BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
December 19, 1962

REGULAR HEARING

IN THE MATTER OF: (De Novo) Application of Marathon Oil Company for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of an unorthodox gas well location in the Atoka-Pennsylvanian Gas Pool at a point 990 feet from the North line and 990 feet from the East line of Section 30, Township 18 South, Range 26 East, Eddy County, New Mexico. This case will be heard de novo under the provisions of Rule 1220.	Case 2628

BEFORE: Honorable Thomas Bolack
Mr. A. L. "Pete" Porter
Mr. E. S. "Johnny" Walker

TRANSCRIPT OF HEARING

MR. PORTER: The Commission will take up next Case 2628.

MR. DURRETT: Application of Marathon Oil Company for an unorthodox gas well location, Eddy County, New Mexico.

MR. MALONE: May it please the Commission, Mr. Terrell Couch, Division Attorney for the applicant at Houston, and I, will present the matter for the applicant. I am Charles Malone, Atwood & Malone at Roswell. We have two witnesses and eight

exhibits. May our witnesses be sworn, please?

(Witnesses sworn.)

(Whereupon, Applicant's Exhibits Nos. 1, 2 and 3 were marked for identification.)

N. E. WEBERNICK

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

DIRECT EXAMINATION

BY MR. MALONE:

Q Would you state your name, please?

A N. E. Webernick.

Q By whom are you employed, Mr. Webernick?

A I am employed by Marathon Oil Company as an area geologist in Roswell, New Mexico.

Q Mr. Webernick, have you previously testified before this Commission in matters of geology?

A No, sir, I have not.

Q Would you briefly state your educational background and your experience in that field?

A I received a Bachelor of Science Degree in geology from Southwestern University in 1949, a Master of Arts Degree in geology from the University of Texas in 1951. I have been employed as a geologist for Marathon Oil Company for the past

ten years. I worked as a geologist, an area geologist in West Texas for nine years and as an area geologist in Roswell, New Mexico for the past one and a half years.

In connection with my duties as area geologist, all leases in Eddy County, New Mexico fall under my supervision. I have been associated with various studies in the Atoka-Pennsylvanian Pool for the past one and one half years and have made recommendations upon which lease acquisitions have been made.

MR. MALONE: Are the qualifications of this witness satisfactory to the Commission?

MR. PORTER: Yes, sir, they are.

Q (By Mr. Malone) Have you made a study of the geology of the Atoka-Pennsylvanian Pool?

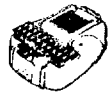
A Yes, I have.

Q Have you prepared exhibits to present in this hearing concerning the geologic nature of the pool?

A Yes, sir.

Q Would you please proceed to a discussion of your Exhibit No. 1, please?

A Exhibit No. 1 is a structural map contoured on top of the B zone, which is the major producing zone or sand body in the Atoka-Pennsylvanian Gas Pool. This zone is encountered at approximately 9100 feet. The contour interval for this map is



50 feet, and the scale of this map is one inch equals 2,000 feet.

Marathon Oil Company leases are shown in yellow; to the best of my knowledge all producing wells completed and all dry holes in the Atoka-Pennsylvanian Field are shown.

The proposed location for the G. W. Nixon Well No. 1, the subject of this application, is circled in red. It is noted that we request authority to drill this well at an unorthodox location, which is 990 feet from the North line and 990 feet from the East line of Section 30, Township 18 South, Range 26 East, Eddy County, New Mexico.

The B zone, upon which this structural map is constructed, is a good marker bed throughout the Atoka-Pennsylvanian Field. This map shows the strike of the area to be in a generally southwest to northeast direction without any features of great structural relief. The dip or structural attitude of the B zone is in a generally southeast direction with variations from a minus 5450 foot datum on the updip or north side of the field to a minus 5850 feet on the south side or downdip side of the field.

This structural map clearly demonstrates, in my opinion, that the Atoka-Pennsylvanian Gas Pool is not a structural trap. The production within this field is stratigraphically controlled by the development of porosity and permeability within the sand.

Q What does this exhibit reflect with respect to the depth of wells in this field which are producing?

A This map shows that there are a number of producing wells at a lower subsea datum than some of the dry holes.

Q Does this reinforce the opinion that you have stated that this pool represents a stratigraphic trap rather than a structural high?

A Yes, sir, it does.

Q Please describe your next exhibit, No. 2.

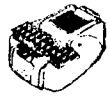
A Exhibit No. 2 is a southwest to northeast cross section through the Atoka-Pennsylvanian Gas Field. The line of section is shown in green on Exhibit No. 1, which is the structural map which has been presented.

Q As I understand your testimony, Exhibit No. 2 shows a cross section of the field at the point indicated by the green line running from the southwest to the northeast through the center of Exhibit 1, is that correct?

A Yes, sir, that is correct.

Q Please go ahead.

A This line of section is also shown on Exhibit No. 3 which will be presented next. The vertical scale of this cross section is one inch equals 1,000 feet, or one inch equals 100 feet, I am sorry. The horizontal scale is one inch equals 1,000



feet, which is a vertical exaggeration of ten times the horizontal. The cross section runs from the Gulf's State "AC" No. 1, located in Section 36, Township 18 South, Range 25 East, then through the Marathon No. 1 Culpepper Well in Section 30, Township 18 South, Range 26 East, then to the northeast where it ends with the Standard of Texas No. 1 Everest Well in Section 14, Township 18 South, Range 26 East.

Q What is the purpose of presenting this exhibit reflecting a cross section southwest to northeast through the pool?

A The purpose of this cross section is to point out the fact that there are three zones within the producing interval of the Atoka-Pennsylvanian Field and that these zones can be carried throughout the field, and also to the west of the field proper.

The cross section is constructed on top of the Benn and delineates the A, B and C zones. You will note that we have the A zone on the cross section shown in green, the B zone in yellow, and the C zone in purple. It should be pointed out that although all three zones can be carried over the entire distance of the line of section, all zones do not produce in each well throughout the field. The B zone is by far the best producing zone within the field. However, there are some

variations in porosity and permeability within this zone.

Q That's within the B zone?

A Yes, sir, that's within the B zone.

Q All right.

A These variations in porosity and permeability result from cementation of the sand grains. The B zone is generally a medium to coarse subangular to subrounded quartz sandstone and conglomerate with varying amounts of cementing material. The B zone in some wells also has shale beds within this zone. The cementing material consists of quartz over gross clay and calcareous cement. The amount of cementation is the main factor which controls the porosity and permeability, which in turn is the deciding factor as to whether the well will be a commercial producer or dry hole.

Q What does this cross section, Exhibit 2, reflect as to the thickness of the B zone?

A You will note the varying thickness of the B zone on the cross section. For example, the Marathon No. 1 Arnquist Well in Section 29, which is Well No. 3 on the cross section, third from the left, has a B zone thickness of 68 feet as compared to 22 feet in the Marathon No. 1 Culpepper Well in Section 30, Township 18 South, Range 26 East.

The Culpepper Well is shown as Well No. 2, or second from

the left on the cross section; 12 feet in the Marathon No. 1 Noel Well in Section 20, Township 18 South, Range 26 East.

Q Please proceed.

A It is important at this time to call attention to the fact that the Marathon No. 1 Culpepper well possesses a greater thickness of B zone sandstone than does the Marathon No. 1 Noel Well. Yet the Culpepper well is a dry hole and incapable of commercial production, whereas the Noel well is a good commercial gas producer.

Q The Culpepper well lies to the south of the proposed unorthodox location in the Southeast Quarter of Section 30, whereas the Noel well you have described lies to the northeast of the proposed location in the South Half of 20, is that correct?

A Yes, sir, that is correct.

Q Please proceed.

A The facts are that although the Culpepper well is located where sufficient amount of B zone sandstone is present, the lack of porosity and permeability which results from the prevalence of cementing material renders this well incapable of commercial production.

The above facts, in my opinion, clearly demonstrate that gas production from the B zone within the Atoka-Pennsylvanian Gas Field is stratigraphically controlled by porosity and

permeability development within the sand, and that locally variations in porosity and permeability exist in a number of areas within the field, and in some cases without any relationship to the amount of total B zone thickness.

Q What does this exhibit show with respect to the A and C zones?

A The A and C zones, as shown on the cross section, can be carried throughout the field proper and also to the west of the field. These zones contribute a minor amount of gas to the total gas production from the Atoka-Pennsylvanian Field. The A and C zones are erratic, but in general they consist of fine to coarse quartz sandstone with varying amounts of limestone and shale; porosity and permeability also vary greatly within these two zones.

Q What is your next exhibit, please?

A The next exhibit is Exhibit No. 3.

Q Will you discuss that exhibit now?

A Exhibit No. 3 is an isopach of the B zone sand, excluding the shale, which as mentioned previously is the main pay zone in the Atoka-Pennsylvanian Field. The isopach interval is ten feet. The scale of the map is one inch equals 2,000 feet.

It was previously demonstrated by Exhibit No. 2, the cross section, that the B zone can be traced throughout the field area

and also west of the field proper. The purpose of this isopach is to show the areal extent of the B zone and to also show the overall configuration of the sand body within the Atoka-Pennsylvanian Field. The thickness of the B zone as shown on this isopach were derived from a study of all electrical and radioactivity logs, an analysis of sample cuttings, and where available an analysis of cores, that is by actually looking at the rock in the cores.

Q In your opinion does this Exhibit No. 3 represent a reasonable geologic interpretation based upon recognized geologic principles?

A The isopach, in my opinion, represents a reasonable and logical interpretation of the distribution of the B zone within the Atoka-Pennsylvanian Field. This isopach shows that the overall trend of the sand body is from southwest to northeast. You will note that the isopach shows that the B zone is present throughout all of the North Half of Section 30, Township 18 South, Range 26 East.

Q That is the proration unit in question in this application, is it not?

A Yes, sir, that is correct.

Q Go ahead.

A The thickness of the zone varies within the North Half

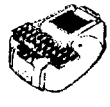
of Section 30, Township 18 South, Range 26 East from approximately ten feet on the extreme western side to approximately 60 feet on the extreme eastern side of the North Half of the section.

Attention is called to the fact that the Marathon No. 1 Culpepper well in the Southeast Quarter of Section 30, Township 18 South, Range 26 East possesses a B zone thickness of 22 feet which is a greater thickness than six commercial producing wells within the field.

Sample and core analyses show that the B zone in the six producers and the No. 1 Culpepper well is similar lithologically except that the presence of cementing material in the Marathon No. 1 Culpepper well results in lack of porosity and permeability.

Q On the basis of your study of this pool, what is your opinion with respect to the B zone and its potential productivity in the North Half of Section 30?

A Based on all information and facts at hand, it is my opinion that the interpretation on the B zone isopach is correct and logical. All points are believed to be connected in a normal and conservative manner. All information leads us to believe that the B zone is present throughout all of the North Half of the Section 30, and that all of this acreage can



reasonably be deemed productive from the B zone.

It has been pointed out previously, however, that the development of porosity and permeability is erratic and is at least in part unrelated to total B zone thickness. The fact that area possesses a thick section of B zone does not imply that the section will be porous and permeable.

Attention is called to the fact that the exact degree or rate of thinning of the B zone, that is the sand of the B zone, from east to west within the North Half of Section 30, Township 18 South, Range 26 East, is not definitely known. It is my personal opinion at this time that a well should not be drilled at a standard location in the North Half of Section 30, because of the great economic risk involved and the difficulty of completing a well in a relatively thin section. This well should be drilled at a location offering the greatest chance for economic success, protection of correlative rights, and the conservation of natural resources.

Q Mr. Webernick, were these three Exhibits Nos. 1, 2 and 3 prepared either by you or under your direct supervision?

A Yes, sir, they were.

MR. MALONE: Mr. Chairman, may we move the admission of these exhibits in evidence?

MR. PORTER: Without objection the Exhibits 1, 2 and 3

will be admitted to the record.

(Whereupon, Applicant's Exhibits Nos. 1, 2 and 3 were admitted in evidence.)

MR. MALONE: That completes our direct examination, Mr. Chairman.

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

CROSS EXAMINATION

BY MR. NUTTER:

Q Referring to your Exhibit No. 3, this isopach of the B zone shows the presence of the sand, is that correct?

A Yes, sir.

Q Does it show the presence of any porosity or permeability in the sand?

A No, sir, it does not. This is an isopach of the B zone sand thickness in itself and has no net pay connotation whatsoever.

MR. NUTTER: Thank you.

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

MR. KELLAHIN: If the Commission please, Jason Kellahin, Kellahin and Fox, Santa Fe, representing Martin, Williams and Judson, offset operators to the proposed location. I have a

couple of questions.

BY MR. KELLAHIN:

Q Mr. Webernick, on your Exhibit No. 2 you show the presence of three sand bodies, but I believe it was your statement that the B sand body is the principal producer in this pool, is that correct?

A That is correct.

Q Are the A and C sand bodies open in any of the wells you have shown on here?

A Yes, sir. I believe that the C zone is perforated in the Marathon No. 1 Noel Well, which is shown on the cross section.

Q Was there any test made of that zone separate from the other zones?

A Would you repeat that, please?

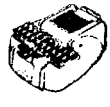
Q Was there any test made of that zone separate from the other zones, as to its productivity?

A I do not believe that that zone was tested separately, no, sir.

Q They're presently open in the well bore?

A Yes, sir.

Q It is your opinion that that is contributing some gas, is that correct?



A Yes, sir, I think so.

Q On the basis of the information that you have, you don't know whether it's contributing gas or not, is that correct?

A I would say that is correct in general. However, upon examination of the sample cuttings in this well, it was our opinion at this time before completion of the well that this zone did have some pay. That was really the reason for perforating the zone, so far as we know we do think it is contributing some gas to the overall pay section.

Q Now, the cementation you have referred to, that would be the same in all of the three zones, would it not?

A Yes, sir.

Q Does it consist of shaling out in some areas?

A There's definitely some shale bodies within all of these zones, and I would say that, in general that the shaling effect throughout the field in all zones probably has some effect on the net amount of porosity and permeability.

Q Referring to the log on the Marathon Culpepper No. 1, the second log on your exhibit --

A Yes, sir.

Q -- does that indicate shaling in the B zone?

A Yes, sir, the B zone does have some shale in that well.

Q Do you have a log of the Marathon Nix Curtis Well

located in Section 32?

A Yes, sir, we have a log on that well.

Q Have you examined it?

A Yes, sir.

Q Does it show shaling in the B zone?

A Yes, there's definitely some shale in the B zone on that well.

Q Have you examined the logs, for example, in the Len Mayer subdivision well in Section 28?

A Yes, sir.

Q That is a producer, is it not?

A Yes, sir.

Q It's completed in what you've indicated as being ten feet of pay -- ten feet of sand body in the B zone?

A This map, of course, does not indicate anything as far as pay goes.

Q I corrected it. I said sand body, ten feet.

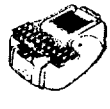
A My map indicates that there is ten feet of B zone sandstone in that well.

Q I think we agree, then, that there's ten feet of sand?

A That is correct.

Q There's more than in the Culpepper well?

A Yes.



Q There's more than in the Nix Curtis Well, both of which are dry?

A That is correct.

Q They are both shaled out to a large extent, isn't that correct?

A I don't particularly like the term shaled out. I'll go along with you in part there.

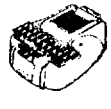
Q You express it in your own terms.

A Part of the section in the Nix Curtis is definitely shale. However, this well does have some sand, as the map indicates, it has 12 feet of sand in the B zone and this sand is non-porous and impermeable because of the presence of cementing material within the sand grains of this sand, which renders it non-porous and impermeable.

Q What is the nature of this cementing material?

A The nature of the cementing material in all of the wells that we've examined in this field is due to mainly three things, the presence of quartz overgrowth which tends to stop up the space between the sand grains, the presence of clay cement which also does the same thing, and also the presence of some calcareous material between the quartz sand grain.

Q Wouldn't the presence of shale in the Culpepper and the Nix well indicate that the wells in the south and western portion



of this immediate area tend to be tight in the formation and shale out to at least some extent whereas those in the north and eastern portion have rather high permeabilities?

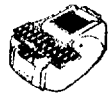
A Would you state that location in the first part of your question, please?

Q The fact that the Culpepper and the Nix wells are non-productive and they are located in the south and western area of the immediate area we're talking about here, that is the central portion of your Exhibit No. 3?

A Yes, sir.

Q Wouldn't that seem to indicate that you are apt to find the wells located in that side of the pool shaled out, or with relatively tight permeabilities, whereas experience has shown those located on the north and to the east have high permeabilities and no shaling?

A I don't believe you can really draw a corollary there in this particular part of the field. Actually what I'm showing here on this map is that we expect a relatively thin body of sand within the western portion of Section 30, that is sand within the B zone. However, this map does not in any way imply that any part of that will be non-porous and impermeable. Therefore, I don't believe that I could draw that conclusion from this map, mainly because this is not a net pay isopach map.



Q Have you prepared a net pay isopach map?

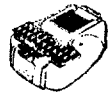
A This map will be presented later in the testimony in the engineering portion of the testimony.

Q You made a conclusion, Mr. Webernick, to the effect that in your opinion the western portion of your unit is productive. Have you offered anything here on which to reach that conclusion?

A Actually this map does not so indicate, mainly because we are going to follow up with another map to show. However, through my study in this field I certainly have come upon these things where I can draw my conclusion. I have been exposed to these things.

Q Yet you don't have enough faith in the productivity of some 25 to 30 feet of sand body that you would recommend a well to be located there, whereas on the eastern side of the pool the production is being obtained from ten feet of pay, is that correct?

A That is correct. However, when we take all of this available data and put it together, all of this data indicates that all of the North Half of Section 30, to the best of our knowledge at this time, we have no reason to believe that it will not be productive. We believe it can reasonably be deemed to be productive. We have no data that states otherwise.



You will note on the map that we have been looking at here, the isopach map, Exhibit No. 3, that the rate of thinning, mainly because of lack of control in that particular part of the field, does not indicate that we do not have some control. Actually we have some off key wells here that sets up some information here to make the isocores on the isopach map. We do not know the exact rate of thinning from the east side of Section 30 over to the west side of Section 30. Based on all facts that we have at hand, we believe that this is a reasonable interpretation we are showing here.

Q But you don't recommend that you drill a well in an orthodox location?

A That is correct, due to the facts that we have presented in the testimony, because of not knowing the exact degree of thinning, because of the localized conditions that we know can exist.

As an example, I pointed to the Culpepper where we had a sufficient amount of B zone sand which is comparable to six producers in the field. However, because of localized conditions that we could not predict, we feel that we do not want to drill, and at this time I'm recommending that we not drill a well at the standard location.

Q Mr. Webernick, we have a Martin, Williams, Judson Well

located in Section 19.

A Yes, sir.

Q According to your map it's located on the 30-foot contour.

A Yes.

Q Where does the contour pass through your acreage, it passes through the West Half?

A Yes, sir.

Q That would pass roughly through an orthodox location, would it not?

A That is correct.

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

MR. PORTER: Anyone else have a question?

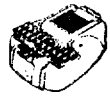
MR. MALONE: Just one or two, Mr. Chairman, if I may.

MR. PORTER: Surely.

REDIRECT EXAMINATION

BY MR. MALONE:

Q A question has been posed to you as to whether your testimony would prove that wells to the west and wells to the south tend to be, as it was called, shaled out or impermeable. Isn't it a fact that the North Half of Section 30 would be as far north as the well immediately to the east, the Andrew Arnquist Marathon Well, which had 68 feet of B zone, and likewise



the North Half of 30 would be just as far north as the Len Mayer Dayton Townsite Well in Section 28, which had ten feet of pay, and as far north as the Newberg and Ingram Hawkins Well, I believe it's called, in the North Half of Section 27, which had 22 feet of B zone sand, isn't that correct?

A Yes, sir, that's a correct statement.

Q Did you previously testify that the shaling and the existence and lack of permeability and porosity was a localized condition?

A Yes, sir.

Q And does it have any relation to the position of the well which is being examined for shale porosity in this pool?

A Based on our study, we do not believe that it has any relationship.

Q In other words, then, wells scattered throughout this pool in various places, north, south, east and west, had varying amounts of lack of porosity and permeability or cementation and have had shale beds, is that correct?

A Yes, sir, that is correct.

Q With respect to the A and C zones, do you know whether the Martin, Williams and Judson Well immediately north of the proposed location had any A or C production?

A To the best of my knowledge, the well is not perforated

in the A and C. It is perforated in the B zone.

MR. MALONE: That's all the redirect, Mr. Chairman.

MR. PORTER: Mr. Webernick, do you have the potential on this Martin, Williams, Judson Well that was just referred to in Section 19?

A Yes, sir, I have it, to the best of my knowledge it was 16,000,000 cubic feet per day.

MR. PORTER: Thank you. Mr. Utz.

RECROSS EXAMINATION

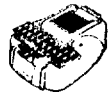
BY MR. UTZ:

Q Mr. Webernick, referring to your Exhibit 3, I would like to discuss the control, for the moment, that you had in contouring your B zone in the northwest portion in the area of Section 19. Do you have any wells for control of this contouring up in Section 24 or Section 19 other than the Martin, Williams, Judson No. 1 Well?

A No, sir, no basis except for those wells other than the fact that I spaced my contours in relation to the area where we have control.

Q In other words, your control for that area in there was from your Culpepper Martin 2 in Section 30 and the Martin, Williams and Judson Well in Section 19, is that true?

A Yes, sir, that is correct.



Q Could not that interpretation be made with much less contouring to the northwest just as easily as the way you contoured?

A Certainly there are other interpretations that can be made on the isopach of the B zone. I believe that this is logical interpretation.

Q In other words, you didn't have too much control to go that far northwest?

A Certainly we lack some control. However, it should be pointed out that we do have some control. As a matter of fact, much more than in many other areas where we are faced with lesser control.

Q First let me ask if the Culpepper Martin well is not on the 25-foot isopach contour?

A The Culpepper well?

Q Yes, the Culpepper well in Section 30.

A The Culpepper well has 22 feet of B zone sandstone.

Q And that contour goes up into the west part of the proposed unit, does it not?

A Yes, sir.

Q Do you have any evidence to show that that contour would be productive up there as dry as it is in the Culpepper well?

A No, sir, we do not have any evidence to show that it will be non-productive.

Q I note that Marathon owns some acreage up in the western half of the Section 19. Do you know whether you have any plans to drill that acreage or not?

A As far as I know we do not have any plans at this time.

Q And in Section 31, you also have some acreage there, do you have any plans to drill that acreage?

A We do not have any plans as far as I know.

MR. UTZ: That's all.

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

MR. MALONE: Would it be permissible to ask one or two further questions on the basis of what has been brought out?

MR. PORTER: Yes, sir.

REDIRECT EXAMINATION

BY MR. MALONE:

Q In discussing the control which you had for drawing the isopachs as they are shown on Exhibit No. 3, isn't it true also that you had control from the well in the Southeast Quarter of Section 20, the Marathon Noel, which had 12 feet of B zone sand?

A Yes, sir, that is correct. Actually the overall configuration of my isopach map is certainly based on all

of those wells.

Q And isn't it true also that the Mallard Petroleum Company Mayer Holt in the Southwest of 28 was used as a control since it lies just inside the ten foot zone?

A Yes, sir, it was used.

Q And you testified that you used the same interval in extending the isopachs to the northwest which you had found to exist under control conditions to the southeast?

A Yes, sir.

Q Is that correct?

A Under controlled conditions in all parts of this particular area.

Q Yes. I believe that's all. Thank you.

MR. PORTER: Any further questions? The exhibits have already been admitted to the record. The witness is excused.

(Witness excused.)

MR. PORTER: Call your next witness, please.

MR. MALONE: Mr. Webb.

(Whereupon, Applicant's Exhibits Nos. 4, 5, 6, 7 & 8 were marked for identification.)

THOMAS O. WEBB

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

DIRECT EXAMINATION

BY MR. MALONE:

Q Would you state your name, please?

A Thomas O. Webb.

Q By whom are you employed and in what capacity, please, Mr. Webb?

A I am employed by Marathon Oil Company in the capacity of area petroleum engineer in Hobbs, New Mexico.

Q Mr. Webb, have you previously testified before this Commission as to matters of petroleum engineering?

A Yes, sir, I have.

Q Have your qualifications been accepted by the Commission on various occasions?

A They have.

MR. MALONE: Mr. Chairman, would the qualifications of the witness be satisfactory?

MR. PORTER: Yes, sir.

Q (By Mr. Malone) Mr. Webb, in connection with your duties as area petroleum engineer for Marathon, do the leases of that company in Eddy County fall under your supervision?

A Yes, sir, they do.

Q How long have you worked in matters of petroleum engineering in this area, the Atoka-Pennsylvanian Gas Pool?

A I've worked in matters of petroleum engineering in this area for approximately six and one-half years.

Q And this pool, as a matter of fact, is what, only three years old or so?

A Discovered in 1957.

Q 1957, all right. Have you made a study of the engineering aspects of the Atoka-Pennsylvanian Pool and of drilling and production therein?

A Yes, sir, I have.

Q Have you prepared exhibits with respect to this matter?

A Yes, sir.

Q Would you please proceed with your first exhibit, which is No. 4?

A Exhibit No. 4 is a schematic cross section that has been labeled B-B^{1} and has been drawn through seven wells in the subject area. The small plat on the right side of this exhibit illustrates the wells which were utilized.

This exhibit is presented to show the manner in which pay is distributed within the B zone. Now, the cross section has been limited to the B zone since this does constitute the main pay horizon for the Atoka-Pennsylvanian Pool.

Q Was this evidence presented at the previous Examiner

Hearing in this matter?

A No, sir, it was not, since two unorthodox well locations had been previously approved by the Commission on essentially the same data that we presented in our first case. We did not feel that it would be necessary to burden the Examiner with detailed information.

Q Please proceed with a discussion of Exhibit No. 4.

A First let me say that all of the available data for each of the wells appearing on this exhibit have been used in the preparation of the exhibit. The total thickness of the B zone in each of these wells is shown. The cross section indicates the continuity of the B zone throughout this area. The occurrence of B zone sand and the distribution of the pay within this sand is shown for each well.

That portion of sand which does not contain sufficient porosity and permeability development to permit commercial gas production has been colored yellow and is covered with dots. That portion of sand considered to be commercial pay is shown as a clear yellow section. Shale lenses are shown in blue.

Q You used the term shale lenses, is that the same as shale beds, as that term has been used previously?

A Yes, sir.

Q Go ahead.

A It will be noted that the B zone is not exactly alike on any two wells on this cross section. In several instances these shale stringers have been deposited within this zone. Therefore, a reduction in total net pay can result from shale deposition within the B zone.

Now, I point out that these shale stringers are not correlative from well to well, which indicates that shale deposition has certainly occurred on a localized basis.

Q On this exhibit I believe you have shown five wells out of the seven having some shale beds within them, is that correct?

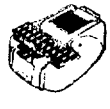
A Yes, sir, that is correct.

Q And the general area of the wells shown on the cross section is shown in the little map on the right side of the exhibit beginning up at the Martin, Williams, Judson in the Southeast Quarter of Section 19, going south to the Culpepper across the proposed unorthodox location area, then east and again north into the far eastern end of the pool, is that correct?

A Yes, sir. This is not a true cross section in the strictest sense of the word. By that I mean it is not a straight line cross section. It's prepared as a graphic representation only.

Q Please go ahead.

A The total B zone sand thickness varies considerably



from well to well and the location and the thickness of the pay within this zone is erratic.

Q Please describe what you mean by erratic location and thickness of the pay within the sand.

A Well, you will note that the pay in the Mallard Mayer Holt No. 1 --

Q That is the fourth well from the right on Exhibit 4?

A Yes, sir.

Q Thank you.

A And the Yates Gushwa No. 1 is located near the bottom of the B zone. The pay within the B zone is located near the bottom of the B zone for those two wells.

In the Yates Linn Mayer No. 1 the pay is located in the middle of the B zone and the Yates Dayton Townsite No. 1 produces from the top part of the B zone. On the other hand, nearly all the B zone in the Ralph Nix No. 1 and the Martin, Williams, Judson FE No. 1 is considered to be productive.

It will be noted that in most of the wells on this exhibit additional B zone sand is present which does not contain sufficient porosity or permeability development to permit commercial gas production.

Q That is the area within the yellow which is shown to be dotted?

A Yes, sir, that is correct.

Q Go ahead.

A Now, the lack of porosity and permeability within this sand is primarily due to an abundance of cementing materials within the sand. This has been testified to. Marathon's Culpepper Unit Well No. 1 appears on this cross section and contains a total of 22 feet of coarse grained B zone sand which is certainly ample to support a commercial completion. However, the lack of porosity and permeability within this sand renders this well incapable of commercial production.

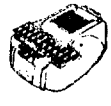
This exhibit clearly indicates that the impermeable sands are not correlative from well to well, and it is evidenced that the loss of porosity and permeability within the B zone can be a result of strictly localized conditions. It is also obvious that permeability development is independent of a well's structural location.

(Whereupon, Applicant's Exhibits Nos. 4 & 5 were marked for identification.)

Q What is your next exhibit, please?

A The next exhibit is Exhibit No. 5, which is an isopach map of the Atoka-Pennsylvanian Pool, and illustrates the total net thickness of the pay in this reservoir.

Q Was this exhibit presented at the Examiner Hearing?



A Yes, sir, it was.

Q The same exhibit?

A Identical.

Q Go ahead.

A To describe this exhibit, first, all of Marathon's properties in this area are shown in yellow and the present horizontal limits of the Atoka-Pennsylvanian Pool are shown with a red line.

Q Those are the limits of the pool declared by this Commission?

A At the present time, yes, sir.

Q Yes.

A All offset operators to Marathon's G. W. Nixon lease have been indicated on this exhibit to the best of my knowledge, and also shown are all producing wells currently completed in the Atoka-Pennsylvanian Pool along with all dry holes that have been drilled to the Pennsylvanian horizon in this area.

Q Now, then, how is the proposed unorthodox location marked?

A The proposed unorthodox location is circled red. We request authority to drill this well at a location 990 feet from the North line, 990 feet from the East line of Section 30, Township 18 South, Range 26 East. The special rules and

regulations for the Atoka-Pennsylvanian Pool as set forth in Order No. R-1670-E require that the wells completed in this pool be located in the Northwest Quarter or the Southeast Quarter of a section and shall be located no nearer than 990 feet to the outer boundary of the section, nor nearer than 330 feet to any governmental quarter, quarter section.

The proposed location for the G. W. Nixon Well No. 1 complies with the footage requirements of this order, but is located in the Northeast Quarter of the section, and is therefore unorthodox.

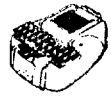
Q The Northeast rather than the Northeast or Southeast, is that correct?

A Yes, that is correct.

Q Go ahead.

A Order R No. 1670-E also specifies that each well completed in this reservoir be located on a tract consisting of approximately 320 acres comprising any two contiguous quarter sections of a single governmental section. We propose to dedicate to this well the North Half of Section 30 in which Marathon Oil Company owns a 100% working interest.

The North Half of Section 30 contains 317.7 acres and will constitute a standard proration unit as defined by the pool rules for the Atoka-Pennsylvanian Pool.



The available subsurface data indicates that the Atoka-Pennsylvanian Pool is a stratigraphic trap rather than a structure. The productive limits of this reservoir are controlled by porosity and permeability development within the sand. The net pay thickness values utilized in the preparation of this exhibit are shown in parentheses at each individual well and include the total net pay for the A, B and C zones encountered in each well. These values were determined from a very careful study of sample cuttings and electrical and radioactivity logs on all wells along with a study of all of the available cores.

The isopach contours appearing on this exhibit illustrate the total thickness of Pennsylvanian sands which contain sufficient porosity and permeability development to permit commercial gas production.

Exhibit No. 5 is therefore my interpretation of pay distribution in the subject reservoir based upon the information that is available to me at this time. It may be noted the major axis of the permeability trend lies in a Northeast-Southwest direction. The configuration of the permeability trend is very erratic and there is considerable fluctuation in pay thickness. It was pointed out in a presentation of my first exhibit, which was No. 4, that this pay thickness is determined by localized

conditions.

Q What does this exhibit show with respect to the North Half of 30, which is in question in this case?

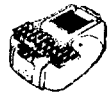
A The isopach contours on this exhibit indicate that the entire North Half of Section 30 can reasonably be deemed to be productive of gas from the Pennsylvanian sands. It is my opinion that Exhibit No. 5 represents the most logical and reasonable method of interpreting pay distribution in this reservoir.

These contours indicate that a well drilled at the proposed unorthodox location at the Northeast Quarter of Section 30 should encounter approximately 30 feet of total net pay. On the other hand, a well drilled at a standard location in the Northwest Quarter of Section 30 would encounter only approximately ten to fifteen feet of net pay for a possible reduction in pay thickness of 50% or more.

Q You have stated that this map, which I assume you prepared, is that correct?

A Yes, sir, that is correct.

Q Would reflect the existence of ten to fifteen feet of pay in the west area where a standard location would lie, say opposed to approximately 30 feet in the east end of that North Half, is that correct?



A That's correct.

Q How would you describe the pay interval in the Northwest Quarter of Section 30?

A Well, it is seen that we are dealing with a relatively thin pay interval in the Northwest Quarter of Section 30. We know that due to localized conditions we stand to lose more of this pay. Now, any additional loss of pay at a standard location due to these localized conditions could possibly be detrimental to a successful well location.

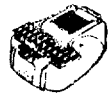
Q These localized conditions to which you refer are cementing and shale, is that correct?

A The depositions of localized shale stringers within the B zone and loss of porosity and permeability within the B zone sand is a result of an abundance of cementing materials, yes, sir.

Q All right, go ahead.

A On the other side the thicker pay interval that we would expect at the proposed unorthodox location would permit a comparable or even larger loss of pay due to these localized conditions without necessarily precluding a successful well completion.

Q Are you saying there, to put it rather too simply, that the more you have the more you can give away and still be



all right?

A Yes, sir, that's it exactly.

Q Go ahead.

A In view of the erratic configuration of the permeability trends in this reservoir, the characteristic of the pay interval to fluctuate from one location to the next, and this possibility of additional pay loss due to localized conditions, it is my opinion that the drilling of a well in the Northwest Quarter of Section 30 would incur excessive economic risk.

(Whereupon, Applicant's Exhibit No. 6 was marked for identification.)

Q What is your next exhibit, please, Mr. Webb?

A The next exhibit is No. 6, and it is an isopach map of the Atoka-Pennsylvanian Pool and illustrates the net thickness of the pay in the B zone only.

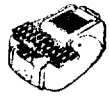
Q The B zone only?

A Yes, sir.

Q All right.

A Now, Exhibit 3 presented by Mr. Webernick depicted the total sand thickness in the B zone, whereas this exhibit shows that portion of B zone sand which contains sufficient porosity and permeability development to permit commerical gas production.

Q All right.



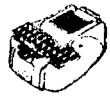
A It may be noted that this exhibit is very comparable to Exhibit No. 5.

Q Which you've just discussed.

A Which we have just discussed. It's the isopach map of the total net pay for the Atoka-Pennsylvanian Pool. This tends to confirm that the B zone constitutes the main pay horizon of this reservoir. The pay section in the producing wells located in the vicinity of Marathon's G. W. Nixon lease occurs predominantly in the B zone. Therefore, there has been very little change in the isopach contours in this area across the North Half of Section 30 throughout this area, as a matter of fact.

These contours indicate that the entire North Half of Section 30 can reasonably be deemed to be productive of gas from the B zone alone. Now, a careful analysis of the available data indicates that Marathon's Andrew Arnquist No. 1 contains four feet of pay in the A zone and the Martin, Williams and Judson Hondo Oil FE No. 1 contains three feet of pay in the C zone.

Although we admit that pay development in the A and C zones is very erratic and that these zones contribute very little to the overall pay thickness in this reservoir, it is nevertheless logical to expect that some pay will exist in the A and/or C zones underlying Marathon's G. W. Nixon lease. This, in my



opinion further substantiates the interpretation that the entire North Half of Section 30 may reasonably be deemed to be productive of gas from the Pennsylvanian section.

Q As I understand your testimony now, you have stated that the well immediately to the north of the North Half of 30 did contain some pay from a zone other than the B zone?

A Yes, sir. They had three feet of pay in the C zone, and this was perforated.

Q And you also stated the Andrew Arnquist well contained some pay from other than the B zone and it lies immediately to the east of the North Half of 30, is that correct?

A Yes, sir, that is correct. It contained four feet of pay in the A zone. Both of these wells are direct offsets to the North Half of Section 30.

Q Please proceed.

Q Now, Mr. Webernick's Exhibit No. 3 shows that a well drilled at the proposed unorthodox location in the Northeast Quarter of Section 30 should encounter a total of approximately 55 feet of B zone sandstone and that a well drilled at a standard location in the Northwest Quarter of Section 30 should encounter approximately 20 to 30 feet of B zone sand.

The isopach contours on my Exhibit No. 6 indicates that at the proposed unorthodox location, approximately 28 feet

of this B zone sandstone should be commercial pay.

Q That would be 28 feet of pay out of 55 feet of sand, is that correct?

A Yes, sir, that's correct. On the other hand, a well drilled as a standard location would encounter only approximately ten to fifteen feet of B zone pay, which would constitute a reduction in pay thickness of 50% or more as compared with the proposed unorthodox location.

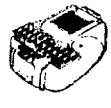
It is again emphasized that the existence of pay within this sand is a result of localized porosity and permeability conditions, and that pay thickness within this zone is erratic from well to well. Attention is again directed to Marathon's Culpepper Unit Well No. 1 which contains a total of 22 feet of B zone sandstone, or approximately the same amount that we would expect to obtain at a standard location.

Q That would be a standard location in the Northwest Quarter of 30?

A Yes, sir, that's correct.

Q All right.

A However, due to the lack of permeability development within this sand in the Culpepper, this well was incapable of commercial production. It is therefore obvious that the thicker sand section to be expected at the proposed unorthodox location



would permit a considerably larger loss of pay due to these localized conditions without being detrimental to a successful well completion, as compared to the amount of loss that you could afford at a standard location on this lease.

Q On the basis of the information shown on this Exhibit 6, what is your opinion with respect to the B zone in this area?

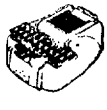
A I beg your pardon.

Q On the basis of the information shown on Exhibit 6, what is your opinion with respect to the B zone in this area?

A I can only conclude, based on the facts, that the configuration of the B zone permeability trend is also very erratic and on the fact that there is considerable fluctuation of pay thickness within this zone and due to the possibility of additional loss of pay due to localized conditions, it's again my opinion that the drilling of a well at a standard location in the Northwest Quarter of Section 30 would incur excessive economic risk and would be contrary to prudent operations.

Q At the same time you have testified, Mr. Webb, that in your opinion, as a petroleum geologist, and on the basis of your training and experience and the control which is available, the entire North Half of 30 can reasonably be deemed to be productive, is that correct?

A As a petroleum engineer that's certainly my opinion.



(Whereupon, Applicant's Exhibit No. 7 was marked for identification.)

Q What is your next exhibit?

A My next exhibit, Exhibit No. 7, which contains a plot of bottom hole pressure versus time labeled as Figure 1, and a plot of bottom hole pressure versus cumulative production from the Atoka-Pennsylvanian Pool labeled No. 2.

Q Figure 1 is at the top and Figure 2 at the bottom?

A Yes, that's correct. All bottom hole pressures appearing on this exhibit have been corrected to a common datum of minus 9600 feet, and are reported in pounds per square inch absolute.

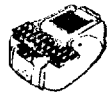
Q Was this information presented at the Examiner Hearing?

A No, sir, it was not.

Q Go ahead.

A Referring now to Figure 1, it will be noted that the original reservoir pressure for the Atoka-Pennsylvanian Pool is plotted with a green dot and a green arrow at the discovery date for the pool. This pressure was recorded in the discovery well for the pool, the Standard of Texas Everest No. 1.

Q With reference to the location of that well, that well is up here almost in the far northeast corner of the area, is that correct?



A Yes, sir, it is.

Q All right.

A This pressure was 3,722 PSIA. The average reservoir pressure at various points in time subsequent to the discovery of the pool was determined in each case by averaging the bottom hole pressure for several wells, and these pressures are plotted with green dots and have been connected with a solid line to provide a reservoir pressure decline curve for the Atoka-Pennsylvanian Pool.

Also plotted on Figure 1 are the initial bottom hole pressures for several wells completed subsequent to the discovery of the pool. These are the initial pressures in these wells. These pressures have been shown with red squares and red arrows.

Referring now to Figure 2, the plot of bottom hole pressure versus cumulative pool production, it will be noted that the original reservoir pressure for the subject pool is plotted at a point representing zero pool production. Also appearing on Figure 2 are the initial bottom hole pressures for the same wells described on Figure 1.

The initial bottom hole pressures for each of these wells is plotted at the point representing the total cumulative production of the pool at the time that pressure was measured.

Let us now go back to Figure 1. It will be noted that

Marathon's Ralph Nix Well No. 1 was completed in October, 1959.

Q That is the well in the Southeast Quarter of Section 20 to the Northeast of the proposed location?

A That is the well in the Southeast Quarter of Section 29.

Q Yes, I'm sorry.

A The initial bottom hole pressure for this well was 3,650 PSIA, or 72 pounds below the original reservoir pressure. Also it will be noted that this pressure was approximately the same as the average reservoir pressure at that time.

Q In other words, at the time that well was drilled, completed and tested for initial bottom hole pressure, it had a pressure approximately equal to the average reservoir pressure, is that correct?

A Yes, sir, that's correct.

Q Go ahead.

A From Figure 2 it is seen that the cumulative pool production at the time of this well completion was 228,000,000 cubic feet of gas. The nearest producing well in the pool at the time of this well completion was Standard of Texas Martin No. 1 located at a distance of approximately 14,000 feet to the Northeast.

Q Up in the far northeast corner of the area?

A Yes, sir, that's correct. This certainly indicates good pressure communication throughout this reservoir. The next well on the exhibit is Marathon's Andrew Arnquist Well No. 1 which was completed in May, 1960.

Q That well lies immediately to the east of the land in question here?

A Yes, sir, it is in the Northwest Quarter of Section 29.

Q Go ahead.

A The initial bottom hole pressure for this well was 3,652 PSIA, or essentially the same as the initial pressure for the Ralph Nix No. 1. Also, here again, this pressure is approximately the same as the average reservoir pressure at that time.

Q All right.

A There was very little production from the pool during the period between the completion of the Nix and the completion of the Arnquist. It is obvious that the decline in pressure throughout this reservoir is a result of the total pool production and it therefore stands to reason that the initial pressures for these two wells should have been essentially the same.

Now, the Arnquist pressure has been omitted from Figure 2 since this pressure and the pressure for the Nix would be plotted at approximately the same cumulative pool production point.

The next well on the exhibit is Marathon's E. V. Noel Well

No. 1 which was completed in October, 1960.

Q That is the well which I was trying to describe previously, it's in the Southeast Quarter of Section 20 in the offsetting land to the northeast?

A Yes, sir.

Q Go ahead.

A The initial bottom hole pressure for this well was 3,642, or 80 pounds below the original reservoir pressure. Here again, this pressure is approximately the same as the average pool pressure at that time. From Figure 2 it is seen that cumulative pool production at the time of the Noel completion was 423,000,000 cubic feet of gas.

Now, the nearest producing well in the pool at the time this pressure was taken was Marathon's Andrew Arnquist No. 1, located approximately 1300 feet to the southwest. The next well on the exhibit is the Yates Mayer No. 1, which was completed in February, 1961.

Q That well lies in the Northwest Quarter of 28, approximately a mile and a quarter east of the land in question?

A Yes, sir, that's correct. The initial bottom hole pressure for the Yates Mayer was 3,592 PSIA, or 132 pounds below the original reservoir pressure. However, here again, this pressure is approximately the same as the average reservoir

pressure at the time of that completion.

From Figure 2 it is seen that the cumulative pool production at the time of this well completion was 2,313,000,000 cubic feet of gas. The nearest producing well in the pool at the time that this pressure was taken was Marathon's Noel Well No. 1, located approximately 2700 feet to the west. The next well on the exhibit is the Yates Gushwa Well No. 1, which was completed in April, 1961.

Q That lies in the Southeast Quarter of 21?

A Yes, sir, that's correct. The initial bottom hole pressure for this well was 3,651 PSIA, or 161 pounds below the original reservoir pressure.

Q Did you say, Mr. Webb, 3,651 PSIA?

A Yes, sir, that's correct.

Q Go ahead.

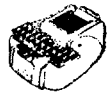
MR. MALONE: May I point out to the witness, Your Honor, that he had previously advised me that that was 3,561 in preparing the testimony, rather than 3,651. I want to clarify this.

Q Which is correct?

A It's 3,561.

Q Thank you. Go ahead.

A This initial bottom hole pressure was 161 pounds



below the original reservoir pressure. I might say that this represents the last initial bottom hole pressure that was available to me for wells completed in the Atoka-Pennsylvanian Pool.

From Figure No. 2 it is seen that the cumulative pool production at the time of the well completion was 3,188,000,000 cubic feet of gas. The nearest producing well in the pool at the time of this well completion was the Yates Dayton Townsite Well No. 1 located approximately 2100 feet to the north.

Q On the basis of the information shown in this exhibit, do you have an opinion with respect to these matters?

A Yes, sir. I certainly do.

Q Please proceed.

A Exhibit No. 7, in my opinion, clearly reflects that the decline in reservoir pressure in the Atoka-Pennsylvanian Pool, or in any tract within this pool, is strictly a result of the total gross production from the pool. It is evidenced that the loss in bottom hole pressure in any tract in this reservoir has no relationship to the distance of the offset wells to that tract.

Referring to Figure 1, it is again pointed out that the initial bottom hole pressures reported thereon in each case is in very close agreement with the average reservoir pressure for the

Atoka-Pennsylvanian Pool.

Now, the distance from these wells to the nearest offset production varied from 14,000 feet to 2100 feet, and yet each of these wells had experienced only a normal decline in pressure. Attention is again directed to the Yates Gushwa No. 1. It will be noted from Figure 1 that the initial pressure for this well was, as I said, in very close agreement with the average pool pressure at the time that the well was completed.

I repeat that the nearest producing well to the Gushwa No. 1 at the time of its completion was the Yates Dayton Townsite No. 1 located at a distance of only 2100 feet. Yet this tract had experienced only a normal decline in pressure. Certainly the productivity of the Gushwa No. 1 had not been adversely affected since this well potentialed for 30,000,000 cubic feet of gas per day from 15 feet of pay. Also, neither of these wells, the Gushwa or the Yates Dayton Townsite, have ever experienced any difficulty in producing their allowable.

Q Mr. Webb, what does this reflect with respect to the application of Marathon for the unorthodox location in your opinion?

A Well, sir, we request authority to drill the G. W. Nixon No. 1 at a point 1390 feet south of the Martin, Williams, Judson Hondo FE No. 1. This is only 120 feet less than the

distance between the Yates Gushwa and its nearest offset. The bottom hole pressure data which I have presented, the major part of which was accepted by this Commission in Case 1679, establishing rules for this pool, proves excellent communication in pools throughout this reservoir. Therefore, the approval of Marathon's proposed location will not result in an abnormal pressure decline in the Martin, Williams, Judson tract.

Q By abnormal, do you mean more than would result from the drilling of a well anywhere else in the pool which was productive?

A Yes, sir. That's correct.

Q Go ahead.

A The unorthodox well would certainly have no more effect upon the Martin, Williams, Judson tract than would a producing well at any point in the North Half of Section 30. Also it is apparent that the drilling of a well at the proposed location will not have any effect upon the ability of the Martin, Williams and Judson well to produce its allowables.

(Whereupon, Applicant's Exhibit No. 8 was marked for identification.)

Q Let's go now to your next exhibit, please, No. 8.

A No. 8 is a tabulation of bottom hole pressure data for the Atoka-Pennsylvanian Pool obtained during the cooperative

surveys conducted in 1961 and 1962. All pressures were measured at a common datum of minus 5600 feet, and here again, they are reported in pounds per square inch absolute.

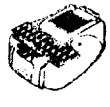
Also included on this exhibit is the cumulative production for each individual well at the time of the bottom hole pressure tests, along with the thickness of the Pennsylvanian pay in each of these wells.

Q Now, your exhibit shows 1961 cooperative survey at the top portion and 1962 at the bottom. What does the 1961 survey of pressures show?

A Referring to the 1961 survey, it is seen that the individual pressures are all in close agreement, indicating very uniform pressure distribution throughout this pool. The initial bottom hole pressures for the Yates Gushwa No. 1 and the Yates Mayer No. 1 have been included on this tabulation.

Although these wells have been previously discussed, these pressures were nevertheless obtained at approximately the same time that the cooperative survey for 1961 was conducted. It will be noted that the initial pressures for these two wells were in very close agreement with the bottom hole pressures obtained on the producing wells.

The cumulative gas production for the producing wells at the time of the bottom hole pressure tests varied from



226,000,000 cubic feet to 769,000,000 cubic feet, whereas there had been no production from the Yates well at the time the initial pressures were measured. Still the bottom hole pressures were all very uniform. It is therefore evidenced that the decline in reservoir pressure in any individual well or tract is determined by the total production from the pool and not by the production from any one well.

Q Your voice dropped there. Did you say is determined by the total production from the pool?

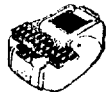
A Yes, sir, that's correct.

Q And not by the production from any one well?

A Yes, sir, that's correct.

Q What did the survey in 1962 show?

A From the 1962 cooperative survey it is again seen that the individual pressures are all in very close agreement, indicating excellent pressure communication throughout this reservoir. The decline in bottom hole pressure between the 1961 and 1962 surveys for each well was very uniform. It will be noted that at the time of this 1962 survey the Pan American Flint No. 1 had produced 1,581,000,000 cubic feet of gas, or substantially more gas than was produced by any other well, and yet the bottom hole pressure in the Flint was almost identical to the other pressures. This certainly again indicates that the



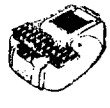
decline in bottom hole pressure in any individual well in this pool is not determined by the production from any one well.

This point is emphasized to show that the production from a well drilled at Marathon's proposed unorthodox location would have no more effect upon the Martin,Williams and Judson lease than would a producing well drilled anywhere in the North Half of Section 30.

The figures listed in the column entitled "Total Pay Thickness" are the same figures that appear on Exhibit No. 5, the isopach map of the total net pay. It will be noted that the pay thicknesses vary from ten feet, which is very nearly the thinnest pay section for any producing well in this pool, to 62 feet, which constitutes the thickest pay section for any well in this pool.

Since the bottom hole pressures for all of these wells is very uniform, it is apparent that the reservoir pressure in any well is independent of the pay thickness. This shows that the bottom hole pressure in a well drilled at Marathon's proposed unorthodox location would be no greather than the bottom hole pressure in a well at a standard location on this lease.

Therefore, Marathon Oil Company will be given no bottom hole pressure advantage by being permitted to drill a well at a point where we expect a thicker pay interval. The average



reservoir pressure for the Atoka-Pennsylvanian Pool at the time of the 1962 cooperative survey was 3,234 PSIA. This means that a well drilled at the present time on Marathon's G. W. Nixon lease would have essentially this pressure. This is approximately 500 pounds, or 13% below the original reservoir pressure for this pool.

Q Would you now describe the past activity of Marathon in development of this pool, and I notice it's already 11:30; would you please proceed as rapidly as possible in this part of your testimony?

A Marathon Oil Company has drilled five wells in the Atoka-Pennsylvanian Pool.

MR. KELLAHIN: I want to object to this line of questioning on the grounds that the fortunes and misfortunes of Marathon Oil Company elsewhere in this pool or other pools has no bearing on the question before the Commission today. The question we're concerned with is the North Half of Section 30. Whether Marathon has been so unfortunate to drill dry holes elsewhere in the pool has no bearing on that question unless it ties into the fact that the North Half of Section 30 is or is not productive.

MR. MALONE: Since the records of this Commission show the wells which have been drilled by Marathon, the number which

produce, the number which are dry, and since the Commission is generally familiar with the great expense of such drilling, we will accede to the objection without any argument.

Q (By Mr. Malone) Mr. Webb, would you proceed, please, to the portion of your testimony which I have discussed with you as follows: It is my understanding you have testified that at the Examiner Hearing in this matter the only one of the exhibits presented in the hearing today which was presented to the Examiner was your Exhibit No. 5, is that correct?

A That's correct.

Q And all of the remaining evidence is heard for the first time today, is that correct?

A That's correct.

Q Now, then, do you have an opinion as to the protection of correlative rights and the prevention of waste in the drilling of a well on the North Half of Section 30?

A On the North Half of Section 30, anywhere at any location, is that what you have reference to?

Q Yes, or perhaps I should put it this way. Do you have an opinion in this regard as to drilling of a well at various places within the North Half of 30?

A Yes, sir, I do. First, it's my opinion that the drilling of a well at a standard location in the Northwest Quarter of

Section 30 would incur excessive economic risk. Now, the original hearing of this case resulted in the issuance of Order No. R-2330, wherein Marathon was authorized to drill an Atoka-Pennsylvanian gas well at an unorthodox location 1295 feet from the North line and 990 feet from the East line of Section 30, or 305 feet south of our proposed location, providing that only the Northeast Quarter and the East Half of the Northwest Quarter of Section 30 be dedicated to that well.

The dedicated acreage would therefore consist of 240 acres, which would result in a 25% allowable reduction. From a standpoint of expected pay thickness this location appears to be acceptable. However, an examination of the economics for drilling this well reveals that the payout time required would be five years at best and that Marathon would suffer a loss in revenue of $116,000 due to the reduction in allowable. The economics for drilling this well just are not attractive.

Q Did you previously testify that this pool appears to you to be already depleted to the extent of approximately 13%?

A It presently contains a reservoir pressure which is 13% below the original. Certainly we could not produce this well to a bottom hole pressure of zero, so, in effect, it is more than 13% depleted.

Q All right, proceed with your opinion.

A All of the available data indicates that the entire North Half of Section 30 may reasonably be deemed to be productive of gas. It's therefore my opinion that Marathon should not be required to suffer a loss of income due to a reduced allowable.

Now, as an alternative, Order No. 2330 also authorized Marathon to drill at an unorthodox location 990 feet from the North line and 2615 feet from the East line of Section 30, or 1625 feet west of our proposed location. In that event the entire North Half of Section 30 could be dedicated to the well.

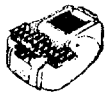
Q Without allowable penalties, is that correct?

A That is correct.

Q Go ahead.

A The isopach contours indicate that slightly more pay could be expected at this location than could be expected at a standard location. In the Northwest Quarter of Section 30, although I'll point out that this location is only 355 feet east of a standard location. However, the fact remains that in this reservoir pay development is a result of localized shale deposition and localized porosity and permeability conditions within the sand.

Since there is at this alternate unorthodox location a possibility of additional loss of pay due to these localized

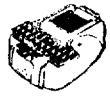


conditions, it is my opinion that the drilling of this well would incur excessive economic risk.

Our proposed location is only 581 feet closer to the Martin, Williams, Judson well than this unorthodox location is. Both of these wells are equidistant from the outer boundary of the Martin, Williams, Judson Unit. Now, the bottom hole pressure data presented in connection with Exhibit No. 7, in my opinion, clearly established that the loss in bottom hole pressure in any tract in this pool has no relationship to the distance of the offset wells to that tract. It was therefore evidenced that we would be given no advantage over Martin, Williams, Judson by being permitted to drill a well at our proposed unorthodox location rather than at any other location in the North Half of Section 30.

Q Mr. Webb, will you, as briefly as possible, summarize your opinion of this testimony?

A The facts established by this testimony may be summarized as follows: All of the available data indicates that the entire North Half of Section 30 may reasonably be deemed to be productive of gas from the Pennsylvanian sand. This is my first point in this summary. This data indicates that a well drilled at a standard location should encounter approximately 20 to 30 feet of B zone sand with approximately 10 to 15 feet

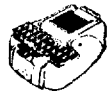


of this sand being total net pay. However, it has been shown that pay thickness in this reservoir fluctuates considerably from one location to the next and that the existence of the pay is controlled by localized conditions.

The correlation was made that Marathon's Culpepper Well No. 1 obtained approximately the same total thickness of B zone sandstone that we could expect to encounter at a standard location, and yet this well was a dry hole. This certainly does not mean that the standard location would be a dry hole since it's again admitted that Culpepper contains more total net sand than did six producing wells in this pool.

Q But I believe you testified that the cementing was there in the Culpepper completely through the total net pay whereas in some of the other wells shown on your exhibit only a portion of that net pay would be cemented or have a shale bed, is that correct?

A That's correct. It is also a recognized fact, established by experience, that it is considerably more difficult to successfully complete a well in a relatively thin pay interval as compared to a pay interval of reasonable thickness. It's understood, of course, that these completion difficulties can result from damage to the formation, drilling muds, cementing operations or other fluids used in the completion processes, also



thin pay sections are more difficult to recognize from well logs and successfully perforating in thin zones by wire line measurements is in general less successful than perforating in thinner intervals.

In other words, you could have the pay but due to these factors you may not be able to successfully complete that well. Whereas, at a thicker interval, completion problems would be considerably less.

Now, in view of the characteristic of the pay interval to fluctuate in thickness, and due to the possibility of additional loss of pay due to localized conditions, I feel that the drilling of a well at a standard location would incur excessive economic risk. It is therefore my opinion that approval of the proposed unorthodox location will most effectively protect the correlative rights of Marathon Oil Company and will permit Marathon to produce its fair share of gas from the Atoka-Pennsylvanian Pool without being subjected to excessive and unnecessary economic risk.

It is also my opinion that a well drilled at the proposed unorthodox location will effectively and efficiently drain the acreage dedicated to it with no waste of hydrocarbon in this reservoir.

Q What is your opinion in this matter with respect to

the correlative rights of others in the pool?

A Concerning the correlative rights of other parties, the following facts have been established: First, pay thickness is not determined by well's structural position. This was clearly evidenced in Exhibit No. 4. Marathon will therefore be given no advantage over other parties by being permitted to drill a well at a location wherein the Pennsylvanian sands would be encountered at a slightly different structural position.

Secondly, bottom hole pressure data has clearly established that there is excellent pressure communication throughout this reservoir with uniform pressure distribution throughout the reservoir. This data also shows that the decline in reservoir pressure is uniform throughout the pool. The decline in bottom hole pressure in any tract in this pool is strictly a function of the total gross production from the pool and is not caused by the production from any one well.

It has also been established that the decline in bottom hole pressure in any tract in this pool has no relationship to the distance of the offset wells to that tract. In view of this, it is my opinion that Marathon Oil Company will be given no advantage over the other parties in this pool by being permitted to drill at the requested unorthodox location and that approval of this application will certainly not injure the correlative

rights of others.

Q Mr. Webb, were Exhibits 4 through 8 prepared by you or under your direct supervision?

A Yes, they were.

MR. MALONE: We respectfully move the admission of these exhibits.

MR. PORTER: If there are no objections the exhibits will be admitted.

(Whereupon, Applicant's Exhibits Nos. 4, 5, 6, 7 and 8 were admitted in evidence.)

MR. MALONE: We have no further direct examination.

MR. PORTER: The hearing will recess until 1:15, at which time the witness will resume the stand for cross examination.

(Whereupon, a recess was held until 1:15.)

MR. PORTER: The hearing will come to order, please. Mr. Webb, will you take the stand? Are there any questions? Mr. Kellahin.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Webb, in connection with your Exhibit No. 4, it was your testimony that it was impossible to correlate the shale bodies from one well to another. Did I understand you correctly?

A Yes, sir. They are not entirely correlative from well to well.

Q Of course, on your shale body shown on the Martin, Williams, Judson Well No. 1 through the Culpepper well you show shale bodies in both wells?

A Yes, we do.

Q But it is your interpretation that they are not connected, is that correct?

A There is a possibility that these shale bodies are connected. We have no evidence to indicate that they are. In the Culpepper Unit there are two shale bodies where in the Martin, Williams and Judson well there is only one.

Q You didn't include on your cross section the Nix Curtis well? Is that another good well?

A Yes, it is.

Q It isn't included on your cross section?

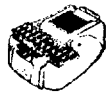
A No, sir. There's a good many wells I didn't include on the cross section.

Q Have you examined the log of that well?

A Yes, sir, we have.

Q Do you find any shale bodies in that well?

A Yes, sir. There are some shale bodies in the well. There also some sand in the well that was impermeable and



incapable of commercial production.

Q The two wells, the Culpepper No. 1 and the Nix Curtis well are comparable as to the formation encountered?

A The Culpepper contains 22 feet of B zone sand whereas the Nix Curtis only contained, I believe contained 12 feet of B zone sand. Without further examination of the log I could not say whether or not the shale deposition within this zone was comparable within the two wells.

Q Now, in examining the Culpepper Well No. 1 log you found one sand body, an intersecting shale, another sand body and another shale section, and a third sand body, is that correct?

A That's correct.

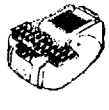
Q You included in your hole 26-foot interval, is that right, including the shale?

A Yes, sir, all of those zones are included in the total gross thickness of the B zone.

Q Didn't you find exactly the same thing in the Nix Curtis well, a sand body with a small shale body, another sand body and a shale body and a third sand body?

A I do not have that log with me. I do recall that this well does contain both shale and sand.

Q In arriving at your 12 feet you only included the



upper sand, didn't you?

A In the Nix Curtis, yes, sir.

Q I believe that includes the total gross sand which was encountered in the Nix Curtis. Do you have that log, Mr. Webb?

A I believe that perhaps our geological witness, Mr. Webernick, does have that log with him.

MR. MALONE: Do you have that, Mr. Webernick?

MR. WEBERNICK: I'm checking that.

MR. MALONE: We do not have it here, Mr. Chairman. I might have it. If Martin,Williams has we would be glad to look it over. May we have just a moment, please?

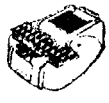
MR. PORTER: Yes.

Q (By Mr. Kellahin) Mr. Webb, I hand you a Welex log on the Nix Curtis Well No. 1, and referring to the zone which commences, I believe, at 9110 feet, is that right, is that the main sand body you identified in the Nix Curtis well?

A Yes, sir, I believe this is the sand body.

Q Does the log indicate another sand body below that?

A The log indicates -- one moment. I would like to make a correction. I believe you'll find that the C zone of the Nix Curtis does occur at ninety one hundred and approximately ten feet, that's correct. Yes, sir. We have another sand body



below that at a depth of approximately 9184. This would be the C zone.

Q C zone?

A Yes, sir.

Q You identified the upper sand as being the C zone first. You meant to say the B zone, did you not, at 9110?

A Yes, sir.

Q The lower sand, then, you identify as being the C zone?

A Yes, sir.

Q Isn't that the same body that you included in the lower section of the Culpepper well?

A By correlation it is not.

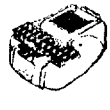
Q If, Mr. Webb, that were included in the entire zone, that would make a total of some 26 feet or more, would it not, gross section, if they were all the same B zone?

A If they were, that would be approximately 26 feet. However, I point out that it's my opinion that the zone that you are referring to is not the B zone but rather it is the C zone.

Q Those zones are somewhat erratic as to the A and C zones, aren't they?

A Yes, sir, they are. Yes, sir, they are.

Q Your B zone is frequently intersected by shale, as I



see the situation here, isn't that correct?

A I think that this Exhibit No. 4 will clearly show in five out of the seven wells on this exhibit there is shale deposition on a localized basis.

Q But it's your interpretation those are two separate zones?

A Yes, sir.

Q Are they interconnected?

A Yes, sir, they are interconnected through man-made connections.

Q Only, is that correct?

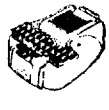
A Yes, sir.

Q Thank you. Now, your Exhibit No. 5 is a net pay map, is that right? Isopach of the net pay?

A Yes, total net pay, and includes the pay for the A, B and C zones.

Q I didn't understand your definition of the net pay that you have used in preparing this map.

A The definition for the term net pay is that the net pay, or that portion of the sand which was considered to be pay for the A, the B and the C zones has been totaled. This is the total net pay that you could expect in all three zones in the Pennsylvanian horizon in this area.



Q Did you say commercial production?

A Yes, sir, I did.

Q What do you define as commercial production?

A I define as commercial production that amount of gas which would allow a prudent operator to spend the amount of money which would be required in the completion of a well.

Q By that definition, then, if you have a well that is commercial you would define the whole sand zone as net pay, is that right?

A I would define net pay as only being that portion of sand which contained sufficient porosity and permeability development to permit production of gas in commercial quantities.

Q To get back to this production of gas in commercial quantities, are you talking about commercial production from the entire well bore? In other words, this is not an isopach net pay map, I mean a porosity net pay map?

A It is an isopach map of that portion of sand which does contain sufficient permeability and porosity development to permit commercial development. It's an isopach pay.

Q Let's put the question this way, in the Martin, Williams, Judson Hondo Well No. 1 you show two well zones which according to your map or your exhibit are net pay, is that right?

A Would you rephrase the question, please?

Q On your Exhibit No. 4 you show, for example, on the Martin, Williams, Judson well, you show two sand zones?

A Yes, the Martin, Williams, Judson well contains zero pay in the A zone and 23 in the B zone and 3 feet of pay in the C zone for a total of 26 feet of total net pay.

Q You are talking about total net pay again as being commercial pay. Suppose for example that lower sand was shut off, would you then call it a commercial well, is that commercial net pay, the upper sand, or are you talking about the whole zone being commercial?

A Certainly this includes both the B and C zones in the case of the Martin, Williams, Judson well in the preparation of Exhibit No. 5.

Q What do you define as commercial production again, please? That will enable an operator to recover his costs and a profit, is that correct?

A Yes, sir, that's correct.

Q Now, if a well were drilled at an orthodox location in the North Half of Section 30, would you get commercial production there?

A All of the available data indicates that the entire North Half of Section 30 could reasonably be deemed to be productive of gas from the Pennsylvanian sand, yes, sir.

Q You say productive of gas say in commercial quantities?

MR. MALONE: May we ask if that is a question?

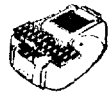
MR. KELLAHIN: That is a question.

MR. PORTER: Is your question, is it productive of gas in commercial quantities?

Q (By Mr. Kellahin) Anywhere in the North Half of Section 30.

A Yes, sir, the data indicates that it would be productive of gas in commercial quantities at a standard location in the North Half of Section 30. However, this same data also indicates that there is a thinning effect of both the total sand thickness in the B zone and a thinning effect of the total expected net pay thickness.

Now, the exact degree of thinning is not known, although this data certainly indicates that it would produce, we do not know just what the rate of thinning across the North Half of Section 30 would be. We know that even though we might obtain a thin pay section which would contain gas, productive gas in commercial quantities, past experience has shown us that the completion of wells in relatively thin pay sections is sometimes quite different. Even though the pay might happen to be there due to these completion difficulties, we might not be able to secure this commercial gas production. On the other hand, at our



proposed unorthodox location with a thicker sand section and thicker pay section to be expected, completion difficulties would not be nearly so severe.

Q If you can't complete a well for commercial production, then you don't have gas in commercial quantities at that location, isn't that right?

A No, sir, that is not right.

Q It's not recoverable gas then, is it?

A Yes, sir, it might have possibly been recoverable. I only said that it's not improbable to always complete a well in a thin pay section, but the chances are considerably more hazardous than they are in a completion of a well in a thick pay section even though gas might exist in commercial quantities in that zone.

Q You would have a pay section of some ten, fifteen feet at an orthodox location?

A All available data indicates that we would. However, we also pointed out that the porosity and permeability development within these sands is strictly a function of localized conditions. Of course, we can not determine what the localized conditions would be at a standard location in the Northwest Quarter of Section 30. Certainly I wish we did know, but we do not. Therefore, this poses a risk factor in the drilling

of a well there when we only expect ten to fifteen feet of pay at best.

Q Wells are completed every day in less pay section than that, aren't they?

A Yes, sir. I also feel that there are a lot of wells that are not completed every day that perhaps could have been completed except for the fact that the pay section was thin.

Q Let's assume for a moment that you encountered at an unorthodox location a well that was in a reservoir condition such as that, that it was shaled out or that the cementation that you had referred had blocked off any permeability to the extent that you found that that area would contribute no gas to any well, is that right?

A You are referring now to a standard location?

Q I'm referring to any location. If you find a condition where you can't complete a well because of cementation and shale, then that acreage has contributed nothing to any well anywhere.

A I certainly can't deny that statement.

Q And that is the risk which you fear in drilling an orthodox location?

A That is one of the risks.

Q That being the case, then, you have no faith that the

entire North Half of the section will be productive of gas in commercial quantities?

A All of the available data certainly indicates that it is reasonable to expect that it would be.

Q You are not willing to rely on the available data and drill a well at an orthodox location?

A The same available data indicates that the drilling of a well at a standard location would incur risk, risk that I do not feel we should subject ourselves to even though all the available data indicates that we have a full 320 acres of gas reserves in this reservoir.

Q Now, you made reference in your testimony to correlative rights. What definition of correlative rights do you have in mind?

A Definition of correlative rights?

Q You used the term, yes, sir, what does it mean to you?

A It means to me that the approval of our well at the proposed unorthodox location will not in any way cause Martin, Williams, Judson to be unable to produce their fair share of the gas from this reservoir.

Q Is that including the total reserves from the reservoir, Mr. Webb, their share of the total reserves in the reservoir?

A I believe, sir, that the only reserves to which they

are entitled are the reserves which exist beneath their tract.

Q That is correct. And that is the definition by statute in the State of New Mexico, you agree to that?

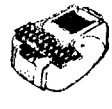
A Yes, sir.

Q In the event, let's assume for a moment that the western portion of your tract is not productive of gas, to that extent you would impair the correlative rights of other operators in the pool by producing a full allowable, would you not?

A I can only say that all of the available data certainly indicates that the entire North Half of Section 30 may reasonably be deemed productive of gas.

Q But will you presume for a moment with me, say 80 acres is not productive, then to the extent that Marathon is assigned a full allowable, you will impair the correlative rights of other parties, would you not?

A Certainly if there's acreage there that does not contain gas reserves in the amount of 80 acres we would, of course, perhaps obtain slightly more than our fair share of the gas from this reservoir from this tract. However, I'll point out again that all of the available data indicates that this is not the case. I'll also point out that the available data indicates that the Martin, Williams and Judson tract is productive in its entirety. However, the control for showing that tract



entirely productive is no better than is the control which was utilized for showing the North Half of Section 30 productive; so, therefore, it stands to reason that there are other operators in this pool who may also produce more than their fair share of the gas from this reservoir.

Q They're not before the Commission, Mr. Webb. I would like to point out that we're only concerned with the North Half of Section 30 in this case. You have no controls to the west, do you?

A I beg your pardon.

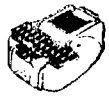
Q You have no controls to the west, is that correct?

A These isopach contours are based on more control than I believe the question implies. First I'll point that we do have a producing well to the north of Section 30. We have several producing wells to the east of Section 30, we have a control point to the south of Section 30 in the form of a dry hole, we have a control point to the southwest of Section 30 in the form of the Gulf AC Well No. 1. This is substantially more control than you quite often have in undeveloped areas.

Q But you still have no control to the west?

A That is correct.

Q Now, you refer to the controls to the south and those two dry holes. I note on your map you assign a zero line as



going directly through the well locations. Is that the normal way of locating a zero line?

A Yes, sir, it is. This is the only control we have for the placement of the zero line.

Q Well, certainly we will have to admit that it's zero at that point, but doesn't it indicate from a geological point of view that it would lie somewhere inside that point?

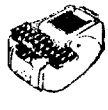
A The truth of the matter is that in reservoirs such as this where loss of permeability and porosity is known to be a result of localized condition, it is possible that any one of the zero control points that we have shown could be a localized condition and that the true zero pay contour line might in fact exist some place outside of that well. This is a practical method of showing the location of the zero contour line.

Q Mr. Webb, the main sand body, and I'm referring to net pay, by your definition lies on a northwest, southeast axis, does it not?

A Yes.

Q Which would run through your Gulf Hondo Well No. 1, your Arnquist No. 1 and on through the Martin, Williams, Judson well?

A The major axis of the permeability trend lies in a northeast, southwest direction, yes, sir.



Q Now, by the same token, northwest, southeast. You said northeast, southwest?

MR. MALONE: Yes, he did, he said northeast, southwest.

Q Which is correct?

A It lies in a northeast, southwest direction.

Q You are talking about the sand body?

A I'm talking about the major axis of the permeability trend in this reservoir.

Q It lies in a northeast, southwest direction?

A Yes, sir.

Q Which well are you referring to?

A I'm referring to all producing wells in this pool.

Q Well, that's included in the standard well up in the northeastern portion and on down through, is that correct?

A That's correct.

Q Now, eliminating that area over here, now, there is a permeability pinchout, or at least some shaling between that area and the area where your proposed well is to be located, isn't that right?

A No, sir, that's not right. There's no permeability pinchout in there. There is a thinning of the pay interval, but there certainly is no permeability pinchout.

Q I didn't mean to say that. There is no permeability

pinchout, but there is a thinning of the pay?

A Yes, sir.

Q There is some shaling?

A Yes.

Q And there's a loss of permeability?

A Right.

Q Then to the southwest of that area you have no control other than the Gulf well in the extreme left-hand section of the exhibit?

A In the extreme western portion of, southwestern portion of this area, the Gulf AC does provide the only producing control point.

Q But in between those two zones you have a permeability development which lies on a northwest, southeast direction, is that correct?

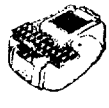
A Yes, sir, the major axis of the permeability trend lies in a northeast, southwest direction.

Q That isn't what I said, Mr. Webb.

A Oh, I see.

Q I said lying between this zone here and this zone down here there is a permeability development lying on a northwest, southeast trend.

A There is a widening effect to the permeability trend



in a northwest, southeast direction, yes, sir.

Q I am sorry, I didn't understand you.

A There's a widening effect to the permeability trend.

Q There is a body of relatively clean sand lying along that axis?

A Yes, sir, that's correct.

Q Now, to the northwest of that section, northeast there is some shaling?

A Yes, sir.

Q And to the southwest or southeast, southwest there is also some shaling, isn't there?

A Yes, sir, there is.

Q Now that also lies on the same axis, does it not, northwest and southeast?

A I believe that you'll find that this shaling effect is predominant throughout this reservoir.

Q I'm talking about this particular area.

A Yes, there's a localized deposition of shale stringers.

Q The two controls you have on the southwestern portion are the Culpepper and the Nix Curtis wells. If you projected that shaling interpretation up through your acreage it would show at least 80 acres of Marathon's acreage as non-productive on the main axis of the main sand development?

A It's certainly my opinion that no correlation can be made from one well to the next as to what might happen a mile away with respect to shale deposition. To illustrate that point I'll point out that Marathon's Ralph Nix No. 1 is a direct offset to the Nix Curtis and yet the Ralph Nix No. 1 which does appear on Exhibit No. 4 contains no shale. This corollary can not be made.

Q The Ralph Nix well, however, is located in an area which you show two feet of net pay?

A Yes. But it's also a direct offset to the Nix Curtis well which we admit has shale. Now certainly it's my opinion that the deposition of shale in this pool is so localized and so non-correlative from one well to the next that no correlation can be made as to where shale might exist along any given contour line.

Q In that event, your zero line to Culpepper Nix Curtis well doesn't mean anything, there may be production out there, is that right?

A That's a probability.

Q Are you willing to drill a well down there, it's your acreage?

MR. MALONE: We object to that. He could be asked for his expert opinion, but he's not in the business of drilling wells.

Q Well, in your expert opinion would you recommend the drilling of a well in the North Half of Section 31?

A Based upon the data that I have available to me at the present time, no, sir, I would not.

Q Then by the same token you wouldn't recommend a well --

MR. COUCH: Excuse me just a moment, Mr. Kellahin. A few moments ago Mr. Kellahin was inquiring of the witness and the witness referred to some other wells in the field. Mr. Kellahin said that's not in the scope of the hearing. Mr. Kellahin is now drilling wells all around this area and I think he should stay with the wells that he asked that we stay with.

MR. KELLAHIN: I'm examining the witness in regard to his net pay map and in regard to the Curtis, Culpepper wells.

MR. PORTER: The Commission will sustain the objection, Mr. Kellahin.

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

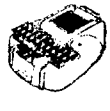
MR. PORTER: Does anyone else have a question?

MR. MALONE: No redirect examination, Mr. Chairman.

MR. PORTER: I believe you've already offered your exhibits.

MR. MALONE: Yes, we did.

MR. PORTER: And they have been made a matter of record. If there are no further questions of the witness he may be



excused.

(Witness excused.)

MR. MALONE: The only thing further we would have would be the possibility of rebuttal evidence if something new comes up on the part of Martin, Williams and a closing statement at the end of the case.

MR. PORTER: Does anyone else desire to present testimony in the case?

MR. KELLAHIN: We would like to offer one witness whose testimony will be rather brief.

MR. PORTER: He may come forward and be sworn.

(Witness sworn.)

EDWARD H. JUDSON

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Will you state your name, please?

A Edward H. Judson.

Q Do you have any connection with the firm of Martin, Williams and Judson?

A Yes, I'm a partner in that firm.

Q Mr. Judson, have you ever testified before the Oil

Conservation Commission of New Mexico?

A No.

Q For the benefit of the Commission would you give an outline of your education and experience in the oil business?

A I received a Bachelor of Science degree from the University of Oklahoma in 1943. I was employed by Shell Oil Company from 1946 until 1952 as an exploitation engineer, this work including both petroleum engineering and petroleum geology. From 1952 until the present time I have been a partner in Martin, Williams and Judson Oil Operators and Petroleum Engineers.

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

MR. PORTER: Yes, sir, they are.

Q (By Mr. Kellahin) Are you familiar with the area involved in the application that is before the Commission at this time?

A Yes, I am.

Q Referring to the Applicant's Exhibit No. 5, have you examined that exhibit?

A Yes, I have.

Q Have you had any occasion to study the manner in which it has been constructed?

A Yes, I have. I'm a little bit uncertain still as to

his question of net pay, but generally in geological sense I'm familiar with his map.

Q Basically are you in agreement with the information that is shown on that map?

A There are certain things that are shown on this map with which I'm not in agreement.

Q Would you take those one by one and outline them for the benefit of the Commission?

A On this map, the net pay is shown as extending into the northwest corner, Northwest Quarter of Section 30. To describe my objection to this I would like to point out that there is a very definite trend of well-developed sand and fine conglomerate in the wells, the Martin, Williams, Judson Hondo FLE No. 1 and the Marathon Arnquist No. 1 and the Marathon Nix Unit No. 1.

The two Marathon wells I understand have essentially clean sand with no shale, and I believe is essentially all productive. The Martin, Williams, Judson well has only three feet in this entire sand section that is non-productive. As you move away from this axis of these wells to the east into the Marathon Noel Unit No. 1 and into the Len Mayer Dayton Townsite well and into the Mallard Mayer Holt well, going in a generally east, northeast direction, all of these wells have rather large amounts of

shale ranging from 50% of the total sand section upward. The same situation exists in a sense in going west and south. As we go into the Marathon Culpepper well we see a large increase in sand percentage, also in the Nix Curtis well a large increase in the shale percentage. In my interpretation, which differs somewhat from the Marathon interpretation of the log in the Marathon Nix Curtis well, there also is a large increase in shale.

In addition to this fact, these two wells, the Marathon Culpepper and Marathon Nix Curtis also have highly cemented sand. The sand that's present is essentially non-productive in these wells. From this it's my conclusion that there's a local geologic feature in this area running north, northwest, or perhaps almost northwest and southeast that has well-developed clean sands.

Now, this is almost at right angles to the general regional trend. I feel that the evidence points toward essentially parallel -- let me restate that. If we were to make a map say of isopermeability lines, I think that these lines in this localized area would run generally north, northwest and south, southeast rather than being extended in an almost westerly direction as they are shown on this map.

I, therefore, feel that in moving west in Section 30, that

it is very probable that although there's sand present there, that it is non-productive, it is probably of a quality comparable to the sand shown in the Marathon Culpepper and the Marathon Nix Curtis wells.

Q Does that sand contribute anything to production from the well located on the east side of the unit as proposed by Marathon?

A I'm sorry, I didn't understand your question.

Q Would that acreage then contribute any production to the well as proposed by Marathon?

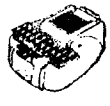
A No, I would say not. It has been shown by previous testimony that that sand in the Culpepper well and in the Nix Curtis is non-commercial and would not contribute to production.

Q You heard the testimony earlier today, Mr. Judson, to the effect that a well located in the eastern portion of the unit, as permitted by the order of the Commission following the Examiner Hearing in this case, would not be commercial or would at least penalize Marathon in the amount of gas to be recovered. Would you recommend the drilling of a well as was permitted by that order?

A By that order?

Q Yes.

A Yes, sir, I would.



MR. MALONE: We object to the question. There's no such testimony in the record that any of our witnesses have testified that a well in the Northeast Quarter would be unproductive.

MR. KELLAHIN: That was not the statement. The first witness offered by Marathon testified that they would not drill the well as permitted by the Commission in its order following the Examiner Hearing for the reason that they would receive a penalized allowable and therefore suffer an economic loss. That is the question directed to the witness.

MR. MALONE: I beg your pardon. I did not understand the question fully.

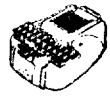
Q (By Mr. Kellahin) Did you take any action yourself in connection with that, Mr. Judson?

A Yes. We feel that a commercial well could be drilled at that location.

Q How strongly do you feel that, did you offer to drill one there?

A We have offered to drill a well there. We have written to Marathon requesting a farmout from their company to drill this well.

MR. KELLAHIN: That's all the questions I have of the witness.



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

CROSS EXAMINATION

BY MR. MALONE:

Q Mr. Judson, as I understand it, you believe that the trend for actual pay in the western portion of this pool is northwest and southeast rather than northeast and southwest, is that correct?

A I think in this local area that's true.

Q You have seen from the Exhibit 5 that in the northeastern portion of the pool there are wells with as much as 50 feet of pay and the only other area in the pool with that much pay is to the southwest, the Andrew Arnquist Unit W, 58 feet according to this exhibit, is that correct?

A Yes, that's right.

Q Would it not be true that this well in the upper right-hand portion with 52 feet is northeast of the Andrew Arnquist well and that the Arnquist is southwest of the first well I referred to?

A Yes, sir, that's true.

MR. KELLAHIN: If the Commission please, the exhibit speaks for itself. The witness' answer was directed to the localized area.

MR. PORTER: The question has already been answered, I believe.

Q (By Mr. Malone) Did you also hear the testimony of Mr. Webernick with respect to the geologic nature of this pool?

A Yes, I did.

Q Did you agree with his structural map showing stratigraphic conditions running from the northeast to the southwest?

A I agree with his structure map that the main overall regional trend is from northeast to southwest.

Q And it is your testimony, as I understand it, that although the two best wells in terms of pay, the Andrew Arnquist and the Yates Brothers Standard of Texas, lie northeast and southwest of each other, and even though the general geologic structure of the area is northeast, southwest, that we have a peculiar northwest, southeast area just east of the land in question which would be at right angles to the pool itself, is that correct?

A That is correct. I believe that's very well brought out here, it's shown to a large extent essentially by this map, Exhibit 5, that we're looking at. We see that the contours in this localized area run over axis of this feature shown here is generally in a northwest, southeast direction. I think that Mr. Webernick and I are in essential agreement as to the shape of this

thing.

My only disagreement is where he brings his contours out in the Northwest Quarter of Section 30. I see absolutely no reason for making them swing out through there. Frankly, I feel that those contours should be drawn parallel to the others. He's shown an anomaly there that he has no control for.

Q How do you feel about the lack of control for the isopachs in the north end of your tract on Exhibit 5? Would you feel that there is little justification for showing the existence of any pay in the north end of your tract?

MR. KELLAHIN: This is their exhibit and we are not attacking that portion of it.

MR. PORTER: You object to the question, Mr. Kellahin?

MR. KELLAHIN: I do. Yes, sir.

MR. MALONE: I ask that only on the basis of the fact that correlative rights is a factor in the contest between these parties on these two units. This witness, I believe, has raised the question of damage to the Martin,Williams, Judson tract from a well at the unorthodox location. He said his correlative rights will be affected. I'm therefore attempting to find out whether he feels that the lack of control on the west end of our tract means also that the north end of his tract is doubtfully productive, because the same situation exists in both units

according to the exhibit.

MR. PORTER: The objection is sustained.

Q (By Mr. Malone) Mr. Judson, did you examine any core data before appearing here today?

A Not recently. At the time we drilled our wells I examined what core data was available to me and, of course, the core data from our well. I have not recently examined it.

Q As I understand it, you have examined the core data from your well and certain other core data. Do you recall what the other core data was?

A I don't recall specifically all of it. No, I don't. This has been a year and more ago. I did see core data from the Mallard Mayer Holt well. I did not actually see the core data from the Culpepper well, but at the time we did discuss it at that time with the Ohio people, although we did not see the core data. We just discussed it in general.

Q As I understand your testimony, you have examined core data from two wells, yours and the Mayer Holt?

A Yes.

Q You have testified that in your opinion it is likely that the west end of the Marathon tract might not be productive at all because of cementing of the sands, is that correct?

A Yes, that's correct, as brought out in earlier testimony

today.

Q Isn't it true, Mr. Judson, in your experience as a petroleum engineer and a geologist, that an examination of core data is almost essential to the determination of this question? This question of cementing, lack of permeability and porosity?

A Yes, sir. That would be. My information on that in these two wells is based upon the testimony presented here this morning, or today.

Q You understood that our witness then had examined core data from seven wells, is that correct?

A I don't recall the exact number.

Q Do you agree that there are localized conditions in this pool which affect the productivity of wells?

A Yes, there are. And I think these follow in many cases trends that can be picked out.

Q And you have chosen to pick out what appears to you to be a trend from the Nix Curtis to the Culpepper and have testified that in your opinion it might well extend onward to the northwest through the Marathon Unit, is that correct?

A Yes, that's correct.

Q Without examining the core data for the Nix Curtis well, can you be at all sure of your opinion that the west end of the Marathon tract would have cementation?

A I can't be sure that it would have cementation. It is my firm opinion that in all likelihood it would have.

Q On what do you base that? You testified that you examined core data from two wells, the Culpepper to the south of our unit, the Mayer Holt about a mile to the east, and slightly south, and perhaps a mile and a half. On what do you base your opinion, which I believe you said you feel it's likely, or you feel it's probable that the west end of our tract would be unproductive from cementing?

A I base that on the testimony presented this morning that the Marathon witnesses who have examined these cores have testified that the sands in these wells were cemented. They did not say that one had some kind of cementing different than the other one.

Q You are willing to accept their testimony to that effect?

A Yes, sir, but not their testimony that the entire North Half of 30 can reasonably be deemed to be productive. Their testimony as to the core as I see it is factual information from data that they have and can put their finger on. I think there's no interpretation involved in that. I think the question of how these contours go on this isopach map are a question of interpretation here and therefore are not the same.

Q Let me just ask this question, then. Do you feel that our isopachs are an unreasonable interpretation in terms of your training and experience?

A I don't feel they're completely that. I feel, however, that in bending the contours to the west in this particular location that in ordinary practice, geologic practice that probably would not have been done because there's no evidence to indicate that they should go that direction.

Q You say there's no evidence to indicate that those isopachs should go out there. May I ask you if you have examined core data on the Gulf AC Well?

A No, I have not.

Q Why then do you say that there is no evidence if you have not examined core data, which I understand you admit is reasonably necessary for discussion, examination of this cementation question? Why do you say there's no reason for it when you haven't examined that data?

A I feel that the Gulf well is so far away that it has very little bearing on that particular point.

Q Have you examined the lithology of the Gulf well, the geologic lithology?

A No, I have not.

Q You have not examined core data?

A No, sir.

Q Do you know the depth from which the sands from which production comes lie?

A I don't have exact figures. In our earlier study of the field I examined the log of the well.

Q You are relying now on some impression which you had at the time you drilled this well quite a while ago, is that it?

A My information on the Gulf well?

Q Yes, sir. You have an impression of what was in that well but you have not looked at it since that time, is that correct?

A That is correct. No, I have not.

Q Just one more question, Mr. Chairman. Mr. Judson, have you found occasions in the past in which geologists differed in their opinion in such matters?

A Yes, sir.

Q Would you testify that in your opinion your evidence is entitled to more weight than that of Marathon on this question?

MR. KELLAHIN: I will submit that's badgering the witness, that's not a proper question and I'll object.

MR. PORTER: The Commission will sustain the objection.

Q (By Mr. Malone) In your opinion as a geologist, is your construction of this matter the only reasonable construction?

A No, I wouldn't say it's the only reasonable construction, but --

Q Thank you very much.

A I think it's strongly based on --

MR. COUCH: Now you are answering the question that counsel objected to.

MR. KELLAHIN: The witness gave the answer. I submit he's entitled to explain.

MR. COUCH: He's trying to answer a question you objected to; that's what he was starting out to say, which one was entitled to the most weight.

MR. PORTER: Any further questions of the witness?

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q You started to answer the question--

A I feel that my interpretation, excuse me --

MR. COUCH: If counsel is now going to ask his witness to give a response to the very thing he formerly objected to the witness testifying about, then I object. In view of the Commission sustaining Mr. Kellahin's objection --

MR. KELLAHIN: There's nothing before the Commission at this time to show that the witness is going to so answer the question. I submit he's entitled to answer it and if he does so

he should be entitled to explain his answer.

MR. COUCH: He was simply starting to volunteer something in response to the question that was asked. I believe if the reporter could read back what he started to volunteer, he started to say, but in my --

MR. KELLAHIN: I withdraw the question. I have no further questions of the witness.

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

(Witness excused.)

MR. PORTER: Anyone else desire to present testimony in the case?

MR. MALONE: Could I have just thirty seconds, Mr. Chairman?

(Whereupon, a short recess was taken.)

MR. MALONE: We have no further evidence, Mr. Chairman.

MR. PORTER: Does anyone have a statement to make in the case? Mr. Kellahin.

MR. KELLAHIN: We have here, I believe in the Commission file there's already a letter which has been received from Hondo Oil Company in opposition to the application of Marathon. We have here some other letters which I would like to hand to the Commission attorney and have him insert in the record.

MR. COUCH: Would it be possible for us to see them, Mr. Kellahin?

MR. KELLAHIN: Certainly.

MR. PORTER: Mr. Malone, did you want to see them?

MR. MALONE: If we may.

MR. PORTER: Mr. Malone.

MR. MALONE: Mr. Chairman, Marathon has no objection to these being offered as exhibits in the case, but we do object to the contents of these letters as constituting proper evidence, and likewise we wish the record to show that these objections present nothing new to the Commission, nothing more than it has heard, because these persons are all apparently owners of an interest in the Martin,Williams,Judson tract only.

MR. DURRETT: If the Commission please, I would like to request that the record show that the Commission does have in its files a letter from Hondo Oil and Gas Company, a letter from Joseph E. Kennedy, a letter from Gordon Street, Inc., a letter from Ace Electric Company, and a letter from Hamilton Concrete Products Company, Inc., and a letter from, I believe it's D-i-a-l-a-t-h-a Mortin, M-o-r-t-i-n. I would like to state for the purposes of the record that these have been tendered to both counsel in the case and ask the Commission to take administrative notice of the entire contents of the letters.

MR. PORTER: The Commission will take administrative notice. Any statements in the case? Mr. Kellahin.

MR. KELLAHIN: I would like to make a very brief statement to the effect that what we are concerned with here primarily is whether non-productive acreage is going to be dedicated to a well with the result that this operator would be unable to, under the acreage allocation that exists in this pool, to recover more than his just and equitable share of the gas within the reservoir.

The testimony shows that the communication in this reservoir is extraordinarily good and yet the acreage underlying an orthodox location, both the Marathon witnesses and our witness feel essentially there is a tremendous risk involved in drilling a well at that location for the fear it might not be productive or the productivity would be so limited that it would not be a commercial well. That essentially is the position that the applicant finds itself in. We have to say that all of the acreage is productive at the same time they don't want to drill it. If it's productive they should drill it; if it isn't productive they were given two excellent alternatives by the Commission following the Examiner Hearing. And to show that we feel that the opportunities given them to develop a 240-acre tract was more than justly fair, Martin, Williams and Judson offered to take the acreage on a farmout. They have received no answer.

MR. PORTER: Mr. Malone.

MR. MALONE: May I first answer the statement of Mr. Kellahin? It has been said that Martin, Williams and Judson are principally concerned with non-productive acreage, and the question whether Marathon might recover more than its fair share. I respectfully submit to the Commission that it should not hear such statement after Martin, Williams and Judson have objected to and kept out of this record any reference to the productivity of the north end of their own tract.

This matter of correlative rights works both ways. Marathon believes in the orderly development of this pool. The Commission can take administrative notice of its own records which show that Marathon has drilled five wells in this pool, all on standard locations. Two of them were dry.

Likewise the records of the Commission show that this Commission has previously granted two unorthodox locations on the same grounds generally as were presented here today by Marathon, somewhat erratic pay distribution and unknown rate of thinning of the pay. We respectfully submit that Marathon has proved its case, that the North Half of 30 can reasonably be deemed to be productive. The isopach contours on that area have been reasonably and conservatively drawn.

There is no evidence really that the North Half is not

productive other than the evidence of a witness who admits that the cementing which he fears is something which can be determined principally through core data, and yet he has not examined any core data except the Culpepper and many many months ago the Mallard Holt. None on the Gulf AC Well, which, of course, is the principal reason that our witnesses apparently have felt that there is a correlation between the Gulf AC and the wells up in the center portion.

There is a lack of subsurface control to the west of this area, but we submit that this should not be used as a basis for penalizing Marathon in this application. When Marathon has made a prima facie case of reasonable productivity of this acreage for, in fact if this lack of subsurface control to the west is used to penalize a reasonable request of this type, then, in fact, this Commission would be discouraging drilling and it would be discouraging the establishment of control by the drilling of this well so we can find out what's out there.

In addition, the statutes and regulations governing this Commission do not require Marathon to prove beyond a reasonable doubt that all of this acreage is productive. We have seen the reaction of the opponent to an attempted discussion of his own tract's productivity. I do not believe that the statutes require us to prove beyond a reasonable doubt that this entire

acreage is productive. We simply must prove that it may reasonably be deemed to be productive, and I believe that a prima facie case has been made on that point.

If proof beyond a reasonable doubt of productivity were required under the statutes and rules, what would we then say of the regulations of this Commission which automatically afford a man 40 acres for a wildcat oil well which produces without any proof by him that the entire 40 acres is productive? This Commission knows as a practical matter that in many pools it is impossible to prove that throughout every foot of geographical area of a proration unit there is production.

We submit that the contention that lack of control to the west should result in a penalty on a reasonable application of the kind filed by Marathon would discourage drilling and exploration in New Mexico, and certainly in this pool.

We submit that the correlative rights of Marathon can only be protected by the allowing of drilling at the proposed unorthodox location, because with localized conditions including cementing and shale found off and on throughout this pool and not just in the western, southwestern portion, it is only reasonable to allow an operator to drill in an area where the pay is thickest, so that if he encounters some of these adverse conditions, he may still make the grade. We believe that

excessive economic risk and the risk of economic waste would thus be prevented.

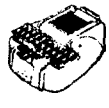
We further submit that there is no damage to the correlative rights of others in the application of Marathon. The bottom hole pressure submitted to the Commission today, that information very clearly shows that a well drilled anywhere on the North Half of 30 would affect Martin,Williams no more than a well drilled offsetting to the east, southeast anywhere in the immediate area. This bottom hole pressure information is uncontradicted. Martin, Williams has presented no evidence on that.

Likewise we respectfully submit that the Commission, in its task of encouraging drilling and exploration, should take into account that when an operator presents a prima facie case, that his proration unit is reasonably deemed to be productive, that others will not be affected by the drilling of an unorthodox location, that there is no substantial reason to deny his application.

Mr. Couch, I believe, has a brief statement.

MR. PORTER: Mr. Couch.

MR. COUCH: Mr. Chairman, with the indulgence of the opposition, I would like to continue with a thorough closing statement. There is only one thing that our witnesses have testified to that I think might need a little clarification, and



that is it's been my understanding that our well in Section 20 was the Edith Noel well. I understand from the testimony today they are calling it the Noel well. Now, that's probably some concession to the Christmas season we have. Outside of that, I think the testimony and the evidence that was presented here was complete and thorough and very persuasive.

In keeping with the Christmas season we are not asking for a Christmas gift, but neither do we want to play Santa Claus. We want an opportunity of, feasible economic opportunity to attempt to complete the well at the location on this proration unit where any reasonable, prudent operator would prefer to try to drill that well, and this evidence shows here today that drilling the well at that location giving us the maximum opportunity to effectively complete in this sand with all the erratic conditions it has will not cause any hardship or grant any advantage to us, will not damage the correlative rights of these people who are opposing us here today.

With the pressure communication that we have in this field there just can not be any drainage that will not be compensated by counterdrainage. The statute recognizes this principle and certainly this is a field where it is of vast importance.

Let's review for just a minute the little bit of evidence that was presented by the opposition by Mr. Judson and compare

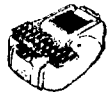
that to the very thorough and complete analysis that we have here.

He says if he were to make a map of the isopermeability lines he said, I think, they would run northwest, southeast. He says that moving west in the section, though it's very probable that the sand exists in the west part of the North Half of Section 30, that probably it's not productive.

Now, what's this based on? This is based on a geologic theory of Mr. Judson's that if he had this map prepared that he's talking about, it would show some permeability lines and barriers running clear across the main axis of the development in this field. Whereas, I submit the map as presented by our expert witnesses contains a very minimum of geologic theory or interpretation, but are very conservatively contoured simply using the best available data that we had.

In order to preclude this Commission from granting us this unorthodox location, the opposition has the burden of showing that to grant this request would constitute a hardship on them and give us an advantage over them. This has not been established and can not be established, and we submit the case is entirely clear and we are entitled to this unorthodox location and correlative rights of all parties, and including ours, and all royalty owners will be protected.

MR. PORTER: Anyone else have anything further?



MR. KELLAHIN: In regard to one statement made by Mr. Malone, Rule 104, Section G, to the effect that "Whenever an exception is granted, the Commission may take such action as will offset any advantage which the person securing the exception may obtain over other producers by reason of the unorthodox location." In view of a statement made by Mr. Malone, I would like to call the Commission's attention to Rule 104, Section G. That's the premise of our case, of course.

MR. COUCH: And no such advantage has been shown.

MR. PORTER: If nothing further to be offered in this case, we'll take it under advisement. We'll take a short recess.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 14th day of January, 1963.

Ada Dearnley
Notary Public-Court Reporter

My commission expires:

June 19, 1963.