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:

APPLICATION OF MESQUITE SWD, INC. TO AMEND ADMINISTRATIVE ORDER SWD-1696 FOR A SALTWATER DISPOSAL WELL IN EDDY COUNTY, NEW MEXICO.

CASE NO. 16308

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

July 12, 2018

Santa Fe, New Mexico

BEFORE: MICHAEL McMILLAN, CHIEF EXAMINER
DAVID K. BROOKS, LEGAL EXAMINER

This matter came on for hearing before the New Mexico Oil Conservation Division, Michael McMillan, Chief Examiner, and David K. Brooks, Legal Examiner, on Thursday, July 12, 2018, at the New Mexico Energy, Minerals and Natural Resources Department, Wendell Chino Building, 1220 South St. Francis Drive, Porter Hall, Room 102, Santa Fe, New Mexico.

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APPEARANCES

FOR APPLICANT MESQUITE SWD, INC.:

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EXHIBITS OFFERED AND ADMITTED

(2:40 p.m.)

EXAMINER McMILLAN: I'd like to call Case Number 16308, application of Mesquite SWD, Incorporated to amend Administrative Order SWD-1696 for a saltwater disposal well, Eddy County, New Mexico.

Call for appearances.

MS. BRADFUTE: Mr. Examiner, Jennifer Bradfute and Deana Bennett on behalf of Mesquite SWD, the Applicant.

EXAMINER McMILLAN: Any other appearances?

Please proceed.

MS. BRADFUTE: Mr. Examiner, I'd like to open by making a short statement. Mesquite SWD has filed this application. This well has been drilled. It's a Devonian saltwater disposal well, the Mesaverde SWD #3, and no tubing has been installed in the well. But because it is a Devonian disposal well, it is a very expensive well to drill. So it's an $8 million well that is sitting without tubing, and there are operators in the area who have had to shut in wells because they're waiting for disposal in the area.

So Mesquite would like to respectfully ask for an expedited order in this matter if it's possible. We understand there's been a past issue at the Division that's created a lot of conversation in Devonian cases with increased tubing requests. So we're happy to respond to any questions that the Division has as it processes this order, but we do request an expedited order if possible.

EXAMINER McMILLAN: Please proceed.

MS. BRADFUTE: Thank you. I'd like to call my first witness, Riley Neatherlin.

EXAMINER McMILLAN: Would all the witnesses please be sworn in?

(Mr. Neatherlin, Mr. Nave, Mr. Wilson, Dr. Zeigler, Ms. Bilck sworn.)

RILEY NEATHERLIN,

after having been first duly sworn under oath, was questioned and testified as follows:

DIRECT EXAMINATION

BY MS. BRADFUTE:

Q. Could you please state your name?

A. Riley Neatherlin.

Q. And, Mr. Neatherlin, who do you work for?

A. Mesquite SWD.

Q. And what is your position at Mesquite?

A. I'm an operations manager for Mesquite.

Q. And what are your responsibilities at Mesquite?

A. I'm in charge of the day-to-day operations, planning and permitting of wells, completions of wells,

anything to do with the day-to-day and drilling and continuing or keeping the wells operating.

Q. And have you previously testified before the Division?

A. Yes.

Q. And were your credentials accepted and made part of the record?

A. Yes.

Q. And does your area of responsibility at Mesquite include the areas of Eddy and Lea Counties in southeastern New Mexico?

A. Yes, it does.

Q. And are you familiar with the application that's been filed by Mesquite in this case?

A. Yes.

Q. And are you familiar with the saltwater disposal well which is the subject matter of this application?

A. Yes, I am.

MS. BRADFUTE: I'd like to tender Mr. Neatherlin as an expert witness in SWD operations.

EXAMINER McMILLAN: So accepted.

Q. (BY MS. BRADFUTE) Mr. Neatherlin, could you please turn to what's been marked as Exhibit Number 1 in the packet in front of you? Is this a copy of

Mesquite's application in this matter?

A. Yes, it is.

Q. Could you please explain to the hearing examiner what Mesquite is requesting in its application?

A. Mesquite is requesting the amendment of the order from a 4-1/2 injection tubing inside of a 7-5/8 liner to upsize it to a 5-1/2 injection tubing inside the liner, as -- as well as running a 7-inch tapered string up inside the 9-5/8 to increase our injection rate and decrease our surface pressure.

Q. And is Mesquite also requesting, in paragraph five of its application on the second page, to increase its injection rate to a maximum of 40,000 barrels of produced water per day?

A. Yes, we are.

Q. Could you please turn to what's been marked as Exhibit Number 2? Does Exhibit 2 contain a copy of the administrative order that's been entered for this well SWD-1696?

A. Yes. Yes, it does.

Q. Could you please point out what is said in this order concerning the size of tubing which has been authorized by the Division for the well?

A. It says, "Injection will occur through either an internally coated 5-1/2-inch or smaller tubing inside

the surface and intermediate casing and a 4-1/2-inch or smaller tubing inside the liner."

Q. So a tapered string tubing was approved in the administrative order, correct?

A. Yes, it was.

Q. And Mesquite is seeking to increase the size of tapered string tubing that it's using in the well?

A. Yes.

Q. And just for clarification, the tapered string tubing that Mesquite is seeking authorization for is 7-inch by 5-1/2 inches?

A. Yes, it is.

Q. Has this well been drilled?

A. Yes, it has.

Q. But the tubing has not yet been installed in the new well?

A. No. We have not done any completion work on it yet.

Q. Can you please turn to what's been marked as Exhibit Number 3? Is this document a diagram of the wellbore showing the tubing that Mesquite is seeking approval for in this case?

A. Yes, it is.

Q. And could you please explain what is shown in this diagram to the hearing examiner?

A. It's a wellbore diagram showing the 7-inch to 5-1/2 tapered string inside the wellbore. It's got the casing and tubing specs along the side.

Q. Okay. I'm going to pass out to you what I'm going to mark as Exhibit Number 25. Could you please explain what is shown on Exhibit Number 25 to the hearing examiner?

A. This is a -- this is tubing specifications for the 5-1/2 tubing that we're seeking to run in this well. It's a 5-1/2, 20-pound P110 tubing. It's got a 5-1/2 OD on the body. Coupling of it is 6.05. It's got an ID of 4.778 inches. It's got a burst of 12,640 pounds and a collapse of 11,100 pounds.

Below that is a list of the wells that have been approved through administrative order for 7-inch to 5-1/2 tapered strings.

Q. Okay. And could you please explain Mesquite's reason for requesting a larger tubing size for this well?

A. Our request to upsize the tubing is so that we can maximize the well. I mean, these wells are very expensive to drill. The more water we can get down one well, the less wells we have to drill. The bigger the tubing, it increases our injection rate, lowers our surface injection pressure and allows us to really

maximize the reservoir.

Q. Mr. Neatherlin, are you aware of the fact that other operators have presented cases in front of the Division requesting larger tubing sizes?

A. Yes, I am.

Q. And are you aware of Black River Water Management, LLC's cases presented to the Division?

A. Yes.

Q. In those cases, is it your understanding that Black River Water Management, LLC testified that it was able to reduce approximately 85 percent of the pressure experienced at the surface when it increased the size of the tubing that was used?

A. Yes.

Q. Okay. And it's the friction that's being reduced?

A. Yes, the friction.

Q. Okay. Thank you.

You mentioned earlier on Exhibit Number 25 that there is a list of approved wells with the same tubing sizes that Mesquite's requesting in this application; is that right?

A. Yes.

Q. So the Division has already issued approvals for 7-inch by 5-1/2-inch tubing?

A. Yes, that is correct.

Q. And those wells are listed in Exhibit 25, right?

A. Yes.

Q. Were those approvals made by the district office?

A. The 5-1/2 was approved before by the Division or the Commission, and then the 7-inch tapered string was approved by the district offices. Yes.

Q. Okay. But Mesquite was asked to present this request at hearing by the Division? It was required?

A. Yes.

Q. Can you please explain where these wells are located?

A. These wells are located in southeast Eddy -- or southwest Eddy and east Lea County. I said that backwards. Southeast Eddy --

EXAMINER BROOKS: I was thinking --

THE WITNESS: Yeah. Sorry.

EXAMINER BROOKS: -- that didn't sound right.

(Laughter.)

MS. BRADFUTE: Thank you.

Q. (BY MS. BRADFUTE) Please turn to what's been marked as Exhibit Number 4 in the packet before you.

Does Exhibit Number 4 contain a map or a diagram which shows wells that have been proposed as Devonian saltwater disposal wells and then existing Devonian saltwater disposal wells surrounding the section for the Mesaverde SWD #3 well?

A. Yes, it does.

Q. And could you please kind of walk through this diagram for the benefit of the Examiner?

A. It's a four-township map consisting of wells that are drilled or permitted Devonian wells in the area. The red wells are proposed -- the red dots are proposed and the green ones are existing Devonian wells.

Q. And can you please explain the spacing between the Mesaverde SWD #3 well which is located in 24 South, Section 13 --

A. Uh-huh.

Q. -- and where it's situated in comparison to the next closest well?

A. The closest well to it is the Striker 2 SWD, which is -- looks like it's a little over a mile -- maybe a mile and a quarter away from each other.

Q. Okay. But it's over a mile away?

A. Yes.

Q. Okay. Could you please turn to Exhibit -- the second page of this exhibit, actually. Does the second

page of Exhibit Number 4 contain the data, the API numbers, the well names, the type of disposal well for all of the wells that are shown on the diagram that we just discussed?
A. Yes, it does.
Q. And are there any productive wells within the Devonian Formation located near the proposed well that you're aware of?
A. No, not that I'm aware of.
Q. Could you please turn to Exhibit Number 5, and could you please explain what that document shows to the hearing examiner?
A. This is a designated Devonian pool map for the area, for the same four townships that are shown on the previous map.
Q. That were shown on the previous map?
A. Yes.
Q. And in this diagram, there are two red triangles. Are those two red triangles Devonian pools that have been designated by the district office?
A. Yes. The rectangles are --
EXAMINER BROOKS: I was going to say they look like rectangles.
MS. BRADFUTE: Yes. Sorry. Thank you. It's been a long day (laughter).

THE WITNESS: -- are designated pools. Yes.
Q. (BY MS. BRADFUTE) And it's the -- they look -- the names are very difficult to read. It's the Paduca Devonian wells there?
A. Uh-huh.
Q. Okay. And what is the distance between the northern pool, the Devonian pool, and the Mesaverde SWD #3 well?
A. It looks like just a little over three miles.
Q. Okay. So the Mesaverde SWD #3 well is not located near an existing Devonian pool; is that correct?
A. No, it's not.
Q. Mr. Neatherlin, I want to kind of switch topics a little bit now and talk about fishability in the event there is a tubing problem or a fishing situation that arises.
Does Mesquite work with a fishing tool expert when considering whether it should increase the size of the tubing that it installs in its wells?
A. Yes.
Q. In this case have you consulted with a fishing tools expert to determine whether increasing the tubing size would be a good choice?
A. Yes, we have, to make sure that we can get --

get the pipe fished if need be.
Q. And is that expert Mr. Steve Nave?
A. Yes, it is.
Q. And will Mr. Nave be presenting testimony today about the fishability of tubing and other things that might fall downhole?
A. Yes, he will.
Q. Could you please look at exhibits -- I just want you to kind of flip through Exhibits 6, 7 and 8. Are these exhibits documents which explain the different kind of fishing tools that Mr. Nave has previously testified about in other cases involving Mesquite SWD's operations?
A. Yes, they are.
Q. And did Mr. Nave provide testimony in Case Number 15654 before the Oil Conservation Commission on behalf of Mesquite SWD?
A. Yes, he did.
Q. Was it Mr. Nave's testimony during that proceeding that there would not be fishing problems with 5-1/2-inch tubing in these deep Devonian wells?
A. Yes, there was.
Q. Could you please turn to what has been marked as Exhibit Number 9. Is Exhibit Number 9 proof that Mesquite has notified all of the entities originally

notified in its administrative application, as well as other parties located within a mile of the well location about this application?
A. Yes, it is.
Q. And does it contain an affidavit that's been prepared by Mesquite's counsel confirming that notification was so provided?
A. Yes, it does.
Q. And if you could please look at the very last page of this exhibit, is the last page of this exhibit an Affidavit of Publication confirming that notification was also provided in the "Carlsbad Current-Argus" newspaper?
A. Yes, it does -- is.
Q. Mr. Neatherlin, were Exhibits 1 through 9 prepared by you or compiled under your supervision and direction?
A. Yes, they were.
MS. BRADFUTE: I'd like to tender Exhibits 1 through 9 into the record.
EXAMINER McMILLAN: Exhibits 1 through 9 will now be accepted as part of the record.
(Mesquite SWD, Inc. Exhibit Numbers 1 through 9 are offered and admitted into evidence.)

MS. BRADFUTE: That concludes my questions for this witness.

CROSS-EXAMINATION

BY EXAMINER McMILLAN:

Q. Okay. Did you notice that NGL? Did you notify them or the operator of the Striker 2?

A. That application was actually in before that well was permitted, I believe.

Q. Okay.

A. I believe so.

Q. That's fine. Okay. That's fine.

So are you using flush joints?

A. On the tubing?

Q. Yes.

A. No. It's collar pipe.

Q. How did you select that instead of going with a flush joint?

A. It's easier to anchor or liner to it as opposed to just flush joint. It makes a better seal for our liner or coating, I guess.

Q. I think we've added additional wording to orders that says if there is -- the well to be shut in within 24 hours if there are any problems. I'll have to go back and look at that.

A. I haven't seen a new permit lately.

Q. There is some new verbiage in there saying you have to notify the district office within 24 hours.

MS. BRADFUTE: If there is a tubing incident?

EXAMINER McMILLAN: Yeah. If there is a problem with the well, it has to be shut in. I'm assuming you wouldn't have a problem with that. And you can find the order.

MS. BRADFUTE: I'll look for one.

THE WITNESS: Yeah. If it's in there, we'll abide by that.

EXAMINER McMILLAN: Do you have any questions?

EXAMINER BROOKS: No questions.

MS. BRADFUTE: Mike, I have one follow-up question.

REDIRECT EXAMINATION

BY MS. BRADFUTE:

Q. In the event of a tubing failure, does Mesquite operate other wells within the area where it can divert produced water that operators need to dispose of?

A. Yes. Our -- most of our wells are tied together with pipelines, so in the event of having to shut down a well, we can send water elsewhere, get rid of it.

Q. Does Mesquite have a system in place that handles disposal in the event of a tubing problem?

A. Yes.

Q. Thank you.

EXAMINER McMILLAN: Please proceed.

MS. BRADFUTE: I'd like to call my second witness, Mr. Nave.

STEVE NAVE,

after having been previously sworn under oath, was questioned and testified as follows:

DIRECT EXAMINATION

BY MS. BRADFUTE:

Q. Good afternoon.

A. Good afternoon.

EXAMINER McMILLAN: You have one more -- Exhibit 25 may now be accepted as part of the record.

MS. BRADFUTE: Oh, thank you. Yes.

(Mesquite SWD, Inc. Exhibit Number 25 is offered and admitted into evidence.)

Q. (BY MS. BRADFUTE) Mr. Nave, could you please state your name for the record?

A. Steve Nave.

Q. And who do you work for?

A. Nave Oil & Gas.

Q. And what is your position at Nave Oil & Gas?

A. I'm president of the company.

Q. And in your capacity at Nave Oil and Gas, have you worked on fishing operations?

A. Yes, ma'am. That's what we do primarily.

Q. And could you give the hearing examiner just a brief explanation of your fishing experience within the basin?

A. Okay. I started out, you know, roughnecking and drilling wells and moved into the fishing tool industry or part of the wing of the deal in 1980. I started running fishing tools for Star Tool Company. I stayed with that until 2001. I had acquired a position in the company, and when we sold it to Smith International, I stayed on with them for a while and then left Smith International and started my own company.

Q. So you've been performing fishing operations within New Mexico for many years?

A. For -- since 1980.

Q. Okay. And have you previously testified before the Oil Conservation Division?

A. Yes, ma'am, I have.

Q. And were your credentials accepted and made a matter of record?

A. Yes, ma'am.

MS. BRADFUTE: I'd like to tender Mr. Nave as an expert in fishing operations.

EXAMINER McMILLAN: So qualified.

Q. (BY MS. BRADFUTE) Mr. Nave, I'd like you to turn back to Exhibit Number 6 in the packet in front of you.

And actually I'd like you to look at Exhibit 25, which is the loose paper right next to you. And I'm going to first look at Exhibit 25.

A. Okay.

Q. Mr. Nave, have you previously reviewed the specifications for the tubing sizes that Mesquite is requesting in its application?

A. Yes, I have.

Q. And in your opinion, if tubing -- this size is used, 7-inch by 5-1/2-inches, will it provide any fishing problems in the event of a tubing failure?

A. Not in the casing sizes, as I understand. I see no issues with it. No, ma'am.

Q. And what are -- what are the casing sizes?

A. As I understand it, we're talking about putting 7-inch tubing inside of 9-5/8-inch casing. The 9-5/8 is -- we're talking ODs here, 7-inch OD tubing inside of 9-5/8-inch casing, and 5-1/2-inch tubing inside of 7-5/8

OD casing.

Q. And in your opinion, does that allow for sufficient clearance between the casing and the proposed tubing in the event you need to fish something out of the tubing?

A. Yes, it does.

Q. I now want to look at Exhibit Number 6. Is this a document that you have previously testified about before the Oil Conservation Commission?

A. Yes, it is.

Q. And does this document contain information about overshot tools that can be used during fishing procedures?

A. Yes, it does.

Q. Could you please briefly explain to the Examiner how you would use an overshot tool to fish something out of a tube?

A. An overshot is a tool designed to attach to a smooth piece of the pipe from the outside. As the name implies, it goes over the top of the tube, and it has basically a slip assembly that bites into the metal and creates a strong connection to the fish. That's kind of an overview of what it does.

Q. Okay. And in your opinion, could an overshot tool be used in a fishing operation, in this instance,

using the specifications of casing and tubing that Mesquite is requesting?

A. Yes, you can. You're talking about two different sizes of overshots. One is for fishing 7-inch inside of the 9-5/8. That tool is an 8-1/8-inch OD. It's readily available. The other for fishing 5-1/2-inch inside of 7-5/8 is originally a 6-5/8 OD overshot with a maximum catch for 5-1/2. It can be turned down to a little smaller if the casing weight reduces the idea [sic] enough for it to be necessary. So yes, overshot can be used in both situations to fish tubing from those size casings.

Q. Okay. Could you please turn to the next exhibit, Exhibit Number 7, in the packet in front of you? Does Exhibit Number 7 contain information about releasing spear tools that can be used in fishing operations?

A. Yes, it does.

Q. And could you please explain how this tool would be used when you need to fish something out of a tubing?

A. This tool is basically the opposite of the overshot. It goes on the inside of the pipe to be fished and slips -- expands and bites on the internal diameter of the -- so to be able to pick up on a broken

piece of pipe or whatever.

Q. And in your opinion, would you be able to use a spear to fish something out of the tubing that's been proposed by Mesquite in this case?

A. Yes, you can.

Q. Could you please turn to the next exhibit, Exhibit Number 8? Does Exhibit Number 8 contain information about a pressure pipe cutter?

A. Yes, it does.

Q. And could you please explain to the Examiner how a pressure pipe cutter would be used in fishing operations?

A. A pressure pipe cutter is a tool that is of a size specific to run inside of the pipe that you want to cut. You run it inside that string of casing. For instance, the 5-1/2-inch tubing in this case, you would run a 3-5/8-inch OD pressure cutter on a work string of 2-7/8 on the tubing down inside the 5-1/2 casing. You start rotation on the tool, start pump pressure going down the tubing that forces some knives out -- pushing the piston down that forces the knives out and cuts the 5-1/2-inch casing in the tube so that it can be freed. From -- from that point up, then you can latch on to it with the overshot and pull it out of the well or whatever the application would be. That is one of many procedures that can be used to separate -- to cut 5-1/2 -- or to cut piping basically of any size, but it works better in the larger sizes. These kind of cutters can't be utilized in smaller -- can in some smaller but not -- not a lot smaller operations than this.

Q. Have you previously testified before the Commission and the Division in other cases that it's your preference to work in tubing with a larger diameter so you can get more tools down there to work with?

A. Yes, I believe I have.

Q. Okay. And is that still your preference?

A. Absolutely.

Q. Mr. Nave, are you currently in the process of working on a fishing operation with a well that has tubing of 7 inches by 5-1/2 inches installed?

A. We actually are on a well, a job. At current time right now, I have a man on the job, and I believe it's on the New Mexico side.

But anyway, they have 5-1/2-inch tubing -- in their case, it was casing. It wasn't tubing. But it would be the exact same thing. It's a drilling operation. They were running this casing in the well to the cement. And they have round numbers, 12,000 feet of 7-5/8 casing set. They have like 19,000 feet of 5-1/2-inch casing that they run in this well, and then

they got it stuck before they got it to bottom.

During trying to free this, they parted the pipe, pulled it in two at -- between 4- and 500 feet from the surface, and that was up in the 7-5/8 casing. As it turned out, it parted in a casing coupling, which is 6.05 diameter.

There were several methods that we talked about to get this -- to fix their problem, and with well-control issues that they have, they opted to run overshot. They wanted to use the overshot and tie the string back together and then start trying to cut it.

And so they ran a -- the first thing we done is left half of that collar, which is 6-inch OD, and we went in and milled that away. It took about an hour to mill that -- half of that 6-and-a-half inch -- or 6.05 collar away. Once they got that milled off, I had a machine shop to build a top bushing to go in this overshot where we could run that on 5-1/2-inch casing. So we just screwed our overshot on the casing, run it in the well then and latched on to the 5-1/2-inch tube, and it packs off so it won't leak around there. You have a rubber packoff assembly on it. And then they have well control, and they also have full inside diameter on the 5-1/2 casing from the surface all the way back to bottom. Basically, we just tied it all back together so

that they could try to work on getting it loose at the bottom.

So it would -- by saying that there was -- that was one method. The other method that I suggested to them to get this out of there would be -- what I thought would be faster and more economical was to just make a wireline cutter trip in with a jet cutter with 4-1/2-inch OD, flop it over then to the 5-1/2, run it to the depth they wanted, cut it off, pull the wireline out of the hole, run it in the hole, stick a spear in it and pull it out of the hole and lay down and we're done. But they had well-control issues and wanted to go about it the other way.

Where that leads us to is that fishing 5-1/2 casing inside of 7-5/8 casing is the way to do it if we have tools in the hole today.

Q. It's doable --

A. Doing just that.

Q. -- you're doing it, and you're being successful at fishing the casing out?

A. That's from the outside. That don't mean you have to fish it from the outside, but that is an option. There are only two ways to fish it, one inside and one outside.

Q. Yeah. And you have felt comfortable with those

fishing operations?

A. We can do it either way.

Q. And in your expert opinion, is there an unreasonable enhanced risk to the wellbore as a result of using 7 inches by 5-1/2-inch tubing for the wells proposed by Mesquite?

A. In the well as prescribed, no, ma'am, I see no problem.

Q. And in your opinion, do see any concerns about the ability to perform fishing operations if you use tubing that's 7 inches by 5-1/2 inches?

A. Not from a -- not from a fishing aspect. From the -- the only consideration is that this is big stuff, and you have to have big tools to work with, like big surface equipment, drilling rig instead of a pulling unit. But they know that.

Q. And as long as an operator has access to a bigger rig --

A. That's correct.

Q. -- there would be no concern?

A. None whatsoever.

Q. And that concludes my questions, Mr. Nave.

CROSS-EXAMINATION

BY EXAMINER McMILLAN:

Q. Okay. So in your scenario, they had 12,000

feet at 7-5/8 casing?

A. Yes, sir.

Q. And then they had how many feet of 5-1/2?

A. They had like 19,000 feet of 5-1/2. They were running it from the surface all the way to TD in a horizontal in the lateral.

Q. Oh, okay.

And it got -- the casing part of it --

A. It got stuck to start with down here somewhere out in the lateral. It packed off. And they were unable to move it and unable to get a good cement job around it on account of it. So what they opted to do was just cut it off, plug the bottom half of the lateral and leave that in there and sidetrack it around and drill your -- start over rather than trying to -- they don't want to go to the trouble of trying to fish that out of that out there. The well's never even been completed out there. It's easier to go around it than it is to fish it out. But then they parted it.

I guess where I'm going is while they were trying to free that out there, they parted their pipe up here at 450 feet from the surface, and that's where we are -- we're latched on and doing the work. We're getting ahold of the pipe. And just like any other fishing operation, it's not a problem. Getting it to

free up out there at 19,000 feet out in the lateral can be a significant problem. But you have to deal with that as the problem is.

And in their situation, the best way to remedy it is not to even attempt to fish it out there. We can probably get it. I mean, it wouldn't be because the tools are not capable of -- you're not capable of fishing it in this. It's just that with the rig time costs and stuff like that that it would take to fish that out out there, they're better off to just leave it and drill around it and carry on.

Q. Okay. If it would be okay -- obviously someone that's more knowledgeable is going to write the order. Can we get a summary more or less of what you're saying?

MS. BRADFUTE: Yes. We can provide, again, an information request to provide a summary.

EXAMINER McMILLAN: Yeah, specific to that.

MS. BRADFUTE: Yes, absolutely. And I just -- are you done with your questions?

EXAMINER McMILLAN: Yeah.

Do you have a problem with that?

THE WITNESS: No, I have no problem with it at all.

EXAMINER McMILLAN: Okay.

THE WITNESS: All I need to know is what

you want.

EXAMINER McMILLAN: Okay. That's fine. Someone better at this will write it.

REDIRECT EXAMINATION

BY MS. BRADFUTE:

Q. Okay. Mr. Nave, just to follow up on the Examiner's question, in your opinion, do you feel like you can still perform fishing operations in the deeper portions of these Devonian wells?

A. Absolutely.

Q. Okay. And you said, you know, it's a significant operation to perform those fishing operations because you're going to need a bigger rig and it's going to have significant costs to perform those fishing operations?

A. That's correct.

Q. But it's still your opinion that fishing operations can be successfully done?

A. Well, it's no different than any other fishing operations on that part. If we had -- if they had 4-1/2 casing stuck in this well, it would be no different than it is. Just because it's 5-1/2 in that size hole, it's not making any difference to us. It would still be the same situation.

Q. And is the most significant challenge obtaining

a large rig in that situation where you're fishing --

A. Yeah. And, I mean, you're going to need a rig similar to what they're doing out here now, which is a large drilling rig.

Q. Yeah. Okay. Thank you very much.

MS. BRADFUTE: And that concludes my questions for Mr. Nave.

EXAMINER BROOKS: Questions?

MS. BRADFUTE: And I'd like to call my third witness.

RECROSS EXAMINATION

BY EXAMINER McMILLAN:

Q. Is it easier for a 5-1/2 or a 4-1/2 to fish?

A. No difference.

Q. It doesn't matter? It's one and the same?

A. Yeah.

Q. Okay. Thank you very much. Nice presentation.

MS. BRADFUTE: I'd like to call my next witness, Ms. Zeigler.

KATE ZEIGLER, Ph.D.,

after having been previously sworn under oath, was questioned and testified as follows:

DIRECT EXAMINATION

BY MS. BRADFUTE:

Q. Could you please state your name for the

record?

A. Kate Zeigler.

Q. And, Ms. Zeigler, who do you work for?

A. Zeigler Geologic Consulting on behalf of Mesquite SWD.

Q. Okay. And what are your responsibilities at Zeigler Geologic Consulting?

A. I am primarily a stratigrapher, so I spend time understanding the stratigraphy of the paleogeography in the Permian Basin and understanding how that SWD is attempting to work in it.

Q. And have you previously testified before the Division?

A. Yes.

Q. And were your credentials accepted and made part of the record?

A. Yes.

Q. And are you familiar with the application that's been filed by Mesquite in Case Number 16308?

A. Yes.

Q. Are you familiar with the status of the lands which are the subject matter of that application?

A. Yes.

Q. And have you conducted a geologic study of the area embracing the proposed location for the Mesaverde

#3 well?

A. I have.

MS. BRADFUTE: I'd like to tender Ms. Zeigler as an expert witness in geology matters.

EXAMINER McMILLAN: So qualified.

Q. (BY MS. BRADFUTE) Can you please turn to Exhibit Number 10 in the packet in front of you? And could you please explain what this document is for the hearing examiner?

A. So this is a stratigraphic chart for the Delaware Basin based on Ron Broadhead's recent publication for all of the Permian Basin in southeast New Mexico. And what this does is shows you not only the age framework that we're working with but also the nomenclature that we're working with. And this will become -- this can be an issue in some cases because in different parts of the section, the way that the geologists refer to the units is different than the way an operator would refer to the units. And I'll clarify that when we get to the cross sections.

And on this, I've also shown, for example, where the freshwater resources within the basin tend to be located, which is near the top in the Triassic and Upper Permian rocks, and then showing the target injection interval for the Mesaverde well with both the

Woodford Shale as the upper permeability barrier and the Simpson Group as the lower permeability barrier.

And in terms of the nomenclature differences between geology and -- geologists and operators, most operators out here refer to what are actually Silurian-age rocks as the slur of the Devonian package that they're injecting into, but we're actually only working with Silurian- to Ordovician-age rocks. So I'm just clarifying (laughter).

EXAMINER McMILLAN: I'm glad that someone is. That's always been -- everything I've read, it's always stated that -- so basically all you're saying is it's a driller's term, the "Devonian"?

THE WITNESS: Yeah.

MS. BRADFUTE: That's right. That's right.

EXAMINER McMILLAN: That's the best way to describe it?

THE WITNESS: So in a minute, I'm going to switch from geology to operator, and I'm going to switch nomenclature. That's all.

Q. (BY MS. BRADFUTE) Could you please turn to the next exhibit, Exhibit Number 11, and explain what this exhibit shows to the hearing examiner.

A. So this is just a summary, a brief description of the lithology of all the different rock units that

are at consideration for these deeper injection wells starting with the Woodford Shale, which is our upper permeability boundary. And this is simply a summary of descriptions from various literature sources, including Ron Broadhead and the Texas Bureau of Economic Geology's work in the basin.

And so the units that are of question here include the Woodford Shale as the upper permeability boundary. The Wristen Group, which is -- and this is again where we get into some of that nomenclature issues. This is, in fact, a Silurian unit and not a Devonian unit. And so this is simply to summarize quickly for you the lithologies of the different units that are in play.

So in this particular well, the Woodford Shale is their upper permeability barrier. We'd be looking at injecting into the Wristen Group, plus or minus some part of the Fusselman Formation, probably not very much of the Montoya Group, and then the Simpson Group, lower permeability shale barrier. And then I also included the Ellenburger Formation description for completeness sake.

Q. I want to go back and cover a couple of fine points. You said that the Woodford Shale is going to be the upper permeablity barrier. What do you mean by

that?

A. So in this case, the Woodford Shale is primarily an organic-rich mudstone and has a very fine grain. The unit's porosity and permeability are less than the fractured vuggy limestones and old stones that are below them, and so this acts as an upper seal in this area. It's anywhere from 150 to almost 300 feet thick right here, where there is a facies variation and gives us a real nice thick Woodford Shale locally in this area.

Q. And in your opinion, does the Woodford Shale Formation basically prevent water or injected fluids from flowing upward?

A. From migrating upwards.

Q. Yeah, migrating upwards.

And then I wanted to focus on the Simpson Group, what you described as being the lower permeability barrier. Could you please describe what you meant by that to the hearing examiner?

A. So the Simpson Group is not quite so simple as the Woodford Group. It can seem more heterogeneous in terms of the different rock types that occur in it, but it's dominated by shale beds. So, again, it has this fine-grain material that's not going to be as porous and permeable. And in this part of the basin, the Simpson

Group can be 650 to 700 feet thick, and so it would be preventing downward migration of fluids into the Ellenburger and on down into the Precambrian Basin, which is something we would prefer to avoid.

Q. Yes.

Could you please next turn to Exhibit Number 12 and explain what this is to the hearing examiner?

A. So this is a structure contour map on the top of the Precambrian. And I apologize that the white contour lines didn't show up very well in the printing. But there are very fine, white contour lines in there that have 1,000-foot interval markings on them, and that's the top of the Precambrian Basin in the area. And it also shows the location of -- Precambrian-penetrating faults go through the thick black lines that occur both to the southwest and to the east of the well location. It has the county boundaries on it for Eddy, Chaves and Lea Counties.

And sort in the south-center part of the figure, there are a series of small wellbores shown. The white wellbores are other wells in the area that we use to develop the cross sections that we'll look at in just a moment, and the green-colored wellbore is the Mesaverde well.

Q. And could you please turn to what's been marked as Exhibit 13? And this exhibit has two different pages. I want to focus on the first page. Could you please explain what this document shows?

A. So this is a north-to-south cross section through the Mesaverde wells, so you are looking east into Texas. And the red arrow's indicating the position of the Mesaverde well. And this is a little different from some of the cross sections that we've -- that we've looked at previously in that for many of these wells, from the OCD Web site, I was only able to capture the very lowest part of the well logs. They didn't have the upper part of the well logs available. And so in order for me to extrapolate upwards where the Woodford Shale is in this area, I went through all of the well files to find the completion documents to find the picks for the tops of those units and then place them above the well logs that I was able to clip out to make the cross section with.

And so where it says "extrapolated picks from the well files," that's where I projected the Woodford Shale and the Mississippian Limestone above the segments of the well logs so that I was able to gain access to.

And the point of the cross section is these

are all hung from land surface, and so we're looking at starting at 15,500 feet below ground surface where you would start to encounter the top of the injection interval.

And so here's where we're going to make the switch from the geologist nomenclature to the operator nomenclature, in that here where I have Ordovician-Devonian, this is referring to that thick package of limestone and dolostone at the injection interval, even though as a geologist, I would call this the Silurian-Ordovician, but I'm switching to operator language now for the name for the target interval.

Q. And could you please turn to the second page of this exhibit and explain what this second page shows?

A. So this is a west-to-east cross section looking north, and again the red arrow showing where the Mesaverde log is. And as with the previous cross section, for the Mesaverde well and the Sand Dunes #2 well, I extrapolated the picks for the Woodford Shale and the Mississippian Limestone based on information from other sources that I was not able to show graphically in this particular case. But showing again below ground surface how far down we would encounter these limestone, dolostone sequences that are the targeted injection interval.

And in both cross sections, another important observation is in looking at the various well-log data that is available for the deepest part of the basin, the geology is very homogeneous. We're seeing these limestones and dolostones. We're not seeing a whole lot of variation in lithology or thickness through the targeted injection interval.

Q. Ms. Zeigler, what conclusions have you drawn from your geologic study of the area where the well is going to be drilled -- or completed?

A. That we have a good, thick section of these limestone and dolostone units that have good porosity. You're looking at a total package thickness of anywhere from 2- to 3,000 feet for this injection interval, and it has a solid shale, upper permeability barrier, as well as a lower permeability barrier.

Q. And during your study of the area, did you locate any productive shales within the injection -- the targeted injection zone?

A. No. There were none observed in the area.

Q. And is it your opinion that the Devonian within the area where this well will be situated is unproductive?

A. True.

Q. In your opinion, will increasing the tubing

size to 7 inches by 5-1/2 inches impact correlative rights of any mineral interest owners?

A. No.

Q. And in your opinion, will the granting of Mesquite's application be in the best interest of conservation, the prevention of waste and the protection of correlative rights?

A. Yes.

Q. Were Exhibits 10 through 13 prepared by you or compiled under your direction and supervision?

A. Yes.

MS. BRADFUTE: I'd like to tender Exhibits 10 through 13 into the record.

EXAMINER McMILLAN: Exhibits 10 through 13 may now be accepted as part of the record.

MS. BRADFUTE: That concludes my questions of this witness.

(Mesquite SWD, Inc. Exhibit Numbers 10 through 13 are offered and admitted into evidence.)

CROSS-EXAMINATION

BY EXAMINER McMILLAN:

Q. I guess I'm at Exhibit 11. You didn't really describe the Montoya, but isn't Montoya the lower barrier?

A. So the Montoya in this area is actually still primarily a dolostone, and it's only probably about 50 feet thick here and sits right over the Simpson Group. So the first place you start seeing more terrestrial sediments that are going to include your shales and mudstones is in the top of the Simpson.

Q. But the Montoya is dolomite tight?

A. Yes. They generally are.

Q. If it's tight, then it's not going to allow any downward migration of the fluids, correct?

A. True. However, in this part of the basin, it is so very thin --

Q. It's difficult?

A. -- but we actually may be north of the pinch-out of the Montoya Group where this well is located. If you look at the Texas Bureau isopach map for the Montana Group, the zero line is actually projected through potentially just south of this.

Q. I didn't know that. I thought Montoya was actually in Chaves County.

So how -- what's the gross interval for Devonian to the Ellenburger in the well?

A. In terms of?

Q. Just gross thickness.

A. Gross thickness? So if we start at the base of

the Woodford Shale -- so I'm excluding that Devonian unit. Sorry. I'm clarifying nomenclature.

Q. I just call it the Devonian.

A. So the classic Silurian-Devonian operator terminology, we're looking at probably on the order of about 2,500 to 3,000 feet all the way down to what little Montoya is there, plus or minus the top of the Simpson Group.

Q. It's 2,500 to 3,000 from the Silurian-Devonian to the Ellenburger?

A. To the base of the Woodford Shale to the top of the Simpson Group.

MS. BRADFUTE: And that does not include the Simpson?

THE WITNESS: That does not include the Simpson. If you want to include the Simpson, add another 700 feet.

Q. (BY EXAMINER McMILLAN) It's 25- to 3,000 feet. Close enough.

MS. BRADFUTE: Yeah (laughter).

THE WITNESS: We'll know more the more of these wells get drilled.

Q. (BY EXAMINER McMILLAN) Yeah. I just want to make sure for clarity purposes that there is a big interval.

A. Yes.
Q. There is a barrier, not a baffle?
A. Yes.
MS. BRADFUTE: Yes.
Q. (BY EXAMINER McMILLAN) That's the biggest thing.
A. Absolutely.
EXAMINER BROOKS: What he was just suggesting reminds me of Mr. Carr's tract of 40 acres more or less. He said, "Every tract in the world is 40 acres more or less. It's either 40 acres, or it's more or it's less."
(Laughter.)
MS. BRADFUTE: It's more here.
EXAMINER BROOKS: I have no questions.
EXAMINER McMILLAN: Thank you very much.
THE WITNESS: Thank you.
EXAMINER McMILLAN: Let's take a ten-minute break.
EXAMINER BROOKS: There's been a suggestion that you need to clarify for the record what you want from Mr. Nave. Maybe you-all can talk about it during the break, and when we get back on the record, a statement can be made about what this is to consist of.
MS. BRADFUTE: Mike, my understanding was

that you wanted a description of the current fishing operations.
EXAMINER McMILLAN: Yeah, just current fishing operations.
EXAMINER BROOKS: The one you're doing -- working on for another client right now.
MR. NAVE: Another client, yes, sir.
EXAMINER McMILLAN: Yeah. So we can have something for the record that shows it has been done. That's what I'm really after. Kind of make sense?
MR. NAVE: Does to me.
MS. BRADFUTE: Yes.
(Recess, 3:32 p.m. to 3:39 p.m.)
EXAMINER McMILLAN: Back on the record.
MS. BRADFUTE: During the break, Mr. Examiner, there was a discussion about the statement that you requested earlier on in the hearing from Mr. Nave. It is my understanding that we are going to provide an affidavit from Mr. Nave that explains the current fishing job that he is doing right now involving similar tubing sizes that are at issue in this application.
EXAMINER McMILLAN: Yes. Okay. Thank you.
MS. BRADFUTE: And I would like to call my next witness, Mr. Wilson.

EXAMINER McMILLAN: Please proceed.
SCOTT WILSON,
after having been previously sworn under oath, was questioned and testified as follows:
DIRECT EXAMINATION
BY MS. BRADFUTE:
Q. Could you please state your name for the record?
A. Scott Wilson.
Q. And, Mr. Wilson, who do you work for?
A. I work for Ryder Scott Company.
Q. And what is your position at Ryder Scott?
A. I'm a senior vice president.
Q. And what are your responsibilities?
A. I teach classes in nodal analysis. I do simulation studies, and I do technical consulting.
Q. And have you previously testified before the Oil Conservation Commission?
A. Yes, ma'am.
Q. And were your credentials accepted and made part of the record?
A. Yes, ma'am.
Q. And are you familiar with the application that's been filed by Mesquite in this case to increase the tubing size and injection rates?

A. I am.
Q. And have you conducted an engineering study related to this application?
A. I have.
MS. BRADFUTE: I'd like to tender Mr. Wilson as an expert witness in petroleum engineering matters.
EXAMINER McMILLAN: So qualified.
Q. (BY MS. BRADFUTE) Could you please turn to what has been marked as Exhibit Number 14 in front of you, and could you please identify what this document is for the hearing examiner?
A. This is a graph that represents the injection rate versus wellhead pressure that you would see in a typical well completed with 5-1/2 by 4-1/2-inch tubing. That's the red line.
The blue diamonds are actual measured data from the Sand Dunes #2 well, which is fairly close to this well. It's three to four miles away. And the green line represents what this well would do if it had 7-inch by 5-1/2-inch tapered string in it.
Q. We're going to come back to this exhibit in a moment, but I would kind of like to turn to Exhibit 15. And my understanding is that Exhibit 15 relates to the chart that you were just discussing, correct?

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A. It does.

Q. And could you please explain what Exhibit 15 is?

A. Exhibit 15 is a classic nodal analysis plot with total liquid rate across the bottom of the x-axis and flowing bottom-hole pressure and injecting bottom-hole pressure on the y-axis.

The analogy to describe how this works is like you have a bucket and you put it on a pile of sand, and then you fill that bucket with water. So the black line -- the black-dashed line represents how much water would drain out of the bucket if it has a small hole in the bottom. And as the bucket fills up, more water will drain out of the bucket. So that's how the reservoir acts as you push more fluid into it.

The other two lines represent the fluids that are filling up the bucket. So if you have a faucet above that and you're filling it up slowly, it looks a little bit like the orange line. So you're filling fluids in. You have a lot of pressure drop through the valve in the faucet, and you'll have a static fluid level that will take small amounts of fluid and also at low pressures.

If you open up that valve, you're taking away some of that friction, and the fluid level in the

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bucket will go up and cause the hole to drain more fluid, and it will cause a new equilibrium to be set. So that's what nodal analysis is.

Q. Exhibit 15 is a diagram that shows the nodal analysis that's been performed for this case?

A. It is, with two different tubing sizes.

Q. Okay. And the blue line is the 7-inch by 5-1/2 inch?

A. Correct.

Q. And the orange line is 5-1/2 by 4-1/2-inch tubing, which is what has been previously authorized by the Division?

A. Yes, ma'am.

Q. I want to now flip back to Exhibit Number 14. Does Exhibit Number 14 provide a summary of what your nodal analysis shows?

A. It does. This relates to all pressures and measurements at the surface. So on the left, the y-axis is wellhead injection pressure.

Q. Okay. And based on your nodal analysis, what observations have you made concerning increasing the tubing size for this well?

A. If you use larger tubing sizes, you have less frictional pressure drop.

Q. Could you please turn to Exhibit Number 16?

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And the title of this exhibit is "Increased injection rate per well equates to fewer injectors," correct?

A. It is, yes.

Q. Could you please explain to the hearing examiner what this graph shows?

A. This graph is a different visualization of the prior exhibit, Number 15, and it shows the two solution points at 41,000-barrels injection per day and roughly an average tubing size of 2.67 for the first string. And then -- that's the upper, right-hand point. So that's the predicted performance of that well at 1,700 psi injection pressure.

And then if you make the tubing smaller, which is the x-axis -- so as you go to smaller tubing sizes, your injection rate decreases, and that one shows 29,000 barrels a day.

Q. So is it your opinion by increasing the tubing size for the Mesaverde SWD #3 well, there will be less need for additional wells within the area?

A. That's correct. The table inset shows at various total injection demand how many wells you will potentially need to meet that demand. And so at 100,000 barrels of injection per day, you need four wells with the smaller tubing description, and you'd only need three wells with the larger tubing description.

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Q. Okay. Could you please turn to the next exhibit, Exhibit Number 17, and could you please explain what this document shows?

A. This document is fairly complex. It shows along the x-axis injection rate in barrels per day. The y-axis shows either surface- or bottom-hole injection pressure. And starting at the top, the light blue dashed, the dot line, shows the fracture pressure predicted potentially using a .45 gradient and .2-psi-per-foot surface pressure requirement.

And the blue-dashed line that angles up from the left to the right is the reservoir performance, the injection performance at various injection rates. And you can see at zero injection, it's effectively the reservoir pressure of 7,750 under these conditions.

And then on the far right side, of 50,000 barrels a day, you can see we're about halfway to the fracture pressure -- predicted fracture pressure. So that -- in order for that blue-dashed line to actually intercept with the fracture pressure, I'd have to expand this scale out to 100,000 barrels a day or --

Q. Okay. And here, Mesquite is seeking a maximum injection rate of 40,000 barrels per day; is that correct?

A. That's correct.

Q. And so at 40,000 barrels per day, when I look at the dark blue line in comparison to the lighter blue line, you're nowhere near the fracture pressure point?
A. There is still a couple thousand psi difference. Yes.
Q. So in your opinion, is there any risk of creating fractures within the formation if the Division allows an injection rate of 40,000 barrels per day?
A. No. There is no risk of that. And there is -- a second reason for that is the maximum wellhead injection pressure is 3,324. So if we were to try to exceed that, the flow rate would drop, so we'd never get above that pressure.
Q. And I know when I look at the bottom part of this graph, you have an orange line, kind of a turquoise line, a red line, green line, purple line. Could you explain what those lines represent?
A. So those four lines represent the frictional pressure drop at various injection rates. So starting at the top with 4-1/2-inch ID tubing, it exerts a frictional drop of -- say at 50,000 psi -- almost 5,000 psi of friction. The 5-1/2 by 4-1/2-inch tubing has a frictional pressure drop of roughly 3,000 psi.
The reservoir, when it's being injected, at 40- to 50,000 barrels a day, has a pressure drop of

1,500 psi. And then the last one, 7-inch by 5-1/2-inch tubing has maybe 750 psi frictional pressure drop at those rates.
Q. So there is less friction when larger tubing sizes are --
A. Yes, ma'am.
Q. Okay. Could you please turn to the next exhibit, Exhibit Number 18, and explain what this document shows to the hearing examiner?
A. Exhibit 18 shows the map that was presented earlier in one of the prior exhibits of a four-township area. That's with the subject well roughly in the center. To the right, that big, red box is a simulation grid with the wells placed approximately at the same place as they are in reality.
Q. Okay. And so the red box over here, you're just making a diagram representation to show that those wells have been plotted into your modeling software?
A. That's correct.
Q. Okay. Could you please turn to the next exhibit, Exhibit 19, and explain what this document shows?
A. Exhibit 19 shows that same grid. And the view there is of the pressure -- injection pressure and the reservoir pressure. And so on right-hand side, I have a

contour grid that shows the blue as the original reservoir pressure and the red hues as the increased pressure in the reservoir at those locations. It's difficult to read that contour map, so I plotted it in a different way. It's basically the same data but plotted three dimensionally so you can see how much of that red is actually the higher pressure. So it shows that the highest pressure at ten years after injecting 40,000 barrels a day is roughly 9,500 psi.
Q. Okay. And by pressure increases, it's not the same as how far the fluid is going to migrate within the formation; is that correct?
A. That's correct. It's like you can hear a person speaking from miles away, but you can't actually touch them. So that's the fluids that have gone into the formation in this grid I've shown on the next exhibit.
Q. Okay. Let's turn to that exhibit, Exhibit Number 20. Could you please explain what this document shows?
A. So this shows the actual saturation of the injected fluid versus the native fluids in the reservoir at the same time point. So at ten years out, the fluids have moved that far away from the well, as indicated by that little contour map.

Q. And were you present earlier for testimony related to where the next closest well was located in comparison to the Mesaverde SWD #3 well?
A. I was present. Yes.
Q. Okay. And on here, on the left-hand grid, it looks like the Mesaverde well is located next to this little rainbow circle?
A. That's correct. It's in the center of that circle.
Q. And then the next closest well was the well that was previously discussed, correct?
A. Correct.
Q. Just over a mile away?
A. It is, yes.
Q. Okay. And you can see that that rainbow circle, which is the area where fluids are migrating to, is still a decent distance away from that closest well?
A. Correct. And it's even larger than you would expect because that's a radial space that's growing.
Q. Yeah.
A. So your distance is going to be a square of the volume that goes into that. So if I doubled the volume inside that little cone, it would only move that distance a little ways.
Q. Interesting. Okay.

Okay. Could you please turn to the next exhibit, Exhibit Number 21, and identify what this document shows?

A. Okay. So this document shows the pressure impact at various locations over time. And this is running for 20 years, so 7,300 days. And so the maximum bottom-hole injection pressure is that red-dashed bar at the top.

The bottom black bar, which is about 7,500 psi, is the original reservoir pressure. As you can see, even at great distances away, the pressure impact is seen because of the big, continuous grid, but the magnitude of those differences is very small and probably not measurable in most cases.

Q. And, Mr. Wilson, could you turn to Exhibit Number 22 and explain what this document shows?

A. So to test whether injection into this well would affect other wells, I arbitrarily turned on the two closest wells to this well at about five years into the life of this well and then injected also at 40,000 barrels a day, and these are the two profiles that I arrived at after 20 years of injection for the first well.

Q. So in your opinion, will the use of 7-inch by 5-1/2-inch tubing have a significant impact if there are

additional existing injection wells within the area?

A. No, not at these distances.

Q. And based on your study of the formation and the modelings that you've performed for this application, what are your conclusions concerning this application's overall impact on the formation?

A. This -- this increased injectivity is entering a very large structure and so the pressure dissipates easily. It takes a long time for the fluids to move far away from this well, since it is such a thick zone. So it won't necessarily affect any of the offset operators to a great extent.

Q. Okay. And it will not have a significant impact on pore pressure?

A. No. The overall pore pressure picture is shown on Exhibit 21. And after 21 -- after 20 years, the increase in average grid pressure is only -- it's that dark black line you can't see. It moved off of the space there.

Q. And in your opinion, will injecting into this well at the proposed amount significantly impact other injection well operations in the area?

A. No. It should not affect them significantly.

Q. And in your opinion, will the granting of Mesquite's application be in the best interest of

conservation, the prevention of waste and the protection of correlative rights?

A. Yes, it would.

Q. And were Exhibits 14 through 22 prepared by you or compiled under your supervision and direction?

A. Yes, they were.

MS. BRADFUTE: I'd like to move the admission of Exhibits 14 through 22 into the record.

EXAMINER McMILLAN: Exhibits 14 through 22 may now be accepted as part of the record.

(Mesquite SWD, Inc. Exhibit Numbers 14 through 22 are offered and admitted into evidence.)

CROSS-EXAMINATION

BY EXAMINER McMILLAN:

Q. So I'm asking you -- referring to Exhibit 21, so that I'm understanding this, the black line represents the bottom-hole pressure?

A. The black line represents the average reservoir pressure for the entire grid.

Q. Average. Okay.

A. And that's labeled at the very bottom of the inset legend.

Q. Okay. And then where's the -- where's the 5-1/2-inch tubing on this?

A. This -- this grid was modeled at 40,000 barrels a day --

Q. Okay.

A. -- and the 5-1/2 would not achieve that kind of rate, so this is the result of 40,000-barrels-a-day injection on three wells.

REDIRECT EXAMINATION

BY MS. BRADFUTE:

Q. So this chart assumes that there are three wells injecting 40,000 barrels per day?

A. That's correct. And you can see that impact. The little red line that kicks up right at the beginning, times zero, that's the first well that goes on injection. And the pressure comes up to about 9,700 pounds and then continues across to the right.

Now, at roughly 1,800 days, you see two more lines kick up from the big grouping near the bottom. Those are the second and third wells that go on injection, also 40,000 barrels a day. So they were able to make the same rate even though the well next to them was injecting at that rate.

CONTINUED CROSS-EXAMINATION

BY EXAMINER McMILLAN:

Q. So you're saying 40,000 barrels is never really going to reach the maximum injection pressure?

A. No, not in this case.
Q. Is that the point of this?
A. Yeah, that's mostly the point.
The other point is that you don't see a lot of pressure distances away from these wells because the magnitude of volumes aren't large enough to make a difference. The structure's just so big.
Q. Exhibit 17 just shows the pressure drops with the different tubing sizes, right?
A. Correct.
Q. And then what does Exhibit 15 show?
A. Oh, Exhibit 15 is the classic nodal analysis plot. That's the plot that you use to kind of generate all the rest of the subplots. And that shows the reservoir IPR curve and the two tubing hydraulics curves as single-well head pressure. So that's kind of the raw materials to build the rest of the analysis.
Q. Okay. What reservoir parameters did you use?
A. On this one -- the values on Exhibit 15? The reservoir pressure is 7,750 psi. The permeability was 7.2 millidarcies, and that was the match parameter I used to match the Sand Dunes well. And then the kh -- the resulting kh is 10,800. And this is all listed in the upper, left-hand corner of that image.
Q. Okay.

A. And that was roughly 1,500 feet of thickness. So if the thickness was greater than that, it would actually just improve these numbers, and the formation would be able to take even more.
Q. Okay.
EXAMINER BROOKS: No questions.
MS. BRADFUTE: That concludes my questions of this witness.
EXAMINER McMILLAN: Thank you very much.
THE WITNESS: Sure.
MS. BRADFUTE: And I'd like to call my last witness, Sue Bilek.

SUSAN L. BILEK,
after having been previously sworn under oath, was questioned and testified as follows:

DIRECT EXAMINATION

BY MS. BRADFUTE:
Q. Could you please state your name for the record?
A. Susan Bilek.
Q. And, Ms. Bilek, who do you work for?
A. New Mexico Tech.
Q. And what is your position at New Mexico Tech?
A. I'm a professor of geology. I specialize in earthquake studies.

Q. And could you just briefly explain what you do when you study earthquake studies for the hearing examiner?
A. Sure. So in my job, I teach classes on seismology, earthquakes, and my research involves doing earthquake location studies so locating earthquakes, determining size of earthquakes, relating them to faults.
Q. And have you previously testified before the Oil Conservation Commission?
A. Yes.
Q. And were your credentials accepted and made part of the record?
A. Yes.
Q. And are you familiar with the application that's been filed by Mesquite in this case to increase the tubing size?
A. Yes.
Q. And have you conducted a seismology study related to this application?
A. I have.
MS. BRADFUTE: I'd like to tender this witness as an expert in seismology.
EXAMINER McMILLAN: So qualified.
Q. (BY MS. BRADFUTE) Ms. Bilek, could you please turn to what's been marked as Exhibit Number 23 in the packet in front of you, and could you please identify what this document is for the hearing examiner?

A. This exhibit outlines some of the results and parameters I used in the study looking at the potential for slip on faults in the area due to injection.
Q. And was this study conducted using the Stanford University fault slip model -- or the Fault Slip Probability [sic] tool?
A. Yes, it was.
Q. And what is this tool commonly used for?
A. This tool was developed to look at the -- to estimate the probability of slip on a given fault due to injection, so it allows you to define a model where you can put in faults. You can also put in geologic parameters. You can build a hydrologic model, and then with given rates of injection, look at the probability of slip on the fault.
Q. Okay. And has this tool been accepted and relied upon by other seismologists?
A. Yes. This tool was -- the methodology was published in 2016 in the "Journal of Geology," which is a peer-reviewed, well-respected journal on earth sciences.
Q. And I want to focus on the first page of this

exhibit. Could you please walk through the first page for the hearing examiner and show -- explain what is shown in the diagram on the right-hand side and then on the table on the left-hand side of this page?

A. Sure. So I ran a number of -- 240 simulations with this tool where I put in the location and an orientation of faults in the area of interest but then modified things like the background stress conditions, modified the dip of the fault and then defined a hydrologic model and then ran simulations to see what -- at the injection rates given, what would be the probability of slip on the faults that I put inside the model.

So what's shown here on the right-hand side is just a graph of the different simulations, the number of simulations there on the y-axis. On the x-axis is the fault slip potentials. This is the number that you determine -- you estimate from this tool for a given fault, so you can estimate the probability of slip on that fault.

So you can see that the vast majority of these 240 simulations produced a fault slip potential of zero in the fault that I put into the model. And a handful of them had higher fault slip potentials largely due to the orientation of one of the faults in the

model, which we can go into in a little bit.

The table that's on the left outlines the parameters that I used in the model, so you can define the orientation of the background stress field. And those are the first two lines, SHmax and APhi. I provide the range of values that I used in the simulations, and these values are based on published data for the given area.

So the SHmax, the orientation of the maximum horizontal stresses, come from ranges in the World Stress Map that has been published to southeast New Mexico and West Texas.

APhi, again, related to the horizontal stresses based on published data from Hurd and Zoback in 2012, again from southeast New Mexico and West Texas.

The next three lines detail information about the hydrologic model that's used, and the values I chose in here largely match what Scott presented in the previous set of exhibits.

And then the final two relate to the fault conditions. So, you know, we have mapped faults. We know the orientation of the faults, the strike of the faults, but the dip of the faults are not constrained. So I used a range of values of fault dip that are reasonable for faults in this area -- the uncertainty of

that.

And then the fault friction, I used a range of values here that are what we would expect for the rocks in this area. So those are again based on the geologic conditions of the area.

Q. Okay. And the majority of the models that you tested led to a zero percent fault slip potential, correct?

A. Yes.

Q. Okay. So that would be a likely zero percent chance of creating a seismic event due to injection?

A. Yes.

Q. And if you could please turn to the next page of this exhibit, could you please explain what this map shows?

A. This is the model geometry that I used for all of the simulations. So what's shown on here, the black lines are the locations of the Precambrian faults that come from the Texas Geology Bureau -- the Bureau of Economic Geology maps. These are what Kate had shown previously. So these are the locations of the faults in my model.

And then the squares with all of the letters and numbers here are the locations of both the Mesaverde well, which is the well of interest here, as

well as the other Mesquite wells that are in the area that had applications previously.

Q. And so in this -- in this test that you ran and all of the different simulations that you ran, you entered injection rates for all of the wells that are shown on this diagram?

A. Yes.

Q. So they would all be injecting at the same time?

A. They're all injecting at the maximum rate that's been applied for for the entire time period of the simulation.

Q. And could you please turn to the next page of this exhibit and explain what this diagram shows?

A. So this is the injection rates for each of the wells on the previous page. The red line is the Mesaverde well, and then the outer lines are the injection rates for the other wells. And there are just multiple lines. You can't see them all because some of them have the same rates.

So this is done for about 40 years, injecting at the maximum rate for 40 years of all of these wells for all of the simulations. That didn't change.

Q. Could you please turn to the next page of this

exhibit and explain what is shown?

A. This is the result for -- a representative example of the fault slip potential simulations. So I'll step through what the plot is here.

On the left-hand side, we see a list of the faults. So I had four faults in the model that I had shown in one of the previous slides. It outlines the fault number and the fault slip potential that was calculated for that particular simulation. And in this case, all of the four faults had a zero fault slip potential.

In the middle, you can see a cutout there of the same geometry map that was shown before. There are four faults on there, the westernmost one. There is a tiny, little segment down here at the bottom, left-hand corner of the box. That's fault number one. And then faults two, three and four are the eastern faults. You can see in the middle of that is the -- are all of the wells that I have in the model, and I've highlighted that Mesaverde well in there.

But, again, I put in that maximum injection for all of the wells, so all of the wells are contributing in here.

The colors that you see are the pore pressures that you would expect based on injection from

all of these wells after 40 years.

Q. Okay. And so what are your conclusions after running these simulations shown here?

A. So as I said, this is a representative handful where all of those faults, we end up getting to zero on the fault slip potential due to injection from these wells, one of the main reasons that these wells are far from these faults that are mapped.

Q. Yeah. So a big part of this analysis -- or a big part of your conclusions of analysis relates to the distance of the proposed well from the known faults?

A. Yeah. The pore pressures that are generated from injection in these wells are not getting to the faults -- the mapped faults in the time period that we're looking at.

Q. And if you turn to the next page of this exhibit, could you please explain what that document shows?

A. This is another example -- or one of the results of the simulation. And so I did mention at the very beginning that there were some cases -- some simulations where one of the faults had a greater-than-zero fault slip potential that was computed. And that's a case here. That westernmost, little, tiny segment of a fault back there has an

elevated fault potential, 36 percent chance of slipping. But I note that, you know, that happens starting at time zero. This is not because of the injection. This is because of the geometry of the fault and the stress parameters that I used for that simulation.

So I tried a range of possible stress parameters and fault frictions. And so for some combinations of those, you get an elevated fault slip potential in that westernmost fault. Again, you're not seeing an increase of fault potential time. It turns on when I start the simulation just because of the geometry and the stress conditions during that simulation.

Q. So is it your opinion that you are seeing some fault slip potential in that particular fault due to just the geologic conditions there and the stress parameters you're putting in?

A. Yes.

Q. And those stress parameters have nothing to do with the injection?

A. Yes. They are background stress conditions, background tectonic stress conditions. The orientation of that fault is actually also different than the orientation if you just look at the map. The strike with respect to north is different than those easternmost faults, which is why that one is getting a

certain stress condition turned on versus the other one.

Q. Okay. And those stress conditions -- that fault slip potential would not change if injection started in the area? It wouldn't decrease or increase as a result of injection?

A. No, because that fault is still, you know, 30 kilometers away from the closest of the injection wells.

Q. Okay. Great.

Could you please turn to the next exhibit, Exhibit Number 24? And this exhibit has two pages, and I want to first look at the first page, which should be an analysis, kind of a summary page document. Could you please explain what this document shows?

A. So this is a prescription of the earthquake catalog for this part of southeast New Mexico, and this is based on analysis of catalogs of earthquakes from the U.S. Geological Survey where they publish earthquake catalogs for around the world but also based on data that we have at New Mexico Tech. New Mexico Tech has been operating a network of seismic instruments in this area since the 1970s. And so we have a catalog of earthquakes that go to even smaller magnitudes than the U.S. Geological Survey can produce going back decades.

So this first page is just a list of the earthquakes in the area within 25 kilometers, about 15 miles, from this well between 1962 and March of this year. So this first page catalogs the 17 -- or sorry -- the seven earthquakes that occurred within 25 kilometers, about 15 miles, of this well since 1962. The largest earthquake in this catalog is a magnitude 3.2 that happened in 1997. And that happened greater than 20 kilometers from the well. And then this last year, there were two earthquakes. Both of them were less than magnitude 2. They were a magnitude 1 and a magnitude 1.2. These are tiny earthquakes that no one feels. We can record them because we have these instruments -- these very sensitive instruments close to this area.

Q. Okay. And just for reference, you said that a magnitude 1.2 earthquake is something you can't feel. What would a magnitude 3.2 be like?

A. So a magnitude 3 earthquake may be felt by people, especially if they're indoors and not moving around very much. It might feel like a truck driving by.

Q. But not a significant seismic event?

A. No.

Q. And can you please turn to the next page of this exhibit and explain what this document shows?

A. So this just shows in map form the previous

discussion, so we're looking at the earthquakes -- the earthquake locations in this part of southeast New Mexico going back to 1962 up through March of this year.

The circles are the earthquake locations, and the size of the circle is related to their magnitude. The color of the circle relates to when the earthquake happened. Also included on here are the locations of the wells. The Mesaverde well is the red square. The other Mesquite wells in the area are these gray squares. The stars are the seismic instruments that New Mexico Tech operates within this area, and then the red lines are these Precambrian faults. These are the ones that end up in the model and the ones that Kate also showed in her testimony.

Q. So since in 1962, there have been seven different seismic events within 25 kilometers of where the well is located?

A. Right. So that's within the dashed box around the Mesaverde well.

Q. In your opinion, does that amount to a significant amount of seismic activity within this area?

A. No. This is, you know, representative of the background level of very small earthquakes. And, again, we have these in our catalogs because we operate the seismic stations very close to the area. If we didn't

have these stations there, you would never see these earthquakes at magnitude 1 and 2 levels. The U.S. Geological Survey, they'll produce catalogs going down to magnitude 3-1/2 to 4, but we're seeing these magnitudes at magnitude 1.

Q. So what does this information tell you about the suitability of the injection well using increased tubing in the area?

A. So the wells that are here are within -- are further than 15 to 20 miles from these larger faults, which there is not a lot of seismicity outside of these faults, so it seems like a particularly good area to be away from those faults and be away from a significant earthquake-producing area.

Q. And it's also very nice that New Mexico Tech has several monitoring stations within the area?

A. Right. And so these stations, again, have been operating since the 1970s, so we actually have a very good record of the seismic activity in this area. And we continue to operate them, so they are still there, you know, to keep monitoring these activities.

Q. So what conclusions have you drawn from your study of the area?

A. That the seismicity within the area of the wells is very small and very limited in number. And

then with the fault slip potential modeling, these mapped faults are, again, far enough away from the area of injection that the pore pressures are not continuing to cause increased fault slip potential.

Q. And were Exhibits 23 and 24 prepared by you or compiled under your supervision and direction?

A. Yes.

MS. BRADFUTE: And I'd like to tender Exhibits 23 and 24 into the record.

EXAMINER McMILLAN: Exhibits 23 and 24 may now be accepted as part of the record.

(Mesquite SWD, Inc. Exhibit Numbers 23 and 24 are offered and admitted into evidence.)

MS. BRADFUTE: And that concludes my questions for this witness.

EXAMINER McMILLAN: I don't have any real questions in this area.

Do you?

EXAMINER BROOKS: No.

(Laughter.)

EXAMINER BROOKS: As a matter of fact, I don't have any imaginary ones either.

(Laughter.)

CROSS-EXAMINATION

BY EXAMINER McMILLAN:

Q. My question is: If you look at -- is the faulting data raw because they actually injected into the Ellenburger and slipped into --

A. Well --

Q. Is that a safe -- is that too generic?

A. I'm not sure I want to comment -- I don't know the --

Q. You don't know. Okay.

A. I don't know the injection levels there, so I'm not going to comment.

Q. Okay. They're actually injecting into the Ellenburger and the Precambrian?

A. In -- in other places, injecting into the basement -- the Precambrian basement has led to increased seismicity in -- in other areas around the country. So --

Q. Okay. Well, there -- there is the example of the Dagger Draw -- injected into it. That's why I picked it.

A. Yes. And so -- but I would suspect that that is the reason, but I am not going to -- I haven't done --

Q. That's fine. That's fine. Nice presentation. Great.

MS. BRADFUTE: We ask that this case be taken under advisement. That concludes my presentation.

EXAMINER McMILLAN: Okay. So Case Number 16308 shall be taken under advisement. Thank you very much.

Nice presentation, everyone.

MS. BRADFUTE: Thank you.

(Case Number 16308 concludes, 4:21 p.m.)

STATE OF NEW MEXICO
COUNTY OF BERNALILLO

CERTIFICATE OF COURT REPORTER

I, MARY C. HANKINS, Certified Court Reporter, New Mexico Certified Court Reporter No. 20, and Registered Professional Reporter, 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 that were reduced to printed form by me to the best of my ability.

I FURTHER CERTIFY that the Reporter's Record of the proceedings truly and accurately reflects the exhibits, if any, offered by the respective parties.

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 case.

DATED THIS 23rd day of July 2018.

MARY C. HANKINS, CCR, RPR
Certified Court Reporter
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