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NEW MEXICO OIL CONSERVATION DIVISION

COMMISSION HEARING

SANTA FE, NEW MEXICO

Hearing Date NOVEMBER 17, 1999 Time 9:00 A.M.

NAME	REPRESENTING	LOCATION
Rick Alvarez	PNM	ALB
Toni Ristau	PNM	Alb
Jim Gillespie	Hinkle Cox et al.	Roswell
John Barnes	Burlington Resources	Farmington
Ken Gray	Pogo Producing Company	Midland, TX
Ned Kendrick	Montgomery & Andrews	SF
James Bruce	~~SF~~	SF
[illegible]	Campbell, Carr, Berge & Sheridan, PA	Santa Fe
Bill Olson	NMOCD	Santa Fe

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:	CASE NO. 12,223
APPLICATION OF POGO PRODUCING COMPANY FOR APPROVAL OF A PILOT PRESSURE MAINTENANCE PROJECT AND TO QUALIFY THE PROJECT FOR THE RECOVERED OIL TAX RATE PURSUANT TO THE ENHANCED OIL RECOVERY ACT, EDDY COUNTY, NEW MEXICO	ORIGINAL

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: MICHAEL E. STOGNER, Hearing Examiner

January 6th, 2000

Santa Fe, New Mexico

This matter came on for hearing before the New Mexico Oil Conservation Division, MICHAEL E. STOGNER, Hearing Examiner, on Thursday, January 6th, 2000, at the New Mexico Energy, Minerals and Natural Resources Department, Porter Hall, 2040 South Pacheco, Santa Fe, New Mexico, Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

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January 6th, 2000
Examiner Hearing
CASE NO. 12,223

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A P P E A R A N C E S

FOR THE DIVISION:

RAND L. CARROLL
Attorney at Law
Legal Counsel to the Division
2040 South Pacheco
Santa Fe, New Mexico 87505

FOR THE APPLICANT:

KELLAHIN & KELLAHIN
117 N. Guadalupe
P.O. Box 2265
Santa Fe, New Mexico 87504-2265
By: W. THOMAS KELLAHIN

* * *

WHEREUPON, the following proceedings were had at 8:35 a.m.:

EXAMINER STOGNER: At this time I'll call Reopened Case 12,223.

MR. CARROLL: Application of Pogo Producing Company for approval of a pilot pressure maintenance project and to quality the project for the recovered oil tax rate pursuant to the Enhanced Oil Recovery Act, Eddy County, New Mexico.

EXAMINER STOGNER: Call for appearances.

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin and Kellahin, appearing in association with Mr. James Bruce. We represent the Applicant, Pogo Producing Company, in this matter.

EXAMINER STOGNER: Any other appearances?

One quick question. Where is Mr. Bruce today?

MR. KELLAHIN: Mr. Bruce is recuperating, Mr. Stogner.

EXAMINER STOGNER: Did he have an injury?

MR. KELLAHIN: He did, sir.

EXAMINER STOGNER: Sports-related?

MR. KELLAHIN: I'm not sure Mr. Bruce's jogging qualifies as a sport. It may simply be a minor leisure activity. It is my understanding by rumor and suspicion that he intentionally fell on ice, detached the ligaments

from his patella in order not to have to appear and present this case today, but that's certainly just rumor.

EXAMINER STOGNER: Perhaps this illness has nothing to do with his cigar-smoking habit?

MR. KELLAHIN: Well, we'll have to subpoena him and examine the cause and effect of his injury, Mr. Examiner.

EXAMINER STOGNER: Well, I might take that suggestion under advisement.

MR. KELLAHIN: Please note that I would not represent him in such a case.

EXAMINER STOGNER: So noted.

Since there's no further appearances, Mr. Kellahin, could you please bring me up to date?

MR. KELLAHIN: Yes, sir. I have three witnesses to be sworn, and then I have an opening statement for you in this matter.

EXAMINER STOGNER: In that case, will the three witnesses please stand to be sworn?

(Thereupon, the witnesses were sworn.)

MR. KELLAHIN: Mr. Examiner, I've handed you a copy of Order R-11,246. It was entered in this case, which has the same case number. It was entered on September 8th, 1999, after a hearing before Examiner Catanach on August 5th of 1999.

If you'll turn for a moment and look at our proposed Exhibit Number 1 for today's hearing, I'll explain to you as best I can why we are back before you today.

If you'll look over in Section 21, you'll find marked by the letter "K" an arrow that identifies a gas well. That gas well is an Atoka gas well. It is operated by Kaiser-Francis. It's located in Unit N of Section 21.

If you see the green boundary, that represents Pogo's proposed pressure maintenance project for various Delaware oil wells. We're going to be discussing what they identify as the BC-4 interval of the Delaware. We're down in the Brushy Canyon portion.

When Mr. Catanach reviewed and approved the pressure maintenance project, you will see from looking at that record that the Kaiser-Francis well, the Pure Gold "A" Federal Number 1, is located just within the edge of the half-mile radius of area of review.

And when you see our exhibits today, you will recognize that when the Kaiser-Francis well was drilled originally by Coquina, that there is an interval of casing in the Delaware that is not covered by cement.

When this case was presented to Examiner Catanach, there was no technical evidence presented to cause him to grant an exception from the normal practice of the Division, which is to require remedial work on what is

characterized as a problem well, as I've just described.

As a result of Mr. Catanach's order, then, Pogo asked the Commission to conduct a *de novo* hearing, which took place on November 17th, 1999.

As a result of that hearing, then, Pogo presented petroleum engineering testimony with regards to the issue of the problem well. Mr. Ron Gasser testified before the Commission. He is back before you today.

As part of that presentation, then, you'll see when you read the transcript of the Commission case, he was contending that it is not necessary to conduct remedial action on the Kaiser-Francis well, for various reasons that he will again describe for you today.

At the conclusion of the Commission hearing, you will see in the transcript that there was deliberations conducted by the Commission after the Applicant, his witness and counsel had departed. And in summary, that post-hearing deliberation focused on several issues.

One was that Carol Leach, the attorney for the Commission at that time due to the absence of Lyn Hebert -- Mr. Carroll was present, and it's my understanding from reading the transcript that Ms. Hebert was going to identify for Mr. Bruce the issues for which the record was to be supplemented. My understanding from Mr. Bruce is, he never received that letter.

His recollection, however, is, rather than have the Commission take this case under advisement and issue a Commission order, that it was to be the decision of the Commission to remand this case to an Examiner hearing at some point, to take additional testimony. That additional testimony was to focus on two major issues.

One issue was raised by Commissioner Bailey. In examining Mr. Gasser, she was raising the issue about whether water injection into the Delaware, regardless of the existence of the Kaiser-Francis well, could be placed in the Delaware in such a way that it would cause water to move from the Delaware potentially down to the Morrow. So she was questioning the geologic integrity of the intervals from the Delaware down.

So as part of our presentation this morning, we want to take the opportunity to have Mr. Bill Hardie, a geologist with Pogo, give you the short information so that you know there is multiple and numerous impermeable layers between the Delaware and the Morrow, as well as above, so that water injected into the Delaware in the BC-4 interval is going to remain confined within that interval.

The second issue was raised by Commissioner Wrotenbery, and it had to do with further information from Mr. Gasser concerning injection pressure. The issue was whether there was any probability that injection into the

injection well, which is identified on your Exhibit Number 1 as the open circle with the symbol, the arrow pointing to the Number 20 -- That's an existing Delaware well that they want to use as the only injector in the pressure maintenance project, it is that well.

She wanted to know whether Mr. Gasser could more clearly document his conclusions then in November that injection into that well was going to have absolutely no effect upon Kaiser-Francis's gas well. He's done that, he's come back today with that information.

Those were the two major reasons, to my understanding, as to why we were asked to supplement the record before an Examiner.

If Mr. Carroll has a more clear recollection than I do, we will attempt to address those questions with these witnesses.

So my plan today is to give you three witnesses so that you can have a general overview pointed specifically at the Kaiser well in relation to injection, so that you can see the land ownership very quickly, so that you can look at the geologic picture very quickly, and so that we can examine with Mr. Gasser his engineering conclusions and his supplemental data to support the fact that this well does not need to have remedial action taken, and it may be exempted from re-cementing or remedial

action.

That's where we are, sir.

EXAMINER STOGNER: Thank you, Mr. Kellahin.

Mr. Carroll, do you have anything to add to shed some light? Because I've reviewed this record, and I'm really unclear about how this got on today's docket.

MR. CARROLL: I agree with Mr. Kellahin. It's my impression that the Commission was a little confused itself and remanded it to the Division for further testimony regarding the remedial work on this Kaiser Well Number 20.

EXAMINER STOGNER: With that, Mr. Kellahin, I guess -- Please present your case.

MR. KELLAHIN: All right sir.

To make the record absolutely clear, Mr. Stogner -- I think it's unnecessary, but I will do it just to be very careful -- we would like to have in this proceeding, then, the Division recognize that this is simply a continuation of Pogo's presentation that started before Mr. Catanach continued through the Commission, and that you would have the opportunity and certainly the authority to review the entire case file, including all these proceedings.

EXAMINER STOGNER: Okay.

MR. KELLAHIN: My first witness is Mr. Scott McDaniel.

SCOTT McDANIEL,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q. Mr. McDaniel, for the record, sir, please state your name and occupation.

A. Yes, my name is Scott McDaniel. I'm a district landman for Pogo Producing Company.

Q. As part of your employment, Mr. McDaniel, are you aware of the ownership of the various interests within the area identified on Exhibit Number 1?

A. Yes, I am.

Q. And you have become knowledgeable because you do this in the normal course of your business as a petroleum landman for Pogo?

A. That's correct.

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

EXAMINER STOGNER: Mr. McDaniel is so qualified.

Q. (By Mr. Kellahin) Let me as you specifically, now, to the best of your knowledge, Mr. McDaniel, we in fact are dealing with Delaware wells in what the Division described as the West Sand Dunes-Delaware Pool?

A. That's correct.

Q. Are you of the understanding that this currently is on 40-acre oil spacing for the Delaware in this zone?

A. Yes, it is.

Q. When we look at the plat, in the northeast quarter we're looking at a portion of Section 21?

A. The northeast quarter?

Q. Of the plat.

A. Oh, yes, uh-huh, that's correct.

Q. We're seeing a portion on this plat of four sections that come together in the middle?

A. That's correct.

Q. What is identified by the green boundary?

A. Our project area is identified by the green area there, or by the green outline.

Q. The gas well symbol that has the letter "K" associated to it with the arrow represents what, sir?

A. That is the Pure Gold "A" Federal Well Number 1, which is currently operated by Kaiser-Francis Oil Company.

Q. And to your knowledge, the Pure Gold "A" Federal 1 produces from what formation?

A. It produces from the Atoka formation.

Q. It is located within a 40-acre tract that has adjacent to it a black dot and the number 3?

A. That's correct.

Q. What does that represent?

A. That represents the Pure Gold "A" Federal Well Number 3, which is a Delaware well producing from our BC-4 formation.

Q. That well is operated by whom?

A. That well is operated by Pogo and is owned 100 percent by Pogo as to the working interest.

Q. The Pure Gold "A" Well Number 3, the Delaware well in that 40-acre tract, is not currently proposed to be included in the pressure maintenance project?

A. That's correct.

Q. But 100 percent of the working interest ownership is controlled by Pogo?

A. That's correct.

Q. What type of lease is that well on?

A. It's on a federal lease.

Q. When we look at the pressure maintenance project to the west, is that project included within federal leases?

A. Yes.

Q. Are there any differences in the federal royalty paid in either the Pure Gold "A" Federal 3 or within the Delaware wells within the pressure maintenance project?

A. There are differences --

Q. As to working interest owner?

A. No, not as to working interest.

Q. And as to royalty is there any difference?

A. Yes, as to royalty there --

Q. I'm talking about --

A. The lease royalty.

Q. The lease royalty.

A. No, there is no difference as between Sections 20 and 21.

Q. All right. Are there any differences as to any overrides?

A. Yes, there are some differences as to overrides.

Q. And what would those be?

A. Basically, in Sections 20 and 21 we have seven owners as to the overriding royalty interest in there. Of these seven owners, there are six that have the exact same override in both Sections 20 and 21. The seventh overriding royalty interest there under both Sections 20 and 21, has a lesser interest in Section 21 than what they have in Section 20, where our proposed injection well is to be located.

Q. So if the -- With the Division approving the pressure maintenance project and the use of this injection well, that if there is any adverse consequence to Delaware oil production, that consequence impacts the parties that are doing the activity, correct?

A. Yes.

Q. Kaiser-Francis has no interest in the Delaware oil?

A. That's correct.

Q. Their interest would be realized based upon the deeper gas in the Atoka?

A. Yes, that's correct.

MR. KELLAHIN: That concludes my examination of Mr. McDaniel.

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. McDaniel, were you present at the hearing on August the 5th?

A. Yes, I was.

Q. Okay. Now, there was a finding in there that Pogo had 100-percent working interest in the Pure Gold "A", "B" and "D" federal leases?

A. Yes, that's correct.

Q. And those are the leases that are in Sections 20, 21 and 28?

A. That's correct.

Q. Now, in Section 29, that's the Mobil Federal lease?

A. Yes, it is.

Q. Okay. And all four of these leases are federal government?

A. Yes, all of them are federal leases, that's correct.

Q. So is there a corporate lease agreement where Pogo and Mobil share in the cost of the injection well, or is this going to be picked up by Pogo 100 percent?

A. It has been borne 100 percent by Pogo, and will continue to be borne in that manner.

Q. Okay. So that did not necessitate any kind of an agreement or cooperative agreement to be filed with the BLM of any kind, or a unitization?

A. That's correct. You know, at this point we feel like the pool that we're situated in here has not been fully developed, and really unitization would be premature.

Q. In the November Commission case transcript, there was mention of ownership of the Kaiser well. Does Pogo have an interest in that Kaiser production?

A. Yes, we do. In fact, we are the majority interest owner of that well.

Q. Okay, and that is a -- what? Deeper Morrow well?

A. It was originally drilled to the Morrow. It now produces from the Atoka, I believe.

Q. Has Kaiser-Francis always been the operator of that Well Number 1, which is the subject today?

A. That well was originally drilled by Coquina and subsequently taken over by Kaiser-Francis.

Q. So Pogo as a majority interest has never been the operator?

A. No, they have not. And in reviewing some of my notes here, I am mistaken as to their interest there in that particular well -- Well, no, huh-uh. No, that is correct, we do own the majority interest there.

Q. Okay, when you say -- Do you have the breakout of that ownership?

A. Yes. Actually, Pogo has something in excess of 64 percent of the working interest there in that particular well. Kaiser-Francis, then, owns an interest which I do not have before me right now, and there may be one other interest owner in there as well, and that is -- I believe that's going to be the company now known as EOG, the old Enron, or the new Enron.

Q. The new Enron?

A. Uh-huh.

Q. Okay. Pogo has 64-percent working interest, Kaiser-Francis and EOG and maybe one other interest make up the remaining?

A. I want to say, the three that I mentioned are probably it, and the EOG I would need to confirm.

Q. Okay, but Pogo is a majority with 64 percent?

A. That's correct, that's correct.

EXAMINER STOGNER: Okay, I don't believe I have

any other questions of this witness at this time.

BILL HARDIE,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A. My name is Bill Hardie. I'm a senior geologist for Pogo Producing Company in Midland, Texas.

Q. On prior occasions have you qualified before the Division as an expert petroleum geologist?

A. Yes, I have.

Q. The geologic exhibits and displays that you're about to discuss and describe were not prepared by you, were they, sir?

A. These were prepared by George Dillman, who was at the original hearing for this case, and he and I --

Q. Mr. Dillman is not available today to testify?

A. He is not available. And he and I work as a team on developing these Delaware fields for Pogo, so I'm very familiar with the case.

Q. To the best of your knowledge, do you agree with how Mr. Dillman has prepared these displays?

A. Yes.

Q. Are you aware of any mistakes or errors for which you would have disagreement?

A. No.

Q. Are the opinions that you're about to describe and express those of your own?

A. Yes, they are.

MR. KELLAHIN: We tender Mr. Hardie as an expert petroleum geologist.

EXAMINER STOGNER: Mr. Hardie is so qualified.

Q. (By Mr. Kellahin) Mr. Stogner obviously did not hear this case originally, Mr. Hardie, so I would like to take a moment and just move through in a narrative fashion some of the basic geologic issues that Mr. Dillman addressed before Examiner Catanach, and then we'll get into the specifics of Commissioner Bailey's questions raised at the Commission.

Let's start first of all, then, with Mr. Dillman's display, which is shown as our Exhibit Number 2 for this hearing. Do you have that before you?

A. Yes, I do.

Q. What are we looking at?

A. Exhibit Number 2 is a structural contour map on the top of what Pogo designates as the lower Brushy Canyon BC-4 zone, and that's the specific zone that we're -- the specific sand that we are targeting for our pilot pressure

maintenance project.

Structure in this area, we're looking at 20-foot contour intervals, and it dips to the east gently, so that the left-hand side of the map is higher than the right-hand side of the map.

As you can see, the wells in the Sand Dunes West and Sand Dunes South field form a north-south orientation along the structure. And you can see also on the structure, there's some subtle structural nosing and even some small closures that are associated with production in the field.

Also labeled on the map is the proposed injection well that's located in the southeast quarter of Section 20, Township 23 South, Range 31 East.

Q. Do you have a display that gives us a regional depiction of the reservoir distribution in terms of thickness?

A. Yes, that would be Exhibit Number 3.

Q. Let's turn to that and have you summarize this display.

A. Exhibit Number 3 is of the same area as Exhibit 2. We're looking at both the Sand Dunes West and Sand Dunes South field. In this case, we're looking at a reservoir-thickness map. The contour interval is 10 feet. We've used a porosity cutoff of 14 percent. And as you can

see, the thickness of the effective porosity varies from less than 10 feet on the flanks of the field, and then approaches thicknesses of 40 to even 70 and 80 feet along the heart of the field, along this north-south-trending thick that comprises these various fields.

Again, I've also labeled the injection well in the southeast quarter of 20.

Q. Let's take the maps now and move to a closer view of the project area with regards to the structure. If you'll turn to Exhibit 4, let's look at this.

A. Exhibit 4 is just like you said, a closer look at the same structural elevation that we were looking at in Exhibit Number 2. We're looking at the top of the Brushy Canyon BC-4 zone, the one we propose injecting into.

On this map we've shown with the yellow colored acreage the acreage that is operated by Pogo. We've also shown with the green outline the proposed pilot project area. And beneath each well symbol in the red lettering you can see the structural elevation for each of the wells in the area.

If you look at the pilot area surrounded by the green line, you see that the average elevation in that area is approximately minus 4360 subsea.

Q. From a geologic perspective, is the injection well located at an appropriate place in which to attempt to

inject water into the BC-4 zone and have some positive response from the offsetting BC-4 producing wells?

A. Yes, that's apparent not only on the structure map where we're located midstructure to the rest of the wells in the field, but it's also apparent on Exhibit Number 5.

Q. Let's turn to 5 and have you show us that comparison.

A. Exhibit Number 5, again, is just a closer view of the isopach on the net pay for this BC-4 interval that we propose injecting into.

And as you can see on this map, I've posted two values beneath each well symbol. The one on the left is the gross sand thickness for the BC-4, it's the greater number. The one on the right is the net sand thickness, using a 14-percent cutoff.

In the proposed pilot area, outlined in green, the average net thickness for the sand is approximately 50 feet in thickness, which is some of the thicker wells in the field, and of course it's along the axis of the main trend of the field. We feel like this is an ideal location to attempt a pilot pressure maintenance program.

Q. Is the net-porosity isopach we're looking at, Exhibit 5, exclusively limited to the BC-4 sand of the Delaware?

A. Yes, it is.

Q. So we're looking at only the thickness for the proposed injection interval?

A. Yes. That is also, by the way, the main producing zone in both the Sand Dunes West and South fields. It is the main contributor to the production from those fields.

Q. When we look at all the proposed producers in the project area, are those producers that are now open in the BC-4 interval?

A. That is correct.

Q. And the injection well was drilled as a producer?

A. It was originally drilled as a producer

Q. And you have modern logs on all these wells by which to make correlations to confirm your opinions about correlation?

A. Yes, that would be part of the next exhibit.

Q. Let's do that, let's turn to Exhibit 6, take a moment to unfold the cross-section, and see the relationship of one well to another. If you'll start with the injection well, it's labeled "Injection Well", you see, Number 20.

A. Yes.

Q. Start there and identify for us this injection interval.

A. This is a stratigraphic cross-section, and it's designed to show the stratigraphic relationships between the proposed injection well and all of the surrounding wells. To get an idea as to the way it's been drawn, there's a locator in the bottom left-hand corner of the cross-section, showing you the relationship of the various wells in the section.

The well in the middle, the Number 20 well, is the proposed injection well, and then all the wells on either side of it are those which surround it.

If we look at the stratigraphic intervals, I'll begin with the lowermost, that being labeled as the Bone Spring at the bottom of the cross-section. It's been colored with purple. The Bone Spring here is a very dense limestone. And it also represents the very base of the Delaware formation, so the top of the Bone Spring is the same as the base of the Delaware.

So moving upward from there and looking at the top of the cross-section, we've labeled a zone at the very top as the A zone. This is the top of the basal Brushy Canyon. In Pogo's designation, we call this the A zone.

Everything in between the A zone and the Bone Spring is this basal Brushy Canyon interval. And we've broken it up at Pogo into several subunits that we can correlate for significant distances, those being, beginning

at the top, the BC-4, and below it the BC-3 and then the BC-2.

As I mentioned earlier, the main producing zone in the Sand Dunes field is the BC-4 interval, and that's been highlighted with the red shading where we've shaded all the porosity that is in excess of 14 percent.

You can also see in the depth columns of each of these wells where they've been perforated in the BC-4.

There's another zone that produces in this field, below it. It's the BC-2. If you look at the porosity comparisons between that and the BC-4, you see that it doesn't have nearly the porosity. And also if you examine the gamma-ray curves, you can see that it's not nearly as clean of a sand as the BC-4. It doesn't contribute nearly as much hydrocarbon as does the BC-4. We do add the perforations because it is productive and does help the commercial viability of these completions.

These zones, when they're completed, are fracture-stimulated. Because they do have relatively low permeabilities, they need that stimulation in order to produce commercially.

All of the producing wells that you see on this cross-section have been fracture-stimulated, except the proposed injection well in the middle, which has not been fracture-stimulated.

Q. Let's talk about the floodability of the BC-4 interval. In terms of porosity value on average, you have a range of porosity of what?

A. In the pilot area that we're proposing, the ranges of porosity begin from, say, 12 percent and move upwards to 15- to 18-percent porosity, which is good porosity for the deeper part of the Delaware. As you move down in the Delaware section, porosities diminish. And when you see these kind of porosities at the base of the Delaware section, it typically indicates a good pay interval.

Q. Have you or other operators initiated pressure maintenance or waterflood projects within the BC-4 interval?

A. Yes, we have, in the Red Tank field.

Q. Is there a name associated with the project that you operate in the Red Tank field?

A. I'm sorry, I'm not familiar with the specific name. We have actually two pilot pressure maintenance injection projects near this one: the one in Red Tank, and then we have another one that's in another lower Brushy zone or another Brushy Canyon zone in the Livingston Ridge field. The Livingstone Ridge project is approximately three years old, and the one in Red Tank is fairly new. It was initiated approximately a year ago.

Q. Do you have an opinion with regards to the ranges of permeability you're anticipating for this interval for a project like this?

A. The range of permeabilities is highly variable, and it's very difficult to determine from standard open logs. But from many of the core studies that have been done, we assume it's somewhere in the neighborhood of four to five, perhaps even as high as ten millidarcies.

Q. When we're looking at the geologic probability that water injected in the injection well will have any effect on the Delaware interval in the Kaiser-Francis gas well, do you have an opinion as to that?

A. I do not believe that water injected into our proposed injection well will reach far enough to affect the Kaiser-Francis well.

Q. Geologically, why do you hold that opinion?

A. Because of the relatively tight nature of the rock. The permeabilities here are relatively low, they don't produce commercially unless they're fracture-stimulated, and so the effective drainage of these wells and the areas that they can influence are dominated by those low permeabilities, and it severely limits the area of influence in any individual well.

Q. Let's address your attention now to the issue that Commissioner Bailey was raising at the Commission and

talk about the integrity of the formations above and below the injection interval, and let's start, first of all, with a follow-up question to your statement that the producers, and not this injector, were fracture-stimulated?

A. That is correct.

Q. Do you have an opinion as to what area above and below the injection interval might have been compromised by any kind of fracture treatment?

A. This is one of the things we think about a lot when we complete Delaware wells, is, we know they need to be fracture-stimulated, and one of the debates we always face is, how big of a vertical interval are we going to stimulate when we do that?

And in this case, most of these wells have above them a pretty prominent shale marker that marks the top of the A. And we consider that to be a relatively effective barrier to frac propagation.

Above that A zone is another porous zone that's water-bearing, so we're very conscious of trying to limit the propagation of the frac, keeping it out of that water-bearing zone.

The fracs that we do cover probably propagate out a distance of perhaps 50 feet above and below the perforated interval and will include any water-producing and oil-producing zones above and below that interval.

Q. Let's turn to Exhibit Number 7, Mr. Hardie. What are we looking at in Exhibit 7?

A. Exhibit 7 is mainly for the Examiner's information. It's all of the data that was obtained in the proposed injection well, the Pure Gold "B" Federal Number 20, all of the open-hole logs that were obtained.

On the left-hand side we've presented for you the gamma-ray curve; in the middle column, all of the resistivity curves; and on the right column the various porosity curves and the Pe curve, mainly just for the record so you'll have all the data that's also available to us.

Q. Identify for us Exhibit 8.

A. Exhibit 8 is really designed to go with some of the other exhibits.

Q. All right, let's do that, let's use 8 as our locator now and turn to Exhibit 9, and identify for us what you're illustrating with Exhibit 9.

A. Okay, Exhibit 9 is designed to address one of the concerns that was expressed at the Commission hearing, and that being what kind of formations exist between the Delaware Brushy Canyon zone where we're proposing to inject, and some of the producing horizons that are deeper in the Atoka and the Morrow.

So what we've done is present basically the well

as it was logged in the Pure Gold "B" Federal Number 1, which is in Section 20 of Exhibit 8, it's the gas well there, and it shows all of the formations that were encountered by that well from the surface all the way to the Barnett shale.

And you can see also shown on the right-hand side of Exhibit 9, we're showing the thicknesses in feet from the proposed injection zone, which is at the base of the Brushy Canyon to the Atoka clastics, which produce in some of the adjacent deeper wells, that being a distance of 5282 feet, and also the distance between that proposed injection interval in the Brushy Canyon and the Morrow producing horizon, which is 6326 feet.

And it also shows the intervening formations that occur and the various lithologies that make up those formations.

Q. When we're looking at the Brushy Canyon interval on Exhibit 9, show us which letter number corresponds to your BC-4 interval.

A. The BC-4 corresponds to what Pogo terms the "A" zone, and it would be one of the very small subdivisions within the "A" zone, which at this scale you can't even make it out, it's so small.

So we prepared this in order to give you the bigger picture of what happens vertically in this part of

the world.

Q. In your opinion, will water injected into the BC-4 interval of the Brushy Canyon in this Delaware pressure maintenance project remain confined to that BC-4 interval, plus or minus 50 feet?

A. That is correct.

Q. And there is excellent geologic integrity of these various zones above and below this to keep that injection out of other producing hydrocarbon zones?

A. Yes, and we've further documented that in some of the following exhibits.

Q. Let's turn to Exhibit 10, then, and have you show us what you're illustrating.

A. Exhibit 10 is simply a cross-section as shown on Exhibit 8. It passes through the two deep wells, the Pure Gold "B" Fed Number 1 and the Pure Gold "A" Fed Number 1. And in between we've shown the proposed injection well.

I would note that the proposed injection well doesn't actually penetrate all the way to the Barnett, as do the other wells, even though the log column extends down that far. It only penetrated the very topmost part of the Bone Spring formation. But this is designed just to simply show you the various lithologies that occur from the top of the Delaware formation to the base of the Morrow formation, the symbols being -- the dots indicating sandstones, the

dashes and brown colors indicating zones that are dominated by the siltstones, and then the blue brick pattern are limestones.

Q. Okay. If you'll turn to Exhibit 11, Mr. Hardie, identify and describe this display for us.

A. Exhibit 11 is the same cross-section we looked at before but in a little bit more detail. We're looking at the upper half of the rock section penetrated by the deep wells. In this case, we're looking from the top of the Delaware formation to the top of the Bone Spring formation here in Exhibit Number 11.

There's a color code to this cross-section that corresponds to porosity. The better porosity intervals -- those being between, say, 20- and 26-percent porosity -- are color-coded with yellow and red colors. And then as the porosity decreases, say around 1 to 2 percent, we get into the green colors. And then the extremely tight and nonporous rocks are shown by the blue and purple colors.

This shows you basically the decrease in porosity that is associated with depth in the Delaware formation, where you see the red colors near the top and the bluer and green colors near the bottom.

Just for your reference, the zone that we intend to inject into is shown between the Bone Spring marker and the formation line that's labeled "BCA". That stands for

Brushy Canyon "A" zone. If you look between those two markers, you see a faint yellow streak, and that is the zone, the BC-4, that we propose injecting into.

Q. Let's look at Exhibit 12 and have you identify this one.

A. Exhibit 12 is simply moving downsection from Exhibit 11. You'll notice there's no wellbore in the middle this time. That's because the middle wellbore, the proposed injector well, did not penetrate this interval. So we're looking at the two deep wells in Section 20 and in Section 21.

And by this time you can see the enormous amount of purple and blue colors that are associated with extremely tight and nonporous rocks. You see those zones occurring in the Bone Spring and in the Wolfcamp and in the Strawn. And then finally we get down to the Atoka and the Morrow intervals where these two wells are known to produce.

The main point being here that there are ample reservoir barriers to prevent any fluids injected in the Delaware from reaching the productive horizons in the Atoka and the Morrow.

Q. Let's go back to Exhibit Number 8 and let me ask you some questions about the injection interval itself. Exhibit Number 8 is the locator map.

A. Right.

Q. You've got your injection well in the BC-4 member. That's open. All your producing wells in that interval are open.

Is the Pure Gold "A" Federal Number 3 well in Section 21 also open in the injection interval?

A. No, it is not.

Q. All right. Where does it produce from?

A. That well produces from, according to *Dwight's*, from two intervals, the Morrow and the Atoka. My knowledge is that it mainly produces from the Atoka at this point.

Q. Move over and look at the oil well that's the Number 3. What does it produce from?

A. That produces from the BC-4 and the BC-2.

Q. All right. If that Pure Gold "A" 3 well is to be -- could be used by Pogo as a monitoring well, could it not?

A. Yes, it could be.

Q. Do you see any geologic discontinuity that would preclude the Number 3 well from being a monitor well to monitor what happens with injection into the injection well?

A. Well, there's an excellent correlation, at least in terms of the sand, from the proposed pilot area and in that well. So if we know that we're only open in that

zone, any effects that we see in that wellbore should tell us what's happening as we inject water into the BC-4 zone.

EXAMINER STOGNER: Mr. Kellahin?

MR. KELLAHIN: Yes, sir.

EXAMINER STOGNER: Ask that question again. I want to hear that one more time.

Q. (By Mr. Kellahin) Mr. Hardie, if you look at the oil well, the Number 3, Pure Gold "A" Federal 3, that is an oil well not in the project area. It's the one adjacent to the Kaiser-Francis gas well. That well is open in the BC-4 interval of the Delaware, is it not?

A. That is correct.

Q. The injection well plus all the producers in the pressure maintenance project are also open in that same interval, right?

A. That is correct.

Q. Do you see any geologic reason why the Number 3 well could not be an affected monitoring well to determine whether or not the injection was pressuring up the Delaware in the BC-4 zone in proximity to the gas well?

A. There is no -- If we were injecting into the proposed injection well and we saw a response in the Number 3 well in Section 21, it would tell us -- and when I say "response", I mean an increase in production -- it would tell us that the injection in the well, in the proposed

injection well, had affected an area that far away.

We don't expect that to occur. That has not been what we've seen in the other pilots that we've conducted. We don't expect the effects to occur that far away. But if they did, an increase in production in that well would be an indication that we had affected the reservoir that far away.

Q. Is the Number 3 oil well in close enough proximity to Kaiser-Francis's Atoka gas well that the Number 3 could be an effective monitor on what's happening in the Delaware as to the gas well, then?

A. Yes, it is. The Number 3 is essentially a twin to the Kaiser-Francis gas well.

MR. KELLAHIN: That concludes my examination of Mr. Hardie, Mr. Stogner.

We would move the introduction of his Exhibits 2 through -- 11, was it? I'm sorry, 12, 2 through 12.

EXAMINER STOGNER: Exhibits 2 through 12 will be admitted into evidence at this time.

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Hardie -- Okay, I'm a little confused here. As far as the pilot project is going, you want the area that's in the green; is that correct?

A. That is correct.

Q. Because that is the -- Why? Why that area in the green?

A. That encompasses all of the surrounding wells to the proposed injector well. Ind it also is -- It approximates the same boundary of effect that we have seen in the other pilot studies that we've done, that being that when we inject water into the Brushy Canyon interval, it seems to affect only the immediately adjacent wells on 40-acre spacing.

Q. Okay. Then why don't you just limit it to the Numbers 5, 4 -- the two 4 wells and the Number 2 well and the Number 5 well that immediately offset the injection well?

A. I was not involved in the initial decision on the outline of that unit, and I'm not exactly sure what all decisions went into that.

Q. Okay. But according to your testimony, the Number 6, the 3 back to the west, the Number 4 and 2 down to the south, and the Number 3 and 5 will not see any benefit or any effect to the injection?

A. We anticipate, based on what we've seen in the other pilots, that the wells that will see the effect are only the ones that immediately surround it.

Now, that may or may not be the case. We've only done this twice, so far, and we're still very early in the

process of trying to implement these types of secondary recovery projects. So we're still learning more about it.

I suppose there is a distinct possibility that we might affect another tier of wells outside of that immediate surrounded -- 40-acre-spaced area.

Q. So the Number 3, back to the east, could be affected?

A. It's theoretically possible that it could be.

Q. Okay. I want to refer now to your Exhibit Number 6. These are the present perforations; is that correct?

A. That is correct.

Q. Okay, what's the plan for the Number 2 well?

A. Our reservoir engineer may be able to better address our details of the plans of that well. I know that we have perforated the BC-4 interval in that well. We acidized it in order to open up the perforations, and we measured that pressure, and I'm not exactly sure what it was. I know it was very low, in that well. We determined that it was not going to be commercially productive as a producer.

And that's the reason that we're here, is that we think it's ideally situated to be a pilot injection well.

Q. Okay, what's the date of this Exhibit Number 6?

A. This was originally prepared by Mr. Dillman in August of 1999 for the -- I believe it was for the original

hearing.

Q. Okay, so the Number 2 well does not actually -- I mean, this exhibit does not actually reflect what's going on in the Number 2 well?

A. Oh, I see your question. You're saying that the Number 2 well is not perforated in the BC-4? Is that --

Q. Yeah, that's what this exhibit shows --

A. It does show that --

Q. -- and you testified that it is perforated.

A. What typically we will do sometimes, and we did it in this well, we perforate the BC-2 zone, and then when we fracture-stimulate the BC-2, it will connect with the BC-4. That's a completion technique that Pogo has been using throughout the Delaware Basin, shooting the lower zone and allowing the fracs to grow up into the upper zone, and it seems to be quite effective in some cases. We are pressure-communicating those two zones when we do that.

But that's what has occurred in that well. So we are producing the BC-4 zone from those perforations down in the 2, by virtue of the fact that it's been fracture-stimulated.

Q. Okay. So if I look at Well Number 4, which is to the left of your injection well, the completion manner is to perforate the lower in that BC-2, fracture it and then come up and perforate the BC-4 and then fracture again?

A. We actually tried a combination of several completion techniques, and the one you described has been tried. We will also perforate the BC-2, fracture-stimulate it and then perforate the BC-4, with no stimulation, just to ensure that we have adequate means of producing in both zones. We also will only perforate the BC-4, fracture-stimulate that, and more than likely connect with the BC-2 zone.

These two zones often produce in tandem like this, and it's a common scenario throughout the Basin. And we have experimented with various completion techniques, the end result being that we have probably pressure-communicated these two zones.

Q. Is there any way to show that there is pressure communications after a frac?

A. Yes, there is. Typically, when we've frac'd one zone we perforate the other one, and it immediately goes on a vacuum and we see the results of the communication with the lower zone. There are indications that they do communicate.

Q. How about if they don't, what do you see?

A. In that case, it would behave more like an unstimulated zone. When you perforated it, it would require some acidization in order to pump into it. And in that case, we may very well fracture-stimulate it again.

Q. Okay. Do you have that record on the Number 4 and 5 wells, that that occurred?

A. I don't have it with me, sir. I don't know exactly the techniques that we used in those two wells.

But I can say decisively that in this area those two zones are for the most part in pressure communication. But it's important to remember that the BC-2 zone is relatively tight, it's a dirty sand, doesn't have much porosity, it doesn't contribute much to the overall productivity.

The vast majority of production that we see is coming from the BC-4. And that's just based on an evaluation of the open-hole logs and an evaluation of the individually completed zones when we -- and also when we've tested the zones on drill stem tests.

EXAMINER STOGNER: I have no other questions of the geologist at this time. I may have some later on, depending upon the next testimony.

MR. KELLAHIN: All right, sir.

EXAMINER STOGNER: Let's go off the record for about two minutes.

(Off the record at 9:31 a.m.)

(The following proceedings had at 9:32 a.m.)

EXAMINER STOGNER: Okay, Mr. Kellahin?

MR. KELLAHIN: Thank you, Mr. Stogner.

Mr. Examiner, our next witness is Mr. Ron Gasser.

Mr. Gasser is the petroleum engineer that testified before the Commission and before Examiner Catanach in earlier proceedings in this case.

RON GASSER,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

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

A. My name is Ron Gasser and I'm the division petroleum engineering manager for Pogo Producing Company in Midland, Texas.

Q. Is the proposed pressure maintenance project one with which you're familiar, Mr. Gasser?

A. Yes, it is.

Q. And have you been involved with the engineering aspects of the project?

A. Yes, I have.

Q. And you were present before the Commission in this matter when it was presented on *de novo* appeal to the Commission?

A. Yes, I was.

Q. In response to the questions at the Commission,

have you compiled additional information and data to present to Mr. Stogner in accordance with what we understand to be the Commission's desire in this case?

A. Yes, I believe I have.

MR. KELLAHIN: We tender Mr. Gasser as an expert petroleum engineer.

EXAMINER STOGNER: Mr. Gasser is so qualified.

Q. (By Mr. Kellahin) Mr. Gasser, let's start back at the earlier portion of this case and deal specifically with the issue of the Kaiser-Francis gas well, and then I'll ask you a series of issues concerning any potential risk that the injection may or may not have on that gas well.

Let's start and identify specifically for Examiner Stogner what was of issue before Examiner Catanach. If you'll do so by turning to Exhibit Number 13, identify for Mr. Stogner what you're showing.

A. Exhibit Number 13 is a wellbore diagram of the Kaiser-Francis Pure Gold "A" Well Number 1. This was not presented at the original hearing; it was presented at the *de novo* hearing. Mr. Catanach was not privy to this at the original hearing.

It shows that we have a surface casing string to 583 feet, intermediate casing down to 4206 feet. Both strings of casing were cemented back to surface with

circulation.

And then the production casing string of 12-1/4-inch is set down to 12,398 feet, and the top of cement was recorded, after it was set, as being at 7850 feet. And then there are various liner hangers within that production string to connect it with the original completion in the Morrow and the current completion in the Atoka.

The interval we're in question about is the Delaware interval that is open from 4206 feet to 7850 feet. That is from the base of the Delaware lime to the base of the Brushy Canyon. That interval is open to the Bradenhead casing annulus within the Pure Gold "A" Well Number 1.

Q. When you testified before Examiner Catanach back in August of last year, was any effort made by your company to present information by which you could obtain an exception from the Division practice of requiring a wellbore like the Kaiser-Francis well from being cemented?

A. No, there was not. When I testified in front of Mr. Catanach, I was mistakenly of the opinion that the Delaware, the BC-4, was covered with cement in the Kaiser-Francis "A" Well Number 1, Pure Gold "A" Well Number 1.

The top of cement in this well was at 7850, and I later discovered that the basal Brushy Canyon interval is approximately 7800 feet, so we're about 50 feet above the top of cement for the BC-4 interval, in which we are

proposing to inject water into.

Q. When the matter was presented, then, to the Commission, you had done study on the issue as to whether or not there was any potential risk or harm caused by deleting the requirement to cement the Delaware interval in the Kaiser-Francis well; is that not true?

A. Yes, that's correct.

Q. Let's look at the Kaiser-Francis wellbore for a moment. If the issue is remedial action on the Kaiser-Francis well, in order to protect freshwater sources, in your opinion, would it be necessary to take immediate remedial action on the Kaiser-Francis well to protect those sources?

A. No, all freshwater sources within this area are covered with cement and casing.

Q. Let me give you a hypothetical. Let's assume the casing fails or has perforated somehow in the Delaware interval of the Kaiser-Francis wellbore. What happens to the oil and water in the Delaware then?

A. We're currently producing the Atoka underneath a packer. If there were to be a casing leak in the Delaware interval through the 12-1/4-inch hole, we would see casing pressure at the surface. And at that point I'm sure that Kaiser -- We would recommend that Kaiser go in and fix the problem.

The well was completed earlier this year, recompleted into the Atoka formation, at which time a casing-integrity test was run by pressuring up at the surface. And we know from that test that the casing is in good quality at this location.

Q. Okay. If there is no potential risk of this wellbore being a conduit to contaminate fresh water, would a casing failure at the Delaware interval of this wellbore pose any risk to any of the hydrocarbon formations?

A. Not initially. With the well being produced underneath the packer, the casing leak would be isolated to the annular volume. Now, if we were to go in and have to fix a casing leak, that would require killing the well, at which time we would put at risk the existing Atoka completion.

Q. At the Commission presentation, you were asking to postpone risking the Kaiser-Francis well so that you would not engage in remedial action now, have to kill the well, jeopardize the remaining recoverable Atoka gas until there was a recognized threat or risk to that wellbore?

A. That is correct.

Q. That was your argument, right?

A. Yes.

Q. Let's look at any opportunity to compromise Delaware oil production by the use of injection in this

area. Is this configured in such a way in a reservoir where you're going to cause oil to be bypassed or swept away by injection?

A. Not in our opinion. The Delaware interval in the Pure Gold "A" Federal Number 1 has been open for 20 years, since it was drilled and completed. I stated earlier, we have a twin completion in the BC-4 interval to this well, which has reduced the pressure in the BC-4. Any crossflow that might have occurred within the Delaware would have already occurred over the past 20 years as a result of the existing production that's occurred in this area.

Q. Let's talk about the pressure issue. What is your opinion of the original Delaware pressure within this interval before you started completing the reservoir?

A. We believe that the initial pressure followed normal gradients and was around 3500 pounds in the Delaware interval.

Q. And what is that pressure now?

A. At the Pure Gold "B" 20, which is the proposed injection well, we measured the reservoir pressure to be approximately 900 p.s.i.g.

Q. When we're looking at the opportunity to utilize the Pure Gold "A" Federal Number 3 well, which is the oil well adjacent to Kaiser-Francis gas well, to use that wellbore as a potential monitor well, do you as an engineer

have an opinion as to its usefulness as a monitor well?

A. Yes, I believe it could serve that purpose excellently. We currently produce all of our wells in a pumped-off fashion, such that we produce all of the fluids that flow into the wellbore. They are lifted from the wellbore each and every day.

If we were to see an increase in the fluid that is entering the wellbore at this location, then we'd know that we would be seeing response as a result of the injection at the Pure Gold "B" 20. That, however, has not been the case in our other pilots in which we have more data.

Q. At the Commission level, Commissioner Wrotenbery was asking you to further document your opinion concerning the short lateral extent of pressure increases in a project like that. Let's start with having you summarize what you were telling Commissioner Wrotenbery at the Commission hearing.

A. At the hearing I stated that it's been our experience that typical waterflood engineering calculations are not modeling the performance we're seeing in our other pilot pressure maintenance projects, most notably the Neff, N-e-f-f, pilot pressure maintenance project, which is located approximately six miles northeast of the proposed pilot pressure maintenance project.

We've been injecting water for approximately three and a half years in that project. We have not seen response in wells that are not direct offsets to the existing injection well. We have seen response -- and when I say "response", it's basically a flattening of the decline in the wells that are directly offsetting the proposed injector -- in the Neff pilot pressure maintenance project.

Q. That's what you told her at the Commission hearing?

A. Yes.

Q. Do you have with you today further documentation so we can attempt to quantify more precisely what you were rendering opinions on then?

A. As a result of her question, we performed a pressure buildup on a well that directly offsets the Neff pilot pressure maintenance project injector.

Q. Let's turn to Exhibit Number 14. This is the half-mile-radius-circle plat on the Neff project, right?

A. Yes, which is located approximately six miles northeast of the proposed project.

Q. In the center of the inner circle is the injection well?

A. Yes. And directly --

EXAMINER STOGNER: I'm sorry, why don't you

identify this Number 14 and make sure that we have the same one. What township and range and section are you showing?

THE WITNESS: Okay, Exhibit Number 14 is in Section 25, Township 22 South, Range 31 East, in Eddy County, New Mexico.

EXAMINER STOGNER: Okay, and what section is being shown on the map and what well location are you proposing to inject into?

THE WITNESS: Okay, what we're showing is the Form C-108 for the Neff pilot pressure maintenance project, which has been undergoing for three and a half years. And we are injecting in Section 25 in the dot in the northwest northwest quarter.

EXAMINER STOGNER: Okay.

THE WITNESS: Okay. And what we did is went to the well directly south of the large dot. You can't read it here, but in Section 25 it is the Neff Federal Number 2. It is approximately a quarter mile south of the injection well.

Now, keep in mind we've been injecting for approximately three and a half years at an average rate of 2000 barrels of oil per day. We shut the --

Q. (By Mr. Kellahin) Barrels of water?

A. Thank you, barrels of water per day.

Q. Three and a half years, 2000 barrels of water a

day, and it's a quarter of a mile distant?

A. Yes.

Q. And that is part of this Neff project?

A. Yes, it is.

Q. All right. Let's look, then, at the Exhibit Number 15, and describe for us what we're showing here with this pressure data.

A. Exhibit Number 15 is a Horner plot, the radial flow plot for the data that was collected from the Neff Number 2. We did this strictly in an attempt to determine the reservoir pressure at this location within the Neff pilot pressure project. We did the analysis and determined that the reservoir pressure you can see in the bottom left-hand corner of the Horner plot as P* to be 438 pounds.

Q. What's the conclusion?

A. The conclusion is that even though we're seeing response in the direct offsets, we're still seeing a decline in reservoir pressure, based off of where we believe it was when we initiated the project.

Q. Turn to Exhibit Number 16. What is this showing?

A. Okay, Exhibit Number --

Q. Oh, I'm sorry, I'm changing gears on you.

A. Yeah.

Q. Let me finish up with Exhibit Number 15. Using the Neff analogy, now, relate that back to Exhibit Number

8, and let's have you talk about your opinions as to the effect of injection into the Number 20 well. Now, let me describe what I'm asking.

You have a project area that encompasses eight Delaware wells that may or may not at some point in the future enjoy some positive injection response. You have circled the injection well with producing wells. What is your opinion of the likely probability that you're going to see some response in those producing wells immediately offsetting the injection well?

A. I believe that we will see a flattening of the decline in the wells immediately offsetting the injection well.

Q. With those take points or withdrawal points from the reservoir in proximity to the injection well, what is the engineering probability that you're going to see a response or an effect out at the Kaiser-Francis wellbore?

A. I believe the probability that we will see any effect at the Kaiser-Francis well is minimal. But that is going to be dependent on reservoir characteristics. If there is a permeability streak within the BC-4 from the proposed injector to the Kaiser-Francis well, then I would expect to see a response within some point of time at that well. That has not been the case in our other pilot pressure maintenance projects, but that risk does exist and

should be noted.

Q. In the unlikely event that that should occur, are you satisfied that the Pure Gold "A" Federal Number 3 well, the oil well, is located in close enough proximity to the gas well to be an effective monitoring well so that you could then take remedial action on the gas well to protect it?

A. Well, not only would it be an effective monitoring well, but it would serve as a take point to stop the response, to even reach the Kaiser-Francis well. From what we've seen in the Neff pilot pressure maintenance project, we are staying well ahead of any type of pressure communication. We are seeing response and we're obtaining response from the wells, but we're continuing to deplete the reservoir.

Q. Mr. Hardie was describing for us geologically the geologic probabilities as to the horizontal and vertical extents of fracturing or communication in this interval.

A. Yes.

Q. Let's have you as an engineer describe where the probabilities are, in a vertical sense, with regards to injection. Are we going to propagate fractures or communicate the reservoirs in such a way as to adversely affect other hydrocarbon-producing formations?

A. Once we've drilled and we're in the completion

operations for the Pure Gold "B" Federal Number 20, we acidized the well and obtained the pressure. At that point in time we deemed it the most prudent course of events to attempt to initiate a pilot pressure maintenance project. Therefore, we did not fracture-stimulate the BC-4 interval in this well. That is in an attempt to try to get a better sweep of oil.

So my point being that we believe the injection at this location has a better chance of being limited to the BC-4 interval by our completion operations.

Now, once we -- If we do have --

Q. Let me make sure I'm clear on this. The injection well in the Number 20 is perforated in the BC-4 interval?

A. Yes.

Q. It was not subject to any fracture stimulation?

A. That is correct.

Q. So at the point of injectivity, at least as to that wellbore, you know you're focusing your injection within the BC-4 interval?

A. Yes.

Q. As it moves out horizontally from that wellbore, you are going to encounter, hopefully, some producing wells adjacent to that, that may have been fractured in a way to propagate fractures outside of the BC-4 sand?

A. That is correct.

Q. All right. Is there any adverse consequence in doing so with regards to how this has been perforated and fractured?

A. The only adverse consequence is the fact that when the injection reaches such an interval that's been fracture-stimulated, the water has the chance to disperse throughout the reservoir, thereby eliminating what we're attempting to do, which is maintain reservoir pressure, and the water disperses throughout a larger interval.

Q. Is that a probable engineering explanation to the fact that after three and a half years of injection into the Neff injection well, you're not seeing hardly any pressure response from a producing oil well only a quarter mile away?

A. That's exactly what we believe is happening.

Q. So as the water is going into this injection well, you're filling up voidage within the BC-4 and maybe some intervals adjacent to it in such a way that you have minimized the horizontal extent at which you'll have a pressure effect?

A. That is correct.

Q. All right. And you've set up a project area here that is approximately like what's occurred in the Neff?

A. Yes, the project area here was set up such that

each offsetting proration unit was included. The proration unit for the Pure Gold "B" 20 is the southeast southeast quarter of Section 20. So simply, we took every offsetting proration unit and included it in the project area.

Q. All right. At some point in the future you may or may not get response from any or all of these producing wells, right?

A. That is correct.

Q. All right. Let's go back to what you told Examiner Catanach, then, in August of 1999 about having the opportunity in a pilot area to test the concept so that if there was a positive injection response you could demonstrate to him what you thought it might be, and you could attach an economic consequence to that.

A. Yes.

Q. If you'll start with Exhibit 16, let's look at what you were hoping would occur if this injection process is successful. Describe what you're showing us here.

A. Exhibit 16 is the summary production plot of all of the wells that are included in the proposed pilot pressure maintenance unit at this location for the Pure Gold "B" 20.

As you can see, I've shown what we expect the decline to be if no remedial action or pressure initiation is taken. This is not the exact same plot that was shown

at the September, 1999, hearing, as -- with the addition of data from the Neff pilot pressure maintenance project and more time, I believe that what we will see in the -- Let me back up.

In the September hearing I showed an increase in production to be expected within 16 months. Now I believe that we will probably only see a flattening of the decline, and that's based off of our analogy from the Neff pilot pressure maintenance project. The reserves that we expect to recover are exactly the same, however. These are risk-adjusted reserves, basically to account for any permeability streaks that might occur throughout the reservoir.

Exhibit Number 17 is that same data in a tabular form, where we show our project costs and our additional facilities costs and the additional recoverable reserves that we expect to get, showing that the total value of the incremental reserves we estimated to be $1.5 million.

Q. With having the new information, and by completing your analogy to the Neff, are you still of the opinion that it's reasonably probable to estimate that implementation of the pressure-maintenance project could recover an additional 127,000 barrels of oil and an additional 1.77 million cubic feet -- MMCF?

A. Yes, 177 million cubic feet --

Q. Million --

A. -- of gas, that is correct.

Q. Do you have it within your control at Pogo to require remedial action to be taken on the Kaiser-Francis well?

A. No, we do not. We're not the operator of that well.

Q. If the Division requires you to take remedial action of the Kaiser-Francis well before you can commence injection into the injection well, is it possible for you to do that?

A. No, not at this point in time.

Q. So unless there's an exception granted, it appears that you will not be able to go forward with this project?

A. That is correct.

MR. KELLAHIN: That concludes my examination of Mr. Gasser.

We move the introduction of his Exhibits. They are 13 through 17.

EXAMINER STOGNER: Exhibits 13 through 17 will be admitted.

EXAMINATION

BY EXAMINER STOGNER:

Q. Mr. Gasser, in referring to Exhibit Number 14,

this is your current pilot project in the Neff area; is that correct?

A. Yes -- Well, no, what this shows is the half-mile radius and the two-mile radius. The pilot pressure maintenance project will consist of every offsetting proration unit.

Q. So it's the 160-acre around that point that's common to Sections 23, 24, 26 and 25?

A. That's correct.

Q. Okay. Now, you referred that you're seeing a response to the well to the south. How about to the wells to the east, to the west, the northwest and the north?

A. Yes, all five offsetting wells in every direction have shown some type of response, a decrease in the decline or a flattening of the decline.

Q. Okay, now how about to the east? Is there any wells over there that's seeing any response?

A. Directly to the east in Section 25, we have the Neff Federal Number 1, and that well is showing some response.

Q. And that's approximately a quarter mile?

A. Yes.

Q. Any other production response, outside, other than those -- are we talking about -- what, about five wells?

A. Five wells, that's correct. No, I've summarized the production for the five wells, and then I've summarized the production for the surrounding wells within the half-mile radius, and there's no change in the decline that we're seeing, which indicates to me that the only response that we're seeing is in the five wells directly surrounding the injector.

Q. Okay. Now, do all of those wells surrounding that injection well -- are they perforated in that BC-4?

A. No, the Neff Federal 3 pilot pressure maintenance project is an upper Brushy Canyon project. It's in the "F" zone, what we term to be the "F" zone. It's similar in nature to the BC-4, which is the zone we're talking about at Sand Dunes, but that is a lower Brushy Canyon interval.

Q. Okay, well, let me restate my question, then. Do all the five wells that surround that injection well -- are they perforated in the same lens or interval --

A. Yes.

Q. -- as the injection well?

A. Yes, they are.

Q. Okay, I'd like to -- going back to Exhibit Number 8 as a reference, why is this project area extended out to include wells that are offsetting present producing wells, that being the Number 6 and 3 to the west --

A. Okay --

Q. -- and the Number 4 and 2 to the south.

A. Okay, the Number 6 is included because it is a diagonal offset to the proration unit in the southeast southeast quarter, which is where the Pure Gold "B" 20 is situated.

Q. So you're expecting to see a response to the Number 6?

A. No, that's not true.

Q. Oh, okay.

A. We did that simply because we wanted to include every offsetting proration unit within the pilot area.

Q. Okay. Well, there again, if you're not expecting to see an increase, why include it?

A. That's really a land question. That was decided upon by our attorney and our land department, and the reason that I was told is because they are the offsetting proration units that offset the unit which we intend to inject into.

Q. Okay, well, I'll ask you the same question referencing the enhanced oil recovery project and the EOR tax credit. You being an engineer, if you're not expecting to see any increase in those wells, then why are you asking that those wells be included for the tax credit?

A. Simply because they were included within the project area. I mean, we could, at any point that you

wanted, apply for the tax credit, if you so desired, on wells that we saw a response in.

Q. But you're not expecting to see it on the Number 6?

A. No, I'm not -- Currently, with the performance of the Neff, I don't expect it to happen, that's correct. But it could.

Q. Or the Number 4 or the Number 2 to the south or the Number 3 back to the west?

A. Well, no, the Number 4 to the south I would expect to see response into, because it direct offsets to the proposed injector. Now, the Number 3 may be far enough away that we may not see any response.

Q. Okay, now, let me --

A. Oh, the Number 4 in Section 29, that is correct, and the Number 2 in Section 28. Yes, when you move one well away, I would be happy to see a response in those wells, which would mean that I would not have to put as many injectors into the ground to recover additional oil if expansion were to be considered.

Q. Okay, it's concerning me that this project area is extended out to include wells that the Applicant is not expecting to.

And along that same questioning there, let's take the second Number 4 well down in Section 29. As the water

encroaches toward the Number 4, you're expecting that the Number 4 in this case, the Number 4 well in Section 20, in the southeast southeast of 20, that would capture that water because it's perforated in the same injection interval?

A. Yes, it would capture what water is allowed to flow into the wellbore.

Q. Okay. Now, how about the water moving down to the southeast toward the Number 3 well? What's going to capture that injection water?

A. In Section 21, in the southwest southwest quarter, Well Number 2 and Well Number 4 -- We may see response in the Number 3 well. It has not been our -- You know, one thing we need to keep in mind here is, this isn't a typical waterflood. This is a one-point, pinpoint injection program, and the water is just going to go the path of least resistance from where we're injecting it. We really don't have that great a control over the movement of fluids within the reservoir with just a one-point injection.

EXAMINER STOGNER: I have no other questions. Thank you, sir.

MR. KELLAHIN: Mr. Examiner, to follow up on that point, I think, if I remember right, that the Division practice requires Pogo and other operators within a period

of time to demonstrate a positive response in order to qualify for the -- maintaining the credit. And it's happened in other cases: If you can't demonstrate it, then the project area contracts, or the area is deleted from capturing that credit.

So I think there is a mechanism in place to make certain that the operator and the Division are appropriately applying the tax credit to wells that truly have a response.

The issue we have before you today is whether or not there is remedial action required on the Kaiser-Francis "A" Number 1 well, the gas well. It's my understanding that the only topic under consideration is that issue.

We would ask that you take under consideration the testimony today and recommend to the Commission that they delete the requirement that the Kaiser-Francis well be cemented and that you approve a process where the Number 3 Federal Gold "A" well can be used as a monitor well in order to document whether or not migration of fluids has taken place that far away from the injection well. We think that's an appropriate remedy in this case, and we would ask that you make that recommendation.

That concludes our presentation.

EXAMINER STOGNER: Okay, I'm going to ask another question then, subsequent to that closing remark, I'd like

to ask this gentleman.

Q. (By Examiner Stogner) Did you prepare the C-108 in the initial application?

A. It was prepared under my supervision by a consultant.

Q. Okay, when I look at Well Number 11, this is a C-108 and it talks about the Number 2 well that's 330 foot from the north and west line in Section 28. It refers to a -- in a statement here, "Additional cement was added to correct a poor cement job." Could you enlighten me on that?

A. Could you tell me what page you're on in the C-108, in that exhibit?

Q. Page 7.

A. Page 7. Page 7 is the Pure Gold "A" Federal Well Number 3?

Q. No, I'm looking down on the bottom, on the well identified in paragraph 11, the Pure Gold Federal "B" Number 2.

A. Paragraph 11. Oh, okay, 10, 11 -- Okay.

Q. First of all, let's make sure we're talking about the same well. What do you show the location of your well?

MR. KELLAHIN: Let me show him, so you're on the same page.

THE WITNESS: Oh, I'm sorry, I didn't get down to

the bottom. Yeah, we're on the same page.

Q. (By Examiner Stogner) So are we on the same one?

A. Now, we are, yes.

Q. Okay.

A. My fault. Okay, it says here, top of cement was 1970, perforated, cement squeezed 7846 to 7848 and 100 sacks, to correct poor cement job, 7846 to 7814.

Okay, apparently -- My conclusion, based off of what I've read, would be that they saw a poor cement job when they were in their cement bond log, and prior to completing the well in the interval from 7851 feet to 7990 feet, they squeeze-cemented above that interval so that they would have isolation.

Q. Do you have any idea what may have caused that problem to pop up?

A. Pure Gold "D" Well Number 2 was drilled in 1992. No, sir, I could only speculate, and I don't know what might have caused the poor cement job across this interval.

Q. Have you seen any, or are you aware of any other potential problems in cementing across this proposed injection interval or production interval?

A. No, sir, I'm not aware of any.

EXAMINER STOGNER: Now I don't have any questions, Mr. Kellahin.

MR. KELLAHIN: All right.

EXAMINER STOGNER: Do you wish to restate or repeat your closing --

MR. KELLAHIN: No, sir.

EXAMINER STOGNER: Okay, we're going to take a five-minute recess at this time before we come back and take this under advisement.

MR. KELLAHIN: All right sir.

EXAMINER STOGNER: See if there's any additional questions by the other Examiner.

(Thereupon, a recess was taken at 10:09 a.m.)

(The following proceedings had at 10:15 a.m.)

EXAMINER STOGNER: Let's go back on the record. I do have on additional question.

Q. (By Examiner Stogner) Order Number R-11,246 issued in the original application gives administrative authority under the General Rules and Regulations for project expansion. Is there any plans for project expansion?

A. Not at this point in time. We would wait to see a response. And then once we saw adequate response and we believed that we understood what was going on with the reservoir so that we could most efficiently capture potential reserves, then we would consider project expansion.

Q. I'm also going to take one more administrative

notice of -- Let me make sure that I'm doing this right. The Number 20 was drilled as a producing well?

A. It was drilled with the intent to make it a producing well, that is correct.

Q. Okay, I will take administrative notice -- Evidently that one probably had a nonstandard location --

MR. KELLAHIN: Yes, sir, it looks like it, doesn't it?

THE WITNESS: It was an unorthodox location. That is -- It was an unorthodox location in --

Q. (By Examiner Stogner) Do you remember the order or have a reference to the order number?

A. It was in your testimony that you handed me. It's going to take a second to find it, but I do have it. And it was in the testimony in the first hearing; is that correct?

EXAMINER STOGNER: Well, in that case, there's a reference somewhere in it, and we'll have it in our records.

So at this particular time, if there's nothing further, we can take this under advisement.

Mr. Kellahin, if you happen to come across if, if you'd just --

MR. KELLAHIN: Yes, sir.

EXAMINER STOGNER: -- send me a piece of paper

with that number on it, and that way we'll save a little bit of time.

MR. KELLAHIN: All right, sir. Thank you.

EXAMINER STOGNER: Okay, thank you.

THE WITNESS: Thank you.

(Thereupon, these proceedings were concluded at 10:17 a.m.)

* * *

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. _____, heard by me on _____ 19__.

_____, Examiner
Oil Conservation Division

CERTIFICATE OF REPORTER

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, Steven T. Brenner, Certified Court Reporter and Notary Public, HEREBY CERTIFY that the foregoing transcript of proceedings before the Oil Conservation Division was reported by me; that I transcribed my notes; and that the foregoing is a true and accurate record of the proceedings.

I FURTHER CERTIFY that I am not a relative or employee of any of the parties or attorneys involved in this matter and that I have no personal interest in the final disposition of this matter.

WITNESS MY HAND AND SEAL January 10th, 2000.

STEVEN T. BRENNER
CCR No. 7

My commission expires: October 14, 2002