BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
May 19, 1960

REGULAR HEARING

IN THE MATTER OF:

Application of Redfern and Herd, Val R. Reese and Associates, Inc., and El Paso Natural Gas Company for the promulgation of special pool rules governing the Devils Fork-Gallup Pool, Rio Arriba County, New Mexico, including provisions relating to drilling and proration units, an allocation formula, and market demand proration for said pool. CASE 1967

BEFORE:

Mr. A. L. Porter, Jr.
Mr. Murray Morgan

TRANSCRIPT OF HEARING

MR. PORTER: The hearing will come to order, please. At this time we will take up Case 1967, and I would like to call for all appearances at this time.

MR. BRATTON: Howard Bratton, Hervey, Dow and Hinkle, on behalf of Redfern.

MR. HANNAH: Fred Hannah, Seth, Montgomery, Federici and Andrews, on behalf of El Paso Natural Gas. Garrett C. Whitworth will conduct the interrogation.

MR. SPERLING: Jim Sperling for Val R. Reese Associates.

MR. KELLAHIN: Jason Kellahin, Kellahin and Fox, Santa Fe, for Standard Oil Company of Texas. I'm representing the

Daniel F. Cunningham representing Killarney Oil Company.

MR. BUELL: For Pan American Petroleum Corporation, Guy Buell.

MR. BRATTON: We seem to have a somewhat anomalous situation here. I think we have the largest crowd and the smallest amount of gas at any hearing I have ever seen. Mr. Redfern observed last night that the entire proceeds of the pool won't pay for the various hearings we have had on this matter.

We come before you on an application of Redfern and Val R. Reese, a joint operation. The size of the crowd does not indicate the extent of the testimony that we intend to offer. It will be relatively brief, as might not be indicated from the appearances. We have three witnesses,on behalf of Redfern and Herd, Mr. Jack Thornton and Mr. John Redfern; and on behalf of El Paso, Mr. Norman Woodruff. I'll ask that they all be sworn at this time.

(Witnesses sworn.)

MR. BRATTON: I would say, before beginning the presentation of the case, as I stated, the case is not going to be as lengthy as the size of the crowd might appear. We intend to put on Mr. Jack Thornton, who will testify to the geological features in the area; Mr. Norman Woodruff will go into the engineering and explain in detail the rules which are proposed on behalf of the Applicant; Mr. John Redfern will testify briefly on economics of the situation as he views them.

The Applicants propose pool rules in general, and Mr. Woodruff will go into them in detail, consisting of 320-acre spacing and proration units, an allocation formula of 25 percent acreage and 75 percent acreage times deliverability, vertical and horizontal limits which Mr. Woodruff will go into, and otherwise the regular San Juan Pool Rules which the Commission has under consideration. I will ask Mr. Thornton to be our first witness.

JACK D. THORNTON

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

DIRECT EXAMINATION

BY MR. BRATTON:

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

A Jack D. Thornton, Geologist for Redfern and Herd, Inc., Midland, Texas.

Q Have you previously appeared before this Commission as an expert witness?

A I have.

Q As a matter of fact, in many in connection with this same Pool?

A I have, yes.

MR. BRATTON: Is the Commission satisfied with his qualifications?

MR. PORTER: We have no questions.

Q (By Mr. Bratton) Mr. Thornton, at the time of the creation of this Pool, you gave extensive testimony as to the geology of the area, did you not?

A Yes.

Q And have you continued your studies since that time?

A Yes.

Q Have there been additional developments in the area since the time you previously examined this area or previously testified as to it?

A Yes, there has been new developments. The testimony, I believe, was given in February, and there has been two additional wells drilled and some changes made.

(Applicant's Exhibits Nos. 1 & 2 marked for identification.)

Q Will you refer to your Exhibit No. 1 and explain what it is and what it shows?

A My Exhibit No. 1 is a structural contour map of the Gallup formation, which is producing in the Devils Fork Pool. It shows the geological changes made since February, and will bring us up to date on wells of the area, the old wells plus the two new wells. The two new wells are the McElvaney No. 1-A Miller located in the Northeast Quarter of Section 13, Township 24, 7; and to the Southeast, the Redfern and Herd No. 3 Largo Spur in the Northeast Quarter of Section 19, 24, 6.

With the addition of those two wells, coupled with the

old wells, it shows the dip of the Gallup formation to remain about as it was. It is dipping to the northeast into the Basin. They do not show any data that indicates structural closure. They just show the uniform dip. The map is contoured on 25-foot intervals and the dip is relatively uniform across the Pool and no structural closure indicated at this time.

Additional information gained from those two wells, those two new wells added to the old wells, is this: The Pool is still producing gas, neither well discovered oil. None of the old wells are producing oil. They're all gas wells, and they do show that the likeliness of finding oil downdip is becoming less probable, in that the distance and dip from the highest well in the Pool, which is the Killarney No. 1 Brown in Section 24, from that well, which is the highest well in the Pool and most updip well in the Pool, to the El Paso No. 89 to the northeast in Section 17, the El Paso well is 139 feet low or downdip to the Brown well, and is still a gas well. That is quite a bit of dip and also quite a bit of distance, practically two miles across there. Moving to Exhibit No. --

Q Refer to your Exhibit No. 2, then, Mr. Thornton.

A All right. As we know, all producing pools will build up to a maximum thickness in gross thickness, and they will build up to a maximum in porosity, and they will decrease in practically all directions to a zero. That is what appears to be happening in the Devils Fork Pool.

Now moving to Exhibit No. 2, which is not a structure map but is an isopaque map of the net sand in the producing zone at this time, the two new wells plus the old wells have added this data. It appears now more conclusively that the producing zone is a lenticular type sand. It decreases to a minimum, passed the minimum to a zero to the west and southwest. It appears to have built up to a maximum axis in a northwest-southeast direction right through here (indicating), and appears to be decreasing in an eastward direction, which is exhibited by the El Paso No. 89 in Section 17 on the East. The McElvaney well helped delineate the northwest-southeast axis right through Section 18, and the Redfern and Herd No. 3 helped delineate the axis to the southeast and to a certain extent, the Redfern No. 1 and definitely the El Paso No. 89 appears to be over the maximum and on the decreasing side to the east.

Therefore, with those wells beginning to decrease to the east, it appears more unlikely that oil will be found downdip because of the distance and dip, amount of dip involved between the Killarney Brown and the El Paso No. 89, the amount of dip which is 139 feet on top of the Gallup, shown on Exhibit 1, and the position of the wells in relation to this isopaque, in that they appear, the Redfern-Herd No. 1 and the El Paso No. 89 appear to be over the maximum; and now down on the degrading or decreasing side to the east.

Q Mr. Thornton, that is an isopaque of gross sand thickness,

isn't it?

A Yes.

Q Somewhere to the northeast there, in your opinion you are going to run into a zero line, just as you have approximately to the west there?

A We should run into that line, yes.

Q The closing of your lines there does not necessarily mean that that Pool isn't going to run northwest and southeast for some additional distance?

A That's true, and I would like to bring that out at this time. The closure here is, of course, five feet, and we did not have conclusive evidence to bring these lines into the northwest or to bring them in at this time too much to the southeast. Those lines, of course, as you know, can open up and may open up, in that we do not have a zero point to the northwest or southeast yet; and what does appear to be in the future is a zero line to the east.

If you will notice, the five-foot contour on the east is a broken line because of lack of control, but if it follows the rules of deposition, if the sand lens follows the rules of deposition, the five-foot contour will definitely be there, which is indicated by the El Paso well to be decreasing, and we should approach a zero line in the near future or in the near distance to the east, which would be something like that (indicating). So not only theoretically, but highly probably, we should reach a

zero line to the east; but back to your question, the elongation of the Pool to the northwest and southeast has not been established yet.

Q In your opinion, then, Mr. Thornton, the information which you had previously, plus the information obtained from the recently completed wells, makes more remote the possibility of the discovery of oil downdip in this gas pool?

A That's what the additional information shows and that's what this map shows.

Q That is based on the fact that your sand bar has thickened up and is now thinning to the northeast?

A Yes, thinning rapidly to the east. It appears that we have predominantly a gas pool here and the likeliness of an oil pool downdip is becoming more remote, that is true.

Q And your pool could run northwest and southeast, you don't have controls as to its extent in those directions?

A No, but it should follow this axis to the northwest and southeast for some distance yet.

Q Do you have anything further to offer at this time, Mr. Thornton?

A That is all I have. The exhibits were primarily to bring us up to date and to show the thickening and thinning attitude of the sand lens.

Q Did you prepare these exhibits?

A I did.

MR. BRATTON: We have no further questions of this witness.

MR. PORTER: Do you want to offer your exhibits?

MR. BRATTON: We would offer in evidence Redfern and Herd's Exhibits No. 1 and No. 2.

MR. PORTER: Without objection the exhibits will be admitted. Did anyone have a question of the witness? Mr. Utz.

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Thornton, I believe you said that your five-foot isopaque contour had no control?

A Not at this time, that's true.

Q So it really is virtually meaningless, except for the fact that the El Paso No. 89 tied together with the McElvaney well, that's your only possible control for that contour, is it not?

A That plus uniformity to the west, that's true. Following the uniformity to the west, that occurs to the west, plus the El Paso and McElvaney wells, showing the short distance there to the northwest and southeast makes me put it in the position it is.

Q Additional thickening to the northwest and to the southeast, as well as to the northeast, could change this picture substantially, could it not?

A It could, it should be uniform. I mean the thickening and thinning should be uniform, from past experience, but it could

change it.

Q It boils down to the fact that we still don't have a whole lot of information, except in a very local area?

A Right.

MR. PORTER: Mr. Arnold.

BY MR. ARNOLD:

Q If this sand lens did extend to the northwest, the way it appears to be cutting across structure, it actually would be down-structure to the northwest of the present producing area, is that right?

A If the sand lens followed or continued along the maximum axis to the northwest?

Q Right.

A It would be down-structure.

Q It would be down-structure if you extended the sand lens further northwest?

A No, it would follow the structure. If it extended along its axis, it should be relatively the same datum plane as the producing pool right now, in that these contours more or less, this monocline continues to dip for another mile. It would be about the same structural position.

Q For another mile, but if it extended far enough northwest it would eventually be down-structure to the northwest from the general trend of the sand bar?

A Yes. I don't conceive of that happening for another two

miles before it starts down-structure from this map right here. See, it would be directly on line with the present axis. Another mile and a half, it would stay just about the same structural position, then it would start downdip, yes, down-structure. In other words, the strike of the bed will change and therefore it would be down.

Q You have no information that there is a discontinuate of the sand in the northwest as yet?

A No, no, not close enough to use in this interpretation. What we have found, or what I have seen happen, and from mapping some of the other type pools, when it continues along strike until the strike changes, it's apt to be there; but when the strike of the beds changes and you would start downdip, the environment that that sand was laid down, the sand may not be there. In other words, the Basin would have been deeper or plunged into the deeper part of the Basin and the sand wouldn't even be present when it started down-structure. The sand would remain up on a relatively flat plane.

Q Well, the structure of the San Juan Basin, the present structure came after the sand deposition, so that there is not necessarily any connection between structural contours and sand isopaques, wouldn't you say that?

A That's highly possible. The relation is hard to establish.

Q That is true in the Pictured Cliff formation, for

instance, isn't it?

A I haven't worked with that one formation as much in detail as I have this one. This type thing is not near the blanket sand type thing that Pictured Cliff is, is why I haven't related this type of thing to Pictured Cliff.

Q But if that sand then were down-structure to the northwest, it still would be possible for this to be an associated oil and gas reservoir, and the data that you have at the present time certainly wouldn't disprove that, would it?

A The data that I have at the present time is more in favor of not finding oil downdip than favoring oil downdip, in that as we mentioned here, from the highest well to the lowest well is 139 feet downdip and is still a gas well, and the most northerly well in the Pool is also, I believe, 144 feet, it's 144 feet on top of the Gallup, and is still very much a gas well. So with that much dip, plus the area that the sand lens covers, that's a lot of distance related to the size of the sand lens, which makes the oil becoming less probable.

BY MR. UTZ:

Q Do you have any information regarding the drillstem testing in the McElvaney well?

A They ran no drillstem test. I do have the logs on the well, but in that interval they didn't stop and test.

Q You have no idea, then, whether it made liquids or not?

A We have the Schlumber-J evaluation; we have the

comparison of it to the logs in the other well, and it certainly doesn't look to have any fluid in it, comparing it to the other wells plus Schlumber-J engineers' evaluation of the content of the reservoir.

Q And they didn't core that well, either, in the Gallup?

A No. I did look at the samples. The samples were available, they were drilling at the same time we were, and you can't tell any difference between it and the other wells.

Q How about the Pan American Dashko No. 1?

A They have just gotten under way on the drilling in Section 11.

Q Are there any other wells drilling to the northwest?

A No, that's the only one at the present time.

MR. UTZ: Thank you.

MR. PORTER: Mr. Nutter.

BY MR. NUTTER:

Q What control did you have to bend the contour lines, particularly the ones at the lower portion of the structure, in a southwesterly direction after having proceeded with them northwest for so far?

A You are referring to Exhibit 1?

Q Yes.

A Why are they curved more to the --

Q No, after you have proceeded northwest on your contour lines and then suddenly they bend west and then southwest.

A There we might relate back to the previous hearing. A distance of three miles over here, which is another mile and a half off this map, there's a number of wells that bend those lines around, and they continue practically in a due westward direction. They appear to be warped quite a bit, but from control three miles over here, it's just a small curve in the strike but they continue further westward. The control of the map, which this map fits.

Q So we have some control used for this map, which isn't actually on the map then?

A That's right, the control wasn't related to this map, wasn't related to this testimony or the purpose of this hearing, so just whacked it off a distance two miles to the west, but enough area covered to clearly show the Devils Fork Pool.

Q As I recall the map at the previous hearing, there were some oil wells to the northeast. Those aren't included on this map, either, are they?

A Northeast?

Q Yes.

A Northwest.

Q Northeast, weren't there some wells up to the northeast, maybe in Section 10 up here, which showed some oil on the original completion?

A To the northwest. Oh, the Otero Pool.

Q No, sir, in between here and Otero, as I recall.

A There was one back to the west about four miles.

Q I believe it was in Section 10, which would be just off Exhibit 1 there.

A In relation to this map, it would be approximately here (indicating), which is about three and a half miles from the El Paso No. 89, but it wasn't brought into the other hearing that I remember.

Q I think it was depicted on the exhibits.

A It probably was, that other map covered a more general area.

Q Yes. Do you know what the top of the Gallup formation was in that well?

A It was some 250 feet, or almost 300 feet, away down, I believe.

MR. BRATTON: If the Commission please, I don't recall the number of the previous hearing in connection with the Pool, but whatever it is, we'll offer the record in that case as a part of the record in this case, for such consideration as the Commission may give to it.

MR. PORTER: Do you know the location of those that you are talking about?

MR. NUTTER: Yes, 1915 is the case number.

MR. BRATTON: Case 1915.

MR. PORTER: Case 1915 will be incorporated.

Q (By Mr. Nutter) Do you happen to know how many feet of pay was encountered in that oil well in Section 10?

A I don't remember the net or gross, but I do remember they did perforate several intervals in the Gallup, and most of them were very comparable to the Otero production, which is the upper part of the Gallup.

Q Now on your isopaque map here, you have shown gross feet of Gallup pay, have you not?

A It's the gross sand in the lens, yes, gross sand in that sand.

Q The thickness that's included for each one of the wells, is that embodied in a single kick on the log, or more than one kick on the log?

A It's a single spot on the log.

Q Do you plan to enter any cross-sections of this lens that you have depicted here today?

A No, I don't plan on offering any cross-section exhibits. The previous hearing, of course, had numerous cross-sections, I imagine they would be incorporated, as you mentioned there. They still apply.

Q As I also recall from a previous hearing, there was more, in my recollection at least, there was more of an abrupt ending of the pay as you proceeded southwest; and then you ran into an impermeable shale or something, rather than a lensing-out effect. Has that picture been changed?

A No, I described it as a facies change from sand to shale. That zero line is still the same.

Q Well, it tapers down to a zero point in the shale, or what?

A The sand appears to be tapering down to a zero sand, but the equivalent rock has changed to shale, which makes the overall interval still the same. Gallup is still Gallup, but it turns to a shale, which was described in the first hearing as a facies change.

Q Then you also described the Devils Fork sand as a clean sand, correct?

A Along the axis it certainly appears to be.

Q Does this clean sand taper to zero or does the quality of the gross sand decrease to zero as it approaches the facies change?

A It could be described as either one or both. Do you mind repeating it?

Q As the Devils Fork sand proceeds to the southeast, your isopaque map shows that it decreases to zero feet of pay. Now, does that mean that the sand itself, the clean sand itself, is tapering to zero feet of thickness, or does the quality of the sand as it meets the facies change and goes into a shale, does the quality of the sand decrease to where you call it zero feet of thickness, although the gross uniform thickness is the same in the shale and in the sand?

A More as a matter of clarity, I would rather say that the clean sand tapers to a zero at the same time the wedge around

that clean sand, the shale is developing. I had rather describe it as a wedge to zero with the reverse wedge occurring in a horizontal --

Q That's what I wanted to know, if that was the case or the other was.

A Yes.

Q Are there any oil wells known to exist on the Devils Fork sand structure to the northwest or to the west?

A No, there are not. The nearest control to the northwest,you can't even see a close resemblance, you can't even find a comparable zone, I would say. You can't find a comparable zone in the Gallup, that's the nearest control to the northwest that we have here.

Q Have any of the wells which have been drilled in the lower part of the structure here made liquids in any form? I believe those would be the three lowest wells, the McElvaney 1-A, the Redfern and Herd Largo Spur No. 1, or El Paso's Canyon Largo No. 89.

A McElvaney is in the process, of course, of completing his well now. The Redfern-Herd No. 1 Largo Spur recovered its frac oil and the fluid decreased rapidly, and at the present time it's making, oh, a little bit, but very little. It's not -- I doubt if it remains enough to be commercial or anything of that nature. Is that what you are referring to?

Q I was talking about liquids of any kind.

A They're very little. They're very minute.

Q How about the El Paso Canyon Largo 89?

A The El Paso is a brand new well and they're recovering their frac oil at this time, but I do have information that it's decreasing rapidly.

Q So of the three wells, actually only one has been on production, you might say?

A For any length of time, of that row of wells you just mentioned, one has been on for any length of time.

Q How much production has been taken from that well?

A I don't know. We have that data, we'll present later.

Q I see. Has there been any change in the gas liquid ratio on that well during its producing life?

A The only change was after we recovered the frac oil, fluids decreased rapidly, and the GOR continued to rise and is still climbing slowly.

Q It is?

A Yes.

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

(Witness excused.)

MR. WHITWORTH: For the record, Garrett Whitworth, representing El Paso Natural Gas Company.

NORMAN F. WOODRUFF

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

DIRECT EXAMINATION

BY MR. WHITWORTH:

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

A I am Norman F. Woodruff. I am employed by El Paso Natural Gas Company as their manager of Gas Proration Operations.

Q Mr. Woodruff, have you testified as an expert witness before this Commission, and is that a matter of record?

A Yes, I have, and it is.

Q Have you made a particular study of the reservoir conditions in the San Juan Basin in New Mexico?

A Yes, I have.

Q Particularly, have you studied the Devils Fork-Gallup Pool in the San Juan Basin, with respect to this case?

A Yes, I have.

Q Will you please explain to the Commission what you've used and what you have done in making this study?

A In making this study I have utilized all of the reservoir data available, consisting of the core analysis on the El Paso Natural Gas Company Canyon Largo Unit No. 89, the various types of logs available for that and other wells in the Pool, the initial potentials on the wells, and the production and pressure

data available on the wells in the Pool.

MR. WHITWORTH: Is the Commission satisfied with the qualifications of the witness?

MR. PORTER: Yes, sir.

Q (By Mr. Whitworth) Would you please continue, Mr. Woodruff, as to what you have learned in studying the Devils Fork-Gallup Pool?

A First let me reiterate what was initially said,that we are going to recommend to the Commission 320-acre spacing, and in recommending that, I'm going to refer to data on various wells. First let me state that this Pool was discovered by the Val Reese, now Killarney Brown 1-24 well, located in Section 24, which was drilled in October, 1958.

Production for this field did not start until December of 1959. It started with the Redfern and Herd No. 1 well located in Section 18, shown on the map, the township and range is not shown, I believe it's Township 24 North, Range 7 West for the Redfern and Herd No. 1 well.

The next well to begin production was the Redfern and Herd No. 2 well located due west of the No. 1 well, an approximate distance of 4311 feet.

I'm going to give you pressure data concerning both of those wells, and in addition pressure data concerning the El Paso Canyon Largo Unit No. 89 well to the southeast an approximate distance of 3,054 feet. The No. 1 Largo Spur well of Redfern and

Herd's showed an initial bottomhole pressure by bomb of 2,015 pounds, upon its completion in December of 1959. On the 20th of January in 1960, upon the completion of the Redfern-Herd No. 2 well, its bottomhole pressure was taken and it showed a bottomhole pressure of 1993 pounds. Now again in the Redfern and Herd Largo Spur No. 2 well, at the time that it was placed on production on March 20, 1960, a pressure was taken, and it showed a bottomhole pressure of 1959 pounds. The 1959 pounds differs from the original reservoir pressure indicated by the Largo Spur No. 1 well by 56 pounds.

Now all of the production which had been withdrawn from this field during the period that the pressure was taken on the Canyon Largo No. 1 well and the pressure was taken on the Canyon Largo No. 2 well at the time that it was initially put on production came solely from the No. 1 well, plus such gas as was produced during completion and testing of the other wells in the Pool. We had a 56-pound pressure decline, apparently, for the No. 2 well, but we do know that from the time that the No. 2 well was completed in January until the time it was put on production in March, that there was a definite 34-pound pressure drop recorded by a bottomhole pressure bomb in the same well. Now those bombs are reported to have been calibrated before and after run into the well, so that we think this is conclusive evidence of pressure decline in this well bore, due to production from the field, attributable primarily and almost solely to production from the

No. 1 well.

Let me say in the No. 1 well that I'm referring to the Redfern Largo Spur No. 1 well, and I think it is also significant that we point out that at the time the Redfern Spur No. 2 well was completed, that the Redfern Largo Spur No. 1 well had produced approximately 80,000,000 cubic feet of gas. At the time that the No. 2 well had its last bottomhole pressure taken, at the time it was put on production, the No. 1 well had produced approximately 320,000,000 cubic feet of gas.

Q Has there been an additional well recently completed in this reservoir?

A Yes. Our Canyon Largo Unit No. 89 well, which I stated was located approximately 3,054 feet to the south and east of this well, has been completed in the intervening time and is not yet on production. However, upon its completion, we took its wellhead pressure; its pressure reflected, or the pressure recorded was 1573 pounds. At the time that the No. 1 Largo Spur Redfern well was completed, its wellhead pressure was 1642 pounds, which reflects a variation in wellhead pressures between the two wells of 69 pounds, and to me indicates that drainage has also occurred in that area, resulting in the pressure drawdown on our Canyon Largo Unit No. 89 well.

Q Mr. Woodruff, what conclusions do you draw from all this data, with respect to whether one well can effectively and efficiently drain an area of at least 320 acres?

A Let me say that, assuming a radius of drainage of the 4311 feet existing between the Largo Spur 1 and Largo Spur 2 wells, that an area of 1340 acres would be indicated as a drainage area, based solely on that distance. To me, the pressure performance and data indicates conclusively that this well can drain acreage in excess of 320 acres, and that a unit size of at least 320 acres should be adopted.

Q Can that opinion be further justified by any additional data?

A I consider that it can, and have prepared an analysis which we have identified as El Paso's Exhibit No. 1, or will identify, of the reservoir characteristics in this Gallup reservoir, and compared it with the average characteristics of the Mesaverde in the Dakota reservoir, which I would like to review.

(El Paso's Exhibits Nos. 1 & 2 marked for identification.)

Q Please do.

A I have also handed out Exhibit 2, which is a core analysis of that pay interval within the El Paso Natural Gas Canyon Largo Unit No. 89, from which the Devils Fork-Gallup reservoir characteristics were derived.

Briefly reviewing this comparison, we find that the Devils Fork-Gallup exhibits a porosity of 12.4, compared to a Mesaverde average porosity of 9.1, and a Dakota average of 7.2. Connate water, 29 percent for the Gallup; 28.6 for the Mesaverde; and 30.6 percent for the Dakota. Thickness average for the first

five wells completed in the Devils Fork-Gallup, ten feet, that is net effective pay; average for Mesaverde is fifty-one feet; average for the Dakota, forty feet. Initial reservoir pressures for the Gallup, 2,015 pounds; for the Mesaverde, 1362 pounds; and for the Dakota, 2,877 pounds. Reservoir temperature for the Gallup, 126 degrees Fahrenheit; Mesaverde, 154 degrees Fahrenheit; and Dakota, 165 degrees Fahrenheit.

Permeability in the Gallup is 14.65 millidarcies, taken from the core on the Canyon Largo Unit No. 89. The average for the various cores available from the Mesaverde is 4.38 millidarcies, and the average for the various cores available for the Dakota, 4.12 millidarcies.

Initial potential for the Gallup, 7,849,000 cubic feet -- may I say that the figures shown on this comparison should be indicated to be in mcf. Average for the Mesaverde is 3,950,000 cubic feet, and for the Dakota, 4,273,000 cubic feet.

Utilizing these reservoir characteristics for the various reservoirs indicates a recoverable reserve in mcf per acre foot of 530 for the Gallup, 235.9 for the Mesaverde, and 329.9 for the Dakota. This data reflects that the Devils Fork reservoir has better reservoir characteristics, based on the wells producing therein, and that it has higher productivity than is true of the wells in the Mesaverde and Dakota reservoirs.

Q You just described Exhibit No. 1, is that right?

A Yes, sir. I have described also Exhibit No. 2, which

was furnished only for information purposes.

Q On the core analysis?

A Right.

Q Are you familiar with the evidence that has been presented in prior hearings to establish the Mesaverde and Dakota reservoir --

A Yes, I have participated in the hearings --

Q -- Pool rules?

A -- as a result of which 320-acre spacing was set up in both of those pools, and which justified the 320-acre spacing. To me the evidence available in this reservoir shows that 320-acre spacing is more apropos, or at least as apropos as was true in those other reservoirs.

Q Utilizing the reservoir characteristics that you have previously described for the Devils Fork-Gallup on your Exhibit No. 1, El Paso's Exhibit No. 1, what data do you have with respect to calculation of recoverable reserves?

A Based on the recoverable reserves per acre foot indicated on Exhibit No. 1, reserves for the average well in the Devils Fork-Gallup Pool on 160-acre basis would be 848,000,000 cubic feet. On a 320-acre basis, 1,696,000,000 cubic feet.

Q Mr. Woodruff, what do the Applicants in this case recommend with respect to the adoption of rules for this field?

A Applicants in this case, in addition to the 320-acre proration spacing unit special rule, request that this pool, or

that the name of this pool be added to the other pools in the San Juan Basin, which the general rules presently being considered by the Commission will be applicable to; or should such general rule not be adopted by the Commission, that the identical rules as set out in such proposed general rules be adopted and applied to this field.

Q Are there any special rules that you care to recommend with respect to this pool?

A Of course, the 320-acre spacing rule is special, and that would, in addition to the acreage allocation, provide, in accordance with the general rules, for a 990 feet from unit line plus or minus 200 feet. May I rephrase that -- would provide a location from unit lines of 990 feet plus or minus 200 feet.

Q What type of --

A The general rules also would provide for a proration formula based on 75 percent acreage times deliverability plus 25 percent acreage. I can explain the mechanism of that, if the Commission desires. I think it's understood by all what it is.

Q That is Rule 9-C of the proposed general rules?

A Yes, that is specifically set out in 9-C of the proposed general rules. I consider that the application of deliverability in the proration formula of this pool is well justified by the analysis of the data that is available in the short time that we have had history on this field.

Q Have you prepared an exhibit to reflect this?

(El Paso's Exhibits Nos. 3 & 4 marked for identification.)

A Yes, I have. I have prepared two exhibits, Exhibit No. 3 and Exhibit No. 4 of El Paso Natural Gas Company; Exhibit No. 3 being a graphic plot of the net effective pay for each of the wells drilled to date, versus the absolute openflow potential calculated for each well, based on a three hour flow test.

No. 4 Exhibit is a graphic plot of both net effective pay and the absolute openflow potential, versus distance from the estimated location of the permeability barrier, which was testified to in the previous case hearing No. 1915.

If we may refer to El Paso Natural Gas Company's Exhibit No. 3, which is a comparison of net effective pay and initial potential, I would like to briefly discuss with you the theory behind this exhibit and the basis for the conclusions which I will state to you. Within this pool, except for the El Paso Natural Gas Company Canyon Largo Unit No. 89 well, the only known variables which influence the calculation of recoverable reserves is net effective pay. That can be derived from the various type of logging means that have been utilized on these wells. For the El Paso Canyon Largo Unit No. 89 well, we have the core analysis from which the various reservoir characteristics, other than thickness, were derived.

Let us make the assumption that those characteristics apply to all wells, which is the assumption that I have made in this exhibit. Then the only variable applicable to each well would

be net effective pay, and net effective pay would be directly related to recoverable reserves so I could have plotted on this particular curve net effective pay or recoverable reserves, and established the identical relationship; and you can note from this exhibit that we have seen fit to draw a straight line which approximately goes through three of the five wells, the Brown No. 1 -- that is the Killarney Brown No. 1, the Redfern Largo Spur No. 1, and the El Paso Canyon Largo Unit No. 89. It also reflects that there are two wells that are considerably at variance with it, the one being the Val Reese and Associates Lybrook No. 1 well, which is shown to exist considerably what you might refer to as this average line.

The operator of this well has advised me that he considers at the time its initial potential was taken, that the well was not cleaned up and that consequently this was not a reliable test. Were we to assume that it was a reliable test, it would reflect that other reservoir characteristics than net effective pay influence the initial potential of this well, which I consider is the fact prevailing for the Redfern Largo Spur No. 2 well, that something other than net effective pay influences its productivity.

Q Now on both these graphs, El Paso's Exhibits No. 3 and 4, you've plotted potential rather than deliverability, is that correct?

A That is correct.

Q Why did you do that?

A I plotted initial potential because that is all that was available to me on each of these wells. Deliverability tests are taken only after the wells have been connected into the pipelines and a test taken in accordance with the Commission rules. An analysis of the performance characteristics of these wells indicates that the initial potential and the deliverability calculated by the Commission procedure should have very close relationships. These are what we term good gas wells, of good characteristics, and I consider that a very close relationship will be established between initial potential and deliverability so that the relationship which I show on my exhibits of initial potential to other reservoir characteristics would hold also with deliverability plotted in relation to those same characteristics.

Q Now in the area of market demand prorationing --

A I would like, before I go to that, to discuss my exhibits a little more in detail. This interpretation reflected by the straight line on the Exhibit No. 3 of El Paso shows that for the average in this pool, initial potential is directly related to the net effective pay, and approximately a one to one relationship. Exhibit No. 4, as I previously briefly explained, shows the plotting of net effective pay and initial potential with relationship to the estimated distance from the permeability barrier.

Now the location of these wells distance-wise from the

permeability barrier were with relationship to a line drawn at a 45-degree angle through the Killarney Brown No. 1 well, with the location of each well perpendicular to that line being the distance shown on Exhibit No. 4.

Q This permeability barrier which you are speaking of was brought out in Case 1915 that has been previously referred to, is that correct?

A That's correct, and supplementary testimony has been made concerning it here today. It is of particular interest, I consider, to see from this exhibit that both net effective pay and initial potential increase in a similar manner departing from the edge of the pool, reaching a peak in the vicinity of the Largo Spur No. 2 or Largo Spur No. 1 area, that would be delineated on this map; and initiating a decline to the northeast through the Canyon Largo No. 89 well.

It's particular interesting to me, prior to this hearing, in conferring with Mr. Thornton to see that his interpretation of the pay characteristics of this reservoir conform to this interpretation, that we have reached a peak of net effective pay and have initiated the decline to the north and east.

Q Do you have anything else, Mr. Woodruff, in the explanation of these two exhibits, 3 and 4?

A I believe not, other than to say that I consider Exhibit 4 here again reflects a reasonable relationship between initial potential and net effective pay.

Q Now getting to market demand prorationing, do you have any recommendation that you would make with respect to that?

A Well, the general rules will provide for market demand prorationing, which Applicants in this case do recommend. Market demand prorationing then would supersede the existing rule of the Commission which limits the production from this pool to a million cubic feet per well. In other words, demand from this pool and the resulting allowables would be based on the nominations of purchasers rather than a set established figure made by a rule of the Commission.

Q And depletion of reservoir would depend on market demand, is that true?

A That is correct.

Q Do you have any recommendations to make to this Commission with respect to horizontal limits that this pool should have?

A Yes, we wish to recommend at this time an extension of the existing horizontal boundaries of this pool so as to include-- and I will refer to Redfern and Herd's Exhibit No. 2 for your referral and understanding -- in Township 24 North, Range 7 West, all of Section 13 and all of Section 24. Now previously -- or let's say the existing rule only includes the Southeast Quarter of 13; we are recommending the inclusion of the entire Section 13. We are recommending the inclusion of the entire Section 24, where the existing rules only included the East Half of Section 24.

In Township 24 North, Range 6 West, we are requesting inclusion of all of Section 17, where according to the existing order only the Southwest Quarter is included. We're requesting the extension to include all of 18, where the present order provides for only the South Half of 18. We're requesting the inclusion of all of Section 19, where the existing order only includes the North Half of 19, and we are requesting the addition to the pool limits of the West Half of Section 20.

We would also recommend to the Commission vertical limits composed of the entire Gallup section.

Q Is there anything else you would like to add to your testimony?

A As an Engineer, I became aware of something which intrigues me after my arrival here in Santa Fe, and that was shut-in pressures available from deliverability tests on three of the wells that are connected to pipelines and have been tested; in fact, the tests have just been completed and are in the process of being calculated and will soon, I assume, be furnished to the Commission.

The Val Reese Lybrook 1-19 well shows a shut-in pressure at the end of the seven-day period prescribed of 1538 pounds; the Redfern and Herd Largo Spur No. 1 well shows a shut-in pressure of 1515 pounds; and the Redfern-Herd Largo Spur No. 2 well shows a shut-in pressure of 1474 pounds.

Well, the thing that raises a question in my mind as an

Engineer is the 59 pounds differential reflected in shut-in pressures between the No. 2 and the No. 1 Largo Spur wells, the No. 1 well being the older well, the No. 2 well being the newer well, and the No. 2 well being 59 pounds different. Well, let me say that I, in my wisdom, have not been able to determine why there is a 59-pound pressure difference, and why the No. 2 is lower. It has been producing the lesser period of time. I think that several conclusions and rationalizations could be made.

I think it definitely shows us that drainage did occur which brought the Spur 2 well down at least in the vicinity of the Spur 1 well, as far as reservoir pressure was concerned; and I rationalize that the lower pressure may be a reflection of the greater withdrawals existing in relationship to the No. 2 well since it was completed, as related to the No. 1 well during the same period.

The No. 2 well has been produced at approximately, at a rate approximately 50 percent greater since it was put on the line than the No. 1 well. We do know, from the pressure history recorded, that the No. 2 well was still building up at a two or so pound rate at the end of the seven-day period.

I also rationalize that there is a possiblity that the pressure on the No. 2 well was influenced by the production of the Lybrook 1-19 well to the south and east of the No. 2 well, the Val Reese 1-19 Lybrook well being on what may be interpreted a strike relationship to the Redfern and Herd Spur No. 2 well.

We do know that the Lybrook well was producing at the time, during the major portion of the time that the Spur 2 well was shut in, so it's entirely possible that its pressure was lower because of the possible drainage influence of the Lybrook No. 2 well.

Of course, for this to be true we would have to have a reflection of a greater tendency of drainage on a strike within the reservoir than we would, you might say, in the dip direction. Otherwise, you would have had a comparable pressure drawdown on the No. 1 well. I think that as an Engineer and with my knowledge of geology, that maybe because of the nature of the laying down of these beds, that a well on strike may have greater opportunity of communication than a well on dip.

I believe that is all that I have.

Q Mr. Woodruff, were El Paso's Exhibits 1 through 4 prepared by you or under your direct supervision?

A Yes, sir, they were.

MR. WHITWORTH: We offer these exhibits in evidence.

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

CROSS EXAMINATION

BY MR. BRATTON:

Q Mr. Woodruff, do you know, is there any gas pool in the San Juan Basin which is as deep as this one which is spaced on 160 acres?

A Not to my knowledge. Certainly no prorated pool. The

only question in my mind would be the Barker Dome Pool, and I am not positive what the spacing is in Barker Dome.

Q As a matter of fact, the Mesaverde is on the average a great deal shallower than this, is it not?

A That is correct.

Q And it's spaced on 320?

A That is correct.

MR. BRATTON: That is all.

MR. PORTER: Mr. Payne.

BY MR. PAYNE:

Q Mr. Woodruff, referring to your Exhibit No. 1, as I understand your testimony it is that,aside from net pay thickness, all this information was gathered from one core, is that right?

A That is correct.

Q The net pay thickness, however, is the average of the five wells?

A That is correct.

Q Do you feel that this gives you a fair and accurate picture of the characteristics of the Devils Fork-Gallup, when you have one core,to use that as a so-called pool average?

A Let me say that it is a reasonable and normal useage of such data when other is not available. It would be much preferable to have cores on every well. Were we to have such cores, we probably could answer more completely the reasons why initial potential and net effective pay on all of these wells did not fall

directly on a straight line. They were influenced by some other factor involved in the reserve calculation that we're not aware of, because we do not have core analyses on those various wells.

Q Now, Mr. Woodruff, in drawing up your Exhibit No. 1, did you consider the desirability or feasibility of considering average Pictured Cliffs?

A No, sir, I did not.

Q How, in your opinion, does it stack up generally as against the Devils Fork-Gallup, in terms of porosity and permeability and so forth?

A My belief is that the Pictured Cliffs would show poorer producing characteristics than any of these three reservoirs. Of course, in answer to your question, it would show poorer characteristics than the Devils Fork-Gallup.

Q Now, Mr. Woodruff, you heard Mr. Thornton's testimony as to liquid production of the wells in the Devils Fork-Gallup Pool. Does it seem somewhat unusual to you that these wells would make no liquids or relatively insignificant amounts, and yet the connate water is 29 percent?

A No, sir, it does not seem incompatible, it would seem normal.

Q Do most of the Mesaverde gas wells make water?

A No.

Q How about the Dakota?

A No.

Q Now, Mr. Woodruff, you are recommending 320-acre spacing. Do you propose that these units run in either direction?

A Yes, sir, I had meant to indicate in my testimony that the 320 acres would consist of any half-section, north, east, south, or west, at the election of the operator.

Q With the well to be drilled in either quarter-section, is that right?

A That is correct. By "either", you mean any quarter-section?

Q Well, either quarter-section comprising the unit.

A Oh, yes, sir.

Q Who are the present purchasers in this pool, Mr. Woodruff?

A The only purchaser at this time is Southern Union Gas Company, but I anticipate that El Paso Natural Gas Company will also be a purchaser there.

Q Do you have any information as to the takes by Southern Union up to the present time?

A Only in a very general fashion, in that I did mention as of March 20th from the Redfern and Herd Largo Spur No. 1 well, there had been 320 million cubic feet; that was approximate as of March 20th. I believe at the end of March they had produced approximately 360 million cubic feet. I have no clear recollection of the production from the other two wells connected, but I'm sure that the data is available here and could be furnished to you by

someone else. I'll be glad to stop and ask, if you would like for me to do so.

Q I was wondering if the average had exceeded the limit imposed by the previous order in this case, if the takes had been greater than a million a day prior to that time.

A Yes, they have been greater than a million a day prior to that time.

Q You say that El Paso does anticipate becoming a purchaser in this pool?

A Yes. We anticipate tying in our own well, and I understand are proceeding towards that end.

Q I realize you have a hard time giving me any kind of an accurate answer; do you have any estimate as to what El Paso's nominations might be, the range in this pool?

A I would estimate it would be something, say for the rest of this year, in the 50 percent of the delivery capacity of the wells to which we are tied.

Q Mr. Woodruff, if this pool was completely developed on 320, assume that first, and then assume that it was completely drilled up on 160, the pool as proposed in your horizontal limits, would the withdrawals of gas be the same if the pool was prorated?

A Well, now, to answer it, first I would have to assume a knowledge of the contractual obligations of the other purchaser in the pool, with which I'm not familiar, but it is my belief there would be no difference in the demand with it.

Q The entire allowable presumably would be produced from the pool, whether it was on 160-acre spacing or 320?

A That is correct.

Q Now, Mr. Woodruff, I believe you testified in regard to your Exhibit No. 3 that there was almost a one to one ratio between net effective pay and initial potential, is that right?

A That is correct.

Q How do you account for the difference in the initial potential of the Largo Spur 1 and the Largo Spur 2?

A I don't know how to account for it, other than to assume that other reservoir characteristics influencing recoverable reserves than net effective pay influence the initial potential.

Q But in regard to these two wells, at least, at least the ratio is not one to one?

A That is correct, as reflected by this graph.

MR. PAYNE: Yes, sir. Thank you.

MR. PORTER: Mr. Arnold.

BY MR. ARNOLD:

Q Mr. Woodruff, you have made more or less of a two dimensional analysis of the reservoir with your exhibits, wouldn't you say?

A I believe possibly that's true, yes, sir.

Q What would you say the elongate direction of this sand is?

A The elongate direction of this sand would be perpendicular

to the area that I have pictured.

Q So actually you have analyzed, possibly, at any rate, a very small portion of the reservoir?

A That is true. I have analyzed the relationship of the wells with relationship to a known or estimated location of a known permeability barrier. I have no knowledge of a permeability barrier on the north, the south, or the east, but we can reasonably determine where it is on the southwest, and I have related this analysis on my Exhibit No. 4, which I assume you are referring to, to that, considering that. relating it to that would give a reflection of all of the reservoir characteristics influencing potential with relationship to the permeability barrier.

MR. ARNOLD: That's all.

MR. PORTER: Mr. Utz.

BY MR. UTZ:

Q Mr. Woodruff, on your Exhibit No. 4, the initial potentials that you plotted on that exhibit are three-quarter inch choke potentials?

A I understand that they are the three-quarter openflow potentials, resulting from a test determined through a three-quarter inch choke.

Q Were they stabilized or were they three-hour tests?

A They were three-hour tests.

Q Three hours.

A And in answer to your question on stabilization, I cannot say whether they were or were not. I was not present nor am I aware whether any pressures were taken before or after the three-hour period, but I am advised that these wells do reflect stabilizing tendencies in comparison, say, with wells in the Mesaverde and Dakota; that they will stabilize in a reasonable length of time.

Q What you mean there is that relative to the Mesaverde and Dakota, they stabilize faster?

A That is correct.

Q But you don't really know how long it takes them to stabilize?

A No, I'm not sure, but I understand that there may have been a four point test taken, the data from which has not been made available to me; but I understand possibly this is a poor test and you may not want to accept it, Mr. Commissioner, that we were able to establish four stabilized points in an effort to project an openflow potential in that manner.

Q Your testimony as to the pressures taken on deliverability tests,in that they were still building up a pound or two a day at the end of seven days, led me to believe that they weren't stabilizing as fast as we first thought they might. Is that true, would that indicate that?

A First let me say that I have no indication of continual build-up except on the Redfern and Herd Canyon Largo -- no, excuse

me, it's Largo Spur No. 2 well, which showed a pound or two pounds pressure build-up per day during the last several days. It's entirely possible that this could have been a reflection of the interference exhibited by the Val Reese Lybrook 1-19 well.

Q How many of these wells have been tested, deliverability?

A I understand that three have.

Q Do you know which three?

A They are the Redfern and Herd Largo Spur 1 and 2 wells and the Val Reese Lybrook 1-19 well. I believe those are the only three presently connected to a pipeline.

Q They are the only three. Are they connected to Southern Union?

A Yes.

Q Do you have any plans for connecting any other wells in this pool except your No. 89?

A I am not aware of any contractual privilege to connect any other well within the pool.

Q Do you know what the status of the Redfern-Herd Largo Spur No. 3 is?

A Nothing other than to know it has penetrated this reservoir and to my knowledge it is under completion at this time. May I say that Mr. Redfern will be a witness following me, and probably more properly that should be referred to him for questioning.

Q Did I understand you to say that you intend, or supposed

that you would nominate 50 percent of the initial potential, or what, 50 percent of what?

A Of the delivery capacity into existing pipeline facilities, is the feature that I meant to refer to.

Q That would be roughly deliverability, wouldn't it?

A Are you referring to the deliverability which we utilize for proration purposes?

Q Yes, sir.

A It would be something less than that deliverability, because the actual ability of the well would be restricted through the production through pipe utilizing its completion.

Q In other words, your pipeline pressure would probably be higher than your deliverability pressure?

A I'm not sure that is true, but the frictional effects and the restrictive effects of the pipe through which the well produces will, I would expect, result in a lesser actual producing capacity than that deliverability calculated for proration purposes, which is calculated negating the effect of the flow through pipe.

Q Did you, in your recommendations, recommend the type of deliverability test?

A Is your question, did I recommend?

Q Yes.

A I recommended the adoption of the general rules, which would provide for the type of deliverability test to be taken.

Q This 333, Order 333-C and D?

A That is correct.

Q Do you feel it is necessary to take that long drawn-out test in this pool, which apparently has a little better permeability than most pools?

A Actually I do not consider that we need that long a test. Maybe we were short-sighted in recommending that long a test. I think the taking of tests on that basis and the accrual of data can indicate to us whether we can recommend to you a test on a different basis.

Q Referring again to your Exhibit No. 4, had you plotted deliverability tests rather than three-hour potential tests, that curve might be substantially different than that, might it not?

A It is my opinion that it would not, that the nature of the curve would be the same. The deliverability will be less than the initial potential, but I consider that the configuration of the curve would be essentially the same and reflect the same, or would permit the same conclusions to be reached that this does.

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

MR. PORTER: Mr. Nutter.

BY MR. NUTTER:

Q Mr. Woodruff, I believe you stated that your calculated reserves were approximately 848,000,000 cubic feet per 160 acres, and 1,696,000,000 per 320 acres?

A That is correct.

Q Has the F.P.C. approved contracts for the sale of gas in this area?

A I do not know.

Q Have they approved the sale of Canyon Largo gas to El Paso Natural Gas Company?

A By Canyon Largo gas, are you referring to the Canyon Largo Unit as a whole?

Q Your No. 89 well.

A Not to my knowledge.

Q So you don't know whatan F.P.C. approved price for this gas in this area would be?

A No, sir, I do not know.

Q So we can't determine how much these reserves under these two different size tracts are worth?

A I consider we can, based on what the contracts provide for price. Whether the F.P.C. permits that or not, I don't know.

Q What's a reasonable estimate of the value of the gas in here?

A May I refer you to the next witness in terms of value of the production.

Q Yes, sir.

A He will testify to that.

Q I will defer that question to the next witness. Where do you propose that the next well will be drilled that will be located on El Paso acreage?

A That is not within my interest, and I do not propose that there will be, or where it will be drilled.

Q Where will the next well be drilled?

A I do not know.

Q Do you know whether El Paso has any immediate plans for drilling another well in here?

A I did not check to see whether we do or not, but I imagine that we do, because this appears to be a reservoir that can produce gas at a rather rapid rate, so I think you need to get in there and be in with the first ones, if at all possible.

Q What is the perforated interval in Canyon Largo No. 89, Mr. Woodruff?

A I do not have that information before me, but I believe I can get it for you.

Q Do you have the core analysis?

A Yes, I have the core analysis here before me, and I also furnished for your use a core analysis and the interval would be -- I know the interval represented in the analysis by samples 31 through 48, which would be 5484 feet to 5501 feet, 5502 feet, for a total of, I believe, 18 feet.

Q Who made the analysis of the core, Core Lab, or did El Paso's technicians?

A The analysis was made by Chemical and Geological Laboratories of Farmington, New Mexico.

Q Did they show any -- do you have the complete analysis

there, Mr. Woodruff?

A Yes, I do.

Q Do they show any variation in the amount of liquids that are present along that core?

A The liquid saturations are reflected on the core analysis within the area that is open. Are you referring to areas other than those which are open into this well bore?

Q Your lowest perforation is 5502, or is that the lowest point?

A That is my estimate where it will be, not knowing exactly where the perforations are in this well. The 5502 is the lowest point within the Gallup interval that was cored.

Q Was it drilled deeper than that?

A Yes, sir, it was drilled on into the Dakota formation. May I refer you to a copy of this core analysis which is present at the table here? You will note that we have furnished to you here the analysis on that interval in which this well is completed, and I'll be happy to furnish you such other portions of the analysis that you might desire to see.

Q Which is the interval in which the well is completed, Mr. Woodruff?

A The interval which would be covered by samples 31 through 48.

Q It's perforated down through 48, Sample No. 48?

A I'm sorry that I am unable to tell you where the

perforations are in this well. It is my understanding that that entire section is available to the well bore in this well.

Q How much gas has been produced from the well to date?

A The well is not connected and only such gas as was required in completing and testing the well has been produced.

Q So sample No. 48 with 21.8 percent residual oil saturation hasn't had a chance to produce yet, has it, Mr. Woodruff?

A It has not produced into the pipeline. I might state in answer to what I assume you are leading up to that drillstem tests were taken during the drilling of this well, and reports by our geologists and engineers indicate that there was no indication of free oil in this reservoir, but rather, it was a gas and condensate producing formation.

Q Was any oil recovered on drillstem test?

A My advice is, no.

Q Whether oil-cut mud or free oil or any other kind of oil?

A My advice is that there was none recovered.

Q Mr. Woodruff, what would be your recommendation to the Commission if and when Canyon Largo No. 89 is placed on stream, it should commence making liquid in an increasing quantity?

A What would my recommendation be to the Commission?

Q Yes, sir.

A I believe that my recommendation would have to wait till that occurred and to analyze the conditions that we considered

existing at that time. If you wanted to set up some hypothetical basis, I might be able to give you an answer, based on that. We may or may not be concerned or alarmed, or feel there was anything requiring action as a result of that. We do not anticipate the occurrence of oil in this well.

Q Would you recommend this same type of pool rules and proration formula, in the event that subsequent development should indicate there is an accumulation of oil to the northeast?

A I would, unless the occurrence of the oil was of such magnitude that it required special consideration.

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

BY MR. PAYNE:

Q Mr. Woodruff, in a gas pool where there's a reasonable possibility that it could be a gas cap for an oil pool, is there any advantage to having 320-acre spacing over 160-acre spacing?

A Your question was, in a reservoir where it is contemplated that there may be a gas cap?

Q Yes, where there's a reasonable possibility that the gas is a gas cap for an oil pool, is there any advantage in such cases in drilling on 320 rather than 160?

A I can see no advantage from that standpoint.

Q Now as I understand it, you aren't proposing any definition of an oil well here in this pool, inasmuch as you don't anticipate that there will be one?

A That is correct.

Q Now in your drainage testimony, Mr. Woodruff, I believe you testified that your pressure data indicated that the wells would have an effect at least as far as, affect 1300 acres?

A Yes, I believe it was 1320 acres, the calculation was.

Q From that you feel that it could efficiently drain at least 320?

A Yes, sir. In fact, I consider it could efficiently and effectively drain considerably in excess of that.

Q But not 1300 acres?

A It could possibly drain efficiently and effectively 1340 acres. We know we have had pressure drops reflecting interference over 4311 feet distance, and if you were to use that distance as a radius of a circle, the circle would encompass 1340 acres.

Q But isn't the drainage, Mr. Woodruff, at the end of that circle going to be less efficient than it is closer in to the center of the circle?

A Certainly would be, but because we have found at the end of the radius a very effective drainage, as reflected by pressure data, I don't know where the end would be as far as an effective drainage radius would be.

Q But you feel that it would be at least in the range of 320 acres?

A Certainly.

MR. PORTER: Any other questions? Mr. Nutter.

BY MR. NUTTER:

Q What would you expect -- now you know the shut-in pressures on these wells. What would you expect that the average deliverability of a well in this pool is going to turn out to be, from the wells that we have to date?

A Would you qualify the word "deliverability" to me, so I know what you are referring to?

Q Deliverability as calculated by the proposed general rules for the Northwest.

A I would estimate about five or six million, but that's an estimation.

Q Now you stated that you expected that you would probably nominate for gas, to produce gas from your well at the rate of about fifty percent of the delivery capacity. Now what would that rate actually turn out to be that you would expect to buy gas from your well?

A I would say about, well, let me state this; that you have phrased your question asking me first what the State deliverability average would be, which I believe I said five to six million.

Q Yes.

A Now the actual deliverability into the existing pipeline is not going to be five to six million, it's going to be, say, four million. Now our obligation, or our probable intent to nominate would be fifty percent of the delivery capacity into

existing pipeline facilities, or half of the four million.

Q So you would expect about two million a day, as a rough estimate?

A That's correct.

Q Well, now, in the Blanco-Mesaverde Gas Pool, I believe an average well with a deliverability in the range of five to six million over the past year has had an allowable of between 1,200,000 and 1,300,000 a day. Do you think that that difference between the average Mesaverde well and the average Devils Fork well is justified?

A Now I'm going to ask you to repeat your question, and particularly I'm asking you to positively state what you mean by an "average deliverability" of a Mesaverde well. If I understood you correctly, I do not concur that the average deliverability of a Mesaverde well is as you have expressed it.

Q I meant the average allowable of a well, with a deliverability in that range between five and six million.

A And you are stating that the average allowable for that--

Q Has been between 1,200,000, 1,300,000, somewhere in that neighborhood.

A You are asking me whether I consider that is a reasonable relationship in comparison with the comparable type deliverability in the Gallup?

Q Yes.

A I do. Actually each well in each pool will receive an

allowable based on the allocation formula for that pool and the total nominations for all purchasers within the pool. Now I can't tell you that a well with an average delivery capacity into the pipeline of four million, or an average stated of five to six million in the Devils Fork-Gallup will give a two million allowable, because I represent just one purchaser and I do not know what the other purchasers will do.

Q I realize you are just speaking of the one.

A So it is influenced not only by more than one purchaser but it is influenced by what other wells in the same pool get.

Q I realize that you were speaking of just one well and what you were expected to take from your one well.

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

MR. PORTER: Any further questions? Mr. Kendrick.

BY MR. KENDRICK:

Q You brought in some pressures as taken on the deliverability test that has been executed on the three connected wells?

A Yes, sir.

Q Did you also inquire as to the approximate average daily production rate of those three wells?

A Yes, sir, I did.

Q Could you give us those, please?

A Starting over, it would be the Reese and Associates Lybrook 1-19 well produced at an average daily rate of 2,419,000 cubic feet a day. The Redfern and Herd Spur No. 1 well produced

at an average rate of 4,361,000 cubic feet a day. The Redfern and Herd Largo Spur No. 2 produced at a rate of 6,077,000 cubic feet per day.

Q This Largo Spur well No. 2 is the well with the lowest shut-in pressure, and you thought maybe the answer might have been that this well of Reese and Associates, the Lybrook 1-19, might have drainage effect upon that shut-in pressure?

A And interference effect would possibly have been a more accurate description of it.

Q Yet this well that was being affected has been producing at a rate considerably in excess of twice the rate of this Lybrook 1-19 well?

A Now I did not testify to that. I do not question that that is true, but the relationship that I was discussing, or that I was theorizing upon was relationship which existed with production from the Lybrook well occurring immediately after it had been shut in for deliverability test, and production during the time that the Largo Spur No. 2 well was being produced, I mean was shut in for its deliverability test.

Q Well, could the rate of production also affect the shut-in pressure?

A If there is interference, it certainly could.

Q Could the rate of production on two wells, say ten miles apart in a similar reservoir, if one is drawn at a more rapid rate than another one, or has a deliverability, or an ability to

produce at a large rate, would you expect it to build up to the same maximum pressure after a fixed time of production and a fixed time of shut-in for the two wells?

A No, sir, I would not expect them to build up to the same pressure, necessarily.

MR. KENDRICK: Thank you.

MR. PORTER: Any further questions?

MR. UTZ: Yes, sir.

BY MR. UTZ:

Q Mr. Woodruff, who took these deliverability tests, Southern Union?

A I am not positive who took them.

Q Where did you get your information?

A I got them from the operators of the wells.

Q Would Mr. Redfern know who took the tests?

A I would assume so.

MR. BRATTON: Yes, Tom Dugan took them. Is that right, Tom?

MR. DUGAN: Yes.

MR. PORTER: Anyone else have any questions? The witness may be excused.

(Witness excused.)

MR. PORTER: We'll take a very short recess.

(Short recess.)

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

Mr. Bratton.

JOHN J. REDFERN, JR.

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

DIRECT EXAMINATION

BY MR. BRATTON:

Q Will you state your name, please?

A John J. Redfern, Junior.

Q You are a partner in Redfern and Herd?

A Yes, sir.

Q You own the Redfern and Herd wells to which there has been testimony in this case?

A I do.

Q How much acreage do you own in this pool, Mr. Redfern?

A Well, in the general area we own four half-sections, three of which I believe are in the area asked for by the previous witness to be incorporated in this well.

Q How many wells do you have?

A Two completed wells and one well that has been fracked and now is in the process of being cleaned out.

Q Mr. Redfern, based on the reserves to which Mr. Woodruff testified, have you calculated an economic valuation of an average well in this pool, based on 320-acre spacing unit?

A I have, and I will try to explain how I approached this problem.

Q I might ask, Mr. Redfern, do these estimated recoverable reserves tally fairly fully closely with what your engineers have advised you?

A Yes, very close.

Q If you will proceed.

A Now the exhibit which has been distributed, labelled "Economic Evaluation of Average Well in the Devils Fork" --

(Whereupon, Applicant's Exhibit No. 3 marked for identification.)

Q That would be Applicant's Exhibit No. 3.

A We have used the reserves as testified to by previous witness of 1,696,000,000 cubic feet; based upon that reserve and a thirteen cent price for gas which we are being paid by Southern Union, I have added to the gas and liquid value 1.6 cents per mcf, which is approximately what we are now getting, eight barrels per million, and netting about two dollars per barrel at Bloomfield. So I have computed in the second column the gas in liquid value for the comparable production of gas.

May I refer back, the average production, we have assumed that the average well would produce approximately 1,000,000 feet of gas per day. Now the third column, the royalty and taxes column, is based upon a twelve and a half percent royalty and a five percent override, less taxes, including Rio Arriba school taxes, which came out to an estimated twenty-three percent.

For operating expenses, I have tried to make an estimate

of what I think it will cost to operate in this particular area. I have computed a net to the operator and a final column, the discounted present worth of the payment at six percent.

Now based upon the reserve estimate and the production estimates of the El Paso's Engineering Department, it indicates that in six years the average well would have produced the ultimate. Now I took, I think, all of you have from previous experience in the oil business, have heard of the various rules of thumb methods of at least two to one or three to one payout. Now from experience and as an independent operator, we are always confronted with the question of what is something worth and we have, over a period of years, come to the conclusion that the maximum fair market value of anything is approximately two-thirds of a discount of the present worth of the future payments. On the final sentence on that page, you see that I have computed that the fair market value of an average well is just a little over $100,000.00. Of course, if we drilled 160-acre well, it would probably be about half of that.

I refer to the top of the page again. We have put down that the average well ought to cost the operator about $80,000.00 to drill and complete. It is my impression from talking to some other people since I have arrived here that they consider that this is probably low, that it may be that the average well might cost a little bit more than that. We feel from our operations in there that we could complete a well for 80,000, however. I think

from an economic standpoint it would be a hardship on an operator if he were to be compelled to drill a well which, when he finishes drilling it, is not worth as much as the cost of drilling and completing.

Q Mr. Redfern, have you tried to drill down to the Dakota and dual some of these wells in here?

A Yes.

Q Have you had any luck in salvaging in that area?

A The original well, of course, was not a Gallup test, but was drilled on the prospect or the hope that we would be able to develop Dakota production, and we have penetrated the Dakota on every well that we have drilled and the results have been very limited amounts of production. In fact, we have concluded at this time, at least, that it would be uneconomic for us to attempt a dual completion with the intention of putting plugs and drilling out the plug and having a single completion after the Gallup has been exhausted.

Q Mr. Redfern, based on the information now available, would you voluntarily drill another well in this pool on 160 acres?

A We really would not voluntarily drill on 160-acre pattern.

Q Based on the economic study which you have made, based on the engineering estimates of El Paso and your own engineers, would it be a fair statement that on 160 acres this could turn into an economic disaster?

A Well, of course, that was what we fear, that an attempt to drill this pool on 160 acres would result in every one, at the best they might get their money back.

Q Would it be a further fair statement that on 320-acre spacing, even with the most optimistic outlook, this pool could not be a bonanza?

A Oh, that's exactly right.

Q Do you concur in the rules recommended by Mr. Woodruff?

A I do.

Q Do you have anything else which you care to offer, Mr. Redfern?

A No, I believe that in my opinion covers the position of the normal operator in this area.

Q This economic evaluation, you personally prepared that, didn't you?

A Yes, I did.

MR. BRATTON: We would offer Redfern and Herd Exhibit No. 3.

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

MR. BRATTON: I might add there were several things as to which various people were interested, which Mr. Redfern might be able to answer. I do not have a list of them. He will be glad to answer any questions pertaining to these other matters.

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

MR. NUTTER: Yes.

MR. PORTER: Mr. Nutter.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Redfern, here on your exhibit, what is this second column, "Annual Gas, MMCF"?

A That's an annual rate of production, based on a million feet of gas per day.

Q Which is what the present rule provides?

A Yes, that's exactly the same.

Q If we adopted the proration formula that you've concurred in here today, the gas takes would probably be in excess of that, wouldn't they?

A Well, in preparing this, I didn't know how much would really be the market demand.

Q Well, assuming that the takes were greater than this, then your net to the operator would be greater per year, and the discounted value of the money would be greater because it would take less time to recover the money, would it not?

A The difference between discounted present worth of six percent, if you doubled, in other words, if you doubled production and halved the life would probably not be more than five percent of the total, something in that range.

Q You still don't feel it would be profitable to drill on 160 acres?

A You can just take the total amount of gas and multiply

it by the price, and it's about a break-even on 160's, I mean even if you got it back in one year.

Q What were the estimated reserves per 160-acre tract?

A 848 as against 1,696,000.

Q Your gross value is 14.6 cents per MCF?

A Yes. I took it and multiplied it by the barrels and added it in, rather than try to compute it separate. You see, the net to the operator, Mr. Nutter, the next to the last column, when you add it up is about 180,000 to 190,000. If you drilled on 160, you would halve it and you would get about $190,000.00 after you took operating expenses and royalty and taxes.

Q What would the gross value be on 160?

A On 160 acres?

Q Yes, sir.

A About $85,000.00 without operating expenses, after royalty and taxes.

MR. NUTTER: I believe that's all.

BY MR. PAYNE:

Q Your Exhibit No. 3, Mr. Redfern, is computed on the basis of eight barrels of oil per million cubic feet of gas?

A Eight barrels, I think, of distillate.

Q What leads you to believe that that's going to be the figure, is that what they're making now?

A Yes, that's about what they're making now, and Mr. Dugan has informed me that's about what we can expect. You see,

the first month or two you are recovering load oil at the same time as you are the liquids.

Q Are these liquids in the reservoir, or does this become liquid when it gets to the surface?

A I just don't know. I'm not really qualified to say.

Q But in any event, the wells do make some liquid, at least by the time it gets to the top of the ground?

A Yes, the gravities are running about 69 to 70, based on the tickets we get.

MR. PAYNE: Thank you.

MR. PORTER: Any further questions? Mr. Utz.

BY MR. UTZ:

Q Did you have a deliverability test taken on your two wells recently?

A Yes, Mr. Dugan has run them.

Q Did you submit that data to the Commission right away?

A Well, I believe as soon as he has computed it, it will be submitted.

MR. UTZ: Thank you.

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

(Witness excused.)

MR. PORTER: Anyone have any further testimony to present in the case? Any statements?

MR. CUNNINGHAM: Mr. Chairman, we of the Killarney Oil

Company are in a peculiar position. We have a north 80 acres of our 320; the lease is expiring on July 1st. The well has to be completed as of that date, and so we are in a position or in a bind, you might say, of this petition being on record here, applying for 320; and we would extend that acreage to cover that 320 rather than attempt to drill a well on short notice. But we would like to know from the Commission what their final determination will be as soon as possible, because it does give us rather short notice. We have several estimates from drillers as to what the costs will be, and we're planning on setting up a location in the near future, providing we are required to drill it.

We go along with the petition here, that 320 acres; if possible, we would prefer to defer drilling that well. We have to drill it to save our lease under the present circumstances.

MR. NUTTER: Isn't your name Mr. Cunningham?

MR. CUNNINGHAM: That's right.

MR. NUTTER: You are the operator in the well of the Northwest Quarter of the Southeast Quarter of Section 24?

MR. CUNNINGHAM: Right.

MR. NUTTER: The 80 acre well, the North Half of the Northeast Quarter of Section 24 is what you are referring to?

MR. CUNNINGHAM: Right.

MR. NUTTER: If a 320-acre order were adopted, you would dedicate that 80 acres to this well?

MR. CUNNINGHAM: Right.

MR. PAYNE: How long does it take to drill a well in this area?

MR. CUNNINGHAM: It depends on the problems you have involved. When you are on a deadline, you run into problems.

MR. PAYNE: It shouldn't take more than two weeks?

MR. CUNNINGHAM: I am not certain.

MR. PAYNE: I am sure the Commission will have a decision prior to June 15th.

MR. CUNNINGHAM: There's a lot of preliminary work has to be done before you start drilling a well.

MR. PORTER: Mr. Buell.

MR. BUELL: Guy Buell for Pan American Petroleum Corporation. We are now drilling our first well in the Devils Fork Gas Pool. Pan American is of the opinion that this is a gas pool and should be prorated and regulated as a gas pool. For those reasons we concur in the rules proposed by the Applicant.

MR. PORTER: Mr. Kellahin.

MR. KELLAHIN: Jason Kellahin for Standard Oil Company of Texas. Standard Oil Company has leases in the Devils Fork area and concurs with the application for 320-acre spacing and for the market demand prorationing.

MR. PORTER: Anyone else desire to make a statement in the case? Mr. Bratton.

MR. BRATTON: I would like to make a few remarks in conclusion, if I could, if the Commission please. Certainly we

wish we had more information to tender to the Commission on the two problems that are -- two questions in which there is considerable interest on the part of the Commission: 1),the problem of spacing; and 2), the problem of what I would call an undiscovered oil pool, which makes this a gas cap.

We wish we had additional information to where we were certain of the answers to all of these problems. We do not. Based upon what we have, everything indicates that as Mr. Redfern pointed out, this thing could turn into a real economic disaster if, by virtue of commitments or acreage situation, holding the deep rights, somebody were to have to trigger off 160-acre drilling in this pool, it could really be a disaster and to an independent operator it could be a shambles.

As to the question of the undiscovered oil pool, I believe the Commission can see our viewpoint, and we can certainly share or sympathize with the concern of the Commission. The Commission must realize that every indication we have is that there is, that this is not a gas cap; that this is a separate, disassociated gas reservoir. On the other hand, we certainly sympathize with the Commission's concern. I would suggest a voluntary observation of my own, that if the Commission is sufficiently concerned as to these two problems, it might grant the application requested here today, and in the order specifically provide that the Commission is retaining jurisdiction of this cause.

I would suggest that, as contrary or opposed to a temporary order, because as Mr. Redfern has pointed out, the small quantity of gas in this pool just can't stand many more hearings, so that would be my hope and suggestion to the Commission.

We appreciate the time, attention, and courtesy of the Commission in this matter.

MR. PORTER: Does anyone else have anything further to offer in the case? The Commission will take the case under advisement; and, Mr. Cunningham, we will try to expedite the decision in the matter as soon as we can have a conference with the Governor.

If that's all to come before the Commission, the hearing is adjourned.

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STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing was reported by me in Stenotype, and that the same was reduced to typewritten transcript under my personal supervision and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

DATED this 29th day of May, 1960, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

June 19, 1963.

I N D E X

EXHIBITS