STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION COMMISSION

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

APPLICATION OF THE FRUITLAND COALBED METHANE STUDY COMMITTEE FOR POOL ABOLISHMENT AND EXPANSION AND TO AMEND RULES 4 AND 7 OF THE SPECIAL RULES AND REGULATIONS FOR THE BASIN-FRUITLAND COAL GAS POOL FOR PURPOSES OF AMENDING WELL DENSITY REQUIREMENTS FOR COALBED METHANE WELLS, RIO ARRIBA, SAN JUAN, MCKINLEY AND SANDOVAL COUNTIES, NEW MEXICO

CASE NO. 12,888

REPORTER'S TRANSCRIPT OF PROCEEDINGS

COMMISSION HEARING (Volume I, Tuesday, June 3rd, 2003)

BEFORE: LORI WROTENBERY, CHAIRMAN
JAMI BAILEY, COMMISSIONER
ROBERT LEE, COMMISSIONER

June 3rd-4th, 2003

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Commission, LORI WROTENBERY, Chairman, on Tuesday and Wednesday, June 3rd and 4th, 2003, 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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I N D E X

June 3rd, 2003
Commission Hearing
CASE NO. 12,888 (Volume I)

(Continued...)

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Additional submissions:

* * *

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* * *

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* * *

WHEREUPON, the following proceedings were had at 9:30 a.m.:

CHAIRMAN WROTENBERY: Okay, we'll get going here. It's 9:30 a.m. on June 3rd, 2003. We're in Porter Hall in Santa Fe, New Mexico, for a special hearing of the Oil Conservation Commission to hear one case, Case 12,888, the Application of the Fruitland Coalbed Methane Study Committee for pool abolishment and expansion and to amend Rules 4 and 7 of the Special Rules and Regulations for the Basin-Fruitland Coal Gas Pool for purposes of amending well density requirements for coalbed methane wells in Rio Arriba, San Juan, McKinley and Sandoval Counties, New Mexico.

And I guess I should mention just for the record at this point that we have bifurcated this particular proceeding and -- Let me get this information here, get the right case numbers here. The portion of the case that was addressed in a motion by San Juan Coal Company will be heard as a separate matter under Case Number 13,100, and that particular portion of the case will be heard at the conclusion of the rest of Case 12,888.

We are here for four days, if necessary. I understand that the counsel for the various parties have given their best estimate of the time it will actually take and think that we may be able to wrap it up sometime during the day Thursday, but we will be prepared to continue into Friday if necessary.

I should just introduce everybody up here, in case there are some folks who don't know us.

I'm Lori Wrotenbery. I'm Director of the Oil Conservation Division. I also serve as Chair of the Oil Conservation Commission.

To my right is Commissioner Jami Bailey, who serves as representative of Land Commissioner Patrick Lyons on the Oil Conservation Commission.

To my left is Dr. Robert Lee, Director of the Petroleum Recovery Research Center, also a member of the Commission. He serves as the appointee of the Secretary of the Energy, Minerals and Natural Resources Department on the Commission.

Also on the far right is Florene Davidson, the Commission Secretary.

To Commissioner Lee's left is David Brooks, who will be serving as Commission counsel in this proceeding.

And Steve Brenner will record these proceedings for us.

I know there's been a lot of preliminary work done already, so I believe at this point we're ready to call for appearances and then move into opening statements. But let's make sure that's the case by calling for appearances. And if you'll let me know if you have any other preliminary matters to address at this point, I'd appreciate it.

MR. HALL: Madame Chairman, Scott Hall, Miller Stratvert law firm, Santa Fe, appearing on behalf of ConocoPhillips Company. I have one witness.

MR. CARR: May it please the Commission, my name is William F. Carr with the Santa Fe office of Holland and Hart, L.L.P. We represent BP America Production Company, ChevronTexaco Corporation and Williams Production Company. I will be presenting five witnesses.

MR. KELLAHIN: Members of the Commission, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin. I'm appearing today on behalf of Burlington Oil and Gas Company and Devon Energy Corporation. I have a total of five witnesses.

MR. KENDRICK: Members of the Commission, I'm Ned Kendrick with the Santa Fe law firm of Montgomery and Andrews, representing Dugan Production Corporation. We have two witnesses.

MR. BRUCE: Madame Chair, Jim Bruce of Santa Fe, entering an appearance on behalf of San Juan Coal Company in the bifurcated case. I'll have one witness. And I will not be making an opening statement. I believe the Commission knows what the position of San Juan Coal Company is.

CHAIRMAN WROTENBERY: Anybody else? Is there anybody here who would like to make a statement in this proceeding? I had understood that there --

MS. GOLDMAN: Jennifer Goldman. I'm with the Oil and Gas Accountability Project. Lori, I believe that I was going to do something in the opening statements.

CHAIRMAN WROTENBERY: That sounds fine. Okay, anybody else?

MR. HENKE: Madame Chair, Steve Henke with the Bureau of Land Management in Farmington. I'd like to make a statement.

CHAIRMAN WROTENBERY: Any other appearances or requests to make statements in this proceeding?

Any other preliminary matters, or can we move into opening statements at this point?

Okay, let's get started. Ms. Goldman and Mr. Henke, if it's okay with you I think we'll hear from the parties, and then when they have made their opening statements we'll ask that you make your statement at that point. Thanks.

MR. CARR: May it please the Commission, we're here today because one of your reservoirs is in trouble. The Basin-Fruitland Coal Gas Pool is in trouble because the rules promulgated by the Division which govern the development of this reservoir are inconsistent with the geological characteristics of the pool and are in conflict with what is needed if we are to effectively produce this resource. Unless these rules are changed, there will be a tremendous waste of coalbed methane gas.

To give you an idea of the magnitude of the issue, the USGS in its National Oil and Gas Assessment has determined that there are over 23 trillion cubic feet of undiscovered gas resource in the Fruitland Coal bed. They have found that almost 4 trillion cubic feet are located in the fairway of the Fruitland Coal bed, and that is on the New Mexico and Colorado side of the line, but in this pool alone we have 50 percent of what they believe to be the total gas resources in the San Juan Basin.

Industry estimates, which we will present today, show that there is incremental recovery to be obtained from infill drilling in the high productivity area in New Mexico of approximately 500 BCF of recoverable reserves.

If you look at the map that's on the easel, this is a map of the Fruitland Coal bed. It's contoured to show cumulative production, and the orange in the center shows the area where there has been the highest cum production to date.

The evidence is going to show you that this is a complex, multi-layered reservoir, that it's characterized by vertical and lateral discontinuities, and these reservoir characteristics are reflected in these cumulative production figures shown on this map.

This pool was created in 1988, and through most of its life it's been operated under special pool rules that provide for 320-acre spacing, one well per half-section, the wells being located in the northeast quarter or the southwest quarter of the section.

Starting in August of 1999, an OCD/industry Study Committee started looking at this pool, trying to determine whether or not there should be changes in the rules, changes that would govern the future development of this resource. And last year the Committee made certain recommendations.

First, they recommended that the reservoir be divided into two distinct areas, one, the high-productivity area, that is the area that is principally in orange and outlined with the black line on the map. That's the high-productivity area. The remainder of the pool, characterized the low-productivity area.

They recommended to the Division that the rules for this pool be amended to authorize infill drilling in the low-productivity area, the area which is largely blue.

They also recommended that infill drilling be authorized in the high-productivity area, subject to a special procedure where operators would notify their offsets of a proposed infill well; there would be opportunity for objection; if an objection, a hearing; and the purpose of the hearing would be to determine whether or not that well was needed.

I can tell you today that all members of the Study Committee who have actually devoted resources and studied this reservoir are in agreement with and support this Committee recommendation.

The order entered by the Division last October accepted only part of the Committee's recommendation. They divided the pool as shown, they authorized infill drilling in the low-productivity area. But they denied infill drilling in the high-productivity area, referred the matter back to the operators for further study, to collect additional data.

We are here today because we believe the Division's order is flawed. We believe that the rules as they now stand will impair correlative rights and will cause waste.

The order is flawed in two ways. First, the order misapplies the boundary between the low productivity and high-productivity areas, and secondly the order denies needed infill development in the high-productivity area.

Now, what do we mean when we say the Division misapplies the boundary between the high-productivity area and the low-productivity area? And to answer that question, we first must understand what the Committee was proposing when it proposed this line a year ago.

If you look at the line, what it is designed to do is encompass a single continuous area, containing wells with a maximum producing rate greater than 2 million a day. That's what it is designed to do.

It was proposed by the Committee because within this high-productivity area there are areas of better reservoir quality, areas where an infill well might not be needed.

But after that it gets more complicated, because a 2-million-a-day rate does not mean that a well that produces at that rate drains 320 acres. It drains less than that. And when you look at this particular line, you'll find that there are wells inside that line that produce at rates of less than 2 million a day, and there are wells outside that line that produce at rates in excess of 2 million day.

So what is the line? The line is, very simply, our best fit. It recognizes that some places within that area, reservoir characteristics are such and well performance is such that an infill well may not be needed.

But the intent of that line was not, as it has played out, to become a line where different spacing patterns converge. It was designed to establish an area within which the administrative procedure changed. Outside that line you can drill an infill well. Inside that line, they recommended that you allow them to drill an infill well, but only after notice, an opportunity for objection, the possibility of a hearing and a determination by the OCD on whether or not that well was needed. It was designed to deal with the complexities of the reservoir, as you can see, and as reflected by this cum-production map.

So regardless of reservoir quality, as it stands today, if you operate a spacing unit outside that line and adjoining it, you can drill two wells. If, however, you're inside that line, you may only drill one.

And therein lies the problem, because as this case unfolds you're going to see that the evidence shows that through a very large portion of the high-productivity area, infill development is warranted and it is needed.

But if you operate in that area, you as the operator, because of the rule -- not because of the reservoir, but because of the rule -- may not drill a needed well. You do not have equal access to the reservoir, and you are denied the opportunity to produce your just and fair share of those reserves. And that is what you are entitled to do by the Oil and Gas Act. The rule as it stands, on its face violates correlative rights.

The other way this order is flawed is that it causes waste. Last year we received the Division's order, and we stopped and we tried to figure out what we were going to do with this, how we were going to deal with it. And while we concluded that the order was flawed, we concluded also that what the Examiner was telling us was not wrong, that the BLM's position really was not incorrect.

The Division said, before we approve infill drilling in the high-productivity area, we need more data, that there is a lack of direct evidence in this record on what is happening in the high-productivity area, and you, the operators, go back, look at the geology, look at the pressure data on this complex, multi-layered reservoir.

And when we looked at it we recognized that there were problems with the case we presented last year. You see, we used data from the low-productivity area, and because of the general similar reservoir characteristics, the vertical and lateral discontinuities, the nature of this formation, we thought it simply made sense that infill drilling should be allowed Basinwide.

The Division said, however, you must come forward with more. That was the test that was set. And we are here today to meet that test.

We're here today to present a record that is very different from what was presented last July. Last summer, we gave the Division part of the story. We were here at a time when work was still going on on the reservoir, it was still being studied, and the parties were not in agreement as to what should be done.

Today we stand before you with those companies who have truly studied the reservoir, in unanimous agreement that what the Committee recommended is the correct way to go.

Three additional companies will present data. And as they do, you're going to see that they have used very different approaches, but they have reached the same conclusion. I guess this is the way sound science should work: You have your hypothesis, and then you validate that with multiple paths of inquiry.

I think that's what has happened here, and the result is a clear and consistent story. And so last June we gave you part of the story, today we're here to give you the rest of the story, to give you the whole story.

Now, the purpose of an opening statement, which I've already breached, is to review the evidence. And instead of working through the case witness by witness, I'd like to very briefly tell you what the general approach is we're using as we come to this hearing.

With each succeeding geological witness, we're going to go to increasing levels of detail. We're going to go from the general to the specific.

And then we're going to hand the case over to the engineers, and they have analyzed this reservoir based on individual well data, perforations, things of that nature, to reach their conclusions about the reservoir.

And instead of now trying to summarize the whole case for you, as we go witness by witness, before each testifies, we will attempt to identify for you what portion of the case they will attempt to cover with their testimony. And what is that evidence going to be?

Well, in terms of the geological presentations we're going to show you the nature of the coals, we're going to show you the vertical and lateral discontinuities in this coal that prevent complete and efficient drainage of the various coal layers. We're going to show you actual photos of coal seams that show the high degree of lateral variation. We're going to show you things that you cannot see on a well log.

And at the end, the geological presentation will have shown a highly discontinuous reservoir in both the low-productivity area and the high-productivity area that requires infill drilling to efficiently recover the reserves located therein.

And then we have the engineering case. Today's case is very different from the case the industry presented in 2002, and here's where you're really going to find the rest of the story. Remember the Examiner said, I need data from the high-productivity area, I need data from the high-productivity area in New Mexico, we need for you to look at the pressure, we need to have you look at the pressure in this multi-layered reservoir.

So therefore today, first and foremost, we are here to present direct pressure evidence of differential depletion in the individual coal layers in the high-productivity area in the New Mexico portion of this pool. We are here to share with you studies based on this evidence. We are here to show that even in the high-productivity area, existing wells are not efficiently recovering the reserves. We are here to show you that initial data from the pilot projects in the low-productivity area have been confirmed with additional data from the high-productivity area, and this is data that a year ago had not been studied and was not presented at that hearing. And we are also here to show you that infill drilling results in the recovery of incremental reserves, not just rate acceleration.

When the evidence is in and the entire record is reviewed, it will be clear that there are undrained and partially drained layers in both the low-productivity and high-productivity areas, where reserves will be wasted unless infill drilling is approved. We will not tell you this is the case for every spacing unit, but the clear reality will be that for most spacing units in the high-productivity area, infill drilling is required, and that we believe we have provided a mechanism whereby those units where it is not required can be culled out and not drilled.

If the pool rules are amended to accept the Committee's recommendation, if you authorize infill drilling poolwide, subject to this special procedural requirement, necessary wells will be drilled, substantial incremental recovery will be obtained, not wasted, correlative-rights problems, those that I discussed a few minutes ago, will be eliminated.

But until that is done, the rules are inconsistent with the geology, the rules are inconsistent with what we know about producing effectively the reserves in this reservoir, and until these rules are changed, this pool is in trouble.

CHAIRMAN WROTENBERY: Thank you, Mr. Carr.

Mr. Hall?

MR. HALL: Madame Chair, Commissioners, on behalf of ConocoPhillips Company, Conoco and Phillips before their merger, and then subsequent to their merger, have always been active participants in the Committee's deliberations on the proposed rule change for infill development.

ConocoPhillips is now one of the largest interest owners in the coalbed methane resource and has recognized that the regulatory change is an important undertaking for the Commission. What the Commission does with this Application will have significant, perhaps irreversible, consequences for the future development of the pool. For this reason, ConocoPhillips has taken a measured, more cautious approach to the rule change, sometimes to the displeasure of the other operators on the Committee. But ConocoPhillips has always, always, counseled prudence along the way.

In the low-productivity area, ConocoPhillips has always believed that infill development will result in incremental recoveries and can be implemented without impairing correlative rights or risking the drilling of unnecessary wells.

In the high-productivity area, ConocoPhillips couldn't readily accept the analytical methodologies that were being utilized to make the determination at the time. Single-point composite pressure data were being used, other data was being available, but perhaps it wasn't being sufficiently scrutinized. There was an apprehension that using composite pressure data to derive material balance might not yield an accurate result when multiple layers with differing pressures were known to exist in the pool. Was it the case that composite pressure data were leading to underestimates in gas in place and overestimates on the recovery factors?

Given the uncertainty, ConocoPhillips favored eventual -- eventual -- infill development in the high-productivity area, provided that sufficient interim safeguards, administrative safeguards, were put into place to guard against waste until the high-productivity area production could be further studied and better understood.

At the time of the Division Hearing in this matter one year ago, the data to make the case and its analysis had not been sufficiently developed. As Mr. Carr said, that was referred back to the Committee and to the operators for further study.

It's been a year that's passed since that hearing, some eleven months rather, and the operators and the Committee have taken that opportunity that the Division Examiner gave them and have analyzed that data and have analyzed that data. Now there is added confidence that infill development in the high-productivity area is warranted. ConocoPhillips fully supports the Committee recommendation to you here today.

ConocoPhillips concludes the current 320-acre well spacing in the high-productivity area does not efficiently drain all coal seams. Lower abandonment pressures can be achieved with 160-acre development in both the high- and low-productivity areas. There is a greater likelihood that more of the laterally discontinuous coal layers can be encountered and produced with infill development. Infill drilling will result in higher ultimate recoveries. Infill development can be implemented in both the low-productivity area and high-productivity area without compromising correlative rights. And the notification provisions proposed by the Committee are sufficient to guard against the drilling of unnecessary wells and again protect correlative rights.

That concludes my statement.

CHAIRMAN WROTENBERY: Thank you, Mr. Hall.

Mr. Kellahin?

MR. KELLAHIN: Madame Chair, I'm appearing on behalf of Burlington and Devon. Burlington has historically been an active participating operator in all the hearings before the Division and the Commission on the rules for the coal gas pool. They've actively participated in this committee process. Devon has been a participant in this process, and we're here to support Mr. Carr's opening statement and to present our witnesses.

At the summer hearing before Mr. Stogner, Burlington's responsibility in that case was to demonstrate the necessity for infill drilling of the low-productivity area. We presented it then, and we have streamlined it and we intend to show that to you again.

We've also investigated the high-productivity area for purposes of this hearing and are in unanimous agreement with the conclusions of the Committee participants that infill drilling of the high-productivity area is necessary and essential at this time.

We'll have five witnesses. Each one flows into the next, and Mr. Carr and I have worked to consolidate the presentation so that you'll get a single continuous point of view from the operators that participated on the Committee.

Mr. Carr has shared with me his opening statement. I've suggested my ideas and he's used most of them, and I thought he did a good job.

(Laughter)

CHAIRMAN WROTENBERY: Thank you, Mr. Kellahin.

MR. KELLAHIN: If there are parts of that you did not like it's not my fault.

(Laughter)

CHAIRMAN WROTENBERY: All Mr. Carr's, we understand.

Mr. Kendrick?

MR. KENDRICK: I'm here on behalf of Dugan Production Corporation. Dugan operates about 144 Fruitland Coal gas wells in the underpressurized area of the San Juan Basin. Dugan has been actively involved in the Fruitland Coalbed Methane Committee and supports the findings of the Committee. Dugan operates no Fruitland Coal gas wells in the high-pressured area or the fairway.

Dugan's purpose in participating in this hearing is to supplement the testimony of BP, Burlington, ConocoPhillips and others. Dugan understands that it is the only producer operating Fruitland Coal gas wells exclusively in the underpressured area.

Dugan supports, as I said, the Fruitland Coalbed Methane Study Committee and the OCD Order Number 8768-C in this case, this case numbered 12,888, that infill wells should be allowed on 160-acre spacing in the underpressured area. Dugan also supports OCD Order Number 11,775 and OCD Order 11,775-B in Case Number 12,734, that infill wells should be allowed on the 15 acres of Richardson Operating Company acreage within the San Juan Underground Mine area.

These infill wells in the underpressured area can be more efficiently dewatered because 320-acre spacing cannot be efficiently dewatered with one well. Such dewatering of infill wells will increase ultimate recovery of gas and not merely accelerate gas production that would have occurred in any event on 320-acre spacing.

Dugan has developed extensive infrastructure to produce Fruitland Coal gas. This includes tanks, pipelines, compressors and roads. Fruitland Coal gas wells in the underpressured area are already economically viable for Dugan. By utilizing existing infrastructure for future infill wells, the economics will improve further.

Dugan plans to present this testimony from two witnesses. I think that will be on Wednesday afternoon or Thursday morning, after completion of the testimony of BP, Burlington, ConocoPhillips and others.

Dugan will also participate in Case Number 13,100, scheduled to begin immediately following this case, 12,888.

Thank you.

CHAIRMAN WROTENBERY: Thank you, Mr. Kendrick.

Mr. Bruce, did you change your mind about making an opening statement?

MR. BRUCE: No, madame Chair.

CHAIRMAN WROTENBERY: Okay. Ms. Goldman, would you like to come on up and make your statement, please?

MS. GOLDMAN: Thank you for accepting my statement today. My name is Jennifer Goldman, and I'm the Associate Director of the Oil and Gas Accountability Project, or OGAP. OGAP works with communities across the country to reduce and prevent environmental, social, economic and public-health impacts of irresponsible oil and gas development in oil- and gasfield communities. We've worked extensively in the New Mexico portion of the San Juan Basin over the last four years.

Today the Oil Conservation Commission must ensure that any decision to allow infill spacing in portions of the San Juan Basin is based upon compelling evidence that increased well density in certain areas is necessary to protect the correlative rights and prevent the waste of the resource.

The issue of well densities, number of allowable wells and all the associated air, soil and water impacts that go on with these wells strikes at the very heart of the public debate occurring in Farmington, Aztec, Bloomfield, Lindrith, amongst ranchers, small-business people, health advocates, retirees, parents, obviously industry and public officials. For perhaps the first time, a critical mass of citizens in these communities are questioning the long-term impact of the industry. Citizens and residents of northwest New Mexico are working with groups like OGAP and are struggling to ensure that industry operate responsibly, without unduly threatening the air quality and public health of the region or squandering the long-term economic viability of an area that is rich in cultural, agricultural, and environmental resources.

I encourage the Commission to take as seriously and literally as possible their own mandate today for the good of northwest New Mexico's long-term future and northwest New Mexico's citizens and residents who are very much engaged in a public debate about what is and what is not responsible oil and gas development. In doing this, I would like to briefly describe some of the forms in which this debate is occurring and introduce into the record, if it's okay, several pieces of correspondence, one from the BLM, which I'm sure Mr. Henke could comment on, and will; Governor Richardson; Navajo Nation's President Joe Shirley; and concerned citizens living in Farmington.

The first forum I want to talk about is the BLM's planning process for the San Juan Basin. In March the Bureau of Land Management released its final planning document for oil and gas development in the San Juan Basin over the next 20 years. They've proposed nearly 10,000 new wells. After receiving 11,000 comments on their draft plan last fall, the BLM released a final environmental impact statement that, like the draft, ignores critical air-quality issues and cultural issues, and elevates oil and gas production to the dominant use of this multiple-use land. For these and other reasons, the BLM received more than 20 protests against the final EIS.

The Commission may also be aware that the Farmington Field Office of the BLM has been struggling with inspection and enforcement issues for years. They have lacked adequate personnel to carry out their legal responsibilities to enforce the law and thus have been unable to ensure good practice by industry at many well sites. This issue has also spawned a tremendous amount of public dialogue about the soil, air, water, noise, habitat and cultural impacts and the inability of the regulating agency to ensure that oil and gas development is done responsibly.

The second forum I want to touch on is the State's Four Corners Ozone Task Force. As many of you may know, San Juan County has recently tested very high for a criteria air pollutant, ground level ozone. Ozone pollution is a contributor to asthma and other respiratory and cardiovascular diseases. Last year the New Mexico Environment Department established a collaborative group known as the Four Corners Ozone Task Force to address ozone levels in San Juan County. The purpose of this task force is to take early action and keep San Juan County from exceeding the Environmental Protection Agency's standard for ozone. The emissions from oil and gas facilities are major contributors to this air pollution, a factor which complicates the BLM's plans to drill nearly 10,000 new wells in the area without a significant change and how this industry is regulated, inspected or enforced.

The BLM, industry, local governments and concerned citizens will have no choice but to continue to wrestle with these issues. Recently, BLM articulated its position on infill spacing in the Fruitland Coal formation in a letter sent to the Division dated February 11th, 2003. In regards to infill drilling in the high-productivity area the BLM states, "The federal lands in this area have high aesthetic appeal and are prime areas for wildlife habitat. Merely rate acceleration of gas production at the expense of additional surface disturbance is difficult to justify to multiple users of public lands." The substance of this letter supports the idea that the BLM may not automatically take the Commission's direction on infill spacing and may require additional data from companies wishing to infill in order to fulfill BLM's own multiple-use mandate.

I'd like to submit this letter into the record, if that's okay.

CHAIRMAN WROTENBERY: Do you have copies?

MS. GOLDMAN: Yeah, this is for you.

CHAIRMAN WROTENBERY: Okay.

MS. GOLDMAN: And I've got several, so if you want to just take them at the end, that's find.

CHAIRMAN WROTENBERY: Okay, that sounds fine.

Are there any objections to the --

MR. CARR: I have no objection to the letter being included in the record. It isn't evidence, but it certainly is something that should be included in the record.

CHAIRMAN WROTENBERY: Thank you.

MS. GOLDMAN: So I'd like to submit this letter to you all as evidence of the ongoing issues -- perhaps not formal evidence -- that should underscore to the Commission the significance of this decision to the citizens of northwest New Mexico. Northwest New Mexicans are productively engaged in trying to ensure that oil and gas development is done responsibly. More wells now, without a significant change in how the industry is regulated, inspected or enforced, will only degrade the public health, safety and welfare of these communities and waste their long-term economic viability and resources.

Yet another example of what is happening on the ground in these communities, I have a letter here dated April 23rd, 2003, from the Navajo Nation President, Joe Shirley. In this letter he formally protested the BLM's final EIS for the Farmington area. He states, quote,

The development will adversely affect the environment, culture and religion of the Navajo and land between the Four Sacred Mountains, specifically Navajo Sacred Mountains Governador Knob and Huerfano Mountain. They each represent a profound significance in the existence of the Navajo people historically and spiritually. Because of their significant contribution to Dine' life, any oil and gas drilling on or near the two mountains will have a devastating effect on Navajo belief.

Again, this letter is for your consideration just as an example of the far-reaching consequences of this issue before the Commission today.

The Governor has also sent a letter to the Director of the BLM, and in this letter, which I'll leave for you here today, the Governor reiterates that one of his first official acts was to implement a policy of cooperation, coordination and open communication with each New Mexico tribe and pueblo. I ask that the Commission follow state policy and ensure that before any infill spacing decision is made, there's adequate consultation, communication and coordination with the Navajo Nation.

Finally, in closing, I will leave with you two more letters today. This letter is from Charlene Anderson and Ed Mosimann from Farmington. They could not be here today, however Charlene sits on the Four Corners Ozone Task

Force and is actively working to define responsible oil and gas development and ensure that industry is held to that standard in her community. She is a small businessperson, originally from the Four Corners.

In her letter Charlene states that:

Farmington is approaching the EPA's legal limit of ground-level ozone. More development is going to exacerbate this problem. According to BLM's data, 60,000 tons of additional NOx, one of the compounds that creates ozone, will be emitted. This makes the oil and gas industry the major contributor of NOx, even greater than the coal-fired power plants. Modern health research indicates that low levels of ozone, 50 to 60 parts per billion, are detrimental to people's health and especially children. I, Charlene, am on the area's task force and have seen that the New Mexico Oil and Gas Association is willing to work on this issue, but the goal should be truly improving the air, not just meeting the bare minimum that EPA requires.

Tweeti Blancett of Blancett Ranches in Aztec could not be here today. I submit her comments in writing on her behalf and would just like to raise one of her points. She says in her letter that she's requested last fall that these hearings be held in the area that would be affected and asks why you did not choose to do this for this particular hearing. I'm interested in the Commission's response to this and just want to underscore for the benefit of northwest New Mexico that again the Commission take its mandate as seriously as possible today.

CHAIRMAN WROTENBERY: Okay, thank you, Ms. Goldman. And if I kept track correctly, there were five letters?

MS. GOLDMAN: Yes.

CHAIRMAN WROTENBERY: Okay, and unless I hear any objection, we will include those letters in the record.

MR. CARR: I have no objection to inclusion in the record of those letters.

MR. BROOKS: It would be helpful if each of those was marked with an exhibit number. I believe your Oil and Gas Accountability Project is the name of your --

MS. GOLDMAN: Yes.

MR. BROOKS: Would you be so kind as to mark them OGAP Exhibits 1, 2, 3, 4 and 5 for the honorable reporter over here?

MS. GOLDMAN: Sure.

MR. BROOKS: And for my file, do you have a card?

MS. GOLDMAN: Yes, I have a copy of my statements if you wish to take it.

MR. BROOKS: Okay, that would be helpful.

CHAIRMAN WROTENBERY: We'll give you just a minute here to mark those. And if you could give them to Mr. Brenner. Thank you very much.

Mr. Henke?

MR. HENKE: Madame Chair, Commissioners, I want to thank you for allowing me the opportunity to enter this statement into the record.

The Bureau of Land Management, Farmington Field Office, is in the final stages of developing a comprehensive resource management plan for the public lands and minerals in northwestern New Mexico. With respect to the projected future oil and gas development of the federal and Indian mineral estate, the BLM, through the Farmington Field Office, intends to maximize development of the hydrocarbon resource while minimizing impacts to surface resources and values.

The Farmington Field Office of the BLM supported the October 15th, 2002, Fruitland infill order of the Commission, allowing 160-acre spacing for all areas except the high-productivity portion of the Basin, also referred to as the fairway. Although that order exasperated [*sic*] the conflict between the development of BHP's federal underground coal mine and the federal oil and gas lessee's

Fruitland Coalbed methane plans, the Farmington Field Office of the BLM encourages the Commission to continue its support for resolution of this conflict outside of the spacing determination process.

The October 15th, 2002, Division Order stated, and I quote, "A preponderance of the evidence [submitted] establishes that the current 320-acre spacing is adequate in the High Productivity Area..." The Order further declares that, quote, "Based on the relative lack of direct evidence of the potential effects from infill drilling within the High Productivity Area, it would not be prudent for the Division to amend the pool rules to provide for increased density within the High Productivity Area at this time. The more prudent course of action would be to refer the matter of infill drilling within the High Productivity Area back to the Committee for further study." Close quotes.

The BLM, through the Farmington Field Office, supports the Commission's October 15th, 2002, finding with respect to the high-productivity area; however, the BLM recognizes that evidence will be presented at this hearing supporting 160-acre spacing in the fairway. The BLM welcomes the opportunity to review the additional technical data presented in support of infill drilling in the Fruitland fairway.

The BLM manages approximately 80 percent of the surface acreage and a little bit more, perhaps 85 percent, of the mineral estate within the fairway. These lands have significant resource values, including aesthetic appeal, dense archaeological resources, threatened and endangered species habitat, public-forage-dependent ranches, and prime big game wintering areas. The Farmington Field Office of the Bureau of Land Management remains concerned about the potential impacts of additional surface disturbance associated with infill drilling in the fairway. To honor the intent of the resource management plan and accompanying environmental impact statement and meet our multiple use mandate, the Bureau of Land Management, Farmington Field Office, cannot support infill drilling merely to accelerate gas production.

In the event the Commission determines that the additional data presented over the next few days adequately supports increased density in the high-productivity area, the BLM Farmington Field Office reserves the right to request site-specific technical data from operators and applicants. In the event that the BLM suspects that primarily rate acceleration, without incremental gas recovery, is involved in the new drilling proposals, particularly where additional surface disturbance is required, a more detailed analysis will be performed as part of the environmental-assessment/application-for-permit-to-drill process. As part of this process, additional data may be requested that include, but are not limited to, geologic cross-sections, reservoir isopachs, reservoir simulations and other pertinent information.

In summary, the Bureau of Land Management Farmington Field Office wants to ensure the orderly development of the tremendous Fruitland Coal gas reservoir. If the technical data support a decision to increase the well density in the high-productivity area of the Fruitland Coal formation, the BLM through the Farmington Field Office wants to minimize the impacts to surface resources and values. We will encourage, and in some cases demand, development of the Fruitland Coal formation by means of recompletion in existing wellbores, commingling and drilling from existing well pads. This type of development will minimize surface disturbances, decrease developmental costs and maximize utilization of existing wellbores.

Again, I appreciate the opportunity to present this statement for the record. Thank you.

CHAIRMAN WROTENBERY: Thank you, Mr. Henke.

MR. HENKE: Would you like me to mark this BLM Number one?

CHAIRMAN WROTENBERY: It's just a copy of your statement, I believe --

MR. HENKE: Okay.

CHAIRMAN WROTENBERY: -- right? Then if you could just submit it to us, I think that will --

MR. HENKE: Yes --

CHAIRMAN WROTENBERY: -- be fine.

MR. HENKE: -- be glad to.

CHAIRMAN WROTENBERY: Thank you very much.

Okay, are all of the witnesses present at this point? Should we swear everybody in at the same time, or is there --

MR. CARR: Swear them in.

MR. KENDRICK: One of the --

CHAIRMAN WROTENBERY: I'm sorry, Mr. Kendrick?

MR. KENDRICK: One of the Dugan witnesses is not here yet.

CHAIRMAN WROTENBERY: Okay, and he's the only one absent at this point in the proceeding? Then if all of the other witnesses would please stand and be sworn.

(Thereupon, the witnesses were sworn.)

CHAIRMAN WROTENBERY: Thank you. And then, Mr. Kendrick, if you'll help me remember, when your other witness arrives we'll swear him in as well.

And Mr. Carr, will you be presenting your witnesses first?

MR. CARR: I think so. Whatever you want.

First, last, any time.

CHAIRMAN WROTENBERY: Commissioners, are you ready to get started with the testimony?

COMMISSIONER BAILEY: Let's do it.

CHAIRMAN WROTENBERY: Okay, let's go then.

MR. CARR: May it please the Commission, I believe you have an exhibit book that was delivered last week on behalf of Burlington, BP and ChevronTexaco, and we'll work through that exhibit book in order.

Our first witness is Bill Hawkins. Mr. Hawkins is with BP. He will testify about the work and the recommendations of the industry/OCD Study Committee. He's going to explain to you the reasons behind the proposed -- or the existing actual boundary between the low-productivity area and the high-productivity area. He's going to then provide an overview of what we believe are the appropriate recommended regulatory changes for this pool.

BILL HAWKINS,

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. Yes, Bill Hawkins.

Q. Mr. Hawkins, where do you reside?
A. In Golden, Colorado.
Q. By whom are you employed?
A. BP America Production Company.
Q. And what is your position with BP America Production Company?
A. I'm a petroleum engineer with BP. I'm responsible for regulatory affairs in Colorado and New Mexico.
Q. Could you summarize for the Commission your educational background?
A. Yes, I have a bachelor of science in petroleum engineering from Texas Tech University in 1972 and a master of engineering from Texas Tech in 1974.
Q. Would you review your employment history?
A. Since 1974 I've been employed by Amoco and now BP, through a merger, as petroleum engineer.
Q. At all times have you held engineering positions?
A. Yes.
Q. Are you in charge of regulatory affairs for the San Juan Basin?
A. Yes, I am.
Q. And in the exhibit book behind Tab 1, is there a copy of your résumé and then a summary of the testimony you're going to be providing here today?

A. Yes, there is.

Q. Were you an engineering witness providing testimony in the Colorado case where infill development was approved for that pool on the Colorado side of the line?

A. Yes, I was.

Q. And you also testified before this Division last year?

A. Yes, I did.

Q. Are you a member of the Division's Fruitland Coalbed Methane Study Committee?

A. Yes, I am.

Q. Have you participated in all aspects of that work since its first meeting in August of 1999?

A. I have.

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

A. I am.

Q. And are you familiar with the Basin Fruitland Coalbed Pool and the rules that govern development of that resource?

A. I am.

MR. CARR: We tender Mr. Hawkins as an expert witness in petroleum engineering.

CHAIRMAN WROTENBERY: Let me ask one question first. I don't believe we have a copy of Mr. Hawkins' résumé in our books. I don't know if that was available in the court reporter's copy.

MR. CARR: The copy of the book that I received has that. I will provide copies of the résumé and summary following Mr. Hawkins' presentation, if you'd like.

CHAIRMAN WROTENBERY: Okay, that sounds fine.

Any objection? Then we find that Mr. Hawkins is qualified to testify as an expert.

Q. (By Mr. Carr) Would you summarize for the Commission the purpose of your testimony?

A. I'd like to review the work that the Study Committee did and basically summarize the recommendations from the Committee. I'll testify about the boundary between the high-productivity area and the low-productivity area. I'll also go over the recommended notice procedure inside the high-productivity area and provide a regulatory summary of the Committee's recommendation.

Q. Let's start with the work of the Committee, and I'd ask you to turn to the page and slide that -- I guess what we're going to start with, Mr. Hawkins, are certain slides that are in the back of the material behind Tab 1, and they're about the last five or six pages there, entitled Supplementary Introduction Exhibits. Would you just identify those, please?

A. I'm going to scoot to those on the projector. We have five pages of a summary of the Study Committee's or the Coalbed Methane Committee's work since 1999 through 2003. And although I won't go through each notation on these, I'd like to point out some of the key events that occurred over the course of that study.

Q. These are actually the exhibits that were presented last summer at the hearing in Farmington by Mr. Hayden of the OCD; is that not correct?

A. That's correct. The first four slides were presented by Steve Hayden, and then the last slide is just an update for the latest meetings.

Q. Why don't you now at this time summarize for the Commission the work of the Study Committee?

A. Well, just to kind of briefly go through this, the Committee was convened in August of 1999, and the primary purpose the Committee was convened was to look at infill drilling in the Fruitland Coal. The Oil and Gas Commission in Colorado had just approved a fieldwide infill spacing hearing in Colorado in the Fruitland Coal, and certainly there was interest by the NMOCD and the BLM and other industry to take a look at the Fruitland Coal in New Mexico.

We met on a number of occasions. I think one of the most important initial meetings occurred in August of 2000 when Burlington presented some of the study they had for their 28-and-6 Unit, and they indicated that the Fruitland Coal appears to behave like a multi-layer reservoir and indicated to importance of starting to look at individual pressures in the different layers in the Fruitland Coal.

Move ahead to the next slide, we continued to have some meetings, and in January of 2001 we set up a group to define the boundary between the high-rate portion of the pool and the low-rate portion of the pool, and that eventually became named the high-productivity area and the low-productivity area. The initial boundary was preliminary, just based on input from a number of companies, but without the benefit of additional studies.

Following that, each of the companies on the Committee began to do some individual studies and present those to the Committee for consideration.

If we move to the next slide, in May of 2001 Burlington presented a case to the NMOCD to pilot-test the low-productivity area. And following that, in August of 2001, we began to look at the high-productivity area. And based on some of the presentations by BP and others that we wanted to allow infill drilling in the high-productivity area and considered an administrative procedure where notice would be given to offset operators.

If we move ahead, in April, 2002, the Committee met again and finalized the high-productivity area as a single continuous area that encompassed wells that produced at greater than 2 million cubic feet a day as the highest average rate from those wells. And you can see that on the board, off just to the right here, we've got -- that black boundary is the boundary that the Committee drew.

Following that, we had the hearing for Fruitland infill in July of 2002 and received an order in October approving infill in the low-productivity area but denying infill in the high-productivity area, basically remanding back to the Committee for further study the high-productivity area.

Two final meetings following that. In November, Burlington and Devon presented layer pressure data from nine wells inside the high-productivity area, showing the individual coalbeds, some being partially drained, some not being drained at all. And in February the Committee reviewed the study of those pressures and considered the alternatives in the high-productivity area. And the majority vote on the Committee was to allow -- to keep the high-productivity-area boundary with an administrative procedure for notice inside the high-productivity area and allow infill with that notice.

Q. And as of February, 2003, the Committee was unanimously in favor of the recommendation that's before the Commission here today?

A. Well, we are all in favor of this -- in support of this recommendation now. I think in February, 2003, there was still maybe some controversy from ConocoPhillips. But subsequent to their study they have concurred with the Committee's recommendation.

Q. Let's now look at the boundary, and let's go back to the first part of the material included behind Tab 1. I'd ask you to go to the slide that's entitled "Fruitland Coal HPA Infill - HPA Boundary" and review that for the Commission.

A. This is a slide that's going to summarize a little bit about the purpose of the boundary and how it fits into the coal reservoir.

As I stated, the Committee's approach was to find a single, continuous boundary that would encompass the high-rate wells. We chose the 2-million-a-day rate based on some of the preliminary studies that BP had done, indicating that those wells were -- that less than that rate, the wells were clearly draining less than 200 acres. Above that rate, there were some of our studies indicating wells draining larger areas than that.

But once we got to put a line, a best-fit line, on the map, about 2 million a day was about the only line we could fit that was a single, continuous boundary to encompass those high-rate wells.

The line was not intended to separate the pool into an area where infill is needed versus an area where infill is not needed. We all recognize that there were areas inside this boundary where infill wells were going to be needed to prevent waste.

Just to give you an idea of the complexity of the reservoir, even though we've drawn this as a single continuous boundary, there are about 75 wells inside the boundary that actually had a maximum rate less than 2 million a day, and there are about a hundred wells on the outside of the boundary, in what we've determined now as the low-productivity area, that had higher rates just above 2 million a day.

So it's not a perfect line, but it's a best-fit line to encompass those higher-rate wells in the reservoir. And our studies, what we'll show you today is that the majority of the spacing units inside the high-productivity area will benefit from infill development and recovering incremental recovery.

Q. All right, let's now go to the plat that is based on the highest average daily rate, which is the next slide. What does it show?

A. This is a map of the Fruitland Coal wells, contoured on highest average daily rate, and this was the map that we used to actually select the boundary in the Committee. The yellow line is the -- or encompasses the wells that are at 2 million a day. The blue are wells that are producing between 1 and 2. And then inside the high-productivity --

COMMISSIONER LEE: Can I ask a question?

THE WITNESS: Yes.

COMMISSIONER LEE: Is this rate the initial rate or the current rate or --

THE WITNESS: It's the highest average annual daily rate.

COMMISSIONER LEE: At -- ?

THE WITNESS: For the life of the well.

COMMISSIONER LEE: For the life of the well. Thank you.

THE WITNESS: So it's the peak rate that the well made. It's annualized and averaged --

COMMISSIONER LEE: -- after you dewater it?

THE WITNESS: Right. Inside the boundary you also see some pink and purple colors, and those are areas inside the high-productivity area where the wells are producing at much higher rates. The pink shows wells making more than 4 million a day, and the purple shows wells making more than 5 million a day for their highest peak rates.

I think the point that I would make here is that you can see inside the boundary there are quite a few areas where we still have wells that are producing much less than the best wells in the pool. And that was our indication that those are the areas that are most likely going to need to be infill drilled.

Subsequent to that, we've looked at the layer pressure information, which I think is going to demonstrate that a large number, if not most of those wells that are even in the pink and purple, will still benefit from infill development.

Q. (By Mr. Carr) All right, let's move to your next slide, and I'd ask you to discuss with the Commission the waste concerns.

A. Approval of infill development in the high-productivity area will prevent waste and allow significant incremental recovery to be recovered from wells -- the infill wells drilled there. The industry estimates, all of our company's studies, indicate incremental recovery will range somewhere from 240 BCF to 640 BCF inside the high-productivity area.

To put that in -- Just to show that that's a conservative estimate, the USGS has recently completed a study of undiscovered resources, and in their study they have identified in the Fruitland Coal fairway a potential for 4 TCF of undiscovered resource in the fairway. That would be both in Colorado and New Mexico. And I think if we look at the map on the board, the brightly -- yellow and orange colors, you can see that the majority of that fairway lies in New Mexico.

In addition to this, the BLM's resource management plan currently provides for wells to be drilled on 160-acre density in New Mexico. So I think -- We have a regulatory scheme in place to allow these wells to be drilled, and there is a recognition that in order for those wells to be drilled, significant recovery would need to be recovered by those wells.

Q. Let's go to the next exhibit. I'd ask you to review for the Commission the relationship between the high-productivity area and the established producing units in that area.

A. Okay. We're going to take a look now at some of the details of what needs to be accomplished in the regulatory scheme or rules to govern the Fruitland Coal Pool, and the first thing I would look at is the boundary for the high-productivity area and, as shown on this slide, the federal units that are in place. And you can see from the different cross-hachured areas the part of the pool that lies inside federal units. About two-thirds of the area in the high-productivity area is covered by federal units.

And one of the benefits that we have inside a federal unit is that the ownership inside the participating areas in there is common and prevents the potential for correlative rights to be violated.

There's about one-third of the area that's shown in white that is what we call drillblock acreage, where each spacing unit has different ownership from the spacing units adjacent. And there is, you know, more opportunity for -- or potential for violation of correlative rights, and more need for -- potential need for notice to those parties for infill drilling in this high-productivity area.

Q. All right, let's go to the next slide, and let's review the well-location issues.

A. We tried to show on this slide the different occasions you might have for drilling wells, both in the federal unit that's shown in the dark outline and in the drillblocks, which are -- in this case they're shown inside of the federal unit, but they're not part of the participating area, and if you were outside of the federal unit it would be treated in the very same way.

And in fact, this slide was shown to the Division at the hearing back in July of 2002, and the recommendations on the setbacks from this slide were approved in the Division's order.

The recommended setback is 660 feet from the boundary of the spacing unit, when you're in a drillblock acreage, 660 feet from the boundary of the unit that is all inside a participating area, and also a 660-foot setback from any individual tracts that are either noncommitted or partially committed to the unit. So we're trying to keep the 660-foot buffer or 660-foot setback from any areas where the ownership is not common.

There's also a 10-foot setback from the -- that's not shown, and that's from the internal subdivisions inside the spacing unit, quarter-section boundaries.

Q. Mr. Hawkins, the Study Committee is recommending that there be a special notice procedure or a special procedure that will apply to operators who are proposing to drill --

A. Yes.

Q. -- in the infill area.

A. Yes.

Q. And would you now go to -- Before we go to the next slide, when I look at this spacing isn't what is being proposed here -- it was not only adopted by the Division, but it is identical to what is required for the Mesaverde and the Dakota formations; isn't that correct?

A. Yes, it is.

Q. Okay. And now, let's go from this and let's review for the Commission those notice procedures that we have been discussing in the high-productivity area.

A. Okay. We've got two slides here on the notice and protection of correlative rights. First is that notice of infill inside the high-productivity area will protect correlative rights of affected parties similar to a nonstandard location procedure. This will allow the operators to drill their wells efficiently when there is no objection from the offset operator. When the offset operator is concerned about correlative rights, they have the opportunity protest, which can initiate a hearing to determine justification for the well.

I have a slide -- the next slide is designed to show a little more detail about how the notice would work, similar to a nonstandard location procedure. In this example, the operator in -- it looks like Section 8 -- is proposing to drill an infill well in the southeast quarter -- Let's see, I've got -- you can see, right here. And we've named that operator Operator A, with a 100-percent working interest. And we're just going to show the example of which spacing units would receive notice.

The spacing units that would receive notice would be these that are designated in yellow. Those are the spacing units that are adjacent to or cornering the quarter section where the proposed infill well is proposed to be drilled.

And then on the right-hand side of the slide we've listed a little excerpt that comes out of Rule 1207 for affected parties for nonstandard locations, and we think that is the same type of language that should be used for the Fruitland Coal, that the notice to those affected parties should primarily be to the Division-designated operator of the spacing unit.

And there are a couple of nuances where the notice might be different than just to the operator. One would be if there is no operator, then the notice would go to the lessee of record, or the mineral owners if there are no lessees, and that would be the example in the north half of Section 9, cornering the drilled quarter for the proposed infill well.

The other nuances would be that if the operator is the same as the proposed infill well and the ownership is not identical, then the notice would go to the rest of the working interest owners in the adjacent spacing unit. And for instance that would be, in the south half of 9, here's the proposed infill well, Operator A 100 percent. In the south half of 9, Operator A is the same operator but only controls 50 percent of the working interest, so notice would have to go to the other 50-percent working interest in that spacing unit.

And finally you would have the situation where you're inside a federal unit or in a drillblock acreage where you have the same operator with the same ownership. The operator -- or ownership, is identical. No notice would be required for Operator A with 100 percent versus here Operator A with 100 percent.

And this is basically the same procedure that's set up for an exception location or a nonstandard location in the Division's Rules today.

Q. All right. Let's now review the regulatory impacts of the infill development on Fruitland Coal in the high-productivity area. Refer to the next slide, please.

A. Okay. An order approving infill drilling in the high-productivity area with our recommended administrative process will provide operators a cost- and time-efficient way to carry out our drilling programs for infill wells.

If we don't have that and we are left with what is in the current order, an NMOCD hearing would be required for each well inside the high-productivity area. There are 400 wells inside the high-productivity area. At an estimated cost of a hearing of up to $10,000 a well, it could add up to $4 million in additional regulatory costs to get approval for infill in the high-productivity area.

COMMISSIONER LEE: So 10M is the $10,000?

THE WITNESS: 10,000.

COMMISSIONER LEE: Is that an engineering term?

THE WITNESS: It's not million. 2 M's is a million.

COMMISSIONER LEE: That's only for gas, not dollars.

THE WITNESS: Do you like K, 10K?

COMMISSIONER LEE: Yes.

THE WITNESS: We'll change it to 10K.

MR. CARR: I helped him with these exhibits.

THE WITNESS: Requiring a hearing on each infill well would add years of additional time for the NMOCD and industry to get approval for infill drilling in the high-productivity area, which would be very inefficient use of our time and money, both for industry and the NMOCD.

Q. (By Mr. Carr) Mr. Hawkins, let's now go to your last slide, and I'd ask you to summarize for the Commission the proposed regulatory requirements that you're advocating here today.

A. First and foremost, NMOCD approval of infill in the high-productivity area will prevent waste and will allow significant incremental reserves to be recovered. We know that -- Our studies all show different estimates, but those estimates all are in the order of several hundred to 500 BCF of gas that would not be recovered if infill wells are not drilled.

The notice procedure that we're recommending will protect the correlative rights of all of the parties inside the high-productivity area, very similar to the nonstandard location process.

And the administrative approach that we are recommending for APDs will provide an efficient procedure for the NMOCD and for industry to infill the high-productivity area.

And lastly, I would point out that the well-location rules that we're using similar to the Mesaverde and Dakota Pools will provide many opportunities for industry to use the existing wellbores or well pads, roads and other facilities, so that we can minimize the potential surface disturbance for infilling.

Q. Now, Mr. Hawkins, you've reviewed the regulatory changes and requirements that have been proposed by the Study Committee?

A. Yes, I have.

Q. Will additional witnesses be testifying as to the geological and engineering data that supports the changes that you have just summarized?

A. Yes.

Q. And those witnesses will be testifying later here today?

A. Yes.

Q. Were the exhibits contained behind Tab A in the exhibit book prepared by you, or have you reviewed them and can you testify as to their accuracy?

A. Yes, they were prepared by me or reviewed by me.

MR. CARR: May it please the Commission, at this time we would move the admission of Mr. Hawkins' exhibits, which are each of the documents contained behind Tab A in the exhibit book.

CHAIRMAN WROTENBERY: Any objection? Then the exhibits behind Tab 1 --

MR. CARR: -- Tab 1 --

CHAIRMAN WROTENBERY: -- will be admitted.

MR. CARR: -- M, K, 1, A... And that concludes my direct examination of Mr. Hawkins.

CHAIRMAN WROTENBERY: Okay, thank you. Did anybody else have any questions of Mr. Hawkins? Commissioners?

EXAMINATION

BY COMMISSIONER BAILEY:

Q. Has every 320-acre spacing unit within the high-productivity area been drilled and completed in the Fruitland?

A. I believe all but possibly one have been drilled.

COMMISSIONER BAILEY: Okay.

CHAIRMAN WROTENBERY: Commissioner Lee?

EXAMINATION

BY COMMISSIONER LEE:

Q. You already dewater it on the other parts of it. Do you think this infill drilling is -- economically, is even better for the exploration well?

A. For the first well?

Q. Yes.

A. What we've seen in Colorado, where we have done infill, is that there has been no negative impact on those original wells. And in many cases there has been continued incline on the first well that was drilled.

So yes, I could say that I think there would be some potential benefit, particularly in the low-productivity area, where there's still dewatering needed.

Q. Right now, in this area, you have a lot of Pictured Cliff, 80 acres. Can you utilize those wellbores?

A. Well, the Pictured Cliffs are on 160s right now, but they're being piloted for 80-acre. I don't know that -- You know, I think there are many opportunities where we could use the Pictured Cliffs well or one of the deeper wells.

Inside the high-productivity area there are still some concerns over how we will complete wells, whether they would need to be perf'd and frac'd, where you could use an existing wellbore, or whether they would need to be cavitated, in which case you would have to drill a new wellbore. But there's always the potential to drill even a new wellbore from an existing pad. So I think operators would look at those as potential solutions.

Q. How many of the Pictured Cliff wells in this area increase their productivity after 30 years?

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

Q. I heard a lot of Pictured Cliff wells in this area increase a lot of productivity. What I'm saying is, a lot of companies steal the Fruitland Coal gas from the Pictured Cliff completions. Do you have any idea about that?

A. I don't have any way to analyze that.

Q. Yeah. The Pictured Cliff is right under the Fruitland Coal.

A. Right.

Q. I think a common practice right now is, I don't have 160 acres, but I use the Pictured Cliff as a -- and penetrate into the Fruitland Coal and get the coal gas out. Is that true? Do you understand?

A. I understand your question.

Q. Is that a BP operation?

A. That is never our intent. I don't think any operator intends to try to complete into the Fruitland Coal through a Pictured Cliff --

Q. Are you sure?
A. -- perforation. Yes.
Q. I thought this is common practice.
A. Common practice?
Q. Yeah, the BLM told me that all the Pictured Cliff, up to 30 years, they recharge, and all the productivity increase.

Well, anyway, I think this is 160, my opinion, although we're going to these four days' hearing, but I think 160 -- I support it, because people have already done it. So -- in reality. So can I go home now?

(Laughter)

MR. CARR: If I can go with you.

CHAIRMAN WROTENBERY: You're in it too.

EXAMINATION

BY CHAIRMAN WROTENBERY:

Q. Mr. Hawkins, it sounds like you're familiar with the spacing rules in the Fruitland Coal in Colorado.
A. Yes.
Q. Could you summarize those for us, please?
A. It's very similar to New Mexico, it's spaced on 320 acres. The setbacks are slightly different, we use a 990 setback in Colorado.

In 1999 -- Well, prior to 1999, there were a number of areas that were piloted for infill in Colorado, and in 1999 a large hearing was held to approve infill drilling.

In 1999 industry didn't ask for infill in the high-productivity area in Colorado. At that point in time we did not have layer pressure data to look at, so we didn't even include it in our application. But it does use a boundary similar to the New Mexico Commission or what we're proposing. There's a 3-million-a-day boundary that was used in Colorado instead of a 2, and I have made a recommendation to our company to get together with other operators and take a look at the high-productivity area in Colorado for potential for infill there.

Q. Thank you. And could you explain how the USGS defines undiscovered resources?

A. You know, I don't know exactly what -- how they define undiscovered, but -- well, I really can't give you a -- We might have somebody that can tell you that.

CHAIRMAN WROTENBERY: Okay, I was just trying to put that estimate of 4 TCF in context.

Any further questions? Anything else of Mr. Hawkins, then?

MR. CARR: That concludes my presentation of this witness.

CHAIRMAN WROTENBERY: Thank you very much for your testimony, Mr. Hawkins.

And I think we'll take about a 10-minute break, if that's okay with everybody.

(Thereupon, a recess was taken at 11:00 a.m.)

(The following proceedings had at 11:10 a.m.)

CHAIRMAN WROTENBERY: Okay, Mr. Carr?

MR. CARR: May it please the Commission, our next witness is going to be James Fassett.

Before we start with Mr. Fassett, there is an error in one of his exhibits. It is the third color slide, and it looks in the book something like this, and you can see it's a mis- -- it was actually in the book as a test to see if anybody read this --

CHAIRMAN WROTENBERY: I noticed.

MR. CARR: -- but the correct page -- I've passed it out -- looks like this. If anybody wants a copy of it, this is the correct page for the exhibit book and it's the third slide.

And so at this time we would call Mr. Fassett. Mr. Fassett is going to review the general geological setting for the Fruitland Coal and is also going to discuss the recent resource assessment by the USGS.

And the way, with your permission, we'll approach this is, I will qualify Mr. Fassett, and then I would like to turn it over to him for his presentation. It's an important presentation, it sets a very sort of important backdrop behind the rest of the testimony which you'll be hearing, and it's a much better presentation if I do what everyone would like me to do and that is shut up and step back. So with your permission, that's how we'll do that.

JAMES E. FASSETT,

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. James E. Fassett.

Q. Mr. Fassett, where do you reside?

A. I reside here in Santa Fe.

Q. Could you explain to the Commission by whom you're employed?

A. I am sort of employed several different ways. I am retired from the US Geological Survey as of June of 2000, and I continue to work for them as an emeritus scientist, and that's kind of a fancy title for saying that they don't pay me anymore but I still work for them.

In addition to that, I've recently started to do some consulting. I consult for a firm named CDX Rockies that's located in Durango, Colorado. It's a company that's involved in the promotion of coalbed methane. And I recently was hired by Dugan Production in Farmington, New

Mexico, and I'm consulting for them as well.

Q. Could you summarize your educational background for the Commission?

A. Yes, I have a bachelor's and a master's degree from Wayne State University in 1959 and 1964, respectively.

Q. You have worked with the USGS from 1960 to 2000; is that right?

A. That is correct.

Q. Could you summarize your work, particularly as it relates to the development of the coalbed deposits in the San Juan Basin?

A. Yes, when I arrived in Farmington in 1961 there was a small district office of the USGS there, and that office was primarily charged with doing research on the leasable minerals in northwest New Mexico. And the principal one of those, of course, is coal.

So along with a colleague of mine named Jim Hinds, we published in 1971 the first Basinwide study of the subsurface coal basin that had ever been done in the western United States. And we came up with a fairly detailed portrayal of the distribution of the coalbeds and the total tonnage of the coal. And our basic tool was geophysical well logs. And at that time the use of logs for determining coal resources was highly questionable among a lot of people, so we were breaking new ground.

Anyway, we published that paper in 1971.

I went on and worked in other parts of the country and other parts of the world. I spent three years in Pakistan for the US Geological Survey in 1990 to 1993, again studying coal resources there. And then my final publication for the USGS was a chapter in the *USGS National Coal Resource Assessment*, and that publication is 1625-B, and my chapter on the San Juan Basin coal resources is Chapter Q. And most of what I'm going to present today, 95 percent of it, is in that publication. And if anyone would like to have a copy, contact me after the meeting and I'll be sure you get it. It's on a CD-ROM, so it's nice and small, compact and easy to --

COMMISSIONER BAILEY: I would.

THE WITNESS: -- deal with. And I can give you a copy if you'd like also.

CHAIRMAN WROTENBERY: Okay, Commissioner Bailey definitely would like to have one.

COMMISSIONER BAILEY: I've already said yes, please.

MR. CARR: May it please the Commission, we would tender Mr. Fassett as an expert witness in petroleum geology, in particular focusing on the San Juan Basin and the coal deposits in the Basin.

CHAIRMAN WROTENBERY: Any objections?

We accept his qualifications.

MR. CARR: And at this time I would like to step back and ask Mr. Fassett to review the coal development in the San Juan Basin for the Commission.

THE WITNESS: Okay, I'd just like to say at the outset that my presentation today will be primarily a review of what I've already published with the US Geological Survey over the years, and most recently the professional paper chapter I just referred to.

And you know, I do want to emphasize I'm not representing any of the clients that I said I was consulting for. This is totally for the US Geological Survey as an emeritus scientist, I guess you might say.

CHAIRMAN WROTENBERY: Thank you, Mr. Carr.

THE WITNESS: The title of my talk is Distribution of Fruitland Formation Coal Beds in Space and Time. I chose this title very carefully because over the years there have been different interpretations of the coalbeds in the Fruitland, in the San Juan Basin, and I think we all can appreciate when we see a geologic cross-section what the distribution of the coalbeds is in space, the geometry of the coalbeds. But most nongeologists and even some geologists, I'm sorry to say, don't really think about the distribution of these coalbeds in time, in other words, how they got to be in the present geometric configuration that they now have.

This is just a little summary slide of the USGS National Coal Assessment. There's the information about it, 1625-B, and there are chapters on this two-CD set on all of these coal basins. And my chapter, of course, is on the San Juan Basin, shown right there.

The index map of the Basin shows that for the purposes, at least, of this talk, I am defining the Basin on the basis of the area contained within the Fruitland formation outcrop, which is shown here in green.

Some of the geographic components of the Basin are shown here, the river system, the Navajo Reservation, Southern Ute Reservation, Jicarilla Apache Reservation, the Bisti De-na-zin Wilderness Area, Chaco Canyon, Mesaverde Park up to the north.

I've shown the two major coal-fired power plants and mines that now exist. Actually, there are three mines. There's a mine here in the Navajo Reservation called the Navajo Mine, a mine north of the river. Both of those are mining Fruitland formation coal. And then the little -- relatively little La Plata Mine up just at the Colorado-New Mexico line, and that mine is about to be abandoned. I think it's about mined out.

On the San Juan Mine they have pretty much mined all the coal that's available through strip-mining and have started to go underground, with an underground mining operation there.

This cross-section is a stratigraphic cross-section, and for those of you not familiar with how we geologists do things, it's oftentimes helpful to depict rocks in terms of relating them to a datum. And the datum I have used here is a volcanic ash bed that's been altered, that was laid down at that time -- I need to put my glasses on here -- 76.76 million years ago. And we know the age of that ashfall because it's been dated with very precise, state-of-the-art methodology using argon-argon single-crystal dating methodology.

And that ash bed represents a layer of material that was laid down almost instantaneously, geologically, that long ago, and so it's a very valuable datum to relate other rock units in the Basin.

The unit shown in yellow here is the Pictured Cliff sandstone. And as Mr. Lee pointed out a few minutes ago, the Fruitland Coal beds are intimately related with the Pictured Cliffs and were laid down on top of this unit as a seaway regressed across the Basin from the southwest part up to the northeast part.

There's a lot of stuff on here that I won't go into right now.

Over on the right side, just in case you're curious, these are ammonite zonation zones that have been very precisely determined by the US Geological Survey over the years, and some of these have been dated. This one's been dated at 73.31 million years ago, up in Montana.

The numbers on the left side of this diagram represent dates that I obtained with colleagues in the US Geological Survey from samples of altered volcanic ash collected at these levels in the Fruitland and Kirtland formation. And you can see the numbers range from 75.76 to 73.04, two and three quarters millions years.

If we just look at the Pictured Cliffs, which underlies the coalbeds that we're talking about here, you can see that the Pictured Cliffs becomes younger by that amount of time across the Basin, and the overlying coalbeds also become younger across the Basin.

And this cross-section goes across the Basin, and it's 80 miles long.

COMMISSIONER BAILEY: Before we leave that, what is the designation of C32r and C33n?

THE WITNESS: Oh, okay, I'm glad you asked that. It's not entirely relevant to the distribution in some ways; in other ways it is. C32r, C33n represents a reversal in the earth's magnetic field, and there is a highly specialized part of geology that's called paleomagnetism. Some people call it paleomagic, but it's acquired quite a lot more credence since that name was first put on it. Anyway, the earth's magnetic field, from that red dashed line down, in that period of time from 73.5 on down -- and it goes down below -- was a normal magnetic field, comparable to what we have today on earth.

At that moment in time -- and it's -- again, geologically it's an instantaneous event; it probably takes 100,000 to 200,000 years for that reversal to take place in the magnetic field. But what happens when that occurs is that the earth's magnetic pole switches from north to south. And those switchings of the polarity of the earth's magnetic field have occurred on a very irregular cycle through geologic time. And so if we can identify one of these things, it makes a very good marker in the rocks, you know, that one might be interested in looking at.

We actually found that reversal down here at a place called Hunter Wash, and then we found it up north in different rocks in an area near Chimney Rock, Colorado, over near Pagosa Springs. And we've dated that quite precisely.

And the dating of these things is very important in construction of geologic time scales.

Okay?

Okay, this is what the North American continent looked like about 72 million years ago. And as you can see, there was a seaway that bisected the continent, that went from the Gulf all the way up to the Arctic Ocean -- I haven't shown the northern extent -- and the San Juan Basin was located on the western shoreway of that sea.

And I have diagrammatically shown the Pictured Cliffs shoreline at 76 million years ago and 73 million years ago. And it was during those approximately 3 million years that the shoreline regressed or retreated from the southwest edge of the Basin to the northeast edge of the Basin.

Looking at the Basin specifically -- and I want to emphasize, the Basin did not exist at the time these rocks were deposited, the structural Basin was not here at all. The San Juan Basin area as we know it today was created during what's called the Laramide Orogeny, between about 55 and 35 million years ago.

The shoreline of the sea at 75.56 million years ago was approximately there, and as the sea regressed -- and if you think of the shoreline, say, at this point where it's 74.56 million years old, think of land being in this direction, sea being in this direction. And what was happening is that the influx of sediments was filling in the seaway, and that's what was causing the shoreline to regress from southwest to northeast across the Basin.

And this shows in a cartoon form what the terrain may have looked like at any given point of time. The Pictured Cliffs sea was out here. The Pictured Cliffs shoreline, where the sandstones of the Pictured Cliffs were being deposited, is here. Rivers flowing to the sea from the southwest to northeast. And then a series of backshore swamps that you can see are quite discontinuous laterally parallel to the shoreline and discontinuous also at right angles to the shoreline.

Okay, we're going to jump now to a structure map of the Basin, and this map depicts the current structural configuration of the Basin. And the map is -- the structure map is drawn on the Huerfanito bentonite bed, the ash layer that I've used for a datum for most of my illustrations. In a little bit we're going to look at a cross-section on this line.

And what a structure map shows is that the dip of the rocks is quite gentle here, into the axis of the Basin. You can see the Basin is very asymmetric, very gentle dip up to here, and then a relatively steep dip on the northern limb of the Basin.

And for purposes of this presentation I have superimposed the high-production area or the fairway for Fruitland Coalbed methane production in the Basin, just so you can see where that lies.

And if we look, then, at the structural profile, here's the configuration of the map or the profile of the Huerfanito bentonite bed, very gentle dips here, steep dips over here, and the top of the Pictured Cliffs sandstone.

And the top of the Pictured Cliffs is diverging from the Huerfanito bentonite bed because of the stratigraphic rising of the Pictured Cliffs through time. And you saw that on the previous cross-section with the stair-stepping upward of the Pictured Cliffs sandstone.

So a structure map drawn on the Pictured Cliffs is not really a very precise depiction of the structure of the Basin, but it's important for us because the coalbeds that we're interested in are right there on that level.

It's always fun to show a 1:1 profile with no vertical exaggeration. That's the same cross-section there.

It's always good to look at where the basic data comes from. This is a type log that I used in my professional paper chapter to show how we can pick with a high degree of confidence the thicknesses of coalbeds in the Fruitland throughout the Basin.

This is what's called a bulk density log. It contains several curves, a gamma-ray curve here, a caliper log here, which is extremely important because that will tell you if the hole is caved or not. This is a very nice, good hole, with very few cavings in it. The brown is the bulk density curve, and then is a backup where the bulk density, the brown line, the bulk density, is running between 2 and 3 grams per cubic centimeter. Most rocks, most sedimentary rocks that you will see will be in the range of about 2.5 grams per cubic centimeter. So normally that's all you need.

But for coal, because it's such a lightweight material, has such a low density, the logging technology has evolved so that this backup curve kicks in, and that goes from a density of between 1 and 2.

And this red line here is commonly used by at least research geologists to define coal. The dictionary definition of the *Glossary of Geology* definition of coal is a rock that contains less than 50 percent material, and that 1.75 grams per cubic centimeter is about 50-percent noncoal material.

So what the bulk density log gives us, then, is a very precise -- if it's a well-calibrated log, which this one is -- a very precise measure of the density of a coalbed. And the coal close to that red line is very high ash. And going over in this direction, toward the 1.3 line, which I have just shown with a dotted line, that's almost pure coal. You can see this upper coalbed just barely hits it. But most of the coalbeds in the Basin are averaging around 30-percent ash, and so they would average somewhere in between the 1.75 and 1.3.

These logs are generally calibrated in 2-foot increments, so the coalbeds can be measured, the thickness of each coalbed can be measured with quite a bit of precision, and also the density of the coalbeds can be measured with precision.

There is 37 feet of net coal shown here on this log. And in a map I'm going to show you in a minute, it will be a net coal isopach of the Basin, and it's going to show -- This is the net coal isopach map. This map used about 750 high-quality density logs similar to the one I just showed you, approximately four per township. These are townships that you see on the map. And it's a pretty good spacing of well control for an overview of the coal resources in the Basin.

If one were interested in a specific township, of course, you'd want to use a lot more wells, and I think probably some of the speakers that follow me will look at the coal thicknesses in more detail.

But you can see there's a very interesting pattern of coal thicknesses. The yellow areas are where the net coal thicknesses are less than 20 feet thick. The gray is zero coal, in a couple of places on the east side of the Basin. The brown is more than 40 feet of coal. And then the tan color -- there aren't too many of those spots

-- represents areas where the coal thickness is over 80 feet.

COMMISSIONER BAILEY: But we can't make any assumptions about the coal rank by looking at this map, can we?

THE WITNESS: No, this map tells you absolutely nothing about the coal rank. I have another map in my publication called a thermal maturity map or vitrinite reflectance map. It's not one of the exhibits that you have, but that shows the coal rank.

COMMISSIONER BAILEY: Which would have a profound effect on the gas in place, wouldn't it?

THE WITNESS: Yes, it does, very much so.

Okay, again, I've superimposed the fairway. It's a slightly different configuration from this one because I have used a 1-million-cubic-foot-per-day cutoff, rather than 2 million. But it's essentially the same pattern.

As you can see, the fairway kind of parallels the thick coal areas in the Basin but not exactly. There's not an exact correspondence between where the fairway is and the thick coal is, although in this part of the Basin there certainly is.

The reason the fairway is there is primarily because of high permeability of the coalbeds with that red area. The coalbeds have been fractured, gas can move easily through them, and it's a very peculiar, interesting geologic area, and we still haven't figured out all the answers to exactly what created the fairway and why it has such an interesting pattern.

Let me back up. So next we're going to look at this line of cross-section that goes across from southwest to northeast. You can see it will cross the fairway right there.

Okay, this is that line of section again, shown up here just for reference, and I put this paleomagnetic reversal up here just to show that it's essentially parallel to the Huerfanito marker bed, which tells us that through time these rocks were indeed stratigraphically rising from southwest to northeast and becoming younger as shown by these dates on the right side.

The total amount of that stratigraphic rise in the Pictured Cliffs from there to there is 1200 feet.

Looking at individual coalbeds down on the far south end of the Basin, there are a couple of coalbeds intermittently intertonguing with the Pictured Cliffs, a nice stack of coalbeds there. And incidentally, some of those coalbeds are producing coalbed methane at a fairly high rate.

But if you just go progressively through time -- and remember this is not just space, it's time; we're getting younger -- you can see that the coalbeds are not at all continuous. Individual beds go out into the Pictured Cliffs sandstone, another higher bed comes in, that goes out, scattered higher beds, and the whole pattern repeats itself through time across the Basin, up to the northeast edge.

The next one, we'll look at just the fairway area in more detail. And I should say that the spacing on the control points, the wells that you see that I use for control in constructing this cross-section, are four to five miles apart. So they're much further apart, as I stated earlier, than a company would want to have in producing a specific area. They'd want to put another four or five wells in between each one of these to see what the geometry of the coalbeds was like.

But even in this gross sense I think you can see quite readily that this well penetrates a series of coalbeds. The only one of which is common to these two wells is up here -- well, this one too. But if you go from well to well, you're going to new coalbeds constantly. This very large, thick coalbed is not present in the well over here, and obviously it's not present here, because it abuts against the Pictured Cliffs sandstone.

And the same pattern continues here. Here's a window. This actually is interesting geologically. The shoreline regressed, the coal swamps built up behind the shoreline, and then the sea came back in. There was a transgression up to that point of the shore, and then it went back out again.

COMMISSIONER BAILEY: Do you see changes in the composition of the coal gas at this scale?

THE WITNESS: Pardon me?

COMMISSIONER BAILEY: Do you see changes in the composition of the coal gas at this type of scale?

THE WITNESS: Well, yeah, and I think that's going to be addressed later. The fairway is defined not only in high rates of production but on the composition of the gas. The gas has high CO_2 and it has some -- You know, there are other different characteristics that sort of dictate how the fairway has been defined.

COMMISSIONER BAILEY: Right, but you pointed out each one of these small, unrelated coalbeds. Will we find different composition of the gases at that scale?

THE WITNESS: That I couldn't answer you. I haven't looked at the chemistry of the coal gas. And I really doubt, to be honest with you, that there's much data about that, because what the major producers do -- Let's look at this well right here on the edge of the fairway. Two pretty thick coalbeds and a series of thick coalbeds there. They complete all of those coalbeds using a method called cavitation, so they don't really know. If they were to take an analysis of the gas coming up, they would be seeing a commingling of the gas from all of those coalbeds.

There have been very few measurements of gas from individual coalbeds that I'm aware of. Now, Burlington or some of the large companies may have that data, but I'm not aware of it. So I can't specifically answer the question.

I would -- Because I think very strongly -- and I think most geologists who've studied these coals feel the same way -- we have come to the conclusion, I think, pretty unanimously now that each individual coalbed that we're looking at is a miniature reservoir in itself, not connected in most cases to the other coalbeds. And so every single one of these would have -- could certainly have a slightly different gas composition.

I do know from a little bit of personal experience, talking to colleagues, that there are drastically different production rates of water in individual coalbeds in a given well. In other words, this thick coal up here, because it is of limited extent, and even though it's thick, might produce less water than a thinner coal that had a greater extent, because it -- you know, it was extending over a greater area.

COMMISSIONER BAILEY: Thank you.

THE WITNESS: And this one I have shown, this is from a publication I did that the US Geological Survey performed a study of the gas seeps up on the northern rim of the Basin, if you look at the map over on the board here. There are some significant gas seeps that La Plata County, Colorado, the BLM, Amoco at the time, were very interested in trying to determine the source of those gas seeps, so we did a study.

And this cross-section is very closely spaced. These wells are averaging about a mile apart. And it's just south of Durango, wherever that would be up here -- probably about there, so this is a relatively short cross-section.

And I show this -- It's not in the fairway, I don't pretend this is in the fairway. And it may be an area where there are more coalbeds than is normal, but I don't think the overall geometry is abnormal in terms of the distribution of Fruitland Coals.

If you count all these coals, individual coalbeds, up, which I have done, there are over 50 separate coalbeds shown in this about six- or seven-mile-long area. And you can see the bewildering kind of discontinuity.

There's a very thick coalbed at the base of the Fruitland here, but it's got a couple of breaks in it, in this well, and several breaks in it here. And then a series of coalbeds here that are very short in lateral extent, that don't go very far. And then up on top of this large stratigraphic rise of the Pictured Cliffs there's a very nice, large coalbed, but it doesn't have a great deal -- this is 1.52 miles across here, and it doesn't have a lot of lateral extent. And then up above, all these thinner rider seams are present.

And this really reflects the -- what nature does. Coal swamps formed out in these environments very randomly and with really not much pattern.

And in the course of my work in constructing this map, I, through modern technology -- at the USGS in Denver we had a program where I could access any series of my 750 control wells and run cross-sections through them. I would just put the cursor of my mouse on six wells, and up would pop a cross-section, and I would see all the coalbeds portrayed. And I tried to orient my cross-sections along the thickest coal trend, every which way I could, and in most cases in the Basin coalbeds in the Fruitland are not continuous at all. Individual coalbeds just cannot be correlated for long distances.

Okay, the conclusion, then, is that Fruitland Coal beds are dis-con-tin-u-ous. Having said that, there are some small areas where there is some continuity of specific coalbeds, and near the San Juan Coal Mine is one of those areas. But in general, and on average, most coalbeds cannot be correlated very, very far at all.

Okay, I've been asked to say a few words about the USGS's National Oil and Gas Assessment. I participated in this study for the San Juan Basin to the extent that my published Chapter Q of Bulletin 1625-B was used as the basis for the Fruitland Coal bed gas fairway and non-fairway coalbed methane determinations.

You will never see me as a co-author of this assessment because the USGS in its wisdom said because -- even though I'm still a scientist emeritus with the USGS, because I'm consulting now as well, they didn't want my name on this report. But my data basically is what's used to derive these numbers here, and it's published material.

I don't think I need to go through all of these numbers. You can see the USGS came up with volumes of coal for all of the conventional -- so-called conventional producing sandstone and other units in the Basin. And the one that stands out in terms of volume is the 19.5 trillion cubic feet of gas for the Fruitland fairway. But then the 4 trillion for the fairway itself, which we heard earlier, has been totally drilled up on 320s except for maybe one location, I think the previous witness said, and the USGS thinks that there are still 4 trillion cubic feet of gas in the coalbeds within the fairway.

The total for the Basin is staggering, 50 trillion cubic feet of gas. The San Juan Basin, for your information, if you didn't know it, is the second largest gas basin in North America. It's second only to the Hugoton of Texas, Oklahoma and Kansas, and it could conceivably surpass Hugoton someday, if things continue.

My personal feeling, by the way, on these resource numbers is that they're too low for the Fruitland. But the USGS methodology is quite, to me, arcane and still sort of -- not totally comprehensible. They took my basic geologic data, but then they have a staff of statisticians who create very small cells throughout an area that's being studied and apply a statistical analysis. And don't ask me what undiscovered means, because I really don't know.

(Laughter)

COMMISSIONER LEE: The Ss, that's source beds?

THE WITNESS: I'm sorry, the what?

COMMISSIONER LEE: The S, that means the source beds?

COMMISSIONER BAILEY: Sandstone.

COMMISSIONER LEE: Sandstone.

THE WITNESS: Sandstone. Okay, yeah, the Lewis shale includes sandstone beds. The Lewis shale is a marine shale unit that has a few scattered sandstone beds in it that produce natural gas.

COMMISSIONER LEE: How many production from these shale in this region?

THE WITNESS: That I couldn't tell you, but Burlington, I think, could -- you know, someone from Burlington could give you a pretty good --

COMMISSIONER LEE: They never tell you.

(Laughter)

THE WITNESS: I think it's public information, it's just not something I've accessed.

And my final slide is this one, comparing the gas resources in the Basin. Essentially, the sandstone reservoirs have produced 26.8 TCF -- I'm sorry, have 26.8 TCF of undiscovered methane, and the Fruitland has 23.6 trillion cubic feet of gas in the undiscovered category. And again, the total is 50.4 TCF.

As a geologist working with industry a little bit now, I feel both of these numbers are somewhat suspect, but again, it's a statistical analysis. It's not done in the way that the oil and gas business would assess an area, for example, if they want to determine fair market value for a sale or something like that. It's a totally different process.

And I think that's the last one.

Q. (By Mr. Carr) Mr. Fassett, were the materials that you have just presented prepared by you or compiled under your direction?

A. Yes, they were all compiled by me.

Q. And you can testify as to their accuracy?

A. Yes, I can.

MR. CARR: May it please the Commission, at this time I would like to move the admission into evidence of the materials just presented. They're in the exhibit book behind Tabs 2 and 3.

CHAIRMAN WROTENBERY: Hearing no objection, we'll admit the materials behind Tabs 2 and 3 into evidence.

MR. CARR: And that concludes our direct presentation of Mr. Fassett.

CHAIRMAN WROTENBERY: Thank you. Does anybody else have any questions of Mr. Fassett? Commissioner --

COMMISSIONER BAILEY: Oh, yeah.

CHAIRMAN WROTENBERY: Yes.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. You said that there was no definitive theory on creation of the fairway, but I've followed your articles for years, and so you're bound to have a favorite theory, your own pet theory. Could you share that with us?

A. Yeah, I -- Yeah, it's no secret. I think everyone knows that the fairway -- What's interesting is that the fairway is an overpressured area within a Basin that is largely underpressured. And what that means is that when a well is drilled into a Fruitland Coal bed in the fairway, the pressures are higher than hydrostatic pressure would be normally in the Basin.

And then outside the fairway, when a well is drilled into one of those coalbeds, the coal is usually underpressured. It's slightly lower pressure than hydrostatic pressure would indicate.

So -- The reason for that is not clearcut. The southern boundary here is an extremely sharp boundary. And in fact, some coalbeds cross that boundary, individual coalbeds. And basically the fairway is there because the coalbeds, as I said before, are more highly fractured within the fairway. Therefore, the gas can get out of the coal and get to a wellbore quite readily and quickly.

Why it's still overpressured is a good question. The only way you can have such a thing exist is if there's some sort of seal that has allowed the pressure to build up and not equalize. And there are theories about that, one of which I kind of like, is that at about the place where you see the boundary of the fairway, the southwest boundary, there's a change in the nature of the thermal maturity of the coal, and the coal north of that line, more or less, is in an area where hydrocarbon fluids -- oil, in other words -- are no longer produced but only gas is produced. But south of that line there are some oily fluids.

And one theory is that these oily materials may have actually formed a physical barrier to the gas, and that occurred as the Basin structure was being created, as I said, between 55 and 30 million years ago. And so I kind of like that idea, and for want of a better answer to the question, I think that's a pretty good one.

The northern rim, I think there may be a little easier explanation, especially on this cross-section. And I haven't run, you know, a dozen cross-sections across here to say unequivocally that's the case, but you can see there's a fairly large, significant stratigraphic rise. And most of these thick coals are budding out into the Pictured Cliffs, and you can see that corresponds with the northern edge of the fairway.

So we've got a pretty nice, at least logical answer for what forms the northern end of the fairway. These coals are just abruptly gone there. But as you can see, the southern boundary is not so susceptible to such a nice, neat answer.

So that's my best guess.

COMMISSIONER BAILEY: Thank you.

THE WITNESS: Uh-huh.

COMMISSIONER BAILEY: That's all I have.

CHAIRMAN WROTENBERY: Okay. Well, thank you very much, Mr. Fassett, for your testimony.

THE WITNESS: Thank you.

COMMISSIONER BAILEY: And don't forget my CD.

THE WITNESS: Okay.

CHAIRMAN WROTENBERY: Well, that was good timing, right at the lunch hour.

MR. CARR: As far as we're concerned, we're right on schedule.

CHAIRMAN WROTENBERY: Okay, great. Okay, let's take a lunch break. How long would you need to get out and get something and get back?

MR. KELLAHIN: At least an hour, an hour and 15 minutes.

MR. CARR: Hour and 15 minutes.

CHAIRMAN WROTENBERY: Okay, start back up at 1:15 then.

MR. CARR: Thank you.

CHAIRMAN WROTENBERY: And then I might just note, we're going to break, wherever we are, at three o'clock and have a little bit of a snack and celebration. Actually, we're going to be commiserating, because Steve Ross is going to be leaving us. Tomorrow is his last day at the Division, and so we want to just take some time and acknowledge the contribution he's made the last several years. And all of you are invited to join us.

MR. BROOKS: We'll all miss him, but most especially I will.

CHAIRMAN WROTENBERY: That's right. So please plan on being here at 3:00 for that.

MR. CARR: And we hope this hearing didn't contribute.

CHAIRMAN WROTENBERY: Okay, we'll be back at 1:15 then.

(Thereupon, a recess was taken at 11:56 a.m.)

(The following proceedings had at 1:15 p.m.)

CHAIRMAN WROTENBERY: We're ready when you are, Mr. Kellahin.

MR. KELLAHIN: Members of the Commission, the next witness is Steve Thibodeaux. Mr. Thibodeaux is a geologist with Burlington, he resides in Farmington, and he has special expertise in the Fruitland Coal.

STEVEN M. THIBODEAUX,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A. My name is Steve Thibodeaux, and I'm a senior staff geologist with Burlington Resources, specializing in

Fruitland Coalbed methane.

Q. On prior occasions have you testified before the Division and the Commission concerning your work in the Fruitland Coal?

A. Yes, I have.

Q. Were you the expert witness for Burlington in the hearing last summer before Examiner Stogner when Burlington presented the geologic interpretation for increasing well density in the low-productivity area?

A. Yes, I was.

Q. For purposes of this hearing, have you expanded your effort of presentation to include work that you had and have revised for the over- -- the high-productivity area?

A. Yes, I did.

Q. When we look at your exhibit book, are all the exhibits that we're about to see your work product?

A. Yes, they are.

MR. KELLAHIN: We tender Mr. Thibodeaux as an expert witness.

CHAIRMAN WROTENBERY: Hearing no objection, we find that he is so qualified.

Q. (By Mr. Kellahin) Let's explain to the Commission, Mr. Thibodeaux, how the exhibit book is organized to display your presentation, and then we'll set the book aside and we'll look at your PowerPoint summaries.

A. Sure. All of my exhibits are in Tab Number 4, primarily pertaining to the HPA portion of the reservoir, although they do include geology that encompasses the LPA.

And then at the very end of the book, under Tab 16, are all the additional exhibits that we originally used when we testified in the LPA portion of the reservoir last July.

Q. At the conclusion of your testimony, are you going to be able to reach the ultimate conclusion that there needs to be additional infill wells in the low-productivity area?

A. Yes.

Q. Are you going to be able to make that same conclusion with regards to the high-productivity area?

A. Yes, I will.

Q. As an expert geologist in this area, is there a geologic basis for the boundary line between the two areas, the 2-million-a-day line?

A. No, there isn't, the coals were all formed in the same environment, and they are -- the same coals exist on both sides of the line.

Q. You were present this morning when Mr. Fassett made his presentation?

A. Yes, I was.

Q. Is there anything that Mr. Fassett said with which you have a disagreement?

A. No, I do not.

Q. Begin for us.

A. I'd like to start with identifying what we'll be talking about. My exhibits will show that Burlington has made an attempt to characterize the Fruitland reservoir by identifying and mapping what we call nine genetic coal packages.

Very similar to Mr. Fassett's work, our genetic coal packages are basically intervals in time during which all the coal and the clastics associated were deposited. So using good geology, as Mr. Fassett indicated, we do use time markers in the coal to identify our packages.

We use these packages as a basis for constructing a geological model so that we can better understand the large degree of production heterogeneity we see in this Basin.

When we correlate cross-sections using these coal packages that we've identified, we can see that individual coal-seam discontinuities, as well as overall large package discontinuities are prevalent in all zones that we encounter and also that these zones change -- frequently change vertical and lateral communication partners.

When we map these coal packages, we're able to come up with a depositional-environment interpretation of which we've compared it to a modern coal-forming depositional environment as an analog to kind of QC ourselves to see that we're making the right kind of interpretations for depositional environment. By doing so, we're able to identify some of the depositional-environment effects that are detrimental to coal gas formation, cleating, fracturing and other things -- and other manners in which depositional environment affects coal quality.

And finally, the coal heterogeneity that we see, both from depositional environments and in discontinuities, I believe, create permeability and flow barriers and pathways to communication between wells as they exist today.

Q. Let's talk about your database, Mr. Thibodeaux. If I remember correctly, Mr. Fassett this morning talked about his data set consisting of logs of a quality that were acceptable to him, and that population was 750 wells?

A. Yes, sir.

Q. And what have you used?

A. We -- My current geological model encompasses approximately 100 townships, and we have about 7500 good-quality density logs across these hundred townships.

Q. Let's contrast the density of the well population that Mr. Fassett was using with the density that you have used.

A. We use about four wells per section, when we can find them. If we have four good density logs in each section, that's what we use, one for each quarter section.

Q. How does your testimony fall in sequence to what Mr. Fassett said?

A. My testimony is just a reasonable view of the Fruitland Coal based on a little bit more detail and the internal interpretation that Burlington has for identification and naming of these nine packages.

Q. When we look at your presentation, have you incorporated new data into you work since the last hearing before Examiner Stogner?

A. We've steadily expanded our area of coverage, and so yes, we have included some new townships of data in our study since we testified last July.

Q. Let's look at the next slide.

A. This is a schematic showing the relative relationship of the nine packages that Burlington was able to identify. These packages were all built in a general transgressive event of the Pictured Cliffs sandstone, as was alluded to by both Dr. Lee and Mr. Fassett earlier.

As the sea slowly retreated to the northeast, we had all the coals following -- in the near coastal environment, following that retreat of the Cretaceous Sea.

Similar to Mr. Fassett's work, you can see that we have identified these basal coals, which we have listed here as Brown 1, 2 and 3, pinching out or terminating against that shoreline, as the Pictured Cliffs sandstones build up.

At the end of this first period, the dashed red line represents a volcanic ashfall that we have identified as the T1 tonstein. Just above that is the last of the coals in this sequence, the Green 3 coal, deposited just above the T1 tonstein.

And then if you recall Mr. Fassett's earlier cross-sections where he pointed out an encroaching tongue or a minor transgression of the Pictured Cliffs Sea, we have identified that here in the orange color, and we had a relatively major sea regression, along with a bunch of minor events associated with that. During this time frame, the following coals were deposited: the P2, G1, G2.

And in the middle of those was yet another of those volcanic ashfalls or tonsteins. These are important to us because we use them as instantaneous time markers in order to correlate some of the larger packages of coals.

After P2 time, the sea began its final transgressive event to the northeast, and all the subsequent coals were deposited, some of which migrated completely out of the Basin, or the shoreline was no longer confined within the San Juan Basin during this time.

My next exhibit is a Fruitland Coal daily rate map.

Q. Let's go back one for a minute, Mr. Thibodeaux.

A. Yes.

Q. Let me ask you to respond to Dr. Lee's question to Mr. Fassett this morning about the relationship between the Fruitland Coal and the PC sand reservoirs and his understanding that it is common practice to impose a massive frac on the PC sandstone and thereby potentially produce the coal gas that's in the Coal. What's the practice, and --

A. It is undisputed that that does occur. We know that there are fracs in the Pictured Cliffs that do grow into the Fruitland Coal. However, within the HPA or the fairway, the Pictured Cliffs is relatively undeveloped, tight and nonproductive, and so there are very few Pictured Cliffs completions or wells within the high-productivity area.

Even wells that fracs do grow up from the Pictured Cliffs into the Coal, I believe that yes, they do -- the coal does contribute some gas to the Pictured Cliffs production via those fracs and perfs. However, just because you've frac'd into the basal member of the coal does not mean, necessarily, that you'll be draining the coals above that because of the stratigraphic separation and discontinuity of those coals.

So although that does occur, it is not a common practice and it's certainly not intended. It's just a fact of life when you're frac'ing one formation that directly underlies another one. But I do not believe that Pictured Cliffs fracs are draining the Fruitland Coal adequately, because we can't even drain the Fruitland Coal adequately with the vertical wells that we are targeting the Fruitland formation in.

Q. Let's go to the next slide.

A. This is a Fruitland Coal daily rate map. It is the average daily production rate of the Fruitland Coal from July of 2001. What we see are the red line, the vertical -- the horizontal red line is the Colorado-New Mexico border. The black outline outlines the HPA as was defined by the last order. These --

Q. Give us a moment to follow the color code. Let's start with the lightest color, and tell us what that rate is and how we move to the darker colors.

A. You bet. The blue colors on the map are a gradation from zero to .5 MCF per day. They're in .1-MMCF per-day rates, increments. The green goes from .5 up to a million up a day, also in the .1-MMCF per-day increments. The red represents ranges of rate from 1 to 3 million a day, the orange from 3 to 5 million a day, and yellow in excess of 5 million a day, all contoured on 1-million-a-day increments.

The next slide is just a closeup of the HPA area, and the reason for doing this is just to illustrate, as was said earlier, that within the HPA we have green areas. Those are wells that were making at that point in time less than a million a day. Also outside of the HPA we have wells in areas in orange which represent wells that are making at that point in time 3 to 5 million a day.

So the whole point of this slide is to show that although we have defined an HPA line, it is not necessarily a boundary of any sort where wells inside are all making greater than 2 million a day and wells outside are making less than.

The next display is a cumulative production map. This is very similar to the map that we have for common reference on the whiteboard. In this map I've listed Farmington down here in the west for our reference. The brown outline at the top of this map represents the Fruitland Coal outcrop. Again, we have the HPA line in black in the middle, to demarcate the HPA line.

And in this map, blue through green colors represent wells that have cumulative production from zero to 1 BCF. All of those are contoured on .1-BCF increments.

And then from red all the way up to purple we have wells that cum'd in excess of 1 BCF to over 15 BCF. The legend that you see on the right will give you the actual color codes for those. Those were all colored in 1-BCF increments.

The outline in blue on this map is the hundred-township mapped area that I referred to earlier, where Burlington has about -- approximately 7500 digital density logs with which we used to make our geological models.

Again, the next exhibit, similar to the one prior, is just a close-up of the high-productivity area, the same cumulative-production map. And there's a couple reasons for showing this.

One, if you notice the blue outlines on your map and on the screen, these are all fairly linear events that are oriented southwest to northeast. These events, in conjunction with this big gap in production, outlined in the two big, long, straight blue lines, are a direct indication or reflection of the underlying geological formation. In other words, the way that this Fruitland Coal formation is stratigraphically oriented and deposited has a direct effect on the production above.

And finally, the red line that extends from the southwest part of the map up to the northeast, from the low-production area all the way up to the high-productivity area, is an approximate location of a cross-section which I'll be talking about in my next exhibit.

Q. Before we transition into all these series of -- to the cross-section itself, is there going to be an index map so we can follow where you've selected to pull these logs for your cross-section?

A. There's an actual index map of this cross-section and the location of those logs behind Tab 16. That was in the very first hearing.

Q. So when we get to your cross-section, we can track it through the exhibit book and find where each one of them is located?

A. Yes.

Q. Let's look at the cross-section.

A. This represents, in essence, a Fruitland Coal dip section. One thing I'll point out before we begin to explain the details is that the approximate location of the underpressured/overpressured line is indicated by the dashed orange line three wells over from the left.

If I can direct your attention to the screen where I have some animated effects that may make my explanation a little bit easier to follow, the reason that -- Well, we'll start with the legend. We have color-coded on the top line blue for what we call the blue coals. Below that, of course, are the purple, the P1 and the P2.

We have the T2 tonstein we mentioned earlier, running through the cross-section, as well as all the coals that are identified in this particular cross-section. They're color-coded by line, with the name of the coal that the line corresponds to on the right-hand part.

The reason for putting up this cross-section is twofold, actually, one to show that the same coals live both in the LPA and HPA portions of the reservoir, at least the coal packages that Burlington has identified internally.

And second, I'd like to point out in particular the three red arrows to show how one package of coals can form multiple vertical communication partners.

If we look at the first well to the left and the red arrow corresponding, we see that the Brown 1, the Brown 2 and the Brown 3 coals are separated by about 30 feet or 40 feet of clastic material.

As we move three wells over to the center well in this cross-section, we see that now all three of these coals have coalesced into one coal package, and most likely will be in vertical communication.

As we move yet one more well over to the right, the fourth well in this section, we now see that these three coals are now three separate and distinct entities and likely not to be in vertical communication with each other. This is typical and prevalent of any coal package that you map across the Basin.

If we look at now -- at one coal in particular -- in this case we'll look at the Green 2 coal -- we can identify the beginning and end of this one sequence of coal in this one cross-section.

On the left we see a fining-upward sequence, indicating that we've got terrestrial sediments in a fining-upward sequence. The second well to the right, we see the first formation of this coal, and we can track this same coal through the middle three cross-sections -- wells in the cross-section, until it terminates in the well to the right, in a coarsening-upward sequence. This coarsening-upward sequence is indeed that transgressive Pictured Cliffs event that Mr. Fassett alluded to earlier.

And finally, if we look at one more coal, we can see that this is the G1 coal, indicated by the two green bars just to the right of the second well in the cross-section. In this case, that one coal package is formed of two discrete seams. In the middle section, this coal is now still two discrete seams, however they've coalesced into one coal package. And as we move to the right, one of those seams has now disappeared.

And the point of this is that these coal packages may be made up of many individual coal seams, however we've identified that as a single coal package for the purpose of mapping and understanding our depositional environment. So within that package we can see a termination of the entire coal package, both in the extreme left and the extreme right wells in this cross-section, as well as the termination of individual seam within that package.

Q. We're going to transition now into a series of displays that we'll build into some isopachs, are we not?

A. Yes, we will.

Q. Let's talk about the depositional environment first, and then take us through that part of the presentation.

A. You bet. This is one of my favorite pictures of the Fruitland Coal. What we identified is, we look at the T1 tonstein. If you remember, that was a volcanic ashfall, an instantaneous moment in time, and in this area outlined by the map on the right of the type log on the left, what we mapped was everything that that ashfall was sitting on. If it was sitting on a coal we colored it brown. If it was sitting on a clastic, a shale or a sandstone, we colored it yellow. And if it was absent, we assumed that that ash was transported away by water and therefore we colored it blue. And then also we made an interpretation as to where the terrestrial sediments transformed into marine sediments so that we could establish a close shoreline.

And if you think about this, this is actually very similar to flying over this portion of the coastline prior to the volcano blowing up and taking an aerial photograph. This is what we would have seen in the swamp formation along that coastline just prior to ashfall.

Now, in order to validate our model, which is what we're interpreting from the subsurface data, we took this very same subcrop map -- and now you see it oriented slightly differently, and the reason I did that was so that it similarly matched the orientation of a picture I have of the Mahakam Delta in Indonesia, which will be your next hard copy in your books.

If we color in the blue on the Mahakam Delta -- and again, I have some animation on the screen that may be easier to follow than the hard copy in the book -- we can see a very -- similarity, a very marked similarity between an existing peat-forming environment and what we've interpreted in our T1 subcrop map to the left.

The striking difference, of course, is that in our T1 subcrop we have a fairly linear shoreline, which I've interpreted to be a wave-dominated shoreline, and the Mahakam Delta is much more lobate, therefore it's probably a tidally controlled shoreline. But other than that, the similarities are fairly remarkable.

Again, in the Mahakam Delta -- we'll look at it in a little bit more detail -- you notice that the areas at the mouth of the river, they've identified as hardwood forests. This is a different ecological niche for plants and would form a different maceral content and a different type of coal than the peats that are forming near the coast, which are from mangrove swamps, a different ecological niche, the peats that are forming right along the beach where we have detrital beach -- detrital plant sediments washing up on shore and forming peat. And the remaining peat in this area is all this light-colored area in the middle that are from Nypa palms.

And this one simplistic view what we see is, during this moment in time, if this delta were to be buried tomorrow, we would find four distinct different peat types within one single little layer of coal.

So therefore we have a great degree of confidence if we begin to look at our isopach maps of the various coals that Burlington has identified and mapped across the Basin.

I'll speak a moment about this first isopach map, because the remaining eight maps have all been subsequently animated so that they flip through them relatively quickly.

On the left of each one of these nine isopach maps we'll have a red box which indicates the coal that has been mapped.

Along the right you'll see a legend of symbols. The red squares will represent areas where Burlington Resources has its HPA data. You can see that in the little red squares on the map.

The little yellow squares are the five pilot UPE or LPA wells that Burlington undertook to drill and test in order to come up with our testimony for infilling the LPA portion of the reservoir.

Q. Let me pause you right now, Mr. Thibodeaux. If you go to the big display board on the foam --

A. Yes.

Q. -- it may be easier for you to show us the five pilot project areas that Burlington obtained Division approval for infill pilot studies. Can you, with your pointer, help us see it in a different color code?

A. Certainly. These stick out a little bit more on this map. We have identified our five pilot areas with the big red dot, and they're there, there, there, there and there. They correspond exactly to the same locations of the little yellow squares on the display.

We have our HPA data areas located in the green, and those are scattered out from there to the northwest, all the way to the southeast in the fairway, in various areas. And those are actually fairly difficult to see.

We have the HPA line outlined in black on the display board and outlined in a burnt orange color in all of the isopach displays.

Where BP has a significant amount of infill data from Colorado on the wall display, we have that area outlined in red, and on the isopach displays it's outlined in yellow. It's the same area.

And then where Devon has additional data within the HPA and the NEBU unit on the wall display, that's outlined in green and it's outlined in red on the isopach maps.

Q. Mr. Thibodeaux, were you the Burlington geologist that participated on the industry Committee work effort on the coal?

A. Yes, I was, one of them.

Q. Did you share with the other industry geologists your methodology to analyze well density and the character of the coal throughout the pool?

A. Yes, I did, both with the Committee and several times at different presentations to the public.

Q. Did you receive any objections from any of your peers about you methodology?

A. No, I did not.

Q. Ultimately, when you got to the end of the process, was there any geologist that disagreed with your conclusions about the geology?

A. No, there weren't.

Q. Take us through the animation of the isopachs.

A. Sure. Each of the following isopachs -- and I'll point out a few things early on. In general, they're all contoured on 5-foot thickness intervals. As we go from light to dark colors, we go from thinner to thicker. The white areas are areas of no coal. The first color will be basically zero to 5 feet, on up to the thickest coals that we have in this case, would be about 15 feet in the middle of the map.

Also we've made an interpretation for the approximate location of the shoreline while these coals were being formed. Each subsequent isopach map will show the previous coastline from the coal formed just below it, so that we can see the overall transgressive event and growth of these delta systems where these coals were formed.

In addition, each one of these maps will show my interpretation of the fluvial systems that fed these marshes. If you'll notice, this is very similar to our T1 subcrop map, very similar to the Mahakam Delta modern-day analog, and exactly like what Dr. Fassett showed earlier on his interpretation for the depositional environment for the Fruitland Coals.

And so now we'll undertake the animation, and the next eight we'll flip through about on five-second intervals.

Q. Let's do that, and then come back and do it again.

A. We can see the delta slowly prograding past the shorelines of the coals before, and the fluvial systems which are just prevalent in every coal layer that we looked at. This was a regression event. Now we see the delta prograding to the northeast, again prograding to the northeast, again prograding to the northeast and dry land.

And finally, for this last coal interval that I have mapped, although there are other coals present in the Fruitland formation that are younger and higher up the section, we see the previous shoreline where we have significant progradation of the delta, the prior -- this shoreline is probably located outside of the Basin. I have not mapped all the way to the edge of the Basin here, but I cannot find the shoreline. And we see significant rivers, as we do in all of them, and then a significant amount of dry land.

So in effect, if you recall Dr. Fassett's slide between the Cretaceous Sea to the right and the dry land to the left and the interval in between where the coals were forming in a proximal coastal location and all the rivers that were feeding this system, this is exactly the same picture that we looked at earlier.

Q. Take us back and run it again so we can see where it goes.

A. I'll try to do that. With the animation that may be tough. Let's see. Here we go. This was that regressive event where you see coastline was actually out beyond the delta of the sea and came back inland.

And one thing I'll point out before we move on from our isopach maps is that if you were watching you can see that the exact same coal packages that we've mapped, now, these are internal designations and each one consists of multiple, multiple individual little seams of our interval of time, very similar to the work that Dr. Fassett did, although he did not lump them into seams. We could maybe have lumped these into multiple, multiple packages, but it's very difficult to correlate these individual seams over any distance.

We can see that in all of these maps, especially the later coals, that the same coal species or same coal packages live in both the lower productive area as well as the high-production area.

One last thing I'd like to point out is that these river systems that are feeding these -- and I just have a few of them marked on every one; had I marked every river system I could see in these coals, I would see nothing but blue as they migrated over time -- you can see these river systems had an effect on the coal quality of the peat around as they flooded their river banks and dumped clastic material out there on the coals, it increased the ash content or the non-coal material within these peats.

And then that has a detrimental effect on cleat formation. The lower-density coals, the brighter, cleaner coals, have a propensity to cleat much more than the dirtier coals, if you will. And so you can see how these multiple river systems that fed each of these coals, they create visual, lateral barriers to communication as they bisect -- physically bisect the coal. And they also have a tendency to degrade coal quality along the river banks or the floodplains for each of the rivers.

Q. Mr. Thibodeaux, can you lead us through a short explanation of the efforts Burlington put on the five pilot project areas that were studied and analyzed and how that data was then used to make judgments about additional wells in the lower productivity area?

A. Yes, I can. We picked the five pilot projects that we picked for the LPA -- They weren't picked at random. We looked to ensure that we had a good representation of all the major packages that Burlington had identified and mapped. Of course in every location you can't have every coal that you looked at, but we tried to pick ones that were representative at least of the geology that we were able to identify and map across the Basin.

In addition, we challenged ourselves to pick areas that exhibited with the same coal species both low-, high- and medium-production characteristics. In other words, we took wells that had most of the packages present, and some of those wells only make 100 a day or less, and we grouped those and said these are low-production areas.

There are also areas in the LPA that have medium production, basically about 100 to 250 MCF a day.

And then there's a whole trend of wells that have, as you can see on the cum map in the lower left, this area right here, we have relatively good production from these LPA wells. And so we also picked a location in the high-production area where wells generally make more than 250 MCF a day with the same nine coals represented.

So our goal was to test the same coals, but in different production areas, so that we could determine whether we're having differential depletion or only partial depletion of the many layers that were present.

And what we found in every single case was that whether we were in a high-production area or a low-production area or how our coals were associated with each other vertically or laterally, that there was differential depletion occurring, and sometimes no depletion at all by the parent offset wells.

Does that answer your question, Mr. Kellahin?

Q. Yes, sir. Did you make that presentation to the industry members that participated on the industry Committee?

A. Yes, I did.

Q. Did you make that presentation to Examiner Stogner last summer?

A. Yes, I did.

Q. Did everyone agree on the necessity for increasing the well density in the low-productivity area?

A. We had a unanimous agreement that well density had to be increased in the lower production area in order to get reserves out of the ground, yes.

Q. Is there a portion of the exhibit book that you can identify for us to look at in support of your statements about the low-productivity area? Are they behind one of these tabs?

A. Behind Tab 16 are all the exhibits that I have put together, as well as all the engineering exhibits, for the LPA hearing in July.

Q. Let's go into the next portion of your presentation and talk about this peat depositional schematic. What are you doing?

A. In this slide --

Q. Don't show us yet, just tell us what you're doing.

A. I'm going to show schematically how coal is formed. It's not exactly like you would intuit from looking at clastic reservoirs. A coal is an entirely different reservoir than anything else we've ever looked at, and I thought it might be beneficial when we're talking about -- you hear heterogeneity, vertical, lateral, coal-quality terms from everybody -- just to show schematically exactly what we mean by that and how this occurs.

So in this instance the screen is animated and the book is a hard copy, so I definitely would like to direct your attention to the screen for this.

Q. Please continue.

A. This is a very simplistic view of coal formation along a prograding delta front. Of course, in this case we'll have a prograding shoreline that goes from the left to the right in this screen, and it's depositing a clastic substrate. In this case it would be the Pictured Cliffs sandstone.

And as that progrades farther and farther and farther to the right, the little color blocks on here will just represent different plant types. These near-shore plants would be following directly, real close to the shore of the beach. These inland grasses would be a little bit farther inland, then finally shrubs and small trees and then maybe woody trees farther inland, away from the saltwater influences, very similar to what we looked at in the Mahakam Delta.

And so in this simplistic view, each one of these little blocks, they could be miles, half miles, quarter miles. Each little thickness could be on the order of a foot or a half a foot of peat, depending on how rapidly that shoreline was prograding to the right in this picture.

So we'll prograde it two more successions, and then commonly what we've seen is that we'll have a river system move into this. And it may bisect the coal, or the coal may terminate up against it, or it may just prevent any peat formation in this one area where we have actively water flowing. Of course, eventually it would fill in with the sandstone, and that would be incorporated into this entire peat-forming sequence.

And then in this case we'll have a minor event where the sea has reversed direction and it is now moving inland, and now we can see the beach coming back in, so now we have a little place, just like Dr. Fassett was talking about, where any peat -- like say this was one little coal stringer -- is going to show to be terminated right against the sandstone, very similar to the diagrams that Dr. -- Mr.

Fassett showed earlier.

And finally, we'll prograde this delta right on off the picture, and we'll have a little minor event where -- we had a little minor flooding event, we had a big sea-level rise and that flooded over all the peats and killed all the plants and finally silted up full of mud.

And so we take this entire sequence of events, and we'll compress it. And published studies show that peat generally compresses about 10 to 1, so 10 feet of peat will generally make about 1 foot of coal. And that's based in large part on Dr. Cohen's research at the University of South Carolina down in Georgia, the Okeefenokee swamp. And I believe Mr. Riese will be referring to that swamp environment of the Okeefenokee in his presentation.

So we add on top of this one little compressed layer, we'll add some additional cycles of deposition and compaction. Each one will be completely unique from the one above and below it, depending on plant species, how fast the river systems moved in, how fast the delta prograded, eustatic sea level rises and falls. And we'll just add a series of those in, and sometimes they're overall transgressive, sometimes they're overall regressive.

And what we have in the end here is about plus or minus 80 feet of peat deposition in tens of thousands of years. If you remember, Dr. Fassett had indicated that the coal formed over a period of about 2.5 to 3 million years. It may take 100,000 just to form ten feet of peat. So this could be tens or hundreds of thousands of years to form this one sequence.

And this sequence equals, when we compress it and bury it, one 8-foot coalbed. And this one 8-foot coalbed could easily be a subset member of one of our mapped coal packages.

So the point of this is to illustrate the great degree of heterogeneity that exists even in a single coalbed, let alone a whole coal package. And these can be -- This might not be representative of an 8-foot, you could easily -- this could be a 1-foot package, and those could be centimeter-size or millimeter-size differences in plant types and things that affect coal. And my belief is that this heterogeneity creates significant baffles and barriers to lateral communication and production within the coal.

Q. Are you familiar with the other reservoirs in the San Juan Basin?

A. Yes, I am.

Q. How does the coal gas pool compare in complexity to the other pools?

A. I'm partial to the coal, but I believe it's the most complex reservoir we have in the San Juan Basin.

Q. From a geologic perspective -- I know the engineers are going to talk about this layered pressure data that's recently been developed --

A. Yes.

Q. -- why do we care about it?

A. We care about it because in the past we had -- especially in the fairway, all of our wells are open-hole completed, so we get one pressure. And that pressure is reflected at the lowest pressure, most depleted reservoir of all these different layers that we have in the open-hole environment.

When we made that assumption earlier, Burlington was seeing relatively uniform pressure drawdown across the fairway. Basically, all the wells in the area would have bout the same bottomhole pressure. But we realized that there was additional gas out there. All we are seeing was a single layer pressure.

And so we realized that in order to determine was there additional gas or incremental reserves, we had to determine were all coals depleting equally?

When we took layer pressure data in the HPA, very similar to the LPA, we found differential depletion was occurring by layer. We had to do this with wellbores, actually POW wells or cased and frac'd wells where we could isolate those coals, because there's no way to isolate them in an open-hole environment.

And so we found identical situations in the HPA that we found with our intensive pilot study in the LPA, was that differential depletion was occurring by layer in the HPA, and therefore we were overestimating the amount of communication these wells had and underestimating probably reserves and overestimating recovery factors.

Q. How do those engineering conclusions and data fit in with your geologic conclusions?

A. They fit in exactly as I would expect them to, and from the geological perspective, I see a laterally discontinuous and heterogeneous reservoir, and we see the same results from the engineering results.

Q. What's that tell you about the current well density in both areas of the pool?

A. I believe the current well density is inadequate and that we will leave or strand in place an enormous resource if we don't infill drill it.

Q. Take us to your conclusion.

A. My conclusions are that the major coal packages are correlatable throughout the Basin. This is not in contrast to Mr. Fassett's work. Mr. Fassett showed that the individual coal seams are very discontinuous and hard to correlate. However, if you lump them into timeconstraint packages you can correlate those packages and you can represent adequately, I believe, and accurately, a depositional environment for this entire sequence of events to occur.

I believe that this depositional environment had a direct impact on the heterogeneity of those coals, as we showed in the schematic, and that that has direct impact on the productive capabilities of each one of those seams, or even little pieces of those seams.

We've shown that these lateral and vertical discontinuities exist in every single coal package that we've mapped, as well as the individual seams that make up those packages, that the major coal packages often change vertical and lateral communication partners, and that these heterogeneities and discontinuities create baffles or barriers to flow.

And so therefore I believe that increased density drilling is necessary in order to get at the resources that we currently cannot tap with our 320-acre spacing.

MR. BRUCE: That concludes our presentation of Mr. Thibodeaux. We move the introduction of his displays that are shown in the exhibit book behind Exhibit Tab 4 and -- 15?

THE WITNESS: Four and 16.

MR. KELLAHIN: Four and 16.

CHAIRMAN WROTENBERY: Hearing no objection, we admit the materials behind Tab 4 and 16 into evidence.

Do any of the other parties have any questions for Mr. Thibodeaux?

Commissioner Bailey?

COMMISSIONER BAILEY: No, I don't think so.

CHAIRMAN WROTENBERY: Commissioner Lee?

COMMISSIONER LEE: (Shakes head)

CHAIRMAN WROTENBERY: Thank you very much for your testimony, Mr. Thibodeaux.

THE WITNESS: Thank you.

MR. CARR: May it please the Commission, we are now going to call Dr. Rusty Riese. Dr. Riese is going to now take us one step farther down the geological road. He's going to talk about the depositional environment for these coals, and he is also going to provide some photographs and additional evidence that shows the discontinuity in the reservoirs, discontinuities that you could not see if you were looking just at well logs.

<u>RUSTY RIESE</u>,

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. My name is Rusty Riese.

Q. Where do you reside?

A. I reside in Katy, Texas.

Q. By whom are you employed?

A. I am presently employed by BP America Production Company.

Q. And what is your position with BP?

A. My title within the company is consulting geologist.

Q. Could you summarize your educational background for the Commission, please?

A. I have a bachelor of science in geology from New Mexico Tech, and I have a master's and PhD in geology from the University of New Mexico. Those were acquired in 1973, 1977 and 1980, respectively.

Q. Would you review your employment history for the Commission?

A. My employment history spans just more than 30 years, and it started with a brief stint with the New Mexico Bureau of Mines in Socorro and most specifically included time with Gulf Mineral Resources, Anaconda, ARCO in its various incarnations, Vastar and now BP.

At the same time that I was employed in the industrial sector, I've pursued an academic career. I've taught and continue to teach at a number of universities.

I presently hold positions at Oregon State University, Cal State Bakersfield, University of New Mexico, and I am at Rice University in Houston where I teach the petroleum geology curriculum.

Q. Are you a certified professional geologist?

A. I am certified.

Q. Are you registered in any states?

A. I am registered in the State of South Carolina.

Q. Are you familiar with the Application filed in this case on behalf of the Fruitland Coalbed Methane Study Committee?

A. Yes, I'm quite familiar with it.

Q. And have you studied the Basin-Fruitland Coal Pool?

A. Yes, I have.

Q. Are you prepared to share the result of that work with the Oil Conservation Division?

A. Yes.

MR. CARR: We tender Dr. Riese as an expert in petroleum geology.

CHAIRMAN WROTENBERY: So qualified.

Q. (By Mr. Carr) Let's go first to the slide, the first slide in you presentation, the material called Summary of Points. I'd ask you to go to that and review the information on that slide for the Commission.

A. Without reading through it literally, the points that I would like you to come away from my discussion with are that the Fruitland Coals were deposited in related environments, as has just been attested to by Mr. Thibodeaux, throughout the San Juan Basin. There are no unique separations of environment within the coal sequences within the Basin.

The coals are laterally discontinuous on a scale approaching 80 acres in some places. The coals are vertically discontinuous at scales, as you have also just heard, at millimeters to centimeters, and the coals are interrupted by both structural and stratigraphic discontinuities, which are far below what we can map with existing wellbore data. And it's my intention to work through these points by showing you what they look like in outcrop and thereby providing some measure of scale context within which to view the materials that have been presented by the previous witnesses.

Q. Let's go to your vegetation map, the next slide. Identify this first and then review what it is you're trying to show with the exhibit.

A. This is a published map of vegetation types taken from the Okeefenokee swamp of Georgia and Florida. Just as Mr. Thibodeaux was commenting that we use analog environments to try and understand past environments, the environment that I've chosen to present here to you today is the Okeefenokee, because it has somewhat more detailed mapping available for the various vegetation communities and the micro-environments that are present there.

One could take all of these various colors -- and you can see from the slide or from the hard copy that's in your exhibit books that there are from 15 to 18 different vegetation types, and all of these could have fit within the uncolored area of the Mahakam Delta that Mr. Thibodeaux was describing.

I'd specifically point out to you that in some areas, particularly down here in the extreme southeastern portion of the swamp or in the southwestern portion of the swamp, if you go to the scale bar that's very difficult to see down here in the corner, you can begin to appreciate that those various colors which represent unique assemblages of vegetation are scaled to areas of between 60 and 100 acres.

And those areas are important because each of those vegetation types, as you have already heard, is going to give us a slightly different coal chemistry, and the -- or slightly different peat chemistry, in turn a different coal chemistry, and in turn, then, different reservoir-performance characteristics.

Q. Dr. Riese, when we move to the next exhibit we're going to a stratigraphic cross-section. In the exhibit material there is not a trace for that cross-section. Could you perhaps even go back to the preceding exhibit and give us an idea of the location of this cross-section?

A. Can I go to the previous exhibit?

Q. Yes.

A. No, the previous exhibit was the Okeefenokee swamp.

Q. Then can you take us to an exhibit that you can show the trace?

A. I can take you to the poster that's shown over here and can describe to you that that cross-section more or less parallels the sections that Mr. Thibodeaux and Mr. Fassett have shown. It starts down here in the southwestern portion of the Basin, crosses the fairway and goes all the way to outcrop over here. So it runs through this way.

And what I would like you to see in this cross-section -- and just look at the gross patterns for a moment -- see that in the lower portion of this cross-section we have yellow-highlighted Pictured Cliffs sands, immediately above that we have some red Fruitland Coals.

We have not -- I have not attempted to subdivide all of these in the manner that Mr. Thibodeaux testified to at Burlington, but what I do want you to see is that those chronosynchronous lines -- in this particular case, are lithostratigraphic lines as well -- become lost at the top of the Pictured Cliffs, so they become lost under another sand. This is that transgressive sand that Mr. Fassett spoke to, this is the transgressive sand that Mr. Thibodeaux spoke to.

And what you can see, then, is that the coals that are slightly older, to the south and west, do not continue to the north and east. We have a new package of coals to the north and east, and those in turn become supplanted as we move further and pick up new packages even higher in the section.

So what I'm offering you is that we have logs here that are approximately a mile to a mile and a quarter apart that very specifically offer a picture that matches what you've seen from Mr. Fassett's presentation, and it mimics what Mr. Thibodeaux has shown you.

Now, what you also need to keep in mind is that coal-to-coal within this interval, as you move from one red in a log to the red in the next log, there are going to be lateral variations in the character of that coal, because these wells are more than an 80-acre spacing or 160-acre spacing or 320-acre spacing apart from one another, and it's those that I would like to start exploring with you.

Q. Let's go to the photographs. Explain what they are, and then -- I think actually the photos on the screen are better and easier to work with than the ones in the book. And so if you'd start and let's just work through these.

A. Yes, the photos in the book are of less than stellar quality, to be sure. What I would refer you to here is, let's start with the discussion of what the stratigraphic discontinuities look like, and Mr. Thibodeaux testified that there are places where there are channels within the Fruitland system that may cut out coals or may just sit on top of them.

This particular picture was taken at the San Juan Mine in the highwall there approximately two years ago, and what you see in the center of the picture is a pale gray to white channel, as denoted by this lens of sand right here. And what you can see on its flank is that it has cut out a coal right here. This matches with the kind of thing that Mr. Thibodeaux was describing.

What you can also see underneath that channel is that there are a couple of other coals that may or may not be truncated by faulting. I'll come back to that point with some other slides as we move forward.

But here what you can see, first and foremost, is a stratigraphic discontinuity that we would never be able to see with well penetrations that are spaced a mile, or even a half a mile apart. This channel was only about a hundred yards wide. And a well drilled here would have drained this coal but would not have drained the equivalent coal on the other side of the channel.

The next exhibit speaks to the vertical discontinuity in the coals. Here you're looking, where the date stamp is in the lower right, at the floor of the open pit. Everything from there on up is the high wall of the mine, and you're looking at about 16 to 18 feet of vertical section.

What I want you to see in here are the subtle changes in texture as you move up through the section and you see that there are coals that don't exhibit much natural fracturing or large-scale cleating. There are coals which do exhibit much more cleating, there are others which appear to be crumbling apart further up in the section. And each of these is a reflection of the kinds of lateral variations that you would also see.

There's a principle in stratigraphy that was articulated in the 19th Century called Walther's principle, where they speak to the fact that vertical sequences in a sedimentary package tell you what the horizontal sequences should be at any given point in time.

So in Mr. Thibodeaux's and Mr. Fassett's presentations you could see that they were working with beaches, and next to that back barrier swamps, and next to that in turn more terrestrial-setting environments. In Walther's principle, you would expect to see those three environments standing one above the other.

So if we extend that principle here to this photograph, as I move vertically through it I can expect that, even though this is nicely cleated right here in the middle, laterally from it, it will look like this and it will look like that. And those are sufficient changes to cause dramatically different responses as we try to produce the gases.

Q. All right, let's go to the next photo, the syndepositional faulting in the Fruitland Coals.

A. This photograph was taken at the Navajo Mine, slightly further to the south and west along the outcrop, and it shows two things. The first it shows is another sandstone lens, which is this white area up here at the top. And in this case, the sandstone did not scour the peats out and did not cut them, but instead what you see is that a later peat, here in black, just laid down right up over the top of it. All right?

Now, this is not to say that this was a peat that was laid down on a sloping surface on the flank of this channel. What this reflects is the distortion in the bedding that occurs as the compaction takes place that Mr.

Thibodeaux was trying to describe for you in the sequence that he walked through. He was unable in that particular piece of software to stop the channels from compacting, and here you can see that indeed this clastic channel has not compacted and that the coals wrap themselves up and around it.

So it makes correlations very, very difficult. It would not be unheard of for a geologist to come in here and see this and tie it to something that's slightly lower in the section further over. Again, these are things that cannot be sorted with any of the data that we have presently available to us.

The second thing that shows up in this photograph is faulting discontinuity of the coals, and in this particular case the fault which follows a trace about like this, all right, is a growth fault. This is a lystric normal fault. This is a fault which broke the rock while it was being deposited. So the lowermost coal that is offset is approximately five feet thick, and you can see there are five to six feet of displacement across the fault. This upper one is about three feet thick, and there's some commensurately less displacement.

And then as you follow up where you think the fault should go, it doesn't go as a fault, and instead all you see is a little fold, right here. And if you continue further still there's no displacement.

What this does is, it allows us to date the faulting, and we know that that fault stopped movement shortly after this folded bed was deposited. We can't map things like that. Neither can we map the one that's right here in front of it where you can see a second break. All right?

If you move further along, those lystric normal faults that become parallel to bedding have to come up someplace, and they do it as little splays. And so here you have what was a fault, over here on the wall, sliding along the bedding and then curling up like this, splitting and coming up here, splitting and coming up here. And each of those is a flow barrier. And then we have a little wrinkle, and then we lose the wrinkles up here.

So all of this displacement took place before the deposition of these upper beds.

Q. Dr. Riese, can you give us some idea of the scale of the material you're showing here?

A. Yes, I can. This lowermost coal is approximately four to five feet thick. Geologists typically put hand lenses and rock hammers and all sorts of other debris in the field of view they're about to photograph, and mining engineers get very upset if we do that in a mine because they're afraid something's going to fall on it, so none of these pictures benefit from those scales.

This is another example of faulting that breaks the coals. This fault probably started life during deposition and finished during Basin formation in the 35-to-40-million-year-ago range. And I suggest that because it is not a nice curvilinear surface but is much straighter surface, and the amount of displacement shown on it, from these lower beds to these uppermost beds does not change, what you are looking at is from the bottom of the picture to the top of the picture, again approximately 18 to 20 feet of section, and you can see that faults as small and subtle as this effect a complete break in reservoir continuity in each place.

This is important, because in BP's and formerly Vastar's experience in recompleting wells and trying to capture thin coals and their potential reserves where they might not previously have been completed, we've found that if these 1-foot little seams are highly vitrinitic in their chemistry and mineralogy, that we can get as much as a million cubic feet a day out of them, which speaks to very, very large volumes in very, very thin coals.

Q. And again, what is the vertical interval that we're looking at here?

A. The vertical, as with the previous slides, is 15 to 18 to 20 feet.

Q. Okay.
A. And I believe that's the last --
Q. All right, using this slide --
A. -- of the pictures.
Q. -- summarize for us, without just reading this, what it is you're trying to show in your presentation here today.
A. Very simply, what I've tried to do is give you a specific rock context to calibrate the kinds of theoretical presentations that Mr. Thibodeaux was just showing you. He drew little blocks and talked about what was happening in them, and I've tried to show you what those little blocks look like here in the Fruitland. He and Mr. Fassett both spoke to the discontinuous nature of the coals, and I've tried to reinforce that by showing you that there are lateral changes in the stratigraphy, there are vertical changes in the stratigraphy, and there are structural perturbations in the reservoir, all of which disrupt flow continuity.
The one piece that I did not elaborate on, and which I should have, in the second photograph where I walked you through the vertical section, here, and I was showing you all of the distinct textures in the coals, the last texture that I ought to have pointed out are these little, subtle clastic breaks. There's one, there's

another down here, there's another down here. Occasionally these probably correlate to the tonsteins, the ashfalls that Mr. Thibodeaux was referring to. In this case, these are simply little clastic interbeds, and they are very effective barriers to vertical flow.

So the summary points are, it's discontinuous, it's stratigraphically discontinuous horizontally, stratigraphically discontinuous vertically and structurally discontinuous at very fine scales.

Q. Were the exhibits behind Tab 5 either prepared by you or compiled by you?

A. They were all prepared by me.

MR. CARR: At this time we'd move the admission into evidence of Dr. Riese's exhibits. They're all contained behind Tab 5 in the exhibit book.

CHAIRMAN WROTENBERY: The exhibits behind Tab 5 are admitted into evidence.

MR. CARR: And that concludes my direct examination of this witness.

CHAIRMAN WROTENBERY: Thank you.

Commissioner Bailey?

EXAMINATION

BY COMMISSIONER BAILEY:

Q. Is it logical to assume, though, that as the coal rank increases towards the high-productivity area, and as the fractures -- the density of fractures and slight faulting increase towards the high-productivity area, that the communication between these discrete lithologic beds would increase into the fairway?

A. Well, let me challenge -- The question that you're offering has two pieces of evidentiary logic in it.

First refers to the change in grade of the coals, the maturation. And the highest-maturation coals are north of the fairway, they're up in here. So as you move south, actually in many places you're moving into lower-grade coals.

The second point is that there are really two kinds of cleating and fractures that are out there. The first, at a very fine scale, are indeed the cleats. And they can be thought of more in the context of cleavage planes within an inorganic mineral. And those are -- their development and their pervasiveness are a function of the coal chemistry.

And so as I move into or out of the fairway, unless I have high vitrinite content, as predetermined by the kind of vegetation that was there, those cleats will all be confined just to little millimeter- and centimeter-thick beds. They're not going to go anyplace else.

Now, the second kind of fracturing that occurs out here is indeed true structural perturbation. They're strain phenomenon from having some sort of stress applied during the evolution of the Basin into its current geometric form. Those fractures do indeed become more pervasive through this area, and they may or may not contribute to extra flow, although I expect that they would.

However, if you look to the engineering data, which I'm not prepared to speak to because that's beyond my expertise, but about which you will hear later today and tomorrow, I think what you'll hear is that the engineering data suggests that they have -- those fractures have not pervasively and ubiquitously extended permeability.

COMMISSIONER BAILEY: Thank you.

THE WITNESS: You're welcome.

CHAIRMAN WROTENBERY: Dr. Lee?

EXAMINATION

BY COMMISSIONER LEE:

Q. I think you guys overkilled it. You have discontinuity, discontinuity. Whenever you have a well you like to have a continuity. So you say it's highly discontinuity, it's -- the vertical is not connected, and this well, you know, in that 1 millimeter they are not going to talk to each other. And I'm telling you 160 acre, is that sufficient enough, or we have to go into the 80 acres?

A. Are you directing that question to counsel or to me?

Q. To you.

A. There are indeed places where 80 acres may be necessary. I don't think it's --

Q. If I'm an investment person and look at this, I'm so depressed. And this is the --

(Laughter)

Q. (By Commissioner Lee) -- this is very good well, good field, so...

A. Well, as an investor I would just suggest that you look at the financial returns --

Q. Right.

A. -- and not get too concerned about the geology --

(Laughter)

A. -- which we have expert staff that you're funding to look at.

COMMISSIONER LEE: No more questions.

CHAIRMAN WROTENBERY: Thank you, Dr. Riese, for your testimony.

MR. CARR: May it please the Commission, our next witness happens to be a geologist.

(Laughter)

MR. CARR: Our witness is Jay C. Close. Dr. Close is with ChevronTexaco Corporation. We're not going to be really talking about dis-con-tin-u-ous reservoirs --

(Laughter)

MR. CARR: -- with Dr. Close. He's going to give us a lesson in the nature of the Fruitland Coals, but he's going to talk with us about how gas content is measured, gas in place determined, how it's most efficiently produced, and really what Dr. Close is going to do is sort of take us to school for a little while, discuss several concepts, provide some general basic information that is, I think, going to be important that we're all on the same page as we move forward into the engineering and more technical portions of this case that we're going to be moving into after we finish with Dr. Close.

So he's spent two or three days very discouraged, trying to teach some of this to me, and now he's going to try to --

(Laughter)

CHAIRMAN WROTENBERY: Okay, let's give it a go.

JAY C. CLOSE,

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. Jay C. Close.

Q. Dr. Close, where do you reside?
A. Houston, Texas.
Q. By whom are you employed?
A. ChevronTexaco Corporation.
Q. And what is your position with ChevronTexaco?
A. Staff geologist with the mid-continent business unit.
Q. Would you summarize for the Commission your educational background?
A. I received bachelor's, master's and doctorate in geology in 1983, 1985 and 1988 from Wittenburg, Miami and Southern Illinois Universities, respectively.
Q. And review your employment history.
A. I worked for TerraTek, Incorporated, from 1988 to 1993, and I was with Burlington Resources from 1993 to 2002. I went then with ChevronTexaco from 2002 to the present.
Q. Are you familiar with the Application filed in this case on behalf of the Fruitland Coalbed Methane Study Committee?
A. Yes, I am.
Q. Are you familiar with the Basin-Fruitland Coal Gas Pool?
A. Yes, I am.
Q. Have you made a geological study of the Fruitland

Coal in the San Juan Basin?
A. Yes, I have.
Q. Are you prepared to share the results of your work with the --
A. Yes, I am.
Q. -- with the New Mexico Commission?
A. Yes, I am.
MR. CARR: We tender Dr. Close as an expert in petroleum geology.
CHAIRMAN WROTENBERY: We accept Dr. Close's qualifications.
Q. (By Mr. Carr) Initially, would you summarize for the Commission the purpose of your testimony here today?
A. What we want to talk about -- and I'll turn to the next slide here -- we want to -- As Mr. Carr told you, this is a short, transitional presentation where we are bridging between some of the geological concepts that you've read about in detail, and bridge that with some of the engineering that you'll hear about later this afternoon as well as throughout the rest of the hearing. And we will talk about coal gas from the source and reservoir rock standpoint, about coal rank -- there's been several questions on that -- we'll talk about how the gas is stored in the coals. We'll talk, then, also how that gas content is measured -- that's a whole separate technology unto

itself -- to determine what gas in place is.

And then we'll very quickly talk about that they are -- you've heard about in some detail that they are naturally fractured systems. We'll start now to introduce you to the concepts of the pressure side of coal-reservoir physics.

We'll then talk about how the gas in place is calculated quantitatively. We'll talk about a very useful relationship -- you've heard a lot about bulk density logs from the presenters this morning and early this afternoon. There are ways we can take the bulk density logs and quantify gas content in the vertical sense in a well and then areally when we sum up and do maps such as Mr. Thibodeaux and others have shown, how we then get gas in place on a per-section -- on a per-township and related basis.

We'll then talk about a typical production profile that a coal gas reservoir will show over time as a function of pressure. And then we'll talk about a very key concept of this short bridge transitional presentation here as to sorption isotherms, what sorption isotherms are and what, then, their effect is on upon recovery.

Q. Let's go to your next slide, the slide on coal rank.

A. As Dr. Riese and others have talked with you about, the Fruitland Coal is composed largely of vitrinite or vitrinitic macerals, and vitrinite -- The prefix, v-i-t-r, stands for vitreous, which means glassy. You look at these coals in hand sample and outcrop, core samples, et cetera, and you also look at them microscopically, and you can determine, then, that in the case, then, of the Fruitland, the material is largely from pine trees, conifers that are very similar to what we see in forests today in various parts of the world, Mahakam Delta, Okeefenokee, et cetera, et cetera.

What happens, then, in basins when you have these various swamps and marshes, et cetera, you've seen over time how these deposits are buried. And then through time, as you can imagine, through this burial process, the peat then will go through what is called a thermal maturity, or more -- in common parlance in the coal industry, in the coal-gas industry, a rank series.

So then as a function of burial, then, you will cause the temperature, then, at which the peat and other materials are present, as they are successively buried the temperature will increase. And because of that, then, over geologic time, this is how you go from the peat to the series you see up here on the chart, through lignite, subbituminous, bituminous, semi-anthracite, anthracite and graphite coals.

And the time and temperature, then, that it takes is a whole study unto itself. But suffice it to say in the case of the HPA, the coals are in the bituminous series, they're typically what's called a high volatile A and the medium volatile coals, as Dr. Riese has talked with you about. These are coals, then, that have achieved sufficient rank through sufficient time and temperature to which gas has been generated in very copious quantities, such that the gas reservoirs at the time were fully charged with gas.

One more point about this is typically a pine tree or a pine-like type of vegetation will generate predominantly methane as a function of its chemistry.

Q. Let's go to the next slide, the slide that shows the coal gas storage perspective. Explain what this is designed to show.

A. As Mr. Thibodeaux was saying earlier that the coal is certainly an unusual reservoir in many respects, and the gas-storage phenomena we'll talk about briefly here are certainly one key part of that whole set of the science of coal-gas storage.

And if you just think in your mind's eye or just diagrammatically, a three-foot by three-foot by three-foot piece of coal, a cubic yard, then, of coal, there are ways to measure what the surface area is in that cubic yard of coal. And typically you're looking at something on the order of 1 billion square feet of surface area.

And a good way to think about why that surface area is so huge, think about wood and think about all the little wood cells, the pores, when you're looking through the cross-section of a log, all those places, then, that gas can potentially be stored, and in fact that is where it is stored in the coal such as the Fruitland.

Q. Let's go now to the next slide and look inside.

A. And looking inside is both somewhat anecdotal as well as a technical aspect here. We'll talk about, again, as I say, the quantification of gas content and gas in place. The very key concept here is because of this surface area phenomena at equivalent pressures and low pressures here -- we're talking 2000 pounds or less, typically -- the coal, then, can contain two to three times as much gas as a conventional sandstone reservoir at those equivalent pressures. So a tremendous amount of gas in place within a relatively small volume.

Q. Let's go now to the "map" view of the matrix gas storage.

A. So imagine if we're looking at a piece of core or we're in an outcrop or in one of the mines that Dr. Riese showed, and we're looking down -- down in helicopter or map view of what the coal might look like. And for scale here, as Dr. Riese indicated, you know, this may be millimeters or centimeters or feet, et cetera. There are a hierarchy of the matrix sizes and the natural-fracture sizes that are present in these coals, as he indicated.

But in, then -- the vitrinite, the wood material, then, would be residing in this green area, as shown in this cartoon here. And one can perform measurements that we'll talk about, such that typically 98 percent or greater of the total gas content and gas in place in the Fruitland reservoirs is in these so-called coal matrices.

Then at this scale the cleats, the natural fractures, the primary or the face cleats, the secondary or the butt-cleat systems, typically, then, that holds the remaining portion of the gas in place. But suffice it to say again, the vast preponderance of the gas is contained in the coal matrices.

Q. Let's take a look at the desorption and go to the next slide.

A. One of the things that is very important about your understanding of coal-gas mechanics is that you cannot take an oilfield log and directly infer what the gas content is without other measurements.

And one must take core samples or cutting samples, sidewall core samples, and then put those materials, after they have been retrieved out of the ground, drill cuttings, over the shell shaker or via coring equipment, one then must take that material, and say for example in the case of a core, a 3.5-inch-diameter core in a 30-foot core barrel, when that material is then retrieved it's then put up on a floor near the rig, and then it's cut typically in 1-foot sections and would then be placed, then, typically, sometimes plastic but more usually aluminum cylinders that look something like this, that are slightly larger than the 3.5-inch diameter of the core and they're slightly higher than approximately a one-foot section of core. One could of course put drill cuttings to a sufficient volume in there as well.

As people have looked at coal gas deposits such as the Fruitland, of course from the economic standpoint how much gas is there is a very important component of the interest that you can generate within your company's management to go, then, to define prospects and then go to drill.

And this is a schematic here, from A on your upper left. This is from a US Bureau of Mines system that was developed over 20 years ago at this point. This so-called inverted cylinder setup was originally used out east in the Appalachian Basin such as in Alabama. And over time the Gas Research Institute, now the Gas Technology Institute, and others have funded quite a few contractors or subcontractors to further refine the precision and reproducibility of gas-content-measurement technologies and equipment. And TRW is one of those many contractors, then, that improved the technology to a notable degree such as you see here on your upper right.

And then over time, as you can imagine, things tend to -- as we understand more and more about these systems we get ever more complex, and so you --

COMMISSIONER LEE: Let me pose one question to you.

THE WITNESS: Sure.

COMMISSIONER LEE: After this experiment, so you just decided that will be your content of your gas underground?

THE WITNESS: I'm not -- I'm trying to understand your question, Dr. Lee.

COMMISSIONER LEE: You're telling us this is the device to see how much gas in your rock?

THE WITNESS: That's correct.

COMMISSIONER LEE: You just cut a rock and move it on the surface, and you're putting this into this lab and you do the experiment and you say, Okay, this experiment use such amount of the gas, so my reservoir got to have this gaseous content. Is that true?

THE WITNESS: That is correct.

COMMISSIONER LEE: That's correct. Let me pose another question.

If you have a water there, what is the saturated, undersaturated?

THE WITNESS: You're talking about saturated or undersaturated coals?

COMMISSIONER LEE: Yeah. Whenever you have a dip like this, right, then you have a 100-percent not saturated on your outcrop, right?

THE WITNESS: That's correct.

COMMISSIONER LEE: So whatever I say is correct, then you go into the deep, it's 100 percent, probably 100 percent. I pose the question, if you put this one with this device, when you got a result do you consider that is the correct gas content inside your reservoir?

THE WITNESS: There are ways to show --

COMMISSIONER LEE: The answer is yes, right?

THE WITNESS: Well, let me say it this way, I'm going to say it technically, having done a tremendous amount of gas-content work and gas-in-place work in basins all over the world, it's a question that --

COMMISSIONER LEE: It's a simple question --

THE WITNESS: Well --

COMMISSIONER LEE: -- it's nothing to do with the world.

THE WITNESS: Well, the answer is that you can use this kind of equipment such as you see here to get physically accurate, reproducible --

COMMISSIONER LEE: It's an estimate.

THE WITNESS: -- precise gas-content measurements.

COMMISSIONER LEE: All right.

THE WITNESS: You can show, then, that they fit with reserve models and other measurements.

COMMISSIONER LEE: Okay. And how you restore the reservoir condition under this --

THE WITNESS: Well, these are -- This is not a reservoir condition, this is at atmospheric temperature and pressure, and so you are measuring the gas that has evolved out of these coal materials as a function of standard temperature and pressure.

COMMISSIONER LEE: Right.

THE WITNESS: There are ways, then, to model what, then, that gas in place, then, is in the ground at reservoir conditions.

COMMISSIONER LEE: Okay, thank you.

THE WITNESS: So just one more point here to emphasize, is that you're looking at a series of burettes in this upright system here, such that you're measuring the gas evolution as a function of time, temperature and pressure. Typically there are companies now that will do that accurate to 1 cc, and they'll take these measurements as quickly as they can, literally. And when I mean that, I mean every few minutes in many cases, early on in the desorption history of the gas-content sample of interest.

Q. (By Mr. Carr) Let's go to your gas-in-place calculation.

A. Now, how do we then get, then, from the gas content to the gas in place? And so you're looking at an equation here such as follows. Gas in place in standard cubic feet. We have this coefficient here to get back to the standard cubic feet, on your left. We have area in acres, net thickness in feet. Here's that bulk density term yet again, and then your gas content that we just talked about measurement with the apparatus you saw on the previous slides.

Now, one more aspect of gas content. It will be the latter part of this short presentation, is that another way to infer what gas content is, is to use the isotherm concepts that we'll talk about here very shortly.

Q. Are you ready to go now to the gas-in-place calculation, the plot?

A. Yes.

Q. Let's go to that.

A. Now, the -- what happens, as Mr. Thibodeaux and others have alluded to you, the bulk density log is a key measurement used in the industry to infer the net thickness of coal as a function of depth. And what happens, then, in a reservoir like this is that the gas content is often very closely related to a statistically significant level to bulk density. Now, why is that?

If you consider that gas content is proportional to the mineral matter in the coal -- so what's happening here -- or as it's commonly called, ash. Ash is the material -- When you take the coal sample, you burn it, that's the material that is left over after the organic material has, then, been combusted. So ash and mineral matter are reasonably synonymous, but that's a whole 'nother story.

If the gas content is then proportional to the ash, which does not store the gas, and the ash content you can show is proportional to bulk density. So if you have A equals B and B equals C, then A equals C. The gas content, then, can be related to bulk density.

You prove this relationship with core samples, your gas content on your Y axis, and these, then, would be density measurements measured in the laboratory. And then this, then, is the type of plot that operators would then receive from the various service companies to depict this relationship. This relationship, then, is then applied by the geologists and engineers, and then estimate what the gas in place is in their area of interest, 320 acres, 160 acres, on and on and on.

So this is the kind of data you can expect, and this is the kind of correlation coefficient you can expect from precision data.

Q. Dr. Close, let's now take a look at a production profile for a coal gas well.

A. Yet another aspect that is different in coal gas reservoirs is the way that these reservoirs will produce, and we'll talk about why that is on the next slide.

But what typically you'll see, you have volume on the Y axis and time, which is also -- you can think of that as pressure, and we'll talk about that here again in the next slide in some detail. You have two colored plots. Gas then would be in red, and then water would be here in blue.

Typically what you see early on in field life, then, as these coals are depressurized or what is commonly termed as dewatering in the lingo, is decreasing water production and increasing gas production, which is the opposite of conventional reservoirs. Then there's some maximum rate that that coal then produces at.

And then you get into decline to some recovery factor, and that's part of the lead-in, then, to the many pieces of engineering testimony that you will see.

The thing that is very important to realize here at this portion of field life, such as we're dealing with here, is that ever-lower reservoir pressures are needed to drain gas reserves as the life of the reservoir matures. That's an extremely important point.

Q. Let's go now to your last slide, and I'd ask you to start by explaining what is an isotherm and then working through this exhibit and showing the relationship between the two lines.

A. This is an important slide, and we'll spend at least a few minutes discussing it.

What an isotherm is, just from the definition, then, is -- that means "same temperature". What you have here, you're dealing with -- when you take your core sample or your drill-cutting sample, you take this material and you put it in a porosimeter, and in effect you're then measuring the microporosity or the surface area that we were talking about in some of our previous slides. That isotherm temperature would then be the same temperature, replicated of course, as you have determined quantitatively through your various reservoir measurements.

So say, for example, if your reservoir pressure -- reservoir temperature, rather, is 120 degrees fahrenheit from your well logs or other data source, the isotherm, then, would be run at that replicated 120-degree reservoir temperature.

One of the first people, then, to perform surface area measurements -- and this goes all the way back to 1918 -- was a fellow named Langmuir, and his work has subsequently been applied by many industries, the coal gas industry being, of course, of interest to us here today.

So you can think, then, of taking your coal sample, and you want to find out how much gas -- this is pressure, it's hard to read on the X axis. And this then would be -- Think of it as gas content, how much the coal can hold, as well as how much gas the coal can give up. We'll talk about that here a little bit more in a minute.

The relationship, then, is described by this equation that you see here. Gas content at equilibrium pressure equals a relationship here between gas content, pressure and some equilibrium pressure.

And you'll often hear people in the industry talking about two parameters, Langmuir volume, the amount of gas that the coal could hold under various conditions, as well as the Langmuir pressure. And the Langmuir pressure you can think of in effect, then, it defines the steepness of the blue curve here that is the isotherm.

What you then measure, then, in the laboratory, you measure the gas content versus pressure at various points. Say for example, 100 pounds the coal holds so much gas, 200 pounds, 300 pounds, 500 pounds, on up to a pressure, then, that would be more than the reservoir pressure that you see in the subsurface.

Now, if you then look at the isotherm curve, then, these points that define this curve defined by the Langmuir equation, note the steepness of this isotherm shape as you get to progressively lower reservoir pressures as you move towards your left on the X axis.

So if you look, then, compare conventional versus the coal, note then there's a much higher percentage of gas in place at low pressure than there is in the conventional reservoir. Because of the nature of the conventional reservoir where you don't have this sorption or the surface phenomenon, then typically you can see the gas liberated in roughly equal amounts as you depressurize the reservoir through pressure depletion.

So I'm going to say it again. There's a much greater percentage of reserves, then, at low pressures, then, in these Fruitland Coals than there is in conventional reservoirs at the same pressures. You must -- The only way to get that gas out is to deplete that reservoir at the lowest possible reservoir pressure. And a very effective way to do that, to effect that ever increasingly lower pressure depletion, is through infill drilling.

Q. Summarize the points you've covered in your presentation.

A. We've talked very briefly about coal being composed, in the Fruitland case, of primarily wood-rich materials that both generate and store a tremendous amount of gas.

We've talked about surface area where that methane or the gas has been generated actually resides. We've talked about ways in which that gas content is measured at the surface with precision laboratory equipment.

We then talked about the isotherm concept where we take coal samples in the laboratory and we measure how much gas the coal can hold and how much the coal can give up as a function of pressure. We then have talked about the important point of how much gas is still left in place versus conventional reservoirs at these very low pressures, and the need to produce coal-gas reservoirs at very low pressures to recover that additional reserve that is in place.

Q. And infill drilling is a vehicle to take that pressure down?

A. That is correct.

Q. Were the exhibits behind Tab 6 in the exhibit book prepared by you?

A. Yes, they were.

MR. CARR: I would move the admission into evidence of ChevronTexaco Exhibits -- all of them being contained behind Tab 6 in the exhibit book.

CHAIRMAN WROTENBERY: Okay, the exhibits behind Tab 6 are admitted into evidence.

MR. CARR: That concludes my direct examination of Dr. Close.

CHAIRMAN WROTENBERY: Thank you. Any questions by the parties?

COMMISSIONER LEE: We have four more days to go, so --

(Laughter)

COMMISSIONER LEE: -- lots of fun.

Since we are going to take a break pretty soon, I disagree this is a geological exhibit. Can you explain it?

MR. CARR: I thought it was a legal exhibit.

(Laughter)

COMMISSIONER LEE: I think the geology, you steal too much from the engineers.

(Laughter)

COMMISSIONER LEE: No more questions.

CHAIRMAN WROTENBERY: Thank you, Dr. Close for your testimony.

THE WITNESS: Thank you.

CHAIRMAN WROTENBERY: Okay, I think since it's just a little bit before three we will take a break now. I hope everybody will stick around. Steve should be here momentarily, as should be the refreshments, so we'll probably spend about 15 or 20 minutes with him and then get started again.

(Thereupon, a recess was taken at 2:53 p.m.)

(The following proceedings had at 3:27 p.m.)

CHAIRMAN WROTENBERY: Okay, I think we can get started again.

Thank you for taking some time out there to help us honor Steve. We really appreciate all he's done for the Commission the last few years.

And we can move on now.

I might just note, the Commission has been quite impressed with the quality of the geological presentations so far. Even Dr. Lee said so.

(Laughter)

CHAIRMAN WROTENBERY: And I understand we have two more geologists who are going to help introduce the material for the engineers, and then we'll see how well the engineers hold up.

(Laughter)

MR. KELLAHIN: There are only two more witnesses.

We've pulled all the engineers.

(Laughter)

CHAIRMAN WROTENBERY: Okay, we'll turn it back over to you, Mr. Carr.

MR. CARR: Mr. Kellahin is going to --

CHAIRMAN WROTENBERY: Oh, Mr. Kellahin.

MR. CARR: -- present Devon's witness.

MR. KELLAHIN: Members of the Commission, we're going to make a transition into a specific area in the high-productivity portion of the pool. We're going to concentrate on a federal unit that's operated by Devon. It's called the NEBU Unit. It's the Northeast Blanco Unit.

And we have two witnesses. There's a geologist and an engineering team that have studied the issue of increased well density in this particular unit, and they want to share their conclusions with you. I think you'll find at the end of their presentation they may have approached the project from a different perspective, but they've gotten to the same ultimate conclusion that the high-productivity area necessitates more wells than the current density provides.

The first witness is Mr. Dale Reitz. His last name is spelled R-i-e-t-z.

MR. REITZ: -- e-i.

MR. KELLAHIN: -- e-i-t-z.

DALE REITZ,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Let me have you introduce yourself. State your name.

(Laughter)

A. It's Dale Reitz, I'm a geologist with Devon Energy Corporation.

Q. And where do you reside?

A. And I live in Edmond, Oklahoma.

Q. Tell me something about your education.

A. I got a bachelor's degree in chemistry and geology from Cal State University, Fresno, and I have a master's degree in geology from the University of Southern California in 1977. And since then I've worked for Shell Oil Company, Union Pacific Resources, and currently Devon Energy.

Q. Describe for me what has been your responsibilities with regards to the issues involved in this case.

A. My responsibility is for the NEBU Unit, to conduct the geology. And Gary Kump is our engineer on the project. We work together on it. And I have constructed six cross-sections around three pressure-observation wells in order to augment the testimony of our engineer.

Q. Has Devon or your participated in the industry Committee study group?

A. Yes, I have participated in the technical Committee since November, since November, 2002.

Q. How long have you been involved in studying the geologic components involved in the Division's Fruitland Coal Gas Pool?

A. Since November, 2002, and prior to that I've worked a couple years on Powder River Basin coalbed methane projects.

MR. KELLAHIN: We tender Mr. Reitz as an expert geologist.

CHAIRMAN WROTENBERY: He's so qualified.

Q. (By Mr. Kellahin) We're going to do the same with you as the other witnesses. We'll let you run through your --

A. Okay.

Q. -- slide show on the PowerPoint. But for purposes of the record, turn with me and identify that behind Exhibit Tab 9 of the hard copies, the materials contained behind Exhibit 9 represent your work product.

A. Correct.

Q. Before we start the slide presentation, let me ask you some conclusionary questions. At the end of your study are you able to determine, in your judgment, if the density of wells within your unit should be more than one well per 320-acre spacing unit?

A. It's my opinion that we do need more wells than the one well per 320 right now, based on what I've seen in my work.

Q. I want you to integrate into a short presentation your work and the engineering work so we can have an understanding of the methodology. We're introducing some pressure-observation wells for the first time that I've heard today.

A. Correct.

Q. What's the plan? What were you trying to do with those?

A. Well, originally some of these wells were drilled as coalbed methane wells, and they were not successful because they were not cavitated. So we went back and drilled an offset well that was cavitated, and the parent well was converted to a pressure-observation well, and we've used that to gather data for engineering purposes, on the first two pressure-observation wells, the 400 and the 404. On the third pressure-observation well, the Number 214, that was a Pictured Cliffs well that had been abandoned and then converted to a pressure-observation well.

And these three pressure-observation wells are located throughout the NEBU Unit, which encompasses approximately two townships in size, and it's located on that easel map, right over about in there, mostly within the HPA, but there are parts of it outside of the HPA on the north and south ends.

Q. Mr. Reitz, the NEBU Unit is identified by the green box?

A. Yes.

Q. And that's superimposed on the pool map with this green outline?

A. Correct.

Q. It extends in a -- Most of it is contained within the high-productivity area?

A. That is correct.

Q. And there's some of it in the north and south that spills out of that 2-million-a-day boundary line, right?

A. Yes.

Q. Within the NEBU Unit, has Devon drilled wells to the current permitted density for coal gas wells in the unit?

A. Yes, yes, they have.

Q. Other than the occurrence of the Navajo dam and the river system that feeds into that river, that, I guess, is the only limitation you've had in your density?

A. Yes.

Q. Walk us through the geologic presentation that explains the relationship of the pressure-observation well to the geologic characteristics that are important to you as we look at the near wells.

A. Okay. Let me just start with the first two cross-sections, A-A' and B-B'. A-A' is a dip cross-section at around the NEBU 400 pressure-observation well. All of these six cross-sections will span an area of about one section in size, some a little larger and some a little bit smaller, but generally we're focusing in on about a one-section-size area and showing what happens when we look at the nearest offsets that we have.

Some of these logs will be the gamma-ray/neutron density logs, and others will be a mud log, which is all we have run on some of the wells, on some of the coal wells. So you'll see some differences in the curves, but generally the coals can be picked out pretty easily.

On A-A', which is the dip section through the POW 400 well, the thickest coal present is about 24 feet thick there, and they go down to about two feet thick. On all of the 16 wells on these six cross-sections, the thickest I saw was about a 40-foot-thick coal, and the thinnest was about two feet.

The coals are shown, of course, in green. The Fruitland sands or the continental redbeds are shown in the red, and the marine Pictured Cliffs sandstones are shown in the yellow. The datum is the top of the massive Pictured Cliffs marine sandstone. And here you can see -- if I point to it -- right there is the marine tongue of the Pictured Cliffs that's been talked about before by previous speakers. And we see that through most of the NEBU Unit. Sometimes there are coals below that and sometimes it's just shales.

I think the main point, though, that I want to bring out here on cross-sections A and B is the discontinuity both laterally and vertically of the coalbeds here. You can pretty much see that they really don't correlate very well between even the closest wells, between the 404 and -- 400 and the 400R. It's only 1500 feet between them, and the coals just do not correlate well at all.

Q. Mr. Reitz, was there any item testified to by a prior witness with which you have any disagreement?

A. No.

Q. Let's look at the next cross-section.

A. There's B-B', showing the same POW well with pressures indicated from the perforations in the coal of

194, 259 and 268 p.s.i. These are not great zonal pressure differences, but the reason why I show these on A and B is to show the discontinuity of the coals, primarily. There will be bigger differences in zonal pressures on the succeeding cross-sections.

C-C' is a depositional strike cross-section through the pressure-observation well 404. The closest well to it is 1600 feet away, the 404R, which is right there. That has a fairly thick coal in it. It's about 40 feet thick right there, and by the time you get over 1600 feet away, if I have it correlated correctly, it would be down to about 14 feet thick.

On cross-sections C and D --

Q. Just before you leave this one --

A. Sorry.

Q. -- when you look at the pressure-observation well --

A. Yes.

Q. -- is this an illustration of the layered pressure data that you have developed?

A. Yes, it is. This well, the 400, shows a little bit more differences in the zonal pressures. You can see they range from 93 p.s.i. all the way up to 771 p.s.i. The coal that is below the Pictured Cliffs tongue appears to correlate reasonably well across these four wells, and the coals above the tongue don't correlate very well at all, and I think that --

Q. None of your presentation was presented to Examiner Stogner last summer, was it?

A. No, it was not.

Q. Please continue.

A. This was done since November, 2002. And again, I think this is a good illustration that with the 771 p.s.i. in that lower coal, that there will be reserves left in the ground if we don't develop on an infill spacing, a little bit smaller.

Q. Next?

A. There's D-D', and this is a dip cross-section through the same pressure-observation well, the 400, from northeast to southwest. It's got the same pressure information in it.

Overall, when I averaged the coal seams in the 16 wells, I came up with an average thickness of about 7 feet, and as I said before, they range from about 40 feet to 2 feet across the wells that I looked at.

And when I calculated the average connectivity, I just looked at two wells and said, Okay, this well the coal correlates or it doesn't correlate. I came up with 30-percent connectivity. I could be a little bit conservative, because I didn't carry each coal too far vertically on each of the next adjacent wells, but I think between 30 and 50 percent connectivity is about right.

The next cross-section is E-E'. That goes through the pressure-observation well 211 which, as I said before, is a Pictured Cliffs well that has been converted to an observation well.

The nearest offset on that is on the next cross-section, F-F', and that is the NEBU 476, which is this well right here, on the left of the pressure-observation well. That is 2455 feet away, the closest well.

And on these two cross-sections, if you can read at the bottom, two coals below the Pictured Cliffs tongue, they show some pretty high pressures. Those coals -- There's three coals there, and two of them were measured. The upper one is six feet thick and the next one is four feet thick, and they had pressures measured of 1486 and 1451 p.s.i. through those perforations.

So I think this is another example that those wells -- or those zones could not be produced unless we have additional infill drilling to access them.

Q. Your work was done in association with Mr. Krump?

A. Gary Kump.

Q. Kump. And the two of you worked on the correlations and the information that we're looking at here?

A. Gary provided the zonal pressure data, and I did all the correlations.

Q. Summarize for us what you've concluded from your work.

A. Well, I would conclude there's a great deal of lateral and vertical facies changes going on out here over a very small area, even between 1500 feet between wells, you can't really -- you're aliasing the information, you can't really tell what's going on there. There's a lot of faulting and fracturing that you'll never see with this well density.

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

We move the introduction of the exhibits he's presented behind Exhibit Tab Number 9.

CHAIRMAN WROTENBERY: Okay, the Exhibits behind Tab 9 are admitted into evidence.

Thank you for your testimony, Mr. Reitz.

THE WITNESS: Thank you.

GARY KUMP,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A. Gary Kump, I'm a petroleum engineer with Devon Energy.

Q. Mr. Kump, where do you reside?

A. I reside in Edmond, Oklahoma.

Q. Have you testified before the Division on prior occasions?

A. Yes, on one occasion.

Q. Summarize for us your education.

A. I have a bachelor of science degree from Montana School of Mines, 1969.

Q. Summarize for us your employment experience.

A. I have over 30 years' experience in the industry, primarily in reservoir engineering. I've worked for Shell Oil Company, Marathon, BHP Petroleum and Devon Energy.

Q. Did Devon participate with the industry Committee in its study of well density in the Fruitland Coal Gas Pool?

A. Yes, we did.

Q. What was your participation in the effort by Devon to determine appropriate well density in the Northeast Blanco Unit?

A. We gathered pressure data in the individual pressure-observation wells, as Dale has alluded to, to see how effectively the individual coal seams were being drained.

Q. Is the work we're about to see your work?

A. Yes, it is.

Q. Do the displays we're about to see represent your displays?

A. Yes.

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

THE WITNESS: Kump.

CHAIRMAN WROTENBERY: We accept Mr. Kump's --

MR. KELLAHIN: Kump?

THE WITNESS: Yes.

CHAIRMAN WROTENBERY: -- qualifications.

MR. KELLAHIN: I'll get it right yet.

THE WITNESS: Okay.

Q. (By Mr. Kellahin) Let's turn to the first slide and have you take us through your presentation.

A. This first map is a map of the NEBU Unit. Dale has already shown you where the unit is located. The unit outline is shown in red on the map. There are 120 Fruitland Coal wells producing from the unit. It's located primarily in Townships 30 North, 7 West, and 31 North, 7 West.

Cumulative production from 120 Fruitland Coal wells is about 950 BCF to date, and it's currently making

140 million cubic feet of gas per day.

Q. What was the purpose of the pressure-observation wells? What were you trying to understand?

A. In the past we've taken composite pressures where we've dipped in to some of the producers and our pressure-observation wells, to get what the current pressure is in the reservoir.

And we realize there may be different pressures in each individual coal seam, so we took three of our pressure-observation wells that are located some distance from existing producers and measured individual coal-seam pressures in each of those three wells.

Q. As a reservoir engineer, if you're taking that consolidated pressure does it matter?

A. Yes, it does.

Q. How is that different than taking the layered pressure information?

A. We will show some of that data a little bit later, but if you use the composite pressure you'll overestimate the amount of drainage and you'll overestimate the amount of drainage area, which has been done in the past and was done in some of the work in the last hearing.

Q. If you were to lump the pressures together in a well that its neighbor you have pressure on, did a drainage calculation, it's likely that that calculation will show a drainage pattern that overlaps?

A. Correct.

Q. And does it actually overlap?

A. No.

Q. Why not?

A. As we'll show, there are -- differential depletion is occurring in individual coal seams.

Q. Okay.

A. In one coal seam it could overlap. It could have one seam, if it's connected to the adjacent well and has high productivity, high permeability, it could overlap for that particular seam. But if you tie all the seams together, the gas in place, generally you'll see that you're not draining 320 acres for all the seams.

Q. Take us through what you've done.

A. If we turn to the second exhibit, this is the isotherm, similar to the one that Mr. Close showed on his presentation. This is the isotherm that represents the gas content of the coals in NEBU.

If you look on the right-hand side of the graph, you'll see a vertical black line. That represents the original pressure of the coals in NEBU, 1642 pounds. Where that black line crosses the isotherm is the original gas content at virgin conditions. That's 593 SCF per ton. That number, 593 SCF per ton, was used in some gas-in-place calculations I'll show a little later, and this isotherm data was used to construct the next exhibit.

Q. All right, sir.

A. This next exhibit is just an alternate way of showing the isotherm data where on the X axis I'm showing gas recovery as a percent of original gas in place, on the Y axis is reservoir pressure. And as you can see from the shape of the curve, this is far from being linear, as Mr. Close has already shown.

As an example, if you look at the first horizontal line to the left, where it says 50-percent pressure depletion, that's the point where you've taken the original reservoir pressure from 1642 pounds down to about 820 pounds, 50-percent depletion. And yet you go over to your isotherm, you see you've only made 13 percent of your gas, 13 percent of the gas has been liberated from the coal.

This is during the period of dewatering where the pressure falls rapidly because you're producing water, primarily, and water is not very compressible, so the pressure drops rapidly, even though you've produced very little gas.

If you go to the lower horizontal line, you'll see that you have to reduce your original reservoir pressure by 87 percent, down to about 215 pounds, before you liberate 50 percent of the gas out of the coal, so that you've reduced the pressure by 1400 pounds to get the first 50 percent of the gas out of the coal, 215 pounds is holding the remaining 50 percent of the gas from desorbing from the coal.

As Mr. Close said, you have to reduce pressures very low in a coalbed methane reservoir to get a high recovery of gas.

Q. Do small pressure reductions matter?

A. They do in the low-pressure range. You can see the red curve is becoming asymptotic to the X axis. So the very small decreases in pressure may give you significant increases in gas recovery.

Q. Can you set up a comparison for us so we can understand how a conventional reservoir might perform, and contrast that to what we see in the coal gas?

A. Yes, I'll show that on my next exhibit.

This shows how the depletion process differs in a conventional gas versus a coalbed methane gas reservoir. The red curve is the same as the curve on the prior exhibit. The blue curve represents the conventional gas reservoir, such as the Mesaverde or the Pictured Cliffs or Dakota. Very similar to what Mr. Close showed. It is almost linear, the conventional gas, whereas we already spoke about the red curve as being far from linear.

Is you reduce the pressure by 50 percent again in the CBM reservoir, you only liberate 13 percent of the gas. In a conventional reservoir, you would have liberated 56 percent of your gas in place.

By the time you've depleted your pressure to 87 percent of the original pressure, again 50 percent of the gas would be produced from the coalbed methane, whereas 89 percent of the gas has already been produced from the conventional reservoir.

So it's very much more important to reduce pressures to a minimum in the coalbed methane reservoir at low pressures than it is in the conventional reservoirs, totally different process.

Q. Can you describe for us the various ways Devon has attempted to obtain a pressure reduction in the unit?

A. Yes, I'll show that on my next exhibit. This exhibit shows the production history of the deposit, 102 producing wells, Fruitland Coal-producing wells at NEBU. Early on we went through the dewatering stage, we see gas production inclining. We reached the maximum rate of 300 million cubic feet a day in 1994, and then the unit went on a decline. It declined to about 170 cubic feet of gas per day by mid-1994.

At that point Devon recognized the need to reduce working pressures, to increase rate and maximize recovery.

So we implemented a program aimed at doing that.

Among the things we did, as shown in the box on the exhibit, we doubled the gathering capacity of our gathering system to reduce friction pressure, thereby reducing wellhead pressures.

We added compression to our central delivery points. There are four central delivery points in the field, again to reduce wellhead pressure.

We added wellhead compressors to all 102 wells in the field, to where we are now producing each well at a wellhead pressure of 5 to 10 p.s.i.

And finally, we installed pumping units on about three-quarters of the wells in the unit to keep any water head off the coals, minimize any pressure on the coals.

As a result of that work, you can see production increased over the next two and a half years from 170 million cubic feet of gas per day to about 265 million cubic feet of gas per day. At that point it went on another natural decline.

If you extrapolate those two declines you see on the exhibit, you'll see that we added -- there's a text box there -- we've added 351 BCF of additional reserves by doing that work of lowering working pressures on all the wells. We did that by lowering the abandonment pressure.

You can see on the curves, the lowermost decline projection abandonment pressure would have been about 280 pounds, had we not done that work. After doing that work, we have reduced our abandonment pressure upon depletion to about 150 pounds for all the wells in the unit, on average.

Q. Mr. Kump, how can Devon further reduce that abandonment pressure in the unit?

A. I think we've done all we can do with the existing infrastructure. The only other way we have to attempt to increase production, increase reserves and prevent waste would be to infill drill the field.

COMMISSIONER LEE: Can I ask a question?

MR. KELLAHIN: Yes, sir.

COMMISSIONER LEE: This whole thing is reduced to 320 acres to 160. Then for that purpose, what's -- what you want to imply here? Do you understand my question?

THE WITNESS: Well, I'm showing that reducing pressure does significantly increase reserves, and we did that initially by --

COMMISSIONER LEE: Yeah, I know what you're showing there. But what is going to relate it to 320 acres and 160 acres?

MR. KELLAHIN: Dr. Lee, we're just about to do that for you.

COMMISSIONER LEE: Okay.

THE WITNESS: Yeah.

Q. (By Mr. Kellahin) So this pressure reduction and the reserve adds are attributable to more efficient things that you've done within the unit, except for adding the infill wells?

A. Correct.

Q. When we look at the analysis of the additional infill well, are you simply accelerating the recovery rate of existing reserves, or are you adding new reserves to your unit?

A. I think the next several exhibits will show that production performance data, pressure data, we'll see that the coal seams are being differentially depleted and that we are leaving reserves behind in some of the coal seams with the existing spacing.

Q. So increasing the density will afford the opportunity to increase the ultimate recover from the pool?

A. Yes.

Q. Let's see how you've done that.

A. My next exhibit shows the 75 wells -- and I should -- Let me back up just one second to our map. I failed to note that part of the unit falls in the LPA area, part of the unit falls in the high-productivity area. The yellow portion is the portion that falls in the low-productivity area. It's about 25 percent of the unit. And the portion of the unit that's in white within the unit boundary, 75 percent falls in the high-pressure area.

And also while we're here, point out three pressure-observation wells we will be talking about later. Up in the northeast portion of the field, that's Well Number 400. That's one of the observation wells we took individual seam pressures in.

And the other two are located in the high-productivity area, in the central part of the unit, Wells 404 and 211. Those are also two wells that we took individual seam pressures in that we'll talk about in later exhibits.

So looking at the 75 wells that are located in the high-productivity area of the field, each of those dots on this exhibit represents one of those wells. If you pick a dot and read to the left, to the Y axis, it will tell you the recovery factor I've projected for that particular well.

And the recovery factor is calculated by the equation shown there where I've taken the estimated ultimate recovery, which I've calculated by decline analysis for each well, divided that by the amount of gas in place on 320 acres around that well. So it's a recovery on the 320 acres around each particular well.

Now, this is the high-productivity area of the field, and you suspect that this would be the area that's most homogeneous, would have the best connectivity, the -- more consistency throughout the wells in this area. If everything was perfect, if the permeability was the same, you had very good connectivity, the recovery factor should be very similar for all these wells, and it should be somewhat of a horizontal line.

The fact that you're seeing recovery factors varying from 20 percent to 140 is a manifestation of the heterogeneity that was described in the geological testimony.

If you take the total EUR of all the 75 wells and divide it by the gas in place for those 75 wells, you'll get an average ultimate recovery for the wells in the high-productivity area of NEBU, 68 percent. That means we're leaving 32 percent of the gas in place behind with existing wells, even though we've optimized the infrastructure of the field to maximize recovery.

Q. Mr. Kump, describe for us your method for determining the gas in place.

A. I use the same equation that Mr. Close showed in his testimony, just a volumetric equation.

Q. Let's go to the next slide, and let's look at the individual pressure-observation wells.

A. This is the first of the three wells in which we took individual seam pressure data. What you're looking at is the gamma-ray density neutron log. The coals are shown in the shaded -- in this particular exhibit, the red-shaded area are the coals.

In the depth track are shown perforations, so you can see we have four sets of perforations, four seams we've perforated in this observation well.

On the left-hand side of the log you'll see the pressure that was measured when each of these zones was isolated.

Now this particular well does not tell us a whole lot about reservoir heterogeneity or differential depletion, for several reasons. First of all, there are only four perforated zones. The bottom two zones could not be isolated because of mechanical reasons, so the pressure you see there is a composite pressure. 268 pounds is the pressure that was measured with both of those lower two zones open. One of those zones could be high pressure, one low pressure. I mean, you just don't know. So that does not tell you a whole lot there about reservoir heterogeneity, looking at those two lowermost coal seams.

So we only have two data points in this particular well. They are somewhat similar in pressure, 194 pounds -- it was just slightly building, probably would have reached a little bit higher than 194 pounds, but not much higher -- and 259 pounds.

On the right you'll see, based on the isotherm I've shown earlier, what depletion you see at this well. Now, this is not a producer, this is an observation well, but what you see at this location in the reservoir as far as depletion of that seam.

I should point out, this well is about 1500 feet from the nearest coal producer, which is only a little bit more than halfway to the point where you would drill an infill. An infill would be about 2640 feet. So only about a little more than 50 percent of that distance. This is the type of depletion you're seeing.

Q. The small box on the lower right has information. Why is that important to us?

A. Again, this particular well is in the low-productivity area, but it's right on the border of the high-productivity area. Those are the four offsetting producers around this pressure-observation well, and the heterogeneity of these wells can be seen by the cumulative production. All of these wells have been producing about the same amount of time -- 11, 12 years -- and yet the cumulative production varies from .8 of a BCF to 13.5 BCF. Very heterogeneous recoveries from offset wells.

Q. Please continue.

A. If we go to the second observation well, this is in the high-productivity area. We have five individual coal seams that are perforated. We were able to measure pressure in all five of these coal seams. Again, this well is about 1500 feet from the nearest coal producer also.

In this well we can see -- I'm sorry that's washed out, some of these numbers have washed out; they were all in red at one time. But the pressure data, you can see, varies from 140 p.s.i. to 770 p.s.i. in the thick coal at the bottom of the section. And you can see recovery varies from 15 percent in that lowermost coal to 72 percent in the second coal down.

Again, the wells surrounding this particular pressure observation well have been producing 11 or 12 years. This is only 1500 feet away from the closest of those wells, and that particular zone you've only depleted 15 percent of the gas in place. Very inefficient drainage of that seam and several others, particularly the thinnermost zone at the top. It has only recovered 20 percent.

Q. Describe for us the box on the upper right.

A. There are three pressures shown in that box. The first is just the average of the pressures you'll see on the left-hand side of the exhibit. That's -- You might suspect, well, what are the average pressure of all these zones? If you just take an average, you get 366 pounds.

If you give more weight to the thicker zones --

that's the second pressure noted there -- you get an average pressure, thickness-weighted average pressure, of 371 pounds, very similar.

The third pressure is a composite pressure. Three months prior to gathering this data, we dipped into this well, and all our pressure-observation wells, which we do annually, and took a pressure when all these zones are exposed, and that pressure was 219 pounds. So you can see the composite pressure is lower than an average pressure or a thickness-weighted pressure.

Q. And what would that cause you to do?

A. Well, in the past what we did and many of the other companies did, and some of the testimony in the prior hearing used composite pressures. They're lower than the average pressure, so you would overestimate drainage and overestimate drainage area by using a composite pressure.

Q. Please continue.

A. And finally again, to show the heterogeneity of the production of nearby wells, again, this is in the high-productivity area, the four nearest offset have produced anywhere from 2.7 BCF to 10.8 BCF. Not very consistent, showing again there's some heterogeneity.

The final of the three observation wells in which we took individual seam pressures is NEBU 211 pressure observation well. And again, that's in the high-productivity area and in the central portion of the unit. This particular well is about 2500 feet from the nearest coal producer, so it's at a location where you would potentially put 160-acre infill location. It is the farthest away from any of the producers that we've shown, and it has the most heterogeneity, or shows the most pressure -- differential pressure depletion, of the three wells.

We show a pressure in this particular well from 152 pounds, the middle coal seam on the log, to near virgin pressure, about 1486 pounds in the lowermost coal that's about six feet thick.

And you can see at this location only 2 percent of the gas has been produced from this zone by the offset producers, very inefficient drainage. Several other zones at this location have given up only about 30 percent, 25 percent of the gas in place, after 12 -- 11 to 12 years of production of the offset coal producers.

Q. Do you have a slide that you can go to, to give us your opinion concerning whether we're increasing ultimate recovery or simply accelerating the recovery of existing reserves?

A. Did you want me to talk about those text boxes or --

Q. It's a repetition of what you've already said.

A. It's a repetition.

Q. You get the same conclusion?

A. Yes.

Okay, this exhibit, again, is the same -- the red curve is the same as we've seen on the earlier exhibit that I've shown, gas recovery versus reservoir pressure. The red cross-hached area shows the current condition of the field -- not of the field, but this is the high-pressure -- high-productivity area, excuse me. We have made 797 BCF or 51 percent of the gas in place in the high-productivity area of NEBU. That correlates to a current pressure average in the high-productivity area of about 215 pounds.

If you look at the blue cross-hached area, that's the ultimate projection for those 75 wells, projected that we will recover 1077 BCF, or that 68 percent that I showed earlier, for the 75 wells in the high-productivity area. That would get you down to a pressure of about 110 pounds.

So the existing wells on 320-acre spacing recover all that are under the -- that's cross-hached.

Because of the complexity of this reservoir, it's very difficult to say how much additional recovery you would get from infill drilling. But if we assume that we could reduce pressure by only 20 more p.s.i. -- and that's that small sliver you see at the very bottom; it's not cross-hached -- because that red curve becomes asymptotic, only 20 pounds of additional pressure reduction would increase your recovery to 1155 BCF or an additional 78 BCF of gas just in the high-productivity area of NEBU. That would leave you with an ultimate recovery of 73 percent, which is not unreasonable in the high-productivity area.

Q. Let's turn to the conclusion slide and have you give us your conclusion.

A. A summary of my testimony. First of all, a major portion of the coalbed methane gas recovery occurs at low pressures. That was also stated by Mr. Close.

Devon has done everything we possibly can at this point to reduce the wellhead pressures of our existing wells in an attempt to maximize that recovery, and yet on 320-acre spacing we're going to leave 32 percent of the original gas in place behind, even with the optimization.

Geological correlations, production performance and pressure data have shown that additional gas can be recovered by infill drilling because of the heterogeneity of the reservoir.

The geological testimony has shown that 30 percent, or 30 to 50 percent, of the coal seams in NEBU are not connected.

The erratic recoveries we've shown also demonstrate the heterogeneity of the reservoir.

And finally, the pressure data measured shows differential depletion is occurring and the individual coal seams are not being efficiently drained.

Finally, infill drilling in the heterogeneous Fruitland Coal seams will enhance recovery efficiency, recover additional reserves and will prevent waste.

A small 20-p.s.i. reduction in just the high-productivity area of NEBU would recover an additional 78 BCF of coalbed methane gas.

MR. KELLAHIN: Madame Chair, that concludes my examination of Mr. Kump.

We move the introduction of his exhibits behind Exhibit Tab Number 10.

CHAIRMAN WROTENBERY: Okay, the exhibits behind Tab Number 10 are admitted into evidence.

Dr. Lee?

EXAMINATION

BY COMMISSIONER LEE:

Q. The individual reservoir, the abandonment, if you put a compressor there, what is the abandonment pressure?

A. If we go back to --

Q. No, don't go back to that, talk to me.

A. Well, I've shown in here, the exhibit, the average --

Q. You see --

A. -- will be 150 p.s.i. across the unit.

Q. Right. You see, the infill drilling will lower down your abandonment pressure. Who decided the abandonment pressure?

A. Well, 150 p.s.i. was calculated. That's the current abandonment pressure of the existing wells.

Q. Right, so you have the infill drilling that can lower that down?

A. That -- Because of the complexity, there's no way to calculate exactly how much pressure --

Q. But your argument is this: The infill drilling will lower down the abandonment; is that right?

A. Yes, because as I've shown earlier, many of the zones are not being efficiently drained. In one case --

Q. Suppose I have a well. I put a compressor, I suck it all out. Is abandonment pressure -- If you put an infill drilling, I suck the same thing, the pressure will be different?

A. It will be lower, because you're not effectively draining all the individual seams with the existing wells. You've got the heterogeneity, they're not well connected, you've got the faulting, like was shown in the earlier testimony.

Q. Oh, then we're talking about -- You are talking about this 160 is connected?

A. Hundred --

Q. This 320, they're all connected?

A. I'm sorry, I don't understand the question.

Q. If you have infill drilling, you are going to affect the other wells.

A. There will be --

Q. That's violating the --

A. There undoubtedly will be some acceleration. But the ultimate point is, you're going to recover additional reserves, and significant additional reserves, by infill drilling.

Q. Okay, but my argument is this: My argument is, this is so complicated, in some cases they may be connected to other cases, but for the most cases they don't connected to other cases. Then we need an infill drilling?

A. Correct.

Q. That's my suggestion, that's not your suggestion.

A. I thought that's what I was showing. I'm sorry if I didn't do it very well.

COMMISSIONER LEE: Well, anyway, it's pretty late. All right, thank you very much

THE WITNESS: Okay.

EXAMINATION

BY CHAIRMAN WROTENBERY:

Q. Mr. Kump, I had one question too. You had indicated that the gas content at initial original reservoir pressure was 593 standard cubic feet --

A. Yes.

Q. -- per ton? Where did that figure come from?

A. That's based on material balance, what I did on the total unit. For three years in a row, 1998, 1999 and 2000, we took approximately 25 of our producing wells and our pressure-observation wells and took pressures on each of those wells and plotted those on a map to a -- contoured those. Then I planimetered those contours within the unit boundary to get an average pressure at that point in time for each year.

Q. Okay.

A. Each of those three points I put on a material balance --

Q. Uh-huh.

A. -- which was shown earlier, a material-balance-type projection, to calculate gas in place, which was over 2 TCF -- this is the total unit now --

Q. Uh-huh.

A. -- and the slope of that curve gives you *in situ* Langmuir volume, which is used in your volumetric equation.

Q. Okay.

A. So it's *in situ*, it's not measured from cores; it's actual *in situ* data, measured from production performance.

CHAIRMAN WROTENBERY: Okay, thank you.

Any other questions?

Thank you very much for your testimony, Mr. Kump.

THE WITNESS: Thank you.

MR. KELLAHIN: May we have a short break so I can figure out what happens next?

CHAIRMAN WROTENBERY: Sounds good. Take about a five- or 10-minute break here.

(Thereupon, a recess was taken at 4:16 p.m.)

(The following proceedings had at 4:20 p.m.)

CHAIRMAN WROTENBERY: Okay, we'll go back on the record.

We've talked with counsel, and it appears that this would be a good stopping point for today. We will start back up at 9:00 a.m. tomorrow morning, and we hope to finish up tomorrow.

Thank you all very much.

(Thereupon, evening recess was taken at 4:21 p.m.)

* * *

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 Commission was reported by me; that I transcribed my notes; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL June 7th, 2003.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 16th, 2006

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION COMMISSION

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

APPLICATION OF THE FRUITLAND COALBED METHANE STUDY COMMITTEE FOR POOL ABOLISHMENT AND EXPANSION AND TO AMEND RULES 4 AND 7 OF THE SPECIAL RULES AND REGULATIONS FOR THE BASIN-FRUITLAND COAL GAS POOL FOR PURPOSES OF AMENDING WELL DENSITY REQUIREMENTS FOR COALBED METHANE WELLS, RIO ARRIBA, SAN JUAN, MCKINLEY AND SANDOVAL COUNTIES, NEW MEXICO

CASE NO. 12,888

RECEIVED

JUN 13 2003

Oil Conservation Division

ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

COMMISSION HEARING (Volume II, Wednesday, June 4th, 2003)

BEFORE: LORI WROTENBERY, CHAIRMAN
JAMI BAILEY, COMMISSIONER
ROBERT LEE, COMMISSIONER

June 3rd-4th, 2003

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Commission, LORI WROTENBERY, Chairman, on Tuesday and Wednesday, June 3rd and 4th, 2003, 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.

* * *

C U M U L A T I V E   I N D E X

June 4th, 2003 (Volume II)
Commission Hearing
CASE NO. 12,888

(Continued...)

(Continued...)

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CUMULATIVE INDEX OF EXHIBITS

Burlington/BP/ChevronTexaco

	Identified	Admitted
Exhibit 1	42, 44	60
Exhibit 2	69	89
Exhibit 3	86	89
Exhibit 4	95	125
Exhibit 5	127	139
Exhibit 6	145	162
Exhibit 7	210	210
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Exhibit 11	214	221
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Exhibit 16	95	125

* * *

ConocoPhillips	Identified	Admitted
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Exhibit 2	299	326
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CUMULATIVE INDEX OF EXHIBITS (Continued)

ConocoPhillips	Identified	Admitted
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* * *

ChevronTexaco	Identified	Admitted
Exhibit 1	331	-

* * *

Williams	Identified	Admitted
Exhibit 1	334	-

* * *

Additional submissions:

* * *

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* * *

WHEREUPON, the following proceedings were had at 9:00 a.m.:

CHAIRMAN WROTENBERY: Good morning, it looks like we're all here. Whenever you're ready.

MR. KELLAHIN: Members of the Commission, yesterday we presented Mr. Thibodeaux's presentation, and I need to do a little housekeeping with you.

When we look at the exhibit book, Mr. Thibodeaux's primary presentation on the PowerPoint, the hard copies of which were behind Exhibit Tab 4, he then said that insofar as his geologic opinions impacted the low-productivity area, you can find that information behind Exhibit Tab 16.

The third exhibit tab I failed to request introduction is the one that Mr. Thibodeaux has behind Exhibit 8, and those are displays that cross over. He's got a type log, and the third page down is a locator map, and it's a nice visual illustration on this display of the five pilot project areas.

I've asked him again this morning, he's confirmed that the major points that are indicated on these displays have been covered in these other presentations and his testimony. If at the end you have questions about his work in either the high-productivity area or the low-productivity area, he will be available to respond if there's anything further.

With your permission and that explanation, we would ask that you admit the slides behind Exhibit Tab Number 8.

CHAIRMAN WROTENBERY: The materials behind Tab 8 are admitted into evidence.

May I ask about one other tab?

MR. KELLAHIN: Yes, ma'am.

CHAIRMAN WROTENBERY: Did we do 7? Did we -- Some of Mr. Fassett's --

MR. KELLAHIN: Yes, this was done by Mr. Fassett yesterday.

CHAIRMAN WROTENBERY: And we did --

MR. CARR: No, you did not admit them. We didn't address these. Again, what we have done -- and this is a summary of what Tom just said about Steve Thibodeaux's work -- we have got supplemental information that we didn't particularly address, but it was covered generally by his testimony. And the material behind Tab 7 also should have been admitted, but it was not, I didn't ask for that. So I'd request it now.

CHAIRMAN WROTENBERY: Okay, then we will admit the material behind Tab 7 into evidence.

I think that gets us --

MR. CARR: There also was a last page in Dr.

Close's material that said supplemental exhibits, and we don't have any.

CHAIRMAN WROTENBERY: Okay.

MR. CARR: If there is a question about that, it's not that we pulled them; there never were --

CHAIRMAN WROTENBERY: Okay.

MR. CARR: -- any of those. Okay.

CHAIRMAN WROTENBERY: Okay, thank you.

MR. KELLAHIN: In an effort not to confuse you, let me share with you what I think is where we're going, and maybe we'll end up there and I will not be confused either.

We have concentrated for the last few witnesses on giving you specific presentations addressing the high-productivity area, which is a portion that supplements the work shown to Examiner Stogner last summer.

We are about to show you stuff that was not presented by Burlington to Mr. Stogner. The next two witnesses, Mr. Pippin and Mr. Balmer, are the geologic and engineering experts with regards to the high-productivity area of the Fruitland Coal. Their responsibility for the hearing before Mr. Stogner was confined to witnesses in the low-productivity area. So in sharing the workload, it was our share to do the low-productivity area.

So we're back before you today to talk about in this last portion about Mr. Pippin's geologic framework in which Mr. Balmer has done the specific science.

In addition, Mr. Balmer, after he completes his discussion of the high-productivity area, we're going to skip Mr. Vu's discussion, which is high-productivity area, and transition with Mr. Balmer back into the low-productivity engineering so that you have a witness that can pass across each area. And if there are questions, then he's a good one to ask your questions of.

That's my plan.

CHAIRMAN WROTENBERY: Sounds good, thank you. Let's go ahead.

EDDIE PIPPIN,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A. I'm Eddie Pippin, geologist for Burlington Resources.

Q. Where do you reside, sir?

A. Farmington, New Mexico.

Q. Summarize for us your education.

A. I've got a bachelor of science degree in geology, 1983, from Southern Illinois University.

Q. How long have you been employed by Burlington with regards to studying the geology of the coal in the Commission's Basin-Fruitland Coal Gas Pool?

A. I've been with Burlington for over 10 years, I've been a geologist on the coal team for a little over six years.

Q. Have you aided the other geologic experts on the industry Committee, reviewed some of their work and had them review some of your work to see if there were major points of difference among any of you?

A. Yes, sir, I've been a part of the Committee since its inception.

Q. With regards to the geologic presentations we've heard up to now, do you have any personal disagreement or objection to any of the comments that you've heard yesterday?

A. No, sir.

Q. Let's set the framework, then, for Mr. Balmer's engineering studies in the high-productivity area. Tell us specifically what you're setting up so that we can transition into Mr. Balmer's work.

A. I'll be continuing the theme of the variability with the HPA, and more specifically for Mr. Balmer, starting the presentation on the pressure information we have gained from our test wells.

Q. Is the work we're about to see your work product?

A. Yes, it is.

Q. And the opinions that you're about to express are your personal opinions?

A. Yes.

MR. KELLAHIN: We tender Mr. Pippin as an expert geologist?

CHAIRMAN WROTENBERY: We accept Mr. Pippin's qualifications.

Q. (By Mr. Kellahin) Please start.

A. The purpose of my discussion today, first I'll show you an original gas-in-place map that I've calculated, use it and several other exhibits to further address the variability I've seen within the HPA and the fairway in general. I will go from more of a regional look down to a specific example on a couple cross-sections, and I will also use those cross-sections to help introduce Dr. Balmer's work following me.

Q. When we talk about the gas-in-place study that you've done, Mr. Pippin, are you using a method that is identical with the gas-in-place methodology used by the other witnesses?

A. Yes, I used the exact same formula that Dr. Close presented and discussed yesterday.

Q. Do you have an access to sufficient geologic information within the high-productivity area to allow you to reach an expert opinion in which you have confidence?

A. I believe so, yes.

Q. We're looking at what you're showing to be an original-gas-in-place map.

A. Uh-huh.

Q. I think it's helpful if you start and tell us the color-coding and how -- what that significance is, and then let's talk about the conclusions.

A. Okay. Color-coding in this, the lesser gas volumes are in the greens and blues. You increase through the reds and yellows for the maximum amount of gas.

Maybe a couple points of orientation I should cover on this. New Mexico state line is across the top of the page. The black outline is the HPA line that the Committee agreed to. The color fill on the map, however, extends beyond that, onto the edge of what we would call the fairway.

One thing I would like you to notice particularly on this map is that if you recall back to Mr. Thibodeaux's presentation yesterday, you can still see the fluvial channels cutting through in multiple places across the fairway, and even in the interfluvial areas you can still see considerable differences, almost down to a well-to-well level.

Q. One of the items the work study group addressed is a study to determine to what extent the high-productivity area was continuous or discontinuous?

A. Yes, that's --

Q. What conclusion have you reached about that?

A. I've found that it's very discontinuous, that those discontinuities are throughout the HPA in the fairway. This slide, combined with the next one, will address that more specifically.

Q. You've done this just a little differently than we saw yesterday. Set up what you're doing and what the points are that we're supposed to get from this display.

A. Okay. These slides are an attempt to help define or to locate where those discontinuities are. We've seen several examples in cross-sections, but as of yet I don't think we've identified the extent of those variabilities within the fairway.

So what you're looking at on this map, each data point represents where Burlington has a digital log entry in its database. It has some sort of curve that is useful across the Fruitland section. In most cases it's a density log, in some cases it's a neutron, on rare occasions it could be even a bond log with a very well defined gamma-ray, something that would define the coal in a matter that we could have confidence correlating to the next well in the cross-section.

So what I did was take that data set, create a series of cross-sections in a rather functional method that would incorporate every one of these wells on at least one of the cross-sections. And then I went through an exercise to correlate every coal that I could.

Q. Having done that, do you have a slide that will illustrate your conclusion?

A. Yes, sir. This slide, now looking at the red dots on the map, represent all those points where I could not correlate a coal in one well to the next well in the cross-section.

Q. A red dot, then, represents what?

A. These red dots represent pinchouts in the coal, where in one well we will have the coal, the next well in the cross-section that coal has disappeared.

Generally, these seams are about 2 to 10 feet thick, and approximately 50 percent of them within the HPA do have some sort of pinchout that I identified. What we don't see on this slide, however, are those coals that we did not intersect with this data set.

The next slide is simply a locator map. The yellow dots represent the test wells or the pressure-observation wells that we collected pressure information.

You can see both our wells and Devon's in here. The base of this map is a daily rate production map where the blues and greens are the lower rates and the pinks and the reds are the higher rate.

This is designed to focus on the New Mexico fairway. The coloring in the upper left of the slide is an attempt to show that the fairway does extend up into Colorado, and then there are three additional Ute wells that we used for testing up in Colorado.

Two points I would like to single out on here is the 30-6 POW Number 2, located right in there, and the Seymour 2A. I'm going to show just two cross-sections to you today. One will be a strike section for the POW Number 2, the other will be the dip in the 2A area.

Q. What's your purpose in selecting those two, Mr. Pippin?

A. There's a couple purposes. One is to show an example of what I picked out as a pinchout that we saw on the previous slide. The other is to show where the pressure tests were placed relative to the coal, which Dr. Balmer will discuss in more detail momentarily.

Q. All right, let's go to the pressure-observation 2 well slide. Are you using a nomenclature that's different from Mr. Thibodeaux's?

A. No, sir, this is exactly the same as what Mr.

Thibodeaux presented in both map view and cross-section view yesterday.

Q. Show us what we're supposed to see.

A. Okay. First, this is a three-well cross-section with the POW Number 2 in the center. What I'd like for you to focus on first are the coals above the blue line. If you look at the well on the right-hand side, there's one, two, maybe even three distinct coal packages there. If you follow that to the middle well, the POW 2, there's only this one seam left which would correlate to the one up above here.

The two coals here that have disappeared, they're no longer in the rest of the cross-section, an example of what would be a red dot on the previous slide.

Likewise, we look below the blue, the blue line, at the coals here. In the left-hand two wells you can see about a 20-, 25-foot-thick coal, and particularly in the POW Number 2 is closely associated with the coals below it. However, if you move to the well on the right-hand side, that's now shrunk down to around 8-foot coal, and it has separated by some 50 to 60 feet from the lower coals.

I think in both instances here we would be challenged to efficiently retrieve all the gas that's in the formation. If we look at the lower coals in this section, scanning left right across the section, you can still see that some of the coals thin and separate, but not nearly so much, to the degree as the upper coals that we looked at.

Another point I'd like to make on here is, if you look at the red bars along the side, and with the labels, the pressures that we measured, we were not able to isolate every individual coal, but even in this attempt we still had to combine two or three or so zones for those measurements. But again, Dr. Balmer will discuss that in a little bit more detail after myself.

The last thing I'd like to show you is a cross-section, and this is the dip section in the Seymour 2A area. Unfortunately, the 2A did not have a good log to put in the cross-section, so I used a twin of that, the Seymour 2B, but the coal sections are the same, so I don't believe I've lost anything at all.

Again, scanning kind of left to right, you can see that the coals do thin, do separate a little bit, particularly focusing on the brown coal at the bottom. You've got a thicker package here. Coming off to the right, it ends down considerably, but again not nearly the same or to the degree that we saw in the previous example. And again, I have posted the pressures on the right-hand side of the 2B.

I guess the one thing I would like you to take away from any and all of these slides that I've presented today is the variability that I've seen within the HPA in the fairway. Whether we're looking more at a regional level, at the gas-in-place map or at specific examples off the cross-section, we are going to be challenged with the present wells that we have to retrieve the gas that's in formation.

So it is my opinion that we need additional wells to help recover that gas.

MR. KELLAHIN: That concludes our presentation of Mr. Pippin.

We move the introduction of his exhibits behind Exhibit Tab 11.

CHAIRMAN WROTENBERY: The exhibits behind Tab 11 are admitted into evidence.

Questions?

Thank you very much, Mr. Pippin.

THE WITNESS: Thank you.

MR. KELLAHIN: Members of the Commission, Dr. Balmer's presentation for the high-productivity area is behind Exhibit Tab 12, and that's where we'll start. And then when we talk about the low-productivity area, we'll move to Exhibit Tab 14.

Dr. Balmer, are you a baseball fan?

DR. BALMER: Yes, I am.

MR. KELLAHIN: You're batting cleaner?

DR. BALMER: I feel good about it. Cubs are in first place, feel pretty good. It's June.

<u>JEFF BALMER</u>,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Please state your name and occupation?

A. My name is Jeff Balmer, I'm a reservoir engineer for Burlington Resources.

Q. Summarize your education.

A. I have a bachelor's of petroleum engineering from the University of Missouri in Rolla, awarded in 1988. Through a series of different jobs I came back and was awarded a master's degree in environmental and planning engineering, also from the University of Missouri in Rolla, in 1993. And then subsequent to some additional work, I came back and received a doctoral degree in petroleum engineering from the same university in 1998.

Q. Summarize for us your experience as a petroleum engineer in the Fruitland Coal gas.

A. I have two years, almost to the day, of experience, primarily in the high-productivity area, as a reservoir engineer in the Fruitland Coal.

Q. The reservoir engineer that presented the engineering study of the low-productivity last summer was not you?

A. That is correct.

Q. That was -- ?

A. Dr. Clarkson.

Q. -- Dr. Clarkson. And he's now residing in Canada, I believe?

A. Uh-huh, with a very pregnant wife. So he's essentially retained in Canada for the duration of the hearing.

Q. Have you talked to Mr. Clarkson?

A. Yes, I have.

Q. Have you reviewed his testimony that he presented before Examiner Stogner?

A. Yes, I have.

Q. Have you made yourself informed as to the reservoir engineering components of the low-productivity area?

A. Yes, I have. In addition to that, I was utilizing a consulting position to help put some of those slides together, primarily done by Mr. Thibodeaux and Mr. Clarkson, however I did have a hand in reviewing those slides prior to the original testimony last July.

MR. KELLAHIN: We tender Dr. Balmer as an expert petroleum engineer.

CHAIRMAN WROTENBERY: And we accept his qualifications.

Q. (By Mr. Kellahin) Let's start with the high-productivity area, Dr. Balmer, and I'm going to let you start, give us some idea where you're going, and let's go.

A. As an engineer I think it's important, in my mind anyhow, to try to visualize what we're talking about. To that extent, after the introduction of a recovery-factor map that Eddie -- or excuse me, Mr. Pippin and myself prepared, I have somewhat of a cartoon description of what I view as the -- what we're facing relative to the stranded gas in the reservoir.

After a description of that I'll introduce the layered pressure testing data that we have performed, discuss a little bit about the methodology behind that, and then more detail, some of the conclusions that we've been able to derive from that.

Towards the conclusion of my presentation, I'll discuss three different methodologies for estimating unique recovery in the high-productivity area, and then have a very brief summary at the end of it.

Q. Let's do it.

A. Okay. This first slide just gives you a basic outline of what I had pretty much just said, introduce the recovery factor map, discuss more or less on a cartoon basis what the stranded gas -- how that will exist in the reservoir under current 320-acre development, discuss layered pressure testing, both kind of in an overall description and then in detail, introduce different methodologies for recovery estimates, and then summarize with a concluding slide.

I'd like to start out with a summary for the reservoir engineering data and kind of start at the end and then go through the middle of it subsequent to this. The important thing is that new data is available since the July, 2002, hearing.

We were charged specifically with coming back after the original hearing and investigating and gathering data in the high-productivity area in New Mexico, and I think both Burlington and Devon and ConocoPhillips have done a good of going back and doing that. So I feel like the original requirements set out in the ruling were followed.

One of the very important things to remember -- and this has been a theme that you've heard several times throughout this from several of the presenters, is that even with a small pressure reduction you're still able to liberate large quantities of gas through infill drilling. The high-productivity area is a very unique area. There's a lot of gas in place in there. We're of the opinion that we'll be able to get more than just small amounts of pressure reduction, that even if you get just a small amount you can still liberate a lot of gas.

Q. Stop right there, Dr. Balmer. Yesterday Dr. Lee asked a question with regards to this issue, and I told him we'd have the answer.

A. Yes.

Q. Let's go back and understand the question.

A. I believe the question that Dr. Lee posed was the effect -- if you infill drill, how would that actually lower the abandonment pressure overall in the reservoir? We have heard a significant amount of testimony that indicates that there are lateral discontinuities in the coal, particularly in the high-productivity area -- or specifically, I should say, in the high-productivity area.

I think the answer to that would be, if you have discontinuous coals and you drill an infill well, your abandonment pressure at your parent-well location may not be that affected. That's on the assumption that none of the coals are intersecting each other or in communication with each other.

However, going with the discontinuity theme, if you're able to effectively lower the abandonment pressure in an area away from the parent well for -- perhaps in an infill-well location, the overall average of the abandonment pressure for that zone would be lowered, therefore liberating increased amounts of gas.

COMMISSIONER LEE: You're telling me -- That's not what you presented yesterday. But what I see is this. If you have an infill drilling, you are accelerating speed to go to the abandonment pressure.

THE WITNESS: You also do that, yes, in addition to recovering unique reserves, yes.

COMMISSIONER LEE: Right, okay.

THE WITNESS: Your overall field life will be reduced.

COMMISSIONER LEE: But abandonment pressure is set by the operator, abandonment pressure is not set by the operation.

THE WITNESS: That is correct.

COMMISSIONER LEE: Okay.

THE WITNESS: And again, going with the theme of discontinuities, if you look at a pressure distribution over time, which we'll see here, you'll -- it will better demonstrate where those higher-pressure areas or higher-gas-concentration areas will be located in your reservoir under current development.

COMMISSIONER LEE: So you're thinking about is a one tank and two tanks, with a valley in between the --

THE WITNESS: That is correct, there is a -- and it's all interrelated. I've drew a reasonably simplistic cartoon approach to it. However, making the assumption that they are intertwined, I believe that that will be a reasonably good explanation for what we're discussing.

COMMISSIONER LEE: Okay, I'm happy.

MR. KELLAHIN: If you're happy, I'm happy.

THE WITNESS: I'm very happy.

Q. (By Mr. Kellahin) Let's go.

A. The -- Really, the conclusions from this testimony will be that the reservoir and geological data indicate that significant amounts of gas are still left in place under current development. My approximations, rounded, are that between 300 and 600 BCF of incremental gas will be recovered due to drilling down to 160 acres in the high-productivity area of the New Mexico Fruitland Coal.

This recovery-factor map was developed with the assistance of Mr. Pippin and taken from his original-gas-in-place map that he's shown. Without going into intimate detail on this particular map, the primary items that I'm trying to demonstrate here are that there is a high degree of variability throughout this reservoir.

To set up a little bit about what this map is showing is, the yellow colors and larger circles are representative of higher recovery factors. The reddish colors and smaller circles are representative of significantly smaller recovery factors. These just are Burlington-operated well, they do not contain any other operator information.

A couple of things to point out here, and this was indicated before. Clearly in the high-productivity area, if you look, the majority of the larger circles are shown in the high-productivity area, and there's no disputing that. However, there are significant amounts of large circles or high recovery factors outside the high-productivity area in the northern sections of 32 and 6 and 32 and 7, just outside some of the 30-and-6 areas, and then to the southern portion of the HPA outline.

Also, it's important to note that inside the high-productivity area -- perhaps a good example is the 30-and-6 area, which is arguably one of the most prolific, if not the most prolific, developments in the high-productivity area -- you still find instances of low recovery factors within the high-productivity area.

Q. Don't leave that just yet, Dr. Balmer. When I look at that map, I'm looking at recovery factors as opposed to drainage circles?

A. That is correct. They're -- In general, you can equate the size of the circle to an enhanced drainage acreage or drainage area. However, there's difficulties associated with that particular methodology, as has been described, and perhaps a flaw in the original hearing, in that if you are trying to assess a drainage area based on a single pressure or a single -- a composite layered system, there's inherent problems with that, based on the variability that we'll demonstrate with the layered pressure testing.

Q. Take your laser pointer and show us an example where it appears that you've got what might be interpreted to be drainage circles that overlap each other and therefore are in competition.

A. Well, a good example is here in the 30-and-6 area, in here, and in these locations right here where, as has been testified by Mr. Kump, there potentially will be areas in layers, and admittedly so, that the drainage areas or drainage radius in those layers will have some overlap, if that's possible.

I think if you look at it from a more -- step back from a physical standpoint, once you reach some type of interference the physical overlapping generally cannot occur. You're either -- that molecule of gas is being pulled one way or another way. But this does demonstrate that, you know, in some areas, in some layers, the drainage areas could conceptually overlap.

Q. Please continue.

A. This is kind of, again, me stepping back and trying to make things a little bit simplistic. And I'll follow this up with the cartoon that I've alluded to.

Really what we're charged with, or as a reservoir engineer for this project, how can we recover gas through infill drilling? I mean, what's the purpose, what are we really after?

And just sort of to repeat the theme that gas is recovered by any reduction in reservoir pressure. If you're able to liberate any amount of gas, it comes through a reduction in pressure.

Even in perfectly zones, additional gas is recovered, because as you move farther away from that well, your pressure will increase the farther you are away from the take point or from that well. And it's clear that the Fruitland Coal is not homogeneous, so even with -- even in a simplistic everything is perfectly talking to each other, you're still going to recover additional gas.

The third point is that gas is recovered in zones that are not effectively intersected by zones [*sic*]. And this is a good example to think back to what Mr. Pippin and Mr. Reitz had indicated in prior testimony, that maybe 50 percent of those zones are only intersected by a single 320-acre well, so you have a pinchout that occurs prior to intersecting the other well. And again, that will be better demonstrated in the next slide.

And then also in addition to this, gas is recovered in zones that are not intersected by any wells. So if you have an isolated zone -- and Mr. Fassett showed some extremely good examples of this where we have a significant portion of zones that are just floating out there, that potentially have not been intersected by an existing 320-acre well, and some of the pressure testing that -- in particular, one example that Devon has shown where they have two zones in a single well that are essentially at virgin pressure in the high-productivity area, that's a good example of a zone that has not been intersected effectively by a 320-acre well.

Here's my take, or my trial at some animation here. Again, as an engineer if I can draw a picture and help myself understand it, it seems to make more sense to me. The points that I had made on the previous slide are now shown graphically here. Starting with the -- We have really four points I'd like to make on here.

The top zone is an example of an isolated zone. The deep red color indicates high gas concentration. This is an example of how the reservoir would be in original conditions. We've just discovered the Fruitland Coal, we begin to develop it on a 320-acre spacing, and these are the types of things that we'll see.

I'd like to repeat that these are very interrelated. This is a simplistic view of it, but again I think it's representative of what we'll find when we begin to investigate a little bit deeper.

The top zone is an example of an isolated zone. It's a zone that is not currently intersected by any 320-acre wells. The middle zone is a zone that is not effectively intersected by wells on current spacing. That would be considered in geologic terms a pinchout. You see it on one well, you follow it along the cross-section and it is not apparent in the well next to it.

The bottom zone -- And this is generally what people conceptually think about when they think about the Fruitland Coal, is a very thick zone that contributes a lot of gas to the productivity area. These are the zones that when you take a single surface pressure, you might see at 100 pounds or 150 pounds, something like that. It masks the complexity of it in there.

And I've tried to associate a minor degree of complexity by introducing these permeability restrictions or baffles, as Mr. Thibodeaux had presented prior evidence.

These are a variety of things. It could be zones of very low permeability, it could be a small stream or creek bed that had gone through that essentially eliminated the coal section, it could be some of the faulting that was demonstrated before. There's a lot of -- a variety of things that could be introduced in here. But in general purposes, for this description, it's called a permeability restriction.

The way that this develops -- and if you could continue to watch the screen so I get credit for my animation here -- the stranded at abandonment conditions will look something like this. And again, you know, semantics would dictate what exactly the colors should be at these different areas. But starting with the top zone again, under current development at abandonment conditions you really haven't produced any gas from that isolated zone.

Again referring to the Devon testimony, their original reservoir pressure was roughly 1642 pounds. The current pressure in those zones was 1450 pounds. To me, based upon my reservoir engineering analysis, those are isolated zones. Those are not -- they are not intersected by a 320-acre well.

The middle zone is an example of a pinchout where, near the 320-acre well that intersects that zone you do have reasonably good depletion. As you move farther away, towards the other -- towards the left-hand side of the screen where that zone is pinched out, you get subsequently higher and higher pressure and appropriately higher and higher gas concentration.

The bottom zone, if you can kind of think of that in two different ways. If you eliminate the permeability restrictions where you have gas stranded or stuck behind those areas and just concentrate on the thick zone that spreads across there, again near each of the 320-acre wells, at that take point, you have very good depletion, you will be able to lower the reservoir pressure reasonably well in those areas.

However, as you move towards the middle -- in this case it's very concentric, so your infill well would lay in a spot in the middle of that -- you still have a higher degree of gas concentration in the middle, simply because your pressure at the well and your pressure at the infill location will be different, so you have higher gas concentrations in the middle.

The permeability restrictions again -- it arbitrarily put in four there -- are just areas where you have trapped gas. The gas is unable to flow effectively, due to either a faulting condition or a permeability baffle, an area of lower permeability. Something is restricting that gas to flow there.

So again on a pictorial example, this is where we are under current development.

If you spot an infill well, this will demonstrate what the effect of this infill well would be. You can drill this infill well. And again, this is drilled right in the middle, and once we hit new abandonment conditions with 160-acre development, this is again clearly just a pictorial representation of what will happen. But you have the opportunity to develop the stranded gas that's in there. I'm not suggesting that you'll receive every single molecule of gas that's available to be taken out of there, as this example perhaps demonstrates, but your opportunity to intersect a gas that will not be produced on 320-acre spacing is certainly enhanced.

Q. On this slide, Dr. Balmer, the infill well as to the middle zone, is some of that gas attributable to rate acceleration?

A. Some of it will be, yes.

Q. But then you would also get gas that you would otherwise not produce by the parent well?

A. That is correct.

Q. Have you gone through a study to determine how much of the gas is recoverable?

A. Yes, I have.

Q. Let's do that.

A. Okay. This is an equation that you've seen several times prior to this, originally introduced by Dr.

Close. And really, I just wanted to put this up here to set the stage for the next slide, which will be what I have termed an incremental isotherm, where I'm going to demonstrate how small amounts of pressure reduction can liberate large amounts of gas.

This is a simple pressure reduction, and -- I've termed it an incremental isotherm -- and it generally applies -- if you think of it conceptually, if you have a very thick, continuous zone -- in this case I've assumed that you have a 50-foot-thick zone. And what I'm trying to demonstrate is, if you drop the reservoir pressure, on average, through infill drilling, by just one pound, just one p.s.i. -- in this particular example I'll show you from 100 pounds to 99 pounds, how much gas will be liberated with simply a 1-p.s.i. drop in reservoir pressure.

And this is a good reason why we continue to work with our field personnel, to try to optimize pumping units and compression at the surface, because every pound of pressure drop you get, that you can translate to downhole conditions, liberates a significant amount of gas.

And here if you enter the graph from the bottom -- and this is again approximately from 100 to 99 p.s.i., and then you read over to the left -- dropping the pressure from 100 p.s.i. to 99 p.s.i. releases 28 million standard cubic feet of gas. That's in a perfectly laterally continuous 50-foot-thick zone, with only a single 1-p.s.i. pressure drop, you'll liberate that amount of gas. And clearly our -- my engineering judgment would tell me that that's an extreme minimum, and your opportunity to decrease reservoir pressure in all the zones would be significantly higher than just the 1 p.s.i.

Q. Let's transition into the layered pressure study.

A. Okay. This slide just essentially sets the stage for the types of wells that we tested and why those wells, we feel, are representative of the high-productivity area.

We utilized two different types of wells for the testing, both wells that were candidates for plug and abandonment from prior formations or essentially wells of opportunity where we had the chance to come in and, instead of plug it, we could do some data-gathering on those wells. And in addition, we utilized four existing pressure-observation wells that we had in the Fruitland Coal.

Essentially the tests consisted of isolating those individual zones on each layer and taking pressure measurements. We utilized temporary gauges with the plug-and-abandonment candidates and permanent gauges in the POWs.

Much to my chagrin, sometimes those temporary gauges were left in there for up to 30 days. I really wish that we didn't have to absorb the cost of having those gauges in there for that long a period of time, but I'm very confident that the readings that we got from those gauges were pretty good pressures. They flattened out, generally, after -- oh, sometimes in a matter of days, and we just didn't have the opportunity to go in there and pull those gauges out, although we continued to pay for them.

The locations of the test are widely dispersed across the high-productivity area, and it's difficult to see.

If I could direct your attention to the map up here, there is -- We have four tests that were done in the 30-and-6 area. These are the green circles on this map. Devon had data that was in the NEBU Unit, which goes through here. Burlington also had the Seymour 2A, which Mr. Pippin showed a cross-section for. The 32-and-9 67A, which is again a very prolific area.

And then we had three data points that were in the Ute wells in Colorado. However, these wells were in very prolific areas, 10 to 15 BCF or more of EUR, estimated ultimate recovery, for those areas. And as any geologist here would attest to, the Fruitland Coal knows no state boundary line. So we felt that the evidence from these Ute wells in Colorado could be utilized as high-productivity-area exhibits for the New Mexico Fruitland Coal.

The locations of the tests varied in the proximity to the parent wells. So we had a few tests that were very, very close to parent wells, we had some tests that were more or less in infill-well locations. Utilizing the nine Burlington wells, we had about six that you could say, plus or minus, were in infill locations, and I had that cutoff of it had to be greater than 1500 feet from the parent well. Utilizing all three Devon wells, however, we had -- they were all in, plus or minus, infill-well locations.

So there was a sampling of nine possible infill locations, including the three Devon wells, that I've culled out and we'll talk about somewhat separately with respect to some data analysis that I've performed.

The cost of the pressure tests -- and this is a gross basis -- was $675,000. I'm not sure how the red K on my slide got translated to a black M on the hard copies, but that's --

(Laughter)

COMMISSIONER LEE: You're almost my favorite --

(Laughter)

COMMISSIONER LEE: Oh, you have a second one of my students there.

THE WITNESS: Yeah, okay, I can understand that.

Again, just a small slide to repeat what Mr. Pippin had demonstrated before. These are the infill well locations. One thing that I would like to note that needs to be changed, is the Devon well -- in the uppermost well labeled the 400 is actually in the low-productivity area. That was incorrectly drawn on this particular map and should be -- it's actually located just outside the line, that's correct.

It's interesting to note, to step back -- and I'm not trying to discuss too much on Devon's data, but if you recall back to their testimony, of all the wells that had the most similar pressures, the well that was in the, quote unquote, low-productivity area actually had the most similar pressures, indicating that the differential depletion that we are touting was seen to a lesser degree in a low-productivity area than the high-productivity area. Just, again, somewhat of a data observation.

The two wells that they had in the high-productivity area actually showed a greater degree of differential depletion, and I'll talk to that a little bit more in detail with the Burlington wells here in the next couple slides.

Again, kind of -- somewhat starting with the end and then working backwards, the conclusions of the layered pressure testing are that the coal is really not being drained efficiently.

It's vertically heterogeneous or variable in quality.

That the prior testimony that was introduced in the original hearing that a single layer pressure test -- or a single test at surface could be effectively utilized to describe all the layers is really probably not a good approach to have.

And that we do see differential depletion is occurring.

One of the thoughts originally that we had is, maybe it's just these -- we're going to get some 1-foot-thick zones or 2-foot-thick zones that are not depleted. Well, as you'll see, and as the Devon data suggested also, there's significant thick layers out here that are not depleted. You take a 10-foot-thick layer that's at 800 or 900 pounds of pressure, and there's a lot of gas in there that's going to remain in place under current spacing.

The other thing that was somewhat surprising and was brought up in some of the committee meetings was, well, let's not confuse original or gas in place with recoverable reserves, and if you're after these thin 1-foot or 2-foot-thick layers, why would we believe that those wells -- those thin zones, could be productive? And I'll demonstrate in some specific testimony that we have examples of 2-foot-thick layers or 1-foot-thick layers that are very well depleted and are obviously very highly permeable and can effectively produce the gas that they have.

I'll take a minute to kind of set this slide, and we can discuss it in brief detail or go over it in as much detail as you would like. But the points on the previous slide are listed off to the right-hand side, and those are the things that I'd like to have everybody keep in mind as I'm discussing some of these specific items on here.

What this columnar examples is, represents five wells that we had layered pressure testing on in the high-productivity area. And then the subsequent slide is this exact same slide, describing in specifics the four wells that were taken in 30-and-6. So you're going to see two slides that are essentially the same format from each other.

The first column introduces the well name.

The second column is labeled the distance to the offset well. And Mr. Pippin did an analysis of the nearest offset well to the layered-pressure-testing well that was completed in that was completed in that zone. So we didn't want to say, hey, we've got a well right here, it's got this layer in it but it's not completed. That's not really fair for analysis. It has to be a zone that has the opportunity to be produced in some of the offset wells.

The third column is a net thickness, which was taken from the density logs.

The fourth column is a measured pressure, or what we actually saw from the gauges that we had in the hole.

And the last column is what I've labeled the percent recovered, which is the percent to date, when that pressure was taken, of how much depletion has occurred at that point in time, utilizing that pressure.

You've probably heard the prior testimony on modified material balance, how that can be utilized to essentially -- at a given pressure and a given recovery factor, you can either use -- excuse me, at a given pressure or a given production, cumulative production to date, you can use one to calculate the other.

In this case, utilizing a pressure I could calculate an estimated recovery to date at that point in time and then back out a percent recovery to date.

A couple things that I'd like to demonstrate here.

If you look at the first well, the Seymour 2A, there's three zones that I'd like to point out. The top two zones, one at 10-foot thickness and one at 7-foot thickness, and then the bottom zone at 21 feet thick, are at, you know, an average of roughly 650 pounds. The recovery percent in those areas, if you average it out, is probably about 25 percent. That's 38 feet of coal in that well that's essentially very, very poorly depleted. That's a good example of an area where we'd probably jump on the opportunity to drill an infill well and try to deplete some of those coals.

COMMISSIONER BAILEY: When was that well completed in the Fruitland?

THE WITNESS: The Seymour 2A was actually not a Fruitland Coal well. It was a P- -- It was a Mesaverde original well. It's probably 25 to 30 years old. I'm not sure, this might be possibly what you're asking. We ensure through bond logs, through cement bond logs, that we are not getting communication behind pipe, which is a very important consideration, so that essentially the data that you're taking is truly isolated and that you're not having communication behind pipe in those zones.

COMMISSIONER BAILEY: No, my question more goes to the fact that Burlington in its previous incarnations as Meridian and El Paso had quite a bit of learning on how best to drill and complete the Fruitland Coal wells --

THE WITNESS: Uh-huh.

COMMISSIONER BAILEY: -- from open-hole to -- and cavitation --

THE WITNESS: Uh-huh.

COMMISSIONER BAILEY: -- to cased hole. So those previous techniques may have an effect on the recovery factor for a well that was completed 30 years ago?

THE WITNESS: I understand. That's a very good question, very appropriate. I believe the answer to that would be, the surrounding wells in that area were cavity-completed with the best technology that we have available to produce those wells. The -- speaking of the offset wells. Those have been on production for approximately 15 years, and therefore if you translate over to the Seymour Number 2A it has essentially -- the layers that intersect the Seymour 2A have been effectively, to the best of our ability, stimulated in the actual producing wells that are offset to the Seymour.

The next well that I'd like to call your attention to is the middle well, the UTE 17 POW. That is a Colorado well in the high-productivity area. The very bottom zone is approximately 1 foot thick, based upon the log that we had available, and that's at a measured pressure of 105 pounds, which, based upon my calculations, shows a 78-percent recovery at that point.

This demonstrates that the thin layers can be productive. I'm not saying that every single 1-foot-thick or 2-foot-thick zone that you'll encounter will be able to be so prolific that in 15 years you'll get 80 percent of the gas out. However, I'm saying that statistically there's a very valid opportunity for that to occur.

The last one that I'd like to point out is the UTE POW Number 1, which is the last zone. Here at essentially an infill-well location you have a 6-foot-thick zone that's still at 1100 pounds pressure. At that calculation, it's only about 10-percent depleted.

One thing to point out is that these numbers, if you utilize the percent-recovered or percent-depleted numbers from the Burlington data here, they won't match up one to one if you utilize the same information and how Devon had done it.

The methodology is identical, however the Langmuir parameters, in particular the Langmuir pressure that we had utilized in a dispersed basis for all of the Fruitland Coal, are different than the Langmuir pressures that Devon had utilized in specific to the NEBU Unit. Their data was NEBU-specific, and our data is more or less specific to the entire high-productivity area. It's just a -- in case you go back and try to, you know, one off, how come Devon's data or their recovery percents are slightly different than the information demonstrated by Burlington? That's the reason behind it. I think they're both relevant assumptions.

Without going into infinite detail, the testing results are continued here, again repeating that the 36-and-6 area is an extremely prolific area, shows the same things that we have -- had done before. You've got some -- They're vertically heterogeneous, you've got differential depletion occurring, the coal is not being drained efficiently, you have thick zones that are at higher pressures, and that your thin layers can be productive.

Just one item that I'd point out. The very bottom well, the 36-and-6 POW Number 2, has a 7-foot-thick zone that's still at 1155 pounds. My calculation shows that that well is only 9-percent depleted in that layer. And if you think about how much gas is contained in a 7-foot-thick zone, it's several BCF of gas, just in that zone.

So if all you did -- I'm not suggesting this would happen, but if that's the only zone that you were able to get, you can still regard large amounts of incremental gas.

The other item possibly to demonstrate here is, you've seen several examples of very thick zones, 40 foot thick, 30 foot thick. Those were lumped together because we were not able to mechanically isolate some of those zones in the later pressure testing. There's a certain, oh, push and shove, when it comes to the drilling department being able to stick six separate bridge plugs and gauges in the wells, so you're somewhat limited by your ability to put the gauges in and get them out.

In addition, based upon some of the completion techniques in these existing wells, some of those layers are broken up. You have some separation between those layers, but you're not able to mechanically put a bridge plug and gauges in between them to isolate them.

Potentially the rambling, what I'm saying, in a short version, is that you have shown up here maybe a 40-foot-thick section that's broken up into a variety of different coal packages that in all likelihood what we're demonstrating here is the lowest pressure for all those zone. We're representing it as a single pressure for those zones, but in all likelihood the zones that are not able to be mechanically isolated, some of those zones would be at higher pressure than what we're demonstrating here.

Q. (By Mr. Kellahin) You mentioned in your introduction that there were multiple methods for estimating recoveries.

A. Yes, there are.

Q. Can you take us through some of the choices?

A. Certainly. I'd like to present three methodologies for incremental recovery in the high-productivity area.

The first one is just data management, and I think as an engineer the first thing that you need to do when you obtain data is just kind of sit back and think about it a little bit, make some observations on the data without trying to do a lot of in-depth, high-level engineering analysis on it. If you don't have a good idea of what's going on just by getting a feel for the data, I think you may be biasing yourself. So that was the original approach.

The second approach is what's termed a modified material balance, which is a proven technique that you can utilize of pressure and cumulative recovery to date to estimate what your future conditions will be, if you're able to lower pressure through time.

The last and perhaps less technical but possibly the most appropriate recovery-estimate method is what I've termed reservoir description, and it goes back to that cartoon that I indicated before. And essentially what I'm trying to do is call out those four different areas -- an isolated zone, a zone that's not effectively intersected or intersected by only one well and then pinches out, a homogeneous zone that's laterally continuous, and a zone or areas of permeability restriction -- and try to assign some incremental recoveries to each of those four different things that we're faced with and then essentially sum them and kind of see where you land at that point.

Q. Okay.

A. The first methodology that I'd like to introduce is again called the data management method. And given the fact that utilizing the Devon data, hopefully with their permission -- I believe Gary gave me his permission, Mr. Kump -- we're -- If you look at the 12 layer tests that we have, about nine of them are in approximate infill locations. If you look at that data, eight of those nine wells -- and that's 89 percent -- have at least one zone that's less than 35-percent depleted. And you can make that cutoff in several different ways, but I think this is potentially one of the more compelling areas.

If you look at each of those individual wells, of those eight wells, and you added up all of the thickness that has less -- depleted less than 35 percent, you come up with 142 feet of coal. If you divide that by nine you get approximately 16 feet of nondepleted coal in every well.

So essentially what this methodology is suggesting is that if you go out and drill an infill well, you're going to intersect 16 feet of coal that has an average recovery factor of less than 23 percent. If you do a thickness-weighted average, those zones have less than 23 percent of recovery factor to date, and that's after about 15 years of production.

If you --

CHAIRMAN WROTENBERY: Sorry about that.

THE WITNESS: That's all right, thank you. I needed the break.

If you can match the recovery factor to date -- and this is not the estimated ultimate recovery, this is just, you know, if you can get 23 percent more gas out of just this zone, these 142 feet or 16 feet per well, you'll make a total of about 10.6 BCF of gas, which is a rough equivalent of 1.2 BCF of gas per well or 1200 million standard cubic feet of gas per well. That's going on the assumption that your recovery, once upon drilling -- or your life upon drilling the infill well will be about 15 years, which is about how much production we've had to date.

Taking the fact that there's approximately 400 infill well locations in the high-productivity area, just simple math of 400 wells and 1.2 BCF of gas per well, just from these zones alone you could conceptually make 480 BCF of gas, just from these zones.

The second methodology, or excuse me, the second portion of the data management method just looks at these isolated zones. And I think this in particular is a very, very conservative estimate, but again I'm not trying to bias myself other than speaking strictly to the data that we had gathered from these wells, and that -- this in particular is one of the Devon wells, is one of the nine wells that -- or plus or minus an infill location, has at least one zone that's not depleted. I think Mr. Kump's testimony indicated that those zones were at 2-percent depletion, which is essentially nothing. If you divide -- and that was a 5-foot-thick section and a 7-foot-thick section, for a total of 12.

If you divide that out and you assume, you know, 1 1/3 feet of coal -- and normally I wouldn't go to that type of detail and take that somewhat leap of faith, but we've got 12 feet and we've got nine wells, so it's 1 1/3 feet of coal.

If you make that assumption that that isolated zone is at 160 acres -- you're going to find zones that are larger than that, you'll find some zones that are smaller -- but if you assume that it's 160 acres and then you apply a 50-percent recovery factor to this coal section, that you would come up with an incremental recovery on a 12-foot coal of 1 BCF total, or divided by nine would give you about 100 million standard cubic feet per well.

And then translating that, if you get 100 million per well, you've got four wells, you'd get an additional 40 BCF from these wells alone -- excuse me, from these zones alone.

And although this is somewhat of a qualitative look at it, I think it's important again to repeat that when you gather data the first thing that you should do is take a look at it and just see what types of things stick out, without trying to apply, oh, very, very detailed, singular-answer recovery factors or analysis in here. And this was kind of a step back and see what we have.

In summary, the data management method of unique recovery, just in these zones, would give you approximately a half of a TCF incremental recovery.

Q. (By Mr. Kellahin) Let's move to the modified material balance presentation.

A. This is a more complicated approach to describing this. However, I've tried to again develop it in kind of a stepwise approach so that it's more or less understandable.

First of all, just to introduce, material balance is a proven pressure- and production-based method for predicting future conditions. Essentially you match what's going on now, and then based upon what you think is going to occur in the future, you can estimate how much recovery you'll get or where your abandonment pressure will be.

And I've quoted an extremely good paper written by two gentlemen, "A Practical Approach to Coalbed Methane Reserve Prediction Using Modified Material Balance Technique", and it's widely used across the industry for recovery techniques -- excuse me, for recovery estimations.

And without potentially looking at the slide, really what I did was, I looked at the offset wells to the layer pressure testing, and I tried to build a Frankenstein well.

If I took -- if I did thickness-weighted average properties of thickness, density and these Langmuir parameters, gas content in particular, what does the average offset well look like to these layered pressure tests? And that was the basis for this analysis.

I utilized 46 wells to perform this analysis over the 12 wells and came out with an estimated ultimate recovery of 11.5 BCF. If you look at -- and Devon again was very good about submitting very timely data and information, both on the pressure and on their decline curve analysis for their recovery estimates on their offset wells. So we had a very good population of wells surrounding our layered pressure tests.

Once that is done and you have this -- oh, I call it a Frankenstein well, it's probably not a very technically correct term, you can impose -- based upon the EUR of that well you can back-calculate what pressure you are at abandonment conditions. And this will become apparent in the next two slides.

Here's the well as it looks. On average, for the average offset well in here, taking the layered pressure test wells, averaging their properties, you're going to have an average of about 60 foot of coal. It's broken up into different layers, but in this approach they're combined to a single layer. Your gas in place is approximately 20 BCF and your density is 1.5 grams per cc.

Those are the types of properties, the thickness, your density and your gas content, are the properties that go into calculating the original gas in place, again via the same equation that you've seen in prior testimony.

And this is where it gets a little bit complicated, but again it's a very appropriate approach. Potentially answering a question that I'm sure Dr. Lee is going to pose to me, this is an approach where you're consolidating all of the layers into a single layer. So in that particular methodology it is somewhat flawed.

However, I would suggest that doing a weighted average of each of the layers reduces the amount of uncertainty that you have when making a composite layer. Essentially we have separate pressures, separate densities, separate gas contents from each of these layers, and those are all averaged to build this one composite model.

In addition to that, I have built more complicated models than this single-layer model. However, it's very difficult to describe a two- or three- or four-layer modified material balance on a single slide. And the problem with that is, the more layers that you break up, the less that you're able to come to a unique solution.

There are ways to get around that, but if you have four different layers and you're trying to make an assumption of pressure reduction in this layer and pressure reduction in that layer and how much gas has been produced from this layer or that layer, it becomes infinitely more confusing to describe, and you do not come up with a unique solution.

In this particular example, by simplifying it in what I feel is a reasonable approach to a single composite system, you are able to introduce a unique solution, again buying into the assumptions that were made.

All that being said, what you do with this graph is that I've introduced -- my apologies -- that the average well, average offset well will produce about 11.5 BCF at its abandonment conditions.

If you read over to the left -- and you have to do this equation of P over P plus Langmuir pressure to back out what the actual pressure would be -- based upon this, the average abandonment pressure in a 60-foot thick layer would be 248 pounds. That's the summation of all those layers put together. Clearly what you'll have is some zones at lower pressure, some zones at much higher pressure. But on average, your average abandonment pressure on a thickness-weighted basis would be 248 pounds.

Taking this, again, at 248 pounds, the starting point --

COMMISSIONER LEE: Will you go back to -- So how you decide that 11 is your abandonment?

THE WITNESS: That was on decline curve analysis of the 46 offset wells to the layered pressure testing wells. If you took an average of the --

COMMISSIONER LEE: Decline curve analysis, you are going to -- Decline curve analysis, then, you point at what? Decline curve analysis you are going to point at the time, right?

THE WITNESS: It's a rate-time, that's correct.

COMMISSIONER LEE: It's a rate-time. So what's the rate of your cutoff rate?

THE WITNESS: The Burlington wells utilized a 72-MCF-a-day cutoff rate. So essentially you're giving it about as much gas as you can. That's -- As you've indicated before, that's an operational consideration, kind of a break-even point for having a pumping unit or compressor or -- you know, you go much below that and you can't justify producing that well.

COMMISSIONER LEE: Okay.

THE WITNESS: But there's a very little -- very small amount of reserves that you'll recover below 72 MCF a day.

COMMISSIONER LEE: Do you have the wells -- 10 instead of 72 in the area?

THE WITNESS: Could you repeat that, please?

COMMISSIONER LEE: You say 72, right?

THE WITNESS: 72 --

COMMISSIONER LEE: So it's --

THE WITNESS: -- MCF a day.

COMMISSIONER LEE: -- your company's decision?

THE WITNESS: That's correct.

COMMISSIONER LEE: Thank you.

THE WITNESS: The way that this graph works here -- and if you show from this modified material balance, you begin at a pressure of 248 pounds, how much incremental gas could we get out of this 60-foot-thick zone if we lower the abandonment pressure? So as the blue curve will indicate, it starts at 248 pounds. So if you don't reduce the pressure, you read over to the left and you do not get any gas.

Every p.s.i. of pressure reduction that you're able to lower, if you read over to the left, that will indicate the amount of gas that you will produce through infill drilling.

In this particular example, what I've indicated is a 25-percent reduction from 248 to 186 pounds, and again this is a -- your layers that are at 120 pounds at abandonment will now be reduced, you know, 68 pounds. However, your wells at 320-acre spacing that are, say, 1000 pounds at abandonment, if you infill drill those, they may drop from 100) to 500 or 300 or something, and there's no single way to approximate that. But on a gross basis, if you look at it -- if you're able to reduce the abandonment pressure 25 percent from 186 pounds -- or excuse me, from 248 pounds to 186 pounds, you make about 1.5 BCF of incremental gas per well.

The final methodology, and one that again helps me kind of visualize what's going on here, is going to be repeated by introducing this cartoon. It's the recovery estimate method called the reservoir description, and it will essentially walk you through each of the individual components that we have, an isolated zone, an ineffectively intersected zone, a thick homogeneous zone, and what types of permeability restrictions that we may encounter in the reservoir.

And this is again, I'll repeat, somewhat of a simplistic view. But you know, if you apply reasonable estimates to these recoveries what you'll find is, when you add them all it still comes out with a very big number.

I've tried to indicate a schematic at the bottom portion of each of these slides so that you can kind of reiterate what part of that cartoon I'm speaking to.

In this case what we're talking about is a laterally continuous thick zone that's perfectly homogeneous. This does not actually truthfully exist in the reservoir, but clearly this would be a significantly conservative estimate if you made these assumptions.

If a 10-p.s.i. drop in average reservoir pressure is achievable in these prolific zones, that would result in the liberation of 260 million standard cubic feet per well. And as Mr. Kump had indicated on his material balance, it went from approximately 110 to 90 pounds reduction in pressure, or a 20-p.s.i. drop. This suggests, as an example, that a 10-pound drop in average reservoir pressure is achievable in these prolific zones.

Moving up the well to a permeability restriction -- and again I would suggest that this is a conservative estimate, that potentially 10-percent of net pay is restricted just over an extent of 160 acres. So if you have a 50-foot-thick zone, five feet of coal is restricted on 160 acres. That has an OGIP, 5 foot thick at 160 acres, of 800 million standard cubic feet of gas. If you're able to intersect that effectively and get a recovery factor of 50 percent, you make another 400 million standard cubic feet of gas just from those zones that are essentially restricted in there. And those restrictions, to repeat, can be a faulting, permeability restrictions or baffles, you know, by creeks or streams or something that a geologist would probably be much more efficient in describing.

This ineffective spacing, taken directly from the testimony of Mr. Pippin where he approximated that 50 percent of the high-productivity wells will have a zone that intersects only one 320-acre well. He introduced testimony that those thicknesses are generally between 2 feet and 10 feet, taking an average of 6 feet and then backing up to my modified material balance and making the assumption that at abandonment this average reservoir pressure is 248 pounds.

If you can reduce it to 186 pounds it gives you a little bit more gas, not much. But again, you know, this zone has been intersected by an existing well. It's reasonably good permeability. And, you know, you can't expect to get a ton more gas out because it's essentially pinching out just on the other side of your infill well. However, you do get incremental gas.

And the last one is essentially a repetition of what was shown previously where you have -- one of your nine wells has an isolated zone, and without going through the detail, in summary you'll come out with an additional 100 million standard cubic feet of gas from these types of zones.

Would you like me to proceed to the summary slides, Mr. Kellahin?

Q. (By Mr. Kellahin) Let's do that, and then I would suggest we could take a short break and then finish up with the low-productivity area.

A. This is a summary of the last method that I indicated. And again, the cartoons located to the right of the numerics will indicate specifically what zone I'm talking about. But in summary, when you add up all these together, you're coming to the conclusion that about 800 million standard cubic feet of gas can be recovered on a per-well basis throughout the high-productivity area.

Moving to the final numeric summary, if you look at the three different methodologies that were employed, the modified material balance, the data management and the reservoir description, in the middle column on a per-well basis it indicates the amount of gas that you'll be able to recover, incremental gas. And on the right-hand, the rightmost column suggests the total amount of gas that you would be able to recover in the high-productivity area through infill drilling.

The summary is plus or minus half of a TCF, in my estimation.

The final conclusions are things that I've been discussing. We do have new data and analysis that has been performed since the July, 2002, hearing. The data, I feel, is very transferable across the high-productivity area.

We've incorporated both Burlington data and Devon data throughout that, and I've introduced three methodologies to predict additional recovery.

The summary is really that under current development we're not adequately draining the reserves in the high-productivity area of the coal. And again, just to repeat my summary of approximately 300 to 600 BCF of incremental gas will be recovered in the New Mexico portion of the Fruitland Coal through infill drilling.

MR. KELLAHIN: Can we take a break?

CHAIRMAN WROTENBERY: Sounds good. Let's take about a -- We'll break till 25 of.

(Thereupon, a recess was taken at 10:20 a.m.)

(The following proceedings had at 10:35 a.m.)

CHAIRMAN WROTENBERY: Okay, we can go on again.

Q. (By Mr. Kellahin) Dr. Balmer, let's make a transition now and have you give us a short summary of the study work that Burlington conducted in the low-productivity area. You have a PowerPoint presentation that we can observe, and the hard copies of that presentation are behind Exhibit Tab 14.

A. That is correct.

Q. Some of this has got a little geologic data involved in it, and so I'm going to let you be a geologist for a few minutes.

A. Okay.

Q. But if you get uncomfortable with that, I want you to recognize that Mr. Thibodeaux has not left for Hawaii yet.

(Laughter)

Q. While he's physically here, mentally he may be gone, so with some degree of caution we'll defer those questions to him.

A. It won't be the last time he'll bail me out, that's for sure.

Q. Let's go.

A. Okay. I'd like to just give you a brief summary of the low-productivity area. There's been a large amount of testimony previously introduced in the July of 2002 hearing. The remainder of that testimony can be seen behind Exhibit Tab 16. What I'm going to introduce is just essentially a summary that will highlight the primary points that Burlington would like to make, that lead to the conclusion that infill drilling is required in the low-productivity area.

As Mr. Thibodeaux had previously testified, the low-productivity-area pilot testing was performed in areas that were specifically chosen to encompass all nine of the genetic coal packages that he was able to map.

Approximately 7500 digital density logs were utilized to create a coverage of over 100 townships, so we really feel like we have a very good geologic understanding, at least from those points, in a regional setting.

The pilot wells were drilled in areas that were comprised of low-productivity areas, medium-productivity areas and high-productivity areas, relative to the overall low-productivity area. That might sound kind of confusing, so -- It is to me. Let me step back.

The low rates is perhaps a better -- low-rate, medium-rate and high-rate is probably a better description. And essentially what we tried to do with the five wells that are indicated again, if I could direct your attention to the map here, the Davis well, the low-productivity-area well, the Turner well, the Huerfano, the 28-and-6 and the 28-and-5, and as you can see from this cumulative recovery map, they are representative of the different quality of wells that we have in these areas. The lighter -- light blue colors indicating a poorer area of recovery, the areas in the LPA that go more towards the green and then into the pink are representative of the more prolific low-productivity-area wells.

It's important to note that when I go through these -- primarily the layered pressure tests that we've taken on isolated zones, that there's a significant amount of those zones that are at or near original reservoir pressure, indicating that depletion has not occurred in those locations.

And essentially what that does is, it confirms the analysis that we've done on comparing the decline curve analysis from a large subset of wells, close to 1300 wells, dividing that by the original gas-in-place calculation and coming to the calculated estimate that only 18 percent of the gas that's in place is going to be effectively recovered in the low-productivity area, which means 82 percent of the gas in place will remain in the low-productivity area under current spacing -- excuse me, under current density.

It's a very brief presentation. I'll talk a little bit about, you know, introducing the end first, and then coming back with original-gas-in-place and recovery-factor calculations, discussing in brief detail the layered pressure test results from the pilot program, and then I'll finish with essentially the same summary and conclusions.

Repeating once again that there's a lot more information behind Exhibit Tab 16, but the conclusions of all the work are clear that the current well density in the UPE portion of the pool -- Burlington terminology is "underpressured portion/overpressured portion" -- in this particular case, the current well density in the low-productivity area of the pool results in inadequate recovery.

The pilot wells demonstrate that inadequate drainage is occurring in some or all of the coal layers, and we feel that the pilot well results are transferable to the LPA, or the UPE in this case.

Similar to what Mr. Hall had indicated with ConocoPhillips' position in the high-productivity area, Burlington Resources was very much that way in the low-productivity area at the inception of the Committee meetings. We were not predisposed to say that clearly we need to drill up infill wells in the low-productivity area. We felt compelled to study it and reach our own conclusions, and the work that I'd like to present are a summary or an aggregate of what those -- that work and what those conclusions will be.

There's several maps that I'd like to demonstrate some geology on. This is just a total thickness isopach. On the left-hand side you'll see a type well that we utilized to demonstrate the different coal packages that we have available. The total thickness is obviously a summation of all the zones and what we would consider net pay.

The five infill wells or the pilot areas are located in the dark red squares on the isopach map and once again indicate that we do have areas that have thicker coals, medium-thickness, and lower-thickness coals.

The next slide is a demonstration of the Fruitland Coal original gas in place. A couple of identifying points: The thick red line that goes horizontally across the upper portion of the map is the defining line between the Colorado and New Mexico states.

The dark red line that essentially comprises the high-productivity area is what we had considered the original overpressured coal or underpressured coal boundary. We wanted to clearly demonstrate that Burlington's intent was to study the underpressured coal or reasonably if not very much lower-productivity production in the Fruitland Coal.

COMMISSIONER BAILEY: Could I have clarification? Greater than 10 BCF per -- square mile, per 320, per what?

THE WITNESS: That would be per well. Is that correct, Steve?

MR. THIBODEAUX: Per well.

THE WITNESS: Per well.

COMMISSIONER BAILEY: Thank you.

THE WITNESS: Uh-huh. What my next slide demonstrates is the current 320-acre recover factor, and this is based on a population of wells that we performed decline curve analysis on in conjunction with Mr.

Thibodeaux's assessment of original gas in place, repeating again that we had 7500 digitized logs across this area, which is an extremely large population that he was able to acquire over -- really diligent attention over a number of years to acquire that information.

This slide does demonstrate that we have representatively sampled the recovery factors by our infill wells. Again, the upper left well, the Davis well, very low recovery factor. The Huerfano, getting into the darker green areas, could be over 70-percent recovery factor for that particular area.

This is a summary slide that I alluded to prior to this. If you look at the existing well population that we have performed estimated ultimate recovery calculations on and assume that those wells are -- you know, we are drilling on 320-acre development, that only 18 percent of the original gas in place will be recovered under current development of 320-acre drilling. The flip side of that is, of course, that 82 percent of that gas is still left in place.

Shifting gears a little bit, the remaining -- I have 11 more slides. Five of them look exactly like this. In this particular case, this well is the Davis 505S, S designating that it's an infill well, that shows the layered pressure tests that we have taken in the wells, and that -- This demonstrates that the drainage is inadequate in some or all of the coal layers.

There's some extrapolation, of course, that we could perform on these, that shows if your original pressure was 1000 pounds and you're at 950 pounds, that you depleted the well at that location by 2 percent or something like that. But that testimony was given prior to these particular slides, both by Mr. Kump and myself, and so without trying to cloud the slides with too much infinite detail, I'd just like to point out that you can clearly see in this particular example that the current pressures or the pressure that we found at the infill well is very, very close to what the original well had on its original completion.

This particular well, the Davis 505S, again it's in a very poor, or reasonably poor area. But this infill well is only located 900 feet away from the parent well, so it's approximately one-third of the distance from where you would put the normal infill well. And yet even at a very close proximity, there's very little depletion that's occurring at this point in time, at that location.

We've demonstrated, you know, some of these items on cross-section, and without going into infinite detail it just reiterates the points. Each of the five infill wells that I will demonstrate pressure tests on also have an associated cross-section that Mr. Thibodeaux has put together and provided.

Without going into a lot of discussion, although I'm sure that Mr. Thibodeaux would be happy to discuss them further, it just reiterates the points that we have a very complex system out here, that we have zones that are thick, that thin out, that disappear, that are inconsistent and laterally discontinuous. The pressures clearly represent what's going on in the reservoir.

The remaining slides are simply a repeat of what you've seen before. In this case, the San Juan 28-and-5 Unit, 201 infill well which is located in the rightmost well on the poster board that we have, again indicate that the pressures that we have measured are at, near or sometimes slightly above what we had calculated for the original pressures in those zones, indicating that essentially very, very little depletion has occurred at the infill well location.

The next slide is just a cross-section, and unless there's any definitive questions on this, I'm just going to continue to put them in as exhibits and then not discuss them in any detail.

The Turner Federal 210S layered pressure test, as you know in the real world, everything doesn't work out perfectly like you'd like it to be, and by gosh, if we weren't able to go in and get this pressure on that uppermost zone. We tried it -- we attempted it twice and just were not able to -- It's either a bad pressure, or you're getting an incredible amount of drainage from that point. But in all fairness, it is a data point that needs to be shown. I personally don't think that it's very relevant in the fact that it's one data point out of probably 15 to 20 zones that consistently show the same thing. However, in all fairness -- It never works out as perfectly as you would expect it to.

The Turner Federal does demonstrate again that the layered pressure tests that were taken at the infill well locations do show very, very little depletion occurring at that location.

Another cross-section through the Turner infill area.

And then we move to the 28-and-6, which is a medium level, and here you do see some depletion in some of these zones. However, if you refer back to some of the material that was presented on a modified material balance, how much gas has resided in these areas at low pressures, even with some depletion occurring, and still have significant amounts of gas left in place.

A subsequent cross-section to the 28-and-6 area.

And then the final well, the Huerfano Unit 258S, which is in the more prolific zones where you would expect that you would have significantly more difference with depletion occurring. This indicates that in the middle zone that was tested, that you do have depletion that has occurred over time.

In this example, I went back -- and perhaps it's appropriate now to look at this cross-section. The top zone in the Huerfanito 258S comprises about 27 feet of coal package. And if you step back again to the actual layered pressure test, the top zone which is not depleted very well is 27 feet thick. The middle zone, which has some depletion that's occurred, is only 9 feet thick. So that you have, you know, essentially a 3-to-1 ratio of gas in place that is not depleted, versus a well that -- layer that is depleted, repeating again that this is one of the most -- more prolific areas that we have.

So if you're taking a look at saying, you know, the Huerfano unit is in a very prolific area, perhaps infill drilling is not required in this area, it is required, even in the more prolific areas of the low-productivity coal.

And in a short summary, the current well density in the UPE portion of the pool results in inadequate recovery.

The pilot wells demonstrate that there's inadequate drainage in some or all of the coal layers.

And we do feel that the pilot well results are transferable across the low-productivity area in the UPE.

MR. KELLAHIN: Madame Chairman, that concludes Dr. Balmer's presentation.

We would move the introduction of the displays behind Exhibit 12 and 14.

CHAIRMAN WROTENBERY: Okay, the exhibits behind Tabs 12 and 14 are admitted into evidence.

I would just like to make sure I can pull all of this information together --

THE WITNESS: Okay.

CHAIRMAN WROTENBERY: -- on the engineering side, and you have to bear with me.

THE WITNESS: Certainly.

CHAIRMAN WROTENBERY: I don't have any training in engineering. Well, I did take a couple of reservoir engineering courses, but I have forgotten most of what I learned.

EXAMINATION

BY CHAIRMAN WROTENBERY:

Q. When you did your recovery estimate using the material balance method --

A. Uh-huh.

Q. -- what did you use for the gas content? How did you get that information?

A. That's a very appropriate question. The gas content was calculated on a correlation between density and gas content that you can develop. As Dr. Close had indicated in prior testimony, you can get an extremely good estimate of gas content versus density, and it's a very linear correlation in that.

So what we were able to do was gather through time -- this is not recent, but over time we've developed a data set that has a number of density measurements and gas-content measurements on that same density and developed a straight-line correlation that allowed us to utilize a log-derived density from the layered pressure tests and calculate through a single graph a gas content from that density.

Q. Okay, so Dr. Close has provided a plot from Drinkard's Wash in Utah.

A. That's correct.

Q. What you're telling me is, you had something similar --

A. Exactly the same.

Q. -- for the San Juan Basin?

A. That is correct.

Q. Okay. And you got the density information off of the logs --

A. Yes.

Q. -- and then used that information with that plot --

A. That is correct.

Q. -- to get the gas content --

A. Yes.

Q. -- and plugged that into your equation?

A. That's correct.

Q. Is that basically -- We've seen several maps showing original gas in place across the Basin.

A. Uh-huh.

Q. Was that methodology used in developing all of those --

A. The --

Q. -- maps, or were there different approaches taken --

A. That --

Q. -- for different maps?

A. That is a very good question. There are different ways to calculate original gas in place. Burlington has several different methodologies that can be used to calculate that. The methodology that we are currently discussing is a methodology to do that.

Another methodology would be to take, oh, canister data, which is essentially a gas-content data for different areas, and then try to associate that. We have a large population of gas or canister data. We've taken cuttings, again very similar or identical to the gas-content discussion that Dr. Close had suggested in his desorption discussion, and translated that across more on a -- oh, a regional contouring level across the high-productivity area, and then backed into that calculation of 1359.7 times the area, times thickness, times the gas content at that point.

So there are different ways to calculate gas in place.

Q. Okay, for example, the map of original gas in place that you've included under Tab 14 --

A. Uh-huh.

Q. -- how was that one developed?

A. Could I refer that question to Mr. Thibodeaux, please, because he did that development?

CHAIRMAN WROTENBERY: Sure, that sounds good. Mr. Thibodeaux.

MR. THIBODEAUX: We used the --

MR. KELLAHIN: Go up to the stand so she can hear you.

MR. THIBODEAUX: We used the former methodology that was just -- the first methodology discussed by Mr. Balmer, where we had a density of the gas content correlation that we derived from a number of different data points across the Basin, and we plugged that in for SCF per ton. And we used that number times the thickness of all my isopach maps, layered and aggregate, along with pressure data to assume -- to figure out what our bottomhole pressures were, and used that data to come up with the gas in place.

CHAIRMAN WROTENBERY: Okay, that helps. Thank you very much.

Do you have any questions?

COMMISSIONER BAILEY: (Shakes head)

CHAIRMAN WROTENBERY: Okay. Then I think we can excuse you. Thank you very much for your testimony, Dr. Balmer.

MR. CARR: May it please the Commission, at this time we call Vu Dinh. Mr. Dinh is a reservoir engineer, and he is the last witness in the BP/Burlington/Chevron-Texaco portion of the case.

For the last day and a half we have been telling you what we believe will happen if you authorize infill drilling in the Basin Fruitland Coal Gas Pool. Mr. Dinh is going to review with you results that have been obtained on the Colorado side of the line immediately adjoining New Mexico where infill drilling was previously approved. And we're going to show you that the results that are being obtained are consistent with what we have been telling you will happen, and we believe his testimony will show that what will be obtained through infill drilling is not rate acceleration but, in fact, principally the production of incremental reserves.

CHAIRMAN WROTENBERY: Thank you.

VU DINH,

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. My name is Vu Dinh.

Q. Mr. Dinh, where do you reside?

A. I reside in Fulshear, Texas.

Q. By whom are you employed?

A. BP America, Inc.

Q. And what is your position with BP America, Inc.?

A. I'm the reservoir engineer responsible for the San Juan Coal.

Q. Could you summarize your educational background for the Commission, please?

A. Yes, I have a bachelor degree in petroleum engineering in 1984 from Colorado School of Mines, and I also have a master in petroleum engineering from University of Texas at Austin in 1993.

Q. Could you review your employment history?

A. Yes, I have -- since graduation from the School of Mines have been working continuously with first of all ARCO and then Vastar, and subsequently BP, so I have approximately 19 years of experience.

Q. Did you testify as a reservoir engineer in the case in which infill drilling was approved in the State of Colorado in this particular reservoir?

A. Yes, I did.

Q. And you testified last summer in the hearing before Examiner Stogner?

A. Yes, I did.

Q. Have you made an engineering study of the Basin-Fruitland Coal Gas Pool?

A. Yes, I did.

Q. And are you prepared to share the results of that work with the New Mexico Oil Conservation Commission?

A. Yes.

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

CHAIRMAN WROTENBERY: And we accept Mr. Dinh's qualifications.

Q. (By Mr. Carr) Mr. Dinh, let's refer to the second page, I believe it is, in the tab -- behind Tab 13.

The top is entitled Colorado Infill Drilling Results. And as we start, before we go into this, could you show the Commission on the map exactly the area we're talking about?

A. Right. First of all, I'd like to point out the border between Colorado and New Mexico. The area I'm going to concentrate in is about a 20-section, right adjacent to the New Mexico border. So the data that we gather through the infill program here is directly applicable to what's going on to the south.

Q. And it extends into an area that would be comparable to the low-productivity, as well as the high-productivity area?

A. That's right, I will discuss the data that we gathered in the, quote, low-productivity area and also some in the high-productivity area also.

Q. And then as we move from that, you're going to present some material balance information on a couple of pairs of wells; is that right?

A. That is correct.

Q. And where are they located on this map?

A. They're located approximately right in this area here, just opposite of the high-productivity line in New Mexico.

Q. Close to the large orange dot on the --

A. That is correct, yes.

Q. All right. Let's go to this first slide, Colorado Infill Drilling Results. Would you review this for the Commission, please?

A. Yes. My intention is to present the actual data from the Colorado side. And I want to point out, the most important thing is that we did not see any detrimental interference with the parent well due to infill and that we were able -- we encountered a lot higher reservoir pressure at the infill well than at the parent well, which indicated that the parent well was not able to adequately recover reserves in the 320-acre unit.

And then I will show two -- or actually four material balance plots -- that would indicate that the infill gas reserves are mostly incremental, not rate acceleration, and then I expect to see similar infill results in New Mexico.

Q. Let's go to the next slide, Colorado/New Mexico Border Infill Coal Results.

A. What this graph shows is a time plot of production. The top red line here is the production from the 36 parent wells, and they were started in January of 1988. And then in the middle of 1998 we started the infill program, and we finished drilling 28 infill wells in about the middle of 1999.

What I'd like to point out is, one thing you need to look at is the trend of the parent well prior to the infill drilling which started in Colorado. Right after infill started what you see is, you don't see any detrimental effect, meaning the production didn't drop sharply as you produced more gas. In fact, what you're actually seeing is that the parent well response actually inclined higher once the infill was started.

One explanation for this was that what we're looking at is probably a beneficial interference in the sense that by putting in new infill wells, you help dewater the whole area and thus enable the gas to be recovered at a higher rate at the parent well.

So the next question is, is there any way that we can tell on this rate-time plot here whether all this production from the infill wells is incremental or purely rate acceleration, because on the rate plot here it's very hard to tell.

So to do that we need to examine some other data, for example, pressure data, that we gather.

Q. Let's go to the --

COMMISSIONER LEE: Can I ask you a question?

THE WITNESS: Yes.

COMMISSIONER LEE: Don't you think it's apparently -- they finish the dewatering process at the same time?

THE WITNESS: That is true. What we observe from Colorado is that the infill well initial rate is approximately two-thirds of what the parent well is. What's also interesting is that what we observe is that the infill well water rate normally comes in at the same rate as the parent well. So in answering your question, yes, it looks like there is interference in water production.

Now, keep in mind what Dr. Close was saying before, that all you need to do is produce just a little bit of water to really depressurize the pressure, the reservoir pressure. And that's probably what happened here, is that additional water production helped -- looks like it improved the production from the parent well.

Did I answer your question, sir?

COMMISSIONER LEE: (Nods)

THE WITNESS: Thank you.

Q. (By Mr. Carr) All right, let's go to the next slide, the Infill and Parent Well Initial Pressure information.

A. Now, you have heard testimony for the last two days about pressure, particularly layered pressure and composite pressure. What I'm showing here is not layered pressure. The only data we have gathered is composite data, pressure data. So keep that in mind.

But one thing I'd like to point out is, on the average, when you look at the sample wells right next to New Mexico, what you observe is that the infill pressure here is significantly higher than the parent well pressure at the same time. What that is saying is that the parent well is not being able to effectively draw down the reservoir pressure, hence not adequately recover gas from the 320-acre spacing unit.

The other thing I'd like to point out is that you can see a lot of pressure differential here. For example, in this well here the infill well practically came in at the original reservoir pressure. And then as -- This well is located in the low-productivity area, I'll show in the next map. But there are some wells, as you get closer to the high-productivity area, you start seeing pressure that is lower than the original reservoir pressure.

So to make this clear what I'd like to do is proceed to the next exhibit.

Q. Okay, let's go the Drainage Area vs. Highest Rate map.

A. All right, first of all I'd like to point out a couple things on this map here. This purple dashed line here is the Colorado-New Mexico border. What's outlined in green here is the current high-productivity-area line in New Mexico.

What is shown up here is the drainage -- ultimate drainage area for each of these wells as calculated from the modified material balance calculation.

Also overlaid on this map is the contour map of rates. So this blue, light blue right here, that's about a million cubic feet a day. Then the light yellow is 2 million, the dark yellow here is 3 million a day. So you practically can bring this high-productivity line up here into Colorado, following that border between the yellow and the dark yellow.

The other thing that I'd like to point out is that when you look at the drainage area here, what is highlighted is any drainage area that is greater -- or less than 320 acre, is highlighted in green. So the red circle here would show a drainage area of about 320 acres.

When you look at the low-productivity area over here where rate is less than a million a day, what you see is a drainage area as calculated from material balance, shows that most of these wells here are producing at less than 160-acre spacing. In fact, most of them are around 100 acres.

This corresponds to the pressure that we gather at the infill well. When you have low drainage area here, you would encounter higher reservoir pressure at the infill well. As you get closer to the fairway what you encounter as the drainage area is getting bigger, the pressure that you encounter at the infill well is now less than the original reservoir pressure.

Q. Now, you're going to present material-balance information on two pairs of wells?

A. Yes, sir.

Q. Where are those wells located on this map?

A. What I'd like to do is answer the most crucial question of this hearing, is, can you get incremental reserves out of high-productivity area? And what I'd like to do is show you data from four wells located right at that spot, Section 21 and 20.

Q. Okay, let's go to the first material balance plot, the material balance plot for the South Ute Well 21-2. That's in Section 21 of 32-9, right?

A. Yes. What I'd like to do is take some time to introduce to some of you who might not be familiar with a typical modified material balance plot, also known as a P/Z*. What we're plotting here is basically a pressure decline -- pressure function, reservoir pressure function, versus cumulative production on the X axis.

Now, we have seen testimony from Mr. Kump that he actually shows the reservoir pressure being curved as a function of the -- because of the Langmuir isotherm. What we have done here is modify the Z term here to account for that. So when we plot it up, you will see a linear trend between pressure decline versus cumulative gas production.

Now, once you get a linear forecast here, what you can do is extrapolate it out to an abandonment pressure. At this point, say it's 75 p.s.i. Now, you can read down and you can see that this well here, when you abandon the reservoir, we should recover about 3 -- close to 3 BCF of reserves.

Now, the question is, how can we tell whether that 3 -- nearly 3 BCF of reserves is going to be incremental or purely rate acceleration?

A couple points to keep in mind. When this well was drilled in March of 1999 we encountered an original pressure of 970 p.s.i.

Let's go to -- take a look at the parent well, offsetting this well.

Q. Now what you have here is, you have a material balance plot on the infill well; is that correct?

A. That is correct, yes.

Q. And that's where you have shown 3 BCF recovered by the well, and now what you're going to do is look at the parent well to see if, in fact, that 3 BCF is incremental or just a rate acceleration?

A. We're going to use the same kind of plot and see whether that 3 BCF that we're going to recover from this well, did we steal it from the parent well.

Q. All right.

A. Okay?

Q. Let's go to the next plot.

A. This is the material balance plot for the parent well in the same section, Section 21. What is shown here is shown here is, once again -- first of all, similar to the other plot, what's shown in this red line right here is the gas rate per month. So this well actually peaked -- the peak rate is about 5 million cubic feet a day. Definitely a high-productivity well.

And one thing to notice is that right here at April of 1999, this is when we drilled the infill well -- I'm sorry, March of 1999, right here.

One thing to note is that there is no deviation from the trend at all before and after the infill well was drilled in March of 1999. The well depletes on the same slope.

So what I'm saying is, the 3 BCF that you're going to recover from the infill well was not impacting this parent well at all. So the only conclusion, logical conclusion you can come up with is, all that 3 BCF is incremental reserves. We're not stealing gas from the parent well.

Q. Let's go to the next plot.

A. Same situation. This is the infill well in

Section 20 of 32-9. Once again, this well was drilled in December of 1999, and based on the pressure, production trend here, we can see that this well is going to recover approximately 3.5 BCF of gas at 75 p.s.i. abandonment pressure.

One thing to notice, when this well was first drilled, the reservoir pressure that was actually encountered was 531 p.s.i. So it is probably a third of what the original pressure is.

Based on this low reservoir pressure here, you would expect to see that this well probably has a large component of rate acceleration, because surely something has depleted pressure here, and it's got to be from the parent well.

So I'd like to go ahead and proceed to the parent well.

Q. Fine, go to the next material balance plot.

A. Once again, this is the material balance plot for the parent well. And what you see is, in approximately the same time that the infill well was drilled, which is in December of 1999, in April of 1999 we did obtain a reservoir pressure. Once again what you see is, there is no change in the production trend prior to when the infill well was drilled and after. What that's saying is, you are not -- that infill well is not stealing gas from the parent well, because if it does what you would see is a change in slope after the well was drilled.

Q. Let's go to the last exhibit in your material, the Infill Reserves vs. the Offset Gas Rate.

A. What I'm going to attempt to do right now is try to use the Colorado data and apply it to the New Mexico data. What's plotted here on the left side, on this graph, scatter plot, is basically -- on the X axis here, I'm plotting the offset gas rate from the parent well. And what's plotted on the Y axis is the ultimate infill recovery from the infill well.

What I'd like to do is point your attention to this area from, say, higher than 2 million a day, because that area there would qualify as a high-productivity area. Even in this -- I don't have a lot of data in the high-productivity area, but just from this sampling here it goes anywhere from 2 BCF to as high as 6 BCF. What I'd like to do is just use a very conservative estimate. For the high-productivity area you can expect, at minimum, 2 BCF incremental reserves per well.

Now, based on our drainage area calculations using composite data -- and you have testimony before how that could be misleading if you don't have the layered pressure data -- but still what we expect is, based on Colorado data, anything above, say, 4 to 5 million cubic feet a day, the well generally recover the 320-acre spacing.

So to apply the data to the New Mexico side, this is the distribution of the well rate in the high-productivity area in New Mexico. And what you see is about, oh, 50 percent of those wells produced less than 4 million a day. So the way I'm using the data is, there's approximately 400 wells in the high-productivity area. I assume that about 50 of those would require infill drilling, or about 194 wells. And at 2 BCF per well that gives me a conservative estimate as the potential price of infill drilling in the high-productivity area in New Mexico to be about 388 BCF.

Q. Could you review the conclusions that you've reached from your study of the reservoir?

A. Based on my conclusion, based on the data that I gathered from Colorado, what is shown is that infill drilling will have a beneficial effect on parent wells. Most of the well do require an additional well in the 320-acre spacing to adequately recover the reserve underground.

Q. And even though the numbers could change, depending on the type of pressure information that you might be using and the type of data you have, is it fair to say that there is no doubt about the conclusion, and that is that there are substantial incremental reserves to be recovered in the high-productivity area in New Mexico through infill drilling?

A. That is correct.

Q. Were the exhibits behind Tab 13 prepared by you?

A. Yes.

MR. CARR: At this time I'd move the admission into evidence of Mr. Dinh's exhibits, which are located behind Tab 13 in the exhibit book.

CHAIRMAN WROTENBERY: The exhibits behind Tab 13 are admitted into evidence.

MR. CARR: That concludes my direct examination of this witness.

CHAIRMAN WROTENBERY: Questions?

COMMISSIONER LEE: (Shakes head)

CHAIRMAN WROTENBERY: Thank you very much, Mr. Dinh.

THE WITNESS: Thank you.

MR. CARR: May it please the Commission, and on behalf of Mr. Kellahin, I'm prepared to pass this table to Mr. Hall.

CHAIRMAN WROTENBERY: Let me ask you one quick question. There was a Tab 15 with some supplemental exhibits in it. Did we -- I don't recall doing that.

DR. BALMER: Those are some supplemental exhibits that I had for the high-productivity area, the reservoir engineering portion of it. I apologize for not mentioning that I had some supplemental exhibits.

MR. KELLAHIN: We'd move their admission.

CHAIRMAN WROTENBERY: Okay, then the supplemental exhibits -- these were supplemental to Dr. Balmer's testimony -- behind Tab 15 will be admitted into evidence.

Ready, Mr. Scott? "Mr. Scott." Mr. Hall?

MR. HALL: Did it again.

CHAIRMAN WROTENBERY: I'm still calling you Mr. Scott.

MR. HALL: Madame Chairman, Commissioners, on behalf of ConocoPhillips Company I wish to announce we have an additional geologic witness. I estimate his direct examination would take an hour, 90 minutes.

The good news, he appears by affidavit and his testimony is found under Exhibit Tab 1 in your notebook.

Over the past two days you've heard the presentations by several well-spoken geologists, I think excellent presentations. We didn't see the value of incurring the cost to fly one more geologist up from Houston to repeat to you what you've already heard over the past two days.

The purpose of providing you with the affidavit is to simply establish for you that ConocoPhillips has conducted its own geologic evaluation of the Fruitland

Basin Coal Gas Pool area, and it concurs with the results that have been presented to you by the other geologists.

We offer the Exhibit 1 into evidence. Of course, we don't have a witness to sponsor it or subject himself to examination, but I suppose in the absence of any objection it's not hearsay. So you can give it the weight you wish. We offer that at this time.

CHAIRMAN WROTENBERY: Thank you, Mr. Hall.

Do I hear any objection?

MR. HALL: No, you don't.

CHAIRMAN WROTENBERY: In that case, we will admit the testimony of Mr. Murphy --

MR. HALL: That's correct.

CHAIRMAN WROTENBERY: -- which appears under Tab 1 of the ConocoPhillips notebook, into evidence.

MR. HALL: At this time, madame Chair, Commissioners, we call Trent Boneau to the stand.

TRENT BONEAU,

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

DIRECT EXAMINATION

BY MR. HALL:

Q. For the record, please state your name, sir.

A. Trent Boneau.

Q. Dr. Boneau, is it?

A. It is Dr. Boneau.

Q. Where do you live and by whom are you employed?

A. I live in Missouri City, Texas, and I'm employed as a senior reservoir engineer with ConocoPhillips.

Q. Dr. Boneau, I understand you've previously testified before the Division but not necessarily the Commission; is that correct?

A. That is correct.

Q. Would you give the Commissioners a brief summary of your educational background and work experience?

A. Sure. I have a bachelor's in mechanical engineering from the University of Notre Dame, granted in 1990. I have a master's in mechanical engineering from Georgia Tech in 1993. Then I started going to good schools, and I have a PhD from New Mexico Tech in 1997.

I've been employed by Conoco and then subsequently ConocoPhillips since 1996, and I've been working in the San Juan Basin, primarily on CBM, since 1999.

Q. All right. And you're familiar with the coal gas pool reservoir and the Application that's been filed in this case?

A. Yes, I am.

Q. And you've conducted an engineering evaluation of the pool, have you not?

A. Yes, I have.

MR. HALL: At this point, madame Chair, we would offer Dr. Boneau as an especially well-qualified petroleum engineer.

CHAIRMAN WROTENBERY: What do you think, Dr. Lee, should we accept his qualifications?

COMMISSIONER LEE: Yeah, wholeheartedly.

CHAIRMAN WROTENBERY: They're accepted.

Q. (By Mr. Hall) Dr. Boneau, did you as well as ConocoPhillips participate in the deliberations of the Fruitland Coalbed Study Methane Committee?

A. Yes, we did. I was one of the many Conoco representatives that were part of the Committee.

Q. All right. It's accurate to say that ConocoPhillips did not warmly endorse the original position to have at least unrestricted infill development in the high-productivity area of the pool; is that correct?

A. That is correct.

Q. And now it's ConocoPhillips' position that the Committee proposal is appropriate for future development; is that right?

A. That is correct.

Q. Could you explain the evolutionary process that brought ConocoPhillips to its present position?

A. I'll attempt to. We participated in the

Committee hearings, in the Committee meetings, and you know, throughout those meetings a lot of the attention was focused on gathering data in the LPA area, and Burlington did a great job of doing a pilot program and gathering data outside the HPA. One of the other big things was to try to determine where to draw a line between the HPA and the LPA.

But at no point did anybody ever -- did we gather much data inside the HPA. So at the original hearing we weren't sure what the right thing to do was, but we were not comfortable with going forward with infill drilling inside the HPA without additional data and additional study. We were comfortable with the LPA but not the HPA.

Q. Let's refer to your Slide 2, Exhibit 2, if you would, please, sir.

A. Sure.

Q. Why don't you explain that to the Commission?

A. Yeah, we -- This is sort of describing our historical on infill drilling, and historical, I guess, starting at the first hearing.

At the original hearing we testified that insufficient data was available to show that infill drilling was warranted in the HPA. That was our position then, I think that was borne out with -- from the result of that hearing.

We recommended that additional study be completed before infill drilling was implemented on a large basis within the HPA. Now, we had done as much analysis as we could do with the data that was available, and I think the other operators had. And it showed some mixed results, but it raised some questions about what was the right way to go. And I think -- you know, subsequently we've gotten more data that clarifies, you know, that casts some doubts on that analysis.

But the pressure data that was available, which was the main data that was analyzed by any of the operators, suggested, at least to us, that portions of the HPA were being adequately drained at the current well spacing.

Q. Let's look at your third bullet point on Slide 2. Could you elaborate on what you mean by that?

A. Yes, up to -- At the point of the original hearing, much of the analysis that was done was material balance, drainage-area calculations, and those calculations were done based on assuming a single pressure fully described the pressure at a given well point. I don't think anybody felt it fully described it, but it was the only data available, so we just took it as this describes the pressure in any seams in the reservoir at a certain point. And that was the data that was used for most of the analysis done by the companies.

Q. All right, let's look at Slide 3, your "Composite" Pressure data. What is that?

A. This is a map generated by Williams based on a bunch of this pressure data where a single pressure point was assumed to fully describe the pressure in all seams at that point. We refer to it as composite pressure data, just because we assume that pressure value is a composite, representative value of all the pressures in all the seams in the reservoir.

And if you look at this slide, what you'll -- if you can see the HPA, is this green cross-hached area here that extends up, and you can see we don't have full coverage. And if you -- Here's our color slide, with yellow being the lowest pressure, up to dark blue being almost virgin pressure.

If you look at this composite pressure data, which is -- we're looking at, we see that a good portion of the HPA, specifically in the southeast, is yellowish in the pressure, and that suggests the pressure is somewhere below 150 pounds. And that was an area of particular concern for us. We thought if the pressure is really 150 pounds, we really need to think about whether we want to infill drill there.

Q. All right, let's look at Slide 4. What were operators doing with this composite pressure data?

A. Well, they would use -- in general, in this -- basically the same thing we did, is, we would look at the production versus the pressure history and start to infer things about how much gas was in place, look at how much gas you could expect to produce and then start making estimates of drainage area or recovery factor, based on this pressure information.

This next slide is an example of using this data to make an estimate of how much of the gas will be recovered. What we have here in the graph, we have this blue line representing production from a group of wells in that yellow portion of the southeast part of the HPA. So this is how much gas is being produced.

These red dots here represent our historical measured composite pressure data up to 1998. We did a material balance -- and this an example, so -- you could do a material balance of this production versus this depletion and estimate how much original gas was in place, and then for any future production you could estimate what the pressure would be.

So at the time of the hearing we estimate that the composite pressure for these group of wells was 147 pounds, and that's why we have a yellow point in our previous map in the HPA.

Using decline analysis, you can go and forecast what you would expect production to be in the future, down to a reasonable abandonment rate, and then you can -- if I took out that much gas, out of my tank, I would be down to 60 pounds of pressure, based on these pressure points. That would be my expected pressure.

And we look at this and say, 60 pounds abandonment pressure, that's pretty good. So this is the kind of analysis that led us to believe that in areas where we saw 150 pounds of estimated composite pressure, that raised some concerns about whether or not we needed infill drilling.

Q. All right, let's look at Slide 5.

A. Okay, the last point on Slide 4, if I --

Q. I'm sorry.

A. -- can stop Scott, is that since then -- and everyone has basically talked about it already -- people have gathered data that shows that this composite pressure data is probably not the right way to go about evaluating the reservoir.

Slide 5 shows some of this layered pressure data, and virtually all of this has been presented either by Dr. Balmer or Mr. Kump. These are from 30-and-6 wells and 32-9 wells which are Burlington wells, and NEBU wells which are the Devon wells.

So what we have here are -- these are seven wells, their locations, the intervals, and then the isolated zonal pressure that was measured in them, here in this column.

And this -- you know, basically what everyone is saying, that all the layers are not being depleted equally. Some of the layers have very high pressure, showing very low recovery factor. Some of the layers have pretty low pressures, suggesting they're probably being adequately drained. But you've got a mixed batch of pressures here.

Well, we went back, and for these areas we did a material balance based on our historical composite pressures and estimated what the composite pressure would be at the time that these layered pressures were measured. Devon went a step further and actually went and measured the composite pressure, but we went and forecasted what it would be.

And that's shown here in the far right column under Estimated Composite Pressure. So this is what our material balance would suggest the pressure was at this point. For the first one it's 152, 189, 183, 144, 221, 177.

And as other people pointed out, these pressures tend to go towards the low end of your layered pressures. And that makes sense. If you shut in a well for a short amount of time, the layer that would build up the fastest is the highest-permeability layer. You'd get crossflow, and essentially you would expect a pressure pretty much representative of your highest permeability layer.

Q. Last year was there an extensive amount of layered pressure data available?

A. It had been mentioned, but it hadn't really been formally presented and certainly had not been evaluated.

Q. All right. Why was there a shortage, relatively speaking?

A. People had not made a concerted effort, I think, to go get it.

Q. Is it expensive to obtain?

A. Yes, it is. That's why you'll notice that all these pressure -- none of them are from ConocoPhillips wells, we just --

(Laughter)

Q. All right, you've highlighted the 132 well in red there. Why is that?

A. Well, I was going to go and describe the material balance for that well and show how -- again, re-emphasize how the composite pressure could be misleading in terms of how much gas there was in place and then compare it to what was in the layered pressure information.

Q. Let's refer to your Slide 6, your material balance plot there.

A. This slide shows a material balance using composite pressure for a well 300 feet away from one of the wells, the highlighted red well where we measured the layered pressure.

The plot shows -- The circles represent our historic measured composite pressures. We can use those pressures to estimate how much gas there was in place, extract the historical production, and -- Well, we could extract the historical production compared to those pressures, figure out how much gas was in place, then we can predict what the pressure would be at any point in the future. This is the modified material balance that was talked about by Dr. Balmer.

This line shows our best-fit estimate of what the composite pressure would be at any given time, and it shows that here we would expect 183 pounds of pressure, which is what we saw in the previous slide.

So we used this composite pressure to solve for a gas in place. The thing is, if we take that gas in place, it really only -- in this location, only equates to 18 feet of coal. If we look at the logs at this location, there's -- depending on what cutoff you use, I think at 1.75 grams per cc there's 45 feet of coal.

So this is further evidence that this composite pressure really only represents a subset of the coal thickness, and there's a disconnect between material balance and volumetric gas in place. If you look at how much coal exists in a log and apply a reasonable SCF per ton to it you're going to get, in general, a higher gas in place than if you use this composite pressure and the material balance to estimate the gas in place. It's going to sell short how big your tank is.

Q. And once you realized there was that disconnect, like you say, between material balance and gas in place, where did you go?

A. Well, yeah, because there is that disconnect we realized that using it for recovery factors and things like that is incorrect because we just don't know how big the tank is. So recovery factors, drainage area, all that's meaningless.

So our next step was to try to find some way to use this layered pressure data to estimate, you know, what we could expect from infill drilling.

Q. Let's refer to Exhibit Slide 7.

A. This is sort of our "take a breath and describe where we are and what we're going to try to do" slide. We're at the point now where we're convinced -- and this is at the point -- this is months back -- where layered pressure gives an accurate picture of the depletion in the reservoir, and composite pressure does not. I think everybody agrees with that. It's been stated many times, but we didn't actually know we were going to be last, so we seem like we're just copying everybody else.

Layered pressure data confirms that the coal seams are not being equally drained. We're seeing 800-pound, 1400-pound pressures. It's not all at the 100- to 200-pound pressure that composite pressure data would suggest.

And if we take that all for granted, the key questions that remained for us were, you know, we see some differential depletion at 10 data points in the HPA, you know. Is that the kind of differential depletion we should expect throughout the HPA? And given that kind of differential depletion, how efficiently will we expect the existing wells to drain these differing layers? And how much additional recovery, you know, can be achieved through infill drilling.

And we're -- We've always been somewhat skeptical, so we really wanted to try to quantify this, we wanted to come up with a number. Dr. Balmer said that engineers like pictures, but I think engineers like numbers. So we're going to go -- We wanted to get a number out of this. And the best way we felt to get a number was to try to appropriately use reservoir simulation to model the HPA.

Q. Now, speaking of skepticism, every once in a while you encounter skeptics who doubt the value of simulations and models in these regulatory proceedings.

A. I have no idea what you're talking about.

(Laughter)

Q. (By Mr. Hall) Well, in case they exist, answer this for me: What is the value to the Commission of using a simulation here? What questions does the simulation try and answer?

A. Well, for us I think it's going to try to answer those key questions. We're going to use it to try to match the observed data and predict what's going to happen. We're not going to say we have a specific answer, but we're going to present a range of answers based on a range of inputs that we think is representative of the HPA.

And that's all the data that -- basically, utilizing the data we have available, which is frankly not sufficient to get a specific, exact answer, we are going to present a distribution of answers that we think is representative of frankly a conservative estimate of what you can expect in the HPA. I mean, it's going to be a quantitative, numerical estimate. I think that -- We're going to try to make our Frankenstein get up and dance around.

Q. All right. Well, let's talk about some of the assumptions you used in your modeling. If you would refer to your Slide 8, please, sir, would you discuss that for the Commission?

A. Sure. Well, I think we've had a number of eminently qualified geologists stand up and describe just how complex and dis-con-tin-u-ous, you know, by syllables, this reservoir is. Now, if we want to -- And that brings up a big question about, well, what's the point in trying to model it if it's so complex we don't even -- you know, we can't fully describe it?

And because of that we elected to try to use a really simple -- to describe a very complex situation that you cannot describe, we wanted to describe it in its simplest terms, we want to use a simple model to try to describe the situation.

The layered pressure data confirms that if you want to try to model the reservoir, you need to use a multiple-layer model. Everything we had done in the past was single-layer models using composite pressures, and that's just not accurate. We need to at least view it as a multiple-layer model. We see different pressures in the different layers, we probably see different permeabilities in the different layers. We need to treat those separately.

We felt that in keeping things simple, you know, the simplest approximation that we could defend of the complexity of the coal was with a two-layer model. Say we have two seams, one seam is higher permeability and one seam is lower permeability.

And the last point is, a multi-layer reservoir can be represented by the sum of multiple single-layer models. And this is kind of getting away from our sort of initial thoughts and sort of into our process -- describing the process we used to describe the model -- the reservoir in the HPA.

The next point about the differences in the pressure of individual layers can be assumed to be due to the respective permeability of those layers. We're seeing -- If we see an 800-pound pressure in a layer in an offset well, we're assuming that that layer has got very low permeability. It's been depleted a little bit by the offset wells, and the offset wells will continue to deplete it a little bit. If it has 140 pounds of pressure, we're assuming it's got higher permeability, it's been depleted significantly by the offset wells, which would imply that there's good communication between it and the offset wells.

So we're going to go with the assumption that the pressure data in the layered pressures is indicative of the permeability of the layers.

We're also going to assume -- and this is -- we may get some contention over this -- that the coal seams are laterally continuous over 160 acres. In the layered pressure data, the empirical data suggest that in most cases there is some drainage at these offset locations, so we thought that was fairly reasonable and it's probably conservative. We're saying that basically the wells are going to be pretty much in communication, so...

If you compare this with what Dr. Balmer talked about of different ways to add up the expected reserves, what we're going to look at is just a subset of his possibilities. We're going to look at assuming that all the wells are in communication, it's just some of the layers have very low permeability and probably are not efficiently draining the reservoir.

COMMISSIONER LEE: So you're presenting the worst case for -- against the infill drilling?

THE WITNESS: That was not intentional. We didn't go into this trying to disprove anybody. We -- Yes, I think you could say that. We are not going to give any credit at all to stranded gas. We're going to assume that anything you see is existent at -- on a scale of 160 acres is -- you know, that the wells are connected.

COMMISSIONER LEE: All right. You have the heterogeneity coming in, and that will even strengthen your position right now?

THE WITNESS: Yes, you should -- you will get additional -- yeah. We felt we could not quantify that. The only thing we could quantify is that there is some communication between wells, so we would assume a worst case, that all coals were communicating between a 320 and a 160. Not beyond that scale, but just between there. You would encounter coal seams that were present and being produced to some extent in the existing well.

And my last point -- It may be a little confusing and it's more to do with the process, but for identical reservoir properties, simulated well production will vary linearly with model thickness. And I have this point in there because we ran our model sort of ahead of time and generated a bunch of expected outputs, and to do that I fixed the model thickness at a certain point. And then if I went back at a certain location and decided, I have a model of similar properties but my coal seam is not that thick, I would just scale back the model results that fit that thickness.

Q. (By Mr. Hall) All right, let's continue on to Slide 9, your Model Setup. Why don't you explain that briefly?

A. Well, I can explain that, but -- Somebody doesn't know how to divide 5280 by 2 here, but that's beside the point.

This shows our simple model. It's a -- We assumed that the wells were at generic locations, they were in the center of all the quarter sections, and this is a -- this represents one 160 acres, which has two parent wells in the northeast and the southwest, and two infill wells -- the southeast and the northwest -- and the infill wells in the northeast and the southwest. This is 3600 grid cells, and it's a single layer. We ran all our models as single layers, and when we wanted to create a two-layer model we would just combine two single-layer models.

Q. All right, let's refer to your Exhibit Slide 10.

A. Okay. As I said, we went and ran the model -- we went and ran Eclipse, which is our reservoir simulator, for a variety of inputs before we went and determined which of those inputs were satisfactory to describe locations in the HPA. We wanted to get a range of outputs, and then we would go to a single location and say, okay, this location sort of is like this model run and this model run, and combine them together and predict how that location would perform.

So we generated type curves, is what I like to call them. We ran the model for a range of coal permeabilities, relative permeability curves and porosities. We had a permeability range from .5 millidarcies to 150 millidarcies, we modified our relative permeability and water saturation to allow for wells that dewatered quickly, moderately or very slowly.

As I said before, we elected to just fix the model thickness at 60 feet here, and then if we felt that the actual thickness of a layer was smaller, we would just scale our results accordingly.

We used initial gas content of 454 SCF per ton at 1.5 grams per cc. That data was based on a median value from 86 isotherm data points we have throughout the Basin. I think we would concede that that number is probably a little bit conservative because we use it to fully describe methane and CO_2 flow stream when it's really just a methane isotherm.

So essentially I went and ran the model for three different relative permeabilities, do they incline quickly, incline slowly, incline moderately, and for these different permeabilities. So we had 60-some model runs, all on a single-layer basis.

So the end result of generating these type curves was an estimate of how a single individual layer or seam with specific reservoir parameters would be depleted with and without infill drilling. So we ran a model with two wells, and then we ran a model with four wells, and we compared the results of those models.

The next step was to find a representative two-layer model for each HPA location. Now, the expected results for that model would be a summation of the results of its single-layer constituents. I want to talk about this a little, because this is the last point.

We went and -- actually went through every single HPA location. And I don't -- we didn't do that so much to describe what would happen at a certain point, but we wanted to get a distribution of inputs representative of the HPA, which would then give us a distribution of outputs representative of the HPA. I wouldn't be a hundred percent comfortable going to any specific location and saying we have an exact answer, because it's non-unique, some of the inputs are -- you know, there are some estimates that go into it. But we think we have a pretty good sampling of what's going on in the HPA.

Q. How many locations in the HPA are there?

A. I had -- I counted 436, and that was just going through *Dwight's* and counting up what there were, versus the possibilities, and I've heard numbers ranging from 400 to 450.

Q. Okay.

A. We had 436 locations. And I'm going to try to walk you through how we determined what an appropriate two-layer model was at a single HPA location. This is a process we repeated 436 times.

Q. For the record, we're looking at Slide 11 now?
A. Yes, that's correct. In order to find the appropriate model you need to use -- have some constraints, you need to use some actual historic data. And we don't have that much of that, but what we have was a thickness map. We had an isopach map, an internal isopach map. So you knew basically how thick the coal was at a given location.

We had this measured composite pressure, which we've talked -- we've discredited, sort of, up to this point, but we did feel we could use this composite pressure to describe the pressure of our highest-permeability layer in the two-layer model. So if we had a two-layer model, one zone was good coal, one zone was bad coal, the pressure that we measure in the composite pressure probably was representative of the existing pressure in our highest permeability layer.

And we also had offset production data from the existing parent wells, so that we want our model to honor the thickness, we want it to have a layer that honored the composite pressure, and we wanted it to honor what we've seen from historical production from existing parent wells.

And these are the -- Here's our sample location. At this sample location we had a mapped coal thickness of 50 feet, we measured the composite pressure at this location at 180 pounds, and this plot here on the right shows our -- a normalized offset production of 320-acre wells within 7500 feet.

Q. Exhibit 11 is actual well data, is it not?

A. This is actual data from one point, yes. This is actual well data, this is a normalized production profile from the existing wells.

So we know that -- We're going to assume that one of our layers is 180 pounds, so we have one fairly high-permeability layer that's depleted the reservoir down to 180 pounds. We just don't know how thick that is, and we don't know -- If we're going to have a second layer we don't know how thick it is or how permeable it is, and we don't know how well -- how quickly it's expected to incline or decline. But we have one known.

So we say, okay, we have this 180 pounds so we can go to a relationship over here, an inverse relationship between pressure and permeability and infer from 180 pounds, well, we think we have one high-perm layer at 39 millidarcies, if you can follow this red line up.

So if we know we have one layer at 39 millidarcies, we can use a brute-force, trial-and-error method to find how thick that layer is and the requisite parameters of our second layer that will equal up to this kind of thickness and give a historical production that matches this kind of production.

So here are the results of doing it at our sample location.

Q. And you're referring to Exhibit Slide 12?

A. Exhibit Slide 12. Our 39-millidarcy layer that represents our composite pressure, we determined to be 15 feet thick. Our second layer, our best-fit match, said that it was 35 feet thick. So this adds up to our 50 feet of observed thickness from log data.

The permeability of that was estimated to be 9 millidarcies, and that corresponds to 462 pounds of current pressure.

Pretty much, these thicknesses and permeabilities -- we need a combination of those that's going to agree with our thickness and also match this production, so we need a sum of KH that's going to give us this kind of production, and this shows a match of our offset production which gives a pretty good indication that -- a reasonable approximation of a two-layer model at this point.

Now, once we have a reasonable model at a point, we can go through and compare it to our data base of type curves and say, okay, this model -- an infill well at this model will produce how much gas? So...

At the bottom, the predicted incremental production from an infill well at this location will be the sum of a 15-foot layer with 39 millidarcies permeability -- which is 25 percent of our model output, since we had a 60-foot-thick model -- and 58 percent, 35 feet divided by 60 foot, of the incremental production from a 9-millidarcy model run.

And what the incremental production would be for this specific location is shown on Slide 13.

Now, what we have here in the red shows our furthest location. This is our estimate of what a 320-acre well will do with no infill, that it will make 10.1 BCF before it becomes uneconomically viable to produce.

If we infill drill, if you'll follow this green line here, then we'll end up producing 11.4 BCF with an incremental recovery of about 1.2 BCF.

The blue line here shows how the parent well will -- what we expect to recover from the parent well if we infill drill. And this is meant to show that, you know, these are incremental reserves. You are going to steal some gas from the parent well, but you're also going to -- you know, you're going to make incremental reserves.

Q. Look at Exhibit Slide 14 and explain that, please.

A. This slide shows the distribution of our results in terms of what the pressures were of the two-layer models throughout the HPA. The blue line here shows the -- our estimated pressure of our high-perm layer in any given model, and the pink point shows the estimated pressure and its corresponding permeability of the second, less permeable, layer in that same model.

So you can see these two green circles highlight a pair where you have -- we estimate you have 100 pressure, a 100-pound layer, and a 525-pound layer.

What's interesting here is, this -- to me, this clearly shows that there's a disconnect between your material balance and your volumetrics throughout the HPA. The composite pressure data does not -- I mean, you have a layer out here in most locations that is of significantly higher pressure than your composite pressure data. So the best-fit model for most locations contains a lower-permeability layer, with pressure considerably higher than the composite pressure.

So to me this would suggest that -- and we're using a rough approximation of a two-layer model that -- you would expect this kind of differential depletion to be ubiquitous throughout the HPA. And consequently, the results suggest that the vast majority of the locations have more gas in place than would be indicated by the composite pressure.

And I think that's the biggest flaw with what was done before, is the composite pressure data just underestimates the gas in place and then overestimates recovery factor.

Taking this distribution of models, we can then get a distribution of incremental recoveries, which we will see here on Slide 15. This is our cumulative-probability plot of reserves. There's reserves on the bottom, and percent less than on the top, so... Our high point was about 2.5 BCF and our low point was about 200 million.

Again, we're going to treat this as a distribution. We're not going to say we have the right answer to any specific location, but we think this is a representative distribution of what you expect find in the HPA, based on our assumptions. And we'll see that 80 percent of the results are between about .7 BCF and 1.7 BCF. So if you discard the lowest ten percent and the highest ten percent, concentrate here in the middle, that's what you would expect to get.

And the average of those is 1.1 BCF, and if you apply that to our 436 HPA locations we get a total incremental reserve estimate of 480 BCF.

Q. Let's look at your conclusions on Exhibit Slide 16. Would you discuss those, please?

A. Sure. I think as I've said and everyone has said, you know, previous analyses were done with composite pressure data, and those kinds of analysis will tend to underpredict gas in place and consequently overpredict recovery factor, you know, based on what we expect to produce from the wells.

The layered pressure data that has been presented indicates that not all coal seams are being efficiently drained at the current well spacing, and also indicate that this composite pressure data is an inaccurate measurement.

The modeling work that we did suggests to me that we could expect this differential drainage to exist throughout the HPA. I think we have a pretty good representation of data points for layered pressure, and I think this just confirms what those show, that at locations throughout the HPA we should expect to see this kind of differential drainage.

And then if we go back and look at our two-layered model and we have a high-perm layer and a low-perm layer, what we see is a significant portion of the reserves we would expect to get are due to being able to deplete these low-recovery-factor, high-pressure, low-perm layers, that basically the existing wells, even if we assume the reservoir is continuous, are not going to produce the gas out of those layers. The permeability is too low. So infill drilling will allow for significant increases in recovery factor in these higher pressure, lower permeability, coal seams.

Additionally, in our two-layer model we had a high-permeability layer. And the modeling suggests that you will see slight reductions in the abandonment pressure of that layer. And even slight reductions, as people have said, will result in fairly significant reserves. So even small decreases in the abandonment pressure, in the higher-perm, lower-pressure seams that we see in some of these layered pressures, are going to add significant reserves.

And the last conclusion is, our estimate was 480 BCF. Now, that tends to sound like a pretty big number, but if you look at the gas in place in this fairway, our estimate was somewhere in the neighborhood of 10 TCF. We're only saying you're going to get a 5-percent increase in recovery factor, you know. And that also neglects any reserves that we're going to get from discontinuous coal seams or stranded gas. We're just talking about more efficiently producing the gas out of zones that we've encountered but don't have significant permeability to be produced on 320 acres.

Q. And your 5-percent incremental increase shows the results of a very conservative case then; is that correct?

A. We think it's conservative. To us it's based on what we could quantify, so the other stuff we're treating as gravy. So yes, we would consider this to be conservative.

Q. Your 5 percent represents only your two layers in your model applied to the 400-plus locations?
A. It only represents the coal seams that we have seen -- We have a two-layer representation of the coal seams we think we have encountered in the 320-acre wells, so it does not represent anything that we did not see or we do not feel we're depleting with the existing wells on some level.
Q. All right. Dr. Balmer, does ConocoPhillips agree with the Committee --
A. Dr. Boneau.
Q. Sorry.
A. It sounds weird to me too.
(Laughter)
Q. Dr. Boneau, does ConocoPhillips concur with the Committee recommendation to maintain the 2-million-a-day line between the LPA and HPA?
A. Yes, we do. We -- There are some locations inside that line that infill drilling is probably not warranted in having that line, and a different notifi- -- having a notification process in that line allows, you know, to address those locations.
Q. Is it your ultimate conclusion that infill development in both the low-productivity area and high-productivity areas will result in the production of

additional incremental reserves that would otherwise go unrecovered?

A. Sure, absolutely.

Q. Were Exhibits 2 through 16 prepared by you?

A. Yes, they were. Williams was nice enough to, you know, give me a map, a composite pressure map, but I put it in a slide.

MR. HALL: All right, that concludes our direct of Dr. Boneau, and we'd move the admission of Exhibits 2 through 16 at this time.

CHAIRMAN WROTENBERY: Okay, ConocoPhillips Exhibits 2 through 16 are admitted into evidence.

Questions? Or do you have so many you want to wait till after lunch?

COMMISSIONER LEE: Oh, after lunch?

CHAIRMAN WROTENBERY: Well --

COMMISSIONER LEE: No, I just want to have a brief --

EXAMINATION

BY COMMISSIONER LEE:

Q. Do you believe in simulation?

A. I think if you apply it appropriately. I think it -- We know it's all non-unique.

Q. Okay. Who did you take your simulation class from?

A. Greg Hasely.
Q. Oh, okay.
A. Are you talking about applied or theory?
Q. Theory.
A. That was from you.
Q. Okay.
A. I didn't apply any theory --

COMMISSIONER LEE: Okay, I -- Everybody laugh about simulation, but I tell you a story. I think the simulation is a very powerful tool. At one time there were companies that did a simulation study, and they want to disprove, one little company, saying that reservoir permeability is -- the permeability is greater than .2, so -- .1, so they don't classify as a tight gas. I think Tom knows this story.

So this small company come to me and say, Well, I don't have much money, but it seems like they have very sophisticated tool, you know. And at that time -- I think it's 1992, and I was -- I say okay. And so he only have $6000, he cannot even pay me to go to Denver to testify. So I took everything, the big companies' report, I put it together and I asked my student to look into that.

Of course they prove the permeability is -- it's greater than .1, because they say the fracture -- it's 8 inches wide inside the reservoir. Okay? The fracture is this big.

So I went to Denver and I told the judge, I say, Well, this is basically -- What happened is, this is a black horse, okay? And the simulation guys, under the simulation and bringing a white pen and pen the horse as a white horse and turn around and tell the general public, say, this is a white horse. Okay?

And I also found -- You know, this Commission also found something, okay, input exactly equal to output, but I don't want to elaborate on this one.

But whenever you want to do the simulation, please have a conscience inside your simulation, just don't try to make up a story and come up with a trend. And you look at a trend, you know, people understand the simulation, you look at those curve. You know, if that is too good to be true then you know it's artificial, it's a garbage-in, garbage out.

I'm sorry to keep everybody thinking this Commissioner is -- this Commission doesn't accept a simulation. But whenever you want to present a simulation -- This is a simple case. Whenever you want to present a complicated simulation, I will spend three days to look into your data set to see what's going on. I think that will be fair to everybody.

Thank you.

CHAIRMAN WROTENBERY: Thank you, Dr. Lee.

Did you have any questions, Commissioner Bailey?

COMMISSIONER BAILEY: (Shakes head)

CHAIRMAN WROTENBERY: Thank you very much, Dr. Boneau, for your testimony.

Anything further, Mr. Hall?

MR. HALL: That's all we have.

CHAIRMAN WROTENBERY: Okay, thank you.

This will be a good time to break for lunch. Let me ask, has anybody been in touch with Mr. Kendrick?

MR. FAGRELIUS: Yes, we have.

CHAIRMAN WROTENBERY: Will he be ready to go at 1:30?

MR. FAGRELIUS: Yes.

CHAIRMAN WROTENBERY: Okay, great. Then we'll start back up at 1:30.

(Thereupon, noon recess was taken at 12:10 p.m.)

(The following proceedings had at 1:35 p.m.)

CHAIRMAN WROTENBERY: Mr. Kendrick?

MR. KENDRICK: Okay, I take it we're still in the first case, the --

CHAIRMAN WROTENBERY: Yes, we are.

MR. KENDRICK: -- Case 12,888?

CHAIRMAN WROTENBERY: That's right.

MR. KENDRICK: We have decided not to put any testimony in this case.

CHAIRMAN WROTENBERY: Oh, okay. So does that bring us to the end of the testimony in that case?

MR. KELLAHIN: Yes, madame Chair, that concludes the presentations that we were making in the poolwide case, the 12,888 case.

CHAIRMAN WROTENBERY: Okay.

MR. KELLAHIN: So we think we're done.

CHAIRMAN WROTENBERY: Okay, thank you very much.

COMMISSIONER LEE: Darn.

(Laughter)

MR. CARR: In view of that, I think we have a couple geologists.

(Laughter)

CHAIRMAN WROTENBERY: You'd please Commissioner Bailey, she was hoping for more geological testimony. Okay.

In that case, we did have a prehearing order in this case that was issued on the 9th of May, and in that order we had provided that we would allow 10 days for the submission of closing statements and any proposed findings of fact and conclusions of law that the parties would like to submit.

MR. CARR: And may it please the Commission, there are a couple of other people here who did want to make brief statements at the conclusion of the testimony.

CHAIRMAN WROTENBERY: Okay.

MR. CARR: Okay?

CHAIRMAN WROTENBERY: Okay. Well, we'll make some time for that, then.

Right now, while I'm thinking about it, I will just note for the record that I guess 10 days from today's date is the 14th, which is Saturday, so we'll ask for the closing statements, the written closing statements and draft findings and conclusions by the 16th of June. Will that work for everybody?

Okay, who would like to make a statement here before we take this case under advisement? Yes?

MR. SCHMID: My name is Tom Schmid, I'm representing ChevronTexaco Corporation. I guess I'll take this one here?

CHAIRMAN WROTENBERY: Yes, please.

MR. SCHMID: Madame Chairman, I have a letter to submit to the Commission. I would like to read it aloud and make sure it's entered in the record.

CHAIRMAN WROTENBERY: Sounds good.

MR. SCHMID: Letter dated June 4th, it's addressed to the New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division, it's:

Attention: Lori Wrotenbery, Director, Oil Conservation Division, regarding Case Number 12,888, *de novo*, Application of the Fruitland Coalbed Methane Study Committee to amend Rules 4 and 7 of the Special Rules and Regulations for the Basin-Fruitland Coal Gas Pool and for the termination of the Cedar Hill-Fruitland Basal Coal Pool and the concomitant expansion of the Basin-Fruitland Coal (Gas) Pool, Rio Arriba, San Juan, McKinley and Sandoval Counties, New Mexico, before the Oil Conservation Commission.

Dear Ms. Wrotenbery,

Chevron U.S.A. Inc. (hereinafter referred to as "Chevron") and its affiliate, Four Star Oil & Gas Company (hereinafter referred to as "Four Star") agrees with the Study Committee's recommendations. We support the above referenced Fruitland Coalbed Methane Infill drilling application. More precisely we support the authorization, under certain restrictions, of a Fruitland Coal operator to drill a second Basin-Fruitland Coalbed Methane well in and produce from an already established 320 acre gas spacing unit for wells located in the pool, based on the operators' prudent assessment of all relevant data.

Chevron and Four Star further believe this is a prudent approach to developing their fields and their leases. The Study Committee has applied technical and logical reasoning to all relevant issues. We believe that the recent technical work done by the Fruitland Coalbed Methane Study Committee and other major San Juan Basin producers, particularly Burlington Resources Oil & Gas Company, BP America Production Company, and Devon Energy Corporation L.P. adequately justifies our position. In our opinion, the approval of the application 1) will promote conservation by assuring a greater ultimate recovery of gas and associated hydrocarbons, 2) will prevent waste by allowing more efficient drainage, and will 3) adequately protect correlative rights though the notice procedures as described in the application and the testimony of the Study Committee.

Chevron, as operator, will actively strive to reduce surface impacts by using new technology to reduce surface disturbances, use existing drillpads and roads where it's economically feasible and will respect landowners' concerns regarding their aesthetic values of the lands.

This letter is respectfully submitted the 4th day of June, 2003, before the New Mexico Oil Conservation Commission.

Sincerely, J.T. Schmid, Jr.

CHAIRMAN WROTENBERY: Thank you very much, Mr. Schmid. And do you have a copy of that letter to --

MR. SCHMID: I've got the original.

CHAIRMAN WROTENBERY: Okay, great. Thank you.

MR. SCHMID: Would you like copies? I do have additional copies.

CHAIRMAN WROTENBERY: We listened carefully, so I think we've got it.

MR. SCHMID: Thank you, ma'am.

CHAIRMAN WROTENBERY: Thank you.

Anybody else like to make a statement? Yes.

MR. HAWKS: I'm Ralph Hawks. I'm a geologist with Williams. With your permission I will not read our statement, but we have been involved in the Committee since 1999 when it was reconvened.

We have participated as indicated by other testimony, we have been providing ConocoPhillips in particular some information that they did use in their testimony.

We do support the Committee's recommendation, and we are in favor of that, and that's what our statement indicates.

I have extra copies, if you would like a copy of our statement as well.

CHAIRMAN WROTENBERY: We've got copies.

MR. HAWKS: Okay. And that's all I have.

CHAIRMAN WROTENBERY: Okay, thank you very much, appreciate it.

MR. HAWKS: Thank you.

CHAIRMAN WROTENBERY: Is there anyone else who would wish to make a statement at this time?

Anything further? Mr. Carr? Mr. Kellahin? Mr. Hall?

MR. CARR: I don't think Mr. Kellahin or I have anything.

CHAIRMAN WROTENBERY: Or Mr. Kendrick, anything?

MR. KENDRICK: Not in this case.

CHAIRMAN WROTENBERY: Okay. In that case, we will take this particular matter under advisement, and we will look forward to receiving the written closing statements on the 16th of June.

(Thereupon, these proceedings were concluded at 1:42 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 Commission was reported by me; that I transcribed my notes; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL June 9th, 2003.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 16th, 2006