

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
February 8, 1967

EXAMINER HEARING

IN THE MATTER OF:)

Case 2750 reopened pursuant to the)
provisions of Order No. R-2441, which)
order established 640 acre spacing units)
for the Indian Basin-Morrow Gas Pool,)
Eddy County, New Mexico)

Case 2750

2749

Case 2749 reopened pursuant to the)
provisions of Order No. R-2440, which)
order established 640 acre spacing units)
for the Indian Basin Upper Pennsylvanian)
Gas Pool, Eddy County, New Mexico)

BEFORE:

DANIEL S. NUTTER, Examiner

Transcript of Hearing

MR. NUTTER: We will call Case 2750.

MR. HATCH: Case 2750, reopened. In the matter of Case 2750 being reopened pursuant to the provisions of Order No. R-2441, which order established 640 acre spacing units for the Indian Basin-Morrow Gas Pool, Eddy County, New Mexico, for a period of one year after the first pipe line connection in the pool.

MR. COUCH: Terrell Couch, appearing for Marathon Oil Company. Mr. Examiner, does the Commission's files contain a letter from Atwood and Malone, signed by Ross Malone entering their appearance? And in association with Mr. Malone, we are entering our appearance in the case here.

MR. NUTTER: Yes, sir, we do have that letter.

MR. COUCH: I would like to request that Case 2749 be consolidated with Case 2750 for the purpose of hearing.

MR. NUTTER: At this time, we will call Case 2749.

MR. HATCH: Case 2749 reopened. In the matter of Case 2749 being reopened pursuant to the provisions of Order No. R-2440, which Order established 640 acre spacing units for the Indian Basin Upper Pennsylvanian Gas Pool, Eddy County, New Mexico, for a period of one year after first pipeline connection in the pool.

MR. NUTTER: For the purpose of testimony, Case No. 2749 and Case No. 2750 will be consolidated. We would

like to call for appearances in these cases at this time.

MR. KELLAHIN: If the Examiner please, Jason Kellahin, appearing on behalf of Standard Oil Company of Texas. We don't know right at the moment whether we will offer any testimony or not. We may want to put on one witness.

MR. JORDAN: J. B. Jordan, Union Oil Company of California. I wish to make a statement that Union supports Marathon's application for 640 acre spacing.

MR. NUTTER: Where are you located?

MR. JORDAN: At Roswell.

MR. NUTTER: Union in Roswell?

MR. JORDAN: Right.

MR. GEDDIE: Ivin Geddie, I-v-i-n G-e-d-d-i-e, representing Kerr-McGee Corporation, Oklahoma City.

MR. FORD: George H. Ford, Fort Worth, Texas, I'll have a closing statement, appearing for Pan American Petroleum Corporation.

MR. GOODMAN: Fred G. Goodman, Midland, representing Ralph Lowe Estates and Lowe Drilling Company. We highly recommend and concur with Marathon's request for the permanent 640-acre spacing.

MR. STURDIVANT: W. C. Sturdivant, Jr., Dallas, Texas, Sun Oil Company.

MR. NUTTER: Is that S-t-u-r-d-i-v-a-n-t?

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MR. STURDIVANT: Right. We anticipate making a statement at the conclusion.

MR. NUTTER: Mr. Kellahin's appearance was for Standard Oil Company, was it not? I believe that's all Mr. Couch, would you proceed?

MR. COUCH: Mr. Nutter, Marathon Oil Company is the operator of twenty wells on a producing status and one temporarily abandoned in the Upper Penn Indian Basin Gas Pool and is also the operator of several wells in the Morrow Gas Pool. It would be our recommendation that the existing spacing rules for each of these pools be made permanent, including 640-acre spacing units. We will have one witness, Mr. Robert Scott, whom I would like to have sworn at this time.

(Witness sworn)

ROBERT SCOTT, called as a witness on behalf of the Applicant, having first been duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. COUCH:

Q Mr. Scott, will you please state your name and by whom you are employed and in what capacity?

A My name is Robert P. Scott, and I'm employed by Marathon Oil Company as staff engineer in our Houston Division Office. I have been employed by Marathon some fifteen years.

Q Mr. Scott, have you previously testified before the New Mexico Oil Conservation Commission or its examiners and are your qualifications a matter of record?

A Yes, they are.

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

MR. NUTTER: Yes, sir.

Q (By Mr. Couch) Mr. Scott, will you please state briefly the history of each of these fields, their time of discovery and general location?

A The Indian Basin Upper Penn and Indian Basin-Morrow Gas Pools were discovered by drilling of the wells which now operates as Marathon Indian Basin Gas Comp. Well No. 1 in Section 23, Township 21, South Range 23 East. This well, at the time of its drilling, was operated by Ralph Lowe interest as the Indian Basin Well No. 1. The field area generally is approximately twenty miles west, northwest of Carlsbad, and twenty miles southwest of Artesia. Both of these pools are of Pennsylvanian age.

Q At the original spacing hearing held for each of these pools in February of 1963, how were the vertical limits of the pools defined at that time?

A At that time, a log of the discovery well was entered and the vertical limits were described by the

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representatives for Ralph Lowe as being from about 7453 feet there for the Upper Penn, 7453 to 8054; for the Morrow as described from about 8949 -- 8945 to 9442 feet.

Q Mr. Scott, I will ask you to look at what has been marked Marathon Oil Company's Exhibit No. 1 in these two cases and tell us what type log that is on the left side of that Exhibit?

A The top log on the left hand side of the Exhibit 1 is the log of the same well which was, at the previous hearing, referred to as the Ralph Lowe Indian Basin Well No. 1.

Q All right, sir, now I notice on that log there is an interval colored in purple in the upper 7400 feet range and a portion colored in orange on the left side of the log down in the 9,000 foot range?

A Yes, sir, those represent the perforated intervals for the two completions in that well, the purple being the Upper Penn, the orange being the Morrow perforations.

Q All right, now, generally describe for us Exhibit 1, what it portrays, please.

A Well, sir, our Exhibit 1, which I will refer to as an ownership map, shows on it five separate unitized areas. These are outlined in green. Those are North Indian Basin units.

Q This is at the north end of the map up there?

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A Yes, sir.

Q The north central part of the map?

A North central part of the map.

Q All right.

A Then toward the right-hand side of the map to the East, is the Indian Hills Unit; directly below is the Walt Canyon Unit; then over on the bottom of the map of the west top portion is the Bogle Flats Unit. Above and toward the top and on just to the left of the North Indian Basin is the west Indian Basin unit.

Q All right, now, I notice there are a lot of red colored areas there on this map, or red boundary areas; will you say what those represent?

A Yes, sir, those red border sections represent -- there are thirty-five of those red border sections, thirty-four of those are sections which have been communitized for the purpose of development under the temporary 640-acre spacing rules. There is one of these red border sections, where the lease name, or the section name has the term "comp" in it. This is the Bogle Flats Unit, Gas Comp in Section 8 of Township 22 South Range 23 East.

Q Excuse me, sir, isn't that in Section 5, but it is Well Number 8?

A That's right, Section 5, Well Number 8.

Q As a matter of legal interpretation, if I can interpose here, this Section was created as a drilling unit by virtue of the provisions of the Bogle Flats Unit agreement, is that your understanding?

A That's right, that's my understanding.

Q It was not separately communitized by a separate communitization unit, but we show it in red because of the name of the well being "Gas Comp", which indicates communitization?

A Yes, sir.

Q As a matter of fact, there are three other sections within the Bogle Flats Unit that are in substantially the same status, is that right?

A Yes, sir.

Q It would be Sections 9, 16 and 17?

A That is my understanding.

Q All right, sir.

A I would point out the legend at the bottom of the page indicates the green, the usage of green border on the red border. Also, in the legend there, you will see that the Indian Basin Upper Penn Gas Pool well is shown by having the purple circle over the well spot. The Indian Basin-Morrow completions are, which are together with the Upper Penn, indicated by having the well spots colored in the orange.

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When using the colors, the orange refers to the Morrow.

Q All right, now, by each of those well spots, you have a date and then a "TD", what is that date on each of the wells, please sir?

A Yes, sir, the dates are the date of completion, the depths are the total depths of the wells.

Q All right, now, I will ask you to look at what has been marked Marathon Oil Company's Exhibit 2; all right, will you state briefly what is depicted by the colors on this map, Mr. Scott?

A Exhibit 2 which I will refer to as the Pool Limit map, the colors here, the purple boundary represents the present horizontal limit of the Indian Basin Upper Penn Gas Pool. The orange border area indicates the horizontal limit of the Indian Basin-Morrow Gas Pool.

MR. NUTTER: As designated?

THE WITNESS: As designated by the Commission.

Q (By Mr. Couch) This is the same base map as Exhibit 1?

A Same base map, same log on the left.

Q So the blue line information on here is the same as Exhibit 1?

A That's right.

Q I notice several little orange semi-circles around

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quite a few wells outside the perimeter of the Morrow Gas Pool, Indian Basin Gas Pool.

A This orange semi-circle has been used -- now this is within the Upper Penn Pool Limits, and it does include two wells inside the Morrow Pool Limit. This orange semi-circle has been used to indicate a well that was drilled to the Morrow but found dry. There are some fourteen of those dry Morrow tests shown within the Upper Penn Pool Limits.

Q What is the total acreage as computed, of the fifty-four sections within the present limits?

A The Indian Basin Upper Penn contain fifty-four sections within the designated pool limits and contain some 34,677,78 acres, approximately.

Q All right, and what is the acreage in Continental Indian Basin-Morrow Pool Limit?

A The Morrow Pool Limit includes some 7,035,26 acres, approximately. The well spot colors here are the same as they were on the first map, on Exhibit 1.

Q All right, now, these dry holes in the Morrow substantially surround, or in the Upper Penn it shows some dry hole symbols around that perimeter. Do you know --

A Around the orange bordered area being the Upper Pennsylvanian Pool Limits --

Q You said around the orange, you mean around the

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purple?

A Around the purple bordered area, being in the first row of the section around that purple border, there have been some fifteen dry holes drilled. These dry holes do substantially surround the present horizontal pool limits and they do at this time reasonably well define the pool limits.

Q Are the pool limits of the Upper Pennsylvanian Pool structurally controlled?

A There is some structural relief here, they have lithologic changes which control a good portion, substantial portion of the pool limits.

Q This would include the gas-water contact in part of the area around there?

A Gas-water contact in part of the area and lithologic change over other parts of the area.

Q You are not testifying about the entire limits of this pool are you?

A No, the entire limits are not either controlled by water or by lithology. It is a combination of the two.

Q As a matter of fact, they are only presently drilling wells outside the pool limits, is that right?

A Yes, sir, Marathon drills in Section 17, Township 21 South Range 24 East, this well we are calling the Indian Hill Unit Gas Comp-A Well No. 6.

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Q Would you expect that some additional drilling might occur around the present pool limits?

A It's possible some may occur around the pool limits.

Q What is your feeling about whether the reservoir limits are reasonably defined at this time?

A Substantially defined, that in addition to one well being drilled, there may be others.

Q All right, now, I ask you to look at what has been marked Marathon's Exhibit No. 3. How would you identify that Exhibit, Mr. Scott?

A This is a data sheet, a development data sheet for the Indian Basin Pool Area.

Q Does it show the state of development at the time of discovery and the spacing hearing in February, '63?

A Yes, sir, there are two groups of data here, one being the development prior to February 6th, 1963, which was the date of the previous spacing hearing, the other on the right-hand side being the present, February 8th, 1967.

Q Approximately four years between those two dates?

A Yes, sir.

Q All right, let's just briefly run through those tabulations of the development. Shown on the first line, from the left to the right, across the page, is "wells penetrating within the map limits".

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A The first line does represent the well penetrating within the limits of this map.

Q You are pointing at Exhibit No. --

A Exhibit No. 2, this being the same map we used in the other. It shows that on February 6th, 1963, there had been six wells within the map limits that penetrated the Upper Penn, five of these had penetrated the Morrow. Now, some four years later there have been within these map limits some seventy-eight wells drilled penetrating the Upper Penn, thirty-four of which have been carried to the Morrow.

Q Those figures are accumulated around this and they include the six and five?

A Yes, they do include --

Q Is the same thing true of the other figures you are going to give?

A Yes.

Q All right, looking across to the second column, from left to right --

A The second column shows wells penetrating within the present Upper Penn Pool Limits. This is the purple bordered area on Exhibit 2. At the time of the previous spacing hearing on February 6th, 1963, there had been three wells within this purple border that penetrated the Upper Penn, and there had been three wells which penetrated the Morrow. Now, some four

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years later within this purple border, there have been fifty-five penetrate the Upper Penn, twenty-two of which penetrated the Morrow.

Going on now to the next line across, this shows wells that were completed within the Upper Penn Pool Limits. On February 6th, '63, there were three wells that had been completed in the Upper Penn, two had been completed in the Morrow. Now, four years later, there have been fifty-three wells completed in the Upper Penn and eight completed in the Morrow.

Now, the last line across there at the bottom, is wells producing within the Upper Penn Pool Limit. At the time of February 6th, '63, there was no pipeline connection to the area, so there were no wells producing. Now, there are fifty-three Upper Penn wells producing and seven Morrow.

Q All right, now, directing your attention specifically toward the Upper Penn Pool and looking at what has been marked as Marathon Oil Company's Exhibit No. 4, will you please discuss that Exhibit, identify it, and discuss it for us?

A Marathon's Exhibit 4 is a data sheet on the Indian Basin Upper Penn Pool, just the Upper Penn. This data sheet shows the number of presently producing wells as fifty-three; it shows the acreage within the present pool limits that I started a minute ago. Below that then, is some production data.

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This is cumulative gas produced to January 1st, 1967. This shows a volume of some 38,912,000,000 cubic feet. The next line shows cumulative condensate production to January 1st, 1967, to be some 310,500 barrels. The cumulative water production shown, that is to January 1st, '67, was 142,000 barrels.

Q Mr. Scott, the source of that information, I see the figures appear to be rounded off, that's correct, isn't it?

A Yes, these are slightly rounded numbers.

Q Where did you obtain those?

A Those numbers were taken from the engineering committee's statistical report, with December's production, being gotten from other productions, so they were rounded --

Q All right, going on with Exhibit 4, the next group of data.

A I would point out one thing here. The condensate production figure does not include any planned product.

MR. NUTTER: Field condensate only?

THE WITNESS: Yes, sir. The next group of data is core and log data. We have there two porosities. The data for the first one, is porosity from cores, these are cores that we had available to us on seven wells. Here we contended that the porosity below 2% didn't represent pay. The average

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porosity from the cores on the seven wells waited for the final sample information, which was 4.32%.

Now, the second figure for porosity, the porosity value that has been obtained from logs, all the logs in the field that we had available to us, which is all the logs. This figure is 4.50% porosity. The next line represents the permeability, the permeability from cores. This is the same seven wells for which we calculated a porosity from the cores. The permeability weighted average 46.3 millidarcies. The range of permeability for these same pays was 3,150 millidarcies, down to 0.1 millidarcies.

Q And again you only consider the permeability where you had porosity?

A This is for the same pay that had 2% or better porosity. The last line there under, is connate water saturation, and as calculated from the logs, showed approximately 25%.

Q All right, sir, going on to fluid data?

A Fluid data presented here for the Upper Penn is this: gas specific gravity, 0.65, compressibility z factor 0.84 condensate gravity, 59 A P I at 60°F, approximate condensate yield is 8 barrels per MMCF.

Q All right, now, then, the reservoir data that appears in the last group?

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A Under reservoir data, the first line represents my estimate of the original reservoir pressure data of a minus 3640. There is an approximate figure of 2917 PSIG. There were pressures higher than this measured. I can think of two immediately, one, 2940 and there was one recorded as high as 2952, that I can recall. This 2917 PSIG approximate original reservoir pressure is a minimum in my estimates.

Q All right, now, your reservoir temperature?

A Reservoir temperature, 146° F.

Q You show the gas-water contact. Is that intended to be exact or specific?

A No, sir, from the drilling and production data that was available to us, we have estimated gas-water contact as a -3770.

Q All right, please look now at what is marked Marathon's Exhibit 5. Again, Mr. Scott, you used the same base map as Exhibits 1 and 2?

A Yes, sir, same base map.

Q You've got a different color scheme here?

A Completely different color scheme.

Q Will you please identify and describe Exhibit 5 for us.

A On Exhibit 5 we have presented all of the bottom-hole pressure data that was available to Marathon through

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January of '67. These bottom-hole pressure measurements are printed on this map in three different colors. You will notice on the legend at the bottom of the page, the orange color is used to indicate the pressure that was taken in the period prior to March 1, '66.

Q Now, why did you cut it off and use one color up to that date, Mr. Scott?

A We considered that prior to March 1st, '66 there had not been a very substantial amount of production from the field at that time.

Q A gas plant handled the main volume of the field and it went on stream in February, '66, didn't it, or late January?

A Yes, Southern Union had been taking some gas since August of '65, but this was a fairly small volume in relation to the total taken from the field prior to that time. The Indian Basin Plant went on, January 26th, 1966. There were start-up difficulties and it was approximately March 1st before we had a really substantial, substantially settled production.

Q All right, then, the next coloring of pressure data there is in red and that covers what period?

A The red bottom-hole pressure points were taken in the period from March 1st, 1966, to August 1st, 1966.

Q And then you have some in green?

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A Yes, sir, the green figures for bottom-hole pressures were taken during August of 1966.

Q Mr. Scott, in relation, then, to the pressures for which data is shown on Marathon's Exhibit 5, were some of these pressures just taken from C-122's, some of these pressures, and this is disregarding the time periods here.

A Some of these pressures were taken from U.S.G.S. Reports.

Q That is reports to the U.S.G.S.?

A To the U.S.G.S. Some were taken from 122's where a bomb was run in where P Sub C was reported.

Q It appeared that way from the C-122?

A Yes, sir.

Q Now, some other pressures, you got directly from another rate?

A Yes, sir, we had actually bottom-hole pressure measurements and we used here all bottom-hole pressures where we knew there was established twenty-four hour shut-in.

Q And you didn't use other pressure data, such as drillstem pressure or things of this nature?

A No, sir, drillstem test pressures do not appear here at all.

Q Why did you select to use the pressures you have shown on this map and not try to include drillstem tests,

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bottom-hole pressures and other sorts of information?

A We really thought that these measurements represented a more accurate picture of the pressure in the reservoir.

Q All right now, the green figures then, represent pressures taken during the month of August 1966?

A That's right.

Q Will you please tell us about those pressures and the procedures, or how they were taken?

A Where there is some there in green? The New Mexico Oil and Gas Engineering Committee was requested by the operators to run a field-wide bottom-hole pressure survey during the month of August. There are thirty-nine green pressures shown on the map that were taken in August. Of these, thirty-eight came from the Engineering Committee's survey. There was one of those green pressures that was available from C-122 data.

Q All right, sir, now in the report of this survey there is one pressure included that you show in red on this map, isn't that right?

A Yes, sir, there was one pressure reported by the Engineering Committee in their summary report of the pressure survey that was taken in June. It is shown in red color to put it in the right time period.

Q All right, which well is that on, please?

A That's the Union Oil Company's Union Federal 28 in Section 28, Township 21, Range 23.

Q All right now, have you computed just the arithmetic average pressure contained during this survey?

A Yes, sir, disregarding the two pressures that were included in that survey that were substantially lower than the rest, and averaging the remaining thirty-seven pressures, the average pressure, the arithmetic average pressure was 2890 pounds per square inch.

MR. NUTTER: Which two were taken?

THE WITNESS: This was 2347 which is on the Infield, by the Infield Federal Well of Section 18, of Township 21, 23. There was 2648 from the Ralph Lowe Indian Basin C Well No. 3 in Section 25, Township 21, Range 23.

MR. NUTTER: Let's do that again.

THE WITNESS: Section 25, Township 21, Range 23.

MR. NUTTER: That's 2648?

THE WITNESS: Yes.

MR. NUTTER: How about that 1659?

THE WITNESS: That was from C-122 data, that was not included in the Engineering Committee Reports so this was not the average I was speaking of.

Q (By Mr. Couch) There are three green figures shown

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here that were not included in the average, is that right?

A Yes, two that were substantially lower than the rest in the Committee's report and then this one, that was reported from C-122.

Q 1659 of the J. C. Williamson Standard Gas Comp?

A Yes, 1659.

Q 1659?

A Yes.

MR. COUCH: I notice here on my map, we corrected nearly all of those, I think, but if any of you all have 1655, it should be 1659.

Q All right now, you have also, on this map, some black arrows, seven of them as I count. Will you tell what those indicate?

A Those black arrows point to wells which we have colored with different colors for each well, and these wells are shown on our next Exhibit, Exhibit 6.

Q Mr. Scott, while we are passing out this Exhibit, why did you select those seven wells, to call your attention, why are they important?

A These wells, these seven wells are the only wells for which we had bottom-hole pressure run, both during the period of substantial production, March to August 1st, and during the survey period in August of 1966. These are only

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seven wells.

Q Where you had pressure in both the red and the green period?

A That's right, in both the red and the green period.

Q All right now, will you then turn to Exhibit 6 and tell us what that shows with respect to these seven wells?

A Exhibit 6 has on it, for each of the seven wells, every bottom hole pressure point that we had available for each of those wells.

Q You are again speaking from the source that you earlier described in more detail?

A Yes, same source, each of these pressures are listed on this map also in its proper color.

Q All right, sir, there are some colored bars down here at the bottom of Exhibit 6 in orange, red and green, what do those represent?

A Those colored bars relate back to the same time periods that we pointed out before on Exhibit 5, the orange representing the time period up to March 1st, '66, the red indicating the time period from March 1st to August 1st, and the green indicating August, 1966.

Q All right, that is before, during and after substantial production?

A Before, during and after.

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Q The color on the bars there, or on the lines connecting the pressure points on Exhibit 6, coincide with the colors of the well spots of those wells shown on Exhibit 5?

A Yes, they do, and each well is listed in the legend on the lower left-hand side of Exhibit 6 with the well name and location next to it.

Q All right now, Mr. Scott, you testified earlier to your data sheet showing a conservative, approximate bottom-hole pressure of 2917 P.S.I.G., is that right?

A That's right.

Q And you mentioned some other wells that had higher pressures, is that right?

A That's right.

Q As far as the original reservoir pressures are concerned?

A The initial pressures may be applied to the well.

Q All right now, Mr. Scott, will you take a pencil, and others that have a copy of this Exhibit, if you will put over here on the left top side of the Exhibit 6, the figure 2940, about where that would fall, and this is a rather wide scale, isn't it, Mr. Scott?

A Yes, this is, as you notice there is a hundred pounds between the two lines in the center there.

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Q 2940 might even be a little bit over the top of that scale?

A No, 2940 will be approximately a half inch below.

Q All right, I have got mine marked. Now, let's put 2917 about where it would be.

A 2917 will fall above any of the points on that exhibit, it would be somewhat over, approximately an inch or so above the bottom of 2931.

Q All right, now referring to that 2970, did you lean pretty heavily on the data of the Marathon well?

A Yes, I did. In arriving at the estimated original reservoir pressure this was the data for which I had the best field. I knew more about how the data was taken, so I estimated the weight of Marathon's data a little more so than I would have such data as C-122 furnished from other operators.

Q You judged the factor on the conservative side?

A Yes, sir, I did.

Q All right. I notice three top colors there, the blue, tan and purple showing the pressure and connected pressure points of the wells. Each of those three have higher pressures on the first pressure shown on them than the pressures of the other colors in, along about that same period of time, during the red period. Do you have the pressures on those three wells starting from the blue one?

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A Yes, the blue one, the first pressure there, is 2907. This is during the red period of time.

Q All right, I'll put that on my map, and any of the rest can follow.

A The brown one is 2887.

Q The purple one?

A The purple one is 2878.

Q All right, Mr. Scott, now your pressure point becomes level at an early point in time for all of those three wells. Tell us why.

A This was the first pressure measurement made on those wells. These wells were either completed at this time or one of them was not connected prior to the time. It had been completed a couple of months early. This is the blue one. It had been completed March the 1st. The pressure measurement was in May, I believe, the scale shows.

Q All right, then would you consider that those top three there, the blue, tan and purple are initial pressures on the three wells, that you referred to?

A Yes, sir, I would.

Q All right now, on the other four wells, those wells have been completed and on production for some time, have they not?

A That's right, each of them had been completed on

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production prior to the time the pressure was taken during the red period.

Q All right now, what is the significant point to you about the way these seven wells behaved in between the time their pressures were taken during the red period of production and then during the August 1966 survey?

A The real significant thing to me is that these are the only wells upon which we had pressure during both the red and green time period and all of them reacted exactly the same, all of them showed increased pressures in August.

Q Some showed more than others?

A Some showed more than others, but they all increased; there were no exceptions.

Q Is it at all significant to you that the initial pressure on the blue, tan and purple were substantially below either of the bottom-hole pressure figures, original bottom-hole pressure figures you have mentioned?

A Yes, sir, it is. I would point out one thing, this August time period, the wells in the field for the purpose of surveying, were shut-in in groups so that when we had -- had pressure measurements on them, there were one, two, three, four wells around it shut-in on the same day.

Q There is no specific or exact pattern to this is there?

A No, sir, there is no all encompassing pattern, they're not all exactly --

Q But some wells around each of these key wells, as we call them, were actually shut in, either for taking pressure or just getting ready to take pressures?

A That's right?

CROSS EXAMINATION

BY MR. NUTTER:

Q Now, Mr. Scott, let me interrupt here. You have got seven wells that had pressures in the red period and those are the only seven pressures that you had during that red period in this field?

A No, sir, we had two other pressures during that period, but for the other two wells, we did not have pressures for the August period.

Q So, these are the only seven wells that you had pressures during the red period and green period?

A Yes, sir.

Q Now, some of these initial pressures were taken upon completion, prior to production, is that correct?

A Yes, sir, three of them are.

Q And they were taken, I presume, by the individual operators as they completed their wells?

A Yes.

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Q Now all of these pressures from this green period were taken by the Engineering Committee?

A Yes.

Q You had a couple of pressures that you threw out, and one because it wasn't taken by the Engineering Committee, but on these seven wells, these were all taken by the Engineering Committee?

A That's right.

Q Now, I'll ask you the obvious question; why are the new pressures higher than the old pressures, than the original pressures?

A You mean why is the August pressure higher?

Q Right.

A There are two things here, one, of course, is related to the fact there were wells shut in around these key wells, if you want to call them that, during August. The other is that in analyzing the production for the month of August for each of these seven wells and looking at it not just as one well, but as a group of wells, the block of wells around that.

MR. COUCH: You are talking about, for example, a nine square section area including all observation wells?

THE WITNESS: There was significantly lower production during August for each of those than there was during

July.

MR. NUTTER: I presume you were going to get to this, but I couldn't wait.

MR. COUCH: We are glad we encouraged this interest, Mr. Nutter.

MR. NUTTER: You are going to show drainage by this effective build-up, I presume?

MR. COUCH: Well, sir, let's just go ahead and let me see what we can show.

REDIRECT EXAMINATION

BY MR. COUCH:

Q Mr. Scott, was that presented as an interference test, this data that you are presenting here?

A No, sir, it was not, we took all the pressure information that is plotted on the map, Exhibit 5, and started analyzing this, and this theory came out. These were not key wells picked for that. These were just ones that fell out in our analysis of it.

Q In other words, what you have attempted to do here is assemble all available pertinent data and bring it to the Commission, not for the purpose of trying to manufacture evidence for the case or anything of that nature, is that right?

A That's right.

Q So this we can't say is a perfect demonstration of an interference test, but it is actual field conditions and field testing procedures that were followed?

A You could not call this ideal interference test conditions.

Q Mr. Scott, two of those wells on which initial pressures were taken were Marathon Oil Company wells, weren't they, in the red period?

A In the red period.

Q Do you know whether Marathon had people present during the taking of the survey, bottom-hole pressure survey in August, '66?

A By Committee survey?

Q Essentially, yes.

A In this survey, the operator did furnish help for the Engineering Committee to run it, yes.

Q Was Marathon present during most of these occasions?

A Yes, sir.

Q Go ahead.

A Yes, sir, there was a Marathon representative each time a pressure was taken around a Marathon well.

Q Do you know whose equipment was used in the taking of those pressures in the survey?

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A During this survey, the Engineering Committee lost their bomb in the fifth well that they bombed. They did ultimately fish it out, but we had to run, that is, Marathon had to run our instrument into the hole behind them on two of these first five wells and we had to check pressures between their bombs and our bombs. When they lost their bomb, they then took our bomb and completed the survey with it.

Q All right, Mr. Scott, I will ask you now, then, to look at what has been marked Marathon's Exhibit No. 7. Please identify that, and tell us briefly what it reflects.

A Marathon's Exhibit 7 is a sheet showing well cost or economics for the Indian Basin Upper Penn Pool. Here is what we have done; and the first line shows the well cost of a typical Upper Penn single completion. We took this from actual dollar values that Marathon has spent on the wells that they have participated in the drilling of. This typical well cost \$155,000.00. I would say that we have not drilled very many for that.

Q As a matter of fact, this typical log expansion you now have is what might cause you to drill another?

A Yes, this cost you could expect today, with the expense you have behind you and I think it is a good typical number of what it would cost Marathon to drill one single well.

Q Do you think it's high or conservative?

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A I think it is a good figure.

Q Go on to the next line.

A In relation to using this \$155,000.00 we have shown here what the approximate cost of fifty-three successful Upper Penn completions would have been, at \$155,000.00 per well. There are fifty-three completions now in the Pool; if these fifty-three completions had cost \$155,000.00 each, that would be an expenditure of \$8,215,000.00. As a matter of fact, there has been substantially more money than that spent to develop these fifty-three completions.

Q All right, and then what is the last figure you have got on there?

A The last line there shows the approximate cost of fifty-two additional wells to drill to 320 acre density within present pool limits at this same \$155,000.00 per well. This would require an expenditure of \$8,060,000.00.

Q Mr. Scott, do you have any opinion on whether any additional volumes of gas that might be produced by the fifty-two additional wells would come anywhere near this \$8,060,000.00 figure?

A It is my opinion that fifty-two additional wells to drill to three hundred and twenty acre density would not yield a substantial, enough volume of additional gas and therefore to have this pool on three hundred and twenty acre spacing would

require drilling fifty-two unnecessary wells and result in economic waste.

Q All right, now, Mr. Scott, you gave us a cumulative production figure awhile ago on your Exhibit No. 4.

A Yes, sir.

Q I wish you would give us that again, please sir.

A This was 38,912,000 cubic feet.

Q That was to January 1, '67, wasn't it?

A That's right.

Q Just briefly referring to your Exhibit 6, again, would you give us some approximation of what the cumulative production was up to the time of the August survey, the green period that was August, '66, what the cumulative production you gave us was to January, '67?

A Yes, sir, I don't have the precise figure on it, it is approximately 19,000,000,000 cubic feet.

Q Now, Mr. Scott, considering all of this information that you have here that is available to you, give us your opinion as to whether a well in the Indian Basin Upper Penn will sufficiently and economically drain in excess of six hundred and forty acres.

A It is my opinion that the Indian Basin Upper Penn Pool will sufficiently and exonomically drain in excess of six hundred and forty acres.

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Q Now, you have already testified that drilling up to a density of three hundred twenty would constitute the drilling of an unnecessary well?

A Yes, sir.

Q So can you state, in relation to the establishment of six hundred and forty acres as permanent spacing for this pool, whether in your opinion that would tend to prevent the drilling of an unnecessary well?

A It is my opinion that the establishment of permanent six hundred forty acre spacing for the Indian Basin Upper Penn Pool will prevent the drilling of unnecessary wells and prevent economic waste.

Q What about exposure to physical waste, Mr. Scott?

A Well, the drilling of a well in the -- there is circulation problems in the Upper Penn; there have, in fact, been two blowouts so the drilling of an unnecessary well to me leaves open the possibility for physical waste.

Q It would increase that exposure?

A Definitely increase that exposure.

Q All right, now, Mr. Scott, let's refer specifically to the Indian Basin-Morrow Gas Pool and look back at Exhibit 2, the Pool Limits map.

A All right, on Exhibit 2 this refers to the Indian Basin-Morrow; now, noticing again that the horizontal pool

limits are outlined in orange.

Q These are the pool limits that Mr. Nutter mentioned that were presently fixed by the Commission?

A That's right.

Q Noting again that the orange half circles have been used to indicate the wells that are Morrow duals. Now, are all Morrow completions duals, Mr. Scott?

A All of the Morrow completions are duals within the Upper Penn. Noting again that the orange half circles show some fourteen dry holes that have been drilled within the Upper Penn Pool Limits, dry as far as the Morrow is concerned. I would point out here that of the eight successful completions in the Morrow only seven are now producing. One of those wells produced only fuel and its bottom hole pressure declined to less than 500 pounds where it will not now go under the basin part.

Q Is that one of seven or one of eight?

A One of eight.

MR. NUTTER: Which one is that?

THE WITNESS: It is Marathon's Indian Basin No. 6, Sections 22, 21, 23.

MR. NUTTER: So it is deleted in the Morrow, so to speak?

THE WITNESS: Until at least such time as it is

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economically feasible for the present method of operation, yes. This leaves us with seven.

Q (By Mr. Couch) It has not been plugged and abandoned in the Morrow?

A No, sir.

Q All right.

A I would like to point out here, referring back to Exhibit 3 that on the record line there, we show that there are two wells penetrating the Morrow as of this date, within the Upper Penn Pool Limits. Only seven of those wells are producing a success ration of one to three for development wells in the Pennsylvanian. A poor success ratio.

Q All right, Mr. Scott, tell us a little more about the reservoir pressure performance and other data regarding the Morrow Pool.

A Exhibit 6 which we have here is a data sheet for the Indian Basin-Morrow Gas Pool and we can go down it again, as we did the one on the Upper Penn, pointing out that it does show the number of wells, the acreage and so on. It doesn't point to other reservoir data.

I have put on this Exhibit the original reservoir pressure data of -5353 and estimated it to be 3680. Right below there, I pointed out that the measured range of initial pressure is from 3208 P.S.I.G., to 3750 P.S.I.G., there again

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using my judgment to make an arithmetic estimate of what the average, or average initial bottom hole pressure is, thirty six eighty.

MR. NUTTER: Did you use two porosity cut-offs on this pool also?

THE WITNESS: Yes, sir.

Q (By Mr. Couch) Mr. Scott, would you say that the reservoir pressure performance is erratic?

A Yes, sir, the pressure performance has been quite erratic for the Morrow.

Q What about the pay in general?

A In drilling of the Morrow, I believe everybody that has drilled it has found the pay, itself, to be quite erratic.

Q In your judgment, in order to have any possible economic way to complete in the Morrow, how would it have to be done?

A In my opinion, the only reasonable and economic way to develop Morrow production is through drilling in the Indian Basin Upper Penn Well.

Q Does the pump limit prevent development of these pools?

A That's right.

Q All right, will you then look at Exhibit 9?

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A All right. Our Exhibit 9 is again, a well cost or economic tabulation. Going down this Exhibit and using again the actual cost figures that were available to me from the Marathon drilling cost as the wells from which Marathon participated in, it is my estimate that a typical Morrow single completion, with no attempt to complete in the Upper Penn, would cost some \$200,000.00; well cost of a typical Morrow single completion.

Q If there was an unsuccessful attempt to complete the Upper Penn, would \$210,000.00 be feasible?

A The well cost of a typical Morrow Upper Penn dual I estimate at \$257,000.00 and I would like to qualify that number. We have not drilled one, a dual completion for that low a figure, so really, what I put down for this figure, the \$257,000.00 for a dual, this is not based on our actual money experience, this is based on the fact that we have no drilling experience in the area and we think we could drill one for this amount. Now the last figure there shows that, the last dollar figure shows the additional cost to dual in the Morrow with an Upper Penn well, that is above the cost of the Upper Penn single, that is \$102,000.00 extra cost, cost of an Upper Penn single. The last line there, I have estimated the chance for success based on the experience in this Pool Area at 33%.

Q Again, you are talking about development wells?

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A Again, we are talking about development wells.

Q Trying to be development wells?

A That's right.

Q All right, now, have you got some estimates and they would have to be estimates, of the ultimate recovery to be expected from a Morrow completion, assuming you could make one?

A Yes, sir, assuming you could make one, and on an average basis, not taking the high nor the low, I would state that you could expect to recover from one to two billion cubic feet from a Morrow completion.

Q All right, sir, what does that mean to you in terms of whether it would be an economic venture to drill a well for Morrow production only?

A A straight up well or Morrow, a well drilled just for the Morrow production, based on this estimate of probable ultimate recovery, would not be an economic venture.

Q Well, is the dual completion commercially attractive?

A A dual completion is a poor economic venture, but it does present the only reasonable economic route to produce from the Morrow.

Q For anyone who wants to attempt it?

A That's right.

Q All right, will you then give us your conclusion with regard to permanent pool rules for the Indian Basin-Morrow Gas

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Pool?

A For the Morrow, based on the manner of practical application of the economics and that is being usage of dual completions out to development of the Morrow and our knowledge, erratic knowledge of the pay, it is my opinion that the development should be the same as that for the Upper Penn.

Q That is spacing?

A The spacing should be the same as that for the Upper Penn. I would therefore recommend that -- it is my opinion that six hundred and forty acre spacing will prevent the drilling of an unnecessary well and prevent economic waste. Again I would point out that there have been two blowouts in the field and the drilling of an unnecessary well does present a problem or possibility of physical waste.

Q Mr. Scott, do you have any other direct testimony to offer at this time?

A No, sir.

MR. COUCH: That concludes the direct examination, Mr. Examiner.

MR. NUTTER: I think before we get into cross examination, we will take a ten-minute recess.

(Whereupon, a short recess was taken)

MR. NUTTER: Hearing will come to order. Does

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anyone have any questions of Mr. Scott?

RE CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Scott, up north of the Indian Basin Pool, there are a couple of Faskin Wells in Sections 4 and 5 of Township 24 South 24 East, I believe those are Morrow wells, are they not?

A Yes, sir, my understanding is that those wells are in the North Indian Hills-Morrow Gas Pool.

Q Now, this Union well of Section 18 of that Township, which is shown "dry hole", did it go to the Morrow zone?

A Yes, sir, the total depth shown on the map is 9,755.

Q And at the present time, Marathon's No. 6 in Section 17, is not projected into the Morrow?

A No, sir, not at the present time.

Q So as far as 17, we know, these two wells in Section 4 and 5 are in different pools and from the wells we have got data on, are not projected today, they will remain in a different pool?

A Yes, sir.

Q It just happens, by the way, that surveys were made of those wells, as 900 acre wells, rather than 640; I just wondered if there would be any apparent drainage by any other

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wells, by those large acreages.

A I wouldn't anticipate it.

Q Now, Mr. Scott, would you elaborate a little further why you have used 2,917 as the original pressure for the Upper Penn?

A We we did take the original measured pressure, the pressure measurements that were made by Marathon were in this time period prior to substantial production. These pressure measurements were on the low side where other pressure measurements were on the high, and since I knew more about how the Marathon pressures were run, I, in my own mind, put more weight on them, this is why I came up with as low an average as that; and this is why I state that it was what I would consider a minimum.

Q Now, these higher pressures, meaning 2952 and 2947, I believe; were those drillstem tests shut-in pressures or were they measured pressures?

A The 2940, that I mentioned earlier, was for the Sunbright Federal Well and this was on a C-122, so here I don't have -- this is the purpose for which it was taken. I believe where I got -- yes, where I got that was from AU, that is a report to U.S.G.S. Form 9-330.

MR. COUCH: Not C-122?

THE WITNESS: That is not where I got it, but the

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Sun gentleman told me this was available from data they had taken from a C-122. I would not -- the question of the usage of a higher original pressure than 2917, it is just in my arriving at a number I had to, in my mind, irradiate it.

Q (By Mr. Nutter) Now, you gave a statement of estimated recovery between one and two billion cubic feet. I didn't hear any figure relating to the ultimate recovery from the Upper Pennsylvanian. We have got all the data we need here to calculate volumetric reserves, except possibly the net feet of pay. Do you have any idea as to reserves here for the average well or for the pool as a whole?

MR. COUCH: Mr. Nutter, excuse me, please sir. I am not attempting to preclude the Commission from any information we have that would be of interest or help to you, but it was our contention in preparing for this hearing that we would be talking in terms of spacing rather than in terms of any allocation or production of the wells, and so no effort was made to attempt to compute these things. It would be necessary in any allocation.

MR. NUTTER: Mr. Couch, the Commission has already considered the economic development of a pool. We have got economics over well costs in here as a matter of record. What it would cost to continue to develop the pool on 640 acre spacing was compared with development, of 320 acre spacing

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reserves and was entered into the order in the original hearing in this case when there were three wells drilled. I believe, well, a maximum of six, apparently, within the map requirement. We had a reserve estimate at that time which was four years ago, and I think subsequent development here has shown a lot of things and might show how, well, these reserves that were entered into the record four years ago, it might show how accurate they were.

MR. COUCH: We do know of a reserve figure that Principal Pipeline Purchaser has made, a reserve for the field and you can allocate that, or use that figure if you like.

THE WITNESS: If you like, from the information that is available to me, that natural gas has worked out, I believe that they estimated for the Upper Penn, dedicated to them, approximately 1.3 trillion. Now, if this is extrapolated for that dedicated to the Southern Union, I believe you would come up with the actual proper range of 1.4 to 1.5 trillion.

Q 1.3, that is dedicated wells?

A Yes, sir.

Q Now do they have a comparable figure on the Morrow wells?

A Yes, the number that they presented to us for the Morrow, dedicated to them is, may I get that out, I believe I

have that letter with me, 24.8 --

MR. COUCH: Just give it as it's shown.

THE WITNESS: All right, 24,868 M.M.C.F., and this is quoted from the letter of Natural Gas Pipeline Company.

This is dedicated natural gas.

Q 24,868 M.M.C.F.?

A Yes.

Q Now, these wells are dedicated to Natural Gas Pipeline?

A Yes.

Q Do they have all connections in the Morrow?

A No, they don't.

Q This extrapolated figure then too includes the Southern Union dedication?

A Yes, sir, it comes to 28,971 M.M.C.F. on their figures.

Q Now, these figures that you have given Mr. Scott, are they up-to-date, I mean we have got fifty-three wells producing from the Indian Basin Upper Penn at this time, or have they done this on the field basis regardless of whether a well had been drilled or not?

A No, sir, the tabulation they mailed to us is on a well basis.

Q Does it have fifty-three wells for the Upper Penn?

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A Yes. Yes, sir.

Q And then the figure of 24,868 or 28,971, is it based on the seven or eight Morrow wells?

A Their tabulation shows nine. I would have to spend a little time with it to see why. Oh, it includes, their tabulation includes one well that was not completed in the Morrow and includes 1,106 M.M.C.F.; that is, well - the figure that they gave for that well was 1,106 M.M.C.F., so this well was not completed in the Morrow. If that number were subtracted off, then this would give a number representing their estimate of reserves for the completed wells and that does include Natural Gas and Southern Union.

Q Now, could you give me the price that is paid for the gas and condensate in this area by the two purchasers?

A Sixteen and a half M.C.F., \$2.76 per barrel. These are the latest numbers available to me.

Q Now, that is Natural Gas Pipeline, do you know what Southern Union pays for their gas?

A No, sir, I don't.

MR. COUCH: For the record, Mr. Nutter, I don't believe Natural Gas Pipeline is the purchaser of condensate, but that is the price, I know for gas. I don't know who the condensate purchaser is.

THE WITNESS: Permian.

MR. COUCH: But again that is condensate sold from the plant as distinguished from condensate that may be sold from any --

Q (By Mr. Nutter) I that condensate less than 18¢ trucking fee?

MR. ENFIELD: 17,725 for the net, less taxes is what we get for condensate.

MR. NUTTER: Let the record show that was Robert Enfield responding to that question.

Q (By Mr. Nutter) Now, Mr. Scott, on those green pressures that we were talking about a while ago, we had two or three that were low. To what do you attribute those low pressures, and what was the length of shut-in time to obtain the other pressures that the Engineering Committee ran?

A During this green period?

Q Yes, sir, the green period.

A They were all at least twenty-four hours. There were two pressure reports of the Engineering Committee that were run by the operators, but they again reported at least twenty-four hours shut-in.

Q Were some shut-in more than twenty-four hours?

A Yes, some were shut-in at least --

Q Were they shut in until pressures were stabilized?

What is the difference in a twenty-four hour and thirty hour

shut-in?

A My estimate would be that the wells were probably shut-in at a certain time of the day and by the time they got around to bombing them, it was some hours later. There was one pressure in that group, I think it was reported by the operator though, yes, sir, one pressure in that group which was run by the operator, was a one month shut-in.

Q Which one was that?

A This was the Redferns Winston Gas Comp, Section 39, 21, 34.

Q And had a pressure of 2,880?

A 2,880.

Q That was a thirty day shut-in?

A Redfern Development Corporation.

Q Well, now, Mr. Scott, does there appear to be variation in the permeability, as you go from one area to the other, that would cause a difference in the way these wells reacted to shut-in, that is whether pressure would build up or not?

A Well, of course, with only cores of seven wells available to me, it would be very difficult for me to make an estimate on a field-wide basis as to whether this occurs or not from the core samples that we had, some were very long cores with lots of samples, some were short ones, and to say that

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they were truly representative in total, and to try to get something like this from it, I would hesitate to do that at this time.

Q Well, we do have a difference in the pressures measured, particularly out here on Section 19 and these pressures are 1,659 pounds, what would contribute to a real low pressure like this?

A Well, sir, if you will look at the Odessa-Natural Winston Standard Gas Comp No. 1, the entire pressure history here has been quite erratic. I would just say that on this well behaves erratically.

Q How about the well's production, is it a good producer?

A Would you like to know how much it is?

A Well, not especially, is it a good producer or a poor producer?

A My understanding is, it is very poor, although I can give you the cumulative on it through 1967 -- through '66, I mean. It has produced cumulative gas of 1,103,198, according to my records, that is M.C.F., 1,103,198 M.C.F.

Q Through '66?

A Through '66.

MR. NUTTER: Does anyone have any questions of Mr. Scott?

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Scott, these porosities from your cores and your logs are relatively low, aren't they, at least they are not very high?

A I think that they are not exceptionally low, considering that this was a dolomite reservoir basically.

Q But the permeability then, is quite good?

A I was pleased to find in my analysis of the permeability that it was this good from the core samples available to us, yes.

Q Would you think that the good production from the wells in this pool results from the relatively good permeability in the pool?

A Do you mean, well by well there, can you rephrase it a little?

Q Yes. These wells are quite good in general, and would you say that the reason they are good is because of the relatively high permeability present in the Pool?

A Yes. I would add this, the dolomite is fracked in part, it's vugular in part, it is possible that this permeability average I have would be even higher if you could evaluate the fracture permeability and some of the permeability due to the vugular nature of it.

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Q Would you consider this permeability to be relatively constant across the main portion of the field?

A I think that the bottom hole pressure behavior that bottom hole pressure data that this is true.

MR. STAMETS: That's all the questions I have.

MR. NUTTER: Are there further questions of Mr. Scott?

MR. COUCH: I have one or two.

REDIRECT EXAMINATION

BY MR. COUCH:

Q Mr. Scott, what is your opinion regarding the capacity of the existing wells in these two pools to supply the market demand for the foreseeable future?

A The capacity of these wells is well in excess of what is necessary to supply the immediately foreseeable market demand.

Q All right, and the overall spread in the pressures taken during the survey is approximately how many pounds, not counting the two low pressures and throwing them out?

A The pressure spread between those that are in a group, is sixty pounds.

Q That is, high and lowest, if you throw out one that you think is just an odd-ball?

A That's right.

Q Over a total of how many acres, did you say?

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A 34,766.6, I would have to look it up again.

MR. NUTTER: Mr. Scott, in saying that the capacity of these wells is sufficient to satisfy the market demand, are you considering the weather in Chicago this last week?

THE WITNESS: Yes, sir.

MR. NUTTER: Are there any further questions. If not the witness may be excused.

MR. COUCH: I would like to offer -- I better ask Mr. Scott.

Q (By Mr. Couch) Were Exhibits 1 through 9 prepared by you or under your supervision, Mr. Scott?

A Yes, sir.

MR. COUCH: I offer in evidence, Marathon's Exhibits 1 through 9.

MR. NUTTER: Marathon's Exhibits 1 through 9 will be admitted in evidence.

(Whereupon Marathon's Exhibits 1 through 9 admitted in evidence)

MR. NUTTER: Do you have anything further, Mr. Couch?

MR. COUCH: No, sir, other than reservation of the right to make a final closing statement.

(Witness excused)

MR. NUTTER: Does anyone have anything?

MR. KELLAHIN: I have one witness. He will be

quite brief, that might be helpful. Jason Kellahin appearing for Standard Oil Company of Texas; I have one witness I would like to have sworn.

(Witness sworn)

PAUL HULL, called as a witness, having first been duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A Paul Hull.

Q By whom are you employed and in what position, Mr. Hull?

A Standard Oil Company of Texas, Supervising Proration Engineer.

Q Have you testified before the Oil Conservation Commission of New Mexico and made your qualifications a matter of record?

A Yes, sir, I have.

MR. KELLAHIN: Are the witness's qualifications acceptable?

MR. NUTTER: Yes, they are.

(Whereupon, Standard's Exhibits 1 and 2 were marked for identification)

Q (By Mr. Kellahin) Mr. Hull, have you made a study

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of the economics of the producing gas from the Indian Basin Upper Pennsylvania Pool?

A Yes, sir.

Q Did you make the same study as to the Morrow?

A No, sir.

Q And for what reason?

A We have no wells in the Morrow.

Q Now, in connection with your study of the Indian Basin Upper Pennsylvanian Pool, what did you do?

A Set up a reservoir group as a computer program, as part of the computer library to calculate a number of factors concerning a gas reservoir, one of which, being cumulative production for spacing and this provided a number of other perimeters at the same time, the period required to produce the reservoir, and this is a rather routine calculation that we make of a number of fields.

Q Now, is this calculation contained on what has been marked Standard's Exhibits No. 1 and 2?

A It is.

Q Would you state briefly what was done on Exhibits 1 and 2?

A The only difference in these Exhibits is that 1 is calculated for one well on 640 and the other for two on 640 acre spacing and 320 acre spacing.

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Q Now, you had to have some basic data in order to perform this calculation, did you not?

A That's right.

Q What was your source of data for the calculation?

A We obtained a number of the reservoir perimeters from Marathon because they had been making a considerable more study, detailed study of the field than we had. Specific gravity of gas is a factor, initial bottom hole pressure and the reservoir, temperature from Marathon, some of the other factors, net pay, we picked from one of our logs.

Other data that was plugged in here, well contract time, the pressure basis and the point when it would be necessary to install a compressor in order to deliver the contract quantity of gas; and working interest, well operating costs, compressor maintenance cost, these things were of value.

Q Now, you have one heading there "contract time, twenty years", that is the term of the contract you have on the gas production, is that correct?

A That's right.

Q You used somewhat of a higher initial pressure than Marathon, did you not?

A No, sir, this is the same. Marathon's gauge was figured the same, one is gauge and the other is absolute.

Q I see; so for the purpose of this calculation, they are the same pressures, basically, is that correct?

I mean, same initial pressures?

A I believe that's right.

Q Now, you picked 142 as your net pay thickness?

A Yes.

Q How did you arrive at this figure?

A This was from one of our logs that had an average potential and we ran this program rather hurriedly and didn't feel we had time to make a detailed analysis of this particular perimeter, and we felt this would be close enough for the purpose of what we are trying to demonstrate here.

Q Now, with that background, would you discuss what the exhibit shows, the exhibits, discussing both of them.

A All right, there is a number of columns there with the heading of time and production rate, flowing bottom hole pressure, cumulative production and center recovery. The production rate, of course, is dictated by the contract itself. One-twentieth of the reserve being produced each year. The reserve in this particular case being calculated from the data we put into the program and the reserves differ slightly from the reserves that are being carried by Natural Gas Pipeline Corporation of America. This particular discrepancy, once again, would not make a significant difference in the ratio

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of the two results. The calculation here of the original gas in place, was 26.6 million M.C.F. and I believe this is gas in place with an 89% recovery and Natural Gas carrying something like 26.3 recoverable, so there is approximately a 10% discrepancy.

Q Would that affect your basic calculation?

A It would not affect it, since it would apply to both cases, it would not affect the ratio to no more significant figures than we are considering.

Now, as you go down this, you will note that after sometime during the twelfth year, it is necessary to install a compressor in either case, in order to deliver the D.C.G. now, to point the production from the 640 acre tract is the same. Whether there is one well or two wells, there is absolutely no difference in the income.

There is no increase in the income to be gained by drilling the second well. At this point; if we have one well, the compressor must be installed in 12.64 years, and for two wells it doesn't have to be installed until 12.71 so we gain a few days there, about seven days, but that is twelve years down the road, and present worth on that installation wouldn't be significant. From that point on until sometime during the nineteenth year with the compressor, we would be able to deliver the D.C.G., in either instance.

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Decline would begin of one well somewhere after 19.48 years and production would continue economically at the end of 21.41 years. For two wells, this decline would begin after 19.74 and would continue until twenty and a half years, so there is about .9 of a year difference there, so that the entire difference in rate of income would occur after this 19.48 years when the one well would begin to decline. The cumulative production, however, in these two instances would differ by less than 1,000,000 cubic feet for one well, the cumulative being 23,000,879.98 M.C.F. -- excuse me, a million cubic feet, M.M.C.F., and for the two wells, it would be 23,000,880.1 M.M.C.F., so we are talking about a difference in recovery here of less than a million cubic feet, a little over a hundred dollars difference in income.

Q Would it be economic then, to drill two wells to recover that much additional gas?

A Even, assume we would be drilling a well for \$155,000.00, Marathon's estimate, obviously would not be economic.

Q Now, their conclusion is based on the assumption that one well will drain at least 640 acres?

A Yes, sir, it is.

Q Now, you heard Mr. Scott's testimony, including his information on pressure tests, permeability of formation

and other factors; taking those factors into consideration in your opinion, will one well drain in excess of 640 acres?

A Yes, sir.

Q Were Exhibits 1 and 2 prepared by you or under your supervision?

A Yes, sir.

MR. KELLAHIN: We will offer Exhibits 1 and 2.

MR. NUTTER: Standard's Exhibits 1 and 2 will be admitted in evidence.

(Whereupon Standards' Exhibits 1 and 2 were admitted in evidence)

MR. NUTTER: Does anyone have any questions of Mr. Hull? He may be excused.

(Witness excused)

MR. KELLAHIN: That's all we have, Mr. Nutter.

MR. NUTTER: Does anyone have anything.

MR. FORD: I have a statement.

MR. NUTTER: We will take statements.

MR. FORD: George Ford from Pan American Petroleum Corporation. We concur wholeheartedly with the recommendation of Marathon Oil Company for permanent field rules including 640 acre units for these two pools.

We are alarmed at the Exhibit 7 of Marathon, this shows over eight million dollars for fifty-two additional

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wells. That would be unnecessary if we have to develop this reservoir to 320 acre spacing, Pan American operates eight completions in the Indian Basin Upper Penn Pool. Our completions would represent about a million and a quarter dollars of this total amount.

We believe that the other evidence and testimony proves conclusively, that a well would drain over 640 acres in this pool, especially Exhibit 6. This Exhibit shows that at least three wells that were completed after a substantial production started, had a pressure draw-down below the original pressure in the vicinity of their well bores, without any production from those well bores. Now this can be due only to pressure communication over wide areas in the reservoir, that is development on 640 acres, so we respectfully urge the Commission to adopt the present temporary rules and permanent rules for the Indian Basin Upper Penn and Morrow Gas Pools.

Thank you, sir.

MR. KELLAHIN: Mr. Nutter, Standard Oil Company as the witness has stated, has no Morrow wells; however, they are the operator of wells in the Upper Pennsylvanian Pool, and are in support of Marathon Oil Company's presentation for 64-acre spacing in that pool. We feel that it has clearly been tabulated that one well will drain in excess of 640 acres and that the drilling of wells on 320 acres would not only be costly

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and unnecessary, but would result in the production of very, very little additional gas, an amount that is almost insignificant and the cost of drilling equipment and connecting up wells would be an economic waste. For that reason, we recommend very strongly the adoption of 640 acre drilling and proration unit for the Indian Basin Upper Pennsylvanian Pool.

Now, as to the Morrow, admittedly, Standard has no wells in that pool. However, we do feel that the testimony shows rather clearly that the production from the Morrow is erratic. That experience has shown that the wells in this particular pool can only be drilled in conjunction with other wells, and in the interest of orderly development and proper development of the pool and, as a matter of fact, in the interest of obtaining any development in the Indian Basin Morrow Pool, the well location drilling and proration unit should be the same for the other horizons in order that the operator might economically dually complete wells in the Morrow.

MR. NUTTER: Thank you. Anyone else?

MR. JORDAN: I have a statement. J. B. Jordan, Union Oil Company of California in Roswell, and I would like to state that Union supports Marathon's application for 640-acre spacing.

MR. NUTTER: Thank you, Mr. Jordan.

MR. ENFIELD: Robert Enfield, and I would like to say

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I support Marathon's presentation for both the Upper Penn and the Lower Penn Morrow.

MR. GEDDIE: Ivan D. Geddie, representative of Kerr-McGee Corporation. Kerr-McGee Corporation operates one well in the Indian Basin field and owns an interest in ten others. From our independent study of the Upper Pennsylvanian and Morrow Reservoirs of the Indian Basin field and from evidence which has been presented here at this hearing, our company has come to the conclusion that 640 acre spacing units are proper for these reservoirs. It is therefore recommended that the Conservation Commission establish 640 acre units for gas wells completed in the Indian Basin Upper Penn and Morrow Pools.

MR. NUTTER: Thank you.

MR. GOODMAN: Fred Goodman, of Ralph Lowe Estates and Lowe Drilling Company. We wholeheartedly concur in Marathon's presentation and recommend the adoption of permanent 640 acre spacing.

MR. NUTTER: Mr. Sturdivant?

MR. STURDIVANT: W. C. Sturdivant, for Sun Oil Company. We operate one well and have an interest in eight wells in these pools. We concur with the statements made and recommend adoption of the permanent 640 acre spacing.

MR. NUTTER: Thank you. Any other statements to

the hearing? Mr. Hatch, do you have any correspondence?

MR. HATCH: I have correspondence from Sinclair Oil and Gas, Texaco, Incorporated, Hannigan Oil Company, Texas Pacific, Redfern, Shell, letters from Tidewater and Odessa Natural Gas Company, all in support of the application.

MR. NUTTER: 640 acre spacing is popular in this pool.

MR. COUCH: As a matter of fact, I think it's unanimous.

MR. NUTTER: Is there anything further in Cases 2749 and 2750?

MR. COUCH: A letter from Mr. Curtis Inman supporting the making permanent of the present 640 acre spacing, and spacing rules in both pools. We have also received a telegram from Mr. Hannigan. Does that telegram have about ten different signatures on it?

MR. HATCH: Yes, it does.

MR. COUCH: All right, I have a telegram from Monsanto supporting the recommendations we are making here today, and I have been advised by telephone from my office in Houston that there is a letter from Phillips concurring and supporting our position. I will submit that letter, if I may, later to the Commission records.

MR. NUTTER: That will be fine.

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MR. COUCH: I would like to make just one observation that in setting 640 acre spacing for these pools, when it did, in 1963, the Commission has encouraged and made possible the very rapid development and extremely significant gas reserve in the State of New Mexico. In this four years time, there has been an average of approximately one and a half wells drilled a month in this pool area at a substantial expenditure and investment by the operators, and the substantial definition of these pool limits in this four years time can, I think, certainly be attributed very gratefully to the Commission's wisdom in adopting the 640 acre spacing when it did. I would like to say also that in this wide area of thirty-four thousand, sum odd, acres, that our pressure differentials across the field there, are still, other than one or two obviously erratic performing wells, are within a reasonable range of 51 pounds from top to bottom and we strongly urge the Commission that they make permanent the spacing rules contained in the original orders entered in these cases four years ago. Thank you, sir.

MR. NUTTER: Thank you. If there is nothing further in Cases 2749 and 2750, we will take those cases under advisement.

