a trucker down to get it, and then they check it usually at the refinery. Of course, the operator's gauger is checking it every now and then also.

Q You mean they do not sample the tank on the lease -- the tank on the lease prior to loading it?

A Oh, I got off, I'm sorry; I see what you mean.

Q I think it would be difficult to determine what the gravity would be, after the tank got into the refinery, if it had picked up oil from several leases?

A Yes.

Q Now, the latest gravity report shows that the gravity on that Standard Number 4-26 was 41 degrees?

A Yes.

Q Now, what is the gravity on the Mason 125?

A 42.

Q What is the gravity on the Brown 124?

A Same source of material, reports 66.

Q And the Lybrook 119, I think you said was 66?

A 66.

Q And the Largo-Spur Number 1 was 69?

A 69.

Q Is there any significance to the fact that as you go from southwest to northeast, the gravities are increasing?

A Southwest to Northeast? On first look, you might think it is significant. It is significant up to a point where it changes abruptly, the entire character changes; is that what you mean? I mean, it does not gradually grade into a higher stuff, it seems to change abruptly, it changes within a half a mile, abruptly from one extreme to the other.

Q But the gravity is increasing as you go from south to north, and also the development of the upper sand is increasing,

but the development of the lower sand is decreasing in that direction.

A What I think is significant there is the Kilarny well, it has just been on the line a short time, and the Lybrook well also; the two wells have not been on the line too long, which may be a, significant of a change there of two or three degrees. This Number 1 of course has been on the line longer than any well, and has produced quite a bit more than the other wells, and I think that is the significant thing. I might point out back here, see, I caught this off of a drillstem test before the well was treated, and after treatment why it went back darker than this, but it is clearing up now, and time may be more significant than the three degrees change in the gravity.

Q Well, --

A Time of production, I mean.

Q -- if time is a factor, and the wells are opened to the lower sand, and producing small amounts of oil, but time is a factor and the lower sand is slowly depleted, that would cause the liquid to clean up as they come to the upper zone, would it not, wouldn't the liquids start lightening in color?

A Yes, any decrease in foreign substance would tend to lighten the well up, undoubtedly, because they are definitely producing from the, primarily producing from the Devils Fork sand lens, so technically they would clean up.

Q Well, now, what foreign substance do you think is causing

the liquids from those two wells to be darker?

A I don't know; there is really very little difference, you can come and look. You can read the paper through, underneath, there is very little difference; but foreign substance, I would have to check with Mr. Reese as to how they were treated, but this one was treated with water -- Was the Lybrook treated with oil?

MR. REESE: Water.

A Water; they were treated with water, and some of that might have its effect.

Q Do you agree with Doctor Muscat, where he states that the color of gas well liquids varies from a white to a light straw color?

A What was that now?

Q The color of gas well liquids, varies from a clear liquid white, or a water white, to a light straw color?

A Yes, I have seen old producers, you know, gas wells, change slightly from one area to the next; I mean, it may change for a few days, and then change back to its original color; it comes kind of in spurts, you might say.

Q Well, now, on your board there, how many of those exhibits would you call a straw color, Mr. Thornton?

A Three.

Q You would?

A Yes.

Q Now, on your cross-sections --

A I can stand this up, it might put a little light on it. It will help you a little, but you can see the blue lines through here.

Q That would be a dark straw though, wouldn't it?

A Yes, technically, in the oil country, I mean you -- I imagine your staff, that is straw colored oil, it sure is, especially in a thin section. This bottle is, oh, an inch or so thick, but in a small section, or the smaller the section, of course, the lighter it gets; and of course oil in a thin section, it does not change as much in different type bottles as condensate type.

Q Now, if we take the light straw colored liquid over there and add a few drops of crude oil to that, would that get darker?

A I don't know, I never tried it.

Q Now, on your cross section, the yellow depicts a clean sand?

A Yes.

Q The dark gray depicts --

A A shale.

Q The yellow with the gray line across it is shaley sand?

A Yes.

Q Does the gray with the yellow line across it, is sandy shale?

A Yes. After looking at El Paso's core, I got more the

silty shale, rather than sandy shale, to differentiate the two, for my own use.

Q Now, did I understand you correctly to say that you didn't think the gray areas on these cross-sections were contributing anything to the production of these wells, and as a matter of fact, may be robbing some production from the other zones?

A Well, we were referring it to a more typical question when I gave that answer to Mr. Payne; but they could be robbing you, I mean, something up here perforated, that would not be contributing anything definitely, could be robbing something. That is what I was referring to, yes.

Q You didn't mean these gray sections you have colored on here?

A That was an answer to a little different question; I mean, that phrase here. Oh, it is just a question of you can't see down that hole to know what would really be a thief zone, and what is not.

Q Well, now, on Exhibit 2 here, we have five wells --

A Yes.

Q -- and of those five wells, four of them have perforations in the gray zone; on the other exhibit we have three wells and two of those three have perforations in the gray zone. Why do these operators perforate the gray zone if it is non-productive?

A Well, it is not operators, I mean, plural.

Q Well, now, you have perforated in the gray on Largo-Spur

Number One.

A If you will notice there, as over on the left, that is a silty-shale, and I was running samples on that. Now, that little old shale there, it is questionable whether it is adding anything or not; but we had a 20-foot perforating gun, which is standard length, and we shot it -- you might say "cheaper by the dozen" -- and we shot that 20-foot. Now, on the Number 2, I think we caught just about the same -- no, we didn't -- Yes, we caught roughly the same zone, slightly left on the Number 2. And then on our 1-A, we realized what we had and shot the six feet of good effective log sand. Our engineer kind of criticised it, I don't know, he kind of criticised me; if it is not contributing anything, it might be a thief zone, but it did not seem to be affecting the well.

Q Just one remark, Mr. Thornton, it appears it was a 24-foot gun?

A Yes, I remember it was a standard gun; I was out there, and here we went.

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

REDIRECT EXAMINATION

BY MR. BUELL:

Q You and Mr. Payne talked considerably about vertical consideration, but let's get to the nut of what your exhibits show with respect to the Devils Fork by -- they show horizontal separation between Devils Fork and Escrito, and then vertical separation, is that not correct?

A Yes, horizontal, there is horizontal separation between the two pools, definitely, by my opinion.

Q So that from the standpoint of the comment about all the various problems we will get into with vertical separation, we are not faced with that here, are we, Mr. Thornton?

A Does not appear to me, no.

MR. BUELL: Thank you.

RECROSS-EXAMINATION

BY MR. ARNOLD:

Q Mr. Thornton, everything you are saying is assuming the Devils Fork sand in this area is not productive, is that right?

A Right.

Q As far as the 4-26 Standard and the 125 well there, if those two wells were producing dry gas from the Devils Fork sand, it would not appreciably change the color of those oils which are coming from the Escrito, would it?

A I don't know, Mr. Arnold, whether the dry gas would change the color or not. It seems like it would definitely change the gravity, by containing a large volume of gas. You take these samples for instance, you can hold them in your hand, in the heat of your hand, and the heat of your hand will make them boil, they will boil gas out. So if these wells were producing that dry gas, they should contain some of it in the sample, and consequently be of a higher gravity; I mean, that is the basis of my work.

Q Actually, so far as the Devils Fork sand in this area is

concerned, because of the fact it is up-structure from the main portion of the Devils Fork field, and because it is a tighter sand in this area, you would expect that it would produce a drier gas than the main portion of the Devils Fork pool, wouldn't you?

A That would be logical, yes, based upon mechanical physics.

Q Do you think that your exhibit, as far as the oil colors are concerned, is conclusive that those two wells are not producing dry gas?

A The gas coming out of there, when I have seen them produce, hasn't been dry; they have run it through a separator, and to me it did not appear dry. And as far as having any analysis of it, I don't have, but we have some analyses on a couple of ours, but not theirs.

Q Of course you probably have a mixture, some solution gas, some --

A Oh, yes. I know this, when it gets to the surface, it still contains a terrific amount of gas in solution; this should, but don't -- Well, it's just not making much oil or gas, really; the pressures are not as high as these, but seems like it should have some more than it does.

Q One other question: Would you agree that there is considerable difference of opinion among people who have drilled gas wells in the sand basin, as to what value an electrolog is on productive pay sand?

A There seems to be considerable argument at times, but

if you will stick by what is good, you won't go broke; you stay with what is bad, and you will.

Q Well, how do you determine, on an electrolog, what is good and what is bad?

A I really have not used one without the other, electrolog without the samples. I am a strong believer in sample running, and I kind of tie the two together; and I have watched, I try to be there, I have been there on all of ours except one, not in this area, to see where the instruments are set, the amplification of the logging, just like the other one, so that we can have something to compare it to. After running the samples on Number 1, and logged it a certain way, we have tried to log the others on the same amplification; and as far as using one without the other, I don't really like to do that. That is kind of like --

Q Where do you break off?

A Oh, well, I don't know, it's a long drawn-out thing.

Q Would you agree that there are gas wells which have been drilled in the San Juan Basin where there are producing sands exhibited for electrologs characteristics, as well as these wells do which still produce gas?

A No, I am not acquainted with, I am not acquainted with any right offhand. I have seen sections perforated that were as poor as, say, as some of these, you know, and a tremendous amount of money spent on them and then abandoned them, up here especially, later, Dakota wells; every now and then an operator will try a

little streak of Gallup, and some of them make it, and some don't, when it is poor. Which brings up the question, or this statement, a potentially good well, and a sustained producing well, is two different things. You can potential one in three hours, but three weeks from now, or three months from now, it may not be producing, it may not even be producing into the line.

Q I think everybody agrees that the Devils Fork sand in the Escrito area is not a good gas reservoir; the question is whether or not it is producing Devils Fork gas?

A Just on the caliber of the logs, compared to the caliber of the sands down in here (indicating), I don't think it is the primary producer; I mean, me.

Q Well, I don't think it is the primary producer either; but you do then agree that you think it may be producing?

A No; no, not that even. I do not agree that it would be producing, but there again you can't look down the hole and tell, because there is a number of spots on that that are better developed, I will say that. And if it was producing, it should have lightened this oil up a little, it should lighten them up a little gravity-wise, and pressures should be higher if that sand were an effective producer -- pressure should be higher, and --

Q The pressure should be higher than what?

A Higher than they are now -- Sorry, higher than they are now in this well, that is what I meant, in relation to what they are now.

MR. ARNOLD: I don't believe I have any more.

MR. PORTER: Does anyone else have any questions?

MR. HOWELL: I have one more question.

MR. PORTER: Mr. Howell.

REDIRECT EXAMINATION

BY MR. HOWELL:

Q Mr. Thornton, of course geologists sometimes have differences of opinion as to various matters. I will ask whether or not if there is any production in the Standard well and Mason well of any character at all, from the Devils Sand, whether or not it is significant in your opinion?

A No, not significant. Is that what you mean?

Q That's right. It could not be very significant if you have got a well that only produces about 68,000 cubic feet a day, and has much better developed sands than the one that is under consideration, it could not contribute very much, could it?

A No.

MR. HOWELL: That's all.

RECROSS-EXAMINATION

BY MR. PAYNE:

Q If it is not significant, then how would it throw off the volumetric formula?

A Well, the volumetric formula, as I see it, includes gas production in relation to oil production, and I think there was one in there, any underage would be made up among wells that could

deliver. And as I see it, I have not really dwelt on that too much, but as I see it, what would happen, these wells then would have to be primarily classified as gas wells which would throw what our original thinking was to make the equitable withdrawal from a common pool. These wells adding to the problem, or adding to the gas production from another pool, would cut down, would cut down on the good producers from that common pool. In other words, good producers in the Devils Fork are related to those oil wells. If you put these in there, then you are cutting down on their equality, compared to that oil well; whereas, they do not seem to be in the same pool.

Q As a matter of fact, Mr. Thornton, you would be increasing the allowables to the other wells, would you not --

A I have not worked that out.

Q -- because of the redistribution to the wells which could make it?

A Then you would be hurting the oil well, I mean, the wells that are capable of delivering could make up that underage, and there would probably be some underage; then you would be unequally drawing more gas than the oil operators got oil.

Q And no matter which pool these wells are in, they are still going to be classified as gas wells, aren't they?

A I don't know.

Q Under the proposed pool rule, they are both in excess of 30,000 to 1, aren't they?

A Yes. And as I pointed out earlier on this map, I think they are primarily gas caps to this production through here; they are structurally higher, the sand lenses are better developed in that area.

Q You agree then, that no matter how this thing is finally resolved, these are gas well?

A Yes; yes, primarily they are gas wells.

MR. PAYNE: Thank you.

QUESTIONS BY MR. KENDRICK:

Q Do you know of anything being done by any operator for drill testing these zones individually, to see what zones contribute to what production?

A Only in the Redfern and Herd Number 1. I don't recall the Standard well, I will look here; but in the Redfern and Herd Number 1, we started up here testing (indicating), and got no results at all. I mean, pressure is practically nothing; one of them, I think your shut-in pressure was 200 pounds, flow pressure is zero.

Q But to your knowledge, separate drillstem tests have not been run below the datum line?

A Drillstem tests?

Q Yes.

A Yes, in Redfern-Herd Number 1, and Redfern-Herd Number 2, drillstem tests were run in that zone only.

Q Does the Devils Fork sand produce oils of the same color

as the Escrito sands, or the samples for the Standard of Texas Number 4-26 Number 1?

A No; no, they are slowly getting lighter, or our wells are. We fracked with oil, and they are slowly getting lighter.

Q What is the color of the oil from the Pan American Company leases that produce from the Devils Fork sand?

A Oh, I do not have a sample of it, I sure don't.

Q Do you know anything about the gravity of that liquid?

A No, I would have to look on the reports.

Q Then it is possible that that sand could also contribute a dark color liquid, in a gravity range of 40 to 42, as well as the Escrito sand producing that type of liquid?

A That might be possible.

MR. KENDRICK: That's all.

QUESTIONS BY MR. NUTTER:

Q Mr. Thornton, you mentioned a moment ago that this Standard well was producing 68,000 cubic feet of gas per day. Now, is that the potential, or the penalized allowable that the Commission has assigned to it?

A No, the G.O.R.'s last report was that the potential was 65,000 to 1; and I think the last G.O.R. I checked up on, it was 68,000.

Q Well, that is the G.O.R., that is not the potential that the well could make, is it?

A Well, it was producing wide open there for 27 days, and

averaged a barrel a day, and the G.O.R.'s last report, check-up I had was 68,000 to 1; and then the last production I had was one barrel a day.

Q It was producing wide open for 27 days --

A Well --

Q -- or penalized allowable, one barrel per day?

A Well, it was producing for 27 days, I believe; I would have to check up on it. (Witness checks.) It was potential; the official potential was 17 barrels of oil a day, with a G.O.R. of 65,000 to 1, was its potential. But as far as penalties right now, or how it is prorated, I don't know the penalties.

Q So you do not know what the well would make, if it were put under gas well allowables, permitted to produce gas well allowables?

MR. BUELL: Unless you particularly want to ask him these questions, we are going into that exhaustively on our direct.

MR. NUTTER: That's all I had on that question.

Q (By Mr. Nutter) You also mentioned a moment ago, Mr. Thornton, that if these wells were assigned a gas allowable in the Devils Fork pool, it would hurt the good producers. Now, how would that happen?

A Mr. Nutter, I am not qualified really to explain the details of the formula, or the workings of it, and I think the engineers have that in their testimony, and if it would please the Commission, I would just as soon let the engineers present it.

I have not really gone into the workings of it. I am waiting to, you know, see our first allowable and our first deliverability, and then try to see how the formula is going to work; but I have not really worked on it right now in any theoretical problems.

Q So, in other words, right now you have no basis for making the statement that it would hurt the good --

A Well, I saw the formula -- I saw how, I understood how the formula would work in relation to oil, and the gas wells. No, I am not qualified to really go into the mathematics of it at all, but I will, once we get an allowable assigned, and it starts working, I do want to keep up with it and see how it is working.

Q You are basically acquainted with the formula though, aren't you?

A Just very vaguely, yes.

Q Are you acquainted with it to the extent that the gas area allowable is equal to the production from the oil area, times certain reservoir factors, times big "A" over little "a", the big "A" equalling the acreage for the gas well, and the little "a" equalling the acreage for the oil well -- Now, if you add some wells to the gas area, you also increase the large "A" in the formula, do you not?

A You would, I believe, yes.

MR. NUTTER: Thank you.

QUESTIONS BY MR. ARNOLD:

Q Mr. Thornton, it is the Commission's responsibility to

draw pool boundaries on various reservoirs in the Basin. In this particular case, if we use your interpretation, the pool boundary should be drawn at a point, I presume, where you show the sand has gone to a shale -- you base this on an electrolog interpretation -- Are you proposing that in the future, so far as the Gallup pool boundaries are concerned, that we attempt to use some value of an electrolog to determine where an individual sand ceases to produce?

A No, technically, I don't think you could use one tool by itself, Mr. Arnold, I really don't. I think it would have to involve a routine as you use now, wait and see. You see how the well turns out, and then use a number of factors you have. If that is all you have, I don't know.

Q Actually, wouldn't that sort of a system end up about what it has in this particular area, five or six hearings to establish a pool boundary?

A It might do it. That is a problem, I mean, you people are faced with a big problem there, drawing the boundary line. It is unfortunate -- it is unfortunate that this pool down here (indicating), is so close to the Devils Fork pool, as far as the rules it is unfortunate that they are that close together; but I think you started off on a, this classification, you know, I think you have a pretty good basis for classifications now, I mean, the staff.

QUESTIONS BY MR. NUTTER:

Q Mr. Thornton, what would be the southern and western boundaries of the Devils Fork?

A In my opinion?

Q Yes, sir. How would you recommend the Commission define the western and southern boundaries of the pool?

A Southern boundary would have to, right now, knock off to the south line of Section 19-24-6--the south line of Section 24-24-7. Western boundary?

Q Yes, sir.

A Western boundary; it is here a little bit elusive due to the streak attitude of the beds, but I would have to wait and see what Val Reese's Byrd Number 123 did. Right now I would put the boundary pretty close to that well, the western boundary.

Q Now, is that going to be a gas well, or an oil well?

A I hate to predict right now.

Q So the western boundary would depend on how it turns out?

A It has a little sand in it there, and I showed you on the last cross-section how rapid that sand is degrading and thinning; it is not going to be much further -- if that is a gas well, the boundary is not going to be much further west.

Q And what about the northern boundary of the Escrito in that area?

A The northern boundary of the Escrito is just south of the Compass well up in Section 7.

Q No, I mean down in this end of the pool, Mr. Thornton (indicating). I presume you would put Section 26 in the Escrito, is that correct?

A Yes.

Q So what would be the boundary of the Escrito pool then?

A Well, for practical purposes right now, temporarily, I would put it at the north line of Section 26 -- right now, depending on the outcome of the Byrd well.

Q Now, what would you do with that 125 in Section 25, would that be in the Escrito pool?

A Escrito, definitely.

Q Well, now where would the pool boundary be, along the north line of 25 also?

A Yes.

Q Now, what about this 130 well down here in Section 30?

A It would be in the Escrito, the north line of that Section 30 would be the north line of the Escrito, and the south line of the Devils Fork there we were talking about; or you could put the Standard in, let's see, the Sperling well -- You might put the north limit of the Escrito through the center, go east and west through the center of Section 30 for the north line.

Q In other words, put the south half in the Escrito?

A Yes; there is quite a distance, there is a mile and a half between it and the Lybrook well.

Q Now, if Mr. Reese would drill a well in the north half

of the 30, which pool would that go in?

A Oh, I would really have to do more than just random thinking here. If he drilled a well in the north half of 30, you would really have to study to see how rapid the sands are thinning coming south out of the Devils Fork, and then make a rough guess as to what the well would be; but the way, the way the sand is acting in the Devils Fork to the northwest, it would be doubtful that he would get a good Devils Fork sand in the north half of Section 30. If he did get some of it -- well, as thin as found in the Redfern Number 1-A.

Q Might get shale and sand both then?

A If it was there, it would be thin; or it could not be there. Just like us drilling the one in Section 14, it was kind of a toss-up whether it would be there or not; and then when it was there, it scared us, it was so thin; but the sand would thin coming that way.

MR. NUTTER: Thank you.

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

(No response.)

MR. PORTER: The witness may be excused.

(Witness excused.)

MR. PORTER: Mr. Howell, did you offer your exhibits?

MR. HOWELL: Yes, we offered the exhibits; and that is all the testimony in that connection. The next will be the Pan American testimony, logical sequence.

MR. PORTER: Since it is past 5:00 o'clock, I think we will recess the hearing until 9:00 o'clock tomorrow morning.

The hearing will adjourn, recess until 9:00 o'clock tomorrow morning.

(Recess.)

MR. PORTER: The meeting will come to order, please. We will continue with Case 2089.

GEORGE W. EATON

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

DIRECT EXAMINATION

BY MR. BUELL:

Q Mr. Eaton, will you state your full name, by whom employed, and in what capacity and what location?

A George W. Eaton, Jr.; I'm employed by Pan American Petroleum Corporation in Farmington, New Mexico, as senior petroleum engineer.

Q You testified at previous Commission hearings and your qualifications as a petroleum engineer are a matter of public record, are they not?

A Yes, they are.

MR. PORTER: The witness' qualifications are accepted.

Q Mr. Eaton, you realize that one of the primary purposes of this hearing is to ascertain whether or not communication or separation exists between the Devils Fork-Gallup Pool and four of the wells in the Escrito-Gallup Pool, is that correct?

A Yes, sir, that is correct.

Q When you, as an engineer, are interested in ascertaining separation or communication, how do you go about it; is the first thing you do to make a subsurface evaluation to see whether or not

the geological opportunity for communication exists.

A Yes, sir, that's the first step.

Q What is the second step?

A We proceed with study of performance data that has occurred in the two groups of wells that we're interested in.

Q In other words, we look first geologically to see whether the opportunity exists and then, second, we look at engineering data to confirm our geological interpretation?

A Yes, sir.

Q Well, now, we have seen Mr. Thornton's geological interpretation, and under his interpretation the opportunity for communication does not exist, is that correct?

A That is correct.

Q We have a clue, I think, that Mr. Arnold will put on testimony which will show that geologically the opportunity for communication does exist?

A That's my understanding, yes, sir.

Q All right. Have you made an engineering evaluation which will confirm, in your opinion, one of these geological interpretations?

A Yes, sir, I have made such an engineering interpretation.

Q At the outset, Mr. Eaton, I'll ask you to state, in your opinion, whether or not the four wells in question are in communication and producing from the pay in the Devils Fork-Gallup Pool?

A It is my opinion that the four wells in question are not

producing from the Devils Fork pay sand.

Q All right. I direct your attention, now, Mr. Eaton, to what has been marked as Pan American's Exhibit No. 1. What does that Exhibit reflect?

A Pan American's Exhibit No. 1 is a map of the Devils Fork-Escrito Pool area showing the location of the wells therein.

Q Mr. Eaton, how have you distinguished the various wells to show in your engineering opinion which wells belong in which pool?

A On Exhibit No. 1, I have colored the gas wells in the Devils Fork-Gallup Pool in yellow. That's the yellow dots. The red dots are the three oil wells which I consider are properly classified in the Devils Fork-Gallup Pool. You'll notice two yellow sections in Section 14, 23 of Township 24 North, Range 7 West, which are two wells which are yet incomplete, but I feel will be properly classified upon completion as Devils Fork gas wells. Moving along to the brown, you'll notice that some of the wells are colored in brown dots, some in brown circles. These are wells which I feel are properly classified in the Escrito Pool. The four wells colored with the brown dots are the four critical wells which you mentioned previously.

Q Would you name and locate those wells for the record, please, Mr. Eaton, because we're going to be discussing those pretty thoroughly, so let's name and locate them for the record.

A The four purple wells commencing to the West are the Standard Oil Company of Texas 2-26 and the Standard Oil Company of Texas

4-26, both of which are located in Section 26, Township 24 North, Range 7 West.

The next well is the Val Reese & Associates Mesa 1-25, which is located in Section 25, Township 24 North, Range 7 West. And the fourth well is the Val Reese & Associates Sperling No. 1-30, which is located in Section 30, Township 24 North, Range 6 West.

Q Those are the four wells that, under the Order R-1793, which the Commission issued after the Examiner Hearing in this case, those four wells would be placed in and prorated and regulated by the Devils Fork-Gallup Pool rules?

A Yes, sir. These four wells would be regulated and prorated under the Devils Fork-Gallup Pool rules.

Q In your testimony, you'll be referring to the four wells as the four critical wells or the four wells in question, and you are talking about those four wells?

A Yes, sir.

Q Does Exhibit No. 1 also reflect structure?

A Yes, sir. The contour lines on Exhibit No. 1 are structure lines as depicted by a Gallup marker; the contour interval in this particular case is 50 feet.

Q Why did you pick a Gallup marker? Why didn't you show structure on the Devils Fork pay or the Escrito pay?

A We wish to have a structure map which would cover the entire area that we're considering here, and since neither the Devils Fork pay nor the Escrito pay exists over the entire area, we had to

pick a marker which did exist over the whole area to contour on.

Q So you could see generally the structural relationship of the Devils Fork Wells and the Escrito Well?

A Yes. That's correct.

Q Does that show the present horizontal limits of the Devils Fork-Gallup Pool?

A Yes, sir. The horizontal limits of the Devils Fork-Gallup Pool as defined by nomenclature orders are shown by the hashered lines.

Q What is the significance of the green line that connects the four critical wells?

A This green line--

* * *

MR. PORTER: The meeting will come to order. Let the record show there was a two-hour delay in the hearing, waiting for the reporter.

Mr. Buell, will you proceed with your questioning of the witness?

BY MR. BUELL:

Q Mr. Eaton, I believe at the time of the recess you were getting ready to state for the record the significance of the green line that connects the four wells colored with the solid brown dots.

A The green line connecting the four brown dot wells is the trace of a cross section which is Pan American's Exhibit No. 2. It is shown on Exhibit No. 1 as 'Cross Section A-A Prime'.

Q Are you ready to discuss that at this time, Mr. Eaton?

A Yes, sir.

Q Would you briefly state for the record what has been marked for identification as Pan American's No. 2 reflects?

A Exhibit No. 2 is a cross section to the four critical wells. It commences with Standard Oil Company of Texas 2-26 in Section 26, proceeds through the Standard of Texas 4-26, also in Section 26; thence to the Val Reese No. 1-25, which is in Section 25, and terminates on the Eastern end at the Val Reese Sperling No. 1-30, which is in Section 30, Township 24 North, Range 6 West.

Q That Exhibit contains the logs of the four wells that will be placed in and regulated by the Devils Fork-Gallup Pool rules unless Order R-1793 is amended by the Commission as a result of this de novo hearing?

A Yes, sir.

Q What is the significance of the brown band that traverses that Section?

A The brown band is the area which we consider to be the Escrito pay. You will note that it is a readily correlatable member and appears in all four wells.

Q Let me ask you, if an engineer or a geologist was attempting to correlate the Devils Fork interval on down into the Escrito Pool, would that interval be within the confines of your brown band?

A Yes, sir, it would be.

Q Would you get Redfern and Herd's Exhibit No. 3 there, it is the small one. Now, so that we can orientate the Commission, let me ask you this: on Redfern and Herd's Exhibit No. 3 there are

three primary zones shown on that Exhibit, is that correct?

A Yes, sir.

Q Let me ask you, does your brown band, what you have termed Escrito pay on your Exhibit 2, does it include all three of those zones?

A Yes, sir, it does.

Q So, if the Devils Fork pay extends into the Escrito you have it in that brown band?

A The brown band would cover the Devils Fork pay as it existed as a productive in the Escrito area.

Q Are all four wells shown on that Exhibit perforated so that, generally speaking, your entire brown band is open to the well?

A Yes, sir, generally speaking, that would be true.

Q If the Devils Fork interval is in those wells and it is productive, it would be producing in those wells; it would be open to the well bore?

A Yes, sir, that's right.

Q Do you agree with the testimony of the previous witness, I believe to the effect that if the Devils Fork interval is productive in this area of the Escrito, it would have to be productive of gas?

A Yes, sir, that is true. It is up-structure from the gas wells, known gas wells in the Devils Fork Pool.

Q So, if it is productive in those wells, it is productive

of gas?

A Yes, sir.

Q Do you feel that each one of those four wells, that they are all completed in the same reservoir?

A Yes, sir. I think that is what this cross section really shows. These four wells were all producing from a common reservoir. It is a readily correlatable member of the Gallup Formation, and I think the cross section illustrates that they are producing from a common reservoir.

Q If any one of those wells should properly be placed in Devils Fork, all four should be?

A That's correct.

Q Let's review the performance of those four wells, Mr. Eaton. Three of those wells on that section have produced in the past, and we have some performances, do we not?

A Yes, sir, we have performance history on the Standard Oil of Texas wells and Val Reese No. 1-30 Sperling well.

Q But the Mesa 1-25 is not produced, has just been completed?

A It has not been produced.

Q Let's start with the well on the extreme left. What did it look like when it was completed?

A Upon completion the Standard Oil of Texas Federal 2-26 flowed thirty barrels of oil per day, gas-oil ratio 70,000 to 1.

Q High gas-oil ratio oil well?

A Yes.

Q Next--

A The Standard of Oil of Texas Federal 4-26 was completed for seventeen barrels of oil with a gas-oil ratio of 59,000. It is also a high gas-oil ratio well.

Q Do you have any completion information on the Mesa 1-25?

A Yes, sir, a little. The Mesa 1-25 was completed flowing 1723 MCF per day, my information showing a heavy spray of oil throughout the tests, which indicates that it, too, has extremely high gas-oil ratio.

Q The last well, the Sperling 1-30, what about that well?

A The Sperling 1-30 was completed for 242 barrels of oil per day, gas-oil ratio of 3,080.

Q Low gas ratio compared with the other three?

A Comparatively speaking, very low.

Q Do you feel that is abnormal?

A No, sir. I feel that is completely normal.

Q Why?

A That well is structurally lower than the three wells upon which we have the higher gas-oil ratio upon completion.

Q And, it isn't abnormal for a low structure well to have a lower ratio than a higher well in the same pool?

A It is completely normal.

Q That was completed, 242 barrels of oil at a gas-oil ratio of 3,080?

A That is correct.

Q In your engineering opinion, if that well had had Devils Fork pay in there, productive, would it have potentialed as it did?

A It would be my opinion if the Devils Fork pay were present and productive in this well it would have had a much higher gas-oil ratio than 3,000 cubic feet per barrel.

Q You base that on, if Devils Fork pay is there and productive, it would be productive of gas?

A It would have to be productive of gas.

Q So it is your engineering opinion, then, is it not, that with respect to the Sperling 1-30, the Devils Fork pay is not productive in that well?

A That would be my conclusion, yes, sir.

Q Let me direct your attention to what has been marked as Exhibit No. 3, and we will discuss that Exhibit and talk about the performance history of the two Standard of Texas wells. What does Exhibit 3 show?

A Exhibit 3 shows the gas potential performance of the two Standard Oil Company of Texas wells, which are the two wells on which we have the greatest amount of history. Actually, only two points were shown on Exhibit 3 for each well, the initial volume of gas potential and the most recent volume of gas potential taken from gas-oil ratio tests.

Q And, you have reflected the performance of each well by a curve on that Exhibit?

A That's correct.

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A It initially had 2,120 MCF per day.

Q What date was that?

A In January, 1958.

Q What is the latest gas potential, and would you also state the date that test was made?

A In September, 1960, this well had a gas potential of 1,212 MCF per day.

Q What kind of a decrease is that percentage-wise?

A A decrease of almost 50 percent.

Q In your opinion, if that well had the Devils Fork pay in it and was productive, would you see performance as we have observed on that well?

A It would not be the performance I would expect. I would expect its productivity to maintain considerably greater than it has by actual performance data.

Q What well does the upper curve represent?

A The upper curve represents the performance of the Federal 2-26 well.

Q Point that out on Exhibit 1.

A The Federal 2-26 is the well in the Northwest 1/4 of Section 26.

Q And, let's make sure now, that well, if it has the Devils Fork pay in it, it is open to the well bore?

A Yes, sir.

Q What was the initial gas potential?

A It initially had 2,120 MCF per day.

Q What date was that?

A In January, 1958.

Q What is the latest gas potential, and would you also state the date that test was made?

A In September, 1960, this well had a gas potential of 1,212 MCF per day.

Q What kind of a decrease is that percentage-wise?

A A decrease of almost 50 percent.

Q In your opinion, if that well had the Devils Fork pay in it and was productive, would you see performance as we have observed on that well?

A It would not be the performance I would expect. I would expect its productivity to maintain considerably greater than it has by actual performance data.

Q If the Devils Fork pay was productive it would still have a good gas potential?

A It would be my opinion it would, yes, sir.

Q In all this data you are showing gas potential, that is not the amount of gas the well made producing a penalized allowable; that shows the actual ability of those wells to produce gas?

A Yes, sir. These numbers are the actual oil production on these tests, multiplied by the gas-oil ratio which we measured on the gas-oil ratio test.

Q Let's go to the lower curve, and that reflects the performance of which well?

A The red curve on Exhibit 3 shows the performance of the Federal 4-26.

Q Point that out on Exhibit 1.

A Federal 4-26 is the well colored in brown, with the brown dot, located in the Northeast 1/4 of Section 26.

Q What would be that well's initial ability to produce gas?

A On initial completion this well had an ability to produce gas at 985 MCF per day.

Q What date?

A January, 1958.

Q These are two of the oldest wells in Escrito, are they not?

A Yes, sir.

Q What is its ability to produce as shown on later tests?

A September, 1960, it had an ability to produce gas of 61

MCF per day.

Q Percentage-wise, what kind of a decrease?

A Almost a 100 percent decrease.

Q In your opinion, does that well have Devils Fork pay in it, productive and producing?

A No, sir. It would be my opinion that a well which had Devils Fork pay in it and was producing from Devils Fork pay would have a gas capacity greater than 61 MCF per day.

Q Keeping in mind the performance of these wells we have been discussing, I am going to read you Finding Number 9 in Order 41793.

"Finding Number 9: That it appears possible that the high gas-oil ratio wells described in Finding Number 2" (and Finding Number 2 refers to the two Standard of Texas wells and the Mesa 1-25 well) "with small amounts of oil being produced from the main pay of the Escrito-Gallup Oil Pool, while relatively larger amounts of gas are being produced from the main pay of the Devils Fork-Gallup Pool."

Mr. Eaton, in your engineering opinion does the performance of these three wells support that Finding?

A No, in my engineering opinion it would appear to me this is not the type of performance that would be expected if there was a high capacity gas zone open to the well bore in these wells.

Q In your opinion, is bottomhole data a good engineering tool to ascertain separation or communication?

A Yes, sir.

Q Do you have a pressure available to you taken from the Mesa 1-25 well?

A Yes, sir, I do.

Q What is that pressure?

A Corrected to a datum of plus 1100 feet--and all of these pressures I am going to be talking about are at this datum of plus 1100 feet, so that they will all be comparable--at a datum of plus 1100 feet, bottomhole pressure obtained in July, 1960, on Mesa 1-25 is 1697 psig.

Q Do you feel that is a representative and accurate pressure; would you qualify it in any way?

A To this extent I would qualify: it is possibly a little higher than would normally be representative of true reservoir pressure, since that well had just recently been fraced and had not been completely cleaned up and all its frac fluid recovered, so the inference might be that possibly the reservoir might have been pumped up in the vicinity of that well, and this pressure could be a little higher than might normally be expected for a true reservoir pressure in the vicinity of the well.

Q The only qualification, it may be a little higher than actually exists, but certainly no lower?

A Yes, sir.

Q Do you have any pressures taken on another well about the same date in the Devils Fork-Gallup Pool?

A Yes, sir. We have bottomhole pressures on the Redfern and

Herd Largo Spur Nos. 1 and 2, which were taken on August 12th.

Q Point those out on Exhibit 1.

A Largo Spur No. 1 is located in the Southeast 1/4 of Section 18, Township 24 North, Range 6 West; the Largo Spur No. 2 is located in the Southeast 1/4 of Section 13, Township 24 North, Range 7 West.

Q What were those pressures, Mr. Eaton?

A The pressure on Largo No. 1 was 1805 psig, and the pressure on Largo Spur No. 2 was 1801 psig.

Q A hundred pounds higher than the pressure in the Mesa 1-25 well?

A Yes, sir, approximately.

Q Has it not been your engineering experience that in a reservoir that is admittedly a common reservoir you might have wells in that reservoir with pressure differences of 100 pounds?

A Yes, sir, it is.

Q What does that do to the relative rate of depletion, one area of the pool developed more and produced more than the other?

A Yes, sir, so that the later developed area will have a more nearly virgin reservoir pressure than the area in the vicinity of the heavy withdrawals.

Q These two Standard of Texas wells in the Escrito were producing prior to the developments in Devils Fork, is that right?

A Yes, sir, that is true.

Q I wonder if what we have here, with a difference of only

100 pounds between the Mesa 1-25 and the Devils Fork proper is this: we simply have a pressure gradient extending from the older area of production on into the Mesa 1-25 and then gradually building up into the Devils Fork; could that be the case here?

A I don't think so.

Q Have you analyzed cumulative production from each of the two areas?

A Yes, sir. We took a look at the relative withdrawals in the Devils Fork, area of heavy withdrawals in Devils Fork as compared with the production from the two Standard of Texas wells in the last two and a half years.

Q Assuming, for the purposes of this question, that these wells are in a common reservoir, let's look at the area of the Standard of Texas wells and the Mesa 1-25 well. What has been the cumulative production from that area?

A The two Standard wells have produced approximately, at the time this pressure measurement was taken, approximately 300,000 MCF.

Q Let's jump up to the north and in the northern area of this assumed common reservoir, what has been the cumulative production from that area?

A The production from that area at the time the pressures were taken was approximately 1.1 billion cubic feet, more than three times as much from the Devils Fork area as from the two Standard wells.

Q 300 percent greater withdrawals from the area of the higher

pressure than the area of the low pressure?

A Yes, sir.

Q Would that indicate to you, then, as an engineer, that this 100 pound pressure differential we see between the 1-25 and Devils Fork indicates the separate nature of the two?

A Yes, sir, you would expect the pressure would be higher in the area of lower withdrawals than in the area of high withdrawals. Exactly the opposite is true, indicating that they are separate.

Q Do you have any other late pressures on any of these four critical wells we have been speaking of?

A On November 12, 1960, a pressure was obtained on the Standard Oil Company 4-26 well, which is the well in the North 1/4 of Section 26.

Q What was that pressure?

A At a datum of plus 1100 feet, it was 1069 psig.

Q That pressure was run on November 12, the well was shut-in November 1, so at the time the pressure was taken it has been shut-in about twelve days?

A Approximately twelve days.

Q In your opinion was that completely built up?

A In my opinion, probably it was not. Even if you said it would be built up two or even three-hundred more pounds, it would still be considerably lower than the pressures obtained in the Devils Fork Pool.

Q What does that indicate to you, as an engineer?

A It would suggest to me they are not in the same reservoir.

Q Could we sum your testimony up by saying, regardless of whether geologically speaking, the opportunity for communication exists, regardless of that, that engineering data conclusively shows that the four wells we are talking about, the Escrito wells, are separate and distinct from the Devils Fork-Gallup Pool?

A Yes, sir, I believe that the engineering data are conclusive in that respect and that there is less area for difference in interpretation of the engineering data than there is, possibly, in the difference of interpretation of geological data.

Q Are you familiar with the volumetric formula that the Commission has adopted at Devils Fork-Gallup?

A Yes, sir.

Q Will that formula work properly unless it operates on the same volume?

A All of the wells that are going to be used in the volumetric formula have got to be completed in the same reservoir.

Q That is a critical point?

A That is a very important point.

Q Any well not producing from that volume should not be regulated or prorated by that volumetric formula, should it?

A No, sir.

Q Is the other side of the coin the same, if a well is actually producing from that volume it should be regulated and prorated?

A Yes, sir. Any well that is actually completed in the

Devils Fork reservoir should, and has to be, regulated with the volu-
19 metric formula for the volumetric formula to truly work and accomplish the ends we hope it will.

Q Do you feel that these four wells that we have been discussing are proper ones to be regulated as being in Devils Fork-Gallup Pool?

A No, sir, I do not feel that they should be regulated in Devils Fork. I feel the result will cause an imbalance in our volumetric formula to the end it wouldn't get a fair opportunity to see whether or not it will work, and I think we should do everything we can to make things possible for us to give it a fair chance to work.

Q Another purpose of this de novo hearing is to consider pool rules for the Escrito-Gallup Oil Pool. Are you generally familiar with the rules that were recommended by Mr. Reese at the Examiner Hearing?

A Yes, sir, I am generally familiar with them?

Q Is it your understanding that those same rules will again be urged by Mr. Reese here today?

A That is my understanding.

Q Do you feel they are proper rules to govern the Escrito Pool?

A I feel they are both proper and workable.

Q In your opinion would a volumetric formula of the type we have in Devils Fork be proper for Escrito?

A No, sir, I think not. I believe the Escrito is at such a

stage of depletion the volumetric formula would not be applicable.

Q These data reflecting performances of the four critical wells here--this may not be proper engineering terminology--to me they appear to be over the hump.

A Yes, sir, I believe so.

Q Do you have anything you would like to add?

A I believe not.

MR. BUELL: That is all we have at this time. May we formally offer our Exhibits 1 through 3?

MR. PORTER: Without objection, the Exhibits will be admitted.

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Eaton, could you tell me what attempt Pan American has made at unitizing this area?

A Yes, sir, not any.

Q Is there any reason for that?

A Yes, sir. The reason is that we don't see the particular advantage to be gained in unitizing this area. Normally, a unit is formed for the recovery of secondary operation, or something like that.

Q Isn't it true in a gas cap area the best way to protect correlative rights and prevent waste would be to shut-in all the gas wells and produce the oil?

A While that might be the way to recover more oil it certain-

ly, I don't believe, would protect correlative rights of the gas op-
21 erators.

Q You produce the gas later and the same parties are still sharing in the production?

MR. BUELL: I don't believe he understood.

A You were talking of a unit operation?

Q Yes, sir.

A Yes, sir, it could be done that way.

Q However, you don't know of any attempts Pan American has made in that direction?

A No, sir. I know of no such attempt.

Q Is it Pan American's policy to select the wells to be perforated?

A Will you explain, Mr. Payne, a little more definitely what you mean?

Q Does your Company make a policy of perforating everything regardless of whether it looks good or not?

A No, sir. We make a policy of perforating only what looks very good.

Q In your engineering opinion, what would account for this operator's continually perforating this section known as the Devils Fork sand, if it is not productive?

A Of course, there is room for differences of opinion as to what is productive and what is not productive. These people who do perforate that evidently feel it is contributing to their production.

Q On your Exhibit No. 2 you didn't break this down into what portion of your brown section is the Devils Fork pay and the Escrito pay and so forth?

A No, sir. I just called everything in that brown line the Escrito pay. I noticed Mr. Thornton broke those members down on his Exhibit.

Q As a matter of fact, on the 1-25 well, he shows Devils Fork pay there, does he not?

A He shows a correlative member in the Devils Fork stratigraphic interval. I don't believe he calls it pay.

Q You are just calling all this sand in these four wells Escrito sand?

A That's right.

Q I believe you testified these four wells in question haven't performed as you would expect them to were they producing gas from the Devils Fork sand, based partially, at least, on the gas capacity, delivery capacity of the wells?

A Yes, sir.

Q Couldn't this merely be due to the fact that these wells are completed in a poorer area of the Devils Fork sand than are the wells in the main body of the Devils Fork Pool?

A I would say that, possibly, they could be. If the Devils Fork sand is present, it is certainly very much more poorly developed than it is out in the body of the field. I think the proper, I will say more simplified assumption that could be made to explain

3

the performance of these wells is that they simply produce from a sand that has a high gas saturation, but some residual oil saturation is being produced along with the gas.

Q Now, you refer to the Sperling 1-30, to the potential on it, the fact that the gas-oil ratio was, I believe, 3,000 to 1?

A Yes, sir.

Q In view of its high oil potential, isn't it true that well would still be making considerable amounts of gas, something in the neighborhood of 900,000 cubic feet per day?

A My data shows that it actually produced a potential of 750 cubic feet per day.

Q How do you account for that 750 MCF; that is a considerable amount of gas?

A Quite a bit.

Q What is the latest GOR on that well?

A I have a gas-oil ratio test taken October 19, 1960, which showed a gas-oil ratio of 41,712. That is a gas ratio of 344 MCF per day, which indicates to me that well's performance is just like the wells depicted on Exhibit No. 3 in that its gas potential, too, is approximately, now, less than 50 percent of what it was initially.

Q Wouldn't you expect a well to decline as it is produced?

A I would expect that the productivity would be sustained much higher than it is if you have a prolific gas sand open to production.

Q I don't think anybody is contending we have a prolific gas

sand, but if you have a poor gas sand and yet it is producing, it will probably decline more rapidly than gas wells in the better part of the field, wouldn't it?

A Yes, sir, it probably would.

Q Referring to that pressure information, was the build-up time on each of the wells exactly the same?

A No, sir.

Q Doesn't that have a lot to do with the pressure figure you come up with?

A I think we had sufficient shut-in time on all of these wells to approximate true build-up.

Q It does take a well in the tight sand longer to build-up, doesn't it, than it does in a better area?

A Yes, sir.

Q Mr. Eaton, assuming that the Commission grants the application here, establishes Angels Peak rules in the Escrito area and leaves the Devils Fork rules in effect in that area, put these four wells in the Escrito area, what happens each time an additional well is drilled in or around this general area?

A I don't believe that we will have any difficulty in defining which of the two pools that well is located in.

Q How are you going to do it, by the log?

A Yes, sir.

Q Because you won't have much engineering data at that point?

A We won't have any performance data on a brand-new well,

and it should be immediately placed in the proper pool.

Q Who is going to look at the log and determine the Devils Fork section is shaled out at the point?

A I think the operator of the well should make the initial determination.

Q What if some other operator doesn't believe it is in that pool; you will have a hearing on each one?

A I don't really think that is a problem; if that occurred, it would.

Q It seems to be a problem here today, since we don't know what pool to put these four wells in.

A All the operators of wells are in agreement as to which pool they should be properly put in, so I don't think there will be a question between operators. That is no point.

Q Mr. Eaton, what alternative do you see here for the Commission, other than you proposal?

A The alternatives, I think, are quite clear. We could let Order H-1793 stand, or we could put these four wells back in Escrito and issue Angels Peak-type rules, or a third possibility is to leave the four wells, critical wells, non-associated gas wells.

Q Let me point out some alternatives to you, and you might elaborate, if you would, on the correlative merits of each.

MR. PORTER: Let's go into this after lunch. Hearing is recessed until 1:30.

(Whereupon, lunch recess was had.)

TRANSCRIPT OF HEARING
(Afternoon Session)

MR. PORTER: The hearing will come to order, please. Mr. Payne, I believe you were questioning the witness?

Q (BY MR. PAYNE) As you pointed out this morning, one alternative would be to keep the present Order in effect, and determine what pool rules, if any, are necessary in the Escrito oil area. As you see it, what are the disadvantages of that, or any advantages that you might see?

A The disadvantages of continuing the present Order in effect, as it is now written, which would in effect put these four critical wells under the pool rules of the Devils Fork-Gallup Pool, would be it would have the effect of destroying the validity and creating an imbalance in the volumetric withdrawal formula we have in effect in the Devils Fork-Gallup.

Q This assumes, of course, that the Devils Fork pay is not productive from these wells?

A That is correct, since I don't believe it is.

Q So, that becomes the critical factor, then, in determining whether the present Order shall stand?

A Yes, sir.

Q Now, another alternative that the Commission might use would be to combine the two pools and have the volumetric formula applied to each. Now, is the critical factor again where the gas is coming from?

A Yes, sir.

Q And, if you are correct, the volumetric formula would be off in both pools?

A Yes, sir.

Q If we are correct, other than the fact that you feel that volumetric formula is not good in a pool depleted as much as the Escrito is, it would be all right, assuming that they are one pool?

A If you make that assumption, yes, sir.

Q I'd like to have you explain, if you would, why the state of depletion has any great bearing on whether a volumetric withdrawal formula should be established in associated oil-gas pool?

A The main reason is that it is not possible to get the data that is needed to properly apply the factor to result in the volumetric calculation. If you could, the state of depletion really has very little to do with it. You need to know what the relationship of the solution gas-oil ratio and bottomhole pressure is, also the reservoir has got to be at such stage of depletion that an unreasonably long period of time is not needed to achieve something in the way of pressure data that approximates true reservoir pressure.

Q Well, the longer a pool is produced, don't you have more and more data as time goes on?

A You have more data, but not necessarily the type of data usable in a volumetric formula.

Q What type of data would we be lacking in the Escrito area?

A One thing that we don't have, to my knowledge, is the bot-

tomhole sample data, reservoir volume, and solution gas-oil ratio functioning pressure.

Q One other alternative would be to combine these two pools and establish rules that would be either identical or similar to the Angels Peak-Gallup Pool. What advantages or disadvantages do you see in that solution?

A The disadvantages, I think, boil down to our attempts in making an equivalent volumetric formula applicable to the Devils Fork Pool, which is the first time it has ever been put into operation, and it really hasn't had a chance yet to see if it will work or won't work. We think it is scientifically sound. We think it has been made simple enough to be practical and workable, but we need to give it a chance to see what it does in the future. As it is now, we haven't even gone through one balancing period.

Q Do you really believe the Devils Fork is the type that would best lend itself to a volumetric withdrawal formula?

A It is my opinion that there would be more pools somewhere else that would be more susceptible to the volumetric withdrawal formula than Devils Fork. I can't name those pools right now. I think they will work in Devils Fork; I think the formula will work in Devils Fork if it is properly applied and doesn't have acreage dedicated to the Devils Fork put in the formula that really should belong somewhere else.

Q Do you think this alternative we are now discussing, that is the Angels Peak rules in both of these areas, would tend to re-

sult in more orderly development of the entire area in that an operator would drill a well, he would know immediately what rules were going to apply to his well; it would not be necessary to have a protracted hearing, or controversy, to determine what pool the well should be put in and prorated under?

A I think the operator knows that now, Mr. Payne. I don't think the operator would have any problem in determining what pools his well is located in.

Q Then, Mr. Eaton, you never did actually say no gas was coming from the Devils Fork sand, did you?

A In the four critical wells?

Q Yes, sir.

A I don't believe I was asked specifically that question. I don't think it is.

Q You don't think any is?

A No, sir.

Q But if any is, then you have a well completed in two pools as a single completion?

A If the Devils Fork pay is producing in any of these critical wells, that is correct.

Q All you know, then, is you are completed in two pools, so which one should the well be classified as being produced from?

A Inasmuch as I don't believe the Devils Fork sand is productive in any of these four wells, the four wells are producing from the Escrito pay.

Q Assuming some of the gas production is coming from the Devils Fork pay, would you use a dollar-wise determination, or something else in determining which pool the well should go in?

A If you make that assumption, I think that you would have to use the economics of production. In other words, if the dollar value of gas is more than the dollar value of the oil you'd have to put it in the pool from which the biggest dollar value is derived. I don't think, to reiterate, I don't think any of the gas production is coming from the Devils Fork.

Q In effect, that is what our present Order says. It should be put in the pool, dollar-wise, the majority of the production is coming from?

A In effect, yes.

Q The fourth alternative is the one that the joint applicants here are proposing, that is to have the volumetric withdrawal formula stand in the Devils Fork, to expand the Escrito to include these four wells, and apply a formula such as the Angels Peak formula in that pool?

A Yes, sir.

Q Now, what effect does this have, if you assume that the gas in these four critical wells is being produced from the Devils Fork sand?

A If I assume that the gas in these four critical wells is coming from the Devils Fork sand, what effect does that have?

Q Yes, sir, insofar as you have two different proration

formulas, what we will assume is one pool.

A If we make the assumption that that gas is coming from the Devils Fork sand, then those wells should properly be put in the Devils Fork Pool and allocated under the volumetric withdrawal formula if we are going to make that formula work.

Q Let's say some of the gas is being produced from the Devils Fork, but, nevertheless, the Commission decides to go along with your proposal and establish the Angels Peak rules in Escrito and keep the Devils Fork rules. Now, wouldn't this have the effect of the Devils Fork Wells producing gas which is not charged to the Devils Fork, thereby throwing off the volumetric formula?

A Yes, sir.

Q Wouldn't it also have the effect of, perhaps, resulting in discrimination between wells in the same pool, assuming that they aren't in the same pool, because it would be unusual, wouldn't it, if the allowables for the gas wells under the volumetric formula would be identical to the allowables assigned under the Angels Peak rules?

A It would be fortuitous, I think.

Q It could discriminate either way?

A Yes, sir.

Q So, it appears, Mr. Eaton, that in three of the alternatives the critical determination is where this gas is coming from?

A Yes, sir.

Q The other alternative, it really doesn't make any difference

where the gas is coming from if you apply the Angels Peak rules to both areas.

A If you apply the Angels Peak rules to both areas then you admit immediately the equivalent volumetric withdrawal formula is not going to work. We shouldn't have installed it in the first place. We really are not in a position to make that determination now. We haven't had time enough to see if we want to keep it in effect.

Q You wouldn't have to be making such a determination; you could determine that in this area, as complex as it is, with these various benches of the Gallup, that perhaps the area doesn't lend itself to the first attempt to use the volumetric withdrawal formula?

A The only concern I have would be that in the future this thing might be looked at as a precedent, and the Devils Fork Pool pointed out as an example, where the volumetric formula didn't work without everybody being fully aware of the circumstances under which the attempt to use it was abandoned.

Q What if the gas is coming from the Devils Fork sand and, therefore, it does not work; it would also be a poor precedent, wouldn't it, for ever having this formula in any other pool?

A It is very important that for the formula to work that all gas that is actually produced from Devils Fork be accounted for. It is just as important, though, gas not produced from Devils Fork be excluded from the volumetric calculations, yes, sir.

Q You don't think perhaps the Commission should take a whole

33

new approach and look at the Gallup as the Gallup and especially where you have what we will call a gas cap on an oil pool and more or less standardize the Angels Peak-Gallup rules, changing, as may be necessary from time to time, the limiting gas-oil ratio based on both engineering principles and economics?

A I would rather think that each pool should probably be considered on its own merits, rather than to make a generalization when all Gallup pools are not identical. The crude oil characteristics vary considerably across the San Juan Basin within the Gallup Formation. I think to make a generalization it might be premature.

Q You think it would be more dangerous, so to speak, not to apply that same doctrine in the Dakota and Mesaverde?

A Yes, sir, for the reason that there is more difference in one area in the Gallup than there is throughout the Dakota and throughout the Mesaverde.

Q I am not sure I followed your testimony this morning, but did you testify you thought the Sperling 1-30 Well was a gas cap well to the other three critical wells, to a pool in that area?

A No, sir. I testified just the opposite, that the reason I think that Sperling 1-30 had a lower gas-oil ratio upon its initial completion was the fact that it is located lower structurally than the other three critical wells, which would be a completely normal expectation that a low well would have a lower gas-oil ratio than a high well.

Q Do you feel it is an oil well or a gas well?

A If the rules which were proposed at the Examiner Hearing, and which I believe will be proposed again here in this hearing, are adopted, the well presently would be classified as a gas well, since it has a gas-oil ratio of 41,000.

Q As I understand it, the basis for the present application is predicated upon the fact the Escrito-Gallup Oil Pool is actually an associated oil-gas pool with these four wells being gas cap wells to that Pool.

A Yes, sir.

Q That is what you feel this well is?

A Yes, sir.

Q Gas cap well to the Escrito Oil Pool?

A Yes, sir.

Q What is the gravity on the 1-30 Well?

A I am sorry. I don't have that information, but one of the later witnesses will--excuse me, 41 degrees.

Q That is a relatively low gravity; would you expect a gas cap well to produce liquids of that gravity or, in fact, any liquids?

A Yes, sir, just because a well produces primarily gas does not mean the formation from which it is producing is 100 percent saturated with gas. It has some oil saturation, too, or else it would have an infinite gas-oil ratio. The gravity of that oil saturation could be anything; it could be anywhere from--about the lowest gravity that I am familiar with in the Gallup is somewhere in the range of 36 degrees--and it could be anything from there on up

to 42. I don't believe there is a relationship between the gravity of an oil and what the gas-oil ratio is.

Q How do you account for the fact, then, that in the Devils Fork Pool the wells which are the gas cap wells to the oil area there are very high gravity liquids, if any?

A That would be condensate.

Q Rather than oil?

A That means, simply, that there isn't a producible liquid saturation in the formation in the Devils Fork Pool.

Q The fact that these wells produce what is a real crude oil means they are producing from a reservoir that has a liquid saturation that is producible?

A In the oil wells, yes, sir; not in the gas wells.

Q In your opinion, a gas cap well can produce liquids or liquids of any gravity, that is not an unusual occurrence?

A It just depends on what the saturation characteristics are. I don't know what the saturation characteristics are in the Escrito field. I don't know what they are in the Devils Fork field, but by inference I can guess what they are because I can see what is being produced.

Q This morning you also went into some detail on the GOR's on this 1-30 well. Does the gas-oil ratio actually tell you anything at all about what sand the production is coming from?

A No, sir.

MR. PAYNE: Thank you.

36

MR. PORTER: Anyone else have questions?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Eaton, on your cross section there you have drawn in a brown line. Did you say that is what you would term the Escrito pay?

A Yes, sir, that is what I called the Escrito pay.

Q If you turn to Mr. Thornton's Exhibit No. 2 and marked on that Exhibit the interval that you have shown the brown pay on your Exhibit, which I believe is from approximately 5440 to about 5470?

A In which well, Mr. Nutter?

Q On that well, that is the 1-25, I believe.

A Yes, sir.

Q Your brown line runs from 5440 to 5470; if you would make a mark on that Exhibit from 5440 to 5470 and then go across to the Brown No. 1-24 Well, would that mark you made on the 1-25 Well be the vertical equivalent of the perforations in the Brown 1-24?

A Approximately, yes, sir.

Q Those wells are all on a common datum, I think Mr. Thornton stated, didn't he?

A Yes, sir.

Q Is the Brown 1-24 a Devils Fork or an Escrito?

A It is a Devils Fork well.

Q If there is a pay in one well which is Escrito and the same interval is open in the perforations in the next well on the

cross section, how do we determine the Escrito stops and the Devils Fork begins between those two wells?

37

A I think you have to do it on the basis of these performance characteristics which we went through this morning, indicating that they have not had the well performance that you would expect if prolific gas zone, like the Devils Fork, were opened in these oil wells.

Q Is it your contention that this porosity and permeability open in the No. 1-25 Well ceases and then commences again when you get to the 1-24?

A I think that it pinches out between the two wells; the productive potential of the decreases--you can make a correlative interpretation to show that geologically that member has an equivalent member in the Mesa 1-25 that is in the Brown 1-24. The critical thing is whether or not it is productive in the Mesa 1-25. Mr. Thornton's Exhibit shows that by the time that member gets as high structurally as the Mesa 1-25 that it is practically all shale, therefore, not productive.

Q It is shown it is shale by virtue of being colored gray on that Exhibit, is that correct?

A Yes, sir.

Q Now, what did the 1-24 potential for when it was completed?

A 1757 MCF.

Q What did the 1-25 potential for?

A 1723 MCF.

Q Are both those 3-hour tests?

38

A I believe so, yes, sir.

Q You mean the No. 1-24 made 1757 in three hours; that is not a daily potential on that well shown in your Exhibit?

A Those tests mean that is the rate at which it was flowing at the end of a 3-hour blow down. That is an instantaneous rate at the end of three hours.

Q So you don't take that figure and multiply by eight; this doesn't mean 1723 are MCF per 3 hours?

A No, sir.

Q If, under the proposed rules, the Federal 226 No. 1 Well had been completed, and it made 30 barrels of oil per day with a GOR of 70,700, as indicated on this Exhibit No. 2, would there have been any question in anyone's mind under these proposed rules whether that was a gas well or an oil well?

A No, sir. It would have been automatically a gas well.

Q How about the 426 No. 1 Federal?

A It would have been classified as a gas well automatically, too.

Q This morning you have called these high GOR oil wells.

A At the time they were completed that is what they were so considered.

Q But you consider them gas wells now?

A Yes, sir.

Q Are these wells gas wells producing from a gas cap in the Escrito-Gallup Pool?

A I think they are.

Q It is a gas cap?

A Let me elaborate there just a little bit, Mr. Nutter. When I refer to a gas cap, I don't refer, necessarily, to a sharp line of demarcation where, below a certain datum, the formation is 100 percent saturated in oil, above that point the formation is 100 percent saturated in gas.

Q That is a true gas cap, however, isn't it?

A As a practical matter, we usually, for simplicity purposes, we call that a gas-oil contact, but we all recognize that they don't exist as a single point datum because of capillary pressure characteristics between the gas and oil, the transition zone in there where it grades from no free gas saturation to the area of very little or no free oil saturation. If there is sufficient structure so the gas column has a vertical length of several hundred feet, then at the top of that you would have, essentially, no producible liquid saturation remaining. I don't know what the oil capillary pressure characteristics of the Escrito are, but knowing it to be a relatively tight, relatively low permeability sand, it would be my expectation that that transition zone would be fairly thick so that even at the top of the structure you still might have oil saturations in the producible range which would still yield very high gas-oil ratios, but it would, through viscous drag, produce some oil, too.

Q These wells you say you suspect are gas wells, are they

40

gas cap wells for the Pan American Zanapti?

A Mr. Nutter, I kind of feel that they are not even completed in the main Escrito pay.

Q They are in another Pool yet?

A That is my opinion.

Q These wells are structurally about the same position as the Southern Union Well in Section 27, and the Ernest Well in Section 22, directly to the West; are they gas cap wells for those oil wells?

A No, sir. It would be my opinion that those wells are probably completed in the same lens as the Pan American Zanapti and the Standard 1-27.

Q Well, are there any wells in between these gas cap wells in the main part of the Escrito Pool producing from the same formation that the gas cap wells in the main Escrito pay are producing from?

A Let me see if I understand your question. Is your question, Mr. Nutter, are there any wells between the nearest Escrito oil wells and the area of the westernmost three critical wells?

Q You stated you thought the Ernest Well and the Zanapti Well were producing from another pay, also, the Ernest Well and the Southern Union Well up in Sections 27, northern part of 27 and south part of 22, were producing from another pay, being the same as the Zanapti. It would appear that the Escrito pay, then, pinches out as it goes from Sections 16, 17 and 21, and then reappears in 26 and 25;

is that the case?

A I am sorry. I misunderstood the wells you are talking about. Just watching where you were pointing, I thought you were pointing to some wells off of my map. No, let me go back to your question as to whether or not the wells in Sections 22 and 27, northwest of 27, are producing from the same interval as the Standard of Texas 4-26 and 2-26. I think that they are.

Q Are these gas cap wells for those wells?

A The Standard of Texas Wells in Section 25 I think are gas cap wells to these wells in Sections 22 and the northwest northwest 27.

Q So if you could draw a gas-oil contact as a line on the Exhibit, where would that gas-oil contact lay?

A Again, I want to reiterate, in a tight reservoir like this you have what could be really a thick transition zone between oil and gas, and in this particular case all we know is that our highest oil well is about plus 1287, our lowest gas well is about plus 1310 on this marker, so that the transition is somewhere in that 23-foot interval, and for practical purposes you probably round it off to plus 1300, since that is approximately the middle.

Q The gas-oil contact is confined to such a narrow interval, is that why the production from these oil wells in 22 and 27 haven't caused them to turn to gas, but the production from 1-30 did cause that well to turn into a gas well?

A The only explanation I can give you is that it is bound

42

into this distribution of saturation characteristics. For some reason or other the native gas saturation in the vicinity of the 1-30 was different from what it is in the vicinity of the three wells which have been produced longer and haven't gone to these extremely high gas-oil ratios.

Q Do you expect that there is any oil saturation down structure from the Standard 2-26 and 4-26 and the Mesa 1-30 Well?

A Down structure?

Q Yes, sir.

A That sand does not appear to be--let me answer this way--there is probably some sort of hydrocarbon saturation in almost all of the Gallup. In most cases it is of such a nature it can't be produced. I think that is the case when you get very far away down structure from the Mesa Well and the two Standard of Texas Wells.

Q Assuming that the wells that you show on Exhibit No. 3 are gas wells, is there anything depicted on that Exhibit that shows that they are not the type of gas wells you would encounter in the Devils Fork Pool?

A Just a rapid decline in productivity, which is abnormally fast for gas wells produced from a sand like we have in Devils Fork. You see, for all practical purposes, one of those wells is depleted.

Q They have produced considerable gas, however?

A The two wells together have produced approximately 300,000 MCF.

Q What did you say the gas-oil ratio is at the present time

43

on the Sperling 1-30?

A It is about 41,000.

Q What would you attribute the decline in gas-oil ratio from 62,000 at the time of the last hearing in September to the present 41,000?

A I was unable to find a record of the 61,000, or 62,000 test. It did seem to me that I heard Mr. Reeves testify that he had a gas-oil ratio in the 60,000 range. I was unable to find the test on it.

Q That was part of the record entered in the previous case?

A Yes. The explanation probably is tied into the fact that in a well that produces as little oil as it was making, it could have characteristics of heading production so the gas-oil ratio characteristics during one 24-hour period might not be the same as it would be in the next 24 hours.

Q You gave some pressures on those Redfern and Herd wells. What was the length of shutdown on those wells?

A Those wells have not both been shut-in the same length of time, Mr. Nutter. Both of them made their production and were shut-in up toward the first part or middle part of July. I will get you the exact dates. The Largo Spur No. 1 was shut-in July 12, 1960, and the pressure was obtained August 12th. The Largo Spur No. 2 was shut-in July 28, 1960, and its pressure measured on August 12, in one case about 31 days and the other case approximately 15.

Q Is it your opinion that those pressures reflect the fully

44

built-up reservoir pressure?

A Yes, sir.

Q You think they had stabilized?

A Yes, sir.

Q What percent of the reserves under the tract had those wells produced at the time these bottom-hole pressures were taken? It doesn't have to be exact, large percentage, or small percentage, half the reserves or--

A Approximately 10 or 12 percent.

Q You gave the pressure as being 1697 on the Mesa Well, I believe?

A Yes, sir.

Q What was the length of shut-in on it? I believe my notation says more than seven days?

A Over seven days.

Q If you have attained pressures up in the other area after being shut-in 15 and 31 days, respectively, and the much more permeable area is reflected by the deliverability on the wells, it would appear that perhaps a longer shut-in than seven days would be necessary in the tighter area?

A I don't think it would. It is, I think, quite possible that the pressure that was obtained on this Mesa 1-25 may be even higher than the **true** reservoir pressure in the vicinity of the well. The reason I believe this is because considerable frac oil was used in completing the well, all of which had not been recovered at the

time the pressure measurements were made. That had a tendency of possibly pumping up the formation in the vicinity of the well and maybe seven days is not enough time for fall-off to occur.

Q How long had this Standard Well been shut-in when you got that pressure of 1069?

A Twelve days.

Q Is that the one that is substantially depleted?

A 4-26, that is the one that is substantially depleted. I will be the first to admit that possibly that well isn't built up in twelve days. I think it is substantially built up, but even if you assume it lacks two or three-hundred pounds of being built up, it is substantially different, lower in pressures obtained than the Devils Fork Pool.

Q You didn't report any pressure on the 2-26, did you?

A No, sir.

Q Is there any pressure available on that well, do you know?

A We recorded a dead weight pressure on it, which I don't seem to have.

Q Was that dead weight pressure ever converted to a datum that would be comparable to the other wells?

A Here's the datum. The dead weight pressure on the casing was 710 pounds, on the tubing was 714 pounds. Now, for comparison purposes, the dead weight pressure on the 4-26 was 871 pounds on the tubing and 869 pounds on the casing.

Q After equal length of shutdown?

A Yes, sir.

Q Has any pressure ever been taken on the 1-24 Well?

A Not to my knowledge.

MR. NUTTER: I believe that is all. Thank you.

BY MR. PAYNE:

Q I take it Pan American's only real interest in this case is to make sure that the Devils Fork-Gallup Pool is protected in order to adequately give the volumetric withdrawal formula an opportunity to prove itself?

A Yes, sir.

Q Now, don't you have even the slightest fear that the four critical wells here might be making gas from the Devils Fork sand, which wouldn't be charged to the Devils Fork Pool?

A There is no doubt in my mind, no, sir.

Q Even in the interests of safety or a conservative approach you wouldn't, therefore, recommend that the Devils Fork perforations in the four critical wells be squeezed?

A No, sir.

BY MR. KENDRICK:

Q Mr. Eaton, do we have any definite information that all the wells that are producing either gas or oil from the Devils Fork reservoir are so treated by the formula? I have reference to a well completed by the Skelly Oil Company in Section 10, 14, 6, approximately two and a half or three miles northeast of the Devils Fork Pool?

47

A You are referring to the well in the Southwest 1/4 of Section 10?

Q I believe there is another completion in Section 10, too, Mr. Eaton?

A You are right.

Q Is there any possibility that that well can also be producing from the same reservoir in the lower Gallup section?

A Yes, sir, it is possible.

Q Then we are not sure yet that we have all the wells in the reservoir controlled by the formula?

A No, sir. I think the limits of the Devils Fork reservoir are yet to be defined. In the case of those two Skelly wells it would appear to me they are probably not producing from the same reservoir as the Devils Fork for this reason, only: the producing correlative member of the Gallup, it is true, that the performance of Pan American's second well indicates to me that the Devils Fork reservoir deteriorates in permeability as you move on down-dip. If that reasoning could be continued on down to the down-dip locations of the Skelly wells I would not expect to have a well that potentials--my map shows 95 barrels a day for the Skelly well--would not expect that much productivity.

Q Do you know of any dry holes that have been drilled between the two areas of the Skelly wells and the Devils Fork Pool?

A No, sir.

Q Do you know of any drillstem tests operated in any of the

48

wells in this questionable area that might have been run to determine whether the production of gas or oil is coming from either of these particular questionable sands?

A I know of no such tests, no, sir.

BY MR. ARNOLD:

Q Assume there is no gas cap in the Escrito sand. Actually, the production of these wells is the only thing on which we could base that at the present time, is that right?

A If you assumed there was no gas cap in the Escrito sand?

Q Right. If we assume there was no gas cap in the Escrito sand, and if we further assume this Devils Fork sand, which overlies the Escrito sand in this area, is contributing gas to these wells, then wouldn't the gas-oil ratio information, in production information, approximate actual conditions as we have seen them?

A You are assuming, again, for the moment, that the Devils Fork sand is present as a productive member in the four critical wells?

Q Right.

A And, you are asking if it were present would the performance that we would expect be what we have observed?

Q Right.

A I think not. I think we would have much higher gas productivity sustained than has been exhibited by the two wells we have any datum on.

Q Along that same line you have mentioned several times one

reason you think the Devils Fork sand is not producing in this area is because there is no prolific production. You don't mean to indicate by that you think that a sand must be prolific to be in a common reservoir?

A No, sir, not necessarily. I think that the lithology and permeability and porosity characteristics can change from one side of the reservoir to another. Most of them have a fairway.

Q So that these wells could actually be producing in Devils Fork sand without necessarily having the producing characteristics of the wells in the fairway of the Devils Fork Pool?

A I would not expect that they would have identical characteristics to the fairway well. It would appear to me that the normal anticipation would be that you will have a sustained productivity bolstered, perhaps, by the fact that they are in connection with a sand that had real good characteristics, a large volume of gas present, in other words.

Q Then characteristics in this type of sand bar may very well change, as you move along that sand bar laterally, so far as rock characteristics and producing characteristics?

A By laterally, you mean, a long strike?

Q I wasn't necessarily relating it to structure.

A Parallel to the shore line?

Q As it grades from shale to sand.

A Yes.

Q Actually, wells drilled at different points along that bar

as the grain size changes might act like wells completed in different reservoirs so far as their producing characteristics are concerned?

A That is true.

MR. ARNOLD: I believe that is all I have.

BY MR. NUTTER:

Q Mr. Eaton, do you think that the Commission should reverse its position that it took in the last Order for the Escrito Pool and abolish the policy which they stated in this particular Order that when you have a marginal sand that is producing with a more prolific sand, in some cases they should be permitted to produce together without the expense of dual completion?

A I don't think that as poor return as the normal Gallup operation is, that the operator should be forced into dual completion within the Gallup horizon, no, sir.

Q You don't think the Commission should abolish that principle?

A No, sir, that principle.

Q You don't think that applies in this case?

A I don't think it applies in this particular case.

BY MR. PAYNE:

Q I believe you testified this morning that, in your opinion, your evidence conclusively proved Pan American's position as to where the production is coming from. Don't you feel drillstem tests or some sort of actual test to determine where the production is coming from would be more conclusive than the pressure information

with a spinner-type survey, of where the gas is entering, which perforation it is entering, you can't be sure if you have a long inter-

and production history?

A There possibly are selective-type tests that might be run to isolate the individual lenses and determine exactly what the saturation in those lenses are that would be more conclusive than what we have. However, we don't have that type of information, so we have to piece together what we do have.

Q It is unusual for an engineer to find himself in a position to conclusively prove something to the satisfaction of all other engineers?

A There is always a little room for interpretation and differences of opinion, yes, sir.

BY MR. NUTTER:

Q Mr. Eaton, one test that comes to my mind is one known as a spinner survey. Are you acquainted with that?

A Yes, sir.

Q Would a spinner survey indicate where the gas is coming from in one of these wells?

A Possibly. We are, at the present time, involved with others in attempting to determine that very thing. One of the most difficult things is to find out where, in a common well-bore that has several sets, or a long set of perforations open, which one set or which group of those perforations are actually contributing the production. Although within the well-bore you can feel very certain, with a spinner-type survey, of where the gas is entering, which perforation it is entering, you can't be sure if you have a long inter-

val perforated, whether there is communication within the cement sheath behind the well-bore from another interval, feeding up to that one perforation, and at that point you pick your point of entry into the well-bore, but you are still uncertain as to exactly which portion it is coming from.

Q If we took a spinner survey and found gas coming from the Devils Fork, that could be coming up the casing from behind the Escrito?

A Yes.

BY MR. PAYNE:

Q You would always have one reservoir man-made when you completed the various sand; not always, but at least it is a possibility?

A Within that well anyway, yes, sir.

BY MR. UTZ:

Q You are familiar with both of these formulas that are to be recommended in this hearing, are you not, the so-called Angels Peak Formula and Devils Fork Formula?

A Yes.

Q I believe you stated, and I don't recall why you feel the Angels Peak Formula is better in the Escrito than the Devils Fork Formula?

A I believe I stated that because the Escrito Pool is in such a stage now that inadequate data can be obtained to properly apply the volumetric formula. In other words, the condition is not right in the Escrito, I don't think, to make the precise computations

it would be necessary to make application of the volumetric formula we hope to do in the Devils Fork.

Q If the Escrito was not in what you would term a latter stage of depletion, do you feel the Devils Fork Formula would be the formula for that field?

A I think, from a scientific or engineering standpoint, a volumetric formula should be applied to all associated reservoirs if you catch them early enough in their life where they have significance.

Q In other words, what we are trying to do with both formulas is keep the gas-oil contact in the same place?

A Yes, sir, and the Angels Peak Formula is a simple way of approximating that result. The Devils Fork Formula is an exact way of calculating that result.

Q It is more technical, more accurate?

A Yes, sir.

BY MR. ERREBO:

Q Mr. Eaton, in regard to the Sperling 1-30, did I understand you to testify that the gas which is being produced is free gas in the reservoir?

A Yes, sir, I think it is.

Q Actually when you find free gas in the reservoir, are you in an oil area or a gas cap?

A You are in, probably, an area which contains some liquid saturation and some gas saturation, and we would normally call that

a gas cap.

Q Then, actually, as the ratio goes up you would expect to get in an area less and less oil saturation?

A Yes, sir, as oil is produced saturation decreases, which permits a greater volume of gas to be produced.

Q You feel a well which is producing 30,000 to 1, then, in this Escrito Pool, for which you are advocating rules, should be treated as being in a gas cap?

A Yes, sir.

Q Because, in fact, you believe it would be in a gas cap?

A Yes, sir.

Q There is no doubt in your mind, is there, from the testimony I have heard today, that the four wells which have been under consideration are in communication with the rest of the oil production to the West in the Escrito Pool?

A That's correct. I was a little confused awhile ago, but that is my opinion, yes, sir.

BY MR. NUTTER:

Q How many unknowns are there in the formula which has been applied to the Devils Fork Pool that you don't have the datum in the Escrito Pool to supply those factors?

A We don't have the bottomhole sample analysis, which is necessary to obtain the relationship of the solution gas-oil ratio and reservoir volume factor is a function of bottomhole pressure. As far as the other factors go, there are probably sufficient data

which can be used to compute the other factors. The critical thing, I think, in Escrito will be the unlikeliness that very good bottomhole pressure coverage will be obtained in order to use the bottomhole pressure data to compute the volumetric withdrawals. I am not sure, in other words, just how many of those oil wells are on pumps. I know there are a number of them which are, and whether or not you could anticipate having adequate bottomhole pressure coverage when it comes down to apply this formula, even if you had all the other factors, I don't know if you could really make a good computation or not.

Q Now, the factors that are missing from an original bottomhole sample would be the solution gas-oil ratio and the reservoir formation volume factor?

A Yes, sir.

Q Now, there is current drilling going on in this pool, and from the potentials of the wells it would appear that Dorfman and Compass may be getting close to the original reservoir conditions in their wells. Couldn't a solution gas-oil ratio be determined that would be pretty close to the original conditions from one of those new wells in there?

A It probably could.

Q And, could a reservoir formation volume factor be determined from one of those wells?

A Probably.

Q Do you think that a volumetric formula, which may have a

little error in it due to not having exact formation volume factors and solution GOR's, would be more accurate than one which you just arbitrarily say 'every gas well', if it is on 320 acres, produces four times what an oil well produces times 2,000, which would actually come the closer to giving correct results?

A Possibly the actual computation from a volumetric equivalent standpoint would result in more nearly accomplishing the end that we hope to achieve in getting the maximum amount of oil out. In the particular case of the Escrito Pool I would like to point out one other thing: apparently the productivity of at least two of these wells is not going to be such that it would make an equivalent volumetric allowable nor the allowable which would accrue to it under the Angels Peak rules. In other words, they would be marginal in either case; the wells would be marginal in either case.

Q There hasn't been a cessation of drilling in the area, has there?

A No, sir.

Q In other words, your fear is that right now there are not enough gas wells to produce the equivalent of the oil production?

A That is correct.

BY MR. PAYNE:

Q When you stated a moment ago that the volumetric withdrawal formula is probably more accurate, at least more technical, that depends, does it not, whether you have been correct in the determination of all factors which go into the formula?

A Yes, sir, we have got to be right.

Q It also depends, does it not, on the acreage attributed to the oil area being productive of oil only, and the acreage to gas, of gas only?

A The formula doesn't contemplate any non-productive acreage being attributed to wells.

Q What happens if the oil area is actually developed, and the gas area is not fully developed, and maybe you have some gas wells which you are not sure yet are part of the gas area, but they are producing?

A Then the gas-oil contact would be expected to move downward.

Q In other words, you would be producing too much gas?

A Or too much oil.

Q We have some gas wells, the way I see it, so that the contact would move?

A Yes, sir.

Q The same would be true in reverse if the gas area were all drilled up and the oil area wasn't?

A Really, that is where you would suffer the greatest decrease in the recovery.

Q Would it seem like the usual case to you, the oil area and gas area would be drilled up at exactly the same time?

A Probably would have different rates of development in them.

Q Perhaps this formula isn't so scientific after all?

A It is a scientific approach.

BY MR. NUTTER:

Q Mr. Eaton, the Angels Peak type of a formula assumes that gas acreage has been developed along the whole acreage, does it not?

A Yes, sir.

Q So, if some of the gas is not developed, or vice versa, that would be in error?

A These things don't work unless the fields are completely developed. They can't be precise. They work, but they are not precise.

Q If, in a case such as we have got here, the oil area would be over-developed as compared with the gas area, and the gas cap moved downward, assuming this is a gas cap on Escrito, does waste ever result from a gas cap moving downward?

A No, sir.

Q Is it finally depleted?

A It goes to the bottom, yes.

BY MR. PAYNE:

Q But correlative rights have been impaired?

A Correlative rights of gas have been impaired.

REDIRECT EXAMINATION

BY MR. BUELL:

Q When you engineers speak of condensates, what do you mean?

A We mean liquid production on the surface that results from

retrograde condensation of a portion of the gas phase. I will explain retrograde condensation. Retrograde condensation is the opposite of normal condensation. Normal condensation would normally occur with the addition of pressure at a constant temperature on a gas. Retrograde condensation occurs with the reduction in temperature, with the reduction in pressure at a given temperature.

Q Maybe I will get it this way. I direct your attention to the straw-colored liquid in the bottle attached to Redfern and Herd's Exhibit No. 3 for Largo Spur No. 1. What phase was that liquid in in the reservoir?

A It was a gas in the reservoir.

Q And, it turns to liquid when you get it to the surface, but in the reservoir it is a gas and not a liquid?

A Yes, sir.

Q Going to the Sperling 1-30 for a moment, let's make sure the record is clear how the gas-oil ratio on that well increased. It did not occur to you, did it, the fact it was invaded by a lot of gas?

A No, sir.

Q Simply, it decreased in oil productivity?

A Yes, sir.

Q Actually, the ability of that well to produce gas has declined about 50 percent?

A It is a little less than 50 percent of the initial capacity.

Q You told Mr. Payne the gas-oil ratio initially on the Sperling 1-30 didn't tell you from which member of the Gallup the production was coming from; did I understand correctly?

A Yes, sir.

Q But it told you from which member it wasn't coming from?

A Yes, sir.

Q Let's assume, along with some of the contentions that have been made, in our four critical wells each and every MCF of gas coming out right now is coming from the Devils Fork interval?

A Yes, sir.

Q Assume that, I know you don't believe it. Now, let's consider these conditions, these wells remain in Escrito and are prorated by the rules recommended by Val Reese. The other assumption is that the present Order stands and they are transferred and prorated and regulated by the Devils Fork Pool rules. Which one of those conditions would be the most harmful?

A The second one.

Q Why is that, Mr. Eaton?

A For the reason that some of these wells, critical wells, will not make the allowable which will accrue to them under the equivalent volumetric formula which is in existence in the Devils Fork Pool. Upon redistribution of that allowable, the production or the under-production from those wells would be allocated to wells which produce in Devils Fork, and, therefore, put an imbalance into the equivalent volumetric withdrawal formula to the detriment

of the oil wells in Devils Fork.

Q So, if you wanted to be on the side of safety, if you wanted to take the most conservative approach from the standpoint of correlative rights and prevention of waste, even under the assumption that each and every cubic foot of gas coming from those four wells was coming from the Devils Fork, the safest approach would be to leave the wells in Escrito and regulate them under the Val Reese rules?

A Yes, sir.

RECROSS EXAMINATION

BY MR. PAYNE:

Q How you can testify that way under this assumption, the gas is being produced from the Devils Fork; therefore, the acreage dedicated should be included in the Devils Fork Formula, and the gas properly should be redistributed to Devils Fork wells. If you assume the gas is being produced from the Devils Fork, small though it may be, if you assume further that each of these wells has 320 productive acres dedicated to it, that is the way the formula should work?

A If you make the initial assumption that the wells are producing from Devils Fork pay, all the gas production coming from the Devils Fork pay, --let me ask you this, was that one of the assumptions you made, Mr. Buell?

MR. BUELL: Yes, sir. I had to make you make that assumption because you don't believe it.

62

Q (BY MR. PAYNE) It is not difficult for me to make that one, so I will ask you that. In any pool, Mr. Eaton, in which you use a volumetric withdrawal formula, you are going to have good areas of production, lesser areas of production and rather poor areas of production, are you not?

A Yes, sir.

Q And, still each of the acres dedicated to the well could be productive of some gas. Now, in that case, the acreage should be dedicated to the particular pool; it should be figured in the formula and wouldn't you say that the gas which it did not make, which these wells did not make, should be redistributed to other gas wells which are capable of making it?

A Since we have this unknown, shall we say, the most conservative approach would be to leave them out, because from a conservation standpoint the loss in oil recovery would only occur because gas withdrawals in the Devils Fork are too great. If the oil withdrawals overbalanced the gas withdrawals, then there is some impairment of correlative rights, but we don't actually have a reduction in oil recovery due to having an imbalance in production. It doesn't result in leaving the gas-oil contact at a given datum.

Q Leaving out the assumption and admitting it is open to question where the gas is coming from, you think the most conservative approach is the one you propose?

A Yes, sir.

MR. PORTER: The witness may be excused.

(Short recess.)

MR. PAYNE: Under the terms of the 1954 or 1955 Attorney General's opinion it stated that one Commissioner could take testimony and consult thereafter with the other Commissioners as to that testimony. Therefore, if you would like to proceed, it is the Attorney General's opinion you may if you want to do so.

MR. PORTER: I think Mr. Morgan will be here in a few minutes.

MR. ERREBO: The testimony which Val Reese will present at this time will be directed primarily toward relating the four gas wells under discussion this afternoon to Escrito oil production to the West, but more importantly it will be directed toward establishing that one well will drain 80 acres as to oil, and 320 acres as to gas. We will have one witness, who has not been sworn.

(Witness sworn.)

LEWIS C. JAMESON

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

DIRECT EXAMINATION

BY MR. ERREBO:

Q Will you state your name, occupation, by whom you are employed and where?

A Lewis C. Jameson, I am employed by Val R. Reese and Associates, Inc., in Albuquerque, as geologist, and I am vice president of Val R. Reese and Associates, Inc.

Q Did you testify in the original hearing on this application?

A Yes, I did.

MR. ERREBO: Mr. Porter, I believe the record will show his qualifications were accepted at that time.

MR. PORTER: The Commission will accept his qualifications at this time, Mr. Errebo.

Q (BY MR. ERREBO) Have you made an analysis, Mr. Jameson, of the Escrito-Gallup Oil Pool as defined by Order of this Commission prior to the filing of this application which is being heard de novo here today?

A Yes, I have.

Q As a result of that analysis and study, have you prepared recommendations which you will today present evidence supporting?

A Yes, my study shows that there is evidence that an oil well in the Escrito Oil Pool will effectively drain 80 acres and that a gas well within the same Pool will drain 320 acres. It also shows that it is uneconomical to drill an oil well on less than 80 acres, or a gas well on less than 320 acres. It is recommended that the limiting gas-oil ratio be 2,000 to 1, and that any well with a ratio in excess of 30,000 to 1 be classified as a gas well. We ask that 80 acres be assigned to an oil well, and that up to four 80-acre proration units be assigned to a gas well for proration purposes. These rules are very similar, in fact, I believe exactly the same as the Commission has previously written for the Angels Peak-Gallup

Pool. The Escrito field is, we believe, an associated reservoir with a gas cap. The deposition is an offshore bar extending in a Northwestern to Southeastern direction.

Q As to the regulations which you propose, relating to the location of the wells, upon proration units, are those also the same as the Angels Peak rules?

A Yes, they are the same as Rule 4 in the Angels Peak Order.

Q Have you prepared any Exhibits in support of the recommendations which you have made?

A Yes, I have. Exhibit No. 1 shows the limits of the Escrito-Gallup Oil Pool. The Eastern portion of those limits is the limits as they were defined prior to the last hearing. In addition, we have enclosed a portion of Section 25, which was not included in the limits of the Devils Fork Pool, but was covered by our original application. That area is closed by dash-line, and the entire area under consideration is colored blue on Exhibit No. 1. The limits of the Devils Fork Pool are shown by the dotted line and is for reference between the two areas only.

Q Actually, have you prepared testimony today for presentation relating to the Devils Fork Pool?

A No, I have not.

Q Actually, the application which is being heard de novo here today is based upon and is confined to the Escrito-Gallup Pool, is it not?

A Yes, sir, that is correct.

Q As defined by the Commission by Order at the time of filing of the application?

A Yes.

Q Will you proceed?

A It will be noted on the Exhibit No. 1 that, in the Eastern portion of the area, there are three wells which I have shown with a gas symbol. These wells are wells which have gas-oil ratios of such magnitude they should be considered as gas wells, the Reese No. 1-25 Mesa, in Section 25, 24 North, 7 West, and the Standard No. 1-2-26 and the Standard 1-4-26 in Section 26, in the same Township, and the Reese No. 1-30 Sperling Well in Section 30, Township 24 North, Range 6 West. Also shown on Exhibit 1 are the cored wells in the area. They are classified, as shown in the legend, by the triangle around the well symbol. Also, there are several location symbols on the map signifying wells which are either being drilled or are in some stage of completion.

Q How many of those wells are there?

A One is the Redfern and Herd No. 1-A Largo Spur No. 14.

Q Do you know what its status is?

A I understand the well has been fractured and it is presently cleaning up after fracture. The Reese No. 1-23 Well in Section 23 is fracing today. In Section 8 of 24 North, Range 7 West, the Compass No. 18 Federal is presently shut-in after attempting a completion in the Dakota Formation after the Gallup was found to be uncommercial. The Dorfman No. 2 Elizabeth Federal in Section 18 of

the same Township has perforated and fraced and is cleaning up after frac. The Compass No. 2-16 State in Section 16, the same Township, is waiting on cable tools and has been perforated in the Gallup. In the Township to the East, Range 6 West, the Reese No. 1-29 Zamora is drilling below 3,000 feet. I believe that is all of them, Mr. Errebo.

Q Actually, then, that is about seven wells in the vicinity of the Escrito Pool that are now being drilled, is that correct?

A Yes.

Q Have you made any determination as to what percent of the acreage within the area outlined in blue on this Exhibit No. 1 is owned or controlled by your Company?

A Yes, Val Reese and Associates owns or has control of 40½ percent of the acreage within this blue-colored area. If that area is extended around this blue area the percentage increases slightly.

Q Would you refer to Exhibit No. 2, if you have nothing further with regard to Exhibit No. 1?

A Exhibit No. 2 is a Well Data Sheet of the wells within the Devils Fork, within the Escrito-Gallup Pool. There are 23 wells, and as previously mentioned, there are four with gas-oil ratios of over the proposed limit of 30,000 to 1. Within these 23 wells there are seven top-unit allowable oil wells. These wells are the Compass No. 1-16 State, all five of the Dorfman Wells, and the Reese No. 2-21 Connie Well. Shown on the Exhibit is the completion date and the initial potential, the perforations within the Gallup Formation, the month and year of first production, the current gas-oil ratio, and

the cumulative production to 9-1-60. I might mention with regard to the current gas-oil ratios, these ratios are the ratios due to be filed with the Commission by November 10, and in each case, except the Eastern No. 1-22 Federal Well, that well had not been filed at the time I got this other information, and as shown by the footnote, the previously filed GOR is used on this Exhibit.

Q Mr. Jameson, how many wells are shown on this Exhibit No. 2?

A 23.

Q How many of those wells have a ratio of say, 5,000 or less to 1?

A Well, all of the wells have a ratio of 5,000 or less, except the four I previously mentioned. If you stretch that point a little bit, there are two with gas-oil ratios over 5,000 to 1, the Reese Connie, 5,310 to 1, and the Standard No. 1-27 Federal is 5,550 to 1. All of these wells are significantly lower than the limit proposed as the dividing line between gas wells and oil wells.

Q Now, as you go upwards then from, say, 5,310 to 1, the gas-oil ratio for the 1-21 Connie and, I believe the other higher ratio is the 1-27 Federal Standard; that last well is down to the South, isn't it, and didn't the previous witness testify he thought that probably was in a separate lens?

A Yes, that is correct.

Q So, if we say go upward and see what the next higher ratio is North, next higher ratio from the Connie 1-21, you have to go all

the way up to 30,000 to 1, don't you?

A Yes, sir.

Q And, there aren't any wells in that range?

A No, and I might add that 30,000 to 1, which is the lowest gas-oil ratio of the four wells in the gas area, actually is 30,400 to 1. That well produces such a small amount of oil that a difference in measurement of one barrel, or even half a barrel, would make a significant difference in its gas-oil ratio.

Q How big would you estimate that significant difference could be?

A Well, if my memory serves me right, that will produce two barrels on the gas-oil ratio tests and it is pretty hard to measure within two barrel accuracy in a tank, so maybe it produced only a barrel or a barrel and a half, which would increase; if it were a barrel, it would double the gas-oil ratio.

Q So that when you have all of the wells in this Pool, except four which have a ratio of above 30,000 to 1, and you have all the other wells that have a ratio of 5,310 or below, wouldn't that indicate to you that you have a gas cap as to the four wells with the 30,000 to 1, or above, ratio?

A Yes.

Q In an oil area, without a gas cap as to the rest of those wells?

A Well--

Q In other words, there is no free gas in the area of the

other wells?

A That is correct. I do believe the gas cap, which the four wells are in, is in the same reservoir as the rest of the oil wells.

Q You will actually have testimony later to demonstrate that, will you not?

A Yes, I will.

Q Will you proceed, then, to your next Exhibit?

A Exhibit No. 3 is a structure map of the Escrito-Gallup Oil Pool. This map is contoured on the same datum which the Pan American structure map was contoured on, and the two maps are very similar. However, this is to a 25-foot contour interval. The Escrito-Gallup Oil Pool limits and the Devils Fork limits are also shown on this map. The line of cross section, A-A Prime, which will be Exhibit No. 4, is shown by the crimson line--at least that is what is the pencil says the color is--and it will be noted that the wells chosen for that cross section, there are ten of them, they are down the center of the Escrito field.

Q You say, down the center; it is down the center as you go the long dimension, is it not?

A Yes, that is correct.

Q That is very typical, is it not, of these offshore sand bars in the San Juan Basin found in the Gallup?

A Yes, normally the deposition is along a line very similar to the present day structural contour lines, and typically, the sand build-up will extend for miles in this Northwest-Southeast di-

rection.

Q Have you had any opportunity to acquaint yourself with the geologic and engineering conditions which are found in the Angels Peak Pool?

A Yes. They are very similar to the conditions in this field. In fact, I know of no difference between the two.

Q In other words, the geologic conditions under which each of the two pools were laid down were similar, is that correct?

A The sediments were derived from the same source and deposited in an offshore bar in both locations.

Q Deposited during the same geologic time?

A That is correct.

Q Along the same shore line?

A Approximately, it was a fluctuating shore line.

Q Are the permeabilities and porosities the same in the two pools?

A Very similar.

Q Do these two sand bars exhibit the same characteristics of continuity?

A Yes, they do.

Q The pool you are comparing this with is the Angels Peak-Gallup?

A Yes, that is correct.

Q Do you have anything further with this Exhibit?

A No, I don't.

Q Will you refer then to your next Exhibit, which is a cross section, I believe?

A Exhibit No. 4 is a West-East cross section through the Escrito-Gallup Pool, one copy of which has been put on the board. However, it is rather difficult to see.

Q Is the well, which is shown furthermost to the left on this Exhibit, the furthermost well to the Northwest in this Pool?

A Yes, it is.

Q How about the well which is shown on the right?

A That is the furthermost to the Southeast. The cross section makes no attempt to show the structural position of the wells. The datum is a marker in the approximate center of the Gallup formation. Also shown on the cross section are the perforations in the center of the well bore, the logs, and to the right of the center column is shown the **analyzed core intervals.**. The productive core intervals are marked in solid. On those cored wells the summary of the core analysis is shown at the bottom of the log.

Q Have you found any dry holes which have been drilled along the sand bar in the area as you now know it?

A No, not down the center of the sand deposition. There is, as I mentioned, one well in Section 8 which was drilled to the side, off to the side of the deposition, and it had a very poor Gallup section.

Q Are each and every one of the wells which is shown on your Exhibit No. 4 now producing or capable of producing?

A Yes, they are.

Q Either oil or gas, is that correct, or both?

A Yes, that is correct. The logs numbered 7 through 10 are the four high gas-oil ratio wells in the Escrito Oil Pool.

Q Have you found any evidence of faulting within this area which would be sufficient to seal off one part of this pool from another?

A No, we know of no evidence of faulting. There is some evidence of fracturing within the Gallup formation.

Q Have you found any evidence whatsoever which would lead you to believe that this pool is not continuous between the points represented by the furthermost left and the furthermost right-hand logs, as shown on this Exhibit No. 4?

A No. It is my belief the evidence is that these wells are all definitely in communication.

Q Do you have anything further with regard to this Exhibit?

A I believe not at this time.

Q Will you then refer to Exhibit No. 5?

A Exhibit No. 5 is composed of four calculations of recoverable reserves, designated A, B, C and D. Each of these calculations was made on a cored well in the Escrito-Gallup Oil Field.

Q The first two parts of the Exhibit, 5-A and 5-B, they refer, do they not, to wells in the oil area?

A Yes.

Q And, the last two calculations as to wells in the gas area?

A That is correct. The porosity, water saturation and oil saturation of the formation was determined from core analysis, and after calculation of the reserves, the gross value of the recoverable reserves was determined and the production and ad valorem taxes were deducted to give the net after royalty and taxes for a 40-acre tract, and then the net value for an 80-acre tract determined. On the Standard No. 1320 Federal Well, which is Exhibit No. 5-A, the net value, after royalty and taxes, of the recoverable reserves from 40-acres was $75,744.00. Since the well cost for an oil well, on which sooner or later you are going to need a pump, averages approximately $85,000.00, there would be no return on this well, or a well such as this. It will be noted that the operating expense is not deducted, and the production has not been discounted over the life of the well.

Q Have you made any deduction for the cost of the well from this net value?

A No. This is the net which will be returned to the operator.

Q Approximately what is the cost of the well?

A $85,000.00.

Q So, then, what would be the net value on a 40-acre tract, approximately?

A Well, you would go in the hole $9,000 some odd dollars.

Q And, that takes into consideration operating costs?

A No, that doesn't take into account operating costs. It is very difficult to say how much you would go in the hole on that, be-

cause you don't know the productive life of the well. As I will show in a later Exhibit, the productive life of this particular well seems to be decreasing quite rapidly, and from the decline curve of this well's production, it looks like these reserves are extremely optimistic.

Q You mean, as you get production information on this well the life expectancy decreases, is that correct?

A Yes, as I will show in a later Exhibit.

Q Will you proceed, then, to your other testimony?

A Exhibit No. 5-B is a similar calculation on the Dorfman No. 1 Colleen Federal in Section 17, Township 24 North, Range 7 West. This well is in the highly permeable belt which contains the better producers and this well is one of the seven top-unit allowable wells in the Escrito-Gallup Oil Pool. The net value of the reserves which I have calculated to be recoverable from this well is $123,412.00 net to the operator after the deduction of royalty and taxes and before operating costs. The net value from 80-acres would be $246,824.00 Actually, this seems pretty good until you decline it over a four and a half year period, which is the minimum amount of time which these reserves could be recovered, and discount the net value on 40 acres, gives you $111,575.00. That is discounted at an interest rate of 6 percent per year. From this $111,575.00 I have deducted the $85,000.00 well cost, and $200.00 per month operating expenses, just to see what the net profit to the operator would be, and I found that was $15,775.00 for a top-unit allowable well, which is

certainly no incentive to drill.

Going on to Exhibit No. 5-C, the calculation is made on the Standard No. 1-4-26 Federal Well in Section 26 of 24 North, Range 7 West. This well is in the gas area, and produces gas and liquids. The recoverable hydrocarbons were calculated for 40 acres, and the gross value of the production found to be $44,510.00. After the deduction of the outstanding royalty interests and the taxes, the net value would be $34,518.00. This is on the 40-acre tract. For 160 acres the net value would be $138,072.00; for 320 acres the value would be $276,144.00.

Q Do you estimate, then, that a profit could or might be made on a 160-acre well?

A No, I don't, for this reason: Your production is going to be spread out over a number of years. Also, as has been previously testified in this case, these wells are not high capacity wells and it means that sooner or later you are going to be forced with the purchase of a compressor, and having just purchased a compressor for our Reese No. 1-30 Sperling Well, we are pretty familiar with the cost. In order to compress 500 MCF per day you are faced with a cost of $22,000.00 for one.

Q Is that an investment?

A That does not include operating costs, which are high, since the compressor must be visited rather frequently. For a compressor to handle the 2,000,000 cubic feet per day it costs $32,000.00. When these figures are added, and it is evident from the productive

history on these wells that a compressor is going to be necessary, there will be very little profit even on 320 acres.

Q You feel, then, that a compressor will be necessary reasonably soon on the Mesa 1-25 Well?

A We hope that it will be a little while, get some of our investment back first.

Q You really don't know what the line pressure is that you will have to buck; you haven't been connected yet?

A That's correct.

Q Do you know exactly what line, at this time, you will be connected into?

A At this time it appears we will be connected to the El Paso line. We had considerable difficulty getting onto the Southern Union line through the series of hearings, and on that line we will receive 11 cents for our gas plus approximately a cent for liquids. This is figured on the Southern Union line price of 13 cents.

Q What is the pressure on the El Paso?

A It is a low-pressure line, 250 pounds. By low-pressure, it is at least lower than the Southern Union line.

Q It might be possible, then, that the installation of a compressor could be deferred for some period of time, but you anticipate it may be necessary sooner or later, is that correct?

A Yes, I think it will.

Q During the life of the well?

A In order to recover these reserves which have been calcu-

lated. Exhibit No. 5-D is approximately the same as the Exhibit No. 5-C. It is a calculation on the Reese No. 1-30 Sperling Well, and shows slightly less reserves than the Standard No. 4-26 Well.

Q Are the reserves shown by these last two Exhibits conservative or liberal?

A Well, I believe that they are more on the conservative side than the liberal side. I tried to calculate them as accurately as possible. I hope they are not too liberal.

Q You have tried to be realistic?

A Tried to calculate as close as we can with present information.

Q But actually, one of the factors which you used was bottomhole pressure, was it not?

A Yes, bottomhole pressure we used is the initial bottomhole pressure which we believed was present in the Escrito-Gallup Oil Field, and was obtained from the Dorfman No. 1 Colleen Federal Well in the Northern portion of the Field. It was 1842 psig. At present, as previous testimony has shown, by other witnesses, the bottomhole pressure in the Standard Wells in Section 26, is slightly over a thousand pounds.

Q So then, to that extent, this is a liberal figure for reserves, isn't it?

A Yes, it is. On that basis it would be particularly on the Standard Wells, however, as I will go into later, the pressure on the 1-25 Mesa Well is higher than the pressures shown on the wells

in Section 26, the Standard Wells, in that it has not produced, whereas the other two wells have been producing their 2,000 to 1 limiting gas-oil ratio gas for approximately two years.

Q Do you have anything further, Mr. Jameson, with regard to these economic studies?

A No, I believe not.

Q Now, turning to the matter of proof of drainage as to the units which you are proposing for gas and for oil today, have you made a study to determine to what extent a well would drain 320 acres if that well is a gas well?

A Yes. I believe there are several things that show that we can drain 320 acres. First, the deposition of the sand is the same as the deposition in other areas where drainage of 320 acres has been conclusive, and secondly, there seems to be some pressure information which tends to support this fact. The Reese No. 1-25 Mesa Well had a bottomhole pressure, after completion, of 1675 psig, and that was 167 pounds less than what we considered to be the original pressure in the Escrito-Gallup Oil Pool. The original pressure was, again, from the Dorfman No.--I believe it was No. 2 Colleen Federal. I said No. 1 previously, I believe it was 1842 pounds. In considering this pressure we find, adjacent to the No. 1-25 Mesa Well, the Standard No. 1226 and No. 1426 Wells.

Q Those are the other two gas wells, are they not, that are considered here today that do not belong to Val Reese?

A Yes, they are. However, Val Reese does own half interest

in the 4-26. These wells have been producing oil and gas for several years. The volume of the produced gas from these wells seems to have affected the reservoir pressure which we have found upon drilling the No. 1-25 Mesa Well. The Mesa Well is 2,500 feet from the nearer of those two wells, the 4-26. Although the magnitude of pressure drop is fairly great at the No. 1-25 Mesa Well we used this 2500 foot radius as a drainage area, and found that the minimum acreage which would be drained would be 451 acres. If you consider that the pressure drop has extended, in fact, beyond the 1-25 Mesa Well, the drainage area would be much greater.

Q What justification do you have for making that assumption?

A Well, if the pressure would drop 167 pounds at the 1-25 Well, it would drop a lesser amount on past.

Q In an opposite direction?

A Yes.

Q And, you feel it has been the production from the two wells, the two Standard Wells to the west, which has caused this pressure drop?

A Yes, I do.

Q It may have been that production, and that drop may have been also contributed to by other wells further to the west?

A Yes, there has been quite a lot of oil taken out of the Escrito-Gallup Pool to the west.

Q Is this conclusive evidence, in your opinion, that one well will drill in excess of 320 acres?

A Yes, one gas well.

Q Do you have any other evidence, or is this the only evidence you have to present to the Commission today in this regard?

A Unless I am overlooking something that is about the only figures as far as pressure that we have at this time.

Q Will you, then, give the Commission the testimony and evidence which you have, which you believe will support the 80-acre spacing for oil wells?

A On the oil well end of the sand lens, the No. 1-320 well in Section 20, of 24 North, Range 7 West, drilled by--

Q That is up in the Northwest part of the Pool?

A Yes, drilled by Standard of Texas, and had its first production, I believe, in September of '57. That well produced along in a pretty uniform rate as is shown on Exhibit No. 6, for a period of some 22 months following June of 1958. The previous production was erratic in that it was a period of very low allowable, and then when the well went on full production the production was higher than it really should have been. After about three months the production in June of 1958 was 1,113 barrels. The following 22 months were pretty uniform as shown on Exhibit No. 6 by the heavy dashed line. This line has an incline to the horizontal of 8°. As will be noted, in the latter part of 1959, Standard was having their troubles. The weather, lack of parts, unable to get to the well to restart the engine, and oil storage problems, plus in March, or January and February, the well was pretty well paraffined up over a period of that

time. These facts all added together to give four months of below what we should consider normal production for this well. I have a detailed breakdown, week by week, of Standard of Texas' troubles on this well during these months. In February of 1960, there were two top-unit allowable wells directly offsetting the No. 320 well which went on production, the Compass No. 1-16 to the Northeast, diagonal offset, and the Dorfman No. 1-G directly to the North. The production in No. 320 well seemed to continue along at approximately the same decline for an additional two months when in April it was within 40 barrels of what the heavy dashed decline line would lead you to estimate it to be. However, at that time, the decline took a sharp dip downward until the production curve, which is extremely straight, has an incline to the horizontal of 38°. This is an increase on the scale which I have used here to draft this Exhibit of 30°. In October the production was 321 barrels from the decline curve when we would have expected 695 barrels. The actual production was, therefore, only 46 percent of what would have been expected from the previously established curve. The portion of the curve which has the sharp dip shows a decline of 58.6 percent in six months, whereas for one year's production, beginning in June of '58, the production incline was 15.5 percent. From these figures it looks like something happened, and the fact that the two top-unit allowable wells directly offsetting this well went on production two months prior to this time, which would have been just about the time you would have expected flow to be felt over this distance,

leads me to the conclusion that the Compass No. 1-16 and the Dorfman No. 1-G began prohibiting the movement of oil from underneath their acreage toward the No. 320 well in April of 1960. The nearer of these two wells, the Dorfman No. 1-G, 1580 feet from the No. 320 well, using this footage as a radius, the drainage area would be over 180 acres. I believe this is evidence that drainage will be effected in the oil area over at least 80 acres.

Q I believe that I understood from some of your testimony just now, that you have determined quite accurately that the dips in this curve which you have labeled mechanical trouble are, in fact, due to mechanical trouble and not due to any other cause?

A Yes, I didn't go into a great deal of the detail on the Exhibit, termed it all mechanical trouble. I believe that in March the well was shut down seven weeks waiting for a saddle bearing; other difficulties I mentioned, due to weather.

Q Didn't you contact Standard of Texas' Field Office and get a day by day and week by week report of the status of this well?

A Yes, in fact, they went to much more trouble than I expected and broke it down by the hours.

Q So then, actually, you feel like you are justified in attributing this sharp decline to an effect by these offset wells having gone into production?

A Yes, I do. In fact, in December, since the well was not produced properly during November, the production jumped several--well, I shouldn't say several hundred, but in excess of 100 barrels

over what the curve shown you would expect, and again in April after the well had been shut down, practically completely in March, April had approximately a week of down time, and still the production was practically up to the decline curve. From that point on there has been this straight line decline and Standard has been working continuously to get this well back up to where they believe it should have been. However, they have been completely unsuccessful. The pump has been pulled, and the well has been hot oil treated in order to eliminate paraffin, and nothing that Standard has been able to do has brought the well up to the previous decline curve.

Q Then, in summary of your testimony, Mr. Jameson, based upon your studies and information, is it your opinion that the two Standard of Texas gas wells and the two Reese gas wells in the Eastern part of the area, as shown on your Exhibits, are, in fact, a gas cap of a reservoir which is a common reservoir and includes the oil production in what is known as the Escrito, to the West?

A Yes, I believe Exhibit No. 4 shows that there is continuity along the length of this Escrito-Gallup Oil Pool.

Q Is there anything to lead you to believe there would not be continuity, that you found in your studies?

A No, there is not.

Q You believe they are, in fact, pressure-connected, the gas cap and oil area?

A I believe in every way they behave as if they were.

Q Is it your opinion the rules you propose today would af-

ford each owner of his rightful share of the oil or gas depending on the area in which his well is located?

A Yes, I believe they will. Our proposed rules would enable the gas wells to be hooked up, something that we have been trying for several months to get done on our Mesa 1-25 well. It would give us an allowable sufficient to justify the laying of the line to those wells, and since the amount of production would be based on limiting gas-oil ratio, the same as oil wells would have, there would not be unequal drainage between the two.

Q How would a gas well be defined under your rule?

A It would be any well which would have in excess of 30,000 to 1 gas-oil ratio.

Q Do you feel this is a realistic definitive gas-oil ratio?

A I believe in the oil column of the Field, the gas-oil ratio will never reach a magnitude of over 10,000 or, possibly, 12,000 to 1.

Q How would the two Standard of Texas wells and the two Reese wells then be classified under this rule?

A They would be classified as gas wells.

Q And, how would their gas allowable be determined?

A It would be determined by multiplying the limiting gas-oil ratio by the top-unit allowable oil production for an 80-acre proration unit, times four, if there were four proration units assigned to the well, that is, 320 acres dedicated to the well.

Q Do you feel that this is a reasonable basis for preventing

substantial migration of gas into the oil area?

A Yes, I believe that there would be very little migration into the oil area, and definitely the oil production is protected in that an oil well would be drawing out its limiting gas-oil ratio plus its oil, and the gas well would be producing an equivalent amount of gas with less oil.

Q Then, I take it, you think the converse would be true, that it would substantially prevent any migration of oil into the gas area?

A I believe there would be very little movement between these two areas.

Q Do you think oil wells and gas wells would have an equal opportunity to production from the reservoir in proportion to their assigned acreage?

A Yes, I do.

Q In the event, and the Commission has already done this and that is the reason we have the hearing de novo today, this Commission should find that these wells are not connected to the Escrito Oil area and should, instead, decide that Escrito was, in fact, an oil pool without a gas cap, and you don't subscribe to that, do you?

A No, I don't.

Q Do you believe, then, that these rules would be equally applicable, deleting the gas portion thereof, to the oil area?

A Yes, they would be.

Q Do you believe your testimony here today shows that?

A Yes, I do. If gas has not been discovered in the Eastern portion of the Escrito-Gallup Oil Pool, the need for 80-acre proration units in the oil area would not be changed.

Q There is nothing in your testimony today which would conflict with or cloud the picture as to rules and as to drainage for 80-acre oil wells?

A That is correct.

Q You have sufficient testimony standing in the record today, in your opinion, to justify the adoption of 80-acre rules for oil wells should the Commission decide to take the alternative which I have just mentioned?

A Yes, I believe that evidence is in the record.

Q You do feel these rules are, then, necessary to prevent the drilling of unnecessary wells, don't you?

A Yes, I do. I believe there is very definitely a need for such a rule, and I believe there is a distinct possibility that we will very soon be forced into 40-acre locations if such a rule is not adopted.

Q Do you think this is a real and not an imaginary possibility; is that correct?

A It definitely is.

Q You know several instances where that could be the case?

A Yes, wells could be staked any day.

Q You feel these rules will result in the prevention of waste?

A Yes, I do. There is definitely waste occurring at the present time in that there is no way you can sell your gas in the gas area.

Q Do you have anything further in connection with your testimony here today?

A No, I believe not.

Q Were these Exhibits 1 through 6 prepared by you or under your supervision?

A Yes, they were.

MR. ERREBO: If the Commission please, we would like to offer them into evidence.

MR. PORTER: Without objection the Exhibits will be admitted.

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Jameson, would you refer to your Exhibit No. 1, please, and tell me if you have properly located the Sperling 1-30?

A Yes, I believe I have.

Q You realize, do you not, it will still be in the Devils Fork Pool even if your application is granted?

A Our application didn't extend quite far enough in actuality when we originally wrote the application. We extended only the limits to cover Section 25, and we will still be, by a margin of two or three-hundred feet, possibly, closer to the Devils Fork Gas Field. However, this well, like the other three high gas-oil ratio

wells, belongs with it.

Q With the Escrito Oil Pool, so you are really asking that the Southwest 1/4 of Section 30 be included in Escrito?

A Yes, we believe that that well is not removed from the other three high gas-oil ratio wells.

Q Referring to your Exhibit No. 4, did I understand your testimony correctly, that the dotted area is a productive interval in the various wells?

A It is the main productive sand in the Escrito-Gallup Oil Pool.

Q The dotted area is?

A Yes.

Q Isn't it true, Mr. Jameson, that Standard of Texas' 4-26, the Val Reese 1-25 and the Val Reese 1-30 all contain the Devils Fork sand in this interval that you have picked as a productive limit?

A It does contain the correlative section, or the section which will correlate to it as previous testimony has been by the other witnesses in this hearing. There is some doubt as to the quality of that correlative interval.

Q Do you think, perhaps, that your productive interval as shown on this Exhibit should be contracted?

A I believe we have picked the top of the main Mayres sand.

Q If I take your Exhibit correctly, it says that the Devils Fork sand is productive in these three wells, if this dotted area is

the productive limits?

A We believe that we get some production from the sands within the area which is enclosed within the dotted area.

Q You testified, I believe, that the Angels Peak and Escrito Pools are similar structurally and geologically, is that right?

A I believe they are.

Q Is the Escrito and Devils Fork Pool also structurally and geologically similar?

A Yes, they are similar. However, there is a difference between the fluid which the two areas produce.

Q Is there any difference between the fluids which the Angels Peak and the Escrito produce?

MR. ERREBO: If it please the Commission, I believe this questioning is going far beyond his direct testimony.

MR. PAYNE: It was you who elicited from this witness the testimony that the Angels Peak-Gallup Pool and the Escrito-Gallup Oil Pool were similar structurally and geologically. Therefore, it seems pertinent to pursue this line of questioning in regard to the Devils Fork, which is certainly more directly involved in this case.

MR. ERREBO: May it please the Commission, may I inquire the ruling on the matter?

MR. PAYNE: I will withdraw the question in any event because the other testimony was not pertinent in the first place.

MR. PORTER: Do you have any further questions?

MR. NUTTER: Just a couple of brief questions.

BY MR. NUTTER:

Q Mr. Jameson, why did you use a 5 percent recovery factor on your calculation of oil reserves for the Standard 1-320?

A I believe that 5 percent recovery is all that will ever be obtained from this well for the footage which I have considered as net pay. If the net sand were counted differently, and a smaller interval considered as net pay, that percentage would go up.

Q Is 5 percent, is that a reflection of a low permeability or what?

A It is a reflection of low permeability and the production history of the well; in other words, the casing will rot out before you get more than that out.

Q If this well has such low permeability why were these other wells able to act on it so quickly, in less than three months?

A The permeability is increasing in the direction toward the two top-unit wells. The core analysis which we have available in the top-unit allowable area is in the Dorfman No. 1 Colleen Well. That well shows that the permeability in one foot goes to 148 millidarcies. Therefore, in this top-unit allowable area you have extremely high permeability and, therefore, the permeability at the well bore on the Standard No. 1-320 Well is less than the average would be between the two wells.

Q But, nevertheless, with the low permeability that the 1-320 has, these other wells were able to affect it within two months?

A That is what the decline curve shows to me.

Q And, the No. 1 Colleen Federal Well has high permeability, correct?

A Yes, it is another top-unit allowable well.

Q But you expect to recover only 15 percent from it?

A Yes, over the interval which I have considered as net pay, although there are several feet which go to extremely high permeability, the average over that interval which I have considered as net pay is 7.84 millidarcies. For a millidarcy of that nature I believe 15 percent is the maximum amount of oil which will be recovered.

Q How about the Reese Connie No. 2-21, does that have permeability or not?

A We didn't core that well. However, from its productive characteristics it seems to have at least a small interval of this extremely high permeability in it.

Q Is there any break on this curve that shows any decrease in productivity on the Standard 1-320 two months after the Connie No. 2-21 went on?

A Let me check when that first production was, and we will look at the Exhibit and see. The Reese 2-21 Connie first produced in April of 1960. Therefore, if it took the same amount of time for the effect to be felt, the effect would have been felt in June of this year and at that time the production was declining along this straight line.

Q In other words, the 2-21 didn't cause any break from that

straight line?

A No, not an additional break.

Q On this calculation of recoverable reserves for the gas area on the Standard 1-4-26, you show recoverable gas per acre of 7216 MCF. Do you share Mr. Eaton's views as reflected by his Exhibit 3 that the 4-26 is in a state of almost total depletion?

A I am afraid I do not. I believe the way the well is producing at present is, in part, due to the complete lack of care which it has received since it has been a losing proposition anyway.

Q Do you think this well can make more than Mr. Eaton shows it can make?

A If you had the paraffin cleaned out of it and properly switched, I believe it is possible, yes. I hope so, since we own half interest in that venture.

Q You own an interest in this Standard lease, then?

A Yes, we pay half the operating costs.

Q How about liquids, is paraffin causing the liquid production problem there, too?

A I believe paraffin in the well bore is cutting the production of both liquids and gas.

Q Where is the paraffin accumulation?

A It is no different from the other wells in the Escrito Field, and paraffin is a problem throughout the Escrito Field. It, I think, is mainly within a couple of thousand feet of the surface.

Q Generally, paraffin problems do occur in the uppermost

portions of the tubing string, don't they?

A Yes, sir.

Q And, that has so much paraffin in the tubing all it can make is one barrel of oil per day, or 30 barrels per month?

A I believe it is definitely restricting its production to some extent.

Q Assuming paraffin weren't the trouble and this well were at a state of advanced depletion, as Mr. Eaton stated, it has produced a total of 122,429 MCF, according to your Exhibit, which, with a recoverable gas per acre, would mean it has recovered about 17 acres of gas. How much acreage do you think this well actually can drain?

A I believe, over a long period of time, this well, when it is cleaned up, will be able to drain 320 acres. Its reserves are not a great deal different than, for instance, the Mesaverde, or its productive capacities much different.

Q If it has drained from 17 acres now, and it is going to drain 320 acres, then Mr. Eaton's curve must be considerably off, is that correct?

A I believe that we were able to sell gas from this well assuming that we clean it up, possibly rework it. These calculations aren't particularly relative to just this well. It is a similar well, for instance, you mentioned the production which has already occurred, and I believe I did mention that the pressure at present was much less than this 1842 pounds. If I were calculating the re-

serves on this particular well I would have to use a lower pressure at present, and also deduct the production which there has been. In other words, Exhibit No. 5-C relates to a well similar to the 1-4-26, which did have virgin pressure. Such does probably not exist.

Q The same arguments that you used for the gas in this Number 1-4-26 well would also apply to liquids as far as the amount of liquids it is producing now relative to the amount you show would be recoverable for per acre?

A Yes, I believe so. The liquids which this well would produce shouldn't change a great deal after cleaning out the paraffin, I don't believe. In other words, it should increase proportionately to the gas.

Q You don't feel, then, the calculation that it has drained 25 acres of liquids would hold any merit?

A Is that what the calculation shows?

Q Something like that.

A I hardly see how that would be possible except that, not shrinking the gas enough to get pipeline gas, in other words, losing more liquids.

Q This produced some 2265 barrels?

A Not losing as much liquids as I have calculated.

Q It has produced 2265 barrels of oil to date?

A That is correct.

Q Your computation is 85 barrels of liquids recoverable per

acre?

A Yes.

Q Mr. Jameson, you stated that you felt that the type of formula which you proposed to be used here, where the gas wells would be limited to an acreage factor times 2,000 to 1, as their maximum productivity, does that assume in order to have equal withdrawals from oil wells and gas wells that the gas wells are producing the maximum 2,000 to 1 ratio?

A Yes, it assumes that. It also assumes the oil wells are producing the maximum allowable gas under the 2,000 to 1 limit.

Q We have, I think you said, eight top allowable oil wells in the pool?

A Seven.

Q How many of the oil wells which have ratios of less than 30,000 to 1 have a ratio of 2,000 to 1 or less?

A Well, the five Dorfman wells would come under that, also the Standard No. 3-19, the Reese No. 2-21 Connie, the Eastern No. 1-22, and the Pan American No. 1 Zanapti.

Q There are a total of seventeen wells in the pool, not counting the four high ratio wells, is that correct?

A Well, by in the pool I also consider the Reese No. 3-29 well, and the Dorfman No. 1 Elizabeth, and the Reese No. 1-16 Bigbee. There are 23 wells listed on Exhibit 2, four of which are the high oil-gas ratio wells which you mentioned, which leaves 19 wells. We are one well off somewhere.

Q At any rate, there are 18 or 19 wells, and 9 are producing with a GOR of less than 2,000 to 1?

A Yes, at present they are.

Q And, seven of the total are producing top allowable?

A Yes.

Q So, your 2,000 to 1 limiting ratio for gas wells, multiplied by the acreage factor depends on all of the oil wells producing top allowable where eleven or twelve of them are not?

A Yes.

Q And, your formula also assumes all oil wells are producing the maximum permissible GOR of 2,000, and nine of them are not, is that correct?

A Would you repeat that, please?

Q The formula also assumes that oil wells produce the maximum limiting ratio of 2,000 to 1, and we found that nine of them do not?

A Yes, that is correct.

Q We find on one point where you have make to an assumption, eleven wells don't meet the criterion; on the other point, nine wells don't?

A That is right, at this present time. However, the gas-oil ratios on the top-unit allowable wells should be changing very shortly.

Q Mr. Jameson, do you know when the Standard 1-320 well reached the bubble point in the neighborhood of the well and at

which time gas might have started breaking out of the oil?

A No, I don't. I have no fluid analysis.

Q When that did happen there would be a decline in the oil production, would there not?

A Yes.

Q What was the nature of the mechanical trouble in the month of November?

A In November they were down 20 hours because of rain, 36 hours engine trouble, 27 hours engine trouble, 62 hours engine trouble. That takes us to the 29th of November.

Q So, that is a total of six or seven days all told in November?

A Yes, that is correct.

Q Now, did they have any mechanical trouble in the month of January?

A Well, they had several kinds of trouble. They were off 48 hours waiting on pulling unit, 24 hours pulling the pump, 120 hours--let's see, I have gone into January.

MR. ERREBO: He was asking about the month of January.

A I was into December. In January they were down 120 hours waiting on repairs, 32 hours unit trouble, seven days waiting on repairs, and then they had one week in which there was no difficulty.

Q Did they have mechanical trouble in February?

A February, yes, February was another bad month. They were down 66 hours with the well not pumping. They didn't give a reason,

just 'well off'; 38 hours gas line froze, and seven days saddle bearing out.

Q And, I presume they had mechanical trouble in March, also?

A March was the worst month of all. They were down the first 21 days--again these are broken down into eight day reports, and there is some overlap. The days which they gave me are the days to the end of each week, so there would be some overlap, one month to the next. In other words, although I am just reading the figures once, if you totalled the number of hours they were off in February and totalled the amount that they were off in January the total number of hours they were off would be correct, but there might be some variations between the two months.

Q At any rate, you haven't attempted to plot what this decline would have been during this period of mechanical trouble if they had not had the trouble, have you?

A I believe that would be an impossible task, since that production isn't all lost. After the well does go back into production, your production is higher than it would have been at the same day had the production continued steadily.

Q As a matter of fact, after the mechanical difficulty in November was corrected, the production in December went well above the normal decline, did it not?

A Yes, it did.

Q And, after the mechanical trouble in March was corrected, is there a possibility that that production went well above what it

would have been if there had not been trouble in January, February and March?

A Possibly, yes.

Q So that declined curve may have been a little lower in April, had there not been some trouble in the previous three months?

A Yes, I didn't get the week by week trouble report through April. However, I do understand they were down approximately seven days during that time.

Q Have they been on production each day since that time, then?

A No, they haven't been. They have been trying to eliminate their sharp drop.

Q That was going to be my last question. You said they are still working on this well trying to restore it to the point where they think it ought to be?

A That is my understanding of it. It is presently producing a maximum of 16 barrels in a day; that is, when they do whatever work they are doing on it, the next day they get a maximum of 16 barrels, is my understanding from a telephone call.

Q Where do they expect to restore the production, to what level to the normal decline curve?

A Of course, they don't have a copy of this decline curve, but they evidently expect it to produce somewhere around 8 or 900 barrels per day. It had averaged that over a long period of time.

Q 8 or 9 per month?

A Per month.

Q They don't share your views, then, that these other wells have affected it and it would be impossible for this well to ever be as good as it was once?

A I doubt if they have looked into it with that in mind.

BY MR. ARNOLD:

Q I have one very short question, Mr. Jameson. How do you use an electric log to determine relative permeability in a sand section?

A I don't believe you can determine relative permeability from an electric log.

Q You get an indication of permeability from an electric log, do you not?

A You do, in that you get an indication of how clean your sand is.

Q And, that is related to permeability?

A Yes, it is.

Q How is this permeability indicated on the electric log?

A Well, with the qualification I gave it, off the S.P. curve.

Q If you get a depletion of the S. P. curve from the shale line?

A Yes.

Q And, in general, in a cleaner sand do you get a further deflection than you do in an--

A Yes, you do.

Q I would like to refer to your Exhibit No. 4, Standard of Texas 4-26 Well. In that well if you used the spontaneous potential curve as an indication of permeability, where would you determine the best permeability in that pay section to be?

A Well, if the log were that accurate, which I doubt, it would be in the upper portion. However, I do believe that the best thing you have got, if you can get around trying to interpret these S.P. curves too close, is your core analysis.

Q However, you do not have a core analysis in that sand section?

A No, you don't, not in the uppermost portion of it.

Q Actually, if you used an electric log interpretation for permeability, then you stated that this upper sand did not produce gas, then you would have to arrive at the conclusion this would be a dry hole, wouldn't you?

A That would probably be correct, yes.

MR. ARNOLD: That is all.

BY MR. PAYNE:

Q I have one question which goes beyond the scope of the direct examination. However, I will point out our rules provide, the rules of evidence of the District Courts can be substantially relaxed in the interests of getting the facts before the Commission, so I will ask the question and give Mr. Errebo an opportunity to object, if he wishes.

Mr. Jameson, I believe you said you are now drilling your

1-29 Reese Zamora Well?

A Yes, that's correct.

Q Down to about 3,000 feet?

A Down to below 3,000.

Q When you run a log on this well, if it shows the same permeability indications or kicks on the log, as did the logs on the three critical wells in question here, would you recommend to Mr. Reese he perforate that section?

A Yes, I would. We perforated it in the 1-25 Mesa Well.

MR. PORTER: Any further questions? The witness may be excused.

MR. BUELL: May it please the Commission, I don't have a question, but I would like to make this observation. Several comments were made about Pan American's Exhibit Number 3. That is the Exhibit that reflects the performance of the two Standard of Texas wells. The data on that Exhibit was filed by the operator with the Commission and we consider them accurate.

MR. ERREBO: We have no other witness.

DAVID H. RAINEY

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

DIRECT EXAMINATION

BY MR. HOWELL:

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

A I am David H. Rainey, employed by El Paso Natural Gas Company as Administrative Assistant in the Proration Department in El Paso.

Q You have testified as to your professional qualifications, and they are a matter of record with this Commission?

A Yes, sir, that is correct.

MR. HOWELL: Are they acceptable?

MR. PORTER: Yes, sir.

Q (BY MR. HOWELL) Mr. Rainey, in the interests of conserving time I am going to suggest that you start off and, on the basis of the testimony that has been introduced in the record in this case, you can add such comments from your own studies and such conclusions as you have drawn from your studies, and from the testimony in this case, with reference to the basic issue in the case, which is where should these four wells, which have been designated as critical wells, be placed in order to achieve the most equitable results in prorating.

A First, let me state that I agree insofar as I have studied their Exhibits, with Mr. Thornton and Mr. Eaton, in the testimony that they presented yesterday and earlier today. It appears to me relatively conclusive that there is considerable doubt from Mr. Thornton's Exhibits as to whether or not the Devils Fork producing interval is producing in the so-called four critical wells. In addition to that data solely on the geological basis, in addition to that, it is a little hard for me to make some of the assumptions

some of the witnesses have been requested to make today, in assuming that all of the gas coming from these four wells is coming from the Devils Fork pay interval. It would appear to me that any reservoir, such as the Escrito, which is producing oil and gas, that a substantial portion of the gas which is being produced must, of necessity, be coming from production with the oil, and I don't think there has been any argument whatsoever the oil is coming from the two lower sands in this interval, that a substantial portion of the gas must, of necessity, be produced with the oil and in association with the oil because of the reduction of pressure in the area around these wells, and the normal increase in gas-oil ratios which these wells have experienced.

I might elaborate on the business about gas-oil ratios. There has been considerable discussion, 30,000 to 1, 60,000 to 1, gas-oil ratio in some of these wells in the critical area. In wells of this kind, where oil productivity has declined very rapidly, is very low, in the neighborhood of 1, 2, 3 barrels, it is obvious with the same amount of gas production very little change in the measured volume of oil production will make a substantial change in the calculated gas-oil ratio, and I think that is pointed out particularly in this Standard 4-26 Well, which I believe on Mr. Jameson's Exhibit showed to have a ratio of only about 30,000 to 1, although it came in initially with 60,000 to 1, and has been producing with a high ratio throughout its history. That well is only producing about a barrel or barrel and a half, or two barrels of oil a day, and if the

operator, in calculating, rounded off the barrels he measured in his tanks in any degree whatsoever, it is going to make a substantial change in the calculated ratio. So I think it is apparent all four of these wells are gas wells under the terms of definitions of gas wells under the rules proposed by Val Reese and Associates. Incidentally, I might add, we subscribe completely to those rules and believe they are proper in the Escrito-Gallup Pool. It is also a little hard for me to believe there is too much communication, if any, between the so-called Devils Fork area and the Escrito area in these four critical wells when you look at the fact that there is a 24° difference in oil gravity, or high grade hydrocarbon gravity in that space of a half a mile between two wells, and that there is at least 100 pounds pressure differential and possibly more between the Devils Fork area and the Escrito area. How, if there is substantial production or any production at all coming from the Devils Fork pay interval in the Escrito wells, or the four critical wells, is it that the pressure is not also in communication, and we don't have considerably more evidence of higher pressures in these four critical wells, and if there is communication between areas, it would appear to me that the liquid hydrocarbon gravity should be much more nearly the same, particularly as I say, in view of the fact there is an acknowledged pressure differential of some kind between the two areas.

As other evidence of the fact that substantial portion, if not all of the gas production in these four wells must, of neces-

sity, be coming from the Escrito interval rather than the Devils Fork interval, I would like to direct your attention to the Reese No. 1-30 Sperling Well, which is the Easternmost well in which, in a period of approximately one year, I believe, 12-28-59, something less than a year, with an initial potential of 242 barrels of oil and 3,080 gas-oil ratio, which was a production of gas of approximately 750 MCF, that within less than a year that well has declined in productivity to, as I understand it, about 17 barrels of oil, 25 barrels of oil; declined markedly, at the same time the oil production has declined although the gas-oil ratio has gone up substantially, the actual production of gas has declined to something in the neighborhood of 340 MCF per day, more than a fifty percent decline, and that decline in gas production, along with the decline in oil production, indicates pretty conclusively to me that a substantial portion of the gas being produced must be coming from the same zones that are producing the oil and not from some extraneous source, or the Devils Fork zone, which should have kept the production of gas from declining.

Now, there has been some question as to the effect on the volumetric equivalent formula in the Devils Fork Pool if these four wells are added to the acreage dedicated in the Devils Fork Pool. Actually, as a gas operator, if we look at it purely from a selfish standpoint, El Paso should probably welcome the addition of these four wells to the Pool. As a gas operator, we would be assigned, with a relatively high deliverability well in the Devils Fork, we

would be assigned a relatively substantial portion of the underages that would accrue to the Sperling Well and Standard Oil of Texas' 4-26 which we know are not capable of producing a volumetric equivalent. El Paso, as a gas operator, would be assigned portions of that under-production, so from a purely selfish standpoint we ought to be tickled to have them added in there.

I would like to go on with Mr. Eaton's testimony, with the principle and the formula established in the Devils Fork Pool. If these wells are added, and are not producing from the Devils Fork interval or even assume they are producing from the Devils Fork interval, it is obvious to me there is very little production, or any, percentage-wise, coming from Devils Fork interval, the assignment of the extra gas allowable to the so-called fairway part of the Devils Fork field will accentuate any possible migration of that oil in the oil zone up dip because the wells will be producing substantially more than a per well volumetric equivalent. Bearing in mind that actually the basis of the volumetric formula is to equate the oil area with the gas area, there are going to be wells in close proximity to the gas-oil contact that will be getting substantially more than a per well volumetric equivalent, which would tend to accentuate any movement of the gas-oil contact and, I think, all the operators in the Pool, and I am sure the Commission feels the volumetric formula should be at least given an opportunity to be shown whether or not it works or not, We are confident that, scientifically, it is sound, and the formula should work, and I don't think the abandon-

ment of such a formula at this stage of the game, when it has only been in operation for half a month actually, is going to achieve anything than convince people that most of us thought we made a mistake in the first place and should never have done it at the outset. So El Paso's position is that the wells are very definitely and have been shown to date to be very definitely not in the Devils Fork Pool. If there is any production whatever coming from the Devils Fork interval it is very insignificant with respect to the total production of gas from the Devils Fork Pool. Consequently, leaving these wells out will have very little effect on the operation of the volumetric equivalent formula even if there is some portion of the gas being produced from that Devils Fork interval in these wells.

I jotted down some notes during the course of the hearing, and I think I have just about covered everything I can think of, offhand, that has been presented here today and yesterday.

MR. HOWELL: That is all.

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Rainey, taking everything you have said there as correct, insofar as the effect on the volumetric formula of placing these wells in the Devils Fork Pool, taking all that as correct, what happens if you have additional drilling and the wells are perforated in the so-called Devils Fork interval and they are top allowable wells, and you still do not know where the production is coming from, whether it is from the Escrito or the Devils Fork inter-

val, then isn't it true that you don't have this insignificant effect?

A Mr. Payne, I don't, personally, believe that we are going to encounter any areas where the so-called Devils Fork interval is productive in substantially enough quantities that it is not going to be pretty apparent the greatest production is coming from that interval. It has been shown on all the Exhibits, all the cross sections that show both the Devils Fork interval and the Escrito interval, that the greatest part of the Escrito producing interval, which are the lower sand zones, are not even present, for the most part, in the main part of the Devils Fork pay. Consequently, I don't think up in the main part of the Devils Fork Field, or even down along these edges that you are going to encounter any substantial dry gas production, as it were, unless that is the whole bulk of the production. I don't believe there is going to be much of the Devils Fork and Escrito intervals occurring in the same well bore where it is not going to be pretty apparent that one or the other is contributing the substantial part of the production. In other words, the Escrito is basically an oil pool. The gravity of the crude, or the gravity of the liquid hydrocarbons in all the Escrito wells is in the neighborhood of 40°, whereas the gravity of the liquids in the Devils Fork, in the areas where there is contact or close association between the Escrito and Devils Fork Pool is in the neighborhood of 60° to 70°. I don't think there is going to be any question when an operator hit that interval, which he is in.

Q Do you think Section 25 and perhaps Section 30 are in this critical area; do you think that acreage in there is likely to be productive of Escrito oil?

A I think it is producing Escrito oil right now.

Q I mean the undrilled acreage?

A I think it is quite possible you can drill anywhere in through here, and you may get a very high ratio well, but I think it is going to produce that 40° gravity crude. You may get a higher ratio well classified as a gas well.

Q Isn't the Devils Fork sand, or shale, isn't that also present in those two sections?

A Yes, sir. I think so, but I don't think it is productive, or in insignificant amounts.

Q How can you say that when it hasn't been drilled?

A Based on the cross sections and evidence presented. I can't say definitely.

Q But you feel if there is additional development you will be able to tell which pool the majority of the production is coming from?

A I think all the operators who have testified today, the operators that have leases and wells in the areas in question here today, have all agreed that it is not too much of a problem to determine whether you have an Escrito or Devils Fork Well.

Q If El Paso had some acreage in here and management had already decided to drill it, would you, as an engineer, recommend to

them, in the interest of obtaining data, they take drillstem tests of wells drilled?

A Yes, if we had acreage it would be advantageous. I don't think we would drill in the first place, but if we did.

BY MR. ARNOLD:

Q In developing the Devils Fork Gas Field, do you start toward the edge of the sand bar?

A Southwest edge?

Q Any edge, preferably one where you wouldn't have the complication of another sand bar immediately beneath it, where it is just merely going to shale, and you are probably going to reach a point where you drill wells which produce, as you were saying, insignificant amounts of gas.

A Yes, sir.

Q Where there would be no question that the gas is coming from the Devils Fork reservoir?

A Yes, sir.

Q In cases of that kind, do you think this acreage should be deleted from the Devils Fork Pool because of the fact that the gas production is insignificant?

A No, sir. I think, though, that in cases of that kind it would probably be incumbent upon the operator to show that if he wanted to dedicate 320 acres, that the entire 320 acres should be presumed to be productive of gas. I think in the area, before your next question comes up, in the area where you have the gas wells in

contact with the oil wells in the Devils Fork you have to be reasonable about it and assume you can dedicate 320 acres and 80 acres to oil offsetting each other, even though there has been considerable discussion about this in past hearings, it may be not the entire 320 acres is productive exclusively of gas, or the entire 80 acres in the oil well productive exclusively of oil.

Q I intended to question you about the insignificant production of gas wells in this Pool, because I seem to get the impression you thought when the gas production in this zone becomes insignificant that it would, in some way, be better to delete the area from the Devils Fork Pool because of the operation of the volumetric formula?

A No, sir. The point I was attempting to make there was, in the wells, the four critical wells we had been discussing, that any gas production coming from those four wells, from the Devils Fork interval, if any, is very insignificant with respect to the total volume of other gas and oil being produced from those wells, and that by adding these wells to the Devils Fork Pool you come a whole lot nearer destroying the effectiveness of the volumetric formula by adding the extra oil and gas coming from the Escrito interval to that formula than you do by hurting the formula by leaving the small, insignificant quantities of gas out of it.

Q Doesn't the inequity there arise from the fact that you redistribute an allowable back to wells that can make it; how does the Escrito oil and gas production necessarily affect it?

A Because that is being counted as part of the volumetric withdrawal from the so-called gas area, and while it is not in wells of the kind of productivity we have right here, it is not substantially significant, there is still a considerable volume of reservoir voidage, which must be attributed to the gas and oil being produced from the Escrito interval which clouds the picture and distorts the results of the application of the volumetric formula.

BY MR. KENDRICK:

Q Mr. Rainey, you refer to the change in the gravities of the liquids in a short distance. Is the gravity of the liquids in there determined by the structural position of the well, or the cleanliness of the sand, or just what would determine the lighter color, or lighter gravity of the liquids?

A That I don't know, Mr. Kendrick. I haven't actually seen any analyses of the liquid itself. The point I was making was, I don't believe there is any particular communication between the liquids produced in the Devils Fork and the liquids produced in the Escrito area. If there were any of the so-called condensates being produced in the Escrito area, it would appear to me, since most of the rest of the crude in the Escrito area is within one or two degrees of that encountered in these four critical wells, that is not an abnormal gravity of crude for the entire Escrito area. If there was any of the condensate being produced in the Devils Fork area also being produced in the area of the four critical wells, the gravity should be much different than the average gravity for the

entire Escrito Pool. That is the point I was trying to make.

Q Are you familiar with any well in the Devils Fork Pool that produces dry gas without liquids?

A I am not that familiar with them, Mr. Kendrick, as individual wells. There may be some, but I doubt it. I think all of the Devils Fork area is probably now below the point so you have retrograde condensation of that liquid out.

Q If that dry gas of the Devils Fork sand were produced with crude oil from the Escrito sand, would there be any change in the crude oil liquid gravity?

A Not necessarily, but I think you would probably expect something different than the 40° gravity we have. It wouldn't necessarily follow, no, sir.

Q Is the crude oil in the Devils Fork sand a gravity approximating 40°?

A I think it is possible. I have never actually seen an analysis of that crude, but it is my understanding, approximately 40.

Q Typically Gallup crude?

A To my understanding.

Q There could be rapid changes in the Devils Fork sand and along the Escrito?

A I don't think it is possible you are going to have a change up dip from a high gravity condensate to a relatively low gravity crude because these wells are completed in so-called gas

column of the Devils Fork, whereas this is in the oil column. We have a gas-oil contact somewhere between the McElvaney and Miller No. 1 and the McElvaney and Miller No. 1-B Well, but I can't see where just a gentle, sloping dip, how this crude can be the same as that crude coming from the same reservoir.

Q Do you agree with Mr. Eaton, the close proximity of the gas-oil contact, the gas should contain more liquids than above the contact?

A I never heard of a sharp-breaking gas-oil contact. There is nearly always a gradation feature.

Q If these four wells are in the gas cap area of the Escrito Pool, should they not be producing considerably lighter liquids since they are producing liquids from the gas cap area along with crude oil?

A Not necessarily, because those wells are probably, obviously, since most of them had substantial oil production to start with, completed to a considerable extent in the oil column of the Escrito Pool. I think the only reason for the gas cap is that this reservoir is way below the bubble point at this time. The gas is bubbling, there may not be any free gas cap under initial conditions.

Q This is a created gas cap instead of the existing gas cap?

A Possibly so. Without a reservoir fluid analysis it is impossible to tell. I think it is the reason you don't have a high gravity condensate from those wells as you do in the Devils Fork area.

MR. PORTER: Witness may be excused.

MR. HOWELL: That is all our testimony, Mr. Commissioner.

MR. PAYNE: At this time I would like to call Mr. Arnold.

(Short recess.)

MR. PORTER: Hearing will come to order. The witness will stand and be sworn, please.

(Witness sworn.)

E. C. ARNOLD

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

DIRECT EXAMINATION

BY MR. PAYNE:

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

A E. C. Arnold, New Mexico Oil Conservation Commission, Supervisor, District III.

Q Mr. Arnold, in your capacity with the Oil Conservation Commission, have you made a study of the general area involved in this case?

A Yes.

Q In that connection, have you prepared cross sections using various electric logs?

A Yes, I have.

Q Would you refer now to Pan American's Exhibit Number 1 and show the Commission by their area map what these cross sections

take in?

A Cross section A-Prime of the Southwest-Northeast cross section, which is approximately four and a half miles long and which crosses the area where the Devils Fork and Escrito Pools have originally been separated.

Q Is that your A-A Prime cross section?

A Runs from Southwest to Northeast, that's right. Section B-B Prime is a West to East cross section, approximately six miles long. It also traverses the area of the Escrito, Northwest end of the Escrito Field and a large portion of the Devils Fork Field.

Q What scale did you use?

A The vertical scale on the cross section, one inch is equal to twenty feet; horizontal, approximately one foot equals one mile.

Q Is the marker the same as used by Pan American and other witnesses?

A That's right. It is strictly a stratigraphic correlation. These sections are hung on this marker in the lower Gallup which was used, I believe, on all the cross sections presented in the previous testimony.

Q These do not reflect structure?

A That's right.

Q Would you please explain to the Commission what these cross sections depict, in your opinion?

A These cross sections depict the Gallup formation in the Escrito, Devils Fork area. Actually, to review a minute, I think I

might go into the problem of why I made a cross section. In the first place, as you know, and it has been testified to today, the Devils Fork-Gallup Field in the Northeast end of this area is a gas cap. The Escrito Pool to the Southwest was originally developed as an oil field in the Gallup formation. By a previous hearing these two areas were separated, and it was granted by the Commission that the main producing sands in these two fields were separate. However, later it developed that there were four wells which have been referred to earlier today which developed abnormally high gas-oil ratios in the Escrito Pool. Therefore, it became necessary to account for the fact that these ratios were abnormally high. Either we had encountered a gas cap in the Escrito sand or perhaps the Devils Fork sand was producing gas in the Escrito area. We, therefore, constructed cross sections to determine whether or not there was an overlap of the two sands. The cross sections indicate that there is an overlap of the Devils Fork pay zone in the Escrito pay zone.

Q The Escrito, is it green, and the red the Devils Fork?

A That's right. Actually, I don't believe that there is any argument about this correlation. This is exactly the same correlation Mr. Thornton arrived at on his Exhibits. The only difference is the interpretation of permeability in the Devils Fork sand in the area where it overlies the Escrito sand. The permeability, I have determined from a spontaneous potential curve on these electric logs--actually, I don't believe that anybody in the hearing to-

day has testified that these zones were really separate. That would be the only positive way of determining whether or not gas is coming from that sand. In the absence of cores or tests about the only thing we can use to determine relative permeability is the electric log. I believe Mr. Thornton showed that on one of his sections, between two wells.

Q Which two?

A I don't remember which two wells offhand. I don't believe that is important. There was a migration from sandstone to shale. On the electric log the shale line, or line of practically zero permeability is this line. Any deflection of this spontaneous potential curve indicates permeability and sandstone. Actually, that is why you do get a deflection, because that particular sand is exhibiting permeability. Therefore, it is clear that in the portion of the Escrito Field there is an overlap of the Devils Fork producing zone and from the evidence which I have studied I see no reason for presenting that this section would not be producing gas, and it is producing gas in the Devils Fork Field. In other words, I simply do not see the possibility where you would draw the line to say you no longer have effective permeability. This is the zero permeability line.

Q The relatively straight line?

A That's right, to the Devils Fork Field, where we have no argument about permeability, this is the zero line. This is maximum permeability. If we go into the Escrito area, that is the scale

line, that is maximum permeability. Obviously, this sand is inferior in the Escrito area to the Devils Fork sand in the Devils Fork area.

MR. ERREBO: I want to identify that one well he has been speaking of. That well is the Killarney 1-24, Unit K of 24, 24, Range 7 West.

A Actually, if would be helpful I will read all these logs, because I was trying to save time.

Q (BY MR. PAYNE) I think, perhaps, you should read them all, Mr. Arnold. Exhibit Number 1--

A This is the Southwest end of the Section. The first well is Pan American's Zanapti 1, C-34, 24, Southern; Standard of Texas 1-27 No. 1, Unit O of 27, 24, 7; next, Standard of Texas Federal 4-26 No. 1 in G of 26, 24, 7. Next is Val Reese's Mesa 1-25 in Unit D of 25, 24, 7; next, Killarney 1-24, Killarney NK of 24, 24, 7; next, Val Reese's Lybrook 1-19, C of 19, 24, 6; next, Redfern and Herd Largo Spur 1-J of 18, 24, 6; finally, the Skelly New Mexico Federal D-1 in F of 18, 24, 7.

I have also drawn on this Section the original position of the Escrito-Devils Fork Pool boundary and also the boundary of the Escrito Pool as it was set out in Order R-1793. That pool boundary was retracted to here, and these wells were then prorated in the Devils Fork Pool. One thing I would like to point out further on this Section, which I think substantiates the fact that this sand is contributing gas in this area, is the fact that you have a very sharp decline in gas-oil ratio between the Standard of Texas 4-26, 1,

and the Standard of Texas Federal 1-27, and you will notice the Devils Fork sand has completely lost all its permeability in the Federal 1-27 Well. At the same time, the ratio drops sharply. This indicates to me the possibility that gas which was being contributed in this well is no longer being contributed in this well, and the total production here is coming from the Escrito pay section, Section B-B Prime.

Q Exhibit 2, Mr. Arnold.

A Exhibit 2 is a West to East Section, and about all this Section shows is that the Devils Fork sand does pinch out very rapidly, going to the Northwest. Excuse me, in fact, the last well over on the Escrito side in which you find any Devils Fork sand whatsoever is the Pan American Dashko 1, and it has a fairly poorly developed sand section, both in the Escrito Pool and in the Devils Fork Pool. I believe that its producing history shows that it is a very poor well, therefore, the area of overlap appears to be further to the South.

Q Mr. Arnold, in your opinion, is the crux of this case dependent on a determination of where the gas produced by the four critical wells is coming from?

A Yes, I believe from testimony that is evident.

Q Now, after examining these logs and drawing your cross section, did you arrive at the conclusion that it is more probable that the gas production from these four critical wells is coming from the Devils Fork sand than from some other sand?

A I wouldn't disagree with the witnesses who have testified that there may be some gas coming from the Escrito sand. I disagree with those who testified that there could be no gas being produced in these wells from the Devils Fork sand because, based upon the evidence I have studied, as I say, the sand is present, and it appears to me from electric logs to have sufficient permeability to produce.

Q And, the electric logs are the only real data that we have to work with?

A Well, I believe in most of the testimony today there has not been any other evidence as to the permeability between the two sections from any other source.

Q And, your study of the electric logs indicates to you that the dome of permeability in the Devils Fork sand does extend throughout the area of the four critical wells and overlaps the Escrito sand?

A That is right.

Q And, are all four of these wells, Mr. Arnold, perforated in both intervals?

A The perforations are marked on the Exhibits from our records, and they are all perforated in the sand.

Q Mr. Arnold, while there are certain alternatives that the Commission could follow, regardless of where the gas is coming from, do you propose to recommend any type of an order that should be entered in this case?

A No, sir. I believe that we have had sufficient hearings

and testimony relating to both these Fields that the Commission should be able to make a wise decision without any further recommendations from me.

Q Do you have anything further you would like to present?

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

MR. PAYNE: That concludes the direct examination of this witness.

CROSS EXAMINATION

BY MR. BUELL:

Q Mr. Arnold, as I understood your testimony and Exhibits, you have restricted your study to strict geological interpretation, is that correct?

A Yes, however, I have observed producing characteristics of the well.

Q Did you cover any of those in your direct testimony? If you did, I did not hear it.

A I believe I did.

Q Would you agree with me, Mr. Arnold, that geologic study and evaluation such as you have made here is highly interpretative?

A Well, of course, when you are working on any problem you are forced to use the tools that are available.

Q I realize that, but it is highly interpretative, isn't it?

A That' right. It is a matter of interpretation.

Q Because we have seen in this hearing, from two sincere, competent geologists, a different interpretation using the same bas-

ic data of electric logs, is that not correct?

A I believe that would be true.

Q So, actually, by your testimony and Exhibits, Mr. Arnold, all you have shown is that, in your interpretation, the opportunity for communication in the Devils Fork pay exists?

A That's right. The opportunity exists and the wells are open in both zones.

Q And, if it is productive, since they are open, they are bound to be producing from where you interpret the Devils Fork pay to be?

A That's right.

Q Now, when we get that far, we see our geologic opportunity, under your interpretation, then what should we do, Mr. Arnold?

A Would you repeat the question?

Q You have shown that your interpretation, based on your subsurface evaluations, geologically speaking, the opportunity for communication exists?

A Right.

Q Now, what do we do, where do we go to confirm this highly interpretative interpretation?

A Well, of course, I would like to say that the possibility of communication between the two reservoirs existing was not first pointed out by geologists, but pointed out by production characteristics of the wells in the area. Suddenly, we have four wells which have abnormal gas-oil ratios. We, therefore, have to explain why

we have abnormal gas-oil ratios. We can do this by either presuming that we have discovered a gas cap in the Escrito, or that there is an overlap of the Devils Fork sand and that it is contributing gas. The more positive theory, to me, seems to be, we know that gas is produced in the Devils Fork sand adjacent to this area. We have traced the Devils Fork sand into this area. Therefore, it doesn't seem illogical to me to presume that is where the gas is coming from if that sand is open.

Q In other words, first we see our geologic opportunity for communication, then we go to other tools, engineering data, to confirm or to prove wrong our geologic interpretation; is that right, does that sound like what you just said?

A I am sure of that.

Q Do you agree with that statement, then?

A Well, I think that you finally might also have a disagreement as between geologists and engineers at times, or even between various engineers as to interpretation of data.

Q But most engineering data are factual?

A Well, some are highly argumentative.

Q Have you made an analysis of the performance of wells where this overlap exists, Mr. Arnold, to satisfy in your own mind whether they are producing anything at all from the Devils Fork pay?

A Well, it is a little difficult to identify Devils Fork gas and Escrito gas after it is produced. Both sections are open.

Q Let me direct your attention to what has been marked as

Pan American's Exhibit 3. As you recall, that is a performance data on two Standard of Texas wells, wells on which you show the overlap of the Devils Fork pay. Do you feel performance shows that these wells are producing any significant volumes of gas from Devils Fork?

A I think that this Devils Fork sand in the Escrito area is a much poorer sand than it is in the Devils Fork Pool, and for that reason would have much poorer producing characteristics.

Q Do you feel it is so poor it isn't in effective communication with what you consider the major portion of the Devils Fork pay?

A I wouldn't want to draw that conclusion based on that.

Q Look at the performance on those two Standard of Texas wells. Do you think we could shut the gas wells in Devils Fork proper, in, and deplete this reservoir through those two wells?

A Do I think you could deplete the reservoir?

Q Yes, sir, the Devils Fork pay through those two wells?

A It would take some time.

Q We would almost be speaking of geologic time?

A I wouldn't want to make a statement as to the length of time.

Q Actually, one of those wells appears to be practically depleted right now, doesn't it?

A Well, it is a characteristic of gas sands in the San Juan Basin, in general, that they sometimes show very abrupt pressure drops because of the tight nature of the sand.

Q When we talk about tight nature, don't we somehow get into

effective communication then, Mr. Arnold?

A What do you mean by effective communication?

Q Well, here's what I mean: I can't believe that a well, Standard of Texas 4-26, you could open that well to the utmost and it will only produce 61 MCF of gas; I can't see how that well could be getting any gas at all from the Devils Fork pay.

A If the Devils Fork pay is where the 61 MCF is coming from, then it is getting gas from the Devils Fork pay regardless of how slow it is getting it.

Q And, do you feel, assuming you are right, with the character of the pay in that well, do you feel it is reflected by only producing 60 MCF's a day; do you feel it is in effective communication with Devils Fork pay proper?

A I think the Devils Fork sand in the area of these three wells has such permeability to produce gas and, actually, as you go from this area back toward the Devils Fork Pool, permeability probably should improve as you go towards the better sand.

Q As another measure of effective communication pressure?

A Yes, that is an indication.

Q Before we leave this area, Mr. Arnold, how would you account for the pressure disparity that exists in this common reservoir as reflected by your Exhibit?

A I haven't, on direct testimony, testified to any pressures. Actually, I think you have to be rather careful with pressure information, particularly in tight gas sands. The reason I say that is,

you have a very slow stabilization rate. We have some gas wells in the San Juan Basin which they have shut-in on pressure build-up which will build up over a two-year period. Actually, we find this on wells which we certainly consider to be good economic wells at the time, with the type sand as you produce the gas. It simply takes quite a long period of time for the gas to move again to the well bore, so that sometimes in measuring shut-in pressures you are not actually measuring the reservoir pressure; you are measuring some portion of it.

Q But that doesn't cause you any concern with the pressure data that we have here, does it, Mr. Arnold? Let me give you a specific example. On the Mesa 1-25, 1697, do you feel that is not a built-up pressure?

A Well, it possibly is because I don't believe that well has had any significant production. However, also I don't know how long it took to complete the well, how much gas they blew from the well, and during completion sometimes you can lower those shut-in pressures just by the amount of gas that is allowed to escape during completion.

Q Surely on that well that has never produced an MCF of gas into the line, hasn't recovered but about 40 percent of its fracing fluid, surely you wouldn't be concerned about the reliability of that pressure from the standpoint of reflecting all the pressure from the reservoir in the area of that well?

A Before I would want to make a categorical statement on

that I would want to know a little more about the method in which the pressure was obtained and, like I say, how long it took them to complete the well.

Q In attempting to confirm your geological interpretation, did you make a study of the completion of this well and that completion pressure?

A No, I don't believe so.

Q Then we have to more or less accept it at its face value, do we not?

A I suppose.

Q I wish you would account for me, and just assume it is an accurate pressure, the difference of 1697 and some 1800 pounds up in Devils Fork?

A Actually, we have common reservoirs in the San Juan Basin which exhibit much more pressure differential than that in what we consider common gas reservoirs.

Q Isn't that due to the cumulative production from the individual area where you have this disparity?

A Well, that disparity, I think, sometimes is related to how tight individual sands are in individual wells more than anything else. Like I say, a very permeable sand will get its pressure very fast.

Q True, but you are getting back again to build-up, and here I said, assume that is accurate, which we sincerely think it is, and assume that it is accurate and completely built-up, I want you to

account for me how this 100 pound differential could exist if this well is in effective communication with these?

A Well, I would prefer not to use your pressure information.

Q I asked you to assume it was accurate.

A I wasn't assuming that it was inaccurate. I simply didn't testify to it.

Q But I am simply asking you, for the purpose of this question, to assume that pressure is accurate; then I want you to account for me, if you can, why, if they are in effective communication, we would have that pressure differential?

A And if they both represent exact reservoir pressure?

Q Yes, sir, that is the assumption.

A As you say, it would be hard to account for a hundred pound differential in a reservoir which had real good communication.

Q Actually, if these are accurate data, it confirms separation, doesn't it, Mr. Arnold?

A It confirms the fact that it is a very tight sand in that direction. I wouldn't say it confirms separation completely.

Q Even if it is tight, how can you account for this hundred pounds difference; the only way you can account for it is by saying this well is not in communication with these.

A All right, based upon the assumption you are making.

Q Your uppermost Exhibit, Mr. Arnold, which one is that?

A Number 2.

Q What is the name of the well to the left that has pink

and green in it?

A That is Pan American Dashko No. 1.

Q Is that well open in what you have shown as pink there?

A Yes, sir, I believe it is.

Q I believe you testified on direct testimony this entire sand section is very poor, I think?

A Yes, sir.

Q But, you show the Devils Fork pay under your interpretation as being productive in that well?

A I don't necessarily show it as being productive, although it is present, and it is a sandstone.

Q Do you feel it is or is not productive, Mr. Arnold?

A I feel it is possible it is contributing some gas.

Q If it is productive it would be productive of what, from the Devils Fork pay?

A Of gas.

Q In other words, its structural position is such that if any hydrocarbons are coming out of the Devils Fork interval it would have to be gas, right?

A I believe that is correct.

Q Have you analyzed the performance of that well, Mr. Arnold, to confirm your interpretation that the Devils Fork pay is productive?

A No, I have not analyzed in detail the production history on that well, except I know it is a very poor well, doesn't produce very much oil or very much gas either.

Q Now, I will hand you what has been marked as Pan American's Exhibit Number 4, which is a tabulation of well tests on that well over a period of time. Would you read for the record the data reflected on that?

A On 6/8/58, first gas-oil ratio test, gas-oil, produced 20 barrels of oil, ratio 28, 30 to 1; 9/25/60 it produced 5.33 barrels of oil, ratio, 2400 to 1.

Q What these data reflect is that well, after production, the gas-oil ratio increased up to a point, it is now declining; is that correct?

A Yes, that appears to be correct.

Q Do these data indicate to you, Mr. Arnold, that the Devils Fork interval is contributing much, if anything, to the production of that well?

A I don't believe I testified that I think the Devils Fork sand is.

Q Do you think any significant volumes of gas is coming out of the interval that you correlated as Devils Fork and Escrito wells, any significant volume of Devils Fork gas?

A Well, there again, I don't know what your definition of significant is. I don't believe these are prolific gas producers.

Q Do you feel that they are producing a substantial enough volume to offset the volumetric formula in the Devils Fork Field, assuming that your interpretation is correct?

A Actually, the way I feel about that whole problem is that

if we set up a volumetric formula to use in a pool, and in order for this formula to work we have to take into consideration all the oil and all the gas in that reservoir, therefore, I don't feel that we should arrive at a system whereby we then start deleting some of this reservoir simply because it is not producing a significant amount of gas.

Q But I am talking about our circumstances here. I am sure you will agree with me that sincere and conscientious and competent people disagree with you that this interval is producing any Devils Fork gas in these wells; in other words, we have a different interpretation. Do you feel that the hazard for the Commission--and it is their decision--do you figure the hazard would be greater if these wells were placed in Devils Fork, or do you feel the hazard would be greater if these wells were continued to be prorated in Escrito? Let me rephrase it.

A I think I understand the point that you wish to make there.

Q I was trying to get around to ask you whether you agree with Mr. Eaton and Mr. Rainey, the safest, most conservative action of the Commission in this matter is to leave these wells in Escrito?

A If I am wrong, and there is no Devils Fork gas being produced in the area of these three or four wells, then we would have an inequity by prorating them into the Devils Fork Field because of the fact that, in the first place, they could not make a Devils Fork allowable. The allowable would be redistributed into the Devils Fork area where the wells could make it, so I think it would be im-

proper to prorate these wells in Devils Fork if they were not in Devils Fork.

Q And, it would not only create an inequity but, due to the redistribution of the allowable, could also cause waste, couldn't it, Mr. Arnold?

A It could cause disproportionate amounts of gas to be produced in the volumetric formula.

Q It could cause waste, couldn't it, because then your Devils Fork gas wells would be producing a disproportionately higher volume than the oil wells?

A That's right. I would certainly agree that it would not be right to prorate any gas under the Devils Fork formula which is not in the Devils Fork reservoir.

Q We have analyzed the hazards of putting these wells in Devils Fork, and we found it could not only cause an inequity, it could also cause waste, assuming you are wrong. Let's assume that you are right and we are wrong, but we leave the wells in Escrito. What happens then; can waste be caused?

A Well, gas will be produced in this area then which will not be accounted for under the volumetric formula so that we certainly will be inaccurate to that extent.

Q But we know, from the characteristics of these wells, three of them, at least, they can't even make the volumetric allowable they would get, so that is not going to cause any harm?

A It will still be gas produced which is not accounted for

on the formula.

Q Could that cause waste, since it would be a lesser volume than their volumetric allowable, it can't cause waste?

A I wouldn't think it would cause waste.

Q If anything, it would result in the expansion of the gas cap. It might violate correlative rights, true, but it couldn't cause waste?

A You have testified to that, I won't have to.

Q So we see, then, Mr. Arnold, if you were wrong and we placed these wells in Devils Fork, we will cause inequity and also possibly cause waste. If you are right and we leave the wells in Escrito there may be a little inequity, but certainly no waste. So under those hypotheses wouldn't you say the safest, most conservative decision for this Commission to make is to leave those wells in Escrito?

A Possibly the safest and most conservative; I am not sure it would be the most correct.

MR. BUELL: That is all.

MR. PORTER: Anyone else have a question?

REDIRECT EXAMINATION

BY MR. PAYNE:

Q Mr. Arnold, Mr. Buell has made reference to Pan American's Exhibit 3, I believe it is, showing the so-called rapid decline in the Standard of Texas wells. Do you recall the testimony of Mr. Jameson that, in his opinion, these wells could be reworked and the

producing ability of these wells could be considerably improved; do you recall that?

A Yes, I believe I recall that.

Q It is a distinct possibility, too, inasmuch as he works for the Company who owns half of one of these wells he should be in a position to know something about it?

A Yes.

Q Wouldn't this also change the so-called insignificant amounts of gas if the reworking of these wells does prove to be effective and the producing capacity is increased?

A Yes, that is possible.

Q Now, incidentally, did you study the Reeve's Exhibit Number 4 showing the area, or the interval, from which they feel that the production is coming from in these wells; the one where they had the dotted interval?

A Yes, I did.

Q Did that Exhibit show that the Devils Fork sand is considered productive by Val Reese and Associates?

A I believe that you might get that impression from looking at his Exhibit.

Q It showed the Devils Fork sand with permeability in the area of the critical wells, did it not?

A Yes.

Q Now, Mr. Buell has asked you some questions concerning pressure information. I believe the figure in the Devils Fork was

1800, was that right?

MR. BUELL: A little over 1800.

Q (BY MR. PAYNE) Would you examine Reese Exhibit Number 5-D, and state what the initial bottomhole pressure is on the Standard 1-26 well and the Sperling 1-30 well?

A Initial bottomhole pressure on the Standard 4-26 is 1842 pounds, and on the Reese 1-30 Sperling well, initial pressure is 1842.

Q That is not significantly different from the pressure encountered in the Devils Fork Pool, is it?

A I don't believe it is.

Q Mr. Arnold, insofar as your testimony is concerned, all that you have attempted to point out is that there is a reasonable probablility that this gas is coming from the Devils Fork sand in these four wells; isn't that correct?

A That is correct.

Q You haven't made any recommendation to the Commission as to what is the safest route to follow, or the more orderly, or the best route to prevent waste or protect correlative rights?

A No, I didn't testify to that.

Q All you propose to do is tell the Commission where you think it is more logical the gas is coming from and then let them decide which is the more logical and practical route to follow, is that right?

A I would like to make a general observation as far as the

Gallup formation in general is concerned.

Q All right.

A It seems to me to be somewhat of an impractical approach to this problem to, on the one hand, accept as a vertical limit of the Gallup formation a 300-foot section, and presume that any sandstone which develops in this 300-foot section is within the vertical limits of the Gallup formation and, in effect, in that pool, and then to devise a set of producing rules which require us, then, to come up with lateral separation based upon a one or two-foot shale break in areas where sandstones overlap. That, of course, is what brought on this problem, the fact that we have one producing formula in one reservoir and another producing formula in another reservoir. Actually, if they were both prorated under the same formula then it wouldn't be necessary to continually be drawing and re-drawing pool boundaries.

Q And, it is possible you might have to draw these boundaries laterally for three or more Gallup pools which overlap each other, is it not, for the wells perforated in each of the intervals?

A That's right.

Q It is possible you would have all three or four of the pools prorated differently?

A Then when you further have to determine the pool boundary on the basis of whether production at a given point is significant or insignificant, this gets rather difficult from the Commission's standpoint in determining pool boundaries.

Q It also creates a problem, doesn't it, Mr. Arnold, in determining what pool a particular well should be placed in?

A That's right.

Q MR. PAYNE: That is all.

MR. BUELL: May I clear up the record with a couple of questions?

MR. PORTER: Surely.

RECROSS EXAMINATION

BY MR. BUELL:

Q Mr. Arnold, Mr. Payne referred you to bottomhole pressure figures on a couple of Val Reese Exhibits, both of which showed 1842?

A Yes, sir.

Q Do you recall Mr. Jameson's testimony where he said that pressure was taken from a well on the extreme West side, and he used it because he did not have an original pressure on those two wells?

A I did not recall that he said that.

MR. BUELL: Where is that well, Mr. Jameson?

MR. JAMESON: It was the No. 2 Colleen in Section 17.

MR. HOWELL: I think we can clear the record up. Let's just put Mr. Jameson back on.

MR. BUELL: I don't think we will need to. The record shows he testified that this was the pressure he had to use because he didn't have any original pressure on these wells.

Q (BY MR. BUELL) Mr. Arnold, would you look at Pan American's Exhibit 1. That pressure was on one of the wells in that area. In

your engineering opinion could it have any effect on the pressure analysis you were making on the other end of the Field here? See, that pressure was taken on a well on the extreme West end.

A Are you saying do I admit this pressure is incorrect insofar as--

Q Comparing it with the pressure in the Devils Fork gas area, you might as well have a pressure from the Bisti-Gallup Field.

A I agree you should have pressures from the individual wells you are talking about.

Q We don't even know when that pressure was taken, do we, and we come back, we are comparing 1697 in the Mesa 1-25 with 1800 in Devils Fork-Gallup gas pool?

A I will agree we have come back to that.

REDIRECT EXAMINATION

BY MR. PAYNE:

Q Mr. Arnold, in your opinion, has the pressure information presented here today established anything at all inasmuch as the build-up times were different, the areas were different, and so forth?

A I believe I have testified I would prefer not to use that pressure information to draw conclusions of my own because I don't know those things.

Q Isn't it true, Mr. Arnold, that the applicant must have, in good faith, felt that the pressures depicted on his Exhibit were fairly accurate or he would not have used it?

MR. HOWELL: If the Commission please, that is a leading question to his own witness, and it is argumentative, has to do with someone else's testimony and the state of mind of another person, and we object to it.

MR. PAYNE: This is an Exhibit, was entered in the case to prove reserves. Now, certainly no applicant is going to introduce any Exhibit unless he feels the information depicted thereon is accurate, so I am simply asking the witness if he doesn't think it is reasonable to assume that this must be a reasonable pressure to use, or it would have been left off the Exhibit entirely.

MR. BUELL: I don't believe the Commission has ruled, and I would like to make a brief statement in argument. This pressure was qualified by the witness as being the virgin pressure, the discovery pressure in the Escrito-Gallup Pool. If you use it on that basis it is more evidence to show that Devils Fork and Escrito are, in fact, separate. The virgin pressure, the discovery pressure in Devils Fork was over 2,000.

MR. PAYNE: Are you testifying to these things?

MR. BUELL: No, I am arguing.

THE WITNESS: I actually believe I could answer that question in such a way as to resolve the argument.

MR. PAYNE: I believe Mr. Howell has an objection pending, so don't answer.

MR. PORTER: The Commission will sustain your objection, Mr. Howell. Does the objection conclude your questioning?

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case up much better than I can.

MR. HOWELL: May it please the Commission, I would like to make two comments upon the testimony of the circumstances in this case. The first comment is with reference to the contribution which the Devils Fork pay may or may not make in, I believe, a total of four wells. I am reminded of the days when I used to work on the Community Chest and there was a man, we will call him Buell, we will call him Charlie Buell. He was a pretty good contributor. He always pledged $1500.00 and he paid $50.00 along with the pledge, but it didn't affect the operations of the Community Chest much because he never paid $1450.00 on the rest of the pledge, and it seems to me that the evidence conclusively shows that the Devils Fork sand in the area which the critical wells are located in is a little bit like Charlie Buell was. It may make a promise, but it hasn't paid out anything.

Furthermore, it seems to me this is an unusual case before this Commission in that there are no operators in disagreement about what should be done. There is no quarrel whatsoever among the operators. It reminds me a little bit of a situation in which a group of people in one town, living together, and they are getting along all right, but a doctor comes along and says, "You should take some medicine here because there are some people over in another town there that are needing it. It will be good for you to take." We are in a position of not feeling that we need anything other than to leave the wells in the Escrito, as they were before the hearing.

The operators seem to have been able to resolve their difficulties, if there were any, in this Pool without any controversy among themselves.

MR. ERREBO: May it please the Commission, when this application was originally filed it was for 80-acre spacing and 320-acre gas well spacing, the 80 being for oil. Now, I just want to remind the Commission and ask you to reconsider that that application is still before the Commission. We certainly did present it to you, and we don't want it to get lost in all of the controversy which has come down upon us, which was a result of that application. It was a basic application for rules and regulations and I just want to call it to your attention again at this time because the testimony in the record is not controverted on the drainage question, and it was only briefly brought before the Commission in these one and a half days of testimony.

MR. BUELL: I formally offer our Exhibit 4 before you adjourn.

MR. PORTER: Without objection Pan American's Exhibit No. 4 will be admitted to the record.

Mr. Payne, do you have a statement?

MR. PAYNE: Well, I didn't, but now you mention it I might say, simply because the operators in a Pool are in agreement on a proration formula does not mean the Commission should necessarily adopt that formula. What this Commission should do is determine, on the basis of all the evidence, on all of the records, which for-

mula will better prevent waste and protect correlative rights.

Now, the Commission's staff has not actually made any recommendation in this case, nor, as a matter of fact, did we intend to. We put on some evidence so that the record would contain, not just one side, but what we think are all the facts, and then let the Commission make its own determination to what should be done, not only looking at these two pools only, but perhaps taking into consideration the precedent for the entire Gallup formation.

MR. PORTER: Anyone have anything to offer in the case? The Commission will take the case under advisement.

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RE CASE 2089 DE NOVO APPLICATION VAL R REESE ET AL INVOLVING ESCRITO GALLUP OIL POOL AND DEVILS FORK GALLUP FIELD. SPECIAL RULE 9-C OF ORDER R-1670-B DEVILS FORK GALLUP PERMITS EACH OIL WELL ON 80 ACRE UNIT TO PRODUCE AN AMOUNT OF GAS DETERMINED BY MULTIPLYING THE TOP UNIT OIL ALLOWABLE BY THE 2000 OIL-GAS RATIO AND SPECIAL RULE 13-A IN SAID ORDER PROVIDES THE TO 80 ACRE UNIT ALLOWABLE TO BE DETERMINED BY MULTIPLYING NW NORMAL UNIT ALLOWABLE BY THE 80 ACRE PROPORTIONAL DEPTH FACTOR FOR THE POOL. THE PLACING OF MARGINAL WELLS FROM ESCRITO WHERE THEY PROPERLY BELONG TO DEVILS FORK HAS THE AFFECT OF TYING GAS ALLOWABLE IN DEVILS FORK TO MARGINAL OIL WELLS THIS DISCRIMINATING MATERIALLY AGAINST THE ALLOWABLE OF GAS WELLS ALTHOUGH ALL OIL WELLS ARE ASSIGNED TOP OIL AND GAS ALLOWABLE. WE BELIEVE SAME RULE SHOULD APPLY TO GAS WELLS ON THE BASIS OF TOP OIL ALLOWABLE MULTIPLYING MAXIMUM RATIO GIVING CREDIT OF ACREAGE. IN OTHER WORDS BOTH OIL AND GAS WELLS SHOULD BE ASSIGNED TOP ALLOWABLE INSTEAD OF ASSIGNING TOP ALLOWABLE TO OIL WELLS ONLY=

GEORGE W SELINGER SKELLY OIL COMPANY=

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, JUNE PAIGE, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing was reported by me in Stenotype, and that the same was reduced to typewritten transcript under my supervision, and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

DATED this 18th day of December, 1960, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

June Paige
NOTARY PUBLIC

My Commission Expires:

May 11, 1964.

I N D E X

(Cont'd)

I N D E X (Cont'd.)

E X H I B I T S

NUMBER	EXHIBIT	IDENTIFIED	OFFERED	ADMITTED
Redfern & Herd's:				
1	Map	7	19	19
2	Cross-Section	9	19	19
3	Cross-Section w/ Samples	9	19	19
4	Cross-Section	15	19	19
Pan American's:				
1	Map	61	78	78
2	Cross-Section	64	78	78
3	Performance Chart	68	78	78
Val Reese:				
1	Map	123	146	146
2	Data Sheet	125	146	146
3	Structure Map	128	146	146
4	Cross-Section	130	146	146
5	Reserve Calculations	131	146	146
6	Chart	139	146	146
Commission:				
1	Log	179	201	201
2	Cross-Section	180	201	201

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WESTERN UNION

TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS

DL=Day Letter

NL=Night Letter

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LA047

DC063 D MDA044 DL PD=MIDLAND TEX 21 1007A CST=

NEW MEXICO OIL CONSERVATION COMMISSION=

SANTA FE NMEX=

WE WISH TO SUPPORT VAL R REESE & ASSOCIATES PROPOSED RULES IN ESCRITO POOL, RIO ARRIBA COUNTY, CASE NUMBER 2089. WE UNDERSTAND REESE WILL RECOMMEND THREE HUNDRED TWENTY ACRE GAS UNITS, EIGHT UNITS, EIGHTY ACRE OIL UNITS WITH LIMITING RATIO TWO THOUSAND TO ONE, GAS ALLOWABLE TO BE FOUR TIME LIMITING GAS PRODUCTION FROM AN OIL WELL. WE HOLD NO ACREAGE WITHIN PRESENT BOUNDARIES OF THIS POOL BUT DO HAVE UNDRILLED ACREAGE IN THE VICINITY=

REDFREN & HERD, INC BY JOHN J REDFERN JR=

1960 SEP 22 AM 10 03

MAIN OFFICE OCC

BEFORE THE
OIL CONSERVATION COMMISSION
September 21, 1960

Examiner Hearing

IN THE MATTER OF: Application of Val R. Reese & Associates, Inc. for the promulgation of special rules and regulations governing the Escrito-Gallup Oil Pool. Applicant, in the above-styled cause, seeks an order promulgating special rules and regulations governing the drilling, spacing and production of oil and gas wells in the Escrito-Gallup Pool, Rio Arriba County, New Mexico, and further, to extend said pool to include all of Section 25, Township 25 North, Range 7 West.	CASE NO. 2089

BEFORE:

Daniel S. Nutter, Examiner
Oliver E. Payne

TRANSCRIPT OF PROCEEDINGS

MR. NUTTER: The hearing will come to order.

MR. PAYNE: Case 2089, application of Val R. Reese & Associates, Inc., for the promulgation of special rules and regulations governing the Escrito-Gallup Oil Pool.

MR. ERREBO: If the Commission please, I am Burns Errebo of Modrall, Seymour, Sperling, Roehl & Harris, appearing on behalf of the Applicant.

MR. NUTTER: Any other appearances to be made in this case?

MR. KELLAHIN: Jason Kellahin, I am representing Standard Oil Company of Texas.

MR. NUTTER: Would you proceed, Mr. Errebo?

MR. ERREBO: We will have one witness.

(Witness sworn.)

LEWIS JAMESON

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

DIRECT EXAMINATION

BY MR. ERREBO:

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

A Lewis Jameson, Val R. Reese, I am a Geologist, I am Vice-president of Val R. Reese & Associates, Inc.

Q Mr. Jameson, have you ever testified before this Commission as a witness?

A Yes, I have.

Q And has your testimony been as a Geologist or engineer, or both?

A Both.

Q Actually have you received a degree in geology?

A Yes, sir, I have a BS degree in geology from Sul Ross State College in Alpine, Texas.

Q What date did you graduate with that degree?

A 1954. I went to work after graduation with Delta Drilling

Company in Tyler, Texas, and in '55 I went to work for Pacific Northwest Pipeline Corporation and later transferred to Northwest Production Corporation.

Q And after that you went to work for Val R. Reese?

A Yes, sir.

Q Since your ~~experience~~ graduation have you had occasion to do geological work?

A Yes, I have.

Q Have you had occasion to do engineering work?

A We have prepared testimony from presentations from the Texas Railroad Commission and the Federal Park Security Exchange meetings with exhibits.

Q In addition to New Mexico, has your engineering work included studies of oil and gas reservoirs?

A Yes, it has.

Q It has included economics?

A Yes, it has.

Q Are the witness' qualifications acceptable?

MR. NUTTER: Yes, sir.

Q (By Mr. Errebo) Mr. Jameson, have you made an engineering and geologic study of the Escrito-Gallup Pool with regard to well spacing, the assignment of proration units and other rules and regulations necessary for the regulation by this Commission of an oil and gas pool?

A Yes, I have.

Q And what are the recommendations which you will make to this Commission today as a result of this study? Will you just give a brief summary of them?

A My study shows that there is evidence that there will be drainage affected over an area of 80 acres on an oil well and over an area of 320 acres in the gas area. It is recommended that the ~~eliminate~~ Present GOR of 2,000 to 1 be maintained and that 30,000 to 1 ~~limit being~~ GOR limit being set ~~as~~ to distinguished between an oil well and a gas well.

Q Will you have any proposal to make with regard to an assignment of an allowable to a gas well?

A Yes, it is our recommendation that 80 acres be assigned to an oil well and ~~a gas well~~ up to 480 acre proration unit be assigned to a gas well, or that the operator be allowed to assign up to 480 acres proration units to a gas well.

Q Do the rules which you will propose this afternoon bear any resemblance to any rules which have been recently issued by this Commission?

A Yes, they are similar to the rules issued for the Angels Peak Pool.

Q Have you prepared any exhibits in connection with the study you have made?

A Yes, I have.

Q And will you refer to the exhibit which has been marked Exhibit Number 1 in this matter and explain to the Commission what it reflects?

(Whereupon, Applicant's Exhibit 1 was marked for identification.)

A Exhibit 1 is an area map showing the presently defined limits of the Escrito-Gallup Pool and the extension requested by this application which is Section 25, Township 24 North, Range 7 West. Also shown on the map are the wells and the initial potential of the wells at locations which are presently being drilled, and the cored wells are distinguished by being closed in a triangle symbol. It should be noted that in the eastern portion of the area, that is Sections 25 and 26 of Township 24 North, Range 7 West and Section 30 of 24 North, Range 6 West, they are either gas wells or wells with very high GORS.

Q Do the gas wells then seem to be found in the particular part of this pool?

A Yes, they are grouped in the eastern portion of the pool.

Q In Section 25 do you know whether there has been an actual extension of any portion of that section by act of this Commission as a result of the nomenclature hearing this month?

A Yes. The northwestern portion of that section has been now included into the limits of the Escrito Pool.

Q The northwest quarter, is that correct?

A Yes, sir.

Q You are asking for the entire section, are you not, to be included within the limits of this pool?

A That is right.

Q That would enable you to assign a north-south or east-west section, half section to that well?

A That is correct. However, since the lease that that particular well is on is the north half of that section that would be the acreage dedicated to the Number 25 well.

Q Have you made an estimate to determine approximately what percent ~~ever what~~ of that portion of the lands which are presently included in this pool and ~~of~~ are the subject of this application today are owned or controlled by Val R. Reese?

A Of the land included within the limits as shown here on Exhibit 1 Val R. Reese and Associates owns or controls 39%. If the limits are extended a mile in each direction that percentage increases slightly.

Q Do you have any further, anything further to add with regard to this exhibit?

A Yes, I might add that all the wells shown here are single completions in the Gallup formation with the exception of the Reese 1-25 Mesa Well in Section 25, 24 North, Range 7 West, and the Reese Number 1-30 Sperling Well in Section 30, Township 24 North, Range 6 West. The Compass Number 17 Federal Well in Section 7, Township 24 North, Range 7 West is a single completion in the Dakota formation as shown as a location only on the map.

Q Do you have any observations to make at this time with regard to the quality or the probability for successful dual completions generally speaking in the area under consideration today?

A Well, the attempts that have been made have been completely unsuccessful. The Number 1-25 Sperling Well and the 1-25 Mesa and 15-25 Sperling are uneconomical in the Dakota and would not pay for the addition to drill to the Dakota formation.

Q Would it be a fair statement then to say that the value of the Dakota in that area is questionable according to the information which you now have?

A Yes, it certainly would be.

Q Would you refer to your Exhibit Number 2, if you have nothing further with regard to that exhibit, and explain what that exhibit shows, please?

(Whereupon, Applicant's Exhibit Number 2 was marked for identification.)

A Exhibit Number 2 is a well data sheet of the Escrito Oil Pool, the wells are listed in order of sections, townships and range, the operator, well number, completion date, initial potential, the perforations in the Gallup, the month and year of first production, the current GOR and the cumulative production to 7/1/60 are given on the sheet. The initial potential of the wells are given on this data sheet, however, it should be pointed out that those initial potentials are not representative of the production capability of the wells at this time. There are four top unit allowable wells in the Escrito-Gallup Oil Pool, the Compass Number 1-16 well in Section 16, the Dorfman Number 1 Coleen and the Dorfman 1 Judy and the Reese Number 2-21 Connie Well

all in 24, Range 7 West.

Q Will you refer to the next exhibit which you have prepared which is Exhibit Number 3 and explain what is shown?

(Whereupon, Applicant's Exhibit Number 3 was marked for identification.)

A Exhibit Number 3 is a structural map of the same area covered by the area map which is Exhibit Number 1. The contours are on the top of the Gallup formation, contour interval of 25 feet. The regional dip to the north-northeast is shown as being very uniform and general, there is no presence or no evidence at this time of presence of closure within this area. I also have shown on Exhibit Number 3 the line of cross section A-A prime, which will be Exhibit Number 4. It should be noted that these wells chosen in this cross section are through the central portion of the Escrito-Gallup Oil Pool.

Q Do you picture this accumulation of oil and gas as being in an off shore sand bar as other Gallup Oil Pools and Gas Pools have been heretofore described to the Commission in other hearings?

A Yes, that is correct.

Q Would you refer to the next exhibit?

(Whereupon, Applicant's Exhibit Number 4 was marked for identification.)

A Exhibit Number 4 is a cross section A-A prime. This cross section includes ten wells in the Escrito-Gallup Oil Pool adjacent to that well to that field in the case of the

Number 1-30 Sperling Well, the structure is not shown on this cross section in that the datum is a marker bed in approximately the central portion of the Gallup formation. In the center column of wells or the logs of the wells the perforations are shown, and to the right of that center column the cored intervals and the cored net productive sand intervals are shown as shown in the legend. On the cored wells there are a summary of the core information at the bottom of the well on the cross section. The main pay in the Escrito-Gallup Oil field is shown by the dot symbol.

Q Do you have any conslusions with regard to what this exhibit shows as to the continuity of the lower Gallup sand throughout the area which is under consideration by this commission?

A Yes, this cross section shows that the main productive sand in the Escrito-Gallup Oil Pool is continuous throughout the area. There are variations in permeability and that accounts for the wells in Sections 16 and 17 and 21 being very high capacity wells - whereas most of the others are very low capacity.

Q Have you found any evidence that there is a discontinuity in the sands running along a longitudinal axis of this pool?

A No, there is continuity along longitudinal axis.

Q Have there been any dry holes drilled along the longitudinal axis?

A Well, not along the longitudinal axis itself, there is a well off the map, I think section 12, I believe of 24 North, Range 8 West, andh ~~he~~ may have been just a little bit to one side

or the other of the longitudinal axis.

Q You say that well was drilled at a point which is not shown on this map?

A To the west.

Q That is actually in this pool?

A No.

Q Has every well which has been drilled shown an ability to produce?

A Yes, every well has reserves and the permeability which is encountered determines how fast you are able to get those reserves out.

Q Do you have anything further to state to the Commission with regard to this exhibit?

A No, I believe not.

(Whereupon, Applicant's Exhibits Numbers 5, 5A, 5B, 5C, 5D, were marked for identification.)

Q Will you then pass to your series of exhibits marked number 5?

A Exhibit Number 5 is composed of four calculations of recoverable reserves in the Escrito-Gallup Oil Pool. The different tabulations are designated as A, B, C and D, each of the calculations is made on the well which has core analysis available. The porosity, oil, water saturations were determined from that core information. The first calculations, Exhibit Number 5A, is made on the Standard Number 1-3-20 Federal Well in Section 20, Township

2½ North, Range 7 West. This calculation shows that after deductions of the assumed royalty interest and taxes a net return is derived of $75,744.00 from the reserves under a 40 acre tract. The net value from 80 acres would be doubled, it should be be $151,488.00 since the cost of the well in the Devils Fork Gallup Pool, including the pumping unit averages approximately $85,000.00, there would be no return on 40 acres.

Q Actually you would suffer a loss then would you not?

A That is correct. These calculations do not consider operating costs and do not discount over the productive life of the well.

Q This would be of course assuming that this pool was drilled on a 40 acre density?

A That is correct.

Q We have to make that assumption unless an 80 rules are adopted by the Commission, is that not correct?

A Yes.

Q As a practical matter, Can you not conceive as you now see the situation of some few instances in which a 40 density might not have to be drilled in this pool?

A Someone offset you on 40 acre you would have to protect yourself or be drained, and either way it is a losing bet. It should be noted there that on that net value of 80 acres that after deductions of your operating expenses, which considering pumping costs and your cost for cutting your parrafin, there would be very

little profit on even 80 acres.

Q Would you refer to your Exhibit Number 5B -- before you pass to that, this Standard 1-3-20 Federal Well would you classify that well a good, average or poor well?

A Well, in June the Number 1-3-20 Well produced 930 barrels and there is 7 wells in the Escrito Pool which produced more than that and ten which produced that or less, there are nine which produced less.

Q This would be slightly above average well?

A On that criteria it would be.

MR. PORTER: How many produced more, did you say?

A Seven, I believe. On Exhibit 5B a reservoir calculation is made of the recoverable on the Dorfman Coleen Federal which is highly permeable and this well is a top unit allowable well. The gross value of the recoverable oil $159,139 and after deduction of royalty and taxes a net is obtained of $123,412.00 on 40 acre drilling block. The net value on 80 acres would be $246,824.00, again these figures do not consider operating costs or not discounted of the productive life of the well. In the case of this one well I notice it was a top unit allowable well, I was curious just what the net profit would be discounted and I declined the production of the well over a four and a half year period and discounted the net value to give a net worth of $111,575.00. This is a discount factor of 6% after deduction of well costs of $85,000.00 and operator expenses $200.00 per month over the four and a half

year period which would be $10,800.00, the net profit is $15,775.00 and again this is one of the four top unit allowable wells in the field.

Q Will you go on then to your Exhibit Number 5C?

A Exhibit Number 5C is calculations in the gas area made on the Standard Number 1-X-26 Federal in Section 26, Township 24 North, Range 7 West. This well has a gross value of recoverable hydrocarbons of $44,510.00 under a 160 acre tract and this is a little misleading in that right at present you wouldn't get anything but your liquids, they have a value of approximately $7,500.00, and the reason for this is that you can't get your well hooked up under present allowable conditions in the Escrito Pool. After you take your value of your hydrocarbons, total of your oil and gas $44,510.00, subtract from that your royalty interest and your taxes you have a net value of $34,516.00 which gives a net value from 160 acres of $138,072.00, this would be doubled for 320 acres or $276,144.00.

Exhibit 5D is calculations in the gas area, this one on the Reese Number 1-30 Sperling Well and it shows slightly less reserves than the X-26. When you deduct the well costs, which in the case of a gas well is about $80,000.00 average plus the cost of the compressor for $22,000.00 if you are looking at 500 MCF per day of $32.00, if you are looking at 1,000 MCF there is certainly no return on either of these wells on 160 acre spacing and are very low return on 320 acres spacing. And the cost of a compressor is

something you are going to have to face sooner or later. At the present time Val R. Reese and Associates are investigating the purchase of a compressor for the 1-30 Sperling Well since this well is adjacent to Southern Union lines and will not produce against line pressure.

Q What is your conclusions from this series of exhibits Number 5?

A I believe that from Exhibit Number 5 it is definitely to be concluded that in the oil area you can't economically drill less than 40 acres, in fact, you can't get your money back, and even on one of the very best wells you get a very low return, very small profit, and that profit would be even less if I miss my decline just a little bit, it was over four and a half years, not a very long period of time. However, the well is a high capacity well.

Q What evidence do you have that in this pool a gas well will in fact drain 320 acres?

A Well, several things bring me to that conclusion. First, as we pointed out earlier the Gallup section in this area is, or was, deposited under conditions very similar to deposition in other areas where it has been previously determined that a Gallup well will drain 320 acres of gas area and in addition there seems to be some pressure data that will indicate in excess of 320 acres drainage. The Reese Number 1-25 Mesa Well was drilled in, a bottom hole pressure test taken, the test showed a pressure of 1675 PSI

which was 167, and the original pressure shown in the Dorfman Coleen Federal Well which had a bottom hole pressure of 1,842 pounds. It is granted that these wells are on opposite ends of the area, however, there is no other pressure information which indicated that bottom hole pressure 1842 pounds is not valid throughout this area. This Number 1-25 Mesa Well is adjacent to two of the wells which were pointed out under discussion of Exhibit Number 1 as being high GOR wells, these are the Number 1-2-26 and 1-4-26 wells in Section 26 directly to the west of the Mesa Well. The distance between the nearer of these wells and the Number 1-25 Mesa Well is 2,500 feet. Using 2,500 feet as a radius there would be a minimum drainage of 451 acres in this area.

Q Using a lineal measure of the drainage ability of the well, would you have any reason from this evidence and your engineering and geology, that this well will drain more than ~~the~~ a lineal distance of 1125 feet?

A There is a very significant pressure drop and considering the amount of gas these two Texas Wells have under the limiting ratio of 2,000 to 1 on 40 acre spacing there is a significant pressure drop in the 1-25 Mesa Well shown and that pressure drop would not stop at that well, but it has evidently moved gas in excess of a radius of 2,500 feet and would exceed of 451 acres as calculated.

Q You would in fact expect gas to be coming from points to the east of the 1-25 Well?

A Yes.

Q As a result of production from the two wells from the north half of Section 26?

A I believe that gas has been moved from this area.

Q Do you feel this is adequate evidence that one well will in fact drain 320 acres when taken with the rest of the testimony which you presented?

A Yes, I do.

Q What evidence do you have that one well will drain 80 acres as to oil?

A Well, in the oil area there seems to be evidence of greater than 80 acre drainage in the case of the Standard 1-3-20 Well in Section 20, Township 21 North, Range 7 West, this well was producing on an average of 900 barrels per month up to the last three months, and at that time it took a rather sharp decline in productive rate and is at present producing from 14 to 16 barrels per day which is a rather significant decline. An additional month or two production will maybe help a little bit in determining whether this is a factor fluid by a mechanical difficulties or whether it is actually being fluid by adjacent wells. However, in conversation with Standard of Texas they certainly know of no mechanical reason why this well should have fallen off as it has. This time at which the decline in production started coincided with the time when Compass Number 1-16 StateWell in Section 16 and the Dorfman Number 1 Judy Well in Section 17 both top unit allowable wells went on

production, and I believe that from this there is a distinct possibility that this Number 1-3-20 Federal of Standard was moving oil from the area of the Dorfman Number 1 Judy and Compass Number 1-16 State, and this would be in excess of 80 acre drainage.

Q With regard to the 1-25 Well, what is the ratio on which you show for that well?

A Referring to Exhibit Number 2 it is shown that the GOR is estimated at 70,000 to 1. This isn't a true GOR test in that the well is not hooked to a pipe line and we can't get it connected to a pipe line since we can't assure Southern Union of high enough allowable to make it economical for them to spend the approximate $20,000.00 it would take to hook this well up. This 70,000 to 1 GOR is what the well did during its initial potential test.

Q Do you have any reason to believe that the potential of such time as the well might be, excuse me, the GOR at such time as the well might be connected and produced would be either higher or lower as shown here?

A It would be hard to say, I believe this would be pretty close. However, it is safe to say it would be considerably above 30,000 to 1.

Q Then you are not able to produce this well until some relief can be had, is that correct?

A That is correct.

Q What is your suggestion with regard to connection of this well time-wise?

A Unless we are allowed to produce the well at a rate which would allow Southern Union to hook it up and that were granted very soon we would not be able to get this well on production until into the winter months, and the weather gets pretty bad in this area. We were unable to get into this area for any heavy work for approximately three months last winter, so therefore any delay is going to cost us the winter production.

Q Any delay in the issuance of some type of order giving relief to this well?

A That is correct.

Q In other words, if this well cannot be given some type of allowable fairly soon, would you say within the next month?

A Yes, that would be reasonable time.

Q You are running the risk because of adverse weather conditions which might be considerable expense, and terrain of the country that Southern Union could not then after that time get in there to connect this well and have to wait until spring to get the well connected and get the benefit of the production?

A Of course, the weather can get bad any day, of course, a month is reasonable time it seems to me.

Q You said these rules are quite similar to the Angels Peak which have been presented, have you prepared these prior to the time that order was received?

A Yes, I did.

Q You had more or less agreed upon this, upon the rules

which have been produced to the Commission prior to that time?

A Definitely so.

Q Do you have anything further you care to elaborate on with regard to the actual rules which you would propose to the Commission, adopt to drilling production of this pool as you have described it?

A No, I think nothing at this time.

Q You think the prevailing provisions of the Angels Peak order are sufficient?

A Yes.

Q The rules relating to the taking of gas?

A Yes.

Q How about the testing that is provided for in that, in those rules?

A I think the testing provided for in the Angels Peak rules will fit the Escrito Pool very nicely.

Q Do you have anything further you wish to add to your testimony at this time?

A No, I don't.

Q Were these exhibits 1 through 5D inclusive prepared by you or under your supervision?

A Yes, they were.

Q We offer them in evidence at this time.

MR. NUTTER: Exhibits 1 through 4 and 5D will be admitted.

MR. ERREBO: I have no further questions of this witness.

MR. NUTTER: Does anyone have a question? Mr. Payne.

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Jameson, I take it that it is your opinion that is an associated oil-gas reservoir, is that right?

A Yes, it is.

Q Now, is the gas up-structure or down-structure from the oil?

A Referring to Exhibit Number 3 it can be seen that the three wells in Sections 25 and 26 are higher structurally than the oil wells to the northwest in the Escrito Pool. There are two wells up-dip from these gas wells, that is the Standard Number 1-17 and 1-27 Well in Section 27 and the Pan American Number 1 Zanotti Well in Section 34. However, as we mentioned here in our discussion of depositions these sands are highly lenticular and there could be some variations in the sands in that area.

Q Now, is it your opinion at the time of the original order to separate when you asked to separate the Devils Forks Area from the Escrito area, that the Escrito is also a gas cap area, have you changed your opinion since that time?

A No, our opinion hasn't changed, we originally felt that maybe the variance in permeability of this area we were producing solution gas. However, in both areas the volume of the gas showed that there was free gas in the reservoir.

Q Now, do you feel either one of these Reese, the 1-25 or the 1-30 are perforated and producing in the same interval from which the wells of the Devils Fork Gallup were produced?

A Both wells are perforated throughout the Gallup formation, there might be some possibility that they would not be the same interval as the Devils Fork. However, it is an unconcludable or undeniable factor that the wells in Escrito are producing a dark oil of approximately 42 gravity, both oil and gas. These gas wells in this area, in the oil area of the Escrito Pool, the average gravity of the oil is a little light, less than 40 degrees in the area of these gas wells, it is 42 degrees or approximately that.

Q So you don't believe there is any connection between the Devils Fork and Escrito-Gallup on either end?

A There has been a lot of evidence put on to the contrary.

Q That was the south end, however, or the southeast end of the pool. How about the northwest end of the pool?

A There is considerable distance between the two areas in that vicinity, and at this time it would be pretty hard to prove there would be an attempt, I would hate to attempt it.

Q Assuming it was subsequently ascertained they were connected and the Commission in the meantime entered an order in the Devils Fork which is different than what you are proposing here, then where would you be?

A Well, I believe that what we are proposing for the Escrito Pool would certainly not hurt the Devils Fork Pool, if what you are assuming were correct.

Q However, it is not what you are proposing in the Devils Fork, is it?

A No, it is not.

MR. PAYNE: Thank you.

MR. NUTTER: Any further questions? Mr. Porter.

BY MR. PORTER:

Q Why do you not propose to this pool as to the Devils Fork?

A Maybe someone could go through those, they sure are complicated.

Q Would the depletion of the reservoir have anything to do with it?

A No, I think not, both areas have had quite a few new wells drilled in them recently.

Q But this is what you propose here?

A Definitely.

Q What is the gas-oil contact in this pool?

A Well, assuming that it is not tilted it would have to be somewhere between the Southern Union Number 1 Ernest and the Standard Number 1-2-26 , the plus elevation on top of the Gallup on the first well, the Southern Union Number 1 Ernest is plus 1430, and on the Standard Number 1-2-26 it is plus 1445.

BY MR. PAYNE:

Q Do you believe the rules you propose here will be effective in keeping the gas-oil contact substantially constant?

A Yes, it will definitely protect the oil area.

Q Even though it is not actually a voluntary thing, a withdrawal formula.

A The formula would call for the allowable to be based on limiting gas-oil ratio. An oil well would be withdrawing his volume of oil plus up to 2,000 to 1 gas; and the gas well would also be withdrawing the equivalent volume of gas with less oil.

MR. PAYNE: Thank you.

MR. NUTTER: Any further questions? Mr. Florsheim.

BY MR. FLORSHEIM:

Q I would like to correct if it makes any difference that one more well which he did not state of ours is a top allowable well, you did not include the Coleen 1.

A Yes, all four of the wells listed. I really didn't realize that, but in looking back at the production for June I see that, that the Coleen Number 2 only produced 16 days, so that would be correct.

Q On your Exhibit Number 4 in your cross section of the dark area is that area described on your cross section only to show the Gallup section as a whole?

A No, those dots show the main productive sand in the

Escrito Pool, the top of the Gallup is shown on the Dorfman Number 1 Coleen, for instance, it would be at about 5935.

Q Well, what I meant, you made a statement a little later in your testimony these sands were lenticular, would you say it is possible that some of the wells on the southeast end of the field could be out of different lens than those of the northwest?

A If there is any change in lens it occurs so fast that I sure can't find it. The wells density is pretty great and I believe ~~it~~ there is sufficient control is present to show that it is the same sand lens, and that would be what you would expect. This cross section is more or less a long strike, it is slightly higher to the eastern end and that is also along the old line of deposition.

Q That is all.

MR. NUTTER: Any further questions of Mr. Jameson? Mr. Arnold.

BY MR. ARNOLD:

Q Do you think the Devils Fork Sand and Escrito sand occupy about the same place in the Gallup formation vertically speaking?

A Yes, sir, very close.

Q Do you think that the Devils Fork sand shale is outcoming southwest at about the same time the Escreto sand starts developing?

A I don't have any cross section showing that at this time. ~~It is a very close well, the distance between the 1-25 Mesa and the~~

Coleen 1 is very small. However, when you are going perpendicular to the line of deposition of these sands changes happen fast, the change even though the sands are in the same position in the Gallup could be in a change in the permeability. It is really something we are not sure about.

Q Do you think it would be possible then one such as 1-25 possibly be producing Devils Fork gas and Escrito oil out of the two lenses in one well bore?

A I think if all our oil were coming out of one sand lens and all your gas out of another sand lens you wouldn't get much oil production because the permeability is shown by core analysis to be pretty uniform throughout the section and it is uniformly low.

Q Well, is this well producing very much oil, the 1-25?

A I believe on its initial potential test it produced approximately 25 barrels per day.

MR. ARNOLD: I believe that is all I have.

MR. NUTTER: Any further questions? Mr. Porter.

BY MR. PORTER:

Q I don't understand your answer to Mr. Arnold. Do you think it is possible this well could be produced from both pools?

A It would be hard to say that the portion of the sand that is in the Devils Fork doesn't occur in the 1-25. However, we don't know it does, we don't know know it doesn't. I know that Pan American and El Paso are very much opposed to the fact that it would be possible, they don't believe it is. I am sure they done

extensive work on it.

Q Do you think there might be a possibility?

A It is hard to say there wouldn't be.

MR. PORTER: That is all.

BY MR. NUTTER:

Q Mr. Jameson, I note on Exhibit Number 1 that the Reese Sperling was a cored well, is that correct?

A Yes, it was.

Q Do you have the core for that well present?

A Yes.

Q Does that show the interval that is saturated with oil or the interval that is saturated with gas?

A All oil saturations average over a 28 foot interval is 31.3%.

Q What 28 feet is that?

A That would be on the core, it starts at 5446 through 75, there might be a slight shift in between the footages over that interval, let's see, there is one foot at 5450 to 51, which shows 14% oil saturation.

Q 1'%?

A Yes. However, that is a foot which is shaling up, it only has a 5% porosity, and that would affect its oil saturation also.

Q What did you have the gas saturation for that area on the log?

A The gas saturation?

Q Yes, sir. Do you have any gas saturation?

A No.

Q Just of oil?

A We got the oil and the water so the remaining, the difference between 100% and the total of the oil and water would be occupied by other hydrocarbons. Of course, this well has, a, oh, it produces approximately 12 barrels per million of oil, therefore a part of the remaining volume would be occupied by liquids.

Q What was the average saturation there of oil except for that one foot interval?

A That one foot is included in this area I was giving you the minimum. In another case I see a 17.7%, the maximum saturation up to 45.6%. So, and from that you can possibly see that the oil saturation on the foot per foot basis is very uniform.

Q May I see that?

A Yes, you may. The 28 feet which I was referring to is shown within these lines marked between sample Number 50 and 51 and samples well down through sample 79 with exceptions of sample 77 which is admitted of productive foot since it has a porosity of only 3.2% and wouldn't contribute to production although it is open.

Q Now, these upper cores are taken pretty high up in the Gallup?

A Yes, they were.

Q As a matter of fact, this well is perforated in the upper portion of the Gallup formation, is it not?

A The upper portion of that core analysis is in what we call the second Gallup sand.

Q I also note that the Number 1-25 Well is perforated in the upper Gallup formation, is that correct?

A Yes.

Q Going further west on your cross section the next well, where is it perforated?

A The only other well perforated in the upper sections is the Reese Number 1-21 Connie, that is the only other well on the cross section. He have recently completed a well in Section 16 in which we opened the upper sections too in order to possibly increase slightly the amount of gas that well got out, those upper sands are shown by core analysis in wells other than this 1-30 to be of very low porosity, fairly high water, low permeability and therefore wouldn't contribute any hydrocarbons except a small amount of gas.

Q Do you think these upper sands are contributing gas in these two wells on the right hand side of your Exhibit Number 4?

A We felt that possibly we had a low capacity well in the case of these two wells and we wanted every additional cubic foot we could get. We hope they are contributing slightly.

Q Do you think they are contributing oil?

A No, I don't.

Q Do you think the lower section is the one that is making the liquids?

A Yes.

Q So in all probability this would be a -- first of all, were individual tests made of the producing characteristics of these various intervals in these wells?

A No, they were not.

Q Now, the liquids which are being produced by these high ratio wells, now, does the gravity of them compare with the liquids that are being produced by the low ratio wells?

A Maybe on one degree, one half degrees higher.

Q Indicating possibly they might be diluted with some distillate from upper sands?

A When I say they are higher I am also including the two Standard wells which aren't included in the upper sand.

Q I see. Now, what was the initial GOR on those two Standard wells?

A I don't believe I have that, Mr. Nutter.

Q These wells have been on production for a considerable length of time, have they not?

A Yes, they have.

Q Do you think it would be indicative of a gas cap situation if these wells had started out with a low GOR and had increased to the high GOR over the life of their production?

A I believe they have always been limited on their production

by a high GOR, I think they are restricted on their production too, I believe I have the June allowable on the wells, the Number 2-26 was 90 barrels for the month, the Number 4-26 was 60 barrels for the month, and we own half interest in that 4-26 well and I followed its production from the first and it has always been restricted and although I don't remember the initial GOR on the well I am confident it was a high GOR from the first.

Q Do you think if the Commission would adopt this proposal and permit the dedication of 320 to gas wells and so classify them as gas wells that Standard Oil Company of Texas could increase the gas producing capability of these by perforations in the upper sand?

A Not significantly.

Q Why do you say that?

A First I should say they wouldn't do that because while you got your frack trucks out there you can frack the upper sands with not a great deal of additional cost. However, you can't call them back out without running into much more money, you would ever derive out of even the most optimistic estimate of these, the capacity of these upper sands.

Q So you think that the additional cost of perforating and stimulating those upper sections would prohibit the work?

A Yes.

Q Now, the Southern Union Ernest Number 1 Well and the Standard of Texas 1-2-26 Well are structurally about the same, is

that correct?

A Yes, that is correct.

Q And one has a ratio of 61,800 to 1 and the other has a ration of 2800 to 1, is that correct?

A Yes. As I pointed out there is only 15 foot difference in structural positions between the two wells.

Q So then if we presume there is a gas-oil contact that separates the gas sand from the oil sand the gas-oil contact would lie between those two wells somewhere?

A Yes.

Q Then as some southwest another gas-oil contact between the Standard 1-2-26 and the Standard 1-1-27?

A Assuming they are in the same sand lens.

Q Did you prepare any cross section which was hung on the common datum showing the structural position of the wells, Mr. Jameson?

A No, I didn't. The cross section which I prepared was so nearly along a strong strike since I wanted to go through the center of the field that it would not show anything except that your not going just exactly in the straight line. The cross section would show, of course, a well, a high at the time, well the Number 8 log on the cross section which is Standard Number 1-4-26 and the lower most well would be the second log of the cross section which is the Dorfman Number 1 Coleen.

Q And also the Reese Sperling Number 1-30 would be a low

well structurally, wouldn't it?

A Yes, that is right, about 82 feet below the 4-26.

Q And it is a gas well?

A Yes.

Q Do you think it is in the Escrito Gas well or in the Devils Fork gas well?

A In the Escrito since it produces a dark oil. That dark oil is the main arguing point against the fields being the same continuous sand.

Q How do you account for the fact if the oil well in here can drain substantially in excess of 40 or 80 acres that the Standard Federal Number 3, Number 1-3-20 which according to your Exhibit Number 2 is the oldest well in the ppol, I stand corrected, it is next to the oldest well in the pool, how do you account for the fact it produced for three years prior to the time these three offsetting wells were completed, and they are the only three top allowable wells with exception of one?

A That is the difference in permeability. The Number 3-20 Well has permeability .11 millidarcy and Number 1 Coleen has an average permeability of 7.84 millidarcy. The Number 1 Coleen has up to 100 and I believe it is 46 millidarcies in one foot of pay which acts as pipe line for oil to come out of.

Q Are there other wells in this pool of low permeability readings similar to the Standard 1-3-20?

A Yes, the majority of them do have. I can give you all of

those, if you like.

Q Yes, sir, I would.

A Starting on the right side of the map the Reese Number 1-30 Sperling has a permeability of .11 millidarcies over, it would be .11 millidarcies over a 28 foot interval. The Number 4-26 Well has .13 millidarcies over a 27 foot interval. The Number 1-27 Well has .32 millidarcies over a 48 foot interval. The Southern Union Number 1 Ernest has slightly higher permeability, .88 millidarcies over a 43 foot interval. The Reese Number 3-29 Connie has a permeability of .08 millidarcies over a 25 foot interval. The Number 3-20 is .11 millidarcies over 57 foot interval. And the Coleen Number 1 is 7.84 millidarcies over a 23 foot interval.

Q So most of these permeabilities are rather low, aren't they?

A Yes, they are.

Q Is this conclusive of drainage of a large radius?

A The permeability is not a great deal different than what is found in other Gallup fields as well as the Mesa Verde and Pictured Cliffs.

Q Is the Number 1-25 Mesa shut in at the present time?

A Yes, it is.

Q What would a cross section drawn from the Pan American Zanotti to the Standard Federal Number 1-27 to the Standard 1-4-26 to the Reese 1-25 to the Killarney look like?

A At the 2-26?

Q The Standard 1-4-26.

A Oh, I see.

Q From the 1-27 to the 1-4-26.

A Okay. What is your next well?

Q The Reese 1-25, and then to the Killarney 1-24, what would that cross section look like?

A It would be very similar looking to what this cross section we have got here since the accuracy of the logs isn't great enough to show the small variations in the lenticularity.

Q Now, by lenticularity do you mean individual lenses in here or this is one large lenticular structure?

A Individual lenses throughout the Gallup in this area. The porosity and permeability build up occurs and disappears very rapidly.

Q On Exhibit 5A and 5B you have determined the economics of a well in the so-called oil area, have you given any value to the gas which would be produced with the oil?

A No, I didn't, for this reason. The selling of gas normally in these oil wells is going to mean purchase of compressor which the cost of which will certainly be more than the price of the gas itself.

Q Well now, on your Exhibit Number 2 you indicate that the Standard 1-2-26 Federal Well has produced 222,000 MCF of gas at a value of say twelve cents, would you agree with, agree that would have a gas value of some $26,000.00?

A That is true.

Q That wouldn't pay for a compressor?

A That is right. Of course, your cost of operating the compressor comes in also, and it increases both due to the amount of fuel you use for the compressor and the fact it has to be visited each day and maintained several times each day.

Q You are going to have a compressor in the gas wells, I think you said?

A We are on the 1-30 we hope, not yet on the 1-25.

Q Now, if the operators in this pool were to form a co-operative compression system would that reduce the compression costs for the gas?

A For MCF it would.

Q Do you think such an arrangement as that is feasible?

A I hope it might be feasible. However, there is little agreement as there seems to have been in times past, it is a long way from occurring.

Q As a matter of fact, your Exhibit Number 2 shows that two Standard Wells, the Number 1-2-26 and the 1-4-26 have produced and flowed some 345,000 MCF, is that correct, Mr. Jameson?

A Yes, that is correct.

Q And what state of depletion are those wells at the present time?

A I don't know what the reservoir pressure would be adjacent to those wells at this time. They have considerably

lowered the reservoir pressure in that area.

Q They would be classifed as gas wells under your rule, would they not?

A Yes, they would.

Q Would your recommendation be that the rules specifically prohibit the flaring of gas from any well that is classified as a gas well?

A No, I wouldn't, for this reason, this is a relatively new area, the distances still great and the topography is extreme, and for the small amount of gas that these oil wells produce there would be a tremendous burden to have a no flare order in this pool.

Q I think you misunderstood me or maybe I stated the question wrong. Specifically prohibit the gas that was classified as a gas well.

A No, I don't think that any operator would flare gas from a gas well. In fact, it is my understanding that Standard is prepared to shut in their Number 1-4-26 Well, I may stand corrected, that may be their other one, one of their two high energy, as soon as they get a lease. We have the farm out with the drilling obligation when we drill it they will shut in their well and, of course, I am sure they would start negotiations immediately for the sale of gas to one of the two pipe line companies in the area under a 320 acre spece, if they didn't on the 4-26 we would be very perturbed, we own half interest.

Q There is a possibility another well may be drilled, would

that be on Section 26?

A No.

Q Where would that well be drilled?

A I am not sure of this, I think it would be in Section 23 to the north.

Q You intend getting an oil well or gas well?

A That would be very hard to say, we have thought we could predict them before.

Q Any further questions? Mr. Utz.

BY MR. UTZ:

Q Mr. Jameson, what do you think is the principle drive mechanism in this pool?

A Gas expansion.

Q Gas expansion. You don't think there is any solution?

A Gas expansion and solution, yes.

Q And solution to gas expansion, you mean from gas cap?

A Well, I actually misstated myself, I should have said solution gas, that is the main drive over the area of Escrito Pool.

Q Then pools of this type, what is generally the rule of recovery factor, what percentage of oil in place will be recovered in pools of this type?

A That varies, of course, on the way you count your net sands for instance on that Dorfman Well, my Exhibit Number 5B, had I counted the sand the same as the East Bisti Engineering Committee I would, I would have had 8 feet less sand since they don't consider

anything of less than one-tenth of a millidarcy I believe as pay.

Q Well, if you had to count the sand you would have calculated the reserves for that sand, would you?

A The thing is they might use 18% where as if you counted your sand a little bit different and include some lower permeability you are going to have to use percentages, that is why I use 5% and 15 on one in 5B. I use 5% on the 3-20 Well based on its production in the past with its decline as shown in recent months.

Q First recovery factor, is that quite low?

A Yes, but on the other hand a lot of people say you can't get any oil out of a .11 millidarcy, they may be right.

MR. UTZ: That is all.

MR. NUTTER: Any further questions?

BY MR. ERREBO:

Q Mr. Jameson, some members of the staff of the Commission have asked you about the Devils Fork rules which were proposed by El Paso at a recent hearing and how they might fit this pool, the Escrito-Gallup . Have you made any study to determine exactly how this complicated formula described as such would effect this pool, the production from it and whether or not that formula would be adapted executed to the situation which we have here?

A It seems to me the formula that El Paso has proposed is more suited to a predominantly gas area whereas we have the reserves in this case predominance, a vast predominance of oil wells and therefore it seems that the oil wells can control the

allowable more directly than through the complicated formulas proposed by El Paso in the other field.

Q Actually you think the formula proposed by El Paso is basically sound, workable to you as it relates ~~allies~~ to the Devils Fork Pool?

A Yes, I do. I don't think it is necessary in the Escrito field. I think a much similar, more direct approach will work in the Escrito.

Q I would like now to ask you to give a little more consideration to the question of depletion of the Escrito Pool as compared to the Devils Fork. You have shown cumulative production on your Exhibit Number 2 --

A Yes.

Q -- and I don't know whether you totaled that up or not. But you are also familiar, are you not, with Devils Fork?

A Yes.

Q And the oil production in that pool?

A Well, the Devils Fork oil production is practically nil, but there is a significant oil production from the Escrito in regard to the question that you mentioned, I was referring to the fact that they are both still under development.

Q Actually the Escrito-Gallup Oil Pool containing this gas area is certainly much older production-wise and taking into consideration the drilling of the initial well than the Devils Fork Pool?

A True.

Q Several years ago, isn't that correct?

A The first wells in Escrito I believe went on production in March of '58 I believe it is.

Q Then which pool, Angels Peak or Devils Fork do you think that the Escrito-Gallup Pool would compare with in these regards?

A Would you repeat that?

Q Are you familiar with the production, the general history of the Angels Peak Pool?

A Yes.

Q Do you think that the Escrito-Gallup Oil Pool considering the stage of development and the oil produced in it compares more with the Angels Peak Pool or the Devils Fork Pool?

A Devils Fork to the Angels Peak, the Angels Peak has an equivalent production history also.

Q A question was asked you awhile ago with regard to the variance of gravities between the 1-25 and some of the wells to the west.

A Yes.

Q Have you had occasion to become acquainted with the various gravities of the wells contained in this pool?

A Yes, I have.

Q Is it not true these gravities, these gravities actually vary within the others well to well from one to two degrees?

A Yes. In fact, they vary a little more than that, I

believe. We will just refer to the latest monthly statistical report from the Commission as for June and the gravity during that month varied from 38 degrees to 41.

Q That variance actually takes place over on the west side, does it not?

A Yes. The 41 is in the Pan American Zanotti Well and the 38 is in the Standard 3-20 Well.

Q So that actually the variance in gravity between the Reese Well and some of the other wells to the west is really not significant considering the variance does take place?

A Not at all.

Q Regarding gravities in other wells, refer if you will to Killarney 1-24 Well which is in the Devils Fork Pool.

A Yes, it is.

Q Are you familiar with what the gravity is in that well?

A It is in excess of 60, and it is a very light colored distillate.

Q What is the gravity of the oil found in the Reese Well, in the 1-25 Well?

A 42 degrees.

Q What color is it?

A Dark green.

Q Would you expect these two wells could be producing from the same reservoir in view of that gravity, considered from that point of view?

A No, I wouldn't.

Q Now, with regard to the pressures found in the 1-30 Sperling Well, was a drill stem test taken on that well?

A Showed approximately 1630 pounds.

Q What is the pressure found over in the western part of the pool, of the Escrito-Gallup?

A The Dorfman Number 2?

Q Actually does it compare quite closely?

A Yes, I have that now. The bottom hole pressure on the Dorfman Number 2 Coleen Federal was 1842 pounds.

Q What is the reservoir pressure in the Devils Fork Pool, do you have any source of information as to that?

A Yes. The initial bottom hole pressure in the Devils Fork Pool was taken from the Redfern Number 1 Largo-Spur Well, 2015.1 pounds.

MR. ERREBO: That is all I have.

MR. NUTTER: Any further question of the witness? You may be excused.

(Witness excused.)

MR. NUTTER: Do you have anything further?

MR. ERREBO: We have no further information.

MR. NUTTER: Does anyone have anything they wish to offer in this case?

MR. KELLAHIN: We would like to make a statement. Re: Standard Oil Company of Texas. "Standard Oil Company is operator

of six wells in the Escrito-Gallup Pool and wished to concur with the recommendations that have been made by Val. R. Reese and Associates, with particular interest on their recommendations for 80 acre spacing for 80 wells and 320 gas wells. It is our opinion the gas wells will drain in excess of 80 acres in the oil area and in excess of 320 acres in the gas area. We also recommend that the gas and oil allowables be based upon acreage as was done of Angels Peak Pool of wells of GORS 30,000 to 1 being classified as gas wells and the gas well allowables being equalled to four times the gas limit of the top unit allowable oil well. We feel this particular pool presents a rather perplexing situation and under the present the operators are not advised just what they might expect if they go ahead and develop it. The adoption of the rules which have been released earlier will clarify this situation and we feel lead to orderly and efficient development and operation of the pool."

MR. NUTTER: Does anyone have anything further?

MR. ERREBO: If it please the Commission, we are in agreement with Standard of Texas. This is an extremely complex pool and we can well appreciate the caution with which this Commission approaches this entire area as well as the Gallup trend in northwestern New Mexico. And in that regard we think that the Angels Peak order which has been recently issued is a forward look and a realistic step in the proration of oil and gas production in New Mexico. Questions have been asked with regard to

the possible connection of some part or other of the Devils Fork Pool with the area under consideration. Certainly in view of the complexity, nobody I think I can state definitely what may eventually happen, on the other hand Val R. Reese and Associates have gotten together the money to drill this well and they drill it and it is capable of producing, the testimony has been here today that as soon as this Commission will take some action which will justify the Southern Union in connecting that well they will do so, we have the contracts which they are willing, to sign and we will sign. Certainly while you must be cautious in not adopting which might conflict should the areas and the testimony so far as they will note, on the other hand Val R. Reese is sitting here with a well that wouldn't produce his money he has in it and unless relief is forth coming soon no production can be had from this well for the entire winter. It might be that some large companies can stand this but a small operator can't. We ask that the Commission, and I know they will proceed as rapidly as possible, to rendering a decision in this case, and should it appear that an order covering the entire scope of the rules as we have proposed them here today should be delayed for any long period of time or even indefinitely, which we hope it will not be, then we would ask that the Commission give us some allowable for this 1-25 Well that will enable us to connect it and obtain production for the winter season.

MR. NUTTER: Does anyone have anything further for Case 2089? We will take the case under advisement, and the hearing is adjourned.

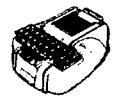
STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, LEW NELSON, 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 Oil Conservation Commission was reported by me in stenotype and reduced to typewritten transcript by me and/or under my personal supervision and that the same is a true and correct record to the best of my knowledge, skill and ability.

Witness my hand and seal this the 26 day of September, 1960, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Lewis T. Nelson
NOTARY PUBLIC

My Commission Expires:
June 14, 1964



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