STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

ORIGINAL

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

CASE NO. 14178

APPLICATION OF MESQUITE SWD, INC. FOR AUTHORIZATION TO INJECT AND TO OBTAIN AN AMENDMENT TO PERMIT NO. SWD-180, EDDY COUNTY, NEW MEXICO

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: DAVID K. BROOKS, Legal Examiner
RICHARD EZEANYIM, Technical Examiner
TERRY G. WARNELL, Technical Examiner

October 15, 2008

Santa Fe, New Mexico

This matter came on for hearing before the New Mexico Oil Conservation Division, DAVID K. BROOKS, Legal Examiner, RICHARD EZEANYIM, Technical Examiner, and TERRY G. WARNELL, Technical Examiner, on Wednesday, October 15, 2008, at the New Mexico Energy, Minerals and Natural Resources Department, 1220 South Saint Francis Drive, Room 102, Santa Fe, New Mexico.

REPORTED BY: JOYCE D. CALVERT, P-03
Paul Baca Court Reporters
500 Fourth Street, NW, Suite 105
Albuquerque, New Mexico 87102

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Examiner Hearing
CASE NO. 14178

A P P E A R A N C E S

FOR THE APPLICANT:

Thomas M. Hnasko, Esq.
Kelcey C. Nichols, Esq.
HINKLE, HENSLEY, SHANOR & MARTIN, LLP
218 Montezuma
Santa Fe, New Mexico 87504

FOR THE OIL CONSERVATION DIVISION:

Sonny Swazo, Esq.
ASSISTANT GENERAL COUNSEL
1220 South Saint Frances Drive
Santa Fe, New Mexico 87505

ALSO PRESENT:

Anita Perini
Michael Perini
Cindy J. Perini

MR. EZEANYIM: Good morning, everybody. As you all know, today is October 15. It's approximately 9 o'clock. Today we're going to consider a special docket. Today for this case, we wanted to have it off-docket so we can hear all the issues involved.

Before I continue, as you see, my name is Richard Ezeanyim, and I'm going to be the presiding technical Hearing Examiner today. By my left is Terry Warnell. He's also a technical Hearing Examiner. And on the right here is our Legal Examiner. He's here for all those legal issues because we don't understand most of these legal issues. So if I make a mistake or if you make an objection, I don't know what you mean.

But that being said, the special docket is Docket No. 34-08, and we are going to consider this application by Mesquite. This is the Application of Mesquite SWD, Inc. for Authorization to Inject and to Obtain an Amendment to Permit No. SWD-180, Eddy County, New Mexico.

Call for appearances.

MR. SWAZO: Sonny Swazo on behalf of the OCD.

MR. HNASKO: My name is Thomas Hnasko. With me is Kelcey Nichols on behalf of the applicant, Mesquite.

MR. EZEANYIM: Any other appearances? Do you guys have any witnesses for this case?

MR. HNASKO: Yes, we do, Mr. Hearing Examiner. We

have --

MR. EZEANYIM: Who are your witnesses, Mr. Swazo?

MR. SWAZO: My witnesses are Will Jones and Daniel Sanchez.

MR. EZEANYIM: Who are your witnesses?

MR. HNASKO: Mr. Examiner, we're going to start with Mr. David Perini and Mr. Clay Wilson and then Dr. Havenor, our hydrogeologist.

MR. EZEANYIM: Very good. May all the witnesses stand up and state your name and be sworn in.

MR. JONES: Will Jones.

MR. WILSON: Clay Wilson.

MR. PERINI: David Perini.

DR. HAVENOR: Kay Havenor.

MR. SANCHEZ: Daniel Sanchez.

[Witnesses sworn.]

MR. EZEANYIM: Having been sworn, before I begin, I want to know if you have any opening statements. I am going to give an opening statement to see why we are, that is, what I understand here and run through it, and then you guys let me know is that why we're here today.

From looking into this case, I didn't understand it before. We had a pre-hearing statement, you guys remember -- and I know that this case is going to take a long time, and it's going to chew off a lot of time from our docket, so we

scheduled you for today.

And going though this, this is what I understand, what this case is all about. From what your pre-hearing statement says, it was on May 8, 1976, -- the operator of this lease was called Pure Lease -- obtained an order, Order No. R-5217, to use a well called Pure State No. 1 for an SWD. This is May 8th, 1976.

However, according to the rules, the operator of that lease wanted to convert that SWD into a producing well instead of using it for an SWD -- wanted to convert it to a producer -- and then applied to OCD to amend Order No. R-5217 to get substituted for that well as an SWD. And this is when the Exxon State No. 8 came in. It was where that was used to substitute the Pure State No. 1, and that was approved by OCD by SWD-180. I think this was on December 3rd, 1976.

Then on February 8th, the operator then obtained approval for application to drill. The order SWD-180 authorizing injection from 517 to, I think, 600 feet. That was the authority given by the SWD. However, on February 18th of 1977, the operator went and obtained what is called an APD, Application for Permit to Drill, and deepened the well to 700 feet. By doing so, the operator thought that by updating the APD that he's authorized to inject into the Exxon State No. 8 up to 700 feet, or 694 feet, whatever that case may be.

But as you know, to have obtained an APD from OCD to

deepen that well, he did not consider that he could not inject to 700 feet, and I think they have been injecting up to 694, 700 feet, whatever. We have to prove that there was some injection from 2005 up to when it was shut in.

So the point here I'm trying to make is that approval of an APD does not constitute approval for an SWD. They are two different applications, and they have different requirements for approval. So I think Mesquite is here today to obtain authorization to inject and get an amendment to SWD-180 so they can inject up to 700 feet.

Meanwhile, this well has been shut in since May of this year, and it remains shut in today until we know what we're going to do. So based on this fact, is there anything that I'm missing? This is my understanding of this, so I can fully hear your testimony and see what we are going to do. Is there something I'm missing? Before I do, I'm going to give you an opportunity to give an opening statement. Tell me if I'm missing something from what I just told you.

MR. HNASKO: Mr. Hearing Examiner, Tom Hnasko. I think that you have accurately summarized and succinctly summarized the essence of the proceeding today.

MR. EZEANYIM: Okay, good.

MR. SWAZO: I agree.

MR. EZEANYIM: Very good. In that case, I will open the floor up and see if you have opening statements or are you

going to go straight to the witnesses?

MR. HNASKO: Mr. Hearing Examiner, a brief opening statement, if I may, on behalf of the applicant.

MR. SWAZO: I'm going to actually wait until I present my case to give my opening statement.

MR. HNASKO: Thank you, Mr. Hearing Examiner. First of all, I would like to thank you for being here and allowing us to make this presentation. I think it's going to be an interesting presentation. At the beginning, I'd like to apologize. I have a cold, so I'm going to be popping throat lozenges and throat gum, with the Hearing Examiner's permission.

I think the Hearing Examiner adequately and appropriately summarized the technical history of the permitting process in this case. The only thing I would add to it, if I were to isolate the confusion in the record which allowed both parties, Mesquite and the OCD, to operate under the assumption that this well was approved to a depth of 694 feet, I would say it's as follows:

Mr. Hearing Examiner, reference the February 18, 1977 application to drill, which was approved. And clearly, technically speaking, it does not constitute an amendment to the permit. We understand that. The confusion probably arose because that particular application to drill, when it was approved, referenced by the OCD's own notation, SWD-180, and I

think that's what engendered the confusion.

Nonetheless, we're here to resolve that confusion, and we're here to do it on the merits because we believe the case is absolutely defensible on the merits. Not only defensible in this case, but we think the information we are going to present today is going to be extremely beneficial for the Division and future applications and to have a greater understanding of the lithology and the geology and the hydrology in this area.

And briefly, we're going to present Mr. David Perini, who was involved in the company and originally had the lease after Mr. Rains and subsequent to that time, of course, but while the well was permitted and disposing of saltwater since 1977. And Mr. Perini is going to briefly go through these documents and show his reliance on them.

It's going to be a bit mundane, but we think it's important to make that record, that everyone understands how we got to where we are to the present circumstances where there's a state-of-the-art facility for the disposal of saltwater, and it has been operating with the concurrence of the OCD for many years through annual inspections -- through their own file on the well itself -- knowing that the depth was, in fact, 694 feet. And Mr. Perini will go through all that.

Secondly, Mr. Wilson will testify that he's the one who decided to implement all the improvements to this disposal

facility, and we think -- we have a PowerPoint presentation on all of our exhibits. The PowerPoint presentation showing the facility itself we think is impressive and that the Hearing Examiners will appreciate seeing the facility. It's a state-of-the-art, computerized facility, and it provides a necessary and needed service in southeastern New Mexico.

But we have a lot of hydrology to talk about today, and I think that's where the rubber meets the road. It's not a legal issue; it's a technical one, Mr. Hearing Examiner. I think you'll appreciate it.

Dr. Havenor has investigated this matter upside and down and responded to literally dozens of questions raised by the OCD, and we have submitted information after information after information. All the reports are contained within our binder. They're all marked as exhibits. And with the Hearing Examiner's permission, we'd like to introduce these at the end of the proceeding to make matters simple.

There is one final report that Dr. Havenor prepared in response to Mr. Swazo's pre-hearing statement concerning another well, the Magnolia No. 1, which will assume some importance today, and why that well was oozing oil to the surface, which is located more than a half mile away from the Exxon State No. 8. But the hydrology is as follows -- and I'm just going to point out the high points and let Dr. Havenor explain them.

In the process of this investigation, Dr. Havenor -- fortuitously, I might add -- discovered some drilling logs that are extremely beneficial in defining the thickness of the Yates formation. All these logs contain a marker, an e-log marker, on the shale evident at a certain depth. As a result of these logs, Dr. Havenor was able to correlate all the wells in the area and essentially provide a mapping and a marker for the depth of the Yates formation.

Based on those e-logs, which are of primary importance in this case, he can determine beyond any doubt and with a reasonable degree of hydrogeologic certainty that the Mesquite Exxon No. 8 well is well within the Yates formation. Conservatively, the initial estimate was that the base of the Yates formation would extend at least 50 feet, perhaps more, beyond the depth of the well, which is presently 694 feet.

Subsequent to that, the OCD requested that he perform a cross section of the various wells and try to further define the thickness of this formation, which he did. And that cross section may be more realistic. And it shows that the base of the Yates formation is actually at least 100 feet below the depth of the Exxon No. 8 well.

So we have this very important lithology that is not only going to be dispositive in this case, but I think is going to be beneficial for the OCD and for future applications and future assessments of the lithology of the area. And that

indicates beyond any scientific doubt that this well is well within the Yates formation.

Secondly, Dr. Havenor is going to testify about the lack of hydrogeologic communication between this well and any water that can be considered to be within the Capitan Reef. Now, he's going to explain in detail how the reef is largely misunderstood. And this well is actually two to three miles from the reef, and it is what we call back-reef.

And there is no hydrogeologic communication evidenced by the wells immediately surrounding the Exxon No. 8 within the lease, the Pure State lease itself. Those wells suffer from a lack of water, not an increase of water, as a result of any potential communication from the Exxon State No. 1. And, in fact, the evidence is going to show that Mesquite typically burns out pumps in those wells because of a lack of water.

Secondly, there's an issue -- Dr. Havenor will explain there is no permeability, will explain the nature of the reef where the reef actually exists, where the protectable waters are within the reef and where we are located with respect to those waters.

The fact of the matter is that none of this water in the vicinity of the Exxon No. 8 is protectable water because of the TDS content. The TDS content is extremely high and, incidentally, the wells surrounding the Exxon State No. 8 on the lease itself have a higher TDS content than the water

injected into the Exxon State No. 8. So, again, we have the salinity issues, which is another reason why the matter should be put to bed.

Finally, Dr. Havenor spent a lot of time responding to concerns raised by a junior hydrologist at the BLM, and he did so -- we sent reports. We sent them to the OCD, and we sent our initial report in support of the application -- which is attached as Exhibit 25 in your package -- to the BLM after we received their letter. And that report was analyzed by Mr. John Simitz of the BLM, who is a noted expert on the Capitan Reef.

And we were not able to get the BLM's response to our information and to Dr. Havenor's report and we were required to subpoena, which we did. We also subpoenaed the testimony of Mr. Simitz because he supported our application. He called me up and said that he had prepared a report concerning this. I asked him what the report said and I was directed to, of course, management. I finally got the report by subpoena. The Department of Interior rejected our request that Mr. Simitz testify today because they felt we had the report and that that would be sufficient for our presentation. And we have to respect that.

Mr. Simitz' report concurs 100 percent with Dr. Havenor's analysis of the reef and the lack of hydrogeologic connection between this well and any waters in the reef. He

concurs 100 percent with the e-log correlations demonstrated by Dr. Havenor that this well is well within the Yates formation. He concurs with Dr. Havenor's conclusions as to the depth where the reef waters begin, and essentially recommends to the BLM that they not protest this application.

The BLM has not done so. As a matter of fact, I think, when the Hearing Examiners review the report submitted to the superiors at BLM by Mr. Simitz, you'll see that the hydrology is sound that we've presented today.

Finally, I think a lot of this issue came to the fore, from OCD's perspective, because of this so-called tracer survey run on the well, the tracer data. The guys that did the tracer data are guys that work in the well fields. They write in their reports. They're not lawyers, and they're not scientists, but they're working people in the oil field area. The report, in our view, is grossly misunderstood.

OCD suggests that because the tracer survey showed fluids dropping below depth that the fluids were bubbling out of the bottom of the hole. That is not true, and Dr. Havenor will explain why, why it has been misapprehended by the OCD. The tracer tool depth did not reach the total depth of the well. It reached 692 feet. At that point, one would have to expect that the water would fall below the tracer depth and then proceed outward from the depth of the well, which it did, because the well is producing on a vacuum. It always has

produced on a vacuum, doesn't even have electricity tied to it. It's a good vacuum. It's a good location for the disposal of these waters.

Nonetheless, with that, what we believe is a misapprehension by the OCD, the OCD has suggested that another well, located more than a half mile away from the Exxon State No. 8 was oozing oil and somehow tried to suggest that this might be attributable to the Exxon No. 8 water disposal. It's not hydrogeologically feasible, because the Exxon State No. 8 is cased and cemented at the depth of the well, Magnolia No. 1.

The well produces water -- or injects water -- on a vacuum, takes water on a vacuum. For that to occur, water would have to travel uphill. The stratographic zone at the base of the Magnolia No. 1 is in the stratographic zone of Exxon No. 8, which is cemented. There's no possibility for communication. Even I, as a lawyer, get that one, that water will not travel uphill.

Subsequently, after submitting all this information, time and time again in reports, we never got a response from OCD that this is good, this is bad, any questions on this one. More issues were raised. The last issue that came up with Mr. Swazo's pre-hearing statement, it was suggested that the oozing from the Magnolia State No. 1, which incidentally was never plugged and abandoned -- never plugged and abandoned -- has stopped.

Well, because the Exxon No. 8 cannot be responsible for the cause of that oozing -- water can't travel uphill -- we took it upon ourselves to investigate what might have been the cause. We found anther well proximate to the Magnolia State No. 1 called the Magnolia State No. 2, which is now a water well. It was never plugged and abandoned and is open. We don't know if it's used. Our physical inspection indicates that it's not.

But that well is in direct hydrologic communication at various zones with the Magnolia No. 1. And we believe that the OCD ought to look at that and get those wells -- at least get the Magnolia No. 2 plugged and abandoned properly.

So that's where we are. We have a lot of hydrology to talk about today, and we're happy to be here to do that today. And we think at the end of the day there will be no doubt that the well is disposing in the Yates formation. Not only is it disposing in the formation, but we have defined the base of the Yates formation. We defined it in a study that will be very valuable for future use by the Division.

We have demonstrated that we're operating in full compliance for all OCD requirements and have been doing so since this well was originally permitted. And we're here to clear up this discrepancy, but we're here to do so in a hydrogeologically sound manner. Thank you, Mr. Hearing Examiners.

MR. EZEANYIM: Thank you, counselor. Let me address this to the counselors. I would appreciate it if we can eliminate all this mundane information, because from what you just ran down through, it looks like it's going to be a long day. Let's use our resources wisely. I'm not interested in listening to any mundane issues. If I have understood that that's what the case is, don't beat it to death. Just go straight to the point, especially the technical and legal points of this case.

If you think something needs to be repeated, don't repeat it, just go ahead to the point so we can at least get done today. For both counselors to not, you know -- if you throw too much at me, I might not understand what you're saying anymore, especially if you continue repeating things. I think we could work with what we have here and using our limited resources that we have without overflowing into tomorrow. Tomorrow we have a normal docket. I don't want that to happen.

So your testimony, please -- the two counselors -- limit your questions. Make sure you go directly to the point. The question here is whether we permit Exxon No. 8 to inject SWD. If I hear anything outside of that, I'm not going to be listening, so just please be direct and to the point so we can get done today.

With that said, do you want to go first and call your first witness?

MR. HNASKO: Thank you, Mr. Hearing Examiner. I fully appreciate that. And we'll extract all the testimony on the previous approvals and so forth simply to have a very brief presentation by Mr. Perini followed by Mr. Wilson and on to the bulk of the matter, and we can assure you we will be done today.

DAVID A. PERINI

after having been first duly sworn under oath,

was questioned and testified as follows:

DIRECT EXAMINATION

BY MR. HNASKO:

Q. Would you state your name for the record, please.

A. David A. Perini.

Q. And what is your involvement with the Exxon State No. 8 well?

A. I'm a partner with Clay Wilson and C&D Energy.

Q. All right. And what is C&D Energy?

A. We actually own the lease and Mesquite operates it. Mesquite SWD operates it.

Q. Do you have Mesquite SWD --

A. Yes.

Q. You have to let me finish my question.

A. I'm sorry.

Q. The court reporter will not be able to take both of us down at once.

A. I'm sorry.

Q. That's okay. Do you have an agreement with Mesquite whereby Mesquite operates the Exxon State No. 8 well?

A. Yes, sir.

Q. All right. Could we turn to PowerPoint -- this is on Exhibit 2, Mr. Hearing Examiners -- and what are we looking at in Exhibit 2?

A. That's the disposal battery, water tanks, and gun barrel. And I was just proud of it. Mr. Clay Wilson, my partner, he did a great job. He built it, Mesquite Services, and it's a state-of-the-art facility that we're proud of.

Q. What are we looking at on the next page?

A. That's the holding tanks as the trucks come in so they don't have to wait. We pride ourselves in trying to get them out in 15 minutes if we can.

MR. EZEANYIM: Let me suggest at this point, without asking my legal counsel, what are we doing here, Mr. Hnasko? You have your witness. He hasn't stated his name and his qualification to be able to give this and how he's involved. Who does he work for?

Right now I don't know -- I know he works for C&D Energy. I want you to go through the process of trying to examine where he lives so that the record will reflect all this information --

MR. HNASKO: I'll be happy to do that.

MR. EZEANYIM: -- before we go into it.

MR. HNASKO: Thank you, Mr. Examiner.

Q. (By Mr. Hnasko): And where do you live, Mr. Perini?

A. Artesia, New Mexico.

Q. You've already explained your relationship with the Exxon No. 8 as being with C&D Energy.

A. Yes.

Q. And what is your position with C&D Energy?

A. I'm vice president, a partner.

Q. And C&D Energy is a corporation?

A. LLC.

Q. A limited liability company?

A. Uh-huh.

Q. And who operates -- which entity operates --

A. Mesquite SWD.

Q. Sir, you're going to have to let me finish my questions because the court reporter can't take us both down at once.

A. Okay.

Q. And who operates the Exxon State No. 8 disposal well?

A. Mesquite SWD, Inc.

Q. And that is done through contractual arrangement with C&D Energy?

A. Yes.

Q. All right. And when did C&D Energy acquire this lease on which the Exxon No. 8 is situated?

A. December of 2005.

Q. All right. And when did C&D Energy enter into the arrangement with Mesquite to operate the disposal well?

A. December of '05.

Q. All right. And what is your position within Mesquite?

A. I really don't have a position within Mesquite.

Q. Do you have an ownership interest in Mesquite?

A. No.

Q. So that company is owned wholly by Mr. Wilson?

A. Yes.

Q. Okay. Let's go to the next page, please. When you acquired the lease in the saltwater disposal well, I assume you did some due diligence work on the permitting as existed in the OCD files?

A. Yes, sir.

Q. And from your layperson's perspective, without going through the various documentation that the Hearing Examiner has in front of him, were you of the impression that you held the proper permits?

A. Yes. Yes, sir.

Q. And for disposal at what depth?

A. 694.

Q. And how long has the Exxon State No. 8 been disposing of produced water at the depth of 694 feet?

A. Since 1977.

Q. And that continued up until recently, correct?

A. Yes, sir.

Q. When we go to the next photograph, what are we looking at here?

A. That's the computer; that's Clay. That's my partner that built it and all truckers -- it's very high-tech. Truckers cannot unload, not unless they have a code. And, again, we're very proud of the facility.

Q. And what type of water or substance does the Exxon No. 8 accept for disposal?

A. Produced water from wells in Eddy County, predominantly -- some Lea County.

Q. All right. And what are we looking at here?

A. We have a well lit facility. That's for safety. We also have cameras, security cameras, in place.

Q. All right. This is the view of the facility in the distance?

A. Yes, sir. And we laid electricity to our oil wells because we want to produce our oil wells.

Q. Do you have electricity connected to the Exxon No. 8 disposal well?

A. No, sir.

Q. And why not?

A. It's on a vacuum, and there's no need for electricity.

Q. Has it always accepted water on a vacuum?

A. Yes, sir.

Q. And what are we looking at here, Mr. Perini?

A. We built a new oil facility for our heavy crude coming out of the Yates formation, and we feel real good about that. It's a brand new facility. We took down the old facility from the '50s, '60s and '70s, and that's a brand new facility.

Q. And, again, here we're looking at part of the PowerPoint slide depicting wells -- there's some numbers up there, one, two, three, eight, and seven. Would you explain what those are?

A. Yes, sir. One, two, three, and seven are producing oil wells. And No. 8 -- you notice there's no pole there -- is the disposal well.

Q. That's the Exxon No. 8?

A. It's surrounded -- the oil well is surrounding the disposal.

Q. Okay. Now, do you have any -- what sort of issues with respect to water quality do you encounter in the surrounding producing wells?

A. Well, the problem is the heavy crude requires water -- it's 16, 18 gravity -- to get out of there. And the most disappointing thing, we put electricity there so we could really pump it, and we burned up all pumps because we ran out of water. I had No. 2 on about five hours a day, No 8 -- No. 8 is about 560 feet -- excuse me. No. 1 is about 560, No. 2 is about 570 feet, No. 7 and 3 are 580-something. I've got them all on timers. We had to install timers because we ran out of the water, which that heavy crude just will not come up without water.

Q. Is the lack of water a persistent problem in these producing wells?

A. Yes, sir, it is.

Q. Okay. Let's go back, and we'll just keep it there.

Now, directing your attention, Mr. Perini, you have a book of exhibits in front of you that has also been provided to the Hearing Examiners. Could I have you flip over to Exhibit 14, please?

A. 14, okay, emergency order?

Q. Yes, sir.

A. Okay.

Q. Now, this emergency order was issued on May 9, 2008?

A. Yes, sir.

Q. And what did you and Mesquite do in response to this emergency order?

A. Shut down immediately.

Q. When you say "shut down," you're talking about the Exxon State No. 8, correct?

A. The 8 and all our oil wells.

Q. Now, do I understand correctly that all of your oil wells surrounding the Exxon State No. 8 have been shut down also as a result of this emergency order?

A. Yes, sir. Because we have no way to get rid of our water.

Q. And you've remained shut until this day?

A. Yes, sir.

Q. And you, through our counsel, have voluntarily agreed with Mr. Swazo and the OCD that you would remain shut in, the Exxon State No. 8, until this matter is resolved through hearing?

A. Yes, sir.

Q. And I suppose the unintended consequence from that is, from the OCD's perspective and ours, that your wells are also shut in and will be shut in until this issue is resolved?

A. Yes, sir. And I'm proud of this. We made 600 barrels of oil sold between November and March. And, of course, since that time we have some in the gun barrel, but we

have not sold it.

Q. Mr. Perini, based on your experience with the Exxon State No. 8 and accepting saltwater for disposal, have you developed an understanding of the need for this type of well in this area?

A. Yes, sir. Our pumpers -- and Clay, too -- they're getting 40, 45 calls a day wondering when we're going to open up because they need the facility with the activity in southeastern New Mexico.

Q. And what has happened to the producers' ability to dispose of produced water as a result of this facility being shut in?

A. They're having to drive a lot further. And often, unfortunately, a lot of these guys I've read in our paper are dumping it on the ground, and that's not good.

MR. HNASKO: I pass the witness, Mr. Hearing Examiner.

MR. EZEANYIM: Thank you very much. Mr. Swazo?

MR. SWAZO: Thank you.

CROSS-EXAMINATION

BY MR. SWAZO:

Q. Mr. Perini, I wanted to talk about the oil wells that surround this Exxon State No. 8 well. You said that the No. 1, 2, 3 and 7 are oil producing wells.

A. Yes, sir.

Q. And I didn't quite get the depth. Could you please tell me the depths of each well?

A. I've got them off the top of my head here. No. 1 is 561. I might be off a foot or so. Wait a minute, I've written them down. No. 2 is 567. No. 3 well is 588. No. 7 well is 580.

Q. You said the No. 1 was 561?

A. 561, yes, sir.

Q. And the No. 7 was 580?

A. Yes, sir.

Q. Now, let me -- I just want to clarify your testimony.

A. Sure.

Q. Am I correct in stating that you testified that the produced water that you obtained from the No. 1, 2, 3 and 7 is reinjected into the Exxon State No. 8 well?

A. Yes, sir.

Q. Okay.

A. Unfortunately, it's not as much as we'd like, because we, as I stated, had run out of the water for production purposes.

MR. SWAZO: I don't have any other questions. Thank you.

MR. EZEANYIM: Do you have any?

MR. BROOKS: Who owns the surface at this location?

THE WITNESS: The BLM.

MR. BROOKS: So it's federal surface?

THE WITNESS: Yes, sir.

MR. BROOKS: Okay. These oil wells are producing from the Yates formation?

THE WITNESS: Yes, sir, they are.

MR. BROOKS: That's all I have.

MR. WARNELL: No questions.

EXAMINATION

BY MR. EZEANYIM:

Q. How many producing wells do you have in that lease? How many?

A. Four.

Q. What is your daily oil production from that one?

A. Well, when we're -- as we're producing, usually a barrel a day from each well.

Q. From each well?

A. Yeah.

Q. So about four or five barrels a day?

A. Four or five barrels a day. And again, we had to cut back, you know. Like I said -- time -- we put them on a timer.

Q. Okay.

A. If we just had enough water, we could make a lot more to get it out of the ground. It's heavy stuff.

Q. How much oil do you produce?

A. Well, again, before we just get into this heavy, 19, 18 gravity crude to drive it up, probably 4- or 500 barrels a day with the way we're producing now.

Q. From each well?

A. Oh, no. Probably the whole thing. Probably 100, 150 barrels a day.

Q. Are you getting any of those waters from off-lease to inject into that well?

A. No, sir.

Q. So all water you got from that producing well; is that right?

A. Yes, sir. Just from the producing wells.

Q. So you don't use it for commercial purposes. Have you used it for commercial, you know, somebody selling the water?

A. No, sir. We get it out; it goes to our battery, our gun barrel. What oil runs over, that heavy stuff, and the produced water goes down No. 8.

Q. And, again, let me understand this now. You know the initial order, the order that we're trying to amend today --

A. Yes, sir.

Q. -- SWD-180 --

A. Yes, sir.

Q. -- and that authorized injection from 570 to 600. Now you are at 694, according to your testimony.

A. Yes, sir.

Q. Is your understanding -- because you got that APD to dip into 694, you thought you had the authority to inject there at 694?

A. Sure.

Q. Okay. Is that a clear statement? That because they thought APD is the same as SWD?

A. Yes, sir.

Q. So they injected -- they considered it to inject to 694?

MR. HNASKO: That was the notation that I mentioned in my opening of the amendment of 180. That's the understanding, correctly or incorrectly.

THE WITNESS: Well, when I read it, I went to Roswell and got the files on the APD of 2/8 was SWD-180. I followed chronologically. And then the completion report in November had SWD-180 on it. And I noticed all the time that Santa Fe got copies. So from my perspective, if a copy comes here and then to the district supervisor, it's got to be okay.

Q. (By Mr. Ezeanyim): So, now, I saw it when I briefly looked at the APD form, C-101, and then there was a handwritten SWD-180. Did the operator write that SWD-180? Who wrote that?

A. I would assume -- conclude -- it was the OCD because the November completion report had posted SWD-180. And that's the final verdict was 694, taking water on a vacuum. And that's where I concluded reading the, you know, reading the OCD file.

Q. It's reading that OCD reviewed these APDs and not being approved in the Santa Fe office here. The SWDs are approved here. I think when you apply for that, they put in the API number and SWD-180 come up and you wrote it there. But them writing it does not mean SWD-180 has been amended. It doesn't mean that because of two different offices there. They have what they do in the district, and we have what we do in the Santa Fe office. We do the SWD here and they do the APD there.

I think what it is, you know, you mistakenly -- you said, okay, this well has been approved for SWD-180 here. That doesn't imply that you're authorized to inject to 694. When you dip into the well from 600 to 694, that's the point I make there.

And we understand that it's just you misunderstood that thinking that because in his brief he said we amended SWD-180. We understood that the APD that he was talking about was amended. So we are clear on that now?

A. Yes, sir. I appreciate it.

MR. WARNELL: I do have a question here, Mr. Perini.

THE WITNESS: Yes, sir.

MR. WARNELL: If you could, could you explain a little bit better or a little more to me about your tank battery? The tank battery, how many tanks are in that battery? Maybe we could go back a few slides.

THE WITNESS: Gosh, Clay, how many do we have? It would be better to ask him. He built the facility.

MR. WARNELL: Okay.

THE WITNESS: That's the gun barrel right there.

MR. WARNELL: And everything that goes into those tanks in that tank battery is from your four oil wells?

THE WITNESS: Oh, no. That's the actual commercial disposal. The other one -- you flipped to the other one.

MR. HNASKO: Yes. That's why I thought we were confused.

THE WITNESS: This is the one we built down at the actual -- which is a good sized one, but remember, that's the gun barrel -- this is the oil tanks on the right, and we have water tanks on the left. I actually -- my wife and I took these pictures.

We built a state-of-the-art facility we're proud of. Based on our knowledge of the paperwork, obviously, we wouldn't have done it had we known we weren't in compliance. We would have came prior to that and got an amendment.

MR. WARNELL: Okay. Thank you.

MR. EZEANYIM: Let me ask you again. What is your interest in Mesquite SWD Incorporated?

THE WITNESS: We have a company -- we were partners in actually buying it. C&D is a company, and then Mesquite operates it.

MR. EZEANYIM: Okay.

THE WITNESS: And he's my partner.

MR. EZEANYIM: Okay. I wanted to understand that.

Any cross-examination or anything?

MR. HNASKO: One follow-up, if I may. I understand from the questions that the disposal facility is what we would call a closed system; there are no pits or anything of that nature?

THE WITNESS: No.

MR. EZEANYIM: Okay, very good. Any more questions? Okay. You may be excused, Mr. Perini.

THE WITNESS: Thank you.

MR. EZEANYIM: Would the counselors approach, please?

[Discussion off the record.]

MR. EZEANYIM: Ms. Nichols, please state your name so we have it for the record and who you work for.

MS. NICHOLS: Yes. Kelcey Nichols from the Hinkle law firm representing Mesquite SWD, Inc.

MR. EZEANYIM: Ms. Nichols, go ahead.

CLAY L. WILSON

after having been first duly sworn under oath,

was questioned and testified as follows:

DIRECT EXAMINATION

BY MS. NICHOLS:

Q. Mr. Wilson, could you state your name?

A. Clay L. Wilson.

Q. And Mr. Wilson, what is your position in Mesquite SWD, Inc.?

A. Owner and president.

Q. And how long have you had Mesquite SWD Inc.?

A. Since 1995.

Q. And Mr. Perini described the facilities that you built at the Exxon State No. 8. What's your background in building those kinds of facilities?

A. I own and operate other saltwater disposals in southeast New Mexico and west Texas.

Q. How many other saltwater disposal wells?

A. About 18.

Q. How long have you operated the Exxon State No. 8?

A. Since January of '06.

Q. And Mr. Perini briefly described his understanding of the depth the well was permitted for disposal. What was your understanding of the permitted depth for disposal when you began operating the Exxon State No. 8?

A. That it was at a depth of 694 feet. And I had three or four conversations with Gerry Guye with the OCD about the depth and being able to turn that facility, you know -- have that facility become a commercial disposal well.

Q. And when did you first learn that there was an issue with the depth of the well?

A. The day Mr. Swazo called me.

Q. And what did Mr. Swazo tell you?

A. He told me I was injecting out of formation -- or notified me that we were injecting out of the formation.

Q. And how did you respond to that?

A. Well, I asked him about three or four times if he was kidding, first of all. I didn't believe him. And then after he explained it to me, I believed what he was saying.

Q. And what did you do after you understood there was an issue about the permit?

A. He asked me to shut the well in, and I immediately called our pumper and shut the well in and sent up a welder and welded up the cattle guard so nobody could go in.

Q. And the well has been shut in since that emergency order from the OCD?

A. It's been shut in since May the 9th, 159 days and counting.

Q. And the purpose of your application here today is to resolve any discrepancy regarding the permitted depth of

disposal?

A. Yes, to amend the depth to 694.

Q. And Mr. Wilson, you have already submitted your application which is in the exhibit binder as Exhibit 1?

A. Yes, ma'am.

Q. And rather than go through all of the details that are already on the C-108, Mr. Wilson, have there been any changes to the form C-108 or the information?

A. All of it's correct.

Q. And Mr. Wilson, did you provide notice to all of the leaseholders, surface owners, everyone with an interest in the area of review?

A. We did.

Q. Okay. And is that contained in attachment 5 to the application, Exhibit 1, attachment 5?

A. Yes, ma'am.

Q. Could you just briefly --

MR. HNASKO: Mr. Hearing Examiner, it may be -- the exhibits may be a bit confusing because Exhibit 1 has attachments. Exhibit 1 is the application itself, and I think it's attachment 5 to Exhibit 1.

THE WITNESS: It's in the front.

MR. EZEANYIM: Is that Exhibit No. 1 and attachment 5? What is it? Okay. How confusing.

Yeah, okay. Go ahead.

Q. (By Ms. Nichols): Mr. Wilson, could you just briefly tell us what notice you provided and to whom?

A. We did the affidavit in the paper, published it in the paper, in the Carlsbad Current-Argus, and then we sent a letter to each, to the landowners, to the BLM, to the State of New Mexico, and to operators in that area in the area of concern.

Q. And subsequent to filing that application with the OCD, did you also provide notice to Bass Enterprises and Westall Operating?

A. Yes, ma'am.

Q. Were any protests to the application received?

A. There were no protests.

Q. Anyone raise any concerns with you?

A. No concerns.

Q. And Mr. Wilson, those other letters of notice are included as Exhibits 16 through 24 after the application?

A. Yes, ma'am.

MR. EZEANYIM: Sixteen?

MS. NICHOLS: 16 through 24, Mr. Hearing Examiner. These include our letters and certified mail receipts.

MR. EZEANYIM: What is this list here on the first?

THE WITNESS: That's just a list to who we sent it to, to the landowners, the guy that has the surface lease, the rancher, the State, the BLM.

MR. EZEANYIM: And this is for the operators or what?

THE WITNESS: I'm sorry?

MR. EZEANYIM: And this 16 through 24 is for?

MS. NICHOLS: 16 through 24. Mr. Wilson, those are 16 through 24 and reflect the letters and the certified mail receipts. There were some leaseholders who were notified after the application was submitted.

MR. EZEANYIM: It's not included in this list here, okay.

MS. NICHOLS: That is correct.

MR. EZEANYIM: Okay.

Q. (By Ms. Nichols): But to clarify, Mr. Wilson, it's your understanding that all leaseholders, owners, and anyone with an interest within the area of review has been notified of that application?

A. Yes, ma'am.

Q. And those notice periods have passed?

A. Yes, ma'am.

Q. And you've received no protests?

A. No protests.

Q. And Mr. Wilson, in your operation of the Mesquite Exxon State No. 8, have you ever deepened the well?

A. No, we have not.

Q. Have you made any changes to the well in terms of depth at all?

A. No, we have not.

Q. And Mr. Wilson, is Mesquite currently in compliance with the New Mexico Oil Conservation Division regulations?

A. Yes.

Q. And what kind of financial assurance does Mesquite have?

A. We have a plugging bond with the OCD, the State of New Mexico.

Q. And if you could turn to Exhibit 4 -- I'm sorry. I apologize -- 24?

MR. SWAZO: I wanted to interrupt. I just wanted to clarify the record. Because I think you said that Exhibits 16 through 24 were the notices, and 24 is actually the plugging bond, so just if that could be cleared up in the record.

MS. NICHOLS: Just to clarify, 16 through 23 are letters of notice.

Q. (By Ms. Nichols): And if you could tell us what Exhibit 24 is, Mr. Wilson?

A. It's our plugging bond to the State.

Q. What's the amount of that bond?

A. $50,000 bond.

Q. And is Mesquite currently the subject of any Division or Commission orders?

A. No, ma'am.

Q. Are there any compliance issues with Mesquite?

A. No, ma'am.

Q. And Mr. Wilson, since the Exxon State No. 8 has been shut in, could you estimate the cost that has been to the business?

A. Probably about a million to a million and a half at the disposal and then probably -- I don't know -- another $40 to $50,000 in lost production from the four wells.

Q. And how much did you invest in the facility at Exxon State No. 8?

A. A million dollars plus.

Q. And as the operator of a saltwater disposal well, what have you perceived as the need for a saltwater disposal well in that area?

A. There's a huge need. Everything else fills up early in the day. The trucking companies are having to drive 40 -- probably 40 miles one way further to get rid of their water.

Q. Have you received any inquiries about disposals?

A. We get probably 30 to 40 calls a day just calling to see if we are going to get back open or when we're going to get back open again.

Q. And, Mr. Wilson, I'd like to briefly go over prior to the well being shut in, what was the average daily injection rate?

A. The average daily injection rate -- it has built up over, since we started, up to probably about 6400 barrels a day, is the average. And that's been a gradual incline, and it's getting there.

Q. And what has caused the gradual increase?

A. The pit closures, some changes the OCD has done, more drilling going on in southeast New Mexico -- and just more produced water -- more wells drilled, more produced water.

Q. And do you -- is the need for a saltwater disposal well fairly steady or does it ebb and flow?

A. There's a huge need for it, yes.

Q. And Mr. Wilson, could you tell us what the maximum daily injection rates that you would expect?

A. I put 15,000 barrels a day on the permit, but you know, it depends on how busy the oil field is. If prices fall out tomorrow, we're at the maximum. But if it keeps growing and doing like it is, we'd like to be able to grow and take water and get rid of water in a safe way instead of just taking care of it.

Q. What have you seen occurring since the Exxon State No. 8 has been shut in?

A. Well, just a lot of -- just -- they get in a hurry. They've been to one place, and there's evidence in the Carlsbad paper in September where the BLM guys are standing on the front page looking at who dumped the load of produced water

on the right-of-way. You see that a lot. If you're out in the morning, you see that a lot on the roads, dirt roads -- you can tell. If we haven't had any rain and it's wet, you know what happened; illegal dumping.

MS. NICHOLS: I have no further questions right now.

MR. EZEANYIM: Thank you. Mr. Swazo?

MR. SWAZO: Yes. Thank you.

CROSS-EXAMINATION

BY MR. SWAZO:

Q. Mr. Wilson, you acquired the well, the Exxon State No. 8 well, in December of 2005; is that correct?

A. Yes, Dave and I did.

Q. Okay. And you actually started injecting into the well in April of 2006?

A. Right.

Q. Now, where do the injected waters come from?

A. All over.

Q. All over? So they're not just -- the waters that are injected are not just water from the Yates Magruder formation?

A. No.

Q. And are there other producing wells in the area because -- I'm sorry, Mr. Perini had talked about the four wells that Mesquite produces surrounding the Exxon State No. 8 well. Are there other producing wells in the vicinity that

aren't owned by Mesquite?

A. At the same depth?

Q. Yes.

A. No.

Q. Now, in your application, you indicated that your proposed daily average injection rate is 6,800 barrels?

A. Yes, sir.

Q. And the proposed maximum daily injection rate is 15,000 barrels?

A. Yes.

Q. And you had testified that -- if I understand your testimony correctly, you indicated that -- is it possible that you may actually exceed the 15,000 barrels that you indicate would be the maximum daily injection?

A. If you all will let me.

Q. Okay. So that's a yes?

A. Yes.

Q. And there's other saltwater disposal wells in the area other than just this one, right?

A. What area?

Q. The area where the Exxon State No. 8 well is?

A. Commercial?

Q. Yes.

A. No.

Q. Where's the next commercial saltwater disposal

injection well? Where's the nearest one to the Exxon State No. 8?

A. It's probably six miles east.

MR. SWAZO: I don't have any other questions.

MR. WARNELL: You said that there are no other Yates wells in that area. What other wells are there?

THE WITNESS: There's some deeper gas wells in the area of review.

MR. WARNELL: Do you know which formation?

THE WITNESS: I think they're deep Morrow gas wells.

MR. WARNELL: I have no other questions.

EXAMINATION

BY MR. BROOKS:

Q. The Exxon State No. 8 is a commercial well, is it not? I was a little confused by the last witness' testimony.

A. Yes.

Q. So you receive water from off the lease --

A. Yes, sir.

Q. -- for disposal?

A. Yes, sir.

Q. Okay. Now, on this list of people you sent notice to, Mewbourne Oil Company, are they an offset operator or what's their --

A. They have a gas well that's northeast of the Exxon No. 8.

Q. Okay. So they're an offset operator, offset owner?

A. Yes.

Q. Now, Michael Shepard, was he just notified because -- the notification of Michael Shepard of Mewbourne Oil Company in Hobbs, is that just two notices to Mewbourne, or does Mr. Shepard own a separate interest?

A. I would assume they addressed that to him and he sent it on though their counsel.

Q. Okay. And Mr. Ballard is the surface lessee, the grazing lessee?

A. Yes, sir.

Q. And there are State lands in the area of review. Was that west State Land Office notified?

A. I don't know. I would assume.

Q. Okay. These are probably questions that should be addressed to counsel, but since they put you on as a witness to identify these documents, I thought I would ask you these questions.

People don't do it a lot, but what I always like to see when I review applications is to have the people who are noticed all broken down to why they were noticed and where their interests are. So that's the only reason for those questions.

That's all I have.

MS. NICHOLS: If I may address that?

MR. BROOKS: You may.

MS. NICHOLS: Dr. Havenor identified for us the leaseholders in the area, and we provided notice initially to everyone we believed had a leasehold interest. Dr. Havenor subsequently identified that Westall Operating had a lease that extended partially in the area of review, and that is why Westall Operating was notified. It was an attempt just to be thorough.

MR. BROOKS: Thank you. That's all I have.

MS. NICHOLS: And Mr. Wilson, I just have one further -- pardon me.

MR. EZEANYIM: Let me finish my question before you redirect.

EXAMINATION

BY MR. EZEANYIM:

Q. Mr. Wilson, you have 18 other saltwater disposal wells that you own, right?

A. I operate them. I don't own them all myself. I own and operate them. I have partners in some of them.

Q. Partners in some of them. Of those, how many of them are commercial?

A. All of them.

Q. All of them are commercial, including the Exxon State No. 8?

A. Yes, sir.

Q. Like my Legal Examiner asked, you know, Mr. Perini said it was just for the production from that, you know, Pure State lease, from those oil wells that were shut in. I didn't understand. So it is now that you use it for commercial. Exxon State No. 8 is a commercial well?

A. Yes, sir.

Q. I just wanted to understand that.

A. That's the first battery he showed you where the trucks come and unload.

Q. Now, so when you get off-lease now, it's no more a closed system. It's an open system. Because when you get -- you're getting the material from many miles away to dispose of at the Exxon State No. 8. It's an open system to the truckers, right?

A. So you're saying if they truck water in off-lease, that's an open system?

Q. I think that's what we understand to be an open system.

A. I thought if you had pits, that's an open system, if you unload into pits.

Q. An open system is when you produce the water off-lease and truck them to your SWD well and then dispose them there. That's what an open system is. But if it goes through pipes, and there's no chance of leaks or spills anything, you

contain the produced water.

So it appears to me that you have an open system, because this is now a commercial well that you could get even produced water from -- you know, it depends on where the well is located -- which you dispose of, right?

A. Yes, sir.

Q. So it's an open system in that case. But on your lease, you said it's a closed system?

A. Yes, sir.

Q. I can understand that. So it's both open and closed. I just wanted to understand that. And that's why I go back to the lost revenues that you mention. It's about $1.5 million. And then where do you say that? What I mean, if Mr. Perini is right, and there are saltwater disposals on your lease and you shut the well in, well, you're not -- you are losing if you have a commercial and they can't send water to you anymore. So that's the lost revenues, right? Is that correct?

A. Yes.

Q. Okay. I wanted to understand. How do you do these calculations that you have? Because it's important to me to know exactly what you have lost since May since this well has been shut in. How did you do that calculation to arrive at that 1.5 million?

A. Just what we've lost in the number of barrels

coming in there, the trucks coming in there to unload on a daily basis and then skim oil sales.

Q. What?

A. Skim oil sales, where it goes through the gun barrel and you get --

Q. And that's just an approximation. You have not done the calculations to really determine what it is. You are just estimating that it's about 1.5 million, right?

A. Uh-huh.

Q. Okay. Now, your counsel asked you if you are in compliance with all OCD rules. Are you in compliance with Exxon State No. 8?

A. You'll to have tell me what it is.

Q. Are you compliance with all the rules that apply to Exxon State No. 8?

A. We thought we were.

Q. Okay. That's a good answer. I'm not trying to catch you. I'm just trying to understand, because she asked are you in compliance with OCD rules and you said yes. But because you were confused, you are not. It's only the OCD wanted to pursue it, and they were just trying to see if we can reopen this well to inject, technically, for us to do that.

But apart from that, when you acquired this well in 2005 or something, you were injecting at 694 feet, and that is a violation of the SWD-180 which only authorized you to

600 feet. But you did it not knowing. Ignorance of the law is not an excuse, but the OCD wanted to pursue that, and that's what we determined at the pre-hearing conference.

All we are trying to discuss now is whether you can amend the SWD-180. So it's not really true that you have not violated the rule, we are just trying to overlook it. Am I right, Mr. Swazo?

MR. SWAZO: That's right.

MR. HNASKO: Mr. Hearing Examiner, your question was are you in compliance. And presently, yes. There is no disposal in the Exxon State No. 8, and the administrative order has been dissolved, the emergency order -- there's no emergency order. But there is a voluntarily recognition as a result of the emergency order that there will be no disposal, period, until such time as the amendment has been resolved.

So the question was are you -- if the question had been the past tense, have you always been in compliance, we'd have to say that's arguably yes or no, depending on your point of view. And clearly, the OCD, if there was an SWD-180 and we're injecting beyond the permitted depth, one could argue despite the diligence and good faith of the applicant, that they are not in compliance. But presently, they are in compliance.

MR. EZEANYIM: Okay.

MR. HNASKO: I think that's a pertinent inquiry, sir.

MR. EZEANYIM: Especially, you know -- if I'm correct or not correct, but I think I understand. But I want to probe so I know what's going on here.

Q. (By Mr. Ezeanyim): Since 2006, you have been injecting into that without knowing that you are violating, and that's why I think OCD will clarify that. But that's okay. It's not a question now. It's gone.

And one more point I want to make here: I don't know whether I leave it to Dr. Havenor about the -- I'm curious. Are you injecting through a tubing up to that 694 feet? Are you injecting an open hole? Do you know that? Is your engineer going to answer that question?

A. Yes.

Q. Do you think you are injecting through a tubing? If I'm correct, is the tubing size 2 3/8?

A. 2 7/8.

Q. 2 7/8. So you have tubing up to 694 feet?

A. Yes.

Q. Are you injecting in an open hole?

A. I think from 600 to 694 is an open hole.

Q. Okay. That's what I thought. I wanted to make sure I understand that. Okay.

MR. EZEANYIM: Any redirect? You want to do that?

REDIRECT EXAMINATION

BY MS. NICHOLS:

Q. Mr. Wilson, you hired Dr. Havenor to help address the hydrogeology around the Exxon State No. 8?

A. Yes, ma'am.

Q. And to investigate the effect of disposed water on any protected water in the area?

A. Yes, ma'am.

Q. And perhaps Dr. Havenor would be better qualified to address some of the more technical aspects of the well and its effect on the area?

A. Yes, yes.

MS. NICHOLS: I have no further questions.

MR. SWAZO: I just have a few brief questions and also a clarification.

RECROSS-EXAMINATION

BY MR. SWAZO:

Q. Mr. Wilson, you testified that the open hole is from 600 to 694 feet. Is that what you told the Hearing Examiner? I didn't quite --

A. Yes. That's my --

Q. Okay. And I wanted to talk about how the water is injected into the well. The water is dumped in storage tanks; is that correct?

A. Yes. The trucks come and unload in the tanks.

Q. And no electricity is used to pump the water into the well?

A. We use -- being that the unload facility is a mile away from the Exxon State, we use a transfer pump at the battery which is a mile away, a mile west of the well. We send it through a poly line to the well. There is no electricity or no pump at the well to pump it downhole. It's on a vacuum.

Q. And -- well, never mind. I'm sorry. Thanks.

MR. SWAZO: I don't have any other questions.

MR. EZEANYIM: Do you have anything, Mr. Hnasko?

MR. HNASKO: No, thank you, Mr. Hearing Examiner.

MR. EZEANYIM: At this point, before we call Dr. Havenor, let's take a 10-minute break.

[Recess taken from 10:14 a.m. to 10:27 a.m., and testimony continued as follows:]

MR. EZEANYIM: Let's go back on the record and continue with the case. At this point, Mr. Hnasko, will you call your next witness?

MR. HNASKO: Yes, Mr. Hearing Examiner, our next witness is Dr. Kay Havenor.

MR. EZEANYIM: Okay, Dr. Havenor, you have been sworn.

THE WITNESS: Yes.

MR. EZEANYIM: You're still under oath.

THE WITNESS: Yes.

KAY C. HAVENOR, Ph.D., P.G.

after having been first duly sworn under oath,

was questioned and testified as follows:

DIRECT EXAMINATION

BY MR. HNASKO:

Q. Would you state your name for the record, please.

A. Kay C. Havenor, H-a-v-e-n-o-r.

Q. And where do you reside, Dr. Havenor?

A. Roswell, New Mexico.

Q. And what is your business?

A. I'm a consulting geologist.

Q. And do you have a company with which you perform consulting geologist services?

A. Under the name of Geoscience Technologies.

Q. All right. And what type of entity is Geoscience Technologies?

A. It's a sole proprietorship.

Q. And you are the sole proprietor?

A. Actually, my wife is.

Q. And are you an employee or owner of Geoscience Technologies?

A. I'm really an employee.

Q. How long have you been engaged in geologic services under the name of Geoscience Technologies?

A. Under Geoscience Technologies since 1987.

Q. And prior to that time?

A. Kay Havenor Consultants.

Q. Could you briefly describe your educational background, sir?

A. I have a Bachelor's degree in geology from Colorado College in Colorado Springs, and a Master of Science in geology from the University of Arizona, and a Ph.D. in geoscience from the University of Arizona.

Q. When did you obtain your Ph.D.?

A. 1992.

Q. And through your years of consulting -- I assume they span 50 years; is that a correct summation?

A. Not quite 50 as a consultant. I went independent as a consultant in 1962.

Q. All right. So 46 years?

A. Yes, as a consultant.

Q. And in the areas of your consultancy, what do they encompass?

A. Oil, gas, mining, ground water extensively; that's been my emphasis since my doctorate.

Q. And your doctorate was on what subject, Dr. Havenor?

A. The regional hydrogeology of the Roswell groundwater basin, including Chaves and Eddy and Otero counties, in New Mexico.

Q. All right. And I take it that your dissertation was accepted in compliance with your Ph.D. requirements?

A. That is correct.

Q. And the issue today concerns which particular basin?

A. The groundwater basin that would be covered is referred to as the Carlsbad Basin.

Q. And would you explain to the Hearing Examiners your experience in conducting geologic, hydrogeologic, or hydrology consulting services in relation to the Carlsbad Basin?

A. Well, I've been involved in a number of studies of groundwater, groundwater movement through the reef and in the reef and supply to and from the reef, which is the primary concern of the State Engineer's Office.

In addition to that, groundwater movement in the formations adjacent to the Pecos River on the west, exposures of sediments in that area, in the gravels and the alluviums in the river valley itself, and I've had experience that went back into the late 1950s of doing groundwater studies in the Delaware Basin itself that would be related to oil activity.

Q. All right. Have you had any articles accepted for publication concerning geology or any other subjects?

A. Yes, I have a number.

Q. And how many would you estimate?

A. There's probably 15 listed at the end of my first report.

Q. Dr. Havenor, have you been qualified to express opinions as an expert witness in the federal courts of the State of New Mexico?

A. Yes, in Albuquerque.

Q. And have you been qualified as an expert witness to render expert opinions concerning hydrology, geology, or hydrogeology in the State district courts for the State of New Mexico?

A. Yes, I have, in District 11 and District 12.

Q. And have you also been qualified as an expert witness to express opinions in proceedings before the New Mexico State Engineer?

A. Yes, on numerous occasions.

Q. You say "numerous." Can you give us an estimate of how many times you've appeared before the State Engineer on groundwater issues or water issues in general?

A. In hearings, six hearings.

Q. Okay. Dr. Havenor, I take it you reviewed and have done extensive reviews of the geology, hydrology, and hydrogeology of the area subject to the application that is being heard today?

A. Yes. Not only the area of review, but an extensive bordering area.

Q. And Dr. Havenor, do you consider yourself qualified to render opinions concerning issues germane to the hydrology, geology, and hydrogeology of this particular area?

A. Yes.

MR. HNASKO: Mr. Hearing Examiners, I would like to tender Dr. Havenor as an expert witness to render opinions today concerning geology, hydrology, and hydrogeology of the particular area.

MR. EZEANYIM: Thank you very much, Mr. Hnasko. Dr. Havenor, have you testified before this body? Have you ever appeared before OCD?

THE WITNESS: It's been many years ago, and it was on oil issues.

MR. EZEANYIM: Do you happen to be a certified petroleum geologist?

THE WITNESS: Yes. I am a certified petroleum geologist with the American Institute of Professional Geologists. I am a registered geologist in Arizona and a registered geologist in Texas.

MR. EZEANYIM: Dr. Havenor is so qualified.

MR. HNASKO: Thank you, Mr. Examiner.

Q. (By Mr. Hnasko): Dr. Havenor, before we begin your testimony, I'd like to briefly provide the Hearing Examiners with a quick review of the reports that are before them which you have prepared, and then we'll go through each

report in some detail.

First of all, I'd like to turn your attention to Exhibit 25 in the binder. For the record, Exhibit 25 is also attached an attachment to the application, which is Exhibit 1. And the attachment to the application, I believe, is Exhibit -- attachment C.

MR. EZEANYIM: Attachment C to --

MR. HNASKO: For ease of convenience, sir, Mr. Hearing Examiner, we're referring to it separately as Exhibit 25.

MR. EZEANYIM: Okay.

MR. HNASKO: I'm just pointing it out for the record. It's also attached as part of the application.

Q. (By Mr. Hnasko): Dr. Havenor, could you briefly describe for the Hearing Examiners what Exhibit 25 is?

A. Exhibit 25 was intended to cover the necessary and required elements for the C-108 application, which would have included a fairly extensive review of the area of review, including groundwater, within a two-mile radius -- we looked at much more -- and very particularly, the depth with which we are working and the relationships to the Capitan Reef.

Q. And in a summary fashion, did you make any conclusions in Exhibit 25 concerning the depth, the thickness, of the Yates formation and whether the Exxon State No. 8 well was within that formation?

A. Yes, I did. And it was developed as a process of extensive log correlation and examination of drilling logs, et cetera. But there's no question in my mind that the Exxon State No. 8 is, as I indicated in this report, at least 50 feet above the base of the Yates formation. It's TD'd.

Q. All right. Dr. Havenor, could I direct your attention briefly to Exhibit 27, which is a letter dated July 18, 2008, from Geoscience Technologies. Could you identify that and explain the purpose of this particular exhibit?

A. Yes. This short report -- not too short -- was in response to a letter submitted to the OCD from the Carlsbad field office of the Bureau of Land Management in which they were not protesting the application C-108, but they were expressing concerns about certain factors. They were concerned in the early part of their report with -- and you'll excuse the television references -- the bubbling of crude out of the Magnolia State No. 1 well.

MR. EZEANYIM: Who is "they"?

THE WITNESS: The Bureau of Land Management.

MR. EZEANYIM: Okay.

THE WITNESS: I was responding to their letters of concern.

MR. EZEANYIM: Okay.

THE WITNESS: They were concerned about crude oil

coming to the surface and implied a connection, a possible connection, to the Exxon State No. 8 as a disposal well.

And then their letter went on to express concern as to possible contamination of water supplies, potable water supplies, in the Capitan Reef aquifer, and they also made reference to the potential of disposal from this well eventually contaminating the Pecos River which, of course, is an major relatively freshwater supply.

Q. (By Mr. Hnasko): And this report was produced to respond to those concerns?

A. That's the primary purpose of this report.

Q. And in a summary fashion, the responses were on the three issues?

A. I can sum it all up with the fact that they absolutely did not know what they were complaining about.

Q. In any event, this report identifies concerns and responded to them on a hydrological --

A. An item-by-item basis.

MR. EZEANYIM: I need to go back and have Dr. Havenor explain what he means that they don't know what they are talking about, because I want to understand what you mean by that.

THE WITNESS: All right. It was probably a poorly used term, but it is factual.

They made a number of allegations of potential

contamination sources and events. For example, they suggested that the waters from this could move towards the southwest to contaminate freshwater supplies for the City of Carlsbad and farming communities. The gradient of this water is from the west to the east, different depths, no connectivity.

They suggested that if -- the implication was that oil field activities and disposal procedures had caused the deterioration of water supplies, freshwater supplies, for irrigation and civil use. And they suggested that if they could restore that back to original qualities, then we would have plenty of fresh water.

And the fact is that if they restored it back to original qualities, they would have salinities in the range of 35,000 parts per million. Because the reef has been exposed at the surface, and the freshwater in the reef has been the original sea water of Permian age was flushed from the other reef and replaced with freshwaters. And as you would approach the river level at the City of Carlsbad, you have freshwaters in the aquifer.

But immediately east of the City of Carlsbad, you have salinities in the range of 1500 parts per million within a very short distance. And then it gets worse immediately.

So all of these things added up to concerns that were expressed by apparently a young hydrologist that was not familiar with the area.

MR. EZEANYIM: And this young hydrologist is working for BLM?

THE WITNESS: Yes.

MR. EZEANYIM: You know, the BLM or whatever, they are charged with protecting the water. Anyway, they may raise a concern. It doesn't mean they don't know what they are doing. It just means they haven't conducted any study to see whether the concern is valid or not. Then you have the burden to prove to BLM that their concern is not really founded. But you are a scientist and here are the facts.

THE WITNESS: Correct. And that's the approach that I took.

MR. EZEANYIM: And that what you are maybe talking about in this memo, or whatever, that you replied to them.

THE WITNESS: I do apologize for my flip comment.

MR. EZEANYIM: So they have a right to raise that question, whether it is true or not.

THE WITNESS: Oh, of course.

MR. EZEANYIM: Just to make sure that they know these waters are going to be protected. And one of the waters that we have protected, we appreciate the technical analysis that we're going to look through today.

THE WITNESS: And my personal desires to protect it.

MR. EZEANYIM: Of course. Very good.

MR. HNASKO: Mr. Hearing Examiner, just for the

record, I'll give you some method to my madness. I'm taking Dr. Havenor through, generally, just all the reports he did and then I'm going to go back through each one and discuss in detail the scientific bases set forward. And I just want to let you know that.

MR. EZEANYIM: Okay.

MR. HNASKO: But I appreciate that. Thank you so much.

Q. (By Ms. Hnasko): And Dr. Havenor, as an aside, you subsequently learned the BLM did review, through Mr. Simitz, your report identified as Exhibit 25, and he concurred with your conclusion that the Exxon State No. 8 was well within the age formation, and there was no hydrogeologic connection with the Capitan Reef waters?

A. Yes. His letters expressed that.

Q. Let's move on. The next report that you prepared is identified as Exhibit 30. And could you explain to the Hearing Examiners what Exhibit 30 is and why you prepared this report?

A. This is a discussion of Capitan Reef aquifer salinities, and it was at this request of the OCD to, among other things, identify what the salinities in the Capitan Reef aquifer are.

Q. And your conclusions, briefly, in this report were?

A. That the salinities of the waters up from the southwest up to Carlsbad are very low. And immediately east and continuing east over to Lovington, the salinities are progressively worse to the 35, 45, 50,000 milligrams per liter scale.

Q. All right. And the Exxon State No. 8 is located in which area? The area of low salinity, or the area of high salinity?

A. Therein lies part of the overall problem. There appears to be some general misunderstanding of what the reef aquifer is in itself, and that the wells that we are dealing with entirely are within the back-reef facies of the reef. So the Capitan Reef aquifer itself is a couple of miles south of the area of review for this well.

And I attempted to comply with their request, and we'll talk about it in detail later.

Q. All right. The next report is Exhibit 33, and dated September 11, 2008, entitled Response to Requests for Additional Information Concerning the Area of Review.

Would you explain the purpose of preparing this report, sir?

A. Yes. Your office received a request for additional information and the report breaks them down into those conditions: Number one, the details of notice which have been gone over already previously, and I assisted -- I assisted

counsel on that in minor degree.

The question was raised to determine -- the OCD asked that Mesquite identify the sources by pool from which the waters that are being disposed into the No. 8 were originally derived. And they also asked for copies of water analyses from those pools. That information is just not available.

It's not required for the disposal operator to obtain, and I doubt seriously that the drivers of the trucks even know the pool names that the waters were derived from. But they do know the lease numbers, and they report that to the disposal facility.

Q. Right.

A. And water analyses, I doubt that even the operators have any real information on the salinities of their produced waters. The next object.

MR. EZEANYIM: But do you have that?

THE WITNESS: No. I don't have any information on that.

MR. EZEANYIM: Why is that? They're supposed to have those water analyses before you can inject them. Why wouldn't you have any water analyses?

THE WITNESS: We don't have any source to obtain the information.

MR. HNASKO: You have water salinity analyses from the Exxon 8, if that's what you're referring to.

MR. EZEANYIM: You don't have any other wells that you can analyze; is that what you're saying?

THE WITNESS: Yes, we do have salinity values for the wells in the Exxon -- in Mesquite's four producing wells. We have salinity values for those, yes.

MR. HNASKO: Yes.

THE WITNESS: I may have mistakenly inferred from this -- but I don't think it's wrong -- that the OCD is asking for an identification of the name of the pool from which other waters, the commercial disposers, were delivering to the disposal facility.

MR. EZEANYIM: We don't want that. We want to know what type of water is coming from those pools. We don't necessarily have to know the name of the pool. All we want to know is what is the salinity of those waters that are you are injecting now at the Exxon State No. 8. That's what we're interested in, the native water that you are injecting into. I think that's the business of the water analysis section.

The water analysis section should look at what are you injecting, and what is the TDS concentration there, what you are injecting them into. If you look at our Rule 700 series, that's really what we are dealing with here.

So we don't care about where you got it, but we care about what the salinity and typical concentration in that water that you are getting off-lease or within lease and you are

injecting in your well.

THE WITNESS: We do have one sample of disposal water, of the commercial disposal water, that is going into the No. 8 well.

MR. EZEANYIM: And I assume that you prepared the form C-108, and those are the things that are contained in the C-108. And if you have those water analyses, you might say, okay, I have the water coming in there. Because they may come from different pools, and they will have different salinities.

THE WITNESS: Correct.

MR. EZEANYIM: So in that case, you know, you see what is going into native water. We're injecting this into -- and I think you may have -- anyway, talk about them, your water analysis from the C-108. I assume you did the form C-108. Did you do the C-108 for them?

THE WITNESS: I did the basic report for the C-108.

MR. EZEANYIM: Yeah, so --

THE WITNESS: I do not recall that we specifically addressed incoming salinities, but I do have a value for that.

MR. EZEANYIM: What value do you have? Are we going to get to it?

THE WITNESS: We will get to it.

MR. EZEANYIM: Because I know what you are doing. I assume you are going to show us some numbers.

THE WITNESS: Yes.

MR. EZEANYIM: As an engineer, I need to see the numbers and see what is going on, you know. When you talk about it, I don't see -- that's why I appreciate your PowerPoint. You showed me these are the salinities of the water and the average, and this is the salinity of the water in the formation we're going to inject, and this is how many miles the Capitan Reef -- because everybody is interested in the Capitan Reef.

THE WITNESS: Sure.

MR. EZEANYIM: We know that the Capitan Reef is important for us to do. And what the approximate salinity is and whether this water, what we inject in one area, Exxon State No. 8, will get to Capitan Reef. Those are the questions I'm going to be asking and getting information from you and that will help me make a decision, too.

I know you are just starting, but go ahead. I'm going to get that number because those are the questions --

THE WITNESS: In relation to that question, we do have one PowerPoint that shows the salinities of the four producing wells and a sample from the commercial disposal.

MR. EZEANYIM: From off-lease wells?

THE WITNESS: Yes, from off-lease.

MR. EZEANYIM: I would like to see those.

THE WITNESS: We will show those.

Q. (By Mr. Hnasko): And continue, Dr. Havenor, the

purpose of Exhibit 33?

A. The question was asked as to the location of the Exxon State No. 8 in relation to the reef. Their question, as I recall it, asked where it was vertically, laterally, and at depth. And this was fairly -- this section was a fairly long response to an attempt to clarify what the reef is, the back-reef facies, and the relationship of the Exxon State to those.

MR. EZEANYIM: Before you go, define back-reef facies. You've been using that word, and I don't quite understand what you mean, back-reef facies.

THE WITNESS: With your permission, that's part of what this is about, and we will show some illustrations to help you understand the relationship of back-reef to fore-reef, et cetera.

MR. EZEANYIM: Okay.

Q. (By Mr. Hnasko): And the they also requested that you provide a calculation of the area of influence of the disposed water.

A. Yes.

Q. And did you endeavor to do that?

A. I did endeavor to do that. And, again, the area of influence is difficult. When a zone is taking water under vacuum, you have no water levels to work with, and therefore, you have nothing to compare to anything else. So I made some

computations on volume. They specifically asked how far the water has moved since injection first began in 1977, so I accumulated that and made several computations to illustrate that.

Q. And they also asked you for area of review, well construction data?

A. Yes. This was just a tabulation from the OCD records as to physical factors of all of the areas within the area of review.

Q. All right. And then also a P&A diagram?

A. And, again, I made diagrams of the well bores for all of the wells that are within the area of review.

Q. All right.

MR. EZEANYIM: How many are in the area of review?

THE WITNESS: I'm sorry, sir?

MR. EZEANYIM: How many are in the area of review?

Q. (By Mr. Hnasko): How many wells are in the area of review?

A. I don't remember counting them. About 25; in that range.

MR. EZEANYIM: And out of that, how many are PA'd, plugged and abandoned?

THE WITNESS: There are -- I haven't tabulated it. I believe there are four producing wells in addition to the four oil wells on the lease, and the rest of those are gas wells.

MR. EZEANYIM: I know you are going to get to those numbers.

THE WITNESS: Yes. And we will discuss those, the plugging and depth and things like that that are pertinent to the analysis.

MR. EZEANYIM: Okay. Go ahead.

Q. (By Mr. Hnasko): And your fifth report, Dr. Havenor, in this matter, is Exhibit 37. And could you initially identify this and explain the genesis of this report dated October 10, 2008, which was very recent?

MR. EZEANYIM: What exhibit is that?

MR. HNASKO: This is Exhibit 37, sir.

MR. EZEANYIM: Okay. Go ahead.

THE WITNESS: This was the result of -- and I don't remember the official name of the document --

Q. (By Mr. Hnasko): The pre-hearing statement?

A. The pre-hearing statement, again, raised the question of crude oil coming to the surface in the Magnolia State No. 2 and indicated that since the disposal operation had been shut down that that bubbling had ceased, and I felt it was important to address that issue. That was, essentially, the basis of this report.

Q. All right. And your conclusion in that regard, briefly?

A. No connection at all.

Q. Okay. All right. Dr. Havenor, if we may, I'd like to direct your attention -- before we get into the hydrology, could we go to PowerPoint slides 11 and 12, please, and briefly go over the some of the information contained within the application?

Then we'll discuss the reports and the hydrology and the lithology and the depth of the -- the base of the depth of the Yates formation and the lack of hydrogeologic communication with the reef?

All right. I put up Exhibit 1, which is the application. We have some of the injection well data sheets and, obviously, the lease is the Exxon State No. 8.

MR. EZEANYIM: Could somebody get that light so we can see better?

Q. (By Mr. Hnasko): Could you just go through the injection well? The data sheets are all clear on what that contains.

A. This is the current setup of the Exxon State No. 8. It had surface casing that was set during original drilling. And then the driller, Mr. Rains, installed 5 1/2-inch casing, and his report indicates that it was 567 feet where that casing was set.

And we can see from the geophysical log that was run as a result of the OCD's stopping disposal, that that depth is actually 587 feet. And I can't explain the difference. It may

have been Mr. Rains just transposing a 6 for an 8, but he did it in a couple of spots. But the log clearly shows that that's 587 feet.

And then the hole is open to a depth of 694 feet. And all of the records since drilling indicate there has been no deepening or change in that total depth.

Q. Okay.

A. The 5 1/2-inch casing is cemented all throughout this interval. I don't remember what the top was, but it was sufficient to adequately protect any of the zones, and particularly the Magruder pay zone, which would occur roughly in this area right here and isolate the formations from anything that is exposed beneath it.

MR. EZEANYIM: We need to know the cement on top of that 5 1/2. I mean, we need to know if it was cemented to the surface or is it to a certain depth. And if it is to a certain depth, like you said, we need to protect all the water. We need to know at what depth when we look at it.

MR. HNASKO: We have that in our presentation.

THE WITNESS: It's in the presentation. It was not circulated, but he indicates the number of sacks of cement that he used.

MR. EZEANYIM: Yeah, but then I want to know about the top of cement. That's what I'm talking about on that 5 1/2.

THE WITNESS: I can't say that we have that piece of information.

MR. EZEANYIM: Okay. So the SWD approved you to use the 2 3/8 tubing. I can't see any tubing there. Is there any tubing there?

THE WITNESS: No. This is just the well diagram itself, not the injection.

MR. EZEANYIM: Okay. So you will have that for us?

THE WITNESS: Yes.

MR. EZEANYIM: I thought this was for your injection well, because I can see the approval from. Okay. Go ahead.

Q. (By Mr. Hnasko): All right. Is there anything else on the injection well data sheet that's attached to the application that's pertinent, any perforations or anything of that nature?

A. No.

Q. All right. And then could we move on to slide 13, please. And PowerPoint slide 13 is also within your Exhibit 25 attached to the application.

MR. EZEANYIM: All these are in here, right?

MR. HNASKO: Yes, sir. Yes, sir. And a copy of the PowerPoint presentation itself is also in here as Exhibit 2.

MR. EZEANYIM: Okay, good.

MR. HNASKO: But everything within the PowerPoint is also contained in the physical files that we have submitted

here.

MR. EZEANYIM: All right.

Q. (By Mr. Hnasko): What do we have here in this PowerPoint slide 13, which is also in your assessment report?

A. This is simply intended to show all of the wells in Section 15 that have close association to the No. 8 well, which is located right here in the middle. And it gives their well type and the name of the well.

Q. And that's within a two-mile radius?

A. No, this is not. This is just a close-up of the field.

Q. I got you. And PowerPoint slide 14, please. And again, this is contained within Exhibit 25 and also contained within the application. But could you explain to the Hearing Examiners this assessment -- the table wells, rather -- that you're depicting here?

A. The wells are listed here. And this portion, actually, is an extension to the right of the data, and it shows the pertinent well data as to the well number, name, depth, and elevation, TD, and geophysical log picks that I made along the formations.

MR. EZEANYIM: Are these wells in the area of review? They are area of review wells?

THE WITNESS: Yes.

Q. (By Mr. Hnasko): And I believe there are 20 of

them, Dr. Havenor; is that correct?

A. These wells are ones that had geophysical logs on them. These are the only ones.

MR. EZEANYIM: So if we don't have geophysical logs, you didn't include them? Is that what you are saying? Are you saying that because these had geophysical logs, you included them, but if they don't, you didn't include them? Did you do that within the area of review?

THE WITNESS: No. I considered all of the wells within the area of review, but this is just a capsule of those which have geophysical logs and the data that we obtained from the geophysical logs in addition to some normal driller's logs, et cetera, which are not on here.

MR. EZEANYIM: But there are other wells in the area of review that we're going to be seeing?

Q. (By Mr. Hnasko): And contained within your report, you're referencing 20 wells within the area of review. And do you recall how many are reported as being plugged?

A. I have a summary --

Q. We're going to get to that.

A. -- in here that shows exactly how many are plugged, temporarily abandoned, et cetera.

Q. And how many are active?

A. And how many are active.

Q. All right.

A. And which ones they are.

Q. And you also have the active wells you show which have casing through the shallower Yates formation?

A. Yes.

Q. Okay. Any concerns that came to your attention when reviewing these wells relative to the Exxon State No. 8?

A. Yes. One of the things that -- I attempted to not only use the geophysical logs for actual correlation from place to place, but I took those driller's logs that were meaningful and had good descriptions and tried to fit them into the picture, also. And we were exceptionally fortunate in the sense that the geophysical log that was run for this purpose, this hearing, the driller's log -- the driller was Mr. Rains, the original operator -- and he had an exceptionally good driller's log. I mean, a detailed driller's log.

And one thing that was extremely helpful was that a geological condition that I'm familiar with, in particular, working with radioactive logs, is that he reported just a little ways above the top of the Magruder pay zone, is a carbonate that had green shale. And that green shale, in my experience in the Permian Basin, is ash that was accumulated from a volcanic eruption and tends to be quite radioactive.

And in correlating the samples with the electric log, I identified that there was a strong radioactive reaction at the location of the green shale. And it's kind of like a

Eureka moment. And then I was able to go back to all of the electric logs in the area and found that same marker in all of the wells. So that increased my confidence in the correlations 1,000 percent.

Q. When you say "increase your confidence," it was confidence in determining the base of the Yates formation?

A. Yes, yes.

Q. All right. Very good.

A. As well as correlations up the hole and farther down the hole.

Q. Yeah. Could we go to PowerPoint slide 15, please. And PowerPoint slide 15, which is in your assessment report on page 21 -- that's, again, Exhibit 25 -- could you describe what you're depicting here?

A. This map displayed on the screen is in relation to the presence of water wells within the area of review, the two miles. And I extended it out considerably beyond that simply because there's essentially no shallow water in these wells. There is no potable water in any of the wells, and that's why I extended the search out.

The search was made based upon Office of the State Engineer well records in the Carlsbad Basin -- of which this area is a part of the Carlsbad Basin -- and this is all there was. And I made a diligent search. And I absolutely -- in fact, I even contacted Mr. Clay Wilson and said, "Does this

rancher have a well?"

And it turned out that he had a 50-foot alluvial sand well off somewhere that is not reported to the State Engineer's Office. But other than that, there is no potable water in this area.

Q. All right. So you found no freshwater wells within one mile of the Exxon State No. 8?

A. Correct.

Q. And any active water wells?

A. Not within two miles.

Q. All right. And any underground drinking water sources or aquifers within a two-mile radius?

A. None.

Q. Okay. So I take it you were not able to conduct a freshwater analysis due to an absence of wells; is that correct?

A. Correct.

Q. Thank you. All right. Dr. Havenor, I'd like to direct your attention first of all to Exhibit 5 of your assessment report submitted with the application and starting on page 4.

MR. EZEANYIM: What exhibit is that?

MR. HNASKO: Exhibit 25, sir.

Q. (By Mr. Hnasko): And in this report, you spent a fair amount of time discussing the lithology of the area and

the correlation between the Exxon No. 8 and other sources within the area, correct?

A. Correct.

Q. Would you explain to the Hearing Examiners how you went about -- but first of all, why is understanding the lithology here important?

A. Well, we need to know the distribution of the rock types in the subsurface; number one, because we want to be able to identify geologically which formation they're in. And then utilizing that information, we can determine formation tops and see what the structural geological configuration of the area is. Because it's not just flat lying rocks, you know, it's undulating.

Q. Could you explain to the Hearing Examiners how you went about determining the lithology of the area using first published reports and then proceeding with your own independent examination?

A. Well, my familiarity with the group of formations that's known as the Artesia Group, they are prolific oil producers in southeastern New Mexico. And so my early oil experience -- and in many cases, setting on wells within this general region -- gave me onsite experience in studying the lithologies and doing subsurface studies of formations in the Artesia Group of which, of course, the Yates formation is a member.

In this particular case, I jumped into a more advanced position. The Roswell Geological Society has been an avid geological resource -- a great geological resource -- over the years, and they have published a sequence of volumes on the oil fields, their geology, productive histories, et cetera, in southeastern New Mexico. And the first volume that they came out with, I believe it was dated in 1959 or somewhere -- maybe this was the '60s volume. I don't remember. Yeah, it would have been the late '60s volume.

Q. I hate to interrupt you, but you can refer to page 4 of your report if you want to follow along with that, if that assists you.

A. Yeah. Well, I did cite the publication here, 1953 -- no, that's when the pay was developed -- 1956, the Roswell Geological Society publication in 1956. And in that report, there was a subsurface structural configuration, a map, published, and that map was prepared by a Mr. Goodyear who was the district geologist for the Pure Oil Company in 1956.

And I went to work for Pure Oil Company in 1958 in that same office in Roswell, so I was privy to how this information was originally obtained and also had some involvement in looking at work that Mr. Goodyear had done, and I was very impressed with it. So I thought this would be an excellent start because this gave me a subsurface well tops of the Magruder pay in the field area.

Q. Right.

A. And from that, I could then go back to the current day logs and driller's logs and extend new information and make determinations as to what the lithologies were. But my understanding of the Yates formation lithologies comes from many years of experience with core drilling as well as sample examination.

Q. After reviewing the Goodyear symposium report on the lithology of the Magruder field, what is your next step in looking at the lithologies of this area?

A. I then tied all of my other information to these original depths, verifying where I could with logs and sample logs, those calls, and that formed the basis of my network of correlation to other wells, newer wells, in the area and just strengthens the source.

Q. And as I understand it, the ultimate goal here is to determine the base of the Yates formation, correct?

A. Well, at that point, it was not necessarily the first point. This was to determine the structure and stratigraphy of the immediate area, and then from that, then we could use information from wells that had actually penetrated the base of the Yates formation to tie it back to what we have here.

Q. All right. And so did you use the driller logs from the Exxon State No. 8 to assess that further?

A. Oh, yes.

Q. Let's talk about that, then. Let's explain to the Hearing Examiners how you went about going through the process of using the Goodyear information, taking the drilling logs, and making conclusions about the location and depth and base of depth of the Yates formation.

And we put up on the PowerPoint here slide 17. And this, again, is in your assessment report on page 7 with the discussion on page 8 of Exhibit 25.

A. The top of the Magruder pay was not reported in the Roswell Geological Society map because this well had not been drilled at that time. But the correlation and depths fit very well. Mr. Rains made some interesting observations in his sample descriptions, and it really is an excellent driller's log.

Q. Are you on page 7 of your report, just for the record?

A. Yes, page 7.

Q. All right. Continue.

A. We can see, for example, that on the right-hand column of the descriptions of the logs that the interval from 568 to 651, which -- excuse me -- from 582 to 651 -- he talks about porous saturated dolomite. And that upper zone is the Magruder pay zone.

Q. Okay.

A. And then, again, we know now that the casing was set in this next lower interval that he logs from 568 to 651 as dolomite that he didn't see any porosity, because he would have -- he certainty would have logged that he didn't report any water. And then he set the 5 1/2-inch casing and cemented it and then drilled out to the total depth.

Now, I'd like to respectfully point out that this sheet that we see here, the dark line that you see across the bottom of the description area where there's a line of data underneath that line, that line is the bottom of the scanned portion of the document that is stored in the OCD digital files. This copy came from the original OCD paper file that we actually retain in the New Mexico Energy Library in Roswell.

So there was important information at the very bottom that is shown on this copy.

Q. All right. So explain to the Hearing Examiners how you went about correlating these various markers or things that you found in these well logs to determine where the Yates formation was situated.

A. I commented earlier about the radioactive green shale that's noted on his log. That's how I identified that particular radioactive kick. And then, utilizing well logs that are in the area that logged this interval with radioactives, I was able to pick up that same marker and correlate it to all of the other wells in the area.

Q. And what does that mean?

A. It means that I have a good point of correlation, reliable point of correlation, throughout the area. And that indicates that the tops that I pick on those logs and the intervals that I see, such as the base of the Yates or the top of the Yates or where the Magruder pay zone is, is more reliable. The logs correlate well, but this really helps fine tune it.

Q. I want to discuss the correlation aspect of the e-logs and the marker you used. The marker was the green shale. Did I understand that correctly?

A. The marker is the radioactive representation of the kick -- the radioactive kick that we see on the log in this well which correlates to similar kicks in the same relative positions of the formation on other wells. Does that make more sense?

Q. And that enables you to do what, with respect to determining the base of the Yates formation in this particular location?

A. Well, that correlation itself, we use sample logs from the deeper wells where they actually had well loggers or geologists recording the samples. We used those, in addition to the electrical logs, to establish the tops and the bottom of the Yates formation. And this is just -- this marker zone is just fine tuning the correlations.

Q. Okay. Could we turn to PowerPoint slide 18, please? And this is out of your assessment report, Exhibit 25, at page 15. And you do have some correlations, some comparison graphs, on page 9 and page 10 as well. But I'd like you to explain to the Hearing Examiners what all this means.

It looks like we're putting these wells logs side-by-side-by-side. We have the Mewbourne Esperanza, the Mesquite No. 8, and the Mewbourne No. 2 Esperanza on page 15. And I wanted to be very clear on it -- because I'm not a geologist -- what all this means in terms of allowing you to correlate these well logs and determine the base of the formation in this area, and ultimately conclude, I take it, that the Exxon No. 8 is within the Yates formation.

A. Okay. The log on the left is from a well that is almost directly north of the Exxon State No. 8.

Q. Excuse me. You're on page 15 of your report?

A. On page 15 of the report. There is a strip in the middle, which is the radioactive log portion of the log that was run on the Mesquite State No. 8. And on the far right is the corresponding radioactivity log on a well that is to the southeast -- generally, more easterly than south -- about a half a mile away.

And you can see from the configuration of the curves that there is good correlativity of the nature of the logs, and in particular, the green shale marker, which is shown on the

log rather faintly right here at this upper line that crosses. That's the radioactive kick that I found that shows up on all of the geophysical logs in the area. So then it's a matter of lithology and correlations down to the deeper horizons.

The log quality on the Mewbourne is not shown in good detail, but one of the significant facts that we see is that the top of the Seven-Rivers formation -- which by some is called the top of the reef, but that's an incorrect association -- we see that the radioactivity log cleans up very significantly. The Seven-Rivers is a very clean formation, and radioactive logs respond sensitively to shales contained within the lithologies themselves.

And so that's a good pick on the top of the Seven-Rivers there, and a good pick on the corresponding Mewbourne well on the right-hand side. And, of course, the Exxon State in the middle does not go that deep, so it doesn't show it. But this correlation between the two Mewbourne wells on either side would suggest that it's at least 50 feet down to the top of the Seven-Rivers or Capitan formation, whichever you prefer to call it.

MR. EZEANYIM: Mr. Hnasko, I wonder: Why do you need to establish the fact that the injection is correlated in the Yates formation? I mean, I think we know for certain that it's correlated in the Yates formation, but why do you have to establish the fact that you are injecting in the Yates

formation?

MR. HNASKO: Because I think it's an important fact, Mr. Hearing Examiner, that we're establishing that we're within the formation; and number two, that there is no hydrogeologic connection between the Yates formation and the Seven-Rivers formation, which is also -- as I think Dr. Havenor indicated -- is sometimes mistakenly referred to as the reef.

So I think it's part and parcel of the hydrogeologic showing that: A, we're within the formation; and B, that particular formation has no hydrogeologic connection with the Capitan Reef.

MR. EZEANYIM: But if you look at the geologic communication, you are going to find out that the Capitan Reef can also communicate with the Yates formation. So even if you demonstrate that you are injecting into the Yates formation, there is the possibility that the Capitan Reef is also occurring in that formation.

If you try to delineate the fact that you are injecting into the Yates formation and the Capitan Reef from the Seven-Rivers -- well, I mean there is some occurring -- there might be some occurring of the Capitan Reef in the Yates formation, even at 600 feet.

MR. HNASKO: We need to address that issue. But I think it's important to identify, based on OCD's concerns; A, they shut in the well in the first place; and B, the notion

that water is falling out of the hole and endangering the Capitan Reef. It seems to me we need to establish; A, the lack of hydrogeologic connection --

MR. EZEANYIM: I can understand that you want to establish that connection, but if you are to trying to establish that you are injecting into the Yates formation, then, yeah, you are injecting into the Yates formation. But there might be a connection between the Yates and the Capitan Reef.

MR. HNASKO: We're going to establish that there is no connection between the -- as a matter of fact, we're going to establish not only that there is no connection between the Yates formation and the Capitan Reef, that in this particular location, the reef is misunderstood. We're not near the reef; we're some two to three miles away from the reef.

And this is what we're going to be discussing as back-reef, waters of high salinities, unprotected waters, that have no association whatsoever, no permeability, and no connection with the Capitan Reef.

So I think it's important to understand that this is a premise where the well actually is and how it is not hydrogeologically plausible for water to be disposed of in the Exxon No. 8 well and somehow, some way, affect; A, the Capitan Reef; or B, any other wells in the area.

MR. EZEANYIM: That's important because the Capitan

Reef is very light in that area, and we want to know where your well is in relation to that Capitan Reef.

MR. HNASKO: Absolutely. And I think it's important to show that, Mr. Hearing Examiner.

We're going to have a detailed presentation on where the well is in relation to the reef, what is commonly misunderstood as the reef, what the difference is between back-reef and the protectable reef, and what the groundwater gradient is in the area, what the salinities are and what's protectable and what isn't protectable and why, in our humble view, we're not endangering or have any potential to endanger protectable water. It's all important. And I think it --

MR. EZEANYIM: How far do you need to go? How much further; do you know how far? I'm trying to suggest if we maybe take a lunch break now and then come back at 1 o'clock.

MR. HNASKO: That's fine. That would work for us, Mr. Hearing Examiner.

MR. EZEANYIM: Mr. Swazo, would that be okay?

MR. SWAZO: That's fine.

MR. HNASKO: I think we're going to have a fully detailed presentation, and I would anticipate some questions. We could be going for an hour and 45 minutes more with him.

MR. EZEANYIM: Okay, we'll take lunch. We'll come back at 1 o'clock.

[Noon recess was taken from 11:35 a.m. to 1:08 p.m.]

MR. EZEANYIM: Good afternoon, everybody. We're back on the record. I hope you all had a nice lunch. We're going to continue the testimony of Dr. Havenor. And I want to remind you, Doctor, that you're still under oath as we continue.

THE WITNESS: Yes.

MR. EZEANYIM: You may continue.

MR. HNASKO: Thank you very much, Mr. Hearing Examiner.

Q. (By Mr. Hnasko): Dr. Havenor, before we concluded and took our lunch break, you were talking about the correlations you made in the e-logs and your determination this Exxon State No. 8 well is within the Yates formation, correct?

A. Correct.

Q. And is your opinion based on a reasonable degree of hydrogeologic certainty?

A. Yes, it is.

Q. The Hearing Examiner had mentioned something about, yes, you may be in formation, but is it possible that the reef has entered into that formation at certain areas, and is this well -- does it communicate with that water and the reef lithologies. Do you recall that before we broke?

A. Yes, I do.

Q. I'd like to direct your attention, if I may, to Exhibit 31, which is PowerPoint 20, and we have that up on the screen, but this is Exhibit 31.

Reviewing Exhibit 31 in your materials that you prepared and your investigation of the reef lithologies, would you first describe to us what Exhibit 31 is and what it depicts?

A. This exhibit is from a report in 1997 by Huff for the U.S. Geological Survey in which they made an effort to obtain the salinities of reef waters. Huff makes very clear that -- Huff makes very clear that the outline that he shows here is the Capitan Reef complex. And that outline was taken from the earlier study by Hiss who attempted to determine as much as the U.S.G.S. could learn about the Capitan Reef.

And it's important that we see that the Capitan, as depicted on this slide and as pointed out by Huff, is what Hiss called the complex, the reef complex. The reef complex is not only the organic portion of the reef which carries the Capitan aquifer -- and that is generally located right along the very front edge of the reef, and the arrows here are not Huff's addition, but it is a description of -- it's the direction of groundwater flow within the reef itself.

Q. Within the reef complex?

A. Within the -- no. Within the Capitan aquifer.

Q. Okay.

A. Now, that's what I'm leading to, is to show the distinction between the reef and what's called the complex. The complex includes actually some very minor materials along

the front edge of the reef and the majority of this area back here is what we refer to as the back-reef facies, and I'll get into that.

Q. Would you like -- should we show an illustration of the reef in general and how the complex and the aquifer are differentiated?

A. Well, first of all, the common opinion has been -- or seems to be that -- and by this, I don't mean a hydrogeological opinion, a common opinion -- that waters come from virtually everywhere and get into the reef and flow around the reef. And even Hiss, in his initial study, made it very clear that -- I think that's -- yes. This is a statement by Hiss from his documents and with your permission, I'll read it to you:

"The Capitan aquifer is underlain by sandstone, siltstones, and limestones of the Delaware Mountain Group" -- that's the formations that are in front and underneath the reef -- "and is overlain by the Artesia Group and the Salado formation." The Artesia Group includes the Yates formation as one of it's members.

"It is bound on the basinward side by impermeable anhydrite of the Castile formation and grades shelfward into the interbedded dolomite, limestone, sandstone, and anhydrite of the Artesia Group and San Andres formation. The basinward edge of the Capitan aquifer is abrupt and can be sharply

defined by the shelfward edge is gradational and cannot be easily defined."

Can we go to the next slide, please? He continues this, and I've added the emphasis on it, "The rock units surrounding the Capitan aquifer generally have significantly less porosity than the Capitan" -- referring to the complex -- "and in most places, act as partially hydraulic barriers to the movement of water into or out of the aquifer."

Q. So what does this mean with respect to the communication of waters and the back-reef vis-a-vis the aquifer?

A. Well, let's go to the slide that depicts --

Q. Before we do that, I just want to mention for the record, the statements of Hiss that Dr. Havenor has quoted are found in his report, Exhibit 30, at page 4.

MR. BROOKS: And just to clarify the record, the exhibit up there says has significantly less permeability and when you read it, you said it had significantly less porosity. Which is it?

THE WITNESS: Which is different? Yes. And it is the permeability with which we are finally concerned. Thank you for that notation.

MR. EZEANYIM: And again, when you have this one here, what is Exxon State No. 8, in relation to this reef complex or reef aquifer? Can we picture that?

THE WITNESS: We will get to that in -- where is it?

MR. HNASKO: I'm sorry, Mr. Hearing Examiner, your question is --

MR. EZEANYIM: My question is, where is the Exxon State No. 8 in relation to this reef?

THE WITNESS: I'll attempt to show you. My hand isn't very steady. It's right in that area there. It's about six miles northeast of Carlsbad.

MR. EZEANYIM: The --

THE WITNESS: The Exxon State.

MR. EZEANYIM: Okay.

THE WITNESS: About six miles.

MR. EZEANYIM: And how far is it from this reef?

THE WITNESS: How far?

MR. EZEANYIM: How far is it from the reef, or is it inside the reef? I mean, where is it, the Exxon State No. 8?

THE WITNESS: It's in the back-reef facies.

MR. EZEANYIM: Okay.

THE WITNESS: It would be -- according to Hiss' terminology, it would be included in the reef complex, but it's physically north and in the back-reef facies, which is not part of the organic reef itself, that contains the Capitan aquifer.

MR. EZEANYIM: Is it instructive at this juncture to define what you mean by back-reef? Because I asked that question before.

THE WITNESS: I'm going there.

MR. EZEANYIM: Okay.

Q. (By Mr. Hnasko): Just to clarify and follow-up on Mr. Hearing Examiner's observation, are you saying the Exxon Well No. 8 is located in what is known -- what Hiss describes as the reef complex?

A. Correct.

Q. And it is located within the back-reef facies of that complex?

A. Yes.

Q. It is not located within the aquifer of that complex?

A. Absolutely. That's correct.

Q. Am I correct in my understanding?

A. Yes.

Q. So let's move forward to your -- where did you want to go next, Dr. Havenor?

A. I think that's PowerPoint 19.

Q. The reef illustration?

A. The diagrammatic.

Q. That's PowerPoint 19. And, incidentally, Mr. Hearing Examiner, that is Exhibit 29.

MR. EZEANYIM: Okay. Go ahead. Go ahead.

THE WITNESS: May I stand up where I can point out some things a little easier?

This is a diagrammatic representation of a reef environment and very closely approximates what we see in southeastern New Mexico. And two things are evident here: The fore-reef area -- and this is the reef body itself -- the fore-reef barrier in many cases is composed of detrital material that is beaten off the reef and deposited in the front.

The back-reef area, behind the living organism portion of the reef, is the collection point of lime, muds that are eroded off of the reef and carried back by water, as well as the input from the land of sands and clays. And because it was Permian age, the temperature area -- this area -- was essentially on the equator at the time of deposition. So there was a lot of evaporation, therefore a lot of gypsum anhydrite formed. Dolomites were predominant. These are the beds that make up the back-reef facies, this area back here.

So in geology, we try to determine -- well, first let me say the Capitan aquifer, as we recognize it, is right along the frontal edge of this organic boundary. The composition of the reef itself becomes mainly dense impermeable limestones, and that organic portion is just close to the surface. The reef itself can only grow at the surface. If the sea level drops, the organisms die. If the sea level rises, the organisms drown. So it's a very delicate balance.

So that porosity zone is in that organic zone on the

leading edge, and the rest of this material becomes the clay muds that are by maturation turned into the very dense limestones. So there's a zone immediately behind the reef, a fairly narrow zone that you can't specifically say where -- but it's not miles -- but that's the dense limestone area that at the same time as it's been deposited and lithofied, the materials that are being washed in from the land and settling out from evaporation are forming the beds of the back-reef facies; the Yates, the Seven-Rivers, the Tansill, et cetera.

And as this diagram shows, they're thin back away from the reef, and thicken as they come towards the reef, because the reef is providing that protection. And as they approach the reef, the lithology transitions from identifiable horizons such as the Yates and the Seven-Rivers into this dense limestone body that we refer to as the reef itself. Again, recognizing that the aquifer is on the leading edge of that.

So in geology where we can recognize Yates and Seven-Rivers, those formations have distinct properties, generalized lithologies. And the boundary between the Yates and the Seven-Rivers is a distinctive lithologic change, and that's expressed in the logs by the characters of the logs which allow us to correlate them.

The point that I'm trying to make is that Hiss, in his original effort to talk about the reef, didn't distinguish. And Huff, the subsequent U.S.G.S. author who did the salinity

studies, took Hiss' report, used his boundaries and then went to great effort to point out that what he calls the complex also includes the back-reef facies, which again, in themselves, are separately identifiable.

But as any one of those beds goes into the reef, there is a zone of transition where the characters of the formation, such as the Yates formation, disappears and take on the dense lime characteristics of the massive reef itself. So the Yates just disappears. You reach a point where you can no longer correlate the Yates.

That's opposed to the concept that, for example, the reef is growing up into the Yates or through the Seven-Rivers, because that's not what happened. They all grew at the same time, and there is a lateral gradation. The lithology changes; the time does not. Each one of those are a lithologic unit covering a generally common time group.

Q. All right. Could we return to Exhibit 31, which is the PowerPoint 20, on the Hiss reef? And could you explain to us -- and I think you have depicted with your arrows -- where the reef itself actually exists and what is the communication, if any, with water found in the back-reef and water in the reef aquifer?

First, let's delineate where the aquifer is located and where the back-reef facies is located.

A. Okay. May I approach the screen?

Q. Yeah, sure.

A. The reef aquifer will be right along this leading edge, literally. Because, as you saw in that other diagram, the seaward side, the reef is growing at somewhat of an angle up into -- because it's extending itself towards the water. So the leading edge is right along here, and that's where the reef waters, or the Capitan aquifer, itself is located.

So when they say they take water out of the Capitan Reef to waterflood a field down in southeastern New Mexico, it's this very frontal edge where they're removing that water. There are also waters in the San Andres formation and others that they use, but the Capitan Reef aquifer is right in the front.

The Exxon No. 8 State is located right here, and it is a considerable distance. Now, each one of these squares here is a township, so that can give you a little bit of a gauge as to mileage. So this is, in all probability, two-and-a-half, three miles before you reach the front margin of the reef where the aquifer is located.

And I think it's also important to understand that the reef aquifer, although the waters may intercommunicate, the zones through which it communicates change. It's not just one porous band that leads all the way around the reef. At some places it may be 200 feet lower than in other places. And there may be some local points where there are cuts in -- surge

cuts -- through the reef itself, and the water is forced to communicate down through a lower zone in the reef itself and continue on. So it's not a pipeline. It's not as simple as the arrows show.

Now, Huff in 1997 was studying the salinities of the Capitan Reef and, of course, we have quite a bit of information in this area simply because that's exposed at the surface and very shallow wells right up to the edge of Carlsbad. So it's easy to sample and get good measurements.

But from the City of Carlsbad on -- and this is where there's a dramatic increase in salinity -- in the City of Roswell, the wells will be potable water, good quality water for the desert area. And a mile from the center of town, the salinities will be in the range of 1500 TDS.

MR. BROOKS: Once again, Doctor, you said Roswell. Do you mean Carlsbad?

THE WITNESS: I mean Carlsbad.

MR. BROOKS: Thank you.

THE WITNESS: Within a mile of downtown Carlsbad, those salinities will reach about 1500 parts per million. And another mile or so along the reef and they'll be up into the 25 to 30,000 parts per million. And they will remain that and higher all the way over towards Lovington. There are only a total of 17 wells that the U.S.G.S. used to measure the salinities of the waters in the reef complex, and that's an

important distinction.

Because if you measure them from the reef complex, for example, you're going to look at the North Cedar Hills well which is just north of the Exxon State No. 8, and their water came from a depth of 1,000 feet, and it's very clearly in the Seven-Rivers formation at least. But because they're dealing with the reef complex, they can say the salinities in the reef complex are this much.

Q. (By Mr. Hnasko): Dr. Havenor, may I ask you a question while you're up there? A couple of issues: When the BLM's initial geologist wrote a report asking some questions and had some concerns which we tried to address, his indication was that the water from the Exxon State No. 8 could potentially affect the City of Carlsbad wells and ultimately the Pecos River. Do you recall that?

A. Yes, I do.

Q. And is that a scientifically sound conclusion based on Hiss' depiction of the reef and the groundwater gradient that you have depicted?

A. No, it's not feasible.

Q. Would you explain that to the Hearing Examiners, please?

A. The dip of the formations in the area of the Exxon State No. 8 is towards the southeast, so the regional dip of the formations is towards the southeast. Water flows

contained within porosity zones of formations and permeable zones will normally tend to move down gradient, which would be towards the southeast. Even using the very, very general application of the Capitan Reef complex and the wells that the U.S.G.S. has utilized for salinity measurements and water level measurements, that movement is very clearly from the west towards the east and then to the south and eventually down towards the Sheffield Channel in Texas.

Again, it's not what a hydrogeologist would prefer to do, to take a water sample from this well and one from this well and one from this and one from this, all out of different formations and thereby say that this is the gradient of the flow. Because in order to determine a gradient of flow, your measurements must be from the same body, the same aquifer, that is transmitting the fluids. And it's a misnomer to say that this is the Capitan Reef aquifer, and all of the water follows this course. It may end up doing that, but on an individual selective basis within the individual formations.

However, when it comes to areas like this where water is coming out of the these formations or through these formations, they're not going to get into the reef aquifer. Number one, they're generally subsurface-wise deeper than the aquifer itself, the Carlsbad aquifer itself. But more importantly, that heavy, dense limestone accumulation is a physical barrier to movement into, up out of, or down into, the

Capitan Reed aquifer. It's just not realistic to assume because it's back there and there's a aquifer over here, it's going to flow in. Because it doesn't work that way.

That dense limestone which is pointed out by Hiss and Huff and any of the drillers that you talk to that drill wells through this stuff, they'll tell you the difference. It takes different bits to drill through these dense limestones than it does through the back-reef facies, because you have different kinds of formations. And in the formations in the back-reef, some do have good porosity and good permeability. But they do not and cannot be categorized as emptying into or communicating into the Capitan Reef aquifer.

We'll talk specifically about the Hiss and Huff's report of salinities in the area around the Exxon State. But in general, this is what has happened, and this is what the BLM author failed or did not understand. They made a statement, a generalized statement, that if we could return the quality of the reef waters back to what it was originally, then we would have much more good water.

Well, you have to understand: This was a reef which was growing at sea level at Permian time. It was subsequently completely buried and covered by many layers of sediment. It was later uplifted and eroded, and this area down here is now the Guadalupe Mountains. And just immediately to the south is Guadalupe Peak, which is the highest point in Texas.

And rain waters accumulate and are transmitted through this Capitan Reef aquifer. And there's much more porosity in the forward part of this here because it has been exposed for 30 million years, approximately, to additional weathering. And the Carlsbad Caverns is just a perfect case of that additional solution that has occurred in more recent geologic time.

This, of course, was 240 million years ago when this was built as compared to 20, 30 million years ago when this uplift occurred and this erosion. Today the fresh rain waters have flushed out all of the original saltwater from the Permian oceans and has cleaned it up. And in the area around Carlsbad, the reef waters have been flushed by the Pecos River, which cuts the reef itself.

So that's why when we look at the salinities in the waters in the aquifer, we've got real good salinities right up to the river and immediately on the other side -- and I mean immediately on the other side -- of the reef, you start getting a drastic increase in salinities. It's because the reef and the rainwaters have flushed out all of the bad water.

Q. So where is the protectable groundwater located based on those salinities you've described?

A. Well, this is Carlsbad right here, and the end of the protectable groundwaters would be approximately here.

Q. And waters from the Exxon State No. 8 is moving

in the opposite direction?

A. Well, it's moving in a southeast direction.

MR. EZEANYIM: Excuse me. It seems to me that you -- stay there, because I want you to point something to me.

It seems to me in Carlsbad, you might have this what you call the reef aquifer outcropping to the surface. Have you been able to see the water on the surface? A stream or something? It looks like some of them are close to the surface where you say the salinity is about 1,500; is that what you are saying?

THE WITNESS: Just to the east of Carlsbad, yes.

MR. EZEANYIM: Okay. Now, this is an ambitious study and very good. You are educating us on this Capitan Reef. We are very much interested in protecting that reef, because as you know, most of Carlsbad and the surrounding cities use that water over there. And that's why I mentioned to you that some of them, it appears to me, that it comes to the surface. So it is really good water to protect.

However, I want you to explain to me. There are three terms I need you to explain to me. One is the reef aquifers. You mentioned that. Tell me where it is in relation to your diagram. You called the reef complex, and what is that reef complex? And then back-reef facies, you know, like you described.

I need to know the distinction so I know what you are

talking about. Because I come in here and you are talking about the Capitan Reef, but you have divided it into three sections. So I need to know what sections you're talking about and how you define it. And you've said that the Exxon State No. 8 is about three miles from the reef. Which reef? The complex? The aquifer? Or the back-reef facies? That's what I'm trying to determine.

And really, that's why I need you to define that point. What is that value so I can determine just what you're saying.

THE WITNESS: All right. First, you mentioned that the reef is at the surface. In the immediate Carlsbad area, the reef is not at the surface, but it's at a depth of 100 or more feet beneath the surface. And in the immediate Pecos River, Carlsbad area, part of that deposition is Pecos River deposited beds of gravels and sands and clays.

The exposure of the reef at the surface comes in about this area. And the waters are moving through the eroded limestones at or above the surface and eventually down beneath the surface and under the City of Carlsbad and the Pecos River. And then we have the -- we actually climb up on to the eroded surface to give some additional elevation on the east side of Carlsbad, which extends the variable.

The reef aquifer is -- could we go back to the diagram, please? If you can project this leading edge here up

and follow it generally across here, it would be this area right along the very front of the reef where the good porosity is developed.

The majority of this, the remaining part of the reef, is the dense compact limestones that form as a part of the growth of the reef. And then instead of an extremely sharp line like we see here, it's a gradational zone where it grades from the dense limestones fairly rapidly into the sedimentary deposited formations of the Yates and the Seven-Rivers and the Grayburg.

MR. EZEANYIM: Is that the complex? Is that the reef complex?

THE WITNESS: Yes. The complex, as shown by Hiss on this diagram, would incorporate all the way from the very front right here and would be back into this area back in here. And this is an area where we have distinct formations where we can trace the ladder.

And could we go to my cross section slide? Now, this slide was -- this cross section was developed as a result of --

Q. (By Mr. Hnasko): For the record, Dr. Havenor, that is Exhibit 33, and page 4 within that exhibit, which was one of the reports that Dr. Havenor submitted. Thank you.

A. This well is -- the distance is shown in feet here. So this is 0. This is 968 feet, and this is 5266, and this is 8,800, and this is 12,500 feet, or two-and-a-half miles

from this point to this point. And throughout this area in each of these logs -- and this is essentially a north/south cross section that comes right through the Exxon State -- it shows that we can clearly identify the overlying Yates formation and the top of the Seven-Rivers formation itself.

And down at the bottom with the deeper wells we can identify where it goes into that part where the reef has leaned over the ocean, and this is the Delaware Mountain group sands that are developed underneath. The point being that we can clearly identify where we are in the Yates formation, and we can see where this projects a better projection than the cross section we showed before.

In this particular case, the base of the Yates would be approximately 100 foot below the bottom of the Exxon State No. 8. But we can still trace the Yates formation for a mile and a half, approximately, down to this well and further on beyond that before you get lost in the -- before these lines can no longer be distinguished farther to the south.

MR. EZEANYIM: Where is this slide?

MR. HNASKO: Excuse me, Doctor. This is, Mr. Hearing Examiner, Exhibit 33, page 4.

MR. EZEANYIM: I'm sorry, I need to see that.

MR. HNASKO: Exhibit 33, page 4.

MR. EZEANYIM: Okay. What are you trying to demonstrate with this exhibit? What are you trying to

demonstrate here?

THE WITNESS: Two things: Number one, the initial problem of where is the bottom of the Exxon State in relation to the base of the Yates; and number two, the high correlativity of the Yates formation through this area showing, or demonstrating, that it is in the back-reef facies of identifiable formations that does not -- isn't part of that organic reef itself but hasn't been incorporated for generality by Hiss as the complex, the reef complex.

MR. HNASKO: Mr. Hearing Examiner, I think with a few questions at the board I could perhaps clarify some of these issues.

MR. EZEANYIM: Okay. Go ahead.

MR. HNASKO: Thank you, sir.

Q. (By Mr. Hnasko): Could we go back to the general reef? All right. Understand, I'm not a geologist, but this is what I get, all right?

As I understand, Dr. Havenor, in the back-reef facies, the various zones are easily depicted; for instance, the Yates formation and the Seven-Rivers formation and so on, correct?

A. Correct.

Q. And as we get closer to the reef itself, the physical reef, those zones become less identifiable and ultimately merge; is that correct?

A. They transition.

Q. They transition.

A. The beds transition into the massive limestones.

Q. So we do not have -- as we get closer to the physical reef, we don't see a separate and identifiable Yates formation any longer. It gets narrower and narrower, correct?

A. No. It's not necessarily narrower or thinner, but it loses its character because it's being dominated by the sediment that is derived from the reef itself.

Q. All right. It loses its character.

A. It loses its character.

Q. Okay. I got it. Let's go back to the cross section, if we could. In the cross section, throughout these distances that you have depicted from north to south on the bottom of this particular exhibit -- it's PowerPoint 22?

MS. NICHOLS: Yes.

Q. (By Mr. Hnasko): We're indicating the top of the Seven-Rivers Capitan or the bottom of the Yates as being identifiable, correct?

A. Yes.

Q. Throughout all these distances?

A. Yes.

Q. And is that the basis by which you determined that the Exxon No. 8 is in the back-reef facies? The fact that you have an identifiable base of the Yates throughout all these

linear distances?

A. That and it's geographic position in relationship to other wells.

Q. May we go back to the general reef diagram, again, please? So using this as a surrogate for what's happening out in the Capitan Reef, we would put the Exxon No. 8 somewhere in the middle of the back-reef facies?

A. Well, probably in this area right in here, yeah.

Q. All right. Can we go to the Hiss diagram, please? I think Mr. Hearing Examiner asked some questions about needing a clear answer on what constitutes reef, the reef aquifer, the back-reef facies, and reef complex.

So there a number of things. Am I correct that this entire demarkation is Hiss' depictions of the reef complex?

A. Correct.

Q. All right. And am I correct that these arrows generally depict the location of the physical reef itself?

A. In general, it was -- the arrows originally were intended to illustrate the direction of groundwater flow --

Q. Correct.

A. -- through the Capitan aquifer.

Q. I understand that. But the aquifer is in front of these arrows; is it not? The reef aquifer?

A. Well, yes. In general, throughout this area here it would be essentially in front it.

Q. Just to give us some idea of what we're talking about, the back-reef facies as contained within the reef complex is the area back here, correct?

A. Yes.

Q. All right. And do I understand from your testimony that there is no hydrogeologic communication between the back-reef facies and the reef aquifer?

A. That is correct.

Q. And it's your opinion, based on a reasonable degree of hydrogeologic certainty?

A. In my opinion yes, and in the literature.

Q. Now, incidentally, you did respond to some of the BLM concerns but subsequently received a memorandum from Mr. Simitz at the BLM.

A. Yes, that's correct.

Q. And did Mr. Simitz concur with your conclusion concerning the lack of communication and the very low permeability --

A. Yes, he did.

Q. -- between the water in the back-reef and the reef aquifer itself?

A. Very clearly he did.

Q. I'd like to turn to that, if we may, at the present time.

MR. EZEANYIM: Thank you very much for that

clarification. One more point. You said there is no communication between the back-reef facies and the reef aquifer.

THE WITNESS: Correct.

MR. EZEANYIM: You are right up there going to demonstrate? I have already read them, so could you tell me why there is no communication? Why is there no communication between the back-reef and the aquifer?

THE WITNESS: That's a very reasonable question. It's because immediately behind the clean or organic zone that is building the reef proper, there is also organisms that are secreting limestones, and that helps to make the body of the reef itself. And these organisms and the clay, the lime muds, that are eroded off the top growing of the reef all form extremely impermeable dense limestones.

They just don't have any reasonable amount of porosity or permeability until they begin to intermix and transition in their deposition with the stuff that's coming in from the land, the land, the Yates and the deposition in the Seven-Rivers, et cetera.

MR. EZEANYIM: So what you are saying is that there is no azeotropic flow from the back-reef to the reef aquifer. Because that's what I'm trying to understand, reef aquifer and back-reef, reef complex. I'm trying to understand what you are trying to demonstrate from what you are saying.

THE WITNESS: There is heterogeneity in the cross section of the reef, but within any given area, there's probably a fairly high degree of homogeneity. The frontal portion where the actual Capitan Reef waters flow around the basin, that's going to be the shales and tests of the organisms that were preserved and not filled in. Immediately behind that narrow zone is going to be the precipitation and accumulation of the dense limestones, and that is uniform throughout all the way behind the reef, even into the outcrops in the surface.

And then there will be the gradational zone, which will be a narrow zone -- in this case, we'll say to the north of the reef -- where the transition is occurring between the land-derived sediments and evaporative sediments in the shallow waters and the dense limestones from the organic portion of the reef.

And then beyond that transition zone -- which the transition zone is a relatively narrow area -- and then we're into the typical sedimentary deposits of the formations.

MR. EZEANYIM: Okay. Go ahead.

MR. HNASKO: Thank you, sir.

Q. (By Mr. Hnasko): Dr. Havenor, one follow-up on the observations by the Hearing Examiner. The limestone formations of the reef itself are essentially the body that inhibits communication or prohibits communication between the back-reef and the reef aquifer, correct?

A. Yes. That prohibition would be the back portion of this diagram and the transitional zone into the formations that we can distinctly identify.

Q. I had a question on transition zones. Can we go back to the cross section?

The Delaware -- I thought you mentioned that as you approach the physical reef itself, that you would encounter limestone at particular depths indicating bending or beginning of the reef, the essentially impermeable limestone.

A. Let's assume that the reef is over here, leaning out like this because it grew towards the open ocean.

Q. Correct.

A. I lost the point of your question.

Q. The point of my question is, of the transition zones, are we seeing evidence of limestone as we get to a larger depth as being the transition towards the physical reef itself?

A. Yes. And that's in part because the reef is leaning. So at this point, you're going to encounter that dense limestone before you do over here, and before you do over here.

Q. And when we get to where the Exxon State No. 8 is located, we're not going to encounter that dense limestone until significant depths; is that correct, if at all?

A. If at all.

Q. Because we're in the back-reef facies?

A. Right.

Q. It may not even start. All right. I just wanted to clear that up.

MR. EZEANYIM: Just one more question, please. What is the vertical extent of that reef complex in this area? Because I know if you look at the reef complex, it's a body somewhere and then there. In the area of this well, do you know the vertical extent of that reef?

THE WITNESS: The vertical extent of the entire reef is approximately 1200 feet.

MR. EZEANYIM: 1200 feet at the thickest point?

THE WITNESS: No. From it's deepest point to its highest point, that vertical distance would be about 1200 feet.

MR. EZEANYIM: Are you starting from what depth? The highest point of that reef; do you know?

THE WITNESS: The highest point of the reef would be at a point where the Castile formation overtakes the growing reef and kills it.

MR. EZEANYIM: The approximate depth of that point?

THE WITNESS: Well, as you go south from the Mesquite well, it will be shallower and shallower. The anhydrite and Salado and might appear and it's going to top over the reef and kill the reef, and that could be at depths of 3 or 400 feet down. Well, 3 or 400 feet to the point where the -- well,

that's not really answering the question.

It's where the reef stops growing --

MR. EZEANYIM: Okay.

THE WITNESS: -- in Permian time. It would probably be in the range of 3 or 400 feet out in this area.

MR. EZEANYIM: Okay.

THE WITNESS: In the intervening area, which would probably be another mile and a half or so, or two, would be the fading of the identifiable properties of the Yates and the Seven-Rivers to a point where it's just solid limestone.

MR. EZEANYIM: Okay.

THE WITNESS: And that would be the back part of the reef. And in front of that would be where the aquifer is located.

MR. EZEANYIM: Okay. Go ahead.

MR. HNASKO: Thank you, sir.

Q. (By Mr. Hnasko): Dr. Havenor, I'd like to turn your attention to Exhibit 28, if I may. Would you identify that, briefly, sir?

A. This is a message that was transmitted to you from John Simitz, the geologist with the BLM in Carlsbad, concerning my report on the Exxon No. 8.

Q. And this is the memorandum we received by subpoena from the Bureau of Land Management, to your understanding?

A. Yes, to my understanding.

Q. And Mr. Simitz had an opportunity to review your report and reached conclusions about that report.

A. Yes.

Q. And what do you understand his conclusions to be, particularly directing your attention to paragraph 3, concerning the hydrogeologic connection between the area where this well is located and what he calls the Capitan Reef or the aquifer?

A. Well, basically he says the same thing, that it's just essentially impermeable and extremely low porosity. Rocks make up the transition area and grading into the identifiable formations themselves.

Q. All right. And then the second page of Mr. Simitz' memorandum, do you see his comment that the office recommends the BLM not protest this particular application?

A. Yes, I read that.

Q. All right. I'd like to talk to you briefly about salinities. And if we could look at PowerPoint number 27? All right.

I think earlier this morning, the Hearing Examiner asked some questions about relative salinities. I think that's important. We may even go back to your cross section -- excuse me -- Hiss' diagram of the reef to identify where these salinities are taking place and where they're not taking place

and where it's protectable groundwater.

Directing your attention to Exhibit 30, which I believe was a memorandum you prepared in response to further information requested by the OCD.

A. Yes, it is.

Q. And on page 7 of that memorandum, you discuss the City of Carlsbad Test Well No. 3 and the Humble No. 1 and some other salinities you found. Can you explain to the Hearing Examiners what you assembled here and why what you assembled is important in terms of the relative salinities?

A. Well, this data was accumulated in an attempt to respond to their questions about salinities. And as I indicated, when I was at the front, the U.S.G.S. had only about a total of about 17 wells in which they have monitored over the years. And the majority of those wells are in the back-reef facies rather than in the Capitan Reef per se.

The City of Carlsbad Well No. 3 is located in the reef aquifer. And it was an old oil well that was drilled in a dry hole and turned over to the City of Carlsbad as a water well. And the U.S.G.S. established a -- or monitored that well by logging. They used a logging device to pull up and measure salinities electronically.

MR. EZEANYIM: What is this slide? Which slide is this?

MR. HNASKO: Yes, I'm sorry, sir. That is

PowerPoint 24. It is also contained in -- the information itself is contained in Exhibit 33 at page 4; however, the slide itself is part of Exhibit 2 at page 24.

MR. EZEANYIM: Okay.

MR. HNASKO: Page 27 -- I am corrected.

MR. EZEANYIM: Page 27.

MR. HNASKO: Page 27 -- PowerPoint 27. I'm sorry. It's Exhibit 33, page 4, and then PowerPoint 27.

MR. EZEANYIM: Okay.

MR. HNASKO: I am so sorry. I think I misspoke. Please pardon me. That is Exhibit 30, page 7, and PowerPoint 27. My mistake. Exhibit 30, page 7. Yes, sir. There's a discussion of those.

MR. EZEANYIM: Discussion of those.

MR. HNASKO: Of those numerical values.

MR. EZEANYIM: Okay. The numerical values we have here. Okay.

MR. HNASKO: Those numerical values are also in the PowerPoint at page 24.

MR. EZEANYIM: You did this work, right?

THE WITNESS: I accumulated the published information, yes.

MR. EZEANYIM: We are looking at there and the Humble State No. 1 has 28,000, and that is being injected into the No. 8, too?

THE WITNESS: Not to my knowledge. That's a monitoring well of the U.S.G.S., and they sample it every year or so.

MR. EZEANYIM: Exxon State No. 1 and 2 has 98,000, approximately. You say Exxon State No. 8 has 800 milligram per liter. Is that the concentration of the native water in the well?

THE WITNESS: No. There are two parts to that answer: Number one, you can't sample the waters that are in the disposal zone at the bottom of the hole because the water moves out off the gravity. It's just absolutely empty in minutes.

MR. EZEANYIM: Okay.

THE WITNESS: The sample number 8 is taken from the tank, which is commercially disposed of water, so it would be a composite average of whatever was in that tank brought in by truckers.

MR. EZEANYIM: Okay. What I'm trying to determine here is what is the Humble State No. 1, the Exxon State No. 1 and 2? Where are those waters disposed of?

THE WITNESS: They are ultimately disposed of in the No. 8.

MR. EZEANYIM: Okay.

THE WITNESS: I don't know if they go into the common commercial disposal tank for --

MR. WILSON: They don't.

Q. (By Mr. Hnasko): Not the 1 and 2 and -- not the wells that are on the lease.

A. Not the wells that are on the lease. So that sample from No. 8 is just a composite of waters trucked in for disposal.

MR. EZEANYIM: And you say there is no way you can get the salinity of the water in the formation you are injecting this produced water? Is there any way we can have the salinity?

THE WITNESS: I think that it would be reasonable. Because first of all, the four producing wells literally box in the No. 8 well. The only difference between them is that the No. 8 well has drilled through and cased off the producing zones in the 1 and 2.

So if you were to go back up to the Magruder zone, perforate it and sample the waters, you would get some combination between 1 and 2 and 7 and 3.

MR. EZEANYIM: You know why I'm making this point here is I'm concerned that this order was issued in 1977, the SWD-180, and there was nothing like the UIC program. We didn't have any authority to do what we are doing today.

But we got primacy to drill what we call the Underground Injection Control program to be able to protect underground and surface drinking water; therefore, what they

examined in 1977 to give you that order is going to be different from what we're going to look at now.

Because the EPA has given us that mandate to make sure we protect the underground and surface sources of drinking water. And I just want you to read our rules, especially the 700s. It says you have to know what type of water you are injecting into a formation. And then you have to also test the underground wells or something and what is the salinity of the water, the native water, so that you don't get a well that is about 1,000 and inject into it a 10,000 parts per million. You are just contaminating that water.

So if you go back to our rules -- correct me if I'm wrong -- that is how it is written. So we don't want water that you inject going into water that's of lower salinity than what you are injecting unless the aquifer is exempt. That's why I want you to read the rules.

MR. BROOKS: Well, I don't think it prohibits putting water into -- injecting water into waters of lesser salinity if they're not statutory freshwater; that is, under 10,000 TDS. If they're under 10,000 TDS, yes. You can only inject if you're injecting equal or better water. But if it's over 10,000 TDS, if you have an qualifier that's got to 20,000 TDS, you can inject -- we can permit the injections of water that's got 40,000 TDS into that aquifer under the UIC.

THE WITNESS: Can I define these salinities?

MR. EZEANYIM: But let me make my point again, because that might help you, I think. I understand what he's trying to say. You have 10,000 parts as a cutoff. You don't do anything there. But let's say the native water is more than that, you know, sometimes people may use 15,000 or something, I don't know. But you have this high salinity water being injected there.

I think the rule is first that it's at the discretion of the OCD to see whether the aquifer is exempt, in which case, you might be allowed to do that. Forbidden strictly is that you can't inject into any salinity that is 10,000 parts per million or less. When I say parts per million, I mean --

MR. BROOKS: Unless the water you're injecting is better than the water you are --

MR. EZEANYIM: Yes. Whatever you are injecting is less than 10,000 parts per million. But here I see they are higher, so that's why I'm curious to get -- at some point, we need an idea what the salinity of the water looks like.

MR. HNASKO: Mr. Hearing Examiner, if I may.

Q. (By Mr. Hnasko): I believe the water -- the composite sample of what is being injected into the Exxon No. 8 is of lower salinity than the native salinity contained within Exxon 1, 2, 7 and 3; is that not correct?

A. Yes.

Q. And so would you like to elaborate on the

question posed by the Hearing Examiner as to how one would -- the relative salinities and why this is protectable or a non-protectable zone?

A. Yes. May I go to the screen? This well is a mile or so north of the Exxon State, and this is one of the wells that U.S.G.S. monitors for water levels and salinity.

The salinities in that zone are obviously less than the salinities in the four producing wells that surround the No. 8. These salinities would average out to something like maybe 105,000 parts per million, whereas the grab sample that was taken out of the mixed waters that have been collected through truckers dumping the water into the tanks is 80,000. So it's clearly, clearly less.

However, in total, if we were to, as I say, perforate the casing in the No. 8 well and sample the waters coming out of the Magruder pay zone, it would be something in this range of about 105 to 110,000 parts per million.

Very clearly in all cases, even in the freshest of zones, there is nothing that even comes close to being potable or useable for livestock. In the entire study area in the township, I found nothing that would approach that level. You couldn't even use it for stock water. Stock water is limited to total dissolved solids probably between 1500 parts per million of chlorides, specifically. Anything over 500 parts per million would be detrimental to the livestock. Does that

help to --

MR. EZEANYIM: Okay.

Q. (By Mr. Hnasko): One other item on this, if I may, Dr. Havenor. Could we go back to the Hiss diagram of the reef complex?

MR. BROOKS: Another one of the clarifications. You were saying about stock water. Is that 1500 parts per million or 15,000?

THE WITNESS: 1500.

MR. BROOKS: 1500. So that's quite a lot less than 10,000.

THE WITNESS: Oh, yes.

MR. BROOKS: Which is the level for statutory freshwater; what is defined by statute as freshwater.

THE WITNESS: Yes.

MR. BROOKS: Then for what purposes would water between, say, 1500 and 10,000 be useful?

THE WITNESS: Drilling oil wells.

MR. BROOKS: What about agriculture?

THE WITNESS: No. Burn your crops.

MR. BROOKS: Well, some crops could grow on something considerably above 1500, could they not? I've heard testimony to that fact. I'm not a specialist.

THE WITNESS: It would be very limited crops. But the crops that would typically grow in the Pecos Valley

Region -- the top salinities, the TDS in the Pecos River waters get up to about 9,000 parts per million, and you can't use that water for irrigation. You have to mix it with freshwater from the aquifer.

MR. BROOKS: Thank you.

MR. EZEANYIM: And this -- let me see now, what is your definition of potable or protectable water? How do you define the concentration?

THE WITNESS: Well, potable water is water that can be utilized by humans and animals. And protectable water is a legal definition of waters that need to be protected for future possibilities of cleaning up to make potable water.

MR. EZEANYIM: What will be your --

THE WITNESS: That would be 10,000. I believe that's what the statutory law is.

MR. BROOKS: And there is also statute for the State of New Mexico that defines potable water as 1,000 parts per million.

THE WITNESS: I believe the State Engineer's limit on what they control is 2,000 parts per million.

MR. HNASKO: Well, quality-wise.

MR. BROOKS: But there is a statute that defines potable water is 1,000 parts per million or better.

THE WITNESS: 1,000. That does not surprise me.

Q. (By Mr. Hnasko): Dr. Havenor, before we reach

our conclusions as to whether this water in the area is protectable or unprotectable, could you go back to the Hiss diagram and point out as best you can where these wells from which the salinity tests were taken are located? And I'm talking about the Carlsbad No. 3 and the Humble. Of course, we know where the others are.

A. May I ask Ms. Nichols a question?

Q. Yes, you may.

A. Do we have a slide of this page number?

MS. NICHOLS: I can bring it up as a PDF file.

Q. (By Mr. Hnasko): We can turn to it. What are you referring to, Doctor? We all have exhibit books -- just to keep matters flowing.

A. That's Exhibit 30, page 6. I'd like to have it on the screen, if we could, because this is a blow up from Hiss' original paper.

Q. Okay.

MR. HNASKO: Mr. Hearing Examiner, could we take a 5-minute break and prepare that for the screen? I think it might be helpful.

MR. EZEANYIM: You don't have it?

MR. HNASKO: It won't take but a minute.

MR. EZEANYIM: Okay. Five minutes, then.

[Recess taken from 2:20 p.m. to 2:31 p.m., and testimony continued as follows:]

MR. EZEANYIM: Let's go back on the record again and proceed with the testimony of Dr. Havenor.

Q. (By Mr. Hnasko): Dr. Havenor, before we proceed, there's one clarification I think we have to have based on the Hearing Examiner's questions concerning the salinity of the water in which the Exxon No. 8 State injects. Do you recall that?

A. Yes.

Q. And your response was if we were to perforate the Exxon State No. 8 at the Magruder pay zones, we would expect to see TDS levels at 98,000 to 114,000, somewhere in that. That's the native salinity in that pay zone; is that correct?

A. Immediately above there.

Q. All right. But the fact of the matter is, the depth that we're injecting at 694 there is no water that we are aware of; is that correct?

A. We can't measure it. We can't find any water. We have no standing water.

Q. So we are not in the -- the Exxon State No. 8, the TDS levels of 79,800 taken by a composite sample from a tank is a sample of the water that is going to be injected into a hole where we, based on our best knowledge, there is no water, whether saline or unsaline, correct?

A. I basically have to presume that, yes.

Q. So the native salinities in the Magruder pay zone

above this is approximately 100,000 TDS?

A. That's correct.

Q. And that water, obviously, is not protectable as per the regulations?

A. Correct.

Q. And you're looking at the City of Carlsbad Test Well No. 3 with a TDS of 28,800, and you wanted to explain something about that. And I believe we PDF'd this diagram, which is page 6 of Exhibit 30. And would you like to explain what you have shown on this screen here?

A. This is the City of Carlsbad. This is the Pecos River. I made the statement that immediately east of Carlsbad salinities reach 1500 parts per million and very quickly go up higher.

The City of Carlsbad Test Well No. 3 is located in the Capitan aquifer, and you will note that it is right on the leading edge of the reef itself as delineated by Hiss' reef complex. And the waters in that well are shown on the previous slide, and they're 23,800 parts were million. So that shows you the gradation of salinity.

I prefer to look at it in another way. We have these high salinities in the reef water which is being cleaned up by mother nature, the Pecos River and rainfall, so that we see a decrease in salinities as we go towards Carlsbad and the river. I hope that helps qualify it.

However, let's go back to the previous slide again, the Humble State well, which is at the top of that previous slide and is located right here. And the Exxon State well is located just a little bit to the northwest of that Humble State well. So looking at the Humble State well, which was not sampled out of the Yates formation but out of a deeper Artesia Group formation for the Hiss report, came in on the permeability -- or the salinity slide. It came in at 28,000 milligrams per liter. And again, that's in a deeper zone that the Yates formation.

So let's go back to the first slide. So what we can see, again, is a decrease in salinities from the Humble State and the City of Carlsbad No. 3 wells back to fresh potable waters here and on down in the reef and in the alluvial material of the Pecos River. I hope that kind of --

MR. HNASKO: Just to clarify, the salinities that were detected in the City of Carlsbad Test Well 3, the Mesquite area, the Humble No. 1, which is proximate to the Mesquite, are all moving at a gradient that is opposite.

A. Generally eastern.

Q. All right. And do not -- those salinities do not affect the freshwater supply of the City of Carlsbad nor do they affect the Pecos River?

A. They do not and will not.

Q. Thank you. All right. Dr. Havenor, in order to

move things along, I think we've covered the bulk of the area and much of it is, of course, in the application and support submitted. However, I would like to --

A. May I add one more comment on salinities in the general area?

Q. Certainly.

A. Throughout the entire township, which the Exxon State No. 8 is in approximately the center of that township, there are no freshwaters. Along the very western most edge of the township is the Pecos River. It cannot have feed from these wells or in disposal, and there are no potable waters or protected waters that are east of the Pecos River in this township.

And that may sound surprising, but it is a fact. And it's borne out by the fact that this is ranching country. And I promise you, with all of the oil wells that have been drilled out there, if there was any potable freshwaters or approaching potable waters, or even 2,000 parts per million, these ranchers would be trying to use it. And there would be wells out there, and they're not there.

Q. Okay. Dr. Havenor, can I direct your attention to Exhibit 34, please? And that's going to be PowerPoint slide 30.

Now, by way of background, this whole thing came up because of a tracer test performed on the Exxon No. 8, and the

OCD issued an administrative order suggesting that the tracer survey indicated that the water was falling out of the bottom of the hole; do you recall that?

A. I think they said it was moving out the bottom of the hole.

Q. And I take it you analyzed that finding in the administrative order and came to some conclusions about it?

A. Yes. Let me point out a couple of preliminary things, and then we'll go to the second page of this log.

Q. And right now we're on Exhibit 34, correct?

A. Yes. This is the injection profile temperature log, which measures the fluid that's going into formations that was run on the 5th of March 2008, and that was in direct response to the order to shut down the well. And despite the fact that the well was shut down, I'm grateful that the log was run because it provides us tremendous information.

The important things on the log heading, which the people that are contracted to come out and run these logs, they typically pick up some basic fundamental information. And the depth by driller is one of the things that they note, and that is 694 feet. The depth of the logger -- and that's the tool that they use to lower down and to measure the flow of water -- reached 692 feet.

And the bottom of the logged interval -- you have to understand that the cylinder, the tool, has a protected area on

the very bottom, and that happens to be about two inches high. And it's only from there up that they can actually record anything. So they can read and measure fluid coming to and past that 690-foot point. Let's go to the next page.

As you open up the electric log -- it's an accordion-folded log -- this is what -- they have an area that says "comments." And it says, "Injection profile indicates fluid going into the open hole just below casing with a majority of it going downhole past TD."

This has raised some confusion, apparently, with the OCD. This is the loggers talking, and they are concerned only with the measurements past the TD of their tool. And so that would be actually, physically, 692 feet, but measurement-wise, would be 690. So they can only record data coming here.

And the statement that I made some time ago is that these guys ain't lawyers, okay? So they're not picky about their words. They want to make a description. And to them, they're talking about the total depth of the logging tool. And it says, "Tracer pass shows fluid movement downhole past logged TD." And that's what they're talking about. They both mean the same thing. Do we have the diagram that I used to --

Q. Yes, we do. It's Exhibit 35. And what are you depicting in Exhibit 35? It's up there now.

A. This is the hole. The total depth of hole is 694 feet deep, according to driller, and that's fundamentally

agreed to by the logging device. Now, we've got casing way back up the hole here that has been cemented. And this is just open hole which has been open hole and receiving water in the open hole where the packer is set back up in the casing since 1977.

So there's going to be some turbulent flow along the walls of this formation. And some material is going to be washed out and settle out at the bottom of the hole. And that's common and expected. In this case, it appears to be approximately two feet of fill at the bottom of the hole. Because their tool reached a depth it can read to 690 feet, the TD is 694 feet, so the tool depth is 692 feet.

And so they're measuring the fluid that is moving past. The deepest they can measure is this point right here. So this is the top of this injection zone which takes fluid on gravity and so the blue arrows are just indicating the flow of water past the logging sonde and out into the formation.

Q. May I ask you a question on that, Doctor? It's been said ad nauseam that the Exxon No. 8 takes water on a vacuum without any pressure assistance whatsoever. Now, if it does, in fact, take water on a vacuum, wouldn't you expect the water to move past the logged TD of the log TD and past that area?

A. Well, it would not be unusual for a horizon to take water on a vacuum and maintain some small column in the

hole. That would then lead you to believe that the zone was filled with water, and this extra water that was put in actually acts as the drive to push it out further.

In the case of the Exxon No. 8, the loggers noted that when they went in the hole -- when they went in, there was no water in the bottom of the hole. And this conforms to my understanding of what happened during the drilling of the well.

It was drilled -- this part was drilled with cable tools. And cable tools require water to be in the bottom of the hole. They need the water so they can lift that bit up and drop it down and just literally bang their way through the rock. And then they pull it out and they run in a hollow cylinder called a bailer which would go in, take the water and the cuttings that are at the bottom of hole, they come out and they dump them.

He stopped here for one of two reasons: Number one, that he could not pound any further through it; it was a change in lithology, and this was a vuggy dolomite that would have drilled easily; or it's taking all of the water that he's putting in to drill. And if he can't pour water in and keep it, he can't drill. Cable tools can't drill in a dry hole.

So this is just additional information of an experience level that I say that we see no water. And when asked about the water in the hole, the logger said, "It was dry when we went in." So that leads me to believe that this was

essentially a porous dolomite, vuggular porosity, which means fairly good sized holes in it, but it did not contain any fluids. And that's not rare. It's not real common, but it's certainly not unheard of.

And so I just -- I have to assume that when the well is turned on to inject, the water piles in, and it'll load up a little ways pretty quickly. Water will go in to some of those formations. About 20 percent of the disposal water will go into the interval below the casing, but above this zone. But the rest of it just zaps right on out. And probably much of the water that went into those upper zones will drain back into the hole and go into this same zone again.

Q. The water is going to go out horizontally?

A. It's going to move out horizontally until it eventually reaches some kind of a barrier or a change in porosity and permeability and begin to fill this zone up.

EXAMINATION

BY MR. EZEANYIM:

Q. Okay. Why is the logging sonde indicated here? Why did you provide us this diagram?

A. I'm sorry?

Q. The logging sonde.

A. Yes.

Q. Why is it in this diagram? Why did you put it in there? Is that to indicate where it is? What you are using

that for?

A. Yes, to illustrate what the configuration was at the time that they were logging the fluid flow past the sonde, because they were on the bottom.

Q. Okay. Now, what is the concentration of this injection well? Is that what you have here? Do you have any of the construction of this well?

A. The construction of the well is as shown, except that the hole, I think, is a 4 1/2-inch hole. It's a small hole because they drilled out of 5 1/2-inch casing and drilled to 684.

Q. Okay. So there is no casing at all?

A. Not below 587 feet. That's the base of the 5 1/2-inch casing.

Q. That casing is not indicated here at all.

A. No. It's way up the hole.

Q. Okay.

A. It would be way up the hole. This is all open hole.

Q. This is this section of the open hole?

A. Thus is just the very bottom section of it. You see, this would represent a 10-foot interval here.

Q. Okay. So I was thinking now, where is the diagram that is incorporated to the top of the hole? I need to see that in relation to this. Is what you do with the APD you

change it from 600 to 694 and then this is what you are injecting. All this is open hole, because I can't see any tubing. I can't see any casing. But you say the casing is --

A. The base of the casing is at 587 feet, and the tubing packer is set back up in the 5 1/2-inch --

MR. HNASKO: I think it's in the injection well data sheet, Mr. Hearing Examiner.

Q. (By Mr. Ezeanyim): I need to see the injection well to tell what's going on.

A. This is the diagram of the hole. They drilled a 12-inch hole to 169 feet, set 8 5/8-inch casing, and then they drilled a 7-inch hole to 687 feet -- excuse me -- 587 feet, and then it was 4 3/4-inch open hole to the bottom.

Q. Yeah, initially did you use any tubing for injection of this well as you allowed on the SWD?

A. Yes. I remember that there were indications that the tubing was set on the packer in the 5 1/2-inch casing.

Q. But it's not --

A. It didn't extend below the packer.

Q. But it's not shown here that you have any tubing there.

A. No, it's not.

Q. So are you injecting through the casing?

A. No. They are injecting through 2 1/2-inch tubing -- 2 7/8-inch tubing.

Q. Your order says 2 3/8. That's what I see on that.

MR. WARNELL: That's the original order.

THE WITNESS: That was the original Rains completion.

Q. (By Mr. Ezeanyim): And then the 2 3/8 was removed and you installed the 2 7/8. It's not shown on the diagram, but is that what happened? You changed?

A. It was 2 7/8 when you got it. Somewhere along the line it went from 2 3/8 to 2 7/8.

Q. It might have been a mistake that you should have it at 2 3/8.

MR. WARNELL: Here they changed. This is on record.

MR. EZEANYIM: Which one is that?

MR. WARNELL: This is in February of this year.

MR. EZEANYIM: They changed it this year?

MR. WARNELL: No. It just says they changed the 2 7/8 tubing out with 3 1/2-inch flush point.

MR. WILSON: No. We were going to, but they didn't approve that.

MR. WARNELL: Okay.

MR. EZEANYIM: It's very confusing.

MR. WARNELL: So sometime in the past -- and I haven't been able to find where -- the 2 3/8 was swapped out with 2 7/8. It could have been some time back.

THE WITNESS: There were several owners between the

original driller Rains and Mesquite, and I don't remember seeing anything that indicated they changed the tubing size, but the original tubing is as I indicated it there.

Q. (By Mr. Ezeanyim): Okay. Now, you have 5 1/2-inch casing?

A. 5 1/2.

Q. Okay. And beside the 5 1/2-inch casing, you have that 2 7/8 tubing?

MR. WILSON: Right.

Q. (By Mr. Ezeanyim): Which is not indicated in this?

A. No. It's way up the hole.

Q. In this diagram?

A. It's not indicated in here.

Q. It's not indicated. Why is that? Did you remove it?

A. The packer is set at 570, and that actual depth there is 587. So it's set a foot and a half above the casing, approximately.

Q. Did you have any packer set in that tubing, in that casing?

MR. WILSON: The 5 1/2 is the packer. You have to have one.

MR. EZEANYIM: Okay. Very good.

Q. (By Mr. Ezeanyim): Now, you dip into 694, and

you're injecting between 684 to a 10-feet interval, right?

A. Well, there are a couple of zones farther up the hole beneath the bottom of the casing that is taking approximately 20 percent of the fluid when it is being injected; however, I have to assume -- because it all goes out the bottom -- that what went into those upper zones is going to pretty well come right back out and go down into the lower zone, too.

Q. Do you know where the top of cement is in this one? Is it at 5 1/2?

A. Oh, yeah. It was circulated.

Q. Circulated to the surface?

MR. WILSON: It says 5 1/2 casing, 110 sacks, surface circulated.

MR. EZEANYIM: Okay.

MR. WILSON: The same on the surface.

THE WITNESS: The 12-inch surface was also circulated.

Q. (By Mr. Ezeanyim): Do you have the form C-108 included in this package?

A. Yes.

Q. We are going to see some of these diagrams that you have, the injection well and then all the area of review wells?

A. Yes, I have.

Q. We'll have the producing wells whether they are plugged and abandoned, or inactive wells in the half-mile area of review?

A. Yes. They were all included in the last -- one of the later accumulations of data. But all of the information is in the --

Q. On the C-108?

A. It's all in the application, Mr. Hearing Examiner.

Q. We want to see it in the C-108.

MR. HNASKO: Most of the information is taken from the application and some from subsequent reports, but the well issues and the diagrams are all on the application.

Q. (By Mr. Ezeanyim): Since we're here, those are the questions I have. Just get this out of the way. So you dip into 694 and your injection interval is from 684 to 694, right? Open hole?

A. Open hole from 587 to 694.

Q. Oh, not 684? Injecting in the well from 587 to --

A. Well, that's open hole, so --

Q. Oh, that's open hole, okay.

A. It's open 4 3/4 hole. Much of that interval is not taking fluid, though.

MR. WARNELL: Did you run the tracer over that entire

open hole interval? Could you see where the tracer goes in up hole?

THE WITNESS: Yes, we did, all the way back up to the bottom of the casing.

Q. (By Mr. Ezeanyim): Are your perforations between 684 and 694? Your perforations where you are injecting?

A. There are no perforations.

Q. Okay. I see what you are saying, okay. Interesting. And you have been trying to argue that this injection interval is still within the Yates formation?

A. In my opinion, yes, it is clearly within the Yates formation. And probably the bottom of the hole is at least 100 feet above the base of the Yates formation.

MR. WARNELL: Do you believe the bottom of the hole there at 694 is the top of the Seven-Rivers?

THE WITNESS: No. The top of the Seven-Rivers would be at least 100 feet below that.

MR. WARNELL: Okay.

Q. (By Mr. Ezeanyim): Why is that important?

A. It was fundamentally important because the initial order to cease injection indicated that the water was going past the total depth of the hole and out of formation. It's not quite that relevant at present.

MR. EZEANYIM: Okay. I don't know. Do you still have questions for him?

MR. HNASKO: I do have one small area yet to cover that I think we have to cover.

MR. EZEANYIM: Okay. Go ahead.

MR. HNASKO: Unless you would like --

MR. EZEANYIM: No. Go ahead.

MR. HNASKO: Thank you, Mr. Hearing Examiner.

REDIRECT EXAMINATION

BY MR. HNASKO:

Q. Dr. Havenor, this might be a good segue to the other aspects for the emergency order. The OCD had made a statement that there was oil apparently oozing from a well known as the Magnolia State No. 1, I believe?

A. Yes.

Q. And somehow, some way, the discharge of the produced waters into the Exxon No. 8 are maybe responsible for that. Do you understand that to be the OCD's statement that they had made?

A. Yes.

Q. And I take it you investigated that, sir?

A. Yes.

Q. I'd like to you to take the Hearing Examiners through your investigation and ultimately culminating with Exhibit 36 and what you have depicted there. But you may start with explaining the communications, if any, that would be possible between these two wells.

MR. EZEANYIM: Before you go ahead, the Magnolia, this is the first time I've heard about it. Who owns that well?

MR. HNASKO: I'm sorry, sir?

MR. EZEANYIM: Who owns the Magnolia, the well that was oozing the crude?

MR. HNASKO: It's an old, old well that was not plugged and abandoned.

MR. EZEANYIM: It's inactive, but who owns it?

MR. WILSON: The OCD does.

MR. EZEANYIM: We don't drill for oil and gas.

MR. HNASKO: I think that Dr. Havenor can clear that up with his investigation of the ownership, the origins, and what happened as far as the plugging and abandoning of that well.

THE WITNESS: The Magnolia State No. 1 well is located in Section 14 immediately east of Section 15 that Mesquite is in, and it is located approximately 2900 feet northeast of the disposal well.

The initial report was -- I don't remember the exact terminology, but the BLM expressed a concern that there was heavy crude seeping out of the abandoned Magnolia No. 1 and contaminating the surface.

And the conclusion or the suggestion that they made was that the Exxon State No. 8 was receiving a lot of water, so

it would be possible for that water drive to pick up the water and somehow get it out onto the surface in the Magnolia No. 2.

In an investigation of the hole, the paperwork on the hole, I found that the well was plugged or abandoned. I use that word "abandoned." And it wasn't until, oh, 10 or 15 years later that one of the OCD staff, Mr. Mike Stubblefield that did field work, he went out one day on a field check, and he was going to check three wells. Number one on the list was the Magnolia State No. 1. And he wrote, "Checked status of well," and he wrote, "Well is plugged and abandoned."

And I presume that, as they usually do, they looked at the marker. Then they welded on the well name and the section, township, and range, and identified that that was this well. And then some time later it became apparent that there was some crude oil that was seeping out of that hole. And then that led in turn to this suggestion that the Exxon No. 8 might be responsible.

In looking at the paperwork, I found that there was absolutely no indication in any way, shape, or form that the well was plugged and abandoned. They had a water flow at the bottom of the hole, and they tried to produce a little oil out of it first.

And then they used an old cable tool drilling technique of taking lead wool -- they took 100 pounds of lead wool and rammed it down to the bottom of the hole and then

followed that up with a 20-pound package of oak gum. Then they essentially tried to pack off that water hole -- that water zone. And then they came out, and there was never any plugging reported or cementing reported.

And some time later, the bonding company that issued a bond for the plugging of that well requested that your office in Santa Fe release the bond. And the office that handled that responded to the insurance company that they would release such-and-such a well and such-and-such a well that this gentleman had drilled. But they would not release this well because there was no indication that the well had been plugged.

And so I'm left to presume with my understanding of cable toolers -- and I've had a lot of exposure to them -- when they drilled that hole and they didn't get an oil zone, they came out of the hole. And when they came out of the hole, the casing that was in the hole came out, too.

Now, there was probably a short joint of 10 1/2 or 10 3/4-inch pipe at the surface, and what they normally did would be to cut a steel plate and tack it on to the top so that nothing would fall into it, and then they're gone.

The OCD apparently made some requests of the operator/driller whose name was Atha, to fill out some paperwork, you know, as to the pugging of the well. And he apparently said, "Well, I plugged the well."

But he never filed any reports. And in my opinion, I

don't think he did. He had that little gum ball thing down at the bottom of the hole to try to stop that water flow, but he did not plug the hole. Then he went over and drilled the No. 2 well, which is --

Q. Before we get to that Doctor, can I ask you a couple of questions about the stratigraphic relationship, if any, between the Exxon 8 and the Magnolia State No. 1? I know the No. 2 is --

A. Is material, but separate.

Q. But what I'd like to do is, putting aside the No. 2, let's talk about the hydrogeologic plausibility or implausibility of the Exxon State No. 8 accepting water on a vacuum and causing the Magnolia State's oozing that was observed.

A. Yes. That was fundamentally the reason that I added the Exxon State No. 8 well to this diagram. Now, this is not accurately to scale, but it's proportional in distance. This is about 2900 feet, and this is about 1900 feet, each of them in a northeast direction away from the Magruder No. 8.

These depths in this column and this column and this column are corrected mean sea level datums so that we can see the relative position of the surface, what the TDs are, and what those -- how those depths correspond to each other in the No. 1 and the No. 2 and how they correspond stratigraphically to the Exxon No. 8. And as we can see, the Magruder is a

little higher in the No. 1 well and lower in the No. 2 well. So this is a cross section in a structural relation also.

And being that the casing is at -- the bottom of the cemented casing is at 2692 in the Exxon State and the bottom of the hole in the No. 2 is 2718. It shows that the stratigraphic horizon that would be taking the majority of the water on a high volume is way down the hole beneath the bottom of this hole.

And looking at lithologies of this interval from the bottom of the casing to the bottom of the hole, it's very apparent that there are a number of relatively thick horizons that are essentially hard, impermeable dolomites and anhydrites and some clays.

Further, if the bottom ten feet of this zone is what is accepting the fluid on vacuum, even though there's a little bit in this upper area beneath the casing that appears to be taking some water, when this goes out on vacuum, it just empties out the hole, the probability to me is that any waters that have come in as disposal into this, the majority is just going to go down the hole and on out with the rest.

If there is no head and this is emptied out on the hole, even if that porosity zone extended to the northeast and was under either of these two wells, there would be such a stratigraphic separation that it would be implausible for the water to have been pushed up even if there was a head developed

in the disposal well, which there is not.

MR. EZEANYIM: Okay. Which one is No. 8? Which well is No. 8?

THE WITNESS: This is the Exxon No. 8.

MR. EZEANYIM: Which one is the Magnolia No. 1?

THE WITNESS: This is the Magnolia No. 1.

MR. EZEANYIM: What is the depth of that well?

THE WITNESS: The depth of the well is -- 530-some feet.

MR. EZEANYIM: Okay. 540, approximately. That's the TD?

THE WITNESS: Yes, that's the TD.

MR. EZEANYIM: Of the Magnolia it was relayed by the parties, you know --

THE WITNESS: Significantly less than the bottom of the casing in the No. 8 well.

MR. EZEANYIM: Okay. What do you think is the permeability of the porosity of that injection interval in the No. 8? Do you have a --

THE WITNESS: The porosity of this down here?

MR. EZEANYIM: Yeah, in that open hole. What would be the porosity of that interval?

THE WITNESS: It would be high. If I had to guess from the way that it takes water, I'd say the porosity in that vuggular dolomite, as the driller described it, would run 25 to

30 percent porosity in that carbonate.

MR. EZEANYIM: And the permeability?

THE WITNESS: I'm sorry?

MR. EZEANYIM: What would be the permeability?

THE WITNESS: Well, the permeability in this would obviously be very, very high because it's taking 500-some acre feet of water since 1977 and still doesn't show any water in the bottom of the hole. So the permeabilities are going to be exceptionally good.

MR. EZEANYIM: But, do you have an estimate?

THE WITNESS: No, I couldn't put a number on it. It would be out of the decimal range, though.

MR. EZEANYIM: Okay.

Q. (By Mr. Hnasko): So, Dr. Havenor, do I understand from your testimony and from me looking at this, that aside from the hydrogeologic reasons and the stratigraphic disconnect between these two wells, do I understand correctly that under the BLM's concern that was initially raised, that water being accepted on the vacuum with no head, no pressure, would somehow have to travel uphill? Is that what we're getting at here?

A. In part, but I have to read between the lines on their concern. And they probably were not aware that this zone is taking it on vacuum.

Q. Okay.

A. So the logical reasoning of that would be that if you put a lot of water into this, you're going to have a pretty significant head of water, which, if there was communication across and up into this, could pick up the old dead oils and stuff that are coming out of this well and eventually raise them up to the surface level where it would then escape onto the surface.

And, of course, the premise is invalid for two reasons: Number one, there is no way that there's a stratigraphic connection that that could occur, and even if it could occur, this is taking water on vacuum, so there is no head buildup in this well. It's down there.

Whatever water level is there, it's unmeasurable because it's just gone. And if you don't have head, you cannot drive the water up.

MR. EZEANYIM: Okay. On those two wells, is that No. 1 and No. 2, Magnolia No. 1 and No. 2?

THE WITNESS: No. 1 and No 2.

MR. EZEANYIM: Okay. No. 1, the depth is 540 feet, the same as No. 2? Is that 540 feet? That's the depth of No. 1, right?

MR. HNASKO: 540 feet on No. 1 and --

THE WITNESS: On No. 1 and just a little deeper on No. 2.

MR. EZEANYIM: What is the depth of No. 2?

THE WITNESS: The total depth of No. 2 would be 3238 minus 2675. That would be 540-some feet.

MR. EZEANYIM: Okay. Now, I know you do some area of review. You told me that No. 1 is about 2900 feet from the Magnolia State No. 2?

THE WITNESS: Yes, 2900 feet from here to here.

MR. EZEANYIM: Which means you've got Magnolia No. 1 and No. 2 penetrated in the injection zone. They could have been in your area of review. But because you didn't penetrate it, you didn't consider it as an area of review well?

THE WITNESS: Correct. This well is just outside the area of review.

MR. EZEANYIM: Both of them in terms of lateral extent and vertical extent?

THE WITNESS: Direct from center of the circle.

MR. EZEANYIM: But both of them are outside?

THE WITNESS: They are both outside the area of review.

MR. HNASKO: Perhaps we should explain why the Magnolia No. 2 came to the fore.

Q. (By Mr. Hnasko): It's been heretofore undiscussed, but the Magnolia No. 2, Dr. Havenor, you uncovered that when researching a potential cause for the secretion of the oil off the top of Magnolia No. 1; is that correct?

A. Yes. And that was a concern expressed by the

Bureau of Land Management.

Q. Why don't you take the Hearing Examiners through how you uncovered the existence of Magnolia No. 2 and why, in your estimation, this well may be a probable source for what has been experienced out of the Magnolia No. 1, if you can.

MR. EZEANYIM: Well, instead of going there, did you do some gradient computations? You mentioned something like that. I would like to see that calculation. Did you do some gradient calculations on injection wells on your Exxon State No. 8? Did you do that? You told me you did that calculation. You did a calculation of the radius of injection.

THE WITNESS: Yes, I did.

MR. EZEANYIM: Because you have enough data. This well has been injected since 1977, so you should have enough data to do that calculation.

THE WITNESS: Well, I had to make some assumptions as to that, and those are included in the area of influence.

MR. HNASKO: That's in response to the OCD's request for additional information, Exhibit 33, Mr. Hearing Examiner, page 9.

MR. EZEANYIM: Okay. Go ahead.

THE WITNESS: The assumption that I made, and would probably change if I were to redo this now, is that the area that was logged right out of the bottom of the casing that shows collectively that it was taking approximately 20 percent

of the fluid flow, while the remainder went down to the bottom zone.

I used that 80 percent in order to make an estimate of what the distance would be. And, fundamentally, what I did, because we don't have any water tables or heads or anything to deal with about the reservoir, I assumed first that this was a 320-acre box-shaped reservoir. And I totalled up all of the reported barrels of water that had been disposed into the well since 1977. And I converted that to acre-feet of water. And then that, of course, makes it simpler to compare acres and feet of accumulation.

So the 10-foot zone at the very bottom of the hole, if that reservoir covered only 320 acres, I estimated or calculated that that will fill up approximately 16.2 percent of that 10-foot interval. And that would leave a very substantial portion of the water, the reservoir, still available for additional disposal.

Then the number that I actually used was 81.8 percent of the disposal water was going to the bottom zone. And then I also made a calculation that if it was spreading out in a wedge-shaped fashion from the bore hole, and it was vertically full and sinking down and spreading out in a 360-degree area -- and, of course, that would be forcing a little bit of water slightly updip, which is not going to happen very well. But anyway, that would then accept 499-acre feet or cover 100 -- in

round numbers -- 150 acres of space.

MR. EZEANYIM: Your assumption of using 82 percent of disposed water going into the Yates formation, where is the other 18 percent going? Your calculation, I haven't got time to look at your assumptions, but you say about 82 percent is going into the Yates formation. The rest is going to --

THE WITNESS: The flow recording sonde indicated several zones were taking lesser amounts of water above the vuggy zone at the bottom, so I added that up, and I think it was 18.2 or something.

MR. EZEANYIM: What assumption would you change today? As you mentioned, what assumption would you change today to do this calculation if you were to do it today?

THE WITNESS: I'd put it all out in the vuggy zone. I'd put it all out in the vuggy zone because I think that any water that went into those sandstones and less porous dolomites, as soon as the pressure is relieved, it's going to come back into the hole and go down.

MR. EZEANYIM: Yeah, that was my concern, okay.

THE WITNESS: Of course, if the vuggy dolomite was only one foot thick -- and it is ten feet thick -- then it would fill what has been put in -- would fill 500 acres.

MR. EZEANYIM: Okay.

THE WITNESS: And that's the way I approached it. Looking at it as a parabola or a fan-type spread or a cone

pouring water out, it's in the overall scheme of things, a relatively insignificant area when the concern is what is happening three miles away.

MR. EZEANYIM: So that's approximately 20 years' time? How many years?

THE WITNESS: '77 to '08. That's 31 years.

MR. EZEANYIM: For 400 acres of area of influence?

THE WITNESS: Yeah, if the aquifer was only one foot thick, and it's ten feet thick.

MR. EZEANYIM: Okay. Go ahead.

MR. HNASKO: Okay. Thank you, sir.

Q. (By Mr. Hnasko): Dr. Havenor, you were just about to discuss, and you made your conclusion -- let me ask you your conclusions, first of all.

Is it your opinion that the discharge -- the acceptance of water in the Exxon 8 has not contributed in any way to the existence of any oil found oozing out of the Magnolia State No. 1?

A. Yes, that is my firm conclusion.

Q. Is that based on a reasonable degree of hydrogeologic certainty?

A. Yes.

Q. And having said that, having concluded that, I take it you went on a bit of an exploration to find out what could have caused the oil to come out of the Magnolia No. 1,

including the observation that it probably was not properly plugged and abandoned.

And could you take the Hearing Examiners through your efforts and what you found?

A. You originally said why I did? Why I looked at that?

Q. Why did you look at that?

A. Well, in Roswell, we have the New Mexico Energy Library where we file electric logs and where all of the original State paper OCD filings -- they're all in our library.

And I was concerned that I had actually all of the data about the Magnolia No. 1, and so I asked the librarian to pull that file. I asked her by telephone to pull the file, and then I went over to the library.

And when I got there, she said, "Kay, you didn't ask for this, but I thought you might want to look at the No. 2 well."

Well, I hadn't thought about the No. 2 well, so I said, "Yeah, I'll take a look at it."

And I looked at the driller's log first because that's my inclination. And the first thing I noticed was something that's very unusual for this area. He logged at 220 to 230 feet. He logged what he called in quotation marks a freshwater zone. And that just -- I hadn't seen anything like that.

And so the next -- exactly the next thing I did was looking at his log that he was describing this, there was a 20-foot gypsum bed on top of it and a 10-foot gypsum bed underneath it. And my conclusion immediately, of course, is that he may call that fresh, but that's fresh relative to what he expects to find in the high sulfurous waters that come out of the Magruder zone.

Anyway, he drilled a dry hole and found that water in the Magruder zone, and again used the oak gum and lead wool to seal it off. But then, apparently, he had talked to the rancher also and told him he had this freshwater. So the rancher said, "Well, if you're going to plug the well, I'll take the well over."

So they went through the proper procedure of going to the State Engineer's Office, and that well then officially became C-507. And he, in writing, and it's in the OCD records, the rancher, in writing, accepted the liability for plugging that well.

This I thought was interesting, and when I plotted things out, this -- may I approach the screen again, please? When I plotted this out and reviewed the log on the No. 1 well, which was an extremely poor driller's log compared to the log on this well. The log on this well was comparable in quality to what Mr. Rains did on the Exxon State. But there was no indication of any water sand developed in here, although at

this depth, there was a sandy zone in which they indicated on the driller's log here that there was an increase in water.

And that statement of increase in water indicated to me that this upper sand was contributing more than just a tiny bit of water. They reached TD. They packed off. They tried to pack off this porosity zone down at the bottom in the Magruder zone, then turned it over to the rancher, and the well is unplugged. It's not plugged.

So in the hopes of finding a well in this area where we might be able to measure a static water level -- because he didn't indicate whether or not there was a rise in water or anything. And so I would like very much to know if this was a hole that we could make a water measurement in.

I telephoned Mr. Clay Wilson, who happened to be in his office or headed to the field, and I explained that I would like very much if he would attempt to go over there and try and locate that well. And he left and went to the field and he called me after a while and said he wasn't having very much luck.

So I got on my computer where I use SPOT 10 satellite imagery maps and Topo maps in combination, and I could spot the activity of the former location. But it didn't look like there had been any recent activity. I guided him to approximately the point where the well should be.

He told me, "Well, the only thing I can find out here

is a couple of old timbers and some cable."

And I said, "Well, that's the location of the well."

He looked all around and he said it was pretty well overgrown and a lot of sand had blown. And so I made the assumption the only way we could actually find that plate that was probably welded onto the top would be with a metal detector. And we had neither the time nor the equipment to do that.

MR. EZEANYIM: Okay. Very good. This is what I think I want to do. There are two things I want you to clear up for me before I ask you what your counsel is trying to do.

It is your testimony today that there is no Capitan Reef in the Yates formation? Is what you are testifying to today?

THE WITNESS: They are separate entities.

MR. EZEANYIM: They are separate, okay. That's what I needed to know. I'm just trying to get it before I'll be able to give you to opposing counsel to cross-examine.

But again, one thing I want to know before we proceed here: Is there hydrocarbon potential around this zone that you are injecting? Because if you look at that Pure State lease, there are about three or four wells producing from there.

I assume they are producing from the Yates, but maybe from the information I pull, they are producing from the Tansill. Where are they producing from? They shouldn't be

producing where you are dumping this water. They should be producing from somewhere where the water doesn't flow. They should be producing from somewhere.

Let me help you answer that, because we have placed this outside that question. And maybe you can't find it. That's why I -- I'm asking -- when I asked him the depths -- I wrote them down, the depths of those wells, those producing wells.

Here -- No. 1 is 561, No. 2 is 576, No. 3 is 580, No. 7 is 580, above your zone of injection. Is that where they all have been produced from, those producing wells; is that correct?

THE WITNESS: All of these wells that we have been discussing are producing from what's called the Magruder pay zone, which is in the Yates formation --

MR. EZEANYIM: Okay.

THE WITNESS: -- at about the middle. And the injection well is cased through the Magruder to 20 or 30 feet below the Magruder sand and cemented and circulated in No. 8.

MR. EZEANYIM: No. 8, where was it cased and cemented? At 5 1/2 inch?

THE WITNESS: At 587 feet.

MR. EZEANYIM: Okay.

THE WITNESS: Now, you also have to take into account the difference in surface terrains on some of these to compare

these, but for all practical purposes, if you put them all out on a straight line relationship, the Magruder would be at this level, and this injection zone would start at the base of the casing, but then would be another 40 or 50 feet below that zone.

So the main zone is about 100-and-some feet -- main injection zone in the No. 8 is approximately -- is a 100 feet below the base of the cemented casing in the No. 8. All of these others are in the Magruder pay, which is just above the casing.

MR. EZEANYIM: Okay. Any further questions?

MR. HNASKO: Just a couple, and then we're done.

Q. (By Mr. Hnasko): Dr. Havenor, just to -- back to our exhibit on the Magnolia State No. 2, is there a stratigraphic connection between 2 and 1 from which you would --

A. I believe there is, and I believe it's a reasonable connection, too. This sand zone that was logged into both of the wells, this one contributed an increase in water to the hole, plus what is being put in from this uppermost water sand. That could establish a head at approximately 320 feet if it was not Artesia, if it was just a water horizon. That in turn could exert enough head that over a period of time it could move water through this sand or through that lower Magruder area into the other well.

And this very viscous oil, some of which was found in the Magruder pay zone, could float up to the top. And if this head were stable, and if it's where I speculate that it would be, then we would have this 200 feet or so area for accumulation, which over 30 or 40 years could seep out enough oil and float up to the top that eventually this head could cause some seepage around that unplugged hole.

MR. EZEANYIM: Yes. What is the difference between No. 1 and No. 2? Because the point you are making here is important. If you look at Magnolia No. 1 and No. 2, what is the distance between those two wells?

THE WITNESS: 1900 feet.

MR. EZEANYIM: 1900 feet. And you are saying there is a connection between them. And that's where this seepage is coming from, maybe from the No. 2 going into No. 1; is that what you are saying?

THE WITNESS: Yes. That's what I'm suggesting.

MR. EZEANYIM: And because you think the head -- because what would happen to that head to be able to move the fluids to the No. 1?

THE WITNESS: Where would it come from?

MR. EZEANYIM: Yeah. Because you said that because of the connection between No. 1 and No. 2 that the fluids might migrate to No. 1 and then cause that seepage to happen.

THE WITNESS: Yes, to cause the naturally seeping oil

to float up and then be pressurized by the raising column. Yes, the head would come from the water that's coming out at 220 feet here. I'm postulating. That's why I would really love to have been able to make an actual water level measurement.

Because if it's as I suspected, this is going to be full up to at least the base of this water sand here, and that's going exert pressure which could drive the water through to the No. 1, which would then create a head. Not exactly the same as this one, but some head, and then the naturally seeping oil, which would accumulate on top, eventually could additionally exert some upward pressure, enough to cause it to seep a little bit.

MR. EZEANYIM: Okay.

THE WITNESS: From what I've heard, I don't believe it's seeping very much, but it is seeping. And in my earlier reports, I indicated the only way you're going to stop it is to properly plug the well.

MR. EZEANYIM: Okay. Go ahead.

MR. HNASKO: Mr. Hearing Examiner, that's going to conclude Dr. Havenor's presentation today.

MR. EZEANYIM: Now, before I go to Mr. Swazo, what do you want to do with your exhibits you discussed today?

MR. HNASKO: Thank you very much. I would like to offer exhibits -- all the exhibits in the binder, which are

Exhibits 1 through 37, into evidence at this time.

MR. EZEANYIM: Any objection?

MR. SWAZO: I have no objection.

MR. EZEANYIM: Okay. Exhibits 1 through 37 will be admitted into evidence.

[Applicant's Exhibits 1 through 37 admitted into evidence.]

MR. EZEANYIM: Mr. Swazo?

MR. SWAZO: Thank you, Mr. Hearing Examiner.

CROSS-EXAMINATION

BY MR. SWAZO:

Q. Dr. Havenor, you were hired in this case by Mesquite to do this study for this case?

A. Yes, that's correct.

Q. And I just want to clarify that you did not do the log test that was run on the Exxon State No. 8 well.

A. No. I do not do it, nor was I present.

Q. Now, where exactly are the fluids going in this well once they are injected? Are they going vertically or laterally or both or --

A. Well, first they're being flowed into the top of the well. And they go down the hole, as the log has shown, and basically it's all ending up going out into that lower vuggy dolomite at the bottom of the hole.

Q. So they're going laterally?

A. Yes.

Q. And this is a fairly shallow well. The total depth is, what, 694?

A. Correct.

Q. And Mesquite's application, the proposed maximum daily injection rate is 15,000 barrels. Would that -- where would that water go?

A. Same place it's gone for the last 31 years.

Q. Is there a point where the well, with that number of volumes of injected fluids, is there a point where the well would meet its capacity for accepting injected fluids?

A. Obviously, at some point in future, but as of today, the 31 years of injection that have been put in it leave no water in the bottom of the hole, so we have to assume that a very small percentage of the capacity of that zone has been utilized.

Q. And is it a fair assumption that the more you inject, the further the injection would spread?

A. That would be a logical assumption.

Q. So you had testified that the Capitan Reef is really a structuralist formation; is that correct?

A. Well, let me -- yes. That is a correct assumption, if you allow me to make the exception that in the geological sense of the use of the word "formation," it is not a formation.

Q. And the Capitan Reef is composed of limestone?
A. Yes.
Q. And it's a porous formation, I guess? Does it have --
A. Porous body?
Q. Yes. Thank you. So water would easily flow through this body with the high porosity?
A. Well, you're going to have to specify where the porosity is. In the case of Capitan Reef, the porosity is essentially confined to the very leading southern edge of the reef itself. The vast majority of the reef body is a structureless mass of dense impermeable limestone.
Q. But assuming -- I mean, in places where there would be high porosity, is it safe to assume that water would flow easily?
A. Within the Capitan Reef aquifer itself, yes, that is correct.
Q. And the Capitan aquifer is the source of drinking water for the City of Carlsbad?
A. Yes, it is.
Q. And how thick is the Seven-Rivers, in your opinion? Because if I understand it correctly, the Seven-Rivers underlies the Yates formation.
A. Correct.
Q. How thick would the Seven-Rivers be underneath

the Exxon State No. 8 well?

A. Probably in the range of 1,000 feet. I don't remember exactly what the thickness of the Seven-Rivers is, right off the top of my head.

Q. And I noticed in some of your documents you have Seven-Rivers, slash, Capitan. Why exactly do you have that?

A. Well, I used that because a number of the well logs that had been correlated -- notes in the files of wells that had been correlated by the Bureau's staff in this region, greater region -- were picking Capitan in the location where I might select it as Seven-Rivers. The terminology that would be correct and preferable would be Seven-Rivers. But I put that in as a method to try to relate to the users of those logs.

Q. And if I understand you correctly, sometimes it's very difficult to -- there is no clear boundary between some of the formations and the Capitan Reef. Because your testimony was that some of these formations have the characteristics of that particular formation and then there's a gradual transition where they take on the characteristics of the Capitan Reef; is that correct?

A. Yes, that's a transition zone. But there is also a lithologic change that occurs within that interval. The Seven-Rivers, for example, is predominately dolomite in its composition, and the main reef body is limestone. And so that gradation from, what is clearly Seven-Rivers to what is clearly

100 percent dolomite, there is an interface there where the dolomites become more calcareous and in a short distance become limestones.

Q. Okay. I want to direct your attention to Applicant's Exhibit No. 31, which is this map that was Hiss' map. Because I was a little -- I just wanted some clarification.

Did you impose these colored -- the red arrows, the blue arrows and this little yellow slash?

A. Yes, I did.

Q. Okay. So that wasn't part of the original Hiss map?

A. Correct. It was not a part of the original Hiss map, and my text reflects that.

Q. Now, your testimony was that the Capitan aquifer is actually at the front to what you've described as the Capitan complex?

A. It's at the front of the reef, the frontal portion of the reef itself.

Q. Okay.

A. Which would be also the front of Hiss' complex.

Q. Well, according to the legend at the bottom of Hiss' map, it indicates that the gray-shaded area is the Capitan aquifer, which would be outside the area that you had indicated would be the Capitan aquifer; isn't that correct?

A. I don't remember his explicit description of that. But having looked at his diagrams and everything in the three dimensional aspect in addition to two dimensional, and reading his descriptions of the lithologies and the locations of the wells and those having been reviewed by Huff from which this map was actually taken, it's easy to determine that the reef complex incorporates a large portion of the back-reef, the back-reef facies.

Q. And actually on this -- I would call it the legend for the map -- doesn't it delineate the shelfward boundary of the Capitan aquifer?

A. Yes, it does.

Q. And it also indicates the basin boundary of the Capitan aquifer?

A. As he referred to it. But, again, Huff points out that what Hiss is incorporating is -- and he very specifically brings this out in his U.S.G.S. report on salinity -- that includes the back-reef facies. And that information is contained in my report somewhere, of Huff's explanation of that.

Q. And I wanted to go back to your testimony concerning the TDS for the waters from the Exxon State No. 8. Your testimony was that there was no way for you to sample -- there was no way for Mesquite to sample the, I guess, the native waters for that well because there are no waters; is

that correct?

A. That's essentially what I said. There is no way to get a sample of the native waters because all of the waters in that zone disappear on vacuum, it disappears from this location at least.

Q. And so the sample that was offered was a sample of produced waters from -- a sample of produced waters that would be injected into this well?

A. Yes, it was.

Q. And is it possible that number could rise depending on the source of the waters?

A. That's an acceptable presumption.

Q. I want to go back to this. I wanted to go to this slide. Is it possible that the head pressure of the Magnolia State No. 2 could be pushing the injected fluids from the Exxon State No. 8 well into the Magnolia State No. 1 well?

A. No.

Q. And why is that?

A. There's no hydraulic connection. The TD of that well is many feet above the disposal zones in the Exxon State.

Q. So it's your testimony that there's no hydraulic connection between both Magnolia State wells?

A. No, I didn't say that. There is hydraulic connection or there could very well be. I can't say absolutely there is, but there's a strong indication that it should be

investigated, between those two zones in the intervals I selected.

In further answer to that question, I should also add that there can be no drive from the Exxon State to push anything up unless there is a head developed in the column of water in the No. 8 Magnolia. And it zips out the bottom, literally, zips out the bottom.

So if there is no head, there's no way to push anything up. As I show in the Magnolia 2 to the No. 1, I show that there's an accumulation of water in the No. 2 that could create a pressure that would push water up a closely related level in the No. 1. That condition does not exist in relation to the No. 8.

Q. Do you have an opinion why the well is on a vacuum?

A. Because the porosity zones are void of fluids.

Q. Could there be any fault in this area?

A. I have no indications, and I've done a lot of structural mapping, both surface via satellite imagery and subsurface work, and I've found no indications of faulting.

Q. And when you look to see if there was any protectable water in this area, where did you look at? I mean, did you look at just the State Engineer's records, or tell me what you looked at to determine whether or not there were protectable waters in this area?

A. I started with the State Engineer's records of wells that were permitted as well as wells that were drilled. And there were several wells that were permitted but which were never drilled. But it's a very -- in that part of the study it is very apparent that people drilled wells along the western boundary of this township because it was in an area that had been influenced by the Pecos River.

But east of that, there just isn't any water. So the second thing I did was in consultation with Mr. Miller, I asked if there were any ranchers that he knew of in the area that had any water wells. And he had to think long and hard, and he finally talked to one rancher that had about a 50-foot well that was located in alluvial sands, sand drift sands, that he got a little bit of water out of.

But physical examinations and searches of wells, even to be used for drilling oil wells, it was very skimpy returns. There just isn't any freshwater. And this is further substantiated by the fact that, as I stated before, this is ranching country. And there have been lots of oil wells that have been drilled and lots of them have been plugged.

And any one of those ranchers would jump out of a ten story building for an opportunity to get ahold of a plugged well that actually had some water in it. And that's evidenced by the No. 2 Magnolia. That rancher took that over even, apparently, before he tried to feed his livestock some of that

water, because they're desperate for water. So that's the third thing.

Q. You said you spoke to Mr. Miller. Who's Mr. Miller?

A. I don't mean Mr. Miller. I mean Clay Wilson. I don't know why Miller came out. But you notice I did hesitate when I said that.

Q. And if I understand correctly, the Seven-Rivers is composed of shallow water back-reef carbonate; is that correct?

A. And evaporates.

Q. And evaporates. And it transitions into the Capitan Reef?

A. Into the Capitan limestone is dense body -- the dense limestone body.

MR. SWAZO: I don't have any further questions.

MR. HNASKO: No redirect, Mr. Hearing Examiner.

MR. EZEANYIM: Do you have any questions?

MR. BROOKS: No questions.

MR. EZEANYIM: Do you have any questions?

MR. WARNELL: No questions.

MR. EZEANYIM: Okay. You may be excused. There might be questions for you later on.

Okay, Mr. Swazo, you may call your witness.

MR. SWAZO: I'll call Mr. Sanchez first.

MR. EZEANYIM: Okay. In order to give our court reporter a break here, let's take a two or three-minute break. We're going to be back in three minutes.

[Recess taken from 4:01 p.m. to 4:08 p.m., and testimony continued as follows:]

MR. EZEANYIM: Let's go back on the record again and, Mr. Swazo, would you call your first witness, please?

MR. SWAZO: I'm going to call Mr. Daniel Sanchez.

DANIEL SANCHEZ

after having been first duly sworn under oath,

was questioned and testified as follows:

DIRECT EXAMINATION

BY MR. SWAZO:

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

A. Daniel Sanchez.

Q. And, Mr. Sanchez, with whom are you employed?

A. The Oil Conservation Division.

Q. And what is your current title?

A. Compliance and Enforcement Manager.

Q. And does part of your duties also involved the regulation of underground injection wells?

A. Yes, it does. I'm the program director for the underground -- the UIC program.

Q. And could you explain what that entails?

A. The UIC program, Underground Injection Control,

is a program that New Mexico has primacy over through the EPA. And my responsibilities include providing the EPA quarterly updates, annual reports, on the condition and number of wells on the five different classes of the wells that the program oversees.

Q. And as part of your duties, do you oversee the regulation of underground injection controls within New Mexico?

A. Yes.

Q. And you testified you have primacy over UICs?

A. Yes, that's correct.

Q. Is there anything else that you would add concerning your job with regard to the UIC program?

A. Mainly, just to make sure that the field offices monitor those wells, perform the inspections on a regular basis, gather that information, and are able to put it together and provide it to the EPA.

Q. And do you currently have a special project for the Capitan Reef?

A. Yes, we do.

Q. And could you explain that?

A. Okay. A couple of years ago, we were asked to submit an application for funding to work on special projects in the State. One of the programs that we had been wanting to work on for a couple of years was the evaluation of the Capitan Reef. And what the first part of that program did with the

limited funding that we had for that year was to actually identify the boundaries of the reef and get those coordinates and set them into our Risk Base Data Management System so they would be available to us and our field people and our Engineering Department, of course.

And once we had that taken care of, the following year we were given additional funding to go ahead and start locating wells within the Capitan Reef, and all that information has been completed by RESPEC. We just haven't got the final report on it. We've gotten some information on it, the number of wells that are actually within the reef and some other information, but the final report is still pending.

MR. SWAZO: I don't have any further questions. I pass the witness.

MR. EZEANYIM: Mr. Sanchez is so qualified. You're done with him?

MR. HNASKO: I have no cross-examination, Mr. Hearing Examiner.

MR. EZEANYIM: You may be excused.

Call your next witness.

MR. SWAZO: Will Jones.

MR. EZEANYIM: You have been sworn.

WILLIAM V. JONES

after having been first duly sworn under oath,

was questioned and testified as follows:

DIRECT EXAMINATION

BY MR. SWAZO:

Q. Mr. Jones, will you please state your name for the record?

A. William V. Jones.

Q. And where do you work?

A. Oil Conservation Division, Santa Fe office.

Q. How long?

A. Six-and-a-half years.

Q. What's your current title?

A. Petroleum engineer.

Q. And how long have you been a petroleum engineer?

A. I've worked as a petroleum engineer since 1979.

Q. And what are your duties?

A. My duties are to, in large part, evaluate saltwater disposal applications.

Q. And I'm assuming that also involves reviewing injection permits?

A. Yes, injection or disposal permits.

Q. Have you ever testified before the Oil Conservation Division?

A. Yes. The Division and the Commission.

Q. And have you been admitted as a petroleum engineer expert before?

A. Yes, I have.

MR. SWAZO: Mr. Hearing Examiner, I move to admit Mr. -- I tender Mr. Jones as an expert in petroleum engineering.

MR. EZEANYIM: Mr. Jones is so qualified.

MR. SWAZO: Thank you.

MR. HNASKO: No objection.

Q. (By Mr. Swazo): I'm going to try to go through the exhibit packet real quick. A lot of the exhibits -- or some of the exhibits are the same exact exhibits that Mesquite has offered, but I will try to be quick about this.

Mr. Jones, will you please look at Exhibit 1-A and identify it?

A. Exhibit 1-A is the --

MR. HNASKO: Excuse me. Are these marked?

MR. SWAZO: They are at the bottom.

MR. HNASKO: Pardon me?

MR. SWAZO: At the bottom.

MR. HNASKO: Thank you very much.

THE WITNESS: Exhibit 1-A is the Commission order in 1976 allowing A. H. Rains to use the Pure State Well No. 1, which is located in Unit J of 15 -- which is just a tiny bit north of the Exxon State No. 8 that's the subject of today's --

as injection, from 540 to 551.

Q. (By Mr. Swazo): And just to clarify, the Pure State wells eventually became the Exxon State wells?

A. Yes. They got renamed, but were still the State.

Q. Identify Exhibit 1-B.

A. Exhibit 1-B is when the --

MR. EZEANYIM: Let me understand this. There is confusion now. Are you saying the Pure State No. 1 became Exxon State No. 8?

THE WITNESS: No. I'm sorry, Mr. Examiner, the Pure State No. 1 became the Exxon State No. 1. I think it was Mr. Rains or his successor that applied to change the name to the Exxon State. Maybe Exxon had an interest or something.

MR. EZEANYIM: But the Pure State No. 1 was the substitute and I know they came back to try the Exxon State No. 8.

THE WITNESS: It wasn't the Federal No. 1, it was the State.

MR. EZEANYIM: Okay. I wanted to clarify that, because, you know, I have it in my head that Exxon State No. 8 is a different well from Pure Sate.

THE WITNESS: It's only -- not that many feet north/south of each other.

Q. (By Mr. Swazo): Let me provide further clarification. Mr. Jones, is it correct that there's more than

several Pure State wells that all eventually became the Exxon State wells?

A. It's my understanding.

Q. Identify Exhibit 1-B.

A. 1-B was the amendment to that original order allowing Mr. Rains to use an alternate well for injection for lease and disposal purposes. Because as I understand it, the first well was drilled and it became a producing well. And so they obviously needed to use a different well, so they got blanket permission to use -- it actually says more than one well -- for lease disposal purposes.

Q. And does this order provide clarification to the prior order?

A. Yes. It refers to the prior order.

Q. What clarification does it provide?

A. It -- I'm sorry.

Q. With regard to the disposal, with regard to the use of the Pure State No. 1 well.

A. It says the Pure State No. 1 is better used as a producer, and the applicant was allowed to use an alternate well as they find. It did not become a producer as an injection well for the future for the lease disposal purposes.

Q. Okay. Could you state that again?

A. The original well was drilled and they obviously encountered oil in the Magruder pay zone, so they didn't want

to use it as an injection well. So they came back to the Commission and got an amendment to the order allowing use of an alternate well for the lease disposal of water.

Q. Well, doesn't this clarify that the prior order, the saltwater disposal well, was to be used as a saltwater disposal well for water production from that Pure State lease?

A. Yes. It says the lease, lease disposal.

MR. EZEANYIM: Let me clarify that, Mr. Swazo. What are you trying to imply? Are you trying to imply that the Exxon State No. 8 should not accept water on the lease other than Pure State lease? Is what had you're trying to say?

You know, because before you continue, I want to understand what you mean by trying to establish that line of questioning.

MR. SWAZO: What I'm trying to show is that the original order that gave rise to the Exxon State No. 8 well, SWD-180, originally envisioned a saltwater disposal for waters from the Pure State lease.

MR. EZEANYIM: Only?

MR. SWAZO: Yes.

MR. EZEANYIM: Is that what you're trying to establish?

MR. SWAZO: That's correct.

MR. EZEANYIM: Go ahead.

Q. (By Mr. Swazo): Will, would you identify Exhibit

No. 1-C?

A. 1-C is the SWD, the supplemental SWD order. After Mr. Rains located his well in Unit O, he apparently drilled a well that was suitable more for injection, so they obtained this SWD-180 to allow injection into that well.

Q. At what depth?

A. It says depths of 572 to approximately 600 feet.

Q. Will, identify Exhibit 1-D, and please state the significance, if anything.

A. 1-D is just stating the that well was actually drilled to 700 feet -- proposed to drill to 700 feet. And they proposed to circulate cement. And that was just a sundry application, but it was a State -- it's checked off as a State lease on top, so it was approved by the Division and not by the BLM.

MR. WARNELL: It also states on there, if I can interrupt you, that it was drilled with a rotary rig; do I see that?

THE WITNESS: Circulate.

MR. WARNELL: Just below Eddy County in box 20? Isn't that where we either --

THE WITNESS: Yes, it does. I don't think that's correct, though, but it's -- the recordkeeping of Mr. Rains wasn't totally -- sometimes it seemed to be after the fact.

MR. EZEANYIM: Excuse me.

THE WITNESS: You have to go with what was said.

MR. EZEANYIM: Which exhibit are we looking at?

MR. WARNELL: 1-D.

MR. SWAZO: 1-D.

MR. EZEANYIM: I thought you said 1-B.

MR. SWAZO: Sorry.

MR. EZEANYIM: Okay. This is from C-101? Form C-101? Is that what it is?

THE WITNESS: Yes. C-101.

MR. EZEANYIM: Okay. Go ahead.

MR. SWAZO: Okay.

Q. (By Mr. Swazo): Mr. Jones, I'm going to try to go through this stuff real quick. I'm going to have you identify it. And if there's any significance, please tell us. If there isn't anything significant, then we'll just go ahead and move on.

A. Okay.

MR. EZEANYIM: Okay. That would be fine.

Q. (By Mr. Swazo): Identify Exhibit No. 1-E.

A. 1-E is the completion report and log, and it just shows that the well was -- but he does say, specifically, 567.9 for the casing set, which is fine.

MR. WARNELL: And then it goes on to say --

THE WITNESS: It's really not fine, but it's what he said. He goes on to say that it was 2 3/8 casing, and it was

packer at 550, 4 3/4 hole drilled to 694 feet. And they used a little acid in it to clean it up.

Q. (By Mr. Swazo): And is there anything significant on the backside?

A. On the backside it shows the top of the Yates and the top of the Seven-Rivers at the same spot. So I think that was just somebody -- the big thing I saw on the backside is that it immediately took water under a vacuum. And the well was drilled to 694 feet, and they're calling it dolomite and a porous TD, so it was immediately a good injection well.

Q. Anything else with that document?

A. No.

Q. Identify Exhibit 1-F.

MR. EZEANYIM: Tell me why you think it was a good injection well.

THE WITNESS: It was injecting on a vacuum.

MR. EZEANYIM: On a vacuum.

THE WITNESS: Yes.

MR. EZEANYIM: Because I just want to understand why it was a good injection well.

THE WITNESS: That was a good point on that. On Exhibit 1-F, it just shows that it was spud 5/23/77, and that's pretty much it for that exhibit.

Q. (By Mr. Swazo): And Exhibit 1-G.

A. 1-G, the significance of that shows that the

actual location of the well is almost the extreme northern part of Unit letter O, and you need to kind of keep that in mind for what we're going to show in the future.

MR. EZEANYIM: Now, what did you say?

THE WITNESS: Its location is not in the center of -- and obviously, these saltwater disposal wells, we don't care -- there's no nonstandard location for them. But just showing that it's located almost at the northern edge of the unit within the section.

MR. EZEANYIM: And this is the Exxon State No. 8?

THE WITNESS: Yes, sir.

MR. EZEANYIM: Okay.

Q. (By Mr. Swazo): Identify Exhibit 1-H and the significance of the document.

A. 1-H, there's not a whole lot of significance except they were talking about it being a production well and not currently producing. This was in 1984, and I really think they meant not presently injecting, but I'm not -- you have to go with what -- but it says disposal up on top. The lease is not presently producing. There's a tubing leak on the well. But that's not a real significant exhibit.

Q. And do you know what the result was of that tubing leak? Had that tubing been repaired?

A. I'm sure it has by now.

MR. WARNELL: This could be the point where we went

from the 2 3/8 to 2 7/8.

THE WITNESS: It could have been the change.

MR. EZEANYIM: What's your guess? Because what is the tubing? Is it 2 7/8 or 2 3/8?

THE WITNESS: It doesn't say anything about changing the tubing size, and that was only eight years after the -- or seven years after the hearing order, so they probably didn't change it at that time.

MR. EZEANYIM: Okay. Go ahead.

Q. (By Mr. Swazo): To be fair, the tubing was probably repaired.

A. It was probably repaired, yes, sir.

Q. Okay. Identify Exhibit 1-I.

A. 1-I just shows the change of operator from Del Taylor, who obviously wasn't the original operator but he was wasn't -- and it changed to Blue Collar. Exhibit I and Exhibit J are just showing a change of operator.

Q. Okay. And the Exhibit 1-K.

A. 1-K is showing the wells operated by Mesquite, SWD, Incorporated under their operator name and OGRID.

Q. And it does include the Exxon State No. 8, right?

A. Yes. And several other saltwater disposal wells.

Q. And identify Exhibit 1-L.

A. 1-L shows the history of injection into the Exxon or Pure State No. 8.

Q. And who created this document?

A. I printed it out and plotted it up from the GOTECH website, which is information that was supplied by the operator on the form C-115s, I guess.

Q. And so tell us what this shows.

A. It shows a couple of periods of inactivity. There's 31 months inactive from '95 to '97 and 12 months inactive right before Clay Wilson started injection again. And there's a couple of other things. It shows that there's about 4.4 million cumulative barrels have been injected since 2005. And it shows that the ramp up of injection from a lease injection well to a commercial injection well between the 2005/2006 time frame.

Q. Now, you said "since 2005." Does that include 2005 or not?

A. No, it doesn't. Since means after.

MR. EZEANYIM: Let's go back to the change of operator. When did that take place?

THE WITNESS: I'm sorry, Mr. Examiner. I brushed over that really quickly. It was 12/1 of 2005.

MR. EZEANYIM: The change of operator was 12/1/05. Now, go back to that 1-F.

THE WITNESS: Okay.

MR. EZEANYIM: Here from 1994 -- some part of 1994 to 1997, you have 12 months of inactivity.

THE WITNESS: There was no injection reported.

MR. EZEANYIM: So by then that was the new operator?

THE WITNESS: I don't know who was the operator then. Let's see.

MR. SWAZO: Well, the operator wasn't Mesquite at that time.

MR. EZEANYIM: It's not Mesquite, it's somebody else. So at that point, even the SWD -- I don't know how they do that -- the SWD-180 is planned. But I don't know what it is at that time.

Let's for a moment forget that and then go back to 2005. When did this current operator own the well? There was 12 months of inactivity.

THE WITNESS: On 12/1 of 2005, the change of operator that was signed. I don't know when the actual --

MR. WARNELL: Effective date it says 12/1.

THE WITNESS: But, you know, there's a time period between when they can start injection, which I'm sure they had to get it cleared with our field people.

MR. EZEANYIM: Okay. Now, one question is what is your testimony on from 1998 to 2004? Is this -- is injection into the 694 feet previously approved from 570 to 600; do you know?

THE WITNESS: It was probably down to the 694.

MR. EZEANYIM: Okay. Now, suddenly after 2005, the

injection volumes increased dramatically --

THE WITNESS: Yes.

MR. EZEANYIM: -- by the current operator.

THE WITNESS: Yes.

MR. EZEANYIM: Okay. Go ahead.

Q. (By Mr. Swazo): Identify Exhibit 1-M.

A. 1-M is just a letter from Daniel Sanchez asking for four items from Clay Wilson, or Mesquite SWD, concerning this well. We asked them, and they did run an electric log. Of course, if the hole was dry -- they ran the electric log from the bottom to the top, and they ran an injection survey. And they reported the first two items to us by the requested time.

Q. And this was done by Daniel Sanchez?

A. Yes.

Q. The UIC director?

A. And the Compliance Manager, yes.

Q. And why was this letter issued?

A. The letter was issued after January. The question about -- we were trying to figure out where the water was coming from through the well that -- our field people sent some pictures of water flowing down a gully from this Magruder well. And it got routed to me, and I noticed that this well was injecting into an open hole interval. And it was injecting large volumes at low pressures.

It's not unusual for us to ask for injection surveys on open hole injection wells because they're obviously not perforated, so you don't know where the water is going sometimes.

Q. So this letter was in response to the well that was back-flowing?

A. It was -- it got kicked in motion by that well, yes, and its proximity to Carlsbad and also the location above the Capitan Reef. So it became kind of a high profile issue.

Q. And identify Exhibit 1-N.

A. It's just showing that Mesquite actually did the asked for work. They ran a log and they ran the survey.

Q. And Exhibit 1-O is the survey that they ran?

A. Yes. Exhibit 1-O is the survey. It shows what Kay pointed out that the bottom log interval was 690. The driller's depth was 694, and the logger's depth was 692, which is pretty good, really, considering. Sure, they just went in and that was their measurement on their wire line. And I'm not -- they didn't have another log to -- they didn't have an original log to get on depth with.

So they, you know -- the difference between 692 and 694 I don't think is real significant. But it is showing -- it pretty much confirmed the depth of the hole. And that's --

Q. Let me clarify. Exhibit 1-O, 1-P and 1-Q are all of the same log?

A. Yes. And Exhibit 1-P, which shows the velocity results. As you can see from the table on the velocity results, it shows 100 percent flow. If you notice the reference rate was 6700 barrels a day, 100 percent of the fluid was going in until they dropped down below the casing into the open hole interval, and they saw a zone that took maybe ten percent.

And then pretty much that was it until they got down closer to the bottom. And then they got another like ten percent. And then on the very bottom they say that the rest of the fluid was going out the bottom, or the bottom part of the hole, or bottom of the hole.

But that's pretty much all that Exhibit 1-P shows.

Q. And how much does it show going out the bottom of the hole?

A. Well, 73 percent of 6700 barrels a day. That would be 4903.77, according to this.

MR. EZEANYIM: Going out of the zone?

THE WITNESS: No, not necessarily going out of the zone. Going out at the bottom of the hole. Whether it's going out directly there or whether it's going out in the last two feet or so, the point is, it was dropping out pretty much at the bottom. But not all of it. Some of it -- if you'll note, some of it was going out right below the casing.

And this, like Kay pointed out, the good thing about

running these a lot of times, as you can see on Exhibit 1-Q, by following that, you can actually confirm where the packer is set. You confirm all the collars and you confirm the bottom of the casing at 587. You see that little blip there above 600 feet on the left side?

And you see your tracer survey is showing where it's showing. And if you look over on the right, the temperature log starts to cool right above that, also, so it kind of confirms what it's showing. And then if you'll go down to the very bottom of the hole, your temperature log just really deviates over to the left.

And so it is good to run these things sometimes. It checks the bottom of your hole and sees where the water is going and finds out where the tubing is at. And in this case, we didn't even have log on this well, so they also ran an electric log on this well, which I'll show you in a few minutes.

MR. WARNELL: This gamma ray, is this gamma ray reflecting the iodine in the hole? Or this looks like a background gamma ray to me.

THE WITNESS: It's a background.

MR. WARNELL: I don't know see anything on here dealing with a tracer.

THE WITNESS: On the left side. Oh, I didn't copy that. All of the tracer passes were in -- they were either in

a separate part of the log or where they would shoot a little bit of the tracer and they would log through it to see where it moves in the well. And this gamma ray is a background gamma ray. It's the natural --

MR. WARNELL: Yes. It is done --

THE WITNESS: But if the hole was empty -- obviously it wasn't -- they weren't injecting at this time. But on the other log, the C&L, if the hole was empty, those porosity readings are probably not very good. But the gamma ray would probably be okay.

MR. WARNELL: Well, the neutron doesn't care for holes with fluid in it.

THE WITNESS: It doesn't matter. Even sidewall neutron versus C&L.

MR. WARNELL: Yes.

THE WITNESS: Okay.

Q. (By Mr. Swazo): Identify Exhibit 1-R.

A. 1-R is an attempt to quantify what the permeability would look like in the bottom of the hole. This is just a history, a quick attempt to history match, the 4.4 million barrels injected over 24 months, about 6,000 barrels a day.

The main thing here to look at is that I got a decent match by coming up with ten darcies of permeability over 20 feet, which is kind of a conservative -- I mean, Kay said

ten feet. If you go ten feet, then that means your permeability is a lot more and 10 darcies and, obviously, 10,000 millidarcies, which, you know, reservoir rock would be I would say closer to 5 millidarcies.

So you got a gigantic permeability here.

MR. EZEANYIM: Where did you get the input data for this?

THE WITNESS: The input data, as I've been questioned over the previous few days by my attorney here, is actually -- you see the reserves number? That's 4.4 million barrels. And as you move up there, you see the porosity number, 35 percent. Kay said, if I remember him correctly, 25 to 30 percent, something like that.

As you move up, 24 months, that's how long it took to inject the 4.4 million. As you move up further, there's 6,000 barrels at the beginning of the period and 5950 at the end. Obviously, he's not -- our field people are saying that he might be hitting a little bit, a tiny bit, of pressure in his well right before it got shut in. I don't know if he's seen that or not or if what they saw was real.

And then as you move up further, well bore radius .35 and formation thickness of 20. This is just a little iterative history match, spreadsheet, that I've had for probably 15 years that you can use to quickly match injection or production and come up with some parameters that you don't have from that.

It's just something petroleum engineers do.

Q. And you created this document?

A. This is one of the freebies that was given to us years ago.

Q. I mean, you performed all the calculations?

A. Yes, yes. I plugged it in and did the matching of the numbers.

Q. Okay. What's the significance of the ten darcies?

A. It just signifies that it's extremely high permeability out there, and it's abnormally high for any kind of reservoir rock, which is -- you can kind of -- I'll let the Examiners reach their own conclusions about that. But I would say, if you look at the next -- can we look at the next exhibit?

Q. Yes, identify the next exhibit.

A. The next exhibit is a little reef on a pinnacle reef up in St. Clair County, Michigan. And, obviously, different reefs build a little bit differently, but from what I've read about reefs and about the detrital sediments around the reefs and from the tight rocky stones to the big green stones, that when you get real close to the reef, you get some permeabilities that are in the range of what I found.

So that's all I was trying to show here.

Q. With this document?

A. Yes.

MR. EZEANYIM: I mean, where did you get this data? Did you make some assumptions?

THE WITNESS: I thought I might get -- you mean this pinnacle reef data?

MR. EZEANYIM: Did you assume that information of 20 feet? Because I know you plugged it into that, you know.

THE WITNESS: 20 feet. We know some of the -- we know the well is on a vacuum, probably on a vacuum from up on the hill where the tanks are above the wellhead. But we do know that some of the water is going out right below the casing, just a little bit. But we know most of it's going out below. So if some of it is going out right below the casing and it's obviously not building, it's obviously got a pretty good permeability there also.

MR. EZEANYIM: Yeah. But what about your skin factor?

THE WITNESS: Well, I used a negative 5 skin here. They asked about the --

MR. EZEANYIM: Okay.

THE WITNESS: I obviously couldn't use zero and get a match, so I used something negative on the skin.

MR. EZEANYIM: Okay. Proceed.

Q. (By Mr. Swazo): Exhibit 2-A?

A. Exhibit 2-A is a locator map showing where the

well is located, the Exxon State No. 8.

Q. And the Exxon No. 8 is in the center of those two circles?

A. Yes. I just drew a couple of circles there.

Q. And the inner circle is a half-mile radius of the Exxon State well?

A. I think that's what it was, yes.

Q. And the outer circle is a one-mile radius?

A. One-mile radius, yes. And it shows Carlsbad off to the left, the lower left, to the southwest there.

Q. And identify Exhibit 2-B.

A. 2-B, we've been talking about that today here. It's from the same data, the Hiss report or the Hiss data set.

It shows what we use here at OCD as the lateral boundaries of reef. And we look closely at any well that's drilled within these lateral boundaries of the reef. And it also shows where the Exxon State No. 8 is located. It's generally in the center of Township 21 South, 27 East.

You kind of need to remember that it's in the center of that township and in Section 15. So it's not generally in the center to the northern part of the reef. It's closer to the southern part -- or actually, I guess, the southeastern part of the reef. And there's the City of Carlsbad right there. It's a locator map.

Q. Identify Exhibit --

MR. EZEANYIM: Before you go away from that exhibit, No. 2-B, when you look at the reef, are those the concentrations? Is this the gradient that you are trying to demonstrate?

THE WITNESS: Those numbers on there?

MR. EZEANYIM: Yeah, yes.

THE WITNESS: I wasn't going to talk about the numbers yet, but I was going to show it later.

MR. EZEANYIM: Okay. As long as you can go there, because my eye just caught that. Okay. Go ahead.

Q. (By Mr. Swazo): Exhibit 3-A.

A. 3-A is, I pulled all the production and injection, actually, all the wells in this township, and I found six injection wells in Township 21, 27, and I sorted them by descending order of water injection in 2007.

As you can see, the Exxon State No. 8 is the top injector in the township, and it's operated on a skeet. And then Bill Taylor operates Welch Federal No. 7, and that well is also in the Yates formation, but it's located to the north and to the west in the Cedar Hills Yates field.

And on the bottom part of that exhibit is all of the -- well, I didn't show all of the producers in the township, but I sorted all of them by the major producers. And the top producer in the township, as you can see, is Bill Taylor's for water -- this is water -- is the Welch Federal

No. 6. And it looks like it's in Unit O of Section 5. And his injection well is in Unit P of Section 5, and as you look at the volumes, you'll see that the volumes are almost exactly the same.

So from that, it looks to me like his well is a lease injection well. It's just taken his big volume water producer and turning it around and dumping it back into his. So it's the same water coming out and same water going back in. And the next thing to notice about this, though, is that over on the fourth column in the right, the formations, you'll notice the injection wells are in the -- well, I think the Exxon State No. 8 is in the Yates Seven-Rivers formation. And the Welch Federal No. 7 is in the Yates -- or actually, I didn't look at that one too close except for the depth of it.

But the other four below, I wanted to make sure they weren't Yates injectors. And they're all Delaware injectors, which that formation occurs about 2600 feet, and it's below the Capitan Reef. So in this township, there's only six injection wells that I could locate, that are reporting injection, and four of them are Delaware wells and two of them Yates wells.

MR. EZEANYIM: The Exxon State No. 8 you said is Yates Seven-Rivers. So is that --

THE WITNESS: Well, we can talk about that pretty quick.

MR. EZEANYIM: Well, I just wanted to --

THE WITNESS: Yeah. I think it's Yates Seven-Rivers myself.

MR. EZEANYIM: Okay. Continue.

Q. (By Mr. Swazo): Exhibit 3-B is essentially the previous exhibit concerning the production for this well?

A. Yes, yes. For some reason, we put it in this place.

Q. Identify Exhibit 3-C.

A. 3-C is just showing that Bill Taylor operated Welch Federal No. 6 out of the Yates pool. Bill Taylor apparently operates some shallow producing wells around this area, but this is his biggest -- this is the biggest water producer in the township. So I just graphed it up so everybody can look at it.

Q. Would you explain it?

A. Did I sign it?

Q. What is its significance?

A. It's just extremely low oil production, and pretty high water, relatively, water production. I would say 500 barrels a day water and really low oil. So I think -- I don't want to guess what Bill Taylor's doing out there. He may be trying to sweep a little oil to his well with that injection well right next to it.

But I just wanted to show the biggest water producer in the township. That's all I wanted to show.

MR. EZEANYIM: Was Bill Taylor once the operator of the Mesquite?

THE WITNESS: I think at one time Bill Taylor did own this well, but the subject of this whole case is down in the Magruder Yates field. This well right here is in the Cedar Hill Yates pool, which was drilled in 1951. It's located up to the -- several miles to the north and west.

Q. (By Mr. Swazo): Well, at the top, it states the Welch Federal 6.

A. What did I say?

Q. It says Welch Federal 6. Is this showing -- the Welch Federal 6; is that a production well or injection well?

A. Yes, production well.

Q. And explain the water. Is that water coming from the Welch Federal No. 6 well?

A. Yes.

MR. WARNELL: That line down there near 0 is the oil production.

THE WITNESS: Yeah. He wishes they were reversed, I'm sure.

Q. (By Mr. Swazo): Identify Exhibit 3-B.

A. Exhibit 3-B is basically what I was leading up to here. The big thing on 3-D is to look at the triangles. These are reported water production in the Magruder Yates pool. This is the Magruder Yates pool, which we've been talking about

today. It's got several producers and as you can see, there was three producers for years, then it jumped to eight producers.

But if I was going to say how much water disposal needs were in that whole Magruder Yates pool, I would draw a line here around 300 and say it's around 300 barrels a day. Now, there's another -- the last -- close to the last point, it jumps up to 1,000 barrels a day. You could say that's statistically not significant, or you could say that all of a sudden one of the wells in the Magruder Yates pool all of a sudden got some water production for some reason.

But that was right at the beginning of 2005, so it's probably insignificant.

Q. Now, we're going to go out of order. We're going to go to the 5 series and identify Exhibit 5-A.

A. 5-A is just a schematic of what diorama of the Capitan Reef would probably have looked like 240 million years ago.

MR. EZEANYIM: Where did you get this?

THE WITNESS: The next few exhibits come from the New Mexico Tech website, and I just printed them out. We've obviously talked about the reef enough, but if we would have gone first, this might have been --

Q. (By Mr. Swazo): Exhibit 5-B, as in boy, that's from New Mexico Tech as well?

A. Yes. It's the same website. It shows the back-reef on the left, and then as you go from northwest to southeast then you grade from -- first of all, you've got the Salado on the surface. Sometimes it's eroded away from the surface.

Then you got your Tansill and then your Yates and Seven-Rivers and then it goes down into the Capitan and sometimes the Goat Seep Reef or the Dolomite or whatever it is below it. And the Delaware Mountain Group in that area is pretty much Cherry Canyon only. But then you get into the reef as you go further southeast.

As you see, those jagged edges there, that's what causes the issues today, I think.

And then as you go into the fore-reef areas off to the right or the southeast, down into the Delaware Basin. Well then, you don't have a reef anymore, and if you drill a well, you'll just -- you'll go through some of those shallower formations like the Castile -- well, actually the Bell Canyon, Cherry Canyon and the Brushy Canyon and the Bone Spring and down into the Pennsylvania age.

MR. EZEANYIM: Looking at that, do you feel that this Capitan Reef could be present in the Yates formation?

THE WITNESS: It's -- the Yates tongues into the reef, is what it shows here, and that's what it seems like it does to me. Because sometimes, like Kay pointed out on that

well, it might be oozing to the surface from time to time.

Well, that Magruder -- you notice he marked the Magruder at a different spot there than he did -- and he correlated it across. But you know there wasn't that much Yates left below that. So the Yates kind of goes away as you get further on top of the reef. At least that's the way I interpret it.

MR. EZEANYIM: Okay. Go ahead.

Q. (By Mr. Swazo): Anything else with this exhibit, Will?

A. This is just to show that it really just depends on where you drill a well out there what you're going to get.

Q. Okay.

A. That's it.

Q. Identify 5-C. Is that also from New Mexico Tech?

A. Yes. That just shows the limestones with all the little fossils and the little growths that became calcium carbonate. And if they got reworked and they got some water moving through them, it was magnesium-rich waters, they became dolomitized or calcium magnesium carbonate, which is a little more -- sometimes a little more permeability and more porosity, unless you have solutioning in the reef.

Q. And identify Exhibit 5-D.

A. Okay. 5-D is the State 22 Com No. 1, which is basically in Unit C of 22. And this well -- what we have here

is a log that penetrates the reef. And I wanted to show you practically how we identify the reef.

We have geologists in Artesia. We have geologists in Hobbs, and we have to look at logs here, ourselves, sometimes too. And we have to know where we're at practically speaking to know how to design wells and regulate how wells are designed.

So you can actually start -- the best place to start on this log is on the very bottom, the back of the log, at 2900 feet and work your way up from there. From 2900 feet, you see there's some sandstone.

On the gamma ray on the left-hand side, you see that it's a higher gamma ray reading, which means it's got more clays, natural radiation in the sands. It's got some sands. The Delaware sands occur there, and as you go vertically up the hole, as your log gets pulled up the hole, you get into a some really clean gamma ray readings. From 2600 to 2750 -- I don't know if that's the Goat Seep or what -- but it's extremely clean.

And as you get further up the hole from 2500, and if you turn the page back to -- actually, I didn't even print from 1400 to 2500 -- but it all looks like the same gamma ray. On the left-hand side, the pertinent thing to look at is the gamma ray and how clean it is going all the way up.

And we interpret that to be -- practically speaking,

we try to protect that area, and we call that the reef. It goes all the way up to the top. You see how it goes up to around 800 on this log. 845 feet would be where I would call that the start of the massive limestone.

And from there down would be a zone that you would -- that drillers, basically, they change their drilling fluid. They usually try to -- it's a different mud program. And practically speaking, that little -- from the -- those are the Yates sands above that. And below that, from 845 feet below, is the clean gamma rays.

The only things people have to look at out here are these electric logs. Because you can't, this is your view below the earth's surface. So the first really clean, continuously clean, gamma ray below that Yates end is what we call the Seven-Rivers Reef. And that's -- I'll show you on some more pages here what our geologists over the years have marked that.

MR. EZEANYIM: Do you have any idea of how many or the distance between this State 22 Com No 1 and the Exxon State?

THE WITNESS: This one, yes. It's about a quarter mile to the southwest.

MR. EZEANYIM: Of the Exxon State?

THE WITNESS: Yes. It's in Unit C of 20.

MR. EZEANYIM: Okay.

Q. (By Mr. Swazo): Identify the next exhibit.

A. The next exhibit just shows -- these are the geologist tops per Bryan Arrant. This is exactly -- this was also included in the application that Mesquite turned in.

And the significance of this is that Bryan Arrant picked the tops. This well is about a half a mile straight east of the Exxon State No. 1 well, and Bryan Arrant picked the Capitan limestone at 632 feet. And as you can see a big difference, a huge thickness between 632 and 3100 where he says the Delaware sands come in on that well.

Q. And who is Bryan Arrant?

A. Bryan was our geologist in Artesia for years and years and he got lured back into the oil industry here recently.

Q. Is that it with that exhibit? Okay. Identify Exhibit 5-F.

A. 5-F is just from another -- it's actually from the State 22 Com No. 1. This was estimated formation tops. As you can see, the person that estimated the tops here -- this is probably before they drilled the well -- they estimated it to be 750 feet. So it was a deeper -- in that well, it was deeper than the Exxon State. That's all I wanted to show on that one.

Q. And identify Exhibit 5-G.

A. 5-G just shows where -- this is the log in E of 23, but it just shows where somebody wrote the Capitan Reef

there. And they -- as you can see, it's the first pretty clean limestone below the Yates sands. This is just showing the methodology that's been used over the years out here.

Q. Is 5-H connected with 5-G?

A. 5-H is not, but it's the same concept. It's just a log out of our logging files, and it shows where somebody -- one of our district geologists picked 855 feet as the top of the Capitan. And then somebody else picked it down at 995 feet. But it looks like -- this points out that it's very hard to know exactly where the Seven-Rivers Reef really is and there's a lot of differences of opinion.

Q. Identify 5-I.

A. 5-I just shows a mud program on a well in Section 9, and it shows you what kind of drilling programs they wanted to use down to 610 feet. And then from 610 to 2970 was probably the Seven-Rivers Reef lithologies, and so they wanted to drill with freshwater to protect the reef.

And that just shows the general changing of a mud program. And they also -- they started looking for lost circulation in that interval. That's it for that one.

Q. Identify 5-J.

A. 5-J was an application to drill where the applicant wanted to use a certain program from 400 to 2600, and it got crossed out, and our district office put freshwater on there with an exclamation point. This was in 2002, and it was

signed by Tim Gum.

Q. So what's the significance of this?

A. Our district office has operators drill with freshwater through that general area, through the reef, or the Seven-Rivers Reef.

Q. So now we're going to go to exhibit, the 4 series. Can you identify Exhibit 4-A?

A. Okay. 4-A is e-mails -- basically, it's log picks in Section 15. As I understand it, Tim Gum in Artesia, who is acting geologist there, he asked Paul Kautz, who is our 26-year geologist, a very experienced geologist in Hobbs, to pick what he considered the top of the Capitan Reef in Section 15.

So these are the picks that Paul Kautz e-mailed back to Tim, and Tim sent them to me. And the big thing to know about this is it's not just that this is the absolute -- this was Paul's picks for the reef top. But the big thing is it's consistent on the logs. And I'll show you in a minute how he picked them on the log and they are pretty consistent from log to log.

Before you switch to the next page there, I wrote down the ground level elevations that these logs were measured from in this area and for each well. And from those, I ended up calculating above sea level cross section. The cross section of the planned view is right below you there. In

Section 15 and 22, it's a north/south cross section going from -- basically, using four wells in Section 15. The further south well would be the Exxon State No. 8. And then dropping off into a lot I could find in Section C of 22, which we already look at.

MR. EZEANYIM: Those API numbers, which one belongs to Exxon State No. 8; do you know?

THE WITNESS: None of those. In fact, the reason you see four of those here and you see only three plus Exxon State, is one of them was in Unit E. And I wanted to do a north/south cross section, so I said the second one down is not included in the cross section. So I didn't include that one.

MR. EZEANYIM: Okay.

THE WITNESS: Okay. The next page shows each one of those logs and the way Paul picked the top of the Seven-Rivers Reef. And as you can see, the first -- this was -- the first one was the extreme well to the north in Unit B. He picked 775 feet for the reef top there. And you can see how he picked it there. And if you look at the next well, you can see it's the same methodology he used.

And then the next well is the same methodology. This was on Exhibit 4-D, which was in J of 15. Now, J of 15 is directly north of the Exxon State well. And as you see this well, look up a little bit on the left-hand side on the gamma ray, and you'll see A, B, C. I wrote down A, B, C. I think A

is in the Tansill formation, and those others are in the Yates.

But the big deal I wanted to show you is how I correlated the log on the Exxon State No. 8, which is the next exhibit, Exhibit 4-E. As you can see, A, B and C, you can clearly see those members there. And you can put those logs side-by-side, and you can actually see them.

And if you go down to where on this Esperanza 15 State No. 1, which is the well right north of the Exxon well, you'll see how Paul picked the top. And that's where he picked the top. And then you can look across at the equivalent zone, which is kind of hard to find in the Exxon State No. 8, but what you have to do is -- we actually shrunk this exhibit a little bit, so it's a little hard to see.

Conservatively speaking, I came up on the top of the Seven-Rivers Capitan right at the total depth. I really think it's a little tiny bit higher than that, but the thickness from zone C down to the bottom of the Yates obviously changed from well to well.

And we are a little bit away here, so conservatively speaking 692, I think, would be a good number. And as you can see also at the bottom of the hole, 692, you see the gamma ray reading and how clean it is right there. Right at the bottom of the hole on the left-hand side of the gamma ray, how clean it is right there. So, obviously, to me, the person that drilled the well drilled down into that sulfur water and

stopped at that point and said that's good enough. We've got a good injection well.

So the next Exhibit 4-F shows by the same methodology -- this is the well in Unit C of 22, the reef top -- by the same methodology would be at 845 feet. Okay, you take those depths, you subtract them from the ground level elevation, you come up with above sea level depths, and you can plot them. On the next page, you can see the plot. It's a cross section.

This is the north/south cross section. This is using the same data that we just saw how we arrived at it. And on the left is the well in Unit B of Section 15. And on the right, the extreme right, is the unit in Unit C, the well in Unit C of 22. And as you can see, from north to south it looks like the reef actually built to basically the top. The Exxon State No. 8 looks like it -- to me, it looks like it's right at the pinnacle of either an erosional surface of the reef or the peak of the reef itself.

And there's a big difference between the Exxon State No. 8, the location, and down to the unit -- the well in Unit C of 22. So as you can see, it just drops off from there. If water is being injected right in the bottom of the hole, which we've already confirmed that it is, and if it don't go into the reef, well, that means that it travels basically along the top of that reef and any other well bores around there that are

uncemented or whatever would be a problem.

But it's possible that -- there's two possibilities. One that I see is that waters are going down into solution channels into the reef through the natural rocks. But John Simitz don't think so and Kay Havenor don't think so. So the other possibility is that it's staying in that upper interval in some sort of boundary rock down there which we can't see on the gamma ray, obviously -- which normally, when you see a radioactive zone in a gamma ray, that's a shale break, and it's a good stress barrier to keep injection down.

But John Simitz, in his article, he says that there's natural barriers in the top of the reef that he can see on the porosity log. Well, you can look yourself on the porosity logs and see if you can see those barriers. But we've got the same data that he's got. And possibly it does, or possibly it don't.

MR. EZEANYIM: On Exhibit 4-G you are saying the Exxon No. 8 is on the fringe?

THE WITNESS: I think it's at the top of the reef or the top of an erosional surface on the reef. Kay testified, if I heard him correctly, that the reef had been uplifted before. And when you uplift something and you expose it to the surface, you get these solution channels in the top just like you have south on the other side of Carlsbad, on the west side of Carlsbad right now. So that's a possibility. That's what I'm

saying.

MR. EZEANYIM: It is very close to the reef complex.

THE WITNESS: I think it's -- Kay said it was 50 to 100 feet below that. I think if you look at the correlation between those wells, you can do your own correlation.

Obviously, I didn't agree with the correlation in the C-108 that he turned in. Those depths in there were not exactly on the logs that I saw on the left or the right, so I couldn't tell really what was going on there.

But I did my own correlation and you can do your own and look at it and see, but it looks to me like the top of the massive limestone is right at the TD of that well. And I think they drilled off into it when they drilled that well and got a huge porosity permeability interval. And that was it.

Another thing I wanted to show you on this log, on this cross section, is when this well in Unit C of 22 -- we got to talk about this well a little bit more, because this well has caverns in the Capitan Reef in this well.

MR. EZEANYIM: Which well is that?

THE WITNESS: The well on the extreme right, Unit C of 22. And as you can see, it looks like by using that consistent method of picking the top, 845 feet would be the bottom of the Yates, the top of the Seven-Rivers, Capitan Reef. Now, they just plugged this well back. They just plugged this well this summer. And I can show it to you later, but we're

trying to go in a hurry here. I can show it to you.

But the plug that they finally -- they finally set a plug above a cavern at 1300 feet in this well. And the next plug they set was 750 feet, and they had to set that plug two or three times before they could get it to hold. And from 750 feet down to 1300 feet could possibly be a conduit down into the reef.

So this well, even though it has -- the cavern has now been plugged, which may have done a mortal blow to the Exxon State No. 8's injection capability, I think it's still a bit of a concern. That's it with this exhibit.

Q. (By Mr. Swazo): And Exhibit 4-H.

A. Exhibit 4-H shows where we all think the Exxon State No. 8 is located in that northwest/southeast cross section.

MR. WARNELL: Do you believe it penetrates the Seven-Rivers?

THE WITNESS: Well, it's kind of hard to draw the line on it right there. I think the Seven-Rivers Reef is really impossible to tell apart, so we pretty much try to protect both of them. And that's what Paul Kautz has told me too, in the past.

Q. (By Mr. Swazo): Now, we're going to go to the 6 series, and this is Exhibit No. 6-A. Please identify this and what's the purpose of it.

A. The purpose of this series is to show what I found in our records that people have submitted to the OCD in applications and what they have said about the waters in this area and the protectablility or not of these waters in this area.

And the first exhibit just shows that -- we already talked about it. The City of Carlsbad gets some of their water from the other side of the city, but it's from 500 to 900 feet deep. And that's all this was supposed to show.

Q. And Exhibit 6-B?

A. 6-B has two sides to it. It shows -- this is that resource map that Kay showed. And as you turn it over, the only thing I wanted to point out on here was a different -- these are actually -- they say in here that these are chloride salinities. These are not necessarily TDS salinities, and I don't know the percentage of chlorides in the TDS in the Permian Basin, actually, to tell you the truth.

I know up in the northwest side of the State it's about 50 percent, but that's a totally different province. You can see there's a township where it says Avalon, Lake Avalon. That is the township we're talking about here. And Section 15 is probably pretty much in the center of that township. And somebody said that the Yates had 5200 TDS here. That was on this exhibit.

Q. So this map shows water quality in the area?

A. It shows water qualities that whoever this Hiss guy or -- and actually, I have -- we can give the court reporter this, the big one. And I'd like to label it Exhibit 6-B, if you want. But it shows this is chloride iron concentration in the groundwater in the Permian Guadalupe rocks. It's by W. L. Hiss.

And this is just one -- I'm just throwing out items that I found here that were related to the salinity of the waters. And I don't have a real background as to where he came up with this, but I can keep going here, quickly.

Q. Yes.

A. Okay. Exhibit 6-C is just a C-108 submittal. This is two attachments, 8 and 11. This was by Randall Harris, who most of us know works for Ray Westall in Loco Hills. And this was on SWD-875-A, which was 2 of '07. This is recently. And this was in Unit M of Section 9, which is I want to say probably two miles away from here.

He said there's one inactive freshwater well. And he says there's possible drinking water overlying injection from 0 to 250 and in the Seven-Rivers formation from 1,000 to 2300. So he calls it Seven-Rivers here just like Kay did. Can we go on to the next one?

Q. Yes. Identify Exhibit 6-D.

A. Exhibit 6-D just -- all I wanted to show here was the same thing Kay had pointed out. This is in the Capitan

controlled water basin, this general area.

Exhibit 6-E is another geology comment on a form C-108. This was for the Myrtle Myra SWD #1 in May of 1990. And Randall Harris -- I guess he's been there a long time, because he's the one that submitted it. His comments were that the base of the freshwater is plus or minus 400 feet.

I think what he really meant was that's where we try to protect by casing off. And he says, "Second underground aquifer contains low salinity water in this area in the Capitan Reef, 2450 base." He doesn't say what the salinity is.

And Exhibit 6-F is another SWD application. This was signed by Gordon Jenner, the geologist of the company that submitted that application. He said, "Native freshwaters are encountered in aquifers from 0 to 592 feet below the earth's surface."

Exhibit 6-G was submitted with a water disposal application in this area, and they submitted the Spears freshwater well, a water sample from the Burton Flat lease. Frequently, on these SWD submittals they'll just tell us what well it came from or where the lease is from.

And on the map, you can actually go back and look at the locator map as well as I can, and you can see Sections 1, 2 and 3 of 21 and 27, which would be a little bit north and a little bit east of here, but that would be the Burton Flat lease. The total dissolved solids were 3844.

Okay, the next one was submitted with SWD-425. This is two-and-a-half miles northwest of the Exxon State well. This is from a depth of 532 feet. It was an oil well sampled, and it was 11,700 TDS. So it was a little bit over 10,000 there.

The next one is kind of significant. On Exhibit 6-I, this was for the Avalon Delaware Unit, the application to inject which is -- the Avalon Delaware unit is located four-and-a-half miles northwest of the Exxon State No. 8. And you notice what they say down here about the makeup water, where they're going to get the makeup water. It's going to be freshwater from the City of Carlsbad and from Bill Taylor.

And it also says that freshwaters occur primarily in the Capitan aquifer from 0 to 750 -- no, at approximately 750. And on the next page, they submitted water samples from Bill Taylor's water tank. This was 2840. This was obviously not drinking water, and it's obviously not -- cattle might not even drink it, but it's below 10,000.

And then the next one the water salinity was 5200, but the remarks down at the bottom says sample contains some Bill Taylor water.

And then the last page behind this is the water that actually exists in the Delaware formation. And this is real consistent with what you see for waters in the Delaware. It's around 150,000 TDS waters.

Q. And Exhibit 6-J.

A. 6-J. 6-J just shows the summary, a graphical summary of what I found out here. The majority of the water production in this township are in the Delaware formation, so they're probably -- and we know they're 150,000 TDS. And the rest of them are those gas wells in the Pennsylvania, and they are all around 50,000 TDS.

And those are the possible sources for any commercial disposal in this area. And if those are going into this well, that means -- and those are being produced below the Capitan Reef, if you make the waste water from below the Capitan Reef, pump it to the surface, carry it over and dump it on top of the Capitan Reef -- and this is the water salinities that I found in this area is 2.5 -- 2500 to 11,000 TDS. So you're dramatically contaminating whatever waters are there, from the data that I found.

Q. Identify Exhibit 7-A.

A. Okay. 7-A was an area of review, and it actually goes out to about a mile because we had this Magnolia well that was a concern. So I looked for all the wells within a mile -- within 4763 feet, to be exact. You can see the distances are sorted in order and this is all the wells that I found.

I think Kay actually turned in another couple of wells on his C-108 that I didn't even find on here. And he couldn't find plugging records on those, but he did turn those

in.

So I think one of the biggest concerns out here is -- as you'll notice on the right-hand side, most of these wells are plugged already. And these wells, a lot of them were drilled in the '50s, and they were plugged. So the way they were plugged may or may not be very good. And the typical well out here the surface pipe was set at maybe 160 feet, and sometimes they drilled from there on down to the sulfur water and they would stop. And that would be pretty much it. They set pipe, or not, from there, depending on how the well was.

And I wanted to show you just a few of the wells that -- I didn't look at every one of these wells. I know that Kay generated a whole bunch of data on those wells, so I just wanted to spot-check some of them, some of the shallower wells that were drilled around 550 feet, and then some of the deeper wells that were drilled through the reef down to the Pennsylvania gas zones.

And the next Exhibit 7 --

MR. EZEANYIM: Just a moment on this. All these wells are within a mile or half mile?

THE WITNESS: These are all within 4800 feet. The distances from the Exxon State are located in the middle.

MR. EZEANYIM: Okay.

THE WITNESS: That's assuming that all of the sections out there were 5280 by 5280.

MR. EZEANYIM: They're not all considered to be within the area of review?

THE WITNESS: You can draw your line wherever you want there. I did search for everything within a mile and then sorted it and then put it on this page. I cut it off at that point. I did highlight that Magnolia state No. 1 well. You can see it's 2911 feet away, according to this. So it is a long ways away.

MR. EZEANYIM: Okay.

THE WITNESS: And the next page, 7-B -- actually, the next few pages just summarize one page per well pretty much. 7-B through 7-G show the sketchy plugging that went on out here, and it was actually sketchy cementing and casing when the wells were drilled. Because this is right after World War II and maybe the oil prices were not too good, because they sure didn't --

MR. EZEANYIM: And this is on all these wells on the previous page?

THE WITNESS: This is on just some of them. I just picked some of them because I didn't think I could justify looking for every one of them here. And I thought the applicant -- obviously, they've got some more data on their application, and I think I pretty much -- all I wanted to show here is -- I should go over at least one of them.

How about 7-C? This was -- they wanted to plug the

well with five sacks in the bottom -- but I don't understand that -- to approximately 775 feet and then ten sacks with mud to the surface, two sacks for the marker.

So the big deal here I did want to point out something out there. And Tim Gum had the operators, or the operator out here, do some fluid levels out here. As you can see, poorly plugged wells, poorly cemented wells, and with all those open hole intervals, well, you have a problem if you ever hit pressure on your injection well. Because if that injection well ever starts pressuring up, you've got pandemonium, you've got lots of problems at the surface. So Tim Gum, being the old oil field guy he is, he did have them look for fluid levels out here. I saw that in here.

And also, another item I saw is that in Section 14, which is directly east of Section 15, there was a lot of wells where the casings on those wells were cleared with the State Engineer as far as the depth that they were going to set casing on those wells. I didn't find any of that in Section 15 for some reason, but definitely in Section 14. And you can take that for what you will, but it seemed like there was something they were trying to protect out here. And for a time, they were actually looking over OCD's shoulder.

MR. EZEANYIM: Okay. Let's go back to that No. 7-A. I'm seeing that your distances from Exxon State No. 8 are on all these wells, right?

THE WITNESS: Yes.

MR. EZEANYIM: Okay. Now, did you only put the 11,000 feet?

THE WITNESS: I put all the wells' depths.

MR. EZEANYIM: Okay. All the wells. For hearing purposes, I think concentrate on the ones that are 560, 589?

THE WITNESS: Those are the ones that probably have the most problems with the exception of a couple maybe -- well, actually, I should say for sure I know one and you guys might find more, I don't know -- of the deeper wells. Just that one that I was talking about earlier in Unit C of Section 22 that seemed to me definitely had been a problem. If you'll look on exhibit --

MR. EZEANYIM: Before you look, is there any reason why you should include these wells in the well information, the ones at 11,000 feet?

THE WITNESS: Well, those all penetrated the injection zone.

MR. EZEANYIM: Okay.

THE WITNESS: Frequently we're dealing with injection below 700 feet, so we exclude the shallow wells from our analysis. You can point out, too, that there are some wells that were shallower than the TD of this well, but I think you have to look at where they set the pipe on this well. Because they did see some fluid going out right below this casing

depth. You probably need to look at that.

And also, you need to remember -- at least what I found, and it think what Kay said also -- is they drilled these wells for producers, and they drilled down until they hit that sulfur water. And they said, that's it. And that sulfur water was I think -- I don't want to say what Kay said, but I think he said that still was in the Yates.

And I think the sulfur water probably could be considered in the Seven-Rivers. But anyway, they stopped at that point. And that was different depths. And I think that depth too, the sulfur water, whatever that extremely high permeability formation is that has that sulfur water in it was encountered at different depths in these wells.

So you can't just totally throw out any well that's not exactly that depth. You have to kind of consider that -- just like when you drill a water well in the Ogalalla, you drill down to the red beds and you stop. Well, here they drilled down to the sulfur water and stopped.

MR. EZEANYIM: How do you get the radius distances for the Exxon State No. 1? Is that by calculation?

THE WITNESS: I have a computer program. I have to do this all the time, so I just download the general area and I throw it in there and it'll give me the distances and then I sort it.

MR. EZEANYIM: Thank you. Continue, please.

THE WITNESS: Okay. Can I talk about 7-H?

Q. (By Mr. Swazo): Go ahead.

A. 7-H, this is the well that I was talking about in Unit C, Section 22. And this well was drilled down to 11, 12,000 feet almost. And they had all kinds of problems with this well, and there was problems with the original cementing of it because of thief zones. It turns out it looks like there were caverns in the well. This well is about a quarter mile a away from the Exxon. And it looks like to me if you follow that sulfur water place, it's down dip from it.

MR. EZEANYIM: From the Exxon State?

THE WITNESS: The Exxon State. Now, as far as where the water goes from the Exxon State, nobody really knows. From what I heard Kay say, he said it was going southeast. Of course, the reef kind of goes northeast, but he said it's going southeast. And nobody asked him why he said that, and he didn't say that I heard. But, anyway, this well is south and west of that and -- but it seems to me it's down dip.

MR. EZEANYIM: Okay.

THE WITNESS: On 7-I you just see the -- this is where they actually set the plugs. The key one to look at, look in the center of the well, look down at the top, you see plug No. 11 is at the surface, plug No. 10 is across the -- is from 523 to 723 and that casing around there is gone because it says that they pulled 1600 feet of casing out.

So that well bore diagram is not totally accurate in that respect, but the next page says exactly the detail and what they did. Then they set that plug No. 9 at 1400 feet above that cavern they found in the reef. So from my cross section, it looks like there's a problem between 750 and 1400 feet. It looks like there could be a possible conduit there.

Now, if there's no other porous part of the reef between plugs 9 and plugs 10, there may not be a problem. But they had a lot of trouble setting that plug No. 19, and they finally said that they did get it set, and that was just this last summer. So it's possible that this could have done some damage to Mesquite's SWD well. But it still seems like it's a bit of a concern just after I drew this cross section.

If I hadn't drawn this cross section, I wouldn't have noticed it being a concern. And this was approved. This plugging was, obviously, witnessed by our inspectors and our acting geologist in Artesia obviously had some say in where the plugs were going to be set.

MR. EZEANYIM: This well was plugged this year?

THE WITNESS: This summer. That's what I see. On the next page of the exhibit, you see the date of the work.

MR. EZEANYIM: Okay. Yeah.

THE WITNESS: So we have already talked about that exhibit. But on the 24th of July is where they were trying to

do all that.

MR. EZEANYIM: This was plugged by BEPCO.

THE WITNESS: Yeah. And the next is just to talk about the well that had the water flow.

Q. (By Mr. Swazo): That's Exhibit 7-K?

A. Yes, I think so. Well, this No. 7 is -- yeah. It's in Section 13, if I see that. But let's go to 7-L. It just shows you another -- how they repaired the casing there. This was in Unit O of 15. This was obviously -- this might be one of the wells that are being produced right now, actually.

So what it shows to me is if their injection well ever gets any pressure on it, there's going to be some problems in that general area, at least as far as something moving up. Maybe it won't hit problems. I don't know.

Exhibit 7-N shows Tim Gum requiring the fluid level to be checked. This was in the Pure Exxon State No. 7, and this was exactly what they testified to earlier. The fluid was -- well it says 28 feet off the bottom, but it was pretty close to the bottom.

And the next, Exhibit 7-O, is just exactly what I found -- the same thing Kay found on the well that's oozing oil to the surface, the Magnolia State No. 1. The reason you see no plugs set here is because I couldn't find any record of plugs. But there is a dry hole marker at the surface.

As you can see, the 7-inch was not -- it was just

barely cemented. And then there's a huge open hole from 212 feet down to 540 feet. Which -- now, I don't know why they stopped drilling that well at 540 feet, but I can imagine it might have been because they hit that sulfur water. And Kay's cross section pointed out that from 540 feet, if you take the vertical distances out here and above sea level, from the numbers on his cross section, you can see there's about 25 feet or so between the bottom of casing where the injection survey did show some water exiting on the Exxon State and this well, and it's 2900 feet away.

So we've a distance of 25 feet vertically over 29 feet laterally, and you tell me if that formation could vary that much. I assume it could. But that's just assuming they did hit the sulfur water in the bottom and that same zone is correlated to the other well. One thing is -- you want to talk about these pictures, or not.

Q. Let's go back a little bit. You testified that -- I wanted to talk about the Magnolia State No. 1 well, the well that had -- was back-flowing accordingly. When did you get the report of the well back-flowing? You said January of 2008?

A. They said -- I just saw it the end of January, some time in January, yes.

Q. Okay. And they sent you pictures?

A. Yeah. Not just me, but I was one of the -- I

wish I hadn't ever gotten these pictures.

Q. Did they -- was there any mention concerning the Exxon State well?

A. There was. Mike Bratcher sent the pictures. He seems to be a budding photographer. He said that there was a well out there that was injecting big volumes at extremely low pressures.

Q. And Mike Bratcher is a compliance officer with the Artesia office?

A. Yes.

Q. And are these the pictures that Mike sent, Exhibit 7-P?

A. I think they are. I remember -- yes. And at first, he had the wrong well. But then he corrected it and he came up with the Magnolia State No. 1.

MR. EZEANYIM: So what are we looking at in these pictures?

MR. SWAZO: Yes, thank you.

Q. (By Mr. Swazo): With regard to Exhibit 7-P, what are we looking at?

A. It just shows that some oily waters are moving out on the salt brush there. I don't know where 7-P is. Oh yeah, I see it. Yes, it shows -- it's black and white, but it shows -- it looks like it.

Q. And Exhibit 7-Q, are these also pictures that

Artesia took?

A. Yes.

Q. And are they also at Magnolia State No. 1 well?

A. Yes. But these look like February the 19th, bubbling out at the surface around the well bore.

Q. And 7-R, can you identify those pictures? Were those pictures that --

A. 7-R is the same well. This was September 12th and there's nothing coming out of that well.

MR. EZEANYIM: Why is that?

THE WITNESS: In my opinion -- I just know it was flowing in February, and it's not flowing now. And the big injection well in the area was shut in between the time it was flowing and it quit flowing.

MR. EZEANYIM: Did somebody clean it up? It looks clean to me.

THE WITNESS: No, it's just the way the pictures look. They're not cleaned.

MR. EZEANYIM: Okay. Go ahead.

THE WITNESS: That was all I had.

Q. (By Mr. Swazo): So when you got this report concerning the Magnolia State No. 1 well, did you look at wells in the area to see if they could be contributing to the well?

A. I did. I just looked at all the injection wells in the township and tried to figure out the ones that were

shallow and the ones that were deep.

Q. What did you come up with?

A. I focused in on the Exxon State well because of the high volumes and the low pressures.

Q. Is that well the nearest saltwater disposal well to the Magnolia State?

A. I think it is.

Q. Was there another injection well that was also injecting into the same formation?

A. Yes.

Q. And did you consider that a possible contributor to this?

A. Well, that well is the Taylor well, and it's over in, I think, Section 5, which is several miles away, so I didn't consider that one.

Q. And what is your opinion concerning whether or not the Magnolia State No. 1 well is properly plugged or not?

A. It's definitely not plugged properly.

Q. And prior to this January 28th -- or January 2008 -- e-mail, have you received any reports of any back-flow occurring at the Magnolia State No. 1 well?

A. No, but I don't get called about things like that because I'm not a surface guy. I like to consider that I work on downhole stuff pretty much. I don't deal with surface issues, unless they are affected by any injection wells.

Q. And can the injection into the Exxon State No. 8 well with the high volumes, could that affect correlative rights?

A. Only if it invaded -- when people apply for a saltwater disposal well, they notice mineral interest controllers in what we usually consider a half-mile area. And at that time, the issue of correlative rights gets addressed. So it can only affect correlative rights, in my opinion, if it damaged some potential Yates oil or gas production intervals.

Q. And in your opinion -- well, didn't you testify that you believe that wells could provide conduits to other formations?

A. Yes. Yes, poorly plugged wells could and poorly cemented wells, especially if there's pressure on an injection well.

Q. I just want to draw your attention to Exhibit 5 -- Mesquite's Exhibit 25. I'm sorry. I have it right here, Mr. Jones, and I'll show you it, specifically, the correlation that Dr. Havenor did. Did you have an opinion with regard to correlation?

A. It looks like what I had called the A, B and C zones correlate real well. The trouble I found when I looked at this is that the log on the left side doesn't seem to correspond with what I could find the log of the header of that. The header of that well says it's Esperanza 15 State,

and it didn't seem like that was the same log.

But the biggest thing with this correlation is the depth column, the first depth column you see from 400 down to 900 feet, it didn't seem like that corresponded with -- well, it obviously don't correspond with the Mesquite well, because that was drilled to 694.

And the -- yeah. The depth on the Mesquite well is the next depth track over. But this depth track with this well didn't seem to be a right depth track. So I ended up drawing my own correlation after that. And everybody has access to the same data, so, I couldn't totally agree with this without checking it myself. And that depth track didn't seem to match to me.

Q. Match with what?

A. With the log on the left. It didn't seem like the header matched with the actual log trace, and the depth didn't match with the log. So I think it needed to be looked at a little closer there.

Q. Now, the reason why we're here today is, obviously, Mesquite is here seeking approval for authority to inject at a depth of 700 feet. Do you think their application should be approved?

A. Well, I think this was definitely beyond the scope of an administrative application, and I think it was a good thing this came to hearing so everybody could stay here

until 7 o'clock at night.

But as far as whether it should be approved or not, I have concerns about the wells in the general area if this well ever catches pressure. And then I have concerns about also that deep well in Unit C of Section 22 to the south there.

So I think the area of review needs to be looked at a lot closer and maybe some wells fixed. Also, I don't like the idea of the 150,000 TDS waters being pumped below the Capitan Reef up on top and then dumped on top of the reef.

But I understand our rules say that if it truly is waters above 10,000 above the reef, then our rules don't say you can't do that. And we don't -- but from the data that I found on the submittals around this area, it seems to me like the waters are or were protectable at least where this well might affect. Maybe not right there right around that well at this time, but after four million barrels of injection over two years, I think it's going to get into something that might be or could be considered protectable.

And so I think there's a well in that same unit that's got, I think, 8-inch casing down to the Delaware. And the Delaware at around 5,000 feet sometimes makes a pretty good injection interval and it's big casing, it's below the reef, you wouldn't have to move the equipment. The well is making a little bit of gas, but Mewbourne might want to sell it. It's a lot less than 100 MCF a day right now. So I'd to have say no,

I don't think it should be.

Q. So what are you asking for in this case?

A. I'm asking --

Q. What would your recommendation be in this case?

A. My recommendation would be that the well, if it's approved for injection at all, it would be limited to injection of only the Yates formation -- from waters from the Yates formation originating above the reef.

Q. I don't have anything else. Is there anything else that you would add? Anything that we forgot or anything else you would add?

A. No. I think we've covered it here. We can't really -- we don't really know where those waters are going, and I don't think you can tell exactly where that porous interval of reef really is.

MR. SWAZO: At this time, I would move the admission of my exhibits, and I would pass the witness.

MR. EZEANYIM: Which exhibits do you want to admit?

MR. SWAZO: All of the exhibits.

MR. EZEANYIM: Any objections?

MR. HNASKO: No objections.

MR. EZEANYIM: The exhibits will be admitted.

[Respondent's Exhibits 1 through 7 admitted into evidence.]

MR. EZEANYIM: I think we're done, but before I allow

you to go, there's one thing I wanted to ask before I forget it. I'm not going to ask your opinion or your judgement. I'm going to ask you from an engineering standpoint. Do you think the injection into this Exxon State No. 8 is causing that seepage in the Magnolia State No. 1, from an engineering standpoint, not your opinion?

THE WITNESS: I think it's a geological issue. I think from an engineering standpoint, you're talking about head of water. And I think while the well is producing, or is injecting, the water is coming from the tanks which are on top of the hill down in the valley to the wellhead and down in the well. So I think there is some -- there is enough u-tube that it could possibly be influencing that well. Yes, I do. At this permeability, I would have to say yes.

MR. EZEANYIM: And you are saying from the judgment a lot is happening that is injected from that u-tube head, and that well, the Magnolia No. 1 is about 2,900 feet from the Exxon State No. 8?

THE WITNESS: It's a long ways away.

MR. EZEANYIM: So that's why I'm asking that.

THE WITNESS: But we have pictures of it not injecting and it bubbling while the well was injecting. We have pictures of it dried up in September.

MR. EZEANYIM: And remember the injection is under a vacuum.

THE WITNESS: It's a vacuum on the surface of the well. It's creates a vacuum because the water falls in the well. The water falls because there's not enough pressure in the formation to hold it up to a certain fluid level. But it will fall down to the fluid level where it reaches equilibrium, and then it will stop. I understand that it falls all the way to the bottom of the well, but -- so the first thought is that it goes into some cavern somewhere.

MR. EZEANYIM: What is your answer to my question? What do you think? I don't want to use the word "think," because it's not thinking. It's your judgment from geology or engineering, you know?

THE WITNESS: I don't think you could put a tracer in it, and it would take probably two years to see anything, even if it was. I think a sample should have been caught of the fluid coming out of that well to see what the TDS was of it and see if it was higher than Yates TDS. I think Yates TDSs are a lot lower than even the Pennsylvanian waters. But, obviously, they can vary, and we've had testimony of that today.

MR. EZEANYIM: Okay.

THE WITNESS: I just have this evidence, and I wanted to show it here. And I would hate to just say that it is, because I have the same evidence that you guys have. I know those tanks are up on top of the hill.

MR. EZEANYIM: Okay. I understand that. Do you have

any cross-examination?

MR. HNASKO: I do have a brief cross-examination.

MR. EZEANYIM: Could you do that quickly?

MR. HNASKO: Yes, I can.

CROSS-EXAMINATION

BY MR. HNASKO:

Q. Mr. Jones, thank you very much for your testimony. I take it when you were looking at the Magnolia No. 1 seepage, you did not investigate the potential connection between the Magnolia No. 2.

A. I didn't, and that's interesting what he found.

Q. And is that something that your office would look at in the future?

A. I think we would. Our procedure is to try to get the well plugged, and if it's an orphan well, obviously, we put it on a list and it gets plugged by us. But if it is determined to be affected by an injection well around it -- because Rule 703 says all operators of injection wells have to make sure that the waters injected in the same zone and don't somehow migrate out of zone or to the surface -- so if we do find out that it has been, then we would probably go after the injection well operator to plug it. That's the way I understand it. That's a compliance issue.

Q. I understand. You've got a menu of options available to you, but what I'm interested in is from an

engineering standpoint, you have not investigated the lithologies and potential communication between the Magnolia No. 2 and 1?

A. I have not.

Q. All right.

MR. EZEANYIM: All right. Before you go any further, let me clarify something. Because maybe from what I understood from Dr. Havenor's testimony, the reason why you should look at Magnolia No. 1 and No. 2 is to demonstrate that it might be caused from either one of them, either one of them causing that oil to seep out of there.

Because if you look at the depth of those two wells, they are -- they don't -- they didn't go to the injection zone. And I don't think even Dr. Havenor thought those wells were in the area of review wells.

MR. HNASKO: That's correct.

MR. EZEANYIM: He didn't even consider that. Then the reason why you brought it up is to demonstrate. Because given maybe because of injection, that seepage is coming, but now you took another well and maybe it's from here. But it's not part of the area of review that I might be looking at when I review that.

MR. HNASKO: I understand.

MR. EZEANYIM: So when we're talking about Magnolia No. 1 and No. 2, and they're not part of the area of review,

are they supposed to be part of the area of review?

THE WITNESS: I expanded the area of review to include that Magnolia No. 1.

MR. EZEANYIM: And the reason being?

THE WITNESS: Because it was potentially being influenced by the injection well, and I wanted to see how far away it was, and it turned out to be between a quarter mile and a half mile -- I mean a half mile and a mile away.

MR. EZEANYIM: So now, if you look at one-mile radius, then it includes --

THE WITNESS: I don't know if it includes the No. 2 well. I thought Kay said that well was 1300 feet away.

MR. WARNELL: 1900.

MR. EZEANYIM: 1900 from No. 1. And then the No. 1 is 1300 feet.

THE WITNESS: From the Exxon State, yeah.

MR. EZEANYIM: If even if you expand it to one mile, you may not get No. 2. But I don't think you're not even going to get one mile would between 640 feet. I don't know. But are they part of the area of review in this case?

THE WITNESS: I do have a opinion on that. And we have seen -- when you inject fluids at such shallow depths, your stress -- you have obviously this high permeability zone, but you also have differences in the stress regimes that change once you get to a really shallow interval. And your vertical

stresses sometimes become not the primary stress and your horizontal stresses become primary. So one of your horizontal stresses becomes the biggest stress, which means that your fracture, instead of going vertically, it turns in a plane horizontally and it can go a lot further than half a mile.

MR. EZEANYIM: Okay. Mr. Hnasko, can you go?

MR. HNASKO: Thank you so much.

Q. (By Mr. Hnasko): You talked a lot about salinity contents of the Yates formation wells; do you recall that?

A. Yes, some of them.

Q. And you said the water from the oils producing in the Yates formation ought to be disposed here and you said not deeper waters. So I want to direct your attention to the salinity contents of the Exxon State No. 3, the TDS concentration of 114,000 parts per million. That's a Yates formation well, correct?

A. It is. 1, 2, 7 and 3, I think, are.

Q. So roughly the average amount there is about 105,000 parts per million?

A. It's pretty high.

Q. Yeah. It's pretty high. It's not protectable water, correct?

A. No.

Q. And the sample obtained from the Exxon State No. 8 holding tank, which is a composite sample of all these

waters, you testified shouldn't be in there and it's actually less than 80,000 parts per million; am I correct?

A. Yes.

Q. Mr. Jones, you mentioned a lot about that there could be a problem -- there could be a problem if this well develops pressure and ceases to accept water in a vacuum.

A. Yes.

Q. And to your knowledge, that had not occurred since 1977?

A. No, it hasn't -- to my knowledge.

Q. And we've seen no evidence today that the acceptance of water on pressure is going to occur?

A. No.

Q. Mr. Jones, you also talked about earlier in response to questions from Mr. Swazo -- I don't want to look at the obvious -- but you talked about these prior orders 5217, and one of the orders 5217-A, referring to produced water from the reef, correct?

A. Yes.

Q. Now, you've always taken the position that it's the SWD that controls the matter; am I correct? SWD-180?

A. SWD-180.

Q. That's the order, isn't it?

A. Well, I'm continuously told by our legal representative that if a hearing order is issued, then it

overrides, actually, the rules. The SWD -- it's my opinion that the SWD -- the wordage in the SWD-180 was -- I hate to say boilerplate, because it's definitely -- we have to go by that. But it did not say that it could not be off-lease, but the hearing order did that allowed the subsequent SWD-180.

Q. But the hearing itself did not allow Mesquite to inject at any depth; is that correct?

A. Oh, it allowed the operator of the well.

Q. Excuse me. The operator. But that wasn't the operative order that authorized injection into a well. We had been told -- you told us we needed an SWD, correct?

A. That's true. All it did was allow the operator to -- whatever the language said in that A order, and it allowed for the subsequent substitution, basically, of another well. But you did have to get an SWD order.

Q. It also allowed for administrative approval by the OCD of subsequent disposal wells and drilling, correct?

A. It did.

Q. When we took the position that those subsequent approvals, by virtue of the APDs that were issued, were done in 5217 and 5217-A, we were told that, no, because SWD-180 is the controlling document, correct?

A. I don't remember saying exactly or if I was even the one that was the guy that said that, you know. It could have been somebody else around here.

Q. It might not have been you, but it was somebody within the Oil Conservation Division.

A. Yeah. I think -- I wasn't involved in the emergency order at all.

Q. I'm not talking about the emergency order. I'm just talking about the authority. As a matter of fact, the Hearing Examiner, when we were at the pre-hearing conference said, "What does the SWD-180 say?"

A. Yeah.

Q. And that document does not constrain the locations from which produced water may be received; am I correct?

A. No, it sure didn't.

MR. EZEANYIM: I wanted to clarify on that. We're not going to bring in Order No. 5217 or 5217-A, because they don't concern Exxon State No. 8. Our concern is the Exxon State No. 8 and the SWD-180. What 5217 says, I think it authorized Pure State to inject. Then a few months later, the operator changed their minds and wanted to convert Pure State to a producer and then got authority to produce the Pure State and any other well. It didn't mention Exxon State No. 8. I think that's the way I read it. And then -- you see what I mean?

MR. HNASKO: Yes, sir.

MR. EZEANYIM: And that's when they got the SWD-180.

MR. HNASKO: I agree completely.

MR. EZEANYIM: Is that correct? These two orders only concern the Exxon State.

MR. HNASKO: And that's my point, essentially. I agree with you. Thank you.

Mr. Hearing Examiner, I have no further questions for this witness.

MR. EZEANYIM: Okay. Do you have any other questions?

MR. SWAZO: Yes, I do have one.

REDIRECT EXAMINATION

BY MR. SWAZO:

Q. Now, counsel asked you whether or not in regards to the stress issues, if I understand correctly, he questioned you whether or not there's been any occurrence of stress -- I hope I'm phrasing this right -- since 1977.

MR. HNASKO: I don't think I used the word stress in any of my questions.

MR. SWAZO: What exactly was your question again, with regard to the 1977?

Q. (By Mr. Swazo): Well, let me go ahead and ask you this --

A. The volume injection?

Q. The volume of injected fluids that are being injected into this well have not been constant since 1977?

A. No. Not according to the records I found.

Q. In fact, before 2005, they were lower -- lower volumes were injected into this well?

A. Yes. It looked like it was a lease injector until 2005.

Q. So higher volumes have been injected into this well since 2006?

A. The bulk of injection has happened in the last two years.

MR. SWAZO: I don't have any other questions.

MR. EZEANYIM: I have other questions. What type of volumes are you requesting to inject in this well if we should approve this order? What volumes are you asking to inject? You know, 8,000 barrels a day or what's going on here?

MR. HNASKO: I believe our application indicated an average daily maximum of 6,800 with a single day maximum of up to 15,000. But this average would be 6800, if I'm correct.

MR. EZEANYIM: Okay. One more question for you, please. Before I forgot to ask this question. I wanted to -- I wanted to ask you under what circumstances you went to a one-mile or two-mile area of review instead of half-mile area of review, so that I understand your thinking of why you went to that one-mile area of review.

THE WITNESS: Okay. It was primarily -- the well is shallow and injecting big volumes, going into a narrow zone.

Hopefully it's staying in that zone. And if you do that -- if you assume the porosity is 25, 30 percent, and it goes out radially, it doesn't go actually that far. Even four million barrels might go a quarter mile.

But then, if you allow this well to operate like this for ten years, you're going to keep continuously increasing your area review. Unlike what we do as our normal practice, we never go back. But, of course, we always reserve the right to do that.

But I did the same, I think, the same calculation that Kay did, and I just don't think things happen radially, exactly. And even he thinks southeast is the direction it's going, and I think -- I don't have any idea where it's going.

MR. EZEANYIM: So you had the suggestion that the half-mile area of review submitted by the operator, you are suggesting that there might be a look at the one-mile as you did?

THE WITNESS: I think that if the well is allowed to inject at 6,000 barrels a day, there needs to be some kind of a rigid look at the well bores within an extended distance from the well. Yes, I do.

And unless they can be shown it's going down into a much broader interval that nobody's worried about -- which means they should probably apply for that interval as an injection interval.

MR. EZEANYIM: Okay. Anybody have anything else?

MR. HNASKO: I want to ask you if you wanted to hear any rebuttal from Dr. Havenor. I don't want --

MR. EZEANYIM: No. We have heard enough from Dr. Havenor.

MR. HNASKO: Well, I think Dr. Havenor would like to comment on some of these observations concerning the beginning of the Capitan Reef and the Seven-Rivers and so forth and the correlation of the logs. But we've been through that as well.

MR. EZEANYIM: Because we're going to go back now and repeat them all. I think I understood what he said, and I have no further questions on that.

MR. HNASKO: And Mr. Simitz as well. Would the Hearing Officer prefer a written summation?

MR. EZEANYIM: Of what?

MR. HNASKO: Would you entertain a written summation or closing argument, or do you feel like you have enough?

MR. EZEANYIM: It's probably wise to give me a written summation because I don't think she can even continue after this. Can you give me a summary of what your case is all about today? And I can put it into consideration, too.

MR. HNASKO: Yes, sir.

MR. EZEANYIM: Let's -- today is what, Monday?

MR. HNASKO: Today is Wednesday.

MR. EZEANYIM: By Monday.

MR. HNASKO: Certainly.

MR. EZEANYIM: Anything further?

MR. HNASKO: Just a thank you for sitting through all this.

MR. EZEANYIM: Okay. Case No. 14178 will be taken under advisement -- at last. And that concludes the hearing.

* * *

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 _____, 20__.

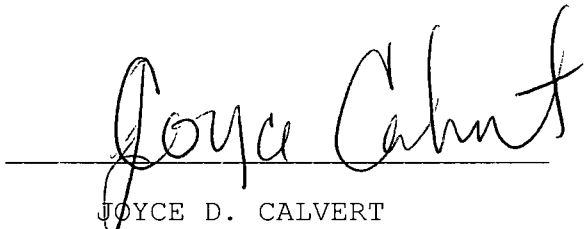
_____, Examiner
Oil Conservation Division

REPORTER'S CERTIFICATE

I, JOYCE D. CALVERT, Provisional Court Reporter for the State of New Mexico, do hereby certify that I reported the foregoing proceedings in stenographic shorthand and that the foregoing pages are a true and correct transcript of those proceedings and was reduced to printed form under my direct supervision.

I FURTHER CERTIFY that I am neither employed by nor related to any of the parties or attorneys in this case and that I have no interest in the final disposition of this proceeding.

DATED this 15th of October, 2008.



JOYCE D. CALVERT
New Mexico P-03
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STATE OF NEW MEXICO)
)
COUNTY OF BERNALILLO)

I, JOYCE D. CALVERT, a New Mexico Provisional Reporter, working under the direction and direct supervision of Paul Baca, New Mexico CCR License Number 112, hereby certify that I reported the attached proceedings; that pages numbered 1-255 inclusive, are a true and correct transcript of my stenographic notes. On the date I reported these proceedings, I was the holder of Provisional License Number P-03.

Dated at Albuquerque, New Mexico, 15th day of October, 2008.

Joyce D. Calvert
Provisional License #P-03
License Expires: 7/31/09

Paul Baca, RPR
Certified Court Reporter #112
License Expires: 12/31/08

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. 14178

APPLICATION OF MESQUITE SWD, INC. FOR AUTHORIZATION TO INJECT AND TO OBTAIN AN AMENDMENT TO PERMIT NO. SWD-180, EDDY COUNTY, NEW MEXICO

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

BEFORE: DAVID K. BROOKS, Legal Examiner
RICHARD EZEANYIM, Technical Examiner
TERRY G. WARNELL, Technical Examiner

October 15, 2008

Santa Fe, New Mexico

This matter came on for hearing before the New Mexico Oil Conservation Division, DAVID K. BROOKS, Legal Examiner, RICHARD EZEANYIM, Technical Examiner, and TERRY G. WARNELL, Technical Examiner, on Wednesday, October 15, 2008, at the New Mexico Energy, Minerals and Natural Resources Department, 1220 South Saint Francis Drive, Room 102, Santa Fe, New Mexico.

REPORTED BY: JOYCE D. CALVERT, P-03
Paul Baca Court Reporters
500 Fourth Street, NW, Suite 105
Albuquerque, New Mexico 87102