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 BLACK HILLS EXPLORATION & PRODUCTION, INC., FOR THE CREATION OF THE JICARILLA APACHE TRIBAL LANDS PRODUCTION AREA AND THE ADOPTION OF SPECIAL POOL RULES AND REGULATIONS THEREFOR IN THE PICTURED CLIFFS FORMATION, EAST BLANCO-PICTURED CLIFFS POOL, AND THE TERTIARY FORMATION, CABRESTO CANYON-TERTIARY POOL, RIO ARRIBA COUNTY, NEW MEXICO	)	CASE NO. 13,816

2006 DEC 13 A 8 3 12

ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: RICHARD EZEANYIM, Hearing Examiner

November 30th, 2006

Santa Fe, New Mexico

This matter came on for hearing before the New Mexico Oil Conservation Division, RICHARD EZEANYIM, Hearing Examiner, on Thursday, November 30th, 2006, at the New Mexico Energy, Minerals and Natural Resources Department, 1220 South Saint Francis Drive, Room 102, Santa Fe, New Mexico, Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

* * *

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November 30th, 2006
Examiner Hearing
CASE NO. 13,816

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* * *

A P P E A R A N C E S

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By: WILLIAM F. CARR

* * *

WHEREUPON, the following proceedings were had at 1:46 p.m.:

EXAMINER EZEANYIM: The next case on the docket is Case Number 13,816. This case was continued from the November 9th Examiner Hearing. This is Application of Black Hills Exploration & Production, Inc., for the creation of the Jicarilla Apache Tribal Lands Production Area and the adoption of special rules and regulations therefor in the Pictured Cliffs and the Tertiary systems in Rio Arriba County, New Mexico.

Call for appearances.

MR. CARR: May it please the Examiner, my name is William F. Carr with the Santa Fe office of Holland and Hart, L.L.P. We represent Black Hills Exploration & Production, Inc., in this matter, and I have three witnesses.

EXAMINER EZEANYIM: Any other appearances? Any other appearances?

Okay, may the witnesses stand to be sworn, please?

(Thereupon, the witnesses were sworn.)

EXAMINER EZEANYIM: Okay, Mr. Carr, you may proceed.

MR. CARR: May it please the Examiner, most of our exhibits are going to be presented on PowerPoint. I

have provided hard copies. Some of the land and geological exhibits, the hard copies are a little small, and I also have larger copies of those exhibits which I can leave behind so you'll have a large copy to refer to --

EXAMINER EZEANYIM: Okay.

MR. CARR: -- and I have those for both the land and the geological presentation.

With your permission, I'd like to give a brief opening statement. I'd like to preview for you what we're going to present. I'd like to tell you what we're seeking and also point out what we're not seeking, because I think it will help put the evidence in some sort of framework as we present it.

EXAMINER EZEANYIM: Yeah, I think I would like to hear that, but let me tell you what I think you are asking so if I'm wrong you can correct me --

MR. CARR: Yes, sir.

EXAMINER EZEANYIM: -- let me go ahead and tell you what I understand you are asking in this case.

First of all, you are asking for the creation this Jicarilla Apache Tribal Lands Production Area, right?

MR. CARR: Yeah.

EXAMINER EZEANYIM: You want to create that. And you want an adoption of special pool rules and regulations for the production area?

MR. CARR: (Nods)

EXAMINER EZEANYIM: Okay. And then anyway, when I looked at some other issues concerning this case, is it Black Hills acquired this interest, or -- is it Mallon Oil?

MR. CARR: Yes, sir, that's correct.

EXAMINER EZEANYIM: -- is correct in this order.

Of course you know, the order we're talking about here is Order Number R-11,858. It talks about the pilot --

MR. CARR: Correct.

EXAMINER EZEANYIM: -- AFE program as follows: You are authorized to drill 50 wells in the one -- in the 25 160-acre, more or less --

MR. CARR: Right.

EXAMINER EZEANYIM: -- units in the Pictured Cliffs.

MR. CARR: Correct.

EXAMINER EZEANYIM: You are authorized to drill test wells, 14 test wells, in the 20 160-acre special units, more or less, in the Tertiary system or --

MR. CARR: Correct.

EXAMINER EZEANYIM: -- system.

MR. CARR: Right.

EXAMINER EZEANYIM: Okay, I think the pilot program is to collect data, engineering data, to see where we are going to establish all these rules.

MR. CARR: Right.

EXAMINER EZEANYIM: Now, I think you are here now -- what you are here now is to tell me that you need this increased density --

MR. CARR: That's right.

EXAMINER EZEANYIM: -- in these units because of the test results you have both in the Pictured Cliffs and in the Tertiary systems.

MR. CARR: Correct.

EXAMINER EZEANYIM: Are you going to do both of them or just one?

MR. CARR: No, we're going to look at both of them.

EXAMINER EZEANYIM: Okay, are going to look at -- Okay. Okay, that's what I understand --

MR. CARR: All right --

EXAMINER EZEANYIM: -- you're asking.

MR. CARR: -- and as you stated, Mr. Examiner, what we're seeking is the creation of what we have called the Jicarilla Apache Tribal Lands Production Area --

EXAMINER EZEANYIM: Uh-huh.

MR. CARR: -- and the adoption of special pool rules for this area. It includes both the Pictured Cliffs formation, which is a portion of the East Blanco-Pictured Cliffs Pool, and it includes the shallower Tertiary

formation that is now called the Cabresto Canyon-Tertiary Pool in Rio Arriba County.

As you noted, Black Hills is the successor to Mallon. Mallon was the company that was the primary company developing the area. And Black Hills, through its subsidiary -- and this is, I think, important -- Black Hills Gas Resources, Inc., that's actually the subsidiary's name that operates the properties. But they're here today to present this case, seeking permanent pool rules for this portion of the reservoir -- of the Tertiary and the Pictured Cliff reservoir.

The evidence is going to show that it's a fairly complex area and that there have been a number of factors that bear on drilling wells in the area. First of all, it's on the Jicarilla reservation, and they have concern about surface disturbances and land use that affects the way any operator develops properties.

And there are also other topographic issues, geological issues, cultural issues and archaeological problems, and these problems have been there for years. And when Mallon was out developing this property, they worked with the Oil Conservation Division to try and develop pools to deal with all of these issues. And we're going to present as part of our case a set of prior orders, administrative and hearing orders that I think help provide

the history for this.

But basically what the OCD did back in 1999 was, they approved Order NSL-4355. And that order, because there were so many unorthodox locations being sought, approved six of them, and then in an area that was in the reservation that encompassed 60,000 acres authorized unorthodox well locations without further OCD involvement. All they had to do was get those approved by the Jicarilla Apaches.

And that administrative order recognized all these problems, archaeological sites, needing to protect forest and wildlife habitat and all of those things.

So basically what we now have is an administrative order that approves unorthodox locations without having to come to you.

EXAMINER EZEANYIM: NSL-4- --

MR. CARR: And it is NSL-4355. And since we've asked for special pool rules, we've asked that they all be in one place and that basically that these same provisions be incorporated into what we're seeking here today.

When Mallon was working the area back in the year 2000, there were at that time initially three Tertiary pools, all called Cabresto Canyon. One was in the San Jose, the other was in the Nacimiento, and then the other one in the Ojo Alamo. And the OCD combined those into one

pool back in 2000, and all of a sudden we had too many wells on a lot of spacing units.

And so Mallon again came in, and the Division approved simultaneous dedication of 17 units because of this. And we'll give you that order as well, as part of the case.

And so today -- And then there was the pilot project that you referenced a few minutes ago for Mallon.

And so today we're coming back, we're looking at the same formation. We're going to give you a brief history of the area. And the history and what we've been talking about is somewhat complex for an area like this, but really what we're seeking isn't that complex.

We're seeking basically one thing: We'd like to increase the well density on this portion of the lands we lease in the Jicarilla reservation.

The Mallon applications covered 60,000 acres. We're looking at about a quarter of that, and we've cut it down to the area where we actually believe we have the kind of data that you're going to want to see, and we're going to present that to you today.

We're going to call a geologist and an engineer to review the technical data for you. We're going to ask you simply, in terms of well locations, basically to incorporate what was done before in the administrative

order.

You're going to hear testimony today about drilling horizontal wells in this area in the Pictured Cliffs, but that's really not an issue in this case, because we're not asking for a change in the rules in horizontal drilling. If we can get the increased density, we'll just proceed under the existing Rule 111 to deal with horizontal development in this area.

We're also seeking for these -- asking that these special pool rules be limited to just this portion of the Pictured Cliffs and Tertiary formations. And although this isn't common, this has been done before. You have a -- different rules for part of the Basin-Fruitland Coal in the fairway area, you've had different spacing rules in the Bravo Dome depending on where in the reservoir you were drilling.

And so what we're asking is that you carve out an area over on the edge of the Basin and approve that for the increased density.

You'll see that it is Jicarilla land. We have been, our testimony will show, been to the Jicarilla nation, and actually during the noon hour we received a resolution from their tribal counsel endorsing this. And you'll be getting a copy of that, we have one for you.

The BLM has also approved this and put conditions

on their approval asking that we report back to you at regular intervals.

And if you look at the Mallon order that was entered in the pilot case, for some reason there was no provision in that order setting any time to ever report back to you.

And so there were no reports. And the BLM thinks that as we go forward, at least annually we should report to you, and you need to know that Black Hills is certainly prepared to do that and has no problems with the conditions imposed by the BLM.

So that's what we're about.

I'm going to call Brenda Mustain, a land witness, to review with you the status of the lands and the notice that we've provided, and I believe I'll draw some notice questions from Mr. Brooks --

(Laughter)

MR. CARR: -- and then we'll have Mr. White present his geological data.

And then we have Tom Zadick, who is a reservoir engineer, to review that part of the case for you.

So with your permission, at this time I'd like to call Brenda Mustain.

EXAMINER EZEANYIM: Okay. Brenda, you have been sworn.

BRENDA MUSTAIN,

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

DIRECT EXAMINATION

BY MR. CARR:

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

A. Brenda Mustain, M-u-s-t-a-i-n.

Q. And where do you reside?

A. Golden, Colorado.

Q. By whom are you employed?

A. Black Hills Exploration and Production, Inc.

Q. And what is your current position with Black Hills?

A. I'm currently a landman. For the last three years -- three and a half years, I've been employed by Black Hills, and the last three years I've been in charge of maintaining the interests on the Jicarilla Apache Nation.

Q. What is the relation between Black Hills Exploration and Production, and Mallon Oil Company?

A. Black Hills is a successor to the Mallon -- to Mallon Oil Company, which we acquired in 2003.

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

A. No, I have not.

Q. Could you summarize your work in the oil and gas industry?

A. I started in the oil and gas industry in 1980. For the past 26 years I've worked at various companies in the land area as a division analyst, lease and title analyst and landman.

Q. And for what companies have you worked?

A. I've worked for Mitchell Energy, Miracle Oil and Gas, Amoco Production, Key Production, St. Mary Land and Exploration.

Q. And have you in the past 26 years always been employed in a land position?

A. Yes.

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

A. I am.

Q. And are you familiar with the status of the lands in the area that is the subject of this Application?

A. I am.

MR. CARR: We tender Ms. Mustain as an expert in petroleum land matters.

EXAMINER EZEANYIM: Ms. Mustain is so qualified.

Q. (By Mr. Carr) Initially, would you summarize for Mr. Ezeanyim what it is that we are seeking in this case?

A. Black Hills is the principal operator of the wells in the East Blanco-Pictured Cliffs Pool in this area. We'd like the creation of a Jicarilla Apache lands production area in the Pictured Cliffs formation, East Blanco-Pictured Cliffs Gas Pool, and the Tertiary formation, which is the Cabresto Canyon-Tertiary Pool.

We'd like adoption of special rules and regulations for the Jicarilla Apache Tribal Production Area, including provisions for infill drilling and special well-location requirements.

Q. In the area that we're asking be created -- is the Jicarilla Apache Tribal Lands Production Area, and in these formations, the base of the Pictured Cliffs, is Black Hills the only operator in this area?

A. Yes.

Q. Let's go now to our background maps that are on PowerPoint. Is Exhibit Number 1 simply the entire PowerPoint presentation?

A. Yes, it is.

Q. And what does it include?

A. It includes exhibits for land, geology and engineering.

Q. And we've numbered the slides?

A. We have.

Q. Would you go to this slide -- it's actually page

2 in the handout material -- and explain to us what this shows?

A. It's a little hard to see, and we do have bigger maps for you as well, but this outline shows the Black Hills leasehold on the Jicarilla lands.

Q. These are all your leasehold positions?

A. Yes.

Q. It's 100-percent Jicarilla property?

A. It is.

Q. And where is it located in the San Juan Basin?

A. It's at the eastern to northeastern edge of the Basin.

Q. Let's go to the next slide. This is slide number 3, this is the same map. What is the difference?

A. This shows the -- the shaded blue areas show the original infill pilot program.

Q. And this is the acreage that the Division approved for Mallon to increase density?

A. Yes, it is.

Q. And the next exhibit? What have you added here, Ms. Mustain?

A. The green shaded area shows our proposed Jicarilla Apache Lands Production Area.

Q. And you've limited it to just this portion of the Jicarilla reservation?

A. Just that portion.

Q. All right, now to the next exhibit. What is this?

A. This shows the working interests within that area of our Application. The yellow shows that Black Hills owns 100 percent of the working interest, surface to the base of the PC. The green shows that we own surface to the base of the PC, 80 percent, Energen owning the other 20 percent.

The peach-colored note there is -- Black Hills owns from the surface to the base of the San Jose, 100 percent, and then Black Hills from the base of the San Jose to the base of the PC owning 80 percent, with Energen owning the other 20 percent.

Q. In the area that is the subject of today's Application, are there only two working interest owners?

A. Yes.

Q. And the other working interest owner being Energen?

A. Yes.

Q. Has Black Hills discussed the Application with Energen?

A. Yes, we have.

Q. And what is your understanding of Energen's position?

A. We understand that they're in support of our

Application.

MR. CARR: And Mr. Examiner, Mr. Poage is here with Energen, if you would like to have him that they are also in support of the Application.

EXAMINER EZEANYIM: Well, I take it on face value that what you're telling me is correct.

Q. (By Mr. Carr) So we have 100 percent of the interests in support of the Application; is that correct?

A. That's correct.

Q. So there should be no correlative rights issue?

A. That is correct.

Q. What rules currently govern the development of this area?

A. Rule 104.C.(3) of the General Rules and Regulations of the Oil Conservation Division.

Q. And what do those require?

A. 160-acre spacing and proration units, with wells to be located at least 660 feet from the outer boundary of the dedicated quarter section.

Q. And that's what we'd be superseding, in part, with the proposed rules?

A. That is correct.

Q. Could you provide Mr. Ezeanyim with a general historical background of the area? And I think we should start by just generally explaining when this portion of the

Basin was developed.

A. It was substantially developed by Mallon in the late 1980s to 1990s. They really did the majority of the exploration and development of these lands.

Q. And as both Mr. Ezeanyim and I have already discussed, this area has been the subject of prior OCD orders and hearings, has it not?

A. Yes, multiple actions.

Q. And why was that?

A. It's a difficult area to develop.

Q. Is Exhibit Number 2 a compilation of orders, both administrative and hearing orders that affect the area that's under consideration here today.

A. Yes.

EXAMINER EZEANYIM: Where is Exhibit Number 2?

MR. CARR: Exhibit 2 -- and Mr. Ezeanyim, they're behind the PowerPoint. There's a clip --

EXAMINER EZEANYIM: Oh, okay --

MR. CARR: -- on them.

EXAMINER EZEANYIM: -- this one.

MR. CARR: Yes, sir.

Q. (By Mr. Carr) Could you explain what that first order is in Exhibit 2?

A. The first order is Administrative Order Number NSL-4355, and this approved six unorthodox well locations,

recognizing the difficult development issues in the area.

A. In fact, the order addressed those, did it not?

A. It did, and it addressed archaeological sites to minimize the disturbance of forest and wildlife habitats, minimizing construction of well pads by avoiding rugged terrain where practical, and positioned wellbores within geologically more favorable locations in order to maximize the likelihood of obtaining commercial gas production.

Q. And then what did it authorize Mallon to do?

A. It adopted procedures that allowed unorthodox well locations within the contract area without further regulatory review.

Q. And there's an order behind that, that is just an amendment of --

A. That's correct.

Q. -- the administrative order.

A. Right.

Q. Does this exhibit also contain Order Number R-11,445?

A. Yes, it does.

Q. And what does that do?

A. This consolidated the Cabresto-San Jose Pool, Nacimiento Pool and Ojo Alamo Pools into the Cabresto Canyon Tertiary Pool.

Q. As a result of that consolidation, did Mallon

have to come back to the OCD?

A. Yes, we needed an administrative order to dedicate 1 spacing units in relation to that.

Q. And so you had multiple wells on 17 spacing units as a result of this?

A. That's correct.

Q. And what was the order number that approved those?

A. That was SD-02-03.

Q. Also included in this material is a copy of the order approving the pilot project; is that correct?

A. It is, and that order is Number 11,858.

Q. Is Black Hills just concerned with the Pictured Cliffs formation?

A. Not at all. It's the most important part of our program, but we also have an interest in other areas as well.

A. Now following the entry of the order approving the pilot project, certain activity was undertaken in response to that order; is that correct?

A. Right.

Q. And that has resulted in technical information that is beyond your land expertise?

A. That is correct.

Q. And that will be reviewed by the geological and

engineering witnesses today?

A. It will.

Q. Is Exhibit Number 3 an affidavit confirming that notice of this Application has been provided to affected interest owners?

A. It is.

Q. And to whom was notice provided?

A. It was -- We noticed all of the operators within the pool.

Q. Did you also notify the BLM and the Jicarilla nations?

A. We did indeed.

Q. And what response did you receive to these notice letters?

A. We received a letter from the President of the Jicarilla Apache Nation supporting our Application, which is attached.

Q. Is that Exhibit 4?

A. Yes.

Q. Is that Exhibit also contained in a letter from the Bureau of Land Management?

A. It does, in support of the Application, yes.

Q. And you're familiar with the conditions that the BLM has imposed in terms of periodic reporting?

A. Yes, we are.

Q. Does Black Hills agree with those?
A. Yes, we do.
Q. Now Exhibit Number 5 is a new exhibit today.
A. Right.
Q. Would you identify that, please?
EXAMINER EZEANYIM: Where is Exhibit Number 4?
MR. CARR: Exhibit --
EXAMINER EZEANYIM: Five, 3 --
MR. BROOKS: This is 4.
EXAMINER EZEANYIM: I don't have that. I don't have 4. I have 3, 5 -- Okay.
MR. CARR: Okay? And Exhibit 4 is the November -- starts with the November 22nd letter, Mr. Ezeanyim letter, Mr. Ezeanyim? Is that right? Do you have that one?
EXAMINER EZEANYIM: Yeah.
Q. (By Mr. Carr) What is Exhibit Number 5, Ms. Mustain?
A. Exhibit Number 5 is a resolution of the Jicarilla Apache Nation in support of our Application.
Q. And we received this today, did we not?
A. Today.
Q. When did you make your presentation to the Jicarilla --
A. We made that presentation this Monday.

Q. You had previously attempted to make the presentation, but there were scheduling issues, were there not?

A. We did, we attempted this on the 2nd of November, but we were not able to present at that time.

Q. Ms. Mustain, were the Black Hills land exhibits prepared by you or compiled under your direction?

A. Yes, they were.

Q. And we're talking about slides 2 through 5 and Exhibits also 2 through 5; is that correct?

A. That is correct.

MR. CARR: May it please the Examiner, at this time we'd move the admission of Slides 2 through 5 and Exhibits 2 through 5.

EXAMINER EZEANYIM: At this point Slides 2 through 5 and Exhibits 2 through 5 will be admitted into evidence.

MR. CARR: Yes, and that concludes my direct examination of Ms. Mustain. We will be calling a geologist and an engineer to review the technical portions of the case.

EXAMINER EZEANYIM: Okay. Do you have any questions?

MR. BROOKS: No questions. Looks like they gave notice to everybody.

MR. CARR: And I would just for the record like to point out that a couple of weeks ago I was called to task for what the Commission counsel or Division counsel thought was an inadequate notice letter. That was my shell notice letter that --

MR. BROOKS: Yes.

MR. CARR: -- and I have revised that, but it was after these notice letters.

MR. BROOKS: We'll appreciate that.

EXAMINER EZEANYIM: Thank you.

MR. CARR: May it please the Examiner, at this time I call Dick White.

RICHARD WHITE,

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

DIRECT EXAMINATION

BY MR. CARR:

Q. State your full name for the record, please.

A. Yes, sir, I'm Richard White.

Q. And where do you reside?

A. I live in Evergreen, Colorado.

Q. By whom are you employed?

A. Black Hills Exploration and Production.

Q. And what is your current position with Black Hills?

A. I'm a geologist at Black Hills.

Q. Mr. White, have you previously testified before the New Mexico Oil Conservation Division?

A. No, sir, I have not.

Q. Would you review for Mr. Ezeanyim your educational background and your work experience?

A. Yes, sir, I obtained a bachelor of science degree from Northern Illinois University in 1980, master of science from University of Wisconsin in 1982. I've worked for Unocal, Tom Brown, Saudi Aramco, Black Hills and Calpine Natural Gas.

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

A. Yes, sir, I am.

Q. And have you made a geological study of the area that is the subject of this Application?

A. Yes, sir.

Q. Are you prepared to share the results of your work with Mr. Ezeanyim?

A. I am.

MR. CARR: Mr. Ezeanyim, we tender Mr. White as an expert witness in petroleum geology.

EXAMINER EZEANYIM: Mr. White is so qualified.

Q. (By Mr. Carr) Mr. White, would you go to what is marked Slide 6, identify that and review this for the

Examiner?

A. Sure. This is a location map in the San Juan Basin. I have Dr. Faucett's map from the USGS in 2001 in the lower left. This shows the Jicarilla Indian Reservation marked in yellow on the east flank of the San Juan Basin. Blown up out of that in the northeast map is again the Jicarilla Indian Reservation in yellow. Black Hills leases are shown in orange and green, and the proposed increased density project is shown in green itself.

This is a structure map on the Huerfanito Bentonite, which is a stratigraphic marker in the Lewis Shale. This structure map further shows that the acreage of interest is on the east flank of the San Juan Basin. Dip is very generally into the west, and there are minor noses and troughs dipping into the Basin at this location.

Q. Let's go now to the information we have on the Pictured Cliffs formation. If you'd go to the -- to Slide 7.

A. This is a north-to-south cross-section through the proposed project area. It shows the stratigraphy that we're interested in, beginning with the Tertiary formations, the San Jose, Nacimiento and Ojo Alamo. The San Jose is present at the surface over most of the Jicarilla Indian Reservation. That formation, along with

the Nacimiento and Ojo Alamo, are composed of fluvial sands. These are stream-deposited reservoirs. They are laterally discontinuous as well as thin and lenticular in a vertical sense.

Beneath the Tertiary intervals are the Cretaceous Kirtland and Fruitland formations. These are swamp paludal deposits of coals, sandstones and shales.

And finally, our main interval of interest, which is the Pictured Cliffs. The Pictured Cliffs marks the final regression of the Cretaceous seaway. It was deposited generally from the southwest to the northeast across the San Juan Basin from 70 to 90 million years ago. It is a mappable unit. It has a fine boundary with the Lewis shale below, and the Kirtland/Fruitland section above these are mappable boundaries, and the porosity units within the Pictured Cliffs are mappable as well.

Q. Your primary zone of interest is the Pictured Cliffs?

A. It is.

Q. In the Tertiary formations, the Ojo Alamo is the primary zone of interest?

A. Yes, it is.

Q. And you're going to be presenting geological information on both of those --

A. Yes, I will.

Q. -- is that correct?

A. Yes, it is.

Q. All right, let's go to the next slide. This is Slide Number 8.

A. Again, the -- a portion of the Black Hills leases are shown in orange and in green, the green portion being our proposed project area of interest. Along with this we are showing the increased density pilot areas in the blue stripes.

This -- Excuse me, this structure map in red is on the top of the Pictured Cliffs, and again we can see that the deepest portion of the Basin lies just to the west of the proposed project area. The dip is to the west, and you can see a structural nose exhibit itself across the green project area in Township 30 North and 3 West. This structural nose helps to accentuate the natural fracture system in this area and keep those fractures open.

The natural fracture direction is exhibited by the dark black lines, which are running generally north to south with a slight east-to-southwest direction. These dikes were emplaced in previously existing fractures, and this is the primary fracture direction in this part of the Basin.

Further evidence of the primary fracture direction was exhibited by John Lorenz of Sandia

Laboratories in 1993 in some outcrop mapping that he had done in the northeast portion of the Basin.

And then another point of evidence is an image log that we ran in one of our wells that we drilled all the way into the Dakota, and all the way through the section we found that the primary fracture direction was just off of straight north-south.

Q. Did you prepare this structure map from well data?

A. I did.

Q. And this map has spotted on it well locations?

A. It does.

Q. It includes for your geologic interpretation wells in the previously approved pilot area and also other wells throughout the region; is that right?

A. Yes, it does, that's correct.

Q. Let's now go to the --

EXAMINER EZEANYIM: Yeah, before you -- before you --

MR. CARR: Yes.

EXAMINER EZEANYIM: Hold it, please. Which one do you have on the -- right? I mean, those shaded areas in red. I know you have the green, and that nose there in the PC?

THE WITNESS: It's a structure on top of the PC,

and you see the nose dipping off to the west from the east, and that nose is very important, we believe, to accentuating the natural fracture system. It works to increase the density of the fractures, as well as hold those fractures open as they're draped over that nose.

EXAMINER EZEANYIM: Okay, well, with all the wells drilled in there, in the PC, both PC and Tertiary systems?

THE WITNESS: These wells are almost exclusively PC, but then of course they penetrate the Tertiary as well.

EXAMINER EZEANYIM: Yeah.

THE WITNESS: Correct.

EXAMINER EZEANYIM: Okay.

Q. (By Mr. Carr) Okay? All right, let's go to the next slide, the stratigraphic cross-section, and what does it show us?

A. This is a stratigraphic cross-section, again generally north to south through the project area. It is hung on the top of the Pictured Cliffs formation. You can see the coals marked in black in the Fruitland section above, and then the Lewis shales below.

There are two tracks per well on this cross-section. The left track in yellow and gray indicates shale content, and that's ranging from zero on the left to 100 percent on the right.

On the right track is an examination of the total porosity, and that track is from zero percent on the left to 20 percent on the right.

In the porosity track we have three colors: a gray color which is irreducible porosity, blue which is moveable water, and then red which is gas-saturated porosity. In general you can see a coarsening upward sequence on the clay volume track and increasing porosity as we rise to the top of the Pictured Cliffs on the right track.

The average porosity in the Pictured Cliffs is about 11 1/2 percent. That increases to about 15 to 18 percent in the upper third of the Pictured Cliffs. The upper third, which constitutes anywhere from 25 to 45 feet in the Pictured Cliffs, is the primary reservoir of interest. It is the best developed and has the highest porosity and permeability.

Q. All right, let's now go to your Slide Number 10, the net sand map.

A. This is a net sand map of the entire Pictured Cliffs formation through the area of interest. I used a cutoff of 8-percent effective porosity to generate this map, and the orientation of the sandbodies you can see generally running northwest to southeast is confined by studies that have shown that that is the orientation of the

shorelines during the deposition of the Pictured Cliffs as it migrated from the southeast to the northwest across this area.

The average net sand in this area is about 65 feet, and that ranges from about 40 feet to as much as 103 feet.

Q. Let's go to Slide 11, the hydrocarbon pore height map.

A. This map was derived from the net sand map. This is the hydrocarbon pore height, again showing an orientation northwest to southeast, exhibiting the ancient shoreline during Pictured Cliffs deposition. The average pore height in this area is about 7 pore-feet, and that ranges from 4 pore-feet to 9 pore-feet.

EXAMINER EZEANYIM: Excuse me, on this -- on this -- on this -- this is -- you have the green and the -- the outline, is that -- what color is that? I'm not really good at colors.

THE WITNESS: There are two colors. There is the green outline which indicates our project of interest, and the orange outline are the Black Hills leases.

EXAMINER EZEANYIM: Oh, okay. Is that why you are including -- But really, where you want your special -- is in the green zone?

THE WITNESS: Yes, sir.

EXAMINER EZEANYIM: I'm not talking about Iraq.

Go ahead.

THE WITNESS: Okay.

Q. (By Mr. Carr) All right, are you ready to go to your next slide?

A. Yes, sir.

Q. This is your schematic.

A. Right. This is an actual cross-section of one of our horizontal wells that's been drilled in the northern part of the Black Hills leases, and you can see the -- We're showing the same three formations of Fruitland, our Pictured Cliffs, which is the main target, and the Lewis Shale. There's a vertical exaggeration of 10 times in this cross-section.

What we want to show here is how we drill these horizontal wells in the Pictured Cliffs.

We come down and kick off in the top of the Pictured Cliffs and begin turning the well immediately. This allows us to build our full curve before we get to the Lewis shale, in most cases at the bottom of the Pictured Cliffs. We then build angle and rise into the upper one-third of the Pictured Cliffs and get into that primary reservoir in that formation, and then try to stay in that better porosity and permeability zone for the duration of the well.

This orientation helps us to expose the well to the best reservoir in the Pictured Cliffs for the longest duration, and we orient these wells generally east to west, normal to the primary fracture direction, so that we get exposure to the greatest number of natural fractures as we can.

Q. Now what you've shown us is the way Black Hills drills a horizontal well in the Pictured Cliffs?

A. That's correct.

Q. And the PC, you're developing that formation primarily with horizontal wellbores?

A. That's correct.

Q. This wellbore also would intersect all of the Tertiary horizons; is that correct?

A. Yes, it is.

Q. Does Black Hills develop the Tertiary with horizontal or vertical wells?

A. The Tertiary is developed with vertical wells.

Q. Now let's go to the next slide. This concludes the base information on the geology of the Pictured Cliffs. Let's take a look now at the Tertiary formation. This looks a lot like an earlier exhibit, Mr. White.

A. It is the same as Exhibit Number 7, sir, and I --

Q. Okay, and what is the purpose of it here?

A. -- I entered this only as a reminder of where the

Ojo Alamo formation is in the section. We are looking at the basal Tertiary section. The Ojo Alamo is a fluvial record of the initial Laramide uplift in the San Juan Basin. It's high-energy streams, and again this unit is highly mappable. It's high sand content, the V shale is low, and porosities range from 9 to 15 percent.

And I say it's highly mappable, however it is extremely discontinuous internally, and it is a very complex -- it has a very complex internal structure.

Q. All right, let's go to the next slide.

A. This is a stratigraphic cross-section. The datum this time is on the top of the Ojo Alamo formation, with the Nacimiento above and the Kirtland formation below. It is the same format as our Pictured Cliffs cross-section earlier with the -- with clay volume on the left and porosity on the right.

What I'd like to show on this is the internal variability of the Ojo Alamo in this area.

In the well track you can see red bands which indicate perforated intervals in the Ojo Alamo. In general, the upper unit of the Ojo Alamo is productive in the area of interest. However, you can see the second well to the right is wet in that upper unit, and the far well on the right has only a very minor amount of perfs in that interval. This indicates that although in general this

unit is productive, it is not in every case.

Further, you see on the fourth well from the left and the fourth well from the right, the absolute top of that interval is wet, it's water-bearing. And my point here is that this internal variability causes us to not be able to map gas zones in the Ojo Alamo with any high degree of confidence.

Gas zones are also found in the lower members of the Ojo Alamo, but with lesser frequency than the upper. The middle well shows some perforations about halfway down, and although I'm not showing any on this cross-section, we find Ojo Alamo sections that are entirely wet, with the exception of one lone gas zone at the bottom of the section.

So all this indicates that there are numerous vertical and lateral permeability barriers which allow gas to be entrained at any point in this Ojo Alamo section. And again, although this main unit can be mapped, mapping individual gas zones cannot be done with any degree of confidence.

Q. Mr. White, what geological conclusions have you been able to reach from your study of this proposed development area?

A. The conclusions that we have come to are three. First is that the Pictured Cliffs is a highly mappable

unit, both lithologically and porositywise, and it is -- it is a very good candidate for development in a horizontal drilling program. We can map that porosity interval in the top of the Pictured Cliffs, and we can design our wells to drill into that formation and remain in that formation.

Further, we believe that the development of the Pictured Cliffs can be enhanced by drilling these wells normal to the natural fracture direction, which in this case is roughly east to west.

Another conclusion is that the Tertiary section is stratigraphically very complex, and although we believe that these wells that we will drill for Pictured Cliffs will encounter gas in the Tertiary section, we will not be able to predict those encounters with gas zones with any degree of confidence.

EXAMINER EZEANYIM: Is the Kirtland in the Tertiary system? The Kirtland, is that in the Tertiary system?

THE WITNESS: I'm sorry, no, the Kirtland is the top of the Cretaceous.

Q. (By Mr. Carr) Mr. White, were Exhibits or slides 6 through 14 prepared by you?

A. Yes, sir, they were.

MR. CARR: May it please the Examiner, at this time we'd move the admission of Slides or Exhibits -- Pages

6 through 14.

EXAMINER EZEANYIM: Slides 6 through 14 shall be admitted into evidence.

MR. CARR: And that concludes my direct examination of Mr. White.

EXAMINER EZEANYIM: Do you have any questions?

MR. BROOKS: No questions.

EXAMINER EZEANYIM: You may be excused.

THE WITNESS: Thank you, sir.

MR. CARR: Mr. Examiner, as to both of the land and geological presentations, I have large copies of the exhibits I'll leave behind.

EXAMINER EZEANYIM: Okay, that will be good.

MR. CARR: And at this time I will call Mr. Zadick.

THOMAS W. ZADICK,

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, please?

A. Thomas W. Zadick, for the record Z like in zebra, A, D like in dog, I, C, K.

Q. Mr. Zadick, where do you reside?

A. Colleyville, Texas.

Q. And by whom are you employed?

A. I'm self-employed, I'm a consultant reservoir engineer.

Q. And what is your relationship with Black Hills?

A. I work for them on a contract basis.

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

A. Yes, I have.

Q. Were you before Mr. Ezeanyim at that time?

A. No, I was not.

Q. Would you review for the Examiner your educational background and your work experience?

A. I have a bachelor's and a master's degree in chemical engineering from Montana State University. I went to work for Shell Oil Company, worked for them for six years, I had 23 years with Union Pacific Resources in various reservoir engineering and management capacities. For the last eight years I've been doing a consulting practice in reservoir engineering.

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

A. Yes, I am.

Q. Have you made an engineering study of the area that is the subject of this Application?

A. Yes, I have.

Q. And are you prepared to share the results of your work with Mr. Ezeanyim?

A. Yes, I am.

MR. CARR: We tender Mr. Zadick as an expert witness in reservoir engineering.

EXAMINER EZEANYIM: Mr. Zadick is so qualified.

Q. (By Mr. Carr) Mr. Zadick, when were you retained by Black Hills?

A. In July of 2006.

Q. And what were you asked to do?

A. To look at the -- to do reservoir studies on the Tertiary formations as well as the Pictured Cliffs, and determine whether there was an opportunity for increasing recovery in these intervals.

Q. And have you concluded that study?

A. Yes, I have.

Q. Have you prepared exhibits for presentation here today?

A. Yes.

Q. Let's go to Slide 15, and I'd ask you to explain what this shows.

A. Well, Slide 15 is simply an overview of the testimony on the Pictured Cliffs reservoir. I'm going to start out with a recommendation, and then I will briefly discuss the work that was done in three areas, the first

being normalized rate-time analysis. We did some finite-difference modeling to look at idealized reservoir recovery in these tight sands. And then we did a statistical study to look at EURs that were calculated from decline curves, and compare those to volumetric gas-in-place numbers generated using wellbore parameters, and to arrive at a recovery efficiency for the wells that were completed only in the Pictured Cliffs formation.

Q. Before you go into the details of your study, I'd like for you to review your recommendations for the Examiner.

EXAMINER EZEANYIM: He said something I didn't catch. Is this analysis only in the PC? Is that what you said?

THE WITNESS: This part of the study is just the Pictured Cliffs.

EXAMINER EZEANYIM: Yeah, the PC.

Q. (By Mr. Carr) All right, let's go to your recommendations on Slide 16.

A. This slide is just based -- the recommendations that were arrived at from the study, and the fundamental recommendation, that is increased well density, is technically justified. And we are recommending two vertical wells per 160-acre drainage unit, or, as an alternative, two horizontal wells per 320-acre drainage

unit.

EXAMINER EZEANYIM: Is that what you used in your studies, you used two vertical wells, two horizontal wells on the --

THE WITNESS: The study was done basically looking at existing wells.

EXAMINER EZEANYIM: Existing wells. Not the two wells on the 160 and the two wells on 320?

THE WITNESS: No.

Q. (By Mr. Carr) All right, now these are your conclusions or your recommendations. Let's see how you got there.

A. All right.

Q. Let's go to the next slide. This is your rate-time analysis?

A. Yes, this slide is just simply a map across the project area, showing the six wells that we used in rate-time analysis. And normalized rate-time analysis is a way of doing a well test without actually shutting in the well and gathering pressure information, and the reason for doing this is that these -- this reservoir is so tight that it would take an extraordinary amount of time to see meaningful pressure buildup data.

The wells were selected across the project area to give us a broad geographical survey of the area, as well

as looking at a range in estimated ultimate recovery numbers, as well as a range in producing time values.

And we also wanted to look at both vertical, hydraulically stimulated wells, as well as horizontal wells in the area. So that's how these wells were selected. And of course we wanted to do the analysis on wells that were completed only in the Pictured Cliffs area.

Q. Okay, let's go to Slide 18.

A. By way of background, this slide summarizes the assumptions that are built into normalized rate-time analysis, and these assumptions are pretty much across the board for all of the models that are available in the industry.

The basic assumption on the reservoir engineering side of things is that you have idealized reservoir properties, the same as the Hurst Van Everdingen model. So we're talking about constant isotropic properties across the drainage volume.

The second thing -- the primary data that we need is either measured or calculated sand-face pressures, and this is in order to get an idea of the magnitude of drawdown on the reservoir, and then we need producing rates for the various fluids. And having this data, we can then input the data into the model along with other parameters and come up with a continuous flowing well test.

The model has type curves for either vertical radial wells, hydraulically fractured vertical wells, or horizontal wells. And by matching on these type curves we can get an idea of things like reservoir permeability, skin, fracture half-length and drainage area.

If we're dealing with tubing pressures, flowing tubing pressures that are measured at the surface, we need a wellbore diagram and a hydraulic model that will calculate sand face pressures. And this particular model that I use has that incorporated into it. The model then computes a normalized productivity index, which is just rate over drawdown, and a flowing material balance time.

And flowing material balance time is similar to the old Horner time where you just take cumulative divided by rate, but it also incorporates into it a density term that converts everything into moles. So what you're doing is looking at the amount of depletion and material from the reservoir over a period of time. And in effect, that's what gives us the ability to do a continuous well test without shutting in.

Q. All right, let's to go the technique employed and go to Slide 19.

A. Yes, Slide 19 just summarizes the technique, and I'm going to start with the figure over on the left and then go across the page and then down.

What is shown here on the first figure is just the basic data that goes into the model. And what we have is, in red is the actual producing rate that was measured on this particular well, and in black on the bottom is the flowing tubing pressures that were measured on the well. The model using the tubing-flow correlation then calculates a sand-face pressure, and that's shown in the darker blue or green number. I think it's blue on this slide.

So then having that data, we go in and transform it into these dimensionless parameters.

So if you look over to the next slide, what you see is a series of lines, and there are actually three different type curves that we're matching to there, that are summarized by these lines, and you see a bunch of symbols. And the symbols are the actual data converted -- transformed into these dimensionless parameters.

So if you look at the dots it's a little easier to follow.

The red curve, the red dots, are the productivity index term, plotted as a function of material balance time.

The green curve is the derivative of that data.

And the blue curve is the integral of the data.

If you look at the white line that extends up vertically from there, that's just separating the two data sets into the transient-dominated regime versus the semi-

steady-state regime. And the idea here is that when you do get into semi-steady-state flow, which is shown by the 45-degree downslope, you're actually encountering a reservoir boundary condition.

So the technique is to take this data and slide it around until you get a simultaneous match on all three curves. Once you're satisfied with that match, you pick the match point and the model will calculate from the material balance time the gas in place in the reservoir. Then using the reservoir parameters that you input from the logs, you get a drainage area term.

The model also calculates flowing efficiency indices, like skin, and permeability for the reservoir. If it's a fractured vertical well it will calculate for you a fracture half-length, and if it's a horizontal well it will calculate the effective horizontal length for the lateral. And the model that I'm using for all of this work is called RTA, and it's developed by Faquit up in Calgary, Alberta.

Q. All right, let's go to the next slide, Slide 20, which shows the rate-versus-time-analysis results.

A. Yeah, these are the results for the Pictured Cliffs reservoir from the rate-time-analysis work. RTA actually gives you the ability to look at this data with three or four different models. The ones that I most typically use are Blasingame -- and the reason I like to

use Blasingame is, it's the only model that has type curves for horizontal wells -- and then NPI, and I like NPI because it seems to give the most consistent match of data in comparing to the Blasingame curves.

Q. The Blasingame and NPI are both shown on this exhibit?

A. And they're both shown, yes.

Q. All right.

A. And if you go -- if you look at the top of the table, about the third or fourth line down, you see Blasingame, and then over a ways you see NPI. And then over to the right of that you see three more things.

The first is called FMB, and that's the flowing material balance. And this is kind of like using the calculated sand-face pressures to do a material-balance P/Z curve for gas wells on a continuous basis from the flowing data.

And then there's the traditional column, and that's basic decline curve theory, so the old Arp's model.

And then finally Fetkovitch. And Fetkovitch was really the first person to incorporate type-curve analysis into decline-curve theory. And the problem or the limitation with Fetkovitch is that he assumes that the well is always being produced at a constant sand-face pressure, so it's always being drawn down, say, to its maximum

capability, whereas Blasingame and NPI, because they calculate this normalized rate-time parameter, they don't have to necessarily -- you know, they can look at situations where the well is being produced in a constrained condition over a long period of time.

The leftmost column is just the well names. And then under the Blasingame we have net feet of pay, porosity, permeability that the model calculates. And you'll notice that the first well has about .28 millidarcies average across the net pay interval. All the balance of the other wells are less than a tenth of a millidarcy, substantially less than a tenth of a millidarcy.

Xf/2 is the calculated fracture half-length. You'll notice two of the wells have relatively poor frac jobs associated with them. And for the horizontal wells, the next column is the effective horizontal well length. You can see for the two that we have, that both of these wells appear to be producing very efficiently from the horizontal lateral. They have 1800 and 3000 feet of effective lateral length.

The column titled OGIP, which is -- skip one and -- you know, the final column under Blasingame, is the calculated original gas in place using the material balance time pick point. And then the area is the calculated area

from -- using the petrophysical parameters for the well.

And you can see from this data, in what's highlighted in red, under the -- using the Blasingame method, is that none of the wells are draining 160 acres. The best well is draining about 120 acres, but most of them are well under 80 acres in drainage area.

When we look at the NPI data, it pretty much mirrors what we're seeing with Blasingame, and the drainage areas are very close. The flowing material balance data is also quite close in terms of OGIP. Flowing material balance generally gives you -- if you employ it the way that I do, it's a look to try to get, well, how big could this thing really be, if I really push it as far as I can?

And then the last two columns just compare the results to the traditional decline curve analysis and the Fetkovitch. Now, one of the wells we could not calculate a Fetkovitch type curve on because there was a problem with the early time data.

So the basic message from this work is that it does not appear that any of our wells in the Pictured Cliffs are draining large areas.

Q. Let's go and look at the idealized recovery factors now, and I'd ask you to refer to Slide 21.

A. When we saw how low the calculated gas permeability numbers were from the RTA work, the natural

question was, well, what does this mean in terms of an idealized recovery factor? Because you would think intuitively that with this low of a permeability value you wouldn't recover very much gas from the reservoir.

So what we wanted to do was build this same idealized condition into a finite difference model, and in this case we used a three-dimensional model that was 51 by 50 grids by one layer thick. It had a 160-acre drainage volume, and we incorporated into it the average Pictured Cliffs reservoir properties. So if you look over to the table on the right, you can see a net pay of about 55 feet, the porosity 11.5 percent, about .06 millidarcies in both the X and Y direction, so no anisotropy, and about 50-percent connate water saturation. And then so forth, the rest of the properties.

The gridding technique hard-wired the fracture, the hydraulically fractured condition into the well, so what we did was, we used a real narrow grid with a high permeability and 500 feet total length or a 250-foot half-length to model to the fracture set in the gridding.

If you go to the next slide, this is just a schematic that shows a visualization of the model using grid permeability. And as you can see, it's constant grid properties, and of course you would expect that because we're trying to simulate the Van Everdingen condition,

except for in the middle where the well is located you see that hot yellow line that's -- in dimension is about 500 feet long and one foot wide, and that simulates the fracture.

Q. All right. Let's now go to Slide 23, and review your efficiency results.

A. Slide 23 shows the results of the modeling work, and let's start off over on the right side and look at the figure.

On the X axis what is plotted is the assumed economic limit, and it varies from 10 MCF per day all the way up to 70 MCF per day. And of course, the price of gas plays a big role in what that economic limit is going to be. And with today's current high prices of gas, we can produce these wells to unusually low economic limits.

On the Y axis we actually have two axes. On the left is recovery efficiency, going from zero to 1. And recovery efficiency is defined as the recovery divided by 160-acre gas-in-place number. And on the right, in the magenta color, is the time to reach that economic limit.

Okay, now over on the left are the results. And the first result that we saw, which was not too surprising, was that recovery efficiency is very sensitive to economic limit. But what's really surprising is how sensitive it gets as you approach these lower values. In fact, recovery

efficiency is not as sensitive to permeability as it is to economic limit when you're down in the 10-MCF-per-day range.

But the time to reach that economic limit is excessive. For example, to get -- for this model to get to an economic limit of 10 MCF per day requires 72 years of producing time.

The other thing that's troublesome is that the ideal model results appear to be much higher in terms of recovery efficiency than what we normally would think would happen in fact or in actuality. And the reason for this is because of the assumption of the idealized reservoir. If you put in even a simple perturbation in the reservoir, like changing the anisotropy from 1 to 1, to 3 to 1, it makes a large difference in recovery efficiency.

And so what's happening in practice is, these reservoirs are much more complex than we realize, and that's why -- the Hurst Van Everdingen model, I should say, and that's why the recovery efficiencies are so much lower. But at the idealized condition the recovery efficiency is 76 percent, using a 10-MCF-per-day economic limit. And you should remember that number because that shows up again in some later slides.

Q. Okay, let's look at your EUR versus original gas-in-place numbers, and that is Slide 24.

A. Now we're going to shift horses a little bit and look at some statistical data that came out of the project area, and these are wells that are completed only in the Pictured Cliffs interval in the project area.

And if you look at this table, the first column is EUR, estimated ultimate recovery, and this data was generated from decline curve analysis.

The second column is original gas in place, and this is calculated using the drainage area of 160 acres in the wellbore parameters from the petrophysical work.

And then recovery efficiency is just the ratio of the two.

Now if you look at the rows in the table, the first one, N, is just the number of wells that we looked at. Max is the maximum value encountered in that data set, min is the minimum. Average refers to arithmetic average, and that's, as we all know, considerably different than geometric mean average. And finally the median is the point in the data set where half of the values are above it and half of the values are below it.

Now if you focus just on the column called recovery efficiency, you'll notice that in the 41 wells that we looked at, one well produced more gas than we could volumetrically put into the 160-acre drainage area. The arithmetic average was about 31 percent, the geometric mean

was only 13 percent, and the median value was about 25 percent.

EXAMINER EZEANYIM: How did you come up with that 1.06? You know, the OGIP is higher than the EUR.

THE WITNESS: The EUR for that particular well appears to be draining more gas than we can put into the 160-acre drainage area around the well using the wellbore parameter that -- from the petrophysics done on the well. So one of two things could have happened.

One is, that -- the properties that came from the log analysis are conservative when compared to the rest of the drainage area.

A second possibility is that we're draining, you know, some of the gas from outside of the drainage area, we're draining larger than 160 acres. So you know, it could be one of those two conditions. My guess is that by -- you know, the problem is, we just used the wellbore parameter from the well that was producing in that 160-acre drainage area.

EXAMINER EZEANYIM: I was wondering how you calculate that. EUR over OGP.

THE WITNESS: Right.

EXAMINER EZEANYIM: If that is the case, then how can you come up with that number? I mean, I understand what you are saying, is that -- calculated at 1.060, is

that -- the model calculated that?

THE WITNESS: No, no, it's not the model, it's just the data.

EXAMINER EZEANYIM: Okay. Now we have an EUR --

THE WITNESS: The other possibility that -- the third possibility is, our EUR is off. The EUR was taken from decline curve work, extrapolating all the way out to a 10-MCF-per-day economic limit. Now if that decline curve is a little bit optimistic in terms of the, you know, slope that we decline the well at, we would calculate a larger EUR. So I mean, this is just the way the data shook out.

But the important thing is that on the average, independent of what average you look at, most of the wells are recovering far less than 160 acres. And in fact, most of them are down around 40 acres, in terms of drainage area. And so that's telling us that if we go in and drill additional wells in the Pictured Cliffs, we should expect most of the reserves -- not all the reserves, but most of the recovery from the new wells to be incremental reserves.

Q. (By Mr. Carr) All right, what is the next slide?

A. The next slide is a visualization of that same data set. On the X axis is original gas in place, on the Y axis is EUR, and then the 41 points from the wells that we looked at.

And then there are two lines there. The first

line is the 45-degree line, and that's the condition where the EUR equals the gas in place. The second line is the condition where the EUR equals 50 percent of the gas in place. And why 50 percent? Well, we're asking to double the number of wells in each spacing unit.

As you can see, there is one data point, the one that you questioned in the table, where the EUR is slightly higher than the OGIP.

EXAMINER EZEANYIM: Uh-huh.

THE WITNESS: There are nine other wells that fall in between the 50-percent line and the 45-degree line. But there are 31 wells that fall below it.

EXAMINER EZEANYIM: Yeah.

THE WITNESS: So again, this is reinforcing our belief that with this program we will be adding primarily incremental reserves.

Q. (By Mr. Carr) All right, let's now go to the recovery efficiency information.

A. Slide Number 26 is the same data, only now we're looking at recovery efficiency. And I think this gets to the problem that you were having with the earlier data, and that is, you know, it's hard -- we know as reservoir engineers that we are not going to recovery all of the gas that is in place.

EXAMINER EZEANYIM: Yeah.

THE WITNESS: So my intention here was to show what we would recover as a recovery-efficiency number if we standardize everything back to the idealized model that said we should expect to get 76 percent within the drainage volume. Okay?

So what we have here is, on the X axis, once again, is original gas in place. On the Y axis is recovery efficiency, and there are two lines again. The first is the blue line, and that's the condition where the recovery efficiency is equal to 76 percent. The second line is the red line, and that's the condition where the recovery efficiency is equal to half of the 76 percent, or 38 percent.

We have two points now that exceed the 76-percent recovery-efficiency value, and we have 12 points that fall between the two. And the balance of the data, which is some 27 points, fall below the 50-percent value. So again, I think this reinforces our belief that there's significant reserve additions to be made by going forward with this program.

Q. (By Mr. Carr) Now let's go to Slide 27.

A. This slide shows the cumulative frequency plot for recovery efficiency, so it's just another way of looking at the same data set.

As we know, the median is the point where the

cumulative frequency on the Y axis is at the 50-percent value, and when you stroll across to the data and come down, it equates to the 25-percent recovery-efficiency number.

The 76-percent recovery-efficiency number from the idealized model, if we take that up to the data and then across to read off a recovery-efficiency number, what we see is that only five percent of the wells are going to recover -- have a recovery efficiency above 76 percent. And if we look at the 38-percent value and go up from there, what we find is 65 percent of the wells will recover less than the 38-percent recovery-efficiency value. So once again, we think that statistically we're going to be in a condition where most of our production is incremental reserve additions.

Q. All right, Mr. Zadick. Well, that concludes the portion of the presentation on the Pictured Cliffs.

Could you go to Slide 28 and review for Mr. Ezeanyim the conclusions you have reached from your study of the Pictured Cliff reservoir in this area?

A. These are conclusions as well as recommendations, and the first is that 80-acre well density is recommended in the project area to improve recovery, and we think that we're going to get significant increased recovery because of this.

The RTA analysis indicates that most of the wells are draining less than 80 acres.

And the idealized model indicates that high recovery efficiency should be expected within the drainage volume if we, in fact, go to a 10-MCF-per-day economic limit.

We think that complex reservoir behavior in the Pictured Cliffs -- and by that I mean things like anisotropy, layers, dual permeability and limited continuity -- are the types of reservoir complexities that are reducing our recovery efficiency.

Statistics on the existing Pictured Cliffs only wells within the study area show that half of the wells drain less than 30 acres, 65 percent of the wells have less than the idealized 80-acre recovery efficiency, and only 5 percent of the wells exceed the idealized 160-acre recovery efficiency.

We are confident with additional testing that we can -- and by that I mean things like RFT data and logs -- that we can optimize Pictured Cliffs recovery.

And we think that with additional experience in drilling the horizontal wells in the Pictured Cliffs we'll be able to reduce costs for drilling these wells, as well as to optimize the well design.

Q. Now Mr. Zadick, the last two points on this slide

are your recommendations?

A. Right.

Q. Additional testing and additional experience with horizontal wells?

A. Yes, sir, that's true.

Q. That information is something that can be reported back to the Division as the BLM is requesting we do; is that correct?

A. Yes, sir.

Q. But would this information, either additional RFT testing and log work or experience with horizontal drilling, would either of these change your -- the conclusions that you have reached that increased density in this area is needed to access the reserves that can be recovered from the area?

A. No.

Q. Now let's go to Slides 29 and 30, and I would ask you to refer to those and review the conclusions you've reached on the Tertiary formation.

A. Yeah, the work in the Tertiary area is -- or the Tertiary formations in the project area leads us to the conclusions that, A), the geology is extremely complex. You know, we saw from Mr. White's presentation how variable the water saturation was vertically within wells, how difficult it was to look at stratigraphic units and

correlate them across the field. On a large -- on a gross basis it's not difficult, but when you start looking at individual sand members it is.

And so we think that, you know, additional engineering data is required in order to properly evaluate how to go about exploiting these reservoirs to increase recovery. And the data that we've collected and analyzed so far, in the Ojo Alamo area primarily, leads us to believe that, you know, increased well density will result in incremental production.

But as long as we're going to be drilling to the Pictured Cliffs we have the opportunity to capture more data -- and by "more data", once again I'm talking about RFT data as well as, you know, open-hole logs -- and get a better picture of the reservoir and try to understand both vertically and laterally how things are changing.

So we'll be able to do this in the Tertiary zone and plan an attack for those zones after we have completed in the Pictured Cliffs and produced those reserves.

Q. All right, and your last slide?

A. This last slide is taken from work that was done by a consultant from Mallon, who was the previous operator, and it showed normalized rate-time analysis using a tool called RPI, and this was done by another consultant back in 1998 and 1999 for that hearing. What we have here on the X

axis is permeability varying from zero to 1.2 millidarcies, and that's average across the zone, versus drainage area.

And what they were trying to show with this slide is, first off, there are a lot of points on the graph that have an estimated drainage area below 80 acres using the RPI tool. And secondly, they were trying to show that there's no real clear-cut relationship between permeability and drainage area. And that's a little bit troublesome, because that's telling you, well, maybe, you know, the stratigraphic component is very important. And my feeling is that if you looked at this same data set with the kind of economic limit that we employed, you would even see more scatter in the data.

So for this reason we think that it's important to capture this data up front as we're drilling for the Pictured Cliffs and allow us to evaluate and use this data to plan our completion intervals and strategies for vertical completions in the Ojo Alamo.

Q. Now Mr. Zadick, in addition to acquiring information on the Tertiary formation, do you have an opinion as to whether or not by increasing well density in that formation you will, in fact, increase recovery from that formation?

A. Yes, I think we will.

Q. And do you have an opinion on whether or not that

would be rate acceleration or incremental recovery?

A. No, I'm talking incremental recovery. I think at this point there will be incremental recovery. We're just trying to fine-tune the best way to optimize it.

Q. Let's go back to Slide 16, and I'd ask you now that you've completed your presentation to once again just summarize your recommendation.

A. Yes, slide 16 is the slide that had my initial recommendations for the Pictured Cliffs formation, and that is that increased well density is technically justified. We feel that two vertical wells per 160-acre drainage unit is necessary, or, in the alternative, two horizontal wells per 320-acre spacing unit.

Q. In your opinion, if this Application is approved and these formations are developed with a second well, either two vertical wells on a 160 or two horizontal wells on a 320, in your opinion would that be in the best interest of conservation, the prevention of waste and the protection of correlative rights?

A. Definitely.

Q. Were slides 15 through 30 prepared by you?

A. Yes.

MR. CARR: Mr. Ezeanyim, at this time I would move the admission into evidence of Black Hills Slides 15 through 30.

EXAMINER EZEANYIM: At this point Slides 15 through 30 will be admitted into evidence.

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

EXAMINER EZEANYIM: Okay, David?

MR. BROOKS: No questions.

EXAMINATION

BY EXAMINER EZEANYIM:

Q. Now, I'm still on Slide 16. You want two vertical wells per 160-acre or two horizontal wells per 320?

A. Right.

Q. You want both, or would you prefer one? What do you want?

A. Well, I think, you know, we're largely looking at horizontal applications for the Pictured Cliffs, so I would think that --

MR. CARR: Mr. Examiner, if in fact an order is entered that increased the well density to allow the optional infill well -- that's what we're seeking -- once you do that under Rule 111 --

EXAMINER EZEANYIM: Okay, you can do --

MR. CARR: -- we can then go ahead and get the horizontal or the two vertical, depending upon whether or not we're in the Pictured Cliffs or in the Tertiary

formation.

EXAMINER EZEANYIM: Okay, yeah.

MR. CARR: And in terms of the way technically to do that, I have prepared just a recommended set of rules that I was going to give to you at the end of the hearing. Basically, Mr. Examiner -- and I can hand them to you now, if that's all right. But basically what they are is, they're in two parts.

The uppermost portion simply creates the Jicarilla Apache Tribal Lands Production Area, and then starting with Rule 3 it authorizes an optional infill well.

And I'll tell you where I got these. The creation of the Jicarilla Apache Tribal Lands Production Area is simply drawn from the Basin-Fruitland Coal rules where you create the high-productivity area. And then Rule 3 parallels the rules in the Blanco-Mesaverde and the Basin-Dakota when you are drilling wells within federal units, but it's been planed down to take out language which wouldn't be applicable here.

But the purpose here was to just at the end of the hearing clarify that, because that is a confusing point, because depending on what horizon you're in, the technique changes, but it's all covered, I believe, by existing rule, and that's why we proposed the rules as we have.

EXAMINER EZEANYIM: Okay, so if it happens that I approve your two wells per 160, then you could exploit the Tertiary system with vertical wells --

MR. CARR: We'd come in --

EXAMINER EZEANYIM: -- and then --

MR. CARR: I will --

EXAMINER EZEANYIM: -- using 111 --

MR. CARR: Correct.

Q. (By Examiner Ezeanyim) Okay, on the -- you know, on the Tertiary system, we haven't done a lot of work on the Tertiary system, but, you know, you told me that you believe that increased density is appropriate because you are going to be going through them as you explore the PC. Is that on that basis you want me to approve the Tertiary system?

A. Well --

Q. Are you going to do more work on that, as you did the PC? You did a good job on the PC, but not much on the Tertiary systems, so are you going to perform more work on the Tertiary system to be able to really convince yourself that you need this increased well density? I mean --

A. We've already done some work on the Tertiary --

Q. Uh-huh.

A. -- and the outshoot of that work was that we felt that in order to adequately plan for the exploitation of

the Tertiary reservoir, that we would like to use the Pictured Cliffs drilling as an opportunity to capture more data and do more studies.

Q. Uh-huh. How many wells -- Out of these 14 wells that you used, all of them went through the Tertiary system, right?

A. Yes.

Q. But you didn't conduct the study then?

A. They did not -- These wells were just wells that produced from the Pictured Cliffs only. Part of the problem, particularly with the shallower horizons, is that the data -- a lot of the data is commingled.

Q. From --

A. -- Tertiary.

Q. -- Tertiary to PC?

A. Yeah, over large intervals. We did look at some wells, though. I can't recall how many.

EXAMINER EZEANYIM: Okay. I really need some notice, I think you -- and I may have forgotten --

MR. BROOKS: Yes.

EXAMINER EZEANYIM: Yeah, he did --

MR. BROOKS: He did.

EXAMINER EZEANYIM: -- so everything is fine there, okay.

MR. BROOKS: He's got -- he notified everybody.

EXAMINER EZEANYIM: Okay, good.

MR. CARR: Mr. Brooks is watching me very carefully on that, Mr. Ezeanyim.

MR. BROOKS: Well, I can't contribute very much to this last gentleman's presentation since I don't understand very much of it. Fortunately, Mr. Ezeanyim does.

EXAMINER EZEANYIM: So let me ask this question. As soon as we approve this request, how frequently will you be reporting the data to us, and what data are you supposed to be reporting to us, to make sure that, you know, what you're doing is correct?

MR. CARR: Mr. Ezeanyim, the BLM requested annual reports, both to you and to them, at least, as I understand it, during the first three years. And we'd be happy to file written reports, or, if you look at that and decide it would be worthwhile to bring us back, we'll come back. It's your call.

EXAMINER EZEANYIM: Okay. Yeah, because we need to keep abreast of what is going on in that area, now that you -- having completed the study.

Q. (By Examiner Ezeanyim) On Slide 25, if you look at Slide 25, that's a very important slide for me. Some of the wells didn't produce anything, they have some gas wells that didn't produce anything.

A. Well, some of that is --

Q. They are just --

A. -- some of that is just round-off. They produced very, very small amounts of gas --

Q. On some of them it's almost zero --

A. Yeah, there is one well that has zero, but the other wells that track along the -- close to the Y axis of zero, they did produce gas, but it was like less than 100 -- you know, it was a very small volume.

EXAMINER EZEANYIM: I want to talk to you about what you are talking about. These are the special rules you want incorporated in this order, right?

MR. CARR: Yes, sir.

EXAMINER EZEANYIM: Okay. I'm not saying it's going to be the same as that, but I need some help here.

MR. CARR: And I've also prepared a proposed order, but I -- and I'll e-mail that to you and you can open it or not --

EXAMINER EZEANYIM: Okay.

MR. CARR: -- depending on what you want to do with it, but it does have all the descriptions, at least, in it.

EXAMINER EZEANYIM: Okay, good. You know, you can send it to me.

MR. CARR: Okay.

EXAMINER EZEANYIM: Anything further?

MR. CARR: Nothing further.

MR. BROOKS: Nothing.

EXAMINER EZEANYIM: Okay, Case Number 13,816 will be taken under advisement.

(Thereupon, these proceedings were concluded at 3:19 p.m.)

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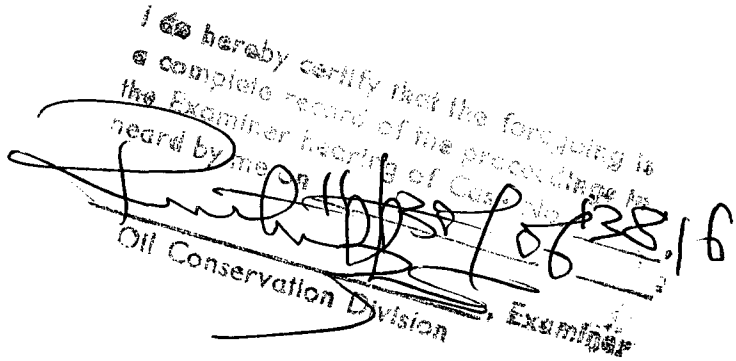

CERTIFICATE OF REPORTER

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 6th, 2006.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 16th, 2010