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 MOBIL EXPLORATION AND PRODUCING, U.S., INC.

CASE NO. 11,071

ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: DAVID R. CATANACH, Hearing Examiner

August 18, 1994

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Division on Thursday, August 18, 1994, 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

August 18, 1994
Examiner Hearing
CASE NO. 11,071

* * *

E X H I B I T S

	Identified	Admitted
Exhibit 1	6	11
Exhibit 2	15	25
Exhibit 3	16	25
Exhibit 4	20	25
Exhibit 5	33	46
Exhibit 6	34	46
Exhibit 7	34	46
Exhibit 8	35	46
Exhibit 9	39	46
Exhibit 10	41	46
Exhibit 11	42	46

* * *

A P P E A R A N C E S

FOR THE APPLICANT:

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By: GALEN M. BULLER

FOR EXXON CORPORATION:

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By: JAMES G. BRUCE

* * *

WHEREUPON, the following proceedings were had at 3:43 p.m.:

EXAMINER CATANACH: Call the hearing back to order, and at this time we'll call Case 11,071, the Application of Mobil Exploration and Producing, U.S., Inc., for a high-angle/horizontal directional drilling pilot project, special operating rules therefor, a nonstandard oil spacing and proration unit and a special project allowable and testing period, Lea County, New Mexico.

Are there appearances in this case?

MR. BULLER: Galen Buller from Montgomery and Andrews law firm here in Santa Fe, representing Mobil Exploration and Production, U.S., Inc., as agent for Mobil Producing, Texas and New Mexico, Inc.

EXAMINER CATANACH: Additional appearances?

MR. BRUCE: Mr. Examiner, Jim Bruce from the Hinkle law firm, representing Exxon Corporation.

EXAMINER CATANACH: Any other appearances?

Mr. Bruce, are you putting on any witnesses?

MR. BRUCE: No.

MR. BULLER: We're putting on three.

EXAMINER CATANACH: Okay. Can I get the three witnesses to stand and be sworn in at this time?

(Thereupon, the witnesses were sworn.)

MR. BULLER: Mr. Hearing Examiner, we would like

to call as our first witness Daniel Pequeno.

DANIEL PEQUENO,

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

DIRECT EXAMINATION

BY MR. BULLER:

Q. Mr. Pequeno, would you please state your name for the record?

A. Yes, my name is Daniel Pequeno.

Q. Where do you reside?

A. I reside in Midland, Texas, and I am employed by Mobil Exploration and Producing, U.S., Inc.

Q. In what capacity?

A. I'm a staff landman.

I will refer to Mobil Exploration as "Mobil" hereinafter, to make it short.

Q. Okay. Have you ever testified before the New Mexico Oil Conservation Division before?

A. No, sir.

Q. Would you please summarize your educational background and your work experience?

A. Yes, sir, I graduated from Texas A&A University in Kingsville, Texas, in 1980.

Upon my graduation, I was employed by Mobil as a landman, and I worked south Texas for four years, east

Texas for one year, when I was transferred to Midland to work the west Texas area and New Mexico.

I have also received my certification as a professional landman from the American Association of Petroleum Landmen, and I also have been certified as an environmental site assessor.

Q. Are you familiar with this Application in Mobil's proposed project concerning the high-angle drilling?

A. Yes, sir.

Q. Could you briefly describe that project for the Hearing Examiner?

A. Yes. Mobil at this time is requesting a permit for three highly directed horizontal wells and a special testing period and allowables.

Q. Have you reviewed any plats depicting the land including and surrounding the proposed project?

A. Yes, sir.

MR. BULLER: Mr. Hearing Examiner, are the witness's qualifications acceptable?

EXAMINER CATANACH: They are.

Q. (By Mr. Buller) Mr. Pequeno, would you please identify what's been marked as Exhibit 1 in the exhibit booklet?

A. Yes, sir. Exhibit 1 is a land ownership plat which depicts the Drinkard field and shows our ownership.

I will start out by saying that this is a nine-section plat. To the north, six sections is in Township 17 South, Range 35 East. The three to the south are in Township 18 South, Range 35 East.

The yellow tract shown as the northwest quarter in Section 34, Mobil owns a leasehold from the State of New Mexico. And the northwest of the southwest, which is a 40-acre tract in Section 33, Mobil owns also a lease from the State of New Mexico.

Q. I see that there are the names of other operators in the sections surrounding the yellow leases. Could you describe --

A. Yes, sir.

Q. -- what those represent?

A. Yes, sir, these other companies which are to the north and in and around the tracts under which Mobil owns are the offset operators in this area, some -- one being Exxon, which is on Section 28. And also in the east half of 32 we have -- The south half of 27, we have Chevron, Phillips and Shell. To the northeast quarter of Section 34 we have Phillips, and to the south half of that section we have Chevron.

Then in Section 33, which are the offset operators to our 40-acre tract to the north, in the north we have Phillips, Texaco and Marathon, and to the south we

have Texaco, Phillips and Shell.

Q. Do you know whether each of these offset owners or operators have been notified of this proceeding?

A. Yes, sir, they have all been notified on July 26th, 1984 [*sic*].

Q. By certified mail?

A. Yes, sir.

Q. Do you know whether any of these offset owners or operators have responded?

A. We have not received any protest. We have received a letter from Phillips Petroleum Company which fully supports our project at this time. They're fairly encouraged by it, and they have supplied us with a letter on August the 2nd, 1994.

Q. Has Exxon entered its appearance in this proceeding?

A. Yes, sir.

Q. But has anyone objected to the Application?

A. Not to my knowledge.

Q. I also see on this Exhibit Number 1 the names of some wells. Can you identify what those wells represent?

A. Yes, sir. This plat, Exhibit 1 again, depicts all the wells that are in the Drinkard field or have been completed in the Drinkard field or formation.

The one offsetting our Section 34 tract in yellow

-- and if you look to the west side of it, being kind of the southeast of the northeast quarter, you will see the Marathon Oil Company, Warn State AC 2 Number 10. That well has been completed in the Drinkard formation.

Going further west to Section 32, there are four wells listed on this plat, wells Number 9, which is in the southeast corner of the section, southeast southwest. And Number 10 and Number 11, to my knowledge, have been completed. The Number 12, which is in the northwest quarter of this section is to be drilled in the near future.

Going south in Section 5, there is a Phillips well in the Drinkard also, which has been completed.

Going back to my parts which are colored in yellow, this also shows the wells that we -- which are the subject of this Application.

Well Number 16, as you see, there's a little "O" or a circle. that is the surface location of this well, and it will bottomhole on the -- where you see the triangle, which is the southeast of the northwest quarter, and this well is currently drilling vertically.

Q. It's been permitted, and it's currently drilling?

A. That is correct, sir.

Going in the north half, you'll see another circle, which is our Well Number 17. This is the second

well, which is the subject of this Application, the surface location being in the northeast of the northwest. And it will be directionally drilled where you see the bottomhole signified by the triangle, which will be the bottomhole for this well, which will be in the northwest of the northwest quarter of that Section 34.

The other well that is the subject of this Application is the State "O" Well Number 3, and that is in Section 33 again, being the northwest of the southwest quarter of that section. And again, there's a zero where it's the surface location of this well. And it will be horizontally drilled to where the triangle is signified there, which will be the bottomhole for this well.

Q. In each of these three cases where the wells have been -- of the three proposed wells, is it Mobil's intent to stay within the 330-foot setback?

A. That is correct, sir.

Q. And I notice that in the two wells in Section 34, they're crossing over two 40-acre sections. Can you describe the intent of Mobil in crossing over into two proration units?

A. The intent of Mobil crossing -- ?

Q. Is it Mobil's intent to have double the allowable by going across the two proration unit boundaries?

A. That is correct.

Q. Is there anything else that you need to describe on this Exhibit 1 plat?

A. I believe I have described basically everything, unless there's other questions.

Q. Okay, was this plat prepared by you or under your supervision?

A. That is correct.

Q. Can you testify to its accuracy?

A. That is correct.

MR. BULLER: At this time, Mr. Hearing Examiner, we move for the admission of Exhibit 1.

EXAMINER CATANACH: Exhibit 1 will be admitted into evidence.

MR. BULLER: And that ends our direct examination of Mr. Pequeno.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Pequeno, which well is currently drilling?

A. The State "M" Well Number 16, which location you will see in the southwest quarter -- Yeah, southwest quarter of the northwest quarter of Section 34.

Q. Okay. Do you know what surface location that well is at? Or can somebody else tell me, one of your other witnesses?

A. I believe I will defer that to the other

witnesses.

EXAMINER CATANACH: Okay.

MR. BULLER: I think, Mr. Lewis, I think you can --

MR. LEWIS: I have copies of --

EXAMINER CATANACH: If you want to present that later, that's fine.

THE WITNESS: Okay.

Q. (By Examiner Catanach) Yeah. Mr. Pequeno, the State "M" lease in the northwest quarter of Section 34, is that a single state lease?

A. Yes, sir.

Q. Is that only -- Is Mobil the only interest owner in that lease?

A. Yes, sir.

Q. Okay. There are no other working interest owners, partners?

A. Well, let me retract on that. We have all rights down to the Glorieta formation as well as the Grayburg-San Andres formation, and these leases are owned by Phillips currently. And from surface down to those depths and below is Mobil, 100 percent.

Q. So in the formation, the Drinkard formation, Mobil is a 100-percent interest owner?

A. That is correct, Mr. Examiner.

Q. Okay. And that is true -- As I understand it, you want to put the north half of the northwest quarter together to form a project area, the south half of the northwest quarter?

A. Yes, sir.

Q. Okay. So the interest within each of the project areas is common?

A. That is correct.

Q. Okay. And you wish to establish just a 40-acre project area at Section 33?

A. That is correct.

Q. And Mobil is a 100-percent interest owner in that tract?

A. That's correct.

EXAMINER CATANACH: Okay, I have no further questions.

You may be excused, Mr. Pequeno.

THE WITNESS: Thank you.

MR. BULLER: Next, call Mr. Don Lewis.

DONALD W. LEWIS,

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

DIRECT EXAMINATION

BY MR. BULLER:

Q. Mr. Lewis, would you please state your name for

the record?

A. My name is Don Walter Lewis.

Q. And where do you reside?

A. Midland, Texas.

Q. By whom are you employed, and what is your current capacity with the company?

A. I'm with Mobil Exploration and Producing, U.S., and I'm a senior staff production geologist. I've been working with Mobil for 13 years, both internationally and domestic.

Q. Have you ever testified before the Division before?

A. No, sir, I have not.

Q. Would you please summarize for the Hearing Examiner your educational background and your work experience?

A. I've got a BS and an MS or master's degree in geology from East Carolina University. I'm also a certified petroleum geologist with the American Association of Petroleum Geologists. And like I said, I've worked for 13 years with Mobil.

Q. In what capacity have you worked with Mobil?

A. I've worked in New Orleans as a production and exploration geologist, I've worked in Dallas as a reservoir description geologist for our international team, I've

worked in Nigeria for the last five years as a production geologist there.

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

A. Yes, I am.

Q. Could you briefly describe the kind of geologic studies you've made in preparation for this proceeding?

A. Okay, we've -- The team that I'm working on has briefly looked at the Drinkard production in the Vacuum Drinkard Pool and seen what kind of production that is.

We've evaluated the Marathon Exploration well that's a recent discovery, and we tried to extrapolate that into our acreage in the area.

MR. BULLER: Are the witness's qualifications as an expert in the field of production geology acceptable, Mr. Examiner?

EXAMINER CATANACH: They are.

Q. (By Mr. Buller) Would you turn to what's identified as Exhibit 2 and tell us what this exhibit is and what it is you're trying to portray through the exhibit?

A. Okay. Exhibit 2 is a schematic or diagrammatic cross-section over the area near the Vacuum field in Lea County.

The two things I want to point out on this cross-

section -- and these are just to orient you, Mr. Examiner, to the stratigraphic unit in question -- the purple is the Abo reef, which is established production in the area for many, many years. And then just above that and to the north, or paleoshelfward, is the Drinkard reef, where the activity is at present.

This color scheme will be prevalent throughout the other exhibits.

Q. Okay. Would you then turn to Exhibit 3 and identify that Exhibit 3 for the Examiner?

A. Okay, Exhibit 3 is a structure map on top of the Abo formation.

Superimposed on top of this structure map in purple is the Abo reef trend, where production is at the moment. Also on this map are shown only wells drilled deeper than 7200 feet, as that is the area of interest that we're talking about here. There are a lot of wells drilled in here shallower.

Just to the north, Abo reef trend, you'll find the Drinkard or the Vacuum Drinkard Pool on the left. You'll see some sawtooth hashmarks in the middle of this, and then also the extrapolation of this Vacuum -- the Drinkard reef trend to the east northeast.

In yellow on this are the Mobil leases, and these are, from left to right, the Mobil State "K", the Mobil

State "O" lease, and then the Mobil State "M" lease. We have production right now in the Drinkard from two wells in the Mobil State "K", from the 11 and 12 wells.

Also on this -- or highlighted in red, the proposed wells, the recently announced discovery for Marathon and the actively drilling "M" 16 well.

And I'll bring you up to date on that. We're 6800 feet in the vertical section on the "M" 16 as of this morning. TD is expected around 8000 feet. We're permitted to 8400 feet.

I might add that the State "O" Number 3 and the State "M" Number 17 are also permitted.

And at this time would you like that surface location that you were asking about?

EXAMINER CATANACH: Yes, sir.

THE WITNESS: For the State "M" Number 16, it's 2075 feet north of the south line [*sic*] , 330 feet west of the -- east of the west line.

EXAMINER CATANACH: That's actually 2075 feet from the north line; is that correct?

THE WITNESS: 2075 from the north line.

EXAMINER CATANACH: Okay, and 330 feet from the west line?

THE WITNESS: From the west line.

EXAMINER CATANACH: Okay. 17, do you have that

one?

THE WITNESS: Yes, I do. 809 feet from the north line, 1833 from the west line.

EXAMINER CATANACH: Okay. How about the Number 3?

THE WITNESS: Okay, this is 1846 from the south line, 330 from the west line.

EXAMINER CATANACH: Okay.

THE WITNESS: Okay. The nearest Drinkard production to this Warn State "AC" 2 Number -- or 2 Number 10 well of Marathon is about 8600 feet to the southwest. That would be the Arco State "B" 1576 Number 10 well. To date, that's the easternmost well in the Vacuum Drinkard Pool.

Therefore, that's the reason for marking the sawtooth hachured lines on the map. We don't know the extent of that pool. There have been no dry holes drilled over in that direction that we know of. That well is located just east of the Mobil Lease State "K".

The projection of the Vacuum Drinkard or the Drinkard reef trend to the northeast is based on the Marathon discovery and the trend of the underlying Abo reef, and we're hopeful that that reef trend extends to the northeast and mimics the underlying reef.

We don't want to make at this time any suggestion

that the Vacuum Drinkard Pool extends that far, but at some point drilling may prove that up, or it may not.

Our plan right now is to drill the vertical wells, the State "M" Number 16, which is currently drilling, and the State "O" Number 3, back to back and evaluate them.

Of course, everything else we do is contingent upon these wells coming in oil-bearing, since they are wildcat wells.

If successful, the 16 will be completed as a straight hole and tested prior to any sidetracking, and after an adequate test period the Number 16 will be sidetracked to a very high angle and completed.

The drilling of the 17 and 17 sidetrack will take place after the evaluation of the 16 sidetrack and the high-angle lateral.

The porosity type within the Drinkard is thought to be intergranular. This is a dolomite and possibly some vuggy porosity.

So far, from talking to operators in the area and from our experience, we don't see much evidence of fracturing, but we don't have core to look at on our leases. But right now we don't think that's the major factor.

The high-angle sidetracks that we'll be drilling

will roughly parallel the strike of the underlying Abo reef trend, and we'll try to maintain these wells as much as we can along strike. And we think, and from preliminary mapping of the Drinkard, the strike direction is the same as it is for the Abo.

Another reason for drilling these wells along strike is that we want to stay away from any water, and I'll discuss water in a few moments.

As mentioned earlier, the high-angle portions of the State "M" 16 and 17 sidetracks will the 40-acre proration boundaries. They will stay legal within our boundaries. And the State "O" Number 3 sidetrack will stay within its 40-acre section and legal at all times.

Also shown on this map is a cross-section profile, A-A', and you'll see four wells highlighted there: Mobil State "K" -- From left to right, Mobil State "K" -- 12K, Mobil State "O" Number 2, which was drilled in 1964, I believe, a new Marathon discovery, and a Mobil State "M" Number 11, which was also in the early Sixties.

Q. (By Mr. Buller) It might be helpful at this point to pull out Exhibit Number 4, and maybe, Mr. Lewis, you could go ahead and identify what we've marked as Exhibit Number 4 and show the relationship between it and the cross-section on the Exhibit Number 3.

A. Okay, Exhibit 4 is a structural cross-section

that's outlined on the previous exhibit. Vertical exaggeration on this cross-section is five times normal.

The yellow areas again represent the Mobil leases. You see the four wells up there that I've outlined already. The two older wells, the State "O" and the State "M" wells that are shown, show the gamma ray and sonic logs.

The sonic log doesn't appear to be an adequate indicator of porosity for the Drinkard out here. As the newer wells show, the density neutron is a much better indicator of porosity.

I might mention here also that the State -- the Mobil wells we have on our leases are right now designated to the Glorieta unit, and they're not available for us to go back in and recomplete in the Drinkard.

On the left of the cross-section you'll notice in green the extent, the rough extent, of the Vacuum Drinkard Pool as we know it right now. There's completion information on the State "K" Number 12, on the left, and on Marathon's recently announced discovery.

You'll notice over in the known Drinkard area that there's very little water being produced. So the actual water contact over there I'm not real sure about, I'm not sure where that is.

However, in Marathon's well to the right they

have three sets of perforations. The bottom set of perforations tested 100 percent water. And you can see the amount of water, 36 barrels per day, in the upper sets. The two sets of perforations, the upper two sets, were tested together with a pretty high water cut.

So from --

Q. May I just break in, Mr. Lewis, and have you identify for the record that it's -- the blue, is that -- Is water shown as blue in here?

A. Yes, that's correct.

Q. And --

A. And green would be oil.

Q. And green would be oil. And the perforations are shown --

A. -- in red.

Q. In red, okay.

A. The depth track.

The green line that projects over into the Mobil State "M" lease is the estimated or calculated oil-water contact.

We're not a hundred percent sure of the depth on this, but from their test information and from a water cutoff saturation of 50 percent on log analysis, we're estimating that we will have about 170 feet of gross oil column within the Drinkard for our "M" 16 well.

Q. I notice that on Section 34, where you're showing the Mobil State "M" 16, you've got a dotted line.

A. That represents the 40-acre proration boundary unit.

You'll notice that the high-angle lateral will be cutting across that, and the completion will be -- should -- It's expected to be in the Drinkard, in both those 40-acre quarter-quarter sections.

Q. And is it the intention of Mobil to stay above the water line? As you've identified --

A. That is a --

Q. -- that was the green --

A. That is a very desired intention of Mobil to stay above that.

As you can see from the structural trend of the Drinkard, the State "M" lease is situated downdip from the Marathon well, and this suggests that we'll have a thinner oil column than they had.

Now, this is very important to us because we don't want to produce water; we want to produce oil.

So by drilling the State "M" at a very high angle within the upper portion of the Drinkard, we should stay away from water and contact about eight times the amount of rock that we would in a vertical well, which is the whole reason for drilling these high-angle laterals in here.

Q. In your opinion as a geologist, do these logs show that this is the proper geologic setting for a high-angle drilling project?

A. Not only a proper setting, it's a very desirable setting.

One of the things we've done worldwide is to try to optimize our drilling right now, and in drilling horizontal wells or high-angle wells to stay within the oil columns above water and away from gas. In this case you don't have to worry about gas.

But in our opinion, this is a classic example of where high-angle drilling and completion techniques should prove very valuable to us.

Q. In a minute we're going to be hearing from the reservoir engineer. Did you provide some of the geologic basis for the computer modeling that the reservoir engineer performed?

A. Yes, I did.

Q. And have you seen the results of that model?

A. Yes, I have.

Q. And do you agree with those results?

A. Yes, I do.

Q. Were Exhibits 2, 3 and 4 prepared by you or under your supervision?

A. Yes, they were.

Q. And you can testify to their accuracy?

A. Yes, I can.

MR. BULLER: We move for admission of Exhibits 2, 3 and 4, Mr. Hearing Examiner.

EXAMINER CATANACH: Exhibits 2, 3 and 4 will be admitted as evidence.

MR. BULLER: I have no further questions on direct examination.

EXAMINER CATANACH: Mr. Bruce?

MR. BRUCE: Yeah, just a couple of quick questions.

EXAMINATION

BY MR. BRUCE:

Q. Mr. Lewis, looking at your Exhibit 4, what is the gravity of oil in your Mobil State "K" Number 12 as compared to the Marathon well? Do you know?

A. I'm unaware.

Q. Okay. And then my one other question is, regarding your -- the horizontal portion of the wellbores, they're all to the northeast or to the southwest. Other than the water you mentioned, is there any other reason to stay in that direction?

A. We pretty much want to stay along strike within the formations, and we believe -- The reason for putting the Vacuum structure map on here is that we believe that

the Drinkard will have the same orientation as the Abo unit.

I mean -- And we're essentially staying along strike for the Abo, therefore we'll be along strike in the Drinkard, according to our interpretation.

MR. BRUCE: Nothing further, Mr. Examiner.

EXAMINATION

BY EXAMINER CATANACH:

Q. Mr. Lewis, the direction of the wellbore, that's already set? That will not change?

A. The -- We would like some latitude, but the "M" 16 sidetrack, we'll be staying within the southern two quarter-quarter sections.

The actual deviation or the actual degree of angle in those wellbores, we'd like latitude in that also, as we don't know exactly what depth the Drinkard will come in. We expect to be about 30 feet downdip to Marathon, but if it varies or if the porosity varies and it's not associated with the top of the formation, we'd like some latitude in being able to move that around.

Q. You've talking about moving --

A. -- the lateral or the sidetrack, the 16 sidetrack, both some degree in angle, some degree in the deviation.

Q. As long as you stay within the 330-foot setbacks?

A. We will, we will.

Q. The State "M" 17, that will stay within that north half there?

A. Yes, sir.

Q. Okay. Are those proposed directions, are those generally the directions you're going to take at this point?

A. That's generally the direction, that's our plan.

Q. You're just going to fine-tune it a little bit?

A. Yes, sir, once the 16 well is down, we should have more information, and we can fine-tune that.

Q. Is there a reason to drill in opposite directions the lateral portions of the wellbore?

A. That's a good question. That's one we've jockeyed back and forth with also.

The 16 was naturally drilled as an offset to Marathon to find out if indeed we have oil on our lease or not, and that's not a given.

Since we have to deviate these things, kick them out, we'll be kicking out about 250 feet above the Drinkard, so we will be away from our vertical section by the time we get into the Drinkard.

So what we wanted to do for the 17 was to have that lateral moved more toward the western portion of our -- those -- northern half of that quarter section. So by

drilling it from the east to the west, we were allowed to do that.

Q. As I understand it, the 16 will be drilled vertically through the Drinkard and tested?

A. Not all the way through, but to the depth where we think water would be, where -- Essentially to that green dashed line that you see on the cross-section.

Q. Okay.

A. And yes, it will be tested.

Q. Once -- Do you intend to produce the well at that point or --

A. For a limited period of time.

And I might defer that question to our reservoir engineer, who will hit on it a little harder.

Q. Okay.

A. We'll need a standard to measure our horizontal section against, and that will be the vertical section.

Q. The -- I believe you mentioned that the Drinkard is not highly fractured in this area?

A. Not that I'm aware of.

Q. Is it your opinion that the horizontal wellbores will just increase the recovery, just by encountering more reservoir?

A. It should do a couple things for us. It should allow us to produce at a water-free rate for a longer

period of time, at a rate at or near our allowable for a longer period of time, and increase the total recovery from the lease.

Q. Is this more than likely an extension of the Vacuum Drinkard Pool?

A. We're hopeful.

Q. It's not -- What I'm saying, it's not likely that this is a new Drinkard pool?

A. The -- There's nothing to suggest it isn't at this time. But that's a long shot, saying it is.

Some of the production right now around the edge of the Vacuum Drinkard Pool, as I have outlined, is less -- or they're poorer quality completions than they are in the center portions of this, which suggests that you may be at the edge of the -- of that pool.

However, like I say, there's no dry holes drilled over on the eastern side yet, so I'm not aware of what Arco's Number 9 has come up with. I just found out yesterday they hit TD. I don't know the results of that well, so that's still in doubt.

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

MR. BULLER: That completes my direct examination of this witness.

EXAMINER CATANACH: Okay.

MR. BULLER: I'd like to next call to the stand Ms. Karen Olson.

KAREN E. OLSON,

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

DIRECT EXAMINATION

BY MR. BULLER:

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

A. Yes, it's Karen Elaine Olson.

Q. And where do you reside?

A. Midland, Texas.

Q. By whom are you employed?

A. Mobil Exploration and Producing, U.S., Incorporated.

Q. And in what capacity?

A. I'm a staff reservoir engineer, and I have been with Mobil for the last eight years.

Q. Have you ever testified before the New Mexico Oil Conservation Division before?

A. No, I have not.

Q. Would you please summarize your educational background and work experience?

A. Yes, I have a BS degree in petroleum engineering from Louisiana State University. I graduated in 1983.

I worked two years for the Western Company of

North America as a field engineer.

I then returned back to school and received a master's of science degree in petroleum engineering from Texas A&M University.

I've written numerous SPE papers and Southwest Petroleum papers on hydraulic fracturing modeling, which includes simulation work on top of that.

And for the last eight years I've been employed with Mobil in Midland as either a production or reservoir engineer.

Q. Are you familiar with the Application currently before the Division?

A. Yes, I am.

Q. What's been your involvement with this Application?

A. Well, actually it was sort of my first idea that maybe this could be -- this would make an excellent horizontal candidate.

I was in charge of helping Regulatory file for the permit for these wells, and also did the simulation work to determine whether a horizontal well would recover the same amount of reserves or more as two vertical wells.

Q. And can you briefly state what the purpose of this Application is, including the test period?

A. Okay. There's, I guess, three main purposes.

We're asking for the horizontal permits for the three wells, the State "M" 16, 17, and the State "O" Number 3.

We're asking for the proration allowables on the State "M" lease for our two wells when they cross a quarter-quarter section line.

We're asking for the test allowables for those two 40-acre tracts for each well, which would equate to 374 barrels a day allowable, for each State "M" well.

And we're also asking for a special test allowable to determine our completion techniques on our horizontal wells.

Currently the vertical Drinkard wells require large -- very large acid fracs, in the 300-gallon-per-foot range. And this being the first horizontal wells in the Drinkard, we're not sure as to our completion techniques. And if you go with the 300 gallons per foot over a 1200 or 1300-foot lateral, you're looking at 300,000 to 400,000 gallons of acid, which we're not going to be doing.

MR. BULLER: Are the witness's qualifications in the field of a petroleum engineer acceptable, Mr. Hearing Examiner?

EXAMINER CATANACH: Yes, sir.

Q. (By Mr. Buller) I think it would work to look at Exhibits 5, 6 and 7 probably together. Could you identify

what we've marked as Exhibits 5, 6 and 7 and explain what we're trying to do with those exhibits?

A. Yes, I can. Exhibits 5, 6 and 7 are -- The main purpose of these well sketches is to give the Examiner an idea of our game plan for the drilling and completion of the three horizontal wells.

The first well in Exhibit 5 is our State "M" Number 16, which we are currently drilling. And the plan is that we will drill it down through the Drinkard, through the oil leg. The casing point will be picked from the logs, and it will be approximately 250 feet above the Drinkard.

The vertical section will be stimulated and tested to verify that we do have oil production. And so we -- For our simulation work, we can verify and refine our simulation work for the vertical well. Right now our simulation work was just done with the data we had from Marathon Oil.

At that point, when we hopefully do receive the permit for the sidetrack, we'll plug back the vertical section, we'll cover up the Drinkard with a sand plug, set a cement plug above it and kick off.

And it will be a medium-radius, lateral section that will be drilled, and it will take approximately 200 feet before we penetrate the Drinkard formation. And

that's 200 feet away from the vertical section.

And the lateral section, this is sort of oversimplified. It's not necessarily going to be exactly 1200 feet. It's going to be dependent on our mud-log reports and how long our bits last and other factors.

And we plan to deviate it through the entire oil leg.

Q. So the deviation won't necessarily be horizontal? It will follow --

A. It's not going to necessarily be perfectly horizontal, that's right.

Q. -- follow the trend?

A. Yeah, we're going to try to go through the main oil -- main zones in the oil leg to recover all the reserves from them, which I'll show later how we simulated that.

Exhibit 6 is basically a duplicate of Exhibit 5, the State "M" Number 17, which this well is contingent on the results of the State "M" 16. This would probably be a next-year project.

Exhibit 7 is the State "O" Number 3, which the vertical section of this well will be drilled immediately after the vertical section of the State "M" Number 16.

We use a drilling rig to drill the vertical holes. We move the drilling rig off, and when we're ready

to drill the sidetrack for the lateral section we'll use a pulling unit, a heavy-duty pulling unit.

So when we're through drilling the State "M" 16, we'll slide over and drill the vertical section on the State "O" Number 3. And the State "O" Number 3 is not contingent on the results of the State "M" 16. It's a go-ahead project.

And the only difference in the State "O" Number 3, since we're staying within just a 40-acre tract, this will be a high-angle or a short-radius, high-angle lateral section, and only take 50 feet to hit the Drinkard formation again.

Q. Have you prepared a computer model depicting what you expect will result from the project?

A. Yes, I have.

Q. And what kind of simulation is that?

A. Looking at Exhibit 8, the Horizontal Well Production Evaluation was done using a simulator. It's called Pegasus. It's a Mobil simulator that was developed internally within Mobil, and it's an integrated finite difference reservoir simulator, and it incorporates Babu and Odeh's horizontal well models which can be referenced in SPE Papers 18,298 and 18,802.

Q. Does Exhibit 8 show the parameters that went into, and the assumptions that went into that computer

model?

A. It shows the majority of the parameters.

Q. Why don't you identify Exhibit 8 and walk us through the various parameters and assumptions that went into the model.

A. Okay. The model is a grid-system model and it's not shown here, but I do have a copy of the grid system if you're interested in looking at it, Mr. Examiner.

But it's a grid system that we broke up in a 100-foot grid pattern, three layers, and incorporated the 80-acre drainage area. And it was lined up in the direction that we feel that our horizontal well will be drilled. So the grid pattern was lined up at a 27-degree angle.

The simulation parameters that were inputted were the drainage area of 80 acres and a gross thickness of 149 feet, which we broke up into three layers. Initial reservoir pressure of 2950 pounds, which that's the original pressure of the Drinkard, the Vacuum Drinkard Pool, and also of the Marathon AC 10 well that just offsets us. That's what they're looking in at also. The minimum producing bottomhole pressure was inputted at 500 pounds, and the horizontal well length was 1300 feet.

All the fluid properties -- you know, your formation volume factors, bubble points, GORs -- were obtained from PVT data that was performed on the Marathon

Drinkard well in the Vacuum Drinkard Pool that they gave us a copy of.

And we then broke up the oil-leg section -- if you'll remember the cross-section, the green section -- into three layers, based on the different porosities that we saw. It's real hard to see it on that fine print. I do have a blown-up copy if you're interested in it.

But we did break it up into what I call the top, middle and bottom layer. And the top depth, starting at 7745, which is the top depth of the Marathon well that offsets us, and the thickness of the top layer was 57 feet with 6-percent porosity. And the porosity was obtained from core-to-log porosity correlations. Marathon supplied us with two core porosity perm reports that they did on two of their wells that they cored in the Vacuum Drinkard.

Water saturations of 30 percent, which were calculated from resistivity logs. And the horizontal permeabilities, in millidarcies, was .42 millidarcies. And this data was obtained from the core analysis.

Vertical permeabilities within the layers, for the top layer was .42. And this is an assumption that we assumed, that the horizontal and vertical permeabilities were the same.

Between the layers, the vertical permeability was assumed to be zero. And this is telling you that if you're

going to -- the only way you can recover those reserves is if your horizontal section is connected through those layers. And the horizontal well length through the top layer was set at 500 feet.

In the middle layer, it's right below the top layer, of course, at 7802, gross thickness of 76 feet, porosity of 8 percent, water saturation at 35 percent, and a horizontal and vertical permeability of .58 millidarcies, zero vertical permeability between the layers, and the horizontal well length is 400 feet.

And then the bottom layer, the top depth was 7878, 16-foot thickness, 7-percent porosity, 35-percent water saturation, .7 millidarcies for your horizontal and vertical permeabilities, zero vertical permeability between the layers, and a 400-foot horizontal well length.

And these are the input parameters. And we started off first simulating just a straight vertical well to see what the recoverable reserves would be. And then we added the horizontal length to it to see if additional reserves would be recovered.

And then we removed the horizontal well length and placed two vertical wells in that 80-acre drainage pattern to see if the two verticals would be comparable to the horizontal.

Q. And are the results of that program shown, then,

on Exhibit Number 9?

A. Yeah, the next exhibits show the results of the simulation work that we did.

Q. Before we get to Exhibit 9, did you run this program for all three wells?

A. No, I just ran this for the State "M" Number 16, which is the offset to the Marathon well, but the --

Q. The conclusion --

A. The conclusion should be comparable for the --

Q. The assumptions and the parameters would also be comparable for all three wells?

A. Hopefully. I mean, that's something we won't know until we drill --

Q. That's right.

A. -- get a log.

Q. But the assumptions going into the program were --

A. Yes, the assumptions going in.

Q. Yes.

Would you then identify for the Hearing Examiner what we've marked as Exhibit 9 and explain what is shown?

A. Exhibit 9 shows a -- assuming an 80-acre drainage area, which assumes no-flow boundaries around your 80-acre drainage, and it shows your Drinkard production.

Your X axis is the years of production, your Y

axis is your cumulative oil produced in thousands of barrels. And the bottom line with the triangles running through it is your one vertical well.

This simulation work was done first, and it was matched to the test of the Marathon well which was producing -- it started -- it came in at 130 and then potentialed at 79 barrels. And it recovered 200,000 barrels of oil, which was only 13 percent of the original oil in place, based on 80 acres.

The middle line with the solid circles through it is the two vertical wells, and the recovery was 381,000 barrels of oil, which was 21 percent of original oil in place.

And then the top line with the open squares or diamonds through it is the horizontal, the one vertical with the horizontal lateral through it. And its cumulative recovery was 464,000 barrels, which equates to 25 percent of original oil in place for the 80-acre drainage.

So after doing the simulation work, I came to the conclusion that a horizontal or a highly deviated lateral section should recover the same or slightly more than two vertical wells.

Q. And so there's the potential here for the recovery of hydrocarbons that might not otherwise be recovered?

A. Yes, there is that possibility.

Q. Would you go ahead, then, and identify what we've marked as Exhibits 10 and 11 and describe what you're trying to show through those exhibits as well?

A. Okay, Exhibits 10 and 11 explain why we're asking for the special test allowable.

Exhibit 10 shows the Drinkard production sensitivity to initial rate and to total skin.

Your X axis is your producing time, in months this time. So this is just a one-year production period. Your Y axis is your producing rate in barrels of oil per day.

And what I simulated here was, I first simulated your bottom two lines where you have your solid circles and your dash, it would be your test allowables of 374 barrels a day, and this is with either being slightly damaged, having a positive-3 skin, or no damage at all.

And looking at this, you can tell that after a three-month period, you still -- you won't know whether your well is stimulated or not.

If you're able to produce the well at a higher rate initially, your well would produce with zero skin at 1200 barrels a day for roughly seven to nine days, max, and then start declining.

And if it had a positive skin -- which we only

used a positive-3 skin; it's not like we put a positive-14 in there, which would be very drastically different -- but even if your well is slightly damaged, you would still see a stark difference in your production rates.

And what we hope to do is, first from our test of the vertical section, we'll refine our vertical model. And then from our test of the horizontal section, we'll determine whether our horizontal section is damaged or not.

And the reason for this, wanting the special test allowable in the first three months is, we plan to already have the vertical well down on the State "O" Number 3, and we want to make sure that when we're completing its sidetrack that we're doing the right completion on it.

And it's not necessarily demonstrated here, but if the well is damaged you won't recover the same reserves than if the well is undamaged or even stimulated. But I didn't make that --

Q. Can you go ahead and identify Exhibit 11? And then we can probably --

A. Okay.

Q. This exhibit backs up Exhibit 10, does it not?

A. Exhibit 11 is just sort of showing why you're seeing the rate difference.

On your X axis again, it's your producing time in months for twelve months. And your Y axis is your average

drainage pressure, and this is 100 feet away from your bottomhole wellbore of your vertical. Our grid system was based on grids of 100 feet, and this is basically one grid cell away.

And what's happening is, the top two lines -- which is your solid circle and your dashed line -- is the wells that are producing at the low rate of 374 barrels a day, and you're not seeing any pressure differential between the two. The only place that you're going to see any pressure differential is when you produce the wells at high rate, and they're either damaged or not damaged.

The open circle is your producing at 1200 barrels a day initially with a positive-3 skin. And then the solid line below it is 1200 barrels a day, and it's zero skin.

And this is just sort of backup to show why you're seeing the rate difference in Exhibit 10.

Q. So in your expert opinion as a reservoir engineer, do you believe that it's imperative that there be a three-month test period at triple allowables?

A. Well, the triple allowables -- I believe the special test allowable is definitely required, first in making the right decisions on the completions of the horizontal sections.

The triple allowable -- Realistically, you know, we're not going to be able to keep it up for the full three

months. But we need that initial rate to make sure we can make -- see this difference, damaged or undamaged.

Q. And you're proposing that this would be made up?

A. Yes, we would make up any overage to do this.

Q. In what time period?

A. In the next 12 months, preceding 12 months [*sic*].

Q. Is it possible that this test period might ultimately lead to recovery of oil from the well that might not otherwise be recovered?

A. It could be.

Q. Would you be willing to conduct a directional survey on the lateral portion of the wellbore during or after completion of drilling operations?

A. Yes, we would. We'll be doing measurement while drilling the whole time, so we'll have readouts the whole time we're drilling and know exactly where we're at.

Q. Would you notify the area office of the date and time so they can observe it?

A. Yes.

Q. And would you be willing to submit copies to the area office?

A. Yes, we will.

Q. And the Division?

A. Yes.

Q. Have we missed anything? Is there anything else

you need to testify to on these exhibits?

A. I do think this is an excellent place for a horizontal well. I know -- I realize I'm not the expert geologist, but it just sort of stood out that maybe this is the place in New Mexico where we could put a good horizontal well.

And the other thing is, with Marathon's well potentialing at 79 barrels, if we don't do a horizontal there's not going to be any drilling around it. You know, the offset operators are not going to drill for 79 barrels a day out there.

So this is something that can generate, if it's successful, a lot of activity for everybody.

As a side note, I've noticed -- this is -- The word is "area". Everybody is so free with their information, everybody knows that everybody else is doing out there, you know. If I need information from Marathon they give it to me. If they want information from me, I give it to them. So...

Q. That might result in a test for more than just one well?

A. Yeah.

Q. In your opinion, will approval of this Application result in the recovery of hydrocarbons otherwise left in the ground?

A. Yes.

Q. And will this approval therefore prevent waste?

A. Yes.

Q. And result in the conservation of oil and gas in the State of New Mexico?

A. Yes, it would.

Q. And the protection of correlative rights?

A. Yes.

Q. Were Exhibits 5 through 11 prepared by you or under your supervision?

A. Yes.

Q. And can you testify to their accuracy?

A. Yes, I can.

MR. BULLER: We move for the admission of Exhibits 5 through 11, Mr. Hearing Examiner.

EXAMINER CATANACH: Exhibits 5 through 11 will be admitted as evidence.

MR. BULLER: That completes my direct examination.

EXAMINER CATANACH: Mr. Bruce?

MR. BRUCE: Just a couple of short ones, Mr. Examiner.

EXAMINATION

BY MR. BRUCE:

Q. Referring to your Exhibit 5, the "M" 16 well,

will the vertical well be acid-treated?

A. Yes, it will.

Q. Okay. And then the lateral section, you say within a 60-foot target zone. Why was that figure selected?

A. The 60 foot is sort of oversimplified, and we really don't want to be held to that.

Initially, looking at it before we completed our simulation work, we thought we'd stay in the top 60 feet of the oil leg. But from our simulation work, it shows that if we want to recover the reserves throughout the whole oil leg we're going to have to deviate throughout it.

Q. And on your Exhibit 9 you show a -- some different scenarios there, a recovery of original oil in place.

A. Right.

Q. What is usual for the Drinkard?

A. Well, as of right now we only have a maximum -- Well, we have less than two years of production in the Drinkard, so we really don't have any good feel. And if the wells come in -- this is -- if the wells come in at a top allowable, they're flat for at least a year. So it's real hard to pin down.

These numbers might be a little optimistic. You know, they're on the upper end --

Q. Sure.

A. -- from our recovery.

But right now we don't have any good numbers for recoverable reserves in the Drinkard.

Q. And you said you would make up any overproduction, and as I understood it, you have the three-month test period, and then you would make up the overproduction --

A. That's correct.

Q. -- in the next twelve months?

A. That's correct.

Q. And after this testing period, what allowable are you asking for the 80-acre units?

A. 374 --

Q. Is that --

A. -- which is the allowables for the two 40-acres.

Q. It's double the depth bracket allowable --

A. Right.

Q. -- for 40 acres?

A. 40-acre allowable is 187.

Q. Okay. What is the depth bracket allowable for a normal 80-acre well at that depth?

A. I'm sorry, I don't know that.

MR. BRUCE: Okay. That's all the questions I have.

EXAMINATION

BY EXAMINER CATANACH:

Q. Ms. Olson, on Exhibit Number 5, is that casing point -- is that at the top of the Drinkard?

A. No, it's going to be roughly 200, 250 feet above the Drinkard, so we can kick off the sidetrack in the open-hole section.

Q. At this point, do you know what your kickoff point is?

A. No, we're assuming it's going to be roughly 7500 feet, but we'll pick it -- And that's one reason we're drilling through the Drinkard and obtaining logs, is one measure we still have -- we do have oil production. And secondly, to pick our kickoff point using the log, so we know exactly when the Drinkard comes in.

Q. Is that the top of the Drinkard at 7762; is that correct?

A. That's correct. That's from the Marathon log.

Q. Okay.

A. That offsets it.

Q. So that's not going to be -- That may be a little off there?

A. Right, it will probably -- You know, we could be deeper by a 30 feet.

That's one of the things that Mobil's learned in

drilling horizontal wells, is that it's better to drill the vertical section through your producing horizon and make sure you know what you're going after.

Q. How long is the Number 16 going to be tested before you --

A. Well, it depends on when we get our permit to do the offtrack. Two, three weeks.

Q. You're just waiting on the permit?

A. Yeah, and also to verify production in the vertical section.

Q. The special testing period, I've discussed it extensively with Phillips. Yours is a little different. You're requesting a three-month test period with a triple allowable; is that correct?

A. That's correct. We're not asking for six months or a year's worth. We don't think it's necessary.

Q. Okay. So you're asking for 1122 barrels a day --

A. That's correct.

Q. -- period of three months.

At what rate do you propose to make up that overproduction?

A. Well, if the well produced at 1122 for the whole three months, we could cut the well back to 274 and make it up within a year's time frame.

But being the reservoir engineer that I am, I

would probably ask them to shut it in and give me a buildup, so we'll probably make it up quicker. And plus, I don't think the well will hold up at the 1122 for the full three months, just for part of it.

Q. So are you proposing that you shut the well in after three months and make up all overproduction?

A. That depends on who wins the battle, whether the field wins the battle or the reservoir engineer wins the battle.

If you have a 374-barrel-a-day allowable well, they don't like you to tell them to shut it in for a long time. But we will make it up.

Q. You would prefer that you shut the well in?

A. From a reservoir standpoint, yeah, for analysis purposes.

Q. You can't state at this time what Mobil wants?

A. Well, I know my personality and I know the field's personality, and -- Usually I win, but not always.

But no, I can't state. But I can guarantee we will make it up in that 12-month time period.

Q. That issue, I understand, is with regards to the special allowable -- that is, Phillips' taking that to the Commission hearing to -- Hopefully, they can resolve that question.

I'm not sure you guys want to wait that long for

resolution of that, but that might give us some guidance on how to handle these. I'm not sure even when that's coming up for hearing.

A. But I think you can see where it's understandable where you'd want to know how your wells are being completed, and there's really not a lot of data trying to determine how a horizontal well is completed.

Even shutting it in and doing a buildup analysis is very difficult in horizontal sections. Buildups in the Drinkard, just in the vertical section, are almost unanalyzable because you see many layering-type reactions and...

Q. Did you testify that it's your opinion that your ultimate recovery may be harmed by not being --

A. It could be. I mean, if you have a damaged horizontal section and that's supposed to be effectively taking the place of two vertical wells, it could be.

Q. It's very difficult to quantify any kind of --

A. You can -- In the simulator, you know, you can put it in a total skin and simulate it out to a certain flowing bottomhole pressure and ultimate recovery, like a life, and see it.

But it is hard, because there's a lot of assumptions that go into a simulator to begin with.

Q. Okay. On the State "O" --

A. Yes.

Q. -- Number 3, you're just asking -- you're not asking for any kind of -- What allowable are you asking for on that well?

A. Just the typical 40-acre, 187-barrel --

A. Are you asking for the special allowable on that well?

A. Just the test allowable, yes.

Q. The testing --

A. Yes.

Q. -- the same -- ?

A. Yes.

Q. Which would be triple the --

A. -- 187, that's correct.

Q. Okay.

A. We can drill one horizontal well out here for approximately $200,000 cheaper than two verticals, so it -- costwise, it's -- the economics are much better.

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

MR. BULLER: That concludes the presentation of our evidence, Mr. Hearing Examiner.

MR. BRUCE: Nothing further from us, Mr. Examiner.

We would like to make it clear that Exxon does

support Mobil's Application.

EXAMINER CATANACH: Okay. Okay, there being nothing further in this case, Case 11,071 will be taken under advisement.

(Thereupon, these proceedings were concluded at 4:50 p.m.)

* * *

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 11071, heard by me on August 18 1994.

David R. Catanach, Examiner
Oil Conservation Division

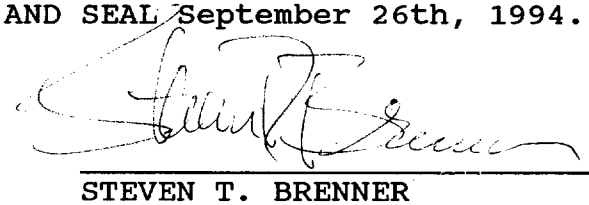
CERTIFICATE OF REPORTER

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 September 26th, 1994.



STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 1994