STATE OF NEW MEXICO
ENERGY, MINERALS, AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION FOR THE PURPOSE OF CONSIDERING:

CASE NO. 9802 DE NOVO
Order No. R-9050-A

APPLICATION OF MARATHON OIL COMPANY FOR AN UNORTHODOX GAS WELL LOCATION AND SIMULTANEOUS DEDICATION, EDDY COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9:00 a.m. on January 18, 1990, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission".

NOW, on this 22nd day of March, 1990, the Commission, a quorum being present, having considered the testimony presented and exhibits received at said hearing, and being fully advised in the premises,

FINDS THAT:

(1) Due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) The applicant, Marathon Oil Company, seeks approval of an unorthodox gas well location 330 feet from the South line and 1650 feet from the West line (Unit N) of Section 9, Township 21 South, Range 23 East, NMPM, to produce from the Indian Basin-Upper Pennsylvanian Gas Pool, Eddy County, New Mexico.

(3) This matter came on for hearing at 8:15 a.m. on November 1, 1989, at Santa Fe, New Mexico before Examiner Victor T. Lyon and pursuant to this hearing, Order No. R-9050 was issued on November 21, 1989 which granted Marathon's application but imposed an eighty percent (80%) penalty factor to offset the advantage gained over the diagonal offset operator as a result of the unorthodox location.

(4) All of said Section 9 is proposed to be dedicated to said well replacing the existing North Indian Basin Unit Well No. 5 located at a standard gas well location 1815 feet from the South line and 1752.3 feet from the East line (Unit J) of said Section 9 forming a 640-acre gas spacing and proration unit for said pool.

(5) Oryx Energy Company (Oryx), owner of 54.1% working interest and operator of Section 17, Township 21 South, Range 23 East, NMPM, appeared in protest of the application and presented evidence designed to show the unorthodox location was contrary to the field rules and would adversely affect Oryx's correlative rights.

(6) Applicant's testimony showed that its North Indian Basin Well No. 5 ceased to flow because of mechanical conditions in the wellbore and needed to be replaced to permit the owners under the gas proration unit (GPU) to recover their just and equitable share of gas from the reservoir.

(7) The testimony showed that the Indian Basin-Upper Pennsylvanian Gas Pool is a water drive reservoir and it is logical and prudent in such a reservoir to locate wells as high as possible on the structure to maximize recovery of gas from the GPU.

(8) Testimony also showed a dolomite/limestone reservoir facies change striking northeast-southwest through the W/2 of Section 9 which is a major factor in governing the quality of gas production encountered, the better quality wells being located in the dolomite reservoir facies and the poor quality wells and dry holes being located in the limestone facies.

(9) The Indian Basin-Upper Pennsylvanian Gas Pool is prorated under the provisions of Order No. R-8170, and its special pool rules are designed to place wells a minimum of 1650 feet from the outer boundary of the gas proration unit.

(10) Marathon's proposed location in Section 9 is located within the North Indian Basin Unit which also includes Section 16 to the South, so crowding Section 16 with a 330 foot offset location does not violate the correlative rights of working interest and royalty interest owners in Section 16.

(11) Both applicant and Oryx presented geologic testimony which, though differing in some details, generally agreed that the proposed location for the replacement well was up-dip from the present well and closer to Oryx's GPU located in Section 17 than a standard location. The expert witnesses did not agree on the extent to which Oryx's correlative rights would be impaired by production from the proposed location.

(12) The diagonal offset interest owner is the only party affected so a penalty should be assessed which reflects the encroachment toward the diagonal interest owners' acreage.

(13) The Oryx expert witness testified that Oryx would not object to any unorthodox location in Section 9 which would be no closer to the corner point of Sections 8, 9, 16 and 17 than a standard location 1650 feet from the South and West lines of Section 9.

(14) The calculated distance from the aforementioned corner point to the aforementioned standard location is 2,333 feet.

(15) The distance from the aforementioned corner point to the proposed location is calculated to be 1,683 feet.

(16) In order to protect correlative rights a penalty should be assigned to the applicant's GPU which will reflect the proportionate distance the proposed location is moved toward the aforementioned corner point.

(17) Ratio penalties have historically been assigned to wells which crowd objecting parties whose acreage directly offsets the crowding well.

(18) When ratio penalties are applied because of objections from parties owning diagonal offsetting acreage, penalty adjustments must be made to account for lesser acreage being effected by drainage from the crowding well.

(19) Mathematical computations show that approximately two times as much direct offset acreage is effected by drainage as diagonal offset acreage assuming theoretical circular drainage and equal radiil.

(20) Correlative rights will be protected by assigning a penalty to the allowable of the proposed location based upon the formula: (0.5) (1-1683/2333) or 14% penalty.

(21) Approval of the subject application with a 14% penalty will afford the applicant the opportunity to produce its just and equitable share of the gas in the affected pool, will prevent the economic loss caused by the drilling of unnecessary wells, avoid the augmentation of risk arising from the drilling of an excessive number of wells and will otherwise prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED THAT:

(1) The application of Marathon Oil Company for an unorthodox gas well location is hereby approved for a well to be located at a point 330 feet from the South line and 1650 feet from the West line of Section 9, Township 21 South, Range 23 East, NMPM, Indian Basin-Upper Pennsylvanian Gas Pool, Eddy County, New Mexico.

(2) All of said Section 9 shall be simultaneously dedicated to the above-described well and the existing North Indian Basin Unit Well No. 5 located at a standard gas well location 1815 feet from the South line and 1752.3 feet from the East line (Unit J) forming a 640-acre gas spacing and proration unit for said pool.

(3) The above described proposed location and gas proration unit shall be assigned a 14% penalty, or an allowable equal to 86% (.86) of the normal monthly allowable assigned to a standard gas proration unit in the Indian Basin-Upper Pennsylvanian Gas Pool.

(4) Jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

WILLIAM R. HUMPHRIES, Member

William W. Weiss

WILLIAM W. WEISS, Member

WILLIAM J. LEMAY, Chairman
and Secretary

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STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 9954
Order No. R-9050-B

APPLICATION OF MARATHON OIL COMPANY
FOR AN ADDENDUM TO DIVISION ORDER
NO. R-9050-A, TO INCLUDE A PROVISION
FOR DUAL COMPLETION AND AN UNORTHODOX
GAS WELL LOCATION IN THE UNDESIGNATED
INDIAN BASIN-MORROW GAS POOL, EDDY
COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 8:15 a.m. on May 30, 1990, at Santa Fe, New Mexico, before Examiner David R. Catanach.

NOW, on this 15th day of August, 1990, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS THAT:

(1) Due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) By Order No. R-9050-A, issued in De Novo Case No. 9802 on January 18, 1990, the Division authorized Marathon Oil Company to drill its North Indian Basin Unit Well No. 8, subject to a production penalty, at an unorthodox gas well location 330 feet from the South line and 1650 feet from the West line (Unit N) of Section 9, Township 21 South, Range 23 East, NMPM, Eddy County, New Mexico, to test the Indian Basin-Upper Pennsylvanian Gas Pool.

(3) The applicant, Marathon Oil Company, seeks an addendum to said Order No. R-9050-A, to include authorization for an unorthodox gas well location for said North

Indian Basin Unit Well No. 8 within the Undesignated Indian Basin-Morrow Gas Pool. In addition, the applicant seeks authority to dually complete said well in such a manner as to permit production of gas from the Undesignated Indian Basin-Morrow Gas Pool through a string of 2 7/8-inch tubing and the production of gas from the Indian Basin-Upper Pennsylvanian Gas Pool through the 5 1/2-inch casing-tubing annulus.

(4) All of said Section 9 is to be dedicated to the Morrow production from said well to form a standard 640-acre gas spacing and proration unit as provided by the Special Rules and Regulations governing the Indian Basin-Morrow Gas Pool.

(5) The evidence and record in this case indicates that the subject well, which was spudded on April 4, 1990 subsequent to the issuance of said Order No. R-9050-A, has been drilled to a depth sufficient to test the Morrow formation and has encountered commercial gas production from the Basal "A" Sand within the Indian Basin-Morrow Gas Pool as well as the Indian Basin-Upper Pennsylvanian Gas Pool.

(6) Oryx Energy Company (Oryx), the owner of the affected diagonal offset acreage in Section 17, Township 21 South, Range 23 East, NMPM, appeared at the hearing in opposition to the unorthodox Morrow location and in support of a production penalty to be assessed against the subject well within the Inidan Basin-Morrow Gas Pool.

(7) The applicant presented geologic and engineering evidence and testimony in its attempt to demonstrate that:

a) The Basal "A" Sand, which is interpreted as a "beach" type deposit, is present over a large area; however, due to the gas-water contact, effective porosity limits, and facies changes, the potentially productive portion of the reservoir is essentially limited to portions of Sections 9, 16 and 17.

b) The potential for gas production from Section 17 is limited to a portion of the NE/4 due to the absence of effective porosity.

c) Recoverable gas reserves from the subject Morrow reservoir are approximately 1.3 BCF,

with some 85% of said reserves underlying Marathon-operated acreage in Sections 9 and 16, and the remaining 15% essentially underlying Section 17.

d) The amount of possible recoverable gas reserves underlying Oryx's acreage (approximately 200 MMCF) does not economically justify the drilling of a Morrow well within said Section 17 to produce said reserves.

(8) The applicant proposed, in view of its geologic and engineering evidence, that no production penalty be assessed against the subject well within the Indian Basin-Morrow Gas Pool.

(9) Oryx also presented geologic and engineering evidence and testimony which differs from the applicant's in the following respects:

a) The Basal "A" Sand has been interpreted as a "channel" type deposit and the extent of said Basal "A" Sand with effective porosity underlies a substantial portion of Section 17.

b) Based on its geologic interpretation, gas reserves underlying Section 17 are estimated to be approximately 3.0 BCF.

(10) According to evidence and testimony, Oryx is currently evaluating the possibility of drilling a Morrow well in Section 17.

(11) In order to secure the protection of its correlative rights, Oryx has proposed that the subject well be allowed to drain only that area of Section 17 which would normally be drained by a well located at a standard location in Section 9. This proposal is to be accomplished by limiting the subject well's production to 55% (45% penalty), thereby reducing its area of drainage to 349 acres.

(12) Due to the highly subjective nature of geologic interpretation and due to limited well control in Section 17, it is difficult to correctly ascertain at this time the amount of gas reserves underlying Oryx's acreage.

(13) Although the estimates differ, both the applicant and Oryx agree that there are gas reserves underlying Section 17 and, therefore, Oryx should be afforded some protection against drainage from the subject well.

(14) The 45% production penalty proposed by Oryx is excessive in that assuming 640-acre radial drainage, the subject well will drain an estimated 42 acres in Section 17, 10.35 acres of which would be legally allowed by a well at a standard location. Therefore, the total additional impact would be 32 acres, or 5% of a standard 640-acre unit comprising said Section 17.

(15) In addition, any penalty imposed on the subject well by the Division will be ultimately ineffective if Oryx chooses not to drill a well to recover its gas reserves in Section 17.

(16) A production penalty based upon the distance the subject well encroaches toward the corner point of Sections 8, 9, 16 and 17 is reasonable and equitable and should be utilized in this case.

(17) The calculated distance from the above-described corner point to a standard well location in Section 9 is 2,333 feet. The calculated distance from the above-described corner point to the actual well location is 1,683 feet.

(18) By calculation, the subject well is 27.9% closer ([2,333' - 1,683']/2,333') to said corner point than a well located at a standard location in Section 9.

(19) Approval of the subject unorthodox Morrow location and dual completion will afford the applicant the opportunity to produce its just and equitable share of the gas in the affected pool, will prevent the economic loss caused by the drilling of unnecessary wells, avoid the augmentation of risk arising from the drilling of an excessive number of wells and will otherwise prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED THAT:

(1) The application of Marathon Oil Company for an addendum to Division Order No. R-9050-A to include authorization for an unorthodox gas well location for its North Indian Basin Unit Well No. 8, located 330 feet from the South line and 1650 feet from the West line (Unit N) of

Section 9, Township 21 South, Range 23 East, NMPM, Eddy County, New Mexico, within the Indian Basin-Morrow Gas Pool is hereby approved.

(2) The applicant is further authorized to dually complete said well in such a manner as to permit production of gas from the Undesignated Indian Basin-Morrow Gas Pool through a string of 2 7/8-inch tubing and the production of gas from the Indian Basin-Upper Pennsylvanian Gas Pool through the 5 1/2-inch casing-tubing annulus.

(3) All of said Section 9 is to be dedicated to the Undesignated Indian Basin-Morrow Gas Pool production from said well to form a standard 640-acre gas spacing and proration unit.

(4) The above-described well and gas proration unit shall be assigned a 27.9% penalty, or an allowable equal to 72.1% (.721) of the normal monthly allowable assigned to a standard gas proration unit in the Indian Basin-Morrow Gas Pool.

(5) Jurisdiction of this cause is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

WILLIAM J. LEMAY
Director

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STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

CASE 9954

EXAMINER HEARING

IN THE MATTER OF:

Application of Marathon Oil Company for an Addendum to Division Order No. R-9050-A, to Include Provision for Dual Completion and an Unorthodox Gas Well Location in the Undesignated Indian Basin-Morrow Gas Pool, Eddy County, New Mexico

TRANSCRIPT OF PROCEEDINGS

BEFORE: DAVID R. CATANACH, EXAMINER

STATE LAND OFFICE BUILDING

SANTA FE, NEW MEXICO

May 30, 1990

A P P E A R A N C E S

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I N D E X

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E X H I B I T S

APPLICANT'S EXHIBITS:

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E X H I B I T S (Continued)

ORYX EXHIBITS:

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WHEREUPON, the following proceedings were had at 10:46 a.m.:

EXAMINER CATANACH: Call the hearing back to order.

At this time we'll call Case 9954.

MR. STOVALL: Application of Marathon Oil Company for an Addendum to Division Number R-9050-A, to include provision for a dual completion and an unorthodox gas well location in the undesignated Indian Basin-Morrow Gas Pool, Eddy County, New Mexico.

EXAMINER CATANACH: Are there appearances in this case?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin, Kellahin and Aubrey, appearing today on behalf of Marathon Oil Company, and I have three witnesses to be sworn.

EXAMINER CATANACH: Other appearances?

MR. CARR: May it please the examiner, my name is William F. Carr with the law firm Campbell and Black, P.A., of Santa Fe.

I represent Oryx Energy Company, and I have two witnesses.

EXAMINER CATANACH: Any other appearances?

Will the five witnesses please stand and be sworn in?

(Thereupon, the witnesses were sworn.)

ERIC D. CARLSON,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Carlson, for the record would you please state your name and occupation?

A. My name is Eric D. Carlson, and I am a petroleum geologist.

Q. Mr. Carlson, on prior occasions have you testified before the Oil Conservation Division as a petroleum geologist, had your qualifications accepted and made a matter of record?

A. Yes, sir.

Q. Pursuant to your employment by Marathon Oil Company, have you made a study of the Morrow geology that has been encountered and found productive in the unorthodox well location described in the docket of this case?

A. Yes, sir.

MR. KELLAHIN: We tender Mr. Carlson as an expert petroleum geologist.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Kellahin) Mr. Carlson, let me have

you turn to what is marked as Marathon Exhibit Number 1, and let's use this for several purposes, the first of which is to orient the Examiner as to what portion of the Morrow you're mapping for structure and the location of the well that's the subject of the hearing.

A. Exhibit 1 is a structure map, made with well control, on the actual pay horizon for this particular hearing of interest.

The pay horizon is located at the base of the Morrow. It's the lowermost sand in the Morrow.

The well of interest is located in Section 9, Township 21 South, Range 23 East. As you can see, it is marked on the exhibit by a red gas-well symbol. It is the North Indian Basin Unit Well Number 8.

Q. The specific location of that well in relationship to its southern and western boundaries for Section 9 is what, sir?

A. It is 330 feet from the south line and 1650 feet from the west line.

Q. In terms of locating a well at a standard location for Morrow production, what would be a standard location?

A. A standard location would be anywhere that is set back 1650 feet from a lease line.

Q. From a section line?

A. Thank you, from a section line.

Q. And the spacing for the Morrow production in this area is what, sir?

A. It's currently 640 acres.

Q. The well, then, in Section 9 has already been drilled, has it?

A. That is correct.

Q. And it would be standard as to the western boundary of Section 9?

A. Yes, sir.

Q. And it is unorthodox in relation to its southern boundary?

A. Yes, sir.

Q. Okay. When we examine the structural information shown on the display, what have you concluded as a geologist?

A. The structure of the pay horizon is about a two-degree east dip. The strike runs roughly north to south.

And we see as well on this map that the actual stratum will pinch out to the north. The actual pay horizon pinches out across Section 7, 8, 9, 10 and, as you can see, up on to Section 2.

So this is a structure map, once again on the pay horizon where the stratum of interest is at

present.

Q. Have you shown the Morrow penetrations, each and every of the Morrow penetrations in the area of review shown on this Exhibit Number 1?

A. Yes, sir. All the wells that have penetrated the Morrow on this map area are shown, and only those wells.

Q. Are there any producing Morrow gas wells out of this Morrow interval, other than the subject well?

A. No, sir.

Q. As part of your geologic study, in addition to mapping the structure on the Morrow basal "A" sand, what else did you do?

A. Well, I constructed several isopach maps and cross-sections. I'd like to turn to Exhibit 2, please.

Q. All right.

A. Exhibit 2 is a gross sand map. I have taken the liberty to name this interval the Morrow basal "A" pay. You could also call it the base of the Lower Morrow.

Several people divide the Morrow into three informal zonations, the C zone at the top being the bend lime, the B being a zone of sand and shale and often- -- sometimes having pays -- and then the A zone also is on a sand and shale.

At the base of the Morrow there's a very prominent shale marker which we will show you shortly, which is a very nice thing to hang your hat on.

But what we have done is simply, returning to the exhibit, taken the stratum of interest, which is the interval section that contains the pay, and made an isopach map.

And what we see, first of all, is that the trend of the sand trends more or less east-west. We see as we look to the south in a seaward direction, there is a facies change to a shallow-water lime.

We lose our sand, it becomes very limey to the south. And those are indicated, as you see, by the wells where we have zero sand and we're in lime.

Also, as you go to the north of this zone, you'll see a zero line. In Section 8 you see a note, north of the zero line the basal "A" sand is absent. Once again, it's just pinched out, if you will.

And you see that in general this sand has the shape of a Galveston-type barrier bar or, if you will, a beach sand such as you'd find along the Texas Gulf Coast. We say that because we have abundant well control here.

And also when we look at the log curves themselves we see what is very clearly an upward

tortioning sequence of sand in this interval; rather than the shape that would be indicative of a bar or a river or something, we see something that looks like a beach on the logs.

So this came as a little bit of a surprise to us. But we have to admit we have the data to show that.

Q. Describe for us the control point and your interpretation for the southern zero line on the map.

A. Once again, the southern zero line is determined by looking at Section 10, and we see a very thick, gross sand there, 24 feet. And in Section 15 we see zero feet of sand. We see that in less than a mile it goes from 25 feet to zero.

And then as we turn eastward to Section 14, we see once again that we go very quickly from 18 feet to zero feet.

So we feel pretty good about that edge. We actually have a cross-section to show you shortly that will show you that facies change.

Q. When we look at Section 17, which is the Oryx-operated section, there's a well in their section that penetrated this Morrow basal "A" sand?

A. Yes, sir.

Q. And what does the information show you about

that well?

A. That well had four feet of gross sand in this particular pay interval. However, it was tight.

Q. Okay, it was then not completed, I assume, for production out of that interval?

A. That is correct.

All the well symbols on these sets of maps are indicative of what this zone had.

So we show a gas well for our symbol in Section 8, and all the other symbols are dry holes because they haven't produced from this basal Morrow pay here.

Q. When we look in the section immediately west of Section 9, **Section 8**, there's a well in the extreme southeast corner of that section. Do you know the approximate location of that well --

A. Yes.

Q. -- at the surface?

A. That **well was drilled 660 feet from the south line and 660 feet from the east line.** It was the -- Santa Fe Exploration's Indian Basin Number 1.

And as you can see, **it also penetrated nine feet of gross sand.**

Q. Did they attempt to produce from the basal "A" sand in that well?

A. No. Once again it was very clear on the log -- and we'll show you this in a while -- that that sand is tight in that well. There is no pay in the Morrow in that well.

Q. On your map, we go from a well that encountered four feet and can't produce gas, to Section 8 with nine feet, to a well that can't produce gas in that zone.

Let's go over to Section 14 --

A. Okay.

Q. -- the eastern margin of your display. There's a well in there that looks like it's got -- what, 18 feet?

A. Yes, sir.

Q. And did they test for gas production in that interval?

A. No, sir, that well was also very tight. It turns out there's a neutron density log there and resistivity logs in that well, and it was tight.

Q. From examining all the data, Mr. Carlson, do you have an indication for us of the range of thickness you have to get in terms of gross reservoir in the basal "A" in order to have the opportunity to produce gas out of that zone?

A. To develop good porosity in this zone, you

need at least ten feet of gross sand before you develop any net sand, any porosity that's good for producing gas.

And we have -- Much of this, Mr. Examiner, as we go on, we'll develop this for you.

Q. All right. Anything else from this display, Exhibit Number 2, Mr. Carlson?

A. These are the important points. We've covered them.

Q. All right, let's go to Exhibit Number 3 then.

Before you describe your conclusions and interpretations from this display, simply orient us as to the wells selected and the orientation, then, of the cross-section.

A. Exhibit 3 is a stratigraphic cross-section. It runs north to south. North is on the left and south is on the east [sic].

The point of this cross-section is to document the shape for you of the barrier beach bar.

So we have started in Section 3 with the North Indian Basin Well Number 3.

And we've then come south to right in the middle of the barrier island bar, that being in Section 10, the North Indian Basin Unit Number 1 Well.

And then we've come directly due south -- so

this is -- to Section 3 -- I'm sorry, to **Well Number 3 in Section 15**, which is the Marathon Federal IBA Number 1 Well.

The idea here is to draw a cross-section directly across the bar to show you the facies changes.

So these wells are actually just one mile east of our pay well, which you see in Section 8, once again marked on the location map with the red gas-well symbol.

And I'd like to draw your attention, first, to the well in the middle, which is the North Indian Basin Number 1, and I have several curves of interest for you here.

This is actually a stratigraphic section. It's hung on the top of the Morrow "A," which is that lowermost or lower Morrow that is productive.

Out here we see that there is a shale right above this. This shale is very famous for dividing the Middle and Lower Morrow or, if you will, the Morrow "B" and Morrow "A."

And so we've chosen this shale as a good stratigraphic time line on which to hang our data.

And we've come down from there, through that well we see in -- once again, the Section 10 well that -- at the basal "A" pay we have, first of all, a

very clean gamma-ray signature which, as you can see, actually gets cleaner as you go shallower.

This is indicative of a beach rather than a river. Okay?

We also see a sonic log in here which gives us good porosity once again. We can calculate these porosities at well over six percent porosity.

We can look at the resistivity log shown, and this particular well is wet. But we also see that the shallow and deep curves are well separated, and indeed we have permeability in this well.

So **we have a nice, fat beach sand here. This time it's wet in this well.**

As we look to the left, to the Section 3 well, we see that once again our datum is quite clear, the shale.

We also see down -- a correlation line I've run across, and below that first correlation, down from the datum, we see what would look like three fingers, if you will, of gamma-ray excursion. All right?

Now, we can take those three fingers of gamma-ray excursion, and I've got a line drawn for correlation purposes right below that. We can bring that, and we can look in the Section 10 well and see those three fingers of gamma-ray excursion again.

So we think we've got a good correlation there.

And if we look below those three fingers of gamma-ray excursion, we see what actually goes over on the backup scale for the gamma ray. We see we're in the Barnett shale, right below those three fingers. All right?

So as you pull over and look at the Barnett shale, it looks very clearly that this beach sand pinches out as you go north.

All right. Similarly, as we look to the south now, we're going to show you that although the sand doesn't actually pinch out, the facies changes to lime. And the way we're going to show you that is with a -- with a SP resistivity log from Section 15.

We see that as we look at the SP log we see some excursion for sands, but there's almost no excursion at all in the lime.

I also have a gamma ray that I couldn't show you because it wasn't clean enough for display purposes. It shows us that we're in a -- The gamma ray shows us a low excursion indicative of lime.

However, the neat thing here is on the resistivity curves, as you'll see, we're very, very much more resistive than a Morrow sand here. We're

over the limit. We're over a thousand ohms here.

So clearly no SP excursion and high resistivity here, we're in the lime.

So once again, as you look from Section 10, which is the middle well, to Section 15, which is the well on the right, we see a change in facies from sand of the barrier bar into a shelf, a shallow-water shelf facies of lime.

So once again, the purpose of this is just to show you some of the evidence we have to support the conclusion that this is a barrier beach bar.

Q. Let's turn now to Exhibit Number 4. Would you identify and describe Exhibit Number 4?

A. Yes. Exhibit Number 4 is a map of the reservoir, if you will. It is a map of effective porosity within, once again, that basal Morrow "A" zone of interest. So it's a very thin interval of the Morrow. It represents that sand bar.

And what we see is that -- We've called it an effective porosity map. Other people would call this simply a net sand map. And from studying the 46 penetrations of the Morrow in this field, obviously I reached a six-percent porosity cutoff as the lower limit for production from the Morrow out here.

Many of the Morrow sands are porosities of 10

percent, some as good as 13. But six percent is the lower limit, so that's what I used for my net-pay cutoff.

Q. If you had used a higher net-pay cutoff, then the shape of your reservoir would have been smaller?

A. Yes, sir. But not very much smaller, because it turns out this is a good, clean beach. Where it does develop porosity, it's 10, 12 percent porosity sometimes, so...

Q. When we look at the display, what is shown with the green dot in Section 9?

A. Okay, the green dots reveal something of the fun and irony of working in the Morrow with which all of us are familiar. The green dots are orthodox locations.

Now, as you can see, I've drawn two orthodox locations, one in Section 9, which would have been an orthodox location that perhaps Marathon could have drilled, and also one in Section 17, which is an orthodox location that Oryx could drill.

And of course, both of these show noncommercial zones, if you will, drilled at that location, whereas at Section -- Excuse me, in Section 9 again, the actual well where it drilled, the North Indian Basin Unit Number 8, encountered 12 feet of net

porosity. It also had gas in it.

But -- So it's very much an irony, perhaps, that if you move north to a standard location, you would not have had a commercial well. If you move over in Section 17 to a standard location, you will not have a commercial well. In fact, you probably won't see the reservoir at all, because we have zero porosity in Section 8 and zero good porosity in Section 17 where our control is.

So we got a little lucky here.

Q. In looking at the display, there is an outline, a dashed outline, that encompasses a number of these sections. To orient you, it runs vertically separating Sections 8 from 9 and then tracks throughout the various sections in the display.

A. Yes, sir.

Q. What is that outline?

A. That is the outline for the land area of the North Indian Basin Unit. So it's the unit boundary for the unit in which all the interests from the working interest and the royalty interests and the override interests are all commingled to be such that if we drill a project within that boundary, everybody participates with the same share and gets the same amount anywhere in that boundary, gets the same return.

And we'll have a landman testify to that more clearly later.

Q. Marathon Oil Company is the operator, then, of that unit?

A. Yes, sir.

Q. Let's turn now, sir, to Exhibit Number 5.

A. Okay.

Q. Identify and describe this exhibit.

A. Exhibit Number 5 is a structural cross-section, and it runs west to east, sort of helps define the nature of the trap for this reservoir.

So what we see in fact is once again, west is on the left, east is on the right. We have three wells for you.

First of all, the Santa Fe Indian Basin Number 1, which is in Section 8, the southeast corner. We've mentioned that previously.

Our gas discovery well in Section 9.

And then the wet well I showed you earlier in Section 10 that also has good porosity.

And what I intend to show you very quickly is just the basis on which we map these net sand lines or, if you will, the limit of effective pay.

So first, if we look once again at the discovery well, Section 9, we look down, and I've

highlighted for you in red the density neutron crossover. This is indicative of a good gas saturation in this zone.

You can see it crosses over four and a half to five chart divisions. It's a good, clean gas zone. It shows up even on this one-inch-to-a-hundred-foot log.

And we can also look at the gamma-ray log for this well, and we see that it is one of these fancy spectral gamma rays, but both the potassium and thorium and the uranium logs, they all show this very clean sand.

We have indeed found a clean sand. That's what SGR means, it's a gamma-ray there. So a low gamma-ray reading, clean sand.

We come and look at the resistivity log on the right hand of this display, and we see at a depth of 9170, for example, a good separation in the pay zone of approximately, oh, I guess that's 30 ohms or so, separation between the deep and shallow curves. This is an indicator of permeability.

So indeed, we actually do have a gas sand with permeability that's clean and, as subsequently we found out, it did produce.

As we look to the right of that log and we

follow the highlighted Morrow basal "A" zone in the cross-hatching, we see that indeed we once again turn to the Section 10 well which, as you can see from the extremely low resistivity, that it is wet. As you can see by the separation between the deep and shallow resistivity curves, it is porosity.

Okay, so we have wet downdip, then we have a gas well in our section.

Now, as you move even further updip into Section 8 -- And incidentally, that's not very far updip, less than half a mile -- we follow this little cross-hatching up, and we see the basal "A" zone again.

And first let's look at the density neutron. We can see that indeed the density neutron curves are nicely reading about two percent porosity here. There just isn't any pay.

And if you look at the resistivity logs, you'll see it's very, very high resistive indication of tight. So we find that the gas, if you will, is kind of trapped updip against this effective porosity pinchout.

So once again, Section 8 well is tight, our well in Section 9 a good gas well, Section 10 well is wet.

Q. Have you also taken this information, then,

Mr. Carlson, and constructed what you have identified as a proven and probable gas map showing the extent and limits of the reservoir?

A. Yes, sir, I have. Exhibit Number 6 is a map of proven and probable gas reserves. We did this -- Of course, proven and probable is that gas which you can reasonably expect to recover, at the very least. So if anything, we'll find that we will probably recover more than this map.

But once again, this is a very standard engineering convention. We map all the gas in the reservoir from the Exhibit 4 where we showed the net -- we showed the net sand. And we fill that net sand up, down as far as the lowest known gas in Section 9. Okay?

Now, we have some indication that this is a conservative view because when we tested this well we actually didn't make any water, but we think that in fact we have quite a bit of gas east of our well as well. But don't exactly know how far that goes yet.

Q. Let's turn to Exhibit Number 7.

A. Exhibit Number 7 is our summary diagram which very neatly and concisely summarizes all the concepts we've covered today, and also will run on your fingers if you smear it.

But we see first of all, once again, the structure map is shown, with the contours showing east dip.

We see the North Indian Basin Unit boundary, showing that the accumulation of gas is -- overwhelmingly seems to be in our acreage.

We see the limit of effective porosity, once again. And we've colored gas and water within the actual reservoir itself.

We see a gross sand. That gross sand is in yellow on this display.

And we also see the lowest known gas, once again, from our well, the highest known water found in the Section 10 well.

We -- We've shown you once again just how lucky we were, I guess, in a sense, because here's the orthodox locations with those little green dots.

If we would have drilled in our orthodox location in Section 9, there's a very good chance we would have missed this pay. It would not have been found, at least not by us at this time.

So this is just a nice little summary map.

We see the updip Morrow basal "A" pinchout which I showed you on the stratigraphic cross-section, that being Exhibit 3.

And we also see the downdip changed to shallow water and lime, which I also showed you with Exhibit 3.

It's just a nice summary map, something that we'll put up -- I'll put up on my wall for a while when I get home, kind of --

Q. Mr. Carlson, geologically, do you have an opinion as to whether or not Marathon has gained an advantage by its unorthodox gas well location, over the diagonal offsetting operator, Oryx, in Section 17 with this well location?

A. Marathon has gained no advantage over Oryx with a well in this location.

Q. Describe for us the reasons you've reached that conclusion.

A. The best information we have suggests that Oryx cannot drill a commercial well in Section 17 to the Morrow.

Just quickly reviewing for you the net-sand exhibit, which is -- or, if you will, the net-pay exhibit, which is Exhibit 6 -- we see that in Section 17 there is very little sand, very little Morrow sand in Section 17 from this particular reservoir.

Now, we don't think they can drill a well to this reservoir and make a commercial success.

Q. Based upon your geologic study, will the unorthodox location, if approved for production out of the Morrow, recover gas that would not otherwise have been recoverable at a standard well location?

A. Absolutely. It's very clear that in a standard location we probably would have only had a foot or two of pay, and where we are now, of course, we have twelve feet of pay.

And likewise, we may recover some gas from Section 16, but I'd like to establish that we're unitized with Section 16, and they share equally in anything we get out of Section 9.

Q. From your perspective having -- examining the available data -- do you see any reason to penalize the production from the Morrow Formation in this well?

A. No, and the reason is very clear. In Section 17, the well drilled in Section 17 didn't see any Morrow reservoir. It can't produce it.

Similarly, in Section 8, that well saw no more reservoir from this -- this zone. They can't produce it.

So there's -- there's no -- there's nothing to -- nothing -- no reason to penalize. There's nothing to protect, if you will. There's no -- There's not a shred of evidence to suggest you could drill a

commercial well in Section 17, to this particular reservoir.

So we feel there's no reason for a penalty.

MR. KELLAHIN: That concludes my examination of Mr. Carlson. We would move the introduction of his Exhibits 1 through 7.

EXAMINER CATANACH: Exhibits 1 through 7 will be admitted as evidence.

CROSS-EXAMINATION

BY MR. CARR:

Q. Mr. Carlson, if we could go to your Exhibit Number 1 for a minute, please --

A. Yes, sir.

Q. -- running across the top of that exhibit you have a Morrow basal "A" pinchout.

There's sort of a nose in Section 8. What is the control that you utilized to see this nose that dips to the south and west in Section 8?

A. Well, I'd like to turn your attention to the gross sand map, which is Exhibit Number 2. And as you'll see, I have an indication that the -- that just northwest of the well in Section 8 we probably have a zero line because we see we go from 22 to nine, and it's probably going to go to zero pretty soon.

Similarly, in Section 7, we see that we have

five feet of gross sand, and so clearly we have to go from zero to five feet.

So what I have hypothesized is that what we are looking at is in Section 17, an area of tidal washover across this sand bar, and in Section 7 we are seeing a tidal delta, if you will, a flood tidal delta coming out.

Q. So what you've got, you've got basically your basal -- or your sand body, your beach deposit coming across the primary area of interest. Then we go up into Section 7, and you've got some sort of a structural anomaly, a thick or something up there. And when you put the two together, that's how you come up with that; is that correct?

A. I say there's sand in Section 7, but it's gross sand, doesn't clean up. So it's probably a delta splay, just a tidal splay.

Q. But when you integrate that in with the zero line on the base of the structural feature that you're showing, that's how you get that?

A. Yes, sir.

Q. Okay. Now, when we look at Exhibit Number 1, it does show that acreage that Oryx operates in Section 17 is in fact updip from the acreage that you operate in the offsetting unit to the east?

A. That is correct.

Q. On Exhibit Number 2, you have placed a zero line running across the southern portion of Sections 14, 15 and 16. If we go to the well in the southeast -- or southwest quarter of Section 14, have you reviewed the log on that particular well?

It's got, beneath the word "zero," in parentheses, "lime."

A. Yes, sir, I have.

Q. Are you aware that that well produced 5 BCF in gas?

A. Yes. In fact, it produced from the Morrow, one zone above this one.

Q. So you're saying that that is a different Morrow zone?

A. It's actually a different Morrow zone. From the Morrow "A" still, but actually one sand stringer above this lime.

Q. And this was an open-hole completion; is that not right?

A. I --

Q. 150 feet?

A. I couldn't tell you for sure whether it was open-hole. I know we had some -- a gas symbol beside that zone.

Q. There were 150 feet open in the zone; do you know that or not?

A. I don't know for sure, but I do know in looking at the logs that that was the only zone that showed -- We had both a proper dense- -- sonic or density, some porosity log and also a resistivity log.

And in that whole section, that was clearly the zone, that 5.7 BCF zone, that was the only thing that showed any potential for pay.

Q. And so was one interval within this section the only possible pay zone?

A. Yes, sir. And it was above this basal "A" zone.

Q. That would be a sand body; it's not lime?

A. Yes, sir. All the payout here, really, has been from sand in the Morrow here.

Q. Okay. If we go to your Exhibit Number 4, you've indicated on this exhibit the two unorthodox locations with the green dots; is that correct? One in Section 9 and one in Section 17?

A. They would be prospective orthodox locations.

Q. And I believe you stated that by moving to the unorthodox location in Section 9 you had gained no advantage, in your opinion, on the acreage in -- on Oryx with its acreage in 17?

A. Yes, sir.

Q. If you had not moved to the unorthodox location, you wouldn't have been able to produce any of the reserves in this Morrow channel, or very few of them; isn't that right?

A. Correct.

Q. And with a well at this location it is fair to say that you anticipate that you'll drain not only the Morrow reserves on Section 9, but also those that extend under Section 17?

A. We don't know the exact drainage radius for this well, yet. Since it's a new discovery, we haven't produced it much.

Q. And you wouldn't anticipate that it would -- its drainage radius would extend on the 17, or do you just not know?

A. I don't think it will extend materially into Section 17.

Q. And why is that? Do you think it will just drain that small an area?

A. It's very possible it would drain a small area.

Q. Now, if we look at this particular map -- All of these maps are based on well control; isn't that correct?

A. That is correct.

Q. You haven't integrated seismic -- Seismic wouldn't show anything in this formation, would it?

A. I have not used seismic to make this map.

Q. Okay. So basically when we draw the zero line through Section 17, we're looking at just the well-control information from the wells shown on this plat?

A. That is correct.

Q. And this is your interpretation?

A. Right. But you must remember, there is some regional Morrow control we can look at here.

Once we establish satisfactorily by looking at the well logs that we think we have a beach bar, then it's necessary to trend that beach bar in a direction that is more or less parallel to the coast line for the Morrow.

And we find in Eddy County -- All of you are probably familiar -- that the coast line in Morrow "A" time through this area ran, if you will, about north 70 east -- or rather south 70 west, plus or minus.

Q. Well, when you were -- Were you involved in the decision to take this well down to the Morrow?

A. Yes, partly.

Q. And at that time, the basic control and

information you had was on the well in the southwest of Section 10; isn't that right?

A. That is correct.

Q. And so what you did is, you projected and you decided to take the risk and drill a well in the southwest of Section 9; isn't that right?

A. We based our decision to drill in Section 9 based on a statistical analysis of the Morrow success rate in this field.

We found that out of 46 attempts to reach the Morrow in this field, ten attempts produced at one-half BCF or more.

Therefore we decided that because we were drilling to the Upper Penn anyway, the incremental costs of drilling to the Morrow substantiated drilling it just based on a one-out-of-five chance of getting a commercial accumulation.

(Off the record)

Q. (By Mr. Carr) All right. When you took your one-in-five chance and took this well down to the Morrow, in fact you were taking a chance that in fact -- hoping that this beach deposit would extend off to the west as, in fact, it apparently does?

A. Actually, we were just looking at the entire Morrow sand interval, which of course exceeds -- I

guess it's about 200 feet.

I can show you on this one log here, or this one structural cross-section, we can see the entire Morrow. And our chance was somewhere, if you look in our well section 2, there's about -- Yeah, just about 200-some-odd feet of Morrow. I guess about 170 feet here.

We were just taking a chance that one of those stringers would be pay.

Q. And if in -- To the same extent, now, if Oryx took the same chance and decided to drill at the proposed location, they might also encounter the Morrow over there; isn't that right?

A. They could encounter one or several Morrow pays.

Q. And they might even get this one?

A. The best interpretation we have shows that this one will not be present.

Q. And the interpretation that you have -- I believe if we look at Exhibit Number 6, you indicated that the zero effective porosity -- You have an area with a zero effective porosity line around it. I think you said this was a conservative view; isn't that right?

A. I did not express an opinion on that at the

time. However, I would say that this interpretation represents the best interpretation I can make based on the data I have.

Q. And you said -- You did not say this was a conservative opinion?

A. I did not say this was a conservative opinion.

Q. This --

A. I'm sorry, I said that in regard to the direction this went in Section 17, it was not conservative. I did express that as one went eastward towards Section 10, that the amount of gas fill-up within the porosity as shown is a conservative figure.

But the important fact is that I believe that this line here of zero, which goes through the base of 16 and around through 17, 8 and 9, that that's the limit of the reservoir.

Q. And that limit is based on the information you have on the well in the southeast of Section 8?

A. Partly that.

Q. And the well in 17, in the southwest of 17?

A. Yes, partly that.

Q. And partly what else?

A. Partly the Section 21 well. Also, the abrupt transition, if you will, less than a mile of -- from

good, clean sand to poor sand that we see from Section 10 to Section 15, as documented on the cross-section in Exhibit 3, and an even more abrupt transition in Section 14 between the Roaring Springs Federal Number 1 in the northwest quarter, and the southwest corner well.

We see that there's a very abrupt change, if you will, in facies.

Q. This line, however, could be a hundred feet to the west, could it not?

A. Once again, the line we've drawn represents our best interpretation.

Q. And your interpretation changed after you completed the well in the Morrow in Section 9, did it not?

A. Once again, I would like to state that -- I'd like to say that I can take full credit for telling our management to drill right here at this location for this reservoir. I cannot do that. We did not approach this project in that way.

Q. Well, the map indicates it was prepared in 5-90. That's this month?

A. Yes, sir.

Q. You did adjust this map based on information from the well in the southwest of Section 9, did you

not?

A. I constructed this map based on that information.

Q. And with that information, you -- Without that information, you wouldn't have extended that zero line into Section 17 as you have, would you?

A. That's correct.

Q. And if Marathon -- or, I'm sorry, if Oryx takes a chance and goes out there and should drill a well, it might extend that line even farther to the west; isn't that right?

A. It is entirely possible that Oryx could have a commercial gas well in Section 17 from one or more Morrow stringers, but it is not likely to be this one.

As you know, if you look at the field as a whole, there is not a single Morrow gas reservoir out of all those 46 wells we see, there isn't a single Morrow gas accumulation that extends more than a mile.

The attempts to offset Morrow wells a mile away have met with no success.

Q. If no other wells are drilled in this Morrow and completed in this Morrow stringer, all the production to be obtained from the Morrow in this zone will be produced by your well; isn't that right?

A. I suppose it's possible other wells could be

drilled in Section 16 later, or perhaps -- But at least if no other wells are drilled, this will be a one-well field which Marathon took the risk to discover, and certainly we don't see any possibility for a commercial well in this reservoir in Section 17.

Q. There are reserves, however, under 17 -- under Section 17, isn't that right, based on this -- on Exhibit Number 6?

A. Our reservoir engineer has planimetered the reserves that we could assume are there under Section 17; they are subeconomic.

Q. When did you make the decision to go on down to the Morrow? Was that made during drilling?

A. No, sir. It was made in March of 1990.

At the end of February, 1990, I was asked to present a candid assessment of the Morrow to our upper management. I also was assisted in that effort by Mr. Kent.

We once again performed a statistical analysis, I talked to you earlier. And our management, our VP, just said let's do it. And so we did it.

There was a change in development philosophy, if you will, of our management to go ahead and take the one-out-of-five likelihood of success and just drill one out of five likelihoods all over the field and then

eventually pay out the program.

So that was -- The end of February, I made the presentation. By the first part of March we were doing paperwork to put that decision into effect.

Q. And when was the well actually drilled?

A. Spring of 1989.

Q. After the decision -- When the well was spudded, did you know you were going to the Morrow?

A. Excuse me just a moment. I have to consult with my reservoir engineer on that.

MR. KELLAHIN: Well, if you don't know the answer --

Q. (By Mr. Carr) Right, can you answer --

A. Okay, I've forgotten the exact detail. We had a -- We had a feeling that it would be, but I'm not sure we had all the permits. I think we did.

MR. CARR: That's all I have.

EXAMINER CATANACH: Do you have anything else?

MR. KELLAHIN: No.

EXAMINER CATANACH: I don't think I have anything at this time, Mr. Kellahin.

MR. KELLAHIN: Okay, I'd like to call Mr. Craig Kent at this time, Mr. Examiner.

CRAIG T. KENT,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Kent, would you please state your name and occupation?

A. My name is Craig Kent, and I'm a petroleum engineer.

Q. Mr. Kent, on prior occasions have you testified as a petroleum engineer before the Division?

A. Yes, I have.

Q. And have you made a study of the engineering details involved with regards to this case?

A. Yes, I have.

MR. KELLAHIN: We tender Mr. Kent as an expert petroleum engineer.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Kellahin) Mr. Kent, in looking at the Morrow completion of this well, have you made a study of the details with regards to the dually -- or the dual completion of this well with the Upper Penn production and the Morrow production?

A. Yes, I have.

Q. Have you also made an engineering assessment

of the available reserves to be produced by this well?

A. Yes, I have.

Q. And based upon your engineering studies and calculations, do you have for us an estimate of whether or not there are reserves available in Section 17, the Oryx section, to be produced?

A. Yes, I do.

Q. Let me direct your attention, Mr. Kent, to what is marked as Exhibit Number 8. Describe for us the information that you utilized in order to make this P-over-Z plot.

A. Exhibit Number 8 was constructed based on several different factors:

First of all, pressure data from the DST we performed on the Morrow zone that we are completed in.

Second of all, on porosity and water-saturation estimates from open-hole logs.

And third, from Mr. Carlson's interpretation of the geology in the area.

Q. What have you concluded to be the total gas in place within this basal "A" Morrow Pool that is penetrated and capable of production from the subject well?

A. Based on -- Based on my data, I concluded that there's about 1.5 BCF gas in place in this pool.

Q. What, in your opinion, is the volume of recoverable gas available within the reservoir that's penetrated by the subject well?

A. Approximately 1.3 BCF of gas.

Q. How did you get from 1.5 down to 1.3 recoverable gas?

A. I made a material balance calculation using an abandonment pressure of approximately 500 pounds to determine the amount of gas that would be produced from the reservoir, from initial pressure down 500 pounds.

Q. I think it might be helpful if we went back to one of Mr. Carlson's displays to help us understand what you did, Mr. Kent, and let me show you if you have available his Exhibit Number 6.

When you look at the reservoir and the relationship to the -- of the reservoir to the interests --

A. Uh-huh.

Q. -- what portion of the reservoir recoverable gas is going to be produced by the interest owners in the Marathon-operated unit?

A. Approximately 85 percent, based on this interpretation.

Q. I assume, then, the remaining 15 percent would be gas available for production from either

Section 8 -- from Sections 8 and 17 on the display?

A. That's correct.

Q. Approximately what would it cost to drill a well to produce gas out of this Morrow basal "A" sand?

A. Based on our experience out there, dryhole cost would be about $400,000.

Q. And give us an estimate of the probable range of gas price.

A. Right now it's running about a dollar-fifty per MCF.

Q. Can you apportion for us the volume of recoverable gas that's available for production in Sections 8 and 17?

A. Based on the 1.3 BCF recoverable from the entire reservoir and the 15 percent that would not be produced from the Marathon North Indian Basin Unit, that leaves about 200 million cubic feet of gas to be produced.

Q. In your opinion, is 200 million cubic feet of gas a sufficient amount of gas to justify the drilling of a well in Section 17?

A. No, it's not.

Q. It would not even recover the dryhole cost one time, would it?

A. That's correct.

Q. Let's turn your attention now, Mr. Kent, to how you propose to produce the Upper Penn with the Morrow production.

A. Okay.

Q. Let me direct your attention to Exhibit Number 9. Is this an exhibit that you prepared or caused to be prepared?

A. Yes, it is.

Q. Describe for us what you propose to do.

A. Basically what you see on the left portion of the diagram is a schematic showing various casing, setting depths, the proposed tubing configuration, the perforation intervals in both the Upper Penn and Morrow. And then on the right part of that description is a detailed description of the tubing configuration.

On the right portion of the diagram is some narrative giving more detailed information on cement volumes, centralizer types and depths, tubing sizes and weights, packer type and perforation and shot density.

Q. Describe for us the location of the Upper Pennsylvanian perforations that were previously approved at this location by the Commission.

A. The Upper Penn is perforated from a depth of 7400 feet to 7416 feet KB, with four jet shots per foot.

Q. The method by which you'll produce that gas, then, is what?

A. We'll produce the gas of the tubing-casing annulus.

Q. And why would you do it that way?

A. That's the most convenient way, due to the expected volumes of gas that we should see.

Our other option was to run with dual 2-1/16 strings. However, through the high friction pressure drop we would expect, it didn't seem to be a good option to produce this well effectively.

Q. Let's turn now to the Morrow perforations. Where are the Morrow perforations in the well?

A. The Morrow is perforated from a depth of 9167 to 9185 feet KB, six shots a foot.

Q. Then you will produce Morrow up to tubing strength?

A. That's correct.

Q. Are you satisfied as an engineer that the design by which you will dually complete and produce both zones has sound mechanical integrity and meets the standards of the industry for production of two gas intervals like this?

A. Yes, sir.

Q. Is there anything specific you'd like to

direct our attention to in terms of the configuration or the method of production of the two zones?

A. No.

Q. Let's turn, now, sir, to Exhibit Number 10. Describe what that is and what it shows.

A. Exhibit Number 10 is a log section showing the density neutron log that was run on this well.

At the top is a scale indicating various curves.

At the bottom you see on the left side of the depth track a rectangle with several circles in it. That indicates the perforated interval in the Morrow.

Q. Describe -- Identify and describe for us Exhibit Number 11.

A. Exhibit Number 11 is a similar log section of the density neutron log, this time through the Upper Penn Formation.

At the top again are the scales for the various curves.

You see just above 7290 feet a line with an indication, top of Upper Penn, and just below 7400 feet on the left side of the depth track another rectangle with several circles in it, which indicates the perforated interval in the Upper Penn.

Q. Have you received any objection from any of

the parties with regards to the dual completion of the well?

A. No, I haven't.

Q. In your opinion as an engineer, Mr. Kent, should the production from the Morrow zone be penalized because the well is at an unorthodox well location?

A. No, it shouldn't.

Q. Why not, sir?

A. First of all, the reservoir does not extend far enough into Section 17 to provide opportunity to drill a commercial well in Section 17.

Q. Is production at the unorthodox location, in your opinion, necessary in order to recover the reserves that are producible that underlie the Section 9 and 16 of the unit?

A. Yes, it is, because as shown on our geologic interpretation, a well which would be located at a legal location in Section 9 would not have encountered the reservoir.

MR. KELLAHIN: That concludes my examination of Mr. Kent.

We move the introduction of Exhibits 8 through 11.

EXAMINER CATANACH: Exhibits 8 through 11 will be admitted as evidence.

CROSS-EXAMINATION

BY MR. CARR:

Q. Mr. Kent, let's go to Exhibit Number 8.

A. Okay.

Q. As I understand this P-over-Z plot, you constructed this utilizing the drill-stem test information on the subject well in the Morrow zone; is that correct?

A. Not only that, but geologic interpretation of open-hole logs, et cetera.

Q. So we have -- and if I can -- I'm trying to find the point. The DST is indicated by the point at which the diagonal line intersects the -- What is it?

A. The zero cumulative production.

Q. And it's right below the 4000 mark?

A. Correct.

Q. That's one pressure point. There was no other pressure point, right?

A. That's correct. This plot was strictly built based on material balance. No other pressure data was available to give us a reservoir size.

Q. Is it normal to draw a P-over-Z plot with only one point?

A. In a case where you have an estimate of your reservoir size and other reservoir parameters, this is

a good tool to use to give you an idea of at what reservoir pressure how much gas you should expect to produce.

Q. So what you also did with this point, then, you also integrated, I guess, some volumetric information; is that right?

A. That's correct, based on the geologic interpretation.

Q. And so you used the drainage area from the geological interpretation; is that right?

A. That's correct.

Q. And then using that, you were able to project this line?

A. Correct.

Q. Now, if -- And again, that is dependent upon the accuracy of the geological interpretation?

A. That's right.

Q. And if that was in fact incorrect and there was a larger drainage area, then in fact that would increase the reserves; isn't that shown on this?

A. That's correct. And conversely, if it -- if the reservoir is smaller it would show less reserve, right.

Q. Were you involved in the decision to take this well down to the Morrow?

A. Yes, I was.

Q. Was that decision made prior to the time you actually began to drill?

A. Yes, it was.

Q. Would you concur in Mr. Carlson's statement that you felt you had like a one-in-five chance of actually making a well in the Morrow?

A. Yes, sir.

Q. And you didn't come back to the Oil Commission at that time. Now, why was that?

A. Because of that one-in-five chance. We felt that there was a very, very small chance of actually getting production from the Morrow.

Q. And so at that time, you weren't really -- You thought you might not have to be here today?

A. That's correct. In fact, we thought there was an 80-percent chance we wouldn't be here today.

Q. If Oryx converse- -- or would now take a chance and drill a well up there, if they have a good chance, why then they wouldn't intersect the Morrow in Section 17; isn't that right?

A. That's right.

Q. And if they did, then again the whole interpretation on the reservoir would change?

A. That's correct.

Q. You said that you felt no penalty was appropriate because you weren't draining anything from Section 17? Was that the correct --

A. No, that's not correct.

Q. Okay, what was your reason for no penalty?

A. First of all, there's not enough reserves to support a commercial well in Section 17. And without a well in Section 17, a penalty on acreage factor serves no purpose.

Q. You couldn't drill a well at the legal location in 17?

A. I'm -- Based on our interpretation, there's not enough reserves in this particular reservoir to justify drilling a well at any location in 17.

Q. You couldn't even have drilled a legal location in your section and produced these reserves in this Morrow?

A. That's correct. But we took advantage of the unit, unitized operations that we have, whereby we're going to share the reserves equally between Section 9 and Section 16.

Q. You're proposing to dually complete this well?

A. Uh-huh.

Q. And you -- If I look at the downhole

mechanism, you've got a sliding sleeve and an on/off tool. Both of these have rubber seals in them; is that not correct?

A. That's correct.

Q. Have you had experience with any problems with leakage with these seals in either the sliding sleeve or the on/off tool?

A. Personally, no.

Q. Is there any way you can monitor this to assure that production coming from the Morrow is actually from the Morrow and not just Upper Penn production getting away from your wellbore?

A. It would be very difficult.

MR. CARR: That's all I have.

THE WITNESS: But again, that's a standard method of producing.

EXAMINER CATANACH: No questions.

MR. KELLAHIN: Mr. Examiner, at this time I would call Mr. Curtis Smith.

CURTIS SMITH,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Smith, will you please state your name

and occupation?

A. My name is Curtis Smith. I'm a petroleum landman for Marathon Oil Company.

Q. Mr. Smith, on prior occasions have you testified as a petroleum landman before the Division?

A. Yes, sir.

Q. Pursuant to your employment as a petroleum landman, are you familiar with not only the offsetting operators to the Indian Basin Unit operated by Marathon, but with the terms and conditions of the operation?

A. Yes, I am.

MR. KELLAHIN: We tender Mr. Smith as an expert petroleum landman.

EXAMINER CATANACH: He is so qualified.

Q. (By Mr. Kellahin) Mr. Smith, let me take both of your displays at the same time, if you will.

Exhibit Number 12 and 13 represent what?

A. Okay, Exhibit Number 12 are the offset operators and lessees in Sections 5, 8 and Section 17. Of course, Section 16 is operated by Marathon, which is in the Indian Basin -- North Indian Basin Unit -- and the Section 13, the dashed outline is the North Indian Basin Unit boundary.

This is a federal- and state-approved

exploration unit. The unit agreement is dated March 11th, 1963. Marathon is the operator with just over 74 percent working interest, and Phillips Petroleum Company and Graham Royalties are working-interest partners.

Q. Having studied the ownership arrangement, can you tell us whether or not, sir, the Morrow production that is shown for the Number 8 well in Section 9, whether that will be production earned by and attributable to the interest owners in the unit which includes Sections 9, 16 and other sections?

A. Yes, yes. The ownership throughout the unit is uniform. Section 9 is a federal lease. Section 16 is a state lease.

It's a state- and federal-approved unit, so the owners that -- royalty owners in Sections 9 and 16 will share in the production, as well as the working-interest owners.

Q. And the definition of the vertical limits of the unit are broad enough to include not only the Upper Penn but the Morrow production?

A. Yes, this -- The unit agreement and operating agreement covered all depths, since it was an exploration unit.

MR. KELLAHIN: That concludes my examination

of Mr. Smith. We move the introduction of his Exhibits 12 and 13.

EXAMINER CATANACH: We have no questions of Mr. Smith.

(Off the record)

MR. KELLAHIN: Mr. Examiner, I'd like to move the introduction of a certificate of mailing which we'll mark for the record as Exhibit Number 14. It's our notification to Oryx and the other offsetting interest owners of the dual completion and the location request. I would move its introduction at this time.

EXAMINER CATANACH: Exhibit Number -- 13?

MR. KELLAHIN: 14.

EXAMINER CATANACH: -- 14, will be admitted as evidence.

MR. KELLAHIN: That's the original.

That concludes our presentation, Mr. Examiner.

(Off the record)

EXAMINER CATANACH: Let's take a short -- just a short 10-minute break between presentations, and then we'll just run right on through.

(Thereupon, a recess was taken at 11:50 a.m.)

(The following proceedings had at 12:07 p.m.)

MR. KELLAHIN: Mr. Examiner, on behalf of

Marathon Oil Company, I'd like the record to reflect that Mr. Larry Garcia, attorney for Marathon, is present and assisting in the presentation today.

That concludes our direct presentation, Mr. Examiner.

EXAMINER CATANACH: Mr. Carr, you can proceed.

MR. CARR: At this time we call Mr. Rojas.

DAVID R. ROJAS,

the witness herein, after having been first duly sworn upon his oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. CARR:

Q. Will you state your full name for the record, please?

A. My name is David R. Rojas.

Q. Mr. Rojas, where do you reside?

A. I reside in Midland, Texas.

Q. By whom are you employed and in what capacity?

A. I am employed by Oryx Energy Company, and I am a staff geologist.

Q. Have you previously testified before this Division and had your credentials as a geologist accepted and made a matter of record?

A. Yes, I have.

Q. Were you qualified as an expert in petroleum geology in the previous hearings?

A. I was.

Q. Are you familiar with the Application filed in this case by Marathon?

A. I am.

Q. Are you familiar with the subject area?

A. Yes, I am.

Q. Have you performed a study of the Morrow in this area?

A. Yes, I have.

Q. Have you prepared certain exhibits for presentation in this hearing?

A. I have.

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

EXAMINER CATANACH: They are.

Q. (By Mr. Carr) What is the purpose of Oryx's presentation in this hearing?

A. Oryx seeks to have a penalty assigned to the Marathon North Indian Basin Unit Number 8 Well, the Morrow production in that well.

Q. Would you refer to what has been marked for identification as Oryx Energy Company Exhibit Number 1,

identify that and review it for the Examiner?

A. Exhibit Number 1 is a structure map on top of the second member of the Lower Morrow Formation.

The scale on this map is one inch equals 4000 feet, and it covers roughly the same area as Marathon's exhibits in the direct testimony that was given by Marathon.

The sections are drawn in turquoise lines and represented by a section number in the middle of each section.

The wellbore -- Or the well symbols have numbers surrounding them. The number on the top is the completion date, original completion date of the well. The number to the right is the well number. The number below the well symbol is the TD of the well. And the number in red to the left of the well symbol is the subsea top of the second Lower Morrow, or the second member of the Lower Morrow.

You will see two brown lines proceeding southwest to northeast, marked A to A prime and B to B prime. These are cross-sections that I will present in Exhibit Number 4.

Q. What basically does this exhibit show you?

A. The primary reason for this exhibit is to show that a potential legal location in Section 17

would be roughly 140 to 150 feet updip to Marathon's North Indian Basin Unit Number 8 Well in Section 9.

Q. Does this also indicate that the same interval is potentially present at that location?

A. Yes, it does.

Q. Let's go now to what has been marked as your Exhibit Number 2. Would you identify that for Mr. Catanach, please?

A. Exhibit Number 2 is a gross isopach of that second member of the Lower Morrow, and again the scale is the same as the previous exhibit.

The numbers around the wellbore symbols are similar, except for the red number to the left of the red well symbol, which now is the gross thickness of this second member of the Lower Morrow.

Again, the cross-sections are shown, and the potential legal location in Section 17 in brown.

Q. Using this, can you generally describe your interpretation of this particular Morrow member?

A. Yes, I've done regional mapping in the area of the Lower Morrow, and I have found that it is a -- generally a channel sand, and that the channels are oriented in a northwest/southeast trend due to the source rock of the Lower Morrow being the pedernal mass, pedernal uplift to the northwest, and that this

map shows a congregate of Lower Morrow channels.

This is a composite of Lower Morrow channels, and it shows thicks and thins.

For example, if you'll look in the lower right-hand corner of the map you'll see **in Section 14 I show a thick gross isopach;** and again **in Section 21, in the northeast quarter of that section, I show a thick of gross isopach.**

Q. If we look at that well in Section 21, do you have an opinion -- Are we looking at a sand body or a lime?

A. Yes, we're looking at a sand in that well.

Q. This is not a porosity isopach, is it?

A. No, this is a gross isopach of the second member of the Lower Morrow.

Q. And does this -- What does this tell you about Section 17?

A. What this shows is, as I said -- stated previously -- a northwest/southeast-trending orientation of these channels or of these members of the congregate channel, and that there are thicks which are oriented in a northwest/southeast direction.

And according to the data that I have, suggest that there are two main bodies of thicks.

The one to the southwest, centering around

Section 21 in the northeast corner, would orient itself such that a sand would be present in Section 17.

Q. This exhibit also contains the traces for the subsequent cross-section?

A. Yes, it does.

Q. Let's go now to Exhibit Number 3. Would you identify that for the Examiner?

A. Exhibit Number 3 covers the same area as the previous two exhibits, and similarly the wells -- the well symbol and the data around it are the same, except for now to the left of the well symbol is in green a number representing the clean gamma-ray thickness, or an isopach of the clean gamma ray within the second member of the Lower Morrow.

I have chosen a cutoff of 60 API units on the gamma ray as a cutoff for clean gamma ray.

Again, this shows similar developments of thicks, indicating once again this northwest-southeast trend, and again, as I've stated, the trend to the south, proceeding up across Section 17 and the potential location in that section.

Q. And what does this tell you about the potential location in Section 17?

A. It tells me that, number one, that there is clean gamma-ray interval present in Section 17, and as

you look, connecting the brown cross-section line from the potential location in Section 17 to the North Indian Basin Unit Number 8 Well in Section 9, that there is a continuous clean gamma-ray member that can be correlated.

Q. Mr. Rojas, when did you receive detailed information on the Number 8 Well in the Morrow interval, the Marathon well in Section 9?

A. I was not made privy to that information until Marathon gave us that information last Thursday.

Q. And what impact on Oryx's plans has this information had?

A. Subsequent mapping that I've done since receiving this information indicates to me that we have a potential location in Section 17.

Further investigation of this information, along with the production that will be recovered from the well in Section 9, will be used to analyze the potential for a proposed location in Section 17.

Q. Do you think you'd have a one-in-five chance, maybe, of intercepting a Morrow pay?

A. I believe that's a -- Correct.

Q. Let's go now to Exhibit Number 4, the cross-section, and I'd ask you to explain what this shows and then review the information for the Examiner.

A. Okay. It would be easiest to look at Exhibit Number 4 and one of the other three exhibits at the same time, to orient yourself as to the direction in which the cross-section travels and the beginning and ending points of this cross-section.

You'll see on Exhibit Number 4 two cross-sections, A to A prime and B to B prime, located one above the other. This is to represent the perpendicular angle at which these cross-sections cross the channel members on the -- that I have mapped on the Exhibits Number 2 and Exhibit Number 3.

The brown curve which -- Excuse me, the brown line which proceeds across each cross-section, labeled the datum on each cross-section, is the top of the second member of the Lower Morrow.

The blue, cyan curve, or the blue -- the cyan line which you see -- proceeds across each one of the cross-sections -- marks the base of the second member of the Lower Morrow.

Between the datum line and this base of second member of Lower Morrow, you'll see places I have shaded in orange. These represent the interval in Exhibit Number 3, being the clean gamma ray, or that portion of the gamma ray which exceeds -- or which is less than 60 API units.

You'll notice that the -- In cross-section A to A prime, the left-hand -- beginning of the cross-section is in the southwest corner of Section 17.

Q. That's not a well --

A. That's --

Q. -- that's just the corner of that section?

A. That is correct. Again, as we move to the right along cross-section A to A prime, we go to Oryx's potential location, legal potential location, in Section 17, and we can see I have presented the data that I showed in the Exhibits 2 and 3 as the gross and the net clean gamma-ray interval.

And then as we go to the third well over, we see the green curve coming down the red line, which represents the gamma-ray curve. The red line represents the gamma-ray cutoff which I used of 60 API units.

Q. What does the stippled area indicate?

A. The stippled area in each curve on both of the cross-sections represents that portion of the second member of the Lower Morrow which has a clean gamma ray.

Q. What conclusions can you reach from this exhibit?

A. There are two conclusions -- main conclusions

that I'd like to point out, and that is, as I stated before, the two cross-sections cross perpendicularly across the main chan- -- main bodies of channels, and that if you look in cross-section A to A prime and compare it with cross-section B to B prime, the Oryx Energy Bright Federal Number 1, the second well from the left in cross-section B to B prime, is in a main portion of a development of the second member of the Lower Morrow.

This I correlate to be the same thickening member present under Section 17.

Similarly, as we move to the right on both of the cross-sections, you'll see another thickening interval.

In cross-section A to A prime this takes place between the Marathon North Indian Basin Unit Number 8 and the Marathon North Indian Basin Unit Number 1.

And in B to B prime this takes place at the Marathon Oil Indian Basin "B" Number 1, the second well from the right in cross-section B to B prime.

Q. So basically if we look at B to B prime and take the second and third wells from the left, this shows a thick. And it is this thick that, when you apply it to the structures you're mapping, it extends

into Section 17 and would tell you that there is a Morrow potential there?

Q. That is correct. It shows that, that there's Morrow potential at these northwest-southeast trends, and that -- The second point which I wanted to make was that it indicates that there is a continuous sand member or a continuous clean gamma-ray member which would proceed from the North Indian Basin Unit Number 8 Well to the potential Oryx location.

Q. And Mr. Rojas, this is a stratigraphic cross-section?

A. That is correct.

Q. What would -- How would this change if it was a structural cross-section?

A. If it was structural, you would see the 140 to 150 feet of structural gain that we would have in the Oryx potential location.

Q. What conclusions can you reach from your study of the Morrow in this area?

A. The conclusions I can reach are that the location of Marathon's North Indian Basin Unit Number 8 well is in a portion of the second member of the Lower Morrow, which has high potential to be present under Section 17 and will actually drain reserves which can be recovered from Section 17.

Q. Were Exhibits 1 through 4 prepared by you?

A. Yes, they were.

MR. CARR: At this time we would move the admission of Oryx Exhibits 1 through 4.

MR. CATANACH: Exhibits 1 through 4 will be admitted as evidence.

MR. CARR: That concludes my direct examination of Mr. Rojas.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Perhaps we should start with Exhibit Number 4, Mr. Rojas.

A. Okay.

Q. I don't know if you have Mr. Carlson's Exhibit Number 3, but we might take a moment and find you a copy of Exhibit Number 3.

When we compare your stratigraphic cross-section, Exhibit 4, Mr. Rojas, to Mr. Carlson's Exhibit Number 3, are both of you gentlemen mapping what Mr. Carlson has referred to as the Morrow basal "A" sand?

A. In Mr. Carlson's cross-section, the central well that he used, the Marathon Indian Basin -- Excuse me, just a moment. I need to reorient myself. I thought that was the one.

I don't believe that Mr. Carlson has made a

correct correlation.

Q. Well, that wasn't my question yet.

A. Oh, I'm sorry.

Q. When you --

A. Can you rephrase the question?

Q. I'll repeat it for you.

When we look at Mr. Carlson's cross-section, Exhibit Number 3 --

A. Yes.

Q. -- see the Number 3 well, he's got the Marathon Federal IBA Number 1 in Section 13?

A. Yes, sir.

Q. Find that?

A. Yes, sir.

Q. If you look at your lower display on your cross-section, the center well is in fact the same well, isn't it?

A. It is the same well, yes.

Q. All right. When we're looking at the interval that you have mapped, are you mapping the Morrow basal "A", or are you mapping something else in the Morrow?

A. I'm mapping as Morrow basal "A" and as Marathon Number 1 well, but he doesn't maintain a stratigraphic correlation, similar stratigraphic

correlation to what I have.

The interval -- I see what you're getting at.

Q. No, you're getting ahead of me. I want to make sure we're dealing with apples and apples, okay?

A. We're not.

Q. Are you gentlemen both looking at the interval that was perforated in the Marathon Number 8 well?

A. Yes, we are.

Q. Do you see any potential in the Marathon 8 well for perforations in other portions of the Morrow than was perforated by the Marathon well?

A. I have not reviewed the entire log to state -- make such a statement, but I -- I don't know of any other interval that I would choose to perforate.

Q. Okay. When we look at the Lower Morrow basal "A" in the area that you've examined, do you find any other well in the area shown on your Exhibit Number 3 that is productive of this Morrow basal "A" sand?

A. Again, we're not looking at apples and apples.

We're looking at two different interpretations of stratigraphic correlations, and I do see another well on my cross-section, B to B prime, that being the Marathon Indian Basin B Number 1, that

has produced out of the equivalent interval that is -- stratigraphic interval that is perforated in the Marathon North Indian Basin Number 8 Well.

Q. Okay. When we look at Section 14 then, you've got 54 feet on your isopach exhibit, Number 3? Did I read that correctly?

A. Clean gamma ray, yes, sir.

Q. Yes, sir, you've got 54 --

A. Yes, sir.

Q. -- as the value?

Mr. Carlson's interpretation shows that that sand productive in that well in Section 14 is not correlative to the sand that he produces in the Section 9 well, and you disagree?

A. Yes, sir.

Q. Okay. In looking at the stratigraphic cross-sections, though, both of you are focused in on what he has called the Morrow basal "A"?

A. By virtue of the North Indian Basin Unit Number 8 Well.

Q. That's right. Okay.

In making your cross-section, you have chosen not to tie in the two cross-sections together so that we can see if they fit?

A. My purpose was to -- in drawing the cross-

sections -- to draw them perpendicularly to the channel, main channel, thick members of the channel, in order to indicate the correlative trends that are present in the area.

There was no purpose or lack of purpose in not connecting the two cross-sections.

Q. Mr. Carlson has shown in his interpretation that the basal Morrow "A" sand is a beach deposition that would be separate and distinct from the area you've shown in the south and east on your display; did I understand that correctly?

A. That is correct.

Q. Okay. What tells you, in your analysis, that this is a channel deposition in this Morrow basal "A" and not a beach environment?

A. Well, I've based this interpretation on a regional -- on looking at the regional area and the presence of Morrow production in the region.

We have Morrow production to the north, Morrow production to the east and Morrow production to the south, which are -- This production from the Lower Morrow is in channel trends from the northwest to the southeast.

And it wasn't based solely on information which would indicate by three wells that we have a

beach sand in an environment not conducive to that.

Q. Other than the well in 9, Section 9, and the well in 14, do we find any other of the wells on your Exhibit Number 3 that are productive from this interval?

A. Productive, no, sir.

Q. Productive of gas?

A. No, sir. Productive of gas --

Q. -- from the -- this Morrow basal "A" sand?

A. No, sir.

Q. When we look at your -- Oryx's potential location -- and I think we can see that on Exhibit Number 4 --

A. Yes.

Q. -- interpret that for me on the cross-section in terms of the thickness that you would estimate you would encounter for the well?

A. The thicknesses that I have shown in the gross isopach of the second member of the Lower Morrow, that being from the brown datum line to the cyan blue line, is correlative with the information that I show in Exhibit Number 2, that being the gross isopach, and shows --

Q. What -- At that location, then, what would be the gross thickness for your well?

A. Nineteen feet.

Q. You've got 19 feet of gross thickness in this basal "A" Morrow sand?

A. That is correct.

Q. All right. What do you get on your net isopach on the gamma-ray value, Exhibit Number 3?

A. Twelve to 14 feet.

Q. What, in your opinion as a geologist, is the necessary minimum footage on the gross map in order to have a commercial location?

A. We have used numbers in the realm of three and four feet of porosity.

However, the footage that Marathon has entered in their presentation of ten feet might be a good number to use in addition to the numbers that I have seen used.

It depends on other factors besides just the thickness.

Q. I didn't understand your answer. When we look at the net map --

A. Yes, sir.

Q. -- the gamma-ray map, you give me a value of 12 to 14 feet?

A. Yes, sir.

Q. Now, does that, in your opinion, satisfy your

criteria for picking a location that has a certain minimal thickness value on that map to be commercial?

A. Yes. In fact, I would use the zero line as an indication of where there are reserves under Oryx's lease, which should be considered in the drainage aspect of our lease.

Q. My question to you, sir, was to pick the optimum location in Section 17, and I wanted to understand whether it was important to you as a geologist to have a higher number on either the gross map or the net map.

A. The higher number that you can reach, the more production that you would anticipate being able to recover from that well.

Q. Okay.

A. However, that isn't -- That would be in a situation where you were structurally flat.

As I have indicated, and so has Mr. Carlson in his testimony, that Oryx's lease on this second member of the Lower Morrow, or the basal "A" member, as he wishes to call it, would be 150 feet updip on our lease in a legal, standard location.

Q. When we compare the two structure maps, is there a material difference between the two of you on the way you've mapped and interpreted the structure?

A. No.

Q. Have you generated a map for the engineer to utilize in determining the volume of gas in place that underlies Section 17 in the basal "A" sand?

A. The maps that I have generated, being the gross and the net isopachs, are the only maps that I have generated for that use.

Q. What was your interpretation prior to getting the data from the Marathon well in Section 9?

A. One more time, if you could, sir?

Q. Yes, sir. What was your geologic interpretation of the basal Morrow "A" sand before you got the Marathon last week on the well in Section 9?

A. As far as its depositional environment, because the channel member is present in the well in Section 10 which we did have, we still maintained an interpretation of a channel of the Lower Morrow.

But because there was -- wasn't any producing Lower Morrow offsetting our acreage, we had no maps at that time which depicted this second member of the Lower Morrow.

Q. So these maps were constructed after receiving the Marathon information for Section 9?

A. Yes, sir.

Q. And that prior to that you did not have an

interpretation of the basal "A" Morrow sand?

A. I did not have a mapped interpretation, no, sir.

Q. That would have encompassed Section 17, if you will?

A. No, sir.

Q. Identify for us what would have to change, in your opinion, for you to agree with Mr. Carlson's interpretation of the geology.

A. What would have to change in respect to Mr. Carlson's exhibits?

Q. What would have to change, in your opinion, for you to agree with Mr. Carlson?

I'm trying to focus in on those -- You gentlemen have utilized the same data and come to different conclusions. I want to understand why.

So describe for me what things would change for you to agree with Mr. Carlson.

A. I think Mr. Carlson and I both agree that there is porous -- either second member of the Lower Morrow or his basal "A" member, there is a porous interval of that same sand that's being produced in Marathon's Number 8 well present under our lease.

The environmental -- the deposition -- environment of deposition, which these channels or bars

were deposited under, are a method of interpretation.

And in order to interpret my maps in the form that Mr. Carlson has with a basal -- with a channel -- with a bar, barrier bar, he would have to change my whole view on the regional depositional environment of the Morrow, the Lower Morrow, which I don't see happening, sir.

Q. Is that the critical issue upon which the differences exist? The fact that you geologically have concluded that this is a channel sand and Mr. Carlson has concluded it was a beach-environment deposition?

A. I believe so.

Q. When I look at the second member, Lower Morrow that you have put on your display, am I clear in understanding that corresponds to what Mr. Carlson has mapped as the Morrow basal "A" sand?

A. Only in their -- in Marathon's Number 8 well. Our stratigraphic correlations do not proceed in the area similarly.

Q. Are you picking up more Morrow sands in the other wells that you correlated?

A. Other than --

Q. Yeah. You've identified the Morrow basal "A" sand in the Number 8 well in Section 9?

A. That's correct.

Q. All right.

A. And stratigraphically, each of the exhibits, including Exhibit Number 4, is only exhibiting the second member of the Lower Morrow.

I have not incorporated any other members of the Lower Morrow in my mapping.

The second member of the Lower Morrow does not maintain equal thickness throughout the mapped area, as I believe both geologic interpretations show.

MR. KELLAHIN: Okay, I have no further questions. Thank you.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Rojas, you can't have two -- the beach-type depositional environment and the channel depositional environment in the same general area; is that correct?

A. Not in the same stratigraphic deposit, no, sir.

Q. So regionally, if these are channel-sand developments, this is likely to be a channel-sand development as well?

A. Yes, sir.

EXAMINER CATANACH: I have no further questions.

EXAMINATION

BY MR. STOVALL:

Q. I have a couple questions, just to understand it.

Would I be correct if I were to say, as a non-geologist looking at your varied interpretations here, that the Morrow interval which you are mapping is -- includes the basal "A" Mr. Carlson used, plus some? Is that a correct statement?

A. I'm using the well which Mr. Kellahin used in his cross-examination.

Q. Which one is that? Let me make sure.

A. The north -- or the Marathon Federal IBA Number 1 Well --

Q. Okay.

A. -- in their Exhibit Number 3 --

Q. Uh-huh.

A. -- being the right-hand well.

And similarly, I have used the same well in my cross-section, B to B prime.

Q. Got you. I see the well in both cross-sections.

A. And you can see we have used completely different intervals to correlate --

Q. No, I can't see that because I'm not a

geologist --

A. I'm sorry.

Q. -- and you don't have a scale or a depth on yours, so I'm not --

A. I'm sorry --

Q. -- can't tell if that correlates there.

A. -- I did not put depth on there.

However, if we look at the subsea of the well in Section 15, we have encountered the Morrow at a minus 5343 on Exhibit Number 1, we can see that.

Q. Your Exhibit Number 1?

A. My Exhibit Number 1, yes, sir.

Q. Let me find your Exhibit Number 1 here.

Okay, your Exhibit Number 1, Section 15.

Now, the top of the member which you are showing on your cross-section is at minus 5343; is that right?

A. Yes, sir. Correct. And if you apply the Kelly Bushing measurement to that in order to back-calculate the depth on the log --

Q. Uh-huh.

A. -- which we would encounter, you would find that at a 9201.

If you'll look on Marathon's Exhibit Number 3, in the Federal IBA Number 1 Well, you'll see that

that depth is correlative to what Mr. Carlson has marked with an unidentified correlation line, being at 92- -- He's got his at 9204.

Q. So your datum line on your B-to-B-prime cross-section is approximately equivalent to that unmarked line below the top of the Morrow "A" on Mr. Carlson's cross-section; is that correct?

A. In that well, yes, sir.

Q. Okay. And approximately where would your -- You called it your cyan line, your curved line --

A. Yes, sir.

Q. -- below the orange section, where would that be on Mr. Carlson's, just to help me relate --

A. Okay, that's fine. If we use again Exhibit Number 2 of my exhibits to see that in Section 15 there's 25 feet of gross isopach, which is represented by that cyan line on my Exhibit Number 4, the cross-section --

Q. Okay.

A. -- then we can proceed from the datum which we've now calculated at 9201, down 25 feet, and that is the point at which we would contact that cyan line, being at 9226. We would correlate that to Mr. Carlson's cross-section well, and...

Q. So if I look at Mr. Carlson's Marathon -- the

IBA well, it's approximately halfway between the line, which we've agreed is the common datum point there, and what he's called the top of the Morrow basal "A"; is that correct?

A. That's correct.

Q. So your cross-section does not show the basal "A" as being part of that net thickness?

A. I don't believe that that line is -- in Mr. Carlson's exhibit in his well, Marathon Federal IBA Number 1 -- is a correlative stratigraphic equivalent to the sandstone that's present in his other wells.

Q. What's below, let's say, your orange-shaded area in Exhibit Number 4, below that 90- -- What was it? 9225, roughly?

A. Right.

Q. What's below that, as far as you can see?

A. That is Barnett shale.

Q. So you'd move the top of the Barnett, which he's got at approximately -- What? 9280? Am I right? Give or -- Or 9278, something like that?

A. Yes, sir.

Q. You'd move the top of that Barnett up to about 9225?

A. Yes, sir. And I'd put that limestone member in the Barnett shale.

Q. And your Barnett would go down 9300 or below; is that correct?

So you're just moving the top of the Barnett up, I -- That's the question, I think.

A. Yes.

Q. And you don't believe that that interval is productive from the top of the Barnett down, as you've identified it?

A. No, sir.

Q. And when you go over to his -- Let's see, let me get myself oriented here.

I think I need to look at the other cross-section, Mr. Carlson's other cross-section.

Now, using Mr. Carlson's Exhibit Number 3 and his Exhibit Number 5, trying to get this thing kind of in my mind, the well number 2 on his cross-section, Number 3, the Indian Basin Number 1, shows that there has been a change from lime to sand in what he's calling the basal "A"; is that correct?

Do you see where I am? Exhibit 3, Carlson Exhibit Number 3.

A. Oh, I'm sorry. Yes, sir.

Q. Okay, and he goes and he shows that in the IBA well it's a lime in that interval -- Just look at the basal "A" --

A. Yes, sir.

Q. -- and then over in the Number 3 it's sand; is that correct?

A. That's correct.

Q. I assume you would move the top of the Barnett and the Indian Basin Number 1 Well up approximately a correlative depth?

A. The Indian Basin Number 1 Well, that being well number 3 in Exhibit Number 5?

Q. Oh, this is getting exciting. I was still looking at Exhibit Number 3, and this is well number 2, but -- Yes, it's well number 3 in Exhibit 5 as well.

A. I'm sorry.

Q. That's okay. I hadn't quite made the transition yet.

A. I see what you're saying. Yes, I would move the base -- or the top of the Barnett shale to a depth of -- What is that? 92-...

Q. Somewhere above the top of his basal "A." Between his basal "A" and that unidentified line, right?

A. I believe he's marked -- Let's see, what has he marked Barnett here? Yes, yes.

Q. Okay. Now, he's shown that -- What he's calling the basal "A" is a -- as being a -- I guess, a

porous sandstone in the Indian Basin Number 1; is that correct?

A. Yes, sir.

Q. But it's limited productivity because of water?

A. Of the water contact, yes, sir.

Q. And in the Indian Basin Number 8, he's showing that as a porous sandstone that's dry and therefore productive of gas; is that correct?

A. That is correct, due to its structural positioning.

Q. And your interpretation, if you look now at his Indian Basin Number 8 on Exhibit 5, his Exhibit 5, is -- I'm trying to keep myself in the same pieces here. Let me get out your exhibit again.

You've got his Indian Basin Number 8 on your A/A prime; is that correct?

A. Yes, sir. The third --

Q. And I assume the datum and the orange interval on that is the same as it is on the B/B prime, so I don't have to go through that exercise again; is that correct?

A. That's correct.

Q. So what he's showing is that productive interval that he's marked with the red coloring on

Exhibit 5 is below your orange interval on your Exhibit Number 4, A to A prime, in the Indian Basin Number 8 Well?

A. No, sir. That is the same strat- -- We both are calling that -- We're both indicating that as being the same member.

Q. Okay.

A. The interval that I show in orange, in the Marathon North Indian Basin Unit Number 8 Well --

Q. Uh-huh.

A. -- in my Exhibit Number 4, is the same interval which Mr. Carlson has colored red in his Exhibit Number 5 of the same well.

Q. Oh, my. Now you've really confused me.

When we were in the IBA Well, that equivalent interval was below your orange interval, was it not? If I understood what you said before?

A. No, if I understand what you're saying, the correlative stratigraphic interval that I am mapping, being the second member of the Lower Morrow --

Q. Uh-huh.

A. -- in the Federal IBA Number 1 Well represented on Marathon's Exhibit Number 3 -- Right? Isn't that the one that you're comparing right now?

Q. Well, I'm on Exhibit 4, your cross-section.

A. Right. The -- You were trying to com- -- Well, I'm putting words in your mouth, but --

Q. Let's go to the Number 8 and run through the exercise again.

A. Okay.

Q. That might be the most accurate way to do it.

A. Okay.

Q. Equate your datum on your Indian Basin Number 8, A to A prime, to a point on well number 2 of Mr. Carlson's log number 5.

A. Exhibit Number 5?

Q. Exhibit Number 5, excuse me, yes.

A. It is the same. The interval that I have colored in orange in my Exhibit Number 4, for the North Indian Basin Unit Number 8 well, is the same interval that Mr. Carlson has colored red.

Q. So your datum line on the top of that one is this line which he's showing as the top of the Morrow basal A; is that correct? Roughly the same?

A. Yes, yes.

Q. Oh, good.

A. You've got it.

Q. Which is -- Okay, I'm not going to ask another question; it's just apt to throw me off.

Yes, I am going to ask that question.

Your -- The interval mapped on your A/A prime is a different interval than is mapped on your B/B prime, then, if I understood you correctly?

A. No, sir. What I was saying was the interval --

All right, let's back up to the first well that you had tacked to it here. I think maybe we can clear this.

The well --

Q. I'm getting a lesson in geology here.

A. The first well that you asked a question on, on my B-to-B-prime was the Marathon Federal IBA Number 1 Well.

Q. Correct.

A. We're trying to equate the stratigraphic interval, which I have called the second member of the Lower Morrow and colored in orange on my cross-section --

Q. Uh-huh.

A. -- with whatever member Mr. Carlson has indicated as being the Morrow basal "A" in his Exhibit Number 3 --

Q. Uh-huh.

A. -- and I showed that my correlation shows the stratigraphic equivalent of the orange interval is

actually present in the IBA Number 1 Well from 9201 to 9226.

That is above Mr. Carlson's Morrow basal "A" member as he maps it in his -- on his cross-section. Does that --

Q. I'm with you.

All right, let me ask you a question and see if I'm following you right, then.

If I were to plug --

I didn't realize I was getting into this when I started this process.

(Off the record)

Q. (By Mr. Stovall) If I take your line in the IBA well --

A. Yes, sir.

Q. -- which is equivalent to that unmarked line below the top of the Morrow A in Mr. Carlson's cross of the IBA well --

A. Yes, sir.

Q. -- and if I were to attempt to correlate that, draw a cross-section, if you will, to the Number 8 Well, the Indian Basin Number 8 --

A. Yes, sir.

Q. -- that line -- Let me see where I am.

Okay, I think I see the difference now. He

hasn't got that line on his Exhibit Number 5, has he?

A. His Exhibit Number 5, in order to go from the point on the Marathon Federal IBA Number 1 Well at 9204, the line which we're talking about --

Q. Uh-huh.

A. -- from that well?

If you were to extend that line to the same stratigraphic interval, as I see it, in the North Indian Basin Number 1 Well in Section 10, that's the number 2 well there --

Q. Got you.

A. -- you would proceed to the top of what he's calling the Morrow Basal "A".

Q. Oh, okay. So you're saying that line on his Exhibit Number 3 is not correlative at all?

A. That's correct.

Q. Got you. Okay, now I'm with you. I feel much better about that.

Okay, now I'll get to the questions I was going to ask a long time ago.

Are you recommending at this time that Oryx drill a well in Section 17 to this interval as you've identified it?

A. Due to the late time in which I -- Or due to the short period of time which I've had to review the

information from Marathon's well, I'm not at a point at which I'm recommending a location.

I am merely suggesting that, from the mapping that I have done, indicates that there are reserves, there are -- potentially are reserves under Section 17 that are in danger of being drained.

Q. Are they economically recoverable by Oryx?

A. As I've stated, at this point in time I haven't done enough research to indicate whether or not the reserves would be economically recoverable under that section, under that proposed -- the potential location.

Q. I'll ask what I think is my last question.

If Oryx were to decide not to drill a well to this -- to the Morrow in Section 17, and if the Commission were to impose a penalty as requested by Oryx on the Marathon well, what would be the effect of that ultimately on the drainage of any reserves that might underlie Section 17?

A. If Oryx would not drill -- If Oryx does not drill a well?

It would depend on the interpretation that I am able to generate as to whether or not economic reserves can definitely be recovered under Section 17.

Q. I understand that you have not made that

decision.

A. Right.

Q. But I'm just asking for a conclusion, assuming you make a decision against drilling a well.

A. Yes, sir, I'm sorry.

Q. And assuming that a penalty is imposed upon the Marathon well in the Morrow, what ultimately would that do as far as protecting the reserves underlying Section 17?

A. If it is deemed uneconomic to attempt to recover reserves from Section 17 by further review and a penalty is imposed on the well in Section 9, and the well does not exhibit production which indicates we should offset it, then the reserves would then be deemed uneconomic to recover.

Q. Would ultimately the Marathon well get them, later rather than sooner, if there's a penalty imposed? Is that what you're saying?

A. Yes.

MR. STOVALL: Okay. I think I'm going to leave this alone for a while. I got myself in deep enough.

MR. CARR: Just one follow-up question, then, if I might.

EXAMINER CATANACH: Uh-huh.

REDIRECT EXAMINATION

BY MR. CARR:

Q. Mr. Rojas, if the location, the Marathon location in the Morrow, is approved and no penalty is imposed and then Oryx does drill a well, what would be the effect in that situation?

A. In that situation, Oryx would suffer damages of reserves that have been recovered by Marathon's well that Oryx will not be able to recover.

MR. CARR: That's all I have.

FURTHER EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Rojas, how long would it take the company to evaluate the potential of that acreage in Section 17?

A. In order to evaluate that, the potential for that acreage, it will be necessary to review the production abilities of the well in Section 8 -- Excuse me, the well in Section 9, Marathon's recent well, and review whether or not economic production is recoverable from this member.

Q. Well, now, if your company indeed finds that it's uneconomical to drill and recover the reserves in Section 17, would you drop the request for a penalty in that case?

A. I believe a decision as to whether or not those reserves are economical would be a decision made on today's economics and that what Oryx is seeking here is protection of their rights of recovering those reserves, whether it be now at the price of gas today or the price of gas tomorrow.

It may change and it may then become economic in the future to drill a well, where now it does not appear economic.

EXAMINER CATANACH: I have nothing further.

FURTHER EXAMINATION

BY MR. STOVALL:

Q. I assume your engineering witness is going to suggest a method for calculating the penalty; is that correct?

A. Excellent assumption, sir.

EXAMINER CATANACH: Anything further of this witness?

MR. CARR: Nothing.

EXAMINER CATANACH: He may be excused.

MR. CARR: At this time we call Bonnie Wilson

(Off the record)

BONNIE WILSON,

the witness herein, after having been first duly sworn upon her oath, was examined and testified as follows:

EXAMINATION

BY MR. CARR:

Q. Would you state your full name for the record, please?

A. Bonnie Wilson.

Q. Miss Wilson, where do you reside?

A. Midland, Texas.

Q. By whom are you employed and in what capacity?

A. By Oryx Energy Company as a reservoir engineer.

Q. Have you previously testified before the Oil Conservation Division and had your credentials as a petroleum engineer accepted and made a matter of record?

A. Yes, I have.

Q. Are you familiar with the Application filed in this case on behalf of Marathon?

A. Yes, I am.

Q. Are you familiar with the area which is involved in this Application?

A. Yes, sir.

Q. Have you prepared certain exhibits for presentation in this hearing?

A. Yes.

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

EXAMINER CATANACH: They are.

Q. (By Mr. Carr) Miss Wilson, would you refer to what has been marked for identification as Oryx Exhibit Number 5, identify that and review it for the Examiner?

A. This shows a four-section area or portions of a four-section area, showing the standard location and the now-drilled unorthodox location for Marathon's North Indian Basin Unit Number 8 in Section 9, and it shows the setbacks.

The standard location would have been 1650, and their unorthodox location is 330 from the south line and 1650 from the west line.

Scribed around each standard location is the drainage area for 640 acres, and that is a drainage radius of 2978 feet.

Q. What does this exhibit show?

A. I have shown in the cross-hatched area in Section 17 the additional area in Section 17 that would be drained by moving from the standard location to an

unorthodox location and without assessing any penalty on that well.

Q. Are you ready now to go to Exhibit Number 6?

A. Yes.

Q. Let's go to the next exhibit, and I would like you to identify this and then explain how this differs from Exhibit Number 5.

A. Well, previously it was stated that Section -- that this area, the cross-hatched area in Section 17 on Exhibit Number 5, represented only five percent of Section 17, so only a five-percent penalty should be assessed.

Whenever this five-percent penalty applied to the rate of the well over its life is converted to a drainage area, that drainage radius is 2902 feet.

And I have scribed that circle on the Exhibit Number 6 so that you can now see the penalized area and then the area of drainage for a non-penalized well and the area of drainage for a penalized well.

Q. And what does this show you?

A. There's basically no difference between the two.

Q. All right, let's go now to Exhibit Number 7 and again explain the difference as depicted on Exhibit Number 7.

A. In the de novo hearing on the Cisco Penn on this well, a 14-percent penalty was assessed against the well at the unorthodox location.

That 14-percent penalty applied to this drainage radius -- applied to a drainage area, would give you a drainage radius of 2762 feet.

And again, you can see the area in Section 17 that is still being drained by a well in the unorthodox location, that is not being protected by that penalty.

Q. In your opinion, would a 14-percent penalty protect your correlative rights in this situation?

A. No, it does not.

Q. Let's go now to Exhibit Number 8, and I'd ask you to explain how this differs from the preceding exhibits.

A. What I did in Exhibit Number 8 was, I left the circle, the 640-acre drainage area scribed around the standard location.

And then I scribed a circle around the unorthodox location, and I reduced the drainage radius of that circle until that circle drained an area in section 17 that was equivalent to the area that would have been drained by a well at a standard location.

So in other words, the smaller circle represents a penalized drainage radius that would

equally drain Section 17 as a well without a penalty in a standard location.

That results in a 45-percent penalty.

Q. Okay, let's go now to Exhibit Number 9.

A. This is how you calculate the 45-percent penalty.

I've used two simple formulas, and I'll review them.

The first one is simply the area of your drainage circle. Area equals πr^2. I've divided that by 43,560 to convert feet, your radius squared, to acres. But that's just a conversion factor.

And then the other equation is the ultimate recovery equation.

In a prorated gas field your rate times your life is your ultimate recovery.

And then also in a gas reservoir, 43,560 times your porosity, times one minus your water saturation, times the difference between your initial gas volume factor, and then the gas volume factor at abandonment pressure, multiplied by your thickness, by your drainage area, will be equal to your ultimate recovery.

It's a standard ultimate-recovery equation.

If you write that equation for both drainage

areas, Q_1 representing the standard location and Q_2 representing the unorthodox location with the smaller drainage area, you can divide those two equations into each other.

And assuming all the other reservoir properties are similar, the wells' lives are similar, the porosities are similar, water saturations are similar, net thickness is similar, then that equation reduces to the ratio between the rates is equal to the ratio between the areas.

And that further reduces to the ratio between the radius squared of the drainage areas.

Putting the ratios of the drainage areas into this equation shows that a well that is drilled at the unorthodox location should have a rate that is 55 percent of the rate of a well at a standard location to make drainage of Section 17 equivalent to what it would have been from a well at a standard location.

Q. In essence what you've done is used volumetric calculations to reduce the producing rate so that the well at the unorthodox location would be limited to a rate that would not gain additional drainage advantage from the offsetting tract; is that correct?

A. That's correct.

Q. Now, let's go to Exhibit Number 10, and would you identify that?

A. Exhibit Number 10 is simply the recommended penalty. The basis is equal drainage of the offsetting lease.

The formula is 1 minus 2200 squared, divided by 2978 squared, and that's .45. That's the penalty, 45 percent.

Q. Now, Miss Wilson, if a 45-percent penalty is imposed, in your opinion would this reduced producing rate offset the advantage gained by Marathon in the Morrow by virtue of the unorthodox location?

A. Yes.

Q. Let's go now to Exhibit Number 11, and I would ask you to review that for Mr. Catanach.

A. This is simply a summary of all of the proposed penalties that have been proposed in this case, and I would just like to review the different methods that have been used to calculate penalties.

The first method is the variance-from-standard-setback method that Oryx proposed in the initial first hearing, and that resulted in a 40-percent penalty.

It was straightforward, universally applicable, and it was consistent with what had been

used in this area on the Santa Fe well.

Another method that had been proposed by Marathon was the well-to-well distance. That resulted in 17.5 percent penalty, which they requested.

However, a problem with this is that it results in invalid boundary conditions.

A well drilled at the intersection of those leases would suffer only a 50-percent penalty, and a well actually drilled on Oryx's Section 17 would suffer a 49-percent penalty.

So that method had invalid boundary conditions.

And the Commission recognized this and they altered the method to be a lease-to-well distance, which resulted in a 27.9-percent penalty.

But this penalty is already -- addresses a diagonal offset. It does not need to be adjusted any further.

Q. And the final --

A. The final penalty is the one that I've recommended today. It's equal drainage of offsetting lease, and it's the most accurate and it results in the 45-percent penalty.

Q. In your opinion, will approval of the Application of Marathon and the imposition of a 45-

percent penalty protect the correlative rights of Oryx Energy Company?

A. Yes.

Q. Against what should this penalty be applied?

A. Against the well's acreage factor.

Q. And what would be the impact on Oryx of any penalty lower than the 45 percent recommended?

A. We will suffer drainage by Marathon's well.

Q. In your opinion, will approval of the Application with this penalty be in the best interest of conservation, the prevention of waste, and the protection of correlative rights?

A. Yes.

Q. Were Exhibits 5 through 11 prepared by you?

A. Yes.

MR. CARR: At this time we would move the admission of Oryx Exhibits 5 through 11.

EXAMINER CATANACH: Exhibits 5 through 11 will be admitted as evidence.

MR. CARR: That concludes my direct examination of Miss Wilson.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Miss Wilson, let me direct your attention to Exhibit Number 11.

I believe -- and correct me if I'm wrong -- I believe you described this Exhibit 11 as representing the various proposed penalties for the well?

A. These are penalty methods that have been discussed.

Q. You've omitted the penalty that the Commission finally adopted for the well, did you not?

A. No, sir. That's the lease-to-well distance, and I stated that that penalty calculation does not -- already addresses a diagonal offset.

The Commission chose to cut that penalty in half because they thought that they had not addressed the fact that we were a diagonal offset.

However, we -- That has already been addressed.

Q. All right. So if we would put another entry in here to reflect the Commission decision about the Upper Penn, it would be a 14-percent penalty?

A. But you would be able to enter no calculation formula or a basis for a penalty method.

Q. So none of these penalties are what the Commission finally adopted for the Upper Penn?

A. That is correct.

Q. Now, when we look at these circles, am I correct in understanding that these are hypothetical

drainage circles --

A. These --

Q. -- that are constructed independent of any reservoir engineering or geology?

A. These are radius-of-drainage areas, not independent of geology but assuming constant thickness.

Q. Well, let's take any of them. How about number 8?

And if you'll take Mr. Rojas's Exhibit 1 through 3 -- Do you have a copy of his net isopach?

The hypothetical drainage circles shown on Exhibit 8 are specifically contrary to and inconsistent with his mapping of the geology, aren't they?

A. They are based on constant thickness. If I adjust these circles to account for Mr. Rojas's geology, the drainage area onto Section 17 would actually be even larger, and the Marathon well would be draining Section 17 even further.

Q. Well, have you done that and have you presented that in terms of a display?

A. No, sir, I have not.

Q. When we look at your hypothetical drainage radiuses for either the standard or the unorthodox location on any of these displays, you have a hypothesized drainage radius that extends through a dry

hole in Section 8, don't you?

A. That is correct.

Q. Have you taken any of these maps to determine volumetrically the amount of gas that underlies Section 17 in this Morrow basal "A" sand?

A. The amount of gas that underlies Section 17, in a rough calculation based on the geology that David presented in Exhibit 3, is a little bit less than 3 BCF, by my estimate of the geological interpretation we have at this time.

Q. Which map did you do in order to arrive at that calculation?

A. Exhibit Number 3.

Q. Okay, and what are the factors you used to make the calculation?

A. I used a porosity of about seven percent, a water saturation of 20 percent, drainage area 320 acres, initial pressure of 3700 pounds.

Q. What did you use for a recovery factor?

A. And abandonment pressure of about 1000 pounds, so that determines recovery factor.

Q. Okay. Mr. Kent's calculation, I believe, if you went through the analysis, would be about an 87-percent recovery factor for gas?

A. That's close.

Q. Is that within the range of reason here?

A. Yes.

Q. Okay. Why did you use a 3700-pound pressure to make your volumetric calculation?

A. Because that was the pressure measured in the North Indian Basin Unit Number 8.

Q. When we look at the well in Section 14, I believe Mr. Rojas told us that well had cum'd some 5.7, approximately, BCF of gas?

A. Yes, sir.

Q. Is that correct?

A. Yes, sir.

Q. And that well has finally been abandoned, has it not?

A. That's correct.

Q. If Mr. Rojas's geology is correct, would you not have expected the pressure in the Number 8 Well in Section 9 to be less than the pressure reported on the DST of something less than 3700 pounds?

A. There may be permeability variations across the field that would cause differences in pressure.

Q. It would appear that Section 9 and Section 14 are not in pressure communication, are they?

A. They may be in pressure communication. It may be that due to the permeability between the two,

there can be a large pressure differential across there while the wells are still in communication.

Q. Without the production from the well in Section 14, would you have expected the initial reported bottom-hole pressure for the well in Section 9 to have been higher than the 3656 reported?

A. Roughly, reservoir pressures for the Morrow in this area are 4000 pounds. That seems very close to reasonable with me.

Q. So the 3656 represents very close to virgin reservoir pressure in the Morrow, doesn't it?

A. Slightly below what you would expect for virgin.

Q. When I look through the various calculations you have made on penalties --

A. Yes, sir.

Q. -- what is your final recommendation on which one of these you're selecting? Exhibit Number 8?

A. The penalty is on Exhibit Number 10, and Exhibit Number 8 shows the drainage areas for those.

Q. 10 is the calculation of penalty, and Exhibit 8 is the predicate or the foundation upon which you get the 45 percent?

A. Yes.

Q. And so that I understand your conclusion, the

45 percent is derived how?

A. It's based on a geometric calculation of the areas so that the two areas geometrically are equal.

Q. Excuse me, which areas?

A. The area that -- in Section 17 that would be drained by a well at a standard location.

Q. All right. I see that. There is an area that has two different kinds of shading. There is -- Out of the corner?

A. Yes.

Q. -- that is going to be drained, hypothetically, by this radial drainage at a standard location, okay? I see that area of the first circle.

A. Yes.

Q. When we look at the area of the second circle --

A. Yes.

Q. -- you still have the same cross-hatched area, plus there is a -- now a shift in the area of excess of the second circle.

A. You can either -- the area -- The two areas are equal, and you can either include the area that is diamond-shaded in the two areas, or you can exclude it so that the area that's only shown by cross-hatched lines leaning in the left direction is equal to the

area shown by cross-hatched lines leaning in the left direction [sic].

Q. Let me put some labels on this so that I can talk with you on the record.

A. Okay.

Q. I'm going to label number 1 that diamond-shaded area --

A. Okay.

Q. -- that's within both circles.

A. Okay.

Q. And if you'll look at the area to the west of that --

A. Yes.

Q. -- there is a crescent-shaped area. If you'd put that number 2?

A. Yes.

Q. And then the last area to the southwest, if you'll make that number 3?

A. Okay.

Q. If we added 1 and 2 together --

A. Yes.

Q. -- and compared that by adding 1 and 3 together, what's the difference?

A. They would be equal. That's the basis of the penalty.

Q. So I can be at a standard location, as compared to the unorthodox location, and still have the same impact on Section 17?

A. Yes, that's the whole purpose of the penalty, is to have a well at a standard location drain the same amount of Section 17 as a well at an unorthodox location with a 45-percent penalty applied to that well by draining the same amount of Section 17.

Q. So the basis for the fact that the radius of the second circle is smaller is the fact that you've assumed the restricted producing rate is going to reduce the drainage circle?

A. That's correct.

Q. Is there any engineering basis for believing that the pressure at the boundary at the circle --

Well, let me phrase this over.

If we have a well at a standard location, and regardless of the rate of withdrawal, there's going to be pressure depletion at the boundary of that circle, is there not?

A. Yes.

Q. And if you reduce the producing rate, it's not going to correspondingly reduce the pressure boundary for production of that well, is it?

A. If you reduce the rate, it will reduce the

drainage area, which will reduce the pressure.

Q. If your drainage radius is assumed in your calculation at 640, then pressure depletion is going to occur at the boundary of that 640 circle regardless of the rate of withdrawals, is it not?

A. It is a factor of the life of the production as well as the rate.

Q. If we've got a single well in a gas pool and it's withdrawing gas from that container, regardless of the rate, over time that pressure is going to be felt throughout the entire shape of the reservoir, isn't it?

A. In time it will be, if the reservoir is in connection.

Q. And by simply reducing the rate of withdrawals, you can't tell that well at a certain distance from the wellbore it's going to stop talking to the rest of the gas in the same reservoir, can you?

A. If that isn't one well field, then it's not prorated.

Q. By prorationing, then, you're going to tell the molecules of gas that are outside of this second circle, don't worry about production of the wellbore, because we're not coming out?

A. In a prorated field, the production from two wells are equal, and therefore their producing lives

are equal, and the pressure between them would be equal.

Q. Well, isn't that the missing component for the analysis, the fact that we don't have the second well over in Section 17?

A. That is correct. We do not have the section -- a well in Section 17.

Q. Until Oryx exercises their opportunity to drill at a location in 17 to get the gas, then regardless of the penalty Marathon's going to get it; they're going to get gas, right?

A. If we do not drill in Section 17, regardless of the penalty, Marathon will recover the gas, that is correct.

MR. KELLAHIN: No further questions.

REDIRECT EXAMINATION

BY MR. CARR.

Q. I believe you testified that if you had integrated your penalty diagrams with the geology, that it in fact would have increased the penalty that would have been applied to the Marathon well; is that right?

A. Yes, it would.

Q. These diagrams also don't consider the fact that the acreage in Section 17 is structurally higher; isn't that right?

A. That is correct.

Q. If you considered that, that would have also changed the penalty against Marathon; isn't that correct?

A. Yes, sir.

Q. And if you do drill a well in Section 17 and no penalty is imposed, will Marathon have an advantage on Oryx?

A. Yes.

MR. CARR: That's all I have.

EXAMINER CATANACH: No further questions.

MR. STOVALL: I do have a couple, just to --

You're lucky, Miss Wilson. I don't understand enough engineering to even get myself in trouble.

EXAMINATION

BY MR. STOVALL:

Q. Mine is very simple. Have you participated in any discussions yet as to whether a recommendation will be made to management whether to drill the well or not?

A. No, we have not recommended it. We found out about this well two weeks ago. David got his maps done a week ago.

We would want to sit and watch production

from this well for a few months to see what it made, what its history was, before we would want to go out and spend $1.3 million to drill a well. Excuse me, not 1.3, I'm confusing it --

Q. A bunch of money.

A. About -- Yeah, $700,000.

MR. STOVALL: I'm not going to ask you to explain the formulas and everything else. I think that's all I'm going to ask.

EXAMINER CATANACH: Witness may be excused.

Would you gentlemen like to give closing statements, or did you have anything else?

MR. CARR: Very brief, very brief.

EXAMINER CATANACH: Go ahead, Mr. Carr.

MR. CARR: Mr. Catanach, this case clearly is primarily a correlative-rights case.

Oryx is confronted with a situation where Marathon has drilled and completed a well that is too close to its acreage in Section 17.

We submit they're gaining an advantage, and we're here asking you to impose a penalty to offset the advantage.

This is also a geological case. And if you think lawyers differ, look at this case in terms of what geologists have come up with. We've got one

geologist contending it's a beach environment, another saying it's a channel sand.

And the problem with the case is that it's all based on geology. Even the engineering is tied into the geology.

There is limited control in Section 17. Marathon, as it indicated, took a one-in-five chance, stepped out and drilled a well and were able to make a well in the Morrow, and now they've mapped to include the data that they obtained from that well.

But if you really look at those maps, there's not control that would limit where that zero line goes across Section 17, and if we're able to take that jump and find the Morrow in Section 17 then we're confronted with a situation where in this case a penalty must be imposed.

As I noted, the engineering is the key to the geology.

We had a P-over-Z curve. And I'm not casting stones at the engineer; he has one point. But he has to go from that and integrate geological information. And if that's -- other things occur in the reservoir, we discover the reservoir is larger, then in fact the engineering interpretation changes.

And so what we're really looking at is the

geology.

I submit that the data is clear. There are reserves under Section 17. The channel extends on to our tract. The volume, the exact volume, is not known. The question is whether or not there is adequate thickness. Marathon says you need ten feet. We believe we've got 12 to 14 feet in clean sand. And so both elements are present, and now the matter is under review.

But unfortunately, the question of penalty is before you today. The question is, will reserves be drained? We believe they will. Clearly they will be. The volume may not be known but the fact of drainage is.

We need a meaningful penalty. We have recommended a 45-percent penalty, which offsets the advantage gained by moving toward a diagonal offset, and we submit to you, unlike what this Commission thought, a diagonal offset doesn't have less in the way of correlative rights to be protected just because they're a diagonal offset.

We believe with this penalty and approval of the Application, waste will be prevented because they can produce their reserves. We believe if this Application is approved, with this penalty, correlative

rights will be protected because they can produce their reserves. Their reserves, not ours.

EXAMINER CATANACH: Mr. Kellahin?

MR. KELLAHIN: Mr. Catanach, I think you can see the unique opportunity Marathon had for developing unique gas reserves in the Morrow that no one believed existed in this entire area.

You can see from the mapping of the geology that some 85 percent of this basal Morrow sand lies within the unit. And because of the unique flexibility of the unit operation, those owners that would be most greatly affected by such an unorthodox location are sharing in the production.

The calculation of all these proposed, hypothetical, theoretical penalties, I think, is meaningless conversation. What Oryx needs to do is, if they really believe that they have gas reserves in Section 17 in the Morrow, which we believe they don't, then they need to go out and drill their location.

It's at that point, then, we would have sufficient data upon which to construct a meaningful and appropriate producing allowable for the well so that the relative merits and correlative rights are balanced.

I think to adopt any of these penalties is

arbitrary and capricious and simply invites us to continue our discussions elsewhere. There's nothing unique or novel about any of these geometric suggestions of a penalty. We've had them all before.

What's unique about this case is it represents one of the few examples where a diagonal offset has complained.

We are standard to the western boundary, but I guess hypothetically we are some distance closer to Section 17. The Commission has determined that in that instance they will apply a geometric solution. It was a 14-percent penalty.

If you were to impose a penalty at all, I think it ought to be consistent with the resolution of that issue when we dealt with the Upper Penn. To adopt any other solution in here, I think, is simply arbitrary.

If you balance the evidence on whole, we believe that substantial evidence supports no penalty at all. Oryx has the opportunity to protect their correlative rights, if they think they exist, by drilling their own well.

I think Mr. Rojas's analysis of the geology is predicated on some assumptions with which our geologist disagrees. You can see from the way he's

mapped it, he assumes a channel deposition, and he's got to tie in Section 14 to 8.

We think there is substantial production that would have demonstrated significantly less pressure in the well in Section 9 than otherwise occurred, and for Mr. Rojas to be correct you'd have to ignore the hard data of the pressure information.

In conclusion, Mr. Examiner, we think that this case is one that justifies no penalty, and we would ask that you impose none.

Thank you.

EXAMINER CATANACH: Is there anything further in this case?

If not, Case 9954 will be taken under advisement.

(Thereupon, these proceedings were concluded at 1:30 p.m.)

CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, Steven T. Brenner, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Division was reported by me; that I transcribed my notes; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL June 14, 1990.

STEVEN T. BRENNER
CSR No. 106

My commission expires: October 14, 1990

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 9934, heard by me on May 30 1990.

David R. Catanach, Examiner
Oil Conservation Division