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:

APPLICATION OF YATES PETROLEUM CORPORATION

APPLICATION OF CONOCO, INC.

CASE NOS. ~~10,869~~ 10,881

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: DAVID R. CATANACH, Hearing Examiner

December 3, 1993

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Division on Friday, December 3rd, 1993, at Morgan Hall, State Land Office Building, 310 Old Santa Fe Trail, Santa Fe, New Mexico, before Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

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# I N D E X

December 3, 1993
Examiner Hearing
CASE NO. 10,869



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E X H I B I T S

| Conoco Exhibits | Identified | Admitted |
|---|---|---|
| Exhibit 1 | 8 | 10 |
| Exhibit 2 | 9 | 10 |
| Exhibit 3 | 12 | 47 |
| Exhibit 4 | 18 | 47 |
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| Yates Exhibits | Identified | Admitted |
|---|---|---|
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| Exhibit 5 | 95 | 104 |
| Exhibit 6 | 97 | 104 |

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| Marathon Exhibit | Identified | Admitted |
|---|---|---|
| Exhibit 1 | 138 | 144 |

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A P P E A R A N C E S

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* * *

WHEREUPON, the following proceedings were had at 8:15 a.m.:

EXAMINER CATANACH: Call the hearing to order this morning for continuation of Docket Number 35-93, and at this time we'll call Case 10,869, the Application of Yates Petroleum Corporation for amendment of the Special Rules and Regulations of the South Dagger Draw-Upper Pennsylvanian Associated Pool, Eddy County, New Mexico.

Are there appearances in this case?

MR. CARR: May it please the Examiner, my name is William F. Carr of the Santa Fe law firm Campbell, Carr, Berge and Sheridan.

In this case I represent Yates Petroleum Corporation, and we have four witnesses.

EXAMINER CATANACH: Additional appearances?

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

At this time we would request that you also call and consolidate for purposes of hearing Conoco's Application in Case 10,881.

EXAMINER CATANACH: At this time I'll call Case 10,881, which is the Application of Conoco, Inc., to amend Rule 5(b) and Rule 6 of the Special Rules and Regulations

for the South Dagger Draw-Upper Pennsylvanian Pool and pool extension, Eddy County, New Mexico.

Are there additional appearances in either of these cases?

MS. AUBREY: Karen Aubrey, Santa Fe, New Mexico. I'm appearing on behalf of Marathon Oil Company, and I have one witness.

MR. BRUCE: Mr. Examiner, Jim Bruce from the Hinkle law firm in Santa Fe, representing Santa Fe Energy Operating Partners, L.P., and I'm also entering an appearance on behalf of Nearburg Producing Company. I have no witnesses.

EXAMINER CATANACH: Any additional -- ?

Can I get all of the witnesses to stand up and be sworn in at this time.

(Thereupon, the witnesses were sworn.)

EXAMINER CATANACH: Mr. Kellahin, are you going first in this case?

MR. KELLAHIN: Mr. Examiner, by stipulation of Counsel, we've decided that the order of presentation would be that Conoco would make theirs first, I believe Mr. Carr will make his presentation, and then Ms. Aubrey would make her presentation.

EXAMINER CATANACH: Okay.

MR. KELLAHIN: I call at this time Mr. David

Scott.

DAVID SCOTT,

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. Scott, would you please state your name and occupation?

A. My name is David Scott. I'm a land advisor for Conoco, Inc., in Midland, Texas.

Q. There's a background noise in here, Mr. Scott. The microphone doesn't amplify your voice; it's just for the court reporter. So you'll have to speak up.

A. Okay.

Q. Are you a certified petroleum landman for your company, Mr. Scott?

A. Yes.

Q. And as part of your duties, have you been asked by Conoco to determine to the best of your ability the ownership and operatorship within the pool designated by the Division to be the South Dagger Draw Associated Pool?

A. Yes, I have.

Q. And have you completed that study?

A. Yes, sir, I have.

Q. Let me direct your attention, sir, to what is

marked as Conoco Exhibit Number 1. Is this a plat that you caused to be prepared?

A. Yes, sir, it is.

Q. Identify this for us.

A. It's a plat that shows the boundaries of the South Dagger Draw Pool along with -- The South Dagger Draw Pool as it currently exists is outlined in blue.

The cross-hatched blue area is the requested extended area.

The outline in red is a buffer zone of one mile around both of those previously mentioned areas.

And I have put the names of the operators of the wells on the map to depict the sections that they're located in, and also the -- Yes, well, perhaps that's what we've got.

Q. All right, sir. What was the purpose of your involvement with regards to this case?

A. We needed to determine who were the owners -- who were the operators of the wells within the South Dagger Draw Pool and the requested extension, plus any unleased mineral owners within that area, and we also needed to determine who operated wells within that one-mile buffer area.

Q. Why did you need to know that?

A. According to Rule 1207A, that was what was

required, the parties to be notified according to that rule.

Q. And the notice you're attempting to satisfy is notification of Conoco's Application in this case?

A. That's correct.

Q. All right, sir. Describe for us what you understand to be the standard of notification for purposes of what you're seeking to do.

A. Okay. According to my interpretation of that rule, you notify the operators of wells located within the South Dagger Draw Pool, the operators of the wells located within the requested extension area, and also any unleased mineral owners within that same area. In addition to that, you notify the operators of wells within that one mile buffer zone.

Q. And did you do that?

A. Yes, sir, I did.

Q. Let me have you turn to what is marked as Exhibit Number 2.

In addition, Mr. Examiner, I have not yet stapled to Exhibit Number 2, but we need to append Mr. Scott's certificate that he has attested to this morning, which sets forth his certification as to the notice.

Describe for us what Exhibit 2 is.

A. Okay, it's a list of operators -- of parties that

were notified about the Conoco Application for this hearing. It lists the operators within the South Dagger Draw Pool and the requested extension.

It also lists -- We went a little beyond what we were required to do. We listed and notified any mineral lessees located within the pool and that requested extension that owned land that was not included in a producing proration unit, and we also on this list list the operators within that buffer zone of one mile around those areas.

Q. What is the date that you sent the notification?

A. We sent them out registered mail, or certified mail, receipt requested, November the 8th.

MR. KELLAHIN: All right, sir. That concludes my examination of Mr. Scott, Mr. Examiner.

We would move the introduction of his Exhibits 1 and 2.

EXAMINER CATANACH: Exhibits 1 and 2 will be admitted as evidence.

Any questions of this witness?

Mr. Carr?

MR. CARR: No questions.

MS. AUBREY: No questions.

EXAMINER CATANACH: The witness may be excused.

MR. KELLAHIN: Call at this time Mr. Bill Hardie.

BILL HARDIE,

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. Hardie, would you please state your name and occupation?

A. My name is Bill Hardie. I'm a geologist with Conoco in Midland, Texas.

Q. You're going to have to speak up too so we can hear you.

On prior occasions, Mr. Hardie, have you testified before the Division?

A. Yes, I have.

Q. In what types of cases have you been involved before the Division as an expert geologic witness?

A. Typically cases involving unorthodox locations, amendments to pool rules and such, usually involving Dagger Draw field.

Q. Describe for us what has been your personal involvement on behalf of your company as a geologist in what has been identified as the South Dagger Draw Associated Pool.

A. I've been a reservoir geologist with Conoco for about three and a half years now, and of that I've spent

about two and a half years working the Dagger Draw field.

You want to know the -- I'm sorry, what was the second question?

Q. I just wanted to know your personal involvement in what we've identified as South Dagger Draw Associated Pool.

A. I've extensively studied all the available data in South Dagger Draw field, as well as the adjacent fields, North Dagger Draw and Indian Basin.

Q. As part of your duties, have you made a geologic study of the issues concerning the South Dagger Draw Associated Pool Rules, which involve Rule 5(b), which is the simultaneous dedication preclusion rule, plus Rule 6, which is the rule that sets forth the gas/oil ratio limit for the pool?

A. Yes, I have.

Q. Have you completed that geologic study?

A. Yes, I have.

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

EXAMINER CATANACH: Witness is so qualified.

Q. (By Mr. Kellahin) Let me have you turn to what is marked as Exhibit 3. Let's have you explain what we're looking at, and then let me ask you some general questions about the reservoir.

A. Okay.

Q. What is it that we're seeing?

A. Exhibit 3 is an isopach map or map of the thickness of the Cisco/Canyon dolomite reservoir.

The Canyon reservoir is a vugular and somewhat fractured carbonate buildup that was preferentially dolomitized.

In order to develop reservoir rock, it has to be dolomitized, so that an effective tool for identifying the thickness of the reservoir is simply to map the dolomite. So this represents a thickness map of the Cisco reservoir, and it ranges in thickness from zero feet at its outer flanks to upwards of 400 feet thick down at the southern portion of the map.

This map actually covers three different fields.

The bottom three rows of sections comprises the northern end of the Indian Basin field.

And then north of that is the South Dagger Draw field.

And then the uppermost row of sections comprises the very southern end of North Dagger Draw.

Q. Do you have a copy of Exhibit 1, Mr. Hardie?

A. I don't have it with me.

Q. Let me give you -- If you look at Exhibit 1 in association with Exhibit 3, will those two displays allow

you to identify the three pools or the areas of those three pools that are shown on Exhibit 3?

A. Yes.

Q. When we look at Exhibit 3, tell us the significance of the different shadings of blue.

A. They correspond to the thickness. The contour interval is 50 feet, and the darker shades of blue just indicate thicker portions of the reservoir. So it goes from light blue at the thinnest areas to dark blue at the thickest.

Q. When we're looking for the Indian Basin Gas Pool, where is that?

A. Indian Basin is that portion -- It's not exactly marked on either one of these maps, but it exists south of South Dagger Draw and comprises the bottom -- essentially the portion of the reservoir that exists in the lower three rows of sections.

Q. Show us where the political boundary is that separates North Dagger Draw from South Dagger Draw.

A. That would be at the northern end of the map, and it passes through the middle of Sections 10, 11 and 12, in 20 South, 24 East, and it makes a jog up around Section 9.

Q. Is North Dagger Draw an associated pool?

A. I believe North Dagger Draw is an oil pool.

Q. South Dagger Draw is an associated pool?

A. That is correct.

Q. And we get down to Indian Basin, and that's treated as a gas pool?

A. That is correct.

Q. There is scribed on Exhibit 1 an area that is outlined by a blue dash. Are you with me?

A. Yes.

Q. What does that area signify?

A. That signifies portions of the reservoir that are currently being produced but are not officially included in the South Dagger Draw Pool, and we would petition that they now be included. I think they are listed in the records as being a part of South Dagger Draw Pool, although it's not exactly official.

Q. In addition to the inclusion of that acreage within the South Dagger Draw Pool, what else is Conoco asking the Division to do?

A. Conoco is asking the Division to amend the pool rules in South Dagger Draw, which would ultimately allow simultaneous dedication of both oil and gas wells in the pool.

We recognize the importance of the simultaneous dedication rule to preserving reservoir energy and would therefore recommend that this rule be replaced with a limit or a cap on the amount of gas which can be withdrawn from

that pool, and that that limit be based on a GOR.

Our exhibits and testimony today, I think, will show that the existing rules do little, if anything, to protect reservoir energy in the field. The gas allowable is simply too high. We will show that the existing rules encourage waste.

Currently, operators are not allowed to have simultaneous dedication. Therefore they must choose whether they want their proration unit to produce gas or oil, and there's an incentive once oil wells become marginally economic to recomplete all wells to the gas cap. This results in not only waste in that particular proration unit, but waste to offset operators who may be trying to produce oil.

And finally, we feel that this change in the rules would prevent -- or would allow the protection of correlative rights.

There are existing situations now, and will be in the future, whereby an operator is offset on one flank by someone producing oil and on another flank by someone producing gas. And with the existing rules he cannot compete against both of those offset operators; he can only compete against one or the other.

We feel that this rule change will allow the protection of correlative rights and will allow a more

effective preservation of reservoir energy.

Q. Do you have an opinion, Mr. Hardie, as to whether the South Dagger Draw Associated Pool ought to continue to be classified as an associated pool?

A. I think it should be, but with a different set of rules.

Q. What's the basis for having this portion of the reservoir, the South Dagger Draw Associated Pool, classified as an associated pool?

A. Because it contains both oil and gas, and although portions of it have very thick columns of oil in it, other portions of it have very thin oil columns, and production of the oil alone is simply not economic. It's necessary to produce a little bit of gas along with it. And in fact, it's impossible not to produce that gas if you complete a well in that part of the reservoir.

Q. Do you have an opinion as to whether or not the associated pool rules provide a mechanism for the conservation of the drive energy realized in the reservoir by the conservation of the gas so that the oil might be produced?

A. I think the current pool rules do not adequately protect reservoir energy, and that's why we're here today.

Q. Let's talk about Exhibit 3. We're looking for the most part in the South Dagger Draw Associated Pool?

A. That is correct.

Q. Describe for us the geologic relationship between North Dagger Draw, South Dagger Draw and Indian Basin.

A. From the standpoint of Exhibit 3, I think you can tell pretty readily that they are part of one continuous feature that we commonly refer to as the dolomite fairway. We believe that they are continuous and in communication.

And from the standpoint of what this map shows you about the three, it simply shows that the reservoir is considerably thick, and Indian Basin down at the south end of the map where it approaches 400 feet and exceeds 400 feet in thickness, that it thins rather dramatically across South Dagger Draw to an average of about 200 feet in thickness. And then if you were to continue on to the north into North Dagger Draw, you would see that it would again thicken to an average of about 250 feet or 300 feet in thickness.

I think a better diagram to show the relationship between those may be Exhibit Number 4.

Q. Let's turn to that, sir. Would you identify and describe the illustration marked as Exhibit 4?

A. Because simultaneous dedication is inherently related to the distribution of fluids in the reservoir, I think it's important that we establish our current level of understanding about fluid distributions in this reservoir,

and this is an exhibit which diagrammatically shows the relationship between the three fields that we're talking about -- Indian Basin, South Dagger Draw and North Dagger Draw -- the most obvious feature being that there's a structural difference; Indian Basin is highest, and then we gradually move downdip toward North Dagger Draw.

The first field to be discovered, I believe, was Indian Basin. And upon its discovery it was pretty soon recognized that there was a tilted gas/water contact in the field, and this was believed to be attributed to a dynamic aquifer whereby the water would be flowing toward the northeast.

This same concept helped to explain what we later found as we continued to develop North Dagger Draw, and that was that there was in fact a tilted oil/water contact.

This distribution of fluids has resulted from really two forces. You've got the upward buoyant force of oil and gas on top of water, coupled with the shear force of a northeastward-moving aquifer, the end result being that you've tilted the gas/water contact in Indian Basin and flushed the oil from it and that you've tilted the oil/water contact in North Dagger Draw.

This diagram easily explains the relationships that we see in Indian Basin and North Dagger Draw. However, as we have continued to develop the reservoir,

particularly in South Dagger Draw, we've also noticed some variation in the gas/oil contact elevation. And while a hydrodynamic aquifer can tilt gas/water contacts and it can tilt oil/water contacts, it cannot tilt a gas/oil contact. It can only affect that which it touches, and it never touches the gas/oil contact.

So we felt we need to look a bit further, and I think Exhibit Number 5 would help to explain that problem.

Q. Before you go to 5, let me ask some clarifying questions on 4.

A. Sure.

Q. One of the issues we have before the Examiner is what to do with this simultaneous dedication rule, and so that we all have a clear understanding of how that is working in South Dagger Draw, give us the rule. Spacing in South Dagger Draw is what?

A. It's 320 acres. You're allowed to develop that 320 acres using, I believe, any combination of oil or gas wells, not both, but -- and the current allowables are based on a 10,000 GOR limit whereby you can produce 1400 barrels of oil per day from that 320-acre spacing unit and 14 million cubic feet of gas per day from that spacing unit.

Q. Rule 5(b), then, will preclude the production of a gas well, for example, in a 320 that already has an

existing oil well?

A. That is correct, and vice versa.

Q. When you look at Exhibit 4 and apply it to the South Dagger Draw, is there a risk to all operators that regardless of where they complete a well in the pool, that within a given spacing unit they may have a simultaneous dedication problem in that they have completed an oil well, and then subsequently find themselves with another well that's a gas well?

A. That risk exists virtually throughout South Dagger Draw, and it's presenting problems even as we speak.

Q. Are the distribution of the hydrocarbons such that within the South Dagger Draw you're going to have gas over the oil, regardless of where you are in the pool?

A. There may be. I'd have to refer to my maps again. There may be one or two locations where the structure is such that there is no gas cap at that particular location, but I believe most of it -- most of the reservoir in South Dagger Draw has a gas cap over it, most of the oil reservoir.

Q. In addition to having a gas component overlying the oil in the reservoir, as we move south in the reservoir and move upstructure, then you're moving into the Indian Basin Gas Pool?

A. That is correct.

Q. On the western flank of South Dagger Draw, is there a gas cap along the western edge of the dolomite?

A. Yes, there is.

Q. When we look at the eastern margin of the dolomite, what do we find in that location?

A. Depending upon where you are exactly, you tend to lose the gas cap along that eastern margin. In portions of the South Dagger Draw where the eastern margin plunges downdip, you actually pass into the water column.

Q. Back to Exhibit 4 --

A. Okay.

Q. -- if this hypothesis about the hydrodynamics of the reservoir are correct, is there going to be a problem for the operators concerning simultaneous dedication?

A. Yes, there is.

Q. And if this hypothesis is right, is it also going to be necessary to limit the gas withdrawals from the pool?

A. Absolutely.

Q. All right. Let's go to Exhibit 5. Identify and describe that display.

A. Exhibit 5 is simply another model which is an attempt to explain the distribution of fluids as we see them in the field today.

It's based on the concept that the Cisco dolomite fairway is actually a series of smaller reservoirs, each of

these reservoirs being separated not so much by a nonpermeable barrier but rather by a less permeable, less porous section of Dolomite, and that's represented on the diagram by the squiggly lines which serve to indicate separate reservoirs.

We believe that the migration of hydrocarbons into the Dagger Draw area occurred fairly late in geologic time and is associated with the regional tilting of the entire Permian Basin whereby the western end of the Permian Basin was uplifted relative to the east. This, we believe, set off secondary hydrocarbon migration from a downdip position, updip into the Dagger Draw area.

As this oil and gas migration occurred, it would have entered the lowermost of these first reservoirs, it would have filled it up, and at some point the buoyant force of the hydrocarbons in that first reservoir on the right-hand side of the map would have exceeded the capacity of the semipermeable barrier to hold it back.

When that happened, the first thing that would have broken through that barrier would have been gas, because gas is more permeable in rock. The gas would have passed through until eventually we started passing oil through the barrier.

And at some point this first reservoir would have reached an equilibrium where the buoyant upward force of

the hydrocarbons on water equaled the ability of that semipermeable barrier to hold it back.

The hydrocarbons that passed through the first reservoir would have then entered the second one in the next updip position and the same thing would have happened again, where it reached a point where it exceeded the force of the barrier to hold back the hydrocarbons. The first thing that passed through would have been gas, then oil, then it would have reached an equilibrium.

The end result, as this migration continues, is that you distill the hydrocarbons in such a way that by the time you end up in Indian Basin, you have only gas. And the end result is one of a -- the appearance of a tilted oil/water contact and the appearance of a tilted gas/oil contact.

This is really the only way you can explain differences in the gas/oil contact in the field, and we feel that this model, in combination with hydrodynamics, is really the best overall model for the distribution of fluids in these fields.

Q. If this hypothesis about the distribution of the fluids and the hydrocarbons in the reservoir is correct, Mr. Hardie, how does this affect what we do about Rule 5(b) and Rule 6?

A. What this tells you, if you apply this model, is

that virtually everywhere within South Dagger Draw, you've got gas cap above your oil column, and that in order to maximize the amount of oil that you get out of the reservoir you need to apply some kind of restriction on the gas withdrawals.

Q. Describe for us the characteristics of the reservoir in terms of whether portions are connected one to another. What I mean by that is whether or not we can treat a portion of the reservoir under a certain set of rules, move further along and have a different set that will somehow protect the gas cap.

A. It would be difficult to subdivide the reservoir in that fashion, simply because it is so heterogeneous. It's very difficult to define -- If there are individual reservoirs, it would be very difficult to define them precisely.

They do appear, if there are separate reservoirs, to be in communication to some degree, at least over a period of time. We've seen evidence where we've gone back into an old portion of the field that's been depleted, gone in and drilled a well, and it's pressured up again. This may be due to recharge by the aquifer, and it may be due to a little bit of bleeding of pressure from the adjacent reservoirs.

Q. Let's talk about the gas allowables. When you

look at Indian Basin, that's a prorated gas pool?

A. Yes.

Q. What's your -- That's what? 640-acre spacing per gas well?

A. I believe it's 640-acre spacing per gas well, and I believe they're allowed to produce somewhere in the neighborhood of 6 million cubic feet of gas per day from that one well.

Q. If you move up into South Dagger Draw, a gas well would be on 320?

A. Yes.

Q. What is the maximum gas withdrawal from a spacing unit using the South Dagger Draw rules?

A. You could withdraw 14 million cubic feet of gas from a spacing unit in South Dagger Draw according to the current rules.

Q. We go into North Dagger Draw, spacing is 160?

A. That's correct.

Q. What's the maximum gas withdrawal that you can withdraw in that pool from a spacing unit?

A. It's the same as South Dagger Draw only downgraded to that spacing size. So for a 160, it would be 7 million cubic feet of gas per day.

Q. Let's look at that area that we have proposed for the pool extension. For convenience, I want to

characterize that as a transition area between Indian Basin and South Dagger Draw, and let's focus on that transition area. In doing so, let me have you turn to Exhibit 6.

A. Exhibit 6 is a structure map on the top of the Cisco/Canyon dolomite reservoir, and it shows an abrupt and rather high degree of dip toward the northeast, coming out of Indian Basin field. Contour interval is 50 feet, so there's a significant amount of northeastern dip as we're coming north out of Indian Basin.

For the most part, once we enter this transition area that you previously described, the dip begins in a general way to flatten, and it continues to be fairly flat, although it undulates across South Dagger Draw.

Q. As development in South Dagger Draw continues to the south, moving towards Indian Basin, I want you to look at Sections 36 and 35. Are you with me?

A. Yes.

Q. They're full-size sections.

A. Right.

Q. And then below that are the half-section sizes, 35 to 36.

A. That's correct.

Q. Within the transition area, I want you to describe for us what is beginning to occur, as development takes you farther south and upstructure, in terms of the

likelihood of encountering gas wells within the same spacing unit that you already have oil wells.

A. Yes. Because this particular transition area really marks the point at which we begin to loose the oil column, primarily due to structure, the risk of encountering a gas well, when you're trying to look for oil, increases as you move toward the south.

We have not yet adequately defined within our means to -- you know, the exact limit of the oil column, so there's still a certain amount of risk when attempting to develop oil toward the south.

Q. Let me have you keep your voice up so we can hear you.

A. Okay.

Q. Illustrate for us the predicament or the dilemma that you and Marathon share in how you're competing for the reservoir reserves as Marathon develops 36 and as you develop 35.

A. The dilemma that we face is that for Conoco in Section 35 -- I believe the section is divided up into laydowns. The north half and the south half are the proration units. The north half is -- It's adequately competing in the oil column.

But as we move south we gain elevation, and it's such that the western half -- or the southwestern corner of

Section 35 has a gas well in it, because that formation lies in the gas cap there.

Q. You're talking about Marathon's --

A. No, we're talking about Conoco's acreage in Section 35.

Q. I'm with you now. The Preston Number 1 --

A. Preston Number 1.

Q. -- in the southwest of 35. Okay.

A. This was drilled in 1971 and completed in the Dolomite reservoir as a gas well.

As development continued to the south, it became apparent that there was oil in the southeastern corner of Section 35.

In order for Conoco to compete with the oil offsets, we would be forced to shut in the Preston 1, drill our oil wells, and compete with Marathon, and then we wouldn't be competing with the Mojave Number 1 in Section 35, which is completed in the gas cap. So we would have to pick and choose between which portion of the reservoir we wanted to compete in.

Q. And that's simply occasioned because of the limitations of Rule 5(b)?

A. Yes, in this particular reservoir.

Q. You or Marathon or Yates are going to have to make a conscious choice of whether you waste the oil, waste

the gas or allow one or the other to be drained by the competing operator?

A. That is correct.

Q. If you take the simultaneous rule out, what does that allow you to do?

A. That allows us to produce and compete in both the gas portion of the reservoir and the oil portion. But again, I'd stress that if we're going to be doing that, that we need to place some kind of a restriction on the amount of gas we can pull out of the reservoir.

Current restrictions are simply not adequate to preserve the oil column. Pulling 14 million cubic feet a day out the gas cap on a 320 is not going preserve your oil column.

Q. If the Examiner adopts your request to have South Dagger Draw Pool extended to include this transition area of acreage, will that give you an effective means, then, for you and the others to make a transition on into the Indian Basin prorated gas pool?

A. Yes, I think so.

Q. Let's look at that relationship or the limitation of the simultaneous rule as you look at the western boundary of the pool. We know from Exhibit 1 that most of that portion of the pool is operated by Yates, do we not?

A. Yes, that's correct.

Q. Okay. Looking at the western tier of sections, on the edge of the dolomite, there area a number of symbols on Exhibit 6 that show as gas symbols?

A. Yes, that's correct.

Q. How do I identify which ones are gas wells in the South Dagger Draw Pool?

A. I believe all of the wells that are -- that have a gas well symbol, that are within the dolomite fairway in that tier of sections are in the South Dagger Draw Pool.

Q. Is the limitation of the simultaneous rule one that affects Yates as well as Marathon and Conoco?

A. It affects Yates to the degree that they may encounter a difficulty, particularly in the future. As the oil column begins to deplete, they have the option of shutting in wells that begin to increase in GOR, while they get the very last drop of oil out.

Or do what economics dictate, and that is to convert all the wells in the proration unit to gas, and that's allowed within the current rules. And we feel that that option is not in the best interests of the reservoir and the preservation of reservoir energy.

Q. Within the heart of the fairway where there are predominantly oil wells in South Dagger Draw, are you beginning to see oil wells that historically have been classified as oil wells now creeping up in GOR so that

they're beginning to exceed the 30,000-to-1 GOR and therefore should soon be reclassified as gas wells?

A. Yes, that is occurring in at least three or four situations where the wells are marked on the map as oil wells and they initially were completed as oil wells, but as time has progressed their GORs have climbed to the point where they're now technically gas wells.

Q. All right. Let's turn now and look at Exhibit Number 7.

A. Exhibit Number 7 is the other aspect of structure within the field. It's simply a structure map on the bottom of the dolomite reservoir, and it shows in -- without all the undulations that you see at the top surface, just a general west-to-east dip on the bottom of the fairway itself.

The real significance of this map is that it is the intersection of the bottom of the fairway with the gas/oil contact that determines the absolute limit of where you might expect to find oil as you move south.

We believe that -- And if you look at the gas/oil contacts throughout the field, they occur somewhere in the neighborhood of a subsea elevation of minus 4060. And that can be variable, as we mentioned before.

So if you were to look at --

Q. Mr. Hardie, what's the number again?

A. Minus 4060 subsea.

Q. And that represents what?

A. The gas/oil contact or an approximation of it.

So if you were to follow that minus 4060 contour on the bottom of the fairway, and you would see it passing through Sections -- It passes by the Preston 4 well in the short Section 34, and then on south. That would be the absolute limit of where you might expect to find oil.

And as you can see, that limit extends into the Indian Basin gas field. And if oil does exist that far down, then it will present problems, eventually, in the Indian Basin gas field.

But to date this has not been documented. A lot of the wells do not penetrate deep enough. There are problems along that part of the reservoir where it may have shaled out. We don't know for sure that oil exists there, but it could possibly.

Q. Having set the geologic parameters, if you will, for the reservoir, have you also mapped what you believe to be the distribution of gas and the distribution of oil in the reservoir, based upon current information?

A. Yes, that would be Exhibits 8 and 9.

Q. Let's look at those together. I'm going to ask you to identify each separately. And then when we talk about them, I'm going to ask you to draw conclusions as we

compare one to the other.

A. Okay.

Q. First of all, Exhibit 8, what are we looking at here?

A. Exhibit 8 is our current knowledge about the extent of the oil column within the reservoir. It's based on some assumptions. First of all, that the oil/water contact is not flat. And for each well the oil/water contact was determined based on completions, based on DST data, based on mud logs. In general, that contact is tilted toward the northeast.

Then we -- We started with that as our bottom for the isopach interval. The top of the isopach interval for Exhibit 8 would be a gas/oil contact that we assume to be around minus 4060 subsea elevation. It varies from well to well, but that gas/oil contact is not as easy to determine, so we arbitrarily called it at 6040.

Within that interval that we've now described, we threw out all the non-pay lithologies, the shales, the limestones. And that's what you've got left, is net dolomite thickness that is within the oil column, and it shows the oil column to be thinning.

As you move to the south, it starts out down in Conoco's acreage at about zero and then thickens as you move to the north and continues to thicken as you move off

this map into North Dagger Draw, to upwards of 250 feet and 350 feet in thickness.

Q. I recognize that you've got some cross-sections that will help illustrate the little pod down there in Section 34.

A. Yes.

Q. You've got some lines and cross-sections, and we'll talk about that in more detail.

But give us a point on the complexity of the reservoir, the incredible difficulty it is for all operators as they move in towards Indian Basin to have reasonable certainty about whether or not they're going to get a gas well or an oil well. What's happened to you down in 34?

A. In Section 34 of 20 South, 24 East, we drilled our Preston Federal Number 5. We fully anticipated that it would be a gas well, based on structural mapping, and had somewhat of a surprise.

The bottom of the reservoir actually took a dip downward, allowing it to be filled with oil, and so the very lowermost portion of the reservoir there has oil in it.

And these kind of surprises are likely going to happen as we explore the southernmost limits of oil production in the field.

Q. Let's turn now to Exhibit 9. Identify that for us.

A. Exhibit 9 is simply an isopach on the gas cap itself with the color range going from yellow, meaning thin, to darker reds, indicating thicker portions of the gas cap.

Again, we're starting at an elevation of minus 4060 for the bottom of our isopach interval, and then we're moving up to the top of the reservoir. And we've thrown out nonproducing lithologies like shales and limestones, leaving us that net portion of the dolomite that has gas in it.

This shows an incredible thickness in the gas cap down at the southern end of the map, in Indian Basin. That thickness continues on up into Conoco's acreage in Section 35 and then abruptly begins to thin as we move into South Dagger Draw proper, from 275 feet or so to an average thickness of about 150 feet at the most, probably about 100 feet in South Dagger Draw.

Q. When you take the gas cap and overlie the oil column in the reservoir and look at South Dagger Draw, what do you find to be the relative thickness, if you will, of the gas cap in relation to the oil?

A. In South Dagger Draw itself, if you just make a section-by-section comparison, you can see for the most

part that there are either equal amounts of reservoir filled with gas and oil, or there's slightly more gas than oil, depending upon where you are.

And as you move to the south, the gas cap completely takes over. And of course Indian Basin is nothing but a large gas cap.

Q. Is it a fair statement to say that up until now, or in the recent past, the simultaneous preclusion rule has in fact protected the gas cap so that the oil could be produced in preference to the gas?

A. That is correct.

Q. If we take that simultaneous rule off in order to balance the equities as we move south in the reservoir, what then is the risk to the gas cap?

A. The risk to the gas cap, if we just simply remove simultaneous dedications, is really nil. It's the risk to the oil column that we're concerned about.

The risk for operators looking for the updip edge of the oil is that they may in fact encounter gas. And then they've got to make a choice: Do we complete this as a gas well and ruin everyone else's chances of producing oil, or do we abandon it as a dry hole? It's a tough choice.

Q. If we take the simultaneous rule off then, what is Conoco's recommendation about a level of gas/oil ratio

for the pool that will protect the oil column?

A. I'm sorry, could you ask that again?

Q. Yes, sir. We've asked the Commission to take Rule 5(b) off and to adjust Rule 6, which is the GOR rule.

A. Correct.

Q. It currently is 10,000 to 1, which allows an operator to produce up to 14 million MCF a day. At what GOR level does Conoco propose to change Rule 6?

A. We propose that the gas allowable be based on a GOR limit of 4500, which we think is much more adequate in protecting the oil column than the 10,000.

Q. And doing the arithmetic, that translates to 6.3 million MCF a day for a 320 spacing unit?

A. That is correct, which would much more adequately protect the oil column than would 14 million a day from that same spacing unit.

Q. Let's turn to the cross-sections, if you will, Exhibit 10. I think it's going to be helpful to keep out Exhibit 8 so you can see the line of cross-sections and where they are in the reservoir.

If you'll start with A-A', which is Exhibit 10 --

A. Exhibit 10 is just a further documentation of the relationships within the reservoir, the fluid distributions and how they're controlled by structure.

Q. We need to know the color code.

A. Yes, in a general sense -- and the lithologies have been generalized -- brown represents mostly shale, blue represents mostly lime, and then purple would represent the Cisco dolomite reservoir. And again, I stress this is generalized; there are a lot of little ratty beds interspersed in there.

So that the part we're interested in producing is the purple section.

And this shows that as you move from west to east across South Dagger Draw, there's a change in structure. And I've placed a reference datum of minus 4000 feet subsea with a red dotted line, just to give you a reference of what happens structurally. And that shows you that in fact as you move to the west, oil wells suddenly become gas wells. And it's simply a result of structure; you're moving up into the gas cap.

Q. As you map of the reservoir, do you see any permeability barriers to preclude vertical migration between the gas and the oil column?

A. There is evidence to the contrary, that in fact there is ample vertical migration of pressure.

We've seen, for example, evidence of our Preston Federal Number 1, which is in Section 35. It's completed in the gas cap. It was drilled in 1971. It has produced for over 20 years at about 1.5 million a day. Current

reservoir pressure in that well is the exact same as the reservoir pressure in the adjacent Preston 5 that's completed in the oil column, indicating that the Preston 1 and any other wells nearby would have drained not only the gas cap but also the pressure in the oil column.

So it's pretty clear that there is a communication, at least pressurewise, between the gas cap and the oil column.

Q. And as a geologist looking at the geology, what you see geologically validates the fact that there is pressure communication?

A. That is correct.

Q. Let's turn to B-B', which is Exhibit 11.

A. This is another dipline section, only this time we're passing through Conoco's acreage. The primary difference between this and the previous cross-section is that the reservoir is now thicker. As we mentioned, it gets considerably thicker as we move into Indian Basin.

In it, you can see again the reference elevation of minus 4000 feet. And if you use that to compare structure, you can adequately see why the Preston Federal Number 1 is a gas well and the Preston Federal Number 8, which was just recently drilled, is an oil well.

The pressures in the oil column of the Preston Federal 8 match those in the gas column of the Preston

Federal 1.

Q. Let's turn to Exhibit 12, C-C'.

A. This is the final cross-section, and it's just designed to show the relationship between the Indian Basin gas field over on the left-hand side with South Dagger Draw on the right-hand side.

Again, I've placed the minus-4000-foot reference datum in the red dotted line so you can compare structure. And you can see that the Indian Basin gas field is significantly higher than South Dagger Draw field.

This cross-section also explains what occurred when we drilled on Preston Federal Number 5, where you see the bottom of the reservoir actually takes a dip downward, allowing oil accumulation. That well currently produces about 100 barrels of oil per day, and it's in the middle of an area that otherwise produces gas.

Q. Tell me again, now, the relative thicknesses of the dolomite as we move from North Dagger Draw, go down to South Dagger Draw and then back up into Indian Hills.

A. Relatively, the dolomite is thicker in North Dagger Draw. Not only is it thicker, but it's almost entirely filed with oil.

As we move into South Dagger Draw, it not only thins significantly but it also gains elevation, so that it's thinner and now it's filled with oil and gas.

As we move into Indian Basin it thickens again and is almost entirely filled with gas.

Q. What are the relative ranges of thickness as we move from one pool to the next in this reservoir?

A. Relatively in North Dagger Draw it's an average of about 300 to 350 feet thick. In South Dagger Draw probably 200 to 250 feet, maybe less. And then in Indian Basin, on the portion we've mapped, it approaches 400 feet, and it goes way beyond that as you move farther south, becomes enormously thick.

Q. I want to focus your attention on the transition area again, and if you'll go back to the cross-section B-B' -- it's Exhibit 11 -- if you'll look at the well that's second from the right on Exhibit 11, it's the Marathon Number 6 Indian Hills well.

A. Yes.

Q. Now, I want you to illustrate for us the predicament that Marathon and Conoco and other operators have in this area in selecting where to perforate and complete their wells. And, in making that choice, what happens to them?

A. Right. Marathon in this case was stepping out. They were the farthest stepout at that point to the field, and they didn't know exactly what they were going to encounter.

I think their first test was the lowest set of perforations, that they determined to be all water. If I'm not mistaken, they squeezed that and then perforated the upper two sets of perforations, and I believe that produced in the neighborhood of 2.8 million cubic feet of gas per day.

Recognizing that they did not want to prematurely deplete the gas cap, they squeezed that and then completed the middle set of perforations. And I believe it's producing around a hundred barrels of oil per day from that set.

They were fortunate in that they had an oil column. If they had not, then they would have had other problems with simultaneous dedication.

Q. Is that circumstance unique only to this well?

A. No, it would exist anywhere along that updip fringe.

Q. While Marathon and Conoco face this transition difficulty between the gas and the oil in the transition area, is that same circumstance or difficulty going to be faced by Yates and interest owners in their wells as the South Dagger Draw reservoir is further depleted of oil?

A. Absolutely. Not only as Yates attempts to find the western limit of oil production, they will encounter the same difficulty along South Dagger Draw where they may

be looking for oil, and instead find gas.

Q. Summarize for us, Mr. Hardie, what you think the Division ought to do and the reasons for doing it.

A. I think the most equitable way of getting all of the oil out of the reservoir that we possibly can is to allow it to be developed fully, and if operators have the risk of not being able to complete wells they're not going to ever develop the oil column.

Therefore, I think it's imperative that we, at least in this case, drop simultaneous dedication, allowing complete development of the oil column.

But at the same time, we cannot withdraw tremendous amounts of gas from the gas cap and hope to preserve oil production. We must limit the amount of gas we withdraw.

And we would propose replacing the simultaneous dedication with a limiting GOR, a new limiting GOR.

Q. That new limiting GOR is the testimony of the engineer, but tell us the basis. That number is derived from what?

A. I believe he based it on the current producing GOR of all the oil wells in the South Dagger Draw Pool. It's very difficult to -- in fact, impossible to complete a well in South Dagger Draw without getting some free gas production. It's a brittle rock; when you go in and

attempt to acidize it, to stimulate it, to bring about economic rates, it's invariable that you're going to fracture up into the gas cap and produce some of that.

So we feel that an adequate limiting GOR would be based on field history. What can we produce out of this field, and what is the limiting factor on GOR that we can produce from this field? And we've used the field history to determine that.

Q. In utilizing the field history, have you isolated out the oil wells from the gas wells in the pool?

A. Yes, it would be improper to include wells completed in the gas cap in your calculation. After all, the idea here is to preserve the oil column, not to preserve gas wells.

Q. In some reservoirs, the Division requires that you preserve the gas cap, and therefore the gas energy, by limiting the oil withdrawals to a number that's equivalent to the solution gas/oil ratio. Is that appropriate in this reservoir?

A. It's not appropriate in South Dagger Draw, because it's mechanically impossible to produce wells at that solution gas GOR. That would be in the neighborhood of a 900 GOR. It's mechanically impossible to complete a well with that low of a GOR in South Dagger Draw. It can be done in North Dagger Draw, in certain areas, because

there is no gas cap.

Q. Based upon your background knowledge and experience, then, if we establish a GOR equivalent to the gas/oil ratio of the oil wells, take the simultaneous dedication rule off, then would that be the best way to continue development and production in the reservoir?

A. It would accomplish two things: It would allow continued development of the oil column, and it would also place a restriction on the gas rates that you could produce from the gas cap. There is currently in effect no restriction on gas cap production.

Q. Would those modifications of the rules help you and Marathon deal with how you're going to compete for the gas and the oil along those common boundary lines between the two companies?

A. Yes.

Q. And if it solves that issue, will it then solve competing offsetting issues for other operators as the reservoir continues to be developed?

A. Yes, it would

MR. KELLAHIN: Okay, that concludes my examination of Mr. Hardie.

We would move the introduction of his Exhibits -- I believe it's 3 through 12.

EXAMINER CATANACH: Exhibits 3 through 12 will be

admitted as evidence.

Mr. Carr?

CROSS-EXAMINATION

BY MR. CARR:

Q. Mr. Hardie, I have just a couple of questions, and I think you've covered this but I want to be sure.

If we look at your Exhibit Number 6, that's the structure map?

A. Yes.

Q. You've shaded in yellow areas that are in the transition zone?

A. The yellow shading denotes Conoco 100 percent working interest acreage.

Q. Could you define for me this transition zone? Is it structurally -- Did I understand it to be between, say, minus 2750 and 2950? Was that the area?

A. No, it's not a structural definition at all. The transition zone is simply a designation between South Dagger Draw Pool and Indian Basin gas field. It's a very nebulous feature from a geologic standpoint, but it's very real in terms of pools.

Q. All right. In terms of -- I'm trying to understand your testimony. I thought you said in this area is where you were having the transition of fluids, and that's where you were encountering the problems in

particular with simultaneous dedication limitations?

A. It's a dilemma in this particular area, because this area has a very thick gas cap and a very thin oil column.

The obvious choice when oil rates are marginal is to produce the gas cap, but that's not in the best interests of reservoir energy.

And that's where this area could be defined as somewhat of a transition zone. As you move farther north, the oil columns and gas caps are fairly even.

Q. Isn't that where you're having your greatest problem in terms of the simultaneous dedication limitations in the existing rule?

A. Yes, the current problems for Conoco exist in this area.

Q. Isn't it fair to say that similar problems would exist as you go up along the western side of South Dagger Draw at, say, a structural depth of minus 2750 to 2950 where again you would have this transition of fluids in the reservoir?

A. Yeah, the -- I'm not sure your depths are correct.

Q. I think my depths were misstated.

A. Yeah.

Q. I think it's 3750; is that right? 37- --

A. I would say that the -- On this structure map that transition would occur around 3900 to 3950, somewhere in there.

Q. All right. But the point is, is that, although you're experiencing these problems with the transition of fluids in the transition zone, similar problems could be experienced along the western edge of South Dagger Draw?

A. Absolutely.

Q. In terms of the 4000-to-1 gas/oil ratio recommendation, would it be more appropriate for me to direct questions concerning the reasoning behind that particular number to a subsequent witness?

A. I think so.

MR. CARR: Okay, that's all I have. Thank you.

EXAMINER CATANACH: Ms. Aubrey, do you have any questions?

MS. AUBREY: Yes, I do.

CROSS-EXAMINATION

BY MS. AUBREY:

Q. Mr. Hardie, do you have an opinion as to whether or not the Indian Basin and the South Dagger Draw are in pressure communication?

A. I believe they are.

Q. And are you aware of any wells in the South Dagger Draw that are producing in excess of 14 million?

A. I am not aware of any wells that have even come close to that.

MS. AUBREY: Thank you.

EXAMINER CATANACH: Mr. Bruce, any questions?

MR. BRUCE: No, sir.

EXAMINATION

BY EXAMINER CATANACH:

Q. Just a couple, Mr. Hardy.

Is it possible to define this transition area on the western portion of the pool and on the southern portion of the pool?

A. I don't think so, not within the means that we had or within -- The idea would be to very precisely define where you could drill your oil wells and gas wells, and we just don't have the means. The structures vary.

Not only do structures vary, but there are variations within units of where that gas/oil contact exists and where that oil/water contact exists, and although we have a range of areas where they may occur, we cannot predict precisely where that may be.

Q. Within the area of the Pool that has been predominantly developed by oil wells along the eastern edge of the Pool, what is the advantage of simultaneous dedication in that area?

A. In that area, the advantage would come

particularly later on in the life of the field when oil production in any given proration unit declines to the point where it becomes marginal.

And for economic reasons, an operator may choose to convert all wells to the gas cap. He can either have them all producing oil or all producing gas. If they're all making ten barrels of oil a day combined, his obvious answer is to go and shoot the gas cap for economic reasons, even though that would leave behind a certain amount of oil.

Q. If you had a situation where you had several wells in a proration unit, say several oil wells, and you did have one or two gas wells, would producing the gas wells have a detrimental effect on the oil wells, in your opinion?

A. It would, but I think that -- There's no question that producing the gas cap is detrimental to oil production, and there's also no question that we cannot rely on only the oil column in portions of this field for economic wells. They simply wouldn't be drilled unless we could produce some gas. So it's kind of a dilemma.

And I think the most reasonable answer to that dilemma is to allow simultaneous dedication but to restrict the amount of gas you can pull out.

As an example of what gas production does to oil

producers, we would turn to Section 35, Conoco's acreage down in 20 South, 24 East, where we have the Preston Federal Number 1 gas well.

It has produced for over 20 years in the gas cap, at about 1.4 million a day. It's cum'd a little over 4 BCF of gas. It, perhaps along with other gas wells farther south in Indian Basin, have depleted reservoir pressure to about 2000 p.s.i. from an original pressure when it was drilled of 2600 p.s.i., about 600 pounds depletion. That same amount of depletion was found in oil wells that were drilled adjacent to it.

Now, you could calculate how much oil you've lost as a result of that reservoir depletion over that 20-year-period, and it's not going to be an incredible amount.

What would be detrimental would be if we were to go into the Preston 1 and complete the entire gas cap, put a pump in that well so that we could make enormous gas rates and really blow down the gas cop. That would be detrimental to oil production in that portion of the field. And that would be our option if -- under the existing set of rules, if we couldn't develop the oil column. And it's not a good option.

EXAMINER CATANACH: I don't have anything else. The witness may be excused.

MR. KELLAHIN: Mr. Examiner, I'd call at this

time Mr. Mark Majcher. Mr. Majcher spells his last name, M-a-j-c-h-e-r. You don't pronounce the "j".

MARK MAJCHER,

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. Majcher, would you please state your name and occupation?

A. My name is Mark Majcher, and I'm a reservoir engineer with Conoco, Incorporated, in Midland, Texas.

Q. Mr. Majcher, on prior occasions have you testified before the Examiner of the Oil Conservation Division as a reservoir engineer?

A. Yes, I have.

Q. And pursuant to your employment as a reservoir engineer with your company, have you made a study of certain reservoir engineering aspects concerning the issues before the Examiner today?

A. Yes, I have.

MR. KELLAHIN: We tender Mr. Majcher as an expert reservoir engineer.

EXAMINER CATANACH: Mr. Majcher is so qualified.

Q. (By Mr. Kellahin) Let me have you turn, sir, to Exhibit Number 13, and let's use that to help illustrate

the work that you did.

A. Okay. Exhibits 13 and 14 are plat maps of South Dagger Draw which show the 1993 average oil, gas and GOR rates for the wells.

The pool boundaries are outlined, as are the limits of the oil column.

Exhibit 13 shows current Cisco producers only.

I will note that there are several wells that are highlighted by yellow, and those are wells which are considered gas wells. They exceed the classifying GOR of 30,000 standard cubic feet per stock tank barrel, and I'd like to talk about them in a little bit more detail later.

Q. All right. Let me ask you a question here. The oil column limit that's indicated on the display, that's an approximation based upon current information?

A. That's correct.

Q. That does not necessarily represent the absolute defined limit of that oil column?

A. That's based on what we know right now.

Q. Okay. As part of your work, were you asked to study whether or not the South Dagger Draw Pool ought to allow simultaneous dedication of gas and oil wells to spacing units in that pool?

A. Yes.

Q. And what conclusion did you reach as a reservoir

engineer?

A. It's my conclusion that Rule 5(b) precluding simultaneous dedication should be removed.

Q. Are those reasons based upon conclusions concerning correlative rights and the prevention of waste?

A. Yes, they are.

Q. As part of your engineering duties, did you study the issue of the gas/oil ratio for the reservoir?

A. I have.

Q. And as part of that study were you able to form and reach conclusions and expert opinions concerning that rate?

A. It's my opinion that the current limiting gas/oil ratio for South Dagger Draw, which is 10,000 to 1, is excessive, it does nothing to preserve the oil column, it promotes the excess depletion of the gas cap.

Q. When we take 10,000 to 1 times the oil allowable for a spacing unit of 1400, we get 14 million MCF gas a day, right?

A. That's correct.

Q. Based upon your study, is there any spacing unit in this pool that can reach that limit?

A. Currently, no.

Q. What is your understanding of the current maximum gas withdrawal per spacing unit in the pool? What's the

highest number you see?

A. I believe it's around 7 million.

Q. What number do you propose to use in the pool for the gas/oil ratio?

A. Conoco recommends a new limiting gas/oil ratio of 4500.

Q. We're going to see in a moment the details of how you get there?

A. That's correct.

Q. But tell us how you got there.

A. Essentially, I got there by incorporating known production data for oil well completions only. That is, those wells that produce under the 30,000 standard cubic feet per stock tank barrel classifying GOR.

I think that it would be unrealistic to include every well in there because, as you'll see later, the end result is an artificially inflated limiting gas/oil ratio.

Q. Okay. Let's look at Exhibit 13 now.

A. Okay.

Q. The associated pool rules require a classification of a gas well, once the GOR exceeds 30,000 to 1?

A. That's correct.

Q. Okay. When you look on 13, is there any significance to the yellow shading around certain of these

wells?

A. The yellow shading indicates those wells which exceed the 30,000 GOR limitation.

Q. If the yellow shading is around a well and the well symbol is still an oil well symbol, what does that mean?

A. It means it probably should be reclassified as a gas well.

Q. And if it is a yellow shading around a gas well symbol, then the oil proration schedule or the pool rules show that well as a gas well?

A. Say that again?

Q. Yeah, it was a crummy question. The gas well symbol is shaded --

A. Right.

Q. -- with yellow.

A. Right.

Q. That well is a gas well under the pool rules?

A. That's correct.

Q. Okay. The yellow shading around an oil well symbol -- it's still an oil well symbol -- that well is still classified as an oil well, but according to your data ought to be reclassified as a gas well?

A. That's correct.

Q. All right.

A. And that data comes from the petroleum information well completion reports.

Q. Let's take that information on 13 and see how the simultaneous rule is affecting or should affect the operators. For example, when you look in Section 36 at the Marathon acreage, what's the predicament for them?

A. Well, if I may, I'd like to refer to Exhibit 14 to talk about that.

Q. Okay, let's do that.

A. Exhibit 14 is the same plat map, but it's focused around Conoco acreage, which is in the southern portion of the South Dagger Draw Pool.

Now, Conoco currently has three Cisco oil producers: the Preston Federals 8 and 9 in Section 35 and the Preston Federal 5 in the east half of Section 34. We currently have one Cisco gas well, the Preston Federal 1 in the western half of Section 35, the southwestern quarter, and we have one Morrow gas well in the northeast quarter of Section 35.

Now, Conoco has plans to continue developing their South Dagger Draw acreage with the addition of five wells in 1994. Those five wells would be the Preston 3 in the short Section 34, which is essentially a replacement well for the Preston 4, which is temporarily shut in and may have to be abandoned because of mechanical conditions.

The Preston 12 in the southeast quarter of Section 34 would be an offset to the Preston 5.

Now, in Section 35 we've planned at least five additional oil well locations in 1994: the Preston 11 in the north half, the Preston 13 and the Preston 10 in the southeast quarter. All three of these wells are necessary to protect Conoco's correlative rights from offset drainage.

The dilemma exists, however, as Bill pointed out, that in the south half of Section 35, which is a laydown proration unit, we have an existing gas well, the Preston 1. Therefore, under current pool rules, we cannot develop our oil reserves on the east half of that laydown. Marathon is in a similar situation in their acreage.

Q. Is this dilemma confined to the margins or the edges of the South Dagger Draw Pool as we move upstructure, or is it potentially a dilemma throughout the pool as the oil column shrinks and the gas column expands?

A. It could be a potential problem throughout the whole pool.

Q. Do you have an illustration to give us a quick visual illustration of the dilemma?

A. I do. Exhibit 15 represents a simplified yet accurate picture of reservoir fluid distribution in South Dagger Draw, primarily as it relates to our southeast

quarter of Section 35. However, it could relate to any portion of South Dagger Draw that has a gas cap which overlays an oil column.

I refer you to plot number 1 which shows an initial conditions scenario, the water column overlaid by an oil column with solution gas, in turn overlaid by a free gas column.

Production scenarios 2 and 3 represent what could potentially happen.

Plot Number 2 represents gas cap production with no oil withdrawals. An example of this may be if Conoco is forced to develop their southeast quarter of section 35 as a gas well, or if gas is withdrawn from offset operators. The result is gas production which causes a pressure depletion.

Consequently, the oil will migrate towards the pressure sink, saturating the reservoir. In the process, oil will be lost to residual saturation, which we believe is between 20 and 25 percent, based on North Dagger Draw core analysis.

Production scenario number 3 represents an undeveloped oil location, which we currently have in the southeast quarter of Section 35. In this scenario, gas and oil would be produced from offset acreage. The result is a loss of reservoir pressure. The end result is a loss of

reserves to the operator -- in this case, Conoco.

I do want to make one note, that I have a label of rock expansion and water influx. In real time that's negligible in South Dagger Draw. We have seen evidence over time in isolated cases of a re-pressurization, but in terms of the withdrawals that we're seeing out there, the aquifer does not support -- does not provide that much support.

Q. To illustrate the dilemma that Conoco faces, have you selected a spacing unit that you operate and tried to quantify the volume of recoverable oil versus the volume of recoverable gas that is at risk under the current preclusion of simultaneous dedication?

A. I have, and that would be the south half of our Section 35 in which we have the undeveloped oil location in the east half, and the Preston Federal 1 gas well in the west half.

Q. Let's turn to Exhibit 16. Identify that for us.

A. Exhibit 16 is a volumetric analysis of the reserves potentially lost by Conoco under the existing pool rules.

Q. Does this represent your work, Mr. Majcher??

A. Yes, it does.

Q. And without going through all the details of the calculation, is this a conventional volumetric calculation?

A. Absolutely.

Q. And are you satisfied that you have accurately selected the parameters for the calculation?

A. Yes.

Q. All right. What's the end result of the calculation?

A. Well, the first case would be the undeveloped oil reserves on our eastern half. The end result would be a loss potentially to Conoco of just under a quarter of a million barrels of oil.

Under the second production scenario, should we choose to shut in the Preston Federal 1 gas well to develop the oil reserves, we can volumetrically determine gas reserves of 4.7 BCF based on the difference between estimated ultimate recovery from the P/Z analysis and -- the difference between that and the cumulative production to date, which is 4.8 BCF.

Now, these reserves, 4.7, BCF would be reserves unaccessed by Conoco, which would either be accessed by offset operators or left unrecovered.

Q. And that's true of either the oil or the gas?

A. That's correct.

Q. All right. What's the point?

A. The point is, operators, specifically Conoco in this case, stand to lose significant reserves if

simultaneous dedication is not permitted.

Q. As a reservoir engineer, what is your understanding of the reason for the simultaneous dedication as it now exists?

A. I believe the reason in general for simultaneous dedication is an attempt to preserve the oil column through the control of the withdrawal of gas.

Q. Does that bias in preference to the oil apply in this particular Pool?

A. Not really. Simultaneous dedication in this case does really nothing to protect the oil column, as we've illustrated here.

Q. All right. Is the oil column worth protecting by restricting the gas withdrawals in this pool?

A. Absolutely.

Q. Have you attempted to quantify the relative value of gas to oil?

A. I have.

Q. Let's turn to 17. Identify and describe that.

A. Exhibit 17 is a financial comparison between equivalent reservoir withdrawals of oil and gas. I believe it -- It quantifies what all of us already know, and that's that oil is much more valuable than gas.

What I've done was taken a barrel of oil and an MCF of gas, converted it to reservoir conditions, and then

applied a dollar value based on average product prices and producing costs for Conoco.

The net result, as you see at the bottom, the comparison, oil is approximately six times more valuable than gas on a reservoir volume basis.

Q. Have you concluded, then, as a reservoir engineer, that we ought to have rules in place in the reservoir that give a preference to having the oil produced first or to maximize oil recoveries --

A. Yes.

Q. -- in preference to the gas?

A. Yes.

Q. You've given us illustrations of why the simultaneous restriction rule is adversely affecting the reservoir and correlative rights.

A. Right.

Q. You've described a need for some kind of gas withdrawal limitation to maximize the oil.

A. That's correct.

Q. How did you go about deciding whether or not we needed a restriction on the gas and what that restriction ought to be?

A. Well, typically in an associated oil and gas pool, that limit is enforced through the use of a limiting gas/oil ratio. Conoco is of the opinion that the current

limiting gas/oil ration of 10,000 to 1 is excessive, it does nothing to protect the oil column, it promotes excessive depletion of the gas cap.

Q. All right. Let me go back and ask you how you get to that conclusion. Did you study and determine what the solution gas/oil ratio was for the reservoir?

A. Yes.

Q. And what is that number?

A. Under initial conditions, it's approximately 910 standard cubic feet per stock tank barrel.

Q. Did you study to determine the drive mechanisms at work in the pool?

A. Yes.

Q. Describe for us what those drive mechanisms are.

A. The drive mechanisms in South Dagger Draw are a combination drive -- that is, gas cap expansion, solution gas drive and a very weak water influx. The gas cap is necessary to drive the oil to the wellbore.

Q. In this reservoir, then, gas withdrawal is going to have an effect on ultimate oil recovery?

A. Absolutely.

Q. No doubt in your mind about that?

A. No doubt in my mind.

Q. Have you plotted for us the relationship between free gas produced out of the pool and solution gas?

A. That's represented in Exhibit 18.

Q. Describe for us what you've done.

A. Exhibit 18 is a plot of gas rate in million cubic feet a day versus time, for the oil wells in South Dagger Draw.

Q. All right, what's the time component?

A. The time component?

Q. When did you start and when did you finish?

A. The last three years from 1990 to 1993 -- four years, excuse me. And this represents really the active development period of South Dagger Draw.

Now, what we see here --

Q. This is all wells?

A. No, sir, this is the oil wells only, those wells which produce under the classifying gas/oil ratio of 30,000.

Q. All right. So the first cut of the analysis is, you excluded the gas wells?

A. That's right.

Q. And plotted the gas production associated with the oil wells that were producing under 30,000 to 1?

A. That's correct.

Q. What does it show you?

A. If you look at the blue shaded area, that represents the solution gas which is produced from the oil

wells. The red shaded area represents the free gas that's produced from the oil wells. And you can see that of the 20,000 or so million cubic feet -- excuse me, the 20 million cubic feet a day -- that 80 percent of that gas from the oil wells is comprised of free gas.

This is the result of several things. First, the nature of the reservoir.

It's a vugular dolomite, it has good permeability. It's a brittle dolomite too, which tends to fracture when the wells are stimulated. The stimulations are required to get economic oil rates and to maintain those rates.

So due to the combination of the vugs, the permeability and the fractures, that creates flow channels for the free gas in the gas cap to flow into the perforations in the oil well. So it's virtually impossible to produce at a solution gas/oil ratio in your oil wells. You will produce free gas from your oil wells.

Q. Let's set this illustration aside for just a moment, and let me ask you to go to some of the verifying data, starting with 19. Identify and describe that display.

A. This is simply the reservoir fluid analysis, PVT analysis, that I used in my calculation. This set of data is -- was determined from correlation.

The correlations are listed below. However, they show good agreement with the actual laboratory-derived PVT data that we have on north Dagger Draw.

Q. Let's go to Exhibit 20, which is the verification of the high GOR. Are those wells producing in excess of 30,000 to 1 that were excluded from the plot of data on 18?

A. Yes, Exhibit 20 contains two tables that show production data for the 10 wells that we had talked about earlier. Those wells which were highlighted in yellow on the plat map and represent wells that produce in excess of the 30,000 classifying GOR.

Table Number A lists the current data, the 1993 average production rates, and the gas/oil ratio. The average of those gas/oil ratios is approximately 184,000 standard cubic feet per stock tank barrel. Six of those wells are classified gas wells.

Q. And what's the significance of the asterisk?

A. Those denote that the well is classified as an oil well, based on my date source, which is the petroleum information well completion reports, or scout tickets if you will.

Q. Based on either current data or cum data, the gas/oil for those wells are all going to cause them to be reclassified as gas wells?

A. That is correct.

Q. Let's turn to Exhibit 20 and all of its subparts. What have you provided here as verification?

A. Exhibit 20 -- or 21, excuse me, A through J, are production plots of those ten wells, which we had just mentioned. These are intended to provide further documentation and a record of rates versus time for all of those wells.

I should note that on the -- The labeling on these plots, the oil is in barrels, the gas rate is in thousand cubic feet, and the GOR is in thousand standard cubic feet per stock tank barrel.

Q. Have you provided an illustration so that we can see the relationship or the effect that these 10 gas wells are having on reservoir voidage?

A. I have, that would be Exhibit 22. And I believe this exhibit diagrammatically illustrates the impact of these 10 gas wells on total field gas production for South Dagger Draw.

As you can see, the blue shaded area represents the total gas produced from the oil wells, solution and free gas produced from the oil wells, whereas the red shaded area represents that amount of gas produced by the 10 gas wells, those wells that exceed the 30,000 GOR, the classifying GOR.

What this is telling us is that a small portion

of the wells in South Dagger Draw, roughly 14 percent, are comprising nearly 50 percent of the total field gas production, total pool gas production.

And it is my opinion that including these 10 gas wells in any limiting GOR calculation would provide a meaningless limiting GOR. You simply have a handful of wells that would artificially inflate any calculated GOR, based on their high individual well GORs.

And the purpose of calculating a new limiting GOR is to limit gas production and to preserve the oil column. And it is our recommendation to use that data from the oil wells only.

Q. Let's look at the supporting documentation --

A. Okay.

Q. -- for Exhibit 22. Let me have you turn to Exhibit 23.

A. Twenty-three. This is the production data for the oil wells in South Dagger Draw. They're listed in tabular form in alphabetical order. Shown here are columns of 1993 total through June, that is, that amount of oil and gas produced between January and June of 1993. So that represents our current data.

I want to add that this data was sourced from *Dwight's Energy Data*, and they were only current through June of 1993 when this analysis was undertaken.

The second set of columns represents the daily average rate of these wells, and the third the cumulative production of all of these wells.

Totals are summed at the bottom. However, the total under daily average rate doesn't necessarily mean -- It's not a total of the daily rates. It's more of an average of all the wells.

This is the data used in the limiting-GOR calculation.

Q. All right. Let's turn to Exhibit 24 and have you identify and describe that.

A. Exhibit 24 is the calculation to determine the new limiting GOR as proposed by Conoco. I did this calculation using all three sets of data just to see how they compared. The first set used the current data, the 1993 production data, and it resulted in a limiting GOR of 4400 standard cubic feet per stock tank barrel.

Using the 1993 average production rate, i.e., an average well in -- an average oil well in South Dagger Draw, the limiting GOR was calculated to be 4385. And using the cumulative volumes, the resulting GOR was 4272.

So while the average is 4353, they're all in fairly good agreement. You've got a high of 4400. Conoco recommends a new limiting GOR of 4500 for convenience's sake.

Q. Let me ask you some questions about what you're able to conclude as a reservoir engineer.

Are you able to conclude that there is a direct relationship between ultimate oil recovery and gas withdrawals in the reservoir?

A. Yes.

Q. In your opinion, is the method by which to maximize oil recovery one that limits gas withdrawals?

A. Yes.

Q. When you've reached those conclusions, show us how that would affect operations in the field.

For example, do you have a general range of probability as an expert as to the life of the typical oil well in South Dagger Draw?

A. The typical life of an oil well in South Dagger Draw is probably between four and six years --

Q. Okay.

A. -- due to the inner oil column, than was present in North Dagger Draw.

Q. You've made the choice to get the oil first because if you don't, you won't get it?

A. That's correct.

Q. The life of the oil wells is four to six years?

A. That's correct.

Q. Can you control the gas withdrawals for that

period of time in order to maximize oil recovery for those oil wells?

A. Yes, and I believe the best way to control the gas production is to limit total proration unit gas production to that which could be accessed by oil well completions.

Q. When we look at the life of a gas well -- and thankfully there are not many yet, but when you look at the Preston 1, what's been the life of the Preston 1?

A. It's been about 20 years now. It's produced a lot of gas, 4.8 BCF.

Q. What's the forecast of the remaining life of that particular well?

A. Under which production scenario?

Q. Well, under the production scenario that you take the gas out of the gas cap first and forget the oil?

A. We anticipate reserves of approximately 4.7 BCF, and I would anticipate that at the current rate it would have a significantly long life.

Q. If the strategy to maximize oil and gas production is one where we take the oil first and go get the gas second, is that a strategy that's going to work?

A. Yes.

Q. Is delaying the withdrawal of gas out of the gas cap for five or six years going to have a material effect

on ultimate gas recovery out of the gas cap?

A. Well, provided that the gas is controlled in some manner, i.e., the new limiting GOR, it should affect all operators equally.

Q. Let's talk about another component, how we are going to apportion the gas withdrawals. If the Examiner adopts your 4500 to 1, the 6.3-million-a-day number --

A. That's correct.

Q. -- do you propose that the operator shall have the flexibility to take that volume of gas out of any of its wells within a spacing unit in any combination?

A. Provided that simultaneous dedication is permitted, yes.

Q. All right. Take the simultaneous dedication preclusion out so you can have gas and oil wells.

A. That's correct.

Q. Does it matter, under your scheme or proposal, whether or not the maximum possible -- eight wells, I guess?

A. That's correct.

Q. -- whether there's any limit on the combination of oil to gas wells within that spacing unit?

A. No.

Q. Shouldn't matter, right?

A. Shouldn't matter.

Q. Okay. If the idea or the strategy is to control the gas cap, how do we balance that point of view with gas withdrawals out of the wells? We're allowing a certain volume of gas to be produced.

A. We're going to allow that volume of gas which is associated with our oil well completions, because there is no way to produce less than that, as we had seen from that one plot.

Q. All right. Have you analyzed the completion periods of the various operators to see if they are maximizing the opportunity to stay within the oil column in the reservoir? You know, what's happening out there in the field?

A. I think for the most part, the prudent operators are trying to stay within the oil column.

Q. The difficulty, then, is as we continue with development of the reservoir the risk to all the prudent operators is that you're going to get closer and closer, in fact, in the gas cap? That's going to happen?

A. Yes.

Q. It's already happened to Marathon? It's already happened to you?

A. It's already happened to everybody.

Q. It's happened to Yates?

A. (Nods)

Q. All right. Let me give you a hypothetical. If we put the gas withdrawal limit now at 6.3 million MCF a day, over time, then, there is a possibility that the gas/oil ratio will climb throughout the pool?

A. That's correct.

Q. What, then, ought we to do, Mr. Majcher, in your opinion?

A. We need to continue with the proposed set of rules until all the oil is recovered, in my opinion.

Q. If subsequent data developed a need for an increase in the gas/oil ratio, then there's certainly a mechanism to accomplish that?

A. Yes, but I believe at this time that data doesn't exist.

Q. Would it unreasonably restrict the opportunities of any of the operators or interest owners to put the gas/oil ratio at 4500 to 1?

A. I think it would enhance opportunities to operators.

Q. In what way?

A. Well, by preserving the more valuable oil column, getting that out first, while still being able to produce at economic gas rates.

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

We move the introduction of Conoco's Exhibits 13 through 24.

EXAMINER CATANACH: Exhibits 13 through 24 will be admitted into evidence.

CROSS-EXAMINATION

BY MR. CARR:

Q. Mr. Majcher, let me be sure I understand what you're recommending as to the gas/oil ratio limitation.

A. Okay.

Q. What you've done is, you have first taken out the gas wells or those wells that should be classified as gas wells?

A. That's correct.

Q. Then you've looked at past performance from the oil wells, and you have set what you believe today is an appropriate limiting gas/oil ratio?

A. That's right, I've looked at past and current production.

Q. And if we look at it, what we basically have is a recommended gas/oil ratio that's just slightly above the current average gas/oil ratio?

A. That's correct.

Q. And your responses to questions from Mr. Kellahin indicated that you recognize that in this pool, the gas/oil ratios, just if we look at the current production profile

of these wells and project it into the future, that the gas/oil ratio will naturally increase?

A. That's true, but my cumulative analysis showed that that gas/oil ratio compares favorably with the current gas/oil ratio.

Q. But as the gas/oil ratio for the reservoir would continue to increase in the future, more and more of the production would be gas/oil-ratio restricted?

A. Right.

Q. And that would prevent production of the gas cap; is that correct? And therefore would maintain reservoir energy; is that what you're saying?

A. Right. It would control, not prevent, production of the gas cap.

Q. But it would limit that?

A. Right.

Q. As we move into the future, we're going to see more and more of the reservoir actually restricted by the proposed gas/oil ratio?

A. Well, what you'll see is a decrease in oil rates significantly greater than increase in gas rates. So your gas/oil ratio will increase at a rate faster than your actual gas production.

Q. And so what this is going to do is continue to limit more and more of the production, and we may have to

come back at some time for another rule change?

A. Well, but by that time the oil would be recovered.

Q. Now, you're saying that will occur in four or five years?

A. In my opinion, that's what I consider the life of these wells to be, yes.

Q. You do have some wells that produced oil for a substantially longer period of time than that, do you not?

A. Not in South Dagger Draw. All of our oil wells down there have been drilled within the last year.

Q. How many oil wells does Conoco operate in South Dagger Draw?

A. Currently three.

Q. Would any of these wells be restricted by a 4500-to-1 gas/oil ratio?

A. No.

MR. CARR: That's all I have.

CROSS-EXAMINATION

BY MS. AUBREY:

Q. Mr. Majcher, you do agree that removing the Rule 5(b) would result in an ultimate increase in recovery of oil reserves?

A. What it would do is prevent waste, yes, and protect operators like Conoco, Yates and Marathon's

correlative rights.

Q. Is it Conoco's position that the gas withdrawals in the pool today are too high?

A. It's Conoco's position that the current limiting GOR is excessive.

Q. But not the current gas production?

A. To my knowledge, no.

Q. So it's the gas/oil ratio today that's too high, in your opinion?

A. The limiting GOR is excessive.

Q. And are there wells in the pool which are producing in excess of that GOR now, except for the ones that are spotted on your plat with the yellow --

A. Right.

Q. -- that should be classified as gas wells, in your opinion?

A. Right.

Q. Are there oil wells that are producing in excess of that?

A. In excess of 30,000?

Q. Right.

A. No.

Q. Can you quantify the amount of oil that would be wasted or not recovered at a GOR, say, of 7000?

A. What I've been able to quantify is that maximum

target of oil potentially lost on Conoco acreage, and gas for that matter.

Q. And what would that be?

A. That would be the 215,000 stock tank barrels of oil and the 4.7 BCF of gas.

Q. At a GOR of 7000?

A. Under current existing rules.

MS. AUBREY: Thank you.

EXAMINER CATANACH: Mr. Bruce, anything?

MR. BRUCE: No, sir.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Majcher, your Exhibit Number 18, I'd like to talk about just a minute.

A. Okay.

Q. Is it your testimony that the oil wells within the pool, 80 percent of the gas that they're producing, is from the gas cap?

A. That's correct.

Q. How did you determine that?

A. I determined that based on taking the total volume of gas, actual data, from the oil wells, and then I calculated a solution -- excuse me, the solution gas volume, based on the PVT analysis we have and actual oil production data. That gave me the blue shaded area. The

difference between the total and the blue shaded area would be the free gas, or the gas-cap gas, that these wells produce.

Q. So there's a lot of gas currently being produced from the gas cap anyway --

A. That's right.

Q. -- within this pool?

Wells, oil wells that produce at a GOR in excess of 4500 to 1 aren't going to be restricted under your proposal, are they?

A. Under my proposal, the total proration unit would be restricted to 6.3 million.

Q. Individual wells that produce above 4500 probably won't be affected by the GOR limitation?

A. Well, no, currently wells that produce above the 10,000 GOR are not restricted.

Q. Ms. Aubrey asked you a question I'm not sure I got the answer to.

Is it your opinion that we will -- the increase, the proposed increase in GOR -- I mean the proposed decrease -- will result in the recovery of more oil ultimately from the pool? Is that your opinion?

A. It's my opinion, yes, because the current rules promote the blowing down of the gas cap, and as -- Every reservoir engineer knows that in order to preserve the oil

column, you need to protect or withdraw gas cap production.

Q. Is it your opinion that -- Or what is your opinion regarding the ultimate recovery of gas from the pool? Would that be affected in any way?

A. Probably not, if everybody is playing on the same field. But even if it is limited slightly, the value ratio is -- oil has a tremendous advantage, and we would want to see that produced first.

EXAMINER CATANACH: I don't have anything else of the witness.

Anything further?

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q. One point of clarification. If we go to 4500-to-1 GOR, that gives a spacing unit gas withdrawal of 6.3 MCF?

A. Yes.

Q. Based upon your study, there appears to be only one well in the spacing unit that would be curtailed --

A. Currently.

Q. -- currently?

A. Yes.

Q. And that is the Yates-operated well -- What is it? The Conoco 10? What's the number?

A. It's the Conoco 14, I believe.

Q. Conoco 14 down there in the southwest of 15 --

A. Yes.

Q. -- appears to be the only well under that situation that might be curtailed below what is currently producing?

A. Currently, yes.

Q. And currently, as you know it, it's producing about what?

A. I believe, if my information is correct, it's producing at about 6.5 million.

Q. All right.

A. Mr. McWhorter may be able to clarify that later.

Q. But that would be the only well that would be curtailed, as best you know?

A. That's right.

MR. KELLAHIN: All right. Nothing further.

EXAMINER CATANACH: Witness may be excused.

Let's take a short ten-minute break here.

(Thereupon, a recess was taken at 10:10 a.m.)

(The following proceedings had at 10:20 a.m.)

EXAMINER CATANACH: Call the hearing back to order, and I'll turn it over to Mr. Carr at this point.

MR. CARR: May it please the Examiner, I have tendered to you copies of a Notice Affidavit signed by me, confirming that notice of the Yates Application has been provided to affected interest owners as required by the

Rules of the Division.

If you will accept this on that representation, I will not call a land witness. So I would move the admission of our Notice Affidavit, Yates Exhibit 1.

EXAMINER CATANACH: Exhibit 1 will be admitted as evidence.

MR. CARR: At this time I would call Pinson McWhorter.

PINSON McWHORTER,

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 name for the record, please?

A. My name is Pinson McWhorter.

Q. Where do you reside?

A. Artesia, New Mexico.

Q. By whom are you employed?

A. Yates Petroleum Corporation.

Q. And what is the position you hold with Yates Petroleum Corporation?

A. Petroleum engineer.

Q. Mr. McWhorter, have you previously testified before this Division?

A. Yes, I have.

Q. At the time of that prior testimony, were your credentials as a petroleum engineer accepted and made a matter of record?

A. They were.

Q. Are you familiar with each of the Applications filed in these consolidated cases?

A. I am familiar with them.

Q. Have you made an engineering study of the characteristics of the reservoirs that are involved in these cases?

A. Yes, I have.

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

EXAMINER CATANACH: They are.

Q. (By Mr. Carr) Could you briefly state what Yates seeks by appearing at this hearing today?

A. Today Yates seeks to amend Rule 5(b) in the R-5353, which restricts and limits the types of wells that can be dedicated to a proration unit in South Dagger Draw field, i.e, a gas well and oil well being dedicated to the same 320-acre proration unit. We seek to see the removal of that 5(b) and -- the result of which would be that we would be, as operators, would be allowed to simultaneously dedicate oil and/or gas well from the same 320-acre proration unit.

Q. Does Yates also oppose a reduction in the gas/oil ratio currently being recommended by Conoco?

A. Yes, the second component is that we are in opposition to changing the gas/oil ratio as currently stated in the pool rules.

Q. Mr. McWhorter, would you refer to what has been marked Yates Petroleum Corporation Exhibit Number 2? It's included inside the back cover of the exhibit booklet. Would you identify that and review it for the Examiner, please?

A. Yes. Exhibit Number 2 shows -- It's a plat that shows those areas in South Dagger Draw that we have determined currently are potential areas for problems with respect to simultaneous dedication of oil and gas wells on 320-acre proration units.

I think that we are in agreement with our colleagues from Conoco that this Rule 5(b) has, and will continue as currently worded, to be an obstruction to the orderly development and proper depletion of this field. We agree that it could lead to waste and violate correlative rights.

Q. If I look at your Exhibit, 2, the south half of 35 is one of those problem proration units?

A. That is correct.

Q. And that is the proration unit that Conoco

discussed on which its Preston Number 5 is located?

A. That is correct.

Q. The other units identified on this exhibit are exhibits [*sic*] where they are, in your opinion, are facing immediate problems with the simultaneous dedication rule?

A. Yes, the one proration unit that's in the north half of 36, which is a problem area for Marathon Oil Company currently, and two areas, one in Section 23 and one in Section 26, the west half of those sections, that are potential problems -- or current problems for Yates Petroleum.

Q. Let's go now to what has been marked Yates Exhibit Number 3. Would you identify this, please?

A. Well, Yates Exhibit Number 3 is a spreadsheet of oil well GOR in the South Dagger Draw field.

The gist of this spreadsheet is that we have accumulated statistics that are provided to the Oil Conservation Commission, C-115 data, from these wells that we have determined that should be classified as oil wells. We have eliminated those wells that are in the problem areas that would not be classified as oil wells.

We have looked at the data for July, August and September, the most current data that we could acquire at the time we made this exhibit.

And what this exhibit shows is the statistical

distribution of gas/oil ratios within the South Dagger Draw field.

And I might just make note of a couple of interesting phenomena.

This is a three-month data sample, but even from the July data, I count approximately seven of the 56 wells that I have in my sample were greater than the current 10,000-to-1 gas/oil ratio. That's about 12 1/2 percent of the wells in July.

Now, this data, I want to emphasize, is July, August, September, which is different than the data that was shown by Conoco that goes from January through June, the first part of this year. This data is the most current data that we had available.

Twenty-two of the 56 wells, or about 39 percent of the wells, are above the recommended -- Conoco-recommended -- 4500 to 1. And that's in the July data.

In the September data, nine of the 56 wells, or roughly 16 percent, have moved into that category that are greater than 10,000 to 1, i.e., they're increasing already. Even over the past three months, we're seeing this phenomenon of gas/oil ratio increase.

Twenty-six of the 56 wells, or 46 percent, are above the recommended -- Conoco-recommended -- 4500 to 1.

If you look at the bottom of page 2 under the

gas/oil ratio data and look at oil well totals, we have calculated an average GOR, gas/oil ratio, standard cubic feet per stock tank barrel -- it says barrel but they are stock tank barrels. We see an increase each month of approximately eight percent.

This phenomenon, which I would conclude, and I think the Conoco reservoir engineer has concluded also, is typical of solution gas drive reservoirs where they have a strong solution gas drive component increasing GORs.

Q. All right. Your conclusions, just from the statistical data, are, one, that there's an increasing gas/oil ratio in the pool?

A. That's correct.

Q. What other conclusions can you reach?

A. Okay, I conclude that the average is above 4500 currently.

I conclude that, as you alluded to, the trend is increasing, it's already increasing, and it will continue to increase for some time.

And I conclude that by this, operators need to provide for the assured increase in the future GOR and not lock in on a number that will force us to come back to ask for an increase in the field GOR within a short period of time.

Q. And the spreadsheet, the data on the spreadsheet

basically shows that 4500 may not be the appropriate GOR level?

A. That is correct.

Q. You'll have other information that will address the 10,000-to-1 question --

A. Yes.

Q. -- is that right?

A. Yes, I will.

Q. Why don't we go to what has been marked as Yates Exhibit Number 4, and I would ask you to identify and review that for Mr. Catanach.

A. Yes, Yates Exhibit 4 is a plot of the Canyon -- Cisco/Canyon, South Dagger Draw-Canyon, whichever you want to call it, bottomhole pressures, corrected to a minus 4000 foot datum, sampled during this year.

The gist of this exhibit is to address the concept of gas cap drainage effects.

The point that I want to demonstrate here is that the gas cap in South Dagger Draw is not a reservoir engineering textbook gas cap example. It's a very complicated field.

Testimony from Mr. Hardie, the geological witness for Conoco -- which I enjoyed his testimony on hydrodynamic distribution of reservoir fluids; I think I've seen elements of it before -- say this: That because of this

hydrodynamic trapping effect, the gas cap will be displaced in an updip direction because of the physical relationships as described by Mr. Hardie, and it will be displaced in hydrodynamic reservoirs off of the oil leg.

Additionally, Mr. Hardie, in his exhibits --

Q. So what you're saying is, instead of the gas cap being above the oil, in this situation it's off to the west?

A. It's displaced to the west.

Q. Okay.

A. And I think both companies agree that the majority of the gas cap is displaced to the west and does not conformably lie on top of the oil column. Therefore, depletion of gas cap would not necessarily hinder what would otherwise be good expansion of the gas cap if it were conformably overlying the oil column.

How does this data that I'm presenting here show that? If you'll notice, that in the western part of this field, in the gas cap, we have measured pressure in August of this year. Reservoir pressure was up around 1500 or 1600 pounds, on average.

If you look over in the oil column, the eastern component of the field, where there is little gas cap overlying the oil column in this part of the field, you'll notice that reservoir pressures are significantly -- half

or less.

The point of this exhibit is that the gas cap, which is at a much higher pressure, is not giving significant pressure support to the oil column as we exist.

If it's not giving significant pressure support at this point, there must -- my conclusion is that there is poor hydraulic communication between this gas cap and the oil column that lies to the east. The gas cap is displaced to the west, it is displaced, and the displacement mechanism of that was the hydrodynamic trapping mechanism of this reservoir.

Again, we agree with the geologic interpretation that there are multiple zones vertically in this well which are directly related to the depositional facies, the original deposition of the reservoir rock, and we see porous zones intermittent with zones that are not impermeable but semi-permeable zones that would effectively create some hydraulic conductivity barriers vertically in the wells. And I think the pressure data here demonstrates that there is not good pressure communication between the gas cap and the oil leg.

Now --

Q. You're not seeing the good vertical communication in the reservoir that Conoco --

A. No, I'm not.

Q. All right.

A. This vertical segregation that is primarily controlled by the reservoir character -- i.e., the rock distribution vertically in the reservoir, the facies distribution in the reservoir -- is most dramatically emphasized in a well that Conoco cored, the Dagger Draw Number 12, which is up in the north pool.

Extensive study of that core by Reservoir, Inc., clearly demonstrates that there is a substantial degree of vertical heterogeneity in the wellbore: porous zones which are essentially bank-and-shoal facies, interlaced and interspersed with basinal facies and slope facies, which are the tighter facies.

If one were to correlate the standard core analysis of vertical permeabilities, you would find that the basinal facies, the slope facies that are intermixed between those porous reservoir facies, are extremely tight with respect to vertical permeability. .01 millidarcies is the range of magnitude that we see in there.

The Saguaro 8, which is in the south pool and is in Section 14 of the south pool, we cored that well also. And the things we saw in that well parallel what is seen in the Conoco Dagger Draw Number 12.

Hence my thesis that there is a vertical segregation in this reservoir. The pressure data indicates

it, the core analyses indicates it. The gas cap is thin over the oil column; the isopachs of that demonstrate that.

Hydrodynamic trapping effects further validate the hypothesis that the gas cap, and hence gas cap expansive energies, are displaced to the west and are not strictly conformable on the top of the oil column.

Expansion of this gas cap is not as effective as when it's actually lying on top of the oil column.

That's the gist of --

Q. -- Exhibit Number 4?

A. That's correct.

Q. Let's go to Exhibit Number 5. Would you just first identify this?

A. Well, in an effort to investigate the effects of gas cap management, gas cap production, on recovery of oil in the South Dagger Draw Pool, we decided that there are basically two approaches that an engineer can take.

One is an analytical approach. An analytical approach does not take into account the large heterogeneities that we see vertically and areally in this field.

Additionally, the analytical approach would be weak in its ability to predict the effects of gas cap production in a gas cap that is displaced off of the oil column by hydrodynamic trapping.

Hence, we went with the second method, and that's performing a numerical solution or performing numerical simulation, and that's what we did.

This exhibit is the documentation, the report of the numerical simulation, black oil simulations, that we conducted in conjunction with Scientific Software-Intercomp in Denver, Colorado.

Q. Now, how were you personally involved in this study?

A. I was involved in this study for -- in that I would make trips to their offices in Denver, approximately one week at a time, and sit down with the consulting engineer that was working on this, and we would work on the basic reservoir description itself, the fluid description as the initial, and then the beginning of the model initialization, the pressure history match, the saturation history match, and then the prediction runs.

So I was involved in working with him on a one-to-one basis in his office throughout a substantial portion of this study.

Q. Generally, what does Exhibit Number 5 show you?

A. The objective of this study was, as I said, to determine the effect of gas cap depletion on downdip oil production. And as I said, it was a three-phase black oil simulator. A little over 500 grid blocks represented a 3-D

model across an area that expands from -- If you'll look at your Exhibit Number 2, I have on there a line showing the wells that were included in this 3-D model, and it goes from the Algerita Number 1 on the western component to the Ceniza Number 3 on the eastern component, Algerita Number 1 being high well in the gas cap, Ceniza Number 3 being a downdip oil well.

So this cross-sectional model samples the -- one of the prime areas in this field, to see the effects of lots of gas cap production and oil column production also.

And the conclusions from this study are that operational changes in the management of the gas cap really have little effect on the oil recoveries.

And so, producing gas cap at various rates does not really encourage waste, either oil recovery waste or gas recovery waste or even economic waste.

Q. Now, if we look at Exhibit 5, that contains all the supporting data?

A. That has all the supporting data in it.

Q. Are you ready to go to Exhibit Number 6 --

A. Yes, I am.

Q. -- and discuss your conclusions?

A. Yes.

Q. Let's go to that now, then.

A. Okay. Exhibit Number 6 highlights the

conclusions of this study. It shows three prediction cases. After we history-matched this model, we ran three prediction cases.

The number one prediction case was continued operations. In other words, continue to produce the field at the current gas rates and oil rates, whatever field rules are in effect, current field rules.

We saw that we produced 682,000 barrels of oil in the model area, and about 19 BCF of gas.

Then we ran a second scenario where we continued the oil production but this time, to see the effects of this purported excessive gas cap drainage, we shut in all the gas cap wells that were in the model, completely shut those wells in, to see the effects of this gas cap.

And we saw that oil production increased 2000 barrels to 684,000 barrels of oil. We saw that the gas, during the time that the simulation was run, of course, with the gas well shut in, gas production went to 9.7 BCF.

If I were to look at the two scenarios from a present worth basis, discount it at a modest five percent, I would see that current operations would generate for that model area $10.5 million over the life of the field.

But if we restrict the gas production, and getting very little incremental oil production, we're talking about $6.8 million over the life of that -- of the

wells that are in that model.

Now, I have reported -- I want to make one point clear, that the gas production in the model was 9.7 BCF, by shutting in those gas wells. In the economics, of course, you're going to open those gas wells up after the oil depletes.

So the difference between the 9.16 and the 19.4 that we saw in the base case was produced in the economics, but it's displaced so far in the future that the present worth of -- even at five percent, it's very little.

I ran a third case: Continue the oil production in the oil leg as is, but accelerate the gas production in the gas cap, produce it as hard as you can.

And the way we accomplish that is, we drilled two more wells, for the simulated drill, two more wells in the gas cap, and we brought those on at maximum production again.

Again, the oil in here has not moved at all. Of course, there's a little more gas production. Now we're talking about 21.5 BCF versus the base case of 19.5 BCF. However, the present worth of that gas stream is $11 million.

Now, my conclusions from this study are that gas cap production from the gas cap has little incremental effect upon oil production in the downdip gas -- or oil

leg, excuse me, oil leg.

Now, this seems at first, I know, maybe a conclusion that violates what many of us learned in our first reservoir engineering course. But remember, we have seen evidence that shows that there's probably very poor communication hydraulically, pressurewise, between the gas cap and the oil leg.

In a carbonate reservoir, such as this, which we all will testify to is very heterogeneous both vertically and areally, there are extremely developed, extremely tortuous paths by which gas could migrate from this western displacement and expand onto an eastern oil leg.

The fact that our textbook knowledge of gas cap expansion lying on top of an oil column is not present in this instance, and I would like to cite two other instances in the Permian Basin in carbonate reservoirs where we have found operators have demonstrated that gas cap in these heterogenous carbonates does not have a significant effect on the oil production.

One of those pools is the Diablo Fusselman Pool in Chaves County, New Mexico. This is a Fusselman pool in a carbonate reservoir. It's a gas cap, large gas cap on top of an oil leg, on top of an aquifer.

We did extensive studies. We are an operator in this pool. We did extensive studies, and history has borne

out the fact that production of the gas cap has not significantly affected the oil production in the oil leg in the oil leg in this pool.

We did -- Again in 1991, we did an extensive simulation study with Scientific Software which bore this fact out.

Second example -- and I believe it's the Seminole San Andres unit. It may be the southeast Seminole San Andres unit. Doesn't matter which one it is. That's a minor point.

The point is, that pool, carbonate reservoir, San Andres time, thick carbonate reservoir, very heterogeneous vertically and areally, consisted of two domal anticlines that had gas cap on top of oil leg, on top of water.

Even with gas cap injection, the operator found that over time, history, actual data, shows that there was no significant improvement in gas cap -- I mean in oil production.

Their conclusions were that they did not know enough about the internal geological architecture of the reservoir. So they proceeded to drill 14 more infill wells that they cored, every one of the wells, and did detailed geologic studies, and they found evidence that is similar to this Dagger Draw core that we have found: many, many zones, layering between a basinal facies and algal facies

that contributed to poor vertical communication between the gas cap injection wells and the oil column, which shows that there was poor expansion characteristics, i.e., poor hydraulic communication between the oil leg and the gas cap.

So these conclusions of the simulation are not in opposition to documented examples that we have of carbonate fields with gas caps in the Permian Basin.

Q. Mr. McWhorter do you see any reason to change the rules for the South Dagger Draw Upper Pennsylvanian Pool to change the current 10,000-to-1 gas/oil ratio?

A. No, I do not.

Q. In Conoco's Application they also oppose, although I don't believe it's been addressed here today, limiting the number of wells on a 320-acre unit. Are you familiar with that?

A. Yeah, I did read that in the Application, yes, sir.

Q. Do you believe such a limitation, limiting the wells to no more than eight, would be appropriate?

A. No, I do not.

Q. And why not?

A. Well, again, I will cite the experience of the petroleum industry in the Permian Basin, that we have -- we, the industry, has found that oftentimes development on

a larger spacing is not adequate to recover even all of the primary reserves that are under a given acreage tract, and they have found that infill drilling increased primary reserves and secondary reserves.

So it's my opinion that Dagger Draw, South Dagger Draw field, is very closely akin to this type of operation, and we should not preclude the opportunity to develop on tighter spacing if we determine with further studies that infill drilling would increase primary oil recovery and probably most assuredly secondary or tertiary oil recovery.

And the language such as that, if it were put in an order, would, I say, my opinion is, requires at some future date to come up and have that changed because of the actual observed data that we would have seen at that point.

Q. In your opinion, will elimination of Rule 5(b) from the pool rules for the South Dagger Draw Upper Penn Pool be in the best interests of conservation, the prevention of waste and the protection of correlative rights?

A. Yes, it would be.

Q. Were Exhibits 2 through 6 either prepared by you or compiled under your direction?

A. They were.

MR. CARR: At this time, Mr. Catanach, we move the admission of Yates Petroleum Corporation Exhibits 2

through 6.

EXAMINER CATANACH: Exhibits 2 through 6 will be admitted as evidence.

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

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. McWhorter, it's been a while since I've fussed with the black oil model on reservoir simulation. I want to ask you some questions so I can understand the process, so that I can take this information and give it to Mr. Kent or Mr. Hoover or someone else and have them duplicate --

A. Yes, sir.

Q. -- what you've done.

When I look at the book, wherever that book may be, is that book complete as it is now presented so that a reservoir engineer like Mr. Kent with experience in reservoir modeling, using various different simulations, can duplicate the results?

A. Okay, this book, as it exists right now, is not exhaustive in its presentation of all of the things that went into this model.

For example, you will find in this book that the tops of the various layers that were used in the vertical

segregation of this model are not included here.

You will find that the -- Okay, go ahead.

Q. Did you give me the geologic mapping or the interpretations that went into the model?

A. Those maps are not in here.

Q. Okay. Are they available to us?

A. Oh, they most certainly are.

Q. All right, sir. In addition to not having the geologic interpretation that was built into the model, is there anything else that's not in the book that Mr. Kent would need in order to validate the simulation?

A. Okay, since you've precluded the geologic evidence such as porosity distributions, permeability, all the petrophysical properties that --

Q. I don't want to preclude anything. I want to know what he needs to do the work that you did.

A. He would need the petrophysical properties of the rock. You would agree that he would have to be able to describe the reservoir rock itself from a petrophysical component to be able to simulate reservoir flow. The petrophysical data is in this book. Okay?

Q. All right, sir.

A. He would also have to have production data. He would have to have pressure data. The pressure data is in this book. The production data is in this book in a

graphical format, production plots.

But it's a matter of public access to gather the production data in order to do the history matching of the production.

Q. The model itself --

A. Yes.

Q. -- the black oil model --

A. Yes.

Q. -- does the book reflect exactly which black oil model was used to run the simulation?

A. Yes, it does.

Q. Describe for me what a black oil model is in a general way.

A. Generally, a black oil model, a three-phase black oil model such as this, is a finite-difference solution to the rather complicated partial differential equations that we use to model reservoir flow.

And the black oil model simulates that and simulates the multi-phase flow of all three phases in the reservoir: oil, water and gas.

It has historically been named a black oil model in opposition to those models which are compositional models. Black oil --

Q. All right --

A. Yes.

Q. -- I think that's where my confusion lies. When you said black oil model, I assumed a single-phase flow model that did not have the multiple components to it.

A. No, sir. As documented in the book here, this is a full three-phase black oil simulation.

Q. All right. Let me talk about the area that was used for the simulation. What was the area study?

A. Okay, the area study was this: It basically, as you have on --

Q. -- Exhibit 4?

A. -- Exhibit -- I think it's 2.

Q. This is Exhibit 4?

A. I think Exhibit -- If you'll look at Exhibit 2, and you can lay beside that also Exhibit 4 if you like Exhibit 4 better. Exhibit 4 is also --

Q. I don't care about either one --

A. Yeah.

Q. -- I just want to know about the area that you modeled. Which area --

A. The area that I modeled is portrayed on both. The area that I modeled on Exhibit 4 goes from the well -- It's on the western edge in Section 16, which is the Algerita Number 1.

Q. I've got nine sections in the model on Exhibit 4.

A. No.

Q. That's all this model modeled, was these nine sections of the pool?

A. No, I haven't finished yet.

Q. Okay.

A. This model goes from the Algerita Number 1 eastward to the Ceniza Number 3, which is in Section 13, which is not portrayed on Exhibit 4, but which is portrayed on Exhibit 2.

There's a strip model, three-dimensional strip model, that covered the cross-section of that area that covers the gas cap to the west and the oil leg to the east.

Q. Okay. Now -- I can't see it, I'm sorry. When I look at Exhibit Number 2 --

A. Two --

Q. -- the area modeled is a portion of 16, 15, 14 and 13?

A. That is correct.

Q. That's it?

A. That is adequate.

Q. All right. The hypothesis that went into the model --

A. Yes.

Q. -- was one that hypothecated a vertical segregation in the reservoir?

A. That is correct, because the real data from the

field, core data and pressure data, indicated that that was entirely a plausible reservoir characterization.

Q. If the hypothesis of vertical segregation is wrong, then all the results of the model are going to be wrong?

A. That's true. And if it were wrong, then we would not be able to get the history match that we got in the simulation.

Q. Okay. What parameters were adjusted to make the history match?

A. The parameters that were adjusted to make the history match, to make it short --

Q. Yes.

A. -- it took a long time to history-match this, because we have all testified that this is an extremely complicated reservoir.

Q. Most simulators --

A. Yes.

Q. -- will take a combination of two or three parameters and within engineering reason make the adjustment to those parameters to make the history match?

A. Depending on which component of the history match you're talking about. The components that you vary are different. For instance -- Go ahead.

Q. There would be a number of components that for

this reservoir are probably good fixed numbers, and you would not likely adjust in order to make the history match?

A. There are some components of the reservoir that definitely you would not adjust, such as formation tops and things like that. Those are fairly well determined.

Q. To shorten the conversation, tell me what were the parameters that were adjusted --

A. Okay.

Q. -- to make the history match.

A. The parameters that were adjusted to make the history match were, one, we had to make some pore volume adjustments.

The way you make pore volume adjustments, you either adjust your height -- But we felt from log analysis we had good height. So we had to adjust our pore volume porosity, our effective porosity, up to account for the pore volume that we were seeing produced in the field through the pressure response.

So that was one component that we adjusted.

Q. Will the report show the range of adjustment made, or do we need other information from you to get that?

A. No, you'd have to have the actual files themselves, the historical development of each file, as you make those adjustments. And I know of no report like this that goes into all of the details of the range of

adjustment made. As long as you make them within a reasonable engineering adjustment range.

Q. In order to expedite the review of Mr. Kent or someone else, I was trying to lead him into the book or information from you so that he would at least know within his engineering judgment what parameter you are adjusting and what range you selected to make that adjustment.

A. Well, the parameters we adjusted were porosity, and that was for pore volume reasons --

Q. Okay.

A. -- we adjusted porosity.

Additionally, for reservoir flow characteristics we had to make some adjustments to horizontal permeability.

Q. Okay.

A. All right? Then just after we had our history match, the history match completed, we did have to do some modification to well indices, because you want the production at the end of the history match up here to be able to tie it to the production at the beginning of your prediction phases.

And as he probably well knows, any simulator well knows, that the constraints, either rate constraints or pressure constraints, are different for the two different phases.

And so that's why you have to make those kinds of

adjustments when you're going through history match into prediction.

Q. The production maps you're making on the performance of the wells, does the book show what wells you're matching?

A. Yes, it does.

Q. Apart from the area examined by you for the simulation --

A. Yes.

Q. -- have you examined as a reservoir engineer the performance of wells in other areas?

A. Yes, I have.

Q. Mr. Hardie and Mr. Majcher were testifying about their wells down in the transition area, some of the Preston wells, the -- particularly the Preston 5, I believe. That's the new well.

A. Yes.

Q. My recollection is that that well -- that the original reservoir pressure should have been in the range of about 2600 pounds, maybe, 2700 pounds?

A. Yes, that's correct.

Q. And that when it was tested, the initial pressure in that well was perhaps slightly below 2000 pounds, if my memory serves me?

A. That's what he testified to.

Q. If there is a segregation in the reservoir between the oil and the gas, what explains the pressure reduction that these fellows saw in the Preston 5 well?

A. Well, Mr. Kellahin, that's explained by the fact of the location of the Preston 5 versus the location of the Preston 1.

The location of the Preston 5 is in the southern portion of the gas cap. It has an oil column below a major section of the gas cap. So we're producing copious amounts of gas out of the gas cap right on top of the oil column.

But in the majority of this field the gas cap, the significant gas reserves, are displaced off of the top of the oil column. This is different.

Q. I want to try to understand your hypothesis.

A. Uh-huh.

Q. I want to show you Mr. Hardie's Exhibit Number 9, which is his isopach of the Cisco gas cap.

A. Uh-huh.

Q. His interpretation from the data he's examined shows that there is substantial thickness to that gas column directly overlying the oil production in the fairway of the pool.

A. In that segment of the pool --

Q. Yes, sir.

A. -- which references a relatively small area of

the total South Dagger Draw Pool.

Q. Look at his color-code down there in 35.

A. Yes.

Q. That's a thicker section. I've forgotten the footage. It's what? 150 feet or so? I've forgotten.

A. Yes.

Q. As you move up that same color code --

A. Yes.

Q. -- it stays on the display and gets up into the fairway --

A. Right.

Q. -- where the Yates operating wells are?

A. Right.

Q. Isn't there gas overlying the oil column within the fairway there?

A. There is gas. But if you look at the Preston Federal Number 1, sir, it never tested for oil in the whole dolomite section. So there is not -- In that location there is not gas on top of oil.

Q. Okay.

A. So there is not gas lying conformably on top of oil. It's displaced.

Again, down to the south in the Mojave Number 1 we've found the same phenomenon. You're on regionalized -- or localized -- highs. And oil does not lie under the gas

cap in those two locations where Mr. Hardie has this darker shading indicating thicker area of the gas cap, and therefore is not conformably lying on top.

Neither are the wells to the east, the Preston wells that have been recently drilled by Conoco. They're off the flanks of the major portion of the gas cap in this well -- in this area.

Q. Am I able to conclude from your hypothesis that the oil column in the Cisco Pool for South Dagger Draw can be produced without having the gas withdrawals from the gas cap affect that oil production?

A. In the major portion of South Dagger Draw field, that is true. And even in the very southern end it is questionable. We have not seen any data presented that shows that there will be adverse effects on oil production in that area.

What we have seen is presented the original oil in place for the Preston Federal Number 5. But no data indicating what excessive gas cap withdrawals would have on the recovery of 219,000 barrels, or is it 200,000 barrels, or is it 150,000 barrels or what?

Q. Has it been Yates's strategy to complete the Cisco so that we stay out of the gas cap in the wells you operate?

A. That is correct, that is correct.

Q. The current rule, 10,000 to 1 --

A. Yes.

Q. -- where did that come from?

A. Well, Mr. Kellahin, that started with North Dagger Draw and started in -- there was a rule that was adopted in -- I think it was December or January of -- December, I think -- of 1977, from the late Seventies.

And at that time, because of indications of increasing GORs, just as we're seeing increasing GORs in the South Dagger Draw Pool now, the statewide rules of 2000 to 1 were modified under expert-witness testimony, that they should be changed to 10,000 to 1 for the North Dagger Draw Pool, which has been testified as not having any gas cap over it.

So even in those wells that have less, I would contend, less gas cap, they immediately, way back in 1977, recognized the importance of adopting a higher GOR than what is normal. Those rules were adopted.

Q. All right. Let me go back --

A. Some years later --

Q. I want to go back.

A. Okay.

Q. You said there was expert testimony?

A. Yes.

Q. Did that expert testimony include any PVT data

for the solution gas/oil ratio for South Dagger Draw?

A. I can look up that expert testimony, but I do not recall them giving detailed PVT analysis for that.

Q. I've got the transcript here, it's --

A. Right.

Q. -- not there.

A. Yeah. So I recall correctly then.

Q. My recollection is, Dr. Boneau testified that they were using the North Dagger Draw gas/oil ratio and simply by simple arithmetic got to 10,000 to 1 in South Dagger Draw.

A. That is not correct.

Q. No?

A. No.

Q. Was there scientific data introduced by Dr. Boneau to justify 10,000 to 1?

A. Dr. Boneau was not the witness at that particular hearing where 10,000 to 1 was adopted for Dagger Draw.

The basis of the 10,000 to 1 was adopted back in 1990, I think. You probably have the order there on your desk. And the testimony was such that at that time South Dagger Draw had 8000 to 1. We were asking for a modest increase to 2000 to 1, and we were asking for an increase in oil well allowables because we recognized through expert geological testimony at that time that these two fields

that historically had been developed as separate fields were very similar.

And so to make the equities more reasonable across the fields, we decided -- and the Commission agreed with us -- that we should increase the oil well allowable and the limiting GOR. And that's the history of that.

Q. When the -- When we look at the oil wells in South Dagger Draw --

A. Yes.

Q. -- 56 are there by your count?

A. Oh, something like that, 56 -- It changes rapidly.

Q. One of your displays had 56 on it.

A. Yeah.

Q. All right. When you take the producing gas/oil ratio for those 56 wells over the life of those wells, what is that average GOR?

A. Well, I don't know the answer to that question.

Q. Yeah. I couldn't find it on your display.

A. No --

Q. You didn't average them out?

A. -- because it's not the display because I wouldn't base GOR, a future GOR, on a field that is solution gas drive based on past GOR performance, because we all recognize that the GOR is increasing with time. Not

will increase; it is increasing with time.

Q. It would help me to know what the average gas/oil producing ratio was for the 56 wells, if I also knew that you had the ability under the current rules to take out 14 million MCF of gas a day. I want to know what that window of opportunity is for you and other operators, above which you're not currently utilizing in terms of gas withdrawals.

A. No, you're right.

Q. Can you tell me?

A. We're not utilizing 14 million a day.

Q. All right, sir --

A. But --

Q. -- what are you utilizing?

A. Of that allowable, 14 million a day?

Q. Yes, sir.

A. Well, we have one proration unit that's producing close to 9 million a day. Significantly above the 6.3 million a day that would be calculated from the 4500-to-1 gas/oil ratio.

Q. Do you have any disagreement with Mr. Majcher's data on the solution gas/oil ratio for South Dagger Draw? He had a number of 911.

A. That is, in fact, what we found the original solution gas/oil ratio to be, computed from PVT data.

But that solution gas/oil ratio changes with

time. It's pressure-dependent, and as pressure depletes the solution gas/oil ratio depletes also.

Hence the evolving of the free gas that is shown on some of his maps here, and the evolution of that gas from the oil contributed to the free gas that he's showing on those wells and is not indicative of necessarily all the free gas being from the gas cap. Much of the free gas is evolved from the oil production.

Q. I think you recognize that there is an aquifer that's dynamic in the reservoir?

A. What I do recognize, sir, is that this reservoir has all the characteristics of hydrodynamic trapping. That would imply that there is water movement within the reservoir rock itself.

Q. My question is, have you attempted to quantify the magnitude of pressure support or effect the aquifer is having on the dynamics of the reservoir?

A. I'm in agreement with the testimony of Mr. Majcher that the water drive in South Dagger Draw is very weak.

Q. Do you have an opinion as to where that water migration is coming from, what is the direction of that water movement?

A. Yes, do.

Q. Yes, sir. Where is it from?

A. In a regional sense, the movement of fresh water is another point to conclude the hydrodynamic trapping, because these are extremely fresh waters. Chlorides run from 5000 to 6000 parts per million, so we're seeing recharge from somewhere.

The only place that we could be seeing recharge are those areas in that area of Eddy County and parts of Chaves and Otero County where we could have a recharge zone through high-angle fault systems in development with the Huapache monocline and the development of the Guadalupe Mountains. And we believe that the recharge comes from the west, basically from the west, in a regional sense from the west.

And that is entirely borne out by the other regional aquifers up the hole, up through the San Andres. Numerous studies of the Roswell/Artesian Basin indicate that recharge for aquifers in this area of New Mexico basically come from the west.

Now, I would agree with Mr. Hardie's testimony that there is a divergence of that flow because of the encountering of the dolomitized rock, which is a greater conduit for fluid flow than the limestones that are to the west in the Pennsylvanian-age rock.

And so the water does begin to take an element of a northeast trend.

Q. What is the source of the water, then?

A. The source is a recharge over geologic time from the west.

Q. Okay.

A. Basically regionally from the west.

Q. Does the reservoir simulation model take into account that component in running the simulation?

A. Well, sir, any reservoir simulator will tell you that no reservoir simulator can start in dynamic conditions. It has to start at static equilibrium.

So to initialize a model, you have to initialize it at static equilibrium. And we were able to do that and able to account for the tilted effects through the use of petrophysical data.

MR. KELLAHIN: Mr. Catanach, we would request opposing counsel to have his client provide us with the necessary supplemental data so that we might validate the model that Mr. McWhorter has presented to the Division today.

EXAMINER CATANACH: Is that a problem, Mr. Carr?

MR. CARR: No, it is not, Mr. Catanach. We'll provide the geological data that Mr. McWhorter discussed.

EXAMINER CATANACH: Thank you.

MR. CARR: We will provide that data to Mr. Kellahin's client and also to Ms. Aubrey's client.

MR. KELLAHIN: Thank you, Mr. Examiner.

EXAMINER CATANACH: Ms. Aubrey?

MS. AUBREY: I have no questions.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. McWhorter, the simulation that you did, do you think that that's a good indication of what is going to happen in the reservoir, on the western edge of the reservoir?

A. Mr. Catanach, I do. I believe that the results of the simulation are indicative of what will happen with various gas-cap management scenarios in the western component and in the eastern component of the reservoir. Yates Petroleum itself is convinced of that.

We have drilled, as you're well aware, the Ocotillo Number 2, which is in the western component, in the gas cap component. It looks like it's going to be in the gas cap component.

And we are currently drilling the Carl TP Number 3, which is south of the well that was alluded to by the Conoco witness, the Conoco 14, which is in the gas cap.

We would not be drilling those wells if the results of this study indicated that gas cap depletion had significant effects on oil production.

Q. The portion of the reservoir that lies to the

south --

A. Yes, sir.

Q. -- do you have an opinion as to whether your model would be indicative of what might happen in that portion of the reservoir?

A. Sir, I cannot extrapolate the results of the model which was modeled in the major portion of this field, the most dramatic portion of gas cap associated to the west of oil production, and extrapolate those results to the very southern end of the field.

But we still see -- Even further south of this in Indian Basin, we still see the effects of this displaced gas cap, because it is knowledge now, more or less common knowledge, that on the eastern flanks of Indian Basin we're testing crude oil in the same dolomitic rock, Cisco/Canyon, that we've produced over a TCF of gas out of the gas region which is more displaced -- I will say more displaced -- to the west, in a high-updip anticlinal roll into a fault on the western flank of the field, which is -- Those wells that are high updip close to that fault are really, truly, gas-saturated columns.

So we see this behavior, this displacement throughout this whole trend.

EXAMINER CATANACH: I don't have anything else of the witness.

He may be excused.

MR. CARR: We have nothing further of Mr. McWhorter.

And I also would like to note that I didn't intend to suggest that we wouldn't provide Mr. Bruce also copies of the data. We want to do so in case we have any -- not timely giving him information.

EXAMINER CATANACH: How about to the Division?

MR. CARR: Yes sir, we'll provide copies to the Division.

Mr. Catanach, I only have one additional witness. It's Dr. Boneau.

There is really only -- really one point we need to cover with his testimony, and I can present it by calling him briefly and covering that point in the form of examination, or Dr. Boneau can make a statement, whatever you prefer.

He is under oath, and he would be subject to cross-examination on anything that's said. However you prefer to do it.

EXAMINER CATANACH: It doesn't matter to me, Mr. Carr.

MR. CARR: Maybe we'll call Dr. Boneau very quickly, then.

At this time we call David Boneau.

DAVID F. BONEAU,

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

DIRECT EXAMINATION

BY MR. CARR:

Q. Would you state your name for the record?

A. David Francis Boneau.

Q. By whom are you employed?

A. Yates Petroleum Corporation.

Q. And what is your position with Yates?

A. Reservoir engineering supervisor.

Q. Have you previously testified before this Division and had your credentials in the area of petroleum engineering accepted and made a matter of record?

A. Yes, sir.

Q. Are you familiar with the Applications filed in each of these cases?

A. Yes, sir.

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

EXAMINER CATANACH: Yes, they are.

Q. (By Mr. Carr) Dr. Boneau, what does Yates seek in this case?

A. Well, I'll tell you what we seek, and I'll tell you a little of my opinion, I think, as you always hear.

We think that adding the acreage, as Conoco suggested, is a good idea.

We think that removing 5(b) is a good idea.

We think it's a poor idea to change the GOR to 4500, and we suggest that the GOR be kept where it is.

My opinion is that -- I'm really embarrassed that Yates and Conoco are bringing this squabble to the Commission. A heck of a lot of good data has come out, and probably that's the benefit of the hearing. But I don't think that's -- this is the forum for that.

If the companies had been reasonable, we would have brought the Commission a joint proposal for a GOR that would work. We've come to this impasse, and we've tried to be reasonable, and it just -- a bad scene, in my opinion.

Q. Dr. Boneau, is Yates concerned about the effects of the production of the gas cap in this reservoir?

A. Yes, I'd like the Commissioner -- the Examiner to believe that we've always been concerned about the gas cap.

Yesterday, he heard Santa Fe beating on us because we were developing the gas cap too slowly, and today Conoco's telling everyone that we are producing too much from the gas cap.

Perhaps these opposing opinions mean that we're not doing all that bad a job. That's the way I'd like to look at it.

But we drilled only enough gas cap wells to delineate the field while the development of the oil leg proceeded. The Yates engineers had many meetings with Yates management where we discussed gas reinjection.

Like Conoco, we thought, the engineers -- Pinson and I are the main ones -- that restricting the gas cap and shutting in the gas wells or reinjecting gas was a good idea in theory.

We decided to test this theory, and we spent really quite a lot of money and a lot of time. Pinson was up in Denver at least ten weeks working on this over a period of a year.

And we tested the theory the best way we could with this computer model. It uses history, it uses pressure data, it uses all the available data in the main part of the field, and it came out with a conclusion that was surprising to me. I did not expect that conclusion.

But the conclusion was that the gas cap has virtually no effect on the oil production. And now I believe that conclusion, and Yates believes that conclusion, and we're -- think it's prudent to drill one well on each 160 in the gas cap, and that's the program that we're going ahead with.

And that came out in the Santa Fe case and it came out in Pinson's testimony.

Q. Dr. Boneau, is Yates considering the implementation of waterflooding in this field?

A. Well, yeah. Pinson didn't mention it, but Yates extended the reservoir study that was talked about to look at waterflooding.

And here again, what the computer says is that waterflooding in South Dagger Draw is economic, but it's not red hot. It's not real great.

And we think it's wise to field-test that. And our engineering people have presented to Yates management a detailed plan for a waterflood pilot on 100-percent Yates acreage in South Dagger Draw, and the plan does include -- and drilling an infill well on 20 acres, mainly for gathering data.

In 1994, I think we will be here with a request for approval to implement this waterflood pilot. We want to go ahead with plans, reasonable plans, for recovering some of the huge amounts of oil that exist in this reservoir. Waterflooding is the next step, in our opinion.

Q. Is it fair to say that Yates is continuing to develop information that can be utilized to implement appropriate rules for the development of the reservoir?

A. That's surely our intention, sir, yes.

Q. Do you have anything further to add to your testimony?

A. Well, yeah, I want the Examiner to believe that Yates has been trying very hard to do what's right for this reservoir.

What's the right GOR? You know, I really don't know what the right GOR is to two or three or four significant figures.

I do know that 10,000 has worked fine, and 4500 is too low. There are so many wells with higher GORs, and there are so many wells that penetrate these gas-bearing intervals.

There's no reason, you know, in my opinion, to fine-tune the present GOR of 10,000. And we've got this engineering study that I consider real engineering data and not just theories, that shows that the present GOR is perfectly acceptable.

And if you want to change it, change it to something that's reasonable, like 8000 or 9000 or 10,000 maybe, and do that, and let's get on with the serious business of improving recovery in this reservoir.

I think it's just wrong that the only time we're talking together and working on this field is when we're arguing before the Commission.

I have strange ideas, and those are my strange ideas.

MR. CARR: I have nothing further of Dr. Boneau.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Dr. Boneau, I don't want to leave the impression with this Examiner that Marathon and Yates and Conoco are simply giving our quarrel to the Examiner.

My understanding is that all three companies exhaustively and extensively discussed this issue, and because of a material difference by the technical people with regards to what to do with this reservoir, there was no agreement.

Is that a fair characterization, that there's really no company here at fault, because there is no solution to address to the Examiner on the gas/oil ratio?

A. The exhaustive part is surely true. Our people spent an awful lot of time, and yours did, talking about this.

I think my point is -- And there was no agreement, we did not come to an agreement. You know, you have a different idea of fault than I do. But we did not come to an agreement.

And my point is that the subject of the argument today is minuscule compared to what we should be talking about, which is 200 million barrels of oil in place in this reservoir and the recovery of a significant portion of that.

Q. Well, I won't argue with you.

A. No, no, I'm not trying to argue at all.

Q. I thought we were here over an incredibly significant issue, and that is what is the appropriate withdrawals of free gas from the reservoir?

Isn't that why we're here?

A. I really don't know. I'm saying that we're wasting time, and I believe that. And if we take the Conoco proposal and that's accepted, Yates cuts back one well, which happens to be owned mostly by Santa Fe, and there's no other change in the operations of the well -- To me the subject isn't all that significant. It really affects one Yates well, it affects Conoco not at all. There's got to be something better.

Q. You made a major point before Examiner Catanach back on December 3rd of 1992 with regards to preservation of the gas reserves and the gas cap of this reservoir?

A. That's correct. I don't know the date, but yes, I'm in total agreement that before this study we were trying to be very protective of the gas cap, and we tried to determine in the best engineering way the truth of the subject. And the truth of the subject is that the gas cap is not all that important to oil recovery. And our opinion has changed, my opinion has changed.

Q. Your opinion back in December of last year led

Examiner Catanach to adopt Finding Number 11. The transcript shows that you were the only expert witness to testify, Dr. Boneau, and that finding says, according to testimony presented, a strong effort has been made by Yates not to develop the gas reserves contained within the gas cap in the subject reservoir, which will result in the conservation of reservoir energy.

Now you're telling me your opinion has changed, and that change has occurred because you've now read the results of the computer simulation of that portion of the reservoir that Mr. McWhorter has described to us? Isn't that what you just told me? You had changed your mind?

A. I told you I changed my mind. I agree with everything in your statement except the implications that I have read the report.

Q. No, sir, I didn't say that you had read it. You changed your mind based upon Mr. McWhorter's report that said that there's no risk to the oil column if we produce the gas cap?

A. I --

Q. Is there anything else that's changed your mind? Is that it?

A. The corollary, the confirming kind of information, is the pressure data. But the pressure data is incorporated in the report.

We have a consistent picture for the main part of the reservoir, and the gas cap to the west does not impact the oil leg to the east, and I believe that.

Q. Do you agree with Mr. McWhorter that that simulation of the reservoir is predicated upon a geologic interpretation that has vertical segregation built into the geologic analysis?

A. I agree that there's a geologic description involved in the simulation, and that geologic description is basically the description that Conoco and Marathon and everyone has presented. I agree that his model has limited vertical segregation.

And going further, I believe that the results of the model are independent of that assumption in the model. There's just simply poor pressure communication between the west and the east, and that limits the impact of the gas cap upon the oil leg.

Q. If that assumption about the limitation of vertical segregation of the reservoir is wrong, then the position you have taken is flawed?

A. I don't believe that's a correct characterization of the situation --

Q. All right, let me restate it.

A. -- but that's fine.

Q. If the simulation is wrong and, in fact, the gas

cap is providing pressure support for the oil column and we take too much gas out of the gas cap, we're going to reduce ultimate oil recovery?

A. One detail of the model may or may not be wrong, but the characterization that the gas cap is not supporting the oil leg is not wrong; it is right.

And the conclusion follows from that, that the GOR of 4500 makes no sense.

Q. Do you know what the current average producing gas/oil ratio is for the 56 wells that are on Mr. McWhorter's display? Do you know what that number is?

A. 5100 is the number for September, and that's an increase from approximately 4400 in July and 4700 in August, is my memory of the numbers. I could look at the on the paper, or you can look at them on the paper.

Q. Well, look at Finding 10 in Order 5353-L2. It says the average gas/oil ratio for the field for 1992 is 5300.

What is it for 1993? Do you know?

A. Well, you're talking about different things.

In the discussion today, almost all the GOR talk has been about the GOR for the so-called oil wells, the wells with less than 30,000 GOR.

I doubt that Order 5353-L2, Finding 9 -- Finding 10 -- is talking about that same GOR. It's talking about a

fieldwide -- I suspect it's talking about a fieldwide GOR, which includes the gas wells and not comparable to the numbers -- most of the numbers we heard today.

Q. Help me understand how the rule works for the Pool.

On a 320 South Dagger Draw, under the associated rules, you can infill drill in 320 with oil wells up to a maximum density of one well per quarter. Isn't that how those rules read?

A. Well, as far as I know, they read you can drill a well on every acre if you wanted, but --

Q. What has been the practice?

A. The practice has been to drill -- in the oil leg, to drill the oil leg up on 40 acres.

Q. Okay. When you apply the 10,000-to-1 gas/oil ratio to the top spacing unit oil allowable, you can produce a combined total of 14 million MCF of gas from any spacing unit within the Pool, can't you?

A. Those are the rules.

Q. Yes, sir.

A. You can produce a maximum 1400 barrels of oil and/or 14 million cubic feet of gas per day --

Q. That's what the rules --

A. -- on the spacing unit.

Q. That's what the rules led us to now?

A. Yes, sir.

Q. What's the highest level Yates currently operates in terms of gas withdrawals for any of the spacing units in the Pool?

A. The highest gas production from a spacing unit comes from the west half of Section 15, which is owned 62 percent by Santa Fe. It contains two gas wells. Together they produce approximately 9 million cubic feet per day.

MR. KELLAHIN: No further questions.

EXAMINER CATANACH: Ms. Aubrey, questions?

MS. AUBREY: I have no questions.

EXAMINER CATANACH: The witness may be excused.

MR. CARR: That concludes Yates's presentation in this case.

EXAMINER CATANACH: Ms. Aubrey?

CRAIG KENT,

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

DIRECT EXAMINATION

BY MS. AUBREY:

Q. State your name for the record, please.

A. My name is Craig Kent.

Q. Where are you employed, Mr. Kent?

A. I'm employed by Marathon Oil Company as a reservoir engineer in Midland, Texas.

Q. Have you testified previously before the New Mexico Oil Conservation Division and had your credentials made a matter of record?

A. Yes, I have.

MS. AUBREY: Are the witness's credentials acceptable?

EXAMINER CATANACH: They are.

Q. (By Ms. Aubrey) Mr. Kent, are you familiar with the interest of Marathon Oil Company in Section 36 in the South Dagger Draw and with the Applications that are being heard today?

A. Yes, I am.

Q. What is Marathon Oil Company's position regarding the elimination of Rule 5(b)?

A. Marathon's position is that it is in the best interest of protection of correlative rights and prevention of waste to remove Rule 5(b) from the special pool rules for the South Dagger Draw Pool.

Q. What is the basis for that position?

A. There are several problems that the current rule is causing as far as development of the oil in the edges of the South Dagger Draw Pool.

Q. In order to explain your position, would you refer to Marathon Exhibit Number 1?

A. Marathon's Exhibit Number 1 is a four-section

plat of the South Dagger Draw Pool.

On the plat are wells, well symbols for the South Dagger Draw Upper Penn producers in this area. Also labeled on there are the operators of the spacing units in each section.

Q. Marathon's interest in South Dagger Draw limited to Section 36; is that correct?

A. That's correct, Marathon operates two spacing units in Section 36.

Q. And those are laydown 320s; is that right?

A. That's correct.

Q. Let me have you talk first about the situation that Marathon is facing with regard to the south half of Section 36.

Are there any correlative rights issues that are causing problems for Marathon at this time due to the bar on simultaneous dedication of oil and gas wells?

A. Currently Marathon's operated south half of Section 36 is dedicated as an oil proration unit, and production is currently from Well Number 8.

Well Number 5 in that section, although it is shown as an oil well symbol, is currently a Morrow oil producer.

Well Number 6 is currently being tested in the Upper Penn section.

Conoco's Well Number 1 to the west is a gas well. That is potentially causing us some problems in that our oil proration unit is unable to protect itself from gas drainage from Conoco's gas proration unit to the west.

And the opposite is also occurring: Conoco, under the present rules, is not able to drill oil wells to offset our oil production to the east.

Q. Now, the Number 6 is currently completed; is that correct?

A. The well is being tested at the present time, and at current rates that well would be classified as a gas well.

Q. If that well is classified as a gas well, and the Marathon Number 8 is classified as an oil well, what are you going to do?

A. Right now, looking at the economics of it, we would be forced economically to complete the Number 8 as a gas well and rededicate the south half of Section 36 as a gas proration unit.

Q. Would that result in the waste of oil reserves underlying the south half of Section 36?

A. Yes, it would.

Q. Has the Number 8 well been previously completed in the gas zone?

A. Yes, it was.

Q. And what happened there?

A. Prior to -- On initial completion, we opened up both the oil and gas zones, and on initial tests we were producing 2.8 million cubic feet of gas a day, 17 barrels of condensate and about 1700 barrels of water per day.

We subsequently went in, set a casing patch across the gas zone, and our initial potential after that was 100 barrels of oil per day, 400 MCF of gas, 250 barrels of water.

What we were able to do was shut off 2.4 million cubic feet of gas and almost 1500 barrels of water with that operation.

Q. So you're now producing the well as an oil well?

A. The well currently would be classified as an oil well with the GOR just over 3000.

Q. Now, in the north half of Section 36, do you have similar problems with having to shut wells in which may test as gas wells?

A. That's correct. In fact, we have already been forced to shut in the Indian Hills State Com Number 1, which was recompleted from the Morrow to the South Dagger Draw-Upper Penn Pool in 1991.

That well was completed as a gas well, and upon completion of our Wells 3 and 4, we were forced to shut that well in with the current prohibition of simultaneous

dedication.

Q. So the gas reserves underlying the north half aren't being produced at all?

A. That's correct. And further, we subsequently drilled our Well Number 7, we did some individual zone testing, starting with the oil zone, but found the oil zone to be entirely wet.

We have not at this point moved up to the gas zone, pending the outcome of this hearing. But should Rule 5(b) not be removed, we have just effectively drilled a dry hole in between two commercial wells.

Q. Even though you have reason to believe that that well may be commercially productive of gas?

A. That's correct.

Q. What would Marathon's plans be for the additional development of the reserves underlying Section 36 if the bar on simultaneous dedication remains in effect?

A. We have at least two other locations that we would drill. They are prospective for oil, and we feel that we would have reserves somewhere on the order of 200,000 to 300,000 barrels of oil from the two wells.

Q. And would those reserves be developed then?

A. Yes, with the removal of 5(b) that would remove an element of risk from the drilling that would encourage us to go ahead and develop those reserves.

Q. Do you have any other comments you want to make about Exhibit 1, Mr. Kent?

A. Yes, potentially there is a correlative rights issue that will arise within Section 36 itself.

The north half of 36 is owned 50 percent by Marathon, 25 percent by Columbia Gas, 25 percent by Southwest Royalties.

The south half is owned 50 percent by Marathon, 50 percent by Columbia Gas.

Should we choose to convert the south half of 36 to a gas proration unit, we would then have correlative rights issues arising between those two spacing units within the same section, whereby one would be dedicated as oil, the other would be dedicated as gas.

There are also -- In conjunction with the correlative rights between 35 and 36, there's an issue between federal and state royalties. Section 36 is state leasehold, and I believe Section 35 is federal.

Q. Is it your opinion, Mr. Kent, that the bar on simultaneous dedication in fact increases the risk of drilling and completing wells in this area and will limit the ultimate production of these reserves?

A. Yes, it does.

Q. Was Exhibit Number 1 prepared by you?

A. Yes, it was.

MS. AUBREY: Mr. Examiner, I tender Exhibit Number 1.

And I have no further questions of the witness.

EXAMINER CATANACH: Exhibit Number 1 will be admitted as evidence.

Mr. Carr?

MR. CARR: Very briefly.

CROSS-EXAMINATION

BY MR. CARR:

Q. Mr. Kent, did I understand your testimony to be that in producing the Number 8 well you initially produced gas and water out of that well and no oil?

A. That's correct. With all zones open, it appeared we were unable to get drawdown on the oil, and the only thing that was contributing was the upper gas zone, and that did produce both gas and water, which is also the case with our Indian Hills State Com Number 1 well, that is a gas well.

MR. CARR: That's all we have. Thank you.

EXAMINER CATANACH: Mr. Kellahin?

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Kent, when we look at Section 36, do you have an opinion as to whether 36 is over -- the oil column is overlain by a gas cap?

A. I think there's a gas zone present entirely across Section 36.

Q. This, then, would not be a situation for you where you have an oil column, and then as you move upstructure into the west in the reservoir you would move into a gas cap?

A. In fact, quite the opposite appears to be happening: As you move to the east, we appear to be encountering the gas cap.

Q. And that was my question for you. In this northwest of 36 we've got a gas well?

A. That's correct.

Q. We've seen a copy of the log, whereon of the Marathon wells -- and I think was the Number 8. Which one were you -- We're in the oil, then in the water, then the gas and the oil?

A. I believe on the exhibit Well Number 6 was shown, although the comments that were made applied to Well Number 8.

Q. Okay. Is that circumstance typical of the wells in your section where you have oil, water, gas?

A. No, I think we've got a variety of things going on.

We have places in our lease where we have water, gas; we have places in our lease where we have water, oil,

water, gas.

So we've got a combination of things going on within our lease.

Q. When we look at the orientation of your spacing units, you have a north-half orientation and then a south-half?

A. That's correct.

Q. Do you know what is the maximum amount of gas withdrawals your wells could produce in either of those spacing units?

A. You're asking what the allowable would be, or the actual capacity?

Q. I want to know the capacity of those wells.

I don't want to confuse you. Currently you could pull out 14 million a day?

A. Correct.

Q. How much of that can you actually produce?

A. In the north half right now, we are producing just over 2 million cubic feet a day from Wells 3 and 4. Well Number 1 has a capacity of at least a million cubic feet a day.

In the south half, if we were to re-open Well Number 8 we would have a capacity of somewhere on the order of 5 million cubic feet a day.

MR. KELLAHIN: No further questions.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Kent, if you mentioned it, I missed it: Does Marathon have a position on the gas/oil ratio for this Pool?

A. No, we don't.

EXAMINER CATANACH: I have nothing further of the witness.

Anything further?

MR. CARR: Nothing further.

EXAMINER CATANACH: He may be excused.

I don't -- Do we need closing statements?

MR. KELLAHIN: No, sir.

MR. CARR: I don't think we do.

EXAMINER CATANACH: Okay.

MR. KELLAHIN: I was going to suggest, if you want them, each position could present a draft order and you could take the case under advisement.

EXAMINER CATANACH: I would -- Yeah, I would ask that each party submit a draft order for this case, please.

MR. KELLAHIN: We have no rebuttal, we're finished.

MR. CARR: So are we.

EXAMINER CATANACH: As far as the additional stuff that you're going to provide to Mr. Kellahin, can

that be done relatively quickly?

MR. McWHORTER: A week to ten days.

EXAMINER CATANACH: Do you need that for the rough draft, Mr. Kellahin?

MR. KELLAHIN: No, sir, I can do the draft order independent of the simulation information.

EXAMINER CATANACH: Okay. So rough-draft orders within, say, two weeks is appropriate?

MR. KELLAHIN: Yes, sir.

MR. CARR: Two weeks would be fine.

EXAMINER CATANACH: Okay. Let's go ahead and do that, then.

And if there's nothing further in these cases, these cases will be taken under advisement.

And this hearing is adjourned.

(Thereupon, these proceedings were concluded at 11:31 a.m.)

* * *

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. _____, heard by me on _____ 19____.

_____, Examiner
Oil Conservation Division

CERTIFICATE OF REPORTER

STATE OF NEW MEXICO )
) ss.
COUNTY OF SANTA FE )

I, Steven T. Brenner, Certified Court 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 December 21, 1993.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 1994