STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:	)	CASE NO. 11,996
APPLICATION OF PENDRAGON ENERGY PARTNERS, INC., AND J.K. EDWARDS ASSOCIATES, INC., TO CONFIRM PRODUCTION FROM THE APPROPRIATE COMMON SOURCE OF SUPPLY, SAN JUAN COUNTY, NEW MEXICO	)	ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS, Volume I

COMMISSION HEARING

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

August 12th, 1999

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Commission, LORI WROTENBERY, Chairman, on Thursday, August 12th, 1999, at the New Mexico Energy, Minerals and Natural Resources Department, Porter Hall, 2040 South Pacheco, 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

August 12th, 1999 (Volume I)
Commission Hearing
CASE NO. 11,996

(Continued...)

APPLICANT'S WITNESSES (Continued):

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E X H I B I T S (Continued)

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Exhibit WA-3	116	-

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A P P E A R A N C E S

FOR THE COMMISSION:

LYN S. HEBERT
Deputy General Counsel
Energy, Minerals and Natural Resources Department
2040 South Pacheco
Santa Fe, New Mexico 87505

FOR PENDRAGON ENERGY PARTNERS, INC.,
PENDRAGON RESOURCES, L.P.,
and J.K. EDWARDS ASSOCIATES, INC.:

MILLER, STRATVERT and TORGERSON, P.A.
150 Washington
Suite 300
Santa Fe, New Mexico 87501
By: J. SCOTT HALL
and
CARLA PRANDO

FOR WHITING PETROLEUM, INC.,
and MARALEX RESOURCES, INC.:

GALLEGOS LAW FIRM
460 St. Michael's Drive, #300
Santa Fe, New Mexico 87505
By: J.E. GALLEGOS
and
MICHAEL J. CONDON

ALSO PRESENT:

ERNIE BUSCH
Geologist
Aztec District Office (District 3)
NMOCD

* * *

WHEREUPON, the following proceedings were had at 9:22 a.m.:

CHAIRMAN WROTENBERY: And then I believe that leaves us with our two lengthy contested cases here.

We will be starting with Case 11,996, the Application of Pendragon Energy Partners, Inc., and J.K. Edwards Associates, Inc., to confirm production from the appropriate common source of supply in San Juan County, New Mexico. This case is before the Commission on *de novo* Applications filed by both Pendragon Energy Partners, Inc., Pendragon Resources, L.P., and J.R. [*sic*] Edwards Associates, Inc., and Whiting Petroleum Corporation and Maralex Resources, Inc. It will be heard *de novo* pursuant to the provisions of Rule 1220.

I believe we're ready to call for appearances. I'm going to make one quick stop, and I'll be right back.

(Off the record)

CHAIRMAN WROTENBERY: Okay, we'll start by calling for appearances in this particular matter.

MR. HALL: If it please the Commission, Madame Chairman, Scott Hall and Carla Prando, from the Miller Stratvert Torgerson law firm, Santa Fe, on behalf of Pendragon Energy and Edwards Energy.

MR. GALLEGOS: Gene Gallegos and Michael Condon appearing, Madame Chairman, on behalf of Whiting Petroleum

Company and Maralex Resources.

CHAIRMAN WROTENBERY: Thank you. Do we have any other appearances in this matter? I don't hear any.

Let's just take up a few preliminary matters so we'll know how we're going to proceed in this particular case.

We have received prefiled testimony from each of the expert witnesses in this particular proceeding. All three Commissioners have reviewed that testimony, so we are thinking that we do not need to go through the direct testimony page by page in the course of our hearing today.

What we would like to do, if the witnesses are interested in doing it, is to hear a brief summary from each of the expert witnesses of their direct testimony before they stand for questions. But we would ask, since we have reviewed the testimony previously, that that summary be kept fairly brief. Probably something on the order of ten minutes is what we're looking for, if that's amenable with everybody. And if you don't wish to give a summary we can forego that, because all of us have read the direct testimony and are prepared to go forward with the questions this morning.

I do also believe that each of the parties has some fact witnesses to present; is that right?

MR. HALL: Yes, that's correct. And I think for

both sides there are witnesses who will present both fact and opinion testimony.

My first witness will be Al Nicol, who's the president of Pendragon. And what I had planned on doing is having him summarize his testimony, as you say, then I would elicit some actual testimony and some conclusory testimony through him, through direct examination. Specifically, I wanted him to address the relief that we ask the Commission to afford in this case.

CHAIRMAN WROTENBERY: Okay.

MR. HALL: I've never done this before, so we're uncertain about the order. I presumed we would follow, generally, the procedures outlined in Rule 40 of the Rules of Civil Procedure where as we the Applicants had the burden on the primary case-in-chief, we would proceed, present our witnesses, they give their summary, then they stand for questions by the Commission. No need for me to go through their testimony through direct questioning. Then they would be subject to cross-examination by counsel for Whiting. Once we complete our case-in-chief, as per Rule 40, it will be up to Whiting to present their responsive case. Then an opportunity for rebuttal after both sides have completed their cases.

CHAIRMAN WROTENBERY: That was my view of the proceedings.

MR. GALLEGOS: That --

Mr. Gallegos?

MR. GALLEGOS: Just the order, Madame Chairman, would be, for the cross-examination what Mr. Scott [*sic*] suggests is, the Commission go before opposing counsel, which may or may not be the best way to do that. I think opposing counsel -- if opposing counsel crosses first, it might be helpful for the Commission and give you more grounds for some of the questions you might have, or clarify things that you otherwise would have a question.

I'm not hard and fast on that, but I just suggest that might be a better way to do it.

CHAIRMAN WROTENBERY: I agree, and I apologize, I didn't pick up on that in Mr. Scott's [*sic*] summary there. But typically what we do is allow opposing counsel to cross-examine, and then if there are any follow-up questions from the Commission, we'll ask those at that point.

MR. GALLEGOS: Sure.

CHAIRMAN WROTENBERY: We also --

MR. GALLEGOS: We --

CHAIRMAN WROTENBERY: I'm sorry.

MR. GALLEGOS: Well, I was going to say that I -- because of the nature of this and this prefiled testimony, and I know the Commission must feel sort of burdened with

all this technical information thrown at them, I would suggest it would be helpful to have opening statements to give some context to, you know, why we're here and what this all might mean. I would be prepared to do that.

CHAIRMAN WROTENBERY: Certainly you'll have that opportunity, to give an opening statement, as well as closing statement.

We also have a stipulation of facts that has been filed --

MR. HALL: Yes.

CHAIRMAN WROTENBERY: -- in this particular matter, and we will be taking those stipulations into account in developing the Commission's order in this particular matter.

I did have to ask one question, one stipulation that I was a little bit confused about, and I wasn't sure if it was a typo or if it was intended to say this.

Page 6, subparagraph F of paragraph 11, which began on page 5, talking about the Chaco Limited Well Number 2-J, summarizes the history of that well. This particular document says the well was perforated and completed in the Fruitland Coal.

MR. HALL: Whoops.

CHAIRMAN WROTENBERY: Whoops. That --

MR. HALL: We don't stipulate to that.

CHAIRMAN WROTENBERY: Okay, I --

MR. GALLEGOS: Mr. Hall prepared this.

CHAIRMAN WROTENBERY: That was contrary to anything I --

MR. GALLEGOS: But we'll let him -- but we'll let him out of that.

MR. HALL: This was a test to see if you actually read that.

CHAIRMAN WROTENBERY: Okay.

(Laughter)

CHAIRMAN WROTENBERY: I assume that was a typo.

MR. HALL: Thank you.

CHAIRMAN WROTENBERY: So we'll --

MR. HALL: We ask that the record be corrected to reflect that is the Pictured Cliffs formation.

CHAIRMAN WROTENBERY: Okay.

MR. GALLEGOS: I think all the prior paragraphs simply said the well was perforated and completed in the -- I mean at a depth of, and didn't name formation, and all the others, and that's probably the way it should read. Do you see the pattern? The second sentence and all the others, it just says the well was perforated and completed from a depth of, and then states the depth. So...

MR. CONDON: And I think the only reason is, until we actually look at where those perfs are, that may

be one of the wells where we have an issue about the upper perfs being in the Fruitland formation --

MR. GALLEGOS: Yeah.

MR. CONDON: -- as opposed to the PC.

MR. GALLEGOS: So I would submit that that sentence should read, The well was perforated and completed from a depth of 1186 feet to 1202 feet.

MR. HALL: I agree.

CHAIRMAN WROTENBERY: Okay. So we'll just strike the phrase "in the Fruitland Coal". We'll make that correction for the record.

We also had motions from each of the parties to strike certain portions of the prefiled testimony, and I believe what we'll do is take up those motions as -- in the context of each witness's testimony and consider those there.

Are there any other preliminary matters that we need to discuss before we --

MR. HALL: I had a --

CHAIRMAN WROTENBERY: -- go with the opening statements?

MR. HALL: -- question with respect to the opponents' exhibit list. I had understood from the Commission's scheduling order that all of the exhibits to be presented in conjunction with expert witness testimony

were due on the 23rd of July, and we didn't receive those.

And I understand that perhaps there may be even more exhibits coming in today, from a phone call I received yesterday from Mr. Condon. I had asked for some clarification about those, what those were, because their identification didn't comport with the Commission's scheduling order, and I never received a reply at inquiry, so maybe we could address that.

MR. GALLEGOS: Well, first of all, the time for filing was by agreement moved to the 26th --

MR. HALL: That's right.

MR. GALLEGOS: -- not the 23rd. On the --

MR. HALL: 28th, in fact.

MR. GALLEGOS: On the 26th we filed our statements with our exhibits, expert exhibits and expert exhibit lists. Since that time, of course, having now the prefiled testimony, we have prepared what I would call counter-exhibits, which will be helpful in terms of cross-examination, until we know what their evidence is, and I have no objection to them doing likewise. When you're dealing with data and the kind of exhibits that are presented here, you can obviously take that data and have different interpretations and use it in different ways.

So in preparation for the hearing, we have added exhibits, as I'd say, counter-exhibits. And typically,

we've numbered those in a way to relate, we'll say, to Mr. Nicol's testimony and tie it to his exhibit and show an exhibit that explains or contradicts or otherwise addresses what his testimony or his exhibit is.

MR. CONDON: Madame Chairman, if I could, let me just explain. I have a revised exhibit list here, which I'm prepared to file today, and let me just explain what we've got, and I wrote Mr. Hall a letter yesterday afternoon to explain this to him.

We have exhibits that we have styled capital W, for Whiting exhibits, and we are, at this point, at 1 through 38 on those. As I told Mr. Hall yesterday in the letter, essentially the first -- I believe it's 25 of those exhibits are identical to exhibits we used at the Division hearing. So he's got those, the first 25, W-1 through W-25, are all exhibits that were introduced at the Division hearing.

CHAIRMAN WROTENBERY: Does the Commission have those in its materials?

MR. CONDON: Yes. Well, there are a couple of them, I believe, that are demo charts that we have and that we've brought here today. But to the extent that they were submitted, they -- you've got them. And what I gave Mr. Hall yesterday was a letter that said, Here are the corresponding numbers from the Division hearing of the

exhibits that are our W-1 through W-25, all right, to identify for him, if he goes back to the copy that he's got from the Division hearing, which number corresponds to which exhibit number from that Division hearing. So that's 1 through 25.

So that leaves 26 through 38, which are the additional exhibits we've been putting together in preparation for the cross-examination of their experts based on the prefiled testimony, and we've got copies of those here for everybody today on those. So that's 38 of the exhibits.

Then we start with, on our exhibit list, the exhibits that you -- that everybody has because they're the exhibits that were attached to each expert's prefiled testimony.

CHAIRMAN WROTENBERY: Uh-huh.

MR. CONDON: Okay, so we have Jim Brown Exhibits 1 through 16, and we've got Brad Robinson Exhibits 1 through 29, Walt Ayers Exhibits WA-1 through WA-14, Mickey O'Hare Exhibits 2 through 9. And those were all submitted along with the prefiled testimony.

And then we have approximately 10 counter-exhibits that are specifically designated for Mr. Nicol, whom we understood would be first up. And again we have been preparing those as we prepare for the cross-

examination after we received his prefiled testimony and have copies of all of those exhibits available, and Mr. Hall is welcome to copies at any time.

So that's what we have, and that's what the revised exhibit list consists of.

MR. HALL: Madame Chairman, if I might respond?

I'm sorry, I didn't receive the letter explanation yesterday, so I don't know how to address that.

You know, this case has been pending before the Commission since January or February, and more than two months ago we met in a prehearing conference and established some ground rules and deadlines for how the proof would be offered to the Commission in this case, and we complied with those ground rules and those deadlines. It seems that it's fair to expect both sides to comply with those same guidelines. It's unfair to us to have to react to exhibits we haven't gotten the opportunity to even review.

If, in fact, some of these Exhibits 1 through 28 or however many now, were used at last summer's hearing, there were problems with some of those exhibits, even what you would think -- The ordinary well files contained notes from unknown third parties. Some of the Whiting consultants had notes in there. We found this out after we reviewed them, after the hearing. So I can't just

stipulate that all of these materials should come in like this.

Also, it's awfully unorthodox to seek to introduce exhibits, new exhibits, through an opposing party's expert. I would object, Madame Chair.

MR. GALLEGOS: Let me speak to that, Madame Chairman.

We have had for approximately a year and a half one case on behalf of the Applicant, and as of the 26th of July we had another case for the first time. That is to say, the position of Pendragon in the District Court, before the OCD, was, there is no communication between the two formations in question, there is no gas that is being produced from the Chaco wells that is from the coal wells, et cetera.

And now, having lost on that position not once but twice -- once in District Court, once before the OCD -- now we have new witnesses. For example, Mr. Conway, a frac-stimulation expert. We have Mr. Nicol, we have other witnesses who have testified before, who have gone 180 degrees the other direction to say, Oh, no, what we said before, forget that. Now we're saying there is communication, but the communication is caused by the fracture-stimulations of your wells, not our wells, we have new theories and here's how we're going to show that, and a

completely new case. And that necessitates different exhibits in order for the Commission to have the whole picture.

What we want to do is, we want you to have what all the information is, and a correct interpretation and treatment of that information.

Let me just give you an example of what we've done as a so-called counter-exhibit.

Mr. Nicol in once place takes and throws out on an exhibit -- I think it's 7-E -- all the Pictured Cliff and all the Fruitland Coal wells and all their BTU heating values from all the dates, and it's about six or seven pages, and says, Look, you look at that and you can't use heating value, BTU value, to differentiate what the source of the gas is, which formation. Well, sure, if you throw it down like that, what good does that do the Commission?

But if you sort it, and if you sort it in BTU ranges by Pictured Cliff Fruitland well, you start getting some meaning to it. That's the kind of exhibits we're providing for you, so it gives this data and, you know, raw numbers some meaning, to help you with that. Now, we don't have to do that through Mr. Nicol. We can call our witnesses. We can do that too and say, you know, here's what's involved. But I think it's more meaningful if it's in context with his testimony or his attempt to present

certain information for you.

So I think we ought to take this as we go along. And as I say, if the Applicant thinks there's anything in our data, our information, our exhibits, that needs to be explained, and do it in a demonstrative way -- which is eminently helpful. When you're dealing with these kind of numbers, values, dates, depths, BTU values, unless it can be visualized, it just becomes -- you know, it's just a mass of information.

So that's the purpose of these additional exhibits. And I say if the Applicants can help the Commission with some additional exhibits, we'll deal with that.

CHAIRMAN WROTENBERY: Ms. Hebert, it sounded to me like these additional exhibits are in the nature of rebuttal materials. Did we make any kind of provision for prefiling rebuttal testimony or exhibits --

MS. HEBERT: I have --

CHAIRMAN WROTENBERY: -- in our pre-hearing order --

MR. CONDON: I don't believe we did.

MR. HALL: We did not. You know, it's not rebuttal in the sense that it's being brought in through my witnesses. There's no rule that provides for that.

First let me state, you know, Mr. Gallegos has

mischaracterized our case. He knows that. We've addressed that in the briefs already.

But we would object, just on the grounds of unfairness, new materials being sprung on us at the last moment, prejudices our ability to prepare for our case. The Commission has established ground rules. It's eminently fair to expect both sides to comply with rules that have been in place for months now.

That's the nature of my objection.

CHAIRMAN WROTENBERY: Okay. Ms. Hebert, advice for us?

MS. HEBERT: Well, it sounds as if the exhibits may in some instances be a re-sorting, as you characterized it, Mr. Gallegos, of exhibits that Mr. Hall had; is that correct? For some of the exhibits?

MR. GALLEGOS: That's true. In most cases I was trying to take information that's just thrown out, you know, without any way to give meaning to it, and then try and put it in a form where you could look at it and say, Well, what does this data --

MR. HALL: I would say it's more appropriate to bring it in through their own witnesses, and they should have done that with their filing.

MR. GALLEGOS: Well, we can't do that with a filing when we haven't seen their testimony. How can we

prefile when we have a contemporaneous filing?

What probably should have been the procedure on this prefiled testimony -- and this is a new thing -- is not have it contemporaneous, because the Applicant has the burden. And you know, you would have thought, well, maybe if we're going to do this then the Applicant files, and 30 days later the opponent files. And then we would have had a chance to meet this.

But because of the contemporaneous filing, we didn't see what we were having to rebut until that time. How could we file on the 26th information or exhibits to rebut the Applicant's case, who has the burden, when we file on the same day? It doesn't make sense.

MR. HALL: These are ground rules that Whiting agreed to months ago.

MS. HEBERT: Mr. Hall, would you have any objection to those exhibits which are essentially the same information in a different organization being examined with his own witnesses, since they were the information that you had provided in the exhibit?

MR. HALL: I don't know what the exhibits contain, frankly. Perhaps that may be a better way to handle them, and we can address them on an exhibit-by-exhibit basis through their witnesses.

MS. HEBERT: That still leaves the exhibits that

aren't just different compositions of the same information.

MR. HALL: There are new exhibits, apparently.

MS. HEBERT: And if you could identify those when those come up, I think that maybe those can be ruled on at that time.

MR. CONDON: Sure. As the exhibits come up, we'll be happy to let you know which ones are new, additional exhibits, and give Mr. Hall an opportunity to review them prior to any attempt to use them, and then deal with any objections that he has at that point.

CHAIRMAN WROTENBERY: It may be appropriate that some of those would be presented during the rebuttal phase of --

MR. CONDON: Sure.

CHAIRMAN WROTENBERY: -- the hearing.

MR. CONDON: Sure, and he'll have a week --

CHAIRMAN WROTENBERY: And that will --

MR. CONDON: And he'll have a week to review those.

CHAIRMAN WROTENBERY: -- give --

MS. HEBERT: And he would also.

MR. CONDON: Sure.

CHAIRMAN WROTENBERY: -- Mr. Hall an opportunity to review those.

MR. HALL: Let me make sure I understand. I

don't want to be here hearing this case in December, frankly.

These new exhibits are coming in through the Whiting witnesses, as I understand the ruling; is that correct?

CHAIRMAN WROTENBERY: Yes.

MR. HALL: All right.

CHAIRMAN WROTENBERY: Yes -- Go ahead.

MS. HEBERT: Mr. Hall, it would seem, in fairness, that you would have opportunity to bring in additional exhibits in your rebuttal argument as well.

MR. HALL: Yes, thank you.

CHAIRMAN WROTENBERY: Thank you. Okay, I think that's everything we needed to do of a preliminary nature, so we will begin with the opportunity for each party to present an opening statement.

Mr. Hall?

MR. HALL: Good morning, finally, to all of you.

Finally, after all these months, finally, you get to see the case that Whiting and Maralex worked so hard to keep from you, finally. At last you have the opportunity to fulfill your roles as Commissioners and make your assessment of this case based on the data and the technical testimony of the expert witnesses.

Let me address something at the outset here. I

feel compelled to comment on what I thought was the rather cynical tone of the Whiting/Maralex filing in this case. It's something that I don't think any of us are used to seeing in proceedings before the Division and the Commission.

Whiting and Maralex has called Pendragon a rogue operator. They have said that Pendragon has intentionally frac'd into their coal formation. They have said that Pendragon has intentionally stole their coal gas. Maralex has said that Pendragon waited around, watched the Maralex wells till they were dewatered, just about dewatered, then went in, bought the wells, ran in with a frac job for the purpose of stealing their coal gas. They have said that.

They've also said that Pendragon has installed compressors on these wells, something every operator does in the San Juan Basin, for the purpose of hiding the fact of communication. They've said that.

They've also said that Pendragon was spying on the Maralex wells, Maralex operations. They use the word "monitored". I think the way it came off, the accusation was that Pendragon was actually spying on them.

I think distasteful comments like that show a misperception about the way this agency, this Commission, decides cases. And I will pledge to you, all of the Commissioners and Counsel, that I will do my best to keep

this case on the high road. There's no question about it, it's a contentious case. But to delve into that kind of testimony, those kinds of accusations, that kind of cynicism, does not serve this process well. I hope Whiting will make the same pledge to you.

Ladies and gentlemen, if confession is good for the soul, and I believe that it is, then I think Whiting and Maralex must be feeling better these days. What am I talking about? After all these months, more than a year, frankly, Whiting and Maralex have finally owned up to what happened here.

Here it is, page 6 of Mr. Bradley Robinson's testimony -- he's a consulting petroleum engineer for Whiting and Maralex -- and again at page 12. This is what Mr. Robinson says:

> We believe that hydraulic fracturing the Whiting Fruitland Coal wells has created a fracture that extended down into the Pictured Cliffs.

There it is, finally, after all of this time. Their other witnesses say it as well, James Brown, the in-house engineer. Whiting says the same thing on page 5 of his testimony.

Well, how did we get here? How did we finally

reach this admission?

In 1992, Maralex was in a hurry. The Section 29 tax credits for coal gas production was about to expire. It was uncertain at the time whether Congress would approve the extension for the coal gas tax credit. So Maralex was out in the Basin, drilling as fast and furious as they could. It was drilling a number of wells, including these coal wells, just as fast as it could, through Christmas, right up to New Year's Eve, literally, at the end of 1992, these coal wells.

They followed up this fast-paced drilling operation with some fracture-stimulation treatments necessary for production of coal gas in this part of the Basin. And they had learned from past experience that where you had fracture treatments into the coal, where there were surfactants and bactericides added to the fluids, that you could cause damage to the coal formation. What did they do to make up for that?

What they did was, to make up for that lack of viscosity, they substantially increased the fluid volumes, they added significant proppant weight to their fracs, and they injected into the coal formation at aggressively high pressures.

Let me show you some numbers we're talking about here. This is a side-by-side comparison of some of the

data from the typical fracture treatments that Whiting applied to its wells, also showing two of the subject Pictured Cliffs wells, the Chaco 4 and the Chaco 5. Let me read these into the record.

For the Gallegos Federal 26-12-6 Number 2, Maralex injected a volume of 81,025 gallons, at a weight of 127,800 pounds, at rates of up to 61 barrels per minute.

For the Gallegos Federal 26-12-7 Number 1, they injected a volume of 85,223 gallons, with sand weights of 127,200 pounds, at rates of up to 60 barrels per minute.

For the Gallegos Federal 26-13-12 Number 1 well, they injected a volume of 18,760 gallons of fluids. Sand weights were 43,200 pounds. Injection rates, 60 barrels per minute.

Those are aggressive fracs.

Compare those to the fracture-stimulation treatment supplied later to the Chaco Pictured Cliffs wells. Relatively gentle.

For the Chaco Number 5 there was a volume of 9366 gallons. Compare that to a volume of 85,000 gallons for the coal well. The Chaco Number 5 sand weight, 30,852 pounds. Injection rate, 27 barrels per minute.

For the Chaco Number 4, fluid volumes 9918 gallons, sand weight 36,000 pounds, injected at a rate of 26 barrels per minute.

All the data you're going to see in the next few days, I hope you bear this in mind more than anything else. These data are significant. What you derive from these data are what is called ISIP, instantaneous shut-in pressure. It's something that operators look for when they perform a frac, to see where the frac may have gone, what happened to it. Bear this in mind.

With these fracture treatments, it's quite clear what happened in at least two of the Fruitland Coal wells certainly, and perhaps even three of them. Fractures grew from the coal down into the Pictured Cliffs formation. We have the admission.

Around the same time that Maralex was completing its coal wells, over two and a half miles away, Edwards Energy had acquired the well called the Chaco Plant Number 5 well. It's an area that had scant coal wells being developed around it. The coal wells that were there hadn't even begun to dewater yet. There was never an allegation before, it's not an allegation now, that the Pictured Cliffs formation in the area of the Chaco Plant 5 is in communication with any coal formation down there.

What happened down there?

When Edwards applied the fracture treatment to the Chaco Plant Number 5, it was successful, as you would expect. The Chaco Plant Number 5 restored production to a

level almost resembling the IPs from the well that had been drilled years before.

That's what attracted Pendragon's interest, that's why it went out and acquired other Pictured Cliffs rights in the area. Based on the model of the Chaco Plant 5, it thought it could apply acid stimulation jobs or fracture treatment jobs and recover additional Pictured Cliffs reserves.

And I think that's fully in accord with the policies of this agency, is to promote development and recover additional reserves. That's what we're all about here.

Earlier, Merrion and Bayless, who own the Pictured Cliffs formation rights in the area, had offered them to Maralex. Maralex looked at it, a very cursory analysis, and said, They're depleted, we're not going to take you up on that.

I can only imagine what Maralex thought when it realized that the Pictured Cliffs formations had been restored to near their IP rates after Pendragon and Edwards applied their fracture-stimulation treatments to the Chaco wells. Maralex was convinced that the Pictured Cliffs formation was depleted. They were wrong.

Maralex had decided that Merrion had perforated the Chaco wells in what it believed was the Fruitland

formation. Wrong again.

Although some coal wells hadn't yet dewatered, Maralex was convinced that the recompleted, re-treated Chaco wells were producing gas from the Fruitland Coal formation. Wrong again.

Ignoring its own heavy, aggressive fracture-stimulation treatments, Maralex was convinced somehow, somehow, that Pendragon's relatively gentle fracture-stimulation treatments penetrated into the coal. Again, Maralex was wrong.

Maralex has had it backwards from day one. And finally today, these admissions, finally, from Maralex and Whiting have arrived.

Thank you, Madame Chairman.

CHAIRMAN WROTENBERY: Thank you, Mr. Hall.

Mr. Gallegos?

MR. GALLEGOS: Yes, let me have a moment to get a few things up here that I think will help illustrate my comments.

CHAIRMAN WROTENBERY: Certainly.

MR. GALLEGOS: Madame Chairman and members of the Commission, this is the third time that, in order to protect its rights and its ownership of the gas in the Fruitland Coal formation in the area in question, Whiting has had to put on an evidentiary hearing, bring experts,

present its case and prove the correctness of its position. The third time. We probably will have a fourth time, the way the process works.

But I think rather than this Commission being hit with a few allegations about two or three pieces of evidence, it will be very helpful for you to have the context, the entire history by which we find ourselves here today, because there is quite a history to this whole matter. And I think it's a problem that is today between these parties, but probably has wider ramifications for this Commission and for this Commission's regulation of gas production in the San Juan Basin, and particularly as it involves the tremendous resources of the Fruitland Coal formation.

Now, the history starts back with a look at what is the formation that Pendragon and Edwards own, that they supposedly should be producing from and that their wells are completed in?

Well, it's helpful that Mr. Nicol, in his Exhibit N-57, has an article by a Mr. Jacobs of Dugan Production Company. Dugan Production Company was the pioneer. Dugan Production, of course, is still one of the principal operators in the San Juan Basin, but Dugan was a pioneer in this area of development of the sandstone reservoirs in the southwest -- what I call the southwest part of the Basin.

We're talking about an area basically south and west of Farmington, New Mexico.

And Mr. Jacobs in his article, which is conveniently provided to us by Mr. Nicol, says -- The title is, "Some Recent Shallow Pictured Cliffs Gas Discoveries". And he's talking about the WAW-Pictured Cliffs, Ojo-Pictured Cliffs, NIPP -- I guess, N-I-P-P -- Pictured Cliffs, and Potwin-Pictured Cliffs Pools.

The WAW-Pictured Cliffs, as it was designated then -- that was the name then; I'll talk about what the correct name is now -- but that's the pool that in question here, if you look at the rights of Pendragon.

And Mr. Jacobson says:

> All of these pools are characterized by small areal extent, thin pay sections, low bottomhole pressures, and consequently, low recoverable reserves. Only the shallow depth and the independents' adaptability to economical operations make these ventures attractive.

And he mentioned the WAW-Pictured Cliff pool is approximately 15 miles south of Farmington, in parts of Township 26, in 27 North, Range 13 West. Our wells are in 26 North, 12 and 13 West.

Mr. Jacobs also observes, having developed this with Dugan Production Company:

> Some of the wells have been perforated in the massive sand below the main producing horizon but our experience indicates that while some gas me be produced from this zone the water production is greatly increased causing production problems.

Keep that in mind. That will become important, because what Pendragon attempts to do, as they do with so much of their evidence, is try and have it both ways. They're going to bring witnesses who are going to try and tell you that this low-reserve, depleted formation, if you fracture down lower into the Pictured Cliffs in this water-saturated area, that explains why their wells, like coal wells, their wells produced quantities of water, water like you'd have from coal wells, which we say this is one of the elements that proves that they're producing coal gases. Well, that's why it does it.

Oh, but then on the other hand they say this water-saturated formation holds tremendous reserves that nobody knew about, and that explains why these wells...

Ladies and Gentlemen, the Chaco wells were producing nothing but one or two MCF a day, until their

fracture-stimulations that communicate with the coal. And that's why they say, Oh, we have all these reserves, they were deep down in that Pictured Cliff formation. It's a watered formation with very little gas. And all of the other operators have stayed away from it.

Finally, Mr. Jacobs concludes that:

> The gas reserves from the fields discussed in this paper will not make any significant contribution to solving the...natural gas shortage.

And Mr. Bayless will be called as a witness -- he was one of the developers -- and will say basically the only way these wells could be drilled back in the late 1970s and early 1980s was because even if you had a well that was only going to produce 200,000 MCF -- that's about what these wells -- their reserves were -- in those days you had NGPA pricing, new well prices, over $3/MCF, and you had long-term purchase contracts with El Paso -- they had to buy the gas -- and you could drill and complete one of these wells for $30,000.

This is a reservoir of minimal reserves.

Now -- And we'll show in Exhibit W-30 the whole history of all the wells in the WAW-Fruitland-Pictured Cliffs, as it came to be known, all the wells, and show

that it had a peak of production about 1980. You had a normal, conventional reservoir depletion curve going down to where this was a depleted reservoir by the late 1980s. And then suddenly, suddenly, a mysterious bump-up in production in 1995, 1996, 1997.

And when you look where that production comes from, it's a few wells, 11 or 12 wells, almost all operated by Pendragon and Edwards. Almost every one -- maybe one exception -- fracture-stimulated under the supervision of Paul Thompson, and of course it includes the Chaco wells that are in question here.

Now, we have the history, then, of this WAW-Fruitland Sand-Pictured Cliffs formation, depleted reservoir, basically nothing left, and we'll show that wells after wells were being plugged and abandoned.

In the 1980s, as I think you all know, the Fruitland Coal formation became an item of focus for the industry in the San Juan Basin. Amoco, the first developer in the Cedar Hills area -- Mr. O'Hare was working for Amoco. In the very early days of Fruitland Coal development, Mickey O'Hare was working on that, learning how you complete wells, what the potential reserves are.

But in the 1980s it became important, that became an important source, with tremendous reserves, trillions of cubic feet of reserves in the coal in the San Juan Basin.

And, as you all know, in the 1980s Section 29 of the Internal Revenue Code provided a tax credit.

Quite an incentive to develop this resource that before had been bypassed and that most people had avoided, operators had avoided because of the water in coal, and they thought, We don't want this, you drill a well and all you get is water. And in fact, the operators have learned that's true. You drill a well and all you get is water for several months. But as you dewater, the gas begins to desorb and you have some tremendous reserves.

But when that was happening in the 1980s, that presented an important issue to your predecessors, to the Oil Commission and to the Division: What are we going to do now, because we've had a history of these various other pools, and all of a sudden we've got a new resource. I can't quote what now is expected to be the trillions of cubic feet of gas in that resources.

So you had an administrative and industry issue that began to form in the late 1980s.

And what happened was that the Commission and the Division created what was called the San Juan Basin Coalbed Methane Committee. It was a select committee of geologists, engineers, industry representatives. Mr. O'Hare served on that committee, Paul Thompson served on that committee, both became very well aware of what was

involved.

Walt Ayers, who you will hear from, our geologist, who is the premiere expert on the San Juan Basin-Fruitland formation and all other related formations -- Walt Ayers for the Gas Research Institute-funded study done by the Texas Bureau of Economics, provided support and scientific geological information to that committee so that that committee could come before the Division and say, Here's what the Fruitland formation is, here's what it consists of.

Because the Division was attempting to define that formation, say, Where is the Fruitland formation? And of course relative to that, Where are the other formations? Everybody knowing that the Fruitland formation basically overlies the Pictured Cliff formation, almost directly, many times directly on top, often separated only by a few feet of shale, siltstone or some other formation.

So there were hearings. This matter was totally explored. And coincidentally in July of 1988, almost ten years to the day of our hearing last summer, and who was the Examiner who dealt with all that? David Catanach. For ten years David Catanach, your Examiner of the Division, has been dealing with these issues that we're talking about.

And it was very clear to everybody at that time

that the Fruitland formation consisted of layers of coal, various layers of coal, interbedded with other rock, with sandstone or shale. And everybody recognized that.

Everybody also recognized that if you're fracture-stimulating the Pictured Cliffs formation, you have to be careful, you have to be sensitive to the fact that it's quite easy for your fracture-stimulations to grow up from the Pictured Cliff into the Fruitland Coal formation. That was testified to by various witnesses, Kevin McCord, Frank Chavez, your own Director at Aztec.

So as a result of those hearing, Order 8768 was issued, written by Mr. Catanach, dated October 17, 1988. And that order, which is very important and I suggest deserves important attention here, recognized -- first of all it recites in paragraph 7 -- and a copy of the important orders are Exhibit 2 to Mr. Ayers' testimony. I quote:

> Geologic evidence presented by the Committee indicates that the Fruitland formation, which is found within the geographic area described above, is composed of alternating layers of shales, sandstones and coal seams.

And then at paragraph 10 the new pool is defined.

Order 8768 says:

> A new pool for gas production from coal seams within the Fruitland formation should be created and designated the Basin-Fruitland Coal Gas Pool, with vertical limits comprising all...

...all...

> ...coal seams within the equivalent of the stratigraphic interval from a depth of...

...and it goes on and it cites a certain Amoco Production Company -- the Schneider B Com well is the type log for identifying the Fruitland formation, and Dr. Ayers will discuss that with you.

And then it goes on and creates some special pool rules, which at that time were temporary. But those pool rules, which became permanent -- and those rules are the ones that Pendragon as Applicant is required to satisfy in order to prevail on its Application, which says -- its Application and the stipulation we were looking at earlier -- its Application and the stipulation says, what Pendragon is telling the Commission and for its Application to be granted, is that it is producing from its proper

source of supply, the Pictured Cliffs, and that Whiting's wells are producing from their proper common source of supply, which is the Fruitland Coal.

You have to ask yourself, How can they even present the evidence that Mr. Hall has told you about when their Application says, Under Rule 3 we're producing from the correct common source of supply and Whiting is producing from the correct common source of supply.

But -- Maybe that can be explained some way. I can't understand it.

But anyway, the rules, the special pool rules, say, when an operator wants to come in and show that they're producing from the Fruitland, or not producing from the Fruitland, there are certain criteria in items that we'll look at.

And among those, notwithstanding that Pendragon thinks that they, in some instances, don't provide any definitive proof -- among those is, you look at log data and you look at gas analysis.

Fruitland Coal gas is basically methane. It is low BTU gas, 1000 to 1025 BTU.

Pictured Cliffs gas has liquids. It has ethanes, propanes, butanes. It should -- If it's true Pictured Cliffs gas, it is going to fall in the BTU area in excess of 1100 BTU, 1100 to 1150.

That's exactly what Order 8768 is talking about. You look at gas composition to find out where is the gas coming from? And there are other things, water analysis.

Now, the temporary rules became permanent rules. But you must also understand and appreciate, in the history of what's already happened in this regulatory framework, is that at the same time that Case 9420 -- which was creating the Basin-Fruitland Pool -- was going on, there was Case 9421, David Catanach, the Examiner. And the purpose of that case is now, for creating this Basin-Fruitland Pool, we realize that there are some other sandstone pools that have been associated with it.

So in Case 9421, Order 8769, the vertical limits of various pools were contracted and redefined. Bear that in mind, because now we're talking about a pool such as what had been called the WAW-Pictured Cliffs Pool. Under that order it became designated as the WAW-Fruitland Sand-Pictured Cliffs Pool.

And then Case 9420 was reopened in 1991, and the rules that I've been talking about, Rule 2 and 3 and so forth, were made permanent rules. There was some slight modification, but those rules were made permanent.

All of this work, all of this work done by Examiner Catanach. So he has a complete background in what is the story when you're dealing with the kind of issues we

have here.

Now, let's forward to 1992. All right. Maralex is developing Fruitland Coal wells around the Basin. It's true they were working rapidly, because the provisions of the Internal Revenue Code provided if a well was not drilled before the end of 1992 it didn't have the tax-qualifying feature to it. So there was a lot of activity going on.

And Mr. O'Hare had worked with the Amoco projects, and he was working with Maralex in developing a great deal of expertise in how to drill and complete and fracture-stimulate these coal wells for the best results.

And he also was doing tracer and temperature surveys on a lot of these wells to determine whether or not the fracture-stimulations were staying in zone, because you do sometimes -- and that's the case here -- you sometimes run into the situation where the ownership of these two zones is differential, is not owned by the same parties.

So Mr. O'Hare for Maralex finds out that Merrion and Bayless and some of their other interest owners have some Fruitland formation rights that they're willing to sell in the area that we're interested in. So they obtain a transfer of those operating rights -- actually, technically a farmout, but then as they develop the wells they were entitled to the rights. So they receive the

farmout and later the assignment.

And here are the operating rights that they receive from Bayless, *et al.*: From the surface of the earth to the base of the Fruitland Coal Gas formation. That's what they became the owner of.

At the same time, Merrion and Bayless and those people said, Well, take a look at the other formations, as long as we're selling you out there. We've got some old wells that we call the Chaco wells, and they're not producing. Are you interested in those?

And Mr. O'Hare does an evaluation and says, These are liabilities. You buy this and you're going to have to plug and abandon. You're going to spend $5000 or $10,000 each well, just to P-and-A those wells, because there's nothing there, there's nothing in the Pictured Cliff formation.

So Merrion and Bayless can't get them sold that way. They put these properties up. The properties now that Pendragon is going to tell you are capable of producing a BCF of gas or more were put up for sale at clearing-house auction by Bayless and Merrion and those people, so they could get rid of it and not have the liability.

J.K. Edwards, in December of 1994, buys the wells at a clearing-house auction, all of the wells, more than

those in question, additional wells, about six or seven of these wells, pays about $10,000 for at auction.

And here's the rights that they receive. And it is important that the operating rights here are not described by a pool. We're not talking about a pool, but this is ignored in all of Pendragon's testimony. The operating rights are specifically designed -- and defined, starting with the word "limited", which has some meaning, limited from the base of the Fruitland Coal formation to the base of the Pictured Cliffs formation.

So all they have, no matter whether there may be some sandstone -- and there is a Fruitland sand that is above the base of the Fruitland Coal, but that's not what the rights are that they have. What they have is limited from the base of the Fruitland Coal. Basically ignored in all of their evidence, and you will see that.

So Maralex starts drilling the wells, they complete their wells in 1993, they put fracture-stimulations on them designed by Mr. O'Hare, very low viscosity, basically using water as their fracture fluid, to keep the viscosity down.

And the perforations in the Maralex wells are all kept up -- are not perforated, and there is a mistake Mr. O'Hare will correct. It says one of the wells perforated in the lower coal, which is not so. All of the Maralex

wells were perforated in the upper, thicker coal only, not in the lower coal. Why? Because Maralex doesn't want its fractures to grow down into what would be a underpressured, depleted formation and lose gas to it. So they design a fracture made to stay in their perforations.

This is a Whiting well here. Most of these are Pendragon wells, but this exhibit -- which is in Mr. Ayers -- it's Mr. Ayers' Exhibit 7, but this is a demonstrative version of it -- shows for you in the brown the Pictured Cliffs formation, the massive sandstone. In the olive color, the Fruitland Coal. And the various Fruitland sands and other sands are in yellow.

So Maralex completes its wells, fractures its wells in 1993, starts producing them. And of course, they're dewatering them. Very little gas. Very little gas production to start with. Lots of water. The water is reported by Maralex, and Whiting has by this time obtained an interest in it. We can call it Whiting and Maralex. The water is reported, and the wells are beginning to dewater, and the gas is beginning to pick up, beginning to come on. By the end of 1994, these wells now are looking very economical and making gas, and they're making a lot less water.

So along comes Pendragon, using Mr. Thompson as its field supervisor to design and perform the fracs, and

takes these Chaco wells, the basically shut-in, nonproductive Chaco wells, and they fracture-stimulate. What they do in January of 1995, they acidize the Chaco 1, the 2-R and the Chaco 4. They can't work with the Chaco 5 because it has a casing leak.

And then later in January of 1995 they fracture-stimulate the Chaco 1 and the 2-R. And in May of 1995 they fracture-stimulate the Chaco 4 and the Chaco 5.

Now, some idea of just what is quite simple and observable when we talk about what fracture-stimulations have what role in communication and effect.

This is an exhibit that illustrates the gas production history of the Chaco 4, supposedly an alleged Pictured Cliff well, purchased by Pendragon as I have described.

Back in its best days, when it was first produced, virgin conditions, it produced for a while as much as an average of 200 MCF a day. That was its best. And then followed what you would expect, a natural decline curve for a conventional reservoir gas well, down to basically being nonproductive.

Now, here in 1993, very close by, wells -- and we'll it, we'll show you the distance -- very close by, two of the Gallegos Federal wells are fracture-stimulated. No effect. No effect on gas response, gas production, on the

Chaco wells.

Well, what happens when they fracture-stimulate the Chaco Number 4? More gas production than this well ever had when it was truly a Pictured Cliffs well, because now it's producing -- prolific well from the largely dewatered coal formation after the fracture-stimulation by Pendragon under Mr. Thompson's supervision.

We have these kinds of demonstrations for all of them, but here's the Chaco 5. Same thing: The well came on early in its life and for a while produced a daily average of, say, 190, 180. Natural decline curve. This is the reservoir that Mr. Jacobs was talking about. Few reserves, goes down to nothing. The Gallegos Federal wells nearby, fracture-stimulated. No effect, no response. And Mr. Robinson will explain why.

Mr. Robinson will say that there is -- one of the -- the 6-2 well, the fracture-stimulation did, in his opinion, probably penetrate down into the Pictured Cliffs, but he'll explain why it had no effect and has no bearing on the question of what is the source of gas being produced from the Chaco wells.

But immediately when the Chaco wells fracture-stimulate -- this would have been May of 1995 -- you can see what the result is.

Now, to give you a flavor of the kind of evidence

you're going to get to try and support Pendragon's unsupportable position, say, Oh, we have a lot of reserves in the Pictured Cliffs, nobody knew it. You know, Dugan's only been in there for 20 years, one of the top operators in the San Juan Basin. Merrion and Bayless. They're not near as smart as us, they don't realize all these reserves there. Only we, who fracture-stimulate these wells -- and I have to say only we; Pendragon fracture-stimulates so they get coal gas -- are able to get these reserves.

But the kind of work that you'll see done is, they come in and they'll say, Here, we do a P/Z curve and tell you that we've got -- These Chaco wells have a potential of 600 -- producing .6 BCF, 600,000 MCF.

And what they do, their witnesses will take and draw a curve based on what happened when they started producing coal gas, and all of a sudden these wells making 200 or 300, instead of calculating what the reserves is and was from Pictured Cliffs formation.

What probably -- you can talk -- You know, witnesses, expert witnesses -- and these fracture-stimulation experts, and I enjoy very much hearing their testimony, talking to them. But basically what they're doing is, they're saying, If I select certain properties, certain rock properties, if I select certain stress values, my computer that certain things happen in fractures, this

is where they go, they're going to take or they're not. It's theoretical, and a lot depends on what you all accept as what the parameters are that they use.

But some of the things that you can't argue with and you can't change, you can't change a parameter and decide that a fracture gradient is going to be this instead of that. You can't change the kind of information that's just objectively ascertainable data that says look what happened here after they fracture-stimulated their wells.

The wells for their whole life, the Chaco 1 had produced 377,000 and then -- I mean 102,000 MCF. And then after it's fracture-stimulated in 1995, 377,000.

The Chaco 4, 380- -- almost twice the gas produced in -- two and a half, three years after this fracture-stimulation of the coal than what it had ever produced before that time.

And what's interesting, we'll show you too, is that wells that they did not fracture-stimulate, Chaco wells that they did not fracture-stimulate but that were in close proximity to our wells, which we did fracture-stimulate, showed no response. None of this. All of a sudden, new source and production of gas. No effect, even though nearby, our wells that were fracture-stimulated.

Now, I will make one comment because there will be things said about the water production, because it's

well known that in connection with coal gas, especially in the early stages, you have large quantities of water produced.

What we -- All that we know in regard to the production of water from the Chaco wells are the following facts:

That no water was reported until suddenly in February of 1998, when the OCD personnel went out and made a field inspection of the Chaco wells, then they started reporting water. Now, this is -- Remember, they were stimulated and producing since 1995. That's all we know about water production because nothing was reported.

Number two, though, we know, and we have photographs Mr. O'Hare will tell you about, that water was being discharged from these wells into large unlined pits and sandy soil. And we have photos of those pits.

So they -- At one point they say, Well, these weren't coal wells, they didn't act like coal wells because there wasn't water production. Of course, we didn't report any water. And then on the other hand, Mr. Nicol will say, Well, if you have coal -- I mean, if you have water from these coal wells, it's because Pictured Cliff wells make water. So everything is rationalized.

Now, the first evidentiary hearing we had in this case, it was in the District Court in June of 1998 before

District Judge Encinias. We put on our evidence. At the close of our evidence he asked if there was anything further. Pendragon opted in spite -- or in contradiction to what Mr. Nicol says in his testimony, as though he didn't get a chance to put on any evidence. The judge asked if there was anything further, did they want to put on anything, and they did not. And Mr. Hall argued, We submit it because we don't think they've proved their case.

Indeed, we have proved our case, and Judge Encinias finds that we have this evidence before you. He found on the evidence presented on the first hearing that, in his words, Mr. Hall argues with our terminology. And I don't remember calling Pendragon a rogue operator, but it probably fits. Judge Encinias says he finds that they are, in his words, hijacking Whiting's gas, stealing Whiting's gas, that they trespassed into the Fruitland Coal formation with their fracture-stimulations, and those wells should be shut in, and he's issuing a preliminary injunction.

But at the request of Pendragon he is going to allow that matters that are in the regulatory expertise of the Oil Conservation Division and Commission to be heard here.

So here we are with a reference from the District Court, but that case is still going on, and we'll go back there.

So then we have a second hearing, David Catanach, the Examiner, this Examiner who has worked with the issue in the Basin Fruitland Coal now at this point for ten years. We had three days of intensive hearing. To the credit of Mr. Catanach, we worked from 8:15 to 7:00 in the evening. And all the evidence was put on. Pendragon's Application was as it's stated now, that, you know, Chaco wells are producing Pictured Cliffs and Gallegos Federal wells are producing from the Fruitland formation.

And after that hearing Examiner Catanach issued an order that, if the members of the Commission have not read it, I would suggest it's very helpful because it's so well done in terms of reviewing all the facts, reviewing the evidence of the various parties. And he finds that the fractured communication of the Chaco wells have caused a trespass, have caused a fracture-stimulation, have caused communication between the formations and that the Chaco wells are producing Fruitland Coal gas and should be shut in.

His order is the one that's under challenge here. It was issued in February of 1999, 29 pages, and I say an extraordinary order. Denies the Application, says the well should be shut in, and invites, invites, Pendragon to come forward and suggest a methodology to the Division by which it could produce its Chaco wells but produce only from its

formation, an invitation which Pendragon has totally ignored, totally ignored, doesn't want to do anything like that where it would produce gas only from its formation.

But yet now we're going to hear all this evidence about how it's really just producing gas from the formation that it's entitled to. But yet when Examiner Catanach says, We invite you to come forward and give us a method by which your wells can produce but produce only from the formation, from the WAW-Fruitland Sand, they do nothing.

So here we are again because of the anomalous circumstance of the statutory scheme here, that you have a full-fledged Examiner hearing and then a *de novo* hearing.

So what happens now? Now after two hearings Pendragon has lost, 180-degree shift in position: Oh, yes, there is communication, we were wrong to take the position in the District Court and take the position before the OCD there was not communication. We were wrong to do that.

It didn't work twice. They're coming up to the third strike. And so a 180-degree shift. But they say, Oh, there's communication, but our wells, our fracture-stimulations, must not have caused it. It must have been the Whiting wells, the Gallegos Federal wells. And there's big reserves, and that's what we're producing from, and nobody realizes that all down there in that massive sandstone that everybody else stayed away from because of

the water saturation, there's these reserves.

Now, what we will present, the evidence we will present, I'll state it briefly. We'll present the testimony of Mr. O'Hare, with a lot of factual information as well as his expert opinion. The coal well completions, his experience, how the were done, why they were done, the manner that they were done, his evaluation of the Pictured Cliffs in this area, why it was obviously a depleted reservoir, and why -- the gas production, matters of when compression went on, what the pressure matches have been when these wells have been shut in to show that the communication clearly exists.

Jim Brown from Whiting will testify, and he will present a lot of the information on the production history, gas composition, matters of that sort. The kind of production history I briefly introduced you to, which shows that these wells were nonproductive, not affected by the fracture-stimulations of Whiting Federal wells, suddenly very much affected by the fracture-stimulations overseen by Mr. Thompson from Pendragon.

Walt Ayers will testify, a geologist, because there's a controversy over what is the true contact point, or the so-called pick, between the base of the Fruitland formation and the top of the Pictured Cliff formation. As I say, he will explain to you the depositional environment

which differentiates these formations, the Pictured Cliffs, the true Pictured Cliffs, being deposited in a marine environment, and the Fruitland Coal being in a nonmarine environment, being in a coastal plain-swam-lagoonal type of environment, and thereby this Fruitland sand that's interbedded with it not being a Pictured Cliff formation sand.

And Mr. Robinson, our fracture expert, will explain that, will demonstrate that the Chaco well fractures went into the coal formation, went through the large coal formation. And he will explain why, in the case of the Gallegos Federal well where the fracture probably went into the Pictured Cliff formation, that has no effect, it makes no difference on the pathways and the communication.

Now, the issues, the issues that you have to deal with, I think it will help somewhat to define.

What is the correct contact between the bottom of the Fruitland formation and the top of the Pictured Cliffs formation?

What is the limitation, notwithstanding whatever we talk about geologically, based upon the transfer of operating rights obtained by Pendragon, what are the limitations as to what Pendragon, and from what formation they're entitled to produce from, since it's limited to the

base of the Fruitland Coal formation.

Third issue is fracture containment. What has happened in regard to whether these fractures have been, have not been, contained in the zone in which they're initiated?

The fourth issue, what is the source, what is the true source of the gas that was produced from the Chaco federal wells from 1995 until they were shut in in July of 1998 by the District Court's preliminary injunction, the shut-in which was affirmed by the Division's order? The gas that's being stole or hijacked.

Another issue, a related issue, is what fracture-stimulations have had what effect? If a fracture-stimulation in either case had been out of zone, there is still the scientific inquiry to be made dealing with things such as pressure sink and relative pressure of the formation. Even if fractures are out of zone by both wells, what is the effect as far as a pathway and as to what gases produced from what wells by reason of those fracture-stimulations?

And finally, sort of the final legal issue is, has Pendragon met the requirements of Pool Rules 2 and 3 in order for its Application to be granted in which he says each of the parties is producing from their proper common source of supply.

Final, last comment. This has been long, I'm sorry, but I hope helpful.

Mr. Hall has complained about some sort of terminology that has been used. Pendragon is and has been clearly operating illegally. Rogue operator? Maybe that's correct. But what you are seeing happen, and you're going to see it because we're not -- The Chaco Plant Number 5 that is so much relied on by Mr. Nicol as their poster well, this is the example in 1993 why we went and did these other wells, that's a Pictured Cliff well fractured into the coal gas. It's another example of the same thing going on.

And then you're going to hear about the Lansdale Federal, nearby offsetting well. Same thing that was done. Call it a Pictured Cliff well, put it on 160-acre spacing. Bear in mind, ladies and gentlemen, true Fruitland wells have a certain standard location, northeast quarter on the east half, southwest quarter on the west half, and 320-acre proration units.

And what you're seeing is these parties going out, 160-acre Pictured Cliff well fracture-stimulated into the coal gas and taking the coal gas. And it's happening here, and we're going to show it's happening other places. And that's what you're dealing with. That's what the Division has said is wrong, has to be stopped, those wells

have to be shut in. That's what the District Court has said, and that is what you're going to say after you've heard the evidence in this case.

Thank you.

CHAIRMAN WROTENBERY: Thank you, Mr. Gallegos.

We will take a short break here, just for a stretch. Let's keep it to about ten minutes. My watch says it's a quarter of eleven. Let's get started again at five till eleven, and we'll start with Pendragon's direct case.

(Thereupon, a recess was taken at 9:45 a.m.)

(The following proceedings had at 10:55 a.m.)

CHAIRMAN WROTENBERY: Okay, we'll go back on the record.

Mr. Scott [*sic*], let me just make sure I understand who is going to be testifying and make sure we all know when, generally when. You have seven expert witnesses on your list, and I think everybody is ready to go this week, with the exception of Mr. Cox --

MR. HALL: Correct.

CHAIRMAN WROTENBERY: -- is that correct? And Mr. Cox was unavailable this week, but we had all agreed that he would be here next Thursday --

MR. HALL: Right.

CHAIRMAN WROTENBERY: -- in order to present his

testimony.

And then in addition, Paul Thompson you intend to call --

MR. HALL: Paul Thompson --

CHAIRMAN WROTENBERY: -- as a fact witness?

MR. HALL: -- as a fact witness. And likely Mike Wagner as well, who is not in attendance today.

CHAIRMAN WROTENBERY: Okay. Will he be here tomorrow or --

MR. HALL: We can have him here tomorrow.

CHAIRMAN WROTENBERY: Okay. In that case, proceed.

MR. CONDON: We have a --

CHAIRMAN WROTENBERY: Yes.

MR. CONDON: I'll just ask a clarification question. There was something in the Commission's order, I thought, that indicated that next Thursday on the 19th, we won't start until 1:00 p.m.; is that correct?

CHAIRMAN WROTENBERY: That is right. The Examiner hearings will be held that morning here in this conference room --

MR. CONDON: Okay.

CHAIRMAN WROTENBERY: -- so we will need to wait till about 1:00 p.m. next Thursday.

MR. HALL: You know, I got the impression I may

have had the only case on that docket next week. Am I wrong? Energen case?

CHAIRMAN WROTENBERY: I don't know. That's something we can check on.

MR. HALL: Because if it is, I'll ask that that one case be continued.

CHAIRMAN WROTENBERY: Okay, well, we'll check on that, and certainly before the end of the day tomorrow we'll know when we'll get started again next Thursday.

MR. HALL: You know, I think we have a housekeeping matter with respect to swearing witnesses. How do we want to handle that, in adopting their testimony?

CHAIRMAN WROTENBERY: Well, they will be sworn as they --

MR. HALL: One by one?

CHAIRMAN WROTENBERY: -- at the out- -- one by one, at the outset of their testimony. And for the experts who have filed prefiled testimony, I think they would start out by introducing themselves and adopting the prefiled testimony --

MR. HALL: All right.

CHAIRMAN WROTENBERY: -- that they have submitted.

MR. HALL: All right.

CHAIRMAN WROTENBERY: Is that -- Any questions

about that process?

Okay.

MR. HALL: At this time -- put this on the record -- this is a matter of ordinary protocol. At this time, Madame Chairman and Commissioners, I would call Al Nicol to the stand and ask that he be sworn.

CHAIRMAN WROTENBERY: Mr. Nicol, would you please stand and be sworn?

ALAN B. NICOL,

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

EXAMINATION

BY MR. HALL:

Q. For the record, sir, would you please state your name?

A. My name is Alan B. Nicol, N-i-c-o-l.

Q. Mr. Nicol, where do you live and by whom are you employed?

A. I live in Jefferson County, Colorado, and I'm the president of Pendragon Energy Partners, Incorporated.

Q. And are you familiar with the Application that's been filed in this case and the subject lands and the subject wells described in the Application?

A. Yes, I am.

Q. Have you also filed testimony in conjunction with

your presentation today?

A. Yes.

Q. And do you today affirm and adopt your filing?

A. Yes.

MR. HALL: Madame Chairman, Mr. Nicol has previously had his credentials accepted as an expert. I'll be glad to go through that routine on the record with him again, if you'd like.

CHAIRMAN WROTENBERY: I don't think that's necessary.

MR. HALL: All right.

CHAIRMAN WROTENBERY: We have that information in the prefiled testimony. I'll ask if there's any objection from the opposing party.

MR. GALLEGOS: No objection.

CHAIRMAN WROTENBERY: He is so qualified.

MR. HALL: All right.

Q. (By Mr. Hall) Mr. Nicol, if you would, would you please provide the Commission with a summary of your testimony you've filed in this case?

A. All right. I'd like to start by addressing this map, which may be helpful for knowing which wells we're talking about and where they're located.

This is Township 26 North, 12 West; 26 North, 13 West; and then parts of 27-13 and 27-12, San Juan County,

as you've heard, perhaps 15 miles south of Farmington in the San Juan Basin.

There are 11 wells that are the crux of the problem here today, and on this map we have colored the Pendragon Pictured Cliff wells in yellow and the Whiting and Maralex Fruitland Coal wells in blue.

Now, Whiting has a very easy designation to follow on their well numbering. For the coal, the one in the northeast corner is the Number 1 in that section, so it's the 13-1 -- or 13 -- In this case it's the 26-13-1 Number 1, so we'll frequently be referring to that as the 1-1 well.

The one in the southwest corner is the Number 2, so it would be the 1-2 well.

Over here we have the 6-2, 12-1 and the 7-1.

There's no such pattern for the Pictured Cliff wells. They were done at different times, different operators. But the one right here, very close to the Gallegos Fruitland 1-1, is the Chaco 2-J. This is the 1-J, this is the Chaco 5, Chaco 4, Chaco 2-R, and down here is the Chaco 1, in Section 18.

The color code is Pendragon's ownership in the area, basically calculated by zone. We have Pictured Cliff rights in those leases.

I think the proceeding involves, really, just two

central issues, the first of which is, which wells operated by which operators have been fractured out of zone. And secondly, are the Pendragon/Pictured Cliff wells completed in the appropriate common source of supply, and specifically in the Pictured Cliffs formation.

Central to determining the answers to those questions are really two other questions:

Did the Pictured Cliffs reservoir have potential for producing additional reserves in 1995 when our wells were fracture-stimulated?

And then what are the correct and logical conclusions to be drawn from the shut-in pressure data collected from those wells during the past year that they've been shut in?

Now, my testimony seems to be overly concerned with the details. It's very thick and very long. But following the details to the logical conclusion is the purpose of that presentation, and it's critical to coming up with the best answers.

The debate has been going on for a long time, as Mr. Gallegos pointed out, but only as a result of the shut-in pressures, the shut-in of our wells for the last year, have sufficient facts become available for us to be able to draw conclusions as to communication between zones and as to which wells are the offending wells.

It's clear to us that communication exists between the Fruitland Coal and the Pictured Cliffs. I don't think anyone here would question that anyone. But it should be also equally clear that it's not a circumstance that exists for all of the wells or all of the leases, and each well must be examined individually whether or not it is communicated or suffering from communication. And finally we have enough information to do that.

Incidentally, in the stipulations is very good concise history of the completions, the history of the wells, so I won't go into that again except to say that our Chaco wells were originally drilled and completed in the Pictured Cliffs formation in the late 1970s and early 1980s. We have not changed the perforated intervals or the designation of the formation.

Three of the wells, the Chaco 1, the Chaco 4 and the Chaco 5, were initially some of the better wells in this limited area here for the Pictured Cliffs. The Chaco 2-R was not nearly as strong, and the 1-J and 2-J wells were poor wells.

Even the better wells did not perform as would be expected. They fell off on the production decline curves, and they did not meet at least our calculations of what volumetrics should have been, or would suggest the production should have been.

We got involved in looking at this in late 1994, first as -- Our first involvement was to buy several wells from Edwards Energy, or J.K. Edwards and Associates at the time. And in conjunction with those conversations we learned about the Chaco Plant 5 well and the success that Edwards had had in recompleting that well -- or, I'm sorry, restimulating that well, in the Pictured Cliffs by fracturing it.

And there's a whole section in my testimony about how that well functioned, but it's critical to note that that well was fractured in 1993 when the surrounding coal wells had only begun to produce. They had not begun to dewater significantly.

After the Chaco Plant 5 got up and running, it was producing more every two months than any of the other wells, coal wells, nearby had produced so far. And it flowed, it did not have to lift water, it did not have to be pumped.

And it peaked very quickly in its life. There is some confusion over exactly when it peaked because there was some confusion over the recording of the production. But looking at the data we have, it's clear that it was very strong, very early.

As for the Chaco wells, when they were put up about that time by Merrion and Bayless at public auction,

we purchased them, basically jointly with Edwards in December of 1994 and began our stimulation work in January of 1995. This was not a matter of waiting for something to happen except for the opportunity to purchase some wells.

Our stimulations began with acid jobs in three of the wells, and the acid cleanups did not work. We didn't see any particular benefit from it. These were 500-gallon jobs done at a barrel a minute, very common for Pictured Cliffs wells historically in the area and nothing different from what people had been doing for a long time.

The Chaco 1 and 2-R wells were then fracture-stimulated in January of 1995. Later in May, we fractured the Chaco 4 and the Chaco 5. And these were small, low-rate treatments. They were designed to stay in zone.

The pressures, shut-in tubing pressure and shut-in casing pressure, seen in the Chaco 1-J well before any stimulation work was done, of 158 pounds -- that's to surface, 158 p.s.i. -- and in the 2-J and Chaco 4 wells after just the acid jobs but before any fracture treatments of any wells were done, showed that there was significant remaining reservoir pressure in January, 1995.

After the acid jobs, the 2-J well was reading pressures above 180 pounds, and we have one pressure after the acid job in the Chaco 4 of 170 pounds. And then after some more work was done and it was blown down and allowed

to build backup, we have about three months of readings of 140 to 147 pounds. That's about 60 percent of the original pressure of 230 pounds in the Pictured Cliffs formation.

Now, after being fractured we have some stabilized pressures for all of the wells, tubing and casing. And we try to use tubing and casing because it's assumed and expected that if you have tubing and casing pressure running virtually the same, that the gas has replaced whatever water might be in the wellbore, enough that you can equalize those, and there's little if any water left in the wellbore.

So after the fracture jobs in early to middle 1995, we had 170 pounds in the Chaco 1, 151 to 153 pounds in the Chaco 4 and 5 wells. The 2-R was reading 104 to 110 pounds, but that well never really produced until late 1996, and by then it had cleaned up, or whatever happens with the gas displacing the water, and was reading 150 pounds.

And all of these are remarkably close, indicating a relatively uniform pressure throughout the PC reservoir. And they can't just be some kind of coincidence. They are not reflecting coal pressures, because coal pressures measured in 1994 in the 6-2 well and the 7-1 well, if I recall correctly, were about 220 pounds, and those wells did not get down into that 160-pound range until late in

1995.

If you do a projection of pressure versus cumulative production, those two wells should have been reading about 210 pounds in January of 1995. So I take exception to the statements that the Chaco wells increased in pressure to the coal pressures. That's not coal pressure that we had, and that's not the case.

The critical points on these pressures are that they are uniform over a large area, they are consistent before and after the stimulations, in one case before any stimulation versus after. And that well, after the acid job, by the way, we had 155 pounds versus 158 before any work was done, so very consistent.

And they're consistent before and after the fracs where we have, for example, the Chaco 4 reading within a few pounds before and after the frac job.

Now, there are two ways to expect what coal pressure the wells should be reflecting. One is to look at what was the average reservoir pressure of the coal away from the producing coal wells. And for the Chaco 1, for example, down here, it's -- I calculated about 4400 feet from the nearest Whiting coal well, and should have seen basically virgin coal pressure at that point. The Whiting well could not have drained or pressure-communicated any significant extent, that far, at that point in time. And

it saw 170 pounds, not the 250 that the coal should have seen. So it wasn't seeing coal pressure.

The other extreme is the 2-J well, which is 180 feet from the 1-1. And the 1-1 was producing at the time, and the 2-J well was seeing 188 pounds, not a drawn down pressure for a pressure sink around a producing well.

The shut-in data that we have collected pretty conclusively shows that the 1-J, the 2-J and the 2-R wells are now known not to show any evidence of communication with the coal.

The Chaco 1, the Chaco 4 and the Chaco 5 wells are seeing pressure communication with the coal, of the coal wells. But we will show through several presentations of facts and analyses that these wells are communicated with the coal because of the fracture treatments in the coal wells, and they're not communicated in their wellbores.

When the Chaco 1, the Chaco 4, the Chaco 5 and 2-4, which are the four wells that were fracture-treated, were shut in in June of 1998, we began monitoring the shut-in tubing and casing pressures on all 11 wells, and we did that jointly with Whiting. The pumpers would meet at a well every morning and go around together and jointly take the pressures.

The data from that shows that the Chaco 1, Chaco

4 and Chaco 5 are being drained by coal wells, and they have lost pressure steadily since we shut them in.

It also shows that the wells -- and I'm talking about all of our wells -- cannot have been fractured into and stimulated to coal in those wellbores. It's demonstrated a number of ways, but one of the most significant is, when the entire field is shut in -- Frequently the El Paso Chaco Plant goes down and wells have to be shut in all over the field. And one example is in August of 1998, the coal wells shut in at higher pressures than did the nearby Chaco wells. And I'll show you why that's significant on this schematic.

Q. Why don't we identify that for the record, the exhibit number, Mr. Nicol?

A. This is my Exhibit Number 10, N-10. And it's just taken from a monograph by Matthews and Russell on well pressure buildup and flow tests in a well. And it's just -- Can you see that all right? It's just a diagram of increasing pressure versus area. And it depicts the pressure sinks around the wellbores of two wells producing at different rates from a uniform reservoir.

Now, if you want to look at this as being the Coal Well 6-2 and the Coal Well 12-1, that would probably be a good example.

In between them is some sort of drainage boundary

where all the molecules of gas on this side of the boundary are going this way, and on this side of the boundary are going that way. And the pressure drops off toward the wellbore, in its own rather complicated mathematical formula, in the shape of a cone. And here you can visualize it as the drain in a bathtub as it's draining out, draining water out of the bathtub.

And then if we put a -- let's say a Chaco 4 well right here, and it is sitting there monitoring pressure and it's seeing some sort of drawdown in pressure here -- Now, Chaco 4 is an example because it has been drawn down in pressure since the day we shut it in. It's never built up like it used to, and it's always been affected by offset production from when we shut it in a year ago. It's been hold lower than the other ones.

So it's monitoring pressure here.

And then all of a sudden we shut in the field, and these cones go away and basically the bathtub fills back up to a stabilized level.

Now, if the bathtub, if you will, or the container the size of this diagram -- the average level would be right in here somewhere when these fill back up. Somewhere in here you could get an average, and everything would equalize. But to do that, these wells would have to come up in pressure, and the one up here would have to go

down as everything stabilized.

If this well goes up in pressure at the same time that these wells go up in pressure, then you've got gas, in this case, filling the reservoir from somewhere else, and it's filling everything back up. But in no way can the well over here reach a higher pressure than the well here, if they're in the same reservoir.

In other words, as this fills up that one reaches a pressure, this one -- If this one bumps up immediately to a higher pressure it tells you that they're not in the same reservoir.

And that's what's happened in the Chaco 1 in one of our exhibits, and I've forgotten the number of that, demonstrates that. The Chaco 2-R sees that situation consistently, and I think I've got that down here.

In this exhibit the orange is the pressures versus date for the Chaco 2-R well, and the blue spots are the shut-in pressures for the closest well to it, the 7-1 we're talking about, these two wells right here.

MR. GALLEGOS: Excuse me, what exhibit is this? I don't recognize this as one of your exhibits. Can we have the number, please?

MR. HALL: This is 17-B, N-17.

THE WITNESS: I guess I'm not surprised you don't have these memorized.

MR. GALLEGOS: No.

THE WITNESS: Anyway, here's --

MR. GALLEGOS: Okay, and the prior exhibit was which? Excuse me, Mr. Nicol.

MR. HALL: Ten.

MR. GALLEGOS: Ten?

THE WITNESS: Yeah. Are you talking about that one here?

MR. GALLEGOS: Yes, sir. Thank you.

THE WITNESS: There's a lot to be said about --

MR. GALLEGOS: This is revised, right? This is not as it appears in your filing? This is what we have.

THE WITNESS: Yeah, the only difference is, we've added the color.

MR. GALLEGOS: The columns and the color?

THE WITNESS: The color, yeah, and the columns, for ease in presentation. The data is the same.

MR. GALLEGOS: Okay.

THE WITNESS: The Chaco 2-R well was building pressure for the first basically 10 months that it was shut in. There's a lot of ramifications to that and what it means about how you get -- what pressure data you can rely on as to what's the average reservoir pressure when you're shutting in wells for 24 hours or when you're taking surface pressure.

But the point to be made here for the subject I was on is the fact that the Chaco -- I mean the Gallegos Federal 7-1 well, shuts in whenever the plant is shut down or, in this case, when just the Whiting wells were shut in, too quickly, much higher pressure than the 2-R was seeing, says that they can't be in that same reservoir, that same bathtub.

Put that back down.

Now, the other thing that that tells you is that if the two wells are not in the same reservoir, then the pressure we're seeing in the Pictured Cliff wells, the shut-in pressure of the orange one on that chart, has to be a valid, real pressure.

So that well was building pressure, it built to over 100 pounds bottomhole pressure during the time it's been shut in. And once again, it's not a depleted reservoir yet. There's reserve left. If it was 100, 101 pounds -- we measured bottomhole pressure in April out there, it had to be a lot higher in 1995 when we fractured the well and started producing it.

Now, my testimony goes through a great deal of information on these pressures, and I would point out that the pressure is best used after it's been adjusted for the fact that there were different gauges and different meters being used. And I go through a discussion of that, because

the meters on the Whiting wells are different from the gauges that the pumpers carry, and our pumper had to change gauges in the middle of this process because he lost or misplaced one.

And we also tried to calibrate his gauge to a deadweight tester, which is a much more accurate way of measuring the pressure than just the gauge, because the gauges are not quite -- not as accurate or dependable, and they don't read in as much detail.

So in the tables I provided, I provided the raw data for all except the 1-1 and the 2-J wells, which are so far apart we didn't feel any need to go into a lot of detail on those.

And then I provided the adjustments I made for the deadweight tester, the mathematical formula we derived from the comparison of the deadweight to Mike Wagner's gauge, and then also adjusted for the differences between Mike's gauge and what readings we were getting off the Whiting wells.

If that is unacceptable for some reason and you want to use the raw data, I think it will provide the same answers. But there again, you still need to make an adjustment between the differences between what Mike's gauge was saying and the Whiting well was saying. If you don't want to use my formulas for what the linear

correlation is, you still need to make the adjustment, because sometimes there's six, seven, eight pounds' difference between two gauges at the same time in the same place.

Now, I'm going back to the chart on the 2-R for a moment. That took about ten months to reach a stabilized shut-in pressure, or what appears to be stabilized. The Chaco 1 took about two weeks to do that.

And in some areas in the Basin back through about 1983 or early 1984 -- I've forgotten the exact date -- pressures were required to be taken once a year in these wells. And they were surface pressures, shut-in pressures. Sometimes only 24 hours were required, sometimes seven days were required.

I have been under the assumption until very recently that most of our well pressures that we have historically were 24 hours, but I understand through conversations that one of our fellows had with Mr. Busch that the frac may have been seven-day pressures.

Seven days is not always enough, clearly. Two of our wells wouldn't have gotten to their highest pressure in seven days. But it's also important to note that even if you get a stabilized pressure in seven days, that is a pressure that's being affected by other producers, so that if other wells are affecting the reservoir pressure and

drawing it down by producing, if we're somewhere in that cone, then what you're seeing is not necessarily the average reservoir pressure for the Pictured Cliffs reservoir; what you're seeing is the pressure that well is seeing at that time. And there's a difference.

I've provided a section on the geological controls on fracture geometry, and also a discussion of my opinion of the FRACPRO model, which is what Whiting's expert uses to show what he thinks happened with their fractures and our fractures.

The use of simulators is a tool to get an idea of what could have happened or what's most likely to have happened, but it's not something that can predict exactly what happens or in any specific case to tell you, in fact, what happened. It just predicts the most probable outcome.

And FRACPRO, in my opinion, is not one of the better tools the way it's currently designed. And it doesn't seem to have to capability to handle layered reservoirs.

Geology controls an awful lot of -- or about, what happens to a fracture. Not just the difference in stresses and ductility or compressibility of the zone, but also the bedding planes seem to have a great deal to do with whether a fracture cuts through something or stops at that point. It's a bit surprising that the bedding planes,

even at thousands of feet deep, seem to be weak and absorb a lot of fracture energy, but they do.

So it's a tool for probabilities, but it's not a tool for exact results.

The more ductile, more compressible rocks take more energy to break. They bend and deform, if you want to call it that, they move and slip on microfractures and planes within the rock and absorb energy. So it takes more energy to break ductile rock than it does a brittle rock. And Pictured Cliffs is a more brittle rock; coals are very soft, very compressible, and they absorb more energy.

The bottom line there is that if a fracture is designed to fracture the coal, it will have a tendency to break out of that coal if the surrounding rock is more easily fractured than the coal. Conversely, if a fracture is designed to break a brittle rock, it may not have the energy to break the more ductile or compressible rock.

And another consideration in this particular case is that fracture-stimulations tend to migrate toward lower pressure. If you have two zones side by side or one on top of the other, that have vastly different pressures, the fracture energy will tend to grow to where it's easier to work, and that's in the lower pressure.

We provided two examples of fractures in the Pictured Cliffs, in the general area. They're off of this

map, one of them over here in Section 3 and one up above, a township away, where the fracture simulations were traced by radioactive materials.

And the geologic controls of where those fractures went are very evident. On one of them the bounding shale on top of the Pictures before it and the overlying coal may have been fractured up about four feet, based on the tracer, but there's no indication or evidence the fracture went any higher than that and got to the coal, certainly not into the coal, and it looks like it never got there.

And that particular one, which is the Dome Federal well on that exhibit, the fracture grew down 30-some feet into the Pictured Cliffs where there's no softer rock, no shale, no coal, below where the perforations were to stop it. So it grew up six feet and down 30-some feet, and that's the geologic control of where the fracture's going.

The other example, which was done after last year's hearing by Edwards in a well in Section 3, the Pictured Cliffs had been perforated in what we term the upper Pictured Cliffs sand and had been produced for years. And Edwards went in, added some perforations to that general interval and fracture-stimulated it, and the fracture pretty much stayed in that zone.

It grew downward through a shale and apparently through a thin Pictured Cliffs coal below the shale, both of these being very thin intervals in the Pictured Cliffs, and stopped apparently at the bedding plane between the coal and the next layer below it. It grew up virtually none above -- no distance above the top perforation, which was right at the shale at the top of the Pictured Cliffs.

I wish we had more of those examples, and in retrospect I wish we had done all this on our wells. But those are the only two examples that we have available to us in the area.

It appears we're going to have a pretty good fight over gas composition, and of course it's being held that gas composition is an indication of change of producing formation. If the gas composition changes, obviously we're producing gas from somewhere else.

However, the producing gas compositions change in the wells in this part of the Basin with changes in producing conditions. My Exhibits N-37-A through -E are an attempt to show what you're up against in trying to use gas compositions to determine where the gas is coming from.

37-A is just a list of wells in the -- sorted by BTU, without any disclosure of whether they're Pictured Cliff wells or Fruitland Coal wells. And the purpose of that was to show that there's really no break somewhere in

that list between a group of BTUs above or a group of BTU values below a certain level where you can say, Okay, clearly these are one kind of well and these are another.

Now, we're not arguing that the coal wells make 1100 or 1150 BTUs. We haven't seen that. So the wells above roughly 1100 BTU, maybe even down into the 1070, 1080 -- I've forgotten the exact number -- are Pictured Cliff wells. And there are no coal wells up in that group. Likewise, there are no Pictured Cliff wells below about 1000 BTU. There are a number of wells below that, but they're all Fruitland Coal wells.

But in that little range between a little over 1000 and 1070, 1080 BTU, there's no separation. And as you go through the exhibits, the next thing I marked was where were the coal wells? And that's Exhibit 37-B, and they fall in a range in that middle interval.

And then 37-C just color-codes certain wells where we have a number of readings and shows that if you picked any arbitrary BTU value as being a cutoff, some of those wells would have crossed back and forth, depending on when the analyses were taken.

Most of these analyses were taken by the purchaser, and usually about every six months. So we have a number of wells where there are quite a few analyses on the same well at the time.

And then 37-D is a tabulation of the BTU values and the amounts of changes of those BTU values for the Designated Hitter Number 2 well -- Thank you, that's desperately needed.

MR. HALL: You sounded thirsty.

THE WITNESS: Yeah.

-- where it started off at 1111 BTUs when it was completed, I think about 1980, and dropped down rather quickly into the mid- to low-1000 range, and then was fracture-stimulated -- this is a Pictured Cliffs well -- fracture-stimulated in 1994, and the next two readings, the values actually went up a little bit from what they had previously been on average. And one was on the high side of what they had been for several years, and then it's dropped back off again on the last reading we had, the third reading.

I'm confident that if we shut that well in like we have our wells, that it would sample Pictured Cliffs original gas composition above 1100 again.

And the point here is that we don't -- I don't know that we know all the answers about how this change of gas happens in the flowstream, in the producing stream, the change of gas composition. But the fact is that it does happen, and there's ample proof of that in these tables that I've provided.

And one way to prove our point would be to take samples of the wells we have shut in and see what kind of gas we got out of those. And we did that in the Chaco 1, the Chaco 4 and the Chaco 5 wells, and in all three cases we got BTUs above 1100, even though they had been producing a year ago at BTUs generally below 1020. And that shows us pretty conclusively that the wells are connected only to the Pictured Cliffs.

One reason I say that is that under Whiting's scenario, if the wells had been fractured into the coal in those wells, and if those wells are pressure-depleted, then when we shut them in, there should be a dynamic flow set up between the Coal and the Pictured Cliffs, with water and gas flowing from the coal into the Pictured Cliffs. What we would debate about is the rates and the volumes that's crossflowing there, but I don't think there's any debate about the fact that it would have to be some sort of dynamic situation until all the pressures stabilized.

So it would be very difficult, in my view, to build up a gas column in that well that came back to BTUs and composition analyses identical, for all practical purposes, to what they'd been when the wells were first completed in the late 1970s, if you had a crossflow where it was the coal trying to flow into the Pictured Cliffs and trying to flow into the wellbore.

So I think it's -- Just from a common-sense standpoint, it seems to make a lot of sense that these wells cannot be crossflowing and cannot be connected to the coal in those wellbores when we get that kind of gas composition after they're shut in and stabilized for a number of months.

The next conclusion you draw, if you accept that premise, is that therefore the pressures that we're seeing in the Pictured Cliffs must be bona fide Pictured Cliffs pressures. And once again, if they're in the 67 to 95 to whatever ranges we measured in April, they must have been a lot higher in 1995 before our several years of production.

The geology is also a big issue, and that's the question of, are we completed in the Pictured Cliffs formation?

There are two sets of perforations in the Pictured Cliffs in five of our six wells. The Chaco 2-R does not have what we term the upper Pictured Cliffs sand. The rest of them are completed and perforated in both sands, and they were originally done so and termed "Pictured Cliffs sand" by Merrion and Bayless when they were completed in the late 1970s and early 1980s.

That sand was designated and described as Pictured Cliffs by each operator in this area on this map they completed in. And I've provided a list, which I think

is Exhibit N-61, of 34 wells where the operator perforated that sand and reported it as Pictured Cliffs production. So it's been accepted as Pictured Cliffs in the writeups for the New Mexico Geological Society guidebooks, the paper that Mr. Gallegos was referring to earlier on the NIPP, N-I-P-P, Pictured Cliff Pool.

You have in there a similar writeup for one of the guidebooks on the WAW PC discovery well, where Kurt Fagrelius with Dugan explains that he had misdrawn the top of the Pictured Cliffs in that particular writeup, but in fact that upper sand is Pictured Cliffs.

And in subsequent wells that have been completed out there where they perforated that zone, they called it Pictured Cliffs, as they did in this one when they reported it, and this well that had the error in the top of the drawing, they reported it all as Pictured Cliffs.

And then you have in the exhibits a letter from George Sharpe with Merrion, clarifying the intention and understanding of the parties at the time we purchased those wells, the fact that they were selling us Pictured Cliffs wells, and there was no intention to break up the ownership so that some of our perforations we would own and others we wouldn't.

Now, the appropriate determination of whether sand is Pictured Cliffs or Fruitland rests on whether it's

marine sand or a nonmarine, basically fluvial, sand. And this upper Pictured Cliffs sand is a marine sand. It has a surprisingly large areal extent for a thin sand. It maps out on the isopach map, which is a thickness map, to be from a few feet up to 12 or 13 feet thick, and it covers a strip, an area, that's a little bit curved, but it's anywhere from two to three miles wide and 16 miles long. Just an area. I've mapped it, and I have not mapped beyond that to determine how far it really goes.

So you picture a blanket of sand that's out there, that correlates extremely well, the correlations are very good and very clear and consistent from well to well to well, thickening consistently to the northeast from the edge of it on the southwest and, at most, not much thicker than this room, but covers a blanket of 48 square miles. It's very difficult to lay a sand down like that in anything but a marine environment, where it can be reworked and spread and laid down in a marine flat form in basically a quiet-water sort of an environment.

Now, the Pictured Cliffs sand coalesces into the main Pictured Cliffs so that it's basically undifferentiated from the rest of the Pictured Cliffs to the northeast, and we show a number of cross-sections where it coalesces into the rest of the sand, so that if you're looking at it on the outcrop you wouldn't see anything

except one big sand column. And then as you move southwest, there is a split in the sand where there are shales and some thin coals between that upper Pictured Cliffs sand and the rest of the thicker Pictured Cliffs column.

The correlations for those sands and coals are also very consistent, the coals perhaps less so in some cases than the shales. But they're thin blankets versus shales over a relatively large area again, and it looks like lagoonal deposits behind a barrier bar in quiet water. If you've been to the Texas Gulf Coast, that's the best example I could provide for it, where you have sands being laid down behind the barrier bars, Padre Island being the best example, and behind it there are clean sands being laid down in the lagoonal areas between that and the actual shoreline of the Gulf.

And that's the environment that I envision this sand having been laid down in. It's very difficult for me to conceive of any other environment in a fluvial setting, a nonmarine setting, that would lay down this sort of consistent sand or the little thin shales that are so consistent underneath it.

I don't think there's any question that there's coals in the Pictured Cliffs. Even on Mr. Ayers' cross-section, he shows some coals down in the Pictured Cliffs.

So the Pictured Cliffs can have coals, and that's also written up in the literature, and I've provided at least one example of that in the exhibits.

The sand was laid down seaward of a little flexure point. There's a kind of a hingeline there where from that point on to the northeast, the Basin starts to thicken a little bit, and the thickening is taken up with this sand, and the underlying lagoonal shales and some thin coals.

There is a coal that comes from the west that is several feet thick until it gets to that hingeline, and then it becomes very thin at that point. Sometimes it thickens again out farther to the east, but that hingeline that I've marked on my cross-sections on -- basically it's on most of the cross-sections H through L -- that coal at that point becomes very thin. It's -- You have to look at the resistivity log, basically, to find it as just a little spike. So it's probably in many cases less than a foot or so thick. I've colored it a little thicker on the cross-section, because otherwise there won't be room for any color.

But it's a very thin little coal. It's almost like when the hingeline occurred, that coal got washed away and reworked and laid down in the lagoons, because that's what waves were lapping up against as the ocean deepened a

STEVEN T. BRENNER, CCR
(505) 989-9317

little bit and the marine sediments transgressed back to the west a little bit.

And that's why I think it's primarily lagoonal sediments. There's no way to tell for sure, but logic and the consistency of correlations tell me that basically everything below the upper Pictured Cliffs sand was laid down in a lagoonal environment.

There is evidence presented on the other side that this sand is a crevasse-splay sand. Crevasse splay is deposited when a river carrying a lot of sediment breaks through its natural levee or over its banks and rushes out into the surrounding delta or floodplain deposits and lays down a blanket of sand. It would take one tremendous river to lay down a single blanket of sand that covers 48 square miles.

Alternatively, the theory would have to be that it was a series of splay sands that did this. But to have that, you've got to have a river someplace that has a channel that carries the sand. And a river carrying that volume of sand is going to make a delta. It doesn't flow into a barrier bar, lagoonal marine sediments and just start dropping splay sands, or crevasse-splay sands. It makes a delta like the Mississippi delta or the Rio Grande delta or the Colorado or the Brazos along the Gulf Coast and does not deposit crevasse-splays in what is a lagoonal

setting or an offshore setting.

And to have a crevasse-splay producing river, you should have the channel, and you should have some kind of downcutting. If you're going to get the kind of velocity that lays out a blanket sand over that area, there should be some downcutting, there should be some wearing of the underlying zones as it flushes out there and scours and moves at tremendous velocity to do that. There's no evidence of that. There's no evidence of any channels, downcutting channel plugs or erosion of the surfaces below our upper Pictured Cliffs sand. It's just very flat-lying, uniform, marine-looking deposits.

Now, that sand is also attacked as not conforming to the description of the Fruitland Coal Gas Pool under Order 8768. And the definition of that was that the Fruitland Coal Gas Pool was the equivalent stratigraphic point above 2880 feet, and the Amoco Schneider Gas Com B Number 1 well, which is in Section 28 of 32 North, 10 West, that's about 35 miles from this area that we're talking about. The point that was picked is the top of the Pictured Cliff formation, the top of the Pictured Cliff sand. There is no upper Pictured Cliff sand in that well.

The term "equivalent stratigraphic" or "stratigraphic equivalent" needs to be a definition that an operator can readily use in common practice. And if you

look at the definition of "stratum" or of a body of strata, it's rock which is defined as like kind of rock.

And for that reason, then, a marine sand cannot be stratigraphically equivalent to a nonmarine Fruitland sand. By definition, the Fruitland is a nonmarine formation, and the Pictured Cliffs is a marine formation. And then by definition, if we have upper Pictured Cliffs sand as a marine sand, it's a Pictured Cliffs sand, and it does not belong within the Fruitland Coal Gas Pool.

We also provided an exhibit toward the end of this monster that shows cross-section with the porosity and resistivity logs of a number of wells, in the -- what I would term the third bench of the Pictured Cliffs. In each case, there is indications of gas saturation in that third bench.

It was completed in two wells, one in the southwest corner of Section 12 up here, not too far from the 12-1 well, caddy corner from it, and in a well in the northwest corner of Section 35, northwest corner of the map. In Section 35 it's completed with the upper two zones, the upper Pictured Cliff sand and what I would term the main sand. But in Section 12, it was the only zone produced in that well when it was completed, and it IP'd for 640 MCF a day out of four feet of pay.

That is correlated through to show that it exists

as a -- what I term a third bench in a number of other wells, including our wells. It was rarely perforated. Those are the two examples I found. And in, I think, Jacobs' article, he mentioned that that zone tends to make a lot of water if you perforate it. Probably so. It's higher water saturation than the rest of the Pictured Cliffs.

But in each case you see a decreasing resistivity with an increasing porosity when you examine the logs, and that says there's gas in there. I don't think we need it to show that we had sufficient reserves to produce when we fractured these wells. But when you do fracture a well and it goes down like the examples we showed for the Dome Federal well up a township to the north, it's going to reach that third bench, and the third bench is going to then provide some additional gas reserves and is probably going to provide some additional water production.

So we have included a discussion in our testimony from some of the other witnesses as to what that third bench could mean in terms of total volume of gas available to us.

That's a summary.

MR. HALL: Madame Chairman, I have some additional direct examination questions. I'd be glad to do those now, or we could break for lunch, whatever you wish.

CHAIRMAN WROTENBERY: Why don't we -- How long do you think that will take?

MR. HALL: I hate to make those predictions.

CHAIRMAN WROTENBERY: Yeah, I know.

MR. HALL: I'm guessing 20, 25 minutes.

CHAIRMAN WROTENBERY: Okay.

(Off the record)

CHAIRMAN WROTENBERY: We'll probably go ahead, then, and hear that testimony before we break.

Let me ask you quickly, though, let's make sure we've dealt with the exhibits that went along with the prefiled testimony. And I want to make sure we're all working from the same material here.

There were 68 exhibits, or exhibits numbered 1 through 68 that were submitted with Mr. Nicol's --

MR. HALL: Yes.

CHAIRMAN WROTENBERY: -- prefiled testimony when it first came in.

And then since then, there was a supplement to Exhibit Number N-16 --

MR. HALL: Correct.

CHAIRMAN WROTENBERY: -- that was submitted.

And then I think just yesterday we got a replacement for Exhibit Number N-8.

MR. HALL: N-8 is correct.

CHAIRMAN WROTENBERY: So I believe those are the exhibits, then, that we're working with right now.

MR. HALL: Yes, so that makes a total of 69 exhibits for Mr. Nicol's testimony.

CHAIRMAN WROTENBERY: Okay, a total of 69. Where does -- Where did the other one --

MR. HALL: Yes, well, there's -- The first one is N-1, and it's followed by N-1-i --

CHAIRMAN WROTENBERY: Ah, yes.

MR. HALL: That brings us up to 69 exhibits.

CHAIRMAN WROTENBERY: Okay.

MR. GALLEGOS: Well, then, and there's various sub-exhibits of some of them, so that's not the actual count. I mean like 7 has an A, B, C, D, E and --

MR. HALL: That's correct.

CHAIRMAN WROTENBERY: That's right, okay.

MR. HALL: We do have --

MR. GALLEGOS: We've objected to and moved to strike that 1-i for rather obvious reasons, but I don't think we have an objection to the rest of them.

CHAIRMAN WROTENBERY: Okay. Mr. Hall, I don't -- I started to call you Mr. Scott.

MR. HALL: That's all right, I'm going to call him Mr. Gene.

CHAIRMAN WROTENBERY: Do you have a response on

the Motion to Strike the Exhibits?

MR. HALL: To tell you the truth --

CHAIRMAN WROTENBERY: Do you want to --

MR. HALL: -- I got it late in the day and didn't get to look at it very much. My understanding of the complaint was, it contained what was purported to be hearsay testimony from Mr. Bruce Williams. Mr. Williams was an engineer for Whiting, testified at the Division hearing last summer, and also attended some meetings before the District Office in Aztec, and at those meetings he had made some statements to the effect that Whiting could show now interference from production by the Pictured Cliffs wells.

That statement was reiterated in the form of affidavits from some of the witnesses who were there. I believe Mr. Nicol testified to it. At the hearing we asked Mr. Williams himself about it.

I don't think it's hearsay because it's an admission against interest, and it comes in under one of the hearsay exceptions for that reason.

Otherwise, it's my understanding that no other substantive objection to the chronology outlined -- that chronology is derived from pleadings, briefs, testimony in this case, and I didn't understand their objection was to that recountal of the history.

MR. GALLEGOS: Well, it is.

MR. CONDON: It is.

MR. GALLEGOS: It's an overall objection, and it was clear from what we filed. This is an inaccurate, argumentative, I suspect product of Counsel that attempts to give some kind of a statement of the case. It's inappropriate as part of an expert testimony in the first place. It really doesn't have anything to do with the expert testimony, data, interpretation of Mr. Nicol.

It should be stricken. And if, you know, Counsel wants to make argument -- and there's a proper place to do that; we've had opening statement, we'll have closing statement.

But we have an overall objection to it. It was just mentioned, among other things, the inaccuracies and the hearsay, that those are additional grounds.

MR. CONDON: Madame Chair, there are other examples, really beginning on page 4 of the chronology, where the chronology purports to describe what various members of the District staff in Aztec sought to do with various meetings, what the parties discussed at various of the preliminary meetings where attempts were being made to resolve the controversy, and then, of course, the statement that Pendragon continues to attempt to assert to Mr. Williams who has twice under oath denied that assertion,

once at the District Court hearing and once at the Division hearing.

So it's just another attempt to try to get this in front of somebody. And, you know, the document itself is hearsay. It's not a document that purports to be kept in the regular course of business by anybody. Rule 1006 allows for summaries, but this is more than a summary, particularly when it starts to say, Here's what happened and here's what the various parties discussed and here's they said. That can all be addressed through the examination of the witnesses themselves who are purported to have said various things.

MR. HALL: Well, let's bear in mind that the chronology -- the bulk of it is contained within the filed testimony, and in addition it's derived, as I said, from previous filings in this case. For example, it states when the Division held the hearing on the original pool rules case in 1988. I don't think that sort of thing is even at issue in this case. It's not hearsay.

What I would suggest we do, if it will satisfy Counsel, is that the Commission can disregard those portions of the chronology which purport to be statements of non-present witnesses, and otherwise I think the Commission is fully entitled to give the exhibit the weight it deems appropriate. It's helpful to the Commission.

It's simply a history, nothing more.

MR. GALLEGOS: Well, even that limitation, Madame Chairman, it's inaccurate. I mean, we could go through here, but this prolongs this. It's just to point out some of the dates and things and so forth that are just not accurate. It just -- It does not belong in this expert compilation.

MR. HALL: Bear in mind, we --

CHAIRMAN WROTENBERY: I think we're ready to rule on this one. It is a long-complicated document with a number of different types of information included.

We will grant the Motion to Strike this particular exhibit from the record. At the same time, I would say that if Mr. Nicol would like to testify in the upcoming portion of his testimony about some of the history that he can recount from his recollection and you wanted to address it that way, that's --

MR. HALL: Certainly.

CHAIRMAN WROTENBERY: -- that's something you could do to cover some of the things, maybe, that aren't already included elsewhere in the prefiled testimony.

MR. HALL: Let me also suggest we can handle it this way: I would make an offer of proof of Exhibit N-1-i and would also ask the Commission take administrative notice of the factual dated chronological materials in

here. That would be my request to the Commission.

MR. CONDON: If we could respond to that, this isn't --

MR. GALLEGOS: Well, I think the Chair has ruled, I think the Chair has --

MR. HALL: I understand. I'm entitled to make an offer of proof --

CHAIRMAN WROTENBERY: Yes.

MR. HALL: -- make the request that you take notice of factual materials.

MR. CONDON: Do we need to prepare an order for you on granting the Motion to Strike, or is the record sufficient?

CHAIRMAN WROTENBERY: Lyn, do you think the record is sufficient on that particular point?

MS. HEBERT: (Nods)

CHAIRMAN WROTENBERY: Okay, I think it's -- we're set right now.

MR. HALL: All right, thank you.

CHAIRMAN WROTENBERY: Granted the Motion.

At this point do I understand that you have offered the remaining --

MR. HALL: So moved.

CHAIRMAN WROTENBERY: -- exhibits for the record?

MR. HALL: I would move the admission of Exhibits

N-1 through N-68, subject to the ruling of the Chair.

CHAIRMAN WROTENBERY: Yes, and I understand that --

MR. GALLEGOS: Well, it's kind of an unusual situation. All this has presented, and presumably the Commission has already looked at these, so what's the use of objecting now, because in effect it's already before the fact finders, I mean all the exhibits are, so we don't object.

I mean, I think everything that's been submitted is already before the Commissioners.

CHAIRMAN WROTENBERY: Okay, we will then admit Exhibits N-1 through N-68 into the record, and that does not, of course, include the chronology that was subject to the Motion to Strike. That includes the record to the prefiled testimony.

Mr. Scott [*sic*], would you like to go ahead with the other questions?

MR. GALLEGOS: Mr. Hall.

CHAIRMAN WROTENBERY: I mean Mr. Hall. I'm sorry. Mr. Hall.

MR. GALLEGOS: Before Mr. Hall starts --

CHAIRMAN WROTENBERY: I apologize.

MR. GALLEGOS: -- may I just make an observation? Instead of objections, I want to make an observation so

lest we forget as this matter goes on, Mr. Nicol's ten-minute summary was 55 minutes, and so we're going to expect similar courtesy, if needed, with our witnesses --

CHAIRMAN WROTENBERY: If needed. I was, before we --

MR. GALLEGOS: Fifty-five minutes of uninterrupted, no questions, testimony.

CHAIRMAN WROTENBERY: I understand that, and I did accommodate Mr. Nicol to some extent because of the length of his prefiled testimony, but I was going to ask before we got into any of the other witnesses that we try to stick a little closer to the ten-minute guideline for the remaining witnesses.

COMMISSIONER LEE: Yours was one hour and five minutes.

(Laughter)

CHAIRMAN WROTENBERY: The opening statement, you mean?

COMMISSIONER LEE: Yeah.

(Laughter)

MR. GALLEGOS: It was about twice as long as it should have been.

CHAIRMAN WROTENBERY: Okay.

MR. HALL: Took the words right out of my mouth.

CHAIRMAN WROTENBERY: Okay. Mr. Hall, I'm sorry,

calling you Mr. Scott. Mr. Hall.

MR. HALL: Well, let me ask you, is it Madame Chairman or Madame Chairperson?

CHAIRMAN WROTENBERY: Whatever.

MR. HALL: Good, I never know.

DIRECT EXAMINATION

BY MR. HALL:

Q. Mr. Nicol, in your testimony filing you stated that in your opinion the stimulation treatments on the Chaco wells did not cause communication with the Fruitland Coal; is that correct?

A. Yes, it is.

Q. Do you believe the two formations are in communication?

A. Yes, they are.

Q. What did you state you determined caused the communication?

A. Some of the fracture treatments done in the Whiting Fruitland Coal wells communicated with the Pictured Cliffs.

Q. Would you care to elaborate? Are you identifying the location of that communication?

A. The 6-2 well is communicated, the 12-1 well is, in my opinion, communicated, and probably the 7-1 well. I don't believe the 1-1 is communicated nor the 1-2 is

communicated.

Q. Mr. Nicol, do you believe that the Whiting consultant, Mr. Robinson, is correct when he states that hydraulic fracturing of the Whiting Fruitland Coal wells has created a fracture that extended down into the Pictured Cliffs?

A. Yes, I believe that's correct.

Q. Now, did Pendragon have the right to fracture-stimulate its wells?

A. Certainly.

Q. And in your view, were the stimulation treatments necessary in order to cover additional Pictured Cliffs reserves?

A. Yes, they were.

Q. Were those stimulation treatments done in a reasonable and prudent manner?

A. Yes.

Q. And did the stimulation treatments remain contained within the Pictured Cliffs formation?

A. Yes.

Q. And the Pictured Cliffs formation includes that interval you have identified as the upper PC, where the upper sets of perforations in each of the wells are located?

A. Yes, it does.

Q. Are these wells, the Chaco wells, completed in and producing from the appropriate common source of supply?

A. Yes.

Q. And what is that source of supply, for the record?

A. That's the Pictured Cliffs formation.

Q. Mr. Nicol, has the operator of the Gallegos Federal wells failed to maintain segregation of the separate sources of supply involved in this case?

A. Yes, it has.

Q. And are Pendragon's Chaco-Pictured Cliffs wells experiencing interference from the Gallegos Federal Coal Gas wells?

A. Yes.

Q. In your view, are the Gallegos Federal wells producing Pictured Cliffs gas reserves?

A. Yes, they are. We're losing pressure, and they're producing Pictured Cliffs gas.

Q. Has the failure of the operator of the Gallegos Federal Coal wells to maintain segregation resulted in waste?

A. Yes. We've lost reserves, and we've lost reservoir energy.

Q. What specifically has been the effect on your Chaco PC wells, and on your Pictured Cliffs rights with --

from the communication caused by the Maralex frac jobs?

A. Well, our leases under the Chaco 1, Chaco 4 and Chaco 5 wells, as I said, are being drained, and the pressure is being drawn down. So the production from the coal wells nearby is depleting those leases and that formation under our leases.

Q. Now, are you able to quantify the loss of reserves?

A. That's very difficult right now. One method would be to say we can take the pressure drop that we've seen for the last year and equate that to the volume of gas that's been lost in those wells. But as I pointed out, that's a pressure drop in wells that are constantly seeing a drawn-down pressure from somewhere in that cone of influence from the other wells. It's not a valid average pressure in the reservoir. It's not as if we could say, well, the Pictured Cliffs had X p.s.i. average pressure in 1998 and Y in 1999. We're seeing a change.

But if we had to quantify it, that would be the only data we could really work with at this point, and that would be just for that year. It doesn't count the gas that's been produced since those wells were completed in 1993, and it doesn't determine when their radius of drainage crossed onto our lease line.

Q. Anything further you wish to add with respect to

quantifying the lost reserves?

A. No, not there.

Q. Mr. Nicol, what relief is Pendragon seeking from the Commission in this case?

A. We would like to have the Whiting wells brought into compliance with the Division's regulations. And to do that, the first step would be to shut them in for a while. Second step would be to allow us to restore the Chaco wells to full production and see what's happened to them. We are very concerned that we've lost the Number 4 well, very probably the Number 1 well, and we don't know how long it's going to be before the water they've injected into the Pictured Cliffs hits the Number 5 well. Right now we don't see water in that well.

But we need to re-establish a steady state of decline for our wells and determine how that has changed from what we were seeing before, a time when there would have been the interference from their wells. And then we could perhaps establish or determine a rate of curtailed production for those coal wells so that they might be restored to production in such a way that we would no longer be being drained by their production, we could compete with it fairly on our leases with our wells.

Alternatively would be to do -- or to provide for a way for Whiting to demonstrate how they're going to

produce their wells without producing Pictured Cliffs reserves from those wellbores, and bring that determination or method back to the Commission, and if they couldn't provide some method of producing their wells without producing Pictured Cliff reserves, then to have those wells permanently shut in.

Q. Now, will restoration of the Chaco wells to production -- is that necessary to enable Pendragon to determine the reserves that have been permanently lost?

A. Yes.

Q. Mr. Nicol, why isn't commingling relief appropriate in this particular circumstance, or is it, in your view?

A. No, it's not a commingling problem. First of all, as I understand the commingling rules, you have to meet some requirements of Rule 303, and some of these requirements couldn't be satisfied under these circumstances. First of all, it's not necessary to recover reserves from an otherwise marginal zone. That's not the question here.

The bottomhole pressure of the highest-pressured zone doesn't exceed the original pressure of the other zone, so that's not a question.

There could be crossflow of water into the PC from the coal still, and reserves would be lost under a

commingling scenario.

But we're also talking about different levels of ownership. We're talking about different ownership on our leases versus their leases. It's not like we have two zones producing on the same lease.

And it's further complicated by the fact that underneath the Whiting leases there's a third owner involved in the ownership of the Pictured Cliffs. So we're talking about gas crossing lease lines, not gas just producing in a wellbore.

So in effect, we have vertical and horizontal leases out there.

Q. Is there any practicable way that you could formulize an allocation under a commingling scenario?

A. Well, there again you'd be looking at some sort of allocation involving coal production and two different owners in the Pictured Cliffs productions, the owner underneath the well, directly under that lease, and the offsetting owner, and I am hard pressed to come up with some sort of allocation formula that could be suggested for a scenario like that.

Q. Well, would an allocation require you to take into consideration past production and past volumes lost, and how would you do that?

A. I don't know how you'd do that.

Q. Mr. Nicol, is Pendragon asking the Commission or the Division to consolidate the two pools here?

A. No, we're not asking for anything like that.

Q. Anything further you wish to address?

A. Nothing further.

MR. HALL: Madame Chairman, if I might approach, Mr. Nicol has addressed the relief-requested issue, and what I might like to do is provide each of the Commissioners with copies of the applicable rules and statutes. I don't seek to have these introduced as an exhibit, but simply for purposes of reference for each of you, if I might.

As I said, I won't introduce this as an exhibit. But let me identify the rules for the record, if I might, briefly.

The rules that we think are applicable in this circumstance are Division Rule 106 which requires the sealing off of strata, Rule 113 having to do with the containment of fractures, Rule 303.A which is the strict prohibition against losing segregation between common sources of supply. We have included the downhole commingling rule as it's referenced in the special pool rules for the Fruitland Coal Pool.

Under the Oil Gas Act, we also think the applicable statutes are Section 70-2-2, addressing waste.

Waste is defined at the next section, Section 70-2-3.

Section 70-2-11 further addresses the power of the Commission and the Division to act to prevent waste.

Then again at Section 70-2-12, sub parts B.(2), B.(4) and B.(7) are applicable here.

Now, that concludes my direct of Mr. Nicol. I had understood that I would be given an opportunity to elicit some of the materials in the chronology through direct examination. I'll be glad to do that.

Was that your ruling, first of all?

CHAIRMAN WROTENBERY: Yes, if there's something that you would like to elicit --

MR. HALL: I'm searching for a way to do that efficiently, without utilizing so much of the Commission's time.

I wonder if I could get together with counsel and we could talk about what should and should not be contained in the chronology, and maybe we can give you a filing that way, if that is preferable. I hate to have to spend the time asking him what's on here. Does that sound like an efficient way to proceed?

CHAIRMAN WROTENBERY: You're certainly welcome to work on that --

MR. HALL: We will try --

CHAIRMAN WROTENBERY: -- while we're on break for lunch.

MR. HALL: All right. That concludes my direct of Mr. Nicol.

CHAIRMAN WROTENBERY: Okay. Then I think this will be a good time to break for the lunch hour. It's 12:20. We'll start back up at 1:30. Thank you.

(Thereupon, a recess was taken at 12:20 p.m.)

(The following proceedings had at 1:32 p.m.)

CHAIRMAN WROTENBERY: Looks like we're all here and ready to go again, so Mr. Scott, did you have anything else -- "Mr. Scott." I did it again.

(Laughter)

CHAIRMAN WROTENBERY: I'm sorry. Ever since Lyn told me that story about the San Juan, we've been calling you Mr. Scott, and now it's stuck, so --

MR. HALL: She said that in court the other day.

MS. HEBERT: I apologize.

(Laughter)

CHAIRMAN WROTENBERY: Mr. Hall, anything else?

MR. HALL: That concludes my direct of Mr. Nicol.

CHAIRMAN WROTENBERY: Okay, Mr. Gallegos?

MR. GALLEGOS: We could hang a little nameplate around his neck.

CHAIRMAN WROTENBERY: We may need to do that.

CROSS-EXAMINATION

BY MR. GALLEGOS:

Q. Mr. Nicol, let me pick up with a few questions sort of where you left off, talking about what you would like the order of the Commission to be. If I understand it, what you're saying is, Pendragon would like to be permitted to produce its wells from -- solely from the Pictured Cliff formation?

A. Yes.

Q. Okay. Now, does that include the Pictured Cliff formation as it's limited to where it exists below the lowest coal in the Fruitland formation?

A. I don't quite know how to answer your question because, you know, I know where you're going with that. But what I want to be able to do is produce the wells in the perforations they're now completed in, which is the Pictured Cliffs sand.

Q. Well, just so it's clear for the Commission, this is a general version of Mr. Ayers' Exhibit 3, and I'll point out what I'm referring to as the lowest coal, the coal seam that varies from, say, two to four feet thick. It's shown just above the brown in this exhibit. I'm referring to that as the lowest coal.

Am I in your --

MR. HALL: Excuse me, I just wanted to clarify

one thing with respect to the exhibit. Is this one of the -- It's marked Exhibit 8, but you called it Ayers Exhibit 3?

MR. GALLEGOS: Well, it's been around. It's W- -- It's Walt Ayers Numbers 3 now.

MR. HALL: Okay.

MR. GALLEGOS: In court it was one thing and at the Examiner hearing it was something else so --

MR. HALL: This is not one of the new exhibits we discussed --

MR. GALLEGOS: This is Walt Ayers 3, the exhibit that's up on the board. So you have a photocopy, right?

Q. (By Mr. Gallegos) We'll go back, Mr. Nicol. I just want to be clear so the Commission is clear what we're talking about. I'm referring to this coal seam in olive color that is above the solid brown as the lowermost coal. And what you're saying is, you do not want to confine the production from your Chaco wells to the Pictured Cliff formation below that coal seam; is that correct?

A. That's correct.

Q. Okay. You want to include production from sandstones that are above the lowest coal seam?

A. I want to include production from that sand right here that we term the upper Pictured Cliffs sand.

Q. Okay, it's in yellow on this exhibit?

A. Yes.

Q. And on a pool-description basis, that would be inclusive, then, of the WAW-Fruitland Sand-Pictured Cliff formation as defined by Order R-8769; is that correct?

A. Yes, as I understand it, the sands in the Fruitland formation and the sands in the Pictured Cliffs are now the same pool.

Q. Are not the same pool?

A. Are now the same pool.

Q. Are now, okay.

Now, in this case, in Order Number R-11,133, issued in February of this year, the Division provided, and I will read to you the following finding. It's at page 27:

> Pendragon should be given the opportunity to propose a method by which its Chaco wells may be produced exclusively from the WAW-Fruitland Sand-Pictured Cliffs Gas Pool, or a method for producing its Chaco wells in their current state, which is acceptable to the Division and to Whiting. These proposals should be evaluated in a forum which allows discussion and/or input from Whiting.

It goes on in the next paragraph:

Pending Division approval of the method by which Pendragon's Chaco wells may be produced exclusively from the WAW-Fruitland Sand-Pictured Cliffs Gas Pool, or a method by which the wells may be produced in their current state, which is acceptable to the Division and to Whiting, Pendragon should shut in its Chaco Wells Number 1, 2-R, 4 and 5 and Chaco Limited Wells Number 1-J and 2-J.

That order goes on in the ordering paragraph to say, page 29:

Pendragon is hereby ordered to shut in its Chaco Wells Number 1, 2-R, 4 and 5, and its Chaco Limited Wells Number 1-J and 2-J, until such time as the Division approves a method by which its Chaco wells may be produced exclusively from the WAW-Fruitland Sand-Pictured Cliffs Gas Pool or a method for producing its Chaco wells in their current state that is acceptable to Whiting.

End quote.

This Division order was provided to you by Counsel promptly after it was issued, wasn't it, Mr. Nicol?

A. Yes.

Q. Okay. And from that date in February of 1999 to this time, Pendragon has not attempted to come forward with any method, has it, to provide for production of its Chaco wells exclusively from the WAW-Fruitland Sand-Pictured Cliff Gas Pool?

MR. HALL: At this point, Madame Chairman, I will object. Questions with respect to the previous order don't seem pertinent in a *de novo* setting. Also, it's far beyond the scope of direct.

MR. GALLEGOS: Madame Chairman, this is an order that's in effect at this time and has been in effect.

CHAIRMAN WROTENBERY: I think we'll allow the question because Mr. Nicol has already testified as to the remedy that they would like to see involved in this case.

Q. (By Mr. Gallegos) Your answer, Mr. Nicol, is, No, Pendragon has not come forward to propose or attempt to propose any method for production of its wells exclusively from that formation, has it?

MR. HALL: You know, let me object to that. It's a mischaracterization of the answer. First, he did not answer your question. You're putting words in his mouth. Feel free to have him answer the question asked, but don't put words in his mouth.

MR. GALLEGOS: I was just asking the question.

THE WITNESS: That order -- First of all, that

order confirmed that this sand is a Pictured Cliffs sand. There was no indication in that order or the Examiner's findings that we were perforated in the wrong zones. The finding was that we might have fractured up into the coal, and we were to find a method of convincing the Commission that we could produce our Pictured Cliff production, both zones, without producing the coal gas.

We had no way to come back and convince the Commission at that point that we could do that. First of all, we were convinced that we weren't in the coal. We had no viable method that we could come up with to think of a way to convince the Commission that we weren't in the coal, because there was no good way to determine where the gas was coming from, that was coming through these perfs.

Since then, we've got all the shut-in data that pretty well shows, when you dig through it, what is and isn't happening. But then we haven't had anything.

Q. (By Mr. Gallegos) But what you're saying is, you had no way of showing the Commission that you could produce from your perforations without producing coal gas?

MR. HALL: I'm going to object. That mischaracterizes his prior testimony.

Q. (By Mr. Gallegos) That's the long and the short of it, Mr. --

A. Under the Commission's assumption that we had

been producing coal gas, that's correct, we could -- we had no way to change that misconception.

Q. But you were provided the opportunity to come forward with a method to show that you would produce exclusively from the WAW-Fruitland Sand, and as you say, the Order gave you that. It recognized or found that that would be inclusive of the yellow sand above the coal.

A. Uh-huh.

Q. Correct?

A. Correct.

Q. And you made no attempt to come forward to the Commission -- The shut-in pressures you've had available have been seen since July of 1998, isn't that true?

A. Yes, sir.

Q. You were seeing shut-in pressures for six months, seven months, before this Order was ever issued? Isn't that right?

A. Yes, sir.

Q. And you're trying to tell the Commission now, the whole reason for your change from the position that said there's no communication to a position that says there is communication is because of what has been observed as far as shut-in pressures since your wells have been shut in, correct?

A. Yes.

MR. HALL: I'm going to object. Again, that mischaracterizes prior testimony. We briefed this issue to the Commission about who's changed whose position in this. I don't know why we're wasting time on that particular issue. That's my objection.

MR. GALLEGOS: Well, I think Mr. Nicol answered the question. He said yes.

Q. (By Mr. Gallegos) That was your answer, wasn't it?

A. Yes, sir.

Q. Now, let me get just a little background information before we go into some of your work here, Mr. Nicol.

Pendragon Energy Partners is comprised of who? Who are the partners?

A. Pendragon Energy Partners, Inc., is a corporation. There are two of us that own it. My partner in the corporation, 50-percent owner, is a fellow by the name of James Rooney.

Q. I'm sorry, I didn't catch it.

A. James Rooney.

Q. All right. J.K. Edwards, or J.K. Edwards and Associates, a corporation, neither of those are interest owners in Pendragon Energy Partners?

A. That's correct, there's no common ownership.

Q. All right. Is there an interest in these wells held by J.K. Edwards individually, Keith Edwards, J.K. Edwards and Associates, Incorporated, or any of those?

A. Any of those speak for 25-percent working interest in the wells in question here, yes.

Q. All right.

A. We own 75 percent, Pendragon owns 75 percent.

Q. And then are there other owners, working interest owners? I'm not talking about the royalty.

A. Well, when I say Pendragon owns, Pendragon is the operator and the properties are actually owned by Pendragon Resources, L.P., which is a limited partnership.

Q. I see.

A. So Pendragon Energy Partners, Inc., has an interest in the partnership and is the operator. It's actually the partnership that's the owner of record.

Q. And are there partners or interest owners that are inclusive of others, then, that you've identified? Is Mr. Blauer an interest owner or a partner?

A. Mr. Blauer was an interest owner in Pendragon Energy Partners, Inc., originally when we entered into these agreements and purchased these wells. He no longer is.

Q. Is Mr. Thompson an interest owner in any respect?

A. In no way.

Q. And he has not been?
A. Has not been.
Q. How many wells does Pendragon Energy Partners operate in New Mexico?
A. Active wells, roughly 45.
Q. All in the San Juan Basin?
A. No, there's some in the Permian Basin down near Artesia.
Q. How long has it been operating any wells in the San Juan Basin?
A. Since early in 1995.
Q. Basically starting with the Chaco wells, then? Is that --
A. No, actually starting with seven wells we purchased before we got into this deal. It was -- We purchased major interest in seven wells from Edwards late in 1994 and became operator in early 1995.
Q. That would include, for example, the Chaco Plant Number 5 that you talked about?
A. That's correct. That was one of them.
Q. All right. Now, Mr. Nicol, what I'd like to do, because 163 pages of testimony and 70-some exhibits is pretty unwieldy, so what I'm going to do, if we can do it this way, I'm going to try and tell you what subject matter I'd like to talk about and sort of give us a chance to

gather up a few exhibits that relate to it, and I think that will be a little more orderly way of proceeding. Because otherwise it just -- you know, subject is addressed here and there and other places.

So what I want to talk to you about first is the Chaco Plant Number 5 well.

A. Okay.

Q. All right? And you have, I think, an exhibit N-2. Is that the exhibit that's up on the --

A. Yes.

MR. GALLEGOS: Okay. And then if you would get out your Exhibit series 7, there's a 7-C that has some various reports on that well. 7-A also, I think, relates to that well.

And if I might suggest something to the Commission, we have an exhibit that's in Mr. Brown's folder. It's Exhibit Number 1. I'd suggest that you just tear that out and put it before you, because it's really helpful. It's the exhibit that shows the five sections, six sections, where these 11 wells are located. It's helpful. It's JTB Number 1.

Q. (By Mr. Gallegos) All right, now on Exhibit 2, which is on the wall and is also in your exhibit folder, you show -- let's see. Well, I haven't counted them. Roughly about 12 sections here that are inclusive of what's

shown on Exhibit JTB-1.

A. The -- about --

Q. Six Chaco wells and five Gallegos Federal wells?

A. Yes.

Q. Okay. Now, if we were to look at the Chaco Plant Number 5, would it be correct that that would be in Section 21, so had you just gone one section farther to the east there, you would have that included?

A. Yes.

Q. I say it's down in the right-hand bottom there --

A. It's right here.

Q. Okay. Now, to get things oriented, your ownership, if you were showing your ownership in Section 21, if we can just sort of imagine that it's up there, the next one to the east, your ownership, Pendragon's ownership, would be from the surface to the base of the Pictured Cliffs, correct?

A. I believe that's correct.

Q. There's not split ownership there between the Fruitland Coal and the Pictured Cliffs?

A. No, there's not.

Q. Okay. And that particular section contains, beside the Chaco Plant Number 5, two wells that are listed in the documents filed with the OCD as Fruitland Coal wells, correct?

A. Yes, sir.

Q. And would you tell the Commission where those wells are, the names of them and who operates them?

A. We operate the Cowsaround 21-1, which is located in the northeast corner. There is another coal well in the southwest quarter. I don't recall right offhand which company operates that or owns it. I think it's included in my testimony. I may be able to find that in a moment.

Q. I think it's the -- Is it the North Bisti Coal?

A. That sounds correct.

Q. Okay. And that was a Giant well, wasn't it, originally? And I think now Central Resources operates that?

A. I can't speak to that.

Q. Okay. But there's two coal wells, and those two coal wells have been completed and producing since 1991. You're aware of that, are you not?

A. Yes.

Q. Okay. And of course as coal wells go, if you know, those wells have been -- or started out producing water and have been dewatering that area since roughly 1991?

A. Let me check your numbers on that.

Q. Okay, please do. I think the Cowsaround went on production in April of 1991 and the North Bisti in November

of 1991.

A. Okay, I don't have that right in front of me, so let's accept that for the moment.

Q. All right, subject to your checking that. All right.

Now, those wells are on a standard proration unit and at an orthodox location, correct?

A. Correct.

Q. So the Cowsaround, which you operate, is dedicated to the east half, and it's in the northeast quarter?

A. I think maybe these are north-south units, 320s.

Q. Pardon me?

A. I said I believe these are north-south 320s.

Q. Oh, all right.

A. So it's 320 for the north --

Q. Laydown --

A. Yeah, laydown 320s.

Q. All right. The North Bisti coal has reported -- are you aware that its operator has reported significant water production from that well since it's gone on production?

A. I don't recall early reports of water in that well.

Q. Have you looked into that?

A. I have pulled it up on *Dwight's*, and I don't think I found in the *Dwight's* reports that there was water, picked up on *Dwight's*, at least.

Q. On the North Bisti coal?

A. Yeah.

Q. You don't --

A. You may be correct, but I don't recall seeing any water production on these wells.

Q. Now, on the Cowsaround 21 Number 1 that Pendragon operates, no water was reported being produced from that well until February, 1998, when the OCD made a field inspection of that and other wells operated by you; isn't that true?

A. Yes.

Q. Your testimony is to the effect that the Chaco Plant Number 5 drilled in that section, completed in that section, is for the prototype or example well for what you did in the area that we're focusing on; is that your testimony?

A. Yes.

Q. Okay. It was such a success that you decided you could replicate that success with what we're calling the Chaco wells; is that the substance of what you have to say?

A. Yes.

Q. Now, that well is classified as a -- as what?

How is it classified? How --

A. Pictured Cliffs well.

Q. Okay, WAW-Fruitland Sand-Pictured Cliff well?

A. If it's in that broader definition now, yes. I don't recall exactly. It was completed in the Pictured Cliffs only.

Q. Okay. It's on 160-acre spacing, correct?

A. Yes, sir.

Q. And the well was originally a well drilled by Jerome McHugh in 1975 under the direction of Tom Dugan?

A. I believe so.

Q. Does that sound right?

A. It sounds right.

Q. Okay. If you'd look at --

A. Yeah, the log heading is Jerome McHugh, and it's 1975, November.

Q. Yeah, there's a -- The very last pages of your Exhibit 7-C gives us that information?

A. Yes.

Q. Okay. It was originally drilled, the daily reports indicate, 4-3/4-inch borehole, no blowout preventer on the well while drilling?

A. If I can take a minute to find that, or to answer it, I guess.

Q. All right, take a minute. That would indicate --

It says on the data no blowout preventer on the well while drilling, indicate that the operator didn't expect significant pressure. Would you agree?

A. Yeah, that would be the indication.

Q. All right. This is what you call a slimhole completion, right? It ended up with a 2 7/8 casing?

A. Right.

Q. And a 1-1/4-inch tubing?

A. Yes.

Q. And it was perforated where? At what depths?

A. Two shots per foot at 1141 to 1144.

Q. And at 1145 through 1149, wasn't it? Seven feet of pay?

A. I'm looking for the second set of perfs. There are two sets of perfs, but I haven't found it on this report.

Q. Let me see if I can help you.

A. Oh, there it is, I see it. 1145 to 1149, you're correct.

Q. Okay, seven feet of pay?

A. Yes.

Q. You don't happen to have the log on that well, do you?

A. Yes, it's in your exhibit --

Q. I thought so.

A. -- somewhere.

MR. HALL: Under Tab E.

THE WITNESS: Yeah, E.

MR. GALLEGOS: Okay. May I approach the witness?

CHAIRMAN WROTENBERY: Yes.

Q. (By Mr. Gallegos) I made a copy of that log that's a little easier to read than under your E. Would you agree that the perforations are correctly placed on that copy?

A. Yes, sir.

Q. And would you agree that the -- what I've colored in yellow by the perforations would be the Pictured Cliffs --

A. Yes.

Q. -- log?

Would you agree that what I've colored in green would be the Fruitland Coal?

A. Generally. I would say probably the thin coal at the bottom there is actually a little thinner in reality, but it is coal.

Q. So it looks like maybe between the perforations in the Pictured Cliff and the lower coal, there's probably about -- what, maybe six -- four to six feet separation?

A. Four to six -- Yes.

MR. GALLEGOS: Okay. Do we have some extra

copies of that? I think we do. I'll furnish those so everybody has a copy. I know we've got some more, I just -- Oh, the reason we can't find them is because I had -- I had it out so it would be handy.

Q. (By Mr. Gallegos) Mr. Nicol, with seven feet of pay, and what you see on the log will probably give you some idea of the porosity, did you calculate the gas in place in the Pictured Cliffs formation, you know, based on what you would see there when this well was completed in 1975?

A. I don't think I ever made a calculation of that.

Q. That well produced about -- what? 62,000, 63,000 MCF over a 10-year, 12-year period?

A. Yes.

Q. And then it just completely went off. It was shut in for five or six years, wasn't it?

A. Basically, yeah. There was a little bit more production over that next period, another three million or something.

Q. Okay. And how did you acquire it? Or how did -- I guess it's Edwards that acquired it originally. How did -- What were the circumstances of Edwards acquiring the Chaco Plant Number 5?

A. If I recall, he bought it from McHugh.

Q. At an auction?

A. I don't think so, but I really don't know. I don't recall. That was before we got involved in it, and I don't recall the trail.

Q. When did Pendragon obtain an interest?

A. I think we actually purchased our interest in November of 1994.

Q. All right. Already, it had been reworked by Edwards at that time?

A. Yes, and back on production for roughly a year and a half.

Q. And did Paul Thompson supervise the rework?

A. Yes.

Q. Okay. Let me see if we can find on Exhibit 7-C the shut-in casing pressure on that well before it was restimulated. I think that's here someplace.

Okay, yeah, I find it here on -- Toward the back there's a sheet that says Walsh Engineering and Production Workover and Completion Report, Chaco Plant Number 5. It starts with a date of June 23rd, 1993.

A. I'm with you.

Q. All right. Shut-in casing pressure 109, shut-in tubing pressure, 108. Okay?

A. Yes, sir.

Q. So that would be the pressure, certainly stabilized pressure. That well had been shut in for five

or six years, correct?

A. Yeah, and I'd have to look to see for sure if it was shut in all that time or produced some of the time. I don't recall exactly when --

Q. Well, don't you have your information there?

A. I've got a little curve somewhere. Grab something out of my file.

I think you're probably correct. I don't show any production between the end of 1998 and --

Q. I think you mean 1988.

A. I'm sorry, yes, 1988, and February of 1994 on this report. Actually, production started a little earlier in 1993, but as I've shown in my testimony, it's a bit garbled.

Q. Okay. Well, we'll talk about that, take it step by step.

So with that kind of shut-in, when we see this 109, 108, that should be indicative of the stabilized surface pressure for that reservoir?

A. It should be if there's no water in the hole.

Q. All right. So then on June 30th, 1993, under the supervision of Mr. Thompson, the well was fractured, hydraulically fractured?

A. Yes.

Q. And the size of the frac was 15,000 pounds of

sand?

A. Right.

Q. And by the way, that 15,000 pounds size of fracture, this was your example well, you stated?

A. Uh-huh.

Q. The Chaco wells' fracture-stimulations were roughly two and a half to three times the size of the frac on the Chaco Plant Number 5, weren't they?

A. Yes, so was the pay.

Q. Are you referring -- You're saying the depth of the pay?

A. Thickness of the pay.

Q. Okay. After the fracture-stimulation on August 3rd -- Well, you say in your testimony at page 24 -- I had trouble finding this, but you say in your testimony at page 24 that then you had a surface shut-in casing pressure of 160 pounds?

A. Yes.

Q. So pre-fracture it's 109, shortly after the fracture it's 160 pounds?

A. Yes.

Q. Fifty-one pounds pressure increase --

A. Right.

Q. -- the fracture?

A. That's pressure increase at the surface, again,

without knowing how much water was in the hole if any.

Q. Okay. Well, indeed, if there was fluid in the hole on August -- in August, 1993, with that reading, the bottomhole pressure would be greater?

A. It would be greater in either case if there's water in the hole.

Q. Well, than greater earlier -- Is there any indication anywhere at all that when the well was first approached in June that there was any fluid buildup?

A. Yes, the fact that we got 160 pounds in August suggests that we had water in the hole in June.

Q. Okay, and then they have water in the hole in August? You start putting soapsticks in and bailing and everything else, so obviously after the frac you had liquid in the hole, didn't you?

A. Yeah, we had to unload it, that's right.

Q. Well --

A. That doesn't mean it wasn't unloaded when we got the 160 pounds.

Q. Well, are you contesting that after your fracture this well had a pressure increase of the magnitude of 50 pounds when it had been somewhere around 109?

A. That's -- No, I'm not contesting that that's the surface shut-in readings, that's -- You're exactly right. Those are the surface shut-in readings. What we don't know

in either case is the fluid level, the -- I shouldn't say fluid. The liquid level.

Q. All right, so what you're thinking is, after that frac the well started producing water, or some liquid of some sort?

A. I think it went off production because of water.

Q. I see. But you don't have any evidence to show that?

A. I have no evidence.

Q. And --

A. Excuse me. That 160 is in there in an exhibit. I think it was part of --

Q. That's right, I remember that I did find that now. It was in the field reports.

A. Yes, sir.

Q. Thank you. I've had trouble finding these other reports, but I remember that's correct because that's where -- When I looked I didn't see any production for this well until -- it seemed like it was well into 1994. The fracture-stimulation was June 30, 1993, and the first production was reported -- what? February of 1994?

A. That's -- Yes.

Q. Okay. And wasn't there a sundry notice filed, if you have it, right after -- or soon after where the well test indicated 5 MCF a day?

A. Soon after the frac?

Q. Yes, the notice that was filed, sundry notice reporting that the fracture had been performed.

A. Let me dig.

Q. Okay.

A. Yeah, I have it here.

Q. Okay. Five MCF a day?

A. Uh-huh.

Q. Okay. So what we see happening with this well is, it starts out with very low production, and it starts out producing liquid, doesn't it? I mean water. Isn't that true?

A. I don't know if this 5 MCF a day was -- You know, I just assumed that this was after the frac but before they got much load back.

Q. Well, Mr. Nicol, what happened -- First off all, let's talk about the water production.

You did not report water production, you've already conceded, until February of 1998, after the field inspection, correct?

A. Yes, sir.

Q. But that well has a sizeable unlined pit in which it is discharging water; isn't that true?

A. I wouldn't call it sizeable, but there is a pit and it does make some water, yes.

Q. And it's an unlined pit?

A. Yes.

Q. And the soil there is a very sandy, porous soil; isn't that true?

A. It's a sandy soil, yes.

Q. All right. And the well has been discharging water into that pit since shortly after this fracture-stimulation in June of 1993; isn't that right?

A. Yes, whatever water it could lift, because it never had to be pumped like a coal well.

Q. Well, speaking of that, you have a slimhole with a 1-1/4-inch tubing. That does give you some velocity with gas to help lift water, doesn't it?

A. Yes, sir.

Q. So you have a well that's producing water, you don't -- you haven't -- Was there any tests made, I mean, even bucket tests or anything that --

A. Not that I've ever found.

Q. All right. It goes -- It starts out with low gas production and increases over time?

A. I don't know that you can say that except for the 5 MCF. The indications from the flowing tubing pressures on the reports in -- later in 1993, indicate pretty good flowing pressures.

The problem is in the reporting, and that's

something I couldn't control. That was before we owned the well. And I -- There is a common-meter situation there, and I think the reports were garbled compared to what was actually happening, because it was commingled with the Cowsaround 21-1 --

Q. Okay, let's --

A. -- surface commingled.

Q. Let's make that clear for the Commission, because you said some things about this well and how it behaved. What you're telling the Commission is that this well was actually producing through a common delivery point with the Cowsaround 21 and the coal well that's also in the north half?

A. Uh-huh.

Q. So as a result of that, it's hard to say at that delivery point what gas was coming from the Chaco Plant Number 5, your example well, and what gas or what quantity of gas was coming from the Cowsaround well?

A. Until there was a separate meter put out there for each well, that's right. And the reporting is poor, to say the least. That's why in my exhibit I provided a hand-drawn production curve based upon what I could glean from the Walsh reports had actually been happening.

And then at the end of that exhibit I also provided what had actually been recorded by Edwards in 1993

and early 1994.

The curves are virtually identical after the first few months of 1994, but in late 1993 and early 1994 it's a judgment call as to how much gas was actually coming from that well. All the indications you have are that it was a very strong well, even in late 1993.

MR. HALL: Why don't you identify those curves for the record, the number?

THE WITNESS: I wish I could, but I pulled them out of my folders here, and I don't know whether it was B or C or which it was.

Q. (By Mr. Gallegos) Well, we can -- or Mr. Hall can get back with you on that, if we can go ahead.

Did I understand you to say that the production curves were very similar for the Cowsaround and the Chaco Plant Number 5?

A. No.

Q. Misunderstood you. I did find in August, in Exhibit 7-C, August 3, 1993, a sheet, J.K. Edwards and Associates. I wish these had been numbered; it's awfully hard to direct anybody to them. But it's August 3, 1993, and it's showing the rate from the Cowsaround is 30 MCF a day, and the Chaco Plant is 100 MCF a day?

A. Yes.

Q. And as a reminder for the Commission, we know

from the log that we looked at, that your upper perforation that you frac'd to is about four to six feet from the bottom coal?

A. Yes.

Q. Okay. Did you do a tracer survey to see if your fracture-stimulation grew up into the coal?

A. Well, first of all, it wasn't me.

Q. No, that's right. Did Edwards?

A. No.

Q. So this well that initially produced over a 12-year period 63,000 MCF, now, since it was fracture-stimulated in 1993, has produced how much?

A. A little over 317 million cubic feet, three-tenths of a BCF, total, cumulative, including that original 60.

Q. So it's about five times what it produced when it was a Pictured Cliff well?

A. Yes, or an additional four times.

Q. Okay. This well, in all probability, has been producing coal gas from the Fruitland formation since it was fractured in June of 1993; isn't that true, Mr. Nicol?

A. No, not at all. No, you asked about --

Q. And --

MR. HALL: He's not finished answering.

MR. GALLEGOS: Well, he's answered the question.

THE WITNESS: Go ahead.

MR. GALLEGOS: Mr. Nicol, when we had the --

MR. HALL: Let him explain his answer.

MR. GALLEGOS: I asked the question, he denies it. That's fine.

MR. HALL: Well, I don't believe he was finished with his answer before another question was asked.

CHAIRMAN WROTENBERY: We'll let him go ahead.

THE WITNESS: Thank you. This well was lifting gas at surprisingly good rates after the frac job. And whatever water it produced, we have no volumes on that but it certainly wasn't enough water to shut off the well. And you are correct, you get velocity when you put a 1-1/4-inch tubing string in the hole to help left everything.

But there's nobody out there making coal wells using slimhole completions and 1-1/4-inch tubing and letting them flow. That's not what's going on out there. If this had been a coal well, it would have loaded up with water. That's all it would have been able to make initially, is water, until it was dewatered enough to desorb the gas and get it flowing.

Q. (By Mr. Gallegos) Well, you were dealing with the configuration of the well as it already existed, or Edwards was, in terms of being slimhole and the size of the tubing. And you're suggesting if somebody does a modern

completion of a coal well in that area, they're not going to have that size of casing and tubing; is that what you're saying?

A. They've got to dewater the coal before they can produce gas. That's not what happened here.

Q. Okay, but this was an existing Pictured Cliff well that Edwards fractured and took it as it existed --

A. Yes, sir.

Q. -- slimhole?

A. Yes.

Q. And your testimony, I quote: "This example well was the impetus for further fracs of older PC wells."

A. Yes.

Q. That's what you're saying?

A. Yes, sir.

Q. Now, in the three days of hearing in July, 1998, in this case before the Division, there as no mention whatsoever of the Chaco Plant Number 5, was there?

A. I don't recall that there was, no.

Q. You did not tell anybody at that time that Edwards and Pendragon did these Chaco wells of interest here because of the success with the Chaco Plant Number 5, did you?

A. That's correct.

Q. And if this well were found to be a well that was

labeled as a Pictured Cliff well but producing from the Fruitland Coal, it would be, a), at a nonstandard location, and b), not dedicated to a proper 320-acre proration unit; isn't that true?

A. If it were, that would be true.

Q. If that proves to be the fact --

A. Uh-huh.

Q. -- it would be an illegal location, a well that would be subject to being shut in; isn't that correct?

MR. HALL: I object, calls for speculation based the assumption, even.

Q. (By Mr. Gallegos) Well, if you assume with me -- We might have a difference of opinion, but if it's labeled as a Pictured Cliff well but producing from the Fruitland Sands, it's an illegal well?

A. If it's shown to be producing from the Coal --

Q. Right.

A. -- it would be an improper location.

Q. And if that happened, you would have to shut it in or have squeezed off the well, as occurred with your Lansdale Federal Number 1 well; isn't that correct?

A. Or prorate or something.

Q. Okay. And what did come out in the hearing in July, 1998, was that your Lansdale Federal Number 1 well, which is up there, shown on your Exhibit N-2, was illegally

producing from the Fruitland formation?

MR. HALL: I'm going to object. That's not what the testimony was a year ago. Again, this is a *de novo* proceeding. You can try to elicit testimony to that effect now. That mischaracterizes prior testimony, I object.

Q. (By Mr. Gallegos) Mr. Hall is partially correct, that's correct, it was illegally producing up to one week before the hearing --

MR. HALL: Same objection.

Q. (By Mr. Gallegos) -- isn't that true?

CHAIRMAN WROTENBERY: Sustained.

Q. (By Mr. Gallegos) All right, let's turn to another subject, give you a chance to get everything organized. I want to talk to you just a little bit abut your testimony on formation pressures. I think you used a -- I'm not sure what the number of the exhibit was that you had up here that showed your pressure sink. Is that --

A. That's 10.

Q. That's 10? Okay.

And I think your Exhibit 8 is a table of shut-in surface pressures?

A. Yes, sir.

Q. We had a little amendment of that we received yesterday, I think, and I'm going to refer you to some of the workover reports for some information. I think those

are at your Exhibits 9 and 11.

A. Okay.

Q. All right, Mr. Nicol, let me see first of all if I understand what your thesis that you talked about in your opening statement. Do I understand you to say that since these wells have been shut in -- from July, 1998, to the present -- they have built surface pressure, and therefore that indicates that the gas is coming from the Pictured Cliff formation?

A. No, that's not what I said. That by itself would not indicate much of anything as to what the source was. It's in the details of what's happened to the pressures during shut-ins and flow periods and that kind of thing that sorts out where the gas is coming from, what pressure the wells are seeing.

Q. All right. And by that you mean that when you observe that the Gallegos Federal wells are shut in, you'll see a reflection of a pressure buildup in those wells and then a sort of a parallel buildup in the Pictured Cliff wells? Is that the variations you refer to?

A. You see that in two wells that you can say with certainty happened, when you're talking about just when the Gallegos Federal wells were shut in, you see that pressure response in the Chaco 4 and the Chaco 5.

Q. All right, let's make it clear what we're saying

here. The Commission -- I think there's some exhibit. But since July, 1998, there have been periods when the gathering system has been off because the -- El Paso's Chaco Plant has been shut down for a period, four days, six days, something like that?

A. Yes.

Q. Okay. When that happens, the surface pressure on the Gallegos Federal wells goes up?

A. Yes.

Q. And the surface pressure on the Chaco wells goes up, parallel fashion?

A. Yes.

Q. That says communication?

A. Some of the Chaco wells, yes --

Q. Some of the Chaco --

A. -- that says communication.

Q. All right.

A. After you subtract out whatever's happening in just the Pictured Cliffs. Keep in mind that except for the one time when just the Whiting wells were shut in, when the plant shuts in, you shut in all of the wells in the area, including the Pictured Cliffs.

Q. Okay. And when you were speaking about gas composition, didn't you say that when the wells are shut in, there's a dynamic flow of gas --

A. I said --

Q. -- from the Fruitland formation to the Pictured Cliffs formation?

A. I said under your client's scenario of what's going on down there, there would have to be a dynamic.

Q. Oh.

A. I wasn't testifying that there is.

Q. All right.

A. On the contrary, it shows that there is not.

Q. I see, all right.

If the wells are in communication, as you've already testified, the pressure in the coal formation is higher than the pressure in the Pictured Cliffs formation?

A. That was the circumstance when the wells were originally completed. I think what's happening now is, gradually the coal is being drawn down lower than the Pictured Cliffs. And as of the last shut-in time on my charts, most of the coal wells are still shutting in higher than the Pictured Cliffs, yes.

Q. Yeah. So you've got two formations in communication with a differential in pressure, the Fruitland Coal having a higher pressure. With that circumstance, the physics are, the gas is going to flow from the Fruitland Coal to the lower-pressured Pictured Cliffs formation? Do you disagree with that?

A. Well, it depends on where you're -- Well, not in our wellbores, but yes, if there is communication, that's the way it's going to flow.

Q. Well, I'm not talking about -- I'm talking about communication between the formations.

A. Yes, sir.

Q. Okay. Now, let's take a look at your Exhibit 8, which I think led you to some conclusions about the Pictured Cliff formation having reservoir pressures that didn't reflect communication with the coal formation --

A. Yes.

Q. -- is that a fair statement?

A. Yes.

Q. All right. First, on the Chaco Number 1, Mr. McCartney in his work, which is Exhibit M-25, he has some pressures, early pressures, for the Chaco Number 1 that you omit. Did you exclude those, or you just didn't share data, or what?

A. I don't know which pressures Jack used. The pressures I have picked are ones where the tubing and the casing were the same, and I was careful to use pressures where the tubing and casing were the same wherever I could get them. There may be other pressures out there. If they're critical to this, let's talk about them.

Q. Okay. This doesn't say anything about that, this

just has a column that says wellhead shut-in pressure. I mean, it doesn't say anything about you only pick the pressures where the tubing and the casing pressure was the same, does it? Or did I miss that? Oh, yes, it does say that. It says 1995-1997, period, readings where tubing casing shut-in pressures were equal are presented.

A. Yeah. No, you're correct, and I should change that. The early pressures were taken from the shut-in reports that were required on the wells through about late 1983.

Q. Yeah. In what we might call the good old days, you used to have to deliverability testing on the wells and shut them in and get these pressures?

A. Yes.

Q. Mr. McCartney had, for August of 1977, on the Chaco 1 a wellhead shut-in pressure of 251, and for August of 1978 a wellhead shut-in pressure of 203. Would that -- Then we see it drops off to the last test in August -- or July of 1983. Would that say anything to you about the pressure decline in the reservoir, in the Pictured Cliffs reservoir?

A. It certainly indicates a decline.

Q. About a 120-pound decline from, presumably, the virgin pressure?

A. If there's no water in that wellbore, that would

be correct, and if there's no interference from other producing wells, that would be correct.

Q. Now, in the Chaco 2-J, there -- in January of 1995 -- You see, you go from August of 1980 to March of 1995?

A. Yes.

Q. In January of 1995 you have a reading of 50 pounds of wellhead shut-in pressure that you've omitted there. Workover report, Chaco 2-J, Walsh Engineering. I think it's the last page of your Exhibit 9.

A. It wasn't my 9.

Q. No? I think it was the very last page of your 9.

A. Okay, I'm missing a page in mine, thank you.

Q. Yeah.

A. Okay.

Q. Okay, at this point this well has been shut in for quite a while, correct? Hasn't produced?

A. Yes, sir.

Q. So 50 pounds ought to be indicative of what the stabilized reservoir pressure was at the surface?

A. At the surface, not knowing how much water is in the hole.

Q. We could say that about every pressure --

A. I'd have to say that about every one, that's right.

Q. Okay. But what's interesting here is, right after that pressure was taken, you did an acidizing job on this well, you acidized the well --

A. Yes, sir.

Q. -- and a short time later, a few weeks later, the pressure is 188 pounds, wellhead shut-in pressure; isn't that true?

A. Uh-huh.

Q. So after acidizing, pressure change of 138 pounds would indicate, at least to some engineers, that the acid had caused communication with a higher-pressured reservoir; isn't that true?

A. That's one conclusion you could reach from it. The other is that we cleaned the well up and we were seeing better pressure readings because we had it cleaned up and dried up after the job.

Q. On the Chaco 4, let's look at that. Your workover report, the rig comes on. Let me see if I can find that. Rig comes on and gets a reading of 119 pounds, acidizes, and two weeks later that well was reading 170 pounds pressure, after being acidized?

A. Yeah, there's one reading of 170, and then there are several readings after that for several months where it stabilizes in the 140- to 147-pound range. I have --

Q. Might have been water in the wellbore?

A. Touché. Except that it seems to stabilize and stay steady for a long time. There's no indicated crossflow. So I wasn't sure that the 170 was a valid reading. If it is, it's still not coal pressure.

Q. All right. And it's still not the acidization causing any communication, in your view?

A. That's correct.

Q. Okay. But you didn't include this information on your Exhibit Number 9, did you?

A. No.

Q. Did you observe, just as far as this field is concerned generally, that the abandonment pressures, abandonment shut-in pressure on these wells, if it were Dugan operating, Merrion, whoever, was around 100, 110 pounds?

A. I don't think you can make that observation. The last readings we have are 1983, early 1984. They are generally in that range. Again, surface readings without knowing what's going on downhole. But I never sat down and correlated them to when the wells were abandoned.

Q. Well, you do know that the El Paso gathering line in that area operates at about 60 pounds -- 60 -- I mean, it various, obviously, but a range of maybe ten pounds one way or the other, around 60 pounds?

A. Well, right now it's running closer to 100. It's

been as low as 35 when we got into this project, and I do not know what it was back in the early 1980s, for example.

Q. Okay, you don't know what it was back when this well was what you might call an active -- I mean, this field was what you might call an active field?

A. Right, I don't know.

Q. All right. You say that -- Or do you still contend that none of the acid jobs was sufficient to create permeability for commercial production rates from the Fruitland Coal? I may be misstating. I think what your testimony was, you have to fracture-stimulate a Fruitland Coal well to get commercial rates of production?

A. Yes.

Q. You can't just acid-stimulate it?

A. There's nobody out there making Fruitland Coal wells by giving them 500-gallon acid jobs, that's correct.

Q. Okay. Now, that certainly was not true in the case of the Lansdale Federal Number 1, was it?

A. The question is wrong. The answer is, your premise is wrong. You can't say that it certainly wasn't true.

Q. Well, let's lay the facts out on that. The Lansdale Federal is right -- if we're looking at this exhibit, JTB --

A. Southeast of 7.

Q. -- it's the southeast of 7, over here sort of to the east of the Chaco 2-R and the Whiting 7 Number 1 well?

A. Yes.

Q. Okay. That well had been initially fracture-stimulated back in 1980?

A. Yes, in the Pictured Cliffs.

Q. In the Pictured Cliffs, with perforations that were about two to four feet below the coal?

A. Yes. About four feet.

Q. All right, let me back up. When that well was fracture-stimulated in 1980, the well-completion reports showed clear evidence that that fracture went up into the coal; isn't that correct?

A. No.

Q. Don't you recall that the reports said observation, observed black water and heavy coal content?

A. I recall that report. You --

Q. That was a --

MR. HALL: Just a second, he wasn't finished answering.

THE WITNESS: You also need to recall that in the core analysis of that, which is provided in these exhibits, there are two coal stringers down in the Pictured Cliffs, very close to the perforations if not in the perforations.

Q. (By Mr. Gallegos) Okay, we'll address that.

So you have a fracture-stimulation through perforations in the Pictured Cliff four feet below the coal, in 1980, there is that observation that I named, that I mentioned?

A. Yes.

Q. All right. Then in 1994, under the supervision of Paul Thompson, you perforate the coal?

A. No.

Q. You perforated from 1046 to 1056?

A. Let me finish. You said "you". We had no interest in that well until August of 1997.

Q. Till August of 1997?

A. Yes.

Q. Okay, Paul Thompson perforated the coal?

A. Yes.

Q. Okay, and acidized the coal, 500 gallons of 7.5 hydrochloric acid --

A. Yes.

Q. -- 7.5-percent hydrochloric acid?

And what was the reaction as far as production?

A. Well, I don't think there was any test of the coal by itself. The perforations in the Pictured Cliffs had been covered with sand. Is that correct? I think so. No, I'm sorry, I'm mixing my dates.

The acid job was done on both the coal

perforations and the Pictured Cliff perforations. Both were open.

Q. Well, after the acid job, with perforations in the coal, that well went from basically producing nothing to producing about 300 MCF a day; isn't that true?

A. The producing nothing had been production from a Farmington sand up at about 400 feet.

Q. So the answer to my question is, yes, it had been producing basically nothing --

A. -- from a totally different zone.

Q. From a different zone. It was perforated in the coal and acidized?

A. And was still open and had been frac'd in the PC.

Q. In 1980?

A. In 1980.

Q. And it was not frac'd in the coal in 1994 --

A. That's correct.

Q. -- it was perforated in the coal?

And that's the well that was -- where the coal perforations were squeezed off one week before the Examiner hearing that was held in this matter last July?

A. Yes.

Q. And at that time Pendragon was certainly the operator, was it not?

A. Yes.

Q. And had been for how long?

A. At that time, about 10 months.

Q. After the squeeze of the Fruitland Coal perforations in July of 1998, the well production went to basically nothing; isn't that right?

A. That's correct. We haven't been able to get it back.

Q. But it's still open to the PC perforations, isn't it, Mr. Nicol?

A. If we haven't frac'd into the PC with the squeeze of the cement job. I mean, a column of cement is above the frac gradient. When you squeeze on it, you create a frac to squeeze the cement. I don't know if we have squeezed cement into the PC cr not, but we have ruined the well.

Q. Well, what you have done is, you have shut the well off from producing from the coal and left it to produce from the Pictured Cliffs? That's what you intended to do, let me put the question that way. That's what you intended to do?

A. No --

MR. HALL: I'm going to object --

THE WITNESS: -- that's not correct.

MR. HALL: -- to the form of the question because it presumes facts not in evidence. There is no evidence the Lansdale produced from the coal.

THE WITNESS: Our intention --

Q. (By Mr. Gallegos) Well, I don't think Mr. Nicol even -- or Mr. Thompson denied that it was producing from the coal and had to be squeezed off in the coal. You don't deny that --

A. Well, let's talk about --

Q. -- the well was producing from the coal, do you?

A. Let's talk about whether it's producing from the coal or whether it's perforated in the coal It was not frac'd in the coal.

Q. No, it was just acidized. That's why I've asked the question, because we started with your testimony saying you couldn't get commercial production from the coal by just acidizing, you have to fracture-stimulate. And so that's why I'm asking you about this well, because you didn't fracture-stimulate the coal, you just acidized it?

A. That's right.

Q. And the production went to 9000 a year -- I mean a month, 300 a day?

A. Yes, it came on very strong after the acid job in the coal and everything was cleaned back out in both zones and put back on. It was a strong well for a while. It came off in a hurry, but it was a strong well.

And as far as why we squeezed it in 1998, that was because, first of all, that was one of 30-some wells we

bought interest in, in August of 1997.

And in going through the files in preparation for the hearing in 1998, I realized that there were perforations in the zone that it shouldn't have been in, in the coal.

So I stewed about it, actually for several months. And then in a meeting in June of 1998 with the Aztec NMOCD staff, I said, Here's my problem, what do I do about it? And they said, You really have not choice, you've got to plug it. So that's what we did. Or not plug it, but squeeze the coal.

Q. Okay. And the intention of what you did was to leave the Pictured Cliff as the producing zone?

A. If we could, yes. That was the hope.

Q. Okay. And after squeezing off the coal, the well has basically gone to producing nothing or two or three MCF a day?

A. That's right. And there's three possibilities there. Either the Pictured Cliffs was not producing much of anything; that's certainly a possibility. We squeezed the Pictured Cliffs with cement, which is a very strong possibility --

Q. You didn't put a bridge plug or anything to prevent that?

MR. HALL: Let's let him answer the question.

THE WITNESS: We covered the perforations, of course, with sand. But as I said, when you squeeze cement, you've got a column of cement that basically is above frac gradient, you squeeze on it, you're going to create a small frac. Basically what you're saying is, or what I'm saying is, you've got a chance of making a fracture with cement from the coal down into the PC and squeezing off the PC.

The third idea, or the third possibility, is that we just damaged the Pictured Cliffs with too much water, having to kill the well and getting ready for all this work, having to squeeze it and so forth. And we may yet get it back, which is our intention to keep trying.

But I don't think you can draw any one conclusion from the circumstances and say, by golly, that's it.

Q. (By Mr. Gallegos) Is your thought about getting the Pictured Cliff back to go in and put a fracture on the Pictured Cliff formation, the Lansdale Federal, like you did in the Chaco 4 or 5 and in those wells?

A. No.

Q. That might get you back into production from the Fruitland Coal.

A. Probably get me back here for another hearing, wouldn't it?

Q. If I understand your testimony, you have excluded the Chaco 1-J and the 2-J as being in communication with

the coal; is that correct?

A. Yes.

Q. I missed the proof on that, though I see your statement, sort of a flat statement in your testimony, but what evidence do you have of that?

A. It comes from the pressure data again. Let's take, first of all, the 1-J, which is on the exhibits and on my charts. It has held steady at pressures in the 150-pound range for the year it's been shut in. It hasn't reacted to shut-ins of the field or pressure changes in the offset wells, it hasn't been drawn down by coal production, and it hasn't bumped up when the field was shut in. It's basically, within a pound or so, stayed flat.

The biggest adjustment in that well was when we tried to adjust for changes in the meter. But if you ignore that bump up or down -- I think it was down a pound or two when we charted it out -- it's been flat. So it has no reaction to shut-in of the field or to the Whiting wells.

The 2-J -- And that well, by the way, if I recall, is about 580 feet, 600 feet, from the nearest coal producer, which has been compression now since October of last year and producing with flowing casing pressures in the 20- to 30-pound range or less. So there should be a pretty big pressure sink around that well, and the Chaco

1-J is not seeing it.

The 2-J is 180 feet from the northernmost of the Whiting wells, the 1-1. And as you saw here, the pressure in 1995 was 188 pounds, and it built up to 196, 198 pounds. We are getting surface pressures on that well right now in the 196-pound range. It hasn't changed, basically, since 1995.

And it's 180 feet from another well that's on compression in the coal, with no correlation between when the wells shut in, the coal wells were shut in, and when the pressure bounces.

Q. Okay, so let's make -- be real clear. The Chaco 1-J and the Chaco 2-J have basically been flat as far as their shut-in pressures go, even though they're close, quite close, to some of the Gallegos Federal coal wells?

A. That's correct.

Q. And the Chaco 1-J and the Chaco 2-J were not fracture-stimulated by you --

A. Also correct.

Q. -- is that correct?

A. Also correct.

Q. So some people would draw the conclusion from that, because they were not fracture-stimulated, that's why their pressures haven't reacted?

A. I know that's what you'd like to do.

Q. Then the other well that you talk about -- Let's just sort of review. The Chaco 1, the Chaco 4 and the Chaco 5, you say that their pressures are, if I may use the term sort of loosely, moving with the pressures with the Gallegos Federal wells?

A. In the case of the Chaco 4 and Chaco 5, yes, definitely they're moving with the Gallegos Federal wells. I don't think you can make that correlation with the Chaco 1.

Q. Okay, not as clear a correlation?

A. Yeah.

Q. Correct?

A. Correct.

Q. Okay. Now -- Then the Chaco 2-R, you say that has behaved different, that it took it about 10 months to reach a stabilized shut-in pressure --

A. Yes.

Q. -- is that your testimony?

A. Yes.

Q. Then -- Whereas the Chaco 4 and the Chaco 5 did that within weeks?

A. 48 hours.

Q. Days, okay.

The Chaco 2-R, Mr. Nicol, happens to be the only well of the four that you fractured where the perforations

are below the top of the massive sandstone, and there are no perforations above the lower coal; isn't that true?

A. Yes, and the reason, despite that cross-section, is, there's no sand above that coal.

Q. Well, this -- I'm pointing to Pendragon Chaco 2-R on the exhibit we're now calling WA-3, and this shows the perforations at the point I'm --

A. That's correct.

Q. -- pointing to; is that correct? Whereas the perforations on your other wells, which are shown here in red, or some of the perforations, are above the lower coal?

A. Yes.

Q. By the way, of all the four Chaco wells that you fracture-stimulated, the 2-R with the perforations below the lower coal is the one well that your fracture expert, Mr. Conway, selected to model; isn't that true? Or at least that's the one that he showed us the results of his modeling? Are you aware of that?

A. I'm not recalling which wells he modeled. I'll take your word for it.

Q. Let's turn to another subject and give you a chance to assemble a few things here, Mr. Nicol. I've got a few questions about what you have to say concerning gas composition.

A. Okay.

Q. Okay, now, you do recognize, do you not, that under the pool rules pertaining to the Basin Fruitland Coal formation, that Rule 3 lists gas analysis as one of the factors that the Division or the Commission would use in determining whether a well is producing from the proper common source of supply?

A. I'm aware of that. It's not always applicable. It doesn't apply, I don't think, in this part of the Basin, in the underpressured part of the Basin. I think that's clear from publications as well as just my data.

It might be applicable for the first indication of gas from a well. I don't see any first analyses of Pictured Cliff wells that are low BTU. I'm not aware of any. They all seem to be high, usually above 1000.

But they change over time. It would be a mistake to use that information on a producing well that's been on, producing characteristics have changed, it's been on compression, it's been on pump, whatever, for a long period of time and assume that what you're going to see is the same kind of gas you saw on day one in the Pictured Cliffs. That's what I'm saying doesn't happen, that the gas composition, that produced stream at the surface, changes for various reasons.

Q. So when Order R-8768 tells us that a gas well within the Basin Fruitland Coal Gas Pool shall be defined

by the Division Director as a well that's producing from the Fruitland Coal seam, as demonstrated by a preponderance of data which could include the following, and one of those is gas analysis, you say that is not a standard that should be applied?

A. Not in this area, not for old Pictured Cliff wells, that's correct.

Q. Not in this area. In other areas of the Basin you can use that?

A. Well, I don't have any production -- or any knowledge of the circumstances for gas analyses up in the high-pressured area. It looks from publications that I've read that it's much more distinct, difference in gas, up there than it is down here. And I think probably the rule and the focus at the time was where the big wells were up in the high-pressured part of the area, where all the activity was. I don't think this area was getting much attention. I don't think the possible problem with gas analysis was even recognized down here.

Q. So we understand what your thesis is on this point, it is that initial production from a Pictured Cliff well, the gas composition will indicate or be reliable evidence that because of the BTU heating value, that it is Pictured Cliff gas, but not after some period of production?

A. Yes.

Q. How long of production does it no longer become a reliable indicator?

A. I don't think anybody can say that. The examples I've shown show pretty remarkable changes within a year. And back and forth sometimes. It depends on whether the well is producing a lot or a little or whether it's been shut in for a while or whether it's back on.

Q. Well, you cite from an article by Scott, Kaiser and Ayers, and that article at one place says, "Previous studies have concluded that Fruitland Coal gases are chemically distinct from Fruitland sandstone and Pictured Cliffs sandstone gases." Do you disagree with that?

A. I disagree with that in this area, and so does that article, when you read it in detail, for the underpressured gas area.

Q. Well, I thought the article on the composition might have been helpful. At page 99 -- This is Mr. Nicol's Exhibit Number 40. I should have identified that in advance so it could be pulled out.

And I'm also going to refer to Exhibit Number 37-A, which has several subparts, 37-A through E.

A. I'm organized, go ahead.

Q. Okay, do you have the Scott, Kaiser, Ayers article?

A. Yes.

Q. Maybe we could give a little attention to page 99 where there's a table labeled "Composition of natural gases in Fruitland sandstone, Fruitland coalbeds and Pictured Cliffs sandstones, San Juan basin."

A. Uh-huh.

Q. It does break down the areas of the Basin, doesn't it, so we know that under UP that means the underpressured area?

A. Uh-huh.

Q. And that would be our area of interest; isn't that true?

A. Yes, sir.

Q. Okay. And the way those factors are used, it's a little different than what we're used to seeing in BTU. Is the way to read that is where it says, for example, under Fruitland Coal UP, 0.92, that means that out of the C_1 through C_5, 92 percent is C_1 or methane?

A. Yes.

Q. That's the way we read it?

A. No, no, that's the -- Well, that's the ratio of methane to the total --

Q. Yeah.

A. -- burnable hydrocarbons.

Q. Okay, if you had all of the -- you have methane,

ethane, propane, butane, the two butanes I guess, through C_5, that would be 100?

A. Yeah, if you didn't have any carbon dioxide or nitrogen it would be --

Q. Or 1.00?

A. Well, it is telling you what the percentage of methane is to the hydrocarbon portion of the total gas stream.

Q. Okay, that's what I thought I was saying.

A. You're right.

Q. Okay. In other words, under Fruitland Coal, .092, is the same as saying of the C_1 through C_5, 92 parts out of 100 are methane?

A. Yes.

Q. Or 92 percent.

A. Yes.

Q. Okay. And so Pictured Cliffs sandstone, 88 percent would be methane, according to this table?

A. Uh-huh.

Q. And Fruitland sandstone, 90 percent would be methane, under the -- in the underpressured area?

A. Well, I think -- Doesn't the Pictured Cliffs sandstone include all areas?

Q. Not the way I read it. Oh, it does say all, I'm sorry. I see in the column -- I hadn't seen that, "All".

So the Pictured Cliff reading is not just for the underpressured/overpressured area, correct?

A. That's correct.

Q. But that's because there's not that kind of differentiation, as far as the Pictured Cliff is concerned, as there is with the coal in the Basin; isn't that true?

A. Well, I think there is. If you look at the chart, for example, on page 98, Figure 7, you've got a cluster there of points that show that you really have trouble differentiating between the two in the underpressured area.

And if you look at Figure 4 on page 97, Chart (b), again these authors show that it's very difficult to differentiate between the two gases in the underpressured area.

Q. Well, if you go back to page 102, the figures there, you've got 185 -- excuse me, getting late in the day, I guess. You've got 857 samples of Pictured Cliff gases, and you get a very good grouping. Do you see the figure? There's three --

A. Uh-huh.

Q. -- bar charts?

A. Uh-huh.

Q. And when you take 857 samples of Pictured Cliffs, that's all over the Basin, that's a very good -- I guess

you'd call it bell curve or grouping, isn't it?

A. Well, it's mixing apples and oranges between the underpressured part and the rest of the Basin. That's part of what this paper is about, is to show the difference between those two areas.

Q. All right. So you're saying that this -- where they group the Pictured Cliffs gas content or heating value together, that's inappropriate, it does not apply to this area, the southwest part of the Basin?

A. Well, let me be very clear on what I'm saying, because I'm not trying to argue with what everybody will accept as fact.

If you were to analyze only the first pressure the day the well -- or, I'm sorry, the first gas the day the well goes on, I believe, yes, you could be comfortable be telling the difference between a coalbed methane well and a Pictured Cliffs well.

Over time, that changes. We've got plenty of examples in the exhibits here of how that does change and you get a variety of analyses after that. I suspect that's probably what caused the problem with these charts that I referenced on page 97 -- or 98 and 97, was there was no understanding at the time that since the Pictured Cliffs is changing over time, you're going to get a mish-mash where you can't tell what kind of gas it is, because they are so

similar in some of the -- and some of the analyses.

Q. Well, one of the reasons that you -- or the reason that you offer this opinion is that when the Chaco wells were producing after being fracture-stimulated and before being shut in, their BTU values were about 1000 to 1025, which was right in line with the coal well production; isn't that true?

A. That's correct, that's the problem we're addressing.

Q. Okay. Because the gas composition of those wells when the Chaco wells were producing matched up with the gas composition of the coal wells? What you say --

A. Yeah --

Q. -- isn't meaningful, that was a fact?

A. -- also, so did three of the analyses from the Chaco 1 and the Chaco 2 wells, which hadn't been frac'd and have been shown not to be communicated with the coal. We've got the same problem of some high readings and some low readings in those wells.

Q. In which wells?

A. Chaco 1-J and 2-J.

Q. All right, we'll examine those. Those are in your list?

A. They're in there, yes.

Q. Okay. You're talking about the 1-J, the 2-J,

you're talking about gas composition, BTU value, what are you --

A. BTU.

Q. BTU.

A. That's the way I've ranked them for these exhibits.

Q. All right.

A. I ran into the same problem not being able to differentiate whether I tried to rank by ethane or propane or CO_2 or nitrogen.

Q. All right.

A. You get a general cluster of where you can say this cluster is predominantly or, in some cases, entirely Pictured Cliffs, and this is entirely coal, but there's a big range in between where they overlap each other.

Q. One thing that I'm interested in, when I look at Table 1 in the article which is in your Exhibit 40 -- it's at that Table 1 at page 99 -- it includes these heating values and gas composition on the Fruitland sandstone. Are you familiar with that formation?

A. Yes.

Q. Do you see any Fruitland sandstone in the cross-section that's up before you, Mr. Ayers' cross-section?

A. He has Fruitland sandstones above the -- what I call the basal Fruitland Coal, the 20-foot thick coal.

Q. Where is that? Would you point that out on the exhibit?

A. The yellow streaks here are his correlations and picks for Fruitland sandstone in this area.

Q. All right. You have a similar cross-section, don't you?

A. Yes.

Q. Do you have any Fruitland sandstone on your cross-section?

A. On several of them, on several of them, yes.

Q. Okay, and --

A. It's kind of the same configuration, the channels, no decent correlation, that sort of thing, yes.

Q. I'm sorry, about the same correlation?

A. About the same configuration.

Q. Same configuration. So that the sandstone above the large coal is Fruitland sandstone, in your opinion?

A. Yes.

Q. And the sandstone below the large coal but above the small coal is not Fruitland sandstone, in your opinion?

A. That's correct. Incidentally, none of those sands he has marked there were pay sands.

MR. GALLEGOS: Would this be a good time to take a break? Mr. O'Hare needs a break.

CHAIRMAN WROTENBERY: Yes, that sounds good.

We'll take a ten-minute break till shortly after 3:15.

(Thereupon, a recess was taken at 3:07 p.m.)

(The following proceedings had at 3:22 p.m.)

CHAIRMAN WROTENBERY: Mr. Gallegos?

MR. GALLEGOS: Thank you.

Q. (By Mr. Gallegos) Mr. Nicol, back up just a little bit. On the squeeze job on the Lansdale Federal Number 1, could you provide us with the daily and the pressure chart and the data on that work, please?

A. I'd be glad to. I don't have it with me. I think I've got the daily, I don't know that I have the pressure chart.

Q. There would be a pressure chart, wouldn't there?

A. There probably would. I don't know whether it would be in my files or in Walsh Engineering files. We'll have to dig to see what we can get. I'd be glad to provide whatever we have.

Q. Did you look at the pressure chart?

A. No.

Q. It would show a break in the pressure if there -- if what happened, that you think may have happened, did happen, which is breaking down into the PC? Isn't that --

A. It would show a break if there was a break. Now, you're talking to a non-frac expert here. But if there was a break somewhere in the process, I would expect that you

could see it. But if it started right from the start and started breaking down or broke down immediately when the frac'ing started and the cracks started, you'd never see any difference, is my understanding.

So I don't think it necessarily be definitive if you didn't see a break. It would be definitive if you did, is probably the best answer.

Q. Okay. I'm just kind of puzzled about your explanation. I'm no artist but --

A. You're about to prove it.

Q. Yeah. -- if we're looking down the wellbore and you're pumping cement out through perforations, and somewhere you think you've got a fracture -- isn't that what you're saying? That the actual -- the cement, because of the weight, creates a fracture, went out of the coal and fractured into the --

A. That's a possibility, yeah.

Q. Possibility?

A. Uh-huh.

Q. So you'd have a fracture growth maybe like that?

A. Yes, sir.

Q. Right? Okay. So you might have, oh, I don't know, a fracture width of half an inch, you might have a half of an inch of your PC sealed off, the drill wellbore on one side and maybe on the other side; isn't that right?

A. I didn't understand the question.

Q. Well, what you're saying, the cement some way sealed off the Pictured Cliff, and I'm saying if it did, maybe a half inch on one side of the wellbore and a half inch on the other, you've got the whole rest of the wellbore and perforations exposed to the Pictured Cliff, don't you?

A. No, what it does is, the fracturing creates the avenue for the cement to travel. But when it hits the porous sand, it imbibes into the sand. It's squeezed into the sand. It will shut off more than just that half-inch fracture. It will actually squeeze into the sand and cement it up. That's what it does, it just fills the pore spaces.

Q. You're saying that if that happens, that this cement is going to just surround that wellbore?

A. Yes. That's the danger of doing a squeeze job to try to separate a zone anytime, is that you damage another zone.

Q. Okay, and you've seen that happen, evidence that that's happened?

A. Yes.

Q. All right. Well, you'll provide us that data, please?

A. I'll dig it out.

Q. Thank you. All right, 37-E is your listing, I believe, of all the Pictured Cliff wells and all the coal wells in the area?

A. It's a listing of all the gas analyses that I found from our files at the time that I did this compilation. I don't want to leave the impression that it's all the wells in the area, because I don't have all the wells in the area. It does include the wells in question here.

Q. All right, and what was the geographic area that you were attempting to capture in this compilation?

A. The geographic area was the accident of where we had information in our files. It was a large number of wells in 26 North, 12 West, and some data points in 26 North, 13 West.

Q. But not necessarily in the sections concentrated -- where these wells exist or offsetting the wells in question?

A. No, every one we had in those sections is included in here. But you know, I took whatever I could find.

Q. Just looking at this list, as I went over it I kept finding the Designated Hitter 2 over and over again, so I counted it, and there's -- I think there's 150 samples, and 22 of them are the Designated Hitter Number 2?

A. Yes.

Q. Which might tend -- If there's some disagreement over whether that's a coal well or a Pictured Cliff well, that might kind of skew any attempt to draw any conclusions from this list; wouldn't you agree?

A. If there is some disagreement, sure.

Q. Did you attempt to do any kind of a sort on this? You know, for example, let's see how many wells fall in this BTU range of 1100 to 1150 or -- any kind of sorting like that to see if it told you anything?

A. Not from the standpoint of did I print out any sorts of various categories, no. I did attempt to look through it and say if I had to determine what's Pictured Cliff and what's Fruitland, how would I do it? That's not a sort.

Q. I think -- Isn't it true that Mr. Cox did some sort of a sort grouping of wells?

A. Yes, he has several exhibits of sorting like that.

Q. But basically, if I understand your testimony, you put all these wells down, you gathered the information and the BTU value and then whether they had been stimulated or not and just said, When I look at this I can't draw any conclusions from it?

A. Well, I drew several conclusions from it.

Q. You drew --

A. What I can't conclude is that I can tell what's a PC well and what's a coal well.

Q. You drew a conclusion that you can't draw any conclusions from this information?

A. Well, there are other --

Q. I mean as to the source?

A. As to the source, that's correct.

Q. Now, Exhibit 39 would be samples taken from the wells in February of 1998; is that correct?

A. Yes.

Q. This -- Wasn't this part of the inspection that the OCD did that we referred to before, in February of 1998, when following that inspection you began to report water on these various wells?

A. Well, you refer to it as an inspection. What generated this and the data on how much water was being produced was the decision at one of the meetings we were jointly having that was hosted by the NMOCD staff in Aztec where it was decided that it would be good to go out and get gas samples and water samples and water-production data from the wells in question and nearby wells, to see if we could get more information to work with. That's what generated the information.

Q. All right. But theretofore you had not been

reporting produced water from these Chaco wells, and beginning with that time, February, 1998, you did start reporting?

A. That's right.

Q. And when we look at Exhibit 39 -- and maybe this is somewhat repetitive of a question answered earlier -- it's basically showing that the BTU content and, for that matter, pretty much the composition of the gas is very similar between the coal wells and the Pictured Cliff wells?

A. In general, that's true, and certainly the BTU of the PC wells in question, the high-rate, high-volume wells that we were producing is low.

But to answer your question properly, there is a difference. You look at these, and the PC wells are showing some percentages of the higher ends, which are showing up as zeros, basically, on the coal wells. So there is a preponderance of high ends showing up on these analyses in the PC wells that are not showing up on the coal wells.

But there again, if you go to specific examples it kind of crosses the line, and you're not sure in some cases where to draw that line and say this is one well versus the other.

Q. When you use the term "higher end" is that -- I

usually refer to them as heavier, as the heavier --

A. Yes.

Q. -- hydrocarbons, like propane, butanes and so forth?

A. Yes.

Q. And what you're pointing out is that the coal wells have little or none of the heaviers; some of these Pictured Cliff wells have some?

A. That's correct. Even though our sample of the coals that was done on the Lansdale Federal showed that the -- what do you want to say? -- the heavy ends do exist in the coal, they're not coming out at this time in these wellbores. So another indication that those heavy ends are staying behind.

Q. At the time that these samples were taken, your Chaco wells had been producing, after they were frac'd, for about 2 1/2 years?

A. Yes.

Q. Is there an explanation for -- that you have for your theory that the BTU levels of the Pictured Cliff wells, some -- at some unspecified period over time as they're produced, diminish?

A. I have my own theories. It's nowhere sufficient for expert testimony, and we'll cover that with another witness but I'm really not qualified to go into the

chemistry and the physics of what's going on here. My purpose has been to point out that whether we understand it or not, it's happening.

Q. All right, the next thing I wanted to ask you about concerns basically testimony that begins at page 79, and it seems to me that you are addressing the expert area of hydraulic fracturing of wells. Is that a fair synopsis of your testimony, or characterization of your testimony?

A. From the standpoint of how the geology controls the fracturing, yes.

Q. And shortly before the recess, I believe you stated you have no expertise in the area of fracture-stimulation? Did I understand that as your testimony?

A. I -- Yeah, what I was talking about, I'm not a fracture expert when it comes to analyzing the mathematics, the physics of what's happening when you've got pressure charts to work with and that kind of thing. I'm learning in a hurry as a result of this proceeding, but I didn't mean to imply that I don't know what I'm talking when it comes to how the geology controls fractures, because I do. I've had that experience.

Q. Do rock properties play a significant role in the evaluation of fracture geometry?

A. They should.

Q. And you are conversant enough with fracture

simulations to know that rock properties and the variables of rock properties are part of the input in formulating the -- I guess what I'd call the formula for doing computer simulations of fractures? Is that -- Do you understand that?

A. Yes. And my point of my conversation on that here, or my testimony on that is, they're frequently used. They're rarely known, so they are guessed at or estimated at. And some of the properties that are most important are very difficult to even guess at. And in some of the simulation models I've seen they're not even a parameter that's input, that's not a parameter that's provided for input.

Q. I'm sorry, could you explain the last part of your answer?

A. Well, let's say, for example, the control of a fracture-stimulation by bedding plane. There are fracture models, simulation models out there that don't even consider that, and it's a major control on where fractures go. When you actually try to find out where it went and trace it, you find out that bedding planes are a major control many times on where that fracture went.

Q. And what you're referring to is the fact that some bedding planes, some places where a formation meets, there's very good bonding, and some there is not. So you

have slippage --

A. That's correct.

Q. -- or shear -- I guess they call it shear slippage?

A. Yes.

Q. That could play a big role in how the fracture behaves, can it not?

A. Yes, it can. And the example I provide in here is not even a question of bonding; it's just a slight change in the organic content of the dolomite that was fractured and how it changed the fracture from an open fracture to a closed slippage.

Q. Did you supply rock properties that would be pertinent to the area in question here to Mr. Conway, your expert on fracture simulations?

A. No, I discussed with him what was a shale and what was a sand and what was a coal so that we were in agreement on those parameters off the logs. But I did not try to influence his judgments as to what properties to put in.

Q. Let me see if I understand. You discussed with him what -- just looking at a log, what you would call a shale as opposed to a sandstone --

A. Yes.

Q. -- so forth?

A. Yes.

Q. Okay. Well, you opine in your testimony that coals and shales are -- let's see, they are ductile rocks?

A. Yes.

Q. Okay, and the sandstone is a brittle rock?

A. By comparison, yes.

Q. That's your characterization?

A. Yes, sir.

Q. All right. And are you testifying that coals and shales do not fracture?

A. Certainly not. They're just more difficult to fracture.

Q. Okay, compared to --

A. To the sandstones.

Q. Okay, the coal is not a brittle material, in your opinion?

A. Not under geologic conditions and not under downhole conditions. It acts more like a plastic material.

Q. All right.

A. It has properties of plasticity, if you want to call it that. It takes more energy to break it than it does for a similar volume of sandstone.

Q. Okay, when we talk about sandstone being a brittle rock, what is the engineering measure of brittleness? In science, what do you use for that measure?

A. Well, I'm trying to see if I know the answer to that. It's been many years since I've been involved in Poisson's ratio and Moore's circle and that kind of thing, and I don't recall which of those parameters --

Q. I think you use Young's modulus.

A. Okay.

Q. Isn't that the measure?

A. You may be correct.

Q. Well, what would be the Young's modulus for the sandstone here that you classify as brittle, in your opinion?

A. I don't recall what Young's modulus we've used, and I haven't done the work on the details of the Young's modulus or that sort of thing in this, so I don't have an answer that I could say I use this number or I have this number.

Q. Well, I was trying to find out, how brittle is it? I mean, you say it's brittle, but on any kind of a scale or measure you can't supply us that information?

A. No. I know that it's greatly different from the coals and the shales, but I don't recall exactly what the numbers are.

And I don't think we know. We use numbers, we put in the best numbers we can come up with from whatever research and experiments and information we have, and back-

calculating from what we find out has actually happened. But the fact is that I don't think we really know, and that's why a simulation is an approximation and a guess and a probability tool, but not a definite, final answer as to what's happened.

Q. Well, but you are aware that there are people in the field, and it's reflected in the literature, who have done extensive studies, so there is some knowledge about what you would use for stress gradients or Young's modulus on various formations in the San Juan Basin?

A. There's a lot of research and a lot of answers, and still a lot of questions. And people come up with the best answers they can come up with, but I don't think we know yet what the right answers are.

And the answer in one township may be different from the answer in another township. It's not a generalization and you can't -- I don't think you dare use Basinwide generalizations for that kind of thing.

And to come up with specific answers to determine the answer to a legal problem, I don't think that can be used.

Q. Okay. So your opinion is that computer simulations of fracture behavior really cannot be relied on with any degree of certainty?

A. No --

MR. HALL: Object, I don't think --

THE WITNESS: -- that's not what I said.

MR. HALL: -- that's what he testified to at all.

THE WITNESS: I said a good simulation, that allows you to put in all the best inputs you can come up with and all the parameters that need to be put in, is a tool that will tell you what is most likely to have happened. That, I think, is about the limit of what you can use it for.

Q. (By Mr. Gallegos) And the validity or reliability of that depends greatly on what parameters the operator puts into the simulation?

A. Yes.

Q. You offered the opinion that FRACPRO -- Well, let's back up. What is FRACPRO?

A. It's a computer simulation model or prediction model for how a fracture is going to occur in a stimulation or how it has occurred.

Q. Do you know how widely it's used in the industry?

A. It's very widely used. It was the accepted tool several years ago. It was considered to be, at one time, a major breakthrough in simulation work, I think, in a lot of circles. It's since been shown to be very limited in what it's really capable of.

Q. In your testimony you offer the opinion, if I may

put it bluntly, that you think FRACPRO does a lousy job of stimulating [*sic*] fracture behavior?

A. I couldn't have said it better.

Q. Okay. How many computer simulations have you run of fractures, let's say, first of all, using FRACPRO?

A. I don't run them.

Q. Have you run computer simulations using any --

A. No.

Q. -- program?

A. That's where I say -- That's out of my area of expertise. I don't know how to use those simulations, I don't run those programs. All I do is review what the program said versus what the results were when we find out the information downhole, if we can.

Q. Okay, and the evidence that you offer the Commission for your opinion that FRACPRO does a lousy job is one occasion on a well in -- I guess, was it in Utah, Piceance Basin?

A. No, Colorado.

Q. Colorado. -- where the FRACPRO simulation did not match up with the tracer surveys --

A. Yes.

Q. -- done on the well?

A. Yes.

Q. What is a tracer survey?

A. It's radioactive materials, sometimes as many as three different radioactive materials, that are mixed with the fracture fluids or the fracture proppants to allow you to go back in after the frac is placed and read the different kinds of radioactivity and determine where the sand went, where fluids went.

Sometimes it's done so that you can determine where the pad went, which is the part of the frac before you start injecting the sand and then where the sand was laid down and where the fluid that was carrying the sand went. And sometimes you can get them all pretty much in the same place, and sometimes they tend to segregate.

Q. Well, so is it your opinion that tracer surveys are a totally reliable device for determining fracture behavior, fracture height growth and --

A. It's my opinion --

Q. -- fracture geometry, call it that?

A. It's my opinion that they are a far more reliable tool than a computer simulation. They're not totally reliable. That's a word I wouldn't use.

Q. All right. When your fracture simulation expert, Mr. Conway, theorizes that a fracture on one of the Whiting wells escaped from zone 750 feet from the wellbore, you would agree your tracer survey would be useless to detect that, correct?

A. Yes.

Q. In fact, the tracer survey is basically only going to detect fracture geometry just within a few inches of the wellbore; isn't that true?

A. You can see out there, I've heard numbers from 12 to 20 inches.

The question I frequently ask is, if -- given all things remaining equal, the bedding remains equal, the quality of the rock remains equal, if that frac didn't have a chance to break out of zone at the wellbore where it had its greatest energy, how was it going to break out of zone or go someplace else farther out in the formation where it had less energy?

Q. You're not familiar --

A. Neither --

Q. Excuse me.

A. Neither that opinion nor that question nor your example really addresses the fact that the thicknesses and the strengths of the rock can change out in the wellbore, or out in the formation away from the wellbore. And that's something we just -- We haven't figured out how to find that yet.

Q. Have you recognized in the literature that -- the principle -- and I may not use the right term -- but near-wellbore stress, that is because of the borehole having

been made in the rock formations, that there is a hardening of the formation close to the wellbore so that a fracture that is going to grow in height would not begin to grow until it passed that area of stress?

A. I guess I'd have to say, I've heard that theory expressed some time in the past. I don't have any knowledge of how valid the information is or how valid that opinion or theory is.

Q. But we're getting out of your area of expertise anyway?

A. We certainly are.

Q. Under this discussion -- and I'm not quite sure how some of these discussions fit together -- you talk about the Dome Federal well --

A. Yes.

Q. -- where you believe that that well sees a fracture in the Pictured Cliff that fractured down into what you refer as the third bench, deep in that massive sandstone?

A. It went 30-some feet down into the Pictured Cliffs, yes.

Q. Okay. And is it Pendragon's position that one of the things that might account for its Chaco wells suddenly having quite a remarkable uplift in gas production is that there is untapped gas in that third bench of the Pictured

Cliff formation?

A. There is gas saturation in that third bench. It's variable, but there is gas in it throughout a large area there, and it needs to be accounted for when you're doing volumetrics on the total gas available under the assumption that our fractures broke down into that zone. It's below where it's perforated, but a fracture, to grow downward, as did that one did in the Dome Federal well, it's going to tap that zone.

Q. Well, for example, when we look at the log -- and I still -- I think you have it right there on the table, the Chaco Plant Number 5 well, that certainly doesn't show any pay down below just that seven feet?

A. I don't think you can say that from this log. There's no porosity log that goes with it. Without being able to look at the porosity in conjunction with the resistivity, I don't think you can say whether or not there's any pay or whether or not there's gas saturation down there. It's certainly lower resistivity than the pay zone that was perforated, there's no question about that. But that does not eliminate it from having gas saturation that will flow.

Q. Well, if I understand your testimony, the example that you give us for some proof that there's -- if you frac a PC well down into what you refer to as a third bench,

you're going to capture some significant reserves?

A. Yes, and I've got that exhibit.

Q. Okay. That's your Exhibit 33 -- Or no, 31, isn't it? 33.

A. Well, let me pull it out of the book.

Q. Yeah, isn't this it?

A. Yeah. Can we just tack that up?

Q. Yeah. It's going to be a little hard to see from that -- why don't we keep it down here where -- Well, actually, the Commissioners have got copies. Go ahead.

A. The well you're referring to is the Dome Federal 17-27-13 Number 3. So it's in Section 17 of 27 North, 13 West, which is basically a diagonal six miles away from this area that we're talking about -- 14 miles away.

And what I did on this is include the resistivity log for the well and the density neutron log, and we were fortunate to have a density and neutron log on the well over here showing the porosity. And then the tracer survey in the middle section of the exhibit, where what you're reading here is radioactivity in this little tracer survey.

So what I had to do was interpret what radioactivity was above the baseline radioactivity of the gamma ray over here on this log. And the increase in radioactivity of any significance, within the range of what you'd get from one gamma ray to another in the same

wellbore, was an indication where the tracer went.

And this tracer was placed in the proppant. This was a radioactive sand that was traced. I have no tracer in the liquid itself, so we're just looking at where the sand went.

And this is the exhibit that shows that it went up about six feet above the top perfs, which incidentally are shown here on the right-hand side, on the middle log, on the casing collar gamma-ray log. It picked up the perfs and said that -- In fact, the operator didn't know exactly where the perfs were, and they were a little bit higher than they thought they were, so there were actually some perfs up into the shale here between the Pictured Cliffs and the overlying coal, which is this interval a little above 1300 feet.

On that cross-section on the density-neutron log, a couple things are happening. The conductivity is backing off in the interval from about 1350 to 1340 coming up through that section. I'm pointing to it here. It's reducing a little bit. That is suggesting that the ability of the rock to conduct electricity is being reduced.

At the same time, the same interval, the density log shows that the sand is cleaning up a little bit and becoming more porous, less clay-filled, so that you're getting an indication of gas content in that sand.

That's very similar to my exhibit at the end of my massive testimony there, discussing that third bench in the general area we're talking about here.

But note also that down about 1362 feet there's a streak of very clean sand. The gamma ray backs off and shows it's cleaned up the sand down there, and you have a high density reading, pushing -- Well, if this is properly calibrated, I'd say it's in the high 26-, 28-percent range. And the neutron is reduced through there, gas effect. So that plus the resistivity backing off over here on the -- or the conductivity. Resistivity is scaled where it's hard to see what's happening; conductivity is an expanded scale and you can see it better.

What it's saying is, that's gas effect right there, that's gas pay. And that's down toward the bottom of the frac, where the -- actually below the total depth that even this fracture got to when it went down in the formation 30-some feet.

So there's gas column all the way down below even where the fracture went here, that this fracture probably never tapped. It may have tapped the gas saturation I'm talking about up in here where you don't see gas effect, but you see some changes on the logs that suggest increasing gas saturation.

That's the kind of thing I'm saying that the

fracture would be able to tap if it grew down into the Pictured Cliffs.

Q. Oh, so you're not saying that -- Back up. Below the perfs, that fracture grew down about 50 feet, didn't it?

A. I think I counted 36 or 38.

Q. Okay. And I thought your testimony was to say that this fracture tapped these -- or opened up these large untapped reserves in the deep Pictured Cliffs. Is that incorrect?

A. There's gas here, below where the tracer says the fracture went. There's gas here well in the interval that the fracture went. In fact, a lot of the treatment right here went into that interval. There's gas right here.

Q. Okay, so that was the --

A. It tapped some of what was available in this particular wellbore, but probably not all of it.

Q. Okay, but the idea was, this was your example to give the Commission about how you could -- that there's these untapped reserves down lower in the Pictured Cliffs, and this well is an example of that resource being reached?

A. Yes.

Q. Okay. And now that we know that, we look at the production history and see this well was frac'd in 1979, and it produced all of 14,000 MCF --

A. Yes.
Q. -- in 12 years?
A. Yes.
Q. And that's your large untapped reserves from the lower Pictured Cliffs, or your example?
A. This was not a good well. Also, they never made any effort to lift any water, that we know of. Now, I --
Q. And you don't know whether there was any water?
A. No. No water reported,1 but I would have to say there was probably water coming from those lower zones, as well as gas.
Q. All right. Then on that same exhibit -- what was that, N-33? -- you've got the Bartlesville Number 1, which is a recent example of taking an old WAW-Fruitland Sand well and recompleting it, fracture-stimulating it?
A. Yes.
Q. Okay. So that one was frac'd in 1996, correct?
A. No, this was a 1998 frac. It was done actually after the hearing last year.
Q. Well, wasn't it frac'd in 1996 first? I mean, re-frac'd? No, frac'd, after Edwards obtained it from Merrion Oil and Gas?
A. Not to my knowledge. All I know about is this frac.
Q. You didn't know -- You didn't realize it was done

in 1996 and then a re-frac in 1998?

A. No.

Q. Do you know anything about why -- Nobody's ever explained to you that circumstance?

A. Well, I'm not agreeing yet that it was frac'd in 1996. I wasn't aware of that. But no, to answer your question, I wasn't. I don't know --

Q. Well, when you look at that interpretation of the -- or when you look at the tracer survey, that would be on the middle of the three logs shown there, is where your -- where the tracer survey is attempting to identify the presence of the fracture-stimulation --

A. Yes.

Q. -- the fracture in the formation?

A. Yes.

Q. All right. And help the Commission by telling us what the color-coding means in terms of formations.

A. The blue is coal, the gray is shale. We have another coal down here, below the upper Pictured Cliffs sand. The yellow is Pictured Cliffs sand. And the tracer I colored -- There were two tracers in this with two different radioactive materials. One is in green and one is in orange.

Q. Okay. Well, you agree that -- the interpretation that the tracer survey shows that the fracture went through

the lower coal?

A. Yes.

Q. Okay.

A. It looks like it stopped at that bedding plane between that coal and the sand. That's where it stopped.

Q. And do you agree with the interpretation that the fracture went up to and stopped at the base of the upper thick coal?

A. No. No, I don't think the fracture went any higher than the top perf, which is about two feet into the shale. Above that, if you look at the radioactivity on this log and the tracer-survey log, compared to the radioactivity over here on the density log, you've got basically the same shale above that point. You don't have any significant change in radioactivity from there up.

So my interpretation is that the fracture stopped right there at the top perf, never went up into the shale, beyond where the -- it looks to me like there may be two feet of perforations in the shale.

Q. You did not include the fracture treatment report in your exhibits, did you, Mr. Nicol? Or at least I couldn't find it.

A. No.

Q. The treatment was done by Halliburton, was it not?

A. I believe so.

Q. Do you have the fracture-treatment report handy?

A. Let me look. I'm told that maybe N-36, it may be in here. Oh, yes, it is.

Q. N-36?

A. In fact, that I had to get Edwards to clarify the heading on this fracture report, because Halliburton got the section wrong, and the --

Q. Yeah, you --

A. -- and the township wrong.

Q. Yeah, you sent a letter to them saying that there was some incorrect information on their treatment report, didn't you?

A. No, they sent it to me.

Q. Oh, they sent it to you?

A. Yes.

Q. Halliburton sent it to you?

A. No, Edwards did.

Q. Oh, I'm sorry. Okay, Edwards -- Let me get this straight. Edwards sent a letter to Halliburton saying Halliburton had some information wrong on their report?

A. Edwards sent a letter to Pendragon saying that Halliburton's information on the heading of the report was incorrect, that they had the wrong sections.

Q. All right. But Edwards didn't say anything to

Halliburton that there was any error when their service treatment report says that the formation fractured was the Fruitland Coal?

A. Formation, it says on the front of the report, Pictured Cliffs.

Q. Well, look back at the fracture service treatment report, this page right here, reporting on the treatment.

CHAIRMAN WROTENBERY: What page number is that?

THE WITNESS: It's the second from the last.

MR. GALLEGOS: It's got a fax page number, 13.

THE WITNESS: Same old problem, they've got --

Q. (By Mr. Gallegos) Same old problem --

A. Same old problem.

Q. -- these service companies just get it wrong. They did that on your Chaco wells too, didn't they?

A. They did that on a couple of them, not all of them.

Q. They thought the fracture was on the Fruitland Coal?

A. Yes.

MR. HALL: I'm going to object, excuse me, it assumes facts not in evidence. We don't know what they assumed. It's simply a mislabeling, period.

MR. GALLEGOS: Well, we don't know that they mislabeled it either, Mr. Hall.

Q. (By Mr. Gallegos) Mr. Nicol, just a few more questions, and the subject is some of what you discussed under your label of geological issues.

A. Go ahead.

Q. All right. And I'm going to refer, but I don't know if you necessarily need to pull it out. I'm going to refer -- I think you'll be familiar with it -- to the definition of the Fruitland Coal Gas Pool, Basin-Fruitland Coal Gas Pool in Order 8768.

A. All right.

COMMISSIONER BAILEY: Where are you?

MR. GALLEGOS: Because -- In his testimony, he's at 147, 149.

Q. (By Mr. Gallegos) I believe what you're telling us is that you disagree with the Order R-8768 definition, because when it defines the Fruitland formation, it uses stratigraphic equivalent in order to make that definition?

A. Oh, no, I don't disagree with it at all.

Q. Oh, you don't?

A. I just say that you've got to know how to use it.

Q. I see, okay. So you're not finding fault with that definition, or that method of defining the vertical limits of the Fruitland formation?

A. No.

Q. All right, okay. I thought your testimony was,

if you used stratigraphic equivalents you could be leaving out similar rock material that might be above that stratigraphic equivalent boundary that would be similar to rock below it. Did I misunderstand your testimony?

A. I think you did. Tell me what page that's on and I'll clarify that.

Q. Around 147 through 149. That's what I thought you were -- You say, "Another attack on the upper Pictured Cliffs sand relates to the definition of the Fruitland Coal Pool as given in Commission Order Number 8768". And then you go on to reference the type log, which is the Schneider Gas Com well?

A. Yes.

Q. But to make a long story short -- we don't need to carry this out -- I misunderstood, and what you're saying is, that's a perfectly usable and applicable definition?

A. I think it's applicable, and I think it can be used. And if I recall, what I was referring to when I said something might be in conflict with that order was the proposition from your clients that used the term "massive" to determine what is a Pictured Cliffs sand.

Q. But you agree with that -- the Commission definition that says the Fruitland formation includes all coals?

A. Above that stratigraphic equivalent. That's just --

Q. Above that stratigraphic equivalent.

A. -- the top of the Pictured Cliffs formation, yes.

MR. GALLEGOS: Okay. That's my questions, Mr. Nicol. Thank you.

CHAIRMAN WROTENBERY: Thank you, Mr. Gallegos.

Commissioners, do you have any questions for Mr. Nicol?

COMMISSIONER LEE: No, I will ask the question -- Ask first.

CHAIRMAN WROTENBERY: Do you have any questions?

COMMISSIONER BAILEY: Yes.

EXAMINATION

BY COMMISSIONER BAILEY:

Q. OCD Order 8768 that we were just discussing also has a paragraph that says that "the Division seeks to contract the vertical limits of 26 existing Fruitland and/or Fruitland-Pictured Cliffs gas pools to include only the Pictured Cliffs sandstone and/or Fruitland Sandstone intervals."

It says that a pool, Basin-Fruitland Coal Gas Pool, in paragraph 10, comprising all coal seams within the equivalent of the stratigraphic equivalent, which is the paragraph that we've been discussing quite a bit -- But I

find it very interesting that the original definition of it does say to include only the sandstone and/or the Fruitland Sandstone intervals for the Pictured Cliffs Pool.

Throughout so much of the prefiled testimony, discussions, there has been quite a bit of confusion that maybe the Pictured Cliffs Pool also includes stratigraphic formations, beds, that may be part of the Fruitland formation.

Is that your interpretation?

A. Yes, the -- Let's see if I can get this one right. The WAW-Fruitland-Pictured Cliffs -- and it may be Fruitland Sandstone-Pictured Cliffs Pool -- was restructured there to include the sandstones of both the Fruitland formation and the Pictured Cliffs formation into a common pool.

The problem we have is that our assignments relate more directly to getting the Pictured Cliffs wells -- the assignments didn't relate to which pool we were getting, we were assigned -- we were buying Pictured Cliff wells. And my purpose in my testimony where I addressed that stratigraphic equivalent in such detail is to show that we are producing from sands that are stratigraphically equivalent to the Pictured Cliffs, which is below the lower boundary of the Fruitland Coal Gas Pool.

And I'm sorry if it creates confusion over

formation versus pool, but that's what I'm trying to accomplish, is to show that we are producing from a zone that is stratigraphically equivalent to an interval below the bottom of the Fruitland Coal Gas Pool.

COMMISSIONER BAILEY: Which is the point I'd like to make for everybody, is that I would love to see the specificity of whether you're talking about the formation or the pool, because there is the potential for a great deal of confusion when you just say "Pictured Cliffs". So let's -- I would love to see everyone be very specific if we're talking about the Pictured Cliffs Pool or the Pictured Cliffs formation. That's just one of my editorials.

But I do have questions for you also.

Q. (By Commissioner Bailey) Did you perform any water analyses of the Pictured Cliffs and the Fruitland formations?

A. Yes, we have a number of water analyses in our files, and I compiled those, and also when the testing was done under the direction of the Aztec staff last -- well, a year ago February, water samples were collected and they were analyzed.

I haven't included those because I don't think they were definitive. The only component of difference that I could identify that was consistent that would

separate Pictured Cliffs from coal was, I believe, the existence of fluorides in the Pictured Cliffs that were not found in the coals, or at least a vast difference with a clean break between the two.

Other than that, it was again kind of like what I've shown on the gas analyses. I couldn't see anything that was helpful in making a differentiation.

Q. But if the fluorides was different between the two different formations, wouldn't that be helpful in determining where that water originated from?

A. It may be, and I have to confess that the question was left open whether the fluorides are coming from some treatment that's being done on the wells to inhibit bacteria or scale, as opposed to whether it's actually something that's a component of the actual water in all of the wells, and that would require some research into the chemicals that are being used to treat the wells, that I haven't an opportunity to follow up on.

Q. Was this one of those items that was discussed in the meeting with the OCD that we've had reference to, to determine what avenues of investigation may lead to more information or decisions on this question?

A. Are you talking about the water analysis or --

Q. Right.

A. Yes, yes. And I think the consensus at the time

at that meeting, or the meeting after the analyses were distributed, was that they weren't definitive, that they weren't something that we were comfortable using. I would love to be able to use the fluorides and say, Here's the separation. But I don't have enough information to prove that the fluorides are coming directly from the formation.

Q. That would be something interesting to find out.

A. Yes.

Q. Are there any recognizable geologic faults or fractures throughout this small area of review?

A. I have found nothing from the subsurface correlations and I've seen nothing on the ground that would indicate that. There are some publications showing deep-seated basement faulting in the area, but I have found nothing in the correlations that suggests there's any separation between wells, or any avenues of open fracturing.

Q. Or any evidence of migration of --

A. No.

Q. -- fluids?

What is the direction of the cleats in the coals through this area? Are they predominantly one direction another?

A. I --

Q. And how cleated is this coal?

A. It's a good permeable coal. It has to be well cleated. I believe I've seen some information that suggests the cleats are running north 60 degrees west, the major cleat systems, but I'd hate to be held to that. That's just a test of my memory.

Q. You mentioned that no water production is available prior November of 1998, but since then do we have a chart or a graph or anything indicating water production from these wells?

A. Yes, and I haven't presented it, but it will be presented in the testimony. We've tabulated what we know and what we can present or what we've been able to dig out of files as to estimates of water, primarily after February of 1998.

Q. So is it coming soon?

A. It's coming, yes.

Q. Okay. Just for the record, on page 114 of your testimony the statement is made, "...but if that P.C. well has certain producing and/or rock characteristics, the producing BTU may drop to a level comparable to that of a producing coal well." For the record, what are those rock characteristics, producing characteristics?

A. I believe the producing characteristics are the rate of flow of the gas through the rock and the pressure drop that the gas is seeing back in the formation. It may

also be the ratio of water to gas and things like that, but nobody really knows.

The rock characteristics, again, it's coming, we're going to present some testimony specifically as to what happens on adsorption/desorption of the various kinds of molecules with water and sand grains and clay and that kind of thing, but I'm not the expert on that.

EXAMINATION

BY COMMISSIONER LEE:

Q. Is this a new theory for you, adsorption and desorption, or is it well cited?

A. I think it's very well cited. It's new to me, and that's why I'm hedging my testimony on it. I'm aware of the testimony that's going to be presented, but I'm not the one that's done the research on it.

Q. You have an expert?

A. Yes, sir.

Q. His name is -- ?

A. Roland Blauer.

COMMISSIONER BAILEY: I have no more questions.

CHAIRMAN WROTENBERY: I just have a couple.

EXAMINATION

BY CHAIRMAN WROTENBERY:

Q. Why don't we have better information on water production from these Chaco wells before February, 1998?

A. Well, the bottom line there is, we just weren't reporting it as properly as we should have. We were letting water that was produced, whatever amounts, were going through a separator and an underground line and dumping into a small pit out there, whatever the dump triggered on the separator.

Our people in the field estimated that it was not enough water to have to be reported. It was -- Their estimates were generally less than five barrels a day. They did not report to us any significant water or indicate to us that they thought we were making significant amounts of water. So it's something that we just didn't follow up on.

We inherited the wells and the reporting scheme and the way the information was being handled, and I didn't change it. Probably should have.

Q. And secondly, maybe you can enlighten me a little bit on the industry practice. I notice that we don't have tracer-survey information on the Chaco wells, or on the Gallegos wells for that matter. What determines when an operator runs the tracer survey? I'm just trying to get a better feel for why they weren't done on these wells.

A. Well, first of all, budget is a large part of it. They're not cheap. If at the time you're doing the fracture you're not particularly concerned about whether or

not you're going to go out of zone, I don't think you would run a tracer, and when we did these we did not think that we would be going out of zone.

The ones I have run for our company, I've done because I was concerned about which of several zones might be taking a fracture, or whether or not our fracture was actually going to be staying in zone or just going somewhere else.

I don't know that there's any specific criteria. There really isn't any specific criteria. It's up to the operator to decide if the questions he wants to answer are important enough to spend the money to find out.

CHAIRMAN WROTENBERY: Any other questions?

FURTHER EXAMINATION

BY COMMISSIONER BAILEY:

Q. When can we expect the water records that we were discussing? You said they were coming, but is it after we're done here, or soon, or --

A. I think it's Mr. McCartney's testimony that's going to address the water volumes.

MR. HALL: And Ancell.

THE WITNESS: Yeah, and Ken Ancell. So...

CHAIRMAN WROTENBERY: Mr. Hall, do you have any redirect that you wanted to do or --

MR. HALL: Briefly. I'm confident I can finish

this before 5:00 too.

REDIRECT EXAMINATION

BY MR. HALL:

Q. Mr. Nicol, you were asked to make the comparison between the pressures reflect on your Exhibit 8 for the Chaco 1 well with those reflected by Exhibit M-25, Mr. McCartney's exhibit, and they were different. What do you understand the explanation to be?

A. I do now, after we took our break. The pressures that are in Mr. McCartney's exhibit are bottomhole pressures. They're adjusted for the weight of the gas column, and they are p.s.i.a., meaning actual pressure, not gauge pressure. So he's added the weight of the atmospheric pressure to it.

So there will be different pressures because of -- And he's also divided by a Z factor. So he has adjusted the pressures to the Z factor adjusted pressure at the bottom of the hole, as opposed to the surface pressures that are in my Exhibit 8.

Q. You were asked about the Lansdale 1 and what was incorrectly called illegal perforations into the coal. I think it's important for the Commission to know who owned the coal rights in the Lansdale 1, don't you?

A. Well, yes. It was an off-pattern location, but the fact is that under that lease Edwards owned the coal

rights when they perforated the zone.

And we acquired the coal rights when we acquired our interest in the well.

Q. And isn't it permissible under the Division's Rule 104.D.(2) that you may complete a well in a nonstandard spacing unit before you --

MR. GALLEGOS: Objection.

Q. (By Mr. Hall) -- have a standard unit --

MR. GALLEGOS: I object. The record is clear this is 160 acres, it was called a Pictured Cliffs well in the documents that were filed. This is totally contrary to what the Applicant's own evidence shows. We're trying to...

MR. HALL: The questions on cross-examination gave the impression this was an illegal completion, which it's not. We're trying to demonstrate why it is not, and I think in that respect we can ask the Commission to take administrative notice of Rule 104.D.(2), in that respect.

The unanswered question as far as Whiting is concerned is whether or not the Lansdale was producing from the coal. That's a different question than I'm asking here.

CHAIRMAN WROTENBERY: Okay, proceed.

Q. (By Mr. Hall) You were asked briefly about some of the simulations our team performed and why the Chaco 2-R

was selected. Do you know why the 2-R was selected?

A. I believe we suggested that Mr. Conway use the 2-R because that was the well that I felt would be least likely to be in controversy out of the four fractured wells, as to whether or not it might have fractured into the coal.

The buildup charts and the relationship between that well and the pressures coming and going in the offsetting 7-and-1 well, I thought, were so clear that that well is not communicated to the coal in its wellbore that it would be the most logical one to use for simulating a fractured well in the Pictured Cliffs.

Q. Mr. Nicol, we had some discussion about the labeling on the frac treatment summary for the Bartlesville well recently, and there was some discussion whether or not it's possible that frac summary treatment reports are ever mislabeled. You recall that, don't you?

A. Yes.

Q. Let me hand you what's been marked as Exhibit 69. Can you identify that, please, sir?

A. That is the --

MR. GALLEGOS: Is that a new exhibit?

MR. HALL: Yes, it is.

MR. GALLEGOS: Do we have a copy?

MR. HALL: I'm sorry, I don't. It just came out.

MR. GALLEGOS: It's okay to have new exhibits?

THE WITNESS: That's the cover page for our fracture treatment of the Chaco 4 well.

Q. (By Mr. Hall) And what's the formation reflected on the face of that?

A. The Fruitland Coal.

Q. All right. Let me hand you what's marked as Exhibit 70. Can you identify that, please?

A. That's the May 17th, 1977, completion report on the Chaco 4 well.

Q. Would you read page 2, about the picks for the top of the Pictured Cliffs?

A. Top of the Pictured Cliffs is at 1163 feet.

Q. And let's refer back to Exhibit N-69. Can you identify for the record where the perforations are reflected on that report?

A. That's the well data sheet from the frac treatment done by BJ on the Chaco 4, and it shows the perforated interval 1163 to 1189, which is identical to the original completed interval in 1977 on the completion.

Q. So the perforations for the frac summary treatment report correctly show the Pictured Cliffs perforations?

A. They do correctly show Pictured Cliffs, and that happened in the other well that was mislabeled as well.

It also, incidently, happens on this Bartlesville report. The perforations interval on the page that states it's in the Fruitland Coal clearly show the perforations to be in the Pictured Cliffs, where we have them shown on this exhibit.

So it's one of several errors in the Halliburton typing.

Q. Okay, let's talk about the other wells you just referenced. Would you identify Exhibits N-71 and N-72?

A. N-71 is the cover page for the fracture treatment on the Chaco 5 well, and N-72 is the BLM completion report on the completion of the Chaco 5.

Q. Again, would you identify the perforation intervals on N-72?

A. N-72 shows the top of the Pictured Cliffs at 1162 feet and the perforations from 1165 to -69 and 1174 to -92, so it's perforated in the Pictured Cliffs.

Q. And refer back again to N-71, the perforations reflected on that frac treatment summary report.

A. Second page, the well-data page, again shows the perforated interval 1165-1192, the same perforations, and again in the Pictured Cliffs.

Q. Are Exhibits 79 through 72 [*sic*] maintained by Pendragon in its files in the ordinary course of business?

A. Yes.

MR. HALL: We'd move the admission of Exhibits 69 through 72.

CHAIRMAN WROTENBERY: Any objections?

MR. GALLEGOS: Not as long as we understand this waives this objection to any exhibits that weren't prefiled.

I mean, if that objection is going to be maintained by Mr. Hall, then we would object. But otherwise, if this opens it up, then we don't have any objection.

MR. HALL: Well, I think this is clearly in the form of a rebuttal-type exhibit.

MR. GALLEGOS: Well, that's what our -- the purpose of our exhibits are too.

MR. CONDON: Could we just ask to get a copy at some point so that we have a --

CHAIRMAN WROTENBERY: Certainly.

MR. HALL: We'll provide that to you.

CHAIRMAN WROTENBERY: We'll admit these into the record. That's Exhibit N-69 through N-72.

MR. HALL: That concludes my redirect of Mr. Nicol.

RECROSS-EXAMINATION

BY MR. GALLEGOS:

Q. Mr. Nicol, you agree, do you not, that both BJ

Services and Halliburton have extensive experience with -- their people have extensive in conducting fracture-stimulations on various formations in the San Juan Basin?

A. From the standpoint of operating the equipment to do the fracturing, absolutely.

Q. Well, their technicians are also very familiar with the fracture stimulations in the formations that are being addressed; isn't that true? That's why they're used?

A. Yes, sir.

Q. And neither BJ Services nor Halliburton has any interest in the outcome of this proceeding, do they?

A. Not to my knowledge.

Q. Now, the Lansdale Federal Number 1, you don't deny that the documents filed with the Division call that well a Pictured Cliffs well; isn't that true?

A. That's correct.

Q. And you don't deny that it was dedicated to a 160-acre spacing, correct?

A. That's correct.

Q. And you don't deny that it was in the southeast quarter?

A. That's correct.

Q. And if it were a Fruitland Coal well in all three respects, that would be contrary -- that location, that spacing and that characterization would be contrary to the

rules, isn't that right?

A. That's correct.

Q. And you don't deny that it was perforated in the Fruitland Coal, acidized and produced from the Fruitland Coal for approximately four, four and a half years?

A. It was perforated and acidized, and I don't know which zone or which zones produced the gas.

Q. Well, it was perforated, acidized, and it was open --

A. It was open --

Q. -- the well was open to the Fruitland Coal?

A. That's correct.

Q. And as a result of that activity, and finally the filing of sundry notices, Pendragon was informed by the Bureau of Land Management that it had committed certain violations of the regulations, BLM regulations, isn't that true?

A. Yeah, we filed the sundries after we actually squeezed the well, and that was the problem they slapped our hands for.

Q. Well, the problem was that you hadn't filed notices also prior to show what you were doing with the well in terms of the perforations; isn't that true?

A. Well, you say "you". Again, that was before my time.

Q. All right, Edwards. Correct?
A. That was the origination of the problem, yeah.
MR. GALLEGOS: All right, that's all.
CHAIRMAN WROTENBERY: Thank you, Mr. Nicol.
THE WITNESS: You're welcome.
CHAIRMAN WROTENBERY: I believe that's all.
It's about 4:30. We would like to plow on a little bit longer if you are willing.
MR. HALL: Yes, we are.
CHAIRMAN WROTENBERY: Who did you plan to call as your next witness?
MR. HALL: Can you give me a second --
CHAIRMAN WROTENBERY: Surely.
MR. HALL: -- to confer with my witnesses?
CHAIRMAN WROTENBERY: Why don't we take just a five-minute stretch break here?
A ten-minute, okay, I've had a request for a ten-minute.
(Thereupon, a recess was taken at 4:37 p.m.)
(The following proceedings had at 4:47 p.m.)
CHAIRMAN WROTENBERY: Okay, we'll get started again.
Who's up next?
MR. HALL: We call Paul Thompson to the stand and have him sworn in.

PAUL C. THOMPSON,

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

DIRECT EXAMINATION

BY MR. HALL:

Q. For the record, state your name.

A. My name is Paul Thompson.

Q. Mr. Thompson, where do you live?

A. I live in Farmington, New Mexico.

Q. By whom are you employed?

A. I am the president of Walsh Engineering and Production Corporation.

Q. All right. What is Walsh, basically?

A. We're a contract engineering and production company. I do well-site supervision work, reserve analysis, contract pumping primarily.

Q. All right. Would you give the Commission a very brief summary of your educational background and work experience?

A. Sure. I have a bachelor's degree in chemical engineering from New Mexico State University. I received that in the fall of 1976.

I worked in the research department for Phillips Petroleum in Bartlesville for three years, transferred back to Farmington in 1979 and went to work for Northwest

Pipeline in the drilling department. In 1983 I became the manager of production and drilling for Northwest Pipeline. We operated several units at that time, drilled some of the first coal wells in the 31-6, 30 and 5, 32-7, 32-8 units.

And in 1992 I bought Walsh Engineering and have been doing consulting work since.

Q. You've previously testified before the Division and the Commission and had your credentials accepted as a matter of record, have you not?

A. Yes, I have.

MR. HALL: And Madame Chairman, I'd state, we're not offering Mr. Thompson as an expert in this particular circumstance. He is a qualified petroleum engineer and has been accepted in the past.

Q. (By Mr. Hall) Can you estimate for the Commission how many wells you've drilled in your career?

A. All of my drilling experience has been in the San Juan Basin, but I'd say several hundred.

Q. Can you estimate how many coal wells?

A. More than 50. Fifty to a hundred.

Q. And how about Pictured Cliffs wells?

A. About the same.

Q. How many well-stimulation treatments have you worked on?

A. Acid jobs, well more than 50, and hundreds of

frac jobs.

Q. In fact, didn't you drill the Maralex wells that are the subject of this Application?

A. Yes, I started working for Mickey in the fall of 1992 and did the permitting work on these wells and actually drilled these wells.

Q. Okay. When you say Mickey you mean Mr. O'Hare?

A. Mr. O'Hare, I'm sorry.

Q. Mr. Thompson, are you familiar with the Application that's been filed in this case?

A. Yes.

Q. And you're familiar with the lands that are the subject of this case?

A. Yes.

Q. And the wells?

A. (Nods)

Q. The answer is yes?

A. Yes.

Q. What is your relationship to Pendragon, the Applicant?

A. I'm the contract operator of his wells. I supervised a lot of the on-site rig work, and my company then contract-pumps his wells now.

Q. All right. Are you familiar with the regulatory filings that are made for Pendragon's Chaco wells?

A. Yes.

Q. Are you familiar with the files that the BLM maintains on these Chaco wells?

A. Yes, I am.

Q. Have you reviewed them recently?

A. Yes, just last week.

Q. All right. Did any of those files contain any plugging-demand letters?

A. No, none of them did.

Q. Did you supervise the acid jobs in 1995 on the Chaco Limited 1-J and 2-J and the Chaco 4?

A. Yes, I did.

Q. Now, you said you've drilled a number of Pictured Cliffs wells and been involved in a number of stimulation treatments. Are acid jobs common treatments for Pictured Cliffs wells?

A. Yeah, they're common treatments for scale removal.

Q. All right. And did you supervise the frac jobs for the Chaco 1, 4, 5 and 2-R wells?

A. Yes, I did.

Q. In each of the Chaco wells, in what formation are the upper set of perforations located?

A. The perforations are in the WAW-Pictured Cliffs, as reported on the original completion reports.

Q. Were the Chaco wells reperforated in any other interval at any time that you're aware?

A. No.

Q. And did you confirm that?

A. Yes, in -- Let's see, I believe it was June of 1998, we pulled the tubing in all four of those wells and ran a gamma-ray collar correlation log, which confirmed the placement of the perforations in the zones as reported. There are no perforations in the coals.

Q. Let me refer you to what's already admitted into evidence as Exhibit N-5. Can you identify that?

A. These are my workover reports when we did that work.

Q. All right. And generally what was the purpose of those reports? Are those casing collar survey logs there?

A. Just to confirm the location of the perforations, that they were as reported, and they all were.

Q. All right. What shape were the Chaco wells in when Edwards and Pendragon acquired them from Merrion?

A. These wells actually had been ignored for quite some time. It was actually even tough to find them when we got there, because no one really had been paying attention to them. There's reports in the files where they had applied for the low-flow measurement, so that was -- they were getting their two or three MCF a day through El Paso's

meters without anybody having to go there.

So basically it didn't look like anybody had been there, to those wells, for a long time.

In my opinion -- You know, they all had 1-inch lined pipe for tubing which is, in my opinion, difficult to unload wellbore fluids. They had probably been sitting with a column of water on the formation for quite some time, and the things were -- you know, I think bottomhole pretty bad shape, but on the surface as well. The casing and tubings weren't manifolded together where it was difficult to equalize and blow the well. There weren't any separators, just underground drips. Pretty much they were tough to operate at the start.

Q. Now, what were your initial efforts to try to restore some decent production to the wells?

A. Well, basically we tried to get the wells to unload on their own, which a lot of times if you add soap to them to try to lighten the wellbore fluids you can get them to come around. But basically there wasn't enough inflow into the wellbore to get much happening.

Q. I believe you were present for the questioning and testimony today, and there was reference to a casing leak on the Chaco Number 5. Do you recall that?

A. Yes, I do.

Q. What do you know about that casing leak?

A. Well, what had happened here is that we had rigged up actually with the frac crew to frac the well to the existing perforations. And just as we started the pad, we started getting communication out the Bradenhead. And there actually weren't even any Bradenhead valves; it was just open there on the back side. So we immediately shut down and said, you know, something's wrong here.

We went in with a packer and determined -- a bridge plug, actually, and a packer -- and determined that the bottomhole was somewhere around, you know, 970 feet, is where we set our bridge plug and tested there, and everything below there tested okay -- or, excuse me, from there to the packer tested okay.

But we found holes up through a couple-hundred-interval. So what we elected to do instead of trying to squeeze off all those holes at one time -- and again, realize we're working with 2-7/8 tubing as casing, so we don't really have a big wellbore to work with here. We elected to back off the 2 7/8.

So we ran a freepoint, determined that that casing was free above 950 feet, backed off the tubing at that point, removed all the bad joints of tubing, ran back in the hole screwed into the 2 7/8 that was left in there and pressure-tested everything to 1000 pounds. Everything held fine, so we didn't have any more leaks below that

level.

Then we perforated two holes down around 950 feet, just above the freepoint, and circulated cement to surface, cleaned the well out and then frac'd it later on.

Q. Now, was that casing leak -- Where was that casing leak with respect to the coals?

A. Well, again, it had several hundred feet of holes, but the bottomhole was at 950 feet. The Fruitland Coal, I believe -- I don't have the logs with me -- I believe the top of the coal stringers are around 1100 feet. And then the PC perfs were down around 1165 feet.

So we had, you know, a hundred and some feet, 200 feet, of cement above the coal, between the coals and the holes.

Q. There was some reference earlier today that there was a report of the well producing black water. What does that mean when you see black water?

A. Well, if you were there at the time, what that was was this old stagnant wellbore fluids that were behind the tubing, and that smelled kind of H_2S. I'm sure it was hydrogen sulfide, you know, that sort of black scale stuff, you know, sewer water.

Q. Is it common?

A. Well, yeah, unfortunately the few casing leaks I've been around, you know, those wellbore fluids that had

been behind the pipe for 20-some years are kind of rancid, and that's what this looked like.

Q. Does the fact that the water was black, does that mean it came from coal?

A. No.

Q. Who designed the frac jobs applied to the Chaco 1, 4, 5 and 2-R?

A. Well, actually I guess I'd have to take credit for the jobs on the 1 and 2-R, and basically I was using techniques that we had used in the area, which actually I had plagiarized some from Giant and now Central, but they had been doing a lot of coal and PC work in that area in the past. And Roland Blauer designed the frac jobs on the 4 and 5.

Q. Did you find them to be effective?

A. Yes. These in particular, or the design itself?

Q. Well, both.

A. Yeah, we had experimented with several different techniques because we had, you know, troubles with screenouts before. I was somewhat worried about Roland's design because he had such a low flow rate, or slower than what I thought would be required to keep the frac open enough to keep it from screening out, but the jobs worked fine.

And the results of the frac job were exactly what

you'd expect from a frac job. The production increased dramatically, which is why you frac wells in the San Juan Basin to being with.

Q. All right. Did the volumes of water increase?

A. Well, yeah, basically we were making no water on the wells before. I think they were so plugged up that we couldn't get any wellbore liquids to unload on their own. So yes.

Q. What are your general observations with respect to the water produced by the Chaco wells?

A. The Chaco wells -- Let me preface by saying that I contract pump about 75 wells in this Chaco Plant area, I call it, probably half Pictured Cliff, half Fruitland Coal wells. So I have somewhat of a feeling just qualitatively, I guess, as what's a coal well and what's a PC well. These wells never made water --

MR. GALLEGOS: Excuse me, Madame Chairman, we've gone quite a ways from a fact witness into being an expert witness. Mr. Thompson is not listed, there's not prefiled testimony, and now he's giving opinion testimony.

We can go a little ways with this, but this is out of line, it's improper, I object to it, and we should not allow it.

MR. HALL: I think he's entitled to testify about his experience, his familiarity with the production of

wells of this type in the area.

MR. GALLEGOS: No, you're asking him to make conclusions, draw conclusions, state opinions, and if he was going to do then he should have been listed as a witness, he should have had prefiled testimony and been treated as any other opinion witness.

MR. HALL: The specific question was, what were his observations?

MR. GALLEGOS: Well, and then he's going off and getting ready to -- He didn't answer that question, he started telling about all his experience and how he can tell the difference between this well and that well, which is obviously opinion testimony.

CHAIRMAN WROTENBERY: Please relate your observations as --

THE WITNESS: -- to these wells in particular. I thought these wells acted like Pictured Cliff wells and that the wells could unload on their own, without having to be pumped, any kind of artificial lift, which to me they were -- You know, once we got the frac fluids back, relatively minor amounts of water.

Q. (By Mr. Hall) Were any of the -- From your observations, were any of the production pits ever full of water?

A. They were certainly full after the frac jobs,

because we'd flow back into these wells, and these wells had extremely small pits when we first started. A couple of them, you know, were only like four by four by a foot deep, because they had all filled in with flow sand. We cleaned those out to the pits that you see in Mr. O'Hare's pictures.

But the only times they've ever been full is when we're doing work on the wells, so we have to either kill it or we blew it down after we get it done.

Q. Other than the times that the Chaco wells were reworked, did you ever observe the pits to be full of water?

A. No.

Q. Let me refer you to Whiting Exhibit O-8, I believe it is, O'Hare 8. Do you recognize those photographs? Why don't we take a minute and let the Commissioners find their copies?

CHAIRMAN WROTENBERY: What are we looking for? I'm sorry.

MR. HALL: It's AMO-8, I think. It's called -- It's the Whiting Exhibit 8 for Mr. O'Hare.

Q. (By Mr. Hall) Let's look at the photograph for the Chaco 1. I believe that's the one on top, isn't it?

A. Yes.

Q. You've seen that pit a number of times?

A. (Nods)

Q. You need to answer verbally.

A. Yes.

Q. There appears to be -- Well, first of all let me ask you, Do you see any water in that pit, in that picture?

A. It doesn't appear to have any water, no.

Q. What's that white ring that you see there?

A. I don't know. It might be alkali in the soil. You see a lot of white stuff in the washes. I don't know.

Q. Is it possible that that white ring was created when the well was worked over?

MR. GALLEGOS: Object, calls for speculation.

CHAIRMAN WROTENBERY: Sustained.

Q. (By Mr. Hall) Let's compare the picture to the Chaco 1, to the picture -- I'm sorry, let's look at the picture for the Chaco 4.

A. This one?

Q. Yes. And it's labeled in the lower right-hand corner, Chaco 4, correct?

A. (Nods)

Q. Just say yes.

A. Yes.

Q. Now, let's compare -- First let me ask you, the Chaco 4 was one of the wells that was frac'd, correct?

A. That's correct.

Q. Let's compare that photograph with the photograph of the Chaco 2-J.

A. Okay.

Q. Let me ask you, was the Chaco 2-J frac'd?

A. No, it was not.

Q. Do you see any appreciable difference between the two photographs for the Chaco 4 pit and the 2-J pit?

A. They look like two empty dirt pits to me.

Q. All right. Mr. Thompson, were the Chaco wells ever put on pump?

A. No, they were not. They were able to unload right after the frac jobs, they'd clean up on their.

Q. Based on your experience, have you ever seen a coal well in this part of the Basin that could be produced without pump?

A. No.

Q. Let's talk about the acid jobs briefly. If you can recall, if you know what rates the acid was injected?

A. I believe we did these jobs at one barrel a minute.

Q. And in your experience, have you ever seen a one-barrel-per-minute acid job on the Pictured Cliffs fracture out of formation?

A. I don't believe so at that rate and those pressures, I don't believe so.

Q. What volumes were typically used for these acid jobs?

A. Normally I'd use 500 gallons of acid and just displace it, five six barrels, down into the perf.

Q. And is that size of acid job common for Pictured Cliff wells?

A. I understand it is. Other operators in this area do the same.

Q. All right. In your experience, did you ever see an acid job on a PC well cause it to start behaving like a coal well?

A. No, I have not.

MR. HALL: That concludes my direct of Mr. Thompson.

CHAIRMAN WROTENBERY: Mr. Gallegos?

CROSS-EXAMINATION

BY MR. GALLEGOS:

Q. Mr. Thompson, my earlier question concerning observation of black water and coal fines had nothing to do with the Chaco Number 5, in spite of Mr. Hall's questions; it had to do with the Lansdale Federal Number 1 and what was reported in 1980 when that well was fractured. You're familiar with that well, are you not?

A. Yes.

Q. And you're familiar with the reports --

A. No, that --

Q. -- reports?

A. -- I guess that was done by Tenneco or someone well before my time.

Q. I think it was Southern Union.

A. Southern Union.

Q. But you haven't -- having worked on that well later, you didn't go back and review the well file?

A. No, I did not.

Q. All right. In 1993 and 1994, isn't it true that from time you were checking the Gallegos Federal wells?

A. Yes, that's true, yeah.

Q. You and sometimes your pumpers would go and check those wells and see what the production levels were, water and just sort of --

A. Well, I can't say my pumpers, but like I mentioned, you know, I permitted those wells and I drilled like 14 wells for Mr. O'Hare between Christmas day and New Year's eve in 1992. I took a little bit of pride in my involvement in that project. I was working out in the area, I didn't see any harm in stopping by the meter to see how they were doing.

Q. Okay.

A. I was glad for Mr. O'Hare that the projects were working out so well.

Q. All right, and you saw that those wells were doing quite well after some period of time?

A. I saw the gas rates, yes.

Q. Well, and those were good gas rates?

A. Those looked good to me.

Q. Was there ever water hauled from these pits in the Chaco wells that we see in these photos?

A. When we would work on them we'd have to, because you can see from the photos those are pretty small pits.

Q. Tell us what the facts are concerning who hauled the water, when, and about what quantities.

A. Well, I couldn't say specifically, but we have James McKnight as the water hauler for Sunco. He was working out there, and we would haul water, you know, from different places, and when we needed a load hauled we'd either call James or Sunco directly, and he'd come haul it off to the disposal well.

Q. Are you testifying that water was only hauled from these pits, just the flowback of the frac fluid when the wells were reworked?

A. That's my recollection. I was never out there when there was much water in the pits. I don't think we ever hauled these pits on a regular basis, only when we worked on them.

Q. Well, how many times did you work on them?

A. Well, we worked on the Chaco 1 a couple times because we thought we had a tubing leak.

Q. And then the rest just one time?

A. I believe so, yes.

Q. Okay. And so your testimony would be, water was hauled by Sunco from these wells just on one occasion?

A. Well, probably immediately after the frac jobs, and then whenever we did workovers.

Q. Well, the workovers were the frac jobs, weren't they?

A. No -- Well, you know, we moved on the Chaco 1 a couple times looking for tubing leaks. Those would be the workovers, as opposed to the frac jobs.

Q. So January of 1995 and May of 1995?

A. I can't remember the exact dates.

Q. When -- in regard -- I'd just like a little more specifics about the casing leaks on the Chaco 5 well. Was it your observation that there were multiple leaks?

A. Yes.

Q. You set the plug at -- What was it? 970 feet?

A. I believe that's right.

Q. And the perforations, the top of the perforations were what? 1165?

A. That's correct.

Q. Was any effort made to determine whether there

were openings in casing between 970 and 1165?

A. I think initially we set the bridge plug right on top of the perfs and then worked our way up to that point. But you know, we'd set the bridge plug and then you'd set the packer, and you could pump in between that interval and establish communication out the back side. So we knew we'd had a hole there, and we just kept moving the packer.

Q. So you didn't just set it initially at 970?

A. No.

Q. Have you had any experience with what effect 7.5-percent hydrochloric acid used to acidize a well has on cement?

A. Yes, I do.

Q. What has been your experience?

A. If acid is not moving, it doesn't have any effect.

Q. And if it is moving?

A. If it's moving, the acid effect on the calcium parts of the cement builds up a film, and so the acid will quit reacting on that. I've seen that happen, drop a piece of cement in a beaker of 15-percent HCl. It bubbles for a little bit, then the whole chip is still there.

But if you keep that film off, like if you're moving the cement, pump the ce- -- or, excuse me, the acid in the formation and keep that film removed, then you will

continue to keep eating on the cement.

But not all of cement is calcium carbonate, so it's not all going to react to the acid. Like if you're trying to do an acid job for calcium carbonate scale, you know, it will keep working on it.

Q. As we've heard, the Lansdale Federal well was opened by perforations under your direction in the Fruitland Coal formation?

A. That's correct.

Q. And that well produced after that work was done on the well; isn't that true?

A. Yes.

Q. And produced rather nicely, about 300 a day?

A. Yes.

Q. That well was not on pump, was it?

A. No.

MR. GALLEGOS: That's all I have.

CHAIRMAN WROTENBERY: Commissioners, any questions?

EXAMINATION

BY COMMISSIONER BAILEY:

Q. The pictures that you've shown us were supposed to indicate that because we don't see any water standing or water lines, that there isn't much water being pumped into these pits; is that --

A. These are actually Mr. O'Hare's photos.

Q. Right, but your discussion of them is that you didn't see much water ever in these pits, right?

A. That's correct, I never saw more than a couple inches to a foot of water in the pits.

Q. Is this sandy soil?

A. Yes, it is.

Q. Would you expect sandy soil to transmit the water down into the ground at the surface?

A. Right. You know, I guess I'm basing my water production rates most on seeing what's coming out of the dump from the separator, you know, when the separator will build up a little water in the pit. It didn't seem like that little trickle of water was more than five barrels of water a day, which kind of was borne out by the tests that we ran when we set the fiberglass pits and tested the wells. They were in the five- to six-, ten-barrel-a-day range.

Q. So that's your best estimate, is five or six, not based on observations --

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

Q. So your estimate of five to six is based on installation of fiberglass pits.

A. That was one point in time, and that seemed to have confirmed by overall impression of what the water

production was.

Q. Do you know what the water table is in this area?

A. No.

COMMISSIONER BAILEY: Okay, that's all.

THE WITNESS: We're well out of the vulnerable area.

CHAIRMAN WROTENBERY: Commissioner Lee?

EXAMINATION

BY COMMISSIONER LEE:

Q. You say the Pictured Cliff can let the water out because you use the small tubing, right? Did you use the same thing for the Fruitland?

A. No, actually we swabbed out tubings. These wells all had the 1-inch, you know, and I there comes a point where the increased velocity you get up to 1-inch versus the extra friction drop you get on the 1-inch is kind of a defeating point. So most of these 2-7/8 wells, we took the 1-inch out and ran 1-1/2 IJ tubing in. But there was enough inflow from the formation to continually lift the liquids.

Q. Your lawyer compared the Pictured Cliffs to Fruitland, so did you use this small tubing in the Fruitland?

A. We -- I do operate some Fruitland coal wells with the smaller tubing, and they won't flow.

Q. But in general this is not a good comparison?

A. No, because in general most of the new Fruitland Coal wells were drilled recently where they have 4-1/2 casing and use 2-3/8 tubing so they can be pumped.

Q. Okay.

A. It's tough to operate with 1-1/2-inch tubing, to try to pump that.

COMMISSIONER LEE: Thank you.

CHAIRMAN WROTENBERY: Thank you. Mr. Hall, any --

MR. HALL: Nothing further.

MR. GALLEGOS: May I -- Just a little information?

FURTHER EXAMINATION

BY MR. GALLEGOS:

Q. When were the fiberglass pits, receptacles, put on these wells?

A. Those were done during that test with the OCD.

Q. Is that a result of when the OCD went out there in February of 1998?

A. Yes.

Q. That was as a result of the direction by the OCD for --

A. Right, we were -- You know, instead of estimating water, we were asked to go out and get gas samples, water

samples, accurate water rates. That was part of that testing program.

MR. GALLEGOS: Okay, thank you.

MR. HALL: One brief question.

CHAIRMAN WROTENBERY: Okay.

FURTHER EXAMINATION

BY MR. HALL:

Q. Mr. Gallegos asked you about your observations on the Maralex coal wells. Do you recall from your observations whether any of those coal wells were put on compressor between February of 1998 and February of 1999?

A. Compressors started going in back in November of 1997, to the best of my recollection.

Q. I see. The compressors were out there before February of 1998, then?

A. Yes.

Q. Are the pits for the Chaco wells permitted with the OCD?

A. Yes.

MR. HALL: Nothing further.

CHAIRMAN WROTENBERY: Anything else, Mr. Gallegos?

MR. GALLEGOS: I have nothing further, thank you.

CHAIRMAN WROTENBERY: Thank you very much.

Do you have another witness --

MR. HALL: We call --

CHAIRMAN WROTENBERY: -- you'd like to go ahead and call?

MR. HALL: I have a technical witness, and we'll be pleased to put him on, if that's the wish of the Commission -- if he's still here. He is.

CHAIRMAN WROTENBERY: Why don't we go ahead and get started, and we'll see how far we get --

MR. HALL: All right.

CHAIRMAN WROTENBERY: -- about six or so, and then --

MR. HALL: All right.

CHAIRMAN WROTENBERY: -- wrapping it up sometime -- 6:00, 6:30, around there.

MR. HALL: Okay. Call Roland Blauer to the stand.

ROLAND BLAUER,

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

DIRECT EXAMINATION

BY MR. HALL:

Q. For the record, state your name.

A. I am Roland Blauer.

Q. Mr. Blauer, where do you live?

A. Larkspur, Colorado.

Q. How are you employed and in what capacity?

A. I am the president of Resource Services, International, a consulting company, in Denver, Colorado, and I was also a -- at one time a partner with Pendragon.

Q. Would you give the Commission a very brief summary of your educational background and work experience?

A. I have a master's degree from Colorado School of Mines, bachelor's and a master's degree from Colorado School of Mines in petroleum engineering, graduated in 1969 and 1975. Since then I've been essentially a consulting engineer working in the areas of hydraulic fracturing and reservoir evaluation and optimization. Early in my career I was also the inventor of Foam-Frac.

Q. You're familiar with the Application that's filed in this case?

A. Yes, sir.

Q. And you're familiar with the lands and the wells that are the subject of the Application?

A. Yes, sir.

Q. You previously testified before the Division and had your credentials accepted as a matter of record?

A. That is correct.

MR. HALL: I assume that we are stipulating to qualifications for each other's experts. In any event, we tender Mr. Blauer as an expert petroleum engineer.

CHAIRMAN WROTENBERY: He is so qualified.

Q. (By Mr. Hall) Mr. Blauer, have you prepared some written testimony in connection with this case?

A. Yes, sir, I have.

Q. And do you adopt and affirm your testimony here today?

A. Yes, sir, I do.

Q. Would you please give the Commission a summary of your investigation and what you've concluded.

A. Yes, sir.

CHAIRMAN WROTENBERY: And Mr. Blauer, if we could keep it to around ten minutes, we'd --

THE WITNESS: I'm going to try and do it faster than that.

(Laughter)

CHAIRMAN WROTENBERY: Thank you.

THE WITNESS: In my previous appearance in front of the Commission, I had briefly touched on the causes of changes in BTU with production rates and times and reservoirs, particularly the Fruitland Coal and the PC.

And I just -- After that very brief touch-on, there was quite a bit of interest developed in maybe more specific information as to why we were comfortable that the changes of the heating content from the production from the Pendragon wells was not just solely because of possible

completion or fracturing or intrusion into the Fruitland coal.

So the testimony that I -- or the work that I brought for today, half of it involves my explanation and my belief of the mechanisms that are at work and working in the Pictured Cliffs wells, explaining the reduction of BTU with production.

I see that there are essentially three or possibly four mechanisms, depending on how you define them. We're dealing with the thermodynamic behavior of pure gases and also mixtures of gases.

The particular temperature and pressures of this reservoir is such that methane, ethane and propane are gaseous at the temperatures and pressures of -- at -- within the study time. Butane and pentane and the heavier hydrocarbons can exist as gaseous or liquid in the pure state. However, this is a complex mixture of gases, and if you assume equilibrium in the gases you may not have the possibility of pure-state liquids.

So one mechanism is the behavior of pure gases, the second mechanism is the behavior of gaseous mixtures.

Now, over and above that is also the fact that gases and particularly CO_2 diluents -- the two diluents particular to this reservoir is nitrogen and CO_2 -- plus methane, ethane and propane have some solubility in water,

and that is absorption of the water into the liquids in the reservoir, and that can happen at the surface of the rock or it can happen in free water.

And then the last one is one that's a little bit more -- the last mechanism that's -- function in this reservoir is one that's a little bit more controversial in the petroleum world because it has not been well studied yet, and that's the adsorption of these gases onto rock materials.

Now, adsorption is well documented in the petroleum industry in organic materials, particularly coals, the Antrim shale. You can review the literature and find that there is quite a bit of study involved in determining the adsorption mechanism in these materials. There has not yet been a large amount of study, and certainly none that I could find in the Pictured Cliffs reservoir, especially in this area, that deals directly with adsorption of CO_2 and methane onto the rock material.

What I am presenting is that based upon a study of Pictured Cliffs wells, the actual histories of Pictured Cliffs wells -- this is the one piece of data that I do have -- is that very consistently the Pictured Cliffs wells have high initial heating contents. And we could go into a lot of details on the ratios of methanes, propanes, ethanes, CO_2 contents and nitrogen contents.

But interestingly enough, and in my data I presented some examples showing that quite often during production, the heating content of Pictured Cliffs wells declines. Now, it doesn't necessarily in a predictable fashion, but it does decline.

And another interesting thing we see in these wells is that if a well is shut in for a protracted period of time, often the heating content rises. Now, my explanation for this phenomenon is a very complicated reaction of the pure materials, being liquid or gaseous at different reservoir pressures and temperatures. That's one element.

As the pressure is dropped during production, gases that are held in solution, most notably CO_2 and methane, will come out of solution and be produced by the wellbore. That would have a tendency to drop the BTU.

And then the fourth mechanism is, also as the pressure drops, the materials that are adsorbed -- again primarily methane and CO_2 -- that are adsorbed onto the surface of the rock materials, are produced and would tend to drop the heating content of the gas.

Now, one of the interesting things about both absorption and adsorption, the solubilities of the gases and the absorptions, is, one, that they're pressure-related and there is some level of hysteresis.

Now, again, I don't have specific data on the adsorption in this particular rock, but from other studies, other rocks, other compounds and the general, I guess I would say, technological understanding of adsorption, is that if you were to increase the pressure in a reservoir that is capable of adsorption, you would increase the amount of material that would go back on. And that's the basis of the adsorption/desorption tests for coal, for example. That's something that I know has been common in the petroleum industry.

The same general mechanism works with rocks. So again, as a reservoir is produced, the reservoir pressure is dropped, the gases that are adsorbed onto the surface of the solid material would tend to come off the material or out of solution, and since the strongest adsorbing materials are methane and CO_2, you would tend to have a depression of your BTU heating content from the production of that gas.

That's all I was intending to say on -- I mean, my written testimony has some details and things.

The other thing that I was asked to discuss very briefly was, as was mentioned by Paul, I was one of the people who had submitted a design for the Chaco frac jobs, and there is in the record a letter, I believe, which was a memo to him about Chaco frac jobs and my concept of how to

fracture.

I was asked to that because I do do fracture-design work for my clients. I have an extensive experience in fracturing coalbed methane reservoirs, is also the reason I had some understanding of adsorption and desorption. And Pendragon had wanted my experience in the design of the frac job because we were desirous of not fracturing into the coal.

A large body of my experience involved trying to keep fractures in the coals, wells that were perforated in a coal zone, and the desire was to maintain the fractures in the coal. The client that's probably most familiar to this body would be Evergreen Resources.

What I found in that work was that it was fairly difficult to keep a fracture contained in a coalbed. A well that was perforated in a coal, fractured with relatively low rates of fluids, low viscosities -- rate is more important than viscosity, incidentally -- would almost immediately fracture out of the coal into the surrounding sands or shales.

What was also interesting was that without exception we would find that the fracture would stop growing when it encountered the next coal-shale barrier. So there was a mechanism in place from direct observation of fracturing in the field with extensive radioactive

tracers that said that lithologic changes were effective fracture growth barriers.

And in this particular case for Pendragon, my commission was to keep the fracture in the sand and out of the coal. And the design that I turned in was intended to do that by minimizing the fracturing rate, which I think is more important than viscosity, but also minimizing the viscosity, and also pumping a very small quantity, both of liquids and of proppants.

I was not particularly that we would break into the coals because of my experience with the coal-sand-shale interfaces and the fact that those interfaces effectively stop fracture growth. And then when I was being very cautions with the rates and the volumes to assure that we would not break those, I felt very confident that we had not.

I think that's my summary.

CHAIRMAN WROTENBERY: Let's make sure we've got the exhibits.

MR. HALL: Do you want me to tender those each time?

CHAIRMAN WROTENBERY: Yeah, I think so.

MR. HALL: We'll do that.

Q. (By Mr. Hall) Mr. Blauer, were Exhibits B-1 through B-26 prepared by you or at your direction and

control?

A. Yes, sir.

MR. HALL: We would move the admission of B-1 through B-26.

CHAIRMAN WROTENBERY: Any objection?

MR. GALLEGOS: No objection.

CHAIRMAN WROTENBERY: Okay, Exhibits B-1 through B-26 are admitted into the record.

Did you have any further questions for Mr. Blauer, or does he stand ready for cross-examination?

MR. HALL: I think he's ready for cross.

CHAIRMAN WROTENBERY: Mr. Gallegos?

CROSS-EXAMINATION

BY MR. GALLEGOS:

Q. Mr. Blauer, at the July, 1998, hearing before the Division in this matter, you were Pendragon's fracture-stimulation expert?

A. That is correct.

Q. Now, you are -- In August of 1999, you are Pendragon's gas-analysis expert?

A. Well, more correctly stated, in the earlier hearing I had information, some information, on the gas analysis, and then I also had information on hydraulic fracturing.

Q. But the thrust of your testimony now is on the

gas analysis?

A. With the exception of my design concepts, when I did the design procedure.

Q. With two or three pages in here about --

A. Yes, sir.

Q. -- the design procedure?

A. Yes, sir.

Q. Okay. And in July of 1998 you were a partner -- I may not have this exactly correct -- a partner in the Pendragon Energy Limited Partnership?

A. Yes, sir.

Q. Is that correct?

And now in August of 1999, you no longer occupy that ownership position?

A. That is correct.

Q. All right. When I reviewed your résumé, which is Exhibit B-1, I did not see gas composition or gas analysis listed as an area of your specialization.

A. Not specifically, no sir.

Q. Okay, so it is not an area of your specialization, you would agree?

A. I would not agree with that.

Q. Okay, you just didn't feel like it was something worth listing on your résumé; would that be your testimony?

A. Not specifically as a gas-composition analyst,

no, sir.

Q. Okay. And when I reviewed your publications, I also saw that you had no publications in that area of subject matter?

A. That is correct.

Q. In your testimony, is -- to try and get at the crux of it -- your opinion that the Pictured Cliff wells in this area initially have a high-BTU value, but a they are produced over time the BTU level drops?

A. Yes, sir, that is correct.

Q. Okay. And then if they're shut in, the BTU level goes up?

A. It might.

Q. It might, all right. What are -- You refer in your testimony to initial -- or high initial heating values of these wells?

A. Yes, sir.

Q. But I don't see any number attached to that, so what would we understand are the, quote, high initial heating values in the Pictured Cliff wells in this area?

A. In my exhibits, Exhibit Number B-15 --

Q. Uh-huh.

A. -- I have a tabulation of wells in the area that is sorted by BTU content, and if you look at this list of example wells, you'll see that the highest-BTU content on

this particular list is 1181 BTUs.

The top part of the list, you see, is predominantly PC wells under "Producing Formation". There's a couple coal wells down -- the Cowsaround -- that have high BTUs of 1064. My comment of high BTUs can have a value that's probably greater than 1000 and something less than 1200.

The significance of high BTU, though, in my study, is that BTUs of particular wells, when you take the entire heating-content history of a well, is that the values start high and then with production decline with time.

Q. Well, let's get back to the question. When they start high in PC wells in this area, what would you expect that level to be?

A. On a reasonable average, I would say somewhere above 1050 and less than 1150.

Q. All right. So then what would you expect to be the average heating value of coal wells in this area?

A. Well, the coal wells, again, have a variety, a variation of heating contents. And again on Schedule B-15 we see some coal wells that show BTU contents at some point in time of 1064, going down into the -- I would say, high 900s, at the bottom of the scale.

Q. So what could we expect -- We're trying to

bracket this. Now you've got a 100-BTU leeway for the Pictured Cliff wells. What is your average or your bracket for the Fruitland Coal wells?

A. Initial heating contents would be around 1000. I mean, if I were to take -- A reasonable average would be around 1000, maybe a little lower.

Q. And when you give us the benefit of these observations, would you say this is unique to this particular area of the Basin?

A. Which part is unique?

Q. The heating values that you've told us that you would expect to see in a Pictured Cliff well initially and you'd expect to see in a Fruitland Coal well.

A. Well, I haven't studied the entire -- I've concentrated this particular area, because this is low-pressure PC, it is a particular area under study, and the conclusions that I'm making, especially in the adsorption phases, would only be applicable within this pressure range.

Q. Well, I'm asking, so this doesn't apply to Pictured Cliff formations Basinwide when you say initially you would expect the BTU value to be 1050 to 1150?

A. I don't know.

Q. Okay. What is our area, then, that we're talking about? The WAW-Fruitland?

A. The area on this map, and specifically the wells in and around the Chaco wells.

Q. Okay. So we're really talking about a very confined area here of maybe six sections?

A. Yes, sir.

Q. All right, where the Chaco wells are and the Whiting wells?

A. Yes, sir.

Q. If the Pictured Cliff wells are continuously produced for, let's say, a period of ten years, then what will the heating value fall to, in your opinion?

A. Well, historically and looking at the actual production data from the PC wells in the area, the heating value does fall. What it falls to is -- I guess I would have to say I have not gone through and done an average of all of the PC wells' BTU declines. I have looked at the declines of the heating content of specific wells, and I presented some of that in my testimony.

I would say, though, that that's a function of the initial heating content, it's a function of the gas constituents contained in the reservoir, it will be a function in the amount of water that's in the PC, both mobile and immobile, and also the amount of, particularly, clays where you have large surface areas for the adsorption.

Q. Are you aware that during the period the Chaco wells were produced, from approximately mid-1995 until they were shut in, July of 1998, their gas composition very closely mirrored the gas composition of the Gallegos Federal Coal wells?

A. I'm sorry, what was the time-frame again, sir?

Q. Mid-1995 until mid-1998.

A. The gas contents were similar. But if you look at the trends of the heating contents from those wells and do an entire examination of the entire heating content, of the history, and you also look at the production rate that occurred in the Chaco wells, there is a very rapid increase in production -- which would have been a very dramatic reduction in reservoir pressure as a result of this rapid production rate -- you would expect that from both solubility and absorption principles, that your CO_2 and methanes would be coming out, and you would expect to see a drop in BTU that would be quite sizeable.

Q. Well, let's go back. So the answer is yes, the heating value, the gas composition from the coal wells and the Chaco wells during that period were very similar?

A. They were similar.

Q. All right. And the objective of your testimony is to explain why Pictured Cliff -- or gas produced from wells that were ostensibly Pictured Cliff wells -- looked

like the coal gas in terms of gas composition and heating value?

A. Well, we were only using heating value as the key, and this came from some --

Q. Okay.

A. -- original information that Whiting presented at the Aztec meeting, and the contention that your client has made is that that change in BTU was solely a result of a direct connection into the Fruitland Coal.

Q. All right.

A. And I'm disagreeing that that's the only explanation for changes in BTU content.

Q. All right, and you're offering some other explanations here, and I think you've listed three mechanisms. I mean, it sort of says four, but then when you put it together it seems like it's more like three mechanisms; is that fair to say?

A. That's a possibility, yes, that's what I'm doing.

Q. Okay. And the first mechanism, if this would be the right label, would be phase change? Would that --

A. Yes, sir.

Q. -- be the phenomenon or the mechanism?

A. Yes, sir.

Q. Okay, and this is where the hydrocarbons in the formation change from a liquid to a vapor; is that a --

A. Yes, sir.

Q. -- fair way to state it?

And you say that's caused by changes in pressure and temperature?

A. Well, you can have phase changes as a result of both pressure and temperature. But since the reservoir temperature is probably constant, we're only dealing with changes in pressure.

Q. Okay, but just so -- to try and get a basic understanding, if temperature or pressure -- and as you say, we're dealing with a constant temperature, I assume here?

A. I would hope so.

Q. Okay.

A. Yes.

Q. About 90, 95 degrees at the face of these formations?

A. Depending on the well, yes. There's some variation, it appears.

Q. Okay. Let's say 90 to 100 degrees.

A. Okay.

Q. All right. Okay, so what you're telling us is, a that temperature and certain pressures, the hydrocarbons, the lighter hydrocarbons, would vaporize and the heaviers would separate and stay back in the formation, *ergo*, you're

getting mostly methane through the wellbore?

A. That's not what I'm saying.

Q. Oh, okay.

A. If you -- Just so I can have a visual reference, Exhibit B-2, which is a phase-change graph, a generalized phase-change graph -- I have specific phase-change graphs for different pure materials behind that.

Q. Well, we're not dealing with pure gases and pure materials here; we're dealing with a composition, aren't we?

A. Well, we have to do the pure materials first, because there is a possibility the can exist as --

Q. Okay.

A. -- in the reservoir.

Q. All right.

A. Essentially, I have on this graph a line which is marked "Constant Temperature", starting in the liquid portion of the component phase diagram. And as pressures dropped, which is the left-hand chart, a number of things happen. But you reach a point where -- It's called the bubble point. It's this elliptical area on the middle of the graph. At the point that the bubble point is reached, the material converts very rapidly from a liquid to a gas. And then over on the right-hand side of the chart, as pressure continues to drop, you have just gaseous phase.

Now, methane and ethane, in this reservoir, at the reservoir conditions of a maximum, say 300 p.s.i., at 100 degrees fahrenheit -- and those are, I think, the next two exhibits, B-3 and -4 -- they are gaseous at all conditions in this reservoir. And these are standard phase diagrams.

Now, with propane, if there's -- starting at 300 p.s.i. in Exhibit B-5, you see there's a small pressure from about 300 p.s.i. to about 140 p.s.i., just reading off the graph, where propane can be in the liquid form. Once the pressure in the reservoir drops below the 140 p.s.i., approximately, you reach the bubble point and the propane can become gaseous.

Now, that particular material, if it is pure material in the reservoir, pure gas in the reservoir, that will become gaseous. Now, the significance of a material becoming gaseous is, it tends to flow a little easier through the reservoir as a gas than a liquid. So if you drop below the 140 pounds, the pure materials that a reservoir will flash off become gas and will probably be produced in the gas stream.

Butane is a little bit different. It's liquid until about 40 degrees, and then it can become gas. And then the heavier hydrocarbons above butane will probably be liquid at all temperatures and pressures in this reservoir.

And the PC gas, from the gas samples that were collected, do produce a certain quantity of hydrocarbons greater than the butanes. Typically it's two or three percent.

Q. Well, let's look at your Exhibit 7.

A. Okay.

Q. I thought perhaps that was a significant exhibit, because I thought I understood this, and your explanation, to be that you're demonstrating where -- what temperature and pressure the heaviers condense and remain in the reservoir, as opposed to being vapor and being part of the gas stream.

A. That's one part -- That's one mechanism. Now, Exhibit B-7 is an equilibrium phase diagram for the mixture of gases. The earlier --

Q. Right, and that's the way they are in the reservoir. They're not a pure ethane or pure propane; they're a mixture?

A. That is correct.

Q. And that's what we're dealing with on Exhibit 7 --

A. That is --

Q. -- as they exist in the reservoir?

A. Well, we're not sure that they exist this way in the reservoir. The gas samples are collected at the wellhead, and it's whatever is produced at the wellhead.

And we assume that that stuff that's produced is exactly the same material that is moving through the reservoir and is only the material.

What I did here in Figure B-7 was, I checked to see if a gas analysis of produced gas was indeed capable of being in equilibrium as gas only at these reservoir conditions. And what I found from B-7 is that at the reservoir temperatures and pressures, I would expect the produced gas to be gaseous at the reservoir conditions. I do not necessarily believe that that eliminates the possibility of heavier hydrocarbons to be present in the reservoir and moving but haven't been produced in gas in these early samples.

Q. Well, isn't this sort of blob envelope here the area where the heaviers would condense and remain in the reservoir?

A. If you were to cross this blob, either by cooling the reservoir below -- it looks like about zero degrees fahrenheit, you would have some of the material become liquid. What this graph shows is that at temperatures above about 40 degrees fahrenheit, which is 280 degrees Kelvin, this gas composition could exist as gas only. But this gas mixture --

Q. That's exactly where I was going, and we're talking about 90 degrees to 100 degrees, way to the right

of this, out of the envelope. So this gas mixture of methane, ethane, propane, butane, et cetera, is going to appear as gas?

A. That is correct, in the reservoir, if you assume equilibrium and if you discount the possibilities of any small-port throats having buildups of heavier hydrocarbons existing as liquids, which has also been reported in the literature as a possibility.

Q. So there would be no phase change with our reservoir temperature?

A. Only for this gas mixture. If there are --

Q. Well, this is the gas mixture that you got.

A. This is the gas mixture that's produced. This is not to say -- This gas mixture that's produced does not necessarily identify the entire gas composition of the hydrocarbons and the diluents in the reservoir.

Q. All right. And as far as the phase change, I see nothing in your testimony of any calculation that indicates to us that you could draw a conclusion that because of what you call phase change, the BTU value of the Pictured Cliff wells has changed one percent or two BTUs or anything else?

A. From phase changes?

Q. Yes.

A. That's correct.

Q. Let's talk about absorption of gas into the

reservoir water.

A. Okay.

Q. All right? And when you're talking about reservoir water, you're talking about connate water, water trapped in the pore spaces of the rock, right? You're not talking about removable water that comes off the formation?

A. I'm talking about both kinds of water.

Q. Okay.

A. Solubility is based upon the total mass of water available, and it can be connate water or it can be movable water.

Q. Okay. And the principle, if I understand it, is that if you increase pressure you may force some gas into solution. You decrease pressure, and you release gas from solution. Is that -- Maybe that was simplified.

A. That is essentially correct, yes, sir.

Q. All right. And if that phenomenon is occurring, you can apply Henry's law of gas composition and you can calculate what happens; isn't that right?

A. With single-phase materials that's essentially correct. It becomes a little bit difficult when you start dealing with binary and tertiary mixtures, meaning two and three different gases. So again, you have gas-mixture issues, and --

Q. But there's a formula, and there's a way to input

your pressure, your temperatures and what you know about gas composition and determine and quantify whether this adsorption is making a difference of whatever --

A. Yes --

Q. -- one percent, ten percent, or whatever?

A. Yes, sir, you can do that.

Q. Right. But you didn't do that, did you?

A. No, sir.

Q. Would you disagree that if the calculation is made taking the pressure from 300 p.s.i. to one -- to zero p.s.i., would make no more than a one-percent difference in the BTU value?

A. I could not agree or disagree with that.

Q. Okay. And now your final mechanism is adsorption of gas into the reservoir rock, if I understand it?

A. Onto the reservoir rock surface, yes, sir.

Q. Okay, and adsorption of gas is a widely recognized principle when you're dealing with a coal reservoir; isn't that true?

A. It's well reported in the petroleum industry, yes.

Q. But here we're addressing the behavior of the Pendragon Chaco wells, which are supposedly in a conventional rock reservoir, correct?

A. That is correct.

Q. All right. And the only thing that I saw in your work that involved any kind of literature -- and I may have missed this -- about this principle, was your Exhibit B-13. Is there anything else?

A. Some of the literature cited was also addressing adsorption of materials onto hydrocarbons, and essentially all of the Antrim shale work, that is well known in the literature, deals with adsorptions of gases onto surfaces of nonorganic materials.

Q. What you're talking about here, Mr. Blauer, is a very esoteric theory when it comes to whether any gas is adsorbed into conventional reservoir rock, isn't it?

A. I don't think it's esoteric at all. I understand that Burlington Northern has issued a report that there's 100 trillion cubic feet of gas in the Lewis shale, which is notably a nonorganic material, and the Antrim shale work, GRI work, reported that even at very low total organic carbon, total organic content percentages, there was a certain amount of methane that was adsorbed onto the surface.

The reason I included B-13 was that I felt the very question you're asking was going to be brought up to me, that adsorption of materials, most notably methane and CO_2, onto nonorganic materials was not a possibility or a probability, or whatever. And I went into the adsorption

literature to look for just a general piece of information that talked about, in this case, oxygen, nitrogen, carbon dioxide, methane and ethane, and their abilities to adsorb onto different mentals [*sic*] and --

Q. Metals --

A. -- different oxides.

Q. -- into different metals, right?

A. And oxides. If you look down the list, you have zinc oxide and aluminum oxide and so on.

The point I was making with Exhibit B-13 was quite honestly that adsorption of methane, ethane, CO_2, nitrogen to a very limited extent, oxygen, onto nonorganic materials is something that's known. It has not been studied in the oil and gas industry particularly well.

After I did this, I found that one of the Commissioners is very well known, and he has an interesting paper, Dr. Lee. One of his students, I think, I'm sorry, has a paper that talks about the adsorption of mercaptan into gas-storage reservoirs. And the interesting thing on that particular analysis is, here we have reservoir that was chosen to not have organic material. It's just rock, doesn't probably have a lot of clay content because they want high permeability, probably not a lot of water. And they found that adsorption of mercaptan was something that could be measured and monitored and predicted.

And so the only point was, again, because I am honestly left with no data in this area, I do not know of any adsorption/desorption curves of the PC anywhere -- I have plenty of adsorption/desorption curves of Antrim shales and Fruitland Coals and Raton coals all over the world. I just needed to say this is not an esoteric possibility. I do not have information to quantify that, though, in this reservoir.

Q. And you have not quantified it in your testimony?

A. Not in the testimony. I had -- When I first went through this process to see if there was a possibility this was a real mechanism, I went into the GRI database, looked at the low total organic tables that they have. They have relationships of adsorbed methane into the Antrim shale, and I looked at five percent and four percent total organic content rates and found that for methane they would predict 10 to 12 to 13 standard cubic foot per ton adsorbed methane into those particular shales.

Methane is interesting because it's not as aggressive in adsorbing as CO_2. So if they had done CO_2, they probably would have found the amount of gas that was adsorbed onto the Antrim shale of CO_2 would be much higher.

Now, the significance of that, when I went through that calculation, I found that there was about a million standard cubic foot per hundred acres of 20-foot-

thick Antrim shale, if we had Antrim shale, available for desorption of methane. And that leads me directly to the fact that there's enough gas there, particularly CO_2 and methane, to materially change the heating content of a produced gas stream.

Taking that as a starting point, I then looked at the historical production, and the historical BTU contents of a number of PC wells found that the behavior of the BTU, the heating content, was as that concept would predict.

So indirectly, I do have that information.

Q. Well, what did that concept predict? Quantify that for us.

A. That as you produce --

Q. You don't have it in your testimony, do you?

A. Yes, sir, I do. If we look at Exhibits -- I've got my exhibit shuffled, I'm sorry. I'd like you to look at Exhibits, simultaneously, B-16 and I believe B-17.

B-16 is -- The upper portion of the curve is the heating content of the Designated Hitter Number 2, and B-17 is the combination of BTU ethane, propane, methane and carbon-dioxide percentages from the test data from the Designated Hitter Number 2.

Realizing that both solubility and adsorption are pressure-related, as you produce the reservoir, you would expect the pressure to decrease. And if this model is

right and you release CO_2 and methane out of solution and off of the rocks, you'd expect the BTU content to drop with production, which is clearly shown in the Designated Hitter data before January of 1992.

You also see that the ethane percentage, the heat con- -- let's see, I have this plotted as ethane and propane content percentage -- drops during that period. The methane increases, and there's a slight increase in the CO_2 from the initial production on.

Interestingly enough, this well was shut in. These processes are reversible, both solubility and adsorption are reversible. You would expect, then, that if a well was shut in and then brought back later on line, in this case as a result of re-entry by the operator, that the BTU content would increase with the shut-in time, because the average reservoir pressure around the wellbore would increase, and indeed it did. We have seen this behavior in many wells.

Q. So you differ with Mr. Nicol, whose testimony was that increased pressure would reflect a higher BTU value from the Pictured Cliff production, and decreased production that would result from production over time would result in a lower BTU value? You disagree with that?

A. No, I don't disagree with that at all. That's what we're seeing in the data.

Q. I thought you said just the opposite, when you shut in the pressure increased.

A. The pressure increases, the BTU will increase.

Q. All right. You're familiar with the equation that's commonly used for calculating reserves on a volumetric basis?

A. From conventional reservoirs, yes, sir.

Q. From conventional reservoirs, that's what we're talking about.

A. Yes, sir.

Q. Although, I don't know -- Do you know that the Designated Hitter is, in fact, a Pictured Cliff well or whether it's producing coal gas.

A. It's identified as a Pictured Cliffs well.

Q. Identified. All right. The equation for calculating reserves on a volumetric basis for conventional wells, that's what I was asking you about, and you're familiar with that formula?

A. Yes, sir.

Q. And I'm sure you've used it many times?

A. I have.

Q. That formula has no term for gas adsorbed from reservoir rock, does it?

A. That is correct.

Q. The industry has never considered that as a

significant factor --

A. I don't think I --

Q. -- has it?

A. I don't think I can say never, I don't know. In my practice up to the last couple years I have not. Adsorption is something that has come around to the oil industry because of coal gas and then Antrim shale.

MR. GALLEGOS: That's all I have.

CHAIRMAN WROTENBERY: Commissioner Lee?

COMMISSIONER LEE: I guess I have to ask questions.

THE WITNESS: I'm in trouble now.

EXAMINATION

BY COMMISSIONER LEE:

Q. Suppose initially your reservoir had a lot of water and is saturated with methane. We're talking about absorption, a-b. So when you first pull the gas, what will the composition be?

A. The composition of the produced gas?

Q. Say now is the --

A. After --

Q. -- methane shut in --

A. Okay.

Q. -- and you have a lot of water and you've got a lot of methane there. When you first draw down, what

happens to your gas composition?

A. I believe what will happen is that some of the methane will come out of solution, also some of the carbon dioxide, which is important in this concept. Some of the methane would come out of solution, and you would have a mixed --

Q. Which one coming out first?

A. I think they would both come out at the same time, but the CO_2 -- Assuming that you were in equilibrium and you had enough material to be fully saturated in the water -- I mean, we have to make a lot of assumptions here about the conditions --

Q. No, no, just -- no assumptions. Just methane.

A. Just methane.

Q. Because the other things to the water, according to your report, other things in the water are negligible, right?

A. Again, that would be a specific-well issue --

Q. But you're saying the methane is coming out from the water?

A. If the methane -- If we take your premise --

Q. Okay.

A. -- of methane and some quantity of water --

Q. All right.

A. -- and we're only dealing with the methane in

solution --

Q. What I'm saying is, if you totally draw down, your gas will be lighter. So in the early life your gases will be light, then later on will be heavy.

A. When you start, before you draw the pressure down, you'd have your mixture of gas that is existing as gas --

Q. When you draw your gas -- Your production is after you draw your gas, right?

A. Well, if you took your gas sample very early in the life of the well, the first four or five days --

Q. Even ten seconds.

A. -- you'd have an immediate -- Right around the wellbore where you have decreased your reservoir pressure, you would have the methane coming out of solution essentially instantaneously.

Q. When you're drilling, you don't lose any gas in the -- initially?

A. Oh, I think you --

Q. You don't test your gas?

A. I don't know that -- I don't think I've ever seen anyone test gas --

Q. Okay.

A. You would lose some, yes.

Q. What I'm saying is, my position is different from

your position.

A. Okay.

Q. All right. I honor your observation.

The second one is adsorption, a-d. Suppose you have the methane, ethane, propane and butane, you put a lot of rock together --

A. Uh-huh.

Q. -- and push them through. Which one goes through first?

A. Well, the methane -- In that order, more the methane. Oh, which one travels through the rock first?

Q. (Nods)

A. I'd say probably the heavier hydrocarbons will go through first.

Q. Then you're violating all the gas chromatograph principles.

A. Excuse me. Maybe I didn't understand the question. The methane, I think, would adsorb first.

Q. Yes --

A. Okay.

Q. -- like big brother coming and kick him out.

A. And so if we had a gas analysis before this mass of rock --

Q. Yes.

A. -- and a gas analysis after this mass of rock --

Q. Yes.

A. -- and there was -- the rock had no -- I mean, if it was completely free surface --

Q. Only adsorption, we're only talking about adsorption.

A. Okay, adsorption. As the gas mixture moved through the rock --

Q. Which one goes through first?

A. I would say the methane would.

Q. Methane.

A. Yes.

Q. So in the early life of your production, according to adsorption, it should be lighter, right?

A. That's why I think in the data, if you look at the Designated Hitter, for example, you see that the very first sample is taken at about 1075.

Q. Okay, I won't argue with that. I just want to --

A. And with a very small -- relatively small amount of production, which means that we're moving -- dropping the pressure away from the wellbore with time, we see a very rapid drop in the BTU content, and then we see a slower drop with time after that. And that particular footprint is seen everywhere I've looked.

Q. Any paper that talks about methane adsorbed into sandstone?

A. I could not find any, sir.

Q. All right, the last question I have is page 9 of your work. The second paragraph, can you explain that to me?

A. Page 9. This is in the text portion?

Q. Yes.

A. I'm sorry, I need to have one that's numbered.

This is "Both pure propane and butane..." Is that the paragraph you're asking?

Q. Yes. You're saying if the pressure is above 44 p.s.i.a., if I interpret it right, the butane will drop. What's the equilibrium criterion?

A. What I was saying in this paragraph.

Q. Phase behavior, phase behavior.

A. Okay, in the phase behavior. And I'm assuming from the analysis I did where I went through that process it was all gaseous.

Q. Just tell me what's equilibrium, what equilibrium means.

A. Equilibrium, in my concept, is that the mixtures of the gases are at a stable content, the masses, small percentages of gas, there's no exchange --

Q. Suppose we have a 100-p.s.i.a. mixture.

A. Yes, sir.

Q. We need to have 44 percent of the butane to meet

that 44 p.s.i.a. Do you know that?

A. Yes, sir.

Q. So...

A. I think what I was saying in this paragraph was just if pure products are available, if -- and I --

Q. What do you mean, the pure products available?

A. Liquid butane, liquid methane.

Q. Do know what the -- From your experience, what is a separator, gas separator -- Suppose you have a liquid part. What separator do you want to set it?

A. I'm sorry, I didn't understand the question.

Q. From your experience, when you produce some heavy gas, then you want to put some separator, on what pressure -- What is the pressure you put in there --

A. You would adjust the pressure to --

Q. -- to retrieve the liquid?

A. You would adjust the pressure to a pressure high enough --

Q. That's --

A. -- for --

Q. -- p.s.i.a.?

A. -- this mixture. I --

Q. For this mixture is -- We are talking about 100 p.s.i.a.?

A. Yes, sir. In the --

Q. In the phase behavior, how can you have a liquid there?

A. You can't. And I think that's what -- that one exhibit I said.

Q. You didn't even show me the result. That's -- You're assuming that's your gas composition.

A. I'm assuming the produced gas is the gas composition, yes, sir --

Q. Then --

A. -- in the reservoir.

Q. So you have a liquid down there?

A. I'm saying --

Q. At that pressure --

A. -- in heavier hydro- -- No. No, sir. No, sir, that's not what I'm saying.

The produced gas was gaseous, and I went through the -- I took a computer program and calculated the equilibrium phase diagram for that composition to --

Q. At that temperature and pressure?

A. Well, the phase diagram was for a range of temperatures and pressures. And what I found when I did that, that at reservoir temperature that mixture of gas was gas only and could not be liquid.

Q. You say the "Heavier hydrocarbons are essentially liquid". Is that your writing here?

A. If there were pure substances and then -- What I was doing was, I was going through the process of first taking pure substances and then taking mixtures. I was also trying to say that --

Q. How can you do this when the whole thing about phase behavior is multi-component?

A. Yes, sir, and that's where I ended up and said that in this reservoir, based upon a specific individual gas composition, the material was all gaseous. And later in my testimony I said that at these reservoir conditions, this mixture is gaseous, and the production is gaseous.

And so I think we're in agreement.

Q. No, we're not.

A. Okay.

Q. Either you're wrong or I'm wrong.

A. Well, the paragraph that you're asking me to -- On page 9, where I'm talking about both pure propane and butane would be liquid if they existed as pure substances, they do not exist as pure substances in this reservoir at these conditions.

COMMISSIONER LEE: Okay, I don't have any further questions.

COMMISSIONER BAILEY: No questions.

CHAIRMAN WROTENBERY: Any redirect, Mr. Hall?

MR. HALL: Dare I?

MR. CONDON: You're going to have to explain the answer.

REDIRECT EXAMINATION

BY MR. HALL:

Q. Let me see if I can get at some of your testimony in response to Dr. Lee's questions.

When you had immediate drop in pressure around the wellbore at initial production, that's when you first experience high-BTU readings?

A. That's -- you're -- I'm assuming that that initial production is the gas that's coming out of the reservoir as it is.

Q. All right. And as the pressure front starts to move away from the wellbore into the formation, what would happen to the methane?

A. The methane that is dissolved and the CO_2 that is dissolved and adsorbed would start to become part of the gas mixture.

Q. It would move easier?

A. It would become part of the gas mixture. It would move out of the water and off the rock, into the gas, and you'd expect to see a change in the gas mixture constituents.

Q. And would that give you a leaner gas BTU reading?

A. Yes, sir.

Q. Is it your conclusion, Mr. Blauer, that in this circumstance BTU values are not a reliable means of determining the source of gas supply?

A. That's my bottom line.

MR. HALL: Nothing further.

CHAIRMAN WROTENBERY: Any follow-up, Mr. Gallegos?

MR. GALLEGOS: Nothing.

CHAIRMAN WROTENBERY: Thank you for your testimony, Mr. Blauer.

And I think we'll shut it down for the evening, then. And what would be a good time to start back up in the morning?

COMMISSIONER LEE: Six o'clock.

CHAIRMAN WROTENBERY: Six o'clock?

(Laughter)

MR. GALLEGOS: Do you want to try 8:30?

CHAIRMAN WROTENBERY: 8:30 sounds good to me.

MR. HALL: That's fine.

CHAIRMAN WROTENBERY: Okay.

MR. CONDON: Could we just get -- make sure we know the order of presentation for tomorrow?

MR. HALL: It's as in the notebooks.

MR. CONDON: Okay, so it will follow the notebook?

MR. HALL: Yes.

MR. CONDON: Okay.

CHAIRMAN WROTENBERY: Do you have any idea how quickly you think you'll cover -- I guess we've got four more expert witnesses and possibly one more fact witness; is that right?

MR. HALL: Yes, and there may be a need for rebuttal. It's hard for me to say.

CHAIRMAN WROTENBERY: I'm just trying to figure out, are we going to be starting at some point tomorrow with the opponents' case?

MR. HALL: At the rate things are going, I'm not optimistic that we will.

CHAIRMAN WROTENBERY: Okay.

MR. HALL: And remember, we're taking Mr. Cox out of order.

CHAIRMAN WROTENBERY: That's right, I was considering that we won't be going through his testimony till next week.

MR. HALL: Yeah. I will say, I think Mr. Nicol was the longest testimony in --

MR. CONDON: -- history.

CHAIRMAN WROTENBERY: We may well, then, get into some of your witnesses --

MR. HALL: It's hard to say.

CHAIRMAN WROTENBERY: -- toward the end of the day tomorrow.

MR. CONDON: Okay.

CHAIRMAN WROTENBERY: We'll see.

MR. CONDON: We'll see.

CHAIRMAN WROTENBERY: We'll see. Just be prepared.

(Thereupon, evening recess was taken at 6:20 p.m.)

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CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, Steven T. Brenner, Certified Court Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Commission was reported by me; that I transcribed my notes; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL August 28th, 1999.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 2002