NEW MEXICO OIL CONSERVATION COMMISSION

STATE LAND OFFICE BUILDING

STATE OF NEW MEXICO

CASE NOS. 10446, 10447, 10448, 10449

Consolidated

IN THE MATTER OF:

The Application of Yates Petroleum Corporation for Authorization to Drill, Eddy County, New Mexico

VOLUME I

BEFORE:

CHAIRMAN WILLIAM LEMAY

COMMISSIONER GARY CARLSON

COMMISSIONER BILL WEISS

FLORENE DAVIDSON, Senior Staff Specialist

State Land Office Building

September 9, 1992

REPORTED BY:

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Certified Shorthand Reporter
for the State of New Mexico

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I N D E X

E X H I B I T S

CHAIRMAN LEMAY: Good morning. This is the Oil Conservation Commission. My name is Bill LeMay. To my right is Commissioner Gary Carlson, representing the Commissioner of Public Lands, State of New Mexico. On my left is Commissioner Bill Weiss.

Today we have four cases which will be consolidated, Case No. 10446.

MR. STOVALL: And it appears on the docket as 10466. This is the application of Yates Petroleum Corporation for authorization to drill, Eddy County, New Mexico.

CHAIRMAN LEMAY: Case No. 10447.

MR. STOVALL: It is styled in the same manner, the application of Yates Petroleum Corporation for authorization to drill.

CHAIRMAN LEMAY: Case No. 10448.

MR. STOVALL: Mr. Chairman, if you would like to call both of them, I'll just read them the same way.

CHAIRMAN LEMAY: And Case 10449.

MR. STOVALL: All four cases are styled the application of Yates Petroleum Corporation for an authorization to drill, Eddy County, New Mexico.

Mr. Chairman, for the record, I think it appears that based upon the last round of this hearing the Commission entered an order, and the functional purpose of these applications are for an exception to the no drilling prohibition of order R-111-P, but they are indeed for an application to drill.

CHAIRMAN LEMAY: I think we're really continuing these cases, are we not, because we had a round of legal arguments? So we'll style them a continuation of the de novo hearing concerning these cases.

We'll call for appearances in all cases.

MR. CARROLL: Mr. Chairman, my name is Ernest Carroll of the Artesia law firm of Losee, Carson, Haas and Carroll, and we are here today representing the Applicant, Yates Petroleum.

CHAIRMAN LEMAY: Thank you, Mr. Carroll. Mr. High?

MR. HIGH: For New Mexico Potash Corporation, Mr. LeMay, Charles C. High, Jr., of the Kemp-Smith Law Firm, and Clinton Marrs also appears for New Mexico Potash.

CHAIRMAN LEMAY: Thank you. Additional

appearances?

MR. CARR: May it please the Commission, my name is William F. Carr with the Santa Fe law firm Campbell, Carr, Berge and Sheridan. I would like to enter my appearance on behalf of Kaiser-Francis Oil Company. We do not intend to present a witness.

CHAIRMAN LEMAY: Additional appearances in the case?

MR. BRUCE: Mr. Chairman, my name is Jim Bruce from the Hinkle Law Firm in Santa Fe. I'm entering an appearance on behalf of Pogo Producing Company, Santa Fe Energy Operating Partners, LP, and in association with Elizabeth Harris, I'm entering an appearance on behalf of Phillips Petroleum. We do not plan to present any witnesses.

CHAIRMAN LEMAY: Mr. Kellahin?

MR. KELLAHIN: Mr. Chairman, I'm Tom Kellahin of the Santa Fe law firm of Kellahin & Kellahin. In the hearing back in March, we entered our appearance on behalf of Bass Enterprises Production, and we continue with that representation today.

CHAIRMAN LEMAY: Will you have any

witnesses?

MR. KELLAHIN: No, sir.

CHAIRMAN LEMAY: Additional appearances? Will those witnesses who will be giving testimony over the next couple of days, please stand to be sworn in?

MR. CARROLL: Mr. Chairman, I have eight of my witnesses here. There is a ninth that may or may not testify. He is not present, so that he would have to be sworn in at a later time, and his name is Arthur Maxwell.

CHAIRMAN LEMAY: We'll swear him in at that time.

MR. CARROLL: I just wanted to bring that to your attention, so we're not trying to hide anything.

CHAIRMAN LEMAY: Sure.

[The witnesses were duly sworn.]

MR. STOVALL: Mr. Chairman, before we start, I'm going to recommend that the Commission, and I'm not sure it was done in the previous rounds of these cases, that the Examiner record be incorporated into the record. There was no actual testimony given at that, but there were legal discussions primarily between myself

and the attorneys for the parties, which laid some of the legal bases that have gotten us here, and if there are no objection from the parties, I believe it would be useful to have that in the record before you.

MR. CARROLL: I would concur in that recommendation and we would so move.

CHAIRMAN LEMAY: Do you concur, Mr. High?

MR. HIGH: We have no objection.

CHAIRMAN LEMAY: Without objection, the record of the Examiner hearing concerning these cases will be entered into the record of this Commission hearing.

I think just to review some of the legal discussions we've had, for those of you that weren't present during our first hearing of this case, the Commission voted to agree to hear exception to the R-111 rule, our R-111 order, which is why two of the applications of course are on the docket for de novo hearing.

We also, and correct me Mr. High, Mr. Carroll, if I'm not stating these correctly, we agreed to confine the cases to arguments concerning exceptions and concerning the actual

applications and not a colateral attack or not a broad discussion of changing the R-111-P order.

MR. HIGH: That was my understanding.

MR. CARROLL: I think that was made clear to us.

CHAIRMAN LEMAY: So, in that light, have you gentlemen agreed how you're going to handle presenting opening arguments and then going on with your cases?

MR. CARROLL: I think the Commission has heard enough opening argument in all the legal arguments that preceded, and I would propose just--I think you're well-educated in what the case is, and I would propose starting with the witnesses and trying to get our job done.

CHAIRMAN LEMAY: Is that agreeable with you, Mr. High?

MR. HIGH: I'll be more than glad to give an opening statement if the Commission wants to hear it again, but I would agree with Mr. Carroll, given the length of time we were up here last time, you may be tired of hearing about it already.

CHAIRMAN LEMAY: I think we have a

pretty good idea where you're coming from, gentlemen, so let's begin.

MR. HIGH: I would say let's go to it.

MR. CARROLL: Thank you, Mr. LeMay. Yates Petroleum would call as its first witness, Randy Patterson.

Do you have your exhibits, Mr. Patterson? Each of my witnesses has been responsible for his exhibits, and as each witness testifies, I'll hand them out.

RANDY G. PATTERSON

Having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. CARROLL:

Q. Would you please state your name for the record and occupation?

A. My name is Randy G. Patterson. I live in Artesia, New Mexico, and I'm land manager for Yates Petroleum Corporation in Artesia.

Q. Mr. Patterson, you have previously testified before the Oil Conservation Division and the Commission, have you not?

A. Yes, sir, that's correct.

Q. And you have had your credentials

accepted as a professional petroleum landman, have you not?

A. Yes, sir.

MR. CARROLL: Mr. LeMay, I think everyone is quite familiar with Mr. Patterson, and I would offer him as an expert in the area of petroleum land management.

CHAIRMAN LEMAY: His qualifications are acceptable.

Q. Mr. Patterson, are you familiar with the four pending applications that are the subject of these four de novo hearings?

A. Yes, sir. Yates Petroleum Corporation is seeking an authorization to drill four wells in Section 2 of Township 22 South, Range 31 East of Eddy County, New Mexico. Those four wells are the Graham AKB State No. 3, the Graham AKB State No. 4, the Flora AKF State No. 1 and the Flora AKF State No. 2, and I'll probably just refer to those as Flora No. 1 and Graham No. 3 from now on, if that's okay.

Q. All right. Mr. Patterson, you have prepared, so we can familiarize ourselves with the location of these four wells, you've prepared an exhibit which is a location plat, have you

not?

A. Yes, sir.

Q. That is Exhibit No. 1?

A. Exhibit No. 1.

Q. Okay. If you would describe the information that's contained on Exhibit No. 1 for the Commission.

A. Exhibit No. 1 is a location plat showing Section 2 in the center of Township 22 South, Range 31 East, Eddy County, along with the sections that border Section 2 all the way around, the total of a nine-section area.

In the northeast quarter of Section 2, you can see the arrow pointing to the Graham No. 3 and the Graham No. 4, the Graham No. 3 being in the northwest/northeast of Section 2, the No. 4 in the southwest of the northeast, and then in the southwest quarter the Flora No. 1 in the southeast of the southwest, and the Flora No. 2 in the northeast of the southwest.

Also on this plat is some lease information. The Graham lease is V-2705, a State of New Mexico lease. That was due to expire 10/1/93. This lease is now held by production of the Graham No. 1 and No. 2 wells there in the

northeast quarter.

The Flora lease is the southwest quarter of Section 2. That's State Lease No. V-2597, and that lease will expire on August 1, 1993, as shown on the plat.

Q. Additional information, this is a nine-section plat, is it not?

A. Yes, sir.

Q. You also show the actual ownership of the minerals in each one of those sections, and that is the notation at basically the center of the bottom of each one of these sections? And in particular, for example on the bottom of Section 2, it shows this section belongs to the State of New Mexico, or the minerals do?

A. That is correct.

Q. Now, the southeast quarter of Section 2 does not belong to Yates Petroleum, is that correct?

A. No, sir. The southeast quarter is another state lease, LH-1523, and that's owned by Pogo Producing Company.

Q. And there are two producing wells located on that acreage at the present time?

A. That is correct.

Q. Now, Yates Petroleum has, in fact, filed four applications to drill, have they not, on these four wells?

A. Yes, sir. Back in November of 1991, Yates Petroleum first began the process to apply for drilling of these four wells.

On November 21, 1991, we first notified New Mexico Potash Company, pursuant to the rules, of our proposal to drill the Flora No. 1 and the Graham No. 3 and No. 4 wells. The Flora No. 2 well notification took place at a later date.

Then, on November 24th, the Flora 1, the Graham 3 and 4 were staked, and on the 25th of November the APD was submitted to the Artesia office of the NMOCD.

On the 4th of December, we got a call or our permit agent that works for me got a call from Mr. Bob Lane of New Mexico Potash saying that they were not going to sign a letter, a waiver letter that we sent, notifying them of the location.

Q. Mr. Patterson, let me interrupt you just a minute. The process that you're describing in sending out this letter and notification, that is done in compliance with

Rule R-111-P, is it not?

A. Yes, sir, that's correct. According to that rule, you're supposed to give notice and at that time we asked for a waiver from the potash company of their objection to our drilling under those rules.

Q. If you would continue on with the chronology of the events.

A. Okay. On December 4th Mr. Lane called and said that they were not going to sign our letter either objecting or voicing no objection, because they were drilling core holes and they would have the results in approximately two weeks. He also advised us at that time that unless the results were poor in Section 2, they probably would not approve these locations.

On January 16th, our permit agent wrote a letter to Mr. Lane requesting the status of our waiver letter since we had not heard anything from them in writing, so we were trying to follow up and get our locations approved so we could go ahead and drill. 1/16

On the same day, we notified New Mexico Potash of our proposal to drill the Flora 2 location, which, as I mentioned before, came a

little bit later.

On the 17th of January we staked the Flora 2 in the same procedure we used in the other three wells, and on the 21st of January we submitted the Flora 2 APD to the Artesia OCD office.

On that same day, a letter was written, received the next day, January 22, by Yates Petroleum, by New Mexico Potash Company, which objected to the Flora No. 1 and the No. 2 wells. This letter, as I said, was received January 22 and it did state their objection to those locations.

On January 23, a similar letter from New Mexico Potash was written objecting to the Graham 3 and 4 wells, and that letter we received on January 27, 1992.

Subsequent to that, we requested the hearing before the NMOCD to try to get these locations approved. That hearing was then continued into March.

On March 25, 1992, we received the order from the OCD, and then on the 26th of March the Artesia OCD office approved the No. 1 and No. 2 Flora wells according to the order.

Q. Now, Mr. Patterson, you have prepared as Exhibits No. 2 and 3, copies of the actual APDs for each of the four wells and copies of each of the well location and acreage dedication plats, is that correct?

A. Yes, sir, that's right.

Q. And Exhibit No. 2 is the packet of APDs for all four wells, is that correct?

A. That's right.

Q. And Exhibit 3 is the package of well location plats?

A. Yes, sir.

Q. Now, Mr. Patterson, you've also prepared to aid the Commissioners an Exhibit No. 4, is that correct?

A. Yes, that's correct.

Q. Would you explain what information is contained in Exhibit No. 4?

A. Exhibit No. 4 is the same nine-section area which was shown in Exhibit No. 1, but this plat contains the potash leases and the ownership of the potash within this nine-section area.

Again, Section 2 of 22 South, 31 East, is in the center with all the bordering sections next to it. Section 2 shows the ownership of the

potash to be New Mexico Potash Corporation. New Mexico Potash Corporation owns the three sections to the north; however, at the time that the original hearing was held and when this plat was created, the sections to the west, directly to the east and to the south, were all unleased for potash.

Q. That fact has changed or is in the process of changing, is that correct, Mr. Patterson?

A. Yes, sir, that's correct. In August the federal government held a sale of potash leases in Carlsbad, and Yates Petroleum and Pogo were the successful bidders on the lease that encompasses the south half of Section 3 to the west there, and all of Section 10 and all of Section 11. So you can see the pencilled writing underneath the unleased area, showing that those leases were purchased by Yates Petroleum and Pogo. However, those leases are not yet issued by the federal government.

Q. Did you personally attend the lease sale that was held last month by the federal government?

A. Yes, sir, I did.

Q. These three sections you just mentioned were actually part of a larger parcel that Yates and Pogo bought?

A. Yes, sir, that's correct.

Q. How many acres was involved in that total parcel?

A. That parcel was 5,280 acres.

Q. Did New Mexico Potash Corporation, to your knowledge, show up for that lease sale, Mr. Patterson?

A. To my knowledge, there was not a representative of New Mexico Potash at the sale.

Q. Mr. Patterson, you've also prepared some additional exhibits to help the Commissioners in understanding and reviewing this case, have you not?

A. Yes, sir.

Q. I believe the next exhibit number is 5, is that correct?

A. Yes.

Q. Would you explain to the Commission what Exhibit No. 5 is and the pertinent information contained therein?

A. Okay. Exhibit No. 5 is a potash mining lease. In the upper left-hand corner, it shows

to be Lease No. M-14957. It was issued February 4, 1967 to Kermac Potash Company of Oklahoma City, Oklahoma.

Down a little bit farther in the middle of the page it shows the description of the lands discovered by the potash lease, a total of 4,489 acres, and the third one on the list shows all the Section 2, Township 22 South, Range 31 East, which is the subject of this hearing.

If you'll turn about four more pages, you'll see an Assignment of Mineral Lease, which is an assignment dated 19 June 1968, and it assigns this potash lease from Kermac Potash Company to Kerr-McGee Corporation, also of Oklahoma City, Oklahoma. And again, the third description on the list was all of Section 2, which we're talking about here.

Q. That assignment occurred in 1968, is that correct?

A. Yes, sir, the 19th of June 1968 at the bottom, just before the signatures.

Q. All right.

A. And then, if you'll turn one more page, there's a New Mexico State Land Office Assignment of Mineral Lease, and this is from Kerr-McGee

Corporation to New Mexico Potash Corporation of Hobbs, New Mexico. This assignment, just before the signature, is dated the 5th of April, 1985.

And if you'll turn the next two pages, the fifth call on the description list shows Section 2 of Township 22 South, Range 31 East. So that is also the assignment on this particular acreage.

Q. It's common knowledge that approximately 1935 is the date that New Mexico Potash actually acquired the particular mine in question from Kerr-McGee, is that correct?

A. According to this assignment, that's correct.

Q. Now, with respect to the original potash mining lease, and again this is a lease between the State of New Mexico and originally Kermac Potash Company, are there certain provisions in this lease that you would like to bring to the attention of the Commission?

A. Yes, sir. Back on the first page of the exhibit, at the bottom of the page, it starts--"Section 2," and it says, "In consideration of the premises, the lessee hereby agrees as follows."

And then, if you'll turn the page on over to small (d), about the fourth paragraph down, it says, "...to pay the lessor a royalty of five percent." So this is a five percent royalty lease on the potash.

Then, continuing on down to paragraph (h), it says, "If said minerals or any of them in commercially paying quantities shall be discovered on the lands embraced herein, to develop and produce"--going back to the first sentence--"We agree to develop and produce in commercial quantities with reasonable diligence the potassium and other mineral deposits susceptible of such production."

Q. Now, Mr. Patterson, have you and your company performed at least an investigation as to the activity that has been had out on Section 2 by the potash company?

A. Yes, sir. To the best of my knowledge, the only activity on that particular section was the core that was drilled in January during our permitting process.

Q. Drilled around the end of last year, beginning of this year?

A. Yes, sir, that's right.

Q. And this lease is approximately 25 years in age?

A. That's correct, 1967.

MR. HIGH: Excuse me. This is not a lease file agent case, and I'm not sure what this has any relevance to.

CHAIRMAN LEMAY: We'll see where he's going. Just setting some background for us, I assume?

MR. CARROLL: That's correct, Mr. LeMay. In fact, we're now ready to move on. I think we've gleaned what we needed to learn.

Q. Now, let's turn to your Exhibit No. 6, Mr. Patterson. What is that?

A. Exhibit No. 6 is a copy of the State of New Mexico oil and gas lease. At the top left-hand corner of the lease it shows Lease No. V-2705. This is the Graham lease, what we call the Graham lease. It's dated October 1, 1988, to Yates Petroleum Corporation, and then down at the bottom it shows the description which describes Lots 1, 2, 3 and 4 in the south half of the north half, which altogether comprise the north half of Section 2, Township 22 South, Range 31 East, 319.48 acres.

Q. All right.

A. This lease, if you'll turn the page to the second page, provides for a primary term of five years, and that's the second grammatical paragraph there of the page, and then the number "1" right there below that, it provides for a 1/6 part of the oil and gas produced, or a 1/6 royalty, 16-2/3 percent.

This lease, as I mentioned before, is presently held by production from the Graham No. 1 and 2 wells in the east half, northeast of that section.

Q. All right, now you've discussed both of these leases at this time?

A. Would you like me to discuss Exhibit 7?

Q. Exhibit 6 is comprised of both of the leases?

A. No, that's just the one. Exhibit 7 is V-2597.

Q. Excuse me. My numbers were mixed up. Exhibit 6 is V-2705, and Exhibit 7 is V-2597?

A. Yes, sir.

Q. All right. Would you describe Exhibit 7, then?

A. Okay. Exhibit 7 is State of New Mexico lease V-2597, which is the Flora lease. It's dated August 1, 1988, and it comprises 160 acres being the southwest quarter of Section 2, Township 22 South, Range 31 East, which was shown at the bottom of the first page.

And then at the top of the second page it also provides for a five-year term and a 1/6 royalty or 16-2/3 percent. The five-year term, since this lease has no wells on it, this lease is due to expire August 1, 1993.

Q. If no drilling or production is gained from this section, does Yates Petroleum stand to lose this particular lease, Mr. Patterson?

A. Yes, sir, that's correct. To my knowledge, there is no provision for suspension or extension of a State of New Mexico oil and gas lease except by drilling.

Q. The next exhibit, Exhibit No. 8, again this is a matter of housekeeping, would you explain what this exhibit is?

A. This Exhibit No. 8 is a certificate of mailing which is notice to the appropriate agencies and to offset potash operators within a mile of our application for the hearing which

we're talking about today. The case number is listed in the upper right-hand corner.

With this certificate of mailing, there were copies of the applications enclosed and notice of the hearing, and it's signed by Ernest Carroll, our attorney.

On page 2, called Exhibit A, is a list of the people that this was sent to. Mr. Armando Lopez of the Bureau of Land Management in Roswell, Mr. Ernie Szabo of the New Mexico State Land Office here in Santa Fe, and Mr. Bob Lane of New Mexico Potash Corporation in Hobbs.

The next page, Exhibit B, is the first of the letters. This is the one to New Mexico State Land Office. It transmits copies of the applications sent for filing. It also states that Mr. Carroll will furnish each individual with a date for the hearing, and requests that they notify us if they plan to protest. Also at the bottom of the page is a copy of the return receipt which was received back by us, and this one was stamped January 22, 1992.

The next page is the same letter to Mr. Bob Lane at New Mexico Potash Company. It was delivered January 22, 1992, at the bottom of the

page.

And the next page is the same letter to Mr. Armando Lopez in Roswell, and it was stamped "received" but the date is sort of blocked out and you can't really tell what it says.

Q. All right.

A. The next three letters are letters to the same people advising these people that the hearing date was changed from February 20 to March 19, 1992, with the corresponding return receipts shown at the bottom of the letter.

Q. The purpose of this exhibit is to show compliance with the basic rules for starting the hearing process with the New Mexico Oil and Gas Division?

A. Yes, sir, that's right.

Q. Now, Mr. Patterson, turning more to the subject at hand before the Commission, it is true that the United States is experiencing a shortfall in oil and gas production, is it not?

A. Yes, sir. I believe that the United States is up over 50 percent imports at this time.

Q. And the State of New Mexico, through the Oil Conservation Division, has at least

espoused certain, for lack of a better word, policy decisions or policy stands, is that correct?

A. Yes, sir, that's correct.

MR. HIGH: I don't want to interrupt a lot, but Mr. Carroll is leading the witness I think a little bit too much, and I object to the leading.

CHAIRMAN LEMAY: I think if you ask the questions, Mr. Patterson is well equipped to answer your questions.

Q. Mr. Patterson, with respect to the subject we're discussing, you've prepared an exhibit. Would you please explain the purpose of the next exhibit, which would be Exhibit 9?

A. Yes, sir. Exhibit 9 is a copy of a letter that was sent to New Mexico Oil Producers by the director of the Oil Conservation Division, Mr. LeMay, during the period of time in 1990 that the United States was experiencing a crisis in the Middle East. The subject of this memo is "Regulatory Initiatives to Increase New Mexico's Oil Production," and you can see it's dated September 6, 1990.

The memo goes on to state, "In response

to the crisis in the Middle East," and then moving on, "the New Mexico Oil Conservation Commission has placed on the September 24, 1990 docket, a hearing to receive comments and suggestions from the oil industry on steps which the Division or the Commission might take to increase New Mexico's oil production immediately, in the short term, three to six months, and in longer time frames."

We were very interested in this memo when we received it because we thought that was a good step for New Mexico state government to take to increase oil production in the state, particularly during this crisis time. I personally attended and presented testimony at that hearing, and it was obvious to me that Mr. LeMay and the OCD was very interested in doing things to increase the oil production in the State of New Mexico.

Q. The particular area with which we are dealing, I think it has--there's a field name or an area name for this section, too, is there not?

A. Yes, sir. We call this the Livingston Ridge area.

Q. With respect to oil and gas activity in

New Mexico, is this a major or a minor player?

A. The Livingston Ridge area appears to be probably one of the best new fields in the State of New Mexico, possibly one of the best new fields in the United States of America. This field has really come on strong. There's been a lot of drilling, and it appears to not be finished yet.

Q. Do you have an opinion as to whether or not development of this field is in compliance with, I guess, the mandate of the letter from Mr. LeMay that you just got through discussing?

A. Yes, sir, we do. The Delaware is a good producer and the Livingston Ridge, as I said, there have been several wells drilled in this area and it has definitely increased the production to the State of New Mexico.

Q. Now, Mr. Patterson, is it not true that the Oil Conservation Division and the Commission, since their obligations and duties are really synonymous, that when they are promoting or trying to increase oil and gas, they do have other considerations or competing considerations that they must also be cognizant of, isn't that true?

A. Yes, sir, that's right. Even though they have a philosophy of increasing the oil production, they--

MR. HIGH: Excuse me, Mr. LeMay. I'm going to object to Mr. Patterson testifying on behalf of the Oil Conservation Division.

CHAIRMAN LEMAY: I think he's just reiterating what his view was at the hearing. I don't think he's putting words in our mouth. If he does, I'll certainly stop him, Mr. High.

Q. If you would continue, Mr. Patterson.

A. Even though the New Mexico State Oil Conservation Commission appears to have a philosophy of increasing oil production in the state, they have to work within certain constraints of the law, and some of the main constraints that the OCD emphasizes is the prevention of waste of oil and gas, the protection of correlative rights of other people and owners and operators, and in the potash area there is a statute that talks about the prevention of undue waste of commercial potash.

Q. What is your understanding with respect to the dictates of that statute? What are the charges?

A. Well, the New Mexico statute 70-3-2-F really has a two-prong definition of what the waste of potash seems to be.

MR. HIGH: Again, Mr. LeMay, this witness has no--no foundation has been laid that this witness has any legal background to testify as to what a law provides or doesn't provide.

CHAIRMAN LEMAY: I think if he gets into controversy in that area, your cross-examination can certainly clarify it. I think he's setting a background for what their actions in relationship to the Oil Conservation Division rules, what the relationship is there, and I think it's perfectly appropriate.

MR. CARROLL: Thank you, Mr. LeMay. And again I would reiterate that part of my question was directed, I'm asking for Mr. Patterson's understanding so that we can judge Yates Petroleum's reaction, because this is who--that's their application, and I think that's the controversy that's before the Commission.

Q. If you would again, Mr. Patterson, please continue on in your answer.

A. We believe that this statute has a two-pronged approach to the definition of the

waste of potash. The first part of it states that drilling or producing operations for oil and gas within any area containing commercial deposits of potash, where such operations would have the effect unduly to reduce the total quantity of such commercial deposits of potash, which may reasonably be discovered in commercial quantities, that would constitute waste.

And then, the second prong of that, waste would be constituted where such oil and gas operations would interfere unduly with the orderly commercial development of such potash deposits.

In my understanding and our company discussions of this, this doesn't mean that the OCD is to prevent all waste. It talks about undue waste and waste of potash economical to produce. And also, the second prong of it talks about unduly interfering with orderly development. In our consideration of drilling these wells and during the time that we were permitting these wells, we did not believe that our operations would interfere. Part of that belief was because of statements made by some representatives of New Mexico Potash and IMC

Potash at certain meetings that we had.

One of these statements was that Section 2 was not part of an LMR of New Mexico Potash. Another statement was made that no plans for Section 2 were made for at least a 10-year period, and another statement was made that the LMR was very questionable in Section 2.

Q. Now, Mr. Patterson, when you make reference to a meeting with New Mexico Potash earlier in the year, this was part of this ongoing process, was it not, when you initiated the, I guess, informational process or notification process calling to the potash company's attention that you had an intention or desire to drill out there, is that correct?

A. Yes, sir, that's correct.

Q. This was not some isolated event? It was part of that chronology of events that you described earlier in your testimony?

A. This was after our notification had been made.

Q. And the drilling in Section 2, was that the main topic of conversation with respect to this meeting that you just referred to?

A. I believe in at least one meeting, that

was the main topic, and in other meetings there were other areas considered, but in one or two meetings, that was the main topic, Section 2.

Q. Do you recall the date of that particular meeting?

A. I believe that meeting was January 10, 1992.

Q. Now, Mr. Patterson, you've also prepared some numbers or economics for the Commissioners' benefit, have you not, with respect to a comparison between the potash and oil company's exploration?

A. Yes, sir, I have.

Q. Would you explain your analysis?

A. Well, we believe that there can also be waste. We were talking about waste and that there can be waste of economics or economic waste if wells are not drilled in Section 2.

In the first place, the oil will be wasted because the oil won't be produced and it will be left in the ground, and there will be considerable economic waste to the State of New Mexico. We'll have testimony later on in this hearing that will confirm that an average well in this Livingston Ridge area around this produces

about 125,000 barrels over its lifetime, and if you use a $20-per-barrel price of oil, the royalty lost to the State of New Mexico is about $417,000 per well. Or, if you consider all four of these wells that we're talking about today, that's $1,668,000 that would be lost in royalty lost to the State of New Mexico.

Also, along with that are the taxes involved. Each well will produce $230,000 worth of taxes, or all four wells would be $920,000. And then the economic waste to the operator, which would be his profit net of drilling, completing, equipping, producing costs, is approximately a million dollars a well. That's another four million dollars.

So the total economic waste that could be created by not drilling these four wells would be $6,588,000. That's only for these four wells in question. You could drill, actually, another eight wells in Section 2, if these were successful.

Q. Now, Mr. Patterson, with respect to this area, Section 2, Yates is more involved in the general area just outside of or including this Section 2, isn't that correct?

A. Yes, sir. Yates has a large commitment in this Livingston Ridge area.

Q. And Exhibit 10 was prepared to help illustrate that commitment, isn't that correct?

A. Yes, sir, that's correct.

Q. Would you explain what you find on Exhibit 10?

A. Exhibit 10 is a map of a several-township area, with blue cross-hatch markings showing Yates' oil and gas leasehold position, federal, state and fee leases cross-hatched in different manners. There's a legend at the bottom of the page showing the different types of leases and how they're marked.

Yates has, on this map alone, 15,520 acres, approximately, in this area. We've invested considerable dollars in that acreage. We've also, right in that immediate area of Section 2 and just to the north, drilled approximately 37 wells and are continuing to drill wells in the area.

We have over 100 APDs in different stages of working at this time, being prepared wells that we would like to drill in this area.

As of May 31, 1992, which was the

accounting numbers I could get, we have made capital expenditures, including drilling and equipping of wells, of $8,422,000. We've built a gas gathering system, pipelines and right-of-ways totaling $1,330,000, and we've installed a salt water disposal system, pipelines and right-of-ways at about $950,000. We've made a total capital commitment in the area of $10,700,000-plus.

And this does not include the purchase price of the leases or the geological research that is done and continues to be done and that was expended before the drilling began in that area.

So, I believe that Yates Petroleum is very committed to this area, and we're ready to continue drilling and ready to begin with these locations if we can get them permitted.

Q. I think all the Commissioners are familiar with Yates Petroleum Corporation's involvement in the state of New Mexico, but with respect to Yates Petroleum, this particular project, is this a major or minor project for Yates Petroleum in terms of dollar investment and manpower investment?

A. This project is one of the two top projects, highest priority projects in Yates Petroleum. This was reiterated to me last week by one of the principals of Yates Petroleum.

Q. The particular applications to drill, two of them have been granted for the Flora wells. The time period those permits are valid for, could you tell us?

A. An APD is issued by the OCD for the period of 180 days, at which time you have to drill or your APD expires.

Q. Mr. Patterson, is there any matter which you wish to bring to the Commissioners which I have neglected to ask you about or foreclosed you from talking about?

A. I don't think so.

Q. Well, then, Mr. Patterson, based upon your area of expertise, do you feel that the granting of these four applications to drill, that they would be in the interests or promotion of conservation, the prevention of waste, and the protection of correlative rights?

A. Yes, sir, I believe they would.

MR. CARROLL: Mr. LeMay, with that I would pass the witness.

CHAIRMAN LEMAY: Thank you Mr. Carroll. Mr. High? I assume you want to cross-examine?

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

EXAMINATION

BY MR. HIGH:

Q. Mr. Patterson, you went real fast for my note taking. I take it you have notes in front of you?

A. I have the exhibits that you have and some notes in front of me.

Q. Those notes are on that legal pad you have?

A. Yes, sir.

Q. And that's where you got all these dates and things that you were telling us about this morning?

A. Yes, sir. Some of them are on the exhibits.

Q. You prepared that yellow legal pad before you came in here today?

A. Yes, sir. I made some notes

Q. How many pages are in that legal pad that have notes on that you were reading from this morning?

A. I don't know. I didn't count them.
Q. More than 10?
A. I don't think so.
Q. Did anyone else make those notes other than you?
A. No, sir.
Q. They're all your notes?
A. Yes, sir.
Q. You're a land manager?
A. Yes, sir.
Q. Is that your only function at Yates Petroleum?
A. I also participate in some management functions.
Q. And what would that be?
A. I'm the secretary of the corporation.
Q. Which corporation?
A. Yates Petroleum Corporation.
Q. How much time do you spend out in the field as opposed to in the office?
A. "Out in the field" meaning what?
Q. Away from the office.
A. Away from the office? Maybe one day a week.
Q. Your primary duties are in the office?

A. Yes, sir.
Q. Do you have any other functions, other than what you just told us about, being secretary/treasurer?
A. Yes, sir, I manage the land department, negotiate trades.
Q. How long have you been with Yates?
A. 16 years.
Q. And your background and training is in what?
A. My degree is in chemistry and physics.
Q. Any advanced degrees?
A. No, sir. I have numerous seminars and classes and college courses in land management, and I'm a certified professional landman through the American Association of Petroleum Landmen.
Q. All right. Let's look at some of these exhibits, Mr. Patterson. Let's start with Exhibit No. 2. This exhibit, as I understand it, is the APD for each of the wells involved here?
A. Yes, sir. This is the front page of the APD that has the information on the location, the well name, et cetera.
Q. Do you know when these APDs were actually filed with the state?

A. Yes, sir, these APDs were filed on the date at the bottom, 11/25/91, 11/25, 11/25. The last one was January 21, 1992.

Q. You're convinced that that was the date that they were actually filed with the State of New Mexico?

A. To my knowledge, that's correct.

Q. Let me ask you to look over at your Exhibit No. 8. Do you have that in front of you?

A. Yes, sir.

Q. Look at the third page down into that document. That document has at the top of it "Exhibit B." Do you see that?

A. Yes, sir.

Q. That's the January 21, 1992 letter, I believe you said from Mr. Carroll to Mr. Ernie Szabo at the State Land Office, is that right?

A. Yes, sir.

Q. This letter, of course, was written on behalf of Yates, correct?

A. Correct.

Q. The second sentence says, "On January 20, 1992, the above-referenced applications were sent for filing by Yates Petroleum Corporation for permits to drill its Graham AKB State No. 3

well, its Graham AKB State No. 4 well, and its Flora AKF State No. 1 well, all in Section 2," so forth and so on. Do you see that?

A. Yes, sir.

Q. Now, were they filed on January 20, 1992 or November 25, 1991, if you know?

MR. CARROLL: Mr. Commissioner, at this point I would like to interject, since this is my letter. The application which is referenced here is the application before the OCD, the formal one which started Case Nos. 10466, 10467, et cetera. This is not the actual APD, this is my notice to them, because we had already received at this point in time an indication that they were going to oppose, and the Oil Conservation Division simply could not give a waiver. The Division office in Artesia notified us that our permits were not going to be granted.

MR. HIGH: I'll object to Mr. Carroll testifying. He offered the exhibit. I have no objection to it, I'm just asking Mr. Patterson about some of the--

CHAIRMAN LEMAY: The point of clarification about that might help, if he presented it, Mr. High. You can continue with

the witness.

Q. Do you know, Mr. Patterson, if the APD for these four wells was filed with the state on January 20, 1992 or the date shown on your Exhibit No. 2?

A. My records indicate that the dates on the APD were the dates that they were filed. And this letter refers to the application before the OCD for hearing.

Q. Okay. And do you know on what date the APDs, whenever they were filed, were sent to New Mexico Potash?

A. I do not know the dates the APDs were sent to New Mexico Potash, I do know that New Mexico Potash did receive notice that they would be filed.

Q. You don't know if they ever received a copy of the APD, do you?

A. I do not know that.

Q. Do you know if they received a copy of the well location documents?

A. I don't recall.

Q. Do you know if R-111-P requires that they receive notice of any of those kinds of things?

A. My understanding is that R-111-P requires notice that a well will be staked and permitted.

Q. Okay, well let's don't guess. Let me read it to you and see if this is your recollection of what it does require, Mr. Patterson, and I'm reading from Section G. Section G of R-111-P, in Section 2, "Before commencing drilling operations for oil or gas on any lands within the potash area, the well operator shall prepare a map or plat showing the location of the proposed well, said map or plat to accompany each company of the notice of intention to drill."

Now, let me stop right there. Did you do that with respect to these four wells?

A. Yes, sir, I believe New Mexico Potash got a copy of the map or plat prior to drilling, because the wells have not been drilled yet.

Q. My question is, did you do that with respect to these four wells?

A. Yes, sir, we submitted a map or plat to New Mexico Potash.

Q. It goes on to say,"In addition to the number of copies required by the Division, the

well operator shall send one copy by registered mail to each potash operator holding potash leases within a radius of one mile of the proposed wells, as reflected by the plat submitted under paragraph 1."

Now, did you send to New Mexico Potash a notice of intention to drill, with a plat of the proposed wells, by registered mail?

A. As I sit here today, I don't know.

Q. You don't have any papers with you here that we can look to see whether or not you did that, do you?

A. No, I don't.

Q. Would you agree with me that the documents shown in Exhibit No. 8, do you think that shows that you sent the plat and notice of intention to drill to New Mexico Potash?

A. I believe that that indicates that those were sent.

Q. If they were sent with the documents in Exhibit 8, it would have been in January of 1992, right?

A. They may have been sent in January 92.

Q. Now, you also testified that after the APD was filed, your permit agent got a call from

Bob Lane of New Mexico Potash, is that correct?

A. That is correct.

Q. Did you get a call from Mr. Lane?

A. I don't recall talking to Mr. Lane, no.

Q. So anything you know about that conversation would be hearsay from what the permit agent told you?

A. Yes, sir. The permit agent works directly for me, and I got a memo to that effect.

MR. HIGH: Mr. LeMay, may I approach the witness?

CHAIRMAN LEMAY: Sure.

Q. Look if you will, Mr. Patterson, in the book I've placed in front of you, to Exhibit 29.

MR. HIGH: And, Mr. LeMay, I've placed in front of each Commissioner a book of exhibits. In two books, those of Mr. Weiss and Mr. Carlson, there are two maps missing, but you have maps in yours. We just ran out of maps and perhaps we can share some of those, but all of our exhibits are in that book.

Q. You have Exhibit No. 29 in front of you, Mr. Patterson?

A. Yes, sir, I do.

Q. Is that the memorandum that you just

referred to that your permit agent wrote you?
A. Yes, sir, that's right.
Q. That permit agent's name, I guess, is Clifton May?
A. That's correct.
Q. And you understood on December the 4th of 1991, the date of Exhibit No. 29, that New Mexico Potash was not going to waive objections to these four wells, weren't you?
A. No, I did not understand that. That's not what the memo said.
Q. Did you understand they would not sign your letters waiving objections?
A. They were not going to sign the letter either waiving or accepting at that time.
Q. Let's look at Exhibit No. 29. I take it that Kathy Porter works for you?
A. That's correct.
Q. This is the memo that you, apparently saw?
A. Yes, sir.
Q. First sentence says, "Mr. Bob Lane of New Mexico Potash called at 9:30 a.m. on December 4, 1991, regarding the above wells. They did not sign our letter of no objection at this time"?

A. Right.
Q. And that's what Mr. May told you?
A. That's what the memo says.
Q. "They are drilling a potash test hole and it will be two weeks before they have their results." He told you that too, right?
A. Yes, sir.
Q. In fact, you had a copy of this memo in front of you testifying from it this morning?
A. No.
Q. But you told us about this conversation this morning?
A. Yes, sir.
Q. You knew on December 4, 1991, then, that if you drilled this well, you would have to have a hearing before the OCD?
A. At that time I did not know that because they had not voiced objections to permitting this well.
Q. They told you they weren't going to waive their objections, didn't they?
A. No, they said they were not going to waive them at that time.
Q. You thought maybe sometime in the future they might waive them?

A. That's correct.

Q. You knew on December 4, 1991, that New Mexico Potash was not waiving its objections to these wells?

A. They were not going to sign our letter at that time.

Q. You thought they might sign it sometime in the future?

A. That's correct, because during the conversation, Mr. May was told that if the core hole was poor, they might waive the objection.

Q. That's even referred to in Exhibit No. 29, isn't it?

A. That's right.

Q. And did you ever later find out what the results of that core hole was?

A. I personally, no, I don't know that.

Q. As you sit here today, September 9, 1992, you don't know the result of the core hole No. 162 in Section 2?

A. No, sir. I'm not an engineer or a geologist.

Q. You don't have any other layman's knowledge of what the result of that hole was?

A. Not that I can recall.

Q. You testified Mr. Patterson, you did some investigation, something about whether or not New Mexico Potash apparently lived up to some lease paragraphs?

A. Yes, sir.

Q. So you knew about the drilling of the hole?

A. I knew about the drilling of the hole and I did not think that anything else had gone on in that section.

Q. You also pointed out a paragraph that said something about due diligence if reserves are found, and that sort of stuff?

A. That's right.

Q. Were you implying by that that New Mexico Potash had a good core hole and should be doing something?

A. I was merely pointing out what the lease said.

Q. You have no particular expertise in the interpretation of those leases, do you?

A. Well, I read oil and gas leases every day.

Q. Do you read potash leases every day?

A. No, sir.

Q. That was just your personal opinion you were giving us?

A. Yes, sir.

Q. Do you know today whether or not there is a grade of potash in Section 2, as shown by core hole No. 162, that's mineable in the basin?

A. I do not.

Q. Does it make any difference to you, Mr. Patterson, if these wells are located in an area where there's potash that can be mined by the mines in Carlsbad?

A. Yes, it does make a difference, because we don't want to unduly waste commercial potash. That's part of the law.

Q. Well, if you don't want to do that, wouldn't you think you would at least go out and try and find out what core hole 162 showed?

A. We have expert witnesses that are very familiar with that that are geologists and engineers. I don't work in that area so I don't personally know that.

Q. Are you in charge of this Livingston Ridge project?

A. No, I'm not in charge of the project.

Q. You're involved with it?

A. Yes, sir, I'm involved with it, in a supervisory capacity.

Q. In a very high supervisory capacity, aren't you?

A. In a supervisory capacity.

Q. Yet you haven't made any efforts to find out if there's good potash in Section 2?

MR. CARROLL: Mr. LeMay, I'm going to object. This is merely argumentative.

MR. HIGH: I'll withdraw that. I think he told us that he doesn't know.

Q. Now, when you did your investigation on what New Mexico Potash did in Section 2, Mr. Patterson, did you talk to anyone at New Mexico Potash?

A. I don't believe that I personally talked to anyone at New Mexico Potash other than at maybe one of these meetings, in conversation.

Q. Did you talk with Mr. Walt Case, the manager down there?

A. I talked with Mr. Case about some wells previous to this, but about Section 2, I don't believe that I did. I don't recall the conversation with Mr. Case.

Q. Did you talk with Mr. Bob Lane, the

former mine engineer?

A. I don't recall a conversation with Mr. Lane, either.

Q. So you really don't know what New Mexico Potash has done in Section 2, do you, Mr. Patterson?

A. I know what my people have told me, that they do not believe that there was much activity on Section 2.

Q. You understand, don't you, that mining is based upon having a long-term asset, don't you?

A. Yes, sir.

Q. That mining is different in terms of how it works, as opposed to oil and gas, is that correct?

A. Yes, sir.

Q. That mining is a long-term venture, whereas oil and gas is a much shorter term business?

A. Okay. If you say so.

Q. Do you think it's unusual for a mine to have reserves under lease that it hasn't mined, even though the lease may have been in effect for 5, 10, 15 years?

A. No, I don't think that's unusual, in that time frame.

Q. You understand in the mining business it's generally the case, that a mine will have reserves that it will not be able to physically get to, even at full production, for maybe 15, 20, 30 years?

A. I understood that a while ago.

Q. Now, if you look at Exhibit No. 6, which I believe you said was your--

A. Mine or yours?

Q. Yours. Let's look at Exhibit No. 6 first, and this is Lease V-2705?

A. Yes, sir.

Q. This is related to which one of the wells, Mr. Patterson?

A. This is the Graham lease, the north half of that section.

Q. Okay. In Exhibit No. 7, which is Lease V-2597, it's related to which wells?

A. That's the Flora lease.

Q. Now, both of these leases were entered into in 1988, is that correct?

A. That is correct.

Q. In fact, Exhibit 6 was entered into on

October 1, 1988, right?

A. That's correct.

Q. And Exhibit No. 7 was entered into on August 1, 1988?

A. That's correct.

Q. You knew at the time you entered into these leases that they were in the R-111-P area, didn't you?

A. I don't recall at the time we purchased that lease whether we knew that or not or whether we looked at it.

Q. Well, if you look at Exhibit 9 in front of you, Mr. Patterson, that is a copy of R-111-P, in my book Exhibit No. 9. You knew that, or you wouldn't argue with the fact that February 18, 1988, when R-111-P was adopted, it preceded the date you entered into these two leases?

A. No, I wouldn't argue with that.

Q. Now, you also said a minute ago, and I don't want to dwell on this but I want to give you a little bit more opportunity to comment, you said there's a shortfall of oil in the United States right now?

A. Yes, sir.

Q. And has that existed for a long time?

A. That's existed for several years.
Q. How would you characterize the price of oil now?
A. Low.
Q. Do you think a low-selling price of oil indicates an undersupply?
A. Well, no, I don't.
Q. Are you telling me that the price and the supply are running in opposite directions?
A. No.
Q. If there was a great shortage of oil, it would be selling for a lot more than it is right now, wouldn't it, Mr. Patterson?
A. That's probably correct.
Q. In fact your industry, like ours, is very cyclical, isn't it?
A. Yes, sir.
Q. We go up and we go down?
A. Yes.
Q. Are you able to sell and transport all the gas that Yates now produces?
A. We are able to sell sometimes more than we're able to transport.
Q. There are limitations on how much gas you can actually get into the system?

A. Sometimes that's true.
Q. Same with respect to oil?
A. No. Usually--well, you can sell all the oil you can produce.
Q. You can transport it in ways you can't gas?
A. That's correct.
Q. You do understand that it's the OCC's duty to prevent, as you call it, the undue waste of potash?
A. Yes, sir, the undue waste of commercial potash, is what the statute says.
Q. You don't have any problem with that concept?
A. No.
Q. Probably where we disagree and what led us here is what's "undue"?
A. What's undue and what's commercial.
Q. And you have one opinion or your own opinion of what's undue and what's commercial, and I understand we have a different view, correct?
A. I believe that we will very effectively present our opinion.
Q. Well, that's a matter yet to be

decided, Mr. Patterson. My question is, you understand we have a different view than you do?

A. I understand you have a different view.

Q. Now, you participated, or your company did, in the events leading up to R-111-P, didn't you?

A. We had a representative that participated on the committee.

Q. What was his name?

A. Norbert Rempe.

Q. You also told the Commissioners about some statements made by some people that I think you said led you to believe that drilling in Section 2 would not interfere with the potash operations?

A. Yes, sir.

Q. And I take it those were meetings that were held with members of the Commission, is that correct?

A. Yes, sir, I believe that's correct.

Q. In fact, those were meetings that were held here in Santa Fe with Mr. LeMay and a number of other people?

A. I believe that's true.

Q. And the purpose of that meeting was to

try and resolve the disagreement between the industries over the development of Section 2?

A. Yes, sir, Section 2 and probably other sections.

Q. And you guys wanted to drill oil and gas wells, and the potash people didn't want you to do that?

A. That's right.

Q. And Mr. LeMay hoped to get everybody together and work it out?

A. That's correct, I believe.

Q. And there were representatives of the oil and gas industry at that meeting along with the potash people?

A. That's right.

Q. And at that meeting there were discussions about langbeinite being the ore in Section 2, wasn't there?

A. I've attended several meetings. I would suspect that there was, but I don't recall just exactly that that was talked about at this time.

Q. Do you know what langbeinite is?

A. Yes, sir, I know that it's a potash ore.

Q. Do you know the difference between langbeinite and sylvite?
A. Not without looking at my notes.
Q. Do you know which one of them is more plentiful in the world?
A. I believe I do know that, yes.
Q. Which one?
A. I believe that sylvite is the more common of the two.
Q. And langbeinite is the one that's harder to find?
A. I believe that's correct.
Q. Do you recall any discussions about why the potash people didn't want oil and gas drilling in Section 2, during this meeting you talked about with Mr. LeMay?
A. I recall some of the discussions.
Q. Was that along the line that there was ore in Section 2 that people wanted to mine?
A. I believe that was stated by your representatives.
Q. How many type meetings like that did you attend with a representative present that discussed or talked about Section 2?
A. I've attended so many meetings the last

several months that they all run together. I would hesitate to say how many.

Q. Well, this one you gave us a date on, I think you got that from your notes, right?

A. I don't believe the date's in the notes, but I did have some notes on the meeting.

Q. I understood you to testify that on January 10, 1992, you attended a meeting and that's when you found out about all of that?

A. That's correct, yes.

Q. And you got that from your notes?

A. The date is not in my notes. I got that up here.

Q. What was it about that meeting that makes it stand out in your mind?

A. Because we were talking about Section 2 quite a lot and because, at that time, it was the same timing that we were trying to permit these wells. And at that time we were, after the comments made by representatives, we were encouraged by the fact that they talked about no plans and that the LMRs were questionable in that area. So we thought we were going to drill wells.

Q. Was there anything said at this January

10, 1992 meeting about a new core hole that was being put down by New Mexico Potash Corporation in Section 2?

A. Very possibly, but I don't recall whether or not it was. I just don't recall.

Q. Did you already know, by January 10, 1992, about the results of the core hole 162?

A. I did not know the results of that, no.

Q. Now, you made a statement earlier, Mr. Patterson, that there can be waste of oil if it's not drilled, by leaving it in the ground?

A. Yes, sir, it can be economically wasted.

Q. By that do you mean simply a delay in getting money for it?

A. That's correct.

Q. Eventually you would recover the oil and get the money but you just can't get it now? Is that what you're saying?

A. I suppose if the oil doesn't move away it will still be there.

Q. And I'm not disagreeing with you, I'm just trying to understand what you mean by economic waste. And I understand that to be the delay in getting the money for the oil itself?

A. That's right, but there's also a drainage problem. If somone else is allowed to drill wells and you're not allowed to drill your acreage, they can take your oil off your lease, and that would be a waste for us.

Q. That's what unitization is designed to eliminate, isn't it?

A. In some cases that is an alternative.

Q. You gave us numbers about the Livingston Ridge and the average well production is 125,000 barrels?

A. Yes, sir.

Q. At $20 a barrel, and you gave us all those numbers?

A. Yes.

Q. Do you have those written down in front of you somewhere?

A. Yes.

Q. Is that from an exhibit, a piece of paper you gave us last time?

A. No.

Q. That's just from your notes?

A. That's just my notes.

Q. Now, you also, in going through those numbers, you said there's economic waste to the

operator. That's Yates Petroleum, isn't it?
A. That's correct.
Q. Of a million dollars a well?
A. That's approximately what it would be.
Q. Is that what a layman like me would call profit?
A. That would be the net to the operator after you've taken out the royalty, taxes, drilling, completion, equipping, producing; the hard charges.
Q. And that's assumed over what lifetime of the well?
A. Well, I would hesitate to say what the lifetime of the well was. We have an engineer that will probably testify to that.
Q. I'm just trying to find out where you got this number from.
A. Our engineer has told me that he believes that the recoverable reserves in the wells average around 125,000 barrels.
Q. Did you calculate this million dollars, or did somebody else do that and tell you what it was?
A. I did that with other parties involved.
Q. When you say a million dollars a well,

my question is, for how long did you assume the well will last?

A. I didn't make that assumption. That's the total oil that will come out of the ground. I don't know for this purpose it matters how long it takes.

Q. You just use the total number of barrels, you get it and that's it?

A. That's right.

Q. You, of course, wouldn't shut the well off if it kept producing after that number of barrels came out of the well, would you?

A. No, certainly not. That would be waste.

Q. But none of those numbers reflected any of these prices?

A. None of what numbers?

Q. Any value of oil in excess of 125,000 barrels.

A. Well, 125,000 barrels is an average of a number of wells in this area that I understand, from our engineer, and he will probably testify to, is an average recoverable reserve for an average Livingston Ridge area Delaware well.

Q. I understand that, Mr. Patterson, and

I'm not really disagreeing with you. I'm just trying to find out who I should cross-examine about these numbers.

MR. CARROLL: If I may help here, Mr. Boneau will testify to that. He has exhibits, and under the heading of Dave Boneau's exhibits you will find those numbers.

Q. Is Dr. Boneau the one you talked to to get these?

A. Yes.

Q. He'll know more about the details than you?

A. Probably.

Q. He'll be able to tell me how he arrived at each one of them?

A. Yes, he probably will.

Q. Then I'll wait and talk to him about it.

Now, with respect to Exhibit No. 10, which is the map that you showed us, I take it that has all of the Yates leases in the R-111-P area?

A. No, sir, that's not correct. That is just in this area that's presented on the map, just in these townships. It's a convenient size,

and it more or less covers this Livingston Ridge Delaware drilling area.

Q. And you would, of course, have leases elsewhere in and around the potash area?

A. Yes, sir.

Q. Now, you said you had drilled 37 wells was it?

A. Yes, sir, I believe that's a correct number, more or less.

Q. In what period of time?

A. Since late 1990.

Q. Well, that's in the last two years or so?

A. It's been within the last year and a half, two years.

Q. Was that an increase in the number of wells that you had drilled before?

A. Before when?

Q. Before 1990.

A. We drill wells--we drill better than a hundred wells each year in the State of New Mexico, so--

Q. Is this 37 wells you referred to over the period of two years, I take it, is that a lot of wells or a little bit of wells?

A. That's a good number of wells in an area as small as what we're dealing with here. Those wells are drilled primarily in just this Livingston Ridge area, 22/31, Sections 24 down to--or 21/31, Section 24, down to Section 24, of 22/31, and then a few of them up here around the Laguna Plata area.

Q. How many wells does Yates Petroleum normally average each year?

A. Between 120 and 160.

Q. How many in the State of New Mexico?

A. I don't know that number just right off my head.

Q. A large percentage?

A. A large percentage.

Q. Upwards of 90 percent?

A. I couldn't say that. I don't know.

Q. How many wells does Yates plan to drill in 1992?

A. For our fiscal year which ends March 31, we will probably drill 120 to 150, 160 wells next year.

Q. Do you have a budget or do you have some planning and forecasting when you say we're going to try to drill--

A. No, sir, we do not use a formal budgeting process.
Q. You just kind of do it as you go?
A. Yes, sir.
Q. You have over 100 APDs in the works now?
A. Yes, in this particular Delaware area.
Q. You, of course, don't drill all the wells that you get an okay to drill, do you?
A. We drill the biggest part of them. We probably don't drill--we don't permit very many that we don't drill.
Q. Do you send letters to the potash people wanting objections or no objections on wells that you have never drilled?
A. No.
Q. In the last year, would you know how many letters you've sent out to the potash people wanting to know if they would object or not object to wells?
A. Not without doing some research.
Q. Would you agree it's been a whole bunch?
A. Yes, it's been several.
Q. Would you agree with me that some of

those have come back "no objection"?
A. Some of those have.
Q. Some were objected to?
A. That's correct.
Q. Would you agree with me that the largest number came back "no objection"?
A. No, I would not.
Q. You think most of them were objected to?
A. I believe they were.
Q. At least as far as Yates was concerned?
A. Yes, sir.
Q. And those for which there are no objections, do you plan to go ahead and go forward and drill those wells?
A. Most of those we have already drilled. We're waiting on some more.
Q. Are you familiar with the Bonneville No. 3 well?
A. Yes, sir, I believe I am.
Q. Was that one drilled?
A. I don't recall whether the No. 3 was drilled or whether the No. 2 was drilled. I get confused on those two.
Q. One of them was directional and one of

them was vertical, is that right?

A. There was a directional well drilled, if that's what you're asking.

Q. Is it your recollection that it was a Bonneville or it might have been?

A. It was a Bonneville.

Q. It was a directional well?

A. It was a directional well.

Q. It was drilled by Yates Petroleum?

A. It was.

Q. Do you recall how far it was offset?

A. No, I don't, not in exact numbers.

Q. Do you recall why it was directionally drilled?

A. Yes.

Q. Why?

A. Because we couldn't get a surface location.

Q. From whom?

A. I don't recall.

Q. It didn't have anything to do with the potash people?

A. I don't recall that.

Q. How many other directional wells do you recall Yates Petroleum drilling in the R-111-P

area, if you know?

A. I think I can remember three to the west of this area.

Q. And when would those have been drilled?

A. Two years ago, maybe three.

Q. And the Bonneville 1 you talked about, do you recall when that one was drilled?

A. That was drilled recently, probably during 1992.

Q. Does May of 1992 sound about right?

A. That sounds reasonable.

Q. Those were Delaware wells?

A. Which of "those wells"?

Q. The Bonneville.

A. The Bonneville is a Delaware well, yes, sir.

Q. It was offset a distance you just don't recall?

A. I don't recall that offset, no.

Q. The other directional wells you told me about were not Delaware wells?

A. Those were not Delaware wells. Those were deeper wells.

Q. Is the only directional well that Yates has ever drilled to the Delaware, that you recall

now, this Bonneville well?

A. Yes, that's a correct statement.

Q. Do you know anyone else who has drilled directional wells to the Delaware?

A. I can't think of anybody now.

Q. And I guess you would agree with me that technologically it's possible to directionally drill to the Delaware?

A. Yes, it's possible.

Q. And economically it's feasible, at least it was in this Bonneville case for Yates?

A. I couldn't testify to that. I don't know the answer to that. Our engineer would be more likely to know the answer to that.

Q. Would you agree with me that going forward and drilling a directional well is pretty good evidence that it's economical to do so?

A. No, I wouldn't agree with that. I couldn't testify to that. Our engineer would have to say that.

Q. Do you sometimes drill wells that are not economically worthwhile?

A. Not intentionally.

Q. Very good. I like that. It's like some of our mining, we don't do things

intentionally.

But at least at the outset, when you started drilling this directional well to the Delaware, you thought it was going to be economical?

A. We drilled that well more or less under duress. We had to drill that well because it was a farmout and we were going to lose our rights if we didn't drill that well, with no chance of getting it back.

Q. Would you, and I don't know how that answered my question, my question was this: Would you agree with me that at least prior to drilling the Bonneville directional well to the Delaware, you thought it was going to be economical or you would not have gone forward?

A. No, that's not a correct statement. We drilled the well because we wanted to maintain our rights in that section, and it was considered that the well might possibly, might very well be uneconomic.

Q. Do you know what's happened, whether it has or has not been economical?

A. I do not know the answer.

Q. You've never been interested enough to

look into it?

A. I have several things to do other than look into that.

Q. So, I take it the answer is no?

A. No, sir.

Q. Now, would you look at Exhibit No. 2. Do you have that in front of you?

A. Yes, sir.

Q. And this is Yates' Exhibit No. 2 I'm referring to.

A. Yes.

Q. These are the APDs for those wells, I believe, you referred to earlier?

A. This is the first page of those APDs, that's correct.

Q. I take it you didn't fill this out yourself, did you?

A. No, sir.

Q. You testified earlier about R-111-P, Mr. Patterson. Do you know whether or not the casing program outlined in Exhibit No. 2 complies with the casing program in R-111-P?

A. I would assume that that is the correct casing program because our engineers and our permit people discuss that in the context of the

regulation.

Q. And you're assuming that it complies because you trust your people?

A. That's correct.

Q. You don't have independent knowledge that it complies?

A. I do not study those casing programs on each and every APD, no, sir.

Q. Okay. Now, look at Exhibit No. 4. There is a handwritten part, I believe that's YPC and Pogo?

A. Yes, sir.

Q. And that's the potash leases that you and Pogo went in and recently bid on?

A. That's correct.

Q. Those were federal leases, weren't they?

A. Those were federal potash leases.

Q. I take it that was a joint venture with Pogo?

A. Yes, sir.

Q. These leases that are shown on Exhibit No. 4 are part of this larger group that you said consisted of 5,000-some-odd acres, right?

A. It's a single lease, being 5,280 acres.

Q. Would it be a fair statement to describe these leases, Mr. Patterson, as being north of WIPP and coming east and going down the east side of WIPP for a ways?

A. Yes, sir, that's a good description.

Q. You knew at the time you bid on these leases that IMC Potash had been trying for several years to get these leases from the BLM, weren't you?

A. Yes, sir, I was aware of that.

Q. You and Pogo decided to get together and outbid the potash people for these leases?

A. We decided to bid on the leases.

Q. And you in fact outbid IMC for these leases, didn't you?

A. We did outbid them, yes.

Q. IMC was there to bid on these leases, weren't they?

A. Yes, there was a representative of IMC there.

Q. What kinds of ore do you understand that IMC mines and mills?

A. Potash.

Q. Do you know whether or not they're one of the largest langbeinite producers in the world?

A. I don't know that.

Q. Do you know whether or not they actually mine langbeinite in the potash basin in Carlsbad?

A. I understand that they do, yes, sir.

Q. Do you know whether or not all the mines down there mine langbeinite?

A. I understand that there are mines that do not.

Q. Do you know whether or not New Mexico Potash can mine langbeinite?

A. I do not believe that they--well, I'm sure that they mine it. There's probably some in the potash, but I don't know that they process it.

Q. Did you work on preparing the bid on these potash leases?

A. Yes, sir.

Q. Did you evaluate the potash?

A. We had consultants evaluate the potash.

Q. And did you read their reports?

A. Yes. Their reports were presented to me, as well as some of Yates' reports.

Q. And you authorized the expenditure of funds, I take it, to bid on this lease?

A. Principals of the company authorized that.

Q. And you and Pogo really, really wanted this lease, didn't you?

A. We went to an open auction with the intent of making a bid.

Q. And would it be a fair statement to say, Mr. Patterson, that you outbid IMC for these potash leases so you can drill oil and gas wells on them?

A. These leases are in the area that we are drilling, but we buy leases all over the United States of various types.

Q. Do you intend to mine the potash on these leases you bought, Mr. Patterson?

A. I don't know whether we'll do that in the future or not.

Q. Has Yates Petroleum taken any steps to see if someone else would mine the potash for Yates?

A. We have not at this point. The leases are not even issued yet.

Q. Is it Yates' intention to produce the potash on those leases and pay the royalties under the leases?

A. We have not continued to make a mine plan or continued having our consultants continue looking at this because it's premature, because the leases have not yet been issued.

Q. Have you discussed with Pogo any intention to mine these leases?

A. We have discussed the leases with Pogo.

Q. Have you discussed with Pogo the intention to mine the leases?

A. I don't recall that that subject has really come up.

Q. Have you discussed with any Pogo people an intention not to mine but instead drill the oil and gas wells?

A. Pogo and Yates are very interested in drilling oil and gas wells in this area, yes.

Q. Have you discussed with the Pogo people the intention to drill oil and gas wells on this lease, and not mine the potash?

A. And not mine the potash, no, sir.

Q. Did Yates and Pogo bid on these potash leases to eliminate conflicts over drilling oil and gas wells on the lease?

A. I think that is a possibility that it may eliminate some conflicts, since we're the

owner of the potash leases.

Q. You understand under R-111-P, consent between a potash lessee and oil and gas lessee makes things easier, don't you?

A. Yes, that's right.

Q. And if Yates and Pogo bought the potash lease and also own the oil and gas lease, that means that you can do things a lot easier, right?

A. Well, you would assume so, but Pogo hasn't granted us any waivers.

Q. And we're not going to wait on those either, are we, Mr. Patterson? We'll probably see one about the same time you do.

MR. HIGH: I believe that's all the questions we have right now.

CHAIRMAN LEMAY: Thank you, Mr. High.

MR. CARROLL: Additional questions of the witness?

MR. CARROLL: Mr. LeMay, I have a couple.

CHAIRMAN LEMAY: Do you want to do it after we have the Commissioners ask questions or do you want to do it now?

MR. CARROLL: It would probably be better now. It's just a couple of areas of

clarification.

CHAIRMAN LEMAY: Fine.

FURTHER EXAMINATION

BY MR. CARROLL:

Q. Mr. Patterson, with respect to the last area of questioning by Mr. High in reference to this lease that was purchased by Yates, is it Yates' attention to evaluate the potash in this newly purchased lease?

A. Yes, sir, we do intend--in fact, we have done some preliminary evaluation prior to our bid, and we do have the intention of evaluating the lease.

Q. In this preliminary evaluation, have you received any advice from your engineer as to whether or not there could be concurrent development of both mineral resources?

A. Yes, sir, we have.

Q. What was that opinion?

A. Our consulting engineer told us that he believed that it could very well be developed concurrently.

Q. Now, I am going to show you four letters, and I apologize to the Commissioners that these are not exhibits. I will make these

exhibits. There are four letters here and we will, for reference, refer to them as Exhibit 8(a), Exhibit 8(b), Exhibit 8(c) and Exhibit 8(d). I will supply sufficient copies to update the Commissioners.

And Mr. Patterson, I have pencilled in those exhibit numbers and I would like you to please examine those quickly for me.

A. Okay.

Q. Now, earlier in your testimony you indicated that it was a policy in compliance with R-111-P that notification to the potash companies be given with respect to Yates' intent to try to permit a well, is that correct?

A. Yes, sir.

Q. Are Exhibit 8(a), (b), (c) and (d) copies of those letters?

A. Yes, they are. These are letters from our permit agent, Mr. Cliff May, to Mr. Bob Lane of New Mexico Potash Company, on the four wells here in question.

Q. Would you, first of all, as to each exhibit, give me the date? Well, let's start with Exhibit 8(a), and just read the letters, since the Commissioners don't have it, and first

of all, give me the date of this letter?

A. This letter is dated November 21, 1991 to Mr. Bob Lane, New Mexico Potash, Hobbs, New Mexico. "Dear Mr. Lane: Yates Petroleum Corporation is the operator of Oil and Gas Lease V-2705. We have staked the following location: Graham AKB State No. 4, 1980 from the north line, 1650 from the east line, Section 2, Township 22 South, Range 31 East, Eddy County, New Mexico.

"An application to drill is being filed with the Oil Conservation District. We have been advised that your company is the owner of record of certain potash leases in this area. We respectfully request that you waive any objection you may have to this proposed well location and so indicate by signing and returning one copy of this letter in the enclosed envelope. Your favorable consideration of this request will be greatly appreciated. Sincerely, Yates Petroleum Corporation, Clifton May, Permit Agent."

And at the bottom there's a place to sign, "no objections offered, New Mexico Potash," by title and date, and then the other part of it is covered up, but on the other side there is a

spot to sign similar to the one on the left, that says, "objections offered."

Q. This is basically a form letter that Yates Petroleum employs with respect to every notification that they send within the potash area?

A. That's right.

Q. Also on the face of Exhibit 8(a) there's xeroxed two other items. What are they?

A. It is the receipt and the return receipt for the mailing.

Q. And that actually shows that that letter was received and signed by a representative of New Mexico Potash, does it not?

A. Yes, it does. It's dated 11/22/91.

Q. One day after the date of the letter?

A. That's correct.

Q. Whose signature does that appear to be?

A. Well, he writes just about like I do, but it looks like Walter--it could be Walter Case, Walter S-C-something.

Q. That's with respect to what well, the Graham 4?

A. The Graham 4, yes.

Q. Exhibit 8(b) is with respect to what

well?

A. Exhibit 8(b) is a similar letter on the Graham 3.

Q. And it shows also the return receipt card and dates?

A. Same signature, 11/22/91.

Q. You had apparently received it the same date as the other letters, is that correct?

A. That's correct.

Q. And 8(c) is what?

A. 8(c) is the same letter on the Flora State No. 1, and the return receipt shows the same signature and the same date, 11/22/91.

Q. And 8(d) is on what well?

A. Exhibit 8(d) is on the Flora No. 2. It's dated January 16.

Q. There is no return receipt card attached to that letter, is there?

A. No, sir.

Q. However, look at the bottom of that letter. In the area of whether or not an objection was made or not, you do see a signature and a date appearing there, is that correct?

A. Yes, there's a signature, Robert Lane, Mining--I can't read the title, but the date

looks like it is--it's difficult to read. It's either 7/21/92 or 1/21/92.

Q. What is the date of that letter?

A. This letter is January 16, 1992.

Q. All right. You are aware that Mr. Lane is the mining superintendent of New Mexico Potash and have seen him at some of these meetings, have you not?

A. Yes, I have.

Q. And this is an apparent voicing of an objection to that particular Flora well, is that correct, the No. 2?

A. That's correct.

Q. One last area I want to talk to you about, Mr. Patterson. Mr. High asked you some questions about the shortage of oil in the United States and the low price. Now, your statement is correct, there is a shortage? In other words, the United States does not produce enough oil to meet its needs, is that correct?

A. As I recall, the United States at this time is importing greater than 50 percent of its oil consumption. Somewhere around there.

Q. However, the world market is in what, oversupply or shortage?

A. The world market appears to be in oversupply because of the OPEC nations' huge reserves.

Q. In your opinion, does that have any relationship to the low price?

A. Well, yes. The United States oil market is sort of a price taker. They have to take whatever the OPEC nations want to dictate the price to be.

Q. Mr. LeMay's letter which is an exhibit, I believe Exhibit 9, do you feel that this letter was written so as to try and encourage some price pressure, or is there another more basic problem with respect to the need to develop oil reserves?

A. It seemed to me, through conversations and listening at the hearing, that it was the Commission's intention to increase oil production because of a potential crisis in the United States, a shortage of oil because of the war situation and/or potential war--I don't recall the timing of it--but the Middle East crisis situation.

Q. One last question. On your Exhibit 2, would you turn to that quickly, that is, again, the applications for permit to drill, are they

not, for all four wells?

A. Yes, they are.

Q. Would you look at the bottom right after the BOP program, and what notation is listed there on each one of these exhibits?

A. It says, "Letter has been sent to NM Potash Corporation."

Q. Is that abbreviation for New Mexico Potash Corporation?

A. Yes, it is. All four APDs contain that statement.

Q. And the notice, in the normal course of business of Yates Petroleum, would that be the letters that we introduced as Exhibits 8(a), (b), (c) and (d)?

A. Yes, sir, that's our normal procedure.

MR. CARROLL: Thank you, Mr. Chairman.

CHAIRMAN LEMAY: Mr. High?

MR. HIGH: Yes. I would like to see those documents.

FURTHER EXAMINATION

BY MR. HIGH:

Q. With respect, Mr. Patterson, to documents 8(a), (b), (c) and (d), I believe it is, those are the letters prepared by Yates

Petroleum, right?

A. Yes, sir.

Q. What's the first document you have to file with the state before starting the process to get to drill a well?

A. We file, I believe it is, the APD.

Q. That's the first document filed by someone who wants to drill a well in the State of New Mexico?

A. That's right.

Q. And that's required to be filed by the state, right?

A. That's required by the OCD.

Q. How many copies do they require of that?

A. I believe they get three copies, but I'm not real sure. I just don't recall.

Q. Now, is it your belief that R-111-P only requires a letter from Yates to the potash people?

A. I believe that it requires a notification and a copy of the information prior to drilling.

Q. The letter that you have there that's marked 8(a), (b) and (c), the ones you sent or

your company sent to New Mexico Potash?

A. Yes.

Q. And we received those, by the way. Are those letters required to be filed with the State of New Mexico?

A. I don't recall. I don't participate in this permitting process every day, but I believe that we do file these letters with our APD.

Q. Turn if you will to R-111-P which are our exhibits in the book. Turn to Exhibit No. 9 and turn over to page 11 for a minute, please.

A. Okay.

Q. You have Exhibit No. 9, which is R-111-P, correct?

A. Yes, sir.

Q. Turn over, if you will, to page No. 11 and come down to the paragraph numbered 2. Do you have that one?

A. Okay.

Q. Follow along here with me, because I want to get your understanding, Mr. Patterson. I read this earlier, but I want to ask you again with respect to these Exhibits 8(a), (b) and (c).

Paragraph 2 says, "Before commencing

drilling operations for oil and gas on any land within the potash area, the well operator," that would be Yates, right?

A. Yes, sir.

Q. "...shall prepare a map or plat showing the location of the proposed well. Said map or plat to accompany each copy of the Notice of Intention to Drill." Do you see that?

A. Yes, sir.

Q. And "Notice of Intention to Drill" is in initial capitalization, is it not?

A. Yes.

Q. Is it your understanding that all you have to do to comply with that is just send a letter to New Mexico Potash?

A. No. But it also says, "Before commencing drilling," and that could be done at any time prior to the drilling operations.

Also, I don't know without reading this entire document, if the capitalized Notice of Intention to Drill is a reference to notice to the potash company or if it's a reference to the APD, because many times, in our industry, the APD is referred to as a notice of intention to drill.

Q. In fact, that's quite common, isn't it?

A. Yes, sir.
Q. That people know the APD is being the notice of intention to drill?
A. That's right.
Q. That's the one you're required to file with the state?
A. That's right.
Q. Three copies?
A. Okay.
Q. With a plat or a well location shown?
A. That's right. That's what we do.
Q. Would you agree with me, Mr. Patterson, that that's what's being referred to in the first sentence of R-111-P?
A. Without reading the document and seeing what the definition of that is, I can't agree with that, no.
Q. Would you agree with me that the letters up there, 8(a), (b) and (c), are not an APD, correct?
A. What are you--
Q. The letters that you identified as being Exhibits 8(a), (b) and (c). The letters you sent to New Mexico Potash.
A. Those are not an APD. I would agree

with you.

Q. And an APD was not attached to them?

A. I cannot tell that from the exhibits. The statement--there is a plat attached to this exhibit, and it's actually stapled to a copy of the APD.

Q. All right. Can you tell from the cover letter whether or not those were attached when they were sent to New Mexico Potash?

A. From this cover letter, I cannot tell whether they were attached or not.

Q. And what's the date of 8(a), (b) and (c)?

A. November 21, 1991.

Q. If you look at Exhibit No. 2, which are the APDs?

A. May I put this away?

Q. We're going to talk about it some more. Are you having trouble locating it?

A. No, I'm just having trouble with too much paper.

CHAIRMAN LEMAY: Do you want to take a break now? How many more questions do you have?

MR. HIGH: I'm almost through. Do you want to break now?

CHAIRMAN LEMAY: Well, I hate to break a witness, but if you have some more questions, we can.

MR. HIGH: I have a few more about R-111-P.

CHAIRMAN LEMAY: Let's take a break, then. We'll take a 15-minute break and come back.

[A recess was taken.]

CHAIRMAN LEMAY: Before we continue, I would just like to make a couple of comments. In the interest of getting everything into the record, I think we're getting somewhat cumulative here, counselors, both of you.

Mr. High, this is the second time, as I understand, you've read paragraph 2, page 11 of your exhibit into the record, and I don't know why it's come up the second time, but you did that the first time.

Mr. Carroll, you could have presented Exhibits 8(a), (b), (c) and (d) at the time Exhibit 8 went in, so that that would be complementary to the presentation then. I either have to assume you think we're wandering around this way or assuming we're not very smart up here

and didn't hear it the first time.

I'm not limiting testimony, but I'm saying, let's get a little better prepared. Let's handle the case in a precise, consise manner, get it in the record, and sit down. That's the purpose of it.

Comments?

MR. HIGH: My follow-up questions were related to the additional exhibits that Mr. Carroll offered.

CHAIRMAN LEMAY: Didn't you read the same thing before? Doesn't it apply to those exhibits as well? Does it have to be referenced again and read again?

MR. HIGH: With respect to other documents, Mr. LeMay.

CHAIRMAN LEMAY: But it's the same paragraph, isn't it?

MR. HIGH: It's the same paragraph, but the question is, what is the notice of intention to drill?

CHAIRMAN LEMAY: I think you covered that the first time, didn't you?

MR. HIGH: Not with respect to these documents.

CHAIRMAN LEMAY: The whole thing, intention to drill is intention to drill, whether it's related to these documents, future witnesses. It seemed very cumulative to me.

MR. HIGH: We didn't think it was. If the Commission did, I apologize. I will tell you that during the break Mr. Carroll and I have talked about this issue and we have agreed that there is no longer an issue in this case of whether New Mexico Potash timely protested these four wells. Therefore, I have no further questions of Mr. Patterson.

CHAIRMAN LEMAY: Fine. Is it possible for you to get together, the two of you, and stipulate other things, too, prior to getting witnesses on the stand and examining, cross-examining, and recross-examining?

MR. HIGH: I'm just telling you what we talked about.

CHAIRMAN LEMAY: Fine. I appreciate that. I really do.

MR. HIGH: We were going back and forth on this timeliness issue, and I thought it had been resurrected. It has not. It is not an issue in the case, and that was the purpose of my

questioning.

CHAIRMAN LEMAY: Thank you. I appreciate it. And I do this in the spirit of cooperation. I think we encourage this type of dialogue between opposing counsel so that it does provide for an efficient, fair and proper hearing.

MR. CARROLL: Chairman LeMay, I think Mr. High and I will endeavor, although I cannot promise we will be able to reach an agreement in any other areas, but I think both of us are well aware of the time constraints, and my representation to you is that I will try and I think Mr. High will do the same.

CHAIRMAN LEMAY: Fine. That's all we ask. Not only time constraints, counselor, but you need for the Commission to focus on the critical, important issues. If you're talking about whether or not a paperclip was included in the correspondence between these individuals, and I can't quite read the date, I can't see how that's relevant for us to focus on the critical issues, and we do want to focus on the critical issues. So please continue.

MR. HIGH: May I ask that the record

reflects whether or not I've correctly stated our agreement, Mr. Carroll, with respect to the timeliness issue?

MR. CARROLL: It does correctly state it, because, as I understand it, as the Commission ruled, this case would be tried as an exception, and the timeliness, therefore, is rendered moot. And I think that's what the record reflects and that's how we will stand and try our case.

MR. HIGH: And I have no further questions of Mr. Patterson.

MR. CARROLL: Nothing further. My next witness would be Mr. Szabo.

CHAIRMAN LEMAY: We may have questions from the Commissioners on this witness.

MR. CARROLL: Excuse me. I'm trying to hurry along.

CHAIRMAN LEMAY: Well, we're trying to hurry as fast as we can, Counselor.

Additional questions from the audience? Commissioner Carlson?

EXAMINATION

BY COMMISSIONER CARLSON:

Q. On your Exhibit No. 1, your Graham

State 1 and 2 wells, those wells are now producing, is that correct?

A. Yes, sir, the Graham No. 1 and No. 2 are producing wells.

Q. When were those wells drilled?

A. I don't recall. I can get that information for you, if you like.

Q. Obviously it was within the last four years, right?

A. Oh, yes, sir.

Q. Subsequent to R-111-P?

A. Yes, sir.

Q. Did you follow R-111-P procedures, as far as notification to New Mexico Potash of those wells?

A. Yes, sir, we did.

Q. And they had no objection?

A. I believe that that's correct, that there was no objections offered for those two wells.

Q. Did you know, at the time you drilled those wells, that they were in the buffer zone of New Mexico Potash's LMR?

A. I don't believe that we did because I'm not sure that we knew what the LMR was. But I'm

uncertain about that answer.

Q. You discussed directional drilling. Do you know what additional costs of drilling a well to the Delaware, what the additional costs would be for directional drilling?

A. Right off the top of my head I don't recall that, but I believe that one of our witnesses may testify to that later.

Q. Okay, fine. On your Exhibit No. 4, your newly acquired potash leases, what is the term of those federal leases?

A. I believe that there is no term to those leases. It is an open-ended lease. I could not find the term in reading the lease. I could not find a term.

Q. So you don't have to be producing within a certain time frame?

A. No, sir. The only thing I read in the lease was that you pay rental, and the rental has an increasing value over time.

Q. Those are yearly rentals that increase until production?

A. Yes, sir, each year, yearly rentals.

COMMISSIONER CARLSON: That's all I have.

CHAIRMAN LEMAY: Commissioner Weiss?

COMMISSIONER WEISS: Yes.

EXAMINATION

BY COMMISSIONER WEISS:

Q. Has Yates been advised of the development plan that the potash company has for Section 2?

A. We have been made aware that in January sometime, that the LMR was extended in Section 2, down into Section 2, and I believe that was based on the new core hole. We were advised that that was the case.

Q. I'm curious as to whether there's something comparable to a drilling permit that the potash people send out, such as you send to them when you want to drill a well?

A. To my knowledge, I've never seen a mine plan or anything such as that that says anything about Section 2.

COMMISSIONER WEISS: Thank you. That's all the questions I have.

EXAMINATION

BY CHAIRMAN LEMAY:

Q. Do you have a location for this Bonneville well that you drilled directionally?

Section, township and range?

A. Yes, sir, just a second, if you would. Let me pull out Exhibit No. 10, and I think maybe I can identify that section.

I understand that Bonneville was in Section 19 of 21 South, 32 East, which is north of that Section 2. It's one of those circles there, open circles in Section 19 of 21 South, 32 East.

Q. Okay. Thank you.

A. And exactly which one, I'm sorry, I can't tell you.

Q. That's okay. I just need to know a general location. One other item, Mr. Patterson, the price you paid, is that confidential or is that a matter of public record?

A. For the potash lease? I don't know that it's public record, but we paid $6 an acre.

CHAIRMAN LEMAY: Thank you.

Additional questions of the witness? If not, he may be excused.

THE WITNESS: Thank you.

You may call your next witness, Mr. Carroll.

MR. CARROLL: Our next witness will be

Ernie Szabo of the State Land Office.

ERNEST SZABO

Having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. CARROLL:

Q. Would you please state your full name and occupation for the record.

A. Ernest Szabo. I'm a geologist for the State Land Office.

Q. Mr. Szabo, do you have a degree in geology?

A. Yes, sir.

Q. How long have you been working with the State Land Office?

A. Seven and a half years.

Q. Mr. Szabo, could you tell me what your duties are with respect to your work with the State Land Office?

A. Primarily I'm responsible for the oil and gas lease end. I do get involved in land trades. I also issue seismic permits and make determinations on behalf of the Land Office as to whether or not people are drilling or intending to drill in potash LMRs or in the buffer zones.

Q. So you do have some duties with respect to the LMR designation process, at least as to how that involves the State Land Office?

A. Yes, sir.

Q. Are you the sole person that handles that area, Mr. Szabo?

A. Unfortunately, yes.

Q. The buck stops there? Is that what you're telling me?

A. [Deponent indicated.]

Q. Mr. Szabo, you are familiar then with, and in fact I believe you were actually, although it may have been confidential, you did give some testimony at the Division level of these four cases, is that correct?

A. Yes, sir.

Q. And you are familiar, then, with at least the facts of these cases and familiar with the LMR that has been designated by New Mexico Potash Corporation with respect to its state leases? I guess, well, in the entire potash enclave, I suppose you get all of that information?

A. Well, I would get all the information in this case, yes, I'm familiar with 34, 35, 36

and Section 2.

Q. Section 2 is a state-owned acreage, is that correct?

A. That's right.

Q. That's why you have concern with it?

A. Yes, sir.

Q. Mr. Szabo, prior to 1/1/92, New Mexico Potash had, in fact, designated an LMR, had it not?

A. Yes, sir.

Q. And it was on file with the State Land Office?

A. That LMR was mailed to us effective 1/1/91.

Q. All right. Subsequent to 1/1/92, there was a change, was there not?

A. Yes, sir.

Q. Do you recall when you received that notice of change?

A. Yes. The letter of transmittal was dated the 14th of January.

Q. Prior to your receipt of that letter dated 1/14/92, was Section 2 within an LMR?

A. No.

Q. Was any part of Section 2 within a

buffer zone of an LMR?

A. Yes.

Q. What portion of Section 2?

A. The north half.

Q. After this notification letter, did that fact change?

A. Yes, sir. The entire section became LMR or was designated LMR by New Mexico Potash. So they added a half-section.

Q. They added that one section?

A. Yes.

Q. Now, Mr. Szabo, did the State Land Office just accept that designation, or could you describe what, in fact, did happen with respect to this designation process?

A. Well, we discussed the extension--

Q. When you say "We discussed," could you explain?

A. The director and I, and then we sought the assistant commissioner's advice. There was no information with the map that accompanied the transmittal. And the R-111 gives us the right to data in the potash area, and if not R-111, then State Land Office Rule No. 3 tells us we're entitled to core and drill hole information on

state acreage.

So, rather than take this at, let's say, artistic value, we then requested data to confirm indeed that this was a real LMR or a real extension or just an exercise.

Q. All right. Did you then request additional information from them?

A. We did.

Q. Did you then receive additional information from them?

A. We received information, I believe it was, March 14th.

Q. Was additional core hole data received with respect to Section 2?

A. There was one core hole listed.

Q. After the receipt of this information in March, did the State Land Office issue a letter to New Mexico Potash Corporation with respect to its stand on the amendment of the LMR?

A. We did.

Q. That letter was signed by Mr. Prando, was it not?

A. That's right.

Q. I'm going to hand you what has been marked as Exhibit 11 by New Mexico Potash, this

is in their black book, Exhibit 11--and I won't hand you the whole book, it's so voluminous. I'm just going to take the exhibit itself. You have just described to me a letter. Is that the letter that you made reference to?

A. It is.

Q. Now, in the first paragraph, that letter indicates that at least there was some acceptance by the State Land Office of this designation, is that correct?

A. Yes.

Q. It mentions "criteria." Is this criteria that the State Land Office has developed, or what is it? and is it something that is going to continue in use by the State Land Office or be changed?

A. We assume R-111-P as a starting point or a zero point. For that, we also accepted what was called the LMRs of the potash companies at that time. The standard for the potash, we went ahead and used BLM standard to be conformable, to be agreeable with them, of four feet of 10 percent sylvite, or four feet or four percent langbeinite.

Q. And that is the standard that the

federal government has utilized when they began the leasing process? That was their leasing standard, isn't it, that's existed from nearly day one?

A. From the establishment of the enclave, as far as I know.

Q. Now, with respect to that, is it the State Land Office policy? Is that something that they consider is correct, or do they feel bound by it? Or is there a process right now going on where it may be changed?

A. We accept it at the present time for lack of standards of our own. They could be changed in the future. They could be increased, they could be decreased.

However, at the present time since my function is primarily that as a petroleum geologist, I didn't feel qualified to establish standards for this particular case or condition, so we used the BLM standard. Now, in the future, we feel that we should and will have more to say on how state acreage is used.

Q. And, in fact, the State Land Office is looking for personnel to help it in that?

A. We are. We are looking for another

geologist. We've interviewed several. One of the qualifications we asked for has been the ability to be fluent or versatile or liquid or whatever in mining operations.

Q. Now, paragraph No. 2 of this particular letter does point out the position of the State Land Office with the state of the information provided, does it not?

A. Yes, it does.

Q. And what is that position? Could you--

A. Well, that is based mainly on my observation, my experience, my opinion, that in contouring, isopaching if you will, between points, things are subject to rapid change especially when you deal in things like sand or reef or evaporites. So the fact that you supply one point doesn't justify extending it for miles around.

Q. Again, this particular letter was the first notification to New Mexico Potash that at least for State Land Office purposes, you had accepted the amendment of the LMR?

A. Yes, sir.

Q. The State Land Office policy, and I ask this question in deference to counsel of the

State Land Office, it is not the State Land Office policy that the State Land Office takes the position that its decisions must govern or direct the Oil Conservation Commission, does it?

A. No. We determine for our own interests and the Oil Conservation Division determines in the general interest of whatever parties are involved.

Q. And all of the processes that we have talked about through your testimony, these were thought processes or procedures that were confined within the State Land Office without consultation outside or direction from the Oil Conservation Division then, wouldn't that be fair?

A. Yes, sir.

MR. CARROLL: That's all the questions I have, Mr. LeMay.

CHAIRMAN LEMAY: Thank you. Mr. High? Before you go, did you want to qualify the witness? I think that might have been eliminated. He is qualified.

MR. CARROLL: I think he's an employee. I don't know that I used him as an expert.

MR. STOVALL: I think that's correct. He is expressing the State Land Office policies and procedures, and is not expressing an opinion but as an expert geologist.

MR. CARROLL: That was my intent.

CHAIRMAN LEMAY: Thank you. That clarifies the issue, then.

EXAMINATION

BY MR. HIGH:

Q. Mr. Szabo, who do you report to?

A. Mr. Floyd Prando, Director.

Q. Have you any prior experience working with potash, other than through the State Land Office?

A. No.

Q. Do you have any prior experience in mining at all?

A. Not experience, no.

Q. Were you with the State Land Office when R-111-P was adopted?

A. I was, but not an active participant. At that time Bruce Stockton was the petroleum engineer and he participated in the, shall we say, proceedings.

Q. Since R-111-P was issued, has the State

Land Office adopted any written procedures with respect to the submission of LMRs by potash lessees?

A. Not written procedures, no.

Q. Has the State Land Office, since R-111-P was issued, adopted any standards that will be imposed by the State Land Office for a potash lessee to get an LMR okayed or whatever it is you say they have to do?

A. We haven't imposed any of our own. We accept whatever the 111-P was trying to convey.

Q. Well, other than the R-111-P document itself, did the State Land Office have any written documents with respect to standards that must be met for an LMR to be accepted or approved, or whatever you said the State Land Office does?

A. No. The objective was to have a certain uniformity to proceeding.

Q. Does the State Land Office have any written document saying it will follow the BLM standard in one area or two areas or all areas concerning mining?

A. No.

Q. Is that something that you decided to

do personally, since you're in charge of this whole area?

A. It's something that we agreed upon because we had to have a starting point.

Q. Who is "we"?

A. The director and I--well, the director and I.

Q. That would be Mr. Prando?

A. Mr. Prando.

Q. When you say follow BLM standards, that was kind of across-the-board type stuff?

A. No more than BLM is across the board with us.

Q. Which BLM standard did you agree to follow, is what I'm getting at?

A. Designation of an LMR, the buffer zone idea, the four-ten and four-four.

Q. Now, I understand under R-111-P a potash lessee can amend their LMR, is that right?

A. Yes, sir.

Q. Do you recall the time period during which they can do that?

A. It's got to be done by January 21 of the next following year.

Q. I think it's probably January 31st.

A. Okay. Somewhere in there.
Q. My recollection is you said that January 31st following the date that new data becomes available?
A. Well, the date I'll not question.
Q. You're aware of the fact that a new core hole was drilled in Section 2 by New Mexico Potash?
A. Yes, sir.
Q. Well, you're aware of that now?
A. I'm aware of that now, yes.
Q. You're aware that core hole 162 was drilled?
A. Yes, after submittal of the data by New Mexico Potash, yes.
Q. Do you recall when that core hole was drilled?
A. No, because I had no previous knowledge of it.
Q. New Mexico Potash did file a designation or some document with the State Land Office prior to January 31st, changing their LMR, correct?
A. Yes.
Q. And you say "we," and you described the

director and an assistant commissioner?

A. I would say we're primarily responsible for consultations.

Q. That's the Commissioner of the Office of Public Lands, right?

A. Yes, sir.

Q. Not the Oil Conservation Commission?

A. No. We have nothing to do with the Oil Conservation Commission, in a business way.

Q. You asked New Mexico Potash for some data to back up the change in LMR, is that right?

A. Exactly.

Q. That was provided to you, was it not?

A. At a later date, yes.

Q. Mr. Bob Lane even came to Santa Fe and met with you, right?

A. That was the date of the hearing for the wells in question.

Q. He showed you information on what core hole 162 showed?

A. No. We discussed operations, the cost of operations, and I got the core hole information with a transmittal letter at a later date.

Q. And when you got the core hole data,

you agree that it shows ore that New Mexico Potash can mine?

A. Judging by the standards set up under BLM, yes.

Q. And you, then, with Commissioner Prando's signature, sent the letter that you called Exhibit No. 11?

A. Okay, yeah.

Q. Now, you say in that letter or Mr. Prando says in that letter, the first paragraph, that "It is our conclusion that core hole 162 did encounter an economical accumulation of sylvite. The quality of ore is such that the southeast quarter of Section 2, Township 22 South, Range 31 East, contains a commercial deposit." And that was the conclusion you and Mr. Prando reached?

A. Right.

Q. That was based on the core hole data given to you by New Mexico Potash?

A. Right.

Q. And your meeting and discussion with Mr. Bob Lane?

A. Yeah.

Q. What standards did you use, Mr. Szabo, to limit the area of commercial potash to the

southeast one-quarter-section of Section 2?

A. By looking at LMRs, I noticed that there are frequent barren areas that can be contoured in if you allow one core hole per section. In other words, I personally feel, as I said earlier, that one core hole does not justify blocking out an entire section.

Q. And you said that's your personal opinion?

A. That's right.

Q. Does the State Land Office have any written standards--

A. No.

Q. Excuse me. Let me finish. Does the State Land Office have any standards on the interpretation to be given to a core hole that's drilled in the potash basin?

A. No, sir.

Q. Are you aware of any standards in the mining industry concerning the area of influence to be used in interpreting a core hole?

A. The BLM uses three-point to contour in.

Q. What distance away from a core hole will the BLM use in interpreting core hole data whole?

A. Well, they claim a mile and a half.
Q. Did you use the BLM standard in that regard?
A. No.
Q. Is there any written document in the State Land Office that says which of the BLM standards you will follow?
A. No. And may I point out, though, if we're discussing three-point and contouring by three-point, that such would be done if all points contained the objective.
Q. Do you know whether or not core hole No. 162 connects up with two other core holes that contain ore that New Mexico Potash can mine?
A. It connects up with at least one to the north and at least two to the south and west.
Q. That show ore that New Mexico Potash can mine?
A. Well, I don't know if they show ore or not, because all I got was the point and no data, and a series of lines connecting in triangles, and that was it. I got no data for the other core holes.
Q. Other than the discussions that you referred to and the information submitted by New

Mexico Potash and your discussion with Mr. Bob Lane, did you do any independent research on whether or not this Section 2 contained commercial potash?

A. We have neither the facilities nor the personnel nor the financing to do any kind of research.

Q. All you considered is what New Mexico Potash submitted to you?

A. We have no choice. We accept the word of the operator as being true.

Q. Did you call the BLM and ask them for any data?

A. No.

Q. You understand that all core hole information is and has been for years filed with the BLM?

A. The fact is, we feel that we should have it, too.

Q. I understand, but--

A. Yes, I understand your point.

Q. You understand that they have people with backgrounds in mining?

A. Undoubtedly.

Q. Do you know whether or not anyone else

at the State Land Office had any communication with the BLM people?

A. No.

Q. At the time you and Mr. Prando decided to send the document marked as New Mexico Potash Exhibit No. 11, Mr. Szabo, were you aware that Section 2 did, in fact, contain a commercial deposit of potash in areas other than the southeast one-quarter?

A. No.

Q. Is it your understanding and interpretation that core hole 162 only influences the southeast one-quarter of Section 2?

A. No, but I could contour the various points in several different ways and either work out or work in, whichever my pleasure was, to show that the ore reserves were or were not there.

Q. Did you do that?

A. I speculated on it. I didn't mark up the information that was submitted, no.

Q. Did you conclude that there were commercial deposits of potash in anyplace in Section 2 other than the southeast one-quarter?

A. I concluded that there was a

possibility of it, but I didn't say there is.

CHAIRMAN LEMAY: Could I just interrupt? For clarification, you're talking about this core hole 162, but no one has given a location for this core hole.

THE WITNESS: It's approximately the center of the southeast quarter.

CHAIRMAN LEMAY: Center of the southeast of the southwest?

THE WITNESS: No, approximately the center of the southeast quarter.

CHAIRMAN LEMAY: Where Pogo has that lease?

THE WITNESS: That would be roughly.

CHAIRMAN LEMAY: That's all. I hope you don't mind the interruption; you just keep talking about that and we need to reference the location.

MR. HIGH: That's all the questions I have, Mr. LeMay. Thank you.

CHAIRMAN LEMAY: Thank you. Additional questions of the witness?

Commissioner Carlson?

COMMISSIONER CARLSON: First of all, as a point of clarification, Mr. High, when Ernie

talks about the assistant commissioner, not being the Oil Conservation Commission, I am the Assistant Commissioner of Public Lands that he's referring to. I think in his one statement there. That's not a question, just a clarification.

EXAMINATION

BY COMMISSIONER CARLSON:

Q. Ernie, you are satisfied, then, by the core hole data that the southeast quarter of Section 2 should be within an LMR?

A. Without question.

Q. Do you have any opinion or knowledge about the northern half of Section 2?

A. The northern half we had placed into the buffer zone because it offset by within a half-mile the LMR that New Mexico Potash had designated in Section 35.

Q. Right, but do you have any knowledge about the location of any commercial potash deposits in the northern half?

A. No, sir. For all the information we have, it could be barren or it could be completely full.

Q. And is that true also of the southwest

quarter?

A. Well, I would lean more toward allowing potash in the southwest quarter, because I would be connecting toward what was indicated as potash accumulation toward the west.

COMMISSIONER CARLSON: That's all.

CHAIRMAN LEMAY: Commissioner Weiss?

COMMISSIONER WEISS: I have just one.

EXAMINATION

BY COMMISSIONER WEISS:

Q. Is it generally accepted in the mining industry that contour points a mile and a half apart are valid?

A. Pretty much so.

Q. Do banks lend money on that?

A. Apparently they do. My experience in petroleum is that that's far too far apart. I can fit a full section into it. And I have so many contour options with three points that, you know, as I said, I can either do or do without. I can put it in or take it out as I please.

COMMISSIONER WEISS: Thank you. That was my only question.

CHAIRMAN LEMAY: I have only one question for you, Mr. Szabo.

EXAMINATION

BY CHAIRMAN LEMAY:

Q. Is it the State Land Office's policy that the acceptance of the LMR is when the potash company files the data, as a example in this case January, or is it the timing of a letter such as Exhibit No. 11 that confirms the findings?

A. We started our acceptance of LMRs as a zero point after the R-111-P was passed and accepted, so that we, in other words, had to have a point at which to take off.

Now, our feeling has been that we cannot delegate to the BLM the right to speak for us, any more than they do for themselves. In other words, if we are agreeable, we have a joint opinion; else, BLM has stated that they'll take their marbles and go elsewhere.

So we feel we have a right to the same thing. We're not any less than the BLM. So we took the designated LMRs as a starting point and, in the future, we are expecting to take a more active part in the LMRs when it comes to state acreage. We don't expect to interfere with the BLM on federal acreage, but we definitely feel we should have more say on state acreage than we

have so far.

In other words, everything that is data goes to BLM. It's BLM that says yes or no. They are, then, determining our right. They're taking away our right to determination. And, in fact, if they so please, they can take our property and prevent maximum utilization. And our instructions are to maximize returns from all state acreage for the benefit of its beneficiaries, so we are intending to take a more active part so that we can maximize our returns.

Q. I guess, then, in this particular situation, what date was the LMR established? Was it in January or March?

A. We feel that it was in March, with the letter.

CHAIRMAN LEMAY: Thank you.

Additional questions of the witness?

MR. HIGH: I have a few follow-up to some of the questions you asked, Mr. LeMay.

FURTHER EXAMINATION

BY MR. HIGH:

Q. Mr. Szabo, has the State Land Office notified potash lessees of the new role that the State Land Office will be taking?

A. No. We're in the process of doing that now.

Q. Has the State Land Office come up with any standards that the potash lessee will have to meet to satisfy the State Land Office with this new active role?

A. If necessary, we will.

Q. You didn't have those standards back in January of 1992, did you?

A. We had embarked on a new-- Yes, the R-111-P clearly stated that we're entitled to the data. A map without data is no better than a piece of Kleenex. Therefore, we had to confirm this as being a serious extension rather than a capricious line-drawing exercise.

Q. Do you feel that a potash mine might, in fact, go through a senseless gesture of sending in an LMR that means nothing?

A. They could, because I've known this to happen in the oil industry. I have known people to send in senseless pieces of paper to hold acreage, yes.

Q. Is it the position of the State Land Office that the State Land Office has the right to approve or disapprove an LMR designated by a

potash lessee?

A. It is our position that we should and will have the right to advise or approve or disapprove on the maximum utilization of our property. We will not waste, but, at the same time, will not idly sit by.

Q. Well, and I appreciate that, but I don't think it answered my question, Mr. Szabo.

When a potash lessee sends an LMR to the State Land Office, are you going to approve it or disapprove it? Is that what you're saying?

A. If they send the data to go with it, we will probably approve it if they're confident the data is valid.

Q. If it's not acceptable to the State Land Office, you're going to disapprove it?

A. We will return the data and inform them that we don't approve.

Q. Is this policy already into effect?

A. No.

Q. Was this policy you just described to me about approving or disapproving, in effect back in January of 1992?

A. Obviously, because we requested and got more data in later.

Q. Were potash lessees notified that the State Land Office was taking a--

A. This was the first case where we had the opportunity to test this.

Q. So New Mexico Potash didn't know before all these events happened about this new role you're telling us about, did they?

A. No, they didn't. If they were serious about it, they could have submitted the data as required by R-111-P.

Q. Would you agree with me, Mr. Szabo, that it would be difficult for a potash lessee to know what they have to do to satisfy the State Land Office without some written standards?

A. No.

Q. Well, they have to get their--

A. They've already got the BLM standard. If we change the BLM standard, they will be notified, but they do have the BLM standard to go by and we have R-111, which clearly states that we're entitled to the data. And if they want to extend it, they've got to have reasonable grounds to extend it on.

Q. My question to you is, you don't have anything in writing that says what those

reasonable grounds will be in your opinion, right?

A. They haven't changed so far. They still say four feet of 10, four feet of four, and submit the data take to prove it.

Q. And that's all they have to do?

A. That's all they have to do so far.

MR. HIGH: Okay. Thank you, Mr. Szabo.

CHAIRMAN LEMAY: Thank you, Mr. High. Additional questions of the witness? If not, he may be excused.

Boy, you timed that just right, didn't you? It's noon time. We'll break for lunch and be back at 1:15.

[The noon recess was taken.]

CHAIRMAN LEMAY: We shall resume when you're ready.

MR. CARROLL: Thank you, Mr. LeMay. The next witness Yates Petroleum will call would be Brent May.

BRENT A. MAY

Having been first duly sworn upon his oath, was examined and testified as follows:

MR. CARROLL: I have just handed out to

the Commissioners the brown envelope, and that will be Mr. May's exhibits, numbered 11 through 21.

May I proceed, Chairman LeMay?

CHAIRMAN LEMAY: Please.

EXAMINATION

BY MR. CARROLL:

Q. Would you please state your name, occupation, and residence for the record?

A. My name is Brent May. I'm a geologist with Yates Petroleum in Artesia.

Q. Mr. May, you have told us that you are a petroleum geologist, is that correct?

A. That is correct.

Q. And you have had occasion to testify as a petroleum geologist before the Oil Conservation Division?

A. Yes, I have.

Q. On numerous occasions?

A. Yes.

Q. And on those occasions, you've had your credentials accepted, is that correct?

A. Yes, I have.

Q. And how many years of experience do you have in the field?

A. Approximately three.
Q. With Yates Petroleum?
A. Yes, that's correct.
Q. You are familiar with Yates Petroleum's applications in the four wells that are before the Commission today?
A. Yes, I am.
MR. CARROLL: Mr. LeMay, I would tender Mr. May as an expert in the field of petroleum geology.
CHAIRMAN LEMAY: His qualifications are acceptable.
Q. Mr. May, you've told us you are familiar with Yates Petroleum's applications in this case?
A. Yes.
Q. Were you the principal geologist for each of the four applications of the four proposed wells?
A. Yes, I was.
Q. You have prepared certain exhibits to illustrate the geological issues with respect to these four particular wells, have you not?
A. Yes, I have.
Q. Your first exhibit, Exhibit 11, that is

basically a synopsis of your testimony, is it not?

A. Yes, it's a brief description of the geologic figures that I will present, which are a stratigraphic cross-section, showing the producing zones, the structure map, a net porosity map, plus an article describing depositional environments in the Delaware, and an initial potential map.

Q. Mr. May, without me trying to interrupt you and so that your discussion can be put on in an expedited fashion, if you can, would you just go through your exhibits and explain to the Commissioners what they are, identifying them for the record, and their relevance to the issues before this Commission?

A. The next exhibit is Exhibit 12, if I can get it unfolded. Cross-section A - A' is a southwest/northeast stratigraphic cross-section. The location is shown in the bottom-right corner with the wells indicated in red. The cross-section is hung on top of a Cherry Canyon shale marker, shown as the datum. The correlations of the Cherry Canyon and Brushy Canyon formations are shown along with perforated

intervals.

The main pay zone is colored in orange along with three secondary pay zones and what I term a potential pay zone. The main pay and secondary pay zones were perforated and producing in this area. The producing zones can be correlated to the Clayton Williams well in Section 15, southwest of the Lost Tank and Livingston Ridge pools, which is on the far left side of the cross-section, and that well is actually within the WIPP boundary.

These zones were not tested in the Clayton Williams well with the exception of what I termed the potential pay zone, which produced oil during a drill-stem test. The possible potential of the Clayton Williams well suggests that the reservoir should extend further west of the established production in the pools.

The primary objective is to test the basal Cherry Canyon Formation, the main pay and the other secondary pays, and extend the western limits of the Lost Tank and Livingston Ridge pools. The secondary objectives include the Brushy Canyon, as shown, and the Bell Canyon Formations.

The sands of these three formations are generally thought to be submarine channel/fan complexes that were deposited in the Delaware basin in Permian time.

Next I would like to move on to Exhibit No. 13. The structure map with a Cherry Canyon shale marker as a datum, shows the east dip in the Livingston Ridge area. Green circles around the location symbols--does everybody have their maps out yet? The green circles around the location symbols indicate the contested locations we're talking about here today. The trapping mechanisms of the Delaware sands is more stratigraphic than structural in nature, thus the structural noses and closures are not necessarily needed for production but can enhance it.

The proposed locations are situated updip from established production; thus, the oil/water contact should not be encountered.

The next exhibit, Exhibit 14, is an article titled, Guadalupian Depositional Cycles of the Delaware Basin and Northwest Shelf by Jacka, et al, and describes the depositional environment of Delaware Mountain Group. Jacka, et al., believed the Delaware sands were

deposited by deep sea submarine fans.

Figure 8 on page 85, in the lower right-hand corner of the page, shows a plan view of a submarine fan. The channels of the fan are separating and fingering into the fan as they move away from the source area. This depositional environment can be applied to the Delaware sands in the Livingston Ridge area. I might add that it's generally common knowledge with most geologists working Delaware that the depositional environment is thought to be submarine fans or channels.

The next exhibit, Exhibit 15, is a net porosity map that shows the limits of the main pay, which I have on my cross-section. This is the main pay only. It does not include the secondary pay zones. The map is an isopach of density porosity of 15 percent or greater. Wells with porosity of 15 percent or greater should produce commercial amounts of oil from this zone. Lower porosities will produce, but the wells are not quite as good. The colors that are used on the map are used to highlight the sands and sand thicks. These are not used as cutoffs in any way on the map.

The depositional environment present is represented by the channels within a submarine fan system, such as the one described by Jacka, et al., and this explains the fingering of the sands. The source area would be back to the north with the sand flowing to the south, starting to finger and separate out, which is what I'm showing with each one of these sand thicks. Most of Section 2 should have a sufficient amount of porosity to establish good, commercial production.

Q. Mr. May, when you talk about this main pay, since we are talking about four wells, what is the average depth of this main pay?

A. For the main pay, it's approximately 7,000 feet.

Q. And that would be similar for all four wells?

A. Yes. Yes.

Q. On your Exhibit No. 15, I notice over in Section 3 there's an open red circle. Could you tell me what that is?

A. That is a Phillips location which they have spotted. It's a Delaware location. And I can assume that evidently they think there's

potential even further west than where I have it shown.

Q. Is this a recent spotting of a location?

A. I think within the last month or two, I believe.

Q. Is it a fair statement that with respect to your map there may be at least some other schools of thought that tend to believe that it is even more optimistically than you have drawn it?

A. That's true. The information I base my map on are the wells in the Livingston Ridge and Lost Tank pools. I could draw this contour map showing the various fingers or thicks of the sands shown, but we have, because of our constraints of drilling, we don't know where the western limits of this field is at presently. There could be possibly another sand going off to the west of what I have drawn.

Q. Would that, Mr. May, be consistent with the depositional type environment that you were just discussing, the fan-type environment that was listed in the study that you used as your exhibit?

A. Yes, it is. As these sands flow from the source area, like I said, as they start to lose energy, they start to separate and spread out and thus there could be another sand lag spreading out to the west.

Q. All right. With respect to your study of this general area, have you seen other legs of these fans that have been existing or moving from an east to a west direction?

A. Let me just give a slight history of what's happened out here and maybe I can explain that. When Yates Petroleum started in this area, on this map the first well that was drilled was in Section 11, the very southeast corner. There were no other Delaware producers at that time on this map; none whatsoever.

As you can see, we encountered one sand with that well, which would be in the middle because I've got one on the left, one in the middle and one just on the very edge of the map to the right. We then jumped up to Section 36 in 21 South, 31 East, and drilled the, let's see, that would be Unit N in 36. And I'll repeat, there were no other Delaware producers up here at this time. The main pay was a lot thinner in

this one, but we still made a well out of it.

We then proceeded to move to the east. We caught this sand thick that we caught in the first well and proved that thick up. I believe the next well we drilled was in Unit J of Section 36, and mind you we had already drilled these other wells to the east and proven up the thick. It looked like we had thinned. At that point we were wondering if we were at the western edge of the field. That well did make a commercial well, and we decided to go one location further west and see what would happen, even though we were worried we were at the western edge of this field.

We drilled Unit K. It thickened again at 31 feet, from 16 feet to 31 feet. We then came down and drilled Unit M. It thickened again from the one just directly to the east. And then we came down and drilled the Grahams, which were showing thicks again. That's where I'm basing this most western thick that I have. This thick has developed up, and with our--since we don't know the western edge of this field at the present, there could be others because we didn't think this western one I have drawn here was

there until we drilled further west.

Q. What you have just described, then, is evidence of this type of depositional environment that, at least from a geological standpoint, has been encountered in other areas of the basin?

A. That's true.

Q. I'm sorry to have interrupted you. If you could move on to your next exhibit.

A. I would like to move on to Exhibit 16. The initial potential map shows an initial daily production from each well in the established pools. The initial potential map was constructed instead of a cumulative production map, because most of the wells have been completed within the last year.

The green numbers represent barrels of oil per day, red represents thousand cubic feet of gas per day, and blue represents barrels of water per day. All the wells on this map are producing from what I call the main pay zone, except for three, and these three are producing from one of the secondary pay zones. They have lower IPs. One is located in the southwest of the northwest of Section 1. Another one is located in the northeast of the southeast of

Section 1, also, and the third one was located in the northeast of the southeast of Section 2.

Generally, these three wells producing from the secondary pays have lower IPs than the wells that are producing from the main pay. The main pay was present in these wells but it was thinner and probably should produce if opened up. Many of the wells are producing from both the main pay zone and one or more of the secondary pay zones.

The four wells in Section 2 are currently producing, all the ones along the east side. Two of our proposed locations are direct offsets to production, and the other two are one location away from being direct offsets. So this is not, in my opinion, a wildcat venture, this is developmental.

Q. Excuse me. Go on.

A. I was going to summarize what I've just gone through.

Q. Going back to your Exhibit 16, I see in the lower, right-hand corner of Section 1, the southwest of the southwest, there's just a dry hole symbol. Is that a recent vintage well or what?

A. Let me explain that. No, that is not a recent well. That well was drilled numerous years ago before this production started up. It only penetrated the very top of the Bell Canyon Formation, which would be approximately 2000 to 2500 feet above our pay zones, so they did not penetrate the pay zones we're producing from.

Q. Do you have any information about the one other dry hole symbol up in Section 35?

A. I believe that is a similar instance. It was a Bell Canyon penetration only.

Q. There's also a gas well symbol in Section 12.

A. That is a Pogo well that I think is producing either out of the Morrow or the Atoka.

Q. That is a very deep well?

A. Yes, and they do have the main pay zone in that well. It's thin, but it is there.

Q. All right. If you would, then, could you give the Commissioners the benefit of at least your opinion as to what the significance of this geology that you find out here in this area means?

A. Basically in summary, four locations have been proposed. These tests should encounter

what I call the main pay zone along with several secondary pay zones. The pay zones should be updip or producing wells and the amount and quality of reservoir encountered should be sufficient to produce economic wells. The locations are very near current production if not directly offsetting it.

These developmental locations will further define the western limits of the Lost Tank and the Livingston Ridge pools. Each well, as I stated before, should produce approximately 125,000 barrels of oil, and at $20 a barrel, this should be around $10 million for the four wells.

Q. Now, Mr. May, besides having performed a study from the geological standpoint of what the productive interval is and the likelihood of encountering that, you have also looked at this area and performed a study addressing, if you will, some of the concerns that have been published or told to us with respect to drilling of wells in this area in relationship to potash mines, is that correct?

A. Yes, I have. This would be on Exhibit 17, in which I summarize the geology of some of the concerns on some of the potash safety

concerns to the oil and gas activity.

Q. Would you, Mr. May, since you do just deal with the area of the field of geology, would you summarize, then, the concerns that you thought you could address from a geological standpoint, and then deal with each one of those, if you would.

A. Okay. I'm looking at this from a--my experience has been in looking for zones of hydrocarbon potential, looking for zones that encompass porosity and permeability for a flow of fluids. And thus, looking at the potash and the safety concerns, I am looking at it in that same point.

Exhibit 18 is a statement that the New Mexico Potash industry, I believe, gave to Mr. Lujan, the Secretary of the Interior, and they go through several things, but the main things I want to look at are some of their safety concerns. They had five safety concerns, and I would like to go through those, each one of those safety concerns, and talk a little bit about those.

Q. From a geological standpoint?

A. From a geological standpoint. No. 1,

it is not known how close to mine workings an oil or gas well can be drilled with the assurance of safety. The petroleum and potash industries have jointly agreed to use one-half mile as a standard for deep oil and gas wells and one-quarter mile for oil wells less than 5,000 feet deep.

Much research is needed to permit defining the safe distance more closely, particularly since ground conditions and the efficiency of casing can be expected to vary widely among individual wells. To drill more closely at present would be to place human life at risk unnecessarily and could be interrupted as violating the intent of federal mine safety and health laws.

Q. Now, Mr. May, that is the actual expression of the concern by the potash company as taken from Exhibit 18?

A. Yes, this is taken straight out of their statement.

MR. HIGH: Excuse me. I'm going to object to this witness testifying what the potash industry has said. If he wants to refer to a document, fine, but the potash industry does not authorize Mr. May to speak on their behalf.

CHAIRMAN LEMAY: He's not qualified as an expert in potash, that's for certain, but I think he can use your document here to explain the geological considerations.

MR. HIGH: We have no objection to that, as long as he doesn't speak for us.

CHAIRMAN LEMAY: Proceed.

A. Going to No. 2, casing programs cannot provide protection in the event of accidents. At least seventeen blowouts or oil-well fires have occurred in the area around the potash basin. It is a virtual certainty that others will occur from time to time.

No. 3, examples of oil migration into potash workings have already been documented. In the most serious of these, oil migrated 700 feet along mud seams from an improperly plugged well into the Eddy Potash Mine. It should be clear that petroleum gases potentially can migrate much greater distance and in much greater quantity than oil. Had the well been a high pressure gas well, the consequences could have been disastrous.

No. 4, practical experience has shown that it is unlikely that a casing and cementing

program can give completely adequate assurance of protection against gas migration, concerning the enormity of the potential consequences. The occurrence of fractures and voids makes it difficult at best to seal off formation fluids, particularly in salt or heavily fractured zones.

No. 5, the occurrence of hydrogen sulfide can be predicted to have a highly corrosive effect on casing, which can lead to casing failure and a leakage of both flammable and toxic gases long after the well has been abandoned.

The third, fourth and fifth concerns I will address in this geologic discussion, while the first two can be better addressed by engineering testimony, which covers casing. Through the need to address these concerns geologically, I would like to discuss the fourth concern first, then proceed to the third, and end with the fifth.

Q. All right. If you would, Mr. May, then.

A. The last sentence of the fourth concern states that there are fractures and voids in salt, thus creating paths of migration for

fluids. And, as I stated before, engineering will discuss the first sentence of this concern involving the casing programs.

It will be shown that the salt in the Salado Formation has very little porosity and is virtually impermeable. A brief description of the general geology I'll show before proceeding any further, which is Exhibit 19. This is a generalized section in the Delaware basin; it's a stratigraphic column just showing all of the formations that are present. Most of the formations that we are concerned with today are from the Delaware up, including the Salado and the McNutt member of the Salado.

Q. Mr. May, with respect to the Salado Formation, which seems to be a broad interval within the Ochoa, approximately what is the depth or the breadth of the Salado Formation?

A. Basically, the thickness of the Salado in the Livingston Ridge area is approximately 2000 feet, with the McNutt member that has approximately 600 feet of salt above and a thousand feet of salt below. The Salado here is composed of mostly halite, with minor amounts of anhydrite potash minerals, which is the McNutt

member, and mudstone. And the Salado is the--the formation above the Salado is the Permian, the Rustler, and the Castile is directly below the Salado.

Q. These zones, there are apparently 10 or more zones of potash. Do they lie at the top, at the bottom, or somewhere in the middle of this McNutt-Salado Formation?

A. They're in the McNutt. The McNutt encompasses the basic potash ore, and probably some of the other witnesses could go into more detail on the individual ore zones and everything. I basically wanted to show a generalized picture here of what the stratigraphy is.

Q. All right.

A. The Salado is formed mainly of halite which is incapable of transmitting any appreciable amount of fluid. George Griswold concurs with this statement in his paper submitted to Mr. High on March 1982, his paper titled, Geology of the Carlsbad Potash Mining District, which is in Appendix 2 of what I term the Miner's Bible.

Q. Now, Mr. May, for purposes of

explanation, what will be referred to by yourself and other witnesses as the Miner's Bible, it is actually a compilation of reports that were prepared and used during the original hearings from R-111-P, is that correct?

A. That's what I understand, yes. And I might point out, I'm not handing out several of these papers I quote from, but I have them available if the Commissioners want to look at them.

Mr. Griswold said in his paper, and I quote, "Halite has the well-known behavior of behaving plastically under pressure. Petrofabric analysis, along with modern-day observation of halite, being deposited in evaporation basins, indicate that loosely packed crystals form within saturated brine pools. Continued burial forces the brine upward so that closer packing is achieved. On continued burial, the halite crystals become completely plastic and all brine is ejected. The only exception being those fluids trapped in negative crystals at the time of crystallization. Thus, halite becomes a true solid and possesses no porosity except for brine-filled negative crystals and, therefore, no

permeability.

Permeability tests performed on sale cores either yield results that are beneath the measurement capability of the test apparatus or, if measurable, can be accounted for by fractures induced into the sample. Generally, the halite itself has very little porosity and no permeability, but it is not completely honogeneous. Thin mud or clay seams, fractures and breccia pipes occur within the Salado halite. The potash industry claims that these are paths of fluid migration. Upon examination of the facts, it is found that this is not entirely the case.

Gas, of an inert nature, has been associated with the clay seams that they had mentioned. In fact, several in-mine explosions, which were nonflammable, have been attributed to gas that has collected at the interface of the halite and clay seams. The Environmental Evaluation Group of the New Mexico Health and Environment Department state, in their March 1984 paper titled, Occurrence of Gases in the Salado Formation, and it is in Appendix 3 of the Miner's Bible, and I quote, "All salt deposits contain

some fluids, brine and gas, and the Salado Formation is no exception. Within halite crystals, gas can often be seen as a bubble within a fluid inclusion.

"To estimate the percentage of fluids in the halite crystals in the Salado Formation, 35 selected core samples from ERDA-9 borehole, which is a WIPP-related borehole, were heated to 500 degrees Celsius and weighted before and after the expulsion of gas and brine. The results showed that more than half the specimen showed only a .5 percent weight loss. The maximum weight loss recorded by one sample was 3.5 percent.

"Since most of the fluid in the inclusions consist of brine, total amount of gas trapped within the crystals is negligible."

The report goes on to say, and I quote, "Almost every reported encounter of gas in potash mines, as well as near the WIPP repository, is associated with either clay seams or clay-enriched zone of salt. The composition of the gas shows that it was mostly derived from the original atmospheric air at the time of the depositional Salado. The gas is depleted in

oxygen mostly due to high chemical activity of oxygen which allows it to react to a variety of elements to form oxides.

"Methane must have originated from decomposition of marine organic life during times when clays were deposited in the Salado sea. The presence of gas near the clay layers is probably due to the contrast of the mechanical properties of the clay and salt. Gas originally trapped must have migrated along crystal boundaries until it reached the impermeable clay layer."

Thus, there are pockets of porosity at the clay-shale interface, and gas has accumulated at these pockets. The gas migrated probably over thousands of years from fluid inclusions within the salt. The clay itself is impermeable, and the porosity pockets are limited in size and are not connected to each other. When mining occurs near an enclosed pocket containing confined, pressurized gas, an explosion can occur, a nonflammable explosion.

The nature of the explosions in the mines can be explained by the limited nature of the porosity pockets and the lack of permeability between the pockets. If the pockets were

permeable and interconnected and not limited, then the gas would continue to blow strongly after the explosion, but this is not the case. Only small blows continue after the explosions, which is characteristic of limited cavities.

The Environmental Evaluation Group report has a 1964 Department of the Interior report within its Appendix A. This report studied gas blows in the potash mines, and the drilling of vertical boreholes into the back, and at dripped intersections to relieve gas pressure.

Some of the boreholes produced blows and it seemed that the holes drilled in the intersections were more likely to blow than holes located elsewhere. In one of the intersections the report states, and I quote, "Gas pressure in one hole in the center of an intersection was sealed in by means of a packer and gauge. The pressure built up to 50 psi. A second hole, drilled 20 feet from the original, and six feet outside the intersection, did not reduce the pressure in the original hole. Another hole drilled in the intersection, seven feet from the original, relieved pressure in the original

hole."

Thus, the permeability carried seven feet, at least, but not more than 20. Looking at the data from this report, it can be concluded that the permeability between the two holes was artificially enhanced by mining. The report states that intersections were more likely to have blows, and at the tested intersection, the hole outside the intersection was not permeable with holes in the intersection.

Conclusions drawn from this data are that when the intersections are mined, support underneath the back is removed and the back can start sagging a little bit, thus creating space above the back and thus artifically enhancing porosity and permeability. This explains why the two holes within the intersection were connected and the hole outside the intersection was not.

Even if the porosity and permeability are not artifically enhanced, the permeability only had a maximum extent of less than 20 feet. The same report notes that some of the holes have pulsating blows.

This also can be explained by low permeability. If a cavity is limited in size and

the surrounding rock has low permeabilities, gas will bleed slowly into the cavity. At some point the pressure will build up enough to bleed into a nearby drilled relief borehole. When this happens, the pressure in the cavity drops, and it will take some time for the gas in the surrounding rock to bleed into the cavity to blow the pressure up again. Thus, low permeabilities can explain these pulsating blows.

Another example of the limited nature of the porosity pockets are seen when wells are drilled in the Livingston Ridge area. Three wells that Yates operated encountered gas pockets while drilling through the Salado. In most cases, when these encounters occur, the drilling activity stops and the blow is allowed to die, which occurred in a few hours. If the pockets had any extent, they should have blown for far longer periods of time.

Fractures within the halite are another possible path of fluid migration. Fractures induced in halite should naturally heal themselves. Griswold, 1982, talks about the plastic nature of halite and how, under pressure from overburden, porosity is destroyed. The same

thing will happen to fractures unless the fluid inside the fracture has a greater pressure than the overburden. The Environmental Evaluation Group report (1984) questions whether fractures present at one explosion site were containing gases or if the fractures were induced by the explosion. That point is really kind of moot in the context of this discussion. What is important are the findings on how extensive the fractures are.

The report states, and I quote, "The fractures associated with the gas blow-outs, however, are not continuous for more than a few tens of feet. They are not intercepted in any of the parallel drifts." Thus, fractures in halite will tend to close up because of overburden, and if they remain open they're limited in area, as are the porosity pockets associated with the clay seams.

The last possible path of fluid migration would be breccia pipes, also known as breccia chimneys and collapse chimneys. Snyder and Gard, in 1982, in their U.S.G.S. report titled, "<u>The Evaluation of Breccia Pipes in Southeastern New Mexico and their Relation to the</u>

WIPP Site, which is in Appendix 20 of the Miner's Bible states, and I quote, "Breccia pipes, also called breccia chimneys, as they occur in evaporites are vertical, cylindrical pipes or chimneys that may or may not involve more than one geologic formation. The chimneys are filled with downward, displaced brecciated rock.

"In this context, the rock is brecciated by having collapsed into a void at depth that was probably created by ground-water solution and removal of deep-lying evaporite or carbonate rocks in an underlying aquifer system." This describes the Capitan Reef. It is a major aquifer system in this area, and it is composed of carbonate rock.

Snyder and Gard in 1982 go on to say, and I quote, "Because the Tansill and Yates do not contain water-soluable evaporites, they are probably not the cause of the collapse of overlying rocks. Below these formations is the Capitan Limestone, a somewhat soluble rock known to contain large caverns, such as Carlsbad Caverns. The most reasonable explanation for collapse of the rocks cored in WIPP 31 is that a large cavern formed in the Capitan, and overlying

rocks, as young as the Triassic Dockum Group, collapsed into the void."

One suspected and three known breccia pipes were identified by Snyder and Gard in 1982, Hills A, B and C, plus the suspected Wills Weaver. Snyder and Gard, in 1982, concluded that breccia pipes only formed over the Capitan Reef. The Livingston Ridge area is not over the Capitan Reef. It is located basinward of the reef, approximately five to six miles to the south, and I would like to show my next exhibit, which is Exhibit 20.

There's a lot of information on this map, and some of the later witnesses will go into great detail on what that means. The main thing I want to point out, at this point, is the location of the Capitan Reef front, which is an approximation, and the location of Section 2, colored yellow.

Section 2 is about five to six miles south of the Capitan Reef in the basin. The Capitan Reef extends from that line, that I have drawn here, to the north, approximately 10-15 miles. Thus, no breccia pipes are present in the area of Livingston Ridge. Some minor solution

features may occur in the Rustler formation above the Salado, but they do not extend through the Salado.

Snyder and Gard (1982) place the age of the breccia pipes at approximately 400,000 to 500,000 years. One borehole, which is WIPP 31, was emplaced in a breccia pipe and that is located on the map as a dashed circle--that would be in Section 5 of Township 21 South, 30 East--with continuous core being taken.

Drill-stem tests were also taken in this borehole. Concerning the drill-stem tests, Snyder and Gard in 1982 concluded, and I quote, "Hydrologic tests," which are the drill-stem tests, "show that the breccia pipe material is not capable of transmitting ground-water. The clay matrix surrounding the rock fragment acts as an impermeable barrier, so there is probably no additional dissolution of evaporitic rocks in the pipe, at least in the upper 1800 feet above the massive anhydrite found at the bottom of the drill hole, WIPP 31."

Thus, Snyder and Gard feel that there will be no fluid movement through the breccia pipe down to the massive anhydrite, which is

probably the Fletcher Anhydrite, which is basal Salado.

The data presented by the potash industry shows that halite, in general, has very little porosity and no permeability. The possible exceptions to this, clay seams, fractures and breccia pipes have been shown to have some porosity but lack the properties to transmit fluids over any distance.

Clay seams are limited and not interconnected; fractures are present but only tens of feet in length, and breccia pipes occur in the Salado but only over the Capitan Reef which is not present in the Livingston Ridge area. It is true, fractures and voids do occur as stated in concern No. 4, but this is the exception and not the rule, and even if the wellbore penetrated some of the fractures and voids, they would be sealed off easily with casing and cement due to their limited extent.

Q. Mr. May, with respect to your Exhibit 20, you've actually located the breccia pipes that were discussed in this paper that was included in what we've been calling the Miner's Bible, is that correct?

A. Yes, I have. There's another one located in Section 35, of 20 South, 30 East, and although it's not marked on the map, there's another one real close to it, and then the one they call the Wills Weaver pipe is in Section 12 of 20 South, 29 East.

Q. Up in the upper left-hand corner which is closer to, I guess, the old Wills Weaver Mine?

A. I believe so. I don't know why they named it that.

Q. And all of these breccia pipes that you've located on this map all appear in the Capitan Reef front, which is above this line you've drawn, a horizontal line across the mid-point of this map?

A. They occur above the Capitan Reef.

Q. All right. Continue on.

A. Safety concern No. 3 refers to examples of oil migration into mine workings, and specifically refers to a serious case around 1965 where oil migrated 700 feet along clay seams from a well into the Eddy potash mine. There have been documented cases of oil seeps in the mine workings, but there is no published evidence, at least that I could find, that says that any of

these seeps are resulting from a leaking oil and gas well.

The case mentioned above is part of Appendix 21 of the Miner's Bible. The only documents pertaining to this incident are a memorandum on National Potash Company stationery, accompanying map, a letter on file with the BLM to Tidewater Oil Company which was the operator of the nearby oil wells, and a memoranda on a meeting between the U.S.G.S. and Tidewater, and those last two I acquired from the U.S.G.S.

The Natural Potash memorandum refers to an oil seep located in the northwest quarter of Section 25 of Township 20 South, Range 29 East, which is shown on Exhibit 20. The well in question, I believe, was the one in the same section in the very far northwest corner.

Q. In relation to the mines that are listed here, so that the Commissioners can hone in on this, which mine is that closest to?

A. That would be inside what is labeled on this exhibit Eddy potash, but it was actually at this time the natural potash mine, was the way I understand it.

Q. I'm not sure if we've located that.

A. It would be in the northwest quarter of Section 25, of Township 20 South, 29 East.

Q. This is on the very left edge?

A. Very left edge, and you see the mine there.

Q. Just below the 20 South, 29 East notation, you have Eddy Potash and it says oil seeps and mine workings, is that correct?

A. Yes, that one specifically in that section is the one I'm talking about.

Q. All right. If you could, continue on.

A. The U.S.G.S. was notified, and everyone involved in the case assumed the oil was coming from one of Tidewater's oil wells. No study was performed to determine the origins of the oil, and no evidence showing that the oil from the Tidewater wells has ever been published, at least as far as I could find.

The U.S.G.S. did ask Tidewater to perform tests on their wells to determine if they were leaking, but due to the poor economic status of the wells and the cost of the test, Tidewater opted to plug the wells in question. Whether the seeps stop before, during or after the plugging operations, I do not know. I could not find any

information on that.

Q. When were these wells, would they have been drilled in an era prior to the adoption of R-111-P?

A. Yes.

Q. And the casing requirements that are also incorporated in R-111-P?

A. Yes, that's true. Also included in Appendix 21 of the Miner's Bible, along with the National Potash memorandum, is a memorandum from Potash Company of America, referring to two other oil seeps in 1965. The next one I'll talk about is just to the northeast of the one I finished describing in Section 24, of the same township and range. I believe the wells in question are in the far southwest corner of that same section.

Q. Actually, this notation says "oil seeps and mine workings," and the arrow actually points to two different locations, does it not?

A. Yes.

Q. One's in 25 and the other is in 24?

A. And the National Potash was the one in 25, which I just described, and the one in 24 is the one I'm talking about right now. This seep was reportedly associated with a fine vertical

fracture extending above and below the ore body. Again, all parties involved assumed the oil was coming from nearby leaking oil wells and again no study was performed nor any evidence offered that this was the case.

Included with the memorandum was a map showing the location of the seeps, the oil wells and the mine workings on those maps, the PCA seep, and I should point out that the PCA seep has mine workings on their map that they submitted with that memorandum, as mine workings in between the reported seep and the suspected wells. If the oil had seeped from the wells, it would seem that there should be more seeps or stains in the workings closest to the wells in question, but there were none that I could find that were reported.

And the last seep that I talked about is in the northwest quarter of Section 9 of Township 20 South, Range 30 East, which would be northeast about three or four miles from the well I was talking about. It's the map showing two seeps reporting in the mine workings and shows some oil stains in the nearby potash core.

The well in question is in Section 8,

along the east line. It's a dry hole shown on this map. Again, no evidence was presented nor a study conducted to prove that the oil actually came from a nearby well. As stated above, there's no available evidence supporting the idea that sources for oil seeps and mine workings are oil wells, but there is a U.S.G.S. Open File Report suggesting that some of the oil seeps are naturally occurring. Open File Report 82-421, which is Exhibit No. 21, entitled Geochemical Analysis of Potash Mine Seep Oils, Collapsed Breccia Pipe Oil Shows and Selected Crude Oils, Eddy County, New Mexico, suggests that the oils in the studied seeps were naturally emplaced and did not leak from present oil wells.

This study examined oil samples from core holes in two breccia pipes, which were Hills A and C, which I pointed out in Section 5, Township 21 South, Range 30 East, which was related to the Mississippi Chemical Potash Mine. This also associated oil samples from different wells completed in different formations to determine the origins of the seep oils.

And I would like to turn to figure 1, page 19 of Exhibit 21. This is just another

location map showing Hill A and Hill C with the--with what we use in the oil and gas industry as gas wells, but they're using it here to show breccia pipes.

I would also like to point out the location of the approximate reef front, the Capitan Reef on this. The samples from the cores and seeps were compared chemically with the samples from the different wells to determine which geologic formation the oils were derived. The samples were found to be most similar to the oils from the Yates Formation. This also fits geologically, as previously stated breccia pipes form over the Capitan Reef.

When the Capitan Reef collapsed forming breccia pipes strata in the Seven Rivers, Yates, Tansill, Dewey Lake, and Dockum, caved into the void created in the Capitan Reef. The U.S.G.S. report, concludes, and I quote from page 14, "The breccia pipe and mine seep oils were probably emplaced during or sometime after brecciation, fracturing and faulting of rocks in response to the dissolution of the Capitan Limestone, a reef facies, and subsequent caving of the overlying rocks. Partial leakage from disrupted Yates oil

reservoirs probably accounts for the above oil shows."

Thus, the oil leaked out of the breached Yates Formation and made its way into the Salado via the breccia pipe. Snyder and Gard, in their 82 paper, conclude and I quote, "It's possible that oil from this formation," and they're referring to the Yates, "migrated toward the area of the breccia pipes and either entered the rocks before collapse occurred or it was forcefully emplaced during collapse, being pushed stratigraphically upward by hydrostatic pressure as water in the underlying void was forced upward by infalling rocks."

The possibility exists that there is some communication within the breccia pipe and oil could have leaked upward after the pipe was formed; but the key point made is that the oil found in the Salado was emplaced naturally.

To the knowledge of myself, all of the reported oil seeps that I have seen have occurred in an area which overlies the Capitan Reef. Knowing that breccia pipes only form in the same area and that breccia pipes are associated with oil seeps, I've concluded that the reported oil

seeps in the mine workings are naturally occurring and are not from oil and gas wells. I have seen no available proof that any oil seep was related to oil and gas wells.

Q. Isn't it also true, Mr. May, that any of the wells that were pointed to as maybe being associated with these seeps were all wells drilled prior to the adoption of R-111-P and the more stringent casing requirements?

A. Are you referring to the location map?

Q. Yes, the wells that we're talking--

A. Oh, yes, yes.

Q. All right, sir. If you would continue on with your testimony.

A. Safety concern No. 5 discusses the problems encountered when hydrogen sulfide is present. This is not a problem when drilling oil wells in the Delaware Mountain Group such as the ones located in the Livingston Ridge area. Oil produced from the Delaware is sweet, which means there's no sulphur or hydrogen sulfide present. It is common knowledge throughout the petroleum industry in southeastern New Mexico, that Delaware oil is sweet. And it is also stated in publications, such as an article titled, Oil and

Geology in the Permian Basin of Texas and New Mexico, authored by Mr. John Galley, page 432.

In the Livingston Ridge area, the only time hydrogen sulfide has been encountered was when drilling through the Upper Castile Formation and only in a few wells. A water flow was encountered along with small amounts of hydrogen sulfide. Water and hydrogen sulfide were detected coming up with the circulating drilling mud. This hydrogen sulfide was natural from the Castile Formation. Commercial sulfur deposits occur in the Castile across the state line in Texas, in the Delaware Basin.

Griswold, in 1982, even mentions hydrogen sulfide occurring naturally in the Solado. The Delaware produces sweet oil so no hydrogen sulfide will come from this formation. The only time hydrogen sulfide might be encountered is when drilling through the Castile or Salado.

An intermediate string is set through the Castile and Salado and drilling resumes into the Delaware. Thus, any hydrogen sulfide is behind casing. Even if hydrogen sulfide did reach the level of the Salado, which is highly

unlikely, you would have to penetrate back into the Salado which, in my opinion, would not happen for the reasons I discussed earlier.

Q. Is that because of the lack of permeability of the Salado Formation?

A. That's true. I should note that only four of the 29 wells in the actual Lost Tank and Livingston Ridge pools that Yates has operated in the Livingston Ridge area have encountered any hydrogen sulfide.

In summary, the potash industry has stated several safety concerns involving oil and gas activity within the potash enclave. It is stated that there are voids and fractures in the salt that will allow migration of fluids into the mine. It is true that there are voids and fractures within the Salado, but this is the exception and not the rule. These voids and fractures are very limited in area and are not innerconnected and will not allow fluids to freely migrate any distance in the Salado.

The potash industry correctly states that there are documented examples of oil migration into mine workings, but then they go on to state that the oil is migrated from an

improperly plugged well. There is no documentation of this that I can find, nor is there any published proof back in this state that I can find.

There is a published U.S.G.S. report showing that many of the oil seeps are natural and not caused by oil and gas activity. Also, all the published reports of oil seeps appear to be located over the Capitan Reef area. And I've stated before that breccia pipes are associated with the oil seeps and the reef. The Livingston Ridge area is several miles south of that reef and out of the breccia pipe area. Hydrogen sulfide is a concern of both the potash and the oil and gas industries.

The Delaware oil is sweet, it contains no sulfur. The only hydrogen sulfide encountered when drilling the Delaware wells was in the Castile, and has only been in a few wells in the Livingston Ridge area.

Q. The last page of that Exhibit 17 is a list of references?

A. Just the references that I referred to.

Q. Mr. May, do you have any further comments to make with respect to the exhibits

that have been prepared by you, and your testimony before the Commission?

A. Not presently, no.

MR. CARROLL: Mr. LeMay, I would pass the witness, then, at this time.

CHAIRMAN LEMAY: Mr. High, you may proceed.

EXAMINATION

BY MR. HIGH:

Q. Mr. May, you say you've been with Yates for three years?

A. Yes, sir.

Q. Where did you work before that?

A. I worked for an environmental firm in Houston.

Q. What were you doing for them?

A. I was a hydrogeologist.

Q. How long have you been out of school?

A. I graduated with a master's degree in 1989.

Q. That was three years ago?

A. Excuse me, 1988.

Q. Four years ago. I'm sorry.

A. Yes.

Q. How long did you work for the

environmental firm?

A. Approximately nine months.

Q. Was that right after you got your degree?

A. After I got my master's degree, yes.

Q. Was that your first professional employment in the area of geology?

A. In the area of geology, yes.

Q. Yates was your second?

A. That's true.

Q. From the time you got your master's degree, it's been four years, and you've had those two jobs?

A. Yes, sir.

Q. Have you ever worked in a mining industry?

A. No, I have not.

Q. Have you ever worked for a potash mine?

A. No, I have not.

Q. Have you ever been inside of a potash mine?

A. I have not been inside of a potash mine.

Q. Have you ever done any laboratory test using potash?

A. No, I have not.
Q. Have you ever done any laboratory test on gas migration through mud seams?
A. Not laboratory tests, no.
Q. Have you ever done any laboratory tests on gas migration through anything?
A. No, I have not.
Q. Have you ever done any on-site test of gas migration in the potash basin?
A. No, I have not.
Q. Have you ever hired anybody to do any of those kinds of tests?
A. No.
Q. Would it be a fair statement to say that your testimony this morning, to the extent that it consisted of reading the document that you've marked Exhibit No. 17, is simply your comments on the literature that's been written on the subjects that you talked about?
A. I went through the data and made my conclusions from that, relying on-- My job at Yates Petroleum is to find porosity and permeability in hydrocarbon-bearing zones, plus I applied that to the salt section, plus my background knowledge of geology in general.

Q. You used your four years of knowledge of geology?

A. It would be more than that. I have a master's degree. Six years.

Q. Six years. And the literature, whatever information was in the literature is what you used to write Exhibit No. 17?

A. Yes, sir, that's true, basically from mostly the potash data.

Q. From what?

A. From data we received from the potash industry.

Q. You were just commenting on it?

A. Yes.

Q. Do you feel, Mr. May, that when lives may be at jeopardy that research and tests ought to be conducted on a fairly high level of sophistication?

A. Sure.

Q. Do you think that your conclusions were based upon research and studies of a high level of sophistication?

A. I used basically your data from the potash industry.

Q. You've commented on our data?

A. Yes, I have.
Q. You didn't do any studies or anything else yourself?
A. I studied the material.
Q. So you think your opinions, your comments as shown in Exhibit 17, reflect a high level of professional research and comments?
A. Yes.
Q. Do you know what hazard methane gas presents to underground mining?
A. I'm sure it presents a very large hazard.
Q. Do you know what that hazard is?
A. An explosion.
Q. Do you know how much methane it takes to propagate an explosion?
A. I don't have that number on the top of my head, no.
Q. Do you think that's something that would be important if you're talking about gas migration, how much it will allow to flow into a mine?
A. That's true, but I'm saying that there should be hardly anything flowing. There should be no-- I've said that this salt is impermeable.

Q. You referred to a study by Mr. George Griswold?

A. Yes.

Q. Do you disagree with that study in any way?

A. In basic context, no.

Q. I'm going to go through some of these comments here. Do you know why Mr. Griswold was talking about the gas that may be found in the crystals? You quoted all of that here. Do you know what he's talking about here?

A. I believe so. He's trying to determine, the way I understood his article, he was trying to show the nature--where the natural occurring gases in the Salado come from.

Q. He wasn't talking about migration, was he?

A. Well, he did talk about, if I'm remembering his paper correctly, he did talk about migration on a small scale through the crystals.

Q. Are you familiar with the geology of domal salt mines?

A. A little bit, through the crystals.

Q. Do you know how methane gas occurs in a

domal salt mine?

A. From what I understand on a domal salt mine, usually hydrocarbons are present in association with salt domes, and usually these salt domes have moved because they are of a lighter density in the overlying formations, and through this movement they have undergone several physical changes.

Q. Well, my question is, do you know how the methane occurs in a domal salt mine?

A. I assume if there's methane occurring in domal salt mines, I assume it comes through fractures through the salt which were induced through the movement of the salt.

Q. Are you guessing, Mr. May, or is that--

A. That's based on the knowledge that I have.

Q. And if the evidence is that that's not what happens, would you dispute that?

A. I don't think I could because I'm not well read or up to par on that.

Q. You did understand that George Griswold was talking that the gas, the methane gas that was encapsulated in the crystals in the halite in the potash basin, were not the hazard?

A. Yes, I understand that, yes, and I'm sorry if I alluded to that but I'm not trying to say that, that the natural occurring gases of the Salado are not a hazard. I'm not trying to say that.

Q. Well, gases in the Salado can occur in a number of ways, right?

A. What do you mean?

Q. Can the gases be entrapped in the halite crystals?

A. I would assume so.

Q. And George Griswold said that was not a problem in the basin?

A. I assume, yes.

Q. Gases may occur in the bedded deposits in the Salado Formation?

A. The natural gases, yes, I assume so.

Q. You talked about the halite being impermeable?

A. Yes.

Q. And also, in referring to your Exhibit No. 19, which is the generalized cross-section, you don't show all the bedded deposits in this--

A. No, it's just a generalized section.

Q. You are aware, or are you aware, that

there are bedded deposits in the potash basin consisting of materials other than halite?

A. Sure. There's potash materials and clay seams, and there could be other evaporite minerals.

Q. Did you address anywhere the extent to which those deposits might provide a path of migration?

A. Halite is the major component of a Salado, and the way I understand, especially the way the potash minerals form, is that they're encapsulated within the halite. Potash minerals are also evaporitic and should have fairly similar qualities to halite.

Q. My question, Mr. May, is did you evaluate at all--

A. I believe I did.

Q. Let me finish. Did you evaluate at all the extent to which gas might migrate along bedded deposits other than halite?

A. I believe I did, yes.

Q. Did you do any studies on that?

A. As far as laboratory studies?

Q. Any studies in the field, the laboratory or whatever.

A. I reviewed the data available.

Q. Tell me what data you reviewed concerning the migration of gas along the bedded deposits containing anhydrite.

A. Including anhydrite?

Q. Yes, sir.

A. That there are--that, I included, basically in general within the halite. The anhydrite is going to act plastically in a similar fashion to the halite, the way I understand it.

Q. What happens to an anhydrite bed when it's opened up into the atmosphere?

A. To the atmosphere? I'm sure when you relieve the confining pressure it might expand a little bit.

Q. Well, do you know?

A. Based on my knowledge of geology, that's what I would expect.

Q. It's your testimony here today that when the strata is opened up and the anhydrite beds are exposed to the general mine atmosphere, they expand?

A. I would assume. How much, I'm not sure.

Q. Is it your conclusion, Mr. May, that all the hoopla from the potash industry about its concerns over the possible migration of methane gas into underground mines is simply totally lacking in foundation?

A. Totally lacking in foundation?

Q. Yes, sir.

A. When it's concerned to low-pressure Delaware oil wells--

Q. I don't want you to qualify it. I'm asking you, is it your testimony to this Commission that the potash industry's expressed concern over the possibility of gas migrating into our underground workings is a big to-do about nothing.

A. Not about nothing, no.

Q. It can happen, can't it, Mr. May?

A. It depends on what circumstances you're talking about.

Q. Well, is it your testimony here today that there are some circumstances under which methane might migrate from an oil and gas well into an underground potash mine?

A. Anything's possible, but I believe that to be a small possibility.

Q. But you're not saying that the geology is such that there is never an instance to prevent that migration from happening?

A. Like I said, anything is possible. I'm saying there's a large likelihood that it will not happen.

Q. Do you know what type gases are generally encountered by the potash?

A. From what I understand, mostly it's nitrogen.

Q. Do you know where they're encountered?

A. You mean within the mines?

Q. Well, what occurs prior to the encounter with this gas you're talking about?

A. I'm not sure I'm getting the drift of your question.

Q. Do you know when it is that the potash mines encounter gas? What it is that they're doing at the time they encounter the mines?

A. They're mining, is what I understand they're doing.

Q. Beyond that you don't know?

A. That's-- On the data I reviewed, that's what I understood, that they encountered the gas when they were mining and encountered the

gas in their vertical boreholes that they drilled to relieve pressure in the back.

Q. Do you know what an air relief hole is?

A. I assume that's what I was talking about.

Q. That's what you called a vertical borehole?

A. Yes.

Q. Do you know how high those go up?

A. Is it, what, approximately, I'm not sure offhand, but I'm sure it's several feet.

Q. Would you think it's important to know how far that went up and what it intersected in talking about the possibility of the migration of methane gas?

A. I'm sure it is.

Q. Did you look at that issue?

A. Yes, but I can't give you that figure off the top of my head right now.

Q. Do you know the type bed that those air relief holes encounter when they go up?

A. Evaporites.

Q. Beyond that, can you be more specific?

A. I mean in general. I don't know specifically, but evaporites; halite, polyhalite,

potash minerals, clay seams.

Q. You referred to, and these pages are not numbered but it's on page 3, you refer to pockets of porosity at the clay salt interface, and gas has accumulated in these pockets. Have you found where I'm reading from the third page? Are you with me?

A. Yes.

Q. The paragraph starts, "There are 'pockets' of porosity at the--

A. Yes.

Q. --clay salt interface, and gas has accumulated at these pockets"?

A. Yes.

Q. Right?

A. Right.

Q. The next sentence says, "The gas migrated probably over a period of thousands of years from the fluid inclusions within the salt"?

A. Yes.

Q. That's gas migration, isn't it?

A. Yes.

Q. So, there can be some migration in the potash basin, right?

A. Over a period of thousands of years.

Slow. Very slow.

Q. You wouldn't have any way of measuring that, would you?

A. No, I don't.

Q. You go on to talk about explosions. What do you mean by the term "explosion"?

A. The way I understand it in the data is when, during mining, they encounter a high pressure gas zone, and then the salt within the mine was removed, it relieved the confining pressure and thus there was an expansion of the confined gases, creating an explosion.

Q. You're not talking about explosions that propagate flames?

A. No, no.

Q. Are you aware, Mr. May, of any incident in the potash basin in which methane gas has been ignited in an underground mine?

A. I'm not aware of that, no.

Q. Are you familiar with the work done by Mr. Rutledge?

A. I believe I've read a few papers by Mr. Rutledge.

Q. Did you read all of his papers?

A. I can't say I've read all of them.

I've read some. I've read all I can find.

Q. Do you know the scope of the studies he did on the profitability of migration in the basin?

A. From what I remember of the name Rutledge, I remember reading some articles on potash geology, and that's basically all I can recall right now.

Q. Do you recall him talking about small vugs in the overhead? Do you know the word vugs, V-U-G-S?

A. I'm familiar with vugs, yes. I might have. I mean, I can't recall at this point.

Q. What is a vug?

A. A vug is a small porosity. It's porosity. It's porosity.

Q. And he observed some of those in the underground mine, didn't he?

A. He probably did, yes.

Q. Up in the back. Will a vug allow migration?

A. If it has no permeability, no. If it's not connected with any other porosity, no.

Q. Does the mining, the activity of mining, have any affect at all on the possibility

of these deposits allowing migration?

A. I would say so, yes, because as you relieve the pressure, the confining pressure on the rock near the mine workings, that could open up some areas like I described in that intersection. It would relieve the pressure and maybe some of the bedding plains would part a small amount.

Q. Ground that has been disturbed by mining activities would have a greater tendency, would it not, to allow migration than these other areas you're talking about?

A. Yes.

Q. Are you aware of the experiences of drilling air relief holes in intersections at distances greater than those you referred to in Exhibit 17?

A. That's the only example I found.

Q. Do you know whether or not other mines have also drilled air relief holes?

A. I would assume they have, yes.

Q. Do you think that what they encountered would be important, Mr. May, before you reached any kind of conclusion?

A. Yes, but I did not find any of those.

Q. Did you contact any of the other potash mines?

A. I went through the data available.

Q. My question was, did you contact any of the other potash mines?

A. No.

Q. So, if they had done or had any experiences with migration from intersection to intersection and the length of those, you wouldn't have any knowledge of that, would you?

A. I am not privy to any of the potash company's files. This is all based on public and published data.

Q. Well, do you feel like your study here and the conclusions you reached, it is as supported as you can get it?

A. I believe so, yes.

Q. You don't feel like you need to get any other studies to support this?

A. As far as I can find from the published data, I believe that, yes.

Q. Now, these oil spots that you talk about, have you ever seen any of them?

A. I have not seen any of them in a potash mine, no.

Q. Have you ever seen the breccia pipes?
A. I have not been inside a potash mine, as you asked before, so I have not seen those breccia pipes, no.
Q. Do you know whether or not any of those oil spots in the potash mine have actually flowed with oil?
A. I read where some of them did flow some oil, but, from what I understand, small amounts, and I believe the one instance, off the top of my head, they tamped a wooden peg in and stopped the flow.
Q. Do you think the presence of these multiple oil spots is some indication that the oil and gas industry and the potash industry are getting real close together in the potash basin?
A. No.
Q. You think all of these are just naturally occurring?
A. Based on the data I've gone through, that's the conclusion I've drawn.
Q. Did you find any oil spot, Mr. May, in the potash basin, whether it was in the old PCA mine or the Mississippi Chemical mine, did you find any oil spot that was not in close proximity

to an oil spot?

A. Did I not?

Q. Did you find any oil spot in the potash basin that was not in close proximity to an oil well?

A. I can't say that I did on the reported oil seeps, no. Maybe I should ask you what you mean by "close."

Q. Would you consider 700 feet in close proximity to an oil well?

A. Okay. I'll go with that.

Q. Did you find any, and let me ask the question again, did you find any oil spots that were not in close proximity to an oil well?

A. No, I did not.

Q. Did you think that the fact that these oil spots all seemed to have occurred in close proximity to an oil well, would make it incumbent upon somebody to investigate where they came from?

A. Yes.

Q. Would that be particularly true if you were concerned about an explosion underground in a mine?

A. I would think so, yes.

Q. Would the presence of oil give you cause to think that perhaps methane was accompanying it?

A. Yes.

Q. And if you get methane in a mine and you have a spark, there can be an explosion, right?

A. Yes.

Q. Do you know of any studies, other than those that you cite in the paper, that have studied where this oil came from?

A. No. That's the only one I found.

Q. Do you know of any study that concluded that the oil spots did not come from the oil well?

A. Could I hear that question again, please?

Q. Yes. Do you know of any study that reached a firm conclusion, let's say, that the oil spots did not come from these oil wells?

A. The one in my Exhibit 21.

Q. Which one is that?

A. It's the article on Geochemical Analysis of Potash Mine Seep Oils.

Q. Is this the Parson study? I'm sorry,

Exhibit what?

A. Exhibit 21.

Q. I mean the Palacas study. Did they conclude it doesn't come from an oil well?

A. They concluded it was natural. It came from the Yates reservoir.

Q. Weren't they studying, Mr. May, whether or not this particular oil spot came from oil that had been poured down a potash borehole? Isn't that what they were studying?

A. Yes, they looked at that.

Q. And they concluded that the oil spot did not come from the five-gallons or so that had been poured down that borehole?

A. That's right.

Q. They did not really study, did they, whether or not that oil came from any oil well, did they?

A. Their conclusions were they were naturally emplaced, and that's what they studied.

Q. Well, the study will speak for itself.

Do you know anything about a dike that runs across the basin?

A. I've heard of that, yes, and I've seen a few references on it.

Q. You haven't gone underground anywhere and observed it, have you?

A. No.

Q. Do you know whether or not there's any fractures coming off that dike anywhere?

A. I don't know, because I haven't observed it.

Q. How far does the dike go across the potash basin?

A. I'm not sure, right off the top of my head.

Q. Wouldn't it seem to be important, Mr. May, to know the extent to which that dike intersects or does not intersect the various horizons through the potash basin?

A. From what I understand, from what I remember, that dike runs well north of the area that we're speaking about.

Q. Do you know what the mining experience has been around that dike?

A. No, I don't.

Q. Do you know any of the geological characteristics that are encountered in close proximity of the dike?

A. All I can say is that I know there's a

dike through the potash area.

Q. Well, you're talking here and testifying this morning and reading from Exhibit No. 17 about the fractures being very small and short. You're not saying there may not be other fractures out there than may be larger than one you referred to, are you?

A. Based on the data I have, that's what I've given.

Q. Are you willing, Mr. May, to expose underground miners to a potentially life-threatening hazard by simply looking at what's published and not going beyond that?

A. I don't want to expose anybody to any hazardous situation.

Q. Would you agree with me that before people are exposed or asked by an employer to be exposed to a life-threatening situation, there ought to be some very detailed studies done on the issue?

A. Sure.

Q. Are you prepared to tell the potash companies that, based upon your study, that we are to expose our miners to hazardous methane gas?

A. I'm not saying anything about exposing anybody to anything.

Q. Are you saying, through your study and testimony, that our miners are not exposed to the possibility of the migration of methane gas?

A. I'm saying that there should be no exposure of methane gases from what I discussed related to Delaware oil wells.

Q. So we shouldn't blow up our people underground?

A. No.

Q. And you're willing to go to the bank with that?

A. There's a small-- You can't guarantee anything in life, but there is an extremely small, extremely small possibility that that would happen.

Q. And you believe that based just on the study that you've done?

A. Yes.

Q. And you don't believe that these oil spots or that the available evidence supports the idea that the oil seeps in the mine workings came from these oil wells?

A. From the data I've reviewed, the only

conclusion I can draw is that they were natural.

Q. Did you take into account whether or not the changing stresses from mining--

A. I have to go on.

Q. Excuse me. Let me finish my question.

A. I'm sorry.

Q. --whether or not the changing stresses from mining may have played some part in the appearance of these oil seeps?

A. I went on the information available to me and drew the conclusions I did off the available data I had.

Q. Are you aware, also, Mr. May, that when the WIPP people were drilling some core holes, they also intersected some oil spots in those core samples?

A. No, I'm not aware of that.

Q. You didn't read that in the literature?

A. I can't recall it off the top of my head.

Q. Did you look at, I believe it's WIPP core hole No. 31?

A. Yes. I did not look at any core descriptions, but I'm aware of WIPP 31, and WIPP 31 is the well that I pointed out associated with

Mississippi Chemical. It drilled through that breccia pipe and it's what Exhibit 21 talks about.

Q. Okay. Well, would it make a difference to you that aside from the oil spot on the breccia pipe, that WIPP core hole 31 also had oil spots in it?

A. It also had oil spots and it was cored inside the breccia pipe.

Q. Okay. Are you aware of any of the other WIPP core samples that also had oil spots on them?

A. That's the only one I can think of right off the top of my head.

Q. If there's any others in the literature, you overlooked them?

A. Based on the data available, the only ones I've come up with are the ones I've discussed, and nowhere have I seen documentation that any of the oil seeps related to oil and gas wells.

Q. Well, did you approach this concept, Mr. May, with the idea that these oil seeps did not come from the wells unless I find evidence that they did?

A. I approached this from an attitude that I was going to research the public data available.

Q. And you've encountered H_2S in four out of the 29 wells in the area?

A. Approximately, yes.

Q. That's 14 percent, roughly?

A. If you say so.

Q. Do you think that's a lot?

A. No, especially considering the small amount of H_2S encountered.

Q. Now, on the significance of the geology that you explained to us about this western part--

A. As far as Livingston Ridge?

Q. Yes. And then you're looking over to the western side, most of the activity so far has been on the eastern side?

A. That's correct.

Q. And now you're saying there may be something over on the west side?

A. That's correct.

Q. You referred to an exhibit where a well had been spotted?

A. Yes.

Q. What do you mean? That's just where you want to drill?

A. That was a location spotted by Phillips Petroleum. They have intentions to drill there.

Q. And that's also located on the lease that Yates and Pogo bought, isn't that correct?

A. I believe so, but that was spotted before that lease was bought.

Q. When did you reach the conclusion that there may be more of this Livingston Ridge stuff out west?

A. As I was talking about--when I went through the history of drilling the different wells, and when we had drilled one of the wells and thought we were to the western extent, we decided to go one more further and encountered a thicker sand.

Q. My question is when.

A. A date?

Q. Yes.

A. I don't think I could give a date off the top of my head.

Q. In the last year? two years?

A. Within the last year, I would think, yes.

Q. Is that one of the reasons that Yates decided to go in and bid on the potash leases in Section 3?

A. I have no idea on that. I was not directly involved in that.

Q. Now, Exhibit No. 20 is a map. Do you know who made that map?

A. Who made the map?

Q. Yes, sir.

A. There were several people that made the map. Well, actually, it was taken from, originally, the 1984 BLM potash map. And, as I stated earlier, one of the next witnesses down the line will describe in more detail all the various features.

Q. I understand what you said about that. My question is, who made the map? Did you help make the map?

A. Our drafting department did, under my supervision.

Q. Would you agree with me, Mr. May, that when we're talking about something as serious as we're talking about here, the possible migration of methane gas, and I use the word "possible," that the consequences of it happening is

something that ought to be taken into consideration in whatever we do?

A. Sure.

Q. You don't have any problems with that, do you?

A. No.

Q. That if the consequences were insignificant, we might be expected to take more risk, right?

A. If you say so, yes.

Q. But if the consequences were of greater magnitude, then you would tend to come down on the more conservative side?

A. In your hypothetical situation, yes.

Q. You don't disagree with that, do you?

A. No, not in your hypothetical situation.

Q. Do you know what the consequences of getting methane gas into an underground mine is?

A. An explosion, I assume.

Q. And it can kill people, right?

A. Sure.

MR. HIGH: That's all I have right now. Thank you.

CHAIRMAN LEMAY: Thank you. Additional questions of the witness?

MR. CARROLL: No.

CHAIRMAN LEMAY: Commissioner Carlson?

EXAMINATION

BY COMMISSIONER CARLSON:

Q. Are you testifying that there will essentially be no migration of hydrocarbons through, I guess, the borehole into a potash mine, is that correct?

A. Yes, that's my interpretation, yes.

Q. Right now, R-111-P generally calls for a half-mile buffer zone. Are you saying that that could be reduced to zero? two inches? three feet? What would you recommend as a safe distance?

A. I don't think I could recommend a distance, but I think the half-mile is too great in the case of Delaware oil wells.

Q. Do you think they could mine right up to the borehole?

A. That would be up to the potash companies. I'm not qualified on that, how close they do mine up to the wells.

Q. You don't think there would be any migration of hydrocarbons into that mine if they came right up to that hole?

A. Right up to it?

Q. Yes.

A. We would have to assume that, first, that there would have to be a leak in the casing program, which other people will talk about later. If the potash was disturbed in any manner around the borehole in short distances, I've talked about that there are permeabilities in short distances. I might point out, and it will be pointed out later, too, that there are, in the active workings, oil wells in some of the mines.

Q. If you were sitting on this Commission, you wouldn't have an opinion as far as how--

A. Let me put it this way. If a well was plugged properly under R-111-P, I don't think I would have too much problem going up real close to it.

Q. You mentioned WIPP core hole 31, and that had oil spots?

A. Yes, sir.

Q. Where was that drilled?

A. That was inside the breccia pipe labeled Hill C in Section 5, of 21 South, 30 East, and it would be over on the left side of the map right around on the northeast side of the

Mississippi Chemical mine.

Q. Right. Okay. I see it. One more question. Could you explain what the difference in the orange hash marks is on this map?

A. I think I better let the next--not the next, but later people talk about that. There's going to be a person who can tell you completely about the other features on this map.

COMMISSIONER CARLSON: Thank you.

CHAIRMAN LEMAY: Commissioner Weiss?

COMMISSIONER WEISS: I have just one question.

EXAMINATION

BY COMMISSIONER WEISS:

Q. Was there an advancement in science in exploration that allowed the discovery of the Delaware zone there since April 21, 1988?

A. Our completion techniques have improved. In the past, from what I've gathered when the Delaware wells were drilled, most all the Delaware sands have to be artificially fractured. And the completion techniques, from what I understand, were of the sort where the frac was, quote, too large--and I'm not a reservoir engineer, but too large, and it frac'd

out of zone, bringing water in from accompanying water zones. And we've learn now how to frac these Delaware sands better and make better production with less water production.

Q. Does the water produced come from the bottom, or out of the zone, or--

A. I don't think there's-- In some of the sands there could be a true oil/water contact, and I think over on the east side of the Livingston Ridge there is, but all of the Delaware wells will produce water and I think it's due to the very fine-grain nature of the sand and the water, because the pore size is so small it captures some of the water.

COMMISSIONER WEISS: That's all the questions I have.

CHAIRMAN LEMAY: I don't have any questions. Are there additional questions of the witness? If not, he may be excused. We'll take a 15-minute break at this time.

[A recess was taken.]

[Commissioner Carlson is not present.]

CHAIRMAN LEMAY: Let's continue. Commissioner Carlson can join us when he wants to.

MR. CARROLL: Our next witness will be Dr. David Boneau, and I have placed his packet of exhibits up there, and they're numbered 22 through 27.

Chairman LeMay, I have not up to this time, but I would like to move our Exhibits 1 through 21 at this time.

CHAIRMAN LEMAY: Without objection, Exhibits 1 through 21 will be admitted into the record.

DAVID FRANCIS BONEAU, Ph.D.

Having been first duly sworn upon his oath, was examined and testified as follows:

EXAMINATION

BY MR. CARROLL:

Q. Dr. Boneau, would you state your full name, place of residence, and employer?

A. My name is David Francis Boneau. I reside in Artesia, New Mexico, where I work for Yates Petroleum.

Q. In what capacity do you work for Yates Petroleum?

A. I'm employed by Yates Petroleum as reservoir engineering supervisor.

Q. What kind of educational background do

you have to support that position?

A. I have a B.S. in physics from the University of Notre Dame in 1962, and a Ph.D. in nuclear spectroscopy from Iowa State University in 1969, plus some experience in the oil and gas industry.

Q. How long have you been in the oil and gas industry?

A. Since 1968; 24 years.

[Commissioner Carlson is present.]

Q. You have testified numerous times before the Commission and the Division as a petroleum engineer and reservoir analyst?

A. Yes, sir, that's correct.

MR. CARROLL: I would tender Dr. Boneau as an expert in the field of petroleum engineering and reservoir analysis.

CHAIRMAN LEMAY: But not nuclear spectroscopy? His qualifications are acceptable.

MR. CARROLL: Thank you.

Q. Dr. Boneau, you are familiar with the four applications that Yates Petroleum has before the Commission today?

A. Yes, sir.

Q. And you have performed certain studies,

have you not, with respect to those four proposed wells?

A. Yes, sir.

Q. And you have also prepared exhibits to illustrate the testimony that you'll be giving, is that correct?

A. That's correct.

Q. Your first exhibit, Exhibit 22, I would ask you to turn to and, if you would, Dr. Boneau, I would like to allow you to testify concerning your exhibits, starting with Exhibit 22.

As you go through and come to your exhibits, would you clearly identify the exhibit by number and identify what it is so the record will be very clear. And if you would, with that, I'll let you present your testimony.

A. My habit is to outline what I'm going to try to say and then try to say it. My intention is to make three points: First, that there are good reserves and good economics for Delaware oil wells in this area. The second point will be that the casing and cementing program designed for these wells will protect the potash; and thirdly, I would like to talk briefly about the lifetime of Delaware production.

One of my ideas in this controversy has been that in some areas the oil and gas can be produced and the well safely abandoned before the potash mines reach the area and I'll discuss that in a minute.

So the first point is the good reserves and the good economics for Deleware oil production. And that brings us to Exhibit 22. And you're going to let me discuss that?

Q. Yes, please. If you'll identify what it is and tell us what the conclusions are from it that you draw.

A. Exhibit 22 is a four-page exhibit listing all the Delaware-producing wells in a 10-township area, with the center being in the Livingston Ridge Delaware Pool. It includes wells in Townships 19 South, 32 and 33 east, 20 South, 32 and 33 East, 21 South, 31 and 32 East, 22 South, 31 and 32 East, and 23 South, 31 and 32 East. It's an area 30 miles in height and 12 miles wide, with the long, thin Livingston Ridge Pool in the middle.

There are 153 Delaware producers in this area. 111 of them are operated by people other than Yates Petroleum, and 42 are operated

by Yates Petroleum.

Really the point of this exhibit is that the average reserves--and this will be at the bottom of the fourth page--for the wells in this area, is 89,452 barrels of oil. 89,000 barrels of oil is an average reserve for a Deleware well in this region, and the further conclusion that the really close wells are the Graham No. 1 and the Graham No. 2, and the reserves of those two wells are on the average of 130,000 barrels of oil.

The Yates wells in this area have average reserves of 113,000 barrels of oil and the other people's wells have average reserves of 81,000 barrels of oil. There's a reason for that other than our superior geology or some such thing. The habit of Yates Petroleum in this area is to complete all the productive zones and produce them. Many of the other companies are just producing the main pay zone and keeping the other pays till, probably, until whether they see whether Yates makes any money producing them.

Anyway, the difference in reserves is probably attributable to the number of producing zones in our wells as compared to other wells.

So, Exhibit 22 sets up the economic calculations. The average well is 89,000 barrels, and the wells adjacent to the wells that are the subject of this hearing average 130,000 barrels of oil.

In the next exhibits I'll discuss the economics of those wells.

Q. So, the purpose of Exhibit 22 was to provide a database to start from in performing economic calculations that you believe will be indicative of these four wells that we're proposing to drill?

A. Yes, sir, that's correct.

Q. So if you'll go into your Exhibit No. 23, would you identify what this is and then discuss it with the Commission?

A. Exhibit 23 is obviously computer-generated, but it's a cash flow projection for an average well that produces 89,000 barrels of oil. It's set in the time frame that you would drill it now, but it's the economics and the cash flow projections for an average well.

The lifetime of the well is approximately 12 years. That was something that

was questioned earlier in the day. The reserves are 89,000 barrels of oil and about 105 million cubic feet of gas. The well cost $700,000 to drill and complete. The completion costs are quite high when you complete numerous producing zones.

The rate of return on this well is 35 percent, which is a nice rate of return. The well, assuming gas prices as shown there of $19 and $1.75 for the associated gas, will pay off the $700,000 cost of the well plus give a profit of $517,000.

Mr. Patterson said similar numbers to this this morning, but the working interest owner of this well would pay $158,000, approximately, in production taxes, and the royalty generated by the well would be about $250,000 for the average well.

So the average well is a good, economic prospect. That's what Exhibit 23 shows. As a Delaware oil well, an average well is a good economic prospect.

Q. That's your professional opinion?

A. Yes, sir.

Q. All right. If you would turn to your

Exhibit 24, then?

A. Exhibit 24 is a similar cash flow for a well with reserves of 130,000 barrels of oil. This is going to be a better well, as I think anyone intuitively would say.

The rate of return on this well is 90 percent per year. This well returns the $700,000 drilling cost plus a profit of about $1.1 million, $1,149,910 is what the computer printout says.

The working interest owner here would pay $230,000 in production taxes and would generate royalty of $420,000, and those are, essentially, equivalent to the two numbers Mr. Patterson quoted this morning, and I believe he attributed them to me at that time.

So, an average well is a good economic prospect. A well like the Graham 1 and 2 is an excellent, very good, super economic prospect.

Q. And that again is your professional conclusion?

A. Yes, sir.

Q. Any other statements you would like to make in relationship to your first three exhibits, 22, 23 or 24?

A. No, sir.

Q. As you indicated, one of the second points that you wanted to discuss with the Commission dealt with the issues of cementing and casing of the four wells, is that correct?

A. Yes, sir, that's correct.

Q. All right, sir. You've prepared Exhibit 25 which actually depicts what the casing would be in at least four proposed wells?

A. That's the idea. Exhibit 25 shows the actual casing and cementing program for the Graham AKB State No. 1, and the casing and cementing program for the four wells we're talking about would be very, very similar, essentially identical to this.

This has real numbers, real--and I think this illustrates the point better than saying this is what we hope to do. This is what we actually did on the Graham 1.

Q. One question before you go into a discussion of this exhibit. The casing program that was performed on this Graham AKB State No. 1, was it in compliance with R-111-P?

A. Yes, sir, it complies with R-111-P.

Q. All right. If you would, then, explain

in detail what's depicted here on Exhibit 25.

A. The Graham AKB State No. 1 has three strings of casing, all of which are cemented to the surface. From the top down, there's a 17-1/2-inch hole to 879 feet, and in that is set 13-3/8-inch casing which is cemented back to the surface and circulated.

Then there's 11-inch hole to 4200 feet, and in that was set 8-5/8-inch casing, so-called intermediate casing, which was then cemented back to the surface and circulated.

Finally, a 7-7/8-inch hole was drilled to total depth of 8450 feet, and in that hole was set the production casing, 5-1/2-inch production casing. It was cemented to surface with cement circulated. Actually, cement was circulated on each of the three stages. So, there are three strings of casing; all of them are cemented back to surface.

The potash in this area is located at about 1800 feet, and that would be opposite the 11-inch hole, and the potash would be protected, is protected by the 8-5/8-inch casing and the 5-1/2-inch casing at that depth of about 1800 feet, so the potash is separated from any

hydrocarbons in the wellbore by first an outside cement sheath, then the steel 8-5/8-inch casing that's about 3/4 of an inch thick, and by an inside cement sheath, and finally, fourthly, by the 5-1/2-inch steel casing.

In my mind, there are some other mitigating kind of safety factors associated with this well. This is an oil well producing from the Delaware at 6700 to 8200. The oil well is pumped. The wells that we want to drill would be pumped up-tubing. There's essentially no pressure, very low pressure in the wellbore. The pressure in the wellbore is much lower than the pressure in the potash or in any of the rock outside.

Q. When you say "low," what range would the pressure be in, associated with the Delaware well?

A. The pressure would be in the range of 10 psi, maybe 25 psi, 5 psi. 2 to 25 psi, in that range. It's not a high-pressure gas well, it's low pressure. In the oil vernacular, it's definitely low pressure.

Q. All right. Now, your statement about the pressure inside the pipe would be less than

the pressure naturally occurring in the formation, is that what you're telling us?

A. When the well is producing, the pressure in the wellbore will be less than the pressure in the surrounding formations anywhere.

Q. So, even if a hole occurred, then, with respect to this casing in the potash area, the pressure going inward to the center of the pipe would be greater than the pressure exerted going out, is that correct?

A. Yes. The pressure would make whatever fluids were in the formation move towards the wellbore, rather than fluid in the wellbore moving toward the formation.

Q. So, then, you wouldn't have, then, the possibility of a leak within--a leak from in the formation towards the outside, or a leak of the oil into the potash areas?

A. That's correct. I think the main point is that there's not going to be a leak. You've got two strings of casing with solid cement between them, and that's going to be very strong. You've got 8-5/8-inch casing reinforced with a 5-1/2-inch casing acting as a liner. You've got a very good casing cement protection

across the entire salt section there, from 4200 feet up.

Q. Dr. Boneau, are you aware of this kind of casing program ever failing and allowing a leak?

A. No. In my experience, which is not universal--there would be other people with different experience--but in my experience, the leaks in casing have always been in casing that had no cement behind it. I've never seen a leak in casing that had two strings cemented in place.

Q. Is there any problem--you've told us that this is actually what happened in the Graham AKB State No. 1. Was this just a lucky chance that you complied with it, or is this something that the state of technology is capable of duplicating time and time again?

A. I think the industry can duplicate this. Yates has drilled, like I said, about 40 wells in this area. They all have essentially this kind of casing and cementing program. We have installed casing and cement, as you see in this diagram, in all of these wells.

The only, what I would call a problem, in one well called Dolores No. 1, which is a few

miles from here, from this area we're discussing, and in that case the first stage on the long string, on the production string, did not reach the DV tool, so there was a 700-foot section at approximately 7000 feet where there was no cement.

Yates went in and perforated the casing and filled that void with casing so that the final result was the scheme you see here. It just didn't go quite as smoothly as it has in the other cases. But we've done 40 wells successfully this way, and I'm confident that we can implement this casing and cementing program in the four wells under discussion here.

Q. There are logs designed or within the industry that can tell you whether or not you have, in fact, achieved this goal of placing cement behind the casing, is that correct?

A. Yes. There are ways to tell that the cement is actually in place there.

Q. All right. And I take it, then, you utilize those means in correcting the problem that occurred on the Dolores and thus achieving this kind of casing program?

A. Yes, sir, that's correct.

Q. Dr. Boneau, in earlier testimony, five basic concerns of the potash industry were illustrated or were taken from a published document or a document prepared by the potash industry.

The second concern that they discussed was, and quoting it it says, "Casing programs cannot provide protection in the events of accidents. At least 17 blow-outs or oil well fires have occurred in the area around the potash basin. It is a virtual certainty that others will occur from time to time."

Now, when you're talking about blow-outs or oil well fires, are those things that casing is designed to prevent, or are we talking about a totally different problem here and actually confusing the real issue?

A. My understanding is that those fires, fires normally occur, and I believe these fires are like that, occur when the drilling encounters an unexpectedly high pressure zone at depth. My understanding is that most of these blow-outs were in Pennsylvanian formations, Atoka Morrow.

But the situation would be that the surface casing and the intermediate casing are in

place, as shown on Exhibit 25, and the 7-1/2-inch hole, the thin, deep hole is being drilled and it encounters high pressure gas which blows the mud out of the hole and hydrocarbons come out, et cetera, and something catches on fire.

When that happens, you have a problem on the surface where you have a fire, and you have a problem down at a depth where the high pressure zone is, but the two casing strings that are in place serve only as a conduit to transfer that high pressure to the surface. When the fire is put out and things are put together, you still have those two strings of surface and intermediate casing intact and unharmed, and in this case the potash would still be protected as if there had been no fire.

Q. In other words, the casing is not designed to protect the surface or explosion of hydrocarbons out of the surface, but they're to protect the intermediate zones between your surface and the pay zones, is that correct?

A. That's correct.

Q. In the kind of situations that they're describing in this concern, the casing performed that function or you wouldn't have had the

explosion of gas to the surface, is that a fair assessment?

A. Yes, sir, that's true.

Q. You also have an Exhibit 26, is that correct?

A. Yes.

Q. Would you explain what that is?

A. Well, let--

Q. Maybe I've jumped you along too far with respect to your Exhibit 25. If I have, would you please finish whatever you had to say.

A. 25 and 26 are details of the cementing program, and I had a couple more comments on those two exhibits that I would like to finish, if you'll let me.

Q. I certainly will.

A. Okay. Really, two points. I was talking about safety factors, and when the well is abandoned, and in my head, really, that's when the mining is going to encounter these wells, and I think the mining is going to be far enough down the road that these wells will be abandoned, and that's just my opinion.

When these wells are abandoned, my recommendation would be that the 5-1/2" casing be

filled with cement, from top to bottom, and that would cost the oil companies a little money but not really very much. You would have a strong--you would have very strong casing with three sets of steel all separated by cement, total cement and steel for a foot of diameter, approximately, and there would be no pressure in the well. There would be nothing but cement in the well.

When that is done, you could mine up close to that abandoned wellbore, and you probably could mine right through it.

Q. In other words, even break through the casing and the cement there in place at the 2000-foot-or-above level?

A. Yes, sir. And that leads, really, to the other point. The protection that this casing design offers is in isolating the Delaware at 6700 feet from the potash at 1800 feet. That's not quite a mile but almost a mile of steel and cement that isolate the source of the methane gas from the mine, where you do not want it to get. This is the protection that we're emphasizing.

One of the problems that the potash people have told me about in the past is

subsidence, which would have no effect on anything below the level of the potash. So, what I view as the main protection from the bottom of the potash to the top of the Delaware, that 4500 feet or so of steel and cement, is not involved in the subsidence issue at all. Okay.

Q. In your professional opinion, then, would that 4500 feet of steel and cement be sufficient to adequately protect the potash zones?

A. Yes, I believe that very muchly.

Q. Are there any other points you would like to make with respect to these exhibits?

A. Not really. Exhibit 26 is simply a detailed listing of the cement program that was used in the Graham AKB State No. 1, and it supplies more details to the picture in Exhibit 25.

Q. All right. You have another exhibit you prepared, Exhibit 27. Would you identify what that is and discuss that with the Commissioners?

A. Exhibit 27 is information concerning the lifetime of Delaware fields in Southeast New Mexico. Like I said, what I think will happen

here is that the oil wells will be drilled, produced and abandoned before the potash mining arrives in Section 2.

Exhibit 27 addresses, then, the issue of how long the oil would have to be produced for us to be finished before the miners came. In Exhibit 27, I've listed information on the 22 Delaware fields in Southeast New Mexico that contain at least 10 wells. There are some small Delaware fields, but this gives us a pretty good cross-section of the Delaware fields. There's 22 fields that contain at least 10 wells. Four of these fields have been waterflooded after primary production, and those are the four that have a number in the column labeled "years flooded." The "N/A" is supposed to mean "not applicable," but the four fields that have numbers there have been waterflooded.

For the most part, the primary production lasts 10 to 18 years, and those numbers are really found most easily under the comments column at the very right-hand side. Brushy Draw Delaware, for example, the second one, says "Primary end, 1998, 15 years." That's my shorthand for primary production from these

fields will become uneconomic in 1998, and that will be 15 years of primary production.

So, you look down that column and there's a 15, 14, 10, 12, 18, 10, 17, 11, 14, 15, 16, on average about 15 years, and that's in agreement with the economic projections I made in Exhibits 23 and 24.

There are a couple fields with primary production of 30 years or more, and those are Mason Delaware North, where years primary says 38, and I think Double X Delaware, where years of primary says 31. These fields have been marginal for the past 20 years, and the incentive for the producer is to maintain them, and they've maintained them in marginal condition. Most of the oil was produced. 90-plus percent of the primary production comes within 15 years, and I don't think those two exceptions detract from my conclusion.

The lifetimes of the four waterfloods, and again you have to look in the comments column to find this, but the lifetimes of the four waterflooded fields are 21, 15, 20 and 28 years. I believe these times would be shortened somewhat under the pressure of an approaching potash mine,

but those are the actual numbers for the waterfloods in the Delaware field.

My conclusion from this exhibit is that primary production will end within 15 years and a waterflood, if one proves to be a good thing to do at Livingston Ridge, would take an extra 15 to 20 years. If we can all cooperate in a reasonable way, the waterflood should start five years before the end of primary production, so that 30 years should be a good estimate for the length of time to produce primary and secondary oil from this area under discussion. I think that we can produce oil for those 30 years, plug the wells with cement, as I described, and then the potash mines can safely mine this same area.

Q. Dr. Boneau, how much additional production would be added, in general terms, by going to the waterflood situation? How much reserves are we actually talking about adding to a well?

A. Let's start--well, Yates has 40 wells in this area we're talking about. At 120 or something, 120, 130,000 barrels a well, that's four million barrels, I believe, if my math is right. As a general rule, waterfloods double

primary production.

The four waterfloods in the Delaware in Southeast New Mexico have been a little poorer than average, so if we're talking about four million barrels of primary oil, a rule of thumb would be four million barrels of secondary oil. My estimate from looking at these four waterfloods would be three million barrels of additional oil. Does that answer your question, sir?

Q. I think it does. Are there any other statements that you would like to make or conclusions, based on your Exhibit No. 27?

A. No, sir. This question has come up in the past, and I just decided it would be informative to look at all these fields and try and make some conclusions. The data is here. I haven't seen all this put together in one place before. Obviously I believe my conclusions, but at least the data is here so that other people can talk sensibly about a different conclusion.

Q. Thank you, Dr. Boneau. Let's now turn to a slightly different subject, one that has been touched upon in earlier testimony, and this deals with the concept--not concept, but the

actual drilling of a directional hole. Yates has had limited experience with respect to that in this area, has it not?

A. Yates has drilled one directional well in this area.

Q. And that's the Bonneville AKH No. 2 well, is that correct?

A. Yes, it's the Bonneville No. 2.

Q. And that is just north of this area. I believe the bottom hole location is in Section 19, is that correct?

A. Yeah, that's correct. That's two or three miles north of this area.

Q. And the actual location of that well was on the section to the west of Section 19?

A. The surface location was in the township to the west.

Q. All right. Would you describe for the Commission, basically, what kind of distances were involved? Were we talking about a direct offset, or less distances; the cost associated with doing a directional hole, and the problems that are associated down there?

A. The bottom hole location of the Bonneville 2 was in the center of Unit M, so it

was 660 feet from the west line of Section 19. The surface location was approximately 300 feet to the west of the township boundary, so the 300 feet added to the 660 feet is the offset. It's about a 900 or a thousand-foot offset. It's a smaller offset from the center of one 40 to the center of the adjacent 40. It's slightly smaller than that. It's about, say, a thousand-foot offset.

The well cost about $900,000. The well was drilled this spring. The date's on Exhibit 22, but it was this spring, June about, something like that, and I'm not completely sure that all the bills have reached our computer system yet, but most of them are and the cost is about $900,000. That's approximately an extra $200,000 over a vertical well.

I know I've answered some parts of that question. I may have missed a part or two.

Q. With respect to drilling wells that are even further deviated, in your experience would that increase the cost or have you reached the limit of the additional cost caused by the directional drilling? Would you touch on the mechanics and the problems involved?

A. Okay. R-111-P requires that any directional well, any deviated well, be vertical through the salt, through the intermediate casing. So you start your deviation at about 4200 feet. The production is at 6500 feet or some number like that, so you've got relatively little vertical distance in which to do the deviation.

The result of that is that you can deviate a well from the one 40 to the center of another 40, about 1320 feet. You can also mechanically deviate a well from the center of one 40 to the center of a diagonally opposite 40, which is a distance of the square root of two times 1320 feet, so about 1800, 2000 feet. Beyond that, you cannot get there because of the--because of starting the deviation low--because of drilling vertically for 4200 feet and then having to make all this deviation from 4200 feet until you reached the Delaware.

A diagonal offset is the furthest you can reach, and, of course, the costs, the cost of drilling to the center of adjacent 40, a 1320-offset, is about an extra $3- to $400,000, and the cost of drilling to a diagonally offset

40 is an extra $550-, $600,000, that range. You almost double the total cost of the well going to a diagonal offset, and you eat up most of your profit, but it can be done.

And beyond that, it cannot be done within the parameters of R-111-P. Of course, if you could deviate starting at the surface, you could reach out further; but in going the distance I talked about, 2000 feet, you're doubling the cost of the well and, going further, you would further increase the cost of the well.

Q. The cost of producing these kinds of wells also increase, do they not, over a traditional vertical well?

A. You have more room for problems, you have trouble pumping the wells. If you can pump them, you wear out tubing and rods rubbing against the sides of things; going around dog legs. Yeah, there are some other associated problems.

Q. Dr. Boneau, were you aware of what the land circumstances were surrounding the drilling of this deviated well? I know I haven't asked you that question. I'm just wondering if you're familiar with those.

A. I am familiar with some of them. There are some details I will not be familiar with. I'm familiar with the fact that at least Yates wanted to save, and that we were not allowed to drill a vertical well to save it, and the feeling of Yates was that ultimately the lease could prove valuable enough that it would be worth drilling a marginal well, spending the extra money to drill a deviated well to save the lease, in the hope that the lease would prove to be productive and, at some future time, we could drill up the rest of the lease with vertical wells that would be economic.

Q. This lease came to Yates by virtue of a farmout agreement that had a very short fuse on it, is that correct, Dr. Boneau?

A. That's my understanding, but that's really somebody else's expertise.

Q. That's why the well had to be drilled when it was drilled and there's no other alternative?

A. That's my understanding.

MR. HIGH: Object as leading.

CHAIRMAN LEMAY: You can phrase the question differently and get the same answer.

Q. Again, would you state for the Commission, then, what the circumstance were for the drilling of this deviated well, knowing the additional costs and risks?

A. As an engineer, all I really know is that there was a farmout. We had a short time to drill a well. There was a surface occupancy problem. We could drill a deviated well that was not deviated too awful much and save the lease. And Yates' management, of which I'm not a member, made the decision that that was a good, economic, way to spend some money, and we did that.

Q. There were additional proration units available, then, on that lease, besides the one drilled?

A. Yes. There were multiple proration units that could possibly be drilled.

Q. Dr. Boneau, with respect to the parameters, the goals that the Commission is charged with protecting by statute, would the granting of Yates' four applications, in your professional opinion, promote conservation, prevent waste, and protect correlative rights?

A. Yes, sir.

Q. And do you feel that, at least with

respect to your area of the testimony, that there is any problem with the causing of waste of potash?

A. No, sir. As I've said, I think what really will happen, what really should happen, is that we drill these wells. They're safe while we produce them. We abandon them, we plug them very securely, and the potash comes in later and mines it. Everybody gets what he wants.

The other way around does not work as well and, of course, fighting over it doesn't work as well.

MR. CARROLL: I would move at this time the admission of Exhibits 22 through 27.

CHAIRMAN LEMAY: Without objection, Exhibits 22 through 27 will be admitted into the record.

MR. CARROLL: I would pass the witness.

CHAIRMAN LEMAY: Thank you. Mr. High?

EXAMINATION

BY MR. HIGH:

Q. Dr. Boneau, during the time you worked for Yates, which I believe you said was since 68, was it?

A. I didn't say that, sir. I just didn't

give that information. I worked in the oil industry since 1968. I worked with Phillips Petroleum for 12 years and for Yates Petroleum for 12 years.

Q. What did you do for Phillips?

A. I worked in the research lab in Bartlesville initially for Phillips Petroleum on the improved oil recovery processes, involving things like polymers, surfactants, CO_2. I was head of the group that worked on tar sands for a while.

Q. You worked on what?

A. Tar sands, the basket tar sands, et cetera. We developed, we, in the lab, my colleagues and myself, developed what we thought at the time was a promising surfactant methodology and formulation, and I spent about three years with Phillips--I assume you're really interested in all this? It's fun for me to talk about, so I'll tell you.

Q. Have you been out in the field drilling any oil wells?

A. That's what I'm getting to.

Q. Okay. That's what I'm interested in knowing.

A. Okay. And I spent three years on a surfactant plug pile involving 25 wells in a place called North Burbank Unit, which is like the third or fourth biggest field in Oklahoma.

Then Phillips shipped me to Odessa and I worked as a district production engineer in Odessa in the years 1977, 78 and 79, where I did field work with the Ellenburger Field, the South Caldon Unit, [phonetic], the biggest fields that Phillips has in West Texas.

Q. Have you ever worked as a drilling supervisor?

A. No.

Q. Have you ever been been in charge of actually drilling the well?

A. I have not been the--I'm trying to answer your question. I've not been the on-site, in-charge person for drilling a well. I could make a statement that I was the office person in charge, but that's probably not what you're after.

Q. Have you ever been in charge of casing design?

A. It's vague what that means, but I have designed casing for a small number of wells. I

have never done that as my main job for an extended period of time.

Q. Has your main job ever included resolving problems that were encountered during drilling by other people?

A. A portion of my job at Yates is involved with that. It's hard to say what my main job is.

Q. You've done some troubleshooting?

A. When there are problems, there's a group of us in the office that consult on the handling of--

Q. Are you basically an office employee of Yates?

A. Yes. I'm a supervisor, yes.

Q. As a reservoir engineer supervisor, is your work more with respect to the reservoir instead of getting it out of the ground, or is that part of the same thing?

A. No. I would say you're right. I view the job as a reservoir engineer as getting the hydrocarbons to the bottom of the well and somebody else worries about them after that.

Q. I want to cover these three areas that you talked about. I want to start with the

economics on Exhibit 22, which is the Livingston Ridge area, the Delaware-producing wells in the Livingston Ridge area.

A. Yes, sir, I have that exhibit.

Q. All right. And I don't know a whole lot about drilling oil and gas wells, Dr. Boneau, so help me out here. How do you decide whether to put a well on here or not?

A. The wells on here are the wells in an area who are located in these 10 townships I mentioned. They're in an area--

Q. How did you decide on the 10 townships?

A. I looked at the Livingston Ridge field, which is that long, skinny thing about six or eight miles long.

Q. Have you looked at your geology maps?

A. No, surface maps. Just plain-old location maps.

Q. Where someone had defined the Livingston Ridge reservoir?

A. I looked at the wells that were producing from what is called Livingston Ridge, Delaware, Lost Tank Delaware.

Q. And is this information in Yates' office, or is this something that you got from

the State OCD and the BLM?

A. This had nothing to do with the BLM.

Q. Where would I go to get this data, if I was trying to find out? Is it--

A. Yeah, it's public data. You could go to the NMOCD office in Artesia or in Hobbs, depending on where the well is. There are commercial--there are people who sell this stuff on CD-roms, on microfiche, on modems over computers. You can go to the NMOCD office and they have a file for every well arranged by location, and you can go and look at all the wells in these locations.

Q. Tell me, if you will, how you arrived at the number on the last page, of the average, ultimate recovery of oil, of 89,452 barrels from wells that are obviously still producing?

A. I took a production history of each individual well and drew a graph for each well, a graph of time versus barrels of oil produced each month, a history of barrels of oil produced each month, and drew a picture of that--what's normally called a decline curve, because they always decline when the amount of oil goes down--and I projected, extrapolated, whatever

word you want to use, forecast how that line, how that production, would extend into the future. And when it reached a point that was not uneconomic, I cut it off and I added up how many barrels that was. So, I took the production for past times and I forecast production for future times for each of these wells.

Q. So the 89,452 barrels is an estimated number that you arrived at which you're expressing as your opinion?

A. Yes, sir. These wells, as you can see on page 4, these wells have produced a total of 4,295,694 barrels of oil, and I'm estimating that ultimately they will produce 13,686,147 barrels of oil. So the actual totally solid numbers that are not my opinion are approximately one-third of the total, and two-thirds of it are my opinion.

Q. I can read your numbers, Dr. Boneau. I'm interested in how you arrived at the 89,000.

A. I went through that procedure for each of these and added them all up.

Q. And that is your opinion as to the ultimate number of barrels in this reservoir?

A. Yes, that's right.

Q. It could be short? it could be long? it

could be wrong?

A. Oh, it probably will be wrong, but this is my main job and this I do better than some other things. And these numbers are the best estimates you're going to get of what these wells are going to make.

Q. Let's pick up Yates Exhibit No. 23.

A. Yes, sir, I have that.

Q. Again, you're going to have to help me out here. This may be old hand to you but it's not to me. Let's start with the first column. You're projecting a life of this well of 12.25 years? Is that what it comes out to?

A. That's correct, I believe.

Q. And that's also shown down toward the bottom center?

A. Yes.

Q. That's driven solely by the reserves which is your opinion?

A. It's driven by some other things which are also my opinion; but, yes, it is driven by--

Q. You've taken the 89 million barrels and decided how long it will take you to get them out of the ground, and that's how you get the life of the well?

A. Your statement is not blatantly false, but it's a little bit misleading. I have history from 153 wells, how they decline, and the picture--the forecast production here is in accord with how those 153 wells have done and are doing. It's my opinion, but there's some basis, from a study of these 153 wells, for how that thing is formed.

Q. Do you take this well beyond the production of 89,000 barrels of oil?

A. No.

Q. You never would, would you?

A. No. This well becomes uneconomic after producing 89,613 barrels, is what Exhibit 23 says.

Q. That's what I'm saying. You wouldn't take this well beyond that number in the reserves, correct?

A. That's correct. This well has reserves of 89,000 barrels of oil.

Q. How do you determine gross production? Is that, again, just based on your experience and knowledge and best hunch?

A. It takes my picture that I've derived from how these 153 wells decline, kind of a

typical decline curve, and that typical decline curve essentially, in my mind, I slide it up and down so that it starts at a place that gives 89,000 barrels of oil before it becomes uneconomic. The shape of the decline curve I determine from the behavior of those 153 wells, and I make it have reserves that are 89,000 barrels of oil because that's the average reserves that I determine in Exhibit 22.

Q. Driven again by the reserve estimate?

A. Yes. Yes.

Q. Now, over in net operating revenues, I assume that's just the mathematical calculations of the gross production and the prices that you have indicated here?

A. That's true. The other factor is, it's a net operating revenue, so it's after royalty and it's based on the net revenue interest of the owner.

Q. Well, do we know what the gross revenues are going to be?

A. Well, they're going to be 15 percent greater than the numbers there.

Q. And how do you know that?

A. Because I've used an NRI of 0.85 in

this example. The other way of calculating would be take the $19-- The numbers that are shown there under net operating revenue are the numbers under the net production, the fourth and fifth column. Do you see where that is?

Q. Yes.

A. So net production of oil times $19, added to net production of gas, $92.43 as an example number, times $1.75, gives $165,002.

Q. And what comes off of gross operating revenues to get net operating revenues?

A. The royalty.

Q. And that's all?

A. That's all.

Q. The next column is entitled, I assume, Severance, plus ADV, plus-- What's all that?

A. The words mean severance, plus ad valorem plus windfall profits taxes, and there are no windfall profits taxes anymore, but severance taxes, what I would call production taxes in New Mexico, it's the sum of the four components that go into that. We sure don't need to talk about that. Anyway, for taking it out of the ground you have to pay a tax, and then you pay ad valorem taxes ostensibly on equipment, but

really on production in New Mexico.

Q. How do you determine net operating expenses?

A. Our experience with those 40 wells in the Livingston Ridge, and those net operating expenses include paying the pumper and fixing things and they also include disposing of water that's produced with these Livingston Ridge wells.

Q. How do you arrive at the net operating expense? Is that just everything added up? Net operating expenses. That's all the expenses added up to operate this well, is that correct?

A. Yes, that's correct.

Q. Is there anything in there for overhead?

A. No, there's nothing in there for--no, that's not true. There is something in there for overhead.

Q. How can I find out if Mr. Yates' salary is in here, for example? Is that in here?

A. No, Mr. Yates' salary is not in there, but there is an overhead charge in there.

Q. And all the expenses of doing business would be included in this?

A. Only the expenses of operating the well.

Q. I understand that part. My question is, going beyond that, is there a pro-rata share of the general corporate expense assigned to any of these wells?

A. No. I mean, my answer is no. I think, as far as I understand your question, the answer is no. There's an overhead charge in there and I'm not sure what you ascribe that to. But, no, Mr. Yates' salary is not in there.

Q. Other than the direct expenses for operating the well, what overhead factors are in here?

A. There's an overhead of something in the order of $300 a month.

Q. Anything else?

A. No, nothing else.

Q. And the next column is capital cost, $700,000. That's the cost of the well?

A. That's the cost to drill and complete the well. This analysis assumes it's all spent on October 1st of 1992. The idea is we go drill a well now, spend $700,000, start producing it. We assume it's going to produce an average of

89,000 barrels of oil.

Q. And you just literally, this is like expensing the $700,000 is what you're doing here, right?

A. No. No. The idea is to get revenue so that when you take away the direct operating costs you have enough money left to repay the $700,000 and make a profit.

Q. But you don't capitalize the cost of the drilling over a period of time?

A. No. This is what is called a before-tax analysis. There are no income tax implications in this at all.

Q. Would that change the rate of return?

A. If you did an after-tax analysis? Yes, that would change the rate of return.

Q. It would increase it substantially, wouldn't it?

A. No, it normally lowers it.

Q. It would lower the rate of return shown on Exhibit 23?

A. Yes, sir, if you pay taxes.

Q. If you took into account the income tax treatment, would it increase or decrease?

A. If you took into account the income tax

treatment, the main income tax treatment is that you pay income tax and that lowers your return for the project.

Q. The rate of return?

A. It lowers the rate of return.

Q. How did you arrive at the $700,000?

A. Our experience in drilling these 40 wells in Livingston Ridge. That's an average kind of cost.

Q. It's your testimony that that's what you ordinarily encountered in drilling these wells in Livingston Ridge?

A. Yes, sir.

Q. Well, I was just looking at some documents, Dr. Boneau, and the Graham AKB State No. 1 which was referred to earlier, I have been given documents showing that the AFE on a completed well was $581,700. Do you agree with that?

A. I do not disagree that there's an AFE for Graham No. 1 that says the number you said.

Q. And the AFE for Graham No. 2 was $556,700?

A. I don't disagree with that, if that's what that paper says.

Q. Would these be atypical wells, since they're well below your $700,000 estimate?

A. No. What I'm telling you is that we actually spend $700--we write these AFEs for $500,000-and-whatever and we spend $700,000, and the difference is we spend a lot by completing them by stimulating these five or six or eight zones, and that stimulation is simply not in that estimate.

Q. Why would you do an AFE for these particular wells that was less than $700,000?

A. Because before they drilled the well they didn't know what the stimulation and how many of these zones they were going to encounter, and the drilling people like to have low numbers and the actual numbers sometimes come out higher.

Q. I appreciate that, Dr. Boneau, but you knew by November of 1991 about these additional costs that you're now telling us about, didn't you?

A. Probably not. That's not a fair statement.

Q. Is that something you discovered recently?

A. My memory of the timing is not going to

be completely accurate, but Yates completed original wells at Livingston Ridge with one or two zones, a small number of zones, more or less in line with that AFE, and we decided to test some of the other zones. We went back into a handful of wells, 5 or 10 wells, and opened up other zones and produced them for six months or something on that order and decided that it was worth producing these other zones and we changed our completions from hitting a single zone to opening most of the zones. And, like I say, I don't remember exactly when that occurred but sometime around November 91. We're not real far off.

Q. You've only started producing from all these other zones after, roughly, November of 91?

A. That's my memory, yes, sir. The only thing possibly with my memory is the exact date when that started.

Q. Is it your testimony that that explains the difference in the $700,000 assumed here in cost on Exhibit No. 24, in the amount shown for the Graham No. 1 and the No. 2?

A. Yes, that is the difference in those two numbers.

Q. Is there anything else that you can think of that would impact or increase the estimate of $700,000 above the numbers that it cost to drill Graham 1 and 2?

A. No, sir. I'm sure you realize that if we could drill these wells for $500-some-thousand, our profit and rate of return would increase and we would be very happy.

Q. You understand that's one issue involved in this litigation, and the higher the number here, the better it's going to look, right?

A. I don't understand that, no.

Q. I don't need your understanding.

A. The lower, the better it would look.

Q. You may not even know the issues involved.

A. I don't know the issue that you're referring to.

Q. All right. Let me direct your attention to Exhibit No. 25, and that's the casing program for these four wells?

A. Is that a question, sir?

Q. Yes, sir, it is.

A. This is specifically the casing program

for the Graham No. 1, which is in the same section. It is the casing, it is representative of the casing program we propose for the four wells, yes, sir.

Q. And you're involved in making sure that those things are taken care of, that the casing program meets R-111-P?

A. I'm involved, yes, sir.

Q. And you're satisfied, of course, that the proposed casing program does meet R-111-P?

A. In my understanding, that casing program meets R-111-P.

Q. All right. I want you to, and you may not have it there in front of you and if it's not I can give you mine, Yates' Exhibit No. 2. Let me let you use my copy of it.

MR. HIGH: May I approach the witness, Mr. Chairman?

CHAIRMAN LEMAY: Please do.

Q. Now, Dr. Boneau, look at Yates Exhibit No. 2. Did you have any part in preparing that document?

A. No, sir.

Q. Can you look at it and tell me if it complies with R-111-P?

A. I believe it complies with R-111-P. It looks to me like it complies with R-111-P.

Q. All right. Let's talk about that, then. Do you know, by memory, what R-111-P requires?

A. I know, and you'll find something about it I don't know, but I know some of the things, yes. I know most of the things.

Q. I assure you, I truly hope I find nothing about it that you don't know, but let's talk about it because we want to see if Yates Exhibit 2 complies with it. The first requirement in R-111-P is the surface casing, correct?

A. Yes, sir.

Q. And that's basically designed to protect the water bearing surface?

A. Protect surface water.

Q. And that casing is required to come down a certain distance, right?

A. To the Rustler anhydrite, is how I say it.

Q. Roughly the top of the salt?

A. Yes, sir.

Q. And your Exhibit No. 25 shows that

surface casing being at 879 feet, right?

A. Yes, sir.

Q. And I believe Yates Exhibit No. 2 shows it as a surface casing down to 850 feet, right?

A. That's correct.

Q. And that's what R-111-P required, that surface casing, right?

A. Uh-huh; 850, 879, that's engineering accuracy. Same place.

Q. Cemented back to the surface?

A. Cemented back to the surface.

Q. Which Yates' Exhibit No. 2 says it will be done, right?

A. Yes, sir.

Q. Now, the next set of casing required by R-111-P is the salt protection string, right?

A. Yes, sir.

Q. That's also required to be set to a specified distance, correct?

A. Not more than 600 feet below the base of the salt, is how I remember it.

Q. You have to be at least 100 feet below but not more than 600 below the base of the salt, right?

A. That's what I remember.

Q. In Exhibit No. 25, that's shown as being how deep?
A. 4200 feet.
Q. On Yates Exhibit No. 2 it's shown as being how deep?
A. 4500 feet.
Q. Is that about where you would estimate the bottom of the salt to be?
A. Yes, sir.
Q. And so those numbers, in your judgment, would be within the range of what's required in the salt protection string?
A. Yes, sir.
Q. Now, after the salt protection string is set, it has to be cemented to the surface, right?
A. Uh-huh.
Q. After you set that one, then R-111-P says you set a production string? I assume you don't set an intermediate string, right?
A. There's no intermediate string here. The salt protection string serves the same purpose.
Q. So the next casing would be to the production string, right?

A. Yes.

Q. And R-111-P requires it to also be cemented to the surface if there's no intermediate string, correct?

A. Yes, I believe that's right. I'm a little fuzzier about that than the other ones, but I believe that's right.

Q. And that's shown on your Exhibit No. 25, correct?

A. Yes.

Q. Now, look at Yates' Exhibit No. 2 and tell me where that production string is to be cemented to.

A. About two minutes ago I got your point and read that. What it says is tie back, are the words used here, and I would interpret that to mean that the cement be brought above the base of the 8-5/8, which is not the surface.

Q. And that's not what R-111-P requires, is it?

A. Frankly, I would have to look at R-111-P, but that's not what--I'm hazy on that requirement of R-111-P. I could read it here, I guess. If you're telling me that's what it says, we can believe you.

Q. Let me represent to you that R-111-P says if you don't run the intermediate string, you have to cement the production string to the surface.

A. All right. And the only discussion there is whether the salt protection string is, in fact, an intermediate string. That would be the only--

Q. You agree with me that the production string proposed by Yates in Yates' Exhibit No. 2 is not cemented to the surface or is not supposed to be cemented to the surface, right?

A. That's what it says here. I think I can tell you that it will be cemented to the surface.

MR. CARROLL: May I--I'm afraid I'm disagreeing with Mr. High's interpretation of R-111-P, and I propose to let Dr. Boneau look at it.

MR. HIGH: Fine. Let him look at it. Exhibit No. 9, page 9.

Q. You have that in front of you now, Dr. Boneau?

A. I have order R-111-P in front of me, yes, sir.

Q. Turn to page 9.
A. I happen to be on that page.
Q. And the first thing at the top is intermediate string?
A. Yes, Item 4.
Q. All right. And under production string--
A. Yes, Item 5.
Q. --A-1 one deals with wells to the shallow zone, right?
A. And you take that to mean above 5000 feet?
Q. Isn't that what R-111-P says it is?
A. I believe so.
Q. If you're going below 5000 feet, R-111-P calls it a deep well, right?
A. Yes, sir.
Q. All right. Drop down to A(ii), the second indented paragraph says, "For wells drilled to the deep zone," and that would be these, "the production string shall be cemented with a volume adequate to protect the pay zone and the casing above such zone, provided that if no intermediate string shall have been run and cemented to the surface, the production string

shall be cemented to the surface." Did I read that correctly?

A. Yes, and that's exactly what I remembered. And what I'm saying is, the question I can't resolve is whether the string set at 4500 is, in fact, an intermediate string.

Q. Well, let's look at R-111-P. Right above it, production string refers to intermediate string, right? Do you see that?

A. Those are the words there in Item 4, yes, sir.

Q. Look at 4(b). It's different from the salt protection string, right? Look at 4(b).

A. I don't know what you mean by "different."

Q. All right. Let me read 4(b). "Cementing procedures and casing tests for the intermediate string shall be the same as provided under subsections D(3), C and F for the salt protection string." Do you see that paragraph?

A. Yes, sir, I surely see that.

Q. So for purposes of R-111-P, the intermediate string is something separate and apart from the salt protection string, right?

A. That's not clear to me, no. It's not

clear where you set the intermediate string in this well. I'm not here to argue with you and I know it's our intention to cement this well to the surface.

Q. Dr. Boneau, I don't doubt that for one minute, but we're here talking about things that can go bad; and human error is one of them, right?

A. Human error causes problems sometimes, yes, sir.

Q. And let me ask you this question. Is it human error that the APD casing program is described in such a way that it doesn't comply with the casing program that R-111-P requires, which you've described on Exhibit 25?

A. It's not clear to me that Exhibit 2 does not comply with R-111-P. That's a question that Mike Williams can answer, or somebody.

Q. Do you know or do you not know whether or not the casing program set forth on Yates Exhibit No. 2 complies or does not comply with R-111-P?

A. I believe that it complies with R-111-P and the other thing I'm telling you is that we intend to cement these back to the surface as

I've shown in Exhibit No. 25.

Q. Notwithstanding what Yates' Exhibit 2 says?

A. Notwithstanding the interpretation of Exhibit No. 2.

Q. Would you agree with me that a tie back is not cemented to the surface?

A. Yes, I'll agree with that.

Q. How long do you think it would take to drill from 4200 feet, or whatever the APD said, 4500 feet, down to the total depth of the hole? You go another 4000 feet?

A. Yes, sir.

Q. How long would it take you to drill that?

A. Two weeks.

Q. That's three shifts a day? When you're drilling you go around-the-clock?

A. When you're drilling, you drill around-the-clock, yes, sir.

Q. Constantly drilling?

A. That's the idea.

Q. How many RPMs do you drill at in the basin?

A. I do not know.

Q. Well, the casing that's reflected on Yates' Exhibit No. 2 will be the casing through which you have rotated the drill stem for 4000 feet, right?

A. Yeah, that's right.

Q. Is there any wear and tear on that casing after drilling through it like that?

A. The wear and tear is non-zero, it's small. There's no appreciable wear and tear.

Q. So the time it would take to drill from 4500 feet to the total depth wouldn't cause any real wear and tear on the casing, right?

A. That's my opinion, yes.

Q. Look at Yates' Exhibit No. 2 and tell me, if you can, the bottom hole depth of that hole for any of these wells. And you can look at all four of them on Yates' Exhibit No. 2, if you like.

A. Item No. 10 on the first one says 8500 feet. And Item No. 10 on all of them say 8500 feet.

Q. Is that the bottom hole location?

A. That's the proposed depth. That's how deep the well will be.

Q. Now, continuing with this casing

program, Dr. Boneau, how far can you or do you have to go down before you kick off on R-111-P?

A. You have to go past, I believe the word's intermediate casing. You have to go past the string at 4200 feet.

Q. Do you know if there's some other sign down there you have to go beyond before you can kick off?

A. I don't recall.

Q. Have you had very much experience in drilling directional wells in the basin?

A. Have I?

Q. Yes, sir.

A. Yates has had a fair amount of experience mainly drilling those Strawn wells that were referred to in the western part of the potash area.

Q. My question is, do you have very much experience with directional wells?

A. I have the same kind of office experience that we talked about with those wells, and I think you want to judge that as not very much experience and I won't dispute that.

Q. I'm not trying to judge anything. I'm trying to figure out how much experience you

have. How much directional drills have you drilled or been personally involved in drilling?

A. I have been personally involved in drilling five.

Q. And were all those here in the potash basin?

A. Those are the four wells at East Burton Flat Strawn plus Bonneville.

Q. One by Yates and the other four by other people back in Oklahoma?

A. The other four are Yates and East Burton Flat Strawn.

Q. And who drilled those wells? Did Yates?

A. Yates is the operator of those five wells.

Q. Who did the actual drilling?

A. It was a drilling contractor, and I don't remember which one.

Q. You don't remember who you contracted it outside to?

A. Not those particular wells, no, I don't.

Q. Does Yates have a drilling company that it owns?

A. No.
Q. Is there a corporation called Yates Drilling Company?
A. Yes.
Q. And is that company in the business of drilling oil wells?
A. No.
Q. Does Yates ever take bids on drilling wells?
A. Yes. That's normal procedure.
Q. Have you taken bids on drilling a directional well in the potash basin?
A. Yes, we took bids related to drilling these wells I referred to.
Q. Which ones? The five you just mentioned?
A. Yes, sir.
Q. All those were bid?
A. All those were bid.
Q. Is this $700,000 that you've estimated for a well in the Delaware, is that based upon bids you received for these wells?
A. That $700,000 is talking about vertical wells.
Q. I understand that and I'm asking you if

that number is based upon bids, or is that--

A. Yes, that's based upon bids. That number is based upon bid for the billing and there's a lot of other expenses.

Q. You know the total offset of these other wells that you mentioned, these five wells?

A. The four in East Burton Flat Strawn were offsets considerably larger than the Bonneville, had offsets approaching a mile.

Q. You gave us some numbers, and let me just jump right to the bottom line, Dr. Boneau. You gave us some numbers earlier about the cost of drilling a directional well. Do you recall telling Mr. Carroll about that?

A. Yes, sir.

Q. Is that based upon your experience with these five wells?

A. Yes, sir.

Q. And a well that was offset 1320 feet, you said cost an additional $300- to $400,000?

A. Yes, sir.

Q. And that's additional over what? Is that over the 700,000?

A. Over the $700,000 dollars.

Q. So it's your testimony that to

directionally drill a well in the potash basin to the Delaware, offset 1320 feet is, ballpark, a million bucks?

A. That's correct.

Q. And I believe you said part of that cost was because you had to go down so far before you kick off?

A. That's part of the cost, but that fact limits the distance that you can offset.

Q. All right. Let me ask you, what do you consider to be a vertical hole?

A. A hole where the deviation is always less than five percent. I should have said five degrees, but five percent is pretty close to the same thing.

Q. Have you ever seen a case where the hole was unintentionally deviated more than five degrees?

A. I have seen holes that were more than five degrees for a short distance.

Q. What's the highest variation you've ever seen of deviation?

A. Oh, eight degrees, something like that. A very short distance.

Q. What would you consider to be an ideal

angle for a directional well in the Delaware? Well, let me back up. Is there such a thing as an ideal angle?

A. I think what would be ideal to one person, I don't think you would get an agreement on what that answer is.

Q. Do you have an opinion on what's an ideal angle?

A. You've got conflicting--well, you want to get there and you also want to test all these zones, so that if your angle is too big, you hit the top Delaware in a legal location and you hit the bottom Delaware on the adjacent guy's lease, and that's unlikely to be a good situation. In the 45-, 50-degree range.

Q. Would be what?

A. Would be the kind of thing I would shoot for.

Q. And why is it you would shoot for an angle of that 45 to 50 degrees?

A. Because, so that you can get there and test all the zones. I'm trying to tell you that this is a different situation than trying to offset to a single target.

Q. You're talking about horizontal

drilling? Is that what you're trying to say?

A. No, no.

Q. Is there a cost ratio between vertical and the degree of angle, or do you know?

A. Well, I don't know what you're asking.

Q. If you don't understand it, please don't answer it. I'll put it in words you understand.

Does it cost more or less to drill a directional well that has a higher degree of angle than one that has a lesser degree of angle?

A. It costs more to drill one with a higher degree of angle.

Q. At what point in the angle does the price start getting higher, or is it a constant increase with the increase in angle, if you know?

A. At a small angle it's not higher at all.

Q. When you say "small," it would be up to what?

A. 10 degrees, things that are normal.

Q. So, roughly up to 10 degrees? In fact some people might even call that a vertical hole, right? Unintended deviated hole?

A. Some people might call it something

else. I don't know.

Q. And that would be about the same cost as a vertical hole?

A. Yes.

Q. At what point in the angle of deviation does it start costing you more? From 10 degrees on up?

A. In my mind there's a jump getting to real deviated holes, 40- to 60-degree holes, and there's an additional jump trying to get to 80- or 90-degree holes, where you're trying to maintain that horizontal.

Q. What is it about the directional drilling that makes the cost escalate?

A. You've got to drill with special tools and you've got to convince yourself by measurements you're going the direction that you want to go.

Q. Okay. Anything else that you can think of?

A. Those are the two main factors.

Q. And do you know whether or not there were companies on the market that provide those kinds of services you just identified?

A. Yes, there surely are.

Q. In fact, there's companies out there whose business is nothing but directional drilling, right?

A. Oh, yes, sir.

Q. Have any of those people been involved in drilling the directional wells that Yates has drilled?

A. Yes, sir.

Q. What angle of draw did you use in coming up with the estimated cost that you gave Mr. Carroll earlier today?

A. You'll have to help me. "Angle of draw" is a potash term, and I don't know how to apply that to an oil well.

Q. I didn't mean angle of draw--the angle of deviation. How much deviation did you assume when you came up with these estimates on directional drilling?

A. Those angles are 35 to 50 degrees, from what I remember.

Q. Have you ever sat down and said, how much would it cost me to directionally drill from a position alongside Graham No. 1 and Graham No. 2 over to where you want Graham 3 and 4?

A. Those are basically the

direct-offset-40 locations. I talked about a 1320-foot offset.

Q. You have done an analysis on the cost of directionally drilling the four wells we're talking about here today?

A. We've done an analysis on drilling a 1320-foot offset in the Delaware in the Livingston Ridge area. It was not personalized to exactly Graham 1 or the Graham 3, but it was--

Q. You just assumed it would be the same?

A. The overall characteristics would be the same, yes, sir.

Q. How about Flora No. 1 and Flora No. 2? Have you done any analysis on what it would cost to directionally drill those?

A. If you'll tell me where the surface location is, I could tell you whether it fits into the limited number of cases we've done, but again, no, I've not done one personalized to Flora 1 and Flora it.

Q. That answered my question. So, you don't know what it would cost you to directionally drill from an area in close proximity to the four wells along the east side of Section 2, and hit the bottom hole location

you want to hit with Flora 1 and Flora 2? You don't know the cost of doing that?

A. I think it's not possible to do that.

Q. I didn't ask you that. You don't know the cost to do that, do you?

A. I don't know what you want for an answer. I studied the problem and my conclusion is you cannot do that.

Q. When you say you've studied the problem, this is in the abstract about the cost of directional drilling?

A. About drilling that big an offset, which would be about a half a mile offset.

Q. Anything beyond these footages you gave me earlier, falls into the no-can-do category?

A. No-can-do and hit the group of Delaware sands.

Q. So, any one of these wells that goes beyond 1320 feet is in the no-can-do category?

A. No. The no-can-do line is, like I said, the square root of 2 times--

MR. MUNCY: 1866.

A. --1866, about 2000 feet.

Q. Can it still be profitable if you offset it 1866? I'm sorry, you were looking at

Mr. Muncy, and I think Mr. Muncy is shaking his head down here; maybe trying to help you out?

A. I'm looking at God and not Mr. Muncy.

MR. MUNCY: I wasn't even looking at him.

MR. HIGH: You were shaking your head.

A. I have analyzed that, and my conclusion is that you just get your money back for an average well. This 89,000 barrel well or 100,000 barrel well, you break even, which is not attractive, but that's what you do. By doing this directional drilling, you get no additional income, you spend extra money drilling the well, and at the deviation you referred to, you use up all your profit in extra charges for drilling the well. So, the economic and the physical limitations are about the same.

Q. You also told Mr. Carroll that, in coming up with these estimates, these numbers for a directional well, that you kicked off at 4200 feet?

A. Yes, sir.

Q. And that's what you assumed in coming up with these numbers?

A. Yes, sir.

Q. Do you know the depth of Marker Bed 126?

A. Not in this area.

Q. Do you even know what Marker Bed 126 is?

A. It's one of the marker beds in the potash zones.

Q. Do you know it has any significance with respect to R-111-P?

A. My memory is that R-111-P says that you cannot kick off above Marker Bed 126.

Q. Do you know how deep Marker Bed 126 is in the area of Section 2?

A. In a vague way I do. If it's less than 4200 feet.

Q. If you kicked up at a point above your 4200 feet, that would reduce the amount of angle, wouldn't it?

A. It would give you more depth, more distance in which to hit your target, yes, sir.

Q. And it would reduce the cost, wouldn't it?

A. It would reduce the cost somewhat.

Q. Did you give any thought in coming up with your estimates in kicking off at a point

above 4200 feet so the angle would be smaller and less costly?

A. No.

Q. When you were talking earlier, Dr. Boneau, about primary life of the well, what does that mean?

A. I don't know that those are the exact words I used, but I think we can come to an understanding as to what that means.

Q. Let's refer specifically to Exhibit No. 27, because you have a column there entitled "years primary"?

A. Yes.

Q. What does that mean?

A. The column in Exhibit 27 that's marked years primary, is the number of years that the field has been on primary production as of today.

Q. So that's--

A. It's 1992 minus the number in "start primary" column.

Q. So some of these wells have been going for 31 years, 23 years, and 38 years?

A. That's correct.

Q. So, when you talked earlier about life-expectancy of 12.25, there's some of them

here that's gone nearly three times that much, correct?

A. Well, you're talking about slightly different things, but it's true that--here we're talking about fields, and elsewhere we're talking about wells, and that can cause you some confusion, but yes, there are wells, Delaware wells, that have produced 30 years.

Q. And you hope there's a whole lot more of them?

A. That would be lovely.

Q. You want a well to go beyond the 12.25 years you project for, right? You want it to keep producing forever until it becomes economical?

A. In a sense, but if I know how much it's going to produce, I want to produce that amount early. All I'm saying, in the earlier exhibits, 23 and 24, is that that's the way the wells in Livingston Ridge produce. The wells in these other fields start lower and go longer and last longer.

Q. You're not going to shut down a well after 12 years if it's still economical?

A. Not going to shut down a well after 12

years if it's still economical.

Q. Now, in Livingston Ridge, and again I'm referring here to Exhibit 27, Livingston Ridge Delaware, you show 29 wells as of 1/1/92?

A. Yes, sir.

Q. Will I find those wells on your Exhibit No. 22?

A. Yes. They should be there.

Q. Will there be any additional wells on there?

A. Exhibit 22 probably contains additional wells that were drilled after 1/1/92.

Q. Would that be the only difference? There's far more than 29 wells on your Exhibit No. 22, correct?

A. Yes.

Q. And it's entitled "Livingston Ridge area"?

A. Okay. Will you give me a second to explain? Livingston Ridge area has two meanings: In my lexicon, Livingston Ridge area has two meanings. First of all, it means Livingston Ridge Delaware Pool, Lost Tank Delaware Pool, Livingston Ridge Delaware Northeast Pool. That's the first definition.

The small group of wells in a contiguous area, that includes the Livingston Ridge Delaware Pool, okay?

Q. And that's the basis for your Exhibit No. 22?

A. No, the other definition is the basis for my Exhibit 22.

Q. All right, what is that?

A. And the other definition is essentially Delaware wells in that 10-township area that I described, that include other wells in what I would call the same trend. You understand the 10 townships is bigger than the Livingston Ridge Pool?

Q. I understand that, and I'm just trying to figure out how you arrived at some of these cutoffs, and I think you've explained that the best you can.

Again, going back to Exhibit No. 27, "Years Flooded," that column means what?

A. That column means the number of years from the time when waterflood started in that pool until the present time.

Q. Well, would there be any type tertiary recovery, polymer CO_2, that sort of stuff?

A. I really don't know.

Q. Well, have you planned for any or projected for any?

A. There are tertiary recovery projects in two or three Delaware pools in the country. The ones I know about have not been primary followed by secondary followed by tertiary.

My assumption, to get it hopefully simple, my assumption is that if tertiary is the thing that people decide to do, they will do it in the time frame of what we're talking about, the waterflood here. You go straight from primary to tertiary, and that's what Exxon and Yates are in the process of planning to do in the Avilon Delaware field, for example, just to tell you I'm not making this up on the spot. This is a procedure that the major oil companies think is the way to go in some fields.

Q. But you don't think we'll see that here in the Delaware, in Livingston Ridge?

A. I'm telling you, I don't know what we'll see. I think that we will see--

Q. If we do, will it extend the life of the wells, life of the field?

A. If there is 15 years of primary

followed by 15 years of waterflood followed by 15 years of CO_2, the lifetime will be 45 years. I think what's more likely is that there will be 15 years of waterflood followed by 15 years of CO_2, or 15 years of nothing.

Q. Now, have you ever been involved, Dr. Boneau, in cementing the casing?

A. Yes.

Q. And you have actually been on site when casing was cemented, and played some role in that?

A. Yes.

Q. On how many occasions are we talking about? Frequently? a few times? or--

A. A few times. 10 perhaps.

Q. Pardon?

A. Perhaps 10.

Q. That's not something that's part of your normal, regular duties?

A. That's correct.

Q. These roughly 10 times or so where you've been on site involved in cementing, has that all been here in the potash basin?

A. No, some of that was when I was with Phillips in Odessa, and the rest of the time was

with Yates, but not all of them in the potash basin.

Q. How many occasions would you say with Yates that you've been on site involved in cementing the casing?

A. I missed the end of that question.

Q. I'm sorry. How many times would you estimate that while you've been employed by Yates you've been on site involved in cementing the casing?

A. Five.

Q. Would you say those were recent or just over the last, what, 12, 14 years that you've been with Yates?

A. A couple of them have been recent, but they've been spread over that time.

Q. What was it that caused you to get involved with these cementing programs?

A. Mostly curiosity, to know how things work.

Q. Just trying to figure out more about the oil drilling business?

A. Yes, sir.

Q. Do you have any special training or education, in any way, Dr. Boneau, with respect

to casing cementing?

A. My mind says I can say yes or no. I really must not understand exactly what you mean.

Q. Well, have you ever been to school and got any degree that in any way involved cementing casing on an oil well?

A. No, sir.

Q. I take it you've attended some seminars, maybe a day or two seminar?

A. That's correct. I described my degrees to you earlier.

Q. In physics, right?

A. Yes, sir.

Q. That's not drilling or cementing gas wells or oil wells, is it?

A. No, sir.

Q. In your nuclear--in fact, I didn't catch all of that. Nuclear something-or-other.

A. Spectroscopy. Spectra. Spectra is a word people hear once in a while.

Q. That has nothing to do with cementing casing in an oil well, does it?

A. There's not much connection, no, sir.

Q. Any other experience or education that you have had with respect to cementing casing on

an oil well that would give you some special expertise with respect to cementing casing in an oil well?

A. I have been to so many jobs, I have been to the cement labs at the cementing companies, I have been to the research labs at the cementing companies. I've seen tests on cement. I've seen flow tests with cement. I did lots of flow tests when I was with Phillips' Research Center, but cementing has never been my primary occupation. I'm trying to provide you the right answer without saying it in one word.

Q. Would you agree with me that you have no special expertise in cementing?

A. I would agree with that, yes, sir.

Q. Look at Exhibit No. 26. That's the cementing program for the Graham No. 1?

A. Yes, sir.

Q. Can you tell me, just from looking at that document, whether or not there was any problem with the cementing on this well?

A. Again, I'm not clear what you mean. I wrote this and I know the background of the well. Are you asking if another person looking at this can tell?

Q. My question to you is, can you look solely at Exhibit No. 26 and, with the information given, tell me if any difficulties or problems were encountered during the cementing of Graham No. 1?

A. No, I can't tell that. To me, the critical information is that cement was circulated on each day, and that information is actually written on Exhibit 25 and is not written on Exhibit 26, just not to duplicate it.

Q. So you can't look at Exhibit 26, anyone familiar with cementing couldn't look at Exhibit No. 26 and tell if something went wrong during the cementing?

A. I think that's true. But if they looked at both those exhibits, they could tell.

Q. Do you know whether or not there were any cementing problems with Graham No. 1?

A. Yes, I know that there were not cementing problems with Graham No. 1.

Q. There were not?

A. There were not.

Q. Okay. Do you know whether or not Graham No. 1 ever lost circulation?

A. I can tell from this that Graham No. 1

never lost circulation below surface casing. I cannot tell whether or not it lost circulation above surface casing.

Q. My question is, do you know whether or not Graham No. 1 lost circulation on any of the cementing?

A. You can't tell from this, and I would be relying on my memory, and my memory is that it lost circulation in drilling the surface casing. But that's just my memory and it's not related to these two exhibits at all.

Q. Do you know what Stage 1, 2 and 3 is under your paragraph C?

A. Yes, sir.

Q. And what are they? What's Stage 1?

A. I think everybody realizes it's not possible or not easy to inject cement down the 5-1/2-inch casing and have it fill up outside the 5-1/2-inch casing from 8450 feet to surface, and--

Q. You're saying that's not possible?

A. I said it's either not possible or not easy. It's not done. You would be foolish to try. So, what is done is that these--these distribution values, DD tools, these stage

cementing tools are inserted in the casing, and that 5-1/2-inch casing is cemented in three stages.

The first stage is injected into the casing and it's designed--it comes up the back side to above 7401 where this DV tool is set, and then a so-called opening bomb is dropped, which opens a valve, and water is pumped in the casing and the cement above 7401 is circulated out of the hole.

So the first stage cements behind the 5-1/2-inch from 7401 to 8450, and that sets for approximately three hours, and then the second stage is pumped, which goes out the tool, the holes, at 7401, and goes up behind the casing to above the DV tool at 4485. And that's the second stage.

And again, a so-called opening bomb is dropped which opens the DV tool at 4485, and the excess cement from that second stage is circulated out of the hole so that State 2 cements the casing from 4485 to 7401.

And then the third stage, after a three-hour wait for that to set up, a third stage is pumped that goes in the DV tool at 4485 and is

circulated to surface, so that the cement behind the 5-1/2-inch is placed there in three stages. And the information on Exhibit 26 describes the cement used in those three stages.

Q. And it's your testimony that the use of Stage 1, 2 and 3, as reflected on Exhibit No. 26, is standard practice in terms of cementing casing?

A. Yes.

Q. Do you know whether or not that same procedure is followed when you've lost circulation?

A. Yes. It's got to be modified. You put the DV tools at advantageous places for the lost circulation, but, yes, that's the procedure that is used.

Q. Even after you lost circulation?

A. Yes, sir.

Q. It's your testimony you use it whether you lost circulation or not?

A. If you want to put cement behind that casing, you need to use DV tools.

Q. It's your testimony you're going to have cement around all or each of those casings?

A. I think the answer is yes, but again,

I'm not sure what you're saying.

Q. The goal is to get cement around each casing, right?

A. Yes. Each piece of casing? each length of casing? Is that what you mean? Yes, the goal is to get cement from the bottom of the hole to the top of the hole.

Q. Is it your belief that that occurs whenever you cement a casing?

A. Whenever you cement it by this procedure, that's what occurs. There's ways you can make that not occur, if you want to.

Q. Would the same amount of cement be equidistant around the casing?

A. It depends if your casing is centralized. The cement fills up the void between the casing and the formation.

Q. What if it's not centralized?

A. The casing fills up that void, but there can be a bigger void on one side than on the other in parts of the hole.

Q. And you'll get a mud displacement? Let me ask you a different way.

A. That doesn't compute.

Q. What happens if it's not centralized,

what might happen when you're cementing?

A. What might happen, you could get a cement job where you've got cement everywhere but you have more of it on one side than the other.

You could get a place where the cement is, where the casing is up against the formation or close enough to the formation that you get no cement there for one foot, 10 foot, 100 foot.

Q. And things like that happen all the time?

A. Well, Yates takes-- The goal, you know, and these are not dummies doing these things, the goal is to get this, and Yates takes precautions and the cementing company takes precautions to try to avoid that, but I'm not going to tell you that it never happens. It does happen, but I'm not going to say it happens all the time.

Q. Yates doesn't do its own cementing, does it?

A. No, sir.

Q. You're like everybody else, you hire somebody to do that, right?

A. Yes, sir.

Q. And you depend on the expertise and the

work and the craftsmanship of the other people, right, that you're hiring?

A. You work with them as a team to get the job done, yes, sir. You depend on them. You have your input, and you depend on them.

Q. Do you know of any instance, Dr. Boneau, where the cement around the casing has leaked?

A. I don't compute what that means. You needs to explain to me what that means.

Q. What part of the word "leak" don't you understand?

A. I don't understand cement leaking.

Q. Do you know of any instance where gas has been present in the annulus behind the casing, even though it was cemented?

A. I don't of any in Yates' wells, but it does happen in wells where there are gas zones, and if the cement is not formulated correctly, the gas will migrate into the cement before it sets up and there will be a weakening of the cement because of the gas in the cement.

Q. It can literally percolate to the top, can't it?

A. Not in Livingston Ridge, but in some

place in the world, yes. The problem that causes that does not exist in this area. But as a general question, yes, that can happen, and cement companies have spent research dollars and a lot of work formulating things that prevent, mitigate, increase the effect of that.

Q. Would you agree with me, Dr. Boneau, that a lot of money is spent on trying to keep gas from leaking around cement?

A. That was a big area of research with the cement companies, and they think they have the answer.

Q. It's still a big issue today, isn't it?

A. If you think it's a big issue today, it's a big issue today. It's not an issue at Livingston Ridge at all.

Q. Do you know what a microannulus is?

A. Yes, sir.

Q. Where would you find a microannulus?

A. In the oil industry, microannulus refers to the condition where the cement is not bonded to the casing and there is an annulus path, a small annulus, a small path, given the word microannulus, between the cement and the casing.

Q. Can it occur anywhere else?
A. If you want to define "anyplace else," where two things come together, and they don't come together quite totally.
Q. It could occur between the cement and the strata as well, couldn't it?
A. It's possible that they wouldn't bond completely, although it's a lot easier to bond there, than it is to steel.
Q. Do you know whether or not there's a lot of money spent being spent today to try to solve this microannulus problem, if you know?
A. I don't know what "lot" means, and no, I don't know.
Q. Do you know whether or not it's even an interest that people are interested in anymore?
A. No. I know that it still occurs in wells from time to time. We do worry about it in wells from time to time. It's not a problem that's totally disappeared.
Q. And people are still trying to find ways to stop it, right?
A. I can agree with that, yes.
Q. Let me just ask you, Dr. Boneau, given that single issue by itself, the issue of

microannulus either between the well casing in the cement or the strata in the cement, and the fact that it is still an on-going issue in debate today, is it still your testimony that these wells present no hazard at all to the underground potash miners down there?

A. Yes, sir, that's my testimony.

Q. Do you think that the cement job that Yates gets on its wells is not going to be subject to this microannulus thing?

A. It's not going to be subject to microannulus over the entire mile that prevents the migration. These are local problems, and there can be local problems and still plenty of cement left to ensure that the gas does not migrate.

Q. But it is still a possibility today, as you and I stand here, that a well can be cemented in the potash basin and that cement can still allow gas to migrate for any number of reasons, correct?

A. I think I disagree with that statement. Again, I'm not exactly clear what you're asking, but just to say that everything--that cement is going to migrate

everywhere, is not true. The cement job is going to prevent the migration.

Q. What is?

A. The casing and cement program is going to prevent the migration of gas in the Delaware.

Q. You have a high degree of confidence in cement, I take it?

A. Yes, sir.

Q. Do you?

A. Yes, sir.

Q. Do you believe that there is at least a risk in the potash basin that gas can migrate, in whatever way, around that cement?

A. No, I don't think that gas will migrate over these distances, with this casing and cement program.

Q. Do you think the fact that a leak might develop in the casings or liners might result in something that we ought to be concerned with?

A. No. A leak is not going to develop that penetrates the 5-/12 inch in the cement, the 8-5/8 inch in the cement.

Q. Do you ever get leaks in the casing? or would you be in a position to even know that?

A. Yes, I clearly know that. I told you,

I testified that, in my experience, I can remember 20 or so wells that had casing leaks, and they all were behind--they all were in casing that had no cement behind them. And at the time I said other people may have different experience; I testified to my experience.

Q. So, leaks do develop in the casing? That's not an issue?

A. No, that's not an issue.

Q. You agree with that, right? Leaks develop in casing?

A. No. The issue is, do leaks develop in two strings of casing both cemented to the surface.

Q. Well, let's just take the casing for a minute, forget about the cementing or where it goes. Does casing leak?

A. Does casing leak? Some casing leaks, some casing--there are leaks in casing. They have occurred and they will occur in the future.

Q. And if oil and gas wells are drilled on the potash basin, we have to expect that leaks in the casing are going to develop? I'm not talking about where it's going to go, but leaks in casing do occur? That's just part of the oil and gas

drilling business, correct?

A. You may penetrate the 5-1/2-inch casing with a leak somewhere sometime. It's very unlikely, but it may happen. But that leak is not going to penetrate the other casing in the outside cement.

Q. And I told you I'm not talking about where it's going to go. I'm just talking about the issue of leaks from casing. That does occur in the oil business, right?

A. It occurs in the oil business. It's very unlikely that it will occur at Livingston Ridge where we have sweet oil. We have none of the things that are normally associated--

Q. You see Mr. Hutchinson shaking his head now, agreeing with you.

A. I think he's nodding off.

CHAIRMAN LEMAY: Mr. Carroll?

MR. CARROLL: I am going to lodge an objection at this point. I think we're getting very argumentative.

CHAIRMAN LEMAY: Well, I don't know how many times we're going to go over this. Mr. High, let me say something for you--

MR. HIGH: All right.

CHAIRMAN LEMAY: --to be efficient in your cross-examination. It took you five minutes to talk around an issue about how much this witness had specialty in cement casing. You could have asked him, you finally did, "Did you have some special expertise in cementing?" Why don't you save the 10 minutes and come out and ask him? Get to the point? You wander all around and are so inefficient with your time.

MR. HIGH: I apologize. He was offered as an expert by Yates. I had no idea the man had no expertise until I started asking him.

CHAIRMAN LEMAY: That's not what my comment concerned. It concerned spending five to 10 minutes talking around an expertise issue, when you could come right out and ask him. We do this here. We're very direct. We don't grandstand, we don't waste a lot of time. We try and make points by being direct. Believe me, you're not going to offend any witnesses by being direct.

MR. HIGH: I apologize if I've not been as efficient as you like. I assumed, and perhaps erroneously, that this man had some expertise with respect to casing and cementing, because

he's offered as an expert. I agree with you that he has no such expertise.

CHAIRMAN LEMAY: No, I didn't say that. I said just to ask him the questions. Don't beat around the bush with it. If you want to find out if he's an expert, ask him.

MR. HIGH: Then let me get right down to the bottom line.

CHAIRMAN LEMAY: That's all I'm asking you to do here, sir.

Q. (BY MR. HIGH) Dr. Boneau, would you agree with me that you have no special expertise on cementing casing?

A. I would agree that the reason I'm here and my expertise is what cement programs Yates follows, and the results of them; and, further, I would agree that the specialized questions that you're asking are not my expertise, and that one of the other witnesses can better answer some of these questions.

Q. If I wanted to get into this real detailed stuff about what I might consider to be a safety hazard from cementing casing, you're not the person I should be asking those questions of, right?

A. I told you my experience, I told you my experience with leaks, and all that supports what I've said, and what I've said is limited and you want to extend it past its limits and there is a limit. I admit there is a limit, and you want to extend it past that.

MR. HIGH: I think you have answered my question, Dr. Boneau, with respect to the limits of your expertise. I appreciate that, and I apologize to the Commission if I've extended this unnecessarily. Again, I assumed the witness had expertise in an area he did not.

CHAIRMAN LEMAY: Ask them directly in the future, either counsel. Additional questions of the witness? Commissioner Carlson?

COMMISSIONER CARLSON: I don't have any.

CHAIRMAN LEMAY: Commissioner Weiss?

EXAMINATION

BY COMMISSIONER WEISS:

Q. I would like to know your opinion of what an expert in cement is. You may be one. I don't know.

A. There have got to be a couple kinds of experts to satisfy the questions involved. An

expert is probably someone who has spent 25 years cementing wells while he was awake and noticed things and understands, and there's got to be a kind of expert who has addressed some of these issues on a fundamental level in a laboratory and related them to the field.

I don't know if one person exists who is both of those, but those are two types of legitimate experts. You're asking my opinion, that's what you're getting.

Q. Thank you.

A. There are other people who have cemented wells and are familiar with the process and can explain what's going on, and that's what I did, for the most part. That's my answer. I hope that helps.

Q. I have one other question, Dr. Boneau. On a deviated well, are there additional cementing problems?

A. On a deviated well, you have additional problems centralizing the casing and getting the cement all around the casing, yes, sir.

COMMISSIONER WEISS: Thank you. Those were the only two questions I had.

CHAIRMAN LEMAY: I've got about three.

EXAMINATION

BY CHAIRMAN LEMAY:

Q. Let's start with your compilation of Delaware sand fields. I take it you didn't separate Ramsey production from the Cherry Canyon, Brushy Canyon, the multi-zone completions you're making in Livingston Ridge in your analysis on Exhibit No. 27?

A. No.

Q. Or in your--

A. That's correct. It's all fields that the State calls "Delaware." I look at all fields that the State calls "Delaware" and threw out the ones with less than 10 wells and included the other ones.

Q. The two different reserve estimates you were giving, 87,000 that was testified before and 125,000, could that be the difference in a single-zone Ramsey completion versus a multi-zone deeper Delaware completion on average?

A. I think that's the main factor in that.

Q. Have you ever encountered or are you cognizant of any high pressure zones while drilling to the Brushy Canyon members? Any blow-outs? Any high pressure zones on the way

down to that objective?

A. Two-part answer. I'm not familiar with any. From my memory of the 17 blow-outs that were discussed, one of those was in a Delaware well, I believe in the Brushy Canyon Field, and there was, I guess, a pocket in the Delaware. I know that Avilon Delaware field, where Yates operates wells, has some gas stringers but, to my knowledge, none of them are extremely high pressure.

Q. In analyzing the Avilon Delaware, which has a little more history than some of the others, in comparison to a possible secondary tertiary operation, would you anticipate, because of water production, what you and Exxon have agreed to in Avilon, that you may go directly from primary to a carbon dioxide flood without trying to waterflood the properties?

A. That looks to be the most attractive option at present. The waterfloods have not been all that wonderful. You need some water injection to repressure the reservoir.

CO_2 has been reasonably successful in two Delaware floods in Texas, south of Lea County. Oh, shucks, Conoco and HNG. I'm not

thinking of other fields at the moment. Yes is the answer to your question.

Q. One final question here. Your analysis in Exhibit No. 27, where you show the years primary and also the years secondary, it looks like some of the older fields back in the early 60s, especially, have the longer primary years. I agree it's before your time, but are you familiar with the allowable system back in the early 60s that New Mexico employed?

A. I'm probably more familiar with Texas's, but I assume they're similar.

Q. I'm talking about the early 60s now. The Texas system was similar. My point is, if you were only allowed to produce 30 or 33 barrels of oil per day and the wells were-- What's the allowable now in Livingston Ridge, do you happen to know?

A. Some places it's up to 187.

Q. Well, could you get the primary production over with quicker? Would you have a shorter life span to a well, if you could produce 180 barrels of oil per day or one you could produce 33 barrels of oil per day?

A. Yes, sir. That same situation, to an

extent, exists in the Avilon Delaware now. Some of those wells are allowable limited, and if you look at that production it's relatively steady for nine years. It hasn't declined like Livingston Ridge wells do.

Q. My question involves some of the older fields that you listed in Exhibit 27.

A. The older fields could have longer primaries because of the allowable system. That's a factor that extends their life.

CHAIRMAN LEMAY: Thank you. Those are the only questions I have.

Are there additional questions of the witness? We are going to break. Let's come back tomorrow.

Check your calendars, Counsel, and we'll do the same. It looks like we'll be here part of Friday, and I'm thinking about 10:00 to 2:00 or 3:00 on Friday, and then coming back some other time if we can't finish up in that length of time.

MR. CARROLL: What time in the morning?

CHAIRMAN LEMAY: 9:00, unless you want to start earlier. 8:30? Let's do it at 8:30.

We'll see you at 8:30.

(And the proceedings were recessed, to reconvene at 8:30 a.m., the following day.)

CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, Carla Diane Rodriguez, Certified Shorthand Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Commission was reported by me; that I caused my notes to be transcribed under my personal supervision; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL September 18, 1992.

Carla Diane Rodriguez

CARLA DIANE RODRIGUEZ, RPR
CSR No. 4