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 RICHARDSON OPERATING COMPANY TO ESTABLISH A SPECIAL "INFILL WELL" AREA WITHIN THE BASIN-FRUITLAND COAL GAS POOL AS AN EXCEPTION FROM RULE 4 OF THE SPECIAL RULES FOR THIS POOL, SAN JUAN COUNTY, NEW MEXICO

CASE NO. 12,734

ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

COMMISSION HEARING (Volume I, October 29th, 2002)

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

October 29th, 2002
Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Commission, LORI WROTENBERY, Chairman, on Tuesday, October 29th, 2002, 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

October 29th, 2002 (Volume I)
Commission Hearing
CASE NO. 12,734

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EXHIBITS

Richardson	Identified	Admitted
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E X H I B I T S (Continued)

Richardson	Identified	Admitted
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E X H I B I T S (Continued)

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San Juan Coal Company	Identified	Admitted
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* * *

WHEREUPON, the following proceedings were had at 9:05 a.m.:

CHAIRMAN WROTENBERY: Okay, we'll go on the record and call this meeting of the Oil Conservation Commission to order. It's Tuesday, October 29th, 2002. We're here in Porter Hall in Santa Fe, New Mexico, for this meeting.

I'm Lori Wrotenbery. I'm Director of the Oil Conservation Division and I serve as chair of the Oil Conservation Commission.

To my right is Jami Bailey, who represents Land Commissioner Ray Powell on the Commission.

To my left is Dr. Robert Lee, who is director of the Petroleum Recovery Research Center at New Mexico Tech, and he serves as the designee of the Secretary of Energy, Minerals and Natural Resources on the Commission.

We also have Florene Davidson, to my far right, who's the Commission's secretary, and I think she'll stay with here for a few minutes until we get started on the Richardson case, and then she'll probably excuse herself.

To Dr. Lee's left is Steve Ross, the Commission's counsel.

And then Steve Brenner is our court reporter. He'll be recording the proceedings today.

We'll call for appearances in the Richardson case in a moment. I just wanted to note we had a couple of other items on the docket for today.

One of them was Case 12,897. This is the Application of the New Mexico Oil Conservation Division through the Environmental Bureau Chief for the adoption of amendments to Division Rule 118 concerning hydrogen sulfide gas.

We do not have an order ready to enter in this case at this moment, but in the course of the next day or two we may well have an order ready for consideration by the Commission, so we may well take that up during the course of these proceedings.

Case 12,622, the Application of Nearburg Exploration Company, L.L.C., for two nonstandard gas spacing and proration units in Lea County, New Mexico, that was on the agenda, but we don't anticipate having an order ready for action by the Commission until the Commission's November 22nd meeting in that particular case.

That case was consolidated with Case 12,908-A, which was the hearing called by the Oil Conservation Division for an order creating, contracting, redesignating and extending the vertical and horizontal limits of certain pools in Lea County, New Mexico. Both of those will be heard November 22nd.

And likewise for Case 12,934, the Application of the New Mexico Oil Conservation Division for repeal of Rule 402 concerning the method and time of shut-in pressure tests for gas wells. We anticipate having a final order ready for the Commission's consideration and action at the November 22nd meeting.

So that brings us to Case 12,734. This is the Application of Richardson Operating Company to establish a special "infill well" area within the Basin-Fruitland Coal Gas Pool as an exception to Rule 4 of the special rules for this pool, in San Juan County, New Mexico.

This case is being heard *de novo* by the Commission upon the Application of San Juan Coal Company. It was filed pursuant to the provisions of Rule 1220.

And I think we're ready to call for appearances in this case.

MR. KELLAHIN: Madame Chairman, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin, appearing on behalf of the Applicant, Richardson Operating Company.

MR. BRUCE: Madame Chair, Jim Bruce of Santa Fe, appearing on behalf of San Juan Coal Company, together with Larry Ausherman of the Modrall Sperling law firm, and Charles Roybal who is in-house counsel for San Juan Coal Company.

CHAIRMAN WROTENBERY: Thank you. Mr. Ausherman, would you spell your name, please?

MR. AUSHERMAN: Yes, A-u-s-h-e-r-m-a-n.

CHAIRMAN WROTENBERY: Thank you. Other appearances?

I take it you both have a number of witnesses that you plan to call?

MR. BRUCE: I have six witnesses, I'm afraid.

CHAIRMAN WROTENBERY: Six witnesses.

MR. KELLAHIN: We have three.

CHAIRMAN WROTENBERY: Three. We'll ask at this point if all of the witnesses will stand and be sworn.

(Thereupon, the witnesses were sworn.)

CHAIRMAN WROTENBERY: Thank you. Before we go any further, I will note that the Commission has received the Motion to Dismiss which Mr. Kellahin filed on behalf of Richardson, and we've received the Response and Supplemental Response from San Juan Coal Company.

What we plan to do at this point is to address those motions and responses in our final order in this particular case. We would like to go ahead today and for the next couple of days, as necessary, and hear the evidence in the case. But we will rule on that Motion as part of the Commission's order in this particular case.

Are there other preliminary matters that we need to discuss?

MR. KELLAHIN: No, ma'am.

CHAIRMAN WROTENBERY: Okay. Then do we have opening statements?

MR. KELLAHIN: Yes, we do.

CHAIRMAN WROTENBERY: In this particular case San Juan is the *de novo* Applicant but Richardson is really the Applicant in the underlying case, so --

MR. KELLAHIN: It would be my preference to make our presentation first, and do it much like we did the Examiner Hearing with the original Applicant making their presentation first, followed by the opposition.

MR. BRUCE: We have no objection to that.

CHAIRMAN WROTENBERY: Okay. Then, Mr. Kellahin, would you like to start?

MR. KELLAHIN: Thank you, Madame Chairman.

You have before you two different binders that were submitted as part of the prehearing exchange of documents. They're divided between a binder that's got the letter A on it and a binder that's marked B&C.

The first binder deals with the regulatory aspects of handling the coal and the coal gas production in the area that we're going to talk about. There's various correspondence, documents that we will address.

Binder B&C is subdivided where B contains the geologic presentation and C contains copies of all the engineering documents that we're going to talk about.

So if you locate the A binder and look inside the A binder, you're going to find a map that's in a sleeve. It should be A-1, I believe. That's going to be a locator map for us.

We're dealing with an area that is west of Farmington. We're in the area of the Basin-Fruitland Coal Gas Pool where San Juan Coal Company is mining or proposes to mine the coal.

What we intend to present to you today is the fact that the coal mine is not the issue. It's our contention that the Commission has no jurisdiction to prevent the waste of coal, but that you do have jurisdiction to prevent the waste of oil and gas.

I see three issues for you to address.

The fundamental issue involved in this case concerns when and how to remove the coalbed methane from the coal.

First, should Richardson Operating, as the owner of the right to the coal gas, be afforded its right to produce and sell the coal gas before the coal is mined?

Or should the Commission allow the coal gas to be vented, and thereby wasted, when San Juan Coal Company mines the coal?

And finally, why should the Commission treat

Richardson's area differently from how the Division now treats the rest of the underpressured area of the Basin-Fruitland Coal Gas Pool?

Richardson started his hearing before Examiner Stogner on November -- we took November 13th and 14th of last year. We had a hearing on Richardson's Application for a special infilled area to increase well density in the Fruitland Coal Gas Pool in the area we're about to show you on the map.

At that time, the Pictured Cliffs reservoir was spaced on one well per 160 acres, and that is still the rule. At that time the Basin-Fruitland Coal Pool Rules provided two gas wells in the coal per section, using 320-acre spacing units and requiring that the wells be located either in the southwest quarter or the northeast quarter of a section. That's not the rule now.

The rule now, as of a Division Order dated October 15th of this year, has decided for the Basin-Fruitland Coal Gas Pool that the underpressured area of that pool can be drilled on four wells per section, excluding the Richardson acreage. That Basinwide discussion about well density subdivided the coal into the fairway or what we call the overpressured coal. That's substantially east of the Richardson area.

Mr. Stogner took that overpressured area, sent it back to the industry committee for further study on well density.

The balance of the pool, including the Richardson area, had it not been objected to, would enjoy four coal gas wells in a section. But because of the objection of San Juan Coal in this pending Commission Hearing, Mr. Stogner deleted Richarsdon's application area from the rule that now allows everyone else, except those in Richardson's area, from having four coal wells per section.

Richardson's Application, while predating the Commission other proceeding on the poolwide case, was made pursuant to a rule of the pool. The rule of the pool allowed an applicant to ask for designation of a special area and then be allowed to increase that well density from two wells to four wells a section.

If you'll look at the locator map -- I have a larger copy here -- let me go through with you some of the basic factual components that you need to be aware of.

MR. ROSS: Tom, you're upside down.

MR. KELLAHIN: I've been accused of that before.

(Laughter)

MR. KELLAHIN: Does that help?

This map, like your map, has a red area that's outlined, and that's the Richardson Application area. We are at the intersection of four townships. Those townships intersect right here where the orange line is, and if you look to the northeast portion, you're in Township 30-15. If you go east of that line, you're in Township 30-14. Then south of the divider you're in 29-15, and then east of the divider you're 29-14.

Within this area, you're going to see from the documentation that there are two coal leases. There's a coal lease that we call the Deep Lease. The Deep Lease coal is the first two columns of townships on the display, on the left side.

Next to that, on the east extension, there's an additional two columns of townships -- or sections within that township that are called the Deep Lease Extension. That is the current extension of the coal gas leases that San Juan Coal Company has control of now.

Within their lease area, the mine has subdivided the leases and designated seven mine districts. You'll see those labeled on your map, and they're all numbered from 1 to 7, and they're the shaded gray area.

My understanding of the mine plan is that within the various districts, there's a time associated with being -- commencing into and getting out of that district. And as you look at the map, you can see some starting and some ending dates. A couple of those overlap where you have mining activity taking place in two districts contemporaneously over some portion of that time.

My understanding is that they would build a system where the longwall mining would commence on the eastern side of a mining district, proceed to the west. So that's the general plan.

The color code for the map on the well locations is down at the bottom. It shows proposed locations, and we're talking about Richardson activity.

Richardson's proposed locations are in yellow.

The Fruitland Coal recompletions are recompletions intended to be performed on Pictured Cliff wells.

And the last one are existing Fruitland Coal wells.

When you look at the map, you can see the distribution. While San Juan Coal has protested, they have protested a column of sections that's east of their lease area. They're disputing what we consider to be our right to have four PC wells and two coal wells in this section, plus the opportunity to increase the coal density so that there's four coal wells. So they object even to this area.

When you look at the plan, at this point in time we have counted up, including Richardson penetrations, there are 70 -- 71 wellbores that penetrate the coal.

Our research indicates that this map, which will be introduced later as Exhibit C-27, shows all the penetrations. The mine must deal with all of these that are existing wells.

And what Richardson is seeking to do at this point is to add three more new wells. The three are shown on Exhibit 1-A, and you can see them outlined in yellow. Those are the three that directly conflict with the mine's mine district.

In addition, when you look at the map, you find that there are five blue wells that are Pictured Cliff wells that Richardson wants to recomplete into the pool.

The current strategy for Richardson and most of the operators in the San Juan Basin is that they drill PC wells, set a bridge plug and isolate the coal and then separately frac and stimulate the coal. The practice has been, and Mr. Cox will demonstrate to you, that it's not effective to simply rely upon your ability to perforate a fracture into the Pictured Cliff and presume that you're then well connected with the coal. It does happen on occasion, but the best technique is to separately fracture and produce each as a downhole commingled wellbore. And so that's what their plan is.

If you see areas outside of the mine district, that's a color code that will indicate to you what is the current status.

When you look at the coal leases, there are two state leases involved in the coal. In the Deep Lease area, Section 36, it's a state lease. When you look over in the Deep Lease Extension, Section 32 is a state lease. You'll find that all the oil and gas leases predate the coal leases.

By our count within the mine districts that we've identified on the exhibit, there are 20 penetrations of wells that are within the mine districts themselves. Our understanding at this point is, the mining process has begun and it's at the point where they take the methane gas that comes out of the coal and it is vented and wasted. My understanding is, it is at a rate of approximately a million cubic feet of gas a day, or it could be more. I guess we're going to find out.

One of the questions for you to decide is, if San Juan Coal is to get relief from our additional three new wells and five recompletions, what are they going to do with the existing 71 wellbores?

You'll find when you look at the oil and gas leases, none of the oil and gas leases we're presenting to you have any stipulations limiting oil and gas exploration, production or operations because of the presence of coal. You will find that the Deep Lease Extension, issued by the Bureau of Land Management, the March 2nd of last year lease, contains three special stipulations on that coal lease.

First of all, the coal lessee must diligently operate to prevent the waste of non-coal resources.

In addition, the second stipulation says the coal lease is subject to all prior existing rights, including the rights of oil and gas lessees.

And then finally the coal lessee is solely responsible, and not the BLM, to clear the coal tract of any legal encumbrance or pre-existing land use, including these oil and gas leases, if they want them out of the way.

When Richardson developed this area starting back in 1992, he had a plan of development that would access the PC and the coal.

And then BLM calls a meeting in November, on the 5th of November of last year, and the BLM invites Richardson, Dugan, San Juan Coal and the BLM representatives to a meeting. And the collective result of that meeting was the agreement to expedite recovery of the coal gas. The plan was to develop some priority by the BLM so that Richardson could exercise his correlative rights and get the coal gas out before it was wasted. And so they discussed an agreement to accelerate that.

Richardson in June and July of last year filed, among other things, four APDs. They were in Section 30 and

31. In Section 30 [*sic*] it was two wells in the north half, in Section 30 it's the two wells in the east half. Those four wells were the subject of the APD.

CHAIRMAN WROTENBERY: Would you say that again.

MR. KELLAHIN: Yes, ma'am.

CHAIRMAN WROTENBERY: Which four wells?

MR. KELLAHIN: He had four wells that he filed APDs for in June and July, and if you look at Section 30 if 30-14, the east half has two wells -- forget the color code for a moment -- but those did not exist then. They have now been drilled.

In the north half of 31 there are two more wells. Those were the subject of APDs. Those wells have now been drilled. All four wells, although they're coded, have not been completed. Because of the dispute we're withholding further action on those wells.

CHAIRMAN WROTENBERY: Okay, thank you.

MR. KELLAHIN: Up until this point, San Juan Coal has agreed to expedite the recovery of the methane coal.

And then you're going to find the evidence will demonstrate to you that on August 30th of last year San Juan Coal changes its position. They send a letter to the BLM, and they now object to these four by Richardson, and they raise for the first time the contention that further drilling is going to cause roof instability, problems with steel casing and the opportunity or possibility for spontaneous combustion. They raise those issues to the BLM. And the evidence will show you that on December 20th last year, the BLM approved Richardson's APDs and denied the coal gas objections.

The Coal Company filed a protest or an appeal to the State Director of the BLM, and on December 17th of last year, the BLM State Director denied the objections and allowed Mr. Richardson to proceed to drill those wells which now have been drilled.

Let's go back to Mr. Stogner's hearing. Back in November of last year he had the hearing on the Richardson Application.

On June 6th of this year, Mr. Stogner and the Division issued an order approving Richardson's Application and denying the San Juan Coal Company's objections.

Then we had what I described a while ago as the pool infill hearing and order. The pool hearing was June of this year, and after two days of hearing before Mr. Stogner in Farmington the Basin-Fruitland Coal Gas Pool Committee made their presentation.

And then on the 15th of October, just a few weeks ago, the Division has entered the Order that I described to you.

So at this point everyone in this underpressured area of the pool enjoys the benefit of four coal gas wells per section except Mr. Richardson.

Part of the dilemma now is that operators in the column of sections just to the east of Mr. Richardson's project area can now drill a coal density of wells where they could put two wells on the east half of those sections, and he now cannot meet that competition.

Let me turn to the technical part of the case that you're going to see during this proceeding. We've discussed this matter with Counsel. I think you're not going to see objections to documents, evidence. All of this is going to come in, and we're all going to talk about it. We disagree with their conclusions and some of their exhibits, but we have technical people that will tell you the differences. So we'll make a full presentation and allow them to do that too, so that you get to see all the pieces of the puzzle. They're going to show you a movie and displays about coal mining so you can have a feel and a sense of how that takes place.

But here's what we think are the key issues:

There's lots of gas present in the Fruitland Coal bed in the Richardson Application area. Richardson will tell you that for as little as 25 or 50 MMCF per well additional reserves, that he can economically recomplete the PC wells and produce the coal. That's all the gas it takes.

And even if you are to believe the San Juan Coal Company's numbers, it will still make sense to approve Richardson's Application.

In approving that Application for Richardson, you're going to provide an opportunity for him to improve ultimate recovery. When this process started he thought he was just going to have to rate-accelerate in order to have a chance to get his coal gas. His expert witness, David Cox, has studied this for him and has now concluded not only is it not rate acceleration, he's going to get substantial additional reserves. And Mr. Cox is going to tell you within the project area there's an additional 27 BCF of gas that's going to come out of this project if you let us do it. That translates, by Mr. Cox's calculation, to about $27 million of additional value.

Those conclusions are going to be supported by Mr. Cox. His testimony and evidence and calculations are going to demonstrate the following for you:

We're going to tell you that there's not enough difference between San Juan Coal and Richardson to make the geology matter. This is not a fight over geology. It's going to be a technical dispute over reservoir engineering. And here's the framework within which that lies:

Mr. Cox is going to demonstrate for you that while Pictured Cliff wells, some of those completions may connect it to the coal, much better completions and connections can exist if the PC wells are allowed to separately isolate the well and perforate that coal and fracture it. The Coal Company doesn't want us to fracture the coal.

Mr. Cox, by using the correct isotherm, will demonstrate that the gas content in the coal is about 240 standard cubic feet of gas per ton of coal. That number matters a lot. So you want to remember 240 standard cubic of gas per ton of coal.

Mr. Cox has analyzed this, and he has determined that because the desorption measurements from coal cores are not reliable, that San Juan Coal Company has underestimated the gas content of the coal. He will demonstrate to you that while they want to use these desorption measurements from their coal cores, those numbers are not reliable. By using those numbers, they substantially undervalue the gas content of the coal. So there's a difference there for you to pay attention to.

There's also going to be dispute about whether this is a saturated or an unsaturated gas reservoir, meaning that the coal is saturated with methane at or near its saturation point.

Mr. Cox will argue for you that his well performance data demonstrates that this is a saturated reservoir, and he'll go through the calculations that demonstrate why that matters one way or another. He's going to give you an initial reservoir pressure of 251 p.s.i. I'm not sure that number's in dispute, but that's the number he's using in his calculation, is, he uses about 250 p.s.i. of original reservoir pressure.

There's going to be a dispute about the thickness of the coal. Mr. Richardson says through his experts that the coal thickness of the upper coal is about 14 feet. The average thickness of the lower coal is about 14 feet also. That gives you a total of 28 feet. You're going to see a little bit of difference. We contend as the geologists map this and show you the isopachs, it really doesn't matter, it's very close. So when Mr. Cox does his calculations using the 28 feet and the other values, he will demonstrate to you that a 320-acre spacing unit in this area has 3.8 BCF of gas in place. He then shows you recovery calculations and where he gets the result to demonstrate that 2.6 BCF of gas are recoverable per 320-acre unit. The question then is, does Mr. Richardson have a chance to produce that gas, or are we going to let the coal mine do that?

In conclusion, then, we believe the evidence will demonstrate that the Commission should consider the

Richardson Application and limit it to the questions of waste and correlative rights associated with the production of those hydrocarbons.

We contend that San Juan Coal Company has a mining plan which will unduly interfere with Richardson's ability and right to produce the coalbed methane within the Fruitland Coalbed formation. Richardson's Application is not only an attempt to prevent the waste of coal by accelerating that production but an opportunity he enjoys to improve ultimate recovery.

We contend that the Commission, after you hear all this evidence, should do what Mr. Stogner did, and that was deny the objection and let Richardson go forward with its project.

Thank you.

CHAIRMAN WROTENBERY: Thank you, Mr. Kellahin.

Mr. Bruce?

MR. BRUCE: Madame Chair, I'm going to make a statement, and then I would request permission for Mr. Ausherman to briefly address just one issue that Mr. Kellahin brought up.

CHAIRMAN WROTENBERY: That will be fine.

MR. BRUCE: May it please the Commission, Richardson basically says it should be treated no differently than in the poolwide case, the order which just issued a couple weeks ago. However, I don't think you need to look any further than one provision of the Oil and Gas Act and then review the facts that will be presented over the next couple of days to make the determination that it should be treated differently.

Section 70-2-17.B says the Division may establish a proration unit for pool, such being the area that can efficiently and economically be drained and developed, but in so doing the Division shall consider, first, the economic loss caused by the drilling of unnecessary wells, second, the prevention of waste, and third, avoidance of the augmentation of risks arising from the drilling of an excessive number of wells.

Now, as to economic loss, you'll hear a lot of numbers today. But frankly, San Juan will show that, first, the economic loss to the mine is severe if additional Fruitland Coal completions are allowed. And second, our reservoir engineer will show that there is little or no economic loss in the mining districts if Richardson is denied in its Application.

As to the prevention of waste, if infill drilling is allowed the waste of coal will be enormous. The value of the coal is ascertainable. And even using what I believe are inflated figures that Richardson will present, the values for the recoverable coal vastly exceed the value of the gas.

As to the augmentation of risk, well, if there's one thing that drives the operation of the mine it is safety. Spontaneous combustion and roof instability are substantial issues which will be addressed in this hearing. Any accident could cause -- or fire, which is a possibility -- could cause miners' deaths and also loss of the entire mine, which initially will have a $140 million capital investment. This investment and the safety of the miners must not be placed at risk.

As to the original Order in this case, if you review the Order the one issue that was ruled on that determined the outcome of the case was not Richardson's economics, not our economics. The Division simply ruled that it had no jurisdiction over waste of coal. We believe that is an incorrect ruling under 70-2-26, which provides that the Secretary of the Energy, Minerals and Natural Resources Department must review decisions of the Commission with due regard for the conservation of the state's oil, gas and mineral resources, which we think clearly includes the coal.

But the final issue -- and I think you can ignore all the other issues, all the other facts that are going to be presented to you, but you can deny the Application because in effect Richardson already has the relief it's requested.

Richardson claims to need four Fruitland Coal wells per section. However, the combination of Fruitland Coal and Pictured Cliffs wells already in this area -- and all you need to do is look at that second chart Mr. Kellahin put up; there's four, five, six, seven, eight wells per section out there already -- gives, in effect, more than four Fruitland Coal completions per section.

The fact of the matter is, the Pictured Cliffs wells in this area, the ones already in place, are actually Fruitland Coal producers. And those allegedly Pictured Cliffs wells produced better than single Fruitland Coal completions.

We ask the Commission to enforce its rules and recognize where the gas is actually coming from in this area. This situation, of course, is aggravated by the fact that operators are already allowed four Pictured Cliffs wells per section. Then they want four Fruitland Coal wells per section. That's a total of eight.

There's also a case before the Division for a pilot project to allow two Pictured Cliffs wells per quarter section. That would add another four. In the future you might be looking at 12 wells per section. They're going to claim they're in the Pictured Cliffs, but the geology -- maybe the one dispute in the geology is that for most of this area there's no meaningful Pictured Cliffs gas. It's all Fruitland Coal.

We believe allowing that many wells is impermissible and aggravates the effect of these wells on the mine. Based on these matters, this case must be treated differently than the Basinwide case. We will ask that you hear the evidence and deny the Application and allow no further Fruitland Coal completions in the mine area.

Thank you.

And I'd like to let Mr. Ausherman address one issue regarding the leases.

MR. AUSHERMAN: Thank you. If I may, I would like to focus on one aspect of what Mr. Kellahin raised in his opening statement, and that is the proceeding before the BLM. I would just like to emphasize that the dispute that was played out in the BLM over four APDs was certainly a separate dispute from that which is before the Commission today. The evidence will show that those four APDs were not infill wells and the issues that the BLM considered there were not the issues that the OCC is to consider here.

Although it was raised before the BLM, the issue of seniority, the question of seniority is not before the Commission today. And the BLM has, you will see from the evidence, ruled that its decisions upon the four APDs will not serve as a precedent for the granting of any further applications for permit to drill before the BLM.

And so I just wanted to clarify that with respect to the relationship with the BLM case, which is separate from the case before the Commission today.

Thank you.

CHAIRMAN WROTENBERY: Thank you, Mr. Bruce and Mr. Ausherman.

I think we're ready, then, Mr. Kellahin, for you to present your witnesses.

MR. KELLAHIN: Yes, ma'am, we're going to start with Exhibit Book A and I'm going to call Mr. David Richardson.

CHAIRMAN WROTENBERY: Good morning, Mr. Richardson.

MR. RICHARDSON: Good morning.

CHAIRMAN WROTENBERY: We're ready.

MR. KELLAHIN: Thank you.

<u>DAVID B. RICHARDSON</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. Mr. Richardson, would you please state your name and occupation?

A. Sure, David B. Richardson. I am president of Richardson Operating Company.
Q. Where do you reside, sir?
A. In Denver.
Q. How long have you had Richardson Operating Company as an oil and gas company?
A. Approximately 20 years.
Q. During that period of time, describe for us the type of production you have drilled and produced in New Mexico?
A. Starting in the late 1980s we drilled coalbed methane wells further east in Bargo Canyon area. We drilled approximately 22 wells, and then subsequently we moved further west.
Q. When we look at your current population of wells in New Mexico, what kinds do you have?
A. We have Pictured Cliff and Fruitland Coal wells.
Q. That predominantly, then, is your activity in New Mexico?
A. Yes, it is.
Q. Is that activity confined to the San Juan Basin?
A. No, it is not.
Q. It spills over into Colorado and other places?
A. Approximately six other states.
Q. Okay. What's your education, sir?

A. I have a bachelor of science from the University of Oklahoma with a degree in geology.

Q. The geologic presentation today is being made by consultants that you've hired in the geologic area to study this for you?

A. Yes, it is.

Q. Do you maintain a staff of geologists and engineers?

A. I use consultants, and I do -- I'm a geologist myself, so I do a lot of the...

Q. So Mr. Cox is a consultant for you?

A. Yes, he is.

Q. Can you give us an indication of the number of wells you have in the coal and in the PC at this point?

A. Right now we have 91 wells in the coal and the PC in the Farmington area. This is just a part of what we're doing out here in the mine area. We've accumulated about -- a little over 30,000 acres, we've drilled 91 wells, we have about another 100 wells to go. So this is just a small portion of it.

Q. In terms of handling your plan for the exploration of the PC and the coal, what type of wells do you drill?

A. I'm sorry?

Q. What type of wells do you drill to access those formations?

A. Conventional vertical wells.

Q. Okay. And do you access the coal and the PC in a single wellbore?

A. Yes, we do.

Q. And how have you been going about doing that?

A. Typically we'll go in and perforate and frac the PC, set a bridge plug and do the same with the coal.

Q. Why do -- Is there any difference in the ownership between the coal and the PC in the areas that you're operating?

A. Sometimes there is.

Q. In the area that we're looking at here for your Application area, is there a difference in ownership between the coal and the Pictured Cliff?

A. No, there isn't, only if it's beyond a 160-acre spacing.

CHAIRMAN WROTENBERY: I'm sorry, could you explain that, the qualification about being beyond --

Q. (By Mr. Kellahin) If you're dealing with a 160-acre PC well --

A. Yes.

Q. -- you're dealing with a 320-acre coal dedication?

A. That's right.

Q. And you might -- because of the fractions, you may have a difference in the adjoining 160s --
A. That's right.
Q. -- that will change the fractions in the coal?
A. Right.
CHAIRMAN WROTENBERY: I understand now.
Q. (By Mr. Kellahin) So it's not a vertical separation?
A. No, it is not.
Q. It has to do with the consolidation of one 160 in the second 160?
A. That's right.
Q. As an experienced operator, Mr. Richardson, have you had success with completing a well in the PC and utilizing that PC frac job to adequately and efficiently drain the coal?
A. Yes, we have.
Q. How often does that happen?
A. Wherever we can do it, we do it.
Q. Separately?
A. Yes.
Q. Oh, you don't do just one frac job?
A. No.
Q. All right. So if you do just one frac job in the PC --

A. Yes.

Q. -- is that enough to let you effectively and efficiently produce the coal?

A. No, it is not.

Q. And why not?

A. Because we haven't perforated the coal. It just makes common sense, if we want to produce gas out of the coal we need to complete that zone separately. They're entirely different reservoirs, and we'll get into that later.

Q. Yeah, and that's your plan of exploration of both zones?

A. Yes, it is.

Q. Is to use a single wellbore?

A. Yes.

Q. All right. Have you and others on behalf of your company been involved with the issue of the San Juan Coal Company seeking to expand their mine area with the acquisition of the Deep Lease Extension?

A. Yes.

Q. Have you been through all that?

A. Yes.

Q. Have you and others on your behalf participated in all those --

A. Yes.

Q. When we look at how you've organized yourself to pay for and finance the level of expenditure required for this kind of activity in the Application area, how are you doing that?

A. I'm doing that with my own money. I own the company 100 percent. I started it, basically from zero, 20 years ago. To date in this area I've spent over $15 million, and ultimately it will be between $35 and $40 million. So I believe it's very economic.

Q. Let's turn to the documents that we have before you in Exhibit Book A, Mr. Richardson. Have you looked at all these documents?

A. Yes, I have.

Q. These documents are taken either from lease files of public record, documents between you and San Juan Coal and the BLM?

A. Yes.

Q. In addition, you've included various orders of the Division?

A. Yes.

Q. Have you reviewed the chronology that's set forth as Exhibit A-2?

A. Yes, I have.

Q. To the best of your knowledge, is that accurate?

A. Yes, it is.

Q. Okay. I don't propose to go through all these entries, Mr. Richardson, but I would like to establish a sequence of the activity that's taken place affecting your oil and gas leases in relation to what is occurring with the coal gas leases.

A. Okay.

Q. And let's start behind Exhibit Tab 3. Exhibit Tab 3 has a Division order. This is one of the coal orders. This is the rules that you operate under?

A. Yes, it is.

Q. You're generally familiar with these rules?

A. Yes, I am.

Q. All right. When we flip past 3, there is an accumulation of oil and gas lease documents. When you go through all those documents, are these the base oil and gas leases that you now operate that affect the Application area?

A. Yes, they are.

Q. If you'll turn past those and go to Tab 5, have you included behind Tab 5 the four co-leases in the Application area?

A. Yes, I have.

Q. You've got the two state leases and the two federal leases?

A. Yes.

Q. All right, let's go past that and start with 6. Okay? Let's talk about events prior to August 19th of 1997. Prior to that time, what was your level of effort in extracting the PC and the coal from the Application area? What were you doing?

A. Prior to 1997?

Q. Yes, sir.

A. We were acquiring leases in the area.

Q. When was the first well that you drilled or had an interest in that piqued your curiosity about producing the coal gas out of the coal?

A. Right, it was the Bushman 6-1 well.

Q. Bushman 6 is in Section 6?

A. Six, yes.

Q. It's the red dot down here in the southeast quarter of Section 6?

A. Yes, it is.

Q. What about that well caused you to have an interest in the coal?

A. That was the first well that we drilled on this side of the Basin. It was on the far western side. And after we drilled it and completed it, we noticed right away that we were getting gas pressure and we were seeing gas almost immediately.

Q. What do you do with the produced water out of your system? Where do you put that water?

A. We reinject it back into the ground, into a deeper formation.

Q. You have a disposal system and a disposal well somewhere?

A. Yes, we do.

Q. Where is that disposal well?

A. It's right here in Section 1. It's called the Salty Dog Number 1 disposal well.

Q. By August of 1997, when we're looking at Exhibit Tab 6, what is beginning to occur that comes to your knowledge?

A. The BHP has applied for an extension of their coal mining lease over into our area.

Q. When we talk about BHP, we're talking about the San Juan Coal Company?

A. Yes.

Q. Just to keep me comfortable with the labels, let's just call them the San Juan Coal Company --

A. Okay.

Q. -- even though there's some other caption.

A. Right.

Q. That's how I know the opposition.

A. They go by several names.

Q. Yeah. This is a letter to the BLM?

A. Yes, it is.
Q. And they're proposing to set up a process where they can obtain coal gas leases for appears to be areas east of their present lease in the Deep Lease area?
A. Yes, it is.
Q. What then happens, Mr. Richardson?
A. Well, we don't agree with that, and we write a letter back to the BLM, and we object to the BLM considering this.
Q. So when we -- And let's just continue through the chronology. If you go to Exhibit Tab A-7, this is a letter over your signature?
A. Yes, it is.
Q. And what's your purpose in sending this letter?
A. To notify the BLM that we disagree with this.
Q. Okay. What then happens, Mr. Richardson, when you go to Exhibit 8?
A. The BLM has an RMP in this area, and they're soliciting feedback from people.
Q. An RMP is the BLM's resource management plan?
A. Yes, it is.
Q. And in order to proceed with issuing coal leases, they have to amend the plan, right?
A. That's true.
Q. If you'll turn to the plan -- and let me see if I

can help you find this. If you turn halfway back, you're going to start some numbering pages, and you'll find page 26. You then get page 27, and then finally you have one that's captioned Protocol from the Mediation of Adverse Impacts on Oil and Gas Revenues. Do you see that page?

A. Yes, I do.

Q. Do you know what the source is of the protocol that's shown on this display?

A. San Juan Coal Company prepared this.

Q. And when you look at the bottom about General Principles --

A. Yes.

Q. -- what does that say?

A. It says San Juan Coal Company "will conduct its operations in a manner consistent with the legally mandated principles of multiple use of federal lands and mineral reserves." San Juan "will use its best efforts to achieve maximum economic recovery of federal resources. Valid existing rights under federal oil and gas leases as well as the 40 acre private oil and gas lease located" in Section 18 which predate San Juan "coal leases, will be honored."

Q. To the best of your knowledge, Mr. Richardson, do all of the oil and gas leases that you are operating under predate the coal leases?

A. Yes, they do.

Q. To the best of your knowledge, have you maintained those leases in full force and effect?

A. Yes, we have.

Q. Have you paid your rentals ad your royalties on all those leases?

A. Yes.

Q. When we turn to Tab 10 -- I'm sorry, I've gone past 9. What are you doing in 9?

A. In 9 again in May of 1998, we sent a letter to the BLM, to the Director, objecting to the new coal leases being issued.

Q. This is over the signature of Cathleen Colby?

A. Yes.

Q. And who is Ms. Colby?

A. She was our land manager at the time.

Q. Was she working under your control and supervision?

A. Yes, she was.

Q. Going to Tab A-10, what's happening here?

A. This is a letter to Ms. Colby from the BLM, reviewing our request and concluding that the BLM New Mexico State Director and Farmington District Manager follow the applicable or planning procedures.

Q. If you'll turn to Exhibit 11, the BLM letter of October 5th, what is the BLM telling you?

A. They "agreed to in the protocols included..." to "...take all reasonable steps to avoid adverse impacts on oil and gas production".

Q. So when you look down at the third paragraph of that letter --

A. Yes.

Q. -- they are summarizing the commitments in the protocol?

A. Yes.

Q. And then you go to Tab 12, this represents the State Mining --

A. Right.

Q. -- documentation showing the requirements that the State is imposing insofar as the permit applies to any of the State lease sections?

A. Yes.

Q. And this would affect Section 32?

A. Yes, it would.

Q. Let's go past that and look at A-13. What's happening now? We're now in February of the year 2000.

A. Okay, they've reviewed our protest letter of January 10th, 2000. It goes on to talk about their promoting "multiple use of Federal resources." And then they say they have canceled the lease sale after our objections.

Q. Let's go to 14.
A. Okay.
Q. We're now on February 22nd of the year 2000, and there's an instructional memo issued by the BLM?
A. Yes.
Q. What are the major points of the memo that you'd like to direct our attention to?
A. To "Clarify that the lessee's right to develop its minerals may be junior to existing development rights for other minerals on the same lands."
Q. All right, let's go through the pieces. If you'll look at page 1 it says Issues.
A. Yes.
Q. And the second full paragraph, the second sentence of the second paragraph, would you read that to me?
A. "Therefore, the Bureau's policy is to optimize the recovery of both resources and ensure the public receives a reasonable return."
Q. As part of that plan do you meet with the Bureau of Land Management and others about accelerating the rate at which you recover the gas?
A. Yes, we do.
Q. That did occur?
A. Yes, it did.

Q. Let's turn to page 3 of the instructional memo from the BLM and look at Use of Lease Provisions and Regulations. Do you see those?

A. Yes, I do.

Q. If you look at the second one from the bottom, what does that say?

A. "Direct the coal lessee to analyze all possible mining plans to allow optimum recovery of CBM and deeper hydrocarbons, as part of the...approval."

Q. And when you read up and find the first bullet point under that heading -- it starts with "Direct rates..."

A. Right.

Q. -- what's that say?

A. Okay, under "...its lease and regulatory authority over conventional oil, gas or CBM development, as appropriate, to: Direct rates of production, Issue orders to produce or plug wells that are not producing in paying quantities."

Is that what you're talking about?

Q. Yeah, it's the first bullet point, it says "Direct rates of CBM exploration..."

Have you been directed by the BLM to accelerate the rate of production of the coal gas?

A. Yes, we have.

Q. If you'll turn to the last page of that, what's the top line say?

A. "Suspend the coal lease or coal operations to allow optimum recovery of CBM."

Q. Let's turn and continue some of the protest language. If you go to 15, this is a letter signed off by you to the BLM. What's the purpose of this letter?

A. We're protesting the lease sale.

Q. Okay. And then when we go to 16, what's happening here?

A. Then they notify us that they're going to --

Q. This is in response to your letter?

A. Yes. And in that response it says, "Although not specified...we will only approve new leases or mine plan modifications that won't impede methane production for the next ten years.

"Given your situation, we encourage rapid development of methane to maximize coalbed methane recovery. To accomplish this, we will be requiring coalbed methane producers to follow our diligence requirements in your Lease Terms for timely development."

Q. Let's see how this fits together, then, with the notification of the offer to lease the coal. If you look at 17, there's a notice page out of the *Federal Register*?

A. Yes.

Q. And when you turn to the second page and look at the first column, the BLM is setting forth --

A. Yes.

Q. -- lease stipulations for the coal?

A. Okay.

Q. We've already talked about those?

A. Do you want me to --

Q. Yeah, are these the same stipulations that --

A. Right.

Q. -- were identified for you earlier in the amended resource management plan?

A. Yes, where it says "The tract is subject to several prior valid and pre-existing surface and subsurface rights."

Q. When we go to 18, what's happening at this point, Mr. Richardson?

A. We are writing a letter to the BLM. We have several APDs that have been filed, and we are requesting to them to expedite their approval of those.

Q. Okay. Let's turn to 19.

A. Same thing.

Q. In the letter on January 2nd [*sic*], the first sentence refers to a meeting on November 2nd [*sic*] of the year before. What's happening at that meeting, on Exhibit 19-A?

A. On November 3rd?

Q. Do you have the January 2nd letter?

A. No, I don't. I go from the 4th to the 8th.

Q. All right, so -- On Tab 19.

MR. AUSHERMAN: Mr. Kellahin, we don't have that either.

MR. KELLAHIN: Okay.

CHAIRMAN WROTENBERY: I think it's the January 4th letter.

MR. KELLAHIN: What did I say?

CHAIRMAN WROTENBERY: I think you said 2nd.

COMMISSIONER LEE: 2nd.

THE WITNESS: Okay --

MR. KELLAHIN: I'm sorry. I'm sorry, it's --

THE WITNESS: It is the 4th.

MR. KELLAHIN: It's the 4th.

MR. AUSHERMAN: We have that one. Thank you.

Q. (By Mr. Kellahin) It refers to a December 2nd [*sic*] meeting. Do you see the letter?

CHAIRMAN WROTENBERY: It refers to a November 3rd meeting.

THE WITNESS: Refers to a November 3rd meeting.

CHAIRMAN WROTENBERY: You've got something on the 2nd.

(Laughter)

MR. KELLAHIN: I have a reason.

(Laughter)

Q. (By Mr. Kellahin) All right, do you see that date?

A. Yes.

Q. What's happening?

A. Well, we were directed by the BLM to expedite our drilling program. Now we are writing them a letter saying if you need to approve our APDs, then we'll start drilling.

Q. Did you attach a plat or a map to document to them what you're proposing to do?

A. Yes, we did.

MR. KELLAHIN: Madame Chairman, this document came to me after we had filed the prehearing documents. I've shown it to Mr. Bruce. This is the same map we showed Mr. Stogner at the -- at his hearing. I believe there's no objection to having this inserted into the exhibit book as the plat that goes along with Exhibit A-19.

MR. BRUCE: No objection, Madame Chair.

CHAIRMAN WROTENBERY: Okay, we'll make that, then, a part of what's been marked as Exhibit A- -- Is it A-19 or A-20? The only reason I ask that is that the letter dated January 8th that's marked as Exhibit A-20 refers to a map.

MR. KELLAHIN: It's an A-20 map. I'm not so good with numbers. You can see that, right?

CHAIRMAN WROTENBERY: Okay, so we'll make this map part of what's been marked as Exhibit A-20.

MR. KELLAHIN: All right.

Q. (By Mr. Kellahin) Bring this back into focus for us, Mr. Richardson. In January of last year, then, you're trying to do what the BLM is telling you?

A. That's true.

Q. And what are they telling you to do?

A. To speed it up and drill it.

Q. Okay. When we look at the map, is this part of your plan to speed this up?

A. Yes, it is.

Q. As part of that effort, do you continue to file applications for permit to drill with the BLM?

A. Yes, we do.

Q. Let's turn, then, to Exhibit Tab 21. What's happening here?

A. This is a letter from the BLM referencing the November 5th, 2000, meeting where "...it was agreed that there is a definite need to expedite development of the gas reserves underlying the Deep Lease..."

Q. Go to 22 with me, and find the last page.

A. Okay.

Q. Down at the bottom it says Deep Lease Extension?

A. Yes.

Q. Are these the same coal lease stipulations that we've talked about a while ago?

A. Yes, I believe this is their actual lease.

Q. Okay. We're going to skip 21 and come back to it. I want you to look at -- We're going to skip 23 first and then go to 24.

A. Okay.

Q. 24 is what, sir?

A. These are the four APDs, applications for wells in the Deep Lease Extension, approved by the BLM.

Q. And we talked about those a while ago. Those wells are in the east half of 30?

A. Yes.

Q. There's a C-102 attached to each of the displays. If you flip through the displays, you can see where the wells are.

A. Some are in 31.

Q. So you've got two in the north half of 31?

A. Yes.

Q. And two in the east half of 30?

A. West half of 30.

Q. In the west half of 30.

A. Yes.

Q. So when flip back to Exhibit 23, you draw protests from the Coal Company about these APDs, don't you?

A. Yes, we do.

Q. It's an August 30th [*sic*] letter?

A. Yes, it is.

Q. What are they now contending is the problem, Mr. Richardson?

A. They've got a number of concerns. In the letter it says their concerns are threefold, the presence of steel casing in the basal coal seam, and then we get into the root stability issue and the increased risk of spontaneous combustion.

Q. You're looking at the first full paragraph on the second page of the letter?

A. Yes.

Q. What then happens to your APDs?

A. They're canceled.

Q. After being canceled, were they ever reinstated?

A. Yes, they were.

Q. Let's go to Exhibit Tab A-25. What's happening now in September of last year?

A. Okay, this is where they -- This is where canceled the approved permits.

Q. Okay.

A. The next...

Q. 25, they've canceled them, and now they're looking at the protest and the issues raised in the protest?

A. Yes.

Q. And so when we go to 26, what is the BLM now saying?

A. This is six days later. Now they deny the protest.

Q. At this point are you then able to go out and drill your wells?

A. Yes, we are.

Q. What happened to the protest of the Farmington BLM's office that was filed by San Juan Coal?

A. It was denied.

Q. Yeah. After that, was that issue was raised to the State Director of the BLM?

A. Yes, it was.

Q. If you turn to Tab 27, what's happening with this communication?

A. It's denied.

Q. So the State Director has denied the objection San Juan Coal Company has made to your three APDs?

A. Yes.

Q. Or four APDs. And the issues raised during all these disputed period of time are the same disputed issues that San Juan Coal raised before Mr. Stogner?

A. Yes.
Q. When you turn to Exhibit Tab 28, what are we looking at here?
A. This is our Application to establish a special infill well area. That was approved.
Q. This is the Division's Order 11,775?
A. Yes.
Q. After that, have you received from the Division a copy of Mr. Stogner's Order on October 15th, approving infill drilling in the underpressured area of the San Juan Coal Pool, with the exclusion of your --
A. Yes.
Q. You've seen that.
MR. KELLAHIN: Would you mark this A-28?
COMMISSIONER LEE: 29.
CHAIRMAN WROTENBERY: 29.
MR. KELLAHIN: 29.
MR. AUSHERMAN: Mr. Kellahin, could I get a copy of that?
If I may for the record, just to clarify that our proceeding has been carved out of the Basinwide proceeding, so to the extent that this addresses issues that are beyond the proceeding before us, we would object. For purposes of background we have no problem with Mr. Kellahin talking from that.

MR. KELLAHIN: I'm not sure I understand the objection. Tell me again, Larry.

MR. AUSHERMAN: The Basinwide proceeding has carved out from it the infill Application which is at issue today. So to the extent that you're offering the Basinwide decision to establish that the infill Application should be granted, we would object to that because the infill Application has been expressly carved out of the Basinwide.

If, on the other hand, what you're doing is wanting to use this as background, then we would not object to that and you're free to do so.

MR. KELLAHIN: Let me respond. Here's what I thought occurred in Farmington before Examiner Stogner. We were proceeding with the infill case. Mr. Bruce entered his appearance in that proceeding on behalf of San Juan Coal. He got up and asked Mr. Stogner to incorporate the record in the Examiner Hearing in the proceeding he was hearing in Farmington. He did that, and in doing his order in this case, now, he's carved back out Richardson's special project area.

I intend, and I would like to have the Commission take administrative notice of the infill case and to compare the technical data presented by Burlington, of which San Juan Coal is now a party in that case, with what we are showing you today in the special area, to demonstrate why should we be carved out?

So that's where I'm going.

CHAIRMAN WROTENBERY: We'll allow the introduction of the exhibit, once it's offered anyway, and then consider the relevance of the action in the Fruitland Coal case on its merits.

MR. KELLAHIN: At this time, madame Chairman, we would move the introduction of Richardson's exhibit in Exhibit Book A, which are Exhibits A-1 through A-29.

CHAIRMAN WROTENBERY: You've stated your objection to --

MR. AUSHERMAN: I have stated the objection --

CHAIRMAN WROTENBERY: -- A-29. Did you have any objection to any of the other --

MR. AUSHERMAN: No, ma'am.

CHAIRMAN WROTENBERY: Okay, we'll admit Richardson Exhibit A-1 through -29 into the record.

Q. (By Mr. Kellahin) Mr. Richardson, let me have you summarize for us your plans. Do you propose to drill any new coal gas wells within what is outlined as San Juan Coal Company's mine districts?

A. Yes, we do.

Q. Are those as indicated on Exhibit A-1?

A. Yes.

Q. Do you also plan to recomplete Pictured Cliff wells at the coal in wells that are still located within any of the mine districts?

A. Yes, we do.

Q. And outside of the mine districts themselves, within the two coal leases, you have other opportunities?

A. Yes, we do.

Q. And do those opportunities include additional coal gas new wells?

A. Yes.

Q. And the recompletion of PC wells?

A. Yes.

Q. And then outside of the leases you have a row of sections for which you intend to -- or would like permission to complete in the coal and produce the coal?

A. Yes.

Q. What's the timing for doing all this?

A. We work very quickly, so in the very near future.

Q. Why haven't you already engaged in that activity at this point?

A. We are unable to. We don't have the right to downspace it. We've been denied that.

Q. You mean infill drill?

A. Yes.

Q. The existing PC wells --

A. Yes.

Q. -- those are standard, pursuant to the Rules?
A. Yes, they are.
Q. And you do have some coal well locations, which would be standard under the old rules of two wells per section?
A. Yes.
Q. The additional development of those resources has been stayed by the Commission pending a decision here, right?
A. Yes, it has.
Q. All right.
A. For the past year.
MR. KELLAHIN: That concludes my examination of Mr. Richardson.
CHAIRMAN WROTENBERY: Thank you. Why don't we take about a ten-minute break here, before we begin your cross-examination?
(Thereupon, a recess was taken at 10:22 a.m.)
(The following proceedings had at 10:34 a.m.)
CHAIRMAN WROTENBERY: Okay, it looks like we're ready to get started again.
MR. AUSHERMAN: Thank you.

CROSS-EXAMINATION

BY MR. AUSHERMAN:
Q. Mr. Richardson, you testified that you had in the

neighborhood of 91 wells in the Farmington area, and you spent about thirty -- you have about 100 wells to go; is that correct?

A. Yes.

Q. But you only have about 20 wells in the actual mine area of San Juan Coal Company's coal leases; isn't that correct?

A. Yes.

Q. How much have you spent on those wells?

A. I have not differentiated between. I just have a total sum.

Q. Any more, any less, on a per-well basis?

A. In this area we've built our own pipeline, water and gas infrastructure and -- No, I haven't broken it out.

Q. When was your first CBM well in San Juan's mine area?

A. That was in 1999.

Q. So you've been active in this area for quite a while before you began drilling wells in the mine area; is that correct?

A. Yes.

Q. How many employees do you have in New Mexico?

A. Approximately 27.

Q. Do you have figures on how much royalty you've paid to the federal and state government from your operations in the mine area?

A. A considerable amount. I don't have an exact number.

Q. No numbers on that?

CHAIRMAN WROTENBERY: Mr. Ausherman, may I ask, when you refer to the mine area, what are you referring to?

MR. AUSHERMAN: I'm referring to the area within the Deep Lease and the Deep Lease extension.

CHAIRMAN WROTENBERY: Okay.

MR. AUSHERMAN: Those are the two areas that Mr. Kellahin has depicted on Exhibit A-1.

CHAIRMAN WROTENBERY: Thank you, I just wanted to make sure I understood.

MR. AUSHERMAN: Yes, and that would include the state leases as well, which are in those southern sections that Mr. Kellahin alluded to.

CHAIRMAN WROTENBERY: Okay, thank you.

Q. (By Mr. Ausherman) You testified that the Bushman well, 6.1, was the well that interested you in developing further in the area of the area of the mine; is that correct?

A. Yes.

Q. The Bushman well is not within the mine area, is it?

A. No, it's not. But however, it is the group of --

tier of sections that excluded from downspacing right now.

Q. But it's outside of the mine area?

A. Yes.

Q. Let me ask you to turn again to Exhibit 8, and specifically turn to the last three pages of that exhibit, which is entitled Protocol for the Mediation of Adverse Impacts on Oil and Gas Reserves.

A. Yes.

Q. You testified about this in your direct examination, did you not?

A. Yes.

Q. I call your attention to the language at the bottom of the first page of that protocol that you read into the record earlier, and that is the very last two lines, "Valid existing rights under federal oil and gas leases..."

A. Yes.

Q. Now, that does not say what the definition of valid and existing rights are, does it?

A. Well, in this case it would be senior rights to yours.

Q. That's your opinion; that's not what the BLM said; isn't that correct?

A. Well, I think anyone with any common sense whatsoever would see the same thing.

Q. Understood, that's your view. But let's take a look at what the BLM's view is.
A. Okay.
Q. Does the BLM say what the definition of valid existing rights are?
A. In this -- No.
Q. And they don't mention your leases specifically, do they?
A. No.
Q. This document goes on to indicate that -- on the last page -- that a binding arbitration procedure is set up under the protocol; isn't that true under c) on page 3?
A. That's what the protocol says, yes.
Q. Are you willing to commit to the protocol?
A. No, I'm not.
Q. You're not willing to engage in binding arbitration?
A. No, I'm not.
Q. You've met with San Juan Coal Company to discuss fair market value and buyout, but it would be fair to say you haven't reached agreement; is that correct?
A. That's true. We've been told many, many times that you would be giving us an offer, and you never have.
Q. I won't go into the status of those specific settlement discussions, given the confidentiality of it,

but I just wanted to establish that pursuant to the protocol we have been in discussions with respect to fair market value, although you're not willing to commit to the arbitration aspect of the protocol?

A. No.

Q. I refer you to Exhibit A-24. Now, those are the applications for permit to drill that were the subject of the BLM proceeding; isn't that correct?

A. That's true.

Q. And you've drilled those wells, have you not?

A. Yes.

Q. So those wells are not in the infill Application proceeding today; is that correct?

A. No.

Q. And those APDs are not at issue today?

A. No.

Q. The Commission is not going to be asked to consider the granting of an APD, because that's the BLM charge; isn't that correct? Isn't it the BLM that considers the granting of APDs, not this Commission?

A. Well, on federal lands.

Q. Since granting those four APDs to you, the BLM has granted no additional APDs to you in the mine area, have they?

A. I don't know for sure on that.

Q. To your knowledge, they have not?

A. We permit so many wells I just couldn't tell you.

Q. So your testimony is today that you don't know whether you've had any APDs granted by the BLM after the grant of the four in Exhibit 24?

A. I just couldn't tell you.

Q. Now, since the BLM granted those four APDs, the BLM has stipulated that their grant of those APDs will not serve as precedent in the consideration of any other wells in the mine area; isn't that correct?

A. I don't know that.

Q. Let me --

MR. KELLAHIN: I'm going to object to the line of questioning. This gentleman is not an attorney. He can't answer these questions.

MR. AUSHERMAN: If I may, I would like to introduce what we have provided as a rebuttal exhibit yesterday, which is Exhibit 25, and the reason that we'd like to introduce it is because it is the order that disposes of the proceeding in the BLM that Mr. Kellahin and Mr. Richardson have talked about.

CHAIRMAN WROTENBERY: Okay.

MR. KELLAHIN: I don't have any objection to the introduction of the document, but it's improper to ask this witness about that. There's no objection to introducing the document --

CHAIRMAN WROTENBERY: Okay.

MR. KELLAHIN: -- I don't challenge that. But I do object to having him ask Mr. Richardson to explain it or talk from it or read from it.

CHAIRMAN WROTENBERY: The way I understood Mr. Ausherman's question, he was asking Mr. Richardson what he knew about the BLM's latest comments on --

MR. AUSHERMAN: Yes.

CHAIRMAN WROTENBERY: -- on the four APDs.

MR. KELLAHIN: Yeah, he said he didn't know.

MR. AUSHERMAN: May I continue?

CHAIRMAN WROTENBERY: Yes.

Q. (By Mr. Ausherman) Mr. Richardson, have you seen the Stipulated Motion for Dismissal which I've handed you, which is San Juan Coal Company Exhibit 25?

A. No, I have not.

CHAIRMAN WROTENBERY: And may I say, I don't believe the Commissioners have copies of the Exhibit 25.

MR. AUSHERMAN: Oh, I'm sorry, we provided those yesterday. Steve, did you get those? I have extras here.

MR. ROSS: I have one. I guess I was supposed to distribute them.

CHAIRMAN WROTENBERY: Do you have multiple copies, Steve? He's got -- Okay, thank you.

Q. (By Mr. Ausherman) I would refer you to the Stipulated Motion for Dismissal.

MR. KELLAHIN: Madame Chairman, I'll continue to object. The document speaks for itself. We've admitted the document. This witness can't testify about it. If Mr. Ausherman wants to argue about it, he can do that in his closing statement.

CHAIRMAN WROTENBERY: Well, let me hear Mr. Ausherman's question.

Q. (By Mr. Ausherman) Just one question. Referring to paragraph 5, does that refresh your recollection about whether you've seen this document before?

A. No, it does not.

MR. AUSHERMAN: I would move the introduction of San Juan Coal Company Exhibit 25.

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: No objection? Okay, San Juan Coal Company Exhibit Number 25 is admitted into evidence.

Q. (By Mr. Ausherman) Now, I'd like to ask you some questions about San Juan Coal Company's opposition to putting more wells in its coal seam. Could you turn to Exhibit A-23, please?

A. Okay.

Q. And this is the letter, is it not, that San Juan raised its concerns about the wells in the coal seam, correct?

A. That's true.

Q. And about the time of this letter you had talked with San Juan about their concerns and expressed some frustration that this was a change of view on the part of San Juan; is that correct?

A. Yes.

Q. And the date of that letter is August 31, 2001, correct?

A. Yes.

Q. The date of your infill Application was September 11th, 2001; is that correct?

A. Yes.

Q. So at the time that you filed the infill Application, you were well aware that San Juan Coal Company had concerns about additional wells in the Coal seam?

A. We had begun the process much earlier than that. That was just the date that it was filed.

Q. I see. But as of the date that it was filed, you were well aware that San Juan Coal Company had objections to additional wells in the coal seam, did it not?

A. Yes, they had made a 180-degree flip-flop on their position at that time, yes.

Q. And you were aware of that --

A. Yes.

Q. -- at the time of the infill Application?

Let me talk with you about the history of the APDs. You have filed quite a number of APDs in the vicinity of the mine area, I assume --

A. Yes, we have.

Q. -- given the production you have there?

And you testified that even well before the APDs which were the subject of the dispute in the BLM, the BLM had asked you to accelerate development in the area?

A. Yes, we have.

Q. And at the time the BLM was asking you to accelerate development, before those APDs, San Juan Coal Company was also of the view that that could be done safely, were they not?

A. Yes.

Q. And it was only after that that they changed their view?

A. Yes.

Q. Refer you to Exhibit A-19. Now, this is the letter you testified about that you had sent to the BLM to explain that you filed numerous APDs in response to their request to accelerate development; is that not correct?

A. Yes.

Q. And this is the list of APDs that Richardson had

filed since May, 2000, correct?
A. Yes.
Q. Are any of the priority 1 wells within the acreage covered by San Juan's coal leases, what we've been referring to as the mine area?
A. The first five are.
Q. Of the priority 1 wells, that would be 4-1 through 5-4?
A. Right.
Q. Are any of the other -- And the rest of the priority 1 wells are not in the mine area; is that correct?
A. True.
Q. The priority 2 wells, are any of those in the mine area?
A. No.
Q. You were accelerating development east of the mine area at this time, were you not?
A. Yes.
Q. Turn to Exhibit 18 if you would, please. This is a letter dated October 19, 2000, and this confirms that the focus of your acceleration of development was actually not in the mine area but to the east of the mine area; isn't that correct?
A. No, that's not true, exactly. We were drilling -- We have 30,000 acres out there. We're drilling in the

mine area, east of the mine area, south of the mine area. It's just -- No, we didn't exclude that area.

Q. I would call your attention to the first sentence of the last paragraph on page 1 where it says, "To date, Richardson has drilled 31 wells east of San Juan Coal Company's mine." Did I read that correctly?

A. Yes. Everything that we've drilled is east of the San Juan Mine.

Q. Oh, so --

A. Your San Juan Mine is in Section 34 to the west.

Q. Oh, so what you're talking about here is not the mine area but the surface mine?

A. That's what I -- maybe this was referencing, yes.

Q. But you're not sure whether that was what it referenced?

A. I would have to review this.

MR. AUSHERMAN: Just for the record, and to clarify for the Commissioners, the surface mine in this area is immediately adjacent to what we've been referring to as the Deep Lease in the mine area to the west. We'll explain that in greater detail in our case.

CHAIRMAN WROTENBERY: Thank you.

Q. (By Mr. Ausherman) The coal to the east of San Juan's coal leases is generally more productive than the coal within the leases; isn't that true?

A. We don't know that to be true, ultimately, as we dewater these wells.

Q. You don't know it to be untrue, it's just that you won't know until you've dewatered the wells; is that correct?

A. That's true.

Q. Just in comparing your efforts to accelerate development to the east of San Juan Coal Company's leases with some of your wells in the mine area, you referred to -- refer you to the wells in the state Section 36 --

A. Yes.

Q. -- on Exhibit A-1.

A. Yes.

Q. Those wells have been frequently shut in, have they not been?

A. Yes, they have.

Q. Are they currently shut in?

A. No, they're not.

Q. You've shut them in for a while, produced them for a while, intermittently?

A. Yes. Two of the wells are producing now.

Q. Which two are those?

A. The 36-3 and the 36-2.

Q. Most of your current production in the infill area is outside of the area of San Juan's coal leases;

isn't that correct?

A. Yes, it is.

Q. If I may, I'd like to ask you a few questions about water disposal. You mentioned the Salty Dog well. Could you show me again where that is?

A. In Section 1, the northeast quarter of 29 North, 15 West.

Q. I see. And this is referring to Exhibit A-1. Is that the only injection well you have?

A. No, it is not.

Q. Where's your other --

A. It's --

Q. How many other injection wells do you have?

A. We have two other ones right now, and we're applying for three more.

Q. Are the two that you have right now servicing the wells in the area -- the wells within the San Juan Coal leases?

A. Yes, they are.

Q. And where are those other two wells?

A. This is the Salty Dog Number 2 well in the southeast of Section 5, 29-14. We also use commercial disposal, and our third well is the Navajo H-13 well.

Q. And where is the Navajo --

A. That's south of the river, and that services wells down there.

Q. Okay, so you don't use that well for your production within the area of San Juan's coal leases; is that --

A. No.

Q. -- correct? So to dispose of water from wells within the area of San Juan coal leases, you use the two wells you've referenced near the mine area, and then you truck water as well, or --

A. Yes, we do.

Q. Do you have an estimate about what percentage of the water you've produced is disposed in the two wells you've referenced in the mine area and what percentage is trucked?

A. No, I don't.

Q. What was the cost of those water injection wells?

A. Several hundred thousand dollars each.

Q. Any more specific than that, how many you've got --

A. No, it would be in the -- maybe $200,000, the low hundred thousands.

Q. And you pipe the water to those?

A. We pipe and truck it, yes.

Q. So there's some water that you're trucking not only down by the river, but you're also trucking the water to these two injection wells in the mine area?

A. Yes.

Q. What's the rate for trucking water to --

A. We own our own water trucks, so it's -- It's over a dollar a barrel.

Q. Do you have an estimate of your current unused capacity for injection of water in the wells near the mine area?

A. Unused capacity -- We are at capacity right now, that's why we're permitting three more wells.

Q. Do you expect that the other three wells that you'll be permitting will also cost in the neighborhood of $200,000 apiece?

A. No, we have one that we're permitting as an Entrada test, a disposal well, and that will be $600,000 or $700,000.

Q. Where are those three wells that you're seeking?

A. The Entrada disposal well is in the northeast of Section 28, and then the other two are in Sections 30 and 31, all in 30 North, 14 West.

Q. Thank you.

A. We had offered to send water over to the mine, because you all dispose of it on the surface, which -- originally you said you would do that, and that fell through.

Q. Do you report the quantities of water that are produced from all of your wells?

A. Yes, we do.

Q. From the very inception of each well?

A. Yes, we do.

Q. What's the first point that you make that report? Is it the first barrel of water that comes out of the ground?

A. Not always. Sometimes just in flow testing, we'll flow it back into the fractates and take it over to the injection well. But we try and get it as close as possible.

Q. You don't handle that calculation reporting personally, do you?

A. Some of the wells that I do, yes, but we have field pumpers, and they report it to our office, and then it gets to me in Denver.

Q. I see. Which wells do you personally handle the reporting of --

A. Ultimately --

Q. -- disposal?

A. Ultimately all of them, I sign for.

Q. You sign for.

A. Yes.

Q. Do you handle the reporting in the field, reporting activities in the field, for any of them?

A. No, I don't take actual measurements myself.

Q. So you leave the measurements to somebody else?

A. Yes, I do.

Q. And if somebody else had failed to report water being produced, you would not have a way of knowing that until it got to the point that it came to your attention?

A. Yes.

Q. You have pointed out that if you compare the lease dates of the oil and gas leases, which are exhibits, with our coal leases, your leases are older; is that correct?

A. Yes.

Q. The holder of those leases held them for 20 or 30 years or more before there was any coalbed methane developed; isn't that right?

A. Yes.

Q. And your contention is that those old leases give you valid and existing rights; is that correct?

A. Yes.

Q. But whatever right you have is by the need to get an application for permit to drill approved by the BLM; is that not correct?

A. That may be a legal question you can ask my lawyer.

Q. And in addition, before you have the opportunity to drill, at least for the wells that you seek in this proceeding, you need to have the infill application approved; isn't that correct?

A. True.

Q. And so you do not at this point in time have the necessary approvals you need to drill the wells which are the subject of the infill Application?

A. That's true.

Q. The mine has obtained its permits and is currently mining; isn't that correct?

A. Yes.

Q. So if you were to compare the date the development rights were granted for the mine with the fact that you have yet to obtain permits for the infill Application, the mine's permit date is senior to yours; isn't that correct?

A. I cannot make a legal conjecture there.

Q. I understand from the exhibits that your geologist will be testifying about the fact that there are seams and stringers of coal above the big Number 8 seam that the Coal Company mines; is that correct --

A. Yes.

Q. -- and the horizons above that?

And you're aware that those other smaller seams and stringers of coal exist above the big Number 8 seam; is that --

A. Yes.

Q. The thickness and continuity of those stringers and seams above the Number 8 seam that the Coal Company mines is certainly less than the Number 8 seam that's the focus of the mine; isn't that correct?

A. Well, I think that the total thickness of the upper stringers is about equal to the lower basal coal.

Q. But it comes in thinner, more discontinuous units; isn't that correct?

A. Yes, that's true.

Q. Are any of your wells completed and frac'd in any of those upper seams or stringers?

A. Yes, they are.

Q. Could you tell me which ones are?

A. From memory I can't, I don't have that information with me.

Q. Do you know how many are?

A. We started doing it -- Initially we didn't, and then we started perforating and frac'ing with the basal coal. I'm not sure how much of it got in the upper stringers, but we opened it at the same time.

Q. I see. Help me out a little bit on that. When you say that you frac'd the upper stringers, are you saying that you frac'd those through a frac in the basal coal?

A. Yes.

Q. Okay. Have you frac'd the upper stringers by focusing on them with the frac, as opposed to a frac in the basal coal?

A. No, we have not.

Q. What would it cost you to complete a frac in a well in some of those upper stringers?

A. Probably $40,000 to $50,000.

Q. Would that be about the same as it would cost you to complete a frac in the big Number 8 coal seam?

A. Yeah, it would actually be a little bit more, because you're selectively perforating various intervals, so that portions of it would be a little more, maybe.

Q. It would be a little bit more to frac the smaller seams and stringers than it would be --

A. Right.

Q. -- the big seam?

Do you have Pictured Cliffs wells too --

A. Yes.

Q. -- testified about?

And many of those wells are completed near the top of the Pictured Cliffs, just below the Fruitland Coal; is that correct?

A. Yes.

Q. Are all of them completed there?
A. We have completed a few. We've -- Where we had low porosity in the top of the Pictured Cliffs, we moved down 20 or 30 feet. But for the most part, it's right at the top of the PC.
Q. You had stated San Juan had not made a written offer of settlement, and then you discussed that you had rejected the protocol provision on arbitration?
A. Yes.
Q. Would you be willing to waive any rights under confidentiality agreement that governs settlement discussions to allow for a demonstration of the offer that's been made to --
MR. KELLAHIN: Madame Chairman, I'm going to object to the question. He's talking about confidential matters that are not permitted to be admitted into evidence under the Rules of Evidence.
CHAIRMAN WROTENBERY: Sustained.
Q. (By Mr. Ausherman) If I may just go back to the two injection wells that you've talked about, what is the barrel-per-day capacity of the two injection wells that you say you were either at or reaching capacity on?
A. Approximately 1000 to 1500 barrels per day.
Q. And the other three wells?
A. The newer ones?

Q. The ones, yeah, that you're --

A. Well, the Entrada well, if it is successful, it could dispose of up to 10,000 to 12,000 barrels a day.

Q. And the other two?

A. In the 1000- to 1500-barrel range. Of course, it's unknown. We're not sure. I mean, we hope it will but we don't know.

MR. AUSHERMAN: That's all I have.

CHAIRMAN WROTENBERY: Mr. Bruce, did you have anything in addition to --

MR. BRUCE: Oh, no, Mr. Ausherman was cross-examining Mr. Richardson.

CHAIRMAN WROTENBERY: Okay, Commissioner Bailey?

COMMISSIONER BAILEY: I have a couple questions.

THE WITNESS: Sure.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. I'm not as familiar with BLM oil and gas leases as I am with the State oil and gas leases. Is there a danger of you losing your BLM leases if you do not drill additional wells?

A. I think there is, or we would have to pay royalties if we are offset by this downspacing. Everyone can go in now and drill on 160s, and if we are unable to do that I don't know that there's a danger that we would lose our leases, but we would have to pay royalties for gas we should be producing.

Q. But that would only apply on the outside borders of the area in question, correct?

A. Yes.

Q. Okay, which would mean the row of sections on the far east side --

A. Right.

Q. -- on the --

A. But to answer your question, I don't think we would lose our lease.

Q. Okay, that's what I need to know.

Under Exhibit 23, on the second page --

A. Yes.

Q. -- are you there? -- there are some alternatives that are listed there as possible activities that may mitigate some of the questions that San Juan has concerning the roof stability and frac'ing and the other concerns. Talk to me about the use of fiberglass casing and what that would entail for you.

A. It's almost a moot point right now, because 95 percent of the wells are already there with steel casing. But we as operators have never used the fiberglass. I've heard in the Black Warrior Basin that it is feasibly possible, but -- We frac these wells, they're so tight, with high pressures, that I don't feel comfortable with it myself. I've never done it.

Q. Are your current gas wells that are producing from the Fruitland, are they inclining or declining in their gas production?

A. We have been developing an infrastructure out here, building our own gas lines, our own water-gathering lines. Sometimes our pipelines pressure up, and we're tweaking it out. It's really a several-year process. Without question these wells will incline.

Q. So you have not seen any breakover into any kind of --

A. No, any decline that you see on our wells, I can say almost without exception it's a mechanical reason.

Q. Okay. Have you projected an economic life for the producing wells?

A. Well, to the dismay of San Juan Coal Company, it's probably well in excess of 20 years.

COMMISSIONER BAILEY: That's all I have.

CHAIRMAN WROTENBERY: Commissioner Lee?

COMMISSIONER LEE: (Shakes head)

EXAMINATION

BY CHAIRMAN WROTENBERY:

Q. I just wanted to ask a couple questions, make sure I understand your testimony.

You had made some reference at the end of your direct testimony to some pending administrative action that had been stayed, and I thought you were referring to something at the Oil Conservation Division, but I was not clear.

A. I think I was referring to this *de novo* hearing.

CHAIRMAN WROTENBERY: Okay.

MR. KELLAHIN: There is a stay issued by the Commission --

CHAIRMAN WROTENBERY: -- Commission --

MR. KELLAHIN: -- staying the Examiner Order.

CHAIRMAN WROTENBERY: -- order, okay.

MR. KELLAHIN: So that's where we are.

CHAIRMAN WROTENBERY: Okay, thank you.

Q. (By Chairman Wrotenbery) And then, I apologize, you pointed it out twice but I still haven't found it on Exhibit A-1, the Salty Dog Number 1 --

A. Yes.

Q. -- it's the first --

A. It's the same location as this Pit and Pond Number 1 well.

Q. Okay.

A. They're about a hundred feet apart out there.

CHAIRMAN WROTENBERY: Okay, thank you. That was all I had.

Mr. Kellahin, did you have anything more?

MR. KELLAHIN: Nothing further.

CHAIRMAN WROTENBERY: Okay, thank you for your testimony, Mr. Richardson.

THE WITNESS: Thank you.

MR. KELLAHIN: May we have a few minutes to get the geologic displays --

CHAIRMAN WROTENBERY: Sure, we'll take a five-minute stand-up break.

(Thereupon, a recess was taken at 11:08 a.m.)

(The following proceedings had at 11:15 a.m.)

CHAIRMAN WROTENBERY: Mr. Kellahin?

MR. KELLAHIN: Madame Chairman, members of the Commission, we're going to present Richardson's geologic summaries. They're in the exhibit book that has the B and C exhibits.

The first half of the book are the B exhibits, which are the geologic displays. In the front of the B section you're going to find a B-1. That's simply a prehearing summary of the displays that Mr. Hively prepared and submitted.

The book failed to include Mr. Hively's résumé, which I have just passed out and which I advised Mr. Bruce that I had omitted from the exhibit books.

So if you'll introduce Mr. Hively's résumé, and just to make the numbers harder for me, why don't we call this the B-1-A.

CHAIRMAN WROTENBERY: Okay.

COMMISSIONER LEE: Capital A or lower case a?

MR. KELLAHIN: You may choose.

CHAIRMAN WROTENBERY: Okay.

MR. KELLAHIN: Thank you.

ROGER E. HIVELY,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. All right, sir. Would you please state your name and occupation?

A. My name is Roger Hively, I'm a petroleum geologist.

Q. Mr. Hively, for the record would you please spell your last name?

A. It's H-i-v- as in Victor -e-l-y.

Q. Where do you reside, Mr. Hively?

A. I live in Lakewood, Colorado.

Q. Summarize for us your education as a geologist?

A. I have a bachelor's degree in geology from Wittenberg University in Springfield, Ohio, and a master's degree in geology from the University of Texas at Arlington, Texas.

Q. Summarize for us your petroleum geology experience.

A. I've been consistently in the oil and gas business in Denver and in the Rocky Mountains and mid-continent, Gulf Coast regions, since 1979. I've lived in Denver through that period of time.

I've been involved in oil and gas exploration in all Rocky Mountain basins and have been involved in coalbed methane exploration for a number of years as well.

Q. Let's specifically focus on the coalbed methane geologic experience. Give us the time frame for which you have been directly involved in analyzing the geology of the coalbed methane?

A. For the past six years, I've been involved specifically in exploration for coalbed methane in a variety of Basins. I've been involved in the Powder River Basin, the Raton Basin, San Juan Basin, of course, and as well the Unitah Basin of Utah.

Q. Have you testified and qualified as a geologic expert before other regulatory bodies, other than the New Mexico Oil Conservation Commission?

A. I have testified a number of times in front of the Colorado Oil and Gas Commission, yes.

Q. Are the geologic exhibits and the geologic conclusions you're about to express your opinions and conclusions?

A. Yes, they are.

Q. Are we about to look at your work product?

A. Yes.

Q. When we look at log correlations and picking thicknesses, this is all your work?

A. Yes, it is.

Q. Have you been retained as a geologic consultant by Mr. Richardson to review his application area for this case?

A. Yes, I have.

Q. Have you completed that work?

A. Yes.

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

MR. BRUCE: No objection.

CHAIRMAN WROTENBERY: We accept Mr. Hively's qualifications.

Q. (By Mr. Kellahin) To set the geologic stage for us, would you refer to what we've marked as Exhibit B-2, which is the type log? Give us a moment to get your type log.

Why have you selected this well as a type log?

A. The type log is the Richardson Operating WF Federal Number 5-3. It is within the Application area.

Q. Find it for us on the A-1 map, will you?

A. It's located at the southeast corner of Section 5, 29 North, 14 West.

Q. Flip up the structure map so that you can see it on the bigger map.

A. It's located right there.

Q. Okay.

A. Southeast quarter of Section 5. It is the well that is included in both of the structural cross-sections that we'll discuss shortly.

I chose the well because it is in the area that is in the middle area or central area of development of the coalbed methane in the Fruitland, and I think it represents accurately the Fruitland Coal picture within the Application area.

Q. Let's take the type log and have you either start at the top or at the bottom and work your way in the other direction, and let's identify the coal members.

A. The log is a cased hole log that is composed of gamma-ray and neutron porosity curves. The formations in the log are Fruitland at the top and Pictured Cliffs at the base of the well and at the bottom of the log.

The coal formations, of course, are at the basal portion of the Fruitland section, the Fruitland formation section and moving upwards from there.

The Pictured Cliffs or PC is immediately beneath the Fruitland Coal section in the well, and it exists at the bottom or the total depth of the well, is Pictured Cliffs.

Q. When you're on the Pictured Cliff, give us the footage off the type log for the top and the bottom of the PC.

A. The top of the Pictured Cliffs PC in this well is at a depth of approximately 680 feet and continues to the base or the total depth of the well.

The Fruitland Coal is anything above that.

Q. When we talk about the coals and attempt to subdivide them between the upper coals and the lower coals, what is the point of subdivision?

A. In my work, the terminology or the term "basal Fruitland Coal" represents the single coalbed that is the first bed immediately above the contact between the Pictured Cliffs and the Fruitland formation, and I did not segregate individual coalbeds above that. I called everything above the basal Fruitland Coal "upper Fruitland".

The basal Fruitand Coal is the same coal referred to by the San Juan Coal Company as the Number 8 bed.

Q. So for your work, if we identify the basal coal as the lower coal, that would be the basal coal package that the Coal Company talks about as being Coal Seam 8?

A. Yes, that's correct.

Q. And if you categorize the coal packages above that, you've characterized them as the shallow coal?

A. Or upper Fruitland Coals. Anything -- Any coal above the basal Fruitland Coal is upper Fruitland Coal.

Q. Is there any difference in nomenclature or point of location between your geologic work and that for what we'll see presented by San Juan Coal Company?

A. Substantially I believe they are the same. San Juan Coal Company exhibits map similarly to the way I do with respect to the basal Fruitland Coal. Their maps of individual coalbed numbers are slightly different above that, however I believe that individual coalbeds that I have illustrated on my cross-sections can be correlated to and identified as the same nomenclature and the same numbers as the San Juan Company.

Q. As an oil and as geologist, when you're looking at a coal seam that might contain coal gas to be produced, are you using a different criteria in selection than a coal geologist would use to determine coal thickness for purposes of mining the coal?

A. The data that I used for the determination in my mapping here is predominantly oil and gas drilling, exploration wells, wells drilled by Richardson as well as other operators. We use predominantly electric log data to determine the thicknesses and presence of the coals.

Q. We're going to look at the structure map in a minute, but let's have a general verbal description about the structure and what is the rate of dip or transition as you move from one direction to another.

A. The dip and strike, or the structure in this immediate area, the immediate area of the Application, is generally downdip from west to east, with a little bit of component to the southwest. The structurally highest area in the Application area is the extreme southwest corner of the area. The structurally lowest area of the Application is in, then, the extreme northeast portion of the Application area. So we have a general southwest-to-northeast downdip area.

Q. As we go from mile to mile across this area, what's the rate of dip as we move across the basal coal?

A. It's very gentle in the area, it's predominantly about 100 to perhaps 150 feet per mile, around one degree dip to the east or northeast.

Q. When you're looking at the logs to identify for yourself what you as an expert would conclude to be coal, what are you looking for and how do you do it?

A. Again, on the electrical logs that are drilled by -- that are run by oil and gas operators, we look at a combination of log parameters. The most definitive log parameter for definition of coal is bulk density. Most of these wells, or quite a few of these wells, don't have the bulk density. We're looking at cased-hole wells.

We also use, then, the neutron porosity curve, and we have cutoffs that determine what gets included or excluded from a thickness measurement of a coal. In addition we use the gamma-ray response to determine cleanliness, if you will, or the degree of shaliness in an individual bed.

So the combination of curves, neutron porosity, bulk density if it's possible, and gamma ray.

Q. Is that methodology the same as generally applied by oil and gas geologists looking for coal gas opportunities in the San Juan Basin?

A. Yes, it is.

Q. It's not unique to you in how you analyze it?

A. No, I would say not.

Q. Let's drop down to the Pictured Cliff and have you characterize the Pictured Cliff formation.

A. The PC in the area is generally considered to be a fine-grained, relatively tight gas reservoir. It is a sandstone that is not -- does not exhibit a great deal of porosity and permeability as related to other reservoirs within, say, the Rockies. It's considered a dirty or a tight sandstone.

Q. When you start at the top of the PC in this area, how far below the base of the basal coal are you starting to get into the top of the PC?

A. The PC contact is generally considered to be the sandstone immediately beneath the basal Fruitland Coal. In some cases there are shale intervals in between, and the sandstone does not occur until lower in the section. In some cases the sandstone is very close to the basal Fruitland Coal.

Q. When you talk about this Pictured Cliff reservoir being tight, can you give us a range of permeabilities that equates to what you're calling tight?

A. I don't have permeability numbers. Porosity numbers can be, in logged porosity reservoir, designations of 10 to 12, 14 percent in some cases.

Q. When you characterize the Pictured Cliff as being a dirty sandstone, what does that mean?

A. Well, dirty means it has a relative abundance of non-sandstone-size particles, perhaps clay particles, for example, or other rock fragments which would limit the porosity and permeability of the sandstone.

Q. When an operator penetrates and tries to perforate the Pictured Cliff interval, will it naturally produce gas without the operator engaging in any stimulation program?

A. No, not at all.

Q. What does the operator have to do?

A. Well, I would presume that a fracture treatment needs to be done in the PC.

Q. When you're looking for the sandstone gas in the PC, I guess you would start at the top of the PC and work your way down?

A. Yes.

Q. Describe what happens as you go downward.

A. In the formation, is that what you mean?

Q. Yes, sir.

A. There's very small distinction in the PC between sandstone reservoir and other fine-grained rocks. As you proceed more deeply into the Pictured Cliffs, predominantly you deal with more shaly rocks.

Q. When you talk about a tight reservoir, are you talking about permeabilities in the range of 0.1 to 1 millidarcies?

A. Less than 1 millidarcy is very common, yes.

Q. Let's turn to the structure map. That would be a foldout out of the exhibit book. Give us a chance to unfold your Exhibit B-3.

In preparing your structure map, give us the point at which you are mapping the structure.

A. The structural datum on the map is the top of the basal Fruitland Coal, or the coalbed, Coal Seam Number 8.

Q. Is that a readily identifiable marker point for oil and gas geologists to use in this area for this type of work?

A. Yes, it is. It's very consistent.

Q. And so there's not a fuss among you about where to pick the top of the basal coal?

A. No, there's not.

Q. Let's look at the structure map you prepared, and direct our attention to the key points. What does this show you?

A. Once again, as I stated, it's a simple -- relatively simple structural picture across the Application area. The regional dip in the area is from the southwest to the northeast, downdip being to the northeast. The attitude of the beds is relatively flat-lying, with dips of around 100 to 150 feet per mile.

Across the Application area, in the four miles of area, across the area, we have probably 700 to 800 feet of structural dip from the highest area in the southwest to the lowest area in the northeast.

Q. Have you looked at the structure map prepared and submitted to the Commission by San Juan Coal Company?

A. Yes, I have.

Q. Are there any material differences between their interpretation of structure and yours that you need to identify for the Commission?

A. I don't believe there are any arguments on that map. As we said, it's a very common datum to mark and to map on, and the structure maps are very similar in nature.

Q. Let's turn to the cross-section. On the structure map you show two lines of cross-section. You have an A-A' cross-section running west to east, and then you have a north-south cross-section. Let's start with the A-A' cross-section.

A. Yes.

Q. Give us a chance to get organized. We've taken a -- They're so big, if you can see that far, we have on the display board.

A. The A-A' section is an east-west structurally controlled, structurally hung cross-section. It's hung on a datum of a positive 5000 feet. That's the elevation that the logs are hung on for this section.

The cross-section illustrates two main points, the first point being, as we've just discussed, that dip in the region or dip across the Application area is downdip to the east and updip to the west or southwest. Therefore, the A edge of the cross-section on this side would be the updip edge of the cross-section. That would be the westernmost portion of the Application area. The A' edge of the edge of the section, again, is the downdip edge of the section on the eastern edge of the cross-section and of the Application area.

With respect to the coals, the Fruitland Coals in this area, the basal Fruitland Coal is the primary target and the primary source of information here. The bottom coal in each case on each log is consistent, and it goes consistently in thickness from the eastern or downdip edge of the area to the western or updip edge. The single coalbed is present and consistent across the area.

Q. Do you see any major stratigraphic changes that would disrupt or break the continuity of the coal?

A. No, things are very consistent across this area. It's a distance of only four miles, so it's relatively easy to make these correlations.

Q. So as you move across that four-mile interval, you're able to conclude as a geologist that you have continuity of the coals?

A. Yes.

Q. Can you say the same thing about all the coal seams, the upper versus the lower?

A. In my mapping, as I suggested, every coal above the basal Fruitland Coal, or the coal -- the Number 8 coal seam, is grouped into what I call upper Fruitland Coals for mapping purposes. We have on the cross-section illustrated a number of the upper Fruitland Coals and indicated that they are also in some cases present across the area, in some cases they are less consistent and somewhat thinner.

The nomenclature between my work and the San Juan Coal Company work suggests that the Number 8 seam is the basal seam. The San Juan Coal Company calls the next main seam up 8.6, and the next seam up that I have mapped on my cross-section is Seam Number 9. So we have the same sorts of geologic work happening here, and differences are in nomenclature.

Q. Let's look at the reservoir in the other dimension, if you go from north to south.

A. Can you see? What I have displayed here is cross-section B-B', is a similar structural cross-section hung again on the structural level of plus 5000 feet. The indication as well on this section is from north to south, the B section being the northern region, the B' edge of the section being in the southern region.

Once again, we can demonstrate the continuity of the basal Fruitland Coal. It is the lowermost coal, and it is consistent with each well as you move from north to south across the area.

Similarly, the upper Fruitland Coals are present, and once again they do exhibit a similar degree with somewhat less amount of thickness and consistency.

Q. Have you looked at the structure in the cross-sections using any other lines of cross-sections, other than the two we're looking at today?

A. Well, I evaluated and looked at in detail all of the wells within the Application area, so that I was able to work within that area and apply those other log data points into the cross-section.

Q. Are these two cross-sections, then, representative of the area?

A. Yes, they are.

Q. When we look at the thickness of the coal displayed on your cross-sections, give us a sense of how that thickness in the Richardson Application area compares to thicknesses elsewhere in the Basin.

A. Well, this being the southern area, outside the so-called fairway of the coalbed methane production in the San Juan Basin, coals in general here are somewhat thinner than the coals in the so-called fairway. Our average thickness that we're using for our work here is 28 feet.

There are coalbeds in the -- accumulation of coalbeds in the northern or fairway -- northern eastern or fairway area is significantly thicker, as much as 70 feet or more in some cases.

Q. How does this area of the San Juan Basin compare to any of the work you've done in the Raton Basin?

A. The Raton Basin is somewhat similar to this. However, the Raton Basin exhibits a series of very thin coal stringers that are productive in the area. There is not a single consistent coalbed that's the primary target in the Raton Basin. The coalbed methane is produced from as many as a half a dozen or more individual coalbeds that are as thin as two feet or even less in some cases.

Q. For purposes of methane gas production out of the coal, do you see an opportunity in all the coal seams to produce coal gas, or are we just confined to gas production out of the basal coal?

A. I think that every single coalbed that's a thickness of two feet or better is potentially gas-productive in this area. And again, it is consistent with the types of coalbed producing zones that are present in other basins.

Q. Are coal seams as thin as one to two feet productive of methane gas by the oil and gas operators?

A. Yes, they are, they're perforated in many cases.

Q. Let's go to the thickness maps. Let me turn this cross-section over. We are going to refer to Mr. Hively's Exhibit B-7.

CHAIRMAN WROTENBERY: B-6.

MR. KELLAHIN: B-6. Can we --

CHAIRMAN WROTENBERY: We have that one out already.

MR. KELLAHIN: You're way ahead of me.

Q. (By Mr. Kellahin) You have prepared two isopachs, have you not?

A. Yes, I have.

Q. You have an isopach for what you've characterized the lower Fruitland Coal, and then you have another isopach for the upper coal?

A. Yes.

Q. Let's start with the lower coal. What's this showing you?

A. The isopach map of the basal Fruitland Coal indicates that -- The individual coalbed mapped here is relatively consistent across the Application area. The range of thicknesses is up to 18 feet, and significantly less, as low as perhaps eight feet. Our average thickness for this bed is 14 feet across the Application area. This is the individual bed.

Q. So when you identify on the cross-section or the type log the basal coal, which we call the lower coal, you are mapping what you believe to be the thickness of that interval?

A. Yes, that's correct.

Q. Describe for us how you go about determining the thickness so that you can put it on your map and then draw your contours.

A. Again, we use data that exists from oil and gas operators, derived from electric logs in wells that were drilled in the Application area, any log that's available, using the combination of parameters we discussed before, the neutron porosity in the case of a cased-hole log, combined with gamma-ray. Bulk density, if it's available, is also a primary tool. A combination of these tools together is used to determine a total thickness for any individual bed.

Q. Let's talk about the criteria you use in analyzing the different types of logs. If you'll start with the density log, are you using any cutoffs to tell you what's going to be picked as coal for the thickness calculation?

A. On a bulk-density log I use a cutoff of 2.0 grams per cubic centimeter.

Q. And why would you use that?

A. That seems to be the most accurate and most consistently accurate parameter as it -- when it's compared to thicknesses that are determined from all the methods and all the producibility studies that we do.

Q. Using that as your cutoff, when you analyze the log and you're finding a coal thickness, is there a minimum thickness that you'll use before you'll count that coal towards your total?

A. I primarily use two feet as a minimum thickness. The log resolution in most cases is not consistent and not accurate enough to go below two feet for this area.

Q. So when we look at your map displaying the basal coal, is there a range of coal thickness that you can describe for us?

A. The basal coal ranges from a minimum thickness of eight or nine feet to a maximum of 18 feet.

Q. On average through the Application area, what would be a good average thickness to use?

A. 14 feet is what we use for average.

Q. There's going to be a difference between you and the San Juan Coal Company's experts on thickness, is there not?

A. I believe there will be a small difference.

Q. Describe for us how that difference is caused.

A. An individual, perhaps, will use judgment in some cases to include or exclude individual coal beds or individual coal thickness. Log parameters are interpreted somewhat differently, sometimes, by some people. In addition, in some cases, core data can be used to determine coal thickness as well.

Q. Let's talk about any possible limitations you might have about using coal core data from which to determine thickness of coal for your mapping purposes.

A. Core data can be a valuable tool, of course it is a valuable tool. We always want as much data as we can get. A problem with that sort of data when used exclusively is that recovery of core is somewhat -- usually less than 100 percent. So coal thicknesses are generally reduced somewhat when using that sort of individual kind of data.

Q. What accounts for the fact that data from a coal core sample might contain less coal gas than otherwise?

A. I'm sorry, less coal gas?

Q. Gas.

A. It certainly takes some time to remove a coalbed from its resting place in the subsurface and put it into a canister or a type of measurement device that will allow you to measure that gas. Within that period of time, of course, some gas is lost. So it will be -- The amount of gas that's measured will then be, certainly, less than the amount of gas that's actually present in the core or in the bed in its formation state.

Q. When you're trying to do this type of work and you're ranking the types of logs that you have to do this work, what's the best possible log to have?

A. The best possible log is expanded scale bulk density, open hole log.

Q. Do we have those generally available for the Application area?

A. Primarily we do not, no.

Q. Are there any in this area that you have had an opportunity to use?

A. No.

Q. They're just no here?

A. No, they were drilled in different methods and at different time periods, and at that point in time -- and the procedures that were used were just not -- they just weren't run.

Q. When you're looking at your logs and trying to analyze the coal thickness and you've used the density cutoffs, is there anything that you use or look at to determine the potential productivity of that coal? Are you looking to see if it's all coal or if it's combined with any other substance?

A. The combination of gamma-ray curve and density curve and density -- or neutron porosity curve can often give you an indication of shaliness or shale partings, as they're called, within coalbeds, yes, you can determine, in some cases, by a shaly or higher gamma-ray reading that an individual bed or parting within a coalbed may not have the same quality as the remaining portion of the coalbed.

Q. How would the ash content of the coal affect the analysis? Or does it affect the analysis?

A. Ash content is a parameter that's generally applied to coalbed reserve studies subsequent to their removal from the wellbore. Again, ash beds and ash content is generally determined by those logging parameters of a less clean gamma-ray and a lower neutron or lower bulk density reading.

Q. So when the petroleum engineer is trying to analyze the coal to come up with a number to represent the standard cubic feet of gas per ton of coal, he will take into consideration the ash content?

A. Those are primarily -- yes, those are considered in that evaluation, yes.

Q. Do you indirectly account for that in your log analysis in deciding whether the coal is clean, dirty or something else?

A. In some cases it can be removed. However, in a general sense, my coal thicknesses perhaps diminish the importance of an ash content in its total isopach value.

Q. When you look at your isopach of the lower coal, do you see any portion of the Application area that is too thin to represent a geologic opportunity to produce the coalbed methane?

A. No, there's certainly enough coal within the area, within the entire Application area, to produce gas. The thinnest coalbed in the Application is eight feet, in the lowest one. That's certainly adequately for gas production.

Q. Let's turn to the upper isopach. Identify for us what we've marked as Richardson Exhibit B-7, Mr. Hively. B-7, what's that?

A. I believe that B-7 is the upper coal isopach.

Q. That's what I have. Let's go through the same explanation. Tell us the major points of what you conclude by preparing an isopach of the upper coal.

A. The purpose of an upper coal isopach is again as a cumulative view of producible coal thickness across the Application area. We're looking at a combination of individual coalbeds that range in thickness down to three feet and up to as much as 21 feet for the combination of these beds, and we are looking for producibility thickness that would be adequate for the producing of oil and gas, of natural gas in this case.

Q. When we're trying to pick a top and the bottom for the container of the coals to manage, then, from an oil and gas perspective, do you see any geologic reason to try to subdivide the pool into little minor pools within the coal?

A. No, primarily every coal with an adequate thickness of over two feet in the Application area should be producible in combination with the other coalbeds and should be combined.

Q. When we look at the upper coals, give us a range of thickness over the Application area.

A. The thinnest coalbed in the -- the thinnest coals in the upper area are three feet, and they range up to 21 feet in thickness.

Q. If we're trying to pick an average number over the Application area, give us a number that's a good pick.

A. Once again, coincidentally, we come up with an average coal thickness of 14 feet for the upper coals.

Q. Do you see any portion of the Application area where the upper coals are so thin that you would recommend that that particular area be excluded from being attempted to be produced with the coalbed methane gas?

A. No.

Q. Let me direct your attention to the Pictured Cliff. Have you attempted to isopach the Pictured Cliff over the Application area?

A. No, I have not.

Q. Why not?

A. The Application is a Fruitland Coal Application, and in my estimation and in our direction it does not deal with the PC. It's not a PC Application.

Q. So you specifically focused on the coal?

A. Yes, I did.

Q. In a general sense, when you look at the Pictured Cliff in the Application area, the PC is a viable target from a geologic perspective in trying to complete a well in that interval?

A. Yes, it is.

Q. We have PC locations or opportunities throughout the Application area?

A. There are, yes.

MR. KELLAHIN: Madame Chairman, that concludes my examination of Mr. Hively.

We'll move the introduction of his Exhibits B-1 through -7.

MR. BRUCE: No objection.

CHAIRMAN WROTENBERY: Okay, Exhibits B-1 through B-7 are admitted into evidence.

And it's almost noon, so this would be a good time, I think, to break for lunch. How much time do you need for lunch?

MR. BRUCE: Till three? No.

MR. KELLAHIN: You know, an hour-plus. We're right at noon, so we have to fight the local employees to find something to eat, so --

MR. BRUCE: I agree.

MR. KELLAHIN: Do you want to try for 1:30? Does that work?

CHAIRMAN WROTENBERY: Does that sound okay to you?

COMMISSIONER BAILEY: Sure.

CHAIRMAN WROTENBERY: 1:30 we'll reconvene.

(Thereupon, noon recess was taken at 11:57 a.m.)

(The following proceedings had at 1:33 p.m.)

CHAIRMAN WROTENBERY: Okay, Mr. Bruce and Mr. Ausherman.

MR. BRUCE: Okay.

CHAIRMAN WROTENBERY: Who's up?

CROSS-EXAMINATION

BY MR. BRUCE:

Q. Mr. Hively, first I'm going to refer to your well log. I just want to clarify a few things which show up on this and on your isopachs.

Your -- What you call your lower Fruitland Coal isopach, which is your Exhibit B-6 -- it might be up on the board there -- does your lower Fruitland Coal isopach only include the basal Fruitland Coal?

A. Yes.

Q. As shown on your cross-section?

A. Yes.

Q. Okay. So then on Exhibit B-7 which shows your upper Fruitland Coals, it's everything except that one basal coal stringer, right?

A. That's correct.

Q. Okay. And then looking at your Exhibit B-7 and your log, the B-2, does the upper Fruitland Coal isopach include everything on this log that shows up as more than two feet?

A. It's my understanding, I think it does, yes.

Q. Okay.

A. Although there may be some discrepancies because we may have gone further up the hole with isopachs of upper Fruitland Coal.

Q. And I guess what I'm looking at is on your well log, if you'll look at it, starting with the second page, it appears to me that there's -- you show on the first page four coal stringers, on the second page there's another four coal stringers, and on the third page, up at the top, there's another coal stringer. So your upper Fruitland Coal isopach includes these seven coal stringers, or I should say -- is it nine coal stringers?

A. Well, we were somewhat arbitrary with those as we come shallow with respect to upper Fruitland Coals. I think I predominantly limited my coal isopachs in upper

Fruitland
Coal to zones within a depth range of about 200 feet of the basal coal. Now, it's -- Obviously individual zones that are blackened in here on the long won't necessarily mean that they are coal, and they also perhaps are shallower than that 200-foot interval that we were looking at.

Q. Okay, so what you're saying is that your Exhibit B-7 would really -- again, looking at your well log, on the very last page of it, it would include that zone just below 600 feet?

A. Yes, that would be -- I think that is your 8.6 zone.

Q. Okay. And then on the prior page it would include the stringer that you have marked at 549 feet?

A. That is -- Yes, that's the Coal Company's 9 seam.

Q. Would it include any of these upper zones that are also on the second to the last page of your well log?

A. No. I see no numbers, no coal numbers, thicknesses, written on the log. I see high gamma-ray in each of those cases. So the presence of a neutron porosity that is blackened in is not necessarily what I'm counting as thickness.

Q. It's not, or is not necessarily?

A. In this case, it's not.

Q. But it might be on some of your other well logs?

A. Depending on the individual log parameters.

Q. Is that noted on any of your cross-sections?

A. I'm sorry, I don't understand your question.

Q. Well, I mean --

A. The cross-sections -- The coals that are counted in the isopach mapping are all denoted on the cross-sections in the blackened zones that you see on the well logs.

Q. Okay, on the well logs. But we can't tell from looking at your Exhibit B-7 whether or not any of these upper thin stringers were included on your upper Fruitland Coal thickness?

A. No, I didn't include copies of all the logs, no.

Q. Okay. In looking at your B-7, you said that the range of these upper thicknesses was from three to 21 feet. Where is the -- I didn't see it off the top. Where is the 21-foot thickness that --

A. I'm not exactly sure. I'd have to look for it.

Q. Okay, B-7, the upper --

A. I see the southeast quarter of Section has --

Q. Okay.

A. -- the Bushman Federal 6-1 at 21 feet.

Q. Okay. Now, in your preparation of your exhibits, did you use -- There was a hearing before this, and there was a Mr. Shapiro, a geologist, who prepared exhibits. Why didn't you use his isopachs?

A. This is a different hearing, I'm a different person, I use my own maps.

Q. Did you disagree with his maps?

A. I didn't see them.

Q. You did not see them?

A. I didn't use them.

Q. Now, in the -- what you call the upper Fruitland Coals, which generally seem to be thinner than the basal Fruitland Coals, do they have the same lateral continuity as the basal coal?

A. In some cases they do. For example, the Seam Number 9 that's illustrated on my cross-section here, A-A', goes from north to south -- or, I'm sorry, from east to west, in a similar fashion as the basal Fruitland or your basal Number 8 seam. In some cases the upper Fruitland Coals are thinner, and you would suppose that they may be less continuous than the basal coal and the Seam Number 9.

CHAIRMAN WROTENBERY: Could you point out Seam Number 9 again? I'm sorry.

THE WITNESS: Seam Number 9, as I understand it, is this one right here. This one would be 8 --

Q. (By Mr. Bruce) And for the record -- I'm sorry, Mr. Hively, but could you identify the well number you're looking at?

A. In the 5-3, my type log, Seam Number 9 is present at a depth of 550 feet.

Q. And is that the upper coal seam that you have on that well?

A. That is one of the ones that I'm including in my mapping of upper Fruitland Coals.

Q. But on that particular well --

A. This is the uppermost coal seam, yes.

Q. Okay, that's all I'm --

A. And you can see that above that I have no more isopach values attributed to coals in that well.

CHAIRMAN WROTENBERY: And the 8 again is -- ?

THE WITNESS: The 8 is the basal Fruitland Coal.

Q. (By Mr. Bruce) Mr. Hively, do you know what the ash content is in these various coal zones?

A. No, I'm not aware of it. I haven't studied that.

Q. In looking again at your Exhibit 4, which is the cross-section...

CHAIRMAN WROTENBERY: It's the B-B' cross-section, right?

MR. BRUCE: The A-A'.

CHAIRMAN WROTENBERY: A-A'. Okay, I think that's Exhibit --

MR. BRUCE: It's the one that is -- Yeah, right in front of you here.

CHAIRMAN WROTENBERY: I think that's Exhibit 3, isn't it? Or do I have that.

MR. BRUCE: You may be right.

CHAIRMAN WROTENBERY: I don't know, I lost track here. No, you're right, it's Exhibit 4.

MR. BRUCE: Okay.

CHAIRMAN WROTENBERY: Sorry, now I'm getting my numbers mixed up.

(Laughter)

MR. KELLAHIN: Don't ask me, please. I have no clue.

Q. (By Mr. Bruce) Mr. Hively, if we could just look at where these wells are completed for a minute, the first one, the WF State 36-3, was completed only in the basal coal; is that correct?

A. Yes, it is.

Q. Okay. And if you need to stand up to look at it, that's fine, Mr. Hively.

A. The perforations are marked. It's hard to see from back there, but the perforations are marked on the well log.

Q. Now, the next one, the State 36 Number 1, where is that one completed?

A. It's completed in the Pictured Cliffs, down below the base of the basal Fruitland.

Q. About how far below the base of the basal coal?
A. It looks like the top perforation is about 20 feet below the bottom of the coal.
Q. Okay. Do you happen to know what the current producing rates are from that well?
A. No, I do not.
Q. Now, in looking at both of your cross-sections, that appears to be the -- shall we say the deepest completion in the Pictured Cliffs. Do you know of any of Richardson's wells out here, completed only in the Pictured Cliffs, that are completed more than 20 feet below the base of the basal coal?
A. As I said before, I haven't studied the PC. The Pictured Cliffs was not part of my investigation. I have limited my work only to the Fruitland section.
Q. Well, but you have the Pictured Cliffs perforations on here?
A. As a matter of information, is all.
Q. Okay. So you don't know of any of the Pictured Cliffs completions?
A. I haven't studied them.
Q. Okay. Do you know of any Fruitland Coal completions that are outside of the basal coal, that are in your upper Fruitland Coal?
A. I believe there are some perforations that

Richardson has, as we suggested this morning, but I'm not specifically aware of those.

Q. You don't know of them?

A. I don't know --

Q. You've only heard that -- Mr. Richardson say that some are completed in the upper Fruitland Coal?

A. Yes.

Q. And certainly none of those are reflected on your cross-section?

A. That's correct.

Q. Do you know what the permeability of the coal is here?

A. No, I don't.

Q. Do you know if it's low or high, in general, relative terms?

A. That is relative, and no, I don't, I wouldn't say low or high.

Q. If it had a high permeability, would there need to be any reason to frac the coal?

A. What is high? I don't know, I'm sorry. I'm not prepared to say low or high.

Q. Okay. If it's, say --

A. I'm not going to talk about permeability and frac techniques and frac'ing.

Q. Now, I believe in response to Mr. Kellahin's question about the PC, you made the statement that there were viable locations throughout this area in the Pictured Cliffs?

A. There are viable locations. There are existing wells there as well. I would --

Q. I thought you said you didn't study the PC?

A. I would extend that only to say that since there are existing wells there in the PC, that there must also be viable locations.

Q. But you admit that you haven't studied the PC. Could you look at any of these maps and predict which PC locations would be good?

A. No, not without further work.

Q. Now, I think you gave some figure about Pictured Cliffs porosity of 10 to 14 percent?

A. That's a range that I talked about, yes.

Q. How many Pictured Cliffs wells in this general area do you know of that are economically productive with 10- to 14-percent porosity?

A. Again, I did not study the Pictured Cliffs. I didn't study the isopach values or the production of the Pictured Cliffs.

Q. Okay, so you really can't tell whether there are any viable Pictured Cliffs locations in this area?

A. Other than to say that there are Pictured Cliffs wells that do exist.

Q. Wells that are fractured in the Pictured Cliffs -- or I mean, excuse me, completed in --

A. Completed in.

MR. BRUCE: -- the Pictured Cliffs?

That's all I have, madame Chair.

CHAIRMAN WROTENBERY: Thank you. Commissioner Bailey?

COMMISSIONER BAILEY: A couple of questions.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. You mentioned that dip was east-northeast. Have you an opinion on the direction of permeability in accordance with the cleats of the coal?

A. No, I don't.

Q. Okay. Would you say it's a very distinct contact between the Fruitland and the PC, or would you say that there has been interfingering between the two different formations?

A. That's a loaded question. If you call the PC-Fruitland contact at the base of the basal Fruitland Coal, then it's very distinct. There is some indication or some evidence that suggests that, in fact, may not be the PC-Fruitland contact, that that contact perhaps could be deeper, below the base of the basal Fruitland Coal by some feet.

Q. Do you also see sands in the lower portion of the Fruitland that could be characterized as Pictured Cliffs?

A. I haven't spent enough time to make that suggestion, no. My study was fairly limited to the Fruitland Coal zones.

COMMISSIONER BAILEY: Okay, that's all I have.

CHAIRMAN WROTENBERY: Commissioner Lee?

EXAMINATION

BY COMMISSIONER LEE:

Q. In your opinion, do you think you can study the Fruitland Coal without studying the Pictured Cliff?

A. I believe that I can with respect to the scope of the tasks that I was assigned, and that is looking specifically at Fruitland Coals, the basal Fruitland Coal or the C Number 8, as it's called, as well as upper Fruitland Coals. I'm not looking at productivity in this case.

Q. You're talking about upper one, you're talking about basal, next to the Pictured Cliffs, you're telling people you don't have to know the Pictured Cliff to understand the --

A. I didn't extend my study to producibility or contact. I'm simply doing isopachs and structure on those specific zones.

COMMISSIONER LEE: Okay.

CHAIRMAN WROTENBERY: Mr. Ross, did you have a question?

MR. ROSS: Yeah, I think we probably ought to clear up one thing.

EXAMINATION

BY MR. ROSS:

Q. On B-6 and B-7 there's --

A. Yes?

Q. -- on this particular map, you've got some numbers in red next to the wells. Are those the depths of the coal at that point?

A. The red numbers --

Q. The red numbers.

A. -- represent the individual coal thicknesses at each particular location.

Q. At the well?

A. Yes.

Q. And the black numbers are your mapping average thicknesses?

A. Black numbers on the contours, is that what you --

Q. Yeah.

A. Yeah, those are the isopach values on the contours.

CHAIRMAN WROTENBERY: Thanks, Mr. Ross.

Mr. Kellahin, did you have anything else --

MR. KELLAHIN: No, ma'am.

CHAIRMAN WROTENBERY: -- of Mr. Hively?

Thank you very much, Mr. Hively, for your testimony.

MR. KELLAHIN: Madame Chairman, we're calling now Mr. David Cox. He's a consulting reservoir engineer for Richardson.

CHAIRMAN WROTENBERY: Mr. Cox.

DAVE O. COX,

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. Cox, you've already been sworn, have you not, sir?

A. Yes, I have.

Q. Please state your name and occupation.

A. My name is Dave O. Cox. I'm a petroleum engineer.

Q. Where do you reside, sir?

A. I live in Golden, Colorado.

Q. Would you summarize for us your education?

A. Yes, I have a bachelor's of science in petroleum engineering from the Colorado School of Mines in 1974 and a master's of science in petroleum engineering from the Colorado School of Mines in 1977.

Q. What's your position now with Questa Engineering Corporation in Golden, Colorado?

A. I am a senior consultant with Questa Engineering.

Q. Have you been retained by Mr. Richardson as an expert witness and petroleum engineer for purposes of this case?

A. Yes, I have.

MR. KELLAHIN: Madame Chairman, the exhibit book distributed failed to include Mr. Cox's résumé. We would like to include it.

CHAIRMAN WROTENBERY: We should make this part of Exhibit C-1; is that right?

MR. KELLAHIN: Yes, ma'am, C-1-A or something --

CHAIRMAN WROTENBERY: C-1-A?

Q. (By Mr. Kellahin) Mr. Cox, the résumé that I have just circulated to the Commission and to counsel is a document that you've prepared. This is your résumé, right? This one right here?

A. Yes, it is. It's actually, though, a previous version of my résumé. It does not include some changes to my employment that have happened in the last few months.

Q. Let's give the Commission a general overview of your experience, Mr. Cox. In addition to your employment as a senior consulting engineer for Questa Engineering, give us a summary of your work experience.

A. Okay. I've been a consulting engineer for most of my career, about 22 years of my career. I spent five and a half years working for an independent oil producer in the mid-1980s and late 1980s and then got back into consulting in 1990. I've been owner or co-owner of the last four consulting firms that I've worked for. And then recently here, in July, I was also appointed vice president of engineering for Trident Exploration Corporation, which is a Calgary based coalbed methane exploration firm, looking for coalbed methane in western Canada.

Q. Have you written or published or presented technical papers?

A. Yes, I have, I've written about 40 different papers through the years, and about ten or a dozen of those have been on coalbed methane.

Q. Do you teach any classes, Mr. Cox, on coalbed methane gas?

A. Yes, I have. I've taught several seminars that I've written and presented for industry seminars on coalbed methane, coalbed methane reservoir engineering and maximizing the asset value of coalbed methane reservoirs. And then I've also taught a graduate level class in coalbed methane at the Colorado School of Mines.

Q. Let's focus on the coalbed methane work experience. Would you summarize that for us?

A. Yes, I've been working on coalbed methane projects since 1981. At that time I was working for a small consulting firm in Denver. We had a client who had obtained a 46,000-acre leasehold in the Raton Basin. Unfortunately, they were about 15 years too early and so they could not make a commercial project at that time. But we basically functioned as their engineering department, looking at coalbed methane projects for them in Raton Basin, the San Juan Basin and in Pennsylvania.

Then from 1984 through 1989 I worked for ANGUS Petroleum. In 1988 the parent company of ANGUS, PG&E, decided that they wanted to get into coalbed methane, and so they had me seconded to PG&E, basically, to assist them in evaluating coalbed methane projects, and I evaluated about a dozen projects for them in 1988 and 1989.

In 1990, when I became a consultant again, I began working on coalbed methane projects for different clients at that time.

And then 1992 through 1996, a five-year period there, I was in a variety of roles becoming, ultimately, vice president of reservoir engineering for Advanced Resources International. Now, they were one of the prime contractors for the Gas Research Institute, so they did a considerable amount of work on coalbed methane. In fact, it was their main line of business, and for that matter still is. So during that five-year period the majority of my work was on coalbed methane reservoirs.

Then in 1997 I joined Questa Engineering -- and by the way, that's Q-u-e-s-t-a, with an "a" at the end -- and since that time again, most of my time has been spent on coalbed methane projects. We prepared the 3M model for the Colorado Oil and Gas Commission, the Southern Ute Tribe and the Bureau of Land Management, where we modeled the entire Colorado portion of the San Juan Basin.

We've also done over 100 different coalbed methane projects for different clients through the years here. So I'm very experienced and have had a lot of work on different areas, not just in the States but also worldwide. I've looked at coalbed methane in India, Australia, New Zealand, even places like Zimbabwe and Poland.

Q. What functions have you performed for Mr. Richardson as a petroleum engineer consulting expert in coalbed methane gas production?

A. Primarily my work has been involved in assisting Mr. Richardson in understanding his reservoirs and figuring out how he can maximize production from those reservoirs.

Q. Are the exhibits and presentation you're about to make on behalf of Mr. Richardson represent your work product?

A. Yes, they do. It's either work that I have personally conducted or that was performed under my direction.

MR. KELLAHIN: We tender Mr. Cox as an expert petroleum engineer with special expertise in coalbed methane gas production.

MR. BRUCE: We have no objection to Mr. Cox as an expert engineer.

CHAIRMAN WROTENBERY: He is so qualified.

Q. (By Mr. Kellahin) Mr. Cox, when we turn to the exhibit book presented to the Commission, we come to Exhibit C-1, this is a summary, a brief summary, of the individual exhibits that you have compiled for the exhibit book?

A. Yes, it is.

Q. And that exhibit summary is work that you have supervised or done yourself?

A. That is correct.

Q. Mr. Cox, in evaluating Mr. Richardson's special infill project area, I think it would be helpful if you would give us an understanding, a basic understanding, of how to know and understand coalbed methane in the project area. Where do we start?

A. Well, we start first with the amount of gas that is present there, and in order to get that we have to say how big is the tank. So it's like a volumetric type of estimate that we start with. We say that the coal extends over a certain area and has a certain thickness and certain density and then gas content.

Now, how we get that gas content is one of the topics that we'll discuss at length today. There are several different methods of that, and we'll go into that in greater depth further here. But once we have those different parameters we can calculate the gas in place.

The gas in place, though, is only a small part of the equation. We also have to look at performance, how are the wells performing? How do they produce and how will they continue to incline? Because at the beginning, coalbed methane wells increase in production, in some cases for extended periods up to several years.

And so understanding that extended incline period before we reach a peak -- and then normally we have a stable production after the peak for a period, followed by a decline -- that really leads us to the economics and the economic viability of the project because of the production profile that we see.

Q. Have you included in the exhibit book an Exhibit

C-2 that would be a good starting point for us to have you describe how coalbed gas methane engineering differs from conventional engineering in a sand reservoir that's volumetrically derived? Where do we start?

A. Okay, this Exhibit C-2 is an excerpt from the Presentation and Exhibits for the San Juan Basin Coalbed Methane Spacing Study. Now, this was actually presented back in 1991, so about 11 years ago. And although our understanding of coalbed methane has changed with some of the details, the basic principles still hold. And so that's the reason why I included this exhibit here.

If you turn to the second page of the exhibit, it shows specifically two different schematic or diagrammatic decline curves. The upper one is a conventional decline curve for a conventional reservoir.

And in a normal reservoir what we see is, production starts off high because our pressure is high. And then as we have a decline in pressure, our production rate drops off. So that's pretty straightforward.

In coalbed methane we see a different type of thing happening. As you can see there on that, on the bottom curve there, there's an initial early peak in production which occurs as we deplete or drop the pressure right near the well. Then as you move -- as water is coming in, because most of the coalbed methane reservoirs start out filled with water, then we see a short decline in production, and from there we have an extended production incline. Many people call this the negative decline period or the production incline period.

Q. Why do we see that characteristic of wells in the coalbed methane?

A. It's because we start out -- The coal has one channel, basically, for gas to get to the well, and that is through the cleat system to whatever type of completion we have. The cleats are natural fractures that exist in the coal, but they're very small scale. In the San Juan we're typically looking at four to as many as 20 cleats per inch. So it's a very finely, or very heavily cleated type of coal. Those cleats provide a channel for the gas to get out of the coal and then move towards the well.

But initially the cleats are filled with water. So what we have to do is, we begin pumping the water out. And as we dewater we reduce the water saturation, increase the gas saturation, and that's the increased gas effective permeability. So it's a case -- That incline basically results from that increase in gas saturation, gas effective permeability.

Now, we reach a peak when the increasing gas saturation, increasing permeability no longer offset the decrease in reservoir pressure, because as we continue to produce we drop reservoir pressure. That part is just like a conventional reservoir, but we follow a different curve.

There's also another factor that can enter in and is well documented in the San Juan Basin, and that's what we call matrix shrinkage. And matrix shrinkage is where the blocks of coal, the little cubes of coal, if you will, actually shrink as we produce the methane, because the methane takes up one to two percent by volume of the coal in its original state, in the adsorbed state. So as we produce that methane, those coal blocks begin to shrink.

Well, that opens up the cleats and then gives us a better pathway or a better conductivity from the reservoir into the well. And as a result of that, that's the reason why we see many of the fairway wells, for example, reach high levels and then sustain at those high levels, in some cases for many years, before they begin to fall off.

Q. What do you mean by the word "isotherm"? What is that?

A. An isotherm is one of the techniques that we use in evaluating coalbed methane reservoirs. And the third page of this Exhibit C-2 shows, again, a diagrammatic isotherm, although this is actually, if I remember correctly -- was taken from a couple of the GRI research wells. And it shows that conceptually what happens with the isotherm, it is measured in the lab at a constant temperature, and that's why we call it "isotherm"; the root words mean "constant temperature". And what we do is, we pump methane, progressively greater and greater volumes at higher and higher pressures and let it equilibrate with a ground-up sample.

And so taking this example here, at 2000 p.s.i. we're at approximately 600 p.s.i. [*sic*] if we're saturated with methane, and that's where the circle is on the right, just under Coal A. So it says there "Coal A is Saturated: Initial Gas Content is on the Sorption Isotherm".

If we were only at 1000 p.s.i., we'd be at approximately 500 cubic feet per ton. And similarly, if we go down to very low pressures, even at a pressure, say, of 100 p.s.i., we're still showing a gas content of about 100 cubic feet per ton here. So there's still a lot of gas at very low pressures.

And so this isotherm gives us an understanding of the amount of gas that the coal can contain at different pressures.

Q. So the purpose of the isotherm is to develop a curve using disciplines of engineering to show how much gas a particular coal can hold?

A. That's correct.

Q. Let me show you an exhibit that we failed to get copied into the book. It's one we used before Mr. Stogner.

Now, if we look at the isotherm that you just displayed and use the help of the additional lines on this -- what is marked as Exhibit 4 as part of this exhibit, it will help you illustrate some of these different steps.

A. Yes, this was just the next page following the previous pages there.

CHAIRMAN WROTENBERY: So we should consider this part of Exhibit C-2?

THE WITNESS: That's correct.

Q. (By Mr. Kellahin) Let me have you take this in pieces now. When you use the term "saturated" or "near saturation", how do you use that in terms of this isotherm?

A. Okay, if I may point at this isotherm here, the circle over here, if we take a coal that's saturated with methane at 1900 p.s.i., then reading from the 1900 p.s.i. up to the isotherm line, we then read left over to the Y axis, and we see that its initial gas content would be 600 standard cubic feet per ton.

Now, if we were to drop the pressure on that even a little bit -- say we drop 100 p.s.i. or about 5 percent of the reservoir pressure, we're going to release methane. We're going to have a little bit of methane come off. In this case that number would be -- to an eyeball that looks like 20 or 30 cubic feet per ton.

But because the isotherm is curved like this, when you're saturated, every pressure drop that you get, every p.s.i., is releasing gas. And because it's curved like this, we have to bring the pressure down further and further to get more of the gas. So in order to maximize recovery, we'd need to bring the reservoir pressure down into the 25- or 50-p.s.i. range.

Q. When you're dealing with pressures, you're dealing with initial reservoir pressures?

A. Yes, in this case this would be the initial reservoir pressure. So we'd start off with Coal A at initial pressure. Then as we are producing, as the pressure drops, that's how we release gas, because the amount of gas between the initial gas content and the gas content at a lower pressure is the amount that we release.

Q. Can we have a well which would have pressure higher than the Coal A point on that display, higher up?

A. You mean gas saturation higher up?

Q. Yeah.

A. Yeah, if at 1900 pounds, let's say we had 700 cubic feet per ton, then we've got a problem because the coal can only hold 600 cubic feet per ton. We don't have any oversaturated coal, not in reality. The cleats can hold a little bit, but the cleat volume is very small.

So basically we -- the operative region of this is at or below the isotherm.

Q. Let's start there. If you're below the isotherm where it says Coal B, are you in an undersaturated condition?

A. Yes, you are. Coal B here at 1900 p.s.i. would hold, it says here, about 450 cubic feet per ton. So that would be an undersaturated coal.

Q. In the reservoir that we're dealing with in Mr. Richardson's Application area, what initial reservoir pressure are you dealing with on this display?

A. Well, we'd actually be dealing with initial pressures down mostly in the 175- to 350-pound range, with an average number of about 250. So we're looking at much lower gas contents, down in about the 240-cubic-feet-per-ton range for the initial gas content.

Q. Help me understand underpressured reservoirs. Can you have an underpressured reservoir that is gas-saturated?

A. Yes, we can. So underpressure -- the pressure level in the reservoir -- Underpressured just means that the pressure is lower than the pressure of a column of water. So it depends on topography and where the standing water level in the well is.

So if we're underpressured but we're saturated -- For example, if we're 250 pounds and 240 cubic feet per ton, we would be saturated here. Whereas this Coal B here might be an overpressured reservoir at 1900 p.s.i., if that was occurring at 3000 feet or 4000-foot depth, that would be an overpressured reservoir.

So whether a reservoir is underpressured, normally pressured or overpressured, it can still be saturated.

Q. What causes the coal to be undersaturated?

A. Well, there are several things that can happen. What we find in practice is that -- In general, they come in a couple of different ways. The first one is that the gas originally had coal in it, because there's considerably more gases formed when we generate coal than the coal can hold. There's about five to ten times as much gas generated as the coal can hold. So because of that, the coals generally start out close to saturated.

But they can have the gas escape. For example, if there's a fault that cuts down into the coal, then the gas can escape through that. Or another way is if there's water washing the coals. And we see that in both the Powder River Basin, in some of the coals, and in the Uintah Basin. There's even a couple of wells in the San Juan Basin like that where they're in small fault blocks where water rushing by or going by over a period of time has washed the methane out of the coal.

The other kind of key thing that has happened worldwide that we see is, up in Canada we find that coals are often undersaturated because they started out saturated when the coal was deeper. Now the coal is shallower and the temperature is colder. And as the temperature has changed, then the isotherm has changed, because at lower temperature the coals can hold more gas. The molecules aren't moving around as fast, so it's easier for the coal t hold more gas. So in that case it started out saturated on the isotherm and then has since changed.

Q. Are the Fruitland Coals in the San Juan Basin generally undersaturated or saturated?

A. They are generally either saturated or close to it. They are mostly within 20 to 50 p.s.i. of being saturated. They're generally very close.

Q. Within Richardson's project area, what do you find the coals to be? Saturated or unsaturated?

A. We find the coals to be saturated in the Richardson area, and there's a very key piece of evidence that shows this, and that is, when Mr. Richardson came in and drilled his wells, they began making gas right away. Now, at times it would be small volume that then grow. But when it begins making gas right away for very little pressure drop, that says we're very close to saturated.

If you look, as an example here, at this Coal B, that Coal B here would be about 25 percent undersaturated. What that meant is, in that particular example, they would have to bring the reservoir pressure from 1900 p.s.i. all the way down to 900 p.s.i. before they got any gas. That's what happens to you in undersaturated reservoirs. You have to dewater for extended periods, and you produce a lot of water before you get any gas.

There's a good example in the Raton Basin of this. There's one project that has produced 57 million barrels of water and only 17 million cubic feet of gas. That's about the amount of gas that you can carry in the water as solution gas. So that project has been pumping now for three and a half years and has not made any gas to speak of. Mr. Richardson's wells made gas from day one.

Q. Help us understand how the water component fits into the analysis.

A. Well, the water is great at the beginning. The water is the reason that the gas -- or that the coals held gas. The pressure from the water is the pressure that was holding that gas in place. If that water pressure or water head had been removed over geologic time, then the coals would have lost their gas. But they didn't. You know, the water held the gas in place.

But what we have to do is, we have to dewater these reservoirs to maximize recovery. We have to bring the pressure down. In order to do that, we have to pump the water off. So it's a fairly complex process, but it really boils down to, very simply, you have to dewater to get the gas out.

Q. The Division's recent order on the pool rule change that distinguished between the overpressured area and the underpressured area, can you be in the underpressured area and still be in saturated coal?

A. Absolutely.

Q. Is Mr. Richardson in a similar circumstance in that he is in a saturated portion of the pool that is underpressured?

A. Yes.

Q. How did you go through the process of deciding how you would take this general concept of an isotherm and find data to generate an isotherm that is useful or characteristic of the coals within Richardson's Application area?

A. Well, we're fortunate that we do have information from the Coal Company. They actually measured isotherms on two samples. And that's shown in Exhibit C-3.

Q. Let's turn to that.

A. Okay. The Test 151 there is the red curve up at the top, and it showed -- What they do on these isotherms, as I said, is, they take the samples and they equilibrate with methane at different pressures so they see how much methane goes onto a sample. On that particular one at 350 p.s.i., they would have had approximately 350 cubic feet per ton.

Now, what they do is, they actually do this at several different points, at different pressures, so I haven't actually plotted their measured pressure points here. This is the isotherm, though, that came from their results. So they fit a mathematical curve called the Langmuir isotherm to this, and then this is that curve.

So we have one sample is the red sample there. The second sample is this green sample. And what I did is, I averaged in between to get the blue isotherm there that I called the average. So that's -- We have two samples, and we find that when we average those we fall in between.

But there's really not that much scatter between the two of them. It's only going from about 310 up to 350. Most of this difference is attributable, most likely, to difference in ash content between the two different samples.

Now, there's one other isotherm that I've shown here, which is the San Juan Basin average isotherm. So you can see, even if we didn't have any isotherm information in this area, we could use the available average isotherms for San Juan Basin coal and find that this is still very close to that isotherm.

Q. This isotherm is called an adsorption isotherm?

A. That's correct.

Q. What's that mean?

A. Adsorption means that we are adsorbing or adding gas to the coal. So more and more gas is being added to it, it's adsorbing onto the coal. And it's a little bit like the word "absorb", but the term "adsorb" refers to -- call it a chemistry type of thing, a physical chemistry type of thing.

Q. What's the significance of these Langmuir pressures and volumes? What's that mean?

A. They just basically tell us what the shapes of the curves are and what the levels are. The Langmuir volume is defined as the maximum amount of methane that we can adsorb on the coal if we carried it all the way up to, in essence, infinite pressure but still had gas molecules. And what that's happening is, we only get a monolayer of methane onto the coal there. So that's the reason why we have a finite volume at very high pressures.

And then the Langmuir pressure is the pressure at which the adsorbed volume is equal to one half of the Langmuir volume. And so that's a measure of the curvature of the isotherm. If we had, like that number there, 1178, a higher pressure, a higher Langmuir pressure means that we have an isotherm that's a little bit straighter. A low Langmuir pressure means that we have an isotherm that's more curved.

So that's why if you look at that San Juan Basin average isotherm with 315 for its Langmuir pressure, it has more curvature than the other isotherms.

Q. Is this methodology for using the Langmuir pressure volumes and these adsorption isotherms an accepted engineering practice among engineers that are trying to analyze the coalbed methane gas production in the San Juan Basin?

A. Yes, it is.

Q. This is simply not unique to your study?

A. No, this is standard industry practice.

Q. Have you satisfied yourself that you've used the best available isotherm in the Application area?

A. Yes.

Q. What result does it give you in terms of knowing the approximate gas content per ton of coal?

A. That's actually on the next exhibit.

Q. Let's look at that.

A. Or, excuse me, it's actually on Exhibit C-5 which for some reason is not in this book. C-4 has pressure data, C-5 would be the next exhibit, or the exhibit about use of the isotherm.

Q. Well, let's step back a moment. If you've satisfied yourself that you have the correct isotherm to use, what then is the next step that you use as an engineer to get you to the ability to calculate the standard cubic feet of gas per ton of coal?

A. Well, my next step is, I need to know at what pressure do I enter that isotherm? So do I come in at 500 p.s.i. or 1000 p.s.i., or what pressure should I enter it at?

Q. All right, so let's go back to Exhibit C-4 and talk about your pressure data.

A. Okay, Exhibit C-4 is a summary of the pressure information that I had in and around the Richardson Application area. What I've done here is, I've shown the well that a pressure measurement came from, the location of the well, which zone that it was completed in, the date of the test, the pressure that was measured, the depth that that pressure was measured at, and then the ground level gradient -- which by the way, the gradients here, as you can see, are all in the .23 to .33 range, so we are substantially underpressured.

And then that last column before the Comments is a potentiometric surface elevation. And what I've done is, I've taken that pressure and then calculated where the equivalent standing water level would be in the well at that point in time.

Q. What pressure, then, did you use in your analysis of the isotherm?

A. Well, what I did is, I actually looked at a range of pressures, depending on what depth that we are at. From this information in Exhibit C-4, I determined that the average potentiometric surface elevation in the Application area around the time that Mr. Richardson was drilling his wells was about 5100 feet. So by taking that number, then, I can look at the depth of the coal and then calculate what pressure the coal reservoir would have for varying depths.

So now if I may move to Exhibit C-5 --

Q. Yes, sir.

A. -- the Gas Content Based on the Isotherm, what we have here, that average came out about 251 p.s.i. for an average pressure, and that was based on looking at the structure contour line that ran roughly through the middle of the Application area, and with a range from 164 up to 294. At 251 p.s.i., then, I see an adsorptive capacity of 250 standard cubic feet per ton.

And then the range of initial adsorptive capacity -- and these would be, then, those other red lines coming up -- on the low end for the shallower coals it would about 178 cubic feet per ton. On the high end for the deeper coals, about 281.

Q. When you read the isotherm and come to an average gas content per ton of coal in this area, what number should we use?

A. We should use this number of about 250 standard cubic feet per ton.

Q. What would happen in the coal if in the Application area it was severely undersaturated?

A. Well then, that number would be substantially lower. If it were slightly undersaturated, say 10 percent, then instead of 250 that number would be, say, 225. But if it were severely under undersaturated, say 50-percent undersaturated, then that number would be down in the 125-standard-cubic-feet-per-ton range.

Q. Do you find any evidence in the Application area to believe that the coals are undersaturated?

A. The only evidence that I see for that were the desorption measurements that the Coal Company did on a number of samples.

Q. Let's talk about that. If the San Juan Coal Company is using core samples and from that they have derived their desorption measurements, why have you not used those numbers in your analysis to determine what the volume of gas in standard cubic feet per ton of coal is?

A. Well, I have a number of problems with desorption measurements. Gas desorption measurements are -- What they do is, they take a core sample -- or cuttings in some cases, but as I understand, the Coal Company actually cut cores -- and you bring that core to the surface and then you put it into a canister. You measure the amount of gas that comes off, and if you wait long enough then all the gas that's there basically will come off. But if you get tired of waiting then you end up either grinding up the sample or heating it up to drive off the residual gas.

Now, one of the problems we have is, we don't know -- Because we haven't measured it, we really don't know the amount of gas that was lost from the time that the core bit penetrated the coal to the time that we got into the canister.

In my classes that I teach I've shown examples from some of the old projects, even here in the San Juan Basin, where people would take three hours tripping, bringing the drill bit to the surface because they had -- the core barrel was integral at the bottom, they could not wireline-retrieve the core, and in three hours you would lose 70 percent of the gas off that core. And then I show other examples where if they wireline-retrieve the core, you can bring the core to the surface and get it into the canister, typically, in less than 15 minutes. And so what you want to do is, you want to minimize that time that you're losing gas.

Now, we can estimate the loss of gas. However, we have to recognize that is an estimate. We have a number of different methods to do that. Basically, we take the early measurements from the gas desorption after it's put into the can, and we back-extrapolate to lost gas time to determine how much gas we lost.

Now, San Juan Basin coals tend to desorb very rapidly. If we look at desorption time -- and that's defined as the time it takes for 63 percent of the gas to come off a sample -- in the San Juan Basin that's typically a few hours up to as much as ten hours.

In other basins we find it to be much higher. For example, back east many of the coals take as much as 300 days, in the Pennsylvania coals, to desorb 63 percent of the gas. So those coals, if we had a three-hour lost-gas time, we wouldn't worry.

Now, without having the information from the original data sheets as to the fluid type that they drilled with, their exact lost-gas times, how much lost gas they determined was there and so on, then I don't have the information, basically, to do a quality control check to see what numbers the Coal Company came up with to tell whether or not I can believe those numbers.

But basically it's very easy to lose gas from a desorption sample, whereas an isotherm, you have control over what's going on in the laboratory. So you know that the isotherm is right. And we have other isotherms from other areas in the San Juan that we compare to, to tell us that we have the right type of information from the isotherm.

Q. Can you use production behavior of a coal gas well to tell you anything about the gas content of the coal, whether you're using the right isotherm or whether you ought to use something else?

A. Yes. Again, as I've said, there's actually two pieces to this. The first one is to the performance. If we get gas early, then that's telling us we're very close to the isotherm. And if we're five percent under the isotherm, frankly, that's beyond the range of measurement that we can get to. But if we're 50 percent under the isotherm we know, because we have to pump water and water only for a long time. So performance tells us.

The other thing that we can do is what's called a modified P/Z plot if we have average reservoir pressure. So that would typically come from a monitor well, and we'd see how does our average reservoir pressure drop as we produce more and more gas?

In this case, though, it's very early in the project and there are no pressure-observation wells, so we don't have the information to do a P/Z* type of plot or an isotherm from the field information.

Q. Do you now have enough information from which you can calculate or evaluate the gas in place and determine what that number is?

A. Yes.

Q. Within the Richardson project area, have you made a calculation of what the original gas in place is?

A. Yes, I have.

Q. Is there a range of gas in place that you can tell us that would be applicable to 320-acre spacing units?

A. Yes, I actually have that on Exhibit C-6.

Q. All right, let's go to Exhibit C-6 and have you identify and describe for the Commission what you are doing here.

A. Okay. Exhibit C-6 here shows the Fruitland CBM calculated recovery as well as gas in place, based on the isotherm. And so what I've done here, this ties the volumetric calculations with the isotherm calculations.

So let's take -- We have different input data here. The area, 320 acres per well, which is the current spacing. Average thickness, now I've got a number here of 28 feet based on work that Mr. Hively did, and I've got a note down to the bottom here that in my calculation of recovery efficiency I actually reduced that number by 10 percent to account for uncompleted or unnconnected coals.

But the 28 is the total gross coal thickness here.

Langmuir pressure, 792 p.s.i. That came from my fit to the two average isotherms that the Coal Company measured.

988 standard cubic feet per ton for the Langmuir volume. Now, the match to the isotherm actually came out 1040 standard cubic feet per ton. I reduced that by 10 percent in the upper coals, because based on the information that we had looking at the logs and the different reports we had, it looked as if the upper coals were ashier, and therefore we reduced the average isotherm by about 5 percent, which would be 10 percent in the upper coal, zero-percent reduction in the basal coal. So that's how I get the 988 there.

Average coal density, 1800 tons per acre foot. That's a representative number for the San Juan Basin.

And then the initial potentiometric elevation, 5100 feet, that's the water level, the equivalent standing water level that we use to calculate the pressure at different points there.

So we have three different cases -- or three different types of behavior that we looked at: a minimum pressure case which was based on a 4750-foot elevation, an average case at 4550, and then a high-pressure case at 4450.

So from the potentiometric level and the structural elevation, I calculated initial pressure. so that ranged, then, from 164 to 294 with an average of about 251. And those then led to the gas content off of the isotherm.

With that I then calculated the initial gas in place, and those numbers ranged from 2.7 to 4.3 BCF in place for 320 acres, with an average of about 3.8 BCF.

Now the next piece here, the next several lines tie back to average reservoir pressure at abandonment. We have to assume for this calculation an average reservoir pressure when we abandon the wells. As we'll talk later, we actually calculate that from the reservoir properties later, but for this calculation we just took -- assumed numbers of 25, 50 or 75 p.s.i.a. As you can see, at 25 p.s.i.a. we get pretty good recovery efficiencies, in the 75- to 80-percent range. At 50 p.s.i.a. it would be in the 59- to 70-percent range, and at 75 we would be in the 45- to 61-percent range.

So if you want to take kind of a middle-of-the-road average value, at 50 p.s.i. abandonment pressure, we'd be looking at about 68 percent of the gas in place being recoverable, and that would then lead us to 2.6 BCF recoverable per 320.

Q. San Juan Coal Company has contended that Mr.

Richardson's PC wells are depleting the coal gas, and he therefore doesn't need anymore wells in the coal. Have you examined the Pictured Cliff reservoir?

A. To a small degree.

Q. Have you examined it to the extent that you have tried to analyze what effect the Pictured Cliff has had on the coal gas production?

A. Yes, I have.

Q. Let's talk about that. Let's go to Exhibit C-7, and let's talk about the Pictured Cliff formation in this area. What is the quality of that reservoir in the Pictured Cliff in this area?

A. The Pictured Cliffs, it's a very ratty, shaly, tight -- a very poor-quality reservoir, you know, let's be honest here. It is a very difficult reservoir to produce from. It's a tight-gas sand and tends to have -- require frac jobs to produce and is low permeability and thus is a difficult reservoir.

Q. Let's talk about your analysis of the Pictured Cliff. Let's explain for the Commission your calculations on exhibit C-7.

A. Okay, what I have here again is, I've looked at a range of values here. In this case, I picked three different thicknesses for the Pictured Cliffs to illustrate the amount of gas in place and the potential recovery from

Pictured Cliffs reservoirs. So this is a volumetric calculation of recovery and gas in place.

I start with the current spacing, or current area for the Pictured Cliffs, 160 acres per well. Initial pressure, about 300 p.s.i. So I've just said, let's take an average number here and look at this, because the range of variability of net pay thickness is the real question here.

Reservoir temperature, about 85 degrees. Z factor at that temperature and pressure would be about .95.

Now, the porosity here. I've thrown in, just for the sake of discussion here, a 20-percent number. The Pictured Cliffs has highly variable and very poor porosity in general. People -- Depending on who you are and where you're at in the Pictured Cliffs, I've seen people counting clear down to 4-percent porosity as pay. Most people are taking a 6- or an 8-percent porosity cutoff. Many people take a 10-percent porosity cutoff.

What I did here is, I just picked a number of 20 percent for illustrative calculations. I'm not saying that the porosity is 20 percent, but I can guarantee you, it doesn't average more than 20 percent. So this is to give an idea of the kinds of gas in place and recovery levels that might be expected from the Pictured Cliffs, really on the high end.

And then an assumed gas saturation of 50 percent. Again, different folks would perhaps quibble with that. Some people might use 40 or 60. In my experience with tight reservoirs, where they have gas, that number tends to center in that 50-percent range. And again, what I'm after here is a comparison between the Pictured Cliffs productivity and the coal productivity. So the exact number on the Pictured Cliffs is less important to me than the range that -- what I see compared to the coal.

So I've taken three different levels, 5, 10 and 20. And once again, exactly what is pay in the Pictured Cliffs is subject to discussion. I've seen operators complete Pictured Cliffs wells that I can't believe they'd make gas out of it, and they do. So given that, we just picked a range.

We have the porosity and gas saturation there, leads to initial gas in place in the .07-to-.286-BCF-per-160 range. This is -- To me, it is clear indication that we're looking at relatively low volumes from the Pictured Cliffs. When I apply recovery efficiencies here, again I'm seeing a range. But now because recovery efficiency in a conventional reservoir, our P/Z curve is very close to P because Z is close to one, so it's almost linear. So we aren't seeing nearly as much variation here as we do in the coal.

So just kind of to pick a number, we're looking at about .12 BCF per 10 feet. So if we have 20 feet it jumps up to about .24 or a quarter of a BCF. If we have five feet, then it's down in the .06 range.

The point I'm making here is, regardless of what numbers you pick -- and as I say, these are really fairly optimistic kind of numbers for the porosity -- I can't get the Pictured Cliffs numbers to be higher than about a quarter of a B per well, and more likely that number is down in the 100-million-cubic-foot range per well. So it's a very low number compared to the gas in place in the coal on the previous slide, in the 3- or 4-BCF range with a potential recovery, say on average, of about 2 1/2 BCF per 320.

So even if we are looking at two wells in the Pictured Cliffs, kind of combined may be making .2 of a BCF, it's very small compared to the potential of the coal.

Q. Mr. Cox, let's analyze some of the producing wells that you've identified in the Application area, and let's compare their production levels with what you now see as your expectation of performance in the Pictured Cliff.

Are there examples of wells that we can talk about?

A. Yes, there are. The first example I have here is actually a well east of the Application area in Exhibit

C-8, the Russell Federal Number 2.

Q. Its location is shown in the caption?

A. Its location, in the southeast of the southwest of Section 33 in 30 North and 14 West, is shown in the caption. And this is an old historical well that was completed as a Pictured Cliffs producer back in 1954.

Q. What's your point here?

A. Well my point here is, when you look at the performance of this well, this well produced 1.6 BCF of gas. That's way, way more than we can account for from the Pictured Cliffs. And so if this gas came from the Pictured Cliffs, it would have to be draining thousands of acres or hundreds of feet of pay, of good-quality pay. Well, the Pictured Cliffs is so tight that we can't drain thousands of acres, and we don't see hundreds of feet of pay.

So the point of this is that the performance of this well indicates it was draining or connected to another source of gas. And obviously that source of gas would be the adjoining formation, the Fruitland Coal.

Mr. Richardson had told me some time ago that this well was the reason he focused on this area, the Application area and the area around it here, for his west Farmington development, because he could see that this well showed that the Fruitland Coal had a substantial amount of gas in it, and that it could be recovered.

So this particular well, even though it's listed as a Pictured Cliffs well, is obviously in connection with the Fruitland Coal.

Q. What's the vintage of this well?

A. It was drilled in 1954 or maybe late 1953, I've forgotten the exact year, but it did produce in 1954, clear up into 1991.

Q. Does it appear to you with the vintage of this well that the operator was trying to frac out of the Pictured Cliff into the coal so he could produce the coal?

A. No, it does not. In fact, you know, they did a small frac job on this, and the high rate that they got early on, over 300 MCF a day there from the well -- and it actually tested at a much higher rate -- that's an indication from the Pictured Cliffs, or from the Coal for that matter, that you're looking at some degree of natural fractures being present there to enhance the permeability of that area.

Now, any natural fractures that occur in the Pictured Cliffs almost certainly occur in the Fruitland as well. Anything that caused fracturing in the Pictured Cliffs would cause it in the Fruitland.

So what would have happened here is, even with a small frac job they would have communicated with the Fruitland through those natural fractures.

Q. Mr. Cox, in general will a fracture stimulation in the Pictured Cliff be the best way to maximize methane coal gas production?

A. No, absolutely not. First off, there's the old common sense part of this. If we want to maximize production from the coal, we need to complete the well in the coal.

But more than that, what we find is that the frac gradient in the Pictured Cliffs is much, much lower on average than the frac gradient in the coal. We see frac gradients in the Pictured Cliffs in the .7 to .8 range, typically, less than 1 p.s.i. per foot. And so if we're at, say, 1000 feet, that says in order to fracture the Pictured Cliffs we need to pump in at 700 to 800 p.s.i. fracture pressure downhole.

To fracture-treat the coal, though, typically takes 1.5 to 3 p.s.i. per foot. So the coal being just immediately above the Pictured Cliffs, that means to treat the coal we need to inject into it at a pressure of 1500 to 3000 p.s.i.

So the much higher treating pressure required for the coal says, if we want to complete the coal we need to come in and perforate the coal and fracture treat it separately from the Pictured Cliffs.

Now, this idea of perforating sands next to coals and then treating those was actually tried on a number of occasions in Alabama, and it was found that it was generally ineffective in completing into the coal. The idea was that if you perforated the sand, then you could treat the well at a lower pressure and that the frac would grow up into the coal. In a few cases it does, but more often than not it doesn't ever penetrate that boundary between the coal and the Pictured Cliffs.

Q. Let's talk about the level of Mr. Richardson's gas production out of the coal beds in the Application area. Do you have an exhibit that summarizes some of the production in that area?

A. Yes, I do, Exhibit C-9.

Q. Let's look at that.

A. Okay. Exhibit C-9 here, what I've done is, I've taken the production from all the Richardson wells in the Application area, whether they're Fruitland Coal wells or PC wells, I've just added them together to show what's happening in this area. And as you can see, early on production was virtually nothing, back in early 1999, and it has since grown to over 4 million cubic feet per day. He has now produced over 2.5 BCF from this Application area.

Q. Would this be a signature of inclining production?

A. Yes, it is.

Q. Are you at a point where you could apply the conventional decline curve analysis to these wells?

A. No, we're not, because we're not yet at the peak rate for the wells. So until we reach that peak rate, and then actually many of the wells may stabilize at that peak rate for some time, then we can't apply conventional decline curve analysis because the wells are still continuing to increase, just as you see this increase on this chart C-9 here.

Q. Have you prepared a tabulation of all of Richardson's wells in the Application area and presented them on Exhibit C-10?

A. Yes, I have.

Q. What are you showing here, Mr. Cox?

A. What I'm showing here is, we've taken the individual well production curves, and what we've done is, we've plotted the daily production information so that we could then calculate such factors as the average rate in the first 30 days or first 31 days, then the median rate and the average rate over the well life through 9-23 of '02, which at the time that we prepared this exhibit that was the last daily information we had, and the total days on production through 9-23 of '02.

So if you look here -- for example, let's take

Well Number 5 there, the Bushman 6-1, that's -- reading across, it's completed in both the Pictured Cliffs and the Fruitland Coal. That's what the PC/FC means. We have its location there in the southeast of the southeast of Section 6 of 29-14.

This well has already accumulated 307 million cubic feet of gas through -- or to May 1 of '02. Its average rate in the first 31 days reported there, 48 MCF per day. Median rate 339, and the average rate 276. Total days on production 1111. So you can see it's been on for just over three years.

And the key point here, if you look at that average rate in the first 30 days versus the median rate or the average rate over the well's life so far, it's gone up from 48 to 339 or 276, so about a factor of five to seven times incline from what it started at.

Now if you look instead, say, at one of the wells -- let's just pick, say, the 29-2 here, which is a Pictured Cliffs well, its average rate at the beginning -- this is line number 22 -- 176 MCF a day, median rate 214, average rate so far 194. So this well has kind of held steady in its rate. It has not shown much of an incline, but it started out at a pretty good rate.

So you have many of these wells that start out at low rates and have grown, but you have other wells -- the well that started out at the highest rate, the Federal 33-3, which it says is a PC well, 758 MCF a day, and it's now down to an average over its life of 429, so it's been declining.

Now, that one says it's a PC well. However, it's already accumulated 219 million cubic feet. So from the Pictured Cliffs analysis that I did before, it's unlikely that this well is producing solely from the Pictured Cliffs. Rather, it has some degree of connection to the coal. But the high rate suggests that there are natural fractures again. Otherwise we would not get 600 MCF a day at the beginning from a well like that.

And so those kind of wells, we're looking at a different type of character than the average well in the area.

Q. Your next series of exhibits here, Mr. Cox, are a series of decline curves. Let's go through those and have you summarize and give us your opinions about the importance of these exhibits.

A. Okay. Well, Exhibit C-11 shows the Bushman 6-1. The key things to me on this are, first off, that the rate -- it started off with a finite rate of gas and then climbed and reached over 300 and has produced consistently in the 300- to 400-MCF-per-day range since about the middle of year 2000.

So this well, again starting early, inclining, that's a characteristic of a coalbed methane well. And this well is the well that we have the longest period of production on in the Application area.

If we move to the next well, the Pittam Pond, again, Pictured Cliffs and Fruitland, you can see this well started out at almost nothing and has since climbed to about 70 MCF per day. This well is not done climbing. Mr. Richardson is not done dewatering.

Now, actually that brings up a good point. You'll notice what I've plotted here are gas rates. I don't have corresponding water rates. The reason is that the water information that Mr. Richardson had is not of the same degree of accuracy on a daily basis as his gas information. And so because of that he's allocating his water production back from his totals, rather than having separate meters on every well.

So the gas measurements are more accurate than the water measurements, and this is normal in many coalbed methane projects.

Now again, the fact that this well began making gas very quickly is a sign that it's saturated, or nearly saturated, with methane. The lower rate is a sign that it either has lower permeability or a less effective completion than the Bushman well.

If we move to the next well here, the State 36-3, this, I think, is a critical well in the understanding of what is going on in this system. The State 36-3 is located in Section 36 of 30 North and 15 West. So if I'm pointing here at Exhibit A-1, then the 36-3 is located right here.

Now, this well, as you can see, is the closest well to where mine activities are currently underway. It's basically the shallowest well there is in this area. And yet, as you can see from the production curve on this well, once they began really producing this well in July, they began getting gas very quickly, and it has been climbing ever since. The well is now up to about 150 MCF per day on the most recent test.

I asked Mr. Richardson to have this well shut in so that we could see what the pressure buildup might be, because this well, being the closest to the mine, and thus the shallowest and the lowest pressure, I thought that it would be instructive to see what would happen if he shut it in. He had his lease operator go and shut the well in for two days.

At the time the well was shut in, the casing pressure on the well was 30 p.s.i. The next day when the pumper came by, it was 70 p.s.i. The next day it had climbed to 115 p.s.i. Now, those are gauge pressures, so if we add about 12 p.s.i. to get to absolute pressures, that means that the gas pressure on this well, after only two days of shut-in, was already up to about 130 p.s.i., and it was still building pressure.

This does not sound like a horribly undersaturated reservoir. This is a reservoir that has a gas pressure there, saturation pressure in excess of 130 p.s.i. And so this is telling me again, a confirmation now from pressure information, that the coals in this area, even very close to the mine like this 36-3, are either saturated or very close to saturated with methane.

The next well that I had is Exhibit C-14, the State 16-1, which is located in the northeast area up here, of the Application area. So this is one of the deeper wells.

The reason that I chose this is, the previous three wells were all down in the southwest part of the Application area. I want to show that we see the same type of performance across the Application area. So this well, again, it started at very low rates, down in the few-MCF-per-day, and has since grown up into the over-a-hundred-MCF-per-day sustained basis.

Now, these wells are not yet dewatered. Many of these wells are still producing over 100 barrels a day. And so until they get fully dewatered they aren't at their peak yet. We don't see peak production until after the wells are dewatered. So we can expect this production from these wells to continue to grow from this point.

Now the next well here, the State 32-1 on Exhibit C-15, is a Pictured Cliffs well. And this is more like the type of production we would expect from the Pictured Cliffs. Low rate, about 45 MCF per day to begin with, and basically a declining curve from there. And so this is more like a Pictured Cliffs well. This well clearly shows that it either is not communicating with the coal or has very little communication with the coal. Otherwise, we would see an inclining production curve. And again, we see this on a number of the wells, that they have low rates and are not inclining. That says that we don't have an effective completion to the coal.

So we can't just perforate the PC and expect it to connect to the coal. Well performance is telling us this.

CHAIRMAN WROTENBERY: May I just ask quickly about your designations? When you say PC only, you've got perforations in the Pictured Cliffs only; is that right?

THE WITNESS: That's correct.

CHAIRMAN WROTENBERY: And if you say FC/PC, you've got perforations in both the Fruitland Coal and the Pictured Cliffs?

THE WITNESS: That's correct.

CHAIRMAN WROTENBERY: And then if it's FC, it's perforated only in the Fruitland Coal.

THE WITNESS: That is correct.

CHAIRMAN WROTENBERY: Okay. And if it's perforated in both the Fruitland Coal and the Pictured Cliffs, are you downhole commingling that production, or are you producing those zones --

THE WITNESS: It's my understanding that they're downhole commingled.

CHAIRMAN WROTENBERY: Thank you, I was just trying to understand.

Q. (By Mr. Kellahin) I think you're read for Exhibit Number 16, Mr. Cox.

A. Yes.

Q. What are you illustrating here for us?

A. Exhibit 16 shows the nearby Fruitland Coal wells and the wells in the Application area. And what I've done here is, because we only have very limited history, we only have a couple of wells with even as much as three years of history in the Application area, I said in order to try and evaluate what is going on within the reservoir here, we need to look at other coalbed methane wells in the vicinity of this, this area here.

And so what we did is, initially I had one of the engineers that worked for me pull up all the Fruitland Coal wells south of the Fairway. It turned out that was in excess of a thousand wells, and many of them were many townships away, and so we tried to narrow in on wells that were as close as we could get that had significant histories.

So these are the wells that were within a couple of townships east of here. And the reason that we're looking mainly east of here, of course, is because the coal outcrops to the west.

Now, the wells that are shown with the gold circles there are the Richardson wells in the Application area.

The open circles are wells outside the Application area, or a few within that are not Richardson wells, that have less than five years of history.

Then the wells that have more than five years of history outside the Application area, we broke them into three different types depending on their performance: the wells that showed extended inclines for several years or more, the wells that were low-rate wells that declined, and then the wells that were high-rate wells that declined. And so we broke them into these three classes to try and identify what was going on in the performance of the wells.

Q. What did you conclude?

A. Well, what we concluded was that most of the wells -- and again we're talking now -- for the wells outside the Application area, we're talking wells that are stated to be Fruitland Coal completions, that most of those showed inclining production periods. And typically they were inclining for about five years. Some of them had been inclining for seven or eight years and had not yet reached a peak in seven or eight years of production.

The wells that are low-rate wells that are declining, accounted for about one well in every seven of these wells. And so those are wells that are either very tight or have poor completions, or maybe they just have not yet begun to incline.

The wells that are high-rate wells that decline, we feel are indicative of a natural fracture type of behavior where we're seeing a much higher permeability than the coal, and in those cases, instead of seeing the incline, they start off at high rates and decline. And so they're starting off, typically, over 300 MCF per day, some of them as high as 600 and 700 MCF per day and declining. The reason we don't see the incline is because they already start off at good gas permeability and decline from there.

Q. Let's turn to the next exhibit, 17. What are you showing, and what's your point?

A. Okay, Exhibit 17 is the production curve from ROPCO Fee Fruitland Coal 6 Number 1. This is an inclining well. This well started out at only 1 or 2 MCF per day, and over a period of years -- you can see that it actually started back in 1994 -- it climbed all the way up to 1.2 million cubic feet per day in the middle of the year 2000. So about seven years later before it reached its peak rate.

Now, obviously if we have wells that have only been producing for six months or a year or two years, if they're going to incline for six years, we're not going to be able to tell that that will happen.

If I take a curve like this, and I only have two years of history and I try and draw a decline curve on this, I will always be wrong, I will always have too low of a number. I can't use decline curves in the Fruitland Coal until I'm well past the peak and I have several years on the downturn. Even here, from 1997 through 1999, you can see a decline. This is probably either market-related or pipeline constraints or other mechanical types of things. It's not related to the reservoir performance of the well.

So when you see a decline like that, if you came in in 1999 and drew a decline curve that started in the period 1997, you would completely miss the fact that this well was going to continue to climb and reach 1.2 million a day.

So this example is showing how these wells in the area do incline. And yes, it takes them many years. Part of the problem is relatively wide spacing. At 320-acre spacing, it takes longer for the wells to dewater, and in a lower-pressure environment it takes longer for the wells to interfere with each other.

Q. Turn to Exhibit 18 now, Mr. Cox.

A. Okay, Exhibit --

Q. Is that another example of inclining production?

A. Yes, Exhibit 18, or C-18, is an example of inclining production.

Now, this one actually showed an early peak at about 200 a day that quickly fell off over less than a year. Again, if you tried to draw a decline curve on there in 1994 or 1995, you'd completely miss the fact that with continued production and dewatering over time, that this well would ultimately come up to over 500 MCF per day. And yes, it took it about nine years. So this one probably had not even reached its peak yet, nine years after it began production.

Q. Next?

A. The next curve here is the Gilbreath 1 curve, on Exhibit C-19. Again, it's an inclining production curve. After the first month the well stabilized at about 100 a day for two years and then began to take off, and again has reached now over 600 MCF per day, by the middle of 2002, again about seven years after the well was put in.

Now, if these wells had had 160-acre offsets early on, then their peak rates would have been achieved much earlier, because interference with coal wells is beneficial in this type of a setting, because what it does is, it helps them dewater more rapidly and helps the matrix shrinkage kick in more quickly, if that's a factor.

Q. Please continue.

A. Okay. These type of inclining curves, as I said, on the wells that started out low accounted for about 80 percent of the wells that started out at low rates.

The next curve here, Exhibit C-20, shows instead, now, a well that started out at a low rate, in the 80- to 100-MCF-per-day range, and has never yet inclined. So it's now declined down to about 20 or 25 MCF per day. So this well has not yet inclined.

So we do see a number of those, as I say. It's about 20 percent of the wells that start out at low rates, act like this, and we have not yet seen an incline.

Q. Next?

A. Now, the next one, Gallegos Canyon Unit 382, started out very high, about 500 MCF a day. This is the kind of well that, yes, we can draw a decline curve on this well. But this is a rarity. On the ones that start out at very high rates where we can estimate the ultimate recovery, yes, then we can do this. But I think it's notable that this well has now cum'd over a BCF of gas and is still producing.

Q. All right, let's continue to C-22.

A. Okay, Exhibit C-22 is a summary table that I prepared showing all of the 51 wells within this nearby area. And by "nearby", what we -- that's the area on that map that had at least five years of production. And so you can see there were 28 of these that had inclining production, there were 16 of them that had high initial production rates that then declined, and then there were seven of them that had low initial production rates without an apparent incline.

You can see on this that the average for the wells that inclined, they reached a peak rate on average of 644 MCF per day and took on average about 5.1 years to incline.

Now, we've also tabled here the basal and upper thickness. I had Mr. Hively apply the same methodology that he applied within the Application area to determine the thicknesses from the logs for these wells.

And then the final column over here, the zone, you can see either I don't have the information or it's in the lower coal, or in some cases -- many of these are completed in both the lower and upper coals. So we're seeing production from basically all the different coalbeds within the Fruitland section.

Q. When we turn to Exhibit 23, what are you showing and what's your conclusion?

A. Exhibit 23, what I was trying to do here was determine whether we could infer from the properties that we have information on what the sources of the peak rate, why we reach different peak rates between wells and the length of incline would be different between different wells.

So in this case here what we have is, we've plotted the wells where we know whether we're in the basal or the upper and basal coal, and we've plotted well depth versus peak gas rate. And as you can see, there's no meaningful correlation between depth and peak rate.

Well, we know that as we get deeper we have higher pressure, so our rates should increase. The fact that we're not seeing a correlation here says some other factor is more important to the peak rate than just depth. And that factor, obviously, is permeability.

Permeability -- Where we've done modeling and analysis of wells, we typically find permeability changed or varied from well to well by a factor of three to ten times on adjoining wells. The 3M study we did in Colorado clearly demonstrates that, where we evaluated 1600 different CBM wells in Colorado.

So in this case we see we don't have the correlation with depth. Depth is not the controlling factor here.

Q. Is there a correlation between coal thickness and peak rate?

A. There is a correlation, but again it's not much of one. It's a very low correlation coefficient on Exhibit C-24. And once again we know, all other things being equal, that if we increase thickness we should increase peak rate. Well, this again, because we don't have a correlation here, it's telling us that all other things are not equal, there are other factors that enter in. Again specifically, permeability and perhaps the degree of effectiveness of the completion.

Q. The next exhibit is C-25. It's part of an SPE paper. What's your point here?

A. My point here is, I wanted to provide the Commission with another factor that I think needs to be considered, and that is the effect of matrix shrinkage or, in this case, as they call it, How Permeability Depends on Stress and Pore Pressure in Coalbeds. This is a paper by Ian Palmer and John Mansoori, who were both with Amoco at the time that they wrote this paper, and this is a paper where they created a model to try and evaluate the effect of matrix shrinkage on these coalbeds.

Now, Amoco had done a lot of work in the San Juan Basin because they own so many wells, and they were one of the first companies to recognize the importance of production from the coal. And one of the things that they found out as they were producing different coalbeds is, they would make models of performance, and over time, and especially in the fairway area, they found that those models were pessimistic, that they would plug in a permeability in an area -- say the plugged in or started with 20 millidarcies -- over time they'd find that the performance of the well improved more than what they could account for with that permeability. And so they came up with this idea of matrix shrinkage.

Now, my own personal experience with this was a well just barely north of the underpressured area into the fairway, where I had a client who had me evaluate a well and then two years later come back and evaluate the well as part of package of wells that they were evaluating. I had them run a well test the second time. They had already run a well test at the beginning when the well was producing all water. They had a permeability of about 20 millidarcies.

Two years later the well had dried out. They had a permeability to gas on the second test of 130 millidarcies. When I looked at the tests, both were good tests. So I'm there -- What's going on here? The permeability of the rock, an intrinsic factor of the rock, had changed. It had gone up a factor of more than six times. Well, the Palmer and Mansoori model accounts for those kinds of increases.

When we were modeling the 3M project, we found that we had to include matrix shrinkage, certainly in the fairway, but even in areas outside the fairway, it was definitely kicking in. They key types of coal where it kicks in are coals that have sufficiently high gas content, typically well over 100 standard cubic feet per ton, so that matrix shrinkage is unimportant, and also very low porosity so that --

COMMISSIONER LEE: I want to point out something -- I think you shouldn't mislead the general public -- is this shrinkage depends on the Young's modulus and the porosity; is that correct?

THE WITNESS: That is correct, yes.

COMMISSIONER LEE: Sometimes it goes up, sometimes it goes down?

THE WITNESS: That is correct.

COMMISSIONER LEE: So it's not a general statement, say, well, if you depressurize it then you have an increase of permeability; is that right?

THE WITNESS: That is correct, yes.

COMMISSIONER LEE: Thank you.

CHAIRMAN WROTENBERY: Dr. Lee, I missed the first factor. You said it depends on something and porosity?

COMMISSIONER LEE: Young's modulus and porosity.

Do you measure Young's modulus?

THE WITNESS: No. In fact, even if you measure Young's modulus there's a factor in here, the ϵ/B factor, that is kind of a fudge factor -- an engineering judgment, excuse me.

But unfortunately, the number that we need to match in the models is about an order of magnitude different than the number that we measure in the lab. And so there's still some considerable question as to exactly what is going on with regard to that parameter. But I think the fact of the matter that we do see in many cases increases in permeability is well documented. And that's true not just in the San Juan Basin, but we also have seen that in parts of the Raton Basin and in the Uintah Basin.

We do not see it in the Powder River Basin. It's not a factor up there because we already start with high porosity coals that already have good permeability.

Q. (By Mr. Kellahin) Do you have an exhibit, Mr. Cox, that summarizes for us what you anticipate in terms of ultimate recovery for the Application area?

A. Yes, I do, that is Exhibit C-26.

Q. Let's have you discuss that display.
A. Okay, Exhibit C-26 -- Excuse me.
CHAIRMAN WROTENBERY: Go ahead, Mr. Cox.
THE WITNESS: Exhibit C-26 is a summary of a whole body of work that we had done for Mr. Richardson since the last hearing. This information on the nearby wells and how long the wells would continue to incline, we did not have prepared before the hearing in November of last year. So this is work that we've done since that time.

So what we did is, we took and set up a simulation model for the area within the Deep Lease and Deep Lease Extension here, except we did not include this area to -- the bottom row of sections to the south or so. It was within the areas that they intend to mine. We set up a simulation model where we modeled the performance of the wells, both as they exist today, and then after we put in, in the model, additional completions and additional wells to fill in effective Fruitland completions throughout the entire area.

So what we did is, we used the production information, the coal thickness information, the initial pressure that we determined using the 5100-foot potentiometric elevation and the isotherm, and then we matched the rates that we had up through the point in time that we had data through, which at that time, if I remember correctly, was the middle of this year.

Then what we did is, we allowed the wells to increase in production in the model, and we brought them up to where they would reach a total of about 500 MCF per day. Now, the reason I picked 500 MCF per day was because the total -- or the peak rate on those wells that inclined was 644 MCF per day, combined or total rate. So by taking 500, I was bringing it up to a number somewhat less than that but still substantial. And I brought that up over a period of five years.

We then figured out what permeability we needed to sustain that higher rate, and we allowed the permeability to increase to that level, and then we held it at that level from then on.

So now we have a reservoir characterization that we could then take and plug in additional wells and see how much additional recovery we would get from those infill wells.

Now, we then took, for this hearing, and scaled that information up to include the entire Application area here. So that's what we've done in these forecasts here, or these calculations here, is, we brought it up for the entire area.

Q. (By Mr. Kellahin) Let me make sure I understand, Mr. Cox. You've taken the input data, calibrated your model using information from existing wells, you've history-matched, and now you're ready to see what happens when you introduce well density consistent with our Application so that we have four coal gas wells per section, and then you see what happens?

A. That's correct. And it's not just well density, it's also effective completions, because many of these wells -- right now there are several of these wells that have not yet been completed, even though they've been drilled. And some of the wells were completed in the Pictured Cliffs, and so their completions are not fully effective yet in the Fruitland Coal.

So we said what happens if we bring all the completions up to an effective level and drill the additional wells?

Q. So if you make the assumptions that the Application is approved, additional wells are drilled, the PC wells are recompleted into the coal, run the model to see what happens in terms of additional reserves, from that plan of operation what result did you get?

A. Well, what we found was, if we look here at this Exhibit C-26, if we take the ultimate recovery in the -- let's just take down here the second to the last set of rows, Ultimate Recovery in Bcf/well, that we found a total on 160-acre spacing of 1.1 BCF or on 320-acre spacing 1.29 BCF. So what we're getting is much higher recovery by adding the additional infill wells within this area.

The total recovery, that second box or Ultimate Recovery in Bcf, went from 39 BCF all the way up to 66 BCF. So it added 27 billion cubic feet of gas recovery by doing those completions and drilling the additional wells.

Q. Have you reduced that to a dollar value so that we can see the financial impact or consequences of obtaining the additional 27 BCF of gas?

A. Yes, the -- I did not bother to bring detailed calculations here. Rather, from the work that we have done, looking at those detailed calculations, we were saying a net value to Mr. Richardson of about one dollar per MCF for the gas production. So what that's saying -- And that was starting with a gas price of about $3.50 and taking off operating cost and transportation and so on.

So what that says, at about a dollar per MCF that we're looking at, about $27 million of added value by doing the work that's contemplated by this Application.

Q. It's obvious, Mr. Cox, that San Juan Coal Company believes that these wells cannot be done profitably or economically, or if they're necessary at all. What does it cost to take a PC well and properly perforate and frac into the coal? What range of costs are associated with that operation?

A. We're generally looking at $35,000 to $50,000 to stimulate the coal. And if you did two treatments, if you did both the lower and the upper, say, as two separate treatments, then that number would double so you'd be looking at between $70,000 and $100,000 per well to do those treatments.

Q. How much additional gas would you have to produce as a result of that treatment in order to make it profitable?

A. Well, per treatment, at gas prices of two to four dollars, you'd only have to produce, say, about 25 to 50 million cubic feet. Fifty million cubic feet would pay off a frac treatment and so on, and give a very good return to Mr. Richardson. And so if you wanted to pay off two frac treatments in a well, certainly 100 million cubic feet would do it, and as little as 50 million cubic feet would be kind of the lower end, depending on gas price.

Q. What about if you drill a new well?

A. Well, drilling new wells, we're typically looking at a number in the $100,000 to $150,000 range, again for one completion. So if you're doing multiple completions you'd have to add to that.

Q. What is the amount of gas associated with recovering that cost and starting to make a profit? If you're dealing with a $150,000 well and using the gas prices that you just utilized for the recompletion, about how much gas is involved in order to make this work?

A. Well, again, it would be in the 150 million cubic feet range. It just does not take much gas recovery to justify a well here.

Q. Would you recommend to the Commission that they approve the Richardson Application?

A. Yes.

Q. There's an additional paper in here. I have it marked as C-28. What is this? Are we looking at the same thing?

A. Yes, Exhibit C-28 is a paper by Mr. William P. Diamond that I copied. It refers to Underground Observations of Mined-Through Stimulation Treatments of Coalbeds.

Q. What's your point here, Mr. Cox?

A. My point here was that I wanted to get across to the Commission that CBM production and fracturing wells is not inherently incompatible with mining for coal, that -- This paper summarizes the results of 22 government-sponsored mineback experiments where they fracture-treated wells, and then as mining progressed they could take and actually look at where the fractures were in the mine and see what effect it had on the mine. Most of these were in

Alabama, but they also did wells and mines in Utah, Illinois and West Virginia.

Then the -- I think the real key result here -- I've highlighted a number of pieces here to point out, but I think the real key result follows from that last sentence of the abstract on the first page where it says, "No roof falls or adverse mining conditions were encountered that could be attributed to the stimulations."

Basically what they found in this study -- and there have been many non-government sponsored minebacks as well, where different operators have mined through different wells. Basically what they find is that the places where they have roof-stability problems are areas where there's already a roof-stability problem, and that the fractures didn't cause it and didn't substantially enhance a roof-stability problem, the hydraulic fracture, that is.

Q. At the Examiner Hearing, San Juan Coal was arguing that they could come in first, vent the coal gas, take out the coal, and in this debris field, post-mining, what they call the gob, that there would be enough residual methane left that Mr. Richardson then could have what was left. Is that going to be feasible? Is that how we ought to do this? Mine the coal first and then go back and get the gob gas?

A. Well, I think the question there is, what type of recovery do you want to maximize? Certainly there are a lot of gob gas projects around.

In Alabama there's a company called Black Warrior Methane. It originally started out as a joint venture between Kaneb and Jim Walters Resources and has since gone through some different owners. At this point Jim Walters Resources in El Paso own Black Warrior Methane. They've produced over 250 BCF of gas, primarily through gob gas and some CBM wells ahead of mining. But many of those are gob wells.

Up in Virginia there's a company called Consol which is producing 130 million cubic feet per day from coalbed methane wells and gob wells in association with their mining activities.

I think there's a couple of key pints here, though.

First, gob gas production is real. Yes, you can produce gas from the gob. Where does that gas come from? Well, it would come from either the coal or from the tight sands next to the coal, such as the Pictured Cliffs, for example. Mr. Richardson already has the right to produce that gas. So to say that he could come back later and produce some of it from the gob, I think, is a little bit disingenuous.

Another factor, though, is, the testimony in a previous hearing about the gobs, the mining engineer mentioned that they were planning to have inert gas in their gobs to try and cut down the chance of explosions. Well, if they fill the gobs with inert gas, how, then, is Mr. Richardson or anyone else supposed to produce methane?

But then the final thing, I think, is very simple. They have to ventilate the methane out of their mine. That methane is coming primarily from the coal, and the methane that's ventilated, that is let go in the atmosphere, cannot be recovered, or is not recovered at this point, to be put into a pipeline. So that methane, it's just wasted into the air. It's gone. Mr. Richardson wouldn't have a chance to produce that from his wells.

So I think this question of, do you do the mining first and follow with wells, it's kind of a mixed question. It doesn't really reflect the fact that there are two different parties here who have different rights.

Alabama, Jim Walter Resources has the coal and they control the coalbed methane extraction, in Alabama.

In Virginia, Consol owns the coal, has their longwall mines and controls the coalbed methane production.

Here Mr. Richardson has the right to the coalbed methane production, the Coal Company has the right to the mine.

Q. Let me have you summarize this, Mr. Cox, so that in summary we can put the technical portion of this case into perspective. Let me get one of these displays.

Mr. Cox, I want you to ignore the first five bullet points, and let's talk about the technical issues. Give me a chance to hand out copies of this.

Forget the background, Mr. Cox, and let's go through the technical issues. And based upon your study of the prefiled exhibits from San Juan Coal Company and your own work, let's go through and have you talk about the things we agree upon. What's in agreement?

A. Okay, as we heard from Mr. Hively earlier, and based on my comparison between the San Juan Coal Company exhibits and Mr. Hively's exhibits, the geology is basically the same. We're seeing very similar structure, we're seeing very similar thickness between the Coal Company's experts and Mr. Hively.

We see pretty similar initial pressures. Point by point they vary from what the Netherland-Sewell exhibits that the Coal Company has to my calculations off of a 5100-foot potentiometric elevation, but they're well within the range of engineering judgment.

We have basically the same isotherm. We're not looking at a different isotherm here, and we shouldn't be because we're looking at the same information. It's coming from the same samples that we took.

I think we're both agreeing that the current wells and spacing will lead to low recovery from the coal. Now, the reasons for that may be in contention, but the fact is that, as currently completed, most of these wells will have fairly low recoveries and will take a considerable period of time before they can reach peak production and thus will get low recovery from the coal.

Finally, we're both agreeing, I think, that the Pictured Cliffs reserves are small. And whether you pick a number of 100 million cubic feet per well or a range between 10 and 200, the number is still a fairly small number.

So these wells are going to need some additional methodology or some additional reserves to improve their economics. The Pictured Cliffs alone are fairly marginal wells.

Q. Let's talk about the points of disagreement. Put those in perspective for us.

A. Well, I see really two key points of disagreement. The first one is, how much gas is there? And really and truly, I see this boiling down to, is the coal saturated or is it severely undersaturated?

The Coal Company exhibits indicate that they feel their desorption measurements are correct and that it is undersaturated, but my analysis of the well performance of Richardson's wells proves that it's saturated or very nearly so.

I think the second point is, what will the CBM reserves be? And the key point here, I believe, is the recognition that coalbed methane wells have an incline at their beginning.

So is production still rising -- you'll remember the exhibit where I showed Mr. Richardson's production in this area being about 4 million cubic feet per day now, having risen from nothing -- or does it start declining today and tomorrow, and that's the peak and we go down from here?

Again, performance suggests to me both of such wells as the Bushman well and the fact that many of these wells have not yet reached a peak and look like they're still inclining, and then tied with the neighboring well performance, tells me that production is still inclining, and with additional coal completions and 160-acre spacing it will go up even more.

Q. In conclusion, Mr. Cox, what's the bottom line of the case?

A. Well, I think the bottom line is that this Application should be approved.

MR. KELLAHIN: That concludes my examination of

Application of Richardson Operating Co.
Record on Appeal, 229.

Mr. Cox.

We move the introduction of his Exhibits C-1 through C-29, and let's mark this as C-29, this demonstrative exhibit.

CHAIRMAN WROTENBERY: Any objection to Exhibits C-1 through C-29?

MR. BRUCE: No, madame Chair.

CHAIRMAN WROTENBERY: Okay, Exhibits C-1 through C-29 are admitted into evidence.

And I think we should take a break here for a few minutes, and then pick up again with cross-examination of Mr. Cox. Is ten minutes enough? Okay.

(Thereupon, a recess was taken at 3:37 p.m.)

(The following proceedings had at 3:50 p.m.)

CHAIRMAN WROTENBERY: Okay, Mr. Bruce?

CROSS-EXAMINATION

BY MR. BRUCE:

Q. Okay, Mr. Cox, right at the end of your testimony you gave me a number, $27 million. What was that number?

A. That number was based on Exhibit C-26, where the ultimate recovery going from 320-acre spacing to 160-acre spacing increased by 27 billion cubic feet, and thus with a value of a dollar per MCF or more, then that number would translate to a benefit to Mr. Richardson of $27 million or more.

Q. Now, so we're straight, is that just from the additional infill well, or all of the wells that you could have, four Fruitland Coal wells per section, in the Application area?

A. Excuse me, would you ask that again?

Q. Well, is that number based on four Fruitland Coal wells per section, or is it based on just the two additional Fruitland Coal wells per section?

A. No, that number is based on -- the 320-acre spacing is based on the existing wells, and then the 160 is actually going to four Fruitland wells per section.

Q. Okay, so that would -- correct me if I'm wrong, but that would mean that this $27-million figure would be the future cash flow to Richardson Operating Company for all of its Fruitland Coal wells in the area of the Application?

CHAIRMAN WROTENBERY: I might be able to help here because I think I'm following it.

MR. KELLAHIN: I think he's asking incremental?

CHAIRMAN WROTENBERY: Yeah, incremental -- In your Exhibit C-26 you show the ultimate recovery in BCF at 39 BCF for 320-acre spacing --

THE WITNESS: Right.

CHAIRMAN WROTENBERY: -- and 66 BCF for 160-acre spacing.

THE WITNESS: Right.

CHAIRMAN WROTENBERY: And the 27 is the difference between the 66 and the 39?

THE WITNESS: That is correct.

CHAIRMAN WROTENBERY: So the 27 is the incremental recovery?

THE WITNESS: Right.

Q. (By Mr. Bruce) Did you see the prehearing statement that Mr. Kellahin filed on behalf of Richardson in this matter, Mr. Cox?

A. I have seen a prehearing statement. I don't know if it's the prehearing statement that you're talking about.

Q. Let me hand you -- This is page 11 of Mr. Kellahin's prehearing statement, and I direct your attention to paragraph 44. There's a $50-million figure for future cash flow to Richardson Operating. What is that number? Where did that come from?

A. Well, I'm not sure exactly where this number came from. But the 50 BCF kind of number, basically at this point it's not just the incremental wells that I understand that you're objecting to, but you're also objecting to Mr. Richardson performing certain functions in the existing wells, such as completing the Fruitland Coal and so on.

So the -- I think if you want to compare you should compare that 50-BCF gross to the 66 BCF at 160-acre spacing here.

Q. Well, then you'd still come up with a different number, though. You'd come up with 16 million, wouldn't you?

A. Well, this says more than 50 BCF.

Q. Well, but then it also says 30 BCF net to Richardson, which would give you a third number, wouldn't it?

A. Well, Mr. Richardson's not entitled to 100 percent of the gross production.

Q. Based on that, he's only entitled to 60 percent of the gross production, isn't he?

A. I wouldn't necessarily say that, no.

Q. Now, if you had used the same ultimate recoveries you used at the Division Hearing, you'd have yet another number, wouldn't you?

A. Yes, we did have a different number at the Division Hearing, and the key reason there was that since that time there are two pieces of work that have been done beyond -- or three pieces, actually, that have been done beyond that. The first one is that we have the detailed geologic work that Mr. Hively did. The second is that we have the analysis of the offsetting nearby wells there that show that wells will incline for extended periods. And then the third one is that we have the modeling analysis that I referred to.

Q. Okay, so that the geology that was done for the Division Hearing by Richardson wasn't detailed?

A. No, it was detailed, it just -- In the previous hearing what I had used was a number of 20 feet as a kind of representative minimum average that I felt could be completed. Since that time, after going through the work that Mr. Hively's done, I've come up with a higher number.

Q. But didn't the geologist at the Division Hearing have much thicker coals on his isopachs than Mr. Hively had?

A. Yes.

Q. Much thicker?

A. Well, some of the coals were thicker, some of them were very similar.

Q. Mr. Cox, I have a number of questions, and maybe first let's start running through some of your exhibits, starting with Number 2.

Now, looking at the coalbed methane curve, not all coalbed methane wells exhibit this decline curve that you have, do they?

A. No.

Q. A lot of them start out at a certain rate and immediately start to decline?

A. Well, the wells that start out at a rate and begin to decline, most of those either we're looking at the very early decline that shows schematically there on the second page of Exhibit C-2, or we're looking at wells that may have been previously dewatered by other activities or maybe in a high-perm system where they dewater very rapidly. And in that case we're looking at more of a high-rate-type phenomenon, as I discussed earlier.

Q. Okay. But you also have some that have a low rate and still decline?

A. There are some that have a low rate and still decline, yes.

Q. Low initial rate, I mean?

A. Yes, that's correct.

Q. And as a fourth category there are some that do show this initial increase, and then a decline, and then subsequent increase?

A. That's true.

Q. So what you're looking at is four different types of coalbed methane production or declines?

A. Well, actually if we look around, there are actually even other classes, categories we could add, such as undersaturated reservoirs that produce all water at the beginning and no gas for a considerable period of time.

Q. So that would be five types of coalbed methane curves, or decline or incline, however you want to put it?

A. Well, it depends on how you want to categorize them. You can come up with five classes. You can also categorize by rate, by time to peak production or a number of other properties as well.

Q. Okay. Now, on these charts, although this is just a schematic, are these gas rates on these charts usually logarithmic?

A. This is a schematic, and I'm not sure whether the author intended it to be logarithmic or not.

Q. Isn't it standard for engineers to use logarithmic charts in plotting production?

A. It depends on what purpose you're using it for. Sometimes we use semi-log plots, like a conventional decline curve. Many times we use linear plots if we want to see trends of production that can be masked on a semi-log plot. And sometimes we use log-log plots. So it depends on the purpose we're using it for.

Q. Okay. Turning to the next page of your -- of that same Exhibit 2, the -- just the relationship chart, and if you do have a coal that is undersaturated -- and by the way, what are the permeabilities in the coal here?

A. Well, I don't know that that relates to whether coals are undersaturated or not --

Q. I'm not saying it is, I'm just asking you.

A. -- but the permeability in the coal here ranges

-- it has a range. We don't have tests, but from the modeling analysis, the numbers that we come up with are typically in the 10- to 20-millidarcy range initially. Over time we have to use higher numbers for the wells in the nearby area. We can't get 1.2 million cubic feet a day out of 10 or 20 millidarcy at this shallow depth, like the ROPCO 6 Number 1 well did, so that over time we're seeing higher permeabilities.

Q. But getting back to the chart, if you're looking at Coal B, if you drew down the pressure fairly quickly or fairly hard near the wellbore, would it start to produce some gas fairly quickly?

A. You can get a little -- I'll call it a little burp of gas from a near wellbore like that. But then that type of thing, if you're getting it in undersaturated reservoir, it very quickly dies out. And so that's like that -- on the previous page, how there's that early spike on the coalbed methane production. What would happen is, you'd get an early bump like that and then it would drop back off to zero because now you've depleted -- or you've dropped the gas right next to the well. And until you can get drawdown out into the reservoir, you aren't going to make gas.

So you might get a little burp of gas like that, but you won't get sustained gas production that then increases with time.

Q. But if you do have a low-permeability coal, it wouldn't immediately recharge around the wellbore, would it? The water?

A. Well, at the beginning you have much higher permeability to water than you have to gas. And so the water can move much easier than the gas at the beginning. So that's exactly what happens, is the water comes in from further out in the reservoir.

Q. And then moving on to Exhibit 5, Mr. Cox -- this is just to confirm -- you did state that San Juan's desorption measurements show the coal is undersaturated?

A. I said that San Juan Coal Company has interpreted their desorption measurements to feel that the coal is undersaturated. I disagree with that interpretation.

Q. Have you seen or considered the data from San Juan on desorption or the Langmuir data?

A. I have seen some summary information such as that contained in the San Juan Coal Company's exhibits that were prefiled for this hearing. I have not seen their detailed desorption data sheets or that type of information that I'd need to make determinations off that.

Now, as far as isotherms, I did see the information on two isotherms contained in Mr. Bertoglio's report done for the San Juan Coal Company.

Q. Okay. And again, if this is saturated, then -- if the coal is undersaturated, then at your average pressure of 251 the coal content would be much lower than the -- well, I think in your other numbers you used 237 standard cubic feet per ton.

A. Okay, I -- Which question are you asking here?

Q. Okay, at your average pressure, which you said is 251 --

A. Yes.

Q. -- if the coal is undersaturated, then of course the gas content of the coal would be much lower than that 250 number you have over on the left-hand side of this chart?

A. Well, it depends on how far undersaturated it is.

Q. Okay. Now, is the coal saturated at the outcrop?

A. In this area, I do not know. In other areas of the Basin where I've seen information, indeed the coal in many cases is saturated at the outcrop.

Q. But you don't know here?

A. I've not seen information about that here.

Q. Next, let's look at y our Exhibit 6, Mr. Cox. Now, is this an economic forecast? Is this what will actually be recovered out here?

A. No, this forecast or this analysis here is a calculation of what's recoverable from the coal to certain abandonment pressures.

Q. And let's go down some of these numbers. Your average thickness is 28, and I understand that comes from Mr. Hively. That's the 14 feet in the lower and 14 feet in the upper coal, correct?

A. That's correct.

Q. Okay. So you basically used 100 percent of his thickness?

A. No, if you look at the note down on the bottom, I used it but I reduced it by 10 percent to account for uncompleted or unconnected coals in calculating the recovery efficiency.

Q. Okay.

A. I used the total thickness on calculating the gas in place.

Q. Okay. You reduced by 10 percent, but that was in the upper coal only?

A. No, I've reduced the total by 10 percent, just across the board, to say that there are going to be some intervals that we don't effect good completions and/or --

Q. Okay.

A. -- we just don't capture.

Q. So you used -- What you're saying is, roughly you used 90 percent of that 28 feet?

A. Right.

Q. Okay.

A. For the recovery efficiency. Again, for the gas in place I used the 28 feet.

Q. Okay. Now, before the Division you used an average thickness of 20 feet, did you not?

A. That is correct.

Q. And if you'll recall, I believe that Mr. Shapiro, the prior geologist, had coal thicknesses, upper and lower, totaling 50, 60 feet or more, did he not?

A. I don't recall exactly what his numbers were.

Q. Assume it's 60 feet. Why did you use one-third of the coal thickness there and 100 percent of the coal thickness here?

A. Well, I don't see the coal thickness as being the real question here. The point, I think, in terms of my testimony, previously I had used 20 feet based on examining several of the logs. And with my experience of looking at logs and determining what should be productive from coalbed methane reservoirs in the San Juan Basin I said that at least 20 feet should be productive on average. And this current number of 28, as I said, is based on Mr. Hively's number.

As far as the 20 feet I used before versus Mr. Shapiro's number, I don't believe his average was anywhere near as high as what you're talking. He may have had individual wells that high.

At this point I'm going to say that the number I feel is perfectly compatible with Mr. Hively's, and I think Mr. Shapiro had picked more of gross intervals rather than the same type of net coal numbers that I've seen Mr. Hively pick.

Q. Keep Exhibit 6 in front of you, but could you turn to your Exhibit C-26, your estimated ultimate recovery summary sheet.

A. Yes. Let me --

Q. Sure, go ahead.

A. -- separate this. Okay.

Q. Now, looking at C-26, your average thickness is the same, but are you using different pressures on Exhibit C-26 than on Exhibit 6?

A. Yes, these are two different types of estimate. Exhibit 6, as I said, was kind of a quick volumetric look tying back to the isotherm.

Exhibit C-26 was based on a much more detailed look where we took the structure and isopach that Mr. Hively prepared and actually introduced that into a model and then analyzed based on the detailed geologic picture.

And so the two don't tie exactly. The one is more of a big-picture kind of stepping back and looking. The other is based on a much more detailed examination.

Q. Now, in your model, Exhibit 26, you give about -- and correct me if I'm wrong. I'm looking at your ultimate recovery numbers. You're giving about 40 percent of the value to the upper coals?

A. Well, I wouldn't think they'd have 40 percent of the value. It's -- if I look at -- on the ultimate recovery of 320s, we've got 11 BCF from the upper coal versus 39, which would be just under 30 percent of the ultimate recovery coming from the upper. And then on 160 we have 19 out of 66, which would be even slightly lower. So it would be in the 25 to 30 percent of the total range.

Q. It still is a substantial number?

A. Yes, it is.

Q. Are there any of the Richardson wells in the Application area that are perforated in the upper coal?

A. Not that I'm aware of in the Application area, but there are outside the Application area.

Q. Now, talking about your model, just tell me a little bit about your model.

A. Well, it's a finite difference model, set up with -- we plugged in the area that we're modeling with 440-foot grid blocks and then -- excuse me, I believe those were 660-foot grid blocks, so that we had six of them in each direction per section. And then we started out -- we modeled the upper and lower coal separately, so we started out with the lower coals and then added to that the upper coals as they were completed.

Q. Did you just use the average thickness, or did you actually go quarter section by quarter section and use the thicknesses that Mr. Hively had charted out on his isopach?

A. Well, we actually had gone through, and we used the same thicknesses, basically, that Mr. Hively had, but well by well, and then mapped that and gridded it so that we could get the correct thickness that was from the maps that Mr. Hively had.

Q. Okay. What permeability number did you use in the model?

A. Well, the starting permeability ranged from about 10 millidarcy up to about, if I remember correctly, 20. We did have to use different permeabilities for some of the different wells. The high-productivity wells needed higher permeability.

Then what we did is, we then allowed the production to increase on the lower coal to 300 MCF per day per well, for the wells that we had increasing, and then rematched those at that rate five years after they were put on production so that we then could take into account the increase in permeability.

We assumed that we'd have no increase in permeability beyond that time, and then what we did is, we came in and put the infill wells and additional completions into the model when -- at different points in time. I think most of those came in approximately towards the end of -- or towards the beginning of next year, and then added the upper coals at some point, and I've forgotten whether that was six months later or a year later, as a separate model.

We took on the upper coals -- we used a reduced isotherm because they appeared to be ashier and they're also considerably lower pressure, and that's the reason why we see much lower recovery efficiency for the upper coals than for the lower coal.

Q. Did the model assume that production would incline?

A. Yes, we brought production up in the model to reflect what we see in the nearby wells. We did that on 80 percent of the wells and left 20 percent of the wells basically at low levels throughout.

Q. What do you consider nearby wells?

A. The wells shown on Exhibit C-16 and C-22. The list is on C-22, the map showing their locations is on Exhibit C-16.

Q. So nearby you're considering 12-plus miles away?

A. Well, we had to do that to get a representative sample, that the wells that are closest there, most of them did not have sufficient time to have inclined and reached a peak yet.

Q. Now, what is -- And I can't remember exactly from Mr. Hively's log, but what is the approximate depth of the Fruitland Coal wells in the Application area, round figures?

A. Anywhere from a few hundred feet to over 1000 foot depth.

Q. What you call the nearby wells, what are the depths of those wells?

A. Let's see here, on Exhibit C-23 you can see that they generally range from just over 1000 -- I believe there were a couple under 1000-foot depth as well, up to about 1800 feet. We did not count any wells that were more than 2000 feet deep.

Q. Okay. But these wells are deeper than the Richardson wells?

A. Yes, they are. But that -- being a little bit deeper is not the controlling factor here. The controlling factor is that when we see wells increasing performance and these wells have similar type of behavior -- and frankly, we don't have five to seven years of history on wells as shallow as Mr. Richardson's, so we could not use wells that shallow as the sole database to look at here.

Q. And these wells you used also have higher pressure than the Richardson wells?

A. Some of them probably do. I don't know that all of them do.

Q. Do they have higher permeabilities than the Richardson wells?

A. In general I would say no, if their pressures were higher and we're seeing similar starting rates, we're probably looking at lower permeabilities. And I think that this can be confirmed by the fact that the Richardson wells have the capability of producing on average more water than these deeper wells, even though they have lower pressure. And that says that on average the Richardson wells would have higher permeability.

Q. Over in the area 29 North, 12 West - 30 North, 12 West, is the Pictured Cliffs thicker and a better producer over there than it is in the Application area?

A. I don't know.

Q. What were the initial water rates in the wells over to the east?

A. They varied, and many of them were low, some of them were high. I don't recall the numbers.

Q. You don't recall the numbers?

A. No, I don't.

Q. Would higher water rates indicate a higher permeability?

A. All other things being equal, yes. But as we know, all other things aren't equal.

Q. Does the -- what happened to your model -- what would happen to your ultimate recovery if the -- you said you used 10 to 20 millidarcies. What if that was 1 millidarcy? How would that affect the ultimate recovery?

A. You can't produce a hundred barrels a day from 1-millidarcy rock with the type of frac jobs that Mr. Richardson has. It would not be meaningful.

Q. And the question is, what would happen to your ultimate recoveries if the permeability was 1 millidarcy versus 10 millidarcies?

A. Well, the ultimate recoveries would be lower if the permeability is lower. But as I say, I don't believe that these are 1-millidarcy rocks.

Q. How much lower?

A. I would have to run a model to see.

Q. You don't know what factor the permeability plays in your model?

A. Oh, I know what factor it plays, but I've found that trying to just change one thing in your head without actually running it, that's a way to make mistakes. I don't know unless I ran the model.

Q. Would a factor of 10 in the millidarcy, or in the permeability level, result in 10-percent decrease in ultimate recovery?

A. It might, it might result in more, it might result in less. I don't know. It would vary, depending on the case you're looking at.

Q. Does the permeability that you use control the projected peak rate, peak production rate in the model?

A. No, it really doesn't. What we did on permeability to begin with is, we were tying that back to the types of water rates and early gas rates we were seeing. The ultimate permeability that we reached was tied to the peak gas rates. As I said, what we used was 500 MCF per day total, which was composed of 300 MCF per day per well in the lower and 200 MCF per day per well from the upper.

Q. Again on your Exhibit C-26, your estimated -- your EUR, is this a reserve number, or do you use a reserve definition anywhere in your testimony?

A. No, I have not used -- These are not reserve numbers, and I have not used the term "reserves". This is what I consider to be an ultimate-recovery type of number or a producible-gas type of number. Reserves depends on many other characteristics.

Q. What characteristics?

A. Well, for example, are you talking proved reserves or probable reserves or possible reserves? Are you talking constant prices or escalating prices? What type of economic scenario are you looking at?

You know, just as an example, are you looking at -- Mr. Richardson had said that he was going to be drilling additional water disposal wells. By doing so, he replaces the operating cost of one dollar per barrel trucking water down to his typical 12-cent-a-barrel disposal cost into his disposal wells.

You know, which type of factors like this do you plug in? There's a whole number of other things that go into the definition of reserves.

Q. One other question on your Exhibit 6, Mr. Cox. You did reduce net thickness for -- or you did use ash content to reduce a certain number. Did you use moisture content to reduce these numbers?

A. No, I assumed that the information that I had tied back to the type of moisture content that the coals have, and so no, I have not reduced this additionally for changes or differences in moisture content.

Q. Are these dry coals or wet coals?

A. Well, these coals start off wet, they start off with water in them, and that's why you have to dewater them in order to get production.

Q. Let's look at a couple of your production charts, starting with your Exhibit 8, which is the Russell Federal well?

A. That's correct.

Q. Do you have -- Again, you said this was a Pictured Cliffs completion. I believe that's what the data show that you reviewed?

A. Yes, it was stated in the information that I reviewed that it was a Pictured Cliffs completion.

Q. Was there any water produced by this well?

A. I don't recall whether water production was reported.

Q. You didn't see any, or you don't recall?

A. I just don't recall.

Q. Okay. Let's move on to your Exhibit 10, Mr. Cox. First off, you have a summary of production from the Application area, and you have 36 wells here. Are these all of the wells that are currently completed in the Application area?

A. They are all of the wells that we received daily production data from Richardson Operating within the Application area.

Q. Okay. There might be a couple others out there that you didn't get the data from?

A. Or that -- Yeah, I know there are several wells out there that the wells have been drilled and they haven't been completed, and some of the wells that have been drilled may not have been put on stream yet or may not have been producing at this point.

Q. Now, which of these, can you tell me, are in -- Let's start with the Deep Lease, which is -- The chart's behind you there, Mr. Cox, but it's the westernmost coal lease. Which of these wells on this list are in the Deep Lease?

A. Which list are you talking about?

Q. Exhibit 10.

A. Now, I have a question on this. I'm not sure -- I don't know whether the Deep Lease actually extends into Sections 1 and 2.

Q. No, it does not, Mr. Cox.

A. Okay, I didn't think that it did. So looking at the wells that would be in this westerly township here, that would be the wells basically in Section 36 there, which would be the State 36-1, -2 and -3. The 36-4 has not yet been drilled.

Q. Okay. And you don't have current daily rates on here, but approximately what would be the current total daily rate from those three wells in the Deep Lease?

A. The 36-3 I do have the rate on. That's Exhibit C-13. It's currently making about 150 MCF per day. I'm not sure what the 36-1 and 36-2 are making at this point.

Q. Okay. So it shows average rate, just a few MCF a day for those two wells?

A. Right. Now, those wells are in this area to the west where it's my understanding that Mr. Richardson had not been focusing his efforts on that as much because of them being shallower.

Now with the 36-3 coming up in rate and with him continuing to work on his gathering and water-disposal system -- See, part of the problem is, the 36-3 is capable of making more water, and so as he had said, he was pegged out on his disposal wells already and needs additional water disposal. So this area here does need to have -- when you look at the production there, you need to factor in operational and mechanical considerations as well.

Q. And which of these wells -- Okay, ignoring the wells that are numbered 30, 31 and 32 on your list, which of the wells are in the Deep Lease Extension?

A. The Deep Lease Extension would be the wells in Sections 19 and 20 and 29 through 32 of Township 30 North, 14 West.

Q. Okay. And looking at your Exhibit 10, and correct me if I'm wrong, those would be the wells numbered 11, 12, 13 and 21 through 26? Would that be correct?

A. Yes, that would be correct.

Q. Okay. Now, first let me get -- There's one number on here that seems to be anomalous. If you look at your well number 24, which is the Federal 29-4 well --

A. Yes.

Q. -- its average rate, its median rate, which are 20, 25 MCF, and then you have average rate, 439 MCF.

A. Looks like we have a typo there, yes, it does.

Q. Do you have -- Would that generally be about 20 MCF? Would you think that would be appropriate, or do you have those numbers handy?

A. Well, you know, I'm not sure what that number would be, because -- We'd have to get the cum and divide it by the number of days. But obviously that number is a typo.

Q. Now, and I haven't totaled them up, but if you take the -- I think part of your testimony on one of your charts was that in the Application area Richardson Operating is producing about 4 million a day?

A. That's correct.

Q. If you took the area in the Deep Lease and the Deep Lease extension, that number would be substantially smaller, would it not?

A. Oh, yes, that's only a small number of the wells, of the total here. And also, though, you've got to recognize, these aren't the current rates. We don't have those tabled here. What we have are the average rate at the beginning and then the median and average rate over life, or over life so far, and so we don't have the current rate on here.

Q. Why didn't you put the current rate on here?

A. Well, I just copied it from the spreadsheet that I had used in the previous hearing and I didn't have it on that one either. I just didn't put it on.

Q. Did you look at all of the wells and the well logs for all of the wells on this list?

A. No, I did not.

Q. Okay. Now, what would you expect, you know, for a -- Let's just take the Deep Lease. Two or three years from now, what would you expect a good well to produce? And I know that's a relative -- but I mean, as opposed to a well that's producing 40 MCF a day, I don't think you'd agree that that's a great well, but what do you expect one of these wells that has been completed, say, within the last year or so to produce after two years?

A. Well, off the 36-3 it's already making 150 a day. It continues to incline. It could very -- Again, we have to couch that with nothing else changing here, other than the well being able to be produced at its capacity. So, you know, this says in 10 of 2004, according to the mining plan this would be mined out. I don't think it will make anything if it's mined out.

But if we assume that the mine were to stop, say, and the well is allowed to produce, it would continue to rise, and if it's fully dewatered, it's in a high-permeability area, it very easily could be making 300 to as much as 500 MCF a day. But at this point, you know, all I can say is, it is making 150 and it has risen to that in a very short period here.

Q. Well, except for the wells on the bottom part of this chart, you know, most of these wells have produced, a good fraction of them, a year, two years, three years, and the production hasn't increased. I'm just looking at the average rate to September 23, comparing these figures. The vast majority of them are under 100 MCF a day.

A. That's correct. I think there's a couple of factors, or three factors, actually, that you need to put into this. The first one is that the gathering system and water disposal system are being revamped. Some of these wells need to be recompleted. But until you get more dewatering out here, which you need better completions and additional wells for, then you aren't going to get the full capacity of the well. And until you get more gas production causing matrix shrinkage, then you aren't going to see matrix shrinkage kick in.

And so I think it's more a level of where you're at in terms of operations today than it is in terms of the capability of the well to produce. Don't make the mistake of thinking just because a well has only made -- or, you know, is making 100 MCF per day now, that that's the same capacity that it would make if it were offset on all sides on a 160-acre location with effective Fruitland completions. It will make a whole lot more in the second case than it would in the first.

Q. Well, do you know of any limitations on commercial water disposal in this area?

A. Well, commercial water disposal would need to be trucked to that. I don't believe that Mr. Richardson actually has a pipeline to a commercial disposal, and so a commercial limitation would be the cost of trucking.

Q. Didn't Mr. Richardson say he was also trucking to his own injection wells?

A. Right, and the reason he's doing that is to try and get more dewatering so that he can raise his gas production.

But at a dollar a barrel for trucking, versus 12 cents a barrel for disposal through his gathering system, he needs to get more of these wells hooked up and needs to get more of a disposal system out there.

A. Now, you don't have water production data on this chart either. What are the average water producing rates from those wells?

A. Well, they vary. I don't -- As I said earlier, I don't have the same type of information on a daily basis for water that we have for gas. What we have instead are monthly totals that have been allocated back. So that's the reason I didn't put the water production information on here.

Q. Then how do you know for a fact that the Bushman well produced gas from day one and not water?

A. Because I've asked Mr. Richardson that specific question.

Q. If the Bushman well produced, say, 30,000, 40,000 barrels of water before it produced any gas, would that indicate that the reservoir is undersaturated?

A. It could indicate -- If that were the case, and if it had actually produced no gas, it could indicate that it was somewhat undersaturated. But I'd need to compare that to the volume of the reservoir and what it was draining.

At the beginning, the Bushman well was the first well out here, and so because of that it's draining not just -- or it's being -- have water coming in not just from 160 acres but from all around here. So in those kind of cases you tend to produce more.

I think you'd be better served to look at such cases as, for example, this 36-3, than just the Bushman well. But it's my understanding that even from the beginning the Bushman well made some gas.

Q. But you have no idea what the water production rates are out here?

A. No, I have an idea. They are typically about 100 barrels a day per well, but they're limited by the water disposal capacity and by the system capacity. It's my understanding that the capacity, or the flow rate, on the 36-3 is even higher than that. It's in the couple hundred to as much as 300 barrels per day per well.

Q. Now, Mr. Cox, I think you testified in an answer to one of Mr. Kellahin's questions that just completing in the Pictured Cliffs was not how to produce these Fruitland Coal out here, if I can paraphrase you, not the best way.

A. Well, you can paraphrase me, but I think my answer is something more to the extent that it's not the best way of completing the Fruitland Coal.

Q. Okay. Well, let's look at your -- again, staying on Exhibit 10, if you'll go to the second column from the right-hand side, and if you'll look -- which is the average rate to September 23, 2002, in MCF produced per day.

Now, if you take every well -- or the average production is more than 100 MCF per day -- and I'll flip through these real quickly, but that would be well number 3, well number 5, well number 15, well number 16, well number 18, 19, 20, 21, 22 -- we'll ignore 24, because that number is -- got to be something wrong with it -- number 27, number 28, number 29, number 34, number 35 and number 36. Now, all of the best wells out here, except for well number 27, are not simple Fruitland Coal producers, are they? They are all Pictured Cliffs completions?

A. You said except for --

Q. Except for item -- well number 27.

A. Well, but if you're using that 100 a day, well number 21, well number 19, well number 5 are all Pictured Cliffs and Fruitland producers.

And also I think you need to look at -- many of the Fruitland wells have not yet gotten full dewatering. In fact, none of them have full dewatering yet. So they are still climbing, they are not up to their peak rate. They're not up to anywhere near what their peak rate will be.

So when you're comparing rates here, you need to recognize that some of these on the Fruitland Coal, PC and Fruitland, are still very low, because they're early in life.

Q. Well, I'm looking in the first grouping of four. The only Fruitland Coal well there has been on production for over two years. The next grouping of four, they've all been on production for two or three years. If you go down the list, except for a very few at the bottom, they've all been on production for a substantial period of time.

A. Well, once again, you need to not just look at how many days they've been on production but how they've been producing and whether or not they've been dewatered to full capacity. And the answer is, they haven't been.

You heard Mr. Richardson say he needs additional disposal wells here to get rid of the water.

Q. And he's also said that you don't have a real clear idea on water production rates from these wells?

A. I don't, but there is a finite volume of water these wells are making.

Q. Well, if you don't have a good handle on it, how can you say they need to be dewatered more?

A. Oh, excuse me, that's a very simple one. Coalbed methane wells that are still making a hundred barrels of water a day in the San Juan Basin are not dewatered. Even coalbed methane wells that are still making 50 barrels of water a day.

These wells -- If we look at some of the offset wells that drop off to one or two or five barrels a day -- many of the wells end up drying out completely, and that's true in much of the San Juan Basin, except where there's connection to aquifers like in the north part, parts of the north part where the Pictured Cliffs is part of the

Fruitland aquifer system.

So for me to say they're not dewatered, just because I don't know the exact production rate, they're still not dewatered yet.

Q. Okay. What about the third well, the Federal 5 Number 3? Is that well producing water?

A. I don't know the exact water production on any of these wells. The one that, as I said, that I know particularly is the 36-3.

Q. But this -- the Federal 5-3 is listed as a Pictured Cliffs well, and it has inclining production. Is that normal Pictured Cliffs production behavior?

A. No, it is not. But again, the Pictured Cliffs in this area, many of those wells benefit from pumps as well. The Pictured Cliffs -- it's got gas and water both, and in some areas you need to pull the water off or it loads up and kills the well.

Q. Now, you use the Bushman 6 Number 1 well, the fifth well on your list, as a key well. It is completed in both the Pictured Cliffs and Fruitland Coal. Could the initial gas production that you talk about have come from the Pictured Cliffs rather than the Fruitland Coal?

A. There could be some component of that, yes. However, I'd have to say that I think the way that the gas production inclined there is characteristic of coal production.

Q. Wouldn't you agree that -- in just looking at your cumulative production figures, cumulative production to May 1, 2002, that -- I mean, you agree that if the Pictured Cliffs is out in this area, it's going to produce a tenth of a BCF, maybe a little bit more? Isn't that what your Exhibit 7 shows?

A. Yeah, I think a typical kind of number, not just in the Application area but elsewhere, is in the 50- to 200-million-cubic-feet range.

Q. And those of these wells -- and if you look at them, whether they're strictly Pictured Cliffs producers or Pictured Cliffs and Fruitland Coal producers, they've already produced in that range, haven't they?

A. Yes.

Q. So there's really -- Even if they're listed as a PC well, they're producing from the Fruitland Coal?

A. Well, they may have some degree of connection to the Fruitland Coal. Again, when we look at this 36-3, for example, it's got to have some degree of fracturing, natural fracturing, to be producing the kind of volumes that it is. To have some degree of connection between the Pictured Cliffs and the coal in some wells shouldn't be a big surprise.

But I think the real question there is, does frac'ing the Pictured Cliffs create an effective completion in the coal? And the answer is no.

Q. Your well 29, the Federal 33-3, is that producing strictly from the Pictured Cliffs?

A. No, I think that one is in connection with the coal as well.

Q. That's the best well out there on this list, isn't it, or --

A. Yeah --

Q. Second best?

A. -- that is an excellent well. Yes.

MR. BRUCE: Madame Chair, could I have five minutes? Could we take a five-minute break and let me go through my notes, and perhaps I could --

CHAIRMAN WROTENBERY: Sure.

MR. BRUCE: -- shorten --

CHAIRMAN WROTENBERY: Okay, thank you.

(Thereupon, a recess was taken at 4:52 p.m.)

(The following proceedings had at 5:00 p.m.)

MR. BRUCE: I've just got a few more questions.

CHAIRMAN WROTENBERY: Okay, go ahead.

Q. (By Mr. Bruce) Getting back to your model, Mr. Cox, what -- were water rates a factor in that model?

A. Yes.

Q. And what rates did you use?

A. I don't recall, I just don't recall.

Q. What effect -- regardless of the water rate, what effect does the rate have on the maximum production rate or on the rate of incline or period of incline?

A. Well, basically, the initial water rate sets the initial permeability, and so -- From there, though, because we were then increasing that over time to reach the level that I mentioned for a peak rate combined of 500 MCF per day per well for those wells that inclined, then what it -- the primary thing that it did by setting the initial permeability is, it sets the degree of interference that occurs between wells.

So by using a number -- Let's say that we used a hundred barrels a day. If we use that instead of 50 barrels a day, then it would show greater interference between wells early on because of the greater permeability. And so the higher the water rate is, then, the greater the amount of early interference that would occur.

But by the time we get out towards the peak rate, then, it has little impact from there because at that point you're now constrained by the permeability to gas when we reach a peak rate.

Q. Now, in your model -- I mean, is the solution you came up with, which I believe is reflected in your Exhibit 26; is that correct? --

A. Yes.

Q. -- is that the only solution, or could you fiddle with the variables and get other numbers?

A. You can certainly fiddle with variables, but we are constrained by the amount of gas and water in place and by the thickness of the wells and by the actual performance on wells. So those provide the constraints.

Q. Did you use actual well performance to input into the model?

A. Yes.

Q. But in the Seam 9, there are no completions in Seam 9 in this area, are there?

A. No, there are not.

Q. So how could you use -- How could you model Seam 9?

A. What we did for the upper seams was, we applied the same permeability as we had calculated for the lower seams, based on performance. Again, without any actual numbers we had to use something.

Q. And again, Exhibit 26 gives the amount of gas you believe can be produced, but it's not an economic figure. This is what you believe can be produced?

A. Oh, no, we ran this through economics to determine what the economic limit was on a well-by-well basis.

Q. And again, roughly, what would the recovery be per half section?

A. Well, on Exhibit C-26 it's showing an ultimate recovery per half section on 320-acre spacing of .91 BCF from the lower coal, .38 BCF from the upper coal, for a total of 1.29 BCF.

At 160-acre spacing those numbers increase to 1.56 BCF per well average, from the lower coal .65 BCF per -- excuse me, BCF per 320-acre spacing unit, so that's from two wells from the upper coal, for a total of 2.21 BCF per 320 acres with two wells.

Q. So 4.4 BCF per section, roughly?

A. Yes, that's correct.

Q. And I'm looking again at your -- just your gas-in-place calculation shows that you show roughly 7.5, 7.6 BCF per section. That's your Exhibit 6, a middle case.

A. Yes, but now recognize again, that's on a different basis than Exhibit C-26.

Q. I understand that, but you're looking at -- your calculation of gas in place, the median value -- an average value of 7.5 BCF per section?

A. Correct.

Q. Okay. In your Exhibit 28, which is the article, and in the introductory part of that article where it says a total of 22 stimulation treatments, et cetera, 21 of them were in the United States, eastern area of the United States.

Now, is roof stability in the eastern coals different than that in western coals?

A. I don't know, I'm not a mining engineer.

Q. Okay. Geology could well be site-specific in that context?

A. Absolutely.

Q. And have you studied or compared the stability of these eastern coals with those in the San Juan Basin?

A. No, I did not.

Q. That's not your area of expertise, is it?

A. No, it is not.

Q. One final thing. Have you ever suggested to Richardson Operating that they obtain some desorption data in this area?

A. Not that I recall.

Q. Would you use it if you had it?

A. I would certainly examine it, but the use that I would put to it would depend on what the information told me.

Q. If you were convinced that the sampling was taken correctly, would you use the data?

A. Well, it would depend on what the information told me.

I can recall one instance in particular that happened here in the San Juan Basin where the isotherms were showing about 350 cubic feet per ton, all the desorption measurements were indicating in the 200-cubic-feet-per-ton range. We couldn't figure out what went on, even from the data sheets. Everything looked like it had gone perfectly till finally we called up the fellow who had done the desorption, and it turned out that he'd done these desorption measurements in his unheated garage in the middle of February. And so they were desorbing at a temperature that was very low compared to the reservoir temperatures. So until we got that piece of information we didn't know what the problem was.

So what I'm saying is, yeah, I have to look at that in context with everything else, all the other information that I have.

Q. Are there any companies out there that specialize in taking this data?

A. Yes, there are several of them.

Q. Who are they?

A. Well, one company that does a lot of this kind of work is Hampton and Associates, and I've forgotten what his partner's -- I think Hampton's now out of it, his partner is now running it.

Q. Where are they located, just for my info?

A. I'm not sure where their office is. I've met them in Denver and I've seen the fellows up in Calgary before as well, so I'm not sure where their office is.

Terra Tech has done work like this. In the past a group called REI did work like this. My former employer, Advanced Resources. has done a lot of this internationally. There's a group in Salt Lake and Calgary called Norwest Corporation that does a lot.

Just who did it is less important to me, in general, than having a chance to actually dig through the information. I always want to see the original data sheets and be able to see the information so that I can do a separate evaluation of it.

Q. On the data that you've seen from San Juan, there were tests on 18 wells. Do you know how many tests were taken per well?

A. No, I do not.

Q. Okay. But you haven't used San Juan's data?

A. Well, I examined the information that I was provided, and because it's inconsistent with the isotherm and the pressure information -- for example, when the 36-3 was shut in and reached that buildup pressure I alluded to earlier -- and the well performance, then after seeing the information that I saw, I considered it and rejected it.

Q. Okay, so you're assuming there was a 100-percent failure rate on San Juan's data?

A. No, I would not say that. I don't know what -- how many samples they ran per well. They may have had some samples that were correct and some that were erroneous. I don't know, again, unless I can see the original data sheets.

MR. BRUCE: That's all I have, Madame Chair.

CHAIRMAN WROTENBERY: Thank you, Mr. Bruce.

Dr. Lee?

EXAMINATION

BY COMMISSIONER LEE:

Q. This goes to the Exhibit C-26. Is this the model you used, the two-phase model?

A. Yes, it is.

Q. What's the boundary condition you use for the wellbore?

A. For the wellbore, we just did it as -- since it's in a square block, we just used the kind of standard formulation, a Peaceman-type of formulation for --

Q. What's the formulation, what formulation?

A. Well, it exhibits radial flow in the well, and then apply the negative skin --

Q. No, I'm asking you what the boundary condition is.

A. For the well or for the model?

Q. For the well.

A. Well --

Q. You have -- How many boundary conditions do you have?

A. Well, the external boundary condition for the model was a no-flow boundary, we put --

Q. No-flow boundary, so --

A. Yes.

Q. -- there's no recharge of the water, everything --

A. Right, what we wanted to do --

Q. Okay, what's the internal boundary condition, wellbore boundary condition?

A. It's just producing as radial flow into the well.

Q. You specify what?

A. Oh, excuse me, I didn't understand. You specify water production at the beginning and then gas production later.

Q. And how can you match your permeability?

A. Well, with the pressure information and assuming that they've -- what pressure that they've drawn it down to in looking at that, then the rates, then, give us a permeability.

Q. I don't think so. I think it has to match the relative permeability.

A. Right, it's an effective -- that's correct, there is a relative --

Q. That's not correct.

A. -- permeability term there.

Q. This too has to match. You specify this, you are not going to match this one.

A. We apply relative permeability curves based on the San Juan average relative permeability --

Q. Okay, then --

A. -- curves.

Q. -- how can you apply the -- You have two fluids.

A. That's correct.

Q. Then you guess those two fluids to match the relative permeability?

A. No, we take a relative-permeability curve determined by matching over a thousand wells in the Basin, so we took that curve as a basis.

Q. But I don't understand why -- This too is not a boundary condition. You either specify the flow rate or you specify the relative permeability. These two, the chances to match it is very nil.

A. No, excuse me, what we are doing is, in order to get the initial permeability, that's single phase with water at the very beginning. And that the water -- effective permeability to water is, in essence, the absolute permeability --

Q. Yes --

A. -- at the beginning.

Q. -- that's the initial absolute permeability. I have no problem.

A. Okay.

Q. Later on when the gas comes out --

A. Later on when the gas comes out --

Q. -- it's dominated by the relative permeability?

A. That's correct.

Q. Then how can you specify the rate? I've never seen people can specify the rate.

A. Well, what we do is, we specify the relative permeability curve, and we don't change that. That's determined from --

Q. You don't change that. How can -- you see, if you specify the rate -- Your rate is governed by your relative permeability.

A. Correct.

Q. Then how can you match?

A. Well, but for a given set of relative permeability curves, then --

Q. Then you're supposed to set a constant pressure instead of a constant rate.

A. And yes, that's what we end up with. At the point where we hit the peak rate we have a pressure boundary condition now where we've said at that point, five years in the future, those wells are pumped down and are pumped off to 25 p.s.i. bottomhole pressure.

Q. Okay, another question. If you have rate, specified rate, how can you distribute it to these two zones? They have a different pressure.

A. Well, what we did is, we just counted the lower coals, we did not include the upper coal. So at this point we said the completions are only in the lower coals right now.

Q. Did you consider the fracture?

A. Yes.

Q. How can you handle a fracture? That's another set of the relative perm.

A. Well, the fracture, we plug in just a negative skin to account for the fracture.

Q. So this is a vigorous simulation? Negative skin. If you specify the rate you do not count the negative skin. You are talking about analytical solution and numerical solution.

A. Well, but you can compare the two because this is very standard in coalbed methane modeling, to take and get the -- to apply a negative skin --

Q. Yeah, I --

A. -- in order to get the rate.

Q. -- I understand it, standard. But the fundamental is always there, right?

A. I don't think I understand the question, sir.

COMMISSIONER LEE: Okay, I'm sorry. All right, no further questions.

CHAIRMAN WROTENBERY: Commissioner Bailey?

EXAMINATION

BY COMMISSIONER BAILEY:

Q. Is there communication between the Fruitland Coals in the area of interest here?

A. Communication between the upper and lower coals, do you mean?

Q. Between the different wells.

A. At this point there's limited communication between the different wells. There just hasn't been enough pulled out of there to get to enough beneficial interference yet. But there is some degree of limited interference already between wells.

Q. Does the preferential production of certain wells mean that there is preferential production of royalty oil -- royalty gas, from the different overriding royalty owners?

A. If I'm understanding your question, I think the answer would be yes, that whatever well the gas comes out of, that's the well that the royalty owners for that well would receive the royalty on it.

Q. And as long as production is depressed artificially because of saltwater disposal problems, say, in Section 36, then that coalbed methane gas that may be found under Section 36 may be produced under another well, along preferential lines of communication?

A. That could happen, but I don't think it has been a significant factor yet, because we're so early in the life of these wells. These wells, from our calculations, will have lives from 20 to as much as 50 years, depending on the type of operation. So we're still very early in the life of these wells.

Q. When would you see that there would be an impact?

A. Well, the impact would grow over time. I'm sorry, I hadn't considered that question. It would -- The significant impact would occur most when the wells are approaching peak rate. You know, early on they're not producing a whole lot of gas yet.

Q. What is your opinion on practicality of the use of fiberglass casing for coalbed methane production?

A. I have not personally been involved in using that. But from discussions I've had with other operators who have run it, it costs more and so typically what they would do is run a joint or two of the fiberglass, but that they've had no problems with their frac jobs as a result of that.

Q. So you're not aware of any operational problems that arise from that?

A. Not that I've heard of, no.

COMMISSIONER BAILEY: That's all I have, thank you.

EXAMINATION

BY CHAIRMAN WROTENBERY:

Q. Mr. Cox, I don't know if you can answer this question or not. It may be a question for Mr. Richardson. But do you know what Richardson Operating's plans are for the production of the wells in this Application area in terms of the length of time that these wells will be produced in relation to the mining plans of San Juan Coal? I'm still a little unclear about how the two operations will mesh if, in fact, the Commission approves the infill drilling Application, and assuming BLM also issues all the necessary permits. What is the plan of operation for Richardson in this area?

A. Well, Mr. Richardson has expressed to me on numerous occasions that his preference would be to finish his development here and produce as much gas as he can produce.

Now, having said that, the proposed activities of the mine would interfere with that, and if -- Obviously some accommodation has to be made somewhere. But I look at this mining plan here, and when it's showing that a well -- well, like, for example, the 36-3, if those dates are correct, would be mined through in October of 2004. Obviously that well can't produce to its full capacity, and certainly by the time they begin mining here, that's going to have a material effect on the production capacity of his well as they are ventilating gas.

You know, they're -- I don't know the exact number they're ventilating. I've heard numbers in the 1- to 2-1/2-million-cubic-feet-per-day range from their mine, so that's a lot of gas to be pulling out, and it's coming out of the coal here. So that would obviously have a very material impact on production.

So I'm not sure how this conflict gets resolved. From a petroleum engineering standpoint I think I've looked at it from the basis of, what is the way to maximize the economic benefit from the coalbed methane? And so that's the way that Mr. Richardson has couched his questions to me.

CHAIRMAN WROTENBERY: Thank you, Mr. Cox.

Mr. Kellahin, did you have --

MR. KELLAHIN: No, ma'am. I'm well beyond done, thank you.

CHAIRMAN WROTENBERY: Okay. I think we're all well beyond done for the day.

We'll break until tomorrow morning and start back up at 9:00 a.m.

MR. KELLAHIN: Thank you.

CHAIRMAN WROTENBERY: Thank you, Mr. Cox, for your testimony.

THE WITNESS: Thank you.

(Thereupon, these proceedings were concluded at 5:25 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 November 13th, 2002.

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 RICHARDSON OPERATING COMPANY TO ESTABLISH A SPECIAL "INFILL WELL" AREA WITHIN THE BASIN-FRUITLAND COAL GAS POOL AS AN EXCEPTION FROM RULE 4 OF THE SPECIAL RULES FOR THIS POOL, SAN JUAN COUNTY, NEW MEXICO

CASE NO. 12,734

ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

COMMISSION HEARING (Volume II, October 30th, 2002)

02 NOV 21 PM 3:18

OIL CONSERVATION DIV.

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

October 30th, 2002
Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Commission, LORI WROTENBERY, Chairman, on Wednesday, October 30th, 2002, 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.

* * *

I N D E X

October 30th, 2002 (Volume II)
Commission Hearing
CASE NO. 12,734

* * *

CUMULATIVE INDEX OF EXHIBITS

Richardson	Identified	Admitted
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CUMULATIVE INDEX OF EXHIBITS (Continued)

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* * *

San Juan Coal Company	Identified	Admitted
Exhibit 1	258	300
Exhibit 2	264	300
Exhibit 3	264	300
Exhibit 4	264	300
Exhibit 5	265	300
Exhibit 6	265	300
Exhibit 7	270	300
Exhibit 8	271	300
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Exhibit 13	292	300
Exhibit 14	344	380
Exhibit 15	348	380
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(Continued...)

CUMULATIVE INDEX OF EXHIBITS (Continued)

San Juan Coal Company	Identified	Admitted
Exhibit 19	373	380
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(Continued...)

CUMULATIVE INDEX OF EXHIBITS (Continued)

* * *

Additional submission by San Juan Coal Company, not offered or admitted:

* * *

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* * *

WHEREUPON, the following proceedings were had at 9:06 a.m.:

CHAIRMAN WROTENBERY: Are you ready?

MR. AUSHERMAN: We are.

CHAIRMAN WROTENBERY: Okay, then let's get started.

Tom, are you finished --

MR. KELLAHIN: Madame Chairman --

CHAIRMAN WROTENBERY: -- with your --

MR. KELLAHIN: -- we have completed our direct presentation to the Commission.

CHAIRMAN WROTENBERY: Okay, thank you.

MR. AUSHERMAN: Madame Chairman, our first witness is Lynn Woomer of San Juan Coal Company.

CHAIRMAN WROTENBERY: Mr. Woomer.

MR. WOOMER: Good morning.

CHAIRMAN WROTENBERY: Good morning.

Go ahead.

LYNN R. WOOMER,

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

DIRECT EXAMINATION

BY MR. AUSHERMAN:

Q. Mr. Woomer, please state your name and occupation.

A. My name is Lynn R. Woomer. I'm the technical services coordinator of the San Juan Coal Company Projects Development Group.

Q. Where did you go to school?

A. I have a bachelor of science degree in forestry from Southern Illinois University and a master's in forestry with an emphasis on soils and land reclamation from Stephen F. Austin State University.

Q. What was your work after school?

A. After school I spent about 13 years in the public sector, working primarily with land reclamation programs, code-administration type of programs, for the States of Missouri, Colorado and Montana.

Q. Did those positions involve regulatory matters?

A. Yes, they did, primarily coal administration and reclamation laws.

Q. When did you begin working at San Juan Coal Company?

A. I began working -- Actually, I came on with BHP Billiton with the Navajo Mine in 1995, November of 1995. I transferred to San Juan in April of 1996.

Q. You've referred to BHP Billiton. Is that affiliated with San Juan Coal Company?

A. Yes, it is. Actually, BHP Billiton is the parent company, headquartered out of Melbourne, Australia.

Q. And you mentioned Navajo Mine. Is that a San Juan Coal Company mine?

A. It's a sister mine of -- a sister company of the San Juan Coal Company called Navajo Coal Company. Basically they operate the Navajo Mine on the Navajo Indian Reservation.

Q. So BHP Billiton is the parent, and BHP Navajo Coal Company operates Navajo Mine, and San Juan Coal Company operates San Juan Mine?

A. Yes, and also San Juan Coal Company operates La Plata mine as well.

Q. How long has your work with San Juan Coal Company focused on the underground project?

A. I started out with the underground project from the outset of permitting, which would be back in the summer of 1997.

Q. And were those responsibilities to initiate development of the underground mine which has been referred to in these proceedings?

A. Yes.

Q. Could you tell the Commissioners your responsibility for the San Juan Underground Mine?

A. Well, initially when I started on with the San Juan Projects Development Group, we were trying to permit a pilot mine, a demonstration mine, a mine basically -- just to determine whether or not it was feasible to mine coal underground in our area.

The pilot mine was permitted -- Actually, we submitted the permit application package or the permit revision package around midsummer, and then that was approved in September of 1997.

Also at about the same, we started putting together our strategy and our plan for accumulating environmental baseline data for the larger mine operation.

Q. Are you generally familiar with all aspects of developing the underground mine?

A. Yes, from a permitting perspective, yes.

Q. Have you been involved with the coordination of negotiations to resolve conflicts with gas producers?

A. Yes, I have. Actually, that's one of my major tasks in this current position, is the oil and gas negotiations.

Q. How many people does San Juan Underground Mine employ?

A. Once it's up to full production we predict we'll be employing about 300 people, of which about 50 percent will be native American, primarily Navajo.

Q. Is BHP Billiton one of the top employers in San Juan County?

A. Yes, it is. As I understand, we're one of the top five employers in the county.

Q. Now, San Juan Coal Company had a mine just immediately west of the underground mine for a number of years, did they not?

A. Yes.

Q. And that was known as the San Juan Mine at the time?

A. Correct.

Q. Why transition from that mine to an underground mine?

A. Well, what's happened here, we actually -- as I alluded to earlier, we actually have -- originally had two surface mines. We had the La Plata Mine, which is about 22 miles up the haul road from San Juan Mine, and then we have San Juan Mine.

The transition -- At least originally, we were geared towards surface coal mining. The transition has recently occurred as a result of our strip ratio. In other words, the coal is getting deeper and we're having to excavate through more overburden in order to get to the coal. So it's not as economically feasible to operate using surface mining techniques as compared to underground mining techniques.

Q. Would you turn to San Juan Coal Company Exhibit 1 in the exhibit notebook and orient the Commissioners to the location of the key features on that map, which is entitled San Juan Mine General Vicinity Map?

A. Okay, actually you can see there's an indication there, immediately to the west of the orange area, that's identified as the San Juan Mine, which is the San Juan Generating Station. That's the power plant that we actually feed all our coal to.

Originally, as I indicated, we had two surface mines. One is La Plata Mine, which is up in the -- basically the far upper right corner, and between La Plata Mine and San Juan is a 22-mile haul road called La Plata Haul Road. As I said, originally we also had a surface mine at San Juan Mine.

The underground mine is immediately to the right of the orange area identified as San Juan Mine. We have two areas there. One is the Deep Lease, and an area further to the east which is referred to as the Deep Lease Extension.

Also you might note on this mine, immediately to the west of the Deep Leases is a small circle, red circle, which indicates or identifies the Underground Pilot Mine.

The mine is actually physically located approximately 16 miles to the west of Farmington, New Mexico.

Q. Mr. Woomer, what is the status of closure of the

La Plata and San Juan surface mines that we see in the orange on this map?

A. In regard to the San Juan Mine, we no longer are mining using surface mining techniques. There's two techniques of underground mining there at this point in time. One is highwall mining, the other is the longwall underground mining technique.

La Plata Mine, on the other hand, I believe that as of the most recent information that's been provided we've got about 500,000 more tons of surface coal to remove from La Plata Mine, then La Plata Mine will officially close down, probably -- Right now what they're predicting is probably around January, February of next year.

Q. So in the very near future there will be no more production from San Juan surface mine or from La Plata surface mine?

A. Correct.

Q. Are those two mines the sole source of coal for what we see on this map as the San Juan Generating Station?

A. Yes, that is correct.

Q. So the underground mines are designed to replace that as the sole source of coal?

A. Yes.

Q. Could you tell us a little bit about the San Juan Generating Station?

A. The San Juan Generating Station, basically, as I indicated earlier, we provide all the coal to the station. The station employs, as I understand, a little more than 400 employees. It's the second largest power plant in the State of New Mexico and provides power to a number of locations throughout the State of New Mexico. The plant is actually owned by Public Service Company of New Mexico.

Q. What if the surface mines are closed and the underground mine became unoperational for some reason? Does San Juan Generating Station have a source of coal, other than from San Juan Coal Company?

A. No. No, they don't.

Q. Is there rail access to San Juan Generating --

A. No, there is no rail access. The only possibility, which is extremely remote, would be to accelerate coal mining at the Navajo Mine. But then you have to figure out a way to get the coal north to the power plant, which is a major hurdle.

Q. Who operates the San Juan Generating Station?

A. Public Service Company of New Mexico.

Q. And was PNM involved with the decision to shift from surface operations to the underground operations?

A. Yes, they were.

Q. And what were their concerns that related to the shift?

A. Well, obviously they're concerned about the price of coal. There was a number of other projects that were being debated at that time too. We were looking at a couple of alternative surface mining projects. One would have been to extend the existing La Plata Mine to the north into the Southern Ute Indian Reservation. Another was a smaller project called Black Diamond Mine. But their primary concern is obviously the price of coal. And in our estimation through the Projects Development Group, we felt that this particular project, the longwall underground mine, would result in a cheaper price for the coal on a per-ton basis.

Q. Had the surface mines continued to operate, would the price of coal become increasingly higher?

A. Yes.

Q. And what effect would that have on the rate payer?

A. Well, ultimately, you know, the majority of the costs are passed on to the power plant, and ultimately it would end up, you know, in the laps of the rate payers.

Q. So the higher the coal, as a general proposition, the more the rate payers pay for electricity?

A. Correct.

Q. Are PNM's coal sales that they've purchased from San Juan Mine governed by a contract?

A. Yes, they are.
Q. The contract is with San Juan Mine?
A. Yes, San Juan Coal Company.
Q. San Juan Coal Company.
For how long does PNM's commitment to buy coal from the San Juan Coal Company extend?
A. The existing contract extends through 2017.
Q. Another 15 years or thereabouts?
A. Correct.
Q. How much coal do you estimate would be supplied from the new underground mine to San Juan Generating Station over the life of the underground mine, or at least over the life of that contract, until 2017?
A. Over the life of the contract we're talking approximately 100 million tons of coal.
Q. Focusing on the Deep Lease and the Deep Lease Extension, what are the coal leases that are the source for the coal that you're mining there?
A. The source for the coal is what we call the 8 Seam, which is -- you know, as a surface mining operator, we have a multiple-seam operation, we mine both the upper seam, which is the 9 Seam, as well as the lower seam.
In the underground operation we're focusing strictly on the 8 Seam, which is the basal coal seam.
Q. Are there leases that are the subject of

operations?

A. Yes.

Q. What are -- I refer you to San Juan Exhibits 2 through 5 in your exhibit book.

A. Okay.

Q. Do you recognize those?

A. Yes, I do.

Q. What are they?

A. Well, Exhibit 2 is a copy of our lease agreement for the Deep Lease, which was effective as of April 1st, 1980.

Q. And the Deep Lease is the lease to the west on the general vicinity map which is Exhibit 1?

A. Correct.

Q. And what is Exhibit Number 3?

A. Exhibit Number 3 is the coal lease agreement for the Deep Lease Extension, which is that area immediately to the east of the Deep Lease. This lease was effective March 1st, 2001.

Q. And what is Exhibit Number 4?

A. Exhibit Number 4 is a lease agreement with the State of New Mexico, it's a coal-leasing agreement for Section 32.

Q. And that's the section that was pointed out yesterday on Exhibit A-1; is that correct?

A. Correct, and that's in the lower portion of the Deep Lease Extension, is where that's located.

Q. And what is Exhibit Number 5?

A. Exhibit Number 5 is our State coal lease for Section 36, which is a section that lies in our Deep Lease area.

Q. I refer you to San Juan Exhibit Number 6. Do you recognize that?

A. Yes, I do.

Q. What is it?

A. Basically, this exhibit shows highlighted in yellow the infill area that Richardson Operating Company is currently applying for. It also shows highlighted in blue the underground mine area. The area immediately on the far left of the map that's highlighted in blue would be the Deep Lease. The area immediately to the right of that, also highlighted in blue, would be the Deep Lease Extension.

Q. Now, immediately to the west of the Deep Lease, on the left side of this map, would be the old San Juan underground mine that we've seen on Exhibit 1; is that correct?

A. That is correct.

Q. And immediately to the west of that is the San Juan Generating Station?

A. Yes.

Q. And just to clarify, the San Juan Generating Station is operated by PNM, I believe you testified, but it is also owned by PNM and other participants; is that correct?

A. That is correct.

Q. Now, moving back to the east, to this map, the Richardson leasehold interests are shown in yellow?

A. Correct.

Q. Richardson infill is shown in a cross-hatched line?

A. That is correct.

Q. And you've testified that the San Juan lease area is shown in blue?

A. Correct.

Q. So most of the Richardson leases fall outside of the mine area; is that correct?

A. That is correct, yes.

Q. And many of the Richardson leases are within the infill area but outside the mine area; is that correct?

A. Correct, yes.

Q. About how many acres are there in the underground mine area?

A. There's approximately 9600 acres within the areas known as the Deep Lease and Deep Lease Extension.

Q. And the infill area extends beyond that to the south and the east, as shown on this map?
A. Correct.
Q. Does coal extend into that area on this map which is east of the eastern boundary of the Deep Lease Extension?
A. Yes, it does.
Q. Is that the same seam that you're mining in the Deep Lease and the Deep Lease Extension?
A. Yes, it is.
Q. Do you have reason to believe that there are significant quantities, minable quantities of coal there?
A. Yes, we do have reason to believe that there are significant reserves in that area.
Q. And what's the basis of your view on that point?
A. Well, the basis of that view is that, you know, our geologists have actually looked at some oil and gas logs and, you know, we know that the coal seam, the existing coal seam, continues to extend to the east of the immediate mine area.
Q. So you have -- Do you have a leasehold to the east of the immediate mine area?
A. No, we don't.
Q. But do you have an interest, long-term, in pursuing that coal beyond the eastern boundary of the Deep

Lease Extension into that area on the east on this map?

A. Yes, we do.

Q. Now, that eastern area where there's coal but you don't have a lease has been referred to in previous proceedings as the Twin Peaks area; is that correct?

A. Yes.

Q. And the Twin Peaks area that San Juan is interested in extends for two sections to the east of the eastern boundary of the Deep Lease Extension; is that right?

A. That is correct.

Q. Were you involved in San Juan Coal Company's acquisition of the Deep Lease Extension, the easternmost area of this blue coal lease area shown on the map?

A. Yes, I was.

Q. What was the first step in acquiring the Deep Lease Extension from the United States?

A. Well, the first step was to file an application with the Bureau of Land Management, which was done in the summer of 1997.

Q. When was the lease actually issued by the BLM to San Juan Coal Company?

A. The lease was issued in March of 2001.

Q. So it was about three and a half years?

A. That is correct.

Q. Why did it take three and a half years to go from the point of applying for the lease to actually being granted the lease?

A. Well, there's a couple of things there. One is that the BLM had to go through a process of amending the existing Resource Management Plan, which also involved a rather extensive environmental assessment.

Secondly, you know, there had to be a big process that was gone through, and actually San Juan Coal Company's initial bid was not accepted, and so it was extended even further for the second round of the bidding process.

Q. You need to bid to the BLM in order to obtain an open-bidding process?

A. Correct.

Q. Were there also significant permitting activity in this intervening three and a half years?

A. Yes, there was.

Q. What did that entail?

A. That entailed -- Basically what we had to do was, we had to amend or revise our existing surface mine permit to allow for underground mining. What that involved is attempting to permit the 9600 acres that would be within the immediate mine area for underground mining. That involved extensive environmental baseline survey work, you know, everything from archaeology to ground water, surface water, vegetation, wildlife, soils et cetera.

Once the environmental baseline information was accumulated, which took approximately a year or so, you know, we had to put the text together for the application. The application actually was submitted in January of 1999 to the Mining and Minerals Division, State of New Mexico, and it consisted of a total of six volumes.

Q. I refer you, Mr. Woomer, to San Juan Exhibit Number 7. Do you recognize that document?

A. Yes, I do.

Q. What is it?

A. This document is San Juan Coal Company's approval of our underground permit revision application by the State of New Mexico Mining and Minerals Division.

Q. So this was the culmination of this stage of the permitting process that you were describing?

A. Correct.

Q. You mentioned also in this three and a half years was a bid process, actually two bid processes because the first one was rejected. What was the amount of San Juan's bid for the Deep Lease Extension that was accepted by the BLM?

A. I believe it was $13 million.

Q. In preparing for the hearing today, you have summarized some of the benefits to the public that San Juan

Coal Company expects to flow from the underground mine, have you not?

A. Yes.

Q. Would you turn to Exhibit 8? Does this contain your summary?

A. Yes, it does.

Q. Would you describe it for us?

A. Basically what we're indicating here is that, you know, we've spent upwards of $150 million in capital investment on gearing up for the underground project.

Also, this once again indicates that we at full production will be employing approximately 300 people associated with the underground mine, and the payroll for those 300 people would be around $33 million.

It also indicates that we are the sole supplier, San Juan Coal Company is the sole supplier of coal to the San Juan Generating Station, which is operated by Public Service Company of New Mexico, which is one of the largest suppliers of -- well, the San Juan Generating Station is one of the largest suppliers of electricity in the state, and that plant employs over 400 employees.

Also, it indicates that we pay approximately $50 million in federal and state taxes and royalties, and that's paid by San Juan Coal Company.

Q. In addition to this exhibit which summarizes public benefit, have you also prepared a summary of estimated coal royalty revenues --

A. Yes.

Q. -- for an underground mine?

A. Yes, we have.

Q. I show you -- Or would you turn to Exhibit 9 in the notebook? Is that your summary?

A. Yes, it is.

Q. Would you describe that for us?

A. Basically what this states is that between the two federal leases and state leases within the underground immediate mine area, we will be mining approximately 100 million tons of coal through the life of the contract with San Juan Generating Station, which extends through 2017.

There's a potential royalty of $250 million. That's based on an 8-percent royalty base. Also, out of that $250 million, approximately 50 percent of that or $125 million would go to the State of New Mexico.

From the state leases, estimates of projected production and royalties of about 10 million tons of coal would result in $25 million in royalties, based on the 8-percent royalty base to the State of New Mexico.

And lastly here, we're suggesting that there's significant federal coal reserves existing adjacent to the immediate mine area as well, primarily to the east of the immediate mine area.

Q. That would be the Twin Peaks area that you've discussed?

A. Correct.

Q. Now, you have testified that you have been involved in the transition from the surface mine to the underground mine, and I would like to show you a blow-up of what is in the exhibit notebook as Exhibit 10. Do you recognize that?

A. Yes, I do.

Q. What is it?

A. This is a -- basically a map of our mine plan for the underground mine area.

Q. Can you orient the Commission to, generally, the two things that are depicted on that map?

A. Sure. Basically the map shows here this western area would, once again, be identified as our Deep Lease area. The area to the east would be identified as our Deep Lease Extension. The map also shows in green Richardson Operating Company's existing leases within the immediate mine area. It also shows the well locations, both producing as well as waiting on completion as well as staked locations.

Within the mine area it also shows our panel alignment. Over here it shows basically where our main portal entry is.

Q. And when you say "over here", you mean the --

A. Yeah, immediately to the west of the Deep Lease.

Q. And it's that green windowpane pattern?

A. Right, the green area actually indicates here the areas that we've actually developed. And what we've developed so far is indicated on the map as we develop our gate roads for our first panel, which is Panel 101.

Q. And those are shown in green going to the south?

A. Correct.

CHAIRMAN WROTENBERY: I'll just note for the record that in our exhibit books it appears that color is a little different. It's more blue.

THE WITNESS: Yes, I noticed that.

CHAIRMAN WROTENBERY: Okay.

THE WITNESS: Anyway, also the green area indicates not only the gate road development but also the primary main development from our primary portal area.

Q. (By Mr. Ausherman) And the primary main development is the area that's going from the west to the east?

A. Correct.

Q. And the gate roads go from north to south?

A. Correct.

Q. And they're depicted in the color on the western part of the map.

Now, there are also squares that are shaded throughout the -- with a cross-hatching, throughout the San Juan Mine area. Can you describe what those squares are? Are those the actual panels?

A. Yes, basically what we have is, we have a number of what's called mining districts, and basically each mining district is made up of several panels.

For instance, our first mining district, which would be labeled in the hundreds, 101, 102, 103, those would be individual panels within that mining district. So we have three panels in our first mining district.

Our second mining district would be immediately to the east, and that would be our 200 panels, so 201, 202, 203 and 204 and so on.

We've got a total of seven panels identified within our immediate mine area -- I'm sorry, seven mining districts with a number of panels per mining district.

Q. And when you refer to a panel, could you show the Commission on the map an example of a coal panel?

A. A fairly decent example of a coal panel and one that we've recently started mining with our longwall equipment would be Panel 101.

Q. And that's this --

A. This panel right here, that is highlighted.

Q. LW-101?

A. Yeah, LW-101. Basically that is -- The periphery is identified in green on the exhibit, but in the exhibit in the book it's identified in blue. The panel is approximately 10,000 feet long and 1000 feet wide.

Q. In what direction is that panel mined?

A. Mining is progressing from south to north.

Q. In that area?

A. Correct.

Q. And the panel to the north of there would progress from north to south?

A. That is correct, yes.

Q. What are those squares within the panel you've just described with dates written on them? And I know that the Commission can't see the dates from that distance, but can you describe generally what those squares depict?

A. Basically what they depict is just an individual block of coal, and it gives a date in which we predict that we're going to actually mine that coal.

Q. Through what machinery will you be mining the coal in both the panels and removing the coal from the gate roads and passageways?

A. The gate roads here around the panels and the passageways are the primary mains to be mined with continuous miners, whereas once we develop the gate roads around each individual panel, we will be progressing coal recovery with longwall mining equipment.

Q. Two vastly different types of apparatus, correct?

A. Correct.

Q. Let me refer you to your exhibit notebook again, in particular Exhibit Number 12 -- I'm sorry, Exhibit Number 11. Do you recognize that?

A. Yes, this exhibit shows a continuous miner.

Q. Can you give the Commission an idea of scale? How big is this?

A. Well, the cutting head or the cutting drum on this machine is around ten feet wide.

Q. So this machine is a lot smaller than what you've referred to as the longwall miner?

A. Correct.

Q. And the purpose of this machine is to develop the windowpane pattern that we see shown in green on that map or blue on the map that's in the witness notebook?

A. That's correct.

Q. And the reason you use it for that is, it's more maneuverable; is that a fair statement?

A. That's a fair statement, yes.

Q. If you would, turn to Exhibit 12 in the witness notebook. What is that?

A. This actually shows the longwall mining equipment. It also depicts the extent of the coal that we'll be mining through in an individual panel. As I indicated earlier, the panel is 10,000 feet long and about 1000 feet wide.

The longwall consists of three primary pieces of equipment. One is a shearer which actually cuts the coal. Then you can see there the shields which support the roof, and then our conveyor immediately behind the shearer, which conveys the coal out onto the primary conveyor belt.

Q. This is an enormous piece of equipment. What this shows is that it's essentially 1000 feet long?

A. That's correct. And actually we have, I believe, about 187 shields to support the roof.

Q. Then in addition you see that there's a conveyor system going off in the direction depicted on this longwall face cutaway as Coal Direction?

A. Correct.

Q. Why did San Juan Coal Company choose this longwall mining method to mine the underground mine?

A. Well, the primary reason is, it's a highly productive piece of equipment. And in order to meet our commitments to the San Juan Generating Station, as indicated earlier, we need to mine -- well, I guess maybe -- well, I'm not sure if we got to this or not, but 6 1/2 to 7 million tons of coal per year is what we mine, and this piece of equipment can certainly mine that amount of tonnage, and even more if necessary.

Q. So taking a look at Exhibit Number 10 on the easel, in the coal panel you're using for illustrative purposes, LW-101, this 1000-foot-wide longwall miner would begin at the southern portion of that coal panel and mine all the way back to the north, to the gate road; is that correct?

A. That is correct.

Q. And that would be what, about --

A. In that one individual panel, which is 10,000 feet long and 1000 feet wide, we would mine that entire expanse of coal in approximately a year, and probably be able to achieve our annual coal tonnage within that one panel area.

Q. One panel? As you're mining with this longwall miner apparatus -- and this is just an introduction; the next witness, Jacques Abrahamse, will be testifying in much more detail about the longwall miner -- but how many coal seams do you mine with this longwall apparatus?

A. We mine just one coal seam, the 8 Seam, which is the basal coal seam.

Q. So the 8 Seam and the basal coal seam that we heard referred to yesterday is the same?

A. Correct.

Q. We heard yesterday that there a number of seams and small stringers and the like above this big Number 8 Seam. Will the Coal Company be mining those?

A. No.

Q. Why is that?

A. Well, I believe it's because they're not economically recoverable. The longwall can't mine a seam that's less than 7 1/2 feet in thickness. The 9 Seam, I believe, is somewhere around 5 to 6 feet; I'm not real sure on that.

Q. Could you describe for the Commission the characteristics of this Number 8 Seam that the Coal Company will be mining?

A. The Number 8 Seam, I believe throughout the life of the mine we're talking about an average mine recovery of around 10 feet. That's going to vary anywhere between 9 to 13 feet. In our initial mining district, the Mining District Number 1, the actual average thickness of coal in that particular area is somewhere between 13 and 14 feet thick.

Q. Is this particular coal deposit that are on San Juan Coal Company's Deep Lease and Deep Lease Extension considered to be a particularly promising one?

A. Yes.

Q. In some respects, it's been described as a world-class coal deposit; is that correct?

A. That is correct.

Q. Despite that characterization and despite its promise, there are some challenges in the development of this particular coal seam, are there not?

A. Yes, there are.

Q. And what are those?

A. Well, we've got a number of geologic and engineering conditions that tend to present a few challenges to us. One is that we have pockets of fairly elevated H_2S, hydrogen sulfide.

We also -- In our risk analysis and our feasibility study, one of the major risks that were identified was spontaneous combustion.

We also have a highly corrosive mining environment as a result of the H_2S and the microbial-type of reaction or sulfur-reducing bacteria.

We also have the issue of a number of wells within the immediate mine area.

Q. Leaving the wells aside for a moment and focusing on these other engineering and technical concerns, were you aware of the extent of those concerns and those challenges when the mine was on the drawing board, or was that more something that you became aware of as you progressed in these initial stages of the mine?

A. I believe in some instances, for instance the H_2S, we had done enough drilling where we identified the pockets. There are a number of pockets, but it's gotten to the point where, you know, I believe we're encountering much more than we ever expected.

The corrosive environment was an issue that has been exacerbated as we've progressed in the underground mining activity.

Another thing that I failed to mention earlier is our roof conditions. You know, we knew that -- You know, and we're leaving a couple of feet of coal for our roof support. The strata immediately above that coal is consisting of weakly laminated mudstones and shales and so forth. We knew we were going to have a weak roof, but I believe that issue has also come to light here recently as being exacerbated beyond our predictions.

Q. Let me refer you to Exhibit Number 12 again in the notebook, and I also think we have a blowup of that. I'd like to ask you a few questions about wellbores.

If you were to imagine a wellbore penetrating what's shown on this Exhibit 12 as a coal seam, would that pose difficulties for the longwall mining apparatus?

A. Yes, it would.

Q. Can you describe what those difficulties would be?

A. Well, first of all, if we don't own the well or don't have the rights to the well we'd have to basically move around the wellbore. According to MSHA requirements, the Mine Safety and Health Administration requirements, we cannot encroach within 300 feet of an existing wellbore without re-entering the well, milling out the casing within the basal coal seam and plugging the well from bottom to top with expanding type of cement.

So therefore, if we don't have rights to the well, then we can't re-enter it, we can't plug it according to those standards. Therefore we have to skirt around it, we have to bypass a block of coal.

Q. So as you're coming to a well, one option is to disassemble the longwall and try to move around that well. But you mentioned that you would do that if the well were not plugged and abandoned. So I guess the second option, then, would be if the well were plugged and abandoned. What would you do then?

A. If the well were plugged and abandoned appropriately, we had milled out the casing within the basal coal seam, cemented it and so forth, we could mine right through it.

Q. Well, let's talk a little bit more about these two issues, and again Mr. Abrahamse will be discussing these in greater detail. But let's talk first about the theoretical option of disassembling the longwall and trying to bypass a wellbore in the block of coal. Are there operational problems that would entail with the 1000-foot-long longwall apparatus?

A. Yes, there are. As you can see, this is a massive piece of equipment. In just a standard longwall move, we're removing the longwall equipment from one panel to the next. It's a rather overwhelming undertaking, you know. The average -- And we don't know right now because we just started the mining activity, but other mines it takes upwards of a month to move this equipment from one panel to the next.

So if we had to bypass a block of coal because there is an existing wellbore, we would have to shut down the longwall miner. It would take us about a month to relocate the equipment ahead of the wellbore. And prior to that, we would have to use our continuous miners to develop a setup room where we could actually set up the longwall equipment.

Q. So from an operational point of view, is moving this 1000-foot-long piece of equipment and stopping production for a month a feasible thing?

A. It can be done, but it's extremely expensive and it's -- you know, as I said, it has a major impact on our production rates.

Q. How does MSHA -- that is, the Mine Safety and Health Administration -- define the amount of coal you need to leave around a wellbore if you were to attempt to bypass it?

A. Basically, the way it's defined in the regulations is that we have to leave a barrier, a 300-foot-diameter barrier, from the wellbore, from the location of the wellbore to our existing mine workings.

Q. For a total of 600 feet in all directions; is that correct?

A. Correct.

Q. I'm sorry, you said diameter? Did you mean radius?

A. Diameter from the wellbore to our existing workings.

CHAIRMAN WROTENBERY: Which is usually -- Well, the distance, then, from the wellbore to --

THE WITNESS: That's right.

CHAIRMAN WROTENBERY: -- the workings, okay.

MR. KELLAHIN: That would be a radius.

CHAIRMAN WROTENBERY: A radius or a --

THE WITNESS: Yeah, so it's the same thing as a radius, basically.

Q. (By Mr. Ausherman) And MSHA has been in contact with you about how to measure that, have they not?

A. Correct. What we had to go through there is, we had to go through what's called a petition for modification. We had to file that petition with the Mine Safety and Health Administration in order to encroach, you know, within 300 feet of a wellbore. And in that petition, you know, it's fairly well defined.

Q. And MSHA has interpreted your requirements to be to leave 300 feet from the wellbore to your face; is that correct?

A. Correct, correct.

Q. And you need to follow MSHA's interpretation of the regulations?

A. That is correct.

Q. Now, I have some questions about the second alternative that you referred to, that upon coming to a well, if it were plugged and abandoned you could mine through it. What are the difficulties with plugging and abandoning the well in order to mine through it?

A. Well, the difficulties are, as I alluded to earlier, is that we have to own the well, obviously, in order to go in it and mill out the casing and plug the well with expanding type of cement. That's obviously a pretty costly process. As a matter of fact, we've actually re-entered three wells thus far -- which are not coalbed methane wells; they were all Gallup wells that had already been previously plugged and abandoned -- and it is a fairly expensive process.

Q. If the well that you seek to mine through has been frac'd before it was plugged and abandoned during its producing history, does that pose additional safety concerns?

A. Yes, it does.

Q. And although Mr. Abrahamse will be discussing this in greater detail, as an introduction what concerns do those pose?

A. Well, actually two concerns potentially. One would be compromising the stability of the roof in the mine, and secondly just enhancing the possibility of spontaneous combustion.

Q. Now, there could be some wells in the coal seam that are already plugged and abandoned, old wells?

A. Correct.

Q. As to those, what approvals would you need in order to mine through those wells?

A. Well, regardless of whether or not they've been plugged and abandoned, we still need to re-enter those wells and plug them according to MSHA standards.

Q. And would it be the BLM you would be working with to do that?

A. That is correct.

Q. And is that a relatively simple procedure --
A. It has been, yes.
Q. -- for those wells?
A. Yes.
Q. Now, for an active well, perhaps one of Mr. Richardson's wells, that has not been plugged and abandoned, are you able to mine through that well without some agreement from Mr. Richardson, for example?
A. No, we're not.
Q. Have you been trying to reach an agreement with Mr. Richardson for a buyout of his wells in the mine area?
A. Yes, we have.
Q. Have you made an offer --
A. Yes, we have --
Q. -- to Mr. Richardson?
A. -- made an offer.
Q. That was for the buyout of the wells in the mine area?
A. Correct.
Q. And you've been unsuccessful in reaching agreement on a buyout value, I take it, or we wouldn't be here today?
A. That is correct, yeah.
Q. Yesterday we learned that Mr. Cox had not reviewed the mine's desorption data. Has the company made

that data available to Mr. Richardson and Mr. Cox?

A. Yes, we have made that data available. Actually, you know, following the extension of our initial offer, Mr. Richardson had indicated he'd like to do his own valuation on his wells within the immediate area, and during the course of that valuation I had indicated to Mr. Richardson that whatever data he'd like to request, we'd be willing to provide that data.

Q. And this would include the backup data for desorption testing?

A. That is correct, and we did actually provide some data.

Q. Now, Mr. Abrahamse will be testifying to this, to safety concerns, in greater detail. But as a general introduction, the safety concerns you've testified to of frac'ing a well in the coal seam relate to spontaneous combustion?

A. Uh-huh.

Q. Have you known from the beginning about this concern of spontaneous combustion in the coal seam, or is this something that the company concluded after planning for the mine was underway for some time?

A. This is something that we concluded after starting development of the underground mine.

Q. What was -- Before learning of the potential for spontaneous combustion, what was the mining company's views about the acceleration of gas development as a solution to this problem?

A. Well, at that point in time -- and that was prior to the summer of 2000, I believe -- basically we felt that -- you know, we knew that we were going to de-gas ahead of the mine, so we felt that continued production, continued well drilling and development might be beneficial to our efforts to de-gas ahead of mining. So basically at that point in time we were promoting additional well development and production in the mine area.

Q. Did the time come when you concluded that that was not a solution to this conflict?

A. Yes.

Q. When did that occur?

A. That occurred in the summer of -- I believe I said 2000 earlier. It was actually the summer of 2001.

Q. And what prompted that change of view?

A. Well, what prompted that change of view is, we had an absence of a fairly significant area of expertise, and that had to do with ventilation engineering. And we brought a ventilation engineer on staff, Jacques Abrahamse, during that summer, and that's when the issue came up that this, you know, continued well development and hydraulic fracturing might have an impact on the safety and continued operation of the mine.

Q. And that impact relates in large part to spontaneous combustion?

A. Yes, it does.

Q. So what's the worst case? What happens if you have a spontaneous combustion event in the mine?

A. Worst case, you know, we might have to shut the mine down.

Q. And there could be --

A. And there could be, you know, some fatalities and injuries associated with that mine fire.

Q. And these are the concerns that Mr. Abrahamse was raising?

A. Correct.

Q. And were his concerns primarily about the frac'ing of the wells?

A. Yes.

Q. Now, in the Powder River Basin and in surface mines, it's common to have agreements to accelerate gas development in advance of coal, isn't it?

A. As I understand, yes.

Q. Are there concerns about frac'ing and mine safety in those surface mines?

A. No, there are not.

Q. Frac'ing is a concern, and the accumulation of gas, that's and underground mine concern?

A. Yes, it's unique to underground mining.

Q. Now, we've heard that a number of the wells that Mr. Richardson proposes are recompletions of old wells. Would fractures in the coal seam from re-entry of an existing wellbore, perhaps originally completed to a lower formation, pose safety concerns as well?

A. Yes, they would.

Q. Does the magnitude of the problem caused by wellbores in the coal seams, for the coal mining company, increase as you put more wells and more fracs into the coal seam?

A. Yes, it does.

Q. And why is that?

A. Well, for several reasons. The more coalbed methane wells that we encounter out there, the more hydraulic fracturing that's occurring, the more -- the greater the potential for encountering unstable roof conditions as well as spontaneous combustion.

Q. Let me ask you to turn to Exhibit 13.

A. Okay.

Q. Have you prepared an estimate of the amount of coal that is bypassed, or that would have to be bypassed according to MSHA requirements and other operational concerns to avoid active wellbores?

A. Yes, we have.
Q. Does this summarize that study?
A. It does.
Q. Would you explain the top half of this Exhibit 13 to us?
A. Okay, the top half --
Q. The top half, the wellbore half.
A. Okay, the top half, basically, is just an illustration of a block of coal we would have to potentially bypass if we were unable to reach a settlement with the gas producers.
What this depicts is a block of coal 600 feet long, 1000 feet wide and 13 feet thick that potentially would have to be bypassed, for a total of 333,000 tons of bypassed coal with a potential lost royalty of $800,000.
Q. And that's at an 8-percent royalty rate?
A. Correct. And then also on top of that, it would result in a delay in longwall mining activities because of having to relocate the longwall, do an additional setup room and so forth.
Q. Let me ask you, if I may, about the dimensions of this top half of the diagram. It's 1000 feet long, and what does that 1000 feet correspond to on the longwall face cutaway exhibit that's on the --
A. Basically what that corresponds to is just the

width of the block of coal, which is 1000 feet wide.

Q. Okay. Then the next dimension which you see on this graphic is 600 feet. How does that relate to the 300-foot barrier you testified to before?

A. Well, basically what MSHA is indicating is, we can't get within 300 feet of that wellbore. So basically we're leaving 300 feet on either side of the wellbore --

Q. When you say MSHA --

A. -- for a total of 600 feet.

Q. When you say MSHA is indicating this, this a result of your discussions with the MSHA regulators?

A. That is correct.

Q. Now let's go, if we could, to the bottom half of this exhibit, which is Bypassed Coal Panels. Could you describe what this depicts?

A. Well, this depicts a couple of scenarios where we have maybe several wells in our gate roads within an individual panel, and then potentially several wells within the panel itself.

The bottom line here is that if there's too many wells within the panel, there's a potential that we might abandon all efforts to retrieve the coal within that panel. The reason for that is, as I indicated before, because of the delays in having to bypass wells because of the expense. We just -- It would not be economically feasible to recover the coal in a panel that had, you know, three or more wells within the panel, for instance, or a couple of wells within the gate roads.

Q. When you say a couple of wells within the gate roads, that would be the scenario depicted on the left at the bottom of this exhibit?

A. That is correct.

Q. And wells in the coal panel are depicted on the right?

A. Correct.

Q. So how many million tons of coal would be bypassed if you had to bypass an entire panel?

A. As indicated earlier, at least in our first mining districts, our panels are 10,000 feet long and 1000 feet wide, and we're mining approximately 13 feet of coal in thickness. Based on that, about 5 1/2 million tons of coal would have to be bypassed in one of these panels, with over $13 million in potential lost royalties.

Q. Yesterday Mr. Richardson testified, I think, that there were about 20 existing wells within the coalbed in your coal leases already. Now, if some of those wells are plugged and abandoned or are wells that are to deeper formations so that there is no frac'ing in the coalbed itself, do those penetrations pose a great problem for the Coal Company?

A. No, not an insurmountable problem, no.

Q. So the greater problem is the wells that are frac'd into the coalbed?

A. Correct.

Q. Let me ask you a few questions about the venting of gas from mine operations. Is the venting of gas from the San Juan Underground Mine a necessary part of the mining operation?

A. Yes, it is.

Q. And why is that?

A. Well, basically we have to de-gas the mine in order for our work force to work in the underground workings safely.

Q. I know Mr. Abrahamse will be testifying right after you in detail about these safety concerns and ventilation in the mine, but generally is the venting of gas common at underground mines?

A. Yes, it is, it's an absolute requirement. As a matter of fact, we have to submit a ventilation plan to MSHA for their review --

Q. And has MSHA --

A. -- and approval.

Q. -- approved your ventilation plan?

A. Yes, they have.

Q. Why does the mining liberate gas? What is it about it that causes the gas to be liberated?

A. Well, as we're cutting coal we're releasing gas into the underground mine workings, and with our ventilation system, which is an exhaust system, we're exhausting the gas through the mine entries or through our ventilation shaft.

Q. You mentioned the ventilation shaft as one way the mine is de-gassed. Are there a couple of other routes by which gas is vented from the mine?

A. Potentially, yes. As a matter of fact, in the first panel, this Panel 101, we have -- we drilled a total of six gob vent boreholes. And once we retrieve coal or recover coal within the location of a gob vent borehole, then we'll start venting gas through that borehole.

Q. So there's gob vent boreholes, and then there's some de-gassing in advance of mining?

A. That's correct.

Q. And do you know what quantity of gas will be liberated in the future from these de-gassing operations?

A. No, we don't. That's something that we're currently studying, as a matter of fact.

Q. But you don't have the numbers about what has occurred just in the brief time that the mine has been operational to date, I guess.

A. Yes.

Application of Richardson Operating Co.
Record on Appeal, 333.

Q. And what's the -- I know this is not your primary expertise, but what's your understanding of the range historically over the last several months?

A. The range, as I understand from our monitoring activities at the entries, would be anywhere between 800,000 and a million cubic feet of gas liberated per day.

Q. Now, you have recently gone from developing these gate roads, which has been ongoing for quite some time, to actually mining coal. When did the longwall apparatus first get up and running?

A. I believe October 15th was when we initially started cutting coal.

Q. So we're looking 15 days ago?

A. Correct.

Q. So your experience on what's going to happen with the longwall is certainly preliminary at this point?

A. Correct.

Q. Now, there's been some discussion about the ability to capture gas that the Coal Company vents from mining. What would be the constraints on the Coal Company's ability to capture this gas at the surface, that it currently is required by MSHA to vent?

A. Well, the primary constraint would be that we don't own the gas, so we can't capture the gas, you know, without the ownership.

Q. Are there safety concerns?
A. In capturing the gas?
Q. Yes.
A. Not that I know of, no.
Q. Are there concerns about accumulating the gas in pipes, trying to collect it, and associated safety and operational concerns associated from that, that the Company is considering?
A. We've discussed that, we've considered that. There potentially could be some safety concerns, I suppose.
Q. And that's still under review?
A. Yes, it is.
Q. That's not your particular area of expertise; you just know that from discussions within the company?
A. Correct.
Q. At this stage, does the company know whether it will be ultimately feasible to recover the gas that MSHA requires to be vented from the mine and capture it?
A. No, as I indicated earlier, we're currently studying that to see what the feasibility is in capturing the gas.
Q. Does methane gas get liberated in the process of mining coal by surface methods as well?
A. If we're surface mining?
Q. Uh-huh.

A. Oh, of course.

Q. There's gas -- same gas in the coal, it's just being liberated to the air in surface mining?

A. Exactly.

Q. So in that respect an underground mine is not unique in its liberation of gas; a surface mine liberates that as well?

A. That is correct.

Q. If coalbed methane development were to go first, can you say that conventional CBM wells would recover as much gas as what is liberated by mining?

A. No, I couldn't see that.

Q. The mine acts as an enormous frac, you've testified before?

A. Yes, uh-huh.

Q. And so it may well be that gas liberated through the mining operation would never be collected through coalbed methane wells, I take it?

A. Possibly, yes.

MR. AUSHERMAN: I would move the introduction of San Juan Exhibits 1 through 13

CHAIRMAN WROTENBERY: Any objection?

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: San Juan Exhibits 1 through 13 are admitted into evidence.

And you're ready to pass the witness to --

MR. AUSHERMAN: I am, Madame Chairman.

CHAIRMAN WROTENBERY: -- Mr. Kellahin?

Go ahead.

MR. KELLAHIN: Thank you.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Woomer, when San Juan Coal acquired the Deep Lease, was it their anticipation at that time that they would utilize the longwall mining technology?

A. Yes.

Q. And when San Juan Coal Company acquired the Deep Lease Extension, was it still your intention to utilize the longwall mining technology?

A. Yes, it was.

Q. When you obtained the Deep Lease Extension in March of last year -- I think it was what? 2001, was it?

A. That's correct.

Q. -- 2001, you obtained that lease subject to certain stipulations, did you not?

A. Yes.

Q. One of those stipulations is based upon the fact that San Juan Coal does not own the coalbed methane gas, right?

A. I believe that is a correct statement.

Q. And under the lease stipulations it's your obligation, and not the BLM's, to resolve any problems in removing the coal and impairing the rights of the oil and gas lessee?

A. One could interpret the stipulation as suggesting that, yes.

Q. When we look at Exhibit 1-A from yesterday, I've made a mistake in extending both the Deep Lease and the Deep Lease Extension a row of sections too far to the south, right?

A. That is correct, yes.

Q. And if the green line is horizontal to the township intersections, that would be correct?

A. Yes.

Q. Okay. When we look at the Deep Lease area, there's an area shaded in that shows mine districts?

A. Yes.

Q. To the best of your knowledge, is that shading correct?

A. It appears to be, yes.

Q. When we look at the Deep Lease Extension, does that shading appear to be correct?

]Yes.

Q. When we look at that shading, can you tell me in what mine district you're currently commencing the longwall mining as of the 15th of this month?

A. Yes, we're commencing in Mining District 1, which is this district to the far west side of the Deep Lease.

Q. And the plan, then, would -- to be on the east side of that district and move to the west?

A. Yes.

Q. The Mine Safety Health Administration -- MSHA is the anachronism?

A. Yes.

Q. We talked about that a while ago. -- that's the federal agency that has rules --

CHAIRMAN WROTENBERY: I think it's an acronym instead of --

MR. KELLAHIN: What did I call it? An accident?

CHAIRMAN WROTENBERY: Anachronism.

(Laughter)

MR. KELLAHIN: Close enough, right?

CHAIRMAN WROTENBERY: Close enough.

Q. (By Mr. Kellahin) MSHA --

A. Uh-huh.

Q. -- that's the federal agency that has rules and regulations concerning mine safety, correct?

A. That is correct, yes.

Q. Within the mine lease area, and pursuant to your mine plan, MSHA has rules and regulations that obligate San

Juan Coal Company to abide by, right?

A. That is correct, yes.

Q. Those rules and regulations set forth requirements for dealing with roof support and stability, do they not?

A. That is also correct.

Q. And those rules and regulations by MSHA include provisions regarding ventilation?

A. Yes.

Q. And they also concern rules and regulations about the presence of methane gas?

A. Uh-huh, yes, sir.

Q. Do those rules and regulations as amended take into consideration the San Juan Coal Company's mining plan to use the longwall mining technology?

A. Yes.

Q. And pursuant to those rules and regulations, MSHA has determined that it is safe to mine the coal, provided that the mine workings stay at least 300 feet away from an existing oil or gas well?

A. That is correct, yes.

Q. So that distance component is what MSHA tells you will be a safety factor to satisfy any concerns about roof stability, correct?

A. Not about roof stability, no.

Q. How about roof support?

A. No.

Q. So the 300-foot radius around that wellbore to keep you away from it does not serve the purpose of the MSHA regulations to allow you, then, to mine the balance of the coal?

A. I'm sorry, I didn't follow that. Can you repeat that?

Q. Let's start over.

A. Okay.

Q. MSHA has got rules in place on roof support, ventilation, stability, all these mine-safety issues, right?

A. That's correct.

Q. And they said you can use the longwall technology, provided you have a buffer or a protection column around an existing wellbore that will have a radius of 300 feet from the nearest workings that you engage in?

A. Yes, but that has nothing to do with roof stability.

Q. At the time that San Juan Coal Company was developing and committing resources or planning to commit resources, I think you said you had committed about $150 million to the project?

A. That is correct, to date, yes.

Q. What portion of that commitment had been made by San Juan Coal before Mr. Abrahamse came on board as your ventilation engineer?

A. I guess I really couldn't say for sure.

Q. When did he come on board, do you know?

A. He came on board in the summer of 2001.

Q. So prior to the summer of last year --

A. Uh-huh.

Q. -- had you taken into consideration the questions about ventilation within the mine plan and concept?

A. In concept, yes.

Q. The specific details an concerns you now express were brought to you by Mr. Abrahamse?

A. That is correct.

Q. And his concerns were articulated by you when you sent the letter to the BLM that's dated August 31st of last year, opposing Richardson's four APDs that were pending at that time?

A. Yes.

Q. You incorporated into that protest or opposition Mr. Abrahamse' concerns about safety that he's articulated?

A. Yes.

Q. The MSHA rules and regulations have procedures regarding spontaneous materials and spontaneous combustion, do they not?

A. I believe they do, yes.

Q. Have you expressed to MSHA all your concerns about the presence of gas wells in the mine area that may impact your operations?

A. I'm really not sure that has been expressed to MSHA, especially in regard to our concerns with hydraulic fracturing.

Q. Did you express any of those concerns about hydraulic fracturing when you had MSHA -- you filed the amended petition with MSHA to amend your project?

A. No, we didn't express those concerns.

Q. Am I correct in understanding, then, that the 30-foot setback from the wellbore is a condition that MSHA believes will satisfy all the safety concerns of underground coal mining in association with gas or oil wells?

MR. AUSHERMAN: Just a point of clarification --

THE WITNESS: Three hundred foot.

MR. AUSHERMAN: -- it's not --

Q. (By Mr. Kellahin) Three hundred feet.

A. Yeah. I would assume that that would be the focus of MSHA's modification for petition approval, yes.

But as I said earlier, really there was nothing brought up at that point, even when we filed the petition, regarding our concerns with hydraulic fracturing related to coalbed methane wells.

Q. Have you contacted MSHA again to further modify your approvals to raise that issue with them?

A. I am not clear on that, but I do not believe that we have.

Q. What's your understanding of who owns the gas that's being vented?

A. The gas that's being vented? It's my understanding that as a coal mine we have the right to vent the gas.

Q. It's not your gas, though?

A. We don't own the gas, no.

Q. Within the coal gas lease, there's no claim by San Juan Coal that they own the gas being vented?

A. No, we haven't laid claim to the gas, no.

Q. Prior to initiating the longwall mining process, what was the volume of vented gas being reported to MSHA on a daily basis?

A. It's my understanding we don't report that on a daily basis to MSHA. We do record that on the mine level. But on a daily basis, as I indicated previously, it ranges anywhere from 800,000 to a million cubic feet per day being vented.

Q. While MSHA allows you to vent the coalbed methane, they also require you to measure that and to report those measurements to MSHA?

A. I believe -- That might be something you'd want to ask Jacques, but I believe that it is a requirement that we monitor the gas levels.

Q. Now that you've commenced the longwall mining process, has the amount of vented gas increased?

A. No, it hasn't, not to my knowledge.

Q. Do you have a contact with MSHA that you can share with us that could verify the amounts of gas being reported by San Juan Coal that's being vented?

A. I think that's probably a better question for Mr. Abrahamse to answer.

Q. Are you aware that MSHA records show that you're reporting 2.3 million cubic feet of gas being vented on a daily basis at this point?

A. I'm sorry, can you say that again?

Q. Are you aware that your company is reporting that you're now venting 2.3 million cubic feet of gas from your coal-mining operations as we speak?

A. No, I am not aware of that.

MR. AUSHERMAN: Just as a point of --

MR. KELLAHIN: You don't --

MR. AUSHERMAN: -- clarification, "as we speak" meaning today?

MR. KELLAHIN: On a daily basis, as of today?

THE WITNESS: We have reported to MSHA.

MR. AUSHERMAN: Yeah.

THE WITNESS: No, I am not aware of that.

Q. (By Mr. Kellahin) Do you pay royalties to either the federal government or the State of New Mexico on the gas vented?

A. No, we don't.

Q. Are you paying Mr. Richardson or any of the working interest owners in the oil and gas leases any interest for the gas vented?

A. No, we're not.

Q. As part of your mine plan, MSHA will allow you to mine through the area within 300 feet of a gas well, provided you do certain things; is that not what you told us a few minutes ago?

A. Yes, it is.

Q. All right.

A. Yeah.

Q. Tell us again what you're allowed to do in order to mine the coal that is now in this pillar around an existing Fruitland Coal gas well, for example.

A. Well, according to the approved modification for petition that we have through MSHA, we have to re-enter the wellbore, we have to mill out the well casing within the target coal seam, and then we have to plug the well with expanding type of cement from bottom to top.

Q. Let's look at Exhibit 1-A. Mr. Woomer, when we look into the mine districts, I count seven mine districts for the mine?

A. Yes, that's correct.

Q. Within the mine district, Mr. Richardson's Application proposes the drilling of three new coal gas wells; the mine company is objecting to those three?

A. That is my knowledge, yes.

Q. That's your company's position?

A. Yes.

Q. With regards to the PC wells that he proposes to recomplete into the coal and to fracture-stimulate -- those are indicated in blue within the mine-district area -- your company is opposed to those?

A. Yes, we are.

Q. Is your company opposed to Mr. Richardson's new wells that are on either of the deep lease or the shallow lease that's outside of the area that you're mining?

A. As I indicated earlier, you know, we do have concerns regarding the area immediately to the east of us, because that area which we had referred to as the Twin Peaks is an area of obvious expansion of the mine activities.

Q. All right, let's talk about areas south of the township line, which, if you adjust the boundaries of the lease, the area south, do you have an objection to those wells that are outside of your lease area to the south?

A. Well, it's my understanding that we're objecting to the whole Application, but obviously those wells are not within the designated mine location, so I would think that we wouldn't have a tremendous objection to those existing wells.

Q. In Section 36, state lease in this township, Mr. Richardson proposes to recomplete a well in the coal in the southeast quarter of that section. The Mine District 7 extends into the top 60 acres, I guess, or 40 acres of that section. Do you object to Mr. Richardson having activity anywhere in Section 36 that's outside Mine District 7?

A. That's Section 32?

Q. Thirty-two --

A. Yes.

Q. -- outside of 7.

A. You know, the only thing I can say is that we are objecting to the entire Application.

Q. So when we get over on the east side, and Mr. Richardson has a row or a column of sections that are east of the eastern boundary of the deep lease extension, San Juan Coal is objecting to that column of sections and the wells he's proposing?

A. Yes.

CHAIRMAN WROTENBERY: Mr. Kellahin, while we're here could we clarify what the Twin Peaks area is? We've talked about it, but I don't think we have --

MR. KELLAHIN: I'm just about there.

CHAIRMAN WROTENBERY: Okay, great.

Q. (By Mr. Kellahin) The Twin Peaks area you've described would be the column of townships I've just identified to the east of the east boundary of the Deep Lease Extension and the next row farther east; is that right?

A. Two sections to the east of the Deep Lease Extension, yes.

Q. So if we take the two rows of sections east of this green boundary, we're now in this Twin Peaks Extension area?

A. That is correct.

CHAIRMAN WROTENBERY: Are we talking about a total of eight sections in the Twin Peaks area?

THE WITNESS: Yes. Yes, we are.

Q. (By Mr. Kellahin) Let's read the section numbers, make sure I'm not misspeaking, because I'm really good at misspeaking. 15, 16, 21, 22, 28, 27, 33 and 34. Did I get all of them?

A. Yes.

Q. Are you aware, Mr. Woomer, that the Division has allowed oil and gas wells to have a density of four wells per section under the new order they issued on October 15th, that would allow four wells to a section within the eastern portion of what you're calling the Twin Peaks Extension?
A. Four coalbed wells per section, yes. Yes, I am aware of that.
Q. What's the position of your company concerning taking a *de novo* hearing on the Commission order that was issued on infill drilling of the underpressured area?
A. You mean for the Basinwide?
Q. Yes, sir.
A. We're currently studying that, and I don't know exactly what our position is there.
Q. Have you made a decision as to whether or not to appeal the Examiner order as to what he's allowed to be infill drilling?
A. I can't say that for sure, no.
Q. So at this point that order, unless you appeal it and get it altered, approves increased well density in the coal in all areas near you, with the exception of the Richardson area that's outlined in red?
A. Can you say that once again? I'm sorry.
Q. The infill order --

A. Yes.

Q. -- just issued --

A. Uh-huh.

Q. -- specifically excludes Richardson's Application area?

A. Correct, yes.

Q. When we talk about the protection pillars around a gas well, Mr. Woomer, and the opportunity to drill up to 300 feet of the mine working, and your approval from MSHA to vent the coalbed methane gas, what do you think is going to happen to the gas production out of that gas well once you vent the gas?

A. As we encroach --

Q. Yes, sir.

A. -- to the 300-foot barrier?

Q. Yes, sir.

A. I guess that's kind of out of my area of expertise.

Q. Are you a mining expert by degree?

A. I guess you could say so, yes. I'm not a mining engineer, but --

Q. By degree?

A. Not by degree, no.

Q. Your degree is in forestry?

A. That is correct, I have two degrees in forestry.

Q. Do you hold a degree in oil and gas engineering?
A. No, I don't.
Q. Do you hold a degree in oil and gas geology?
A. No, I don't.
Q. Do you hold a degree in any mining discipline?
A. Only from the land-rehabilitation perspective.
Q. You talked a moment ago about the fact that you had provided Richardson with some of the data on the desorption measurements from San Juan Coal Company's coal core tests?
A. No, we didn't provide that because it wasn't requested. We provided some other data. We provided some lithologic data, as well as coal thickness data, to Mr. Cox.
Q. Am I correct in understanding that that data was provided to Mr. Cox pursuant to potential settlement evaluations of your offer and it was subject to a confidentiality agreement?
A. That is correct, yes.
Q. You're negotiating with Mr. Richardson to purchase these wellbores and to buy what can be agreed upon as the value of the gas to be produced?
A. Yes.
Q. And you're doing that because of the obligations of your coal leases?

A. That's one of the reasons, yes.
Q. Let me take you back to your Exhibit 13.
A. Okay.
Q. When we look at 13, it shows 13 feet of typical coal thickness on there?
A. Yes.
Q. Mr. Hively yesterday was using 14 feet when he was measuring that basal coal that you're mining in?
A. Uh-huh.
Q. Is there an appreciable difference between what you've shown us to be 13 feet and what he had as 14 feet?
A. No, not appreciable.
Q. This longwall mining contraption, how big a coal portion of the seam can it mine?
A. It can mine anywhere from 7 1/2 feet to 13 feet of coal.
Q. All right, so the minimum distance is 7 1/2?
A. Correct.
Q. And so it's capable of being adjusted so that it could take out all this basal coal seam?
A. Up to 13 feet, yes.
Q. Okay. Am I correct in understanding that prior to Mr. Abrahamse coming on board with the Coal Company, the Company's position was to have the methane gas production accelerated by the gas operators in the mine area, such as

Mr. Richardson?

A. That is correct.

Q. And that after Mr. Abrahamse came on board you've changed your position on that and no longer want the additional wells drilled or frac'd in the area we've described?

A. Yes.

Q. Mr. Woomer, is there criteria that you can provide us that demonstrates why you have not taken other portions of the Deep Lease or the Deep Lease Extension and proposed mine districts in those areas?

A. Yes, there are criteria. Would you like me to describe those?

Q. For example, when we look in Section 29, the west half of that section is in Mine District 7. The eastern portion substantially is not to be mined, correct?

A. Can I just look --

Q. You bet.

A. -- at our exhibit real quick? That is correct, yes.

Q. All right. So within your Deep Lease and your Deep Lease Extension, you have excluded portions of the coal that you're not going to mine? Is that because the basal coal is now too shallow to mine using your longwall mining, in terms of thickness?

A. There could be a couple of reasons there --
Q. Tell us what they are.
A. -- Mr. Kellahin. One is that there is a thin zone of coal that extends through the Deep Lease Extension. That thin zone averages somewhere around seven feet of coal. Now, we have committed to mining that coal ultimately, using continuous miners.
The other reason might be that -- you know, that basically what we're seeing here is an adequate plan to mine 100 million tons of coal in order to meet our contractual agreements through 2017.
Q. And to meet those contractual commitments, then, there is a volume of coal that you've calculated that's minable that's satisfied within the seven mine districts?
A. Correct. What I can't say for sure is why we excluded, for instance, the eastern half of Section 29.
Q. All right, sir. Can you tell us why you excluded any other of the lease portions of the Deep Lease or the Deep Lease Extension that are not subject to the mine district currently displayed?
A. Well, I can tell you that this area here, through Section 18, 19, 30, 31 and I believe into Section 32 as well, we have what I refer to as the thin zone. These areas, these -- This is a little exaggerated here in terms of the distance between the mining districts, but we leave

a barrier pillar between our mining districts.

MR. KELLAHIN: Thank you, Mr. Woomer, that concludes my questions.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. You mentioned that the San Juan and the La Plata mines were the only ones that furnished coal to the San Juan Generating Plant --

A. Correct.

Q. -- and that the Navajo Mine does not?

A. No, they don't.

Q. What is the market for the coal from the Navajo Mine?

A. The Navajo coal goes to the APS Four Corners Power Plant.

Q. What distance is that?

A. I believe the power plant is over 20 miles away from the San Juan Generating Station. The mine, the Navajo Mine, is probably greater than 20 miles, 25 miles possibly.

Q. I'm a little confused. Are you saying that it's a shorter distance to the APS than it is to the San Juan from the Navajo Mine?

A. No, no, what I'm saying is that the location of the Navajo Mine to San Juan Mine -- to the San Juan Generating Station, is greater than 20 miles.

Once again, Navajo Mine is a mine-to-mouth operation. So in other words, they haul their coal directly to the generating plant, the Four Corners generating plant. So it's right there immediately adjacent to the mine, to the Navajo Mine.

Q. Okay, and all of their coal is contracted to that power plant?

A. Yes, it is.

Q. There's been some discussion about spontaneous combustion.

A. Yes.

Q. That's not necessarily characteristic of underground mines, though, is it? Doesn't Navajo Mine have a history of spontaneous combustion?

A. Well, yes. As I said, in our feasibility study, our risk-assessment study, we identified spon com as one of the larger hazards. And yes, our coal at San Juan Mine, as well as at Navajo Coal Company, are -- you know, keen on spontaneous combustion. We see that in our stockpiles periodically, as a matter of fact.

Q. Okay. We have a request for the mechanism for spontaneous combustion, whether it's underground or surface mining.

A. The mechanism?

Q. Yes.

A. Well, it's a combination -- and this is, you know, a little bit out of my area, but it's a combination of oxidation and hydration of the coal that results in coal fires.

But I think in terms of specific, you know, details of spontaneous combustion and the reasons behind it, Mr. Abrahamse could answer those questions more thoroughly.

Q. Great, thank you. You characterized the roof of the mine as a shaly sand. You, in fact, even said it was a weak roof because of its lithology.

A. What we do, ma'am, is, we leave behind a couple of feet of coal, which is considered our roof stratum. That's what basically exists in our roof. Above that two feet of coal or so is weakly laminated sand- -- or not sandstones but mudstones and shales.

Q. So wouldn't you have to take precautions anyway, for roof instability?

A. We do. We do take significant precautions to support our roof, as is -- I guess what I'm saying in terms of the hydraulically fractured areas, you know, could we even support the roof, you know, in those areas? It's hard to say, we haven't mined through a fractured area thus far.

Q. Okay, so it's speculative at this point?

A. To a certain degree, yes.

Q. Exhibit 9 talks about the royalties to be paid. Have you applied to the BLM for a coal royalty reduction?

A. Yes, we have.

Q. To what point would that affect the figures that you give here?

A. We have applied for a reduction from 8 percent to 5 percent.

Q. So how much lower would that be here?

A. From 250 million -- You know, without a calculator I couldn't tell you for sure. But I believe what we're estimating is a savings of $70 to $80 million. So possibly $180 million or something like that.

COMMISSIONER LEE: A hundred sixty.

THE WITNESS: A hundred sixty.

Q. (By Commissioner Bailey) You talked very generally about mining through wellbores, and I sit here and I count wellbores, not only in the Fruitland but all the other formations.

A. Yes.

Q. And in fact the figure 71 different wellbores was thrown around yesterday?

A. I believe a figure of 76.

Q. Seventy-six?

A. Yes.

Q. How many of those wellbores do you have rights to?

A. We don't have rights to any of the existing wellbores. The ones that were historically plugged and abandoned, you know, as I said we've actually re-entered those wells and -- three of those wells and plugged and abandoned those, but had to go through an application process with the BLM in order to do that.

Q. So you've only obtained rights to three wellbores within these two areas?

A. That is correct.

Q. And a big question: On state sections you are aware that we lease coalbed methane as part of our oil and gas lease; is that right?

A. Yes, I am aware of that.

Q. Which means that the beneficiaries expect royalty payments for all coalbed methane that's produced from state resources?

A. (Nods)

Q. Are you saying that with venting that San Juan Coal Company expects to do, that no royalties would be paid to the state beneficiary?

A. I guess, ma'am, all I'm saying is that as I understand the existing laws and so forth, we do have the right to vent the gas, you know, as part of our underground mining activities. I'm not saying that we have ownership to the gas, I'm just saying that we do have the right to vent the gas.

Q. Without compensation to the royalty owners?

A. As was indicated earlier, we're attempting to arrive at some sort of reasonable compensation.

COMMISSIONER BAILEY: Those are all the questions I have.

THE WITNESS: Okay, thank you.

EXAMINATION

BY CHAIRMAN WROTENBERY:

Q. I have a few more on some of those same points, and since we were just talking about the venting or the de-gassing as you described it at one point, you indicated that the de-gassing is performed through boreholes; is that right?

A. Yes.

Q. How many of those boreholes do you have now, and where are they located?

A. Right now, ma'am, we've got a total of six gob vent boreholes, and they're located in our Panel 101, which is our first panel that we're currently developing.

Q. Okay, so you have a series of six boreholes along the length of the panel --

A. Correct.

Q. -- is that right?

A. Correct.

Q. And from those six boreholes, you indicated that you're currently producing somewhere between 800,000 and a million cubic feet a day?

A. No, not from the boreholes.

Q. Okay.

A. We're not producing anything from the boreholes, because we haven't intersected any of the boreholes thus far with the longwall operation.

Q. Okay.

A. We've drilled the holes, but they're not currently venting gas.

Q. Okay.

A. The 800,000 to 1 million cubic feet of gas being vented originally was being vented through the entries. It's now being vented through our ventilation shaft.

Q. Okay, and where is your ventilation shaft?

A. The ventilation shaft, if I can just show you on this map here, the ventilation shaft is located right in this area, just about our first panel, Panel 101.

Q. Okay, and by "ventilation shaft", that is a shaft that extends from the mine main to the surface --

A. From the basal coal seam, from the underground workings to the surface, yes.

Q. How big is that shaft?

A. You know, I don't know for sure. Jacques would know, I believe. Yes.

Q. Okay, so the 800,000 to a million cubic feet per day is coming through the ventilation shaft. You anticipate in the future as you mine in District 1 and then in other districts throughout the operation there will be additional gas --

A. I don't know about --

Q. -- ventilated --

A. -- additional gas. You know, it could be that we'll stay within that average range. You know, it's uncertain at this point.

Q. Right, you had said you don't know --

A. Right.

Q. -- what the projected volume would be.

Okay, since we're considering in this case the applicability of the Oil and Gas Act to certain aspects of coal-mining operations, how the Commission should address coal mining under the Oil and Gas Act, have you looked at possible permitting requirements for boreholes that produce gas under the Oil and Gas Act?

A. To the best of my knowledge, I don't believe we've looked into that, no.

Q. At this point you don't have any permits to produce or vent gas through those shafts or boreholes from the state or --

A. Well, we're not actually capturing the gas, as I indicated, because we don't have ownership to the gas. But we do within our -- If you were to look at our underground mine permit application, we do have within the application, within the operations plan portion of the application, an indication that we're going to be using gob vent boreholes to vent the gas out of our gobbed area.

Q. Okay.

A. We also indicate in there, allude to the fact that we are going to be venting gas through our entries and our ventilation shaft.

So basically, we have been permitted, you know, by the State of New Mexico to mine the coal. And according to our operations plan, which has also been approved by Mining and Minerals Division, we have indicated that the gas will be vented.

Q. Okay, I guess what I'm asking you about are requirements under the Oil and Gas Act, since that's --

A. No, we haven't --

Q. -- the subject of this hearing.

A. No, we haven't addressed those --

Q. Are you aware that there are certain regulations relating to the venting of gas? In fact, there are some pretty broad prohibitions on the venting of gas that apply to some operations. I know we're considering here today the extent to which the Oil and Gas applies to the coal-mine operations, but --

A. Yeah, I'm not --

Q. -- have you looked at that issue at all?

A. -- I'm not real familiar with those regulations, no.

Q. And you talked about the questions about the ownership of the gas, and you indicated a couple of times that your understanding is that San Juan Coal Company has the right to vent the gas. What is your understanding of the source of that right, or the basis for that right?

A. Well, you know, that's more or less a legal question. But as I understand, a case between the Southern Ute Tribe and Amoco which was decided upon at the Supreme Court level indicated that, you know, as a matter of course in the process of mining coal underground, we do have the right as a coal mine to vent the gas.

Q. You also made a couple comments about the corrosion concerns and the roof-stability concerns being exacerbated as you've gotten into the mining operations. What did you mean by that? What is it that has exacerbated the concerns since you started the mining operations?

A. Right. Well, I think we knew from the git-go that our roof conditions weren't going to be real good.

But we didn't realize that we were going to have roof falls -- as many roof falls as we have had in just developing our gate roads and our mains. As a result of those roof falls, we've had to enhance our roof-control mechanisms in order to hold that roof up. Jacques Abrahamse, once again, could probably address specific questions about what we've had to do there.

Q. Okay.

A. Probably additional roof-bolting would have to occur, as well as meshing, as well as cribbing and so forth.

On the corrosion side of the issue, as I said, you know, it's a matter of the amount of H_2S that we're encountering, primarily in the water, as we're mining the coal in the coal seam, and a microbial type of activity that's going on with these sulfur-producing bacteria.

And what's happening there is, it's causing a lot of the equipment to corrode more quickly. We're having to replace, for instance, brakes on our vehicles and so forth more readily.

COMMISSIONER LEE: Because you don't have pressure. You don't have the pressure to support the corrosion.

THE WITNESS: Right. Well, one thing that we've also noticed with the corrosion is that our roof bolts actually were falling out of the roof as a result of corrosion.

I'm not sure -- I can't address the issue, Mr. Commissioner, of the pressure.

Q. (By Chairman Wrotenbery) What is cribbing? I understood bolting and meshing, but I didn't understand cribbing.

A. Cribbing is just, you know, basically supporting the roof -- and Jacques can address this a little more thoroughly -- supporting the roof from the floor up, with either wood cribbing or whatever the case might be.

Q. Okay, it's some type of structure that's used to support --

A. That's right.

Q. Okay. And you didn't mention de-watering. We talked a lot about de-gassing, but is de-watering an issue as well for the mining operation?

A. It really hasn't been a major issue thus far.

Q. Okay.

A. And we are pumping water out of the underground mine, but a lot of that water source is just from the sprays on the cutting drums of our continuous miner and our longwall equipment. So we really haven't encountered a significant amount of water underground thus far.

Q. And then back to the plugging of wells, you indicated that you've plugged three wells at this point. Can you identify which wells those are?

A. Well, you know, I don't believe they're on -- Well, yes, they are. Well, one of them is on here anyway. This -- I believe this Federal K 3 well was one of them that we plugged, and there's a couple over in the Fruitland lease, which would be over in here, in this area here.

Q. Okay.

A. And that is mainly the south end of the last panel in the first mining district, Panel 103.

Q. Okay, so --

A. Those wells were abandoned -- were completed back in the early 1960s, in 1963, and they were plugged and abandoned, I believe, in something like 1969.

Q. Okay. So the only one that shows up on this Exhibit A-1 is the New Mexico Federal K 3, and that's in your District 1?

A. That's correct.

Q. Okay. And the other two are to the west?

A. To the west and south of that location, yes.

Q. Okay.

A. One of them actually had to be re-entered, plugged and abandoned because of our pilot mine activities, so that would be further down in this location south of Section 34.

Q. And what did you do when you re-entered those three mines?

A. Well, what we did is --

Q. Well, I'm sorry.

A. Yeah, they -- Basically, we hired a drilling company to re-enter the wells, drilled down through. Apparently there was no casing below 125 feet. They were all Gallup wells. We did -- There was a portion, a lengthy portion of a couple of thousand feet where there was absolutely no casing in the hole, and then there was casing below, obviously, as it progresses through the Gallup seam, or the Gallup formation.

Q. Uh-huh.

A. What they had to do was go down in -- They had to mill out the wellbore. They did encounter some wooden posts and rails and a few other odds and ends in there, and once they milled out the entire wellbore, then we put in an expanding type of bridge plug below the basal coal seam, and then we filled it from bottom to top with the expanding type of cement.

Q. And now that you've done that, the longwall miner will be able to go --

A. Right.

Q. -- straight through that --

A. Only one of the --

Q. -- location?

A. -- three wells are actually in a location where the longwall would be mining.

Q. And that's that --

A. That would be the --

Q. -- Federal K 3?

A. -- K 3, this K 3 well right here.

Q. Okay. And how much did it cost you to do that replugging work?

A. For the three wells it cost us $124,000.

Q. For all three?

A. For all three. There was the one well I said that they encountered a number of things down the hole. As a matter of fact, the second well they encountered -- in the record of abandonment it had indicated they had put 19 sacks of cement down the hole. Well, they found the sacks, but they didn't find the cement. So...

Q. We have an orphan well plugging program, and so we encounter some of the same things.

And the existing wells, you talked a little bit about that with Commissioner Bailey, and I can't remember if you said -- How many of those 76 or so have already been plugged and abandoned?

A. Madame Chairman, I really couldn't tell you for sure. Now, we've plugged the three wells as I've indicated. There's quite a number of wells out there that have been plugged and abandoned. The majority of those wells are either Gallup- or Dakota-formation wells. There's a few PCS wells, as well, that have been plugged and abandoned.

Q. And would it be San Juan Coal Company's plan to plug those wells like it did the Federal K 3?

A. Correct. We would have to re-enter every one of those wells and plug according to the MSHA standards.

Q. And then one last question about the desorption data that San Juan Coal Company has. I understand how the coalbed methane operators use that kind of data. How is it that the coal companies use that kind of data? What would prompt a coal company to collect desorption data? How would they apply it to --

A. You know, I could just answer that generally.

Q. Okay.

A. You know, technically, I think, once again, Mr. Abrahamse could address that, or Mr. Mercier. Generally, you know, it's an analysis that's utilized to determine the amount of methane in the coal, which obviously a concern to us, not from a production side of things but from a safety side of things.

CHAIRMAN WROTENBERY: Okay, thank you.

THE WITNESS: Thanks.

CHAIRMAN WROTENBERY: That's all I had.

Mr. Ausherman?

MR. AUSHERMAN: Short redirect.

REDIRECT EXAMINATION

BY MR. AUSHERMAN:

Q. Mr. Woomer, we've heard testimony that there are 70-some wells in the area of the mine, and 20 of those are actually within the area covered by San Juan Coal Company's coal leases. Did I understand that correctly?

A. Yes, that's correct.

Q. Would you have the need to plug and abandon wells that are outside the area that San Juan Coal Company would mine?

A. No, we wouldn't have that need.

MR. AUSHERMAN: That's all.

CHAIRMAN WROTENBERY: Thank you.

Anything else --

MR. KELLAHIN: Yes.

CHAIRMAN WROTENBERY: -- Mr. Kellahin?

MR. KELLAHIN: I'm confused by the last answer.

RECROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Woomer, when we look at Richardson's Exhibit C-27, by his count he has 71 penetrations of the coal within his Application area. Can you tell us which ones of these wells, in response to Mr. Ausherman's question, you would not have to deal with in terms of plugging those wells?

A. Well, what I can say to address your question, Mr. Kellahin, is that where the wells are outside of that 300-foot area, you know, as far as the location of the wellbore and where we're actively mining, then obviously we don't have to re-enter and plug and abandon that particular well.

So these wells basically that are located within our mining district, certainly we're going to have to deal with those wells. These wells, possibly, over here, some of these other wells in what I called earlier the thin zone, we more than likely won't have to deal with those, as long as they're outside of the 300-foot criteria.

MR. KELLAHIN: Thank you.

CHAIRMAN WROTENBERY: Anything else? Okay, thank you for your testimony --

THE WITNESS: Thank you.

CHAIRMAN WROTENBERY: -- Mr. Woomer.

And let's take a break here.

(Thereupon, a recess was taken at 11:03 a.m.)

(The following proceedings had at 11:20 a.m.)

CHAIRMAN WROTENBERY: Okay, I think we're ready.

MR. AUSHERMAN: Madame Chairman, our next witness is Jacques Abrahamse.

JACQUES F. ABRAHAMSE,

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

DIRECT EXAMINATION

BY MR. AUSHERMAN:

Q. Jacques, would you please state your name and profession?

A. I'm Jacques F. Abrahamse. I'm a mining engineer, and my current position at San Juan Underground is the ventilation engineer.

Q. Mr. Abrahamse, is Exhibit 20 in your exhibit notebook your personal résumé?

A. That is correct.

Q. What are your responsibilities as ventilation engineer for San Juan Underground Mine?

A. Responsibilities include the design and the implementation of ventilation appliances that render noxious and harmful gases -- flammable, noxious and harmful gases -- render them harmless underground, including gas-monitoring processes and systems, and we liaison, obviously, with regulatory bodies like MSHA.

Q. When did you come on board with San Juan Coal Company as its ventilation engineer for the underground mine?

A. I started 9th of July of 2001.

Q. As a ventilation engineer, are you generally familiar with the longwall mining plan and method?

A. Yes, I am.

Q. What underground mining jobs have you held since your graduation? And maybe first start by telling us of your schooling.

A. Okay, I graduated, obviously from the accent, from Australia, from the Wollongong University in New South Wales, in 1987 with a bachelor of mining engineering specializing in -- a bachelor of engineering specializing in mining.

I've since worked as an underground operator for many years, and I joined BHP in the Bowen Basin in the State of Queensland in about 1991 and have been working with BHP ever since then.

My roles have been as a mining engineer in different locations, one year in an open-cut operation and the remainder of my years in underground environments. So most of working life I've worked in underground environments. The operations that I've worked in within BHP have been Norwich Park for one year, 1991 to 1992, at the Moura Number 2 Underground from 1992 to 1996, and then at the Crinum mine operation from 1996 to 2001.

Q. And was that a statutory position?

A. Yes, there were --

Q. Can you describe what a statutory position in Australia consists of?

A. A statutory position involves the compliance with the Coal Mining Act, which is a statutory body governed by the States of Queensland and New South Wales, and it's an official position that you have to have to manage and operate shifts where underground people have to work.

Q. Have you testified before the New Mexico Oil Conservation Division as an expert mining engineer in this proceeding, with expertise in longwall mining and spontaneous combustion?

A. Yes, I have.

MR. AUSHERMAN: We tender Mr. Abrahamse as an expert mining engineer with particular expertise in mine ventilation.

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: We accept his qualifications.

Q. (By Mr. Ausherman) You've heard Mr. Woomer testify this morning generally that San Juan Coal Company seeks to use continuous miners for its gate road development but primarily an underground mine for the -- primarily a longwall mine for the development of the coal panel. Are you familiar with the longwall mining apparatus?

A. Yes, I am.

Q. Would you use Exhibit 12 and go into a bit more detail than Mr. Woomer about the components of the longwall apparatus as an introduction to the animation that we will show?

A. Okay. Just to start off first, the Exhibit Number 12 is the CM, continuous mining unit, and its primary function is to establish roadways or tunnels that are of a dimension of 20 foot wide, nine foot high, and we basically create tunnels, three tunnels in the headgate, which we'll -- in the gate roads, we'll call the headgate and tailgate gate roads, to establish a solid block of coal that is of the dimension 1000 foot long by 10,000 foot -- 1000 foot wide by 10,000 foot long. Obviously we need these tunnels to physically get all these heavy pieces of machinery down to one specific location.

On the longwall itself there are the four major components, as we start from Exhibit Number 12 on the right-hand side. The first component are our longwall shields. Now, those longwall shields are the primary walkway and the primary support for establishing a working environment for operators and for ensuring that the rest of the components are in a safe condition. The reason I say safe condition is because that 1000-foot block -- 1000-

foot-by-10-000-foot block, obviously is a solid structure, and it is a primary support.

Between that solid block, on the other side of the longwall shields is what we call our gob, and basically that is broken roof that falls behind the longwall shields. So the shields are our primary roof support on the longwall face. And in the animation we will actually stop and start the shield motion process to see how they actually work.

Q. Mr. Abrahamse, if you were to depict on that cutaway the location of the gob, where would it be, this part that falls away?

A. Okay, the gob basically will fall behind the back of the longwall shields, basically where the title "Shields" is on Exhibit Number 12. That would be the location of the gob, from there back.

The other components on the longwall equipment is our shearer, and our shearer is basically a big metal box with what we call ranging arms. And on the end of the ranging arms are the cutting drums that cut a meter web, what we call a meter web.

This shearer travels on the AFC, the armored face conveyor, and the armored face conveyor is basically a set of links of chains and flight bars, just metal bars that run parallel to that 1000-foot face.

The AFC actually -- The AFC turns 90 degrees at the head drive, what is indicated on Exhibit Number 12, the head drive on the left-hand side of that diagram, and then the coal is then turned at 90 degrees and is directionally loaded onto the conveyor belt system as the coal heads outby to the surface.

Q. Does that conclude your general orientation of the depiction on the cutaway?

A. That's correct, yes.

Q. Have you brought an animation to show how this machine actually mines through a coal seam?

A. Yes, it helps depict the motion of the longwall shields. It also depicts how the shearer traverses from one side of that thousand-foot block, from one side to the next. It indicates people position and just general techniques.

Now, in the video they talk about two types of longwall mining, one being a retreat longwall mining system -- that is what we employ at San Juan Underground -- and there is an advancing longwall mining system, and it is a technique that has been utilized in the UK because of mining depth conditions. But it's not -- We do not employ that system.

Q. And your presentation is on PowerPoint, is it not?

A. Yes, it is.

Q. Just for the record, the longwall animation that Mr. Abrahamse has put together is in the exhibit notebook at Exhibit 14.

Mr. Abrahamse, would you show the animation now and pause it as appropriate to demonstrate the various aspects of the longwall mining operation?

CD-ROM soundtrack: "The longwall mining system differs from conventional mining in that the coal seam is removed in one operation by means of a long working face or wall, from which the name 'longwall' is derived. The coal is mined in a continuous line, cutting across a coal face which may be several hundred feet in length."

THE WITNESS: I just stopped it at this point to identify, we see the -- towards the left-hand side of the screen, the red circular drum. That is the cutting drum of the shearer, and as you can see it physically takes a slice of the coal and traverses from one side of the block to the next.

As that shearer traverses from one side of the block to the next, the shields that you can see in the corners have been advanced, and as those shields advance, they then create a safe working environment for persons to work on that longwall system.

On the left-hand side you can see the black coal, and it gets turned basically at 90 degrees at the stage loader or at the head drive, and then gets transported all the way out to the surface via conveyor belt.

Beg your pardon?

COMMISSIONER BAILEY: Is that as a slurry or as dry material?

THE WITNESS: Dry material.

COMMISSIONER BAILEY: Okay.

THE WITNESS: Obviously there are water sprays on the shearer itself, so during the cutting process we utilize water for dampening of dust that's generated on the longwall face. And then at the transfer point at the headgate drive there are more water sprays. Again, as coal moves -- when it's turned over it generates dust again, and the water suppression is for dust control.

COMMISSIONER BAILEY: Okay.

CD-ROM soundtrack: "There are two basic systems of longwall mining, the advancing and the retreating systems. In the longwall advancing system of mining, the coal is extracted from a face, starting from a shaft and advancing through the coal deposit toward a boundary or other limit lines.

"In the longwall retreating system, narrow developing headings are driven through to the boundary or limit line of the coal seam, and then the coal is extracted by longwall faces retreating back in the direction of the shaft."

THE WITNESS: As Mr. Woomer had indicated, on Exhibit Number 10, at this stage of the game the District 1 or the 100 series, we are currently in LW-101, LW identified as longwall 101. Mr. Woomer identified that our shaft location are our, you know, east mains, and the direction that the longwall is currently mining is from the southern end of LW-101 and will move from there towards the east mains.

The rationale for utilizing that technique is to ensure that when the coal -- when you mine that coal, that area that becomes the gob remains behind you. In an advancing scenario you have a gob that follows you all the way through, which is not -- it's not the safest way to mine coal. All longwalls that are mined in the US and in Australia utilize the longwall retreat mining systems.

CD-ROM soundtrack: "As the mining machine makes a pass across the face, cutting a width of coal, the pan conveyor and roof supports are advanced immediately be- --"

THE WITNESS: As they just indicated there -- I don't know if we can see, but we can go back if people didn't catch it, but the shields -- the longwall mining cut for San Juan Coal Company cuts to 13 feet. The design of those longwall shields has a maximum stroke length of 14 feet. So to advance the longwall shields, individually each shield has to be released from the roof, pulled forward and then reset. So the reason for cutting a 13-foot roof is that if we go to 14 or beyond, we then do not have the ability to positively set our shield to something above us, we'll have a void above us.

CD-ROM soundtrack: " -- behind it toward the new face. As this happens, a void is left behind the supports. The roof is allowed to collapse or cave in, filling this void."

THE WITNESS: And that is the final picture of what it actually looks like underground where the roof has fallen in behind the longwall shields, and that's a picture taken at what we call the headgate of the longwall and the loose rubble that's left behind.

Q. (By Mr. Ausherman) Mr. Abrahamse, does that conclude the animation?

A. That certainly does.

Q. In the very last section of the video, when the roof collapses, that's known as the gob; is that correct?

A. That is correct, yes.

Q. And that would be the same area as you depicted on the poster "Longwall Face Cut-away" near where the label "Shields" --

A. That is correct.

Q. -- appears?

Mr. Abrahamse, I'd ask you to turn to what is marked as San Juan Exhibit 15 in the witness notebook, if you would. What does this depict?

A. Exhibit Number 15 is just a typical longwall layout that again depicts the shearer on the right-hand side, and then the red self-advancing hydraulic roof supports or what we call the shields.

Q. What are the green things on either side of the coal seam?

A. Okay, the green things on the left-hand side basically indicate coal pillars that have been left. As I indicated previously, the continuous miners -- the first job is for the continuous miners to develop roadway headings, and we have three roadway headings at San Juan Underground, and those -- of centerline dimensions between 150 feet in length and -- but approximately 80 feet in width.

Q. So between the green pillars, the white on the typical longwall layout, which is Exhibit 15, would be the gate road, essentially?

A. Would be called the gate road. If we went underground today, we would be traveling basically in between that white area, yes.

Q. And where is the gob on this depiction?

A. The gob is identified behind the self-advancing hydraulic roof supports.

Q. At San Juan Mine we've heard of the existence of coal stringers and seams above the Number 8 Seam that is the seam the mining company will be mining. Would those fall into the gob, would some of those fall into the gob?

A. The one foot of remaining coal within the 8 Seam, as well as the mudstone and shale roof and the Number 9 seam would be debris in the back of the gob, yes.

Q. Is it important that the longwall mining apparatus move in a systematic way?

A. It's quite a definite dimension of steel segments that have been put together that form, obviously, this 1000-foot-long piece of machinery. Each piece of machinery has to be individually taken underground in segments, one shield at a time, one AFC section at a time, the shearer -- Yes, it's just a whole lot of small pieces -- not small pieces, but a whole lot of large mechanical pieces that have to be put together like a jigsaw, underground in the setup room.

Q. Are continuous miners, that we've seen the picture of, more flexible in their movement than this 1000-foot-wide longwall apparatus?

A. Yes, they are.

Q. Is it important that the longwall apparatus keep moving?

A. Yes, from a geotechnical point of view and from a ventilation point of view, it is critical that the longwall doesn't sit for prolonged periods of time and that you continuously keep in front of abutment loadings that you see on the longwall face.

Q. If you would turn to Exhibit 10, which is the large map on the poster, for orientation between what we've been looking at, which is Exhibit 15 that depicts gate roads, could you show us the gate roads on Exhibit 10?

A. Okay. As the current status is, you can see rectangular pillar -- rectangular blocks, beg your pardon, in HG 101, and rectangular pillars in TG 101. Those are your headgate and tailgate by definition, and those are the coal pillars in the headgate section.

Q. Can you describe what a coal pillar is and what is its purpose in an underground mine such as this one?

A. The coal pillar's primary function is for roof-control measures. We establish a solid block of coal, and it's your primary means of roof support. You open an excavation that is between 19 and 20 foot wide, and the load is then transferred from one coal pillar to the next. We obviously, then, put supplementary support in the form of roof bolts to secure that opening even further.

Q. Are coal pillars also involved in your ventilation system to help establish seals to control the movement of gases?

A. That is correct, yes, they are.

Q. You heard Mr. Woomer testify about the risk of spontaneous combustion in the mine. As a ventilation engineer, how do your responsibilities relate to potential for spontaneous combustion in the mine?

A. Identifying in the project, initially identified the risk of spontaneous combustion, a technique that is well utilized in Australia as well as some mines in the western districts of the United States. The role of controlling air flow into gob areas that have loose coal within themselves, that management of that process is the spontaneous combustion event that we need to -- that I have to be mindful of, and the process to do that is to remove oxygen and air flow to as large a degree as possible, utilizing these coal pillars and also seals in between the coal pillars.

Q. In a moment I'll ask you how you accomplish that as a ventilation engineer. But before we get there, I'd like for you to explain the elements of spontaneous combustion. In previous testimony, you used the analogy of a fire triangle to do so.

A. Yes. As Mr. Woomer had indicated, spontaneous combustion is an oxidizing process that is related to coal. It has many factors that contribute to an actual spontaneous combustion event occurring, the least -- sort of the least serious casing being when we've developed first workings, the headings and the gate roads, we have oxygen basically being -- we have coal being oxidized by the oxygen that is in those headings. That is the most simple case. Just like rust, metal and rust.

The worst-case scenario is that we have loose coal that is located underground, and it actually has gone past its own latent temperature and actually sustains its own ignition source and basically is the formation of burning of coal.

From an open-cut point of view we see that very clearly in the San Juan area and the Navajo Mine area, where coal that is being uncovered by draglines and that has been spoiled by the draglines onto the spoil heaps, a little bit of moisture, a lot of aeration, and that coal will burn on the stockpiles, and also -- on the spoil piles and also stockpiles, coal stockpiles.

Q. Mr. Abrahamse, could you describe the three legs of the fire triangle with reference to what each leg would constitute at the San Juan Underground Mine?

A. Okay. Part of the process for management of spontaneous combustion underground, I used the analogy in the last hearing of this fire triangle: your source, your fuel and then obviously your oxygen, okay, to complete that fire triangle.

The process that I have to require to minimize the effects of spon com underground is to eliminate that oxygen component from the gob. The fuel basically being coal that has come from the upper seams, and also methane that we have underground, your fuel being -- you know, once it starts generating it can live on itself, the coal that's there, and the oxygen component of that triangle.

By managing that triangle by eliminating oxygen, I control that fire triangle for a spontaneous-combustion-prone mine.

Q. Do you have concerns about spontaneous combustion at the San Juan Underground Mine?

A. Yes, prior to me coming on board, the project feasibility evaluation identified it as their number-one risk.

Q. Are there concerns that you and others at San Juan Mine have about spontaneous combustion, based upon principles that are well established in science and industry?

A. Yes, they are.

Q. Do the concerns arise, at least in part, from instances in other underground mines where spontaneous combustion has caused mine fire?

A. Yes. The western districts of the United States have within the last five years rated the occurrences of fires in the western districts as being -- have really woken up the industry in the States to better understand the techniques and systems that can be utilized to manage mine fires and spontaneous combustion events in this end of the world.

The eastern end of the States does not have the same characteristic coal. Even though they do have, and they have had, mine fires, the relationship to spontaneous combustion events are not as well documented as such.

In Australia we -- it is in the Bowen Basin, which is identified as a spontaneous-combustion-prone region, the methods that we are employing at San Juan are the methods that they employ in that region.

Q. If you were to assess the extent to which a particular coal deposit were prone to spontaneous combustion, I take it from your testimony that there would be a number of factors that could influence whether a given coal seam is more or less prone to spontaneous combustion than another; is that correct?

A. That is correct.

Q. What would those factors include?

A. There are numerous what I call cherries that need to be aligned to give a final result of coal burning underground, and they are dependent on things like the rank of the coal.

A lower-ranked coal has a higher propensity to burn, to spontaneous combustion.

If you leave a lot of loose material, loose coal material, in areas -- whether they be behind your seals, whether it be in the gob -- by exposing a greater percentage of surface area of coal, that is another factor that affects spontaneous combustion.

The dryness of the coal is another factor. If you have a coal that has been dried significantly, it then leads to this potential for greater friability, greater looseness, and therefore also enhance the potential for spontaneous combustion.

Q. So if you compare those different factors -- or cherries, if you will -- to the particular coal seam we're talking about at the San Juan Mine, San Juan Underground Mine, how would you characterize the San Juan Underground Mine with respect to whether it's prone to spontaneous combustion?

A. It has been identified as being a coal that is liable to -- that is prone to spontaneous combustion. And like I said, it is evident in the coal stockpiles that they have at the generating plant. It's been evident in the open-cut mining processes where the draglines have uncovered coal, because they're light as well.

Q. Is it more prone to spontaneous combustion than eastern coals, generally?
A. Yes.
Q. Is it more prone to spontaneous combustion than most western coals?
A. Because of its location, being at the bottom end of the Basin -- it is difficult to categorize everything in the west, but it has a higher propensity to be affected by spontaneous combustion.
Q. What areas of the mine are most prone to spontaneous combustion?
A. The major area of concern is obviously our gob.
Q. Now, spontaneous combustion exists at surface as well, as you testified?
A. That's right.
Q. Is it as of great a concern at a surface mine as it is an underground mine?
A. No, it's just a lot more accessible, and it's just located within fresh air.
Q. Well, it's easier to control in a surface mine than it is --
A. That's right.
Q. So you've talked about the control with ventilation and the importance of seals as one element of the tools you have to control the fire triangle in a way to

prevent spontaneous combustion.

Is the introduction of gases such as nitrogen another factor that enables you as a ventilation engineer to try to control spontaneous-combustion risk?

A. That is correct. As the project was developed -- It was critically identified as, obviously, the number-one risk factor in the early stages of the project. And to assist me in my job, we are the first underground coal mine in the United States to have on tap, if you can call it that, nitrogen, 99.95-percent nitrogen gas, and we have that pumped into behind the seals to try to reduce the amount of oxygen in our gob area at all times.

We also have another system, what we call a tube bundle system, a system that I brought over from Australia. It is a requirement in Australia to have a monitoring system that can go to remote places and that does not require power in an underground environment to analyze gases. And between those two systems, as well as the development of seal construction, that's how we are going to manage the spontaneous combustion events underground.

Q. And this ventilation system has been presented to MSHA, has it not?

A. Yes, what we call the bleederless mining ventilation system has been approved by MSHA. We are the second coal mine in the United States to incorporate this design, and there are two other mines that are in line to go through the approval process for a bleederless mining system.

Q. I'd like to ask you in a second, what is a bleederless mining system? But let me follow up on one question about MSHA before I get there.

There was testimony this morning about whether MSHA was aware of problems for spontaneous combustion posed by frac'ing of the wells in the San Juan Mine area. To your knowledge, has the company briefed MSHA on that potential problem?

A. Last year we actually briefed the BLM initially before we had sought any approval for the bleederless system at San Juan. I was aware that the BLM had discussions with the Denver MSHA office, the Division 9 Denver office, so they are aware of the proceedings.

San Juan has not officially addressed it with MSHA. And the reason for that is, the longwall bleederless mining system only has just been approved, but it is approved for the initial district, the Longwall 100 District area. And this is obviously up for review on an annual basis. And as we do not have any oil wells within the District Number 1, there was a three-year period, obviously, before that had to be addressed. And hopefully these proceedings will assist us before we get to that stage.

Q. Okay. Now, Mr. Abrahamse, can you give us the basics of a bleederless ventilation system? How does it work?

A. Very simply, the word "bleeder" and "bleederless" clarifies what is actually happening to the ventilation.

In the East, most -- 99 percent of the underground operations utilize a bleeder system. And the bleeder system means that air is forced to the longwall face, and that air is then bled through the gob to a fan that takes it to the surface. The reason for that is so that it actually reduces the methane content within the gob and takes it to the shaft and out the shaft. That's -- In the most simplest terms, that's what a bleeder system is.

A bleederless system employs the technique where we do not bleed air through our gob, and that is done by construction of the seals in the gate roads so that the air comes into the longwall face, goes across the longwall face and back out to the shaft. It doesn't go through the gob.

So by doing that, that assists me in ensuring that I do not dilute the oxygen -- or increase the oxygen content, which is part of the spontaneous-combustion management system.

Q. Now, we will come back to the bleederless system with a diagram that will allow you to show that in greater detail, specifically with respect to the problems that a frac can impose. But with that introduction alone, just as a simple background, simply stated, what is the goal of the bleederless ventilation system?

A. The goal is to reduce the oxygen content behind the longwall face and create an inert atmosphere behind there so that it does not sustain a potential heating. And that can be greater than 25-percent methane, you know, to create an inert atmosphere, or if we get to a stage where you get a lot more nitrogen in there. But the idea is to remove the oxygen content from the gob area.

Q. Is that important to prevent mine fires?

A. That is correct.

Q. Is a mine fire the ultimate result of spontaneous combustion, or could be?

A. It is the first stage, and the ultimate is if you have high levels of methane in your gob to an explosion.

Q. And then explosion, then, could cause a mine fire?

A. The explosion will close the pit, yes, close the mine.

Q. Could the explosion or the mine fire cause problems for coalbed methane wells in the vicinity of the fire or explosion?

A. It could, yes, very much so.

Q. Could it cause problems for San Juan Generating Station?

A. It would cause a lot of problems for San Juan Generating Station.

Q. Is that because it could render not viable San Juan's sole coal supply?

A. Yes, that's correct.

MR. AUSHERMAN: Madame, Chairman, the next step of the direct examination would be to go through the effect of coalbed methane wells on the risk of spontaneous combustion. I'd be happy to do that now, if you'd like. It's noon --

CHAIRMAN WROTENBERY: This would be a good time for lunch --

MR. AUSHERMAN: Okay.

CHAIRMAN WROTENBERY: -- I think. So should we get back together at 1:30 like we did yesterday? Okay, that's good.

(Thereupon, noon recess was taken at 12:00 noon.)

(The following proceedings had at 1:36 p.m.)

CHAIRMAN WROTENBERY: Okay, whenever you're ready.

Q. (By Mr. Ausherman) Mr. Abrahamse, beginning again after lunch, we were just to the point before lunch that I was about to ask you about the effect of coalbed methane wells on the risk of spontaneous combustion.

Is the spontaneous combustion risk at the San Juan Underground Mine influenced by the existence of coalbed methane wells in the coal seam?

A. Yes, it is my belief that it is, yes.

Q. And how is it influenced by those wells?

A. There are three -- two or -- two factors. As Mr. Woomer had indicated previously, on arrival at San Juan we had identified that -- what we would identify as relatively weak roof in our overlying stratas. To combat that, in the 14-foot-high seam, on the first -- on the main heading developments, we would not cut to that 13-foot or 14-foot horizon, we would only actually cut to 9 to 10 foot. This effectively left a more secure beam across our 20-foot roadways.

So the first point was, we had identified that we have weak roof. And during the process of the mining of headgates it became evident that we have a weaker roof structure than people have anticipated, resulting in -- what? We have five falls within a period of less than a year.

So the effects of understanding that on primary development we have this weak roof, by having coal -- by having CBM wells located within our workings, by fracturing that component of your upper strata would lead to potentially more damage and weaker structure and also weaker roofs, by introducing water into shales and also mudstone roof. That was one concern.

And the second concern obviously has to do with once we frac our coal seam, to some degree we deteriorate the coal pillars in our headings where we need to place our seals. It deteriorates the potential credibility of those seals.

Q. Have you prepared a diagram today showing how frac'ing of the Number 8 Seam could cause risk for the longwall mining process?

A. Yes, I have.

Q. Looking on the postern, the enlargement of San Juan Coal Company Exhibit 16, do you recognize that?

A. Yes, I do.

Q. What is it?

A. It is a cartoon depiction of what our cross-section -- sectional area between the Number 8 and the Number 9 seam, identifying a number of laminated mudstone shales, siltstone factors.

It also identifies in a cartoon configuration -- understanding that there are no dimensions on this, it is just to depict a potential zone or potential area -- the red line on the left-hand side indicates a cased well, and the potential zones of -- if the Number 8 coal seam is fractured.

We also have indicated on the right-hand side, behind the longwall shield, zone 1 and zone 2. And those two zones are important zones in understanding -- for two reasons: understanding the formation of our gob in two specific zone types, and then also the -- basically the transferring, potential transferring of a load from behind the gob in front of the longwall face.

Q. Just a few questions about the schematic nature of the diagram, that it's not to scale. Fracs are depicted by cross-hatched lenses in red on the left side of the diagram by the wellbore, correct?

A. That is correct, yes.

Q. Are those fracs to scale?

A. No, no, it's just a cartoon diagram to give some appreciation, potential appreciation.

Q. Fracs would -- If you were to look at the dimension above, 9-foot mudstone, 3-foot coal/shale, and apply that dimension to the fracs, you would be much too small?

A. That is correct. Yes, that is correct. There is an indication on one of those zones, a hydrofrac distribution, typical type, and it's estimated between 100- to 400-foot regions. Which direction has the oil industry in a major debate as well. We will find out.

Q. Using that diagram, could you list for us the problems for spontaneous combustion that frac'ing presents?

A. Okay. As I have indicated before, understand the zone 1 and zone 2 that's identified on the right-hand side, as the longwall retreats -- when I say retreat, it's retreating towards the east main, so those shields are moving from the right-hand side to the left-hand side on the -- sorry, on Exhibit Number 16.

As the wall progresses, you have an initial gob zone 1 fall. As you can see behind you, there are -- behind the shields are basically step configurations as you go up into the higher stratas. The zone 2 is basically a second-stage fall behind the shields to give maximum subsidence on the surface and also maximum compaction in your gob.

Now, as the shields move closer to that potentially disturbed well casing, the load that gets transferred from the gob area, you can see there's a cantilevering action on the upper stratas above the shields. This cantilevering action transfers loads in front of the shields in your coal. If those hached zones are disturbed to a great degree in the upper strata, then this could potentially lead to the roof falling out in front of the shields.

If this occurs -- and when I initially identified cherries -- that is not enough to create a spontaneous-combustion event. But the results of the roof falling to a higher height than 14 feet means that now the shields are unable to physically push from floor to something above them, because there's nothing above the shields to push up against, which therefore stops the longwall operation from being able to be advanced through that process.

In the longwall industry the action, the course of action, is to cavity-fill the voids above the shields. Now, this process takes a number of days. And during that period of time, that is when we have the loose coal in the gob. The longwall is stationary for a number of days, and potentially for a number of weeks, and if it is not rectified fairly soon, that longwall piece of machinery sits there, and then we just keep fanning the coal that is behind the gob.

So that is what would lead to a potential spontaneous-combustion event occurring behind the longwall.

Q. In addition to roof falls, do fracs inhibit your ability to maintain seals in other parts of the mine?

A. Yes, as indicated previously, if we frac the coal then what we are doing is potentially creating leakage paths through the coal seam, and those leakage paths that allow air to pass through small cracks, once we've passed it, is also a typical example of a potential spontaneous-combustion event occurring, because now the coal is drier, we have these open paths for air to flow through, and if you create a very tight seal to minimize or to actually reduce the oxygen behind -- in the gob, you've effectively created another problem for allowing air to escape or travel through the coal seam itself that has been fractured.

Q. You talked about roof stability and its effect on mine safety, Mr. Abrahamse. Would you turn to Exhibit 17 in the witness notebook? It's a photograph. Do you recognize that?

A. Certainly do.

Q. What is it?

A. It is a -- what we would call a heading in one of the gate roads.

Q. What does it demonstrate about roof conditions?

A. Okay, what we can se on both sides of the heading, we have what we call rock props, and those rock props are providing additional support to what looks like a potential beam failure. As you can see, the roof is sagging and cracking on the left-hand side of the heading.

Q. Now, this roof condition is unaffected by any coalbed methane well. It's sagging on its own; is that correct?

A. That is correct.

Q. Is that because the roof conditions naturally in the mine are relatively instable?

A. It is an example of an area of instability from a geotechnical point of view, yes.

Q. Now, this depicts roof support that you use as a matter of course for the gate roads that you can see on the upper part of the gate road in this picture; is that correct?

A. That is correct.

Q. Mr. Abrahamse, I'd ask you to turn to Exhibit Number 19 in the exhibit book. Can you describe what this is and what it depicts?

A. Okay, this is an area --

Q. I'm sorry, I believe that's 18. The exhibit that we've just -- that we looked at showing the sagging roof condition was 18, and we're now at Exhibit -- Exhibit Number 17 showed the sagging roof conditions, and I'm now asking you to look at the picture which is San Juan Coal Company Exhibit 18, I'm sorry.

A. Okay, this is a photo of the aftermath of an area that exhibited signs like we saw in Exhibit Number 17, that has fallen, has been cleaned up and has been resupported.

On Exhibit Number 17 you can see on our driveage we install roof bolts, eight-foot roof bolts, with wire mesh to prevent what we call fretting of roof, just little bits of roof falling through the mats.

Then we have what we call monster mats or beams, and in Number 18 at the top of the page, Exhibit Number 18 at the top of the page, you can see again a mesh strap with your monster mats and your roof bolts. And then it turns up into the cavity that was formed in that particular fall.

Q. Does it take more time and money and operational effort to shore up a roof after conditions such as those depicted in Exhibit 18 occur than a normal roof condition?

A. Yes, it certainly does.

Q. And you can see that in the upper part of Exhibit 18 by the extent of support that exists in the caved-in area?

A. That is correct.

Q. Is this the only area of the mine that has experienced cave-ins so far?

A. No, as I've indicated we actually have -- if we talk to reference in Item Number 10, we have had five conditions similar to that within the HG-101 and the TG-101 areas.

Q. How could hydrofrac'ing affect roof stability?

A. Well, one of the major issues with the hydrofrac'ing process is the introduction of water, water gels, sands, basically solutions into the coal seam or the Pictured Cliffs or wherever, to stimulate the frac'ing process.

With having a geology of overlying strata made up of siltstones, mudstones and shales that are affected by water, those components would actually deteriorate the condition of our upper stratas and actually reduce the compressive strengths of those rocks.

One of the techniques in our bolting action is that we use what we call a dry drilling process. When we install bolts we use a vacuum system so we don't introduce water into the upper stratas, and this has helped significantly in the process of when we mine. Like I said, by adding the hydrofrac'ing process into such areas only deteriorates the roof to a greater degree.

Q. Does the effect of hydrofrac'ing linger in the coal seam even after a well is plugged and abandoned?

A. Yes, it does.

Q. The fracs are there forever?

A. They are there forever.

Q. Could roof instability cause the longwall miner to stop?

A. Yes, as indicated previously that's the initial result of failure in front of the shields.

Q. And that's what you described before about inhibiting your ability to manage the components of the fire triangle?

A. That is correct.

Q. Now yesterday Mr. Cox introduced an exhibit which he did not offer and which he testified he has no expertise. It was Exhibit C-28. I hand you a copy of that.

Mr. Abrahamse, have you reviewed that particular report before it was introduced yesterday?

A. Yes, I have.

Q. And in what context did you review that report?

A. On informing the BLM last year sometime when we did them, part of the request from the BLM was to conduct a literature search on the potential effects of stimulated hydrofrac'ing in coal-mine operations. This might not be the -- Mr. Richardson might have had this himself, but this was a document that we submitted to the BLM as part of our literature search.

Q. What are your views about whether its conclusions should diminish or allay San Juan Coal Company's concerns about roof instability?

A. It's not site-specific to us, and that's the most important issue out of taking this report and putting it into context of where we are at.

Q. What mines are listed in the data that contributed to that report?

A. Okay, in the introduction it identifies 22 government-sponsored treatment gas-bearing coalbed studies. Twenty-one of the 22 were conducted in the eastern United States, which exhibit a very different type of coal, a very different type of roof -- potentially, roof lithology. There is one that was conducted in Utah, which is in the western districts, you know, to try to give an overall picture.

What is important out of this particular paper was in the abstract, the second sentence from the bottom, it actually identified that "Penetration of strata overlying coalbeds was observed in nearly half of the treatments intercepted..." Okay?

Now, understanding that, and putting that in context with the situation we have, that is really one of our main issues, understanding those two factors.

Q. Mr. Abrahamse, is the coal at the San Juan Underground Mine more susceptible to roof fall than eastern coals?

A. It's hard to generalize to the fullest extent. You can say that one area is better than the next in the eastern -- In the eastern coalfields they do have what we call "shitty roof". Excuse the expression, but -- and that is part of your mining. Part of going underground is being able to cope with poor roof conditions.

What we have found here, and we have had geotechnical persons from the United States identify that we have what we call a very soft roof condition for the United States overall, and we're doing quite a bit of extensive work in identifying techniques to understand our soft roof nature and how to manage it properly.

In that regard, we are a little bit different to -- we are different to the eastern coalfields. This is very similar roof that I have experienced in the Bowen Basin where the roof -- and at Crinum and down in the western area of the Bowen Basin, it had very soft roof as per what we have at San Juan.

Q. And the Bowen Basin is the area you testified about in Australia; is that correct?

A. That is correct, yes.

In the paper too, it just -- it identifies where there were areas of instability. It's on page 164. Excuse me, I'm just -- It identifies evidence of deterioration where areas have been stressed, you know. And that's not astounding news; I mean, that's just a fact of life. Where you have areas of highly stressed roof, whether it be due to jointing, faults, dikes, and you introduce a stimulant like a frac well in those areas, it's great for coal -- for CBM production, but from an underground point of view it can be a nightmare.

Q. Mr. Abrahamse, I'd ask you to turn to Exhibit 19 in the witness book, and I have an enlargement of that here. Before we touched on the effect of hydrofracturing on the ventilation system's ability to control gases, you said we'd come back to that in a bit greater detail with a diagram. What does this exhibit show?

A. This is a blown-up version of the longwall face line. In the middle of the longwall block you can see rectangles, and those rectangles indicate the actual shields. We have 178 shields on that longwall face, each being roughly 5.5 feet wide.

This also depicts on the HG-101 side, behind the shields, a number of seals that we install in the crosscuts on both sides of what we call the Longwall 101 gob area.

Q. For the record, what do the shields look like? Are they the bars with the little dots next to them?

A. No, the seals --

Q. Or the seals, rather, I'm sorry?

A. Yes, beg your pardon, the seals in the headgate are identified by a thick black line with five circular dots on either side of that black line.

This diagram also indicates what we call the ventilation circuit of the mining face, and the blue arrows indicate fresh air that comes into that longwall area, and the red arrow with the two arrowheads indicates what we call the return air, the air that has been exposed to dust, to gases, and it's on its way out to the fan.

Q. What do the red target-shaped depictions on the gate road to the right illustrate?

A. The red target areas are from our last hearing here in Santa Fe. It was basically to identify that if we had areas that were frac'd in our gate road headings, the potential effect that they would have on the integrity of our seals. Keep in mind that, like I had indicated before, the seals are our primary method to ensure that we don't get air coming from the intake side and going across the back of the gob to the longwall return where the two red arrows are.

If you have these areas -- if you have the seals in the tailgate area compromised to any degree, then the air that comes into the beginning of that longwall face will actually find its way to the areas that are disturbed, that are not sealed off properly.

So the idea is, if you create very good barriers all the way up in your longwall gate roads on both sides, you actually keep that air at the right spot, which is along the face line, underneath the shields.

Q. Mr. Abrahamse, we heard this morning from Lynn Woomer a little bit about the quantification of this ventilation gas as it exits the mine. Mr. Woomer said that over time historically, it had averaged 800,000 to a million MCF a day, but Mr. Kellahin alluded to a number that as of today MSHA might have taken a higher daily reading. Are you -- And I believe the number that Mr. Kellahin referred to was over 2 million.

Are you aware of a higher number, and can there be spikes in the amount of methane that is produced from the ventilation system?

A. To do that, the data recording system that MSHA have, they can come in, and they do spot samples in the return. So what we do need from Mr. Kellahin is to clearly identify a time frame, the date that that was taken, where it was taken, to be able to validate that information, and then on that particular day to identify what was actually occurring on that particular event at that time frame.

It's a little bit hard to -- At this stage, as we speak today -- or not today, as of Saturday, Saturday morning, we were liberating, when not mining, around the 800,000 CFM a day, and that represents about .1 of a percent of methane coming up the fan shaft. When the longwall was running we were somewhere between .1 and .2 percent methane coming up the shaft.

And that is a requirement from MSHA, to ensure that we dilute any noxious and harmful gases in the mine.

Q. That's MCF, was the measure?

A. Sorry?

Q. The measure of the methane was MCF?
A. Cubic feet per day.
Q. Cubic feet per day.
A. Sorry, what did I say?
Q. Next, if you could, I'd like to follow up --
A. Just to put that in context -- sorry, sorry, sir -- understanding that that quantity of methane -- the topic has risen its head -- is air that comes into the mine workings through the portals and then traverses approximately 14 miles of roadways --
Q. If you could --
A. -- before it gets to the shaft.
Q. -- illustrate, Mr. Abrahamse, the length of roadway -- you spoke of the extent of the effective venting -- on Exhibit Number 10, please.
A. Sorry, beg your pardon. On Exhibit Number 10, on the left-hand side of the exhibit we have a note called the north portals. Air is actually sucked into those north portals, the five portal areas -- excuse me, the four portal areas -- and travels into the mine, travels south down headgate HG-101 to the longwall face, across the 1000-foot-long wall face, and then travels out the three headings, all the way back up TG-101 to where the shaft is located, approximately 500 feet from the beginning of TG-101.

So that methane concentration encompasses that entire district of the mine, if that -- Does that make sense?

Q. Mr. Abrahamse, does MSHA have certain percentages of methane concentrations in the vent gas that they require?

A. They do. Under MSHA Part 75, if you have more than 1-percent methane at a coal-working face, work is to stop and work is required to rectify that problem. And the problem is rectified by running curtains or putting in extra auxiliary fans to dilute that.

Q. Have you considered whether dewatering of gas wells in the coal seam can affect mining risk?

A. Yes, I have. And as I have indicated before, it is one of the cherries. By dewatering process -- if we refer back to Exhibit Number 19, if we de-gas a section of the coal seam where the coal pillars are an integral part of the seal procedure, then we create an area that has dried out the sand or whatever other medium is used in the hydrofrac'ing process. If it is actually pumped into the coal, then it creates additional leakage paths.

The drying-out process makes coal a little bit more brittle and, as Mr. Cox had indicated yesterday, a little bit more -- opens up the cleat spacing in those areas. So a drying-out process does not assist -- is one of the factors that does not assist a spontaneous-combustion prone seam.

Q. So the drier the coal, all other things being equal, the more susceptible it would be to spontaneous combustion?

A. That is correct, yes.

Q. Is there any different level of risk posed by frac'ing a new well on the one hand, as compared with frac'ing a recompleted well, as a ventilation engineer?

A. No, they're all a problem to me. They will all be some type of problem.

Q. Now, the Coal Company has put exploration holes into the coal seam, have they not?

A. That is correct.

Q. Do those exploration holes pose a risk of spontaneous combustion?

A. No, part of the procedure for exploration holes is, when they are completed they are filled from bottom to top.

Q. Does the risk to the San Juan Underground Mine increase as more wells in the mine are frac'd?

A. It will do, yes.

MR. AUSHERMAN: I move the introduction of San Juan Exhibits 14 through 20.

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: Okay, San Juan Coal Company Exhibits 14 through -- 20 did you say?

MR. AUSHERMAN: Yes. Oh, I had --

CHAIRMAN WROTENBERY: -- through 20 are admitted into evidence.

MR. AUSHERMAN: And I had one other question, just following up on this morning.

CHAIRMAN WROTENBERY: Okay.

Q. (By Mr. Ausherman) From the point of view of a mining engineer, what is the basis for MSHA's requiring the 300-foot barrier around active wellbores?

A. I don't know specifically. Coal-mining acts have always been written after something terrible has happened, most of the laws have.

I do not know specifically when that rule was made or its total or -- you know, encompassing all of the effects for coming to that reasoning. But my understanding is that the dimension that has been put into the Act is really for the absolute safeguard of the people that are underground.

In many occasions wells that have been put in from the surface most probably haven't been cased. If you are an underground operator mining to a potential hazard the issues that the MSHA body would have been faced -- well, where the heck are the holes? They might know where they are on the surface, but where they are underground is an unknown. Were they fully cased, or were they uncased?

So from -- Like I said, I don't know exactly, but the way the mining engineers are, would think, you're establishing a barrier, whatever that barrier is. It's got nothing to do with roof control, it's more about ensuring safety of persons.

The incident in Pennsylvania where miners were flooded out is a classic example. If you don't have legislation like that in place and a miner -- mining company mines towards a potential known zone, well then they're putting their miners at risk.

If that area is frac'd, then depending on the frac material and process that was used, those could lead between 100 and 400 feet in diameter of that zone. So if you're mining towards that zone, if you've got gas going up a well and you intersect the fissures where the fracture has occurred, well then you potentially could get gas that's going up the hole, instead of going up, going into the mine workings.

So from a mining engineering point of view, that's where I think they were coming from.

MR. AUSHERMAN: Thank you, madame Chair.

CHAIRMAN WROTENBERY: Thank you. Mr. Kellahin?

MR. KELLAHIN: Yes, ma'am.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Abrahamse, let's talk about where we are now with the MSHA regulations. Am I correct in understanding that the safety issues that you're attempting to address today are resolved pursuant to MSHA regulations by leaving a coal pillar that has a radius of 300 feet around that gas well?

A. That is as per the regulations, yes, sir, a rectangular pillar. I mean, we have to leave a pillar, you know.

Q. I understand you're working with equipment that forms a square --

A. That's right.

Q. -- but in general terms --

A. In general terms, yes, sir.

Q. So that's correct, that's the purpose of those rules and regulations, is safety?

A. Is safety of underground personnel, yes, sir.

Q. Are there roof-stability issues without having coal gas wells in the area?

A. Yes.

Q. Are there spontaneous-combustion issues in a coal mine, in the absence of having coal gas wells?

A. Yes.

Q. Are the coals that you mine naturally fractured?
A. Coal formations have natural cleats.
Q. Okay.
A. It's not fractured, though.
Q. When MSHA developed its regulations using this 300-foot distance, they were taking into consideration not only roof stability but spontaneous-combustion issues as well?
A. I'd like to think they did, but with the current standard of U.S. legislation and MSHA knowledge about spon com I don't think it was part of that equation.
Q. Let's find a place where you're comfortable. When we talk about the existence of the gas well and the fact that it's there, MSHA for its safety regulations have given you a 300-foot setback distance. Have you studied hydraulic fracturing techniques that the oil and gas industry utilizes to enhance methane recovery from coal reservoirs like this?
A. Not in great depth, but I have a general understanding.
Q. Are you degreed in any of the oil and gas disciplines?
A. No, I'm not.
Q. Have you expressed to MSHA your concerns that the 300-foot distance is not enough to protect the mine from

wellbores in the coal that have been fracture-stimulated?

A. We have not officially written to MSHA to identify the location of gas wells and its problem. The Denver office have been approached by the BLM in the Farmington office, and they are aware of it, they are aware of these proceedings.

Q. And you have approached the BLM office in Farmington about your concerns about fracturing of coal gas wells in your area?

A. We did that last year, yes.

Q. Did you describe to the BLM the distance that you felt would be necessary to be set back from a coal gas well that had been artificially fracture-stimulated in the coal?

A. It wouldn't be in my expertise to identify that, and I don't think it's in the oil industry -- they are not aware of the extent and the planes that they effectively are able to reach. It's a real guess.

Q. In order to study the concern you have about the fracture length of these hydraulic fractures introduced by the gas operator into the coal, have you retained any experts in the gas industry to make calculations for you about fracture lengths?

A. We do have gentlemen in the back that have assisted us with generic ideas. We have spoken to Burlington Resources about ideas on what their information is, but they were none the wiser themselves.

Q. You've illustrated on one of your displays here, this cartoon, that you have an area of influence around a gas well that has been fractured in the coal, and you give us an approximate distance of 400 feet. Is that a radius from the wellbore out to the mine working, this 400 number?

A. Sorry, that particular notation on that just identifies the oil and gas drill hole at 400 feet, plus or minus. Like I said, it's a cartoon, it's a cartoon indicator. That's the actual hole depth.

Q. All right, so on Exhibit 16, this first 200 number on the upper portion of the display is the depth of that hole, that oil and gas well, into the coal?

A. Where we are at the moment from a mining depth, we are at a depth of approximately 480 feet.

Q. Okay.

A. And that was all that notation was there for.

Q. I understand. So if this coal well is fractured in the coal, you have approximated for us a distance of 100 to 400 feet of horizontal fracture impact?

A. With an estimate at the back, that's right.

Q. Well, I'm happy to put a question mark at the end. Do you want to make the 400 bigger, or is 400 good enough to give you a protection zone from a gas well that's been frac'd?

A. It is something that the oil industry don't know themselves, so it's very difficult for a coal industry that does not information on the effects of a well in that area.

Q. If I'm like you and I'm going to be underground in this environment, wouldn't you expect to have you and others find out for your own safety how far away I have to set back from a hazard that may be created by the fracturing of that coal gas well?

A. I daresay in time we will identify that.

Q. So is the 400-number setback too big or too small?

A. That's beyond me at this stage of the game.

Q. Should it be 800 feet?

A. Like I said, it's beyond me at this stage of the game.

Q. How far is far enough? How far is far enough?

A. That's a technical aspect that hasn't been addressed yet.

Q. Well, see, I'm not a ventilation expert in coal, Mr. Abrahamse, and I'm trying to figure out why, if you have your mine districts in the gray, you're protesting Mr. Richardson's opportunity two miles away to fracture the coal artificially with his frac treatments?

A. Yeah, I understand these proceedings are to be an absolute -- There's an absolute condition on it. That's where we are at this stage, as of today.

Q. Okay. Is Mr. Richardson, over in Section 4, far away enough from the mine plan not to pose a risk of having spontaneous-combustion or roof-stability issues in your area of your mine district?

A. I mean, I understand your line of questioning, sir, but at this stage the hearing is for total infill spacing, to not allow total infill spacing for the Application. I understand where you're coming from.

Q. Sure. If we're outside the Application area in the Twin Peaks area, the second row -- column of sections east of that line, are these wells far enough away from the mine operations not to pose a risk if they're fracture-stimulated in the coal?

A. Well the ones that you had indicated in Section 27 and 28 will be in our zones of mining. Is that correct?

Q. You're telling me in Section 27 --

A. The Twin Peaks area.

Q. -- this is in your forecasted Twin Peaks area; is that right?

A. That's right, yes.

Q. Do you understand the Division has already allowed whoever operates the oil and gas interest in Section 28 to have four Fruitland Coal gas wells in that section and that they might be perforated, completed and frac'd?

A. I do understand that.

Q. Is that far enough away not to pose a risk to you?

A. Same reasoning, sir.

Q. I'm trying to find your reason. Is there a reason to have a certain minimum distance, and what is that reason?

A. Technically, I'm not able to answer you on the exact distance.

Q. Mr. Abrahamse, let me direct your attention to your Exhibit 10. When I look at Exhibit 10, can you find the locations on that display that will identify the points of measurement of the methane that's being vented from the mine?

A. As I indicated before, it is the entire mining area that is indicated in the green, to where you can see coal rectangles or coal pillars, starting from the north portal on the north portal notation on the right-hand side, to the bottom of the longwall face, which is in the bottom of Section 35, and back up to the shaft.

Q. At what point does that methane escape into the atmosphere?

A. It escapes into the atmosphere -- It's difficult to identify a clear location, but if you -- for generality, between HG-101 and TG-101, in the east mains, in the middle, for the record.

Q. Is that the only point at which the gas is being vented from the mining operations into the atmosphere?

A. That is correct. There's that shaft. There is also another fan that is located in the pilot mine, which is at the bottom end of Section 34, and that set of workings is under care of maintenance and is not producing any methane at all.

Q. Is that fan system you just described connected to the ventilation system we started with?

A. That is correct, sir.

Q. So the point of discharge into the atmosphere for that fan, once it's working or if it does work, would still be the same discharge point?

A. Oh, no, sorry. There are two fans that are operational at the mine, one being the very first point that I indicated. The second is at -- you know, like I said, at the bottom of Section 34.

Q. So there's two points of measurement there?

A. There are two points of measurement --

Q. We have two points of measurement?

A. -- as we stand today, yes.

Q. Does San Juan Coal Company monitor or measure the volume of methane discharged at each of those two points?

A. Yes, we do.

Q. How do you do that?

A. There's two methods of doing that. On a weekly basis we will take what we call a bag sample, and that bag sample is gas collected in a silvery -- a silver bag anyway, and it goes away for analysis, to come back with a gas content.

Q. Okay. Unlike a gas well in the coal that would take the gas to the surface and run that volume of gas through a meter, you're making the estimate of the volume of methane discharged from the mine based upon a sampling protocol?

A. That is correct.

Q. How often do you sample the coal?

A. In the --

Q. I'm sorry, sample the methane discharged by the coal mine?

A. As we've started mining with the main fans, on a weekly basis.

Q. And is that a measurement taken by San Juan Coal?

A. That is correct.

Q. Does MSHA have representatives that take samples, that make their own studies and calculations?

A. They do, yes.

Q. Are your numbers reported to MSHA on a quarterly basis?

A. Not at all, no. Not that I'm aware of, no.

Q. How often do you report those numbers?

A. I don't think we report them at all.

Q. I didn't think so either.

A. No.

Q. You don't report it?

A. No.

Q. MSHA maintains their own system of sampling, and they determine for themselves the level of methane being vented on a daily basis, using some protocol to measure and figure out the volume?

A. Daily would be an overexaggeration. That's what I indicated, that particular number that you obtained, I'd be very interested to see on what particular day that that sample was taken, so we could try to correlate what sort of mining activities were occurring, what time frame, you know.

Q. Do you know Mr. Ed Ventner of MSHA in the Aztec office?

A. I know him well, yes.

Q. And what does he do?

A. He's the MSHA inspector for San Juan Coal Company.

Q. And Mr. Ventner would be in a position to have the MSHA samples and the protocol and the numbers on what the volume is of methane being vented from the mine?

A. That is correct.

Q. If you're taking these samples, how do you make the calculation to give us a daily average in MCF per gas [*sic*] being vented? You're talking about 800 to a million a day. How do you get that number?

A. Okay, there's two -- Like I said, we would do bag samples on a weekly basis just to correlate, to ensure that our monitors are picking up the same gas content as what we call the AMS system, atmospheric monitoring system, will pick up, and those are instantaneous readings that we have as well.

We also have a tube bundle that would take a sample on a half-hourly basis at the top of the shaft, and we have a number of those points underground as well.

Q. Has San Juan Coal Company made any proposals to MSHA to change their setback or their safety footages around the gas wells?

A. No, we have not addressed that issue in our ventilation plan.

Q. Is there a procedure available to you at MSHA where you can address your concerns about the safety distance to stay back from a gas well in the coal?

A. It's upon amendment of our ventilation plan. If we produce evidence that that is a potential hazard we can make amendments as -- or apply for amendments to MSHA as we see fit.

Q. When was the last time that was done, Mr. Abrahamse?

A. The latest amendment to the ventilation plan was approved by MSHA beginning of October for the bleederless system for longwall mining.

Q. This was October of last year?

A. This year.

Q. This year.

A. Just gone.

Q. It just happened?

A. Just happened.

Q. So in October of last year when you come on staff -- I think it was the 9th of August you came on duty with San Juan Coal, and by the 30th of August they have identified in correspondence to the BLM that there are concerns about spontaneous combustion, roof stability. You're on board at that point, and the information in that letter is derived from you and your recommendations about ventilation and safety?

A. That is correct.

Q. Did you recommend to your company that a safety distance of 300 foot around that gas wellbore was sufficient to satisfy your concerns as a ventilation expert?

A. Well, at that stage of the game we were hoping to resolve this issue, so we did not know.

Q. All right, 14 months later when you go back to MSHA and get these latest changes, have you told them within that 14-month period that you have further concerns about safety caused by these gas wells being --

A. They are very aware of our proceedings that we are in today. In the first district for the next three years, in the 100 panel area, LW-101, -102 and -103, all risks have been mitigated for gas wells in that area.

Q. Okay, let's look at the map and see how they've been mitigated. Let me show you Richardson Exhibit 1-A. At this point, we're talking about District 1?

A. 1 only.

Q. 1 only, and the mitigation that's occurred is this gas well down here in the south has been acquired by the Coal Company, and you've gone in there and taken the necessary remedial work so that you can now longwall mine that district?

A. That is correct.

Q. When you get to District 2 with your longwall mining, what are you going to do about the existing coalbed gas methane well that Mr. Richardson has down in the southeast quarter of that mine district?

A. Hopefully, we'll have this little issue resolved.

Q. And how do you propose that? We're going to do it with money, right?

A. That's what it is.

Q. If you'll acquire all of Mr. Richardson's wells that adversely affect the mine district, he's out of the way insofar as you can now mine these districts without having the interference of these wells that are trying to produce the coal gas?

A. That is right.

Q. Do you have plans for drilling -- or extracting the coal from the balance of either lease area that we're seeing on this display?

A. Sorry?

Q. Within the Deep Lease and the Deep Lease Extension, there are portions of that lease that are not in proposed district areas.

A. I understand your question again, sir, but as --

Q. All right.

A. -- back where we are today.

Q. So why have you omitted portions of the Deep Lease and the Deep Lease Extension from mining districts?

A. Sorry, I've missed that one.

Q. Let's try it again. In Section 29, Mine District

7 is only part of Section 29. Why have you excluded the eastern part of the section?

A. Mr. Mercier will be able to fill you in on more exact details of seam lensing, what we call seam lensing. He'll be able to identify what the thin zone consists of, and basically, as Mr. Woomer had indicated, those are areas that were identified to supply our contractual arrangements with the San Juan Company, the generating plant.

Q. If Mr. Richardson's wells in the mine district are acquired by you and you're allowed to resolve or terminate the wellbores, do you think it's going to be necessary for you also to acquire the balance of Mr. Richardson's wells in the coal within his Application area?

A. Well, I think that's a legal argument at the end of the day.

Q. I'm looking at safety issues, mine safety issues. Are you telling me it's going to be necessary to acquire the wells adjacent to the mine districts in order to satisfy your concerns about safety?

A. If that -- From a technical aspect, if we are not going to be mining in those areas, then there is no need. But as we stand today, we're in a situation where we have an Application before the hearing, and that's where we are.

Q. I don't know how any of this gets resolved, but --

A. I don't know --

Q. -- let me ask you this: If you've acquired the wells in the mine districts, then those wells outside the mine district, if I understand, do not pose a safety risk that you see as a ventilation expert?

A. No, it would not indicate a ventilation risk.

Q. If you acquire Mr. Richardson's wells, how are you going to resolve with that that there are 20 other wells that have penetrated the coal, that currently exist within the seven mine districts? What are you going to do?

A. I'd say there's a bit of hard work ahead of us, isn't there?

Q. How are you going to go about managing that workload?

A. If you're talking about job security, I think someone's got to do it, haven't they?

Q. Well, what jobs should you and I look for then?

A. I know where I'll be.

Q. I never know.

When we look at the 20 wells in the mine districts under the mine safety ventilation concept, it's going to be necessary for you to acquire the ownership of those wellbores from whoever may own them, correct?

A. Correct assumption.

Q. In addition, you're going to have to do something about the fact that San Juan Coal does not own the coalbed methane gas?

A. That is correct.

Q. What is the effect of the injection of nitrogen in the gob on the coalbed methane?

A. It's like a ventilation engineer on narcotics. It's a lifesaver from a spon-com point of view.

Q. So the idea is, you inject nitrogen into the gob?

A. That is correct.

Q. You're trying to displace the potential for oxygen --

A. That is correct?

A. -- saturation in the area? Maybe that's the wrong word.

A. Wrong -- Air consists of 80-percent nitrogen.

Q. And by increasing the nitrogen level of the air --

A. Yes.

Q. -- you can reduce the effects of spontaneous combustion?

A. That's correct, yes.

Q. What effect does the nitrogen injection in the coal gas have on the methane?

A. It's not a linear relationship. In the exercises that we have done, we still have a -- once you have a decrease in your oxygen content, you still have a potential increase in your methane. Part of our management plan process is to ensure that when we go through what we call the explosive ranges of gas concentrations, that people will be evacuated. And we just had an exercise three days ago where people were out of the mine for a period of just less than two days while we inertized a specific area.

Q. If you're introducing nitrogen into the mine, are you affecting -- How is that gas injection affecting the coal gas well? Is that well going to be producing the nitrogen as well as the methane?

A. The coal gas well -- are you making reference to the gob vent boreholes?

Q. No, I'm talking about the operator, Richardson's well that is perforated, in fact, in the coal. He's producing the methane.

A. If his well is in the middle of our gob, then we've resolved this little issue, haven't we? And we've mined through it.

Q. So that's the only way the nitrogen can get into the gas well? You're not introducing nitrogen into the coal system in such a way it could then subsequently be produced by Mr. Richardson's well?

A. No, if we were in the unfortunate circumstance of having to leave 600-foot longwall blocks, then that well would not be affected.

MR. KELLAHIN: Thank you, madame Chairman.

CHAIRMAN WROTENBERY: Thank you.

Commissioner Lee?

EXAMINATION

BY COMMISSIONER LEE:

Q. What's cribbing?

A. Creeping?

Q. Yes.

CHAIRMAN WROTENBERY: Cribbing.

THE WITNESS: Cribbing. In Exhibit Number -- It's a form of secondary support. There are a lot of ways you can -- when you have poor roof and you have an expansion of 20 feet and the roof is sagging, what you do is, you place a secondary support, a passive support as we call it, in those areas. One way -- And basically it is a support from floor to roof, to stop the roof from continuing to come down.

Cribbing is the use of timber, timber cogs, sleepers, like a sleeper, and you basically set it up like the kids' blocks, and you build a square of timber from the roof to the floor, and that acts as a passive support.

Q. (By Commissioner Lee) What is the nitrogen content you're circulating?

A. Injecting?

Q. Yes.

A. The injection -- at this stage the analysis of samples that have been taken have been 99.95-percent nitrogen.

Q. Oh, so you have a separator, the membrane operation on the surface?

A. Yes, there is a separate -- We actually have nitrogen gas -- a pipeline from -- Sorry, Lynn?

MR. WOOMER: Western Gas.

THE WITNESS: Western Gas, sorry, from Western Gas, that is in Kirtland, and they pipe -- We have a pipeline that pumps nitrogen to the surface facilities and then down a borehole all the way to the longwall.

Q. (By Commissioner Lee) So how are your personnel down there --

A. Sorry?

Q. How's your personnel?

A. The pressure?

Q. Personnel --

A. Oh.

Q. -- down there? You don't have enough oxygen there.

A. No, one of the beauties about inertization processes, in Australia we have a number of systems. One is the use of liquid nitrogen, and that has only been used in the case of major emergencies, what they call Tomlinson boilers, they basically -- jet engines, or engines that produce gases like CO, CO_2, other hydrocarbons and a low oxygen content, and they pump that underground to make things inert.

Another system is CO_2, the use of CO_2 as a gas. But because CO_2 is a heavy gas, if you've got a seam that's on an angle, wherever you place it, it will run down to the lower spot.

The use of nitrogen, because it's the largest component of air, it's a good gas to use for inertization, for displacement of oxygen. Only where we have the -- if I can describe on this exhibit, on the longwall face we will have points of injection through the seals into the gob, at least two seals behind the longwall face. The idea is to make sure that this area behind -- because you have air -- if you can imagine these great hunks of metal sitting side by side, they don't fit flush, there are gaps, right, for the entire thousand-foot face.

So as we put air into that point, you have some air go across the back of the gob. So by injecting in the points behind the longwall face, we have the ability to inertize this area and nitrogen to flow to that point.

From a monitoring point of view on what we call the tailgate shield we have a methane sensor, an oxygen sensor and an H_2S sensor. As part of the statutory requirements by the face foreman, they will make sure that they have sufficient air across the face, that they do continuous measurements with, and they have meters that identify potential oxygen-deficiency areas.

If we had used CO_2, because the seam dips in that direction, so the CO_2 would go straight down there. Nitrogen, being a general-body gas, doesn't have that tendency.

COMMISSIONER LEE: No questions.

EXAMINATION

BY CHAIRMAN WROTENBERY:

Q. Just a follow-up question to that. What is the content of the gas at the point that it's vented?

A. What is the quality of the --

Q. Yeah, how much nitrogen, how much methane?

A. It's predominantly fresh air, but you have constitutions of a bit of methane in -- because of the mine workings. You could get a little bit of CO_2, although we produce very, very little. At this -- There's naturally .03 percent in air. We don't produce very much CO_2 from our coal seam.

The only other thing that we do produce is CO, carbon monoxide. We have about three to four parts as a general-body carbon monoxide level in our mine, and it is a function of the coal oxidation process.

CHAIRMAN WROTENBERY: Did you have some questions? I have a few more.

COMMISSIONER BAILEY: No, go ahead.

Q. (By Chairman Wrotenbery) Okay. Can you talk a little bit about the seals and how those are --

A. -- constructed?

Q. -- built? Yes.

A. There are -- MSHA have a wide range of construction techniques for seal-building. We employ predominantly two methods. The first method is, we use solid ash blocks -- sorry, concrete blocks, and we build two walls roughly 18 inches apart, and those walls -- in between the two walls it contains gravel. And as we construct it we'll place gravel between the wall and then put what we call a rock-lock material, and a rock-lock material is basically like a two-component glue system, so -- and build that up for the entire width of the heading. So that's 20 foot by 10 foot high. That's one type of seal, and it's called a Micon 550 seal.

The second seal that we are currently installing is called a Tech Seal, and it is a cementaceous product that is basically pumped between two frames, and it ranges from five foot wide to seven foot wide. There are criteria for seal construction that are directed to us from MSHA.

There are half a dozen different type of seal constructions, but those are the two that we are employing at San Juan Underground.

Q. And you construct these seals just behind the miner --

A. The longwall --

Q. -- as it passes --

A. No, no, we actually --

Q. -- or when do you construct the seal?

A. Say for example, in Exhibit Number 19, when the longwall -- the tip, the front end of the longwall shield, what we call the tip of the shield -- enters that crosscut, we will have done all the prep work in the form of passive support, the structure, the form work on each side, and that seal has to be constructed before the back of the shields goes through that crosscut.

Q. Okay, so on this diagram that should be sealed by now, probably?

A. In the process of being built.

Q. Or in the process of --

A. Yes, in the --

Q. Okay.

A. -- process of being built, yes.

Q. Okay. And you expressed concern about the effect of hydraulic fracturing of coalbed methane wells on your seals?

A. In the seal side, yes, in the gate roads.

Q. In the gate roads?

A. Yes. Now, the depiction there was just on the tailgate. But the headgate, headgate 101, the same rationale applies to that.

Q. Okay, so it's not that the hydraulic fracturing has an adverse effect on the seals themselves, but it may have an adverse effect on the --

A. -- the surrounding --

Q. -- the surrounding rock, and --

A. It's like a foundation, you know. If you build a house on a weak foundation you potentially -- You line your cherries up, that's what you're doing. You've given yourself an extra cherry on your tote machine.

Q. Okay. And then I just wanted to clarify for the roof-stability issue. Where exactly is it that the roof collapses is a primary concern? And you've talked about this to some extent, but I'm not sure I followed all the discussion. And where I'm having a little bit of difficulty is, the mine is designed for the roof to collapse behind --

A. Behind --

Q. -- the miner?

A. Behind the longwall, yes.

Q. Yes. So could you summarize again --
A. Yes.
Q. -- where it is that the collapse creates --
A. -- a problem?
Q. -- a safety problem --
A. Yes.
Q. -- or any other kind of operational problem?
A. It has to do with the transferring of load, your bending moment of your strata to the face in front of you.

As I indicated before, when we talk about -- Sorry, referring to Exhibit Number 16, if you can look at the -- and again it's a cartoon arrangement but the engineering principles are exactly the same.

Behind the longwall shield your roof breaks away into your first gob area. As that shield moves further away from that initial Zone 1 cave, you get a further failure behind that zone. And that Zone 2 is a total function on the type of roof material that you have, the depth that you mine at, and the consistency of that material. Okay? If you have a material that's got a very high bulking factor, then that height in those zones will change.

But what doesn't change is the fact that this support, the top of the shield, is supporting a load that goes back that way. So you actually have a cantilevering effect on your shield.

Now, as we explained previously, the reason -- in your heading developments your coal pillars are your -- are primary roof support. It's your -- you know, your bearings on your arch for your support. So your shield and your coal are your two points of support, okay, to carry this load that transfers back to that point, okay, at an angle to the top of that...

If we get to this zone where the well is located, and depending on the nature of the frac that was conducted, depending on the extent of the damage in the upper stratas, depending how much we've degraded this material, when the shield gets close to that area and we exert that same bending moment across onto the solid coal, which isn't solid anymore, we then create a potential cavity, a roof fall, in that area.

Q. Okay. And in this scenario, you are assuming that the fractures extend outside of the coalbed --

A. Yes.

Q. -- and into the shale and mudstones and the coalbed?

A. I'll be honest, that's a major assumption on our behalf. The literature that Mr. Cox presented, that's why I highlighted that point, that in half of the cases there was some penetration into the upper stratas, depending on the geology of each of those locations, I am saying that for our case, with a whole other mudstone and shale, that we potentially will exacerbate our problems by introducing those cracks into that area, which will then have water that goes into it, which will make that -- which will give it a weaker compressive strength.

Q. So you think that the fractures would be propagated into the shales and mudstones?

A. There's a good chance of that. To what extent, I wouldn't be able to hold my hand on my heart and say it goes up 10 feet or 15 feet, but to the fact that it will propagate to those areas and give us weaker roof, yeah.

Q. Also I had a question, in your prior work in Australia, did you do any coal mining work in a coalbed-methane producing area?

A. No, I didn't, no.

Q. Okay.

A. There is work that -- in the conference that we went to in Denver last year, CBM development is going very strong --

Q. In Australia?

A. -- in Australia, in the Bowen Basin area. But as most of the coalbed methane projects -- and they are touching on the same issues of oil and gas versus coal. It's, you know, different locations, same --

Q. Same --

A. -- problem.

Q. Okay.

A. The availability of areas where CBM is occurring is in more fractured zones, more steeply dipping zones in some cases, in some cases deeper zones where Australian coal mines don't have to go to at the moment. And so in all the cases in our literature search that we looked at, I drew a blank everywhere to try to correlate hydrofrac'ing cases in softer bearing stratas and correlate coal mining activities with that.

Q. And then Mr. Woomer had talked about some work that was currently being done to evaluate the potential to recovery the methane. Have you been involved in that work at all?

A. There is work that's -- At this stage of the game, no, I've been very much operations-driven. But there is a whole lot of work that is still ongoing at the moment, investigative work. I personally have been involved in methane drainage projects, underground methane drainage processes like -- as part of my previous lives, and so I will obviously have input into it on how we want to conduct ourselves underground, but it's all technical at the moment.

Q. What kind of methane drainage work have you been involved in, in the past?

A. At the Moura mine we inseam-drilled, what we call inseams. You actually went underground and you drilled in the coal in advance of mining units.

Q. I'm just trying to relate that to what I know. Is that some type of horizontal drilling or --

A. Purely horizontal drilling from inseam operation, from and underground perspective, yes.

Q. Okay.

A. There are a host of -- The Denver conference identified a host of alternatives that are out there. We just haven't evaluated, you know, what we want to do and what system is available and who's available. At the end of the day, no one will touch us with a ten-foot pole until we resolve this, you know?

Q. Okay, and then one last thing. You had stated a couple of times that you understood that this Application was an all-or-nothing kind of issue.

A. Yeah.

Q. If I were to tell you that the Commission has quite a bit of discretion to fashion an order that addresses the Application in whole or in part or in different ways, would that affect at all your comments about the wells in the area outside of the --

A. Yes --

Q. -- mining districts?

A. -- it most certainly would, yeah.

Q. So do I understand correctly that from the standpoint of the spontaneous-combustion concerns and the roof-stability concerns, that your primary focus is the wells within the mining districts?

A. That is correct, yes.

CHAIRMAN WROTENBERY: Thank you.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. Referring to the exhibit that you have up on the easel --

A. Yes.

Q. -- can we assume that there's also Zones 3, 4, 5, 6, on up to the surface? And what is the subsidence potential?

A. Okay, the subsidence is approximately 80 percent. It's been deemed engineering-studywise to be about 80 percent of the recovery of coal that we take out from the seam.

If we were back at site, we most probably would be able to give you a really good idea, because we've actually mined 150 -- 160, say, foot from the startoff of the longwall. So again -- Yeah, so you would drop the seam roughly 80 -- you drop the surface roughly 80 percent of the coal thickness that you remove.

Q. And you're removing that 13 feet, right?

A. Yes.

Q. Okay.

A. To validate that, you actually need to get -- we need to go and do -- The face is 1000 foot long. The first real numbers that we could identify -- We have survey locations above this Longwall 101 panel. When we reach what we call the square, a thousand foot -- Once we've advanced a thousand foot and we have a thousand-foot face, that will give us the most correct subsidence levels that we will see at the San Juan area. It is very typically dependent on the bulking factor of the overlying strata, you know.

Q. Logically, in my mind, the faster that your milling machine can eat through the face of the coal wall, the better the business for you?

A. The better the business for the ventilation engineer to inertize his gob, yes.

Q. That means the faster the coal is produced, the better for San Juan Coal Company?

A. No. No, San Juan Coal Company has got a very funny arrangement. Its contract for the generating plant is very definite to tons of coal produced for a given time frame. It is not like anything I've ever worked for. You are correct when you say the faster we cut coal, the more coal that gets on the surface, the more we sell -- In every real world that I have lived in, that's been the case.

San Juan's agreement with the generating power station is totally different. They have identified a set amount of coal they want on an annual basis, nothing more, nothing less.

Q. So there's no advantage for the coalbed to be fractured, making it easier to mill through?

A. Sorry?

Q. Because I'm more familiar with the drilling rate going through coal --

A. Right.

Q. -- than chewing it horizontally, the rate of penetration in a fractured coal is going to be very much different from the rate of penetration of an unfractured bed. So logically I was trying to find whether there would be an advantage to San Juan Coal Company to be milling through a fractured bed. Am I completely off base?

A. No, the situation that would arise, that if we had ownership of well and we removed the well casing, as the ventilation engineer I would identify that zone as being a critical zone. Okay?

In that critical zone we would then clearly identify a maintenance time frame and clearly identify a coal-cutting time frame so that we would move through that particular area in a timely manner.

The same applies for any geological structures that you have. If you go through a geological structure that goes across a thousand-foot face, the worst thing you can do is stop, have a drink, wait a couple of days and start again. You know, from a geological point of view that's putting yourself in a vulnerable position.

So again, from a risk-management process you would want to move through that particular zone, if the well is removed, and go through that area, so that you wouldn't have this abutment load cantilevering in that particular area, creating a weakness above your shields.

Q. Just so I get it very clear in my notes, you mentioned that 800,000 to a million MCF per day of methane is being ventilated. But yet we've also heard that .1, .2 percent of the ventilated air is methane. So is it a million MCF per day of methane or a million MCF per day of the gas mixture that's being ventilated?

A. The calculation is the quantity of air that comes up the shaft times your -- and we measure that in feet per minute. So you multiply that by 60, multiply that by 24 and multiply that by your percentage that you are recording at that time of methane coming out the mine, and that's --

Q. Okay, so the bottom line is 800,000 to a million

MCF per day of methane?

A. Of methane.

Q. And no taxes and no royalties are being paid on this?

A. No, it is my understanding that that's part of the MSHA requirement to ensure that you dilute any noxious and harmful gases out of coal mining.

CHAIRMAN WROTENBERY: Just to clarify, I think the testimony was 800,000 to a million cubic feet per day, rather than 800,000 to a million MCF.

THE WITNESS: Oh, sorry. Yes, cubic feet. And like I said, you know, that encompasses -- that's the entire 14 miles of headings at 20 feet by 9 feet, you know? So you're looking at a perimeter -- Because we leave coal in the roof, a little bit in the floor and also your walls, your entire mine entry, what you see in Exhibit 17, has a dimension of 20 foot across, 9 foot down, 20 foot on the floor and 9 foot up, you know. So you're looking at -- what? That's 58 feet of exposed perimeter, times 14 miles, you know.

Q. (By Commissioner Bailey) So most of this methane that's being vented is from Section 35?

A. No, that's what I'm saying, that --

Q. I'd like to hear a specific section or sections that contribute to the --

A. Well, the sections would be where the actual markings are of our coal mine at the moment.

So it's the very bottom half -- the bottom line between 22 and 27 -- It gets very messy, but it's where the workings are on your Exhibit Number 10. That constitutes, you know, approximately 14 miles of heading. So it's, you know --

Q. Okay, primarily from Sections 26 and 35?

A. 26 and 35, yes.

COMMISSIONER BAILEY: Okay, thank you.

CHAIRMAN WROTENBERY: Anything further?

MR. AUSHERMAN: I just have one point of clarification.

FURTHER EXAMINATION

BY MR. AUSHERMAN:

Q. Commissioner Lee had asked you some questions about the safety of the air for the people working in the environment underground.

Do miners working in the area of the face wear individual monitoring devices?

A. They most certainly do, yes.

Q. Do those monitoring devices monitor for different kinds of gases?

A. Oh, yes. Yes, they measure one unit, our industrial scientific unit measures for four gases, your oxygen, methane, CO and H_2S, and then we have other individual units that just monitor H_2S for -- because we have that in our seam, we have MSHA specifications on limits that we're allowed to mine in.

MR. AUSHERMAN: That's all, ma'am.

CHAIRMAN WROTENBERY: Mr. Kellahin, did you have anything else for Mr. Abrahamse?

MR. KELLAHIN: Nothing further, thank you.

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

THE WITNESS: Thank you.

CHAIRMAN WROTENBERY: And I think it's just about time to take a break, but could we talk just a little bit about scheduling?

MR. AUSHERMAN: Yes.

CHAIRMAN WROTENBERY: How does it look at this point, and what should be our plan for the rest of the day?

MR. BRUCE: The next two witnesses are a geologist -- an engineer and a geologist, and they will, combined, be fairly brief.

I don't know if we will get through two of them today or maybe all three. Our final witness is our reservoir engineer, and I think it would be wise to wait until tomorrow morning for him.

CHAIRMAN WROTENBERY: Okay. Well, let's take a ten-minute break then.

(Thereupon, a recess was taken at 3:10 p.m.)

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

JOHN M. MERCIER,

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

DIRECT EXAMINATION

BY MR. BRUCE:

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

A. My name is John M. Mercier.

Q. Could you spell your last name for the court reporter?

A. M-e-r-c-i-e-r.

Q. Where do you reside?

A. I live in Farmington, New Mexico.

Q. Who do you work for and in what capacity?

A. I work for the San Juan Coal Company, and I'm a senior mine geologist for the underground mine.

Q. What are your duties at the San Juan Underground Mine?

A. Basically, I manage the geologic program. I'm involved with data acquisition, drilling programs, data correlation, modeling work with safety and operations and I gather geologic information, document geologic features underground, mapping and things like that. I try to relay that information to the safety and operations people and try to work -- or build predictive maps of hazardous conditions or geologic features in advance of mining.

Q. Have you previously testified before the Oil Conservation Division or the Commission?

A. No, I have not.

Q. Could you summarize your educational and employment background for the Commissioners?

A. I have a bachelor of science in geology from the University of Redlands in California, and I have a master's in geology from Washington State University.

Basically my professional experience, I have worked for a variety of consulting and engineering companies. Starting in about 1975 I worked for Resources Company and Kaiser Engineers on the Kaiparowits Plateau Coal Project. From there I consulted for some utilities, Utah Power and Light, specifically, from 1976 to 1978; worked for an international rock mechanics firm, Seegmiller International, from 1978 to 1980; and worked for Getty Mining Company from 1980 until Texaco took it over, and then that moved it to Cyprus Minerals and into RAG Mining Company until November of 2000. Since that point I've worked for Norwest Consulting or Norwest Engineers in Salt Lake City for a period of months, and most recently for RAG.

Q. When did you become employed by San Juan Coal Company?

A. In the latter part of August, 2001.

Q. Okay. And does San Juan Exhibit 21 contain your résumé?

A. It does not. That's about a year and a half out of date there.

Q. Okay, it's not your current résumé, it was your prior one?

A. Right.

Q. It omits your BHP or San Juan Coal Company experience?

A. Yes, it does.

Q. Okay. And are you familiar with the coal geology involving the San Juan Underground Mine?

A. Over the past 14 months I've become familiar with that, yes.

MR. BRUCE: Madame Chair, I'd tender Mr. Mercier as an expert geologist with a specialization in coal geology.

CHAIRMAN WROTENBERY: Any objection, Mr. Kellahin?

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: We find him so qualified.

Q. (By Mr. Bruce) Mr. Mercier, could you first identify San Juan Coal Company Exhibit 29 for the Commissioners?

A. Okay, that is a report I generated from the Coal Company, San Juan Coal Company's geologic database. And in that I was trying to summarize the -- in our database, the total coal thicknesses that we have noted from all our drill holes. We have approximately -- We have over 400 drill holes we're using for a database. And in there I've also noted the thickness of the lower Fruitland Coal, which we're calling the Minable 8 Seam here. And so the middle column, entitled Total Coal, shows the total thickness that we would have in the Fruitland formation, that we've noted.

Q. Okay. Now, the minable 8 Seam is what is sometimes referred to as the basal coal?

A. Right. Actually, there is a bit more coal thickness in the 8 Seam. The minable, we have identified for computer modeling as the -- The coal seam is built up of a series of benches. Maybe I should digress a little bit here.

Q. Oh, sure.

A. As a coal mining geologist, we focus on the detail in the seams of interest. We look for the detail because small changes in thickness or quality have big impacts on underground operations. So we have broken the seam down into five plies or benches. Each one of those benches are separated by a volcanic episode or a series of episodes. So we have 8-1 on the bottom to 8-5 on top.

And also there is a rider seam, or another separate, thinner seam that is in part connected to the main 8 Seam and can get up to 15 feet or more above the seam, and that may have been included in what Richardson identifies as the upper Fruitland Coals, so...

Q. Okay. Now, you were here during Mr. Hively's testimony, were you not?

A. Yes, I was.

Q. And he used well logs to measure his thicknesses?

A. Right.

Q. And as a matter of course -- You look at it a little bit differently than Mr. Hively does?

A. Yes, we do.

Q. And as a matter of course, do coal geologists usually look at these drill holes and cores that they take when determining what is minable?

A. Yes, we do. In part, where we don't have company data, we've gone out and acquired the oil and gas logs, and in those cases I've identified basic -- you know, as closely as possible, the seam thickness from those logs. They're not the logs that we would typically use in our exploration programs. And our -- We've also gathered information from USGS drilling programs and any other source that we could.

Typically for the Coal Company, or San Juan Coal Company, we would drill a hole down to above the coal seams of interest and then core that zone. And the reason for that is to gather samples for coal quality, for strength testing, for gas desorption, for quality parameters, you know, which is part of a typical program.

And then we would geophysically log the hole. And some of the geophysical curves would be gamma, bulk density or compensated density so we can really tie the thickness and the character of the seam, especially in areas where, if we didn't get complete core recovery, we could get much closer on coal thickness. We also run the curves slower, so the curve has more time to adjust, and we get a tighter control on thicknesses and things like that. We also run neutron in some cases, sonic resistivity and caliper. All of them are important to define the character of the coal seam.

Q. Now, it's fair to say that your interpretation of the minable coal or the Seam 8 coal is probably more conservative than Mr. Hively's?

A. Yes. One thing here in the report I've generated, my database identifies coal, volcanic ash bands, shales -- you know, it breaks it out. So this is probably quite conservative. I'm giving coal only there. The seam itself could be a couple -- or a foot and a half thicker if I add the ash-band zones in.

Q. If you take the total -- not what you call minable 8 Seam coal, but the whole Seam 8 coal, is there an average ash content in the coal?

A. Okay, just -- The total coal designation, that includes all of the rider coals in the section and the 9 Seam or the upper Fruitland Coal thickness and any other coals that we've seen in the coring or the geophysical logging, probably to half a foot, if we could define that.

And your question again? I'm sorry.

Q. And the question is, what is the average ash content in the coal in this area?

A. For the -- Let's say the minable 8 seam, we're probably looking for something like 17 to 23 percent. And that would include the ash bands and so on.

Q. Okay. Let's move on to your next exhibit, 30, and could you identify that, please?

A. Thirty is a cross-section. I generated the cross-section, trying to follow a cross-section from a previous Richardson exhibit.

Q. Okay. Now, when you say previous -- Hold on a minute, Mr. Mercier.

When you say previous Richardson exhibit, you're talking about the Richardson geology that was done for the original Division hearing?

A. Yes.

Q. You're not talking about Mr. Hively's exhibits?

A. No.

Q. Okay.

A. No, I'm not.

CHAIRMAN WROTENBERY: Mr. Bruce, may I ask -- I have a little different exhibit than everybody else has, apparently.

MR. BRUCE: Well, you got short-changed --

CHAIRMAN WROTENBERY: I did.

MR. BRUCE: -- because so did I.

CHAIRMAN WROTENBERY: Okay. That's okay, I'll look on with -- Is this the same --

MR. BRUCE: That should be the same, yes.

CHAIRMAN WROTENBERY: -- it's just a miniature of the --

MR. BRUCE: Exhibit 30, yes, ma'am.

CHAIRMAN WROTENBERY: Okay.

THE WITNESS: And under the seam, this is roughly the cross-section from northwest to east, across the Deep Lease and Deep Lease Extension. And what I show there is some of the detail that I have in the database, the lithologic columns we created from our database and the detail on the coal thicknesses for both the 8 Seam, which is the lower bench, and the 9 Seam --

Q. (By Mr. Bruce) Okay.

A. -- and our coal thicknesses, which should match the report that I generated.

Q. Okay, so then down below each of these well logs or boreholes there's numbers in black, and those are the coal thicknesses that you have calculated, and that would be the total coal, the lower and the upper?

A. Yes, and any rider seams and splits, we --

Q. Okay.

A. -- figure that a half a foot.

Q. And now although the point is kind of moot, what are the red numbers immediately below your black numbers, say on the left-hand side, that 58 number?

A. That 58 number is a composite of the previous isolith maps that we had as Richardson exhibits, showing the thickness through the cut of the cross-section --

Q. Okay, so --

A. -- for both the upper and lower coals.

Q. Okay. So anyway, you found 15.9 feet, and not Mr. Hively but Richardson's previous geologist found 58 feet of coal in that same position?

A. Yes.

MR. BRUCE: Okay.

CHAIRMAN WROTENBERY: Mr. Bruce, I may have missed some of the foundation here for this particular cross-section. Do we have a map that shows where these boreholes are located, or did --

MR. BRUCE: You know what, we -- I do not have my -- I don't. I can get that for you, I believe I can get that for you maybe for tomorrow morning, but it is -- What it was was, the prior Richardson geologist had a cross-section, more or less of a west-east cross-section, and this mirrors that cross-section.

Now, we should have had a -- we meant to place it on our next map, and if it's okay with you what we could do is, at the end of the day we could highlight it on one of our maps so you can see exactly where it is.

CHAIRMAN WROTENBERY: That would be great.

Q. (By Mr. Bruce) And then, Mr. Mercier, is your next exhibit, Exhibit 31, is that essentially the same? Richardson had two cross-sections previously, an east-west and a north-south, and your Exhibit 31 is simply a mirror of the original Richardson north-south cross-section?

A. That's essentially correct. As closely as possible I've followed that trend, and this is more on a north-south section, but I've used our drill-hole data.

Q. Okay. And again, the numbers at the bottom reflect your calculation of the coal thickness, as opposed to Richardson's prior coal geologist and his coal thickness numbers?

A. Yes.

Q. Okay. Let's move on to your next exhibit, and I think we'll be fairly brief with this exhibit, but would you identify it for the Commission and highlight what the colors mean on this map?

A. Okay, this is Exhibit 32, and what I've shown here in color is basically the total coal thickness in the Fruitland zone across the Deep Lease here and the Deep Lease Extension.

And basically there's a color code on the right-hand side showing, you know, an aggregate thin zone cutting from the west to the northeast, and --

Q. At the top of the chart?

A. At the top of the map. And the general total thickness of the coals across.

Part of what I do is develop depositional models so we can better understand the coals, you know, in those benches and try to reconstruct what was happening 70 million years ago. There's a large distributary drainage across -- you know, like a drainage in the Mississippi, is a modern counterpart, and we can see episodes of flooding and over-bank flow that come down into the property and thinned-out coals in certain areas and some of the resultant effects that impact our ability to mine in those areas. So all of the fine detail is very important to us.

And also on the exhibit in green are the existing works we have now where the first panel in the first district shows basically where we've mined up, and I have even greater detail at the mine documenting conditions and features that we've encountered underground. And I'm trying to project those features into other areas of the mine.

Q. And on that map -- There's been some comment before about areas, there's some space between the mining districts. That northwest-southeast-trending area, what is that?

A. That -- My interpretation of that low-coal area, again in our minable Number 8 Seam, in the bottom part of the number 1 bench of the 8 Seam, we have loss of thickness in that zone. And what that is, likely, is an overflow or a storm event that created what's called a crevasse splay. And it actually breaks through the banks of that distributary to the north and flows across the swam, and it displaced peat -- or is contemporaneous with the peat formation, so you didn't get the formation of that bottom bench. And we also can see smaller features developing off of that.

So this area has a very large -- like a mudstone fan in the basal part of the seam that sweeps across this area. And, you know, there's a whole lot of features that are important to us, to help us understand what the floor-bearing capacity is going to be of the seam, seam quality in certain benches, so -- and that would -- some of the higher ash zones, we would be able to identify as certain depositional causes, and also let us plan on periods of changes in our coal quality as we produce that.

Q. Okay. Now, as part of San Juan's evaluation of the coal in its mine, did it have desorption tests conducted at certain parts of its leases?

A. It did. There are, I think, several different companies that were involved with the desorption sampling.

Q. Out of how many wells were samples taken?

A. Let's see, of -- like the in-house, 300 holes or 270 holes, we probably had 17 or 18 holes that were sampled for desorption.

Q. Is there just one desorption sample taken per hole?

A. Our files show that typically we took four to ten or more samples per seam --

Q. Okay.

A. -- per hole.

Q. So really, the number of data point is more like 100 or something, rather than 18?

A. Yes.

Q. And those tests were provided to your consulting engineer?

A. Yes.

Q. Just one final issue. There's been some questions about the effect of fracturing ahead of the mining. Could you address that from your geologic standpoint?

A. One of the reasons why I came down to work for BHP is, you know, we're starting in a major underground operation in a new basin as -- you're new in the Basin, you're in a new field, you're seeing things that really no one else has seen. I do a lot of very detailed mapping underground. As the entries are developed by the mining or the operations, I get in and map practically every fracture, every split variation. You know, that's important to what I do in our predictive side of things.

So I've mapped -- Very commonly we have slump features, which are soft sediment deformation faults. They have moved during compaction and they have slickensided or mirror-smooth surfaces. Those slump features are both peat-contemporaneous in the lower part of the seam, they happened while it was still peat and there's movement, and you see these features offsetting the seam a little bit, a couple feet. I've done everything from a half foot to over seven feet.

And you can see slumping or compaction after the seam was completed and covered over with mudstone. So they're slumps that go into the seam but, you know, were propagated up in the roof.

We've also got exposures in the adjacent surface mines. So we can follow our seam for thousands of feet and see large-scale slump features in them. And it's, more than anywhere that I've worked in 27 years, displaced as soft sediment deformation because of the soft strength of the strata. It's very clay-rich. And the roof is characterized by slumps, these small features that range from a half foot to more than that.

Q. Were Exhibits 21 and 29 through 32 prepared by you or under your supervision? 21 is simply your résumé.

A. Okay, through -- ?

Q. And 29 through 32?

A. Yes, they were prepared by me.

Q. And in your opinion should Richardson's Application be denied?

A. Safetywise, for the safety of the people working underground, I believe so, you know, for what would impact the safety of the people underground. The last mine I worked at had a fire and explosion and killed some guys.

MR. BRUCE: Thank you, Mr. Mercier.

I'd pass the witness.

MR. KELLAHIN: Mr. Mercier, your geological --

CHAIRMAN WROTENBERY: Would you like us to introduce --

MR. BRUCE: Oh, yes, excuse me. I'd move the admission of Exhibits 21 and 29 through 32.

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: Okay, those exhibits are admitted into evidence.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Mercier, your geologic objectives as a geologist for a coal mine are different from Mr. Hively's objectives as a geologist for methane coal gas production, are they not?

A. Not entirely. Mr. Hively is, you know, identifying his resource, his source for coalbed methane, and I'm identifying a coal material that is, you know, going to be mined, but they're --

Q. That is the difference, then?

A. Yes.

Q. You're mining a coal member to determine if it is thick enough to be minable?

A. Right.

Q. And you're looking for a quality of coal that is minable?

A. That's correct.

Q. So when you're picking the top and the bottom of the basal coal, that's your objective?

A. Right.

Q. Mr. Hively's objective for the gas company is to look at a coal thickness that would contain methane that could be produced out of the coal? They're not necessarily the same, are they?

A. Not entirely the same, but the principles, I think, are close to the same.

Q. How many coalbed methane projects have you worked on as a geologist to pick coal thicknesses for a gas operator in the coal?

A. Perhaps only one. The previous mine, we had a gas company as a joint venture or joint partner, and the data that I gave to them was important in their evaluation of the resource available.

Q. Did you participate on behalf of San Juan Coal Company in the committee process in the San Juan Basin to study the coal and determine the density of wells to be drilled in the coal?

A. For exploration?

Q. For any purpose?

A. I have -- Since starting with BHP I've conducted several drilling programs. One was exploration to the north to define the distributary system, and the others were to develop the gob vent borehole system.

Q. Was that study part of your participation with the industry committee under the chairmanship of Mr. Hayden up in Farmington with the Oil Conservation Division?

A. No, sir.

Q. You didn't participate in that committee work?

A. No.

Q. Did you testify at the October hearing on behalf of your company, in which the Division considered changing the density in the underpressured area of the pool?

A. No.

Q. Did you avail yourself of the opportunity to look at the geologic data submitted by Burlington in that hearing, to talk about coal thicknesses and coal quality in the underpressured area of the coal?

A. No, I did not.

Q. Are you aware that the Burlington presentation in that case was based upon log calculations of coal, and not coal coreholes?

A. No.

Q. When we look at your map, how many coreholes in the coal do we have in Richardson's Application area?

A. I don't know what the exact number is.

Q. When we look at Exhibit 29, how many total coreholes are we looking at? Don't we have an Exhibit 29 that shows the coreholes?

A. That includes public-record drill holes that have both core and/or just geophysical logs. That includes rotary holes with geophysical logs from surface operations, oil and gas holes from public record like are on file at the BLM, and also San Juan Coal Company coreholes, with or without geophysical logs.

Q. Can we go through this exhibit and have you tell us how it's indexed so we can find the drill holes identified with the cores the San Juan Coal Company has generated in this mine area?

A. This report, you wouldn't be able to do that, *per se*, unless you were familiar with all of the drill holes that could be available --

Q. So I can't take Exhibit 29 and figure out which one of these coreholes represent core data points the company has developed within Richardson's Application area?

A. You could go take the drill hole name and locate those drill holes on Exhibit 32 and find out which --

Q. You can count them up, right?

A. Yeah, count them up.

Q. And you've not yet counted them up to figure out how many of those coreholes are within Richardson's project area?

A. I haven't done that specifically, no.

MR. KELLAHIN: No further questions.

CHAIRMAN WROTENBERY: Commissioner Lee?

COMMISSIONER LEE: No.

CHAIRMAN WROTENBERY: Commissioner Bailey?

EXAMINATION

BY COMMISSIONER BAILEY:

Q. What do you see as the orientation for the primary fractures of the cleat system?

A. Primary cleat would be north-50-east. I think that's the -- And secondary or butt cleat would be about north-50-west.

Q. Thank you.

A. North-40, say north-40-east and north-50-west for a butt cleat, yes.

COMMISSIONER BAILEY: Thank you.

CHAIRMAN WROTENBERY: Did you have any follow-up, Mr. Bruce?

MR. BRUCE: I have no further questions.

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

MR. BRUCE: Madame Chair, Exhibit Number 33 is simply a San Juan Basin map, just for informational purposes. If Mr. Kellahin has no objection, I would just move the admission of that exhibit.

MR. KELLAHIN: Not a problem.

CHAIRMAN WROTENBERY: San Juan Coal Company Exhibit Number 33 is admitted into evidence.

Mr. Bruce, at a hearing last week Mr. Kellahin marked all over Mr. Carr's exhibit, so he's been very restrained. I don't know --

MR. BRUCE: God bless him.

MR. KELLAHIN: We're not done yet.

(Laughter)

MR. BRUCE: He's not as mad at me as...

PAUL C. BERTOGLIO,

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

DIRECT EXAMINATION

BY MR. BRUCE:

Q. Could you please state your name and city of residence for the record?

A. Yes, my name is Paul Bertoglio -- that's spelled B-e-r-t-o-g-l-i-o -- and I reside in Casper, Wyoming.

Q. And by profession what do you do?

A. I am a petroleum engineer.

Q. Who do you work for currently?

A. I am a co-owner of an oil and gas company called RM Energy.

Q. In Wyoming?

A. In Casper, Wyoming.
Q. Okay. What is your relationship to San Juan Coal Company in this matter?
A. San Juan Coal Company is a -- BHP was a sister company of BHP Petroleum, who I had worked for for 13 years. After I went out on my own BHP had sold all their oil and gas assets onshore, as well as pretty well disposed of all their engineering talent that related to anything onshore. They were looking for an outside petroleum engineer that could give them some advice. They contacted --
Q. San Juan Coal Company?
A. San Juan Coal Company. They contacted me, and I believe it was about early 1996 when the Coal Company was looking at the potential to do some underground mining and was just doing some scoping work at that point.
Since that time, I have worked to advise them beyond the scoping portion, which included locating problem wellbores, pipelines that need to be relocated, reserve analysis, reviewing outside reports that included anything from MSHA to reserve reports, reviewing methane tests, just the whole gamut of anything that related to the oil and gas operations.
Q. Okay, to advise the Coal Company on oil and gas matters?

A. Yes.

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

A. Yes, I have.

Q. And were your credentials as an expert petroleum engineer accepted as a matter of record?

A. Yes, they were.

Q. And are you familiar with the oil and gas engineering related to the Application area in this case?

A. Yes, I am.

Q. Now, if I could, could you just briefly go over your employment history, because you said you were previously employed by a predecessor -- or I should say a sister company to San Juan Coal Company.

A. Yes, I graduated from Montana Tech, Montana School of Minerals Science and Technology -- that was the name at that point -- in 1981 with a bachelor of science degree in petroleum engineering.

I went to work for a small company called Energy Reserves Group in Casper, Wyoming. I worked for them for about five years in the capacity as a petroleum engineer, which included all facets of petroleum engineering, which included drilling, production, reservoir, I did a lot of geology, permitting. We were a very small company. My area of primary focus was the San Juan Basin. At that point in time Energy Reserves Group had operations in about 300 wells, including one that I learned a tremendous about this area in the Gallegos Canyon Unit.

Q. And for reference, the Gallegos Canyon Unit where -- Mr. Cox used a number of wells from that unit --

A. Yes.

Q. -- in his analysis?

A. Yes.

Q. Okay.

A. Energy Reserves Group was bought by BHP. At that point -- it was approximately November of 1985, they wanted to get into the United States. BHP was -- At that point in time their only oil and gas assets were in the Bass Straits in Australia. They were looking to expand worldwide. They bought Energy Reserves Group.

Subsequently they bought -- in about another eight-month period they bought Monsanto's oil and gas assets. They merged the two companies together and consolidated the companies under BHP Petroleum.

At that point in time, unfortunately, we also had a very significant downturn in the oil and gas industry, and they closed quite a number of offices. I went from the petroleum engineering side into the petroleum operations side, where I was the superintendent of operations in Farmington and actually lived there for about 15 months. I had managerial responsibilities over employees as well as oil and gas assets of about 20, 25 million a day and about a thousand barrels of oil.

I stayed there for about -- as I said, till about November of 1987, moved to Oklahoma City as a senior petroleum engineer. I was there for two years, and that was the only time I was really out of the Rockies area, as far as engineering focus. They again went through another downturn in the industry, and we closed all our engineering -- offices that had engineers in, and moved to Houston. Lived in Houston and worked for BHP for five years, where I did a significant number of different tasks ranging from acquisition analysis to senior engineering. Engineering supervisor was my final position when I left.

I went to work for Snyder for a short period of time in Denver and elected at that point in time to strike out on my own, and I have a business partner and we have been in business since 1995 and focusing on oil and gas acquisitions.

Q. And did your experience at Energy Reserves Group and BHP include experience with respect to production from both the Fruitland Coal and the Pictured Cliffs formation?

A. Yes.

MR. BRUCE: Madame Chair, I'd tender Mr. Bertoglio as an expert petroleum engineer.

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: We accept Mr. Bertoglio's qualifications.

Q. (By Mr. Bruce) Mr. Bertoglio, could you identify San Juan Exhibit 34 and discuss its contents?

A. Exhibit 34 is a production plat indicating all penetrations that were focused on the Pictured Cliff or Fruitland Coal. That does not include all penetrations that were somewhat deeper that were exploration holes, but by and large it's representative of all the wells. Really, the primary focus was the Pictured Cliff and Fruitland.

Q. Now, it's not outlined on here, but does this include the entire Application area of Richardson Operating's Application?

A. To the best of my knowledge, yes.

Q. Okay, this is just an orientation map?

A. This is a typical map. Anytime I get an area, this is probably the first map I make.

Q. Okay, let's skip one and move on to your Exhibit 36, and could you describe what type of production was coming from the Application area?

A. In reviewing the area, one of the first reports I did, actually looked at the potential. And from that it became fairly clear that the Pictured Cliff, as almost every expert will testify, is very poor. To what degree --

I would classify it very poor.

So when I started seeing Pictured Cliff production that was, in my opinion, Fruitland Coal Production, I started really questioning what was completed, and it's --

Q. And what type of materials did you review to make your determination?

A. Well, a Fruitland Coal well, or any coal well, has some very unique characteristics that are different than conventional wells. Conventional wells typically -- the best date of production is first, thereafter you're seeing declining pressure and the wells typically tend to decline accordingly. Coal wells typically come on with high water, low gas, inclining production.

What I'm trying to depict with Exhibit 36 is a review summarizing the production characteristics of the Pictured Cliff-only completions in light of what a coal well would look like. And to do this, the first three columns are primarily driven by examination of production history.

Again, typically a Pictured Cliff producer would have a high initial gas rate. So in reference to the WF State Number 36, using it as an example, a typical Pictured Cliff would have a very high initial gas rate, and a coal well would typically have a low one. So there I put a note, high initial water production. Pictured Cliff producing wells, with the exception of maybe one that I'm aware of, and that one is questionable, typically do not produce high quantities of water. A few barrels a day would be a high Pictured Cliff completion.

So the WF State 36 1 exhibited high initial water on its test.

Initial gas rate incline, I don't have enough data. The well has been completed, but there isn't enough data to suggest whether it's going to incline or not.

The Pictured Cliff, as everyone has said, the reserves are fairly low. If I'm seeing reserves that clearly, based on production, exceed 100 million, the gas has to be coming from somewhere else.

So what I did in the next two columns was to look at the production, existing current production as well as cumulative production. And in the third column from the right was a projection, is the gas going to -- is the cumulative going to be more than 100 million from that well? If it were, then the gas had to -- it's an indication it's coming, most likely, from the coal.

The net 15 foot was simply a way of cutting off whether or not there was any productive Pictured Cliff sand.

To tie all those together you have to actually

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say, is the coal characteristics in this area acting like a coal well? So I would examine the immediate offsetting coal wells and say, What are their coal characteristics? And when I see the exact same characteristics in the offset wells that are coal wells to these wells, I indicated those characteristics with a "yes".

The far right column basically just is a summation of my opinion that if, given those criteria, they met what I believe was a coal well, then I believe the Pictured Cliff is effectively communicated with the coal. And as you will note, it's predominantly a yes answer.

Statistically, on the bottom, there are 27 Pictured Cliff wells. Nineteen of them I have no doubt are communicated with the Pictured Cliff. That's 70 percent of the wells. Six, given a little bit more time, I believe, would clearly be -- would turn into a "yes". The production is fairly -- Completion data as well as some of the initial data would indicate that they're most likely communicated.

Only one well do I actually believe is acting like a Pictured Cliff well, and Mr. Cox alluded to that. That was the WF State 32-1.

And one well, there just really isn't enough data to make an opinion on.

Q. Do have an opinion on the WF State 32 Number 1?

Do you have an idea what that well is currently producing?

A. I believe it's like 35 MCF a day. I think it was -- in Mr. Cox's exhibit, which I don't have, the number was initially 45 MCF a day. It's down to 35 MCF a day.

Q. Okay, relatively small?

A. Yes.

Q. So in your opinion, over 90 percent of these wells, which are supposed to be Pictured Cliffs wells, are really Fruitland Coal wells?

A. If they are not entirely Fruitland Coal, they're very close. Very few of them have any sand to speak of that would be considered productive in any quantity. So yes, I would say that that is the logical conclusion.

Q. Okay. Let's move back to your Exhibit 35. What does that --

A. Thirty-five is just a very simple picture of spacing, effective spacing. The yellow wells that are circled are Fruitland Coal-completed, currently. They're either PC-Fruitland Coal or Fruitland Coal individually, and those are typically in your standard spacing, northeast-southwest quarters.

The yellow triangles are Pictured Cliff-only completions that are exhibiting Fruitland Coal production characteristics. The yellow triangles with the circle are the probables. The reds are wells that either have not been drilled, have not been completed, or there's not enough data at this point.

Q. So pretty much at this point there's -- for the most part, there's one Fruitland Coal well per quarter section at this point?

A. Yes, with the exception of Section 32, in which case I believe due to the completion there's actually two Fruitland Coal wells already there, effectively.

Q. And did you have a chance to review, look at Mr. Cox's exhibits, and in particular his Exhibit 10, which was a listing of the Richardson wells in the area?

A. I looked at all of them, but I'm not exactly sure which one you're referencing.

Q. It was just a listing of the wells with their average producing rate --

A. Yes.

Q. And without going into detail, is it fair to say that the better wells on that chart are Pictured Cliffs wells, allegedly, or Pictured Cliffs-Fruitland Coal dual completions?

A. I would say that the majority, yes, are.

Q. Are you surprised by that?

A. No, actually I'm not. I found in the Gallegos Canyon Unit that in large part some of the best completions were actually Pictured Cliff wells that exhibited extremely strong coal characteristics.

Q. Were they generally completed at the top of the Pictured Cliffs?

A. They could be. Typically in the Gallegos Canyon Unit the sand is located within five feet or less. There are places where there's a shale barrier, as much up to 20 feet. Surprisingly, that did not appear to be a detriment to the communication of the coal to the sand.

A lot of that came about -- If you look at it on a production basis, it started when we started doing foam fracs. There is a vintage of wells where we drilled wells, before my time, before I was born, and they would set casing on top of the coal -- or on top of the PC, drill through it, shoot it with nitrogen. That lasted to the mid-1960s or sometime in there. Subsequent drilling drilled it, did a -- put casing all the way through the sand, perforated, did a slick water frac.

1970s, we did casing and cross-linked gel fracs. When we started doing foam fracs, we started getting these exact same characteristics that you're seeing in Richardson's wells, where you have very low bottomhole pressure in the Pictured Cliffs, where even in the Pictured Cliffs in the Gallegos Canyon Unit, you could only put 300 million cubic feet. Great reservoir sands. Could only put 300 million cubic feet of gas in it. The wells will produce 2 1/2 BCF. That's all --

Q. So the gas had to be coming from somewhere --

A. The gas had to be coming from somewhere else.

Q. Okay. And finally, Mr. Bertoglio, is Exhibit 37 -- is that just a listing of the Fruitland Coal, Fruitland sand and Pictured Cliffs wells in the general area of the Application area, just for information purposes?

A. It appears to be. I did not create this exhibit.

I have a duplicate -- I have one that I prepared similar to this. My understanding is, this was prepared from data that I had supplied, and just reformatted.

Q. Were Exhibits 22 and 34 through 37 prepared by you, under your supervision or compiled from company records?

A. Yes.

Q. And in your opinion is the denial of Richardson's Application in the interests of conservation and the prevention of waste?

A. Yes.

MR. BRUCE: Madame Chair, I'd move the admission of San Juan Exhibits 22 and 34 through 37.

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: Those exhibits are admitted.

Do you pass the witness now?

MR. BRUCE: Yes, I pass the witness to Mr. Kellahin.

CHAIRMAN WROTENBERY: Thank you.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Bertoglio, is it your opinion as a petroleum engineer that a frac in the Pictured Cliff is the equivalent of a frac job in the Fruitland for purposes of producing and depleting the methane in the Fruitland Coal?

A. In most cases in this particular area, yes.

Q. So it's your position that if you have the Fruitland and you frac the Fruitland, you don't have to separately perforate and frac the Pictured Cliff to obtain the maximum opportunity to produce the methane out of the coal?

A. Could you restate that?

Q. Let's see if I can. In Richardson's Application area, if a well is completed in the Pictured Cliff and that well is fracture-stimulated, you're telling me that's as good as if that operator had set a bridge plug, gone in and perforated the coal and separately fracture-stimulated the coal in order to produce that methane?

A. In most cases, based on the production right now, I would say that's true.

Q. Do you know any operator in the San Juan Basin that currently completes its coalbed methane gas wells by fracturing the PC only?

A. No.

Q. Are you saying that there's communication between the PC and the Basin-Fruitland Coal methane?

A. Yes.

Q. Your study did show some communication?

A. A significant communication.

Q. Is that the most effective and efficient way to obtain completion of a coal well, by reliance upon that communication?

A. If I had to say that -- Reliance?

Q. Uh-huh.

A. No. If I had to -- if I look at the data, based on the data that I see, I would -- the data to me right now suggests that the coal is being more effectively completed via the existing Pictured Cliff completions than the coal completions.

Q. Do you consider the Gallegos Canyon coalbed methane and the Pictured Cliff wells to be analogous to Mr. Richardson's wells in his Application area?

A. Parts of the Gallegos Canyon are analogous, parts are not. The Gallegos Canyon Unit has some very large sandbodies in it that are 60 to 100 feet. They have 22-percent, extremely clean porosity, wells --

MR. BRUCE: Is that Pictured Cliffs or --

THE WITNESS: That's the Pictured Cliffs. The wells -- There are wells there that will have produced 1 to 3 BCF natural completions out of the Pictured Cliffs.

The coal is, in my opinion, very comparable as it relates to quality. Methane composition or content, I believe, is significantly higher in this area due to depth.

Q. (By Mr. Kellahin) Are you in agreement with Mr. Cox that the Richardson wells in this Application area are in the early stages of performance and their production is inclining?

A. I would -- Based on the data I have right now, I would say there's a significant number that have already peaked and are declining.

Q. Let me refer you to the transcript of November 13th of the year 2001 and ask you whether this is the question I asked you, and is this the answer you gave: Are you and Cox "...in disagreement, then, about the fact that the Richardson wells are in the early stages of..." their performance curves and that they have inclining pressure?

You then correct me and say, "Inclining production."

I correct myself and say, "Inclining production." And then you say "Yes".

A. Yes, that was --

Q. Is that still your answer?

A. That was a year ago --

Q. That's not your answer now?

A. That is not my answer now. We've got another year of production that is available, and I'd be glad to go well by well. But I do see wells right now, given just strictly the production, that appear to have peaked within six to 18 months and are either flat or have rolled over and started to decline.

Q. Have you conducted any type of coalbed methane simulations like those performed by Mr. Cox?

A. I have not.

Q. Have you ever conducted simulations in the coalbed methane?

A. No, I have not.

Q. Have you ever evaluated undersaturated coalbed methane reservoirs?

A. From what standpoint?

Q. From whether they're undersaturated or oversaturated, between saturated and undersaturated?

A. Not from the standpoint of making that the sole objective. I have reviewed desorption-adsorption data from the standpoint of trying to determine reserves and whether they were fully saturated or undersaturated, to make some kind of determination of how much water is going to have to get out to lower the pressure before I was going to start seeing some gas.

Q. Were you the petroleum engineer responsible to the Coal Company for the sampling of the coal cores in order to get data from whence to derive the desorption measurements?

A. No, I was not.

Q. You did not collect that data?

A. I did not collect the data.

Q. As a petroleum engineer, can you define for me within the context of gas reservoir engineering what I mean by the concept of correlative rights?

A. Yes, we did this last time.

Q. Let's do it again.

A. Okay.

Q. What's correlative rights?

A. Correlative rights is, I have the right to produce my gas that is underlying my lease.

Q. Is it an absolute right?

A. I believe we discussed this before. I believe that's a legal question, which I cannot answer.

Q. What if I tell you correlative rights is the opportunity to produce your share of gas reserves underlying your tract in relation to the gas produced in the pool? Would you agree with me?

A. Yes.

Q. How is Mr. Richardson going to exercise and protect his correlative rights to produce the coalbed methane gas if that gas is vented by your client before Mr. Richardson can produce it?

A. In the context of the mine and the oil and gas interplay, conflict if you wish, I don't know if correlative rights is even applicable. When I review correlative rights, I'm looking at it from an oil and gas lease versus another oil and gas lease, and I don't know if the two are even applicable, to be meshed together.

Q. Let's do that, then. Within the context of your understanding of correlative rights, you're talking about the competition for the coalbed methane between parties that have interest in the coalbed, right?

A. Yes.

Q. And so what we're looking at is, within Richardson project area, if we took the eastern boundary of his project and compared it to what happens on the other side, the question of correlative rights arises when you look to see if operators on each side of that line have an equal and fair opportunity to produce their share of the gas?

A. Yes.

Q. Wasn't the basis of your opposition and testimony back in November of last year the fact that Mr. Richardson -- his Application area was premature, right?

A. One of them, as well as a violation of correlative rights, or could lead to a violation of correlative rights. I think I had three reasons, but the one we're currently discussing was one of those reasons.

Q. One of those reasons was, you thought Mr. Richardson's Application was premature?

A. From the standpoint of drainage, yes.

Q. And that was in response not to my question but to a question from Mr. Bruce?

A. I don't know who the question came from, but yes, that was my testimony.

Q. Mr. Bruce asked you, on page 221, "Mr. Bertoglio, just briefly, what are the three or four primary points..." you're making about your testimony?

Number one, in your answer, "that any decision for infill drilling at this point is premature."

A. Yes.

Q. And the basis for saying it's premature is that you observed that Mr. Richardson, on his side of the project area, would have coal density of four coal wells per section?

A. No, the premature was from the standpoint I couldn't ascertain drainage at that point. One of the further points down is exactly the point you've just made, though.

Q. Let's talk about that point, then. That was your concern, is that Mr. Richardson would have a correlative-rights advantage --

A. Yes.

Q. -- over the offsets, because his well density is four wells to the other side of the line, which would enjoy only two wells to a section?

A. Correct.

Q. Are you aware on October 15th of this year the Commission -- the Division has now approved four-well densities on those sections adjoining Mr. Richardson?

A. Yes.

Q. Is that going to impair Mr. Richardson's correlative rights, if he now is denied on his side of the line the chance to have four coal gas wells?

A. Yes, and no. If the wells that are in Section 27, 34 and Section 3, 10, 15, 22, 27 and 33 of 30 North, 14 West, as well as Sections 3, 7, 8, 9 and 10 of Sections -- of Township 29 North, 14 West -- if the operator is a different operator, yes, that would occur.

If the operator was different and they were allowed a Pictured Cliff and a coal well, two separate wellbores in the same section, I believe that would -- and the Pictured Cliffs acts as the offset wells are, which act like a coal well, you would have two coal wells in the section.

Right now -- My observation suggests that right now there are four coal wells producing in most of those sections. So it's possible you would see some. However, in some of these cases, I know that Mr. Richardson is the offset operator. But there are going to be a couple of areas where correlative-rights issues could come into play.

Q. Let me ask you this: If Mr. Richardson is the operator of the adjoining spacing unit, are you telling me there's no correlative-rights violation if there's a common operator?

A. If there's a common operator and a common royalty owner.

Q. All right, so we have to have the same interest owners in each spacing unit and a common operator?

A. Yes.

Q. Okay. The concept of waste, let's talk about that. Under the Oil and Gas Act, the Division or the Commission has a responsibility not only to protect correlative rights, but they must prevent the waste of hydrocarbons. Do you understand that concept?

A. Yes.

Q. If Mr. Richardson is attempting to exercise his correlative rights and the coal mine is venting the methane, is that not waste?

MR. BRUCE: I would to the extent that that's a legal question, madame Chair. I think that's been brought up before with Mr. Woomer and others about what waste and what rights the Coal Company has.

MR. KELLAHIN: Madame Chairman, Mr. Bruce has waived that when he asked this witness his conclusions about waste and correlative rights as the last question he asked this witness.

CHAIRMAN WROTENBERY: He did ask that. I'll allow the question.

Q. (By Mr. Kellahin) Describe for me waste.

A. Waste would be the loss of economically recoverable reserves.

Q. When the mine vents the methane, are they paying royalties on that venting?

A. No.

Q. Are they paying anyone for the value of that gas?

A. I have no idea whether that gas at this point has any economic value.

Q. Have you looked within the concept of waste to see what the total volume of gas will be wasted by the coal before it's produced by Mr. Richardson?

A. I did a review a long time ago, and the mine plans have changed numerous times. So I did do some preliminary projections, albeit significantly less reserves, that overlay production histories with mine plans, but that was -- the mine plan at that point was going -- the panels were going east-west. They've changed a significant number of times, so it's hard to do that.

But yes, I have where I actually looked at where I believed there was going to be impact, looked at a projection of production and at what point would we start seeing an impact and how much reserves would have been produced to that date, versus how much was remaining.

Q. Under any method of analysis, the coal mine is going to vent and waste the methane, right?

A. Again, the definition of waste, I in a lot of cases question whether or not the reserves are economic reserves. Until we know whether they're economic, I can't quantify that there's economic waste occurring.

Q. See, I didn't ask you that, Mr. Bertoglio. I asked you, Are they going to vent the gas?

A. The gas will be vented, yes, as it is currently occurring.

Q. Have you made an economic analysis of the Richardson wells to determine whether it meets an economic threshold?

A. Yes.

Q. That's part of your work?
A. Yes.
Q. Have you looked at the Bushman well that Mr. Richardson operates?
A. Yes.
Q. Is that well economic?
A. Yes.
Q. How about the 33 and 2 well? Is that economic?
A. Could you be more -- The WF Federal 33-2 in Section 33?
Q. Yes.
A. Yes.
Q. How about the 36 Number 1 well? Is that economic?
A. In my opinion, no --
Q. It's not --
A. -- it's not right now.
Q. Okay.
A. The question of economics -- The Bushman, initially I would have said it was not economic. But circumstances have changed since Mr. Richardson has put in disposal wells.

Without a disposal well I would say it's marginal at best, with the high water rates that the well has produced and is continuing to produce, although it's declining.

Q. Until Mr. Richardson is able to implement a full and effective means by which he can produce and dispose of produced water, we're not going to know if these coal gas wells are going to be economic?

A. True.

Q. Is the 36-and-3 well economic?

A. Which location?

Q. In Section 36, the 36-and-3 well?

A. At this point, given the production rate that Mr. Cox has given, it's hard to say. Commercial doesn't mean the initial rate; commercial, to me, means that it will pay out the well.

These wells may come up to 150 MCF, 200 MCF a day for three or four months, and fall. That happens in the Powder River Basin. A short-term production does not indicate commerciality.

Q. Have you made any study of the area outside Mr. Richardson's Application area to see if the underpressured portion of the pool, exclusive of his area, is economic?

A. I have reviewed it, and based on reserve volumes and production -- I know Dugan has some very good wells to the east, as well as have -- they have the infrastructure to handle the water volumes.

So I believe he's got some good commercial wells over in there.

Q. Is the area adjoining Mr. Richardson's Application area that now enjoys four coal wells density to a section any different economically from Mr. Richardson's wells inside his Application area?

A. Economically, I believe that you are going to see higher return as you go from west to east. The wells on the western side produce higher volumes of water.

There is clearly no disagreement that the gas contents, whether saturated or undersaturated, is less. So from an economic standpoint, you're going to see an increasing value as you go deeper into the Basin.

Q. Are you contending that this is an undersaturated reservoir?

A. Yes.

Q. Did you participate on behalf of your company with the Division's committee that studied the Basin-Fruitland Coal Gas Pool?

A. No.

Q. Did you testify at the Examiner Hearing in October of this year concerning changing the pool rules?

A. No.

Q. Were you present at that hearing?

A. No.

Q. Have you reviewed any of the exhibits from that hearing?

A. No.

MR. KELLAHIN: No further questions.

CHAIRMAN WROTENBERY: Commissioner Bailey?

EXAMINATION

BY COMMISSIONER BAILEY:

Q. Your Exhibit 36, did you look at the well logs, or did you look at the C-105 that were filed?

A. Regarding -- ?

Q. Regarding where these wells are producing from.

A. Where they are perforated?

Q. Uh-huh.

A. I relied on the scout cards as well as, when I had well logs, I reviewed the perforations on those.

Q. So you did pick the tops of the Pictured Cliffs for some of the wells by yourself?

A. Generally, ma'am, I relied on the operator's pick. When the operator said he has perforated the Pictured Cliff from 1000 to 1010 feet, he is calling it the Pictured Cliffs. So no, I haven't verified the tops myself.

Q. Okay. Did you see interfingering of the Pictured Cliffs and the Fruitland?

A. In this particular area I don't see -- In some areas you do see a one- or two-foot stringer that comes in, but generally in this area, no.

COMMISSIONER BAILEY: That's all I have.

CHAIRMAN WROTENBERY: Dr. Lee?

EXAMINATION

BY COMMISSIONER LEE:

Q. Did you perform a simulation on this well?

A. No, I do not have access to a simulator, and -- I have been trained on one, but I've never actually performed a --

Q. So all your data is the truth, nothing but the truth? You didn't make any assumptions?

A. No, other than the visual review.

Q. So you never used any dynamic parameters on this study?

A. Dynamic parameters, such as --

Q. Like permeability?

A. No.

Q. So you didn't change the permeability like Mr. Cox did?

A. No. In fact, the degree that I used permeability -- I'll digress a little bit to get back to something.

The Pictured Cliffs permeability in this area, in my opinion, is extremely low, based on porosities that I've seen. And that's one of the reasons why I think the Pictured Cliff has essentially no commercial gas quantities in it.

In the Gallegos Canyon Unit there's a tremendous number of coreholes that were taken early in the life and analysis done. When you get less than 16-percent porosity, you're looking at water saturations, connate water saturations due to the clay contents, of upwards of 75 percent. So that alone precludes any significant portion of gas being in the Pictured Cliffs.

That's about the limit of permeability I've even considered.

Q. From your engineering point of view, if you had the same volume of the fracture fluid, same thickness of the Fruitland Coal and the Pictured Cliff, which one would go further if you fracture it?

A. If you fracture it? My opinion on that is based on production. I believe where you have the ability to propagate, as it relates to a coal, if you can propagate a significant distance you will get a better fracture from a Pictured Cliffs than you do a coal.

A lot of the data I have seen, the coal fractures tend to -- they will go out a certain distance, and the fracs immediately go to the roof and pancake, so you don't get a vertical fracture.

If you can propagate a fracture into the sand, the sand goes out and then it goes up.

The reason I say it's my opinion based on production is, when you look at the production you get those same coal characteristics except for the -- they act stronger than a Fruitland Coal frac, which would indicate that you're getting a better communication back to the wellbore via a Pictured Cliff fracture that has propagated out farther before it went to the roof, versus a coal that has either crushed the coal around the wellbore area and then have the sand go to the roof and stay on the roof. So you're really not opening up the coal as significantly as you potentially can if you can propagate the fracture out through the sand.

Q. Have you ever performed a frac job for the Fruitland Coal or the Pictured Cliff?

A. Have I frac'd either?

Q. Yes.

A. Yes, hundreds.

Q. Do you -- In your calculations do you think those fractures are contained only in those zones?

A. Only in the zones, in the Pictured Cliff and the Coal?

Q. Yes.

A. In the Gallegos Canyon Unit we saw frac gradients in excess of 1 p.s.i. when we fractured the Pictured Cliff, which would be significantly higher than you would expect if it were staying entirely in the zone. It makes no sense why it's higher, because one would anticipate that the frac would have stayed in the sand. But that frac reading is more indicative of a coal frac.

Q. There's another thought. I heard the Pictured Cliff production is maybe recharged from the Lewis shale. Is that possible?

A. I believe you do get -- I don't know about the Lewis shale. I know that in the Gallegos Canyon Unit there is a significant section underneath, a hundred feet. It shows up very well on an electric log, the SP has some fairly decent deflection, and you do see some reservoir sand in there. It may be 100 feet of 10-percent gas saturation, but that 10 feet over 100-foot thickness over -- the Gallegos Canyon Unit was 55,000 acres, or is 55,000 acres -- has a tremendous recharge in it. If you perforated it, you would get little if any gas. But from a recharge -- I know that at least some of the basal, real dirty, dirty sands, can act as a recharge, in my opinion.

Q. So to summarize your opinions, you look at the data, production data, you draw your engineering conclusion, you say most of the production is from the Fruitland Coal?

A. Yes.

COMMISSIONER LEE: Okay, thank you.

EXAMINATION

BY CHAIRMAN WROTENBERY:

Q. Mr. Bertoglio, I just had a couple more questions about the completions in the PC and the production of Fruitland Coal methane through those completions.

You made some kind of statement -- and I don't have it down exactly, but to the effect that you thought the coalbed methane was more effectively completed or produced through the Pictured Cliffs than through the Fruitland Coal itself?

A. Yes.

Q. And you based that on your review of production --

A. Production.

Q. -- data?

What area were you talking about there? That's the part that --

A. In the Application area, the --

Q. Okay, so that's based on your review of the Richardson wells and the other wells in the Application area?

A. Yes, there's very -- other than a couple of Dugan wells with just a couple of months' production history, the Application area in the mine where the development is, the wells are almost all Richardson's wells.

Q. Okay. And does that mean you do not believe that you'll get significantly more production by frac'ing -- completing in the Fruitland Coal and frac'ing in the Fruitland Coal itself, or what does that mean as far as maximizing the recovery of the coalbed methane?

A. Significantly more reserve recovery. Incrementally, you might see a little bit more gas, but it may be at the very later stages in life, at very low rates.

However, initially, what I'm saying right now is that qualitatively the coal appears to be yielding higher rates from the Pictured Cliff well -- Pictured Cliff-completed perforations that are immediately underneath it.

Q. Okay. And you explain that with reference to the propagation of the --

A. Yes.

Q. -- fractures in the Pictured Cliffs versus --

A. Uh-huh.

Q. -- the Fruitland Coal?

Let me ask you too about your experience with frac'ing in the coal. We heard earlier today that some of the concern about the safety hazards created by frac'ing in the coal related to the propagation of fractures into the shales and mudstones above the coal.

What has been your experience about where those fractures go in the Fruitland Coal and above?

A. Okay, when we started in the Gallegos Canyon Unit, we started a program that we did a lot of testing data that most companies would never do: adsorption, desorption, approximate -- we studied it significantly, because we were getting ready to kick off a fairly large program. It was probably one of the first big programs in the underpressured area. We gathered as much data as we could get from every source.

Most of the interesting, real hands-on, real-world data came from minebacks, and what you would find is, the coal -- your perception of the coal frac'ing in a nice penny in either direction doesn't hold. They found blocks that would separate four inches and be packed with sand. But in large part they would find that -- a distance out, that you would get significant impact, or the sand would impact and get on the roof and stay on the roof.

So you weren't -- You were getting either the sand going out and doing all kinds of gyrations through the cleat system and then eventually getting to a point where it was -- especially at the shallower depths, you would start seeing pancaking of the sand, either being on the floor or the roof.

Q. Okay, and when you talk about the roof, what are you talking about there?

A. The roof would be the interval separating the top of the coal and the shale.

Q. The shales and mudstones?

A. Uh-huh.

Q. So the sand would move -- or would be found right there at the top of the coal?

A. Right. You still have the permeability, the fluid leaking off in the least -- in the easiest direction, which is still into the coal and along that parting. So there's no reason for it to go up.

Originally, when fracturing first started, one of the fracture-design criteria was, what's my top and bottom? And if you had a coal you always said, well, it cannot go through the coal, because once it hits the coal it will -- the permeability in the coal will be higher than the surrounding strata.

The fluid wants to go down that least path of resistance, so if once it gets into the coal it tends to stay in the coal.

CHAIRMAN WROTENBERY: Okay, thank you.

Did you have some follow-up?

MR. BRUCE: I just had a couple of follow-up questions.

REDIRECT EXAMINATION

BY MR. BRUCE:

Q. Mr. Bertoglio, with respect to -- and I refer you to your Exhibit 35.

With respect to Mr. Kellahin's questions about correlative rights, by your estimation, other than maybe in the northeast quarter of Section 21, there are four Fruitland Coal wells per section at this point, are there not?

A. Yes.

Q. So anything outside the Application area, Richardson Operating has already covered with respect to protection of correlative rights?

A. Yes.

Q. And when you were asked about what you reviewed, the data, the PC wells in the area of the Application, to determine if they're producing from the Fruitland Coal, again, you also saw similar behavior in the Gallegos Canyon Unit?

A. Yes.

Q. And the Gallegos Canyon Unit is where most of Mr. Cox's -- quote, unquote -- nearby wells came from that he used in his modeling?

A. They're either in the unit or in the immediate area --

Q. Immediately adjacent --

A. -- to the north of it.

MR. BRUCE: That's all I have.

CHAIRMAN WROTENBERY: Thank you.

Mr. Kellahin, do you have anything else of Mr. Bertoglio?

EXAMINATION

BY MR. KELLAHIN:

Q. Just a quick question here, Mr. Bertoglio. Aren't there areas all over this map where Mr. Richardson is not yet able to have a density of four coal gas wells per section?

A. Physically, to perforate the coal in each quarter-quarter -- or each quarter?

Q. Right.

A. Yes.

Q. Show me where it is that you think he's protecting his correlative rights in his Application area that's adjacent to an area that already has four wells, for which he has four wells. Where are those areas?

I'm trying to follow up on Mr. Bruce's question.

Are you contending that in Section 28 Mr. Richardson already has four wells that are coal wells that allow him to protect himself from Section 27? Is that what you're saying?

A. Yes.

Q. How is Mr. Richardson going to be able to protect the State of New Mexico in Section 32? He's only got one well right now?

A. Right, and that would be my one area, one well of concern, because that is the one well I don't believe is completed or effectively communicating with the coal. And you have the two wells in the northeast corner of 32 that I currently show -- I believe are effectively both producing from the coal.

Q. With the exception of Mr. Richardson's well in the southeast quarter of 32, do you believe the rest of his PC wells are effectively depleting the coal?

A. At this point, yes.

Q. So in order for Mr. Richardson to protect the State Section 32, he needs some more coal gas wells, does he not?

A. I don't know what spacing the current coal well is, whether it's a laydown or a standup.

Q. It doesn't matter.

A. Well --

Q. -- if we're just talking about well density per section.

A. If well density was the controlling factor.

Q. Under the existing Rules that were recently amended, even under the amendment the operator is required to put a well in the southwest quarter and the northeast quarter; that's the first pattern?

A. Right.

Q. Without the increased-density Application being granted, Mr. Richardson under the current Rules in Section 19 can make this a coal gas well in the northeast quarter, can he not?

A. Yes.

Q. Are you contending that the well in 29, in the southeast quarter, this Richardson WF Federal 29 Number 2, that this PC well is a coal well?

A. Yes.

Q. How is Mr. Richardson then going to protect the State lease from drainage by that well if he's not allowed the opportunity to have a coal gas well in the northeast quarter of that section?

A. In the northeast quarter of Section 32?

Q. Right.

A. The northeast quarter of Section 32 is owned by Dugan, and Dugan currently has two wells on that, that are both coal wells. But one is definitely a coal well, and one that acts like a coal well.

Q. So when we look in Section 32, if we add in the Dugan-operated wells, are you satisfied that State section is fully protected in the coal?

A. No.

Q. In Section 6, what are we going to do in Section

6 when right now there's three undrilled coal locations?

A. To do what?

Q. In order to effectively and efficiently produce the gas that's underlying Section 36 in the coal, are you telling us that that single well in the southeast quarter is going to be enough?

A. My calculations would indicate that the Bushman well is going to drain in excess of 320 acres. You would still need a well at least in the north. As far as protecting from wells surrounding it, the wells in the south half of 31 are so far that they're never going to affect it. So the drainage would -- any effect would most likely have come from the mine.

Q. So in Section 6 Mr. Richardson ought to have a second well in order to properly drain the section?

A. Under current spacing, he could drill three additional PC wells and effectively -- if it follows what I'm seeing out there, he could effectively have four coal wells, even without a downspacing of the coal.

Q. So if we drill this whole area up on 160-acre PC wells, can you design a frac treatment for us that we can put in the PC that will let us effectively communicate with the coal and use that well to deplete the coal gas methane?

A. Can I?

Q. Yeah.

A. I believe that Mr. Richardson is currently doing that, so whatever he's doing I believe is effective.

Q. You said you've designed hundreds of frac jobs --

A. Yes, I could -- If I were doing it, I'd go look and see what Mr. Richardson's doing, because I believe it's effectively doing it.

So I would follow Mr. Richardson. I think he's doing a great job of development out there.

Q. Have you looked at his data to see the magnitude of frac job that he's --

A. Yes.

Q. -- putting into the Pictured Cliff?

A. Relative to what I can get through public data, which is not much more than volumes -- I don't know sand schedules, I don't know pressure data, I don't know rates. All I know is what has been pumped in.

Q. And you can't name me a single operator in the Basin that currently accesses the coal by fracturing the Pictured Cliffs separately in trying to extract the methane from the coal.

Is there anyone that uses your technique?

A. I'm not suggesting it is a technique, I'm just suggesting that it is doing it.

MR. KELLAHIN: All right, nothing further.

MR. BRUCE: I have nothing further. I have one final closing matter for today.

CHAIRMAN WROTENBERY: One -- I'm sorry, one final closing what?

MR. BRUCE: Yeah, I think everybody's done with Mr. Bertoglio, unless the Commission has further questions.

CHAIRMAN WROTENBERY: Thank you for your testimony, Mr. Bertoglio.

MR. BRUCE: I'm guessing it's the end of the day.

CHAIRMAN WROTENBERY: It's five o'clock.

MR. BRUCE: One final thing, madame Chair, you asked for the line of cross-sections on Mr. Mercier's --

CHAIRMAN WROTENBERY: That would help us understand the --

MR. BRUCE: -- two cross-sections. What I have is what is his coal thickness map. It's not the rainbow-colored one, but it's basically the same, and on it are the two lines of cross-section, the A-A' -- the east-west and the north-south, and it's the only copy I have, but if I can just provide that for your information, for your file, and it will show where those lines of cross-section are.

CHAIRMAN WROTENBERY: Okay, thank you. I can't remember if he summarized for us -- Roughly where does it run?

MR. BRUCE: I think you -- when you -- You will be able to see on his map where this --

CHAIRMAN WROTENBERY: Okay. Anything else for today?

MR. BRUCE: No.

MR. KELLAHIN: (Shakes head)

CHAIRMAN WROTENBERY: We will then break until 9:00 a.m.

MR. KELLAHIN: Thank you.

CHAIRMAN WROTENBERY: Thank you.

(Evening recess taken at 5:00 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 November 18th, 2002.

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 RICHARDSON OPERATING COMPANY TO ESTABLISH A SPECIAL "INFILL WELL" AREA WITHIN THE BASIN-FRUITLAND COAL GAS POOL AS AN EXCEPTION FROM RULE 4 OF THE SPECIAL RULES FOR THIS POOL, SAN JUAN COUNTY, NEW MEXICO	CASE NO. 12,734

ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

COMMISSION HEARING (Volume III, October 31st, 2002)

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

October 31st, 2002
Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Commission, LORI WROTENBERY, Chairman, on Thursday, October 31st, 2002, 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

October 31st, 2002 (Volume III)
Commission Hearing
CASE NO. 12,734

* * *

CUMULATIVE INDEX OF EXHIBITS

Richardson	Identified	Admitted
Exhibit A		
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CUMULATIVE INDEX OF EXHIBITS (Continued)

Richardson	Identified	Admitted
Exhibit C		
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* * *

San Juan Coal Company	Identified	Admitted
Exhibit 1	258	300
Exhibit 2	264	300
Exhibit 3	264	300
Exhibit 4	264	300
Exhibit 5	265	300
Exhibit 6	265	300
Exhibit 7	270	300
Exhibit 8	271	300
Exhibit 9	272	300
Exhibit 10	273	300
Exhibit 11	277	300
Exhibit 12	277	300
Exhibit 13	292	300
Exhibit 14	344	380
Exhibit 15	348	380
Exhibit 16	363	380
Exhibit 17	367	380
Exhibit 18	368	380

(Continued...)

CUMULATIVE INDEX OF EXHIBITS (Continued)

San Juan Coal Company	Identified	Admitted
Exhibit 19	373	380
Exhibit 20	338	380
Exhibit 21	421	434
Exhibit 22	-	451
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Exhibit 24	519	566
Exhibit 25	68	69
Exhibit 26	507	513
Exhibit 27	529	-
Exhibit 28	-	-
Exhibit 29	421	434
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Exhibit 33	438	438
Exhibit 34	444	451
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Exhibit 46	543	566
Exhibit 47	544	566
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(Continued...)

CUMULATIVE INDEX OF EXHIBITS (Continued)

* * *

Additional submissions by San Juan Coal Company, not offered or admitted:

* * *

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* * *

WHEREUPON, the following proceedings were had at 9:02 a.m.:

CHAIRMAN WROTENBERY: Are we ready to get started here?

MR. BRUCE: I'd like to start, madame Chair, by just recalling Paul Bertoglio to the stand, just for essentially one question. If we could have the record reflect that he was previously sworn and qualified.

CHAIRMAN WROTENBERY: Okay.

MR. BERTOGLIO: Good morning.

PAUL C. BERTOGLIO (Recalled),

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

DIRECT EXAMINATION

BY MR. BRUCE:

Q. Mr. Bertoglio, yesterday there were questions when you were talking about the frac'ing of the coal, frac'ing of the PC, and how the fracture went up to the ceiling, and you talked about a pancake shape. Could you expand upon that to the effect that, does the frac just run along the top of the coal, or does it affect the materials above the top of the coal?

A. The frac -- The fluid especially is going to follow the path of least resistance. So wherever it intersects an existing fracture or lineament, any stress point, you're going to see leakage, most likely vertical up into that.

So if, for example, the frac was near an existing fracture that's already in the strata immediately above the coal, most likely you would see leakage into there, compounding an already existing weak point in the roof.

MR. BRUCE: Thank you. Pass the witness.

MR. KELLAHIN: Yes, ma'am.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Bertoglio, when we look at San Juan Coal Exhibit Number 16 and we find the coal wellbore and look over on the far right corner, there is an elliptical shape. Is this the pancake area you're talking about?

A. No. No, in fact, that is showing a vertical. The pancake I'm talking about is a horizontal sandbody that would be similar to the two lower lobes right here where you would see it come across here. And the fluid would leak -- If there was a, for example, lineament or an existing fracture, the fluid and potentially the sand would follow up that path, simply because it's the highest-permeability section.

Q. For illustration purposes, then, the pancake is not this umbrella, it's the representation of the two lower shapes?

A. Yes.

MR. KELLAHIN: Thank you.

CHAIRMAN WROTENBERY: Anything else? Is that all you had --

MR. BRUCE: That's all I have for --

CHAIRMAN WROTENBERY: -- for Mr. Bertoglio?

MR. BRUCE: -- Mr. Bertoglio.

CHAIRMAN WROTENBERY: Thank you, Mr. Bertoglio.

THE WITNESS: Thank you.

MR. BRUCE: Call Mr. Hattner to the stand.

JOHN G. HATTNER,

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

DIRECT EXAMINATION

BY MR. BRUCE:

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

A. John G. Hattner.

Q. And how do you spell your last name?

A. H-a-t-t-n-e-r.

Q. What is your occupation?

A. I'm a professional petroleum geologist.

Q. Where do you reside?

A. I reside in Keller, Texas.

Q. And who to you work for?

A. I work for Netherland, Sewell and Associates.

Q. Just briefly, what is Netherland, Sewell?

A. Netherland, Sewell and Associates is a reservoir engineering consulting firm.

Q. Okay. Have you previously testified before the Division?

A. I have not.

Q. Could you summarize your educational and employment background for the Commissioners?

A. I have a bachelor's in geology from the University of Miami, I have a master's in geological oceanography from Florida State University, I have an MBA from St. Mary's College in California.

I started work in the petroleum industry for Chevron in 1980. I spent 12 years with Chevron; two and a half years domestic, five years working for Chevron North Sea, in the North Sea; two years for Chevron Overseas, working east Africa; a year working in Indonesia with Amoseas/Caltex, a 50-50 joint venture of Chevron and Texaco; then I spent another two years with Chevron working north and west Africa. And since 1991, November, I've been working with Netherland, Sewell and Associates as a geologist/geophysicist.

I've worked projects in most areas of the world, specifically the geophysical arena, and then in the last six and a half years I've been working a large variety of

CBM projects.

Q. Okay. What is Netherland, Sewell's relationship to San Juan Coal Company?

A. Netherland, Sewell's relationship with San Juan Coal Company is, we were hired on a project basis to evaluate the potential of the San Juan Coal Company, I guess leases or mine area and what the reserves would be within that area, as an independent third-party consultant.

Q. Were you employed to minimize the value of the reserves?

A. No, actually in this case, under the direction of our contact with San Juan Coal Company -- primary contact is Lynn Woomer -- his specific direction to us was to not be conservative, to do a reasonable estimate without being conservative, since there had been, as we were informed, some negotiations on trying to come to some kind of agreement with the outside interest holders, other than the Coal Company, and some previous work had been considered ultra-conservative.

So our charge was to come in as an independent third party, evaluate this as we would any project, but without a conservative -- definitely without a conservative bias.

Q. Okay. And when you did your evaluation, did you use the standard evaluation that Netherland, Sewell uses

Application of Richardson Operating Co.
Record on Appeal, 532.

for any project?

A. I used the standard practices that I would approach this project on a CBM basis. As I said, I've worked a lot of CBM in the western US. And consequently, therefore, I approached it as an oil company -- or an geologist, using just the wireline logs. And again, some of that was discussed yesterday, Mr. Mercier, some of Mr. Hively's work.

I used just the electric logs instead of using the cores because cores, on the logging basis and the database provided by San Juan Coal Company, tend to be more conservative. Coal miners tend to work on a scale of inches. Our logging tools are used, basically, on a scale of one to two feet.

So in order to come up with approach that would approximate another oil company geologist working this type of analysis, I basically just used the wireline logs.

Q. Okay. Similar to Mr. Hively?

A. Yeah, actually, after having just received the maps this weekend, my analysts do a difference map between Mr. Hively's maps and mine, and we differ by 7 1/2 percent, approximately, in the Deep Lease, and in the Deep Lease Extension we differ by about 10 percent in total volume, which equilibrates basically to one two-foot coal stringer. So as a general statement it appears that Mr. Hively and I picked things fairly consistently, which I would expect using wireline logs and oil and gas analysis.

Q. Based on that 7-1/2- to 10-percent difference, you really don't dispute Mr. Hively's coal geology?

A. No, and as I said, I think the difference is basically summarized to about one two-foot coal stringer. I basically dealt with the S8 Seam, as we talked about, the basal, and the little difference in that is just where assigned the coal, because I've lumped the S8.6, which merges onto the 8 Coal in the mine area, and it diverges as you move into the east, whereas when that divergence is there, Mr. Hively's put that in the upper. So it's more of an assignment.

And then I just dealt with those coals in the 9, so one two-foot stringer in there, which Mr. Hively had some of his cross-sections, is basically the differential in our interpretation.

Q. Okay, and were you charged with looking at both the Fruitland Coal and the Pictured Cliffs geology?

A. Yes, actually we were charged -- we -- Mr. Smith is the engineer on this project with me -- we have a significant number of projects we've worked together, actually, over the last 11 years. We were charged with looking at all the value in the area, not just the Fruitland but the PC, and we looked at the Gallup and the other potential in the area. So I did look at the PC as well as the Fruitland.

Q. Okay, and you mentioned Mr. Smith, our next witness. Is he a reservoir engineer?

A. Yes, he is.

Q. And you essentially work as a team with him?

A. Yes, we have for about 11 1/2 years.

Q. And when you looked at this area, you looked at the Deep Lease; is that correct?

A. We looked at the Deep Lease, Deep Lease Extension, and also part of our charge was to look out in the Twin Peaks area.

MR. BRUCE: Madame Chair, I'd tender Mr. Hattner as an expert petroleum geologist.

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: Mr. Hattner is so qualified.

Q. (By Mr. Bruce) And Mr. Hattner, the first thing, is Exhibit 23 a copy of your résumé?

A. I don't have that one. I'll believe it.

Q. Let's start with your exhibits. I think the first one is 38.

A. Yes.

Q. You mentioned that you looked at the Pictured Cliffs geology. Could you identify the exhibit for the

Examiner [*sic*] and discuss the Pictured Cliffs in the area of interest?

A. Exhibit 38 is an isopach map of the Pictured Cliffs that I prepared. I guess all the exhibits that are my exhibits here and the maps are my maps as prepared and mapped by me.

I looked at approximately 176 logs in the area, not only in the lease areas but surrounding the lease areas and looked at basically all the logs that were available to me at the time of the preparation of this.

The Pictured Cliffs isopach map -- and again, in some of the discussion with Mr. Hively yesterday, the base-of-the-Fruitland Coal, top-of-the-PC pick is -- There's some disagreement or different picks. The structure map that I've picked is the base of the S8 Coal, which is basically in agreement with Mr. Hively. He just picked the tops. We're pretty close.

The reason there's just the PC isopach is, this deals with an area in the southeast part of the region where I have some logs that basically indicate an area of porosity development of over 20 percent. So local porosity development, it's probably a bar-type area and the environment is a little bit cleaner than the average PC in the area, which is immediately underneath the Fruitland Coal also in this area.

And some of the work with this goes back to looking at the Russell Federal well and its PC production. It's the old well that was referred to, some of the previous testimony.

But looking at the porosity logs, there's a porosity development in this southeast corner, in the PC, versus the rest of the area.

Q. So the PC thins to the north and the west?

A. Well, some of the discussion -- the PC is probably -- the exact sand members are time-transgressed over this area, and there's probably a local porosity development. There is PC sand across the rest of the area, but the majority of it is lower porosity, as described by Mr. Hively, and I think Mr. Cox also referred to that earlier.

Q. Based on the production performance of the PC to the north and west of this -- the area that you show on your map, the PC is there, but would you from a geologic standpoint expect it to be marginal?

A. I did not see the 20-percent-type porosity development I saw in the southeast corner in those other areas, and the performance -- You'd have to ask Mr. Smith on that. I just know that we had the good performance of the Russell Federal and some of the other wells in this area that tied into this area of the PC.

Q. Okay. But from a geologic standpoint, you would not recommend drilling --

A. I did not see a good porosity development in that area. Consequently, compared to the performances Mr. Bertoglio referred to in other areas, the PC doesn't perform well in those low 10- to 14-percent type porosities.

Q. Okay. So based on the performance, the production, say, in the Deep Lease and the northern part of the Deep Lease Extension would probably be from the Fruitland Coal rather than the PC?

A. I think the majority of that would be expected to be from the Fruitland. And I think again, supporting Mr. Cox's analysis and Mr. Smith's, there's small volumes of PC gas in that area.

Q. Okay. Let's move on to your next exhibit. Could you identify that and discuss the basal coal seam in this area, how it compares to Mr. Hively's --

A. This is my isopach of -- as I said, the slight difference here is the S8 and the S8.6. I think Mr. Mercier referred to it as the -- the overlying stringer as the 8.6.

When you come into the mine area, the actual -- the surface mine area, the San Juan Mine to the west, the 8.6 actually is in connection with the 8 Coal. There is no division in that particular area.

As you move to the east, the 8.6 begins to ride up into the section, up to 35 to 50 feet above the 8 Seam. So I've made an isopach of the 8 and the 8.6, and it's just basically one seam over to the west.

So I guess a statement would be that Mr. Hively and I, when we get to the west, are probably in exact agreement on the lower, and as that coal splits and runs further up above the 8, we would diverge in our lower isopach a little bit, just by the amount of the 8.6 seam.

Q. Okay, so the difference is in how you group the coal seams, rather than the actual thickness?

A. Right, he would then count the 8.6 in his upper, as indicated by his cross-sections, and I've counted it as a lower. But as I said, in total we're -- basically in total in the whole area, we're within about a 9-percent, 8-1/2-percent difference.

Q. Okay. And what does your next exhibit show, Number 40?

A. My next exhibit, which is Exhibit 40 --

Q. The -- yeah, 40.

A. -- is a depth structure of the top of the S8. And again the difference here, as I did state, with Mr. Hively it's -- we're pretty much showing the same amount of dip, around 100 feet or so per mile in the western part of the area, and then when we get into the Deep Lease Extension the dip flattens. There's a flattening of the dip to about 150 feet per mile. So there's a little bit of a flexure across the Deep Lease, the Deep Lease Extension, on the top of that coal, and I think we're in -- again with Mr. Hively, we're very, very close, within a couple of feet.

Q. And then your next exhibit, 41, what does that --

A. Exhibit 41 is -- that's an isopach of the S9 Coal, the Seam 9, which Mr. Hively indicated on his cross-section is one of his coals in the upper coal. It's actually probably the most significant coal in the upper Fruitland Coal section that Mr. Hively maps. And as I said, when we add these together we're within basically 9 percent.

Q. And the upper coals, of course, are thinner than that basal coal?

A. Yes. There are some local areas where you get a little bit of a thickening. But you know, average across here, it's probably about average, seven, eight feet for the S9 seam.

Q. Okay.

A. And this seam, out of the upper coals, is the most continuous. I mean, there are the other stringers, but you'd expect those to be less continuous across the area.

Q. The two-foot ones or whatever could be discontinuous?

A. Yes.

Q. Okay. And then move on to your next exhibit, Number 42.

A. My next exhibit, Number 42, is just a structure map on the top of that S9 seam across the area. It basically mirrors the structure of the S8 Coal, so there's no significant depositional changes or growth faulting across this area that was noticeable within this section. I think Mr. Hively's cross-section illustrated the same pretty general dip into the Basin.

Q. Okay. Then your next exhibit, 43, which is a portion of a well log -- this may be superfluous at this time, but could you just say what you were trying to show on this one?

A. Yeah, these log exhibits were prepared based on the previous cross-sections prepared by Richardson, which was shown on some of Mr. Mercier's cross-sections yesterday, and this was just to illustrate some of the differences in that interpretation.

Using the density log as a comparison in here, you can clearly see cases where, as Mr. Hively discussed how net pays were picked yesterday, if you look at the

Turk's Toast Number 1 well, on the top of the S8 Coal, you can see fairly reasonable agreement.

But then you see in the next coal or section picked up above that -- if you actually look at the density log, the comparison of the Netherland, Sewell pick shows a three-foot coal, and the previous geological work showed about a 12- or 14-foot coal. Clearly, looking at the gamma-ray response and the density response, over half, actually about eight feet of that pick of the previous geological interpretation was shale or bentonite.

So it was an extremely optimistic interpretation. And I think, as I said, Mr. Hively and I are in -- and we did not collaborate on this -- we're almost in complete agreement. So it really makes these exhibits kind of mute [*sic*], because we're in almost excellent agreement on those picks.

Q. Okay.

A. I think as a reasonable geological -- petroleum geologist, this is the way you would interpret these sections.

Q. There's essentially no difference between you and Mr. Hively?

A. No.

Q. Mr. Hattner, finally I hand you what's been marked Exhibit 26. Can you just briefly identify what this exhibit is?

A. Exhibit 26 is a paper from the AAPG of -- actually it's tomorrow's, it's November, 2002's, *Bulletin* of the AAPG.

Q. And when did you first receive this, and maybe more importantly, when did you have a chance to fully --

A. Actually, I received my volume last week, I think at the start of the week, when we started this proceeding, I think -- I thought it was about eight days ago. Finally finished reading the article yesterday. So it's somewhere between ten days and two weeks ago.

Q. And could you perhaps just point out a few key matters out of this article regarding Fruitland Coal production in the San Juan Basin?

A. I think this article is a great summary article of a lot of the work that's going on in both the San Juan and Powder River Basins, in which we do an awful lot of work, especially in the Powder.

Some of the main points about the article is, a lot of this work was funded by the, you know, GRI, who's one of the leaders in the coalbed methane, funding of CBM research, in having this work become a part of the database for the companies in the Basins, and a lot of people have relied on this work over the years.

And again, some of the work was done -- it's referred to here in the acknowledgements, as Mr. Whitehead at New Mexico Bureau of Mines and Mineral Resources. So there are a lot of collaborators in this research, it's not just Mr. Ayers.

And some of the basic data -- like in 1857 you can see some of the range of permeabilities within the Basin. The San Juan is the squares. And again, it ranges from basically less than a millidarcy through, with some exceptions, up over 100 millidarcies. But clearly not the type of permeability in some of the coals that we see in like the Powder River.

And then it discusses some of the basics of CBM projects, including water handling, gas treatment, et cetera, and I think that we're all in agreement on those things. Just a lot of the details that Mr. Cox discussed, including coal thickness and extent, thermal maturity permeability, permeability-thickness, these things.

Then on 1859 is a reasonable cross-section across the Basin, just showing the relationship of the various units, including the Pictured Cliffs and the Fruitland Coals.

And then you have -- several of the questions refer to kind of the fairway area and basin dip, and I think you -- 1860 you see the regional structure across the Basin. The fairway is indicated on those sections, and you can see that the area of discussion is west of Farmington, and you can see the fairly consistent dip out quite a ways into the Basin.

Then 1861 you see the Fruitland Coal and the deal with several areas and different reservoir characteristics, shall we say, within those different trend areas. There's some tables in there to talk about those reservoir characteristics later.

Q. And this is referred to as the Trend 2 area that we're --

A. Yes, this is the Trend 2 area, is where we're at.

Turn to page 1862, it's a Fruitland net coal thickness map, and you actually see the area just west of Farmington, and this area is less than 30 feet. And I think Mr. Hively and myself were in the 28-foot-type range, or 26, and he's at 28. So that's in good agreement with the map. It's just that basically this research is just supporting about where we're at.

The next page, 1863, just talks about vitrinite reflectance and the grade of the coal, and I think we're all in pretty good agreement on that.

There's discussion on coal and -- on page 1864, on the Basin uplift and the removal of section under the Coal and Coalbed Gas Origin, Composition, and Resources, the paragraph up from the bottom in the left-hand column, and it talks about thermogenic gas generation, uplift of the Basin, overburden removal and loss of coal -- or changing coal capacity, and it's caused the coalbeds to be undersaturated, according to this article.

Q. Now, one thing on this same page, it talks about ash content and it talks about it commonly exceeds 20 percent. That would confirm Mr. Mercier's statement yesterday, would it not?

A. Yes, under that same section -- sorry, I missed that -- second sentence in that first paragraph, "Ash content in the Fruitland Coal ranges from 10 to 30% and commonly exceeds 20%," with moisture content of 10 percent in the southern part of the basin, 2 percent in the north. So it just gives some basic characteristics of the coals in the area for the Fruitland.

The next page, 1865, Figure 12, calculates in place volumes regionally through the Basin, and it shows this area west of Farmington having less than 5 BCF in place per section.

Q. And that would differ from Mr. Cox's estimate?

A. That would differ from Mr. Cox's. And again, this is a general trend map. And of course you'd expect that the closer you get to the outcrop, that that would even be reduced further.

The next page, 1866, may answer some of the

Commissioner's questions -- I know there were some questions the last couple days -- about cleat orientation in the area that we're at, west of Farmington. It shows the northeast-southwest-trending cleat orientation. I believe Mr. Mercier's north-40-east, and that would be -- the base cleats and the butt cleats are at 90 degrees of that, so I think that was north-50-west, I believe was Mr. Mercier's testimony yesterday.

And then page 1867 just shows a potentiometric surface map of the area, and I believe from Mr. Smith that -- I think we're in agreement with Mr. Cox. It's 5100 feet within this area, so it would just be one more contour in the area just around the mine, just west of Farmington.

And then page 1868, Table 1 goes through characteristics of the trends from Figure 8. The area west of Farmington is in Trend 2, 30 to 50 feet of coal. We're close to that, 28 feet. I think it's just a little bit of a difference toward the outcrop.

The grade of the coal, mostly less than 150 s.c.f. a ton, undersaturated, 3 to 15 b.c.f. per square mile. Ratio of gas composition. CO_2 content less than 1.5 percent. And since that hasn't been discussed, I think everybody's in pretty fair agreement on that.

Underpressured, northeast dip into the Basin, 5 to 25 millidarcies, which seems to fit the previous discussion. Then there's production rates, water rates, then depth. Now, the one difference in our area of Trend 2 is that we're up closer to the outcrop so our depths are -- if you go actually to the mine face, I think Mr. Mercier said we're at about 400 feet, and I think we pass down to about a thousand feet, which is at the -- Well, the upper end of that range is actually above that range a bit, so...

Q. And this table indicates that in the Trend 2 area, that the gas contents of the coal are what, generally less than 150 standard cubic feet per ton?

A. Yeah, that's what it says in this table. And then there's a written discussion of that also on page 1869 where it basically writes out, I think, the results of the table.

Q. And it also states that this area is undersaturated?

A. Yes, it does.

Q. Could you finally refer to page 1881 and discuss that final issue?

A. Page 1881 talks about Coalbed Formation Evaluation. It discusses some of the same issues we've had. "The most important and difficult coalbed gas parameters to assess are gas content and permeability during the early project stages."

And then it goes down and basically says you can't use well logs to measure methane content or permeability. "Instead, gas content of coal must be measured by desorbing samples in the laboratory. Core samples provide the most accurate results, but gas content can be measured from cuttings," but with a large margin of error. That's under the CBM Formation Evaluation Issues.

Q. Does this article -- and I know Mr. Smith hasn't testified -- generally confirm Netherland, Sewell's geologic and engineering study of this area?

A. From my understanding of Mr. Smith's work, that's true, but you'd have to ask him some of those specific questions on that side. But geologically, I think this ties in very well with our analysis.

Q. Were Exhibits 23, 26 and 38 through 43 prepared by you or compiled from the magazine article?

A. Yes.

MR. BRUCE: And madame Chair, I'd move the admission of San Juan Coal Company Exhibits 23, 26 and 38 through 33 [*sic*].

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: Okay, those exhibits are admitted into evidence.

MR. BRUCE: Pass the witness.

CHAIRMAN WROTENBERY: Mr. Kellahin?

MR. KELLAHIN: Thank you.

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. What's the exhibit number, Mr. Hattner, for Walter Ayers' paper?

A. I believe, if I read this right, it's 26.

Q. Okay. Do you see Mr. Ayers in the room today?

A. I don't know him, no.

Q. He's not here, is he?

A. I don't believe so.

Q. Are you urging the Commission that this paper represents a current representation of the Fruitland Coal Gas Pool?

A. This is the most recent publication that I have knowledge of that refers to the Fruitland Basin and the Powder.

Q. Let's see how recent this is. If you'll turn to page 1857, let's look at page 1857. If you look over at Figure 5 --

A. Yes.

Q. -- if you look at the reference, you'll see that this data is more than 15 years old, is it not?

A. If I go from 1988 to 2002, I get 14 years, depending on the month you want to deal with, 14, 15 years, yes.

Q. Fourteen, 15 years.

A. But it is modified from that original data, it says. It's not completely that original data, if I read that right.

Q. If we relied on this display back in -- several years ago, we would not have believed that you could successfully drill and complete and produce wells in the coal fairway which are at depths of approximately 2000 feet, 2000 to 3000 feet?

A. I believe there's comments in here if we want to go -- if we want to take the paper apart section by section where it discusses the fairway and drilling -- it says generalities, but it does discuss drilling in the fairway, if we want to go find that.

Q. So if I'm looking at Exhibit 5 on this display, that information shown would not encourage me to go drill the fairway for coals as deep as 2000 to 3000 feet?

A. (No response)

Q. Isn't the point of Figure 5 is, they're trying to demonstrate that coals at that depth would have too low a permeability to be productive?

A. There are indications of the higher perms that range up to -- I guess it's about 60 or 70. It looks like at 2000 feet, because -- exactly where you pick that up. But it does discuss in the paper overpressuring and that effect on performance.

Q. Let's turn to page 1661 -- I'm sorry, 1861. There's a figure on this page, it's Figure 7 -- I'm sorry, Figure 8.

A. Yes.

Q. Figure 8 at the top. This appears to be more than 10 years old, does it not?

A. Again, if you read the title it says it's modified, so...

And if you go back to the table of contents it refers to production characteristics from the associates from Wyoming, data from 2002, Wyoming Oil and Gas Conservation Commission, coalbed production, accessed June 27th, 2002, page 1890, third reference from the top, left-hand column.

Q. Am I correct in understanding that on Figure 5 the basis of this work originates from more than 10 years ago?

A. Figure 5 is 15 years ago, and it's been modified since then. But all basic work in science, when it's done, gets modified along the way. But that doesn't mean we throw out the baby with the bathwater.

Q. Are you satisfied that this paper is current in all its respects?

A. Can I verify every word and every piece of data in here is absolutely accurate up until today, to the last second? Absolutely not.

Q. All right, let's go to page 1681.

A. 1881?

Q. I'm sorry, you've got to help me with numbers, 1881.

A. Yes, sir.

Q. Look at the far left column on page 1881, just below the caption that says Coalbed Formation Evaluation Issues.

A. Yes, sir.

Q. Am I reading this correctly when I find it says, "Instead, gas content of coal must be measured by..." desorption "...samples in the laboratory"?

A. Yes, sir.

Q. "Core samples provide the most accurate results..."

A. Yes, sir.

Q. "...but gas content can be measured from drill cuttings, with a large..." margin of error. Right?

A. Yes, sir.

Q. When you see these desorption calculations of gas content, do you always believe those numbers to be accurate?

A. Again, I'll have to refer to -- a lot of -- to Mr. Smith.

I think if you had one sample or one number, certainly take that with a large grain of salt, whereas if you have a preponderance of numbers, statistically, obviously, that you'd have a higher degree of confidence in those numbers.

Q. Have you used the available data and your best geologic judgments and talents to determine the measured values for gas content on a standard cubic of gas per ton of coal?

A. As I said, Mr. Smith handles that part, the desorption values and the assignment of gas content. I just do the isopachs and the volumetric part through that stage, so you'll have to ask him.

Q. So you would not have been involved in preparing the exhibit that deals with the measured values of gas content per ton of coal?

A. I did not.

Q. Okay. When you look at this paper, is there any of this work that includes the data for Mr. Richardson's coalbed methane area?

A. I do not know if it has any of Mr. Richardson's specific data, no.

Q. Do you see if it includes information from any of his specific wells?

A. As I said, I do not know that data.

Q. Let me show you your résumé and Mr. Smith's résumé, they're Exhibits 24 and 23. Mr. Hattner, yours is 23 --

A. Yes, sir.

Q. -- and Mr. Smith's is 24. Is your coalbed methane experience identical to Mr. Smith's?

A. Pretty close.

Q. So when those résumés have exactly the same words in each, they represent both of you in the same way?

A. Yes, as I said, we worked as a project team, and there are very few projects that we have not worked together over the last 11 1/2 years. The organization of Netherland, Sewell is engineering teams with a support group of geology. The geologists are assigned on a team basis to the engineers. Mr. Smith and I have worked, and we've looked at a lot of the rest of the projects that are listed under here. You'll see a lot of those projects show as exactly the same.

Q. Let's go to the Pictured Cliff. I'd like to look at the isopach that you submitted as Exhibit 38.

A. Are we --

Q. We're done with that.

A. I'm sorry, which figure --

Q. Yes, sir --

A. -- excuse me?

Q. -- 38.

A. Figure 38. I only have a Figure 32.

Q. Okay --

A. In the paper?

MR. ROSS: Exhibit 38.

THE WITNESS: Oh, I'm sorry, I'm sorry, I was looking in the paper. I'm sorry.

Q. (By Mr. Kellahin) I'm going back to the exhibit book and looking at Exhibit 38.

A. The other Figure 38.

Q. I'm sorry, this is contagious, apparently.

A. Yes, sir.

Q. All right. This is your isopach on the Pictured Cliff?

A. Yes, sir.

Q. When I look at the contours on here, there's a zero line depicted on the map?

A. Yes, sir.

Q. Is this a gross isopach of the PC?

A. This is an isopach of the PC, basically 20-percent porosity. So well-developed porosity. As I explained earlier, this is that well-developed porosity that we see down in this area.

Q. Okay. I was trying to figure out how you've taken a gross PC interval and reduced it. And so you've reduced it by using a cutoff of -- did you say 20-percent porosity?

A. Twenty percent.

Q. So if a portion of the PC has a thickness and a porosity of less than 20 percent, you've excluded it?

A. Yes, this was just to -- the performance in this area and to see what the log characteristics looked like, and there was an increased porosity development in this area, and it was just a -- It's an isopach of that porosity development.

Q. Is it your professional geologic opinion that you have to have a cutoff of 20 percent porosity in order to have a PC interval that will be gas-productive?

A. No.

Q. Okay. Do you have a gross PC map?

A. No, I do not.

Q. So you have not presented us a gross isopach of the PC so we could see how it's distributed over the whole area?

A. No, performance was the driver in the rest of the area.

Q. Are you aware that in the San Juan Basin there is substantial PC gas production from areas of the Pictured Cliff that have porosities of 6 to 8 percent?

A. I'm aware there is production from those levels.

Q. And is there also production below 20-percent porosity, in the range of 10 to 14 percent?

A. I've heard of some of those numbers, but could you inform me where those 6-percent producing Pictured Cliff wells are?

Q. Well, apparently you've excluded any of those from this display, have you?

A. You asked me if I was aware of those wells, and I just asked you if you could tell me where all those 6-percent producing wells were at.

Q. Well, let's see if we can find them. When we look at your map and I'm using a 20-percent porosity cutoff, the way you've isopached what I would call a net map --

A. Yes.

Q. -- is that we should not have PC wells outside the zero contour lines on this display?

A. No, this map just indicates area of high porosity, and hopefully it's tied -- I tried to tie that and explain the production, like the Russell Federal Number 2 well in the PC.

Q. Mr. Hattner, let me see if I can go through some of the rest of these things, which I think you're in agreement with Mr. Hively on. I just want to make sure I'm not wrong. I believe you said you don't see any significant differences between you and Mr. Hively on your structure map.

A. The only difference would be the comments that were made that we see a hundred-foot-per-mile dip basically across the entire area, and then as I mentioned, there is a flexural change in the Deep Lease Extension where those contours flatten out and actually you're up to about 150 feet -- or you're actually down to more like 50 feet per mile. The dip flattens out in the west.

So the hundred-foot-per-section statement across the entire area is not totally correct, but as I said, we're in reasonable agreement. It's not significant.

Q. Is that difference of a magnitude that we should bring it to the attention of the Commission and that would be a deciding factor in how to resolve this case?

A. I can't tell you whether it's a significant factor for the Commission to decide on or not. I rather doubt it, but that's their decision.

Q. Let's talk about the isopach.

A. Yes, sir.

Q. Would you agree with --

A. Which one?

Q. I'm going to look at the isopach map of the Seam 8 and the Seam --

A. -- and the Seam 9, the two -- the 8 plus the 8.6

and then the 9? You're looking at both at the same?

Q. No, I'm looking at the 8 and the 8.6 first.

A. Okay.

Q. That's Exhibit Number what?

A. 39, I believe.

Q. All right. I believe you've agreed with Mr. Hively that your map of this Seam 8 and Seam 8.6 is very similar to Mr. Hively's isopach of what he called the lower coal?

A. Yeah, I -- well, actually a bit thicker to the east, as I said earlier, because I include the 8.6 in the basal, where he includes the 8.6 in his upper. As I said in total, when you add the 9 and the 8 and the 8.6 to Mr. Hively's upper and lower, we are within about 7 percent.

Q. Let's go to the second map, that's the map of the Seam 9?

A. Yes, sir.

Q. That's Exhibit Number --

A. That will be Exhibit Number 41.

Q. -- 41. Would you agree with me that your Exhibit 41 is different from Mr. Hively's map at the upper coal in that his map excluded from that seam little splits that you have included? There is a difference there, is there not?

A. No, we're in agreement. I did not include any of the thin splits.

Q. So he did. I have it backwards, Mr. Hively included some thin splits just above yours?

A. Yeah, looking at his cross-section, very few, because those don't extend, as he stated several days ago, which I forget which day. Those are not as continuous or not across the entire area.

So as I stated, when you add my 8-plus-8.6 map, which is where we differ, and that is in the lower to Mr. Hively's, which to the east he has included in the upper, when you add his upper and lower maps together with my 9 plus my 8 and 8.6, then we are within that 7- to 9-percent difference.

Q. So when we look at your Exhibit 41, and looking at Coal Seam 9, I think we see that your map is slightly thinner than Mr. Hively's map of the lower coal?

A. No, you said the lower coal. My map is thicker for the lower coal and thinner for the upper, if you're trying to compare those on that basis.

Q. All right.

A. I think that's what you were trying to ask.

Q. And the collective difference between these is not of a range of magnitude that matters?

A. If you want to argue it on a percentage basis, as I said, it's 7.5 to 10.0 -- 7.48 to 10.02 percent. If you add the two together, then the difference is about 8.5 to 9 percent, which is approximately one two-foot stringer, which I'm not going to stand up here -- I couldn't stand up here and say that you couldn't find those differences within my interpretation and his.

Q. That would be a range of difference that's common among geologists using the same data and applying their own analysis?

A. It's very easy on how you would pick logs and shoulder effects, and you could easily pick a difference of six inches on each shoulder of each of the significant coalbeds, and you won't even need a stringer for a difference.

Another thing, as I said, if you look at the maps there's cases where I'm thicker and there's cases where Mr. Hively's thicker. In aggregate, I think, I said, we're within that 7-1/2- to 10-percent range.

MR. KELLAHIN: Thank you, madame Chairman.

CHAIRMAN WROTENBERY: Thank you.

Commissioner Bailey?

EXAMINATION

BY COMMISSIONER BAILEY:

Q. If you could help me orient myself on the article, Exhibit Number 26 --

A. Yes, ma'am.

Q. -- page 1863.

A. 1863. Yes, ma'am.

Q. Could you tell me where the Deep Lease and the Deep Lease Extension would be located on that map, if they would fall into the subbituminous or the high-volatile C bituminous, because both of them are marked on my map?

A. They're going to fall right on the -- if I've got my distances right, if you look at the map, the mine is, I guess, 10 to 12 miles west of Farmington. So take that scale bar, it's over -- probably about where the "r" is at in "Farmington", just above that.

And I'm not the exact person to say the exact mine location which -- Mr. Mercier and the other people in the room could probably give you a better mine location than I can exactly on this map. But somewhere just above the "r", I would believe, in "Farmington".

Q. So according to that map, the coal is subbituminous?

A. It's right at the edge of that change, yes, ma'am.

Q. But as the subsurface mine progresses to the est it would be going into the high-volatile C bituminous --

A. That's, yes, indicated on this map --

Q. -- is your anticipation?

A. -- it says this paper was presented -- yes.

Q. Does that shed any light on Mr. Abrahamse' testimony that said that -- when we were talking about spontaneous combustion, that the lower rank the coal, the higher the combustibility, which conversely tells me the higher rank the coal, the lower the combustibility?

A. I believe that was Mr. Abrahamse' statement, but I'm not a mining geologist and can't make fair comment on combustibility of coal. And I don't know -- And again, these contours are here and look good on a map, but it's certainly gradational, and I can't say or don't know how much of a gradation or change in coal quality is necessary before that issue, which, as I said, I do not know anything about, takes effect.

I'm afraid that would have to be directed to like Mr. Abrahamse or Mr. Mercier. I apologize, ma'am, for not knowing that.

COMMISSIONER BAILEY: Maybe the San Juan Coal Company witnesses could help me with this question?

MR. BRUCE: Mr. Abrahamse has returned to his job, so I'm afraid we can't help you on that at this point. I guess the best we could would be to have Mr. Brenner find that in his transcript. But there's no -- The geologist and the engineer from San Juan Mine have gone back to the mine.

COMMISSIONER BAILEY: Thank you, that's all I have.

CHAIRMAN WROTENBERY: Did you have any follow-up, Mr. Bruce?

MR. BRUCE: I have nothing further of Mr. Hattner.

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

THE WITNESS: Thank you.

CHAIRMAN WROTENBERY: Mr. Bruce, just a little bit of cleanup before we go further.

MR. BRUCE: Yes, ma'am.

CHAIRMAN WROTENBERY: At the end of the day yesterday you gave us a map. It's not marked as an exhibit, but it's entitled San Juan Underground, Composite Fruitland Coal Thickness, and it shows the cross-sections A-A' and C-C', related to Exhibits 30 and 31; is that right?

MR. BRUCE: Yes. Yes, those -- A-A' and C-C' were used by Richardson's previous geologist, and San Juan Coal Company Exhibits 30 and 31 use those same line of cross-sections.

CHAIRMAN WROTENBERY: Okay. Should we mark this? Would that help us keep track of it, or --

MR. BRUCE: We could. I think it could be marked as San Juan Coal Company Exhibit 27.

CHAIRMAN WROTENBERY: Okay.

MR. BRUCE: And I believe it is simply an uncolored copy of San Juan Coal Company Exhibit 32, with the line of cross-section drawn on it.

CHAIRMAN WROTENBERY: Do we need a break? We need just a five-minute break here.

MR. BRUCE: Yeah, I think our next witness is going to be lengthy.

(Thereupon, a recess was taken at 9:55 a.m.)

(The following proceedings had at 10:05 a.m.)

CHAIRMAN WROTENBERY: Okay, Mr. Bruce, we're ready.

MR. BRUCE: One matter to answer Commissioner Bailey's question. If Mr. Bertoglio could just stand here for a minute and -- Commissioner Bailey, you referred to Exhibit 26, page 1863. Mr. Bertoglio has been at the mine numerous times and can tell you with more precision where the mine is actually located.

PAUL C. BERTOGLIO (Recalled),

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

DIRECT TESTIMONY

BY MR. BERTOGLIO:

The mine, relative to this map, is more in the -- above the .5 line. But the proximate analyses that have been done out there all indicate that the coal is all subbituminous -- or excuse me, high-volatile C. The vitrinite reflectance values are all greater than .5 and less than .7, with the average probably close to .6.

COMMISSIONER BAILEY: So does that make it a high-ranking in the coal system?

MR. BERTOGLIO: No, it's a low rank in the -- The rank goes subbituminous, high-volatile -- If you look at that chart from bottom to top is the rank order --

COMMISSIONER BAILEY: Okay.

MR. BERTOGLIO: -- so subbituminous would be a very low rank, and the low-volatile bituminous would be the high rank.

COMMISSIONER BAILEY: Thank you for that clarification.

MR. BERTOGLIO: You're welcome.

DAN PAUL SMITH,

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

DIRECT EXAMINATION

BY MR. BRUCE:

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

A. Yes, my name is Dan Paul Smith.

Q. And where do you reside, Mr. Smith?

A. Dallas, Texas.

Q. Who do you work for and in what capacity?

A. I work for Netherland, Sewell and Associates in Dallas as a -- I'm a senior vice president there and a petroleum engineer.

Q. And did you work on this project in conjunction with Mr. Hattner, our prior witness?

A. Yes, I did.

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

A. No, I have not.

Q. Could you summarize your employment and educational background for the Commissioners?

A. Yes, I graduated from Mississippi State University in 1973 with a bachelor of science degree in petroleum engineering. I then spent about three years in New Orleans with Exxon Company USA, working in their Gulf Coast Division. And I left Exxon and spent five years with Pennzoil Producing Company in Shreveport, Louisiana, working kind of the south, southeast US properties.

Then in 1980 I joined Netherland, Sewell and Associates as a consultant and have been a consultant for the past 22 years with that firm.

My coalbed methane experience, as our résumés indicate, kind of mirrors Mr. Hattner's résumé. John and I had been involved pretty much with most of the development of the coalbed methane business of Netherland, Sewell and

Associates, and that's why our histories are quite similar in that regard.

I actually was with the firm before John, became involved in the coalbed methane, and so my coalbed methane experience really started back in around 1990 or maybe the late 1980s.

My initial experience was in the San Juan Basin in connection with a lot of the Section-29 tax credits that were going around at that time, and so we were working in the San Juan Basin in that regard.

And from that time to the present, I'd say my résumé and our firm's résumé has kind of followed the industry. We went through the Black Warrior Basin cycle and then through the San Juan Basin, and I'd say right now that our biggest focus is the Powder River Basin. We currently as a firm have probably three-fourths of the Powder River Basin clients, three-fourths coverage of the Powder River Basin in terms of number of clients and acreage.

And we also have been quite involved in most of the other basins in the US, most of the major basins in the US, and are conducting international projects, or have conducted international projects in Australia, Mexico, Czechoslovakia, Poland, many countries around the world.

Q. And are you familiar with the engineering matters related to this case?

A. Yes, I am.

MR. BRUCE: Madame Chair, I'd tender Mr. Smith as an expert petroleum or reservoir engineer.

MR. KELLAHIN: No objection to his qualifications.

CHAIRMAN WROTENBERY: We accept Mr. Smith's qualifications.

Q. (By Mr. Bruce) Before we get into your exhibits, Mr. Smith, and before we go to your handout, could you summarize for the Commissioners your agreements and disagreements with Richardson?

A. Yes, I think Mr. Cox actually went over a list the other day when he was testifying that's very similar to my list, so in some ways I'll be restating some of the same things that Mr. Cox mentioned.

In general, the structure map, I think there are some minor differences, but we have a general agreement there.

We are in agreement with the potentiometric surface, although as you'll see as my testimony progresses, most all of our work is done with a specific value for every 160-acre plot or tract, so we'll have a different answer for every 160-acre block.

Q. You don't use an average value across --

A. We don't use an average value across there. But in general, our potentiometric surface, even though it varies across the area, is very close to 5100, so I don't think we have any issue there in particular. So as a consequence of that, our pressures are roughly, I'd say, in the range that Mr. Cox was discussing.

I think we do agree that there is some level of communication between the Pictured Cliffs and the Fruitland Coal. Maybe the level of that communication may be in dispute.

We are in general agreement with the overall isotherm curve that's being used.

We are in general agreement with the abandonment pressures for the zones. And as you'll see, even our abandonment pressures are a bit lower than those being used by Mr. Cox.

My areas of disagreement may be a little longer than Mr. Cox had indicated.

I'll put coal thickness as a minor area of disagreement. As John Hattner has testified, that's in the range of 7-percent difference for the coal thickness.

We have what I would classify as a major difference in the gas content of the coal, in that I believe Mr. Cox would consider it to be saturated, and we would consider it to be undersaturated.

COMMISSIONER LEE: Gas content?

THE WITNESS: Yes, the standard cubic-feet-per-ton gas content of the coal.

COMMISSIONER LEE: Of the rock.

THE WITNESS: Of the -- Yes, yes.

COMMISSIONER LEE: I thought you were talking about composition.

THE WITNESS: Yes, content. Yes.

I think we would have a different view with regard to what constitutes an analogy well. I think we would tend to look more at the wells on the Deep Lease and the Deep Lease Extension, rather than going a great distance away from this area to find wells to draw analogy to. So I think we would have a fundamental disagreement there.

And in the same way, that would then result in a disagreement with regard to what a typical well looks like, because we would look at a typical well in the context of the wells that are already on the Deep Lease and Deep Lease Extension.

We would have some differences with regard to reserve categorization, as well talk about. We as a firm tend to classify our reserves as proven, probable and possible, whereas I don't think we understood what reserve category Mr. Cox was using.

And then finally, I think we would have some difference of opinion with regard to the model. We have not done a computer model of this area and don't really think that it's very appropriate to do that.

Q. (By Mr. Bruce) Thank you. Would you now refer to your handout -- it's not been marked as an exhibit -- and discuss two things: the type of people you work for, the type of reserve categories you use and why you use those categories?

A. Good, yeah, I did want to kind of expand on Mr. Hattner's discussion of Netherland, Sewell and who we are and kind of our view of this project.

We have never testified before the Board. We don't like to do this, to be honest with you, it's not our favorite work to do, we try to avoid it. But I wanted to let you know what our normal course of business is, and that will maybe kind of help you understand how we look at this project.

We normally work for major and independent oil and gas companies in the US and around the world, and we also do a great deal of work for government oil companies. In that regard, we're currently doing a study of the coalbed methane potential in Mexico for Pemex.

We normally work for financial institutions where our work is used to finance projects, to -- as collateral for loans. So in that regard we normally have to be very clear in defining reserve categories for the estimates that we put forward.

The next page shows kind of a list of some of our coalbed methane clients that we now have, and these are pretty active producers in the US, and I'm sure you'll notice some of the names. For the most part, our work for these clients is used for SEC filings or to collateralize loans that they have. And again, I think that's important because we do have to be very careful how we categorize our estimates for these companies, and that our numbers will be used by the Securities and Exchange Commission of the US.

Now, I have this Oil and Gas Reserves and Resource Terminology exhibit here that really shows that there's all kind of rules and regulations with regard to how you tag and identify reserve estimates, all the way from those that are not discovered yet. And the AAPG has definitions of undiscovered reserves, and we won't have to deal with those today.

Under discovered reserves, there's a subdivision between commercial and noncommercial. And then once you get into a commercial development or a play, then you have reserves. And the three classifications that we have under reserves that we normally use are proven and probable and possible, and those are the three that you see at the bottom of the page there.

Q. Okay.

A. The next page shows some of the authorities with regard to reserve categorization. The Securities and Exchange Commission is a very important one for classifying proven reserves for SEC filings, and we also use the SPE/WPC, Society of Petroleum Engineers and World Petroleum Congress, definitions.

Q. Now with respect to the SEC filings, these public companies you work for have to meet the SEC guidelines, so you darn well better use their definitions; is that right?

A. That's correct. And the reason I'm going through this is to show you why I think it's important -- it's the very last page of the handout -- is, these reserve definitions have meaning in that they identify the relative risk of that reserve that you've estimated.

Under the SPE/WPC definitions, a proven reserve should have a 90-percent-or-greater probability of being produced, so that's a fairly certain reserve. And we have to take that very seriously when we assign a proven reserve classification.

In the same way, a proven plus a probable reserve should have a 50-percent chance of being equal to or greater than the estimates, and the possible reserves should have a 10-percent chance of being greater than the estimates.

So really, the important part of this is, when you throw out a recoverable volume estimate you need to label it and tag it so that you can compare it to other estimates. It makes it very difficult, we believe, to take our numbers and compare them with the Richardson estimates, that ours are really classified and categorized, and the Cox estimates are not.

Q. Based on what you've seen -- You've been present during the last two-plus days of testimony, have you not?

A. Unfortunately, yes.

Q. Based on what you've seen, how would you categorize the values Mr. Cox has given in his testimony and exhibits?

A. Certainly the way Netherland Sewell would classify reserves, anything in excess of our estimates of prudent or probable reserves would be in the possible reserve categories, I'd say. A substantial portion of Mr. Cox's estimates would be what we would normally classify as possible.

Q. Okay. Let's start with your exhibits, and first let's skip Exhibit 44 and go to Exhibit 45 as your first point of reference, and could you discuss your methodology in determining the reserves in the three areas you've discussed -- or the two areas, the Deep Lease and the Deep

Lease Extension?

A. Yes, we were hired to conduct an independent third-party study of the proven, probable and possible gas reserves in the Fruitland Coal and the Pictured Cliffs -- and, as John mentioned, even for the other zones, even though that's not a subject of this discussion -- as of January 1, 2002. Now what that means is that at the time we did our work, the effective date of our estimates was January 1, 2002. We have done our work in accordance with SPE/WPC reserve definitions.

In the course of doing our work we go through a pretty standard process -- it sounds very similar to the one Mr. Cox described -- in that we will estimate the original gas in place in the Fruitland Coal and the Pictured Cliffs. We will then determine how much gas is in there and then try to run some cash flow and economics.

In the course of our work we have estimated -- we've used what we refer to as a discounted cash-flow method, where we actually estimate year by year for every property the reserves and revenue cost associated with that to determine whether those reserves are commercial or not.

Q. Now again, was Netherland, Sewell hired to do a conservative study of the data?

A. We normally would say that we don't care why we're hired, whether it's conservative or optimistic, we're going to call it like we see it. In this case I would say that the instructions we had from BHP San Juan Coal Company was, if there's a gray area try to err on the optimistic side because we don't want a lowball report on these reserves.

Q. Okay. Let's go to your Exhibit 44, which is actually kind of a -- maybe a final answer that you'll get to after you go through your other exhibits, but could you identify that and discuss what that shows.

A. As you say, that is essentially the final answer. The important column is the right-hand column, which is the gas ultimate reserves, and they are separated by the Deep Lease and the Deep Lease Extension.

You'll notice in my discussions today I'll be very focused on those project areas, with very little discussion of Twin Peaks and any other areas outside there. I've tried to focus on those areas primarily.

In the Deep Lease, for example, what you see here is there's three proved developed producing wells that we've used. Proved developed producing, those are wells with actual history and that are actually selling gas, and we classify those as PDP. And in the Deep Lease there's three of those.

Proved developed non-producing on the table here would be wells that are completed but not yet on line, and we weren't aware of any of those.

We had nine proved undeveloped wells in the Deep Lease that range in reserves from 114 to 216 million cubic feet per well, and we have 11 probable undeveloped locations on the Deep Lease that range in reserves from 128 to 254 million cubic feet per well.

For the Deep Lease Extension we have a history and have a classified proved developed producing reserves for 20 wells that ranges from essentially 1 million cubic feet to 525 million feet. We have 10 proved undeveloped wells in the Deep Lease Extension that range in reserves from 16 to 322 million, and we have 12 probable undeveloped locations that range in reserves from 168 to 349 million cubic feet.

Q. Well, let's maybe now just start in on discussing how you go to those numbers. And if I could refer you to Exhibit 46, could you discuss what is shown on that exhibit?

A. Yeah, I have a series of kind of cartoon graphs that kind of just spot things areally. Exhibit 46 is a list of the desorption measurements from -- I believe there 18 wells here -- kind of posted in an areal sense so you can kind of see where they fall. As I think the discussion has evolved, it's become very clear that we have used those desorption measurements.

Q. Okay. Do you think that is the proper way to measure gas content?

A. We saw no reason not to use them. And as I'll discuss later, we think that the undersaturated reservoir of coal that these measurements are indicating tie reasonably well with the performance of the wells that are producing in the Deep Lease and Deep Lease Extension. So we were comfortable using those.

Q. Well, let's move on to your adsorption isotherm, Exhibit 47. And Commissioners, that is one of the revised exhibits I've given you.

Mr. Smith, could you discuss Exhibit 47? And first off, what is the only difference between the original Exhibit 47 and the revised Exhibit 47?

A. Yeah, in the revised Exhibit 47 we've actually put the points down there that correspond to the desorption test, just for comparison purposes.

I think Mr. Cox had explained the adsorption curve. We've talked about that quite a bit already, so I won't talk about that. But the important point there is that the adsorption curve measures the ability of a coal to hold gas. It doesn't necessarily say that that's how much is actually in the coal. And that really defines saturated versus undersaturated coals.

What we're seeing here, and what this exhibit is indicating, is that the measurements from the desorption canister analysis are showing that this coal doesn't have all the gas in it that it could, in theory, hold.

Q. Again, the basic adsorption isotherm is -- you don't have a substantial disagreement with Mr. Cox's on that particular issue?

A. That's very close.

Q. Okay. And then what is Exhibit 48?

A. Exhibit 48 is a plot of the depth to the top of the coal versus the desorption gas content.

What we're attempting to do in this case is to establish a trend of gas content that we might expect as we move from the shallower portion to the west of the Deep Lease, over to the deeper portion as we move easterly to the Deep Lease Extension and eventually into Twin Peaks. So we're trying to get a relationship of these desorption measurements as they relate to the depth of the coal.

Q. And is that then reflected on your next exhibit, 49?

A. Yes, Exhibit 49 takes the theoretical gas in place that you would have -- or excuse me, it takes the theoretical gas content that you would have at each section from the Langmuir curve and it compares that to the linear relationship that we've developed of the gas content versus depth from the desorption curve.

And so it's an indication of the relative amount of saturation of the Fruitland Coal as you move, in this case, from the west side, which is around 4900 feet, to the east side, which goes down to 4400 feet. It shows that at the surface, or very near the surface, that the coal is very undersaturated, maybe 10 to 15 percent, and that as you move to the west -- excuse me, to the east of the project area and you gain depth, you're actually becoming more and more saturated, and it would be more of a transition from undersaturated to more saturated as you move from west to east.

Q. Okay, so the undersaturation ranges from about 10 to 40 percent?

A. In this area.

Q. In this area.

A. Yes.

Q. And would that be consistent with the paper that Mr. Hattner discussed, Exhibit 26?

A. Yeah, that paper -- and I honestly have not had a chance to look at that paper, but yeah, that paper does indicate what you can read in most literature, is that because this area of the Basin has been uplifted and cooled, that when it's cooled it can hold more gas, and so it would become undersaturated with that uplifting. And that would be consistent with that observation.

Q. Did you then take the desorption data, the undersaturation data, the gas-content data, and apply that to determine gas content within the project areas?

A. Yes, I did, and that's Exhibit 50, which again with my love of cartoons, it just kind of shows how the gas content for every 160-acre block there varies as you move across the Deep Lease, Deep Lease Extension and Twin Peaks, and just a visual of that shows that the gas contents are low in the west and increase as you move to the east, which is normally expected because you're getting deeper and the pressure is increasing.

Q. Okay. So you have a gas content per quarter section in this entire area?

A. That's correct.

Q. And you do not use an average value?

A. That's correct.

Q. Now, in looking at the data that you've just discussed, perhaps at this point -- maybe just briefly again -- this has probably been gone over before, but what's the difference between the adsorption and desorption?

A. Okay, the adsorption is a measure of the ability of the coal to hold methane gas. The desorption test is a measure of how much gas is actually there. And so that would be an indication of whether all the gas is there that could in theory be contained in the coal.

Q. Now, if Mr. Cox had used these last two exhibits, could that, in your opinion, explain the poor performance of certain Richardson wells in the area of the Deep Lease and Deep Lease Extension?

A. It would be more consistent with the poor performance.

Q. Okay. Now, using this data, moving on to Exhibit 51, what does this reflect?

A. This is an indication of the pressure for each 160-acre block across the area. And again, this is based on the potentiometric surface map that we've applied across the area and basically takes a pressure calculation down to the midpoint of the coal, and then just post that.

So it again indicates that as you get further to the east, you're deeper and the pressure is increasing.

Q. And again, when you make your final calculations, you did not use an average pressure, did you?

A. That's correct.

Q. You used the pressure per quarter section?

A. That's right.

Q. And what numbers did you come up with? And I refer you to Exhibit 52.

A. Generally in the Deep Lease the pressure varies from 60 p.s.i. in the extreme southwest portion up to a high of -- you have 250 p.s.i. along the eastern edge, and the pressure continues to increase to a pressure of 300 p.s.i. as you move to the eastern edge of the Deep Lease Extension.

Q. And what are the original gas in place in the coal that you derived after using these numbers? And I refer you to Exhibit 52.

A. Yeah, Exhibit 52 only relates to the S8 Coal, and what we've done is, we've combined the gas content information that you just saw with the mapped thickness provided by Mr. Hattner, and with the localized densities that we had from proximate analysis provided by BHP. We've combined all these into a calculation of the original gas in place per 160-acre tract.

Q. Okay, now this is only the Seam 8, right?

A. This is only Seam 8, that's correct.

Q. But your final numbers do take into account Seam 9, do they not?

A. That's correct.

Q. Let's move on to your next exhibit, 53, and identify what you have projected from the data you have.

A. Yeah, this is the same type of exhibit but includes the 8 and the 9 coals.

Q. And are these --

A. On these -- I'm sorry, Exhibit 53 is a calculation if the reserves for the 8 and 9 Coal. The reserves differed from the original gas in place in that we assumed that you can go down to an abandonment pressure of 10 p.s.i. in both the 8 and the 9 Coal, and so this reflects your recoverable reserves that you would get, in theory, if you were to reduce every 160-acre tract down to a 10-p.s.i. abandonment pressure.

Q. Okay, so Exhibit 52 is original gas in place in Seam 8, whereas Exhibit 53 are your projection of reserves in both the Seam 8 and Seam 9?

A. That's correct.

Q. Okay. Now, did you also look at -- Well, let's move on to Exhibit 54. What does this reflect? And again, a revised Exhibit 54 was submitted to the Commission.

A. Okay, what we've done is, once we determine the theoretical gas in place and theoretical reserves down to the 10-p.s.i. abandonment pressure for every 160-acre tract, we then have gone back to the wells that are actually producing in the Deep Lease, the Deep Lease Extension and in this case Twin Peaks. We've attempted to make projections of, based on performance, what the reserves would be for the wells that are actually producing.

We then compared those performance-based projections to the theoretical amount of reserves, and then we back-calculated a recovery factor based on performance as a percent of the original gas in place.

Q. Okay. In then preparing Exhibits 54 and 55, is Exhibit -- excuse me, Exhibit 53 and 54. Is Exhibit 53, your Seam 8 and 9 coal reserves -- does this reflect what is commercially recoverable?

A. The proved developed producing projections would include commerciality tests, and they are based on projections of reserves and operating cost. And when the well goes noncommercial then we cut off the production. So to the extent that those are proved developed producing reserves, they do have a commerciality test included.

Q. Okay. To the -- You mean on Exhibit 53?

A. On Exhibit --

Q. But Exhibit 53, which is your --

A. No, Exhibit 53 does not have a commerciality test. That is only the theoretical gas that could be recovered down to 10 p.s.i. abandonment pressures.

Q. Okay. So this isn't saying that any operator out there, say in the northeast quarter of Section 19, would recover 260 -- a quarter of a BCF of coal gas, based on -- He's not necessarily going to recover that, because it may not be commercial to recover that?

A. That's correct, that would be the theoretical amount of gas he would produce.

Q. Okay. Now, did you also look at potential reserves in the Pictured Cliffs?

A. Yes, those estimates are contained in Exhibit 55, and as Mr. Hattner's maps indicate, we think that the -- what we'll call the sweet spot of the Pictured Cliffs is down to the southern and southeast portion of the Deep Lease Extension and extends over into Twin Peaks, and by Mr. Hattner's maps they actually would extend on down below, south of the Deep Lease Extension --

Q. Okay.

A. -- to the south of Twin Peaks.

Q. So this is, again, volumetric reserves. It's what, somewhat similar to Exhibit 53, but for the Pictured Cliffs?

A. That's correct. But that would be the volumetric reserves to be recovered from the current pressure, not from original pressure.

Q. Okay. Now this question has come up: Based on performance, you don't see any reserves in the northern part of the Deep Lease Extension or in the Deep Lease in the Pictured Cliffs?

A. We don't see very much effective pay up in that area.

Q. Okay. There's gas there --

A. Right, there --

Q. -- just not much?
A. That's right.
Q. What then is Exhibit 56?
A. Exhibit 56 is, again, a calculation of reserves for the 8 and 9 Coal, but this time we've added in the Pictured Cliffs reserves. So you can see that the size of the circles increases to the south of the Deep Lease Extension and the south of Twin Peaks because in those cases we've added in the Pictured Cliffs reserves.
Q. Okay. Now, again, this does not show commercially recoverable reserves?
A. That's correct.
Q. Let's move on to your next two exhibits, and I think we have some blown-up charts for these, Mr. Smith. Let's go first to San Juan Coal Exhibit Number 57. There's a fair amount of data on this. Could you go through it for the Commissioners?
A. Yeah, this is a bit of a vision test, and I appreciate that you won't be able to see everything exactly, but --
COMMISSIONER LEE: Is this fifty- --
MR. BRUCE: Fifty-seven.
THE WITNESS: Yes, what we've attempted to do here is take each producing well that's in the Deep Lease and Deep Lease Extension and post a production history plot

in an areal sense, where the well is actually located. It seems we spend a lot of time kind of talking about performance of wells outside this area, but we haven't, I don't think, kind of focused in on exactly how the wells inside the Deep Lease and the Deep Lease Extension are performing.

So I'm just going to go through it very quickly. I'll try not to take too much time, we all want to get to Hallowe'en.

But in Section 36, in the Deep Lease -- and this is the Deep Lease area -- there are three wells producing in Section 36 -- I guess for purposes of my discussion I'm going to say that 30 MCF a day or 35 MCF a day or 1000 MCF a month is essentially subcommercial. You're not making hardly any money. You certainly couldn't drill a well for that, so those are wells that aren't performing well.

The scale here is the same. The red is the gas and the blue is the water production for each well. I think the important line here for commerciality is the third line from the bottom, second from the top, is always the 1000-MCF-per-month line, which says that any red line below that is noncommercial. So in some cases you'll have to take my word for it and go back and look at this later.

But Section 36, what we have there is three wells. Two of them are essentially below the economic limit at this point, and one of them has some recent performance improvement that's looking pretty good. That would be the 36-3.

So in terms of the production inside the Deep Lease, there are two wells essentially that are noncommercial in that section and one well that's begun to increase. And that's really the database in terms of existing production that we have there in the Deep Lease.

This will become more important in the next map, but the green line here is the S8 Coal thickness greater than 16 feet. And there's a yellow line that doesn't appear on here -- it will appear on the Deep Lease Extension -- that's greater than five feet in the Pictured Cliffs.

There was really not that much information available on the deep ones.

Q. (By Mr. Bruce) Why don't you move, then, to your Exhibit 58, which is the next large chart. And that is part of the -- Now we're into the Deep Lease Extension?

A. Yes.

Q. Maybe start off first with what are the green and the yellow lines on that map?

A. Again, the yellow line here is the Pictured Cliffs greater than five feet of pay, so this is Mr. Hattner's kind of sweet spot where he has greater than five feet of high-quality PC. You can see that it actually incorporates a large portion of Section 29, and then a portion of Section 31 and most of the southern two-thirds of Section 32. So this is going to be an area that would be influenced by the PC in those areas.

The green is kind of the thicker coal members, greater than 16 feet, and there are some areas where you kind of have a corresponding thickness of the coal and the PC. So obviously what we're going to try to do is relate wells that appear to be performing better than others to -- it's in the better portion of the coal and the PC at the same time.

I'm just to go on a quick little spin tour right here. I'll start with Section 31 and go up and just kind of tell you about how the wells are performing.

Section 31 has two wells. The average ultimate for those two wells is about 90 to 100 million cubic feet. We have used decline-curve analysis on those. One has a history of 17 months, and one has like a 16-year history. They would both below that 1000-MCF-per-day line currently, 1000-MCF-a-month line, which would be not commercial.

As part of your vision test, if you can see these red lines, one of the things that's important to notice, whether they're actually inclining, which would indicate that there's significant contribution of coalbed methane.

And in these two sections, wells in Section 31, there's very little indication of incline for those two wells.

In Section 30 it's really one well with two completions, as far as State reports are concerned, which we got a lot of our production information from State information. It's one wellbore but two completions. They have histories of 11 and 30 months, roughly, and both wells are below this 1000-MCF-per-month level and not exhibiting commerciality as yet.

Section 29, we didn't find anything -- Excuse me, Section 19, we didn't find anything.

Section 18 has two wells. Again, both are below this 1000-MCF-per-month line, both at this point noncommercial. Both of those wells have been on production for about six months each. And both of these wells, coincidentally, make a pretty large volume of water for each one.

For these wells that appear to be still rising -- as you can see, these two wells appear to be on an incline -- we have projected in our work that they continue to incline up to rates of 100 to 150 MCF per day per well and then go to the volumetric ultimates that we have previously shown to you. So we would project these two to continue to increase.

Section 17, there's no history.

In Section 20 there's two wells that are -- actually four completions, two wells. One has been on line 16 months and one 29 months. Three of them are very poor, below the 1000-MCF-per-month line, and one looks really good in the Fruitland Coal, the 29-1. We estimate 266 million cubic feet by performance, and the other, the 29-2, we estimate 521 million cubic feet by performance.

As we get into Section 29, we're getting into some good wells here, but we're within this area where the PC is thicker and the coal is thicker, so we're expecting to see some better things happen.

Section 32 has lots of wells in it. I think there's six completions. Three of the six are subcommercial at this point, we would say, at less than 30 MCF a day. They are essentially flat or declining, no incline. Three are good wells, in this area, at 246 million cubic feet, 525 million cubic feet and 282 million cubic feet, by decline-curve analysis.

That's kind of a quick spin through that, and really our conclusion -- and we are always led very much by performance, how are the wells in that area actually performing? And in this area we saw that you're seeing some pretty good performance down in 29 and 32, but the other ones, we interpreted, have already increased, in many cases they dewatered in four to 12 months, and many of them have already plateau'd and appeared in some cases to be already turning over. And we tried to use a projection of that actual performance to calculate the PDP performance.

The thing that we think is important is that once we go through that exercise of projecting these wells and compare that to our theoretical recovery using the desorption data, it's a pretty good match. You're really at recovery factors that make sense to us.

Q. In this area you don't see years of incline, do you?

A. No, no, that was one of the reasons I've created this exhibit, was, I wanted to get a feel myself for whether I saw a large number of wells exhibiting a consistent incline.

Q. And based on the production data and the geology prepared by Mr. Hattner, you're not surprised at the good wells in Sections 29 and 32?

A. No, I would have expected those to be the better wells, at least.

Q. Okay. You did mention the decline curves. Are your decline curves submitted as Exhibit 59?

A. Yes, I have included those. And what each decline curve shows is the history for the gas in MCF per month. And then where you see a line on there, that is my actual projection that I've drawn. So you can kind of see for each well what the history looks like and then what my proved developed producing projection looks like.

In some cases we've actually made a projection, but it was not commercial. For example, this WF Federal 20-1, the first one, and in that case there would be a "No Economic Reserves" block included on that plot.

But just in the interest of full disclosure, I wanted everyone to see every decline curve that we had in there.

Q. Okay. You're not going to spend a lot of time on these --

A. No, I won't.

Q. -- this is just backup data for your conclusions?

A. That's right.

Q. Okay. Let's go to your conclusions, which are submitted on a list as Exhibit 60, and discuss what you find in this area.

A. Our conclusions, after going through our study, was that the Fruitland Coal appears to us to be undersaturated in the Deep Lease and Deep Lease Extension. We believe that is because it's close to the outcrop and there's been some leakage, and also we've mentioned that we think the whole area is at least somewhat undersaturated.

We think that the level of undersaturation decreases in proportion to distance from the outcrop, which is generally southwest to northeast or west to east.

We think that the gas reserves in the Deep Lease and the Deep Lease Extension are directly affected by this level of undersaturation.

We conclude that the bottomhole pressures in the S8 Coal vary from 60 p.s.i. in the Deep Lease to 300 p.s.i. in the Deep Lease Extension.

We conclude that the gas reserves per 160-acre Fruitland Coal/PC well varies from near zero in the southwest to 558 million cubic feet on the west edge of the Deep Lease Extension.

We find that the Deep Lease average volumetric reserves per 160-acre well are estimated to be 116 million cubic feet for 23 wells.

We see that the Deep Lease Extension average volumetric reserve per 160-acre well are estimated to be 287 million cubic feet for 32 wells.

We believe that at a gas price of $3.20 per MCF that the minimum commercial well that you would be able to drill in this area is in the range of 100 to 200 million cubic feet.

Our average performance base reserve for the Deep Lease three wells was 20 million cubic feet, and our average performance base over the Deep Lease Extension was 116 million cubic feet.

Q. In looking at these numbers, again, you say that the minimum amount for a commercial well is in the range of 100 to 200 MMCF. That's relatively -- I mean, that's in the same range -- I think Mr. Cox gave a figure of, say, 150 MMCF for a new well?

A. I believe that's correct.

Q. Now, you use this $3.20-per-MCF gas price. Where did you get that value?

A. That -- At the time we did our original study, which was as of January 1, 2002, the BLM, I believe, had specified that the price to be used in reports presented to them should be the 12-month average price prior to the effective date.

Q. Has a quick check been made of what the October, 2002, gas prices are in the San Juan Basin?

A. I haven't done a lot of research on that, but I've heard that it's in the $2.40-per-MCF range. But I've been too busy and haven't researched that recently.

Q. Okay. But obviously matters like gas price, operating costs, transportation costs, et cetera, will have a substantial effect on commerciality?

A. Yes.

Q. Now, based on the numbers you've gotten, what is the -- what would you estimate is the maximum revenue stream over the life of the reservoir for Richardson's proven reserves, assuming Richardson's price -- which I think was what, $3.50 an MCF?

A. Now again, we didn't evaluate Richardson's interest. We were asked to evaluate the Deep Lease and the Deep Lease Extension --

Q. Yeah.

A. -- the coal area, but we didn't focus on Richardson's -- We also have some information and some production from other operators in the area. So -- But for the Deep Lease and the Deep Lease Extension, based on our work, based on a gas price of $3.20, the proven revenue, total revenue, was in the neighborhood of $16 million, and the proven plus probable total revenue was in the neighborhood of $29 million.

Q. Okay. So that would be the total revenue stream in both the Deep Lease and Deep Lease Extension?

A. That's correct.

Q. And it's not all Richardson acreage, is your understanding?

A. That's my understanding.

Q. Okay. Now, so if that's the revenue stream, then the royalty interests are going to be what, about an eighth of that?

A. That's correct.

Q. So you're looking at what, two to three million dollars in royalty revenue off of the coal gas production in the Deep Lease and Deep Lease Extension?

A. I haven't made that calculation, but that sounds close.

Q. Now, you know, there's been questions about bypassing coal and -- or I should say -- yeah, bypassing coal if there's a wellbore. What -- and I don't know if you want to just pick out a well that you feel comfortable looking at, but what is the royalty value of the coal -- or excuse me, the estimated future revenue of a decent well in the Richardson Application area, say Deep Lease Extension?

A. If you took, for example, a-300-million-cubic-foot well as an infill well in that area at the gas price that we've used of $3.20 per MCF, that's roughly a million dollars of revenue for that well.

Q. Okay, and again that's total revenue, 100 percent, 8/8 of the production?

A. Right.

Q. One final question. Oh, the other thing, when you were talking about when you do your calculations on revenue stream, did you use the operating costs that Richardson gave Netherland, Sewell?

A. One of the differences in our work on this project was that we did not have full access to the operators. We normally are hired by the operator, and they spend lots of time with us and explain their plans and cost structures, but we didn't have the benefit of that.

I did have some brief discussions with two of the operators, and based on those discussions I used the costs that were conveyed to me during those discussions.

Q. Okay, so you didn't have any verification, you just used the numbers they gave you?

A. Right, that's correct.

Q. Okay, the final matter. There's been discussion by San Juan of gas that is vented from the mine, coalbed methane gas that is vented from the mine. Is the amount that is vented from the mine -- does that reflect gas that could be commercially produced from vertical wellbores in the coalbed methane?

A. That would be very difficult for me to answer. It would be dependent on where the gate roads and all those things were that the gas was coming from and whether or not a well would be commercial in the neighborhood of where that gas was being sourced from, so it would be difficult for me to make that assessment.

Q. Okay. But the fact of -- In the mine there are -- what do they say? -- 14 miles substantial exposed surface, as opposed to a little wellbore going into the Fruitland Coal, and -- which is a factor in the large amounts of gas that is vented?

A. Yes, certainly to the extent that wells become less commercial toward the west, the commerciality of those wells would be less. And so they would be, I guess, less subject to capturing gas that could be recovered from a well in that area as compared to the east side of the block.

Q. Okay. But just as a general matter, the gas that's vented doesn't reflect gas that could be commercially produced from a wellbore?

A. I'd rather not make that assessment.

Q. And were Exhibits -- let me make sure I've got the right numbers -- 24 and 44 through 60 prepared by you or under your supervision?

A. Yes, they were.

MR. BRUCE: Madame Chair, I would move the admission of Exhibits 24 and 44 through 60.

MR. KELLAHIN: No objection.

CHAIRMAN WROTENBERY: Exhibits 24 and 44 through 60 are admitted into evidence.

MR. BRUCE: And I pass the witness to Mr. Kellahin

CHAIRMAN WROTENBERY: Mr. Kellahin?

Oh, that wasn't marked as an exhibit, yeah, the handout that Mr. Smith spoke from.

MR. BRUCE: The handout was not marked as an exhibit.

CHAIRMAN WROTENBERY: That was just a...

CROSS-EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Smith, when you analyze whether Mr. Richardson's well is economic, can we translate that into a total volume of gas?

A. In terms of an existing producing well or a well to be drilled?

Q. Let's subdivide it. In terms of a well to be drilled to penetrate the coal gas, to be perforated and to produce that coal gas, is there a number we can use for convenience this morning to say if we can get that much gas, we can pay the cost of the well, the operations and have a profit?

A. Based on our work, we were estimating somewhere in the neighborhood of 100 million to 200 million cubic feet per well in this area would be the minimum commercial well.

Q. And if we were to take a Pictured Cliff well, an existing Pictured Cliff well, and choose to recomplete that by perforation and frac into the coal, is there a volume of gas associated with your definition of what is commercial?

A. That would certainly be less. And I heard your number the other day, that those values sound somewhat reasonable.

Q. Mr. Cox testified that it would be between the range of 25 and 50 MCF?

A. Uh-huh, yes, I believe that's correct.

Q. Yeah, and that would be enough to allow Mr. Richardson to recomplete these PC wells in the coal and qualify as commercial wells?

A. That's correct.

Q. When you analyze the Richardson wells in the Deep Lease, you have presented those to us on Exhibit 57; is that what this is?

A. That's correct.

Q. On 57. When we look at this analysis, can you tell me which wells in the Deep Lease on my Exhibit 1-A -- and remember, I've made a mistake. The green line at the bottom is a row of sections too far south, and it should be up a line. Which ones of those are economic, using the criteria you've given me for a new well between 100 and 200 MCF?

A. For the existing wells in Section 36, as I mentioned, two of those were noncommercial in that they were below what we consider to be minimum commerciality by about 30 MCF a day.

So I believe they are the 36-1 and 36-2 at this point, would be subcommercial based on performance data.

And the 36-3 well is one that Mr. Cox presented the graph on during his testimony that that well has increased up to -- I believe, 150 MCF a day was the testimony.

Q. Let me find these wells that are in Section 36. I've got two coal gas wells, I've got a location, and then I have a PC potential recompletion. Among the four spots, which, if any, of those wells would you say is economic?

A. Well, to the 36-3 -- between those three existing wells, the 36-3 is the one that's actually performing well currently.

Q. All right, this was the good one.

A. Yeah.

Q. That one meets the standard for being economic.

COMMISSIONER LEE: Is that your chart?

CHAIRMAN WROTENBERY: That's his.

Q. (By Mr. Kellahin) Are there any other wells in the Deep Lease that you've analyzed to see if they were economic?

A. Based on the publicly available production records, those are the three that we found in the Deep Lease.

Q. Did you seek to obtain data from Richardson?

A. Actually, I did call Mr. Richardson early on in the process and asked if I could come visit and gather some information and never got that invitation, so we didn't exchange information.

Q. Did you ask your attorneys to subpoena that data for purposes of preparing your testimony on your evaluation?

A. No.

Q. Have you or any personnel under your direction talked to staff or contract employees or consultants hired on behalf of Mr. Richardson?

A. We did have one meeting in Mr. Richardson's office in Denver several months back, and it was a -- I'd say a very brief three- or four-hour meeting where we had some technical discussions, primarily with Mr. Cox at that time. Those are essentially the only discussions that we've had where we got any information from Richardson.

Q. When I look at your exhibit and look at Section 36, I don't see the PC coal overlap that you have shown on Exhibit 78 -- or 58.

A. That's correct.

Q. Is there a Fruitland component to the fact that the 36-and-3 well is economic?

A. I'm not sure I understand the question.

Q. It appears to me that you've drawn some relationship with whether a well in the Deep Lease Extension is economic based upon a juxtaposition of the overlap of the coal and the PC.

A. We're saying that the better wells appear to be in that area.

Q. When we look at Section 3, you've not demonstrated a map that shows a coal-PC overlap?

A. That's correct.

Q. What accounts for the fact that in your opinion Well 36-and-3 is economic?

A. Well, 36-and-3 at the time I looked at it was not economic, as you can see from the production graph there. It was below the economic limit. Since we gathered that production information, beginning in actually July, I think, that well had a rather significant increase in producing rates, and as Mr. Cox's exhibit showed, it has increased up to over 100 MCF a day now. That -- I'm not sure there was a question there.

Q. Well, there's about to be. When you look at that production data at a given point in time, are you presuming that you have achieved peak production rate, and from there you draw a decline curve?

A. In our analysis of the 36-3 well, when we looked at it, it was down at only 200 or 300 MCF a day -- per month, which is only 10 MCF per day. We projected in our study that that well would increase up to a rate of 100 MCF a day over the next several months and then go to the volumetric estimate.

Q. All right. So the assumption, then, is, you have a coal gas well that is in, still, the inclining phase?

A. For that well, we did project it to be inclining.

Q. Well, how do you know on your forecast when it's going to get the peak rate, or when you can then start to project a decline?

A. Our philosophy has been that to get to the volumetric ultimate that we calculated for these wells, we know about what peak rate we have to get to to have a curve that looks like typical wells in the area. And for this well we assumed that that well would increase up to 100 MCF a day during this year to achieve that.

Q. When we look at Exhibit 44, I think it is, Mr. Smith, we're looking at your tabulation of estimated ultimate recoveries for various wells? Am I reading this right?

A. That's right.

Q. Let's find the 36-3 well on Exhibit 44. Where is that?

A. It's the second from the top.

Q. And what do you forecast for the expected ultimate recovery from that well?

A. Approximately 30 million cubic feet.

Q. What was the peak rate you used on your decline curve for that well?

A. 3000 per month or 100 MCF per day.

Q. Once you start declining at that rate, can you match this estimated ultimate recovery for that well that's shown on Exhibit 44?

A. Well, what happens in that case is, once I hit 100 MCF a day, it's very near the volumetric ultimate that we estimate, so there's very little production. So based on our projection that was contained in the report, it goes on a very rapid decline from that point and only lasts a few more months.

Q. Have you controlled the estimated ultimate recovery from the well based upon what you calculate volumetrically would be contained in the container from which that well produces?

A. Based on 160-acre drainage, that's correct.

Q. When we look at your Deep Lease Extension work -- Well, let's go back to the Deep Lease and look at the PC potential recompletion for the well. It's the 36-and-1 well in the southeast quarter of -- 36-and-1 well in Section 36 well, in the southeast quarter. In order to recomplete that well and have it economic, we need 25 to 50 MCF of gas; is that right?

A. Million.

Q. I'm sorry, I forgot an M. MMCF, right?

A. That's correct.

Q. Have you analyzed to see if there's potential in this well to recover that volume of gas and allow it to be then commercial as a recompletion?

A. We map no commercial PC production in that area, so I would not have ascribed any PC reserves to that well.

Q. Well, I meant in terms of coal, the coal value for the PC well being recompleted into the coal. All we need is about 25 to 50 MMCF of coal gas?

A. In that well, we basically used the decline-curve analysis that we had. We did not give any further reserves to any of the zones there, under the theory that if it's frac'd, it's probably already communicating with those zones.

Q. What was your estimated ultimate recovery from Exhibit 44 for that well?

A. It would be equal to the cumulative in that it was essentially noncommercial, so we would estimate no remaining reserves.

Q. So you assign no further potential for that wellbore in the coal?

A. That's correct.

Q. Okay. On Exhibit 57 you've analyzed the Fruitland -- or Mr. Richardson's wells that are in the Deep Lease Extension?

A. Yes.

Q. I've got these backwards. Try again. Exhibit 58 is the Deep Lease Extension, correct?

A. That's correct.

Q. Okay. When we're looking at this display, help me find on my Exhibit 2-1 the Richardson coal wells that are not yet recompleted into the coal, that under your classification or criteria would be economic.

A. I'm not sure I understand the question, I apologize.

Q. It's probably my fault. Let's look at the Deep Lease Extension. When we look at that area, can we use your criteria for any of these sections in that area and have you tell me which of Mr. Richardson's wells are going to be able to produce between 100 and 200 MMCF of coal gas?

A. I'll tell you that for any quarter section that has a PC completion only, we would assume that a well would be drilled there and it would recover the volumetric ultimate that we show on our exhibits. So if there's only a PC completion in that quarter section, we would classify that as either a proven undeveloped location or a probable undeveloped location to be drilled in the future.

The way we distinguish between proven and probable is based on whether it was currently a legal location or not.

Q. In the Deep Lease Extension area there are some existing Richardson wells that are coal wells. I get eight of those in the Deep Lease Extension. Are any of those economic by your criteria?

A. I believe so. I believe I pointed some of those out earlier as I went through.

Q. Yeah, I want to be able to mark those on my display so I know which ones you tell me you expect to be economic.

A. Again, I ask the question, economic in terms of being commercially viable for the existing well in a decline-curve analysis, or economic in terms of, if I drilled that well today and have two offsets, recover the investment and have a positive net present value?

Q. I'm talking about these wells in terms of -- Let's call these new drills, with the red. And so I haven't produced enough gas out of these wells at this point, I assume, to recover the original investment. It's those wells I want to know.

So let me correct myself. What I'm looking for is, I'm looking for -- Let's talk about the recompletions. We started in that direction.

If you take the PC wells and recomplete to the coal, is there any way for you to tell me which ones of those are going to be able to produce the 25 to 50 MMCF that's needed to make them commercial?

A. In our analysis we have assumed that there is a PC well that is producing, and there's no coal in the quarter section, and we assume that well will be drilled to the coal and completed separately, and then we'll recover the volumetric reserves that we've estimated. In our analysis, each 160-acre tract stood on its own merits in terms of whether or not it was able to recapture or recover the investment for that well.

Q. Are you going to be able to tell me for a potential PC recompletion if Mr. Richardson ought to try to recomplete that into the coal?

A. We have not taken that approach. We've -- As I mentioned, we have assumed that a new well would be drilled to recover the Fruitland Coal reserves.

Q. I'm slowly beginning to understand. Let's go back to my map, and now let's look at the yellow wells in the Deep Lease Extension. And if I can count, I see six of them. Based upon your analysis of the yellow symbols, are we going to be able to drill those wells and have them economic?

A. We assign undeveloped locations either proved or probable in the undrilled quarter sections.

Q. Yes, sir.

A. Again, each location stands on its own merits with regard to whether or not it can support commerciality.

Q. Which ones of these are going to be quarter sections that are going to be economic?

A. I would have to go back to my exhibits.

Q. Can I pull off of your Exhibit 58 wells within the Deep Lease Extension that you've analyzed that are going to be economic?

A. Again, in terms of existing wells being -- having remaining commercial reserves?

Q. Right.

A. In the Deep Lease Extension, many of the wells have remaining commercial proved development producing reserves. I can't count those right now, but you can go to the production plots listed under Exhibit, I believe, 58, and go through the individual PDP projections and see which ones have remaining reserves.

Q. I know you can, Mr. Smith, I just didn't want to do it. And I was hopeful that you would have a display that would outline Richardson's area, and we could highlight those wells that you can see are economic by whatever criteria?

A. No, I certainly --

Q. You can't do that here?

A. I certainly have not memorized which ones are commercial and which ones are not.

Q. Okay. Well then I'll stop right there.

If we're looking at your analysis, am I correct in understanding your assumption about economics is predicated upon your belief that we're dealing with undersaturated coal?

A. That's correct.

Q. If it is saturated coal, you're going to be wrong?

A. That's correct.

Q. When we look outside of the Deep Lease and the Deep Lease Extension, have you analyzed any of the wells in the performance of the Fruitland Coal wells, say, east of Mr. Richardson's Application area?

A. We have analyzed the wells in the Twin -- what's referred to as the Twin Peaks area.

Q. Does your analysis demonstrate that any of the wells in the Deep -- in the -- what am I calling it?

A. Twin Peaks.

Q. -- the Twin Peaks Extension, economic by your criteria?

A. Yes, the wells, as you move from west to east, get progressively better, as indicated by most of my exhibits. And by the time you're in Twin Peaks, the wells are calculating nice volumetric reserves.

Q. Help me understand. My recollection from yesterday is, the furthestmost tier or column of sections adjacent to the Deep Lease Extension is the first column of the Twin Peaks area, and the next one is the second column of sections in the Twin Peaks.

A. I think I agree with that.

Q. Okay. Where do I go from east to west, to find the edge of the commercial coal before I transcend into an area that you think is not economic?

A. That's been the whole idea of doing everything on each specific 160-acre tract, is, when we do that analysis at that detailed level, then each location has to pass the commerciality test. And I doubt it's a straight line.

Q. I was trying to visualize, is when you look at that analysis can we see a pattern so that we know as we move from east to west we can find a point where we transcend into an area that you know by your analysis is uneconomic?

A. It's a function of thickness, structure, pressure, degree of saturation. There's many things that go into the calculation of ever reserve for every 160-acre tract, so it's gradational, there's no one line that defines the commerciality point.

Q. Mr. Smith, have you analyzed the wells to the south of the Deep Lease or the Deep Lease Extension in terms of --

A. We have looked at them. I would say we have not presented any findings. Consultants tend to do what we're hired to do, and we were hired to look at the Deep Lease, Deep Lease Extension and Twin Peaks, and we looked at them only to the extent that we thought they might be analogy wells.

Q. As part of your résumé, I saw a substantial list of oil and gas companies that you have performed work for?

A. That's correct.

Q. Is that work that you personally performed?

A. In most cases.

Q. And is it work you've personally performed in the coalbed methane?

A. That's correct.

Q. Have you done any work in the underpressured area of the San Juan Basin-Fruitland Coal Pool, other than the Deep Lease and the Deep Lease Extension?

A. Yes.

Q. Did you present that work to the Division when they had the hearing in July to talk about well density in the underpressured area of the pool?

A. No.

Q. We talked about your conclusion that you believe this area is predicated on it being undersaturated?

A. Yes.

Q. How far do we have to move to the east before we get into a saturated area of the pool?

A. We haven't extended our analysis any further than Twin Peaks.

Q. Okay, and as we go south you're not able to tell me if we move from a place of undersaturation to saturation?

A. That's correct.

Q. Help me remember, did you present individual production plots for each of Mr. Richardson's wells?

A. That was the intent.

Q. Right, I'm just reflecting back. Is there a plot, a diagram, a production profile for each of the wells?

A. I believe that's correct.

Q. Let's find one, just -- You pick one and tell me what exhibit number it is.

A. The first one I have here is the -- under Exhibit 59, is the WF Federal 20-1.

Q. Let's start with that well on Exhibit 58. When I look at this well and I look at the first production, is there any indication to you as an engineer that you're dealing with a coal gas well that has inclining production?

A. No.

Q. This is obviously straight line, it's flat, it really doesn't present much of a decline at this point that you can plot very well?

A. That's correct.

Q. Is this the signature of a coal gas well?

A. In our view, this was a well that appeared to be tight, low productivity, and we simply projected this based on the over two years' performance that the well has already exhibited. We saw no indication that this well is heading toward inclining.

Q. The source of this data, Mr. Smith, is what source?

A. It's publicly available data from IHS.

Q. Okay. Now, all these production plots are collected behind Exhibit Tab 58, are they not?

A. 59, I believe.

Q. I'm sorry, 59. Let's go through and help me find the one that shows the Dugan well. I'm looking for the Dugan well in Section 30. It's a coal gas well. Yeah, I have it as the Mayre 90R.

A. Okay, I see that one.

Q. This is a well that Mr. Dugan apparently started to produce in early year 2001. That well has an inclining rate of production. Do you see that?

A. That's correct, for the first year -- or say nine months that it was on, it inclined.

Q. And then halfway through the year, it takes a drop in July, and then afterwards -- apparently one month, it starts climbing back up to the top?

A. Yes.

Q. And then you project a decline, based upon what you have for a data point in mid year 2002. I see that?

A. Yes, correct.

Q. You're forecasting this decline based upon a starting point in 2002, about halfway through the year?

A. That's correct.

Q. Isn't it typical to forecast a decline curve based upon multiple points?

A. It's typical to project a decline curve based on your judgment as to where the well is headed, based on the history.

Q. How were you able to forecast that this well had achieved peak production?

A. To me -- and again, these are judgment calls -- it appeared to have flattened out for a six-month period and was showing no indication of further increase or inclining production.

Q. Is that the criteria that you apply to establish you have peak production from which you can now start to forecast a decline?

A. That's pretty much all we have, is the ability to analyze and look at the production, and then when it appears to flatten off, we then think that it may have achieved a peak.

Q. Mr. Smith, if you'll turn back for -- It's one of our exhibits, isn't it? Mr. Smith, let me approach you and give you a copy of Mr. Cox's Exhibit C-17.

A. Thank you.

Q. Let me give you a moment to look at that.

A. Okay, I see it.

Q. All right. When you look at that signature of production, it starts off initially and it climbs. Do you see the inclining production?

A. Yes, I do.

Q. And then it will hit a first peak, and then it will have a profile where it starts declining. Do you see that?

A. I see that, yes.

Q. How come that first peak does not represent the maximum rate of production on that well, from which we could then use the other data points and draw a decline and figure out its EUR?

A. In this case I believe there was an operational change, in terms of compression, where it initially began declining in 1997 and there was an operator change, I believe, and then some compression was added, and it began to incline again after that operational change was made.

Q. If we had forecasted EUR off the top of the first peak under the assumption that was the peak rate, we would have underestimated the ultimate recovery from that well, would we not?

A. That's correct.

Q. When we look at these coal gas wells in this area, isn't it truly difficult to find if you're at the peak rate of production with only one year's worth of production?

A. It's preferable to have a sustained flat life, to make a 100-percent as to whether or not you have actually achieved that peak. With one year's production it is difficult. With two and three years' production, you think you're getting to the point where you can begin to make those judgments with some accuracy.

I will be the first to admit that we had no access to the operators, and we don't have any way of knowing -- or did not have any way of knowing, if there were any operational changes that were anticipated or planned for these wells, that we might have included. Had we been allowed access to the operators, we may have been able to incorporate some of those enhancements into our evaluation, but we didn't have the luxury of that information.

Q. Well, you did have the luxury, Mr. Smith. You could have obtained the data through your attorney, could you not?

A. That's not my call.

Q. Did you recommend to your attorney that you were short of data and needed more information from Mr. Richardson to complete your analysis?

A. I was not dealing with attorneys at the time, I was dealing with the BHP managers.

Q. Okay. One of those operational limitations could be the fact that the coal gas well is not adequately and efficiently being dewatered so that we can get the water off the reservoir and achieve a peak rate from which we start declining?

A. Could be, yes.

Q. When you look at the Richardson wells in the area, do you have a display that will show us how you've accumulated that information to reach a conclusion, which I believe you raised, that Richardson's wells are now all declining? Is that not your conclusion?

A. No, I didn't say Richardson's wells were all declining. There are -- My philosophy was, if based on my judgment I thought the well had peaked or was already declining, I then applied a decline.

For wells that appeared to be increasing I then continued to project that those wells would increase, up to a rate that would support the volumetric ultimate that we show in our analysis.

So it was a combination of some wells we project to decline and some wells we project to incline.

Q. When dealing with coal gas wells, Mr. Smith, give us a list of the factors that will affect whether a well is to be inclined and at what point it's going to achieve a peak from which it will start a decline?

A. Well, based on our study, we have defined what we believe to be the ultimate recoverable reserves from that well. We incline a well up to a rate that will support that ultimate. If in our judgment a well has already exhibited characteristics of flattening or declining, we then honor that production performance data.

Q. Does your evaluation show an evaluation of what would happen in the upper coals if those coals are perforated and produced?

A. I think we've been very liberal in that regard in that we include all of the S8 and all of the S9 together in every well that we drilled, so there is no additional investment or treatment or cost imposed to achieve the additional S9 reserves.

So we treat, in our study, the S8 and the S9 as one coal, effectively.

Q. Do you share Mr. Bertoglio's conclusion and belief that the frac jobs in the PC have extended up into the coal?

A. I think there's evidence that there is communication between the PC and the Fruitland Coal.

Q. Have those fracs, to your knowledge, extended and communicated the PC with the upper coals?

A. I can't make that judgment.

Q. We don't know if they've gone that far?

A. Don't know.

Q. If Mr. Richardson is able to obtain additional disposal and more effectively and efficiently dewater the coal, whether it's saturated or unsaturated, that will have the effect of increasing performance of the wells, will it not?

A. In all of our studies, data allows us to make new interpretations. So as new data becomes available, whether in the form of additional saltwater disposal capability or other operational changes, it could potentially change our conclusions. It is a dynamic process.

Q. So one of the variables about your forecast at this point is that if the wells are more effectively dewatered, or more completely dewatered, it would result in a new forecast having to be performed?

A. It could. But I will say, one of our difficult conclusions would be that there's an extremely large difference in our reserve estimates and Mr. Cox's reserve estimates, and there would have to be rather dramatic increases in gas rates from the -- what we interpret to be flat production now, to go from the reserve level that I'm estimating versus the reserve level that Mr. Cox is estimating.

Q. Let me have you direct your attention to your Exhibit 46.

A. Yes.

Q. Am I correct in understanding that this exhibit represents a measured gas content from the coal cores in standard cubic feet per ton of coal?

A. That's correct.

Q. That's what we're displaying here. I believe I'm correct in understanding that you and Mr. Cox have a disagreement, that he thinks these numbers are not correct representations of the gas content in the coal, and you think they're correct?

A. Our interpretations differ on that point.

Q. Okay, I'm looking for points of difference, and that is a point of difference?

A. That's correct.

Q. You advance your conclusion based upon this exhibit that demonstrates the measured gas content using the coreholes, and you display that in terms of data in quarter-section locations?

A. But the data that's presented here on 46 is just a visual display of where the gas-content analyses were taken, just to get a visual sense of the gas contents over the study area.

Q. Let's find Mr. Richardson's Section 36, where has the 36-and-3 well.

A. Yes.

Q. Down in Section 36 I'm going to look over in the southeast quarter of Section 36, and I see -- southwest quarter of Section 36, and I see the number 43.

A. Yes.

Q. Do you see that? That represents a measured number for the coal gas -- the content of the gas in the coal in that quarter section?

A. That measure is -- that is a representation of a measurement at that point, yes.

Q. Let's do Exhibit 50 now. If you look at Exhibit 50, Mr. Smith, we're now looking at your calculations of gas content in terms of standard cubic feet of gas per ton of coal. That's what this is, right?

A. That's correct.

Q. Let's look down in this same Section 36. In the southwest quarter of Section 36 I see the number 32.

A. That's correct.

Q. When we move from Exhibit 46 to 50, it appears that the gas content of the coal has been reduced by about 25 percent?

A. Exhibit 50 is based on the overall gas content trend that we presented earlier. There will be localized differences in the actual measured points versus this trend, but what we've done is tried to establish an overall gradational change in gas content versus structure. So you will be able to find localized differences in the actual measurement and the one that we've used.

If you look at the northeast of Section 32 you'll see that coincidentally, that one came out to be exactly 75 in both cases. Purely coincidental, actually, but -- So you're going to see some that are close and some that aren't that close, because we have converted the individual points to a straight-line relationship.

Q. When I look at Exhibit 46 and I go up into the northern portion of the display and look at Section 18, I see the number 98?

A. Yes.

Q. And when I come down on -- That's the measured gas content. When I come down to the calculated content displayed in that same quarter section in 18, it's been reduced to 72?

A. That's right, again for the same reason.

Q. If you'll add now your isotherm -- It's Exhibit 47, if you'll look at the isotherm now with me.

A. Okay.

Q. When I look at the data from the calculated gas content in the coal in the southwest quarter of 36 and I use the number 32 as my value, and I want to interpret that value in relationship to Exhibit 47, what pressure in terms of p.s.i.a. will I find if I look --

A. Well, this is Exhibit 47.

Q. Yeah, I'm on Exhibit 47 and I'm looking at the vertical scale. I have a gas content of 32?

A. Okay.

Q. All right. And I'm going to put that on the vertical scale. And what I do then is, I read over to the right until I'm on the isotherm --

A. Okay.

Q. -- and then I would read down until I bisect the horizontal line, and that should give me a pressure in p.s.i.a., does it not?

A. Yes.

Q. My guess is -- The scale is not useful here, but my guess is, that's about 20 p.s.i.a.

A. I would have said 30, but that's --

Q. All right, let's say 30. Let's find a number you like.

Now, if I want to take p.s.i.a. and convert it to a gauge pressure, to a p.s.i.g., and I have 30 as my starting number, that translates into what as a p.s.i.g. value?

A. You subtract 12.

Q. Okay, and I get what? I can't do numbers.

A. Eighteen.

Q. So I now have 18. Do you remember Mr. Cox's testimony yesterday on Mr. Richardson's well, the 36-and --

COMMISSIONER LEE: Why is 12?

MR. KELLAHIN: Huh?

COMMISSIONER LEE: Why is 12?

THE WITNESS: It's the difference in the atmospheric pressure.

COMMISSIONER LEE: So that's 14.7.

THE WITNESS: In the Rockies it's closer to 12 because of -- higher it is.

Q. (By Mr. Kellahin) I believe it's 12.5 used around here, Mr. Smith.

A. I'm rounding.

Q. Okay, and 12.5 would be a conversion for atmosphere.

All right, let's work in p.s.i.g. So if we're down to 18 and Mr. Cox tells Mr. Richardson to shut in the 36-and-3 well, he did so at a point in time where Mr. Cox knew that the pressure on the gauge was 30 p.s.i.g. Right? He testified to that yesterday; assume it for purposes of the discussion, that that's the number.

A. But your discussion is based on the adsorption curve being the correct curve. We haven't used the adsorption curve.

Q. I'm sorry?

A. We haven't used the adsorption curve. Your discussion was premised on this adsorption curve being the correct curve. We have not used this curve. So this hypothetical example doesn't reflect what we've done. We've used the desorption data.

Q. I understand that, but I want to use the isotherm on your exhibit and see if I can take the various gas contents, gas volumes in standard cubic feet of gas per ton of coal, and some pressure numbers and see where I would be on your curve here if I was to use the isotherms and not your measured volumes of gas. We can do that, can't we? Do you want to do it?

A. No, it makes no sense. You're mixing the adsorption with the desorption data and trying to make a conclusion from one based on data from the other.

Q. Well, Mr. Smith, you're telling me the reservoir is undersaturated. At some point it's going to be saturated, is it not?

A. If you drop the pressure sufficiently, that's correct.

Q. So I want to deal with the pressure on the 36-and-3 well using this isotherm and see if I can take that pressure and work back to a gas content per ton of coal, and see how that number compares with what you told me was your calculated value for the gas content on this other display.

A. Again, Mr. Cox can do that in his evaluation because he's used the adsorption curve. I have not used the adsorption curve, so you can't go through that math exercise with my numbers because I haven't used that curve.

Q. Mr. Smith, if you didn't use that, how are you able to conclude that you're not dealing with a saturated reservoir?

A. I used the desorption data, and then I compared the desorption data to the adsorption data, and to the extent that it was less it indicated that the coal was undersaturated, which caused me then to make the decision not to use the adsorption curve.

Q. Did you use any pressure numbers on the 36-and-3 well in your analysis?

A. I only heard that number from Mr. Cox's testimony just the other day.

Q. When you're looking at the performance of the

36-and-3 well and looking at the production, did you also look at any of the pressure date from that well?

A. Again, I just saw the 36-and-3 updated production data a few days ago. I haven't had a chance -- or I haven't been asked to update my analysis for that well.

At the time I looked at the 36-3 well it was noncommercial. It's had a very nice increase of production since I saw it, with production through May of this year.

Q. Have you used any pressure information in your analysis?

A. I've calculated pressure for every 160-acre block.

Q. And you and Mr. Cox are in agreement about the original reservoir pressure numbers to use? That's not a point of difference?

A. That's correct, in rough agreement, not exact agreement.

Q. So if we're going to resolve the engineering difference between the two of you, we have to decide whether it is an undersaturated reservoir, as you contend it is, or we have to believe it is a saturated or an almost saturated reservoir, as Mr. Cox believes it is?

A. I think the way we resolve the difference is produce a couple more years, and we'll all know the answer.

Q. We'd like to do that, and we'd like to do it by infilling the density of the area that the mine tells us we can't do.

How long do you think we would have to go before we would know the answer?

A. It depends on how the data evolves, it depends on the certainty of the data as the wells are produced. It's just difficult to say.

Q. What's the methodology utilized in the Basin, Mr. Smith, for producing the coal gas? They drill a wellbore, penetrate the coal, and I guess they perforate something. What do they perforate in the basal seam coal?

A. They perforate the coal.

Q. That's what they do?

A. (Nods)

Q. Is there any selected portion of the basal coal that you perforate, or do you perforate the whole thing?

A. I'm not sure I -- The coal is perforated and treated and brought on production.

Q. How is it treated?

A. By fracture treatments.

Q. The operators perforate the coal, and they fracture-stimulate the well in order to make it produce, right?

A. That's correct.

Q. Is that the recommended method for producing the coalbed methane out of the coal?

A. That's the common practice in this area of the basin.

MR. KELLAHIN: May I have a moment to decide if I'm through?

CHAIRMAN WROTENBERY: Certainly.

MR. KELLAHIN: Thank you.

CHAIRMAN WROTENBERY: We'll take a five-minute break.

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

(The following proceedings had at 11:55 a.m.)

CHAIRMAN WROTENBERY: Okay, Mr. Kellahin.

MR. KELLAHIN: Madame Chairman, Mr. Carr and I are going trick-or-treating tonight, and --

CHAIRMAN WROTENBERY: Are you?

MR. KELLAHIN: -- if I'm not there to help him with his costume and his candy jug, we're just not going to go out, so I'm going to stop now and let you ask Mr. Smith some questions. I'm done.

CHAIRMAN WROTENBERY: Thank you. Do you have any questions?

COMMISSIONER BAILEY: No, Mr. Kellahin asked mine.

COMMISSIONER LEE: I want to ask one.

CHAIRMAN WROTENBERY: Oh, certainly.

EXAMINATION

BY COMMISSIONER LEE:

Q. Can you tell me how you determine the desorption curve on taking a core from the bottom of your wellbore?

A. The desorption measurements were done by industry firms that do that for a living, and they collected the cores and analyzed anywhere from three to, in some cases, ten samples per well from the cores, and they sent them to a lab that analyzed them, and we were provided the results of those.

Q. But you didn't know what's the process of this?

A. We weren't on site to witness them. It all happened before we were hired, so all we had was --

Q. So anybody in your sites can explain how they do? Because this is very important data for you, right?

A. Yes.

Q. Whenever you do the engineering calculations, you relied on this data.

A. Oh, I -- Yeah.

Q. You should know how it goes.

A. Okay. Yeah, they put the core into a canister, and then they record the pressure buildup. And then from that information, from the pressures, they can --

Q. Pressure buildup, what do you --

A. Within the canister, the --

Q. Down there, they cut a core --

A. Yes.

Q. -- they put a container there?

A. No, they bring it to the surface --

Q. They bring it to the surface.

A. -- and then cut it, put it into a canister and seal it.

Q. And it exposes to atmospheric pressure?

A. Just for a short period of time, as short as possible between the time they get it to the surface, they get it into the canister and then seal it, and then as the gas in the coal then continues to desorb it builds up pressure in the canister.

Q. What is the drilling mud they use?

A. I don't know what muds they used on these particular cores, I don't recall.

Q. But you don't question about how they do this?

A. Well, we -- Yeah, I think the strength of this data is that there were two to three, I believe, companies that did these desorption tests, I think, 60, 70 samples. So I mean, the fact that you have such a large statistical sampling of desorption information makes you feel like there's some reliability there. So that was something that gave us a great deal of comfort.

One of the biggest issues with the desorption analysis is how much gas you lost from the time you cut the core and get it into the canister, and those are called lost-gas correlations. And luckily in these cases, those lost-gas volumes were estimated to be relatively small.

Q. How? Did you present it?

A. No, we didn't present that.

Q. Why you don't want to present that data?

A. I don't have any of that date with me, but I did review it --

Q. You're engineers, are you entitled to question this question?

A. Yeah, we get desorption tests all the time, and we conduct reviews of them and check some of the things that are, you know, typical to check.

Q. Did you include in your review here?

A. I did not put in my reserve report or --

Q. I thought this was the focal point of the argument, of whether this data is right or wrong. If you do any work, why don't you present it?

A. The measurement of the desorption tests we didn't do, we just provided the results. There was some --

Q. Well, I still hold you responsible --

A. Right, right.

Q. -- because you used that data.

A. That's right, that's right. And we have that data in our offices in Dallas, but we didn't bring it with us.

COMMISSIONER LEE: No further questions.

EXAMINATION

BY CHAIRMAN WROTENBERY:

Q. I just had one question to, I think, clarify the record, although it may be that I'm the one that's confused about the numbers. But I believe we talked about the Twin Peaks area yesterday as including eight sections, and I note on your exhibits -- for instance, Exhibit Number 46 is the one I'm looking at right now -- it actually includes Sections 9 and 10, for a total of ten sections. Is that --

A. I was surprised yesterday when it was described as only eight sections. I understood it to be ten sections. But --

Q. Okay.

A. -- I'm not sure which one it is, to be honest with you.

MR. HATTNER: I don't know how to do this, but I had a discussion with Mr. Woomer yesterday about that same issue. But the actual area of interest is only eight sections. They had us look at the ten, the two northernmost sections, just within our analysis. It's not part of what the mine actually considers the Twin Peaks.

CHAIRMAN WROTENBERY: Okay, thank you, Mr.

Hattner.

That's all I had, then.

Mr. Bruce, did you have any follow-up?

MR. BRUCE: Just a few.

FURTHER EXAMINATION

BY MR. BRUCE:

Q. When you're looking at the recoverable coal gas, did you use both the 8 and 9 Seam in your estimate?

A. Yes, I did.

Q. Is that an optimistic assumption at this point?

A. It assumes that they were both open to flow and both frac'd and producing together.

Q. Okay, but there's no wells in this immediate area that are produced from the Seam 9 at this time, is there?

A. That is correct, there is no isolated Seam 9 production that I'm aware of.

Q. Okay. Now, if -- You use performance and production, do you not, to reasonably estimate reserves? I mean, is it better than a theoretical calculation?

A. We as a firm have a hierarchy of things that we like to rely on, and performance is at the top of that list, and everything kind of goes down from there.

Q. Okay. Now, you were asked questions by Mr. Kellahin about the ROPCO well. Do you consider that to be an analogous well to the mine area?

A. That's a well that's 10, 12 miles away, I believe.

Q. Yeah. Do you consider that to be an analogy well?

A. Well, we think it's pretty far away, it's deeper, higher perm, and -- lots of reasons not to use that well for an analogy.

Q. Okay. Have you done any volumetrics on that ROPCO 6-1 well?

A. No.

Q. And finally, is use of desorption test data standard in your analysis and other people who work like you?

A. Yes.

MR. BRUCE: Thank you. That's all I have, madame Chair.

CHAIRMAN WROTENBERY: Thank you.

Mr. Kellahin?

MR. KELLAHIN: No further questions.

CHAIRMAN WROTENBERY: Okay. Thank you, Mr. Smith, for your testimony.

MR. KELLAHIN: May we have a lunch break?

CHAIRMAN WROTENBERY: Okay, I was just going to ask, what do you need to do before we can take this case under advisement?

MR. BRUCE: Mr. Smith was my last witness.

CHAIRMAN WROTENBERY: Okay.

MR. KELLAHIN: Mr. Cox and I need to discuss rebuttal, and then Mr. Cox needs to return so that he can respond to any questions that Dr. Lee has.

CHAIRMAN WROTENBERY: That's right.

MR. KELLAHIN: And then we need to have short closing statements, and then we can go home.

CHAIRMAN WROTENBERY: Okay, so we --

COMMISSIONER LEE: Can we go first? I ask the questions and then the rebuttal, before we take a break?

CHAIRMAN WROTENBERY: Okay, actually Dr. Lee has a list of questions, so maybe it would be helpful if we told you before the lunch break what those questions were.

MR. KELLAHIN: Let's do that. May we recall Mr. Cox at this time?

COMMISSIONER LEE: All right.

CHAIRMAN WROTENBERY: And then we'll break for lunch.

<u>DAVE O. COX</u> (Recalled),

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

EXAMINATION

BY COMMISSIONER LEE:

Q. Look at the exhibit, your Exhibit Number 26.

When I first looked at it I thought this is a very simple volumetric calculation. But after I talked to you, I know this is a full-scale simulation. So --

CHAIRMAN WROTENBERY: Just a second, Mr. Cox hasn't found the exhibit yet. Okay, he's there now.

Q. (By Commissioner Lee) So this data is coming out from the simulation, right?

A. That's correct, yes.

Q. Okay. So you decided to go into this sophisticated simulator yourself, right?

A. Yes.

Q. You decided? You believe you have enough reliable data to put into this model?

A. Yes, I do.

Q. Okay. All right. So I would like to know first of all, maybe, the methodology of the model, the two-phase, you know. Briefly describe this model with the two-phase. Is that 3-D or 2-D?

A. This one is a 2-D model. It's model -- the 3M model that we used -- that the Colorado Oil and Gas Conservation Commission asked us to prepare to analyze coalbed methane reservoirs.

Q. Okay. Is that a finite difference model?

A. Yes, it is.

Q. Okay. So would you please supply us the structure map? Because during the simulation -- you say this is a model -- I think it's only for this Commission to know the details of your simulation.

A. Yes, the structure that we had was basically that that Mr. Hively presented.

Q. Yeah, but when you cut it to the pieces, I want to know how you cut it to the pieces.

A. We just put it into SURFER, and I had SURFER dump it out in quarter sections.

Q. You don't have a printout?

A. No, I don't have a printout with me.

Q. So it's a -- really input-output, huh?

MR. KELLAHIN: Well, we can -- you can print those things out, you just don't have it with you?

THE WITNESS: Right, I just don't have it with me.

MR. KELLAHIN: Dr. Lee, we're happy to present it to you.

Q. (By Commissioner Lee) Okay, I would like to see that, all right?

A. Okay.

Q. And I would like to know where is your defined no-flow boundary, okay? --

A. Okay.

Q. -- from the map. Where is your no-flow boundary?

What's the area you simulated?
A. Okay, would you like me to answer that right now?
Q. Well, you can answer it.
A. Yes. What we did is, we actually modeled the area that was within the area to be mined, with the exception -- and within this Application. So it's the Deep Lease and Deep Lease Extension, except we only included Section 36, because that's all that Mr. Richardson had rights to. We didn't want to be pulling gas in from outside the model.
Q. Well, what are you talking about? You're not going to pull in water, and you decided, or the physics decided?
A. No, I decided -- if we took and set up the model and didn't have all the other wells around, then it would have too much gas available to come to these wells. And so I said --
Q. So that's the constraint you put on to this model?
A. Yes, I put a constraint on it --
Q. All right.
A. -- so that we only included the gas within the area that Mr. Richardson had there.
Q. All right, thank you. This is number four. I would like to see your initial condition, including your

permeability direction and your distribution of that.

A. Okay, the permeability direction, we used an isotropic permeability. The tests in the San Juan Basin generally indicate a directional permeability between 1 and 1.4 to 1, and that low level of anisotropy does not materially affect the results.

Q. That's your engineering judgment?

A. That's my engineering judgment --

Q. So another --

A. -- yes, sir.

Q. -- assumption you give to this sophisticated model?

A. Well, I think it's key to note why we used that model, sir, because what we had, we had the basic information in terms of the volumetrics tied with the isotherm, but --

Q. But I believe there are more introduced parameters you can tune into this sophisticated model than the simple model, all right? But if you want to present it, then I would like to see that.

A. Well, if I may finish here, sir, I think I can -- I think I understand -- and if I can repeat here, perhaps, how I'm understanding your questions. I think that there's a misconception, perhaps, in terms of I may not have communicated well on my testimony.

The information that's summarized in Exhibit C-6 was based, as I had said, on some average type of parameters and such. C-6, which is the isotherm information, is very simple. We can't use this type of information, though, to evaluate the different -- This tells us for various abandonment pressures and such what will happen. It doesn't tell us, though, what that abandonment pressure is going to be under different conditions.

And so that's the reason why we went to the model, so that we could evaluate the effect of the different factors, particularly completing the upper coals and additional dewatering and interference.

Q. If you presented something, you make ten assumptions into your model, then this Commission -- I think this Commission has a right to know that. Right?

A. Yes, sir, I'm responding to your questions, as best I can, sir.

Q. And the other one, number five, how can you specify the water rate and the gas rate in a single well simultaneously? All right? I want you to explain it now or in writing.

A. Okay, we do not specify both rates simultaneously. We specify water rate at the beginning and have it convert later to gas rate. And so we have two different -- During time, either water rate is specified or gas rate is specified. And then in addition we have a minimum bottomhole pressure constraint that is specified, so that if the pressure drops below that minimum pressure in the well, then it curtails the well and won't allow it to produce at the specified rate.

Q. I heard what you're saying. You put two boundary conditions in your one point. You put out the water production and the constraint of the pressure into the well. How can you do that?

A. No, we put a minimum pressure that the -- the pressure -- as we produce water, the pressure drops in the well. And once that pressure -- or gas -- once that pressure reaches the minimum level, then it converts to a constant bottomhole pressure constraint.

Q. All right. All right, number seven. Every well, when you simulate it, every well, your production data, your prediction and your corresponding absolute permeability and -- changing because of your shrinkage. You know, every time you change the permeability, would you please give out the -- and submit it to the Commission? All right?

A. Okay, basically what we did is, we just took two points on permeability, though.

Q. Well, did you tell us about it?

A. Yes, what we did is, we were tying -- we started out the forecast at initial permeability level to obtain the correct gas and water rates, type of gas and water rates at the beginning. But then what we did is, we allowed those rates to increase over an average of five years of production on each well until they reached a total combined rate of 500 MCF per day per well on 80 percent of the wells. The other wells we held flat. So at that point, that's where we said we needed that higher permeability.

So it was really with that permeability from that point forward that our modeling was taking place.

Q. Okay, number eight. How can you distribute your rate to the two different zones?

A. We assumed that because we didn't have information to divide those, that we would just combine those and lump them together as a single equivalent sum.

Q. So right now the truth comes out. Your --

A. Well, the truth's been out all along, sir.

Q. Your regress simulation is communicated with each other?

A. Yes, there is a degree of communication in many of the wells --

Q. All right.

A. -- between the Pictured Cliffs and the Fruitland

Coal.

Q. What is -- the lower Coal and the upper Coal, right?

A. We separated the lower Coal and upper Coal and did those as independent layers.

Q. Then why do you want to do the simulation? You separate the two zones, you're producing at the same time.

A. No, the upper and lower Coals are not being produced at the same time.

Q. Are you assuming they are going to produce at the same time? Are you assuming the producer is going to produce the upper Coal first and the lower Coal second?

A. No, I'm assuming that Mr. Richardson -- In fact, we assumed that he would come in at approximately 2004 and fracture-treat and complete the upper Coals as well.

Q. You see, I have a lot of questions because I didn't see the output, right? I didn't see the write-up. This is a single page about a whole model.

A. That's the summary of the results from the model, yes, sir.

Q. Okay. The next one, yesterday you said you used a skin factor to represent a fracture, so I would like to see what the fracture looks like, and I would also like to see how you explain the two-phase skin factor. This is two-phase flow, right?

A. This is two-phase flow, yes.

Q. What is this two-phase skin factor?

A. In coalbed methane modeling, the way that the skin factors are applied in this industry -- and we currently have four different coalbed methane models in house, simulation models, and I have in the past used other models as well -- they all use a single skin factor for both single-phase or two-phase. They don't break up the two different skin factors.

Q. I thought this was a vigorous simulation. It has to be hundred percent, as close as possible, to represent the physics. And right now you are telling me that 20 feet of the fracture, you are assuming the wellbore is bigger. Is that a right simulation?

A. A which kind, excuse me?

Q. Is that a right description --

A. Oh --

Q. -- of the physics?

A. Well, coalbed methane simulation is extremely complex. We need to make certain simplifications to make it work, and this is the same type of -- whether we're running in COMET or EXODUS or 3M or a MORE model or any of the commercial models, they all make these simplifications.

Q. This is the hearing. This is the hearing, you are using the tool, the data to present it to show the other side you are right, they are wrong. And in your model you have 20 assumptions there. And do you think this Commission has a right to know those 20 assumptions, instead of only know this is the model? One word, model?

A. In terms, sir, of -- we normally don't provide an entire simulation deck on every project, because it's just numbers and doesn't give the background of what happens. Instead --

Q. Okay --

A. -- what we have to do as consulting engineers is, we use our best judgment, just as we would on decline curves or material balance or other techniques, and we apply the same techniques that we do in other projects.

Q. Okay. About the -- you say it's not going to affect the final answer. How about relative perm? Where did you get the relative perm?

A. The relative permeability curve that we used is a curve we developed from matching many of the San Juan Basin wells. And so --

Q. Regardless about the regions?

A. Well, we don't have sufficient information in this area to match a relative permeability curve specific for this project, so we had to apply one from another area, yes.

Q. Okay, but that relative perm curve is determining when the gas will flow, how much gas will flow and how fast it can flow; is that right?

A. Yes, it does, but we have to calibrate that back to the actual performance on the wells.

Q. And that calibration is your engineering judgment?

A. Well, that calibration is -- yes, it is, but we have to use that actual performance to match back to.

Q. Yeah, I just want to establish that something is -- whenever the case is coming to the Commission, you should have the input on how you do it and the output, instead of telling us, This is the model. If you give me the 69 parameters, I can tell you there's an elephant in back of this room, all right? And I really strongly believe, you know, the -- if you can -- you can do that and you can give me more, then, of this. All right?

A. Well, but --

Q. But this is your -- this question, okay? But I have a -- I want to know more data. So --

A. Sir --

Q. -- eleven, I want to know the conclusion. All right?

So let's see, let's go through the list. Can you write it down?

Methodology of the model, that's number one.

Okay, number two is the --

CHAIRMAN WROTENBERY: Hold on just a second, Mr. Cox is writing. Okay.

Q. (By Commissioner Lee) Number two is the structure map and where is the no-flow boundary?

Number three is the initial condition and also including the permeability direction assignment distribution.

CHAIRMAN WROTENBERY: Okay, hold on just a second. Okay, now.

Q. (By Commissioner Lee) Number four, how you specify the water and gas rate to the well. If you have something, write it down.

Number five, if you have any constraint of the model, please say so.

Number six, every well, whenever you simulate it, every well, all the production data in your prediction, please plot it. Okay? And also, what is the permeability changing of every time? What's your scheme of the permeability change?

Number seven, how you distribute a rate to the two different zones.

Number eight --

A. Do you mean the PC and the Coal, or do you mean the upper and lower --

Q. Upper and lower.

A. -- coal? Okay.

Q. Explain the two-phase skin factor and what the fracture looks like. For every well, how you change those fractures to skin.

Number nine, the conclusion.

I have no further questions.

CHAIRMAN WROTENBERY: Thank you. Mr. Cox, did you have something else you wanted to say? You had started to say something.

THE WITNESS: Yeah, I'm sorry, I didn't mean to attempt to interrupt.

We don't have much of this information, because the models don't work in this way. There are no two-phase skin factors. What the frac looks like does not go in the model, a skin factor goes into the model.

So many of these questions are not -- they're not something that I can answer. But I can tell you the conclusions and the results are summarized here in C-26.

But in addition, the other piece that I need to get across here is, what we had done was modeled a smaller area, rather than come back and attempt -- or rather than come back and model the entire Application area, what we did was, we then did a scale-up to the Application area, as I had mentioned, applying the recovery efficiencies determined from the model in order to get the total recovery from the Application area.

So we don't have a model of the entire Application area, we don't have every single well, and so what we have is only basically the model that we have. And I can provide you the input deck from the model that we have, but all this other stuff, we really don't have that.

Q. (By Commissioner Lee) If you don't have that -- Well, I think you should have it. But if you don't have it, just say you don't have it.

A. Well --

CHAIRMAN WROTENBERY: And explain why --

COMMISSIONER LEE: And explain --

CHAIRMAN WROTENBERY: -- briefly, you don't have it.

THE WITNESS: Okay.

CHAIRMAN WROTENBERY: I think that would work. Provide what you can, and then what you can't provide, state that and explain why.

THE WITNESS: Well, now, there's another problem that I have, and I recognize this is not the Commission's problem, this is a personal problem, but I am traveling a considerable amount, and I will only be in the States for a few days in the next two months, so --

Q. (By Commissioner Lee) Wait a minute, this is already done?

A. Yes, but still, when you want the write-ups of these different things -- As I say, I can gladly provide you the input decks, but when you're asking for all this other information, we don't have that put together, and that would require me to go and put it together, or else to say we just don't have that.

CHAIRMAN WROTENBERY: Well, why don't you visit over lunch with your attorney, and then we can talk after lunch about the scheduling for the Commission.

MR. KELLAHIN: I think we can do this now.

CHAIRMAN WROTENBERY: You think so?

MR. KELLAHIN: Dr. Lee has raised some interesting things, and we want him satisfied about the model. If you'll allow us, Mr. Cox and I will submit that together, we'll give you a narrative so that you can understand how we did it, and if you disagree then you can disagree on the points of difference.

And maybe we've had enough in the last two and a half days. And if you want to stop now, that's fine with me. We'll stop doing this and we'll submit a written closing to you and a summary for Dr. Lee so he can analyze the simulation, and we can just -- I think we're done.

CHAIRMAN WROTENBERY: Okay. Did you have anything else, Mr. Bruce?

MR. BRUCE: Well, I don't have anything else to submit, but we would certainly appreciate the chance for a couple weeks' time for our experts to look at Mr. Cox's submission.

CHAIRMAN WROTENBERY: Certainly, we can plan on that.

MR. KELLAHIN: That's only fair. We will submit that to Mr. Bruce ahead of time so that he has a chance to look at it, and we can decide if there's a --

CHAIRMAN WROTENBERY: Okay. Then let's talk a little bit about due dates for the additional information and also for the written closing statements. And I got away without my palm pilot. Does anybody have a calendar up here? Steve, do you have your calendar with you?

MR. ROSS: Yes, I do. What do you think a date --

CHAIRMAN WROTENBERY: Let's let them talk a little bit about when they might be able to submit their...

Mr. Kellahin, when do you think you might be able to submit the additional information requested by Dr. Lee?

MR. KELLAHIN: I'm losing Mr. Cox, he's going to Hawaii without me. He leaves tomorrow. I gave him my travel books and he's leaving. And so his associate Rhonda and I will have to e-mail Mr. Cox, and we will do our very best to have Dr. Lee's information to Dr. Lee and to Mr.

Bruce. If you could give us ten days, we can do that.

CHAIRMAN WROTENBERY: Ten days will be roughly the -- the 12th of November, because the 11th of November is a holiday, so --

MR. KELLAHIN: The 12th is what day of the week?

CHAIRMAN WROTENBERY: It's a Tuesday.

MR. KELLAHIN: That would be good.

CHAIRMAN WROTENBERY: And then Mr. Bruce, how long would you need to respond?

MR. BRUCE: A week, madame Chair.

CHAIRMAN WROTENBERY: Okay, and that will get us to the 19th of November. And how about we make the written closing statements due that same day, the 19th? Will that work for everyone?

MR. KELLAHIN: Yes, ma'am, we can do that.

CHAIRMAN WROTENBERY: Okay, good. Are there any other matters we need to address today?

MR. KELLAHIN: There have been a lot of people that have sat here all week long. I don't know if there's any parties that want to make statements or any of that stuff. There was a representative from Mr. Dugan's office, and I don't know if he wants to say anything.

CHAIRMAN WROTENBERY: He left, yeah.

MR. KELLAHIN: I guess we know what he wants.

CHAIRMAN WROTENBERY: Okay.

MR. KELLAHIN: I do have one short witness that I want to call for an unsworn statement, if I might.

CHAIRMAN WROTENBERY: Okay, are you going to surprise us?

MR. BRUCE: Is that Mr. Carr in there?

(Off the record)

CHAIRMAN WROTENBERY: Okay, we'll go ahead and adjourn this proceeding. Thank you very much to all of the witnesses who testified. We appreciate everybody's time and attention to this matter. It's been quite instructive, this particular hearing process, and so we'll look for the addition information and closing statements in the next few weeks.

And at this point we'll take this matter under advisement.

I would ask at this point for a motion from the Commission to go into closed executive session in order that we may deliberate on this matter.

COMMISSIONER BAILEY: I so move.

COMMISSIONER LEE: Second.

CHAIRMAN WROTENBERY: All in favor say "aye".

COMMISSIONER BAILEY: Aye.

COMMISSIONER LEE: Aye.

CHAIRMAN WROTENBERY: Aye.

(Off the record at 12:28 p.m.)

(The following proceedings had at 1:18 p.m.)

CHAIRMAN WROTENBERY: And I'll entertain a motion to end our executive session and go back into open meeting.

COMMISSIONER BAILEY: I so move.

COMMISSIONER LEE: Second.

CHAIRMAN WROTENBERY: All in favor say "aye".

COMMISSIONER BAILEY: Aye.

COMMISSIONER LEE: Aye.

CHAIRMAN WROTENBERY: Aye. And I'll just note for the record that while we were in closed executive session the only matter we discussed was Case 12,734, the Application of Richardson Operating Company to establish a special infill well area within the Basin Fruitland Coal Gas Pool, which is the case we just spent two and a half days on hearing testimony and taking other evidence.

I'll also note that we had talked at the outset of this particular meeting about possibly acting on Case 12,897, the Application of the New Mexico Oil Conservation Division through the Environmental Bureau Chief for the adoption of amendments to Division Rule 118 concerning hydrogen sulfide gas.

Commissioners, Mr. Ross and I were not able to complete the process of getting the draft order in final form, so we will need to defer action on that particular matter until we meet again on November 22nd. Okay?

And I believe that is everything we need to cover at this particular meeting. Shall we adjourn?

COMMISSIONER BAILEY: I move we adjourn.

COMMISSIONER LEE: Second.

CHAIRMAN WROTENBERY: Okay, all in favor say "aye".

COMMISSIONER BAILEY: Aye.

COMMISSIONER LEE: Aye.

CHAIRMAN WROTENBERY: Aye. We're done, thank you.

(Thereupon, these proceedings were concluded at 1:20 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 November 20th, 2002.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 16th, 2006